

# RJF0614JSP

60V, 1.5A N Channel Thermal FET  
Power Switching

R07DS1251EJ0100  
Rev.1.00  
Jun 16, 2015

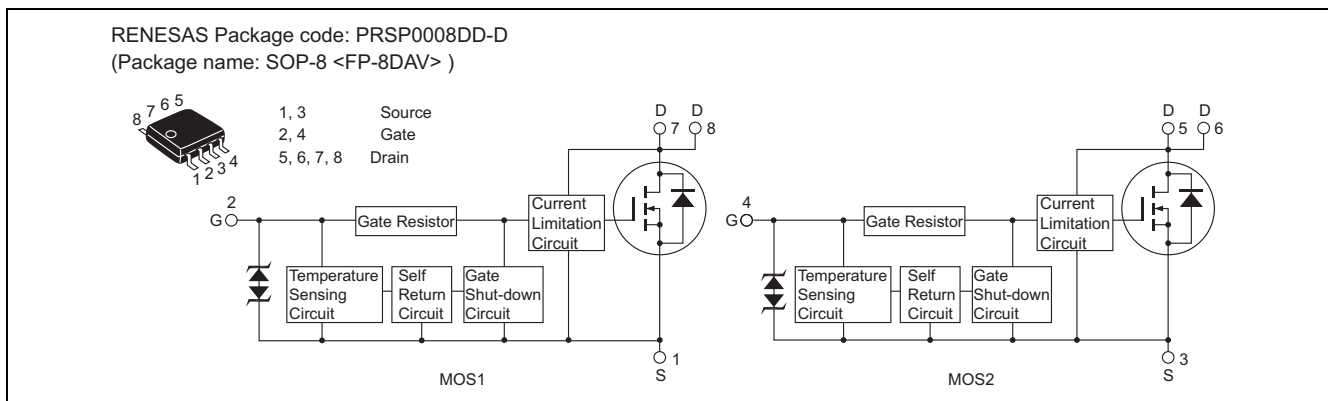
## Description

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).
- Built-in the over temperature shut-down circuit.
- High endurance capability against to the short circuit.
- Temperature hysteresis type.
- High density mounting
- Power supply voltage applies 12 V and 24 V.
- AEC-Q101 Compliant

## Outline



## Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	$V_{DSS}$	60	V
Gate to source voltage	$V_{GSS}$	16	V
Gate to source voltage	$V_{GSS}$	-2.5	V
Drain current	$I_D$ <sup>Note 4</sup>	1.5	A
Body-drain diode reverse drain current	$I_{DR}$	1.5	A
Avalanche current	$I_{AP}$ <sup>Note 3</sup>	0.9	A
Avalanche energy	$E_{AR}$ <sup>Note 3</sup>	69.4	mJ
Channel dissipation	$P_{ch}$ <sup>Note 1</sup>	2	W
Channel dissipation	$P_{ch}$ <sup>Note 2</sup>	3	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	-55 to +150	°C

- Notes:
- 1 Drive operation: When using the glass epoxy board (FR4 40 × 40 × 1.6 mm), PW ≤ 10 s
  - 2 Drive operation: When using the glass epoxy board (FR4 40 × 40 × 1.6 mm), PW ≤ 10 s
  - 3 Tch = 25°C, Rg ≥ 50 Ω, L = 100 mH
  - 4 It provides by the current limitation lower bound value.

