

HAF2015RJ

Silicon N Channel MOS FET Series Power Switching

REJ03G1141-0300

Rev.3.00

Aug 27, 2007

Description

This FET has the over temperature shut-down capability sensing to the junction temperature.

This FET has the built-in over temperature shut-down circuit in the gate area. And this circuit operation to shut-down the gate voltage in case of high junction temperature like applying over power consumption, over current etc.

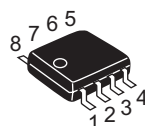
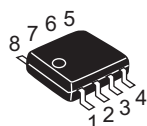
Features

- Logic level operation (5 to 6 V Gate drive)
- High endurance capability against to the short circuit
- Built-in the over temperature shut-down circuit
- Temperature hysteresis type.
- High density mounting.

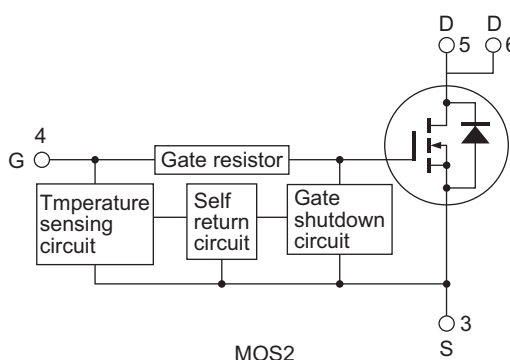
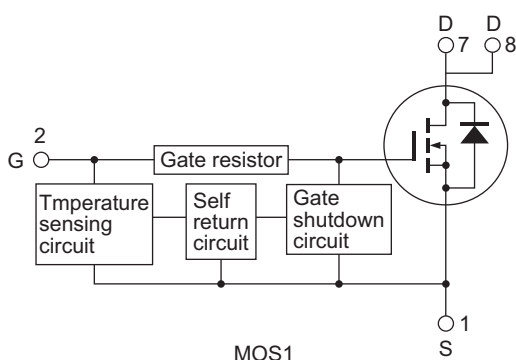
Outline

RENESAS Package code: PRSP0008DD-A
(Package name: SOP-8 <FP-8DA>)

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



1, 3 Source
2, 4 Gate
5, 6, 7, 8 Drain



Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Value	Unit
Drain to source voltage	V _{DSS}	60	V
Gate to source voltage	V _{GSS}	16	V
	V _{GSS}	-2.5	V
Drain current	I _D	2	A
Drain peak current	I _{D (pulse)} ^{Note 1}	4	A
Body-drain diode reverse drain current	I _{DR}	2	A
Avalanche current	I _{AP} ^{Note 4}	0.54	A
Avalanche energy	E _{AR} ^{Note 4}	25	mJ
Channel dissipation	P _{ch} ^{Note 2}	2	W
Channel dissipation	P _{ch} ^{Note 3}	1.5	W
Channel temperature	T _{ch}	150	°C
Storage temperature	T _{stg}	-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. T_{ch} = 25°C, R_g > 50 Ω

Typical Operation Characteristics

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input voltage	V _{IH}	3.5	—	—	V	
	V _{IL}	—	—	1.2	V	
Input current (Gate non shut down)	I _{IH1}	—	—	100	μA	V _i = 5 V, V _{DS} = 0
	I _{IH2}	—	—	50	μA	V _i = 3.5 V, V _{DS} = 0
	I _{IL}	—	—	1	μA	V _i = 1.2 V, V _{DS} = 0
Input current (Gate shut down)	I _{IH (sd) 1}	—	0.53	—	mA	V _i = 8 V, V _{DS} = 0
	I _{IH (sd) 2}	—	0.2	—	mA	V _i = 3.5 V, V _{DS} = 0
Shut down temperature	T _{sd}	—	175	—	°C	Channel temperature
Hysteresis temperature	T _{hr}	—	120	—	°C	Channel temperature
Gate operation voltage	V _{OP}	3.5	—	12	V	

Electrical Characteristics

(Ta = 25°C)

