

To our customers,

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## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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N-CHANNEL MOS FIELD EFFECT TRANSISTOR  
FOR SWITCHING

DESCRIPTION

The  $\mu$ PA2451 is a switching device which can be driven directly by a 2.5 V power source.

This device features a low on-state resistance and excellent switching characteristics, and is suitable for applications such as power switch of portable machine and so on.

FEATURES

- 2.5 V drive available
- Low on-state resistance  
 $R_{DS(on)1} = 20 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 4.0 \text{ A)}$   
 $R_{DS(on)2} = 21 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.0 \text{ V, } I_D = 4.0 \text{ A)}$   
 $R_{DS(on)3} = 25 \text{ m}\Omega \text{ MAX. (} V_{GS} = 3.1 \text{ V, } I_D = 4.0 \text{ A)}$   
 $R_{DS(on)4} = 32 \text{ m}\Omega \text{ MAX. (} V_{GS} = 2.5 \text{ V, } I_D = 4.0 \text{ A)}$
- Built-in G-S protection diode against ESD

ORDERING INFORMATION

PART NUMBER	PACKAGE
$\mu$ PA2451TL	6PIN HWSON (4521)

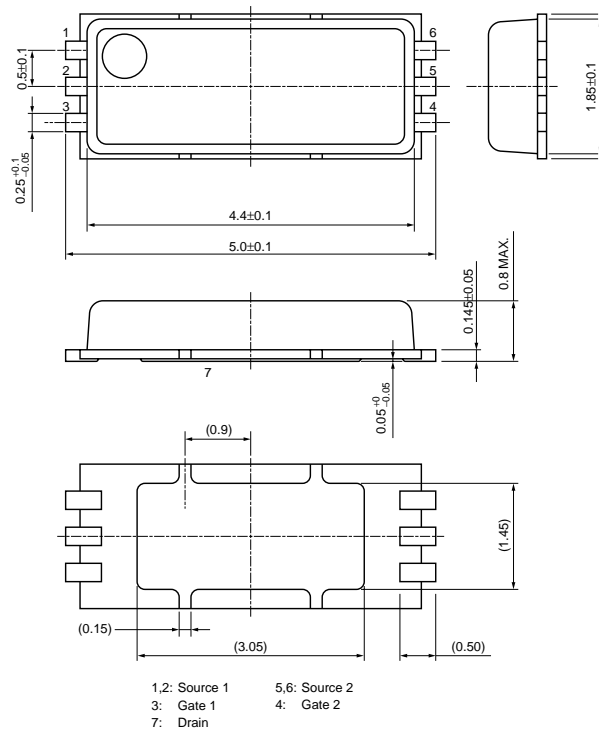
ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	30	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 12$	V
Drain Current (DC) ( $T_A = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 8.2$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 80$	A
Total Power Dissipation (2unit) <sup>Note2</sup>	$P_{T1}$	2.5	W
Total Power Dissipation (2unit) <sup>Note3</sup>	$P_{T2}$	0.7	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

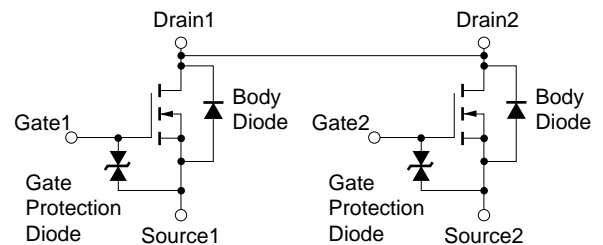
- Notes 1.  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$   
 2.  $T_A = 25^\circ\text{C}$  Mounted on ceramic board  
 3.  $T_A = 25^\circ\text{C}$  Mounted on FR4 board

**Remark** The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

PACKAGE DRAWING (Unit : mm)



