

# HAT2096H

Silicon N Channel Power MOS FET  
Power Switching

# HITACHI

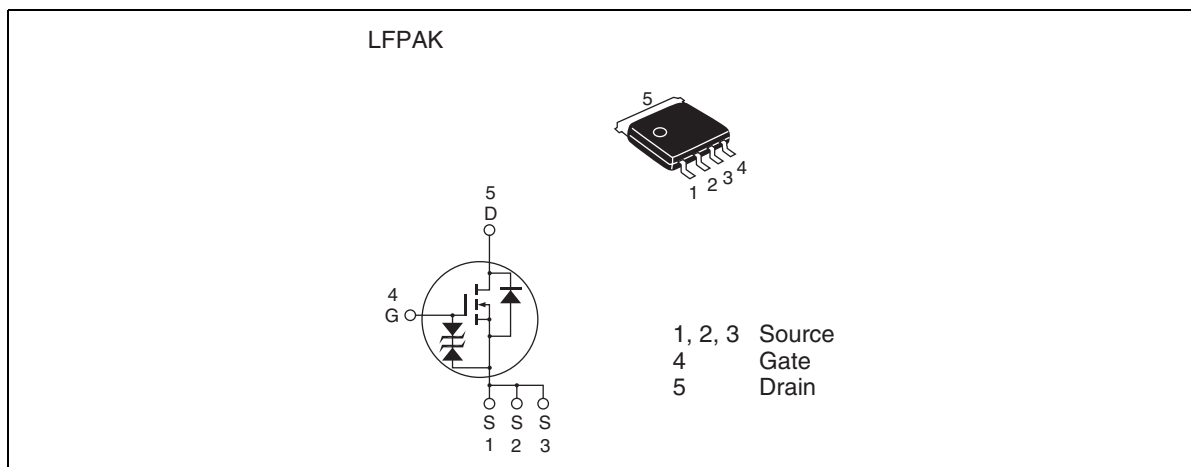
ADE-208-1431B (Z)

3rd. Edition  
Aug. 2002

## Features

- Capable of 4.5 V gate drive
- Low drive current
- High density mounting
- Low on-resistance  
 $R_{DS(on)} = 4.2 \text{ m}\Omega$  typ. (at  $V_{GS} = 10 \text{ V}$ )

## Outline



## Absolute Maximum Ratings

( $T_a = 25^\circ\text{C}$ )

Item	Symbol	Ratings	Unit
Drain to source voltage	$V_{DSS}$	30	V
Gate to source voltage	$V_{GSS}$	$\pm 20$	V
Drain current	$I_D$	40	A
Drain peak current	$I_{D(pulse)}$ <sup>Note1</sup>	160	A
Body-drain diode reverse drain current	$I_{DR}$	40	A
Channel dissipation	$P_{ch}$ <sup>Note2</sup>	20	W
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-55 to + 150	$^\circ\text{C}$

