NEC

MOS FIELD EFFECT TRANSISTOR

μPA2701GR

SWITCHING
N-CHANNEL POWER MOS FET

DESCRIPTION

The μPA2701GR is N-Channel MOS Field Effect Transistor designed for DC/DC converters and power management applications of notebook computers.

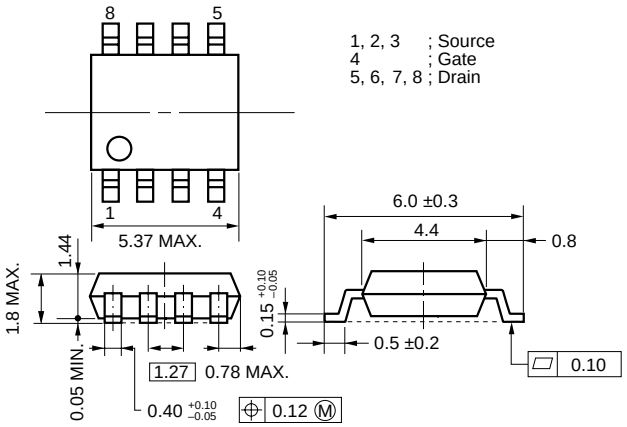
FEATURES

- Low on-state resistance
  $R_{DS(on)1}$ = 7.5 mΩ MAX. (V_{GS} = 10 V, I_D = 7.0 A)
  $R_{DS(on)2}$ = 11.6 mΩ MAX. (V_{GS} = 4.5 V, I_D = 7.0 A)
- Low C_{iss}: C_{iss} = 1200 pF TYP. (V_{DS} = 10 V, V_{GS} = 0 V)
- Small and surface mount package (Power SOP8)

ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA2701GR	Power SOP8

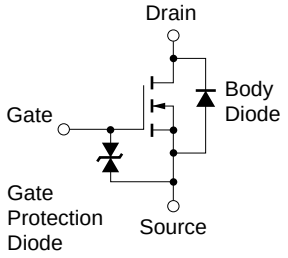
PACKAGE DRAWING (Unit: mm)



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)	$I_{D(DC)}$	±14	A
Drain Current (pulse) **Note1**	$I_{D(pulse)}$	±56	A
Total Power Dissipation (T_A = 25°C) **Note2**	P_T	2.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C
Single Avalanche Current **Note3**	I_{AS}	14	A
Single Avalanche Energy **Note3**	E_{AS}	19.6	mJ

EQUIVALENT CIRCUIT



Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%

2. Mounted on ceramic substrate of 1200 mm^2 x 2.2 mm

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

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 extemally required if a voltage exceeding the rated voltage may be applied to this device.

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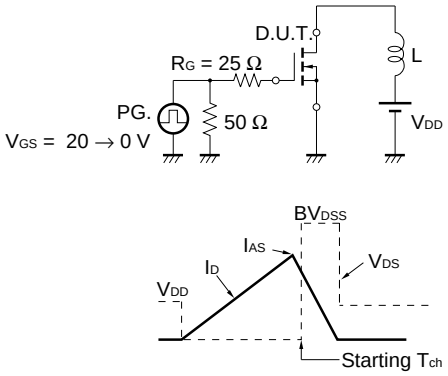
The mark ★ shows major revised points.

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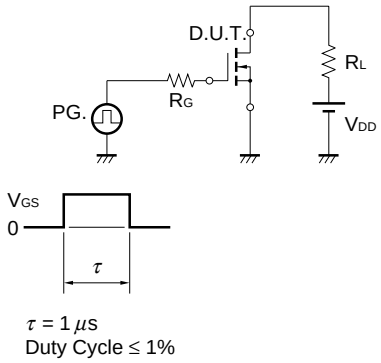
ELECTRICAL CHARACTERISTICS (T_A = 25°C, All terminals are connected.)

