

# HAT2028R/HAT2028RJ

Silicon N Channel Power MOS FET  
High Speed Power Switching

# HITACHI

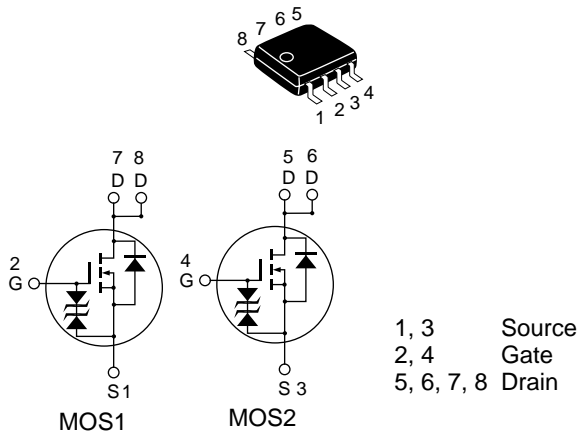
ADE-208-524C (Z)  
4th. Edition  
February 1999

## 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 (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		$I_D$	4	A
Drain peak current		$I_{D(pulse)}$ <sup>Note1</sup>	32	A
Body-drain diode reverse drain current		$I_{DR}$	4	A
Avalanche current	HAT2028R	$I_{AP}$ <sup>Note4</sup>	—	—
	HAT2028RJ		4	A
Avalanche energy	HAT2028R	$E_{AR}$ <sup>Note4</sup>	—	—
	HAT2028RJ		1.37	mJ
Channel dissipation		$Pch$ <sup>Note2</sup>	2	W
Channel dissipation		$Pch$ <sup>Note3</sup>	3	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. 1 Drive operation : When using the glass epoxy board (FR4 40 x 40 x 1.6 mm),  $PW \leq 10s$

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

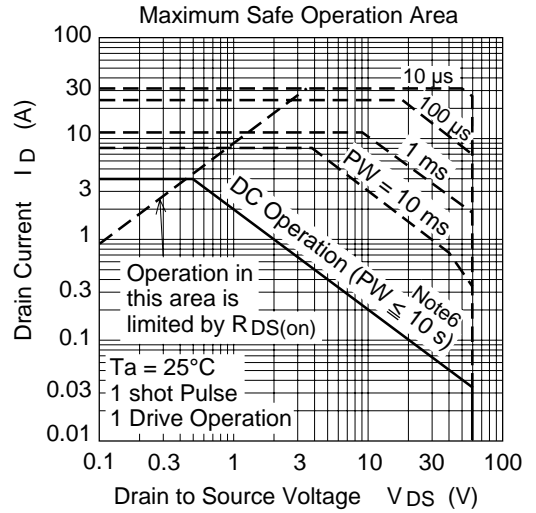
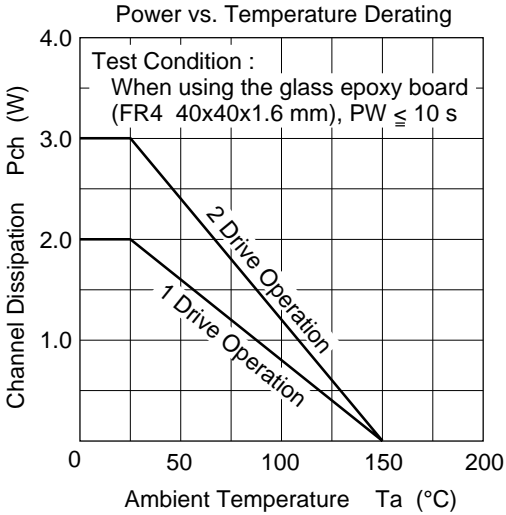
4. Value at  $Tch=25^\circ C$ ,  $Rg \geq 50\Omega$

