

To all our customers

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

Cautions

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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HAT1038R/HAT1038RJ

Silicon P Channel Power MOS FET
High Speed Power Switching

RENESAS

ADE-208-663C (Z)

4th. Edition

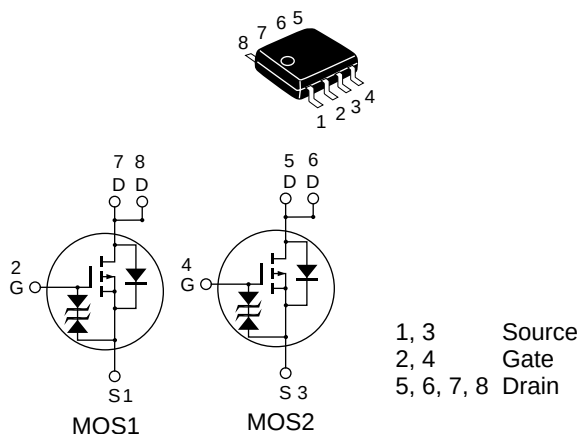
Feb. 1999

Features

- For Automotive Application (at Type Code “J “)
- Low on-resistance
- Capable of 4 V gate drive
- High density mounting

Outline

SOP-8



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	– 3.5	A
Drain peak current	$I_{D(pulse)}$ ^{Note1}	– 28	A
Body-drain diode reverse drain current	I_{DR}	– 3.5	A
Avalanche current	HAT1038R I_{AP} ^{Note4}	—	—
	HAT1038RJ	– 3.5	A
Avalanche energy	HAT1038R E_{AR} ^{Note4}	—	—
	HAT1038RJ	1.05	mJ
Channel dissipation	P_{ch} ^{Note2}	2	W
Channel dissipation	P_{ch} ^{Note3}	3	W
Channel temperature	T_{ch}	150	°C
Storage temperature	T_{stg}	– 55 to + 150	°C

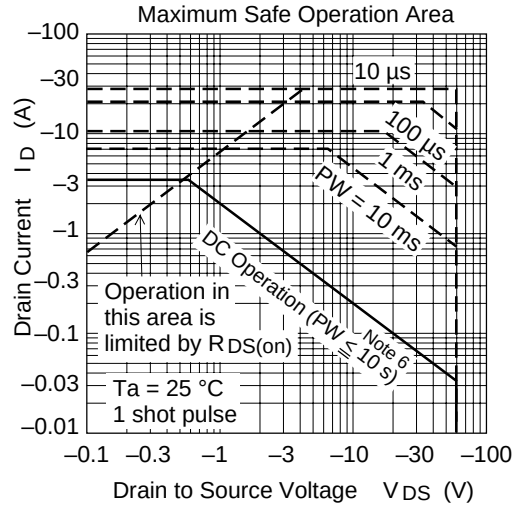
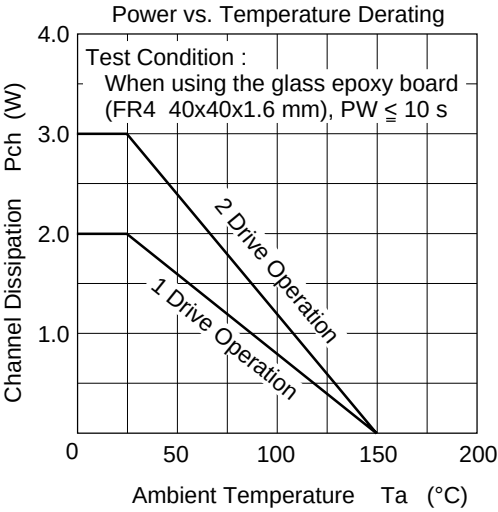
Note: 1. $PW \leq 10 \mu s$, duty cycle $\leq 1 \%$
2. 1 Drive operation : When using the glass epoxy board (FR4 40 x 40 x 1.6 mm), $PW \leq 10 s$
3. 2 Drive operation : When using the glass epoxy board (FR4 40 x 40 x 1.6 mm), $PW \leq 10 s$
4. Value at $T_{ch} = 25^\circ C$, $R_g \geq 50 \Omega$

Electrical Characteristics (Ta = 25°C)

