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April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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HAT1097R, HAT1097RJ

Silicon P Channel Power MOS FET
High Speed Power Switching

REJ03G0529-0100

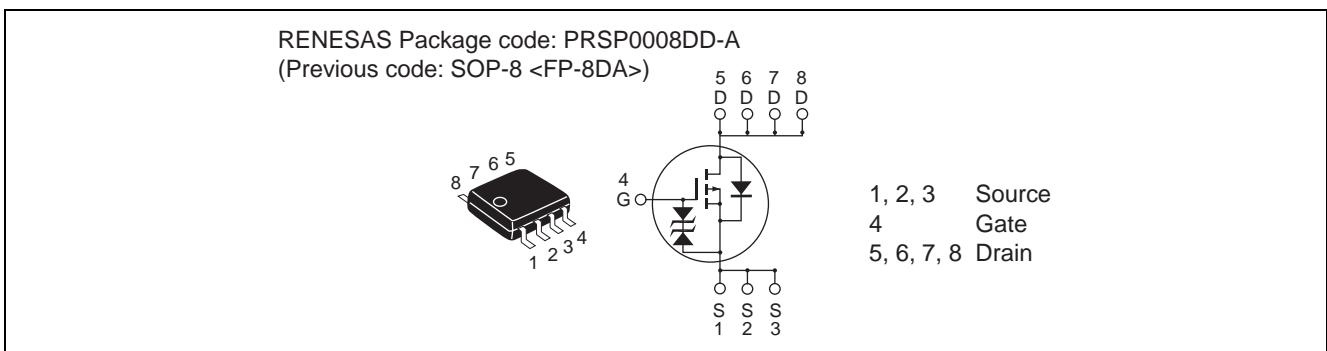
Rev.1.00

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} | ±20 | ±20 | V |
| Drain current | I_D | -5 | -5 | A |
| Drain peak current | I_D (pulse) ^{Note1} | -40 | -40 | A |
| Avalanche current | I_{AP} ^{Note3} | — | -5 | A |
| Avalanche energy | E_{AR} ^{Note3} | — | 2.14 | mJ |
| Channel dissipation | P_{ch} ^{Note2} | 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), $PW \leq 10 s$

