DATA SHEET

NEC

MOS FIELD EFFECT TRANSISTOR

μPA1802

N-CHANNEL MOS FIELD EFFECT TRANSISTOR FOR SWITCHING

DESCRIPTION

The μPA1802 is a switching device which can be driven directly by a 2.5-V power source.

The μPA1802 features a low on-state resistance and excellent switching characteristics, and is suitable for applications such as power switch of portable machine and so on.

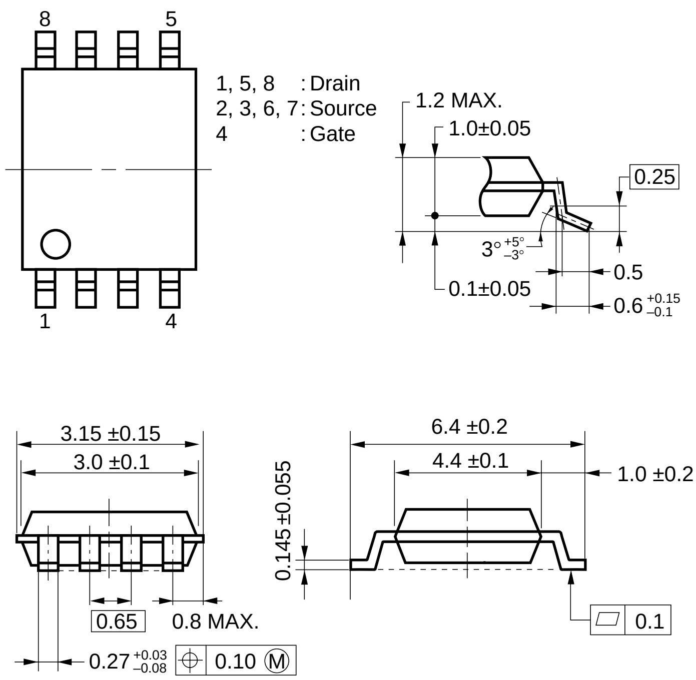
FEATURES

- Can be driven by a 2.5-V power source
- Low on-state resistance
  $R_{DS(on)1}$ = 23 mΩ MAX. (V_{GS} = 4.5 V, I_D = 3.5 A)
  $R_{DS(on)2}$ = 25 mΩ MAX. (V_{GS} = 4.0 V, I_D = 3.5 A)
  $R_{DS(on)3}$ = 32 mΩ MAX. (V_{GS} = 2.5 V, I_D = 3.5 A)

ORDERING INFORMATION

PART NUMBER	PACKAGE
μPA1802GR-9JG	Power TSSOP8

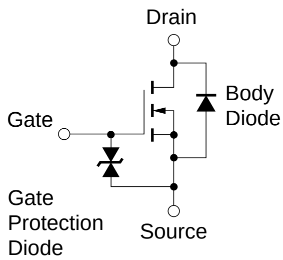
PACKAGE DRAWING (Unit : mm)



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage	V_{DSS}	20	V
Gate to Source Voltage	V_{GSS}	±12	V
Drain Current (DC)	$I_{D(DC)}$	±7.0	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	±28	A
Total Power Dissipation Note2	P_T	2.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	–55 to +150	°C

EQUIVALENT CIRCUIT



Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1 %

2. Mounted on ceramic substrate of 5000 mm^2 x 1.1 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.

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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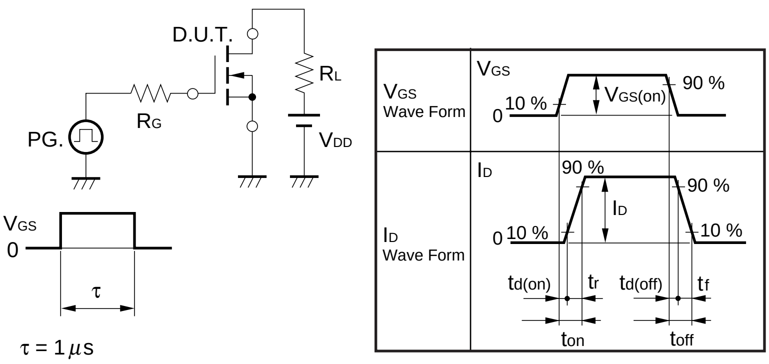
The mark ★ shows major revised points.