## Electrical Characteristics (Ta = 25°C)

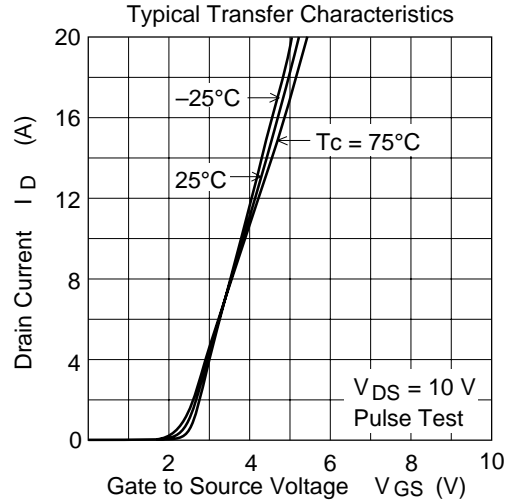
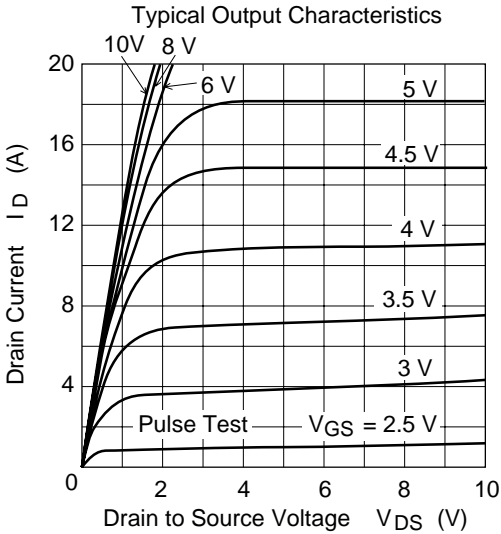
Item		Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdownvoltage		$V_{(BR)DSS}$	60	—	—	V	$I_D = 10 \text{ mA}$ , $V_{GS} = 0$
Gate to source breakdownvoltage		$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100 \text{ }\mu\text{A}$ , $V_{DS} = 0$
Gate to source leak current		$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$
Zero gate voltage drain current	HAT2028R	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 60 \text{ V}$ , $V_{GS} = 0$
	HAT2028RJ	$I_{DSS}$	—	—	0.1	$\mu\text{A}$	
Zero gate voltage drain current	HAT2028R	$I_{DSS}$	—	—	—	$\mu\text{A}$	$V_{DS} = 48 \text{ V}$ , $V_{GS} = 0$
	HAT2028RJ	$I_{DSS}$	—	—	10	$\mu\text{A}$	Ta = 125°C
Gate to source cutoff voltage		$V_{GS(off)}$	1.3	—	2.3	V	$V_{DS} = 10 \text{ V}$ , $I_D = 1 \text{ mA}$
Static drain to source on state resistance		$R_{DS(on)}$	—	0.08	0.1	$\Omega$	$I_D = 2 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note5</sup>
		$R_{DS(on)}$	—	0.12	0.16	$\Omega$	$I_D = 2 \text{ A}$ , $V_{GS} = 4 \text{ V}$ <sup>Note5</sup>
Forward transfer admittance		$ y_{fs} $	3.3	5	—	S	$I_D = 2 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Note5</sup>
Input capacitance		$C_{iss}$	—	280	—	pF	$V_{DS} = 10 \text{ V}$
Output capacitance		$C_{oss}$	—	150	—	pF	$V_{GS} = 0$
Reverse transfer capacitance		$C_{rss}$	—	55	—	pF	f = 1MHz
Turn-on delay time		$t_{d(on)}$	—	15	—	ns	$V_{GS} = 4 \text{ V}$ , $I_D = 2 \text{ A}$
Rise time		$t_r$	—	100	—	ns	$V_{DD} \cong 30 \text{ V}$
Turn-off delay time		$t_{d(off)}$	—	35	—	ns	
Fall time		$t_f$	—	45	—	ns	
Body–drain diode forwardvoltage		$V_{DF}$	—	0.88	1.15	V	$I_F = 4 \text{ A}$ , $V_{GS} = 0$ <sup>Note5</sup>
Body–drain diode reverse recovery time		$t_{rr}$	—	40	—	ns	$I_F = 4 \text{ A}$ , $V_{GS} = 0$ $diF/dt = 50 \text{ A}/\mu\text{s}$

