

To all our customers

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Renesas Technology Corp.  
Customer Support Dept.  
April 1, 2003

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# HAT2096H

## Silicon N Channel Power MOS FET Power Switching

# RENESAS

ADE-208-1431B (Z)

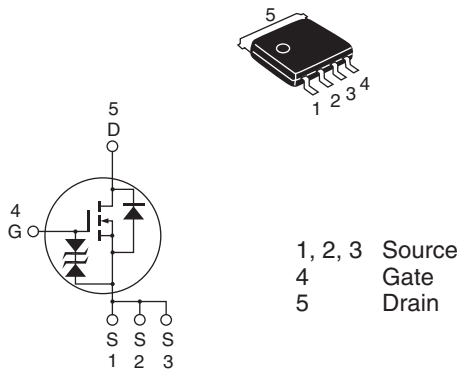
3rd. Edition  
Aug. 2002

### 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

LFAK



## Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	$V_{DSS}$	30	V
Gate to source voltage	$V_{GSS}$	±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	$Pch$ <sup>Note2</sup>	20	W
Channel temperature	Tch	150	°C
Storage temperature	Tstg	-55 to + 150	°C

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

2.  $T_c = 25^\circ C$

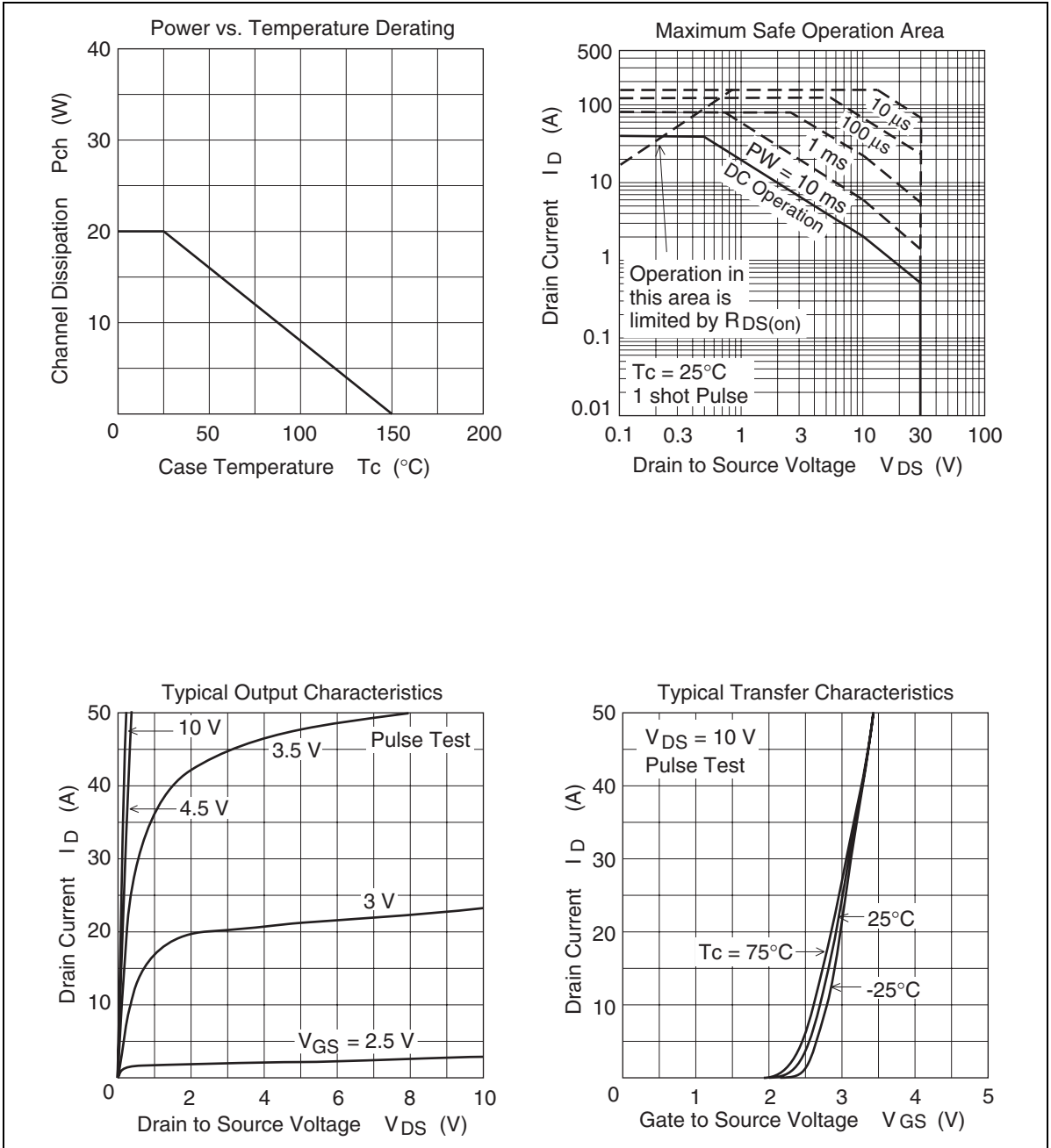
## Electrical Characteristics

(Ta = 25°C)

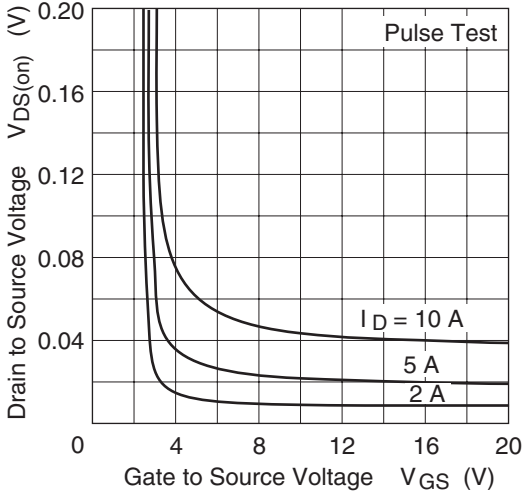
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	30	—	—	V	$I_D = 10 \text{ mA}$ , $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100 \text{ }\mu\text{A}$ , $V_{DS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$
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	$\text{m}\Omega$	$I_D = 20 \text{ A}$ , $V_{GS} = 10 \text{ V}$ <sup>Note3</sup>
	$R_{DS(on)}$	—	7.0	10	$\text{m}\Omega$	$I_D = 20 \text{ A}$ , $V_{GS} = 4.5 \text{ V}$ <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	Ciss	—	2200	—	pF	$V_{DS} = 10 \text{ V}$
Output capacitance	Coss	—	600	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	Crss	—	330	—	pF	$f = 1 \text{ MHz}$
Total gate charge	Qg	—	40	—	nc	$V_{DD} = 10 \text{ V}$
Gate to source charge	Qgs	—	7	—	nc	$V_{GS} = 10 \text{ V}$
Gate to drain charge	Qgd	—	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	$R_L = 0.5 \text{ }\Omega$
Fall time	$t_f$	—	15	—	ns	$R_g = 4.7 \text{ }\Omega$
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

