

To all our customers

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Renesas Technology Corp.  
Customer Support Dept.  
April 1, 2003

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Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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# 2SK2851

## Silicon N Channel MOS FET High Speed Power Switching

# RENESAS

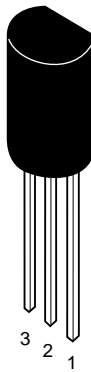
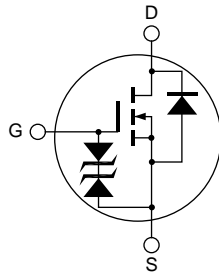
ADE-208-478 (Z)  
1st. Edition  
Sep. 1997

### Features

- Low on-resistance  
 $R_{DS(on)} = 0.055\Omega$  typ. (at  $V_{GS} = 10\text{ V}$ ,  $I_D = 2.5\text{ A}$ )
- 4V gate drive devices.
- Large current capacitance  
 $I_D = 5\text{ A}$

### Outline

TO-92MOD.



1. Source
2. Drain
3. Gate

**Absolute Maximum Ratings** (Ta = 25°C)

<b>Item</b>	<b>Symbol</b>	<b>Ratings</b>	<b>Unit</b>
Drain to source voltage	$V_{DSS}$	60	V
Gate to source voltage	$V_{GSS}$	±20	V
Drain current	$I_D$	5	A
Drain peak current	$I_{D(pulse)}^{*1}$	20	A
Body to drain diode reverse drain current	$I_{DR}$	5	A
Avalanche current	$I_{AP}^{*3}$	5	A
Avalanche energy	$E_{AR}^{*3}$	2.14	mJ
Channel dissipation	$P_{ch}^{*2}$	0.9	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	-55 to +150	°C

Notes: 1.  $PW \leq 10\mu s$ , duty cycle  $\leq 1\%$

2. Value at Ta = 25°C

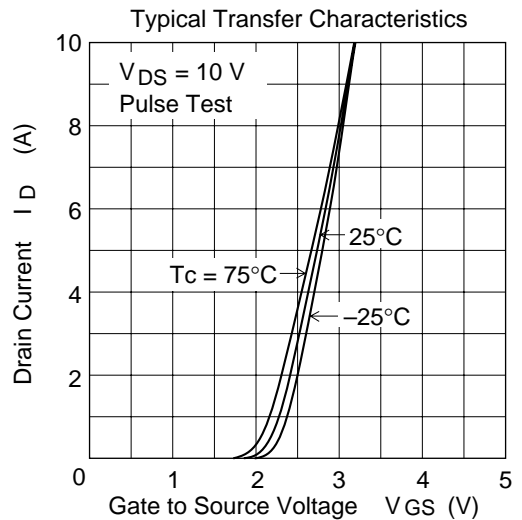
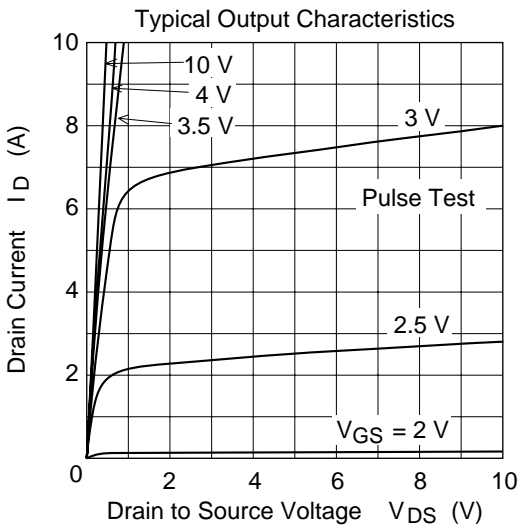
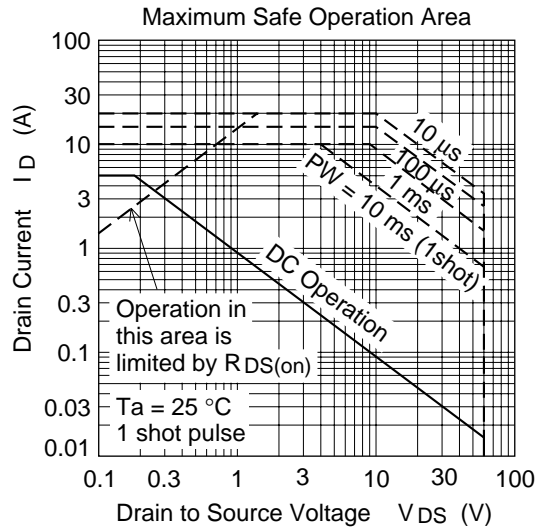
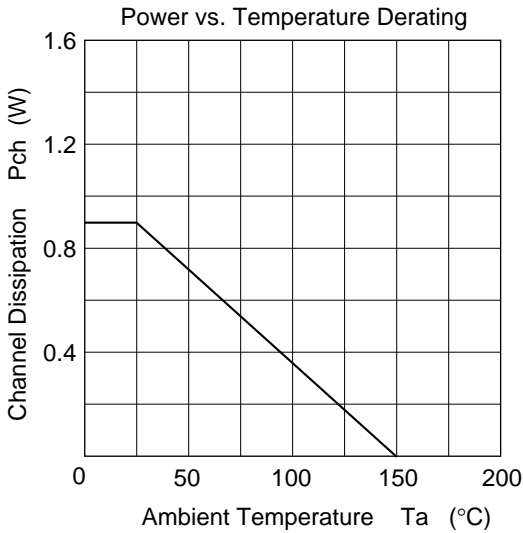
3. Value at Tch = 25°C, Rg  $\geq 50\ \Omega$

