HAT3006R

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

HITACHI

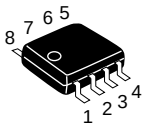
ADE-208-480 E (Z)
6th. Edition
June 1997

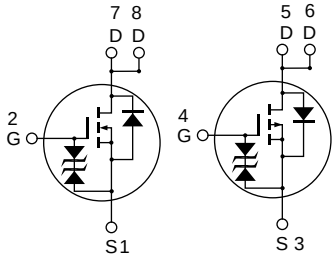
Features

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

Outline

SOP–8





1, 3	Source
2, 4	Gate
5, 6, 7, 8	Drain

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	$I_{D(pulse)}$ Note1	52	–36	A
Body-drain diode reverse drain current	I_{DR}	6.5	–4.5	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 ≤ 10µs, duty cycle ≤ 1 %
2. 1 Drive operation : When using the glass epoxy board (FR4 40 x 40 x 1.6 mm), PW≤ 10s
3. 2 Drive operation : When using the glass epoxy board (FR4 40 x 40 x 1.6 mm), PW≤ 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 = 10mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	±20	—	—	V	I_G = ±100µA, V_{DS} = 0
Gate to source leak current	I_{GSS}	—	—	±10	µA	V_{GS} = ±16V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS}	—	—	10	µA	V_{DS} = 30 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.0	V	V_{DS} = 10V, I_D = 1mA
Static drain to source on state resistance	$R_{DS(on)}$	—	0.03	0.045	Ω	I_D = 4A, V_{GS} = 10V Note4
	$R_{DS(on)}$	—	0.05	0.08	Ω	I_D = 4A, V_{GS} = 4V Note4
Forward transfer admittance	$\|y_{fs}\|$	5	8	—	S	I_D = 4A, V_{DS} = 10V Note4
Input capacitance	Ciss	—	560	—	pF	V_{DS} = 10V
Output capacitance	Coss	—	380	—	pF	V_{GS} = 0
Reverse transfer capacitance	Crss	—	170	—	pF	f = 1MHz
Turn-on delay time	$t_{d(on)}$	—	30	—	ns	V_{GS} = 4V, I_D = 4A
Rise time	t_r	—	270	—	ns	V_{DD} ≅ 10V
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 = 6.5A, V_{GS} = 0 Note4
Body–drain diode reverse recovery time	t_{rr}	—	45	—	ns	IF = 6.5A, V_{GS} = 0 diF/ dt =20A/µs

Note: 4. Pulse test

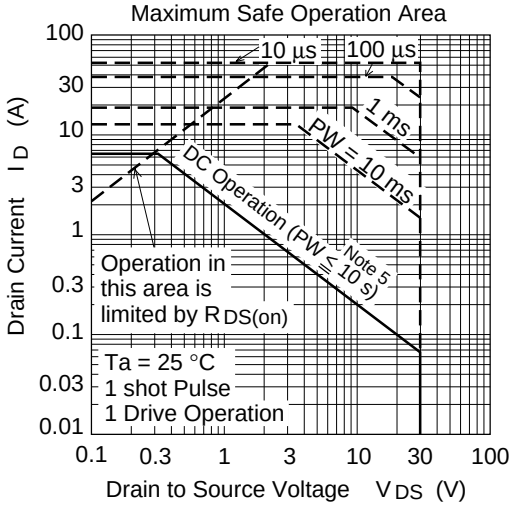
Electrical Characteristics (P channel) (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	–30	—	—	V	I_D = –10mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	±20	—	—	V	I_G = ±100µA, V_{DS} = 0
Gate to source leak current	I_{GSS}	—	—	±10	µA	V_{GS} = ±16V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS}	—	—	–10	µA	V_{DS} = –30 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	–1.0	—	–2.5	V	V_{DS} = –10V, I_D = –1mA
Static drain to source on state resistance	$R_{DS(on)}$	—	0.07	0.09	Ω	I_D = –3A, V_{GS} = –10V [Note5]
	$R_{DS(on)}$	—	0.11	0.18	Ω	I_D = –3A, V_{GS} = –4V [Note5]
Forward transfer admittance	$\|y_{fs}\|$	4	6	—	S	I_D = –3A, V_{DS} = –10V [Note5]
Input capacitance	Ciss	—	660	—	pF	V_{DS} = –10V
Output capacitance	Coss	—	440	—	pF	V_{GS} = 0
Reverse transfer capacitance	Crss	—	140	—	pF	f = 1MHz
Turn-on delay time	$t_{d(on)}$	—	24	—	ns	V_{GS} = –4V, I_D = –3A
Rise time	t_r	—	165	—	ns	V_{DD} ≅ –10V
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	IF = –4.5A, V_{GS} = 0 [Note5]
Body–drain diode reverse recovery time	t_{rr}	—	60	—	ns	IF = –4.5A, V_{GS} = 0 diF/ dt =20A/µs

