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April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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HAF1009(L), HAF1009(S)

Silicon P Channel MOS FET Series Power Switching

REJ03G0029-0100Z
(Previous ADE-208-1525 (Z))
Rev.1.00
May.13.2003

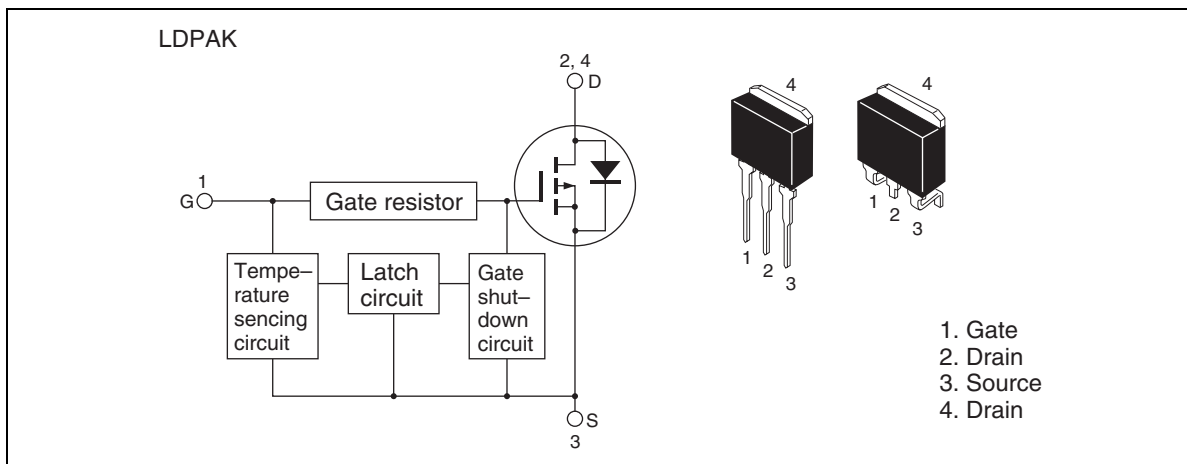
Description

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



HAF1009(L), HAF1009(S)

Absolute Maximum Ratings

($T_a = 25^\circ\text{C}$)

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	-40	A
Drain peak current	I_D (pulse) ^{Note1}	-80	A
Body-drain diode reverse drain current	I_{DR}	-40	A
Channel dissipation	P_{ch} ^{Note2}	50	W
Channel temperature	T_{ch}	150	$^\circ\text{C}$
Storage temperature	T_{stg}	-55 to +150	$^\circ\text{C}$

Notes: 1. $PW \leq 10\mu\text{s}$, duty cycle $\leq 1\%$

2. Value at $T_c = 25^\circ\text{C}$

Typical Operation Characteristics

($T_a = 25^\circ\text{C}$)

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	$V_i = -8\text{ V}, V_{DS} = 0$
	I_{IH2}	—	—	-50	μA	$V_i = -3.5\text{ V}, V_{DS} = 0$
	I_{IL}	—	—	-1	μA	$V_i = -1.2\text{ V}, V_{DS} = 0$
Input current (Gate shut down)	$I_{IH(sd)1}$	—	-0.8	—	mA	$V_i = -8\text{ V}, V_{DS} = 0$
	$I_{IH(sd)2}$	—	-0.35	—	mA	$V_i = -3.5\text{ V}, V_{DS} = 0$
Shut down temperature	T_{sd}	—	175	—	$^\circ\text{C}$	Channel temperature
Gate operation voltage	V_{op}	-3.5	—	-12	V	

HAF1009(L), HAF1009(S)

