To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

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

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HAT2038R, HAT2038RJ

Silicon N Channel Power MOS FET
High Speed Power Switching

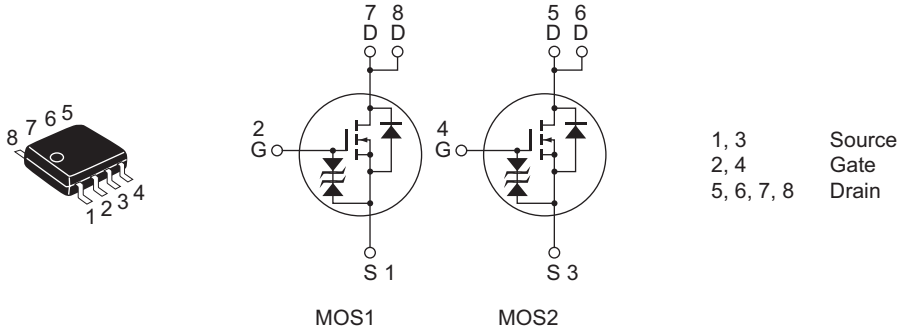
REJ03G1167-0600
Rev.6.00
Aug 25, 2009

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	HAT2038R	I_{AP} Note 4	—	—
	HAT2038RJ		5	A
Avalanche energy	HAT2038R	E_{AR} Note 4	—	—
	HAT2038RJ		2.14	mJ
Channel dissipation		Pch Note 2	2	W
Channel dissipation		Pch Note 3	3	W
Channel temperature		Tch	150	°C
Storage temperature		Tstg	–55 to +150	°C

Notes: 1. PW ≤ 10 μs, duty cycle ≤ 1%
2. 1 Drive operation: When using the glass epoxy board (FR4 40 × 40 × 1.6 mm), PW ≤ 10 s
3. 2 Drive operation: When using the glass epoxy board (FR4 40 × 40 × 1.6 mm), PW ≤ 10 s
4. Value at Tch = 25°C, Rg ≥ 50 Ω

Electrical Characteristics

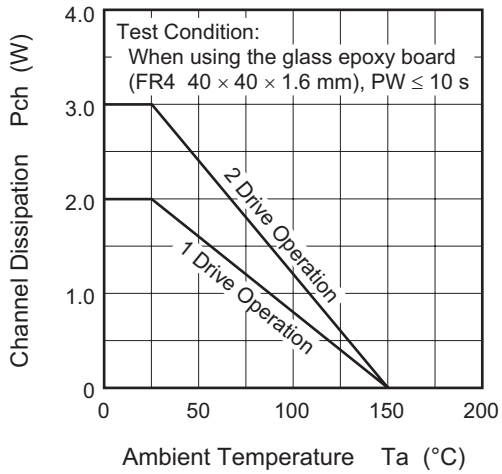
(Ta = 25°C)

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 breakdown voltage		$V_{(BR)\ GSS}$	±20	—	—	V	I_G = ±100 μA, V_{DS} = 0
Gate to source leak current		I_{GSS}	—	—	±10	μA	V_{GS} = ±16 V, V_{DS} = 0
Zero gate voltage drain current	HAT2038R	I_{DSS}	—	—	1	μA	V_{DS} = 60 V, V_{GS} = 0
	HAT2038RJ	I_{DSS}	—	—	0.1	μA	
Zero gate voltage drain current	HAT2038R	I_{DSS}	—	—	—	μA	V_{DS} = 48 V, V_{GS} = 0 Ta = 125°C
	HAT2038RJ	I_{DSS}	—	—	10	μA	
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		$R_{DS\ (on)}$	—	0.043	0.058	Ω	I_D = 3 A, V_{GS} = 10 V Note 5
		$R_{DS\ (on)}$	—	0.056	0.084	Ω	I_D = 3 A, V_{GS} = 4 V Note 5
Forward transfer admittance		$\|y_{fs}\|$	6	9	—	S	I_D = 3 A, V_{DS} = 10 V Note 5
Input capacitance		Ciss	—	520	—	pF	V_{DS} = 10 V V_{GS} = 0 f = 1 MHz
Output capacitance		Coss	—	270	—	pF	
Reverse transfer capacitance		Crss	—	100	—	pF	
Turn-on delay time		$t_{d\ (on)}$	—	11	—	ns	V_{GS} = 10 V, I_D = 3 A, V_{DD} ≅ 30 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 A, V_{GS} = 0 Note 5
Body-drain diode reverse recovery time		t_{rr}	—	40	—	ns	I_F = 5 A, V_{GS} = 0 di_F/dt = 50 A/μs

