

To our customers,

Old Company Name in Catalogs and Other Documents

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April 1st, 2010
Renesas Electronics Corporation

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

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N- AND P-CHANNEL MOS FIELD EFFECT TRANSISTOR FOR SWITCHING

DESCRIPTION

The μ PA1890 is a switching device which can be driven directly by a 4.0-V power source.

The μ PA1890 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

- Can be driven by a 4.0-V power source
- Low on-state resistance

N-Channel $R_{DS(on)} = 27 \text{ m}\Omega$ MAX. ($V_{GS} = 10 \text{ V}$, $I_D = 3.0 \text{ A}$)

$R_{DS(on)} = 37 \text{ m}\Omega \text{ MAX. (V}_{GS} = 4.5 \text{ V, I}_{D} = 3.0 \text{ A)}$

$R_{DS(on)3} = 47 \text{ m}\Omega \text{ MAX. (}V_{GS} = 4.0 \text{ V, } I_D = 3.0 \text{ A}\text{)}$

P-Channel $R_{DS(on)1} \equiv 37 \text{ m}\Omega \text{ MAX.}$ ($V_{GS} \equiv -10 \text{ V}$, $I_D \equiv -2.5 \text{ A}$)

$R_{DS(on)}^2 = 56 \text{ m}\Omega \text{ MAX } (V_{GS} = -4.5 \text{ V}, I_D = -2.5 \text{ A})$

$R_{DS(on)}^2 = 50 \text{ m}\Omega^2 \text{ MAX. } (V_{GS} = -4.5 \text{ V}, I_D = -2.5 \text{ A})$

- Built-in G-S protection diode against ESD

ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1890GR-9JG	Power TSSOP8

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

N-Channel / P-Channel

Drain to Source Voltage	V _{DSS}	30/-30	V
Gate to Source Voltage	V _{GSS}	±20/±20	V
Drain Current (DC)	I _{D(DC)}	±6.0/±5.0	A
Drain Current (pulse) ^{Note1}	I _{D(pulse)}	±24/±20	A
Total Power Dissipation ^{Note2}	P _T	2.0	W
Channel Temperature	T _{ch}	150	°C
Storage Temperature	T _{stg}	-55 to +150	°C

Notes 1. PW \leq 10 μ s, Duty Cycle \leq 1%

2. Mounted on ceramic substrate of $5000 \text{ mm}^2 \times 1.1 \text{ mm}$

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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Printed in Japan

The mark ★ shows major revised points.

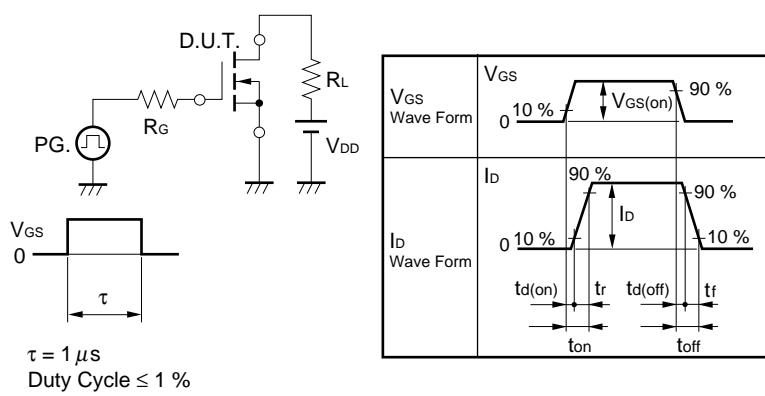
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ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

