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

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HAT2126RP

Silicon N Channel Power MOS FET with Schottky Barrier Diode
High Speed Power Switching

RENESAS

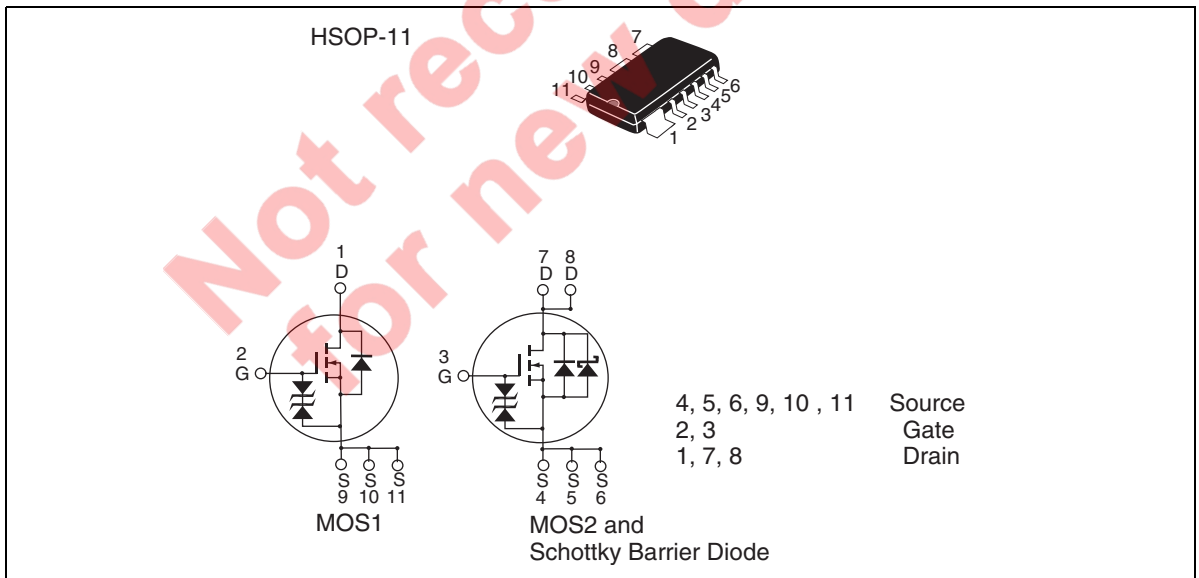
ADE-208-1576D (Z)

5th. Edition
Dec. 2002

Features

- Low on-resistance
- Capable of 4.5 V gate drive
- High density mounting
- Built-in Schottky Barrier Diode

Outline



Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings		Unit
		MOS1	MOS2 & SBD	
Drain to source voltage	V_{DSS}	30	30	V
Gate to source voltage	V_{GSS}	±20	±12	V
Drain current	I_D	12	16	A
Drain peak current	$I_{D(pulse)}$ ^{Note1}	96	128	A
Reverse drain current	I_{DR}	12	16	A
Channel dissipation	Pch ^{Note2}	2.0	3.5	W
Channel temperature	Tch	150	150	°C
Storage temperature	Tstg	-55 to +150	-55 to +150	°C

Notes: 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), $PW \leq 10s$

Not recommended
for new design

Electrical Characteristics

(Ta = 25°C)

• MOS1

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}	—	—	1	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	$R_{DS(on)}$	—	10	13	$\text{m}\Omega$	$I_D = 6\text{A}$, $V_{GS} = 10\text{V}$ ^{Note3}
	$R_{DS(on)}$	—	18	27	$\text{m}\Omega$	$I_D = 6\text{A}$, $V_{GS} = 4.5\text{V}$ ^{Note3}
Forward transfer admittance	$ y_{fs} $	12	20	—	S	$I_D = 6\text{A}$, $V_{DS} = 10\text{V}$ ^{Note3}
Input capacitance	Ciss	—	1000	—	pF	$V_{DS} = 10\text{V}$
Output capacitance	Coss	—	280	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	Crss	—	160	—	pF	$f = 1\text{MHz}$
Total gate charge	Qg	—	9	—	nc	$V_{DD} = 10\text{V}$
Gate to source charge	Qgs	—	3.6	—	nc	$V_{GS} = 5\text{V}$
Gate to drain charge	Qgd	—	3.2	—	nc	$I_D = 16\text{A}$
Turn-on delay time	$t_{d(on)}$	—	12	—	ns	$V_{GS} = 10\text{V}$, $I_D = 6\text{A}$
Rise time	t_r	—	22	—	ns	$V_{DD} \approx 10\text{V}$
Turn-off delay time	$t_{d(off)}$	—	55	—	ns	$R_L = 1.67\Omega$
Fall time	t_f	—	9	—	ns	$R_g = 4.7\Omega$
Body-drain diode forward voltage	V_{DF}	—	0.82	1.07	V	$I_F = 12\text{A}$, $V_{GS} = 0$ ^{Note3}
Body-drain diode reverse recovery time	t_{rr}	—	25	—	ns	$I_F = 12\text{A}$, $V_{GS} = 0$ $diF/dt = 50\text{A}/\mu\text{s}$