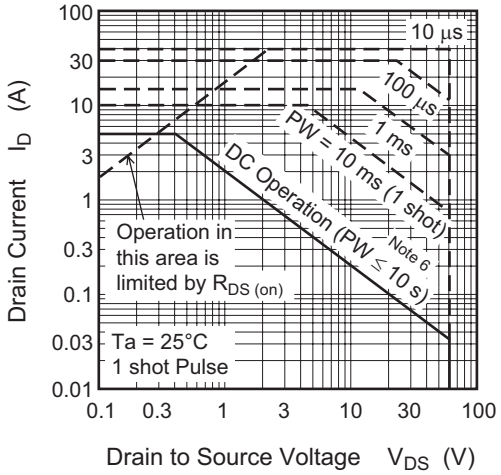
Note: 5. Pulse test

Main Characteristics

Power vs. Temperature Derating

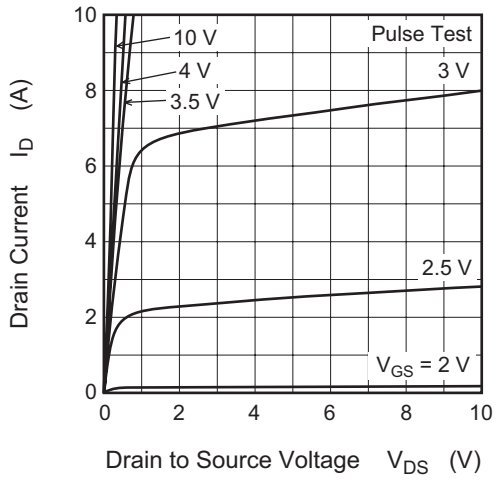


Maximum Safe Operation Area

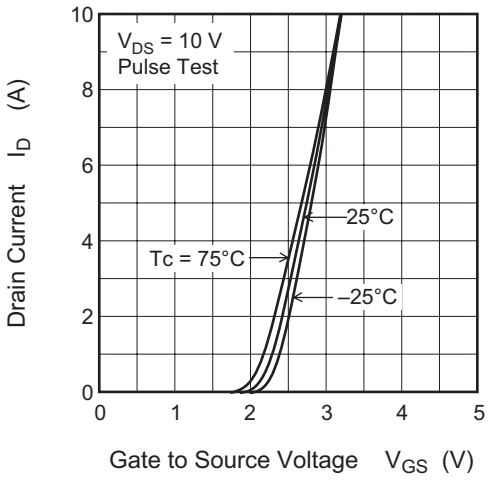


Note 6:
When using the glass epoxy board
(FR4 40 × 40 × 1.6 mm)

