

# HAT1097R, HAT1097RJ

Silicon P Channel Power MOS FET  
High Speed Power Switching

REJ03G0529-0100

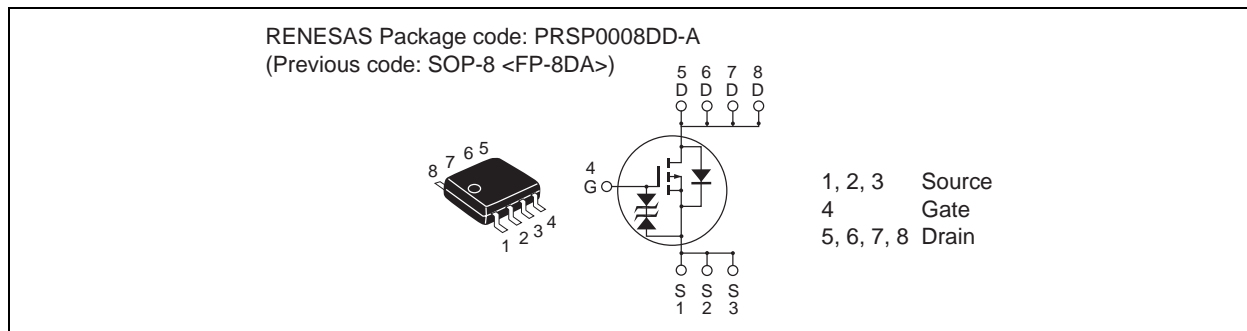
Rev.1.00

Feb.15.2005

## Features

- Low on-resistance
- Capable of 4.5 V gate drive
- High density mounting
- “J” is for Automotive application  
High temperature D-S leakage guarantee  
Avalanche rating

## Outline



## Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings		Unit
		HAT1097R	HAT1097RJ	
Drain to source voltage	$V_{DSS}$	-60	-60	V
Gate to source voltage	$V_{GSS}$	$\pm 20$	$\pm 20$	V
Drain current	$I_D$	-5	-5	A
Drain peak current	$I_D$ (pulse) <sup>Note1</sup>	-40	-40	A
Avalanche current	$I_{AP}$ <sup>Note3</sup>	—	-5	A
Avalanche energy	$E_{AR}$ <sup>Note3</sup>	—	2.14	mJ
Channel dissipation	$P_{ch}$ <sup>Note2</sup>	2	2	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. When using the glass epoxy board (FR4 40 x 40 x 1.6 mm),  $PW \leq 10 s$

