

HAT3004R

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

HITACHI

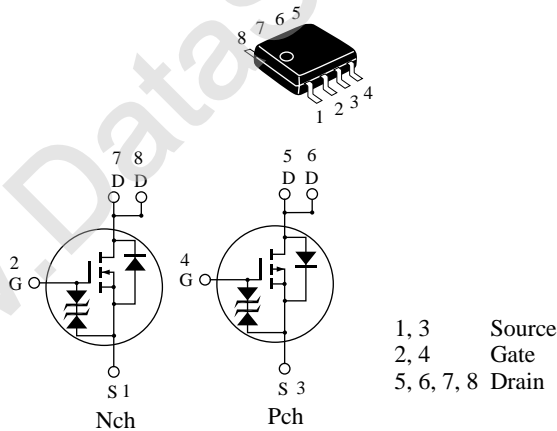
ADE-208-500I (Z)
10th. Edition
Aug. 1997

Features

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

Outline

SOP-8



HAT3004R

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	$I_{D(pulse)}$ ^{Note1}	44	-28	A
Body-drain diode reverse drain current	I_{DR}	5.5	-3.5	A
Channel dissipation	Pch ^{Note2}	2		W
Channel dissipation	Pch ^{Note3}	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	$I_G = \pm 100\mu\text{A}$, $V_{DS} = 0$
Gate to source leak current	I_{GSS}	—	—	± 10	μA	$V_{GS} = \pm 16\text{V}$, $V_{DS} = 0$
Zero gate voltage drain current	I_{DSS}	—	—	10	μA	$V_{DS} = 30\text{V}$, $V_{GS} = 0$
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	Ω	$I_D = 3\text{A}$, $V_{GS} = 10\text{V}$ ^{Note4}
	$R_{DS(on)}$	—	0.078	0.11	Ω	$I_D = 3\text{A}$, $V_{GS} = 4\text{V}$ ^{Note4}
Forward transfer admittance	$ y_{fs} $	3.5	5.5	—	S	$I_D = 3\text{A}$, $V_{DS} = 10\text{V}$ ^{Note4}
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	$I_F = 5.5\text{A}$, $V_{GS} = 0$ ^{Note4}
Body-drain diode reverse recovery time	t_{rr}	—	50	—	ns	$I_F = 5.5\text{A}$, $V_{GS} = 0$ $di_F/dt = 20\text{A}/\mu\text{s}$

Note: 4. Pulse test

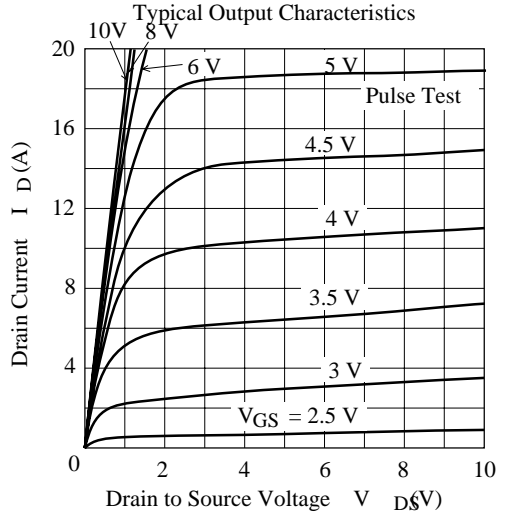
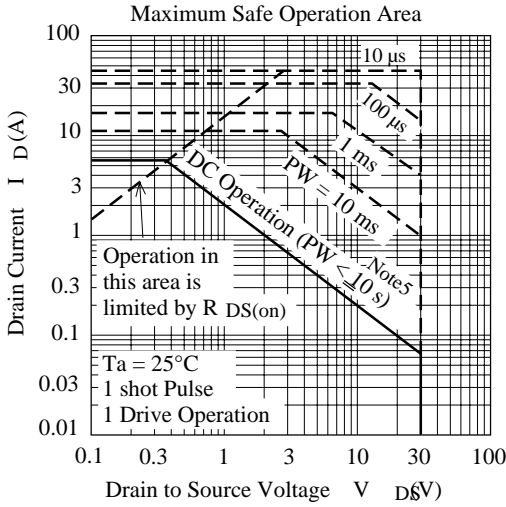
HAT3004R

