

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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# 6AM15

## Silicon N/P Channel MOS FET High Speed Power Switching

# RENESAS

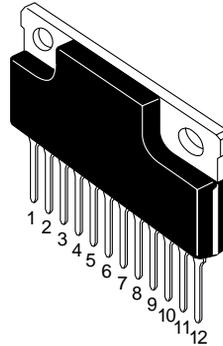
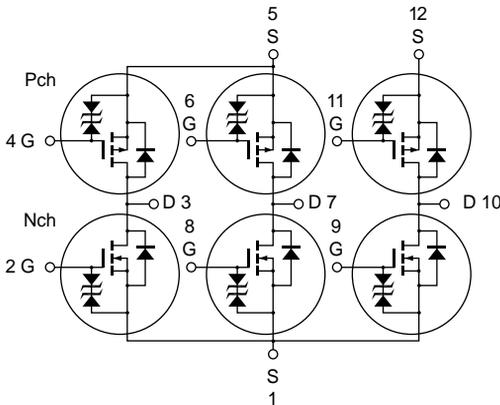
ADE-208-719 (Z)  
1st. Edition  
Feb. 1999

### Features

- Low on-resistance  
N Channel :  $R_{DS(on)} = 0.045 \Omega$  typ.  
P Channel :  $R_{DS(on)} = 0.085 \Omega$  typ.
- High speed switching
- 4 V gate drive device can be driven from 5 V source
- High density mounting

### Outline

SP-12TA



1. Nch Source
- 2, 8, Nch Gate
- 3, 7, 10 Nch Drain  
Pch Drain
- 4, 6, 11 Pch Gate
- 5, 12. Pch Source

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

Item	Symbol	Ratings		Unit
		Nch	Pch	
Drain to source voltage	$V_{DSS}$	60	-60	V
Gate to source voltage	$V_{GSS}$	±20	±20	V
Drain current	$I_D$	10	-10	A
Drain peak current	$I_{D(pulse)}$ <sup>Note1</sup>	40	-40	A
Body-drain diode reverse drain current	$I_{DR}$	10	-10	A
Avalanche current	$I_{AP}$ <sup>Note3</sup>	10	-10	A
Avalanche energy	$E_{AR}$ <sup>Note3</sup>		8.5	mJ
Channel dissipation	$Pch$ (Tc = 25°C) <sup>Note2</sup>		42	W
Channel dissipation	$Pch$ <sup>Note2</sup>		4.8	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. 6 Devices operation  
3. Value at Ta = 25°C, Rg  $\geq 50$

## Electrical Characteristics (N Channel) (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	$V_{DS} = 10 \text{ V}$ , $I_D = 1 \text{ mA}$
Static drain to source on state resistance	$R_{DS(on)}$	—	0.045	0.060	$\Omega$	$I_D = 5 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note5</sup>
	$R_{DS(on)}$	—	0.070	0.115	$\Omega$	$I_D = 5 \text{ A}$ , $V_{GS} = 4 \text{ V}$ <sup>Note5</sup>
Forward transfer admittance	$ y_{fs} $	5.5	9	—	S	$I_D = 5 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Note5</sup>
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	$V_{GS} = 10 \text{ V}$ , $I_D = 5 \text{ A}$
Rise time	$t_r$	—	50	—	ns	$R_L = 6 \Omega$
Turn-off delay time	$t_{d(off)}$	—	90	—	ns	
Fall time	$t_f$	—	100	—	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	$t_{rr}$	—	52	—	ns	$I_F = 10 \text{ A}$ , $V_{GS} = 0$ $di_F/dt = 50\text{A}/\mu\text{s}$

