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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

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

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HAF1004(L), HAF1004(S)

Silicon P Channel MOS FET Series Power Switching

REJ03G0028-0500Z
(Previous ADE-208-629B (Z))
Rev.5.00
2003.04.29

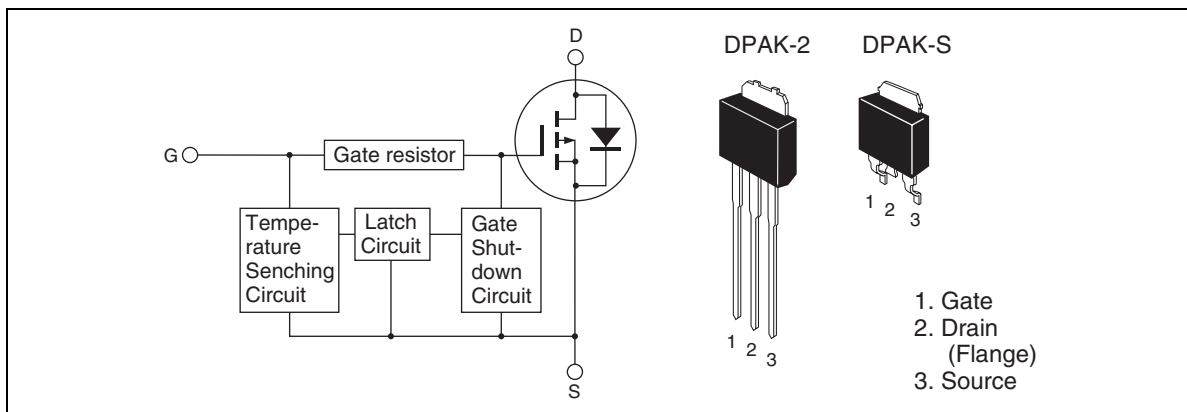
Description

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

Outline



HAF1004(L), HAF1004(S)

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	-5	A
Drain peak current	I _{D (pulse)} ^{Note1}	-10	A
Body-drain diode reverse drain current	I _{DR}	-5	A
Channel dissipation	P _{ch} ^{Note2}	20	W
Channel temperature	T _{ch}	150	°C
Storage temperature	T _{stg}	-55 to +150	°C

Notes: 1. PW ≤ 0μs, duty cycle ≤ 1%
2. Value at Ta = 25°C

Typical Operation Characteristics

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 V, V _{DS} = 0
	I _{IH2}	—	—	-50	μA	V _i = -3.5 V, V _{DS} = 0
	I _{IL}	—	—	-1	μA	V _i = -1.2 V, V _{DS} = 0
Input current (Gate shut down)	I _{IH(sd)1}	—	-0.8	—	mA	V _i = -8 V, V _{DS} = 0
	I _{IH(sd)2}	—	-0.35	—	mA	V _i = -3.5 V, V _{DS} = 0
Shut down temperature	T _{sd}	—	175	—	°C	Channel temperature
Gate operation voltage	V _{op}	-3.5	—	-12	V	

HAF1004(L), HAF1004(S)