Note: 5. Pulse test

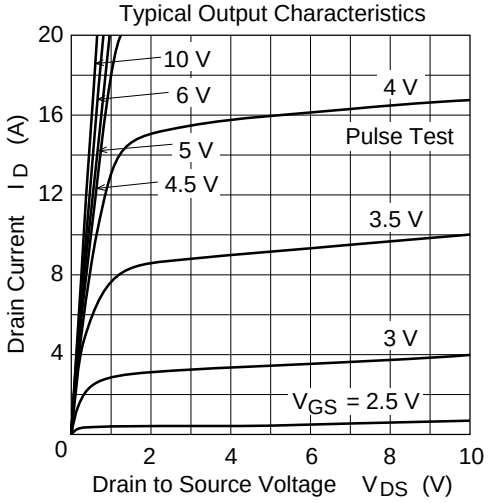
Main Characteristics (N channel)

Maximum Safe Operation Area

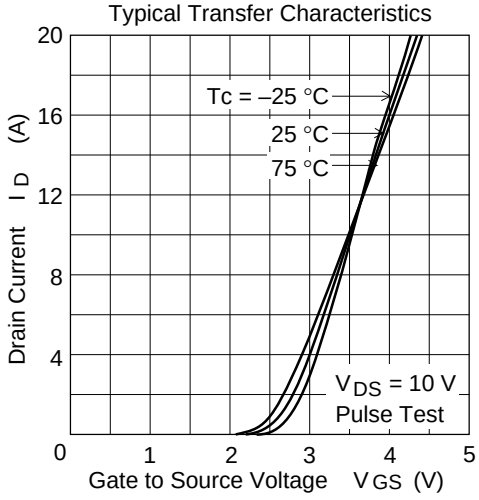


Note 5 :
When using the glass epoxy board
(FR4 40x40x1.6 mm)

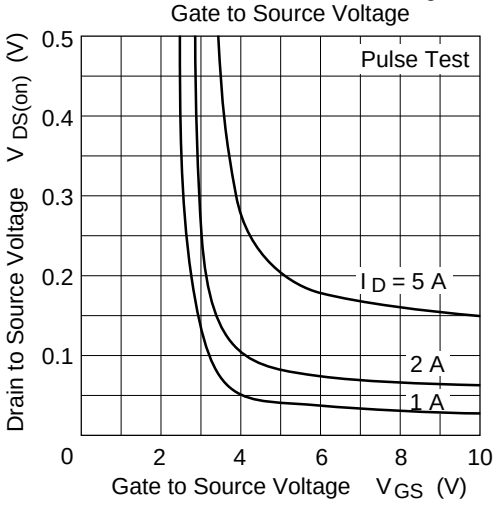
Typical Output Characteristics



Typical Transfer Characteristics

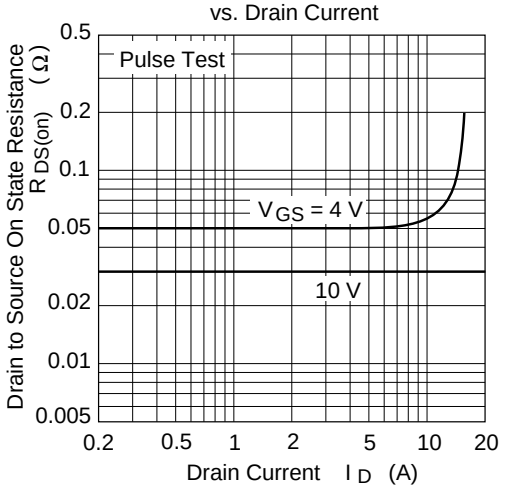


Drain to Source Saturation Voltage vs.
Gate to Source Voltage

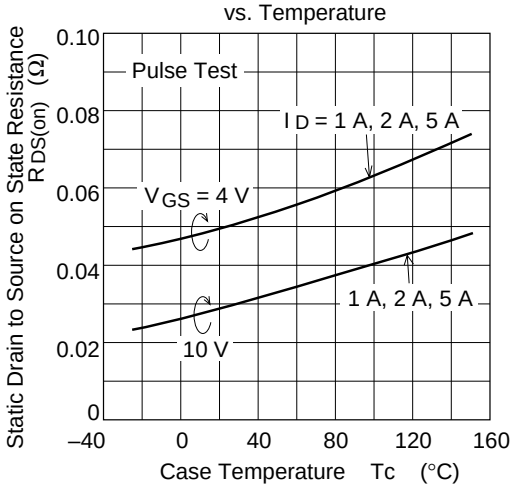


Main Characteristics (N channel)

