



# 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.

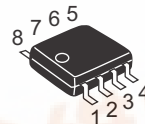
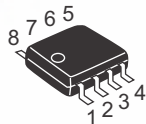
### Features

- 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.

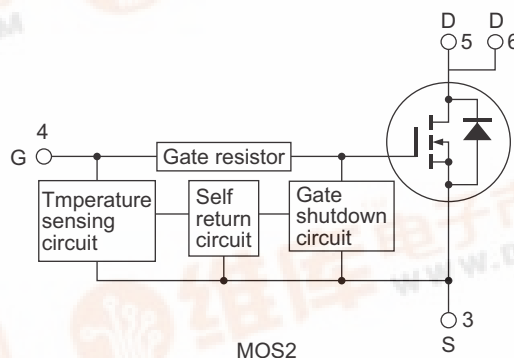
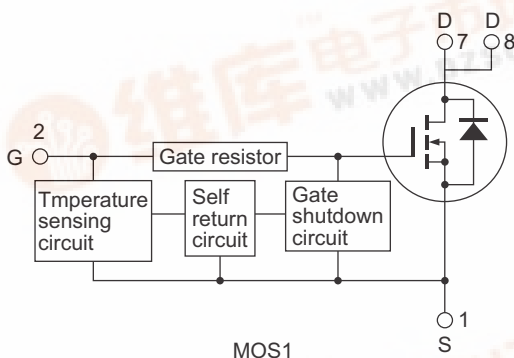
### Outline

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 <sub>DSS</sub>	60	V
Gate to source voltage	V <sub>GSS</sub>	16	V
	V <sub>GSS</sub>	-2.5	V
Drain current	I <sub>D</sub>	2	A
Drain peak current	I <sub>D (pulse)</sub> <sup>Note 1</sup>	4	A
Body-drain diode reverse drain current	I <sub>DR</sub>	2	A
Avalanche current	I <sub>AP</sub> <sup>Note 4</sup>	0.54	A
Avalanche energy	E <sub>AR</sub> <sup>Note 4</sup>	25	mJ
Channel dissipation	P <sub>ch</sub> <sup>Note 2</sup>	2	W
Channel dissipation	P <sub>ch</sub> <sup>Note 3</sup>	1.5	W
Channel temperature	T <sub>ch</sub>	150	°C
Storage temperature	T <sub>stg</sub>	-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<sub>ch</sub> = 25°C, R<sub>g</sub> > 50 Ω

## Typical Operation Characteristics

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

## Electrical Characteristics

(Ta = 25°C)

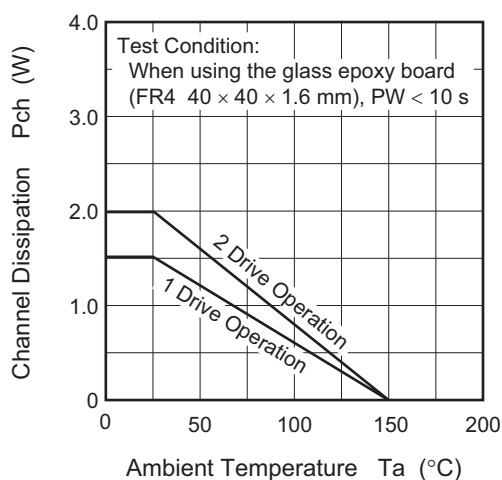
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	$I_{D1}$	0.7	—	—	A	$V_{GS} = 3.5 \text{ V}$ , $V_{DS} = 2 \text{ V}$
	$I_{D2}$	—	—	10	mA	$V_{GS} = 1.2 \text{ V}$ , $V_{DS} = 2 \text{ V}$
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	$I_D = 10 \text{ mA}$ , $V_{GS} = 0$
Gate to source 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	$\mu\text{A}$	$V_{GS} = 5 \text{ V}$ , $V_{DS} = 0$
	$I_{GSS2}$	—	—	50	$\mu\text{A}$	$V_{GS} = 3.5 \text{ V}$ , $V_{DS} = 0$
	$I_{GSS3}$	—	—	1	$\mu\text{A}$	$V_{GS} = 1.2 \text{ V}$ , $V_{DS} = 0$
	$I_{GSS4}$	—	—	-100	$\mu\text{A}$	$V_{GS} = -2.4 \text{ V}$ , $V_{DS} = 0$
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	$\mu\text{A}$	$V_{DS} = 60 \text{ V}$ , $V_{GS} = 0$
	$I_{DSS2}$	—	—	10	$\mu\text{A}$	$V_{DS} = 48 \text{ V}$ , $V_{GS} = 0$ $T_a = 125^\circ\text{C}$
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	$\text{m}\Omega$	$I_D = 1 \text{ A}$ , $V_{GS} = 5 \text{ V}$ <sup>Note 5</sup>
	$R_{DS (on)}$	—	110	160	$\text{m}\Omega$	$I_D = 1 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note 5</sup>
Forward transfer admittance	$ y_{fs} $	0.5	2.5	—	S	$I_D = 1 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Note 5</sup>
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	—	$\mu\text{s}$	$I_D = 1 \text{ A}$ $V_{GS} = 5 \text{ V}$ $R_L = 30 \Omega$
Rise time	$t_r$	—	20	—	$\mu\text{s}$	
Turn-off delay time	$t_{d (off)}$	—	1	—	$\mu\text{s}$	
Fall time	$t_f$	—	1	—	$\mu\text{s}$	
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 <sup>Note6</sup>	$t_{os1}$	—	15	—	ms	$V_{GS} = 5 \text{ V}$ , $V_{DD} = 16 \text{ V}$

