NEC

MOS FIELD EFFECT TRANSISTOR

μPA2701TP

SWITCHING
N-CHANNEL POWER MOS FET

DESCRIPTION

The μPA2701TP, which has a heat spreader, is N-Channel MOS Field Effect Transistor designed for DC/DC converter and power management applications of notebook computers.

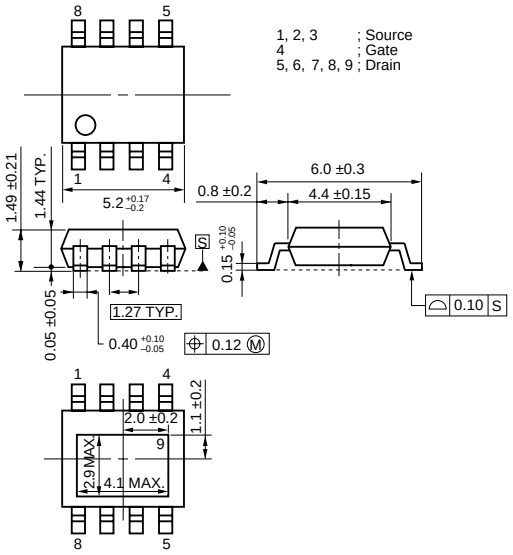
FEATURES

- 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 HSOP8)

ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA2701TP	Power HSOP8

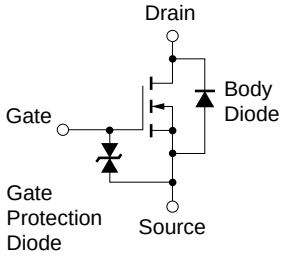
PACKAGE DRAWING (Unit: mm)



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, Unless otherwise noted, 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) (T_C = 25°C)	$I_{D(DC)1}$	±35	A
Drain Current (DC) (T_A = 25°C) Note1	$I_{D(DC)2}$	±16	A
Drain Current (pulse) Note2	$I_{D(pulse)}$	±80	A
Total Power Dissipation (T_C = 25°C)	P_{T1}	28	W
Total Power Dissipation (T_A = 25°C) Note1	P_{T2}	3	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

EQUIVALENT CIRCUIT



Notes 1. Mounted on a glass epoxy board (1 inch x 1 inch x 0.8 mm), PW = 10 sec
2. PW ≤ 10 μs, Duty Cycle ≤ 1%
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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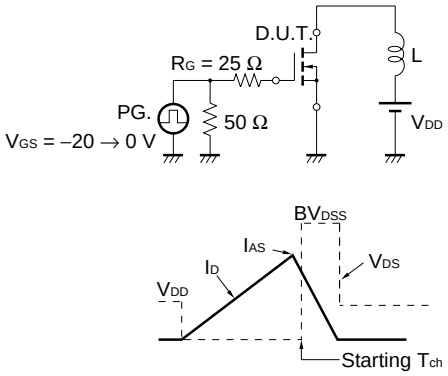
The mark ★ shows major revised points.

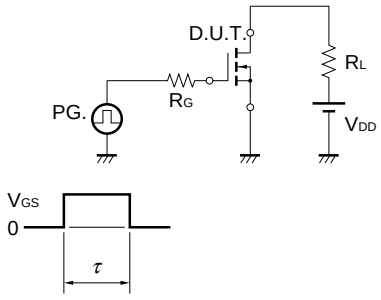
ELECTRICAL CHARACTERISTICS (T_A = 25°C, Unless otherwise noted, All terminals are connected.)