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

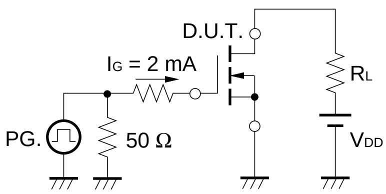
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V			10	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ±12 V, V_{DS} = 0 V			±10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	V_{DS} = 10 V, I_D = 1 mA	0.5	0.8	1.5	V
★ Forward Transfer Admittance	$\lvert y_{fs} \rvert$	V_{DS} = 10 V, I_D = 3.5 A	5	16		S
★ Drain to Source On-state Resistance	$R_{DS(on)1}$	V_{GS} = 4.5 V, I_D = 3.5 A		16	23	mΩ
	$R_{DS(on)2}$	V_{GS} = 4.0V, I_D = 3.5 A		17	25	mΩ
	$R_{DS(on)3}$	V_{GS} = 2.5 V, I_D = 3.5 A		21	32	mΩ
Input Capacitance	C_{iss}	V_{DS} = 10 V		970		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V		510		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		230		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 10 V		60		ns
Rise Time	t_r	I_D = 3.5 A		210		ns
Turn-off Delay Time	$t_{d(off)}$	$V_{GS(on)}$ = 4.0 V		590		ns
Fall Time	t_f	R_G = 10 Ω		820		ns
Total Gate Charge	Q_G	V_{DS} = 16 V		13		nC
Gate to Source Charge	Q_{GS}	I_D = 7.0 A		3		nC
Gate to Drain Charge	Q_{GD}	V_{GS} = 4.0 V		5		nC
Diode Forward Voltage	$V_{F(S-D)}$	I_F = 7.0 A, V_{GS} = 0 V		0.74		V

TEST CIRCUIT 1 SWITCHING TIME



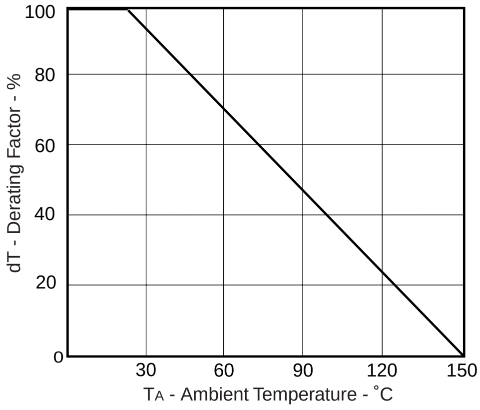
τ = 1 μs
Duty Cycle ≤ 1 %

TEST CIRCUIT 2 GATE CHARGE

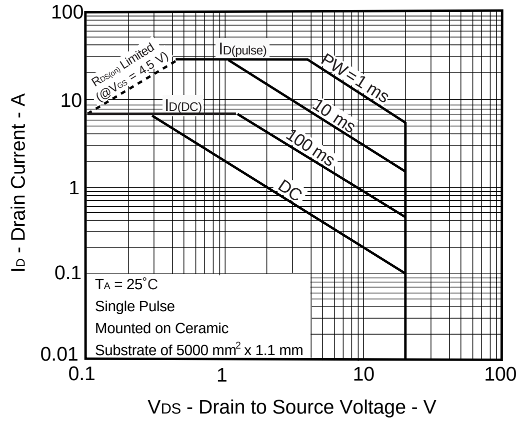


★ TYPICAL CHARACTERISTICS (T_A = 25 °C)

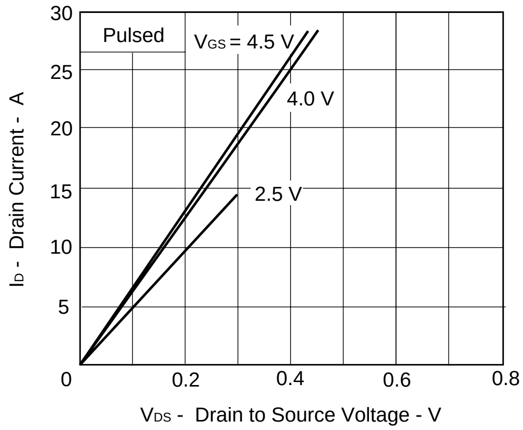
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