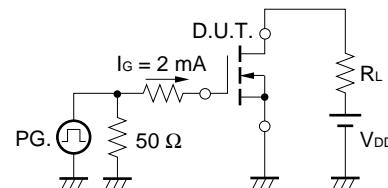
A) N-Channel

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain Cut-off Current	I_{DSS}	$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$			-10	μA
Gate Leakage Current	I_{GSS}	$V_{GS} = \pm 16\text{ V}$, $V_{DS} = 0\text{ V}$			± 10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = 10\text{ V}$, $I_D = 1\text{ mA}$	1.5	1.8	2.5	V
Forward Transfer Admittance	$ y_{fs} $	$V_{DS} = 10\text{ V}$, $I_D = 3.0\text{ A}$	3	7.6		S
Drain to Source On-state Resistance	$R_{DS(on)1}$	$V_{GS} = 10\text{ V}$, $I_D = 3.0\text{ A}$		18	27	$\text{m}\Omega$
	$R_{DS(on)2}$	$V_{GS} = 4.5\text{ V}$, $I_D = 3.0\text{ A}$		24	37	$\text{m}\Omega$
	$R_{DS(on)3}$	$V_{GS} = 4.0\text{ V}$, $I_D = 3.0\text{ A}$		27	47	$\text{m}\Omega$
Input Capacitance	C_{iss}	$V_{DS} = 10\text{ V}$		748		pF
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V}$		227		pF
Reverse Transfer Capacitance	C_{rss}	$f = 1\text{ MHz}$		107		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}$		20		ns
Rise Time	t_r	$I_D = 3.0\text{ A}$		80		ns
Turn-off Delay Time	$t_{d(off)}$	$V_{GS(on)} = 10\text{ V}$		48		ns
Fall Time	t_f	$R_G = 10\Omega$		30		ns
Total Gate Charge	Q_G	$V_{DD} = 24\text{ V}$		14		nC
Gate to Source Charge	Q_{GS}	$I_D = 6.0\text{ A}$		1.9		nC
Gate to Drain Charge	Q_{GD}	$V_{GS} = 10\text{ V}$		3.8		nC
Diode Forward Voltage	$V_{F(S-D)}$	$I_F = 6.0\text{ A}$, $V_{GS} = 0\text{ V}$		0.82		V
Reverse Recovery Time	t_{rr}	$I_F = 6.0\text{ A}$, $V_{GS} = 0\text{ V}$		31		ns
Reverse Recovery Charge	Q_{rr}	$di/dt = 100\text{ A}/\mu\text{s}$		32		nC

TEST CIRCUIT 1 SWITCHING TIME



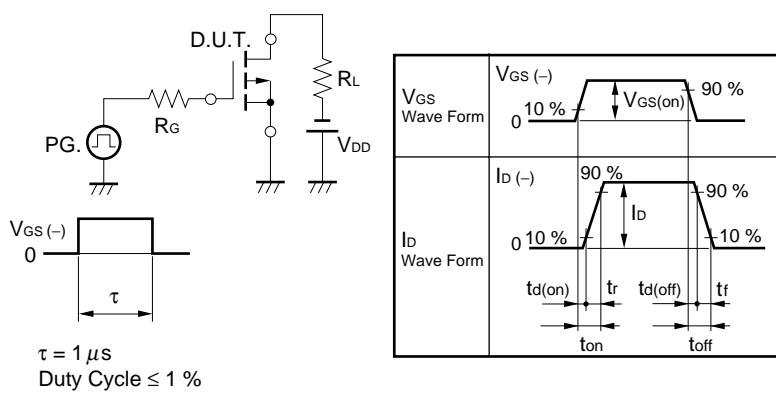
TEST CIRCUIT 2 GATE CHARGE



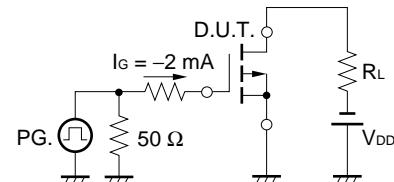
B) P-Channel

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain Cut-off Current	I_{DSS}	$V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V}$			-10	μA
Gate Leakage Current	I_{GSS}	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$			± 10	μA
Gate Cut-off Voltage	$V_{GS(\text{off})}$	$V_{DS} = -10 \text{ V}, I_D = -1 \text{ mA}$	-1.3	-1.8	-2.3	V
Forward Transfer Admittance	$ y_{fs} $	$V_{DS} = -10 \text{ V}, I_D = -2.5 \text{ A}$	3	7.8		S
Drain to Source On-state Resistance	$R_{DS(\text{on})1}$	$V_{GS} = -10 \text{ V}, I_D = -2.5 \text{ A}$		28	37	$\text{m}\Omega$
	$R_{DS(\text{on})2}$	$V_{GS} = -4.5 \text{ V}, I_D = -2.5 \text{ A}$		42	56	$\text{m}\Omega$
	$R_{DS(\text{on})3}$	$V_{GS} = -4.0 \text{ V}, I_D = -2.5 \text{ A}$		47	64	$\text{m}\Omega$
Input Capacitance	C_{iss}	$V_{DS} = -10 \text{ V}$		851		pF
Output Capacitance	C_{oss}	$V_{GS} = 0 \text{ V}$		279		pF
Reverse Transfer Capacitance	C_{rss}	$f = 1 \text{ MHz}$		128		pF
Turn-on Delay Time	$t_{d(\text{on})}$	$V_{DD} = -15 \text{ V}$ $I_D = -2.5 \text{ A}$ $V_{GS(\text{on})} = -10 \text{ V}$ $R_G = 10 \Omega$		17		ns
Rise Time	t_r			52		ns
Turn-off Delay Time	$t_{d(\text{off})}$			84		ns
Fall Time	t_f			73		ns
Total Gate Charge	Q_G	$V_{DD} = -24 \text{ V}$ $I_D = -5.0 \text{ A}$ $V_{GS} = -10 \text{ V}$		15		nC
Gate to Source Charge	Q_{GS}			1.9		nC
Gate to Drain Charge	Q_{GD}			4.2		nC
Diode Forward Voltage	$V_{F(S-D)}$	$I_F = 5.0 \text{ A}, V_{GS} = 0 \text{ V}$		0.83		V
Reverse Recovery Time	t_{rr}	$I_F = 5.0 \text{ A}, V_{GS} = 0 \text{ V}$ $di/dt = 50 \text{ A}/\mu\text{s}$		38		ns
Reverse Recovery Charge	Q_{rr}			35		nC