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	2.0	2.5	V
Forward Transfer Admittance	$\|y_{fs}\|$	V_{DS} = 10 V, I_D = 7.0 A	7	14		S
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = 10 V, I_D = 7.0 A		6.2	7.5	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.5 V, I_D = 7.0 A		8.7	11.6	mΩ
	$R_{DS(on)3}$	V_{GS} = 4.0 V, I_D = 7.0 A		10.3	13.7	mΩ
Input Capacitance	C_{iss}	V_{DS} = 10 V		1200		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		500		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		160		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		13		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 10 Ω		44		ns
Fall Time	t_f			11		ns
Total Gate Charge	Q_G	V_{DD} = 15 V		12		nC
Gate to Source Charge	Q_{GS}	V_{GS} = 5 V		4		nC
Gate to Drain Charge	Q_{GD}	I_D = 14 A		6		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 14 A, V_{GS} = 0 V		0.8	1.2	V
Reverse Recovery Time	t_{rr}	I_F = 14 A, V_{GS} = 0 V		32		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 100 A/ μs		27		nC

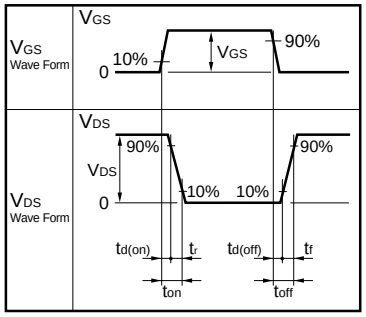
TEST CIRCUIT 1 AVALANCHE CAPABILITY



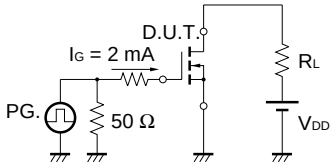
TEST CIRCUIT 2 SWITCHING TIME



τ = 1 μs
Duty Cycle ≤ 1%



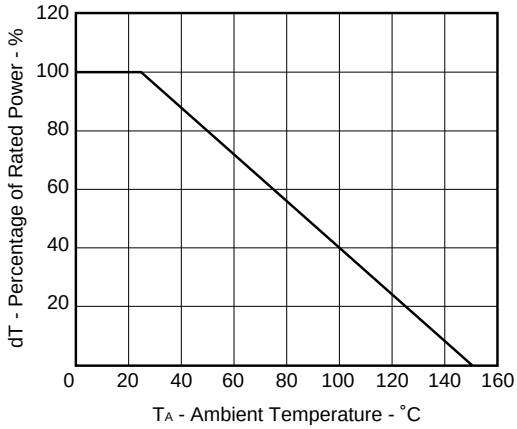
TEST CIRCUIT 3 GATE CHARGE



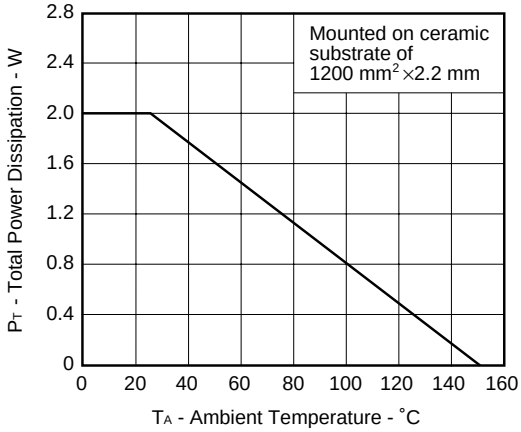
TYPICAL CHARACTERISTICS (T_A = 25°C)

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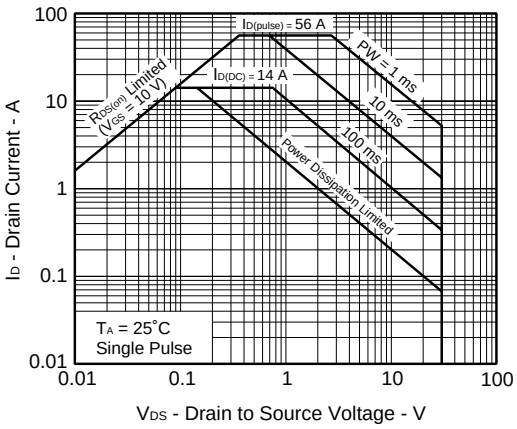
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE

