DATA SHEET

NEC

MOS FIELD EFFECT TRANSISTOR

μPA1706

SWITCHING
N-CHANNEL POWER MOS FET
INDUSTRIAL USE

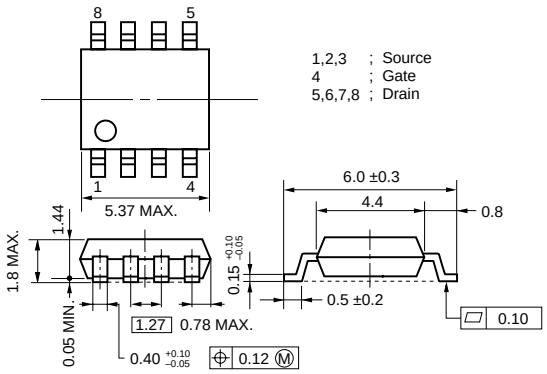
DESCRIPTION

This product is N-Channel MOS Field Effect Transistor designed for DC/DC Converters and power management applications of notebook computers.

FEATURES

- Super low on-resistance
  $R_{DS(on)1}$ = 5.8 mΩ TYP. (V_{GS} = 10 V, I_D = 7.0 A)
  $R_{DS(on)2}$ = 7.0 mΩ TYP. (V_{GS} = 4.5 V, I_D = 7.0 A)
  $R_{DS(on)3}$ = 8.0 mΩ TYP. (V_{GS} = 4.0 V, I_D = 7.0 A)
- Low C_{iss} : C_{iss} = 3000 pF TYP.
- Built-in G-S protection diode
- Small and surface mount package (Power SOP8)

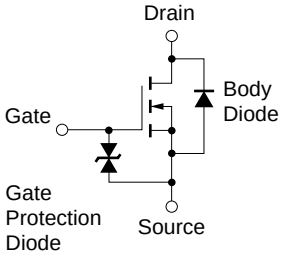
PACKAGE DRAWING (Unit : mm)



ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1706G	Power SOP8

EQUIVALENT CIRCUIT



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

Drain to Source Voltage Note1	V_{DSS}	30	V
Gate to Source Voltage Note2	V_{GSS}	±20	V
Drain Current (DC)	$I_{D(DC)}$	±13	A
Drain Current (pulse) Note3	$I_{D(pulse)}$	±52	A
Total Power Dissipation (T_A = 25 °C) Note4	P_T	2.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to + 150	°C

Notes 1. V_{GS} = 0 V
2. V_{DS} = 0 V
3. PW ≤ 10 μs, Duty cycle ≤ 1 %
4. Mounted on ceramic substrate of 1200 mm^2 x 0.7 mm

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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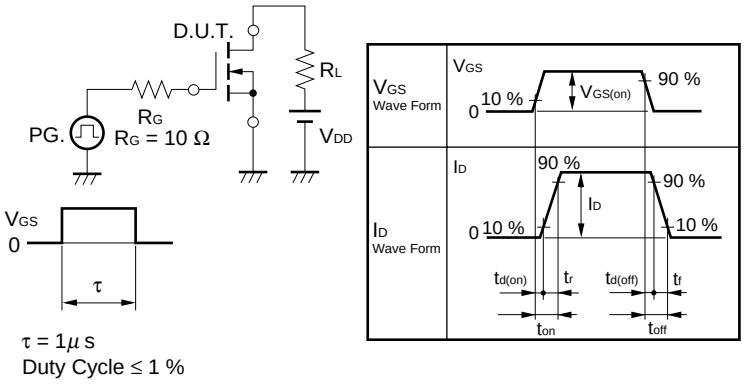
The mark ★ shows major revised points.

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

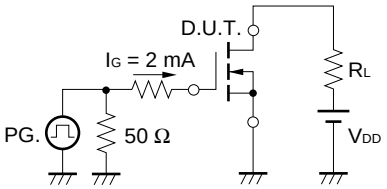
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = 10 V, I_D = 7.0 A		5.8	7.8	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.5 V, I_D = 7.0 A		7.0	10.0	mΩ
	$R_{DS(on)3}$	V_{GS} = 4.0 V, I_D = 7.0 A		8.0	12.0	mΩ
Gate to Source Cut-off Voltage	$V_{GS(off)}$	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 Leakage Current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V			10	μA
Gate to Source Leakage Current	I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V			±10	μA
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	$t_{d(on)}$	I_D = 7.0 A		40		ns
Rise Time	t_r	$V_{GS(on)}$ = 10 V		220		ns
Turn-off Delay Time	$t_{d(off)}$	V_{DD} = 15 V		140		ns
Fall Time	t_f	R_G = 10 Ω		90		ns
Total Gate Charge	Q_G	I_D = 13 A		56		nC
Gate to Source Charge	Q_{GS}	V_{DD} = 24 V		9		nC
Gate to Drain Charge	Q_{GD}	V_{GS} = 10 V		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 = 100A/μs		50		nC

