

MOS FIELD EFFECT TRANSISTOR

μ PA2592T1H

N- AND P-CANNEL MOSFET FOR SWITCHING

DESCRIPTION

The μ PA2592T1H is N- and P-channel MOSFETs designed for DC/DC converters and power management applications of portable equipments.

N- and P-channel MOSFETs are assembled in one package, to contribute minimize the equipments.

FEATURES

- 2.5 V drive available
- Low on-state resistance

N-channel $R_{DS(on)1} = 50 \text{ m}\Omega \text{ MAX.}$ ($V_{GS} = 4.5 \text{ V}$, $I_D = 2 \text{ A}$)

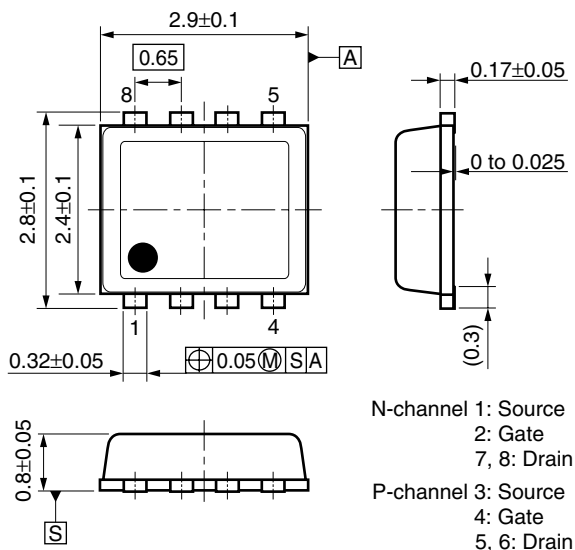
$R_{DS(on)2} = 65 \text{ m}\Omega \text{ MAX.}$ ($V_{GS} = 2.5 \text{ V}$, $I_D = 2 \text{ A}$)

P-channel $R_{DS(on)1} = 80 \text{ m}\Omega \text{ MAX.}$ ($V_{GS} = -4.5 \text{ V}$, $I_D = -2 \text{ A}$)

$R_{DS(on)2} = 140 \text{ m}\Omega \text{ MAX.}$ ($V_{GS} = -2.5 \text{ V}$, $I_D = -1 \text{ A}$)

- Built-in gate protection diode
- Small and surface mount package (8-pin VSOFF (2429))

PACKAGE DRAWING (Unit: mm)



ORDERING INFORMATION

PART NUMBER	LEAD PLATING	PACKING	PACKAGE
μ PA2592T1H-T1-AT <small>Note</small>	Pure Sn	8 mm embossed taping	8-pin VSOFF (2429)
μ PA2592T1H-T2-AT <small>Note</small>		3000 p/reel	

Note Pb-free (This product does not contain Pb in the external electrode and other parts.)

Marking: 2592

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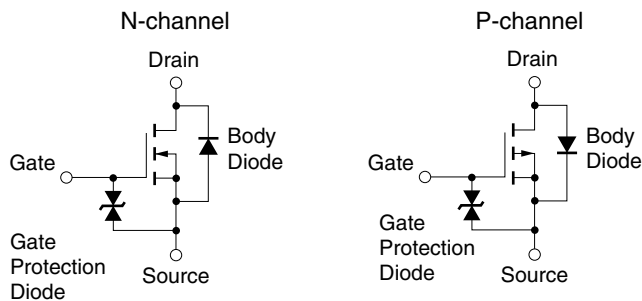
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

PARAMETER	SYMBOL	N-CHANNEL	P-CHANNEL	UNIT
Drain to Source Voltage (V _{GS} = 0 V)	V _{DSS}	20	-20	V
Gate to Source Voltage (V _{DS} = 0 V)	V _{GSS}	±12	∓12	V
Drain Current (DC)	I _{D(DC)}	±4.0	∓3.0	A
Drain Current (pulse) ^{Note1}	I _{D(pulse)}	±16	∓12	A
Total Power Dissipation (1 unit, 5 s) ^{Note2}	P _{T1}	1.5		W
Total Power Dissipation (2 units, 5 s) ^{Note2}	P _{T2}	1.24		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 FR-4 board of 25.4 mm x 25.4 mm x 0.8 mm

EQUIVALENT CIRCUIT



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.

Caution This product is electrostatic-sensitive device due to low ESD capability and should be handled with caution for electrostatic discharge.