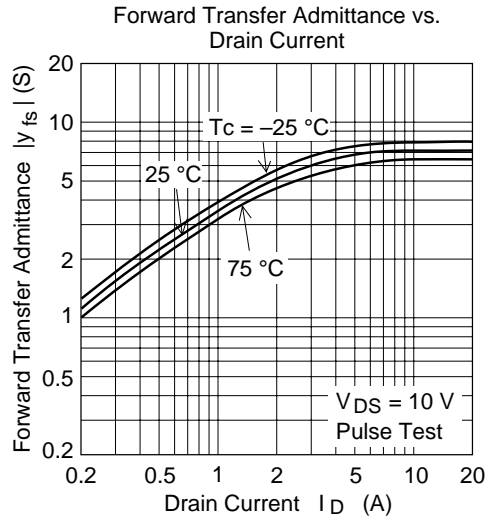
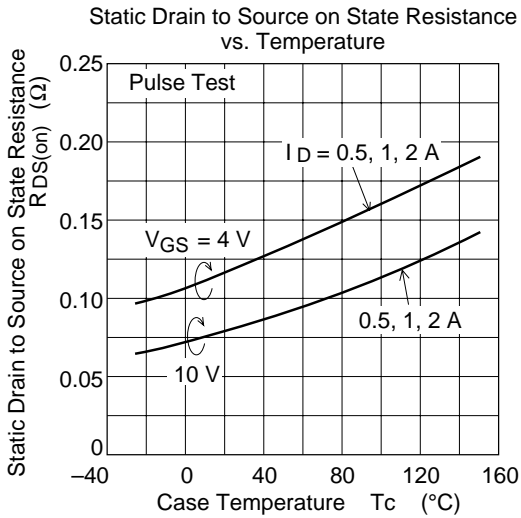
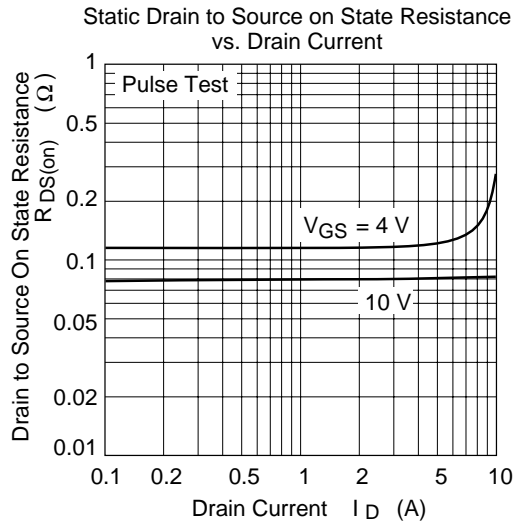
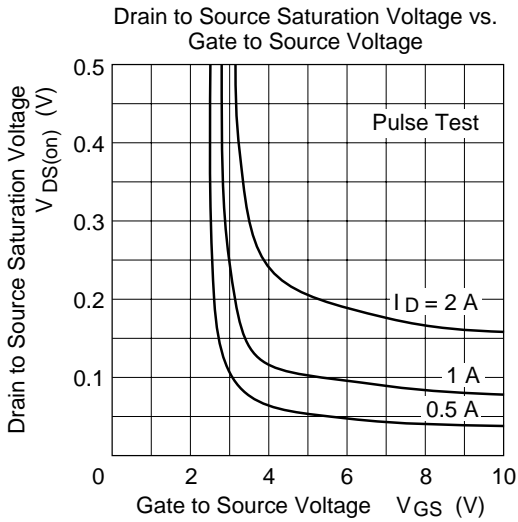
Note: 5. Pulse test

