2012.04

瑞萨 分立器件

晶体管 / 二极管 / 双向晶闸管 / 晶闸管

综合产品目录

Renesas Discrete General Catalog

Transistor / Diode / Triac / Thyristor

General Catalog

Discrete

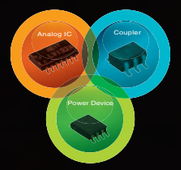
瑞萨电子

www.renesas.com

RENESAS

这样的结合会创造出什么？

What gives rise to this sort of encounter?



◎ **Green Stream Solution**
控制功率(能量)的转化，
进一步削减功耗的解决方案。
These solutions control the flow of power (energy) and contribute to reduced power consumption overall.

功率器件 Power Device	非MOS类 Non-MOS	元件的功率密度 Element power density
	低耐压MOS Low-voltage MOS	开关的低损失化和速度 Lower switching loss and high speed
	高耐压MOS High-voltage MOS	封装的电流容量、热阻 Package current capacity and thermal resistance

二极管 Diodes		低电容、高抗性 Low capacity, high tolerance
		线性度和变化比 Linearity and change ratio
		封装的小型化、复合化 Smaller, composite packages

高频器件 High Frequency Device		高fT化 Higher fT
		效　率 Efficiency
		封装小型化 Smaller packages

产品分类

Product category map

http://cn.renesas.com/products/discrete/index.jsp　http://hk.renesas.com/products/discrete/index.jsp

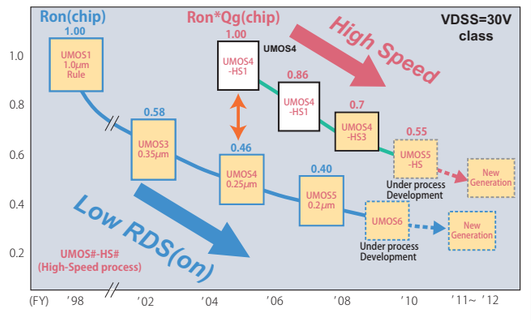
低耐压功率MOSFET的技术趋势

Trends in Low-Voltage Power MOSFET Technology

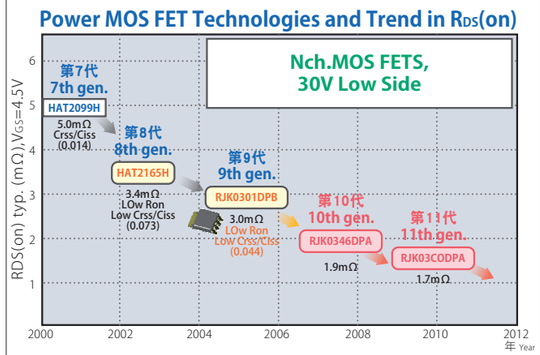
瑞萨利用基于行业顶级沟槽技术和细微工艺技术的低导通电阻化，以及多引线焊接、Cu管夹、肖特基二极管内置等复合化、小型化等顶尖封装技术，不断改善低耐压功率MOSFET的性能，并通过提高电源等的效率促进节能。

Renesas Electronics is constantly improving the performance of its lineup of low-voltage power MOSFETs to enable more efficient power supplies that use less energy. Trench technology and ultra fine process technology at the top class in the industry contribute to reduced on-resistance, while advanced package technologies such as multi-bonding, copper-clip connection, composite configuration with integrated Schottky diodes, and compact dimensions enable low-voltage characteristics.

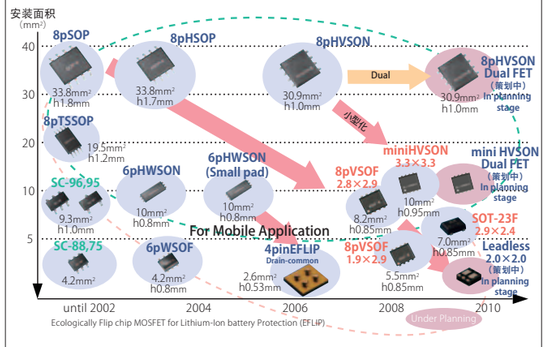
低耐压功率MOSFET的导通电阻性能趋势
Trend in On-Resistance Performance of Low-Voltage Power MOSFETs



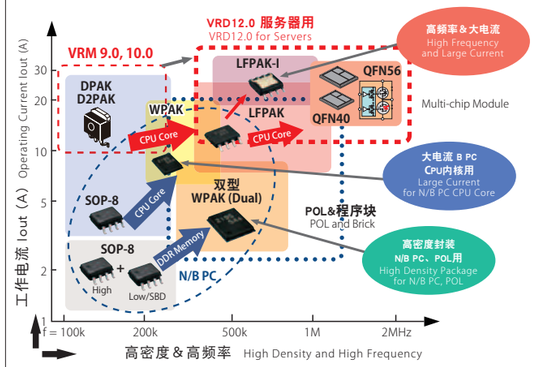
低耐压功率MOSFET的导通电阻发展图
Low-Voltage Power MOSFET On-Resistance Roadmap



低耐压功率MOS FET的封装趋势
Trend in Low-Voltage Power MOSFET Packages



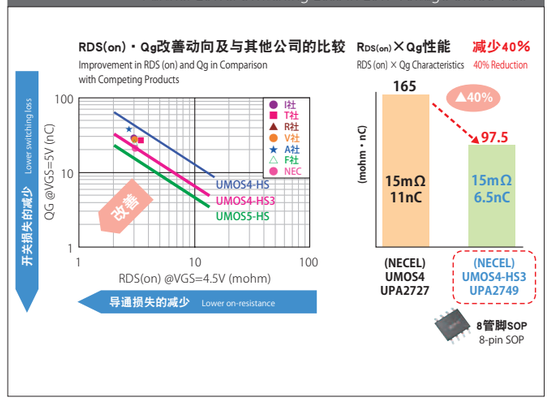
低耐压功率MOS FET的封装趋势
Trend in Low-Voltage Power MOSFET Packages



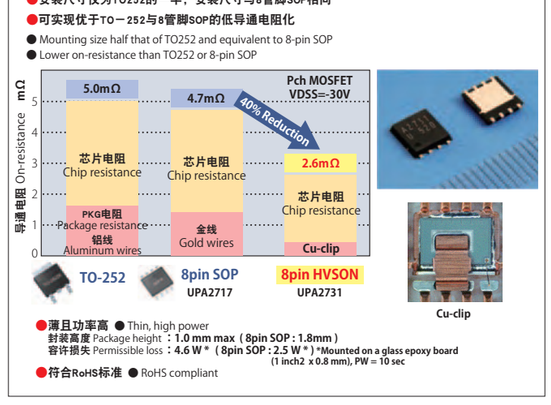
开关电源作为当前的主流电源方式，除导通电阻引起的损失外，栅电荷引起的开关损失也不容小觑。瑞萨将在通过工艺实现低电容化和低导通电阻化的同时，利用封装进一步推进低电抗化和低导通电阻化。

In switching power supplies, currently the most widely used type, power loss arises not only from on-resistance but also from switching loss due to the gate load. Renesas Electronics improves performance with process technology that reduces capacitance and on-resistance, combined with package technology designed to lower reactance and on-resistance.

低耐压UMOS-HS3将进一步减少开关损失
Further Lower Switching Loss in Low-Voltage UMOS-HS3



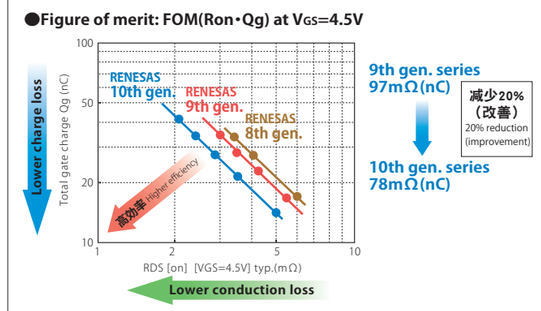
8管脚HVSON的特点
Features of 8-Pin HVSON



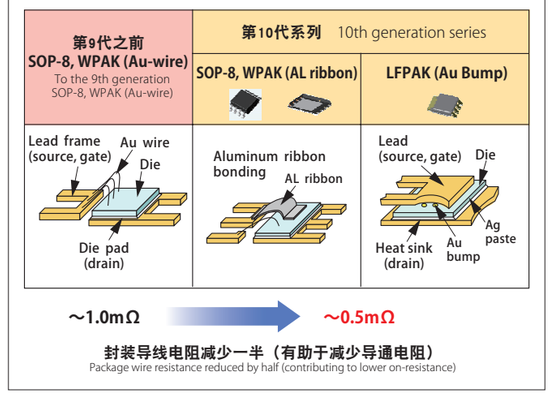
在利用封装改善性能的这一领域中，改善散热性能也十分关键，无线接合与两面散热技术可有效防止因结合温度上升而引起的RdsON增加现象。

Better heat dispersion is another important aspect of improved package performance. Wireless bonding and dual-face heat dispersion help to prevent increased RDS on-resistance due to higher junction temperatures.

第10代功率MOS FET的性能 （VDSS=30V）
10th Generation Power MOSFET Performance (VDSS = 30 V)



第10代的封装结构
10th Generation Package Configuration



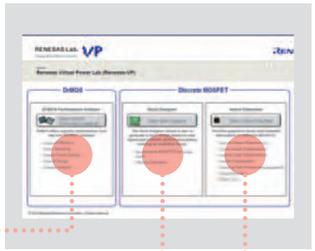
降压转换器用功率MOSFET的在线设计工具

Online Design Tool for Power MOSFETs Used in Buck Converters

降压转换器MOSFET的工程师
瑞萨VP升级了！！
Your Buck Converter MOSFET Sommelier
Renesas VP has been updated!!

From Overseas
Renesas Online MOSFET Design Tool
http://www.renesas.com/vp

用户注册请点击此处！
Visit this URL to register!
http://japan.renesas.com/vp



NEW

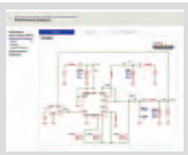
DrMOS Performance Analyzer
也可适用于DrMOS（驱动器内置SiP），并可执行比单个MOSFET更为出色的DrMOS模拟。
Since DrMOS (SiP with integrated driver) products are supported, you can run simulations for DrMOS devices, which are superior to standalone MOSFETs.

设定与客户用途相近的条件。
Specify conditions similar to those of your application.

▼

将显示起初所设条件下各DrMOS的计算结果。
First, the DrMOS calculation results for the condition settings are displayed.

▼



选择任一DrMOS将显示电路图，对于电路图上蓝色字体表示的元件，可变更其参数。此外，可确认各点的波形图等，对于分立器件可在比较效率的同时执行模拟。
When you select a DrMOS, a circuit diagram is displayed. You can change the parameters for parts appearing in blue type. You can also view waveforms, etc., for the various points and run simulations while comparing the efficiency with a design using discrete devices.

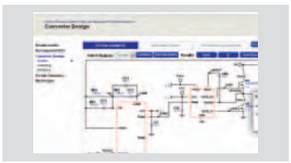
Buck Designer
模拟同步整流式降压型DC/DC转换器的功率MOSFET在模型电路中的动作。
Simulate power MOSFET operation in a synchronous rectification type step-down DC/DC converter employing a model circuit design.

设定与客户用途相近的条件。
Specify conditions similar to those of your application.

▼

显示推荐组合。
可通过CUSTOM SOLUTION功能改变组合。
A recommended combination of devices is displayed. You can use the custom solution function to make changes to the combination of devices.

▼



电路上蓝色字体表示的元件可变更参数。此外，可确认各点的波形图等信息。
You can change the parameters for parts appearing in blue type in the circuit diagram. You can also view waveforms, etc., for the various points.

Active Datasheet
可在变更各参数设定的同时，更详细地模拟单个功率MOSFET的特性。
Obtain detailed simulations based on standalone power MOSFET characteristics by changing various parameter settings.

选择FET。
Select a FET.

▼

确认各特性图。也可下载SPICE数据。
Visual representations of characteristics are displayed. You can also download SPICE data.

▼

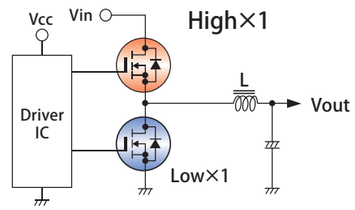
也可变更各参数的设定。
You can also change the parameter settings.

高功能视图器 High-Functionality Graph Viewer
若点击模拟作业中所显示的各波形图和特性曲线，将打开专用视图窗口。在视图中利用操作工具，对细微处也可进行确认和调整。
While running a simulation, click on a waveform graph or characteristic curve illustration to display a dedicated graph viewer. The viewer has tools that enable you to check fine details or adjust the appearance of the display.

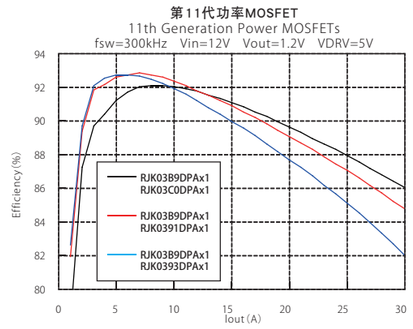
降压转换器的效率

Buck Converter Efficiency

适用实例 Application Example



Renesas discrete evaluation board
Ta=25℃、无气流
L=0.45μH
Renesas discrete device evaluation board
Ta = 25°C, no airflow
L = 0.45 μH



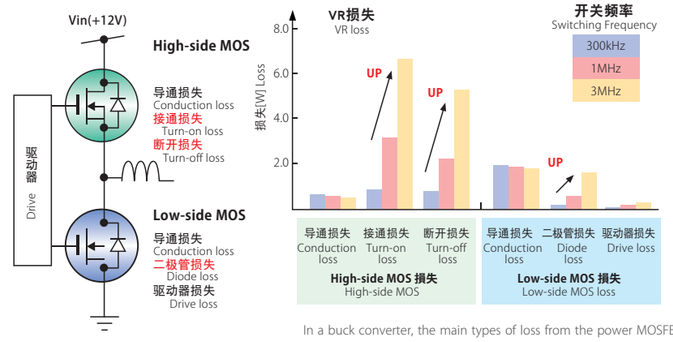
设计降压型同步整流式DCDC转换器时，高压侧、低压侧MOS的组合取决于所重视的动作条件、目标效率和哪个负载领域等因素。
一般MOSFET的导通电阻和电容(Qg,Qgd)相互限制。例如，比较上述效率图中使用的3个低压侧品种，可得出如下关系。
导通电阻：RJK03C0DPA < RJK0391DPA < RJK0393DPA
电容(Qg,Qgd)：RJK03C0DPA > RJK0391DPA > RJK0393DPA
在大电流区域中，导通损失所占的损失比例较大。因此，选择导通电阻较小的MOS可减少导通损失，并提高效率。
另一方面，小电流区域中驱动损失和开关损失所占的比例较大，因此电容(Qg,Qgd)较小的MOS更为高效。
瑞萨设有模拟网站RenesasVP，支持客户的MOSFET选择。可根据客户的各种使用条件，推荐高压侧和低压侧的MOSFET组合，以及模拟所选MOS的使用效率。

When designing a synchronous rectification step-down DC-DC converter, the high-side and low-side MOS devices selected will differ according on considerations such as the operating conditions, the target efficiency, and the key load range.
Generally, there is a trade-off between the on-resistance and capacitance (Qg, Qgd) of a MOSFET. For example, a comparison of the three low-side products used in the efficiency graph above shows the following relationships.

On-resistance: RJK03C0DPA < RJK0391DPA < RJK0393DPA
Capacitance (Qg, Qgd): RJK03C0DPA > RJK0391DPA > RJK0393DPA

In the large-current range, conduction loss accounts for a large portion of the total loss. Therefore, selecting a MOS with low on-resistance will provide increased efficiency by reducing the conduction loss. In the small-current range, conversely, drive loss and switching loss account for more of the total loss, so selecting a MOS with low capacitance (Qg, Qgd) is an effective way to increase efficiency.
Renesas Electronics has created a simulation site called Renesas VP to assist customers in the selection of MOSFET products. It presents recommended pairs of high-side and low-side devices to match particular usage conditions and allows you to select MOS products and run efficiency simulations using them.

降压转换器的损失 Buck converter Loss



■高频率化导致损失增大
高压侧MOS：接通损失、断开损失增大
低压侧MOS：二极管损失增大

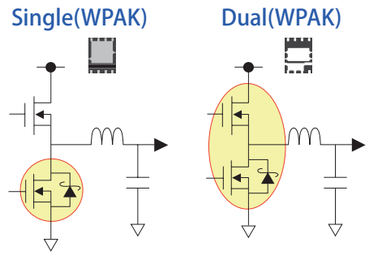
♦ Increased Loss at Higher Frequencies
High-side MOS: Increased turn-on and turn-off loss
Low-side MOS: Increased diode loss

降压转换器的功率MOSFET损失中，以MOSFET导通时的导通损失和开关时对随附的电容充放电产生的损失为主。输入电压与输出电压的比值接近1时，高压侧的通电时间会变长；接近0时，则低压侧的通电时间会变长。一般来说，通电时间较长情况下的损失以RdsON产生的损失为主，这可通过选择导通电阻较小的MOSFET减少这一损失，但导通电阻较小的MOSFET的芯片尺寸也会相应增大，因此会因栅电容等增加使得开关损失也有所增加。因此，通电时间较短的情况下进行选择时，相对于导通电阻，更需重视栅电容等因素。此外，提高开关频率并将线圈、变压器等零件小型化时，也需重视栅电容等因素。

In a buck converter, the main types of loss from the power MOSFETs are conduction loss when current flows through the MOSFET and loss during switching associated with capacitance charging and discharging loss. When the ratio of the input to the output voltage approaches 1, the duration of high-side current flow is longer. As the ratio approaches 0, the low-side current flow duration increases.
Generally speaking, RdSON is the main cause of loss for the side with the longer current flow duration, and this loss can be reduced by selecting a MOSFET with a low on-resistance for this side. However, MOSFETs with low on-resistance tend to have a correspondingly larger chip size, and they also have slightly higher switching loss due to factors such as higher gate capacitance.
Consequently, it is necessary to place more emphasis on characteristics such as gate capacitance than on on-resistance when selecting a MOSFET for the side with the shorter current flow duration. It is also important to pay close attention to characteristics such as gate capacitance when using a higher switching frequency and more compact parts such as coils and transformers.

内置SBD功率MOSFET
SBD MOSFET

第10代+内置SBD（Single/Dual） 10th Generation + SBD (Single/Dual)



特点(Single)

●S-D间内置SBD
・实现更高效率
减少空载时间的VDF损失
・EMI噪声小：高压侧接通时的
低压侧D-S间峰值电压减小

Features (Single)
・SBD between source and drain
– Higher efficiency
Reduced VDF loss during dead time
– Low EMI noise: Reduced low-side D-S spike voltage at high-side turn-on

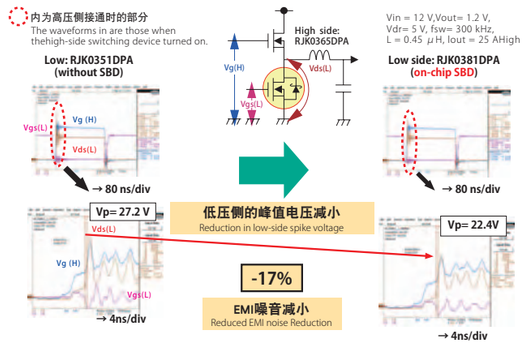
特点(Dual)

●单个封装配备Hi+Lo两个元件
・PCB面积减半，实现小型化
低压侧元件内置SBD
・实现更高效率
减少空载时间的VDF损失
・EMI噪声小：高压侧接通时的
低压侧D-S间峰值电压减小

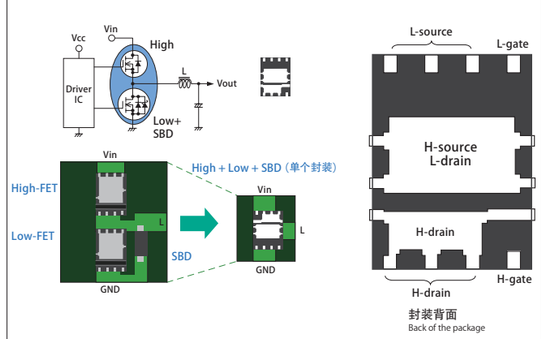
Features (Dual)
・Two elements (high and low) in a single package
– Smaller package with 50% lower PCB area
Low-side element with SBD
– Higher efficiency
Reduced VDF loss during dead time
– Low EMI noise: Reduced low-side D-S spike voltage at high-side turn-on

第10代WPAK(Dual)新产品 10th Generation WPAK (Dual) – New Product

峰值电压减小（动作波形比较）
Reduction of Spike Voltages(Comparison of Operating Frequency)



PCB安装面积的减小与小型化
Reduction of PCB mounting area; more compact



WPAK Single

No.	型号 Part No.	最大额定值 Maximum Rating VDSS (V)	VGSS (V)	ID (A)	P-ch (W)	RDS (on) (mΩ) VGS=4.5V typ.	VGS=4.5V max.	VGS=10V typ.	VGS=10V max.	Qgd (nC)	Qg (nC)
1	RJK0379DPA	30V	+20/-20	50	55	2.4	3.4	1.8	2.3	10.7	37
2	RJK0380DPA			45	50	3.3	4.7	2.4	3.2	6.7	24
3	RJK03A4DPA			42	45	4.3	6.0	2.9	3.8	5.2	17
4	RJK0381DPA			40	45	4.7	6.6	3.4	4.5	4.3	15

WPAK Dual

No.	型号 Part No.	FET	最大额定值 Maximum Rating VDSS (V)	VGSS (V)	ID (A)	P-ch (W)	RDS (on) (mΩ) VGS=4.5V typ.	VGS=4.5V max.	VGS=10V typ.	VGS=10V max.	Qgd (nC)	Qg (nC)
1	RJK0389DPA	High	30	+20/-20	15	10	11.8	16.5	8.2	10.7	1.4	6.3
		Low			20	10	10.5	14.7	6.8	8.9	2.2	7.2

BEAM2+SBD series WPAK 5x6mm 注)

No.	型号 Part No.	最大额定值 Maximum Rating VDSS (V)	VGSS (V)	ID (A)	P-ch (W)	RDS (on) VGS=4.5V typ.	VGS=4.5V max.	VGS=10V typ.	VGS=10V max.	Ciss (pF)
1	RJK03N0DPA	30	+12/-12	TBD	TBD	2.5	3.1	2.2	2.6	4450
2	RJK03N1DPA			TBD	TBD	3.2	4.0	2.8	3.4	3280
3	RJK03N2DPA			TBD	TBD	4.1	5.1	3.6	4.3	2700
4	RJK03N3DPA			TBD	TBD	4.9	6.1	4.3	5.2	2180
5	RJK03N4DPA	30	+20/-20	TBD	TBD	2.7	3.5	2.2	2.6	3100
6	RJK03N5DPA			TBD	TBD	3.5	4.6	2.8	3.4	2300
7	RJK03N6DPA			TBD	TBD	4.4	5.8	3.6	4.3	1900
8	RJK03N7DPA			TBD	TBD	5.4	7.0	4.3	5.2	1550

BWAM2+SBD series 3.3x3.3mm Package (HWSON3030-8) 注)

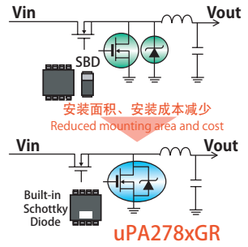
No.	型号 Part No.	最大额定值 Maximum Rating VDSS (V)	VGSS (V)	ID (A)	P-ch (W)	RDS (on) VGS=4.5V typ.	VGS=4.5V max.	VGS=10V typ.	VGS=10V max.	Ciss (pF)
1	RJK03N8DNS	30	+12/-12	TBD	TBD	5.5	6.9	5.0	6.0	2416
2	RJK03N9DNS			TBD	TBD	7.1	8.8	6.3	7.5	1748
3	RJK03L2DNS	30	+20/-20	TBD	TBD	5.9	7.7	5.0	6.0	1700
4	RJK03L3DNS			TBD	TBD	7.7	10.0	6.3	7.5	1250

■ for Lo-Side SW, Synchronous rectification

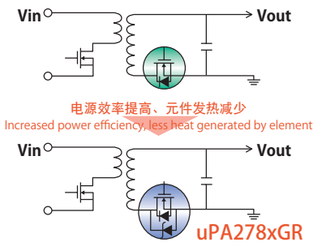
注) 本产品现处于开发阶段，电气特性及具体日程等变更恕不另行通知。
Note: This product is under development. The electrical characteristics or schedule may be subject to change without notice.

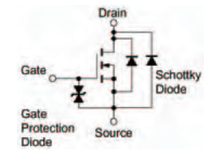
SOP8 Built-in Schottky diode Series

笔记本电脑 / 游戏机的的电源电路
Power Supply Circuit of Notebook PC or Game Console



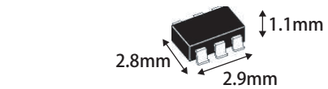
单板电源的次级整流电路
Secondary-Side Rectifier Circuit of Onboard Power Supply

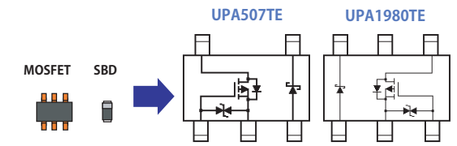




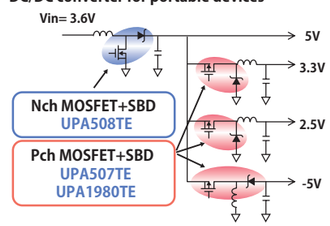
Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) VGS=10V typ./max	RDS (on) (mΩ) VGS=4.5V typ./max	Clss (pF)	Qg (nC) VGS=5V	VF Max (V) 1F=1A
UPA2780GR	Nch+SBD	30	±20	±14	6.2/7.5	8.7/11.6	1200	12	0.5
UPA2781GR	Nch+SBD	30	±20	±13	7.6/9.5	11.3/15.1	900	9	0.5
UPA2782GR	Nch+SBD	30	±20	±11	11/15	16/22.5	660	7.1	0.5

SC-95 Built-in Schottky diode Series





Application:
DC/DC converter for portable devices



Type No.	MOSFET Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) VGS=4.5V typ./max	RDS (on) (mΩ) VGS=2.5V typ./max	RDS (on) (mΩ) VGS=1.8V typ./max	Clss (pF)	Qg (nC) VGS=4V	SBD VRRM (V)	IF(AV) (A)	VF (V)	IR (uA)
UPA507TE	Pch	-20	±8	±2	68/85	84/120	109/180	380	4.7	30	1	0.38 1F=1A	200 VR=10V
UPA508TE	Nch	20	±12	±2	40/51	59/90	–	170	2.7				
UPA1980TE	Pch	-20	±8	±2	116/135	142/183	170/284	272	2.3	40	0.5	0.51 1F=0.5A	20 VR=40V

适用于笔记本电脑、电源的低耐压功率MOSFET

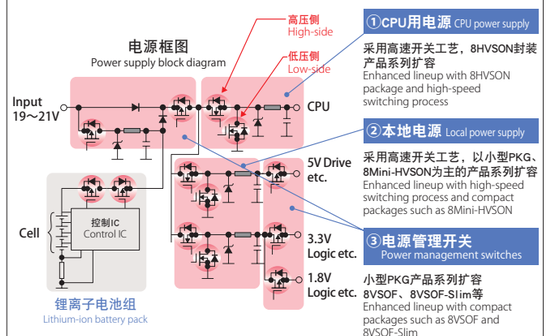
Low-Voltage Power MOSFETs for Notebook PC Power Supplies

笔记本电脑追求低损失和薄度。
瑞萨备有众多符合该要求的产品。

MOSFETs for notebook PC applications demand low-loss characteristics and a low mounting profile. Renesas Electronics offers a large number of products that meet these requirements.

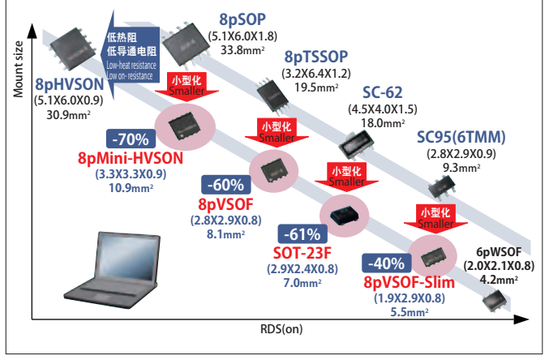
电源用低耐压功率MOSFET

Low-Voltage Power MOSFETs for Power Supplies



低耐压功率MOSFET封装的发展

Low-Voltage Power MOSFET Package Options

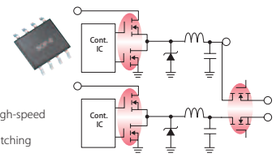


SOP8 Dual Series

采用2合1封装，减小安装面积
适用于DCDC转换器等高速开关用途
UPA2750GR,2755AGR,2757GR
配备高速开关元件和低Ron元件
UPA2751GR,2758GR
负载开关用途
UPA1770G,1772G,1774G

2-in-1 package for smaller mounting area
UPA2750GR, UPA2755AGR, and UPA2757GR for high-speed switching applications such as DC/DC converters
UPA2751GR and UPA2758GR with high-speed switching element and low-on-resistance element
UPA1770G, UPA1772G, and UPA1774G for load switching applications

DC/DC Converter Power line load switch



Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) VGS=10V typ./max.	RDS (on) (mΩ) VGS=4.5V typ./max.	RDS (on) (mΩ) VGS=2.5V typ./max.	Ciss (pF)	Qg (nC) VGS=10V
UPA1770	Pch Dual	-20	± 12	± 6	-	28/37	44/59	1300	11 VGS=4.5V
UPA1772	Pch Dual	-30	± 20	± 8	17.4/20	23.5/29.5	-	1500	34
UPA1774	Pch Dual	-60	± 20	± 2.8	200/250	230/300	-	420	10

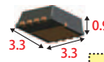
Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) VGS=10V typ./max.	RDS (on) (mΩ) VGS=4.5V typ./max.	RDS (on) (mΩ) VGS=2.5V typ./max.	Ciss (pF)	Qg (nC) VGS=10V
UPA1759G	Nch Dual	60	± 20	± 5	110/150	170/240 VGS=4V	-	190	8
UPA1763G	Nch Dual	60	± 20	± 4.5	37/47	45/57	-	870	20
UPA1764G	Nch Dual	60	± 20	± 7	27/35	32/42	-	1300	29
UPA2750GR	Nch Dual	30	± 20	± 9	12.5/15.5	16/21	-	1040	21
UPA2750GR	Nch	30	± 20	± 9	12.5/15.5	16/21	-	1040	21
	Nch	30	± 20	± 8	18.4/23.0	26.3/35.0	-	480	10
UPA2754GR	Nch Dual	30	± 12	± 11	-	11.5/14.5	13.9/18.6	1940	25 VGS=4.5V
UPA2755AGR	Nch Dual	30	± 20	± 8	14/18	21/29	-	650	13
UPA2756GR	Nch Dual	60	± 20	± 4	85/105	106/150	-	260	13
UPA2757GR	Nch Dual	30	± 20	± 5	28.5/36	36/50	-	400	10
UPA3753GR**	Nch Dual	60	± 20	± 4	44/56	49/72	-	640	8

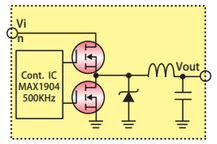
** 本产品现处于开发阶段，电气特性及具体日程等变更恕不另行通知。
Note: This product is under development. The electrical characteristics or schedule may be subject to change without notice.

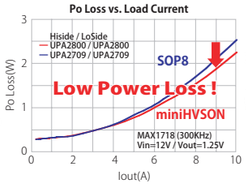
Mini-HVSON Series

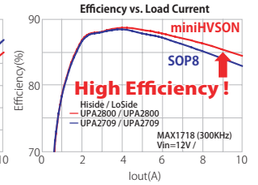
●特点：1) 高速开关
2) 薄型高功率封装
3) 低导通电阻
4) 内置栅保护二极管

●Features: 1) High-speed switching
2) Thin high-power package
3) Low on-resistance
4) Integrated gate protection diode









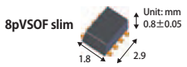
Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) @10V	RDS (on) (mΩ) @4.5V	RDS (on) (mΩ) @2.5V	Ciss (pF)	Qg (nC) VGS=5V
UPA2802T1L	Nch	20	±20	±18	6.0	9.7	–	1800	13
UPA2803T1L	Nch	20	±12	±20	–	5.8	8.8	2450	17
UPA2804T1L	Nch	30	±20	±28	6.8	–	–	1850	16
UPA2810T1L	Pch	-30	±20	±13	12	23	–	1860	40(注2)
UPA2806TIL	Nch	100	±20	±21	47/57	47/70(注1)	–	780	18(注2)
UPA2811TIL	Pch	-30	±25	±19	12/15	20/28	–	1360	30(注2)

（注 1)@VGS=8V （注 2)@VGS=10V

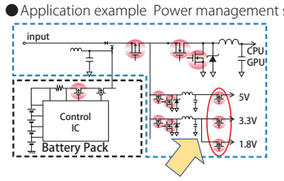
8pin VSOF-Slim Series

●特点：1) 低电压驱动
2) 小型、薄型封装
3) 低导通电阻
4) 内置栅保护二极管

●Features: 1) Low-voltage drive
2) Compact, thin package
3) Low on-resistance
4) Integrated gate protection diode



●应用实例　笔记本电脑　电源管理开关
●Application example Power management switch for notebook PC



Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) VGS=10V typ	RDS (on) (mΩ) VGS=4.5V typ	RDS (on) (mΩ) VGS=2.5V typ	RDS (on) (mΩ) VGS=1.8V typ	Ciss (pF)	Qg (nC) VGS=5V
UPA2200T1M	Nch	30	±20	±8	23	31	-	-	870	9
UPA2201T1M	Nch	20	±12	±9	-	18	27	-	920	13
UPA2210T1M	Pch	-20	±8	±8	-	30	41	81	1350	17
UPA2211T1M	Pch	-12	±8	±8	-	24	34	66	1350	15

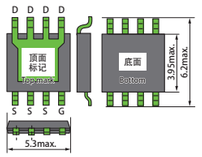
LFPAK-i和CMFPAK-6

LFPAK-i and CMFPAK-6

LFPAK-i封装功率MOS FET系列 LFPAK-i Package Power MOSFET Series

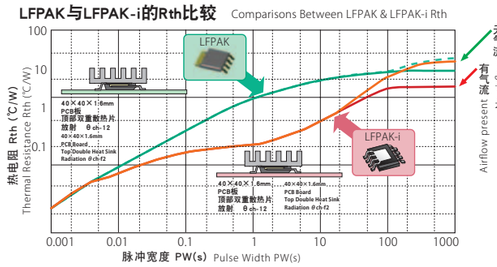
- 配备时的热电阻减少40%，电流提高30%
- 可进行SOP-8、LFPAK封装
- 配备顶部冷却功能
- 40% less heat resistance and 30% better current characteristics when mounted
- SOP-8 and LFPAK packages also available
- Top side cooling function

外形尺寸 单位：mm Package Dimensions Unit:mm



*[ ]:VGS=8V

LFPAK与LFPAK-i的Rth比较 Comparisons Between LFPAK & LFPAK-i Rth



产品系列 Lineup

型号 Part No.	额定值 Rating		RDS (on) (mΩ)				Qg	Qgd
	V_{DSS}	I_D	V_{GS}=4.5V*		V_{GS}=10V		typ.	typ.
	(V)	(A)	typ.	max.	typ.	max.	(nC)	(nC)
HAT2165N	30	55	3.7	5.6	2.8	3.6	33	7.1
HAT2166N	30	45	4.3	6.4	3.2	4.1	27	5.9
HAT2168N	30	30	9.1	13.8	6.3	8.2	11	2.4
HAT2172N	40	30	(6.9)	(9.5)	6.1	7.8	32	4
HAT2173N	100	25	[13.3]	[17.8]	12.3	15.3	61	14.5
HAT2174N	100	20	[22]	[30]	21	27	33.5	8.4
HAT2175N	100	15	[34]	[46]	33	42	21	4.5

第10代LFPAK封装的产品系列 Lineup of 10th Generation Products in LFPAK Package

No.	型号 Part No.	最大额定值 Maximum Rating				RDS (on) (mΩ)				Qgd (nC)	Qg (nC)
		V_{DSS} (V)	V_{GSS} (V)	I_D (A)	P-ch (W)	V_{GS}=4.5V typ.	V_{GS}=4.5V max.	V_{GS}=10V typ.	V_{GS}=10V max.		
1	RJK0328DPB	30	+20/-20V	60	65	2.1	2.9	1.6	2.1	8.8	42
2	RJK0329DPB			55	60	2.4	3.4	1.8	2.3	7.3	35
3	RJK0330DPB			45	55	2.8	3.9	2.1	2.7	5.8	27
4	RJK0331DPB			40	50	3.5	4.9	2.6	3.4	4.6	21
5	RJK0332DPB			35	45	5.0	7.0	3.6	4.7	3.0	14

for low-side switch and synchronous rectifier
for high-side switch

第10代SOP-8封装的产品系列 Lineup of 10th Generation Products in SOP-8 Package

No.	型号 Part No.	最大额定值 Maximum Rating				RDS (on) (mΩ)				Qgd (nC)	Qg (nC)
		V_{DSS} (V)	V_{GSS} (V)	I_D (A)	P-ch (W)	V_{GS}=4.5V typ.	V_{GS}=4.5V max.	V_{GS}=10V typ.	V_{GS}=10V max.		
1	RJK0348DSP	30	+20/-20V	22	2.5	3.2	4.5	2.6	3.4	7.0	34
2	RJK0349DSP			20	2.5	3.6	5.0	2.9	3.8	5.3	25
3	RJK0351DSP			20	2.5	5.0	6.9	4.0	5.2	3.7	17
4	RJK0352DSP			18	2.0	5.5	7.0	4.3	5.6	3.4	16
5	RJK0353DSP			18	2.0	5.9	8.3	4.5	5.9	3.0	15
6	RJK0354DSP			16	2.0	7.5	10.5	5.4	7.0	2.5	12
7	RJK0355DSP			12	1.8	12.0	16.8	8.5	11.1	1.4	6.0

for low-side switch and synchronous rectifier
for high-side switch

WINFET系列 WINFET series

No.	型号 Part No.	封装 Package	最大额定值 Maximum Rating				RDS (on) (mΩ)				Qgd (nC)	Qg (nC)	Rg (Ω)
			V_{DSS} (V)	V_{GSS} (V)	I_D (A)	P-ch (W)	V_{GS}=10V typ.	V_{GS}=10V max.	V_{GS}=4.5V typ.	V_{GS}=4.5V max.			
1	RJK0210DPA	WPAK (5x6)	25	+16/-12	40	45	4.5	5.4	5.7	7.4	11.8	1.2	0.9
2	RJK0211DPA				30	30	6.8	8.2	8.7	11.3	7.5	0.9	1.3
3	RJK0212DPA				25	30	9.0	10.8	12.0	15.6	5.4	0.6	1.5
4	RJK0225DNS	Mini-HVSON (3.3x3.3)			30	30	5.8	7.3	7.4	9.6	8.5	0.9	2.5

for Hi-Side SW, DC-DC

BEAM（第11代）系列的开发 Development of BEAM (11th generation) series

No.	型号 Part No.	最大额定值 Maximum Rating				RDS (on) (mΩ)				Qgd (nC)	Qg (nC)	Rg (Ω)
		V_{DSS} [V]	V_{GSS} [V]	I_D [A]	P-ch [W]	V_{GS}=4.5V typ.	V_{GS}=4.5V max.	V_{GS}=10V typ.	V_{GS}=10V max.			
1	RJK03C0DPA	30	+20/-20V	70	65	1.8	2.5	1.5	2.0	13.7	66	0.75
2	RJK0390DPA			65	60	2.1	2.9	1.7	2.2	11.3	54	0.8
3	RJK0391DPA			50	50	2.8	3.9	2.2	2.9	7.4	34	0.95
4	RJK0392DPA			45	45	3.4	4.8	2.7	3.5	5.9	26	0.8
5	RJK0393DPA			40	40	4.2	5.9	3.3	4.3	4.7	21	1.4
6	RJK0394DPA			35	35	5.3	7.4	4.1	5.3	3.7	15.5	1.4
7	RJK0395DPA			30	30	7.6	10.6	5.9	7.7	2.6	11.0	2.2
8	RJK0396DPA			30	28	9.0	12.6	6.9	9.0	2.2	9	2.5
9	RJK0397DPA			30	25	10.4	14.6	7.8	10.1	1.9	7.4	2.5
10	RJK03B7DPA			30	30	7.7	10.7	6.0	7.8	2.6	11.0	1.0
11	RJK03B8DPA			30	28	9.3	12.9	7.0	9.3	2.2	9	1.2
12	RJK03B9DPA			30	25	10.9	15.1	8.3	10.6	1.9	7.4	1.2

for low-side switch and synchronous rectifier
for high-side switch

BEAM2系列WPAK 5x6mm 注)

BEAM2 series WPAK 5 x 6mm 注)

No.	型号 Part No.	最大额定值 Maximum Rating				RDS (on)				Ciss (pF)
		V_{DSS} (V)	V_{GSS} (V)	I_D (A)	P-ch (W)	V_{GS}=4.5V typ.	V_{GS}=4.5V max.	V_{GS}=10V typ.	V_{GS}=10V max.	
1	RJK03M0DPA	30	+20/-20V	TBD	TBD	2.0	2.6	1.7	2.0	4400
2	RJK03M1DPA			TBD	TBD	2.5	3.3	2.1	2.5	3350
3	RJK03M2DPA			TBD	TBD	3.0	3.9	2.5	3.0	2750
4	RJK03M3DPA			TBD	TBD	4.0	5.2	3.4	4.1	2100
5	RJK03M4DPA			TBD	TBD	5.0	6.5	4.1	4.9	1600
6	RJK03M5DPA	30	+20/-20V	TBD	TBD	7.0	9.1	6.0	7.2	1350
7	RJK03M6DPA			TBD	TBD	10.0	13.0	8.5	10.2	850
8	RJK03M7DPA			TBD	TBD	10.0	13.0	8.3	10.0	840

for Lo-Side SW, Synchronous rectification
for Hi-Side SW, DC-DC

BWAM2系列 3.3x3.3mm封装（HWSON3030-8）注)

BWAM2 series 3.3x3.3mm Package (HWSON3030-8) 注)

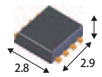
No.	型号 Part No.	最大额定值 Maximum Rating				RDS (on)				Ciss (pF)
		V_{DSS} (V)	V_{GSS} (V)	I_D (A)	P-ch (W)	V_{GS}=4.5V typ.	V_{GS}=4.5V max.	V_{GS}=10V typ.	V_{GS}=10V max.	
1	RJK03M8DNS	30	+20/-20V	TBD	TBD	5.5	7.2	4.8	5.8	1850
2	RJK03M5DNS			TBD	TBD	7.0	9.1	6.0	7.2	1350
3	RJK03M6DNS			TBD	TBD	10.2	13.3	8.5	10.2	850
4	RJK03M9DNS			TBD	TBD	12.5	16.3	10.3	12.4	680

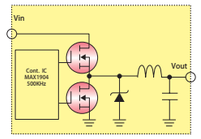
注) 本产品现处于开发阶段，电气特性及具体日程等变更恕不另行通知。
Note: This product is under development. The electrical characteristics or schedule may be subject to change without notice.

