

# HAF2026RJ

## Silicon N Channel Power MOS FET Power Switching

REJ03G1255-0200

Rev.2.00

Jun 02, 2006

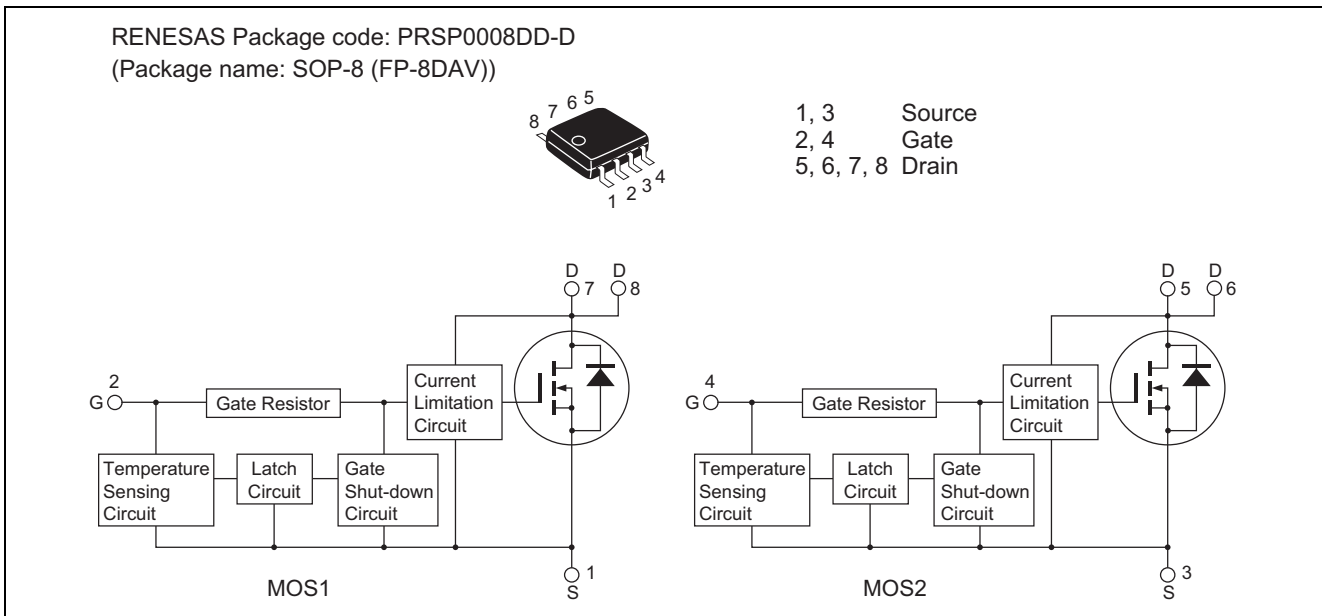
### Description

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 <sub>DSS</sub>	60	V
Gate to source voltage	V <sub>GSS</sub>	16	V
Gate to source voltage	V <sub>GSS</sub>	-2.5	V
Drain current	I <sub>D</sub>	0.6	A
Body-drain diode reverse drain current	I <sub>DR</sub>	1	A
Avalanche current	I <sub>AF</sub> <sup>Note3</sup>	0.6	A
Avalanche energy	E <sub>AR</sub> <sup>Note3</sup>	1.54	mJ
Channel dissipation	P <sub>ch</sub> <sup>Note1</sup>	1	W
Channel dissipation	P <sub>ch</sub> <sup>Note2</sup>	1.5	W
Channel temperature	T <sub>ch</sub>	150	°C
Storage temperature	T <sub>stg</sub>	-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. T<sub>c</sub> = 25°C, R<sub>g</sub> ≥ 50 Ω