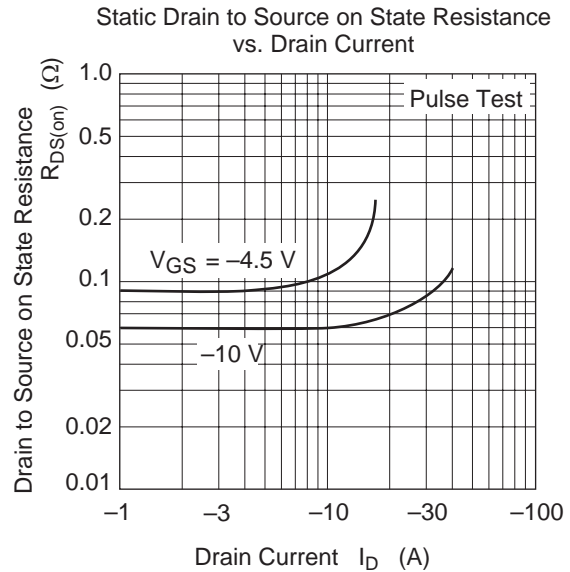
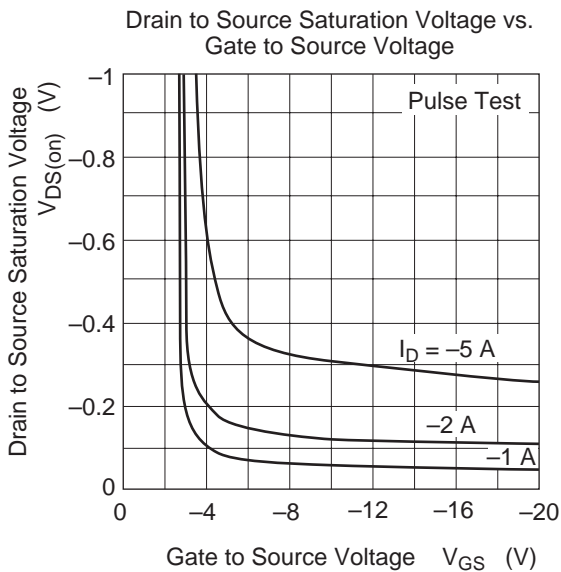
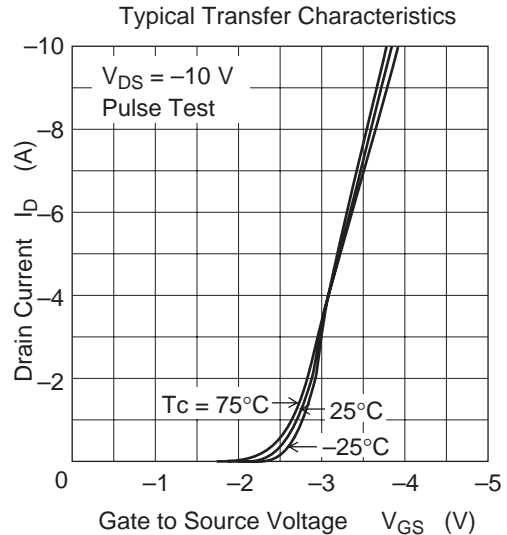
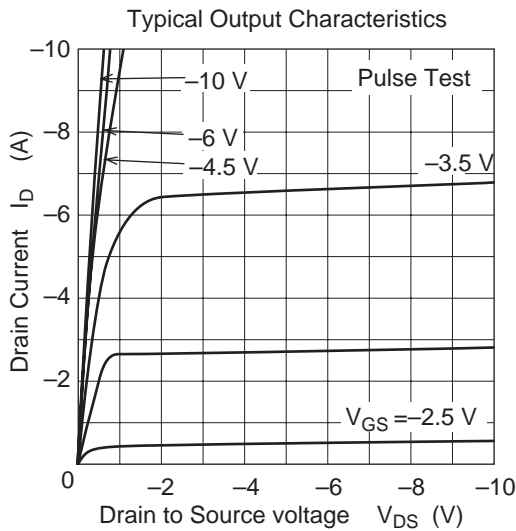
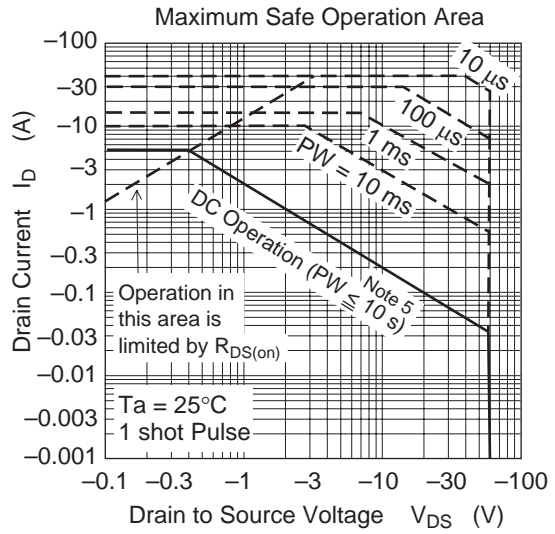
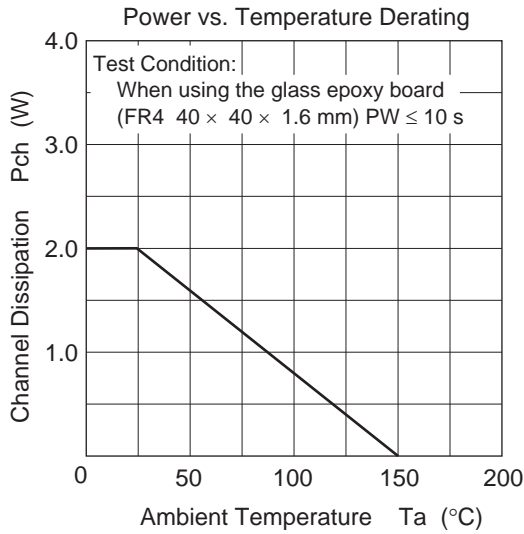
3. Value at Tch = 25°C, $R_g \geq 50 \Omega$

