

HAT1038R/HAT1038RJ

Silicon P Channel Power MOS FET
High Speed Power Switching

HITACHI

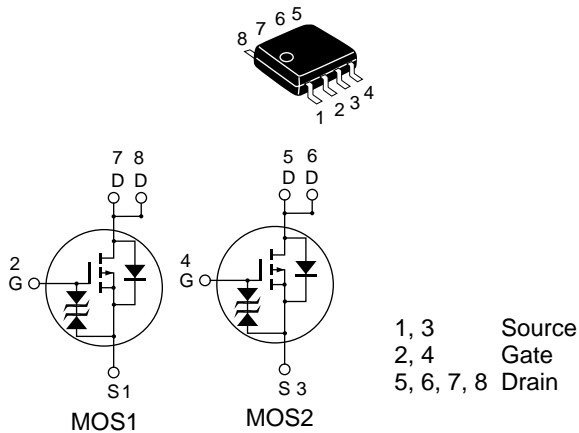
ADE-208-663C (Z)
4th. Edition
February 1999

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 ($T_a = 25^\circ\text{C}$)

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	$^\circ\text{C}$
Storage temperature		T_{stg}	- 55 to + 150	$^\circ\text{C}$

Note: 1. $PW \leq 10 \mu\text{s}$, duty cycle $\leq 1 \%$

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

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

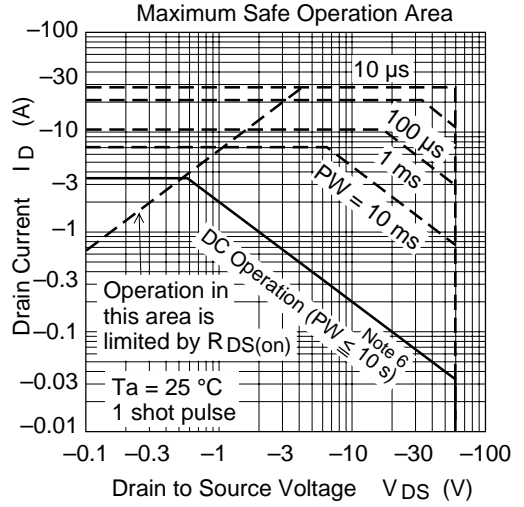
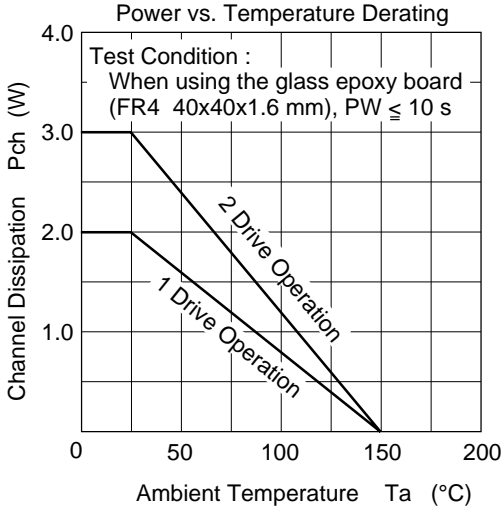
4. Value at $T_{ch} = 25^\circ\text{C}$, $R_g \geq 50 \Omega$

Electrical Characteristics (Ta = 25°C)

