

HAT3004R

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

HITACHI

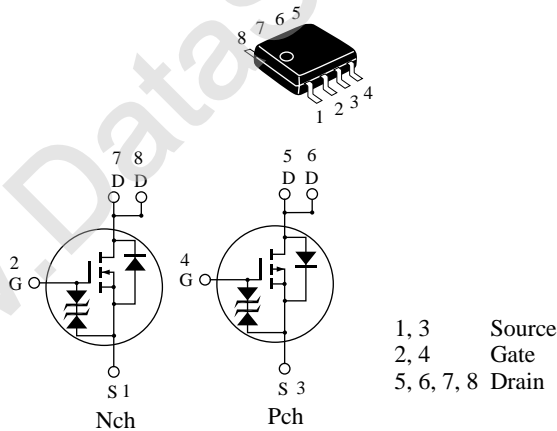
ADE-208-500I (Z)
10th. Edition
Aug. 1997

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

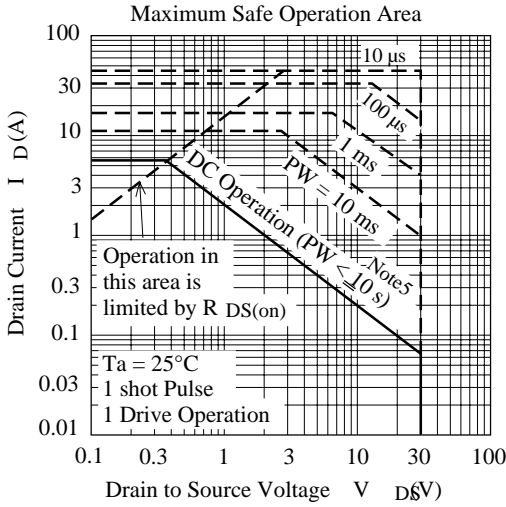
HAT3004R

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

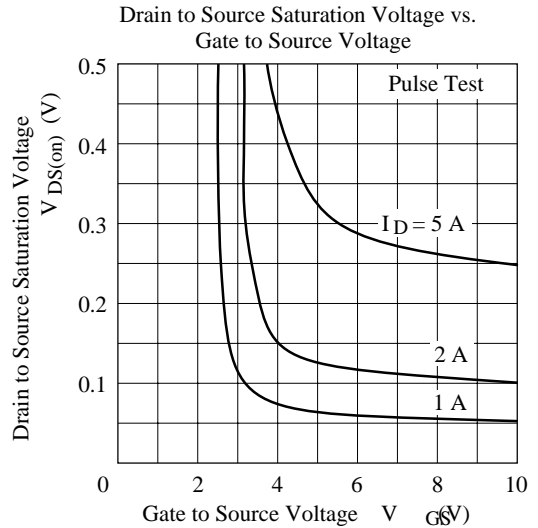
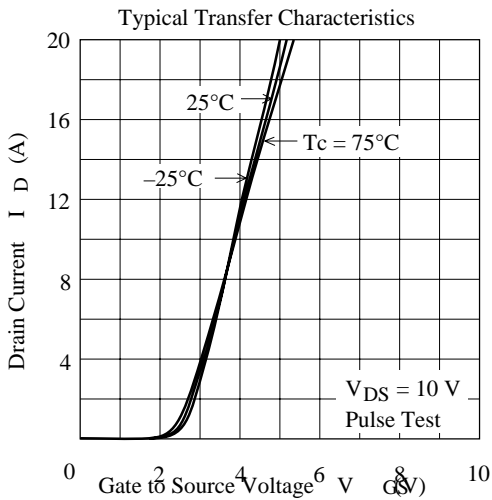
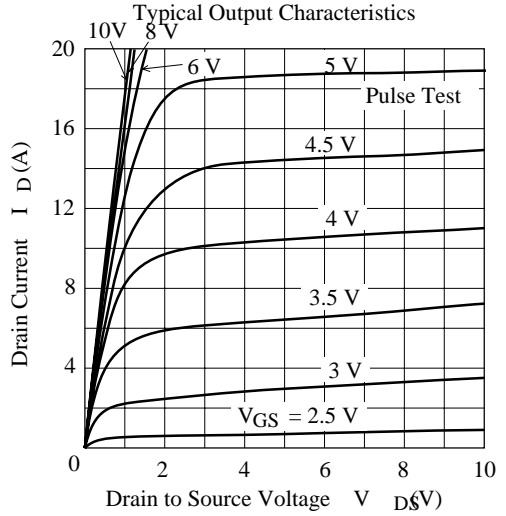
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	-30	—	—	V	$I_D = -10\text{mA}$, $V_{GS} = 0$
Gate to source breakdown voltage	$V_{(BR)GSS}$	±20	—	—	V	$I_G = \pm 100\mu\text{A}$, $V_{DS} = 0$
Gate to source leak current	I_{GSS}	—	—	±10	μA	$V_{GS} = \pm 16\text{V}$, $V_{DS} = 0$
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