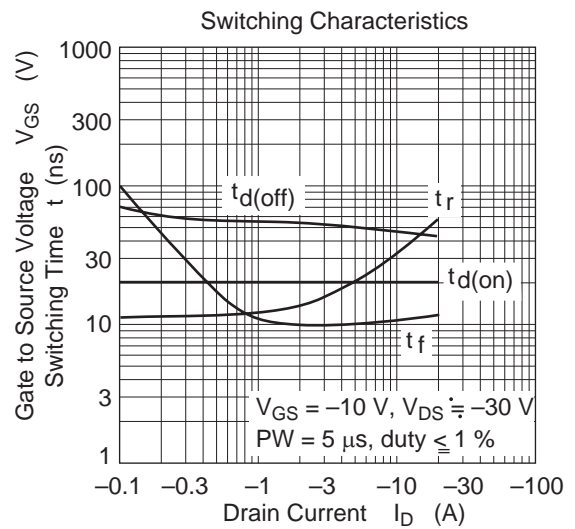
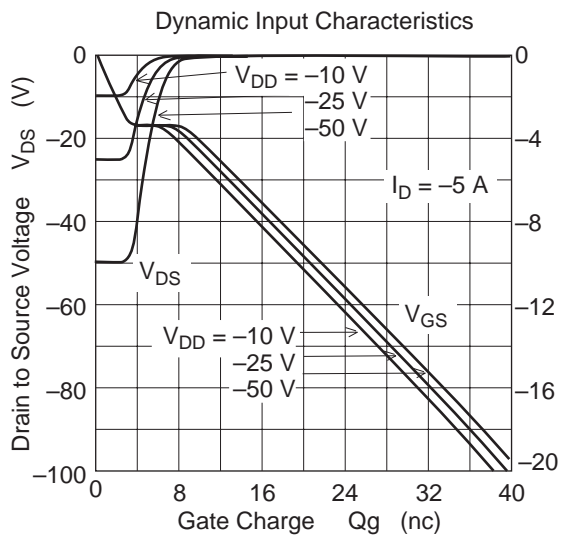
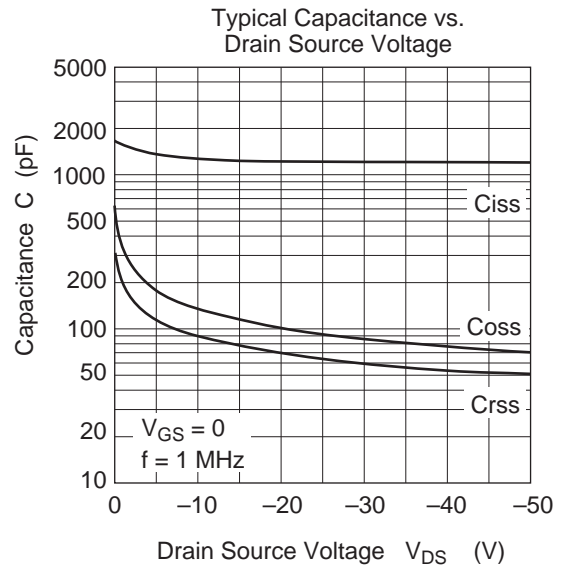
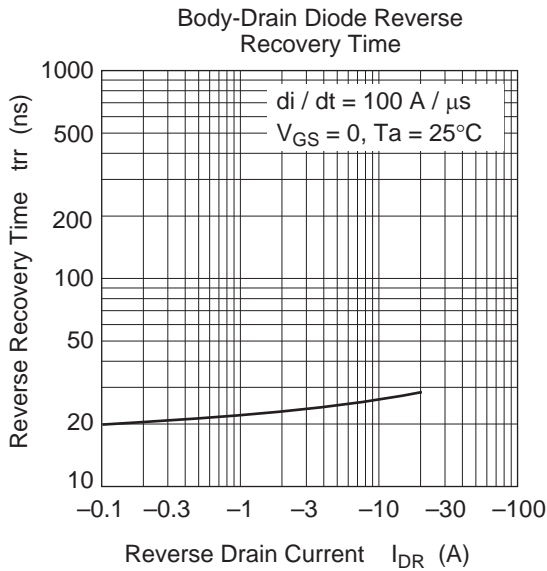
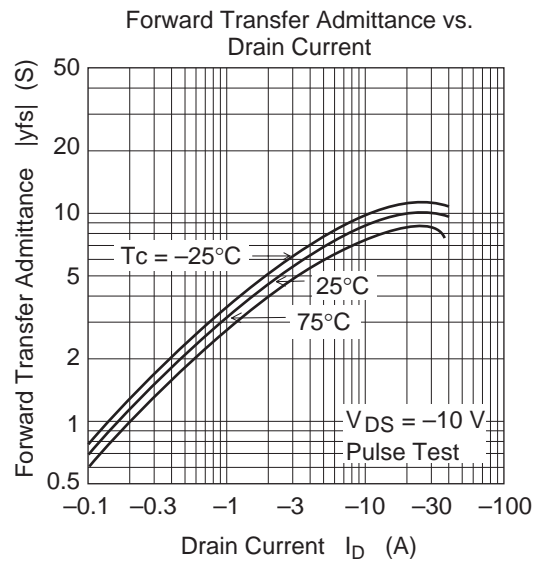
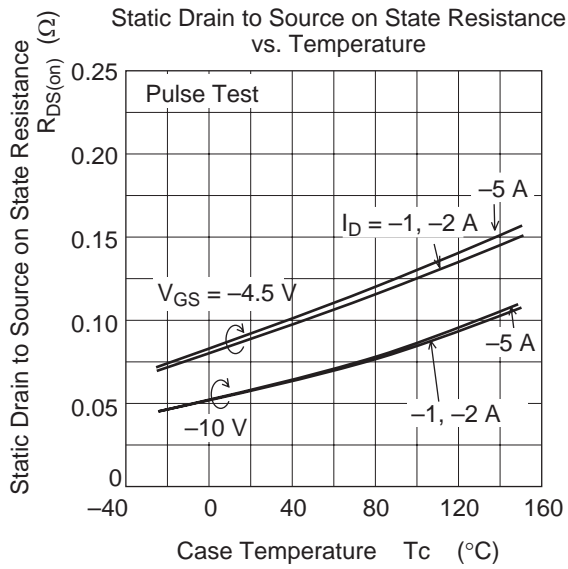
Electrical Characteristics

