

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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# HAT2058R/HAT2058RJ

Silicon N Channel Power MOS FET  
High Speed Power Switching

**RENESAS**

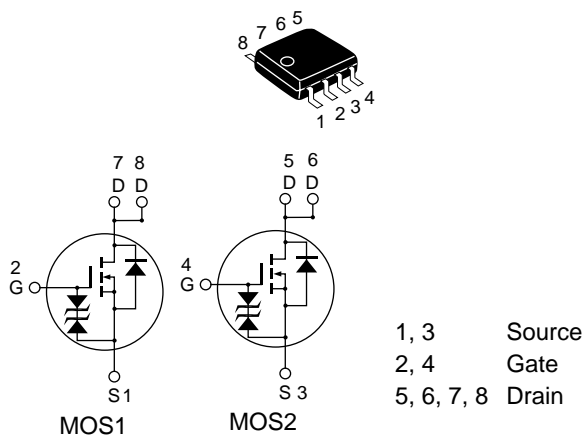
ADE-208-934 (Z)  
1st. Edition  
Mar. 2001

## Features

- Low on-resistance
- Capable of 4 V gate drive
- Low drive current
- High density mounting
- “J” is for Automotive application  
High temperature D-S leakage guarantee  
Avalanche rating

## Outline

SOP-8



# HAT2058R/HAT2058RJ

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

Item	Symbol	Ratings		Unit
		HAT2058R	HAT2058RJ	
Drain to source voltage	$V_{DSS}$	100	100	V
Gate to source voltage	$V_{GSS}$	±20	±20	V
Drain current	$I_D$	4	4	A
Drain peak current	$I_D$ (pulse) <sup>Note1</sup>	32	32	A
Body-drain diode reverse drain current	$I_{DR}$	4	4	A
Avalanche current	$I_{AP}$ <sup>Note4</sup>	—	4	A
Avalanche energy	$E_{AR}$ <sup>Note4</sup>	—	1.6	mJ
Channel dissipation	$P_{ch}$ <sup>Note2</sup>	2	2	W
	$P_{ch}$ <sup>Note3</sup>	3	3	W
Channel temperature	Tch	150	150	°C
Storage temperature	Tstg	−55 to +150	−55 to +150	°C

Notes: 1.  $PW \leq 10 \mu s$ , duty cycle  $\leq 1\%$

2. 1 Drive operation; When using the glass epoxy board (FR4 40 x 40 x 1.6 mm),  $PW \leq 10 s$

3. 2 Drive operation; When using the glass epoxy board (FR4 40 x 40 x 1.6 mm),  $PW \leq 10 s$

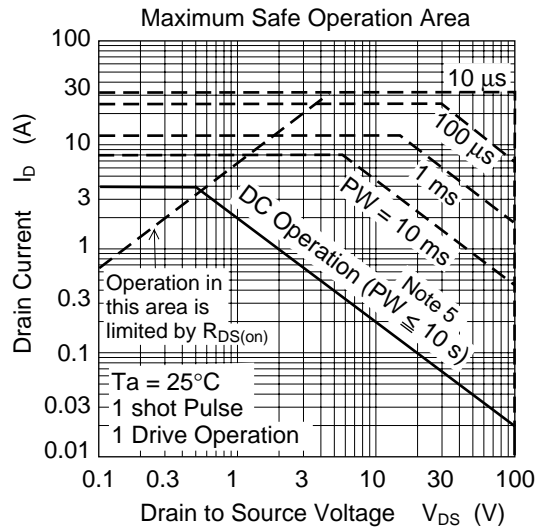
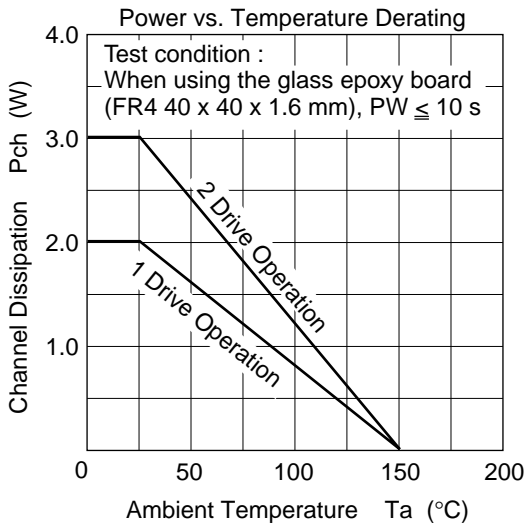
4. Value at Tch = 25°C,  $R_g \geq 50 \Omega$