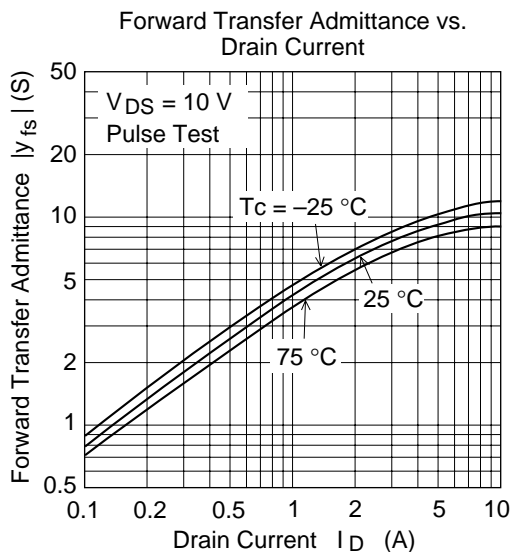
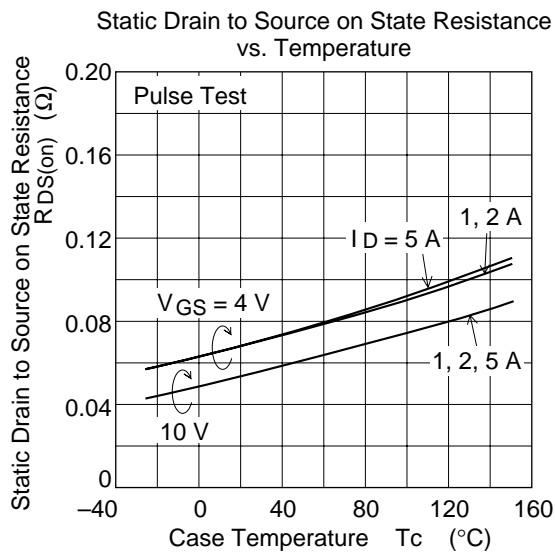
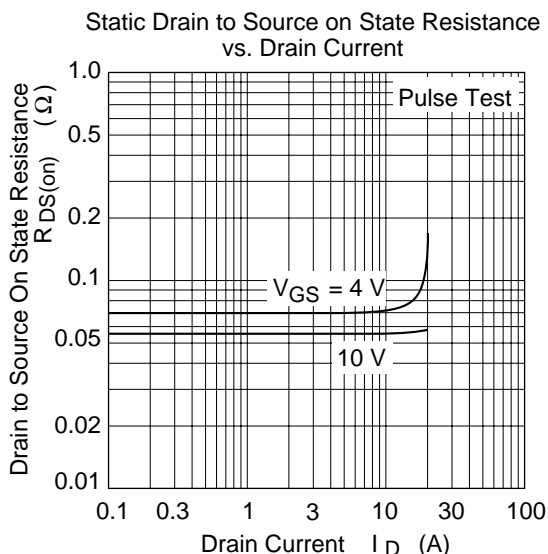
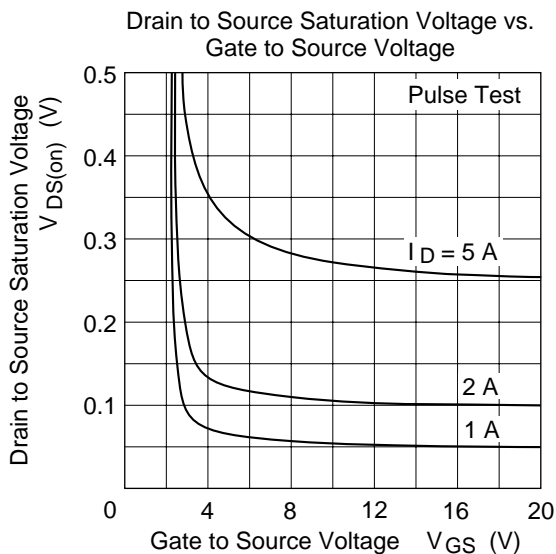
## Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	$I_D = 10\text{mA}$ , $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100\mu\text{A}$ , $V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	10	$\mu\text{A}$	$V_{DS} = 60\text{V}$ , $V_{GS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 16\text{V}$ , $V_{DS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.0	V	$I_D = 1\text{mA}$ , $V_{DS} = 10\text{V}$
Static drain to source on state resistance	$R_{DS(on)}$	—	0.055	0.07	$\Omega$	$I_D = 2.5\text{A}$ , $V_{GS} = 10\text{V}^{*1}$
