

# HAF1002(L), HAF1002(S)

Silicon P Channel MOS FET Series  
Power Switching

## HITACHI

ADE-208-586 (Z)

1st. Edition

October 1997

### Features

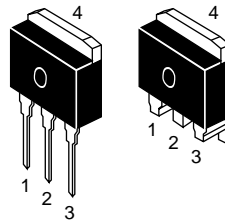
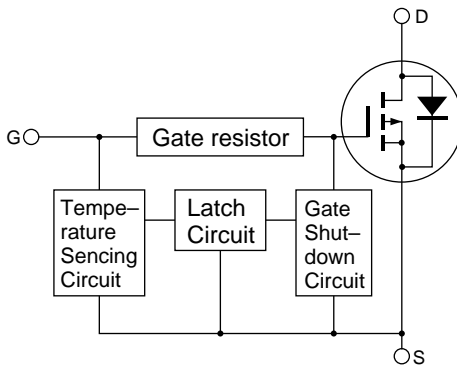
This FET has the over temperature shut-down capability sensing to the junction temperature.

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.

- 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

LDBPAK



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

# HAF1002(L), HAF1002(S)

## Absolute Maximum Ratings (Ta = 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>	3	V
Drain current	I <sub>D</sub>	-15	A
Drain peak current	I <sub>D(pulse)</sub> <sup>Note1</sup>	-30	A
Body-drain diode reverse drain current	I <sub>DR</sub>	-15	A
Channel dissipation	Pch <sup>Note2</sup>	50	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	-55 to +150	°C

Note: 1. PW ≤ 10μs, duty cycle ≤ 1 %  
2. Value at Tc = 25°C

## Typical Operation Characteristics

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	I <sub>IH1</sub>	—	—	-100	μA	V <sub>i</sub> = -8V, V <sub>DS</sub> = 0
(Gate non shut down)	I <sub>IH2</sub>	—	—	-50	μA	V <sub>i</sub> = -3.5V, V <sub>DS</sub> = 0
	I <sub>IL</sub>	—	—	-1	μA	V <sub>i</sub> = -1.2V, V <sub>DS</sub> = 0
Input current	I <sub>IH(sd)1</sub>	—	-0.8	—	mA	V <sub>i</sub> = -8V, V <sub>DS</sub> = 0
(Gate shut down)	I <sub>IH(sd)2</sub>	—	-0.35	—	mA	V <sub>i</sub> = -3.5V, 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	—	-13	V	

**Electrical Characteristics (Ta = 25°C)**

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	$I_{D1}$	-7	—	—	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	$I_G = -100\mu A, V_{DS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS-}$	3	—	—	V	$I_G = 100\mu A, V_{DS} = 0$
Gate to source leak current	$I_{GSS+1}$	—	—	-100	$\mu A$	$V_{GS} = -8V, V_{DS} = 0$
	$I_{GSS+2}$	—	—	-50	$\mu A$	$V_{GS} = -3.5V, V_{DS} = 0$
	$I_{GSS+3}$	—	—	-1	$\mu A$	$V_{GS} = -1.2V, V_{DS} = 0$
	$I_{GSS-}$	—	—	100	$\mu A$	$V_{GS} = 2.4V, V_{DS} = 0$
Input current (shut down)	$I_{GS(op)1}$	—	-0.8	—	mA	$V_{GS} = -8V, V_{DS} = 0$
	$I_{GS(op)1}$	—	-0.35	—	mA	$V_{GS} = -3.5V, V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	-250	$\mu A$	$V_{DS} = -50V, V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	-1.1	—	-2.25	V	$I_D = -1mA, V_{DS} = -10V$
Static drain to source on state resistance	$R_{DS(on)}$	—	100	130	m $\Omega$	$I_D = -7.5A, V_{GS} = -4V$ <sup>Note3</sup>
Static drain to source on state resistance	$R_{DS(on)}$	—	70	90	m $\Omega$	$I_D = -7.5A$ $V_{GS} = -10V$ <sup>Note3</sup>
Forward transfer admittance	$ y_{fs} $	5	10	—	S	$I_D = -7.5A, V_{DS} = -10V$ <sup>Note3</sup>
Output capacitance	C <sub>oss</sub>	—	610	—	pF	$V_{DS} = -10V, V_{GS} = 0$ $f = 1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	7.5	—	$\mu s$	$I_D = -7.5A, V_{GS} = -5V$
Rise time	$t_r$	—	36	—	$\mu s$	$R_L = 4\Omega$
Turn-off delay time	$t_{d(off)}$	—	32	—	$\mu s$	
Fall time	$t_f$	—	29	—	$\mu s$	
Body-drain diode forward voltage	$V_{DF}$	—	-1.0	—	V	$I_F = -15A, V_{GS} = 0$
Body-drain diode reverse recovery time	$t_{rr}$	—	200	—	ns	$I_F = -15A, V_{GS} = 0$ $diF/dt = 50A/\mu s$
Over load shut down operation time <sup>Note4</sup>	$t_{os1}$	—	3.7	—	ms	$V_{GS} = -5V, V_{DD} = -12V$
	$t_{os2}$	—	1	—	ms	$V_{GS} = -5V, V_{DD} = -24V$