8管脚 VSOF Nch（单）系列

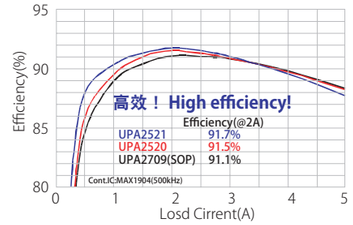
●特点：1) 高速开关
2) 封装与8pSOP相比，更小更薄
3) 低导通电阻
4) 内置栅保护二极管

●Features: 1) High-speed switching
2) Smaller and thinner package than 8-pin SOP
3) Low on-resistance
4) Integrated gate protection diode





●应用实例 DC/DC转换器
●Application example
Losd Current vs. Efficiency (Vin=15V/Vout=3.3V)



Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) @10V	RDS (on) (mΩ) @4.5V	RDS (on) (mΩ) @2.5V	Ciss (pF)	Qg (nC) VGS=5V
UPA2520T1H	Nch	30	±20	±10	13.2	17	–	1000	10.8
UPA2521T1H	Nch	30	±20	±8	16.5	25	–	780	7.6

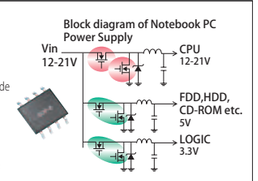
SOP8 Nch Single Series

●特点：
1) 低电压驱动
2) 小型、薄型封装
3) 低导通电阻
4) 内置栅保护二极管

●Features:
1) Low-voltage drive
2) Compact, thin package
3) Low on-resistance
4) Integrated gate protection diode

最适于同步整流式电源的MOSFET
用于高压侧的高速开关UPA2709AGR
用于低压侧的低Ron（最大4.3mΩ@10V）UPA2707GR
MOSFETs ideal for synchronous rectification power supplies
UPA2709AGR with improved high-speed switching for low side
UPA2707GR with low on-resistance (max. 4.3mΩ@10V) for high side

Block diagram of Notebook PC Power Supply



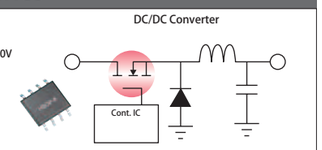
Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) VGS=10V typ./max.	RDS (on) (mΩ) VGS=4.5V typ./max.	RDS (on) (mΩ) VGS=2.5V typ./max.	Ciss (pF)	Coss (pF)	Qg (nC) VGS=5V	Qgd (nC) VGS=5V
UPA1724G	Nch	20	± 12	± 10	-	8.6/11	11/15	1850	320	18 VGS=4.5V	7.8 VGS=4.5V
UPA1725G	Nch	20	± 12	± 7	-	16.5/21	22/30	950	160	9.6 VGS=4.5V	4.1 VGS=4.5V
UPA1727G	Nch	60	± 20	± 10	14/19	17/22	-	2400	200	45 VGS=10V	13 VGS=10V
UPA1728G	Nch	60	± 20	± 9	19/26	23/29	-	1700	130	31 VGS=10V	9.1 VGS=10V
UPA2709AGR	Nch	30	± 20	± 13	7.9/10.5	10/15	-	1200	110	11	3.3
UPA2720AGR	Nch	30	± 20	± 14	5.5/6.6	7/14 VGS=5V	-	3600	250	28	11
UPA2721AGR	Nch	30	± 20	± 19	3.6/4.3	4.7/10 VGS=5V	-	7100	490	52	20
UPA2728GR	Nch	30	± 20	± 13	8.3/10.5	12/18	-	1020	88	8.8	2.6
UPA2761GR	Nch	30	± 20	± 9	15/18.5	22.5/30	-	550	49	5.2	2.1
UPA2762GR	Nch	30	± 25	± 12	10.6/13.3	16.5/22	-	841	116	7	2.8

SOP8 Pch Single Series

低导通电阻 Low on-resistance
UPA2715GR：RDS(on)=3.7mΩ(typ)@10V

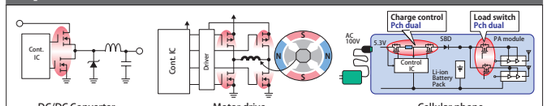
高速开关 High-speed switching
UPA2733GR：Qg=18nC @VGS=10V

DC/DC Converter



Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) VGS=10V typ./max.	RDS (on) (mΩ) VGS=4.5V typ./max.	RDS (on) (mΩ) VGS=2.5V typ./max.	Ciss (pF)	Qg (nC) VGS=10V
UPA2715GR	Pch	-30	20	± 18	3.9/4.6	6.2/9.0	-	3500	118
UPA2716AGR	Pch	-30	± 20	± 14	5.5/7.0	7.3/11.3	-	3000	95
UPA2717AGR	Pch	-30	± 20	± 15	4.7/5.5	6.1/6.9	-	3550	130
UPA2718AGR	Pch	-30	± 20	± 13	7.2/9.0	9.9/14.5	-	2810	67
UPA2719AGR	Pch	-30	± 20	± 10	10/13	14/20.9	-	2010	43
UPA2733GR	Pch	-30	± 20	± 5	30/38	39/53	-	870	18
UPA2734GR	Pch	-30	± 12	± 7	-	30/38	40/72	1050	29.5 VGS=4.5V

8pin VSOF Dual,Pch+Nch Series



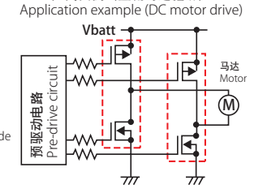
Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) 10V	RDS (on) (mΩ) 4.5V	RDS (on) (mΩ) 2.5V	Ciss (pF)	Qg (nC) VGS=5V
UPA2550T1H	Pch Dual	-12	±8	±5	-	40	60	930	8.7
UPA2560T1H	Nch Dual	30	±20	±4.5	50	83	-	310	6.6
UPA2561T1H	Nch Dual	20	±12	±4.5	-	50	65	415	5.4
UPA2562T1H	Nch Dual	30	±12	±4.5	-	55	70	405	6.1
UPA2590T1H	Nch	30	±20	±4.5	50	83	-	310	6.6
	Pch	-30	±20	±4.5	72	105	-	310	7.5
UPA2591T1H	Nch	30	±12	±4.0	-	55	70	405	6.1
	Pch	-30	±12	±3.0	-	88	150	450	5.2
UPA2592T1H	Nch	20	±12	±4.0	-	50	65	415	5.4
	Pch	-20	±12	±3.0	-	80	140	450	5.2
UPA2593T1H	Nch	40	±20	±4.5	65	125	-	310	6.6
	Pch	-40	±20	±4.5	150	200	-	310	7.5

SOP8 Complementary Series

●特点：1) 小型面贴封装
2) 低导通电阻
3) 逻辑驱动型（4.5V驱动）
4) 低Ciss
5) 内置栅保护齐纳二极管

●Features: 1) Small surface mount package
2) Low on-resistance
3) Logic drive type (4.5V drive)
4) Low Ciss
5) Integrated gate protection Zener diode

应用实例（直流马达驱动）
Application example (DC motor drive)



Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) 10V typ./max.	RDS (on) (mΩ) 4.5V typ./max.	RDS (on) (mΩ) 2.5V typ./max.	Ciss (pF)	Qg (nC) VGS=10V
UPA1792G	Nch	30	± 20	± 6.8	20.5/26	27/36	-	760	14
	Pch	-30	± 20	± 5.8	30/36	43/54	-	900	17
UPA1793G	Nch	20	± 12	± 3	-	55/69	78/107	160	3.1 VGS=4V
	Pch	-20	± 12	± 3	-	75/115	116/190	370	3.4 VGS=4V
UPA2790GR	Nch	30	± 20	± 6.8	21/28	28/40	-	500	12.6
	Pch	-30	± 20	± 6.8	43/60	58/80	-	460	11
UPA2791GR	Nch	30	± 20	± 5	28.5/36	36/50	-	400	10
	Pch	-30	± 20	± 5	63/82	79/110	-	300	8.3
UPA2792AGR	Nch	30	± 20	± 10	10/12.5	14.5/21	-	2200	42
	Pch	-30	± 20	± 10	14/18	17.5/26	-	2200	47
UPA2793AGR	Nch	40	± 20	± 7	12/15	16.5/23	-	2200	40
	Pch	-40	± 20	± 7	21/26	24/36	-	2200	45
UPA2794AGR	Nch	60	± 20	± 5.5	19.5/25	23/33	-	2200	41
	Pch	-60	± 20	± 5.5	33/43	36/54	-	2200	45

P通道MOS FET系列 P-Channel MOSFET Series

●特点
超低RDS(on)
HAT1125H RDS(on)=2.7mΩ
●应用
锂电池保护电路、负载开关、
笔记本电脑用充电器

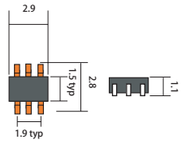
・Features
– Ultra-low RDS(on),
HAT1125H RDS(on) = 2.7mΩ
・Applications
– Li-ion battery protection circuits, load switches, notebook PC chargers

No.	型号 Part No.	封装 Package	V_{DSS} [V]	V_{GSS} [V]	I_D [A]	4.5V R_{DS}(on) typ. (mΩ)	4.5V R_{DS}(on) max. (mΩ)	10V R_{DS}(on) typ. (mΩ)	10V R_{DS}(on) max. (mΩ)	Qg (nC)	Qgd (nC)
1	HAT1125H	LFPAK	30	+10/-20	-45	4.1	5.9	2.7	3.6	165	40
2	HAT1127H	LFPAK	30	+10/-20	-40	6.0	8.6	3.6	4.5	125	28
3	RJJ0315DSP	SOP-8	30	+10/-20	-16	7.2	10.5	5.2	6.5	48	20
4	RJJ0318DSP	SOP-8	30	+10/-20	-12	14.0	22.0	9.5	12.0	22	10
5	RJJ0319DSP	SOP-8	30	+10/-20	-10	19.0	28.0	12.5	15.5	17	5.5
6	RJJ0315DPA	WPAK	30	+10/-20	-35	6.8	10.0	4.8	5.9	48	20

SC-95 Dual Series

●特点
低导通电阻、低Qg
●Features
Low on-resistance, low Qg

6pin type SC-95



应用
手机、笔记本电脑、PDA、DC/DC转换器等
Application example (DC motor drive)
Pre-drive circuit

Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) VGS=10V typ./max	VGS=4.5V typ./max	VGS=2.5V typ./max	VGS=1.8V typ./max	Ciss (pF)	Qg (nC) VGS=5V
UPA1970	Nch Dual	20	±12	±2.2	-	55/69	80/107	-	160	2.3
UPA1950	Pch Dual	-12	±8	±2.5	-	105/130	160/205	225/375	220	1.9
UPA1951	Pch Dual	-12	±8	±2.5	-	70/88	100/133	140/234	270	2.4
UPA1952	Pch Dual	-20	±8	±2.0	-	108/135	137/183	170/284	272	2.3

SC-95 Single Series

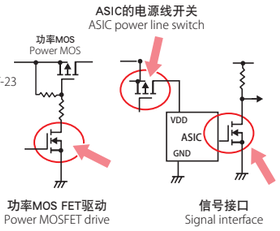
Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) VGS=10V typ./max	VGS=4.5V typ./max	VGS=2.5V typ./max	VGS=1.8V typ./max	Ciss (pF)	Qg (nC) VGS=5V
UPA1901	Nch Single	30	±12	±6.5	-	31/39	40/54	-	470	5.4
UPA1902	Nch Single	30	±20	±7.0	17/22	22/30	-	-	780	15
UPA1912	Pch Single	-12	±10	±4.5	-	39/50	53/70		810	5.6
UPA1916	Pch Single	-12	±8	±4.5	-	30/39	41/55	59/98	950	8.0
UPA1917	Pch Single	-20	±8	±6.0	-	42/53	52/70	64/107	835	8.0
UPA1911A	Pch Single	-20	±12	±2.5	-	82/115	122/190	-	370	2.3
UPA1913	Pch Single	-20	±12	±4.5	-	44/55	66/90	-	700	6.0
UPA1915	Pch Single	-20	±12	±4.5	-	45/55	67/90	-	820	5.0
UPA1919	Pch Single	-20	±12	±6.0	-	46/58	63/84	-	680	6.0
UPA1914	Pch Single	-30	±20	±4.5	43/57	58/86	-	-	589	11.0
UPA1930	Pch Single	-30	±20	±4.5	58/77	77/100	-	-	325	7.5
UPA1918	Pch Single	-60	±20	±3.5	114/143	134/179	-	-	666	12
UPA1931	Pch Single	-40	±20	±4.5	44/65	53/100	-	-	115	20
UPA1932	Pch Single	-30	±20	±6.0	30/38	36/59	-	-	950	20

SC-96 Series

Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) VGS=10V typ./max	VGS=4.5V typ./max	VGS=2.5V typ./max	VGS=1.8V typ./max	Ciss (pF)	Qg (nC) VGS=4V
N0300N	Nch	30	±20	±4.5	38/50	48/83	-	-	350	7.4 VGS=4.5V
N2500N	Nch	250	±12	±0.5	-	4200/5800	4300/6600	-	145	7.4 VGS=4.5V
2SK3408	Nch	43±5	±20	±1.0	155 / 195	185 / 250	-	-	230	4 VGS=10V
2SK3576	Nch	20	±12	±4.0	-	40 / 50	56 / 75	-	250	3.3
2SK3577	Nch	30	±12	±3.5	-	50 / 63	68 / 91	-	260	3
2SK4035	Nch	250	±30	±0.5	3200 /4500	-	-	-	74	4 VGS=10V
2SK4147	Nch	250	±20	±0.5	3600 /4500	3600 / 5200	-	-	120	5.5 VGS=10V
N0300P	Pch	30	±20	±4.5	56/72	75/105	-	-	345	8.3 VGS=10V
2SJ557A	Pch	-30	±20	±2.5	75/100	91/134	-	-	315	3.2
2SJ621	Pch	-12	±8	±3.5	-	35/44	46/62	63/105	630	6.2
2SJ624	Pch	-20	±8	±4.5	-	43/54	53/71	65/108	813	8.1
2SJ625	Pch	-20	±8	±3.0	-	90/113	128/171	188/314	348	2.6
2SJ626	Pch	-60	±20	±1.5	310/388	385/514	-	-	255	8.2 VGS=10V
2SJ690	Pch	-30	±12	±2.5	-	87/119	120/217	-	450	5.2 VGS=4.5V

SOT-23F Series

●特点
1）与SOT-23的安装垫可互换
2）薄型封装 t=0.8mm
3）可由SC-62置换而成
● Features
1) Mounting pad compatible with SOT-23
2) Thin package (t = 0.8mm)
3) Suitable replacement for SC-62, etc.



Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) VGS=10V typ	VGS=4.5V typ	VGS=2.5V typ	VGS=1.8V typ	Ciss (pF)	Qg (nC)
N0100P	Pch	-12	±8	±3.5	-	44	62	105	720	7.4
N0301P	Pch	-30	±12	±4.5	-	75	106	-	780	8.7
N0302P	Pch	-30	±20	±4.4	54	77	-	-	620	6.8
N0301N	Nch	30	±20	±4.5	36	50	-	-	400	4.3

2x2 package series 注)

Type No.	Polarity	VDSS (V)	VGSS (V)	ID(DC) (A)	Ron typ./max. VGS=4.5V	VGS=2.5V	VGS=1.8V
uPA2672	Pch-Dual	-12V	10V	-4.0A	48/60mΩ	68/92mΩ	112/179mΩ
uPA2670	Pch-Dual	-20V	10V	-4.0A	61/77mΩ	76/102mΩ	122/196mΩ
uPA2630	Pch-Single	-12V	8V	-7.0A	15/18mΩ	21/28mΩ	35/56mΩ
uPA2631	Pch-Single	-20V	8V	-7.0A	20/24mΩ	24/33mΩ	39/62mΩ
uPA2600	Nch-Single	20V	12V	7.0A	8/10mΩ	12/16mΩ	—
uPA2601	Nch-Single	30V	20V	7.0A	12/16mΩ	—	—

注）本产品现处于开发阶段，电气特性及具体日程等变更恕不另行通知。
Note: This product is under development. The electrical characteristics or schedule may be subject to change without notice.

低电压驱动小功率MOS FET系列
Low-Voltage Drive Low-Power MOSFET Series

产品理念 Product Concept

在满足近年来各种控制器集成电路低电压化市场需求的过程中，开发出了维持以往的耐压性能，并可进行低电压栅驱动的FET产品
While responding to recent market demand for low-voltage controller ICs of various types, Renesas Electronics develops FET products that keep both the voltage tolerance of earlier products and enable low-voltage gate drive.

特点 Features

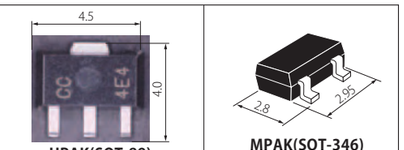
・VDSS 60V且栅驱动电压2.5V
VDSS of 60V and gate drive voltage of 2.5V
耐压60V产品的低电压驱动化（4.5V→2.5驱动化）
Voltage tolerance of 60V and lower drive voltage (drive voltage: 4.5V → 2.5V)
-适用于3.3V系列的单片机
– Support for 3.3V MCUs
・配备小型通用封装且具有历史的双封装
Small, general-purpose packages Two packages with long histories
-UPAK：高功率、Pch：1.5W
– UPAK: High-power, Pch: 1.5W
-MPAK：可进行流焊安装的最小封装
– MPAK: Smallest package suitable for flow mounting
・环保、含有完全无铅粘片、完全无铅
Environmentally friendly, completely lead-free Completely lead-free, including die bonding
-符合RoHS限制等标准
– RoHS Directive compliant

主要用途 Main Applications

・最适于下列需使用小型化且低损失、高效率器件的各种用途
Ideal for applications requiring compact, low-loss, high-efficiency devices
-用于小型马达驱动控制开关
– Compact motor drive control switching applications
-用于小型DC/DC转换器的开关
– Compact DC/DC converter switching applications

外形尺寸图 Package Dimensions

封装 (mm) Package	UPAK(SOT-89)	MPAK(SOT-346)
安装面积(mm²)Mount area	18	8
封装高度Max.height Max. (mm)	1.6	1.3
Pch(W)	1.5	0.8



UPAK产品系列 UPAK Lineup

No.	封装 Package	型号 Part No.	最大额定值 Maximum Rating V_{DSS} (V)	V_{GSS} (V)	I_D (A)	RDS (on) (mΩ) VGS=10V Typ.	VGS=10V Max.	VGS=4.5V Typ.	VGS=4.5V Max.	VGS=2.5V Typ.	VGS=2.5V Max.	Ciss (pF)	标记 mark
1	UPAK	RQK0601AGDQS	60	±20	5.0	56	70	65	91	-	-	540	AG
2	UPAK	RQK0603CGDQS	60	±20	2.8	205	257	240	336	-	-	130	CG
3	UPAK	RQK0609CQDQS	60	±12	4.0	-	-	78	100	90	125	470	CQ
4	UPAK	RQK0608BQDQS	60	±12	3.2	-	-	120	155	140	195	300	BQ
5	UPAK	RQK0607AQDQS	60	±12	2.4	-	-	210	270	250	350	170	AQ
6	UPAK	RQJ0601DGDQS	-60	+10/-20	-2.8	124	155	150	210	-	-	590	DG
7	UPAK	RQJ0602EGDQS	-60	+10/-20	-1.5	485	607	620	868	-	-	135	EG
8	UPAK	RQK0301FGDQS	30	±20	3.0	28	35	35	49	-	-	750	FG
9	UPAK	RQK0302GGDQS	30	±20	3.8	81	102	107	150	-	-	170	GG
10	UPAK	RQJ0301HGDQS	-30	+10/-20	-5.2	38	48	56	79	-	-	845	HG
11	UPAK	RQJ0306FQDQS	-30	+8/-12	-4.0	-	-	75	95	120	165	510	FQ
12	UPAK	RQJ0305EQDQS	-30	+8/-12	-3.4	-	-	110	140	165	230	330	EQ
13	UPAK	RQJ0304DQDQS	-30	+8/-12	-2.6	-	-	195	245	300	420	185	DQ

MPAK产品系列 MPAK Lineup

No.	封装 Package	型号 Part No.	最大额定值 Maximum Rating V_{DSS} (V)	V_{GSS} (V)	I_D (A)	RDS (on) (mΩ) VGS=10V Typ.	VGS=10V Max.	VGS=4.5V Typ.	VGS=4.5V Max.	VGS=2.5V Typ.	VGS=2.5V Max.	Ciss (pF)	标记 mark
1	MPAK	RQK2501YGDQA	250	±10	0.4	-	-	(4000)	(5400)	4100	5600	80	YG
2	MPAK	RQK2001HQDQA	200	±30	0.4	5000	6700	-	-	-	-	30	HQ
3	MPAK	RQK0605JGDQA	60	±20	3.1	82	103	93	131	-	-	405	JG
4	MPAK	RQK0603CGDQA	60	±20	2.0	212	265	248	348	-	-	130	CG
5	MPAK	RQK0604IGDQA	60	±12	2.0	-	-	111	144	129	180	320	IG
6	MPAK	RQK0606KGDQA	60	±12	1.5	-	-	173	225	207	290	200	KG
7	MPAK	RQJ0603LGDQA	-60	+10/-20	-1.8	158	198	196	275	-	-	440	LG
8	MPAK	RQJ0602EGDQA	-60	+10/-20	-1.1	490	613	613	854	-	-	145	EG
9	MPAK	RQK0303MGDQA	30	±20	3.7	42	53	50	70	-	-	550	MG
10	MPAK	RQK0302GGDQA	30	±20	2.7	92	115	122	171	-	-	175	GG
11	MPAK	RQJ0303PGDQA	-30	+10/-20	-3.3	54	68	76	107	-	-	625	PG
12	MPAK	RQJ0306FQDQA	-30	+8/-12	-3.0	-	-	75	95	120	165	510	FQ
13	MPAK	RQJ0305EQDQA	-30	+8/-12	-2.4	-	-	110	140	165	230	330	EQ
14	MPAK	RQJ0302NGDQA	-30	+10/-20	-2.2	138	173	216	303	-	-	195	NG
15	MPAK	RQJ0304DQDQA	-30	+8/-12	-1.8	-	-	195	245	300	420	185	DQ
16	MPAK	RQK0201QGDQA	20	±12	4.5	-	-	30	39	38	53	479	QG
17	MPAK	RQK0202RGDQA	20	±12	3.8	-	-	42	55	62	85	293	RG
18	MPAK	RQK0203SGDQA	20	±12	2.9	-	-	68	90	105	150	159	SG
19	MPAK	RQK0204TGDQA	20	±12	2.3	-	-	100	130	146	204	127	TG
20	MPAK	RQJ0201UGDQA	-20	±12	-3.4	-	-	53	69	80	112	597	UG
21	MPAK	RQJ0202VGDQA	-20	±12	-2.7	-	-	83	105	124	170	365	VG
22	MPAK	RQJ0203WGDQA	-20	±12	-2.1	-	-	142	180	216	300	205	WG
23	MPAK	RQJ0204XGDQA	-20	±12	-1.6	-	-	219	280	363	510	153	XG

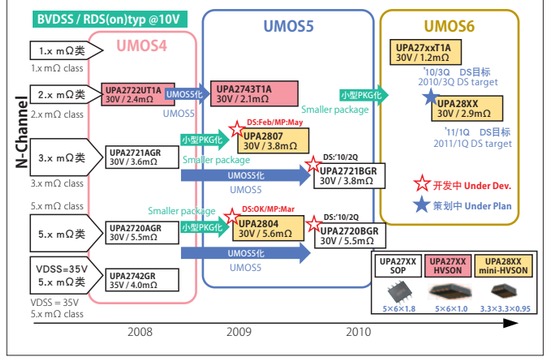
注）：( ) 表示VGS = 4 V条件下的值。 Note: The parentheses represents value of VGS = 4 V.

锂电池保护电路用功率MOSFET

Power MOSFETs for Lithium-Ion Battery Protection Circuits

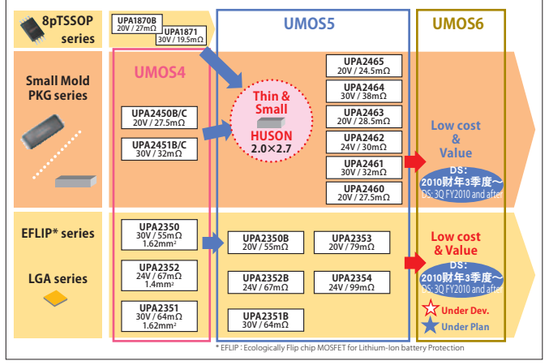
锂电池产品发展图（笔记本电脑）

Lithium-Ion Battery Product Roadmap (for Notebook PCs)



锂电池产品发展图（便携设备）

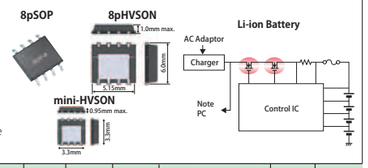
Lithium-Ion Battery Product Roadmap (for Mobile Phones)



用于控制充放电的Nch系列 N-Channel Series for Charge/Discharge Control

●特点
1) VDSS 30V & 35V
2) 小型、薄型封装
3) 低导通电阻
4) 符合RoHS标准/不含卤素

● Features
1) VDSS: 30V and 35V
2) Compact, thin package
3) Low on-resistance
4) RoHS compliant, halogen free



Type No.	Package	VDSS (V)	VGSS (V)	ID(DC) (A)	ID (PULES) (A)	RDS (on) (mΩ) VGS=10V typ./max.	RDS (on) (mΩ) VGS=4.5V typ./max.	Ciss (pF)	Qg (nC) VGS=5V
UPA2743T1A	8pHVSON	30	± 20	± 29	± 170	2.1/3.3	3.1/4.6	5080	39
UPA2742GR	8pSOP	35	± 25	± 17	± 150	4.0/4.8	4.7/8.0 VGS=5V	4600	43
UPA2804T1L	mini-HVSON	30	± 20	± 28	± 115	5.6/6.8	8.2/13.9	1850	15
UPA2807T1L	mini-HVSON	30	± 20	± 34	± 150	3.8/4.6	6.0/10	2400	21
UPA2720CGR ③	8pSOP	30	±20	± 12		5/6	8.5/14.5	2450	TBD
UPA2721CGR ③		30	±20	± 16		3.4/4.3	7.5/12.5	3800	TBD
UPA2820T1S ③	HWSON8	30	±20	± 22		4.2/5.3	9/15	2490	TBD
UPA2821T1L ③	Mini-HVSON	30	±20	± 26		3.3/4.2	7/12	2720	TBD
UPA2822T1L ③		30	±20	± 34		2.3/2.8	4.2/7	4780	TBD

注）本产品现处于开发阶段，电气特性及具体日程等变更恕不另行通知。
Note: This product is under development. The electrical characteristics or schedule may be subject to change without notice.

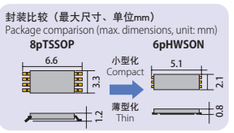
TSSOP,HWSON Series

●特点 小型、薄型化(HWSON)
●Features Compact, thin (HWSON)

	平面面积 Footprint	高度 Height
8pTSSOP	21.8mm²	1.2mm MAX
6pHWSON	10.7mm²	0.8mm MAX

可实现等同于以往8pTSSOP的热电阻（漏极电极外形背面引出）
Heat resistance comparable to earlier 8-pin TSSOP (flat drain contact configuration)
低导通电阻 Low on-resistance
高抗ID(脉冲) High ID (pulse) tolerance

封装比较（最大尺寸、单位mm）
Package comparison (max. dimensions, unit: mm)



Type No.	Polarity	Drain	VDSS (V)	VGSS (V)	ID(DC) (A)	RDS (on) (mΩ) VGS=4.5V typ./max.	RDS (on) (mΩ) VGS=4.5V typ./max.	RDS (on) (mΩ) VGS=2.5V typ./max.
UPA1870B	8pTSSOP	Commom	20	± 12	± 6.0	16.0/20.0	15.5/21.0	20.0/27.0
UPA1871	8pTSSOP	Commom	30	± 12	± 6.0	20.5/26.0	21.5/27.0	27.8/38.0
UPA1872B*1	8pTSSOP	Commom	20	± 12	± 10.0	10.0/13.0	10.5/13.5	13.0/18.0
UPA1873	8pTSSOP	Commom	20	± 12	± 6.0	18.0/23.0	19.0/24.0	24.5/29.0
UPA1874B*1	8pTSSOP	Commom	30	± 12	± 8.0	11.5/14.0	12.0/14.5	15.0/19.5
UPA2450B*1	6pHWSON	Commom	20	± 12	± 8.6	12.5/17.5	13.0/18.5	18.0/27.5
UPA2451B*1	6pHWSON	Commom	30	± 12	± 8.2	15.0/20.0	15.5/21.0	22.0/32.0
UPA2450C*1	6pHWSON	Commom	20	± 12	± 8.6	12.5/17.5	13.0/18.5	18.0/27.5
UPA2451C*1	6pHWSON	Commom	30	± 12	± 8.2	17.5/20.0	18.0/21.0	25.5/32.0
UPA2452*1	6pHWSON	Commom	24	± 12	± 7.8	17.5/21.5	18.5/22.5	25.0/30.0
UPA2454	6pHWSON	Commom	24	± 12	± 15.0	8.0/10.0	8.3/10.5	12.5/15.5
UPA2455	6pHWSON	Commom	30	± 12	± 15.0	9.5/12.0	10.0/13.0	13.0/18.0

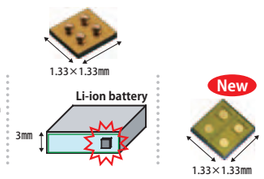
*1:Wireless bonding product

EFLIP UMOS5 Series

Ecologically Flip chip MOSFET for Lithium-Ion battery Protection (EFLIP)

●特点：电池保护MOSFET的最小化
1) 小型 1.47mm x 1.47mm 1.33mm x 1.33mm
2) 漏极内部连接（漏极公共端）
3) 无铅凸出部或LGA
4) 等同于6pHWSON的导通电阻

● Features:
Minimizes the size of the battery protection MOSFET.
1) Compact: 1.47mm × 1.47mm 1.33mm × 1.33mm
2) Internal drain connection (common drain)
3) Lead-free solder bumps or LGA
4) On-resistance comparable to 6-pin HWSON

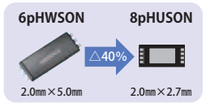


Type No.	Polarity	Outline	VDSS (V)	VGSS (V)	RDS (on) (mΩ) VGS=4.5V typ./max	RDS (on) (mΩ) VGS=3.1V typ./max	RDS (on) (mΩ) VGS=2.5V typ./max	RDS (on) (mΩ) VGS=1.8V typ./max
UPA2350BT1G	1.47mm□	4pEFLIP -BGA	20	±12	27/35	32/44	40/55	-
UPA2352BT1G	1.33mm□		24	±12	35/43	43/55	55/67	-
UPA2353T1G	1.47mm□		20	±8	29/31	31/38	34/43	44/79
UPA2354T1G	1.33mm□		24	±8	35/42	40/49	43/57	57/99
UPA2350BT1P	1.47mm□	4pEFLIP -LGA	20	±12	27/35	32/44	40/55	-
UPA2352BT1P	1.33mm□		24	±12	35/43	43/55	55/67	-
UPA2351BT1P	1.47mm□		30	±12	32/40	37/50	45/64	-
UPA2353T1P	1.47mm□		20	±8	29/31	31/38	34/43	44/79
UPA2354T1P	1.33mm□		24	±8	35/42	40/49	43/57	57/99

8pin HUSON(2720) Series

●特点
6pHWSON后续产品
小型、薄型化（相对于6pHWSON）
采用CSP封装，组装简单
不含卤素
漏极公共端

● Features
Successor to 6-pin HWSON
More compact and thin (than 6-pin HWSON)
CSP package for easy assembly
Halogen-free
Common drain



Item	UPA2460	UPA2461	UPA2462	UPA2463	UPA2464	UPA2465
Size	2.0×2.7	2.0×2.7	2.0×2.7	2.0×2.7	2.0×2.7	2.0×2.7
VDSS-V	20	30	24	20	30	20
VGSS-V	+/-12	+/-12	+/-12	+/-12	+/-12	+/-12
Rds(on)-mohm atVGS=4.5V	11.0/14.5/17.5	12.0/17.5/21.5	12.0/16.0/21.5	12.0/16.0/20.0	15.0/20.0/26.0	9.5/13.5/16.5
Rds(on)-mohm atVGS=4.0V	11.5/15.0/18.5	12.5/18.0/22.0	12.5/16.5/22.5	13.0/16.5/21.0	16.0/20.5/27.0	10.5/14/17
Rds(on)-mohm atVGS=3.1V	12.0/16.0/22.0	14.0/19.5/25.0	14.5/18.0/26.5	13.5/18.0/24.0	17.0/22.0/30.0	12/16/22
Rds(on)-mohm atVGS=2.5V	15.3/18.5/27.5	15.5/22.0/32.0	15.5/21.0/30.0	15.0/21.0/28.5	19.0/25.5/38.0	14/18/24.5
	UPA2450B compatible	UPA2451B compatible	UPA2452 compatible	UPA1870B compatible	UPA1871 compatible	

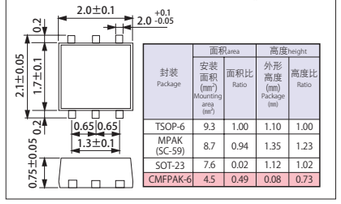
新一代小型、低损失功率MOS FET CMFPAK-6系列 Next-Generation Compact, Low-Loss MOSFET CMFPAK-6 Series

CMFPAK-6配备功率MOS FET
-栅驱动电压：备有1.8V～2.5V一系列产品
-利用D8工艺将Pch/Nch产品化
-最适于便携设备(小型组件)的升降压DC-DC转换器和电源管理

Power MOSFET in a CMFPAK-6 package
– Gate drive voltage: 1.8V to 2.5V available
– Pch/Nch products fabricated using D8 process
– Ideal for voltage step-up/step-down DC/DC converters and power management circuits for mobile devices (compact electronic products)

主要应用 Main Applications
・数码相机 Digital Still cameras
・手机 Mobile phones
・便携式信息终端等 Mobile information terminals, etc.

CMFPAK-6 外形尺寸图 CMFPAK-6 Package Dimensions



封装 Package	面积 Area 安装面积 (mm²) Mounting area (mm²)	面积比 Ratio	高度 Height 外形高度 (mm) Package (mm)	高度比 Ratio
TSOP-6	9.3	1.00	1.10	1.00
MPAK (SC-59)	8.7	0.94	1.35	1.23
SOT-23	7.6	0.02	1.12	1.02
CMFPAK-6	4.5	0.49	0.08	0.73

产品系列 Lineup

极性 Polarity	型号 Part No.	驱动电压 (V) Drive Voltage	绝对最大额定值 Absolute Maximum Rating V_{DSS} (V)	V_{GSS} (V)	I_D (A)	电特性 Electrical Characteristics R_{DS} (on) (mΩ) at 10 V	R_{DS} (on) (mΩ) at 4.5 V	R_{DS} (on) (mΩ) at 2.5 V	R_{DS} (on) (mΩ) at 1.8 V	Ciss (pF)	实际产品标记 Marking
P	HAT1069C	1.8	-12	±8	-4.0	-	38/52	48/70	60/93	1380	VY-
	HAT1093C				3.0	-	41/54	54/76	85/128	940	VM-
	HAT1094C				-2.5	-	67/88	90/126	128/192	530	VN-
	HAT1095C				-2.0	-	108/140	146/205	225/337	290	VP-
	RJJ0102DQM				-1.2	-	265/315	400/535	625/930	123	TBD
	HAT1090C	2.5	-20	±12	-2.5	-	50/65	74/104	-	590	VJ-
	HAT1089C				-2.0	-	79/103	120/168	-	365	VK-
	HAT1091C				-1.5	-	134/175	205/287	-	200	VL-
	HAT1096C				-1.0	-	225/293	380/530	-	155	VQ-
	HAT1108C	4.5	-30	+20/-10	-1.5	155/194	245/356	-	-	160	VZ-
	HAT1142C				-3.0	50/63	75/109	-	-	505	TBD
	HAT1111C		-60		-2.0	245/307	310/450	-	-	290	UA-
	HAT1141C		-80		-0.8	800/1050	1020/1380	-	-	170	UM-
N	HAT2204C	1.8	12	±8	3.5	-	26/34	34/44	45/69	770	VU-
	HAT2205C				3	-	38/50	48/67	65/97	430	VV-
	HAT2206C				2	-	65/85	81/114	113/170	260	VW-
	HAT2202C	2.5	20	±12	3	-	31/40	43/55	-	520	VR-
	HAT2196C				2.5	-	45/58	66/93	-	270	VS-
	HAT2203C				2	-	69/90	107/150	-	165	VT-
	HAT2207C				1.5	-	100/130	140/210	-	135	VX-
	HAT2268C	4.5	30	+20/-10	4.0	27/34	37/54	-	-	440	UN-
	HAT2221C				1.5	120/150	160/235	-	-	110	UC-
	HAT2240C	2.5	60	±12	2.5	-	75/98	85/119	-	590	UK-
	HAT2281C				2.0	-	120/156	140/196	-	350	UH-
	HAT2282C				1.5	-	195/254	240/336	-	210	UJ-
	HAT2217C	4.5		+20/-10	3.0	105/132	126/183	-	-	275	UB-

CMFPAK-6 复合型功率MOS FET CMFPAK-6 Composite Power MOSFETs

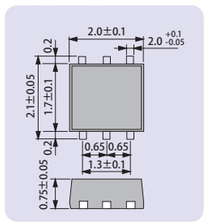
●特点
・复合型（N-ch复合、P-ch复合、Nch＋Pch）
・低驱动电压（1.8V、2.5V）
・小型封装（CMFPAK-6）
・高速开关

●用途
・DC-DC转换器
・电源管理开关

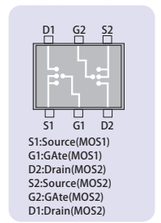
● Features
・Composite type (N-channel composite, P-channel composite, N-channel + P-channel)
・Low drive voltage (1.8V, 2.5V)
・Compact package (CMFPAK-6)
・High-speed switching

● Applications
・DC-DC converters
・Power management switches

外形尺寸 Package dimensions



管脚排列 Pin assignments



极性 Polarity	型号 Part No.	驱动电压 (V) Drive Voltage	最大额定值 Maximum Rating V_{DSS} (V)	V_{GSS} (V)	I_D (A)	电特性 Electrical Characteristics RDS (on) (mΩ)(typ./max.) VGS=4.5V	VGS=2.5V	VGS=1.8V	Ciss (pF)
P-ch (Dual)	HAT1146C	1.8	-12	±8	-1.2	265/330	400/565	625/1130	125
	HAT1147C	2.5	-20	±12	-1.0	340/440	575/960	-	85
N-ch (Dual)	HAT2291C	1.8	12	±8	1.8	150/200	200/290	265/440	100
	HAT2292C	2.5	20	±12	1.5	165/215	255/370	-	73
	HAT2286C		60		0.9	460/595	560/770	-	80
N-ch+P-ch	HAT3042C	1.8	12	±8	1.8	150/200	220/290	265/440	100
			-12		-1.2	265/330	400/565	625/1130	125
	HAT3043C	2.5	20	±12	1.5	165/215	255/370	-	73
			-20		-1.0	340/440	575/960	-	85

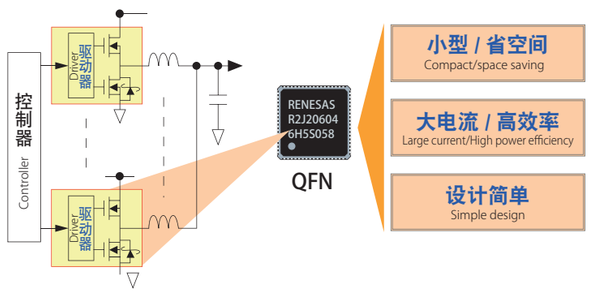
IC-MOSFET集成SiP产品家族

IC-MOSFET Integrated SiP Product Series

瑞萨备有MOSFET内置SiP，可轻松构成高性能多相位电源。
将控制器+驱动器+MOSFET或驱动器+MOSFET装配于单个封装上，即可实现寄生
容量/电感的减少和高密度安装，并轻松实现高性能DC/DC转换器。

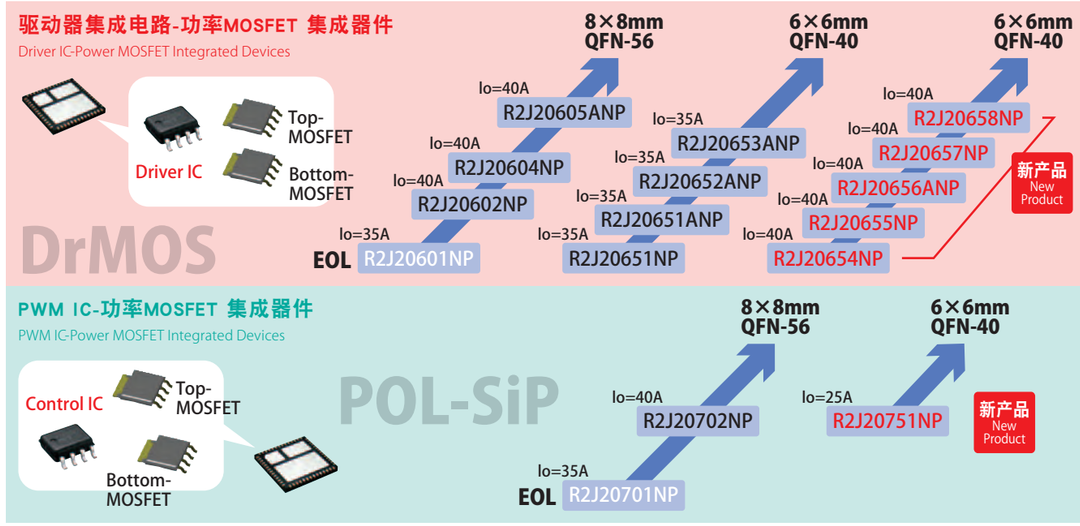
Renesas Electronics offers SiP products with integrated MOSFETs to enable easy configuration of high-performance multi-phase power supplies. They combine in a single package either controller, driver, and MOSFETs or driver and MOSFETs. These products make it easy to build a high-performance DC/DC converter while reducing stray capacitance and inductance, and achieving higher mounting density.

多相位电源构成示例
Multi-Phase Power Supply Configuration Example



无线构造封装＝性能升级
Wireless package structure for improved performance

瑞萨集成功率器件 产品家族 Renesas Integrated Power Device Product Families



MOSFET内置集成SiP IC-MOSFET Integrated SiP Products

Part No.	Function	Vin(V)	Vout(V)	Iout Max. (A)	PWM Input (V)	Fmax. (MHz)	Tj-opr (℃)	Pin count	Package	Remarks
R2J20702NP	POL-SiP	Up to 16	40	40	-	1.0	-40 to +150	56	QFN-56	Built in PWM controller MOSFETs for Switching
R2J20751NP	POL-SiP	Up to 27	25	25	-	1.0	-40 to +150	40	QFN-40	Built in PWM controller MOSFETs for Switching
R2J20602NP	DrMOS	Up to 16	40	40	5.0	2.0	-40 to +150	56	QFN-56	Built in Driver MOSFETs for Switching
R2J20604NP	DrMOS	Up to 16	40	40	3.3/5.0	2.0	-40 to +150	56	QFN-56	Built in Driver MOSFETs for Switching
R2J20605ANP	DrMOS	Up to 27	40	40	5.0	2.0	-40 to +150	56	QFN-56	Built in Driver MOSFETs for Switching
R2J20651NP	DrMOS	Up to 16	35	35	3.3/5.0	2.0	-40 to +150	40	QFN-40	Built in Driver MOSFETs for Switching
R2J20651ANP	DrMOS	Up to 16	35	35	5.0	2.0	-40 to +150	40	QFN-40	Built in Driver MOSFETs for Switching
R2J20653ANP	DrMOS	Up to 27	35	35	5.0	2.0	-40 to +150	40	QFN-40	Built in Driver MOSFETs for Switching
R2J20654NP	DrMOS	Up to 20	40	40	3.3/5.0	2.0	-40 to +150	40	QFN-40	Built in Driver MOSFETs for Switching
R2J20655NP	DrMOS	Up to 27	35	35	3.3/5.0	2.0	-40 to +150	40	QFN-40	Built in Driver MOSFETs for Switching
R2J20656ANP	DrMOS	Up to 27	35	35	5.0	2.0	-40 to +150	40	QFN-40	Built in Driver MOSFETs for Switching
R2J20657NP	DrMOS	Up to 20	40	40	3.3/5.0	2.0	-40 to +150	40	QFN-40	Built in Driver MOSFETs for Switching
R2J20658NP	DrMOS	Up to 20	40	40	3.3/5.0	2.0	-40 to +150	40	QFN-40	Built in Driver MOSFETs for Switching

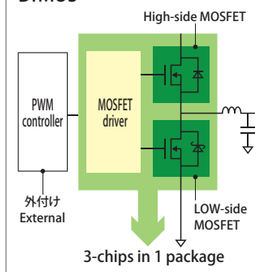
各种MOS FET内置SiP

SiP Products with Various Types of Integrated MOSFETs

瑞萨集成功率器件 产品家族 Renesas Integrated Power Device Product Families

驱动器集成电路-功率MOSFET 集成器件
Driver IC Power MOSFET Driver IC-integrated devices

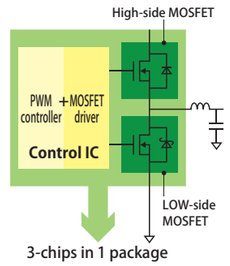
DrMOS



主要用途：CPU, GPU（40～200A 大电流用）
Main applications: CPUs and GPUs (large current, 40A to 200A)

PWM IC-功率MOSFET 集成器件
PWM IC Power MOSFET Driver IC-integrated devices

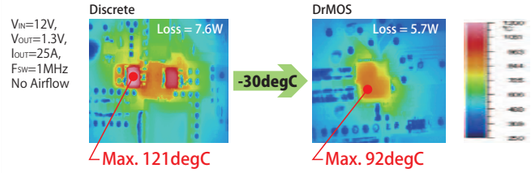
POL-SiP



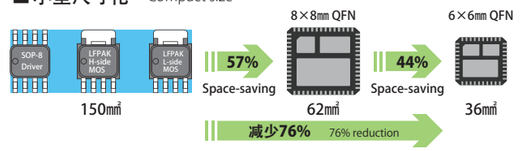
主要用途：DDR 存储器、FPGA（5～40A 中电流用）
Main applications: DDR Memory and FPGA (medium current, 5A to 40A)

DrMOS的优点 Advantages of DrMOS

■高效率 / 低发热 High efficiency/low heat generation

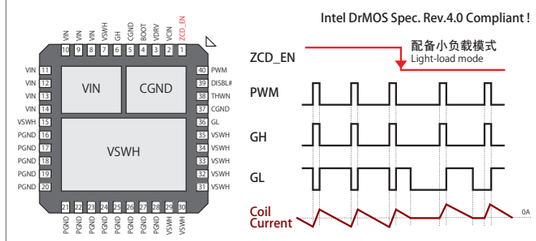


■小型尺寸化 Compact size



DrMOS (R2J20656ANP)

Zero Current Detection



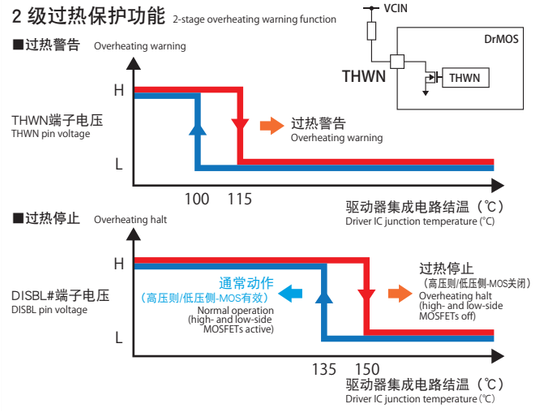
Notes: - ZCD_EN pin low: DCM mode and ZCD enabled
- ZCD_EN pin high: CCM mode and ZCD disabled
- ZCD_EN pin open: CCM mode and ZCD disabled

配备小负载模式
Light-load mode

可自动检测出线圈电流为零状态，并关闭低压侧FET
Automatically detects when inductor current is zero and turns off low-side FET.

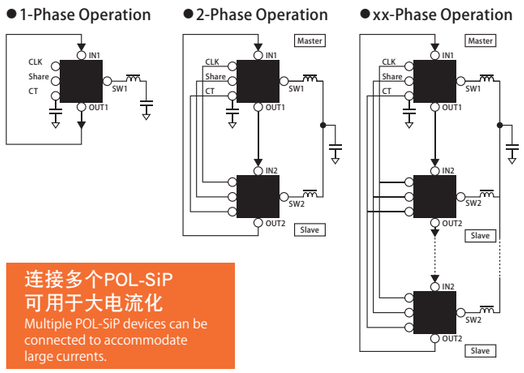
内置保护功能 On-Chip Protection Function

2 级过热保护功能 2-stage overheating warning function



R2J20751NP(6x6mm□) Concept

■可扩缩理念 Scalability concept

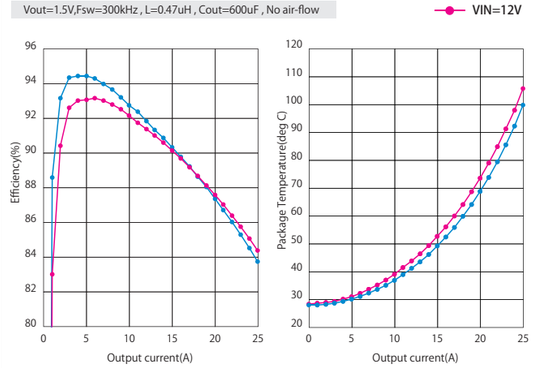


连接多个POL-SiP
可用于大电流化
Multiple POL-SiP devices can be connected to accommodate large currents.