EQUIVALENT CIRCUIT

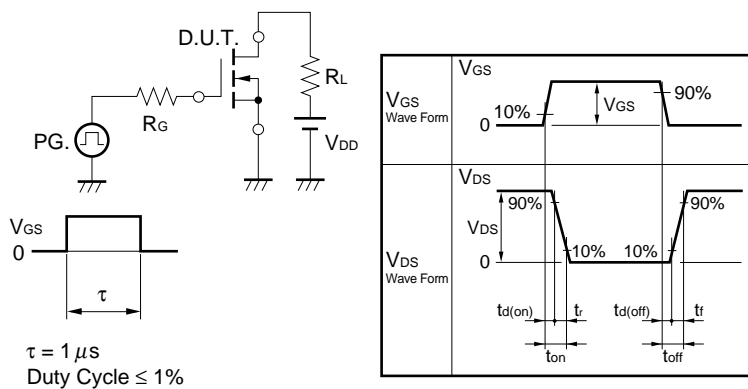


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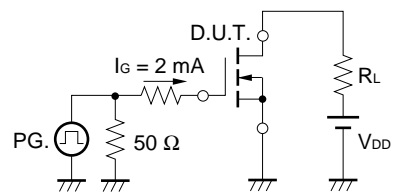
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			10	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±12 V, V <sub>DS</sub> = 0 V			±10	μA
Gate Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1.0 mA	0.5	1.0	1.5	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 4.0 A	5.0			S
Drain to Source On-state Resistance	R <sub>DS(on)1</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 4.0 A	12	16	20	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 4.0 A	12.5	16.5	21	mΩ
	R <sub>DS(on)3</sub>	V <sub>GS</sub> = 3.1 V, I <sub>D</sub> = 4.0 A	14	18.5	25	mΩ
	R <sub>DS(on)4</sub>	V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 4.0 A	15.5	22.5	32	mΩ
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		540		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		150		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1.0 MHz		80		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 15 V, I <sub>D</sub> = 4.0 A		17		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V		45		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 6.0 Ω		360		ns
Fall Time	t <sub>f</sub>			160		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = 24 V		9.0		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = 4.0 V		1.5		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 8.2 A		4.5		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 8.2 A, V <sub>GS</sub> = 0 V		0.84		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 8.2 A, V <sub>GS</sub> = 0 V		160		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		200		nC

