

To our customers,

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## Old Company Name in Catalogs and Other Documents

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On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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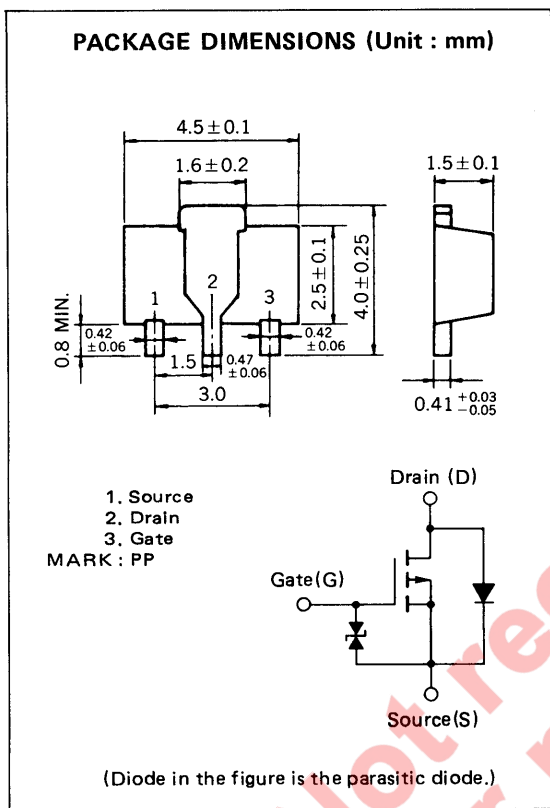
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P-CHANNEL MOS FET  
FOR SWITCHING



The 2SJ213, P-channel vertical type MOS FET, is a switching device which can be driven directly by the output of ICs having a 5 V power source.

As the MOS FET has low on-state resistance and excellent switching characteristics, it is suitable for driving actuators such as motors, relays, and solenoids.

FEATURES

- Directly driven by ICs having a 5 V power supply.
- Has low on-state resistance  
 $R_{DS(on)} = 5.0 \Omega \text{ MAX. @ } V_{GS} = -4.0 \text{ V, } I_D = -0.3 \text{ A}$   
 $R_{DS(on)} = 4.2 \Omega \text{ MAX. @ } V_{GS} = -10 \text{ V, } I_D = -0.3 \text{ A}$

QUALITY GRADE

Standard

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

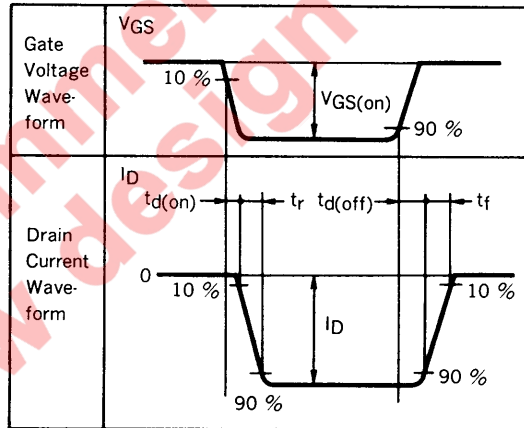
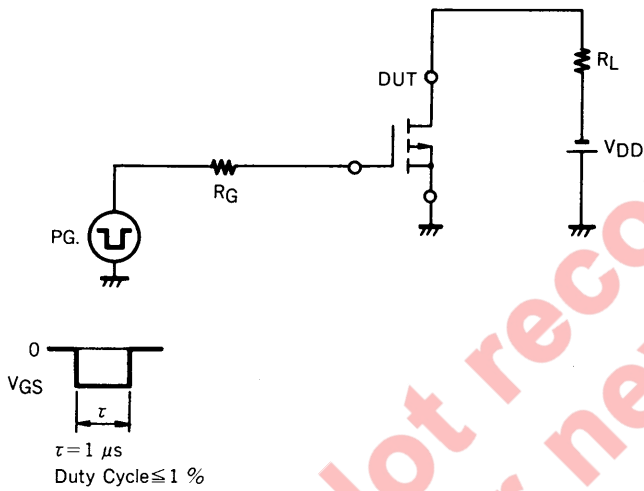
ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

