

RJF0610DSP

Silicon N Channel MOS FET Series Power Switching

R07DS0560EJ0200
Rev.2.00
Apr 16, 2012

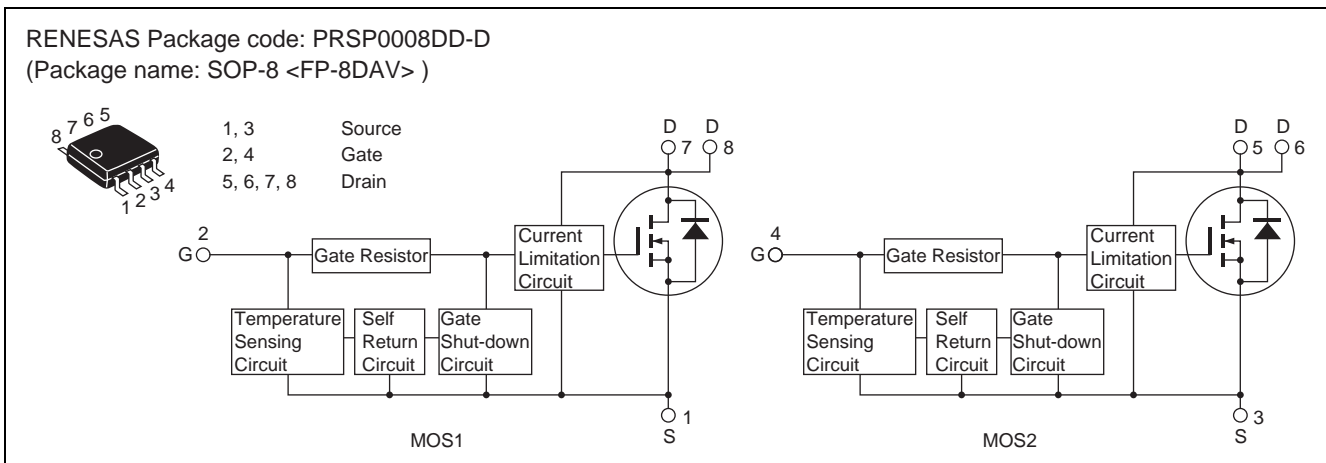
Description

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.

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 ^{Note4}	1.5	A
Body-drain diode reverse drain current	I_{DR}	1.5	A
Avalanche current	I_{AP} ^{Note 3}	0.95	A
Avalanche energy	E_{AR} ^{Note 3}	77.4	mJ
Channel dissipation	P_{ch} ^{Note 1}	2	W
Channel dissipation	P_{ch} ^{Note 2}	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 _{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}	—	0.4	—	mA	V _i = 8 V, V _{DS} = 0
	I _{IH(sd)2}	—	0.24	—	mA	V _i = 5 V, V _{DS} = 0
	I _{IH(sd)3}	—	0.16	—	mA	V _i = 3.5 V, V _{DS} = 0
Shut down temperature	T _{sd}	—	175	—	°C	Channel temperature
Return temperature	Thr	—	120	—	°C	Channel temperature
Gate operation voltage	V _{op}	3.5	—	12	V	
Drain current (Current limitation value)	I _{D limit}	1.5	—	—	A	V _{GS} = 5 V, V _{DS} = 10 V ^{Note 5}

