

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.

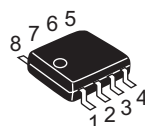
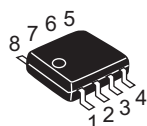
Features

- 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.

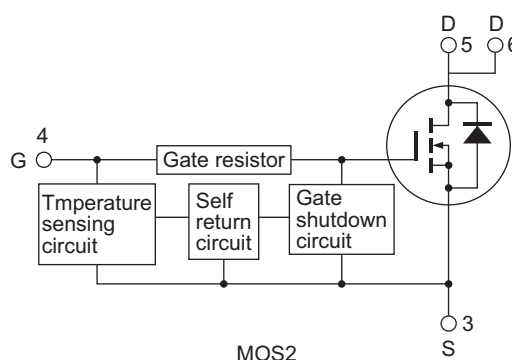
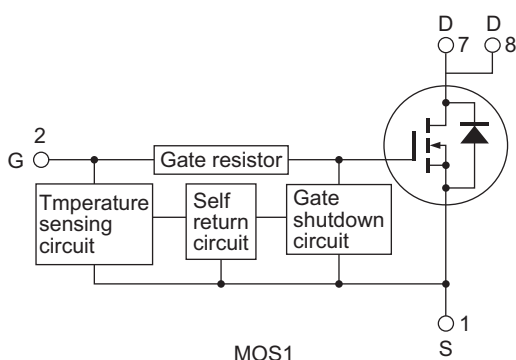
Outline

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)

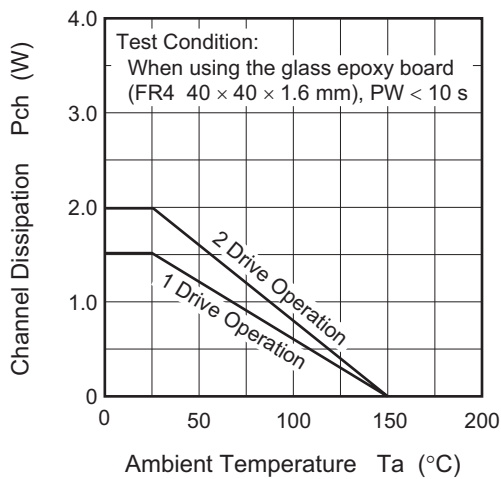
| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|--|-----------------|------|------|------|---------------|--|
| Drain current | I_{D1} | 0.7 | — | — | A | $V_{GS} = 3.5 \text{ V}$, $V_{DS} = 2 \text{ V}$ |
| | I_{D2} | — | — | 10 | mA | $V_{GS} = 1.2 \text{ V}$, $V_{DS} = 2 \text{ V}$ |
| 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

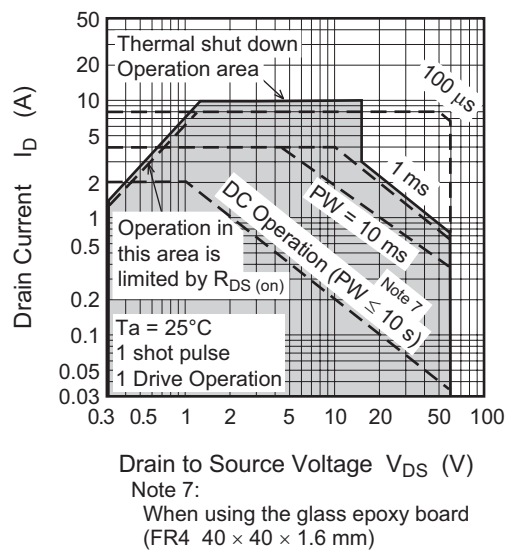
6. Including the junction temperature rise of the over loaded condition.