Electrical Characteristics

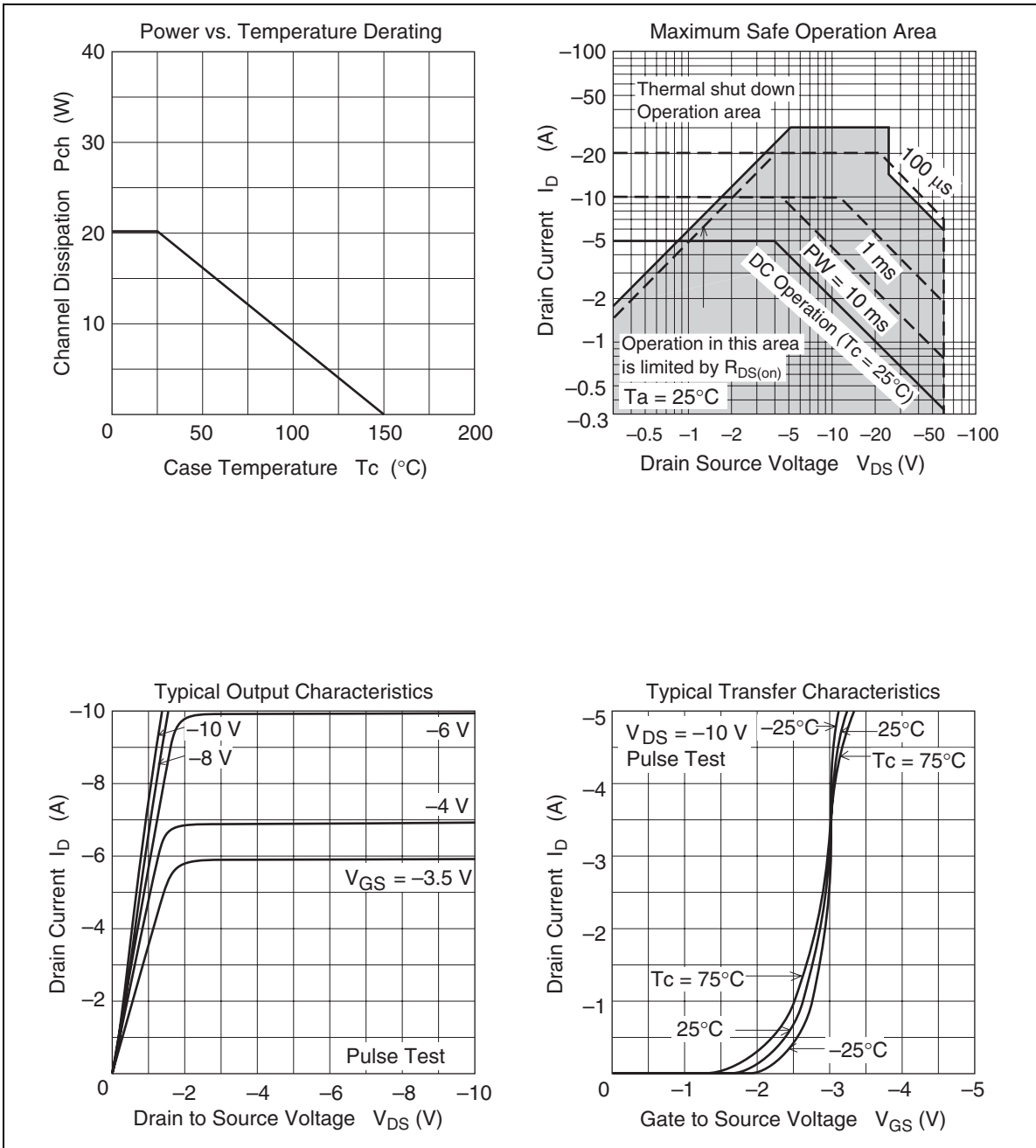
(Ta = 25°C)