## 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>	—	0.53	—	mA	V <sub>i</sub> = 8 V, V <sub>DS</sub> = 0
	I <sub>IH(sd)2</sub>	—	0.23	—	mA	V <sub>i</sub> = 3.5 V, V <sub>DS</sub> = 0
Shut down temperature	T <sub>sd</sub>	—	175	—	°C	Channel temperature
Gate operation voltage	V <sub>op</sub>	3.5	—	12	V	
Drain current (Current limitation)	I <sub>D limit</sub>	0.6	—	1.0	A	V <sub>i</sub> = 5 V, V <sub>DS</sub> = 3 V

## Electrical Characteristics

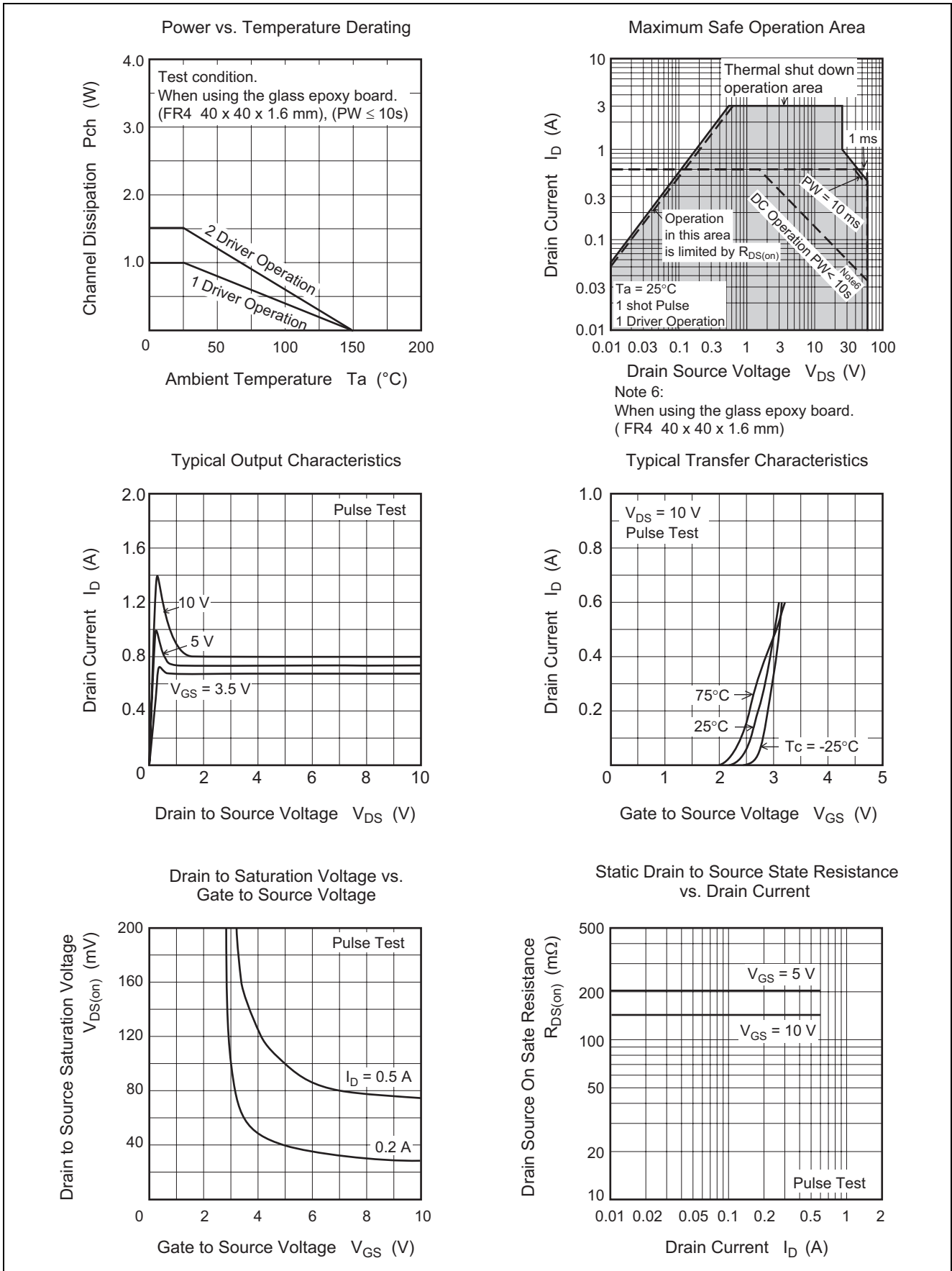
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I <sub>D1</sub>	0.25	—	—	A	V <sub>GS</sub> = 3.5 V, V <sub>DS</sub> = 2 V
	I <sub>D2</sub>	—	—	10	mA	V <sub>GS</sub> = 1.2 V, V <sub>DS</sub> = 2 V
	I <sub>D3</sub>	0.6	—	1.0	A	V <sub>GS</sub> = 5 V, V <sub>DS</sub> = 3 V
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>	—	0.53	—	mA	V <sub>GS</sub> = 8 V, V <sub>DS</sub> = 0
	I <sub>GS(OP)2</sub>	—	0.23	—	mA	V <sub>GS</sub> = 3.5 V, V <sub>DS</sub> = 0
Zero gate voltage drain current	I <sub>DSS1</sub>	—	—	10	μA	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0
	I <sub>DSS2</sub>	—	—	10	μA	V <sub>DS</sub> = 48 V, V <sub>GS</sub> = 0, Ta = 125°C