## Typical Operation Characteristics

(Ta = 25°C)

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> = 8 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>	—	0.8	—	mA	V <sub>i</sub> = 8 V, V <sub>DS</sub> = 0
	I <sub>IH(sd)2</sub>	—	0.35	—	mA	V <sub>i</sub> = 3.5 V, V <sub>DS</sub> = 0
Shut down temperature	T <sub>sd</sub>	—	175	—	°C	Channel temperature
Return temperature	Thr	—	120	—	°C	Channel temperature
Gate operation voltage	V <sub>op</sub>	3.5	—	12	V	
Drain current (Current limitation value)	I <sub>D limit</sub>	1.5	—	—	A	V <sub>GS</sub> = 5 V, V <sub>DS</sub> = 10 V <sup>Note 5</sup>

Notes: 5. Pulse test

## Electrical Characteristics

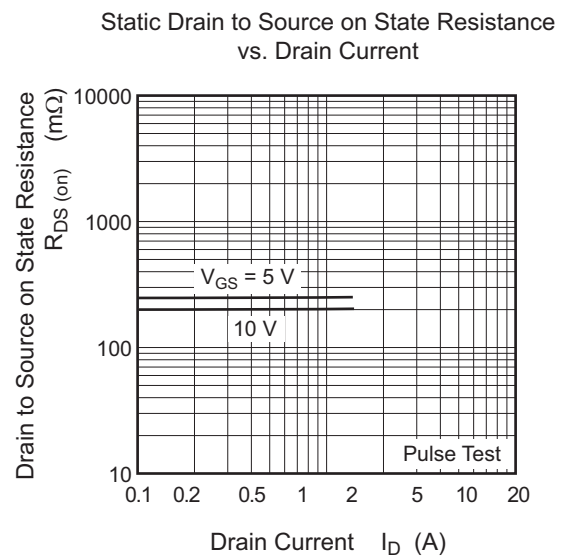
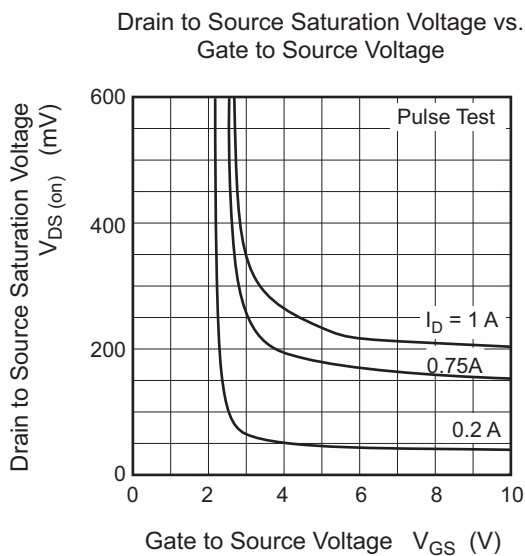
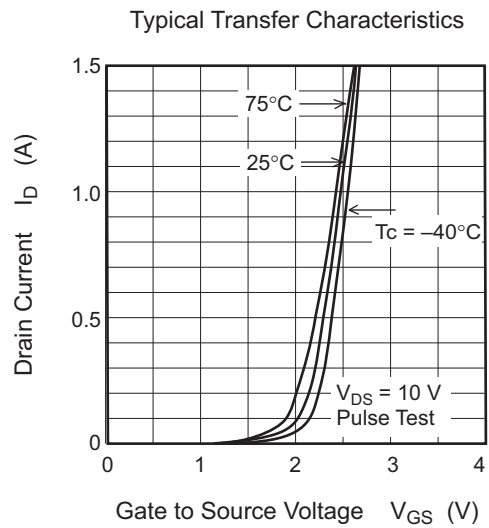
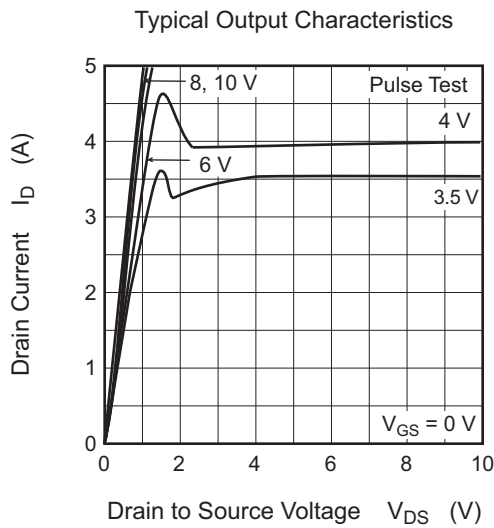
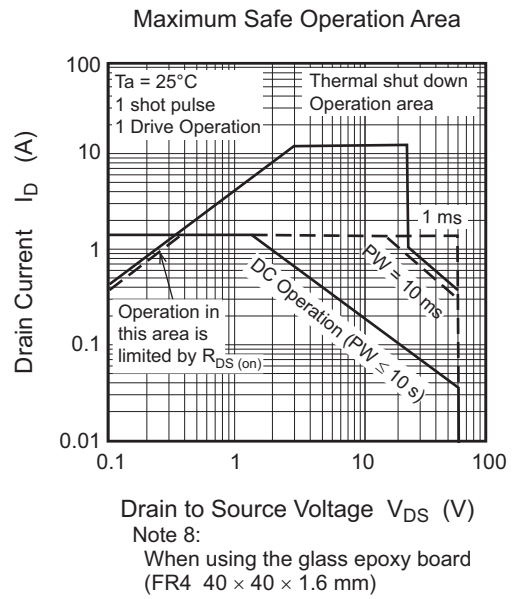
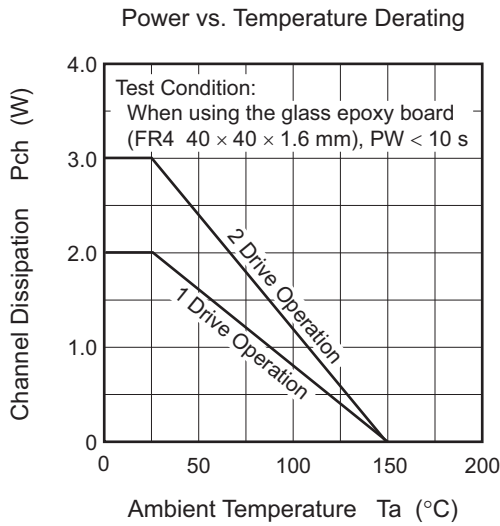
(Ta = 25°C)

