

SWITCHING P-CHANNEL MOS FET

DESCRIPTION

The μPA2715GR is P-Channel MOS FET designed for power management applications of notebook computers and Li-ion battery protection circuit.

FEATURES

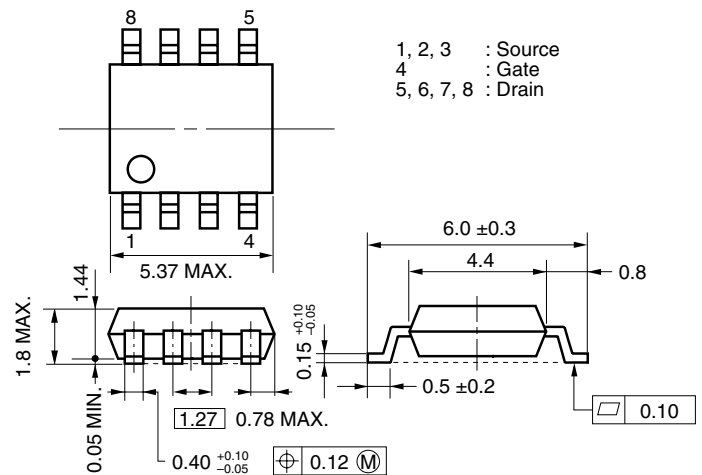
- Low on-state resistance
 $R_{DS(on)1} = 4.6 \text{ m}\Omega \text{ MAX. (} V_{GS} = -10 \text{ V, } I_D = -9.0 \text{ A)}$
 $R_{DS(on)2} = 9.0 \text{ m}\Omega \text{ MAX. (} V_{GS} = -4.5 \text{ V, } I_D = -9.0 \text{ A)}$
- Low C_{iss} : $C_{iss} = 3500 \text{ pF TYP.}$
- Built-in gate protection diode
- Small and surface mount package (Power SOP8)

ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA2715GR-E1-A ^{Note}	Power SOP8
μPA2715GR-E2-A ^{Note}	Power SOP8

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

PACKAGE DRAWING (Unit: mm)



ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, All terminals are connected.)

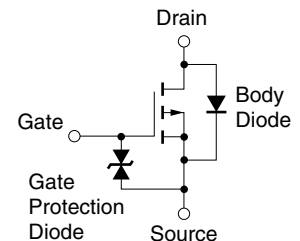
Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	-30	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	±20	V
Drain Current (DC)	$I_{D(DC)}$	±18	A
Drain Current (pulse) ^{Note1}	$I_{D(pulse)}$	±150	A
Total Power Dissipation ^{Note2}	P_{T1}	1.1	W
Total Power Dissipation ($PW = 10 \text{ sec}$) ^{Note2}	P_{T2}	2.5	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	-55 to +150	°C
Single Avalanche Current ^{Note3}	I_{AS}	-18	A
Single Avalanche Energy ^{Note3}	E_{AS}	32.4	mJ

Notes 1. $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1\%$

2. Mounted on a glass epoxy board of $25.4 \text{ mm}^2 \times 0.8 \text{ mm}$, $PW = 10 \text{ sec}$

3. Starting $T_{ch} = 25^\circ\text{C}$, $V_{BD} = -15 \text{ V}$, $R_G = 25 \Omega$, $L = 100 \mu\text{H}$, $V_{GS} = -20 \rightarrow 0 \text{ V}$

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.

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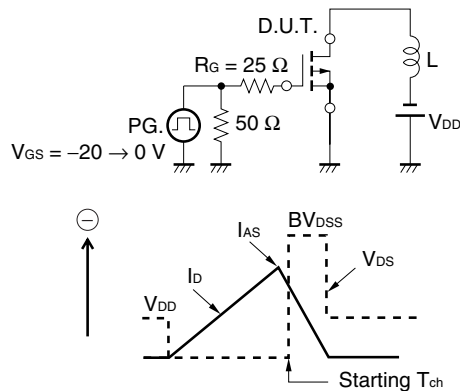
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ELECTRICAL CHARACTERISTICS (TA = 25°C, All terminals are connected.)