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

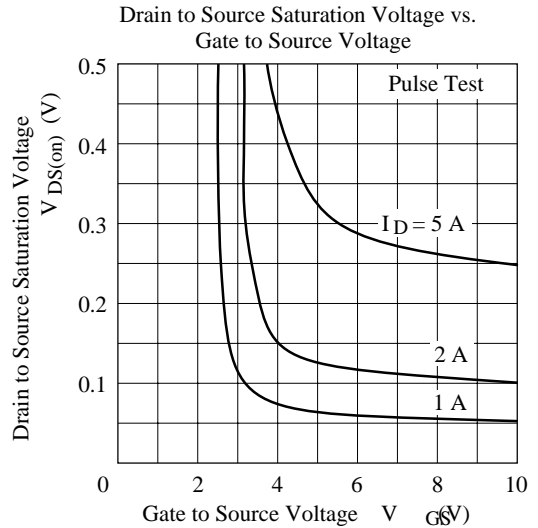
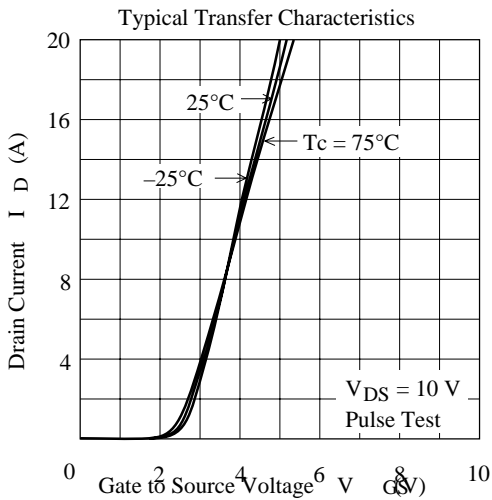
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	-30	—	—	V	$I_D = -10\text{mA}$, $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	±20	—	—	V	$I_G = \pm 100\mu\text{A}$, $V_{DS} = 0$
Gate to source leak current	I_{GSS}	—	—	±10	μA	$V_{GS} = \pm 16\text{V}$, $V_{DS} = 0$
Zero gate voltage drain current	I_{DSS}	—	—	-10	μA	$V_{DS} = -30\text{V}$, $V_{GS} = 0$
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	Ω	$I_D = -2\text{A}$, $V_{GS} = -10\text{V}$ ^{Note5}
	$R_{DS(on)}$	—	0.20	0.34	Ω	$I_D = -2\text{A}$, $V_{GS} = -4\text{V}$ ^{Note5}
Forward transfer admittance	$ y_{fs} $	2.5	3.5	—	S	$I_D = -2\text{A}$, $V_{DS} = -10\text{V}$ ^{Note5}
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	$I_F = -3.5\text{A}$, $V_{GS} = 0$ ^{Note5}
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

