

# HAF1008(L), HAF1008(S)

## Silicon P Channel MOS FET Series Power Switching

REJ03G0027-0100Z

Rev.1.00

May.13.2003

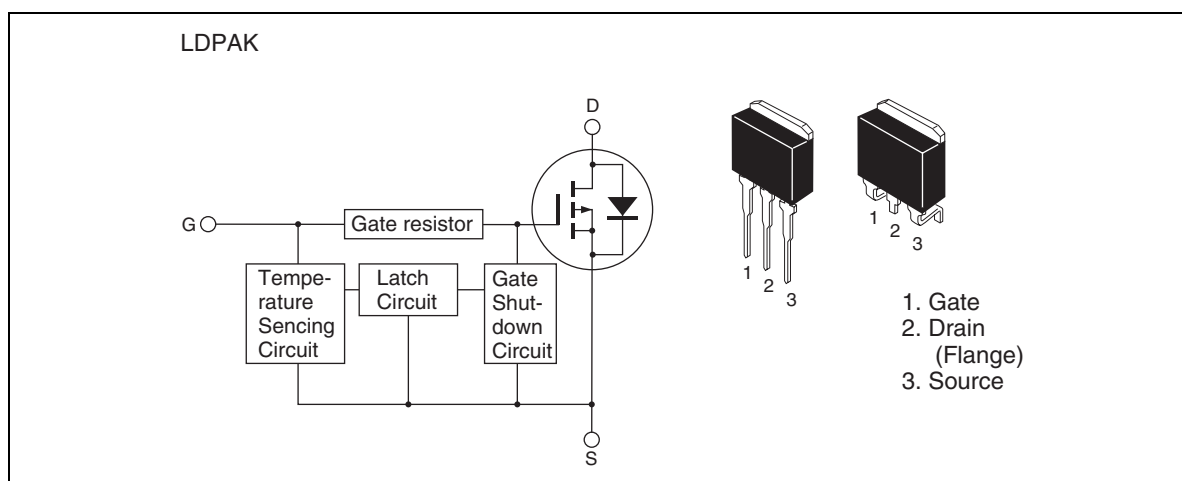
### Description

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



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### 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	

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### Electrical Characteristics