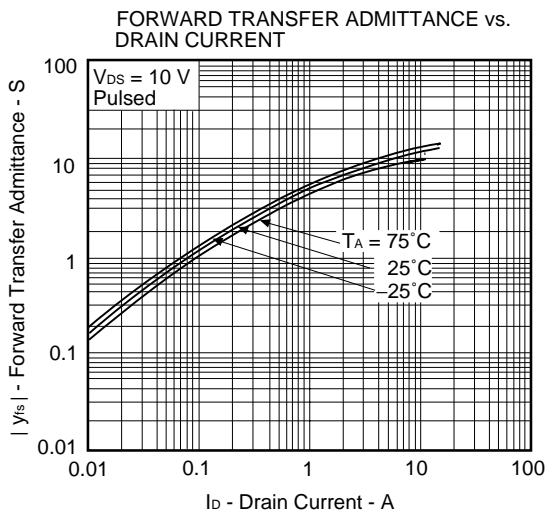
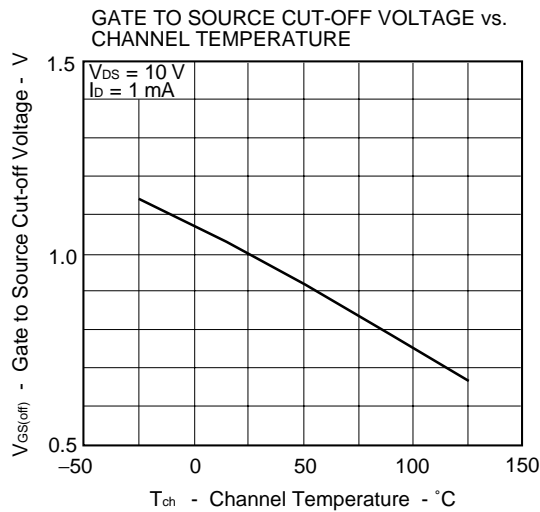
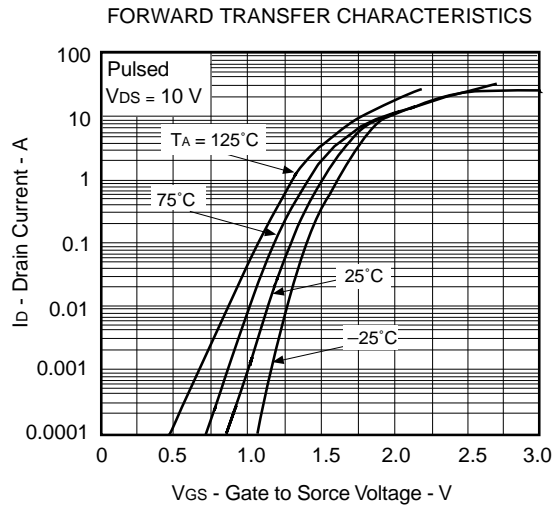
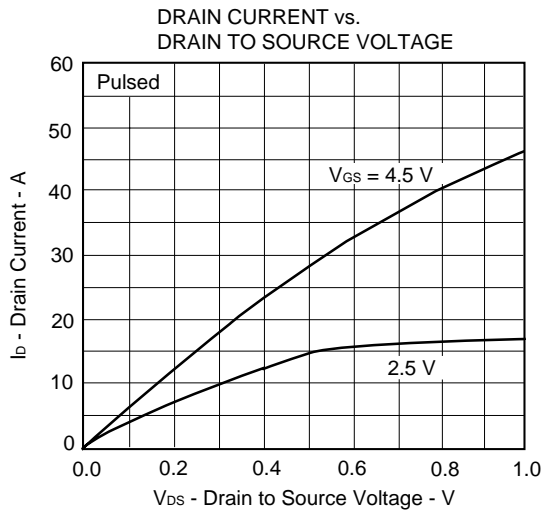
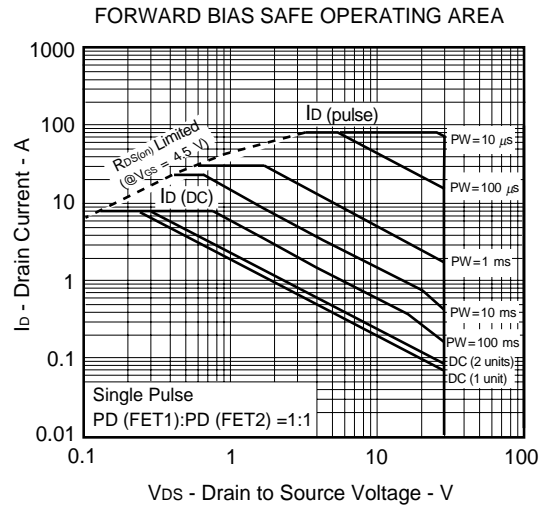
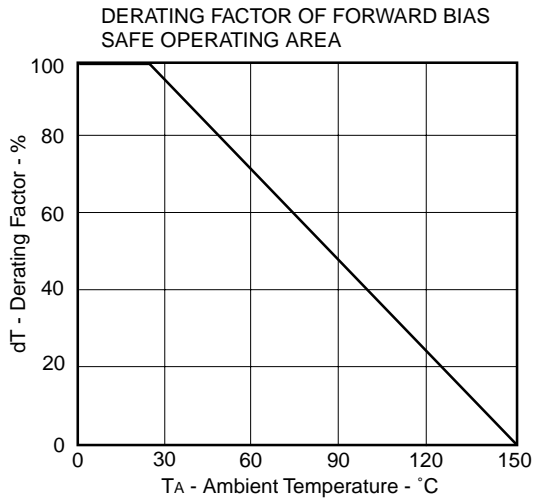
**TEST CIRCUIT 1 SWITCHING TIME**

