NEC

# MOS FIELD EFFECT TRANSISTOR
# μPA1803

## N-CHANNEL MOS FIELD EFFECT TRANSISTOR FOR SWITCHING

### DESCRIPTION

This product is a switching device which can be driven directly by a 4.5-V power source.

The μPA1803 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.

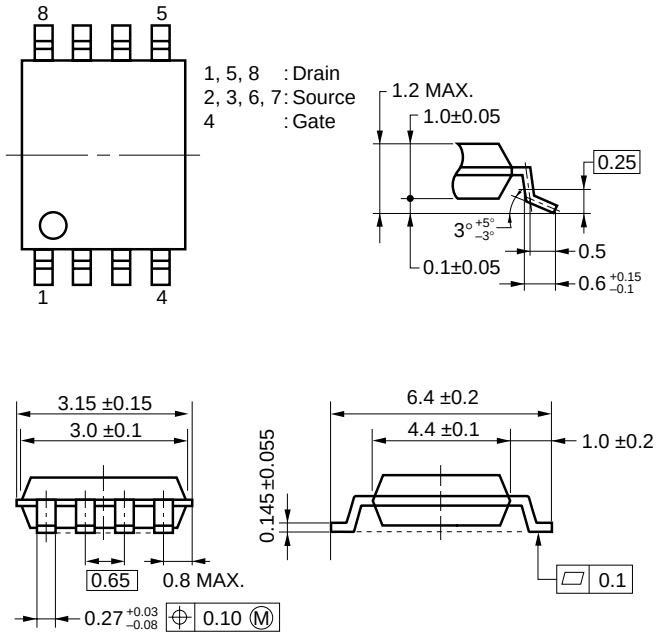
### FEATURES

- Can be driven by a 4.5-V power source
- Low on-state resistance
  $R_{DS(on)1}$ = 12 mΩ MAX. ($V_{GS}$ = 10 V, $I_D$ = 4.0 A)
  $R_{DS(on)2}$ = 16 mΩ MAX. ($V_{GS}$ = 4.5 V, $I_D$ = 4.0 A)
- Built-in G-S protection diode against ESD

### ORDERING INFORMATION

| PART NUMBER | PACKAGE |
|---|---|
| μPA1803GR-9JG | Power TSSOP8 |

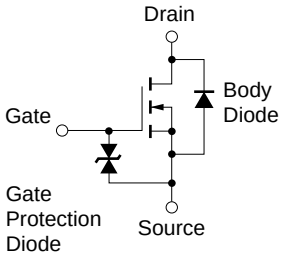
### PACKAGE DRAWING (Unit : mm)




### ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25°C)

| | | | |
|---|---|---|---|
| Drain to Source Voltage | $V_{DSS}$ | 30 | V |
| Gate to Source Voltage | $V_{GSS}$ | ±20 | V |
| Drain Current (DC) | $I_{D(DC)}$ | ±8.0 | A |
| Drain Current (pulse) Note1 | $I_{D(pulse)}$ | ±32 | 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.



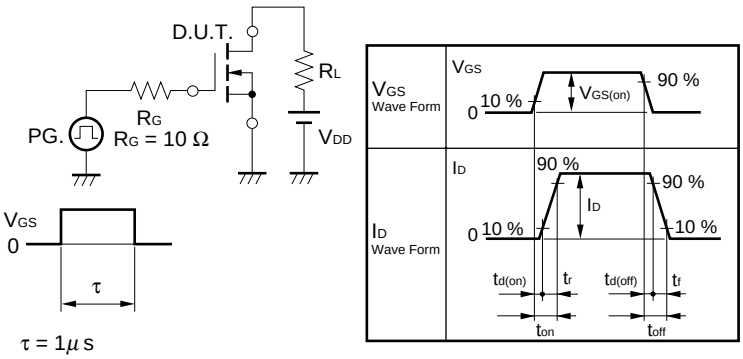
Document No. D13803EJ1V0DS00 (1st edition)
Date Published April 1999 NS CP(K)
Printed in Japan