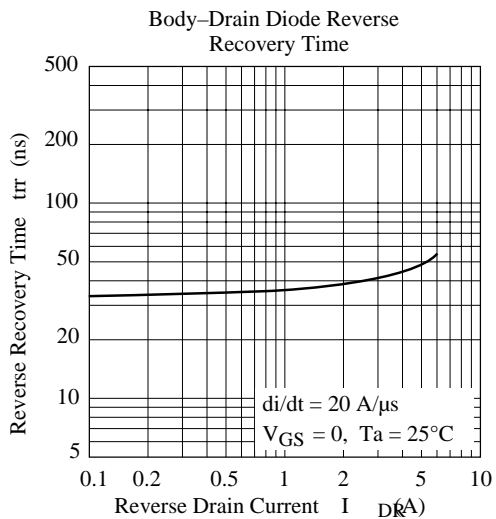
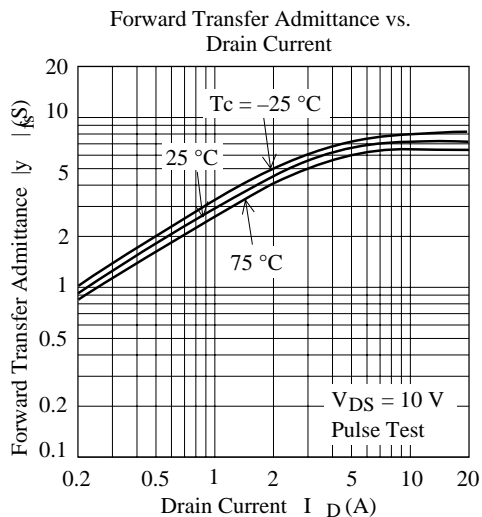
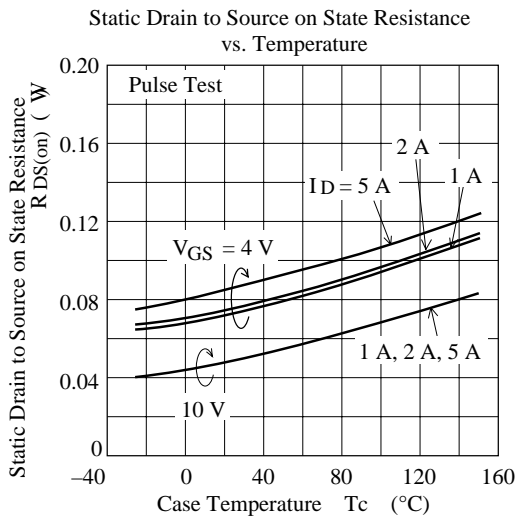
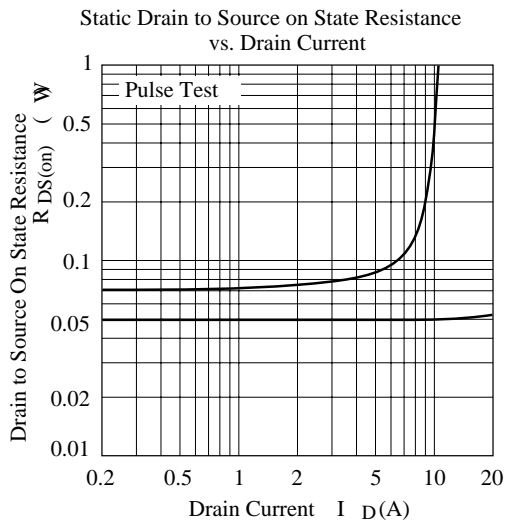
Main Characteristics (N channel)



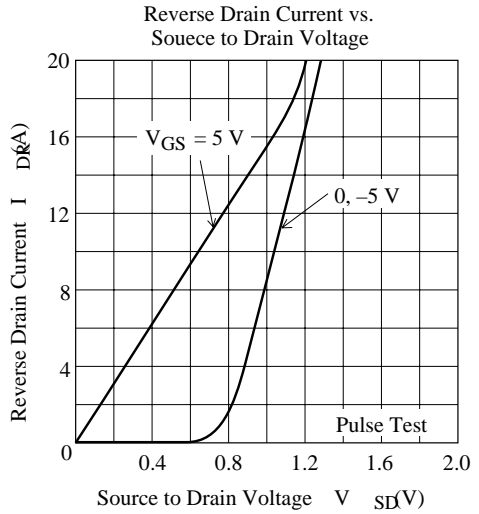
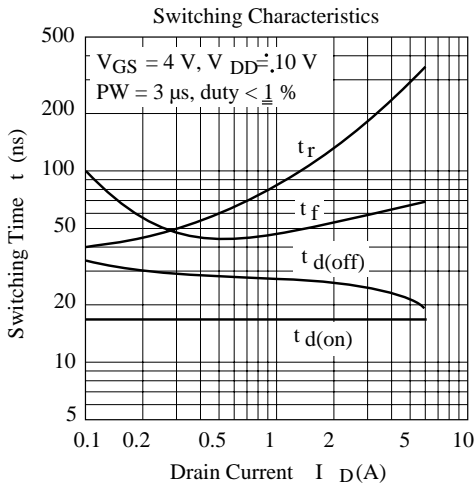
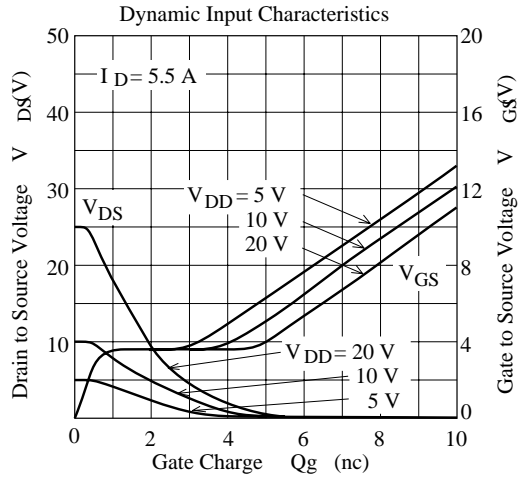
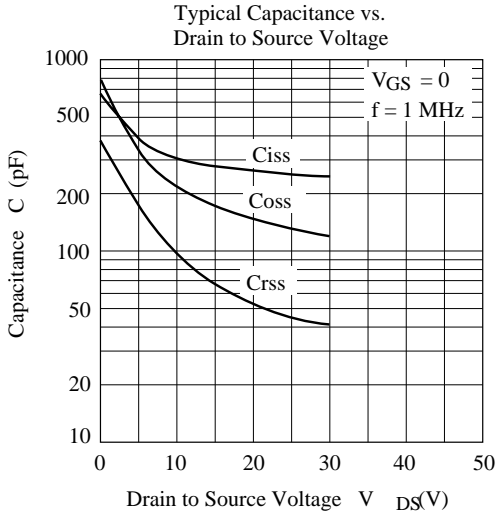
Note 5 :
When using the glass epoxy board
(FR4 40x40x1.6 mm)



