To all our customers

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Renesas Technology Home Page: http://www.renesas.com

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

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HAT3010R

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

RENESAS

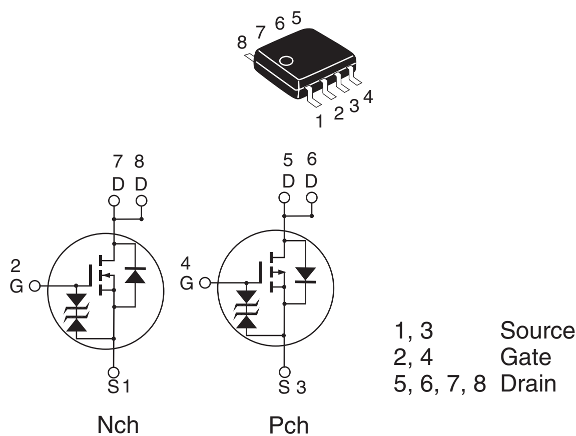
ADE-208-1402H (Z)

9th. Edition
Aug. 2002

Features

- Low on-resistance
- Capable of 4.5 V gate drive
- High density mounting

Outline



Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings		Unit
		Nch	Pch	
Drain to source voltage	V_{DSS}	60	–60	V
Gate to source voltage	V_{GSS}	±20	±20	V
Drain current	I_D	6	–5	A
Drain peak current	$I_{D(pulse)}$ Note1	48	–40	A
Body-drain diode reverse drain current	I_{DR}	6	–5	A
Channel dissipation	Pch Note2	2	2	W
Channel dissipation	Pch Note3	3	3	W
Channel temperature	Tch	150	150	°C
Storage temperature	Tstg	–55 to +150	–55 to +150	°C

Notes: 1. PW ≤ 10 µs, duty cycle ≤ 1 %
2. 1 Drive operation ; When using the glass epoxy board (FR4 40 x 40 x 1.6 mm), PW ≤ 10 s
3. 2 Drive operation ; When using the glass epoxy board (FR4 40 x 40 x 1.6 mm), PW ≤ 10 s

Electrical Characteristics (Ta = 25°C)

• N Channel

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	60	—	—	V	I_D = 10 mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	±20	—	—	V	I_G = ±100 µA, V_{DS} = 0
Gate to source leak current	I_{GSS}	—	—	±10	µA	V_{GS} = ±16 V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS}	—	—	1	µA	V_{DS} = 60 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	1.0	—	2.5	V	V_{DS} = 10 V, I_D = 1 mA
Static drain to source on state resistance	$R_{DS(on)}$	—	25	32	mΩ	I_D = 3 A, V_{GS} = 10 V Note4
	$R_{DS(on)}$	—	32	45	mΩ	I_D = 3 A, V_{GS} = 4.5 V Note4
Forward transfer admittance	$\|y_{fs}\|$	7	11	—	S	I_D = 3 A, V_{DS} = 10 V Note4
Input capacitance	Ciss	—	1050	—	pF	V_{DS} = 10 V
Output capacitance	Coss	—	150	—	pF	V_{GS} = 0
Reverse transfer capacitance	Crss	—	90	—	pF	f = 1 MHz
Turn-on delay time	$t_{d(on)}$	—	15	—	ns	V_{GS} = 10 V, I_D = 3 A
Rise time	t_r	—	15	—	ns	V_{DD} ≈ 30 V
Turn-off delay time	$t_{d(off)}$	—	55	—	ns	R_L = 10 Ω
Fall time	t_f	—	10	—	ns	R_g = 4.7 Ω
Body–drain diode forward voltage	V_{DF}	—	0.85	1.10	V	IF = 6 A, V_{GS} = 0 Note4
Body–drain diode reverse recovery time	t_{rr}	—	50	—	ns	IF =6 A, V_{GS} = 0 diF/ dt =100 A/µs

