NEC

MOS FIELD EFFECT TRANSISTOR

μPA1706TP

SWITCHING
N-CHANNEL POWER MOS FET

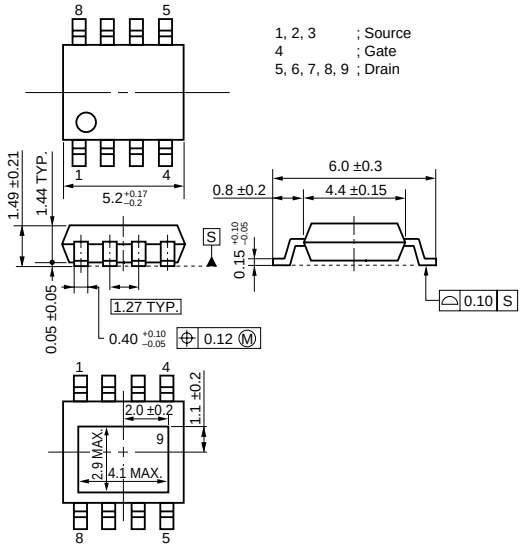
DESCRIPTION

The μPA1706TP which has a heat spreader is N-Channel MOS Field Effect Transistor designed for DC/DC converter and power management application of notebook computer.

FEATURES

- Low on-state resistance
  $R_{DS(on)1}$ = 7.8 mΩ MAX. (V_{GS} = 10 V, I_D = 7.0 A)
  $R_{DS(on)2}$ = 10.0 mΩ MAX. (V_{GS} = 4.5 V, I_D = 7.0 A)
- Low C_{iss}: C_{iss} = 3000 pF TYP. (V_{DS} = 10 V, V_{GS} = 0 V)
- Small and surface mount package (Power HSOP8)

PACKAGE DRAWING (Unit: mm)



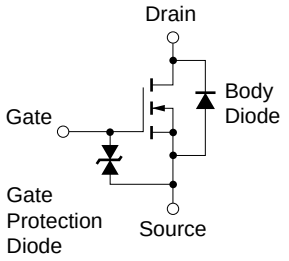
ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1706TP	Power HSOP8

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) (T_C = 25°C)	$I_{D(DC)1}$	±28	A
Drain Current (DC) Note1	$I_{D(DC)2}$	±17	A
Drain Current (pulse) Note2	$I_{D(pulse)}$	±100	A
Total Power Dissipation (T_C = 25°C)	P_{T1}	39	W
Total Power Dissipation 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}	19	A
Single Avalanche Energy Note3	E_{AS}	36.1	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

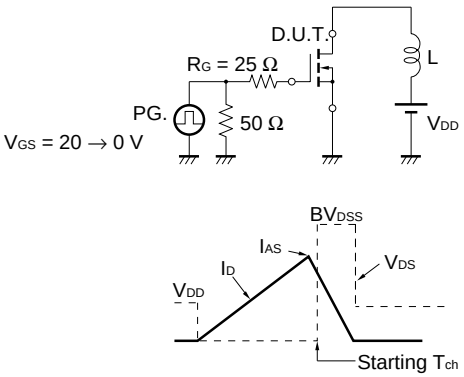
Remark The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

Document No. G15850EJ1V0DS00 (1st edition)
Date Published May 2002 NS CP(K)
Printed in Japan

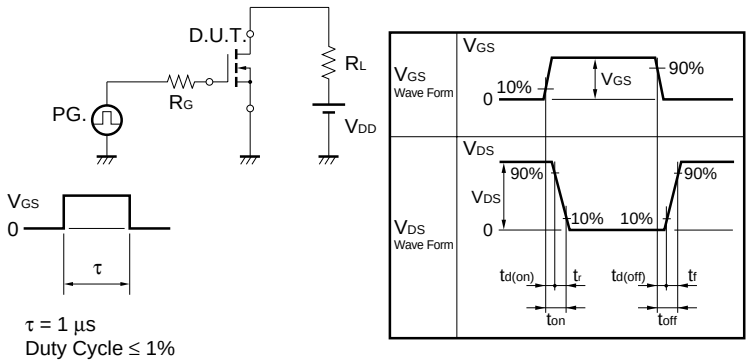
ELECTRICAL CHARACTERISTICS (T_A = 25°C, All terminals are connected.)