Notes: 3. Pulse test

HAT2126RP

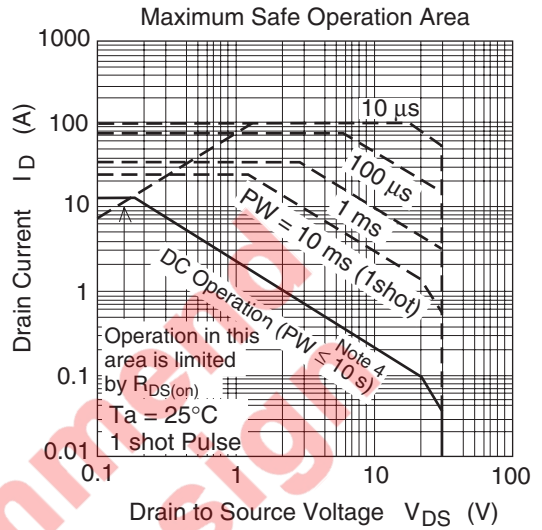
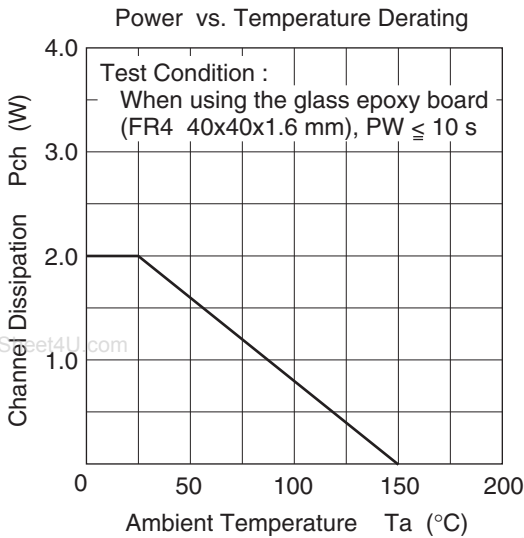
• MOS2 & Schottky Barrier Diode

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	$V_{(BR)GSS}$	± 12	—	—	V	$I_G = \pm 100\mu\text{A}, V_{DS} = 0$
Gate to source leak current	I_{GSS}	—	—	± 10	μA	$V_{GS} = \pm 10\text{V}, V_{DS} = 0$
Zero gate voltage drain current	I_{DSS}	—	—	1	m A	$V_{DS} = 30\text{V}, V_{GS} = 0$
Gate to source cutoff voltage	$V_{GS(off)}$	1.4	—	2.5	V	$V_{DS} = 10\text{V}, I_D = 1\text{mA}$
Static drain to source on state resistance	$R_{DS(on)}$	—	5.6	7.3	$\text{m}\Omega$	$I_D = 8\text{A}, V_{GS} = 10\text{V}$ ^{Note3}
	$R_{DS(on)}$	—	7.3	9.5	$\text{m}\Omega$	$I_D = 8\text{A}, V_{GS} = 4.5\text{V}$ ^{Note3}
Forward transfer admittance	$ y_{fs} $	25	41	—	S	$I_D = 8\text{A}, V_{DS} = 10\text{V}$ ^{Note3}
Input capacitance	Ciss	—	3800	—	pF	$V_{DS} = 10\text{V}$
Output capacitance	Coss	—	745	—	pF	$V_{GS} = 0$
Reverse transfer capacitance	Crss	—	300	—	pF	$f = 1\text{MHz}$
Total gate charge	Qg	—	34	—	nc	$V_{DD} = 10\text{V}$
Gate to source charge	Qgs	—	10	—	nc	$V_{GS} = 5\text{V}$
Gate to drain charge	Qgd	—	8	—	nc	$I_D = 16\text{A}$
Turn-on delay time	$t_{d(on)}$	—	18	—	ns	$V_{GS} = 10\text{V}, I_D = 8\text{A}$
Rise time	t_r	—	22	—	ns	$V_{DD} \approx 10\text{V}$
Turn-off delay time	$t_{d(off)}$	—	88	—	ns	$R_L = 1.25\Omega$
Fall time	t_f	—	9.0	—	ns	$R_g = 4.7\Omega$
Schottky Barrier diode forward voltage	V_F	—	0.5	—	V	$I_F = 3.5\text{A}, V_{GS} = 0$ ^{Note3}
Body-drain diode reverse recovery time	t_{rr}	—	35	—	ns	$I_F = 16\text{A}, V_{GS} = 0$ $diF/dt = 50\text{A}/\mu\text{s}$

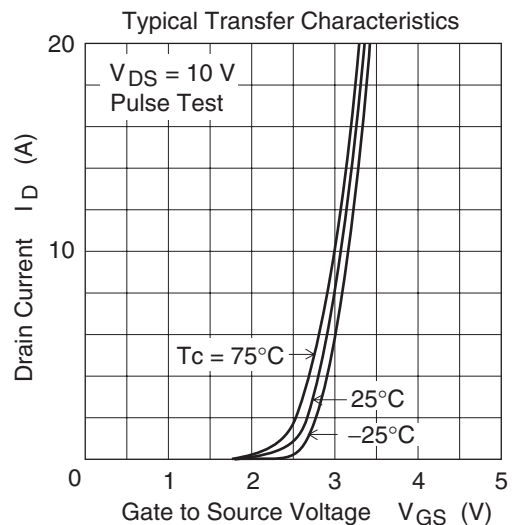
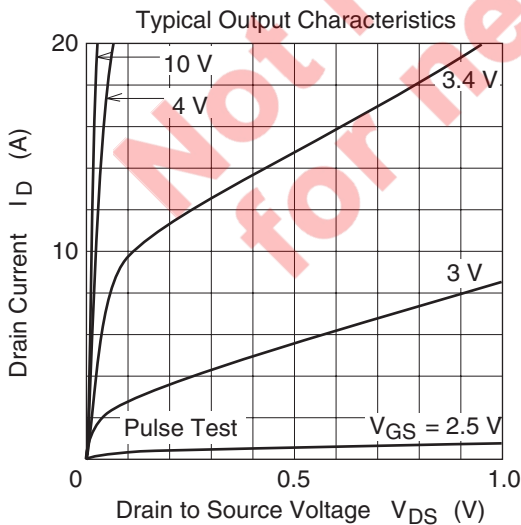
Notes: 3. Pulse test