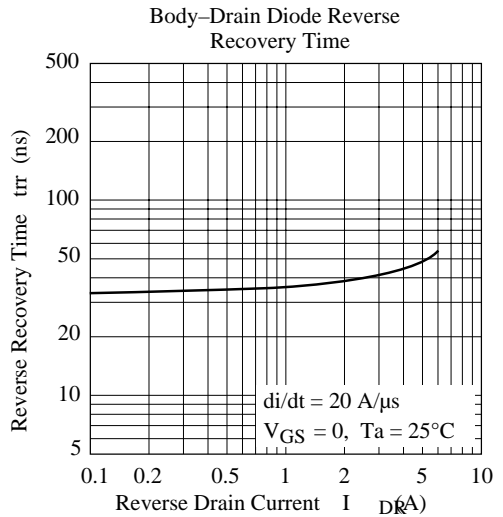
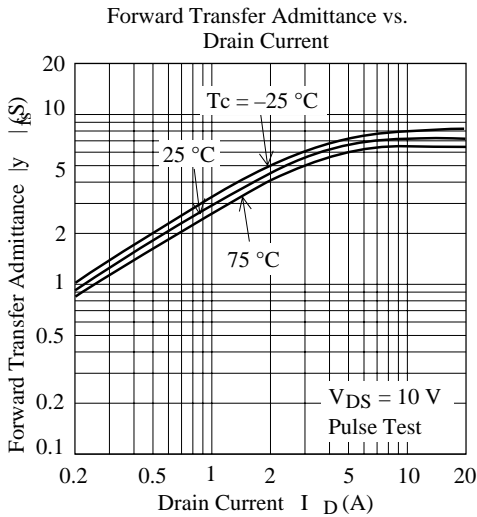
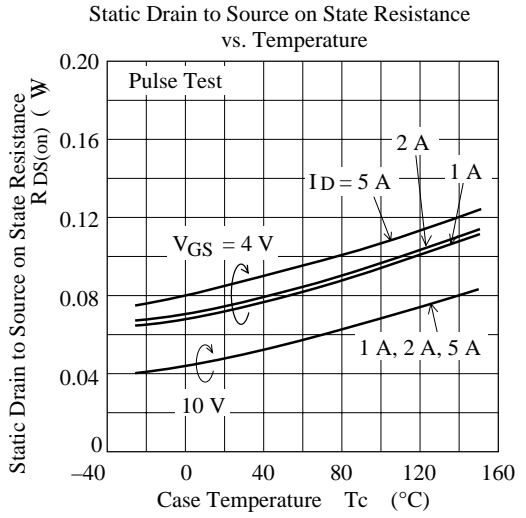
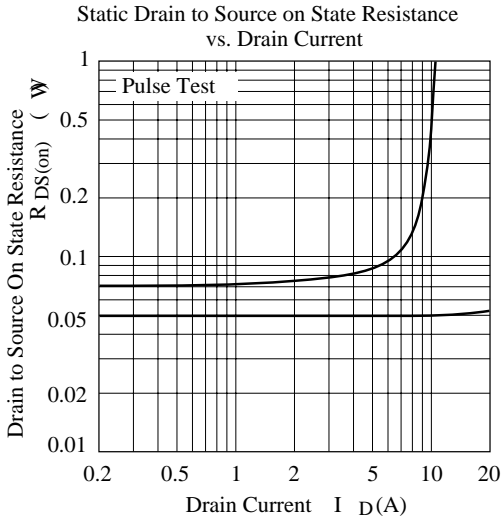
Main Characteristics (N channel)



