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# HAT3004R

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

# HITACHI

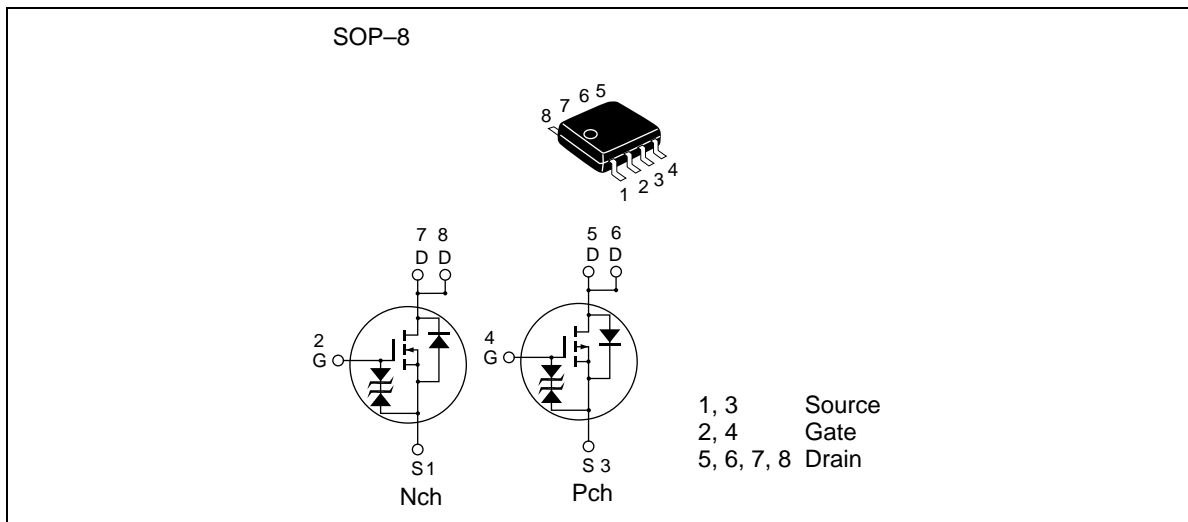
ADE-208-500 G (Z)  
8th. Edition  
January. 1997

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## Features

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

## Outline



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## HAT3004R

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### 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	$V_{(BR)GSS}$	±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	$I_D = 3\text{A}, V_{GS} = 10\text{V}$ <sup>Note4</sup>
	$R_{DS(on)}$	—	0.078	0.11	Ω	$I_D = 3\text{A}, V_{GS} = 4\text{V}$ <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	$V_{DD} \cong 10\text{V}$
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