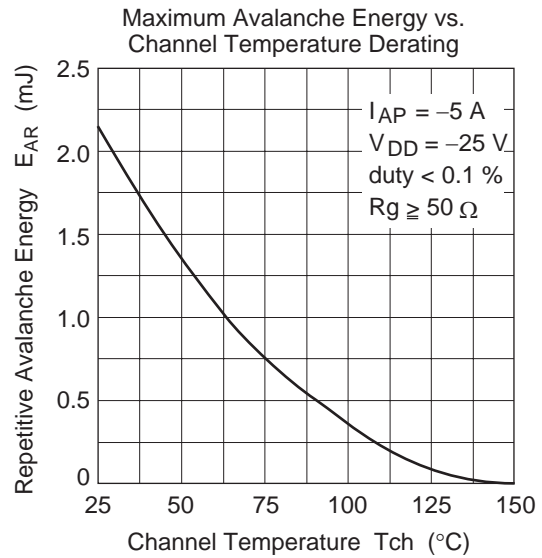
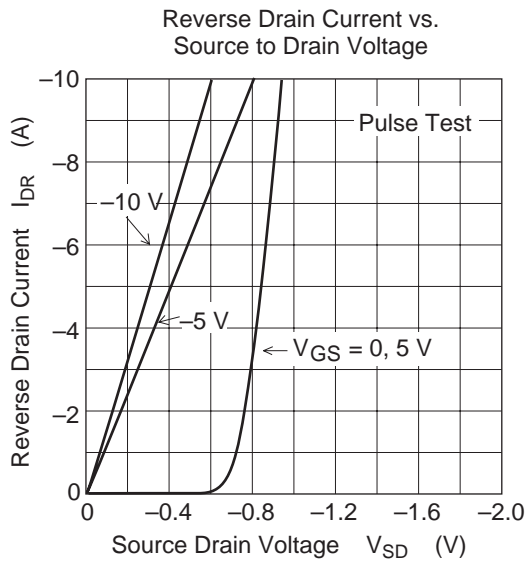
| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|--|---------------|-----------|-------|----------|------------------|---|
| Drain to source breakdown voltage | $V_{(BR)DSS}$ | -60 | — | — | V | $I_D = -10 \text{ mA}$, $V_{GS} = 0$ |
| Gate to Source breakdown voltage | $V_{(BR)GSS}$ | ± 20 | — | — | V | $I_G = \pm 100 \mu\text{A}$, $V_{DS} = 0$ |
| Zero gate voltage drain current | I_{DSS} | — | — | -1 | μA | $V_{DS} = -60 \text{ V}$, $V_{GS} = 0$ |
| Zero gate voltage drain current | HAT1097R | I_{DSS} | — | — | μA | $V_{DS} = -48 \text{ V}$, $V_{GS} = 0$ |
| | HAT1055RJ | I_{DSS} | — | -10 | μA | $T_a = 125^\circ\text{C}$ |
| Gate to source leak current | I_{GSS} | — | — | ± 10 | μA | $V_{GS} = \pm 16 \text{ V}$, $V_{DS} = 0$ |
| 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 | $V_{DS} = -10 \text{ V}$, $V_{GS} = 0$ |
| Output capacitance | C_{oss} | — | 135 | — | pF | $f = 1 \text{ MHz}$ |
| 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 | $I_F = -5 \text{ A}$, $V_{GS} = 0$ $diF/dt = 100 \text{ A}/\mu\text{s}$ |

