DATA SHEET

NEC

MOS FIELD EFFECT TRANSISTOR

μPA2709GR

SWITCHING
N-CHANNEL POWER MOSFET

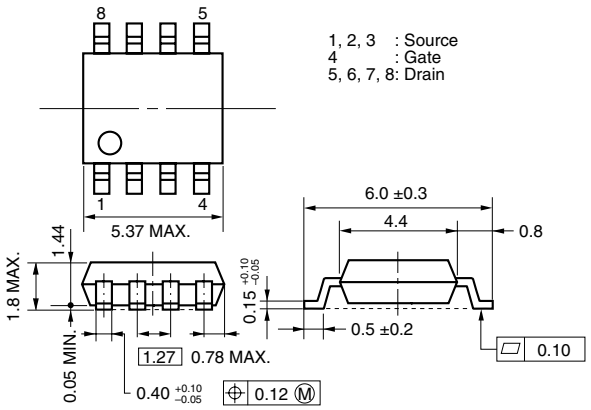
DESCRIPTION

The μPA2709GR is N-channel MOS Field Effect Transistor designed for DC/DC converter and power management applications of notebook computer.

FEATURES

- Low on-state resistance
  $R_{DS(on)1}$ = 10.5 mΩ MAX. (V_{GS} = 10 V, I_D = 7.0 A)
  $R_{DS(on)2}$ = 15 mΩ MAX. (V_{GS} = 4.5 V, I_D = 7.0 A)
- Low Q_{GD}: Q_{GD} = 3.3 nC TYP. (V_{DD} = 15 V, I_D = 13 A)
- Built-in gate protection diode
- Small and surface mount package (Power SOP8)

PACKAGE DRAWING (Unit: mm)



ORDERING INFORMATION

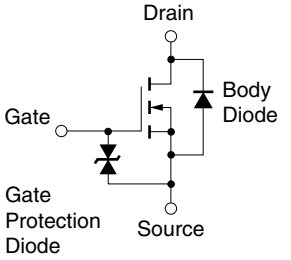
PART NUMBER	PACKAGE
μPA2709GR-E1-A Note	Power SOP8
μPA2709GR-E2-A Note	Power SOP8

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

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

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	30	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±20	V
Drain Current (DC)	$I_{D(DC)}$	±13	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	±52	A
Total Power Dissipation Note2	P_{T1}	1.1	W
Total Power Dissipation (PW = 10 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}	13	A
Single Avalanche Energy Note3	E_{AS}	17	mJ

EQUIVALENT CIRCUIT



Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%

2. Mounted on glass epoxy board of 25.4 mm x 25.4 mm x 0.8 mm

3. Starting T_{ch} = 25°C, V_{DD} = 15 V, R_G = 25 Ω, V_{GS} = 20 → 0 V, L = 100 μH

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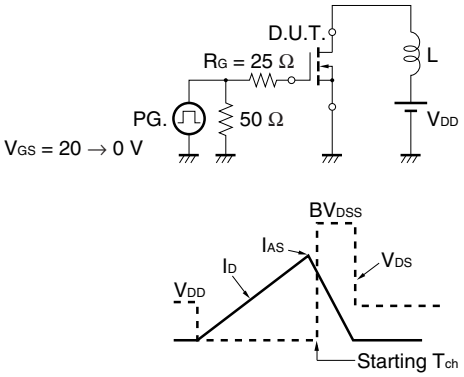
ELECTRICAL CHARACTERISTICS (T_A = 25°C, All terminals are connected.)

