

## HAF1008(L), HAF1008(S)

### Silicon P Channel MOS FET Series Power Switching

REJ03G0027-0100Z

Rev.1.00

May.13.2003

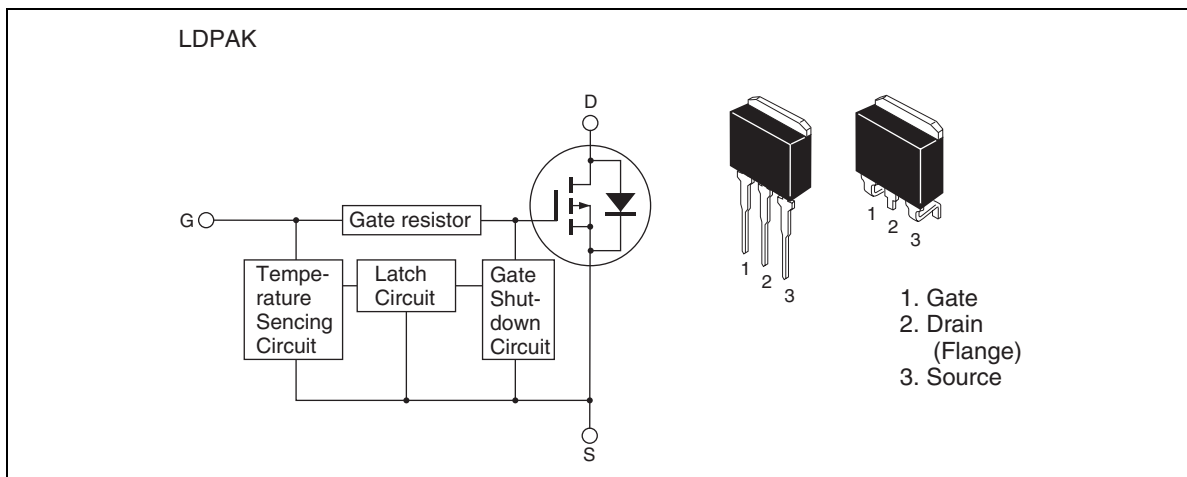
#### Description

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 (-4 to -6 V Gate drive)
- High endurance capability against to the short circuit
- Built-in the over temperature shut-down circuit
- Latch type shut-down operation (Need 0 voltage recovery)

#### Outline



## HAF1008(L), HAF1008(S)

### Absolute Maximum Ratings

(T<sub>a</sub> = 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>	-20	A
Drain peak current	I <sub>D</sub> (pulse) <sup>Note1</sup>	-40	A
Body-drain diode reverse drain current	I <sub>DR</sub>	-20	A
Channel dissipation	P <sub>ch</sub> <sup>Note2</sup>	50	W
Channel temperature	T <sub>ch</sub>	150	°C
Storage temperature	T <sub>stg</sub>	-55 to +150	°C

Notes: 1. PW ≤ 10μs, duty cycle ≤ 1 %

2. Value at T<sub>c</sub> = 25°C

### Typical Operation Characteristics

(T<sub>a</sub> = 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
Gate operation voltage	V <sub>op</sub>	-3.5	—	-12	V	

