HAF2002

Silicon N Channel MOS FET Series
Power Switching

HITACHI

ADE-208-503 A (Z)
2nd. Edition
October 1997

Features

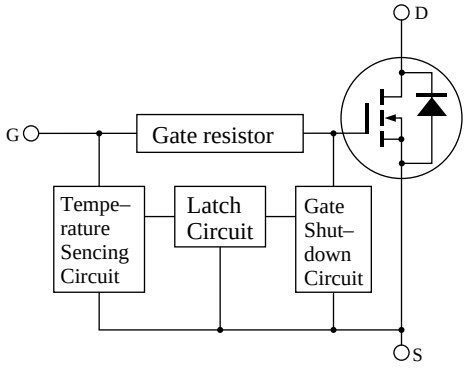
This FET has the over temperature shut–down capability sensing to the junction temperature.

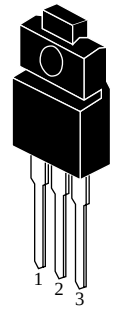
This FET has the built–in over temperature shut–down circuit in the gate area. And this circuit operation to shut–down the gate voltage in case of high junction temperature like applying over power consumption, over current etc.

- 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

TO–220FM





1. Gate
2. Drain
3. Source

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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}	–2.8	V
Drain current	I_D	20	A
Drain peak current	$I_{D(pulse)}$ Note1	40	A
Body-drain diode reverse drain current	I_{DR}	20	A
Channel dissipation	Pch Note2	30	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	—	13	V	

Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain current	I_{D1}	10	—	—	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 = 100µA, V_{DS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	–2.8	—	—	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 voltege drain current	I_{DSS}	—	—	250	µA	V_{DS} = 50 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	$R_{DS(on)}$	—	50	65	mΩ	I_D = 10A, V_{GS} = 4V [Note3]
Static drain to source on state resistance	$R_{DS(on)}$	—	30	43	mΩ	I_D = 10A, V_{GS} = 10V [Note3]
Forward transfer admittance	$\|y_{fs}\|$	6	12	—	S	I_D = 10A, V_{DS} = 10V [Note3]
Output capacitance	Coss	—	630	—	pF	V_{DS} = 10V , V_{GS} = 0 f = 1 MHz
Turn-on delay time	$t_{d(on)}$	—	7.5	—	µs	I_D = 5A, V_{GS} = 5V
Rise time	t_r	—	29	—	µs	R_L = 6Ω
Turn-off delay time	$t_{d(off)}$	—	34	—	µs	
Fall time	t_f	—	26	—	µs	
Body–drain diode forward voltage	V_{DF}	—	1.0	—	V	I_F = 20A, V_{GS} = 0
Body–drain diode reverse recovery time	t_{rr}	—	110	—	ns	I_F = 20A, V_{GS} = 0 diF/ dt =50A/µs
Over load shut down operation time [Note4]	t_{os1}	—	1.8	—	ms	V_{GS} = 5V, V_{DD} = 12V
	t_{os2}	—	0.7	—	ms	V_{GS} = 5V, V_{DD} = 24V

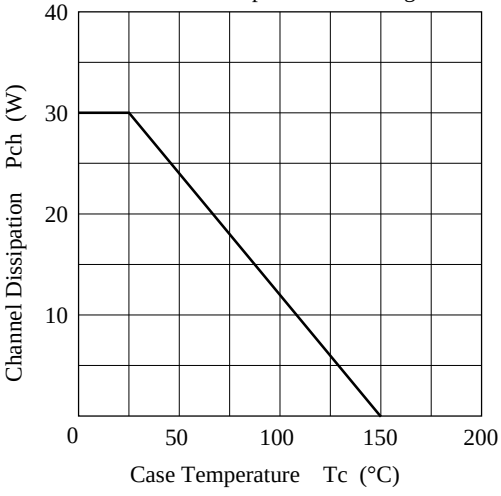
Note: 3. Pulse test

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

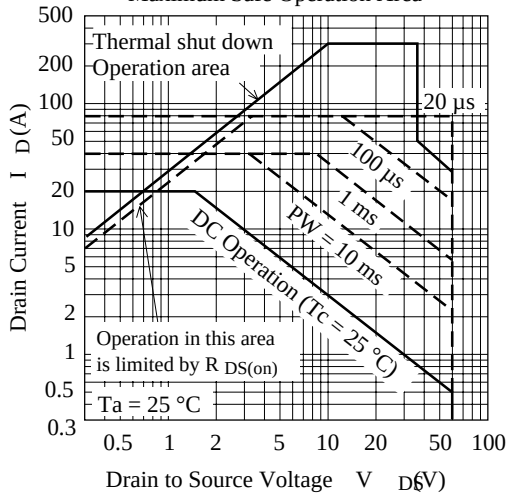
See characteristic curve of HAF2001.