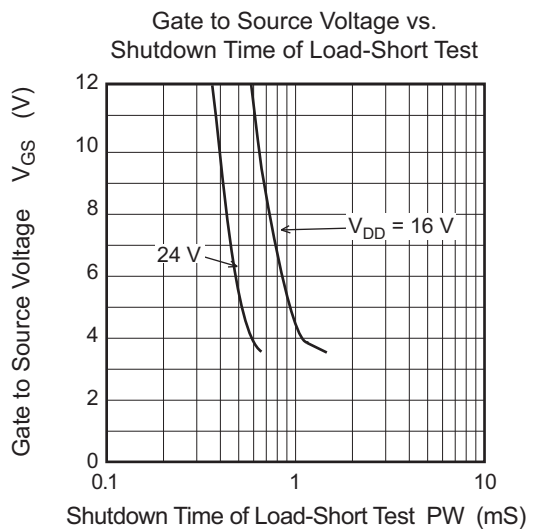
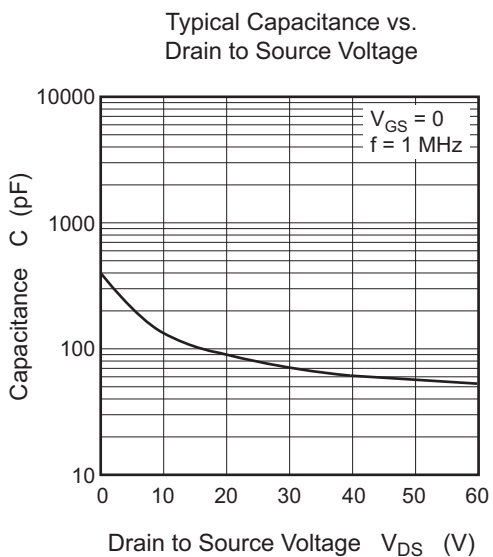
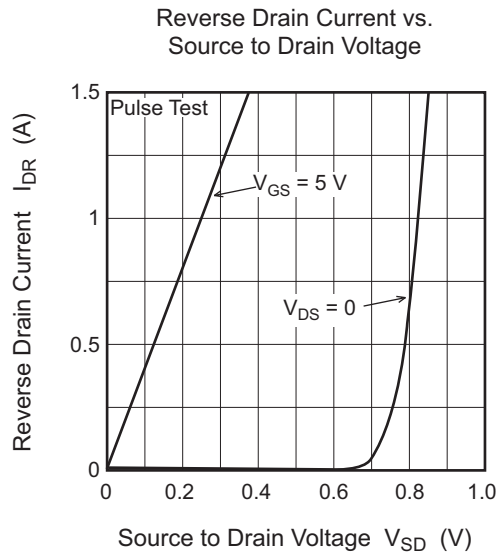
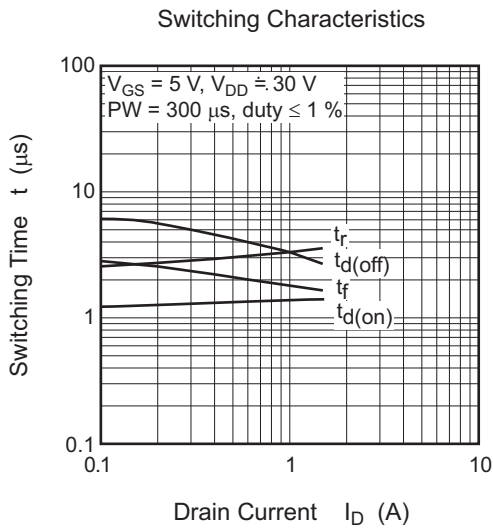
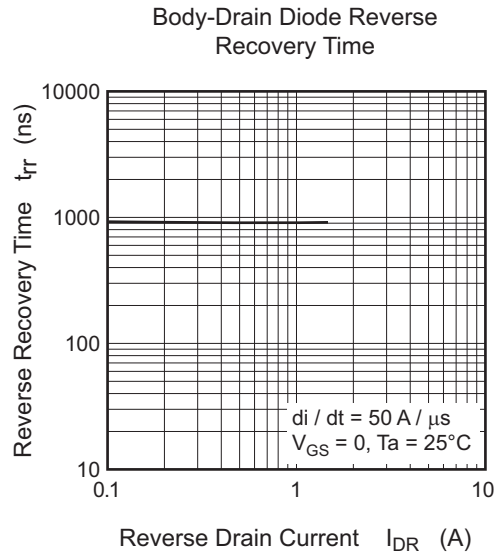
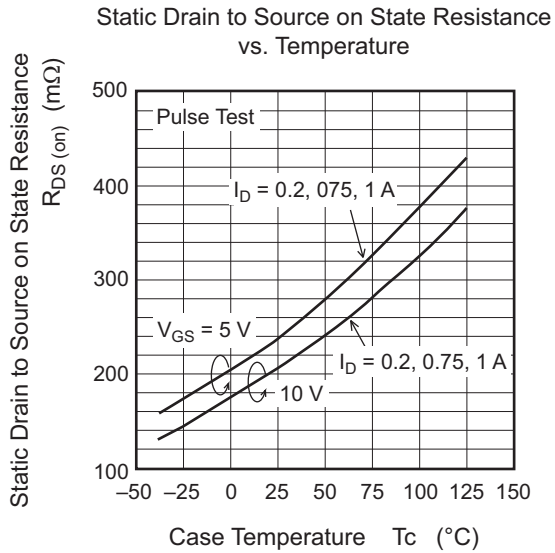
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I <sub>D1</sub>	—	—	5.5	A	V <sub>GS</sub> = 3.5 V, V <sub>DS</sub> = 10 V <sup>Note 6</sup>
	I <sub>D2</sub>	—	—	10	mA	V <sub>GS</sub> = 1.2 V, V <sub>DS</sub> = 10 V
	I <sub>D3</sub>	1.5	—	—	A	V <sub>GS</sub> = 5 V, V <sub>DS</sub> = 10 V <sup>Note 6</sup>
Drain to source breakdown voltage	V <sub>(BR)DSS</sub>	60	—	—	V	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0
Gate to source breakdown voltage	V <sub>(BR)GSS</sub>	16	—	—	V	I <sub>G</sub> = 800 μA, V <sub>DS</sub> = 0
	V <sub>(BR)GSS</sub>	-2.5	—	—	V	I <sub>G</sub> = -100 μA, V <sub>DS</sub> = 0
Gate to source leak current	I <sub>GSS1</sub>	—	—	100	μA	V <sub>GS</sub> = 8 V, V <sub>DS</sub> = 0
	I <sub>GSS2</sub>	—	—	50	μA	V <sub>GS</sub> = 3.5 V, V <sub>DS</sub> = 0
	I <sub>GSS3</sub>	—	—	1	μA	V <sub>GS</sub> = 1.2 V, V <sub>DS</sub> = 0
	I <sub>GSS4</sub>	—	—	-100	μA	V <sub>GS</sub> = -2.4 V, V <sub>DS</sub> = 0
Input current (shut down)	I <sub>GS(OP)1</sub>	—	0.8	—	mA	V <sub>GS</sub> = 8 V, V <sub>DS</sub> = 0