Gate to source cut off voltage	V <sub>GS(off)</sub>	1.4	—	2.5	V	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA
Forward transfer admittance	y <sub>fs</sub>	0.26	1.3	—	S	I <sub>D</sub> = 0.5 A, V <sub>DS</sub> = 10 V <sup>Note4</sup>
Static drain to source on state resistance	R <sub>DS(on)</sub>	—	200	300	mΩ	I <sub>D</sub> = 0.5 A, V <sub>GS</sub> = 5 V <sup>Note4</sup>
	R <sub>DS(on)</sub>	—	150	210	mΩ	I <sub>D</sub> = 0.5 A, V <sub>GS</sub> = 10 V <sup>Note4</sup>
Output capacitance	C <sub>oss</sub>	—	140	—	pF	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0, f = 1MHz
Turn-on delay time	t <sub>d(on)</sub>	—	2.9	—	μs	V <sub>GS</sub> = 5 V, I <sub>D</sub> = 0.5 A, R <sub>L</sub> = 60 Ω
Rise time	t <sub>r</sub>	—	11	—	μs	
Turn off delay time	t <sub>d(off)</sub>	—	0.9	—	μs	
Fall time	t <sub>f</sub>	—	1	—	μs	
Body-drain diode forward voltage	V <sub>DF</sub>	—	0.9	—	V	I <sub>F</sub> = 1 A, V <sub>GS</sub> = 0
Body-drain diode reverse recovery time	t <sub>rr</sub>	—	61	—	ns	I <sub>F</sub> = 1 A, V <sub>GS</sub> = 0, di <sub>F</sub> /dt = 50 A/μs
Over load shut down operation time <sup>note5</sup>	t <sub>os1</sub>	—	85	—	ms	V <sub>GS</sub> = 5 V, V <sub>DD</sub> = 16 V
	t <sub>os2</sub>	—	30	—	ms	V <sub>GS</sub> = 5 V, V <sub>DD</sub> = 24 V

