To our customers,

Old Company Name in Catalogs and Other Documents

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

April 1st, 2010
Renesas Electronics Corporation

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

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RENESAS

MOS FIELD EFFECT TRANSISTOR

μPA1970

N-CHANNEL MOS FIELD EFFECT TRANSISTOR FOR SWITCHING

DESCRIPTION

The μPA1970 is a switching device which can be driven directly by a 2.5 V power source.

The 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

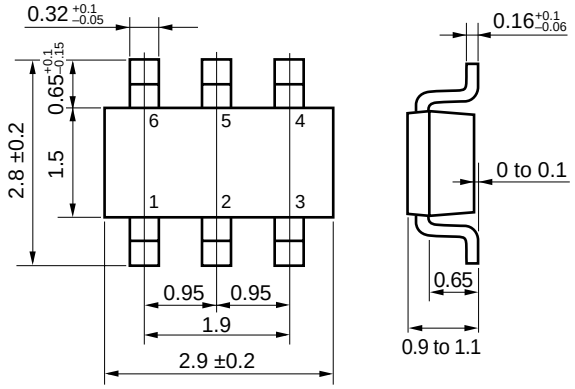
- 2.5 V drive available
- Low on-state resistance
  $R_{DS(on)1}$ = 69 mΩ MAX. (V_{GS} = 4.5 V, I_D = 1.0 A)
  $R_{DS(on)2}$ = 72 mΩ MAX. (V_{GS} = 4.0 V, I_D = 1.0 A)
  $R_{DS(on)3}$ = 107 mΩ MAX. (V_{GS} = 2.5 V, I_D = 1.0 A)

ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1970TE Note	SC-95 (Mini Mold Thin Type)

Note Marking: TT

PACKAGE DRAWING (Unit: mm)

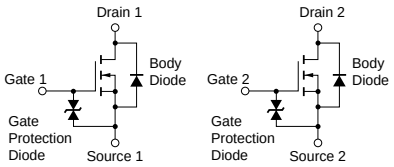


6: Drain 1 4: Drain 2
1: Gate 1 3: Gate 2
5: Source 1 2: Source 2

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	20	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±12	V
Drain Current (DC) (T_A = 25°C)	$I_{D(DC)}$	±2.2	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	±8.8	A
Total Power Dissipation (2 units) (T_A = 25°C) Note2	P_{T1}	1.15	W
Total Power Dissipation (1 unit) (T_A = 25°C) Note2	P_{T2}	0.57	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C

EQUIVALENT CIRCUITS



Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%

2. Mounted on FR-4 board of 5000 mm² x 1.1 mm, t ≤ 5 sec.

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.

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Date Published September 2002 NS CP(K)
Printed in Japan

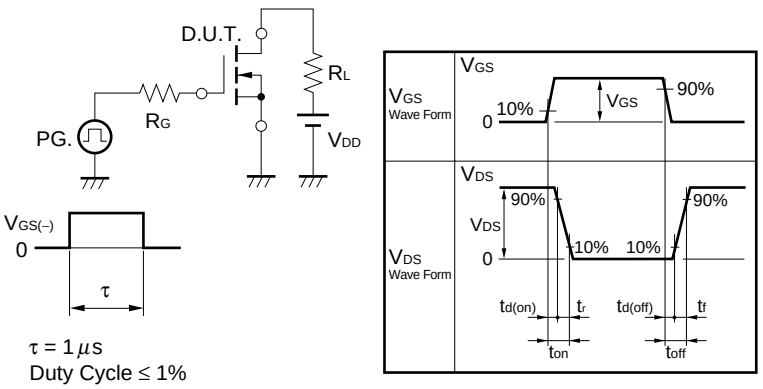
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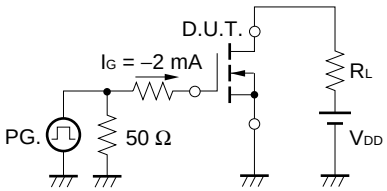
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V			10	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±12 V, V_{DS} = 0 V			±10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 10 V, I_D = 1.0 mA	0.5	0.97	1.5	V
Forward Transfer Admittance	$\|y_{fs}\|$	V_{DS} = 10 V, I_D = 1.0 A	1.0	3.3		S
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = 4.5 V, I_D = 1.0 A		55	69	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.0 V, I_D = 1.0 A		57	72	mΩ
	$R_{DS(on)3}$	V_{GS} = 2.5 V, I_D = 1.0 A		80	107	mΩ
Input Capacitance	C_{iss}	V_{DS} = 10 V		160		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		60		pF
Reverse Transfer Capacitance	C_{rss}	f = 1.0 MHz		40		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 10 V, I_D = 1.0 A		17		ns
Rise Time	t_r	V_{GS} = 4.0 V		90		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 10 Ω		100		ns
Fall Time	t_f			120		ns
Total Gate Charge	Q_G	V_{DD} = 16 V		2.3		nC
Gate to Source Charge	Q_{GS}	V_{GS} = 4.0 V		0.5		nC
Gate to Drain Charge	Q_{GD}	I_D = 2.2 A		1.1		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 2.2 A, V_{GS} = 0 V		0.85		V