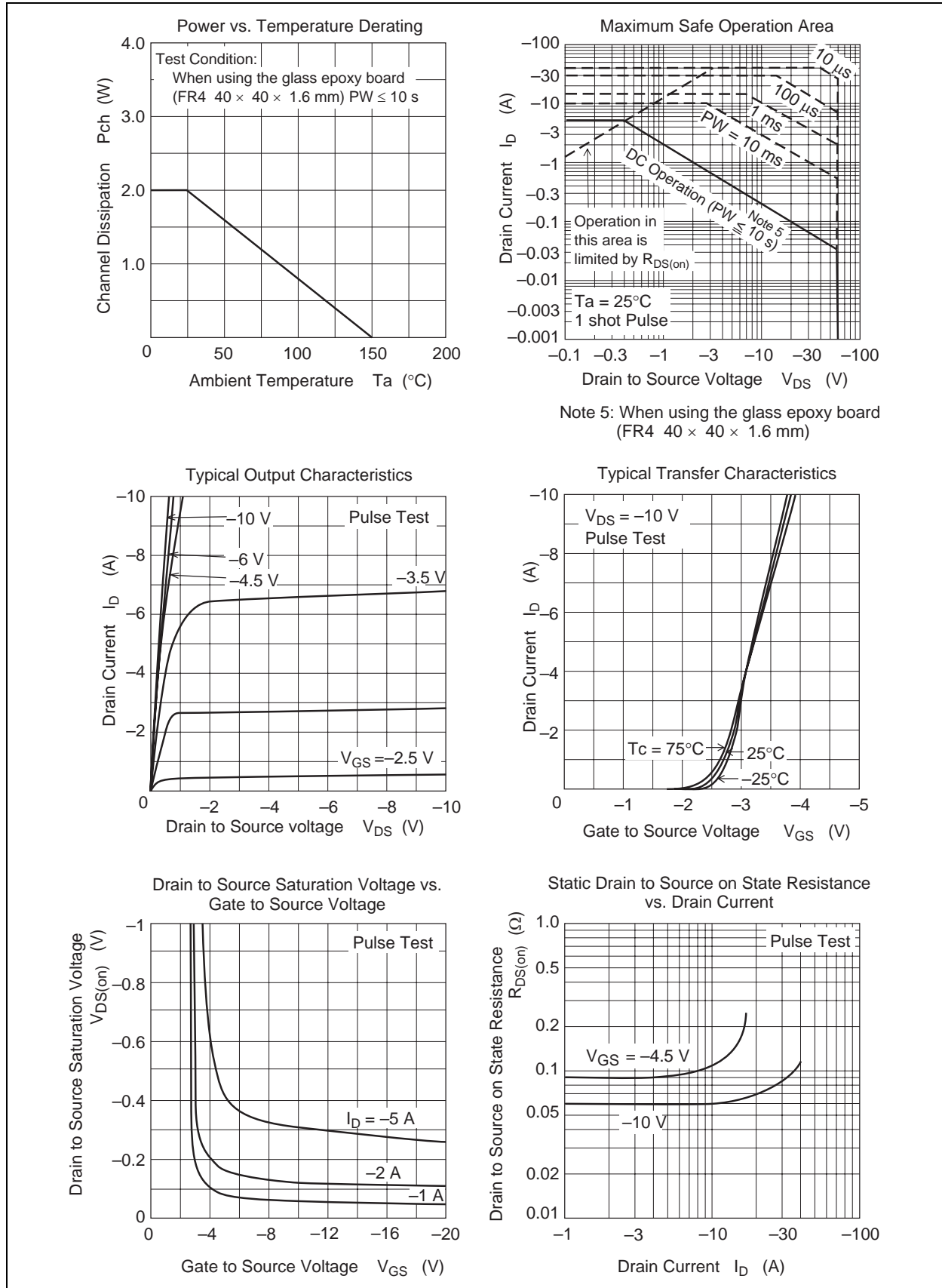
3. Value at Tch = 25°C,  $R_g \geq 50 \Omega$