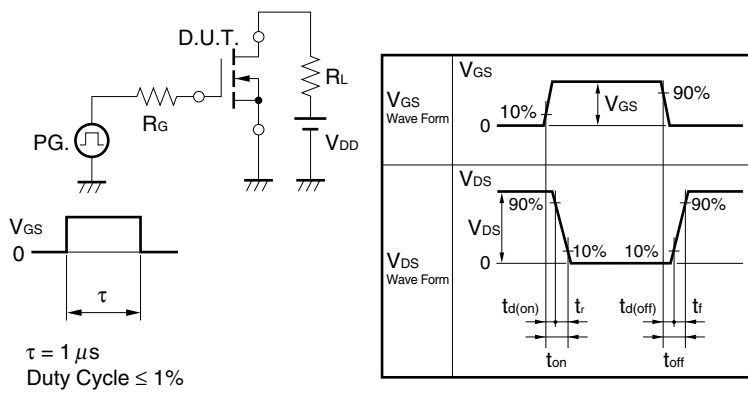
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

N-channel MOSFET

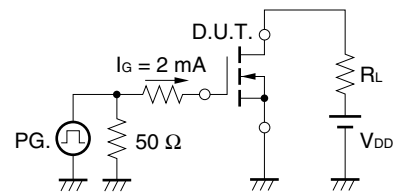
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 20 V, V _{GS} = 0 V			1	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±12 V, V _{DS} = 0 V			±10	μA
Gate to Source Cut-off Voltage	V _{GS(off)}	V _{DS} = 10 V, I _D = 1 mA	0.5		1.5	V
Forward Transfer Admittance ^{Note}	y _{fs}	V _{DS} = 10 V, I _D = 2 A	2			S
Drain to Source On-state Resistance ^{Note}	R _{DS(on)1}	V _{GS} = 4.5 V, I _D = 2 A		29	50	mΩ
	R _{DS(on)2}	V _{GS} = 2.5 V, I _D = 2 A		41	65	mΩ
Input Capacitance	C _{iss}	V _{DS} = 10 V,		455		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V,		75		pF
Reverse Transfer Capacitance	C _{rss}	f = 1.0 MHz		47		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = 10 V, I _D = 2 A, V _{GS} = 4.5 V, R _G = 6 Ω		8		ns
Rise Time	t _r			8		ns
Turn-off Delay Time	t _{d(off)}			20		ns
Fall Time	t _f			6		ns
Total Gate Charge	Q _G	V _{DD} = 16 V, V _{GS} = 4.5 V, I _D = 4 A		5.4		nC
Gate to Source Charge	Q _{GS}			0.9		nC
Gate to Drain Charge	Q _{GD}			1.6		nC
Body Diode Forward Voltage ^{Note}	V _{F(S-D)}	I _F = 4 A, V _{GS} = 0 V		0.85		V

Note Pulsed

TEST CIRCUIT 1 SWITCHING TIME



TEST CIRCUIT 2 GATE CHARGE

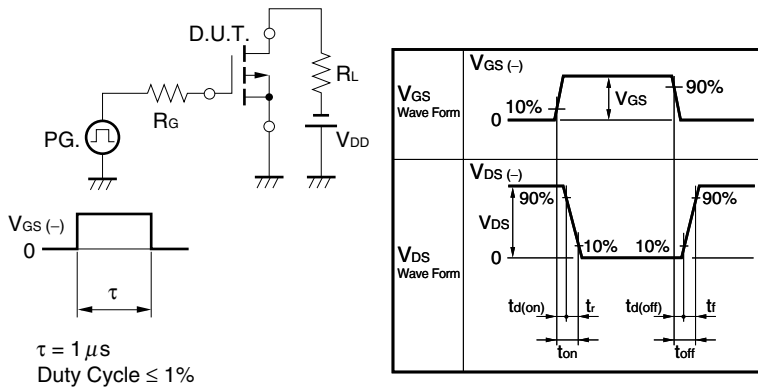


P-channel MOSFET

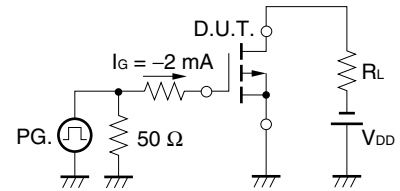
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
Gate Leakage Current	I_{GSS}	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0\text{ V}$			∓ 10	μA
Gate to Source Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = -10\text{ V}, I_D = -1\text{ mA}$	-0.5		-1.5	V
Forward Transfer Admittance ^{Note}	$ y_{fs} $	$V_{DS} = -10\text{ V}, I_D = -1.5\text{ A}$	2			S
Drain to Source On-state Resistance ^{Note}	$R_{DS(on)1}$	$V_{GS} = -4.5\text{ V}, I_D = -2\text{ A}$		55	80	$\text{m}\Omega$
	$R_{DS(on)2}$	$V_{GS} = -2.5\text{ V}, I_D = -1\text{ A}$		80	140	$\text{m}\Omega$
Input Capacitance	C_{iss}	$V_{DS} = -10\text{ V},$		445		pF
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V},$		96		pF
Reverse Transfer Capacitance	C_{rss}	$f = 1.0\text{ MHz}$		82		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, I_D = -1.5\text{ A},$		12		ns
Rise Time	t_r	$V_{GS} = -4.5\text{ V},$		5		ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 6\ \Omega$		36		ns
Fall Time	t_f			20		ns
Total Gate Charge	Q_G	$V_{DD} = -16\text{ V}, V_{GS} = -4.5\text{ V},$		5.7		nC
Gate to Source Charge	Q_{GS}	$I_D = -3\text{ A}$		1.2		nC
Gate to Drain Charge	Q_{GD}			2.2		nC
Body Diode Forward Voltage ^{Note}	$V_{F(S-D)}$	$I_F = -3\text{ A}, V_{GS} = 0\text{ V}$		0.88		V