	$R_{DS(on)}$	—	0.07	0.1	$\Omega$	$I_D = 2.5\text{A}$ , $V_{GS} = 4\text{V}^{*1}$
Forward transfer admittance	$ y_{fs} $	5	7	—	S	$I_D = 2.5\text{A}$ , $V_{DS} = 10\text{V}^{*1}$
Input capacitance	$C_{iss}$	—	500	—	pF	$V_{DS} = 10\text{V}$
Output capacitance	$C_{oss}$	—	260	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	110	—	pF	$f = 1\text{MHz}$
Turn-on delay time	$t_{d(on)}$	—	10	—	ns	$V_{GS} = 10\text{V}$ , $I_D = 2.5\text{A}$
Rise time	$t_r$	—	30	—	ns	$R_L = 12\Omega$
Turn-off delay time	$t_{d(off)}$	—	100	—	ns	
Fall time	$t_f$	—	75	—	ns	
Body to drain diode forward voltage	$V_{DF}$	—	0.9	—	V	$I_D = 5\text{A}$ , $V_{GS} = 0$
Body to drain diode reverse recovery time	$t_{rr}$	—	50	—	ns	$I_F = 5\text{A}$ , $V_{GS} = 0$ $di_F/dt = 50\text{A}/\mu\text{s}$