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

2.  $T_c = 25^\circ\text{C}$

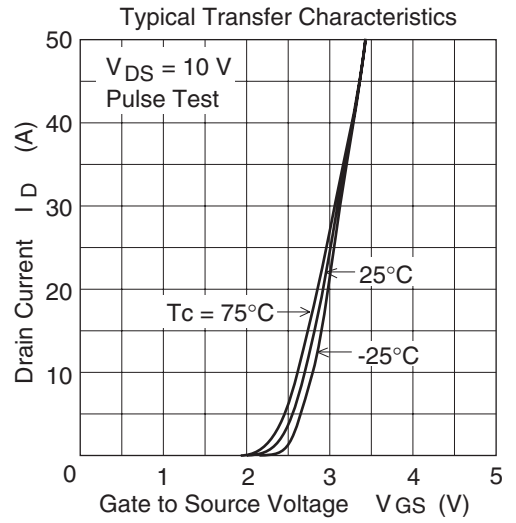
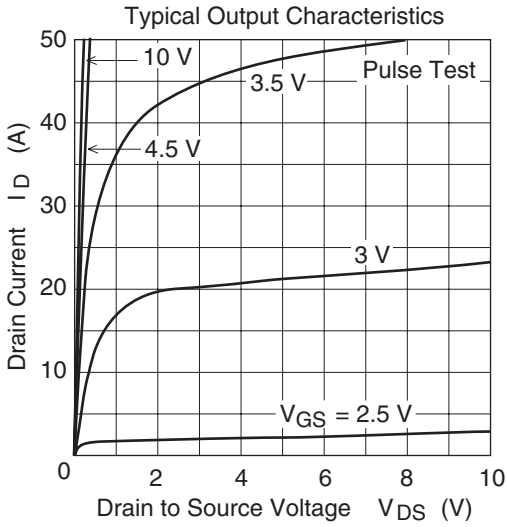
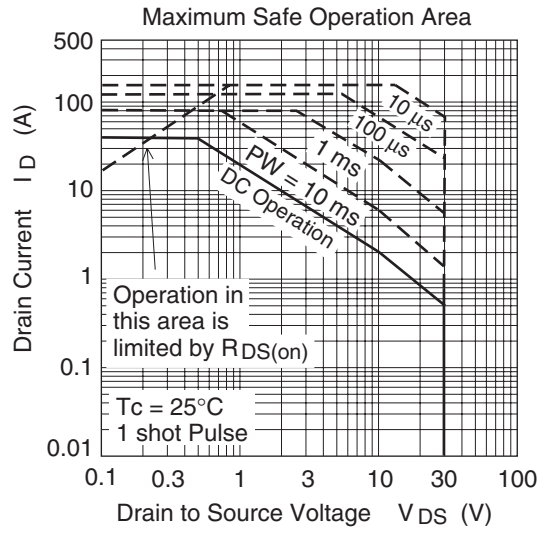
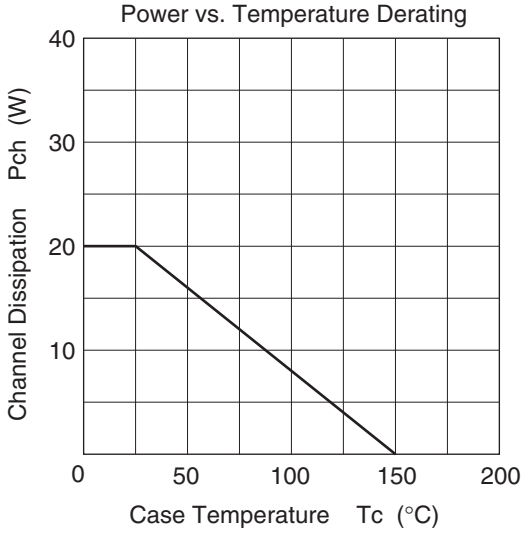
## Electrical Characteristics

(Ta = 25°C)

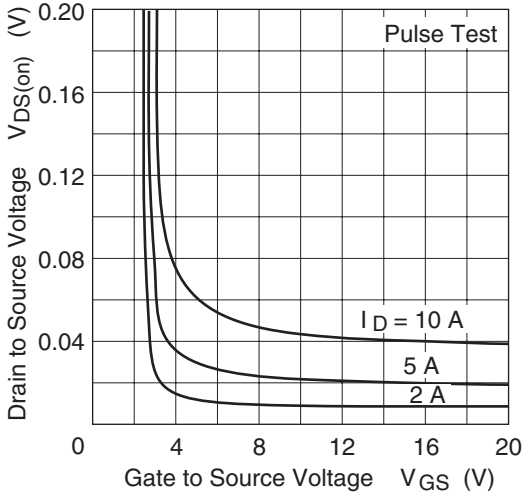
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	30	—	—	V	$I_D = 10 \text{ mA}$ , $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100 \mu\text{A}$ , $V_{DS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	1	$\mu\text{A}$	$V_{DS} = 30 \text{ V}$ , $V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.5	V	$V_{DS} = 10 \text{ V}$ , $I_D = 1 \text{ mA}$
Static drain to source on state resistance	$R_{DS(on)}$	—	4.2	5.3	m $\Omega$	$I_D = 20 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note3</sup>
	$R_{DS(on)}$	—	7.0	10	m $\Omega$	$I_D = 20 \text{ A}$ , $V_{GS} = 4.5 \text{ V}$ <sup>Note3</sup>
Forward transfer admittance	$ y_{fs} $	30	50	—	S	$I_D = 20 \text{ A}$ , $V_{DS} = 10 \text{ V}$ <sup>Note3</sup>
Input capacitance	$C_{iss}$	—	2200	—	pF	$V_{DS} = 10 \text{ V}$
Output capacitance	$C_{oss}$	—	600	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	330	—	pF	$f = 1 \text{ MHz}$
Total gate charge	$Q_g$	—	40	—	nc	$V_{DD} = 10 \text{ V}$
Gate to source charge	$Q_{gs}$	—	7	—	nc	$V_{GS} = 10 \text{ V}$
Gate to drain charge	$Q_{gd}$	—	8	—	nc	$I_D = 40 \text{ A}$
Turn-on delay time	$t_{d(on)}$	—	20	—	ns	$V_{GS} = 10 \text{ V}$ , $I_D = 20 \text{ A}$
Rise time	$t_r$	—	49	—	ns	$V_{DD} \cong 10 \text{ V}$
Turn-off delay time	$t_{d(off)}$	—	62	—	ns	$R_L = 0.5 \Omega$
Fall time	$t_f$	—	15	—	ns	$R_g = 4.7 \Omega$
Body-drain diode forward voltage	$V_{DF}$	—	0.85	1.11	V	$I_F = 40 \text{ A}$ , $V_{GS} = 0$ <sup>Note3</sup>
Body-drain diode reverse recovery time	$t_{rr}$	—	60	—	ns	$I_F = 40 \text{ A}$ , $V_{GS} = 0$ $diF/dt = 50 \text{ A}/\mu\text{s}$