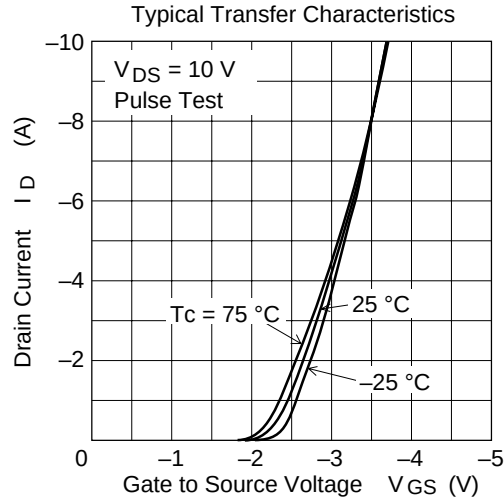
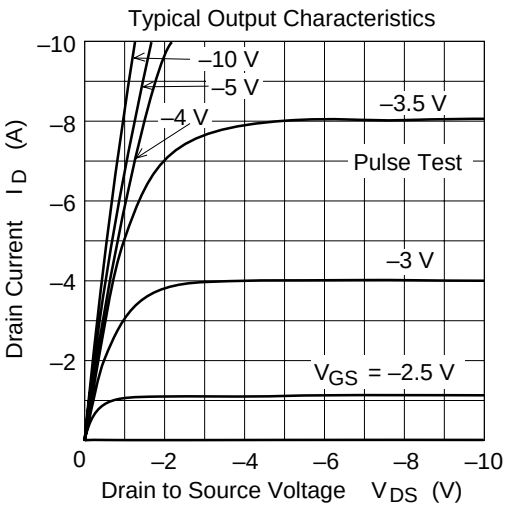
Item		Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage		$V_{(BR)DSS}$	- 60	—	—	V	$I_D = -10 \text{ mA}$, $V_{GS} = 0$
Gate to source breakdown voltage		$V_{(BR)GSS}$	± 20	—	—	V	$I_G = \pm 100 \text{ }\mu\text{A}$, $V_{DS} = 0$
Gate to source leak current		I_{GSS}	—	—	± 10	μA	$V_{GS} = \pm 16 \text{ V}$, $V_{DS} = 0$
Zero gate voltage	HAT1038R	I_{DSS}	—	—	- 1	μA	$V_{DS} = -60 \text{ V}$, $V_{GS} = 0$
drain current	HAT1038RJ	I_{DSS}	—	—	- 0.1	μA	
Zero gate voltage	HAT1038R	I_{DSS}	—	—	—	μA	$V_{DS} = -48 \text{ V}$, $V_{GS} = 0$ Ta=125°C
drain current	HAT1038RJ	I_{DSS}	—	—	-10	μA	
Gate to source cutoff voltage		$V_{GS(off)}$	- 1.2	—	- 2.2	V	$V_{DS} = -10 \text{ V}$, $I_D = -1 \text{ mA}$
Static drain to source on state resistance		$R_{DS(on)}$	—	0.12	0.15	Ω	$I_D = -2 \text{ A}$, $V_{GS} = -10 \text{ V}$ ^{Note5}
		$R_{DS(on)}$	—	0.16	0.23	Ω	$I_D = -2 \text{ A}$, $V_{GS} = -4 \text{ V}$ ^{Note5}
Forward transfer admittance		$ y_{fs} $	3	4.5	—	S	$I_D = -2 \text{ A}$, $V_{DS} = -10 \text{ V}$ ^{Note5}
Input capacitance		C_{iss}	—	600	—	pF	$V_{DS} = -10 \text{ V}$
Output capacitance		C_{oss}	—	290	—	pF	$V_{GS} = 0$
Reverse transfer capacitance		C_{rss}	—	75	—	pF	$f = 1 \text{ MHz}$
Turn-on delay time		$t_{d(on)}$	—	11	—	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		$t_{d(off)}$	—	100	—	ns	
Fall time		t_f	—	55	—	ns	
Body-drain diode forward voltage		V_{DF}	—	- 0.98	- 1.28	V	$I_F = -3.5 \text{ A}$, $V_{GS} = 0$ ^{Note5}
Body-drain diode reverse recovery time		t_{rr}	—	70	—	ns	$I_F = -3.5 \text{ A}$, $V_{GS} = 0$ $diF/dt = 50 \text{ A}/\mu\text{s}$

