

### P-CHANNEL MOS FIELD EFFECT TRANSISTOR FOR SWITCHING

#### DESCRIPTION

The  $\mu$ PA1814 is a switching device which can be driven directly by a 4 V power source.

The  $\mu$ PA1814 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 V power source
- ★ Low on-state resistance
  - $R_{DS(on)1} = 16 \text{ m}\Omega \text{ MAX. (} V_{GS} = -10 \text{ V, } I_D = -3.5 \text{ A)}$
  - $R_{DS(on)2} = 24 \text{ m}\Omega \text{ MAX. (} V_{GS} = -4.5 \text{ V, } I_D = -3.5 \text{ A)}$
  - $R_{DS(on)3} = 27 \text{ m}\Omega \text{ MAX. (} V_{GS} = -4.0 \text{ V, } I_D = -3.5 \text{ A)}$
- Built-in G-S protection diode against ESD

#### ORDERING INFORMATION

| PART NUMBER        | PACKAGE      |
|--------------------|--------------|
| $\mu$ PA1814GR-9JG | Power TSSOP8 |

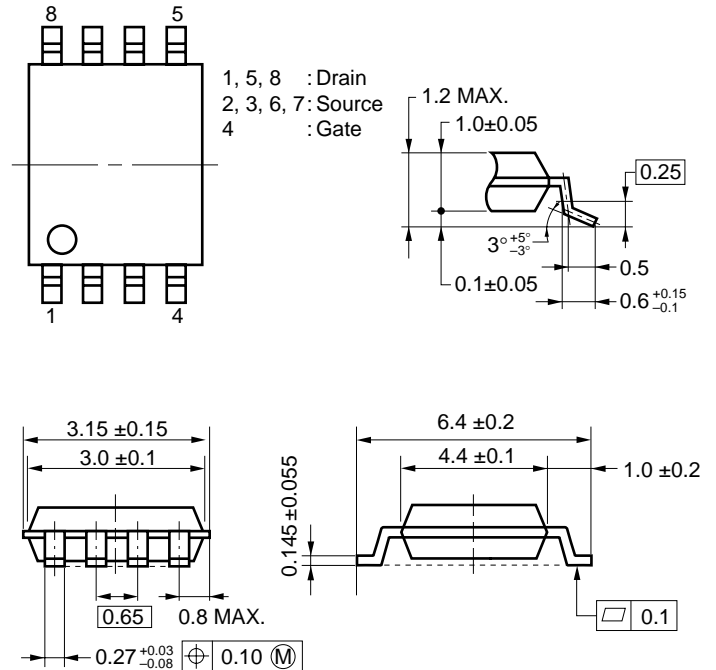
#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

|  |                |             |                  |
|--|----------------|-------------|------------------|
| Drain to Source Voltage                  | $V_{DSS}$      | -30         | V                |
| Gate to Source Voltage                   | $V_{GSS}$      | $\pm 20$    | V                |
| Drain Current (DC)                       | $I_{D(DC)}$    | $\pm 7.0$   | A                |
| Drain Current (pulse) <sup>Note1</sup>   | $I_{D(pulse)}$ | $\pm 28$    | A                |
| Total Power Dissipation <sup>Note2</sup> | $P_T$          | 2.0         | W                |
| Channel Temperature                      | $T_{ch}$       | 150         | $^\circ\text{C}$ |
| Storage Temperature                      | $T_{stg}$      | -55 to +150 | $^\circ\text{C}$ |

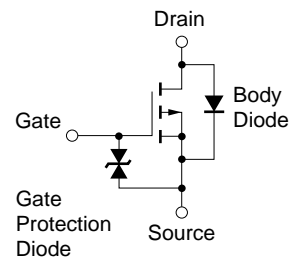
- Notes 1.**  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$   
**2.** Mounted on ceramic substrate of  $5000 \text{ mm}^2 \times 1.1 \text{ mm}$

**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.

#### PACKAGE DRAWING (Unit : mm)



#### EQUIVALENT CIRCUIT

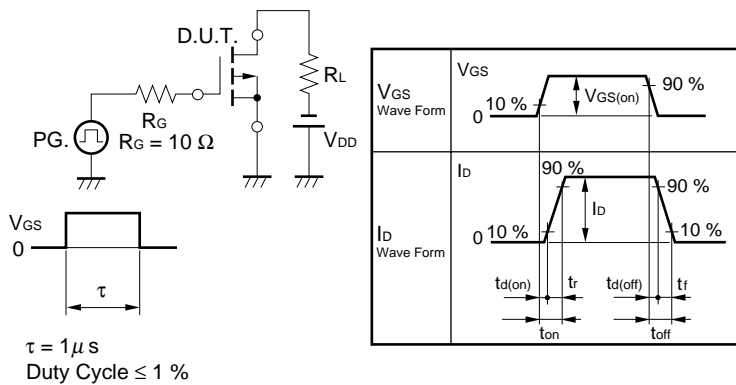


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 Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

