

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!

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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# 2SK2725

Silicon N Channel MOS FET  
High Speed Power Switching

**RENESAS**

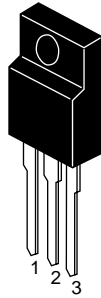
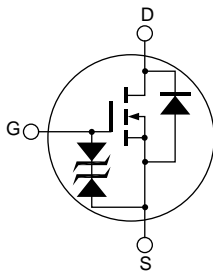
ADE-208-452B (Z)  
3rd. Edition  
Sep. 1997

## Features

- Low on-resistance
- High speed switching
- Low drive current
- No secondary breakdown
- Avalanche ratings

## Outline

TO-220CFM



1. Gate
2. Drain
3. Source

**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	$V_{DSS}$	500	V
Gate to source voltage	$V_{GSS}$	$\pm 30$	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	$E_{AR}^{*3}$	1.38	mJ
Channel dissipation	$P_{ch}^{*2}$	30	W
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

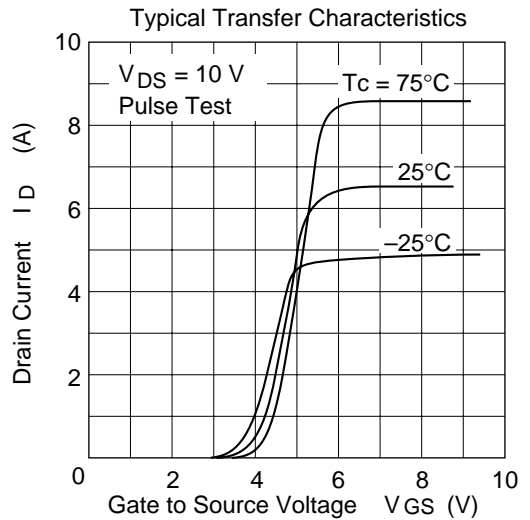
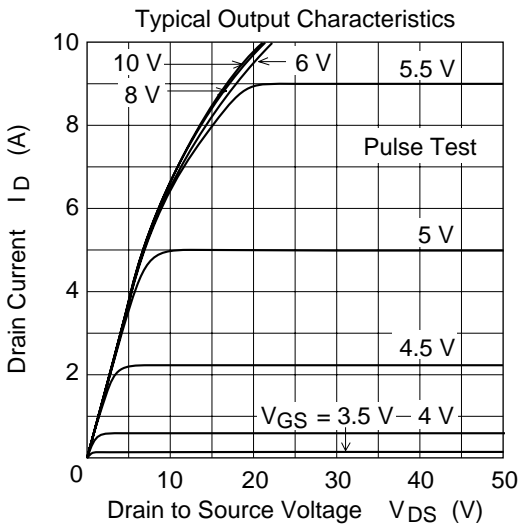
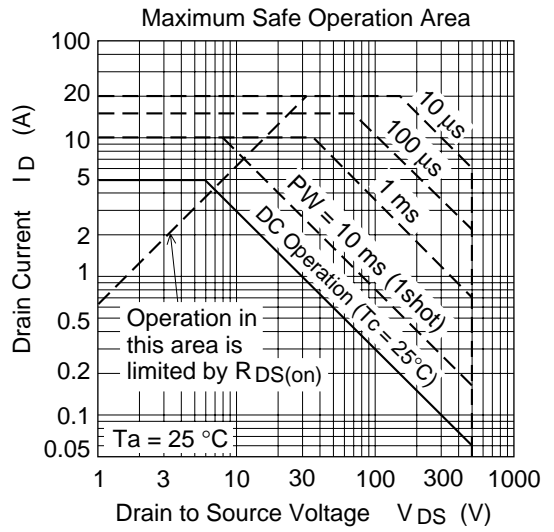
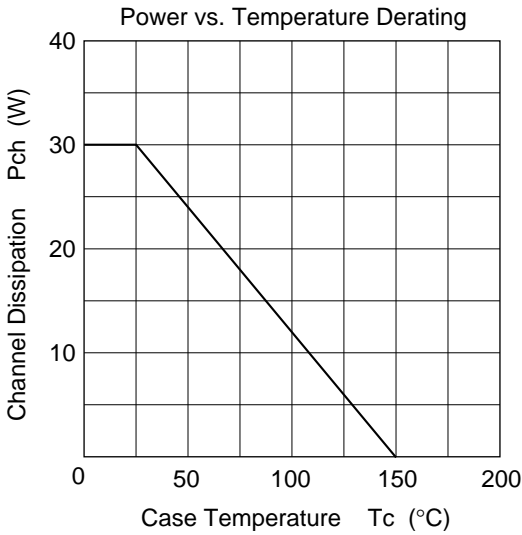
- Notes: 1.  $PW \leq 10\mu\text{s}$ , duty cycle  $\leq 1\%$   
2. Value at  $T_c = 25^\circ\text{C}$   
3. Value at  $T_{ch} = 25^\circ\text{C}$ ,  $R_g \geq 50\Omega$