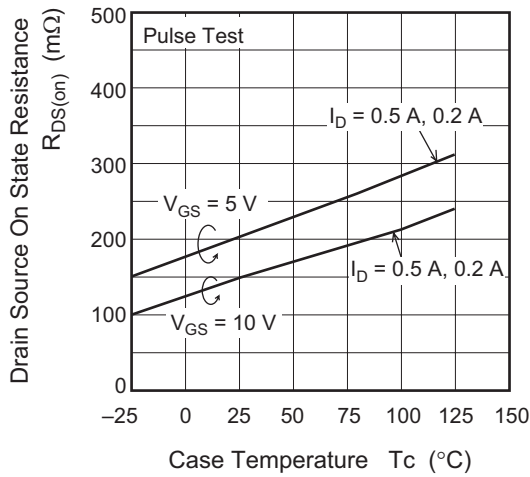
Notes: 4. Pulse test

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

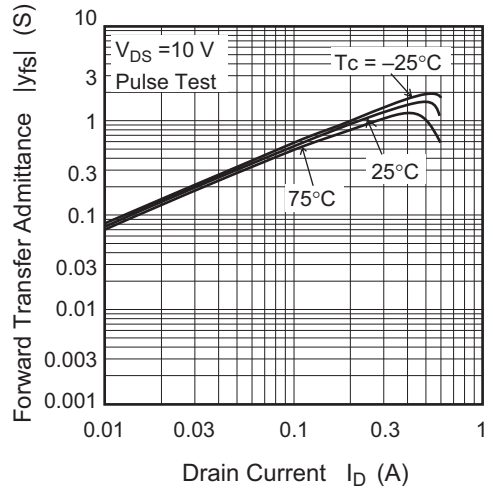
## Main Characteristics



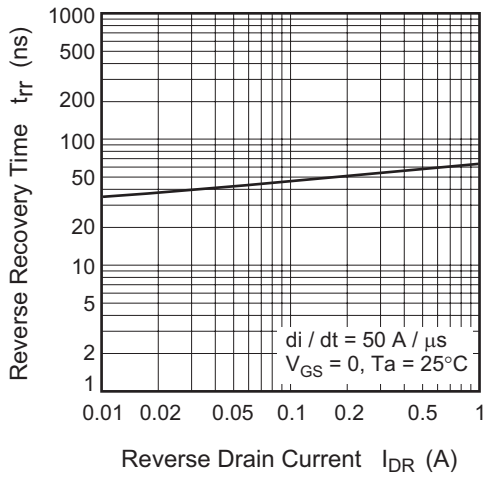
Drain to Source On State Resistance vs. Temperature



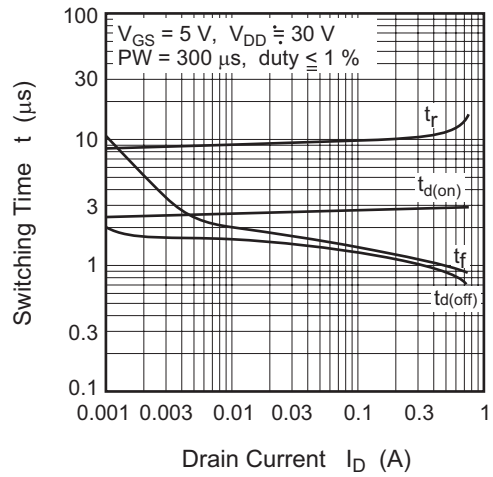
Forward Transfer Admittance vs. Drain Current



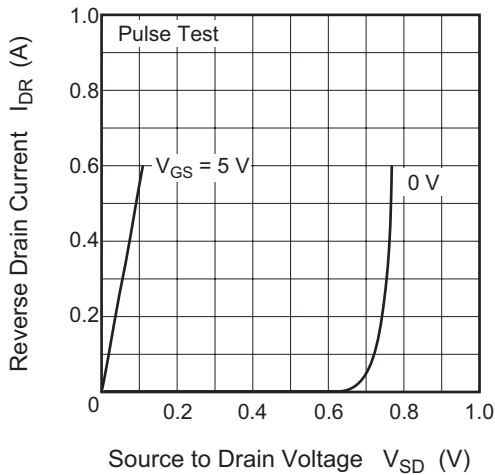
Body to Drain Diode Reverse Recovery Time



