

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

#### DESCRIPTION

The  $\mu$ PA1807 is a switching device, which can be driven directly by a 4.0 V power source.

This device features a low on-state resistance and excellent switching characteristics, and is suitable for applications such as DC/DC converters and power management of notebook computers and so on.

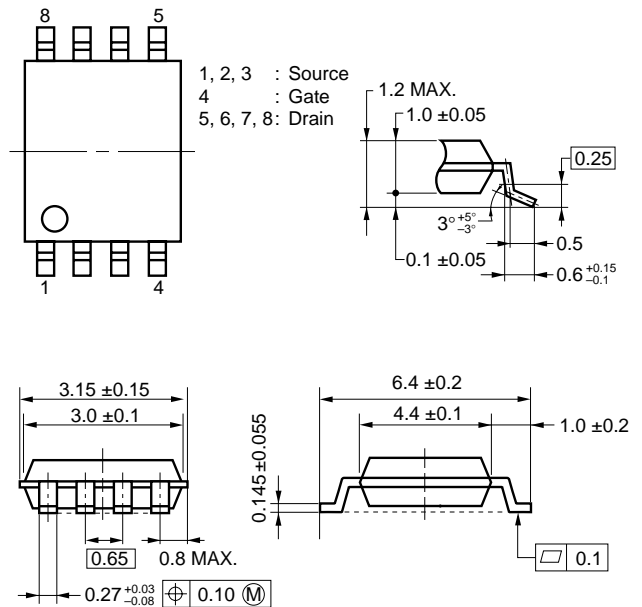
#### FEATURES

- 4.0 V drive available
- Low on-state resistance
  - $R_{DS(on)1} = 10 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 6.0 \text{ A)}$
  - $R_{DS(on)2} = 14 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 6.0 \text{ A)}$
  - $R_{DS(on)3} = 16 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.0 \text{ V, } I_D = 6.0 \text{ A)}$
- Built-in G-S protection diode against ESD

#### ORDERING INFORMATION

PART NUMBER	PACKAGE
$\mu$ PA1807GR-9JG	Power TSSOP8

#### PACKAGE DRAWING (Unit: mm)



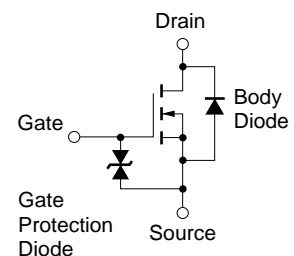
#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	30	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 20$	V
Drain Current (DC) ( $T_A = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 12$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 48$	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.

#### EQUIVALENT CIRCUIT

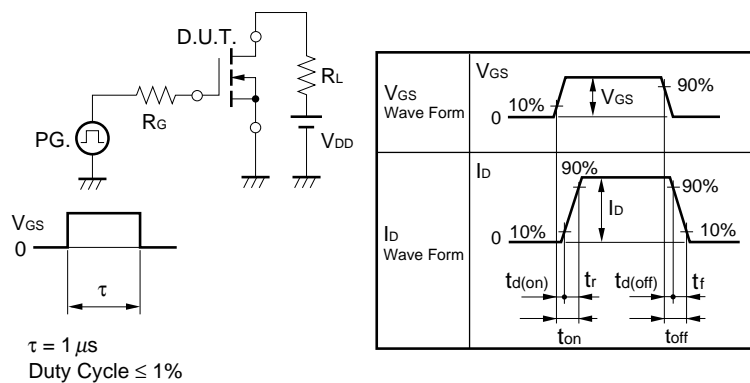


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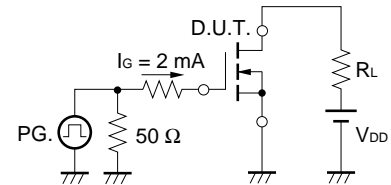
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

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			1.0	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> = 1.0 mA	1.5	2.0	2.5	V
Forward Transfer Admittance	y <sub>ts</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 6.0 A	7.0	15		S
Drain to Source On-state Resistance	R <sub>DS(on)1</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 6.0 A		8.1	10	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 6.0 A		10.5	14	mΩ
	R <sub>DS(on)3</sub>	V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 6.0 A		12	16	mΩ
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		1000		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		390		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1.0 MHz		140		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 15 V, I <sub>D</sub> = 6.0 A		16		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V		11		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		46		ns
Fall Time	t <sub>f</sub>			11.5		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = 24 V		19		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = 10 V		3.1		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 12 A		5.0		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 12 A, V <sub>GS</sub> = 0 V		0.82		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 12 A, V <sub>GS</sub> = 0 V		32		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		24		nC