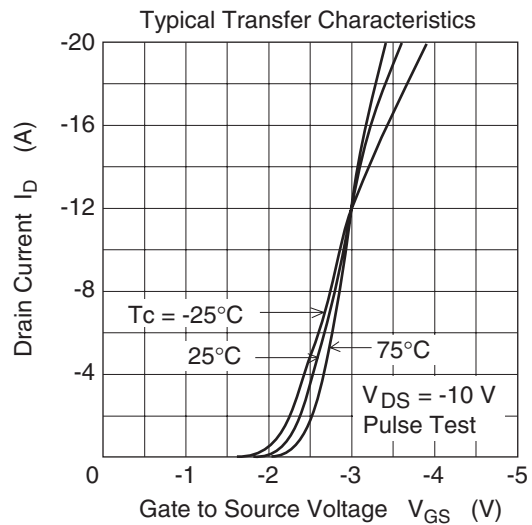
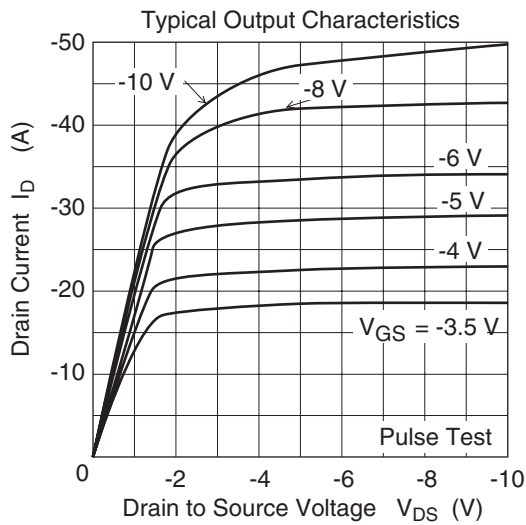
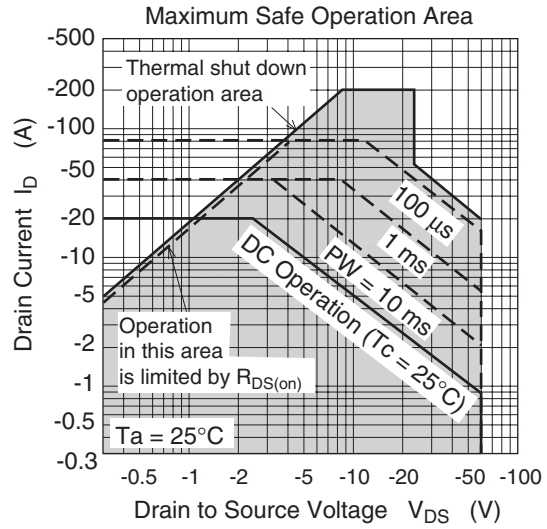
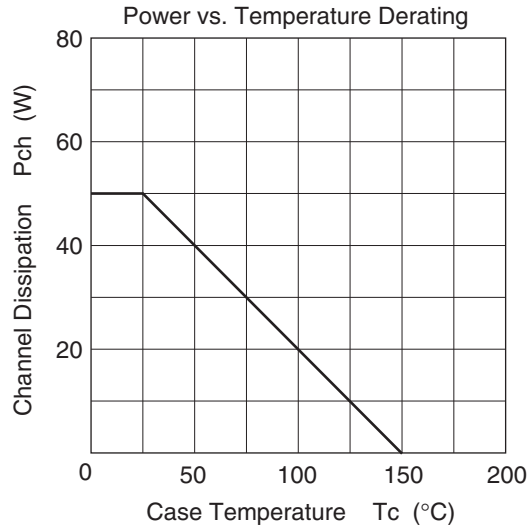
(T<sub>a</sub> = 25°C)

