

HAF1005

Silicon P Channel MOS FET Series Power Switching

HITACHI

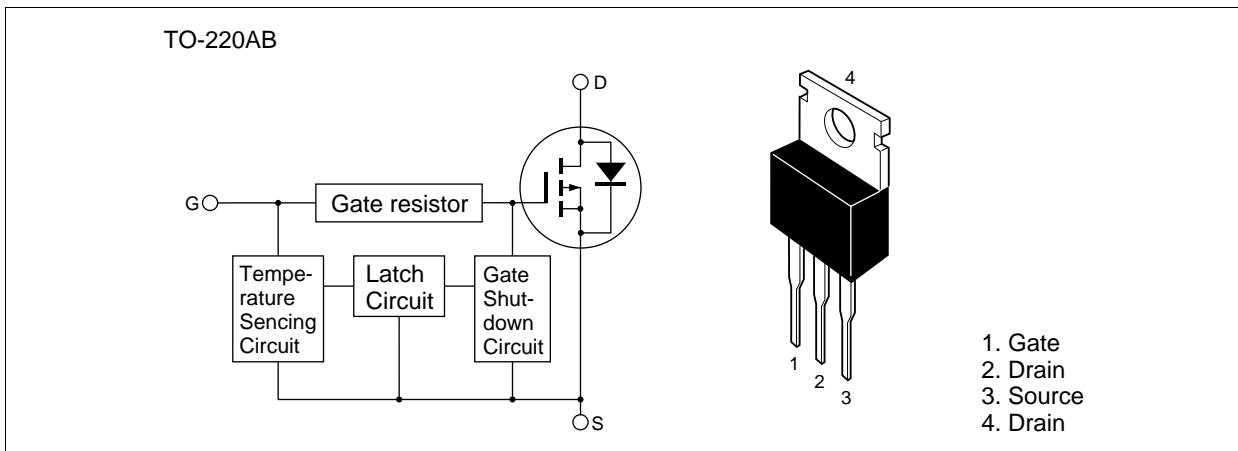
ADE-208-952 (Z)
Target specification 1st. Edition
Dec. 2000

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

- 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



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	-30	A
Drain peak current	$I_{D(pulse)}$ ^{Note1}	-60	A
Body-drain diode reverse drain current	I_{DR}	-30	A
Channel dissipation	P_{ch} ^{Note2}	50	W
Channel temperature	T_{ch}	150	$^\circ\text{C}$
Storage temperature	T_{stg}	-55 to +150	$^\circ\text{C}$

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

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

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	$V_i = -8\text{V}$, $V_{DS} = 0$
	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	

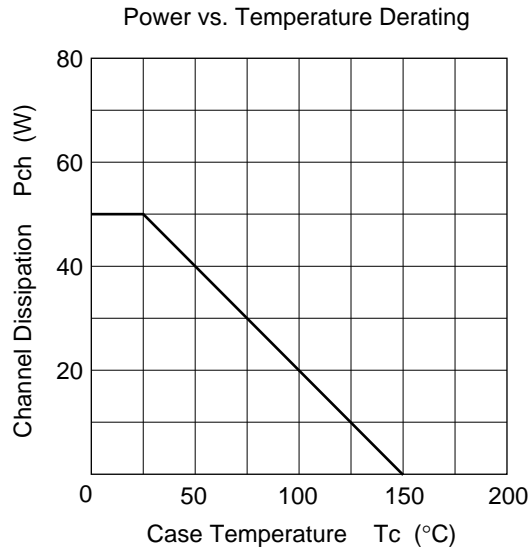
Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I_{D1}	(-30)	—	—	A	($V_{GS} = -10V, V_{DS} = -10V$)
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	$I_G = -300\mu A, V_{DS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	2.5	—	—	V	$I_G = 100\mu A, V_{DS} = 0$
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	$V_{DS} = -60V, V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	(-2.3)	—	(-3.4)	V	$I_D = -1mA, V_{DS} = -10V$
Static drain to source on state resistance	$R_{DS(on)}$	—	(42)	(50)	m Ω	$I_D = -15A, V_{GS} = -10V$ ^{Note3}
Forward transfer admittance	$ y_{fs} $	(5)	(15)	—	S	$I_D = -15A, V_{DS} = -10V$ ^{Note3}
Output capacitance	C_{oss}	—	(2500)	—	pF	$V_{DS} = -10V, V_{GS} = 0$ $f = 1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	(9)	—	μs	$I_D = -15A, V_{GS} = -10V$
Rise time	t_r	—	(20)	—	μs	$R_L = 2\Omega$
Turn-off delay time	$t_{d(off)}$	—	(5)	—	μs	
Fall time	t_f	—	(3.5)	—	μs	
Body-drain diode forward voltage	V_{DF}	—	(-1)	—	V	$I_F = -30A, V_{GS} = 0$
Body-drain diode reverse recovery time	t_{rr}	—	(150)	—	ns	$I_F = -30A, V_{GS} = 0$ $di_F/dt = 50A/\mu s$
Over load shut down Operation time ^{Note4}	t_{os1}	—	()	—	ms	$V_{GS} = -5V, V_{DD} = -16V$

Note: 3. Pulse test

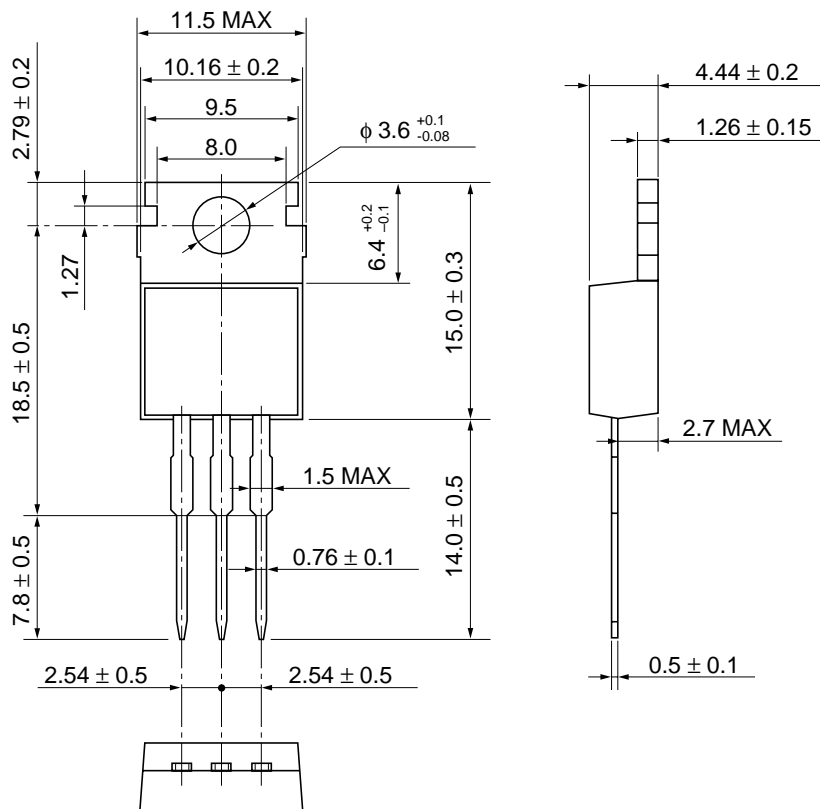
4. Including the junction temperature rise of the over loaded condition.

Main Characteristics



Package Dimensions

As of January, 2001
Unit: mm



Hitachi Code	TO-220AB
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	1.8 g

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