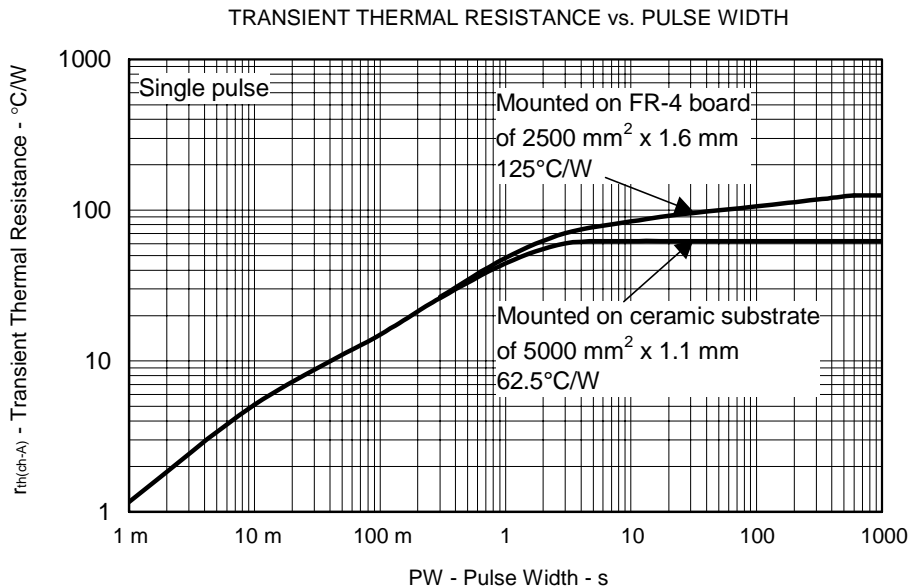
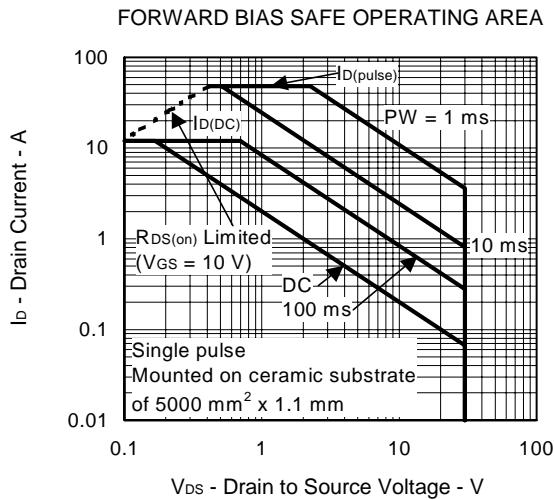
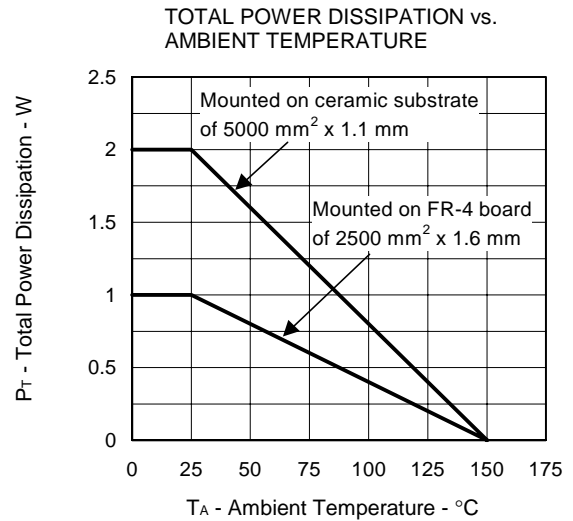
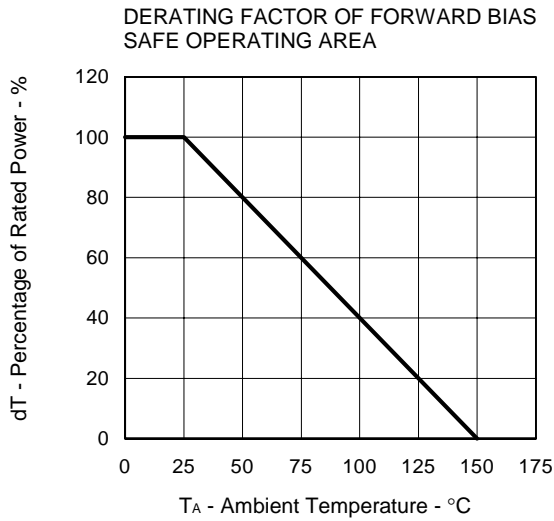
**TEST CIRCUIT 1 SWITCHING TIME**