TEST CIRCUIT 1 SWITCHING TIME

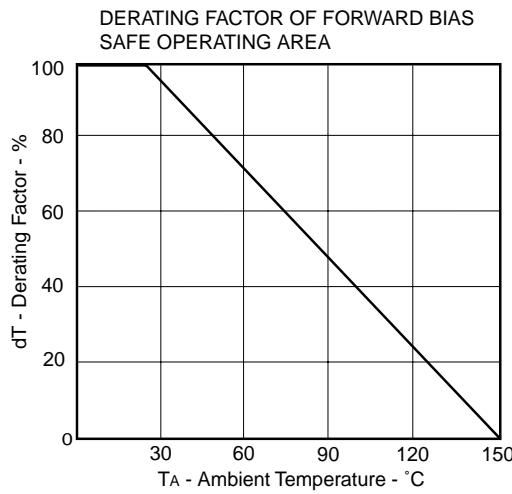


TEST CIRCUIT 2 GATE CHARGE

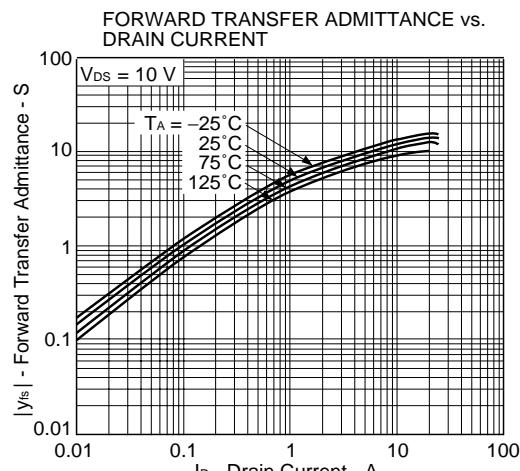
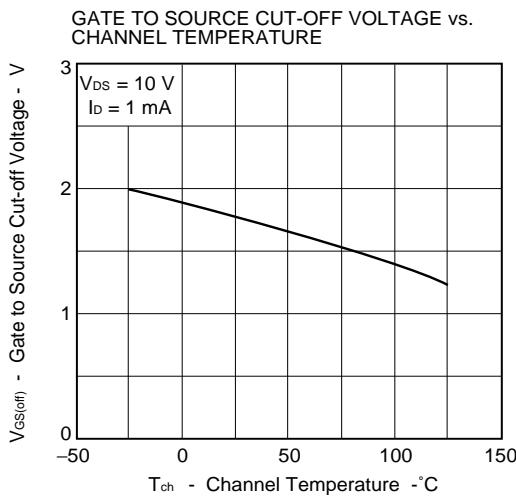
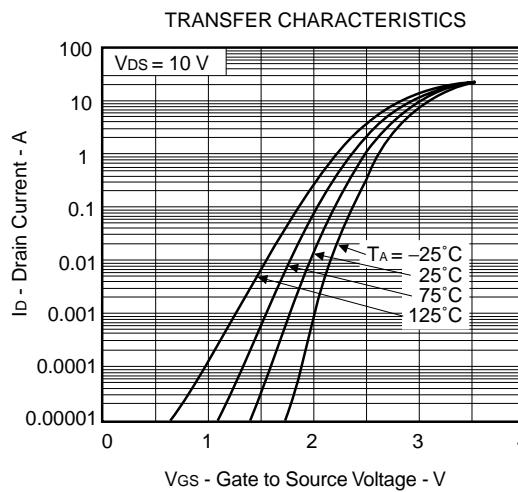
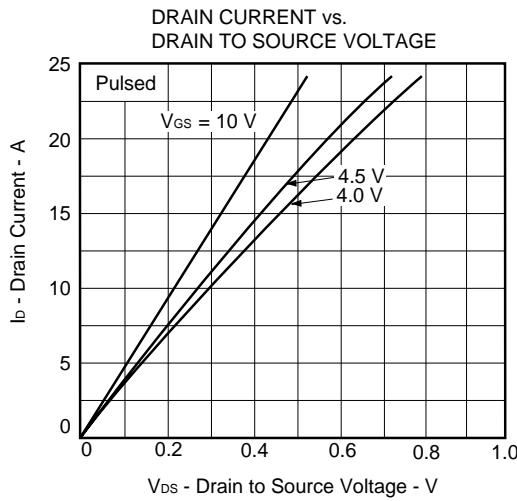
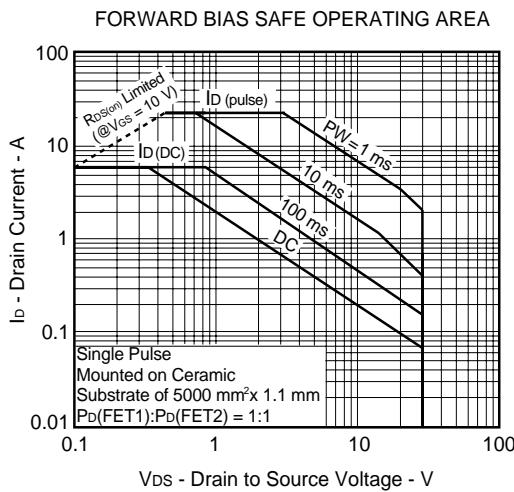