TEST CIRCUIT 1 SWITCHING TIME



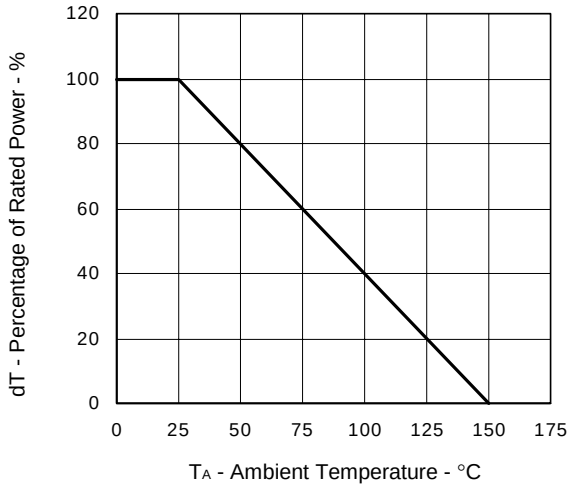
TEST CIRCUIT 2 GATE CHARGE



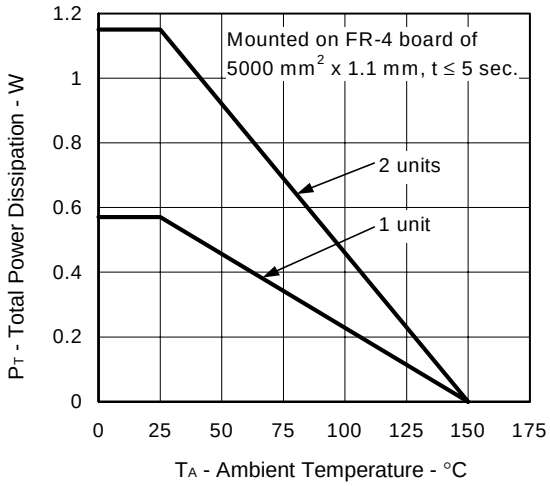
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TYPICAL CHARACTERISTICS (T_A = 25°C)

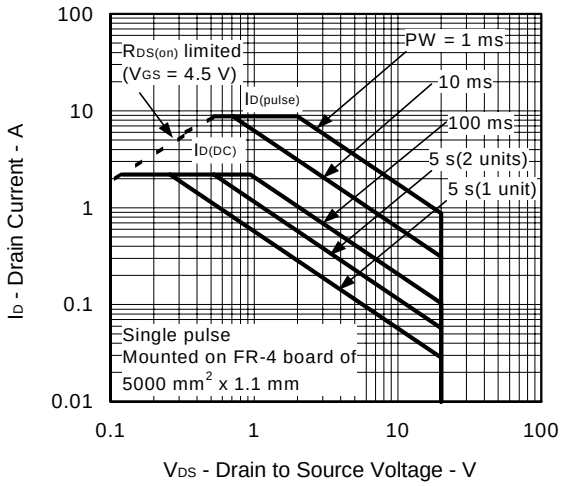
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



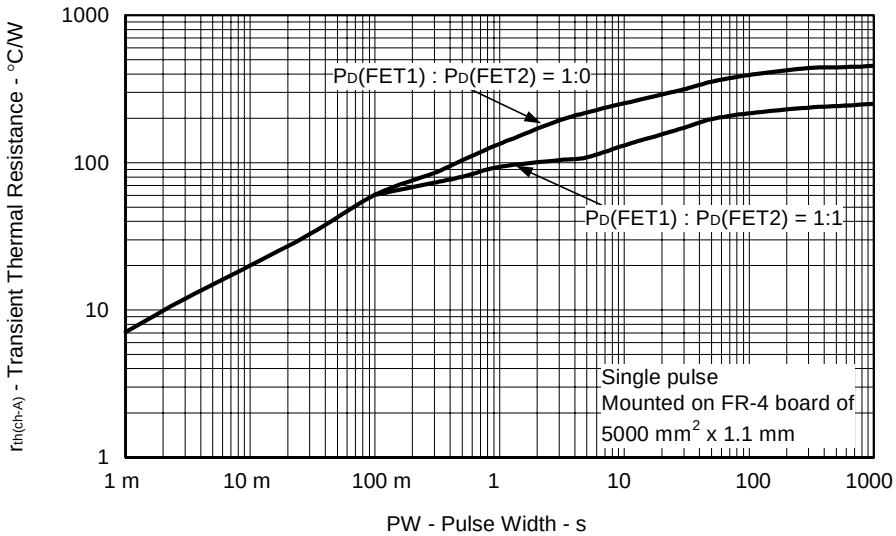
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



