DATA SHEET

MOS FIELD EFFECT TRANSISTOR

μPA1793

SWITCHING
N- AND P-CHANNEL POWER MOS FET

DESCRIPTION

The μPA1793 is N- and P-Channel MOS Field Effect Transistors designed for Motor Drive application.

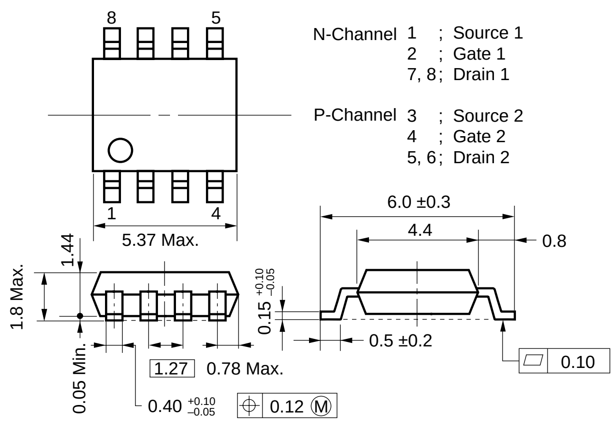
FEATURES

- Low on-state resistance
  - N-Channel $R_{DS(on)1}$ = 69 mΩ MAX. (V_{GS} = 4.5 V, I_D = 1.5 A)
  - $R_{DS(on)2}$ = 72 mΩ MAX. (V_{GS} = 4.0 V, I_D = 1.5 A)
  - $R_{DS(on)3}$ = 107 mΩ MAX. (V_{GS} = 2.5 V, I_D = 1.0 A)
  - P-Channel $R_{DS(on)1}$ = 115 mΩ MAX. (V_{GS} = –4.5 V, I_D = –1.5 A)
  - $R_{DS(on)2}$ = 120 mΩ MAX. (V_{GS} = –4.0 V, I_D = –1.5 A)
  - $R_{DS(on)3}$ = 190 mΩ MAX. (V_{GS} = –2.5 V, I_D = –1.0 A)
- Low input capacitance
  - N-Channel C_{iss} = 160 pF TYP.
  - P-Channel C_{iss} = 370 pF TYP.
- Built-in G-S protection diode
- Small and surface mount package (Power SOP8)

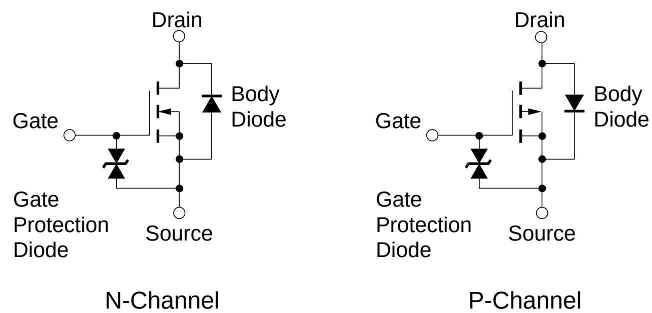
ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1793G	Power SOP8

PACKAGE DRAWING (Unit: 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.

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

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ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, All terminals are connected.)

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)	$I_{D(DC)}$	± 3	∓ 3	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	± 12	∓ 12	A
Total Power Dissipation (1 unit) Note2	P_T	1.7		W
Total Power Dissipation (2 units) 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%

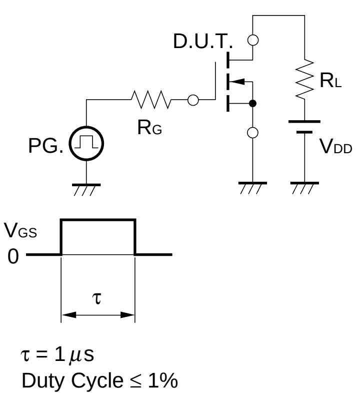
2. Mounted on ceramic substrate of 5500 mm^2 × 2.2 mm, T_A = 25°C

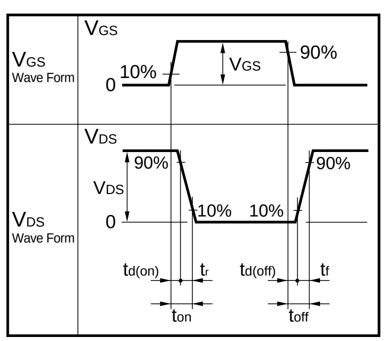
ELECTRICAL CHARACTERISTICS (T_A = 25°C, All terminals are connected.)

A) N-Channel

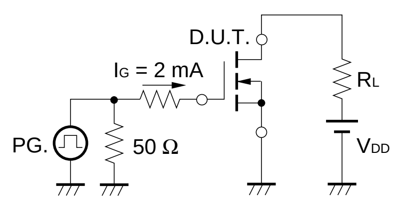
Characteristice	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V			10	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±12 V, V_{DS} = 0 V			±10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 10 V, I_D = 1 mA	0.5	1.0	1.5	V
Forward Transfer Admittance	$\| y_{fs} \|$	V_{DS} = 10 V, I_D =1.5 A	1.0			S
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = 4.5 V, I_D = 1.5 A		55	69	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.0 V, I_D = 1.5 A		57	72	mΩ
	$R_{DS(on)3}$	V_{GS} = 2.5 V, I_D = 1.0 A		78	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 MHz		40		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 10 V, I_D = 1.5 A		17		ns
Rise Time	t_r	V_{GS} = 4.0 V		50		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 10 Ω		86		ns
Fall Time	t_f			80		ns
Total Gate Charge	Q_G	V_{DD} = 16 V		3.1		nC
Gate to Source Charge	Q_{GS}	V_{GS} = 4.0 V		0.7		nC
Gate to Drain Charge	Q_{GD}	I_D = 3.0 A		1.4		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 3.0 A, V_{GS} = 0 V		0.86		V
Reverse Recovery Time	t_{rr}	I_F = 3 A, V_{GS} = 0 V		70		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 50 A/μs		12		nC