Notes; 5. Pulse test

Electrical Characteristics

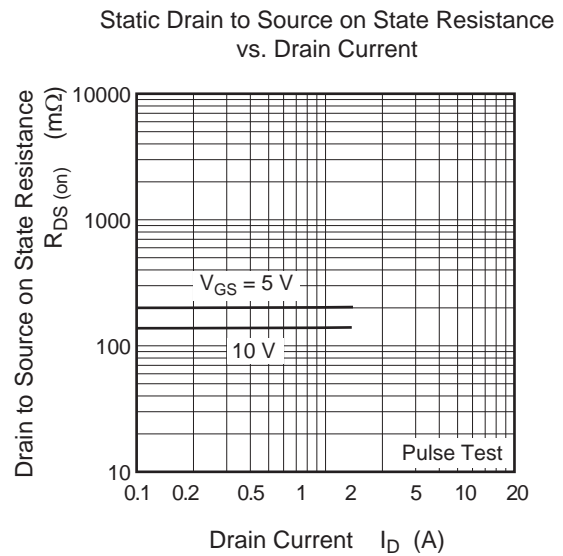
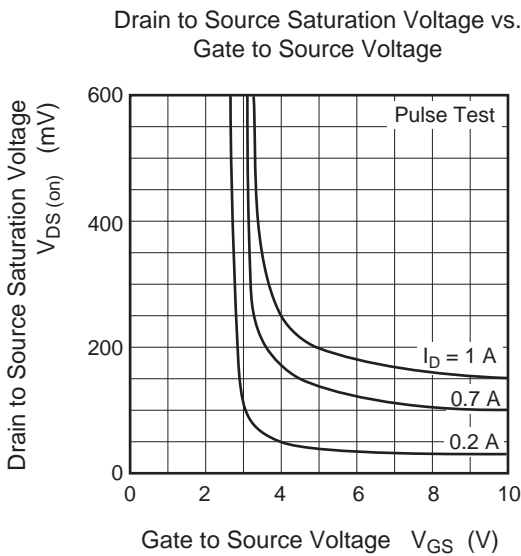
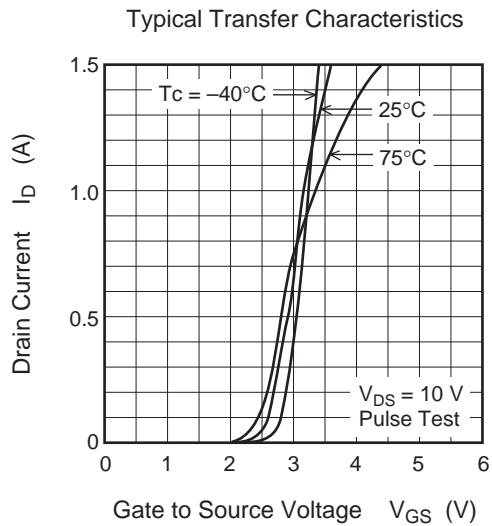
