

To all our customers

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

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# HAT3004R

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

**RENESAS**

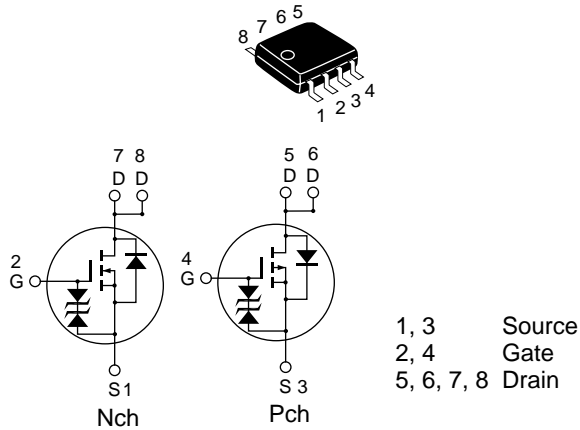
ADE-208-500I (Z)  
10th. Edition  
Aug. 1997

## 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	$I_D$	5.5	-3.5	A
Drain peak current	$I_{D(pulse)}$ <sup>Note1</sup>	44	-28	A
Body-drain diode reverse drain current	$I_{DR}$	5.5	-3.5	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	$V_{(BR)GSS}$	$\pm 20$	—	—	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	—	2.0	V	$V_{DS} = 10\text{V}$ , $I_D = 1\text{mA}$
Static drain to source on state resistance	$R_{DS(on)}$	—	0.050	0.065	$\Omega$	$I_D = 3\text{A}$ , $V_{GS} = 10\text{V}$ <sup>Note4</sup>
	$R_{DS(on)}$	—	0.078	0.11	$\Omega$	$I_D = 3\text{A}$ , $V_{GS} = 4\text{V}$ <sup>Note4</sup>
Forward transfer admittance	$ y_{fs} $	3.5	5.5	—	S	$I_D = 3\text{A}$ , $V_{DS} = 10\text{V}$ <sup>Note4</sup>
Input capacitance	$C_{iss}$	—	310	—	pF	$V_{DS} = 10\text{V}$
Output capacitance	$C_{oss}$	—	220	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	100	—	pF	$f = 1\text{MHz}$
Turn-on delay time	$t_{d(on)}$	—	17	—	ns	$V_{GS} = 4\text{V}$ , $I_D = 3\text{A}$
Rise time	$t_r$	—	190	—	ns	$V_{DD} \div 10\text{V}$
Turn-off delay time	$t_{d(off)}$	—	25	—	ns	
Fall time	$t_f$	—	60	—	ns	
Body-drain diode forward voltage	$V_{DF}$	—	0.9	1.4	V	$I_F = 5.5\text{A}$ , $V_{GS} = 0$ <sup>Note4</sup>
Body-drain diode reverse recovery time	$t_{rr}$	—	50	—	ns	$I_F = 5.5\text{A}$ , $V_{GS} = 0$ $diF/dt = 20\text{A}/\mu\text{s}$

