To all our customers

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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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HAF2011(L),HAF2011(S)

Silicon N Channel MOS FET Series
Power Switching

ADE-208-738A (Z)
2nd. Edition
July 2000

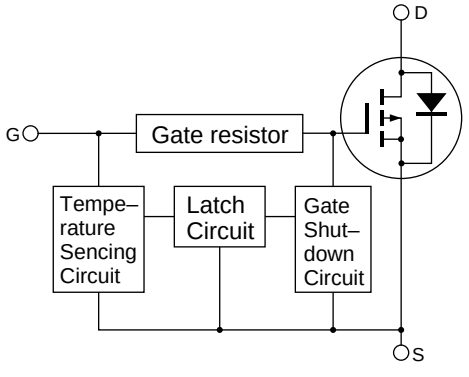
This FET has the over temperature shut–down capability sensing to the junction temperature. This FET has the built–in over temperature shut–down circuit in the gate area. And this circuit operation to shut–down the gate voltage in case of high junction temperature like applying over power consumption, over current etc.

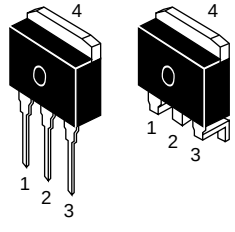
Features

- 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

LDPAK





1. Gate
2. Drain
3. Source
4. Drain

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	40	A
Drain peak current	$I_{D(pulse)}$ Note1	80	A
Body-drain diode reverse drain current	I_{DR}	40	A
Channel dissipation	Pch Note2	50	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C

Note: 1. PW ≤ 10µs, 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	I_{IH1}	—	—	100	µA	Vi = 8V, V_{DS} = 0
(Gate non shut down)	I_{IH2}	—	—	50	µA	Vi = 3.5V, V_{DS} = 0
	I_{IL}	—	—	1	µA	Vi = 1.2V, V_{DS} = 0
Input current	$I_{IH(sd)1}$	—	0.8	—	mA	Vi = 8V, V_{DS} = 0
(Gate shut down)	$I_{IH(sd)2}$	—	0.35	—	mA	Vi = 3.5V, V_{DS} = 0
Shut down temperature	T_{sd}	—	175	—	°C	Channel temperature
Gate operation voltage	V_{OP}	3.5	—	12	V	

Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I_{D1}	15	—	—	A	V_{GS} = 3.5V, V_{DS} = 2V
Drain current	I_{D2}	—	—	10	mA	V_{GS} = 1.2V, V_{DS} = 2V
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	I_D = 10mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	16	—	—	V	I_G = 300µA, V_{DS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	–2.5	—	—	V	I_G = –100µA, V_{DS} = 0
Gate to source leak current	I_{GSS1}	—	—	100	µA	V_{GS} = 8V, V_{DS} = 0
	I_{GSS2}	—	—	50	µA	V_{GS} = 3.5V, V_{DS} = 0
	I_{GSS3}	—	—	1	µA	V_{GS} = 1.2V, V_{DS} = 0
	I_{GSS4}	—	—	–100	µA	V_{GS} = –2.4V, V_{DS} = 0
Input current (shut down)	$I_{GS(op)1}$	—	0.8	—	mA	V_{GS} = 8V, V_{DS} = 0
	$I_{GS(op)2}$	—	0.35	—	mA	V_{GS} = 3.5V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS}	—	—	10	µA	V_{DS} = 60 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.25	V	I_D = 1mA, V_{DS} = 10V
Static drain to source on state resistance	$R_{DS(on)}$	—	25	33	mΩ	I_D = 20A, V_{GS} = 4V [Note3]
Static drain to source on state resistance	$R_{DS(on)}$	—	15	20	mΩ	I_D = 20A, V_{GS} = 10V [Note3]
Forward transfer admittance	$\|y_{fs}\|$	8	16	—	S	I_D = 20A, V_{DS} = 10V [Note3]
Output capacitance	Coss	—	940	—	pF	V_{DS} = 10V , V_{GS} = 0 f = 1 MHz
Turn-on delay time	$t_{d(on)}$	—	10.7	—	µs	I_D = 20A, V_{GS} = 5V
Rise time	t_r	—	66	—	µs	R_L = 1.5Ω
Turn-off delay time	$t_{d(off)}$	—	15.5	—	µs	
Fall time	t_f	—	19	—	µs	
Body–drain diode forward voltage	V_{DF}	—	1	—	V	I_F = 40A, V_{GS} = 0
Body–drain diode reverse recovery time	t_{rr}	—	200	—	ns	I_F = 40A, V_{GS} = 0 diF/ dt =50A/µs
Over load shut down operation time [Note4]	t_{os1}	—	1	—	ms	V_{GS} = 5V, V_{DD} = 16V