Notes: 5. Pulse test

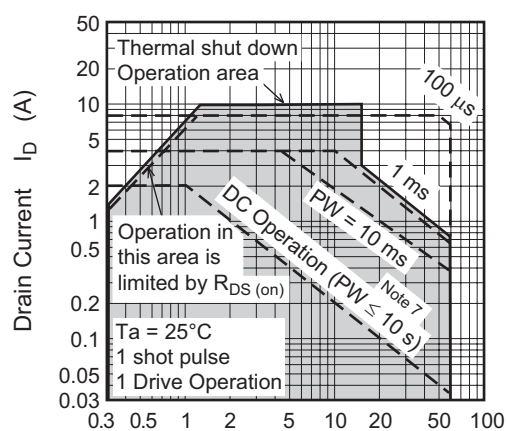
6. Including the junction temperature rise of the over loaded condition.

## Main Characteristics

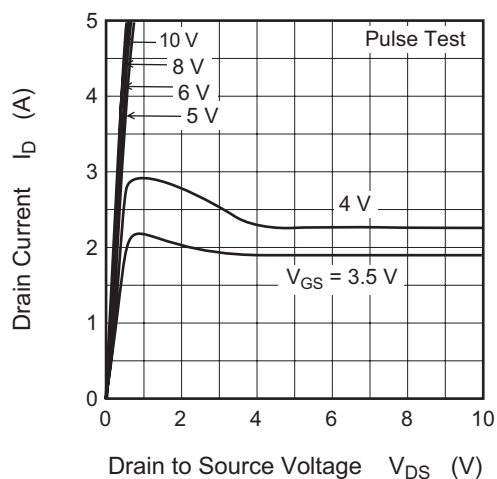
Power vs. Temperature Derating



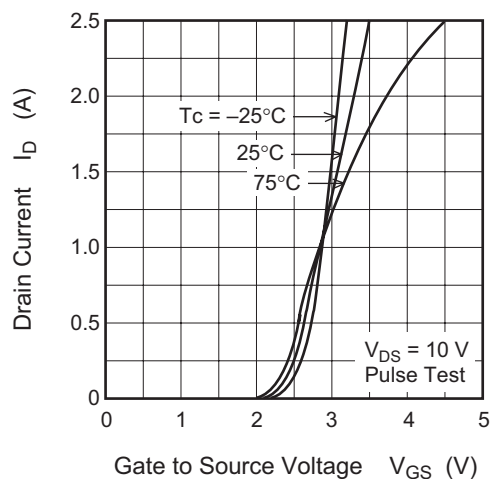
Maximum Safe Operation Area



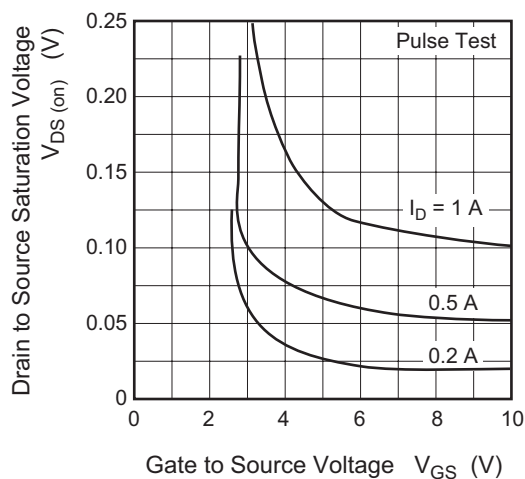