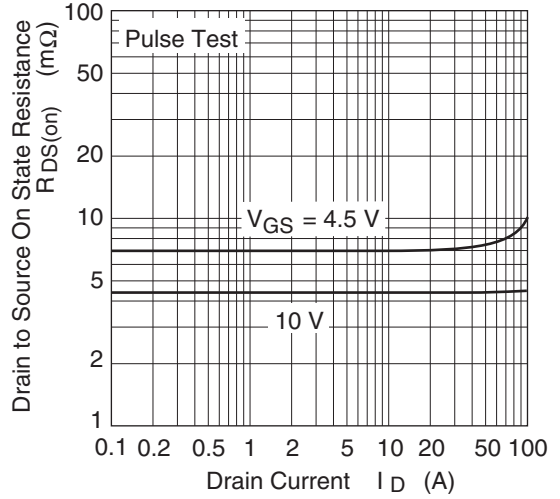
## Main Characteristics



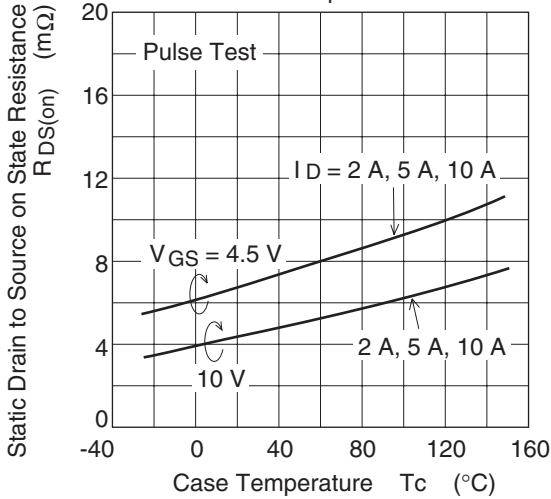
Drain to Source Saturation Voltage vs. Gate to Source Voltage



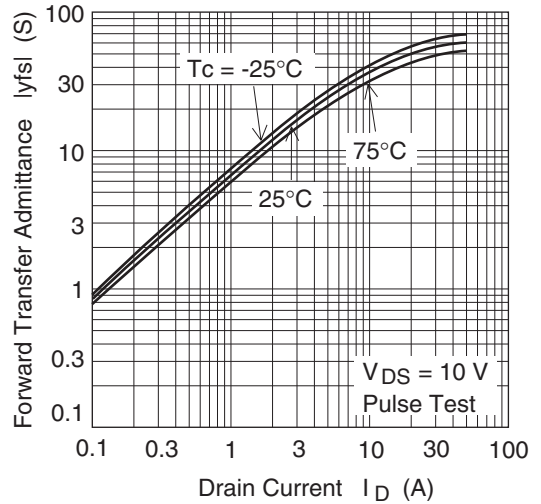
Static Drain to Source on State Resistance vs. Drain Current



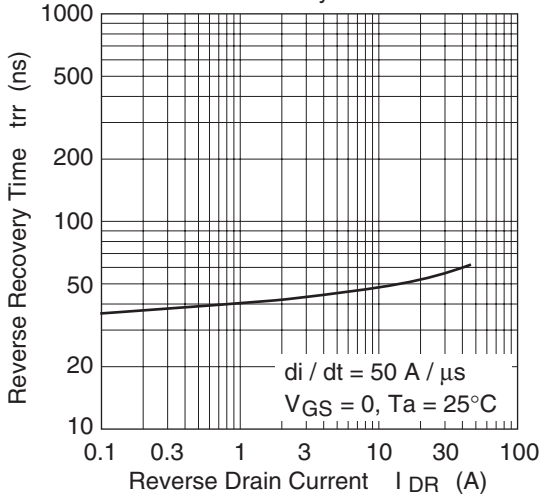
Static Drain to Source on State Resistance vs. Temperature



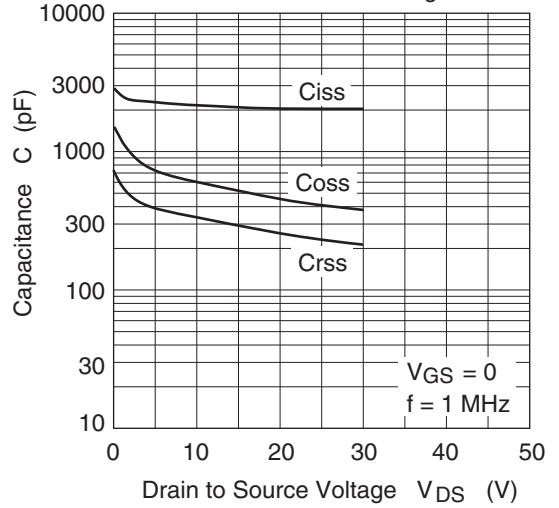
Forward Transfer Admittance vs. Drain Current