Main Characteristics

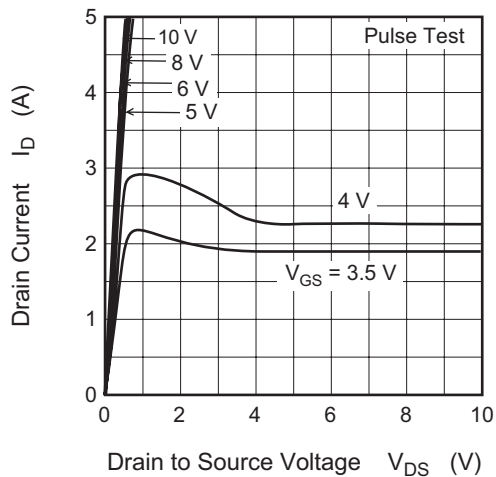
Power vs. Temperature Derating



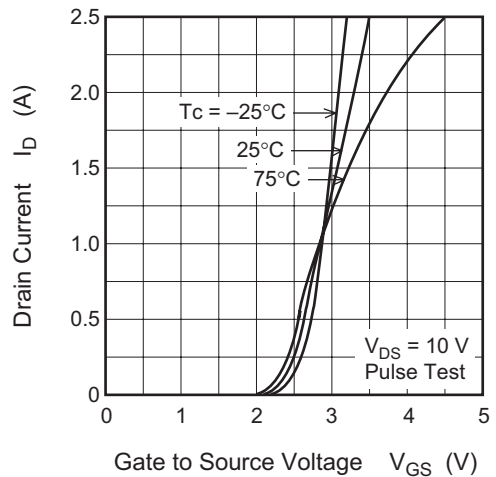
Maximum Safe Operation Area



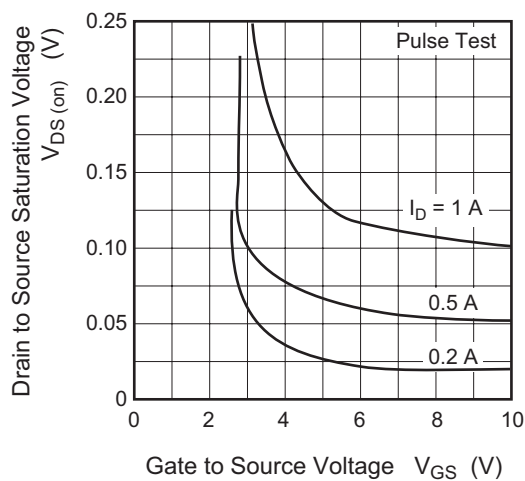
Typical Output Characteristics



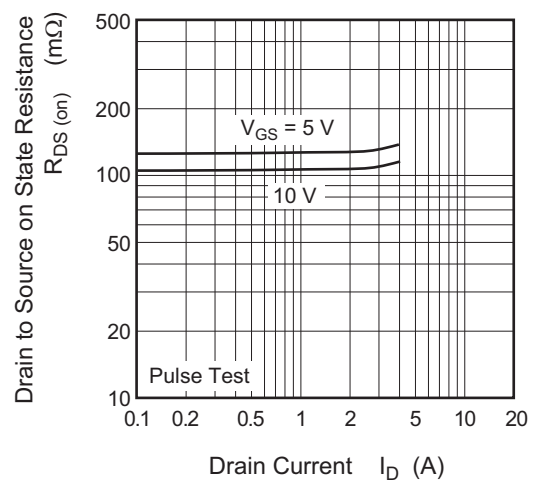