Note: 5. Pulse test

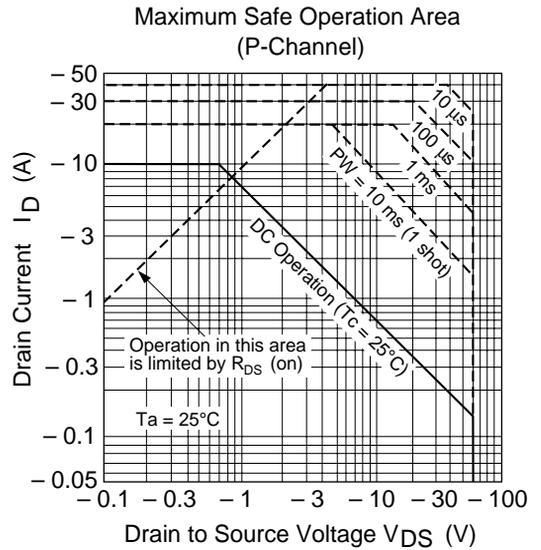
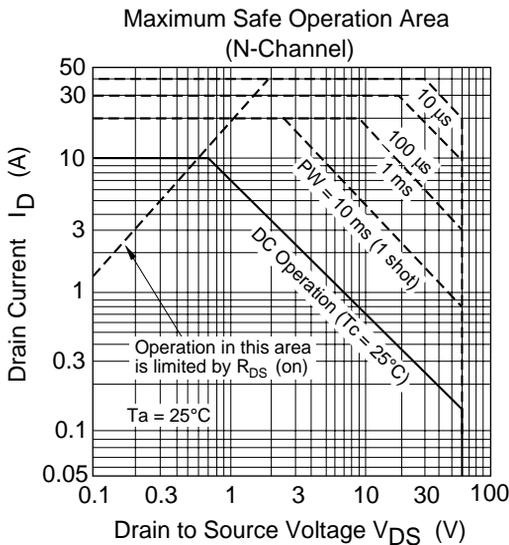
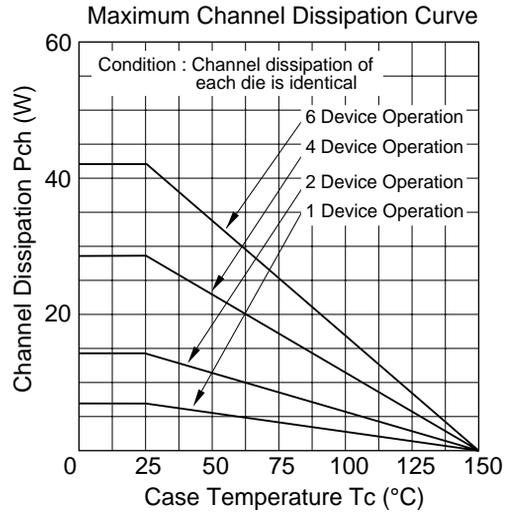
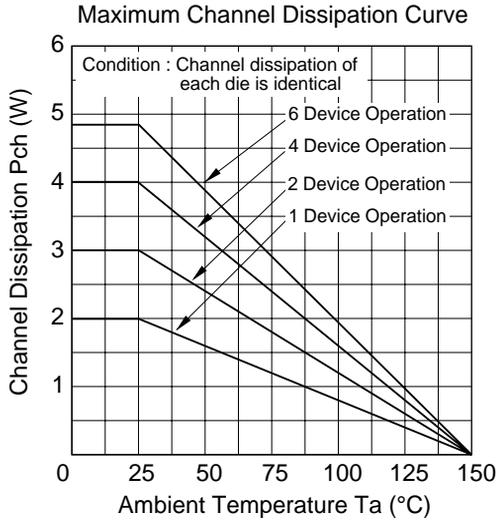
# 6AM15