Note: 4. Pulse test

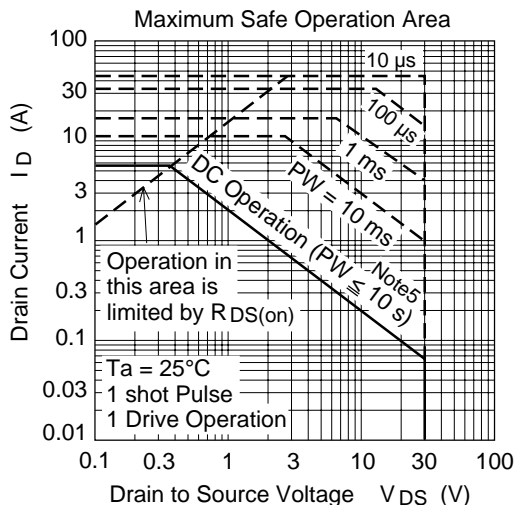
# HAT3004R

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

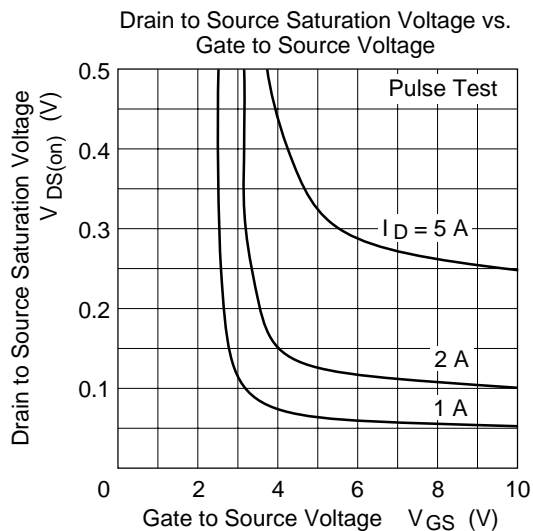
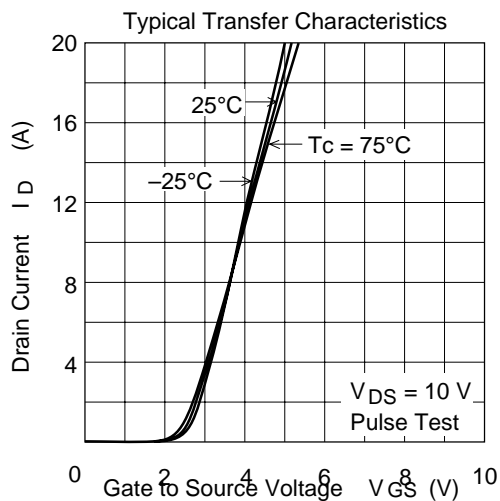
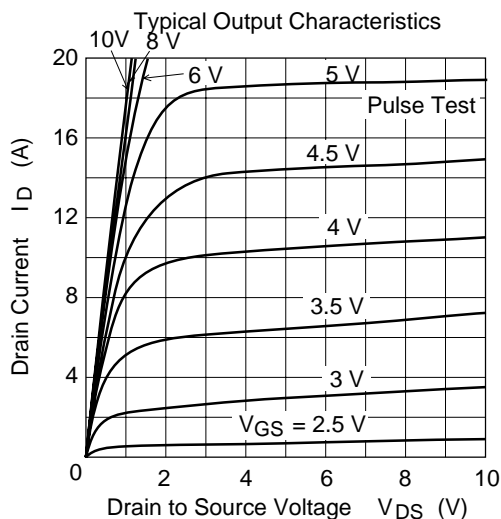
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	-30	—	—	V	$I_D = -10\text{mA}$ , $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	$\pm 20$	—	—	V	$I_G = \pm 100\mu\text{A}$ , $V_{DS} = 0$
Gate to source leak current	$I_{GSS}$	—	—	$\pm 10$	$\mu\text{A}$	$V_{GS} = \pm 16\text{V}$ , $V_{DS} = 0$
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	$R_{DS(on)}$	—	0.12	0.16	$\Omega$	$I_D = -2\text{A}$ , $V_{GS} = -10\text{V}$ <sup>Note5</sup>
	$R_{DS(on)}$	—	0.20	0.34	$\Omega$	$I_D = -2\text{A}$ , $V_{GS} = -4\text{V}$ <sup>Note5</sup>
Forward transfer admittance	$ y_{fs} $	2.5	3.5	—	S	$I_D = -2\text{A}$ , $V_{DS} = -10\text{V}$ <sup>Note5</sup>
Input capacitance	$C_{iss}$	—	350	—	pF	$V_{DS} = -10\text{V}$
Output capacitance	$C_{oss}$	—	230	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	$C_{rss}$	—	75	—	pF	$f = 1\text{MHz}$
Turn-on delay time	$t_{d(on)}$	—	18	—	ns	$V_{GS} = -4\text{V}$ , $I_D = -2\text{A}$
Rise time	$t_r$	—	110	—	ns	$V_{DD} \div -10\text{V}$
Turn-off delay time	$t_{d(off)}$	—	20	—	ns	
Fall time	$t_f$	—	30	—	ns	
Body-drain diode forward voltage	$V_{DF}$	—	-1.0	-1.5	V	$I_F = -3.5\text{A}$ , $V_{GS} = 0$ <sup>Note5</sup>
Body-drain diode reverse recovery time	$t_{rr}$	—	60	—	ns	$I_F = -3.5\text{A}$ , $V_{GS} = 0$ $diF/dt = 20\text{A}/\mu\text{s}$