## Electrical Characteristics (Ta = 25°C)

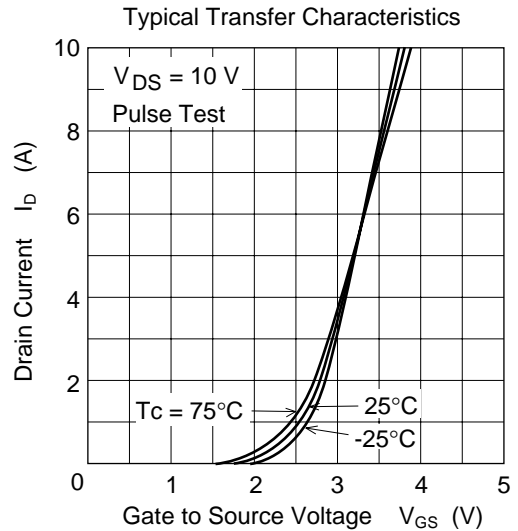
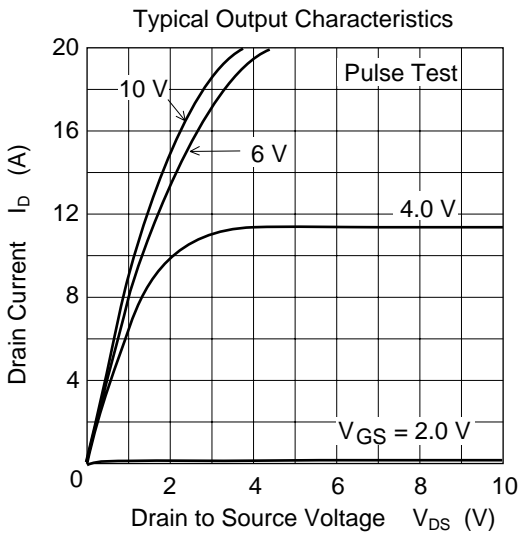
Item	Symbol	Min	Typ	Max	Unit	Test conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	100	—	—	V	$I_D = 10 \text{ mA}$ , $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100 \text{ }\mu\text{A}$ , $V_{DS} = 0$
Zero gate voltage drain current	HAT2058R $I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 100 \text{ V}$ , $V_{GS} = 0$
	HAT2058RJ $I_{DSS}$	—	—	0.1	$\mu\text{A}$	
Zero gate voltage drain current	HAT2058R $I_{DSS}$	—	—	—	$\mu\text{A}$	$V_{DS} = 80 \text{ V}$ , $V_{GS} = 0$
	HAT2058RJ $I_{DSS}$	—	—	10	$\mu\text{A}$	$T_a = 125^\circ\text{C}$
Gate to source cutoff voltage	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$
Static drain to source on state resistance	$V_{GS(off)}$	1.0	—	2.5	V	$V_{DS} = 10 \text{ V}$ , $I_D = 1 \text{ mA}$
Forward transfer admittance	$ y_{fs} $	3	5	—	S	$I_D = 2 \text{ A}^{*1}$ , $V_{DS} = 10 \text{ V}$
Static drain to source on state resistance	$R_{DS(on)}$	—	120	145	$\text{m}\Omega$	$I_D = 2 \text{ A}^{*1}$ , $V_{GS} = 10 \text{ V}$
	$R_{DS(on)}$	—	150	180	$\text{m}\Omega$	$I_D = 2 \text{ A}^{*1}$ , $V_{GS} = 4 \text{ V}$
Input capacitance	$C_{iss}$	—	420	—	pF	$V_{DS} = 10 \text{ V}$ , $V_{GS} = 0$
Output capacitance	$C_{oss}$	—	180	—	pF	$f = 1 \text{ MHz}$
Reverse transfer capacitance	$C_{rss}$	—	100	—	pF	
Turn-on delay time	$t_{d(on)}$	—	10	—	ns	$V_{GS} = 10 \text{ V}$ , $I_D = 2 \text{ A}$
Rise time	$t_r$	—	30	—	ns	$V_{DD} \cong 30 \text{ V}$
Turn-off delay time	$t_{d(off)}$	—	110	—	ns	
Fall time	$t_f$	—	60	—	ns	
Body-drain diode forward voltage	$V_{DF}$	—	0.85	1.1	V	$I_F = 4 \text{ A}$ , $V_{GS} = 0^{*1}$
Body-drain diode reverse recovery time	$t_{rr}$	—	75	—	ns	$I_F = 4 \text{ A}$ , $V_{GS} = 0$ $diF/dt = 50 \text{ A}/\mu\text{s}$