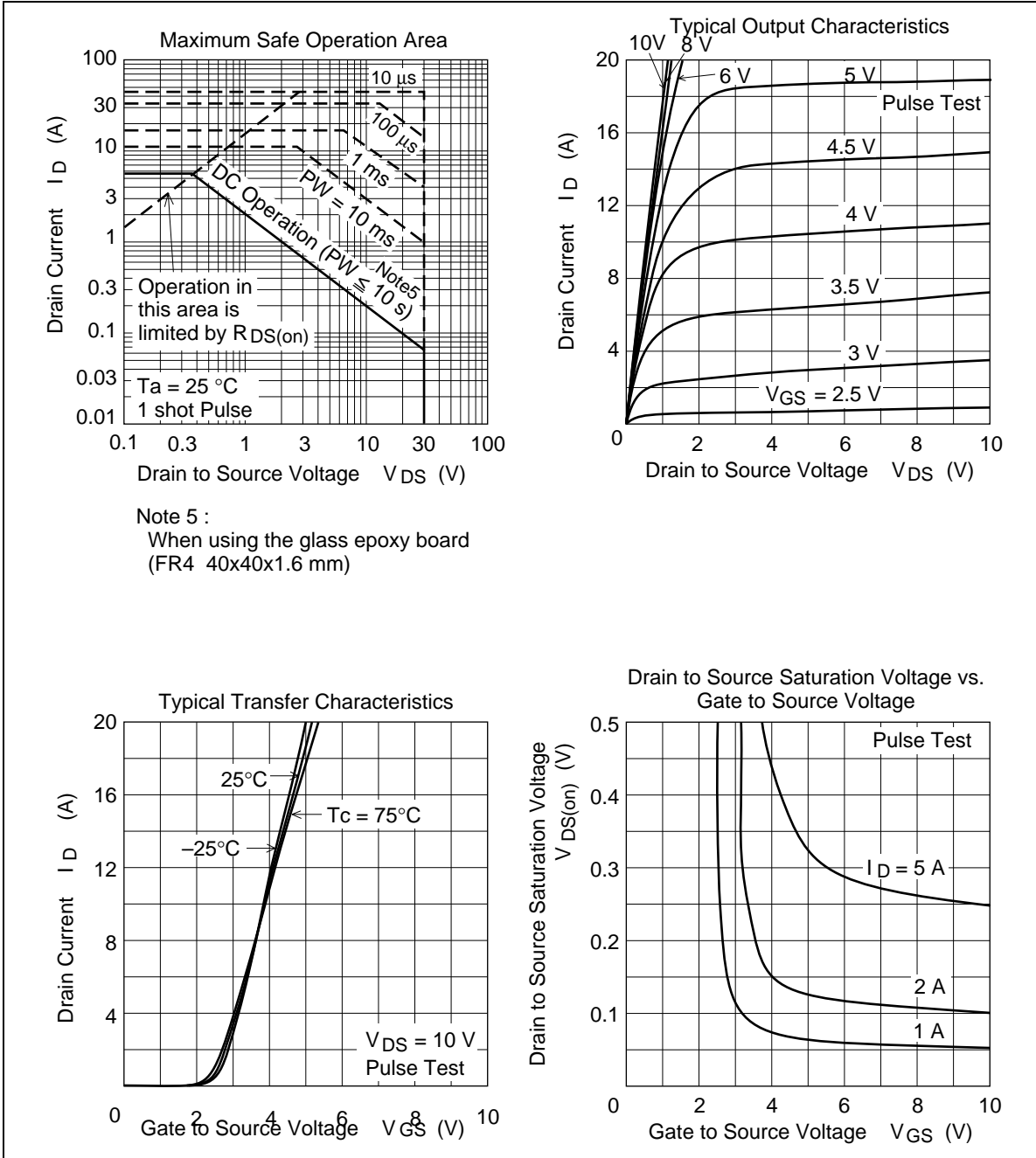
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### Electrical Characteristics (P channel) (Ta = 25°C)

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	$\Omega$	$I_D = -2\text{A}, V_{GS} = -10\text{V}^{\text{Note4}}$
	$R_{DS(on)}$	—	0.20	0.34	$\Omega$	$I_D = -2\text{A}, V_{GS} = -4\text{V}^{\text{Note4}}$
Forward transfer admittance	$ y_{fs} $	2.5	3.5	—	S	$I_D = -2\text{A}, V_{DS} = -10\text{V}^{\text{Note4}}$
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	$V_{DD} \cong -10\text{V}$
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	$I_F = -3.5\text{A}, V_{GS} = 0^{\text{Note4}}$
Body-drain diode reverse recovery time	$t_{rr}$	—	60	—	ns	$I_F = -3.5\text{A}, V_{GS} = 0$ $diF/dt = 20\text{A}/\mu\text{s}$