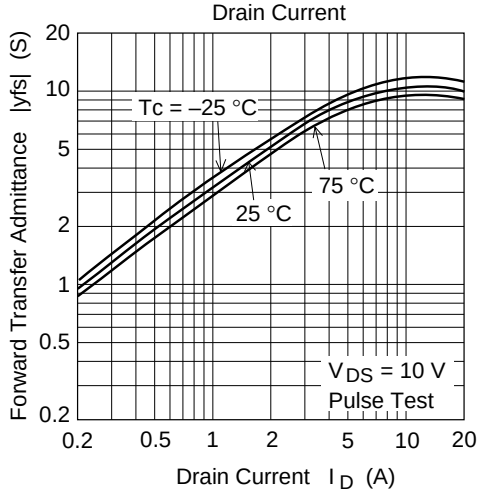
Static Drain to Source on State Resistance vs. Drain Current



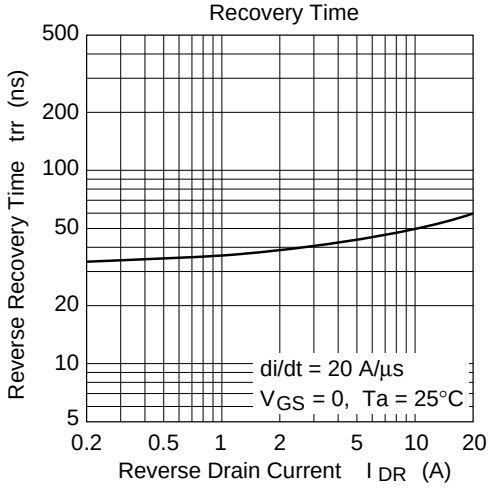
Static Drain to Source on State Resistance vs. Temperature



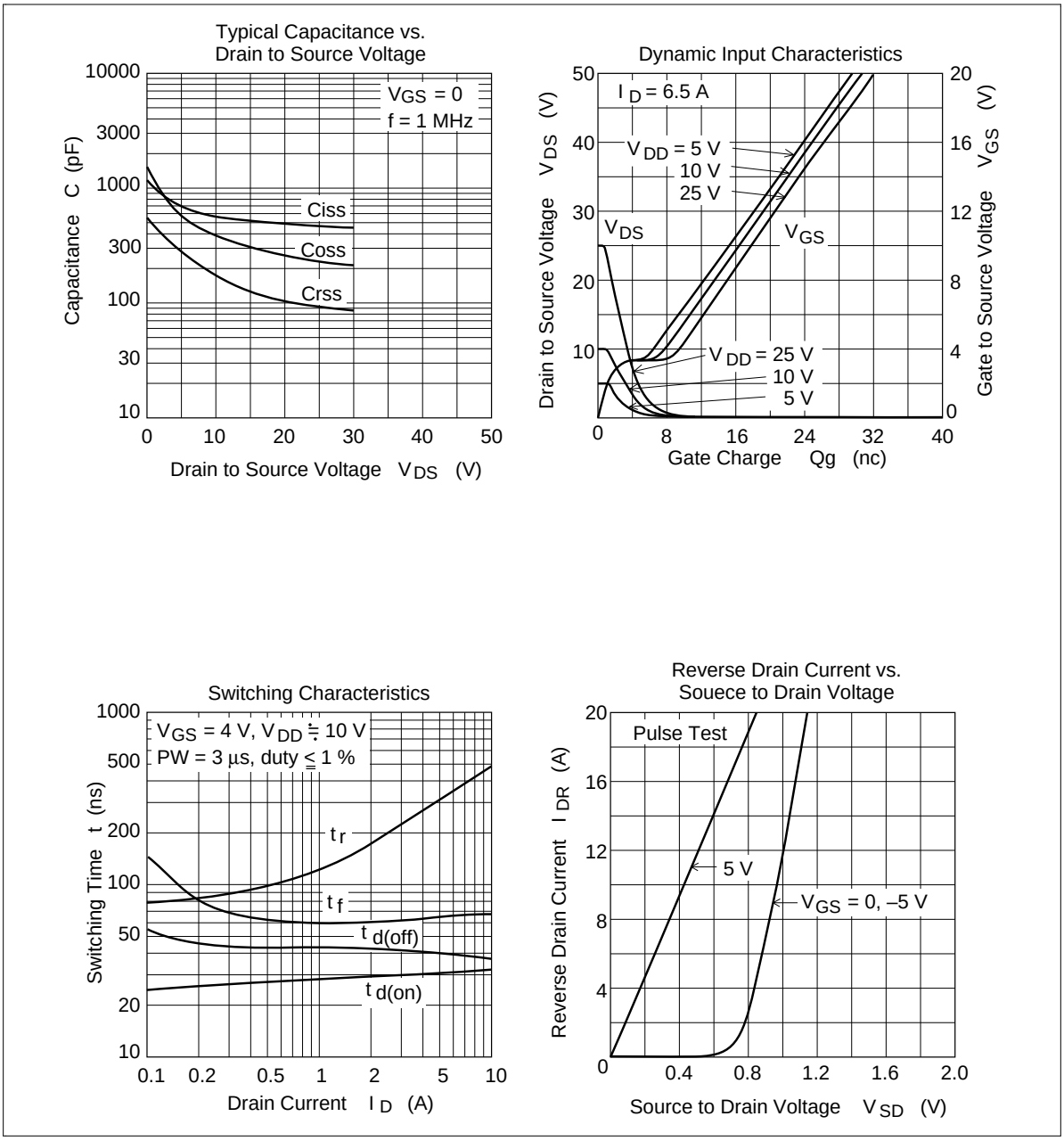
Forward Transfer Admittance vs. Drain Current



