

HAF2026RJ

Silicon N Channel Power MOS FET Power Switching

R07DS0122EJ0300
(Previous: REJ03G1255-0200)
Rev.3.00
Sep 01, 2010

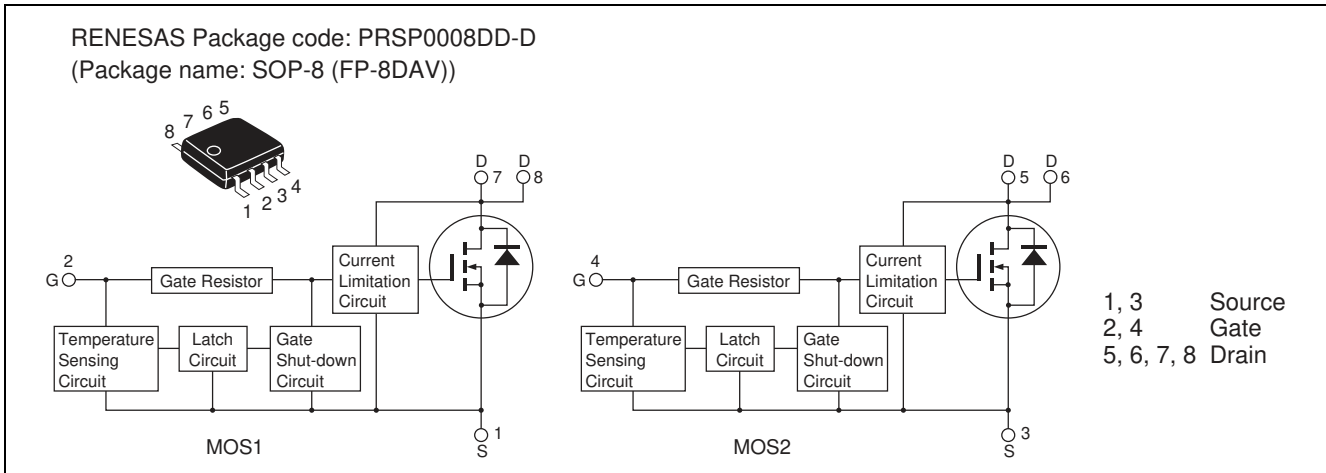
Description

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 shut-down circuit
- Latch type shut down operation (need 0 voltage recovery)
- Built-in the current limitation circuit

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	0.6	A
Body-drain diode reverse drain current	I _{DR}	1	A
Avalanche current	I _{AP} ^{Note3}	0.6	A
Avalanche energy	E _{AR} ^{Note3}	1.54	mJ
Channel dissipation	P _{ch} ^{Note1}	1	W
Channel dissipation	P _{ch} ^{Note2}	1.5	W
Channel temperature	T _{ch}	150	°C
Storage temperature	T _{stg}	-55 to +150	°C

Notes: 1. 1 Drive operation: When using the glass epoxy board (FR4 40 x 40 x 1.6 mm), PW ≤ 10s
 2. 2 Drive operation: When using the glass epoxy board (FR4 40 x 40 x 1.6 mm), PW ≤ 10s
 3. Tc = 25°C, Rg ≥ 50 Ω

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	μ A	$V_i = 8\text{ V}, V_{DS} = 0$
	I_{IH2}	—	—	50	μ A	$V_i = 3.5\text{ V}, V_{DS} = 0$
	I_{IL}	—	—	10	μ A	$V_i = 1.2\text{ V}, V_{DS} = 0$
Input current (Gate shut down)	$I_{IH(sd)1}$	—	0.53	—	mA	$V_i = 8\text{ V}, V_{DS} = 0$
	$I_{IH(sd)2}$	—	0.23	—	mA	$V_i = 3.5\text{ V}, V_{DS} = 0$
Shut down temperature	Tsd	—	175	—	°C	Cannel temperature
Gate operation voltage	Vop	3.5	—	12	V	
Drain current (Current limitation)	$I_{D\ limit}$	0.6	—	1.0	A	$V_i = 5\text{ V}, V_{DS} = 3\text{ V}$