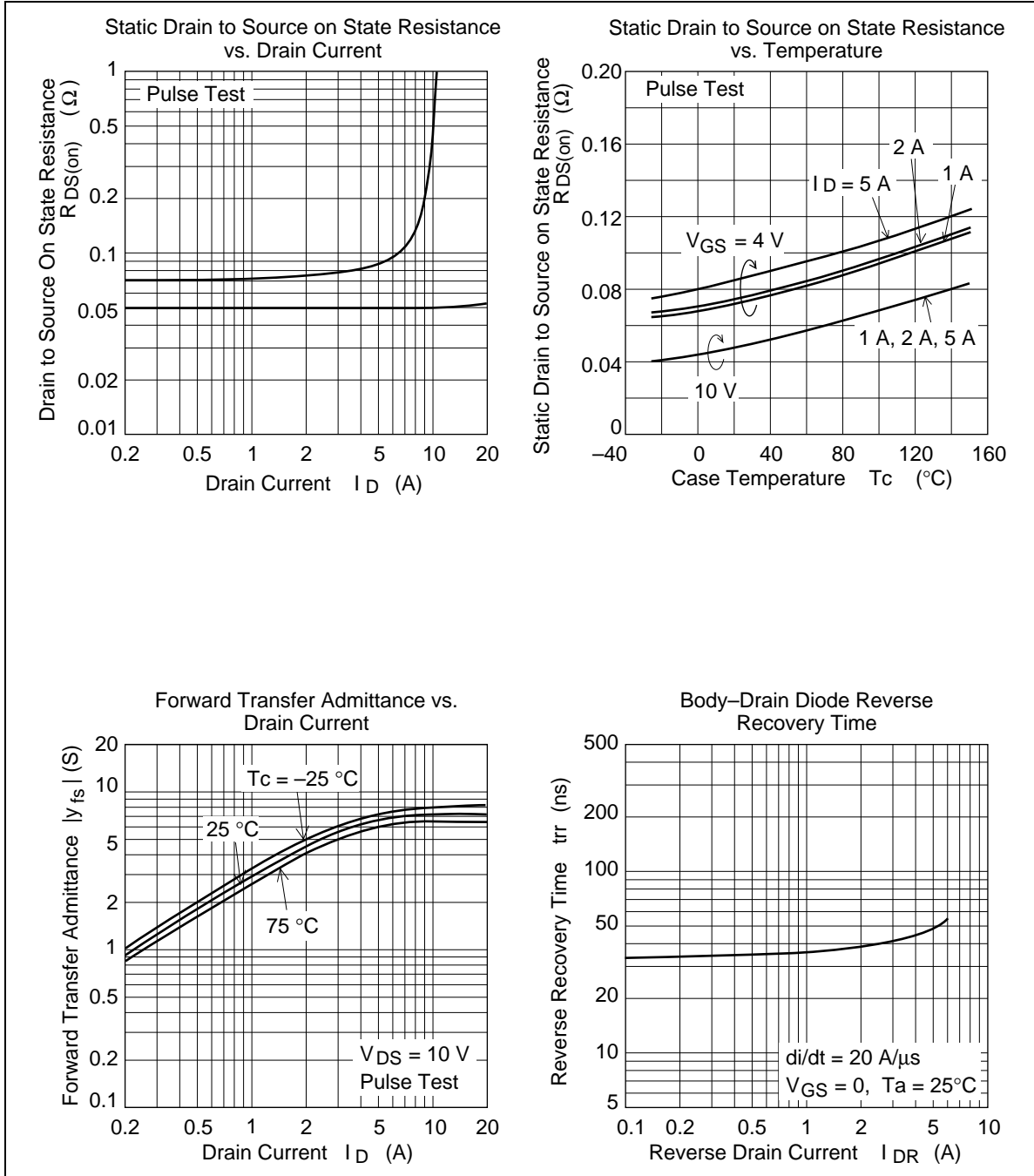
Note: 4. Pulse test

Main Characteristics (N channel)