Note Pulsed

TEST CIRCUIT 1 SWITCHING TIME

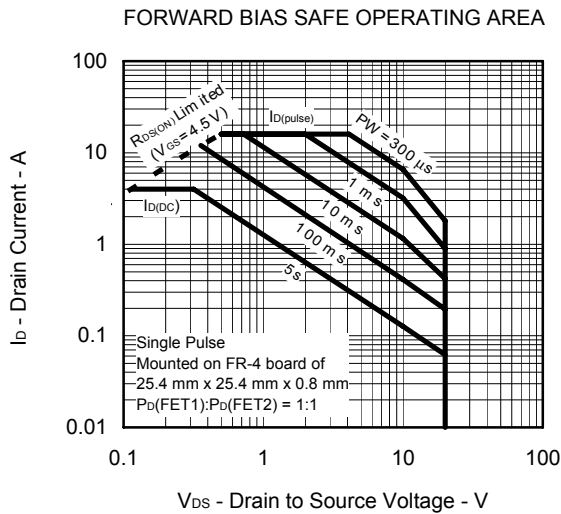
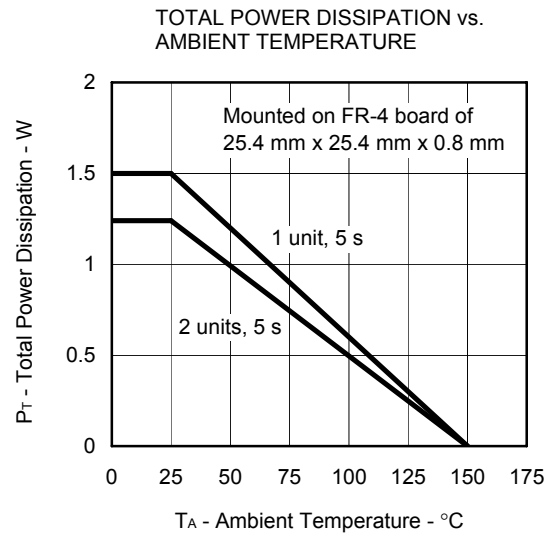
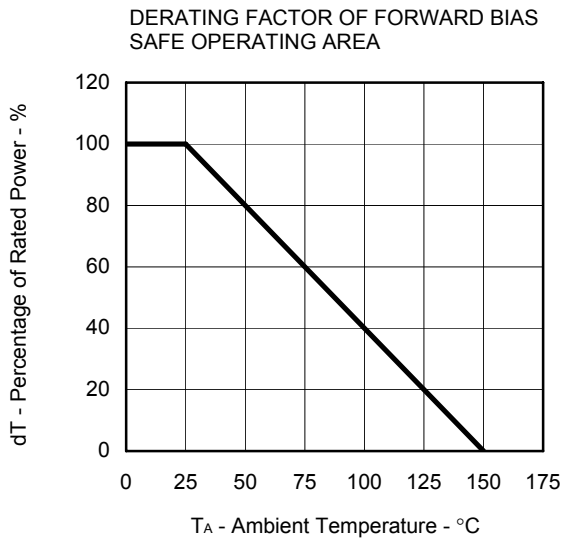