Typical Output Characteristics



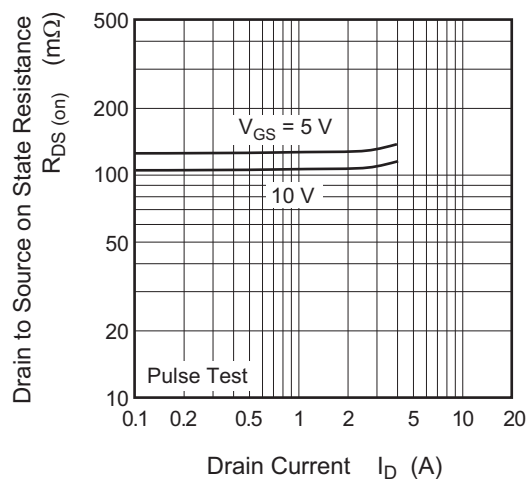
Typical Transfer Characteristics

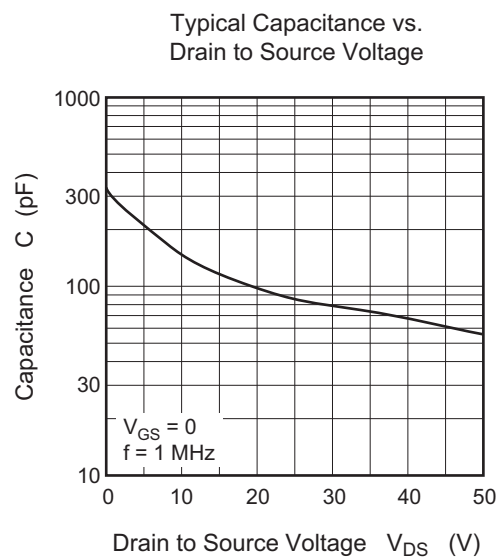
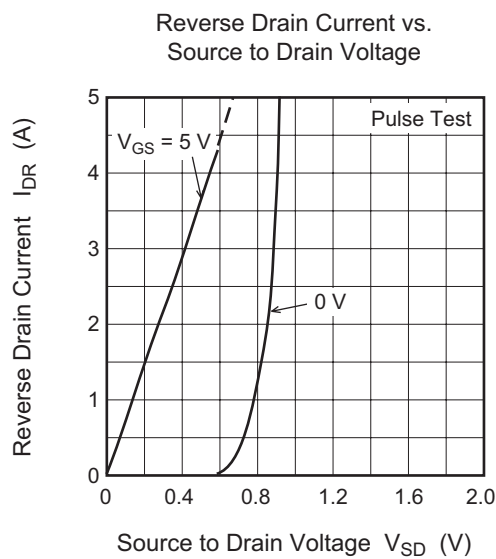
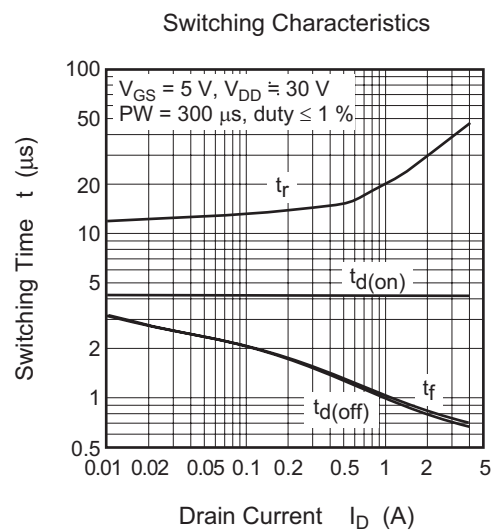
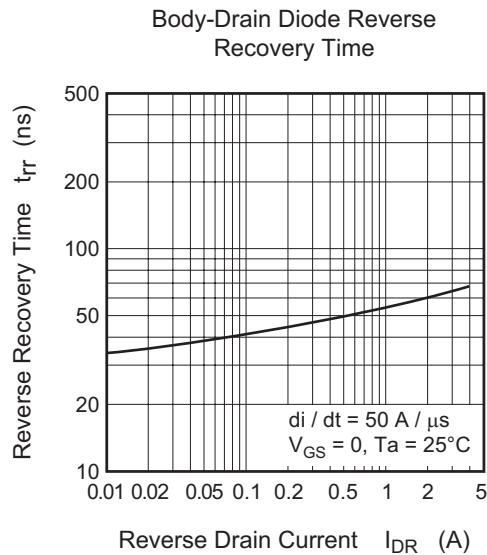
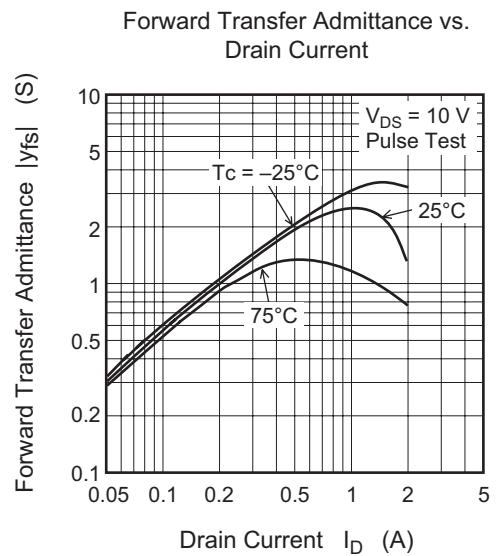
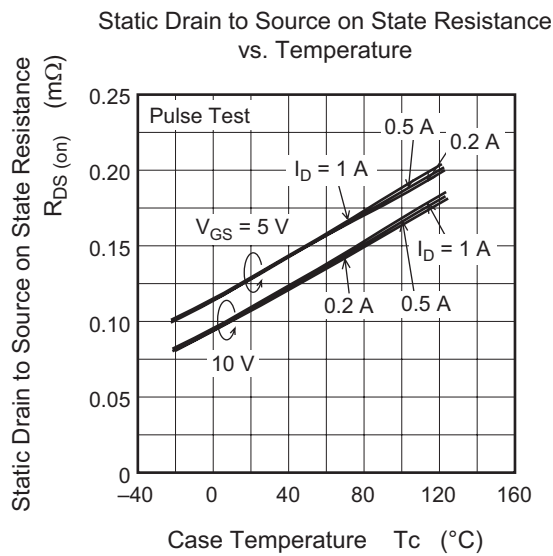