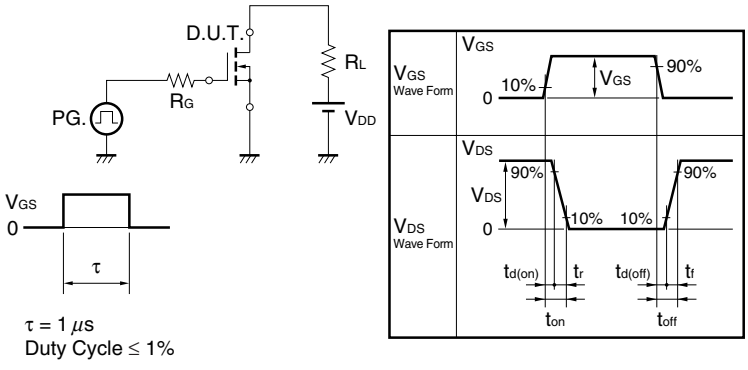
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V			10	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V			±10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 10 V, I_D = 1 mA	1.5		2.5	V
Forward Transfer Admittance Note	$\|y_{fs}\|$	V_{DS} = 10 V, I_D = 7.0 A	7			S
Drain to Source On-state Resistance Note	$R_{DS(on)1}$	V_{GS} = 10 V, I_D = 7.0 A		8.3	10.5	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.5 V, I_D = 7.0 A		10.6	15	mΩ
Input Capacitance	C_{iss}	V_{DS} = 10 V		1270		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		320		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		110		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 15 V, I_D = 7.0 A		10		ns
Rise Time	t_r	V_{GS} = 10 V		5.3		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 10 Ω		40		ns
Fall Time	t_f			7.8		ns
Total Gate Charge	Q_G	V_{DD} = 15 V		11		nC
Gate to Source Charge	Q_{GS}	V_{GS} = 5 V		3.8		nC
Gate to Drain Charge	Q_{GD}	I_D = 13 A		3.3		nC
Body Diode Forward Voltage Note	$V_{F(S-D)}$	I_F = 13 A, V_{GS} = 0 V		0.8		V
Reverse Recovery Time	t_{rr}	I_F = 13 A, V_{GS} = 0 V		25		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 100 A/μs		22		nC
Gate Resistance	R_G	f = 1 MHz		1.2		Ω

Note Pulsed

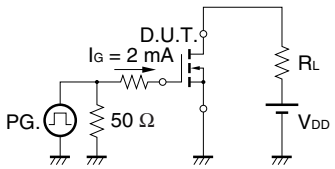
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

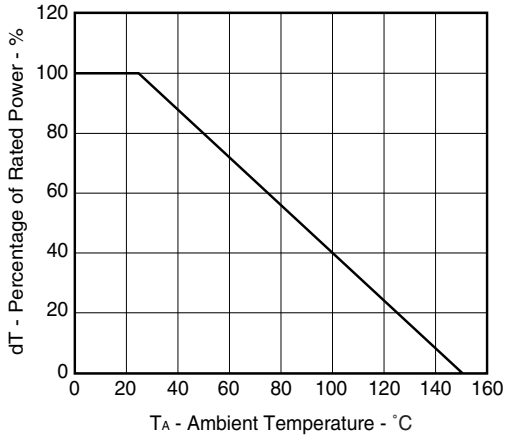


TEST CIRCUIT 3 GATE CHARGE

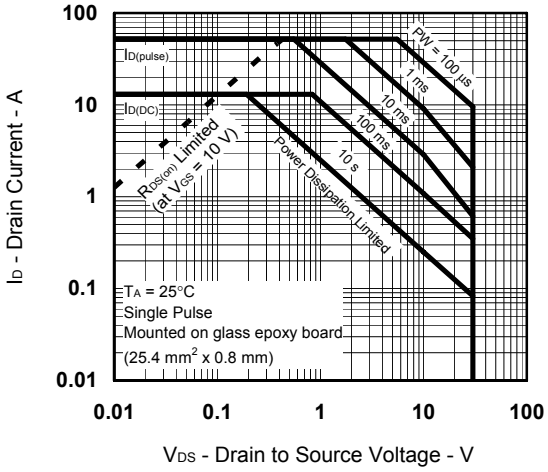


TYPICAL CHARACTERISTICS (T_A = 25°C)