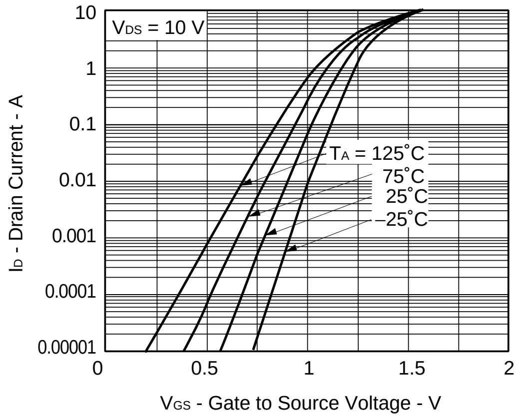
FORWARD BIAS SAFE OPERATING AREA



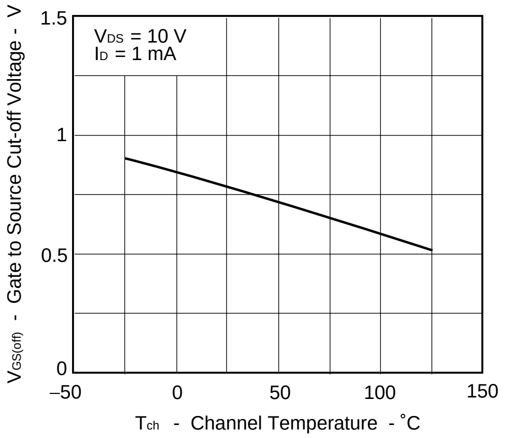
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



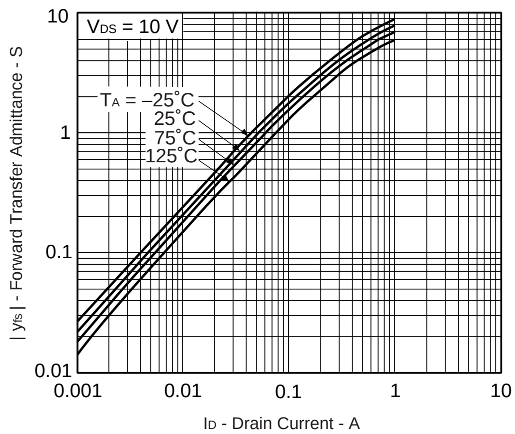
FORWARD TRANSFER CHARACTERISTICS



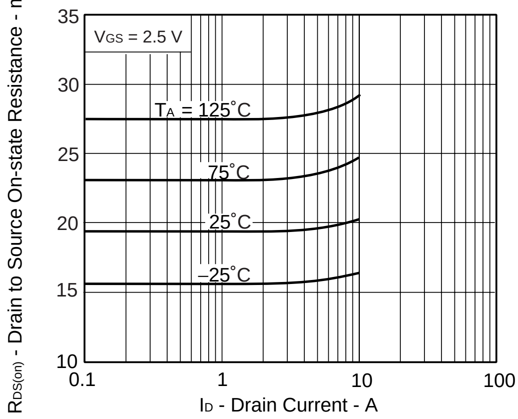
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



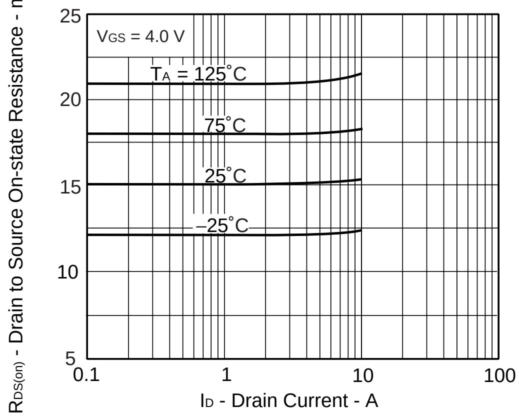
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