	I <sub>GS(OP)2</sub>	—	0.35	—	mA	V <sub>GS</sub> = 3.5 V, V <sub>DS</sub> = 0
Zero gate voltage drain current	I <sub>DSS</sub>	—	—	10	μA	V <sub>DS</sub> = 32 V, V <sub>GS</sub> = 0, Ta = 125°C
Gate to source cutoff voltage	V <sub>GS(off)</sub>	1.1	—	2.1	V	I <sub>D</sub> = 1 mA, V <sub>DS</sub> = 10 V
Static drain to source on state resistance	R <sub>DS(on)</sub>	—	238	297	mΩ	I <sub>D</sub> = 0.75 A, V <sub>GS</sub> = 5 V <sup>Note 6</sup>
	R <sub>DS(on)</sub>	—	201	250	mΩ	I <sub>D</sub> = 0.75 A, V <sub>GS</sub> = 10 V <sup>Note 6</sup>
Output capacitance	C <sub>oss</sub>	—	130	—	pF	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0, f = 1MHz
Turn-on delay time	t <sub>d(on)</sub>	—	1.4	—	μs	I <sub>D</sub> = 0.75 A, V <sub>GS</sub> = 5 V, R <sub>L</sub> = 40 Ω
Rise time	t <sub>r</sub>	—	3.1	—	μs	
Turn-off delay time	t <sub>d(off)</sub>	—	3.6	—	μs	
Fall time	t <sub>f</sub>	—	1.9	—	μs	
Body-drain diode forward voltage	V <sub>DF</sub>	—	0.8	—	V	I <sub>F</sub> = 1.5 A, V <sub>GS</sub> = 0
Body-drain diode reverse recovery time	t <sub>rr</sub>	—	910	—	ns	I <sub>F</sub> = 1.5 A, V <sub>GS</sub> = 0 di <sub>F</sub> /dt = 50 A/μs
Over load shut down operation time <sup>Note 7</sup>	t <sub>os1</sub>	—	0.94	—	ms	V <sub>GS</sub> = 5 V, V <sub>DD</sub> = 16 V
	t <sub>os2</sub>	—	0.53	—	ms	V <sub>GS</sub> = 5 V, V <sub>DD</sub> = 24 V