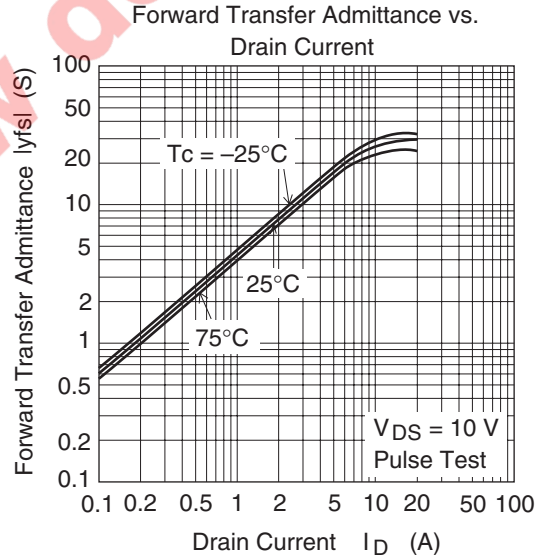
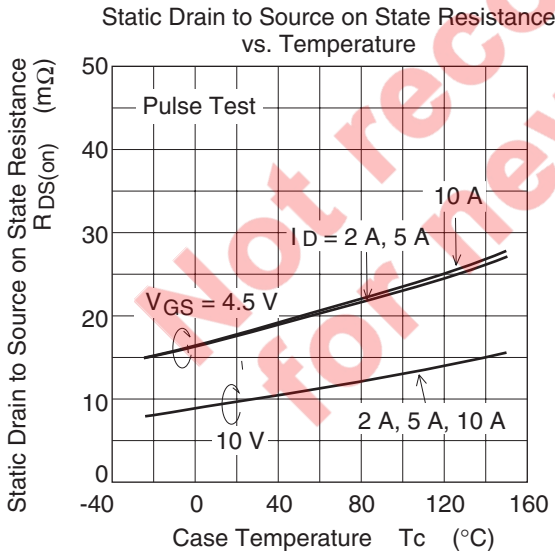
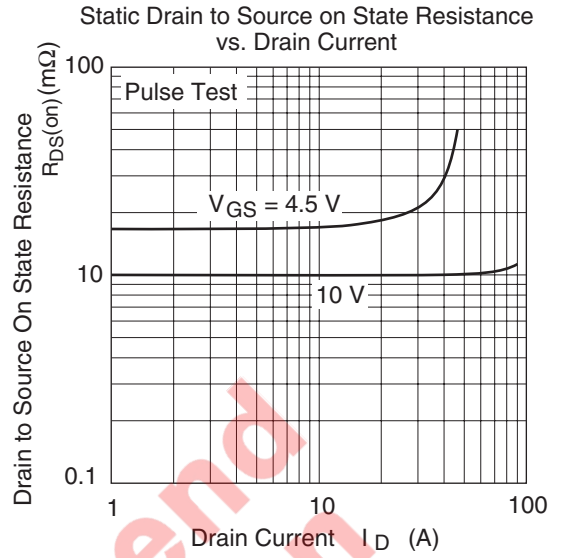
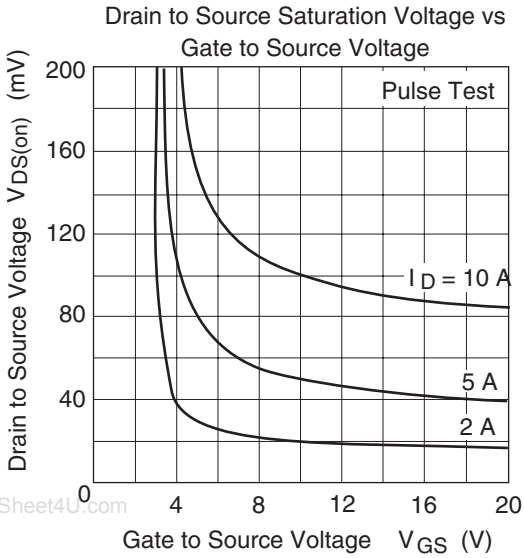
Main Characteristics