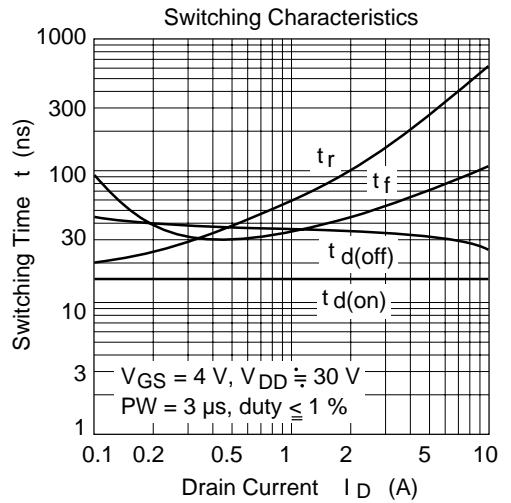
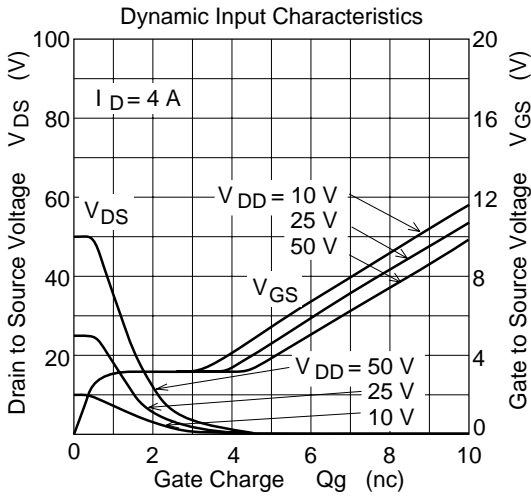
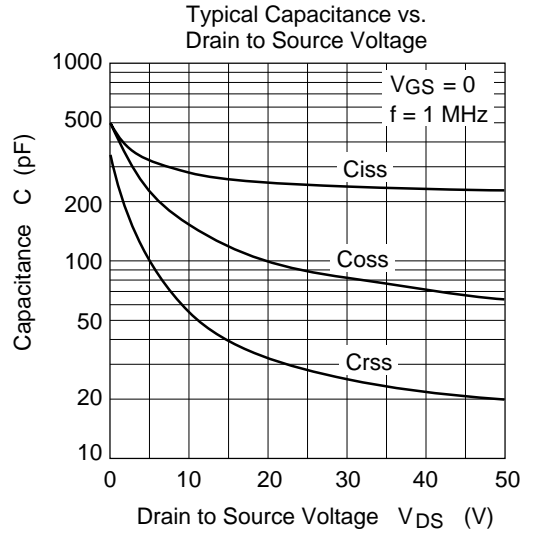
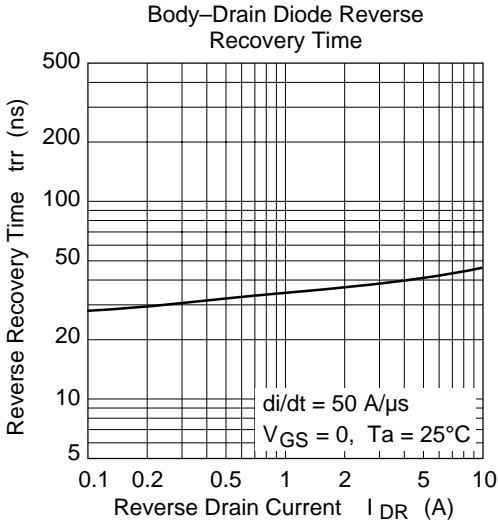
## Main Characteristics

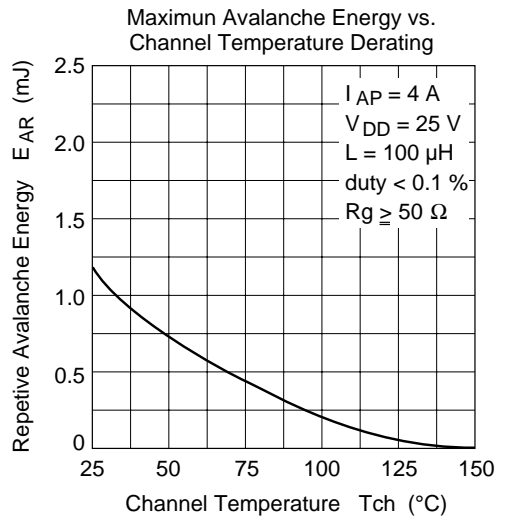
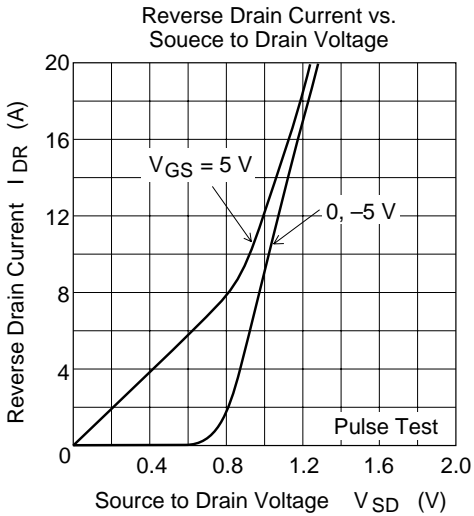


Note 6 :  
When using the glass epoxy board (FR4 40x40x1.6 mm)