Note: 5. Pulse test

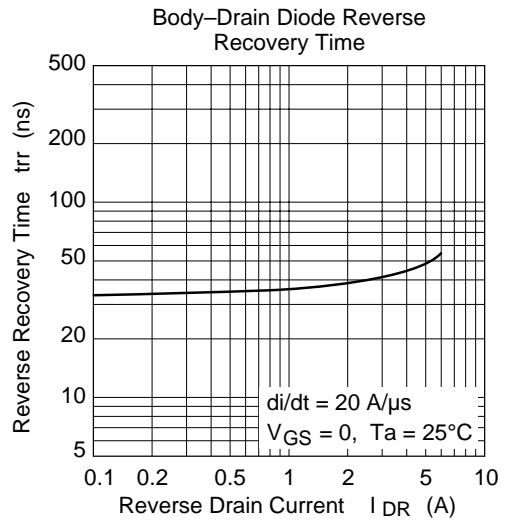
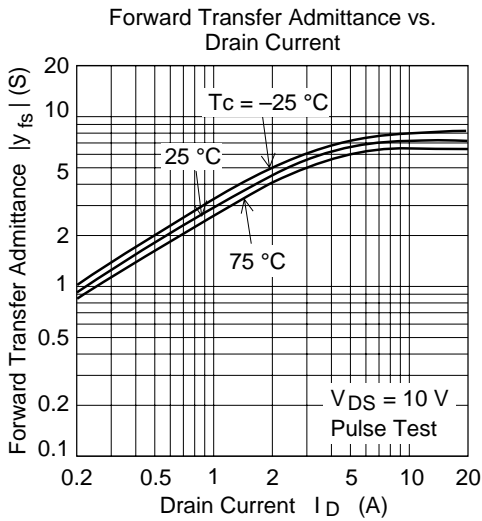
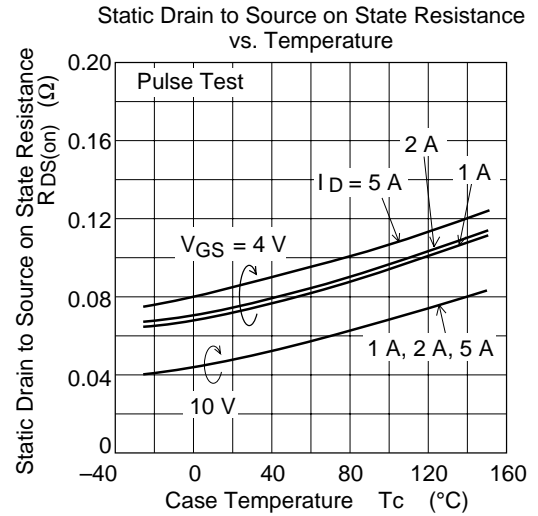
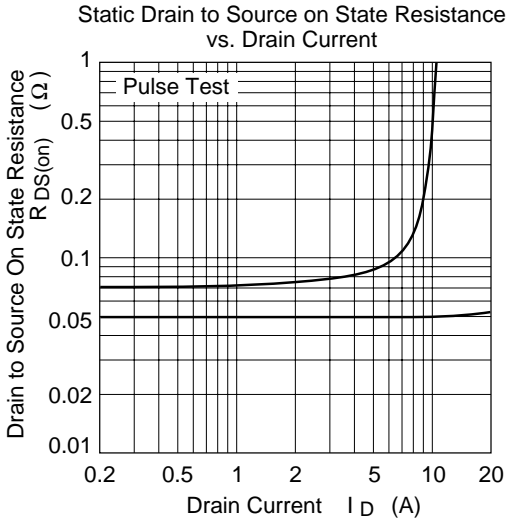
Main Characteristics (N channel)