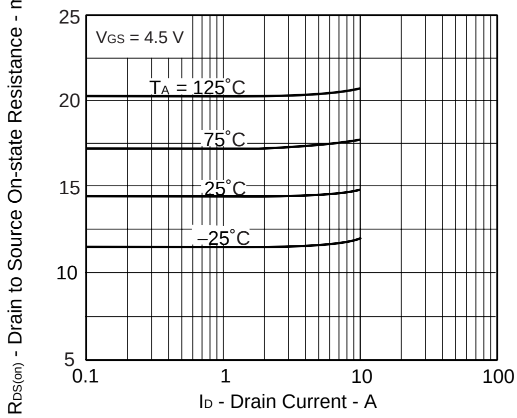
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



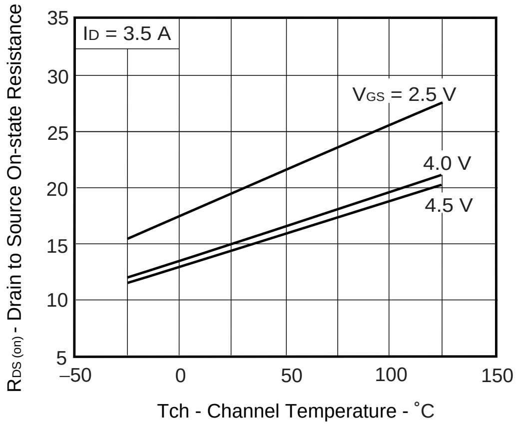
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



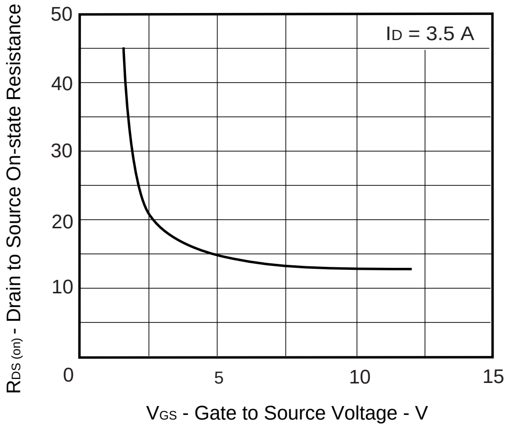
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



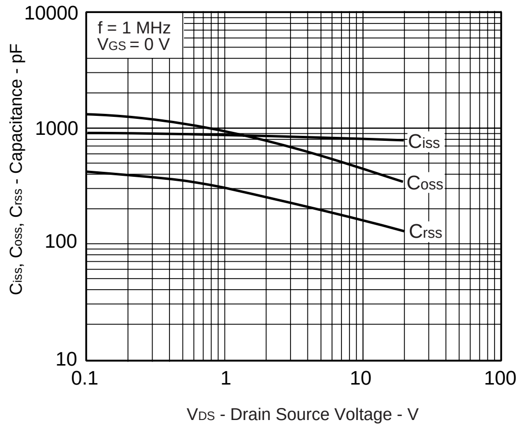
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE

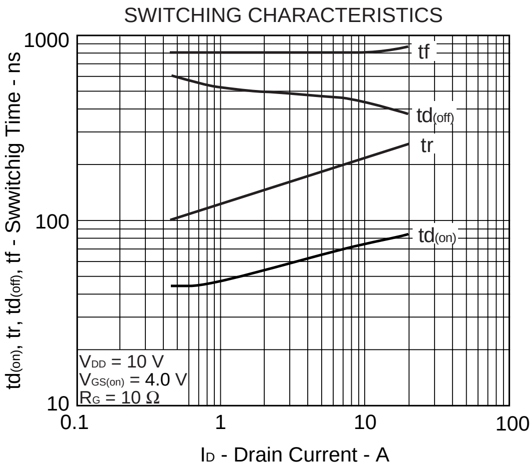


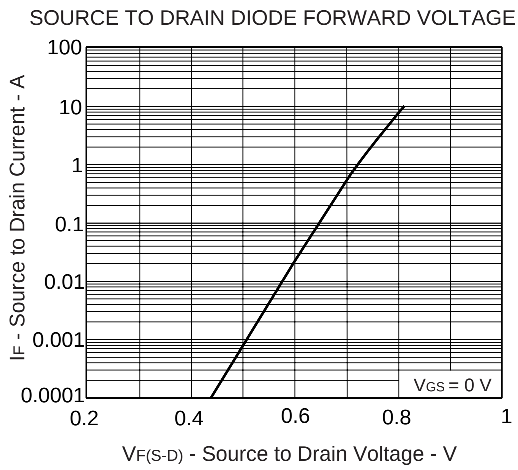
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE