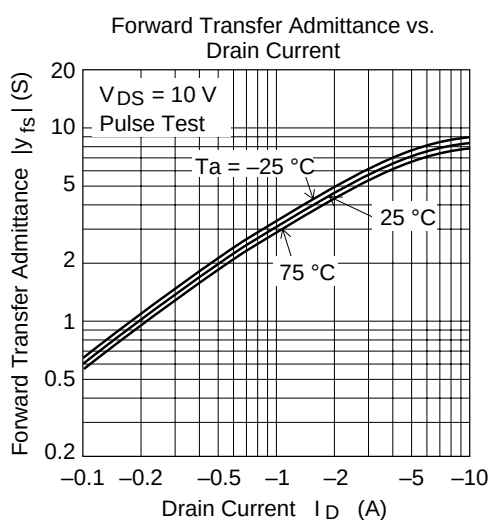
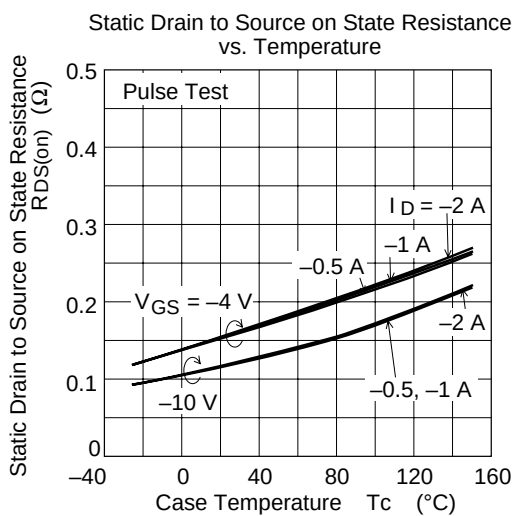
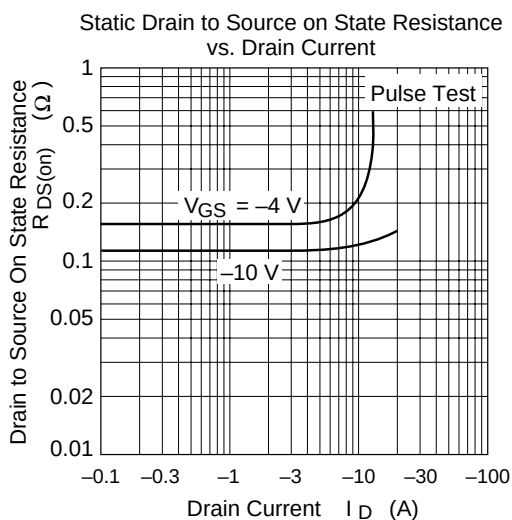
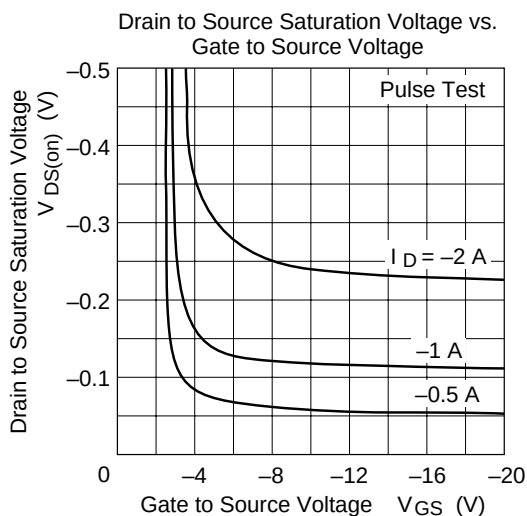
Note: 5. Pulse test

Main Characteristics

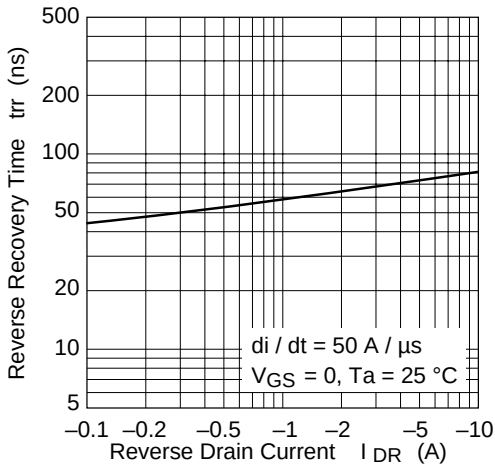


Note 6 :
When using the glass epoxy board
(FR4 40x40x1.6 mm)

