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

μPA1890

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

DESCRIPTION

The μPA1890 is a switching device which can be driven directly by a 4.0-V power source.

The μPA1890 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

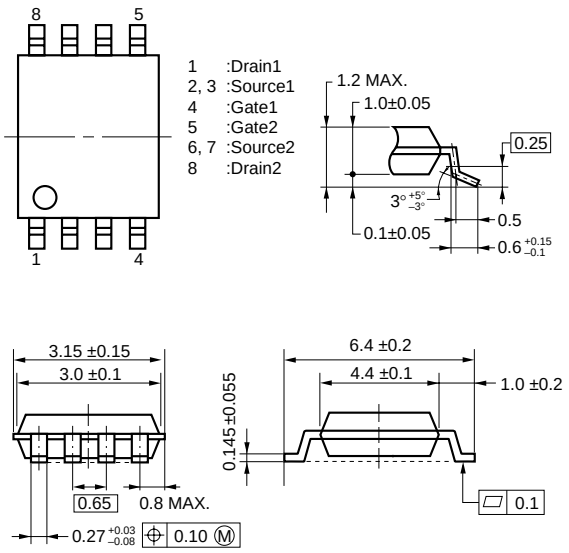
  N-Channel $R_{DS(on)1}$ = 27 mΩ MAX. (V_{GS} = 10 V, I_D = 3.0 A)
  $R_{DS(on)2}$ = 37 mΩ MAX. (V_{GS} = 4.5 V, I_D = 3.0 A)
  $R_{DS(on)3}$ = 47 mΩ MAX. (V_{GS} = 4.0 V, I_D = 3.0 A)

  P-Channel $R_{DS(on)1}$ = 37 mΩ MAX. (V_{GS} = –10 V, I_D = –2.5 A)
  $R_{DS(on)2}$ = 56 mΩ MAX. (V_{GS} = –4.5 V, I_D = –2.5 A)
  $R_{DS(on)3}$ = 64 mΩ MAX. (V_{GS} = –4.0 V, I_D = –2.5 A)
- Built-in G-S protection diode against ESD

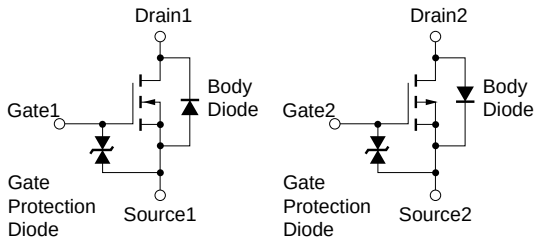
ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1890GR-9JG	Power TSSOP8

PACKAGE DRAWING (Unit: mm)



EQUIVALENT CIRCUIT



N-Channel P-Channel

To keep good radiate condition, it is recommended that all pins are soldering to print board.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°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 ≤ 10 μs, Duty Cycle ≤ 1%

2. Mounted on ceramic substrate of 5000 mm^2 x 1.1 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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Document No. G14762EJ2V0DS00 (2nd edition)
Date Published May 2001 NS CP(K)
Printed in Japan

The mark ★ shows major revised points.

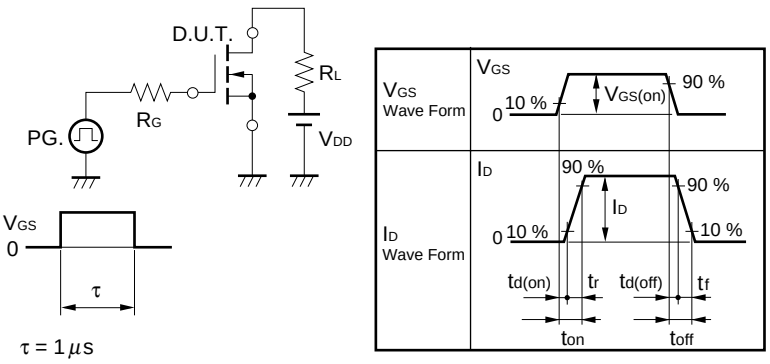
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ELECTRICAL CHARACTERISTICS (T_A = 25°C)