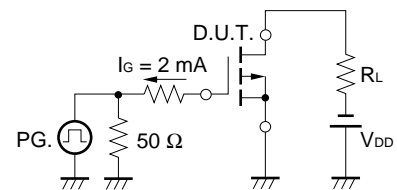
★ ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)

| CHARACTERISTICS                     | SYMBOL               | TEST CONDITIONS                                   | MIN. | TYP. | MAX. | UNIT |
|-------------------------------------|----------------------|---|------|------|------|------|
| Zero Gate Voltage Drain Current     | I <sub>DSS</sub>     | V <sub>DS</sub> = -30 V, V <sub>GS</sub> = 0 V    |      |      | -10  | μA   |
| Gate Leakage Current                | I <sub>GSS</sub>     | V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V    |      |      | ±10  | μA   |
| Gate Cut-off Voltage                | V <sub>GS(off)</sub> | V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1 mA   | -1.0 | -1.7 | -2.5 | V    |
| Forward Transfer Admittance         | y <sub>fs</sub>      | V <sub>DS</sub> = -10 V, I <sub>D</sub> = -3.5 A  | 3    | 14   |      | S    |
| Drain to Source On-state Resistance | R <sub>DS(on)1</sub> | V <sub>GS</sub> = -10 V, I <sub>D</sub> = -3.5 A  |      | 12   | 16   | mΩ   |
|                                     | R <sub>DS(on)2</sub> | V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -3.5 A |      | 18   | 24   | mΩ   |
|                                     | R <sub>DS(on)3</sub> | V <sub>GS</sub> = -4.0 V, I <sub>D</sub> = -3.5 A |      | 20   | 27   | mΩ   |
| Input Capacitance                   | C <sub>iSS</sub>     | V <sub>DS</sub> = -10 V                           |      | 2180 |      | pF   |
| Output Capacitance                  | C <sub>oSS</sub>     | V <sub>GS</sub> = 0 V                             |      | 658  |      | pF   |
| Reverse Transfer Capacitance        | C <sub>rSS</sub>     | f = 1 MHz   |      | 303  |      | pF   |
| Turn-on Delay Time                  | t <sub>d(on)</sub>   | V <sub>DD</sub> = -15 V                           |      | 30   |      | ns   |
| Rise Time                           | t <sub>r</sub>       | I <sub>D</sub> = -3.5 A                           |      | 140  |      | ns   |
| Turn-off Delay Time                 | t <sub>d(off)</sub>  | V <sub>GS(on)</sub> = -10 V                       |      | 97   |      | ns   |
| Fall Time                           | t <sub>f</sub>       | R <sub>G</sub> = 10 Ω                             |      | 86   |      | ns   |
| Total Gate Charge                   | Q <sub>G</sub>       | V <sub>DS</sub> = -24 V                           |      | 38   |      | nC   |
| Gate to Source Charge               | Q <sub>GS</sub>      | I <sub>D</sub> = -7.0 A                           |      | 5.9  |      | nC   |
| Gate to Drain Charge                | Q <sub>GD</sub>      | V <sub>GS</sub> = -10 V                           |      | 8.5  |      | nC   |
| Diode Forward Voltage               | V <sub>F(S-D)</sub>  | I <sub>F</sub> = 7.0 A, V <sub>GS</sub> = 0 V     |      | 0.79 |      | V    |