**The mark ★ shows major revised points.**

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25 °C)

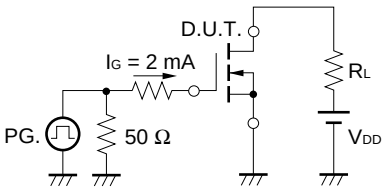
| CHARACTERISTICS | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 30 V, $V_{GS}$ = 0 V | | | 10 | μA |
| Gate Leakage Current | $I_{GSS}$ | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 V | | | ±10 | μA |
| Gate to Source Cut-off Voltage | $V_{GS(off)}$ | $V_{DS}$ = 10 V, $I_D$ = 1 mA | 1.0 | 1.9 | 2.5 | V |
| Forward Transfer Admittance | $\|y_{fs}\|$ | $V_{DS}$ = 10 V, $I_D$ = 4.0 A | 3 | 14 | | S |
| Drain to Source On-state Resistance | $R_{DS(on)1}$ | $V_{GS}$ = 10 V, $I_D$ = 4.0 A | | 8.6 | 12 | mΩ |
| | $R_{DS(on)2}$ | $V_{GS}$ = 4.5 V, $I_D$ = 4.0 A | | 11 | 16 | mΩ |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = 10 V | | 1880 | | pF |
| Output Capacitance | $C_{oss}$ | $V_{GS}$ = 0 V | | 571 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | f = 1 MHz | | 214 | | pF |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$ = 15 V | | 27 | | ns |
| Rise Time | $t_r$ | $I_D$ = 4.0 A | | 77 | | ns |
| Turn-off Delay Time | $t_{d(off)}$ | $V_{GS(on)}$ = 10 V | | 72 | | ns |
| Fall Time | $t_f$ | $R_G$ = 10 Ω | | 47 | | ns |
| Total Gate Charge | $Q_G$ | $V_{DS}$ = 24 V | | 36 | | nC |
| Gate to Source Charge | $Q_{GS}$ | $I_D$ = 8.0 A | | 5.1 | | nC |
| Gate to Drain Charge | $Q_{GD}$ | $V_{GS}$ = 10 V | | 8.7 | | nC |
| Diode Forward Voltage | $V_{F(S-D)}$ | $I_F$ = 8.0 A, $V_{GS}$ = 0 V | | 0.78 | | V |
| Reverse Recovery Time | $t_{rr}$ | $I_F$ = 8.0 A, $V_{GS}$ = 0 V | | 37 | | ns |
| Reverse Recovery Charge | $Q_{rr}$ | di/dt = 100 A/μs | | 35 | | nC |