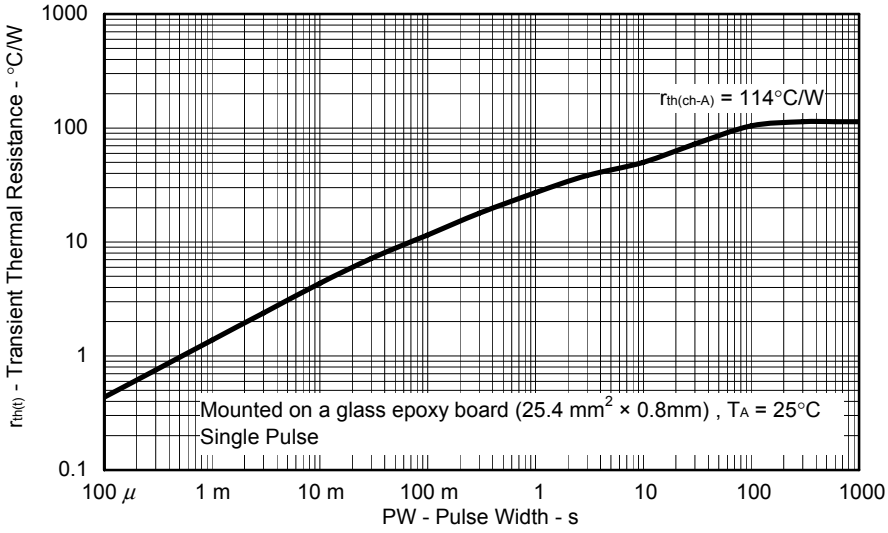
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



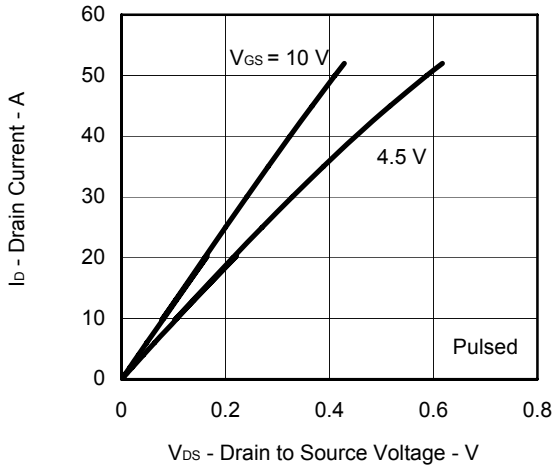
FORWARD BIAS SAFE OPERATING AREA



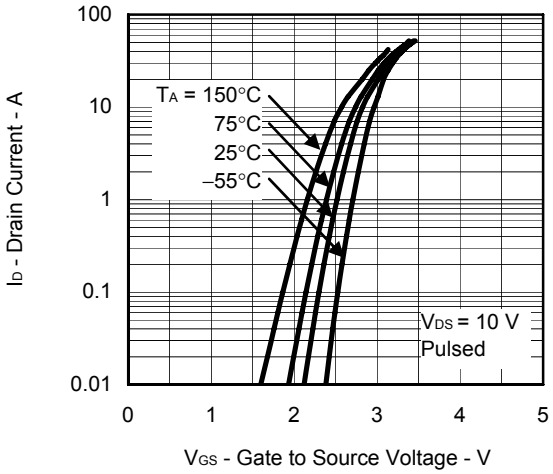
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



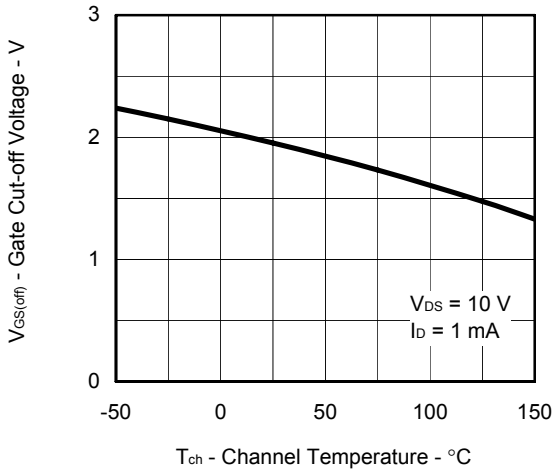
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