TEST CIRCUIT 2 GATE CHARGE

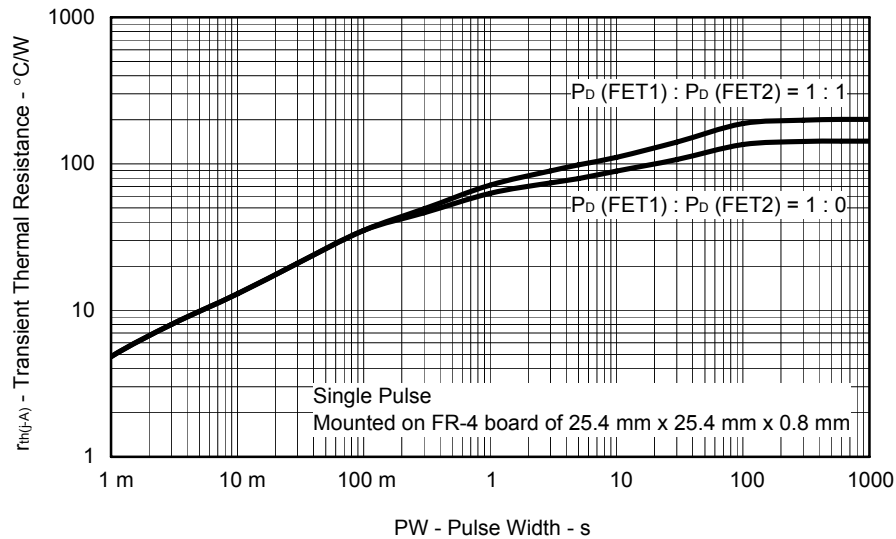


TYPICAL CHARACTERISTICS (T_A = 25°C)

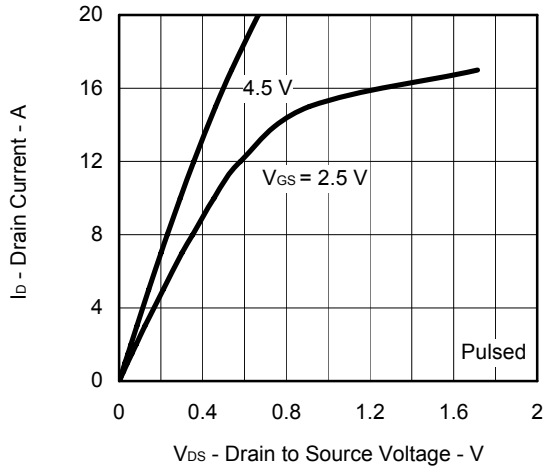
(1) N-channel MOSFET



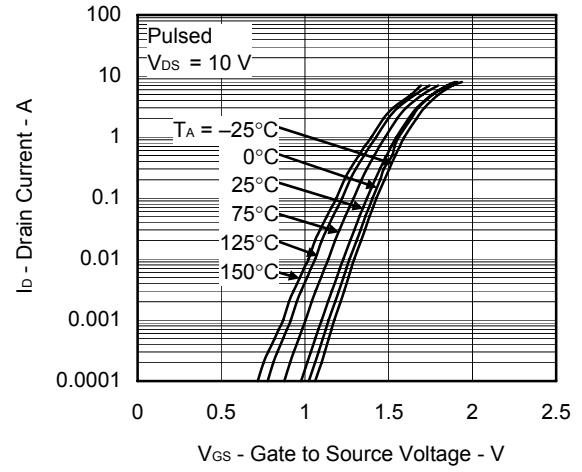
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



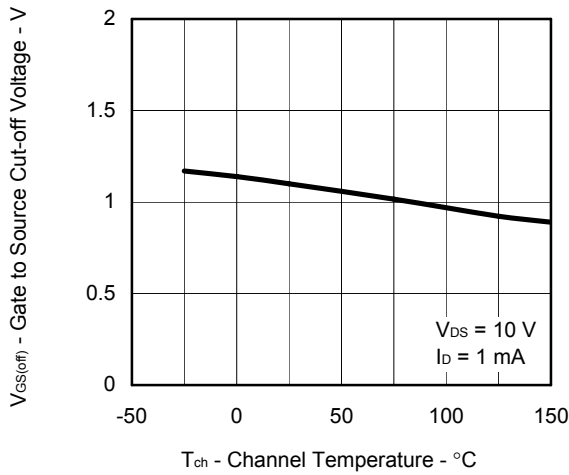
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



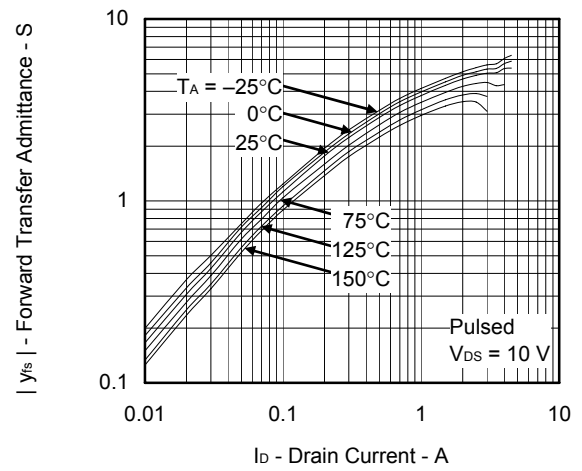
FORWARD TRANSFER CHARACTERISTICS



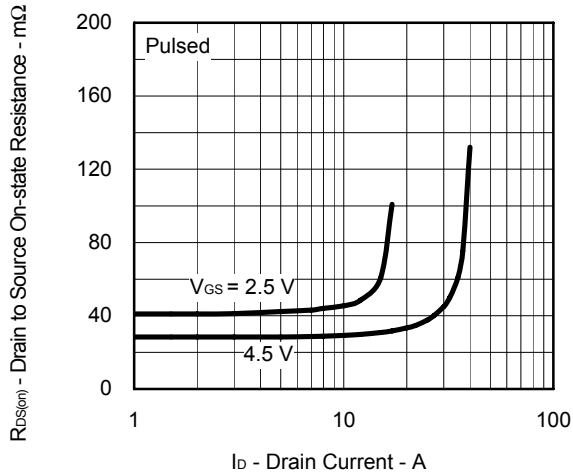
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