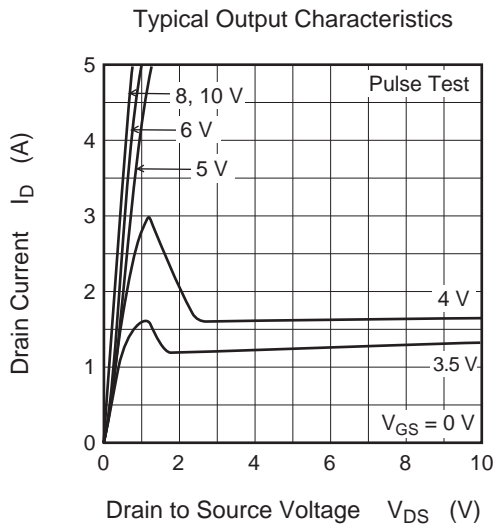
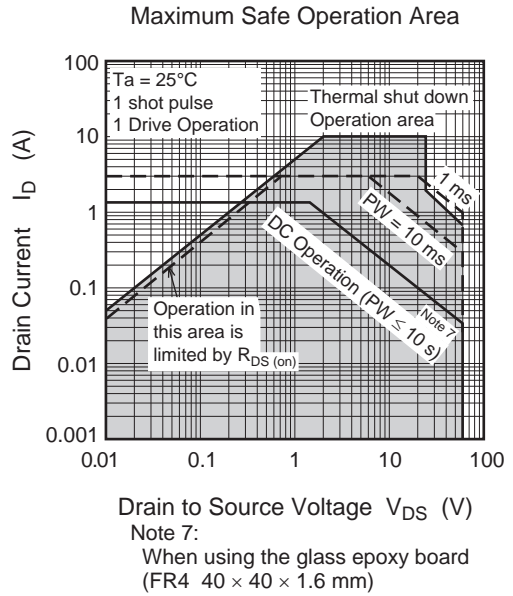
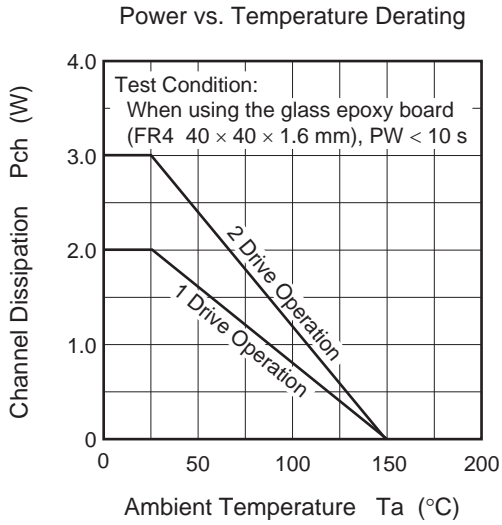
(Ta = 25°C)