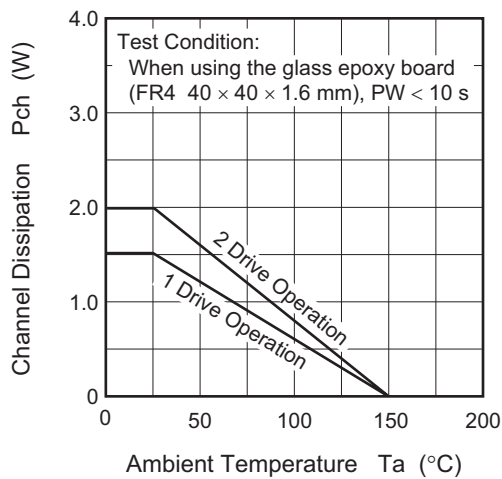
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I_{D1}	0.7	—	—	A	$V_{GS} = 3.5 \text{ V}$, $V_{DS} = 2 \text{ V}$
	I_{D2}	—	—	10	mA	$V_{GS} = 1.2 \text{ V}$, $V_{DS} = 2 \text{ V}$
Drain to source breakdown voltage	$V_{(BR) DSS}$	60	—	—	V	$I_D = 10 \text{ mA}$, $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR) GSS}$	16	—	—	V	$I_G = 500 \mu\text{A}$, $V_{DS} = 0$
	$V_{(BR) GSS}$	-2.5	—	—	V	$I_G = -100 \mu\text{A}$, $V_{DS} = 0$
Gate to source leak current	I_{GSS1}	—	—	100	μA	$V_{GS} = 5 \text{ V}$, $V_{DS} = 0$
	I_{GSS2}	—	—	50	μA	$V_{GS} = 3.5 \text{ V}$, $V_{DS} = 0$
	I_{GSS3}	—	—	1	μA	$V_{GS} = 1.2 \text{ V}$, $V_{DS} = 0$
	I_{GSS4}	—	—	-100	μA	$V_{GS} = -2.4 \text{ V}$, $V_{DS} = 0$
Input current (shut down)	$I_{GS (op) 1}$	—	0.53	—	mA	$V_{GS} = 8 \text{ V}$, $V_{DS} = 0$
	$I_{GS (op) 2}$	—	0.2	—	mA	$V_{GS} = 3.5 \text{ V}$, $V_{DS} = 0$
Zero gate voltage drain current	I_{DSS1}	—	—	10	μA	$V_{DS} = 60 \text{ V}$, $V_{GS} = 0$
	I_{DSS2}	—	—	10	μA	$V_{DS} = 48 \text{ V}$, $V_{GS} = 0$ $T_a = 125^\circ\text{C}$
Gate to source cutoff voltage	$V_{GS (off)}$	1.4	—	2.5	V	$I_D = 1 \text{ mA}$, $V_{DS} = 10 \text{ V}$
Static drain to source on state resistance	$R_{DS (on)}$	—	130	200	m Ω	$I_D = 1 \text{ A}$, $V_{GS} = 5 \text{ V}$ ^{Note 5}
	$R_{DS (on)}$	—	110	160	m Ω	$I_D = 1 \text{ A}$, $V_{GS} = 10 \text{ V}$ ^{Note 5}
Forward transfer admittance	$ y_{fs} $	0.5	2.5	—	S	$I_D = 1 \text{ A}$, $V_{DS} = 10 \text{ V}$ ^{Note 5}
Output capacitance	C_{OSS}	—	139	—	pF	$V_{DS} = 10 \text{ V}$, $V_{GS} = 0$ $f = 1 \text{ MHz}$
Turn-on delay time	$t_{d (on)}$	—	4.2	—	μs	$I_D = 1 \text{ A}$ $V_{GS} = 5 \text{ V}$ $R_L = 30 \Omega$
Rise time	t_r	—	20	—	μs	
Turn-off delay time	$t_{d (off)}$	—	1	—	μs	
Fall time	t_f	—	1	—	μs	
Body-drain diode forward voltage	V_{DF}	—	0.82	—	V	$I_F = 2 \text{ A}$, $V_{GS} = 0$
Body-drain diode reverse recovery time	t_{rr}	—	55	—	ns	$I_F = 2 \text{ A}$, $V_{GS} = 0$ $di_F/dt = 50 \text{ A}/\mu\text{s}$
Over load shut down operation time ^{Note 6}	t_{os1}	—	15	—	ms	$V_{GS} = 5 \text{ V}$, $V_{DD} = 16 \text{ V}$

