

HAT2038R, HAT2038RJ

Silicon N Channel Power MOS FET
High Speed Power Switching

REJ03G1167-0600

Rev.6.00

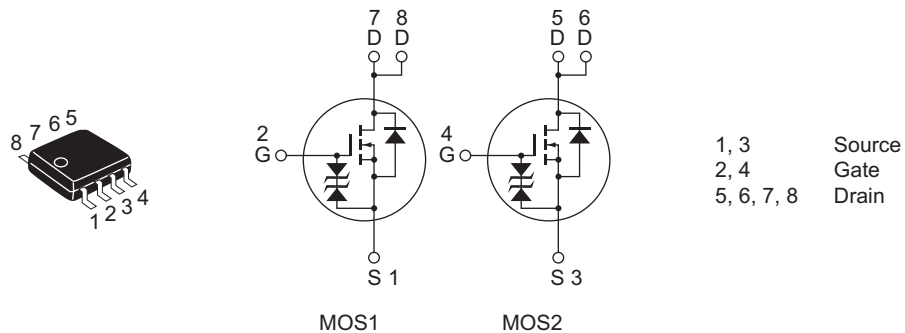
Aug 25, 2009

Features

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

Outline

RENESAS Package code: PRSP0008DD-D
(Package name: SOP-8 <FP-8DAV>)



Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Value	Unit
Drain to source voltage	V_{DSS}	60	V
Gate to source voltage	V_{GSS}	± 20	V
Drain current	I_D	5	A
Drain peak current	$I_{D(pulse)}$ ^{Note 1}	40	A
Body-drain diode reverse drain current	I_{DR}	5	A
Avalanche current	I_{AP} ^{Note 4}	—	—
		5	A
Avalanche energy	E_{AR} ^{Note 4}	—	—
		2.14	mJ
Channel dissipation	P_{ch} ^{Note 2}	2	W
Channel dissipation	P_{ch} ^{Note 3}	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

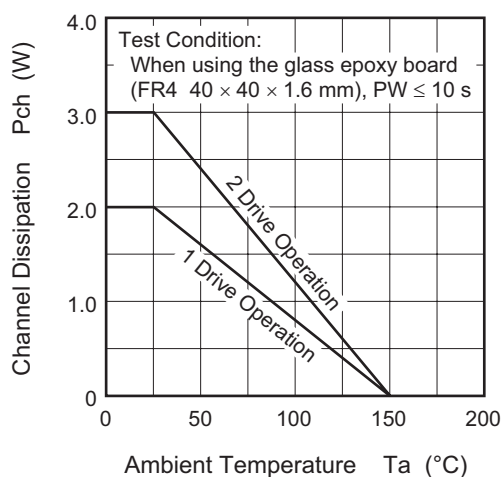
(Ta = 25°C)

Item		Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage		$V_{(BR)DSS}$	60	—	—	V	$I_D = 10 \text{ mA}$, $V_{GS} = 0$
Gate to source breakdown voltage		$V_{(BR)GSS}$	± 20	—	—	V	$I_G = \pm 100 \text{ }\mu\text{A}$, $V_{DS} = 0$
Gate to source leak current		I_{GSS}	—	—	± 10	μA	$V_{GS} = \pm 16 \text{ V}$, $V_{DS} = 0$
Zero gate voltage drain current	HAT2038R	I_{DSS}	—	—	1	μA	$V_{DS} = 60 \text{ V}$, $V_{GS} = 0$
	HAT2038RJ	I_{DSS}	—	—	0.1	μA	
Zero gate voltage drain current	HAT2038R	I_{DSS}	—	—	—	μA	$V_{DS} = 48 \text{ V}$, $V_{GS} = 0$ $T_a = 125^\circ\text{C}$
	HAT2038RJ	I_{DSS}	—	—	10	μA	
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		$R_{DS(on)}$	—	0.043	0.058	Ω	$I_D = 3 \text{ A}$, $V_{GS} = 10 \text{ V}$ ^{Note 5}
		$R_{DS(on)}$	—	0.056	0.084	Ω	$I_D = 3 \text{ A}$, $V_{GS} = 4 \text{ V}$ ^{Note 5}
Forward transfer admittance		$ y_{fs} $	6	9	—	S	$I_D = 3 \text{ A}$, $V_{DS} = 10 \text{ V}$ ^{Note 5}
Input capacitance		C_{iss}	—	520	—	pF	$V_{DS} = 10 \text{ V}$ $V_{GS} = 0$ $f = 1 \text{ MHz}$
Output capacitance		C_{oss}	—	270	—	pF	
Reverse transfer capacitance		C_{rss}	—	100	—	pF	
Turn-on delay time		$t_{d(on)}$	—	11	—	ns	$V_{GS} = 10 \text{ V}$, $I_D = 3 \text{ A}$, $V_{DD} \cong 30 \text{ V}$
Rise time		t_r	—	40	—	ns	
Turn-off delay time		$t_{d(off)}$	—	110	—	ns	
Fall time		t_f	—	80	—	ns	
Body-drain diode forward voltage		V_{DF}	—	0.84	1.1	V	$I_F = 5 \text{ A}$, $V_{GS} = 0$ ^{Note 5}
Body-drain diode reverse recovery time		t_{rr}	—	40	—	ns	$I_F = 5 \text{ A}$, $V_{GS} = 0$ $di_F/dt = 50 \text{ A}/\mu\text{s}$