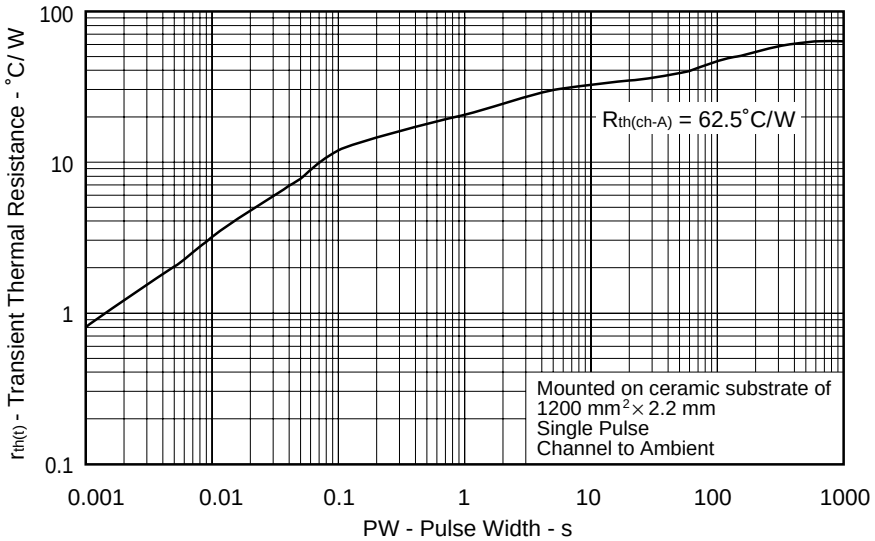


FORWARD BIAS SAFE OPERATING AREA

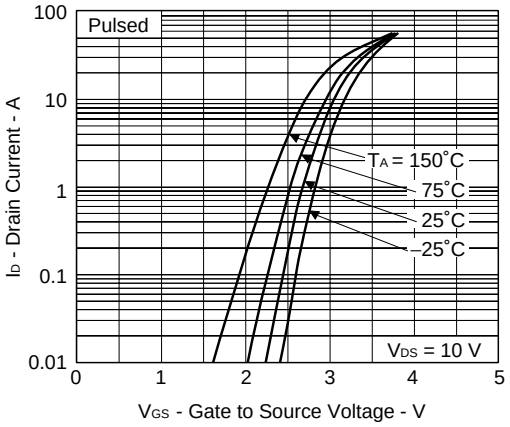


Remark Mounted on ceramicsubstrate of 1200 mm^2 x 2.2 mm

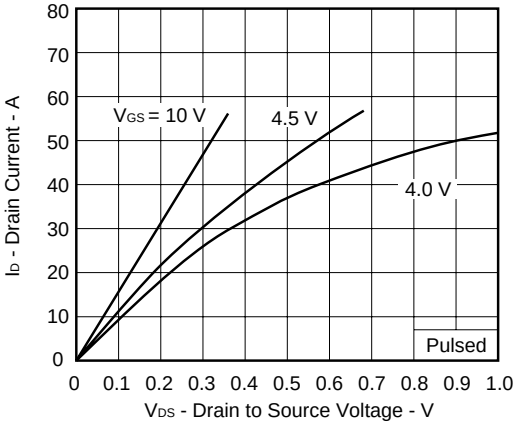
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