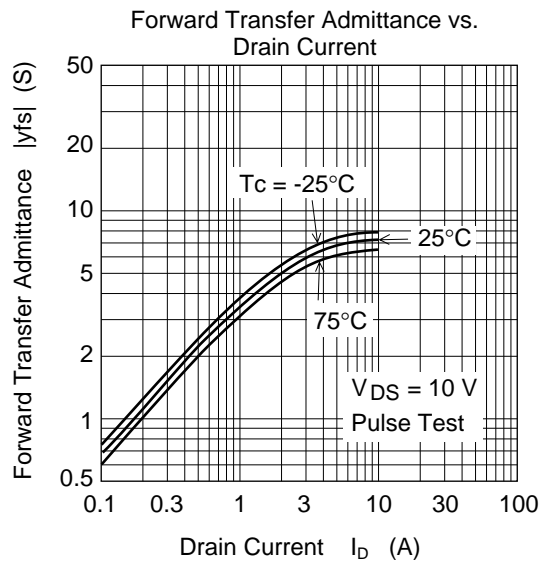
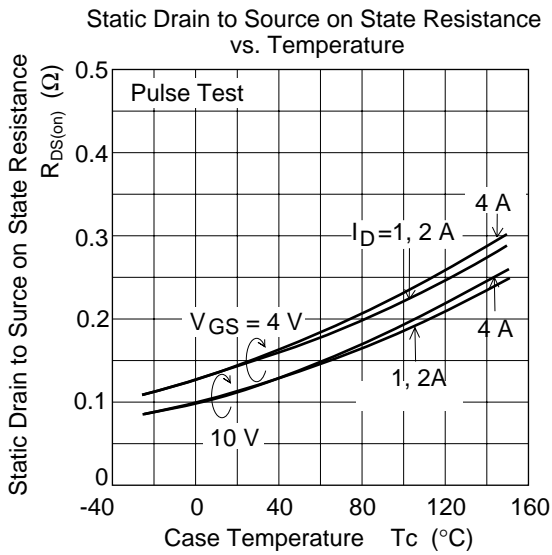
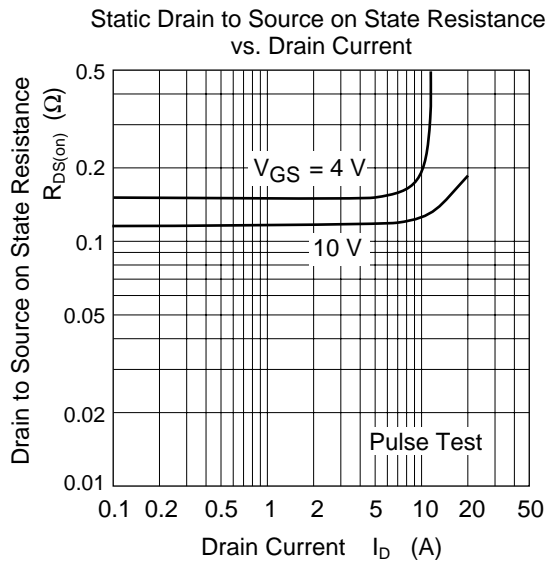
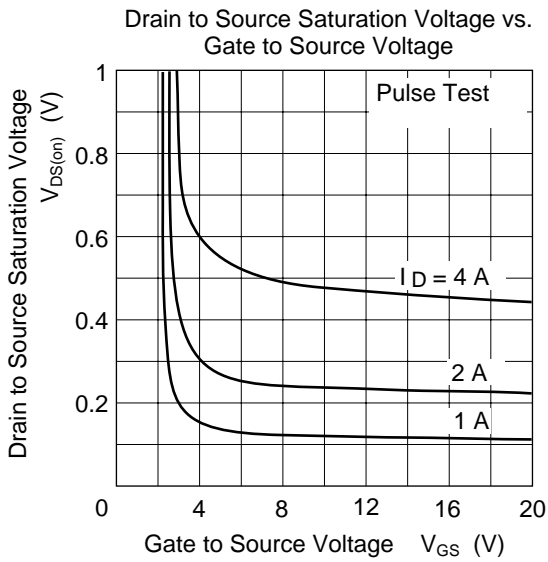
Note: 1. Pulse test