Electrical Characteristics

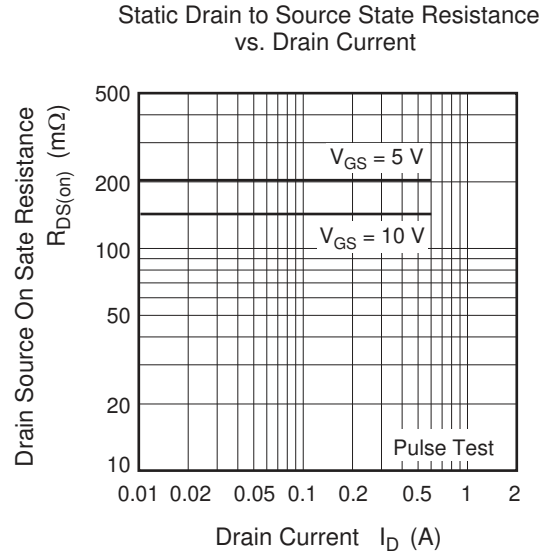
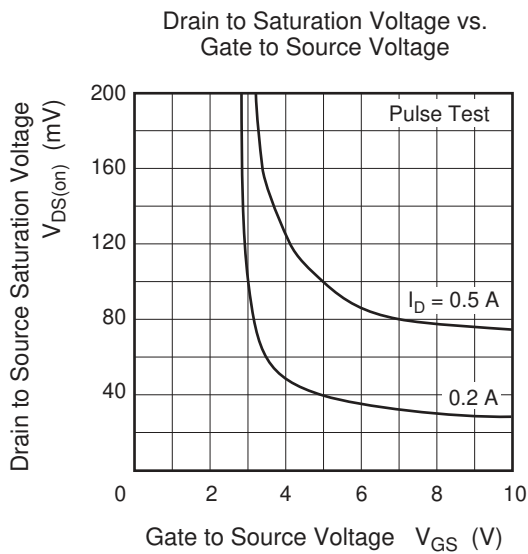
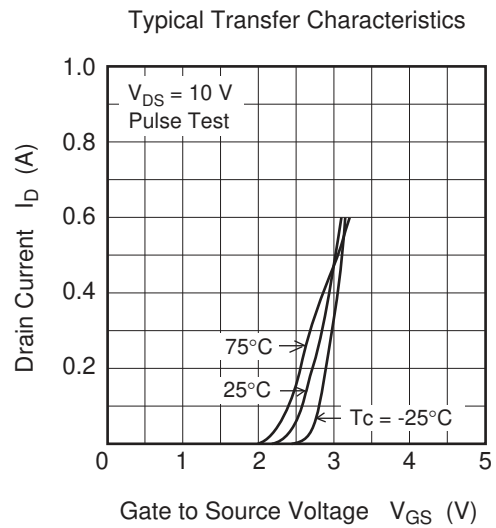
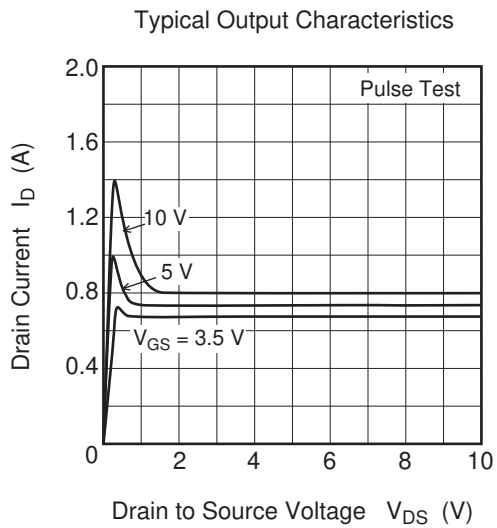
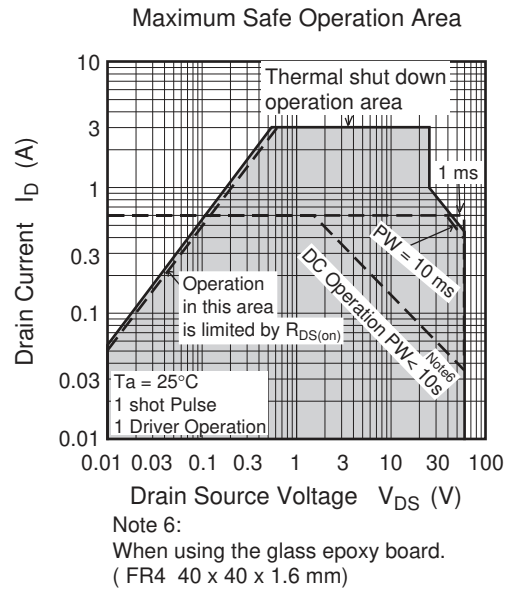
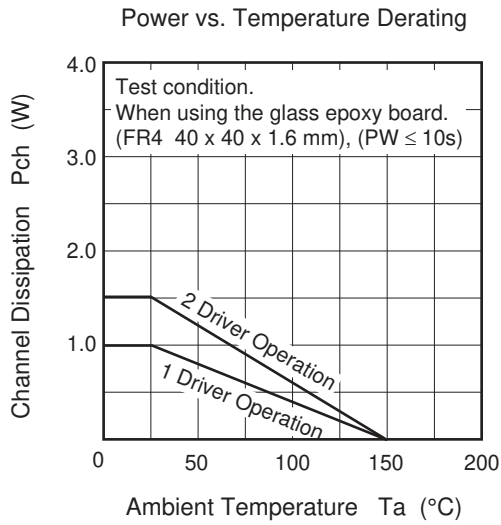
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I_{D1}	0.25	—	—	A	$V_{GS} = 3.5\text{ V}, V_{DS} = 2\text{ V}$
	I_{D2}	—	—	10	mA	$V_{GS} = 1.2\text{ V}, V_{DS} = 2\text{ V}$
	I_{D3}	0.6	—	1.0	A	$V_{GS} = 5\text{ V}, V_{DS} = 3\text{ V}$
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	$I_G = 800\ \mu\text{A}, V_{DS} = 0$
	$V_{(BR)GSS}$	-2.5	—	—	V	$I_G = -100\ \mu\text{A}, V_{DS} = 0$
Gate to source leak current	I_{GSS1}	—	—	100	μ A	$V_{GS} = 8\text{ V}, V_{DS} = 0$
	I_{GSS2}	—	—	50	μ A	$V_{GS} = 3.5\text{ V}, V_{DS} = 0$
	I_{GSS3}	—	—	10	μ A	$V_{GS} = 1.2\text{ V}, V_{DS} = 0$
	I_{GSS4}	—	—	-100	μ A	$V_{GS} = -2.4\text{ V}, V_{DS} = 0$
Input current (shut down)	$I_{GS(OP)1}$	—	0.53	—	mA	$V_{GS} = 8\text{ V}, V_{DS} = 0$
	$I_{GS(OP)2}$	—	0.23	—	mA	$V_{GS} = 3.5\text{ V}, V_{DS} = 0$
Zero gate voltage drain current	I_{DSS1}	—	—	10	μ A	$V_{DS} = 60\text{ V}, V_{GS} = 0$