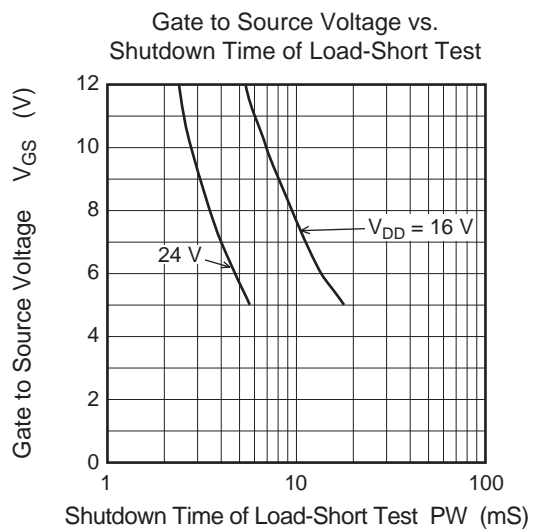
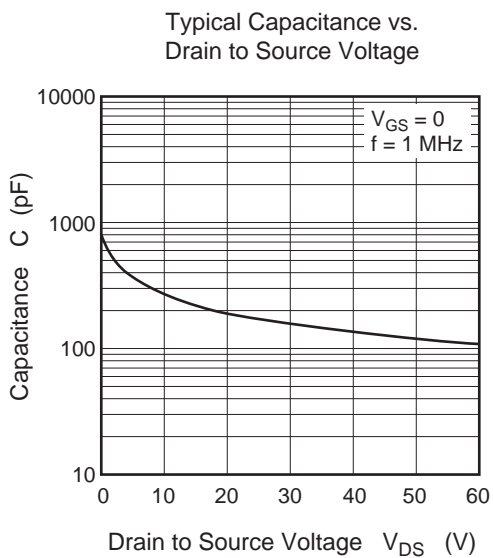
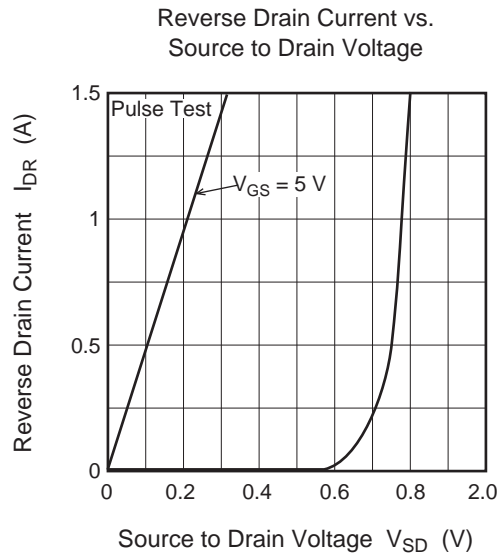
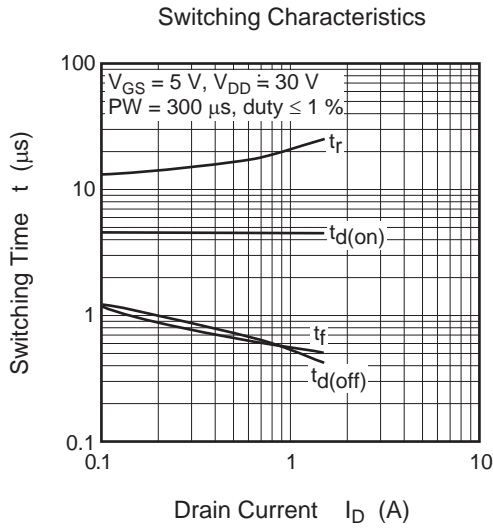
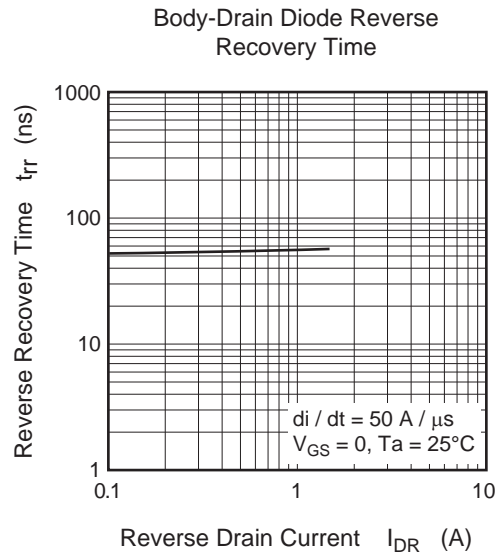
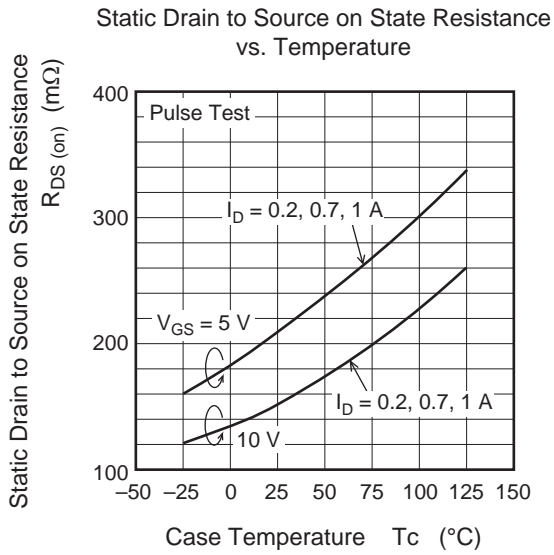
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I _{D1}	—	—	2.4	A	V _{GS} = 3.5 V, V _{DS} = 2 V
	I _{D2}	—	—	10	mA	V _{GS} = 1.2 V, V _{DS} = 2 V
	I _{D3}	1.5	—	—	—	V _{GS} = 5 V, V _{DS} = 10 V ^{Note 6}
Drain to source breakdown voltage	V _{(BR)DSS}	60	—	—	V	I _D = 10 mA, V _{GS} = 0
Gate to source breakdown voltage	V _{(BR)GSS}	16	—	—	V	I _G = 500 μA, V _{DS} = 0
	V _{(BR)GSS}	-2.5	—	—	V	I _G = -100 μA, V _{DS} = 0
Gate to source leak current	I _{GSS1}	—	—	100	μA	V _{GS} = 5 V, V _{DS} = 0
	I _{GSS2}	—	—	50	μA	V _{GS} = 3.5 V, V _{DS} = 0
	I _{GSS3}	—	—	1	μA	V _{GS} = 1.2 V, V _{DS} = 0
	I _{GSS4}	—	—	-100	μA	V _{GS} = -2.4 V, V _{DS} = 0
Input current (shut down)	I _{GS(OP)1}	—	0.4	—	mA	V _{GS} = 8 V, V _{DS} = 0