### TEST CIRCUIT 1 SWITCHING TIME



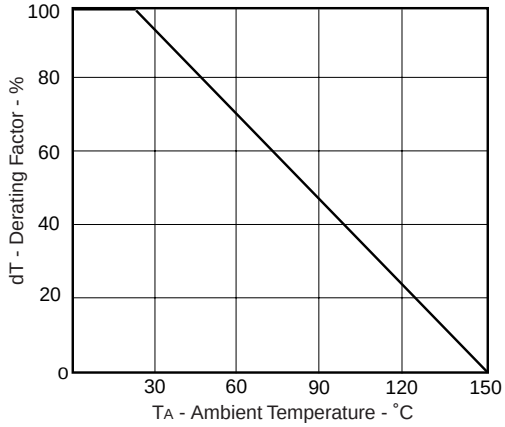

τ = 1μs
Duty Cycle ≤ 1 %

### TEST CIRCUIT 2 GATE CHARGE

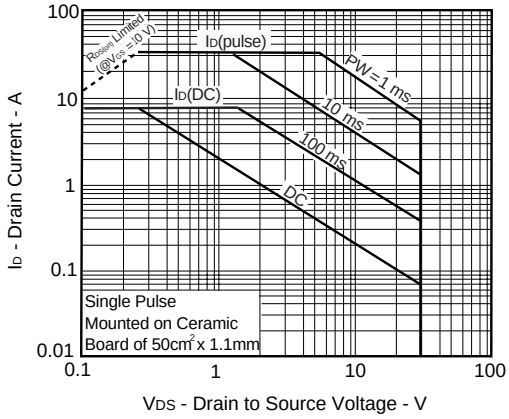


## ★ TYPICAL CHARACTERISTICS ($T_A$ = 25 °C)

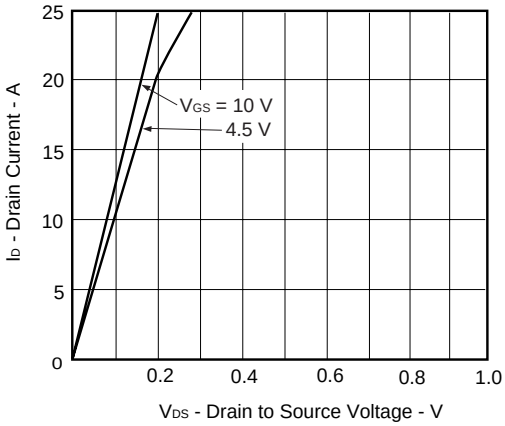
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