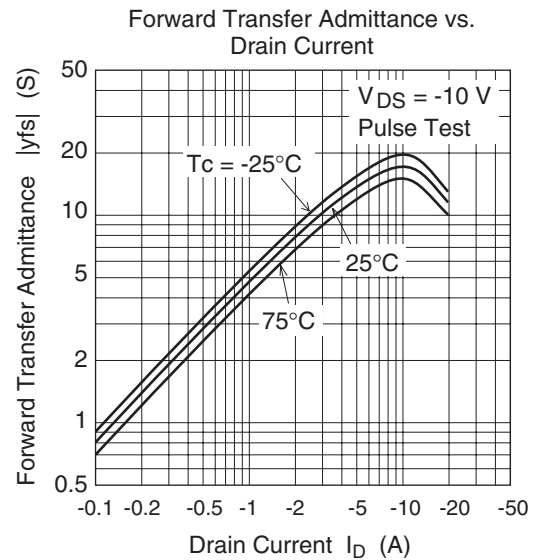
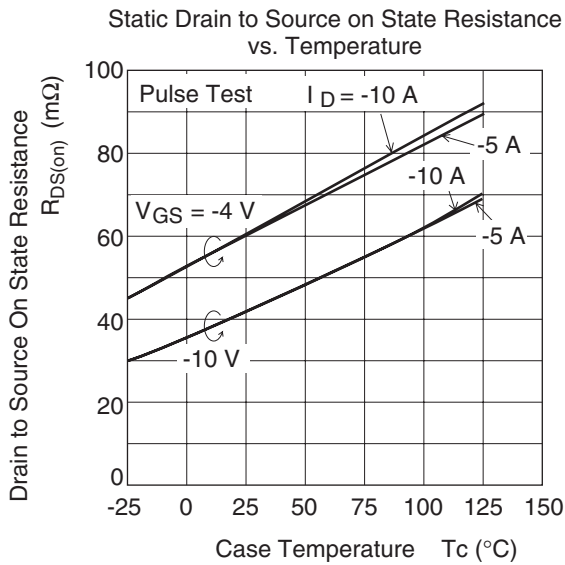
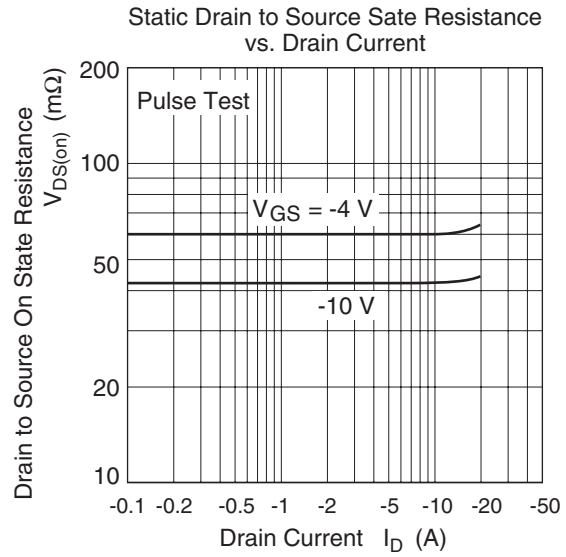
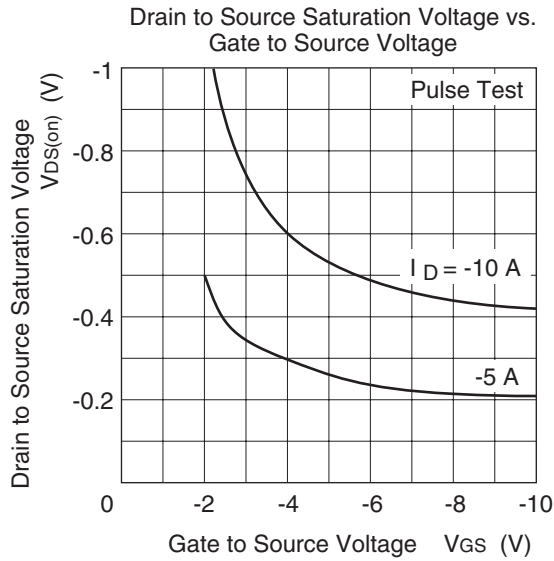
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I <sub>D1</sub>	-7	—	—	A	V <sub>GS</sub> = -3.5 V, V <sub>DS</sub> = -2 V
Drain current	I <sub>D2</sub>	—	—	-10	mA	V <sub>GS</sub> = -1.2 V, V <sub>DS</sub> = -2 V
Drain to source breakdown voltage	V <sub>(BR)DSS</sub>	-60	—	—	V	I <sub>D</sub> = -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	t <sub>d(on)</sub>	—	5.7	—	µs	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -10 A, R <sub>L</sub> = 3 Ω
Rise time	t <sub>r</sub>	—	26	—	µs	
Turn-off delay time	t <sub>d(off)</sub>	—	6.5	—	µs	
Fall time	t <sub>f</sub>	—	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	t <sub>rr</sub>	—	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