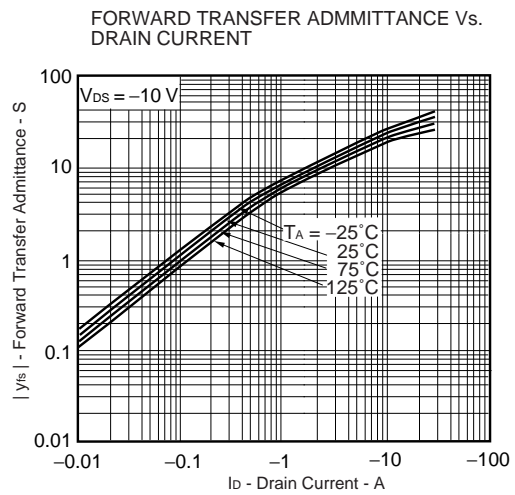
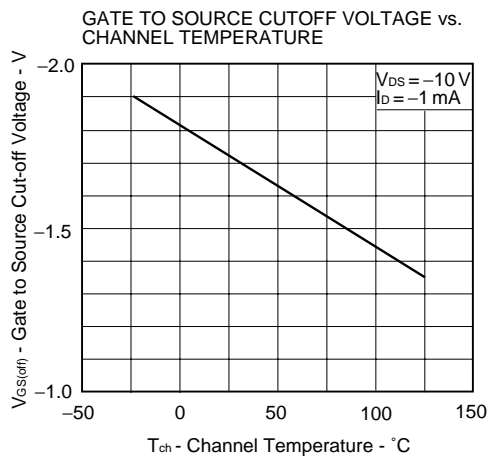
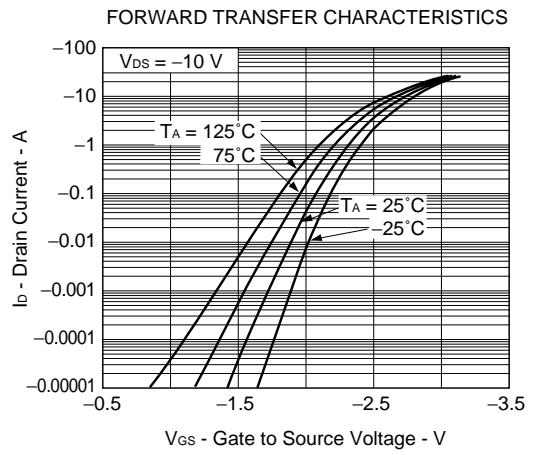
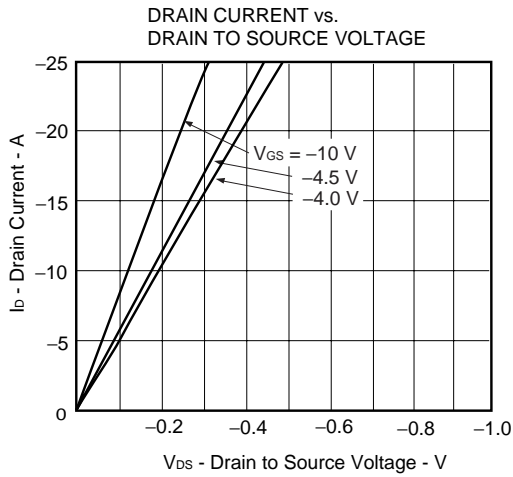
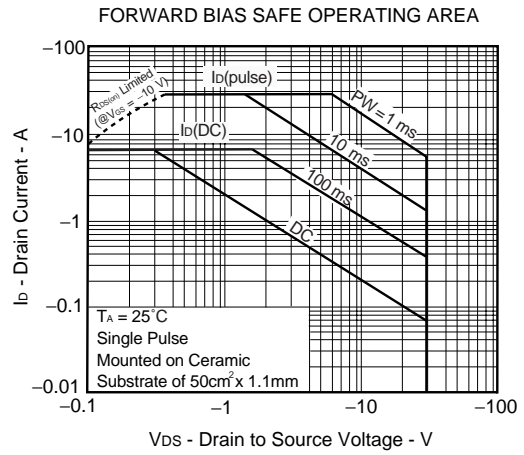
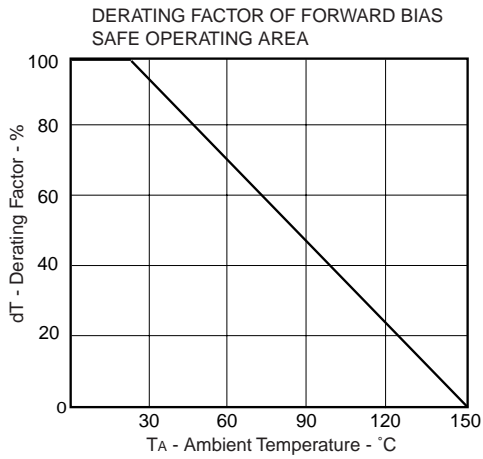
TEST CIRCUIT 1 SWITCHING TIME

