

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 $R_{DS(on)1} = 27 \text{ m}\Omega \text{ MAX.}$ ($V_{GS} = 10 \text{ V}$, $I_D = 3.0 \text{ A}$)

$R_{DS(on)2} = 37 \text{ m}\Omega \text{ MAX.}$ ($V_{GS} = 4.5 \text{ V}$, $I_D = 3.0 \text{ A}$)

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

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

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

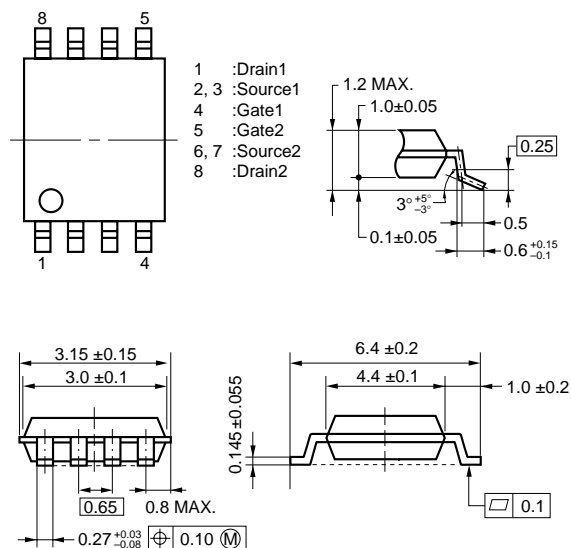
$R_{DS(on)3} = 64 \text{ m}\Omega \text{ MAX.}$ ($V_{GS} = -4.0 \text{ V}$, $I_D = -2.5 \text{ A}$)

- Built-in G-S protection diode against ESD

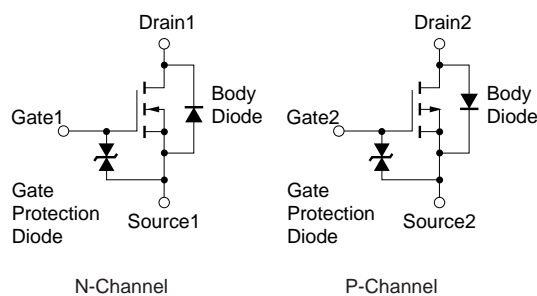
ORDERING INFORMATION

PART NUMBER	PACKAGE
μ PA1890GR-9JG	Power TSSOP8

PACKAGE DRAWING (Unit : mm)



EQUIVALENT CIRCUIT



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

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

N-Channel / P-Channel

Drain to Source Voltage	V_{DS}	30/-30	V
Gate to Source Voltage	V_{GS}	$\pm 20/\mp 20$	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 6.0/\mp 5.0$	A
Drain Current (pulse) ^{Note1}	$I_{D(pulse)}$	$\pm 24/\mp 20$	A
Total Power Dissipation ^{Note2}	P_T	2.0	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. 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.

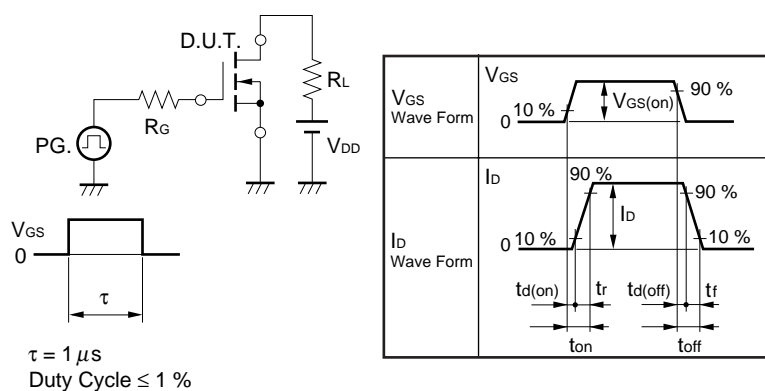
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ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