R2J20751NP(6x6mm□) Performance

■效率曲线（单相 EVB） Efficiency curve (single-phase EVB)

Vout=1.5V,Fsw=300kHz , L=0.47uH , Cout=600uF , No air-flow



车载用功率器件①

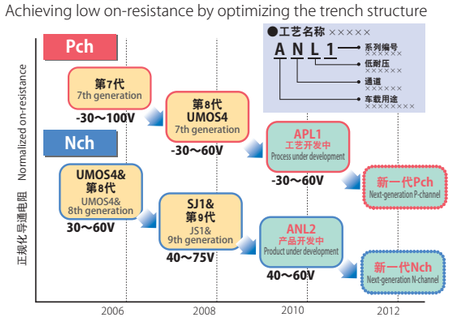
Automotive Power Devices

以“节能环保”、“更安全方便”、“节省空间”为目标而不断研发的新一代汽车、电气设备对高性能、高效率、高功能功率器件的需求日益增加。
瑞萨电子为满足这种需求，基于“希望能使用令人放心、信赖性超高的产品”这一市场需求，立足于注重汽车实用性的设计、开发及工序管理，实现了优于普通产品的高质量与高可靠性。
此外，与其他电子设备相同，为追求小型化和低导通电阻，本公司利用基于最新沟槽技术的“0.25μ的UMOS4工艺为主的细微化技术”，以及“利用新多种焊接的封装技术”实现了世界顶尖水平的超导通电阻，此外也配备利用“智能技术”、适于车载规格的产品。

Demand for power devices with superior performance, high efficiency, and excellent functionality is growing among manufacturers of next-generation automobiles and electrical systems striving to achieve advances in environmental performance, energy efficiency, improved safety, enhanced convenience, and reduced space requirements. Aware of these requirements and the demand in this market for trustworthiness and ultrahigh reliability, Renesas Electronics designs, develops, and manufactures products that deliver an exceptionally high level of quality and reliability. Like other electronic devices, products for the automotive field must combine compact size and low on-resistance. Renesas Electronics achieves on-resistance specs among the lowest in the world through the use of ultrafine technology, such as our 0.25μ UMOS4 process employing the latest trench technology, and package technology utilizing a new multi-bonding mount technology. Our extensive lineup of automotive power devices driven by “intelligent technology” delivers performance to match the most demanding specifications.

车载用低耐压功率MOSFET工艺趋势　Process Trend of Low-Voltage Power MOSFETs for Automotive Applications

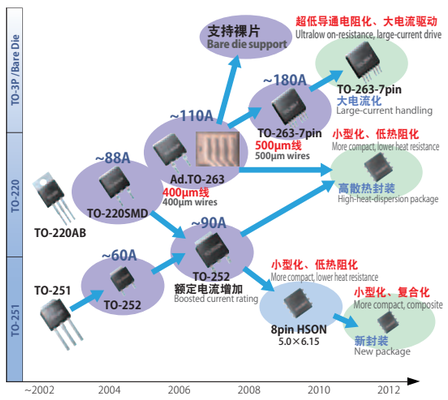
利用沟槽构造最佳化，力争实现低导通电阻特性
Achieving low on-resistance by optimizing the trench structure



为了在高温环境中控制大电流驱动，作为汽车电气用功率MOSFET，最重要的特性就是低导通电阻。此外，随着近年来PWM应用和电源应用的扩大，开关特性也逐渐受到重视。基于这些技术动向，瑞萨将继续开发兼备超低导通电阻特性和低栅电容的高性能工艺。此外，为了实现高抗破坏性、高信赖性以放心使用，我们将继续采用含有本公司多年技术经验的高抗破坏性设计。

Since automotive power MOSFETs perform large-current drive control in high-temperature environments, low on-resistance is a key performance factor. In recent years, as PWM support and compatibility with a wider range of power supplies become more important, attention has also begun to focus on switching performance. Renesas Electronics is continuously working to develop new high-performance fabrication processes to deliver ultralow on-resistance and low gate capacitance in response to these technical trends. In addition, many years of experience enable us to design products with high breakdown tolerance and high reliability that customers can have confidence in.

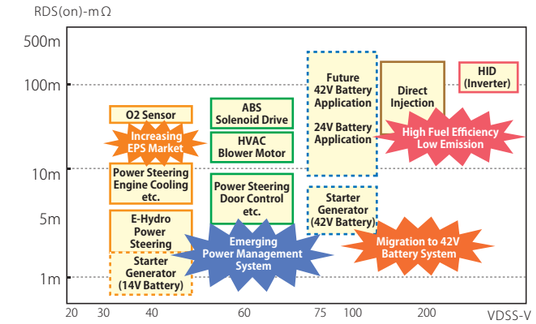
车载功率器件封装的发展　Automotive Power Device Package Evolution



在汽车电气用途方面，大电流类的EPS用途至中电流类的发动机控制用途需使用各种类型的封装。为满足上述各种要求事项，瑞萨正在以采用最新功率器件组装技术的功率封装开发高性能功率器件。EPS等通过多条焊线焊接实现对应大电流的同时，在发动机控制等中电流用途中，将通过推出8管脚SOP等新封装，实现小型化和安装面积的缩减。

Renesas Electronics supplies power MOSFET products for automotive electrical systems in a wide variety of packages to accommodate implementations ranging from large-current applications such as electric power steering to medium-current applications such as engine control. To meet the diverse requirements of our customers, we develop high-performance power devices with power packages employing the latest assembly technology. Multi-wire bonding is used to provide large-current capabilities for applications such as electric power steering. For medium-current applications such as engine control, new packages such as the 8-pin HSON provide smaller size and reduced mounting area.

汽车电气用途的应用图　Map of Automotive Electrical System Applications



汽车电气应用示例　Automotive Electrical System Application Examples

泵驱动器 Pump Driver
NP55N04SUG
NP55N055SUG
NP35N04YUG*
NP50N04YUK**

风扇马达 Fan Motor
NP90N04MUG
NP88N04NUG
NP82N04MUG

发动机控制 Engine Control
NP23N06YDG*
NP33N06YDG*
NP28N10SDE*
NP20N10YDF**
NP32N055SHE
RJM0404JSC
RJM0603JSC
RJK2061JPE

蓄电池管理 Battery Management
Pch Series

*新产品 New Product　**开发中 Under development

EPS, EHPS
NP88N04NUG
NP90N04VUG
NP109N04PUJ
NP160N04TUJ*
NP109N04PUK*
NP160N04TUK*

ABS - F/S SW
NP35N04YUG (F/S)*
NP55N055SDG (F/S)
NP110N04PUJ (pump)

ISG
NP180N04TUJ*
NP180N055TUJ*
NP180N04TUK*
NP180N055TUK*

HVAC
NP90N04MUG
NP82N04MUG
NP80N06MLG

雨刮器 Wiper
NP82N04PUG
NP90N04VUG
NP75N04YUG*

车灯 Light
NP55N03SUG
NP70N10KUF
NP36N10SDE*

电动车窗 Power Window
NP55N04SUG
NP55N055SUG
NP90N055VDG

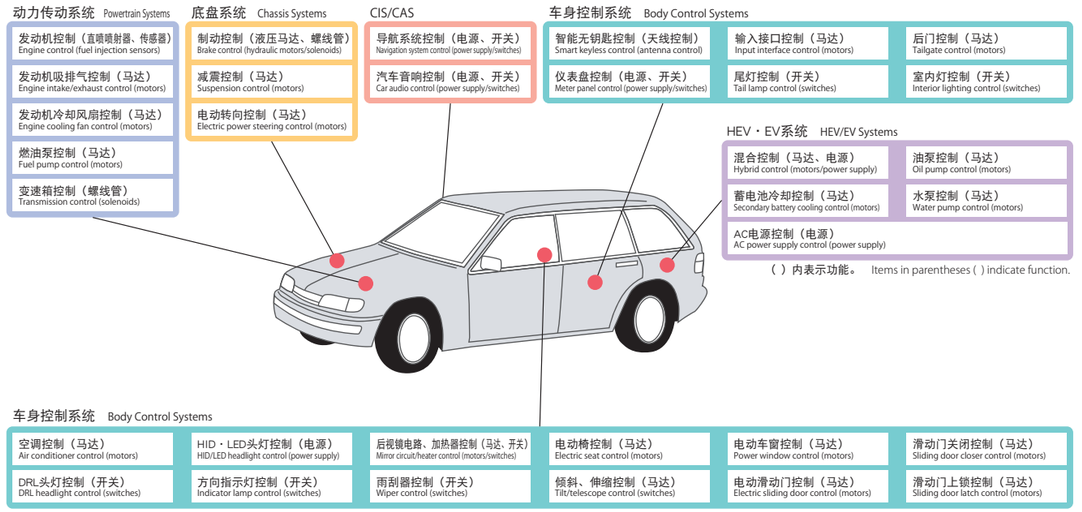
接线盒 Junction Box
NP36N055SHE
NP55N055SUG
NP55N04SUG

车载用功率器件②

Automotive Power Devices

车载用功率器件的主要应用　Main Applications for Automotive Power Devices

功率器件广泛应用于各种用途。 Power devices are used in a variety of applications.



（ ）内表示功能。 Items in parentheses ( ) indicate function.

NP系列 NP Series

NP系列的特点
除以往2SK/2SJ系列外，以汽车电气配备为前提，
增加了可确保在高温环境下使用的NP系列。
- 确保Tch=175℃（适用于AEC-Q101）
- 基于UMOS/超结合技术的超低导通电阻/低QG特性
  NP180N04TUK(ANL2) 实现1.05mΩ（最大值）/198nC（标准值）
- 大额定电流
  TO263-7pin package ID(DC)=180A (max)
  TO263 package ID(DC)=110A (max)
  Adv.TO252 package ID(DC)=90A (max)
  8pinHSON Package ID(DC)=75A (max)

NP Series features
The new NP Series joins the earlier 2SK Series and 2SJ Series for automotive applications and provides guaranteed operation at even higher temperatures.
- Tch = 175°C guaranteed (AEC-Q101 qualified)
- UMOS, super junction technology for ultralow on-resistance and low QG characteristics
  NP180N04TUK (ANL2) 1.05mΩ(max.)/198nC(typ.)
- Large-current rating

N通道 大电流产品系列 N-Channel Large-Current Product Series

外形 Package	品名 Part No.	极性 Polarity	V_{DSS} (V)	V_{GSS} (V)	ID(DC) [A] Tc= 25℃	PT [W] Tc= 25℃	VGS(th) [V]	RDS (on) (mΩ) VGS=10V typ.	RDS (on) (mΩ) VGS=10V max.	RDS (on) (mΩ) VGS=4.5V typ.	RDS (on) (mΩ) VGS=4.5V max.	Ciss (pF) typ.
TO-263-7pin	NP180N04TUG		40	±20	180	288	2.0～4.0	1.2	1.5	-	-	16300
	NP180N04TUJ		40	±20	180	348	2.0～4.0	1.2	1.5	-	-	9500
	NP160N04TDG		40	±20	160	220	1.5～2.5	1.6	2.0	2.2	5.4	10500
	NP160N04TUG		40	±20	160	220	2.0～4.0	1.6	2.0	-	-	10500
	NP160N04TUJ		40	±20	160	220	2.0～4.0	1.6	2.0	-	-	6900
	NP161N04TUG		40	±20	160	250	2.0～4.0	1.4	1.8	-	-	13500
	NP180N04TUK		40	±20	180	348	2.0～4.0	0.85	1.05	-	-	10500
	NP160N04TUK		40	±20	160	250	2.0～4.0	1.25	1.5	-	-	7200
	NP180N055TUJ		55	±20	180	348	2.0～4.0	1.7	2.4	-	-	9500
	NP160N055TUJ		55	±20	160	220	2.0～4.0	2.4	3.0	-	-	6900
	NP180N055TUK		55	±20	180	348	2.0～4.0	1.15	1.4	-	-	10700
	NP160N055TUK		55	±20	160	250	2.0～4.0	0.9	2.1	-	-	7500
TO-263 (MP-25ZP)	NP110N03PUG	Nch	30	±20	110	288	2.0～4.0	1.1	1.5	-	-	16400
	NP109N04PUG		40	±20	110	220	2.0～4.0	1.7	2.3	-	-	10500
	NP109N04PUJ		40	±20	110	220	2.0～4.0	1.7	2.3	-	-	6900
	NP110N04PDG		40	±20	110	288	1.5～2.5	1.4	1.8	2.1	3.2	14500
	NP110N04PUG		40	±20	110	288	2.0～4.0	1.4	1.8	-	-	17100
	NP110N04PUJ		40	±20	110	288	2.0～4.0	1.4	1.8	-	-	9500
	NP110N04PUK		40	±20	110	348	2.0～4.0	1.15	1.4	-	-	10500
	NP109N04PUK		40	±20	110	250	2.0～4.0	1.4	1.75	-	-	7200
	NP100N04PUK		40	±20	100	176	2.0～4.0	1.9	2.3	-	-	4700
	NP89N04PUK		40	±20	90	147	2.0～4.0	2.45	2.95	-	-	3900
	NP109N055PUJ		55	±20	110	220	2.0～4.0	2.5	3.2	-	-	6900
	NP110N055PUG		55	±20	110	288	2.0～4.0	1.9	2.4	-	-	17100
	NP110N055PUJ		55	±20	110	288	2.0～4.0	1.9	2.4	-	-	9500
	NP110N055PUK		55	±20	110	348	2.0～4.0	1.45	1.75	-	-	10700
	NP109N055PUK		55	±20	110	250	2.0～4.0	1.85	2.2	-	-	7500
	NP100N055PUK		55	±20	100	176	2.0～4.0	2.7	3.25	-	-	4900
	NP89N055PUK		55	±20	90	147	2.0～4.0	3.3	4.0	-	-	4000
TO-262 (MP-25SK)	NP100N04NUJ		40	±20	100	220	2.0～4.0	2.5	3.0	-	-	5600

N通道TO-252封装系列 N-Channel TO-252 Package Series

外形 Package	品名 Part No.	极性 Polarity	V_{DSS} (V)	V_{GSS} (V)	ID(DC) [A] Tc= 25℃	PT [W] Tc= 25℃	VGS(th) [V]	RDS (on) (mΩ) VGS=10V typ.	RDS (on) (mΩ) VGS=10V max.	RDS (on) (mΩ) VGS=4.5V typ.	RDS (on) (mΩ) VGS=4.5V max.	Ciss (pF) typ.
TO-252 (MP-3ZP)	NP90N03VHG		30	±20	90	105	2.0～4.0	2.5	3.2	-	-	5000
	NP90N03VLG		30	±20	90	105	1.4～2.5	2.5	3.2	3.8	8	5000
	NP90N03VUG		30	±20	90	105	2.0～4.0	2.5	3.2	-	-	5000
	NP90N04VUG		40	±20	90	105	2.0～4.0	3.2	4.0	-	-	5000
	NP90N04VDG		40	±20	90	105	1.4～2.5	3.2	4.0	4.3	8.6	5000
	NP90N04VLG		40	±20	90	105	1.4～2.5	3.2	4.0	4.3	8.6	5000
	NP90N04VUK		40	±20	90	147	2.0～4.0	2.35	2.8	-	-	3900
	NP60N04VUK		40	±20	60	105	2.0～4.0	3.2	3.85	-	-	2450
	NP90N055VUG		55	±20	90	105	2.0～4.0	4.8	6.0	-	-	5000
	NP90N055VDG	Nch	55	±20	90	105	1.4～2.5	4.8	6.0	6	10.5	5000
	NP90N055VUK		55	±20	90	147	2.0～4.0	3.2	3.85	-	-	4000
	NP60N055VUK		55	±20	60	105	2.0～4.0	4.6	5.5	-	-	2500
	NP90N06VLG		60	±20	90	105	1.4～2.5	6.2	7.8	7.5	12.5	5000
TO-252 (MP-3ZK)	NP60N03SUG		30	±20	60	105	2.0～4.0	3.0	3.8	-	-	5000
	NP55N03SUG		30	±20	55	77	2.0～4.0	4.0	5.0	-	-	3500
	NP55N04SUG		40	±20	55	77	2.0～4.0	5.0	6.5	-	-	3400
	NP55N055SDG		55	±20	55	77	1.5～2.5	7.4	9.5	8.9	12	3200
	NP55N055SUG		55	±20	55	77	2.0～4.0	7.7	10.0	-	-	3500
	NP52N055SUG		55	±20	52	56	2.0～4.0	11.0	14.0	-	-	2100
	NP52N06SLG		60	±20	52	56	1.5～2.5	13.6	17.5	17.5	25	2100

8管脚HSON封装系列（背面散热） 8-Pin HSON Package Series (Underside Heat Dispersion)

外形 Package	品名 Part No.	极性 Polarity	V_{DSS} (V)	V_{GSS} (V)	ID(DC) [A] Tc= 25℃	PT [W] Tc= 25℃	VGS(th) [V]	RDS (on) (mΩ) VGS=10V typ.	RDS (on) (mΩ) VGS=10V max.	RDS (on) (mΩ) VGS=5V typ.	RDS (on) (mΩ) VGS=5V max.	Ciss (pF) typ.
8pin HSON	NP40N10YDF	Nch	100	±20	40	120	1.5～2.5	21	25	23	30	2100
	NP20N10YDF★★		100	±20	20	73	1.5～-2.5	44	55	49	68	1100
	NP33N075YDF		75	±20	33	92	1.5～2.5	23	28	25	32	1300
	NP33N06YDG		60	±20	33	97	1.4～2.5	11.2	14	12.8	20	2600
	NP23N06YDG		60	±20	23	60	1.4～2.5	22	27	24	37	1200
	NP35N055YUK★★		55	±20	35	97	2.0～4.0	5.4	6.7	-	-	2240
	NP75N055YUK★★		55	±20	75	138	2.0～4.0	3.6	4.5	-	-	3500
	NP75N04YUG		40	±20	75	138	2.0～4.0	3.8	4.8	-	-	4300
	NP74N04YUG		40	±20	75	120	2.0～4.0	4.2	5.5	-	-	3620
	NP75N04YUK★★		40	±20	75	138	2.0～4.0	2.6	3.3	-	-	3400
	NP50N04YUK★★		40	±20	50	97	2.0～4.0	3.9	4.8	-	-	2100
	NP35N04YLG		40	±20	35	77	1.4～2.5	7.8	9.7	9.6	15	1900
	NP35N04YUG		40	±20	35	77	2.0～4.0	7.9	10	-	-	1900
	NP16N04YUG		40	±20	16	36	2～4	20	25	-	-	740
	NP75P03YDG	Pch	-30	±20	-75	138	-1.0～-2.5	4.8	6.2	6.2	9.6	3200
	NP50P03YDG		-30	±20	-50	102	-1.0～-2.5	6.7	8.4	8.5	13	2300
	NP75P04YLG		-40	±20	-75	138	-1.0～-2.5	7.7	9.7	9.3	14	3200
	NP20P06YLG★★		-60	±20	20	67	-1.0～-2.5	37	49	42	64	1600

★★:开发中 Under development

P通道低Ron系列 P-Channel Low Ron Series

外形 Package	品名 Part No.	极性 Polarity	V_{DSS} (V)	V_{GSS} (V)	ID(DC) [A] Tc= 25℃	PT [W] Tc= 25℃	VGS(th) [V]	RDS (on) (mΩ) VGS=10V typ.	RDS (on) (mΩ) VGS=10V max.	RDS (on) (mΩ) VGS=4.5V typ.	RDS (on) (mΩ) VGS=4.5V max.	Ciss (pF) typ.
TO-263 (MP-25ZP)	NP100P06PDG	Pch	-60	±20	-100	200	-1.0～-2.5	4.4	6.0	5.0	7.8	15000
	NP100P06PLG		-60	±20	-100	200	-1.0～-2.5	4.4	6.0	5.0	7.8	15000
	NP83P06PDG		-60	±20	-83	150	-1.0～-2.5	6.9	8.8	8.0	12.0	10100
	NP100P04PDG		-40	±20	-100	200	-1.0～-2.5	2.8	3.5	3.4	5.1	15100
	NP100P04PLG		-40	±20	-100	200	-1.0～-2.5	2.8	3.7	3.4	5.1	15100
	NP83P04PDG		-40	±20	-83	150	-1.0～-2.5	4.1	5.3	5.1	8.0	9820
	NP82P04PLF		-40	±20	-82	150	-1.5～-2.5	6.5	8.0	8.3	12.0	5000
TO-263 (MP-25ZK)	NP50P06KDG		-60	±20	-50	90	-1.0～-2.5	13.5	17.0	15.4	23.0	5000
	NP36P06KDG		-60	±20	-36	56	-1.0～-2.5	23.1	29.5	27.0	37.5	3100
	NP50P04KDG		-40	±20	-50	90	-1.0～-2.5	7.9	10.0	9.8	15.0	5100
	NP36P04KDG		-40	±20	-36	56	-1.0～-2.5	12.8	17.0	16.6	23.5	2800
TO-252 (MP-3ZK)	NP50P06SDG		-60	±20	-50	84	-1.0～-2.5	13.2	16.5	14.9	23.0	5000
	NP36P06SLG		-60	±20	-36	56	-1.0～-2.5	24.0	30.0	27.0	40.0	3200
	NP20P06SLG		-60	±20	-20	38	-1.0～-2.5	36.0	48.0	42.0	64.0	1650
	NP15P06SLG		-60	±20	-15	30	-1.0～-2.5	56.0	70.0	62.0	95.0	1100
	NP50P04SDG		-40	±20	-50	84	-1.0～-2.5	7.7	9.6	9.3	15.0	5100
	NP36P04SDG		-40	±20	-36	56	-1.0～-2.5	12.5	17.0	15.4	23.5	2800
	NP20P04SLG		-40	±20	-20	38	-1.0～-2.5	20.0	25.0	24.0	38.0	1650
	NP15P04SLG		-40	±20	-15	30	-1.0～-2.5	31.0	40.0	38.0	60.0	1100

N通道100V系列 N-Channel 100V Series

外形 Package	品名 Part No.	极性 Polarity	V_{DSS} (V)	V_{GSS} (V)	ID(DC) [A] Tc= 25℃	PT [W] Tc= 25℃	VGS(th) [V]	RDS (on) (mΩ) VGS=10V typ.	RDS (on) (mΩ) VGS=10V max.	RDS (on) (mΩ) VGS=4.5V typ.	RDS (on) (mΩ) VGS=4.5V max.	Ciss (pF) typ.
TO-263 (MP-25ZP)	NP82N10PUF	Nch	100	±20	82	150	1.7～3.3	12	15	-	-	2900
	NP40N10PDF		100	±20	40	120	1.5～2.5	21	27.0	24	38	2100
TO-263 (MP-25ZK)	NP70N10KUF		100	±20	70	120	1.7～3.3	17.0	20.0	-	-	2500
TO-252 (MP-3ZP)	NP40N10VDF		100	±20	40	120	1.5～2.5	21	26.0	24	37.0	2100
TO-252 (MP-3ZK)	NP36N10SDE		100	±20	36	142	1.5～-2.5	27	33	29	39	3500
	NP28N10SDE		100	±20	28	100	1.5～-2.5	41	52	45	59	2200
8pin HSON	NP40N10YDF		100	±20	40	120	1.5～2.5	21.0	25.0	24.0	36.0	2100
	NP20N10YDF★★		100	±20	20	73	1.5～-2.5	44	55	TBD	TBD	1100

★★:开发中 Under development

超低导通电阻工艺“第9代功率MOSFET系列（40～60V漏极耐压类）” Ultralow On-Resistance Process: 9th Generation Power MOSFET Series (40V to 60V Drain Voltage Class)

■特点

此系列与本公司以往系列相比，减少20%的导通电阻性能和50%的Ciss性能，实现了真正的高性能化，为行业内性能最高的功率MOSFET系列。

特别是超低导通电阻产品，使用了实现“无线构造”的高散热、低电阻封装技术，对于大电流系统也是最适合的产品。

此外，全部达到“结合温度Tch：确保175℃”。（依照AEC－Q101）

■推荐应用

马达控制、车身控制、发动机控制等

■ Features

This series of power MOSFET devices delivers the world's best performance, with on-resistance 20% lower and Ciss 50% lower than comparable earlier devices from Renesas Electronics. In particular, our ultralow on-resistance products with wire-less structure and high-heat-dispersion, low-resistance package design are ideal for large-current systems. All have a guaranteed junction temperature (Tch) of 175°C.

■ Suggested applications

Motor control, body control, engine control, etc.

代次 Generation	封装 Package	型号 Part No.	极性 Polarity	最大额定值 Maximum Rating V_{DSS} (V)	V_{GSS} (V)	I_D (A)	P-ch (W)	$V_{GS(off)}$ (V)	RDS (on) (mΩ) VGS=4.5V typ.	VGS=4.5V max.	VGS=10V typ.	VGS=10V max.	Ciss (pF)	备注 Remarks
第9代 9th	DPAK	RJK0632JPD	Nch	60	±20	20	20	1.0～2.0	29	35	41	55	440	
		RJK0631JPD		60	±20	30	37	1.0～2.0	12	15	15	20	1350	
	LDPAK	RJK0415JPE		40	±20	80	70	2.0～3.5	4.4	5.5	-	-	2100	
		RJK0631JPE		60	±20	30	50	1.0～2.0	12	15	15	20	1350	
		RJK0630JPE		60	±20	75	70	1.0～2.0	6.2	7.5	8.5	11.5	2100	
		RJK0629JPE		60	±20	85	100	1.0～2.0	3.75	4.5	4.9	6.6	4100	
		RJK0406JPE		40	±20	160	125	2.0～3.5	1.65	2	-	-	6300	无线 Wire-less
第8代 8th	SOP-8	HAT2210RJ		30	±20	7.5	1.5	1.0～2.5	19	24	27	40	630	
					±20	8		1.0～2.5	17	22	21	29	1330	
		HAT2215RJ		80	±20	3.4	1.5	1.0～2.5	88	115	100	145	400	
	DPAK	RJK0323JPD		30	±20	30	40	1.0～2.5	7	9	9	13	2600	
	LDPAK	RJK1207JPE★★		120	±20	(50)	(135)	2.5～3.5	(25)	(35)	-	-	1750	
	SOP-8	RJM0301JSP	Nch	30	±20	5	1.5	1.0～2.5	33	43	46	70	395	Nch×1个元件 N-ch × 1 element
			Pch	-30		-4			58	70	95	140	450	Pch×1个元件 P-ch × 1 element
		RJM0306JSP	Nch	30	±20	3.5	1.5	1.0～2.5	50	65	70	105	290	Nch×2个元件 N-ch × 2 element
			Pch	-30		-3.5			90	120	140	210	320	Pch×2个元件 N-ch × 2 element
	HSOP-20	RJM0404JSC	Nch	40	±20	20	45	1.0～2.5	17	21	24	34	1400	Nch×3个元件 N-ch × 3 element
			Pch	-40		-20			34	42	48	68	1500	Pch×3个元件 P-ch × 3 element
		RJM0603JSC	Nch	60	±20	20	45	1.0～2.5	16	20	21	32	2600	Nch×3个元件 N-ch × 3 element
			Pch	-60		-20			32	40	42	64	2800	Pch×3个元件 P-ch × 3 element

★★:开发中 Under development

车载用多芯片器件

Automotive Multichip Devices

新一代汽车、电气设备中，开发最深入的部分为使用各种马达的“电动”应用。瑞萨电子为满足这种需求，开发出考虑到马达控制方式的“专用封装”。利用多芯片搭载技术开发而成。

The area where next-generation automobiles and electrical systems are showing the most notable development is electric “powered” applications employing motors of various types. Renesas Electronics responds to demand in this area with “custom package” products designed specifically with motor control in mind. These devices are developed using multichip technology.

特点 Features

在多芯片上装配低导通电阻的Nch型和Pch型功率MOSFET，构成马达控制的基本电路。

1. 专用于小型3相无刷马达，采用在HSOP20外形基础上配备6个MOSFET元件的“6合1”小型化设计（与DPAK×6个相比：约减少40%）
2. 用于超小型直流有刷马达控制电路，采用在SOP8外形基础上配备4个元件的“4合1”小型化设计（与SOP8×2个相比：减少50%）

The basic circuit needed for motor control is implemented using N-channel and P-channel power MOSFETs with low on-resistance in a multi-chip configuration.

1. The 6-in-1 configuration integrates six MOSFET elements in a HSOP20 package and is intended for controlling compact three-phase brushless motors. (Size comparison with DPAC × 6: Approx. 40% reduction)
2. The 4-in-1 configuration integrates four elements in a SOP8 package and is intended for controlling ultra-compact brushed DC motors. (Size comparison with SOP8 × 2: Approx. 50% reduction)

推荐应用 Suggested Applications

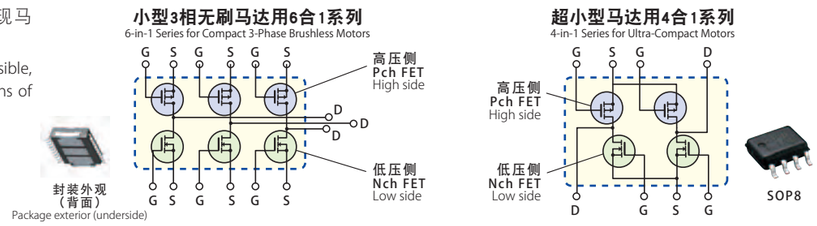
用于发动机辅助控制马达（排气循环、水循环、油循环）等的3相无刷马达（6合1系列）。后视镜角度调整马达（4合1系列）

Three-phase brushless motors used as engine auxiliary control motors (for exhaust gas circulation, water circulation, oil circulation), etc. (6-in-1 Series), mirror angle adjustment motors (4-in-1 Series)

用户优势 Advantages for Customers

可高密度安装，因此有助于实现马达的机电一体化。

Since a high mounting density is possible, the electrical and mechanical portions of the motor can be integrated easily.



6合1系列 功率MOSFET产品系列 6-in-1 Series Power MOSFET Lineup

外形 Package	品名 Type No.	极性 Polarity	最大额定值 Maximum Rating V_{DSS} (V)	V_{GSS} (V)	I_D (A)	Pch (W)	VGS(off) (V)	RDS (on) (mΩ) VGS=10V typ.	VGS=10V max.	VGS=4.5V typ.	VGS=4.5V max.	备注 Remarks
HSOP20 6 in 1	RJM0404JSC	Nch	40	±20	20	45	1.0～2.5	17	21	24	34	
		Pch	-40		-20			34	42	48	68	
	RJM0603JSC	Nch	60	±20	20	45	1.0～2.5	16	20	21	32	
		Pch	-60		-20			32	40	42	64	

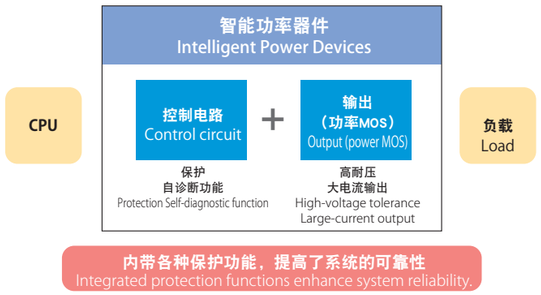
4合1系列 功率MOSFET产品系列 4-in-1 Series Power MOSFET Lineup

外形 Package	品名 Type No.	极性 Polarity	最大额定值 Maximum Rating V_{DSS} (V)	V_{GSS} (V)	I_D (A)	Pch (W)	VGS(off) (V)	RDS (on) (mΩ) VGS=10V typ.	VGS=10V max.	VGS=4.5V typ.	VGS=4.5V max.	备注 Remarks
SOP-8 4 in1	RJM0306JSP MOS1	Nch	30	±20	3.5	1.5	1.0～2.5	55	70	75	110	
	MOS2	Pch		±20	-3.5		1.0～2.5	75	100	120	180	

智能功率器件（IPD）
Intelligent Power Devices

智能功率器件为功率MOS、保护电路和监控输出三合一封装的车载用功率器件。实现了小型、轻量化，并提高了可靠性。

Designed for use as automotive power devices, intelligent power devices combine a power MOS, protection circuit, and monitor output in a single package. This enables more compact size, lighter weight, and improved reliability.



通过发动机控制、车体控制/安全控制2大系统，加速开发进程 Engine Control and Body/Safety Control: Accelerated Development of Two Types of Systems

为使本公司提供的智能功率器件最适于发动机控制所需的EUC小型化、可直接安装至发动机，以及车体控制/安全控制所需的组件小型轻量化、节能化、继电器的电子化等各种需求，将开发工艺分为发动机控制和车体控制/安全控制2大体系进行产品开发。

在发动机控制方面，需要螺线管等驱动元件内带保护功能的产品。对此，本公司发布了用于驱动燃油喷射（喷射器）的130伏（V）行业最高耐压产品。采用本产品可对缸体内的燃油喷射量进行细微控制，因此可减少油耗与排气量。

在车体控制/安全控制方面，需要替换机械继电器的大电流/低导通电阻产品。本公司率先在日本发布了MCP（多芯片封装）产品。该产品由功率芯片与控制芯片2块芯片构成，从而实现了性能与价格方面的双赢。

近年来，随着功率MOSFET的高性能化发展，半导体在车载用途上的应用范围也越来越广。以往在几十安（A）类的车载应用中，考虑到价格等因素，机械继电器被大量使用。将其更换成智能功率器件，可实现小型轻量化，并提高可靠性。

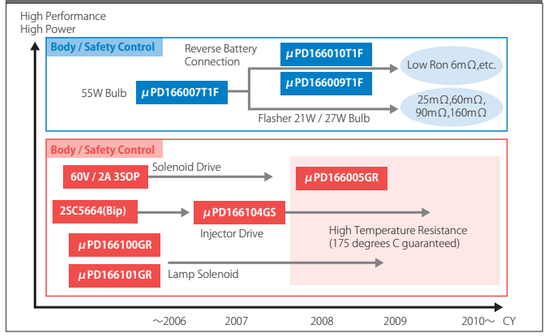
Renesas Electronics develops intelligent power device products with an emphasis on two types of systems: engine control and body/safety control. This enables us to focus on features needed for engine control, such as EUC compactness and direct mounting on the engine housing, as well as features needed for body/safety control, such as unit compactness and lightness, energy efficiency, and use of electronic relays.

In the area of engine control, there is demand for products that provide integration of protection functions in drive elements for solenoids, etc. Renesas Electronics has released fuel injector driver products with a voltage tolerance of 130 V, the highest in the industry. They make possible extremely precise control of the volume of fuel injected into the cylinder, contributing to improved fuel efficiency and reduced emissions.

In the area of body/safety control, there is demand for products with large-current and low on-resistance specs to replace mechanical relays. Renesas Electronics was one of the first in Japan to release multichip package (MCP) products to meet this need. They combine a power chip and control chip in a single package to deliver excellent performance and economy.

As the performance of power MOSFETs has improved in recent years, the use of semiconductor devices has expanded to include a wider range of automotive applications. In the past, partly due to economic reasons, mechanical relays were generally used in automotive applications requiring the ability to handle currents of several tens of amperes. By using intelligent power devices instead, systems can be made more compact and lightweight, and more reliable as well.

产品系列 Product Lineup



产品一览表 List of Products

Device	VDSS	IL(LIM) Amps.	RDS(ON) mOhm	PD Watts	Channel	Package
μPD166100GR	40	1.0	160	2.0	1ch	8pinSOP
μPD166101GR	40	1.0/ch	160	2.0	2ch	8pinSOP
μPD166104GR	100	1.7/ch	90	2.0	2ch	20pinSOP
μPD166005GR	60	2.0	100	1.8	1ch	8pinSOP
μPD166007T1F	36	5 to 10	10	59	1ch	TO-252 5pin
μPD166009T1F, μPD166010T1F	40	5 to 10	10	59	1ch	TO-252 5pin

http://cn.renesas.com/products/discrete/ipd/index.jsp　http://hk.renesas.com/products/discrete/ipd/index.jsp

热敏FET Thermal FETs
内置过热保护电路的功率MOSFET Power MOSFETs with Integrated Overheating Protection Circuit

特点 Features

●内置过热断路功能（Tch=150℃及以上时切断电流）
●自行保持断路功能（锁存型）/
　准备自行复位（温度滞后型）
●适用于低压侧 / 高压侧任意驱动方式

・Integrated overheating shutoff function (current shutoff when Tch = 150°C or higher)
・Shutoff function either self-holding (latch) or self-recovering (temperature hysteresis)
・Suitable for either low-side or high-side drive

主要用途 Main Applications

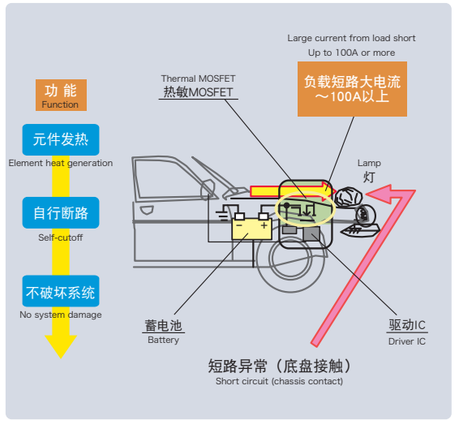
●汽车用电子设备
　（灯驱动、代替继电器、各种执行器驱动）

・Automotive electronic equipment (lamp drive, relay replacement, actuator drive)

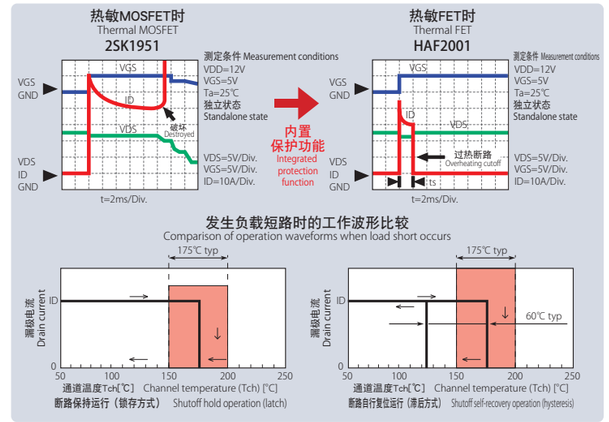
用户优势 Advantages for Customers

● 对于负载短路事故可防止破坏元件　● Protection from element destruction due to load shorts

热敏FET的功能 Thermal FET Function



热敏FET的过热断路特性 Thermal FET Overheating Shutoff Characteristics



第2代热敏FET系列 2nd Generation Thermal FET Series

外形 Package	型号 Part No.	极性 Polarity	最大额定值 Maximum Rating VDSS (V)	VGSS (V)	ID (A)	Pch (W)	RDS (on) (mΩ) VGS=10V{5V} typ.	VGS=10V{5V} max.	VGS=4V(6V)[4.5V] typ.	VGS=4V(6V)[4.5V] max.	断路温度 Typ. Shutoff temp.	断路时保持方式 Shutoff hold type	备注 Remarks
LDPAK	HAF2017	Nch	60	+16 -2.5	20	50	27	43	[35]	[53]	175℃	锁存 Latch	
TO-220FM	HAF2005				40	30	15	20	25	33	175℃	锁存 Latch	
LDPAK	HAF2011				40	50	15	20	25	33	175℃	锁存 Latch	
TO-220AB	HAF2014				40	50	15	20	25	33	175℃	锁存 Latch	
DPAK	HAF2007				5	20	55	75	73	120	175℃	锁存 Latch	
LDPAK	HAF2021				50	100	8	12	(9.5)	(15)	175℃	锁存 Latch	
SOP-8	HAF2015RJ				2	1.5	110	160	130	200	175℃	滞后 Hysteresis	带2个元件 2 elements
	HAF2026RJ				1	1.5	150	210	{200}	{300}	175℃	锁存 Latch	带2个元件 2 elements
LDPAK	HAF2027				50	100	7.7	10	10	15	175℃	锁存 Latch	
SOP-8	HAF1010RJ	Pch	-60	-16 +2.5	-5	2.5	140	200	200	340	175℃	锁存 Latch	
DPAK	HAF1004				-5	20	140	200	200	340	175℃	锁存 Latch	
LDPAK	HAF1008				-20	50	42	54	60	80	175℃	锁存 Latch	
	HAF1009				-40	50	22	27	33	50	175℃	锁存 Latch	

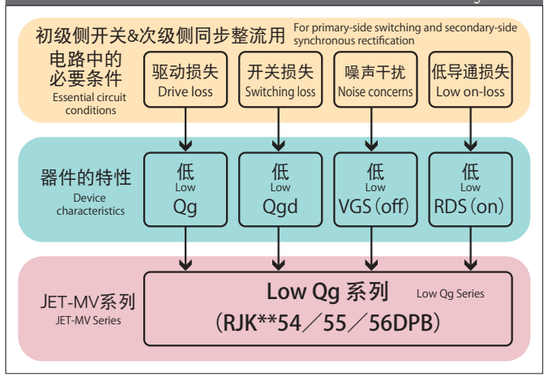
第3代沟槽型热敏FET系列 3rd Generation Trench-Type Thermal FET Series

外形 Package	型号 Part No.	极性 Polarity	最大额定值 Maximum Rating VDSS (V)	VGSS (V)	ID (A)	Pch (W)	RDS (on) (mΩ) VGS=10V{5V} typ.	VGS=10V{5V} max.	VGS=6V typ.	VGS=6V max.	断路温度 Typ. Shutoff temp.	断路时保持方式 Shutoff hold type	备注 Remarks
LDPAK	RJE0601JPE	Pch	-60	-16 +2.5	-40	50	22	27	27	45	175℃	锁存 Latch	
LDPAK	RJE0603JPE				-50	100	12	15	16	30	175℃	锁存 Latch	
DPAK	RJE0605JPD				-10	30	58	75	75	110	175℃	锁存 Latch	
	RJE0609JPD				-4	30	79	100	102	170	175℃	锁存 Latch	
SOP-8	RJE0607JSP				-1.5	1.5	140	260	185	380	175℃	锁存 Latch	带2个元件 2 elements
	RJF0615JSP				-10	2.5	53	65	70	95	175℃	锁存 Latch	带1个元件 1 elements
	RJE0616JSP				-4	2.5	77	90	102	150	175℃	锁存 Latch	带1个元件 1 elements

对于伺服器和通信用高性能电源而言，低损失化是解决发热问题的重要课题。
40V～100V的中耐压范围中，瑞萨备有低Qg且耐压种类丰富的产品系列。
这显著改善了性能指数（FOM）。

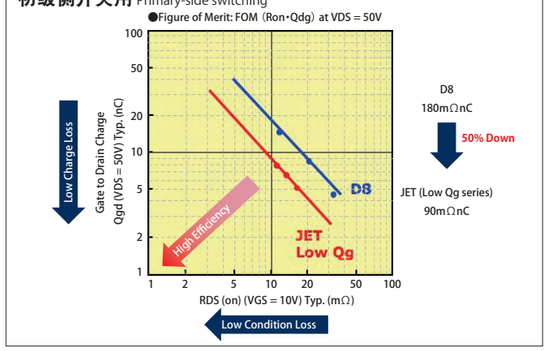
Reducing power loss is a key issue in overcoming problems related to heat generation in high-performance power supplies for computer servers and communication equipment. Renesas Electronics supplies a wide range of low-Qg power MOSFET products in the medium-voltage range (40V to 100V). They provide significantly improved performance (FOM) as well.

JET中压系列的多样性 Diversification of JET Middle Voltage Series



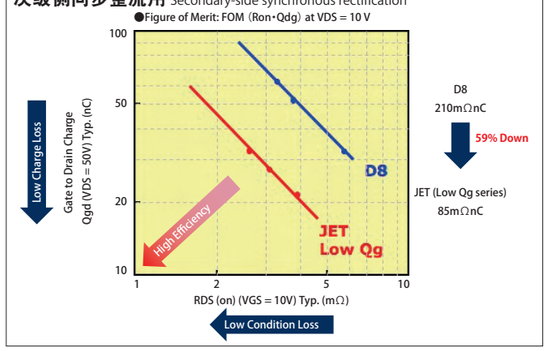
低电容（Qg）JET中压（VDSS=100V） Low-Capacitance (Qg) JET Middle Voltage (VDSS = 100V)

初级侧开关用 Primary-side switching



JET中压系列的多样性 Diversification of JET Middle Voltage Series

次级侧同步整流用 Secondary-side synchronous rectification



低电容（Qg）第11代中压产品系列（低-最大额定值） Low-Capacitance (Qg) 11th Generation Middle Voltage Lineup

主要应用： DC/DC电源、马达驱动用及蓄电池控制用等。
- 特点： 低Qg（低电容） & Qdg（低开关损失）
高驱动电压（高抗噪声性）

Main applications: DC/DC power supplies, motor drive, battery control, etc.
• Features: Low Qg and Qdg (low switching loss)
High drive voltage (high noise tolerance)

Type No.	Max. ratings				VGS(off) (V) min-max	RDS (on) (mΩ) VGS=10V		Qdg (nC)	Qg (nC)
	VDSS (V)	VGSS (V)	ID (A)	P-ch (W)		typ.	max.	VGS=10V	
RJK0454DPB	40	±20	40	55	2.0～4.0	3.9	4.9	3.2	22
RJK0455DPB			45	60	2.0～4.0	3.1	3.8	4.1	27
RJK0456DPB			50	65	2.0～4.0	2.6	3.2	4.9	33
RJK0654DPB	60		30	55	2.0～4.0	6.5	8.3	3.3	22
RJK0655DPB			35	60	2.0～4.0	5.3	6.7	4.2	28
RJK0656DPB			40	65	2.0～4.0	4.5	5.6	5.0	34
RJK0854DPB	80		25	55	2.0～4.0	10	13	5.0	30
RJK0855DPB			30	60	2.0～4.0	8.2	11	6.3	37
RJK0856DPB			35	65	2.0～4.0	6.9	8.9	7.6	45
RJK1054DPB	100		20	55	2.0～4.0	17	22	5.1	30
RJK1055DPB			23	60	2.0～4.0	13	17	6.5	38
RJK1056DPB			25	65	2.0～4.0	11	14	7.8	45

可适用于电动工具的大电流、低导通电阻马达驱动用MOSFET
Motor drive MOSFETs with low on-voltage and large-current handling for applications such as power tools

特点 Features

●ID=100A(DC)，也可适用于电动工具
●新增 VDSS=40V/60V 产品，适用的输入电压范围更宽
●独立封装型(TO－220/262)和表面安装封装

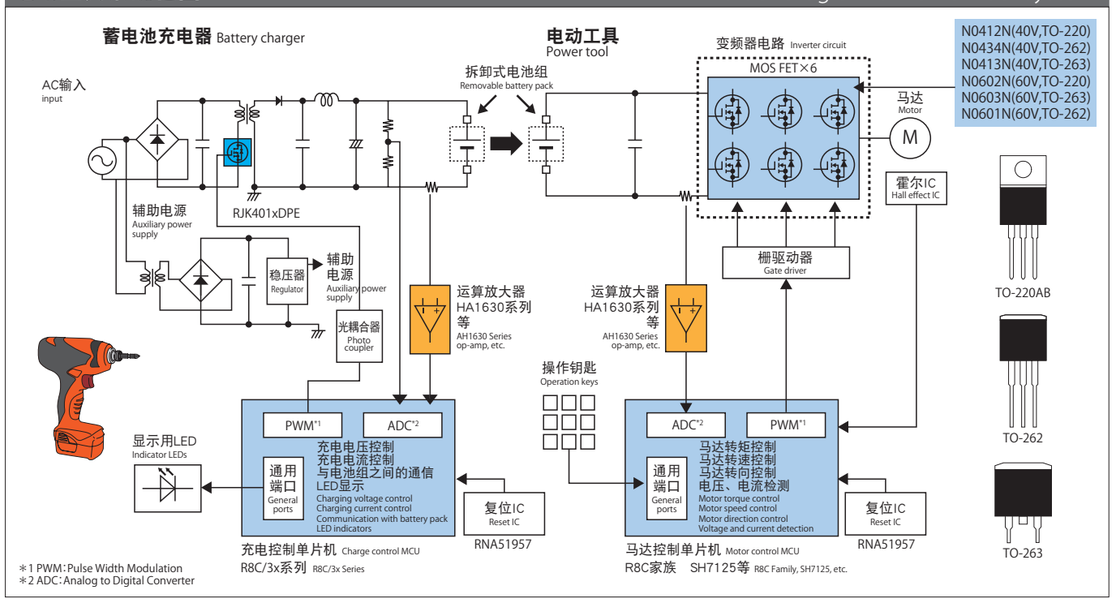
- Large-current handling sufficient for power tools, ID = 100A (DC)
- VDSS = 40V/60V product lineup to accommodate wide range of input voltages
- Standalone (TO-220/TO262) and surface-mount (TO-263) packages available

目标领域 Target fields

●无刷马达单元
●电动工具开关
●有刷马达单元

- Brushless motor units
- Power tool switches
- Brushed motor units

电动工具系统框图 Block Diagram of Power Tool System



产品一览表 Product Lineup

Parts No.	PKG	VDSS (V)	VGSS (V)	ID (A)	Rds(on)[mΩ]@10V Typ.	Rds(on)[mΩ]@10V Max.	Qg [nC]	Ciss [pF]
N0412N	TO-220	40	±20	±100	3.0	3.7	97	6000
N0434N	TO-262	40	±20	±100	3.0	3.7	97	6000
N0413N	TO-263	40	±20	±100	2.7	3.3	97	6000
N0602N	TO-220	60	±20	±100	3.6	4.6	148	8000
N0603N	TO-262	60	±20	±100	3.6	4.6	148	8000
N0601N	TO-263	60	±20	±100	3.3	4.2	148	8000

注）本产品现处于开发阶段，电气特性及具体日程等变更恕不另行通知。
Note: This product is under development. The electrical characteristics or schedule may be subject to change without notice.