## Main Characteristics

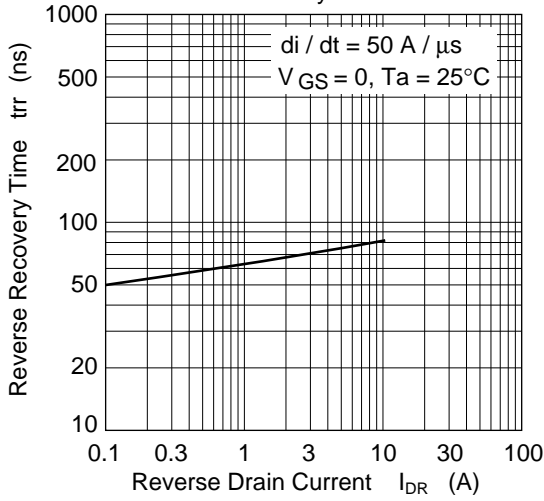


Note 6:  
When using the glass epoxy board  
(FR4 40 x 40 x 1.6 mm)

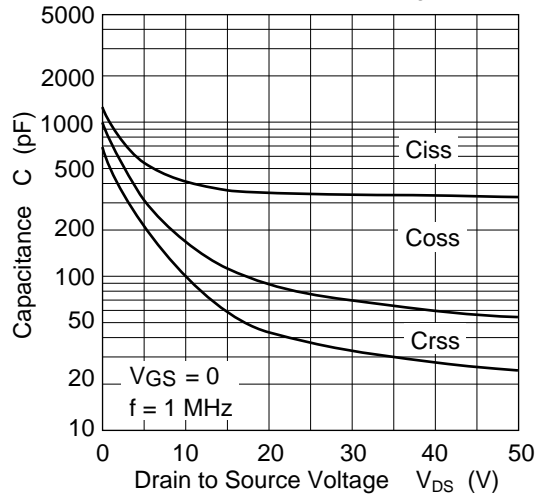




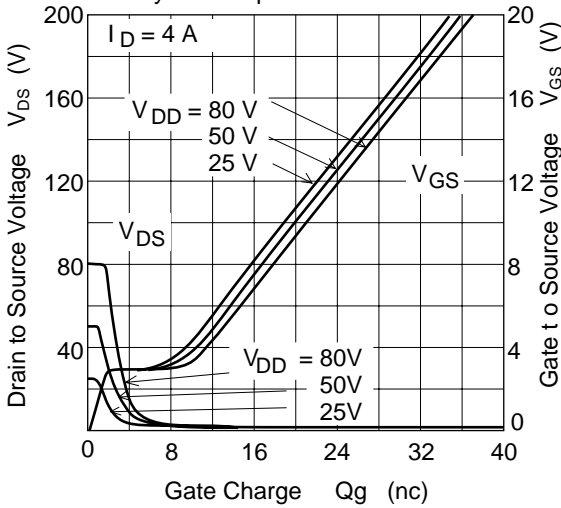
Body-Drain Diode Reverse Recovery Time



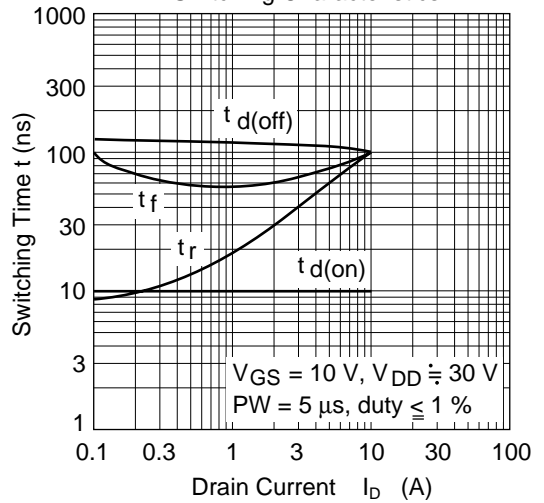