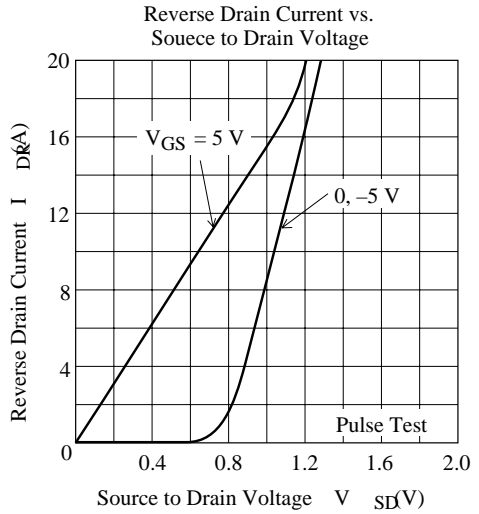
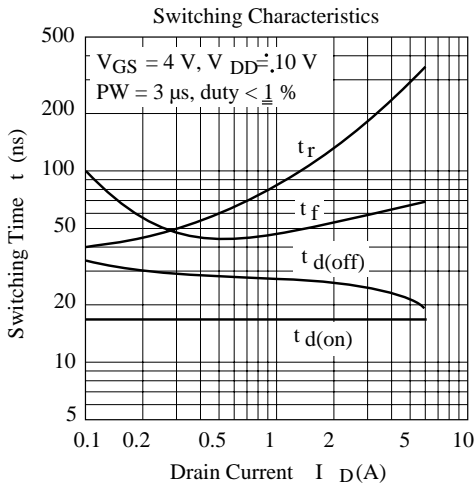
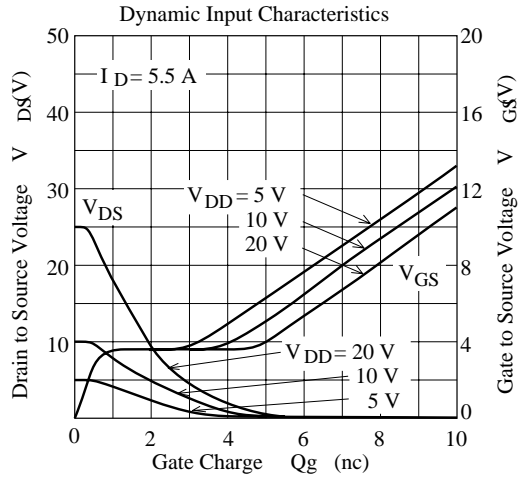
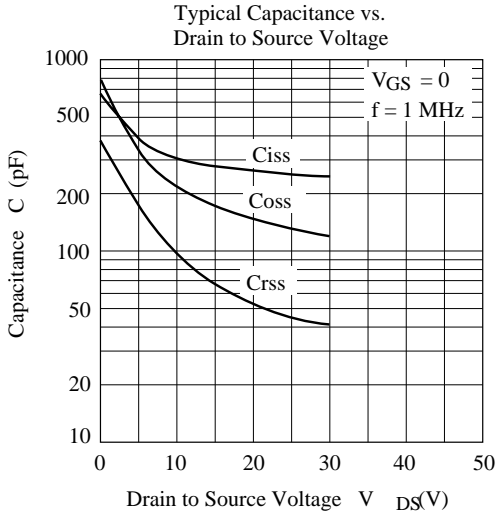
Note 5 :
When using the glass epoxy board
(FR4 40x40x1.6 mm)