	I_{DSS2}	—	—	10	μ A	$V_{DS} = 48\text{ V}, V_{GS} = 0, T_a = 125^\circ\text{C}$
Gate to source cut off voltage	$V_{GS(off)}$	1.4	—	2.5	V	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$
Forward transfer admittance	$ y_{fs} $	0.26	1.3	—	S	$I_D = 0.5\text{ A}, V_{DS} = 10\text{ V}$ ^{Note4}
Static drain to source on state resistance	$R_{DS(on)}$	—	200	300	m Ω	$I_D = 0.5\text{ A}, V_{GS} = 5\text{ V}$ ^{Note4}
	$R_{DS(on)}$	—	150	210	m Ω	$I_D = 0.5\text{ A}, V_{GS} = 10\text{ V}$ ^{Note4}
Output capacitance	Coss	—	140	—	pF	$V_{DS} = 10\text{ V}, V_{GS} = 0, f = 1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	2.9	—	μ s	$V_{GS} = 5\text{ V}, I_D = 0.5\text{ A}, R_L = 60\ \Omega$
Rise time	t_r	—	11	—	μ s	
Turn off delay time	$t_{d(off)}$	—	0.9	—	μ s	
Fall time	t_f	—	1	—	μ s	
Body-drain diode forward voltage	V_{DF}	—	0.9	—	V	$I_F = 1\text{ A}, V_{GS} = 0$
Body-drain diode reverse recovery time	t_{rr}	—	61	—	ns	$I_F = 1\text{ A}, V_{GS} = 0, di_F/dt = 50\text{ A}/\mu\text{s}$
Over load shut down operation time ^{note5}	t_{os1}	—	85	—	ms	$V_{GS} = 5\text{ V}, V_{DD} = 16\text{ V}$
	t_{os2}	—	30	—	ms	$V_{GS} = 5\text{ V}, V_{DD} = 24\text{ V}$

