

To all our customers

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

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Keep safety first in your circuit designs!

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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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# 2SK2978

## Silicon N Channel MOS FET High Speed Power Switching

# RENESAS

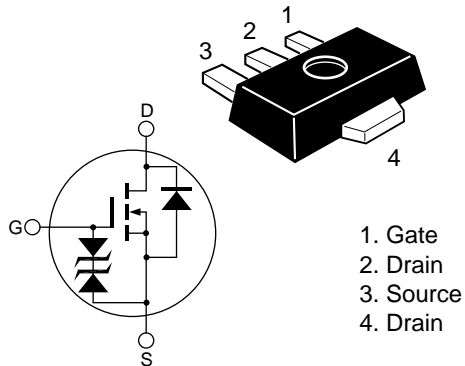
ADE-208-659C (Z)  
4th. Edition  
Jul. 1998

### Features

- Low on-resistance  
 $R_{DS(on)} = 0.09\Omega$  typ. ( $V_{GS} = 4\text{ V}$ ,  $I_D = 1.5\text{ A}$ )
- Low drive current
- High speed switching
- 2.5V gate drive devices.

### Outline

UPAK



**Absolute Maximum Ratings** ( $T_a = 25^\circ\text{C}$ )

<b>Item</b>	<b>Symbol</b>	<b>Ratings</b>	<b>Unit</b>
Drain to source voltage	$V_{DSS}$	20	V
Gate to source voltage	$V_{GSS}$	$\pm 10$	V
Drain current	$I_D$	2.5	A
Drain peak current	$I_{D(pulse)}$ <sup>Note1</sup>	5	A
Body-drain diode reverse drain current	$I_{DR}$	2.5	A
Channel dissipation	$P_{ch}$ <sup>Note2</sup>	1	W
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