A) N-Channel

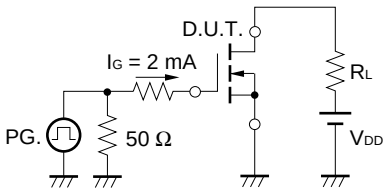
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain Cut-off Current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V			–10	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V			±10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 10 V, I_D = 1 mA	1.5	1.8	2.5	V
Forward Transfer Admittance	$\|y_{fs}\|$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

TEST CIRCUIT 1 SWITCHING TIME



τ = 1 μs
Duty Cycle ≤ 1 %

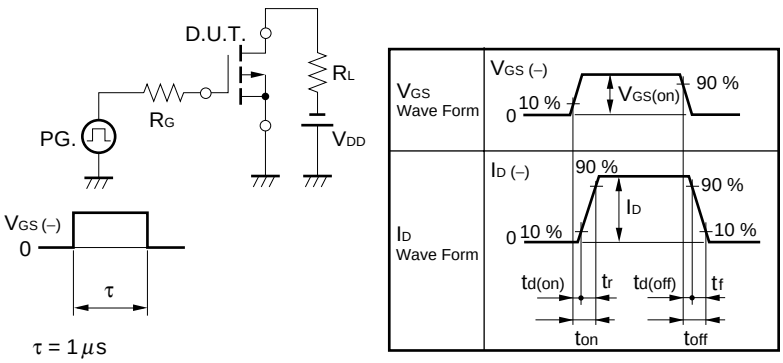
TEST CIRCUIT 2 GATE CHARGE



B) P-Channel

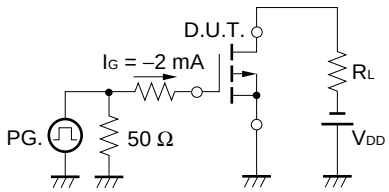
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain Cut-off Current	I_{DSS}	V_{DS} = –30 V, V_{GS} = 0 V			–10	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ∓16 V, V_{DS} = 0 V			∓10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = –10 V, I_D = –1 mA	–1.3	–1.8	–2.3	V
Forward Transfer Admittance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

TEST CIRCUIT 1 SWITCHING TIME



τ = 1 μs
Duty Cycle ≤ 1 %

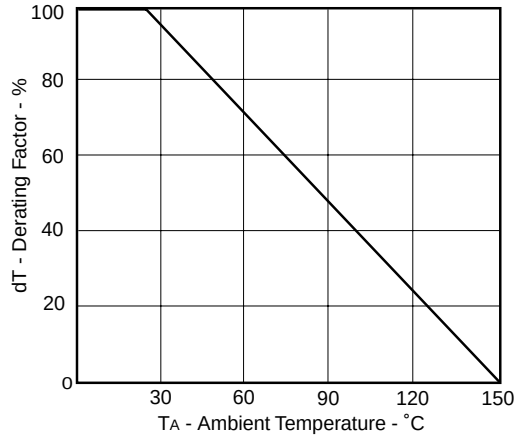
TEST CIRCUIT 2 GATE CHARGE



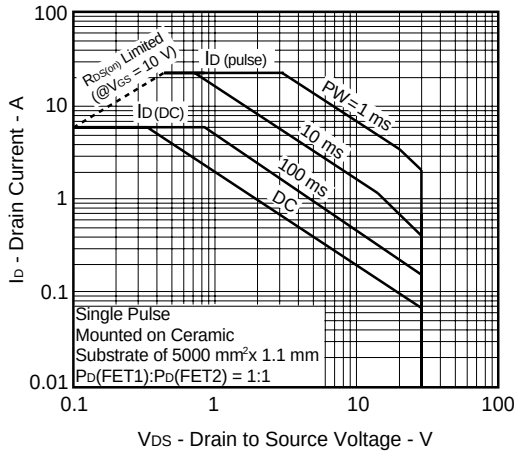
TYPICAL CHARACTERISTICS (T_A = 25°C)