Typical Transfer Characteristics

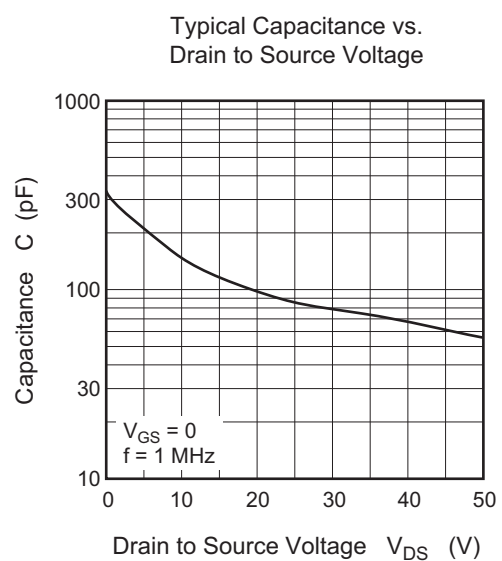
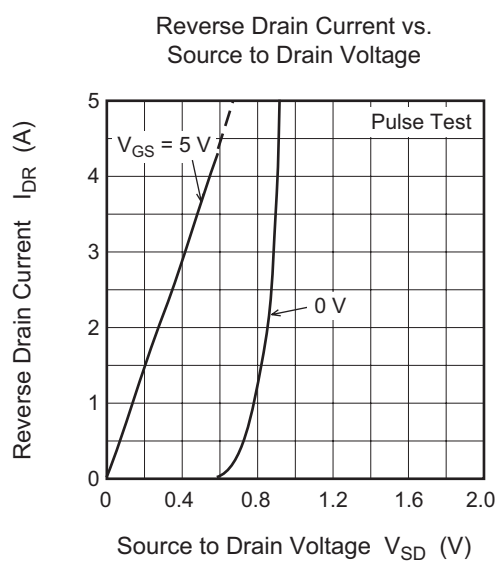
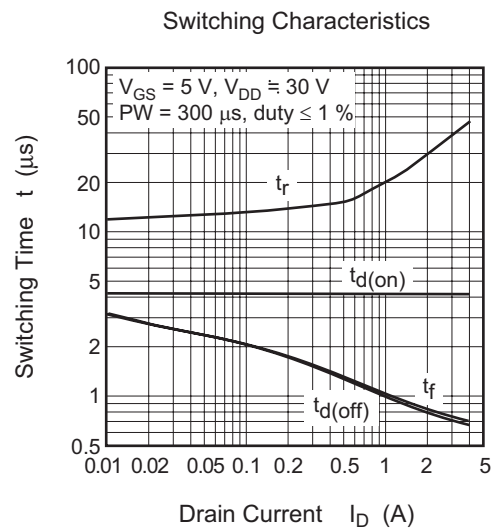
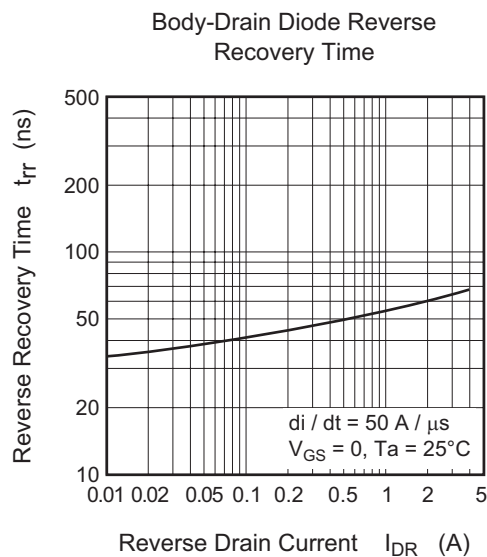
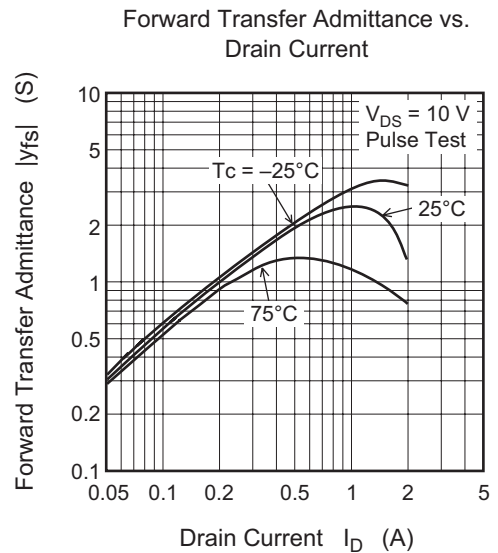
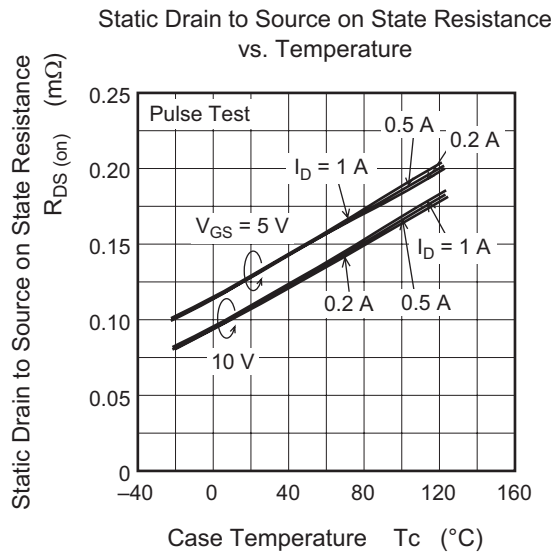