Notes: 5. Pulse test

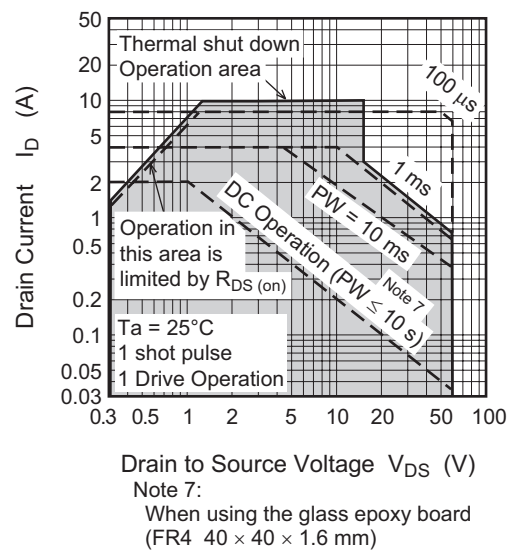
6. Including the junction temperature rise of the over loaded condition.

Main Characteristics

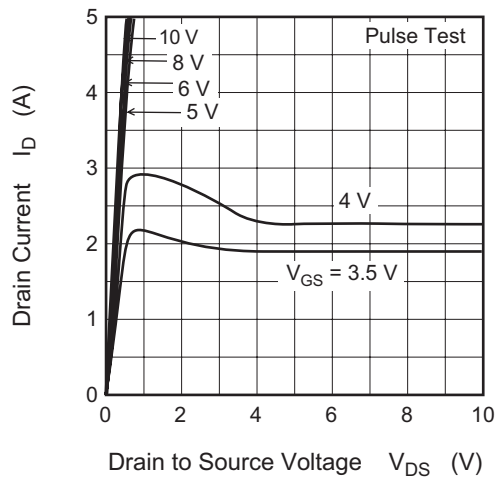
Power vs. Temperature Derating