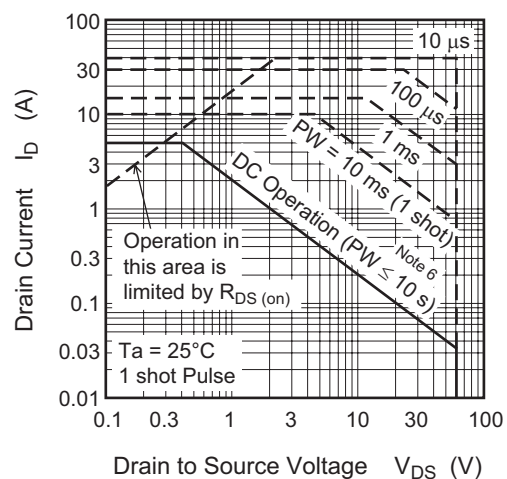
Note: 5. Pulse test

Main Characteristics

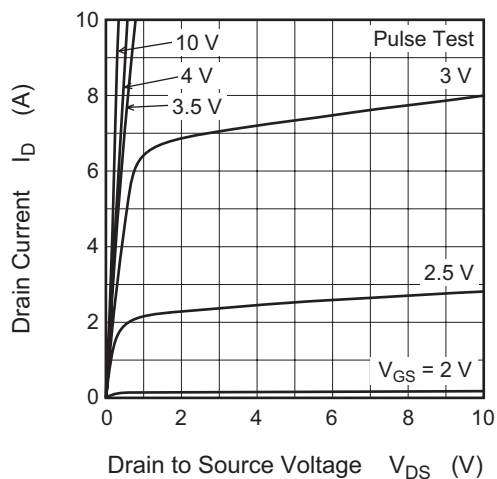
Power vs. Temperature Derating



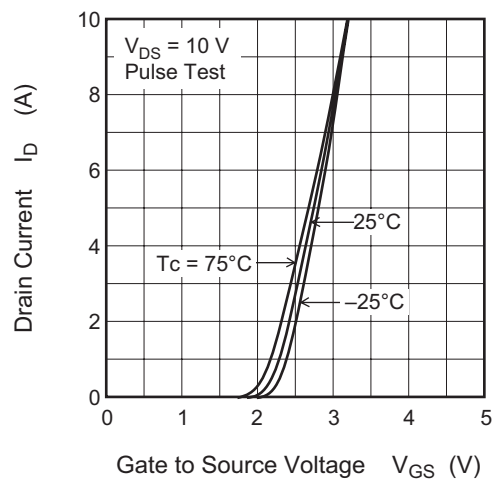
Maximum Safe Operation Area



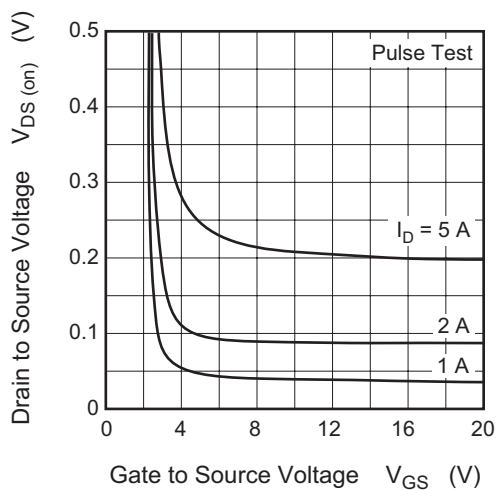
Typical Output Characteristics