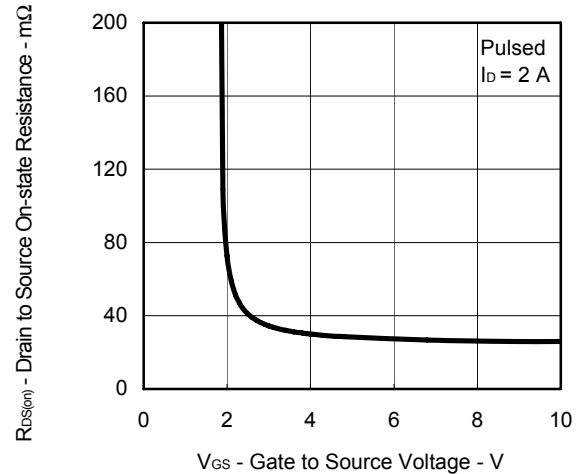
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



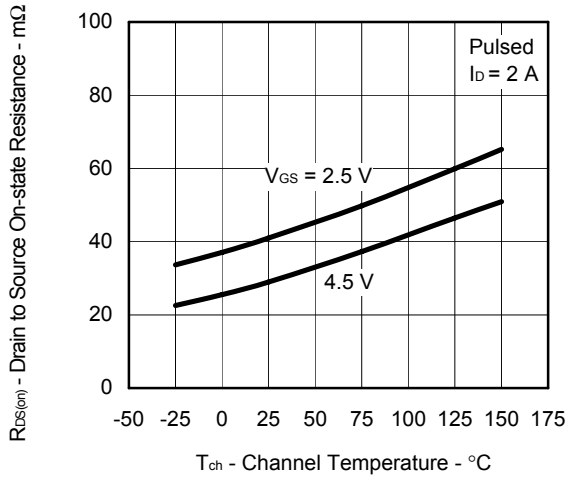
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



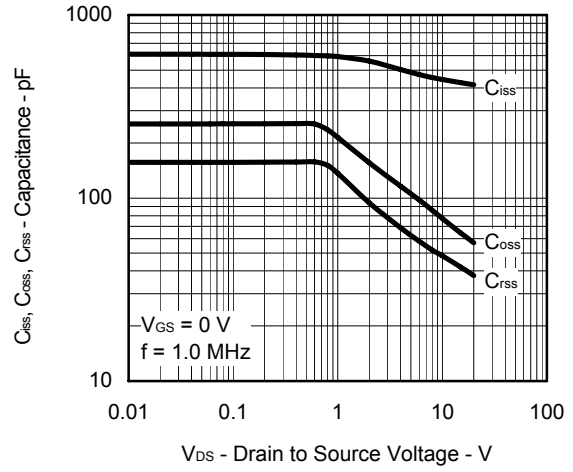
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



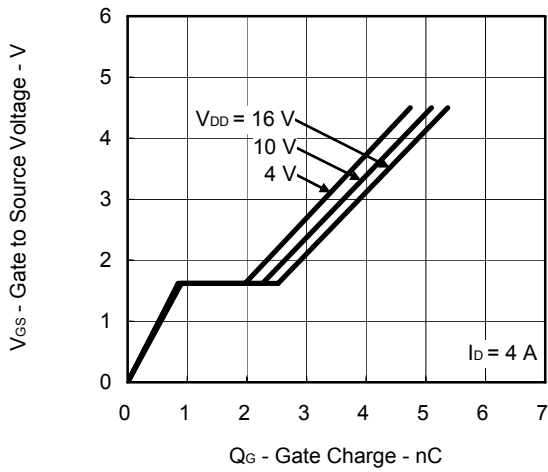
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



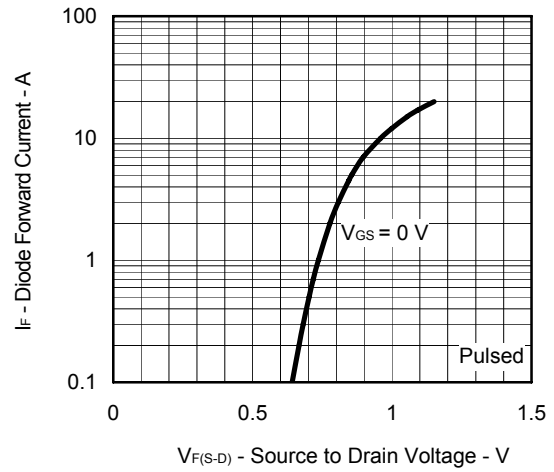
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