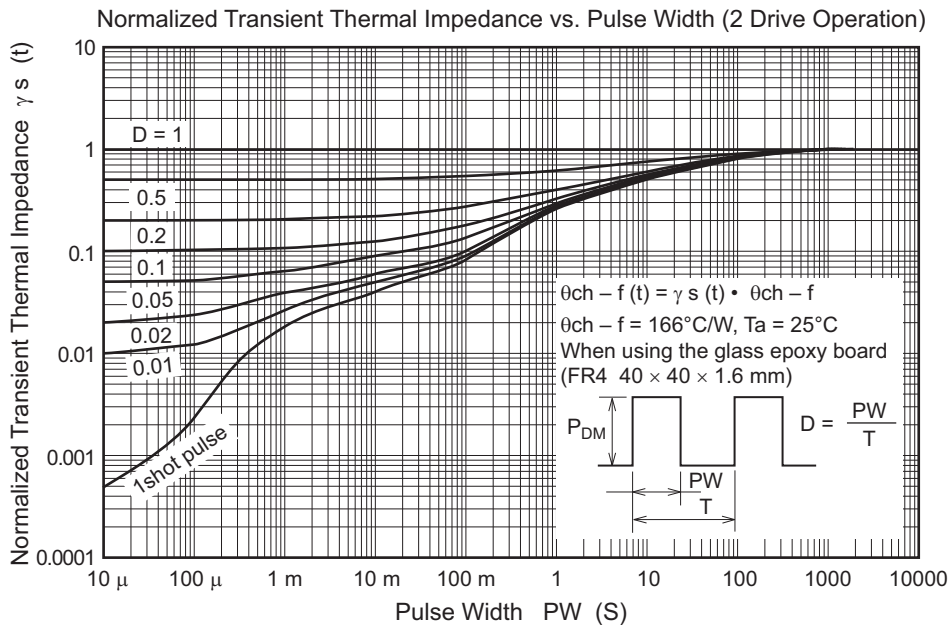
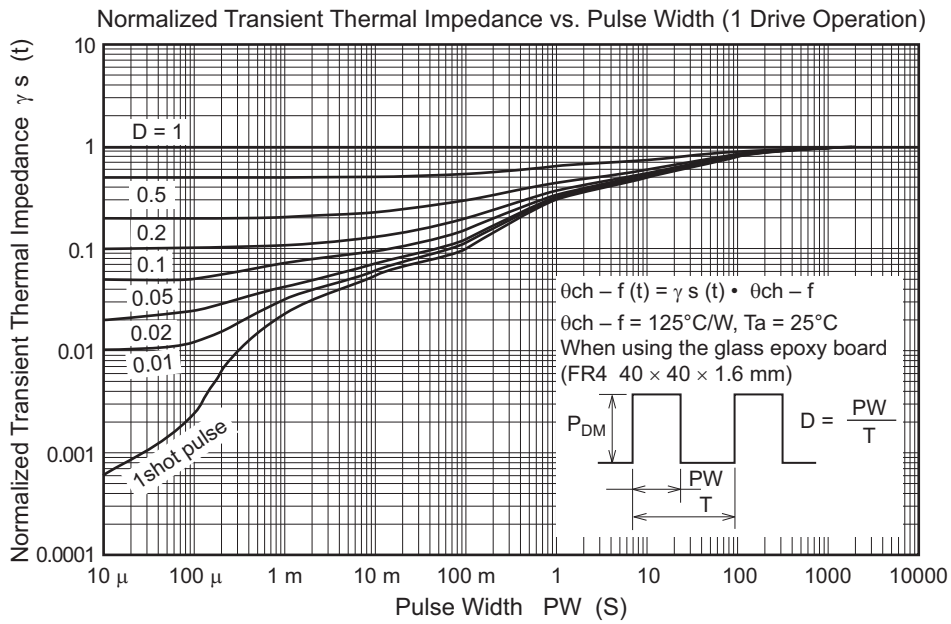
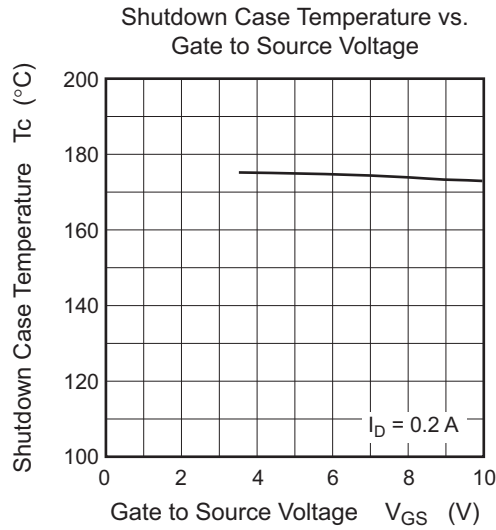
Notes: 6. Pulse test