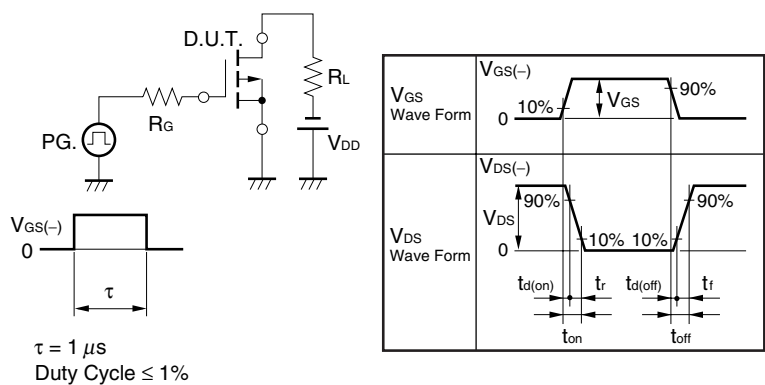
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
Gate Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			±10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = -10\text{ V}, I_D = -1\text{ mA}$	-1.0		-2.5	V
Forward Transfer Admittance ^{Note}	$ y_{fs} $	$V_{DS} = -10\text{ V}, I_D = -9.0\text{ A}$	16			S
Drain to Source On-state Resistance ^{Note}	$R_{DS(on)1}$	$V_{GS} = -10\text{ V}, I_D = -9.0\text{ A}$		3.9	4.6	mΩ
	$R_{DS(on)2}$	$V_{GS} = -4.5\text{ V}, I_D = -9.0\text{ A}$		6.2	9.0	mΩ
Input Capacitance	C_{iss}	$V_{DS} = -10\text{ V}$		3500		pF
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V}$		1250		pF
Reverse Transfer Capacitance	C_{rss}	$f = 1\text{ MHz}$		560		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = -15\text{ V}$		16		ns
Rise Time	t_r	$I_D = -9.0\text{ A}$		25		ns
Turn-off Delay Time	$t_{d(off)}$	$V_{GS} = -10\text{ V}$		690		ns
Fall Time	t_f	$R_G = 10\ \Omega$		400		ns
Total Gate Charge	Q_G	$V_{DD} = -24\text{ V}$		118		nC
Gate to Source Charge	Q_{GS}	$V_{GS} = -10\text{ V}$		13		nC
Gate to Drain Charge	Q_{GD}	$I_D = -18\text{ A}$		45		nC
Body Diode Forward Voltage ^{Note}	$V_{F(S-D)}$	$I_F = 18\text{ A}, V_{GS} = 0\text{ V}$		0.81		V
Reverse Recovery Time	t_{rr}	$I_F = 18\text{ A}, V_{GS} = 0\text{ V}$		490		ns
Reverse Recovery Charge	Q_{rr}	$di/dt = 50\text{ A}/\mu\text{s}$		2450		nC

Note Pulsed

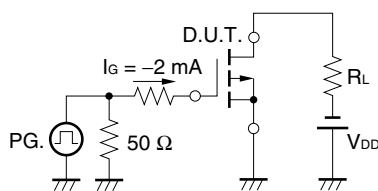
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