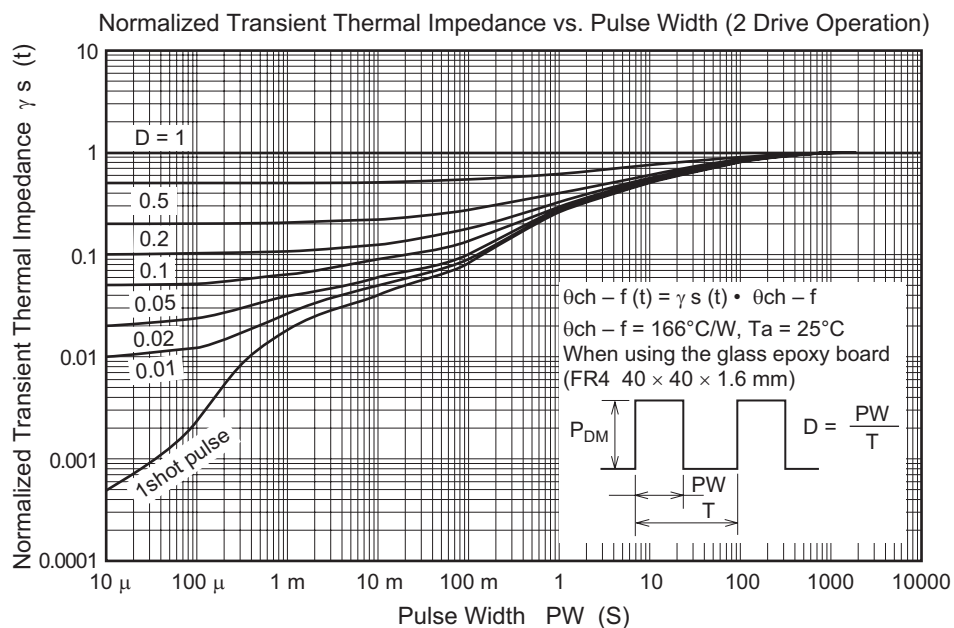
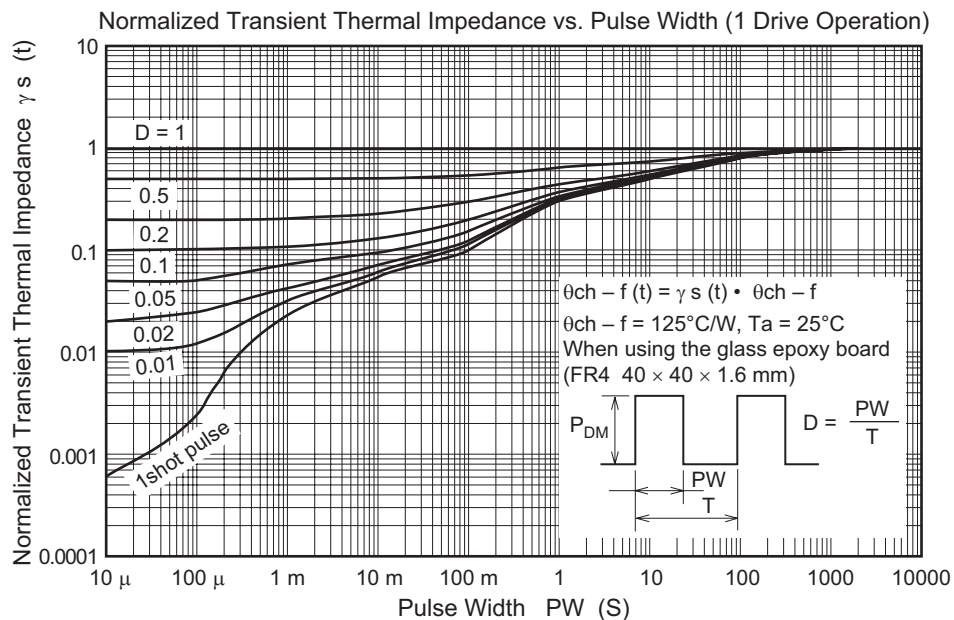
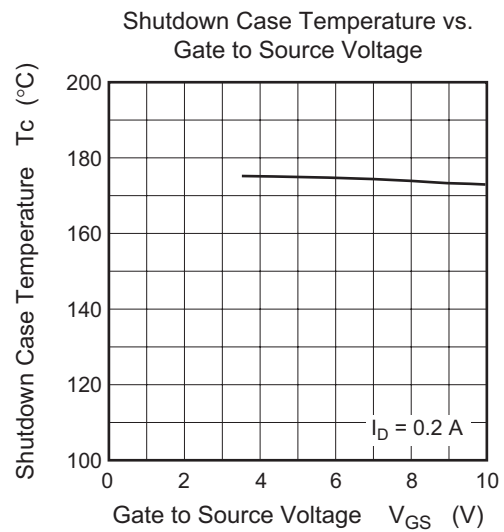
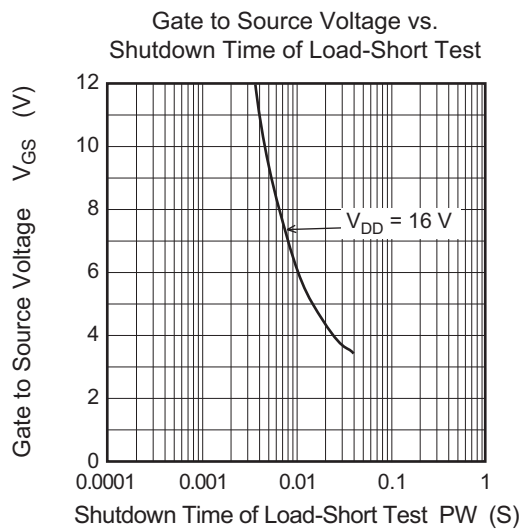
Drain to Source Saturation Voltage vs. Gate to Source Voltage