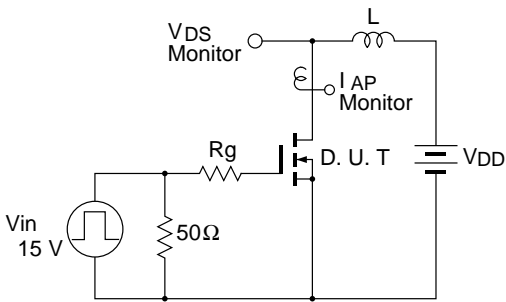






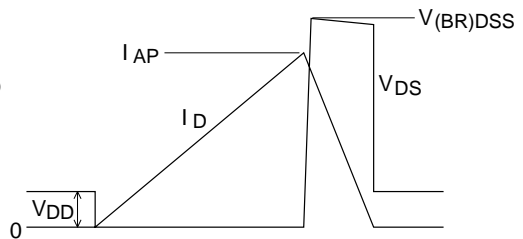


Avalanche Test Circuit

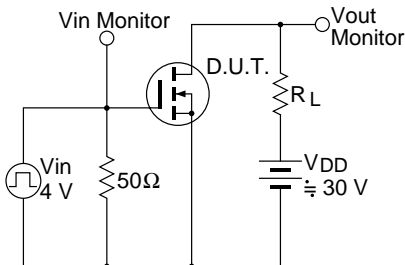


Avalanche Waveform

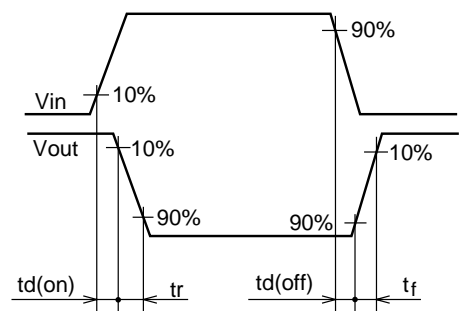
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$

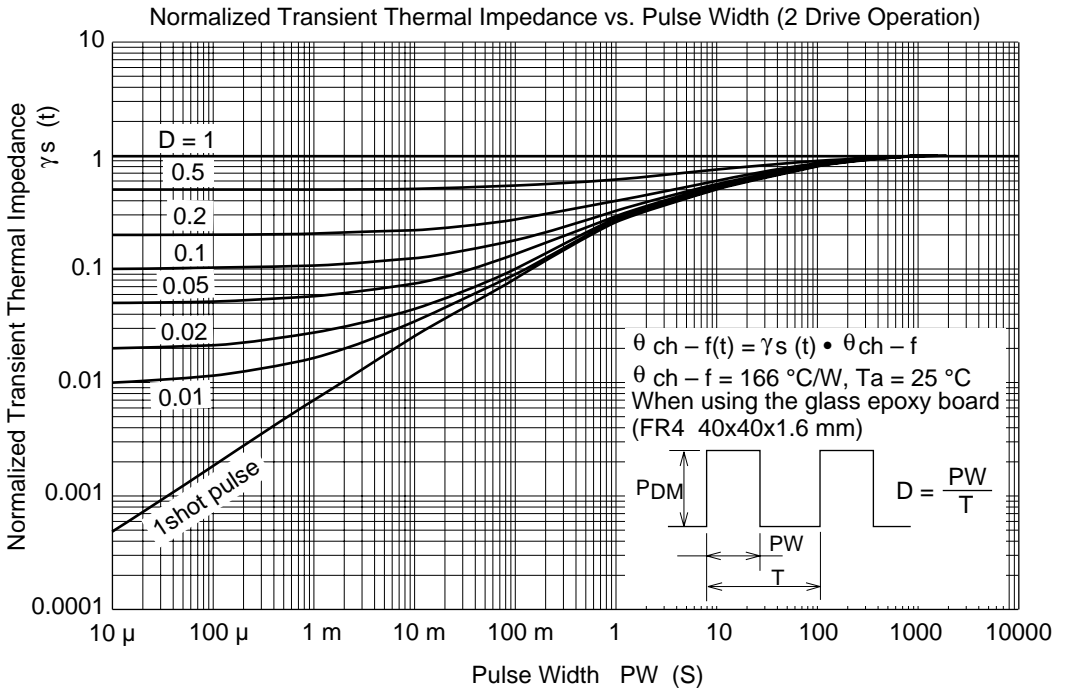
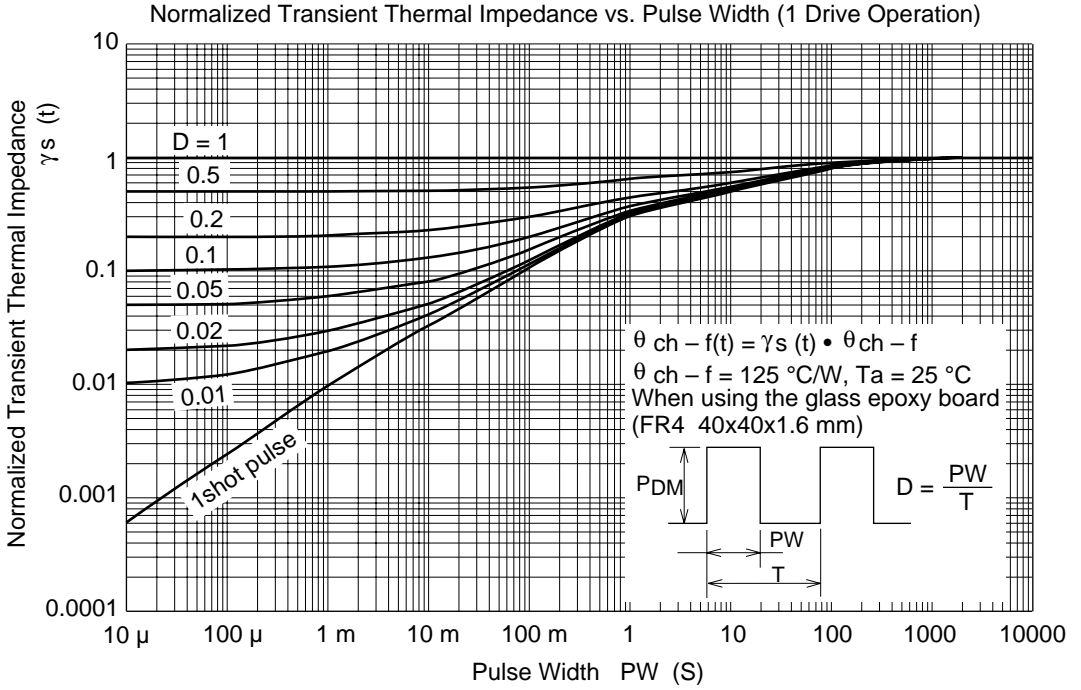