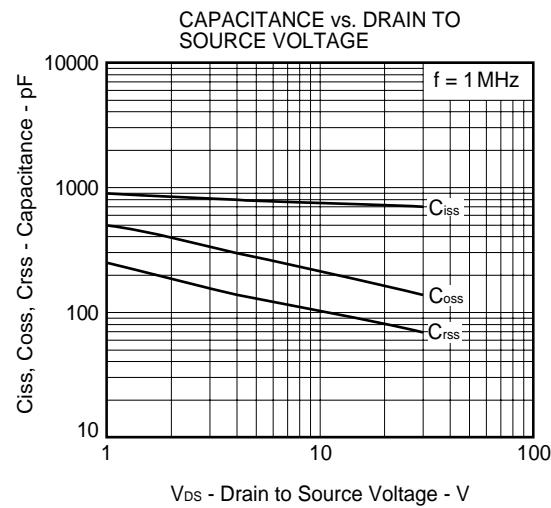
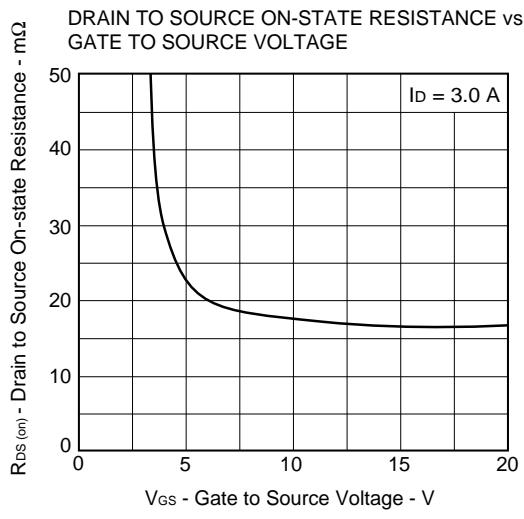
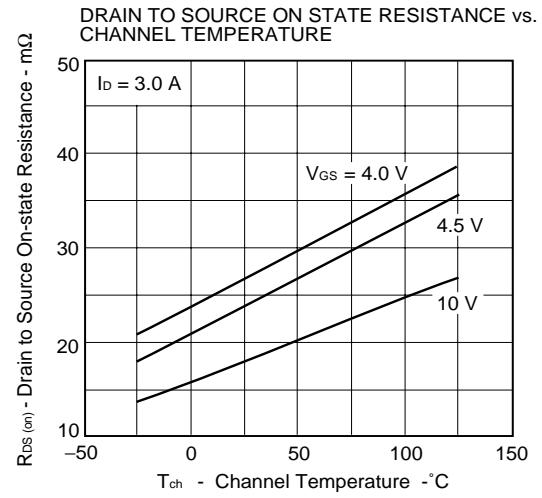
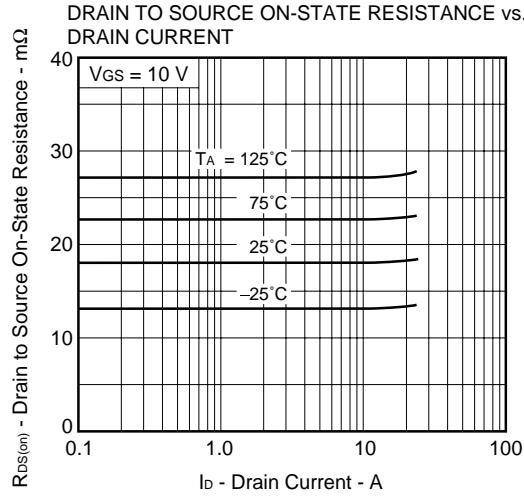
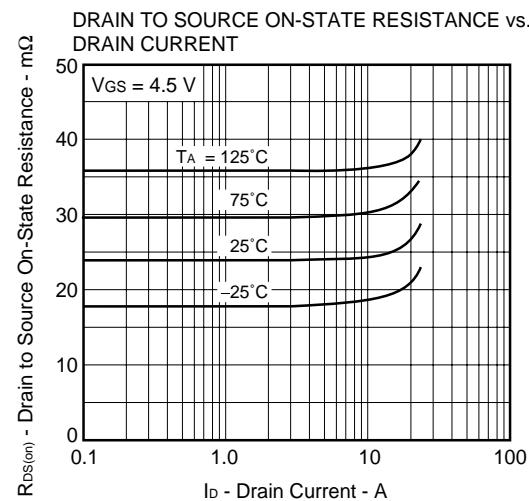
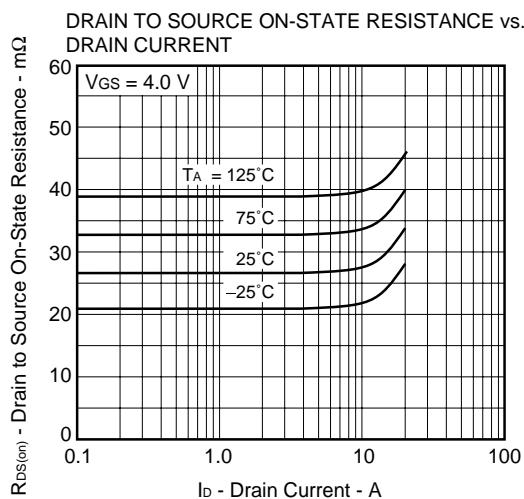
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

