

To all our customers

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

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# 2SK2931

## Silicon N Channel MOS FET High Speed Power Switching

# RENESAS

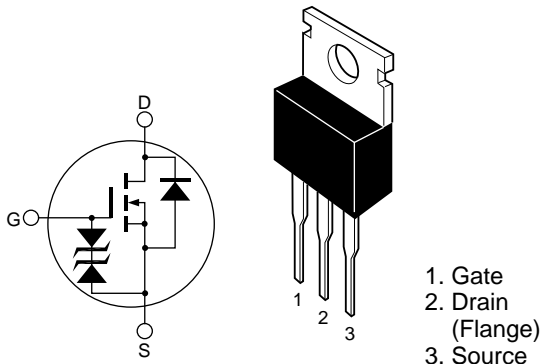
ADE-208-554C (Z)  
4th. Edition  
Jul. 1998

### Features

- Low on-resistance  
 $R_{DS} = 0.010 \Omega$  typ.
- High speed switching
- 4V gate drive device can be driven from 5V source

### Outline

TO-220AB



**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	$I_D$	45	A
Drain peak current	$I_{D(pulse)}$ <sup>Note1</sup>	180	A
Body-drain diode reverse drain current	$I_{DR}$	45	A
Avalanche current	$I_{AP}$ <sup>Note3</sup>	45	A
Avalanche energy	$E_{AR}$ <sup>Note3</sup>	173	mJ
Channel dissipation	$Pch$ <sup>Note2</sup>	75	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	-55 to +150	°C

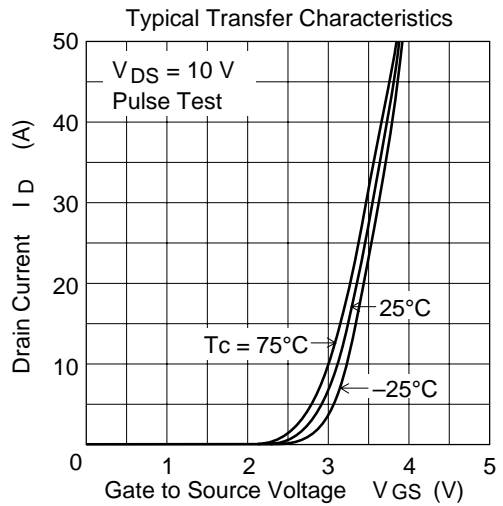
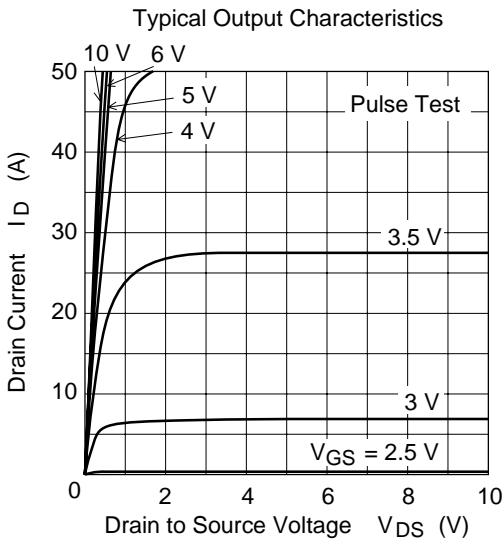
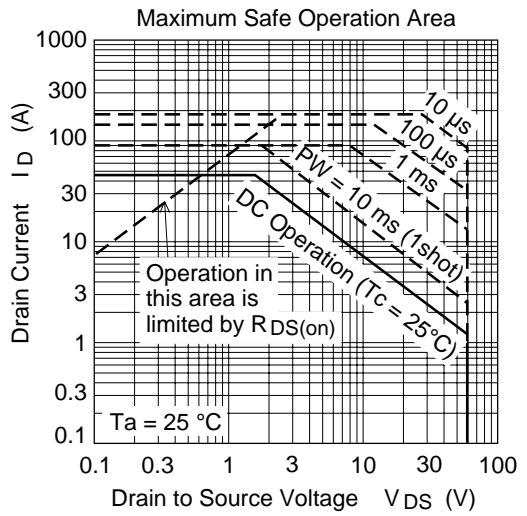
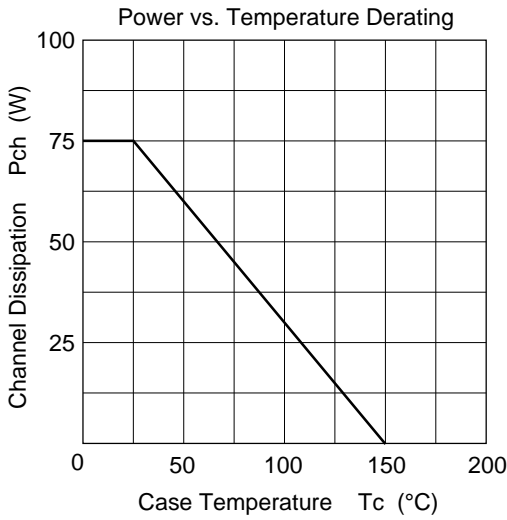
Note: 1.  $PW \leq 10\mu s$ , duty cycle  $\leq 1\%$   
2. Value at  $T_c = 25^\circ C$   
3. Value at  $Tch = 25^\circ C$ ,  $R_g = 50\Omega$