PARAMETER	SYMBOL	RATINGS	UNIT	TEST CONDITIONS
Drain to Source Voltage	$V_{DSS}$	-100	V	$V_{GS} = 0$
Gate to Source Voltage	$V_{GSS}$	$\pm 20$	V	$V_{DS} = 0$
Drain Current	$I_D(\text{DC})$	$\pm 500$	mA	
Drain Current	$I_D(\text{pulse})$	$\pm 1.0$	A	$PW \leq 10 \text{ ms, Duty Cycle} \leq 50 \%$
Total Power Dissipation	$P_T$	2.0	W	when using ceramic board of $16 \text{ cm}^2 \times 0.7 \text{ mm}$
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$	
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$	

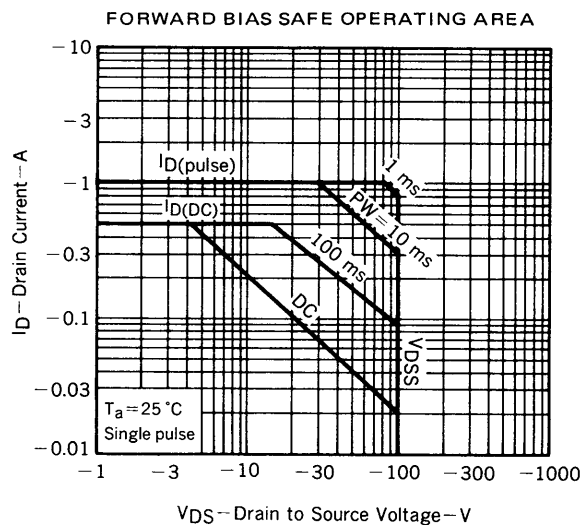
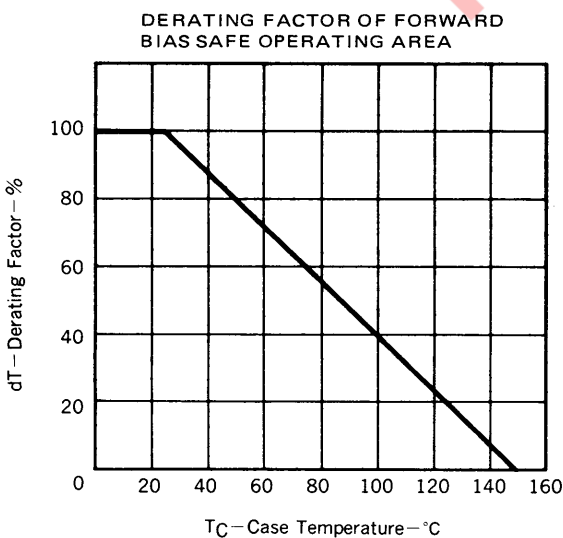
ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)

