

To all our customers

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

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# HAT3006R

Silicon N Channel / P Channel Power MOS FET  
High Speed Power Switching

**RENESAS**

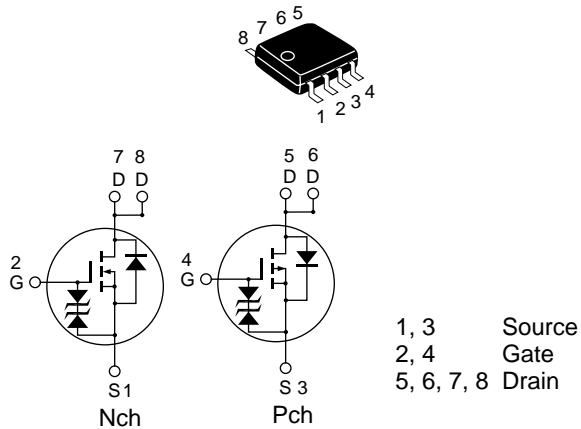
ADE-208-480F (Z)  
7th. Edition  
Feb. 1999

## Features

- Low on-resistance
- Capable of 4 V gate drive
- Low drive current
- High density mounting

## Outline

SOP-8



## Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings		Unit
		Nch	Pch	
Drain to source voltage	$V_{DSS}$	30	- 30	V
Gate to source voltage	$V_{GSS}$	± 20	± 20	V
Drain current	$I_D$	6.5	- 4.5	A
Drain peak current	$I_{D(pulse)}$ <sup>Note1</sup>	52	- 36	A
Body-drain diode reverse drain current	$I_{DR}$	6.5	- 4.5	A
Channel dissipation	Pch <sup>Note2</sup>	2		W
Channel dissipation	Pch <sup>Note3</sup>	3		W
Channel temperature	Tch	150		°C
Storage temperature	Tstg	- 55 to + 150		°C

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

2. 1 Drive operation : When using the glass epoxy board (FR4 40 x 40 x 1.6 mm),  $PW \leq 10s$

3. 2 Drive operation : When using the glass epoxy board (FR4 40 x 40 x 1.6 mm),  $PW \leq 10s$

## Electrical Characteristics (N channel) (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	$V_{(BR)GSS}$	± 20	—	—	V	$I_G = \pm 100\ \mu A$ , $V_{DS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	± 10	$\mu A$	$V_{GS} = \pm 16\text{ V}$ , $V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	10	$\mu A$	$V_{DS} = 30\text{ V}$ , $V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.0	V	$V_{DS} = 10\text{ V}$ , $I_D = 1\text{ mA}$
Static drain to source on state resistance	$R_{DS(on)}$	—	0.03	0.045	$\Omega$	$I_D = 4\text{ A}$ , $V_{GS} = 10\text{ V}$ <sup>Note4</sup>
	$R_{DS(on)}$	—	0.05	0.08	$\Omega$	$I_D = 4\text{ A}$ , $V_{GS} = 4\text{ V}$ <sup>Note4</sup>
Forward transfer admittance	$ y_{fs} $	5	8	—	S	$I_D = 4\text{ A}$ , $V_{DS} = 10\text{ V}$ <sup>Note4</sup>
Input capacitance	Ciss	—	560	—	pF	$V_{DS} = 10\text{ V}$
Output capacitance	Coss	—	380	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	Crss	—	170	—	pF	$f = 1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	30	—	ns	$V_{GS} = 4\text{ V}$ , $I_D = 4\text{ A}$
Rise time	$t_r$	—	270	—	ns	$V_{DD} \cong 10\text{ V}$
Turn-off delay time	$t_{d(off)}$	—	40	—	ns	
Fall time	$t_f$	—	65	—	ns	
Body-drain diode forward voltage	$V_{DF}$	—	0.9	1.4	V	$IF = 6.5\text{ A}$ , $V_{GS} = 0$ <sup>Note4</sup>
Body-drain diode reverse recovery time	$t_{rr}$	—	45	—	ns	$IF = 6.5\text{ A}$ , $V_{GS} = 0$ $diF/dt = 20\text{ A}/\mu s$