## Electrical Characteristics (P Channel) (Ta = 25°C)

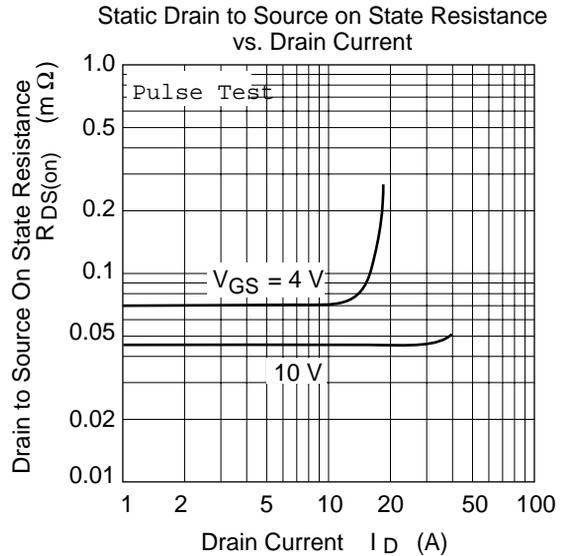
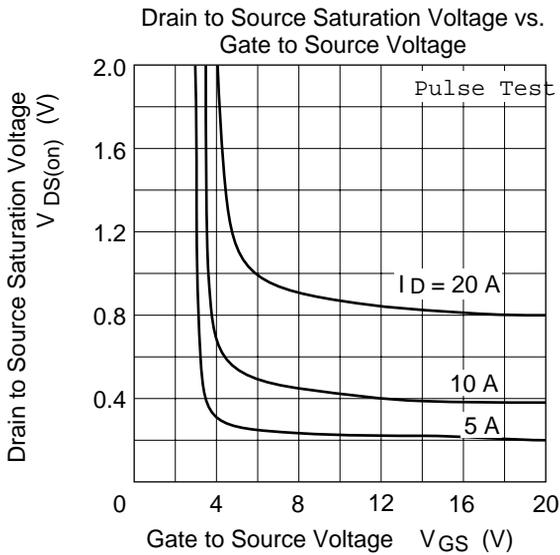
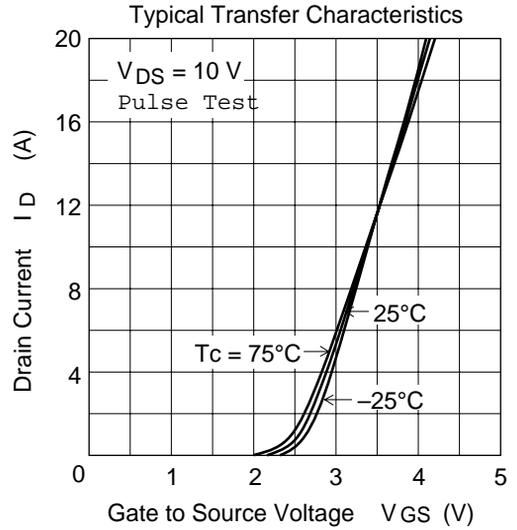
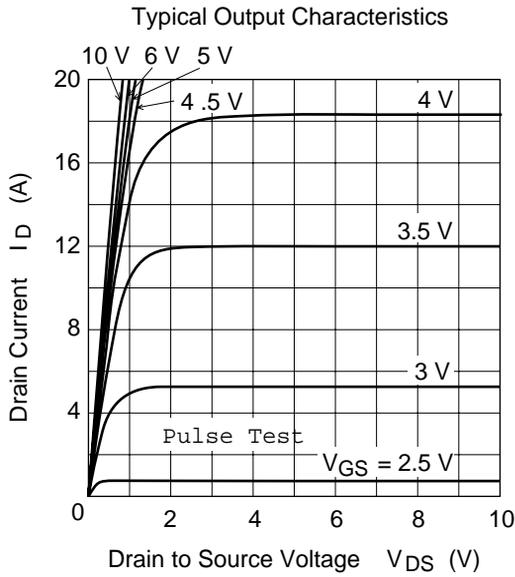
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	-60	—	—	V	$I_D = -10 \text{ mA}$ , $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100 \mu\text{A}$ , $V_{DS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	-10	$\mu\text{A}$	$V_{DS} = -60 \text{ V}$ , $V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	-1.0	—	-2.0	V	$V_{DS} = -10 \text{ V}$ , $I_D = -1 \text{ mA}$
Static drain to source on state resistance	$R_{DS(on)}$	—	0.085	0.105	$\Omega$	$I_D = -5 \text{ A}$ , $V_{GS} = -10 \text{ V}$ <sup>Note5</sup>
	$R_{DS(on)}$	—	0.115	0.165	$\Omega$	$I_D = -5 \text{ A}$ , $V_{GS} = -4 \text{ V}$ <sup>Note5</sup>
Forward transfer admittance	$ y_{fs} $	5.5	9	—	S	$I_D = -5 \text{ A}$ , $V_{DS} = -10 \text{ V}$ <sup>Note5</sup>
Input capacitance	$C_{iss}$	—	850	—	pF	$V_{DS} = -10 \text{ V}$
Output capacitance	$C_{oss}$	—	420	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	110	—	pF	$f = 1 \text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	12	—	ns	$V_{GS} = -10 \text{ V}$ , $I_D = -5 \text{ A}$
Rise time	$t_r$	—	55	—	ns	$R_L = 6 \Omega$
Turn-off delay time	$t_{d(off)}$	—	130	—	ns	
Fall time	$t_f$	—	70	—	ns	
Body-drain diode forward voltage	$V_{DF}$	—	-0.95	—	V	$I_F = -10 \text{ A}$ , $V_{GS} = 0$
Body-drain diode reverse recovery time	$t_{rr}$	—	65	—	ns	$I_F = -10 \text{ A}$ , $V_{GS} = 0$ $diF/dt = 50 \text{ A}/\mu\text{s}$

