DATA SHEET

MOS FIELD EFFECT TRANSISTOR
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.

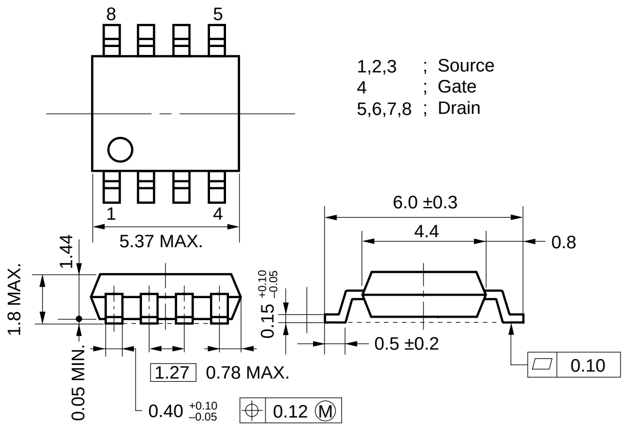
FEATURES

- 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)

ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1704G	Power SOP8

PACKAGE DRAWING (Unit : mm)



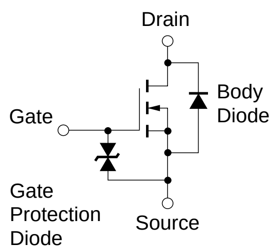
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, All terminals are connected.)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	30	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±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.

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

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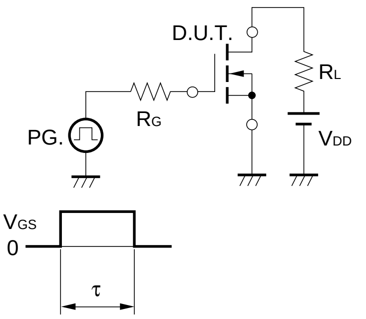
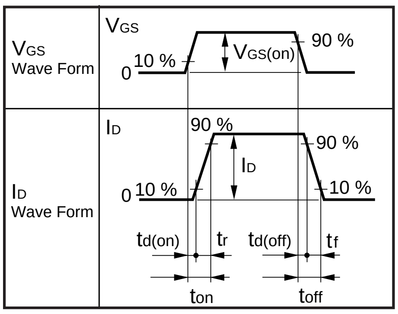
ELECTRICAL CHARACTERISTICS (T_A = 25 °C, All terminals are connected.)