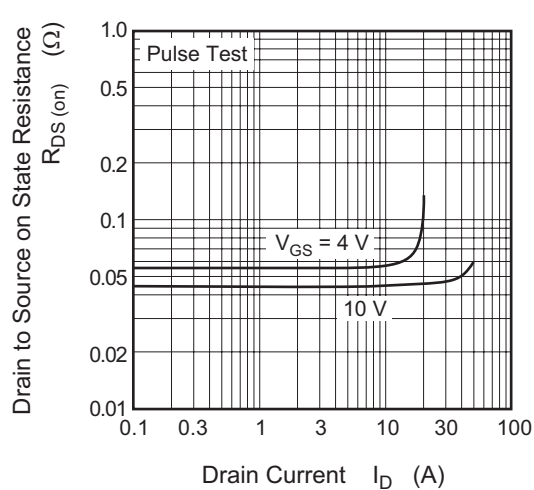
Typical Transfer Characteristics

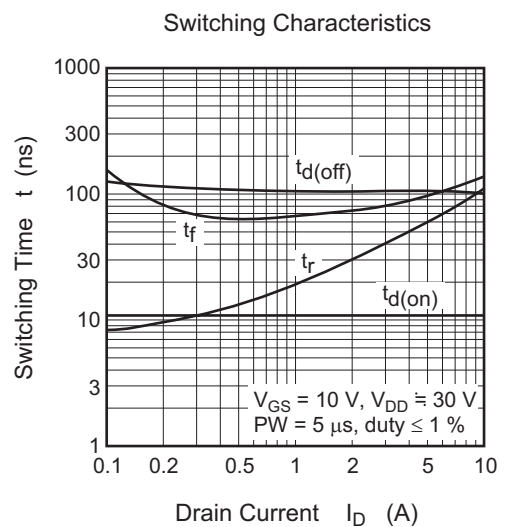
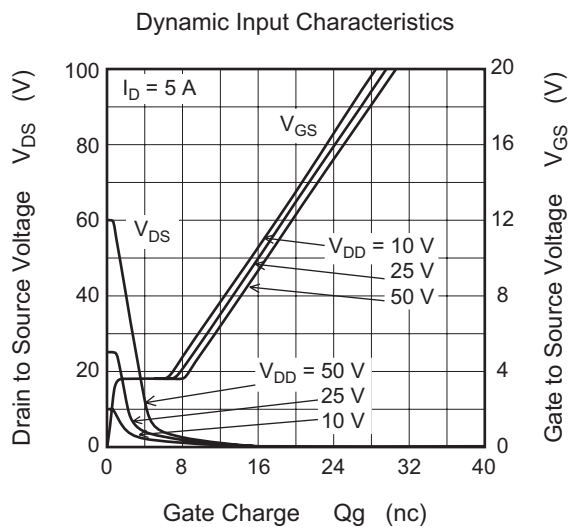
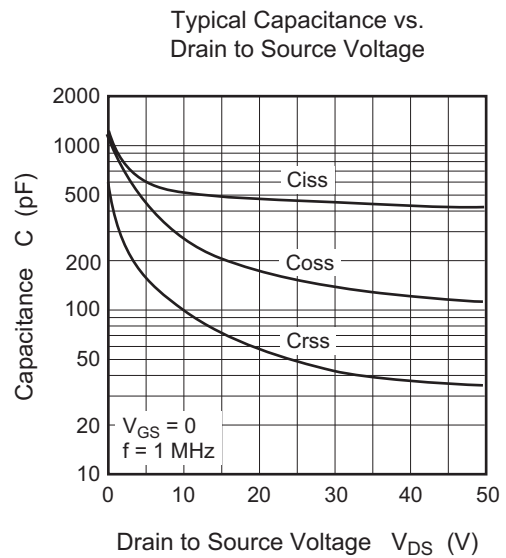
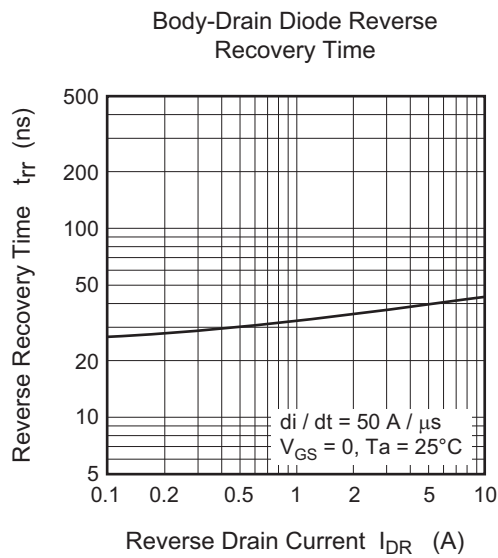
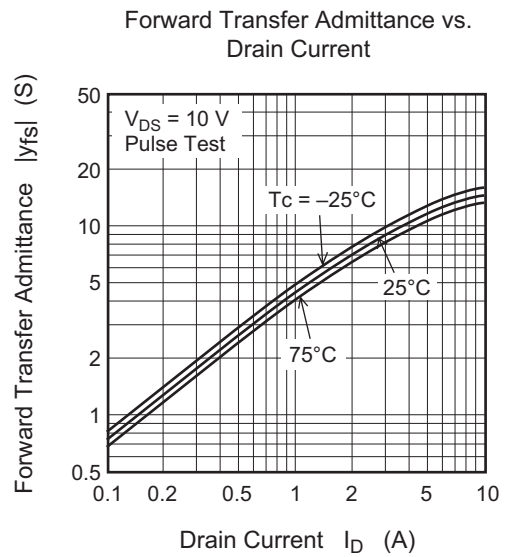
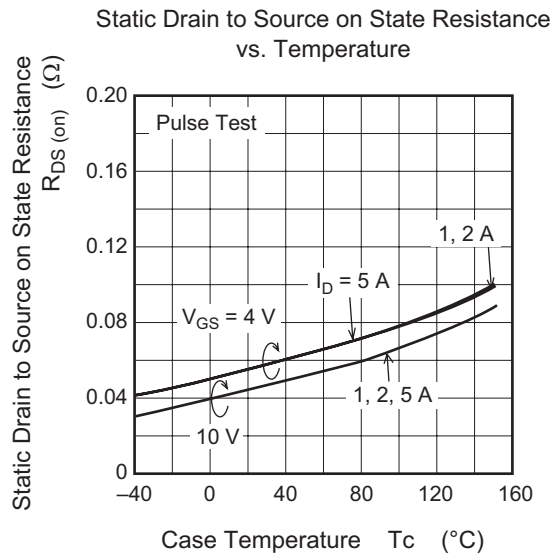


