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

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Keep safety first in your circuit designs!

1. Renesas Technology Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.

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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2SK2932

Silicon N Channel MOS FET High Speed Power Switching

RENESAS

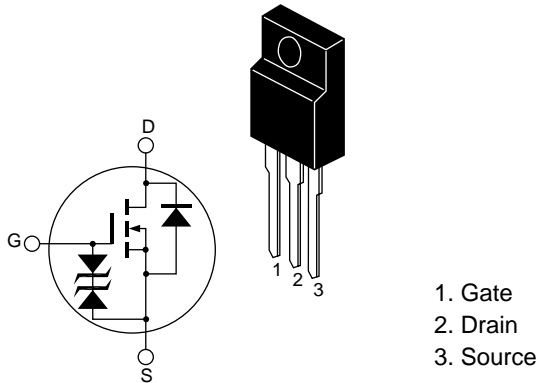
ADE-208-555B (Z)
3rd. Edition
Jul. 1998

Features

- Low on-resistance
 $R_{DS} = 0.055 \Omega$ typ.
- High speed switching
- 4V gate drive device can be driven from 5V source

Outline

TO-220CFM



Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DSS}	60	V
Gate to source voltage	V_{GSS}	±20	V
Drain current	I_D	10	A
Drain peak current	$I_{D(pulse)}$ ^{Note1}	40	A
Body-drain diode reverse drain current	I_{DR}	10	A
Avalanche current	I_{AP} ^{Note3}	10	A
Avalanche energy	E_{AR} ^{Note3}	8.5	mJ
Channel dissipation	Pch ^{Note2}	20	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	-55 to +150	°C

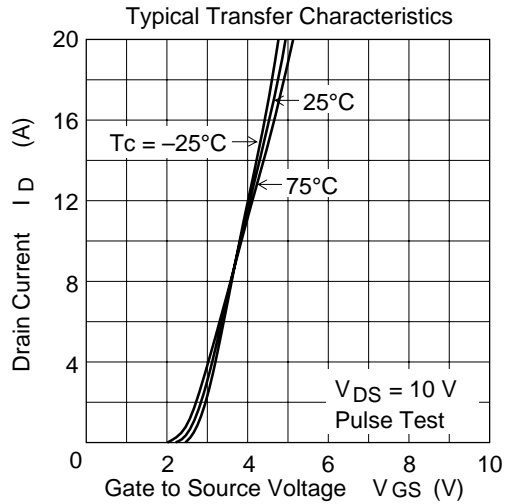
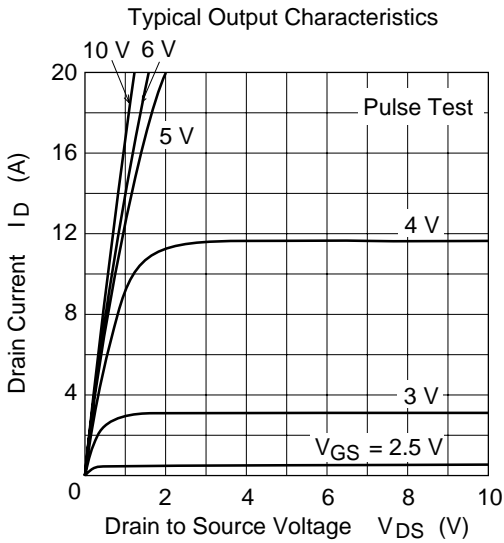
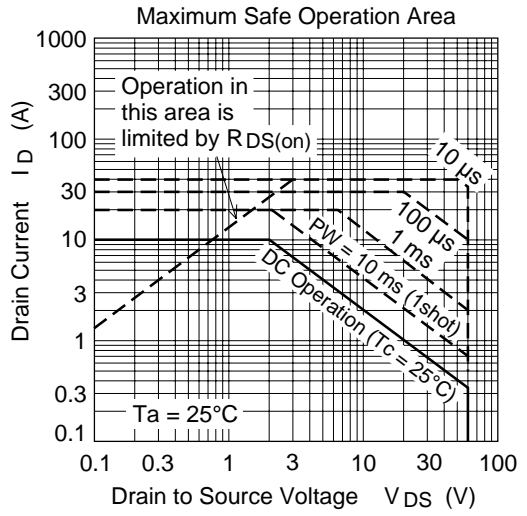
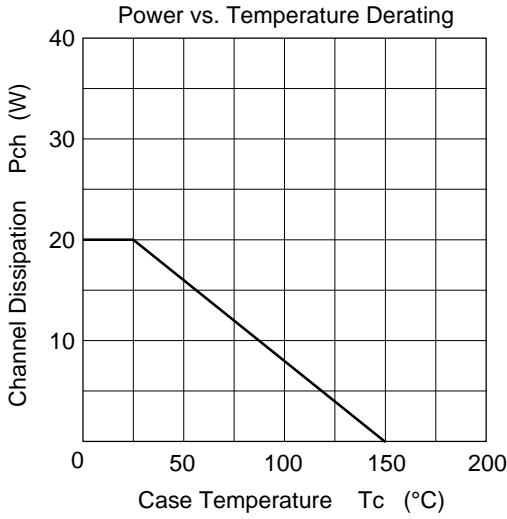
Note: 1. $PW \leq 10\mu s$, duty cycle $\leq 1\%$
2. Value at $T_c = 25^\circ C$
3. Value at $Tch = 25^\circ C$, $R_g = 50\Omega$