A) N-Channel

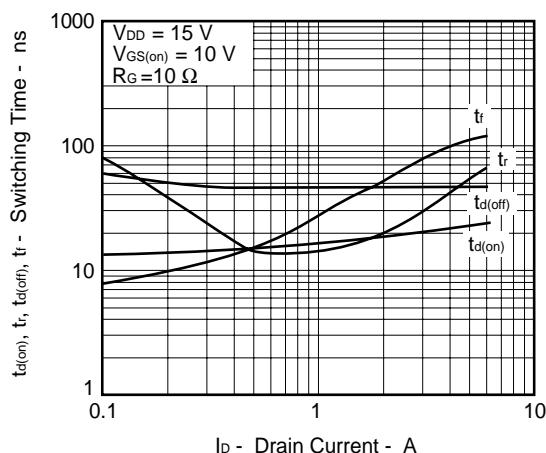


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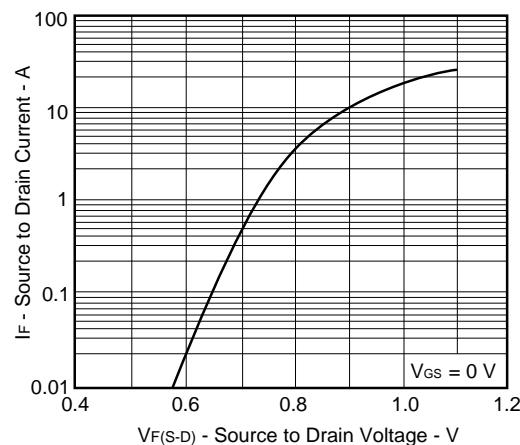




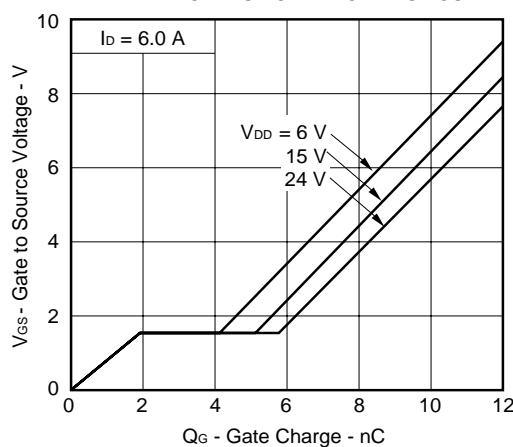
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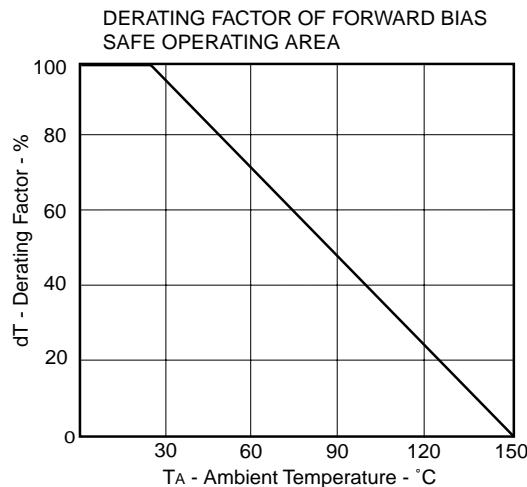