• MOS1

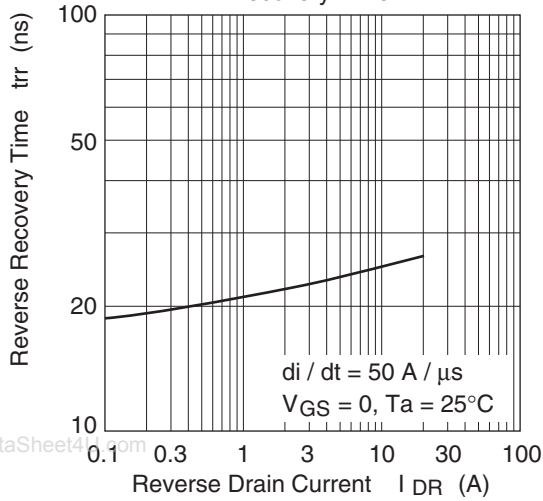


Note 4 :
When using the glass epoxy board (FR4 40x40x1.6 mm)

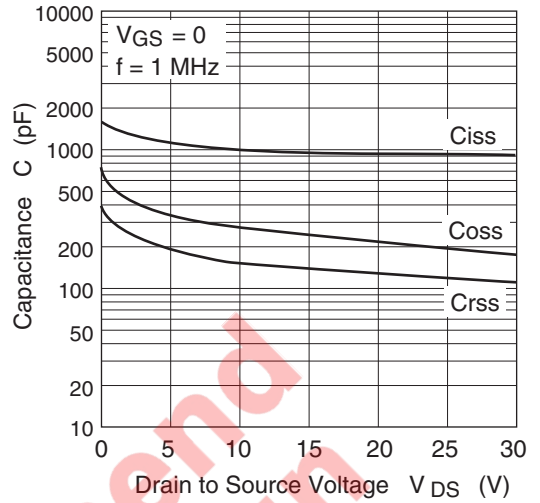




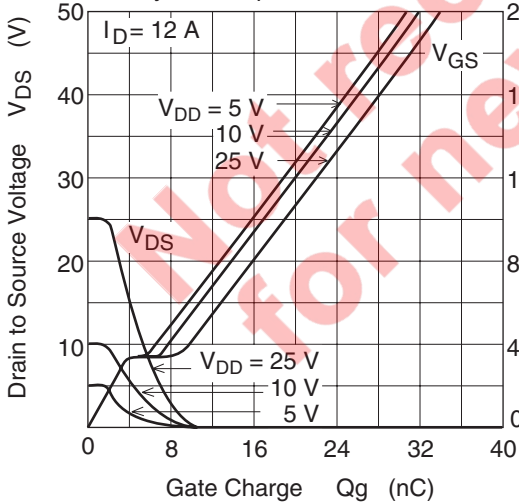
Body-Drain Diode Reverse Recovery Time



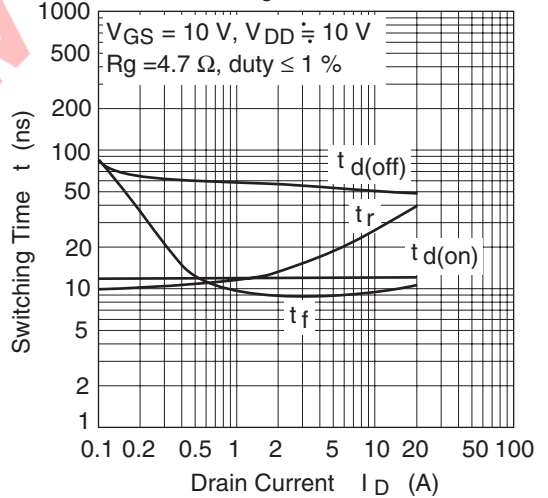
Typical Capacitance vs. Drain to Source Voltage

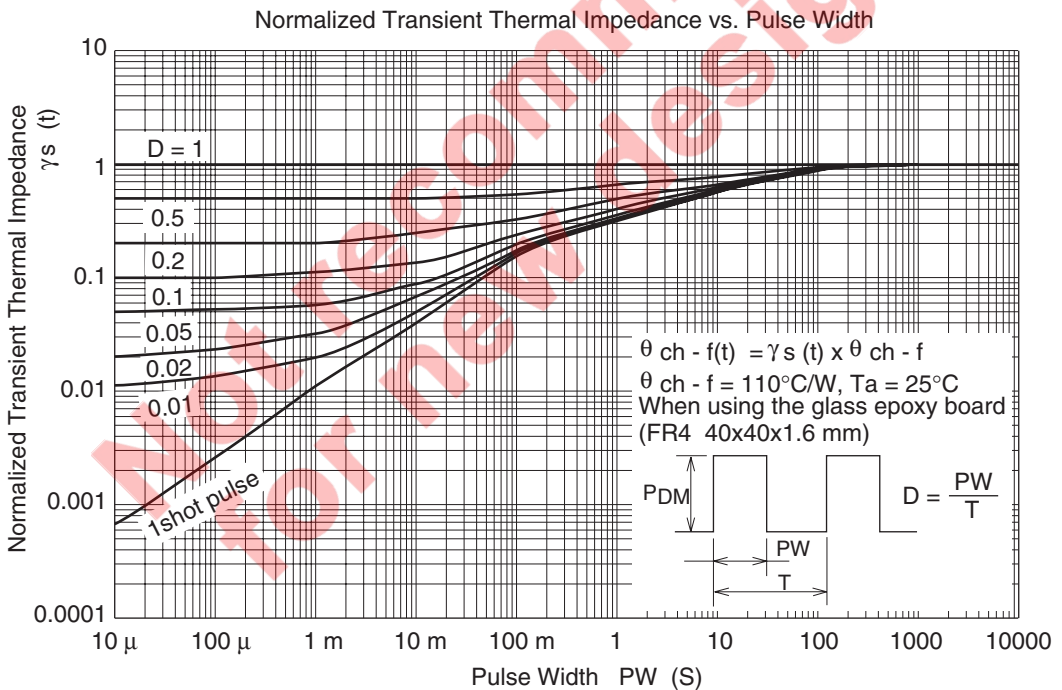
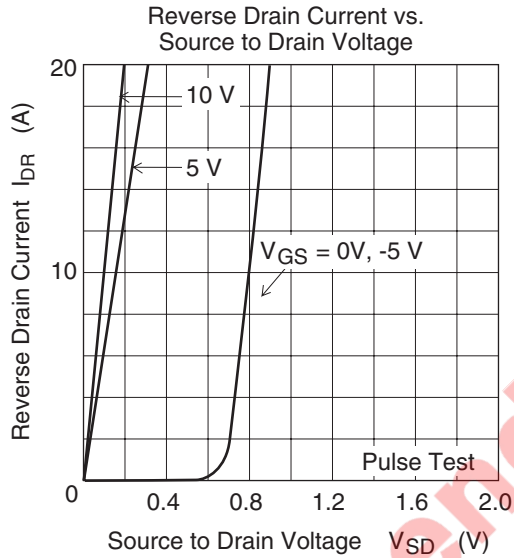