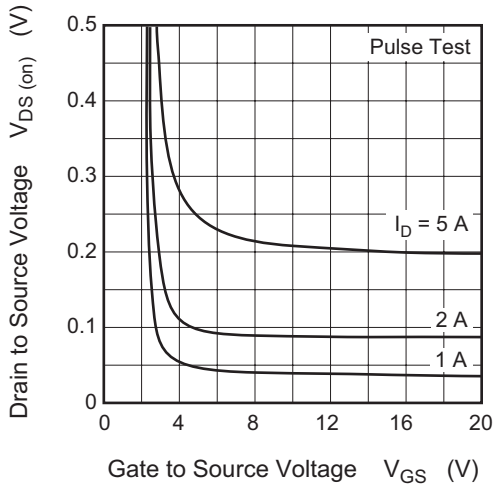
Typical Output Characteristics



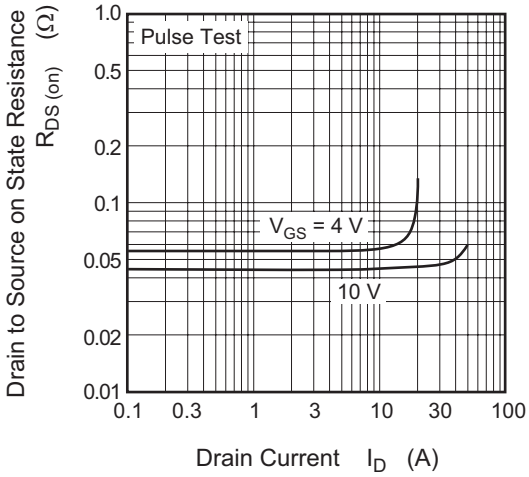
Typical Transfer Characteristics



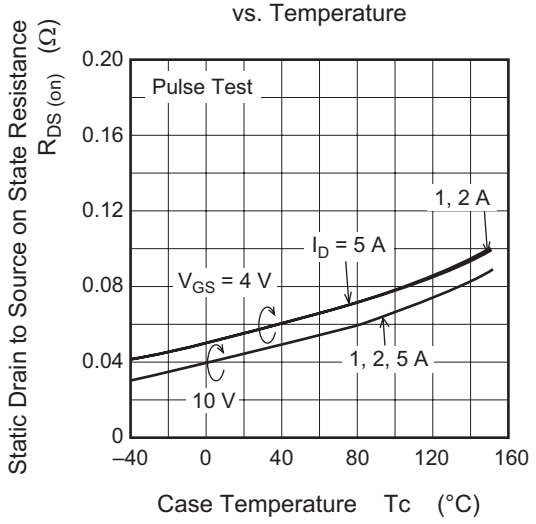
Drain to Source Saturation Voltage vs.
Gate to Source Voltage



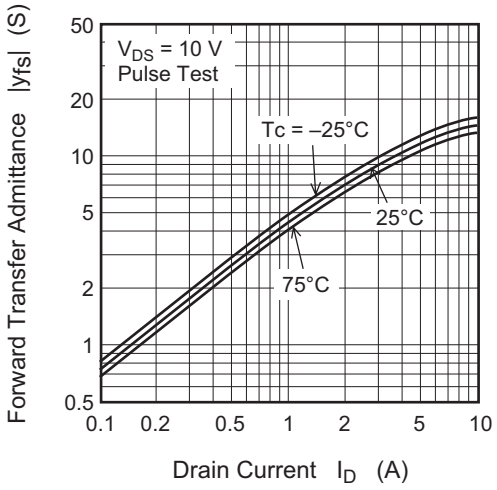
Static Drain to Source on State Resistance
vs. Drain Current



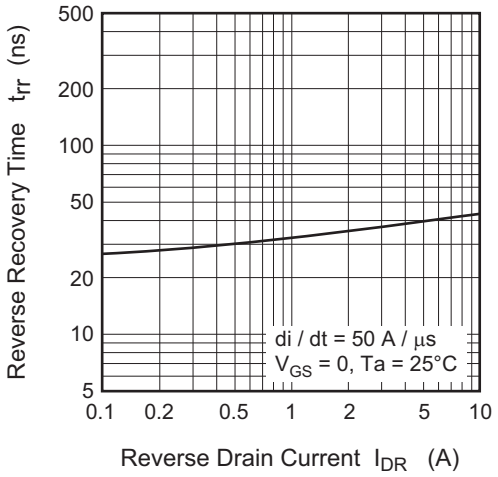
Static Drain to Source on State Resistance vs. Temperature