Note: 5. Pulse test

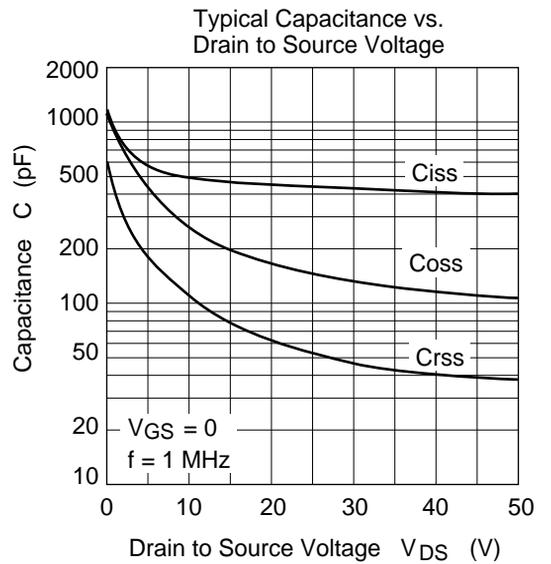
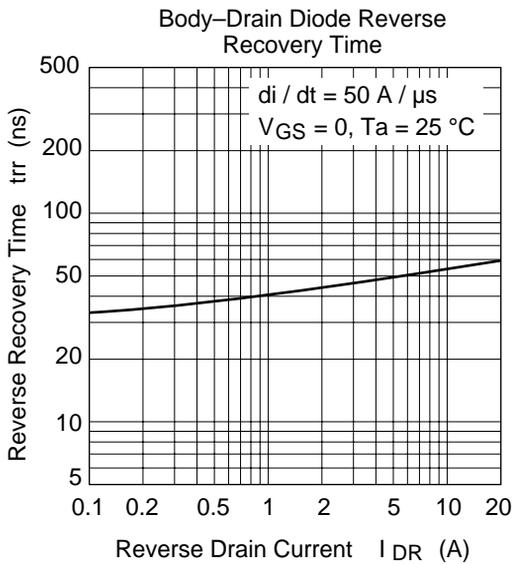
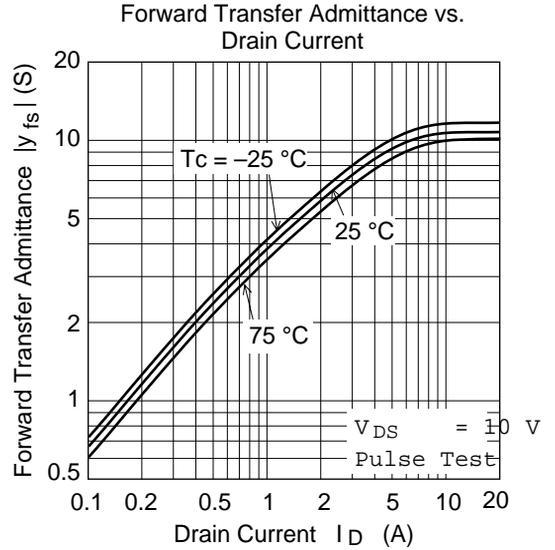
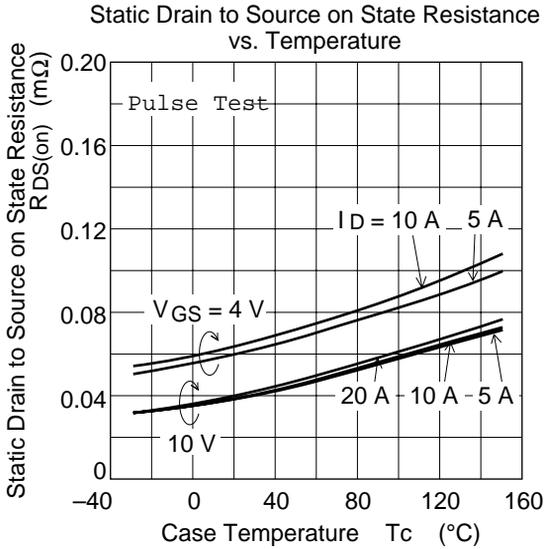
Main Characteristics



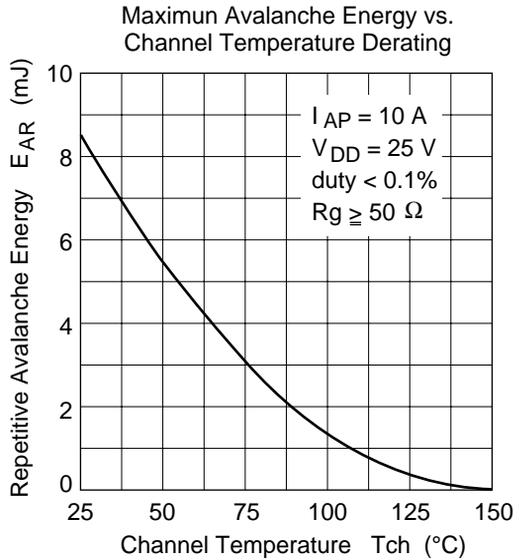
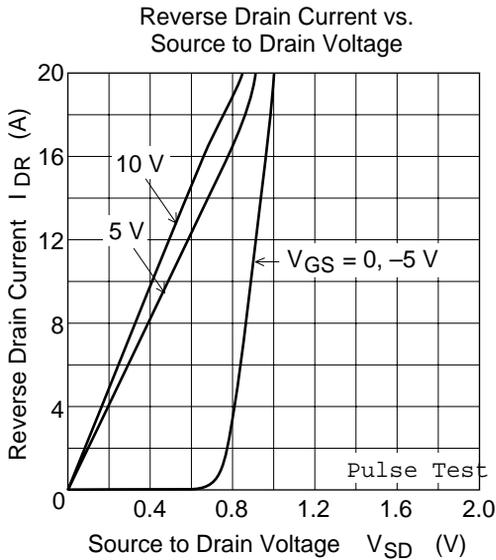
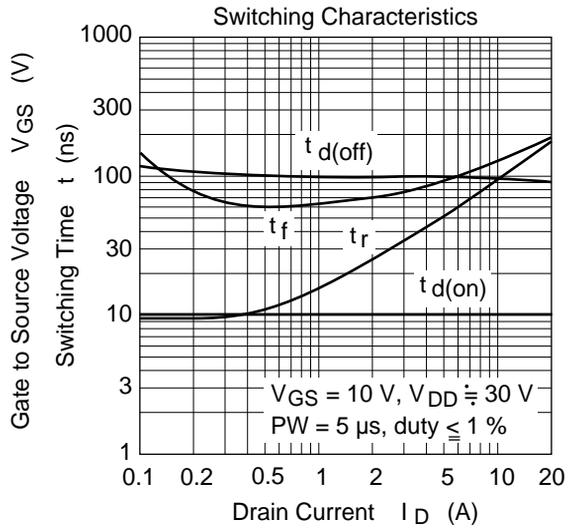
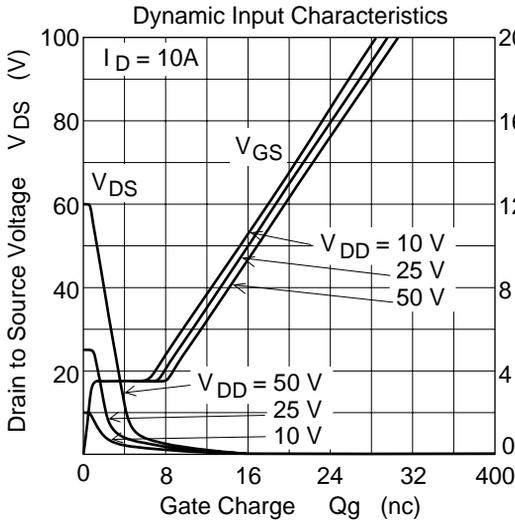
Main Characteristics ( N Channel )