Body–Drain Diode Reverse Recovery Time

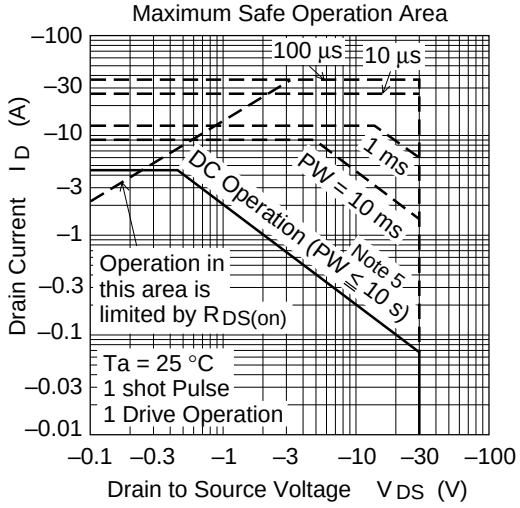


Main Characteristics (N channel)



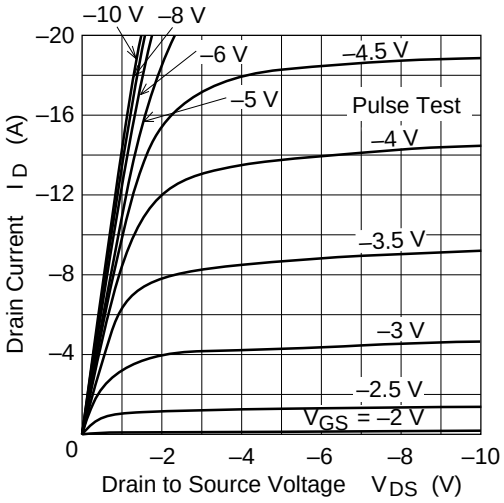
Main Characteristics (P channel)

Maximum Safe Operation Area

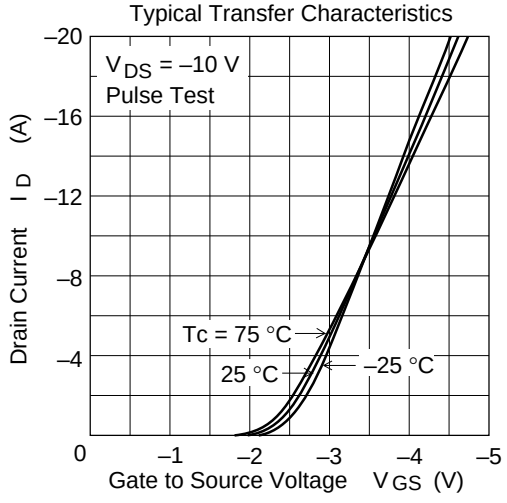


Note 5 :
When using the glass epoxy board
(FR4 40 x 40 x 1.6 mm)