Electrical Characteristics

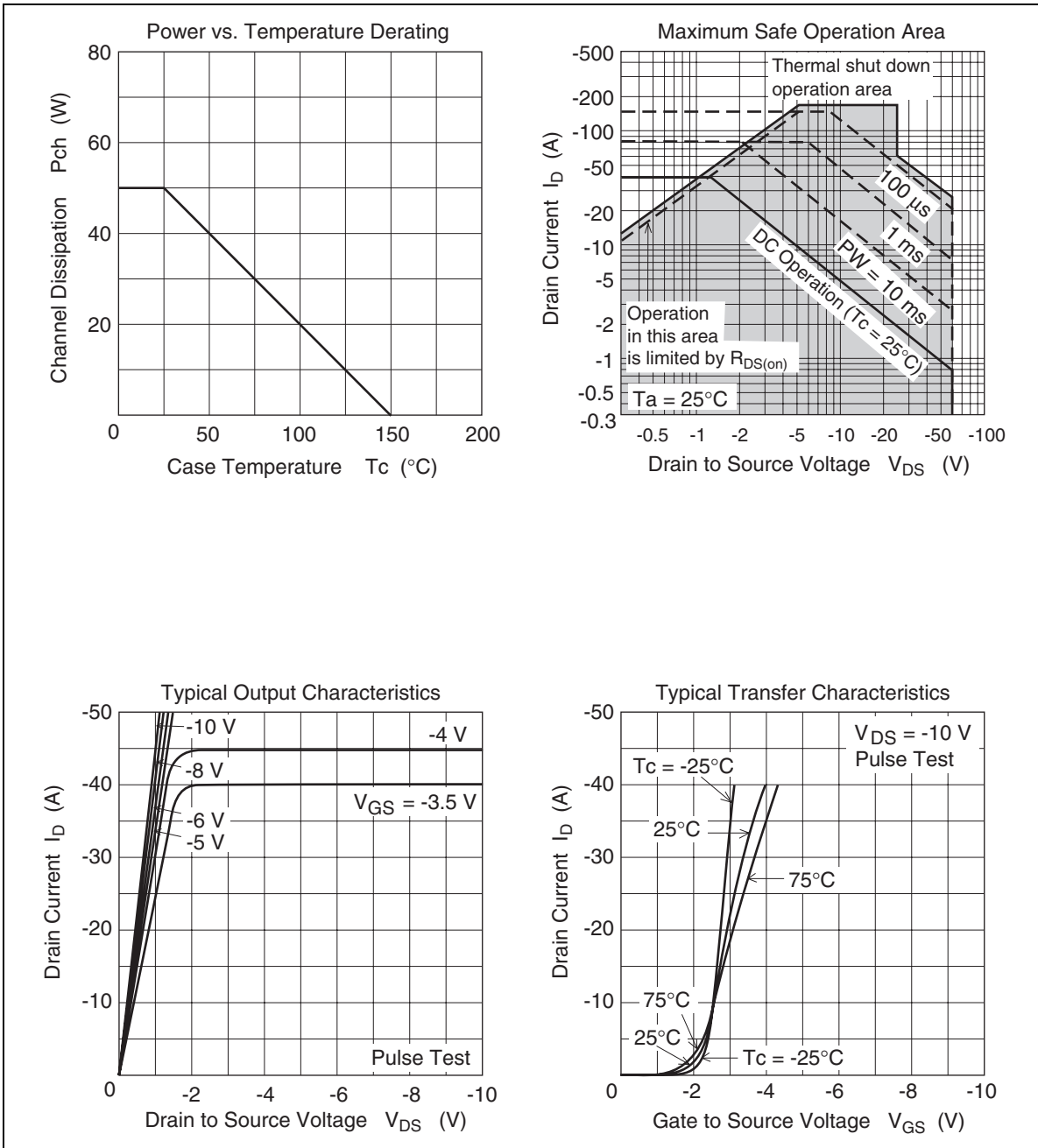
(T_a = 25°C)