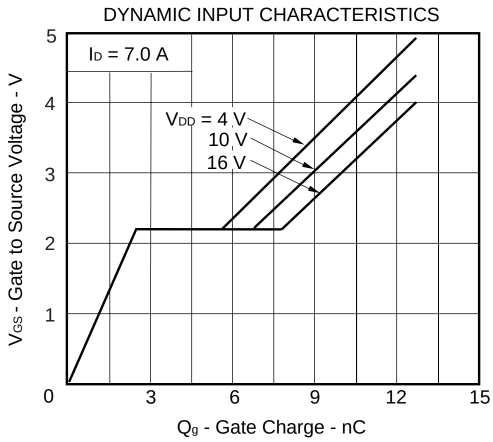


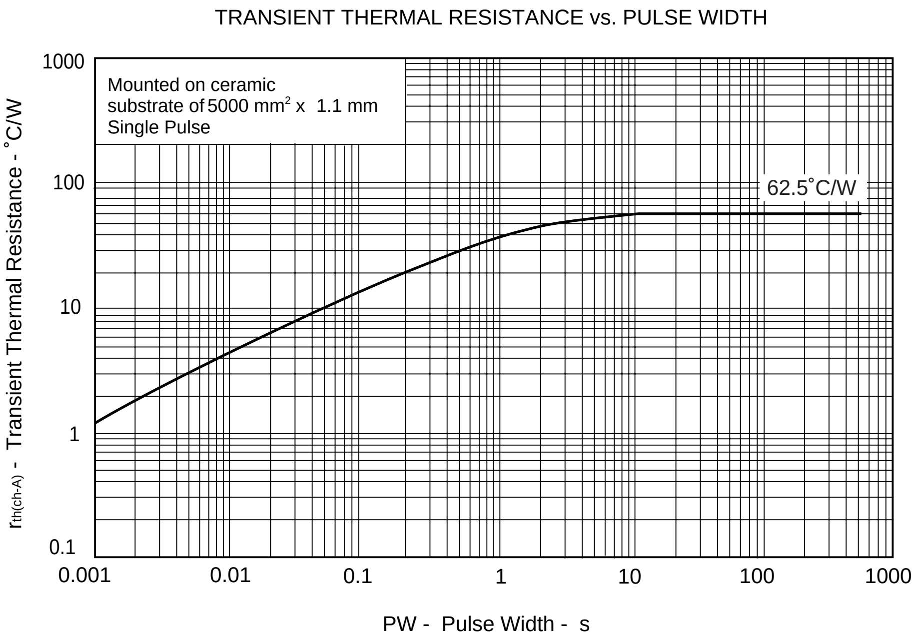
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE




SWITCHING CHARACTERISTICS
td(on), tr, td(off), tf - Swwitchig Time - ns
1000
100
10
0.1
1
10
100
tf
td(off)
tr
td(on)
VDD = 10 V
VGS(on) = 4.0 V
RG = 10 Ω
ID - Drain Current - A


SOURCE TO DRAIN DIODE FORWARD VOLTAGE
IF - Source to Drain Current - A
100
10
1
0.1
0.01
0.001
0.0001
0.2
0.4
0.6
0.8
1
VGS = 0 V
VF(S-D) - Source to Drain Voltage - V


DYNAMIC INPUT CHARACTERISTICS
VGS - Gate to Source Voltage - V
5
4
3
2
1
0
3
6
9
12
15
ID = 7.0 A
VDD = 4 V
10 V
16 V
Qg - Gate Charge - nC


TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH
rth(ch-A) - Transient Thermal Resistance - °C/W
1000
100
10
1
0.1
0.001
0.01
0.1
1
10
100
1000
Mounted on ceramic
substrate of 5000 mm² x 1.1 mm
Single Pulse
62.5°C/W
PW - Pulse Width - s

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