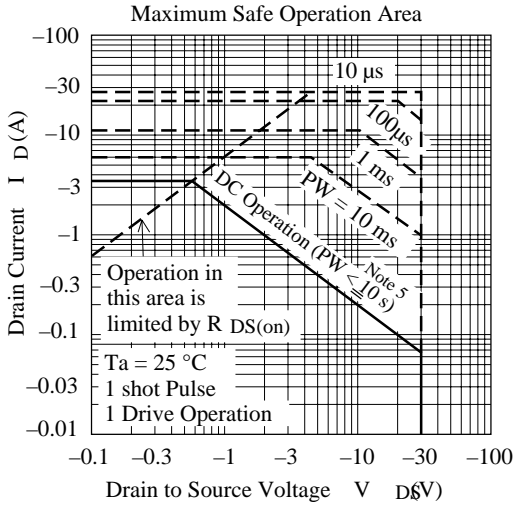
Main Characteristics (N channel)



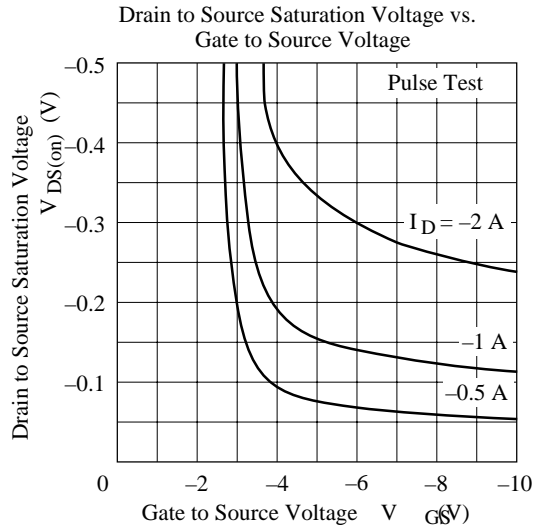
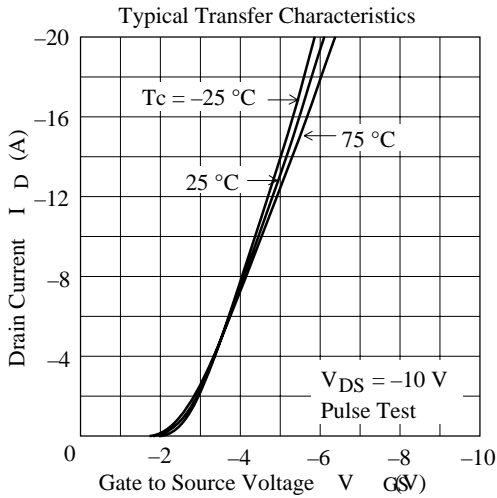
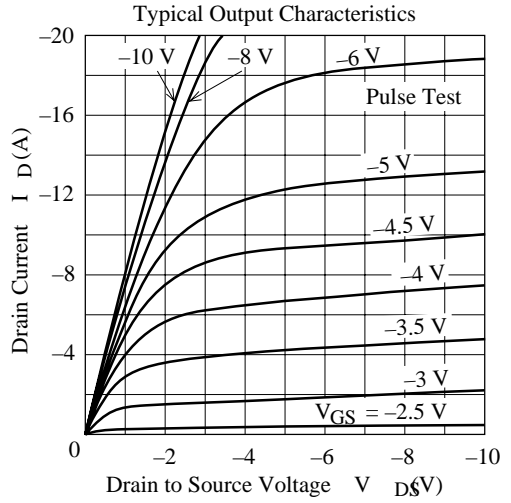
Main Characteristics (N channel)