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	10	22		S
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = 10 V, I_D = 7.0 A		5.8	7.8	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.5 V, I_D = 7.0 A		7.0	10.0	mΩ
	$R_{DS(on)3}$	V_{GS} = 4.0 V, I_D = 7.0 A		8.0	12.0	mΩ
Input Capacitance	C_{iss}	V_{DS} = 10 V		3000		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		950		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		380		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 15 V, I_D = 13 A		20		ns
Rise Time	t_r	V_{GS} = 10 V		20		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 10 Ω		80		ns
Fall Time	t_f			30		ns
Total Gate Charge	Q_G	V_{DD} = 24 V		56		nC
Gate to Source Charge	Q_{GS}	V_{GS} = 10 V		9		nC
Gate to Drain Charge	Q_{GD}	I_D = 13 A		14		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 13 A, V_{GS} = 0 V		0.8		V
Reverse Recovery Time	t_{rr}	I_F = 13 A, V_{GS} = 0 V		43		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 100 A/μs		50		nC

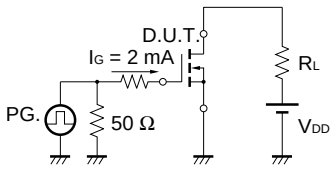
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

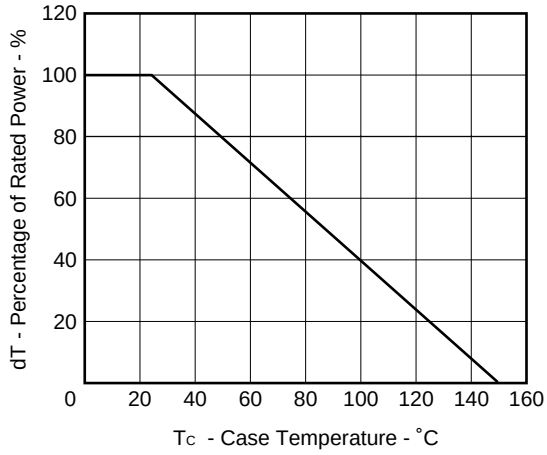


TEST CIRCUIT 3 GATE CHARGE

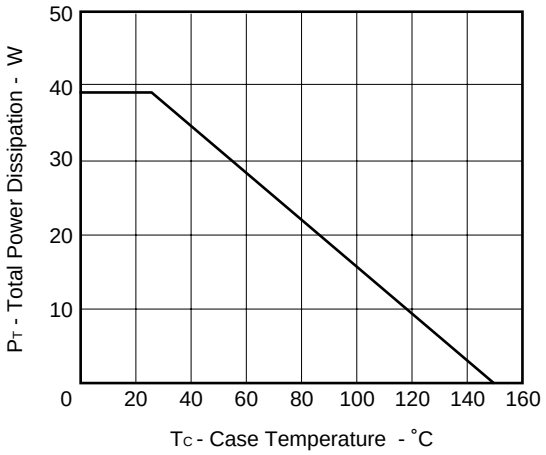


TYPICAL CHARACTERISTICS (T_A = 25°C)