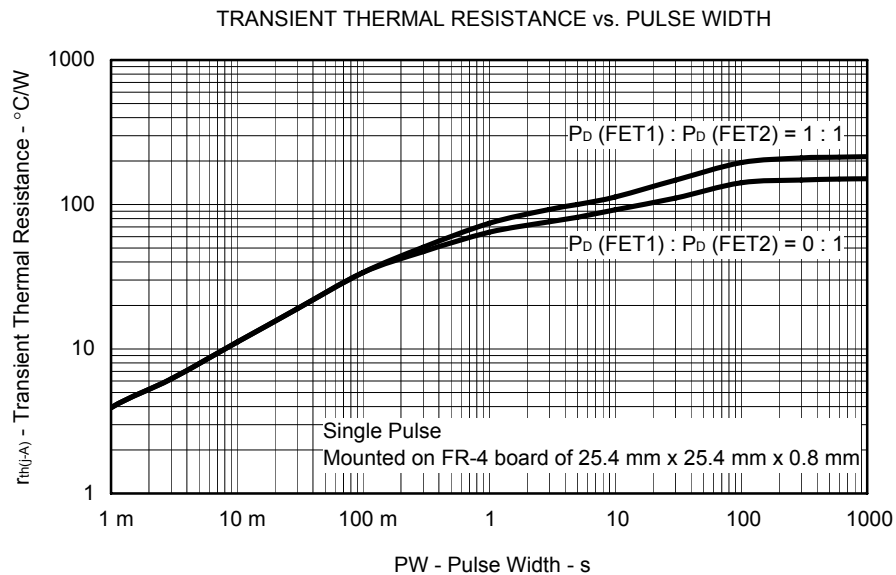
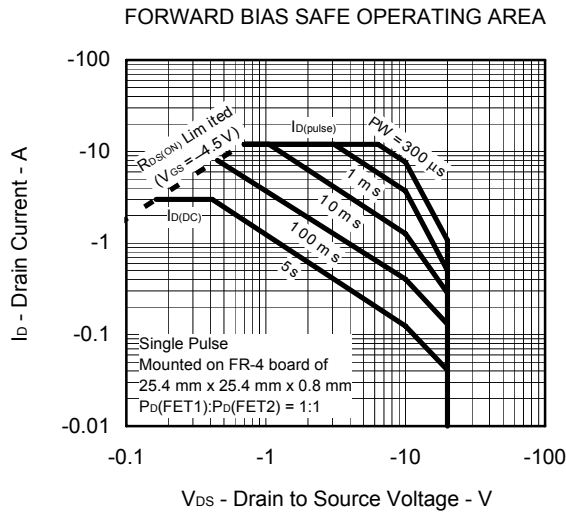
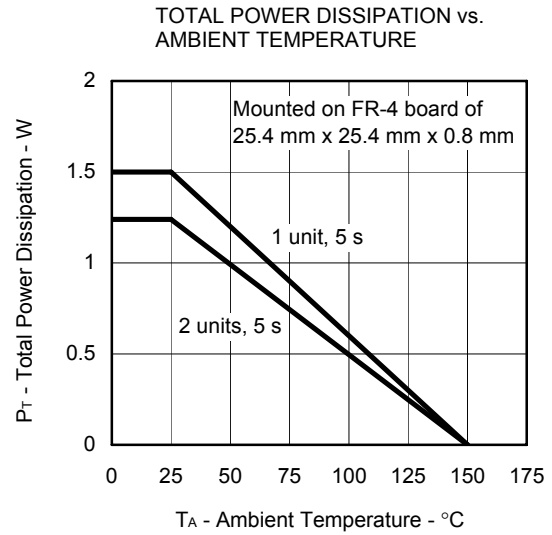
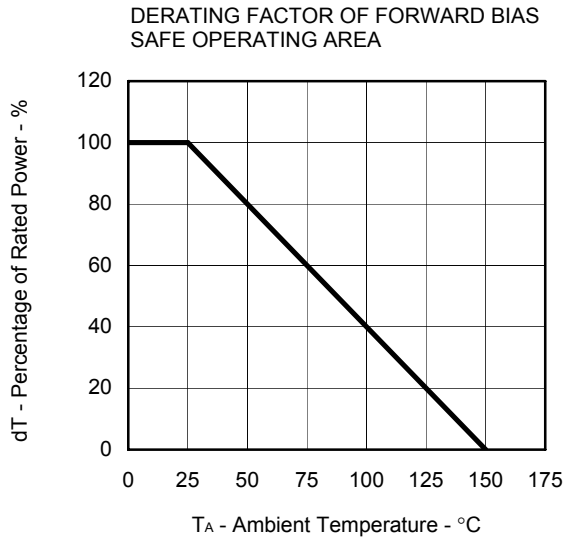
DYNAMIC INPUT CHARACTERISTICS