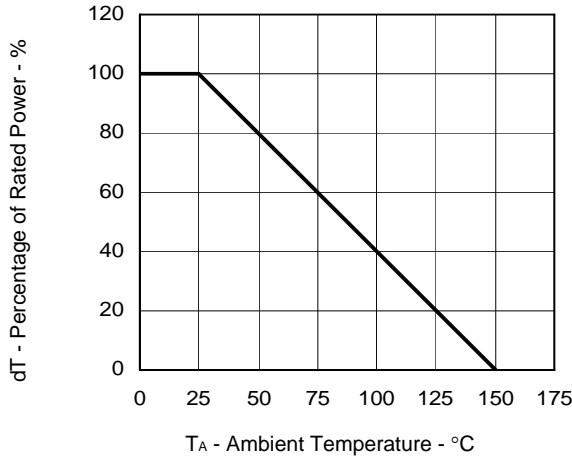


TEST CIRCUIT 3 GATE CHARGE

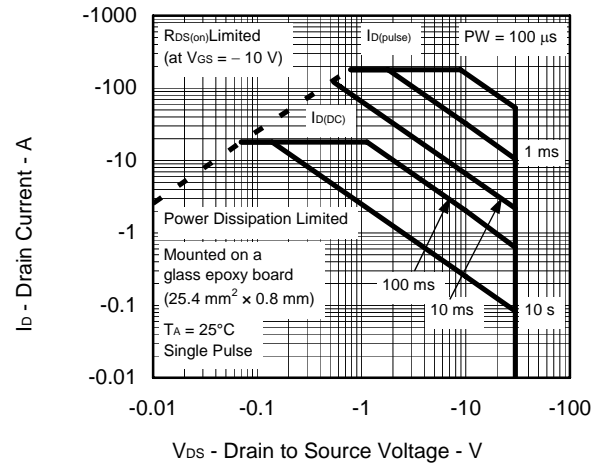


TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

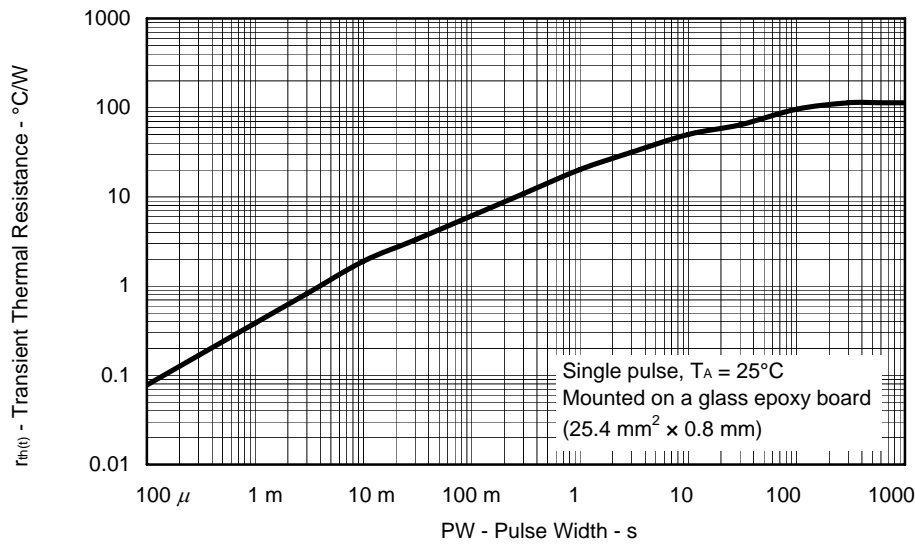
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



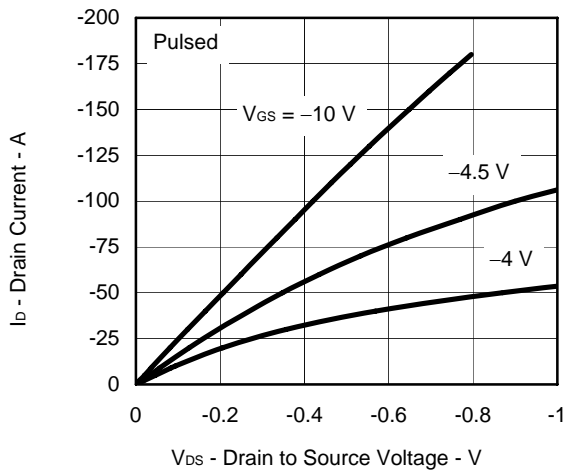
FORWARD BIAS SAFE OPERATING AREA



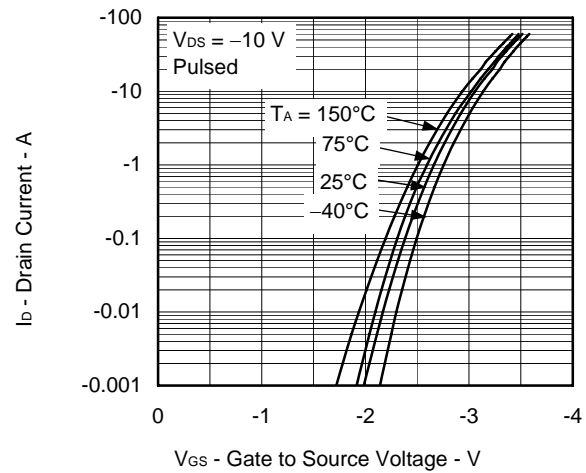
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



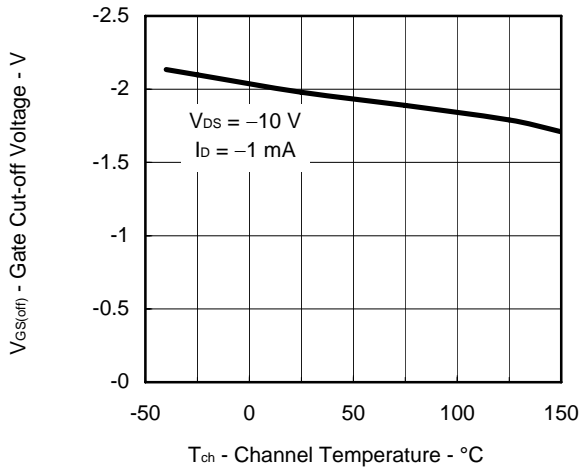
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