## HAF1008(L), HAF1008(S)

### Electrical Characteristics

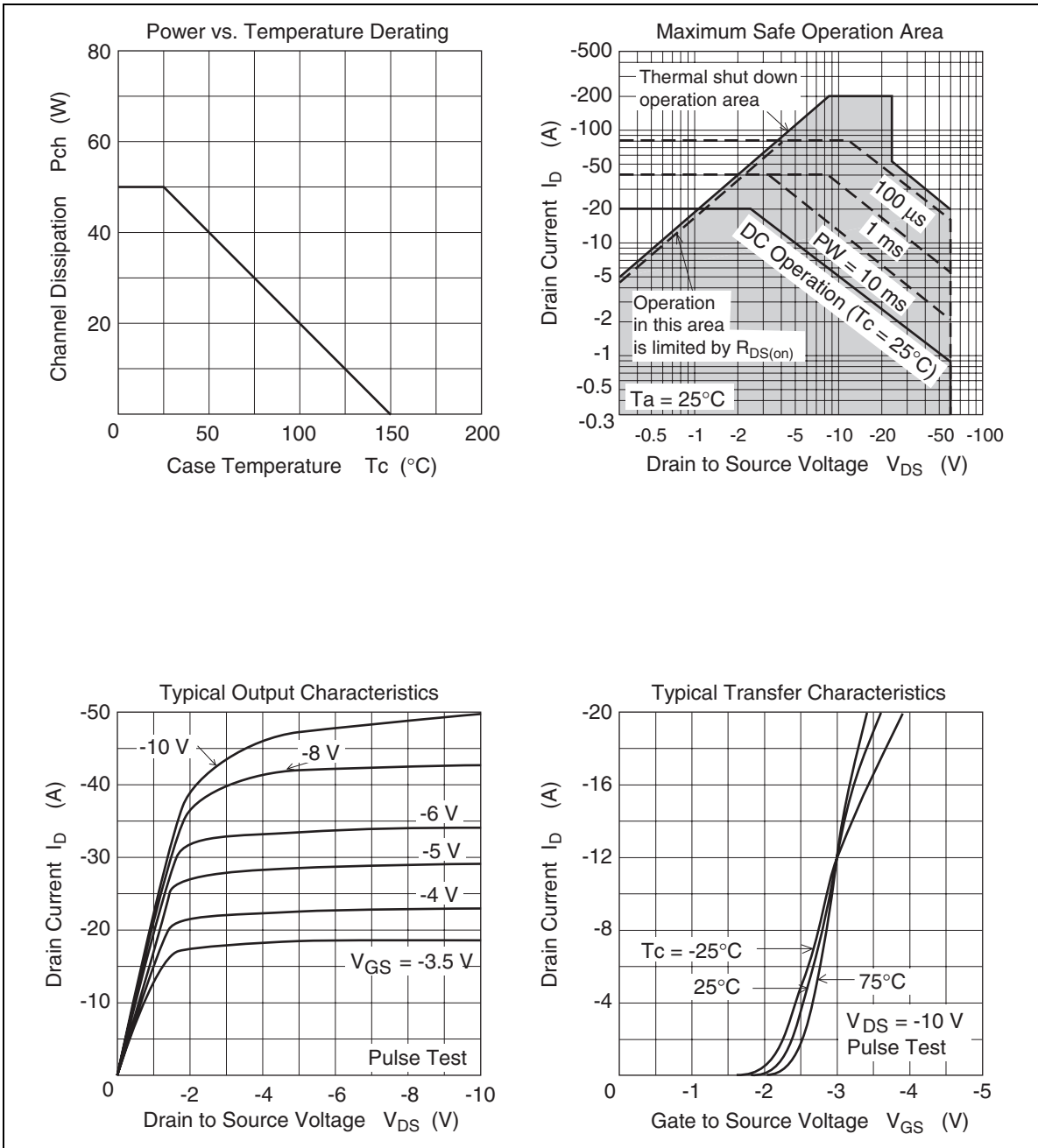
(T<sub>a</sub> = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I <sub>D1</sub>	-7	—	—	A	V <sub>GS</sub> = -3.5 V, V <sub>DS</sub> = -2 V
Drain current	I <sub>D2</sub>	—	—	-10	mA	V <sub>GS</sub> = -1.2 V, V <sub>DS</sub> = -2 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
Gate to source breakdown voltage	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> = -60 V, V <sub>GS</sub> = 0
Gate to source cutoff voltage	V <sub>GS(off)</sub>	-1.1	—	-2.15	V	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1 mA
Forward transfer admittance	y <sub>fs</sub>	10	18.5	—	S	I <sub>D</sub> = -10 A, V <sub>DS</sub> = -10 V <sup>Note3</sup>
Static drain to source on state resistance	R <sub>DS(on)</sub>	—	60	80	mΩ	I <sub>D</sub> = -10 A, V <sub>GS</sub> = -4 V <sup>Note3</sup>
	R <sub>DS(on)</sub>	—	42	54	mΩ	I <sub>D</sub> = -10 A, V <sub>GS</sub> = -10 V <sup>Note3</sup>
Output capacitance	C <sub>oss</sub>	—	865	—	pF	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0, f = 1 MHz
Turn-on delay time	td(on)	—	5.7	—	μs	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -10 A, R <sub>L</sub> = 3 Ω
Rise time	tr	—	26	—	μs	
Turn-off delay time	td(off)	—	6.5	—	μs	
Fall time	tf	—	9	—	μs	
Body-drain diode forward voltage	V <sub>DF</sub>	—	-0.9	—	V	I <sub>F</sub> = -20 A, V <sub>GS</sub> = 0
Body-drain diode reverse recovery time	trr	—	100	—	ns	I <sub>F</sub> = -20 A, V <sub>GS</sub> = 0 diF/dt = 50A/μs
Over load shut down operation time <sup>Note4</sup>	t <sub>os1</sub>	—	1.84	—	ms	V <sub>GS</sub> = -5 V, V <sub>DD</sub> = -16 V
	t <sub>os2</sub>	—	1	—	ms	V <sub>GS</sub> = -5 V, V <sub>DD</sub> = -24 V

