

## N-CHANNEL MOS FIELD EFFECT TRANSISTOR FOR SWITCHING

### DESCRIPTION

The  $\mu$ PA1871 is a switching device which can be driven directly by a 2.5-V power source.

The  $\mu$ PA1871 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.

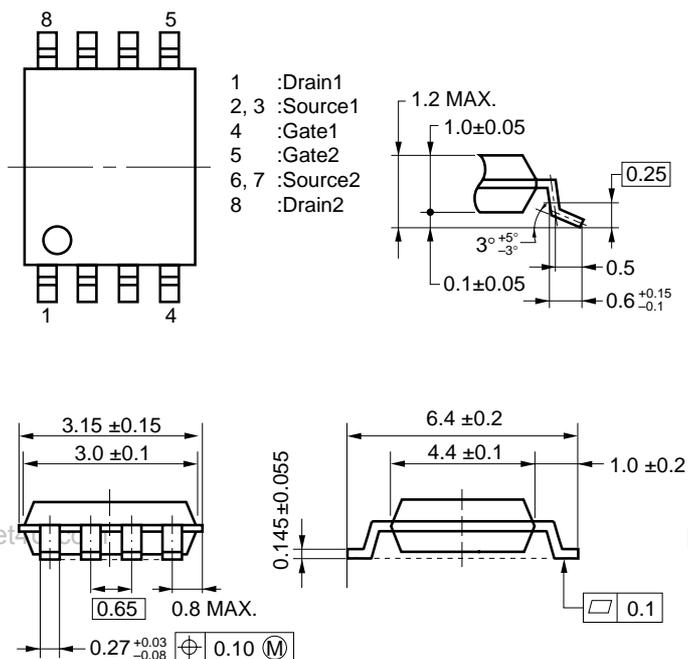
### FEATURES

- Can be driven by a 2.5-V power source
- Low on-state resistance
  - $R_{DS(on)1} = 26.0 \text{ m}\Omega \text{ MAX.}$  ( $V_{GS} = 4.5 \text{ V}$ ,  $I_D = 3.0 \text{ A}$ )
  - $R_{DS(on)2} = 27.0 \text{ m}\Omega \text{ MAX.}$  ( $V_{GS} = 4.0 \text{ V}$ ,  $I_D = 3.0 \text{ A}$ )
  - $R_{DS(on)3} = 38.0 \text{ m}\Omega \text{ MAX.}$  ( $V_{GS} = 2.5 \text{ V}$ ,  $I_D = 3.0 \text{ A}$ )
- Built-in G-S protection diode against ESD

### ORDERING INFORMATION

PART NUMBER	PACKAGE
$\mu$ PA1871GR-9JG	Power TSSOP8

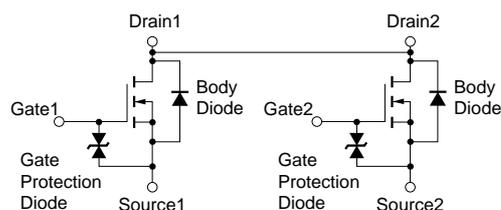
### PACKAGE DRAWING (Unit: mm)



### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C)

Drain to Source Voltage	$V_{DSS}$	30	V
Gate to Source Voltage	$V_{GSS}$	±12	V
Drain Current (DC)	$I_{D(DC)}$	±6.0	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	±80	A
Total Power Dissipation <sup>Note2</sup>	$P_T$	2.0	W
Channel Temperature	$T_{ch}$	150	°C
Storage Temperature	$T_{stg}$	-55 to +150	°C

### EQUIVALENT CIRCUIT



- Notes 1.**  $PW \leq 10 \mu s$ , Duty Cycle  $\leq 1\%$
- 2.** Mounted on ceramic substrate of  $50 \text{ cm}^2 \times 1.1 \text{ mm}$