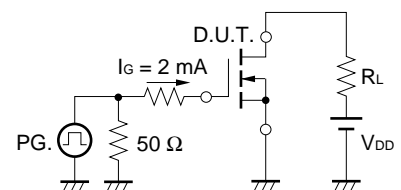
A) N-Channel

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



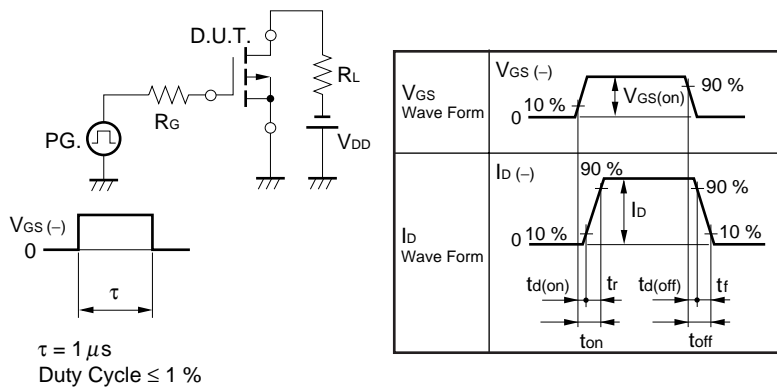
TEST CIRCUIT 2 GATE CHARGE



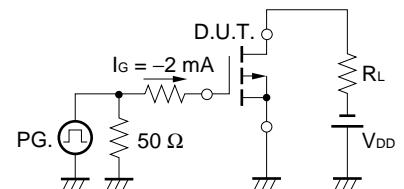
B) P-Channel

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	$V_{GS(off)}$	$V_{DS} = -10\text{ V}, I_D = -1\text{ mA}$	-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	$R_{DS(on)1}$	$V_{GS} = -10\text{ V}, I_D = -2.5\text{ A}$		28	37	$\text{m}\Omega$
	$R_{DS(on)2}$	$V_{GS} = -4.5\text{ V}, I_D = -2.5\text{ A}$		42	56	$\text{m}\Omega$
	$R_{DS(on)3}$	$V_{GS} = -4.0\text{ V}, I_D = -2.5\text{ A}$		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	$t_{d(on)}$	$V_{DD} = -15\text{ V}$		17		ns
Rise Time	t_r	$I_D = -2.5\text{ A}$		52		ns
Turn-off Delay Time	$t_{d(off)}$	$V_{GS(on)} = -10\text{ V}$		84		ns
Fall Time	t_f	$R_G = 10\text{ }\Omega$		73		ns
Total Gate Charge	Q_G	$V_{DD} = -24\text{ V}$		15		nC
Gate to Source Charge	Q_{GS}	$I_D = -5.0\text{ A}$		1.9		nC
Gate to Drain Charge	Q_{GD}	$V_{GS} = -10\text{ V}$		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}	$I_F = 5.0\text{ A}, V_{GS} = 0\text{ V}$		38		ns
Reverse Recovery Charge	Q_{rr}	$di/dt = 50\text{ A}/\mu\text{s}$		35		nC