Notes: 4. Pulse test

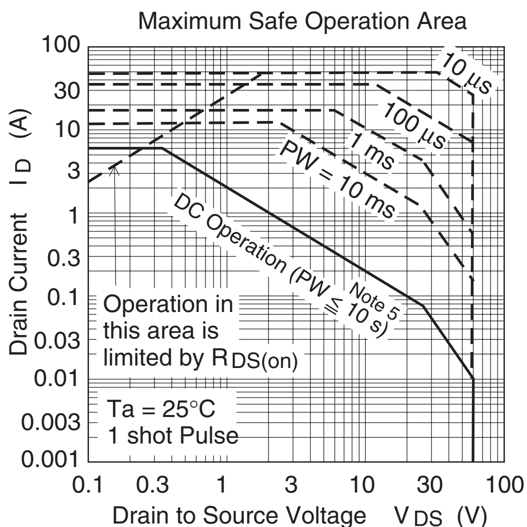
- **P Channel**

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	–60	—	—	V	I_D = –10 mA, V_{GS} = 0
Gate to source breakdown voltage	$V_{(BR)GSS}$	±20	—	—	V	I_G = ±100 µA, V_{DS} = 0
Gate to source leak current	I_{GSS}	—	—	±10	µA	V_{GS} = ±16 V, V_{DS} = 0
Zero gate voltage drain current	I_{DSS}	—	—	–1	µA	V_{DS} = –60 V, V_{GS} = 0
Gate to source cutoff voltage	$V_{GS(off)}$	–1.0	—	–2.5	V	V_{DS} = –10 V, I_D = –1 mA
Static drain to source on state resistance	$R_{DS(on)}$	—	60	76	mΩ	I_D = –2.5 A, V_{GS} = –10 V Note5
	$R_{DS(on)}$	—	90	130	mΩ	I_D = –2.5 A, V_{GS} = – 4.5 V Note5
Forward transfer admittance	$\|y_{fs}\|$	3	5	—	S	I_D = –2.5 A, V_{DS} = –10 V Note5
Input capacitance	Ciss	—	1350	—	pF	V_{DS} = –10 V
Output capacitance	Coss	—	135	—	pF	V_{GS} = 0
Reverse transfer capacitance	Crss	—	85	—	pF	f = 1 MHz
Turn-on delay time	$t_{d(on)}$	—	20	—	ns	V_{GS} = –10 V, I_D = –2.5 A
Rise time	t_r	—	15	—	ns	V_{DD} ≈ –30 V
Turn-off delay time	$t_{d(off)}$	—	55	—	ns	R_L = 12 Ω
Fall time	t_f	—	10	—	ns	R_g = 4.7 Ω
Body–drain diode forward voltage	V_{DF}	—	-0.85	-1.10	V	IF = –5 A, V_{GS} = 0 Note5
Body–drain diode reverse recovery time	t_{rr}	—	50	—	ns	IF = –5 A, V_{GS} = 0 diF/ dt = 100 A/µs