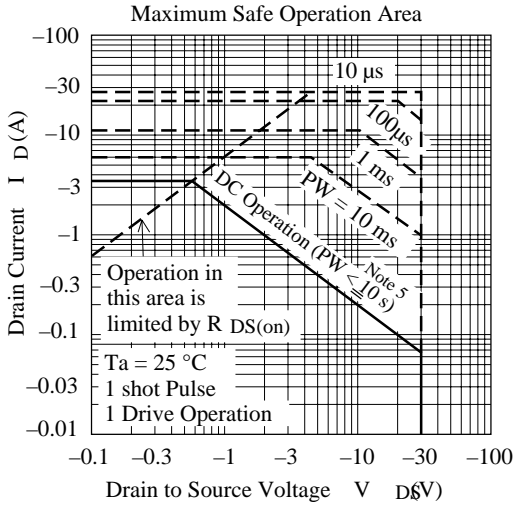
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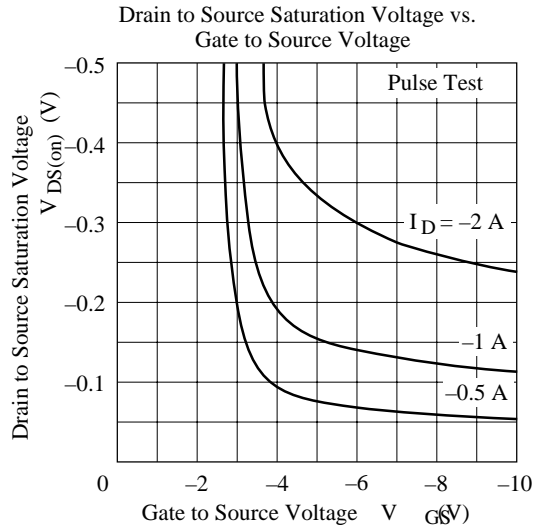
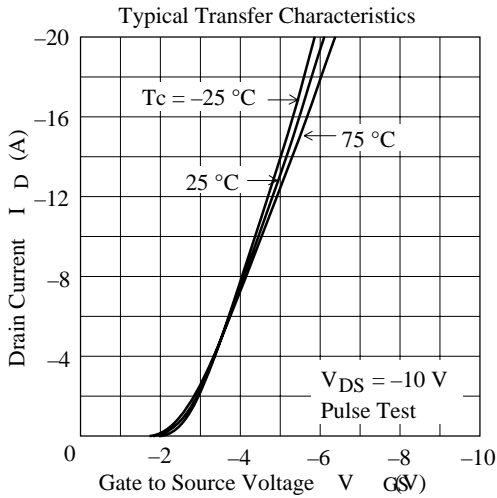
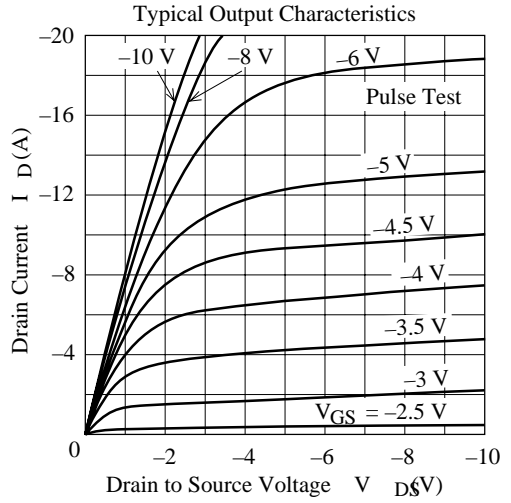