Main Characteristics ( N Channel )

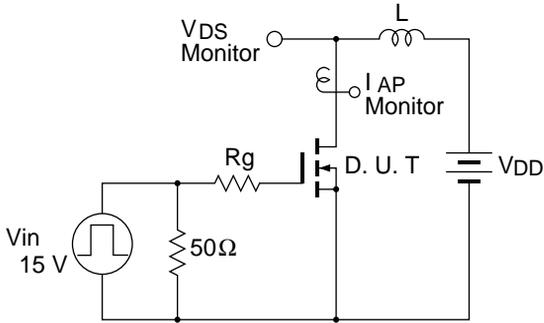


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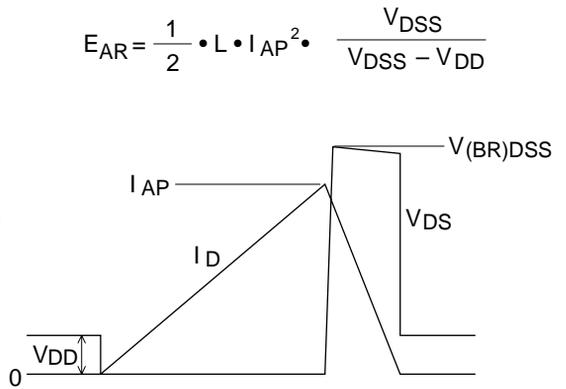


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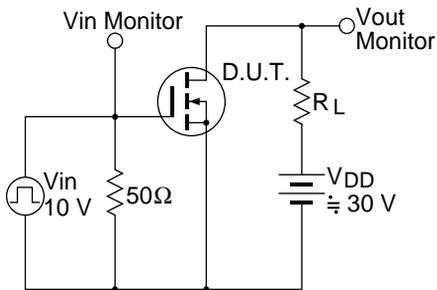
Avalanche Test Circuit