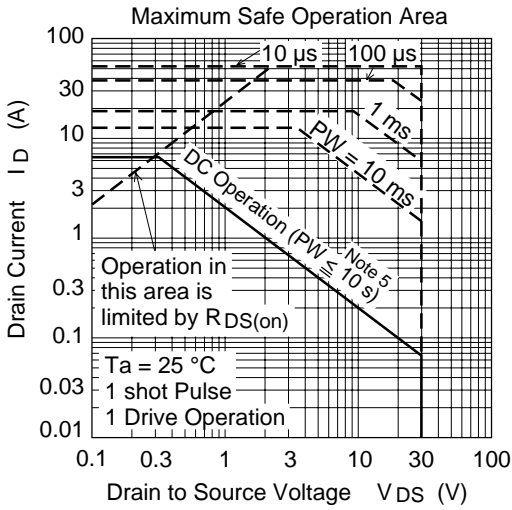
Note: 4. Pulse test

## Electrical Characteristics (P channel) (Ta = 25°C)

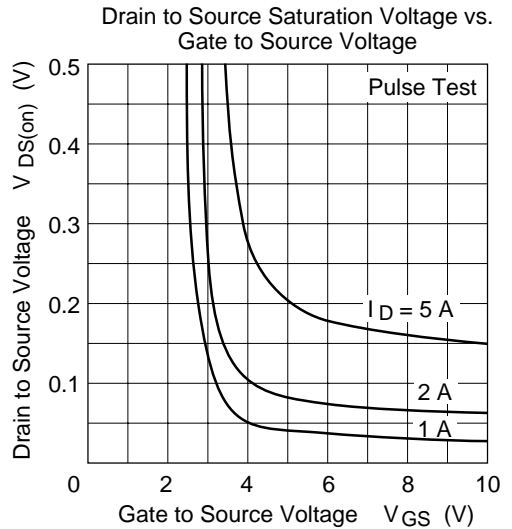
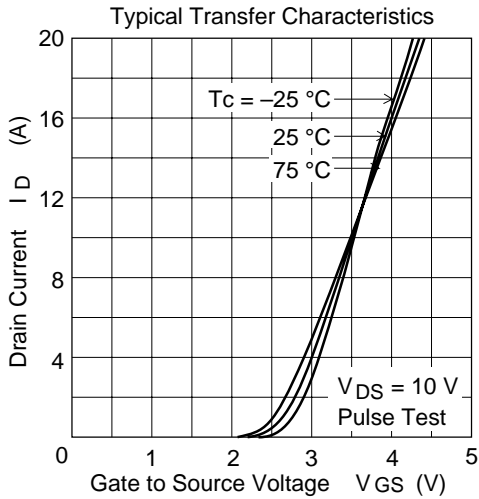
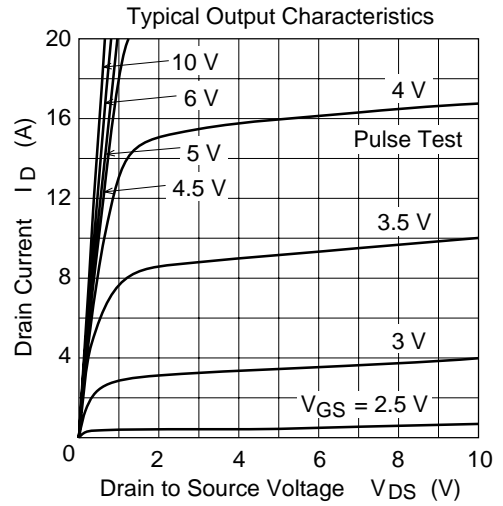
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	-30	—	—	V	$I_D = -10 \text{ mA}$ , $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100 \mu\text{A}$ , $V_{DS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 16 \text{ V}$ , $V_{DS} = 0$
Zero gate voltage drain current	$I_{DSS}$	—	—	-10	$\mu\text{A}$	$V_{DS} = -30 \text{ V}$ , $V_{GS} = 0$
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	$R_{DS(on)}$	—	0.07	0.09	$\Omega$	$I_D = -3 \text{ A}$ , $V_{GS} = -10 \text{ V}$ <sup>Note5</sup>
	$R_{DS(on)}$	—	0.11	0.18	$\Omega$	$I_D = -3 \text{ A}$ , $V_{GS} = -4 \text{ V}$ <sup>Note5</sup>
Forward transfer admittance	$ y_{fs} $	4	6	—	S	$I_D = -3 \text{ A}$ , $V_{DS} = -10 \text{ V}$ <sup>Note5</sup>
Input capacitance	$C_{iss}$	—	660	—	pF	$V_{DS} = -10 \text{ V}$
Output capacitance	$C_{oss}$	—	440	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	140	—	pF	$f = 1 \text{ MHz}$
Turn-on delay time	$t_{d(on)}$	—	24	—	ns	$V_{GS} = -4 \text{ V}$ , $I_D = -3 \text{ A}$
Rise time	$t_r$	—	165	—	ns	$V_{DD} \cong -10 \text{ V}$
Turn-off delay time	$t_{d(off)}$	—	35	—	ns	
Fall time	$t_f$	—	70	—	ns	
Body-drain diode forward voltage	$V_{DF}$	—	-0.9	-1.4	V	$I_F = -4.5 \text{ A}$ , $V_{GS} = 0$ <sup>Note5</sup>
Body-drain diode reverse recovery time	$t_{rr}$	—	60	—	ns	$I_F = -4.5 \text{ A}$ , $V_{GS} = 0$ $diF/dt = 20 \text{ A}/\mu\text{s}$