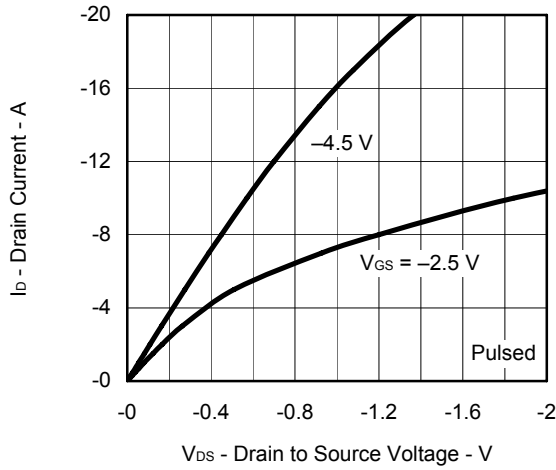
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



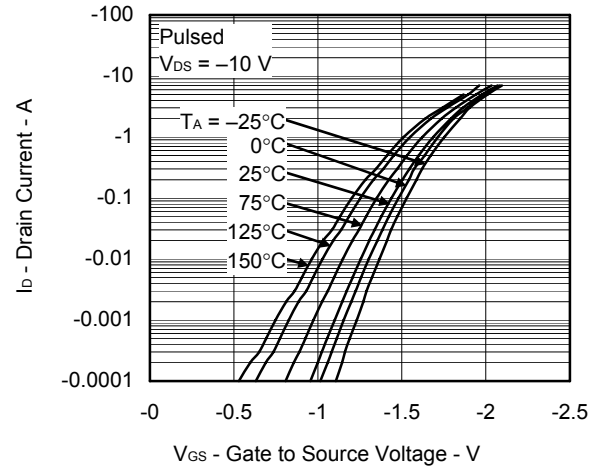
(2) P-channel MOSFET



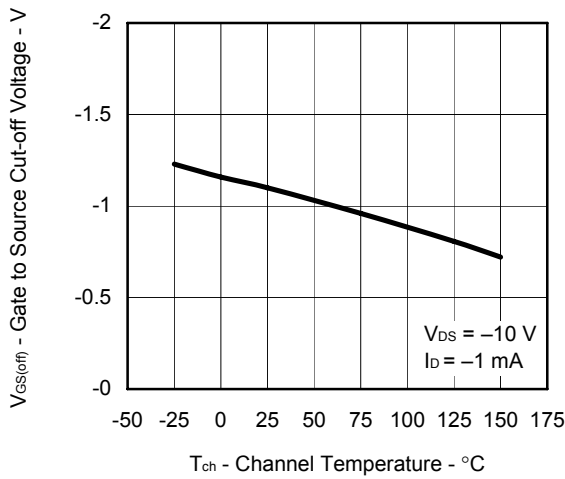
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



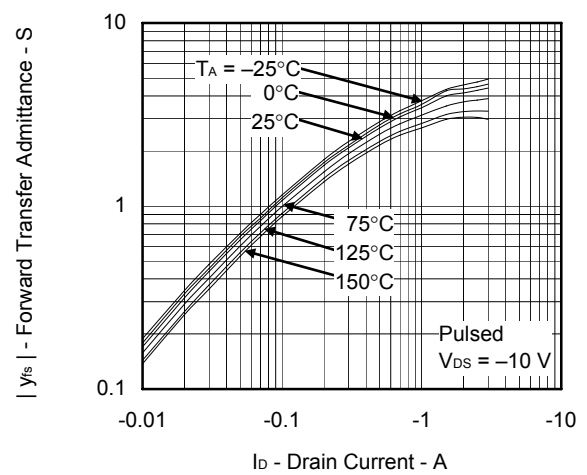
FORWARD TRANSFER CHARACTERISTICS



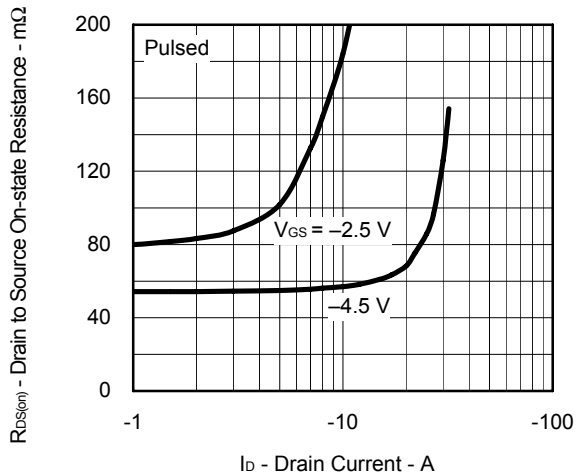
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