Electrical Characteristics (Ta = 25°C)

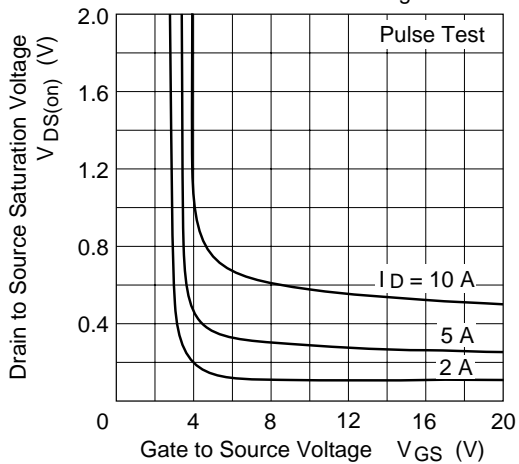
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	$I_D = 10\text{mA}, V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	± 20	—	—	V	$I_G = \pm 100\mu\text{A}, V_{DS} = 0$
Gate to source leak current	I_{GSS}	—	—	± 10	μA	$V_{GS} = \pm 16\text{V}, V_{DS} = 0$
Zero gate voltage drain current	I_{DSS}	—	—	10	μA	$V_{DS} = 60\text{V}, V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.5	—	2.5	V	$I_D = 1\text{mA}, V_{DS} = 10\text{V}$
Static drain to source on state resistance	$R_{DS(on)}$	—	0.055	0.075	Ω	$I_D = 5\text{A}, V_{GS} = 10\text{V}^{\text{Note4}}$
	$R_{DS(on)}$	—	0.090	0.150	Ω	$I_D = 5\text{A}, V_{GS} = 4\text{V}^{\text{Note4}}$
Forward transfer admittance	$ y_{fs} $	5	8	—	S	$I_D = 5\text{A}, V_{DS} = 10\text{V}^{\text{Note4}}$
Input capacitance	C_{iss}	—	350	—	pF	$V_{DS} = 10\text{V}$
Output capacitance	C_{oss}	—	190	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	C_{rss}	—	70	—	pF	$f = 1\text{MHz}$
Turn-on delay time	$t_{d(on)}$	—	10	—	ns	$I_D = 5\text{A}, V_{GS} = 10\text{V}$
Rise time	t_r	—	55	—	ns	$R_L = 6\Omega$
Turn-off delay time	$t_{d(off)}$	—	60	—	ns	
Fall time	t_f	—	70	—	ns	
Body-drain diode forward voltage	V_{DF}	—	0.9	—	V	$I_F = 10\text{A}, V_{GS} = 0$
Body-drain diode reverse recovery time	t_{rr}	—	50	—	ns	$I_F = 10\text{A}, V_{GS} = 0$ $di_F/dt = 50\text{A}/\mu\text{s}$