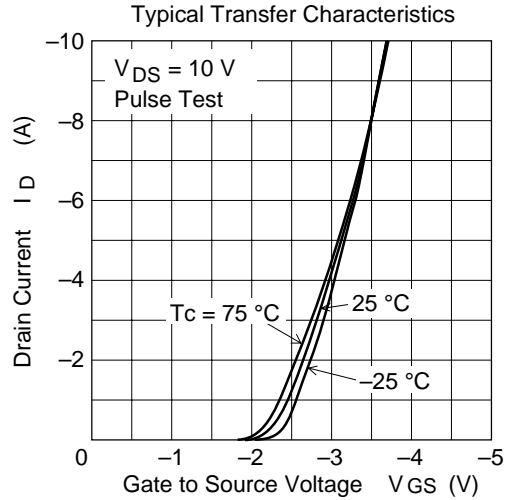
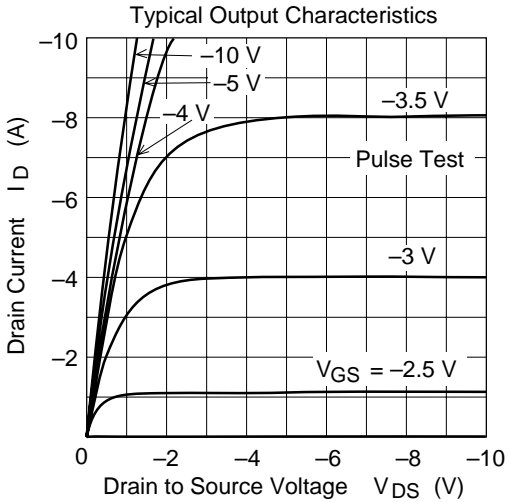
Item		Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage		$V_{(BR)DSS}$	-60	—	—	V	$I_D = -10\text{ mA}$, $V_{GS} = 0$
Gate to source breakdown voltage		$V_{(BR)GSS}$	± 20	—	—	V	$I_G = \pm 100\ \mu\text{A}$, $V_{DS} = 0$
Gate to source leak current		I_{GSS}	—	—	± 10	μA	$V_{GS} = \pm 16\text{ V}$, $V_{DS} = 0$
Zero gate voltage drain current	HAT1038R	I_{DSS}	—	—	-1	μA	$V_{DS} = -60\text{ V}$, $V_{GS} = 0$
	HAT1038RJ	I_{DSS}	—	—	-0.1	μA	
Zero gate voltage drain current	HAT1038R	I_{DSS}	—	—	—	μA	$V_{DS} = -48\text{ V}$, $V_{GS} = 0$
	HAT1038RJ	I_{DSS}	—	—	-10	μA	Ta=125°C
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 = 1MHz
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 = 50A/ μs

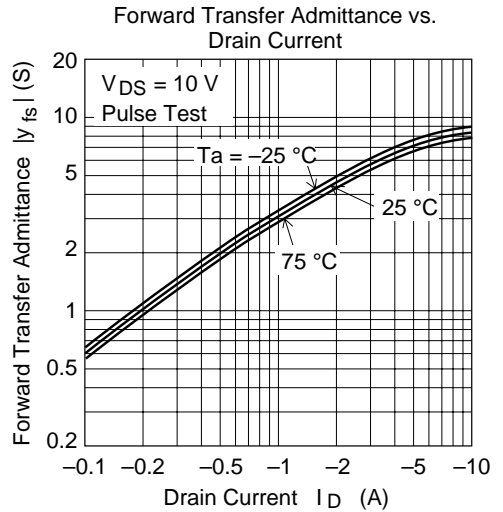
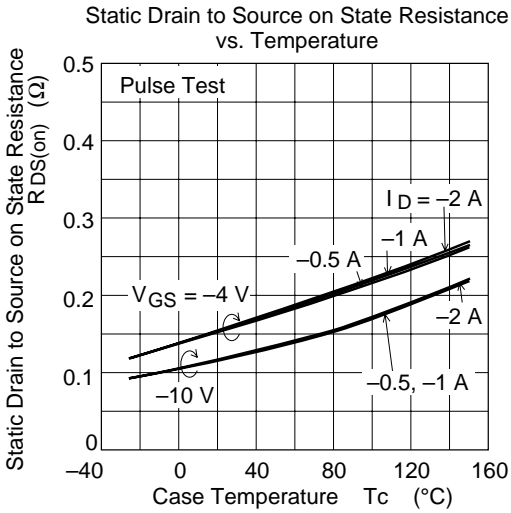
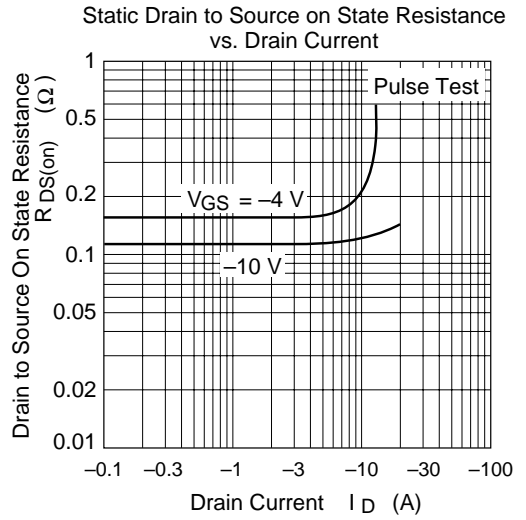
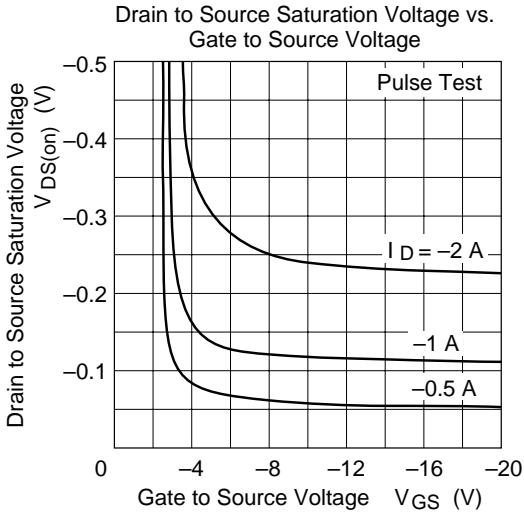
Note: 5. Pulse test