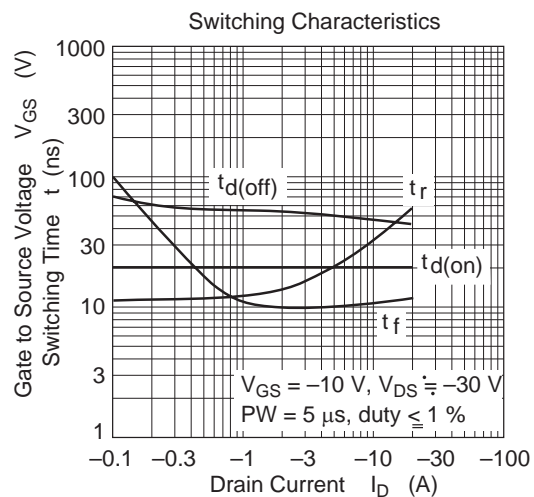
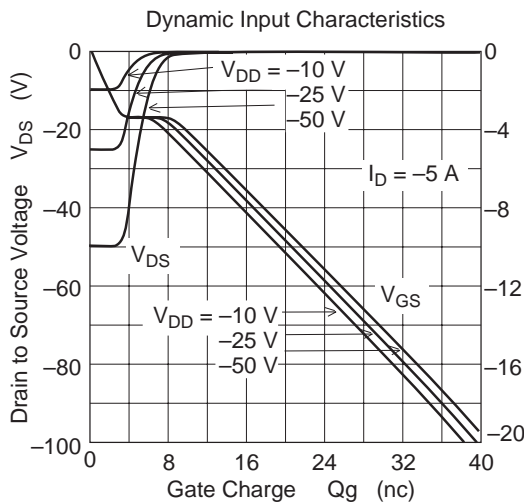
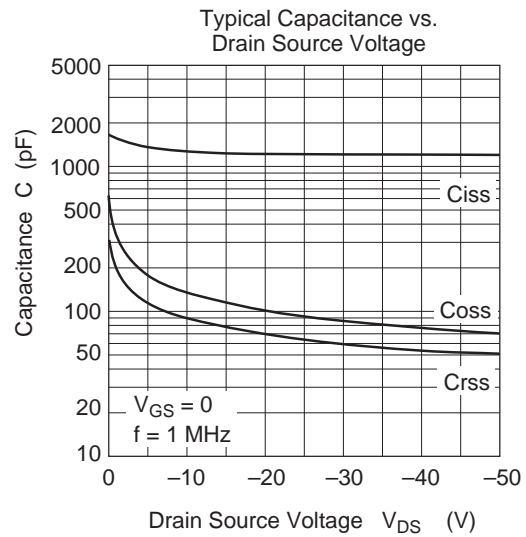
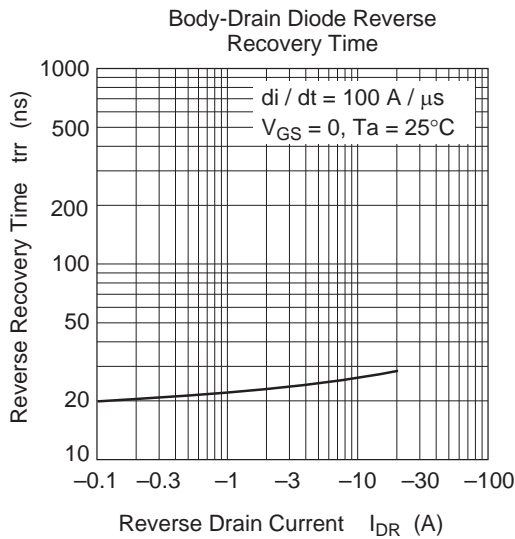
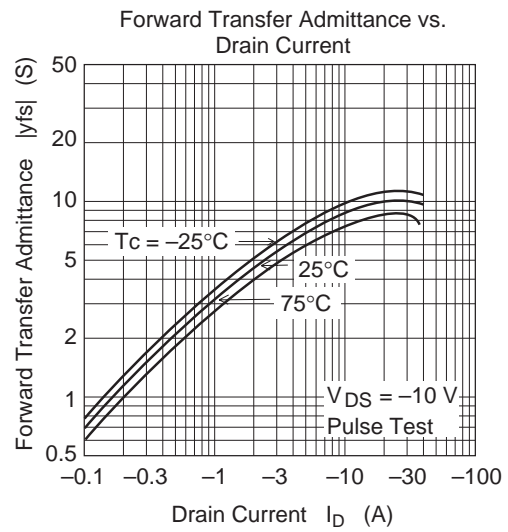
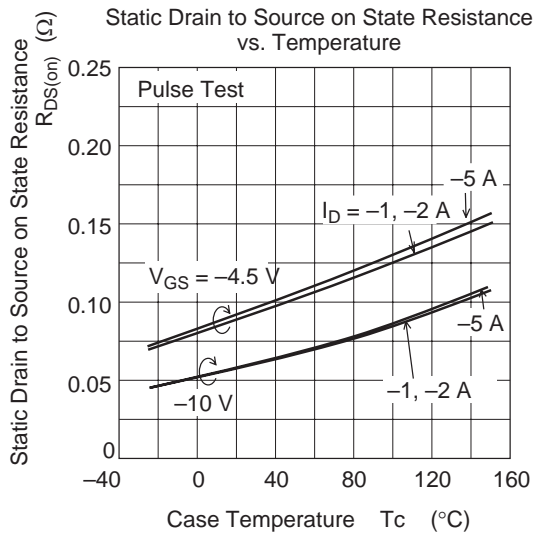
## Electrical Characteristics