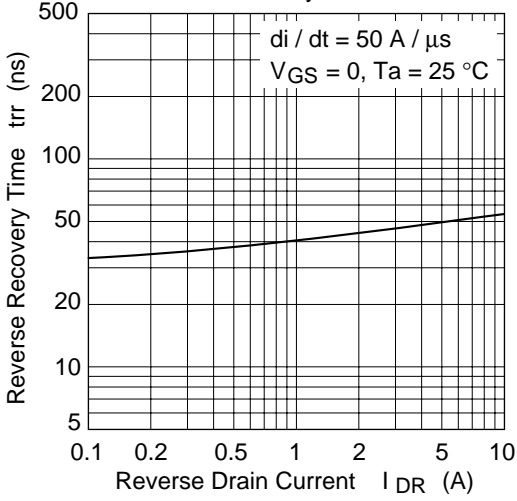
Note: 1. Pulse test

Main Characteristics

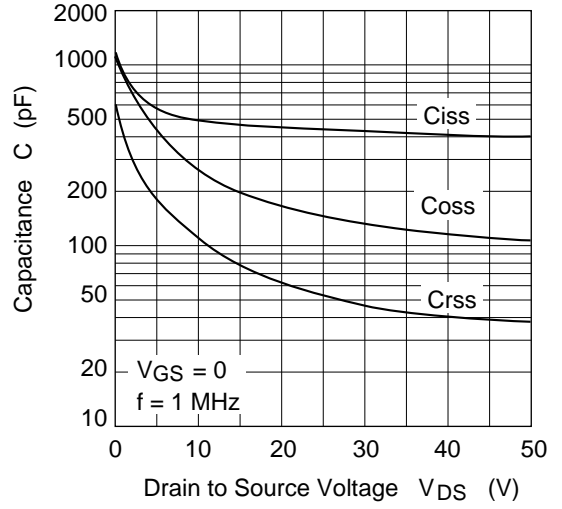




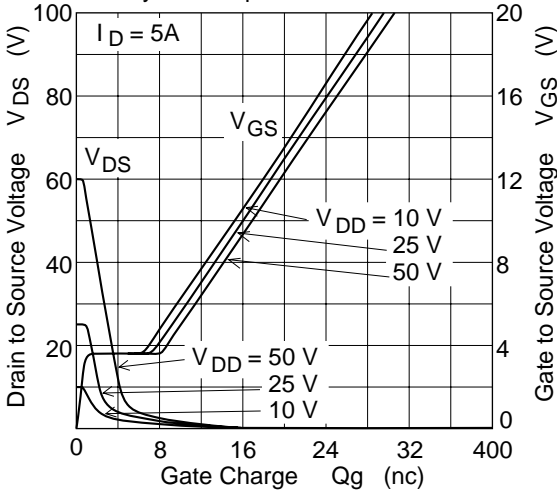
Body to Drain Diode Reverse Recovery Time



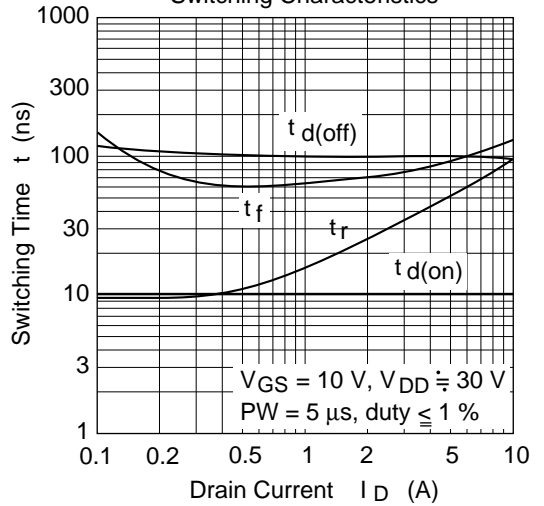
Typical Capacitance vs. Drain to Source Voltage