## Electrical Characteristics (Ta = 25°C)

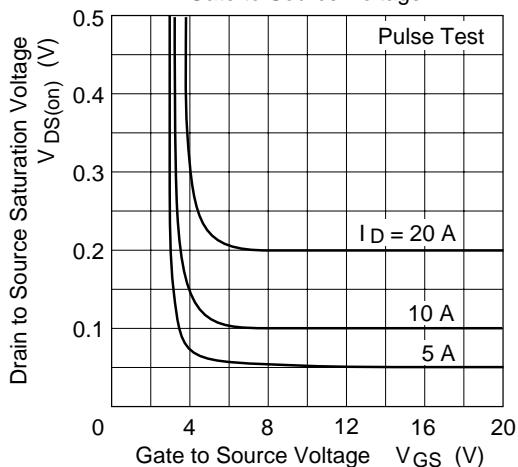
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	$I_D = 10\text{mA}, V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100\mu\text{A}, V_{DS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 16\text{V}, V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	10	$\mu\text{A}$	$V_{DS} = 60\text{V}, V_{GS} = 0$
Gate to source 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	$R_{DS(on)}$	—	0.010	0.013	$\Omega$	$I_D = 20\text{A}, V_{GS} = 10\text{V}^{\text{Note4}}$
	$R_{DS(on)}$	—	0.015	0.025	$\Omega$	$I_D = 20\text{A}, V_{GS} = 4\text{V}^{\text{Note4}}$
Forward transfer admittance	$ y_{fs} $	24	40	—	S	$I_D = 20\text{A}, V_{DS} = 10\text{V}^{\text{Note4}}$
Input capacitance	$C_{iss}$	—	2200	—	pF	$V_{DS} = 10\text{V}$
Output capacitance	$C_{oss}$	—	1050	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	320	—	pF	$f = 1\text{MHz}$
Turn-on delay time	$t_{d(on)}$	—	25	—	ns	$I_D = 20\text{A}, V_{GS} = 10\text{V}$
Rise time	$t_r$	—	200	—	ns	$R_L = 1.5\Omega$
Turn-off delay time	$t_{d(off)}$	—	320	—	ns	
Fall time	$t_f$	—	240	—	ns	
Body-drain diode forward voltage	$V_{DF}$	—	0.95	—	V	$I_F = 45\text{A}, V_{GS} = 0$
Body-drain diode reverse recovery time	$t_{rr}$	—	60	—	ns	$I_F = 45\text{A}, V_{GS} = 0$ $di_F/dt = 50\text{A}/\mu\text{s}$