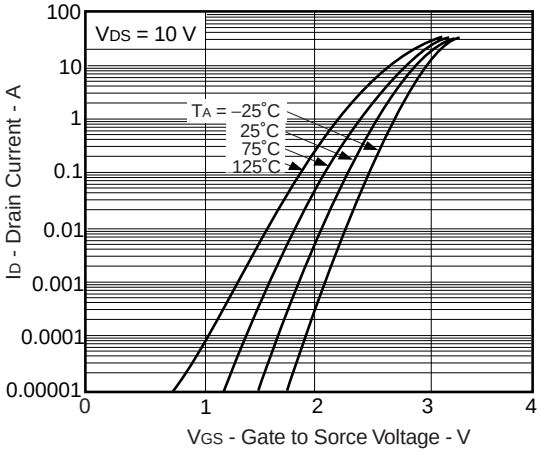

FORWARD BIAS SAFE OPERATING AREA



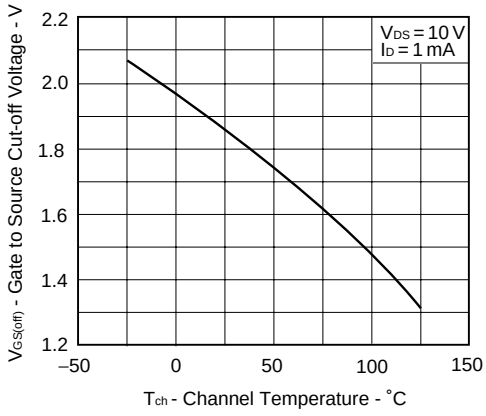

DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



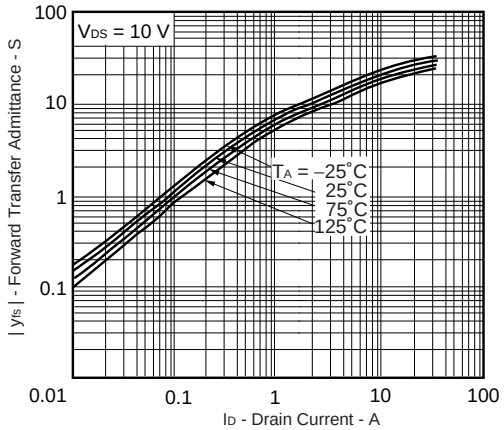

TRANSFER CHARACTERISTICS



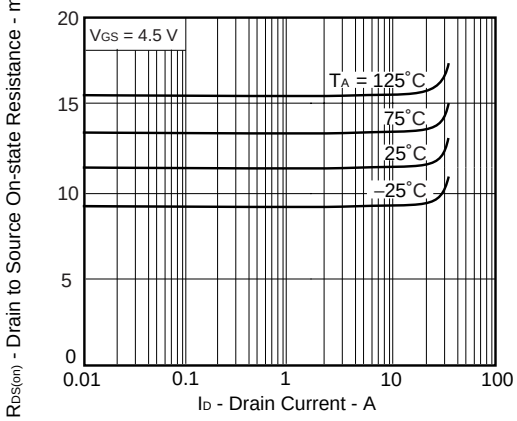

GATE TO SOURCE CUTOFF VOLTAGE vs. CHANNEL TEMPERATURE



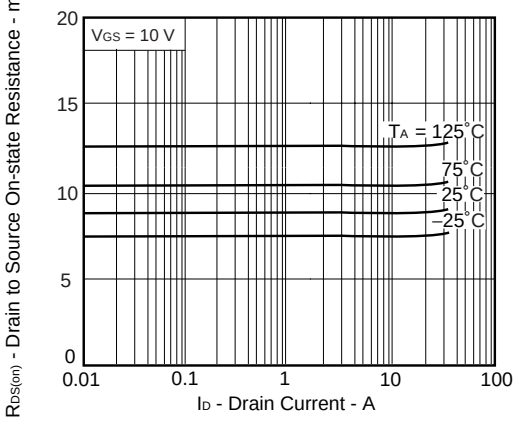

FORWARD TRANSFER ADMMITTANCE Vs. DRAIN CURRENT



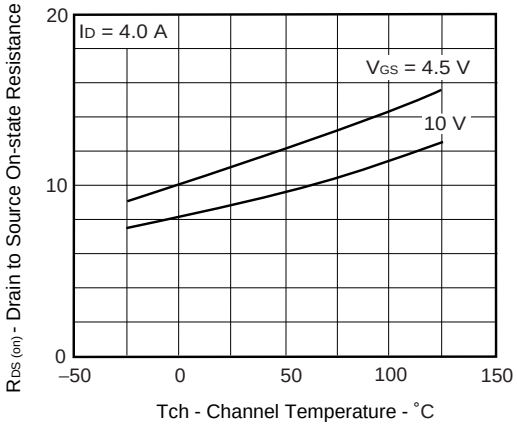
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