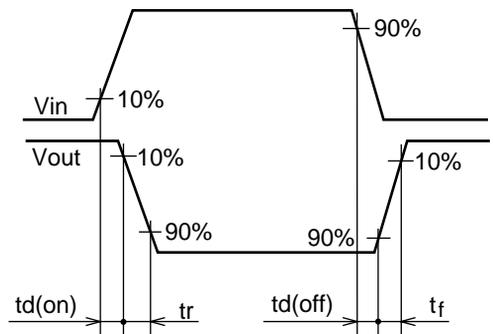
Avalanche Waveform



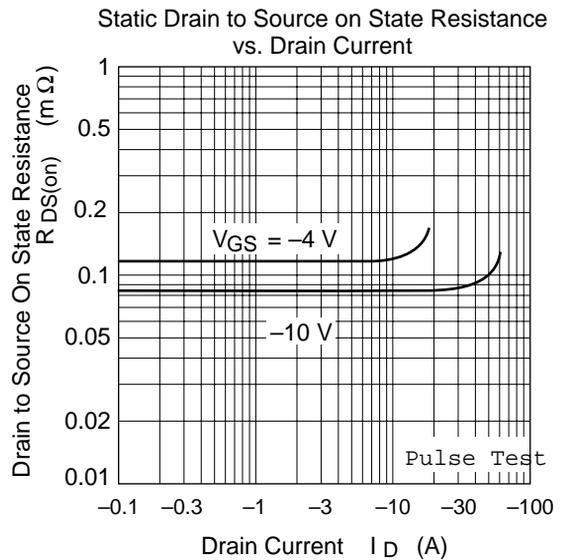
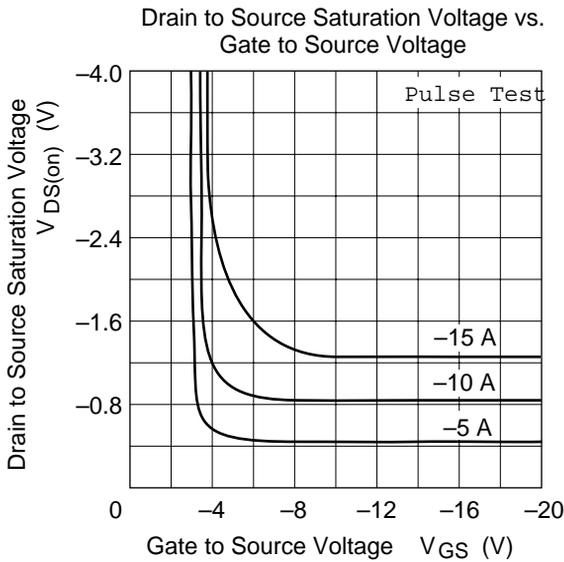
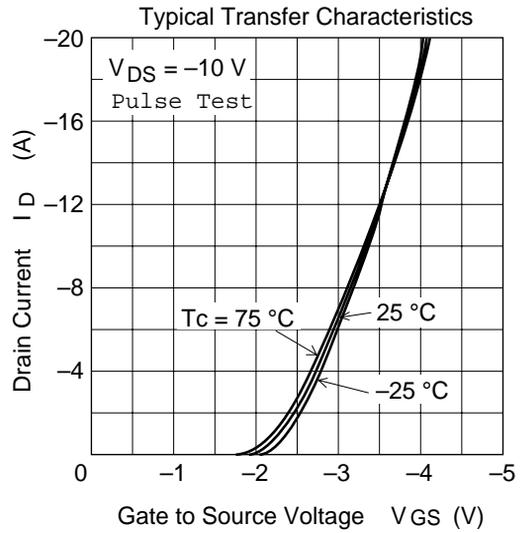
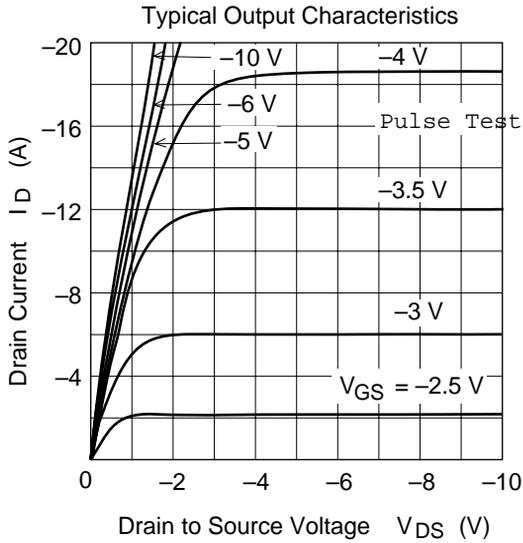
Switching Time Test Circuit



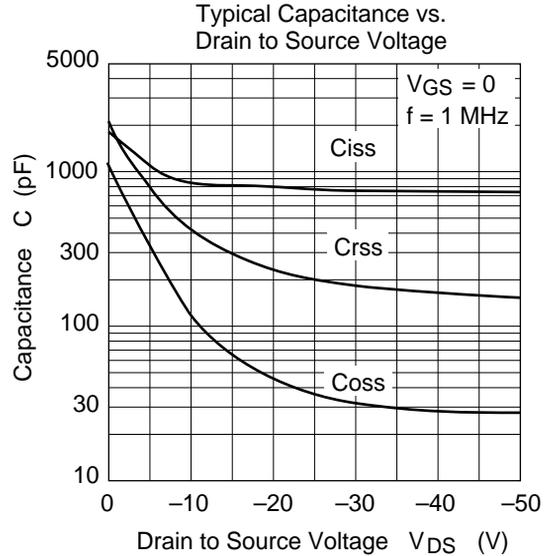
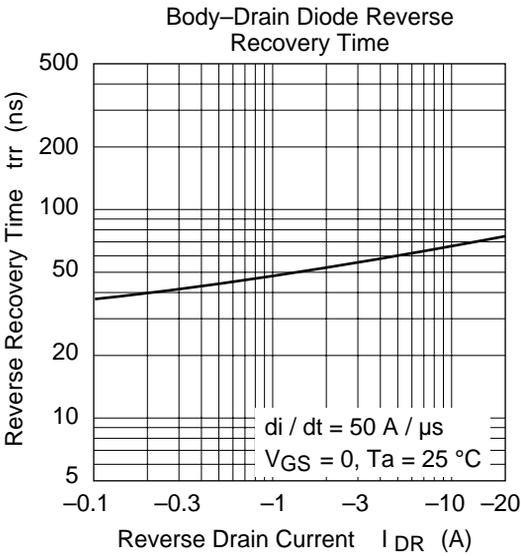
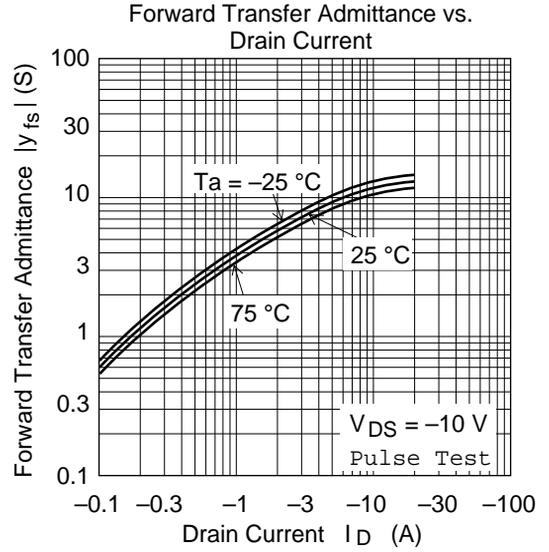
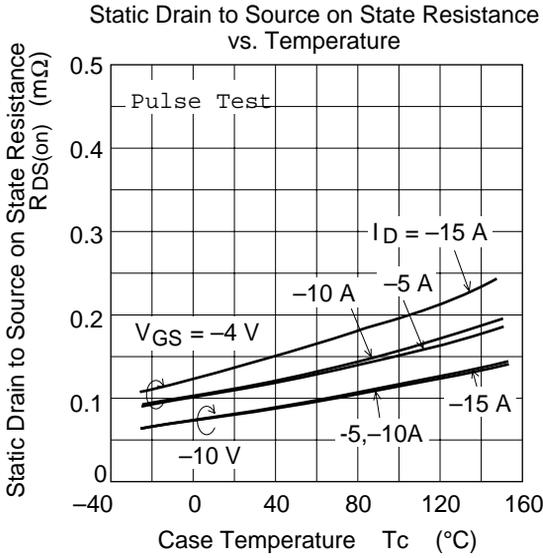
Waveform



