

# HAT1038R, HAT1038RJ

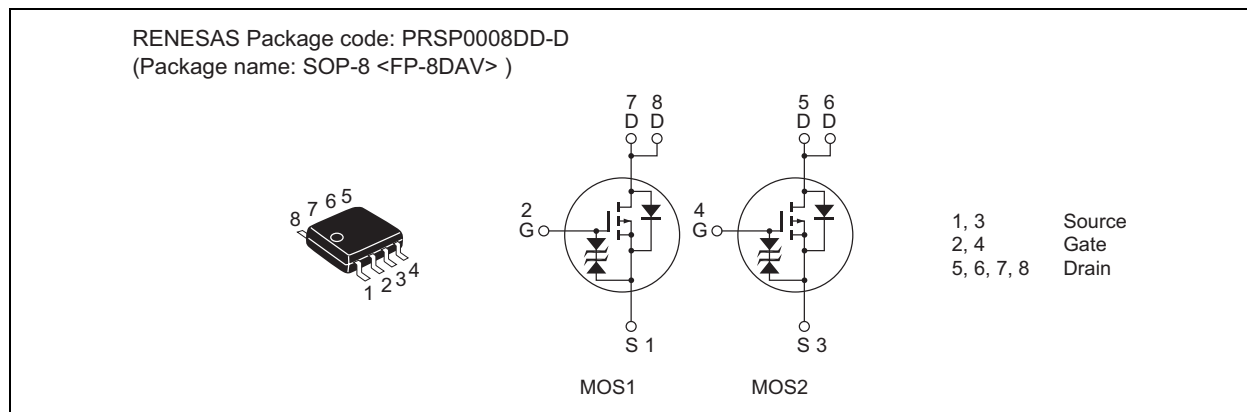
Silicon P Channel Power MOS FET  
High Speed Power Switching

REJ03G1150-0500  
(Previous: ADE-208-663C)  
Rev.5.00  
Sep 07, 2005

## Features

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

## Outline



## Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Value	Unit
Drain to source voltage	$V_{DSS}$	-60	V
Gate to source voltage	$V_{GSS}$	$\pm 20$	V
Drain current	$I_D$	-3.5	A
Drain peak current	$I_{D(pulse)}$ <sup>Note 1</sup>	-28	A
Body-drain diode reverse drain current	$I_{DR}$	-3.5	A
Avalanche current	HAT1038R	—	—
	HAT1038RJ	-3.5	A
Avalanche energy	HAT1038R	—	—
	HAT1038RJ	1.05	mJ
Channel dissipation	$P_{ch}$ <sup>Note 2</sup>	2	W
Channel dissipation	$P_{ch}$ <sup>Note 3</sup>	3	W
Channel temperature	$T_{ch}$	150	°C
Storage temperature	$T_{stg}$	-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 × 40 × 1.6 mm),  $PW \leq 10 s$ 3. 2 Drive operation: When using the glass epoxy board (FR4 40 × 40 × 1.6 mm),  $PW \leq 10 s$ 4. Value at  $T_{ch} = 25^\circ C$ ,  $R_g \geq 50 \Omega$ 