Note: 4. Pulse test

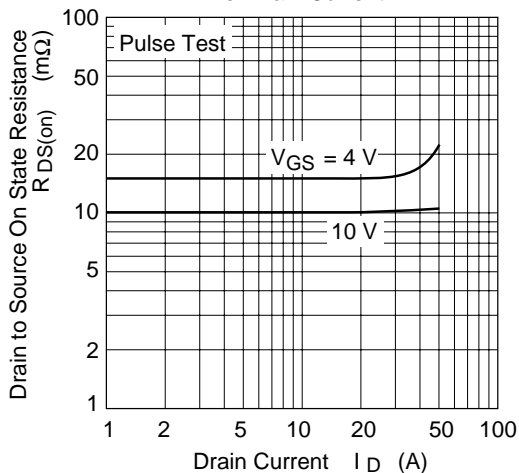
Main Characteristics



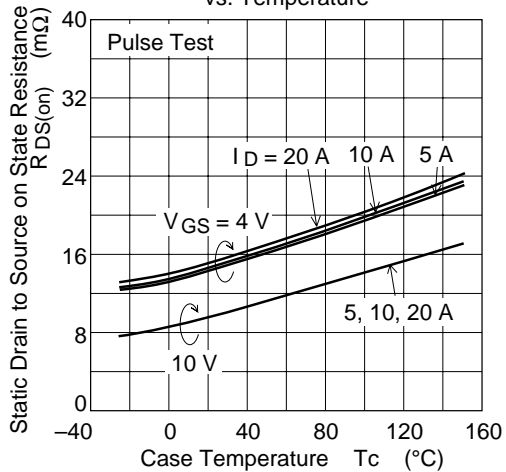
Drain to Source Saturation Voltage vs. Gate to Source Voltage



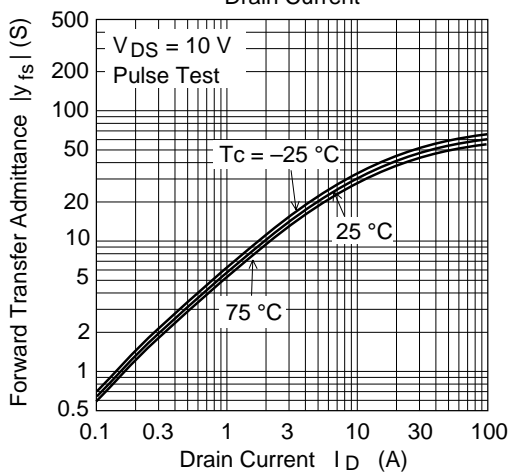
Static Drain to Source on State Resistance vs. Drain Current



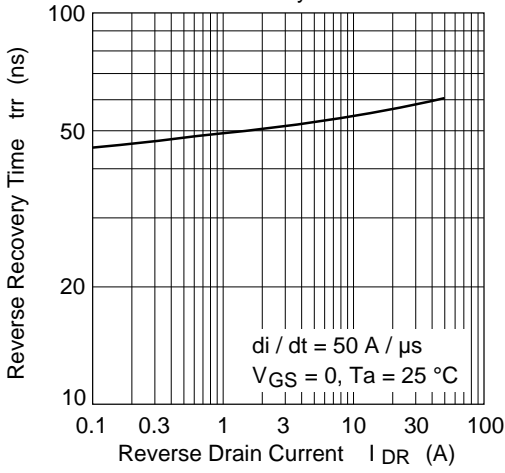
Static Drain to Source on State Resistance vs. Temperature



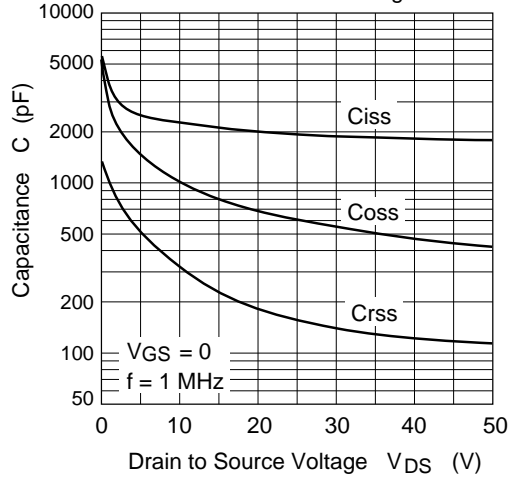
Forward Transfer Admittance vs. Drain Current