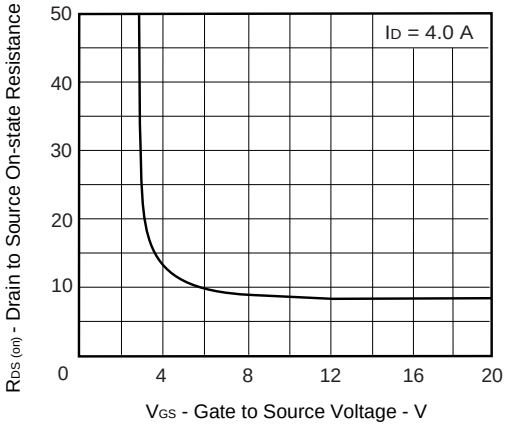

DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



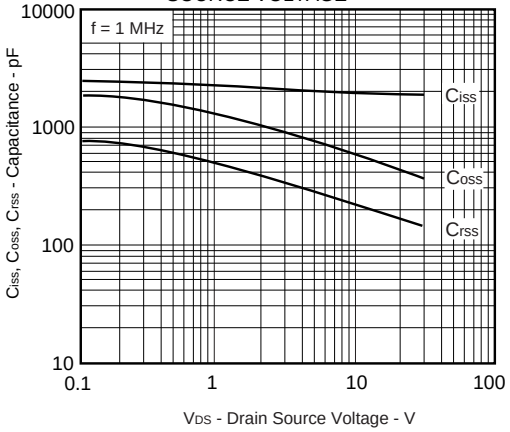

DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



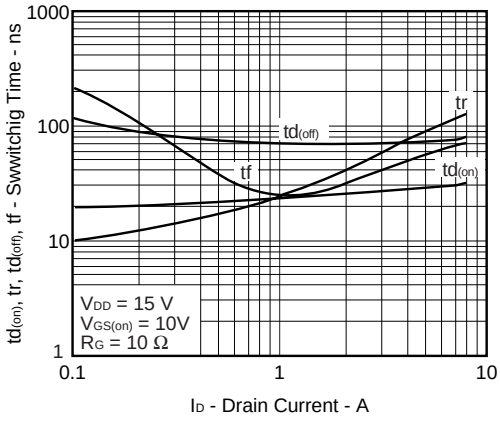

DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



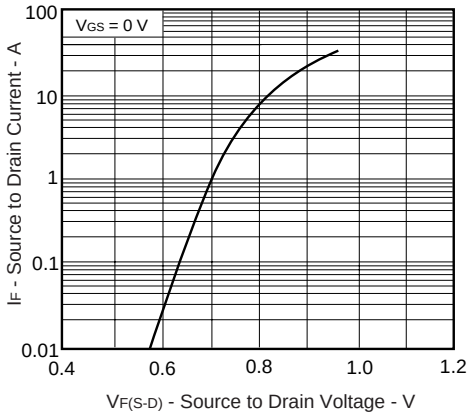

CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



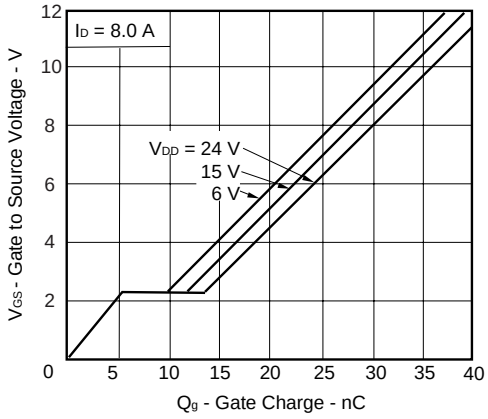

SWITCHING CHARACTERISTICS



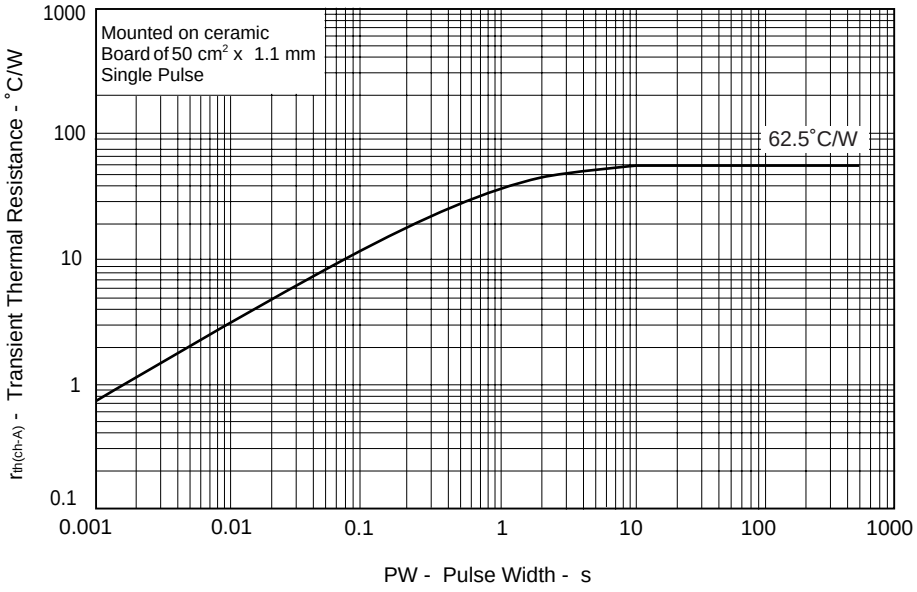
SOURCE TO DRAIN DIODE FORWARD VOLTAGE




DYNAMIC INPUT CHARACTERISTICS




TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



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