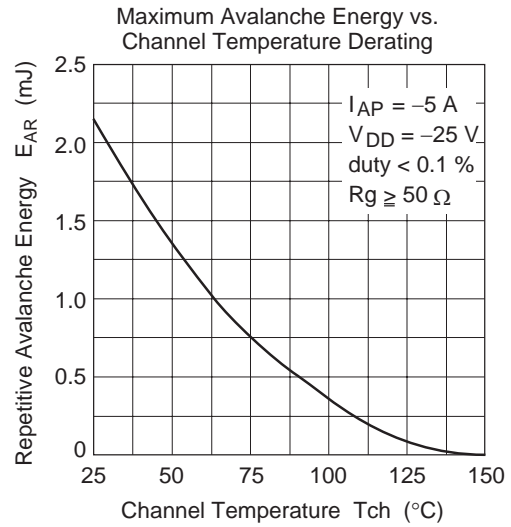
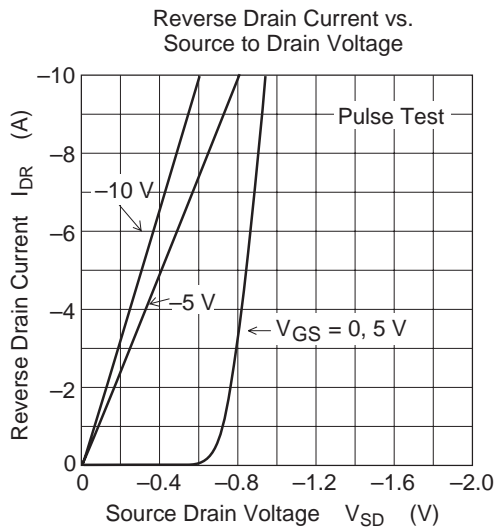
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	-60	—	—	V	$I_D = -10 \text{ mA}$ , $V_{GS} = 0$
Gate to Source breakdown voltage	$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100 \mu\text{A}$ , $V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	-1	$\mu\text{A}$	$V_{DS} = -60 \text{ V}$ , $V_{GS} = 0$
Zero gate voltage drain current	HAT1097R	$I_{DSS}$	—	—	$\mu\text{A}$	$V_{DS} = -48 \text{ V}$ , $V_{GS} = 0$ $T_a = 125^\circ\text{C}$
	HAT1055RJ	$I_{DSS}$	—	-10	$\mu\text{A}$	
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	-1.0	—	-2.5	V	$V_{DS} = -10 \text{ V}$ , $I_D = -1 \text{ mA}$
Forward transfer admittance	$ y_{fs} $	3	5	—	S	$I_D = -2.5 \text{ A}^{\text{Note4}}$ , $V_{DS} = -10 \text{ V}$
Static drain to source on state resistance	$R_{DS(on)}$	—	60	76	$\text{m}\Omega$	$I_D = -2.5 \text{ A}^{\text{Note4}}$ , $V_{GS} = -10 \text{ V}$
	$R_{DS(on)}$	—	90	130	$\text{m}\Omega$	$I_D = -2.5 \text{ A}^{\text{Note4}}$ , $V_{GS} = -4.5 \text{ V}$
Input capacitance	$C_{iss}$	—	1350	—	pF	$V_{DS} = -10 \text{ V}$ , $V_{GS} = 0$ $f = 1 \text{ MHz}$
Output capacitance	$C_{oss}$	—	135	—	pF	
Reverse transfer capacitance	$C_{rss}$	—	85	—	pF	
Total gate charge	$Q_g$	—	21	—	nC	$V_{DD} = -25 \text{ V}$
Gate to source charge	$Q_{gs}$	—	3	—	nC	$V_{GS} = -10 \text{ V}$
Gate to drain charge	$Q_{gd}$	—	4	—	nC	$I_D = -5 \text{ A}$
Turn-on delay time	$t_{d(on)}$	—	20	—	ns	$V_{GS} = -10 \text{ V}$ , $I_D = -2.5 \text{ A}$
Rise time	$t_r$	—	15	—	ns	$V_{DD} \cong -30 \text{ V}$
Turn-off delay time	$t_{d(off)}$	—	55	—	ns	$R_L = 12 \Omega$
Fall time	$t_f$	—	10	—	ns	$R_G = 4.7 \Omega$
Body-drain diode forward voltage	$V_{DF}$	—	-0.85	-1.10	V	$I_F = -5 \text{ A}$ , $V_{GS} = 0^{\text{Note4}}$
Body-drain diode reverse recovery time	$t_{rr}$	—	25	—	ns	$I_F = -5 \text{ A}$ , $V_{GS} = 0$ $di/dt = 100 \text{ A}/\mu\text{s}$