Notes: 3. Pulse test

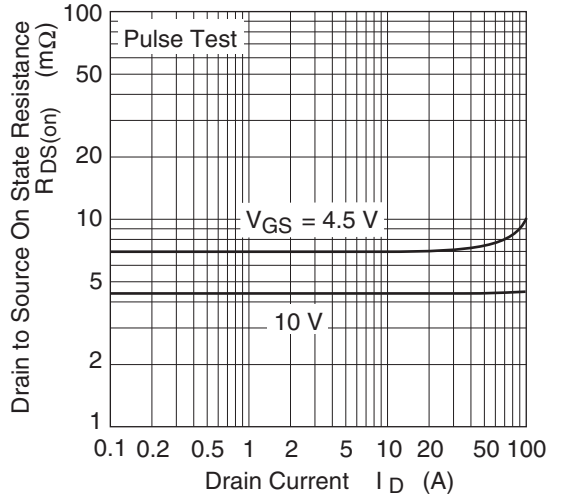
## Main Characteristics



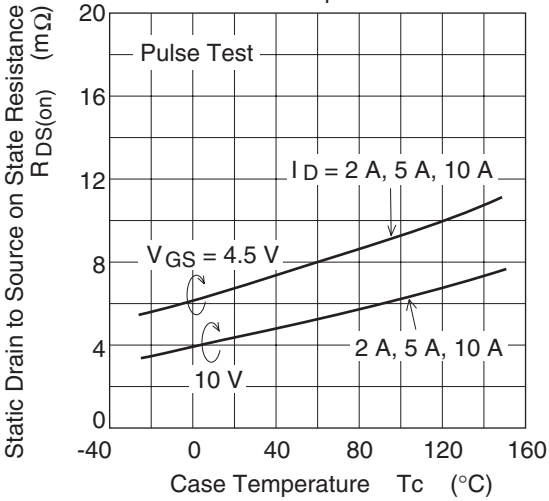
Drain to Source Saturation Voltage vs. Gate to Source Voltage



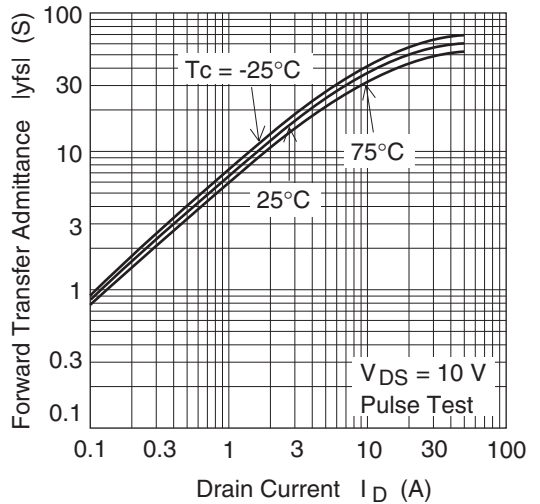
Static Drain to Source on State Resistance vs. Drain Current



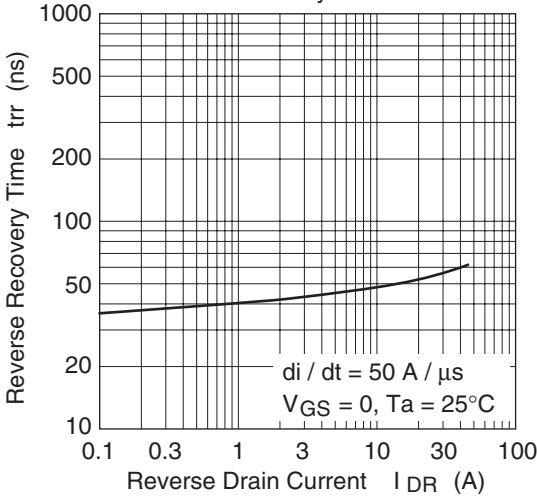
Static Drain to Source on State Resistance vs. Temperature