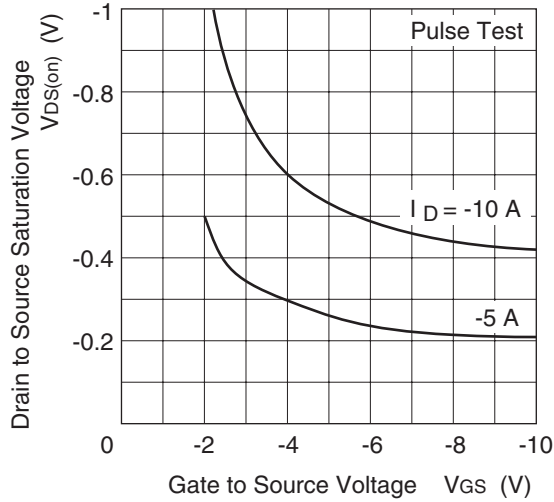
Notes: 3. Pulse test

4. Include the time shift based on increasing of channel temperature when operate under over load condition.

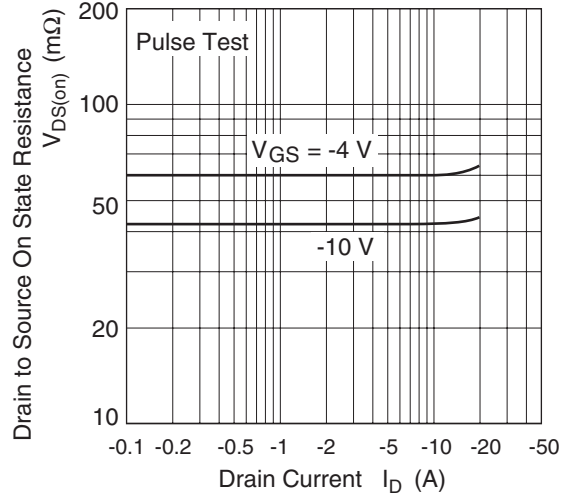
Main Characteristics



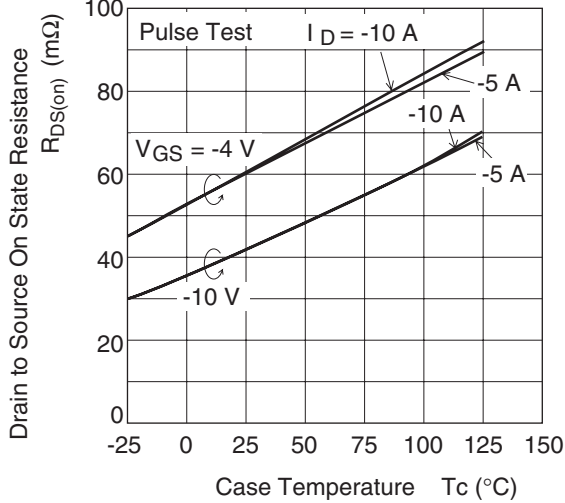
Drain to Source Saturation Voltage vs. Gate to Source Voltage