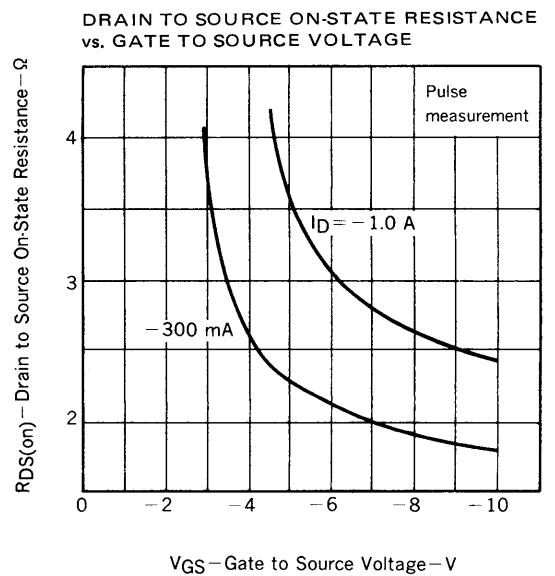
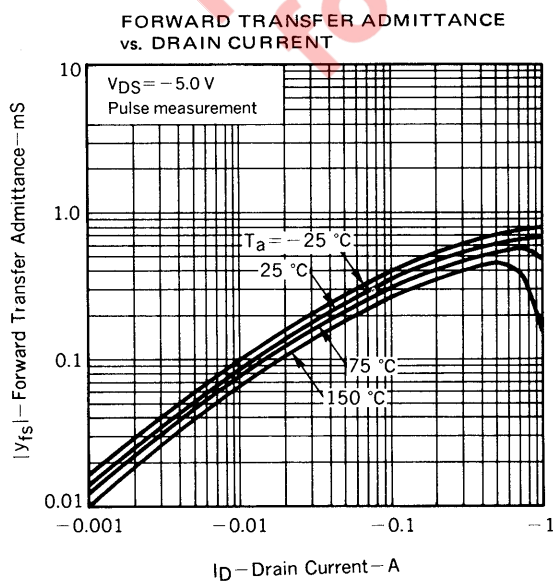
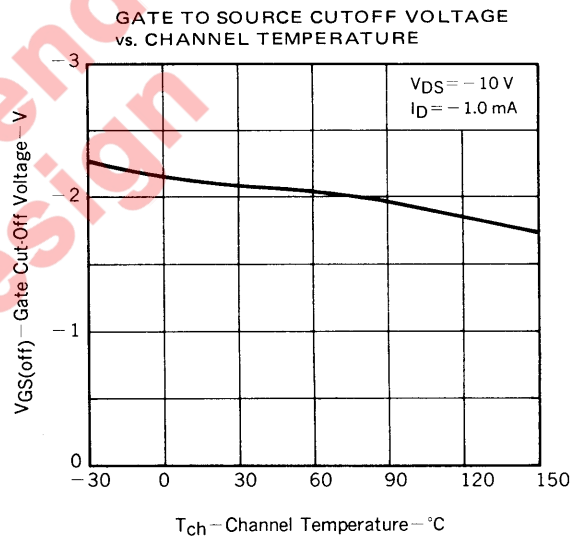
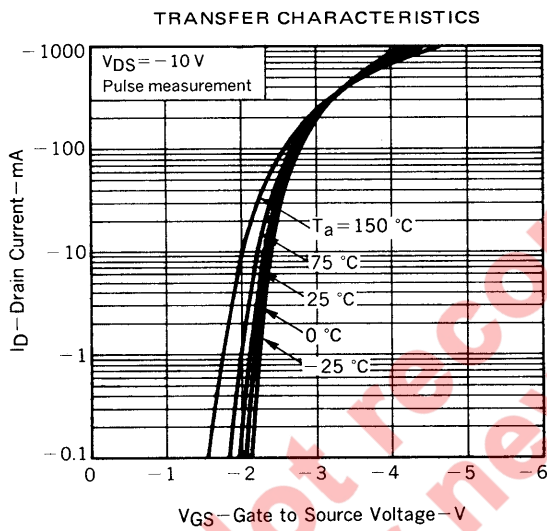
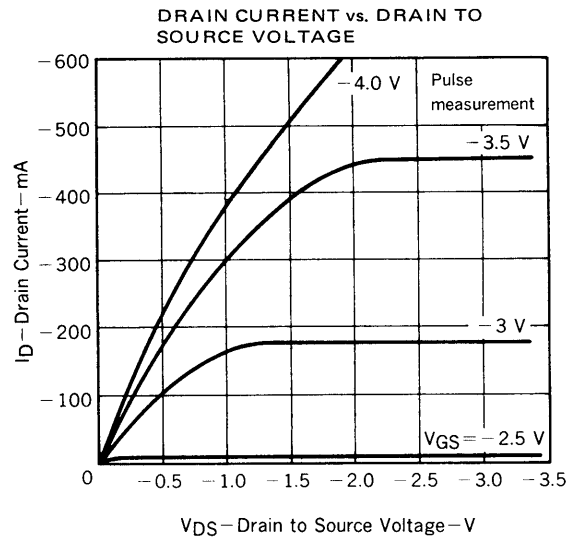
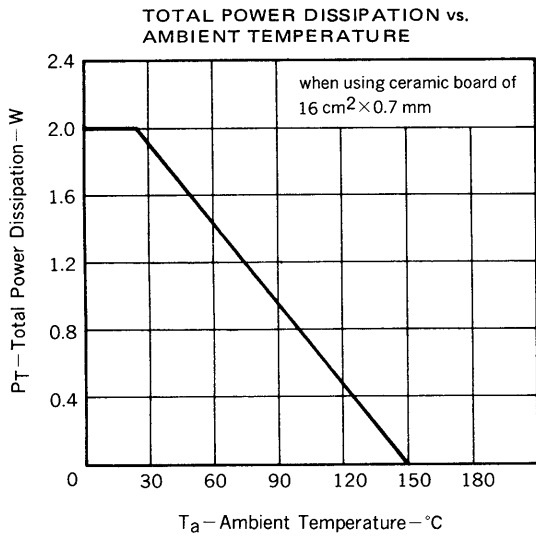
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain Breaking Current	I <sub>DSS</sub>			-10	μA	V <sub>DS</sub> = -100 V, V <sub>GS</sub> = 0
Gate Leakage Current	I <sub>GSS</sub>			±10	μA	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0
Gate Cutoff Voltage	V <sub>GS(off)</sub>	-1.0	-2.1	-3.0	V	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1 mA
Forward Transfer Admittance	y <sub>fs</sub>	0.4	0.5		S	V <sub>DS</sub> = -5.0 V, I <sub>D</sub> = -300 mA
Drain to Source On-State Resistance 1	R <sub>DS(on)1</sub>		2.5	5.0	Ω	V <sub>GS</sub> = -4.0 V, I <sub>D</sub> = -300 mA
Drain to Source On-State Resistance 2	R <sub>DS(on)2</sub>		1.8	4.2	Ω	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -300 mA
Input Capacitance	C <sub>iss</sub>		165		pF	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0, f = 1 MHz
Output Capacitance	C <sub>oss</sub>		75		pF	
Feedback Capacitance	C <sub>rss</sub>		13		pF	
On-State Delay Time	t <sub>d(on)</sub>		110		ns	I <sub>D</sub> = -0.3 A, R <sub>L</sub> = 1.5 Ω V <sub>GS(on)</sub> = -4 V R <sub>G</sub> = 10 Ω, V <sub>DD</sub> = -5 V
Rise Time	t <sub>r</sub>		320		ns	
Off-State Delay Time	t <sub>d(off)</sub>		100		ns	
Fall Time	t <sub>f</sub>		130		ns	