Note: 5. Pulse test

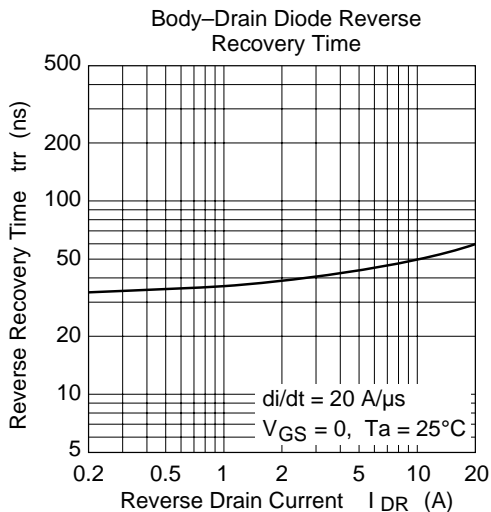
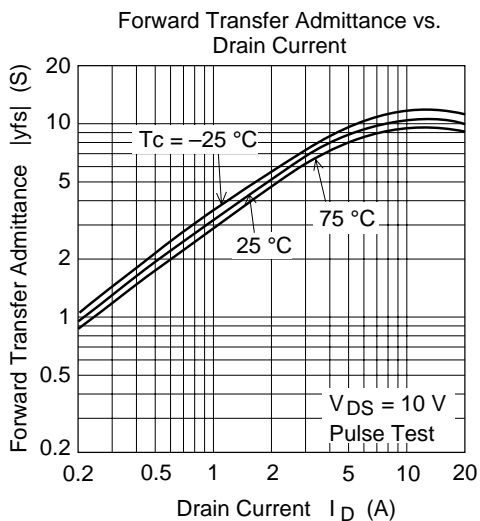
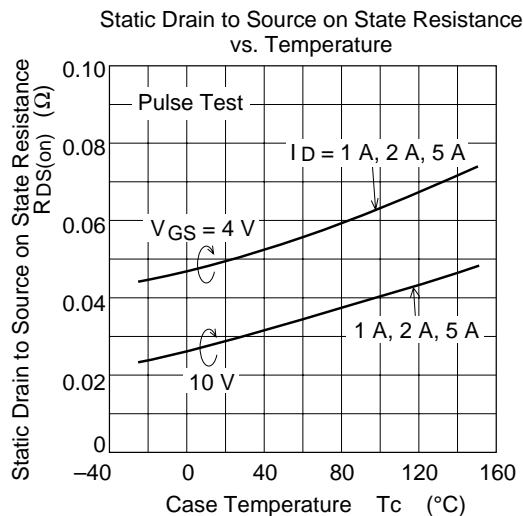
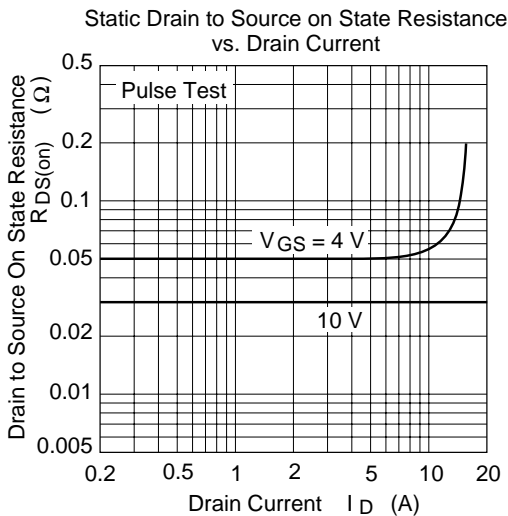
## Main Characteristics (N channel)