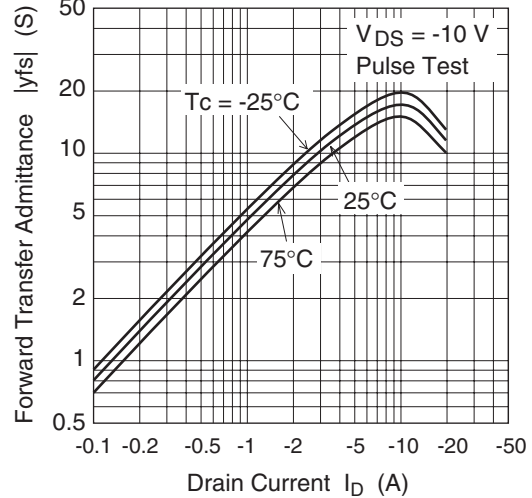
Static Drain to Source Sat Resistance vs. Drain Current

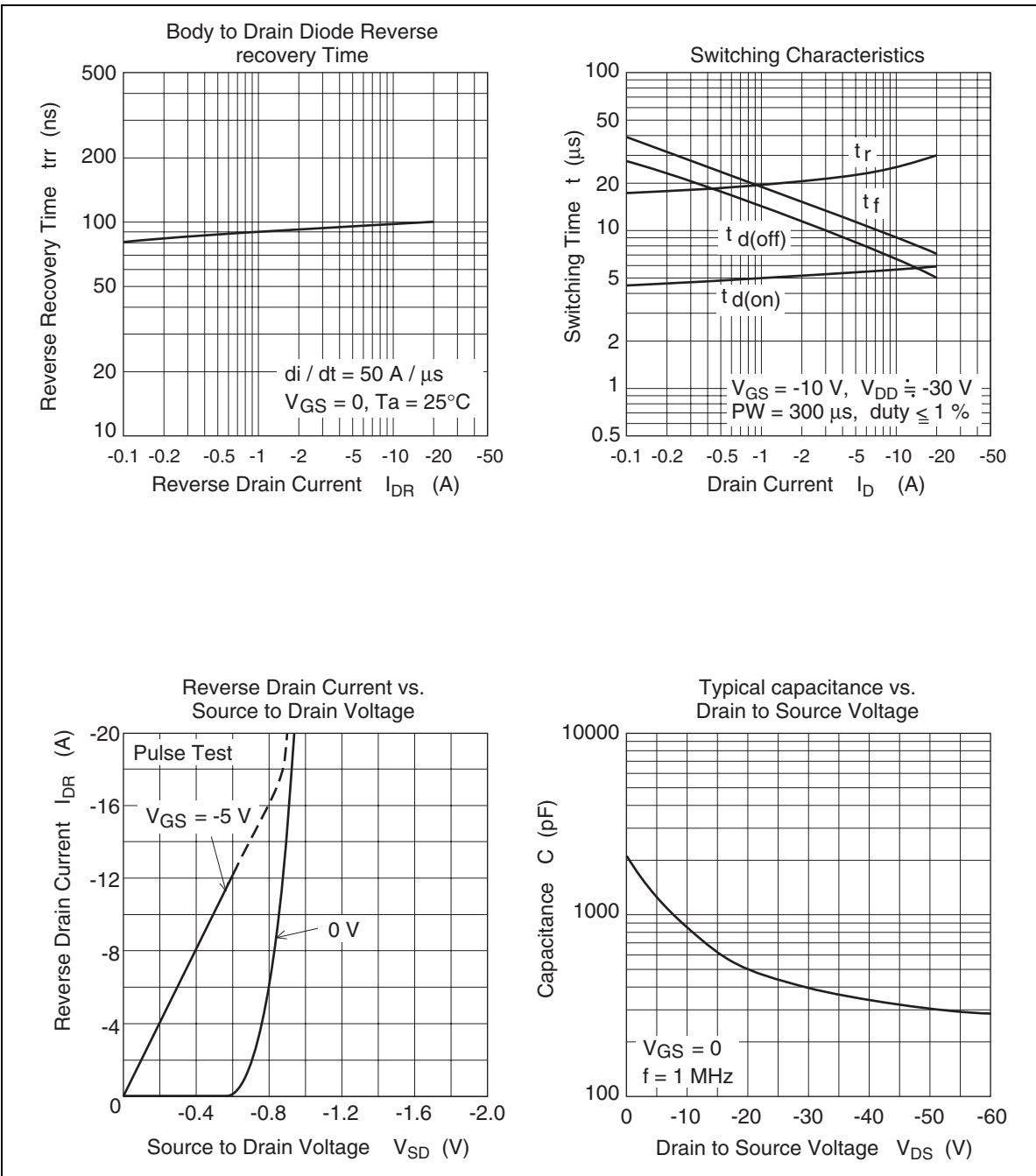