TEST CIRCUIT 1 SWITCHING TIME





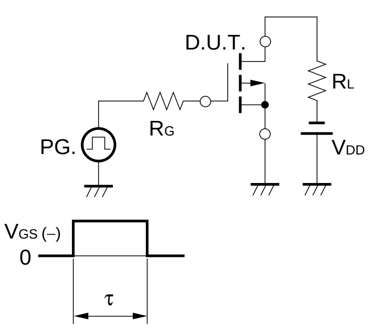
TEST CIRCUIT 2 GATE CHARGE

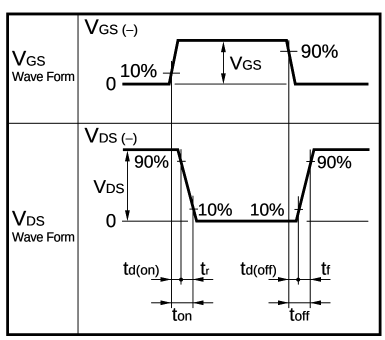


B) P-Channel

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 mA	–0.5	–1.0	–1.5	V
Forward Transfer Admittance	$\| y_{fs} \|$	V_{DS} = –10 V, I_D = –1.5 A	1.0			S
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = –4.5 V, I_D = –1.5 A		75	115	mΩ
	$R_{DS(on)2}$	V_{GS} = –4.0 V, I_D = –1.5 A		80	120	mΩ
	$R_{DS(on)3}$	V_{GS} = –2.5 V, I_D = –1.0 A		116	190	mΩ
Input Capacitance	C_{iss}	V_{DS} = –10 V		370		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		110		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		40		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = –10 V, I_D = –1.5 A		120		ns
Rise Time	t_r	V_{GS} = –4.0 V		260		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 10 Ω		410		ns
Fall Time	t_f			360		ns
Total Gate Charge	Q_G	V_{DD} = –10 V		3.4		nC
Gate to Source Charge	Q_{GS}	V_{GS} = –4.0 V		1.3		nC
Gate to Drain Charge	Q_{GD}	I_D = –3.0 A		1.6		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 3.0 A, V_{GS} = 0 V		0.86		V
Reverse Recovery Time	t_{rr}	I_F = 3 A, V_{GS} = 0 V		24		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 10 A/μs		1.5		nC

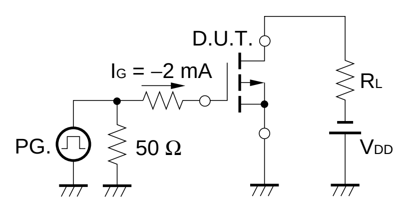
TEST CIRCUIT 1 SWITCHING TIME





τ = 1 μs
Duty Cycle ≤ 1%

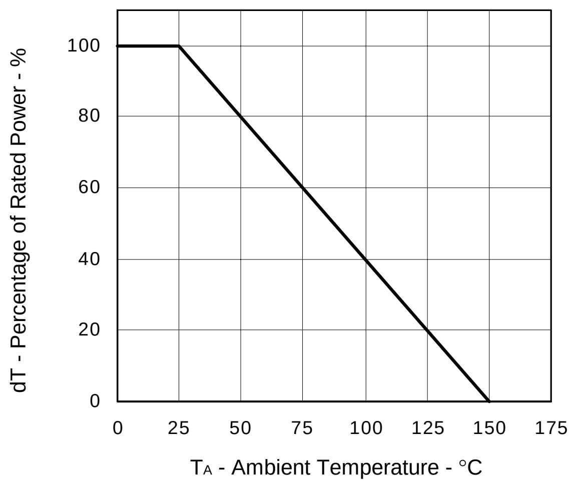
TEST CIRCUIT 2 GATE CHARGE



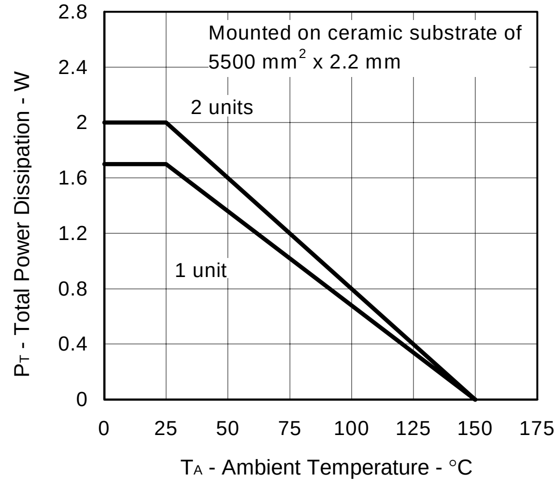
TYPICAL CHARACTERISTICS (T_A = 25°C)