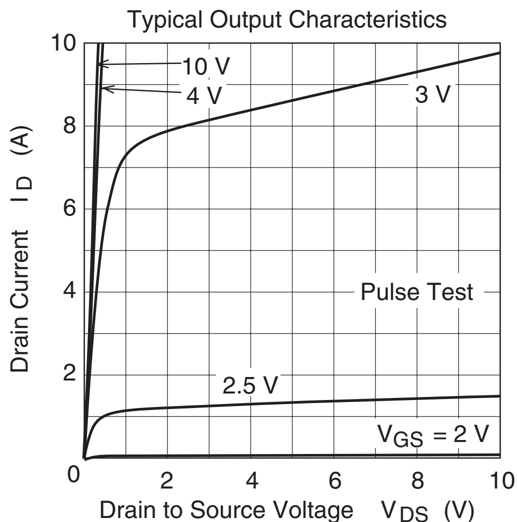
Notes: 5. Pulse test

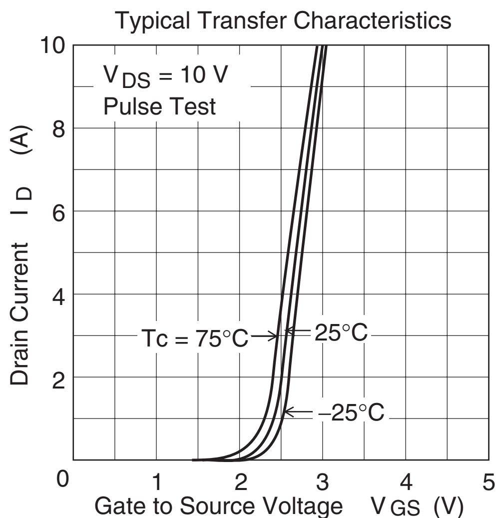
Main Charactristice

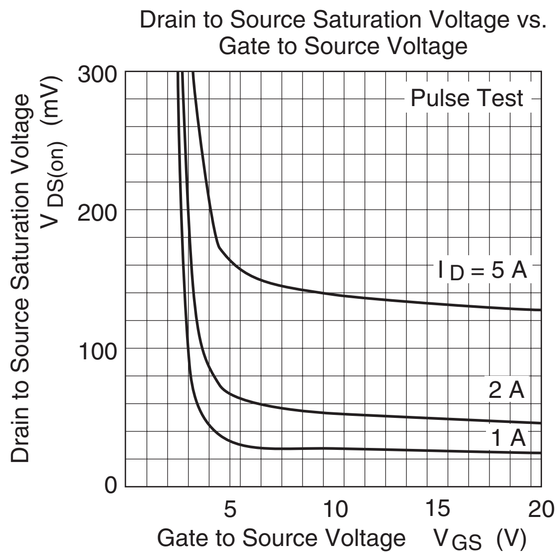
• N Channel

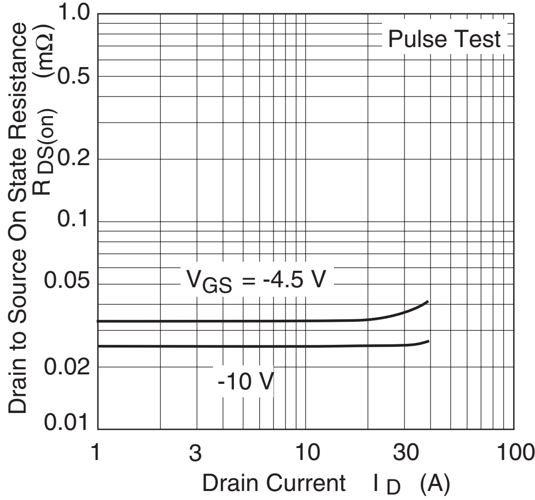


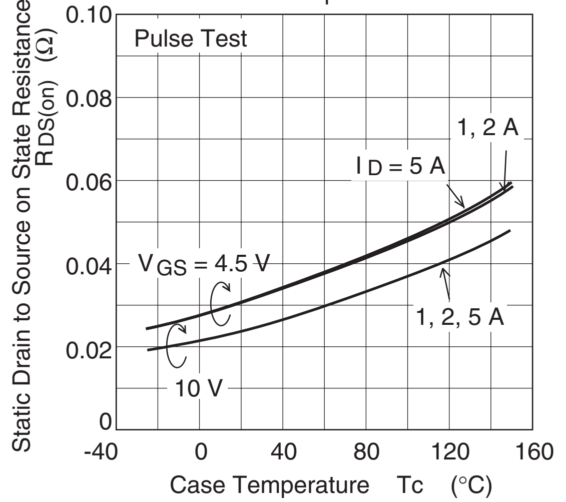
Note 5 :
When using the glass epoxy board (FR4 40 x 40 x 1.6 mm)