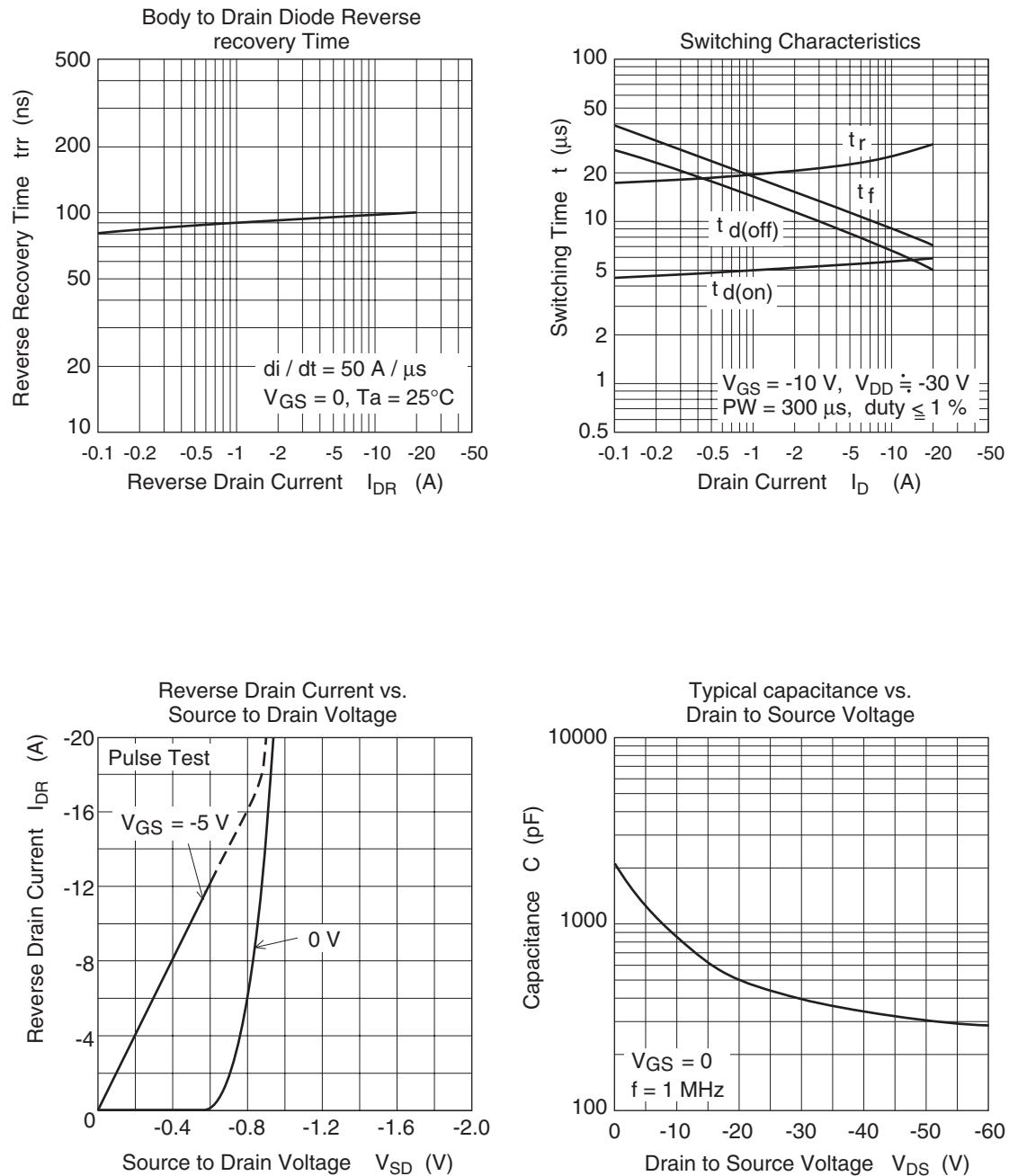
Notes: 3. Pulse test

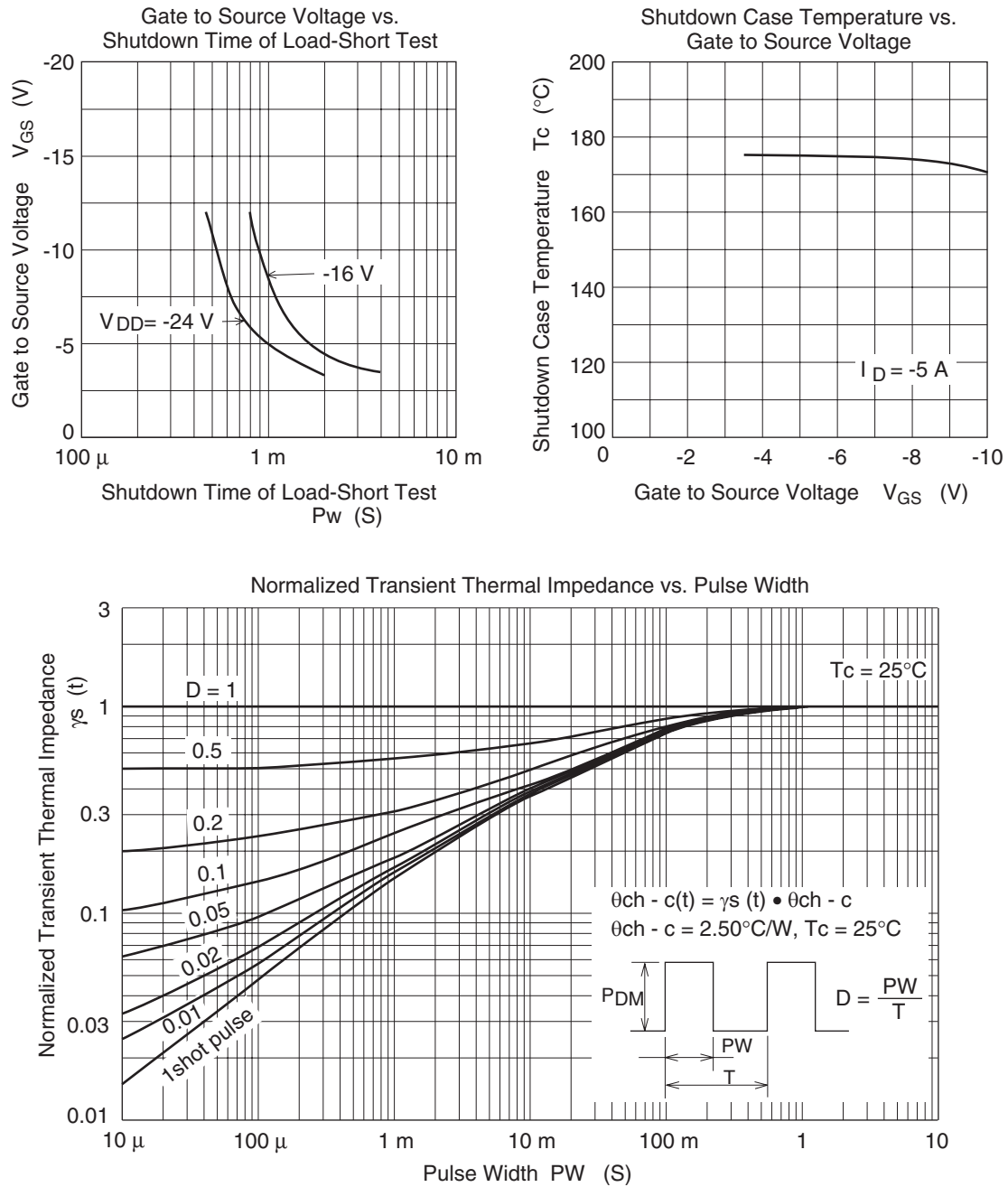
4. Include the time shift based on increasing of channel temperature when operate under over load condition.