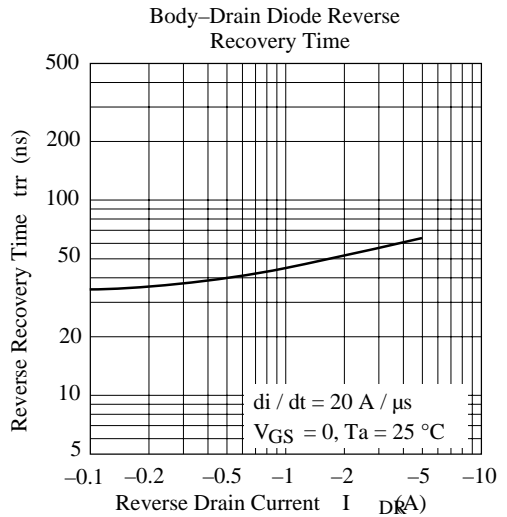
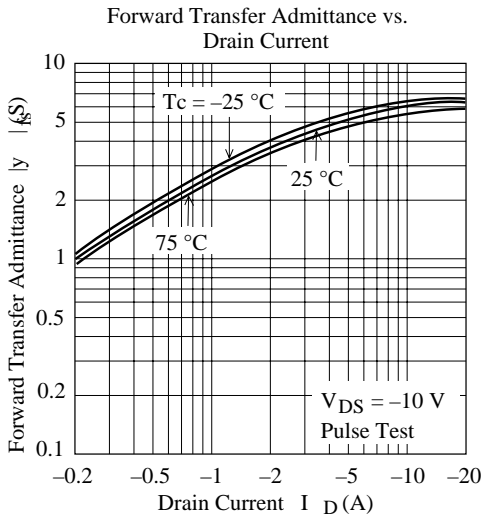
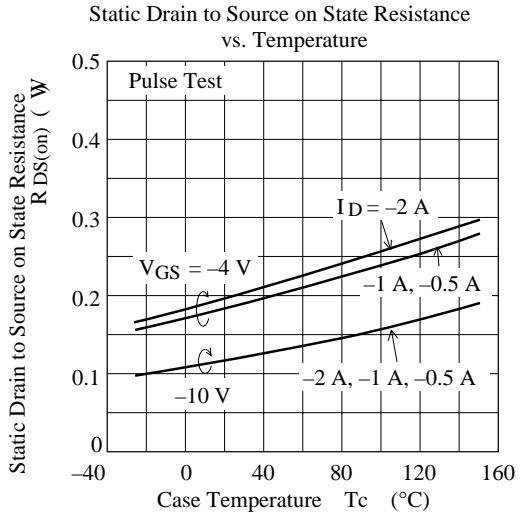
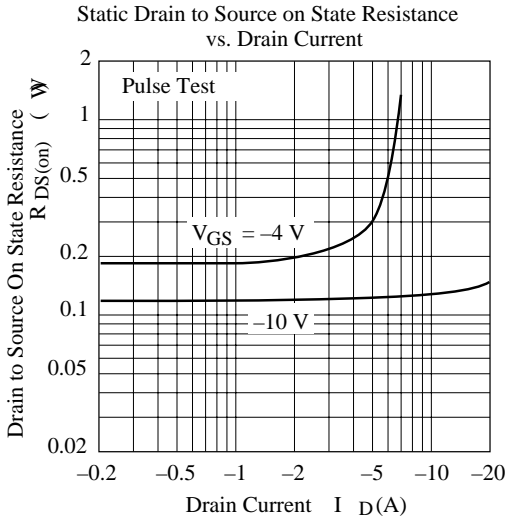
Main Characteristics (P channel)