Typical Capacitance vs. Drain to Source Voltage



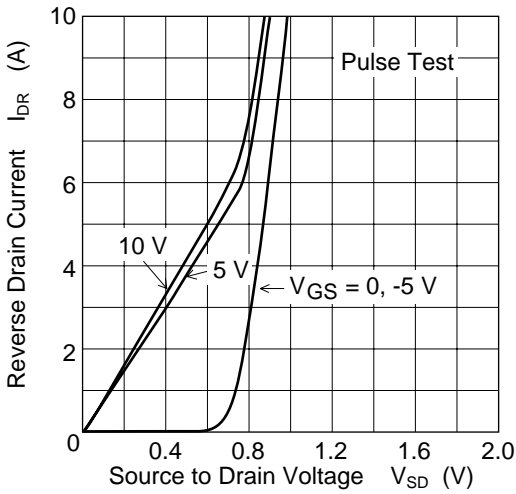
Dynamic Input Characteristics



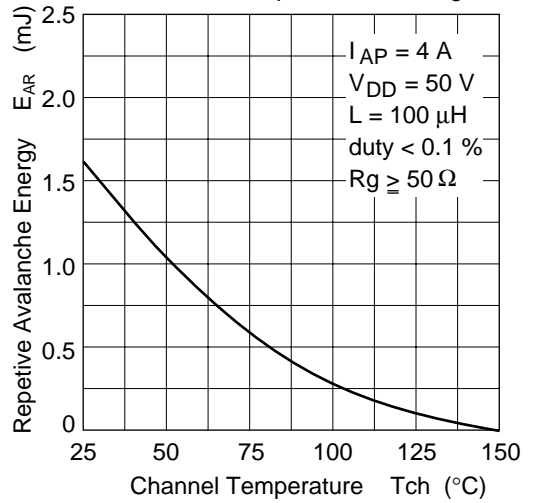
Switching Characteristics



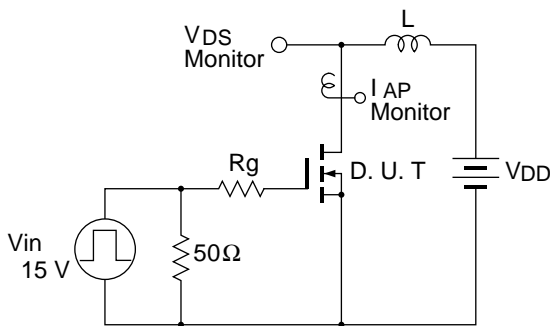
Reverse Drain Current vs. Source to Drain Voltage