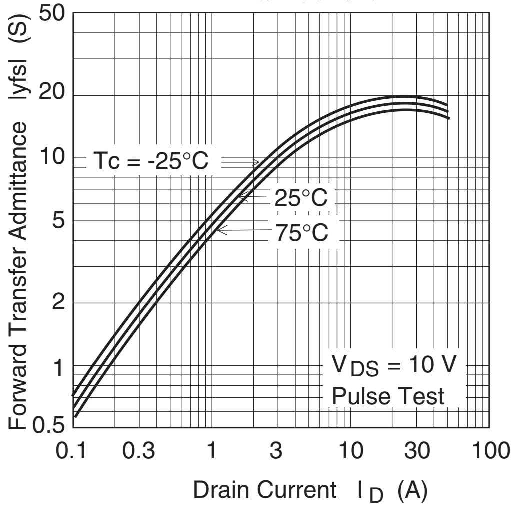


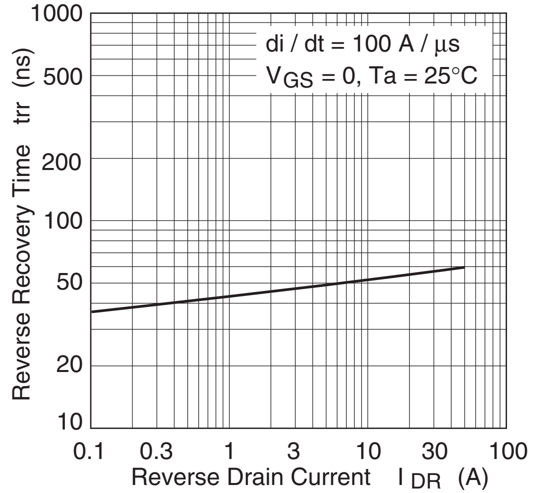












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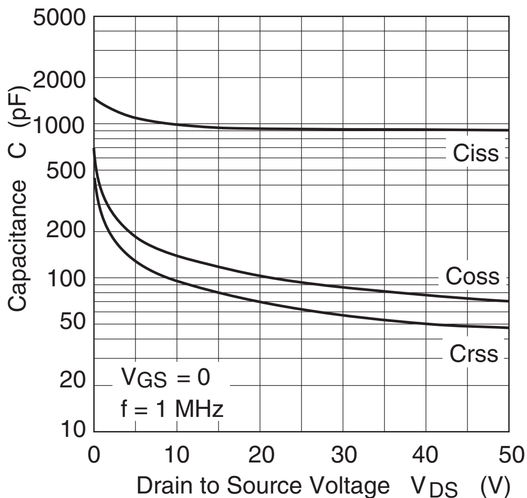
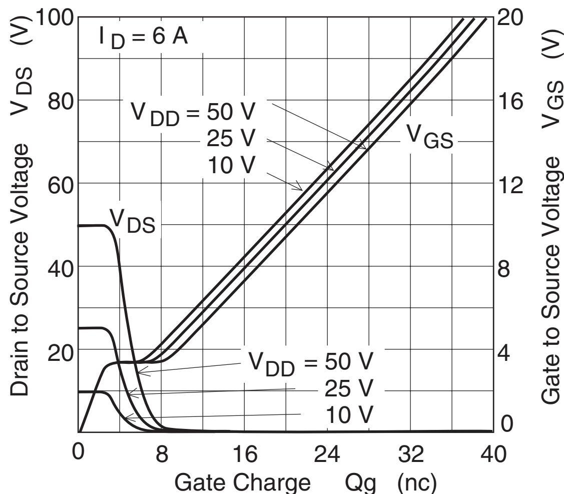
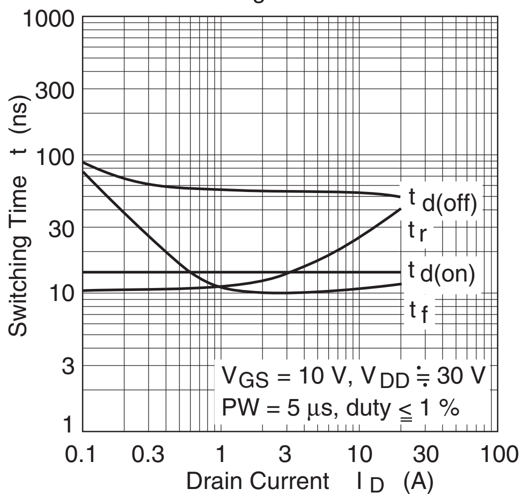
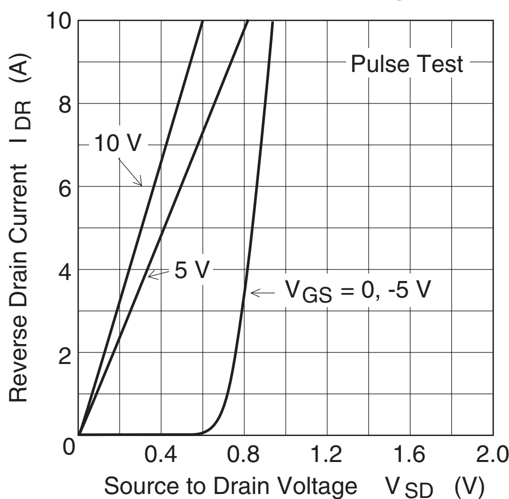
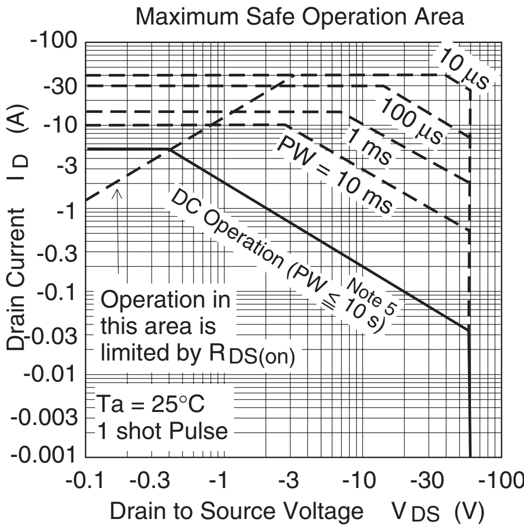

Typical Capacitance vs.
Drain to Source Voltage
Capacitance C (pF)
5000
2000
1000
500
200
100
50
20
10
Ciss
Coss
Crss
VGS = 0
f = 1 MHz
0
10
20
30
40
50
Drain to Source Voltage VDS (V)


Dynamic Input Characteristics
Drain to Source Voltage VDS (V)
Gate to Source Voltage VGS (V)
I D = 6 A
VDD = 50 V
25 V
10 V
VGS
VDS
VDD = 50 V
25 V
10 V
100
80
60
40
20
20
16
12
8
4
0
0
8
16
24
32
40
Gate Charge Qg (nc)

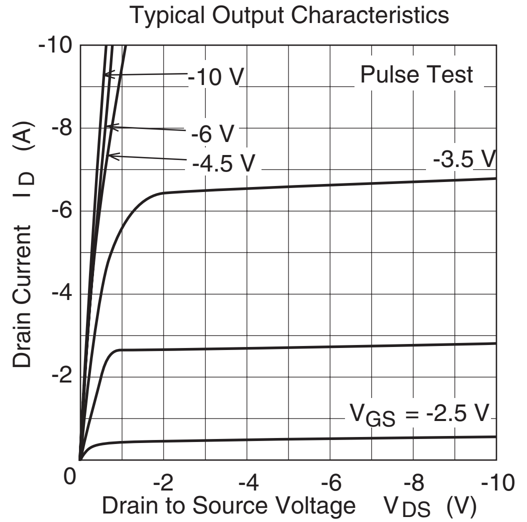

Switching Characteristics
Switching Time t (ns)
1000
300
100
30
10
3
1
t d(off)
t r
t d(on)
t f
VGS = 10 V, VDD ≒ 30 V
PW = 5 µs, duty ≦ 1 %
0.1
0.3
1
3
10
30
100
Drain Current I D (A)