Main Characteristics

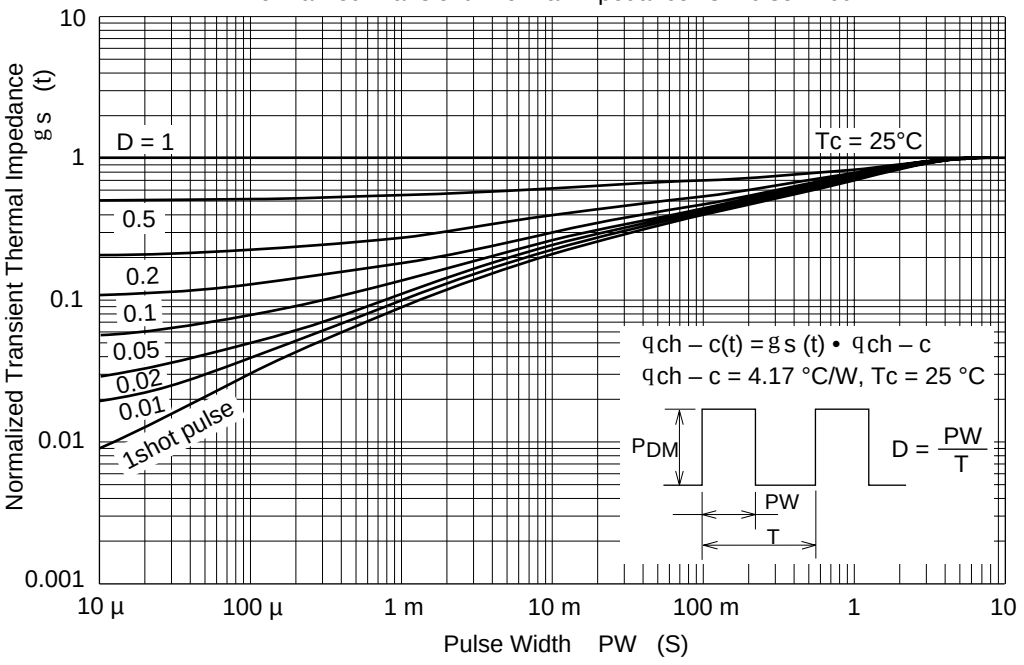
Power vs. Temperature Derating



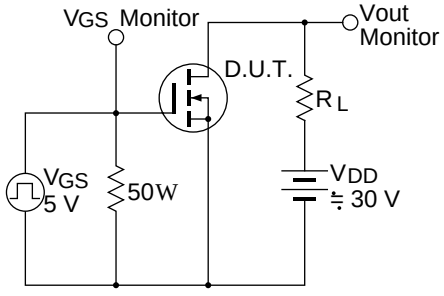
Maximum Safe Operation Area



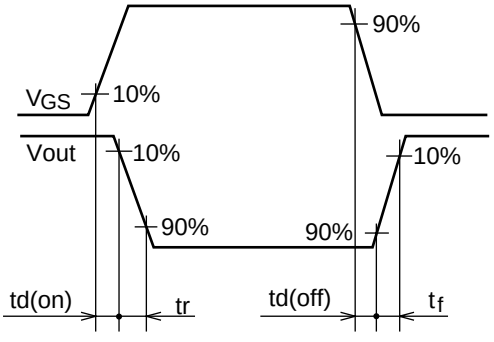
Normalized Transient Thermal Impedance vs. Pulse Width



Switching Time Test Circuit

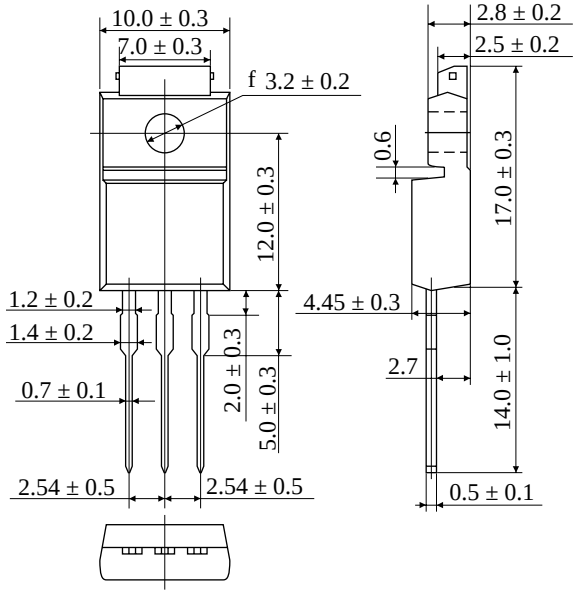


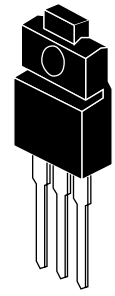
Waveform



Package Dimensions

Unit: mm





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HITACHI

Hitachi, Ltd.
Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

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For further information write to:

Hitachi Semiconductor
(America) Inc.
179 East Tasman Drive,
San Jose,CA 95134
Tel: <1> (408) 433-1990
Fax: <1>(408) 433-0223

Hitachi Europe GmbH
Electronic components Group
Dornacher Straße 3
D-85622 Feldkirchen, Munich
Germany
Tel: <49> (89) 9 9180-0
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 049318
Tel: 535-2100
Fax: 535-1533

Hitachi Asia Ltd.
Taipei Branch Office
3F, Hung Kuo Building. No.167,
Tun-Hwa North Road, Taipei (105)
Tel: <886> (2) 2718-3666
Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower, World Finance Centre,
Harbour City, Canton Road, Tsim Sha Tsui,
Kowloon, Hong Kong
Tel: <852> (2) 735 9218
Fax: <852> (2) 730 0281
Telex: 40815 HITEC HX