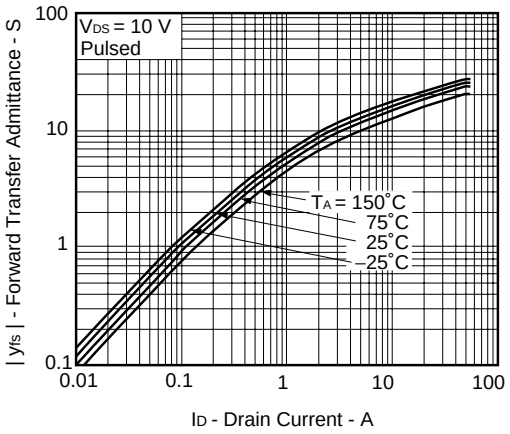
FORWARD TRANSFER CHARACTERISTICS



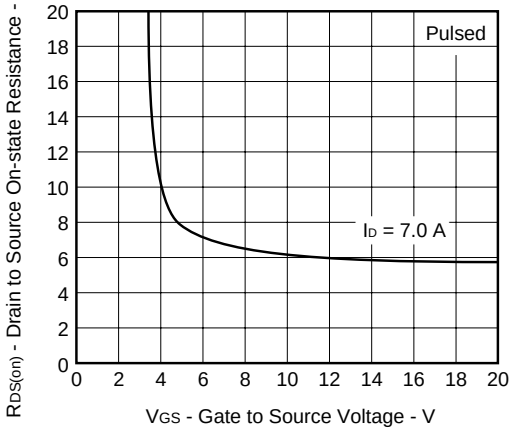
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



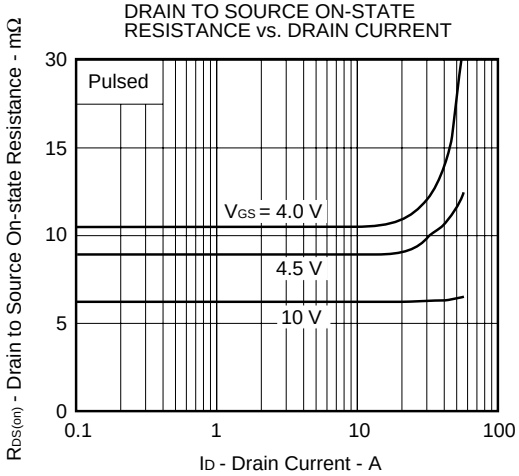
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



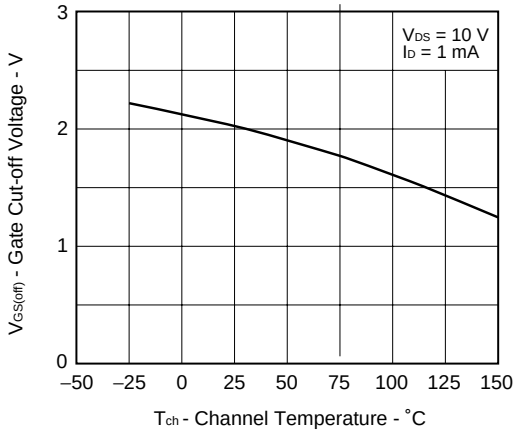
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



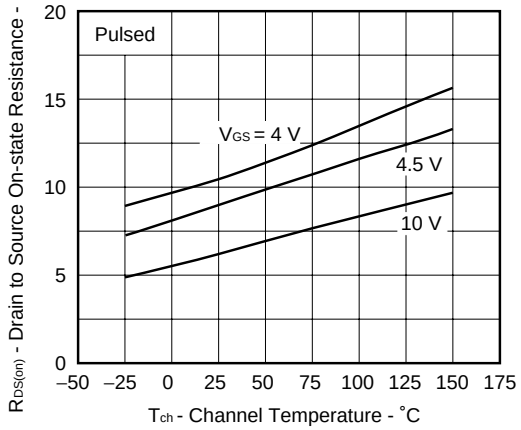
DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT