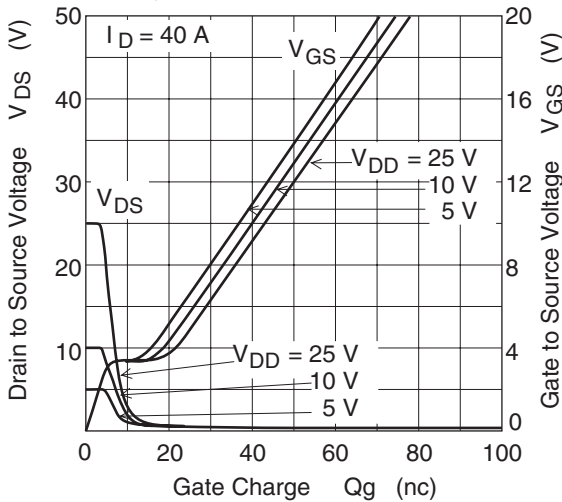
Body-Drain Diode Reverse Recovery Time



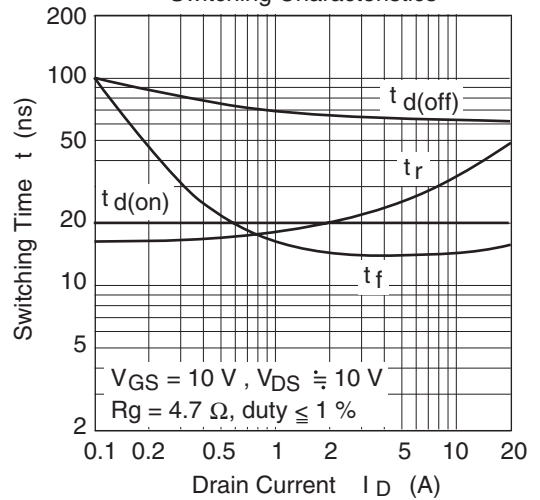
Typical Capacitance vs. Drain to Source Voltage



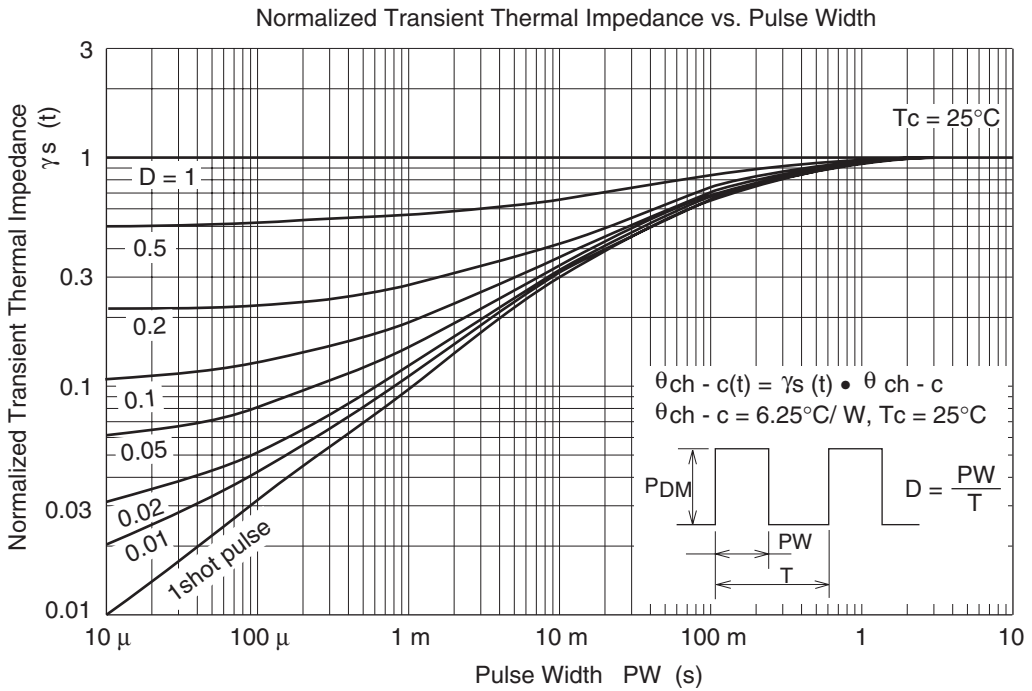
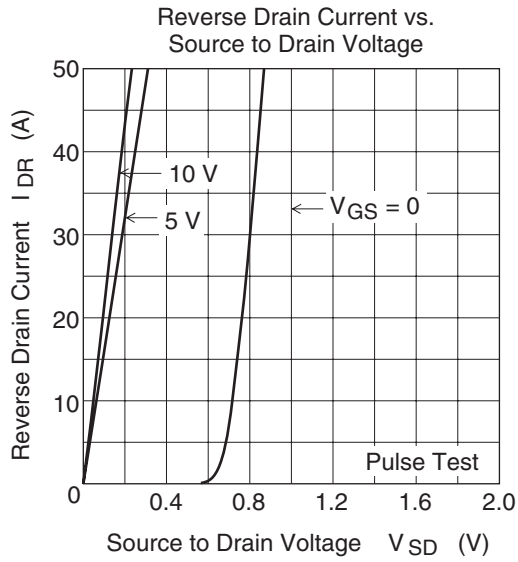
Dynamic Input Characteristics