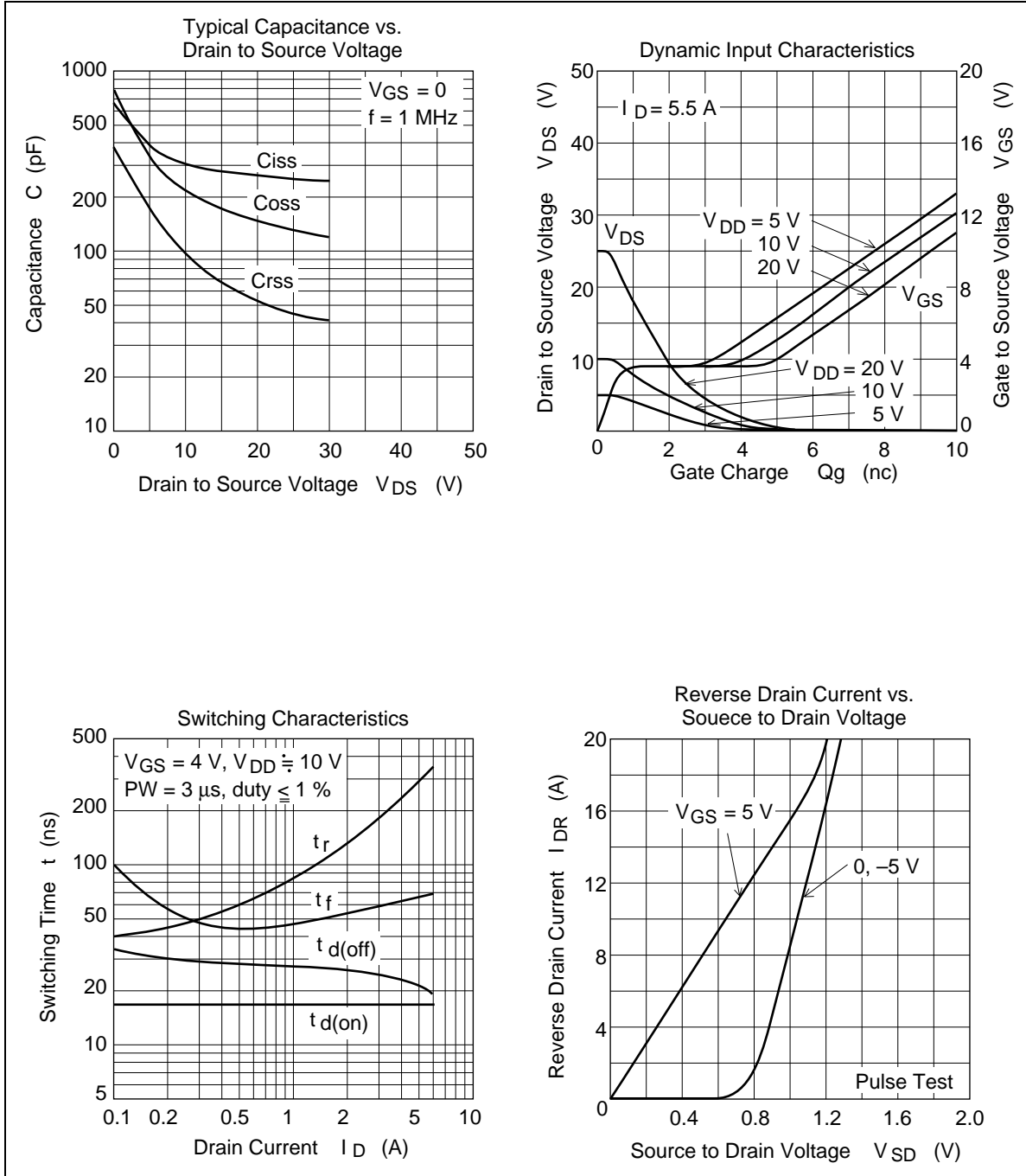


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## Main Characteristics (N channel)