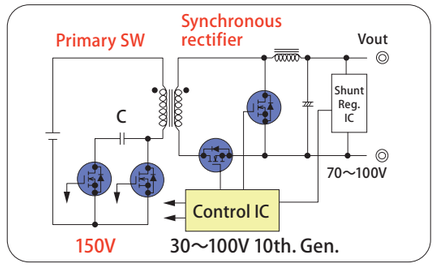
中高耐压MOSFET概要

Overview of Medium- and High-Voltage MOSFETs

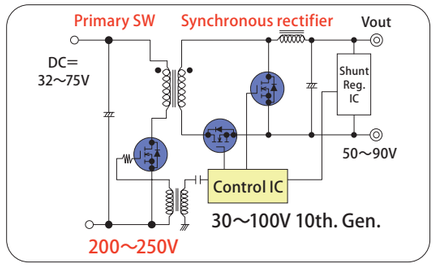
150V以上的耐压功率MOSFET虽被归类于中高耐压用功率MOSFET，但也适用于绝缘型DC/DC转换器的初级侧及AC/DC转换器的初级侧和次级侧。
除以往的平面型外，还新增了沟槽型结构系列，从而进一步推进产品的高性能化进程。

Our power MOSFETs with a voltage tolerance of 150V or more are classified as medium- and high-voltage MOSFETs. They are used in the primary side of insulated DC/DC converters and in the primary or secondary side of AC/DC converters. In addition to conventional planar MOSFETs, trench MOSFETs are available for even better performance.

代表电路示例 Typical Circuit Example



有源箝位电路方式
Active clamp circuit



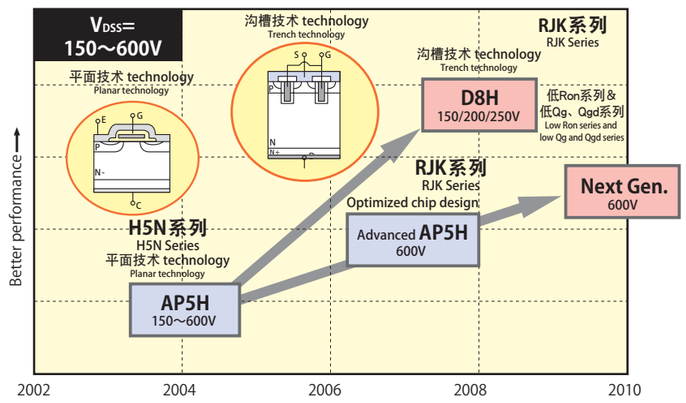
单端正激式变换电路方式
Single-ended forward converter circuit

中高耐压功率MOSFET的特点
Features of Medium- and High-Voltage Power MOSFETs

- 超低导通电阻、大电流产品齐全
  -RJK2511DPK：250V, 65A, 34mΩ, TO-3P
  -RJK4018DPK：400V, 43A, 100mΩ, TO-3P
  -RJK5020DPK：500V, 40A, 115mΩ, TO-3P
  -RJK6020DPK：600V, 32A, 175mΩ, TO-3P
- 低门控充电（低Qg）
- 确保抗雪崩击穿
- 内置二极管高抗破坏性

- Ultra-low on-resistance and large-current products available
  – RJK2511DPK: 250V, 65A, 34mΩ, TO-3P
  – RJK4018DPK: 400V, 43A, 100mΩ, TO-3P
  – RJK5020DPK: 500V, 40A, 115mΩ, TO-3P
  – RJK6020DPK: 600V, 32A, 175mΩ, TO-3P
- Low gate charge (low Qg)
- Guaranteed avalanche tolerance
- Integrated diode with high breakdown tolerance

中高耐压功率MOSFET发展图
Medium- and High-Voltage Power MOSFET Roadmap



低导通电阻系列 Low on-state Resistance

封装 Package	型号 Part No.	VDSS (V)	ID (A)	RDS (on) Max. (Ω)	Ciss Typ.(pF)	Qg Typ.(nC)	Qgd Typ.(nC)
WPAK	RJK1555DPA	150	25	0.048	2400	38	10.2
	RJK2055DPA	200	20	0.069	2400	38	9.0
	RJK2555DPA	250	17	0.104	2400	39	10.5

低电容系列 High Speed Switching

封装 Package	型号 Part No.	VDSS (V)	ID (A)	RDS (on) Max. (Ω)	Ciss Typ.(pF)	Qg Typ.(nC)	Qgd Typ.(nC)
WPAK	RJK1557DPA	150	25	0.058	1250	20	5
	RJK2057DPA	200	20	0.085	1250	19	5.3
	RJK2557DPA	250	17	0.128	1250	20	5.9

中高耐压MOSFET产品系列

Medium- and High-Voltage MOSFET Lineup

150～600V 功率MOS FET产品系列（小型封装&表面安装）
150V to 600V Power MOSFET Lineup (Small Package and Surface-mount type)

封装 Package	型号 Part No.	VDSS [V]	ID [A]	RDS (on) Max. [Ω]	Ciss Typ. [pF]
TO-92	2SK4151	150	1	1.95	98
	2SK4150	250	0.4	5.7	80
	HS54095	600	0.15	25	50
	HS54097		0.2	16.5	66
TO-92MOD	2SK4093	250	1	2.6	140
	RJK6011DJE	600	0.1	52	25
	RJK6022DJE		0.2	15	84
	HS56021		0.2	15	84
MP-3A (SMD)	RJK4006DPD	400	8	0.8	650
	RJK5003DPD	500	5	1.5	550
	RJK5006DPD		7	1.3	650
	RJK6002DPD	600	2	6.8	160
	RJK6023DPD		0.15	25	240
	RJK6024DPD		0.4	42	TBD
	RJK6025DPD		0.8	20	TBD
LDPAK-S (SMD)	RJK2006DPE	200	40	0.059	1800
	RJK4012DPE	400	15	0.41	1120
	RJK4013DPE		17	0.3	1470
	RJK4512DPE	450	14	0.51	1100
	RJK4513DPE		16	0.38	1440
	RJK5012DPE	500	12	0.62	1100
	RJK5013DPE		14	0.465	1470
	RJK6026DPE	600	5	2.4	440
	RJK6012DPE		10	0.92	1100
	RJK6024DPE		0.4	42	TBD
	RJK6025DPE		0.8	20	TBD
	RJK6013DPE		11	0.7	1470

250～600V内置高速二极管产品系列
250V to 600V with Integrated High-Speed Diode Lineup

封装 Package	型号 Part No.	VDSS [V]	ID [A]	RDS (on) Max. [Ω]	Ciss [pF]
TO-220FN （全塑封） (Full mold)	H5N2512CF	250	18	0.105	2200
	H5N3007CF	300	15	0.16	2180
TO-220FN （全塑封） (Full mold)	H5N2522FN	250	12	0.21	1300
	RJL5012DPP	500	12	0.7	1050
	RJL5013DPP		14	0.51	1400
	RJL6012DPP	600	10	1.1	1050
	RJL6013DPP		11	0.81	1400
	RJL6014DPP		15	0.635	1680
TO-3P	H5N2507P	250	50	0.055	5000
	H5N3008P	300	40	0.069	5150
	RJL5020DPK	500	38	0.14	TBD
	RJL6020DPK	600	30	0.21	TBD

400～600V产品系列 独立（3管脚）封装
400V to 600V Lineup (Standalone (3-Pin) Package)

封装 Package	型号 Part No.	VDSS [V]	ID [A]	RDS (on) Max. [Ω]	Ciss [pF]
TO-220FN （全塑封） (Full mold)	RJK4007DPP	400	7.6	0.55	850
	RJK5026DPP	500	6	1.75	450
	RJK5012DPP		12	0.62	1100
	RJK5013DPP		14	0.465	1470
	RJK5014DPP		19	0.38	1800
	RJK5009DPP		20	0.3	2600
	RJK6026DPP	600	5	2.4	440
	RJK6012DPP		10	0.92	1100
	RJK6013DPP		11	0.7	1470
	RJK6014DPP		16	0.575	1800
TO-3PFM	RJK2009DPM	200	40	0.036	2900
	RJK5015DPM	500	25	0.24	2600
	RJK6015DPM	600	21	0.36	2600
TO-3P	RJK2508DPK	250	50	0.064	2600
	RJK2511DPK		65	0.034	4900
	RJK4014DPK	400	24	0.24	1820
	RJK4015DPK		30	0.165	2600
	RJK4018DPK		43	0.1	4100
	RJK4514DPK	450	22	0.3	1820
	RJK4515DPK		27	0.2	2600
	RJK4518DPK		39	0.13	4100
	RJK5013DPK	500	14	0.465	1470
	RJK5014DPK		19	0.38	1800
	RJK5015DPK		25	0.24	2600
	RJK5018DPK		35	0.155	4100
	RJK5020DPK		40	0.118	5150
	RJK6014DPK	600	16	0.575	1800
	RJK6015DPK		21	0.36	2600
	RJK6018DPK		30	0.235	4100
	RJK6020DPK		32	0.175	5150

晶闸管、双向晶闸管概要

Overview of Thyristors and TRIACs

晶闸管、双向晶闸管导通后的特性与二极管基本相同，会显示恒压降，因此在处理大电流开/关的应用中可进行高效控制，应用领域十分广泛汇集了。各具特色的瑞萨晶闸管、双向晶闸管产品群在各自的应用领域中，一直保持着较高的市场占有率。

The basic characteristic of thyristors and TRIACs is a constant voltage drop in the signal passing through them, as with diodes. They provide highly efficient control in applications requiring on/off switching of large currents, and are used in a wide range of fields. Renesas Electronics supplies a variety of thyristor and TRIAC products with distinctive characteristics and maintains a high market share in many application areas.

瑞萨晶闸管/双向晶闸管的特点　Features of Renesas Electronics Thyristors and TRIACs

●推广确保结温150℃的产品（600V/700V/800V）
- LB/LC/LD/LG系列

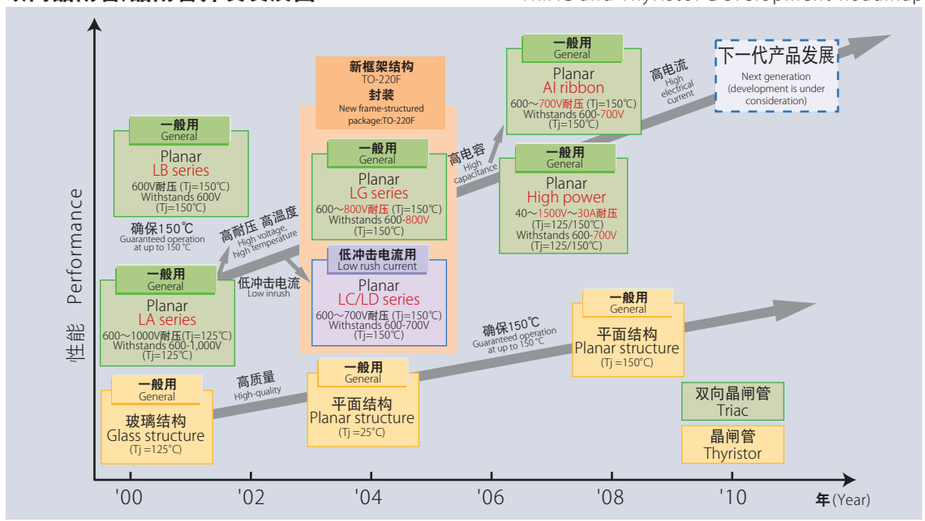
●种类丰富的系列产品
- TO-220采用全塑封外形，并通过UL认证
- TO-3P采用全塑封外形，为大电流产品
- 丰富的管脚成形形状

●根据用途推广最适合的产品
- 低冲击电流应用…LC/LD系列等

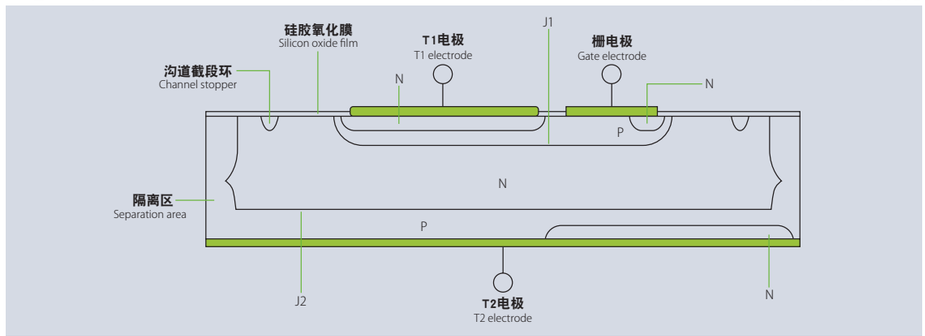
●高耐压产品的推广
- 700V、800V、1000V、1500V

- Products available with guaranteed junction temperature of 150°C (600V, 700V, 800V)
  - LB, LC, LD, and LG series
- Extensive lineup
  - TO-220 full molded package, UL approved
  - TO-3P full molded package, large-current specification
  - Many lead forming configurations available
- Products tailored to specific applications
  - For low-rush-current applications: LC and LD series, etc.
- High-current products available
  - 700V, 800V, 1,000V, 1,500V

双向晶闸管/晶闸管开发发展图　TRIAC and Thyristor Development Roadmap



平面结构　Planar structure



晶闸管、双向晶闸管的应用和特色

Applications and Characteristics of Thyristors and TRIACs

推广确保150℃的双向晶闸管系列　Development of 150℃ Triac Series

功能概要 Outline of functions

● 确保额定结温为150℃（以往确保125℃）
● 通过提高额定温度增强通电能力
● 采用平面结构

- Guaranty of rated junction temperature 150℃ (conventionally, 125℃ warranty)
- Expansion of current-carrying capacity by increase of rated temperature
- Adoption of planar structure

产品系列 Product line

● LB系列：BCRxxxx-xxLB
● LC系列：BCRxxxx-xxLC
● LD系列：BCRxxPM-xxLD
● LG系列：BCRxxPM-xxLG
● BCR2PM-12RE/14LE
● BCR3KM/5KM-12RB

- LB Series : BCRxxxx-xxLB
- LC Series : BCRxxxx-xxLC
- LD Series: BCRxxPM-xxLD
- LG Series: BCRxxPM-xxLG
- BCR2PM-12RE/14LE
- BCR3KM/5KM-12RB

商品特点 Selling point

●高温下的关闭电流小
采用平面结构，关闭电流比玻璃结构更小

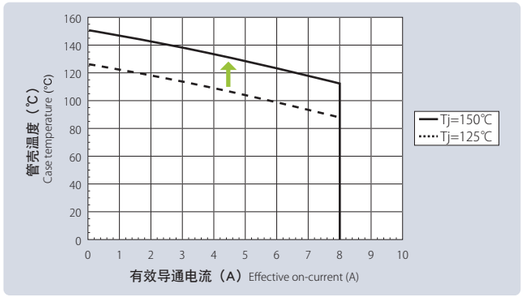
•Small amount of OFF-current at a high temperature
Planar structure enables smaller off-current than glass structure.

●热设计范围扩大→设计更为方便
例）设计范围为80%时，Tj=150×80%=120℃
（以往 Tj=125×80%=100℃）

•Expansion of thermal design margin→Increase in easiness of design
Ex.) At a design margin of 80%, Tj=150x 80%=120℃
(Conventionally, Tj=125×80%=100 ℃. Therefore, increase by 20℃)

通电能力的增强（ex.BCR8KM-12L）

Expansion of current-carrying capacity (ex.BCR8KM-12L)



●散热片的小型化……面积1/4
•Size-reduction of radiating fin: Footprint is reduced to 1/4.
例）BCR8KM：Ta=60℃、IT(RMS)=8A时，
Rth(f-a)=4.8℃/W(50cm²)（以往Rth(f-a)=2.3℃/W(200cm²)，
面积缩至1/4。）
Ex.) At BCR8KM Ta=60℃ and IT(RMS)=8A, Rth(f-a)=4.8 ℃/W(50cm²) (Conventionally, Rth(f-a)=2.3 ℃/W(200cm²). Therefore, the footprint is reduced to 1/4.)

●无需散热片
•Radiating fin is not required.
例）加热器控制在BCR3KM：Ta=80℃、AC100V/140W时，
→Tj=1.3W×50℃/W+80℃=145℃
Ex.) When the heater is controlled at BCR3KM Ta=80℃, and AC100V/140W, Tj=1.3W x 50℃/W+80℃=145℃.

●高可靠性 •High reliability

●可在高温下使用 •Usable at a high temperature

晶闸管、双向晶闸管产品系列
Thyristor/TRIAC Lineup

一般用双向晶闸管LG系列 General-Purpose TRIAC LG Series

•用途
洗衣机、吸尘器、电饭锅等的加热器控制、马达控制
•特点
1. 高可靠性：采用平面结构
2. 绝缘外形：TO-220FL 介电强度1800V 通过UL认证
3. 高温保证：确保150℃
4. 支持管脚成形

・Applications
Heater control and motor control in washing machines, vacuum cleaners, rice cookers, etc.
・Features
1) Highly reliable: Planar structure
2) Insulation configuration: TO-220FL, dielectric strength of 1,800V, UL approved
3) Guaranteed operation at high temperatures: Guaranteed up to 150°C
4) Support for lead forming

产品系列 Product Lineup

型号 Part No.	V_{DRMS} [V]	I_{TRMS} [A]	I_{TSM} [A]	I_{GT} (max.) [mA]	备注 Notes
BCR3LM-12LB	600	3	30	20	-
BCR3LM-12RB		3	30	15	
BCR5LM-12LB		5	50	20	
BCR5LM-12RB		5	50	15	
BCR8LM-12LB		8	80	30	
BCR10LM-12LB		10	100	30	
BCR12LM-12LB		12	120	30	
BCR16LM-12LB		16	160	30	
BCR3LM-14LB	700	3	30	30	适用于 V_{DRM}=800V Available V_{DRMS} 800 V (@Tj=125℃)
BCR5LM-14LB		5	50	30	
BCR8LM-14LB		8	80	30	
BCR12LM-14LB		12	120	30	
BCR16LM-14LB		16	160	30	

低冲击电流用双向晶闸管LD系列 Low-Rush-Current TRIAC LD Series

•用途
陶瓷加热器等低冲击电流用途
•特点
1. 高可靠性：采用平面结构
2. 绝缘外形：TO-220FL 介电强度2000V 通过UL认证
3. 高温保证：确保150℃
4. 高抗噪声性（IGT≦50mA）
5. 支持管脚成形

・Applications
Low-rush-current applications such as ceramic heaters
・Features
1) Highly reliable: Planar structure
2) Insulation configuration: TO-220FL, dielectric strength of 2,000V, UL approved
3) Guaranteed operation at high temperatures: Guaranteed up to 150°C
4) High noise tolerance (IGT ≦ 50mA)
5) Support for lead forming

产品系列 Product Lineup

型号 Part No.	V_{DRM} [V]	T_j [℃]	I_T (RMS) [A]	I_{TSM} [A]	I_{GT} (max.) [mA]	备注 Notes
BCR8LM-12LD	600	150	8	48	50	TO-220FL
BCR10LM-12LD		150	10	60	50	
BCR12LM-12LD		150	12	72	50	
BCR16LM-12LD		150	16	96	50	
BCR5LM-14LD	700	150	5	30	50	TO-220FL
BCR8LM-14LD		150	8	48	50	
BCR12LM-14LD		150	12	72	50	

一般用高耐压/大电容双向晶闸管 General-Purpose High-Voltage/High-Capacity TRIACs

•用途
防电源冲击电流电路、加热器控制、马达控制
•特点
1. 高可靠性：采用平面结构
2. 绝缘外形：TO-220F/TO-220FN/TO-3P/TO-3PF
3. 高耐压化：1000V、1500V
4. 大电流化：25A/30A@TO-220FN
5. 支持管脚成形

・Applications
Power supply rush-current prevention circuits, heater control, motor control
・Features
1) Highly reliable: Planar structure
2) Insulation configuration: TO-220F, TO-220FN, TO-3P, TO-3PF
3) High voltage tolerance: 1,000V, 1,500V
4) High current: 25A/30A @ TO-220FN
5) Support for lead forming

产品系列 Product Lineup

型号 Part No.	V_{DRMS} [V]	T_j [℃]	I_{TRMS} [A]	I_{TSM} [A]	I_{GT} (max.) [mA]	封装 Package
BCR30KM-8LB	600	150	30	300	30	TO-220FN
BCR16RM-12LB		150	16	160	30	TO-3PFN
BCR25KM-12LB		150	25	250	50	TO-220FN
BCR25RM-12LB		150	25	250	50	TO-3PFM
BCR30AM-12LA		125	30	300	50	TO-3P
BCR30AM-12LB		150	30	300	50	
BCR8PM-20LA	1000	125	8	80	30	TO-220F
BCR8KM-20LA		125	8	80	30	TO-220FN
BCR20RM-30LA	1500	125	20	200	50	TO-3PFM

一般用新TO-220FL封装 双向晶闸管 General-Purpose New TO-220FL Package TRIACs

•用途
洗衣机、吸尘器、电饭锅等的马达控制、加热器控制
•特点
1. 高可靠性：采用平面结构
2. 绝缘外形：TO-220FL、介电强度1800V 通过UL认证
3. 高温保证：确保150℃
4. 支持管脚成形

・Applications
Motor and heater control in washing machines, vacuum cleaners, rice cookers, etc.
・Features
1) Highly reliable: Planar structure
2) Insulated package: TO-220FL, 1,800V dielectric strength, UL approved
3) High-temperature guarantee: 150°C guaranteed
4) Suitable for lead forming

产品系列 Product Lineup

型号 Part No.	VDRM (V)	IT(RMS) (A)	ITSM (A)	IGT(MAX.) (mA)	状态 Status ES	状态 Status MP	备注 Note
BCR3LM-12LB	600	3	30	20	OK	OK	–
BCR3LM-12RB		3	30	15	OK		
BCR5LM-12LB		5	50	20	OK		
BCR5LM-12RB		5	50	15	OK		
BCR8LM-12LB		8	80	30	OK		
BCR10LM-12LB		10	100	30	OK		
BCR12LM-12LB		12	120	30	OK		
BCR16LM-12LB		16	160	30	OK		
BCR3LM-14LB	700	3	30	30	OK	OK	适用于 VDRM=800V Available VDRMS 800V (@Tj=125℃)
BCR5LM-14LB		5	50	30	OK		
BCR8LM-14LB		8	80	30	OK		
BCR12LM-14LB		12	120	30	OK		
BCR16LM-14LB		16	160	30	OK		

一般用晶闸管 General-Purpose Thyristors

•用途
加热器控制、点火器、稳压器、马达控制
防冲击电流电路（开关电源、变频照明、变频器）
•特点
1. 结温：110℃、125℃
2. 支持IGT项目
3. 支持管脚成形

・Applications
Heater control, igniters, regulators, motor control, inrush current protection circuits (switching power supplies, inverter lighting fixtures, inverters)
・Features
1) Junction temperature: 110°C, 125°C
2) IGT item support
3) Suitable for lead forming

产品系列 Product Lineup

型号 Part No.	VDRM (V)	Tj (℃)	IT(AV) (A)	ITSM (A)	IGT(MAX.) (mA)	状态 Status ES	状态 Status MP	封装 Package
CR02AM-8	400	125	0.3	10	0.1	OK	OK	TO-92
CR02AM-8		125	0.3	10	0.1	OK	OK	TO-92(3)
CR05AS-8		125	0.5	10	0.1	OK	OK	UPAK
CR05BS-8		125	0.1	10	0.1	OK	OK	MPAK
CR04AM-12	600	125	0.4	10	0.1	OK	OK	TO-92
CR05AM-12		110	0.3	10	0.1	OK	OK	
CR03AM-12		110	0.3	20	0.1	OK	OK	
CR05BM-12		125	0.5	8	0.1	OK	OK	
CR08AS-12		125	0.8	10	0.1	OK	OK	UPAK
CR5AS-12		125	5	90	0.1	OK	OK	MP-3A
CR5AS-12		125	5	90	0.1	OK	OK	DPAK(L)-(3)
CR3KM-12		125	3	70	0.1	OK	OK	TO-220FN
CR6KM-12A		125	6	90	10	OK	OK	
CR8KM-12A		125	8	120	15	OK	OK	
CR3PM-12		125	3	70	0.1	OK	OK	TO-220F
CR6KM-12A		125	6	90	10	OK	OK	
CR8PM-12A		125	8	120	15	OK	OK	
CR12PM-12A		125	12	360	30	OK	OK	
CR6CM-12A		125	6	90	10	OK	OK	TO-220
CR8CM-12A		125	8	120	15	OK	OK	
CR12CM-12A		125	12	360	30	OK	OK	
CR05AM-16	800	110	0.3	10	0.1	OK	OK	TO-92
CR03AM-16		110	0.3	20	0.1	OK	OK	

确保150℃的平面结构晶闸管 150°C Guaranteed Planar Thyristors

•用途
加热器控制、点火器、稳压器、马达控制防冲击电流电路
（开关电源、变频照明、变频器）
•特点
1. 高可靠性：采用平面结构
2. 确保150℃：设计余量增加
3. 支持管脚成形
•优点
- 可靠性提高
- 热容限增加
- 散热片尺寸缩小
- 可在高温环境下使用

・Applications
Heater control, igniters, regulators, motor control, inrush current protection circuits (switching power supplies, inverter lighting fixtures, inverters)
・Features
1) Highly reliable: Planar structure
2) 150°C guaranteed: Greater design margin
3) Suitable for lead forming
・Key points
- Improved reliability
- Larger thermal margin
- Smaller heat sink
- Suitable for use in high-temperature environments

产品系列 Product Lineup

型号 Part No.	VDRM (V)	Tj (℃)	IT(AV) (A)	ITSM (A)	IGT(MAX.) (mA)	状态 Status ES	状态 Status MP	封装 Package
CR6CM-12B	600	150	6	90	10	OK	OK	TO-220
CR8CM-12B			8	120	15	OK	OK	
CR12CM-12B			12	360	30	OK	OK	
CR6PM-12B			6	90	10	OK	OK	TO-220F
CR8PM-12B			8	120	15	OK	OK	
CR12PM-12B			12	360	30	OK	OK	
CR25RM-12D			25	360	30	OK	OK	TO-3PFM

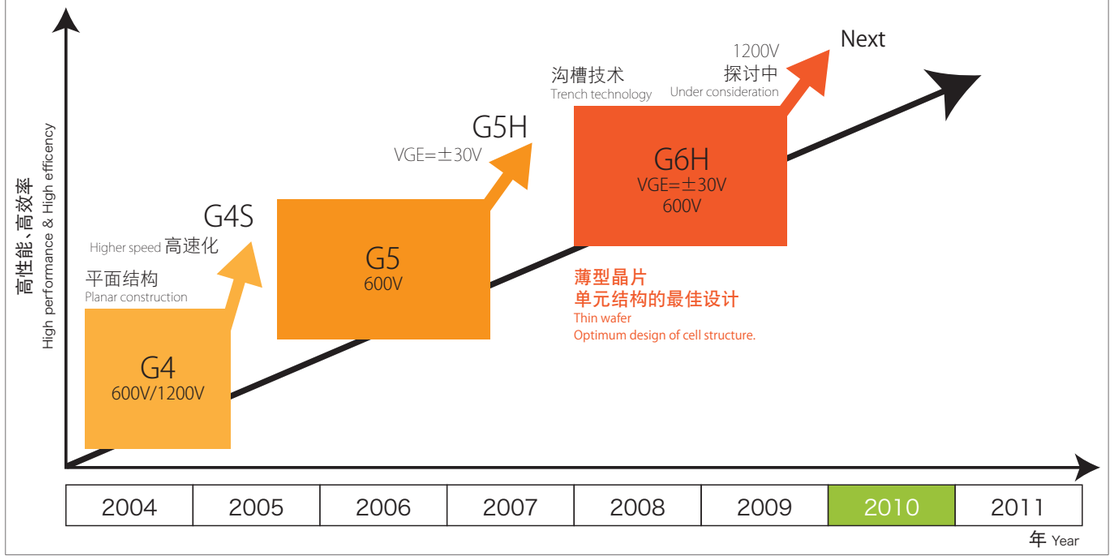
瑞萨IGBT的概要

Overview of Renesas Electronics IGBTs

瑞萨备有为用于DSC及手机内置闪光灯的超小型高性能IGBT、PDP等各类应用而量身打造的IGBT。此外，也备有最适于PFC等电源电路的大电容IGBT产品系列，将其与本公司的PFC控制器组合使用，则可实现高效的电源电路。

Renesas Electronics supplies ultracompact, high-performance IGBTs for built-in flash units for digital still cameras and mobile phones, as well as specialized IGBTs for applications such as plasma display panels. Our product lineup also includes large-capacity IGBTs for power supply circuits such as PFCs. Highly efficient power supply circuits can be achieved by combining Renesas Electronics IGBTs and PFC controllers.

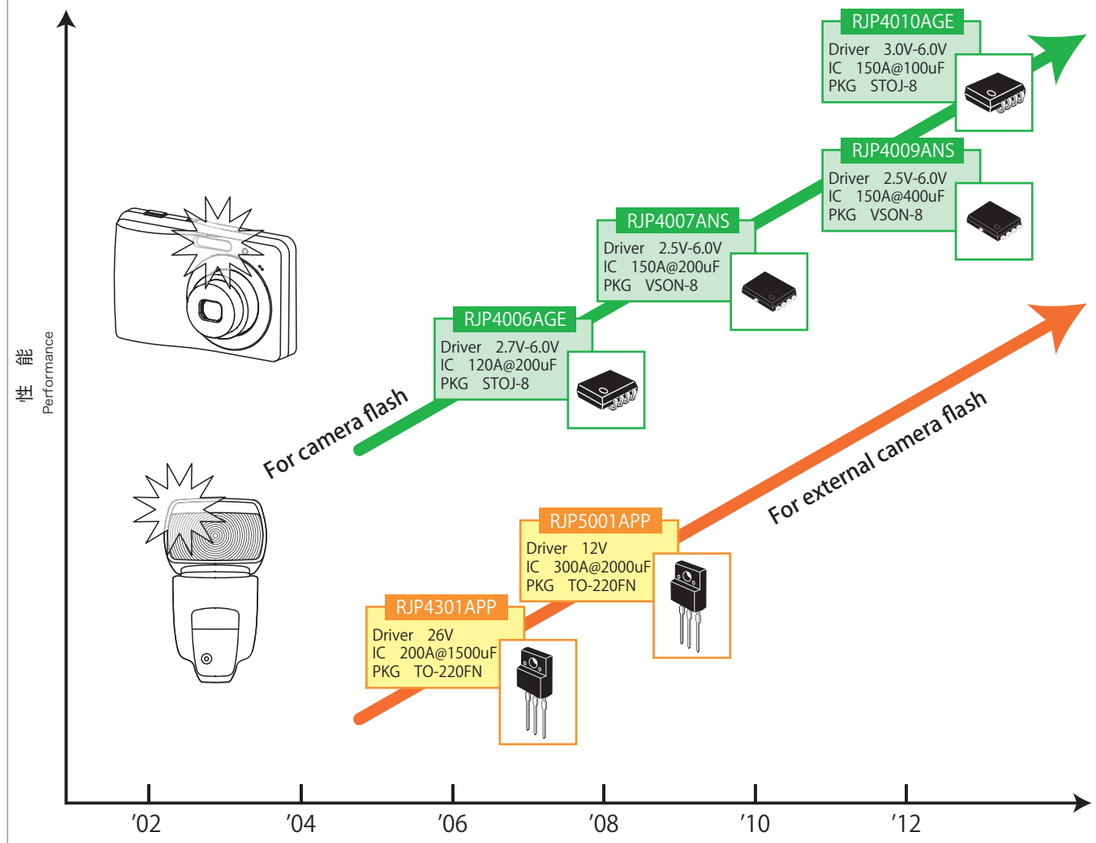
IGBT开发发展图 Development Roadmap of IGBTs



IH厨房用具 IH Kitchen Appliances		高输出低损失化 全金属化 High Output, Low Loss, All Metal	沟槽高速IGBT 内置FRD复合产品 High-Speed Trench IGBTs Composite Products with FRD
变频器 Inverters		高频工作 高抗短路性 High-Frequency Operation, High Short Circuit Tolerance	高抗短路性HiGT** 内置高速FRD*复合产品 HiGT** with High Short Circuit Tolerance Composite Products with High-Speed FRD*
PFC电路 PFC Circuits		大电流化 高效率化 Large Current, High Efficiency	超高速IGBT 内置高速FRD*复合产品 Ultra-High-Speed IGBTs Composite Products with High-Speed FRD*
平面电视 Flat Screen TVs		面板亮度提高 小功耗化 Increased Panel Brightness, Low Power Consumption	新一代沟槽IGBT 内置FRD*复合产品 Next-Generation Trench IGBTs Composite Products with FRD*
闪光灯 Camera Flash Units		大电流化 小型化 Large Current, Small Size	沟槽IGBT VSON-8 Trench IGBTs VSON-8

*Fast recovery diode

闪光灯用IGBT开发发展图 Development Roadmap for IGBTs for Camera Flash Applications



瑞萨闪光灯用IGBT产品系列 Product Lineup of IGBTs for Camera Flash Applications

型号 Part No.	最大额定值 Maximum Ratings			封装 Package
	V_{CES}[V]	I_{CP}[A]	Drive[V]	
CY20AAJ-8H(注)	400	130	4.0	SOP-8
RJP4301APP **(注)	400	200	30.0	TO-220FN
RJP5001APP **(注)	400	300	12.0	TO-220FN
RJP4006AGE	400	120	2.7-6.0	TSOJ-8
RJP4007ANS	400	150	2.5-6.0	VSON-8
RJP4009ANS **	400	150	2.5-6.0	VSON-8
RJP4010AGE **	400	150	3.0-6.0	TSOJ-8

** ：开发中 Under Development Note: High frequency type

闪光灯用IGBT

IGBTs for Camera Flash Applications

闪光灯用IGBT新产品介绍 New IGBT Products for Camera Flash Applications

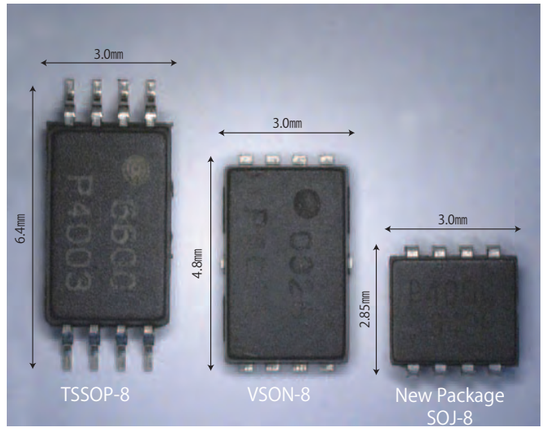
●型号
1. VSON-8封装：RJP4009ANS
2. TSOJ-8封装：RJP4010AGE

●特点
1. 超小型封装（TSOJ-8：尺寸：3.05×2.85mm）
2. 驱动电压无限制（2.7V（3.0V）～6.0V）
3. 高抗静电性（内置栅齐纳Di）
4. 完全无铅&不含卤素

● Part No.
1. VSON-8 package: RJP4009ANS
2. TSOJ-8 package: RJP4010AGE

● Features
1. Ultra-compact package (TSOJ-8 size: 3.05mm × 2.85mm)
2. Range of drive voltages (2.7V (3.0V) to 6.0V)
3. High electrostatic tolerance (integrated gate Zener diode)
4. Completely lead and halogen free

开发中 Under development

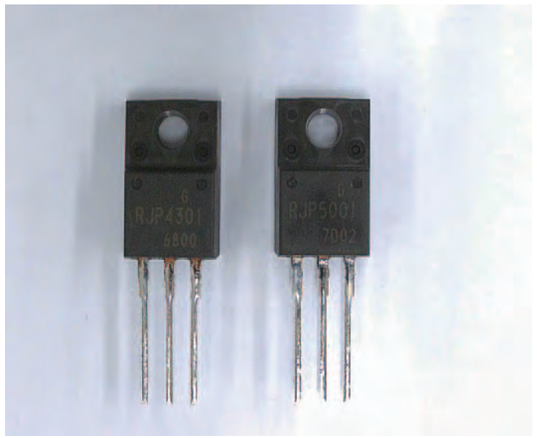


型号 Part No.	VCES[V]	ICP[A]	Drive[V]	封装 Package
RJP4010AGE	400	150	3.0～6.0	TSOJ-8
RJP4009ANS	400	150	2.5～6.0	VSON-8

大电流控制 外装闪光灯用IGBT Large-Current Control IGBTs for External Camera Flash Units

●特点
1. 大电流控制（RJP5001APP: 300A）
2. 低电压驱动（RJP4301APP: 12V驱动）
3. 高抗ESD性（内置栅齐纳Di）
4. 无铅（符合RoHS标准）

● Features
1. Large-current control (RJP5001APP: 300A)
2. Low-voltage drive (RJP4301APP: 12V drive)
3. High ESD Imunity (integrated gate Zener diode)
4. Lead free (RoHS compliant)



型号 Part No.	VCES[V]	ICP[A]	Drive[V]	封装 Package
RJP4301APP	430	200	26	TO-220FN
RJP5001APP	500	300	12	TO-220FN

IGBT各主要用途的要求特性与产品系列

Characteristics Required for Main IGBT Applications and Product Lineup

IGBT各主要用途的要求特性 Characteristics Required for Main IGBT Applications

用途 Application		"PFC（1kW以上）" PFC(1kW and over)			"IH烹调器" IH cooking heater		"太阳能发电系统" Photovoltaic system	"变频器用途（UPS等）" Inverter use(UPS, etc.)	PDP		
特性 Characteristics		有源滤波器（局部开关） Active filter (Partial SW)	有源滤波器（连续开关）f=20kHz Active filter (Continuation SW) f=20kHz	有源滤波器（局部开关）f=50kHz Active filter (Continuation SW) f=50kHz	电流谐振型 Current resonance type	电流谐振型 Voltage resonance type			SUS	ERC	PASS
输出饱和电压（VCE(sat)） Output saturation voltage(VCE(sat))		○	◎	○	◎◎	◎	◎	◎	◎	◎◎	◎
高速开关 High-speed SW	toff	○	◎	◎◎	◎	○	○	○	◎	○	○
	ton	—	—	—	—	—	—	—	◎◎	◎	—
FRD		—	—	○	○	—	○	◎	◎	◎	—
抗负载短路性 Load short resistance		—	—	—	—	—	○	◎◎	—	—	—
高脉冲电流 High pulse current		—	—	—	—	—	—	—	◎	—	—
耐压 Withstand voltage		600V	600V	600V	600V	900-1200V	600-900V	600-800V	300-400V	300-400V	150-300V
推荐IGBT Recommended IGBT		用于局部开关 for partial SW	低VCE(sat)型 Low VCE(sat)type	"高速开关型" High speed SWtype	低VCE(sat)型 Low VCE(sat)type	—	低VCE（sat） Low VCE(sat)type	高抗破坏型 High breakdown resistance type Inverter			

◎◎: 关键特性 high-priority characteristics
◎ : 重要特性 Priority characteristics
○ : 必要特性 Requisite characteristics
– : 一般特性 Non-focused characteristics

特点 Product Lineup

	用途 Application	马达 Motor		"电源（PFC）(1kW以上)" Power supply(PFC)			太阳能系统 Solar system
		变频器 Inverter	DC斩波器 DC chopper	有源滤波器（局部开关方式） Active filter(Partial SW)	有源滤波器（全开关方式） Active filter(Full SW)		变频器 Inverter
					f=20kHz左右 f=20kHz and near	f=50kHz左右 f=50kHz and near	
高抗负载短路型 Hight-loaded short circuit resistance type	RJH60C9DPD ★	◎	○				
	RJH60D1DPP ★	◎	○				
	RJH60D1DPE ★	◎	○				
	RJH60D2DPP ★	◎	○				
	RJH60D2DPE ★	◎	○				
	RJH60D3DPP ★	◎	○				
	RJH60D3DPE ★	◎	○				
	RJH60D0DPK ★	◎	○				◎
	RJH60D5DPK ★	◎	○				◎
	RJH60D6DPK ★	◎	○				◎
	RJH60D7DPK ★	◎	○				
用于局部开关方式 for Partial SW system	RJP60D0DPK ★			◎			
	RJP60D0DPM ★			◎			
低VCE（sat）型 Low VCE(sat)type	RJH60F0DPK ★				◎		○
	RJH60F4DPK ★		◎		◎		○
	RJH60F5DPK ★		◎		◎		○
	RJH60F6DPK ★		◎		◎		
	RJH60F7ADPK ★		◎		◎		
高速开关型 High speed SW type	RJP6085DPN					◎	
	RJP6085DPK					◎	
	RJH6085BDPK ★					◎	
	RJH6086BDPK ★					◎	
	RJH6087BDPK ★					◎	
	RJH6088BDPK ★					◎	

★: 新产品 New Product

小信号晶体管（内置电阻晶体管）

Small-Signal Transistors (Transistors with Integrated Resistors)

小信号晶体管（内置电阻晶体管） Small-Signal Transistors (Transistors with Integrated Resistors)

◆小型、轻量化
- 备有USM(SC-75）、SSP(SC-70)等各种表面安装的小型封装，可满足便携设备为主的小型、薄型、轻量化需求。
- 将不同种类的半导体（齐纳二极管）封装在一起，可减少元件个数并实现组件的小型化。
- 内置电阻种类齐全，提供的产品系列丰富多样。

■今后动向
开发封装更小型化的产品。

■内置电阻晶体管的特点
- 内置电阻种类齐全，产品系列丰富多样。
- 备有额定值为全损失～2.0W的丰富产品系列。

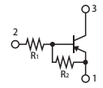
◆内置电阻晶体管产品系列

♦ Compact and lightweight
- Small surface mount packages such as USM (SC-75) and SSP (SC-70) for applications such as portable devices requiring compactness, thinness, and lightness.
- Incorporation of different semiconductor element (Zener diode) into a single package, reducing total number of components and allowing more compact size
- Diverse lineup with wide variety of internal resistors to choose from

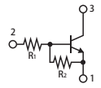
■ Future improvements
New products with even smaller packages are under development.

■ Features of internal transistors
- Diverse lineup with wide variety of internal resistors to choose from
- Extensive product lineup with total loss ratings up to 2.0W

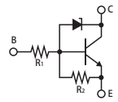
♦ Lineup of transistors with integrated resistors



PNP



NPN



带ZeDi的NPN
NPN with ZeDi

封装 Package				VCEO(V)	Ic(mA)	hFE	特点 Features
SC-75	SC-70	SC-59	SC-62				
KA4[ ]	GA4[ ]	FA4[ ]		50	100	35～600	
KN4[ ]	GN4[ ]	FN4[ ]		-50	-100	35～600	
		FB1[ ]		25	700	300～	
		FP1[ ]		-25	-700	100～	
			HD1[ ]	60	1000	300～	
			HD2[ ]	60±10	1000	300～	C-B间带Ze Ze between C and B.
			HQ1[ ]	-20	-2000	150～	
			HR1[ ]	-60	-1000	100～	

按电阻值分类的产品一览表 List of Products by Resistance Value

R1 (KΩ)	R2 (KΩ)	SC-75		SC-70		SC-59		SC-59		SC-59	
		NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP	NPN	PNP
10.0	10.0	KA4A4M	KN4A4M	GA4A4M	GN4A4M	FA4A4M	FN4A4M	-	-	-	-
22.0	22.0	KA4F4M	KN4F4M	GA4F4M	GN4F4M	FA4F4M	FN4F4M	-	-	-	-
47.0	47.0	KA4L4M	KN4L4M	GA4L4M	GN4L4M	FA4L4M	FN4L4M	-	-	-	-
4.7	4.7	KA4L3M	KN4L3M	GA4L3M	GN4L3M	FA4L3M	FN4L3M	-	-	-	-
4.7	10.0	KA4L3N	KN4L3N	GA4L3N	GN4L3N	FA4L3N	FN4L3N	-	-	-	-
4.7	-	KA4L3Z	KN4L3Z	GA4L3Z	GN4L3Z	FA4L3Z	FN4L3Z	-	-	-	-
1.0	10.0	KA4A3Q	KN4A3Q	GA4A3Q	GN4A3Q	FA4A3Q	FN4A3Q	-	-	-	-
10.0	47.0	KA4A4P	KN4A4P	GA4A4P	GN4A4P	FA4A4P	FN4A4P	-	-	-	-
22.0	47.0	KA4F4N	KN4F4N	GA4F4N	GN4F4N	FA4F4N	FN4F4N	-	-	-	-
47.0	22.0	KA4L4L	KN4L4L	GA4L4L	GN4L4L	FA4L4L	FN4L4L	-	-	-	-
10.0	-	KA4A4Z	KN4A4Z	GA4A4Z	GN4A4Z	FA4A4Z	FN4A4Z	-	-	-	-
22.0	-	KA4F4Z	KN4F4Z	GA4F4Z	GN4F4Z	FA4F4Z	FN4F4Z	-	-	-	-
47.0	-	KA4L4Z	KN4L4Z	GA4L4Z	GN4L4Z	FA4L4Z	FN4L4Z	-	-	-	-
2.2	2.2	KA4F3M	KN4F3M	GA4F3M	GN4F3M	FA4F3M	FN4F3M	-	-	-	-
2.2	10.0	KA4F3P	KN4F3P	GA4F3P	GN4F3P	FA4F3P	FN4F3P	-	-	-	-
2.2	47.0	KA4F3R	KN4F3R	GA4F3R	GN4F3R	FA4F3R	FN4F3R	-	-	-	-
10.0	4.7	KA4A4L	KN4A4L	GA4A4L	GN4A4L	FA4A4L	FN4A4L	-	-	-	-
47.0	10.0	KA4L4K	KN4L4K	GA4L4K	GN4L4K	FA4L4K	FN4L4K	-	-	-	-
-	10.0	-	-	-	-	FB1A4A	FP1A4A	HD1A4A	HR1A4A	HQ1A4A	HD2A4A
0.47	4.7	-	-	-	-	FB1L2Q	FP1L2Q	HD1L2Q	HR1L2Q	HQ1L2Q	HD2L2Q
1.0	1.0	-	-	-	-	FB1A3M	FP1A3M	HD1A3M	HR1A3M	HQ1A3M	HD2A3M
2.2	10.0	-	-	-	-	FB1F3P	FP1F3P	HD1F3P	HR1F3P	HQ1F3P	HD2F3P
3.3	10.0	-	-	-	-	FB1J3P	FP1J3P	-	-	-	-
4.7	10.0	-	-	-	-	FB1L3N	FP1L3N	HD1L3N	HR1L3N	-	HD2L3N
10.0	10.0	-	-	-	-	FB1A4M	FP1A4M	HD1L4M	HR1L4M	-	HD2A4M
0.22	2.2	-	-	-	-	-	-	HD1F2Q	HR1F2Q	HQ1F2Q	HD2F2G
0.47	1.0	-	-	-	-	-	-	-	-	HQ1L2N	-
2.2	2.2	-	-	-	-	-	-	-	-	HQ1F3M	-

开发中　信号晶体管、SOT-23F系列 Under development SOT-23F Series Signal Transistors

【特点】
- 采用SOT23F封装，实现等同于SC-62的容许损失更换为新封装，可减少约61%的安装面积！

[Features]
- SOT23F package with permissible loss comparable to the SC-62 Switching to the new package enables a reduction of about 61% in the mounting area!