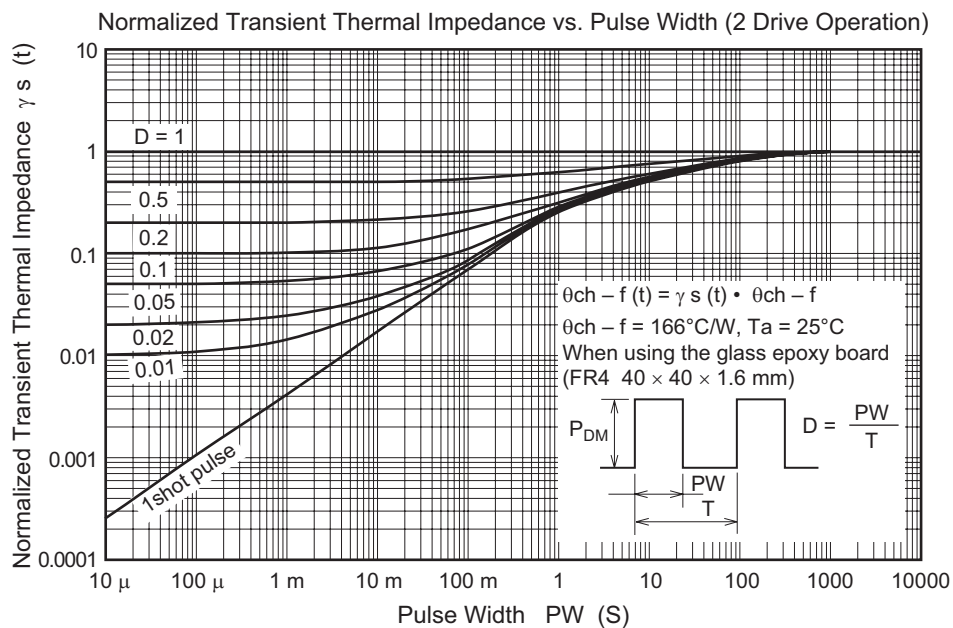
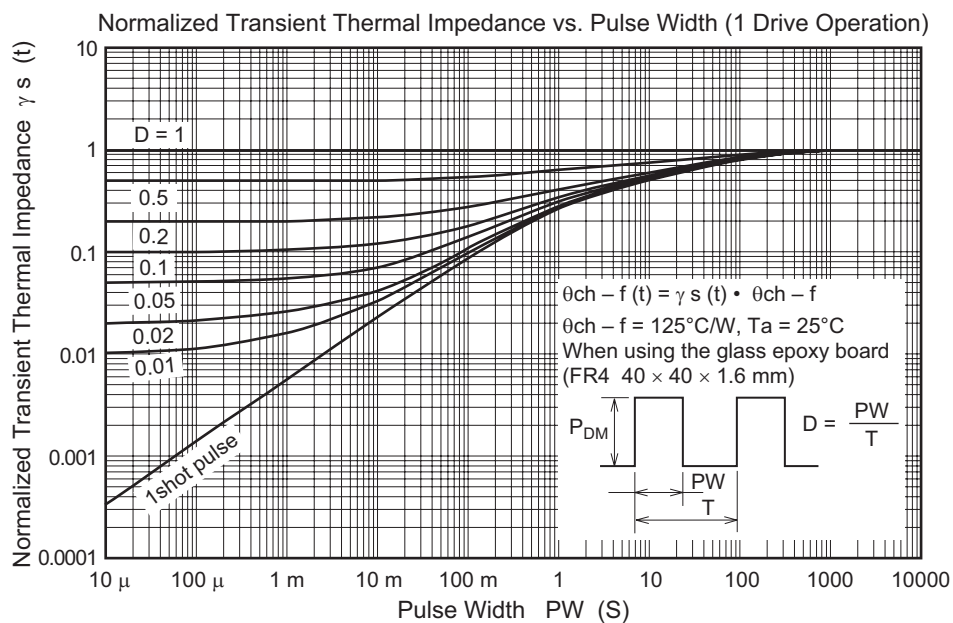
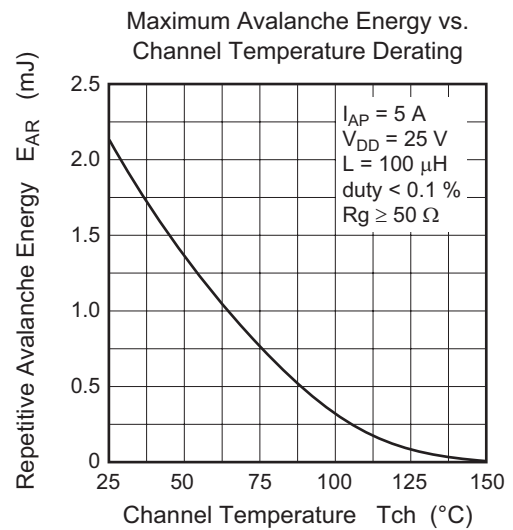
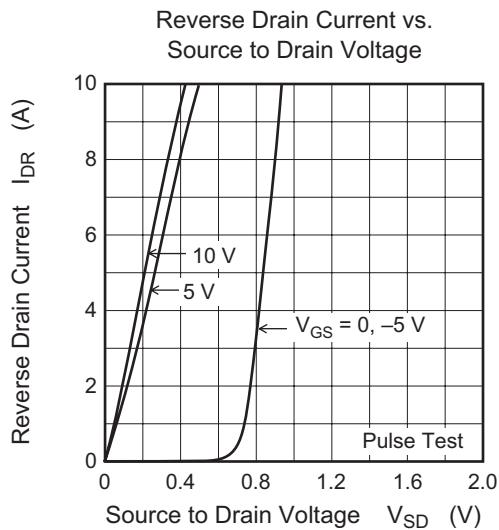
Drain to Source Saturation Voltage vs. Gate to Source Voltage