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

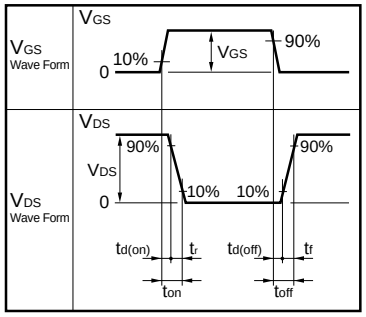
TEST CIRCUIT 1 AVALANCHE CAPABILITY



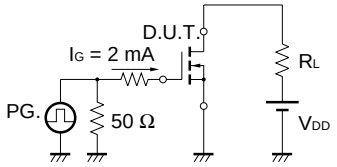
TEST CIRCUIT 2 SWITCHING TIME



τ = 1 μs
Duty Cycle ≤ 1%

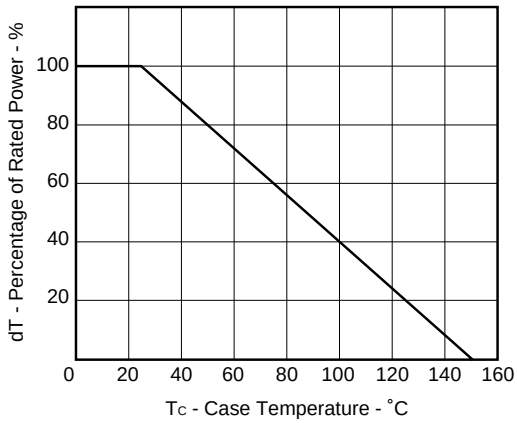


TEST CIRCUIT 3 GATE CHARGE

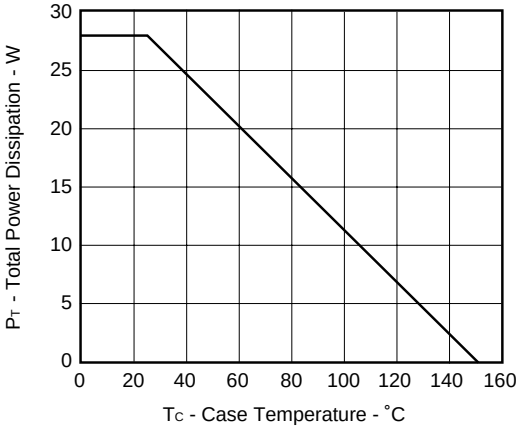


TYPICAL CHARACTERISTICS (T_A = 25°C)

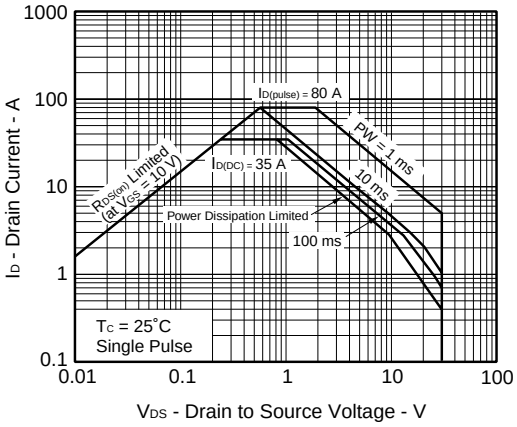
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



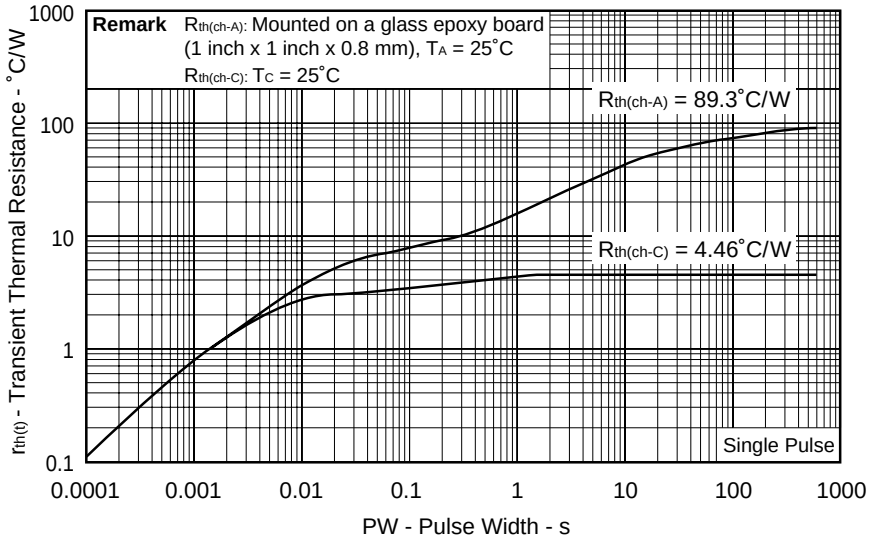
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