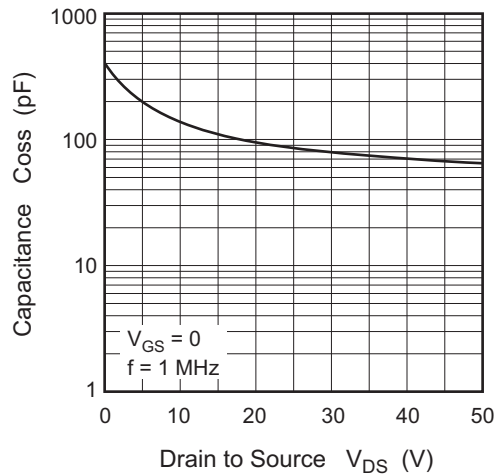
Switching Characteristics

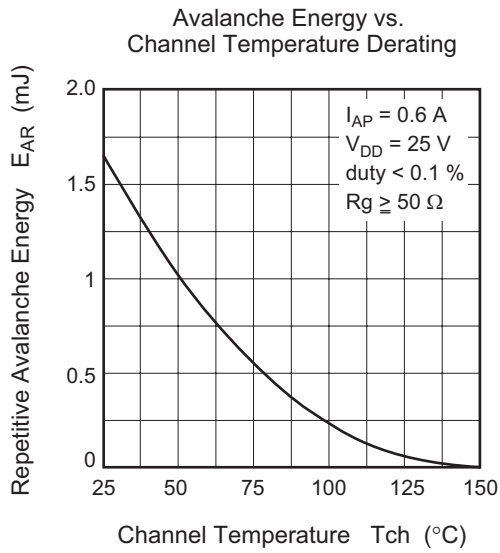
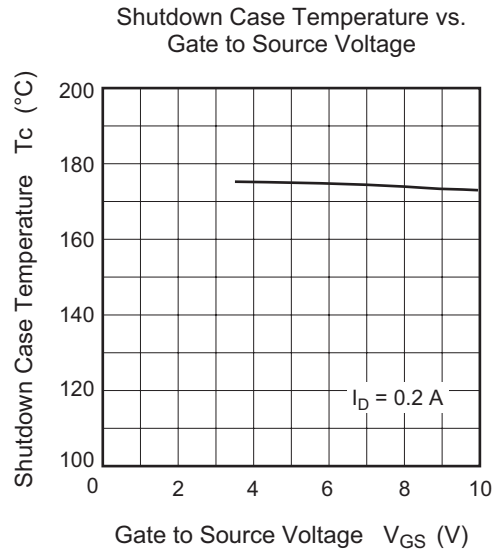
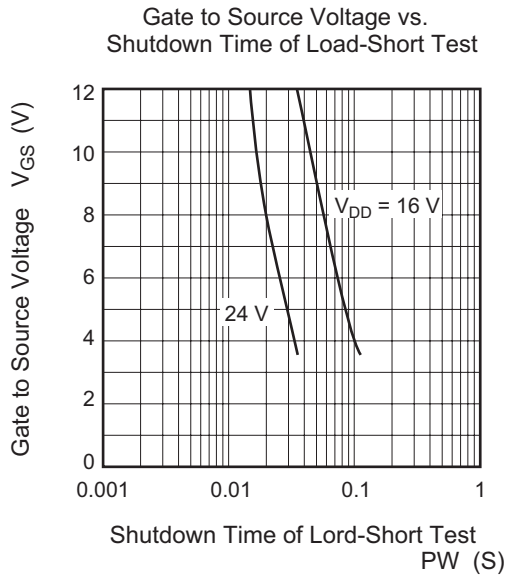