A) N-Channel

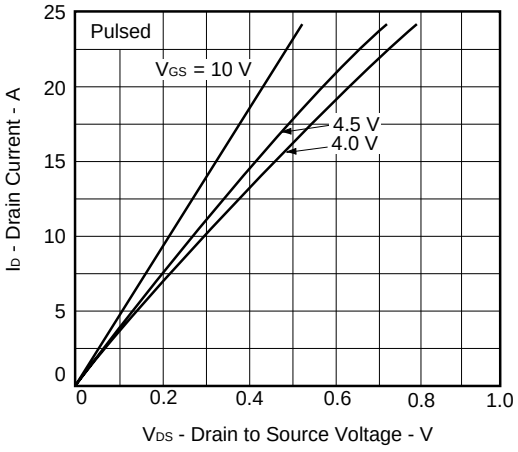
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



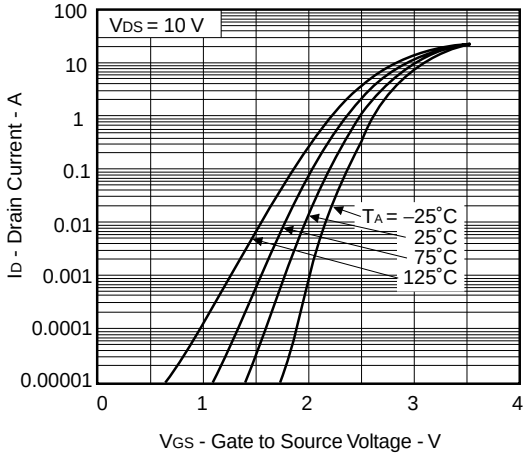
★ FORWARD BIAS SAFE OPERATING AREA



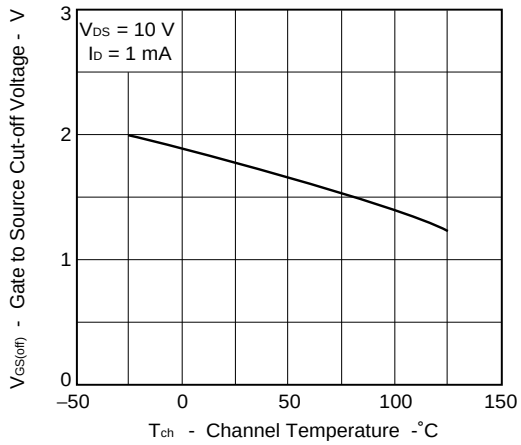
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



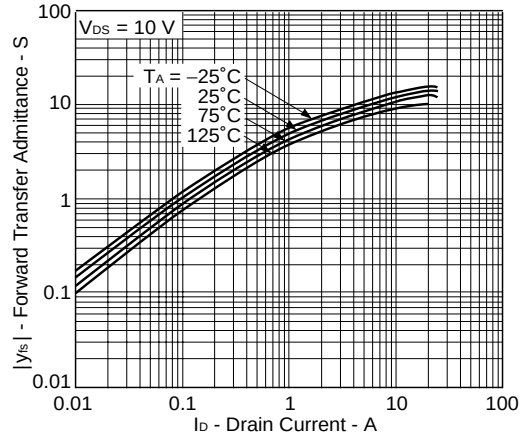
TRANSFER CHARACTERISTICS



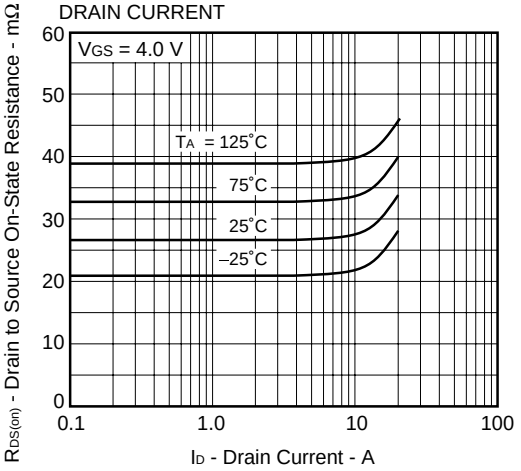
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



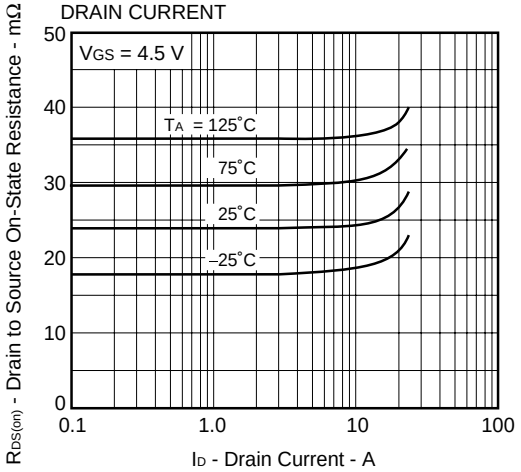
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