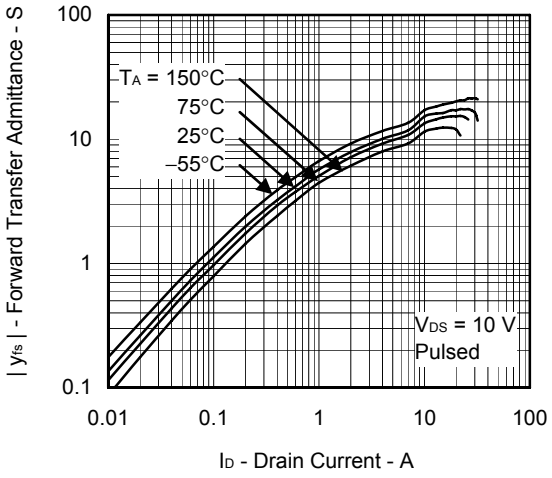
FORWARD TRANSFER CHARACTERISTICS



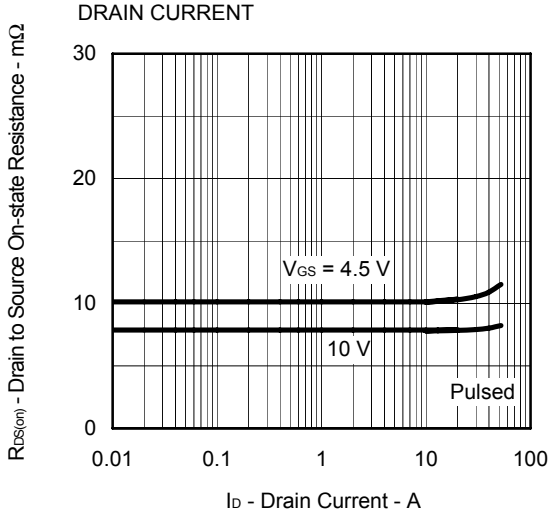
GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



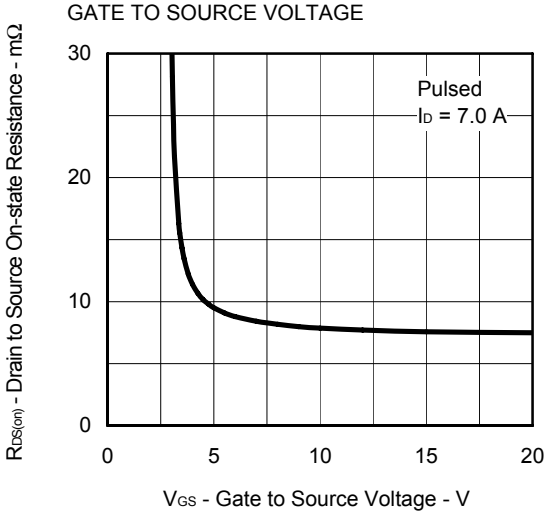
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



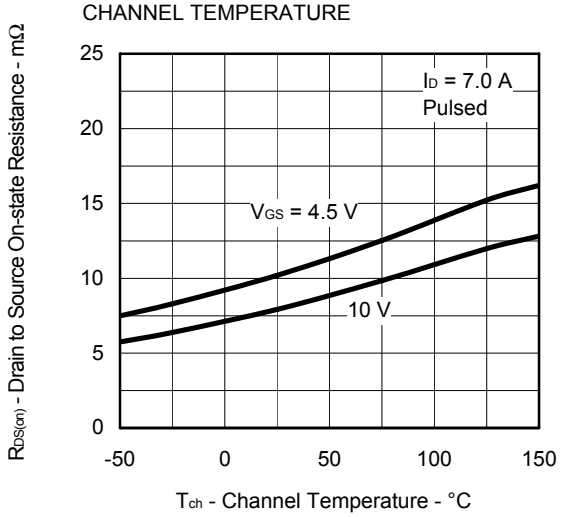
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