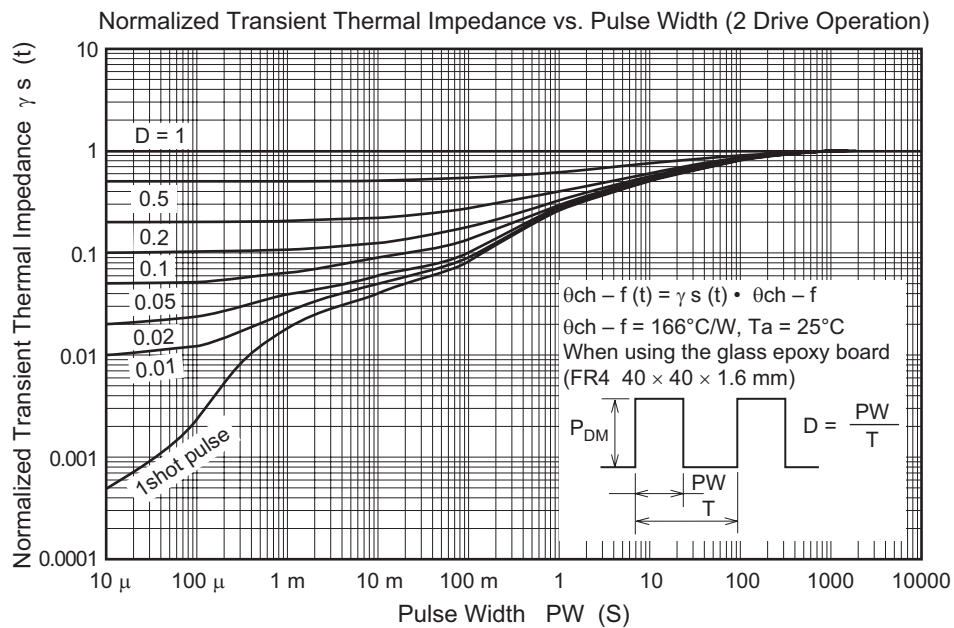
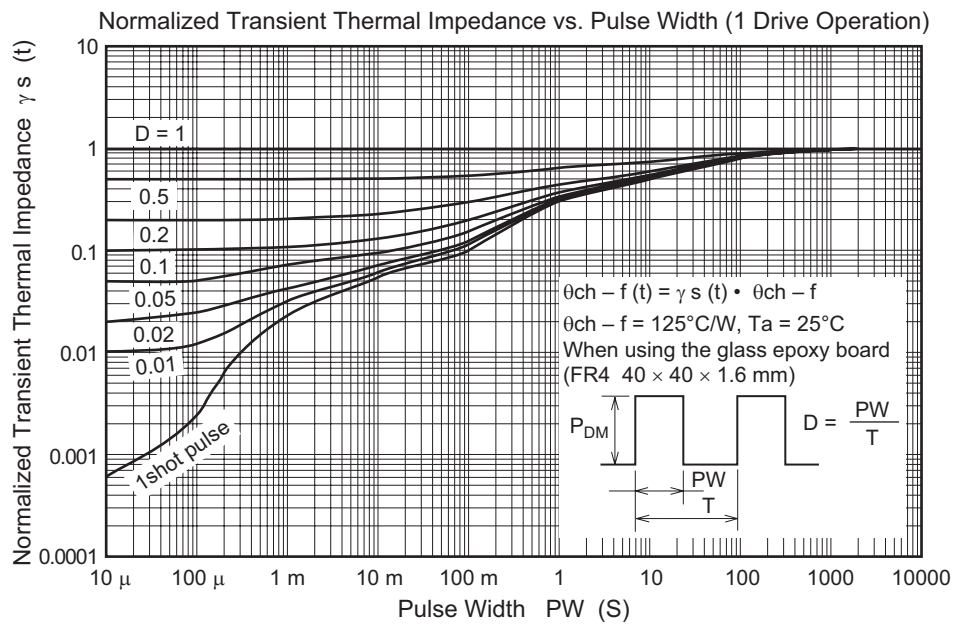
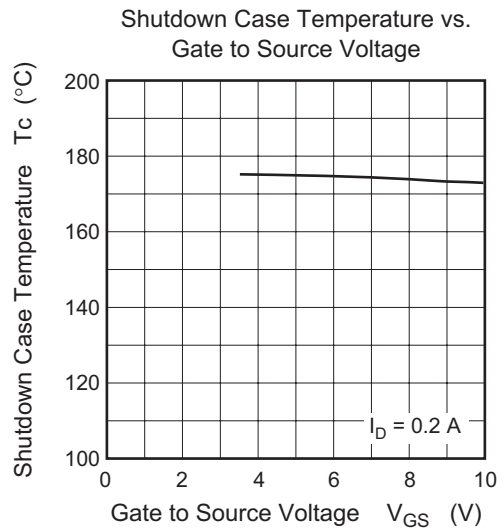
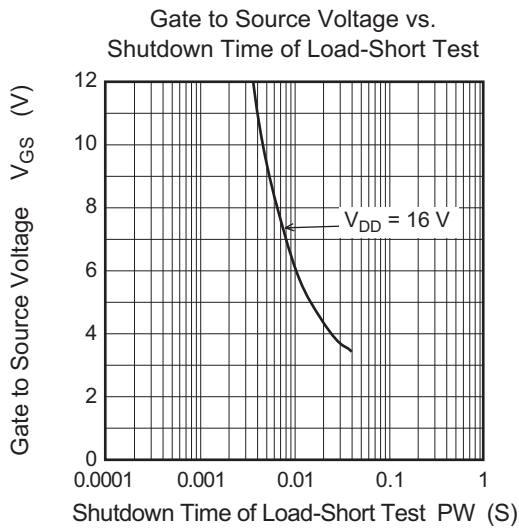
Drain to Source Saturation Voltage vs. Gate to Source Voltage



