DATA SHEET

NEC

MOS FIELD EFFECT TRANSISTOR

Phase-out/Discontinued

μPA1704

SWITCHING
N-CHANNEL POWER MOS FET
INDUSTRIAL USE

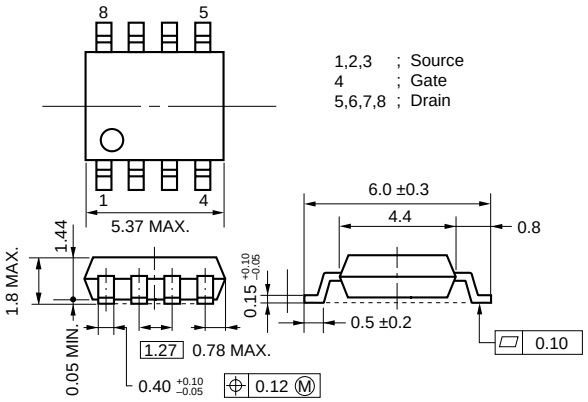
DESCRIPTION

This μPA1704 is N-Channel MOS Field Effect Transistor designed for power management applications and Li-ion battery application.

FEATURES

- 2.5-V gate drive and low on-resistance
  $R_{DS(on)1}$ = 13 mΩ MAX. (V_{GS} = 4.0 V, I_D = 5.0 A)
  $R_{DS(on)2}$ = 16 mΩ MAX. (V_{GS} = 2.5 V, I_D = 5.0 A)
- Low C_{iss} : C_{iss} = 2700 pF TYP.
- Built-in G-S protection diode
- Small and surface mount package (Power SOP8)

PACKAGE DRAWING (Unit : mm)



ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1704G	Power SOP8

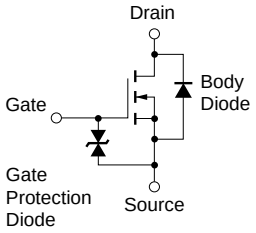
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, All terminals are connected.)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	30	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±12	V
Drain Current (DC)	$I_{D(DC)}$	±10	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	±40	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

Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1 %

2. Mounted on ceramic substrate of 1200 mm^2 x 0.7 mm

EQUIVALENT CIRCUIT



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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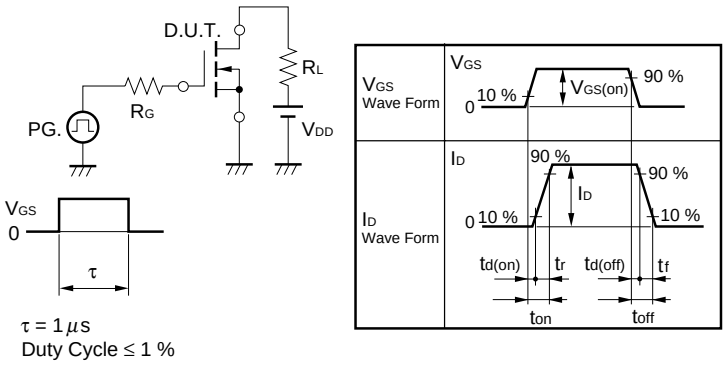
The mark ★ shows major revised points.

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

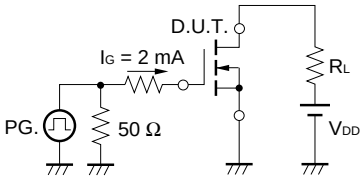
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = 4.0 V, I_D = 5.0 A		9.8	13	mΩ
	$R_{DS(on)2}$	V_{GS} = 2.5 V, I_D = 5.0 A		12	16	mΩ
Gate to Source Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 10 V, I_D = 1 mA	0.5	0.8	1.5	V
Forward Transfer Admittance	$\|y_{fs}\|$	V_{DS} = 10 V, I_D = 5.0 A	10	25		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} = ±12 V, V_{DS} = 0 V			±10	μA
Input Capacitance	C_{iss}	V_{DS} = 10 V		2700		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		880		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		400		pF
Turn-on Delay Time	$t_{d(on)}$	I_D = 5.0 A		25		ns
Rise Time	t_r	$V_{GS(on)}$ = 4.0 V		95		ns
Turn-off Delay Time	$t_{d(off)}$	V_{DD} = 15 V		235		ns
Fall Time	t_f	R_G = 10 Ω		200		ns
Total Gate Charge	Q_G	I_D = 10 A		38		nC
Gate to Source Charge	Q_{GS}	V_{DD} = 24 V		3.3		nC
Gate to Drain Charge	Q_{GD}	V_{GS} = 4.0 V		15		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	I_F = 10 A, V_{GS} = 0 V		0.8		V
Reverse Recovery Time	t_{rr}	I_F = 10 A, V_{GS} = 0 V		48		ns
Reverse Recovery Charge	Q_{rr}	di/dt = 100 A/ μs		53		nC