Note: 4. Pulse test

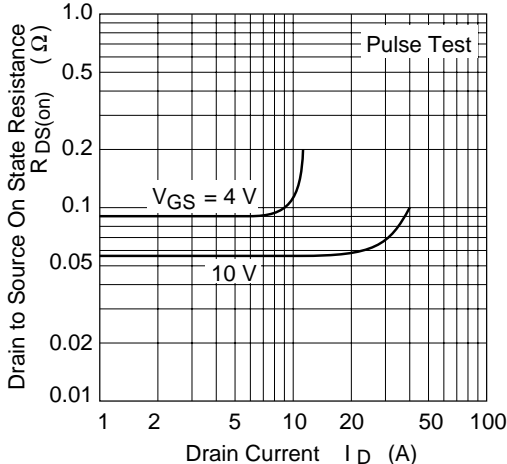
Main Characteristics



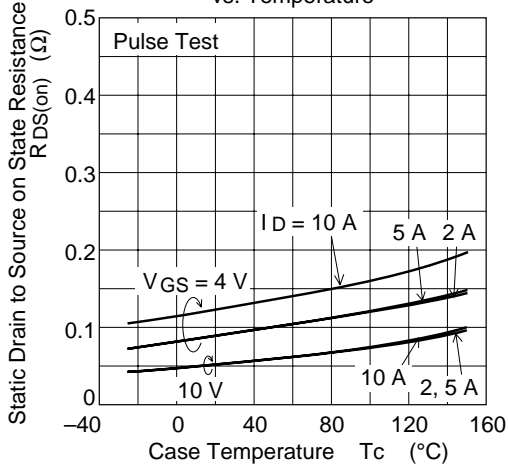
Drain to Source Saturation Voltage vs. Gate to Source Voltage



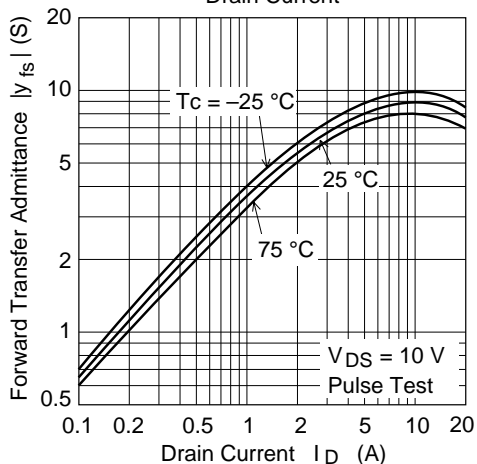
Static Drain to Source on State Resistance vs. Drain Current



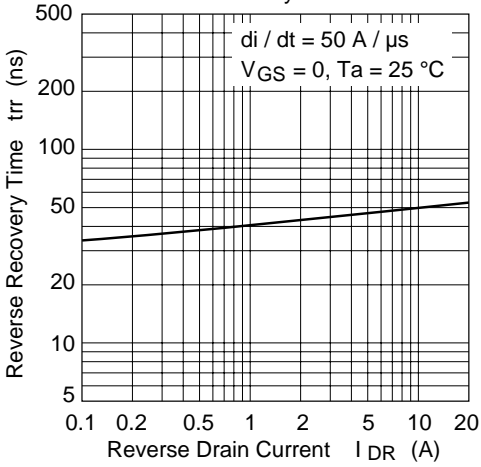
Static Drain to Source on State Resistance vs. Temperature