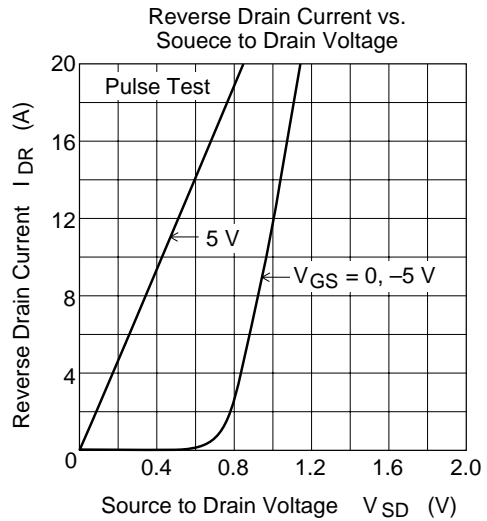
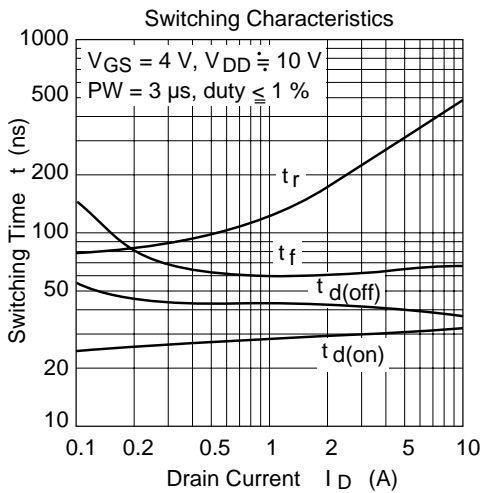
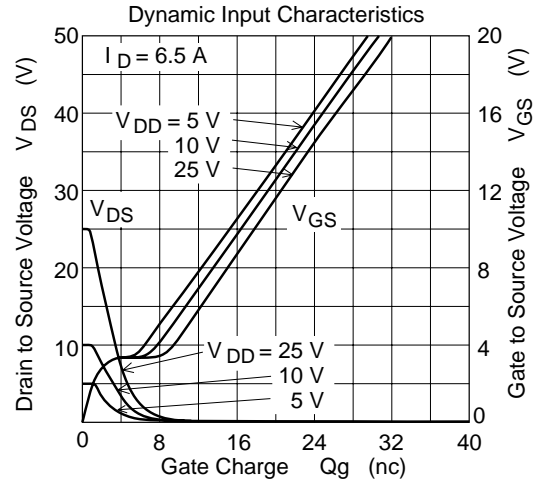
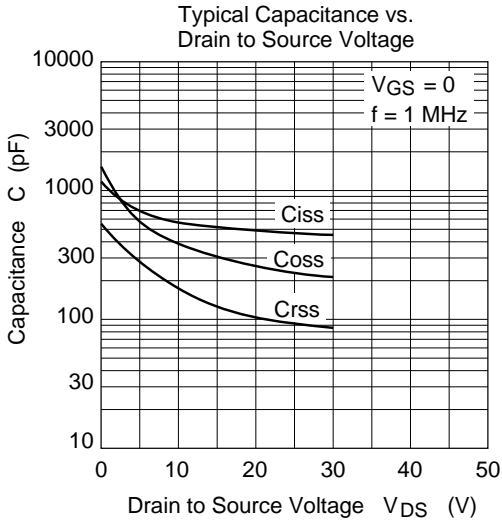
Note 5 :  
When using the glass epoxy board  
(FR4 40x40x1.6 mm)



Main Characteristics (N channel)

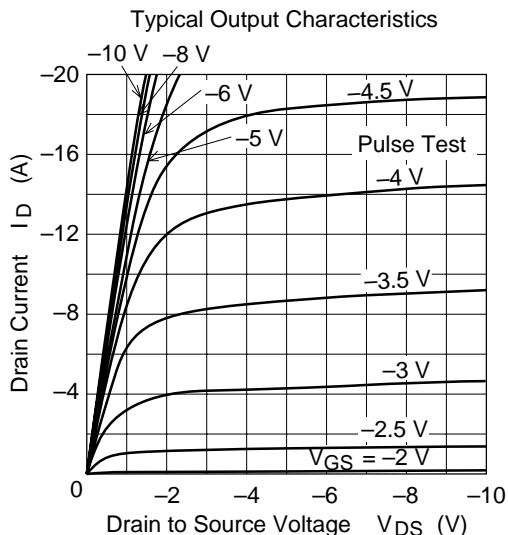
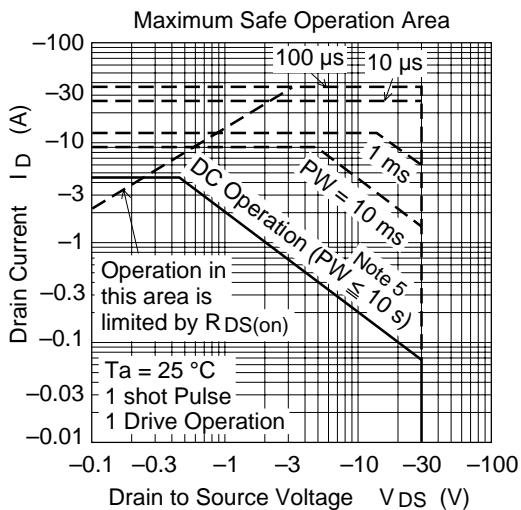