## Main Characteristics

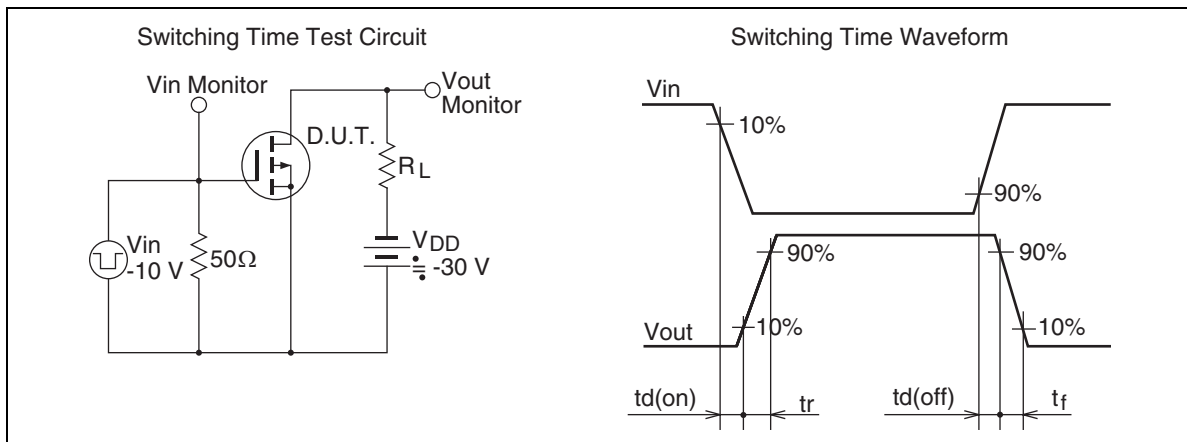








## HAF1008(L), HAF1008(S)

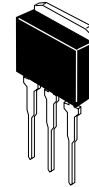
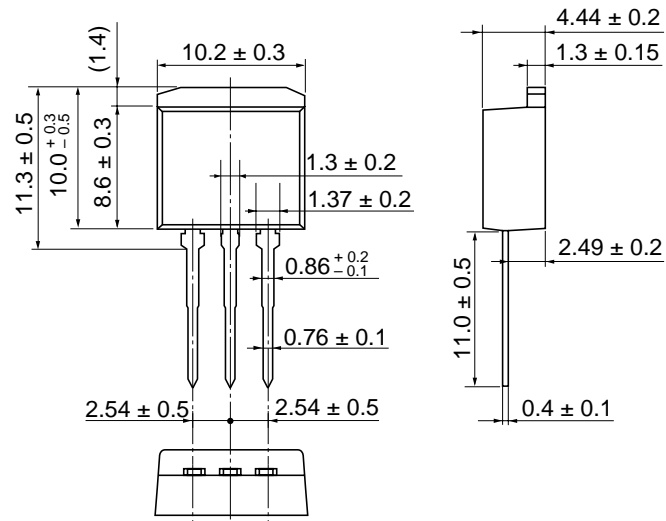




# Package Dimensions

As of January, 2003

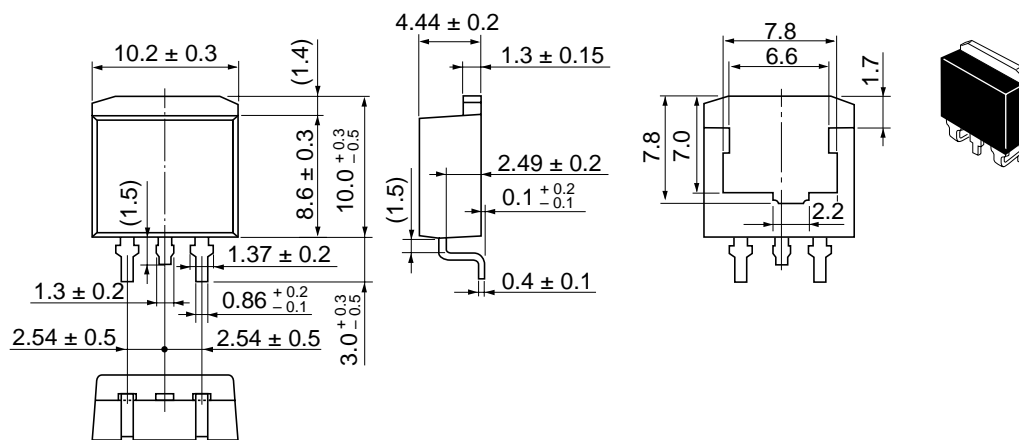
Unit: mm



Package Code	LDPAK (L)
JEDEC	—
JEITA	—
Mass (reference value)	1.40 g

As of January, 2003

Unit: mm



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

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