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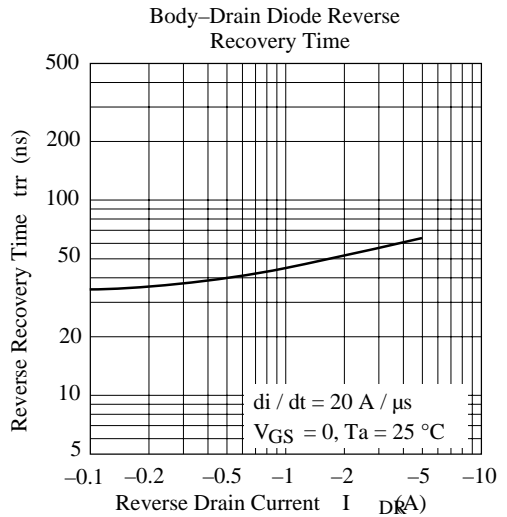
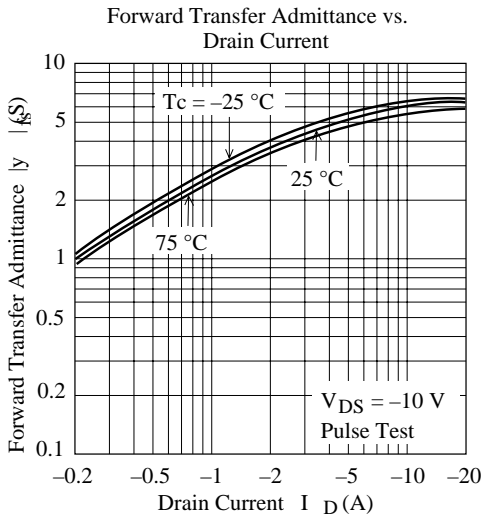
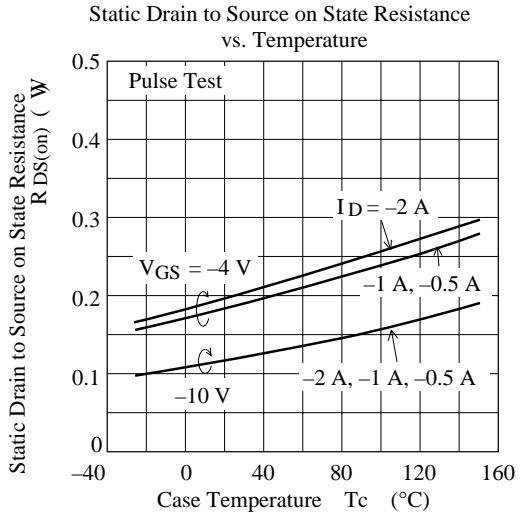
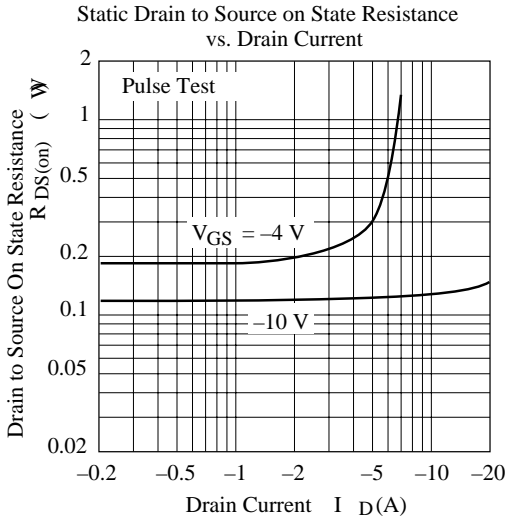
Main Characteristics (P channel)