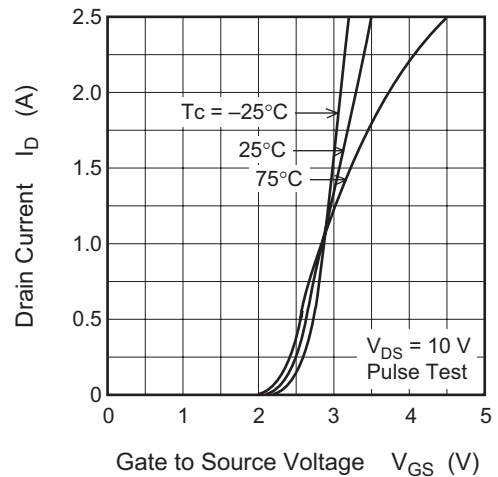
Maximum Safe Operation Area



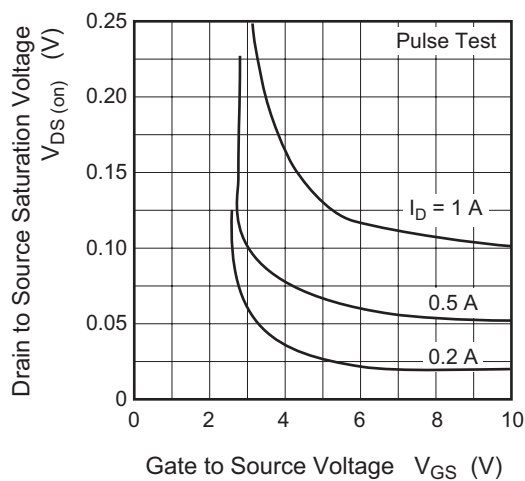
Typical Output Characteristics



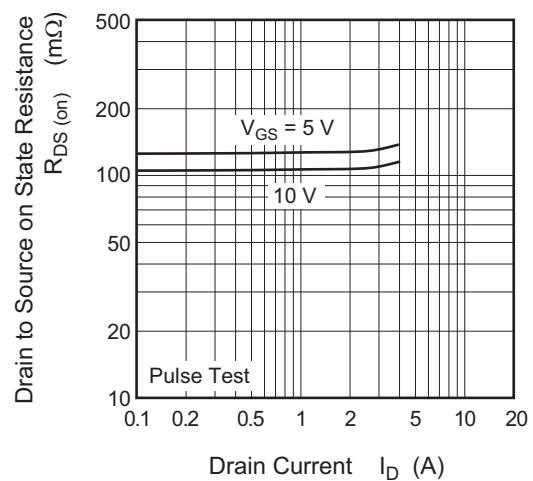
Typical Transfer Characteristics