A) N-Channel

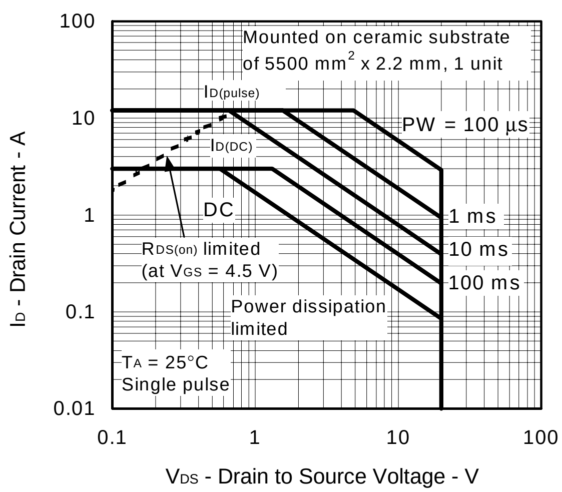
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



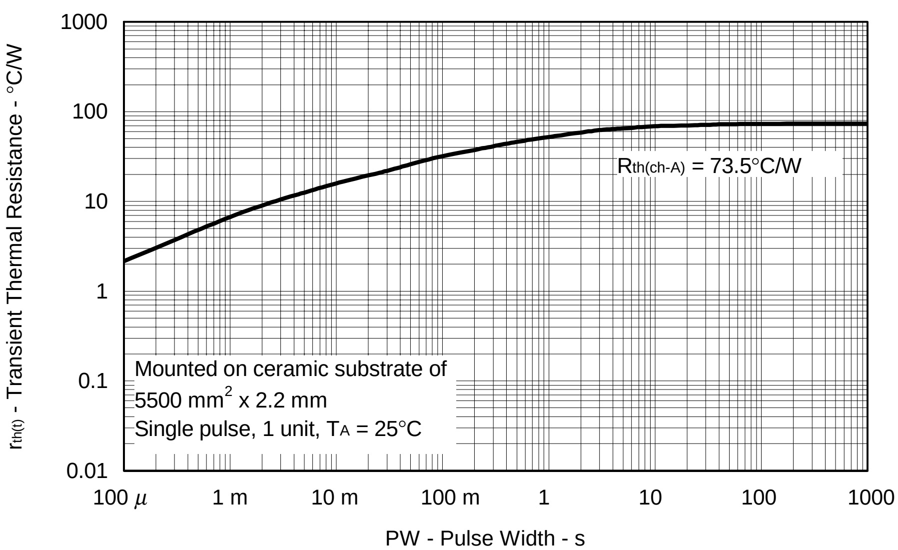
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