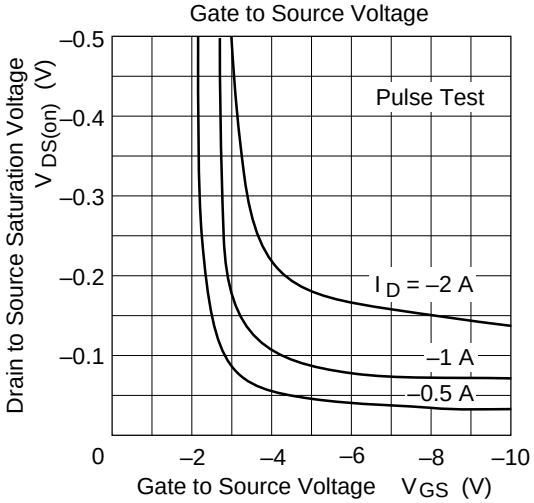
Typical Output Characteristics



Typical Transfer Characteristics

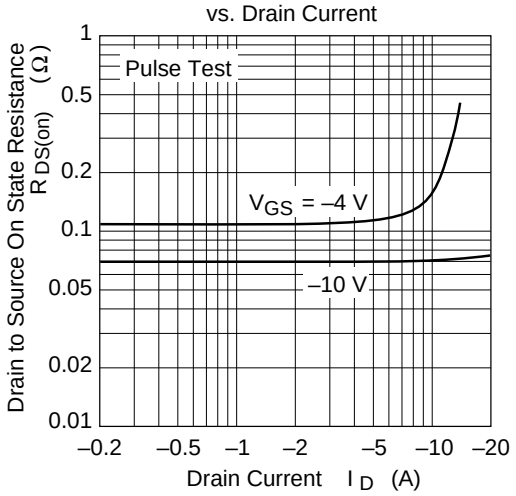


Drain to Source Saturation Voltage vs. Gate to Source Voltage

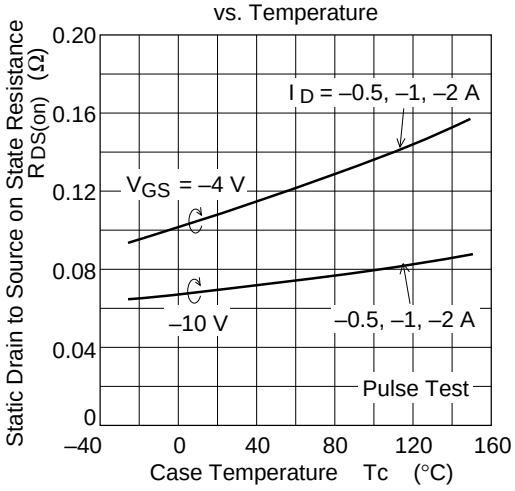


Main Characteristics (P channel)

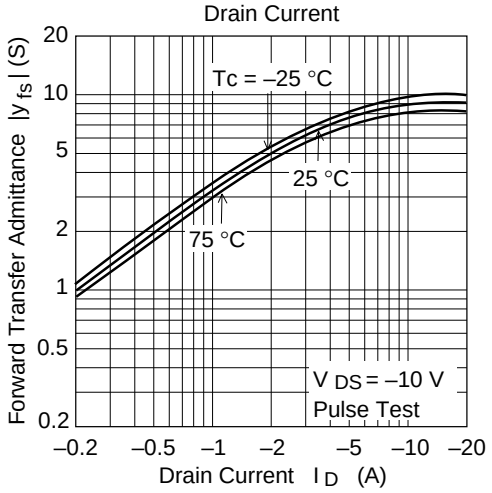
Static Drain to Source on State Resistance vs. Drain Current



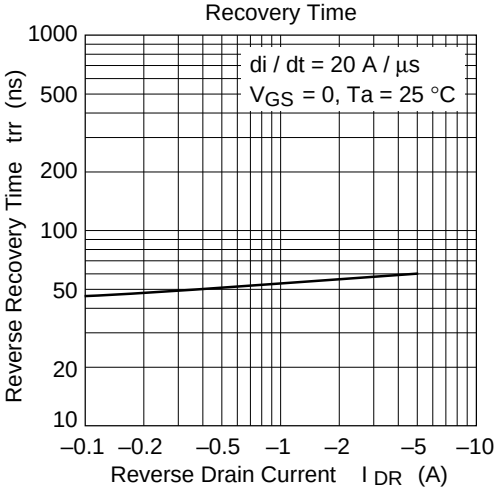
Static Drain to Source on State Resistance vs. Temperature