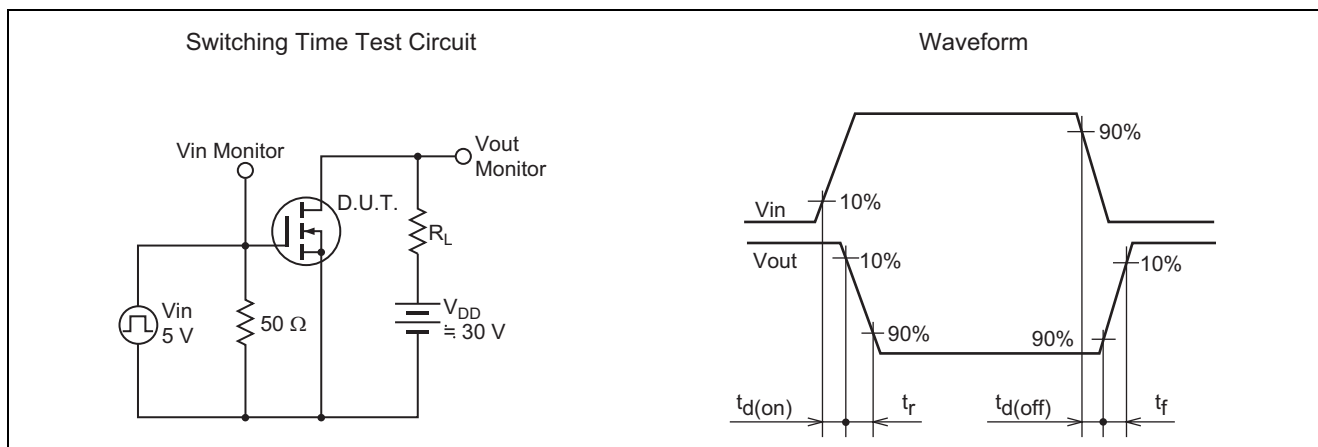


Static Drain to Source on State Resistance vs. Drain Current









## 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

Index mark

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 <sub>2</sub>	—	—	—
A <sub>1</sub>	0.10	0.14	0.25
A	—	—	1.75
b <sub>p</sub>	0.34	0.42	0.50
b <sub>1</sub>	—	0.40	—
c	0.19	0.22	0.25
c <sub>1</sub>	—	0.20	—
θ	0°	—	8°
H <sub>E</sub>	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 <sub>1</sub>	—	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

Index mark

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 <sub>2</sub>	—	—	—
A <sub>1</sub>	0.10	0.14	0.25
A	—	—	1.75
b <sub>p</sub>	0.34	0.40	0.46
b <sub>1</sub>	—	—	—
c	0.15	0.20	0.25
c <sub>1</sub>	—	—	—
θ	0°	—	8°
H <sub>E</sub>	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 <sub>1</sub>	—	1.08	—



HAF2015RJ

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### Ordering Information

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

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450 Holger Way, San Jose, CA 95134-1368, U.S.A  
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

**Renesas Technology Europe Limited**  
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.  
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

**Renesas Technology (Shanghai) Co., Ltd.**  
Unit 204, 205, AZIACenter, No.1233 Lujiazui Ring Rd, Pudong District, Shanghai, China 200120  
Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7898

**Renesas Technology Hong Kong Ltd.**  
7th Floor, North Tower, World Finance Centre, Harbour City, 1 Canton Road, Tsimshatsui, Kowloon, Hong Kong  
Tel: <852> 2265-6688, Fax: <852> 2730-6071

**Renesas Technology Taiwan Co., Ltd.**  
10th Floor, No.99, Fushing North Road, Taipei, Taiwan  
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

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

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Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea  
Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

**Renesas Technology Malaysia Sdn. Bhd**  
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jalan Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia  
Tel: <603> 7955-9390, Fax: <603> 7955-9510