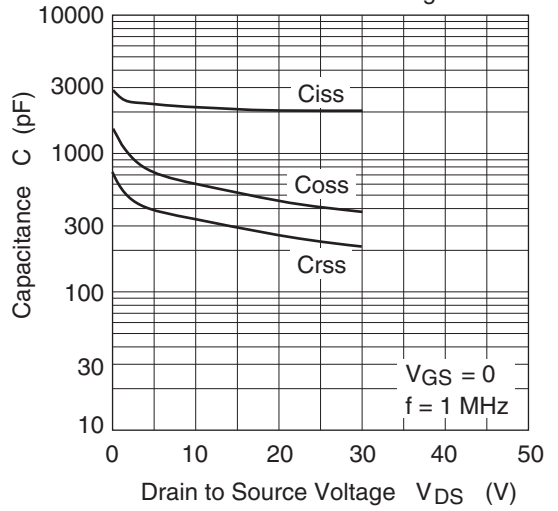
Forward Transfer Admittance vs. Drain Current



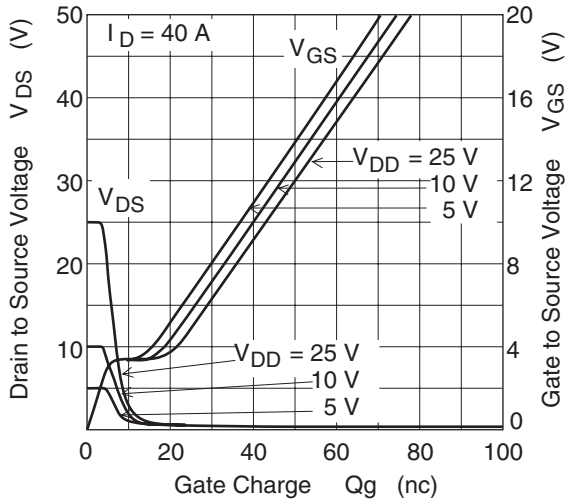
Body-Drain Diode Reverse Recovery Time



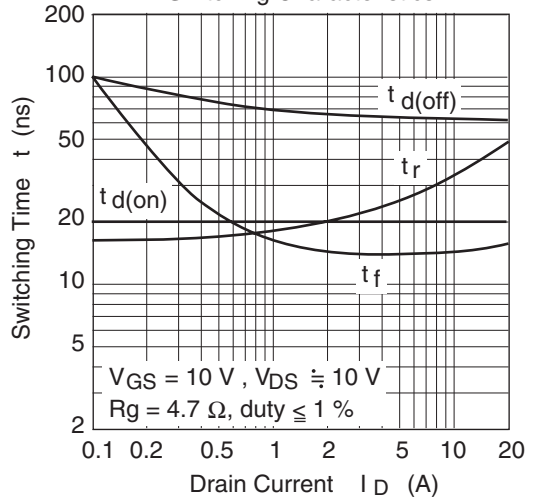
Typical Capacitance vs. Drain to Source Voltage