FORWARD BIAS SAFE OPERATING AREA

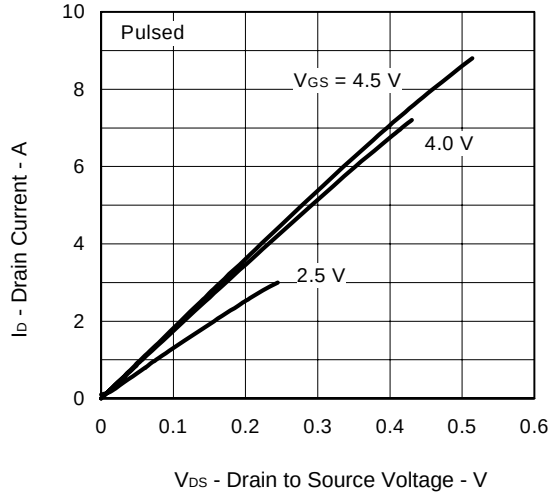


TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

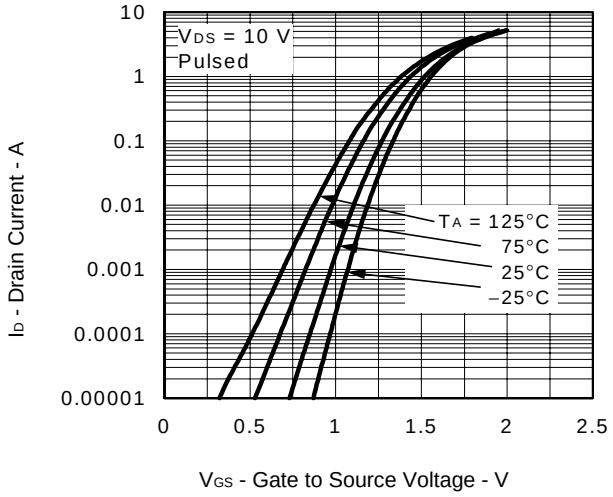


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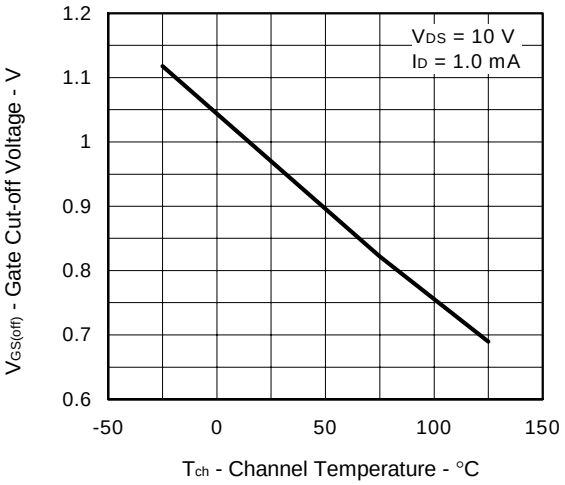
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