Main Characteristics

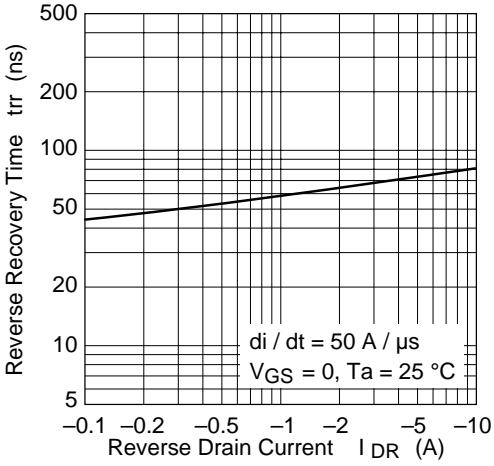


Note 6 :
When using the glass epoxy board
(FR4 40x40x1.6 mm)

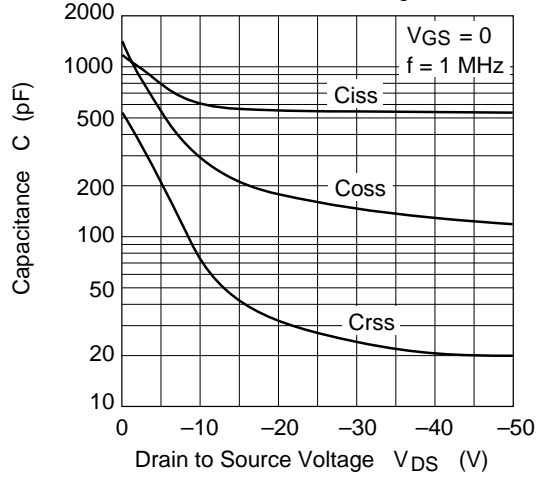




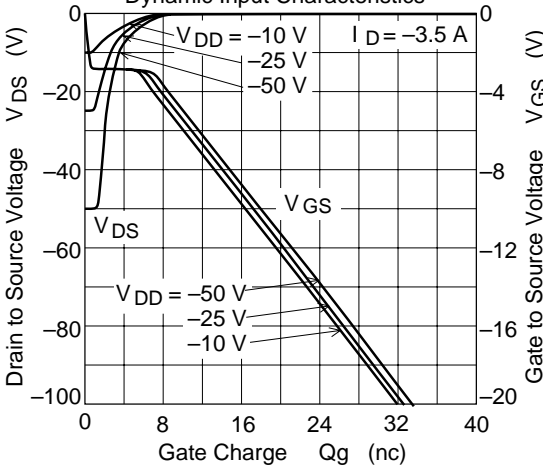
Body-Drain Diode Reverse Recovery Time



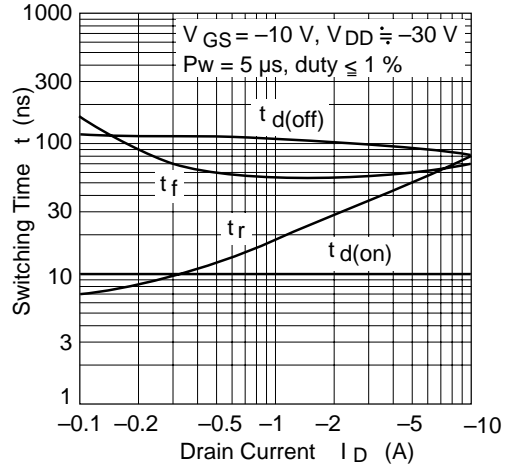
Typical Capacitance vs. Drain to Source Voltage

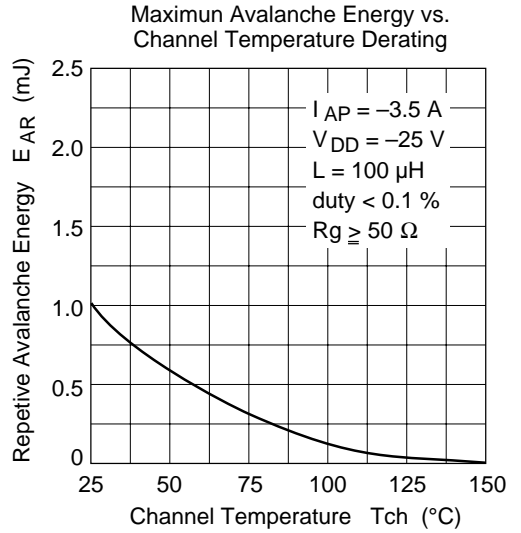