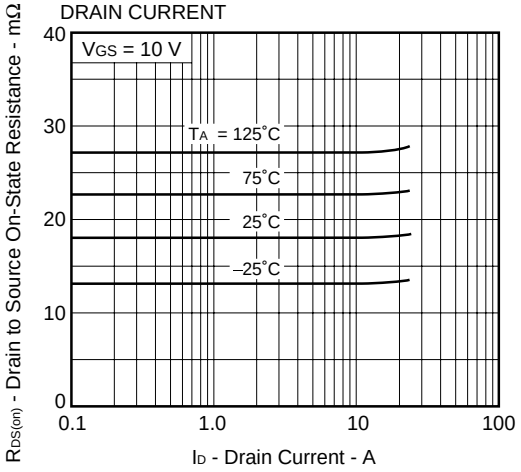
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



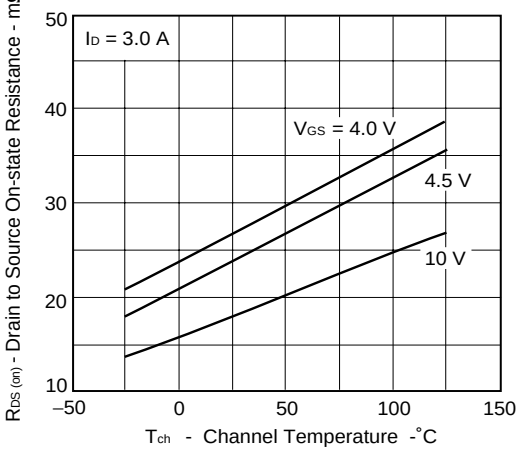
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



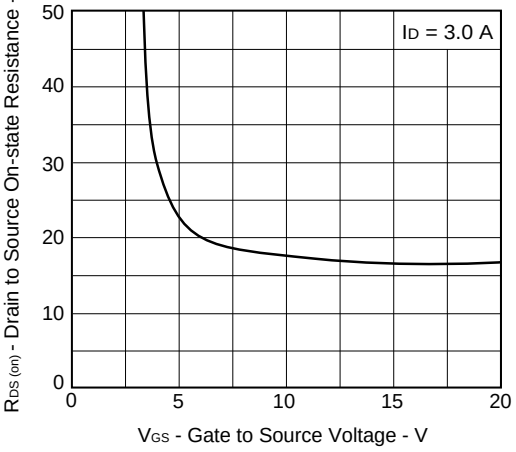
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



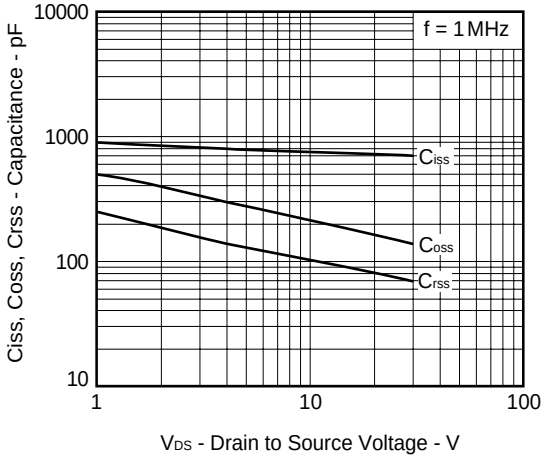
DRAIN TO SOURCE ON STATE RESISTANCE vs. CHANNEL TEMPERATURE