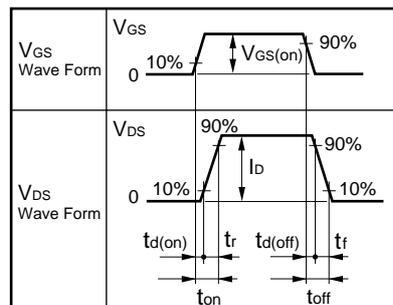
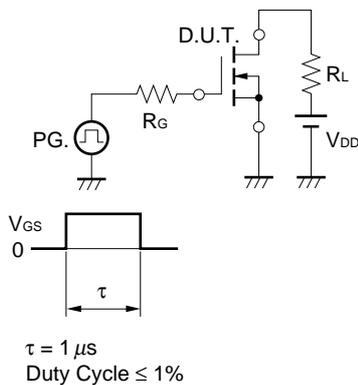
**Remark** The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

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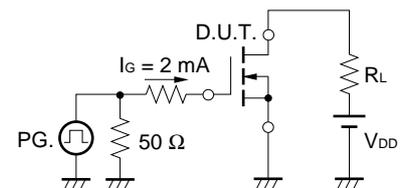
ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

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			10	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±12 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	0.5	1.0	1.5	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 3.0 A	5			S
Drain to Source On-state Resistance	R <sub>DS(on)1</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 3.0 A	15.0	20.5	26.0	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 3.0 A	16.0	21.5	27.0	mΩ
	R <sub>DS(on)3</sub>	V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 3.0 A	21.0	27.8	38.0	mΩ
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		930		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		220		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		105		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 10 V, I <sub>D</sub> = 3.0 A		55		ns
Rise Time	t <sub>r</sub>	V <sub>GS(on)</sub> = 4.0 V		180		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		260		ns
Fall Time	t <sub>f</sub>			230		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DD</sub> = 24 V		9		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = 4.0 V		2		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 6.0 A		4		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 6.0 A, V <sub>GS</sub> = 0 V		0.80		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 6.0 A, V <sub>GS</sub> = 0 V		180		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 50 A/μs		120		nC