FORWARD BIAS SAFE OPERATING AREA

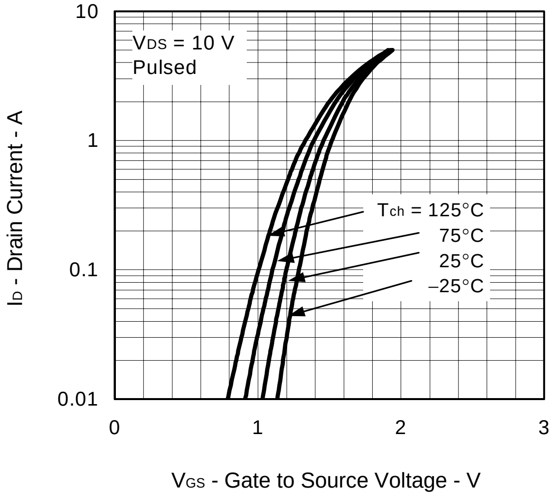


TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

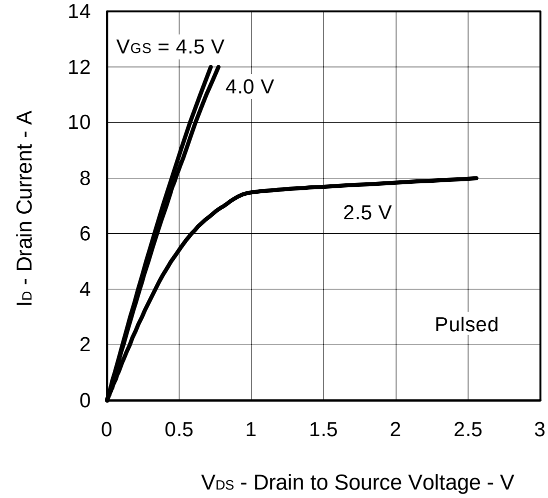


A) N-Channel

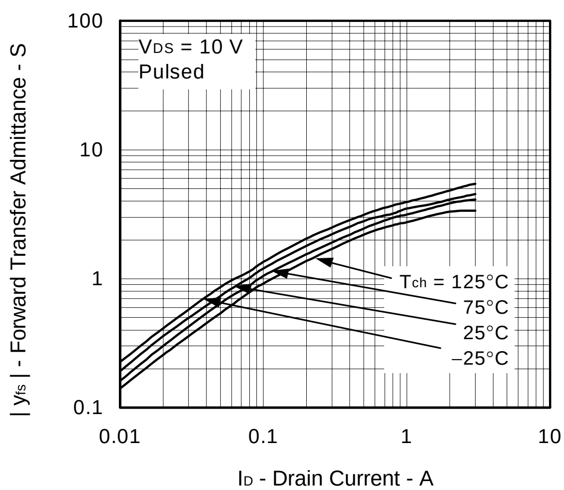
FORWARD TRANSFER CHARACTERISTICS



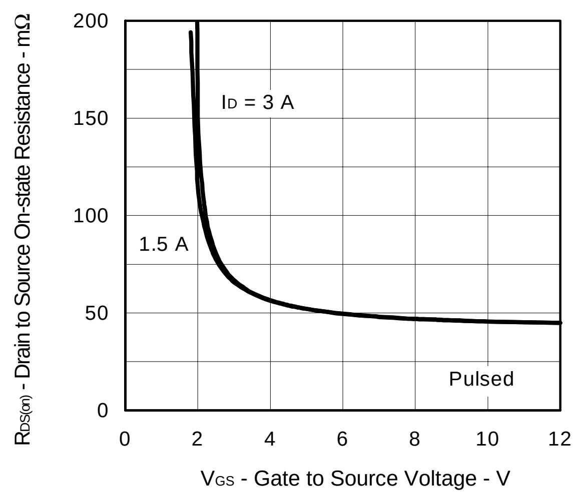
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



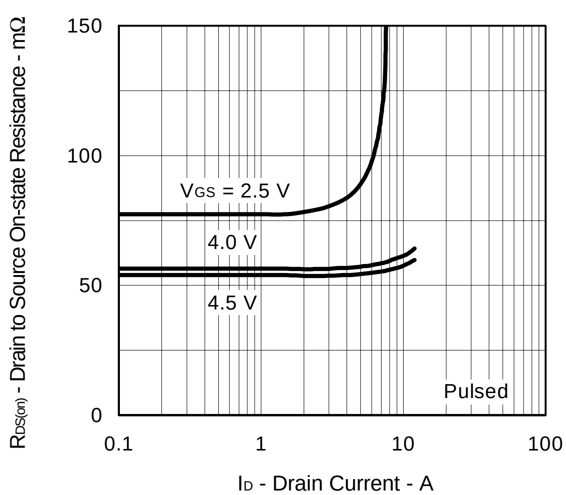
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



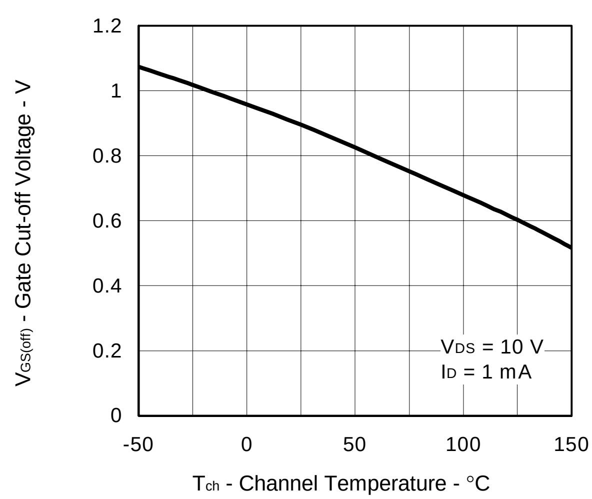
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT