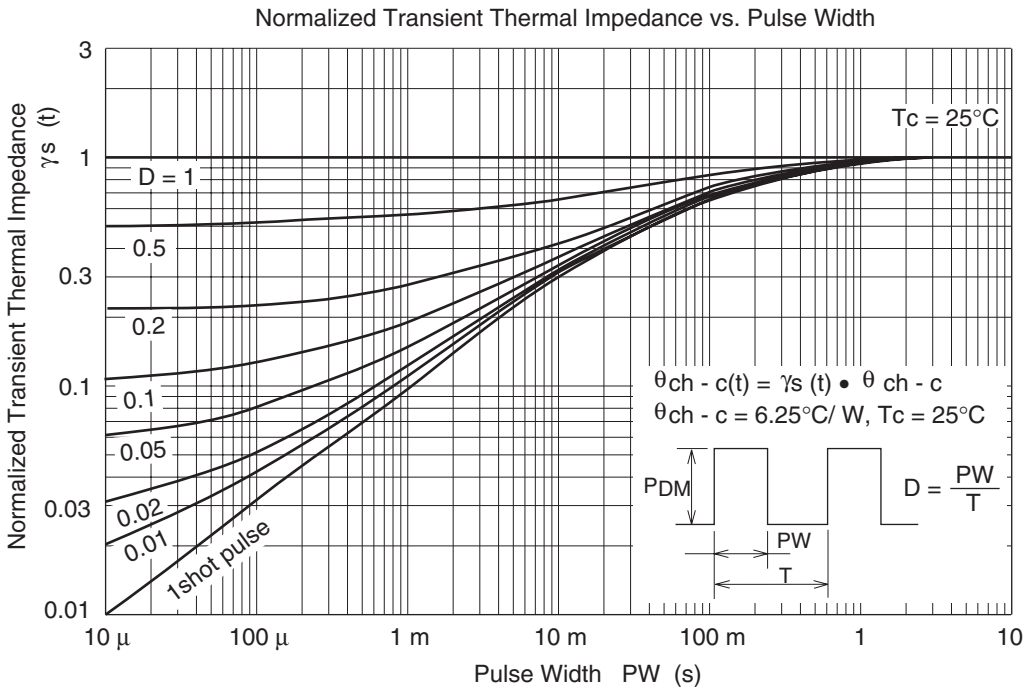
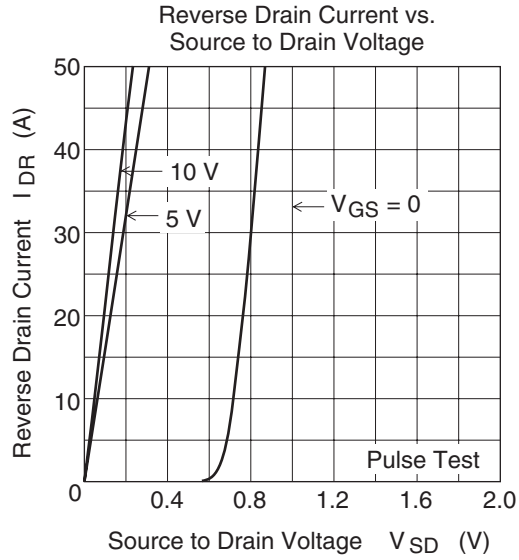


Dynamic Input Characteristics

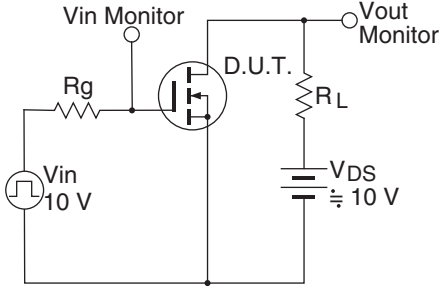


Switching Characteristics

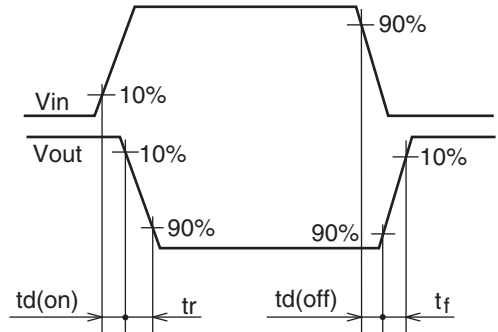




Switching Time Test Circuit



Switching Time Waveform







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# HITACHI

### Hitachi, Ltd.

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

URL <http://www.hitachisemiconductor.com/>

### 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 Ltd.  
Electronic Components Group  
Whitebrook Park  
Lower Cookham Road  
Maidenhead  
Berkshire SL6 8YA, United Kingdom  
Tel: <44> (1628) 585000  
Fax: <44> (1628) 585200

Hitachi Asia Ltd.  
Hitachi Tower  
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Tel : <65>-6538-6533/6538-8577  
Fax : <65>-6538-6933/6538-3877  
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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>-2735-9218  
Fax : <852>-2730-0281  
URL : <http://semiconductor.hitachi.com.hk>

Hitachi Europe GmbH  
Electronic Components Group  
Dornacher Straße 3  
D-85622 Feldkirchen  
Postfach 201, D-85619 Feldkirchen  
Germany  
Tel: <49> (89) 9 9180-0  
Fax: <49> (89) 9 29 30 00

Hitachi Asia Ltd.  
(Taipei Branch Office)  
4/F, No. 167, Tun Hwa North Road  
Hung-Kuo Building  
Taipei (105), Taiwan  
Tel : <886>-(2)-2718-3666  
Fax : <886>-(2)-2718-8180  
Telex : 23222 HAS-TP  
URL : <http://www.hitachi.com.tw>

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