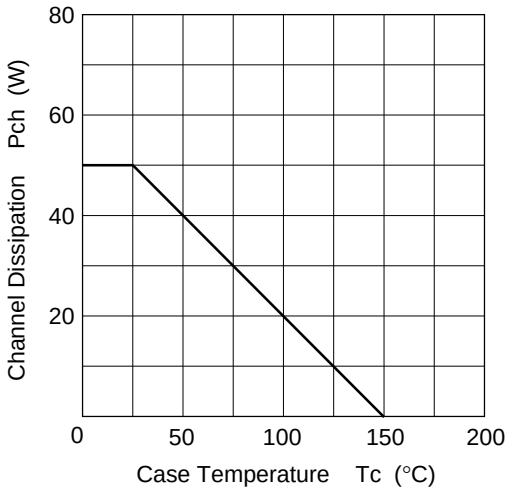
Note: 3. Pulse test

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

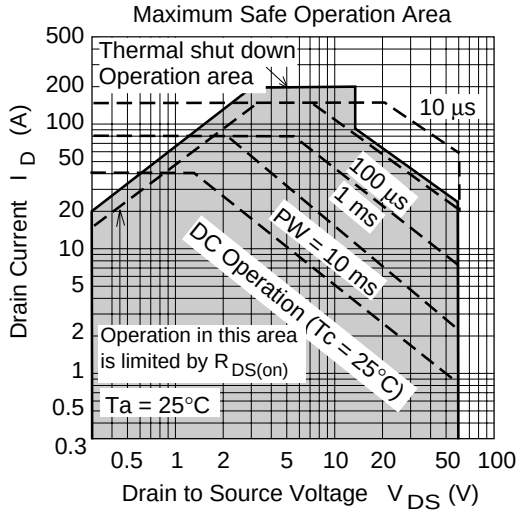
See characteristic curve of HAF2005.