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

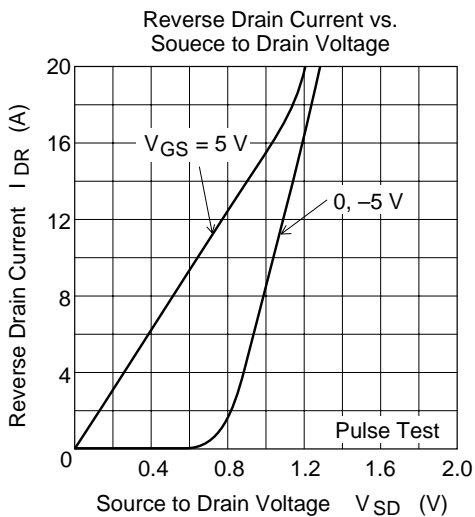
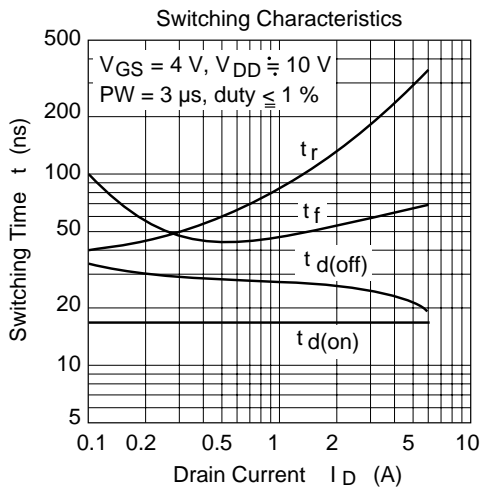
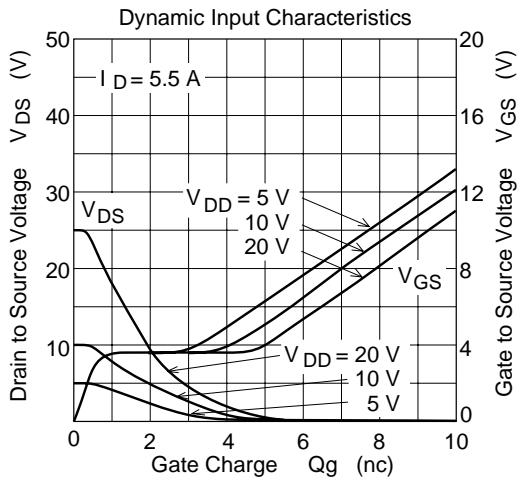
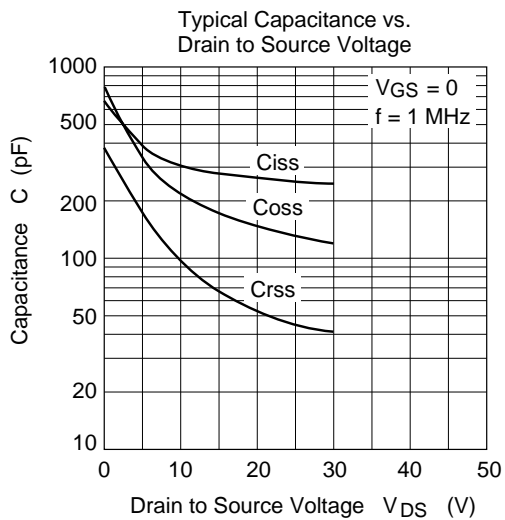