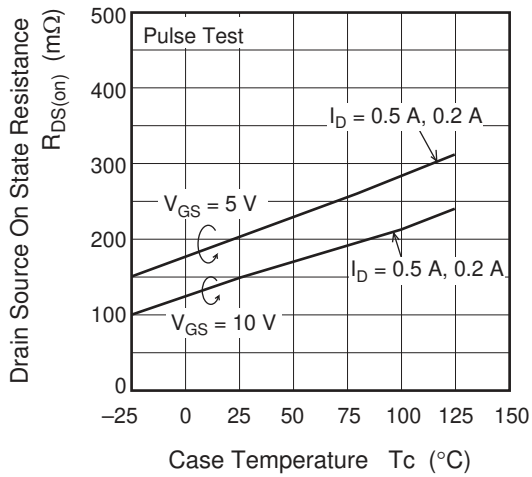
Notes: 4. Pulse test

5. Including the junction temperature rise of the over loded condition.

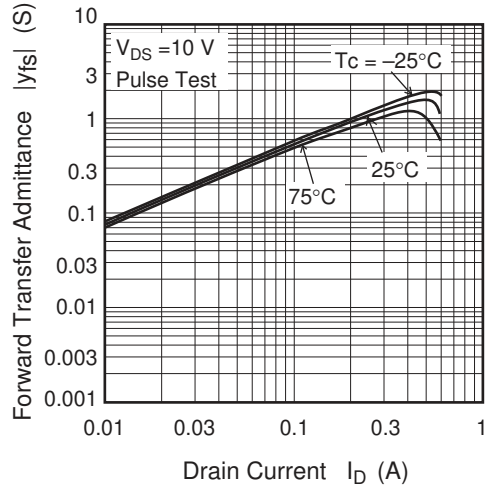
Main Characteristics



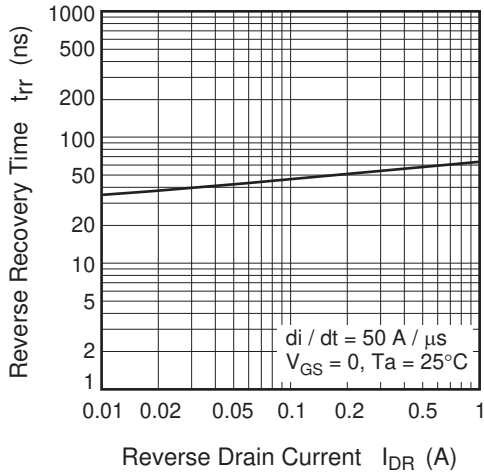
Drain to Source On State Resistance vs. Temperature



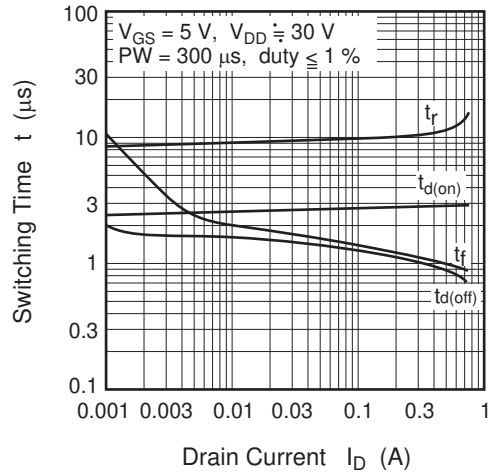
Forward Transfer Admittance vs. Drain Current