Notes: 4. Pulse test

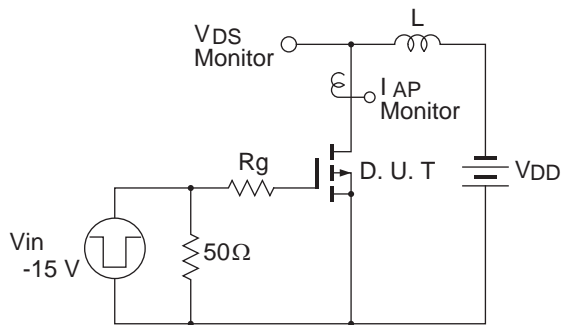
Main Characteristics





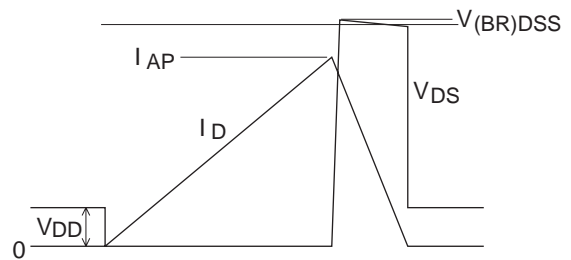


Avalanche Test Circuit

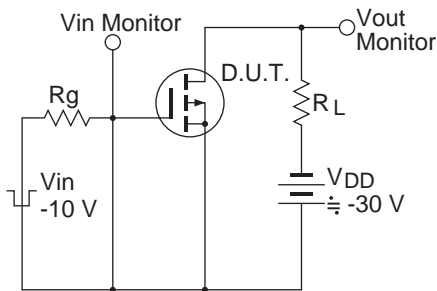


Avalanche Waveform

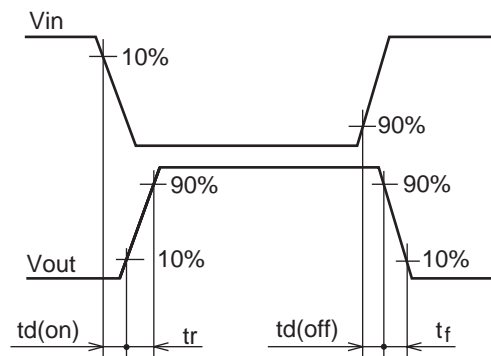
$$E_{AR} = \frac{1}{2} L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$