Dynamic Input Characteristics

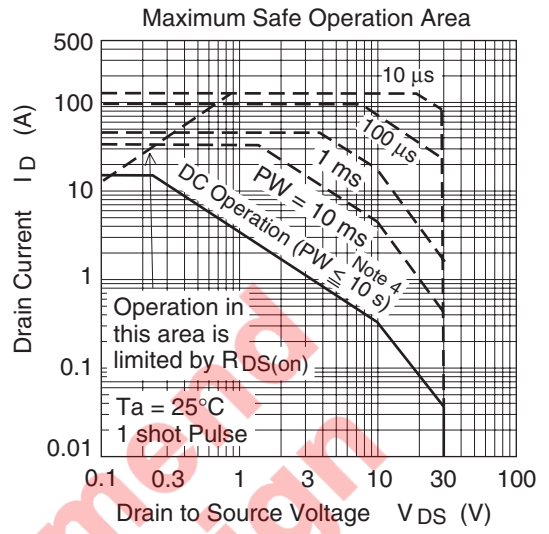
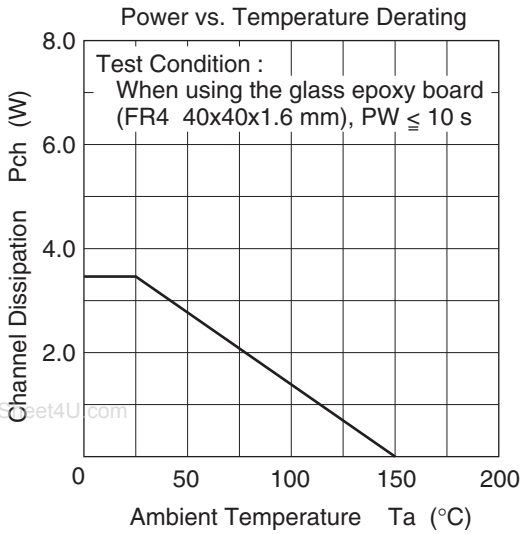


Switching Characteristics

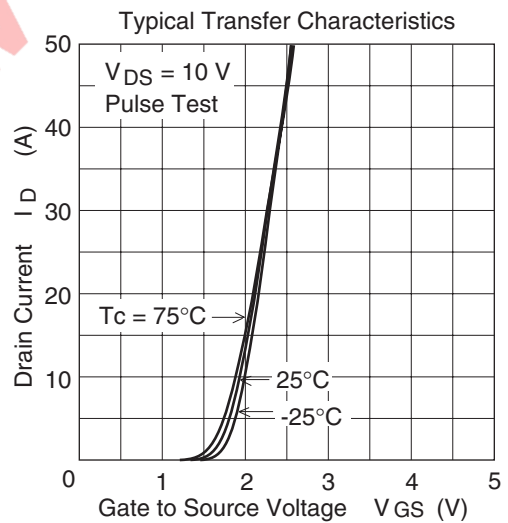
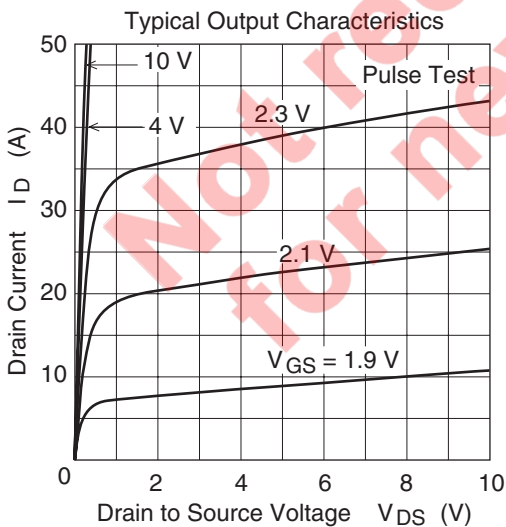