TEST CIRCUIT 1 SWITCHING TIME

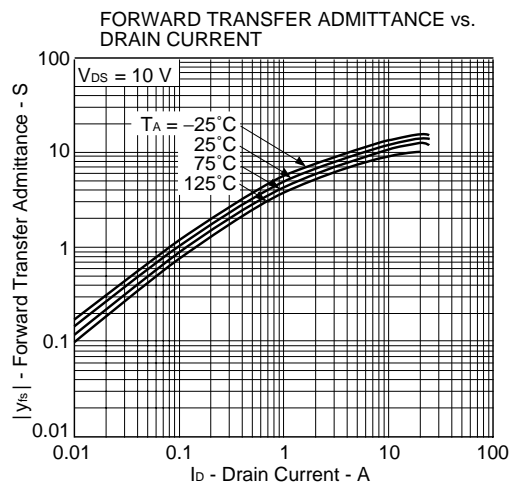
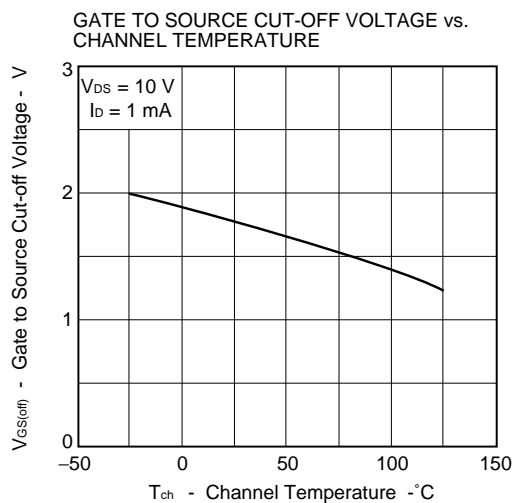
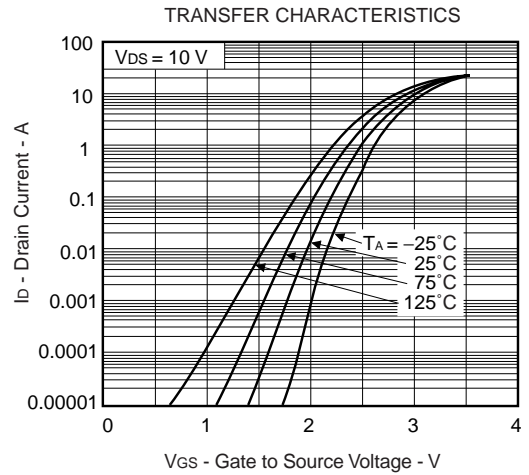
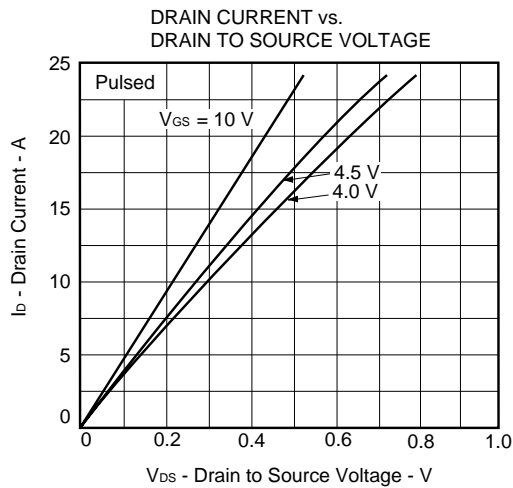
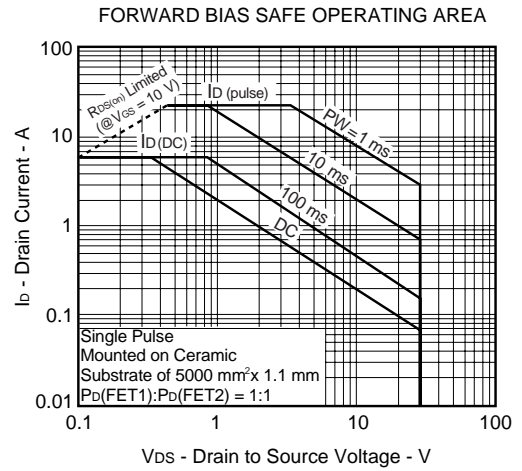
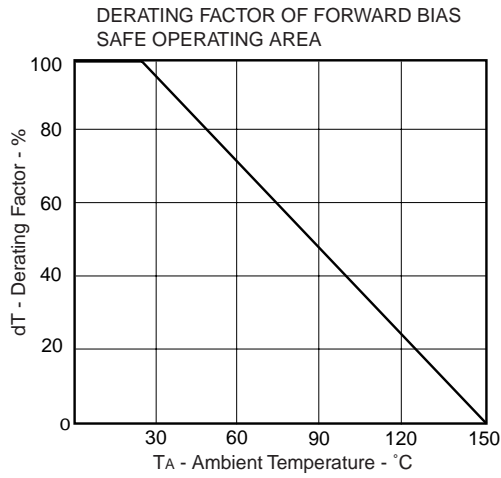