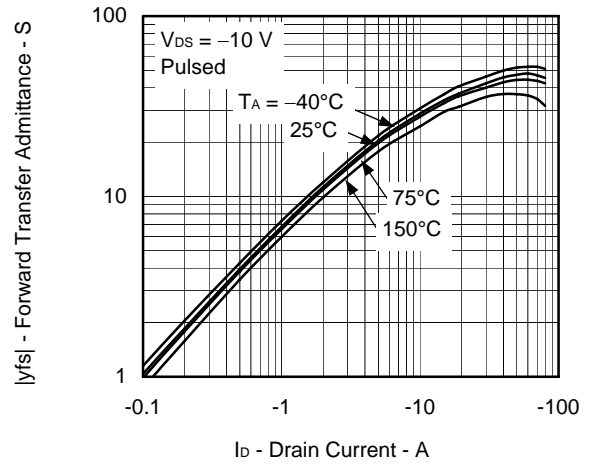
FORWARD TRANSFER CHARACTERISTICS



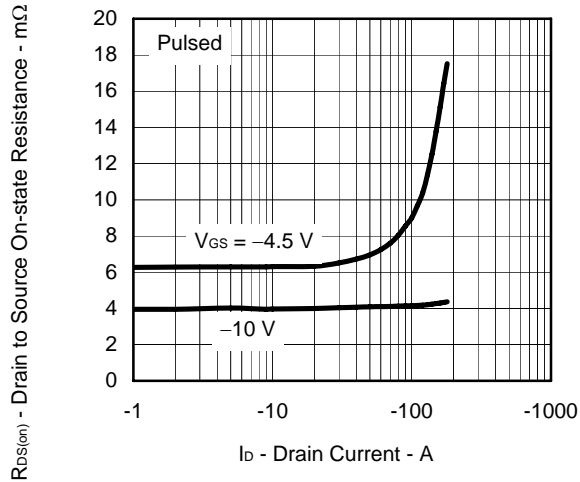
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



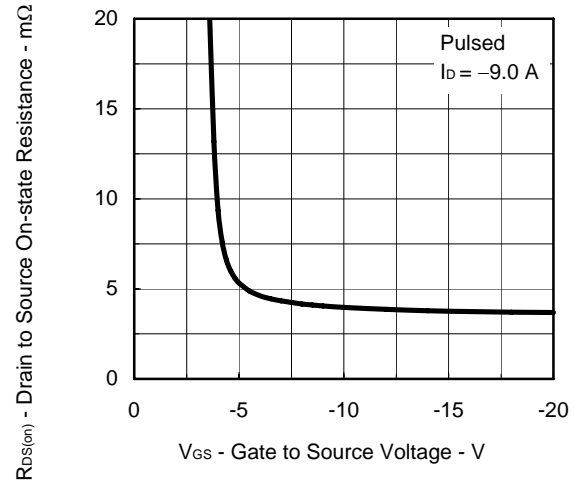
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



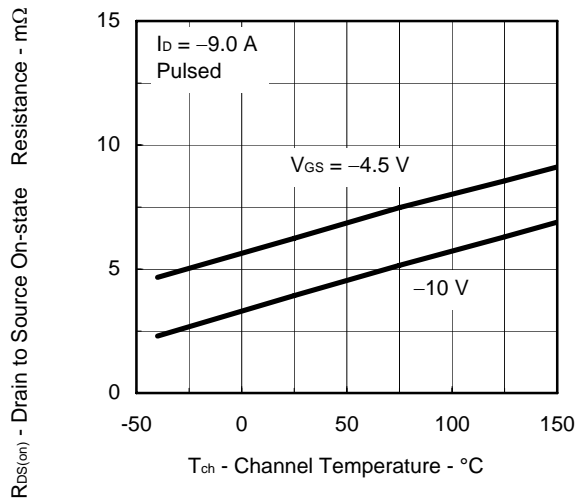
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