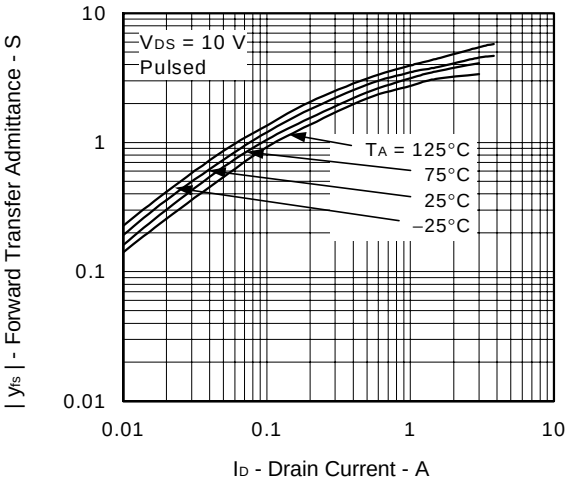
FORWARD TRANSFER CHARACTERISTICS



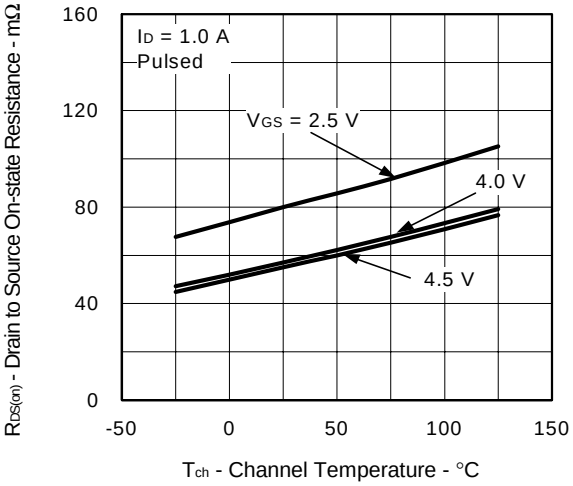
GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



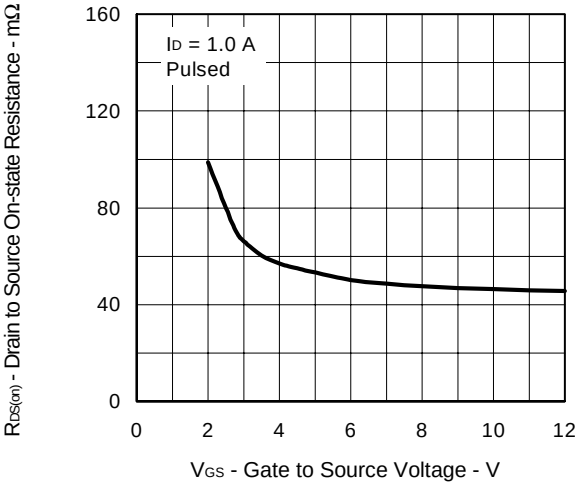
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



DRAIN TO SOURCE ON-STATE RESISTANCE vs.
CHANNEL TEMPERATURE

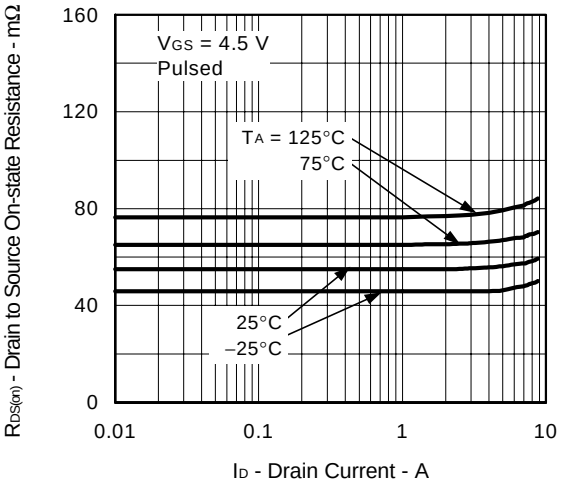


DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE

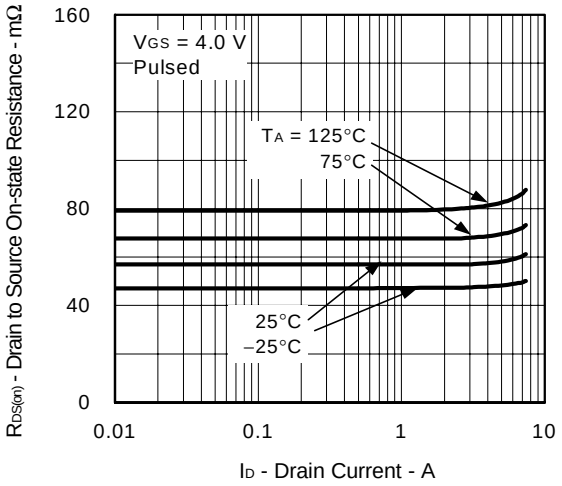


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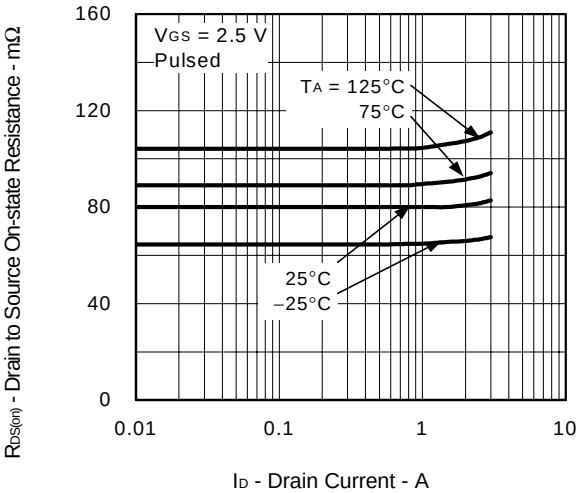
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