	I _{GS(OP)2}	—	0.24	—	mA	V _{GS} = 5 V, V _{DS} = 0
	I _{GS(OP)3}	—	0.16	—	mA	V _{GS} = 3.5 V, V _{DS} = 0
Zero gate voltage drain current	I _{DSS}	—	—	10	μA	V _{DS} = 60 V, V _{GS} = 0
Gate to source cutoff voltage	V _{GS(off)}	1.4	—	2.5	V	I _D = 1 mA, V _{DS} = 10 V
Static drain to source on state resistance	R _{DS(on)}	—	207	285	mΩ	I _D = 0.7 A, V _{GS} = 5 V ^{Note 6}
	R _{DS(on)}	—	153	214	mΩ	I _D = 0.7 A, V _{GS} = 10 V ^{Note 6}
Output capacitance	C _{oss}	—	267	—	pF	V _{DS} = 10 V, V _{GS} = 0, f = 1MHz
Turn-on delay time	t _{d(on)}	—	4.3	—	μs	I _D = 0.7 A, V _{GS} = 5 V, R _L = 43 Ω
Rise time	t _r	—	18.3	—	μs	
Turn-off delay time	t _{d(off)}	—	0.62	—	μs	
Fall time	t _f	—	0.61	—	μs	
Body-drain diode forward voltage	V _{DF}	—	0.8	—	V	I _F = 1.5 A, V _{GS} = 0
Body-drain diode reverse recovery time	t _{rr}	—	55	—	ns	I _F = 1.5 A, V _{GS} = 0 di _F /dt = 50 A/μs
Over load shut down operation time ^{Note 7}	t _{os1}	—	18	—	ms	V _{GS} = 5 V, V _{DD} = 16 V
	t _{os2}	—	5.7	—	ms	V _{GS} = 5 V, V _{DD} = 24 V