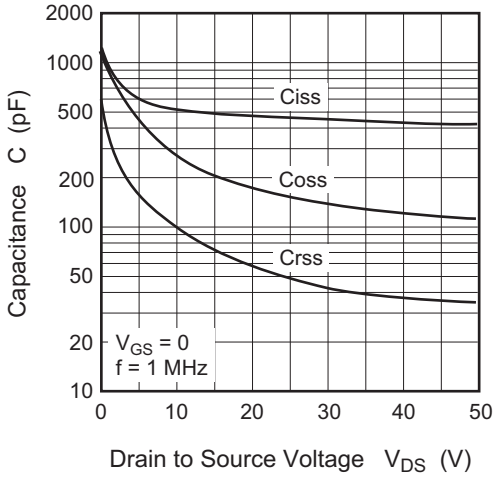
Forward Transfer Admittance vs. Drain Current



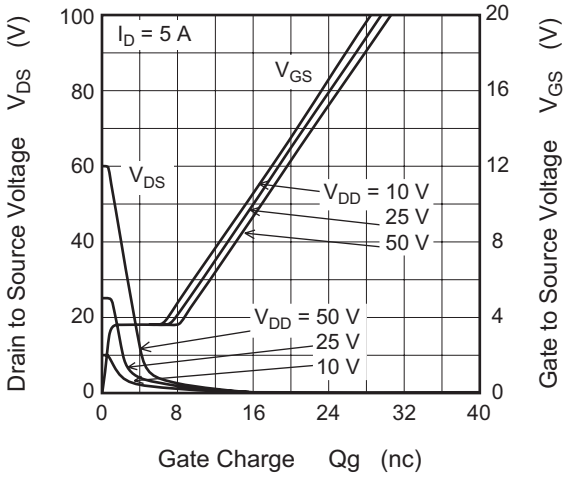
Body-Drain Diode Reverse Recovery Time



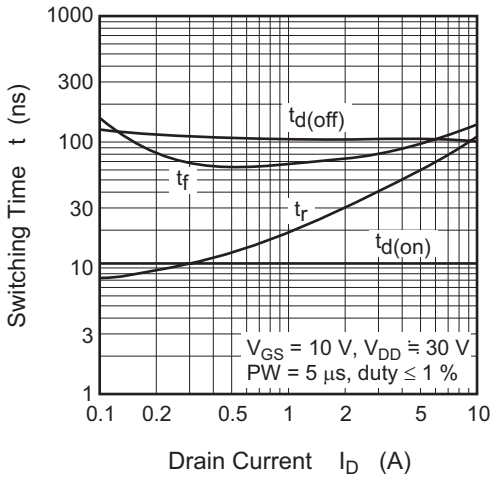
Typical Capacitance vs. Drain to Source Voltage