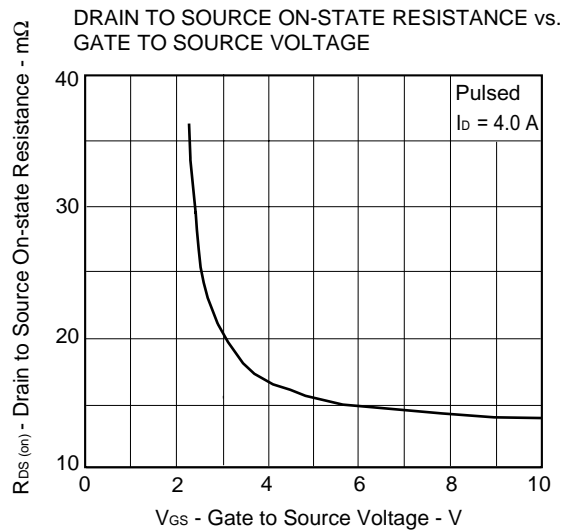
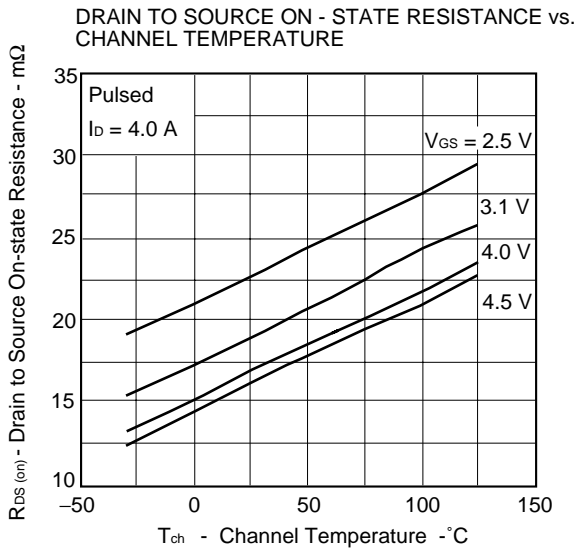
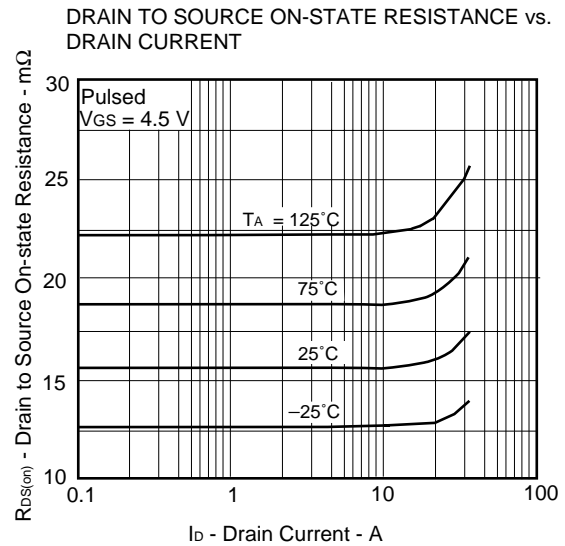