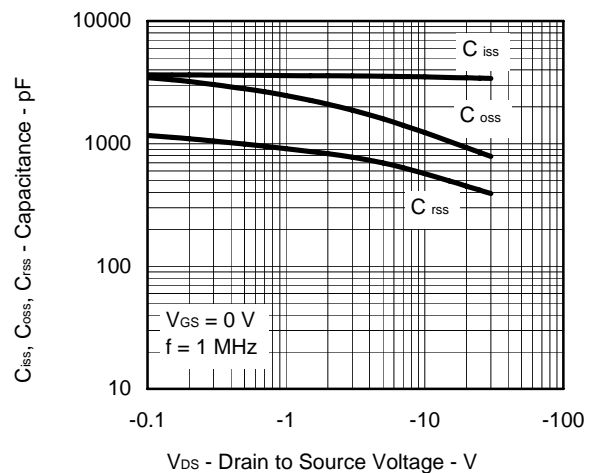
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



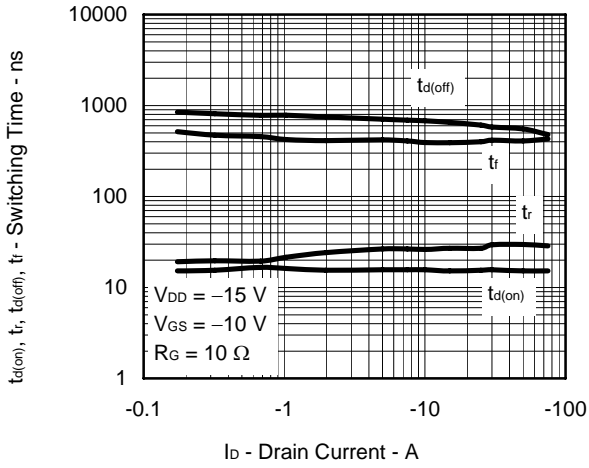
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



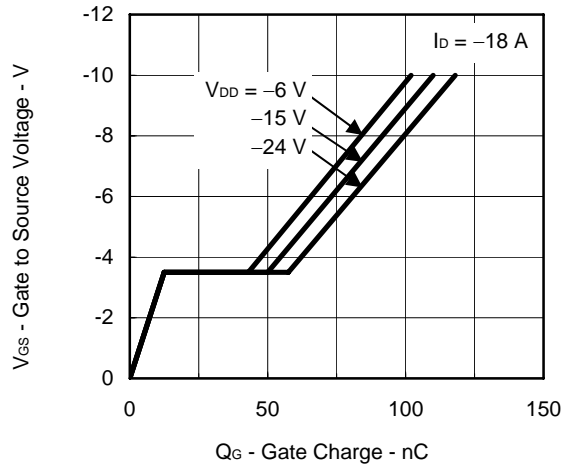
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



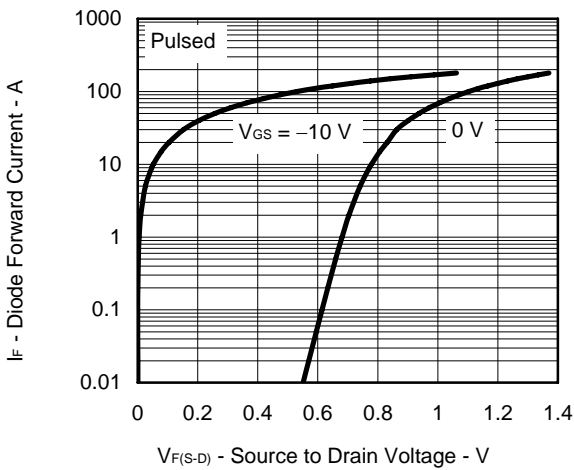
SWITCHING CHARACTERISTICS



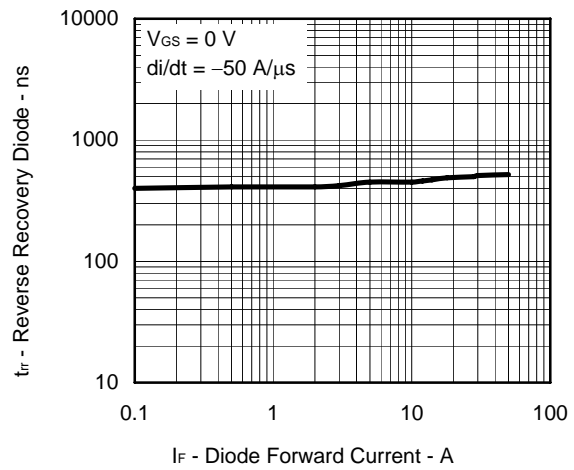
DYNAMIC INPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



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