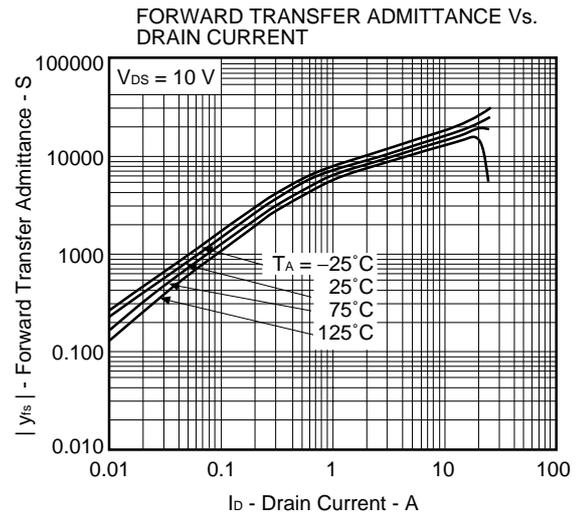
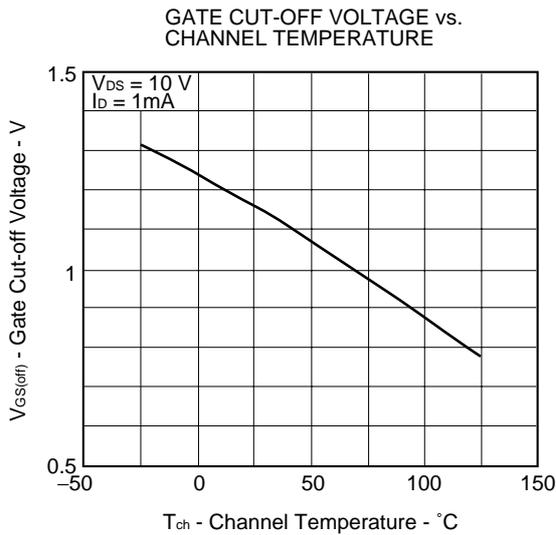
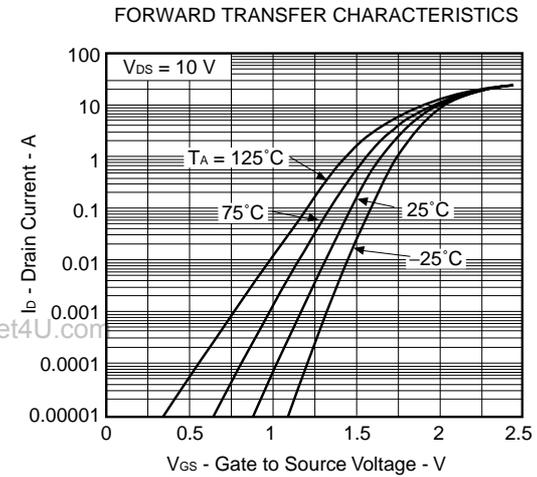
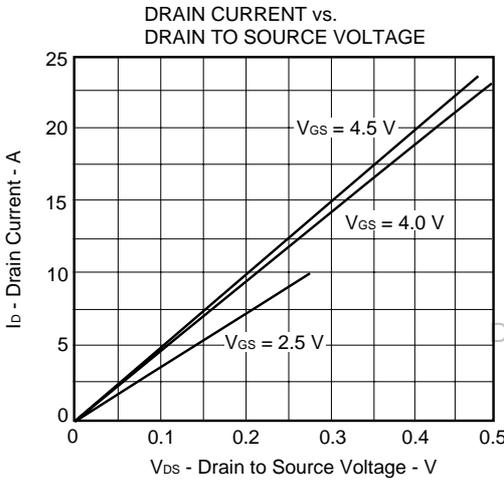
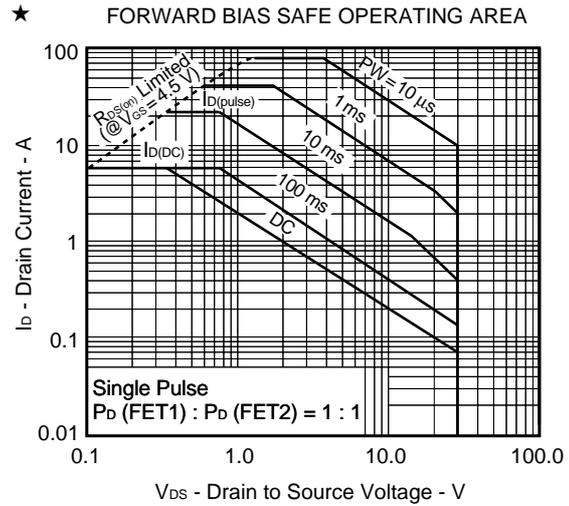
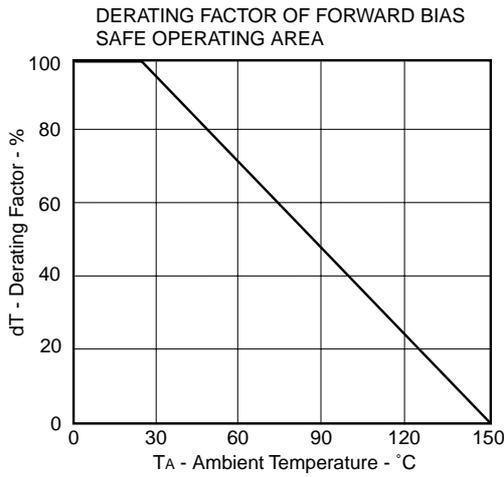
## TEST CIRCUIT 1 SWITCHING TIME