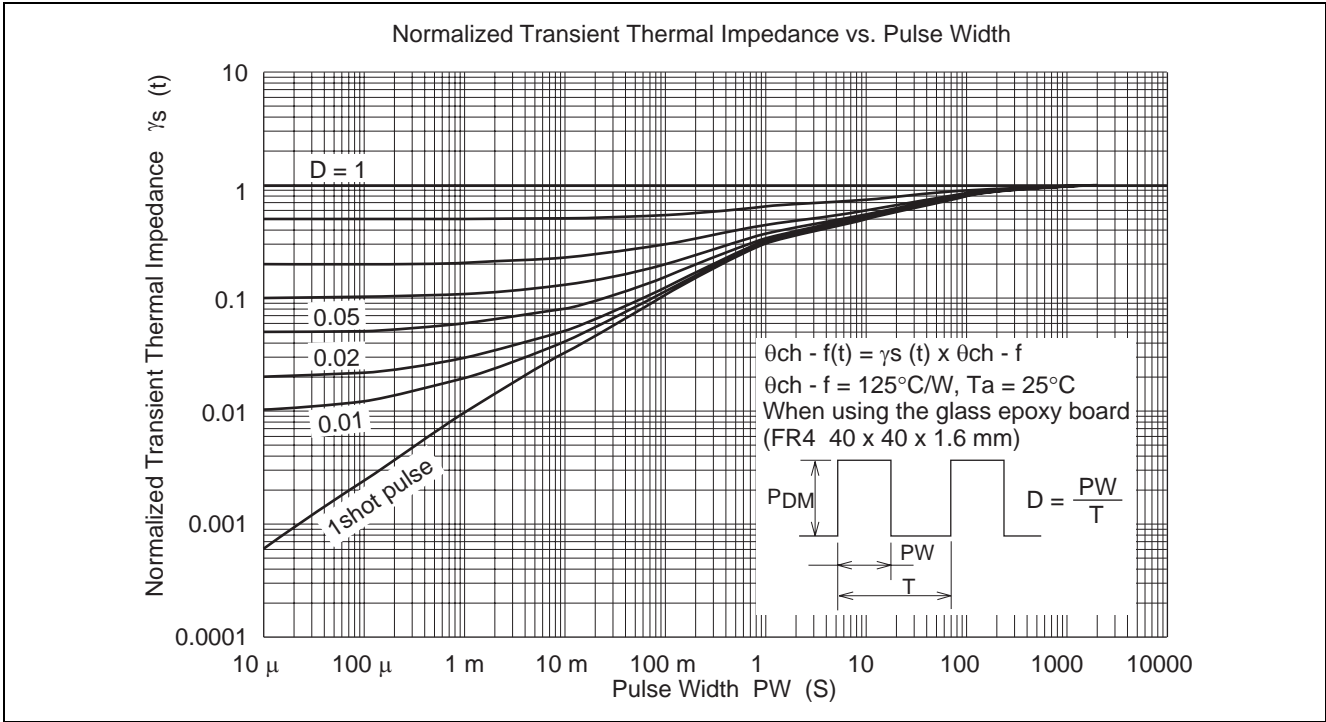


Switching Time Test Circuit

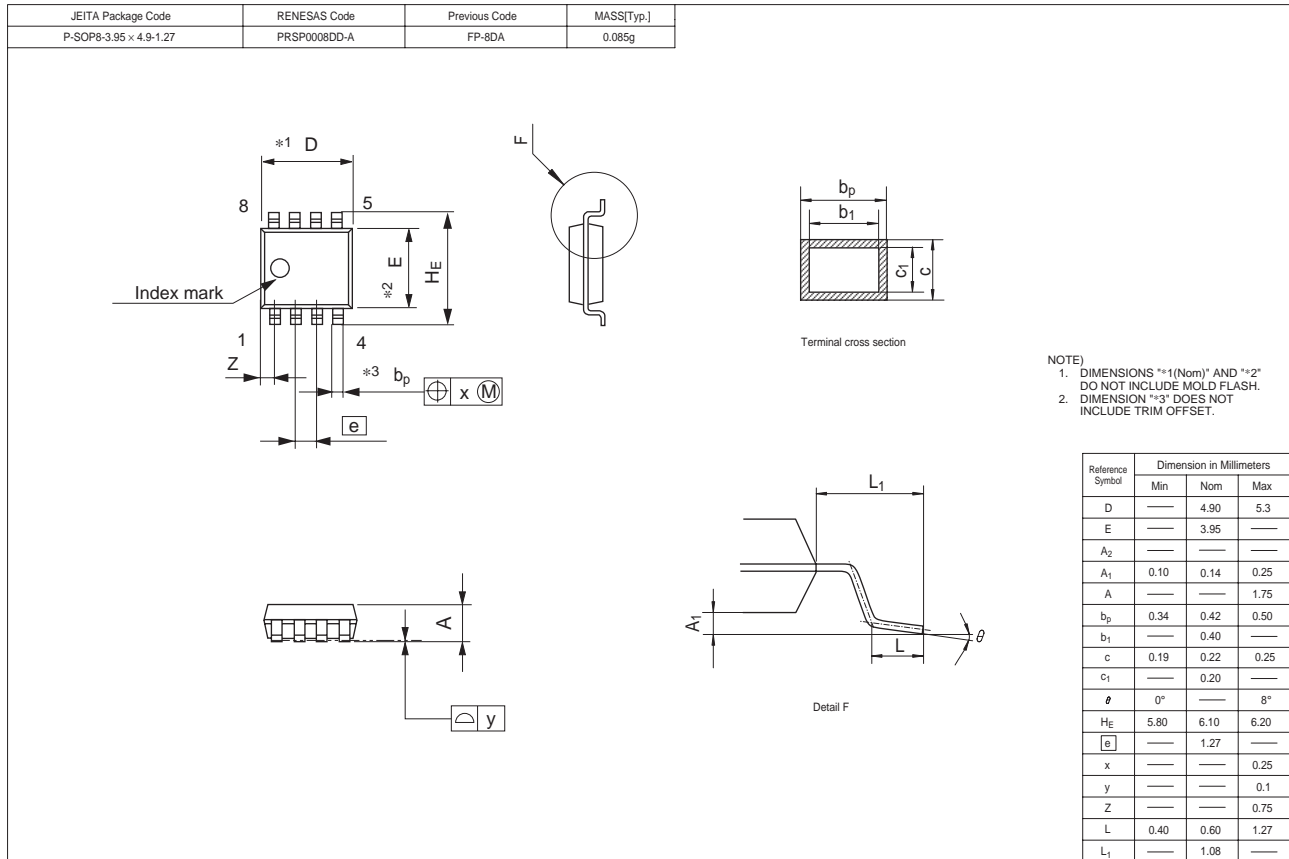


Switching Time Waveform





Package Dimensions



Ordering Information

| Part Name | Quantity | Shipping Container |
|----------------|-----------|--------------------|
| HAT1097R-EL-E | 2500 pcs. | Taping |
| HAT1097RJ-EL-E | 2500 pcs. | Taping |

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