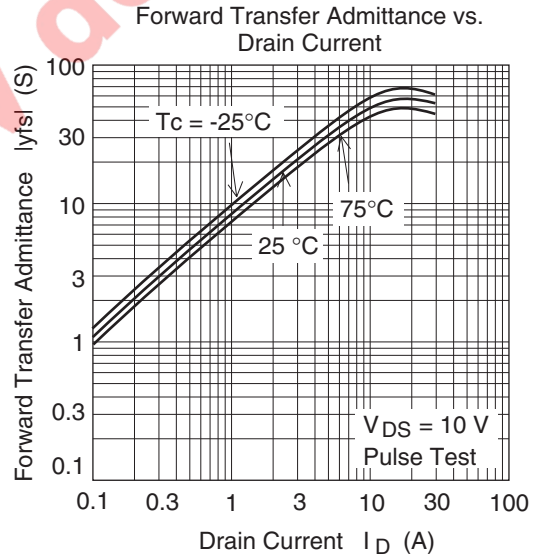
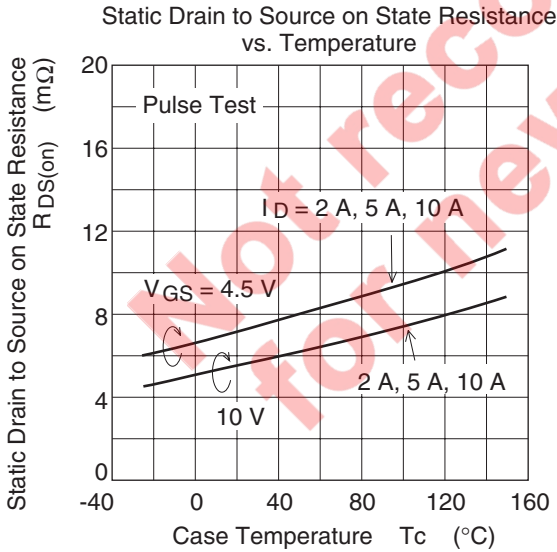
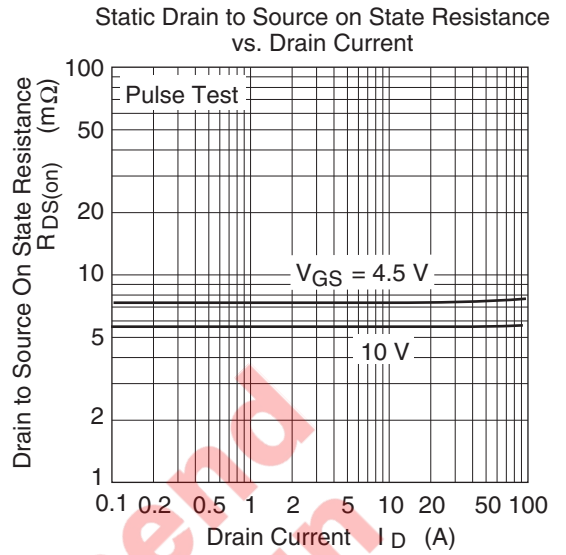
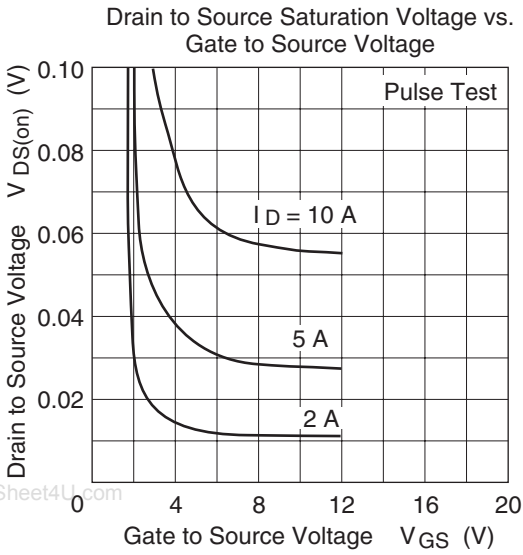


• MOS2 & Schottky Barrier Diode

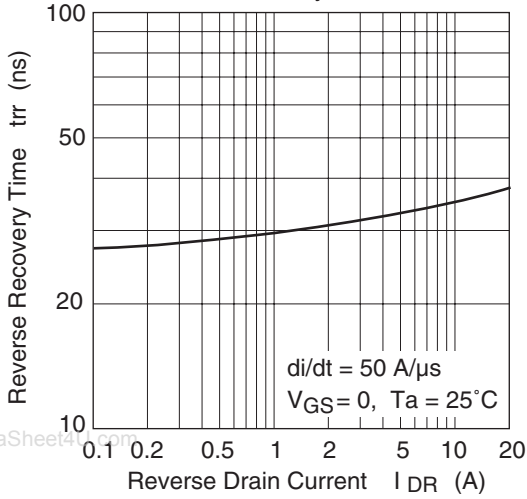


Note 4 :
When using the glass epoxy board (FR4 40x40x1.6 mm)