## Main Characteristics (N channel)

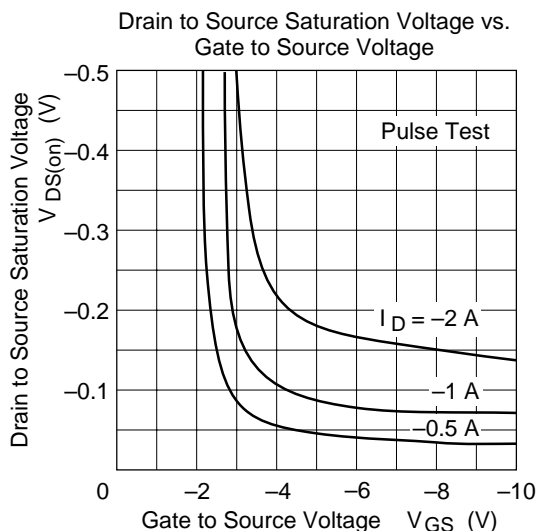
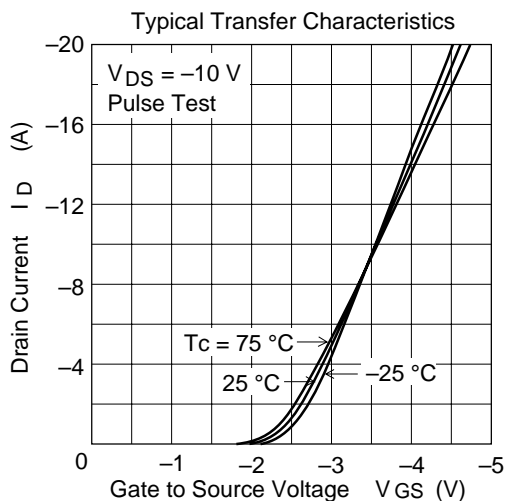




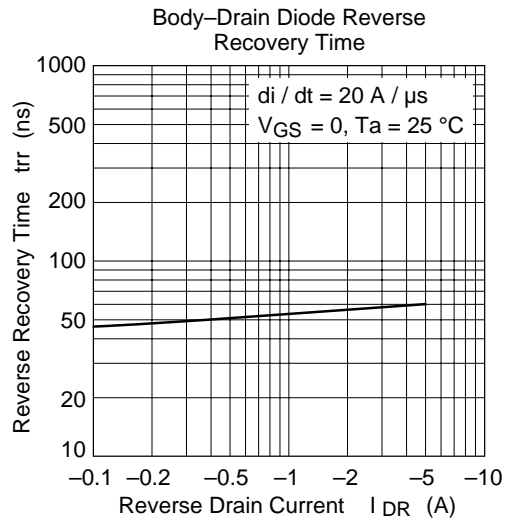
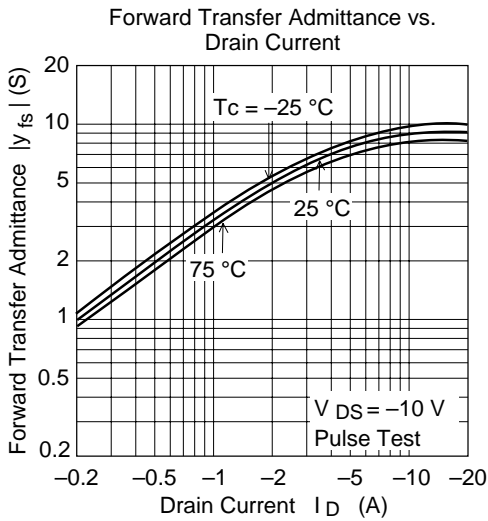
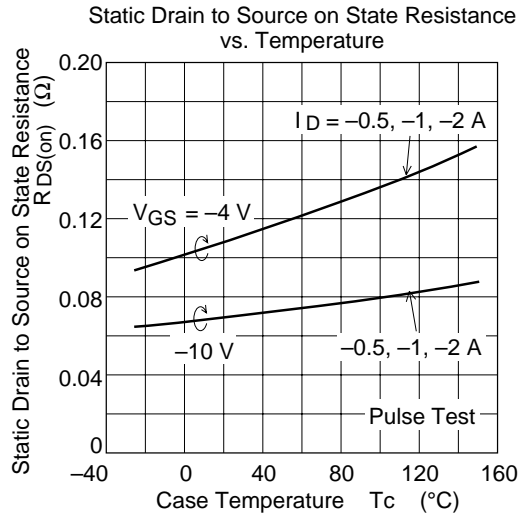
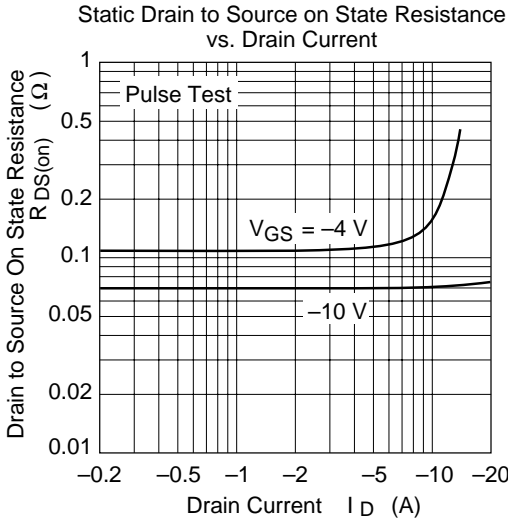
Main Characteristics (P channel)