SC-62

容许损失:0.52W
Permissible loss: 0.52W
安装面积:18mm²
Mounting area: 18mm²

SOT-23F

許容損失:0.46W
Permissible loss: 0.46W
実装面積:6.96mm²
Mounting area: 6.96mm²

将SC-62封装产品（品名）拓展为SOT-23F封装 Availability of SC-62 Package Products (Product Numbers) in SOT-23F Package Versions

对象型号 Target Product Number		VCEO [V]	Ic [A]	hFE	VCE (sat) [V] MAX.
PNP	NPN				
N0201R(2SB798)	N0201S(2SD999)	-25/25	-1.0/1.0	90～400	-0.4/0.4
N0500R(2SB799)	N0500S(2SD1000)	-50/50	-0.7/0.7	90～400	-0.4/0.4
N0800R(2SB800)	N0800S(2SD1001)	-80/80	-0.3/0.3	90～400	-0.6/0.6
N0801R(2SB804)	N0801S(2SD1005)	-80/80	-1.0/1.0	90～400	-0.5/0.5
N0202R(2SB1114)	N0202S(2SD1614)	-20/20	-2.0/2.0	135～600	-0.5/0.5
N0501R(2SB1115)	N0501S(2SD1615)	-50/50	-1.0/1.0	135～600	-0.3/0.3

放大用晶体管概要和高输出RF MOSFET

Transistors for Amplification and High-Output RF MOSFETs

对于信号放大，频率越高时杂音越多且无法获得增益，因此根据具体应用，分别使用化合物TRS、Si双极型TRS、Si-MOSFET。其中，Si类的高频TRS由于其出色的量产性，被市场广泛使用。

In signal amplification, noise increases and gain becomes more difficult to achieve the higher the frequency. This is why specific types of devices, such as compound transistors, silicon bipolar transistors, and Si-MOSFETs, are used for different applications. Of these, silicon high-frequency transistors have come into wide use due to their suitability for mass production.

高频率MOS FET的市场需求 High-Frequency MOSFET Market Requirements

主要领域 Main areas	●调谐器 TV、DVD调谐器 ·Tuners TV and DVD tuners	●无线设备 FRS、GMRS、RF-ID ·Wireless devices
市场需求 Market requirements	●小型化、减少制造成本 ·More compact, lower production cost ●ECO（低电压 / 低电流动作） ·Eco-friendly (low-voltage/low-current operation)	●高性能产品（高频运行） ·High-performance products (high-frequency operation) ●小型、高散热产品 ·Compact, good heat dispersion
对应产品 Suitable products	●双栅MOSFET ·Dual-gate MOSFETs	●高频功率MOSFET ·High-frequency power MOSFETs
高频率MOSFET适用方针 High-frequency MOSFET application guidelines	●内置偏压电路 ·Integrated bias circuit ●低工作电压产品 ·Low operating voltage ●高性能产品（低噪音、低失真） ·High performance (low noise, low distortion)	●小型高散热产品 ·Compact and good heat dispersion ●高性能产品（高效率、高功率产品） ·High performance (high efficiency, high power)

利用细微加工技术，提供杂音更小、失真更少的产品
Ultrafine processing technology for products with lower noise and distortion characteristics!

双栅MOS FET Dual-Gate MOSFETs

双栅MOSFET的发展趋势
Trend in Dual-Gate MOSFETs

使用单个双栅MOSFET时
●需4个外装电阻、4个电容器
●工作电压最高9V
Standalone dual-gate MOS devices
- Four external resistors and four capacitors required.
- Operating voltage up to 9V

▼

使用BBFET时
●可减少3个外装电阻、1个电容器
●可实现低电压工作（5V工作）
BBFET
- Only three external resistors and one capacitor required.
- Low operating voltage (5V)

▼

使用双BBFET时
●一个产品可支持UHF、VHF两个波段
●安装面积可减少至1/2
Twin BBFETs
- One device each for UHF and VHF2 bands is sufficient.
- Mounting area is reduced by half.

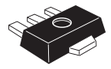
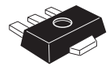
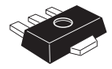
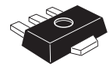
内置偏压电路产品系列
Integrated Bias Circuit Product Lineup

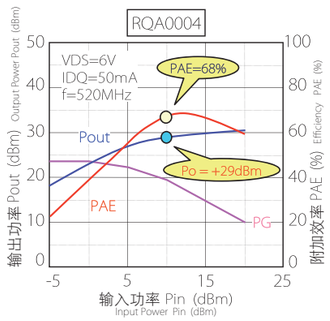
分类 Category	UHF	VHF	封装 Package
频率 (GHz) Frequency (GHz)	0.5～1	0.05～0.5	
BBFET系列 BBFET Series	BB502C BB505C BB506C	–	 CMPAK-4
	BB504C		
Twin BBFET系列 Twin BBFET Series	TBB1002 TBB1004 TBB1005 TBB1010 TBB1012 TBB1016		 CMPAK-6

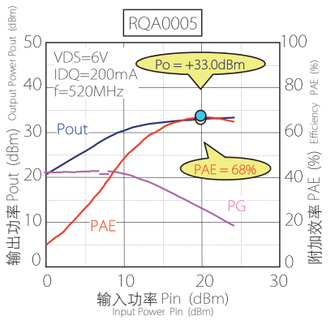
BBFET:Build in Biasing Circuit MOS FET IC
TBBFET:Twin Build in Biasing Circuit MOS FET IC

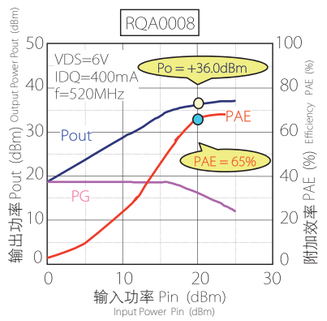
高频功率MOSFET
High-Frequency Power MOSFETs

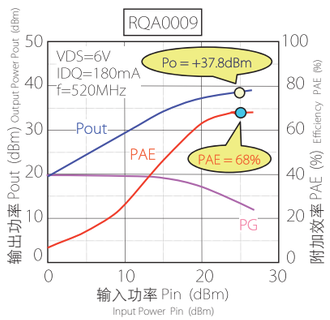
产品系列 Lineup

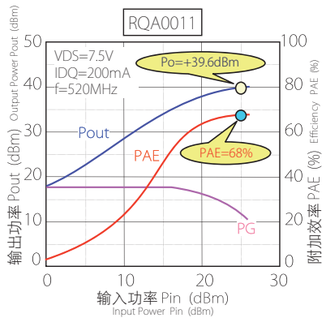
产品型号 Product Part No.		RQA0004	RQA0005	RQA0008	RQA0009	RQA0011
最大额定值 Max. Rating	VDSS	16V	16V	16V	16V	16V
	ID	0.3A	0.8A	2.4A	3.2A	3.8A
	Pch(max)	3W	9W	10W	15W	15W
试验条件 Test Conditions	Frequency	520MHz				
	VDS	6 V				7.2V
	Pin	13dBm	20dBm			
主要特性 Main Features	Pout	29.7dBm	33.0dBm	36.0dBm	37.8dBm	39.6dBm
		0.93W	2.0W	3.98W	6.0W	9.12W
	PAE	68%	68%	65%	65%	68%
	Linear Gain	23.0dB	21.0dB	18.5dB	18.0dB	18.5dB
	P1dB	27.0dBm	31.5dBm	35.0dBm	35.5dBm	38.0dBm
	ESD Immunity	level 3	level 3	level 3	level 4	level 4
封装 Package	名称 Name	UPAK	UPAK	UPAK	UPAK	WSON0504-2
	尺寸(mm) Dimensions	4.5×2.5×1.5 (含管脚:4.5×4.25) (including leads: 4.5 × 4.25)	4.5×2.5×1.5 (含管脚:4.5×4.25) (including leads: 4.5 × 4.25)	4.5×2.5×1.5 (含管脚:4.5×4.25) (including leads: 4.5 × 4.25)	4.5×2.5×1.5 (含管脚:4.5×4.25) (including leads: 4.5 × 4.25)	4.5×2.5×1.5 (含管脚:4.5×4.25) (including leads: 4.5 × 4.25)
	外观 Exterior					











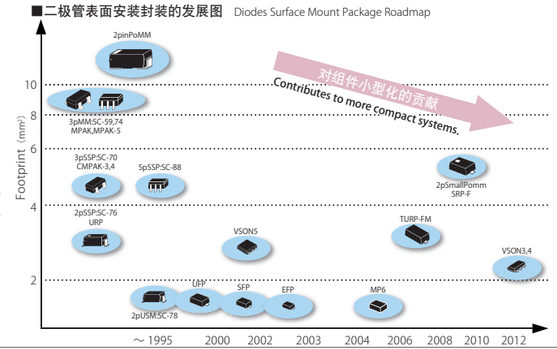
二极管概要和齐纳二极管
Overview of Diodes and Zener Diodes

二极管封装 Diodes Packages

瑞萨备有电涌吸收及电源用齐纳二极管、肖特基势垒二极管等一般用二极管、调谐器和VCO用的变容、高频前端开关用的PIN二极管之类的高频二极管，并通过各种小型、薄型封装及配备多元件的封装、高容许损失封装的组合，支持客户的各种应用。

Renesas Electronics has a wide-ranging lineup of diode products, including Zener diodes used for surge absorption and in power supplies, general-purpose diodes such as Schottky barrier diodes, varicap diodes used in tuners and VCOs, and high-frequency diodes such as PIN diodes used for switching in high-frequency front ends. The many package options include compact and thin packages, multi-element packages, and high-loss-tolerance packages. Customers can combine the characteristics they require to select the devices that best match their applications.

■二极管表面安装封装的发展图 Diodes Surface Mount Package Roadmap



齐纳二极管（用于电涌吸收） Zener Diodes (for Surge Absorption)

●市场需求
- 符合EMC（电磁兼容性）指令
- 改善高速信号线中的失真（USB等）
- 小型/薄型化
- 环保

●今后动向
- 确保IEC61000-4-2要求的抗ESD性
- 低电容化
- 复合、小型化（4个元件、2个元件/封装）VSON-5（含4个元件）
- 无铅、不含卤素

● Market Requirements
– Compliance with EMC (Electromagnetic Compatibility) Directive
– Reduced distortion on high-speed signal lines (USB, etc.)
– Compact and thin dimensions
– Environmental considerations
● Goals Moving Forward
– Guaranteed ESD Immunity complying with IEC 61000-4-2
– Low capacitance
– Composite and more compact devices (2 or 4 elements per package), VSON-5 (contains 4 elements)
– Lead and halogen free

封装 Package	型号 Part No.	额定值 Rating Pd (mW)	特性 Characteristics Vz (V)	C (pF) (max.)	ESD (kV) (min.)	备注 Remarks
MPAK 内置2个元件 MPAK two-devices	HZM3.3WA	200	3.1～3.5	—	30	
	HZM6.2ZMWA	200	5.9～6.5	8.5	13	低电容 Low capacitance
	HZM6.8MWA	200	6.47～7.0	130	30	
	HZM6.8ZMWA	200	6.47～7.0	25	20	低电容 Low capacitance
	HZM27WA	200	25.1～28.9	(27)	30	
MPAK-5 内置4个元件 MPAK-5 four-devices	HZM5.6ZFA	200	5.31～5.92	8.5	8	低电容 Low capacitance
	HZM6.2ZMFA	200	5.9～6.5	8.5	13	
	HZM6.8MFA	200	6.47～7.0	130	30	
	HZM6.8ZMFA	200	6.47～7.0	25	25	低电容 Low capacitance
	HZM27FA	200	25.1～28.9	(27)	30	
CMPAK 内置2个元件 CMPAK two-devices	HZB6.8MWA	200	6.47～7.0	130	30	
VSON-5 内置4个元件 VSON-5 four-devices	RKZ6.8ZMFAKT	150	6.47～7.0	25	25	低电容 Low capacitance

封装 Package	型号 Part No.	额定值 Rating Pd (mW)	特性 Characteristics Vz (V)	C (pF) (max.)	ESD (kV) (min.)	备注 Remarks
EFP*	HZL6.2Z4	100	5.9～6.5	4	8	低电容 Low capacitance
	HZL6.8Z4	100	6.47～7.0	4	8	
SFP*	HZD6.2Z4	150	5.9～6.5	4	8	低电容 Low capacitance
	HZD6.8Z4	150	6.47～7.0	4	8	
MPAK 内置2个元件 MPAK two-devices	HZM6.2Z4MWA	200	5.9～6.5	4typ.	8	低电容 Low capacitance
	HZM6.8Z4MWA	200	6.47～7.0	4typ.	8	
VSON-5 内置4个元件 VSON-5 four-devices	RKZ6.2Z4MFAKT	150	5.9～6.5	4typ.	8	低电容 Low capacitance
	RKZ6.8Z4MFAKT	150	6.47～7.0	4typ.	8	
MPAK-5 内置4个元件 MPAK-5 four-devices	HZM6.2Z4MFA	200	5.9～6.5	4typ.	8	低电容 Low capacitance
	HZM6.8Z4MFA	200	6.47～7.0	4typ.	8	

*：可采用不含卤素的封装 *: The package is available for halogen-free diodes.

封装 Package	型号 Part No.	额定值 Rating Pd (mW)	特性 Characteristics Vz (V)	C (pF) (max.)	ESD (kV) (min.)	备注 Remarks
URP	HZU5.1～13G	200	4.84～13.96	-	30	高抗ESD性 Low capacitance
	HZU5.6Z	200	5.31～5.92	8.5	8	低电容 Low capacitance
	HZU6.2Z	200	5.9～6.5	8.5	-	
	HZU6.8Z	200	6.47～7.0	25	20	
UFP	HZC2.0～30	150	1.90～32.0	-	30	
	HZC33	150	31.0～35.0	-	25	
	HZC36	150	34.0～38.0	-	20	
EFP*	RKZ6.2KL	100	5.86～6.53	-	30	超小型、高抗ESD性 Ultra-small, high ESD resistance
UFP	RKZ6.8TKJ	150	5.80～7.80	-	25	双向型 Bi-directional type
SFP*	RKZ6.8TKK	150	5.80～7.80	-	25	

*：可采用不含卤素的封装 *: The package is available for halogen-free diodes.

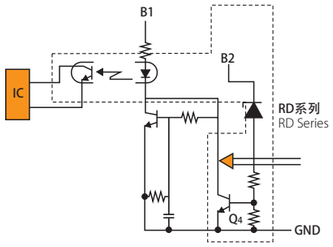
电压用 / 电涌吸收用二极管 Constant Voltage/Surge Absorber Diodes

正在拓展针对齐纳二极管特制的产品。
〈稳压用途〉=> 名称：RD系列
●与晶体管等并用，可实现小型电源的电压稳定化，此外也可用于检测基准电压和吸收电涌。
●随着电子设备的小型、轻量化发展，瑞萨以SMD产品群为主推出了一系列小型、薄型、复合化封装的产品系列。
〈电涌吸收用途〉=> 名称：NNCD系列
●在抗静电（EDS）用途方面，遵照EMC（电磁兼容性）指令，经过IEC61000-4-2静电放电抗扰度试验，确保齐纳二极管本体的抗EDS性。
●随着电子设备的小型、轻量、薄型化发展，瑞萨以SMD产品群为主推出了一系列小型、薄型、复合化封装，且可应对接口高速化的低电容产品。
■今后动向
●稳压用和电涌吸收用品种均不含卤素。
●电涌吸收用产品开发以封装更小、低电容、高抗ESD性为目标。

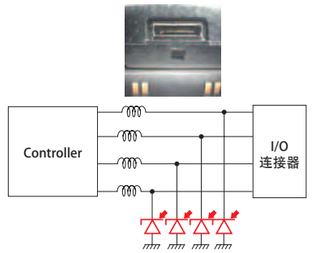
A variety of Zener diode products are available for specific applications.
< Constant voltage applications > → Name: RD Series
● Suitable applications include use in combination with transistors to stabilize the power supply voltage in compact power supplies, outputting a reference voltage, and surge absorption.
● The lineup includes small, thin packages such as SMD products for use in compact, lightweight electronic devices, and composite packages.
< Surge absorber applications > → Name: NNCD Series
● The Zener diode meets electromagnetic compatibility (EMC) standards for use in electrostatic discharge (EDS) countermeasures and has guaranteed EDS tolerance based on the IEC61000-4 contact discharge test.
● The lineup includes small, thin packages such as SMD products for use in compact, thin, lightweight electronic devices, and composite packages. In addition, low-capacitance products suitable for high-speed interfaces are available.

■ Future improvements
● New halogen-free versions of both constant voltage and surge absorber products.
● New surge absorber products with even smaller packages as well as reduced capacitance and higher ESD are under development.

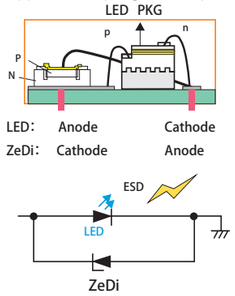
■ 稳压用途的应用 [电压检测 OVP电路示例（RD系列）]
■ Use in constant voltage application [voltage detection OVP circuit example (RD Series)]



■ 避免受到由手机接口外部进入的ESD干扰
■ Protection against external ESD in mobile phone interface



■ LED芯片保护（LED封装内部构造简图）
■ LED chip protection (LED package interior simplified)



■稳压二极管的特点（RD系列）
●产品系列分3种容许损失（150mW、200mW、1000mW），RD系列共有8个品种的SMD型产品。
●产品系列丰富，低噪声设计产品及适用于齐纳电压2.0～150V的产品等一应俱全。

■ Features of constant voltage diodes (RD Series)
● Versions with three permissible loss ratings (150mW, 200mW, and 1,000mW) are available, and the RD Series comprises eight SMD-type product groups.
● The wide variety of available products includes low-noise versions and versions with Zener voltages from 2.0V to 150V.

■RD系列产品 RD Series Product Lines

容许损失 Permissible loss		150mW		200mW				1.0W	
封装 Package		SC-78		SC-76		SC-59（双路，共用阳极） (dual, common anode)		2pinPoMM	2p小型PoMM 2-pin compact PoMM
类型 Type		低噪声 Low noise	通用 General purpose	低噪声 Low noise	通用 General purpose	通用 General purpose	ESD保护 ESD protection	通用 General purpose	通用 General purpose
系列 Series		RD[ ]UJ	RD[ ]UM	RD[ ]SL	RD[ ]S	RD[ ]MW	RD[ ]Z	RD[ ]FM	RD[ ]FS
齐纳电压 Zener voltage	2.0	-	RD2.0UM	-	RD2.0S	-	RD2.0S	RD2.0FM	RD2.0FS
	2.2	-	RD2.2UM	-	RD2.2S	-	RD2.2S	RD2.2FM	RD2.2FS
	2.4	-	RD2.4UM	-	RD2.4S	-	RD2.4S	RD2.4FM	RD2.4FS
	2.7	-	RD2.7UM	-	RD2.7S	-	RD2.7S	RD2.7FM	RD2.7FS
	3.0	-	RD3.0UM	-	RD3.0S	-	RD3.0S	RD3.0FM	RD3.0FS
	3.3	-	RD3.3UM	-	RD3.3S	-	RD3.3S	RD3.3FM	RD3.3FS
	3.6	-	RD3.6UM	-	RD3.6S	-	RD3.6S	RD3.6FM	RD3.6FS
	3.9	-	RD3.9UM	-	RD3.9S		RD3.9S	RD3.9FM	RD3.9FS
	4.3	-	RD4.3UM	-	RD4.3S	-	RD4.3S	RD4.3FM	RD4.3FS
	4.7	RD4.7UJ	RD4.7UM	RD4.7SL	RD4.7S	-	RD4.7S	RD4.7FM	RD4.7FS
	5.1	RD5.1UJ	RD5.1UM	RD5.1SL	RD5.1S	-	RD5.1S	RD5.1FM	RD5.1FS
	5.6	RD5.6UJ	RD5.6UM	RD5.6SL	RD5.6S	-	RD5.6S	RD5.6FM	RD5.6FS
	6.2	RD6.2UJ	RD6.2UM	RD6.2SL	RD6.2S	RD6.2Z	RD6.2S	RD6.2FM	RD6.2FS
	6.8	RD6.8UJ	RD6.8UM	RD6.8SL	RD6.8S	-	RD6.8S	RD6.8FM	RD6.8FS
	7.5	RD7.5UJ	RD7.5UM	RD7.5SL	RD7.5S	-	RD7.5S	RD7.5FM	RD7.5FS
	8.2	RD8.2UJ	RD8.2UM	RD8.2SL	RD8.2S	-	RD8.2S	RD8.2FM	RD8.2FS
	9.1	RD9.1UJ	RD9.1UM	RD9.1SL	RD9.1S	-	RD9.1S	RD9.1FM	RD9.1FS

电涌吸收二极管的特点（NNCD系列） Features of Surge Absorber Diodes (NNCD Series)

●产品系列分2种容许损失（150mW、200mW），NNCD系列共有13个品种的SMD型产品。
●备有在电磁兼容性IEC6100-4-2的静电放电抗扰度试验中确保最小8kV或30kV的产品，以及具有双向功能的产品等，基准电压及适用于其他用途的各种电压和封装种类齐全。

● Versions with two permissible loss ratings (150mW and 200mW) are available, and the NNCD Series comprises 13 SMD-type product groups.
● Products are available with guaranteed minimum ratings of 8kV and 30kV in the IEC61000-4-2 contact discharge test of electromagnetic compatibility. Products with bidirectional functionality as well as many voltage specifications and packages are available for a variety of applications, including reference power sources.

RD系列产品（10V～） RD Series products (10V and up)

容许损失 Permissible loss		150mW		200mW				1.0W	
封装 Package		SC-78		SC-76		SC-59（双路，共用阳极）通用 SC-59 (dual, anode common), general use		2pinPoMM	2p小型PoMM 2-pin compact PoMM
类型 Type		低噪声 Low noise	通用 General purpose	低噪声 Low noise	通用 General purpose	通用 General purpose	ESD保护 ESD protection	通用 General purpose	通用 General purpose
系列 Series		RD[ ]UJ	RD[ ]UM	RD[ ]SL	RD[ ]S	RD[ ]MW	RD[ ]Z	RD[ ]FM	RD[ ]FS
齐纳电压 Zener voltage	10	RD10UJ	RD10UM	RD10SL	RD10S	RD10MW	-	RD10FM	RD10FS
	11	RD11UJ	RD11UM	RD11SL	RD11S	RD11MW	-	RD11FM	RD11FS
	12	RD12UJ	RD12UM	RD12SL	RD12S	RD12MW	-	RD12FM	RD12FS
	13	RD13UJ	RD13UM	RD13SL	RD13S	RD13MW	-	RD13FM	RD13FS
	15	RD15UJ	RD15UM	RD15SL	RD15S	RD15MW	-	RD15FM	RD15FS
	16	RD16UJ	RD16UM	RD16SL	RD16S	RD16MW	-	RD16FM	RD16FS
	18	RD18UJ	RD18UM	RD18SL	RD18S	RD18MW	-	RD18FM	RD18FS
	20	RD20UJ	RD20UM	RD20SL	RD20S	RD20MW	-	RD20FM	RD20FS
	22	RD22UJ	RD22UM	RD22SL	RD22S	RD22MW	-	RD22FM	RD22FS
	24	RD24UJ	RD24UM	RD24SL	RD24S	RD24MW	-	RD24FM	RD24FS
	27	RD27UJ	RD27UM	RD27SL	RD27S	RD27MW	-	RD27FM	RD27FS
	30	RD30UJ	RD30UM	RD30SL	RD30S	RD30MW	-	RD30FM	RD30FS
	33	RD33UJ	RD33UM	RD33SL	RD33S	RD33MW	-	RD33FM	RD33FS
	36	RD36UJ	RD36UM	RD36SL	RD36S	RD36MW	-	RD36FM	RD36FS
	39	RD39UJ	RD39UM	RD39DL	RD39S	RD39MW	-	RD39FM	RD39FS
	43	-	-	-	RD43S	-	-	RD43FM	RD43FS
	47	-	-	-	RD47S	-	-	RD47FM	RD47FS
	51	-	-	-	RD51S	-	-	RD51FM	RD51FS
	56	-	-	-	RD56S	-	-	RD56FM	RD56FS
	62	-	-	-	RD62S	-	-	RD62FM	RD62FS
	68	-	-	-	RD68S	-	-	RD68FM	RD68FS
	75	-	-	-	RD75S	-	-	RD75FM	RD75FS
	82	-	-	-	RD82S	-	-	RD82FM	RD82FS
	91	-	-	-	RD91S	-	-	RD91FM	RD91FS
	100	-	-	-	RD100S	-	-	RD100FM	RD100FS
	110	-	-	-	RD110S	-	-	RD110FM	RD110FS
	120	-	-	-	RD120S	-	-	RD120FM	RD120FS
	150	-	-	-	RD150S	-	-	-	-

NNCD系列产品 NNCD Series Product Lines

分类 Category		高抗ESD型 High-ESD type						低电容(20pF)、高抗ESD性 Low-capacitance (20pF), high-ESD		低电容(10pF)型 Low-capacitance (10pF) type		高抗ESD/双向型 High-ESD, bidirectional type		
容许损失 Permissible loss		150mW	200mW					200mW		200mW		200mW		
		SC-78	SC-76	SC-76	SC-59（双芯导线） (double)	SC-74A（四芯导线） (quad)	SC-88A（四芯导线） (quad)	SC-59（双芯导线） (double)	SC-74A（四芯导线） (quad)	SC-74A（四芯导线） (quad)	SC-88A（四芯导线） (quad)	SC-76	SC-76	SC-70（双芯导线） (double)
系列 Series		NNCD[ ]C	NNCD[ ]D	NNCD[ ]DA	NNCD[ ]F	NNCD[ ]G	NNCD[ ]H	NNCD[ ]MF	NNCD[ ]MG	NNCD[ ]LG	NNCD[ ]LH	NNCD[ ]MDT	NNCD[ ]DT	NNCD[ ]ST
击穿电压 Breakdown voltage	2.0V			NNCD2.0DA								-	-	-
	2.2V			NNCD2.2DA								-	-	-
	2.4V			NNCD2.4DA								-	-	-
	2.7V			NNCD2.7DA								-	-	-
	3.0V			NNCD3.0DA								-	-	-
	3.3V	NNCD3.3C	NNCD3.3D	NNCD3.3DA	NNCD3.3F	NNCD3.3G	-	-	-	-	-	-	-	-
	3.6V	NNCD3.6C	NNCD3.6D	NNCD3.6DA	NNCD3.6F	NNCD3.6G	-	-	-	-	-	-	-	-
	3.9V	NNCD3.9C	NNCD3.9D	NNCD3.9DA	NNCD3.9F	NNCD3.9G	-	-	-	-	-	-	-	-
	4.3V	NNCD4.3C	NNCD4.3D	NNCD4.3DA	NNCD4.3F	NNCD4.3G	-	-	-	-	-	-	-	
	4.7V	NNCD4.7C	NNCD4.7D	NNCD4.7DA	NNCD4.7F	NNCD4.7G	-	-	-	-	-	-	-	-
	5.1V	NNCD5.1C	NNCD5.1D	NNCD5.1DA	NNCD5.1F	NNCD5.1G	-	-	-	-	-	-	-	-
	5.6V	NNCD5.6C	NNCD5.6D	NNCD5.6DA	NNCD5.6F	NNCD5.6G	NNCD5.6H	-	NNCD5.6MG	NNCD5.6LG	NNCD5.6LH	-	-	-
	6.2V	NNCD6.2C	NNCD6.2D	NNCD6.2DA	NNCD6.2F	NNCD6.2G	-	NNCD6.2MF	NNCD6.2MG	NNCD6.2LG	NNCD6.2LH	-	-	-
	6.8V	NNCD6.8C	NNCD6.8D	NNCD6.8DA	NNCD6.8F	NNCD6.8PG	NNCD6.8PH	-	NNCD6.8MG	NNCD6.8RG	NNCD6.8RH	-	-	NNCD6.8ST
	7.5V	NNCD7.5C	NNCD7.5D	NNCD7.5DA	NNCD7.5F	NNCD7.5G	-	-	-	-	-	NNCD7.5MDT	-	-
	8.2V	NNCD8.2C	NNCD8.2D	NNCD8.2DA	NNCD8.2F	-	-	-	-	-	-	-	-	-
	9.1V	NNCD9.1C	NNCD9.1D	NNCD9.1DA	NNCD9.1F	-	-	-	-	-	-	-	-	
	10V	NNCD10C	NNCD10D	NNCD10DA	NNCD10F	-	-	-	-	-	-	-	-	-
	11V	NNCD11C	NNCD11D	NNCD11DA	NNCD11F	-	-	-	-	-	-	-	-	-
	12V	NNCD12C	NNCD12D	NNCD12DA	NNCD12F	-	-	-	-	-	-	-	-	-
	16V	-	-	NNCD16DA	-	-	-	-	-	-	-	-	-	
	18V	-	-	NNCD18DA	-	-	-	-	-	-	-	-	NNCD18DT	NNCD18ST
	20V	-	-	NNCD20DA	-	-	-	-	-	-	-	-	NNCD20DT	-
	22V	-	-	NNCD22DA	-	-	-	-	-	-	-	-	-	-
	24V	-	-	NNCD24DA	-	-	-	-	-	-	-	-	-	-
	27V	-	-	NNCD27DA	-	NNCD27G	-	-	-	-	-	-	NNCD27DT	NNCD27ST
	36V	-	-	NNCD36DA	-	NNCD36G	-	-	-	-	-	-	NNCD36DT	NNCD36ST
	39V	-	-	NNCD39DA	-	-	-	-	-	-	-	-	-	-

※高抗ESD型：确保抗30kV产品组、低电容（10PF）型：确保抗8kV产品组
Note: High-ESD type is product group with guaranteed tolerance of 30kV. Low-capacitance (10pF) type is product group with guaranteed tolerance of 8kV.

肖特基势垒二极管
Schottky Barrier Diodes

肖特基势垒二极管 Schottky Barrier Diodes

●市场需求
- 高效率/低损失
- 高速信号的低失真化
- 容许电流的多样化
- 小型/轻量化
- 环保

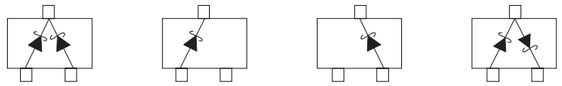
●今后动向
- 低VF化
- 低泄漏电流化
- 低电容化
- 扩充产品种类
- 外形小型、复合化
- 无铅、不含卤素

● Market Requirements
– High efficiency and low loss
– Reduced distortion on high-speed signal lines
– Wide-ranging current tolerance
– Environmental considerations
● Goals Moving Forward
– Low VF
– Low leak current
– Low capacitance
– More extensive product lineup
– More compact and composite devices
– Lead and halogen free

分类 Classification	封装 Package	型号 Part No.	最大额定值 Maximum Rating VRRM (V)	Io (A)	特性 Characteristics VF(V) (max.)	IF(A)	IR (mA) (max.)	VR(V)	管脚连接 Pin Connection
整流用 肖特基 二极管 (三管脚型) Three-terminal Schottky diodes for use in rectifiers	MPAK	HRW0202A	20	0.2	0.40	0.1	0.05	20	CC
		HRW0202B	20	0.2	0.42	0.1	0.01	20	CC
		HRW0203A	30	0.2	0.50	0.2	0.05	30	SI(1)
		HRW0203B	30	0.2	0.50	0.2	0.05	30	SI(2)
		HRW0302A	20	0.3	0.40	0.3	0.1	20	SI(1)
		HRW0502A	20	0.5	0.40	0.5	0.2	20	SI(1)
		HRW0503A	30	0.5	0.55	0.5	0.05	30	SI(1)
		HRW0702A	20	0.7*	0.43	0.7	0.2	20	SI(1)
	CMPAK	HRB0103A	30	0.1	0.44	0.1	0.05	30	SI(1)
		HRB0103B	30	0.1	0.44	0.1	0.05	30	SE
		HRB0502A	20	0.5*	0.40	0.5	0.2	20	SI(1)
		RKR0202AQE	20	0.2	0.40	0.1	0.05	20	CC

*: IF值 *: IF value

管脚连接 Pin Connection



CC 型 CC Type　SI（1）型 SI(1) Type　SI（2）型 SI(2) Type　SE 型 SE Type

分类 Classification	封装 Package	型号 Part No.	最大额定值 Maximum Rating VRRM (V)	Io (A)	特性 Characteristics VF(V) (max.)	IF(A)	IR (mA) (max.)	VR(V)
整流用 肖特基 二极管 (两管脚型) Two-terminal Schottky diodes for use in rectifiers	SRP-F	RKR104BKV	40	1	0.55	0.7	0.05	40
	TURP	HRV103A	30	1	0.36	0.7	1	30
		HRV103B	30	1	0.45	0.7	0.1	30
		RKR0505AKH	50	0.5	0.46	0.5	0.4	20
		RKR0505BKH	50	0.5	0.60	0.5	0.04	30
		RKR0703BKH	30	0.7	0.55	0.7	0.05	30
		RKR104BKH	40	1	0.55	0.7	0.05	40
	URP	HRU0103A	30	0.1	0.44	0.1	0.05	30
		HRU0103C	30	0.1	0.60	0.1	0.0001	5
		HRU0203A	30	0.2	0.50	0.2	0.05	30
		HRU0302A	20	0.3	0.40	0.3	0.10	20
	UFP	HRC0103A	30	0.1	0.44	0.1	0.05	30
		HRC0103C	30	0.1	0.60	0.1	0.0001	5
		HRC0201A	15	0.2	0.39	0.2	0.05	6
		HRC0203B	30	0.2	0.52	0.2	0.01	30
		HRC0203C	30	0.2	0.45	0.2	0.03	10
	SFP*	HRD0103C	30	0.1	0.60	0.1	0.0001	5
		HRD0203C	30	0.2	0.45	0.2	0.03	10
	EFP*	HRL0103C	30	0.1	0.60	0.1	0.0001	5

封装 Package	型号 Part No.	最大额定值 Maximum Rating VR(V)	Io(mA)	特性 Characteristics C(pF)max
URP	HSU276A	5(VRRM)	30	0.85
	HSU227	25(VRRM)	50	3.0
	HSU285	2	5	0.3*2
UFP	HSC88	10	15	0.8
	HSC226	25(VRRM)	50*1	2.8
	HSC276A	5(VRRM)	30	0.85
	HSC278	30	30	1.2
	HSC285	2	5	0.3*2
	RKD700KJ	30	50	2.8
SFP*	HSD88	10	15	0.8
	HSD226	25(VRRM)	50*1	2.8
	HSD276A	5(VRRM)	30	0.85
	HSD278	30	30	1.5
	RKD700KK	30	50	2.8
EFP*	HSL226	25(VRRM)	50*1	2.8
	HSL278	30	30	1.5
	HSL285	2	5	0.3*2
	HSL276A	3	30	0.85
	RKD700KL	30	50	2.8
	RKD702KL	30(VRRM)	50*1	2.5

封装 Package	型号 Part No.	最大额定值 Maximum Rating VR(V)	Io(mA)	特性 Characteristics C(pF)max
MPAK	HSM198S	10	30	1.5
	HSM276AS/ASR	5(VRRM)	30	0.9
	HSM88AS/ASR	10	15	0.85
	HSM88WA	10	15	0.85
	HSM88WK	10	15	0.85
CMPAK	HSB88AS	10	15	0.8
	HSB88WK	10	15	0.8
	HSB226S	25(VRRM)	50*1	2.8
	HSB226WK	25(VRRM)	50*1	2.8
	HSB276AS	5(VRRM)	30	0.9
	HSB285S	2	5	0.3*2
CMPAK-4	HSB226YP	25(VRRM)	50*1	2.8
	HSB88YP	10	15	0.8
	HSB276AYP	5(VRRM)	30	0.85
	HSB0104YP	40	100*1	20.0*2
MP6*	RKD702KP	30(VRRM)	50*1	2.5
	RKD703KP	30(VRRM)	100*1	5
	RKD704KP	30(VRRM)	50*1	5
	RKD750KP	2	5	0.3
	RKD751KP	3	30	1.0

*1: IF值 *2: Typ *1: IF value *2: Typ
*：可采用不含卤素的封装 *: The package is available for halogen-free diodes

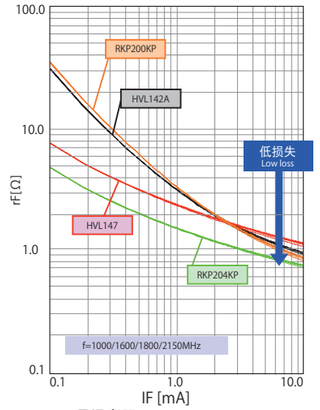
http://cn.renesas.com/products/discrete/diode/index.jsp　http://hk.renesas.com/products/discrete/diode/index.jsp

PIN二极管/变容二极管
PiN Diodes / Vari-cap Diodes

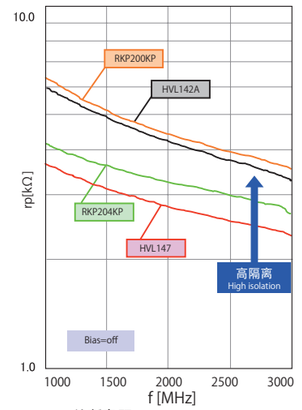
PIN二极管 PiN Diodes

●通过降低导通电阻减少插入损失
●通过降低低电流范围内的导通电阻减少功耗
●通过推进关断时的低电容化改善隔离
●通过 2 次引入新工艺，改善高次谐波失真通过推进外形的小型化（MP6）减少高次谐波
●通过推进复合化（MFP12）实现小型、轻量化
●通过提供无铅、不含卤素产品，支持环保。

● Low on-resistance for reduced insertion loss
● Low on-resistance in low-current range for reduced power consumption
● Lower capacitance when off for improved isolation
● New fabrication process for lower distortion at high frequencies
● Smaller package (MP6) for reduced secondary harmonics
● Composite package (MFP12) for reduced size and weight
● Less environmental impact through elimination of lead and halogen



导通电阻 On resistance Characteristics



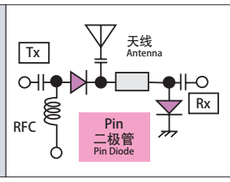
关断电阻 Off resistance characteristics

手机、无线LAN高频前端用PIN二极管 PiN Diode for High-Frequency Front Ends for Mobile Phones and Wireless LAN Equipment

利用沟槽结构工艺，实现管脚间低电容
●备有小型表面安装扁平管脚外形产品 1006(SFP)、0806(EFP)
●频率（GHz）频率（GHz）rf(Ω）最大

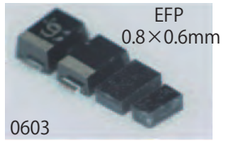
Trench structure process for low capacitance between pins
● Compact Surface-mount flat-lead package versions
1006 (SEP), 0806 (EFP), MP6 (0603), MFP12 (12 pins)

SPDT SW

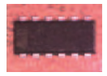


PIN二极管的插入损失 Insertion Loss of PIN Diode 频率与损失 Freq. and Loss	型号 Part No.
2.4GHz(6mA) 0.20dB	HVD/L142A RKP200KP
2.4GHz(2mA) 0.20dB	HVD/L144A
5.2GHz(2mA) 0.20dB	HVD/L147 RKP204KP

封装 Package



Multi-Chip



MFP-12
2.7×1.2×0.5mm

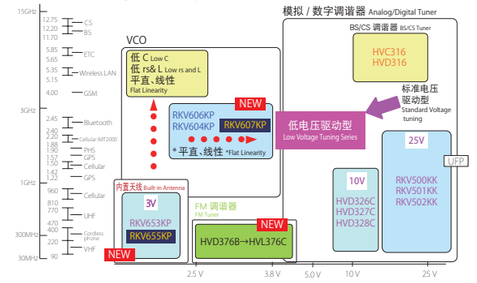
封装 Package	型号 Part No.	频率(GHz) Freq. (GHz) up to 2.4	up to 5.8	rf(Ω) max.	IF(mA)	C (pF) max.	2nd HD (dB))	特性 Features
SFP(1006)	HVD131	○		1.0	10	0.8	-36.8	
	HVD132	○		2.0	10	0.5	-36.4	
EFP(0806)	HVD/L142A	○		1.3	10	0.35	-42.0	
	HVD/L144A		○	1.8	2	0.43	-30.2	Low current
	HVD/L147	○	○	1.5 (2.5)	10 (2)	0.31	-46.1	
	HVD191	○	○	2.5	10	0.37	-60.0	High Isolation
EFP(0806)	RKP201KL		○	2.0	2	0.35	-33.3	
	RKP300KL	○	○	3.7	10	0.25	-65.0	Low Harmonic
MP6 (0603)	RKP200KP	○		1.3	10	0.35	-42.0	WS: MP: OK
	RKP204KP		○	1.8	2	0.35	-46.1	
MFP12	RKP400KS	○		6 in 1 (HVD142A ×4, 201 ×2)				Multi-chip /Max. 6 in 1 WS: OK,MP: OK
	RKP401KS	○		5 in 1 (HVD147 ×1, 200 ×4)				
	RKP402KS	○		5 in 1 (RKP200 ×5)				

变容二极管 Vari-cap Diodes

●通过减小 CV 特性偏差减少特性差异
通过改善电容特性和直线性改善工序成品率
●支持 VR = 0.5～4.0V，改善灵敏度
●通过低电容化实现 RF 高频化
通过小型、薄型化 (EFP) 实现小型、轻量化
▶强化 MP6 产品系列
通过提供无铅、不含卤素产品，支持环保。

● Less variation in properties to meet narrower tolerances for deviation in C-V characteristics through improved process yields for better capacitance and linearity
● Higher sensitivity (VR = 0.5V to 4.0V)
● Lower capacitance for higher RF
● Smaller, thinner, lighter packages (EFP)
→ Additions to MP6 lineup
● Less environmental impact through elimination of lead and halogen

高频变容二极管产品图
High Frequency Vari-Cap Diode Products Map

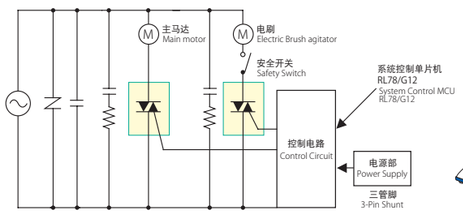


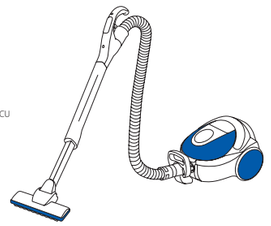
吸尘器、电饭锅

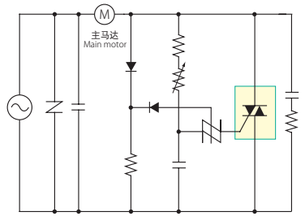
Vacuum Cleaners, Rice Cookers

吸尘器 Vacuum cleaners

■应用电路示例 Sample application circuit







开关控制器
Switching Controllers:

M62213FP,
M62281FP,
M51998FP,
HA178L05UA,
HA17431

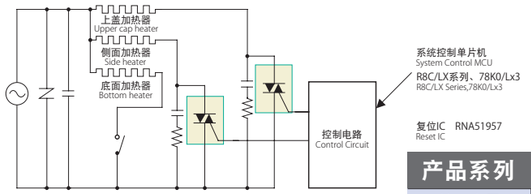
产品系列 Product Lineup

	输入电压 Input Voltage	电容 Capacity	真空马达 Main Vacuum Motor	电刷 Motorized Brush
双向晶闸管 TRIACs	AC100V～120V	500～1000W	BCR16CM-12LA/LB BCR16KM-12LA/LB BCR16PM-12LA/LG	BCR2PM-14LE BCR3KM-12LA/LB BCR3PM-12LA/LG
		1000～1500W	BCR20AM-12LA/LB BCR20KM-12LA/LB BCR30KM-8LB	BCR2PM-14LE BCR3KM-12LA/LB BCR3PM-12LA/LG
	AC200V～240V	500～1000W	BCR8CM-12LA/LB BCR8KM-12LA/LB BCR8PM-12LA/LG	BCR2PM-14LE BCR3KM-12LA/LB BCR3PM-12LA/LG
		1000～1500W	BCR12CM-12LA/LB BCR12KM-12LA/LB BCR12PM-12LA/LG	BCR2PM-14LE BCR3KM-12LA/LB BCR3PM-12LA/LG

二极管 Diodes	通用电涌吸收 / 电路保护 General-Purpose Surge Absorption, Circuit Protection	齐纳二极管 Zener Diodes	RKZXXKG系列 HZM*NB系列 HZ/HZS系列 RKZxxKG Series: HZM*NB Series: HZ/HZS Series:	两管脚表面安装外形，高抗ESD性，最适于吸收电涌 三管脚表面安装外形，高抗ESD性，最适于吸收电涌 两管脚玻璃插入外形，高抗ESD性，最适于吸收电涌 2-pin surface-mount package, high ESD ideal for surge absorption 3-pin surface-mount package, high ESD ideal for surge absorption 2-pin glass insertion package, high ESD ideal for surge absorption
		开关二极管 Switching Diodes	HSU119/HSC119 HSM2838C,HSM123 1S2076、1SS119 HSU119, HSC119: HSM2838C, HSM123: 1S2076, 1SS119:	两管脚表面安装外形 三管脚（带2个元件）表面安装外形 两管脚玻璃插入外形 2-pin surface-mount package 3-pin surface-mount package (containing 2 elements) 2-pin glass insertion package
		肖特基势垒二极管 Schottky Barrier Diodes	HRC0103C HRB0502A HRV103B、RKR104BKH HRC0103C: HRB0502A: HRV103B, RKR104BKH:	两管脚表面安装外形（低Vf、低泄漏电流） 三管脚表面安装外形（低Vf） 两管脚表面安装小型外形（Io＝1A） 低IR，最适于电路保护 2-pin surface-mount package (low Vf, low leak current) 3-pin surface-mount package (low Vf) Compact 2-pin surface-mount package (IO = 1A), low IR ideal for circuit protection