Switching Time Test Circuit



Switching Time Waveform

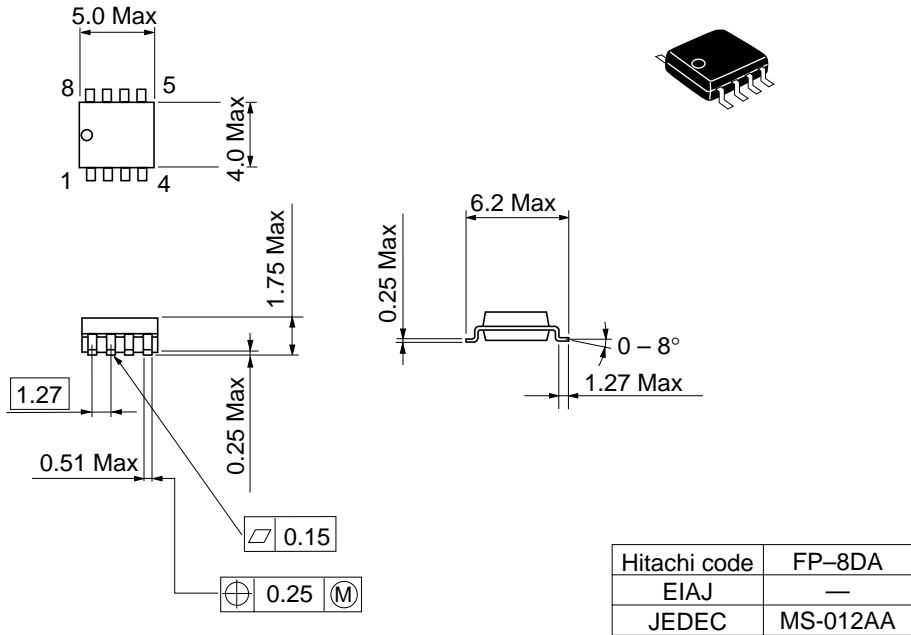






Package Dimensions

Unit: mm



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