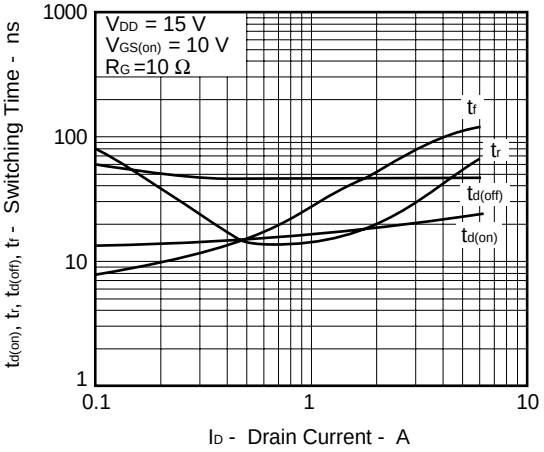
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



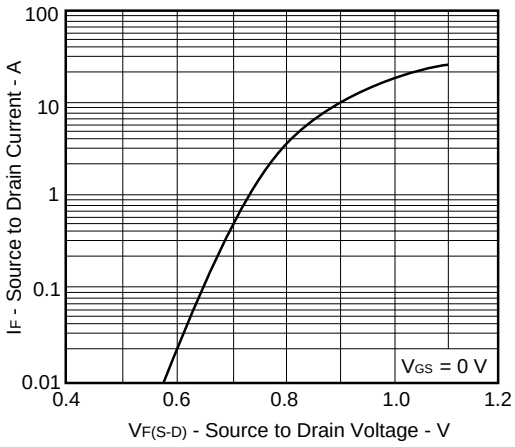
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



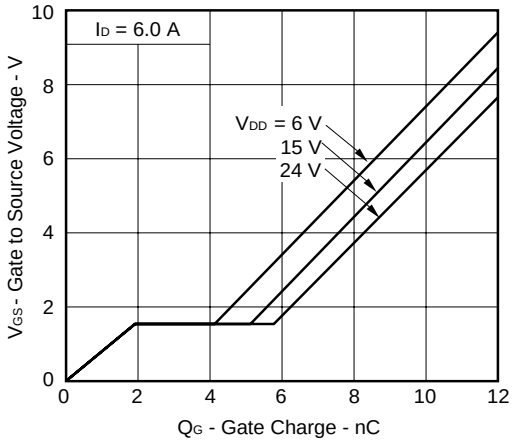
SWITCHING CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

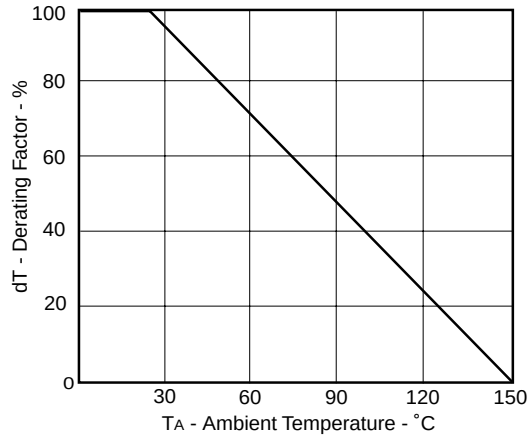


DYNAMIC INPUT CHARACTERISTICS

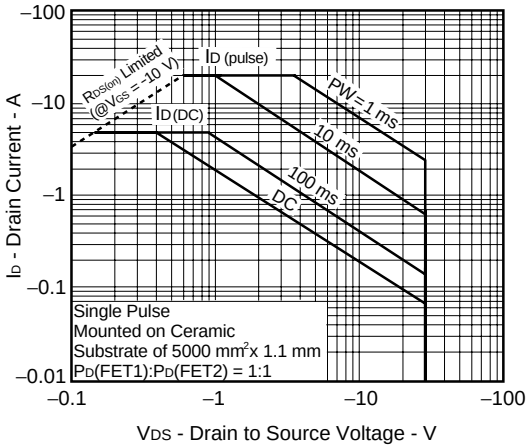


B) P-Channel

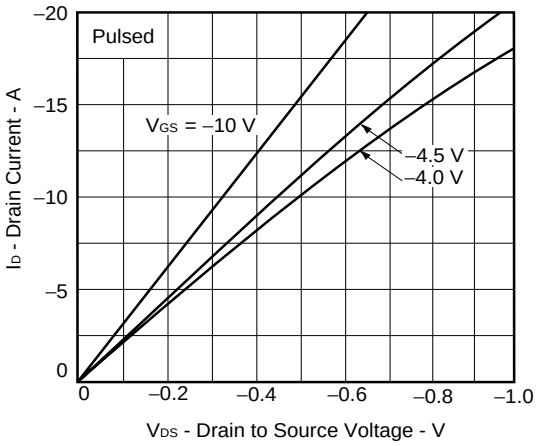
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