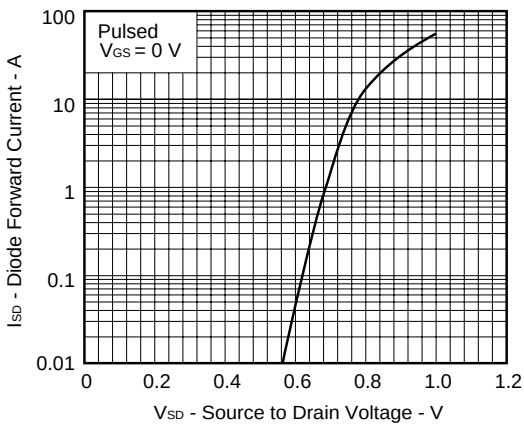
GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



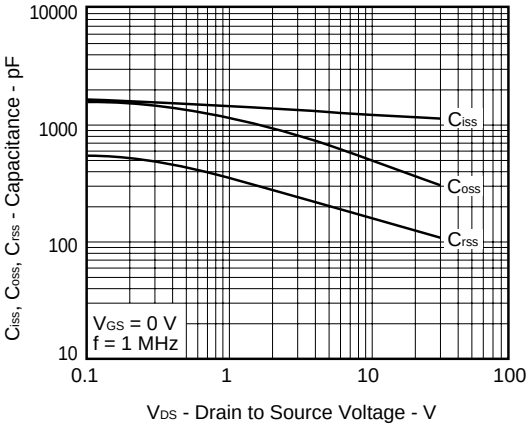
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
CHANNEL TEMPERATURE



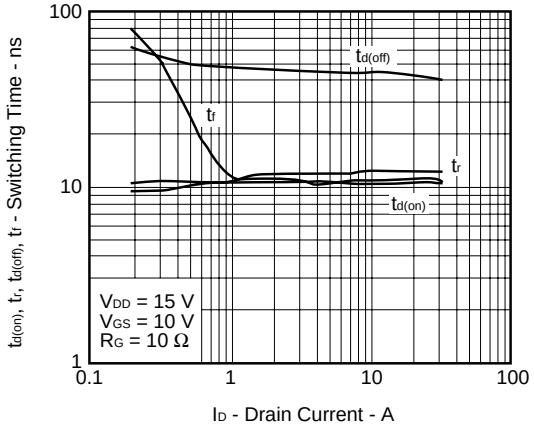
SOURCE TO DRAIN DIODE
FORWARD VOLTAGE



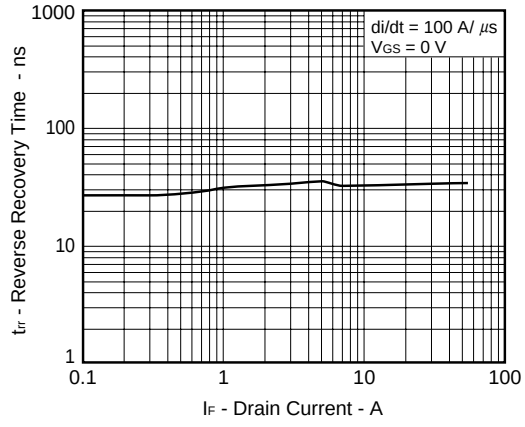
CAPACITANCE vs.
DRAIN TO SOURCE VOLTAGE



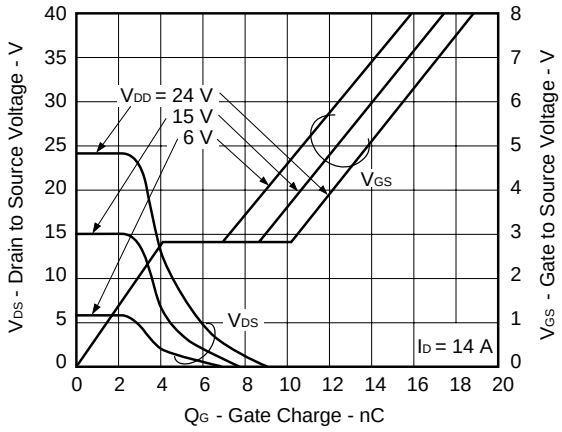
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs.
DRAIN CURRENT



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



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