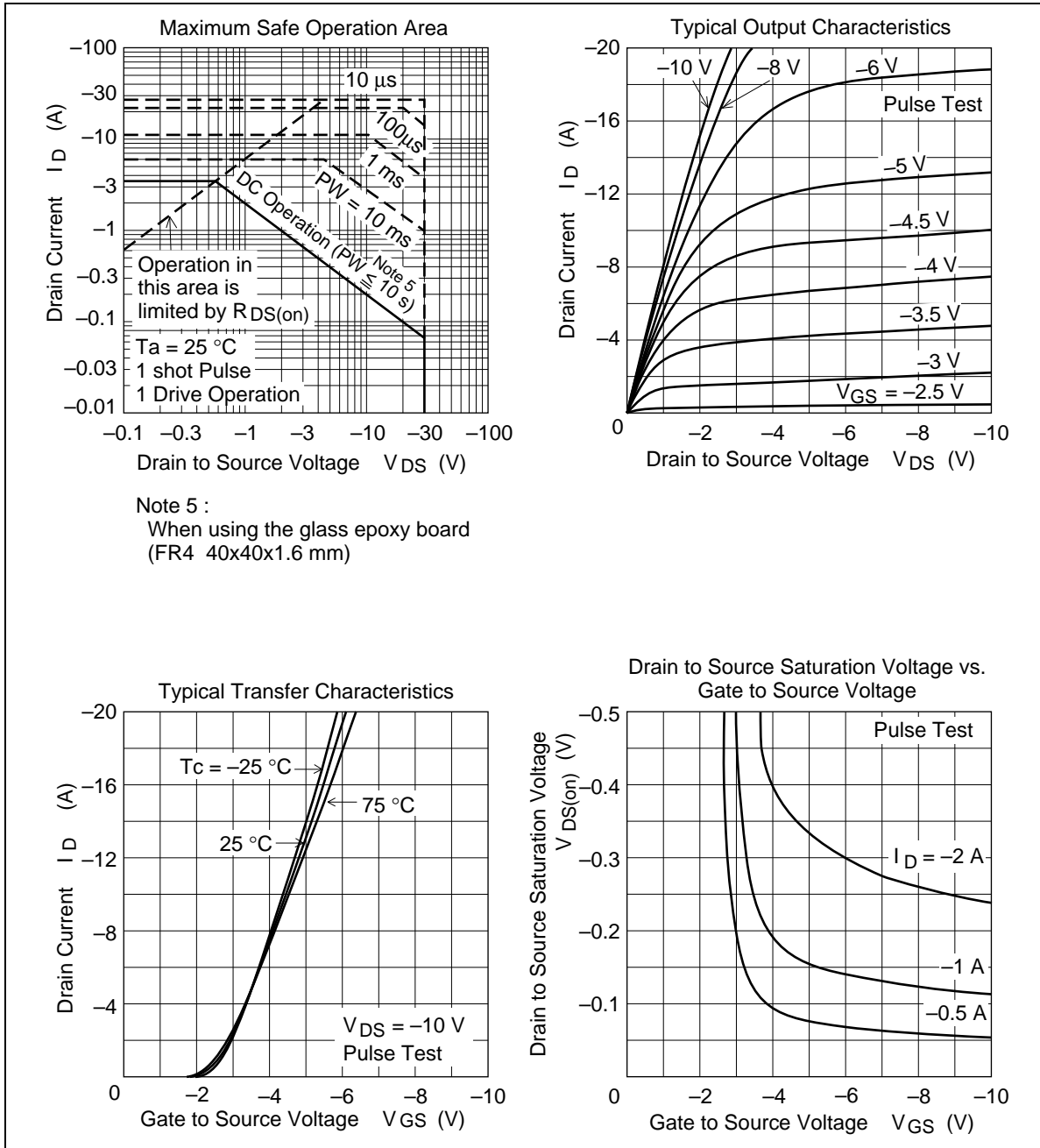


Main Characteristics (N channel)



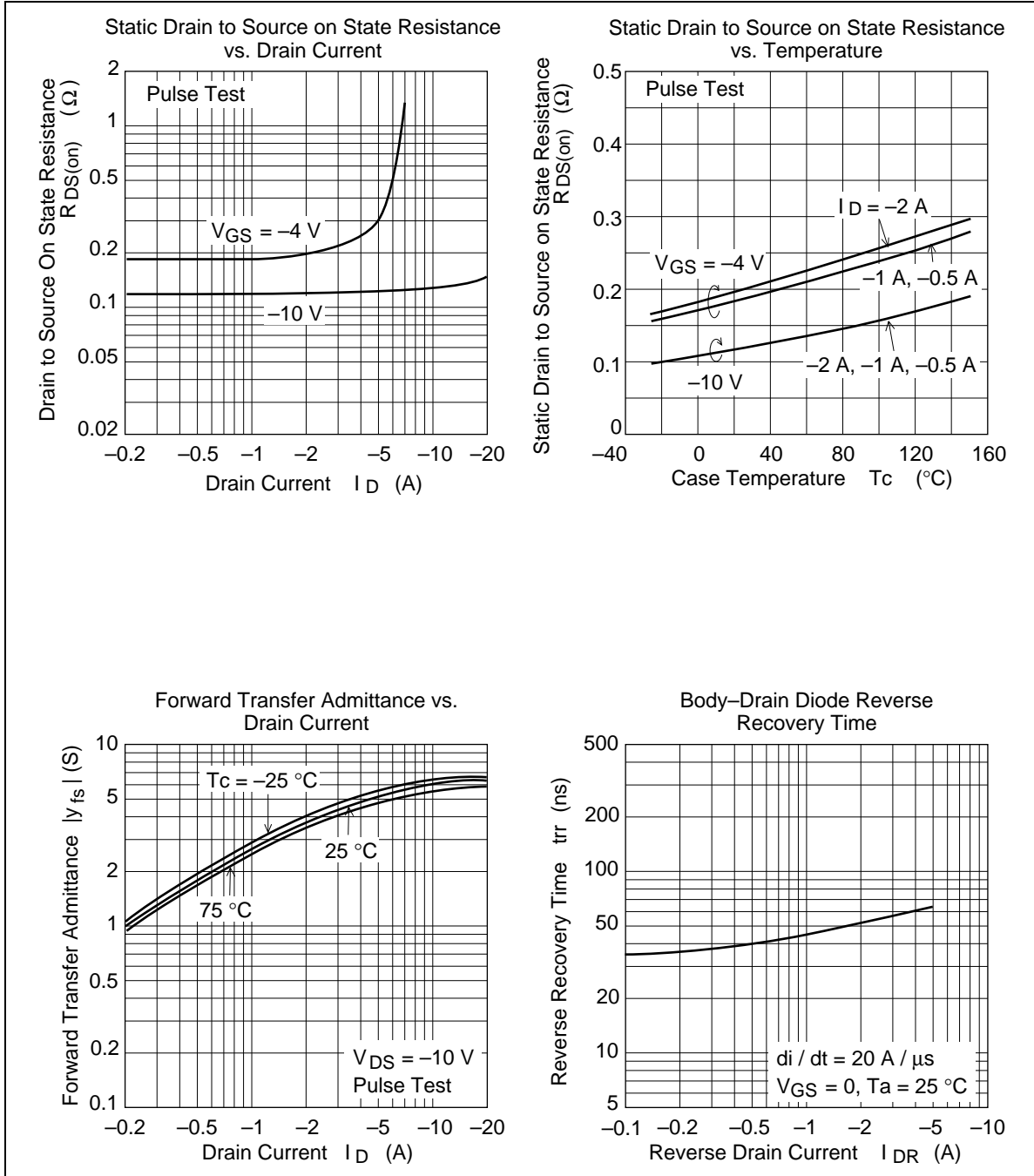
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## Main Characteristics (P channel)