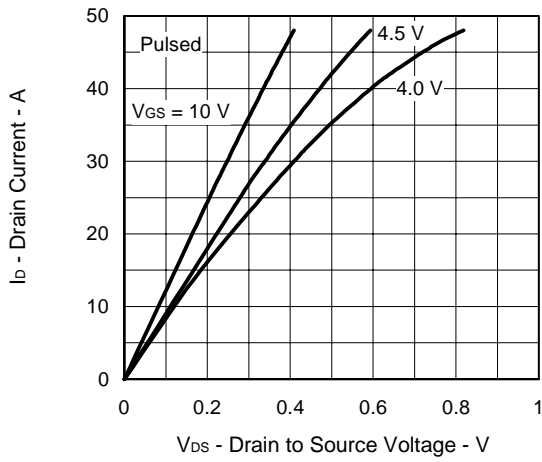
**TEST CIRCUIT 2 GATE CHARGE**



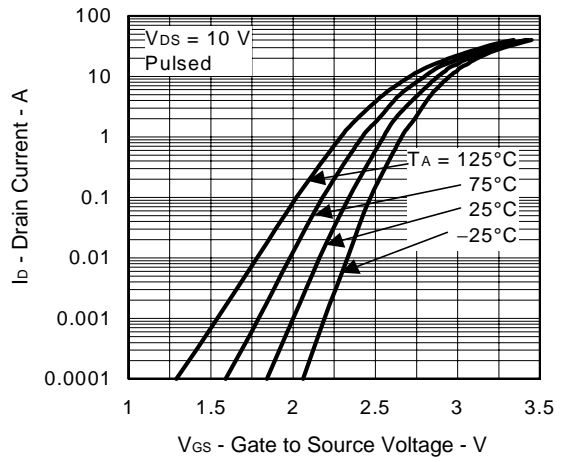
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



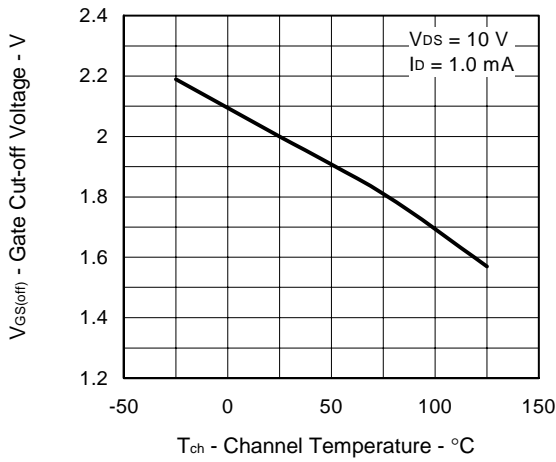
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



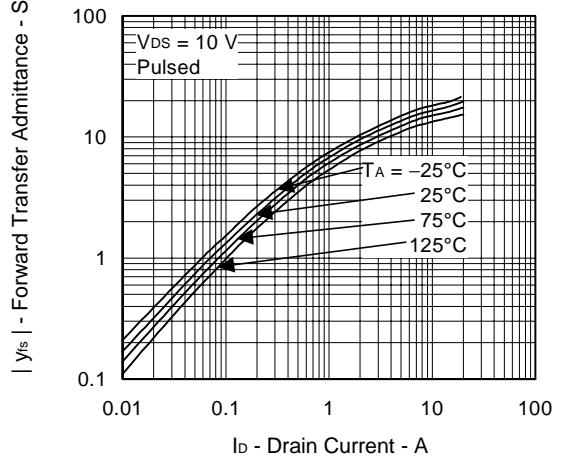
FORWARD TRANSFER CHARACTERISTICS



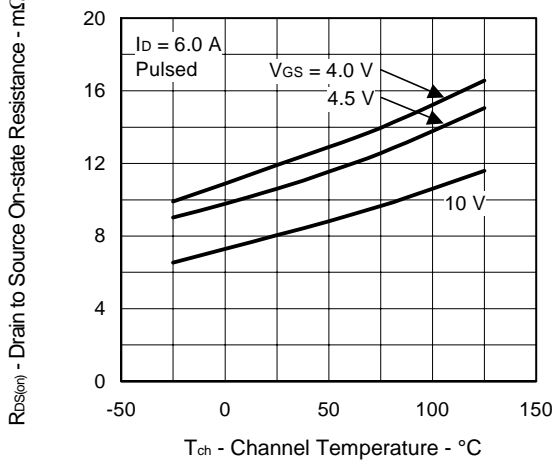
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



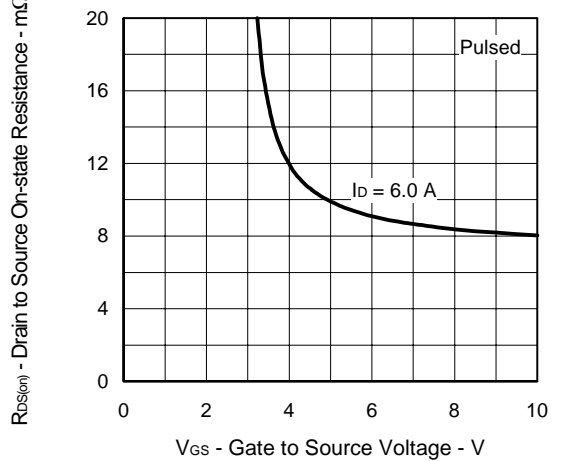
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