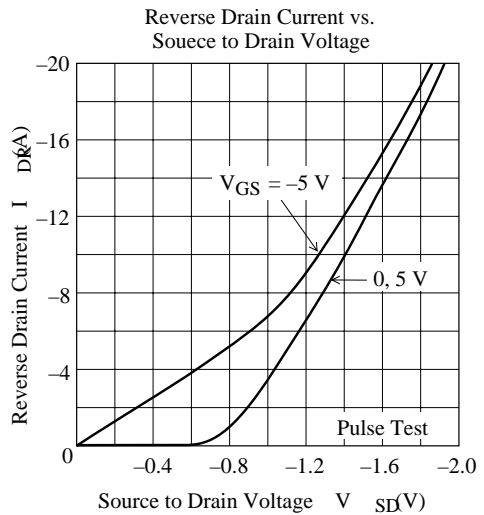
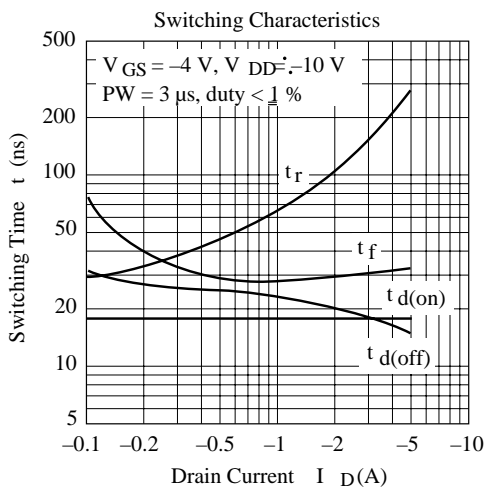
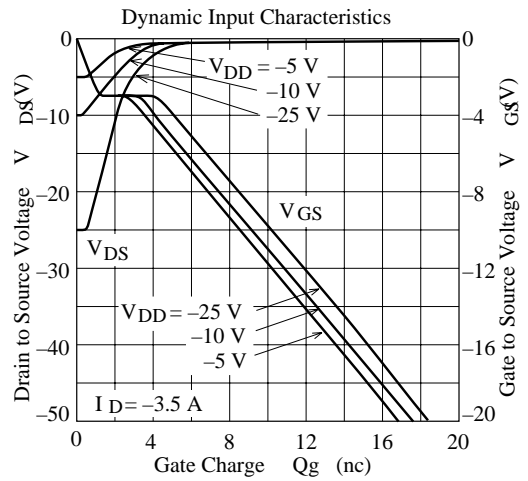
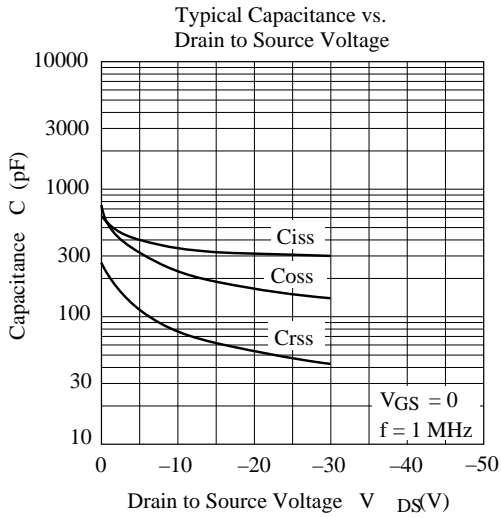
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When using the glass epoxy board
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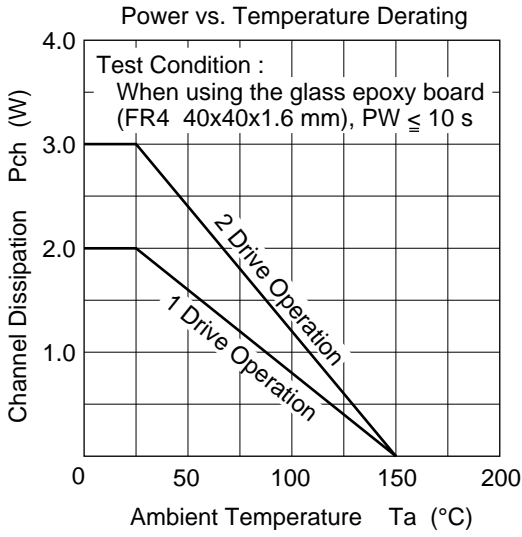