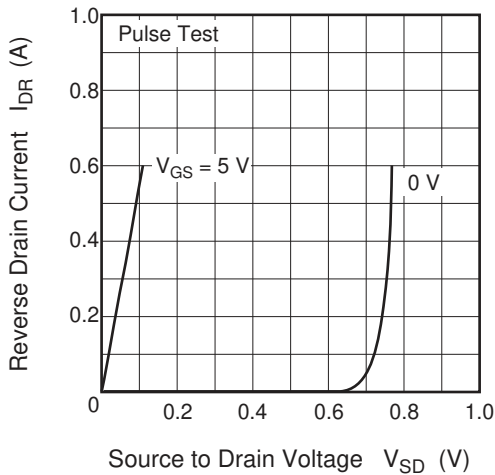
Body to Drain Diode Reverse Recovery Time



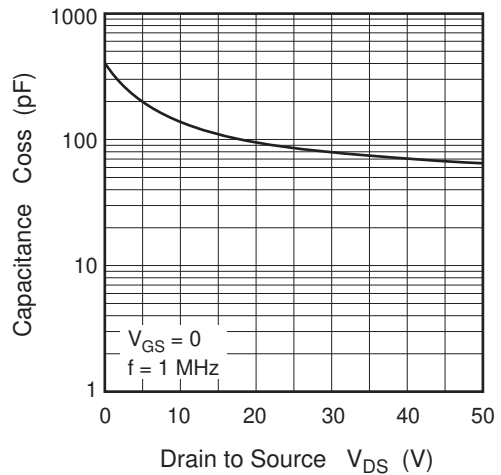
Switching Characteristics



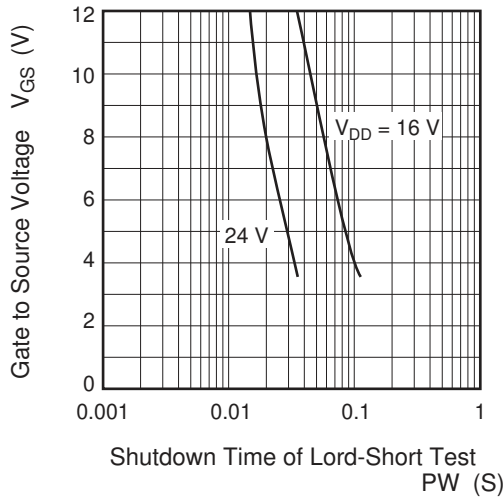
Reverse Drain Current vs. Source to Drain Voltage



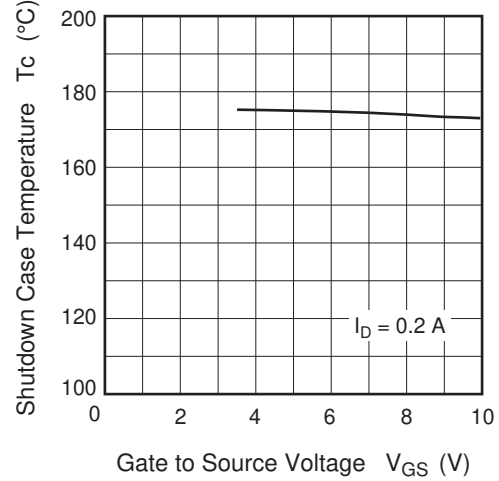
Typical capacitance vs. Drain to Source Voltage



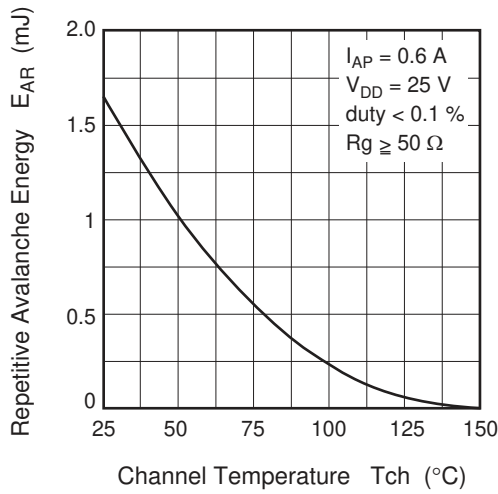
Gate to Source Voltage vs. Shutdown Time of Load-Short Test