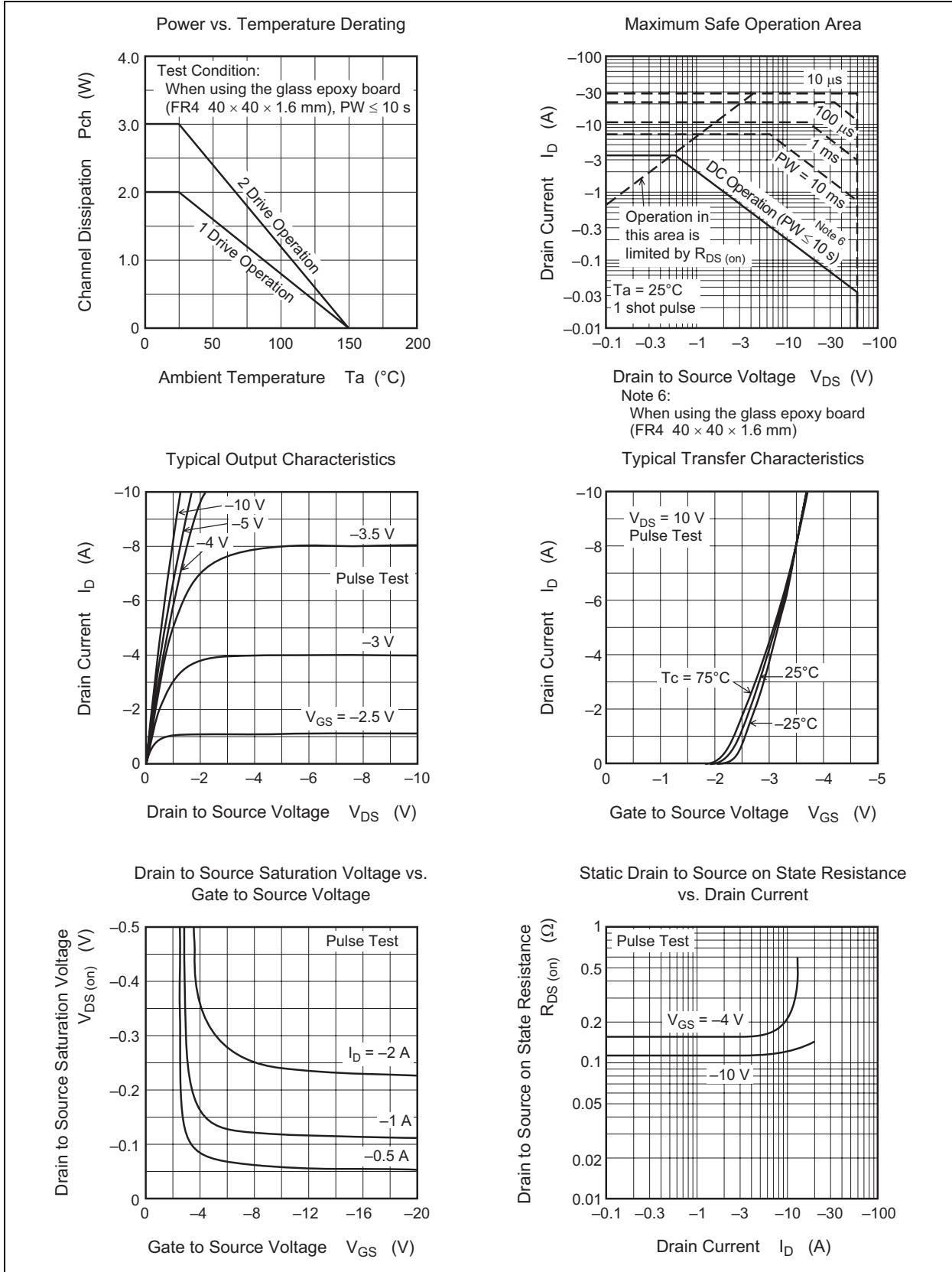
## Electrical Characteristics

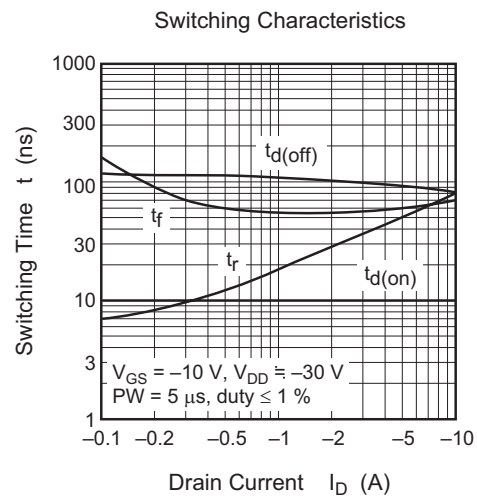
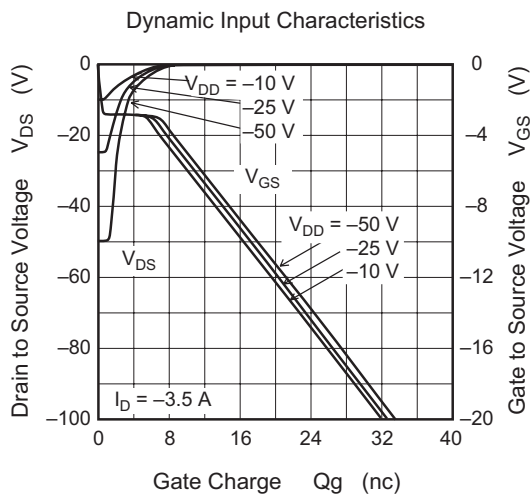