电饭锅 Rice cookers

■应用电路示例 Sample application circuit



产品系列 Product Lineup

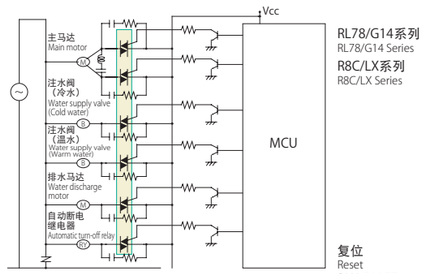
输入电压 Input Voltage	上盖加热器 Top (Lid) Heater		侧面加热器 Side Heater	
AC100V～120V	～60W	BCR1AM-12A	～60W	BCR1AM-12A
	～120W	BCR2PM-12RE	～120W	BCR2PM-12RE
AC200V～240V	～80W	BCR08AM-12A	～80W	BCR08AM-12A
	～120W	BCR1AM-12A	～120W	BCR1AM-12A
二极管 Diodes	齐纳二极管 Zener Diodes	RKZXXKG/KJ系列 高抗ESD性，最适于吸收电涌 RKZxxKG/K Series: High ESD ideal for surge absorption		
	开关二极管 Switching Diodes	HSU119/1ＳＳ120		

洗衣机、电扇

Washing Machines, Fans

洗衣机 Washing machines

■应用电路示例 Sample application circuit



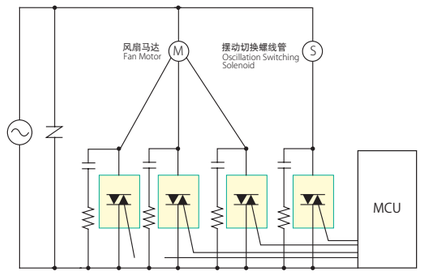
产品系列 Product Lineup

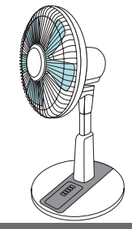
	输入电压 Input Voltage	电容 Capacity	洗涤马达 Washer Motor	注水阀 Water Supply Pump	排水马达 Drain Motor	自动断电继电器 Auto-Power-Off Relay	浴缸水用泵 Bathwater Pump
双向晶闸管 TRIACs	AC100V～120V	～7kg	BCR8PM-12LG	BCR1AM-12A	BCR1AM-12A	BCR1AM-12A	BCR5PM- 12LG
		～10kg	BCR10PM-12LG	BCR1AM-12A	BCR1AM-12A	BCR1AM-12A	BCR5PM-12LG
	AC200V～240V	～7kg	BCR8PM-14LG BCR8PM-16LG	BCR08AM-14A	BCR08AM-14A	BCR08AM-14A	BCR3PM-14LG
		AC100V／AC200V兼用 AC100V／AC200V Aoto-Switching	BCR12PM-14LG	BCR08AM-14A	BCR08AM-14A	BCR08AM-14A	BCR3PM-14LG

二极管 Diodes	通用电涌吸收 / 电路保护 General-Purpose Surge Absorption, Circuit Protection	齐纳二极管 Zener Diodes	RKZXXKG系列 HZM*NB系列 HZ/HZS系列 RKZxxKG Series: HZM*NB Series: HZ/HZS Series:	两管脚表面安装外形，高抗ESD性，最适于吸收电涌 三管脚表面安装外形，高抗ESD性，最适于吸收电涌 两管脚玻璃插入外形，高抗ESD性，最适于吸收电涌 2-pin surface-mount package, high ESD ideal for surge absorption 3-pin surface-mount package, high ESD ideal for surge absorption 2-pin glass insertion package, high ESD ideal for surge absorption
		开关二极管 Switching Diodes	HSU119/HSC119 HSM2838C,HSM123 1S2076、1SS119 HSU119, HSC119: HSM2838C, HSM123: 1S2076, 1SS119:	两管脚表面安装外形 三管脚（带2个元件）表面安装外形 两管脚玻璃插入外形 2-pin surface-mount package 3-pin surface-mount package (containing 2 elements) 2-pin glass insertion package
		肖特基势垒二极管 Schottky Barrier Diodes	HRC0103C HRB0502A HRV103B、RKR104BKH HRC0103C: HRB0502A: HRV103B, RKR104BKH:	两管脚表面安装外形（低Vf、低泄漏电流） 三管脚表面安装外形（低Vf） 两管脚表面安装小型外形（Io＝1A） 低IR，最适于电路保护 2-pin surface-mount package (low Vf, low leak current) 3-pin surface-mount package (low Vf) Compact 2-pin surface-mount package (IO = 1A), low IR ideal for circuit protection

电扇 Fans

■应用电路示例 Sample application circuit





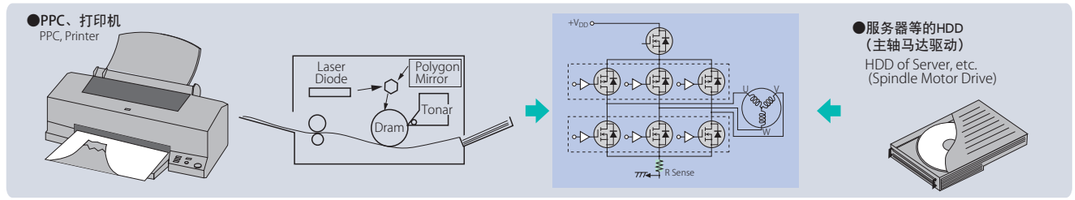
产品系列 Product Lineup

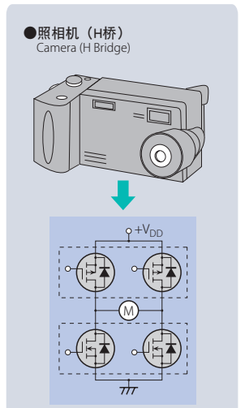
输入电压 Input Voltage	风扇马达 Fan Motor	水平摆动 Horizontal Oscillation	垂直摆动 Vertical Oscillation
AC100V～120V	BCR1AM-12A	BCR1AM-12A	BCR1AM-12A
AC200V～240V	BCR08AM-12A	BCR08AM-12A	BCR08AM-12A

http://cn.renesas.com/applications/consumer/index.jsp http://hk.renesas.com/applications/consumer/index.jsp

小型马达驱动/打印机
Compact Motor Drivers, Printers

小型马达驱动用功率MOSFET　Power MOSFETs for Driving Compact Motors



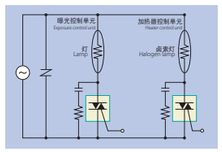


MPAK产品系列　MPAK Lineup

封装 package	型号 Part No.		最大额定值 Maximum Rating VDSS (V)	VGss (V)	ID (A)	RDS (on) (mΩ) VGS=4.5v(8v) typ	VGS=4.5v(8v) max	VGS=10v typ	VGS=10v max	Qgd (nc)	Qg (nC)
SOP-8	HAT2199R	Single (Nch)	30	±20	11	17	25	13	16.5	1.8	7.5
	HAT2208R		30	±20	9	24	35	18	23	1.1	4.4
	HAT2256R		60	±20	8	28	41	24	30	3.2	10
	HAT1131R	Single (Pch)	-30	±20	-9	21.5	31	15	19	5.8	17
	HAT1132R		-30	±20	-7	27.5	40	20	25	5.2	11.5
	HAT2276R	Nch+Nch	30	±20	7.5	27	40	19	24	1.2	4.6
	HAT2280R		30	±20	6	40	58	27	34	1.1	3
	HAT2275R		60	±20	6.6	29	43	25	32	3.2	10
	HAT2215R		80	±20	3.4	100	145	88	115	1.3	7.3
	HAT1126R	Pch+Pch	-60	±20	6	60	85	40	50	8	37
	HAT3029R	Nch+Pch	30	±20	6	40	58	27	34	1.1	3.1
			-30	+10/-20	-6	36	53	25	32	4.4	11.5
	HAT3037R		45	±20	5	55	75	44	55	0.9	3.0
			-45	+10/-20	-3.8	95	130	75	95	1.5	4.9
	HAT3010R		60	±20	6	32	45	25	32	8	18
			-60	±20	-5	90	130	60	76	8	18
	HAT3031R		60	±20	6.6	29	43	25	32	2.8	10
			-60	+10/-20	-3.4	120	175	95	120	2.2	6.0
	HAT3038R		60	±20	5	55	80	48	60	1.4	-
			-60	±20	-3.8	90	130	80	100	2.8	-
	HAT3021R		80	±20	3.4	100	145	90	115	1.3	7.3
			-80	±20	-2.6	200	290	165	210	2.4	16
	HAT3019R		100	±20	3.5	120	160	90	115	3.2	15
			-100	±20	-2.3	300	500	240	300	3.1	16
UPAK	RQK0601DQS	Single (Nch)	60	±20	5.0	65	91	56	70	1	8.9
	RQK0603DQS		60	±20	2.8	240	336	205	257	0.4	2.7
	RQJ0601DQS	Single (Pch)	-60	+10/-20	-2.8	150	210	124	155	1.5	9.6
	RQJ0602DQS		-60	+10/-20	-1.5	620	868	485	607	0.3	2.9
	RQK0301DQS	Single (Nch)	30	±20	6.0	35	49	28	35	2.1	12
	RQK0302DQS		30	±20	3.8	107	150	81	102	1.2	3.2
	RQJ0301DQS	Single(Pch)	-30	+10/-20	-5.2	56	79	38	48	6	18
MPAK	RQK0605DQA	Single (Nch)	60	±20	3.1	93	131	82	103	0.8	6.9
	RQK0603DQA		60	±20	2.0	248	348	212	265	0.4	2.8
	RQJ0603DQA	Single (Pch)	-60		-1.8	196	275	158	198	1.1	7.4
	RQJ0602DQA		-60	+10/-20	-1.1	613	854	490	613	0.6	3
	RQK0303DQA	Single (Nch)	30	±20	3.7	50	70	42	53	1.3	8.9
	RQK0302DQA		30	±20	2.7	122	171	92	115	0.5	3.3
	RQJ0303DQA	Single (Pch)	-30	+10/-20	-3.3	76	107	54	68	2.9	12
	RQJ0302DQA		-30	+10/-20	-2.2	216	303	138	173	1	4.2

打印机　Printers

■应用电路示例
Sample application circuit



曝光控制单元　Exposure Control Units

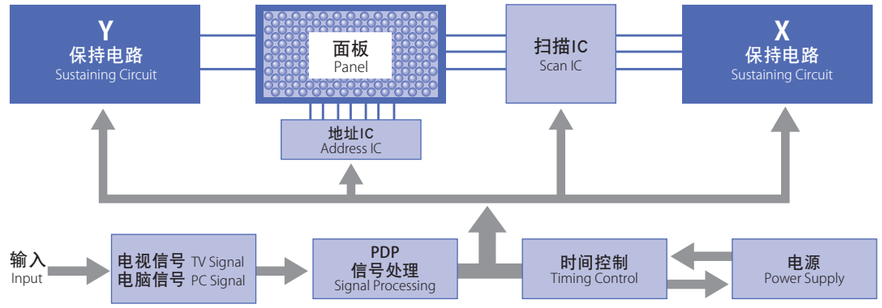
输入电压 Input Voltage	电容 Capacity	非绝缘外形 Non-Insulation Package	绝缘外形 Uninsulated Package
AC100V～120V	200W	BCR5AM-12LA/LB	BCR5KM-12LA/LB BCR5PM-12LA/LG
	300W	BCR6AM-12LA/LB	BCR8KM-12LA/LB BCR8PM-12LA/LG
	400W	BCR8CM-12LA/LB	BCR8KM-12LA/LB BCR8PM-12LA/LG
AC200V～240V	200W	–	BCR3KM-12LA/LB BCR3PM-12LA/LG
	300W	–	BCR3KM-12LA/LB BCR3PM-12LA/LG
	400W	BCR5AM-12LA/LB	BCR5KM-12LA/LB BCR5PM-12LA/LG

加热器控制单元　Heater Control Units

输入电压 Input Voltage	电容 Capacity	非绝缘外形 Non-Insulation Package	绝缘外形 Uninsulated Package
AC100V～120V	400W	BCR8CM-12LA/LB	BCR8KM-12LA BCR5PM-12LA/LG
	600W	BCR12CM-12LA/LB	BCR12KM-12LA BCR12PM-12LA/LG
	800W	BCR16CM-12LA/LB	BCR16KM-12LA BCR16PM-12LA/LG
	1000W	BCR30AM-12LA/LB	–
AC200V～240V	400W	BCR5AM-12LA/LB	BCR5KM-12LA BCR5PM-12LA/LG
	600W	BCR6AM-12LA/LB	BCR8KM-12LA BCR8PM-12LA/LG
	800W	BCR8CM-12LA/LB	BCR8KM-12LA BCR8PM-12LA/LG
	1000W	BCR10CM-12LA/LB	BCR10KM-12LA BCR10PM-12LA/LG

PDP
PDP

PDP系统构成　PDP System Configuration



IGBT（高速型）　IGBTs (High-Speed Type)

Part No.	Maximum Rating VCES[V]	IC[A]	VGE[V]	Electrical Characteristics VCE(sat)[V]typ.	tf[μs]typ.	Package
RJP30E2DPK	360	35	±30	1.7	0.15	TO-3PSG
RJP30E3DPK	360	40	±30	1.6	0.15	TO-3PSG
RJP30E2DPP	360	35	±30	1.7	0.15	TO-220FL
RJP30E3DPP	360	40	±30	1.6	0.15	TO-220FL
RJP30H2DPP	360	35	±30	1.3	0.15	TO-220FL
RJP30H3DPP	360	40	±30	1.2	0.15	TO-220FL
RJP30K3DPP	360	40	±30	1.1	0.25	TO-220FL
RJP63F3DPP	630	40	±30	1.7	0.1	TO-220FL
RJP63K2DPP	630	35	±30	1.9	0.2	TO-220FL
RJP63K3DPP	630	40	±30	1.7	0.2	TO-220FL

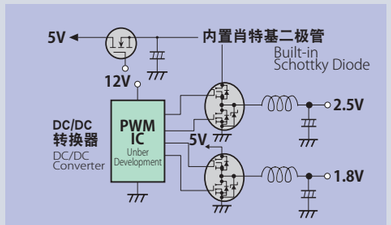
AC/DC转换器同步整流

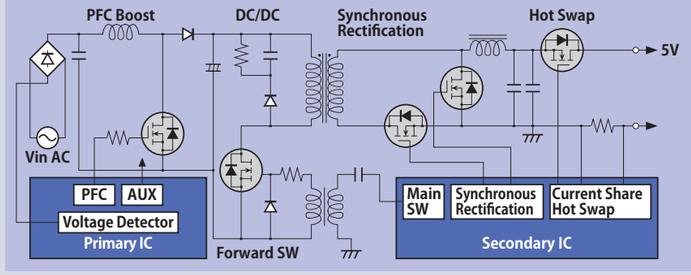
Synchronous Rectifiers for AD/DC Converters

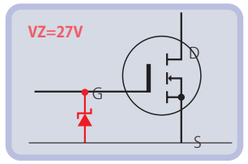
应用示例 Application Examples

应用块 Application Blocks

应用 Application	MOSFET	控制IC Control IC
PFC PFC+PWM	500V	HA16174 HA16158
DC/DC	500V	—
次级侧同步整流 Secondary Side Synchronous Rectification	30 to 60V	
热插拔 Hot Swap	20 to 30V	
VRM	20 to 30V	HA16167







GS间保护
过电压保护（OVP）
→破坏模式需为短路模式
G-S Protection and Overvoltage Protection (OVP)
→ Breakdown mode must be short mode.

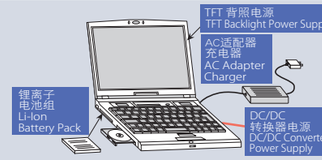
产品系列 Product Lineup

应用 Application	型号 Part No.	外形 Package	VDSS (V)	VGSS (V)	ID (A)	Pch (W)	RDS (on) (mΩ) VGS=10V typ	RDS (on) (mΩ) VGS=10V max
起动开关SW Start SW	RJK6011DJE	TO-92M	600	±30	0.1	0.9	35	52
	RJK6022DJE	TO-92M	600	±30	0.2	0.9	13	15
PFC DC/DC	RJK6015DPK	TO-3P	600	±30	21	150	315	360
	RJK5020DPK	TO-3P	500	±30	40	200	103	115
次级侧同步整流 Secondary Side Synchronous Rectification	HAT2165H	LFPAK	30	±20	55	30	2.5	3.3
	HAT2170H		40	±20	45	30	3.3	4.2
	H7N0308LD	LDPAK	30	±20	70	100	3.8	4.8
	H7N0602LD		30	±20	85	100	4.1	5.2
热插拔 Hot Swap	H7N0203AB	TO-220AB	20	±20	90	100	2.4	3
	RJK0328DPB	LFPAK	30	±20	60	65	1.6	2.1
DC/DC 转换器 DC/DC converters	RJK0354DSP	SOP-8	30	±20	16	2.0	5.4	7.0
	RJK0352DSP		30	±20	18	2.0	4.3	5.6
	RJK0305DPB	LFPAK	30	±20	30	45	6.7	8.0
	RJK0303DPB		30	±20	40	55	3.1	3.7
	RJK0331DPB		30	±20	40	50	2.6	3.4
	RJK0330DPB		30	±20	45	55	2.1	2.7
GS间保护 G-S Protection	系列 Series	封装 Package	Pd	备注 Notes				
	RKZ-KV系列 Series	SRP-F	0.7W	IEC61000-4-2 30kV(接触) IEC 61000-2-4 compliant, 30kV (contact)				
	RKZ-KV系列 Series	TURP-FM	0.5W	IEC61000-4-2 30kV(接触) IEC 61000-2-4 compliant, 30kV (contact)				

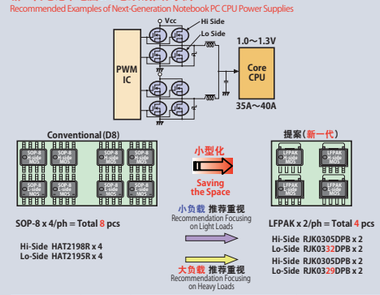
笔记本电脑

Notebook PCs

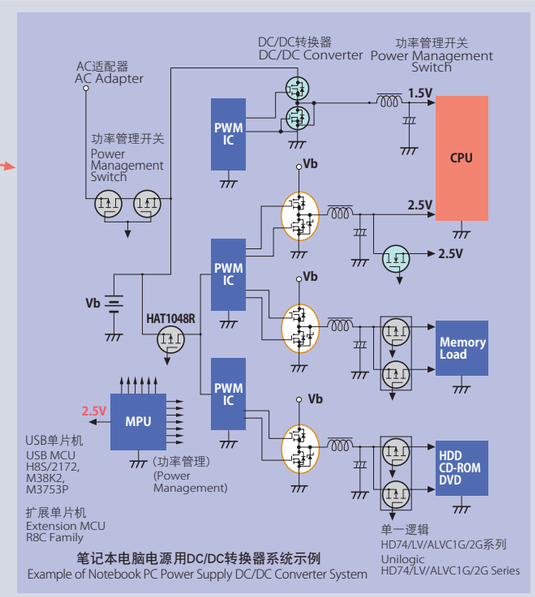
应用示例（保护笔记本电脑、锂离子电池） Application Example (Notebook PC Lithium-Ion Battery Protection)



新一代笔记本电脑CPU电源的推荐示例
Recommended Examples of Next-Generation Notebook PC CPU Power Supplies



MOSFET 使用数量 Number of MOSFETs Used	控制IC Control IC: LI Ion	DC/DC	功率管理开关 Power Management SW	TFT背照电源 TFT backlight Power Supply	共计 Total
	2～4个	8～10个	4～6个	2～4个	15～22个
	2 to 4	8 to 10	4 to 6	2 to 4	15 to 22



笔记本电脑电源用DC/DC转换器系统示例
Example of Notebook PC Power Supply DC/DC Converter System

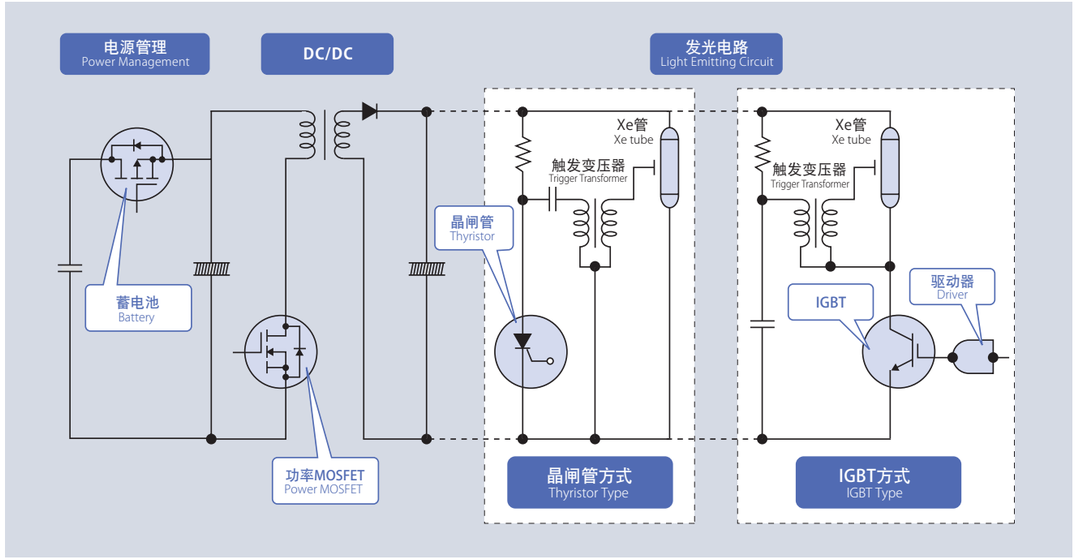
产品系列 Product Lineup

应用 Application		型号 Part No.	外形 Package	VDSS (V)	ID (A)	10V RDS (on) (mΩ) Typ	10V RDS (on) (mΩ) max	Qg(nC) Note1)	MP
同步整流 DC/DC Synchronous Rectification DC/DC	CPU Drive	RJK0355DSP	LFPAK	30	12	8.5	11.1	6.0	OK
		RJK0305DPB		30	45	6.7	8.0	8	OK
		RJK0328DPB		30	60	1.6	2.1	42	OK
		RJK0329DPB		30	55	1.8	2.3	35	OK
		RJK0330DPB		30	45	2.1	2.7	27	OK
		RJK0331DPB		30	40	2.6	3.4	21	OK
		RJK0332DPB		30	35	3.6	4.7	14	OK
		RJK0346DPA	WPAK	30	65	1.5	2.0	49	OK
		RJK0348DPA		30	50	1.9	2.5	34	OK
		RJK0349DPA		30	45	2.4	3.1	25	OK
		RJK0351DPA		30	40	3.2	4.2	17	OK
		RJK0353DPA		30	35	4.0	5.2	14	OK
		RJK0355DPA		30	30	8.2	10.7	6.3	OK
		RJK0379DPA	WPAK (Single) +SBD	30	50	1.8	2.3	37.0	OK
		RJK0380DPA		30	45	2.4	3.2	24.0	OK
		RJK03A4DPA		30	42	2.9	3.8	17.0	OK
		RJK0381DPA		30	40	3.4	4.5	15.0	OK
		RJK0383DPA	WPAK (Dual) +SBD	30	15/45	8.5/2.5	11.1/3.3	6.8/20	09/5
		RJK0384DPA		30	15/42	8.5/2.9	11.1/3.8	6.8/17	09/5
		RJK0389DPA		30	15/20	8.2/6.8	10.7/8.9	6.0/7.2	OK
	Memory CD-ROM HDD	HAT2218R[D] (SBD应用)	SOP-8	30/30	7.5/8	19/17	24/22	4.6/11	OK
		HAT2285WP[D] (SBD)	WPAK	30/30	14/22	19/14	24/18	4.6/18	OK
功率管理开关 Power Management SW		HAT1054R[D]	SOP-8	-20	-6	(24)	(30)	—	OK
		HAT1128R		-30	-16	6.0	7.5	—	OK
		HAT1125H	LFPAK	-30	-45	2.7	3.6	165	OK
LED背照 LED back-light		HAT2114R[D]	SOP-8	60	6	28	32	15	OK
		HAT2215R[D]		80	3.4	88	115	7.3	OK

应用 Application	产品 Category	型号 Part No.	备注 Notes
电源功率管理 Power supply power management	肖特基势垒二极管 Schottky barrier diode	HRW0702A HRW0202B	低VF、低IR Low Vf, low TR
		HRV103B, RKR104BKH	Io=1A 小型外形 IO = 1A, small package, 低IR，最适于电路保护 low IR ideal for circuit protection
外部接口 External interface	齐纳二极管 Zener diode	HZM6.8Z4MFA RKZ6.8Z4MFAKT RKZXXKJ/KK系列	低电容(4pF)， 最适于USB端口的电涌吸收 Low capacitance (4pF) ideal for USB pin surge absorption

闪光灯电路
Strobe flash

应用示例（照相机闪光灯） Application Examples (Camera flash)



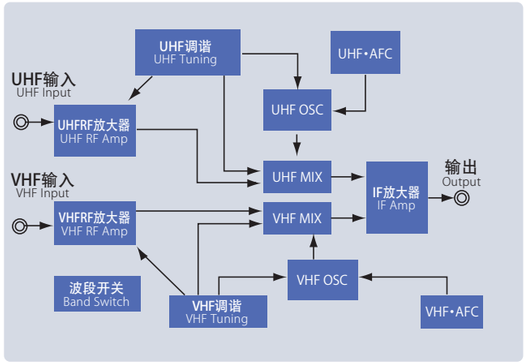
产品系列 Product Lineup

用途 Application	家族 Family	型号 Part No.	特性 Characteristics	外形 Package
电源管理 Power management	功率MOSFET Power MOSFET	HAT1069C	12V,3A,70mΩtyp※1,1.8V驱动 12V, 3A, 70mΩtyp※1, 1.8V drive	CMFPAK-6
		HAT1089C	20V,2.5A,103mΩtyp※2,2.5V驱动 20V, 2.5A, 103mΩtyp※1, 2.5V drive	
DC/DC		HAT2217C	60V,3.0A,126mΩtyp※2,4.5V驱动 60V, 3.0A, 126mΩtyp※2, 4.5V drive	
		HAT2240C*	60V,2.5A,62mΩtyp※2,2.5V驱动 60V, 2.5A, 62mΩtyp※2, 2.5V drive	
发光电路 Light-emitting circuits	IGBT	RJP4009ANS	400V,150A,2.5V驱动 400V, 150A, 2.5V drive	VSON-8
		RJP4010AGE	400V,150A,3V驱动 400V, 150A, 3V drive	VSON-8
	晶闸管 Thyristor	CR05BS-8	400V,0.1A,IGT=100μA	SC-59
		CR05AS-8	400V,0.5A,IGT=100μA	SOT-89
		CR08AS-12	600V,0.8A,IGT=100μA	SOT-89
	驱动器 Driver	RD5CYD08	Vcc=4-6V,IOHshort=-100mA(@Vcc=5.0V)	CMPAK-5
		RD3CYD08	Vcc=2.5-3.6V,IOHshort=-100mA(@Vcc=3.3V)	
		RD5CYDT08	Vcc=4-6V,IOHshort=-100mA(@Vcc=5.0V) Logic level translate function(30V CMOS Logic -> 5V CMOS Logic)	

*：新产品 *: New product ※1: VGS=2.5V时 ※2: VGS=4.5V时 ※1. When VGS = 2.5V ※2. When VGS = 4.5V

高频应用领域
High-Frequency Application Areas**

UHF/VHF调谐器 UHF/VHF Tuners



VHF调谐器用晶体管产品系列
VHF Tuner Transistor Lineup

用途 Application		封装代码 Package Code		
		MPAK-4	CMPAK-4(T)	CMPAK-6
RF	MOS	3SK297		
			3SK317	
	BBFET	BB305M		
				TBB1002
				TBB1004
				TBB1005
				TBB1010

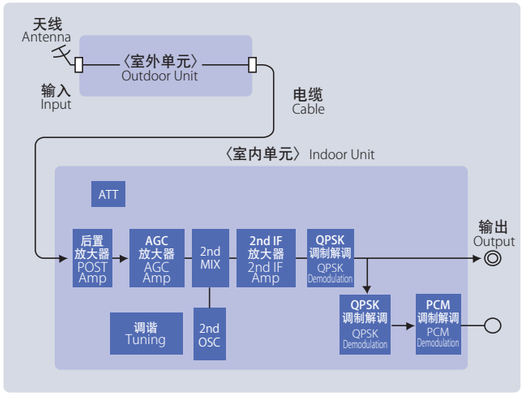
UHF调谐器用晶体管产品系列
UHF Tuner Transistor Lineup

用途 Application		封装代码 Package Code		
		MPAK-4	CMPAK	CMPAK-6
RF	BBFET TBB	BB502M	BB502C	
		BB504M	BB504C	
			BB505C	
			BB506C	TBB1002
				TBB1004
				TBB1005
				TBB1010

UHF/VHF调谐器用二极管产品系列
UHF/VHF Tuner Diode Lineup

用途 Application		封装代码 Package Code				
		MPAK	URP	UFP	SFP	EFP
UHF	调谐 Tuning		HVU202B	HVC202B		
			RKV500KG	RKV500KJ	RKV500KK	
			HVU326C	HVC326C	HVD326C	
	MIX	HSM276AS	HSU276A	HSC276A	HSD276A	HSL276A
VHF	调谐 Tuning		HVU306C	HVC306C		
			RKV501KG	RKV501KJ	RKV501KK	
			HVU327C	HVC327C	HVD327C	
			HVU307			
			HVU300C	HVC300C		
			RKV502KG	RKV502KJ	RKV502KK	
			HVU363B	HVC363B		
			HVU328C	HVC328C	HVD328C	
			HSU277	HSC277	RKS150KK	
	波段开关 Band Switch			RKS151KJ	RKS151KK	
		HSM2694				
UHF/VHF	AFC			HVC308A		

BS/CS调谐器 BS/CS Tuners



BS/CS调谐器用晶体管产品系列
BS/CS Tuner Transistor Lineup

用途 Application	封装代码 Package Code			
	MPAK	MPAK-4	CMPAK	CMPAK-4(T)(UPAK)
后置放大器 Post-Amp				2SC5594
		2SC4926		
2nd IF 放大器 2nd IF Amp.	2SC5890		2SC4901	
2nd OSC			2SC4901	

BS/CS调谐器用二极管产品系列
BS/CS Tuner Diode Lineup

用途 Application	封装代码 Package Code					
	MPAK	CMPAK／-4	URP	UFP	SFP	EFP
2nd MIX	HSM276AS	HSB276AS	HSU276A	HSC276A	HSD276A	HSL276A
ATT	HVM14					
	HVM14S/SR	HVB14S				
	HVM187S	HVB187YP	HVU187			
	HVM189S					
	HVM187WK					
		HVB190S				
				HVC190		
					HVD191	
						HVL192
Tuning			HVU316	HVC316		
			HVU417C	HVC417C		
			HVU202B	HVC202B		
			RKV500KG	RKV500KJ	RKV500KK	

型号说明
Part No. Destination

功率晶体管产品型号的命名方法【瑞萨统一型号】 Power Transistor Product No. Designation (Renesas Uniform Product Number)

●功率晶体管
Power Transistor

存在部分例外
WITH SOME EXCEPTIONS

R J K 04 01 J PE - 00 # J 4

- R：瑞萨半导体（固定）Renesas's Semiconductors (Fixed)
- J：表示功率晶体管 Power transistor (Fixed)
- K：表示产品分类（1～2位字母，参照表-1）Product series (1 or 2-letters, See table-1.)
- 04：表示耐压分类（2位数字，参照表-2）Voltage class (2-digit, See table-2.)
- 01：表示连续编号（2位数字）Serial number (2-digit)
- J：表示质量分类（1位字母，参照表-3）Quality characteristics (1 letter, See table-3.)
- PE：表示外形代码（2位字母，参照表-4）Package code (2-alphanumeric, See table-4.)
- 00：表示特殊规格（2位字母数字）Special specification (2-alphanumeric)
- J：表示包装规格（1位字母数字，参照表-5）Packing specification (1 alphanumeric, See table-5.)
- 4：表示有无铅、卤素的代码（1位数字，参照表-6）Lead/Halogen-free (1 digit, See table-6.)

▶表-1. 产品分类
Table-1. Product series

符号 Symbol	产品分类 Productseries
E	带功能MOS Pch MOS Pch w/ function
F	带功能MOS Nch MOS Nch w/ function
G	带功能MOS N/P混装 MOS Pch and Nch w/ function
H	IGBT + 二极管 IGBT + Diode
J	功率MOS Pch Power MOS Pch
K	功率MOS Nch Power MOS Nch
L	功率MOS Nch（内置高速二极管） Power MOS Nch(Built-in high-speed diode)
M	功率MOS N/P混装 Power MOS Pch and Nch
P	IGBT IGBT
Q	带功能IGBT IGBT w/ function
U	二极管（SFD等） Diode (SFD, etc.)

▶表-2. 产品分类
Table-2. Voltage class

符号 Symbol	耐压（V） Voltage (V)
01	10～19
02	20～29
03	30～39
：	：
：	：
99	990～999
1A	1000～1099
1B	1100～1199
1C	1200～1299
1D	1300～1399
1E	1400～1499
1F	1500-1599

之后按需进行设定
* Set as necessary.

▶表-3. 质量分类
Table-3. Quality characteristics

符号 Symbol	质量等级 Quality characteristics
J	高可靠性1 High reliability 1
P	高可靠性2 High reliability 2
D	工业用等 For industrial use, etc.
A	民用 For consumer use
S	特殊、定制用 For special and custom use

▶表-6. 有无铅、卤素
Table-6. Lead/Halogen-free

完全无铅 Full lead-free	0	无铋 w/o Bi
	1	有铋 w/ Bi
管脚无铅 Pin lead-free	2	无铋 w/o Bi
	3	有铋 w/ Bi
有铅 Leaded	4	-
不含卤素 Halogen-free	5	无铋 w/o Bi
完全无铅 Full lead-free	6	有铋 w/ Bi
不含卤素 Halogen-free	7	无铋 w/o Bi
管脚无铅 Pin lead-free	8	有铋 w/ Bi

▶特殊规格代码
00为标准规格代码。
此外均为特殊规格代码。
▶Special Specification Code
00 : Standard specification
Others : Special specification

▶表-5. 包装规格
Table-5. Packing Specification

包装代码 Symbol	包装规格 Specification
0	散装（塑料袋） Bulk (Plastic bag)
1	散装（托盘） Bulk (Tray)
2	散装（专用箱） Bulk (Special case)
H	压纹带（左） Emboss taping (Left)
J	压纹带（左）大号 Emboss taping (Left) Large
Q	压纹带（右）大号 Emboss taping (Right) Large
T	料盒 Tube
Z	径向带（TZ） Radial taping (TZ)
W	晶片 Wafer
X	芯片 Chip

▶表-4. 外形代码
Table-4. Package Code

代码 Code	外形 Package
JA	TO-92（SC-43A）
JE	TO-92M（SC-51）
QS	UPAK（SC-62）
QM	CMFPAK-6
PA	WPAK
PB	LFPAK
PC	LFPAK-i
PD	DPAK-S（MP-3A）
PE	LDPAK-S1（TO—220S）
PF	LDPAK-S2（SOT-263）
PH	DPAK-L（MP-3）
PJ	LDPAK-L（TO—220C）
PK	TO-3P
PL	TO-3PL
PM	TO-3PFM
PN	TO-220AB
PP	TO-220FN （但PP-M0为TO-220FL） (However, TO-220FL for PP-M0)
PQ	TO-220F
PR	TO-220FM
PS	TO-220CFM
SA	TSOP-8
SP	SOP-8
SC	HSOP-20
NP	QFN
NS	VSON-8
WA	晶片 / Wafer
WT	芯片 / Chip

功率晶体管产品型号的命名方法【瑞萨以往产品】 Power Transistor Product No. Designation (Previous Renesas Products)

●HAT系列、热敏FET系列
HAT Series, Thermal FET Series

HAT 2 064 R - EL - E

- 2：系列名称 Series name
- 064：表示极性（N/P）N/P
- R：连续编号 Product number
- EL：封装缩写 Package abbreviation
- E：表示带包装规格 Taping direction
- E：表示管脚无铅 Lead-free

▶N/P

1	P ch
2	N ch
3	N ch/P ch

▶封装缩写
Package abbreviation

H	LFPAK
N	LFPAK-I
T	TSSOP-8
R	SOP-8
RP	HSOP-11
M	TSOP-6
C	CMFPAK-6
G	CMPAK-6

HAF 1 001 - 91 - TL - E

- 1：通过系列名称表示热敏FET Thermal FET series
- 001：表示极性（N/P）N/P
- 91：连续编号 Product number
- TL：特殊规格号（2位数字）Special specification number (2 digits)
- E：表示带包装规格 Taping direction
- E：表示管脚无铅 Lead-free

▶N/P

1	P ch
2	N ch

●H5N、H7N、H8N系列
H5N, H7N, H8N Series

存在部分例外
WITH SOME EXCEPTIONS

H5 N 50 11 PL - E

- H5：系列名称 Series name
- N：表示极性（N/P）N/P
- 50：耐压VDSS VDSS
- 11：连续编号 Product number
- PL：封装缩写 Package abbreviation
- E：表示管脚无铅 Lead-free

▶系列名称
Series name

H5
H7
H8

▶N/P

N	N ch
P	P ch

▶耐压 VDSS= x10
Voltage VDSS= x 10

50	500V
02	20V

▶封装缩写
Package abbreviation

PL	TO-3PL
P	TO-P
AB	TO-220AB
FM	TO-220FM
CFM	TO-220CFM
LD	LDPAK-L
DL	DPAK-L(1), (2)
PF	TO-3PFM
LS/LM	LDPAK-S(1)/S(2)
DS	DPAK-S

晶闸管、双向晶闸管型号的命名方法 Thyristor and triac Part No. designation

CR 8 K M -12 A
BCR 8 C M -12 L A

- CR：晶闸管 CR : Thyristor
- BCR：双向晶闸管 BCR : Triac
- 种类 Type
- 8：额定电流 Rated current
- C：版本 Sub-number
  K, P ：绝缘型（全塑封型）K, P : Insulation type (Full mold type)
  其他：非绝缘型 Others : Non-insulation type
- M：外形 Mount type
  M：通孔型 M : Through-hole type
  S ：表面安装型 S : Surface mount type
- -12：耐压类 Standing voltage class
  V_{DRM}=耐压类×50V
  V_{DRM}=Dielectric resistance class x 50V
- L：换向特性（仅双向晶闸管）Commutation characteristics(Triac only)
  L：感性负载用 L : For an inductive load
  ：阻性负载用 : For a resistive load
- A：版本 Version

▶额定电流（例）
Current ratings (Ex.)

符号 Symbol	额定电流 Current ratings
05	0.5A
1D5	1.5A
8	8A
0	20A

▶换向特性
Commutation chara.

符号 Symbol	□□□□□□□□
L、无 L, Blank	保证 Guaranteed
R	不保证 Non-guaranteed

▶外形
Package type

符号 Symbol	外形 Package
M	电路板插入型 Lead mount
S	表面安装型 Surface mount
R	电路板插入型(铝带) Lead mount (Aluminum ribbon)

▶种类
Type

代码 Code	种类 Type
BCR	双向晶闸管 Triac
CR	晶闸管 Thyristor

▶封装
Package

A~C	TO-92,TO-220AB,TO-3P,MP-3A DPAK-L,UPAK,MPAK
K	TO-220FN
P	TO-220F・TO-220F(2) ※1
R	TO-3PFM
T	TO-220F(2)

※1：LC、LE系列和BCR2PM
*Note1: LC, LE series and BCR2PM

▶包装
Package

版本 Version	芯片结构 Chipstructure	收缩芯片 Shurinked chip	外形 Package	结温 Tj.
无 Blank	玻璃钝化 Glass passivation	-	-	125℃
A	平面 Planar	-	-	125℃
B		-	-	150℃
C		○	TO-220F(2)	150℃
D		○	TO-220F	150℃
E		-	TO-220F(2)	125℃
F		-	TO-220F	125℃
G		-	TO-220F	150℃

●复合型（2合1）外形产品
Composite type (2-in-1) package products

TBB 1005 AM 01 TR -E

- 1005：系列名称 Series name
- AM：实际产品标记 2位字母 Stock mark: 2 letters
- 01：产品型号 使用从1001开始的连续号码 Product model name: Serial number from 1001 used
- TR：带包装方向 TR、TL Taping direction TR, TL
- -E：无铅 Pb free

特殊编号 Special specification code：无 nothing / 2位数字 2 digits
标准品 Standard / 特殊规格 special specification

▶特殊规格号
Special specification code

无 nothing	标准产品 Standard
2位数字 2 digits	特殊规格 Special specification

●内置偏压类型产品
Built-in bias type products

BB 1 01 M AU- 01 TR -E

- BB：Built-in Biasing Circuit MOS FET
- 1：用途、工艺 1位数字 ※1表 Use/process: 1 digit * See table below
- 01：产品型号 01～ Product model name: Serial number from 01
- M：封装分类 Package：M:MPAK-4 / C:CMPAK-4
- AU：实际产品标记 2位字母 Stock mark: 2 letters
- 01：特殊编号 Special specification code：无 nothing / 2位数字 2 digits
  标准品 Standard / 特殊规格 standard special specification
- TR：带包装方向 TR、TL Taping direction TR, TL
- -E：无铅 Pb free

▶特殊规格号
Special specification code

无 nothing	标准产品 Standard
2位数字 2 digits	特殊规格 Special specification

▶封装分类
Package

M	MPAK-4
C	CMPAK-4

▶用途、工艺 1位数字
Use/process

1	UHF放大 UHF amplifier
3	VHF放大 VHF amplifier
5	UHF放大/VHF放大 UHF amplifier/VHF amplifier

●高频功率MOSFET
Power MOSFET for high frequency

R Q A 0001 xxx D NS H 3

- A：小信号晶体管产品 Small signal transistor products
- Q：高频功率MOSFET Power MOSFET for high frequency
- R：瑞萨产品 Renesas products
- 0001：固有编号 使用从01开始的连续号码 Unique number(Serial number from 01)
- xxx：标记型号 最多3位字母 Stock mark 3 letters(Maximum)
- D：可靠性分类 Reliability code
- NS：外形分类 Package code
- H：包装规格 Packing code
- 3：无铅 Pb free

※附表 BBFET用途、工艺 * Table: BBFET Use/process

1	3	5
UHF放大 UHF amplifier	VHF放大 VHF amplifier	UHF放大/VHF放大 UHF amplifier / VHF amplifier

※上述之前的型号 Above former Part No.
•NPN:2SCxxxx,2SDxxxx •n-ch:2SKxxxx,3SKxxx
•PNP:2SAxxxx,2SBxxxx •p-ch:2SJxxx

▶表-1. 质量等级
Table-1. Quality characteristics

符号 Symbol	质量等级 Quality characteristics
J	高可靠性1 High reliability 1
P	高可靠性2 High reliability 2
D	工业用等 For industrial use, etc.
A	民用 For consumer use
S	特殊、定制用 For special and custom use

▶表-3. 包装规格
Table-3. Packing Specification

包装代码 Symbol	包装规格 Specification
0	散装（塑料袋） Bulk (Plastic bag)
1	散装（托盘） Bulk (Tray)
2	散装（专用箱） Bulk (Special case)
H	压纹带（左） Emboss taping (Left)
J	压纹带（左）大号 Emboss taping (Left) Large
Q	压纹带（右）大号 Emboss taping (Right) Large
T	料盒 Tube
Z	径向带（TZ） Radial taping (TZ)
W	晶片 Wafer
X	芯片 Chip

▶表-4. 有无铅、卤素
Table-4. Lead/Halogen-free

完全无铅 Full lead-free	0	无铋 w/o Bi
	1	有铋 w/ Bi
管脚无铅 Pin lead-free	2	无铋 w/o Bi
	3	有铋 w/ Bi
有铅 Leaded	4	-
不含卤素 Halogen-free	5	无铋 w/o Bi
完全无铅 Full lead-free	6	有铋 w/ Bi
不含卤素 Halogen-free	7	无铋 w/o Bi
管脚无铅 Pin lead-free	8	有铋 w/ Bi

▶表-2. 外形代码
Table-2. Package Code

代码 Code	外形 Package
JA	TO-92（SC-43A）
JE	TO-92M（SC-51）
QS	UPAK（SC-62）
QM	CMFPAK-6
PA	WPAK
PB	LFPAK
PC	LFPAK-i
PD	DPAK-S（MP-3A）
PE	LDPAK-S1（TO—220S）
PF	LDPAK-S2（SOT-263）
PH	DPAK-L（MP-3）
PJ	LDPAK-L（TO—220C）
PK	TO-3P
PL	TO-3PL
PM	TO-3PFM
PN	TO-220AB
PP	TO-220FN
PQ	TO-220F
PR	TO-220FM
PS	TO-220CFM
SA	TSOP-8
SP	SOP-8
SC	HSOP-20
NP	QFN
NS	VSON-8
WA	晶片 / Wafer
WT	芯片 / Chip

二极管产品型号（采购型号）的命名方法（瑞萨统一型号） Diode Part No. Destination (Renesas Uniform Product Number)

R K Z 6.8Z4 .... KL -1 R 1 Q

- R：瑞萨半导体（固定） Renesas's Semiconductors (FIX)
- K：二极管（固定） Diode (FIX)
- Z：产品家族 Family Name
- 6.8Z4：产品固有编号、管脚排列符号 Unique number and Pin arrangement
- KL：质量等级（可省略） Quality Level (omissible)
- -1：外形代码 Package
- R：特殊规格号（特殊规格时）（可省略） Special Specification Code (omissible)
- 1：包装规格 Packing
- Q：无铅规格 Lead Free
- 直接进口品 Direct import

存在部分例外 With Some Exceptions

包装规格 Packing / 树脂外形 Resin Mold

4mm	TR	P
	TL	H
	UR	Q
	UL	J
2mm	KR	R
	KL	K
	PR	S
	PL	L

玻璃外形 Glass

袋装 Bulk		0
52mm	TG	A
	TA	7
	TK	7
26mm	TE	8
	TJ	8
	TD	9
	TN	9
	TDX	B
弧形 Radial	RE/RX	6
	RF/RY	5

产品家族与产品固有编号 Family Name and Unique number

V	变容 Vari-Cap	调谐器 Tuner	500 ~ 599
		VCO	600 ~ 699
P	PIN二极管 PIN Diodes	天线开关 Antt.Sw	200 ~ 299
		衰减器 Attenuator	300 ~ 399
S	开关 Switching	开关 Switching	100 ~ 149
		波段开关 RF Switch	150 ~ 199
D	高频肖特基 Schottky		700 ~ 799
R	整流肖特基 Rect.Schottky	依照整流电流值、耐压值（*1） Depend on Io,VR(*1)	
Z	齐纳 Zener	基准Vz值 + 电容分类（*）（*）4pF类：Z4 低电容（8～25pF）类：Z 一般产品：无	Depend on Vz,Cd(*) (*) 4pF : Z4 Low Cd(8~25pF): Z others: none
C(*2)	复合多种芯片 Compound Chips	6管脚以上 more than 6pin	400 ~ 499

（*1）参照下列附表 （*2）同类芯片取决于产品家族
(*1)Refer to the another Table(Rectification schottky) (*2)Depend on Family

管脚排列符号 Pin Arrangement

S	系列 Series Connect
SR	反向系列 Rev.Series.Connect
WK	共用阴极 Cathode Common
WA	共用阳极 Anode Common
WS	串联连接 2个 Series Connect(x2)
FA	4个元件共用阳极 Anode Common(x4)
FK	4个元件共用阴极 Cathode Common(x4)
YP	2个元件并行 Parallel(x2)

质量等级 Quality Level

J	Q1A/B
（省略；D） (omissible; D)	Q2
A	Q3

外形代码 Package

KA	DO-35	KP	MP6
KB	DO-41	KQ	(0402)
KC	MHD	KR	MOP
KD	LLD	KS	MFP12
KE	MAP系	KT	VSON-5
KF	SRP	QA	MPAK
KG	URP	QC	MPAK5
KH	TURP	QE	CMPAK
KJ	UFP	QF	CMPAK4
KK	SFP	QK	MFPAK
KL	EFP	WA	晶片发货-1 Wafer-1
KM	TEFP	WB	晶片发货-2 Wafer-2
KN	MP8	WC	晶片发货-3 Wafer-3
		WD	晶片发货-4 Wafer-4
		WE	晶片发货-5 Wafer-5
		WF	晶片发货-6 Wafer-6
		WT	芯片发货-1 Chip-1
		WS	芯片发货-2 Chip-2
		WR	芯片发货-3 Chip-3

无铅规格 Lead Free

完全无铅 Full Pb Free	0	无铋 without Bi	
完全无铅 Full Pb Free	1	有铋 with Bi	
管脚无铅 Terminal Pb Free	2	无铋 without Bi	
管脚无铅 Terminal Pb Free	3	有铋 with Bi	
有铅 Pb	4	—	

二极管产品型号的命名方法（瑞萨以往产品） Diode Part No. Destination (Previous Renesas Products)

●玻璃（插入）型（JEITA）
Glass (Inserting) Type [JEITA]

1 S S 270 A TD -E Q

- 1：表示半导体元件 Indicates semiconductor element
- S：产品分类 Product category
- S：固有编号（连续编号） Unique number(Serial)
- 270：等级 Grade
- A：包装规格 Packing specifications
- TD：无铅 Pb free
- -E：直接进口品 Direct import
- Q：

产品分类 Product category

R	整流二极管 Rectification diode
S	信号二极管 Signal diode
V	变容PIN二极管 Varicap/PIN diode
Z	齐纳二极管 Zener diode

固有编号 Unique number

300 ~ 499	变容 Varicap
10 ~ 229	变容PIN Varicap/PIN
Vz中心值的整数 Vz center value integer	齐纳 Zener
0103 ~ 0703	整流用肖特基（*附表） Rectification schottky (*See table)

包装规格 Packing specifications

请于http://www.japan.renesas.com/diode参照"二极管通用事项"⇒"标准带包装规格"。
Please refer to Web-site concern to Diode

表示 Rectification schottky (*See table)

HRW 05 03 A

- HRW：
- 05：整流电流分类 Rectification current
- 03：耐压分类 Breakdown voltage
- A：产品分类 Product category

电流(A) Current(A)		耐压(V) Breakdown voltage(V)	
01	0.1	02	20
02	0.2	03	30
03	0.3	04	40
05	0.5		
07	0.7		
1	1.0		

●表面安装型
Surface-mount Type

存在部分例外 With Some Exceptions

H S M 88 WA TR -E Q

- H：系列名称 Series name
- S：用途缩写 Abbreviation indicating application
- M：封装缩写 Package abbreviation
- 88：固有编号 Unique number
- WA：内部连接或改良品 Internal connection or improved products
- TR：包装规格 Packing specifications
- -E：无铅 Pb free
- Q：直接进口品 Direct import

用途缩写 Abbreviation indicating application

S	信号用 For signal
V	变容PIN Varicap/PIN
R	整流用 For rectifier
Z	齐纳 Zener
C	芯片、晶片 Chip,Wafer

封装缩写 Package abbreviation

B	CMPAK, MOP	N	VSON-5
C	UFP	P	Do-41*
D	SFP	R	SRP
G	Do-35*	S	MHD*
K	LLD	T	（温度补偿齐纳）用途 (Temp. compen-sation zener) useURP
L	EFP	U	URP
M	MPAK, MPAK5	W	整流用MPAK MPAK for rectifier

*: 玻璃（插入）型 *: Glass (inserting) type.