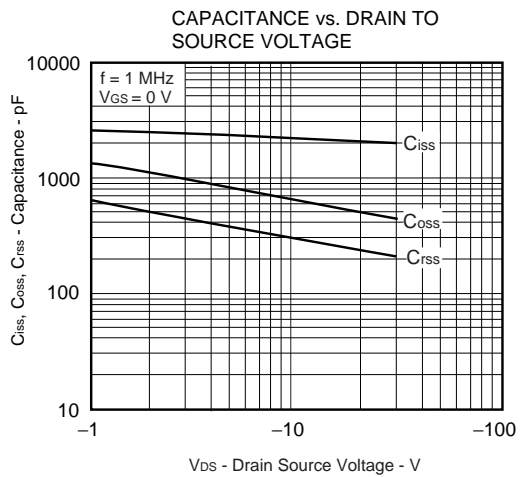
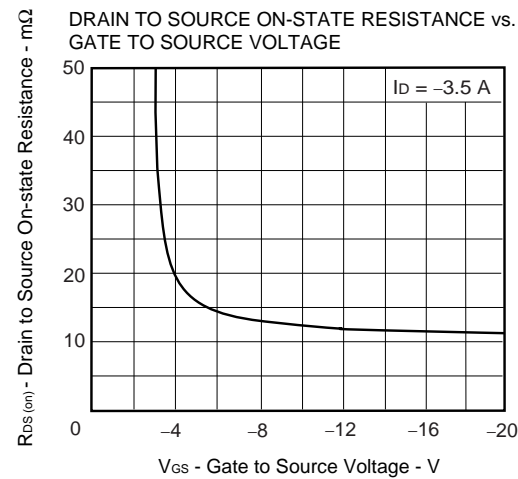
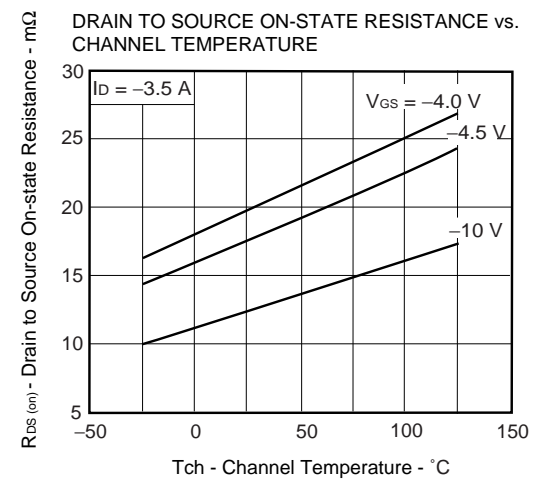
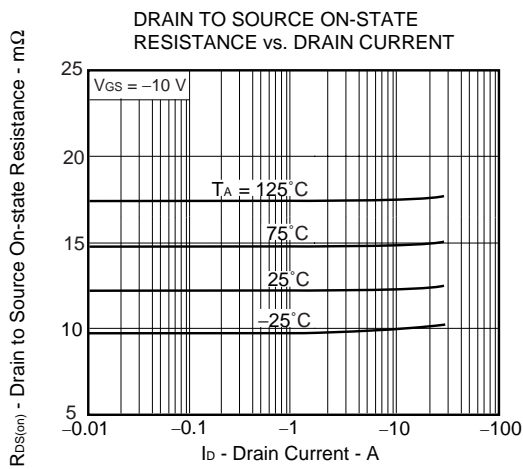
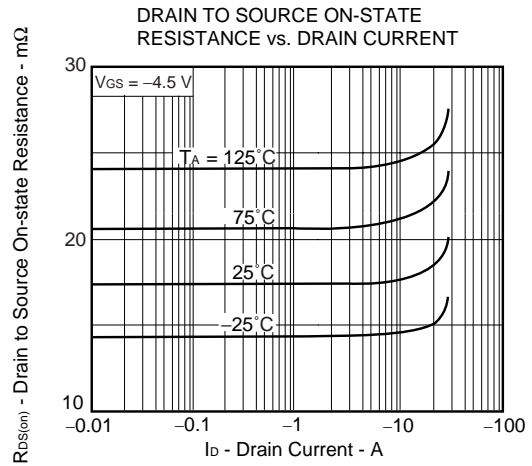
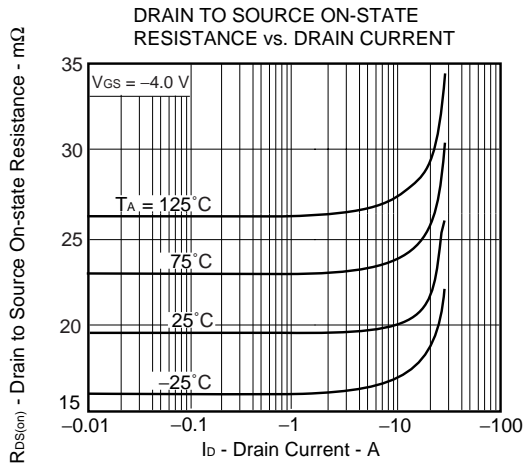