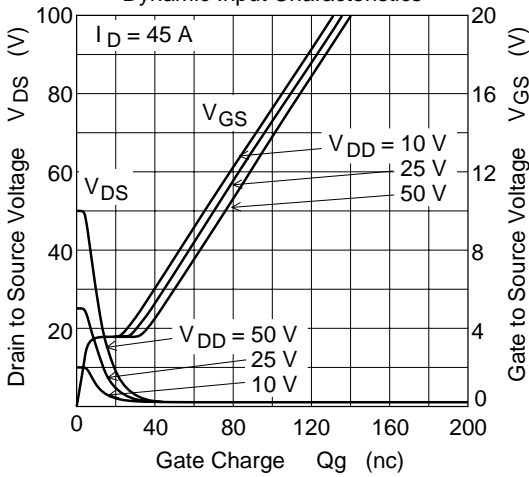
Body-Drain Diode Reverse Recovery Time



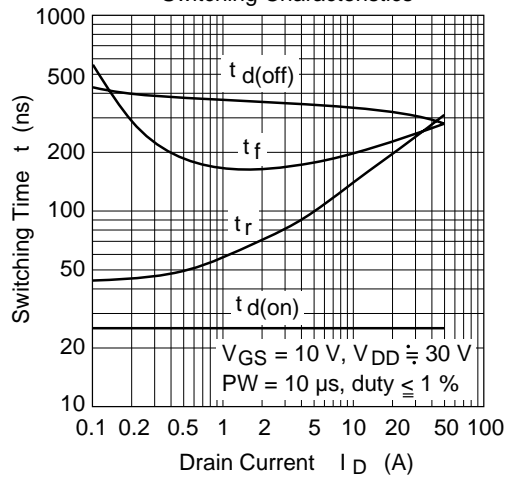
Typical Capacitance vs. Drain to Source Voltage



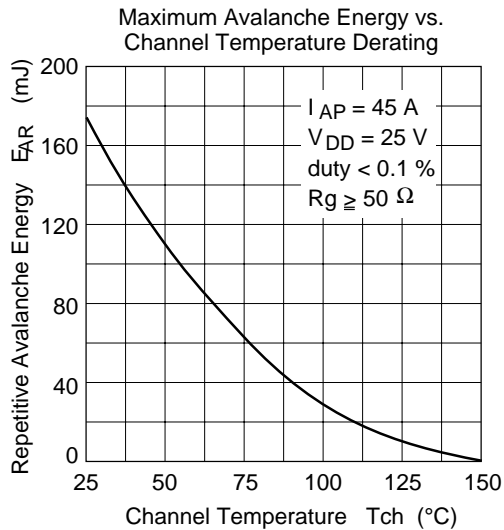
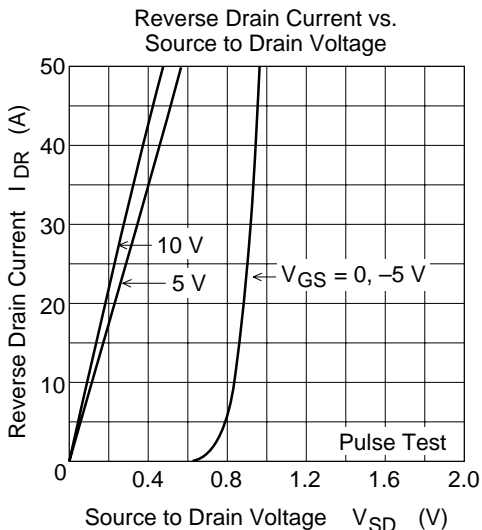
Dynamic Input Characteristics