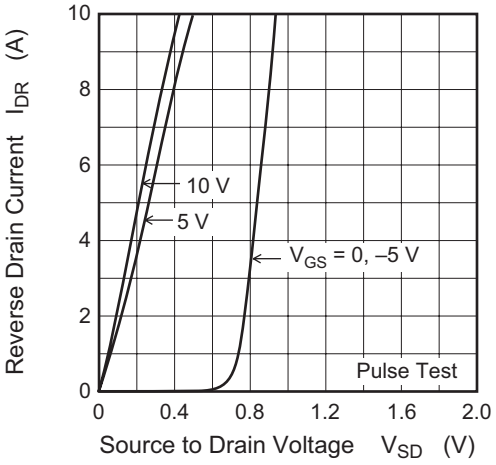
Dynamic Input Characteristics



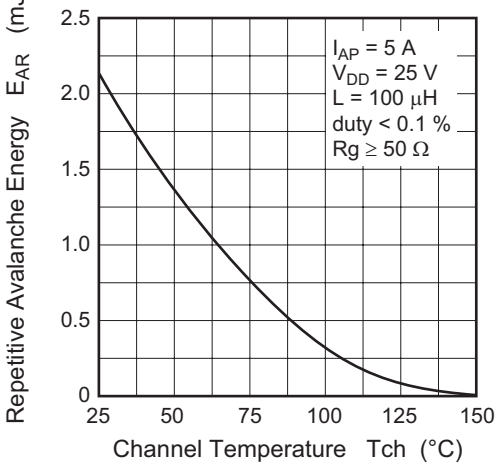
Switching Characteristics



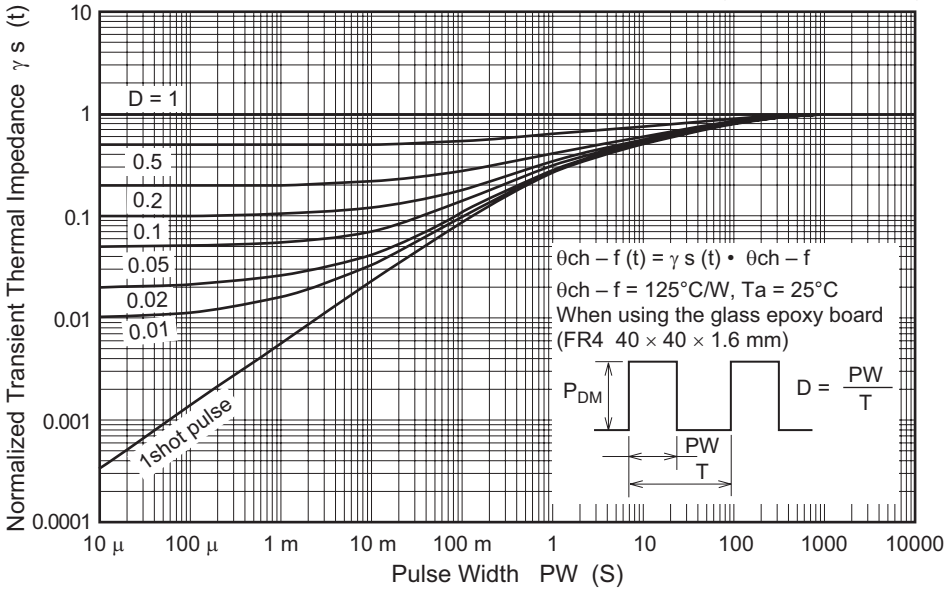
Reverse Drain Current vs. Source to Drain Voltage



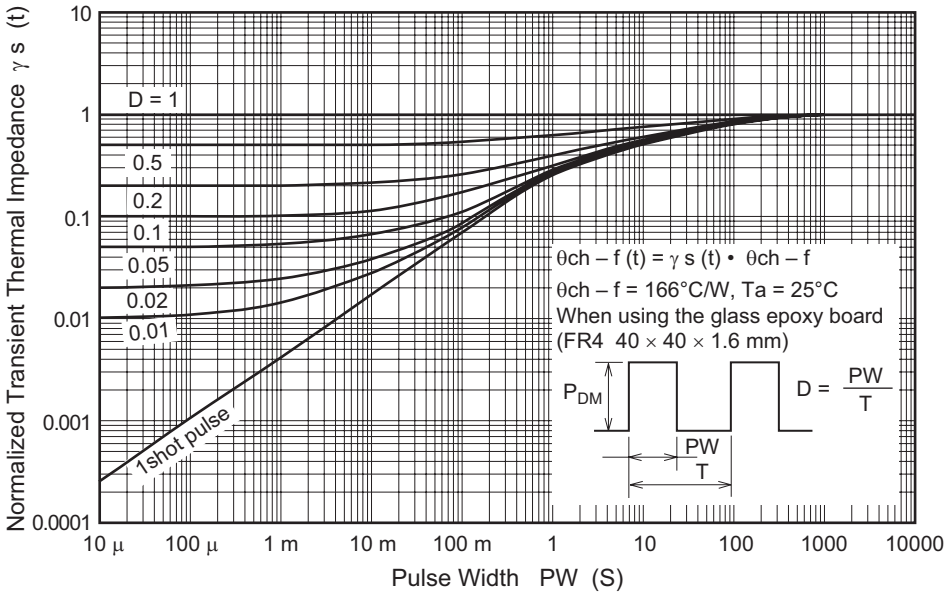
Maximum Avalanche Energy vs. Channel Temperature Derating