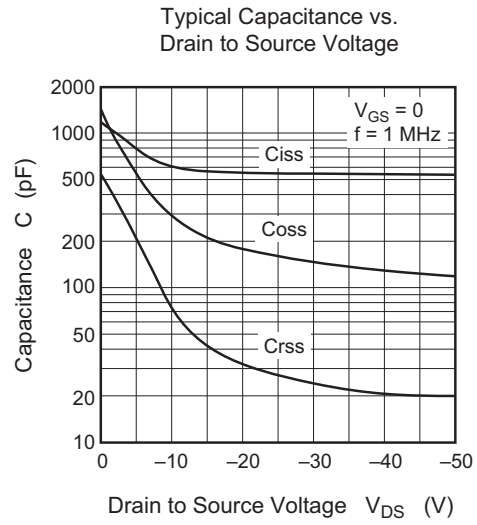
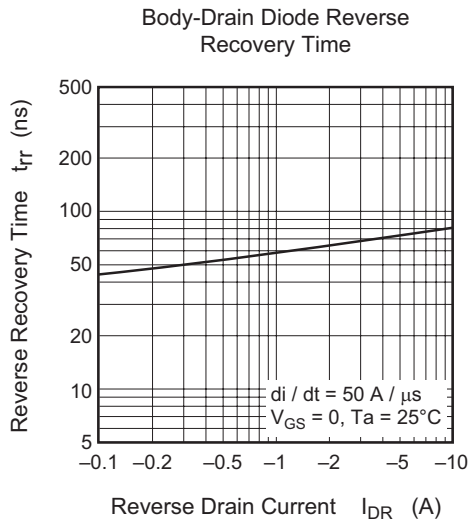
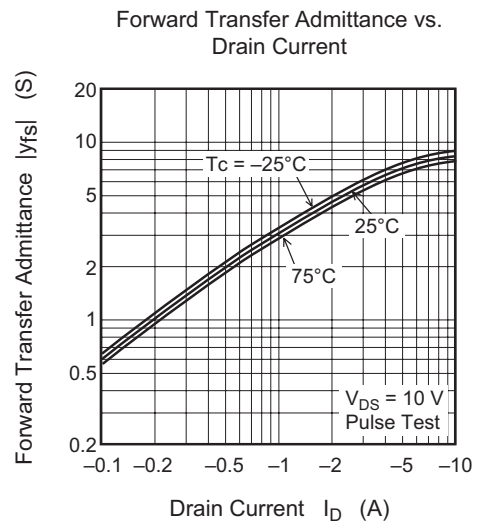
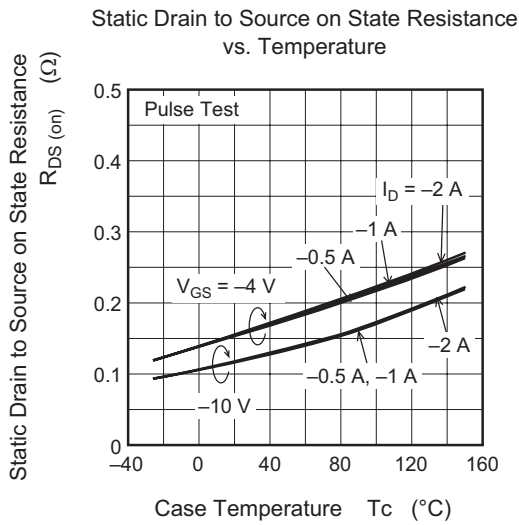
(Ta = 25°C)