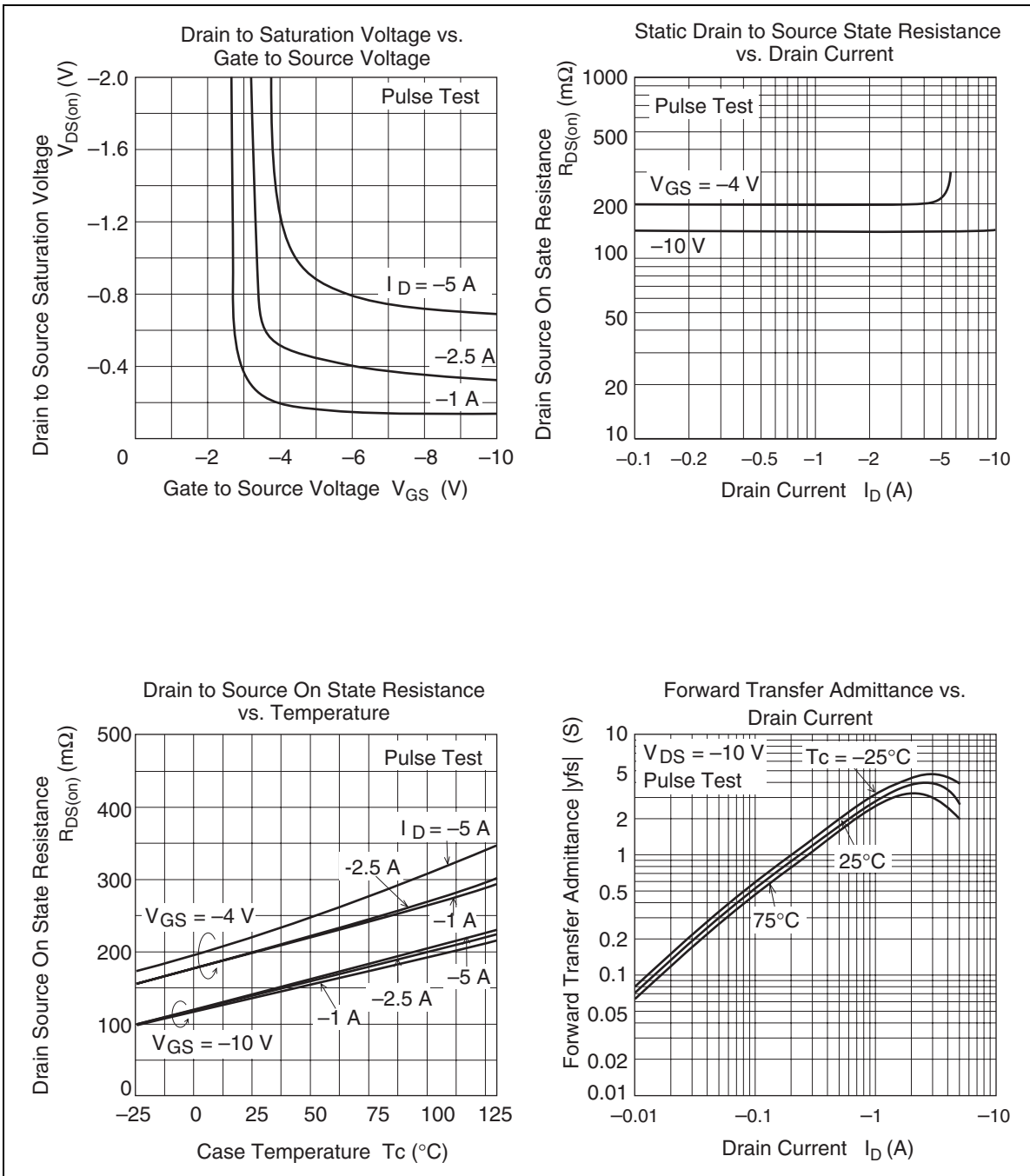
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I _{D1}	4	—	—	A	V _{GS} = -3.5 V, V _{DS} = -2 V
Drain current	I _{D2}	—	—	-10	mA	V _{GS} = -1.2 V, V _{DS} = -2 V
Drain to source breakdown voltage	V _{(BR)DSS}	-60	—	—	V	I _D = -10 mA, V _{GS} = 0
Gate to source breakdown voltage	V _{(BR)GSS}	-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 cut off voltage	V _{GS(off)}	-1.1	—	-2.25	V	V _{DS} = -10 V, I _D = -1 mA
Forward transfer admittance	y _{fs}	2	4	—	S	I _D = -2.5 A, V _{DS} = -10 V ^{Note3}
Static drain to source on state resistance	R _{DS(on)}	—	140	200	mΩ	I _D = -2.5 A, V _{GS} = -10 V ^{Note3}
Static drain to source on state resistance	R _{DS(on)}	—	200	340	mΩ	I _D = -2.5 A, V _{GS} = -4 V ^{Note3}
Output capacitance	C _{oss}	—	326	—	pF	V _{DS} = -10 V, V _{GS} = 0, f = 1 MHz
Turn-on delay time	t _{d(on)}	—	2	—	μs	V _{GS} = -5 V, I _D = -2.5 A, R _L = 12 Ω
Rise time	t _r	—	7.6	—	μs	
Turn off delay time	t _{d(off)}	—	3.2	—	μs	
Fall time	t _f	—	3.2	—	μs	
Body-drain diode forward voltage	V _{DF}	—	-0.9	—	V	I _F = -5A, V _{GS} = 0
Body-drain diode reverse recovery time	t _{rr}	—	77	—	ns	I _F = -5 A, V _{GS} = 0 diF/dt = 50 A/μs
Over load shut down operation time ^{note4}	t _{os1}	—	8.4	—	ms	V _{GS} = -5 V, V _{DD} = -16 V
	t _{os2}	—	2.4	—	ms	V _{GS} = -5 V, V _{DD} = -24 V