Note: 3. Pulse test

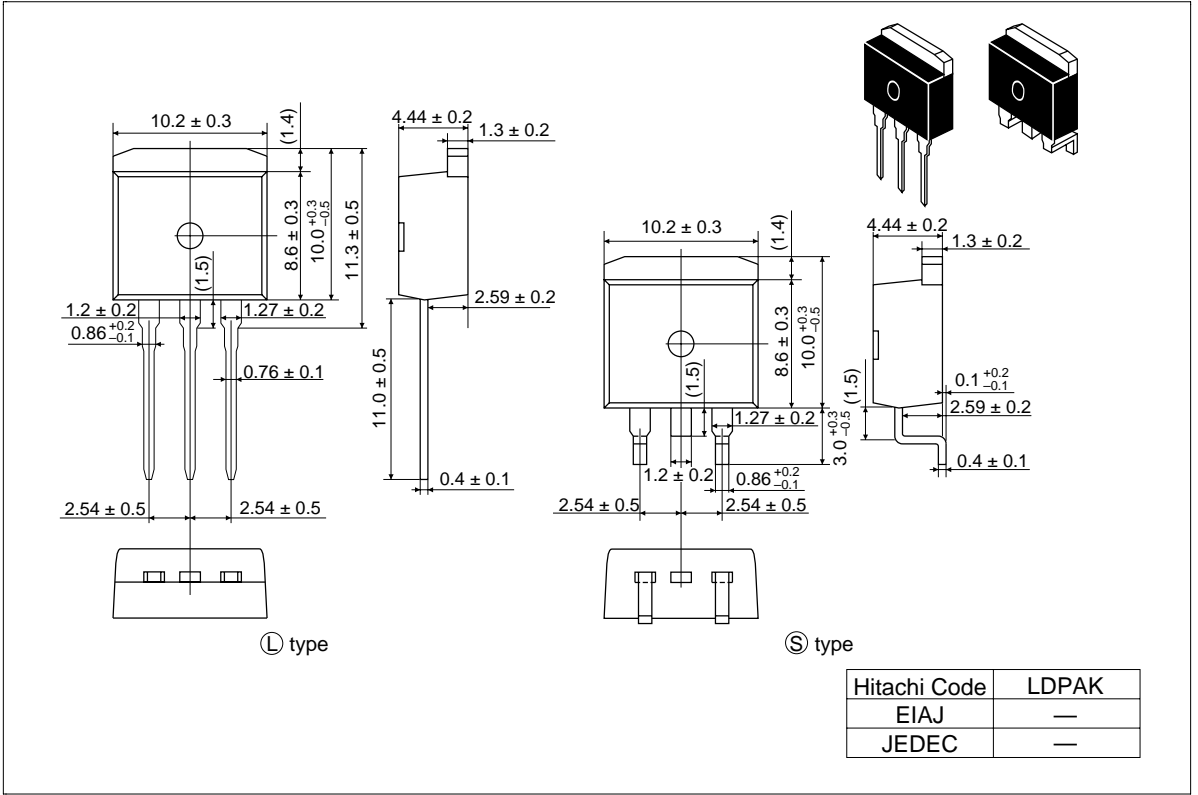
4. Including the junction temperature rise of the over loaded condition.

- See characteristics curve of HAF1001.

# HAF1002(L), HAF1002(S)

## Package Dimensions

Unit: mm



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