Forward Transfer Admittance vs. Drain Current

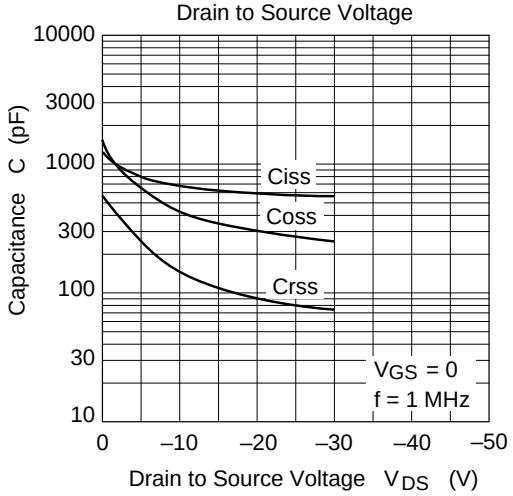


Body–Drain Diode Reverse Recovery Time

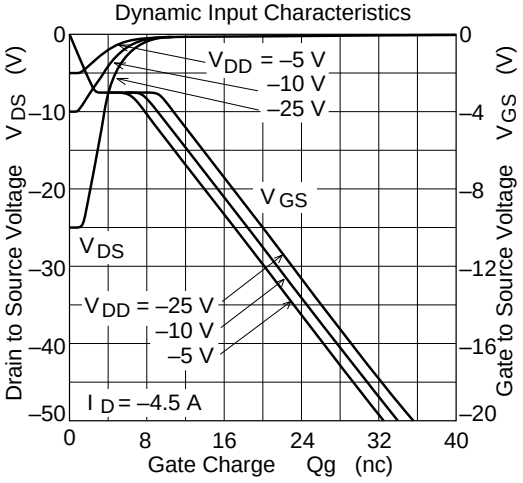


Main Characteristics (P channel)

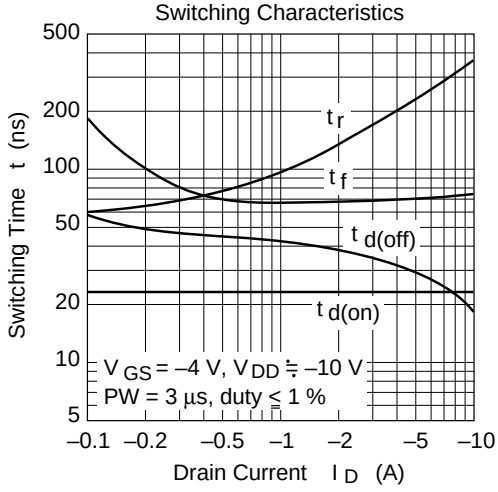
Typical Capacitance vs.
Drain to Source Voltage