Notes: 4. Pulse test

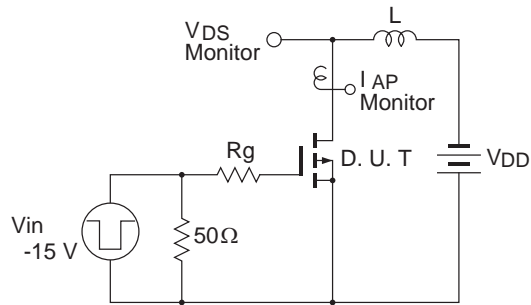
Main Characteristics





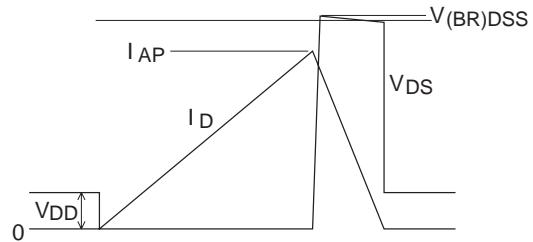


Avalanche Test Circuit

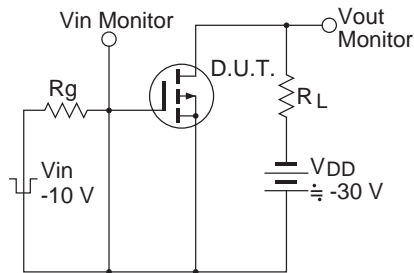


Avalanche Waveform

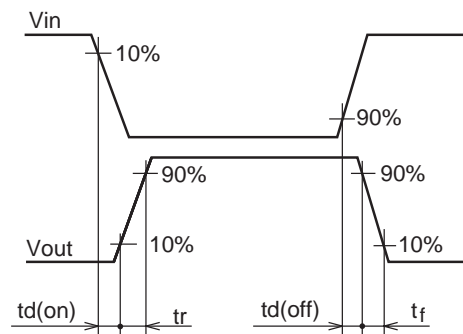
$$E_{AR} = \frac{1}{2} L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$