Note: 1.  $PW \leq 10\mu\text{s}$ , duty cycle  $\leq 1\%$

2. When using the alumina ceramic board (12.5 x 20 x 0.7 mm)

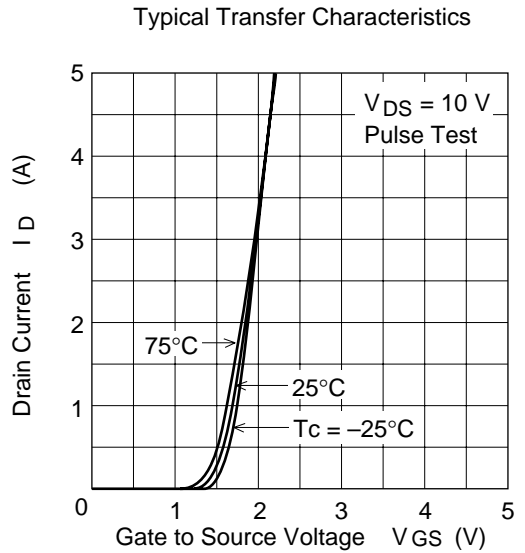
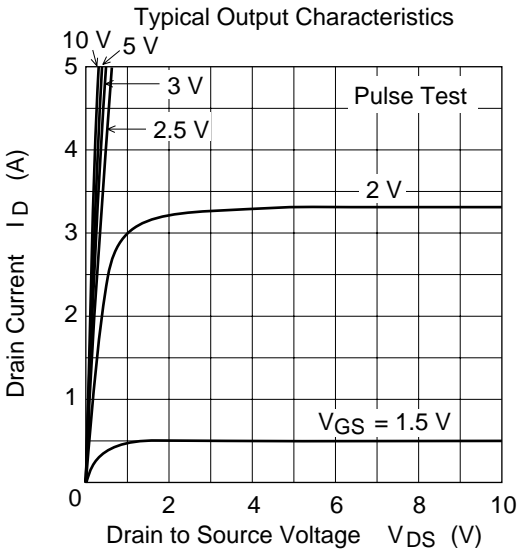
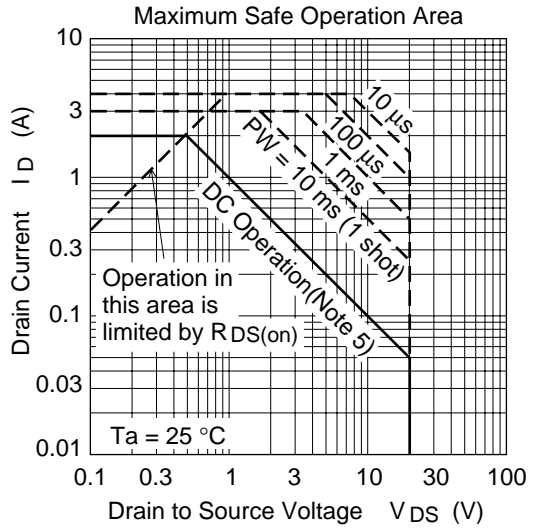
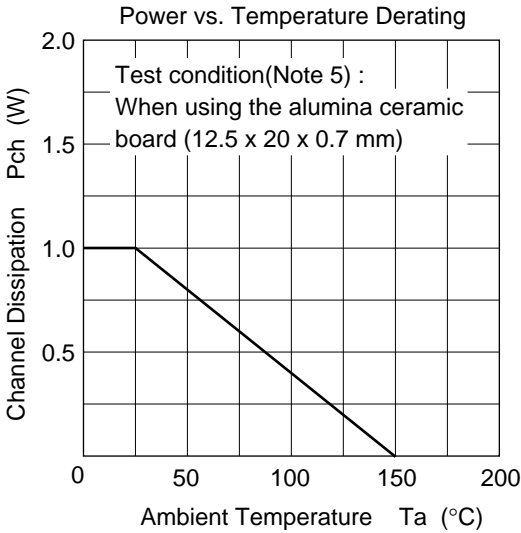
## Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	20	—	—	V	$I_D = 10\text{mA}, V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 10$	—	—	V	$I_G = \pm 100\mu\text{A}, V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	10	$\mu\text{A}$	$V_{DS} = 20\text{V}, V_{GS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 8\text{V}, V_{DS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	0.5	—	1.5	V	$I_D = 1\text{mA}, V_{DS} = 10\text{V}$
Static drain to source on state resistance	$R_{DS(on)}$	—	0.09	0.12	$\Omega$	$I_D = 1.5\text{A}, V_{GS} = 4\text{V}$ <sup>Note3</sup>
Static drain to source on state resistance	$R_{DS(on)}$	—	0.12	0.20	$\Omega$	$I_D = 1.5\text{A}, V_{GS} = 2.5\text{V}$ <sup>Note3</sup>
Forward transfer admittance	$ y_{fs} $	3.0	5.0	—	S	$I_D = 1.5\text{A}, V_{DS} = 10\text{V}$ <sup>Note3</sup>
Input capacitance	$C_{iss}$	—	260	—	pF	$V_{DS} = 10\text{V}$
Output capacitance	$C_{oss}$	—	150	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	75	—	pF	$f = 1\text{MHz}$
Turn-on delay time	$t_{d(on)}$	—	15	—	ns	$V_{GS} = 4\text{V}, I_D = 1.5\text{A}$
Rise time	$t_r$	—	70	—	ns	$R_L = 6.67\Omega$
Turn-off delay time	$t_{d(off)}$	—	55	—	ns	
Fall time	$t_f$	—	70	—	ns	
Body-drain diode forward voltage	$V_{DF}$	—	0.9	—	V	$I_F = 2.5\text{A}, V_{GS} = 0$
Body-drain diode reverse recovery time	$t_{rr}$	—	75	—	ns	$I_F = 2.5\text{A}, V_{GS} = 0$ $di_F/dt = 50\text{A}/\mu\text{s}$