## Main Characteristics (N channel)

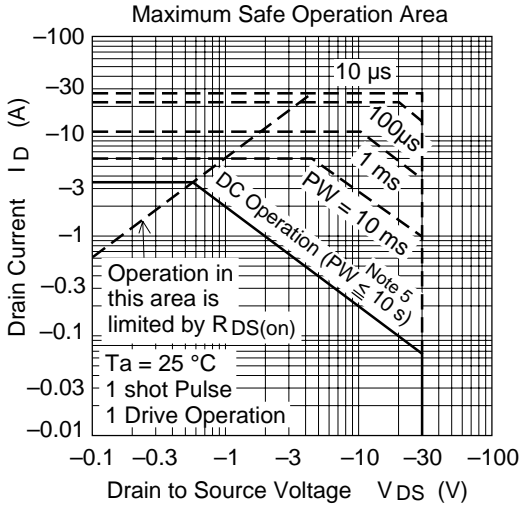




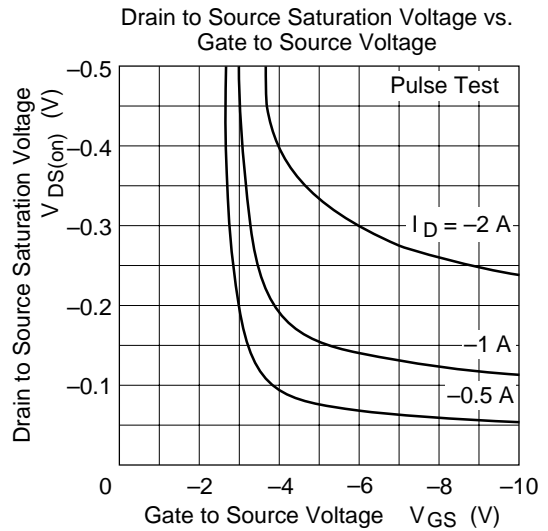
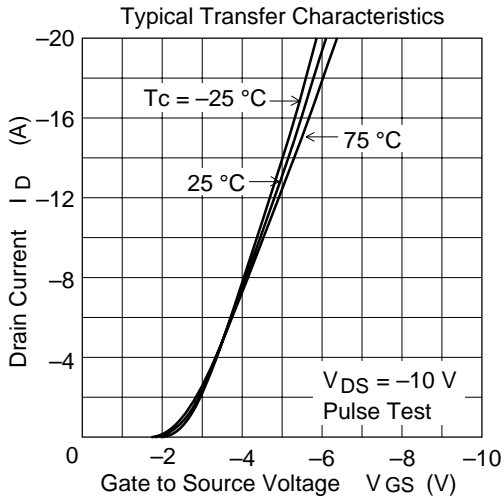
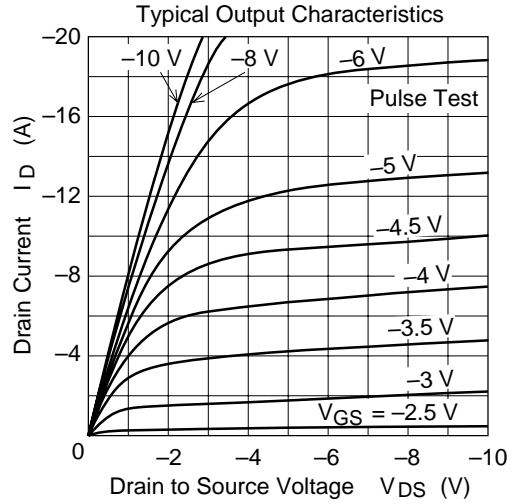
Main Characteristics (N channel)