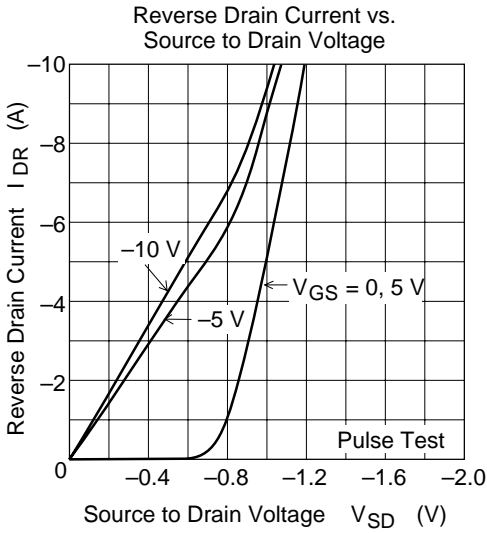


Dynamic Input Characteristics

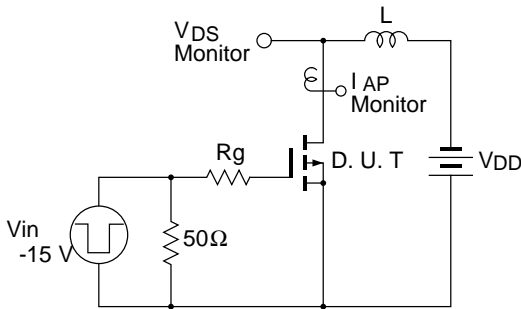


Switching Characteristics



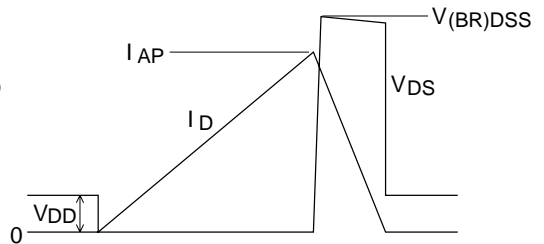


Avalanche Test Circuit

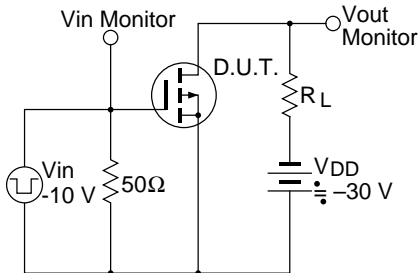


Avalanche Waveform

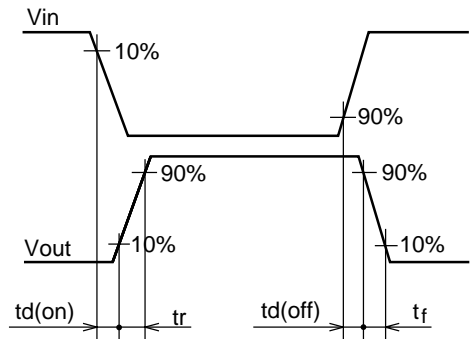
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$