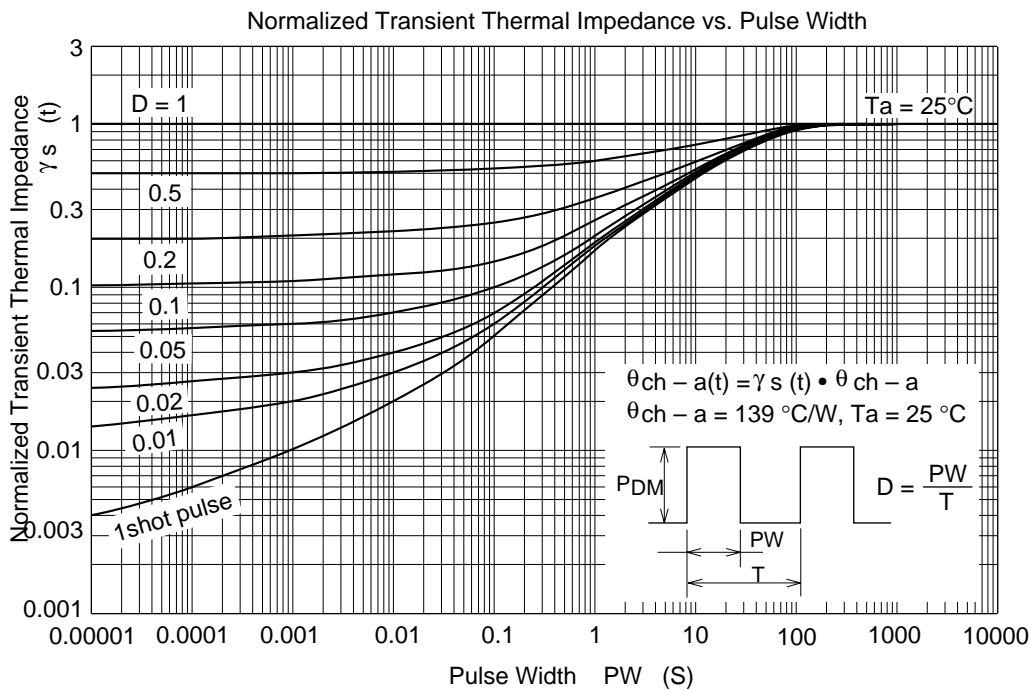
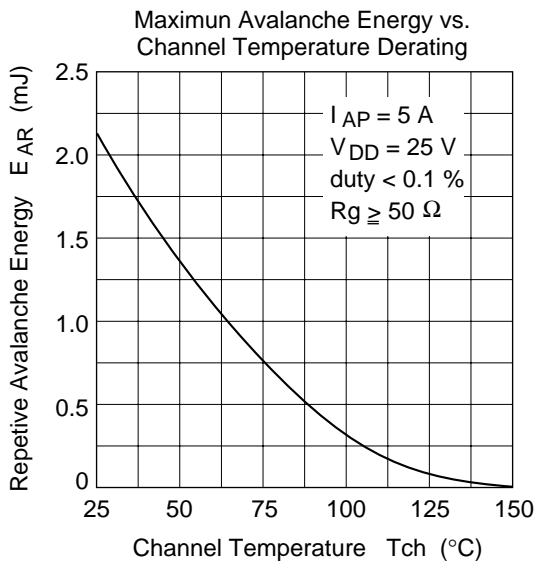
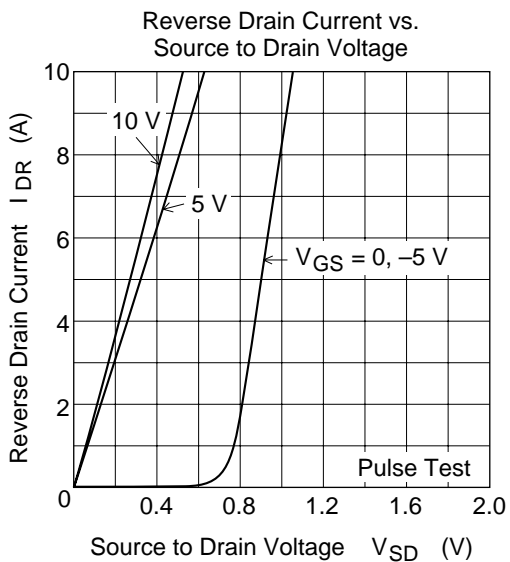