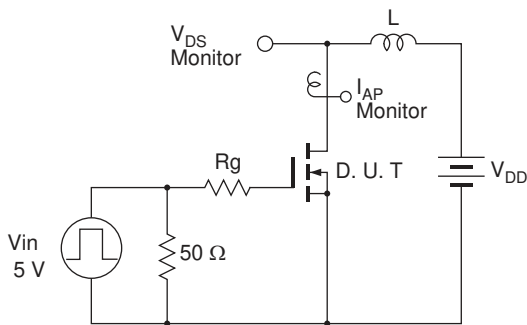
Shutdown Case Temperature vs. Gate to Source Voltage



Avalanche Energy vs. Channel Temperature Derating

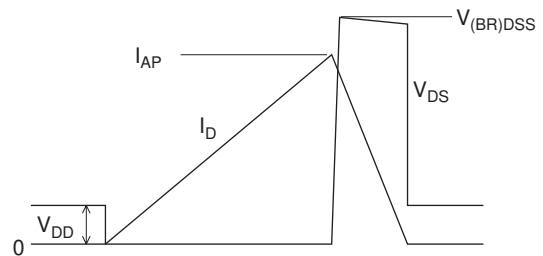


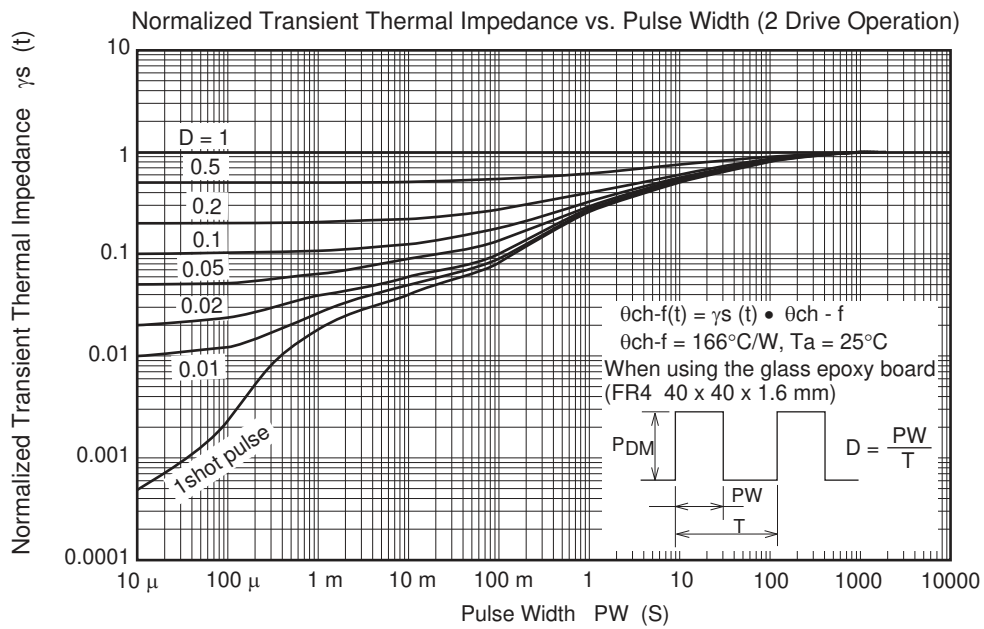
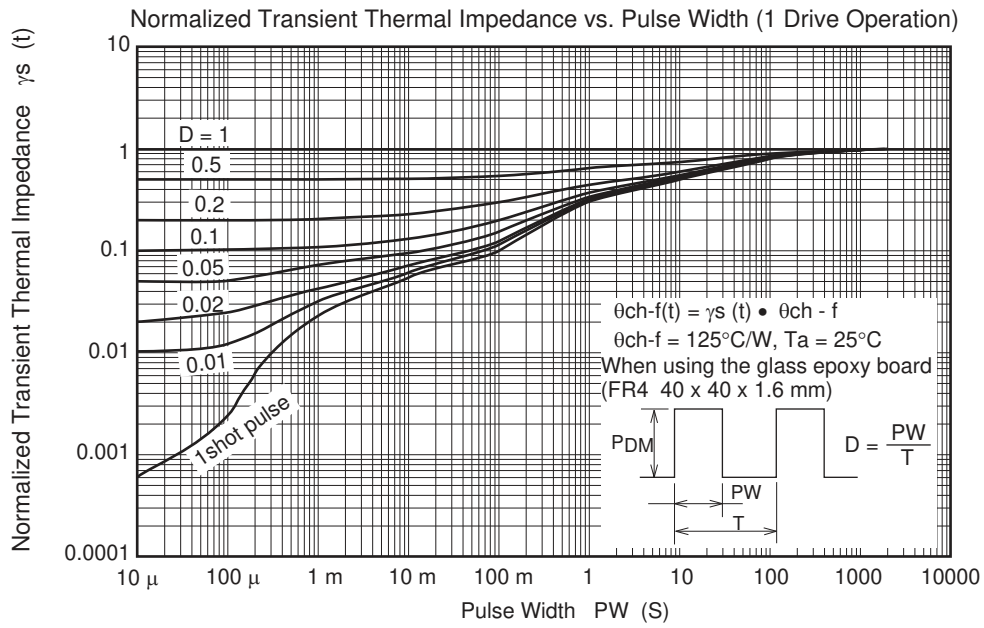
Avalanche Test Circuit