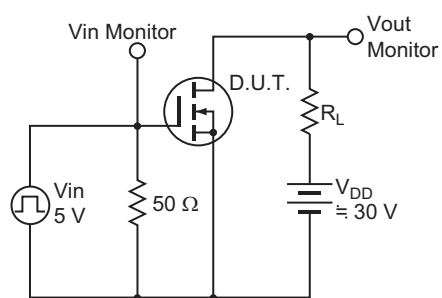
Static Drain to Source on State Resistance vs. Drain Current



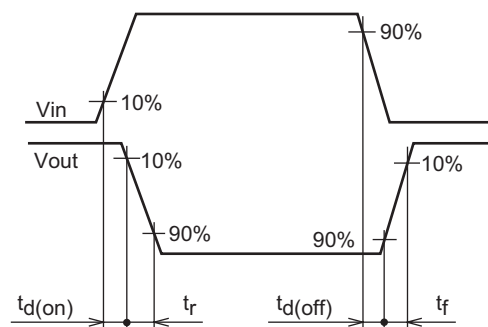




Switching Time Test Circuit

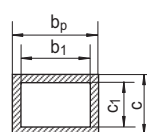
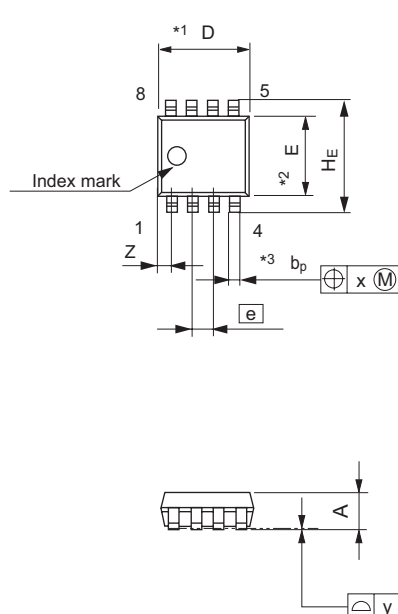


Waveform



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 |

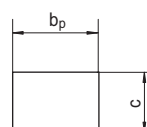
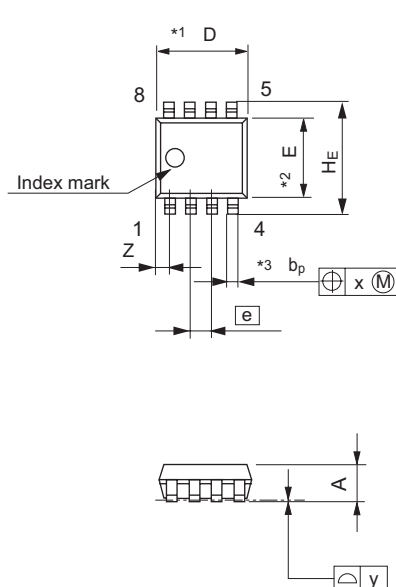


Terminal cross section

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 |
| ⌀ | — | 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)

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 |
| ⌀ | — | 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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