Main Characteristics (P channel)

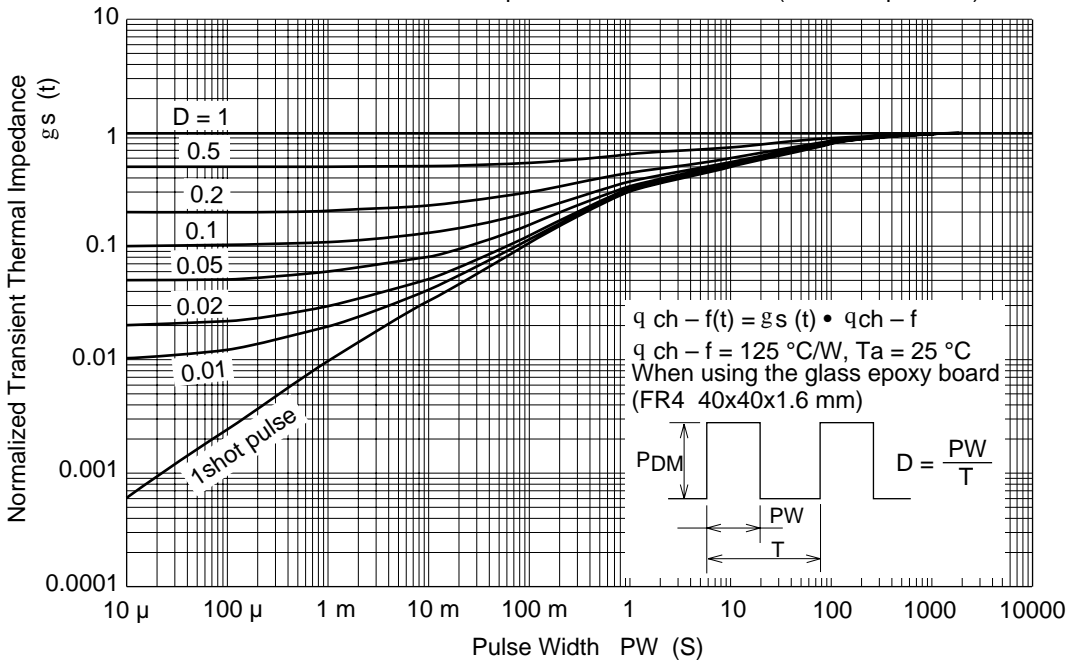


Main Characteristics (P channel)