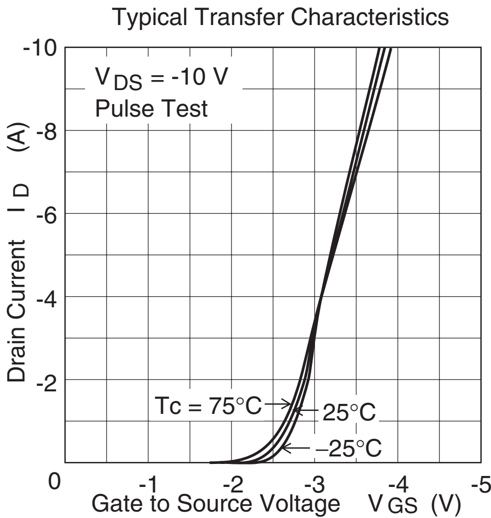

Reverse Drain Current vs.
Source to Drain Voltage
Reverse Drain Current I DR (A)
10
8
6
4
2
0
Pulse Test
10 V
5 V
VGS = 0, -5 V
0.4
0.8
1.2
1.6
2.0
Source to Drain Voltage VSD (V)

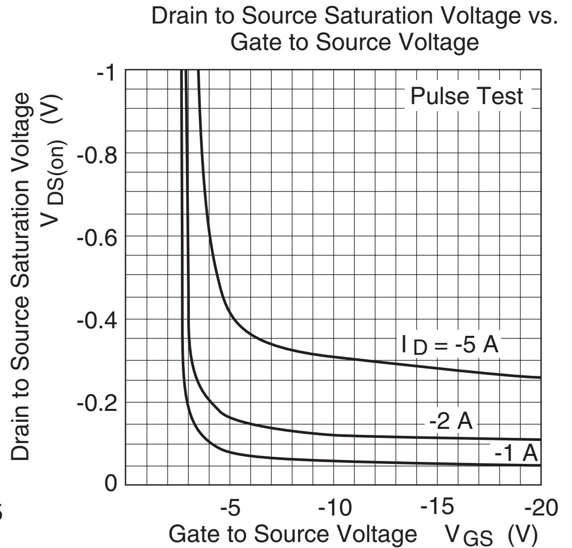
• **P Channel**



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







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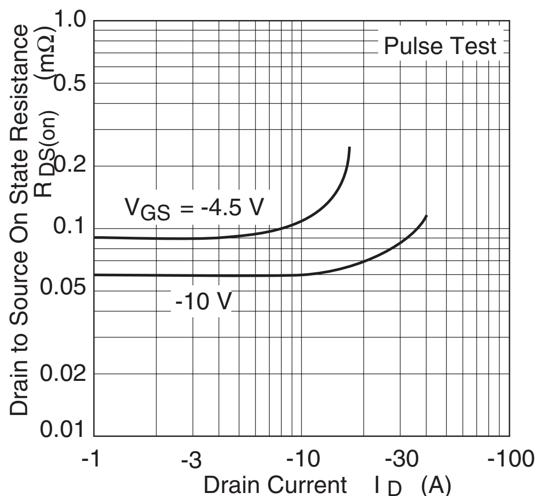
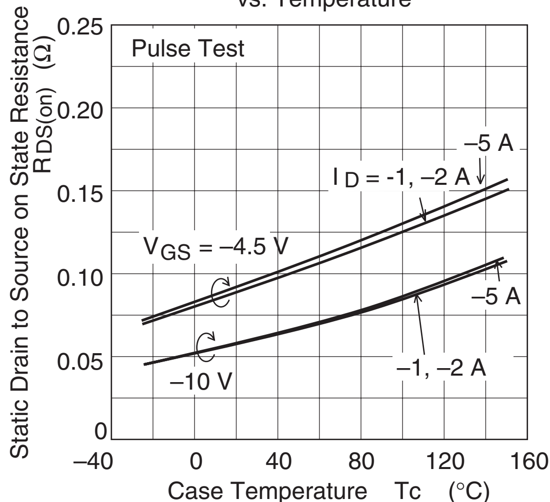
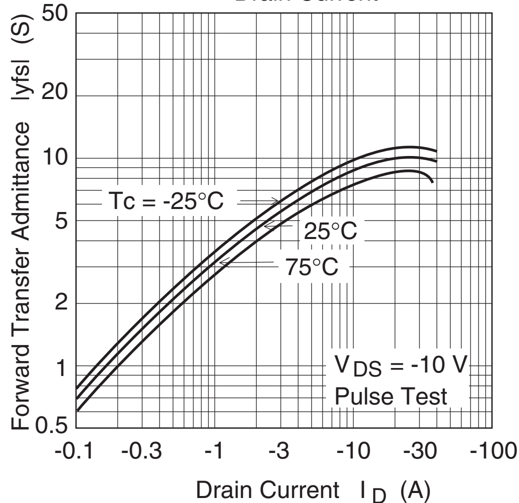
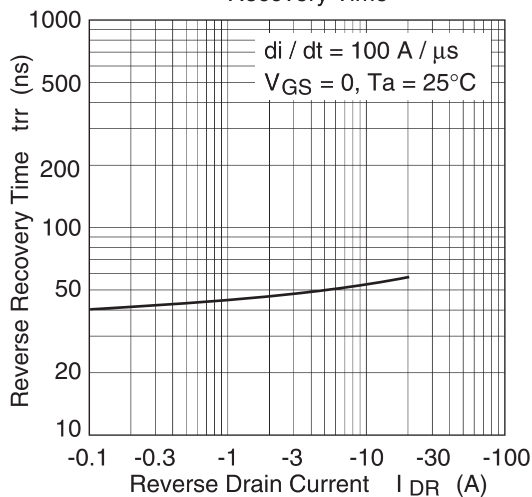
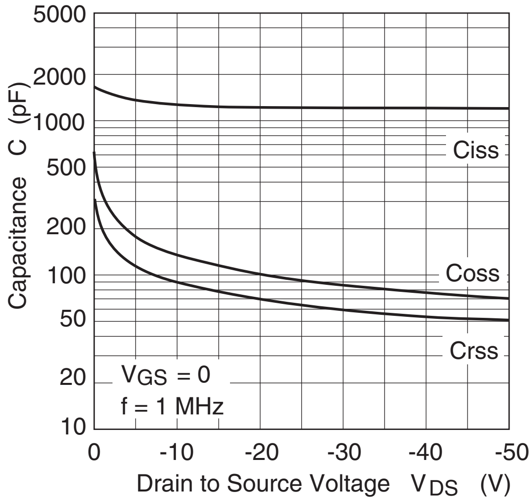
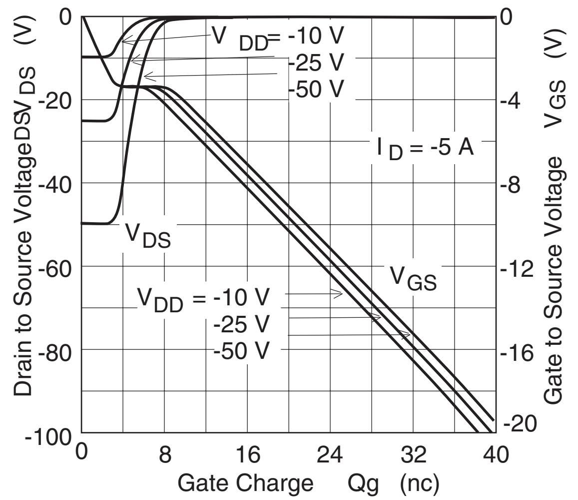