内部连接 Internal connection

S	系列 Series
SR	反向系列 Reverse series
WK	共用阴极 Cathode common
WA	共用阳极 Anode common
WS	串联连接 2个 2 series connections
FA	4个元件共用阳极 4 elements anode common
YP	2个元件并行 2 elements parallel

型号命名方法 Part No. designation

●JEITA品名
JEITA Part No.

例 Example.

2 S C 945 A

- 2：有效电极数 3个 Three of effective electrode
- S：半导体 Semiconductor
- C：NPN高频用TR NPN high frequency TR
- 945：注册号 Registration number
- A：最初的改良品 Improved product first

1位数字 Single digit	S	1位字母 1 digit alphabetic	2～4位数字 2 to 4 digits	1位字母 1 digit alphabetic
*a	*b	*c	*d	*e

*a: 有效电极.1 The number of effective electrodes--1
*b: 表示半导体 Semiconductors (Semiconductors) show.
*c: 器件的功能、种类 Features of the device type
*d: 注册号（11～） Registration number(11--)
*e: 表示改良。（按字母顺序。） Represents improvement. (And in alphabetical order.)

符号 Symbol	器件的功能、种类 Device type	符号 Symbol	器件的功能、种类 Device type
A	PNP高频用TR PNP high frequency TR	K	Nch FET Nch FET
B	PNP低频用TR NPN low frequency TR		
C	PNP高频用TR NPN high frequency TR		
D	PNP低频用TR NPN low frequency TR		

●内置电阻晶体管
Transistor with Internal Resistor

1位字母 1 digit alphabetic	1位字母+1位数字 1 digit alphabetic + Single digit	1位字母 1 digit alphabetic	1位数字 Single digit	1位字母 1 digit alphabetic	(1～2位数字或1位字母 1 to 2 digits or 1 digit alphabetic)	– 1～2位字母数字 1 to 2 digit alphanumeric	– 环保 Environmental
*a	*b	*c	*d	*e	*f	*g	*h

*a: 表示外形。 Shows the outside.

*b: 表示极性和电气特性。字母表示极性，数字表示电气特性。字母数字的含义如下所示。
Indicate the polarity and electrical characteristics. Polarity with a letter, a number that represents the electrical characteristics.
The meaning of letters is as follows.

字母数字 Alphanumeric	A到M：NPN晶体管 NPN transistor	字母数字 Alphanumeric	N到X：NPN晶体管 PNP transistor	字母数字 Alphanumeric	Y：NPN+PNP晶体管 NPN+PNP transistor
A 1	小信号型 Small signal type	N 1	小信号型 Small signal type	Y 5	小信号型 Small signal type
A 2	小信号高hFE型 Small signal high hFE type	N 2	小信号高hFE型 Small signal high hFE type		
A 3	内置小信号二极管 Small-signal with internal diode	N 3	内置小信号二极管 Small-signal with internal diode		
A 4	小信号型（收缩芯片版） Small-signal type (Flat chip shrink version)	N 4	小信号型（收缩芯片版） Small-signal type (Flat chip shrink version)		
A 5	小信号（Ic=0.05A类） Small signal (Ic=0.05A class)	N 5	小信号（Ic=0.05A类） Small-signal (Ic=0.05A class)		
B 1	中功率型1（Ic=0.7A类） Semi-power type 1 (Ic=0.7A class)	P 1	中功率型1（Ic=0.7A类） Semi-power type 1 (Ic=0.7A class)		
C 1	中功率型2（Ic=2A类） Semi-power type 2 (Ic=2A class)	Q 1	中功率型2（Ic=2A类） Semi-power type 2 (Ic=2A class)		
C 2	中功率型3（Ic=3A类） Semi-power type 3 (Ic=3A class)	Q 2	中功率型3（Ic=3A类） Semi-power type 3 (Ic=3A class)		
D 1	中功率型4（Ic=1A类） Semi-power type 4 (Ic=1A class)	R 1	中功率型4（Ic=1A类） Semi-power type 4 (Ic=1A class)		
D 2	中功率型5（内置ZeDi） Semi-power type 5 (ZeDi internal)				
E 1	中功率型6（高hFE） Semi-power type 6 (High hFE)				
E 2	中功率型7（高hFE、内置ZeDi） Semi-power type 7 (High hFE , ZeDi internal)				

*c: R1电阻的有效数字。 *与指数d结合使用。
R1 significant figures of resistance. *d be used in conjunction with the index.

*d: R1电阻的指数。 以10的n次方表示。数值为n值。
R1 resistance index. The squares represent 10 n. N the number.

*e: R2/R1电阻值之比。但无R1时，*c、*d表示R2电阻值。
R2 / R1 ratio of the resistance. However, R1-free configurations *c , *d is that the value of the resistor R2.

*f: 表示特殊对应。为从1开始的连续编号。
A section of special support. Serial number starting with # 1.

*g: 包装形态（表示带包装）
Packing (view taping)
① 插入型……T
Insert type
②表面安装型
Surface mount

*h: 环保
Environmental

型号命名方法 Part No. designation

●功率MOSFET（NP系列）
Power MOSFET (NP Series)

NP	2～3位数字 2 to 3 digits	1位字母 1 digit alphabetic	2～3位数字 2 to 3 digits	1位字母 1 digit alphabetic	1位字母 1 digit alphabetic	1位字母 1 digit alphabetic	(	1～2位数字 1 to 2 digits	)	1位字母－1位字母1位数字 1 digit alphabetic-1 digit alphabetic Single digit	–	1～3位字母数字 1 to 3 digit alphanumeric
*a	*b	*c	*d	*e	*f	*g		*h		*i		*j

–	1～3位字母数字 1 to 3 digit alphanumeric	–	样品形态 Sample form	–	订购形态 Order Form	–	环保 Environmental
	*k		*l		*m		*n

***a: 表示功率MOSFET。**
Indicate the Power MOSFET.

***b: 表示ID(DC)额定值。**
Represents the ID(DC) rating.
例） 50：额定50A、110：额定110A
Example) 50: 50A rating, 110: 110A rating

***c: 表示极性。**
Represents the polarity.
N：Nch P：Pch
N：Nch P：Pch

***d: 表示VDSS额定值。**
Represents the VDSS rating.
例） 60：额定60V、10：额定100V、055：额定55V、100：额定1000V
Example) 60: 60V rating, 10: 100V rating, 055: 55V rating, 50: 500V rating, 100: 1000V rating

***e: 表示封装分类。**
Represents the package types.

符号 Sign	名称 Name	符号 Sign	名称 Name
A	TOP-3(MP-88)	K	TO-263AB(MP-25ZK)
B	TO-220绝缘型(MP-45F) TO-220 Isolated(MP-45F)	M	TO-220AB(MP25、JEDEC版) TO-220AB(MP25、JEDEC version.)
C	TO-220AB(MP25、JEITA版) TO-220AB(MP25、JEITA version.)	N	TO-262AA(MP-25去毛刺、JEDEC版) TO-262AA(MP-25fins cut、JEDEC version.)
D	TO-262AA(MP-25去毛刺、JEITA版) TO-262AA(MP-25fins cut、JEITA version.)	P	TO-263(MP-25ZP)
E	TO-220SMD(MP-25ZJ)	R	TO-251(MP-3、JEDEC版) TO-251(MP-3、JEDEC version.)
F	MP-10	S	TO-252(MP-3Z、JEDEC版) TO-252(MP-3Z、JEDEC version.)
G	TO-126	T	TO-263-7管脚
H	TO-251(MP-3、JEITA版) TO-251(MP-3、JEITA version.)	V	TO-252(MP-3ZP)
I	TO-252(MP-3Z、JEITA版) TO-252(MP-3Z、JEITA version.)	Y	8管脚HSON
J	SOT-89(功率迷你塑封) SOT-89(Power mini mold.)	Z	晶片、管芯 Wafer,Pellet

***f: 表示栅-源间保护二极管的有无及驱动电压。**
Gate-represents the presence of protection diodes and voltage source drive.
B: 有栅-源间保护二极管、驱动电压2.5V
Built in Gate to Source protection diode drive voltage 2.5V
L: 有栅-源间保护二极管、驱动电压4、4.5V
Built in Gate to Source protection diode drive voltage 4, 4.5V
H: 有栅-源间保护二极管、驱动电压10V
Built in Gate to Source protection diode drive voltage 10V
D: 无栅-源间保护二极管、驱动电压4、4.5V
No protection diode between Gate and Source drive voltage 4, 4.5V
U: 无栅-源间保护二极管、驱动电压10V
No protection diode between Gate and Source drive voltage 10V

***g: 表示系列名称。**
Represents the series name.
A: 第3代系列 Generation 3 Series
B: 第4代系列 Generation 4 Series
C: 第5代系列 Generation 5 Series
D: 第6代系列 Generation 6 Series
E: 第7代系列 Generation 7 Series
F: 第8代系列 Generation 8 Series
G: 第9代系列 Generation 9 Series
H: 第7代系列 Generation 7 Series
J: 第10代系列 Generation 10 Series
K: 第11代系列 Generation 11 Series

***h: 表示特殊规格。为从1开始的连续编号。**
Represents the special specification. Serial number starting with # 1.

***i: 表示晶片、管芯的包装形态。**
Represents the packing wafer or pellets.
W–S ……晶片（已切片） Wafer(diced)
W–U ……晶片（未切片） Wafer(no diced)
P–T ……管芯（托盘包装） Pellet(tray packed)
P–S ……管芯（波浪带） Pellet(Surf tape)
管芯（压纹带）按带包装的芯片方向分为以下几类。
Pellet(Embossed taping) is divided into the following chip in the direction of the tape pack.
P–E 1 ……从卷带的拉出侧看，栅极垫的位置在左侧时 Look left from the position of the gate pad tape drawerIf you have a embossed carrier taping of which gate pad is faced to feed direction to reel direction.
P–E 2 ……从卷带的拉出侧看，栅极垫的位置在右侧时 Look right from the position of the gate pad tape drawerIf you have a embossed carrier taping of which gate pad is faced to feed direction to reel direction.
P–E 3 ……正方形芯片的情况下，栅极垫的位置位于边缘中央并且在卷带的卷入侧时 In the case of a square chip which Gate pad is positioned middle of the side is face to reef direction.
P–E 4 ……正方形芯片的情况下，栅极垫的位置位于边缘中央并且在卷带的拉出侧时 In the case of a square chip which Gate pad is positioned middle of the side is face to reef direction.

***j: 封装品包装形态**
Product packing package.
从S开始的数字：管装料盒
Numbers that begin with S: Stick Magazine
表面安装型
Surface mount

***k: OEM代码**
OEM code

***l: 样品形态**
Sample form

***m: 订购形态**
Order form

***n: 环保**
Environmental

例 Example.

NP 110 N 04 P U G (1)

- *h 特殊规格 Special specifications
- *g 系列名称：第9代 Series name: Generation 9 series
- *f 无栅-源间保护二极管、驱动电压10V Gate-no protection diode between the source and drive voltage 10V
- *e 封装：TO-263(MP-25ZP) Package: TO-263(MP-25ZP)
- *d VDSS额定值：额定40V VDSS rating: 40V rating
- *c 极性：Nch Polarity: Nch
- *b ID(DC)额定值：额定110A ID(DC) rating: 110A rating

●晶体管、MOSFET、J.FET（House型号）
Transistor. MOSFET, J–FET (House)

N	2位数字 Double-digit number	2位字母数字 Double-digit alphanumeric	1位字母 1 digit alphabetic	1位字母 1 digit alphabetic	(	1～3位字母数字 1 to 3 digit alphanumeric	)–	1～2位字母数字 1 to 2 digit alphanumeric	–	1～3位字母数字 1 to 3 digit alphanumeric	–	样品形态 Sample form	–	环保 Environmental
*a	*b	*c	*d	*e		*f		*g		*h		*i		*j

***a: 表示晶体管、MOSFET、J.FET。**
Indicate the Transistor, MOSFET or J-FET.

***b: 表示额定耐压（Vceo,VDSS）。参照01～99代码表。**
Represents the voltage rating(Vceo, VDSS). 01 to 99 table of code.

代码 Code	Vceo / Vdss	代码 Code	Vceo / Vdss	代码 Code	Vceo / Vdss
01	10 to 19V	07	70 to 79V	13	130 to 139V
02	20 to 29V	08	80 to 89V	…	…
03	30 to 39V	09	90 to 99V	…	…
04	40 to 49V	10	100 to 109V	88	880 to 889V
05	50 to 59V	11	110 to 119V	89	890 to 899V
06	60 to 69V	12	120 to 129V	90	900 to Over

***c: 编号（按耐压等级以连号设定）** 00 to 99, AD to ZZ
Part number. (a set sequential breakdown by voltage rating)

***d: 表示极性。**
Represents the polarity.
R：PNP-Tr, S：NPN-Tr
N：Nch-FET, P：Pch-FET

***e: 表示改良。（按字母顺序。）**
Represents the improvement. (And in alphabetical order.)

***f: 表示特殊规格。为从1开始的连续编号。**
Represents the special specification. Serial number starting with # 1.

***g: 特殊管脚规格**
Special specification Lead
S：TO-262
Z：TO-252, TO-220SMD
ZJ：TO-263
ZK: TO-252(MP-3ZK), TO-263AB
ZP: TO-252(MP-3ZP), TO-263

***h: 包装形态（表示带包装）**
Packing (view taping)
插入型 Insert type
从S开始的数字：管装料盒 Numbers that begin with S: Stick magazine
安装型 Surface mount
…… T：径向带 Radial
…… L：管状料盒（横向对齐料盒） Stick magazine (magazine packed horizontal)
……VM: 料盒（纵向对齐料盒） magazine (magazine packed height)

***i: 样品形态**
Sample form

***n: 环保**
Environmental

e～j可省略。 Technical e to j can be omitted.

例 Example.

N 06 00 P A (1) – ZK – E1 – AY

- *j 环保 Environmental
- *h 包装形态 表面安装型 Surface mount type
- *g 封装：TO-252(MP-3ZK)、TO-263AB Package: TO-252(MP-3ZK), TO-263AB
- *f 特殊规格 Special specifications
- *e 最初的改良品 Improved product first
- *d 极性：Pch-FET Polarity: Pch-FET
- *c 编号 Part number
- *b VDSS60–69V

型号命名方法 Part No. designation

●低电压二极管
Zener Diodes

RD	2～3位数字 2 to 3 digits	1～2位字母数字 1 to 2 digit alphabetic	(	1～2位数字 1 to 2 digits	)–	2～3位字母数字 2 to 3 digit alphanumeric	–	订购形态 Order Form	–	环保 Environmental
*a	*b	*c		*d		*e		*f		*g

***a: 表示低电压二极管。**
Indicate the constant voltage display.

***b: 表示齐纳电压。以含小数点的数字表示。**
Represents the zener voltage display.
The figures represent the number of digits including a decimal point.

***c: 表示系列。按功耗、外形与以往的区别分类。**
Indicate the series. The distinction beyween shape and function to classify and power.

***d: 表示特殊对应。为从1开始的连续编号。**
A section of special suppoet. Serial number starting with # 1.

***e: 包装形态（表示带包装）**
Packing (view taping)
①表面安装型 Surface mount
②玻璃型 Glass type

***f: 订购形态**
Order form

***g: 环保**
Environmental

例 Example.

RD 5.1 S (50) – T 1

- 带包装分类：轴向带包装装箱 Axial taping segment boxed
- 特殊对应 Special support
- 2管脚SSP/200mW型 2Pin SSP / 200mW type
- 齐纳电压：5.1V Zener voltage: 5.1V

●噪音限幅二极管
ESD Noise-Clipping Diodes

NNCD	2～3位数字 2 to 3 digits	0～1位字母 0 to 1 digit alphabetic	1位字母 1 digit alphabetic	1位字母 1 digit alphabetic	(	1～2位数字 1 to 2 digits	) –	2～3位字母数字 2 to 3 digit alphanumeric	–	1～3位字母 1 to 3 digit alphanumeric	–	订购形态 Order Form	–	环保 Environmental
*a	*b	*c	*d	*e		*f		*g		*h		*i		*j

***a: 表示噪音限幅二极管。**
Indicate the Noise-Clipping diode.

***b: 表示击穿电压。可使用小数点。**
Represents the breakdown voltage. Usable point.
（例 Example) 3.3V → 3.3 12V → 12

***c: 表示系列符号。产品系列的符号。**
Indicate the series. Symbol product series

符号 Symbol	类型 Type	符号 Symbol	类型 Type
无 None	高抗ESD型（多芯片） High ESD type (Multi-chip)	R	低电容、高抗ESD型（多芯片） Low capacitance (monolithic chip)
L	低电容型（多芯片） Low capacitance type (Multi-chip)	S	低电容、高抗ESD型（单芯片） Low capacitance high ESD type (monolithic chip)
M	低电容（单芯片） High-low capacitance ESD type (Multi-chip)		
P	高抗ESD型（单芯片） High ESD type (monolithic chip)		

***d: 表示封装分类。**
表示封装的符号（采用1位字母表示的开发顺序连号）。
Represents the package type.
Package Symbol (alphabet 1 taken in sequential order and character development.)

符号 Symbol	封装 Package	符号 Symbol	封装 Package
A	–	K	3pin XSOF
B	–	L	5pin XSOF
C	SC-78(2pinUSM(G))	M	2pinSSP (F)
D	SC-76(2pinSSP(G))	N	1008LLP Single-type
E	–	P	缺号 Missing number
F	SC-59(3pinMM)Dual-type	R	1611LLP Quad-type
G	SC-74A(5pinMM)Quad-type	S	SC-70 (3pinSSP(G))
H	SC-88A(5pinssp)Quad-type	T	1008LLP Dual-type
J	2pin XSOF		

***e: 附加符号**
Additional symbols

符号 Symbol	封装 Package	符号 Symbol	封装 Package
A	特性改善、改良 附加符号 Characteristic improvement additional symbol	T	内部连接符号（双向连接） Internal connection symbol (two-way connection)
B			
C			
D			

***f: 区分特殊规格的数字**
Special specification section numbers

***g: 包装形态（表示带包装）**
Packing (view taping)

***h: OEM代码**
OEM code

***i: 订购形态**
Order form

***h: 环保**
Environmental

e～j可省略。 Technical e to j can be omitted.

例 Example.

NNCD 5. 6 D A (1) – T1 – AT

- *j 环保分类 Environmental classification
- *g 带包装分类：压纹带 Embossed Taping division
- *f 区分特殊规格的数字 Special specification section numbers
- *e 特性改良 Characteristic improvement
- *d SC-76 (2管脚SSP)
- *c 无：高抗ESD型 None: High ESD type
- *b 击穿电压：5.6V Breakdown voltage: 5.6V
- *a 表示噪音限幅二极管 Indicate the NNCD

- 产品目录品名 Name catalog: abcdef
- 交纳规格书品名 Name specification sheet: abcdefghi
- KeyA4品名 Key A4 Name: abcdefghij

●低电容电涌保护元件
Surge Absorber Device

NSAD	2～3位字母数字 2 to 3 digit alphanumeric	0～1位字母 0 to 1 digit alphabetic	1位字母 1 digit alphabetic	(	1～2位字母数字 1 to 2 digit alphanumeric	) –	2～3位字母数字 2 to 3 digit alphanumeric	–	1～3位数字 1 to 3 digits	–	订购形态 Order Form	–	环保 Environmental
*a	*b	*c	*d		*e		*f		*g		*h		*i

***a: 表示电涌保护元件。**
Indicate the of surge protection devices.

***b: 表示最大信号频率。**
Represents the max. signal frequency.
（例 Example）500MHz → 500 1GHz → 1G

***c: 表示系列符号。**
Indicate the series.
现开发品：无
Under development products: None
……以下（2）依照噪音限幅二极管……
The folloeing……(2) Noise-Clipping diode equivalent

***d: 表示封装分类。**
Represents the package types.

***e: 区分特殊规格的数字。**
Special specification section numbers.

***f: 包装形态（表示带包装）**
Packing (view taping)

***g: OEM代码**
OEM code

***h: 订购形态**
Order form

***i: 环保**
Environmental

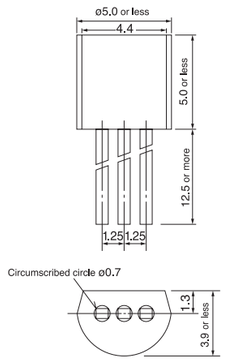
e～j可省略。 Technical e to j can be omitted.

参考：品名（例）
Note: Name (example)
NSAD500H-T1
NSAD500F-T1

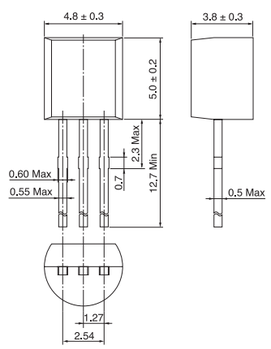
封装名称 Package Name
封装代码 Package Code

（单位：mm）
(Units : mm)

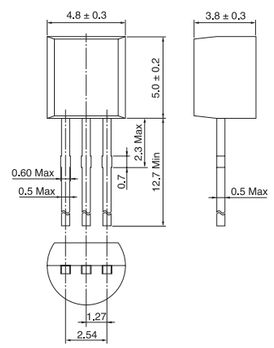
TO-92*
PRSS0003EA-A



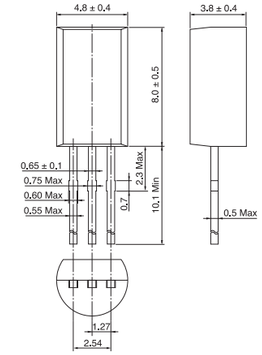
TO-92(1)
PRSS0003DA-A/PRSS0003DB-A



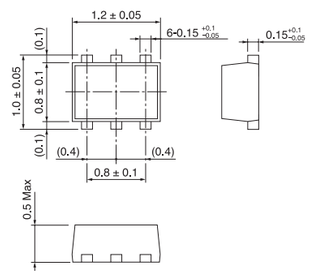
TO-92(2)
PRSS0003DA-C/PRSS0003DB-C



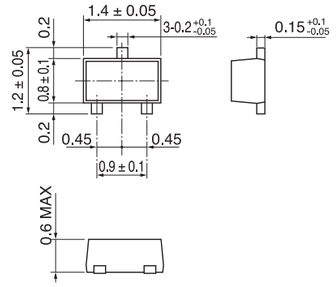
TO-92MOD
PRSS0003DC-A



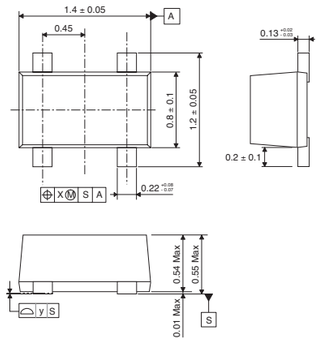
EMFPAK-6
PXSF0006LA-A



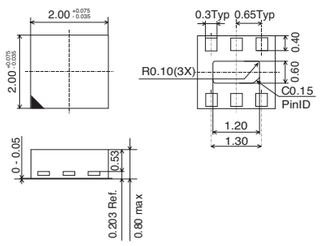
MFPAK
PUSF0003ZA-A



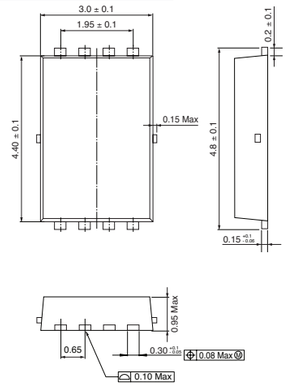
MFPAK-4
PUSF0004ZA-A



TNP-6DTV
PWSN0006JA-A



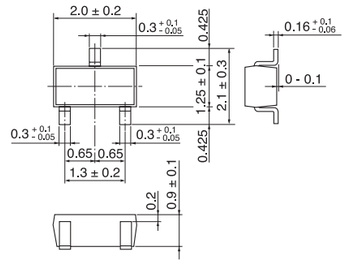
VSON-8
PVSN0008JA-A



封装名称 Package Name
封装代码 Package Code

（单位：mm）
(Units : mm)

CMPAK
PTSP0003ZA-A



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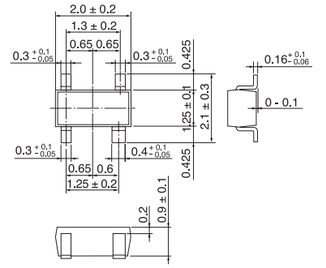
PTSP0004ZA-A



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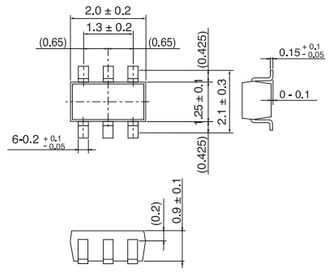
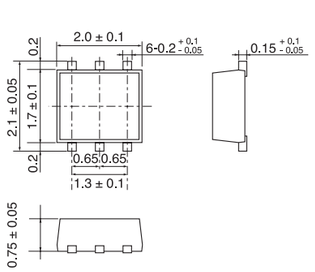
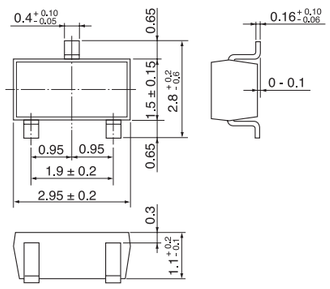


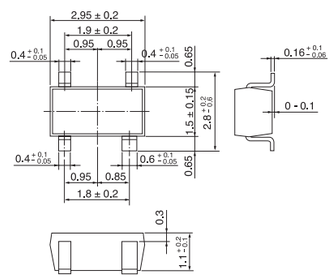
CMFPAK-6
PWSF0006JA-A



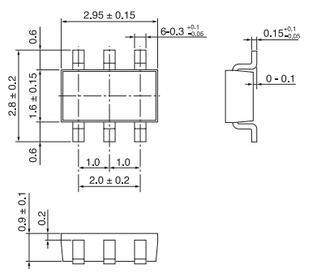
MPAK
PLSP0003ZB-A



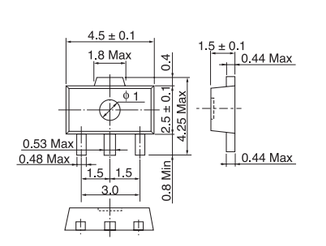
MPAK-4
PLSP0004ZA-A



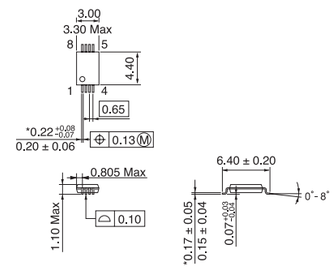
TSOP-6
PTSP0006FA-A



UPAK
PLZZ0004CA-A



TTP-8D
PTSP0008JB-A

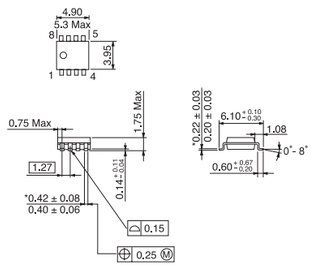


http://cn.renesas.com/products/package/index.jsp　http://hk.renesas.com/products/package/index.jsp

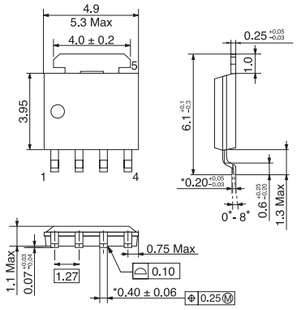
封装名称 Package Name
封装代码 Package Code

（单位：mm）
(Units : mm)

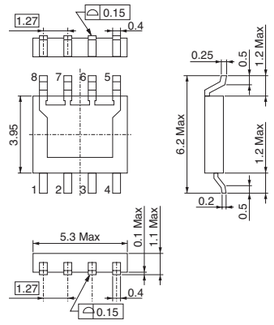
FP-8DA
PRSP0008DD-A



LFPAK
PTZZ0005DA-A



LFPAK-i
PTSP0008DC-A



WPAK
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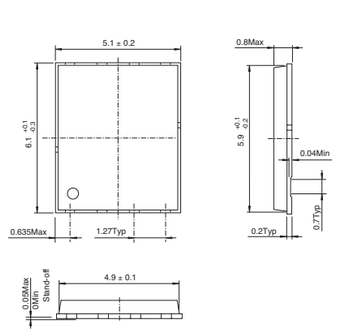
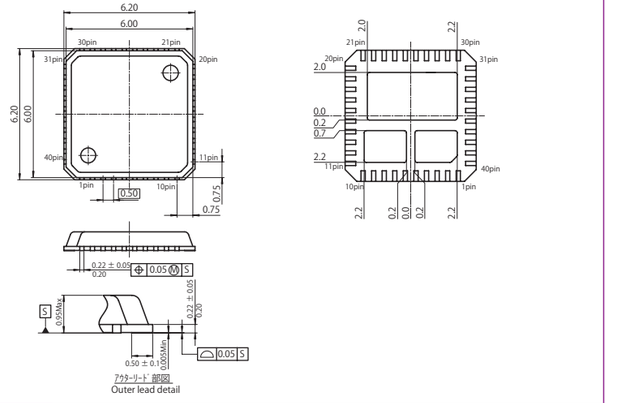
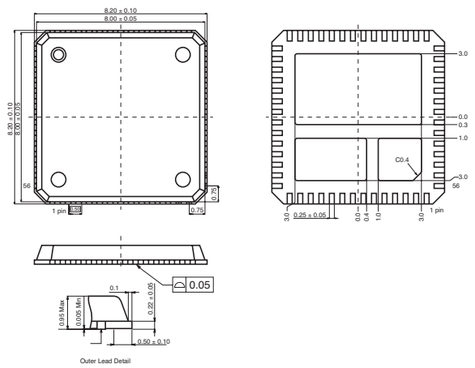


QFN40
PVQN0040KC-A



QFN56(2)
PVQN0056KA-A



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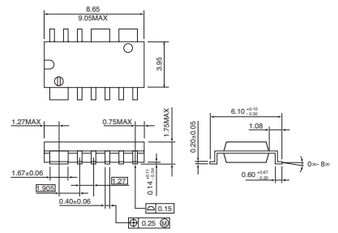
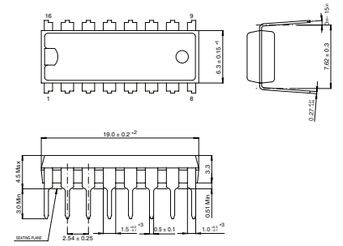
(Units : mm)

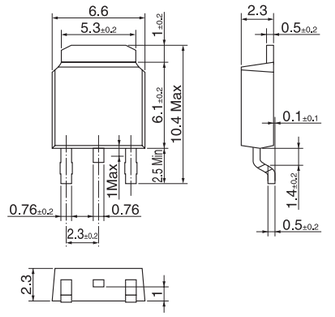
FP-11DTV
PRSP0014DE-B



16P4
PRDP0016AA-A



MP-3A
PRSS0004ZA-A



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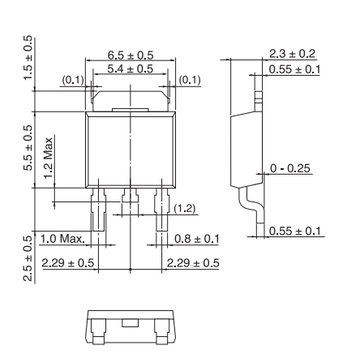
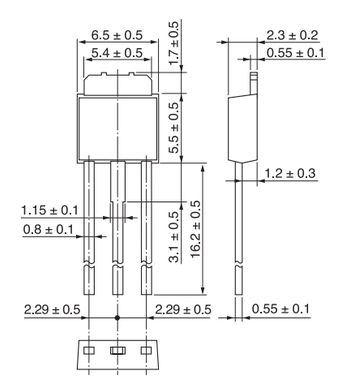
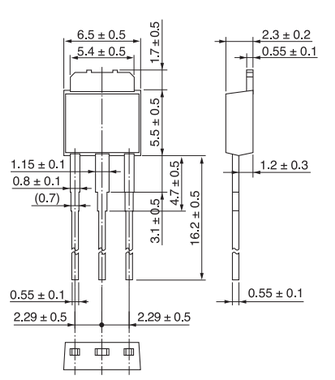


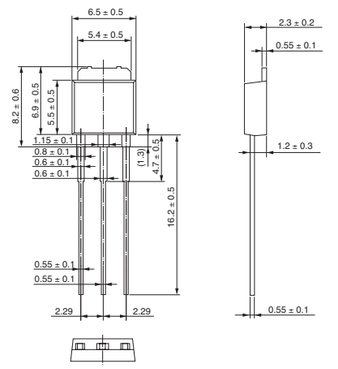
DPAK(L)-(1)
PRSS0004ZD-A



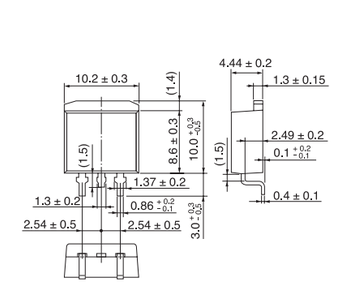
DPAK(L)-(2)
PRSS0004ZD-B



DPAK(L)-(3)
PRSS0004ZD-D



LDPAK(S)-(1)
PRSS0004AE-B



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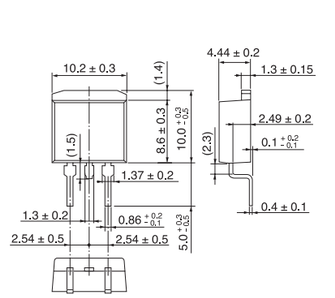
PRSS0004AE-C



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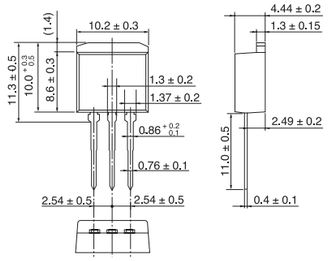
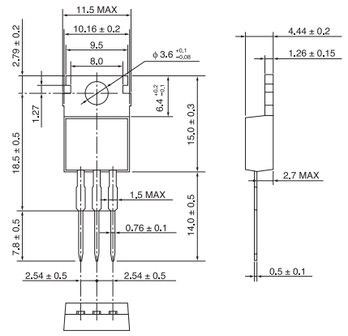
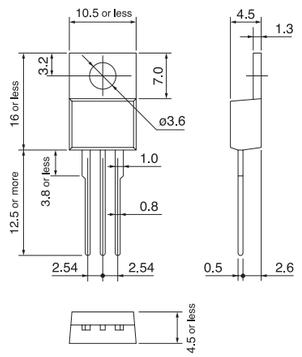
LDPAK(L)
PRSS0004AE-A



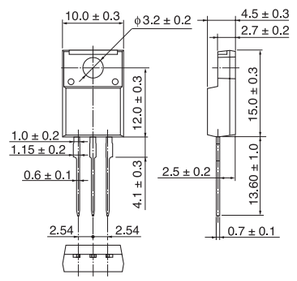
TO-220AB
PRSS0004AC-A



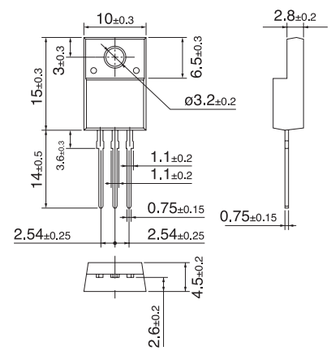
TO-220
PRSS0004AA-A



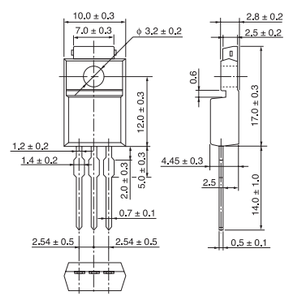
TO-220CFM
PRSS0003AE-A



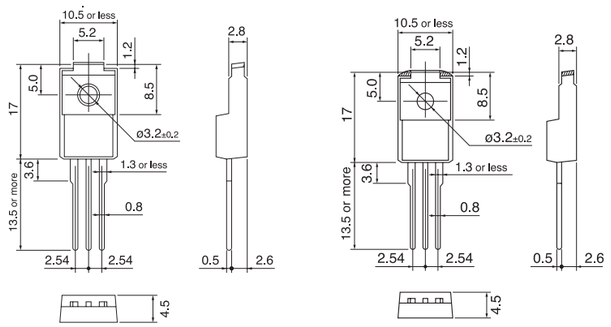
TO-220FN
PRSS0003AB-A



TO-220FM
PRSS0003AD-A



TO-220F*/TO-220F**
PRSS0003AA-A



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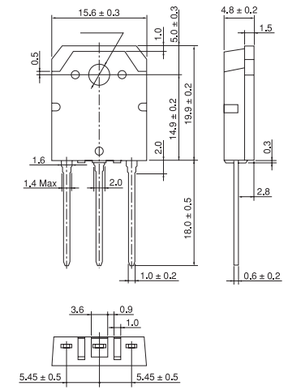
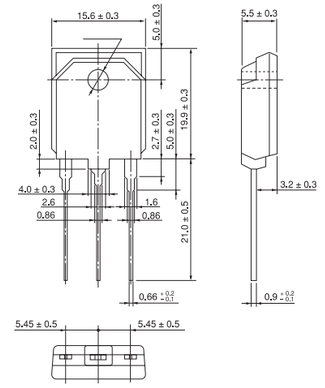
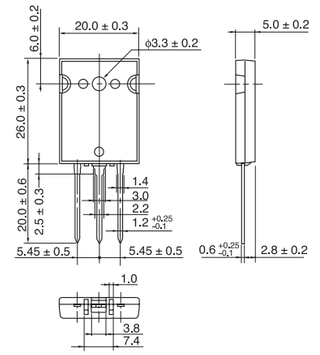
TO-3P
PRSS0004ZE-A



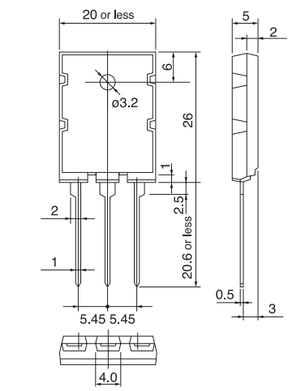
TO-3PFM
PRSS0003ZA-A



TO-3PL
PRSS0004ZF-A



TO-3PL*
PRSS0004ZC-A



RF-K-8
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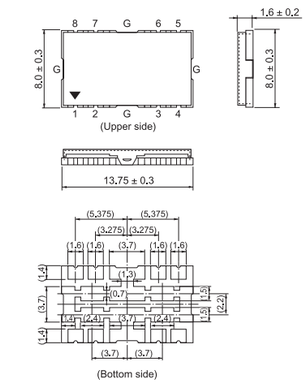
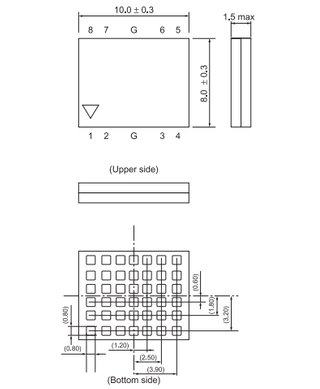


RF-Q-8
CLMR0022ZQ-A



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(Units : mm)

LLD
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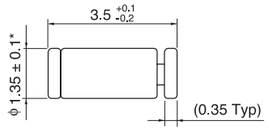
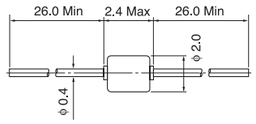


MHD
GRZZ0002ZC-A



DO-35
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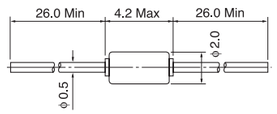

EFP
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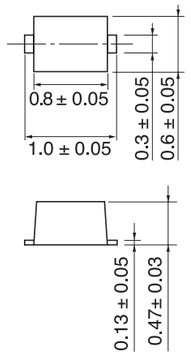

SFP
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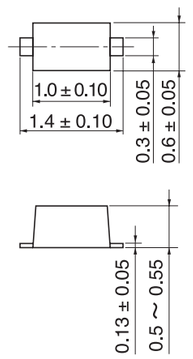

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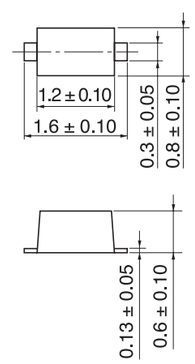
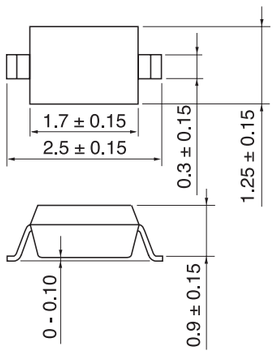


URP
PTSP0002ZA-A



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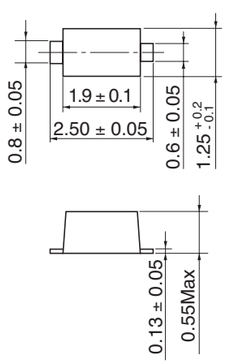

CMPAK
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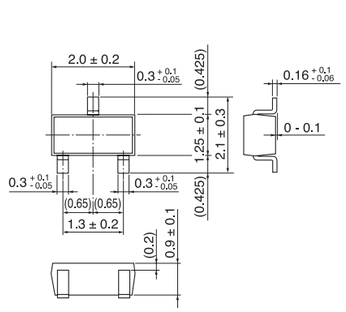

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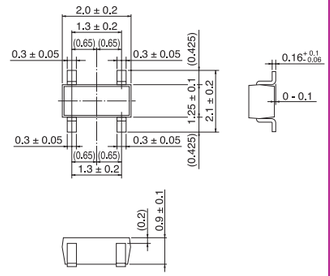
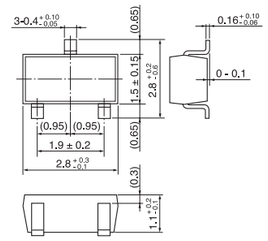
(Units : mm)