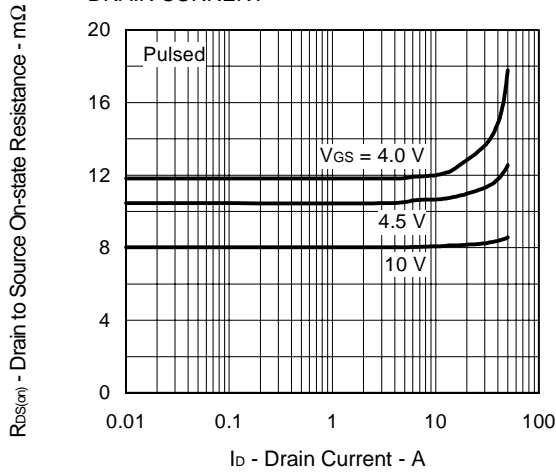
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



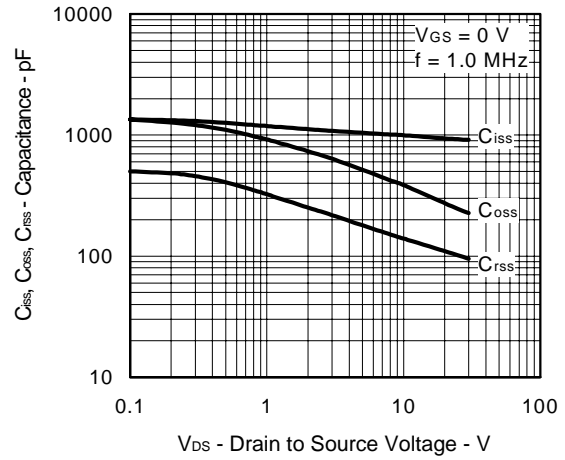
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



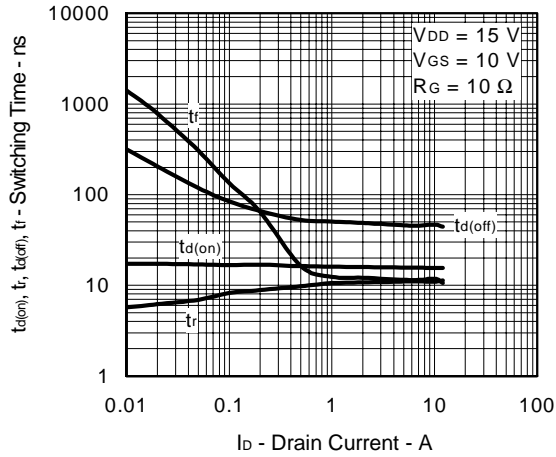
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



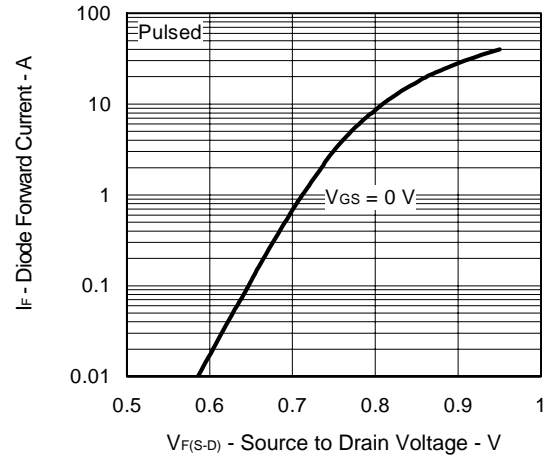
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



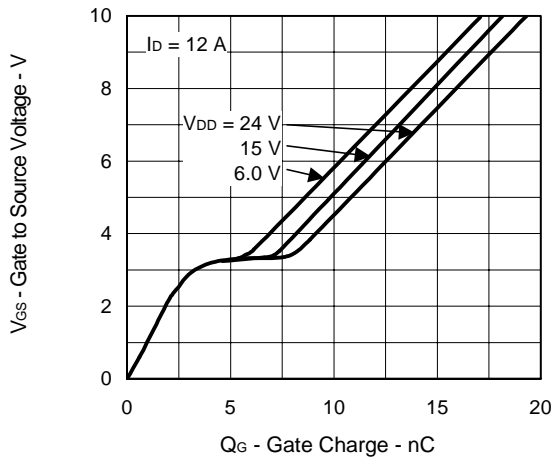
SWITCHING CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



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