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

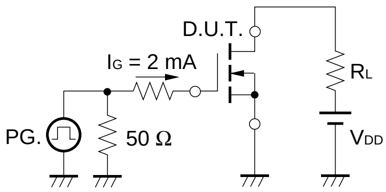
TEST CIRCUIT 1 SWITCHING TIME



τ = 1 μs
Duty Cycle ≤ 1 %

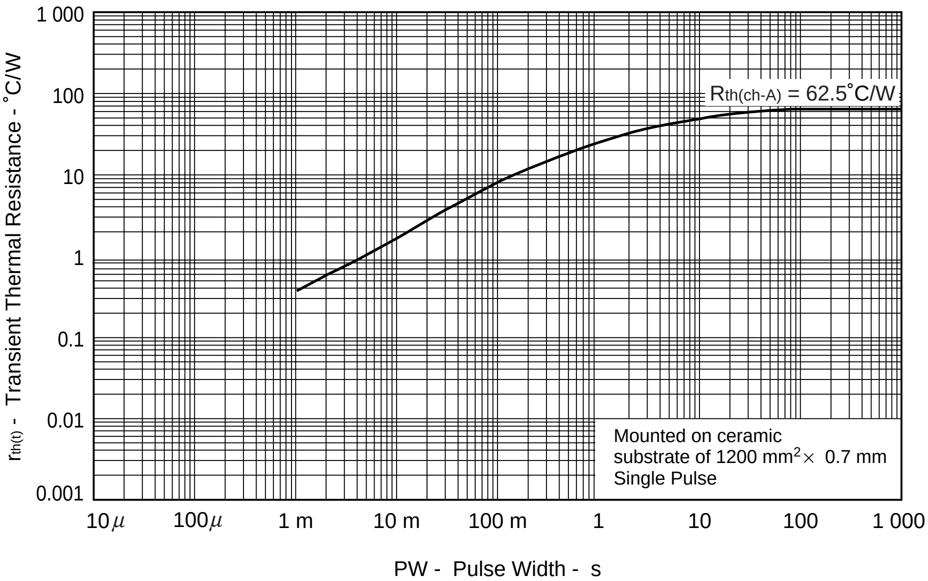


TEST CIRCUIT 2 GATE CHARGE

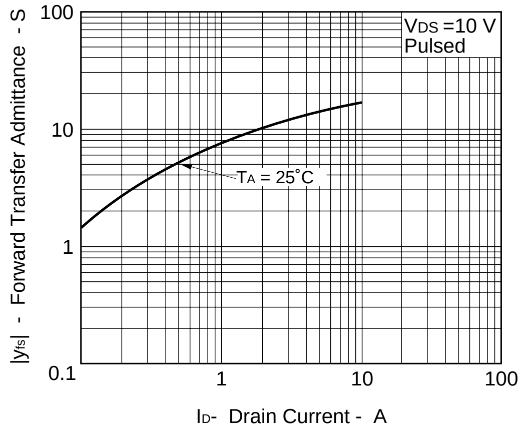


TYPICAL CHARACTERISTICS (T_A = 25 °C)

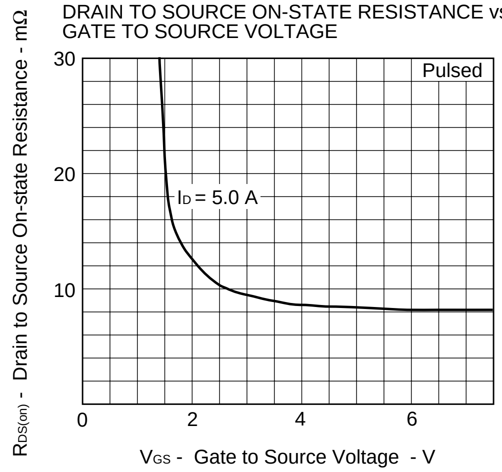
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



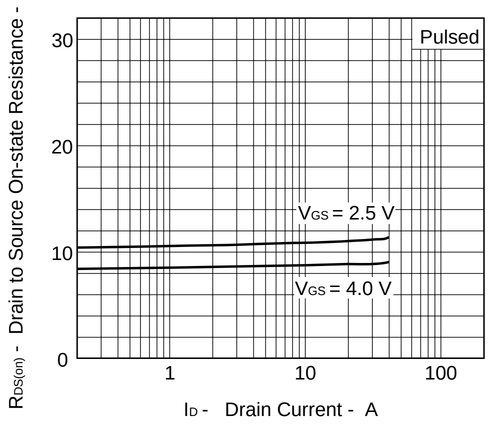
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



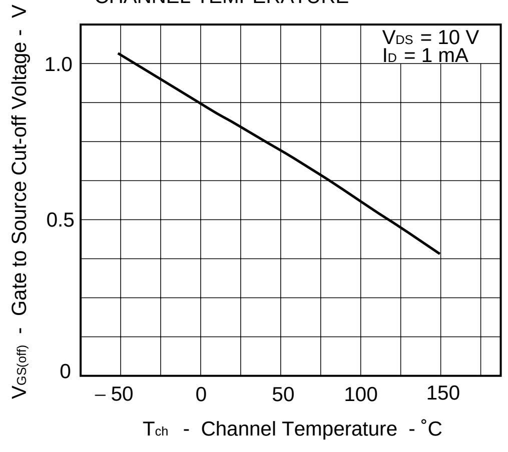
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