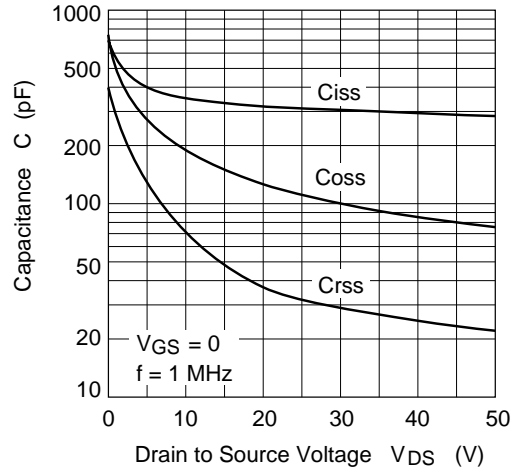
Forward Transfer Admittance vs. Drain Current



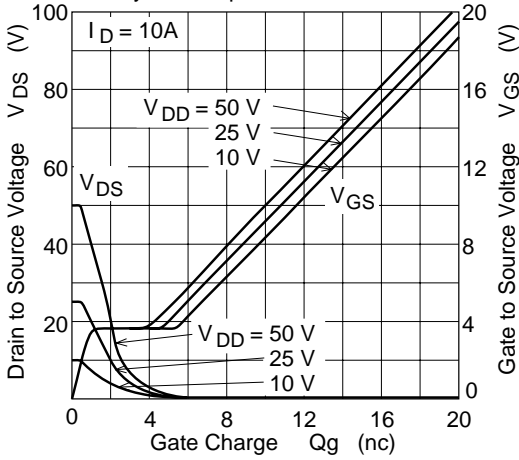
Body-Drain Diode Reverse Recovery Time



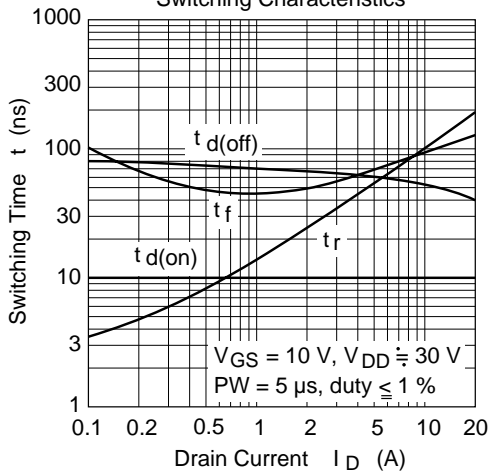
Typical Capacitance vs. Drain to Source Voltage

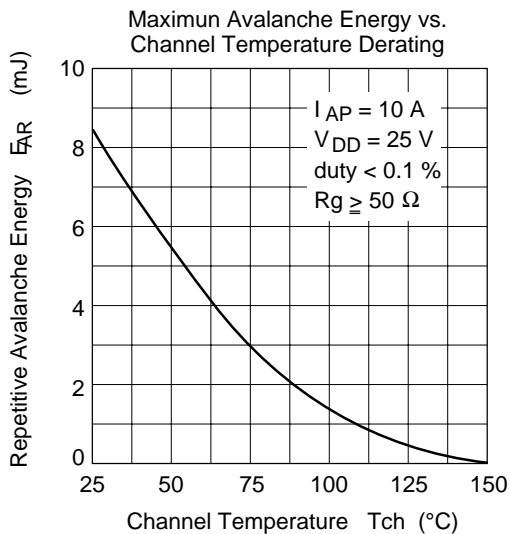
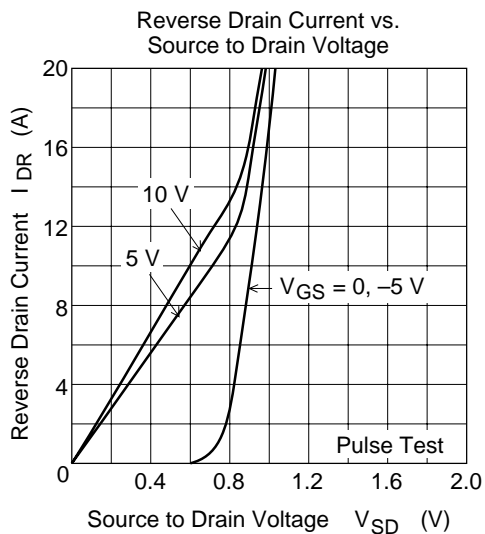