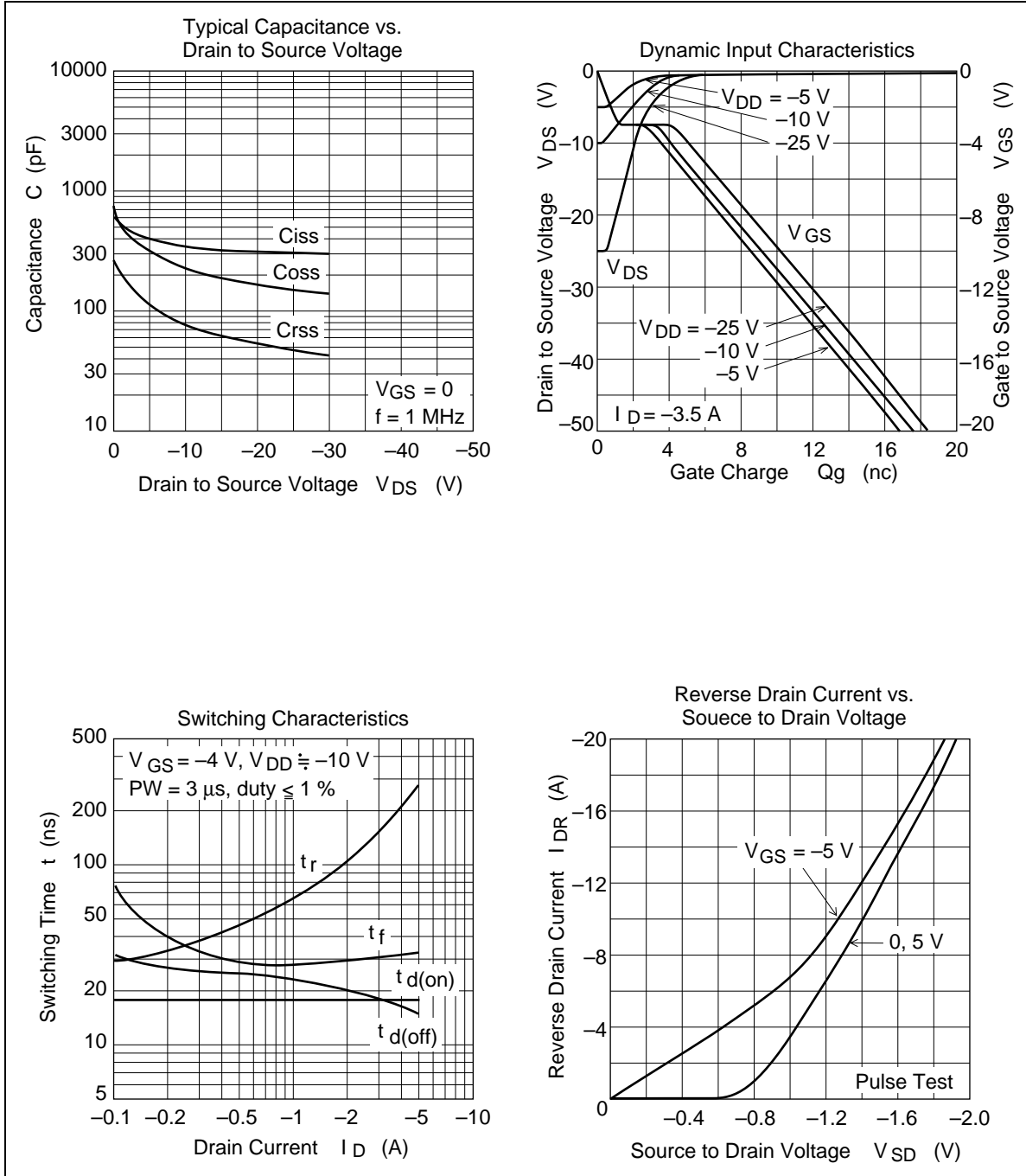


Main Characteristics (P channel)