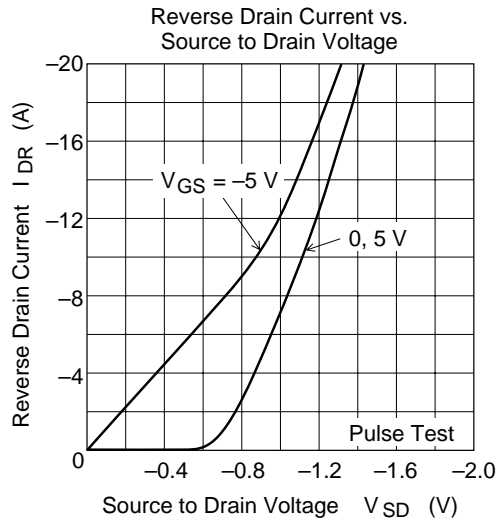
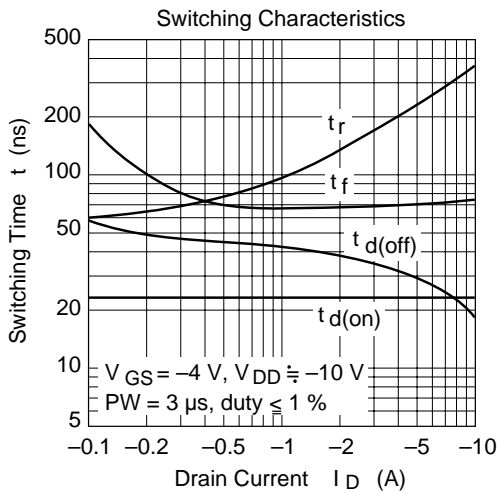
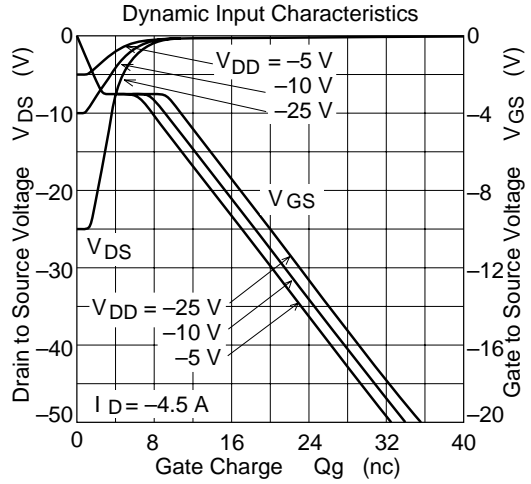
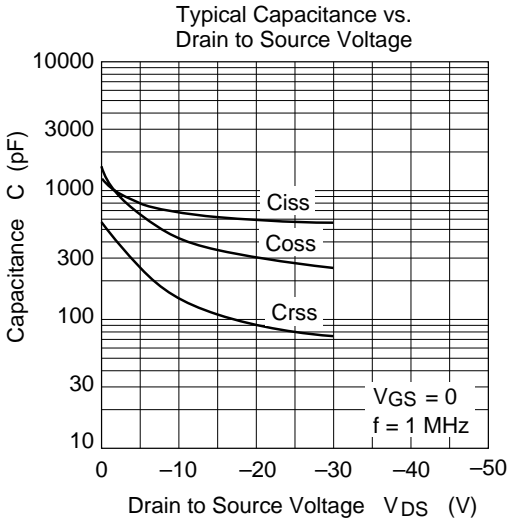
Note 5 :  
When using the glass epoxy board (FR4 40 x 40 x 1.6 mm)