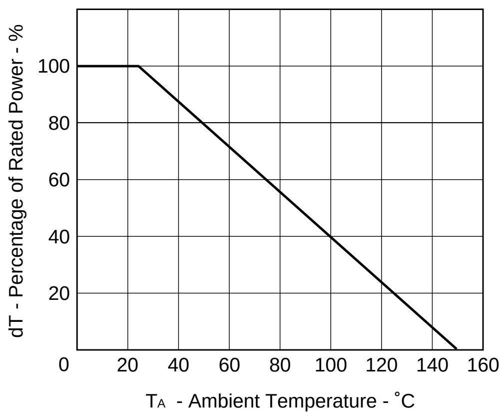
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



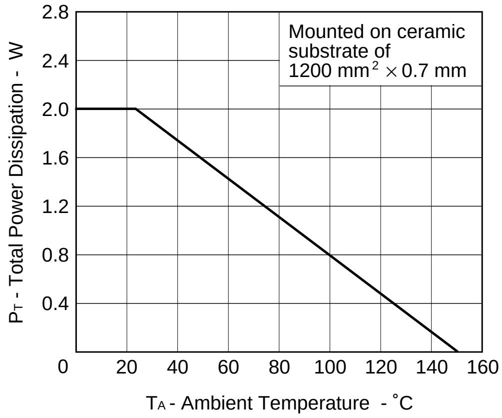
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



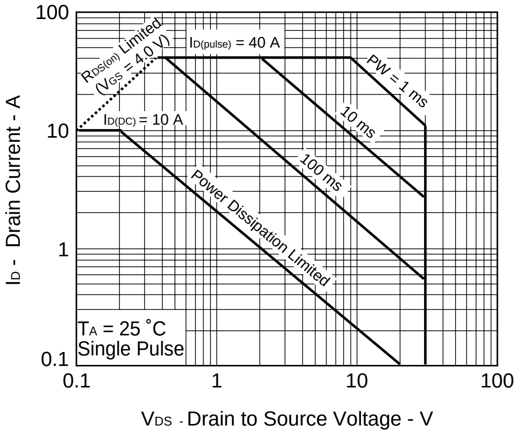
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE

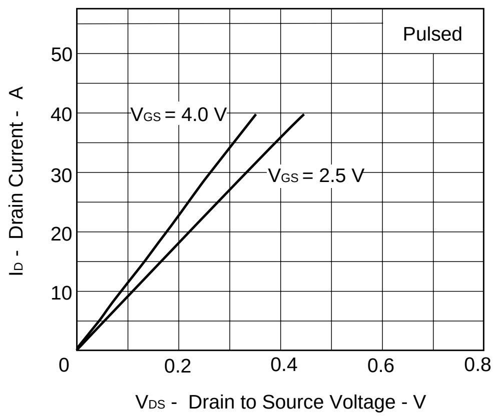


FORWARD BIAS SAFE OPERATING AREA

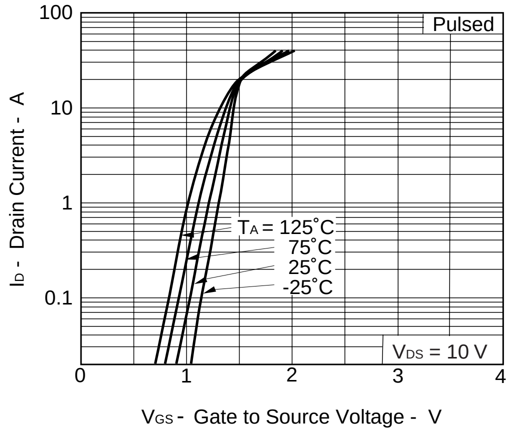


Remark
Mounted on ceramic substrate of 1200 mm^2 x 0.7 mm

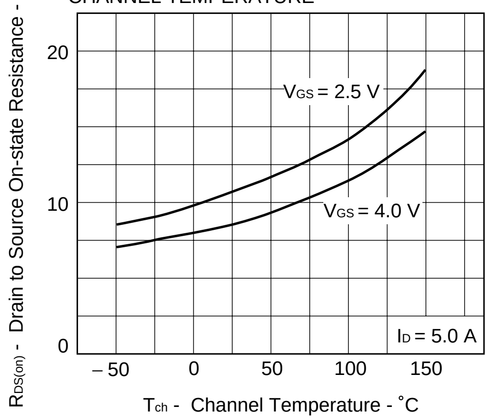
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