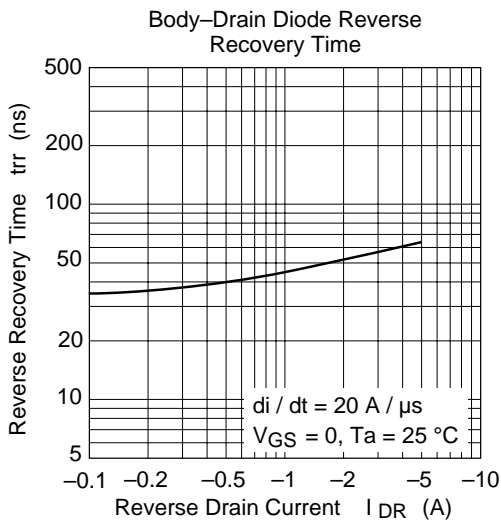
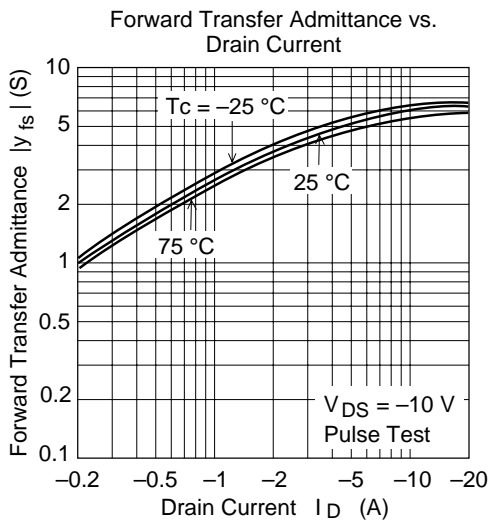
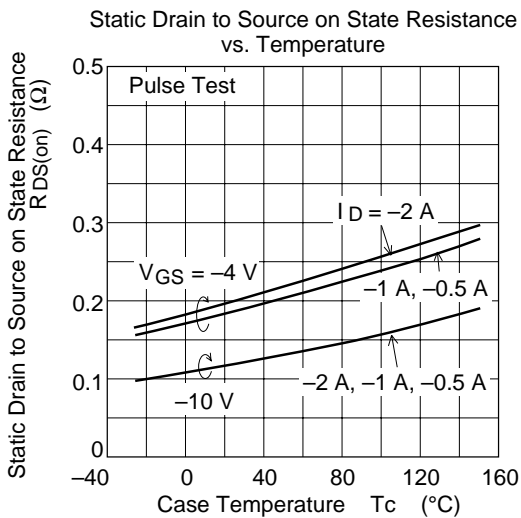
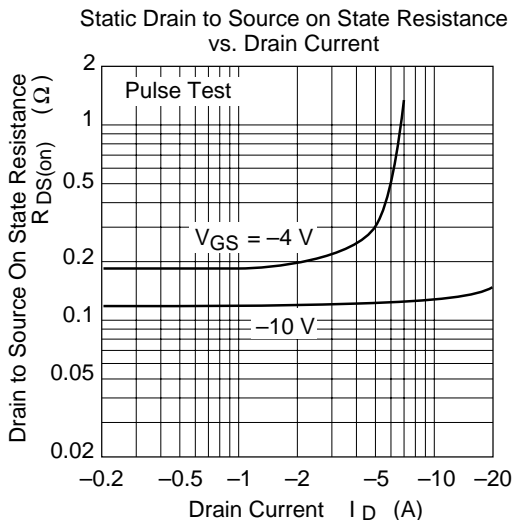
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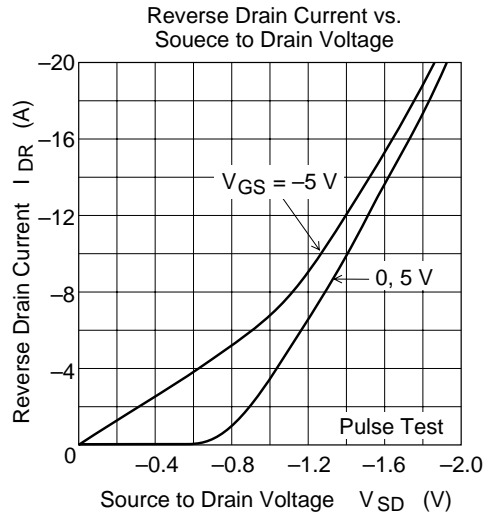
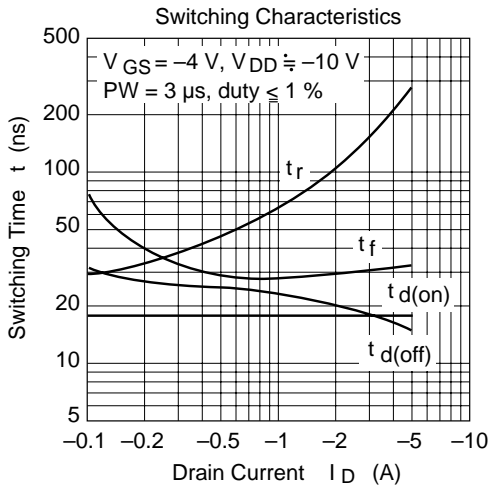
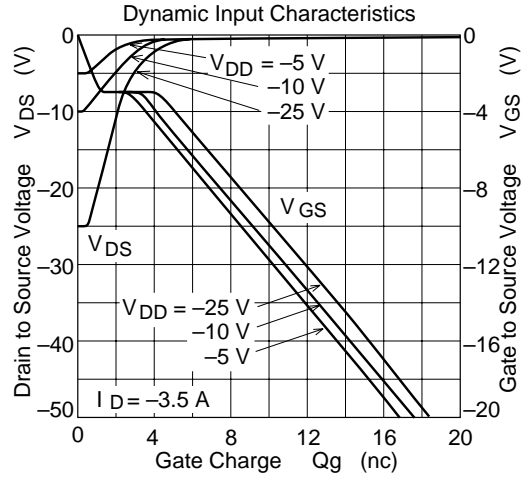
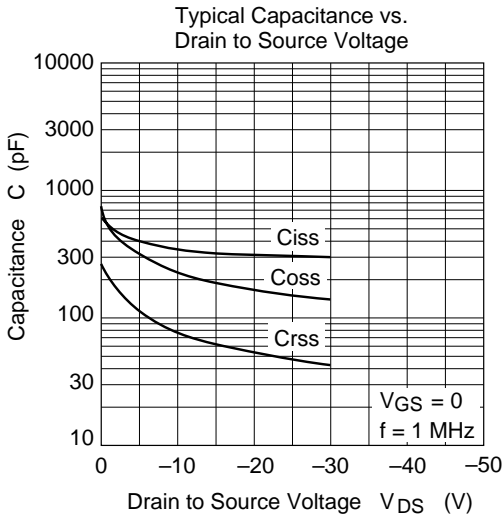
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When using the glass epoxy board (FR4 40x40x1.6 mm)