CMPAK-4
PTSP0004ZB-A



MPAK
PLSP0003ZC-A



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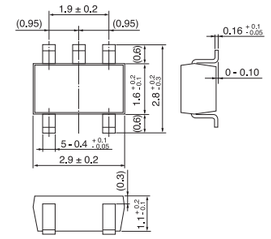
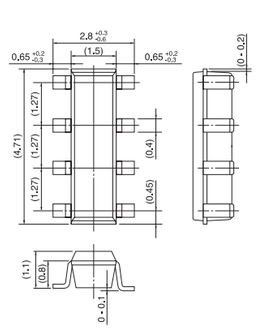
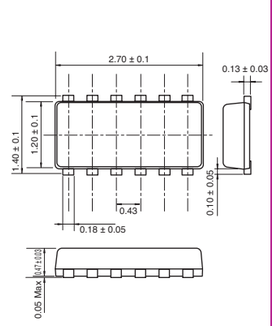


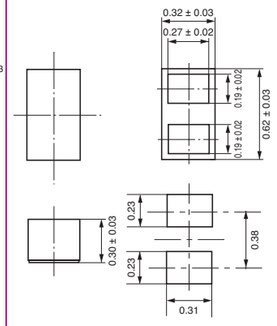
MOP
PTSP0008DB-A



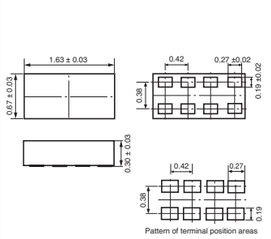
MFP12
PUSF0012ZA-A



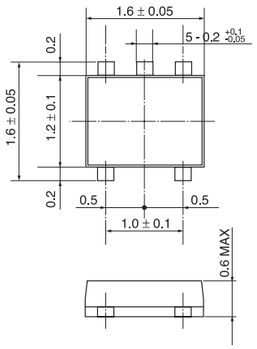
MP6
PXSN0002ZB-A



MP6-8
PXSN0008ZA-A



VSON-5
PUSN0005KA-A



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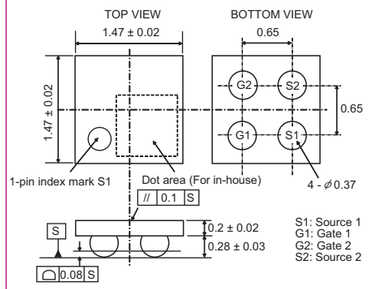
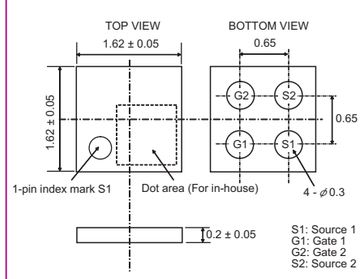
4PIN EFLIP
PKG4Q1-411-0000



4PIN EFLIP-LGA
PKG4Q1-221-0001



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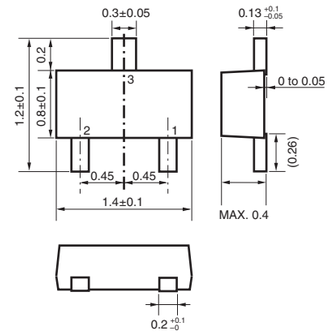
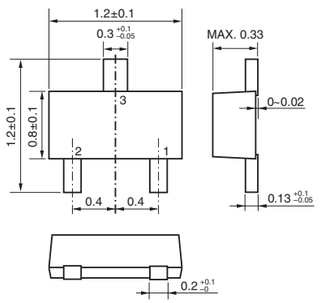
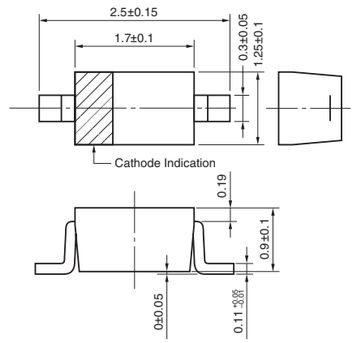
PKG3D1-323-0412



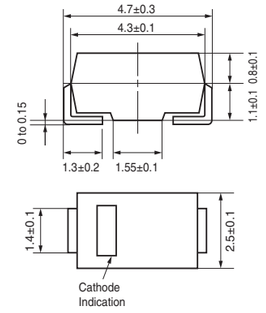
3pin XSOF03(0812)
PKG3D1-212-0412



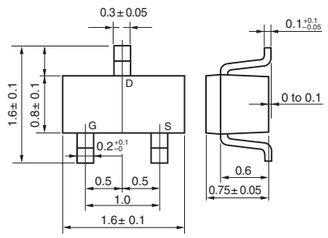
2pin SSP
PKG2C1-111-0412



2pin PoMM
PKG2C4-121-0432



3pin USM(SC-75)
PKG3C2-222-0412



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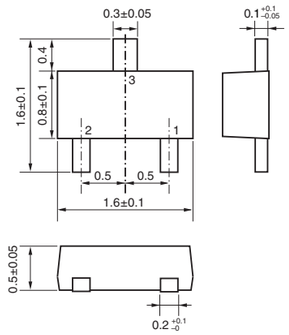
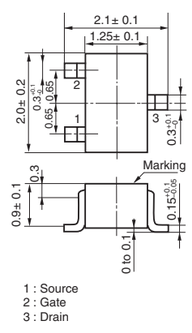
PKG3C2-212-0412



3pinSSP(SC-70)
PKG3C1-212-0412



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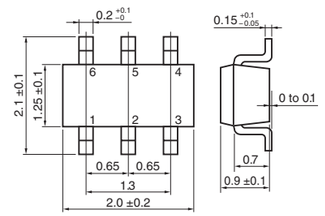
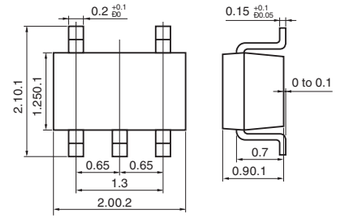
(Units : mm)

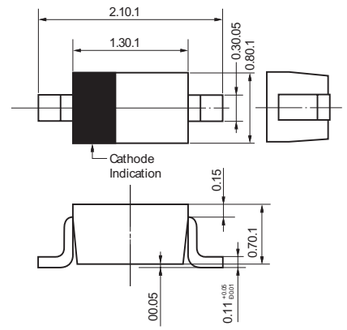
6pin SSP(SC-88)
PKG6C1-212-0412



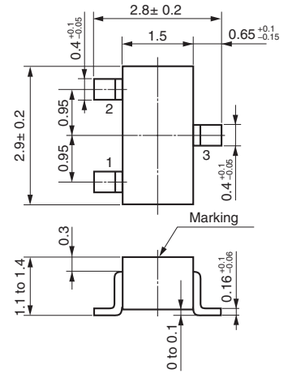
5pinSSP(SC-88A)
PKG5C1-212-0412



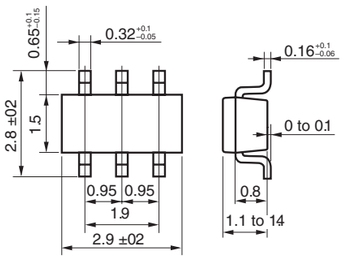
2pinUSM(SC-78)
PKG2C2-212-0412



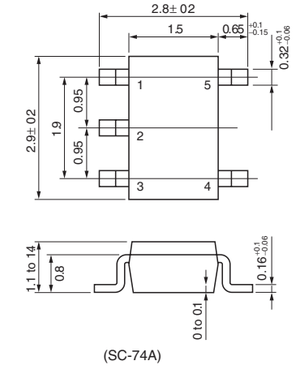
3pinMM(SC-59)
PKG3C3-121-0212



6pinMM(SC-74)
PKG6C3-121-0412

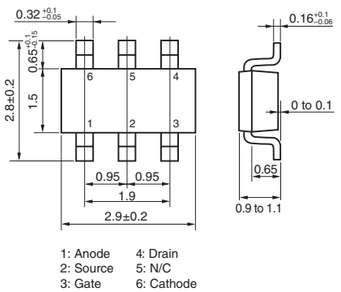


5pinMM(SC-74A)
PKG5C3-121-0412



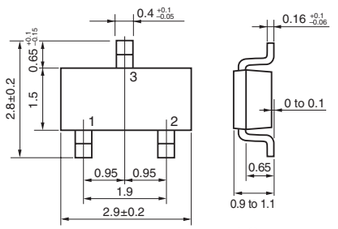
(SC-74A)

6pinTMM(SC-95)
PKG6C3-111-0422



1: Anode 4: Drain
2: Source 5: N/C
3: Gate 6: Cathode

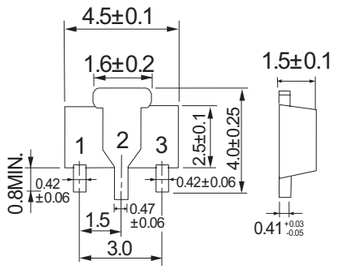
3pinTMM(SC-96)
PKG3C3-111-0422



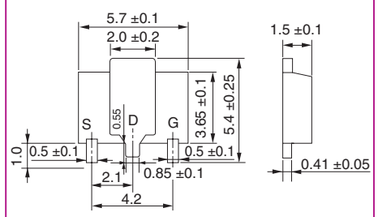
1. Gate
2. Source
3. Drain

封装名称 Package Name
封装代码 Package Code
（单位：mm）
(Units : mm)

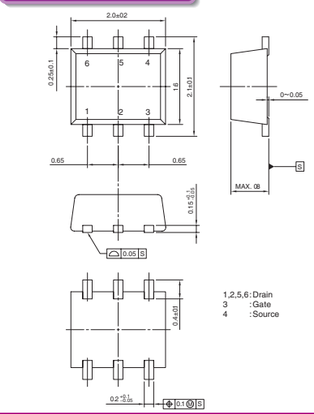
3pin PoMM(SC-62)
PKG3C4-212-0432



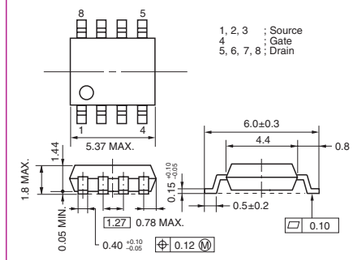
MP-2(SC-84)
PKG3J4-111-0432



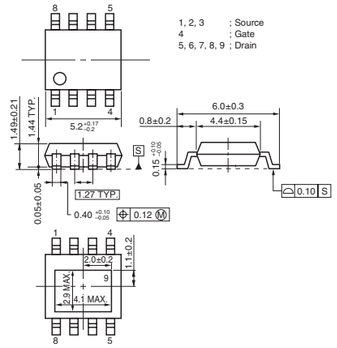
6pinWSOF(1620)
PKG6D1-545-0422



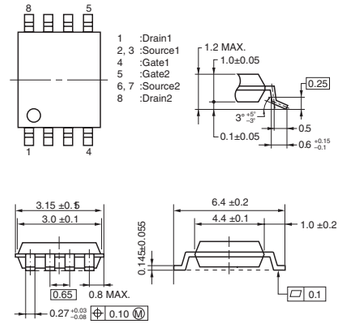
8pin SOP
PKG8GR-0403



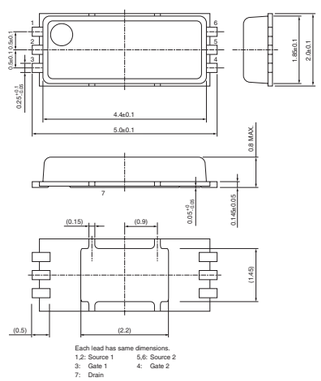
8pin HSOP
PKG8U1-111-0432



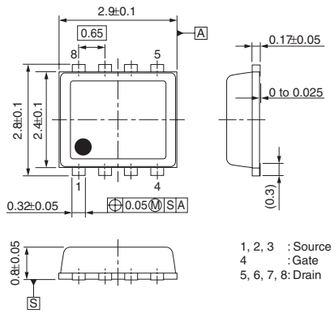
8pin TSSOP
PKG8GR-9JG-0405



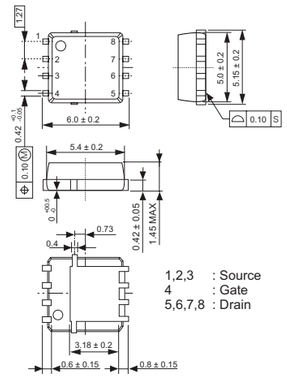
6pinHWSON(4521)
PKG6E1-111-0424



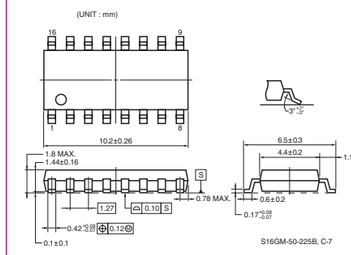
8pinVSOF(2429)
PKG8D1-655-0422



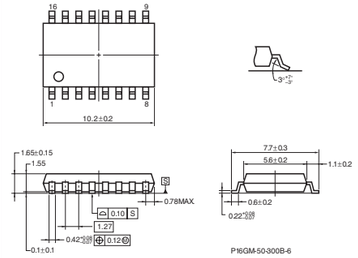
8PIN HSON
PKG8E1-343-0431



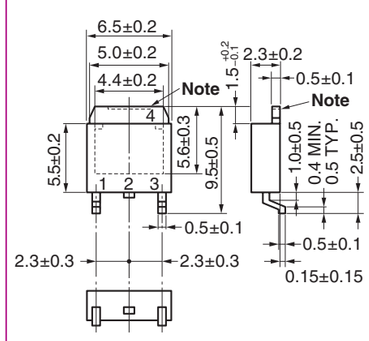
16pin SOP(225ml)
PKG16GR-0103



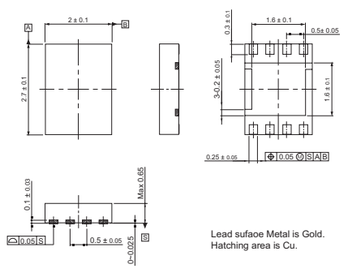
16pin SOP(300ml)
PKG16GS-0403



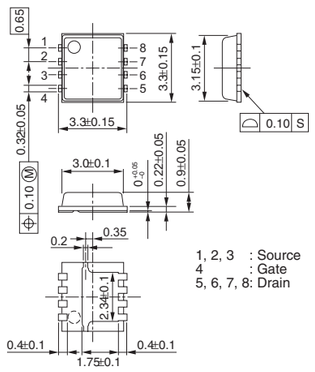
MP-3Z（TO-252）
PKG3J5-212-0431



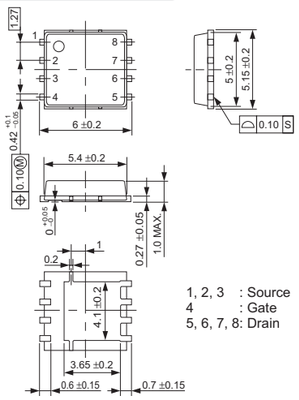
8pin HUSON(2027)
PKG8E1-551-0422



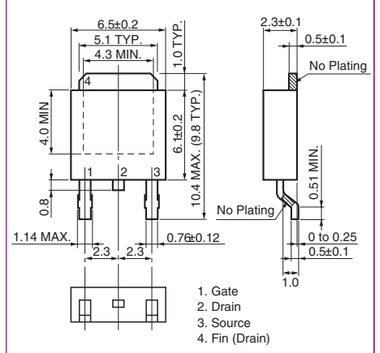
8pin HVSON(3333)
PKG8E1-432-0432



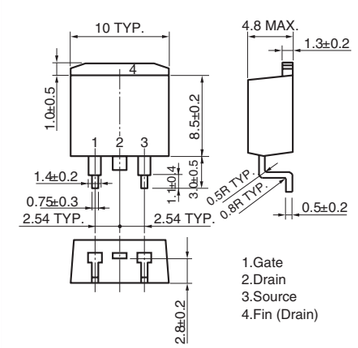
8pinHVSON(6051)
PKG8E1-323-0432



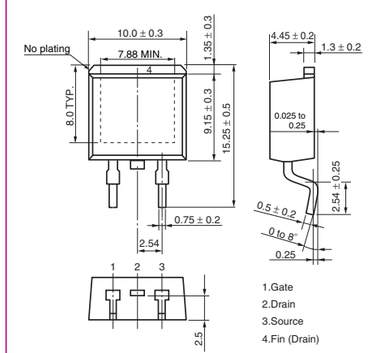
MP-3ZK (TO-252)
PKG3J5-312-0431



MP-25Z（TO-220SMD）
PKG3J9-323-0431

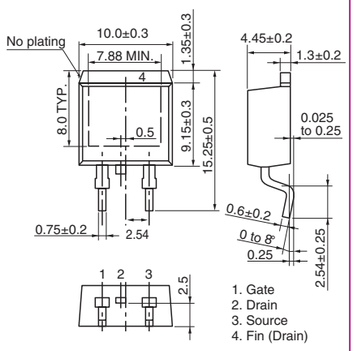


MP-25ZK(TO-263)
PKG3J9-513-0431

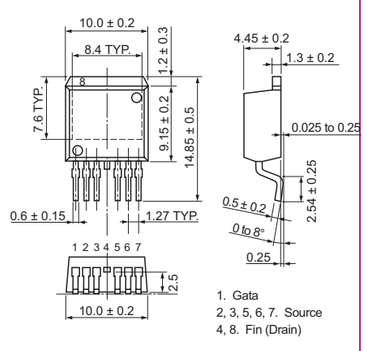


封装名称 Package Name
封装代码 Package Code
（单位：mm）
(Units : mm)

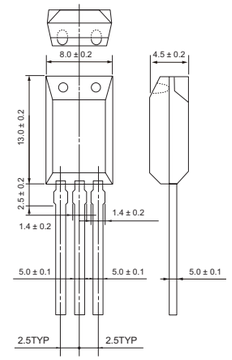
MP-25ZP(TO-263)
PKG3J9-713-0431



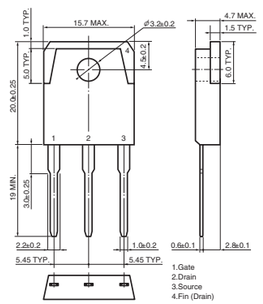
MP-25ZT(TO-263-7pin)
PKG7J9-321-0431



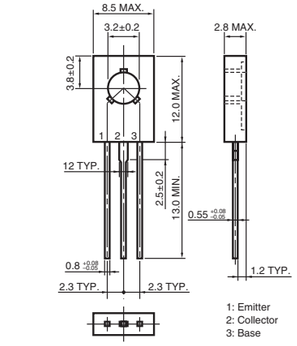
MP-10
PKG3J8-111-0431



MP-88（TO-3P）
PKG3JC-111-0441

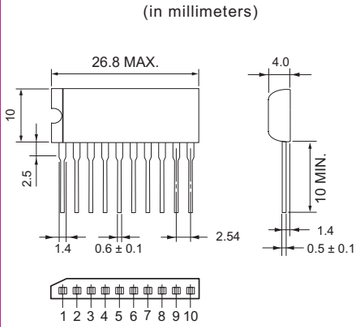


MP-5(TO-126)
PKG3J6-113-0432

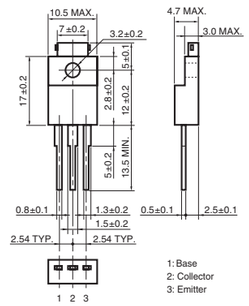


SIP10
PKG10H2-111-0432

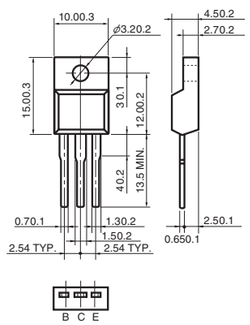
(in millimeters)



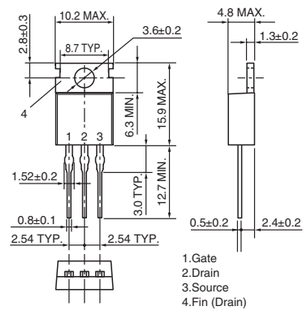
MP-45 (Isolated TO-220)
PKG3JB-111-0431



MP-45F (Isolated TO-220)
PKG3JB-212-0431

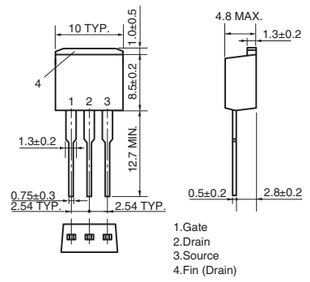


MP-25 (TO-220)
PKG3J9-123-0431

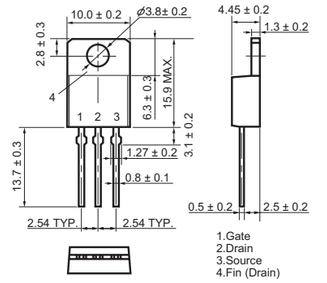


封装名称 Package Name
封装代码 Package Code
（单位：mm）
(Units : mm)

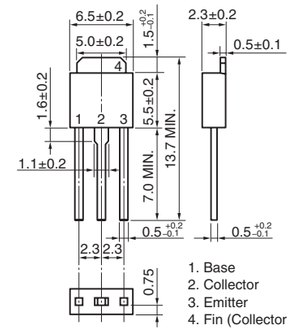
MP-25Fincut（TO-262）
PKG3J9-223-0431



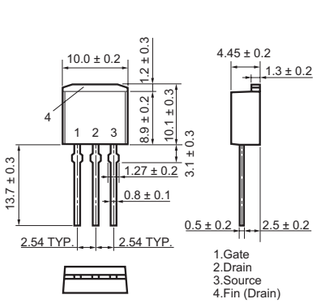
MP-25K（TO-220）
PKG3J9-913-0431



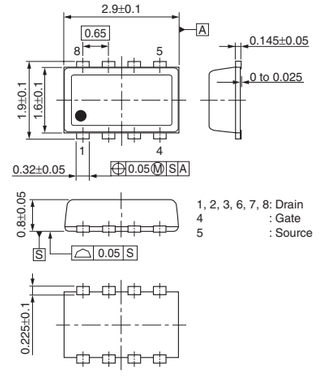
MP-3(TO-251)
PKG3J5-112-0431



MP-25SK（TO-262）
PKG3J9-813-0431

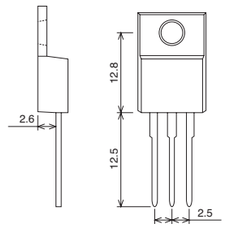


8pin VSOF(1629)
PKG8D1-755-0422

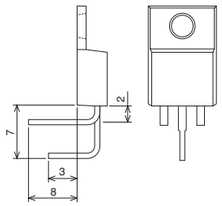


（单位：mm） (Units : mm)

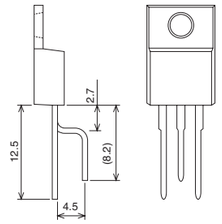
TO-220（标准外形） Standard package



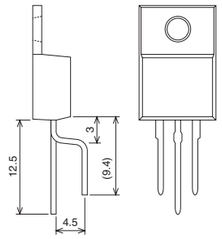
TO-220-A6



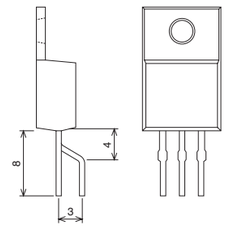
TO-220-A8



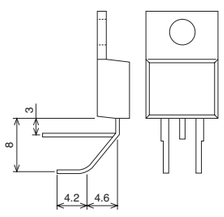
TO-220-AA



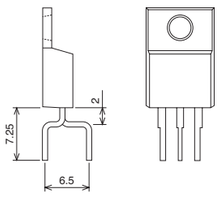
TO-220-AN



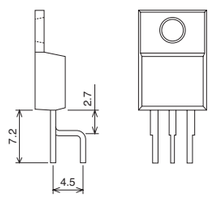
TO-220-AP



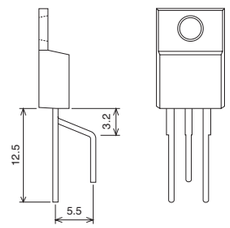
TO-220-AR



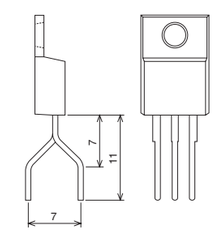
TO-220-AS



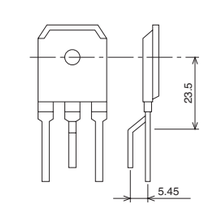
TO-220-AT



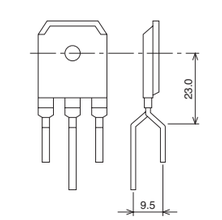
TO-220-AV



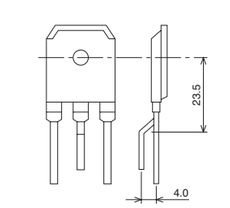
TO-3P-A8



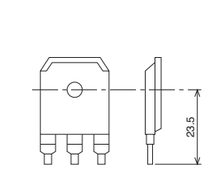
TO-3P-AB



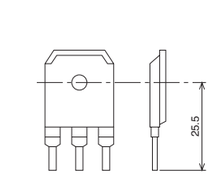
TO-3P-AN



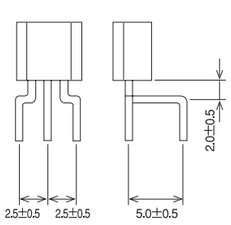
TO-3P-AV



TO-3P-AW

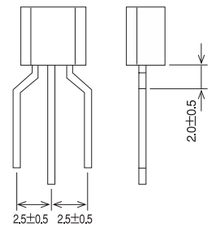


TO-92-A6（标准成形外形）
Standard Forming package

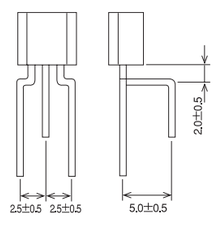


（单位：mm） (Units : mm)

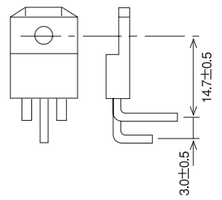
TO-92-A8（标准成形外形）
Standard Forming package



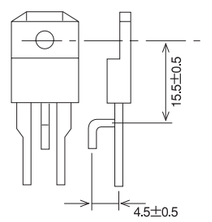
TO-92-AB（标准成形外形）
Standard Forming package



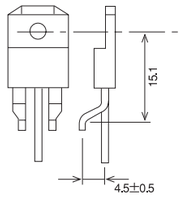
TO-220F-A5（标准成形外形）
Standard Forming package



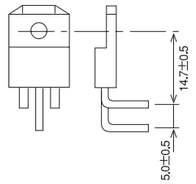
TO-220F-A8（标准成形外形）
Standard Forming package



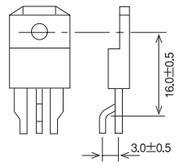
TO-220F-AA（标准成形外形）
Standard Forming package



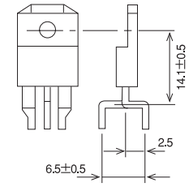
TO-220F-AK（标准成形外形）
Standard Forming package



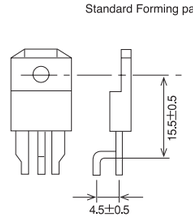
TO-220F-AN（标准成形外形）
Standard Forming package



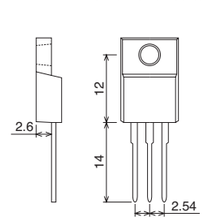
TO-220F-AR（标准成形外形）
Standard Forming package



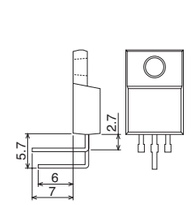
TO-220F-AS（标准成形外形）
Standard Forming package



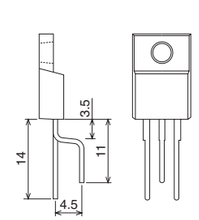
TO-220FN（标准外形） Standard package



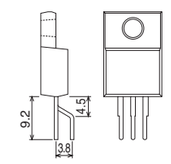
TO-220FN-A5



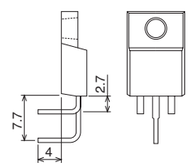
TO-220FN-A8



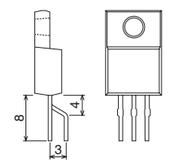
TO-220FN-AG



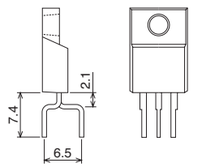
TO-220FN-AK



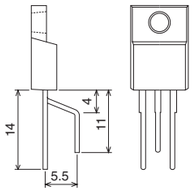
TO-220FN-AN



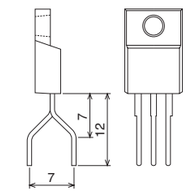
TO-220FN-AR



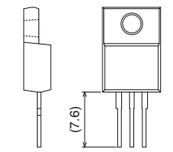
TO-220FN-AT



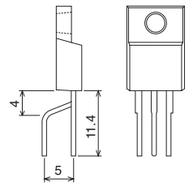
TO-220FN-AV

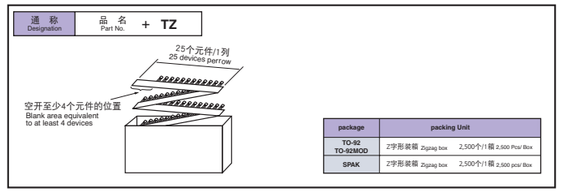


TO-220FN-AW



TO-220FN-AY



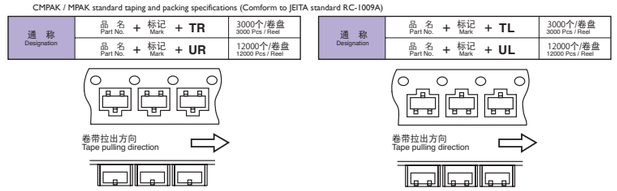


TR、UR的“R”适用于标记面朝上，卷带朝拉出方向，且CMPAK的中心管脚朝右包装的产品。

“R” of TR and UR is applied to those items which are packed face up with the marking surface positioned in the direction in which the tape can be pulled out so that the center terminal of CMPAK turns on the right side.

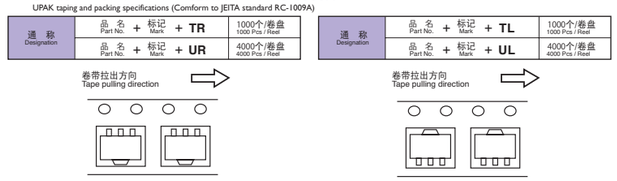
CMPAK/MPAK标准带包装规格（遵照JEITA规格的RC-1009A）

CMPAK / MPAK standard taping and packing specifications (Comform to JEITA standard RC-1009A)



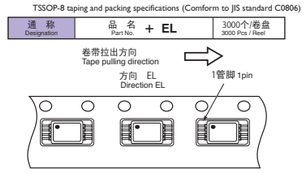
UPAK 带包装规格（遵照JEITA规格的RC-1009A）

UPAK taping and packing specifications (Comform to JETA standard RC-1009A)



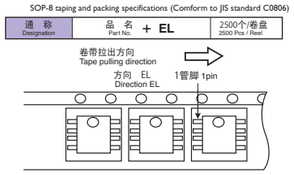
TSSOP-8 带包装规格（遵照JIS规格的C0806）

TSSOP-8 taping and packing specifications (Comform to JIS standard C0806)



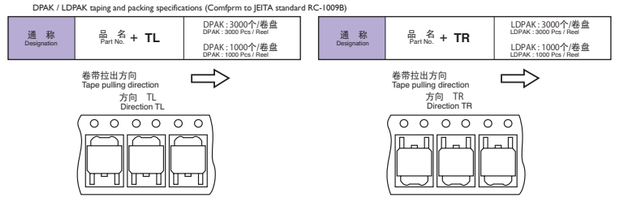
SOP-8 带包装规格（遵照JIS规格的C0806）

SOP-8 taping and packing specifications (Comform to JIS standard C0806)



DPAK/LDPAK 带包装规格（遵照JEITA规格的RC-1009B）

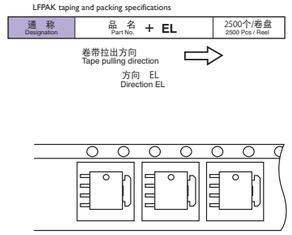
DPAK / LDPAK taping and packing specifications (Comfprm to JEITA standard RC-1009B)



TL为标准规格。关于TR，根据需要进行个别对应。
TL is the standard spec. For TR, we will support individually if there is any request.

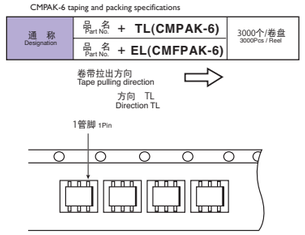
LFPAK 带包装规格

LFPAK taping and packing specifications



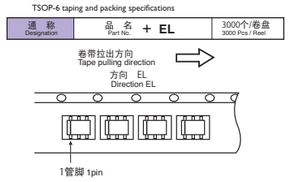
CMPAK-6 带包装规格

CMPAK-6 taping and packing specifications



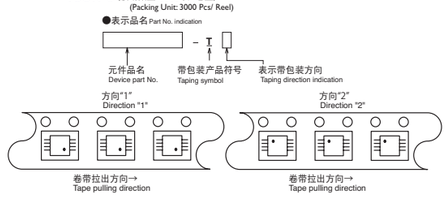
TSSOP-6 带包装规格

TSOP-6 taping and packing specifications



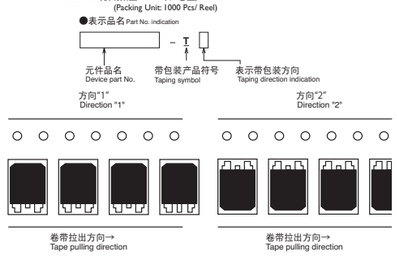
VSON-8 (收纳数量:3000个/1卷盘)

(Packing Unit: 3000 Pcs/ Reel)



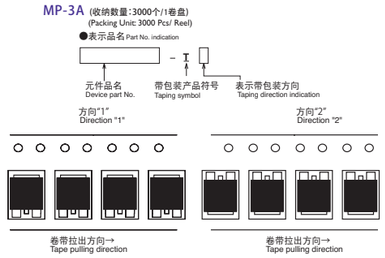
TO-220S (收纳数量:1000个/1卷盘)

(Packing Unit: 1000 Pcs/ Reel)



MP-3A (收纳数量:3000个/1卷盘)

(Packing Unit: 3000 Pcs/ Reel)



压纹带包装 Emboss Taping Reel Pack

Package	Packing Unit	Name	Packing Configurations
URP	3,000	品名+TL[H]/TR[P]	卷带包装（卷盘）
		Part No.+TL[H]/TR[P]	Emboss TAPING REEL PACK
MPAK	3,000	品名+TL[H]/TR[P]	（遵照JEITA规格的RC-1009B）
CMPAK		Part No.+TL[H]/TR[P]	(Conforming to JEITA standard
CMPAK-4			RC-1009B)
MPAK-5	3,000	品名+TL[H]/TR[P]	8mm宽压纹带
VSON-5		Part No.+TL[H]/TR[P]	8mm emboss tape
LLD	2,500	品名+TL[H]/TR[P]	（相当于JEITA卷带型号TE84F）
		Part No.+TL[H]/TR[P]	(Tape equivalent to JEITA type
UFP	4mm pitch	品名+TR(TRF)[P]	TE84F)
(TURP)	4,000	Part No.+TR(TRF)[P]	
	2mm pitch	品名+KR(KRF)[R]	
	8,000	Part No.+KR(KRF)[R]	
SFP	2mm pitch	品名+KR[R]	
	8,000	Part No.+KR[R]	
EFP	2mm pitch	品名+KR[R]	
MP6	10,000	Part No.+KR[R]	
MFP12	4mm pitch	品名+TR[P]	
	4,000	Part No.+TR[P]	
MOP	3,000	品名+TL[H]/TR[P]	12mm宽压纹带
		Part No.+TL[H]/TR[P]	12mm emboss tape

注）TR为推荐的带包装规格。
Note) TR is recommended for emboss taping and reel specification.

・Name栏的［ ］内为新代码。
Characters in [ ] in Name column are new codes.

卷带拉出方向 Taping Pulling Direction

Package	Taping Code	Appearance
URP LLD MOP	TR[P] (Taping to Right)	TR拉出方向 TR Pulling direction
UFP (TURP)	TR[P] (Taping to Right) (TRF)	TR拉出方向 TR Pulling direction
	KR[R] (KRF)	KR拉出方向 KR Pulling direction
SFP EFP MP6	KR[R]	KR拉出方向 KR Pulling direction SFP/EFP　MP6
MPAK CMPAK CMPAK-4 MPAK-5 MFPAK VSON-5	TR[P] (Taping to Right)	TR拉出方向 TR Pulling direction MPAK/CMPAK/MFPAK　CMPAK-4　MPAK-5/CMPAK-5/VSON-5
MFP12	TR[P] (Taping to Right)	TR拉出方向 TR Pulling direction

Taping Code栏的［ ］内为新代码。
Characters in [ ] in Taping Code column are new codes.

URP外形产品的带包装根据1卷的数量、分组等附有下列带包装符号。
Taping of URP package takes the following symbols according to quantity in 1 reel, group, and other items.

带包装代码 Taping code	TRF[P]	TRU[P]	TRV[P]
带包装方向 Taping direction	TR[P]	TR[P]	TR[P]
1卷内的最大种类数 Quantity of maximum category in 1 reel	—	4	
1卷内的数量 Quantity in 1 reel	3000 pcs		
分组 Grouping	—	10个以上 10 pcs or more	
分组间隔 End of group	—	4个间隔 4 spaces	1个间隔放无反射带 Non-reflection tape on 1 space
备注 Note	—	C.C 方式* C.C system*	

* 变容二极管连续带包装方式
** 需TL型时，请先与本公司的销售窗口联系。
*. Continuous Connected taping system of variable capacitance diode.
**. Please contact our sales office if you need the TL type.

UFP/SFP外形产品的带包装根据1卷的数量、分组等附有下列带包装符号。(SFP外形仅限KR※规格)
Taping of UFP/SFP package takes the following symbols according to quantity in 1 reel, group, and other items. (SFP Package only KR※ taping)

带包装代码 Taping code	TRF[P]	TRU[P]	TRV[P]	KRF[R]	KRU[R]	KRV[R]
带包装方向 Taping direction	TR[P]			KR[R]		
1卷内的最大种类数 Quantity of maximum category in 1 reel	—	5 max.		—	10 max.	
1卷内的数量 Quantity in 1 reel	4000 pcs			8000 pcs		
分组 Grouping	—	10个以上 10 pcs or more		—	10个以上 10 pcs or more	
分组间隔 End of group	—	9个间隔 9 spaces	1个间隔+ 1个间隔 无反射带+ 1个间隔 1space+ Non-reflection tape on 1space+1space	—	4个间隔 4 spaces	1个间隔放无反射带 Non-reflection tape on 1 space
备注 Note	—	C.C 方式* C.C system*		—		C.C 方式* C.C system*

* 变容二极管连续带包装方式
* Continuous Connected taping system of variable capacitance diode

Home Page

●网站介绍

Introducing Our Web Site

瑞萨电子通过网站为客户的开发提供全方位的综合支持。

根据用途检索的客户

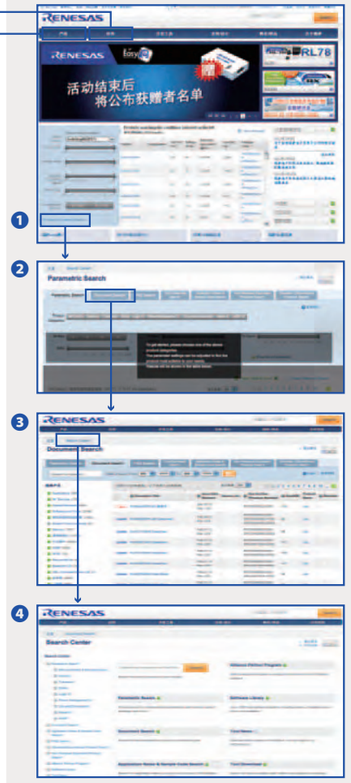
瑞萨进一步充实了应用实例。

- 移动设备 / 网络
- 电脑和电脑外围设备
- 民用电子设备
- 保健器材
- 汽车
- 产业、楼宇管理
- 元器件技术

客户可从以上类别中检索符合目的要求的产品实例。

根据类别检索的客户

从分立器件的首页，可根据不同的系列，找到功率 MOSFET、二极管、IGBT、双向晶闸管与晶闸管、RF& 微波器件、光电器件等类别。此外，利用左侧的导航菜单也可立即找到分立器件相关文档。



知道产品名称的客户

可从首页利用检索功能立即找到目标内容。

❶关键字 / 型号检索

可利用关键字在站内检索，或者根据型号显示产品信息和数据表。

❷参数检索功能更丰富（高级产品选择）

根据不同的产品类别 _ 子类别，再加上各种产品特性等检索条件，可在最短的时间内连接到您需要的产品信息。

❸文档检索

可根据关键字、产品类别和文档类型进行检索。

❹检索中心

关键字检索、参数检索、文档检索、样品代码检索、FAQ 检索、其他公司同等品检索等，各种检索汇集于一个页面。可选择最合适的检索方法获得所需信息。

●其他强大功能

支持信息 Support Information

瑞萨电子以提供模拟数据、常见问题解答、举办研讨会、受理网站垂询等形式，根据客户需求提供全方位综合支持。

Renesas VP

利用在线设计支持工具功率 MOSFET 的工程师瑞萨 VP，只要在 Buck Designer 中输入客户的使用条件，即可用图形显示并确认与降压转换器最匹配的功率 MOSFET 组合及其特性。

用户注册 User Registration

通过因特网为您提供的样品系列齐全。用户登录后可请求需要的样品。

http://cn.renesas.com

国内 http:// cn.renesas.com/discrete

Overseas http://www.renesas.com/en/discrete

The Renesas Electronics website provides comprehensive support for your development work.

Searching by Application

The selection of application examples on the Renesas Electronics website has been further enhanced. You can search for product examples among the following categories.

- Mobile/networking
- PCs and PC peripherals
- Consumer electronics
- Healthcare
- Automotive
- Industrial/building management
- Elemental technologies

Searching by Category

From the discrete devices top page you can search for content arranged by product series from among categories such as power MOSFETs, diodes, IGBTs, TRIACs and thyristors, RF and microwave devices, and optoelectronic devices. In addition, you can use the navigation panel on the left to locate documentation related to discrete devices.

Searching by Product Name

By using the search function on the top page you can go directly to the content that interests you.

❶ Keyword/Part No. Search

You can search the contents of the website by entering keywords or enter a part number to view a listing of product information, data sheets, and more.

❷ Enhanced Parametric Search (Advanced Product Selector)

You can specify the product category and subcategory and quickly locate the product information you need by narrowing your search according to a variety of product characteristics.

❸ Document Search

You can search for documents by keyword, document category, or document type.

❹ Search Center

The Search Center gives you quick access from a single page to powerful search functions, including Keyword Search, Parametric Search, Document Search, Software Library, FAQ Search, and Non-Renesas Equivalent Product Search. Use the optimal search tool to locate exactly the information you require.

Support Information

We aim to offer a total support package to meet customers' needs through the provision of simulation data, FAQ, seminars, inquiries via the Web, and so on.

Renesas VP

The Buck Designer section of Renesas VP enables you to enter your usage conditions to obtain a listing of the optimal power MOSFETs for your buck converter and a graphical display of its simulated characteristics.

User Registration

MyRenesas Registration provide rich informationabout Renesas by mail-magazine and various premium supports.

http://www.renesas.com/index.jsp

Overseas http://www.renesas.com/en/discrete

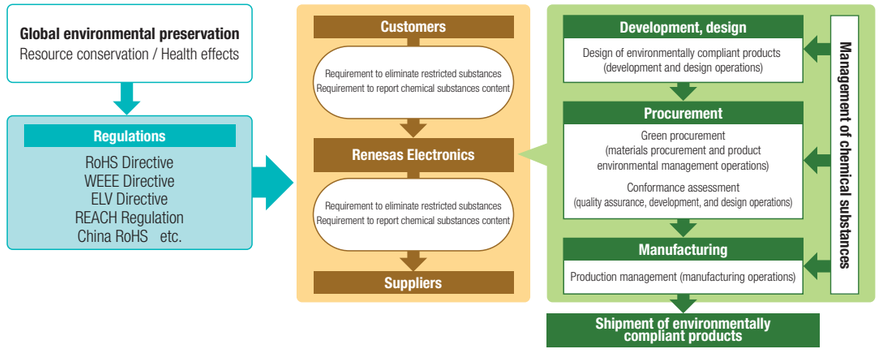
Environmental Considerations for Renesas Electronics Products

Renesas Electronics is working actively to improve product environmental quality in all aspects of its business operations, including product design, materials procurement, manufacturing, and shipping.

Design

- **Development of environmentally compliant products through product environmental assessment**
  Making products more resource and energy efficient (more compact, higher integration, reduced power consumption, extended service life)
  Reducing environmental load due to chemicals (management of chemical content of products)
- **Compliance with domestic and international product environmental regulations**
  EU RoHS Directive, China RoHS, ELV Directive, REACH Regulation

< Renesas Product Environmental Quality Management Sequence >



Procurement

- **Thoroughgoing green procurement activities**
- **Investigation and confirmation of chemical content of procured parts and materials**

Manufacturing

- **Prevention of inclusion or contamination by prohibited chemicals in products (process management)**
- **Reduction of CO_2 emissions (reduction of PFC output and energy usage), reduction of environmental load from chemicals used in manufacturing, reduction of waste materials**

Shipping

- **Reduction of volume of packing materials (expanding reuse of plastic packaging materials)**
- **Reduction of energy consumption in transport (improving overall efficiency of distribution)**

Compliance with customer requirements — **Transmission of information such as chemical content of products**

RoHS : Restriction of the use of certain Hazardous Substances in electrical and electronic equipment
WEEE : Waste Electrical and Electronic Equipment
ELV : End of Life Vehicles
REACH : Registration, Evaluation, Authorisation and Restriction of Chemicals

Renesas Green Device Accreditation System

Renesas green device definitions:
Renesas Electronics defines green devices as products that reduce environmental impact by more than a specified amount over their life cycle, which includes procurement, production, distribution, use, and disposal, as determined at the R&D and design stage according to the company's internal environmental standards. Renesas Electronics recognizes three green device ranks for each fiscal year.

a) Green devices:
Products having a “FactorX” score of 1 or higher after completion of a product environmental assessment (at completion of development) and an improvement ratio of 10% or greater.

b) Supergreen devices:
Products that have been assigned a “FactorX” score after completion of a product environmental assessment (at completion of development) and an improvement ratio that place them among the top 20 products.

c) Ultragreen devices:
Products selected from among the supergreen devices as having environmental performance that is No. 1 in the industry or extremely high, or products that combine high environmental performance with excellence in another aspect such that they are considered to contribute substantially to boosting the presence of Renesas Electronics.

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MEMO

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Refer to "http://www.renesas.com/" for the latest and detailed information.

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