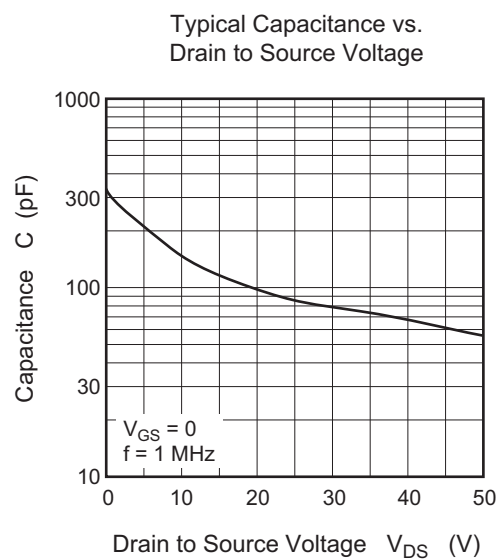
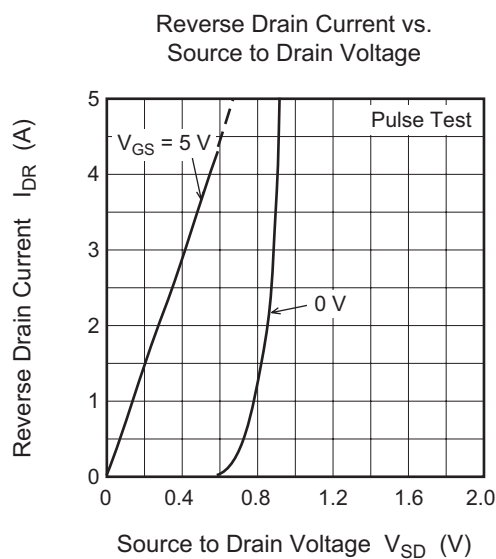
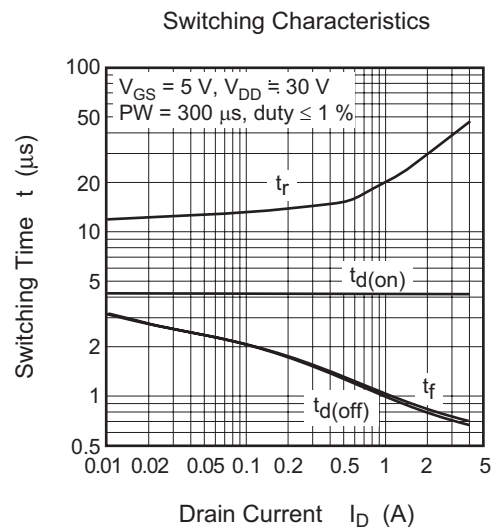
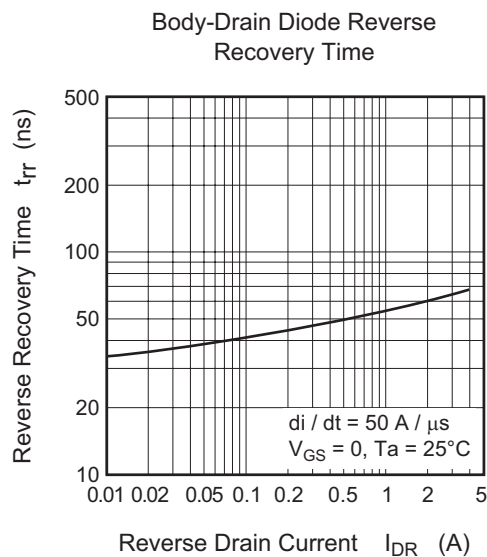
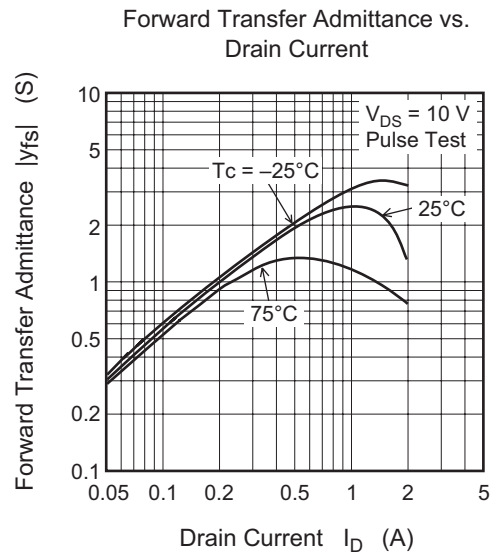
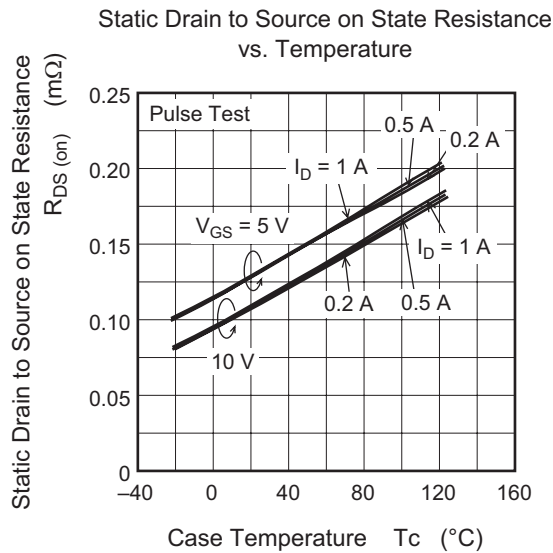