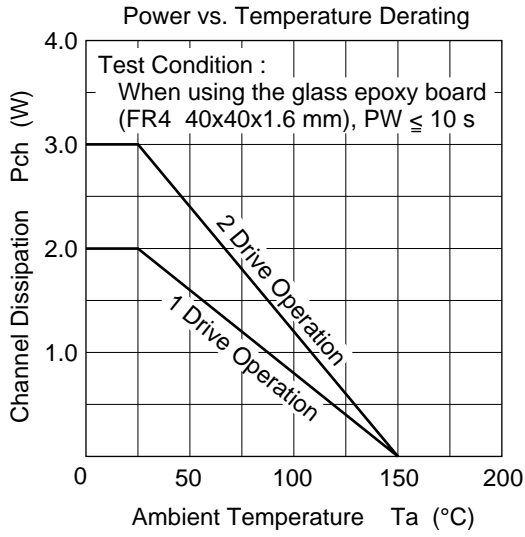


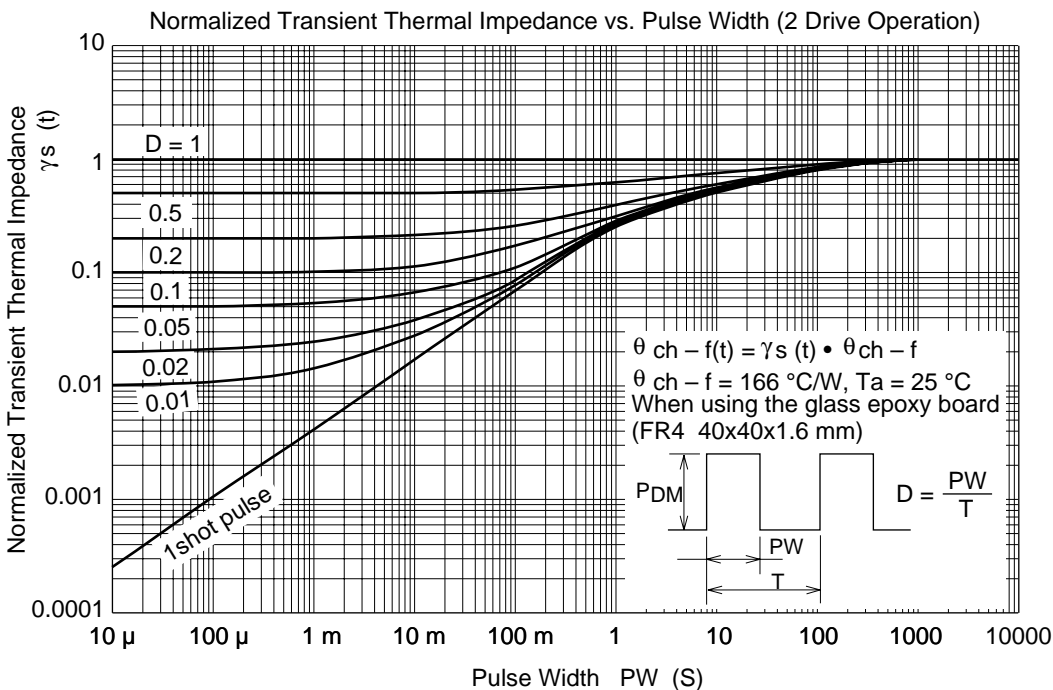
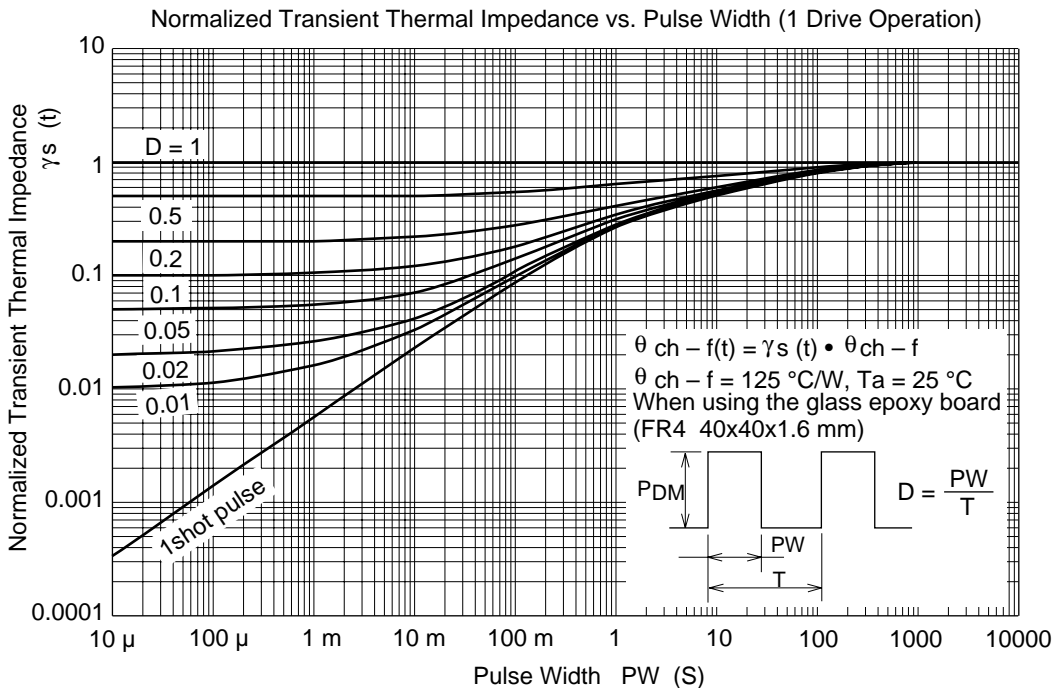
## Main Characteristics (P channel)