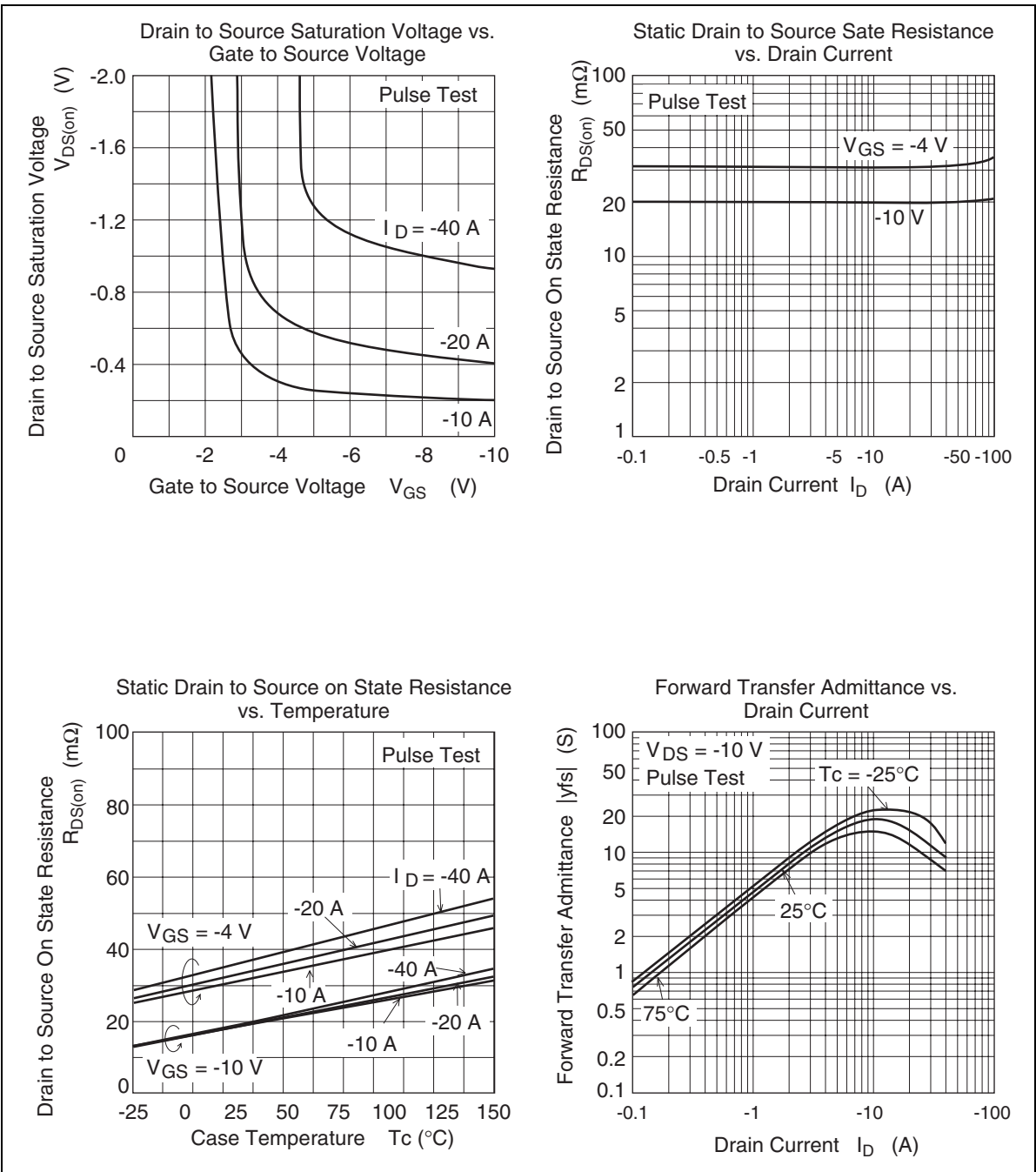
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I _{D1}	-10	—	—	A	V _{GS} = -3.5, V _{DS} = -2 V
Drain current	I _{D2}	—	—	-10	mA	V _{GS} = -1.2V, V _{DS} = -2 V
Drain to source breakdown voltage	V _{(BR)DSS}	-60	—	—	V	I _D = -10 mA, V _{GS} = 0
Gate to source breakdown voltage	V _{(BR)GSS}	-16	—	—	V	I _G = -800 μA, V _{DS} = 0
Gate to source breakdown voltage	V _{(BR)GSS}	2.5	—	—	V	I _G = 100 μA, V _{DS} = 0
Gate to source leak current	I _{GSS1}	—	—	-100	μA	V _{GS} = -8 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}	—	-0.8	—	mA	V _{GS} = -8 V, V _{DS} = 0
	I _{GS(OP)2}	—	-0.35	—	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)}	-1.1	—	-2.15	V	V _{DS} = -10 V, I _D = -1 mA