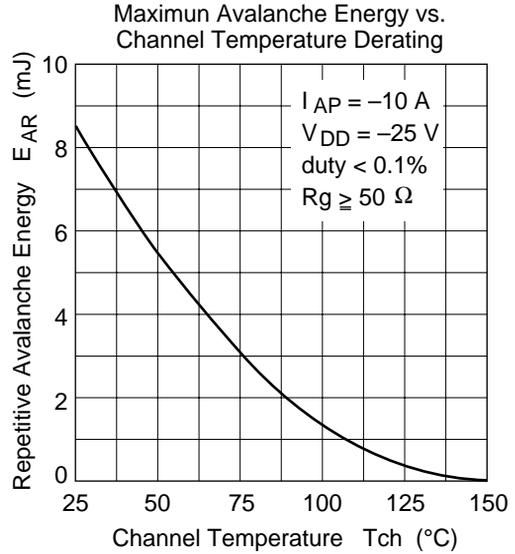
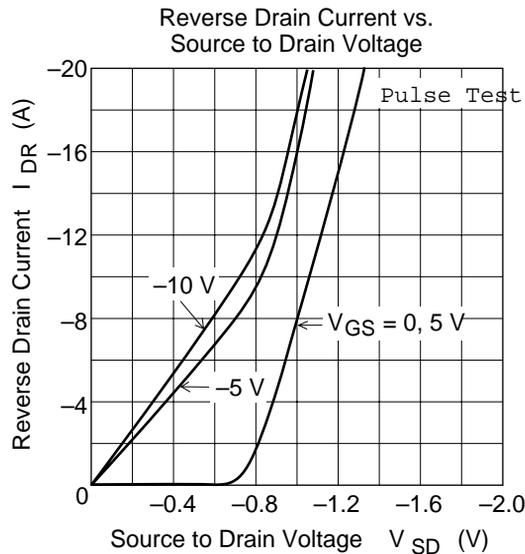
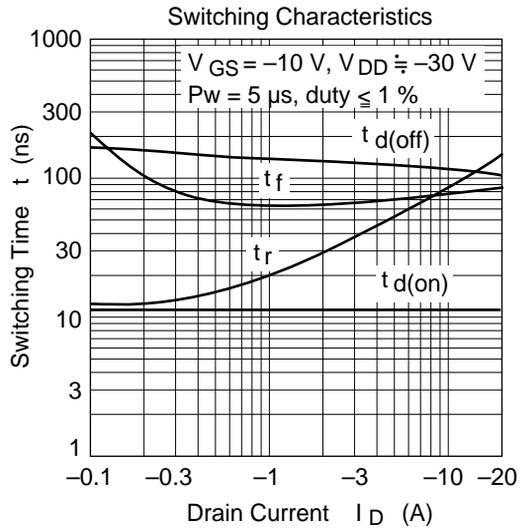
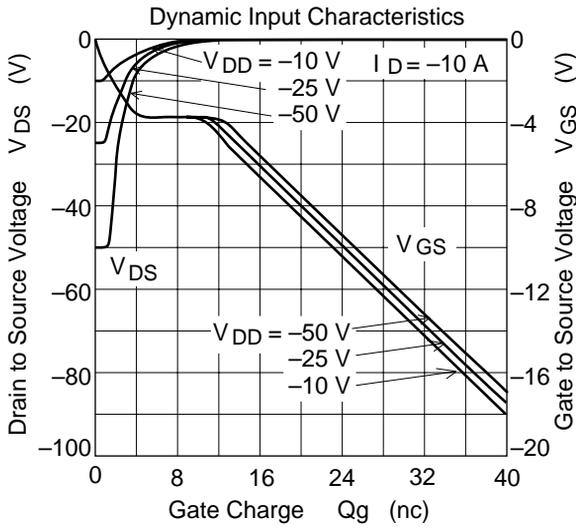
Main Characteristics ( P Channel )