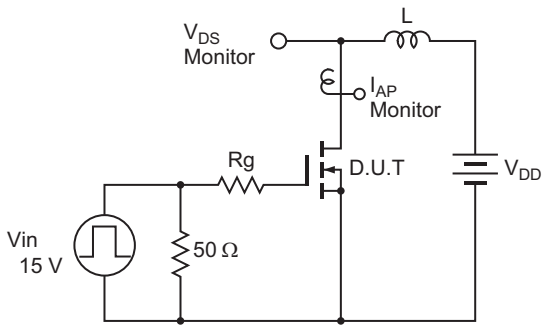
Normalized Transient Thermal Impedance vs. Pulse Width (1 Drive Operation)



Normalized Transient Thermal Impedance vs. Pulse Width (2 Drive Operation)

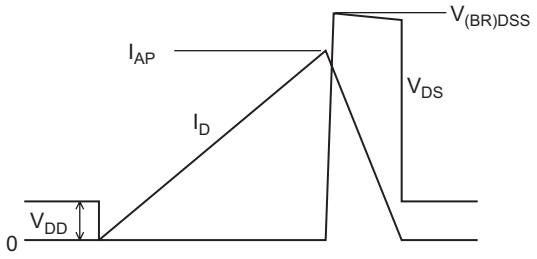


Avalanche Test Circuit

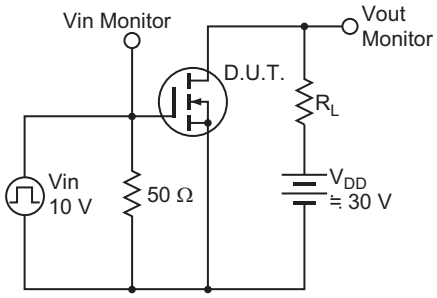


Avalanche Waveform

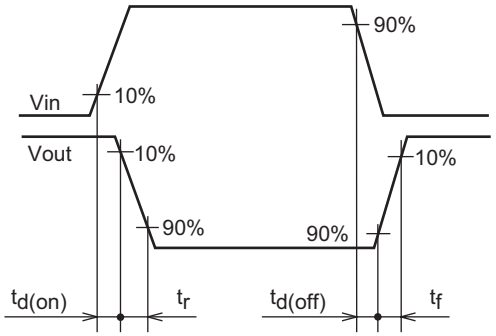
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



Switching Time Test Circuit

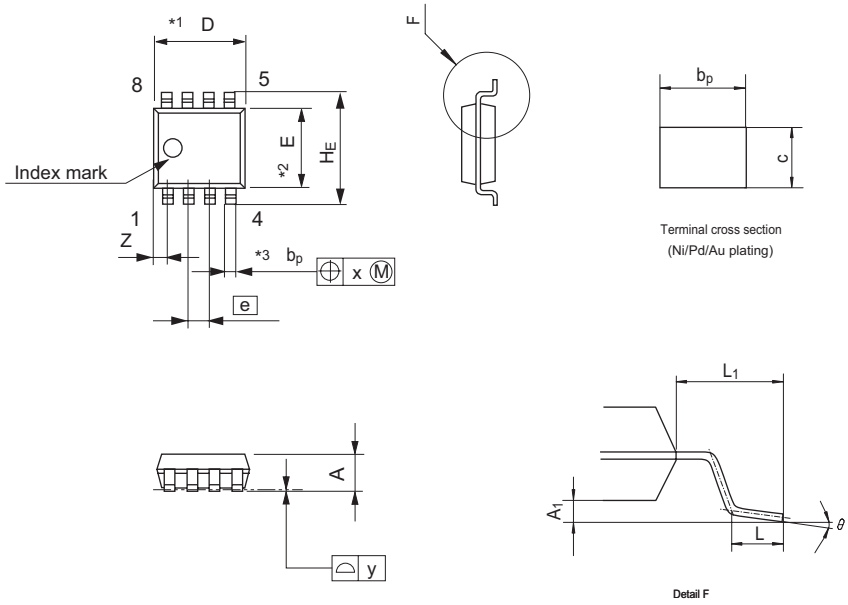


Switching Time Waveform



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



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

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
e	—	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

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