## Electrical Characteristics (Ta = 25°C)

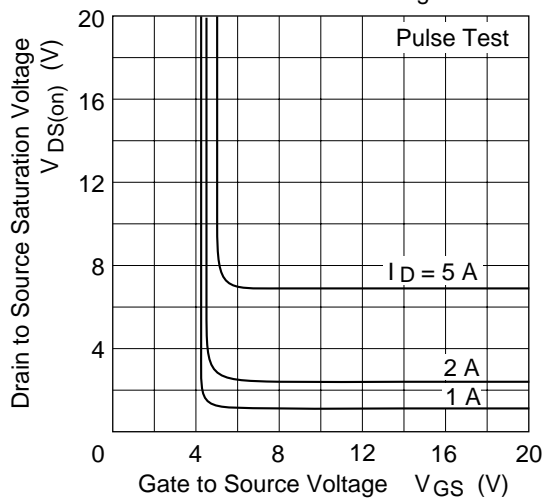
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	500	—	—	V	$I_D = 10\text{mA}$ , $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 30$	—	—	V	$I_G = \pm 100\mu\text{A}$ , $V_{DS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 25\text{V}$ , $V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	10	$\mu\text{A}$	$V_{DS} = 500\text{V}$ , $V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	2.5	—	3.5	V	$I_D = 1\text{mA}$ , $V_{DS} = 10\text{V}^{*1}$
Static drain to source on state resistance	$R_{DS(on)}$	—	1.2	1.6	$\Omega$	$I_D = 3\text{A}$ , $V_{GS} = 10\text{V}^{*1}$
Forward transfer admittance	$ y_{fs} $	2.5	4.5	—	S	$I_D = 3\text{A}$ , $V_{DS} = 10\text{V}^{*1}$
Input capacitance	Ciss	—	630	—	pF	$V_{DS} = 10\text{V}$
Output capacitance	Coss	—	250	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	Crss	—	55	—	pF	$f = 1\text{MHz}$
Total gate charge	Qg	—	13.5	—	nc	$V_{DD} = 400\text{V}$
Gate to source charge	Qgs	—	3.5	—	nc	$V_{GS} = 10\text{V}$
Gate to drain charge	Qgd	—	5.0	—	nc	$I_D = 5\text{A}$
Turn-on delay time	$t_{d(on)}$	—	11	—	ns	$V_{GS} = 10\text{V}$ , $I_D = 3\text{A}$
Rise time	$t_r$	—	45	—	ns	$R_L = 10\Omega$
Turn-off delay time	$t_{d(off)}$	—	40	—	ns	
Fall time	$t_f$	—	50	—	ns	
Body to drain diode forward voltage	$V_{DF}$	—	0.95	—	V	$I_D = 5\text{A}$ , $V_{GS} = 0$
Body to drain diode reverse recovery time	$t_{rr}$	—	200	—	ns	$I_F = 5\text{A}$ , $V_{GS} = 0$ $diF/dt = 100\text{A}/\mu\text{s}$