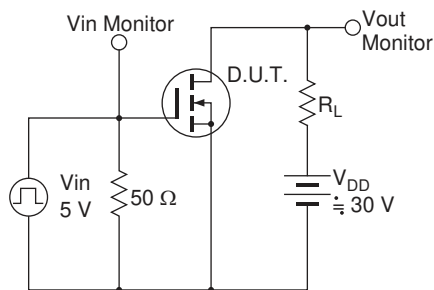
Avalanche Waveform

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

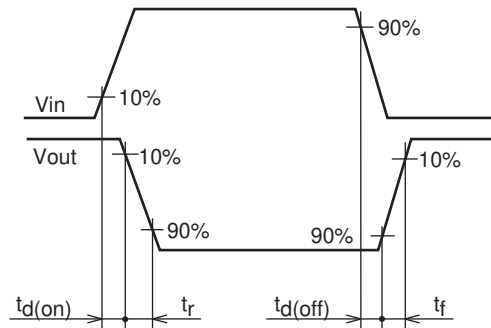




Switching Time Test Circuit

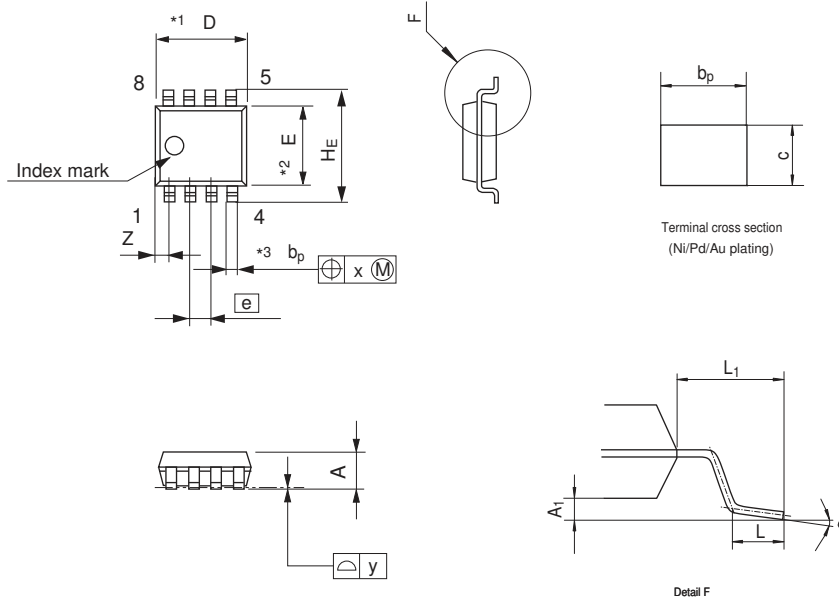


Switching Time Waveform



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
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 Name	Quantity	Shipping Container
HAF2026RJ-EL-E	2500 pcs	Taping

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