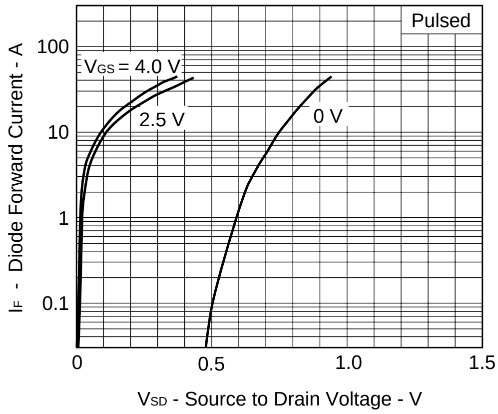
FORWARD TRANSFER CHARACTERISTICS



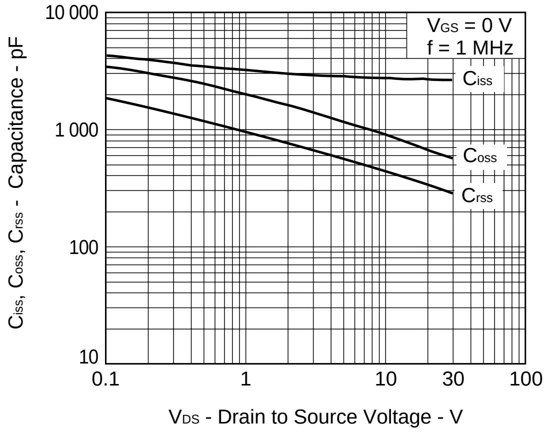
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



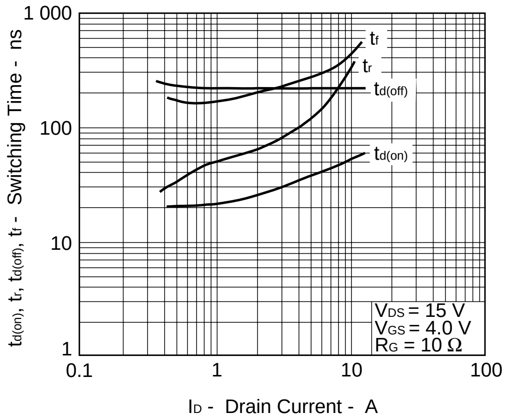
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



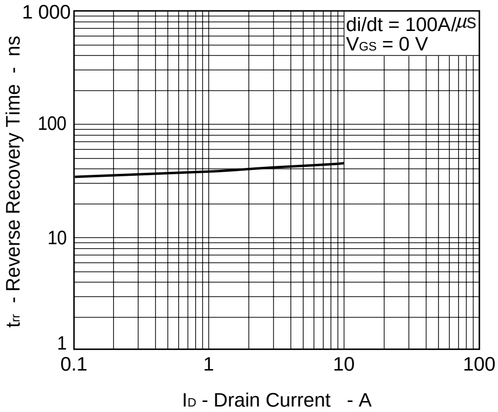
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



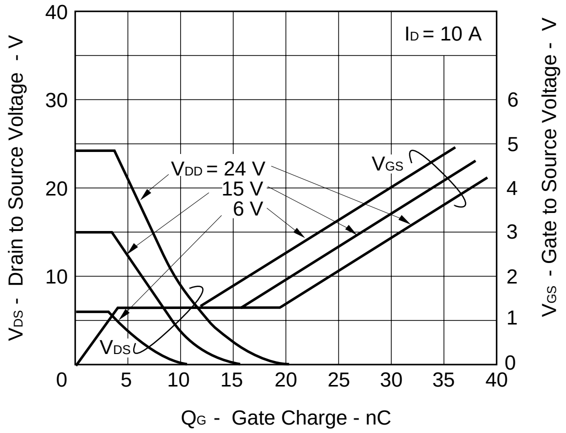
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs. DRAIN CURRENT



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



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