Note: 1. Pulse test

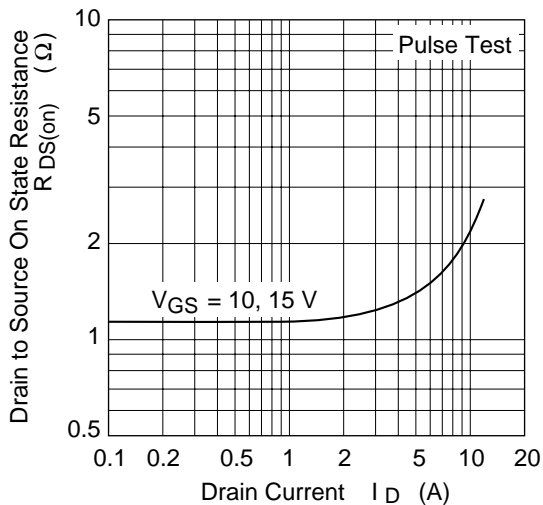
Main Characteristics



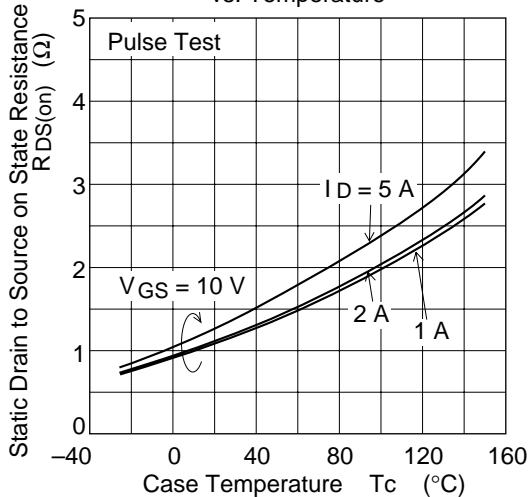
Drain to Source Saturation Voltage vs. Gate to Source Voltage



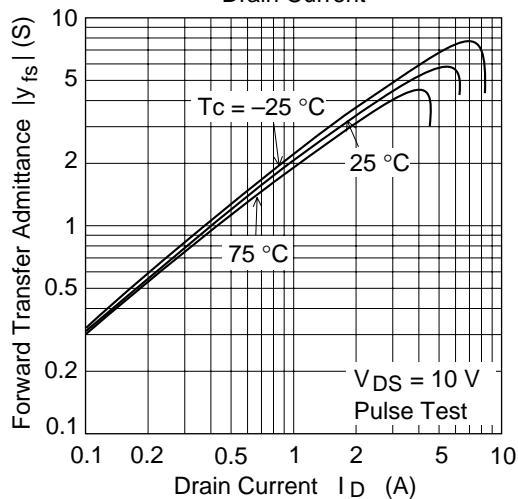
Static Drain to Source on State Resistance vs. Drain Current



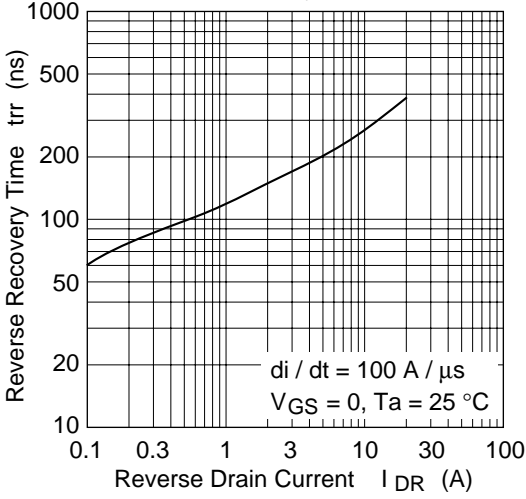
Static Drain to Source on State Resistance vs. Temperature



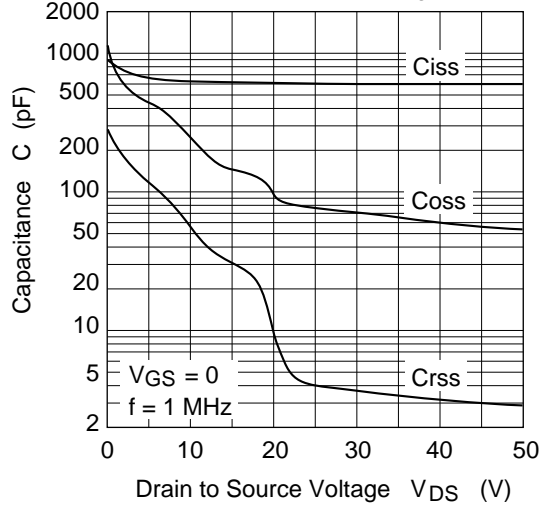
Forward Transfer Admittance vs. Drain Current



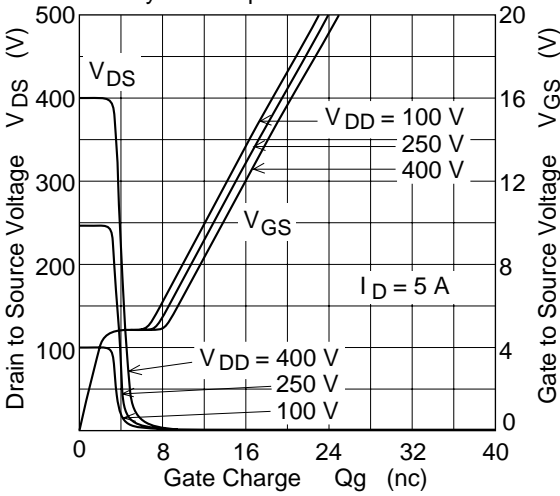
Body to Drain Diode Reverse Recovery Time