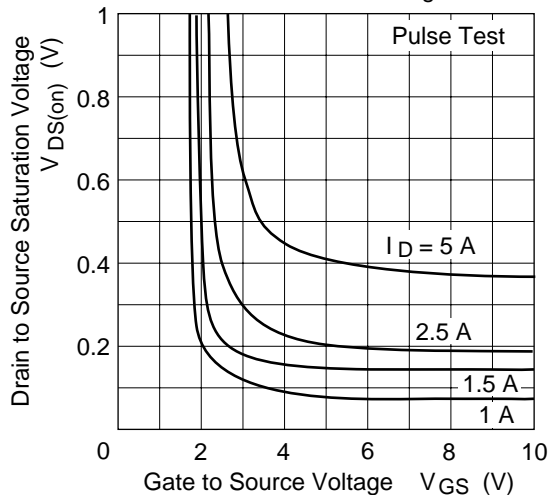
Note: 3. Pulse test

4. Marking is "ZY"

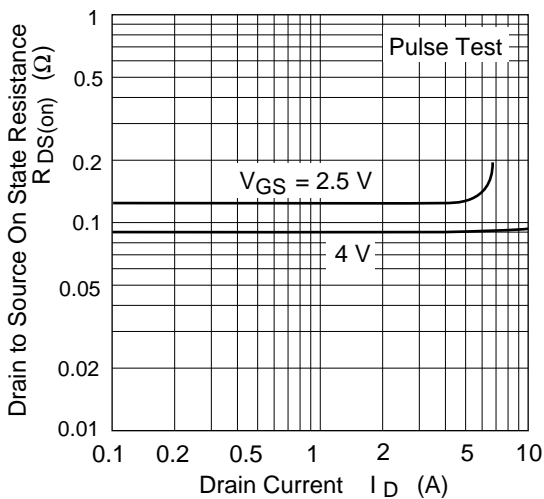
Main Characteristics



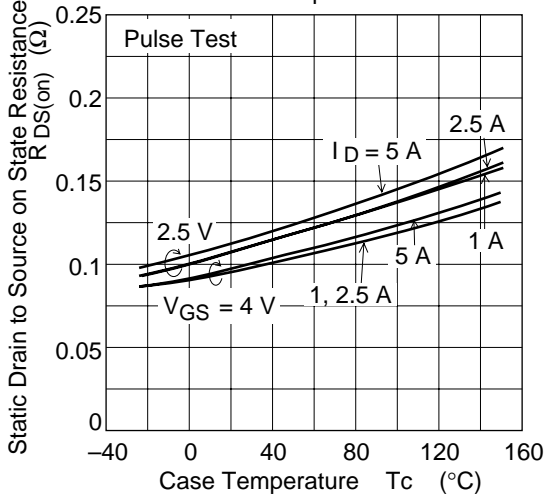
Drain to Source Saturation Voltage vs. Gate to Source Voltage



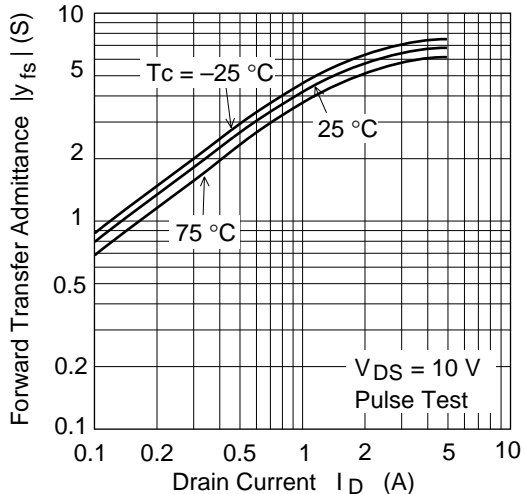
Static Drain to Source on State Resistance vs. Drain Current



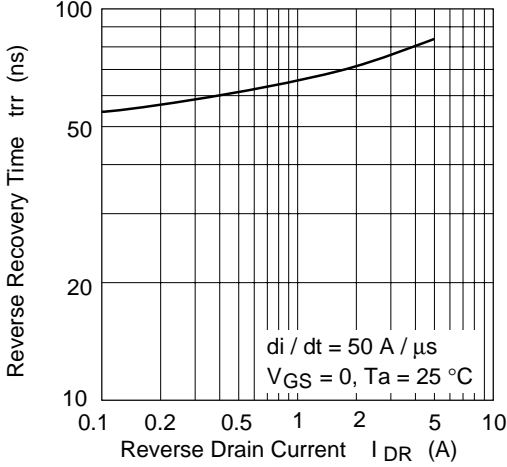
Static Drain to Source on State Resistance vs. Temperature



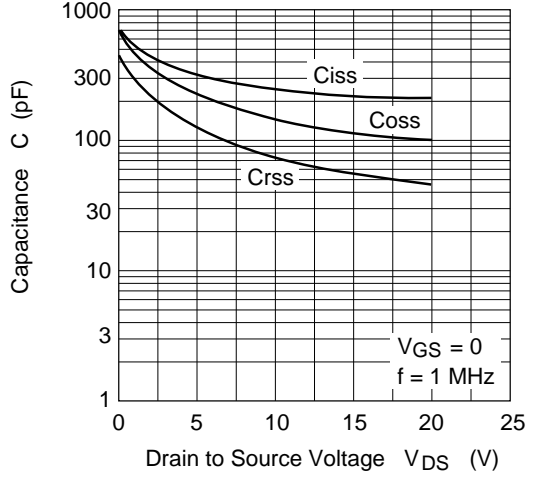
Forward Transfer Admittance vs. Drain Current