Maximum Avalanche Energy vs. Channel Temperature Derating

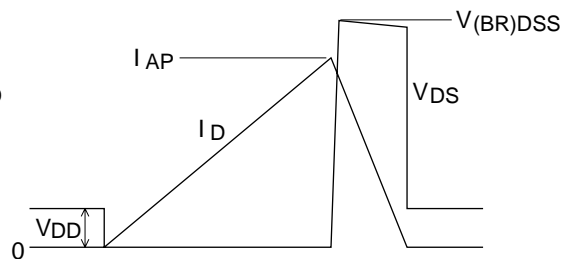


Avalanche Test Circuit

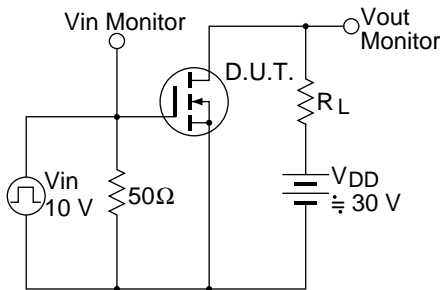


Avalanche Waveform

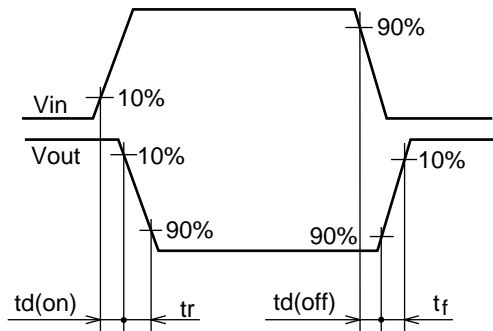
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$