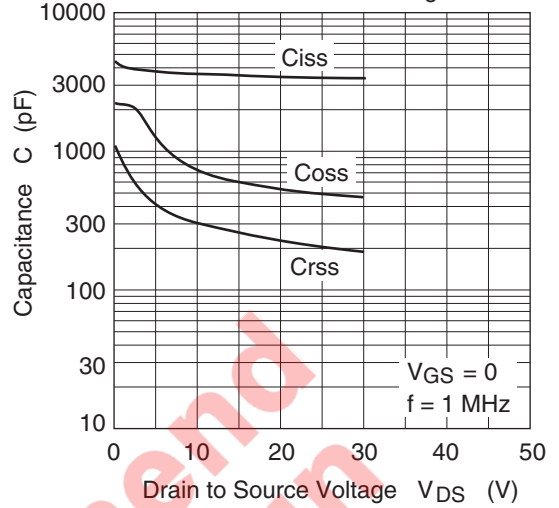




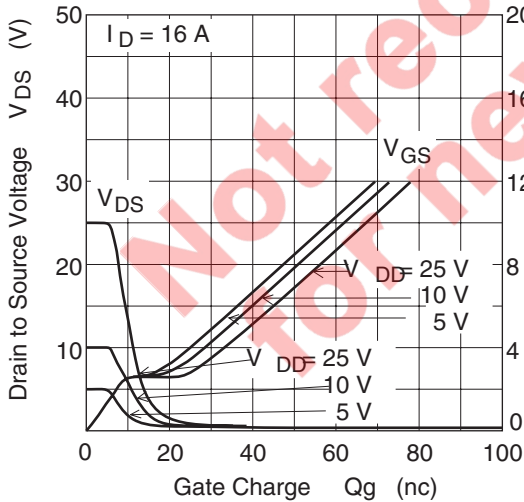
Body - Drain Diode Reverse Recovery Time



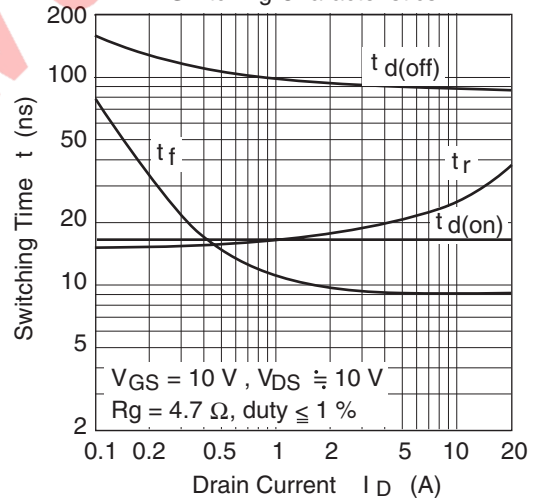
Typical Capacitance vs. Drain to Source Voltage

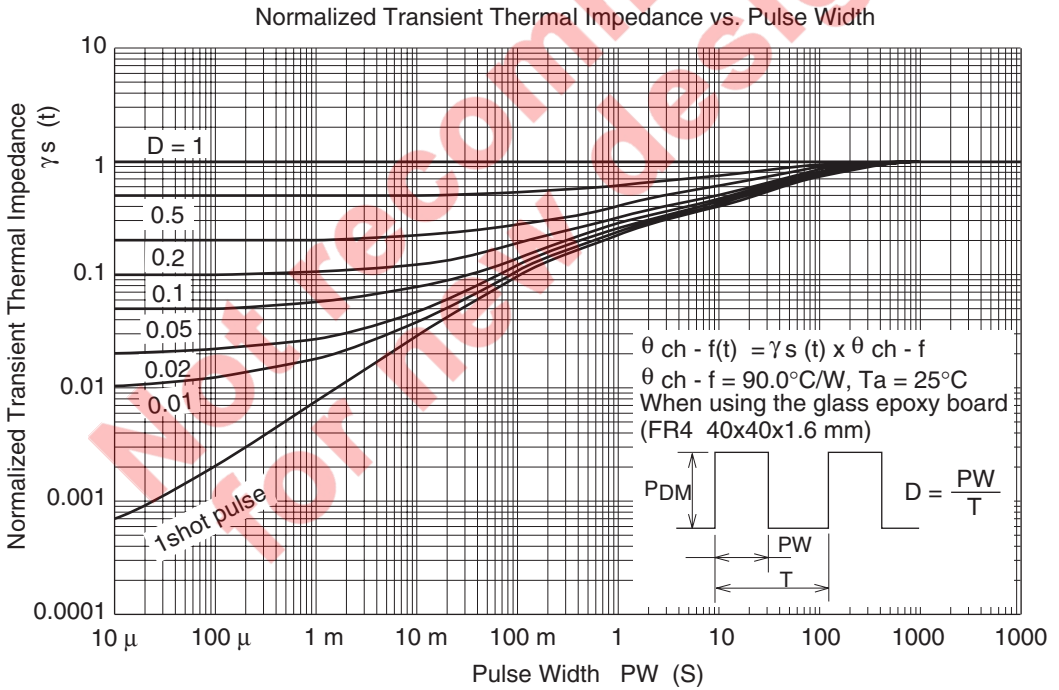
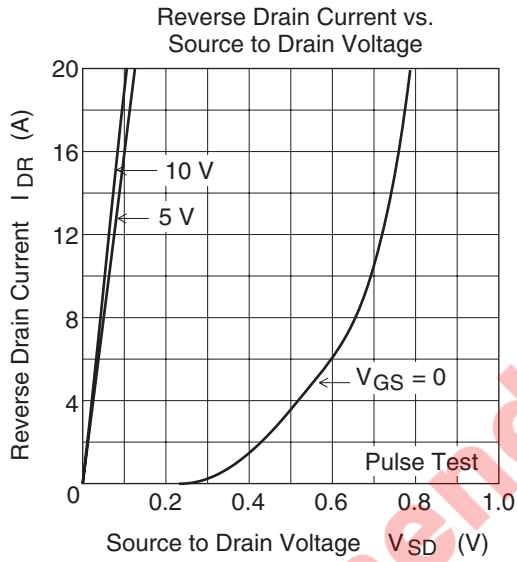