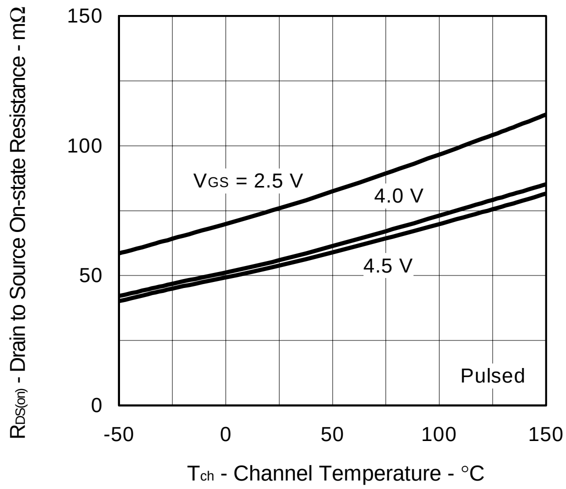


GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE

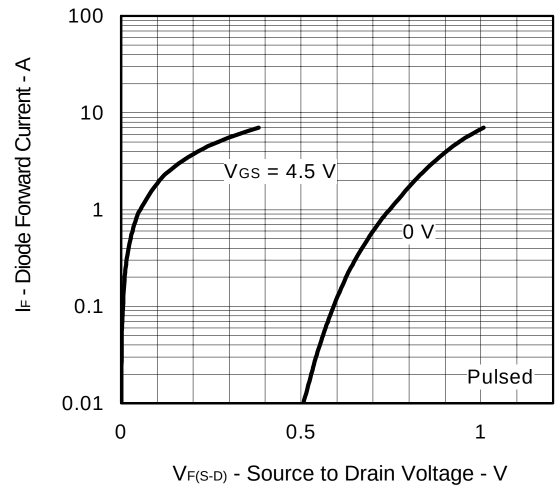


A) N-Channel

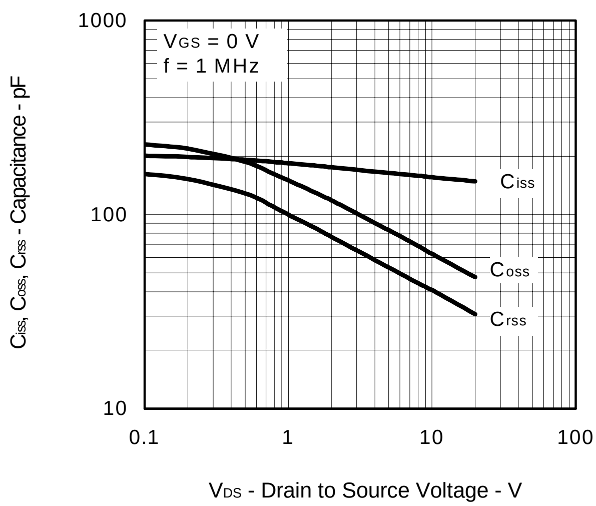
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



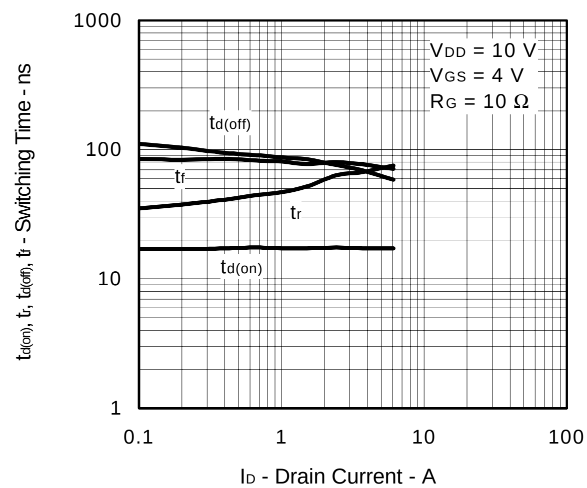
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



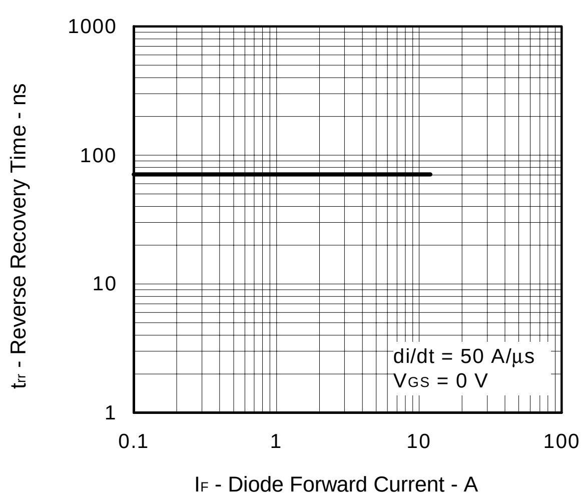
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



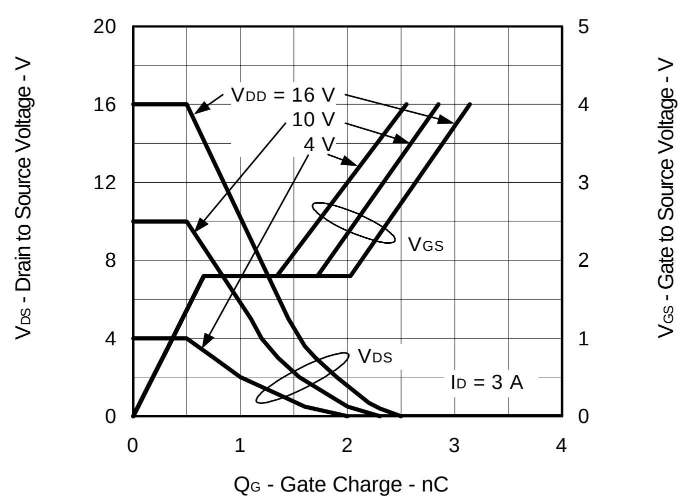
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