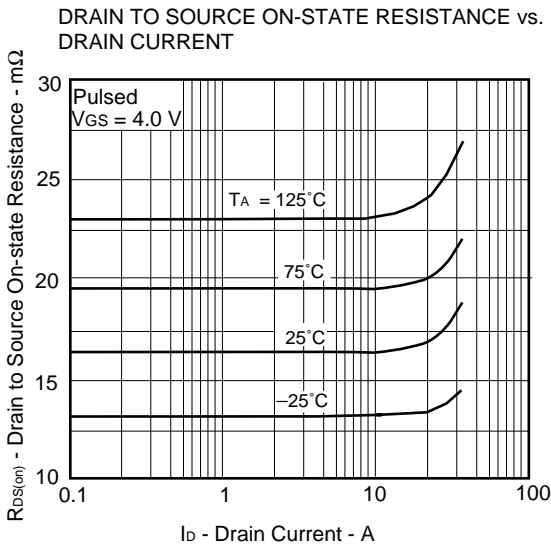
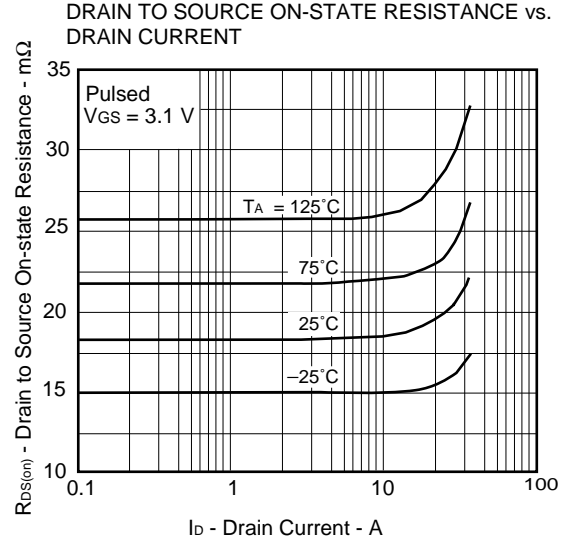
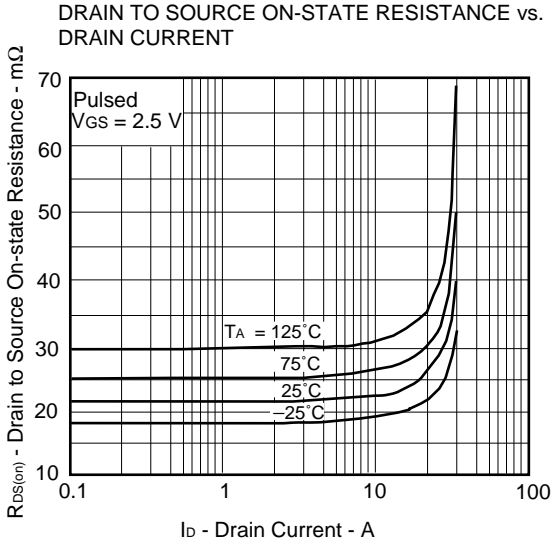