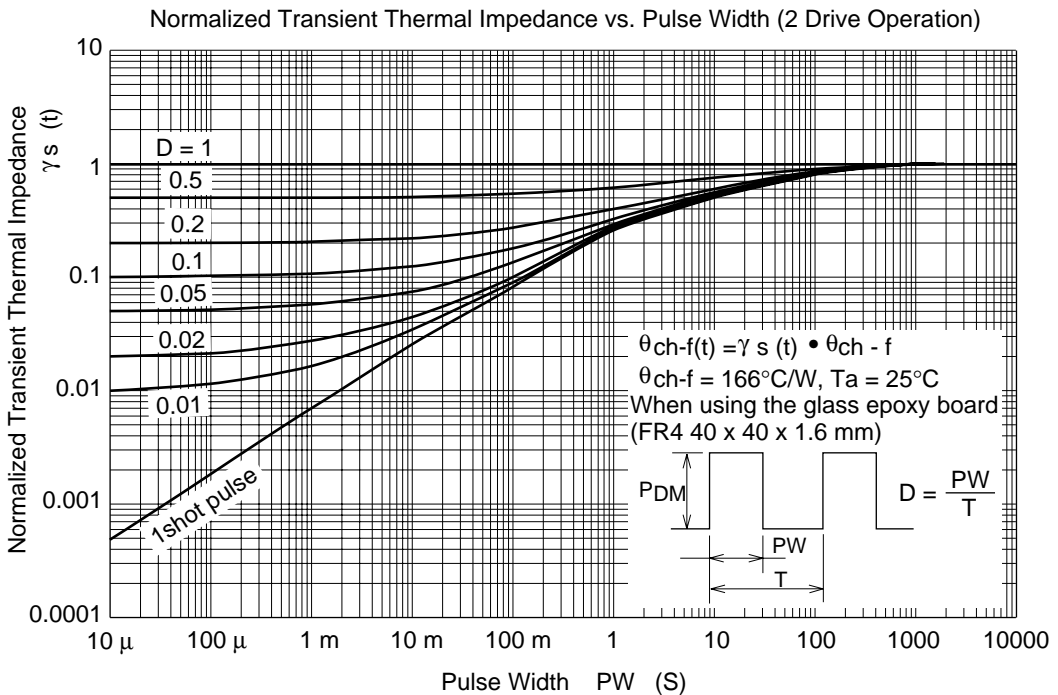
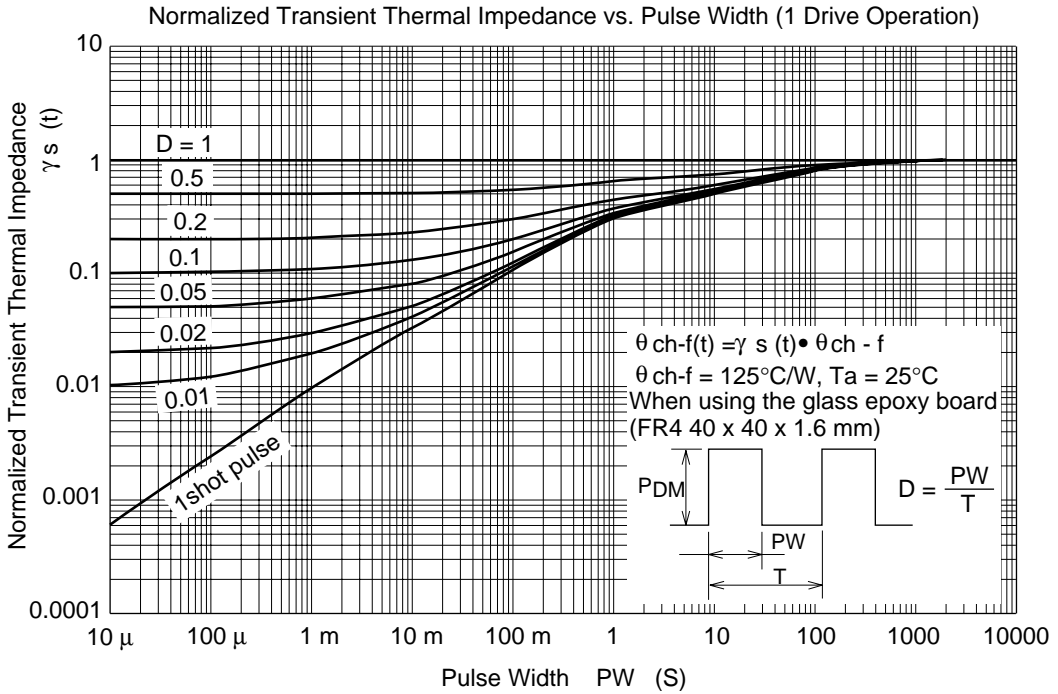


Switching Time Test Circuit



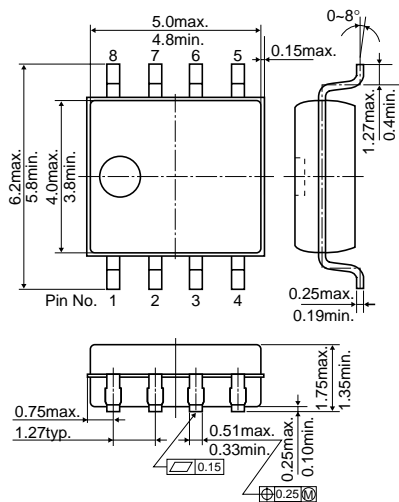
Switching Time Waveform





Package Dimensions

Unit: mm



Hitachi Code	FP-8DA
JEDEC	—
EIAJ	—

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