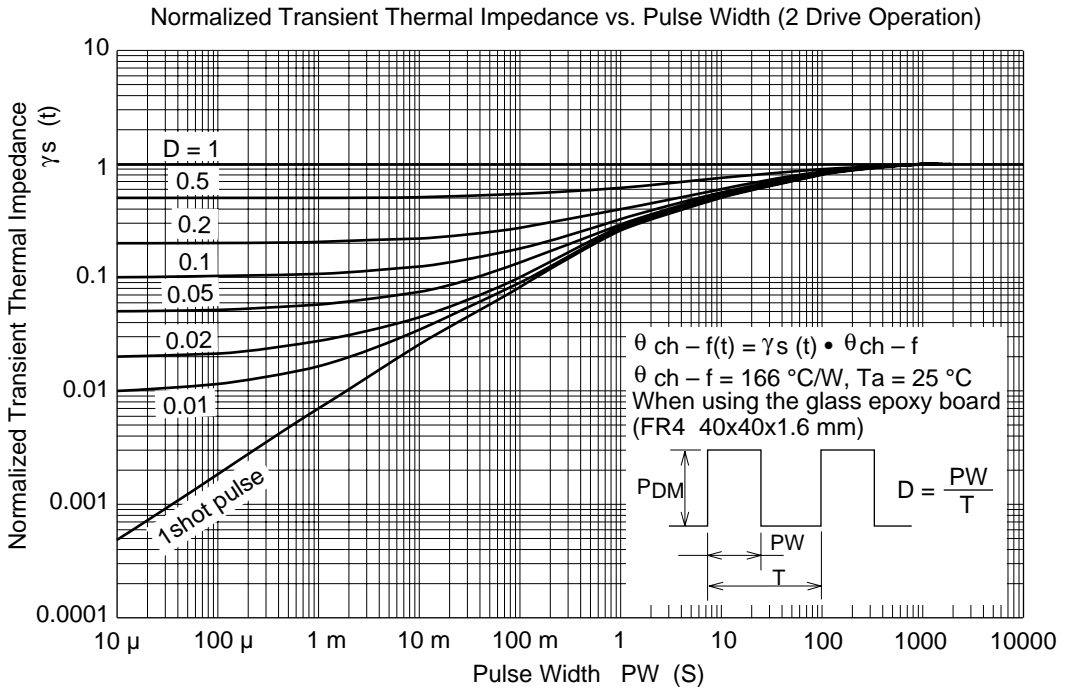
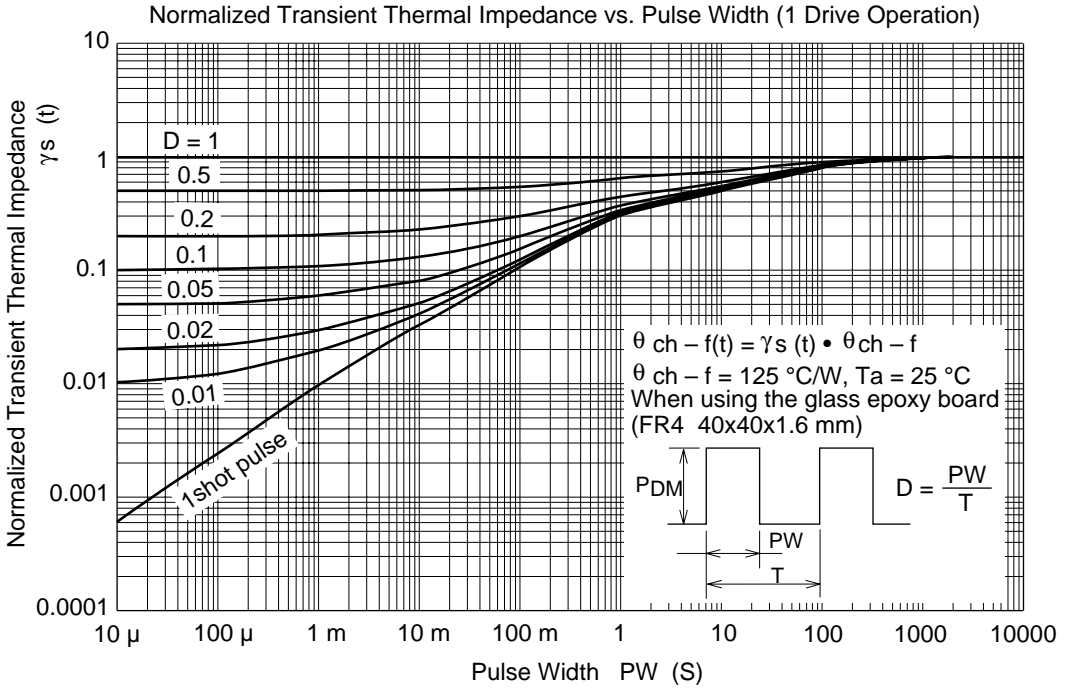