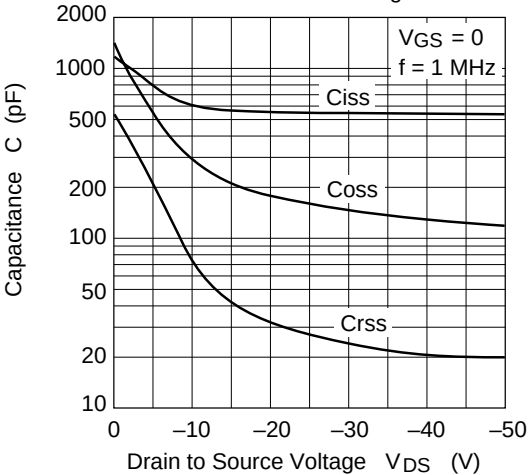




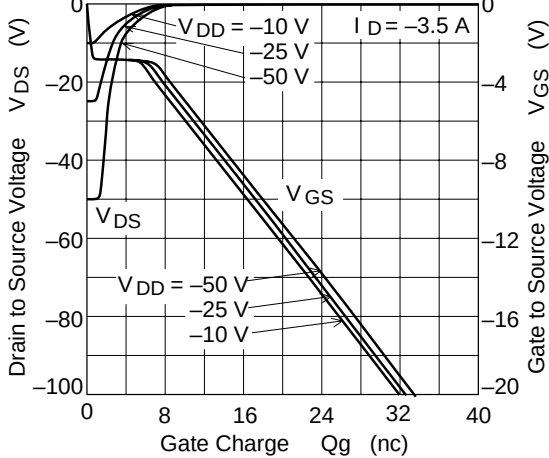
Body-Drain Diode Reverse
Recovery Time



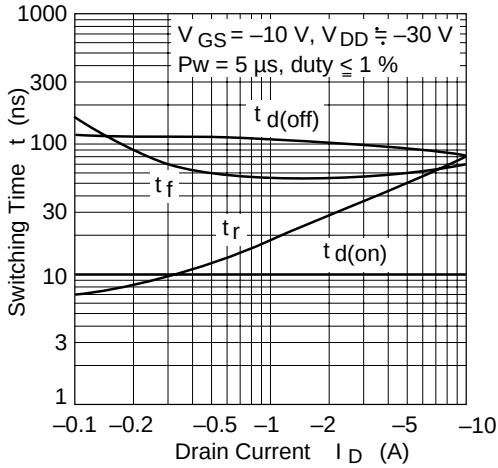
Typical Capacitance vs.
Drain to Source Voltage

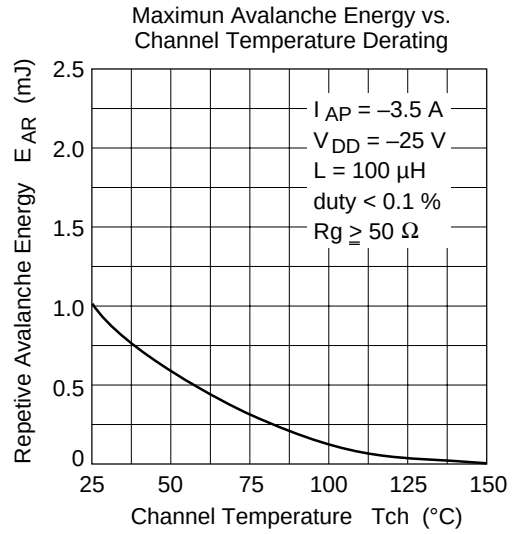
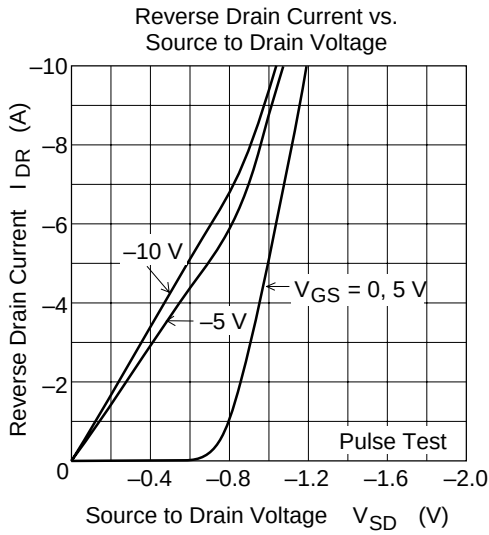