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

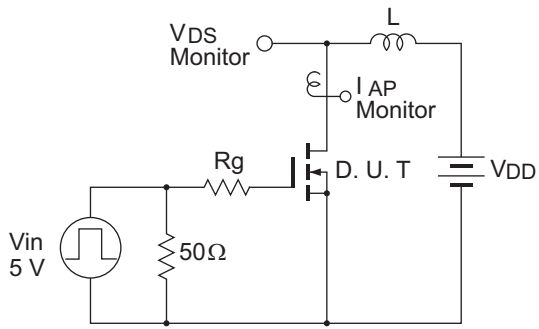
### Main Characteristics





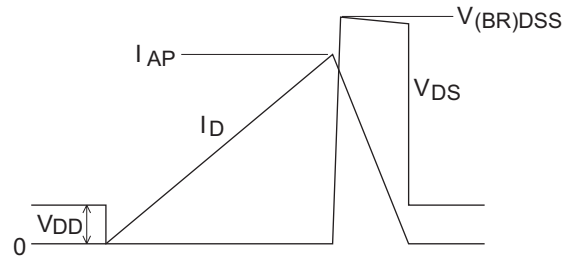


Avalanche Test Circuit

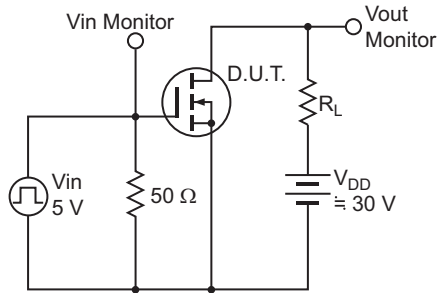


Avalanche Waveform

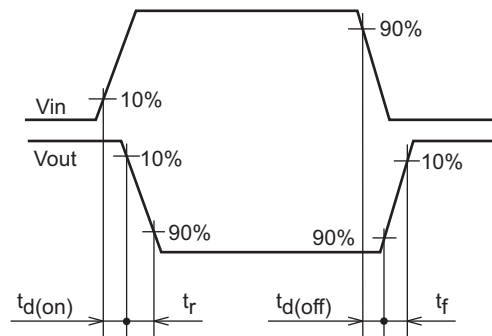
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