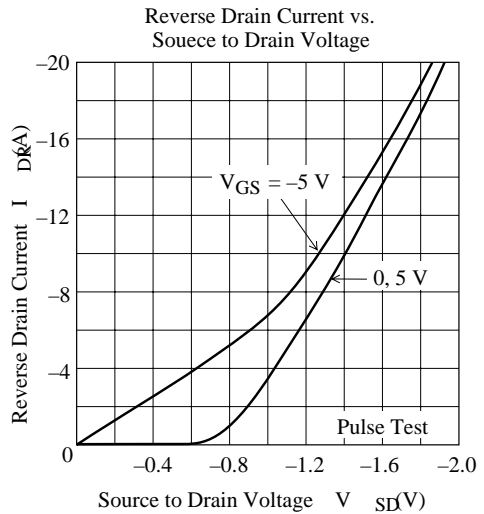
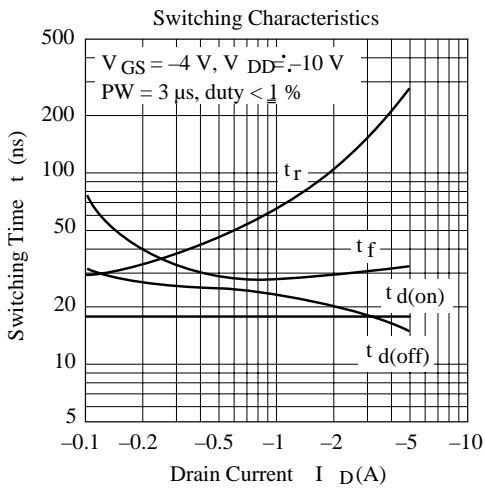
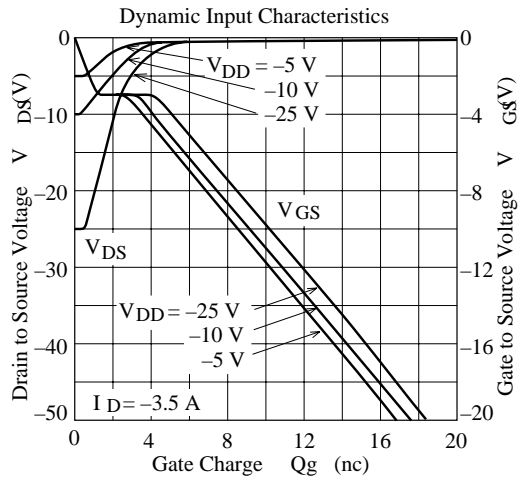
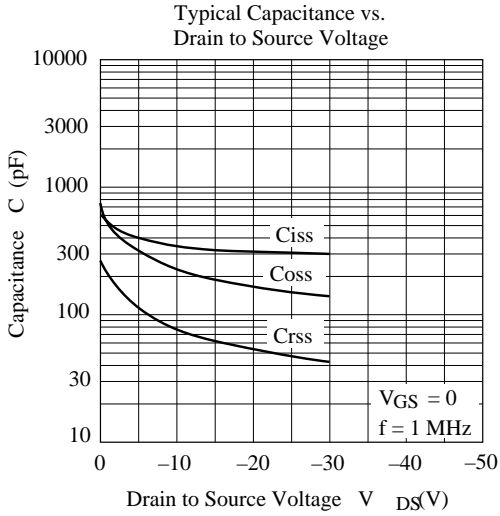
Note 5 :
When using the glass epoxy board (FR4 40x40x1.6 mm)

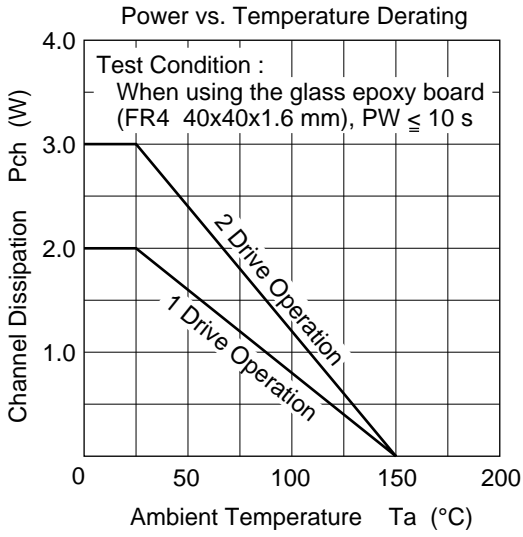


Main Characteristics (P channel)