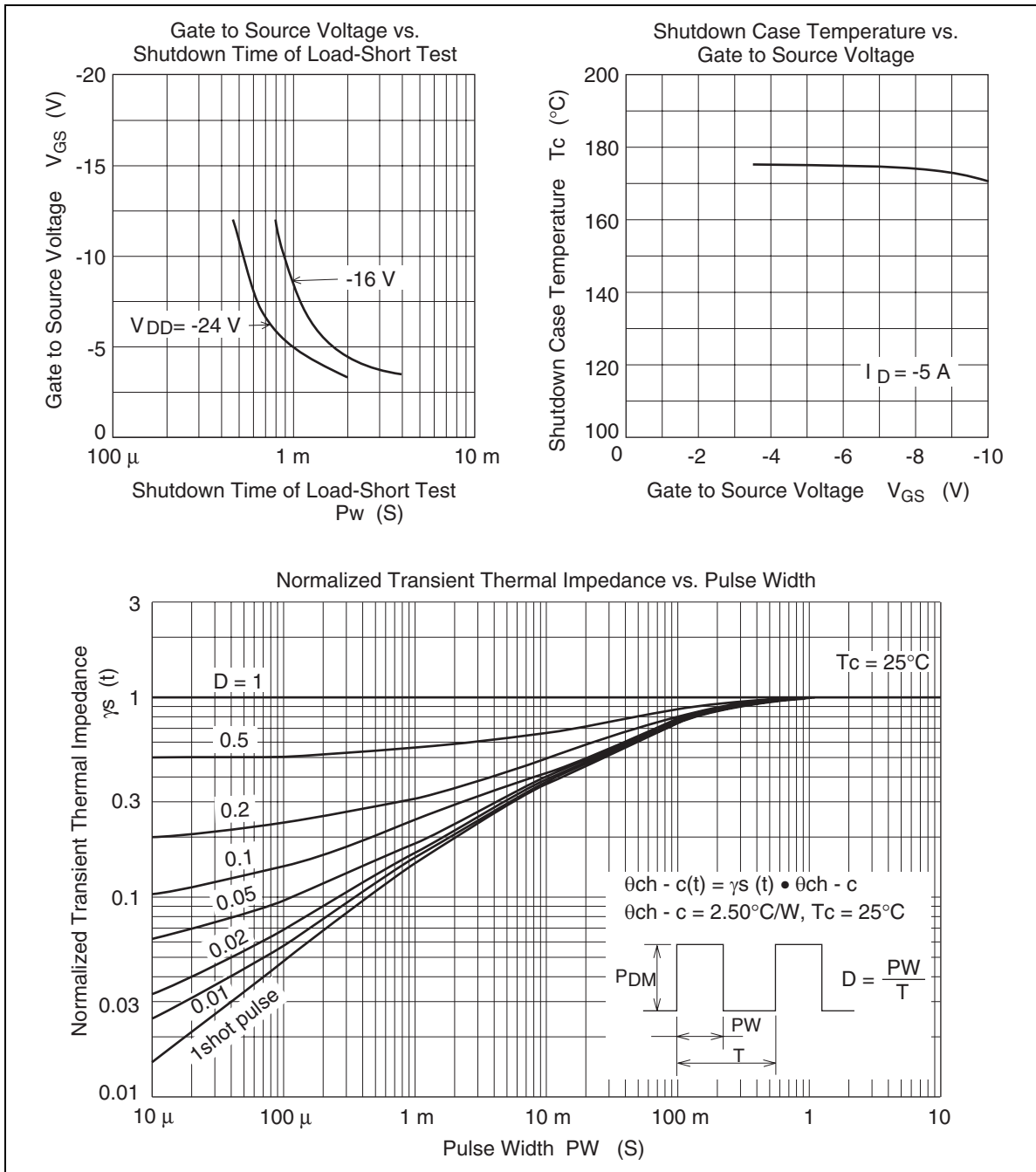
Static Drain to Source on State Resistance vs. Temperature