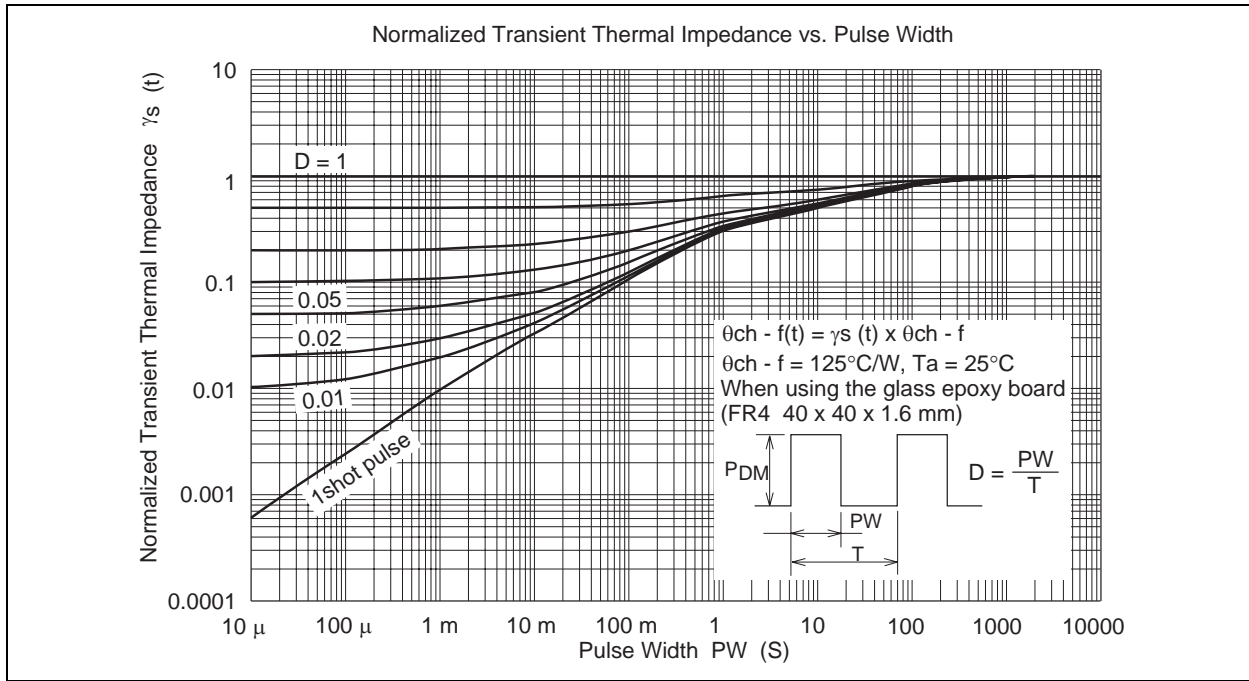


Switching Time Test Circuit

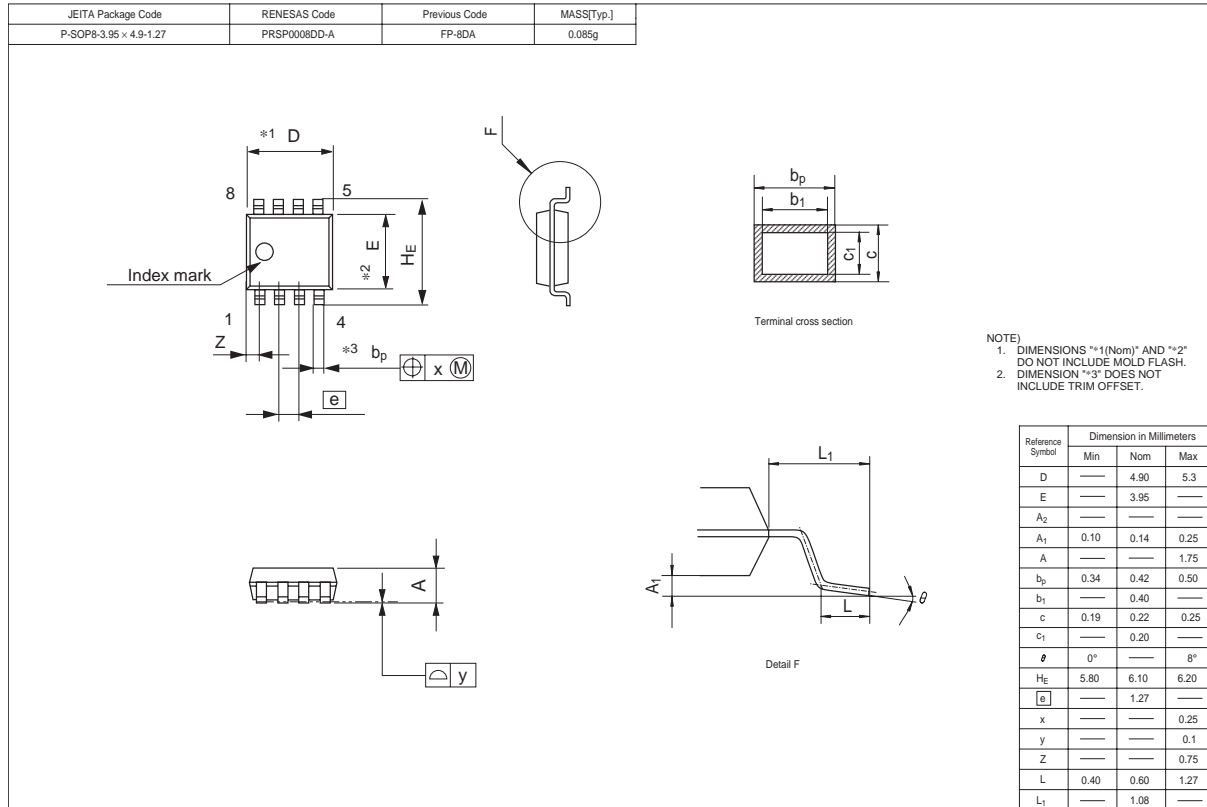


Switching Time Waveform





Package Dimensions



Ordering Information

Part Name	Quantity	Shipping Container
HAT1097R-EL-E	2500 pcs.	Taping
HAT1097RJ-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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**Renesas Technology Taiwan Co., Ltd.**

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**Renesas Technology (Shanghai) Co., Ltd.**

Unit2607 Ruijing Building, No.205 Maoming Road (S), Shanghai 200020, China  
Tel: <86> (21) 6472-1001, Fax: <86> (21) 6415-2952

**Renesas Technology Singapore Pte. Ltd.**

1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632  
Tel: <65> 6213-0200, Fax: <65> 6278-8001