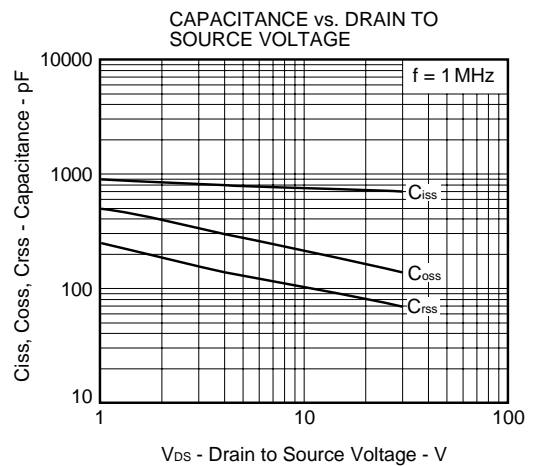
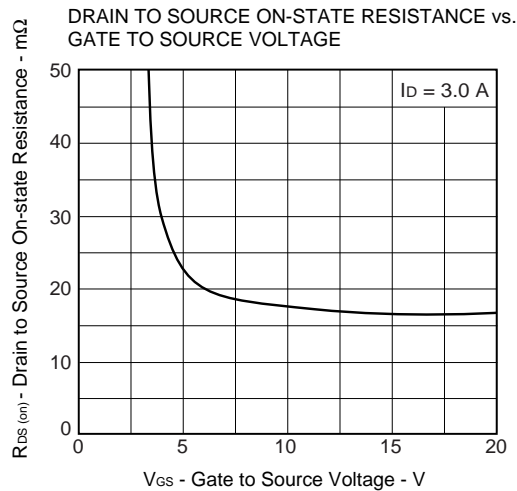
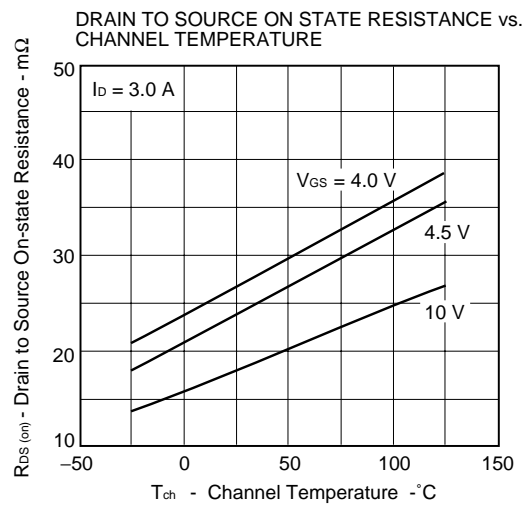
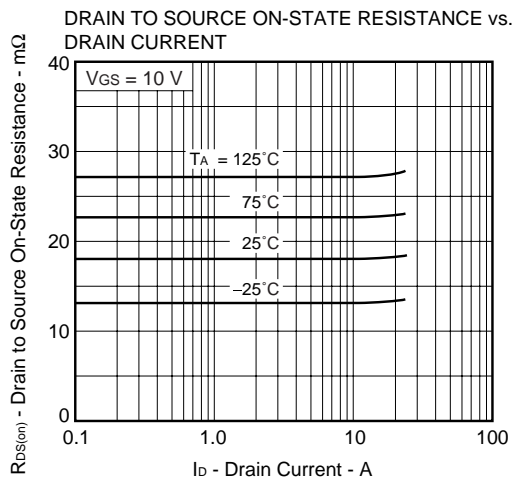
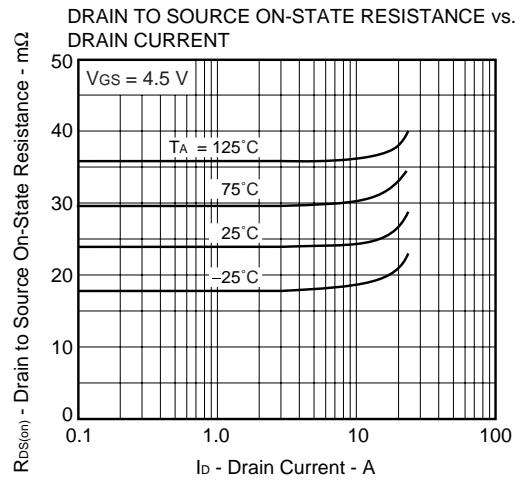
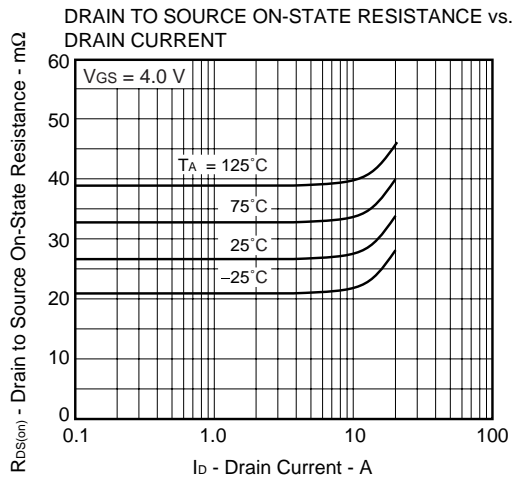
TEST CIRCUIT 2 GATE CHARGE