Switching Time Test Circuit



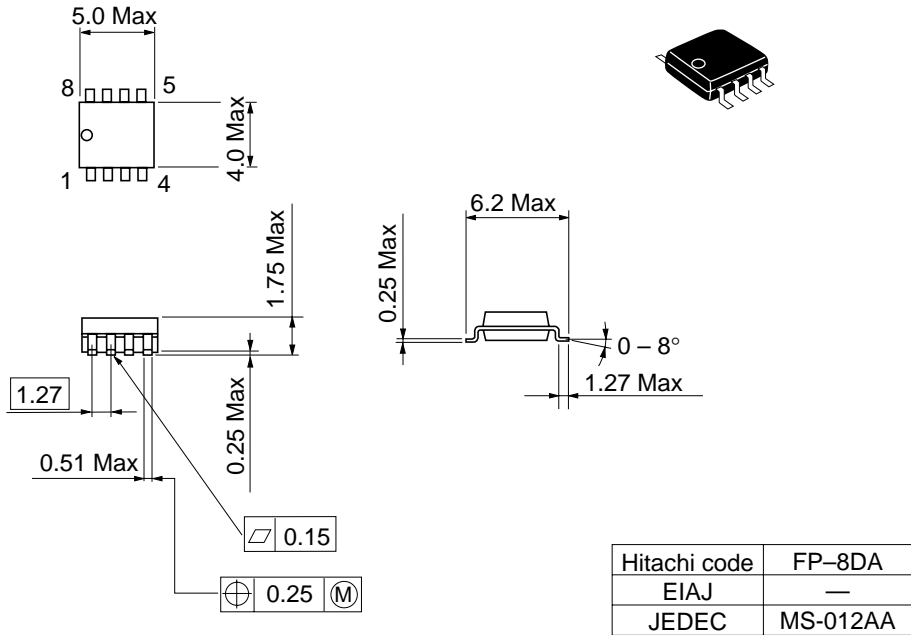
Switching Time Waveform





Package Dimensions

Unit: mm



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HITACHI

Hitachi, Ltd.

Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL North America : <http://semiconductor.hitachi.com/>
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For further information write to:

Hitachi Semiconductor
(America) Inc.
179 East Tasman Drive,
San Jose, CA 95134
Tel: <1> (408) 433-1990
Fax: <1> (408) 433-0223

Hitachi Europe GmbH
Electronic components Group
Dornacher Straße 3
D-85622 Feldkirchen, Munich
Germany
Tel: <49> (89) 9 9180-0
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 049318
Tel: 535-2100
Fax: 535-1533

Hitachi Asia Ltd.
Taipei Branch Office
3F, Hung Kuo Building, No.167,
Tun-Hwa North Road, Taipei (105)
Tel: <886> (2) 2718-3666
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower, World Finance Centre,
Harbour City, Canton Road, Tsim Sha Tsui,
Kowloon, Hong Kong
Tel: <852> (2) 735 9218
Fax: <852> (2) 730 0281
Telex: 40815 HITEC HX

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