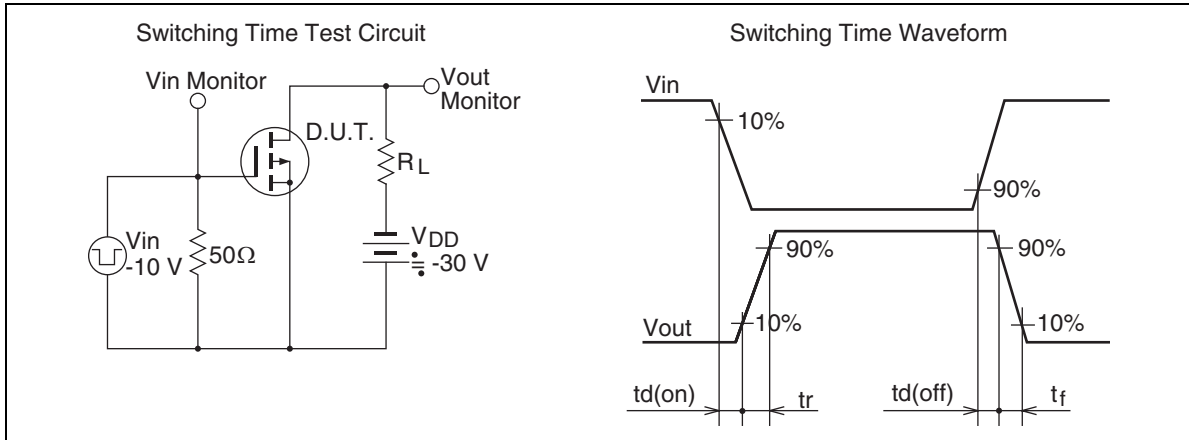
Forward Transfer Admittance vs. Drain Current