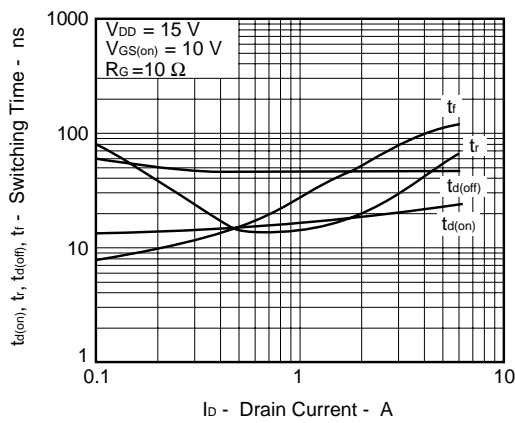
TYPICAL CHARACTERISTICS (TA = 25°C)

A) N-Channel

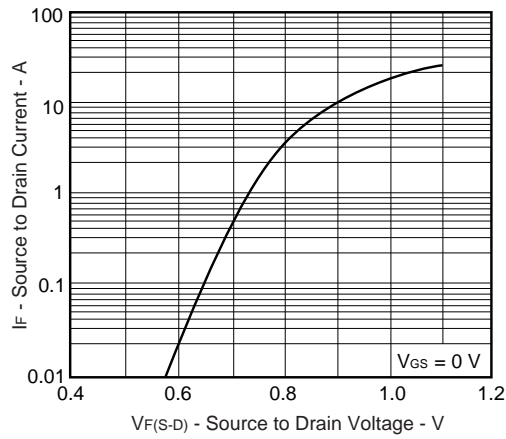




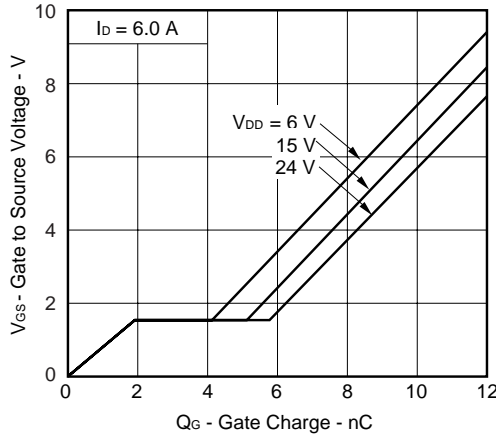
SWITCHING CHARACTERISTICS



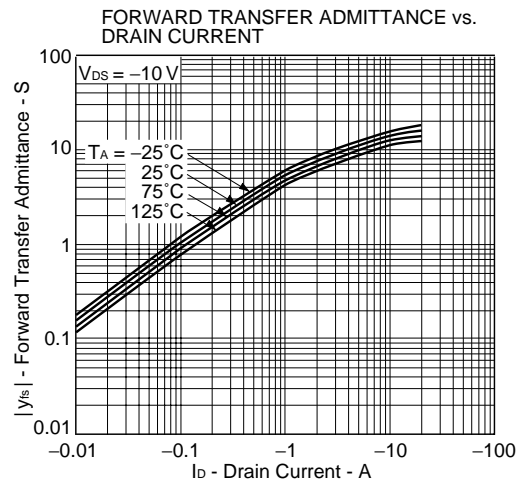