Dynamic Input Characteristics

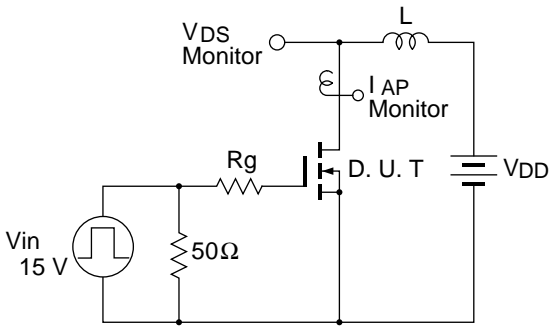


Switching Characteristics



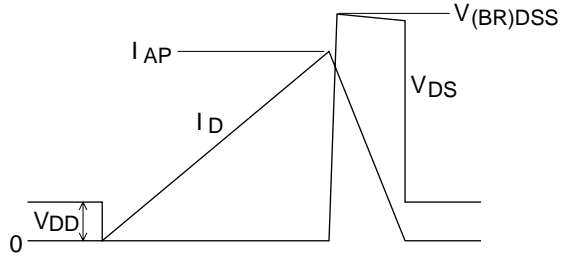


Avalanche Test Circuit

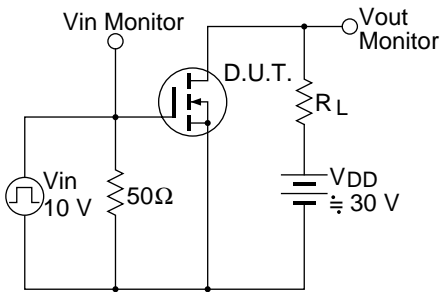


Avalanche Waveform

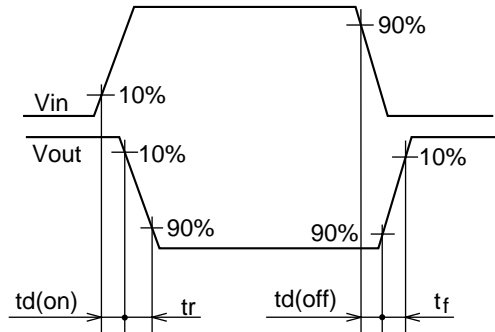
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



Switching Time Test Circuit

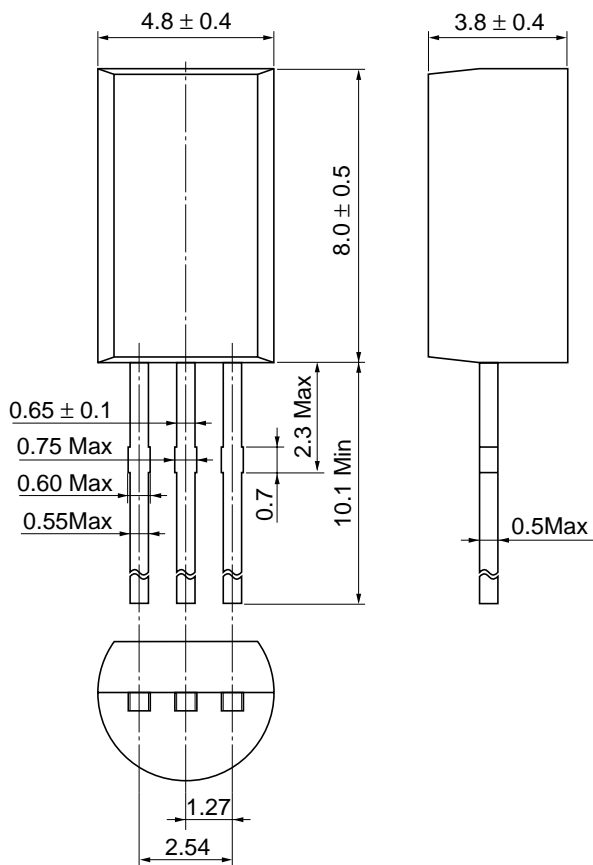


Switching Time Waveform



Package Dimensions

As of January, 2001  
Unit: mm



Hitachi Code	TO-92 Mod
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.35 g

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