TEST CIRCUIT 1 SWITCHING TIME



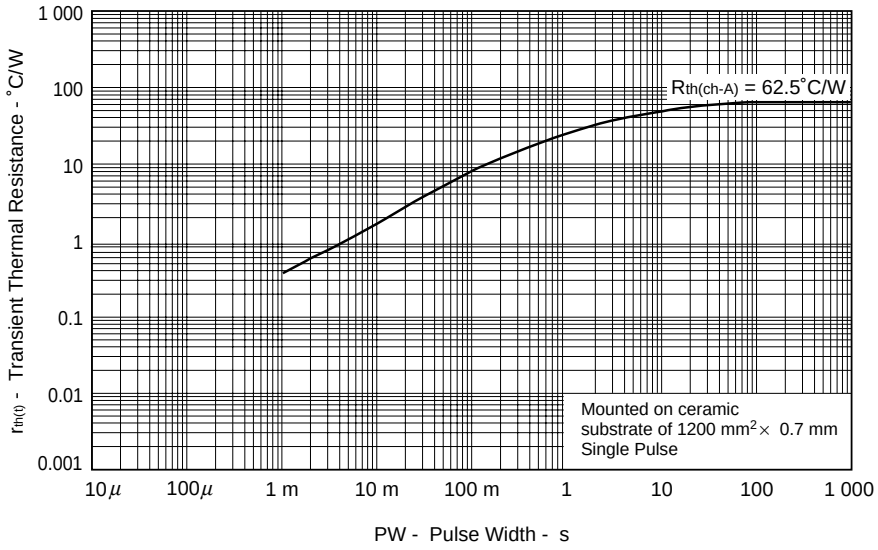
τ = 1 μs
Duty Cycle ≤ 1 %

TEST CIRCUIT 2 GATE CHARGE

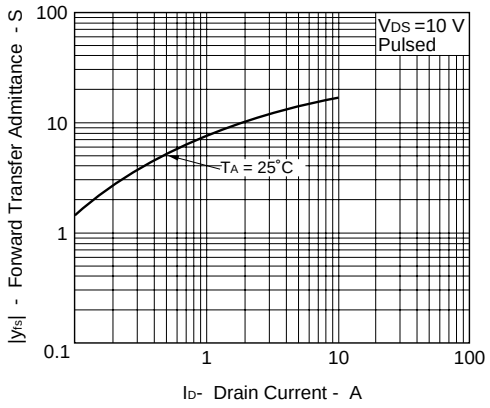


TYPICAL CHARACTERISTICS (T_A = 25°C)

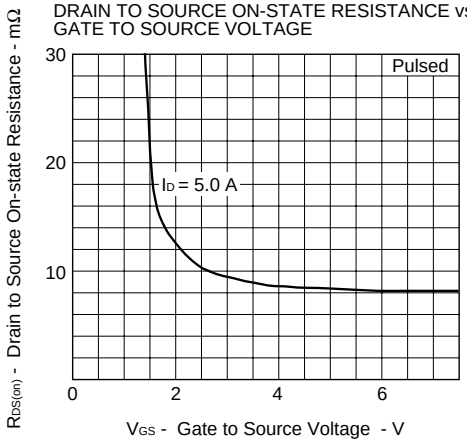
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



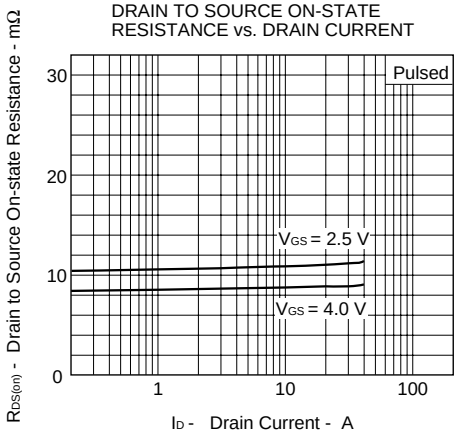
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