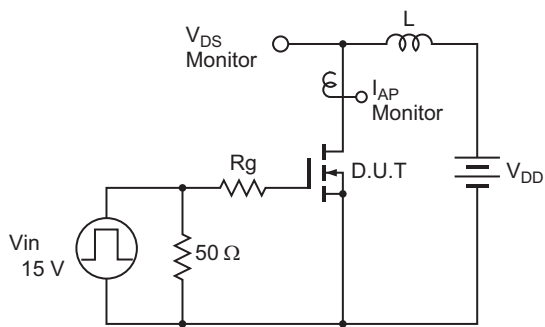
Static Drain to Source on State Resistance vs. Drain Current





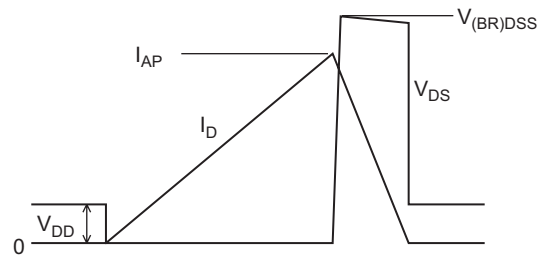


Avalanche Test Circuit

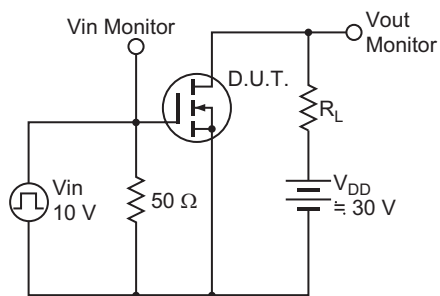


Avalanche Waveform

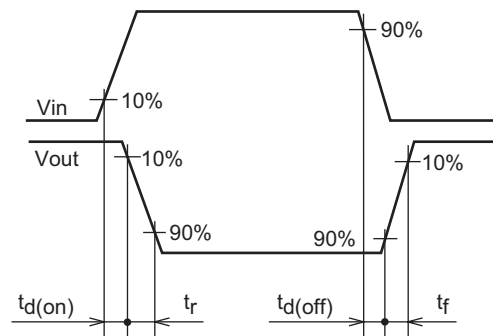
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



Switching Time Test Circuit

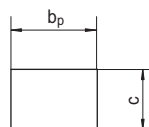
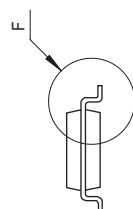
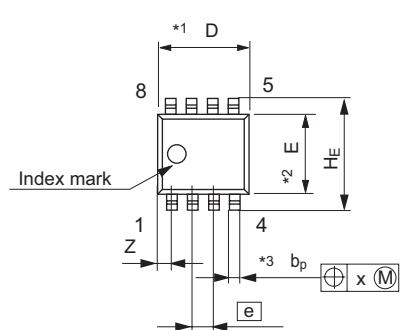


Switching Time Waveform



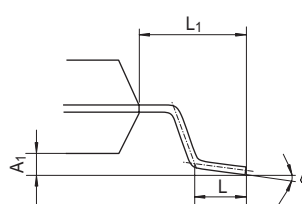
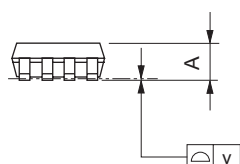
Package Dimensions

Package Name	JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
SOP-8	P-SOP8-3.95 × 4.9-1.27	PRSP0008DD-D	FP-8DAV	0.085g



Terminal cross section
(Ni/Pd/Au plating)

NOTE)
1. DIMENSIONS **1(Nom)" AND "**2"
DO NOT INCLUDE MOLD FLASH.
2. DIMENSION **3" DOES NOT
INCLUDE TRIM OFFSET.



Detail F

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	4.90	5.3
E	—	3.95	—
A ₂	—	—	—
A ₁	0.10	0.14	0.25
A	—	—	1.75
b _p	0.34	0.40	0.46
b ₁	—	—	—
c	0.15	0.20	0.25
c ₁	—	—	—
θ	0°	—	8°
H _E	5.80	6.10	6.20
⓪	—	1.27	—
x	—	—	0.25
y	—	—	0.1
Z	—	—	0.75
L	0.40	0.60	1.27
L ₁	—	1.08	—

Ordering Information

Part Name	Quantity	Shipping Container
HAT2038R-EL-E	2500 pcs	Taping
HAT2038RJ-EL-E	2500 pcs	Taping

Notes:

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