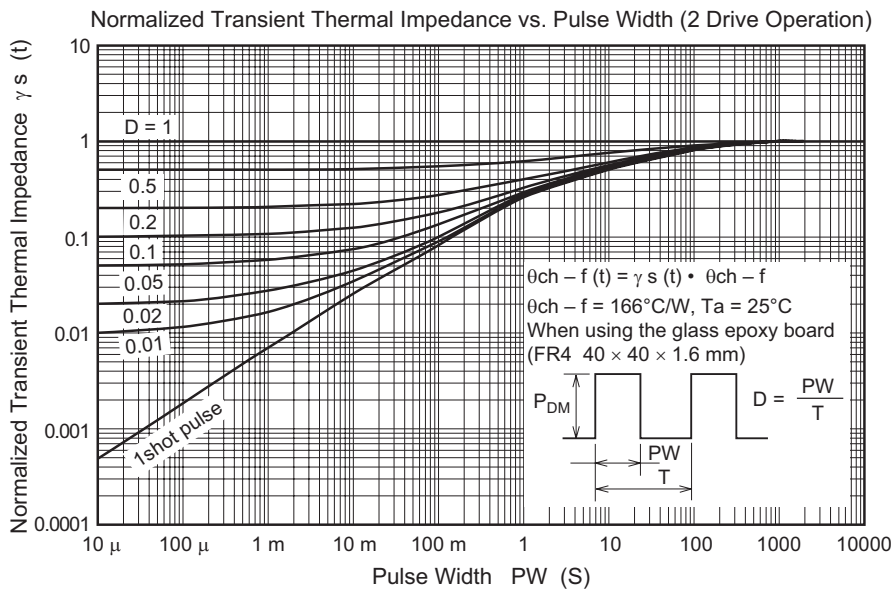
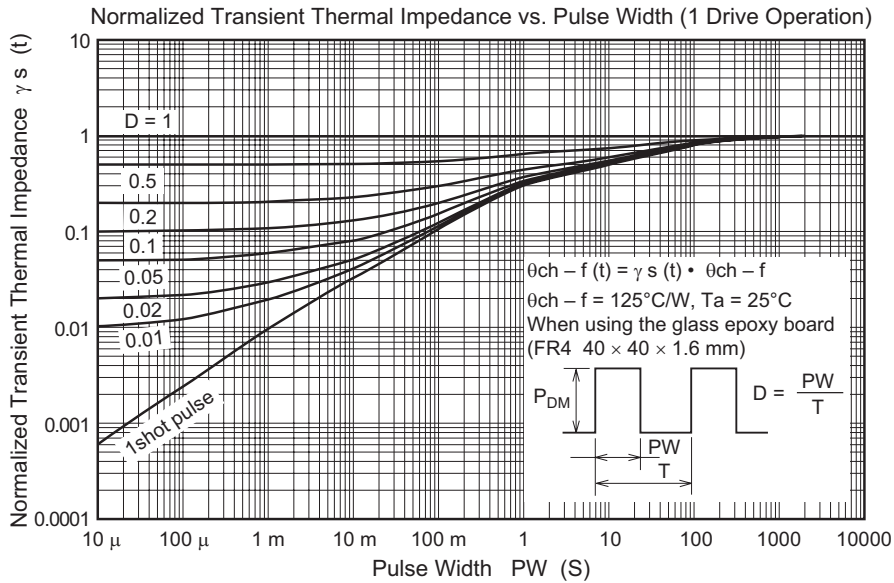
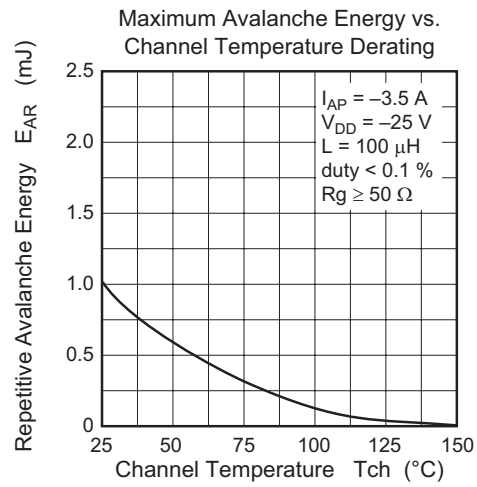
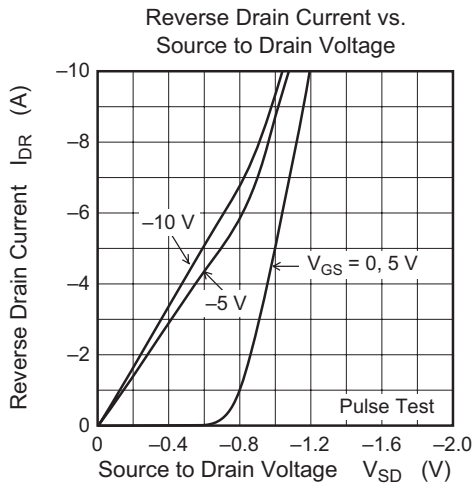
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	-60	—	—	V	$I_D = -10 mA$ , $V_{GS} = 0$
Gate to source leak voltage	$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100 \mu A$ , $V_{DS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu A$	$V_{GS} = \pm 16 V$ , $V_{DS} = 0$
Zero gate voltage drain current	HAT1038R	$I_{DSS}$	—	-1	$\mu A$	$V_{DS} = -60 V$ , $V_{GS} = 0$
	HAT1038RJ	$I_{DSS}$	—	-0.1	$\mu A$	
Zero gate voltage drain current	HAT1038R	$I_{DSS}$	—	—	$\mu A$	$V_{DS} = -48 V$ , $V_{GS} = 0$ $T_a = 125^\circ C$
	HAT1038RJ	$I_{DSS}$	—	-10	$\mu A$	
Gate to source cutoff voltage	$V_{GS(off)}$	-1.2	—	-2.2	V	$V_{DS} = -10 V$ , $I_D = -1 mA$
Static drain to source on state resistance	$R_{DS(on)}$	—	0.12	0.15	$\Omega$	$I_D = -2 A$ , $V_{GS} = -10 V$ <sup>Note 5</sup> $I_D = -2 A$ , $V_{GS} = -4 V$ <sup>Note 5</sup>
	$R_{DS(on)}$	—	0.16	0.23	$\Omega$	
Forward transfer admittance	$ y_{fs} $	3	4.5	—	S	$I_D = -2 A$ , $V_{DS} = -10 V$ <sup>Note 5</sup>
Input capacitance	$C_{iss}$	—	600	—	pF	$V_{DS} = -10 V$
Output capacitance	$C_{oss}$	—	290	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	75	—	pF	$f = 1 MHz$
Turn-on delay time	$t_{d(on)}$	—	11	—	ns	$V_{GS} = -10 V$ , $I_D = -2 A$ , $V_{DD} \cong -30 V$
Rise time	$t_r$	—	30	—	ns	
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	$I_F = -3.5 A$ , $V_{GS} = 0$ <sup>Note 5</sup>
Body-drain diode reverse recovery time	$t_{rr}$	—	70	—	ns	$I_F = -3.5 A$ , $V_{GS} = 0$ $di_F/dt = 50 A/\mu s$