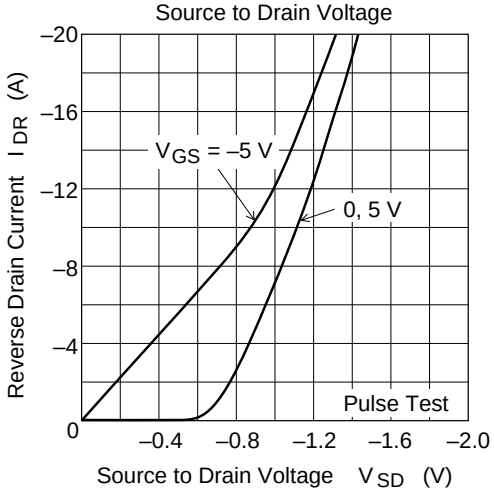
Dynamic Input Characteristics

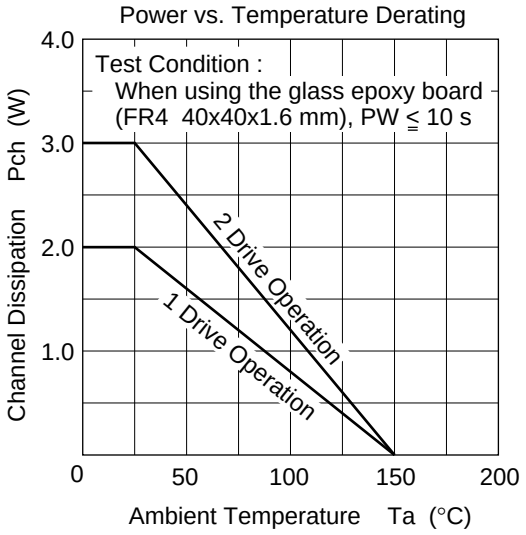


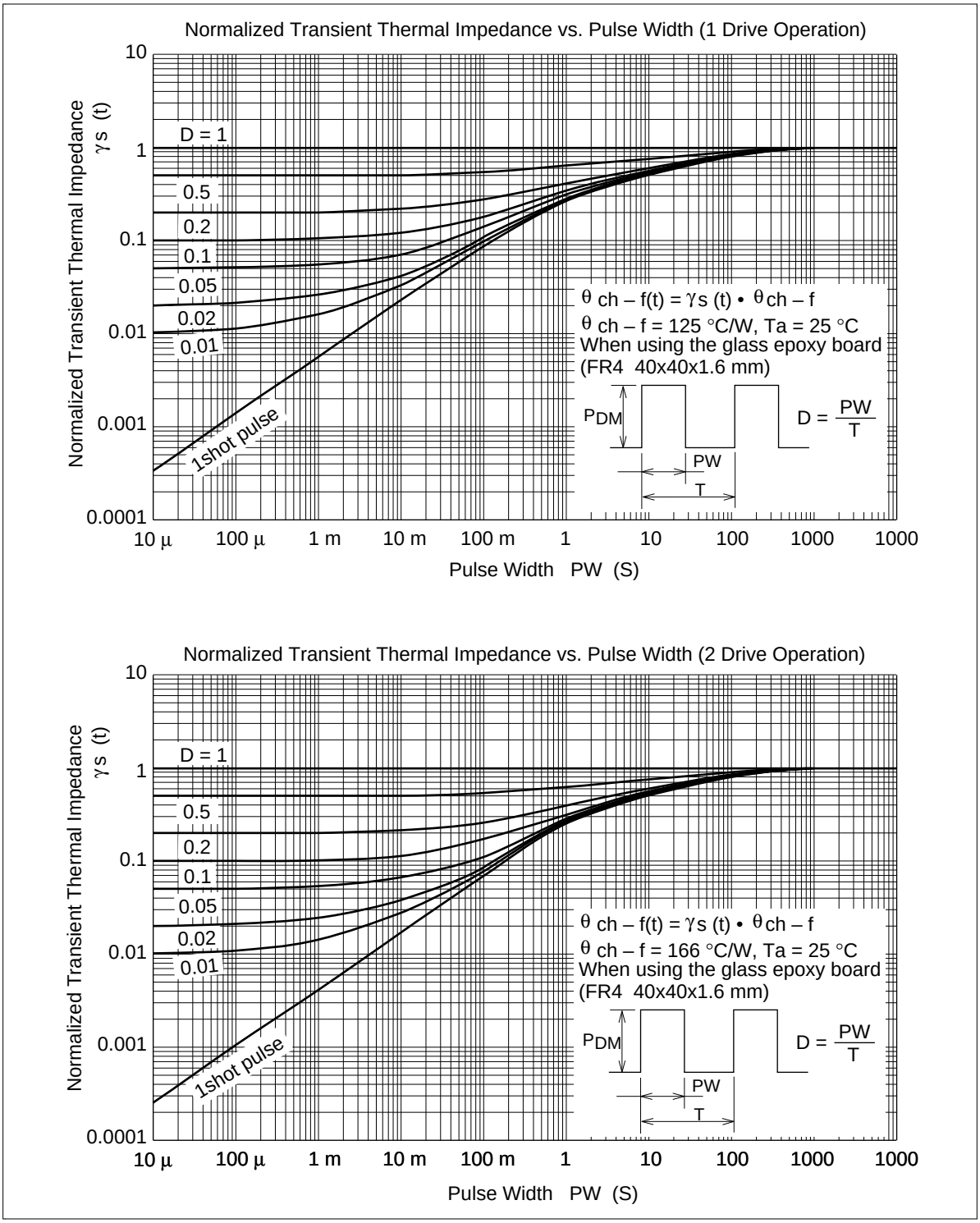
Switching Characteristics



Reverse Drain Current vs.
Source to Drain Voltage

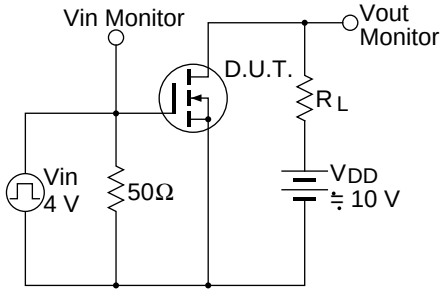



Power vs. Temperature Derating
Test Condition :
When using the glass epoxy board
(FR4 40x40x1.6 mm), PW ≦ 10 s
Channel Dissipation Pch (W)
4.0
3.0
2.0
1.0
0
50
100
150
200
2 Drive Operation
1 Drive Operation
Ambient Temperature Ta (°C)

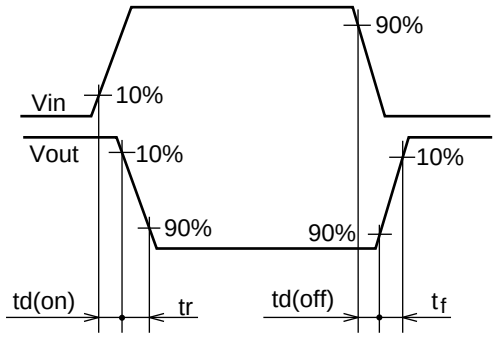

Normalized Transient Thermal Impedance vs. Pulse Width (1 Drive Operation)
Normalized Transient Thermal Impedance γs (t)
10
1
0.1
0.01
0.001
0.0001
D = 1
0.5
0.2
0.1
0.05
0.02
0.01
1shot pulse
θ ch – f(t) = γs (t) • θch – f
θ ch – f = 125 °C/W, Ta = 25 °C
When using the glass epoxy board
(FR4 40x40x1.6 mm)
PDM
D = PW / T
PW
T
10 µ
100 µ
1 m
10 m
100 m
1
10
100
1000
1000
Pulse Width PW (S)
Normalized Transient Thermal Impedance vs. Pulse Width (2 Drive Operation)
Normalized Transient Thermal Impedance γs (t)
10
1
0.1
0.01
0.001
0.0001
D = 1
0.5
0.2
0.1
0.05
0.02
0.01
1shot pulse
θ ch – f(t) = γs (t) • θch – f
θ ch – f = 166 °C/W, Ta = 25 °C
When using the glass epoxy board
(FR4 40x40x1.6 mm)
PDM
D = PW / T
PW
T
10 µ
100 µ
1 m
10 m
100 m
1
10
100
1000
1000
Pulse Width PW (S)