Dynamic Input Characteristics

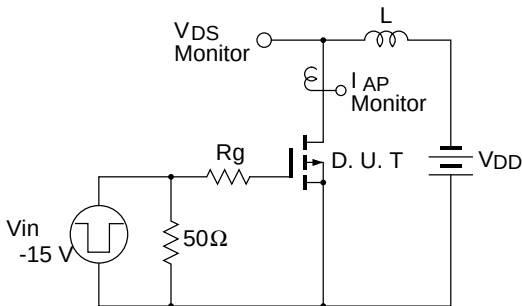


Switching Characteristics



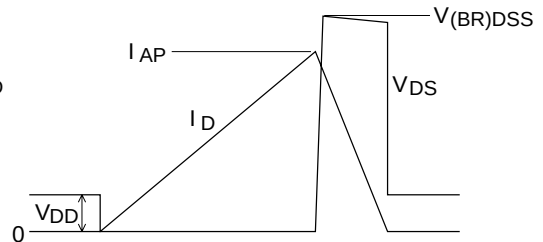


Avalanche Test Circuit

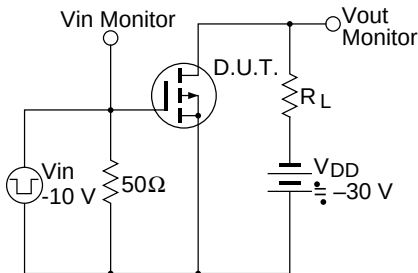


Avalanche Waveform

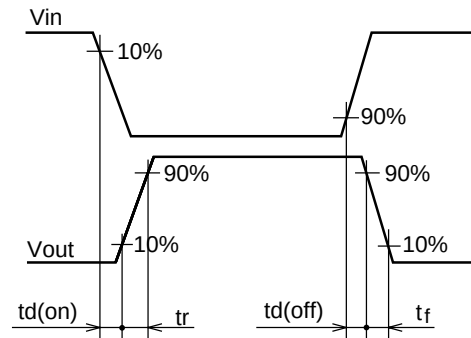
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$