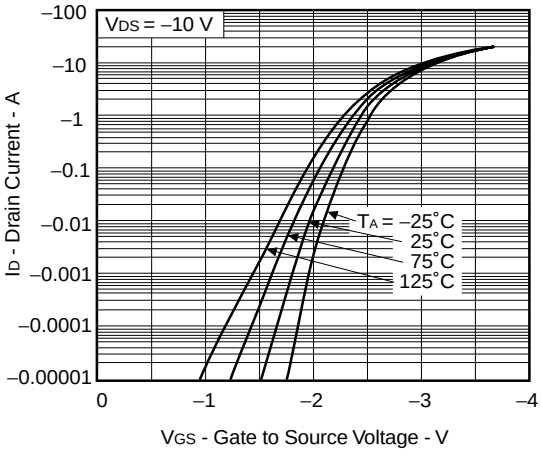
★ FORWARD BIAS SAFE OPERATING AREA



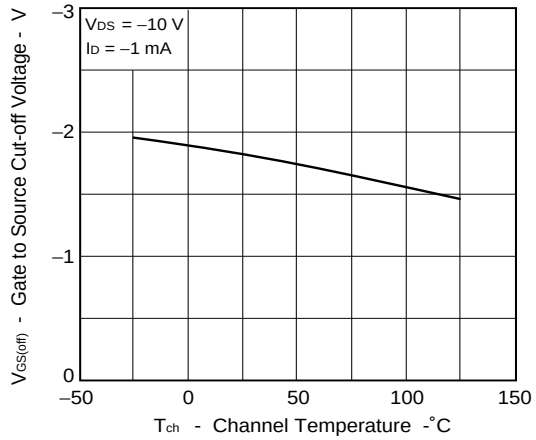
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



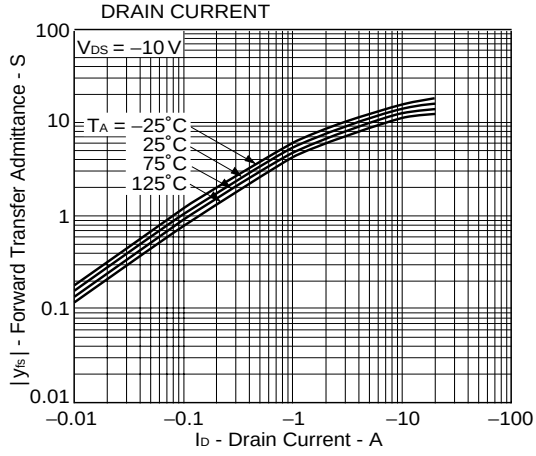
TRANSFER CHARACTERISTICS



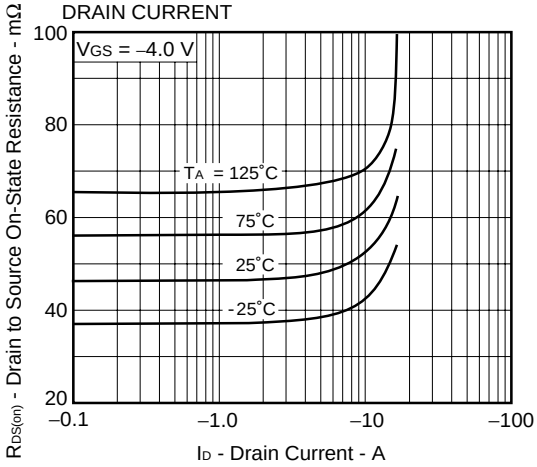
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