Forward transfer admittance	y _{fs}	8.4	14.8	—	S	I _D = -20 A, V _{DS} = -10 V ^{Note3}
Static drain to source on state resistance	R _{DS(on)}	—	33	50	mΩ	I _D = -20 A, V _{GS} = -4 V ^{Note3}
	R _{DS(on)}	—	20	27	mΩ	I _D = -20 A, V _{GS} = -10 V ^{Note3}
Output capacitance	C _{oss}	—	1500	—	pF	V _{DS} = -10 V, V _{GS} = 0, f = 1 MHz
Turn-on delay time	td(on)	—	10.6	—	μs	V _{GS} = -10 V, I _D = -20 A, R _L = 1.5 Ω
Rise time	tr	—	45	—	μs	
Turn-off delay time	td(off)	—	12	—	μs	
Fall time	tf	—	13	—	μs	
Body-drain diode forward voltage	V _{DF}	—	-0.95	—	V	I _F = -40 A, V _{GS} = 0
Body-drain diode reverse recovery time	trr	—	100	—	ns	I _F = -40 A, V _{GS} = 0 diF/dt = 50 A/μs
Over load shut down operation time ^{Note4}	t _{os1}	—	4.1	—	ms	V _{GS} = -5 V, V _{DD} = -16 V
	t _{os2}	—	1.5	—	ms	V _{GS} = -5 V, V _{DD} = -24 V