Main Characteristics

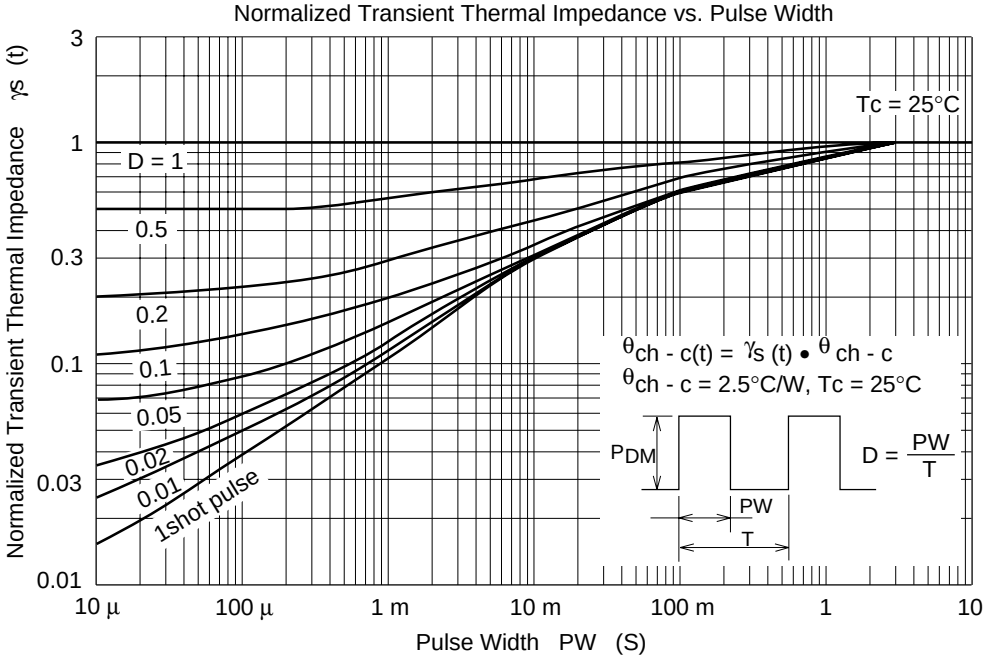
Power vs. Temperature Derating



Maximum Safe Operation Area



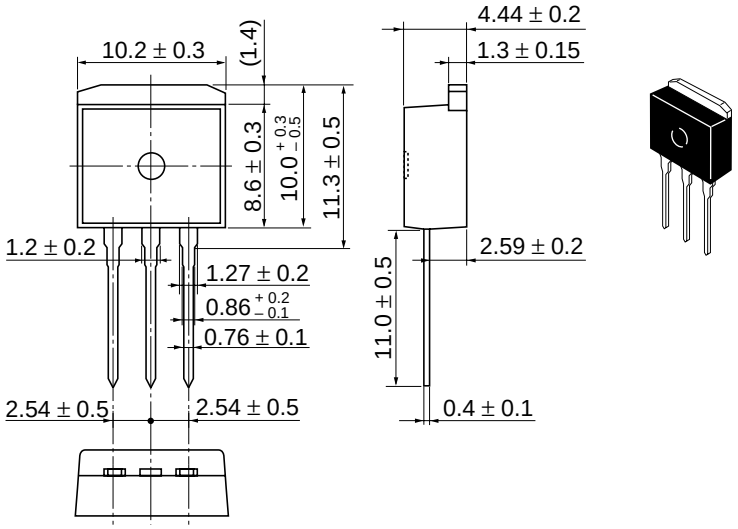
Normalized Transient Thermal Impedance vs. Pulse Width



Package Dimensions

As of January, 2001

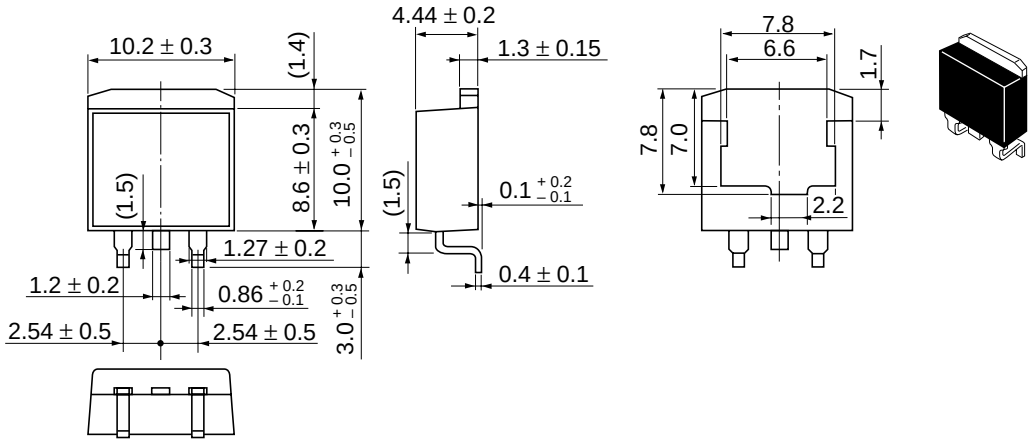
Unit: mm



Hitachi Code	LDPAK (L)
JEDEC	—
EIAJ	—
Mass (reference value)	1.4 g

As of January, 2001

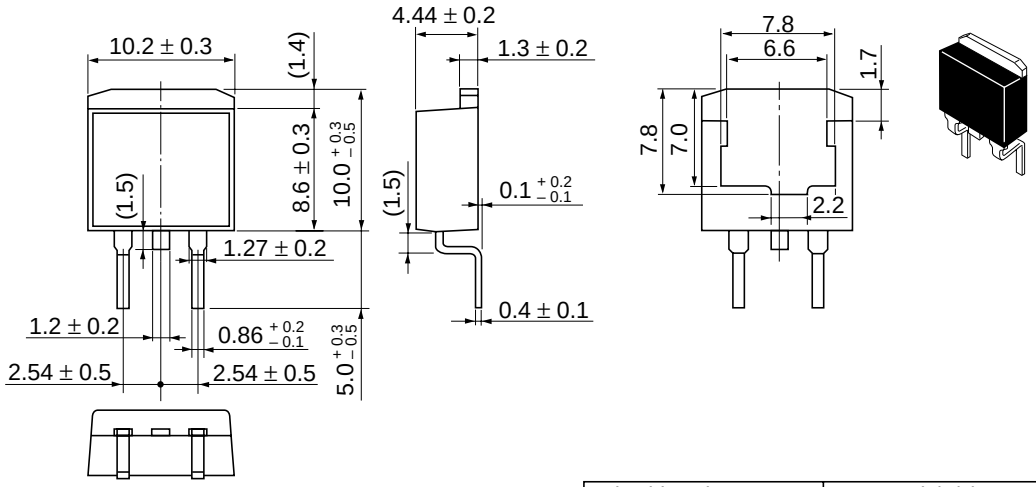
Unit: mm



Hitachi Code	LDPAK (S)-(1)
JEDEC	—
EIAJ	—
Mass (reference value)	1.3 g

As of January, 2001

Unit: mm



Hitachi Code	LDPAK (S)-(2)
JEDEC	—
EIAJ	—
Mass (reference value)	1.35 g

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