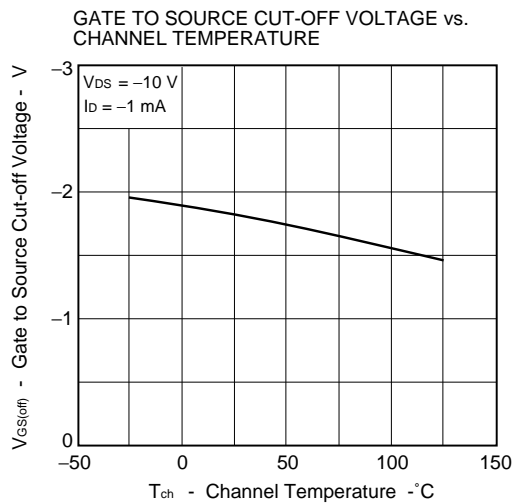
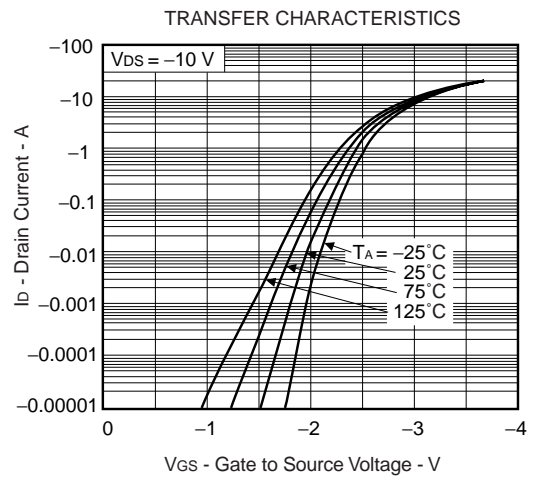
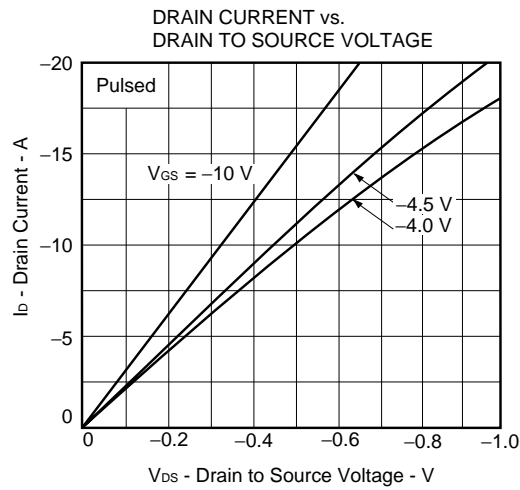
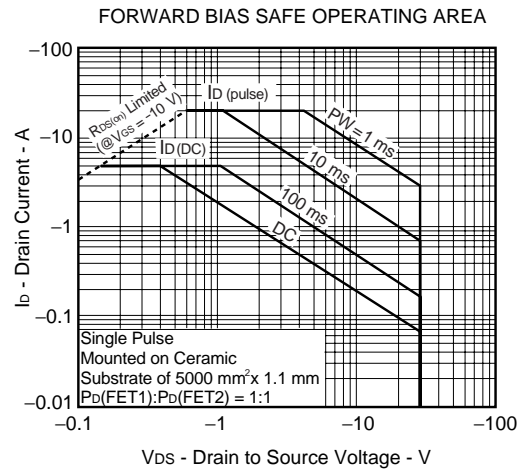
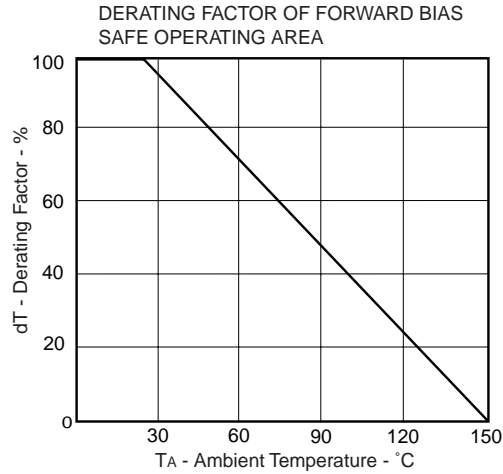
SOURCE TO DRAIN DIODE FORWARD VOLTAGE