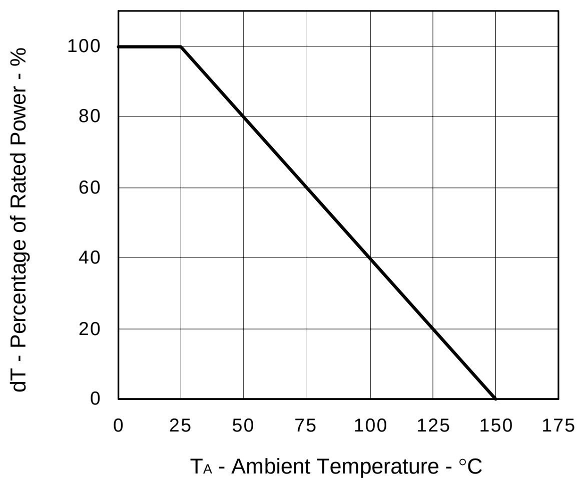


DYNAMIC INPUT/OUTPUT CHARACTERITICS

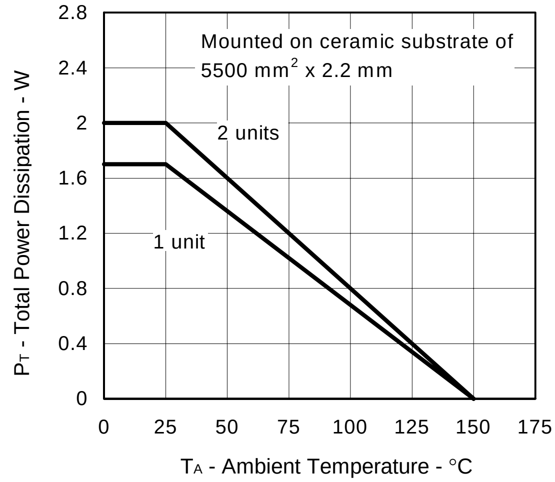


B) P-Channel

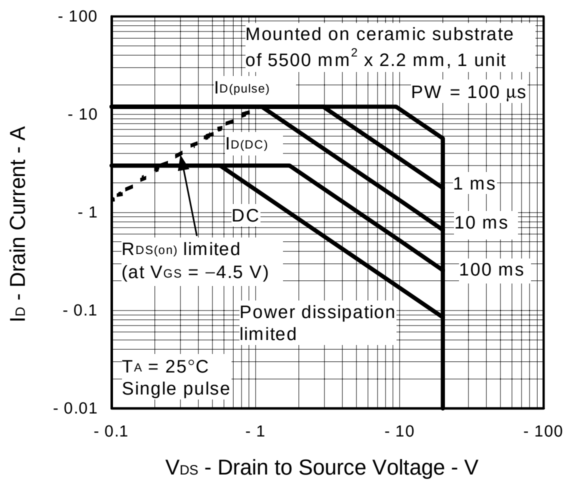
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



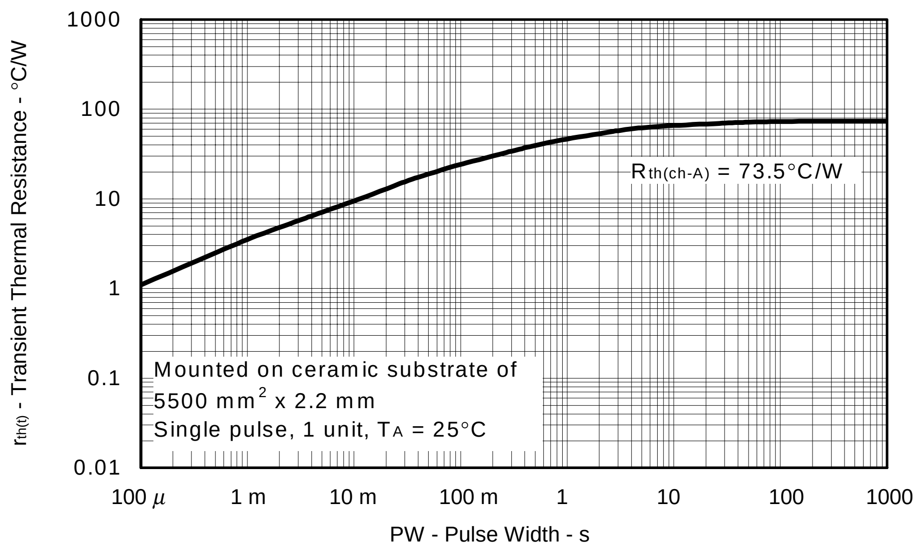
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