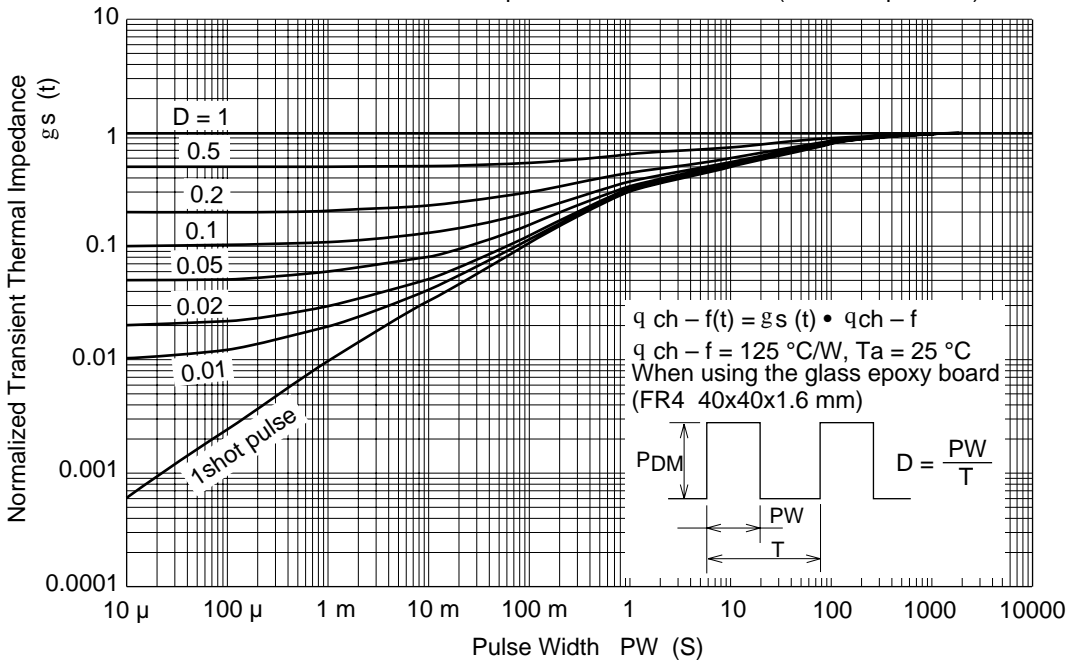


Main Characteristics (P channel)

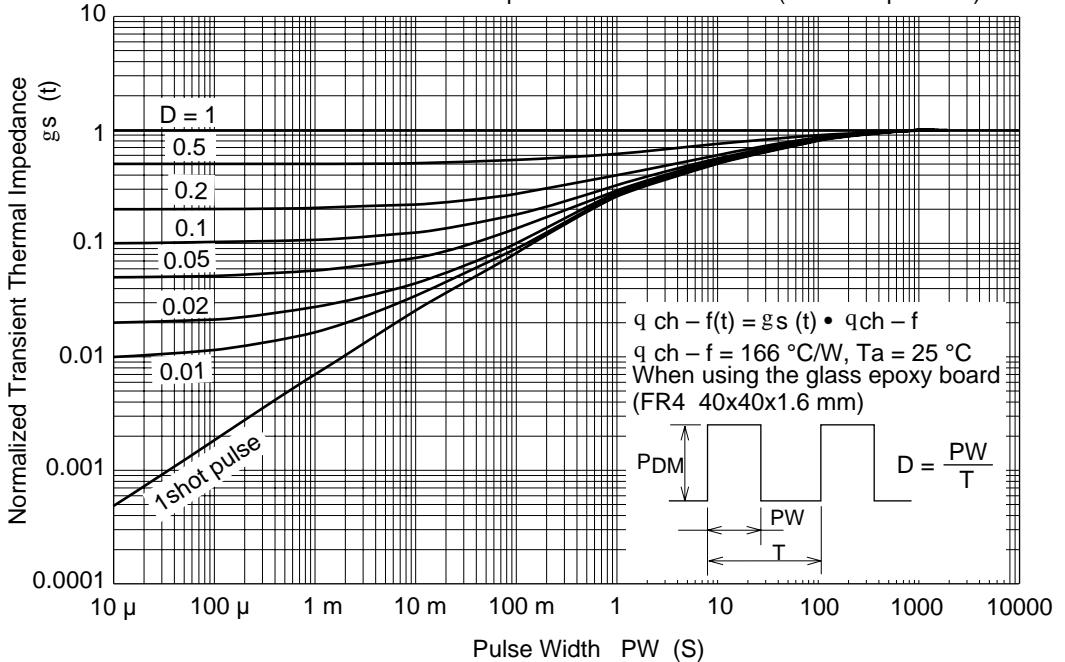




Normalized Transient Thermal Impedance vs. Pulse Width (1 Drive Operation)