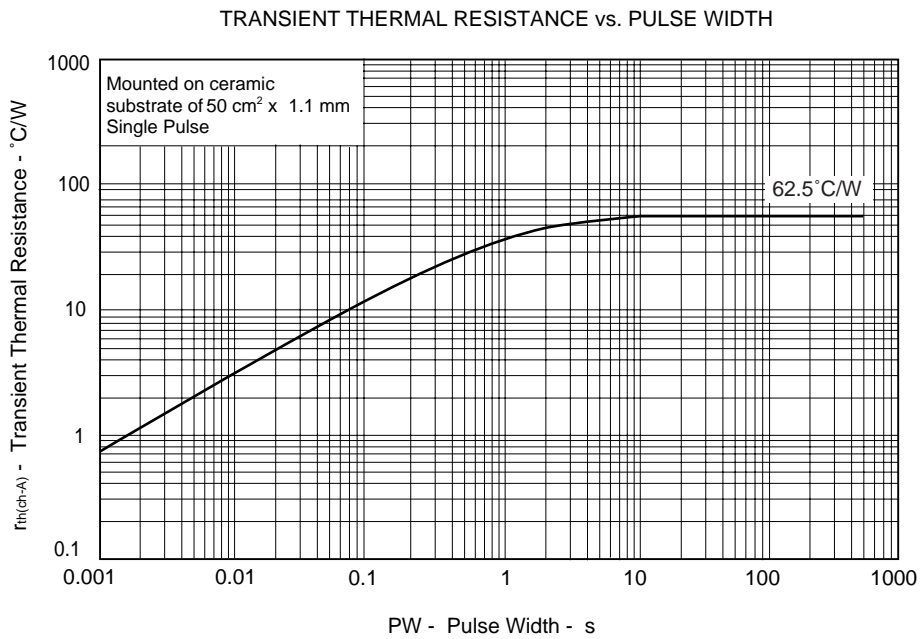
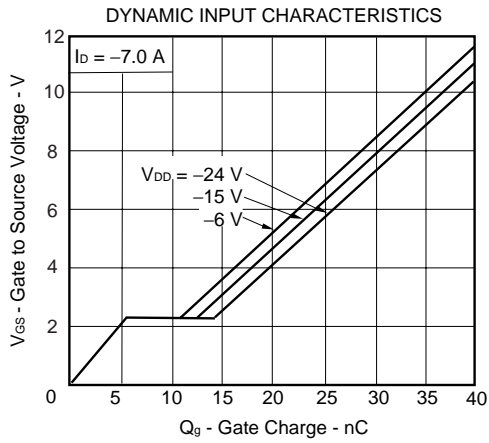
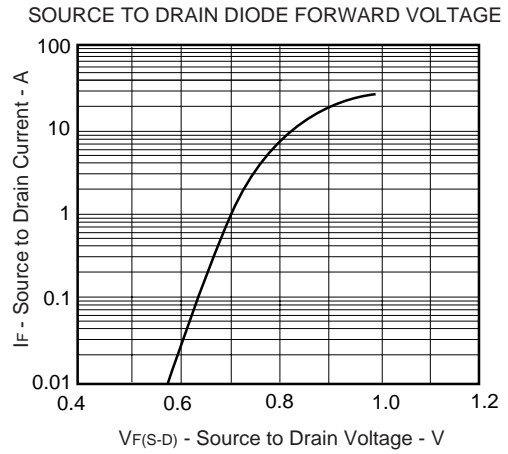
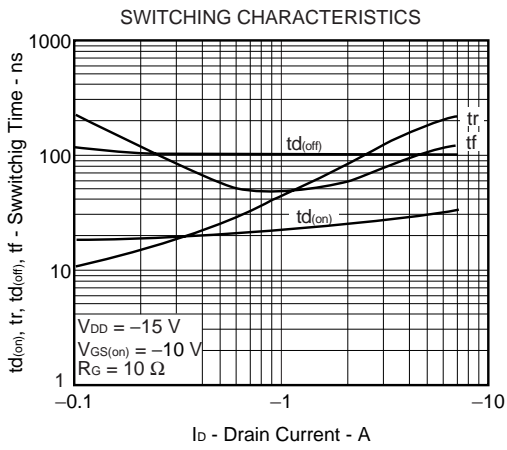
TEST CIRCUIT 2 GATE CHARGE



★ TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C)







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