Main Characteristics (P channel)

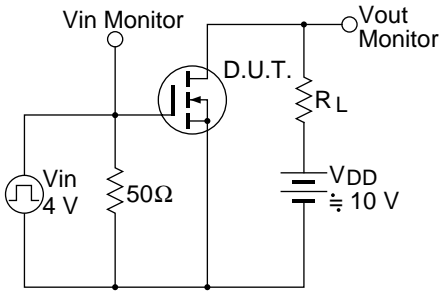




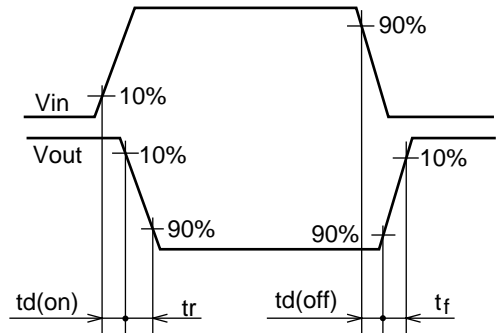


## N channel

Switching Time Test Circuit

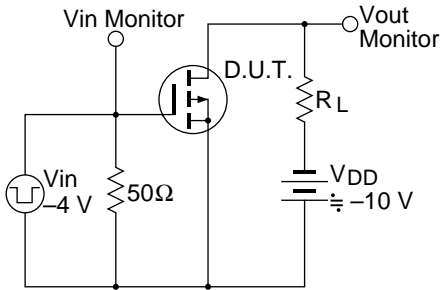


Switching Time Waveform

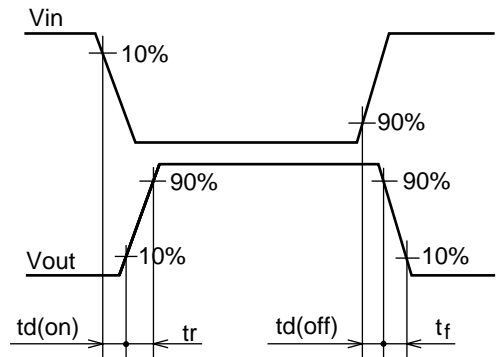


## P channel

Switching Time Test Circuit

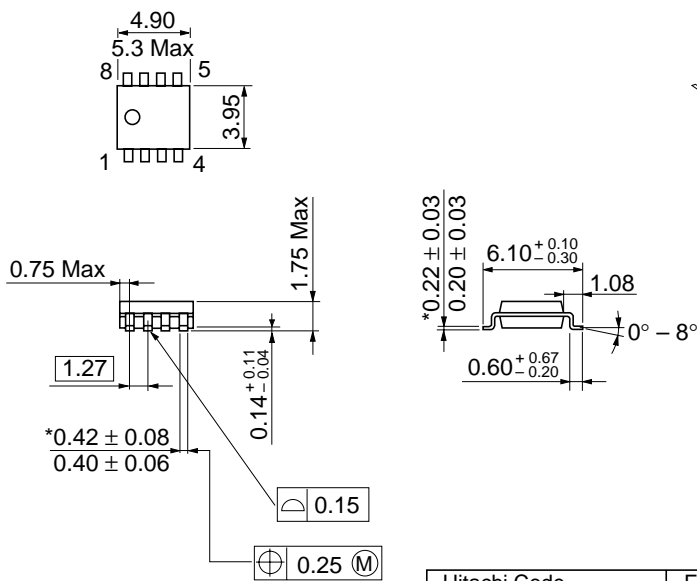


Switching Time Waveform



Package Dimensions

As of January, 2001  
Unit: mm



\*Dimension including the plating thickness  
Base material dimension

Hitachi Code	FP-8DA
JEDEC	Conforms
EIAJ	—
Mass (reference value)	0.085 g

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