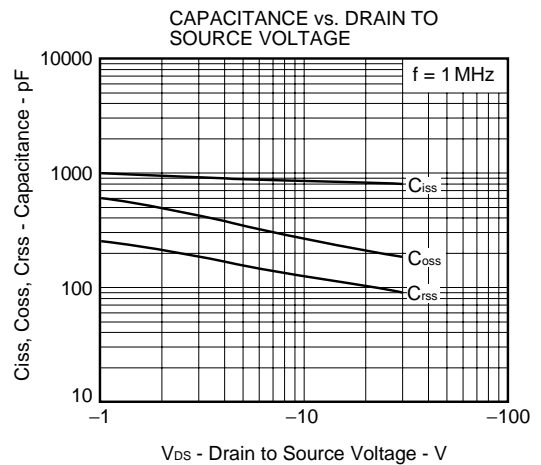
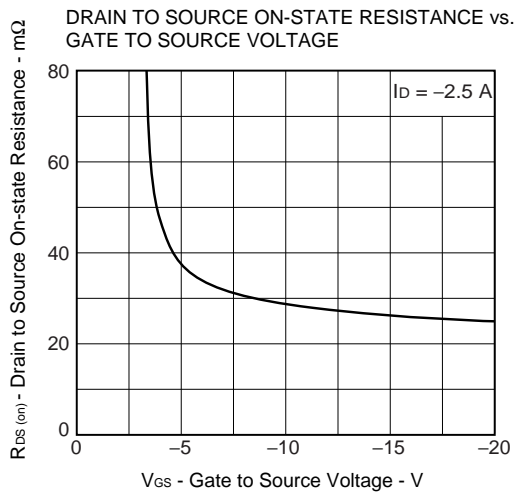
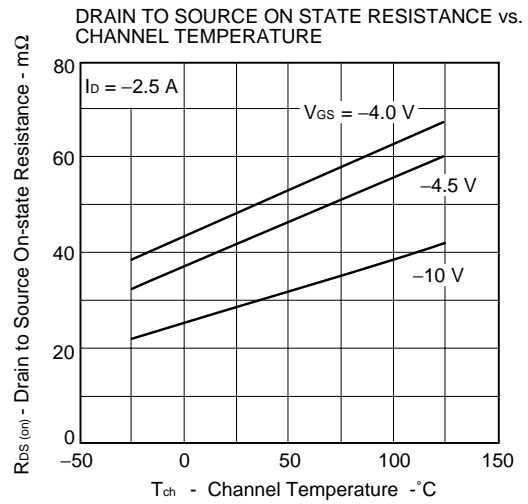
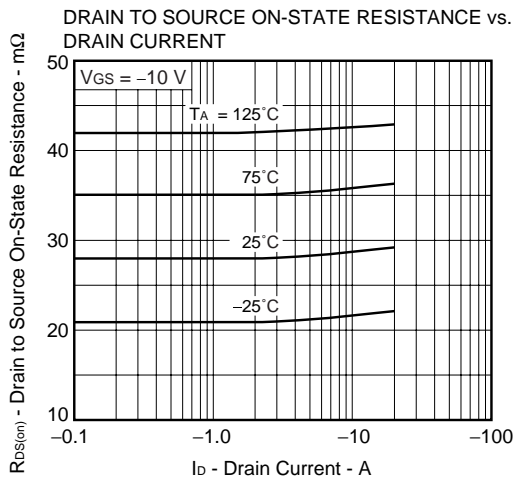
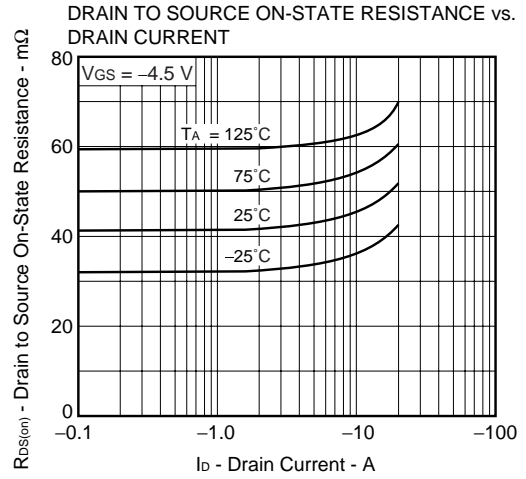
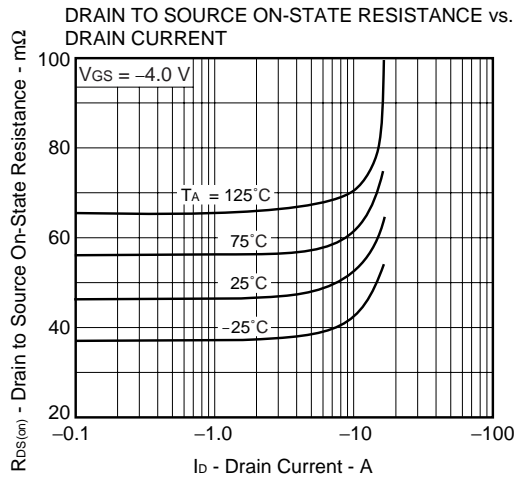