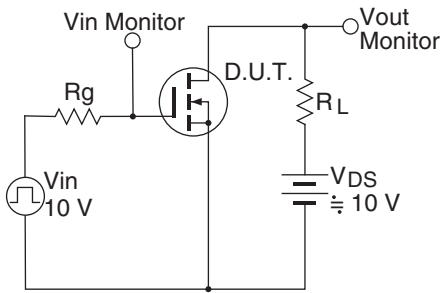
Switching Characteristics



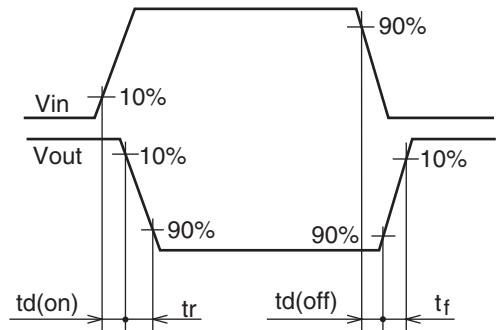




Switching Time Test Circuit



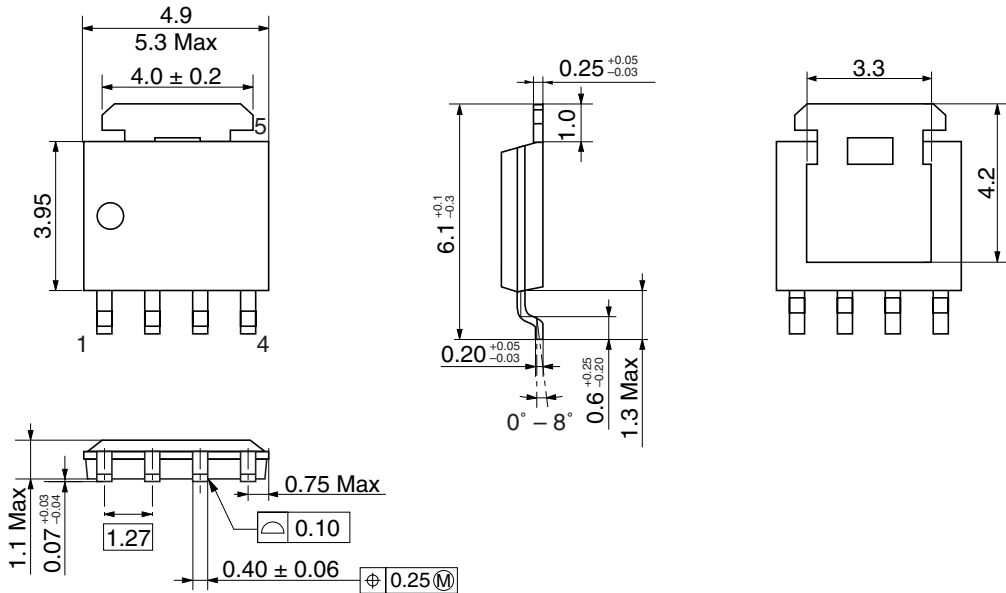
Switching Time Waveform



Package Dimensions

As of January, 2002

Unit: mm



Hitachi Code	LFLPAK
JEDEC	—
JEITA	—
Mass (reference value)	0.080 g

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