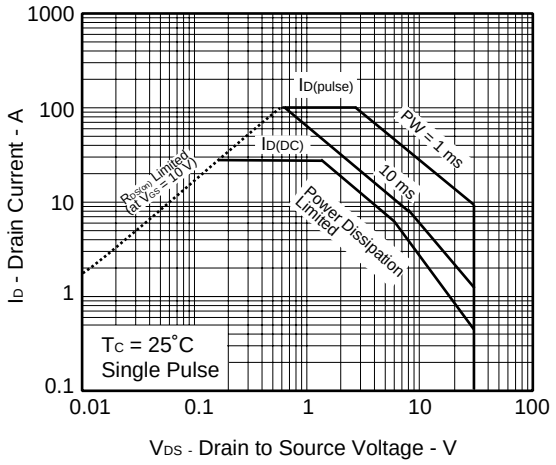
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



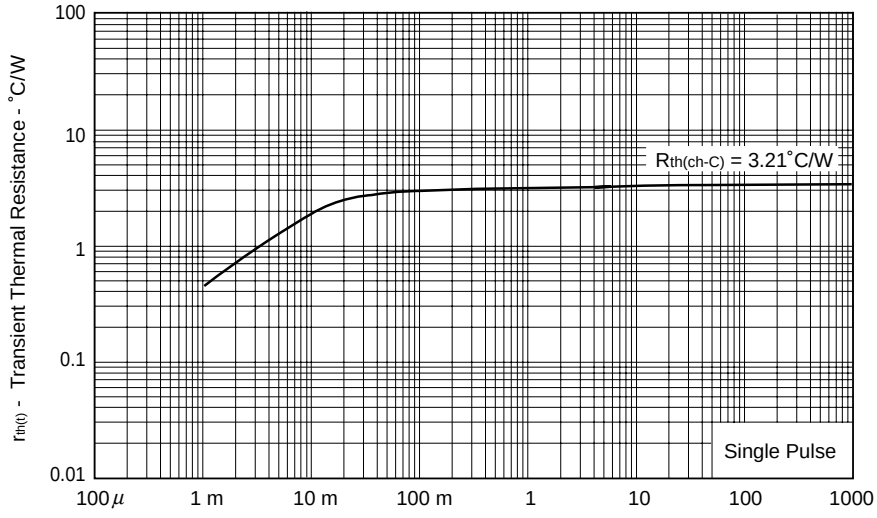
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



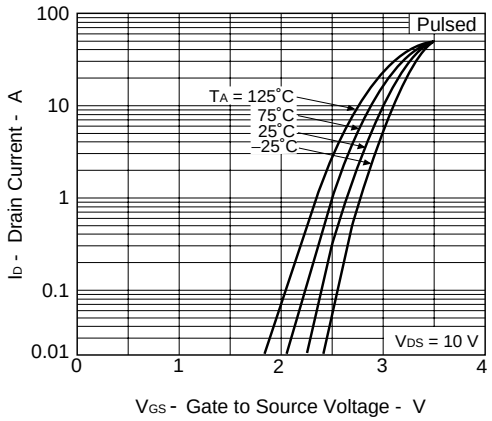
FORWARD BIAS SAFE OPERATING AREA



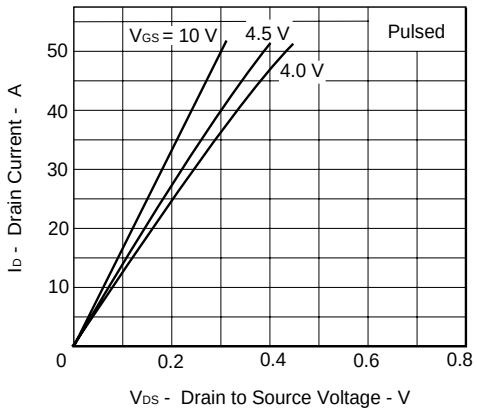
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