Static Drain to Source on State Resistance
vs. Drain Current
Drain to Source On State Resistance
R DS(on) (mΩ)
Pulse Test
V GS = -4.5 V
-10 V
1.0
0.5
0.2
0.1
0.05
0.02
0.01
-1
-3
-10
-30
-100
Drain Current I D (A)

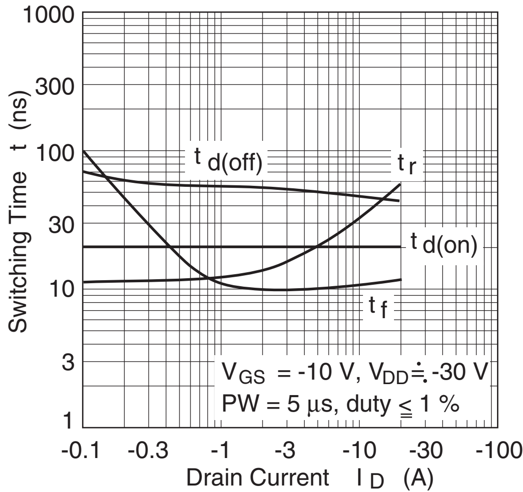

Static Drain to Source on State Resistance
vs. Temperature
Static Drain to Source on State Resistance
R DS(on) (Ω)
Pulse Test
–5 A
I D = -1, –2 A
V GS = –4.5 V
–5 A
–1, –2 A
–10 V
0.25
0.20
0.15
0.10
0.05
0
–40
0
40
80
120
160
Case Temperature Tc (°C)

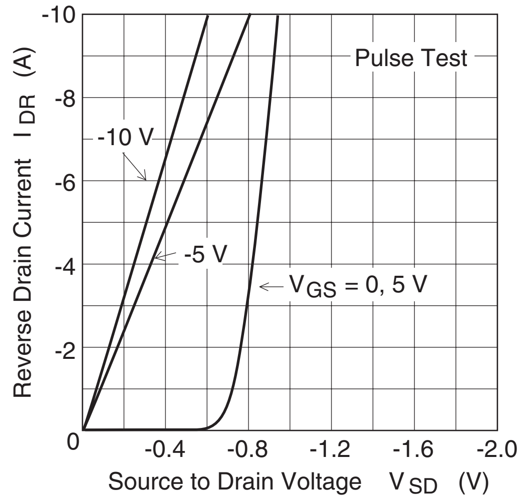

Forward Transfer Admittance vs.
Drain Current
Forward Transfer Admittance |yfs| (S)
Tc = -25°C
25°C
75°C
V DS = -10 V
Pulse Test
50
20
10
5
2
1
0.5
-0.1
-0.3
-1
-3
-10
-30
-100
Drain Current I D (A)