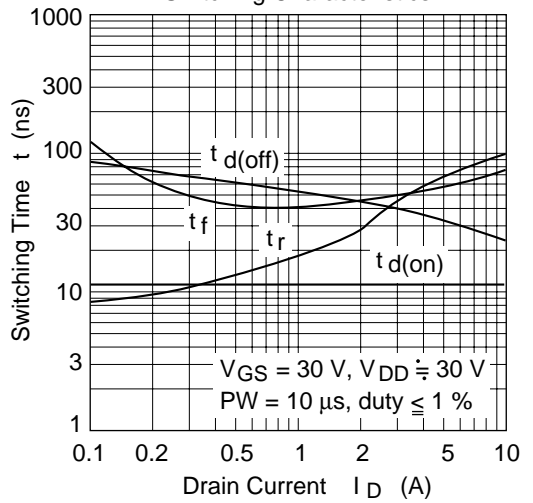
Typical Capacitance vs. Drain to Source Voltage

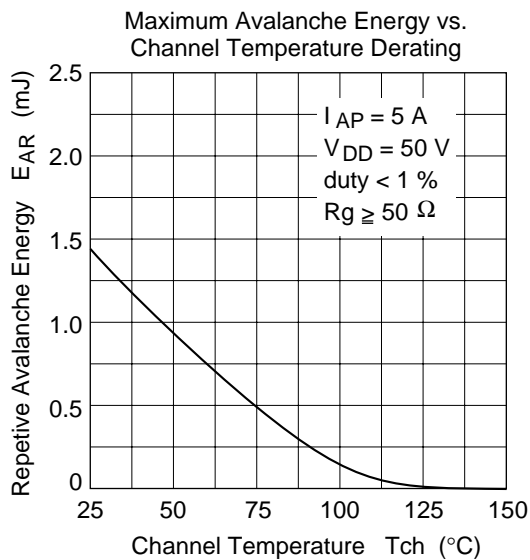
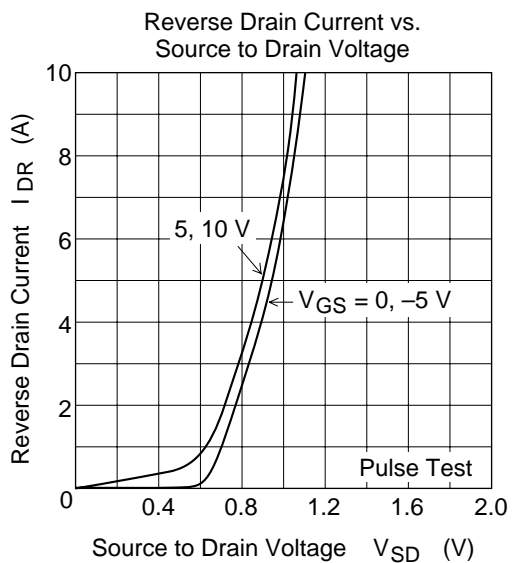