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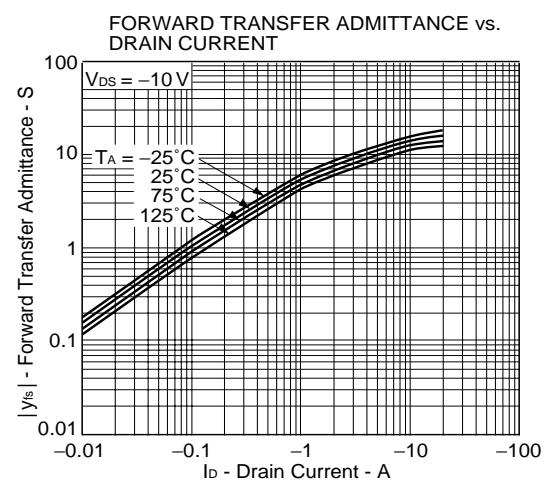
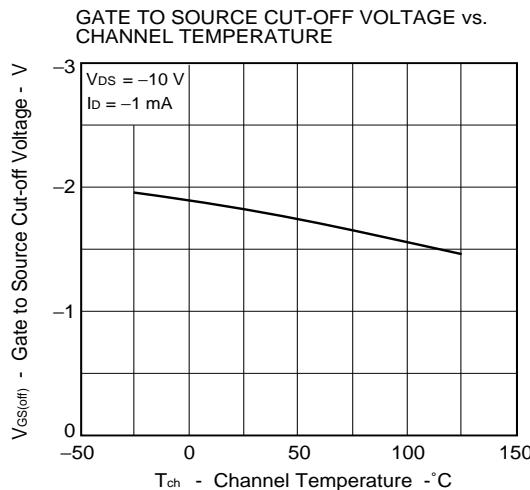
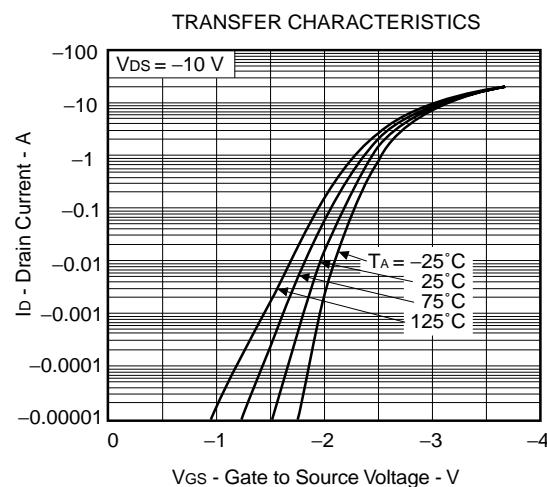
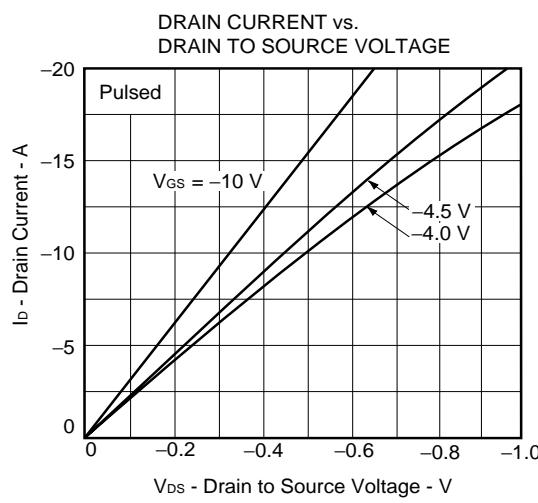
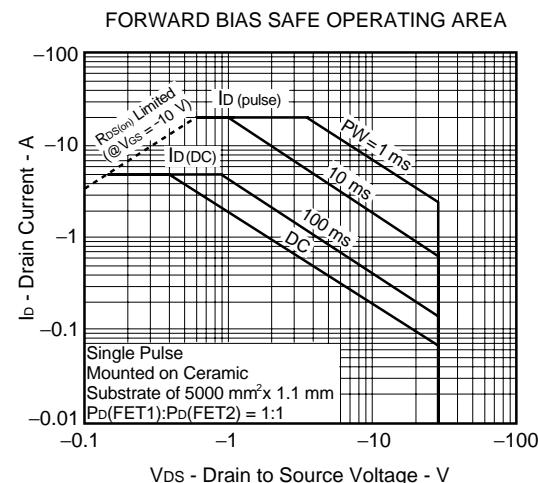