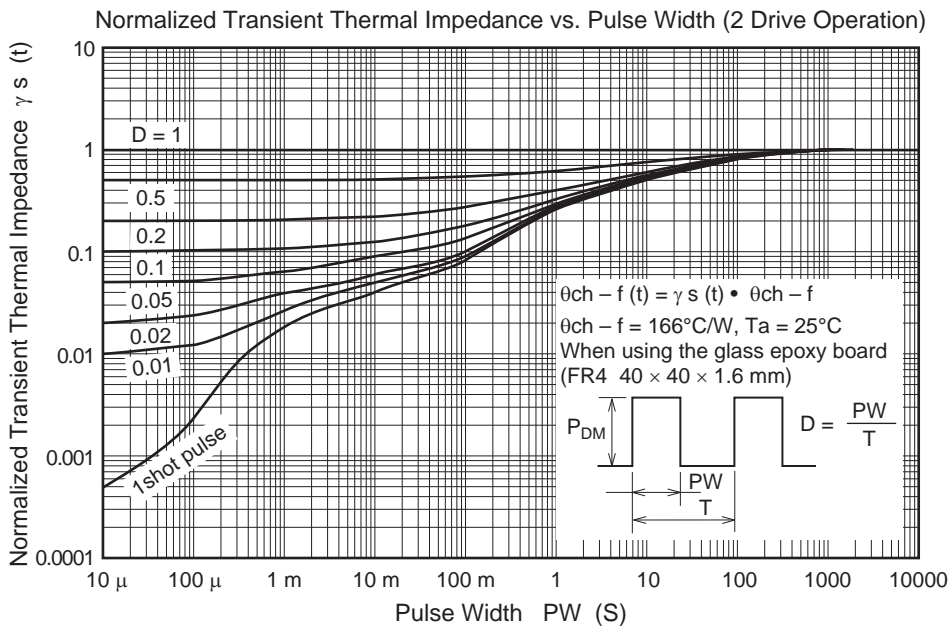
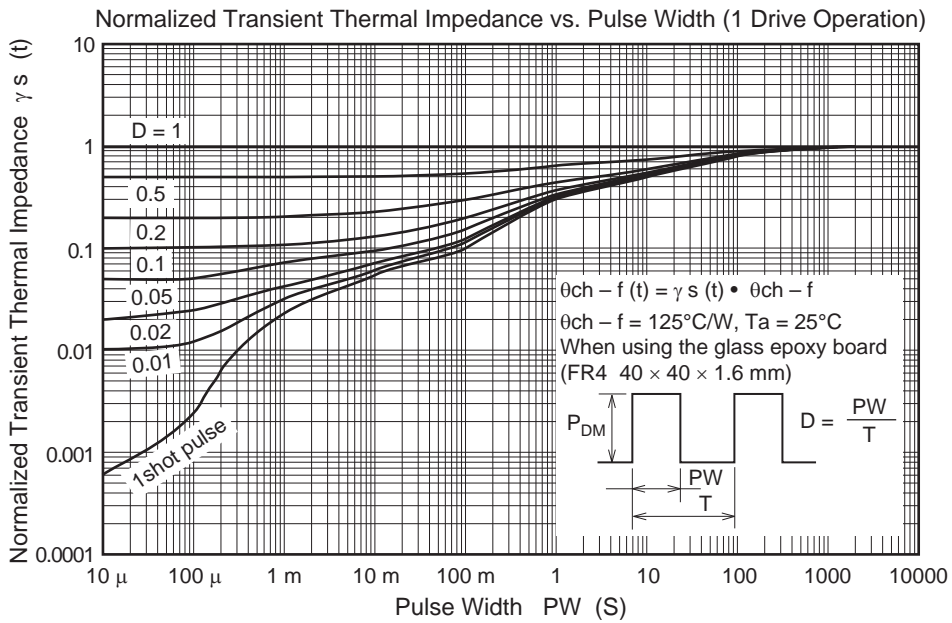
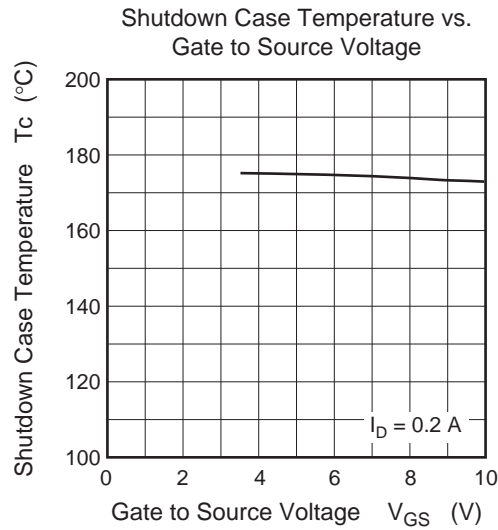
Notes: 6. Pulse test