Reverse Drain Current vs. Source to Drain Voltage

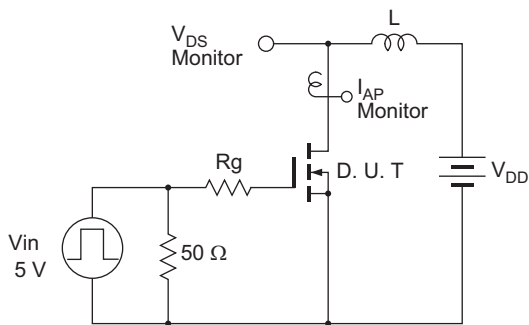


Typical capacitance vs. Drain to Source Voltage

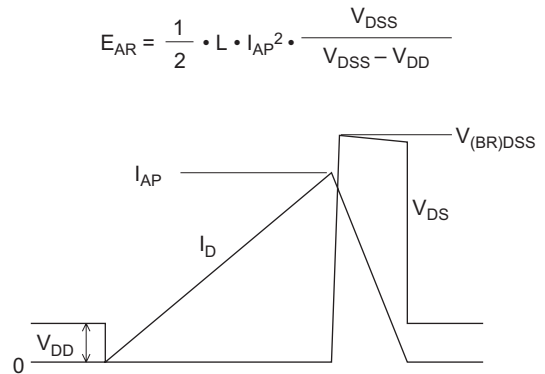


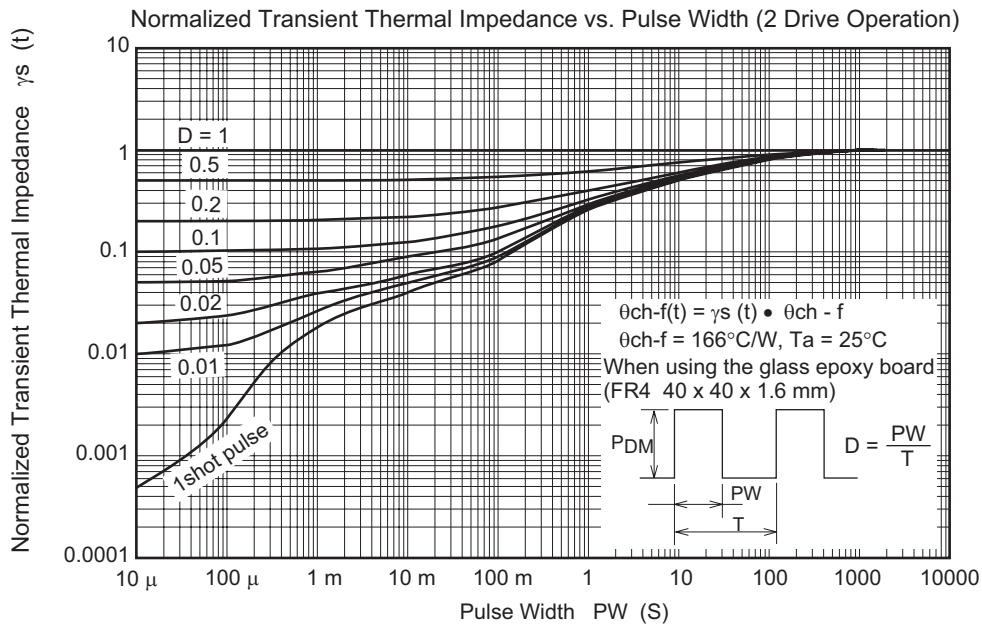
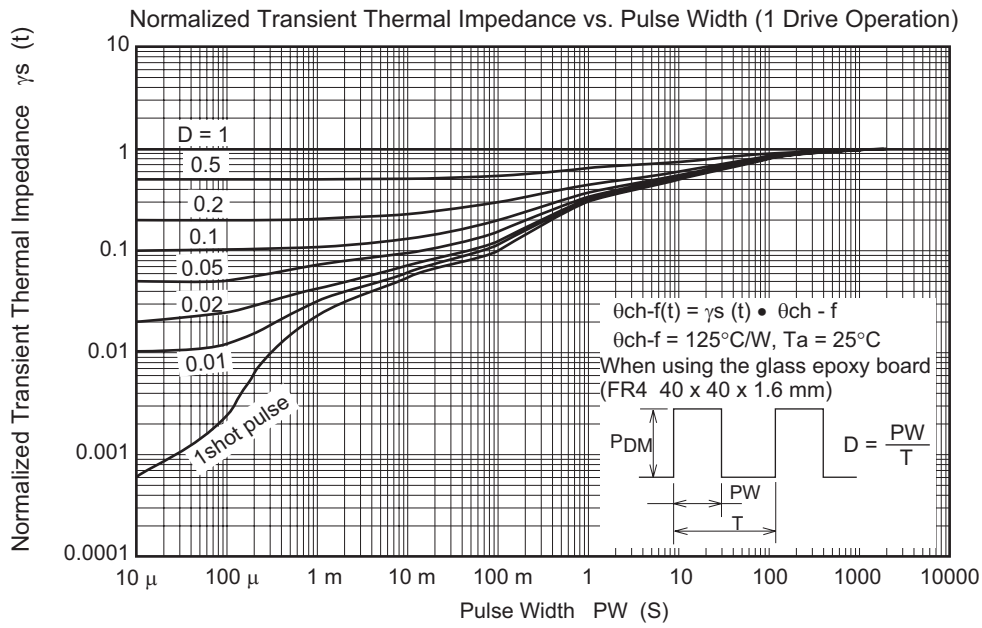