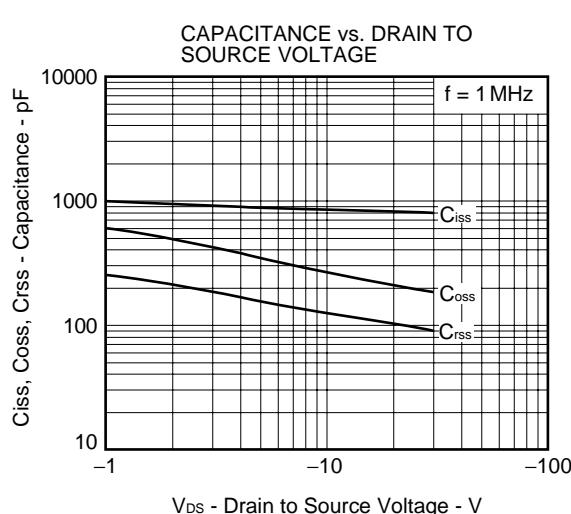
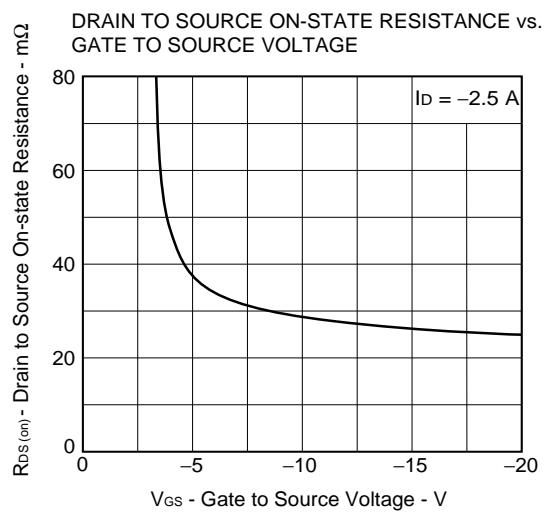
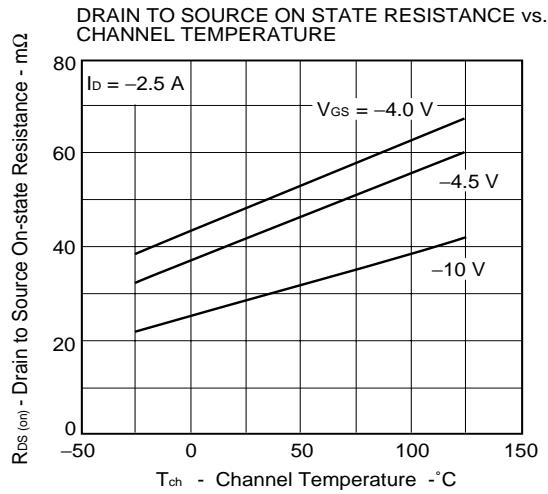
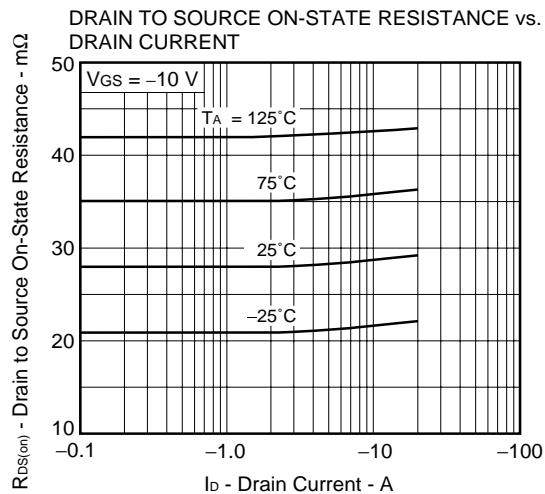
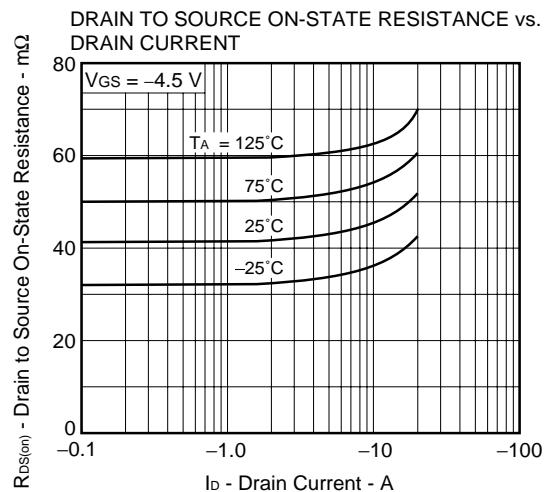
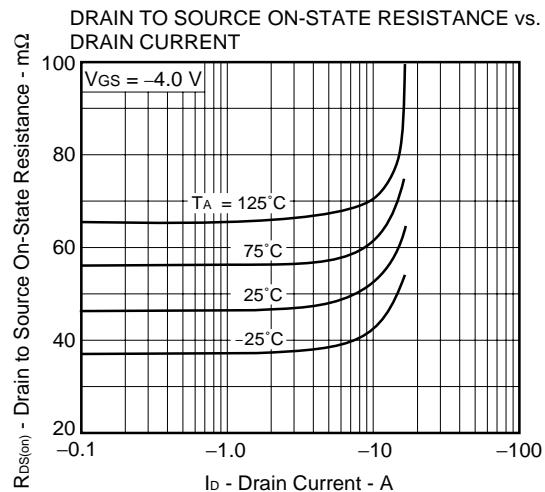
DYNAMIC INPUT CHARACTERISTICS