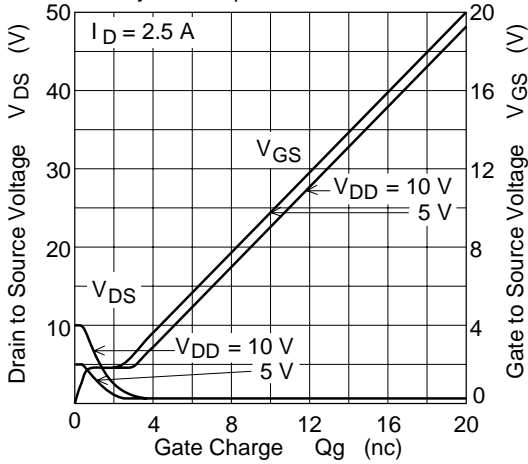
Body-Drain Diode Reverse Recovery Time



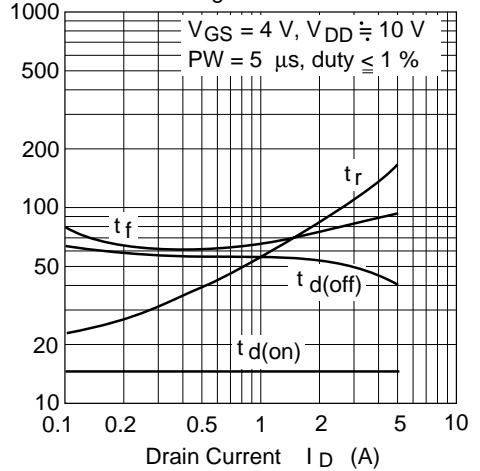
Typical Capacitance vs. Drain to Source Voltage

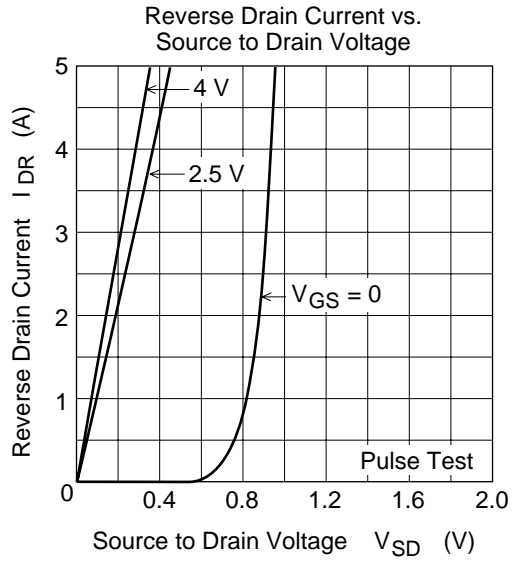


Dynamic Input Characteristics

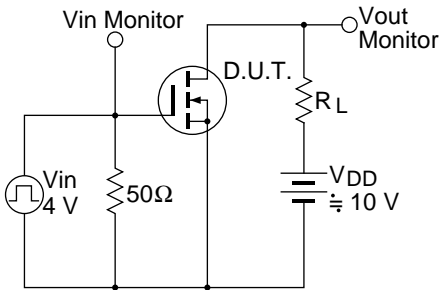


Switching Characteristics

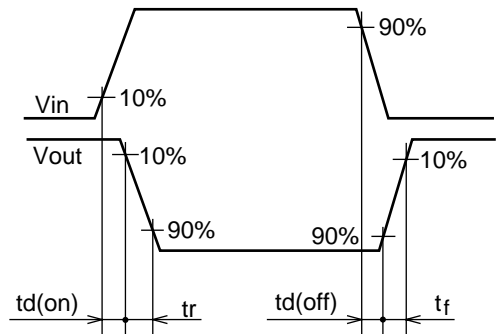




Switching Time Test Circuit



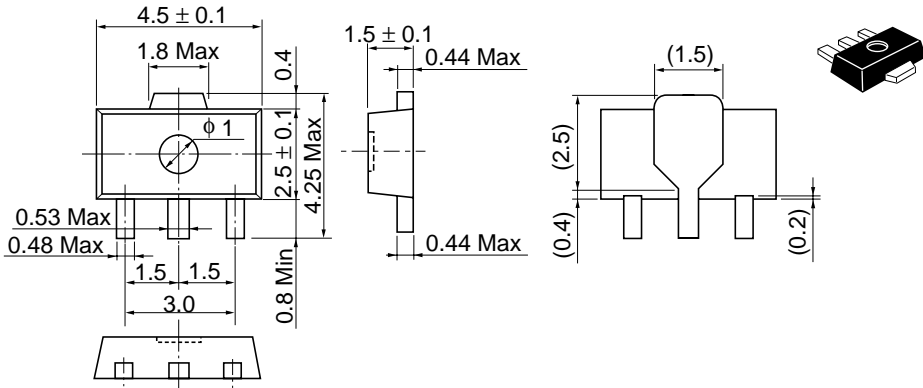
Waveform



Package Dimensions

As of January, 2001

Unit: mm



Hitachi Code	UPAK
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.050 g

## Cautions

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