SWITCHING TIME MEASUREMENT CIRCUIT AND CONDITIONS

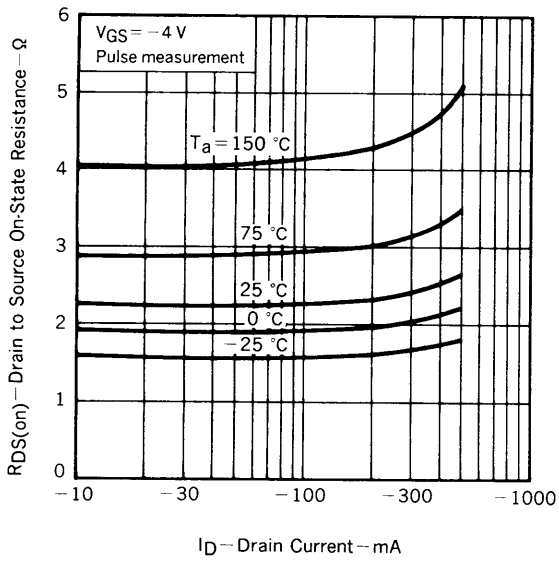


TYPICAL CHARACTERISTICS (T<sub>a</sub> = 25 °C)

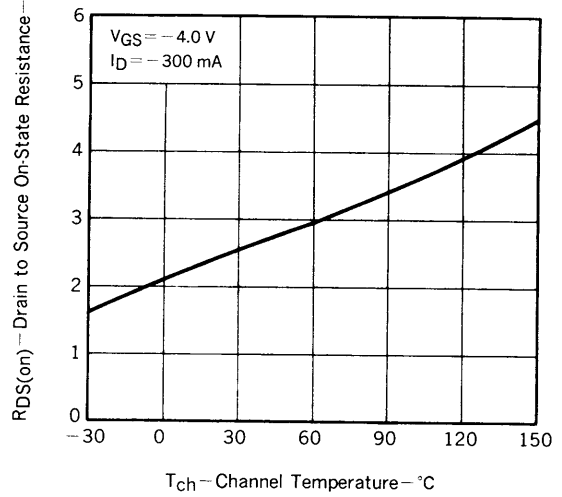




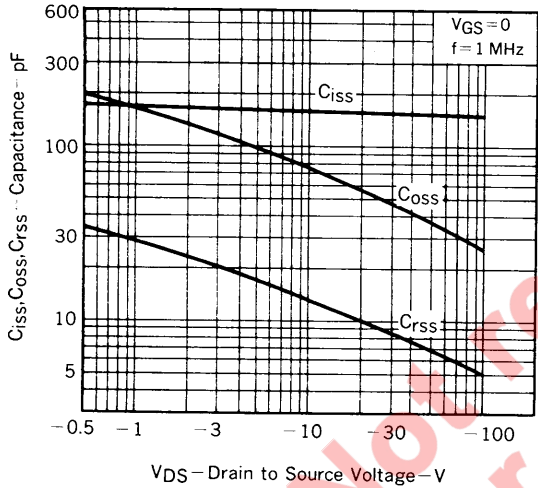
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



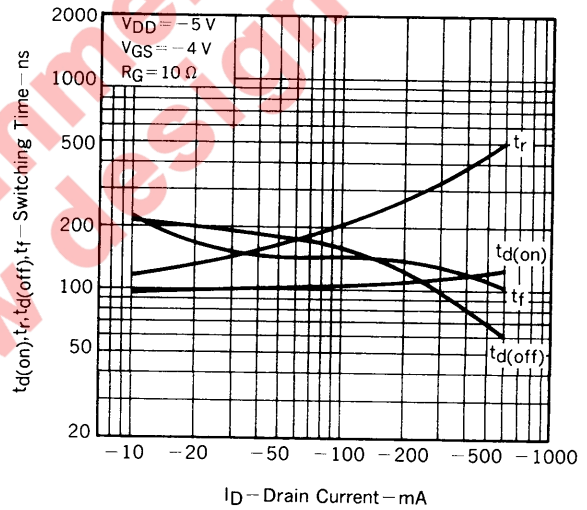
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



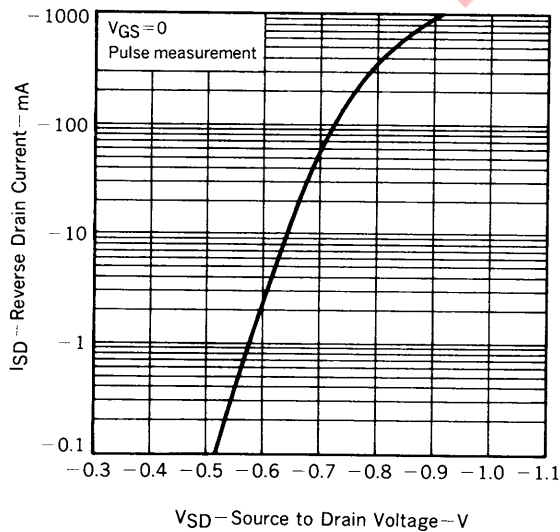
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



SWITCHING CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



**RECOMMENDED SOLDERING CONDITIONS**

Mounting of this product by soldering should be done under the following conditions.  
Please consult our representatives about soldering methods and conditions other than these.

**SURFACE MOUNT TYPE**

For details of the recommended soldering conditions, see the information document.  
"Device Mounting Manual for Surface Mounting (IEI-1207)."

Soldering Method	Soldering Conditions	Symbol for Recommended Conditions
Infrared Reflow	Package peak temp.: 230 °C Soldering time: within 30 sec (above 210 °C) Soldering times: 1, Days limitation: none*	IR30-00
Vapor Phase Soldering	Package peak temp.: 215 °C Soldering time: within 40 sec (above 200 °C) Soldering times: 1, Days limitation: none*	VP15-00
Wave Soldering	Soldering bath temp.: below 260 °C Soldering time: within 10 sec Soldering times: 1, Days limitation: none*	WS60-00

\*: Stored days under storage conditions at 25 °C and below 65 % R.H. after the dry-pack has been opened.

Note 1: Combination of soldering methods should be avoided.

**REFERENCE**

Document Name	Document No.
NEC semiconductor device reliability/quality control system.	TEI-1202
Quality grade on NEC semiconductor devices.	IEI-1209
Semiconductor device mounting technology manual.	IEI-1207
Semiconductor device package manual.	IEI-1213
Guide to quality assurance for semiconductor devices.	MEI-1202
Semiconductor selection guide.	MF-1134

Not recommended for new design



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