Dynamic Input Characteristics

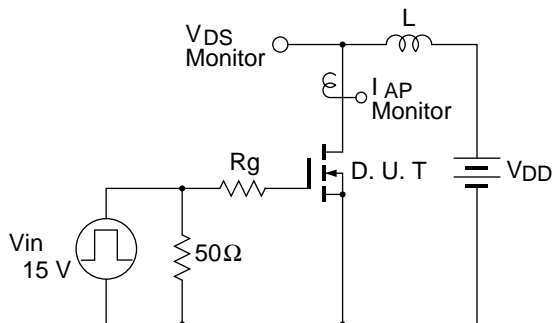


Switching Characteristics



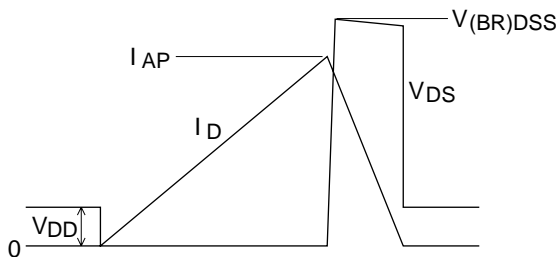


Avalanche Test Circuit

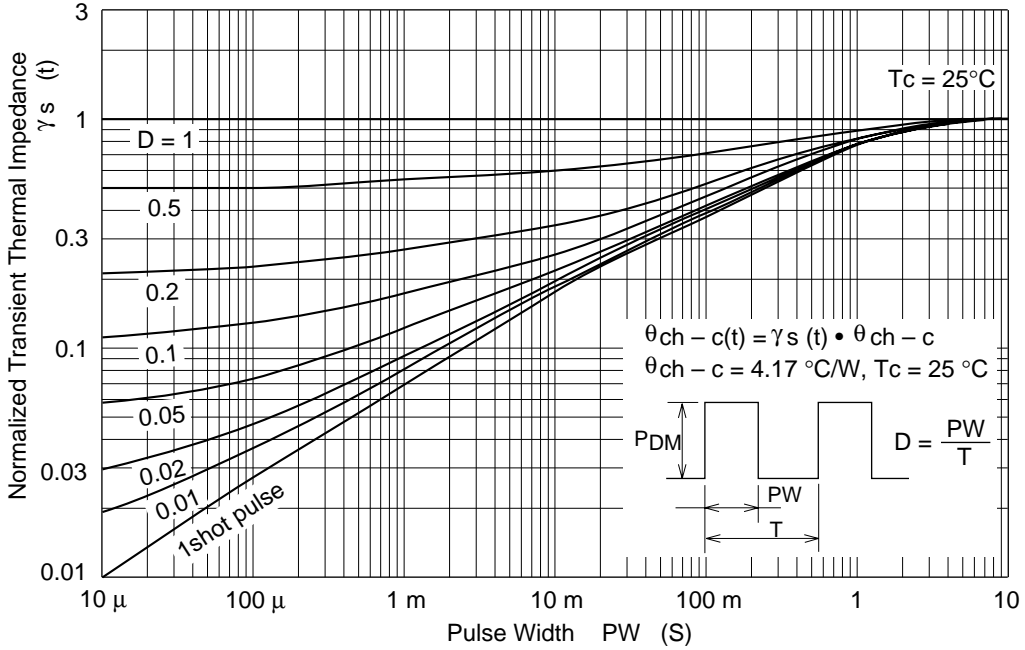


Avalanche Waveform

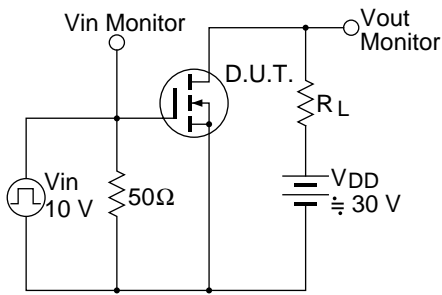
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



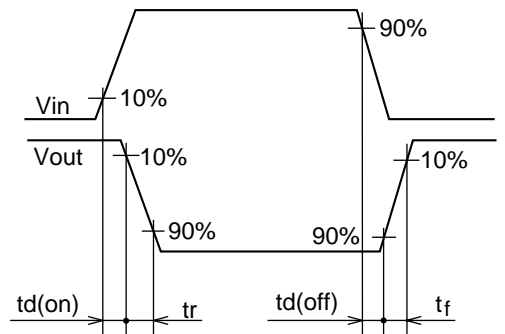
Normalized Transient Thermal Impedance vs. Pulse Width



Switching Time Test Circuit



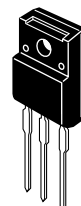
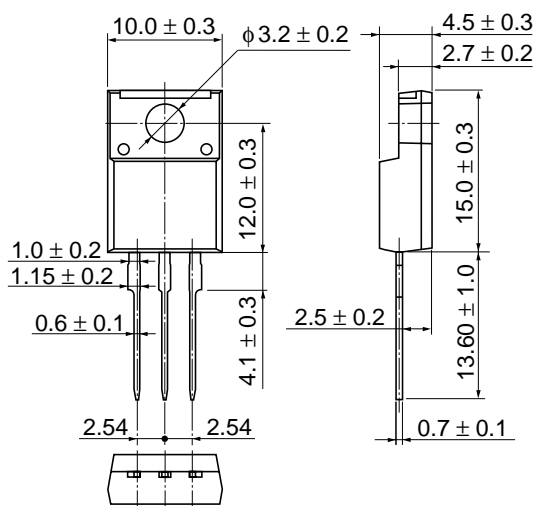
Switching Time Waveforms



## Package Dimensions

As of January, 2001

Unit: mm



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

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