Dynamic Input Characteristics

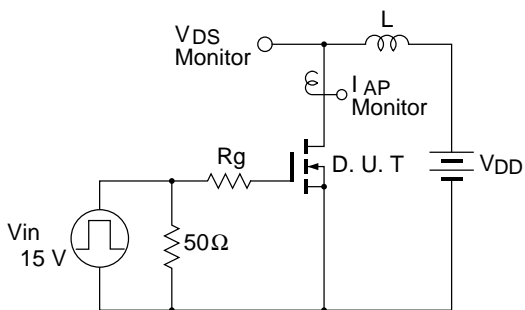


Switching Characteristics



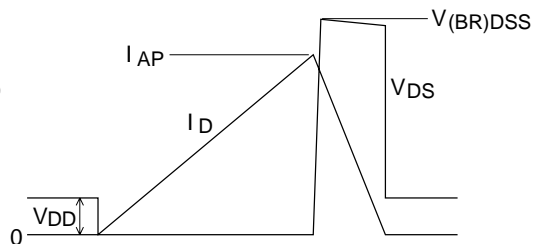


Avalanche Test Circuit

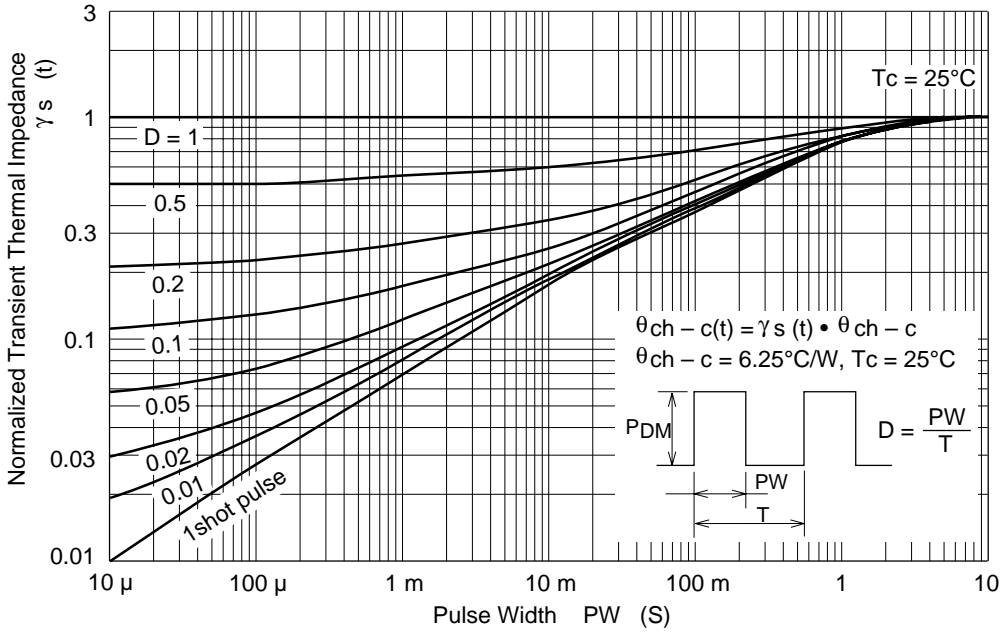


Avalanche Waveform

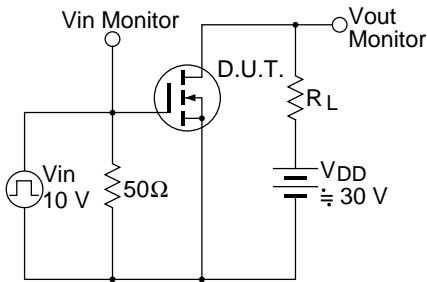
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