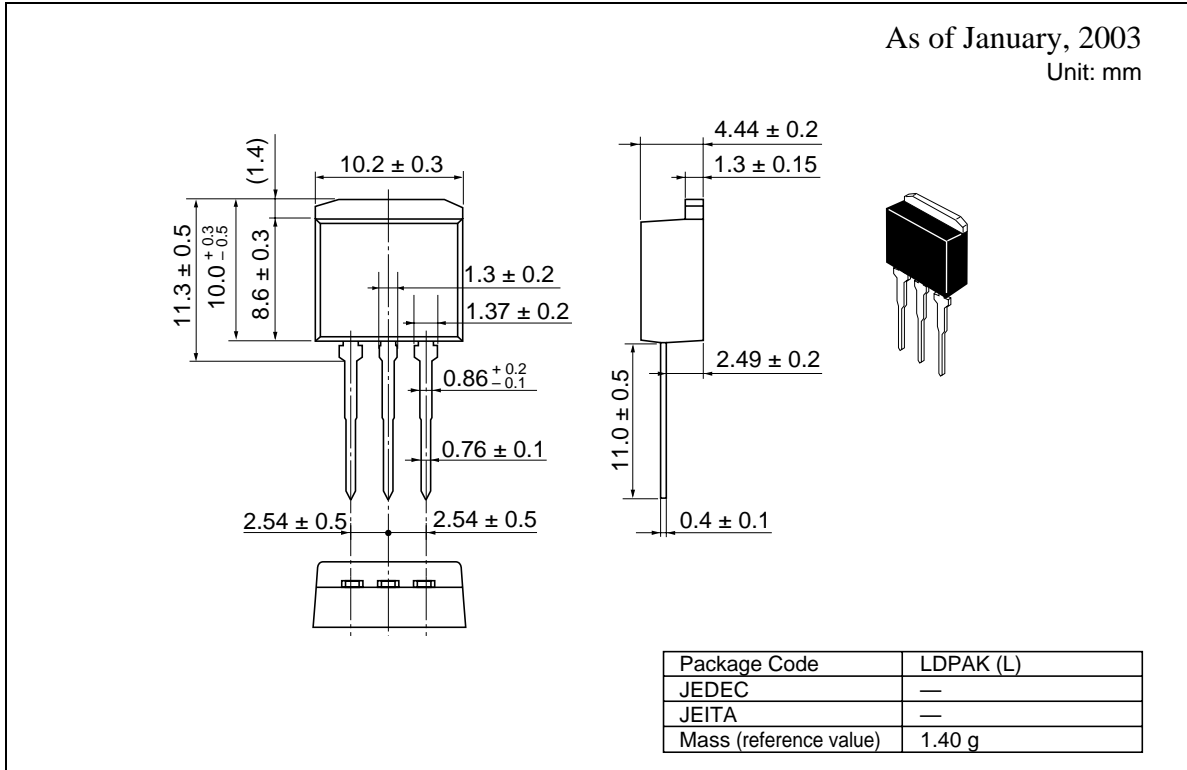


# HAF1008(L), HAF1008(S)





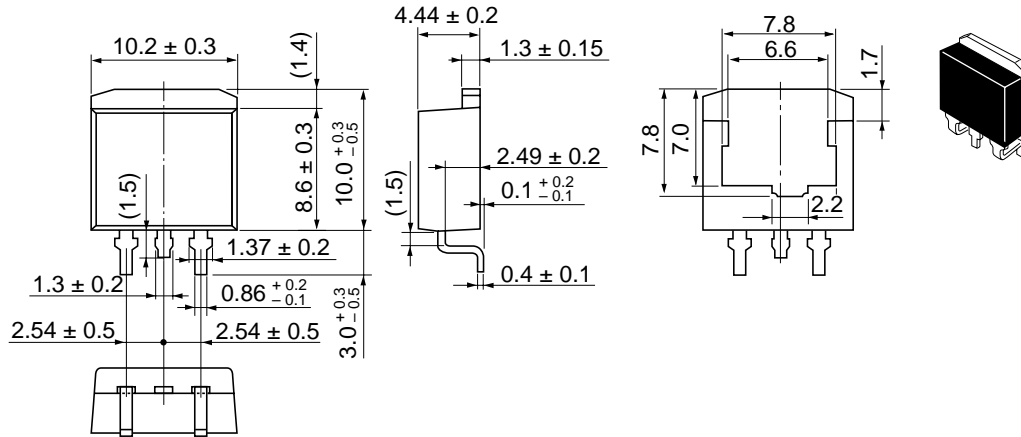
Package Dimensions



HAF1008(L), HAF1008(S)

As of January, 2003

Unit: mm



Package Code	LDBAK (S)-(1)
JEDEC	—
JEITA	—
Mass (reference value)	1.30 g

**Renesas Technology Corp.** Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

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**Keep safety first in your circuit designs!**

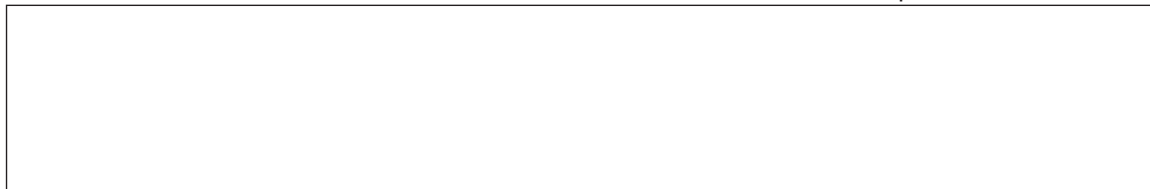
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