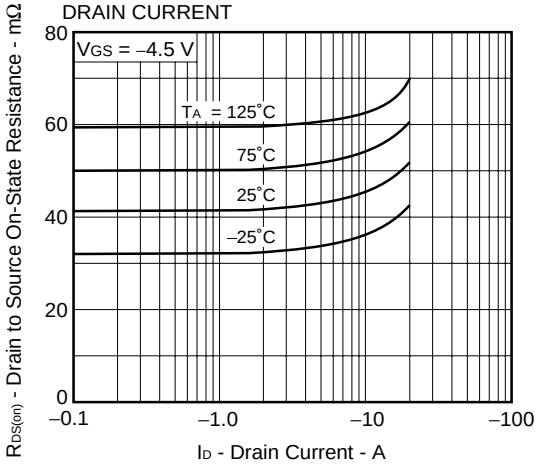
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



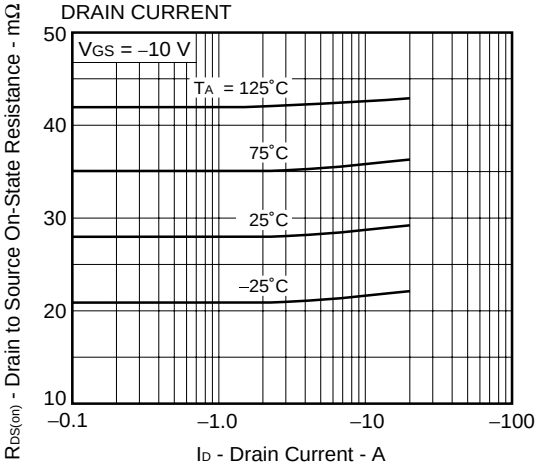
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



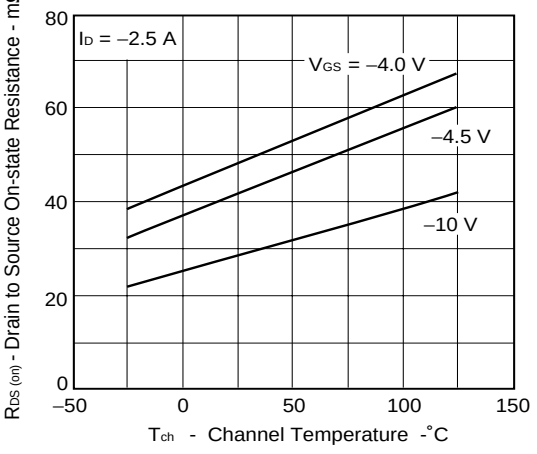
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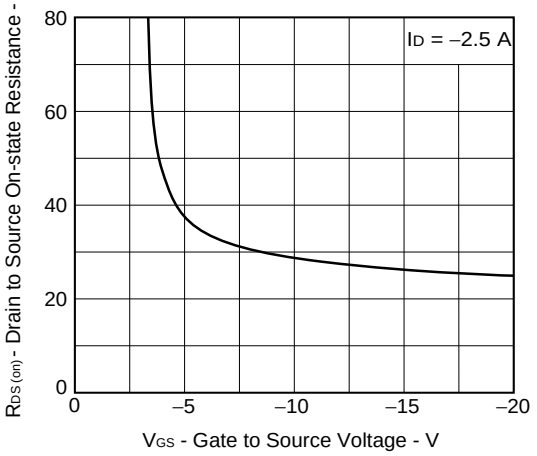
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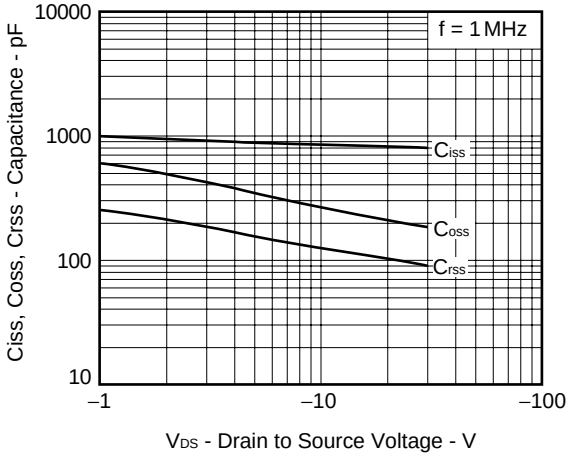
DRAIN TO SOURCE ON STATE RESISTANCE vs. CHANNEL TEMPERATURE