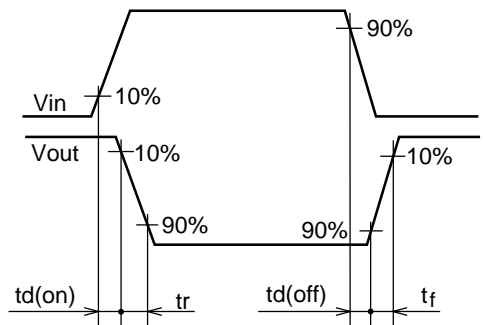
Normalized Transient Thermal Impedance vs. Pulse Width



Switching Time Test Circuit



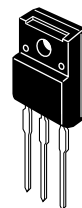
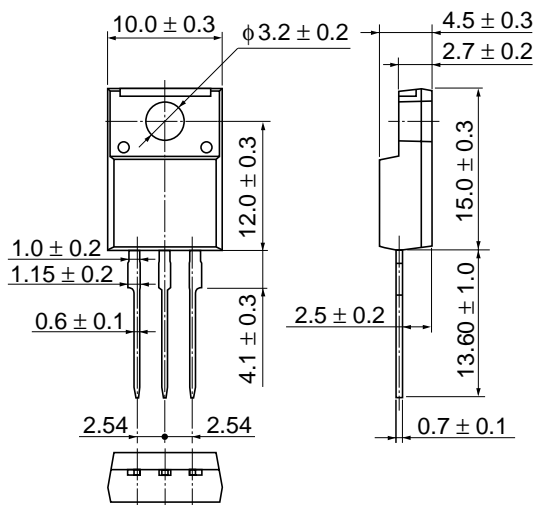
Waveform



Package Dimensions

As of January, 2001

Unit: mm



Hitachi Code	TO-220CFM
JEDEC	—
EIAJ	—
Mass (reference value)	1.9 g

Cautions

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HITACHI

Hitachi, Ltd.

Semiconductor & Integrated Circuits.

Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL NorthAmerica : <http://semiconductor.hitachi.com/>
 Europe : <http://www.hitachi-eu.com/hel/ecg>
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For further information write to:

Hitachi Semiconductor
(America) Inc.
179 East Tasman Drive,
San Jose, CA 95134
Tel: <1> (408) 433-1990
Fax: <1> (408) 433-0223

Hitachi Europe GmbH
Electronic Components Group
Dornacher Straße 3
D-85622 Feldkirchen, Munich
Germany
Tel: <49> (89) 9 9180-0
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 585160

Hitachi Asia Ltd.
Hitachi Tower
16 Collyer Quay #20-00,
Singapore 049318
Tel : <65>-538-6533/538-8577
Fax : <65>-538-6933/538-3877
URL : <http://www.hitachi.com.sg>

Hitachi Asia Ltd.
(Taipei Branch Office)
4/F, No. 167, Tun Hwa North Road,
Hung-Kuo Building,
Taipei (105), Taiwan
Tel : <886>-(2)-2718-3666
Fax : <886>-(2)-2718-8180
Telex : 23222 HAS-TP
URL : <http://www.hitachi.com.tw>

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower,
World Finance Centre,
Harbour City, Canton Road
Tsim Sha Tsui, Kowloon,
Hong Kong
Tel : <852>-(2)-735-9218
Fax : <852>-(2)-730-0281
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Colophon 2.0



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