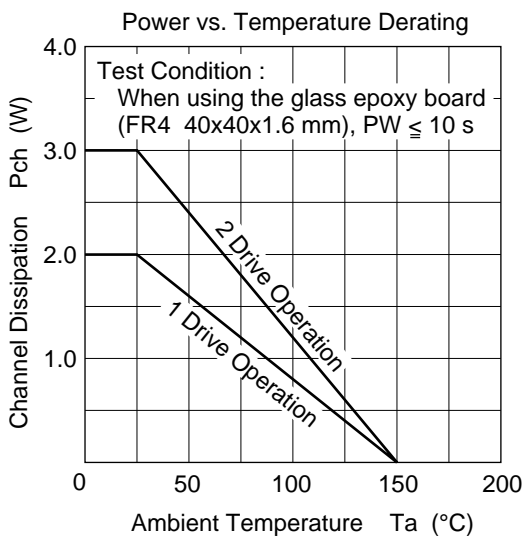


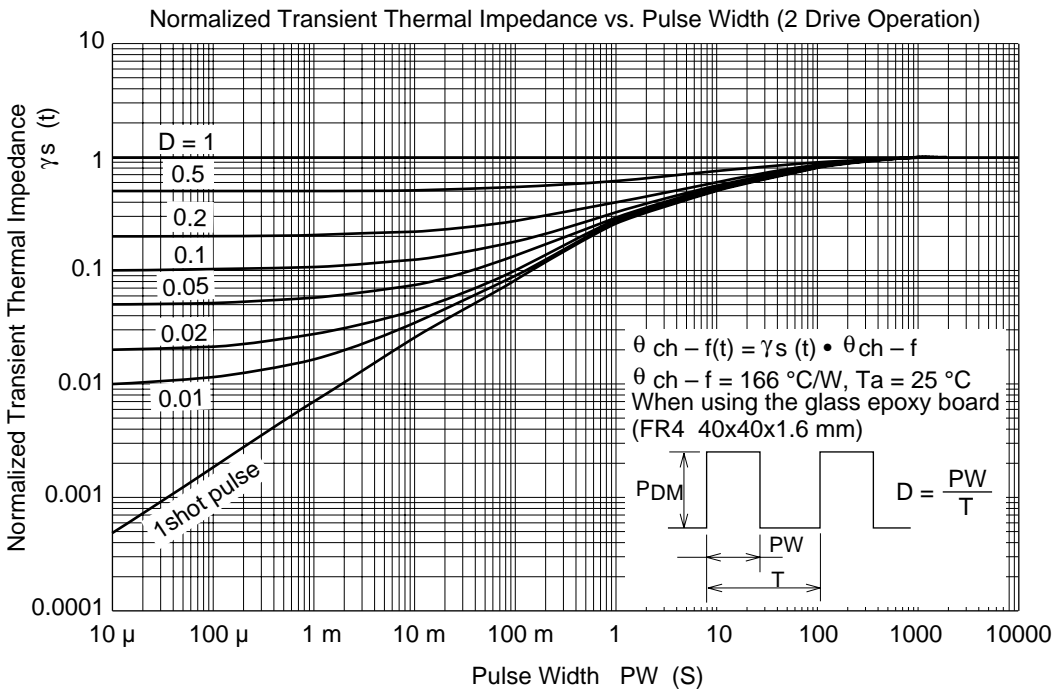
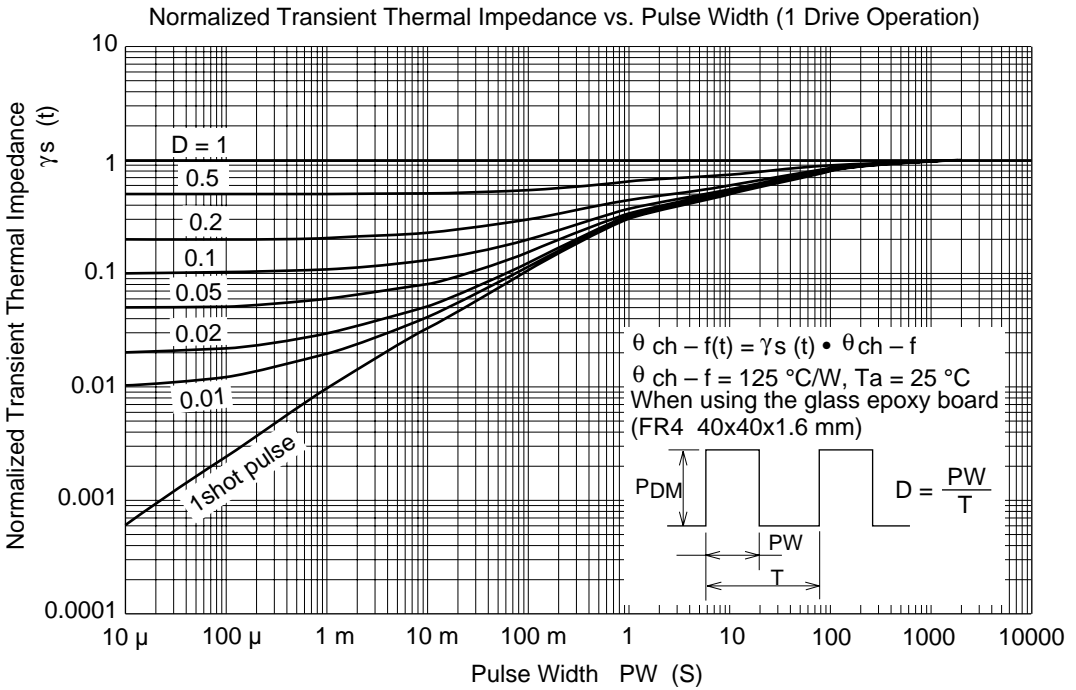
Main Characteristics (P channel)