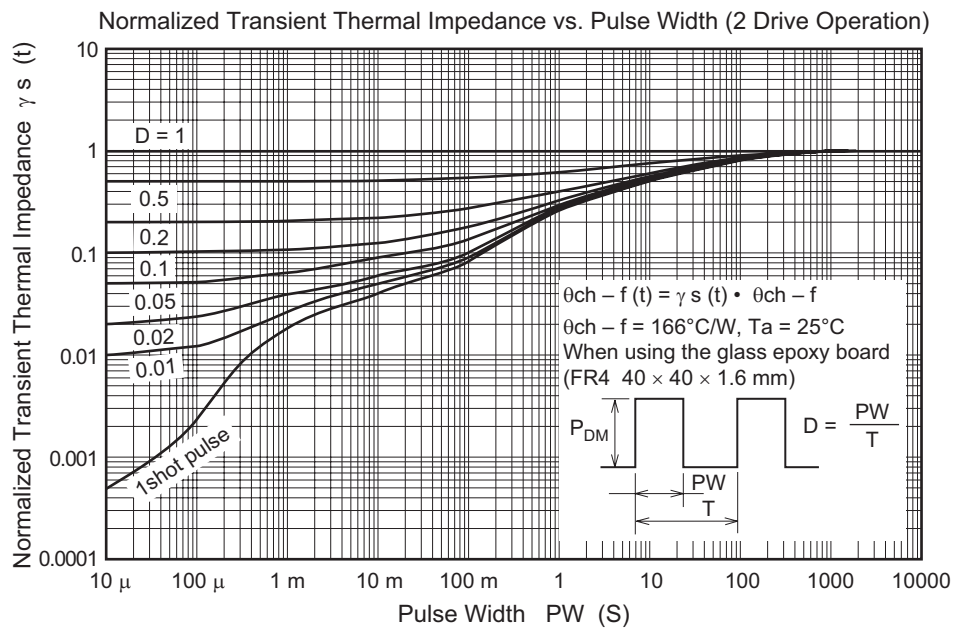
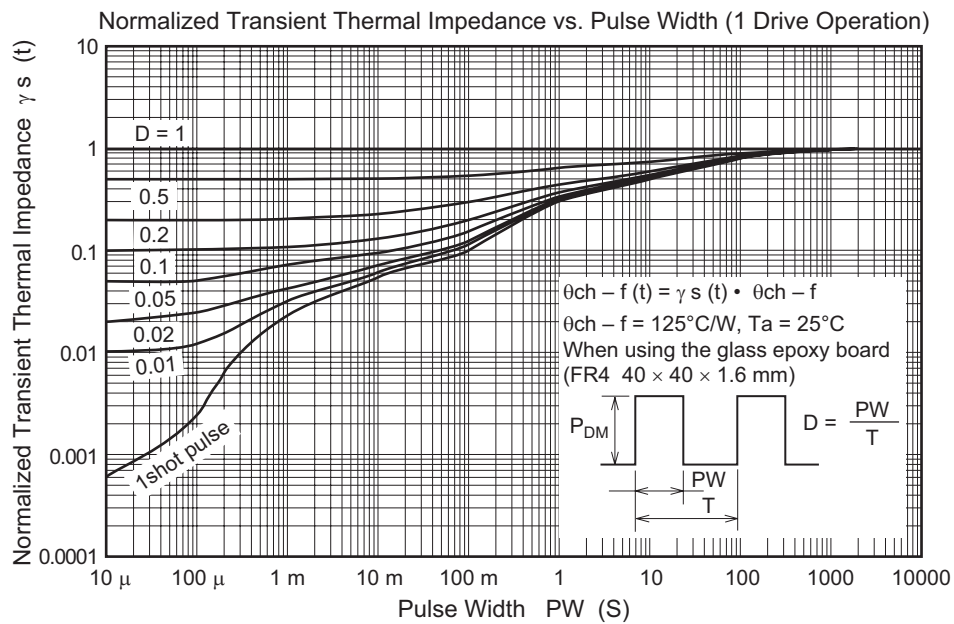
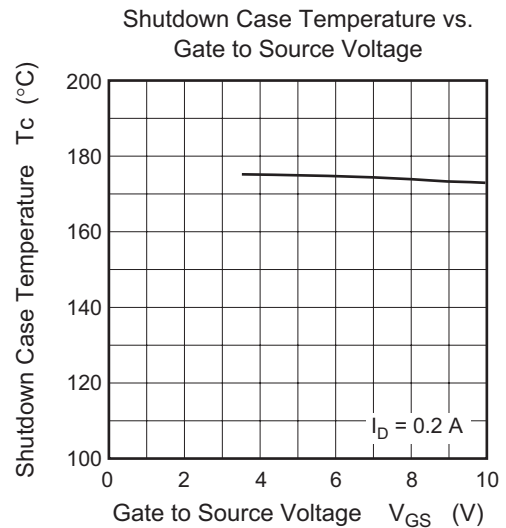
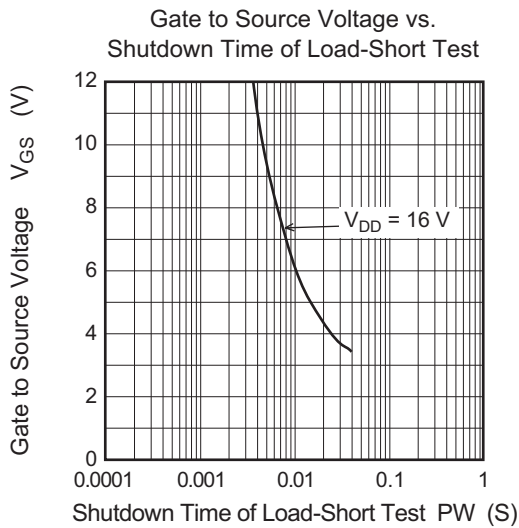
Drain to Source Saturation Voltage vs. Gate to Source Voltage