Note: 5. Pulse test

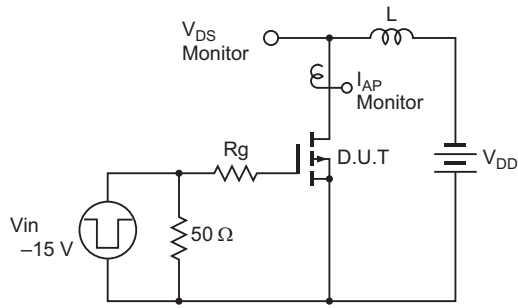
Main Characteristics





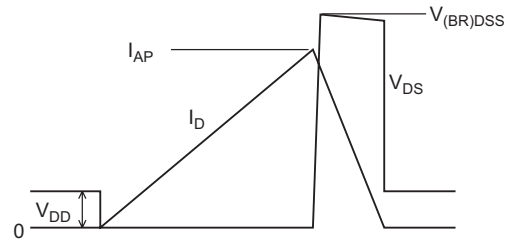


Avalanche Test Circuit

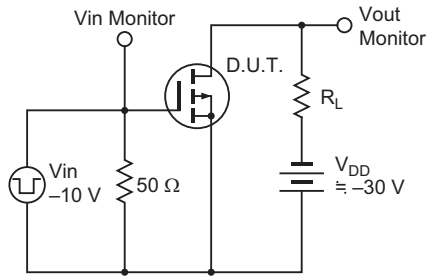


Avalanche Waveform

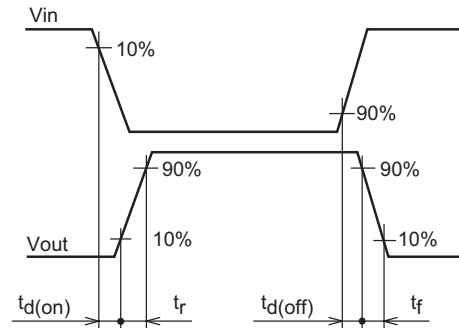
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



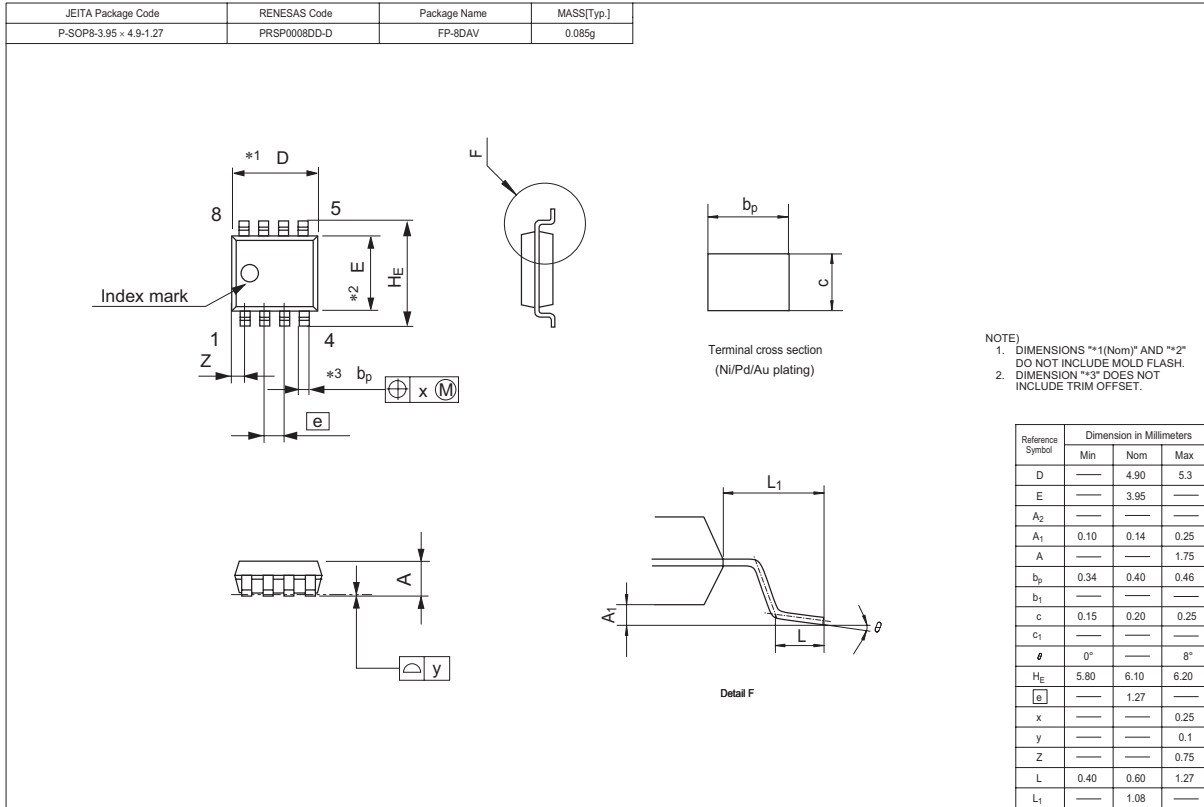
Switching Time Test Circuit



Switching Time Waveform



Package Dimensions



Ordering Information

Part Name	Quantity	Shipping Container
HAT1038R-EL-E	2500 pcs	Taping
HAT1038RJ-EL-E	2500 pcs	Taping

Note: For some grades, production may be terminated. Please contact the Renesas sales office to check the state of production before ordering the product.

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