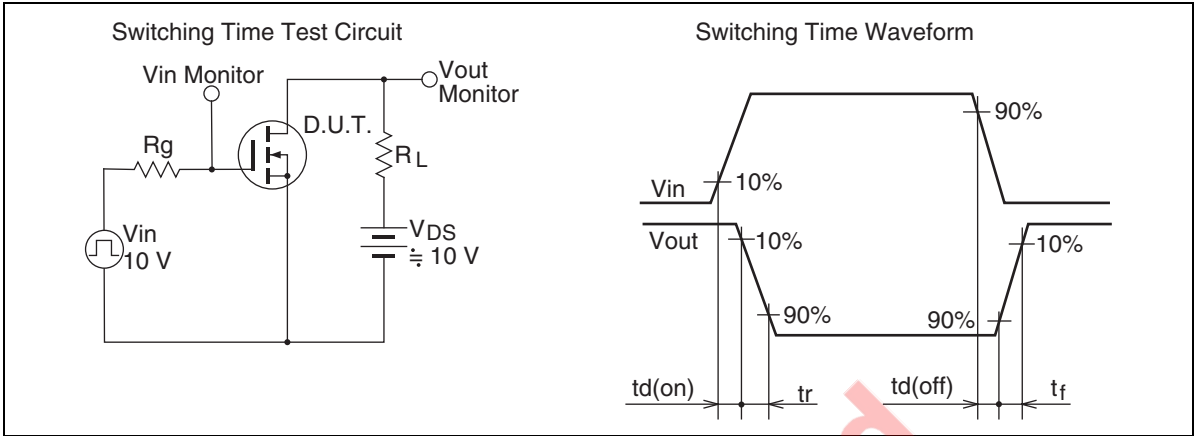
Dynamic Input Characteristics



Switching Characteristics



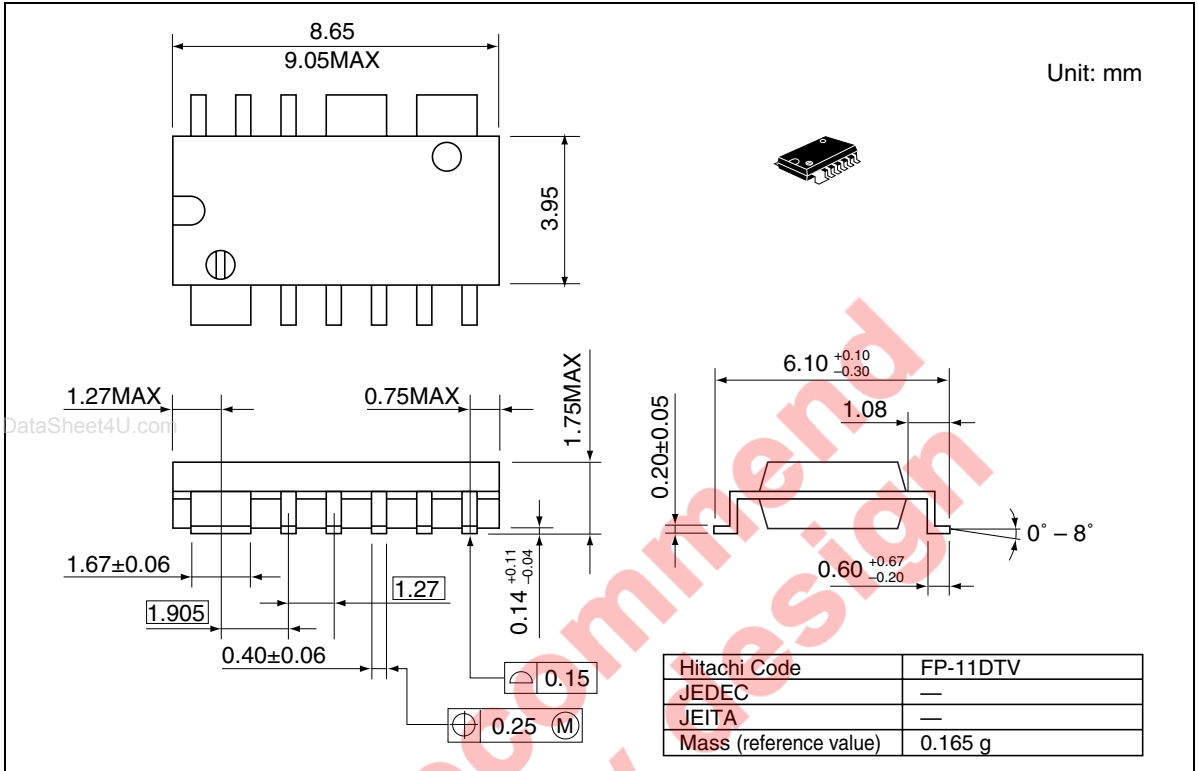




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Not recommended for new design

Package Dimensions



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