Main Characteristics ( P Channel )

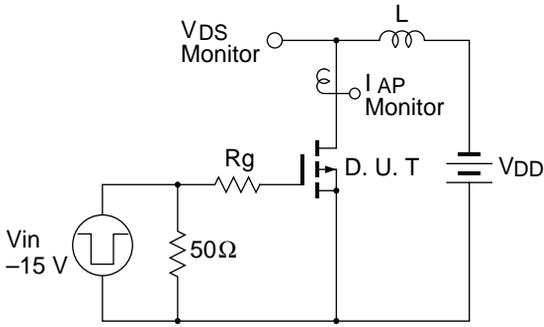


Main Characteristics ( P Channel )

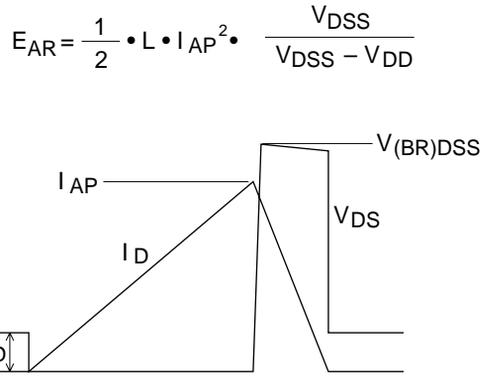


Main Characteristics ( P Channel )

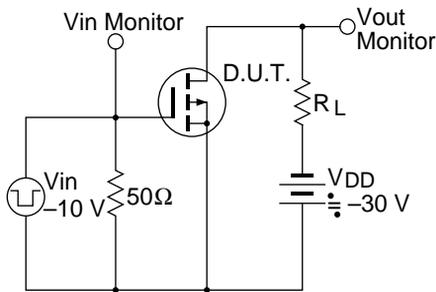
Avalanche Test Circuit



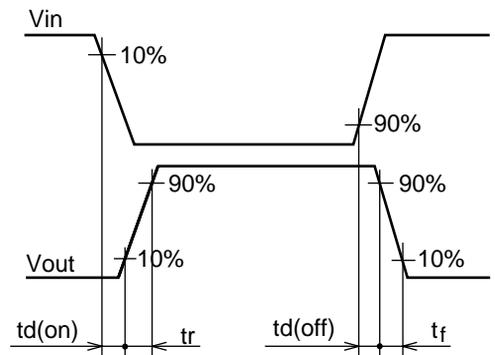
Avalanche Waveform



Switching Time Test Circuit



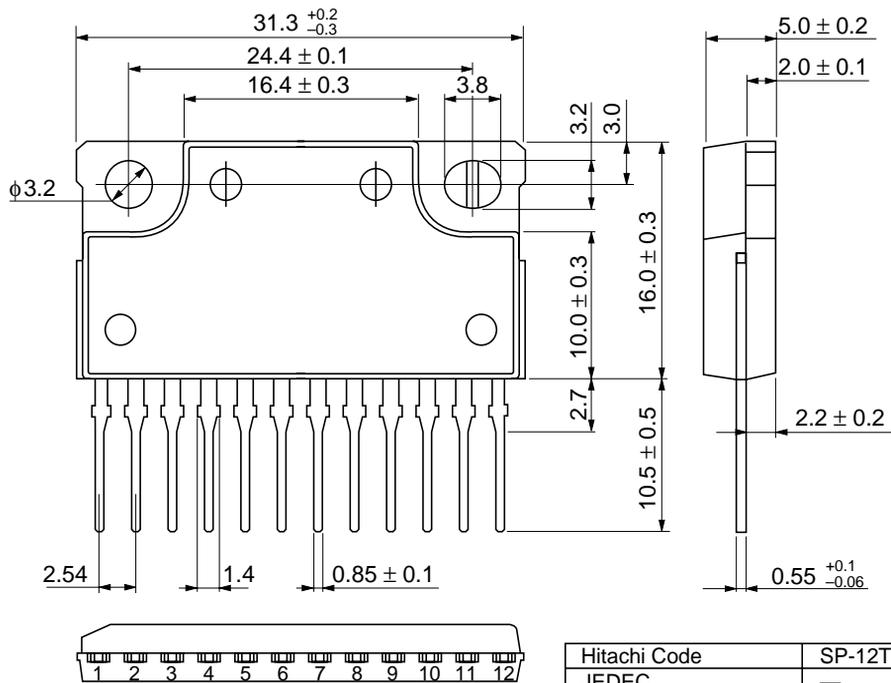
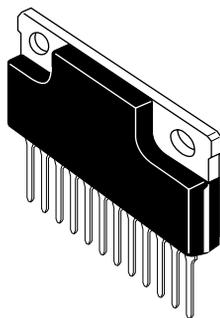
Waveform



## Package Dimensions

As of January, 2001

Unit: mm



Hitachi Code	SP-12TA
JEDEC	—
EIAJ	—
Mass (reference value)	6.1 g

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