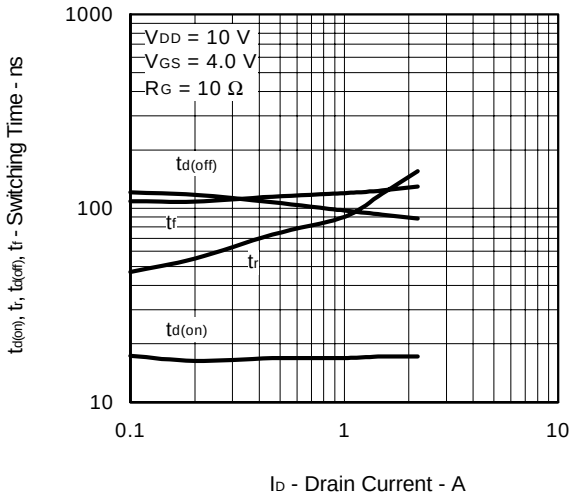
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



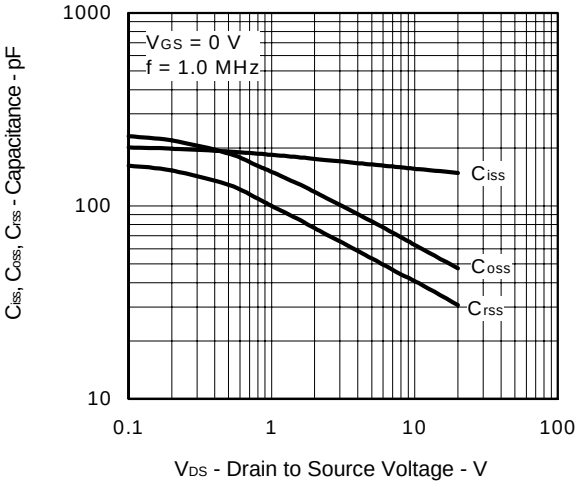
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



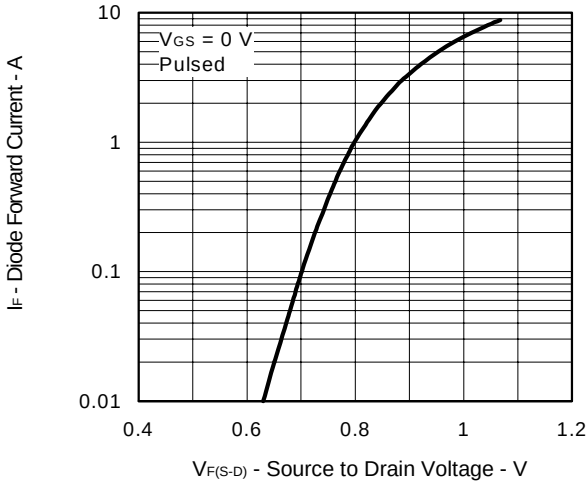
SWITCHING CHARACTERISTICS



CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE

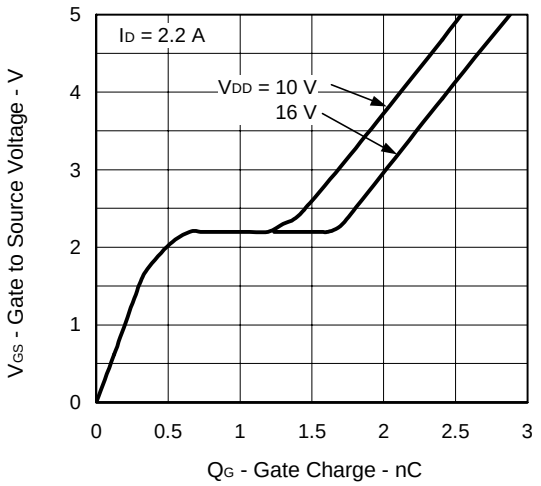


SOURCE TO DRAIN DIODE FORWARD VOLTAGE



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DYNAMIC INPUT/OUTPUT CHARACTERISTICS



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