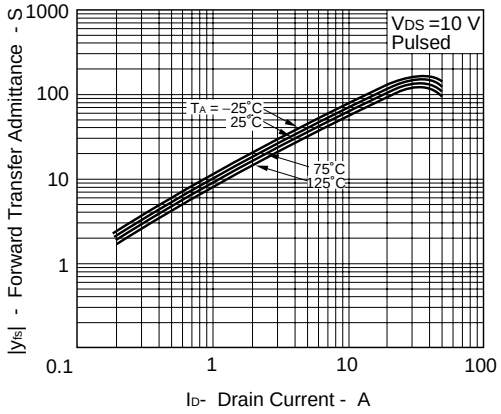
FORWARD TRANSFER CHARACTERISTICS



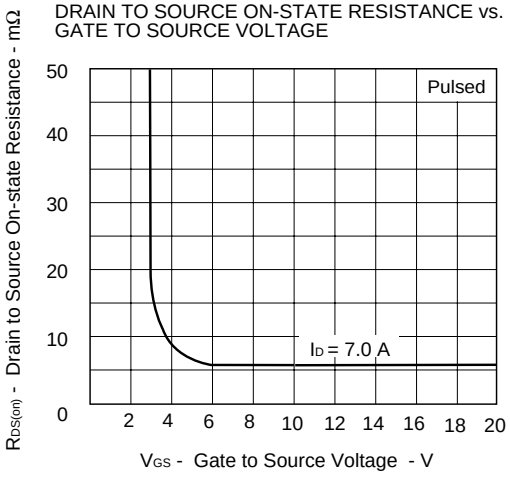
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



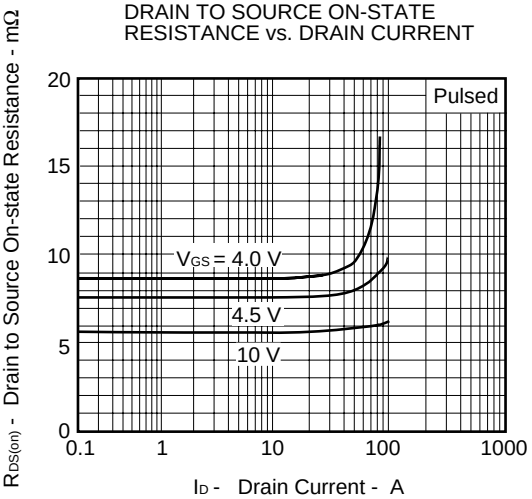
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



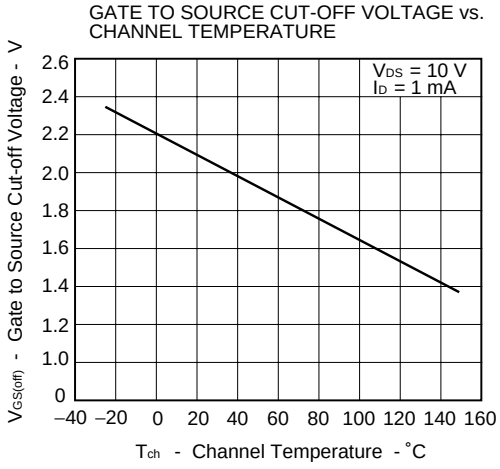
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



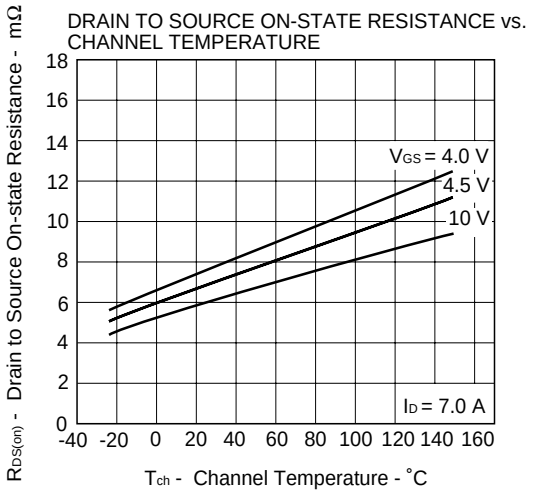
DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT



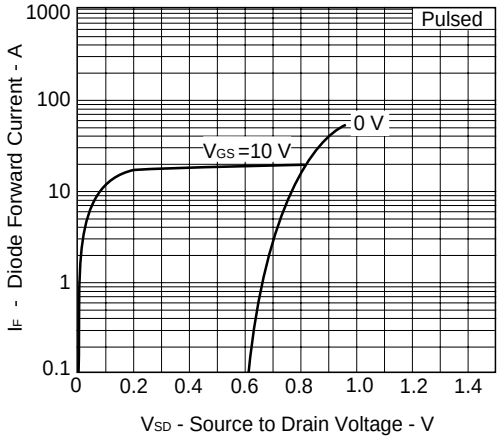
GATE TO SOURCE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



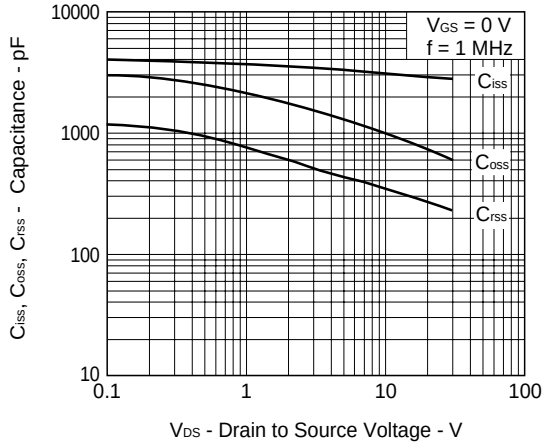
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



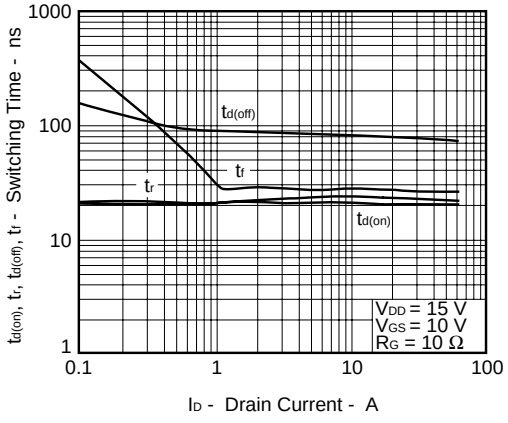
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



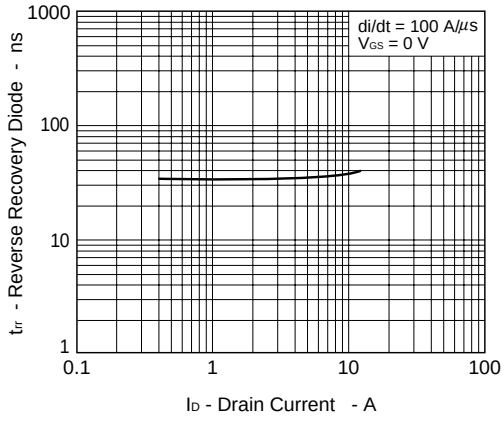
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



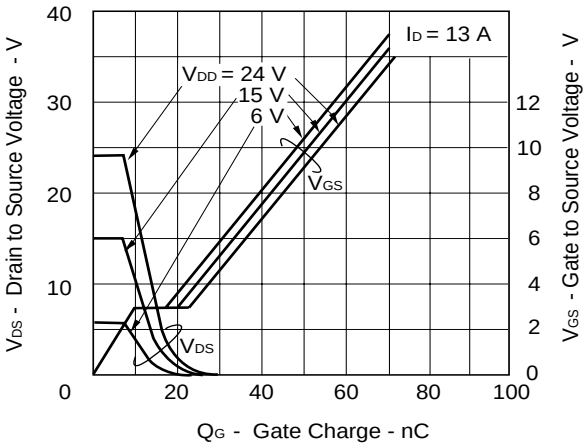
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs. DRAIN CURRENT



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



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