FORWARD BIAS SAFE OPERATING AREA

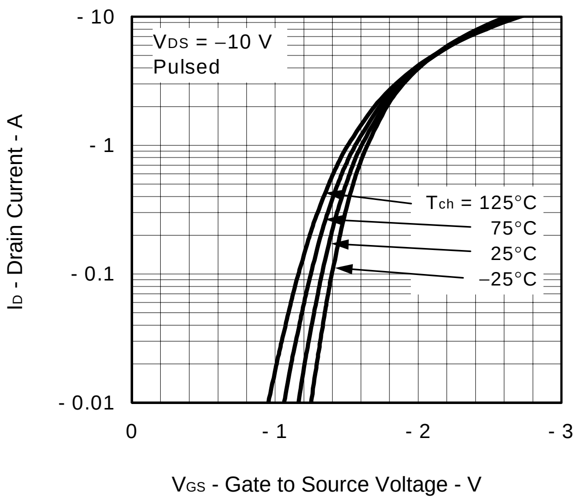


TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

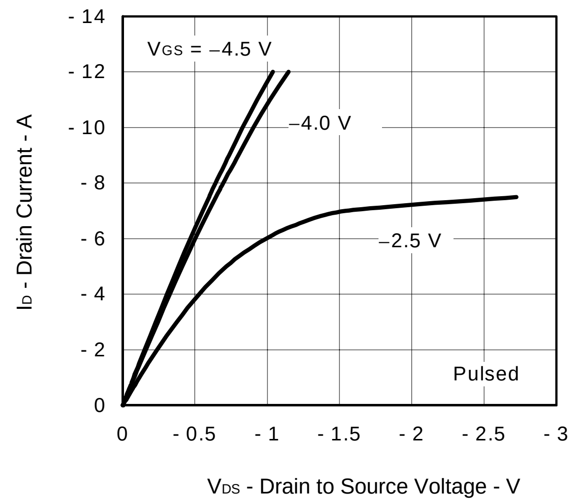


B) P-Channel

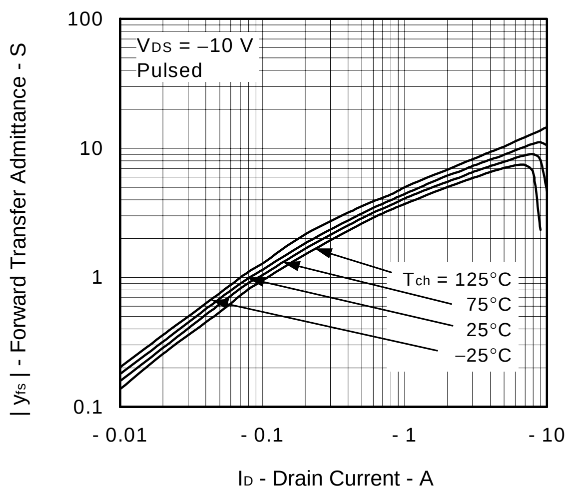
FORWARD TRANSFER CHARACTERISTICS



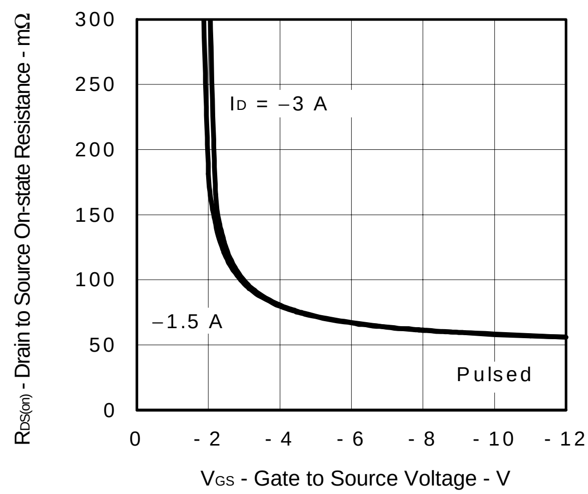
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



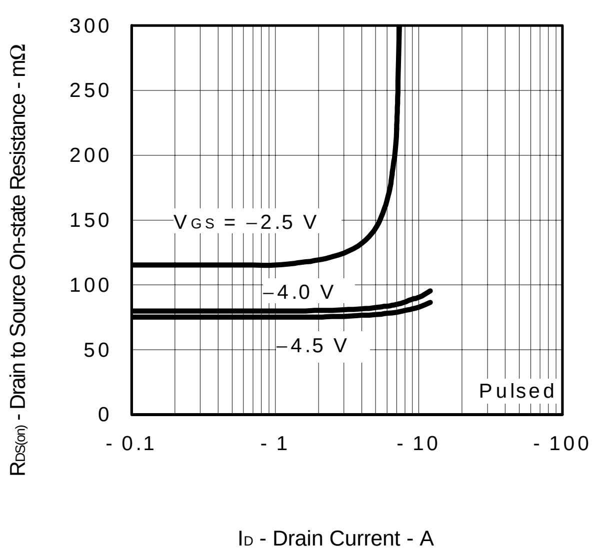
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



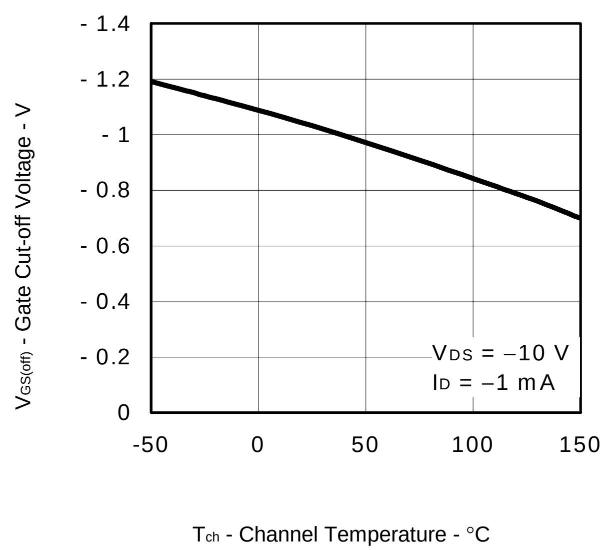
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT