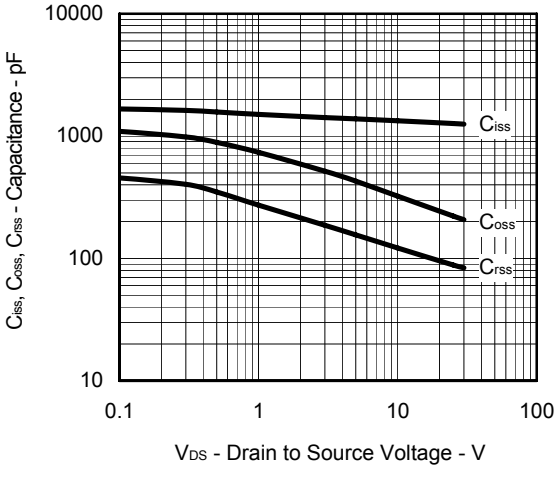
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



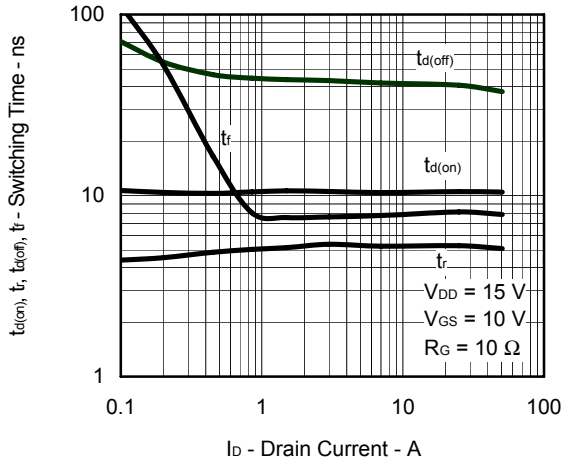
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
CHANNEL TEMPERATURE



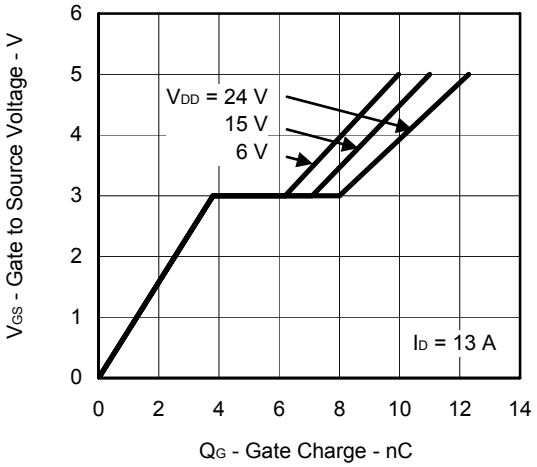
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



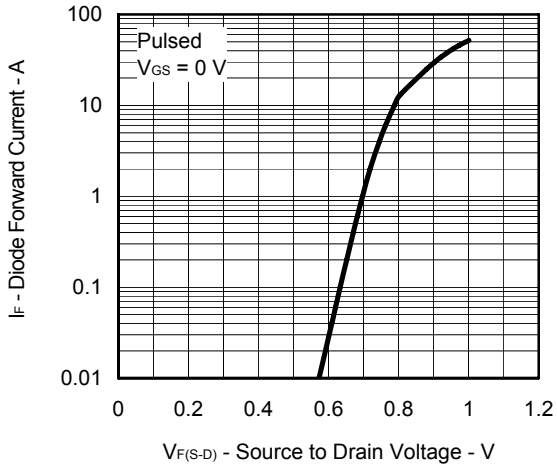
SWITCHING CHARACTERISTICS



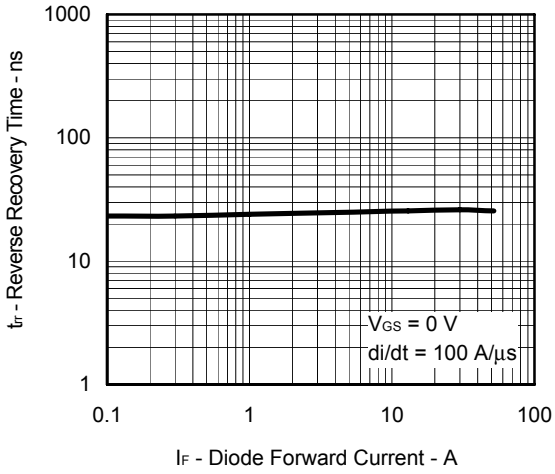
DYNAMIC INPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



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