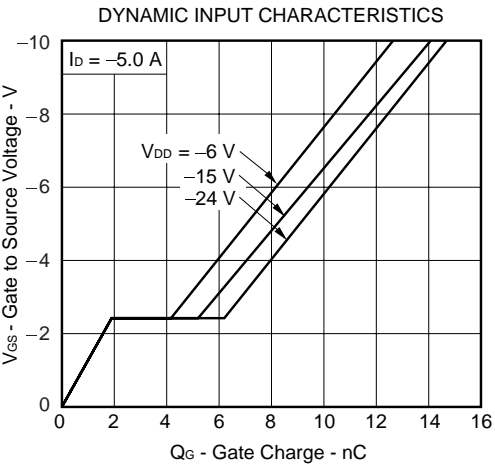
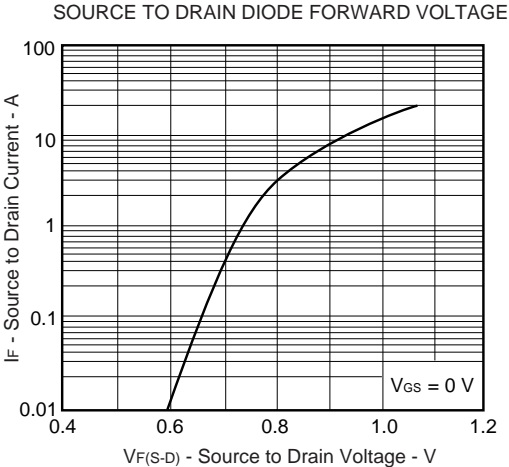
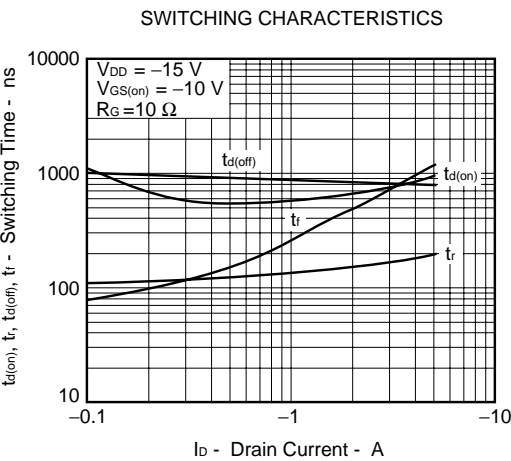
DYNAMIC INPUT CHARACTERISTICS



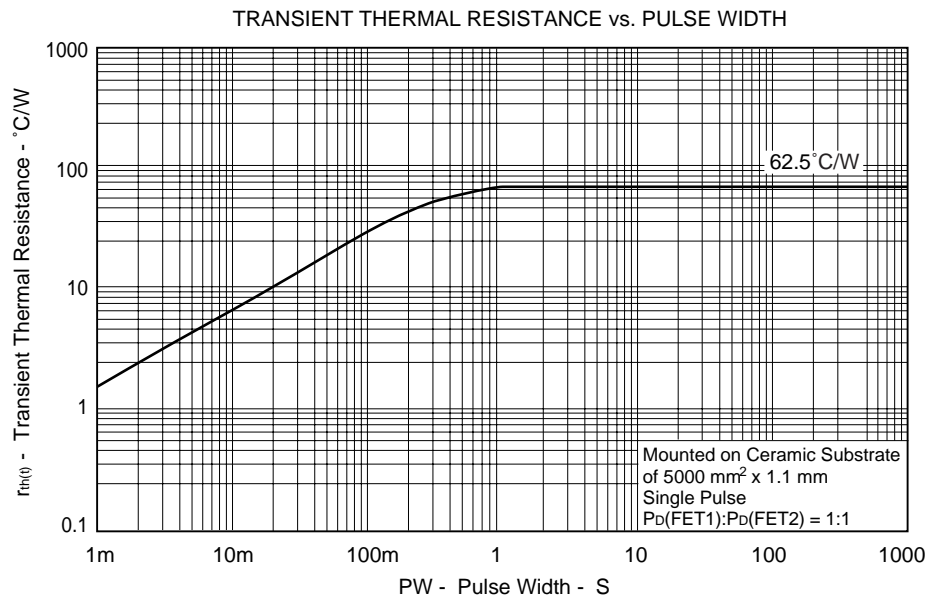
B) P-Channel







C) Common



[MEMO]

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