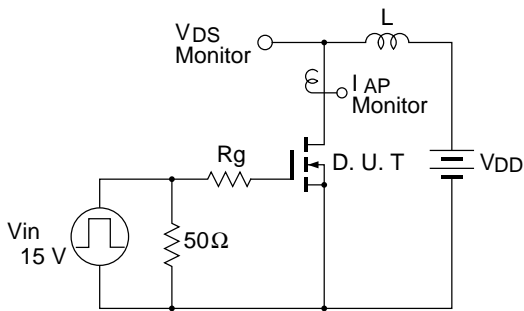
Switching Characteristics





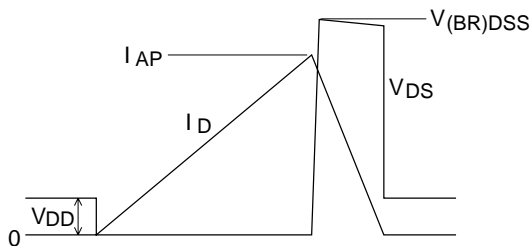


Avalanche Test Circuit

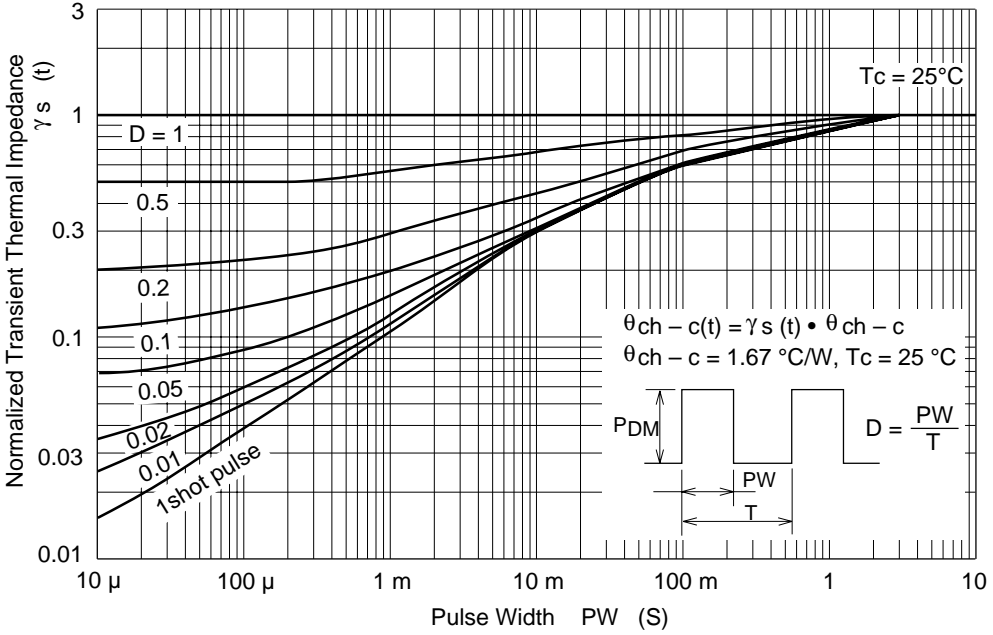


Avalanche Waveform

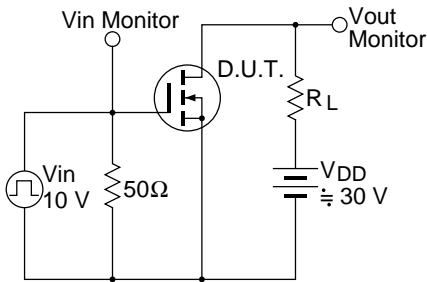
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



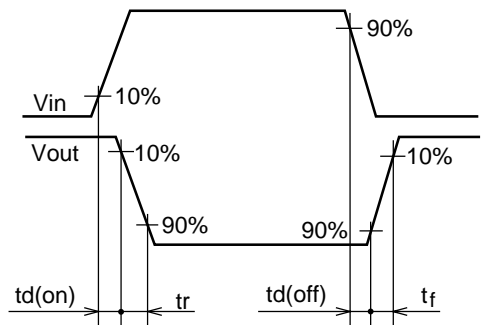
Normalized Transient Thermal Impedance vs. Pulse Width



Switching Time Test Circuit



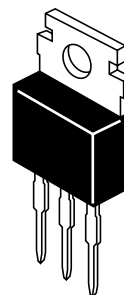
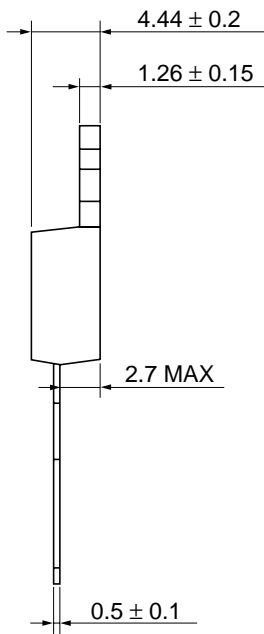
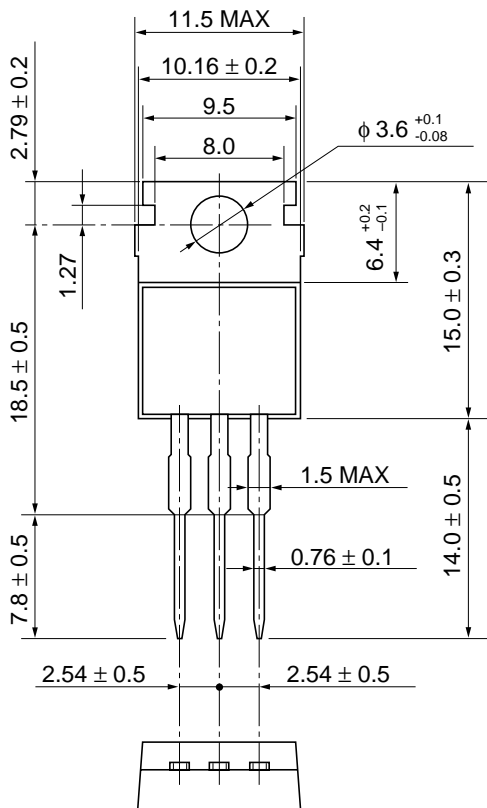
Waveform



Package Dimensions

As of January, 2001

Unit: mm



Hitachi Code	TO-220AB
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	1.8 g

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