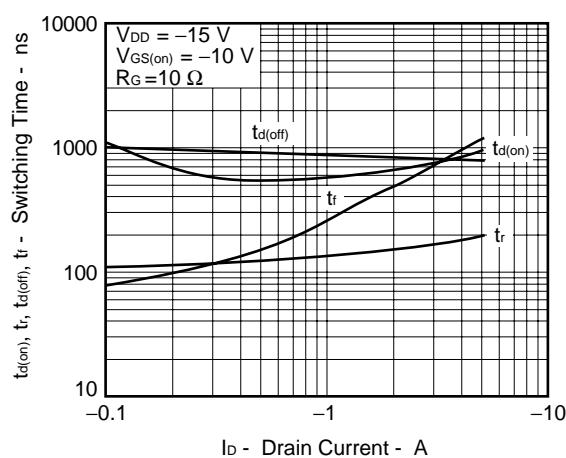
B) P-Channel

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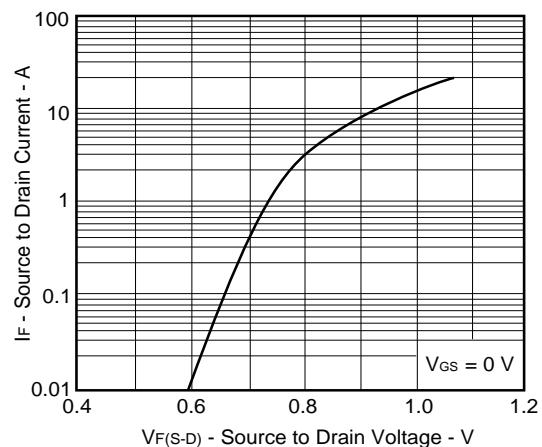




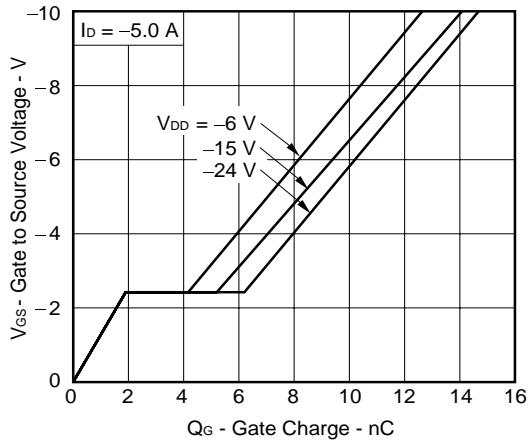
SWITCHING CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

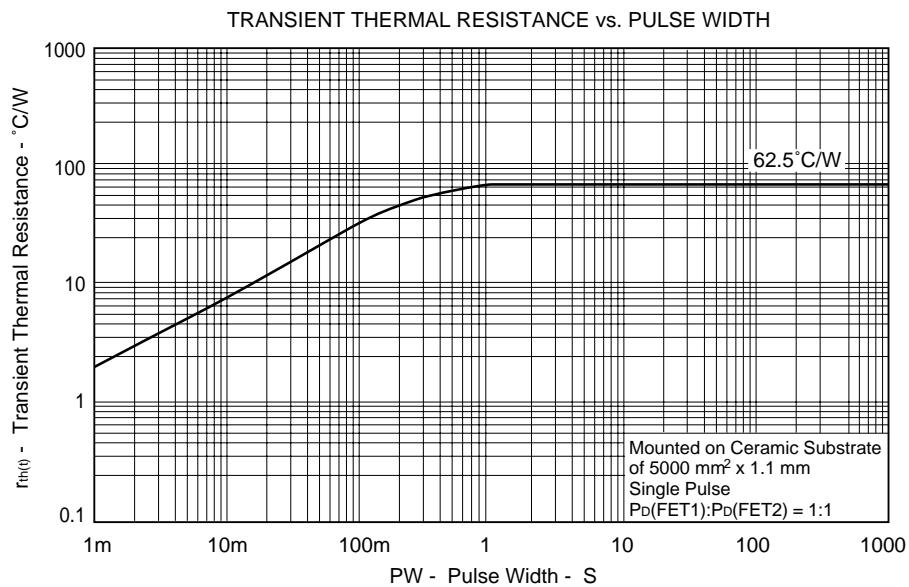


DYNAMIC INPUT CHARACTERISTICS



C) Common

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