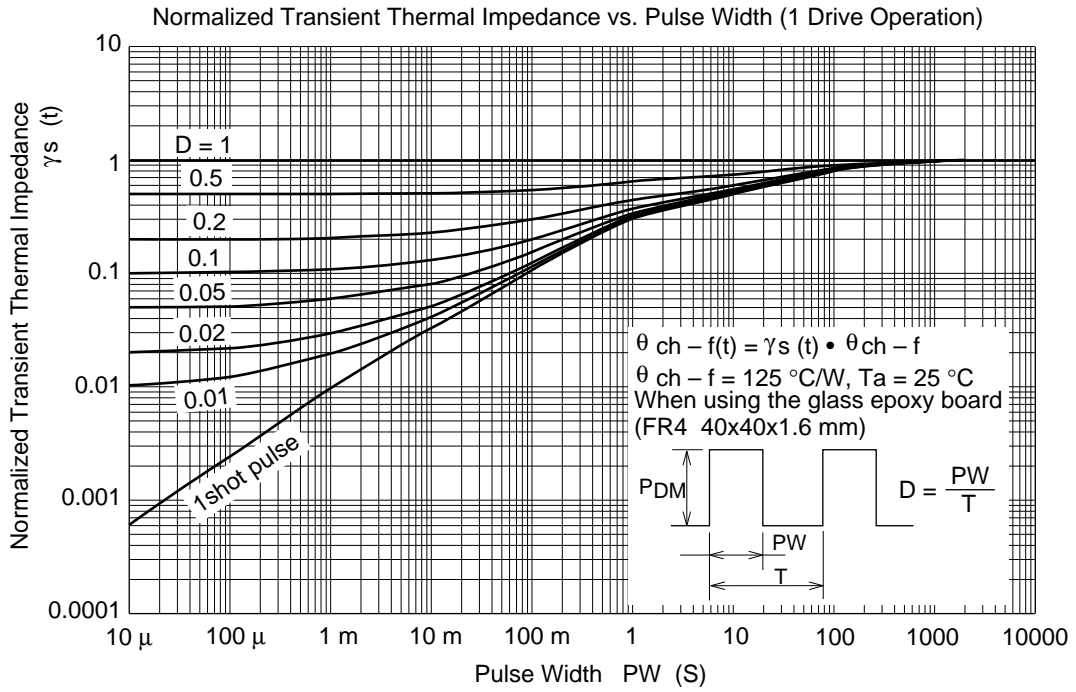
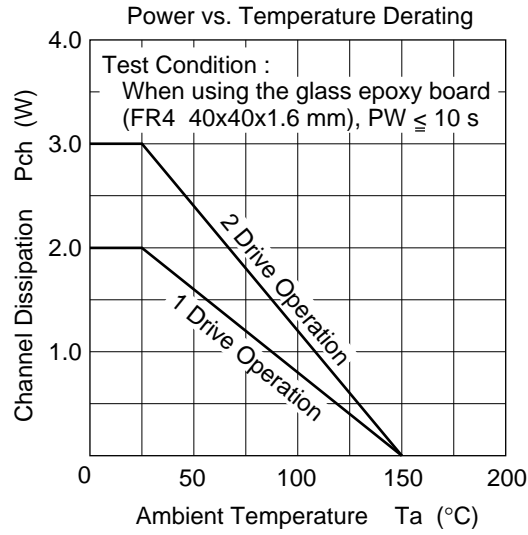