TEST CIRCUIT 1 SWITCHING TIME



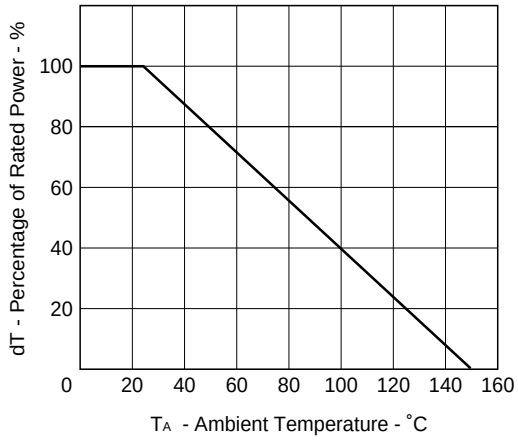
τ = 1μ s
Duty Cycle ≤ 1 %

TEST CIRCUIT 2 GATE CHARGE

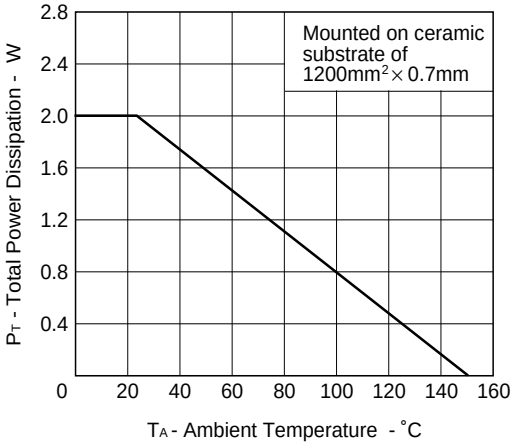


TYPICAL CHARACTERISTICS (T_A = 25°C)

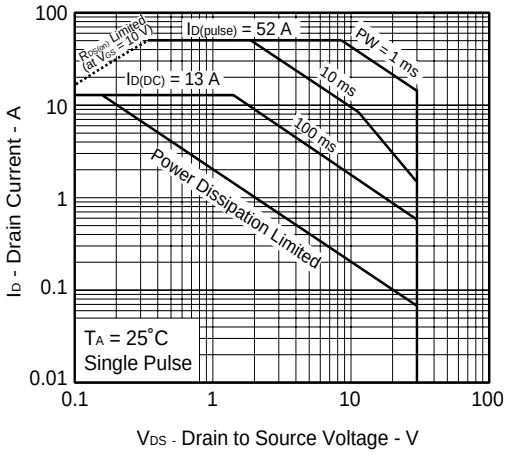
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE

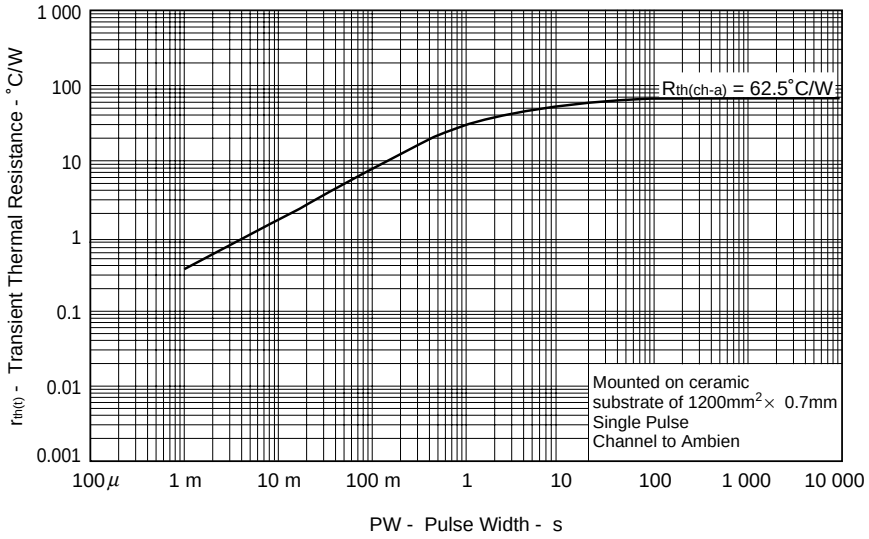


★ FORWARD BIAS SAFE OPERATING AREA

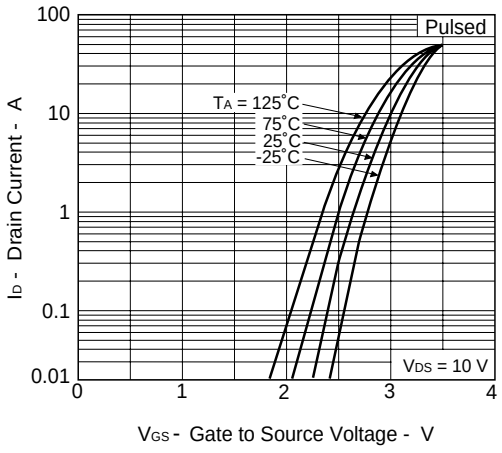


Remark Mounted on ceramic substrate of 1200 mm^2 × 0.7 mm

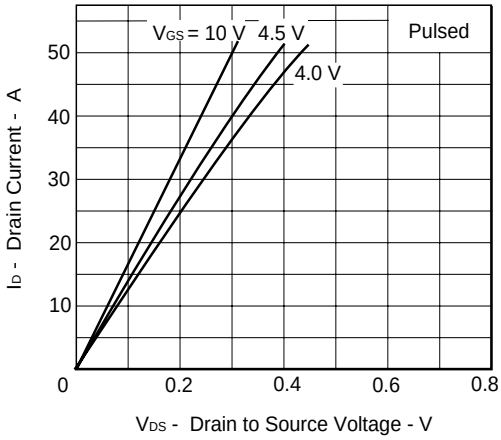
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



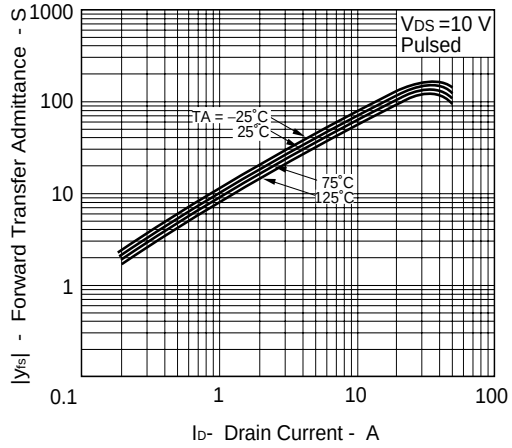
FORWARD TRANSFER CHARACTERISTICS



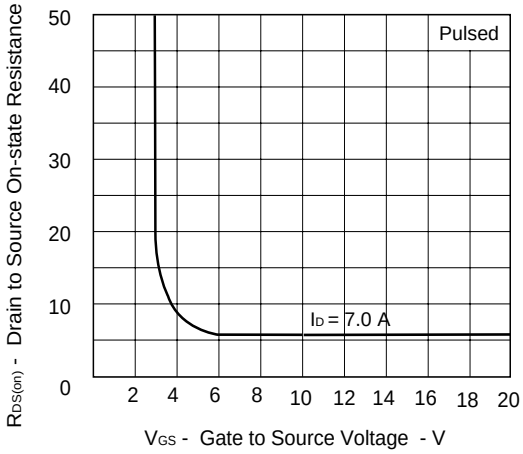
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



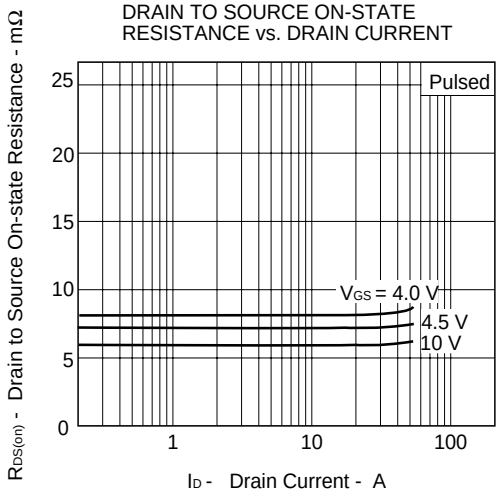
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



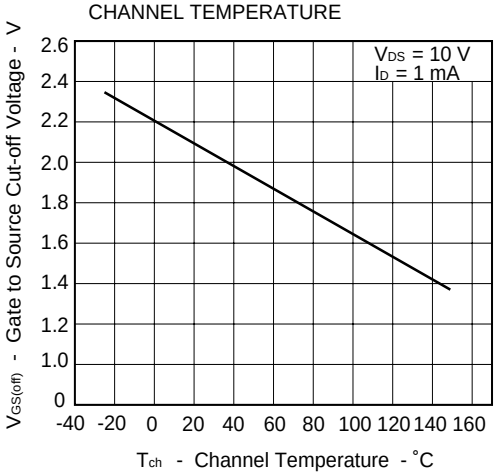
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