## Main Characteristics (P channel)

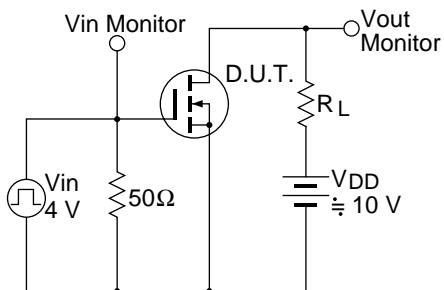




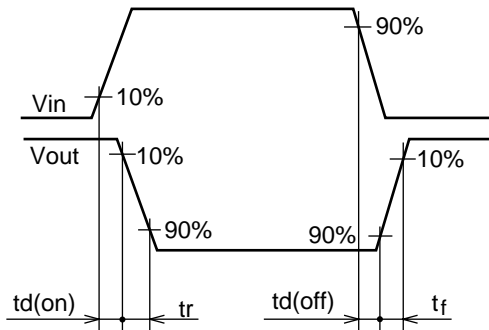


N channel

Switching Time Test Circuit

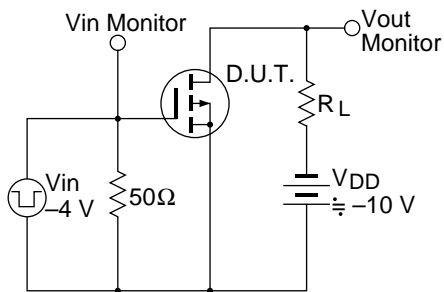


Switching Time Waveform

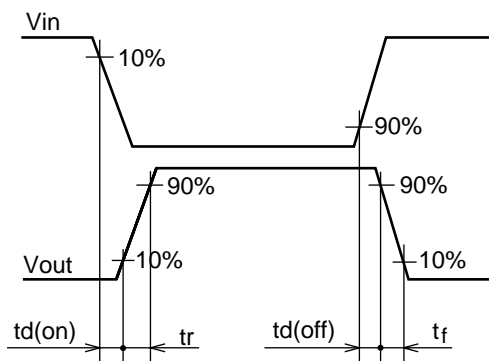


P channel

Switching Time Test Circuit



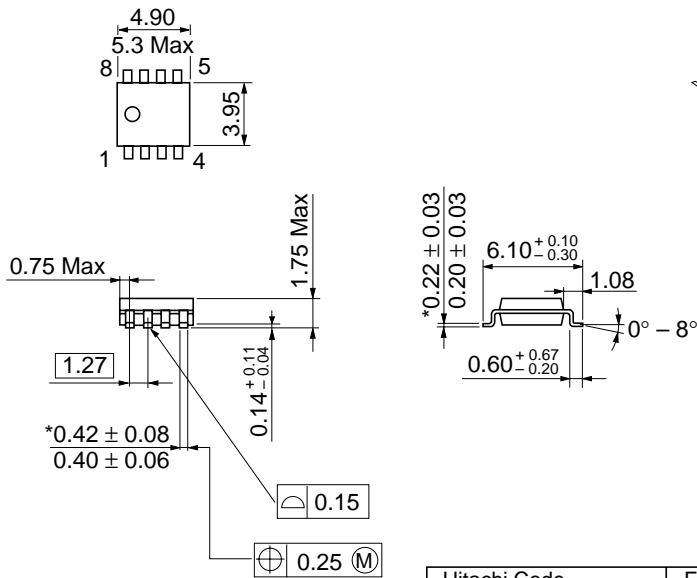
Switching Time Waveform



## 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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