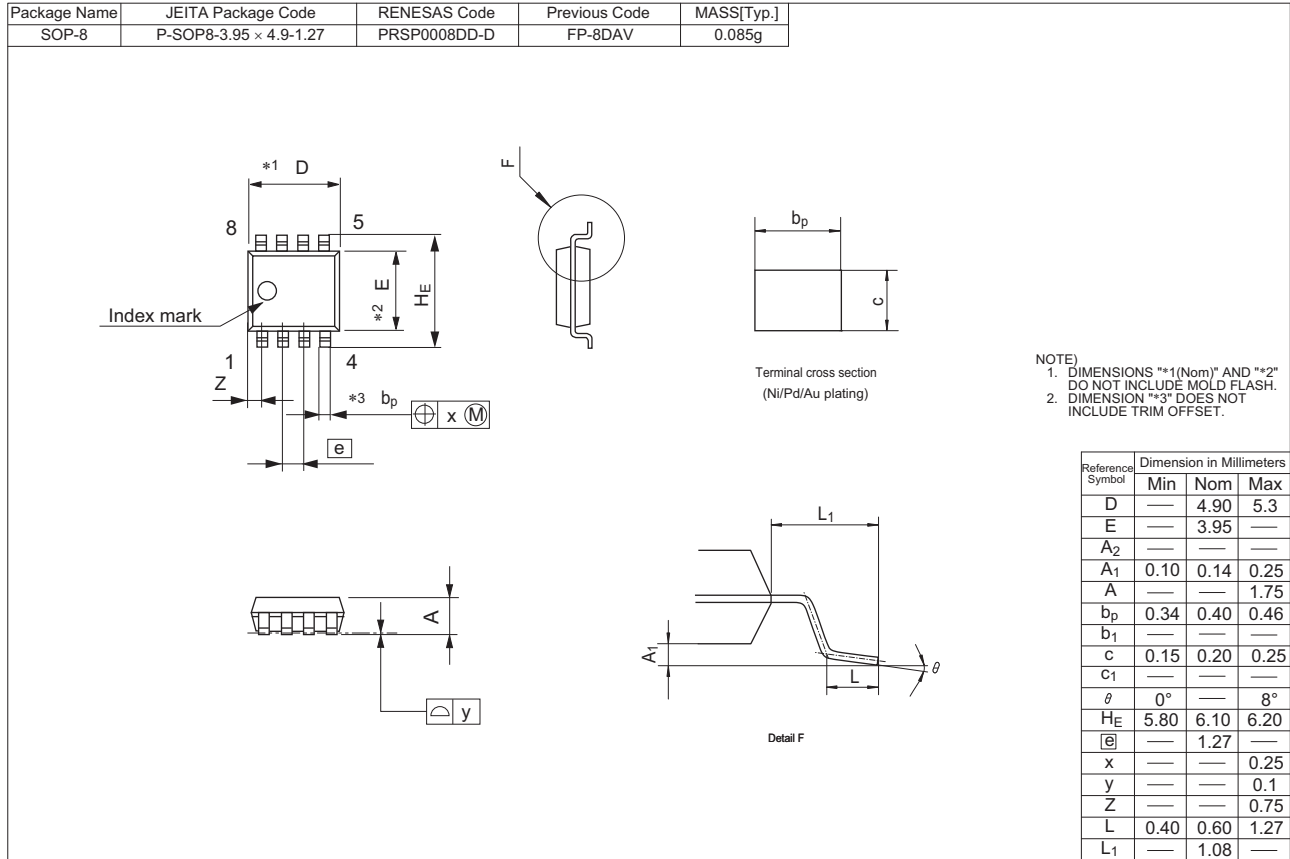
Switching Time Test Circuit



Waveform



### Package Dimensions



### Ordering Information

Orderable Part Number	Quantity	Shipping Container
RJF0614JSP-00#J0	2500 pcs	Taping (Reel)

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Tel: +1-408-588-6000, Fax: +1-408-588-6130

**Renesas Electronics Canada Limited**  
9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3  
Tel: +1-905-237-2004

**Renesas Electronics Europe Limited**  
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K  
Tel: +44-1628-585-100, Fax: +44-1628-585-900

**Renesas Electronics Europe GmbH**  
Arcadiastrasse 10, 40472 Düsseldorf, Germany  
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

**Renesas Electronics (China) Co., Ltd.**  
Room 1709, Quantum Plaza, No.27 ZhichunLu Haidian District, Beijing 100191, P.R.China  
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

**Renesas Electronics (Shanghai) Co., Ltd.**  
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, P. R. China 200333  
Tel: +86-21-2226-0888, Fax: +86-21-2226-0899

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