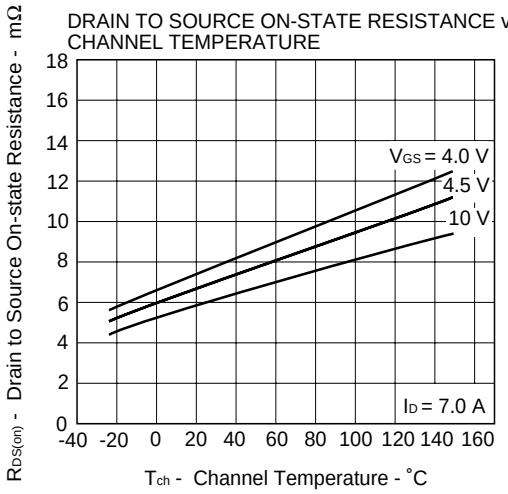
DRAIN TO SOURCE ON-STATE
RESISTANCE vs. DRAIN CURRENT



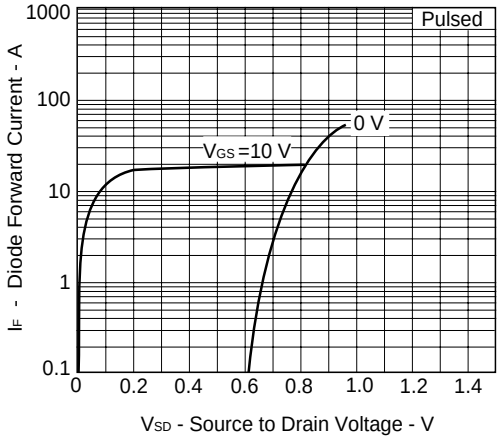
GATE TO SOURCE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



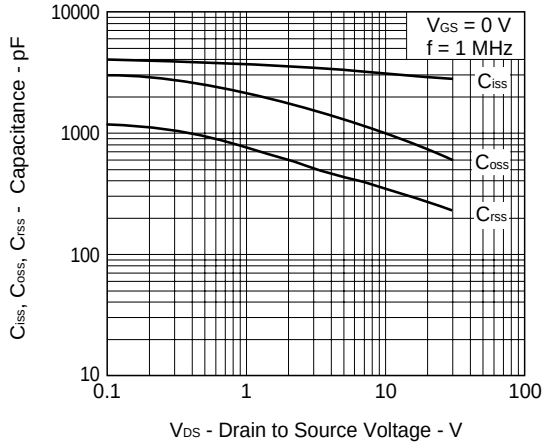
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



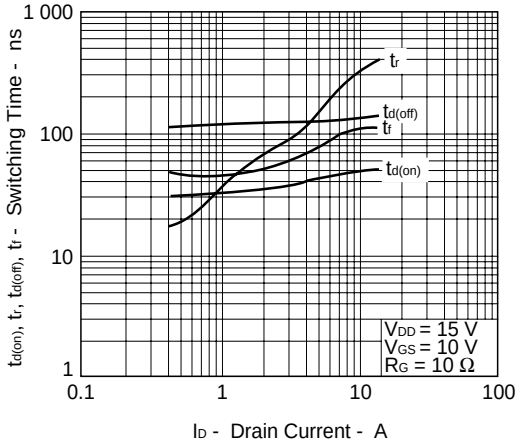
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



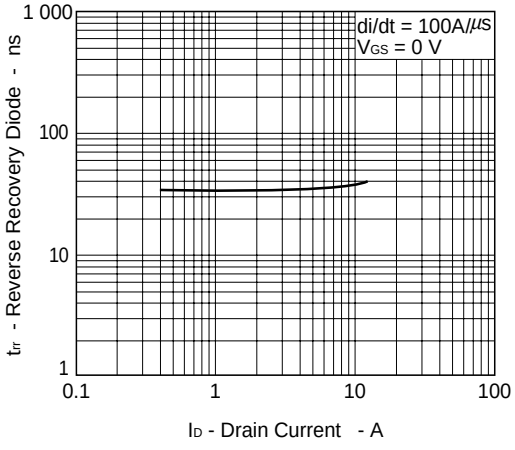
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



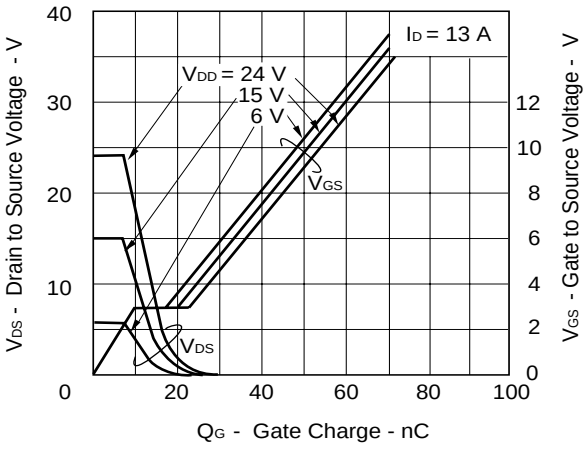
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs. DRAIN CURRENT



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



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