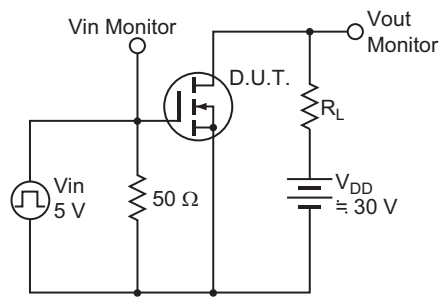
Static Drain to Source on State Resistance vs. Drain Current



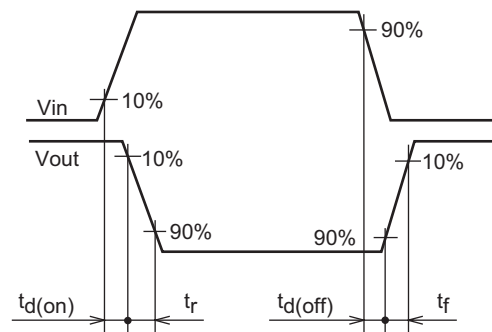




Switching Time Test Circuit

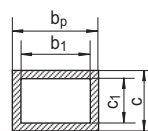
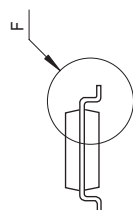
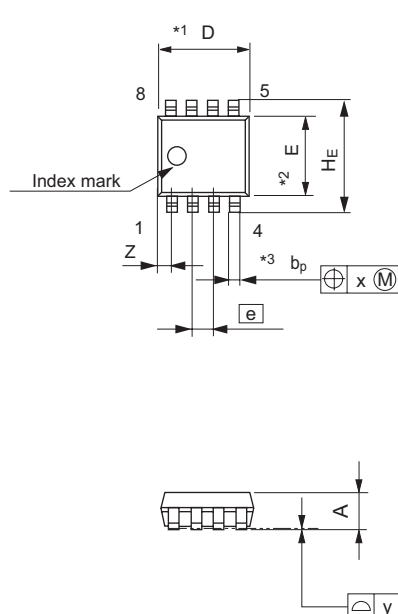


Waveform

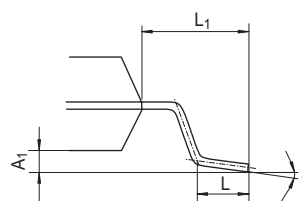


Package Dimensions

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



Terminal cross section

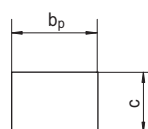
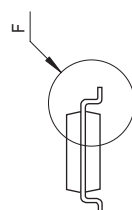
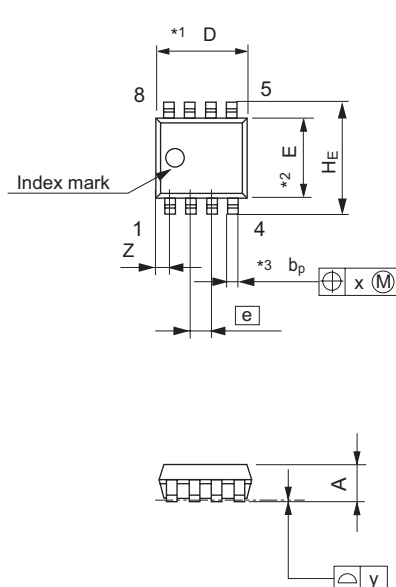
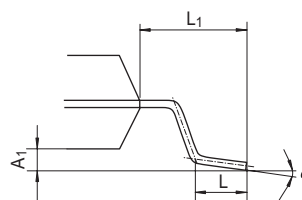


Detail F

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	0.42	0.50
b ₁	—	0.40	—
c	0.19	0.22	0.25
c ₁	—	0.20	—
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	—

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)

Detail F

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 No.	Quantity	Shipping Container
HAF2015RJ-EL	2500 pcs/Reel	Embossed tape

Notes:

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