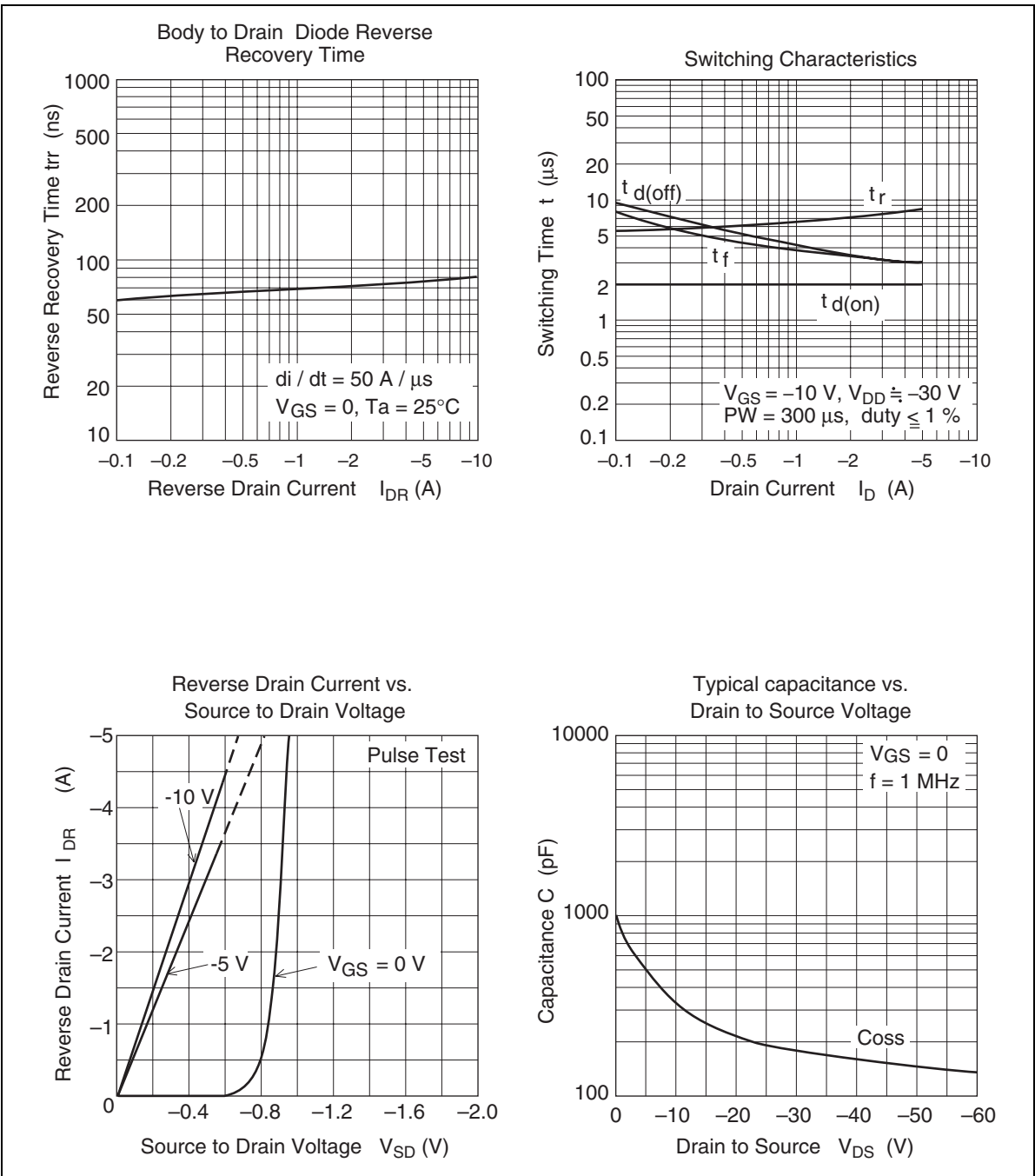
Notes: 3. Pulse test

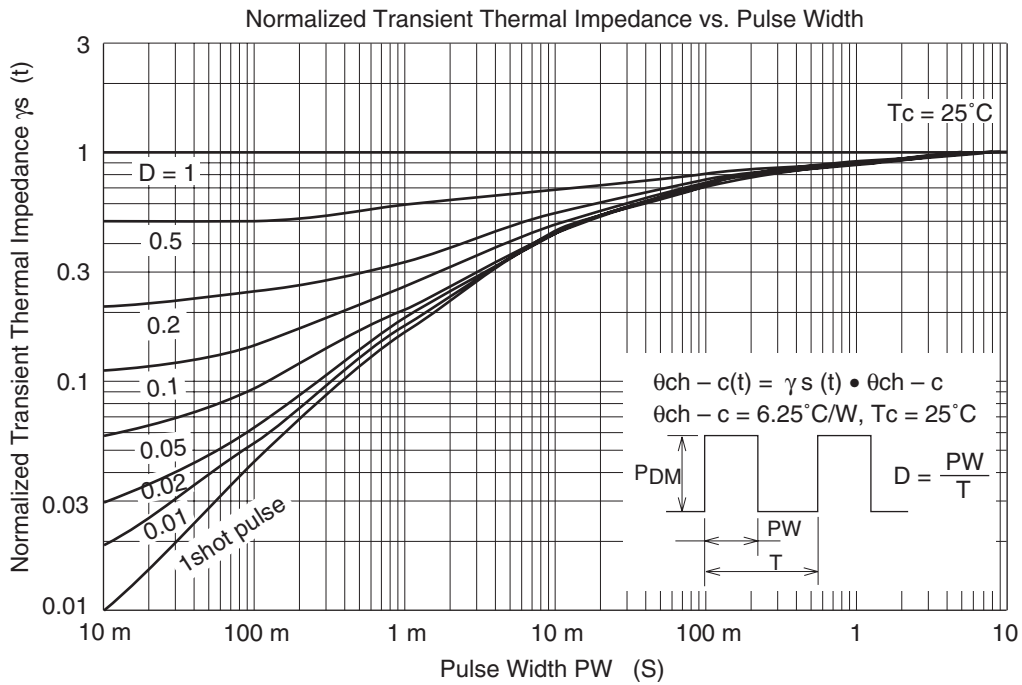
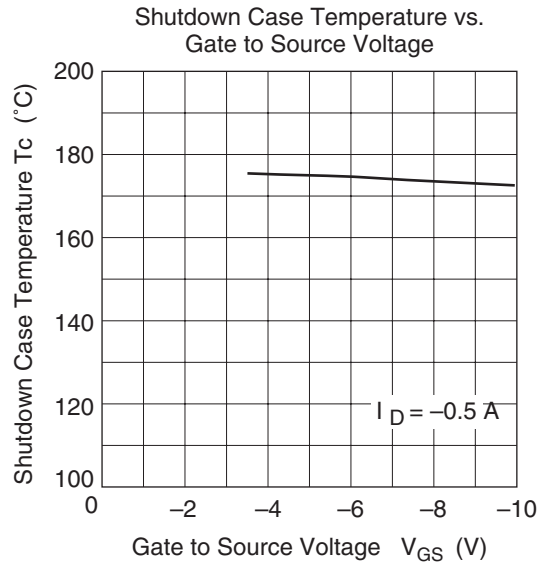
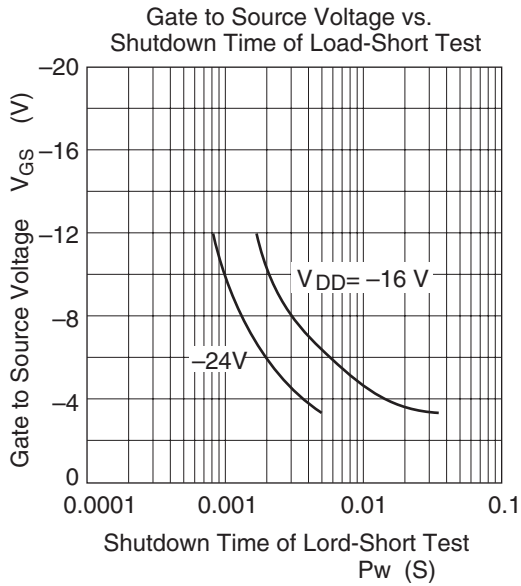
4. Including the junction temperature rise of the lored condition