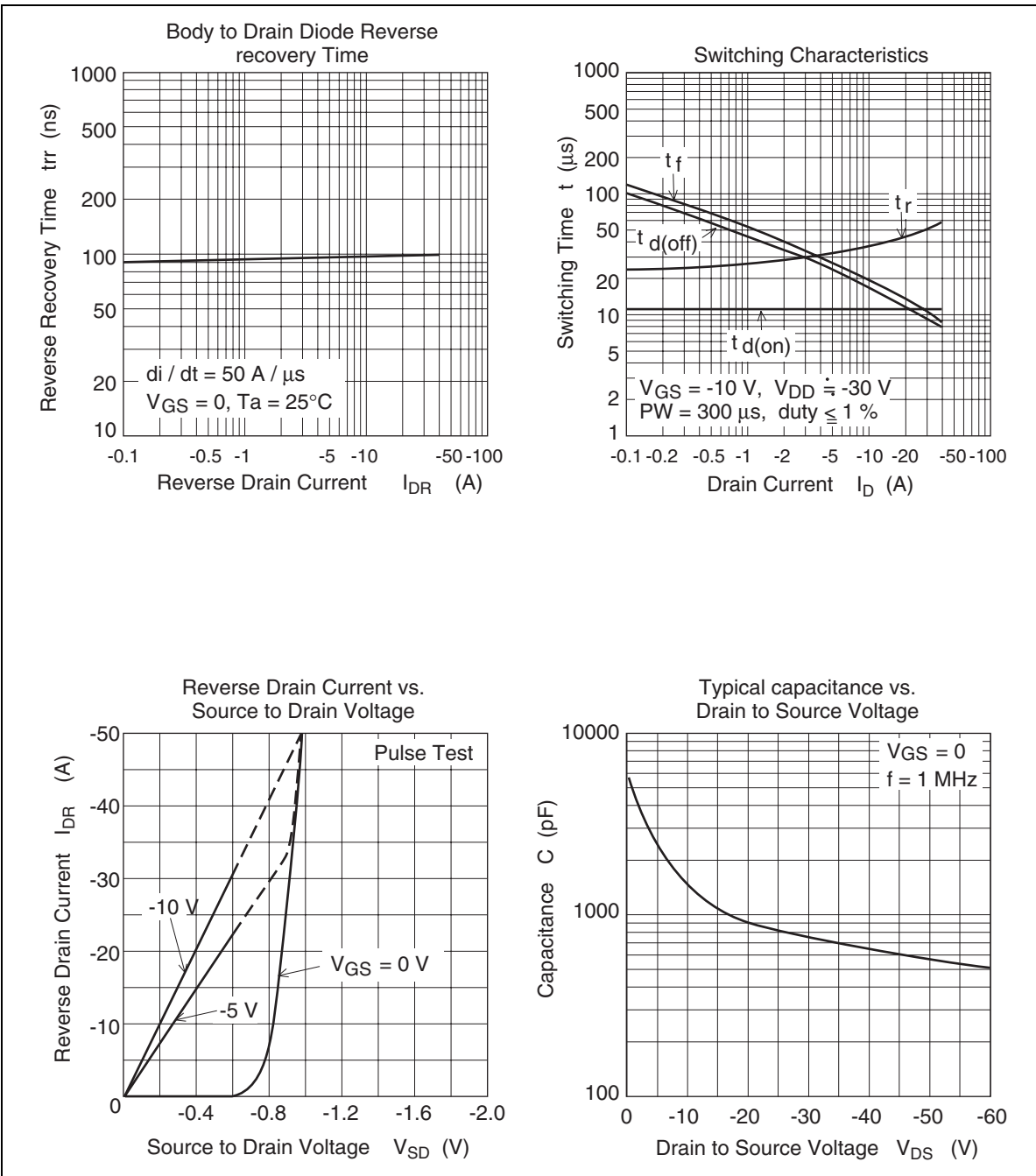
Notes: 3. Pulse test

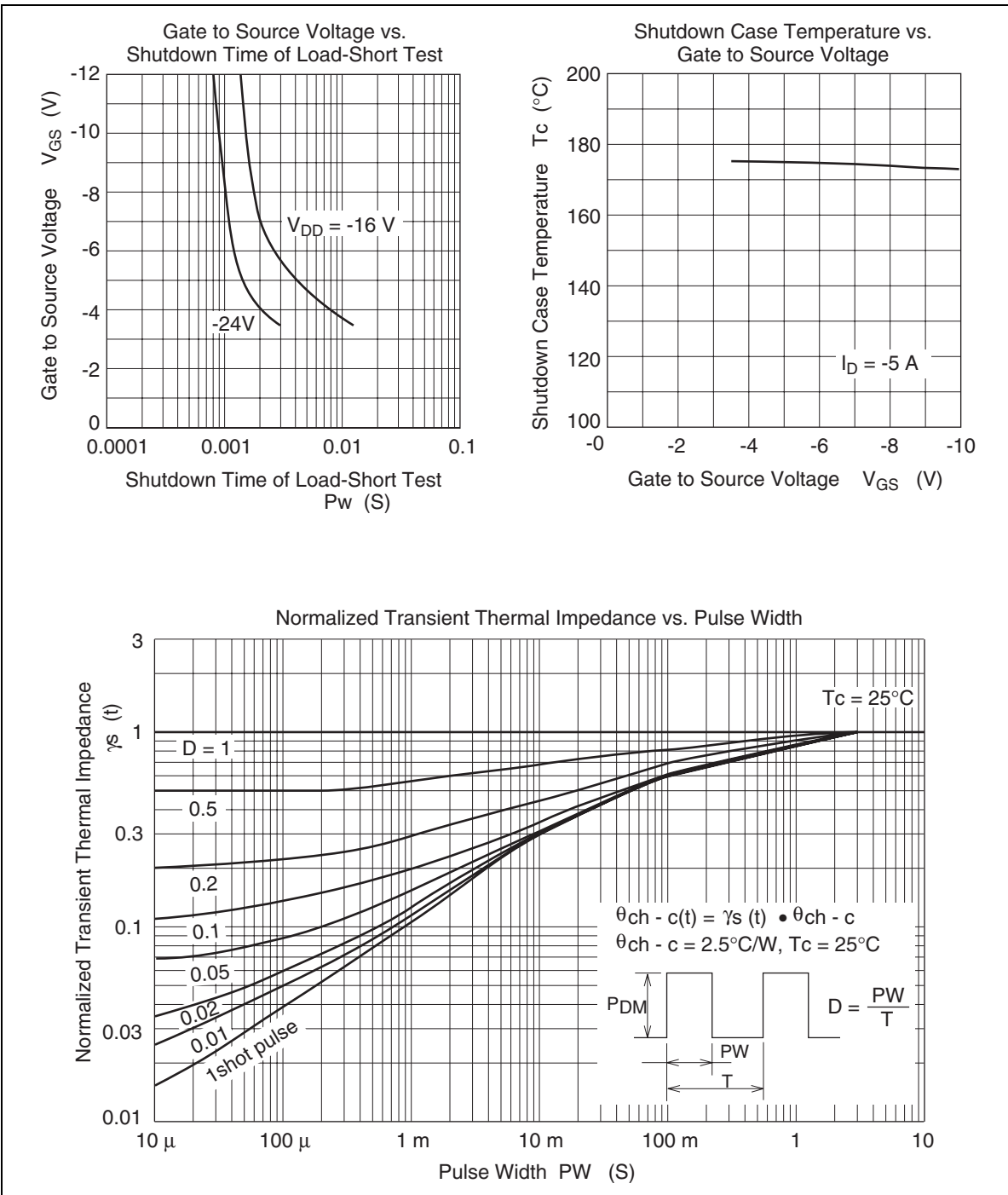
4. Including the junction temperature rise of the over loaded condition.