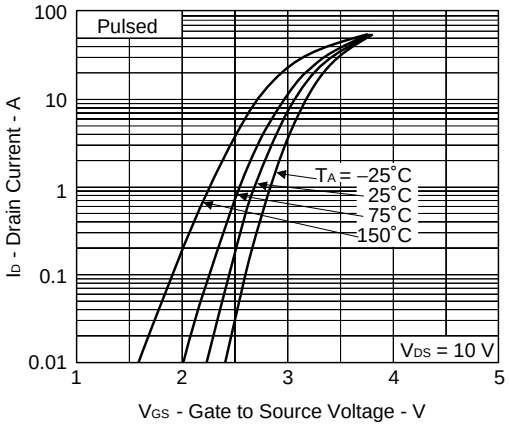
FORWARD BIAS SAFE OPERATING AREA



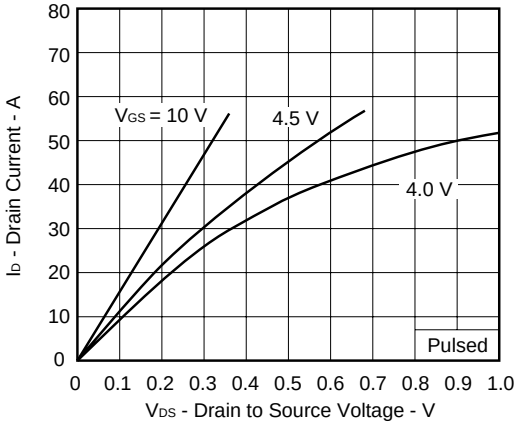
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



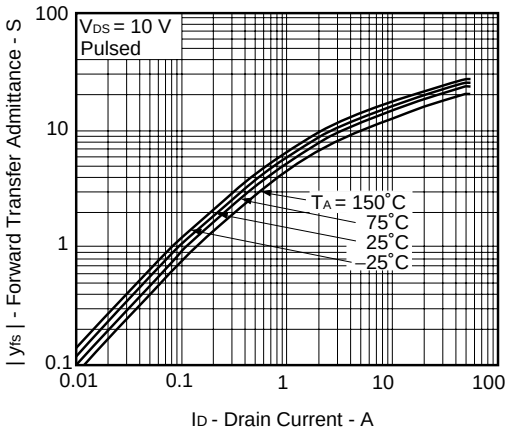
FORWARD TRANSFER CHARACTERISTICS



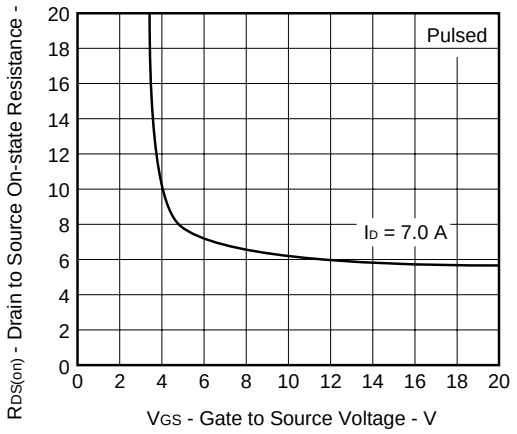
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



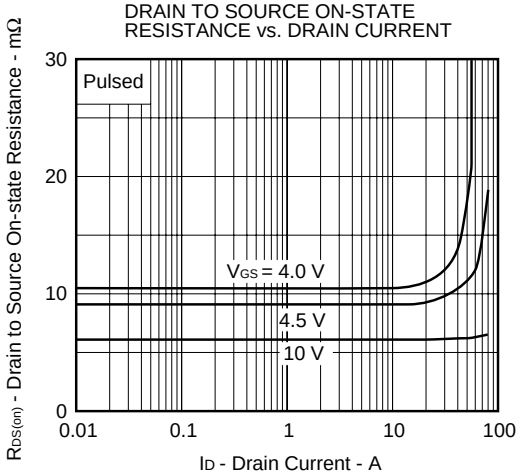
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



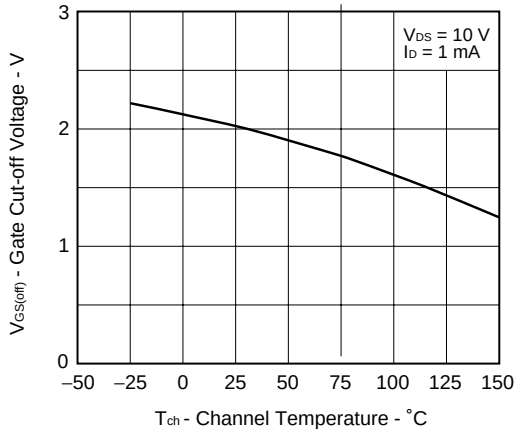
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



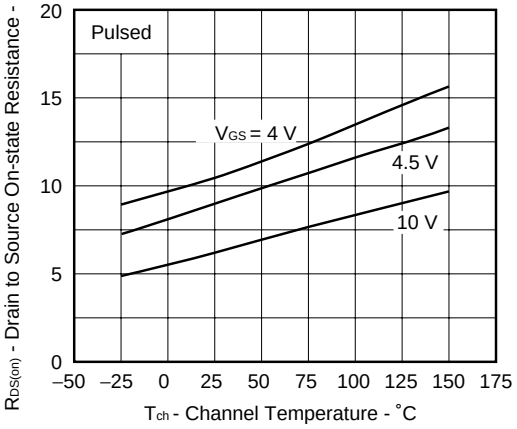
DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT



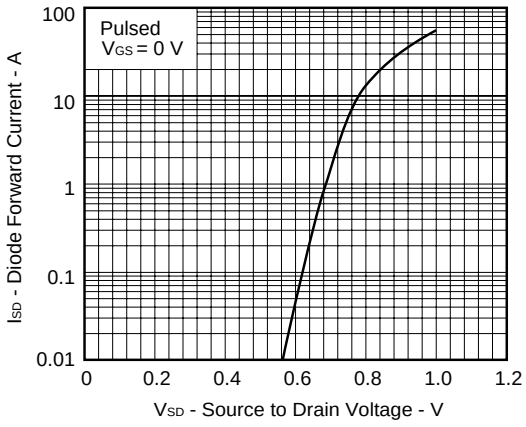
GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



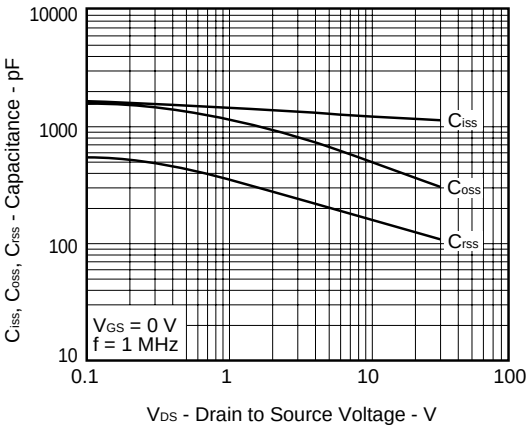
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
CHANNEL TEMPERATURE



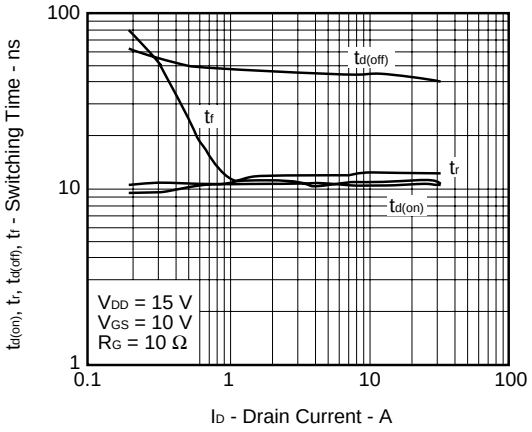
SOURCE TO DRAIN DIODE
FORWARD VOLTAGE



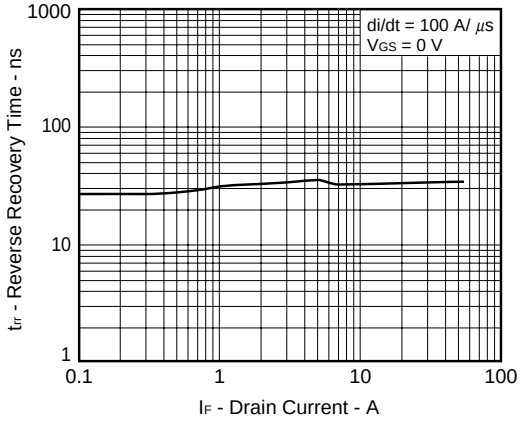
CAPACITANCE vs.
DRAIN TO SOURCE VOLTAGE



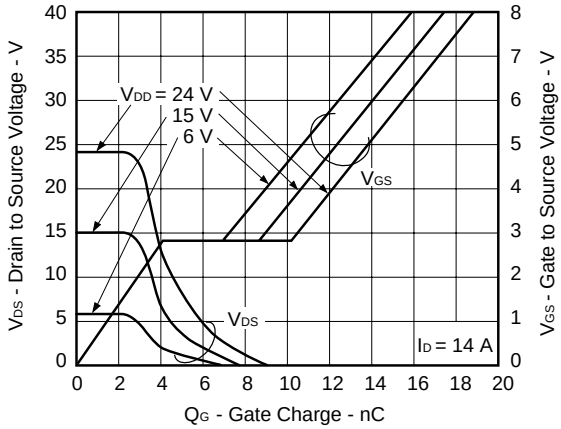
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs.
DRAIN CURRENT



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



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