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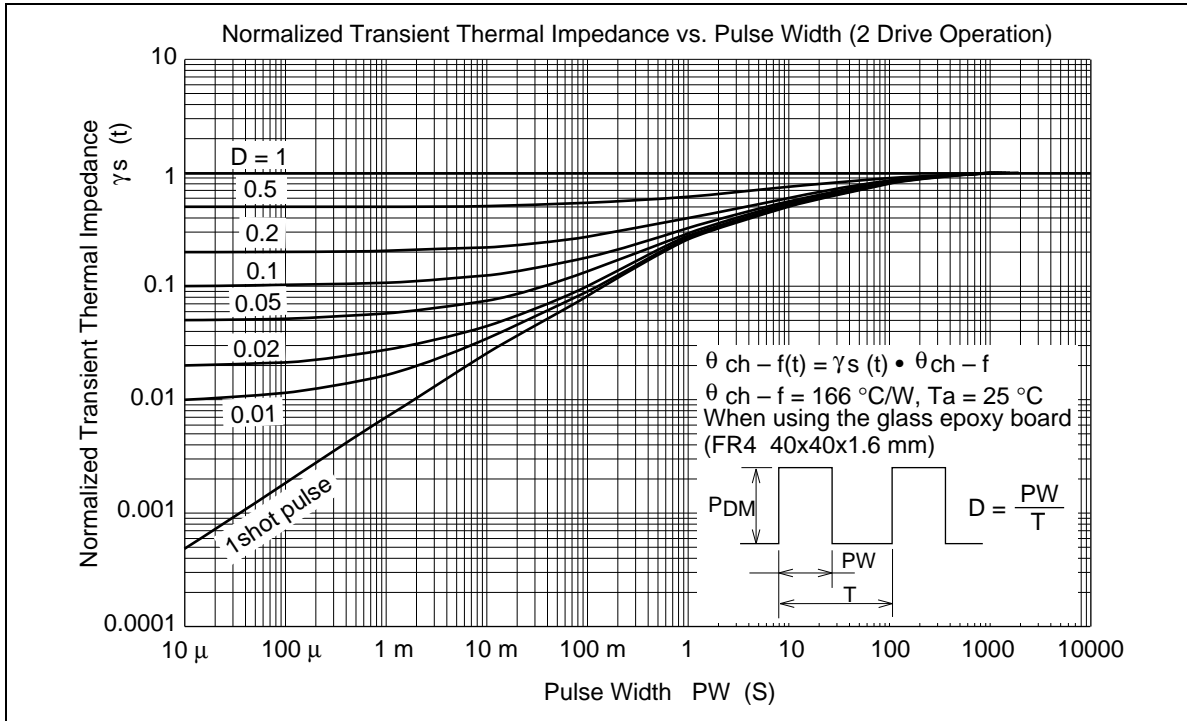
## Main Characteristics (P channel)



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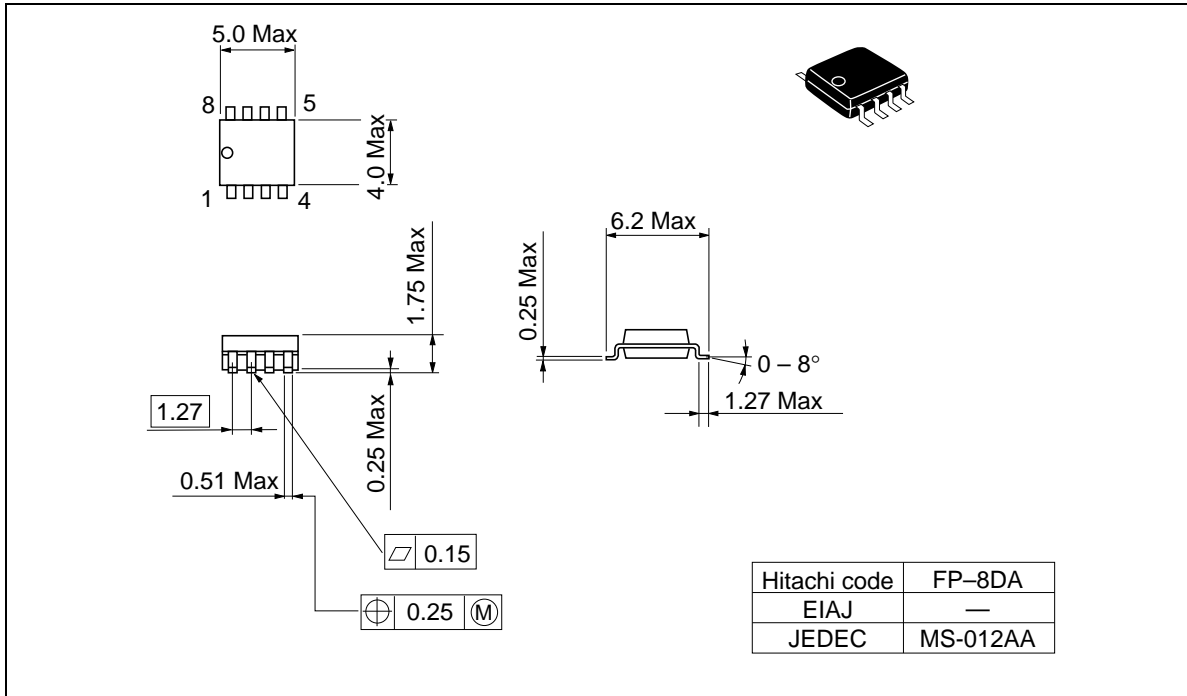


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Package Dimentions

Unit: mm



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