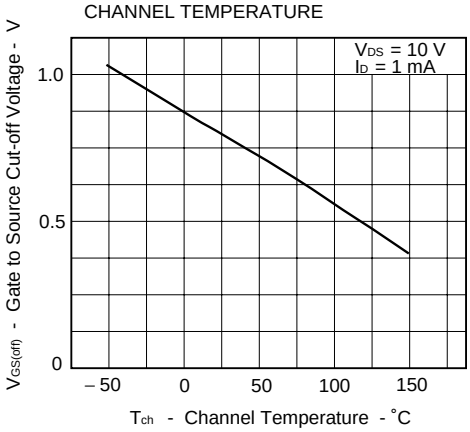
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



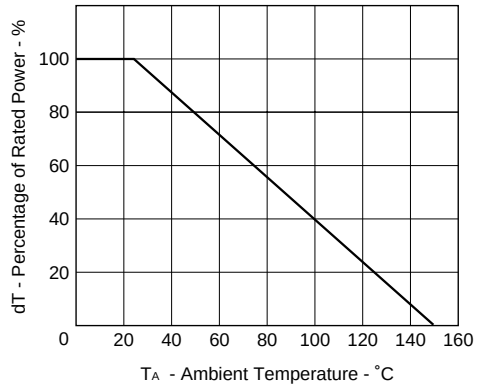
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



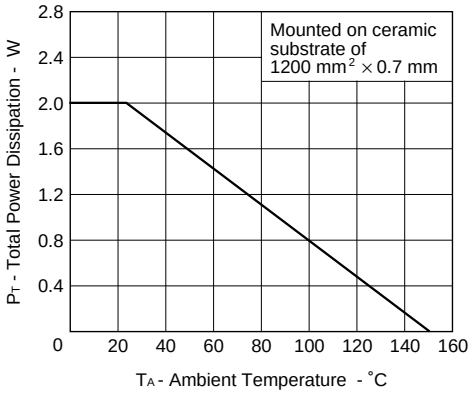
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



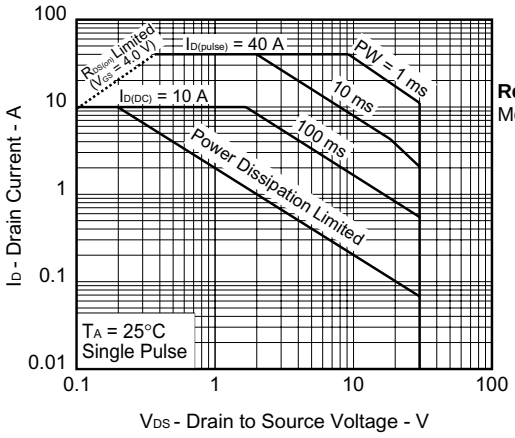
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE

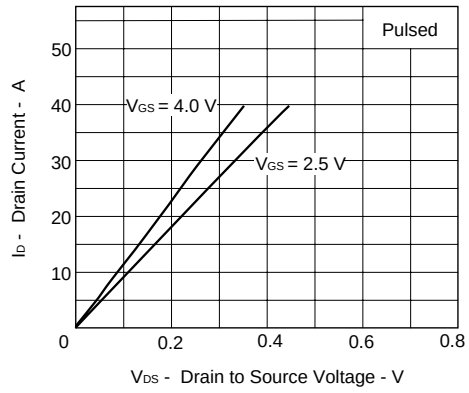


★ FORWARD BIAS SAFE OPERATING AREA

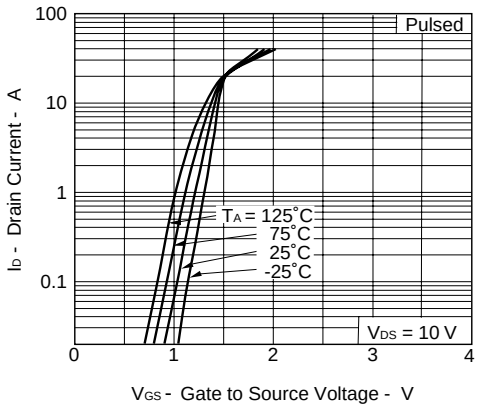


Remark
Mounted on ceramic substrate of 1200 mm^2 x 0.7 mm

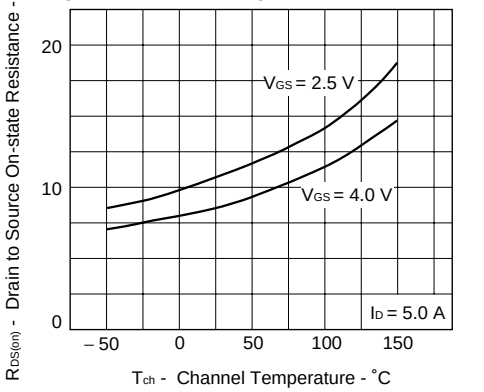
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



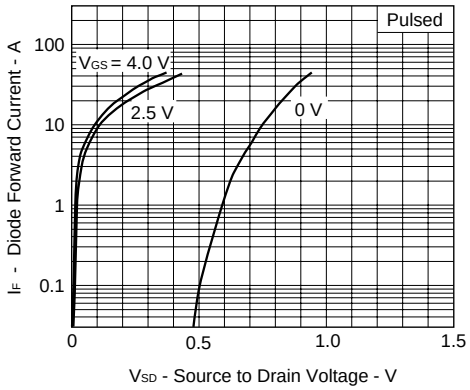
FORWARD TRANSFER CHARACTERISTICS



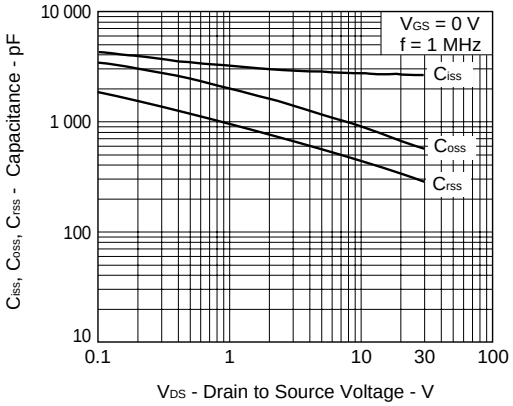
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



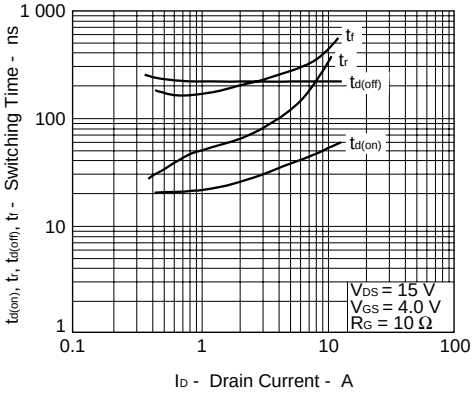
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



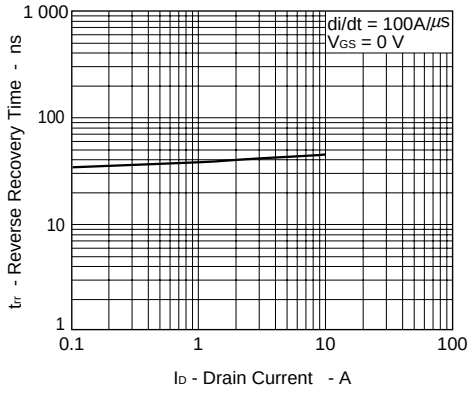
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



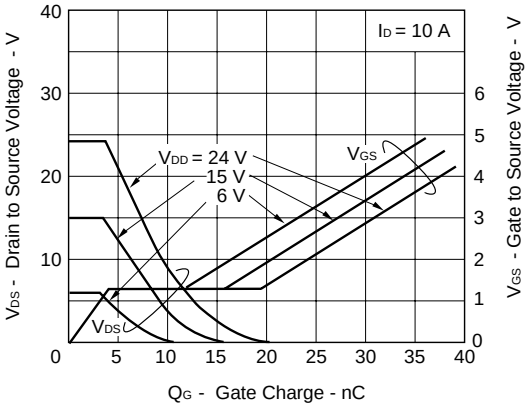
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs. DRAIN CURRENT



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



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