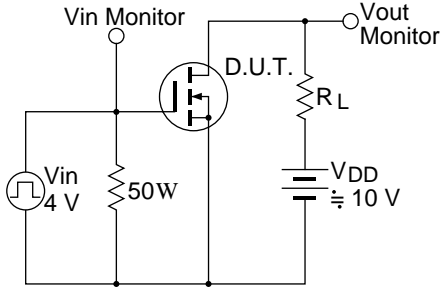


Normalized Transient Thermal Impedance vs. Pulse Width (2 Drive Operation)

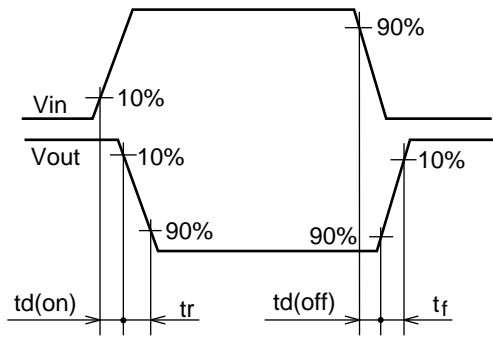


N channel

Switching Time Test Circuit

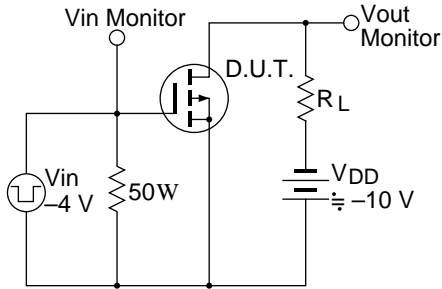


Switching Time Waveform

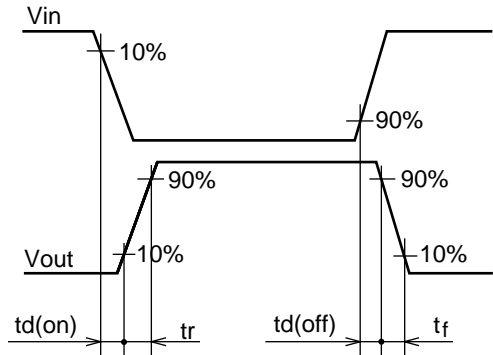


P channel

Switching Time Test Circuit



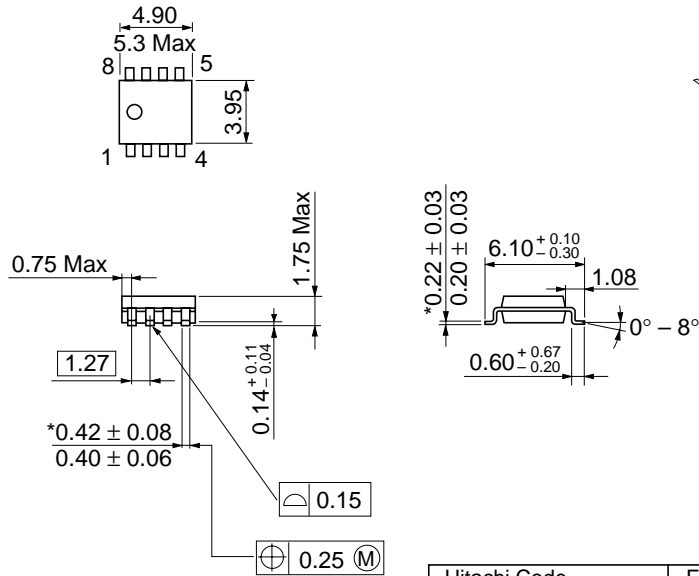
Switching Time Waveform



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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