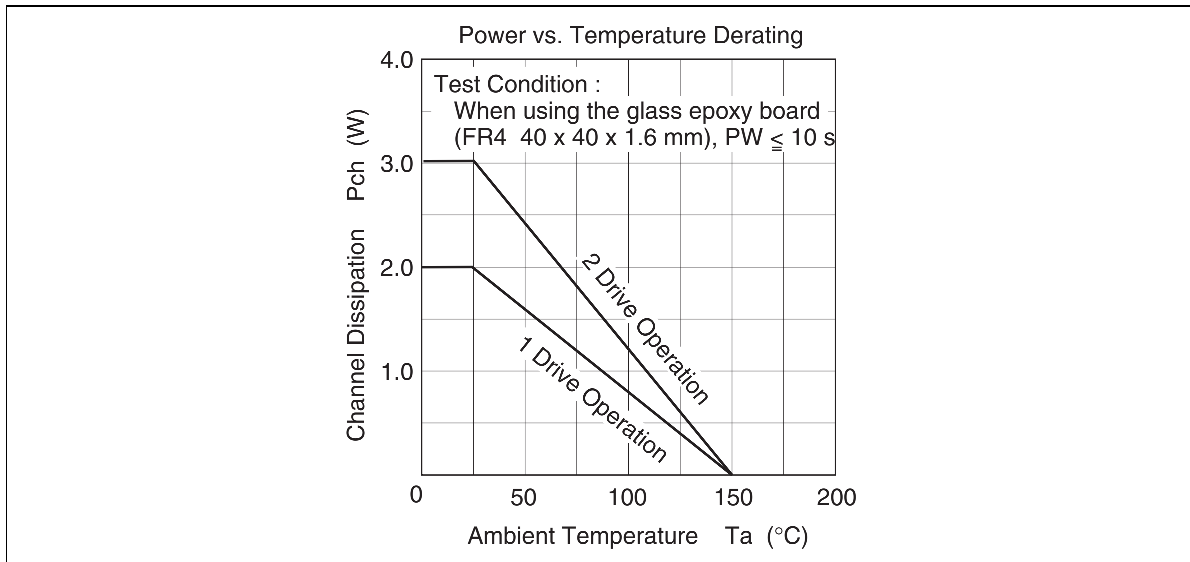

Body-Drain Diode Reverse
Recovery Time
Reverse Recovery Time trr (ns)
di / dt = 100 A / µs
V GS = 0, Ta = 25°C
1000
500
200
100
50
20
10
-0.1
-0.3
-1
-3
-10
-30
-100
Reverse Drain Current I DR (A)


Typical Capacitance vs.
Drain to Source Voltage
Capacitance C (pF)
Drain to Source Voltage V DS (V)
Ciss
Coss
Crss
VGS = 0
f = 1 MHz
5000
2000
1000
500
200
100
50
20
10
0
-10
-20
-30
-40
-50


Dynamic Input Characteristics
Drain to Source Voltage VDS (V)
Gate to Source Voltage VGS (V)
Gate Charge Qg (nc)
V DD = -10 V
-25 V
-50 V
I D = -5 A
VDS
VGS
VDD = -10 V
-25 V
-50 V
0
-20
-40
-60
-80
-100
0
-4
-8
-12
-16
-20
0
8
16
24
32
40


Switching Characteristics
Switching Time t (ns)
Drain Current I D (A)
t d(off)
t r
t d(on)
t f
VGS = -10 V, VDD ≒ -30 V
PW = 5 µs, duty ≦ 1 %
1000
300
100
30
10
3
1
-0.1
-0.3
-1
-3
-10
-30
-100


Reverse Drain Current vs.
Source to Drain Voltage
Reverse Drain Current I DR (A)
Source to Drain Voltage V SD (V)
Pulse Test
-10 V
-5 V
VGS = 0, 5 V
-10
-8
-6
-4
-2
0
-0.4
-0.8
-1.2
-1.6
-2.0