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

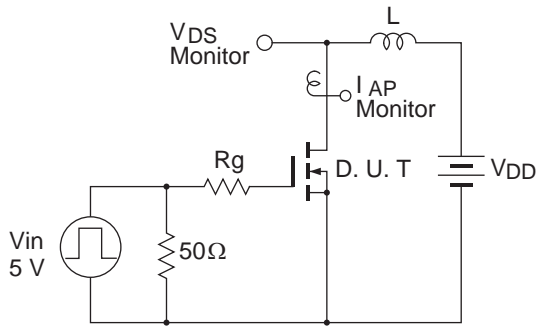
Main Characteristics





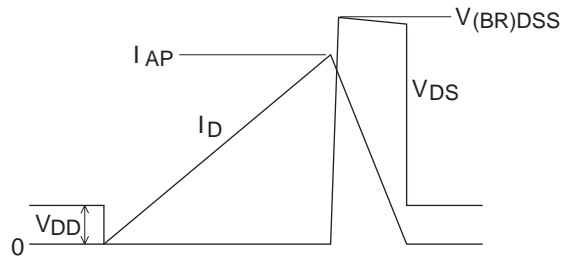


Avalanche Test Circuit

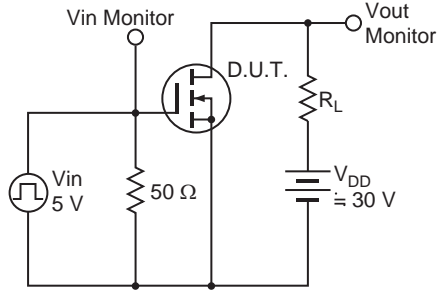


Avalanche Waveform

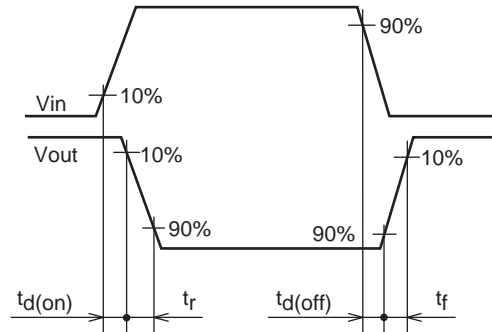
$$E_{AR} = \frac{1}{2} \cdot L \cdot I_{AP}^2 \cdot \frac{V_{DSS}}{V_{DSS} - V_{DD}}$$



Switching Time Test Circuit

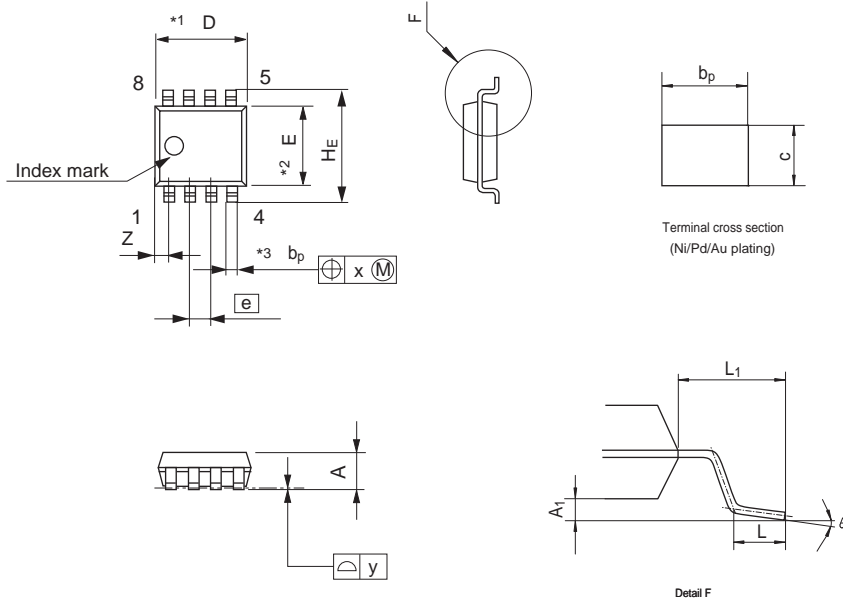


Waveform



Package Dimensions

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
ⓐ	—	1.27	—
x	—	—	0.25
y	—	—	0.1
Z	—	—	0.75
L	0.40	0.60	1.27
L ₁	—	1.08	—

Ordering Information

Orderable Part Number	Quantity	Shipping Container
RJF0610DSP-00#J0	2500 pcs	Taping (Reel)

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