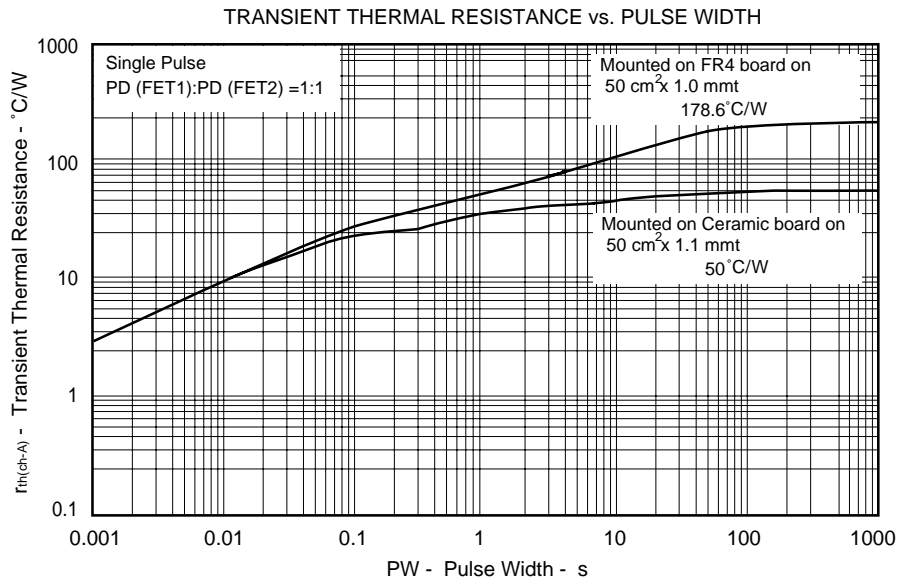
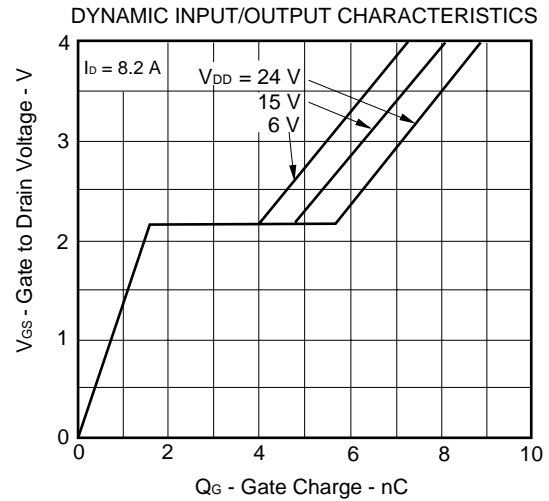
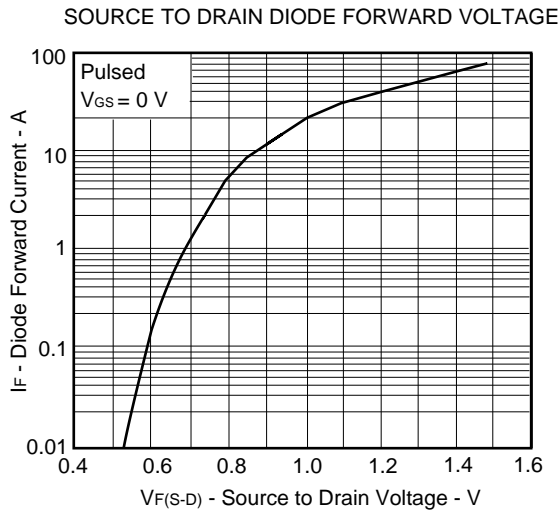
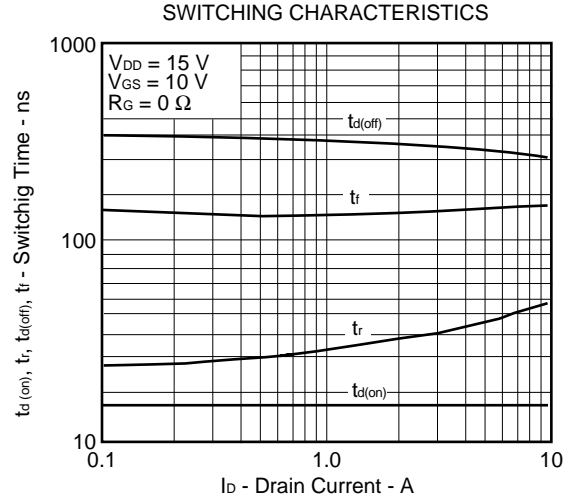
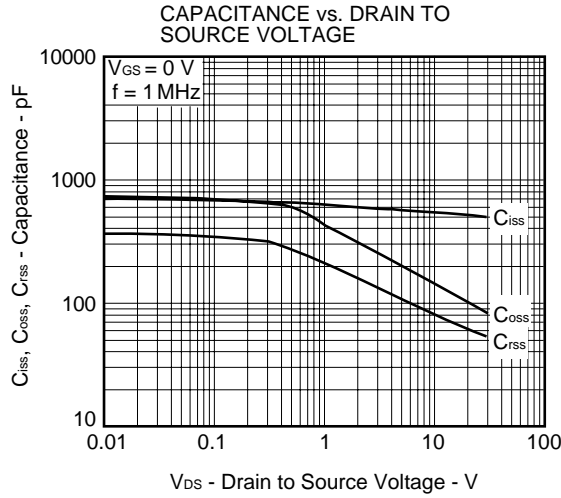
**TEST CIRCUIT 2 GATE CHARGE**



TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )







[MEMO]



[MEMO]

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