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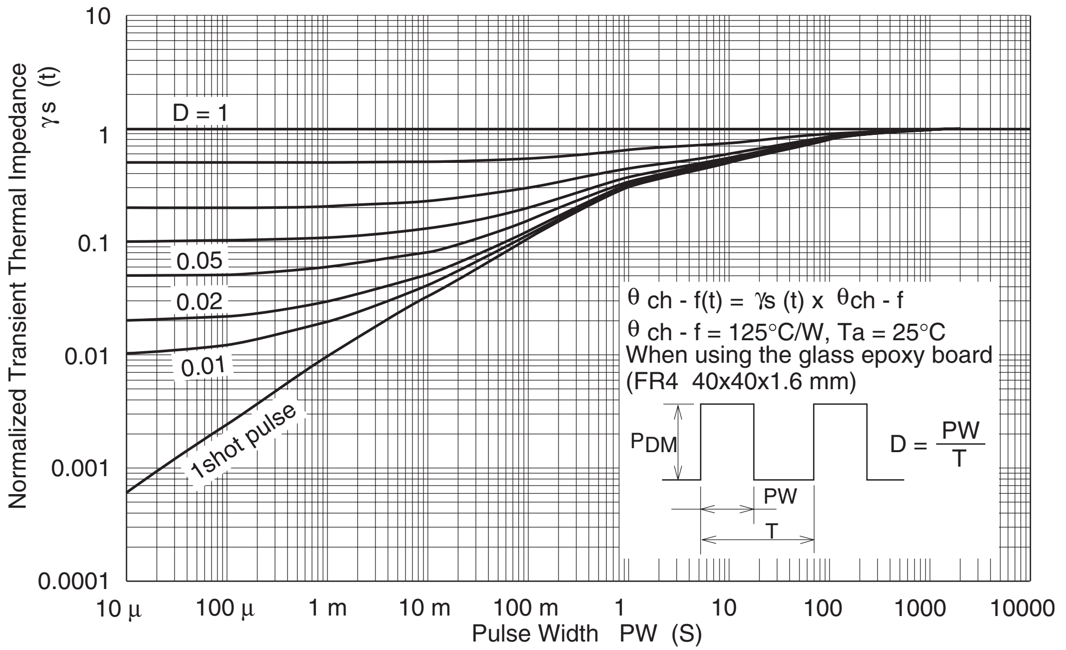
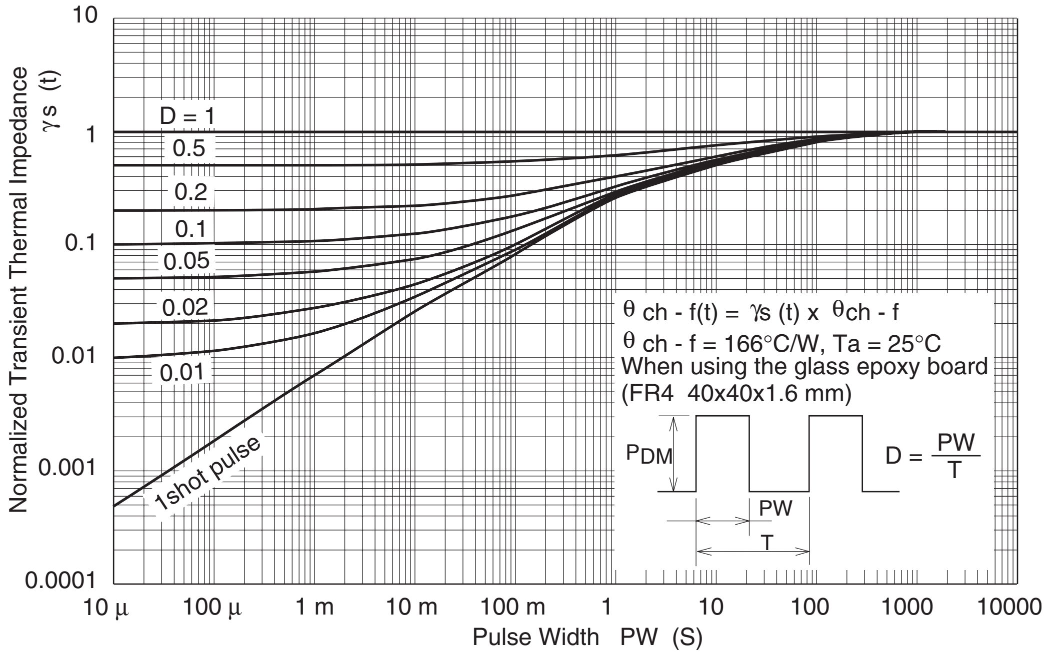
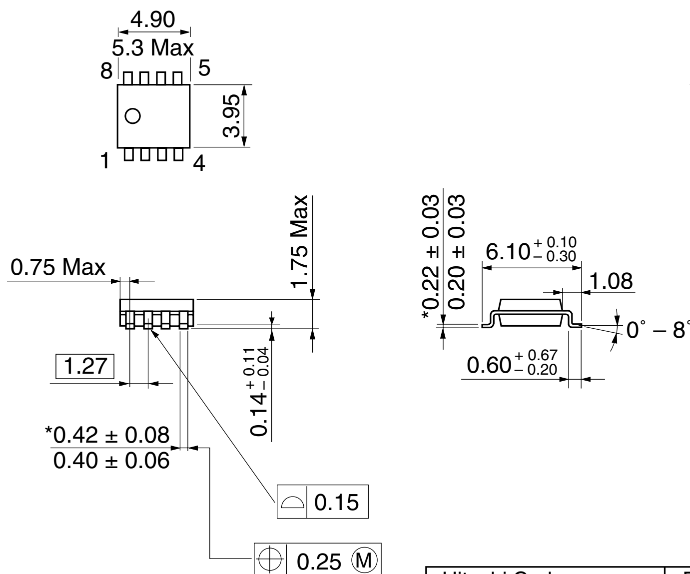


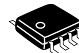


RENESAS

Package Dimensions

As of January, 2002
Unit: mm





Hitachi Code	FP-8DA
JEDEC	Conforms
JEITA	—
Mass (reference value)	0.085 g

*Dimension including the plating thickness
Base material dimension

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