

HAF2005

Silicon N Channel MOS FET Series Power Switching

HITACHI

ADE-208-688 (Z)
Target specification 1st. Edition
Nov. 1998

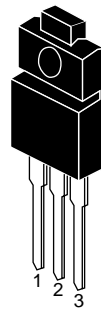
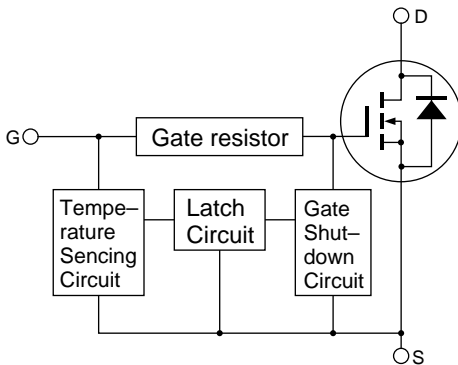
This FET has the over temperature shut-down capability sensing to the junction temperature. This FET has the built-in over temperature shut-down circuit in the gate area. And this circuit operation to shut-down the gate voltage in case of high junction temperature like applying over power consumption,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

TO-220FM



1. Gate
2. Drain
3. Source

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	$I_{\text{D(pulse)}}$ ^{Note1}	80	A
Body-drain diode reverse drain current	I_{DR}	40	A
Channel dissipation	P_{ch} ^{Note2}	30	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	I_{IH1}	—	—	100	μA	$V_i = 8\text{V}$, $V_{\text{DS}} = 0$
(Gate non shut down)	I_{IH2}	—	—	50	μA	$V_i = 3.5\text{V}$, $V_{\text{DS}} = 0$
	I_{IL}	—	—	1	μA	$V_i = 1.2\text{V}$, $V_{\text{DS}} = 0$
Input current	$I_{\text{IH(sd)1}}$	—	0.8	—	mA	$V_i = 8\text{V}$, $V_{\text{DS}} = 0$
(Gate non shut down)	$I_{\text{IH(sd)2}}$	—	0.35	—	mA	$V_i = 3.5\text{V}$, $V_{\text{DS}} = 0$
Shut down temperature	T_{sd}	—	175	—	$^\circ\text{C}$	Channel temperature
Gate operation voltage	V_{op}	3.5	—	12	V	

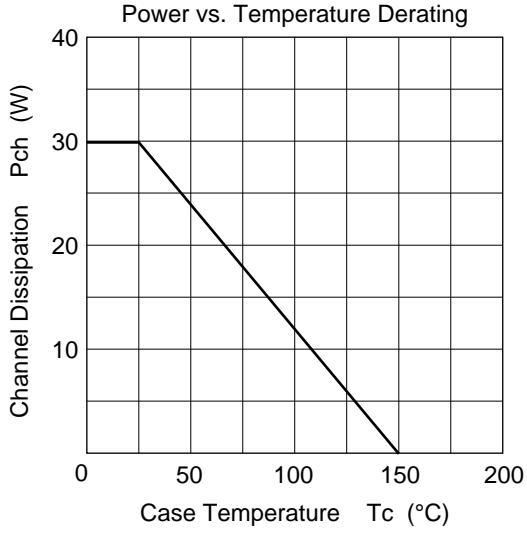
Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I_{D1}	(25)	—	—	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	$I_G = (300\mu A), V_{DS} = 0$
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}	—	—	250	μA	$V_{DS} = 50V, V_{GS} = 0$
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	m Ω	$I_D = 20A, V_{GS} = 4V$ ^{Note3}
Static drain to source on state resistance	$R_{DS(on)}$	—	15	20	m Ω	$I_D = 20A, V_{GS} = 10V$ ^{Note3}
Forward transfer admittance	$ y_{fs} $	25	50	—	S	$I_D = 20A, V_{DS} = 10V$ ^{Note3}
Output capacitance	C_{oss}	—	940	—	pF	$V_{DS} = 10V, V_{GS} = 0$ $f = 1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	(7.8)	—	μs	$I_D = 20A, V_{GS} = 5V$
Rise time	t_r	—	(64)	—	μs	$R_L = 1.5\Omega$
Turn-off delay time	$t_{d(off)}$	—	(19)	—	μs	
Fall time	t_f	—	(30)	—	μs	
Body-drain diode forward voltage	V_{DF}	—	(0.85)	—	V	$I_F = 20A, V_{GS} = 0$
Body-drain diode reverse recovery time	t_{rr}	—	()	—	ns	$I_F = 20A, V_{GS} = 0$ $diF/dt = 50A/\mu s$
Over load shut down operation time ^{Note4}	t_{os1}	—	()	—	ms	$V_{GS} = 5V, V_{DD} = 12V$
	t_{os2}	—	()	—	ms	$V_{GS} = 5V, V_{DD} = 24V$

Note: 3. Pulse test

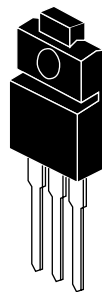
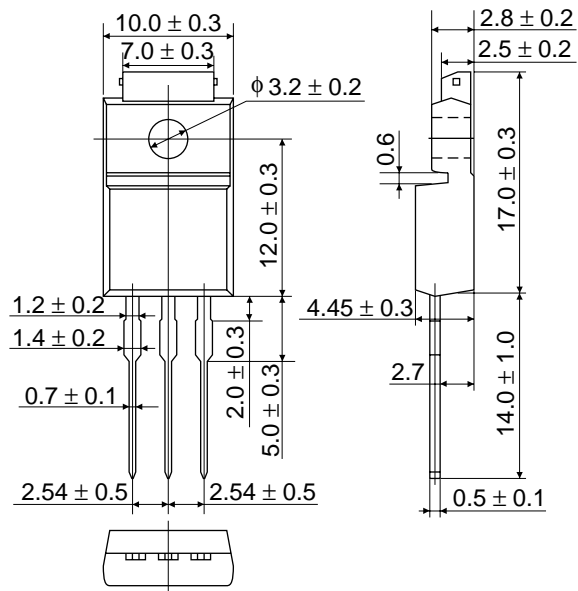
4. Include the time shift based on increasing of channel temperature when operate under over load condition.

Main Characteristics



Package Dimensions

Unit: mm



Hitachi Code	TO-220FM
EIAJ Code	SC-72
JEDEC Code	—

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