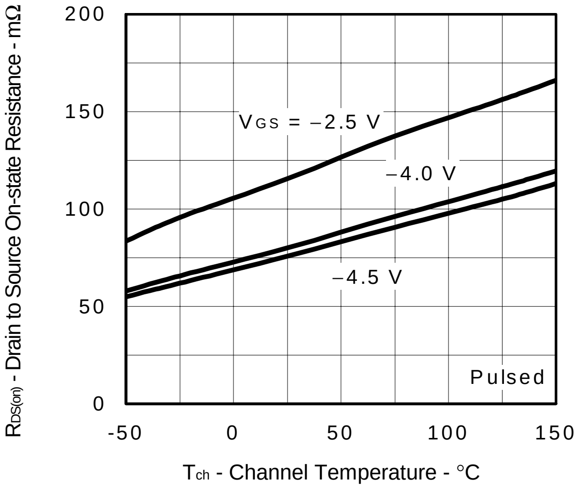


GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE

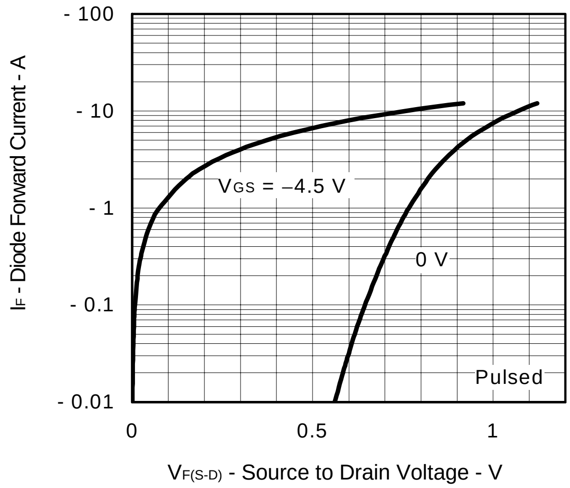


) P-Channel

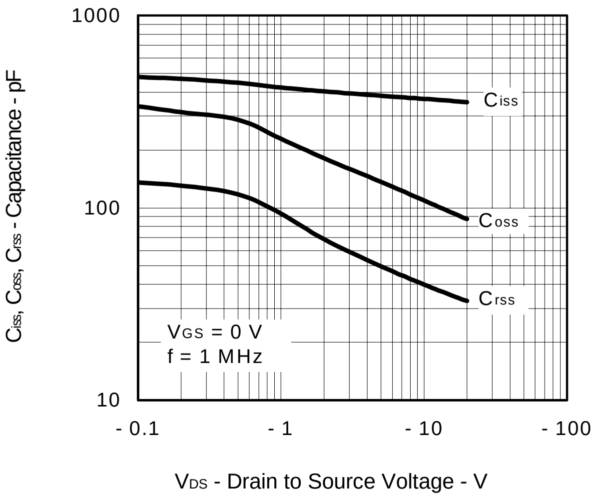
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
CHANNEL TEMPERATURE



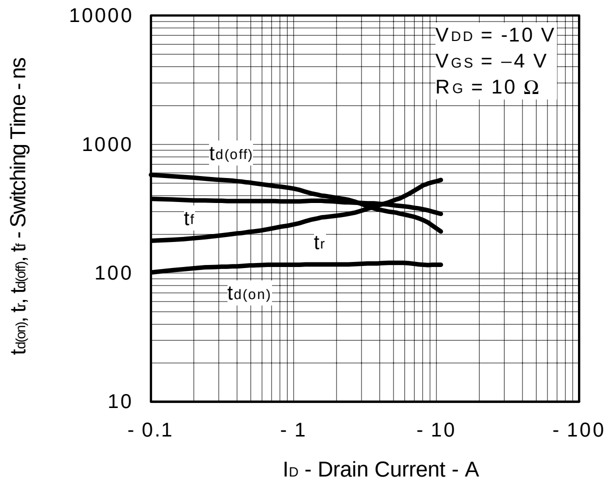
SOURCE TO DRAIN DIODE
FORWARD VOLTAGE



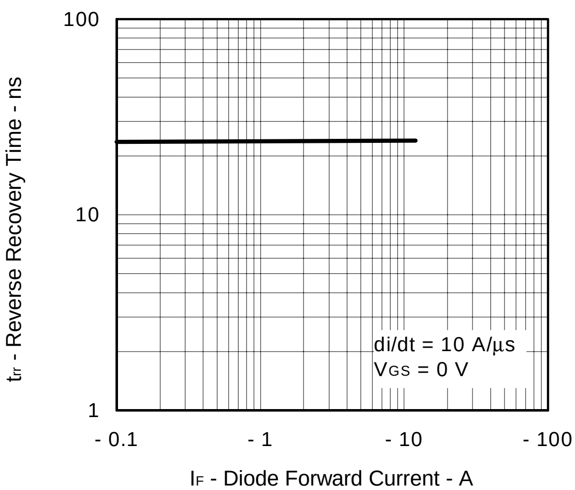
CAPACITANCE vs.
DRAIN TO SOURCE VOLTAGE



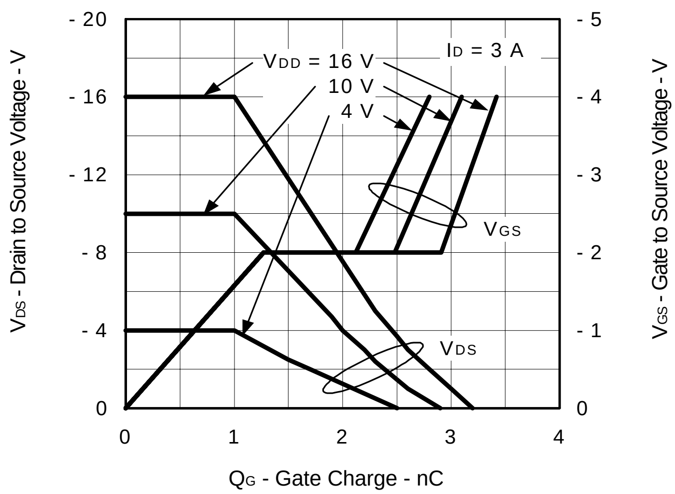
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs.
DIODE FORWARD CURRENT



DYNAMIC INPUT/OUTPUT CHARACTERITICS



[MEMO]