Main Characteristics

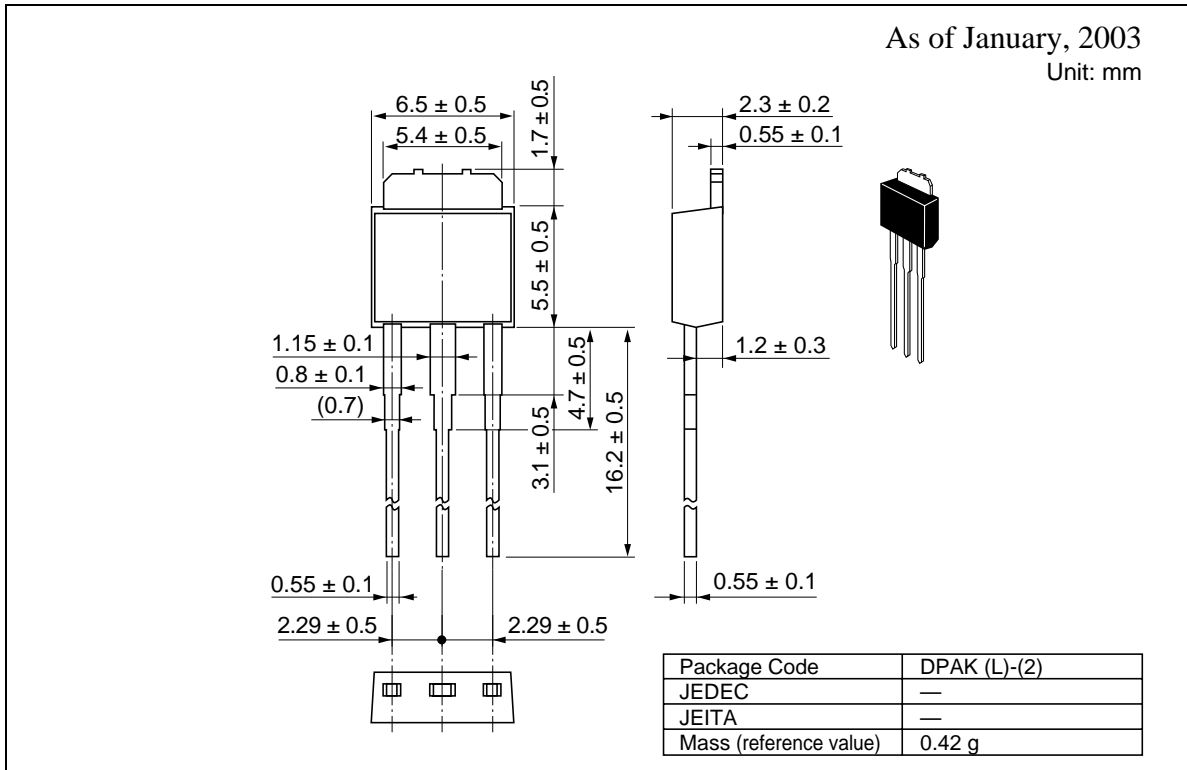








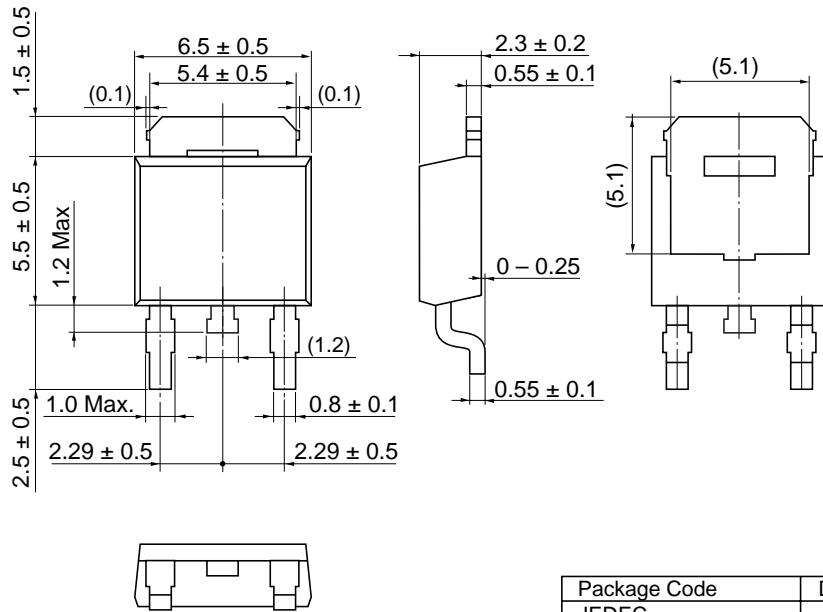
Package Dimensions



HAF1004(L), HAF1004(S)

As of January, 2003

Unit: mm



Package Code	DPAK (S)
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.28 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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