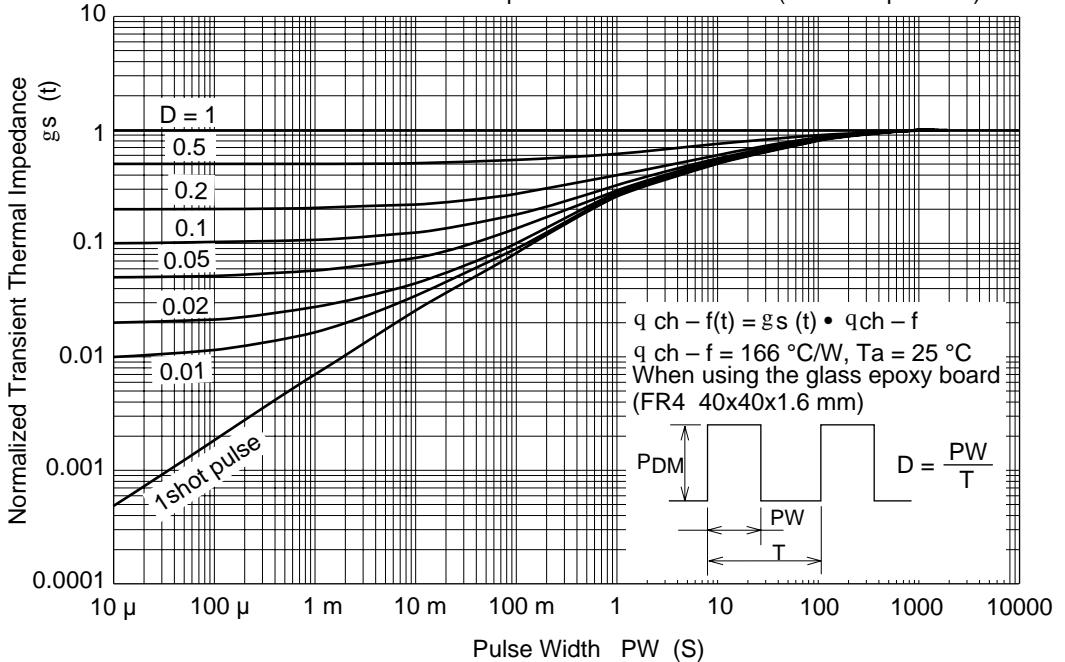




Normalized Transient Thermal Impedance vs. Pulse Width (1 Drive Operation)

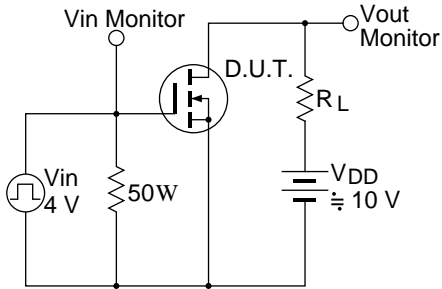


Normalized Transient Thermal Impedance vs. Pulse Width (2 Drive Operation)

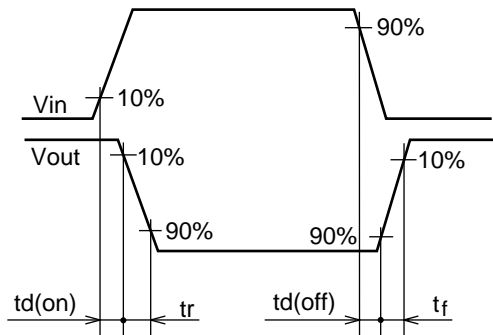


N channel

Switching Time Test Circuit

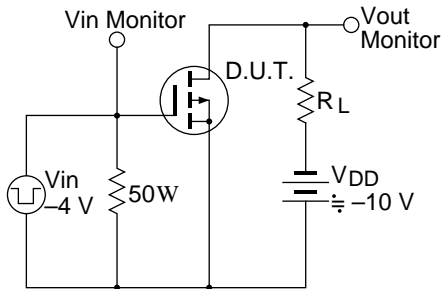


Switching Time Waveform

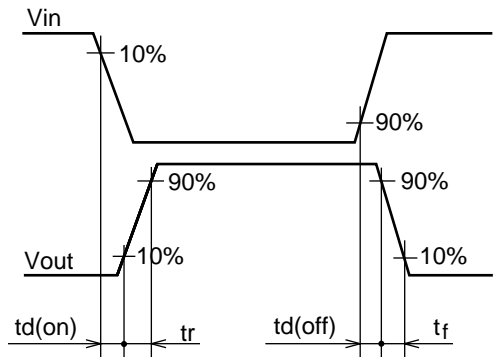


P channel

Switching Time Test Circuit



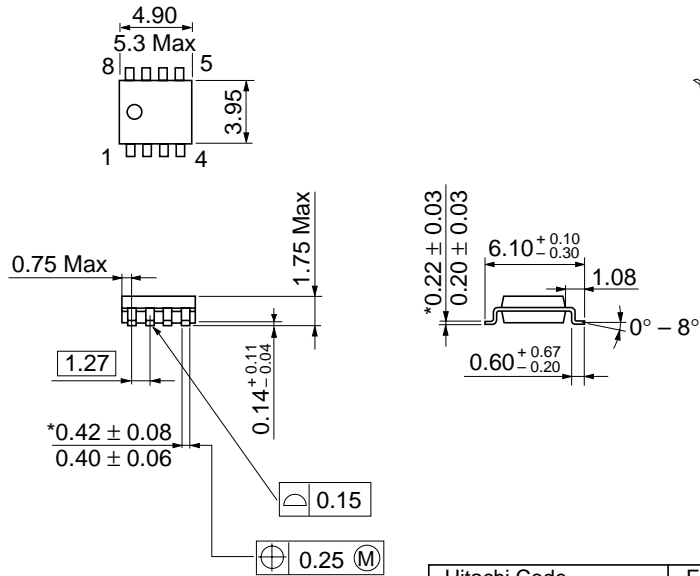
Switching Time Waveform



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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