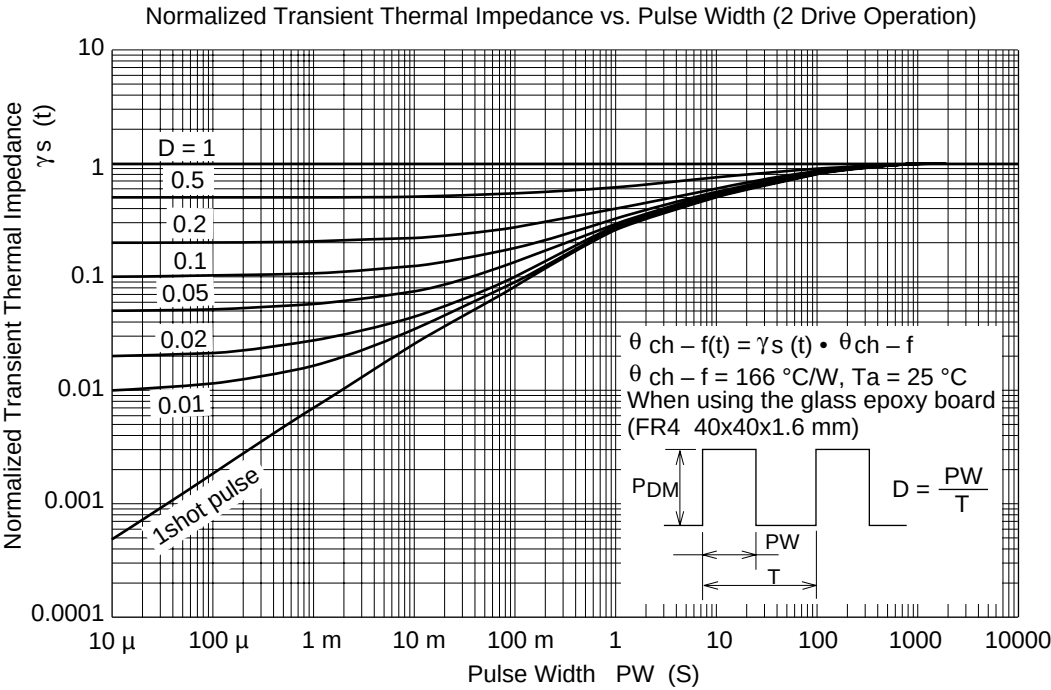
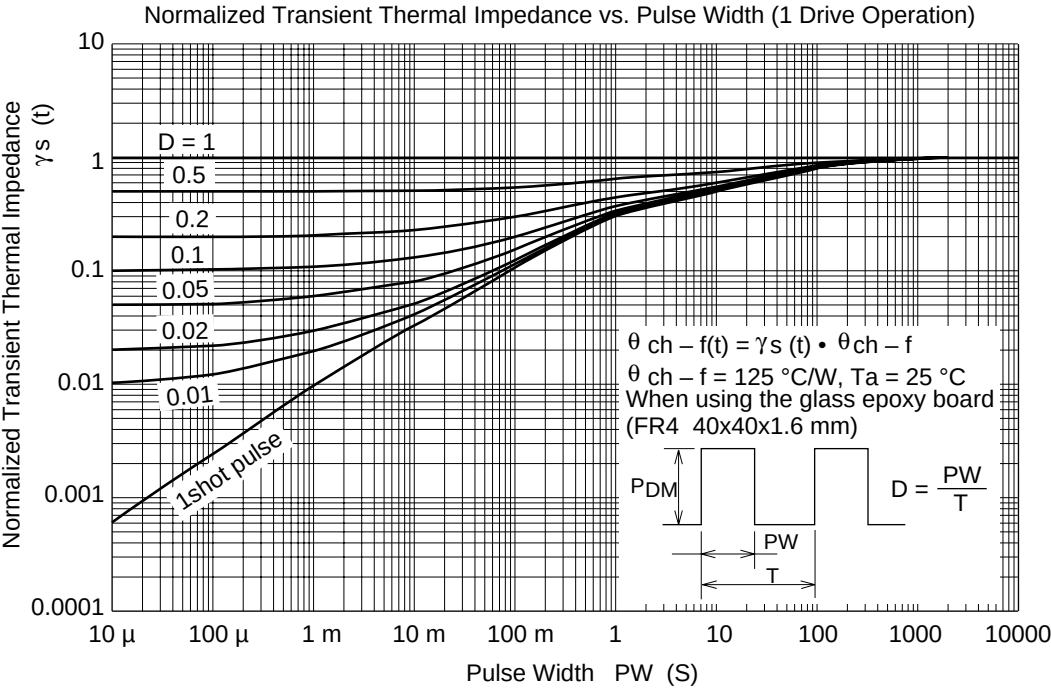


Switching Time Test Circuit



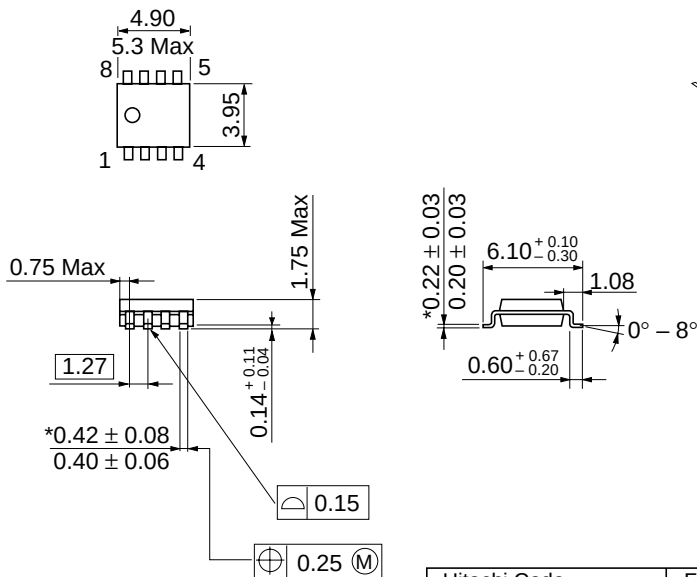
Switching Time Waveform





Package Dimensions

As of January, 2001
Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-8DA
JEDEC	Conforms
EIAJ	—
Mass (reference value)	0.085 g

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