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瑞萨电子公司网址：http://www.renesas.com

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【发行】瑞萨电子公司（http://www.renesas.com）

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二极管

瑞萨二极管使用的符号和定义

使用半导体产品进行电路设计时，在通过最大额定值及电特性表读取该品种性能的情况下，多用符号来表示。上述符号的严密定义请参照技术书籍，为了便于使用，在此对于二极管数据手册中所使用的符号进行简要说明。

1. 普通符号的表示方法

一般情况下，表示直流特性的符号及后缀用大写的罗马字母，交流或小信号特性则用小写字母表示。

但是，即使不是直流特性，也有一部分使用大写字母表示，例如容许功率(Pd)等。

除少许例外和习惯用法外，后缀的接续方法如下所示：

表1　符号表示例子

符号	第1项	定义
T	opr	第1项是补充说明符号的表示内容时的例子
R	th	
P	d	
I	F	第1项是表示传输方向的例子
V	R	

第1项大致分为以下2种。

a. 当补充说明符号表示的内容时。（第1项存在超出3个字的情况）
b. 表示传输的方向。
F: 正向
R: 反向

2. 关于最大额定值的符号

半导体产品的最大额定值通常规定为“绝对最大额定值”，必须严格注意绝对不能超过各品种最大额定值表中所表示的数值。必须认识到如果不小心超过了最大额定值，就会直接导致该产品的劣化或损坏，即使稍后再工作也会严重缩短新产品的寿命。因此在设计使用半导体产品的电子电路时，要注意在使用中无论外部条件如何变化都不能超过使用品种的最大额定值。

例如，当对使用的二极管外加电流、电压时，虽然都不超过最大额定值，但功耗却是两者的乘积，这个数值必须保持在该品种的损耗容限范围内。而且，在使用温度高的情况下该损耗容限也会减少，从而更加缩小了使用范围。

以下，对收录于二极管数据手册中各品种所规定的最大额定值各项目的定义进行了简要说明。

表2　二极管的最大额定值

用语	符号	定义
反向重复峰值电压	V_{RRM}	可重复外加的反向电压的最大容许峰值
反向不重复峰值电压	V_{RSM}	可不重复外加的反向电压的最大容许电涌值
反向峰值电压	$V_{RM}[V_{R(peak)}]$	可外加的反向电压的最大容许峰值
反向电压	V_R	可外加的反向电压的最大值
正向重复峰值电流	I_{FRM}	可重复外加的正向电流的最大容许电涌值
正向不重复峰值电流	$I_{FSM}[I_{F(surge)}]$	可不重复外加的正向电流的最大容许电涌值
正向峰值电流	$I_{FM}[I_{F(peak)}]$	可外加的正向电流的最大容许峰值
平均整流电流	I_O	在指定条件下，可通入的正向电流的最大连续平均电流值
正向电流	I_F	可正向通入的最大电流
热阻	Rth [Rth(j-a)]、 [Rth(j-c)]	在导通中的热恒定状态下，结和大气环境之间或者结和外壳之间温度差的每个结处单位功耗的值。
损耗容限	Pd	在指定条件基础下，二极管中可反复消耗的最大容许功率值。
结处温度	Tj	规定作为额定标准的结处温度，以器件工作中的容许范围表示。
保存温度	Tstg	在不外加功率的状态下，避免电特性发生异常的温度范围。
工作环境温度	Topr	在指定的加热条件基础下，可工作的环境温度的临界值。
引脚温度	Tl	引线的容许温度的最大值

3. 关于电特性的符号

表3 开关二极管的电特性

用语	符号	定义
反向电压	V_R	反向通入指定电流(I_R)时的电压值
正向电压	V_F	正向通入指定电流(I_F)时的电压值
反向电流	I_R	反向外加指定电压(V_R)时的电流值
正向电流	I_F	正向外加指定电压(V_F)时的电流值
引脚间电容	C	反向外加指定电压(V_R)和频率(f)时的引脚间电容
整流效率	η	在指定条件基础下，对于交流输入电压进行整流后，在负载中出现的直流输出电压的比例
高频正电阻	r_f	正向追加指定电流和频率时的电阻值
正向温度系数	$\Delta V_F/\Delta Ta$	相对于环境温度变化的正向电压变化的比例
反向恢复时间	t_{rr}	在正向导通状态下反向外加电压(V_R)时，通入的反向电流(I_R)达到指定反向电流(Irr)所需的时间。在没有规定Irr的情况下，设定为$0.1I_R$。

表4 齐纳二极管的电特性

用语	符号	定义
齐纳电压	V_Z	反向通入指定电流(I_Z)时的电压值
齐纳电流	I_Z	测量齐纳电压的标准电流
工作电阻	Z_Z、r_d、Z_{ZT}、Z_{ZK}	相对于齐纳电流值微小变化的齐纳电压微小变化比例
温度系数(V_Z)	γ_Z	相对于环境温度变化的齐纳电压变化比例

表5 变容二极管的电特性

用语	符号	定义
组内电容偏差	ΔC/C	在指定条件基础下，组内器件中的电容偏差幅度的比例 $\Delta C/C=(Cmax-Cmin) \div Cmin \times 100\%$
电容变化比	n	指定了不同电压时的电容比
串联电阻	r_S	反向外加指定的电压和频率时的串联电阻值
性能指数	Q	通过反向外加指定电压及频率时的串联电阻及电容值，表示高频特性的性能 $Q=1/(2\pi f \cdot r_S \cdot C)$

4. 单位及位数的表示方法

关于最大额定值及各特性等的单位位数，如下所示：

a 单位的表示方法*1

计量的种类	符号	单位的缩写	读法
电流	I,i	A	安培
电压	V,v	V	伏特
功率	P	W	瓦特
电阻	R,r	Ω	欧姆
静电电容	C	F	法拉
感应系数	L	H	亨利
导纳	y	S	西门子
电导系数	g	S	西门子
电纳	b	S	西门子
增益、衰减量	—	dB	分贝
时间	t	s	秒
频率	f	Hz	赫兹
角度	(ϕ)	°	度
温度	T	°C	度
长度	(l)	m	米
效率	η	%	百分率

【注】 1. 这里表示的单位全部适用10^0时的位数，在时间t(s)、频率f(Hz)上并列表示位数时，为t(μs)、f(kHz)等。

b. 位数的表示方法

位数	符号	前缀
10^9	G	千兆
10^6	M	兆
10^3	k	千
10^0	—	—
10^{-3}	m	毫
10^{-6}	μ	微
10^{-9}	n	毫微
10^{-12}	p	微微
10^{-15}	f	飞母托

【注】 1. 现在对于半导体产品使用10^9～10^{-15}的位数，但根据计量的种类，未必全部使用。
例如，静电电容中不常用10^{-3}(m)和10^{-9}(n)。

修订记录

Rev.	发行日	修订内容	
		页	修订处
1.00	2008.02.29	—	初版发行

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