Avalanche Test Circuit

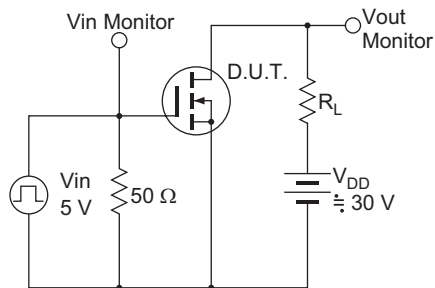


Avalanche Waveform

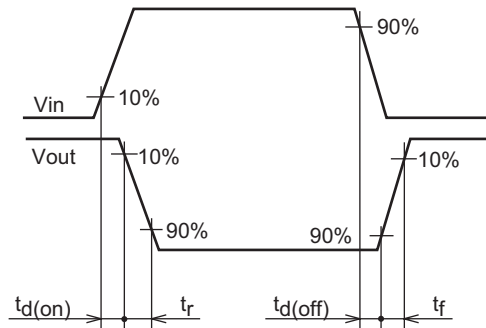




Switching Time Test Circuit

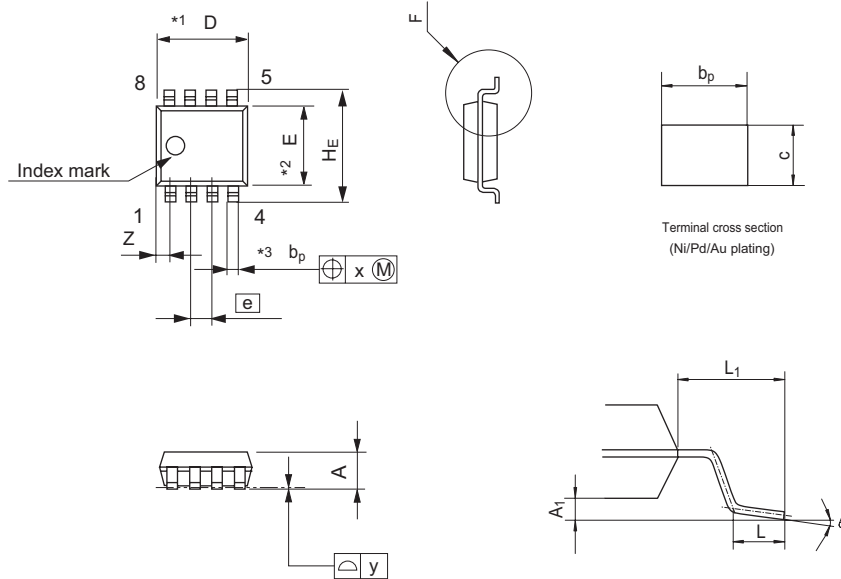


Switching Time Waveform



### 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 <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°
HE	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 <sub>1</sub>	—	1.08	—

### Ordering Information

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

Note: For some grades, production may be terminated.  
 Please contact the Renesas sales office to check the state of production before ordering the product.



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