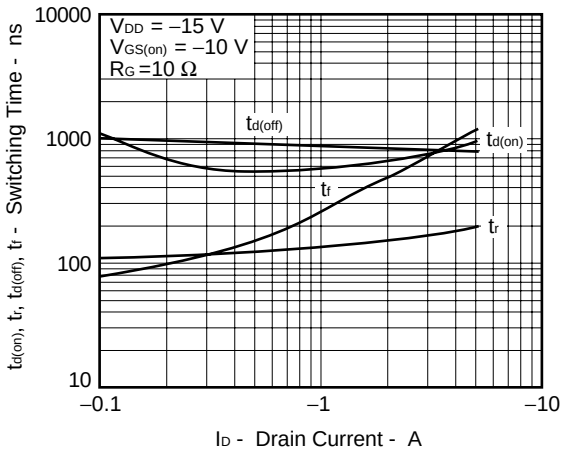
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



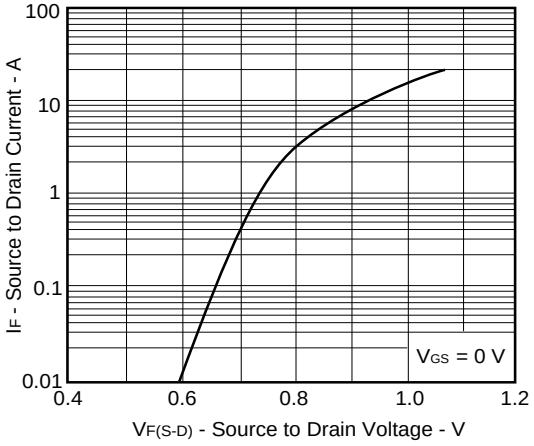
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



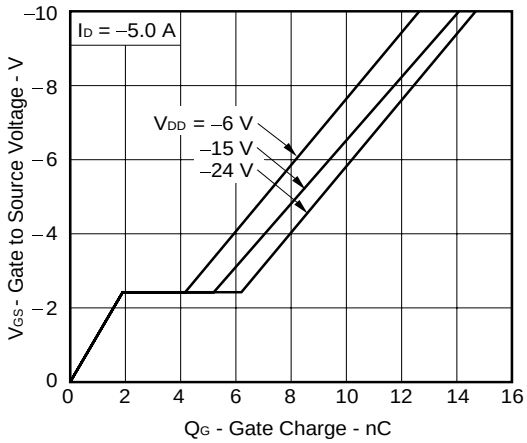
SWITCHING CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



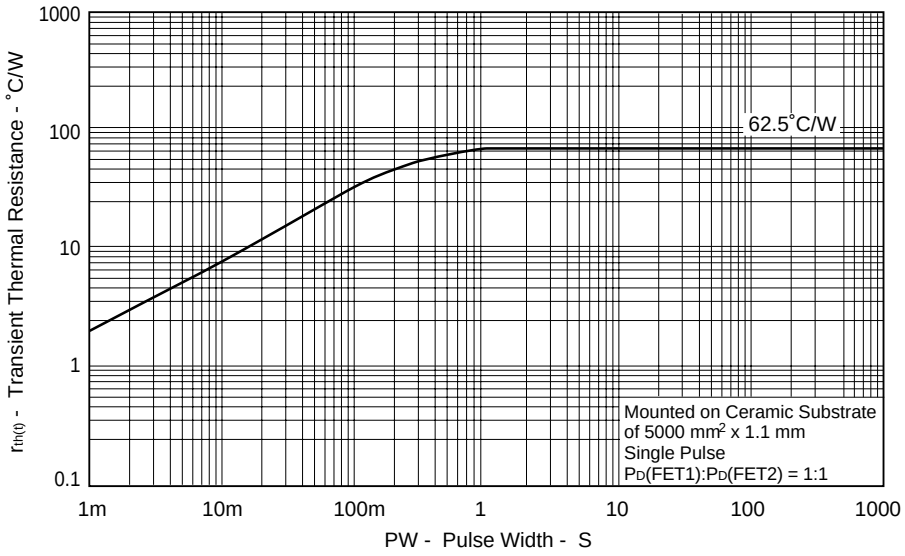
DYNAMIC INPUT CHARACTERISTICS



C) Common

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TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



[MEMO]

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