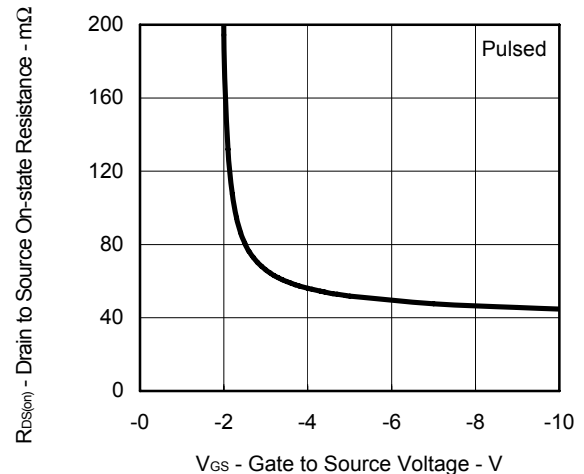
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



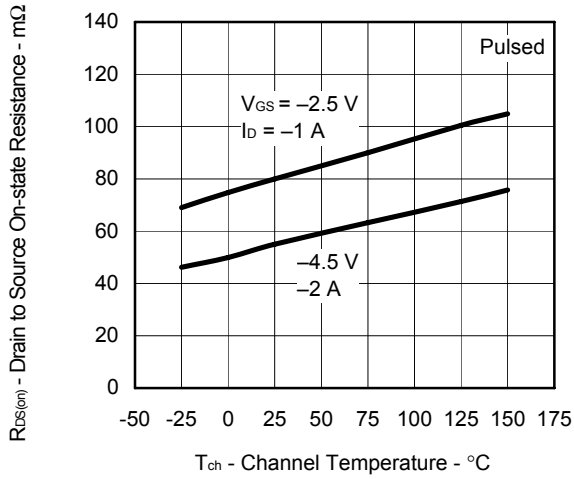
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



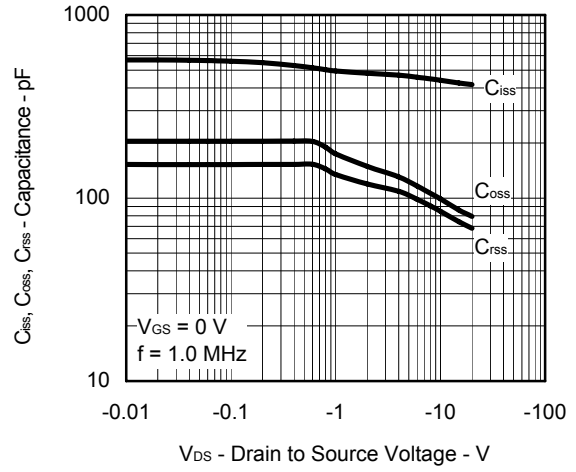
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



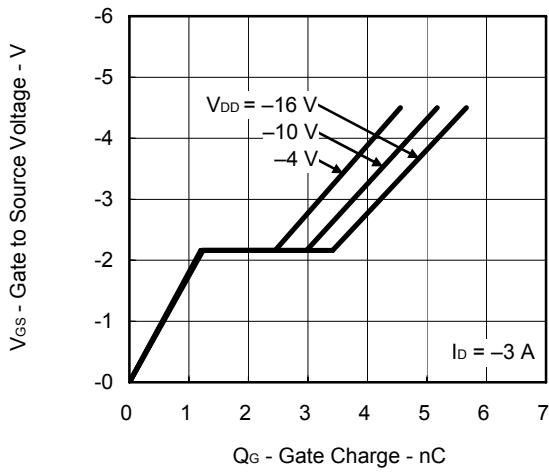
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



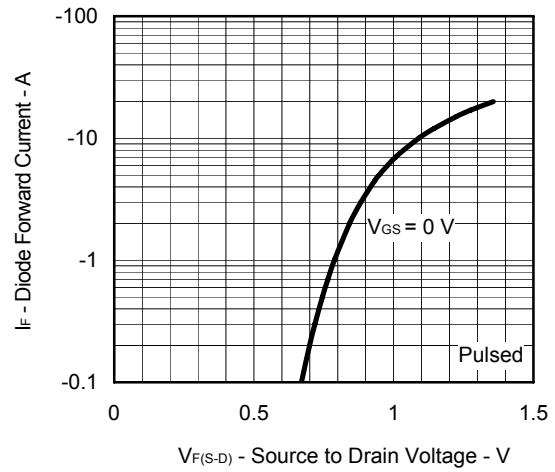
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



DYNAMIC INPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



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