Main Characteristics

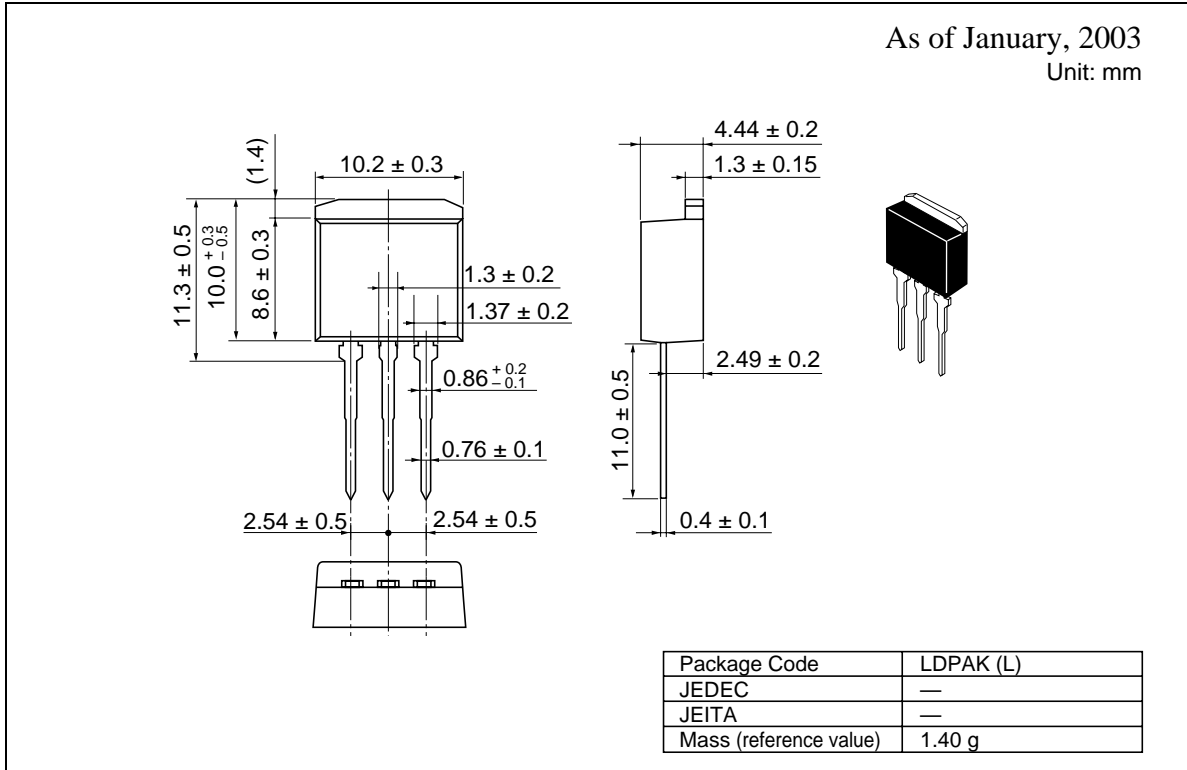








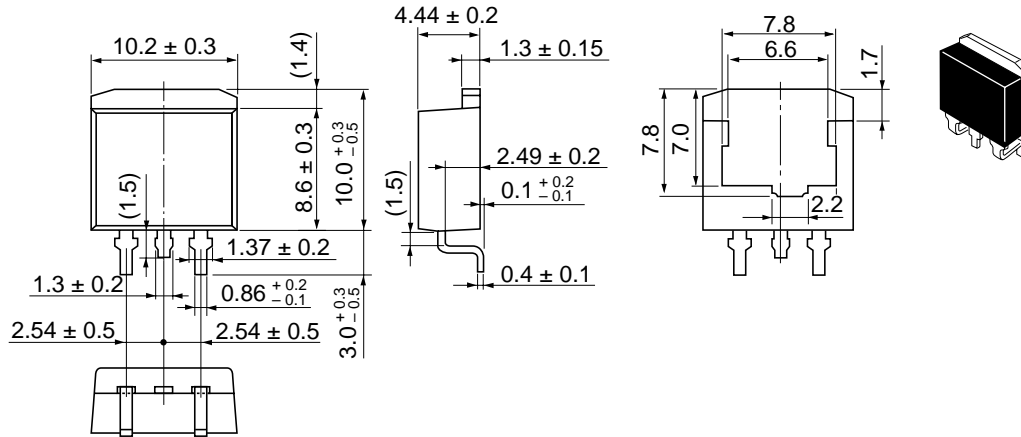
Package Dimensions



HAF1009(L), HAF1009(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

Keep safety first in your circuit designs!

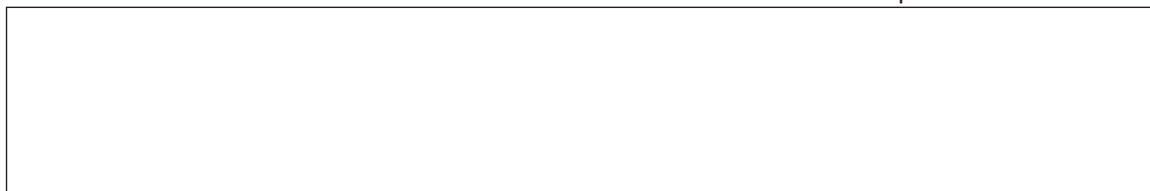
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