N channel

Switching Time Test Circuit

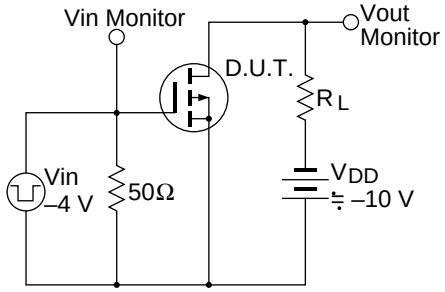


Switching Time Waveform

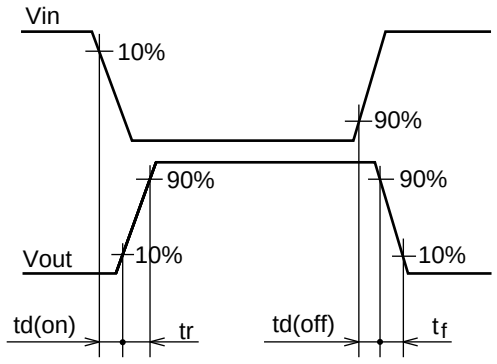


P channel

Switching Time Test Circuit

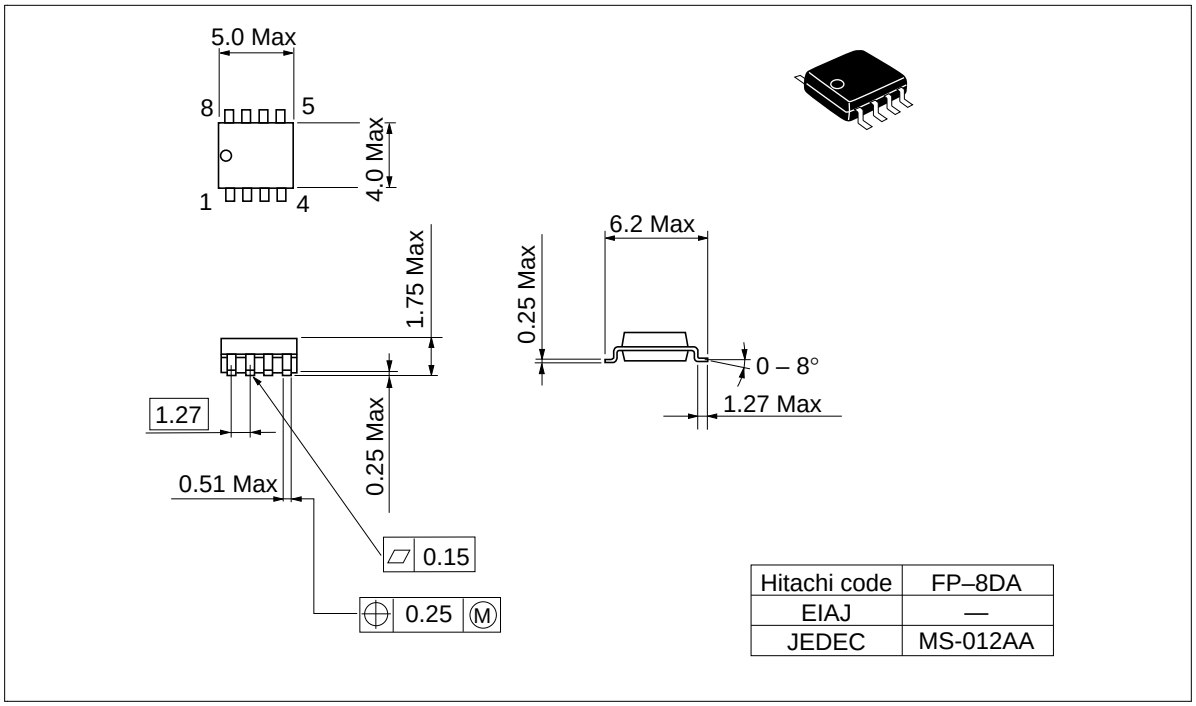


Switching Time Waveform



Package Dimensions

Unit: mm



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