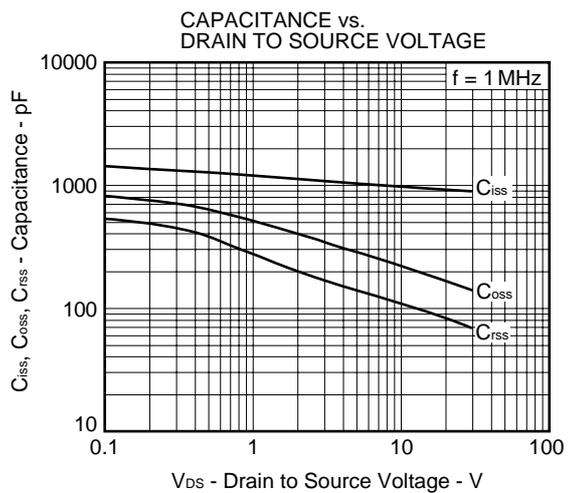
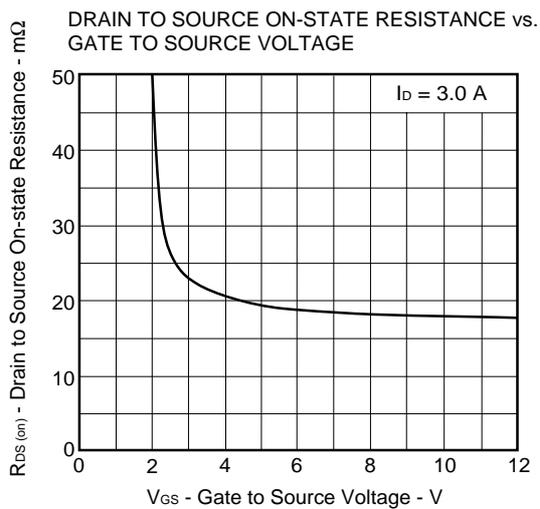
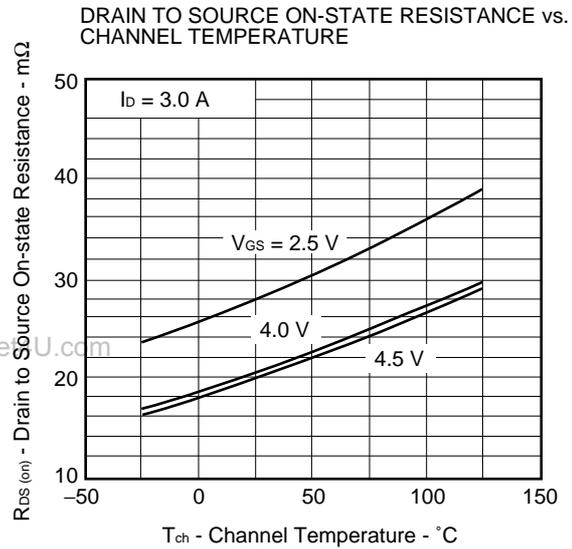
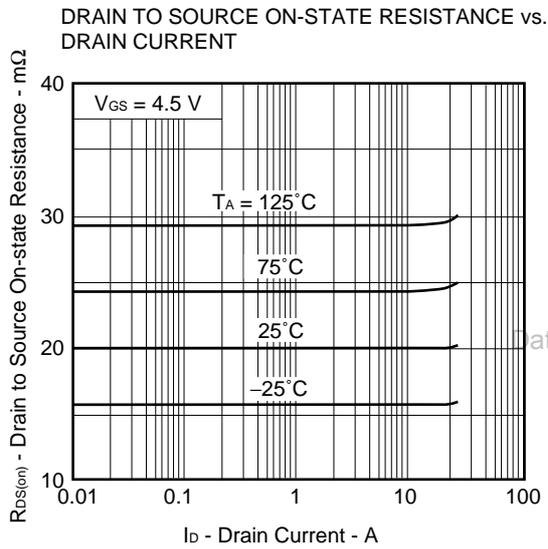
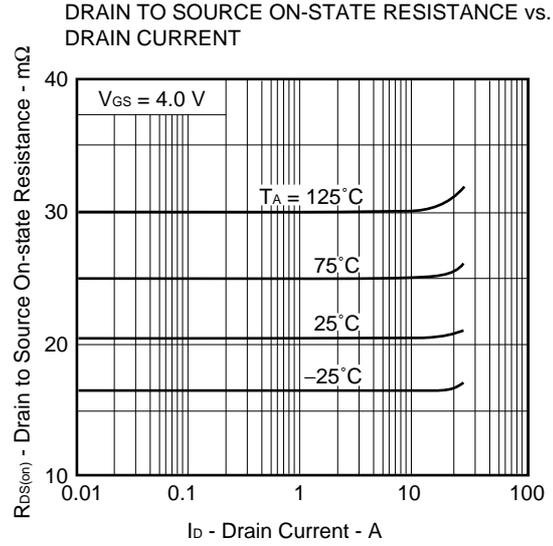
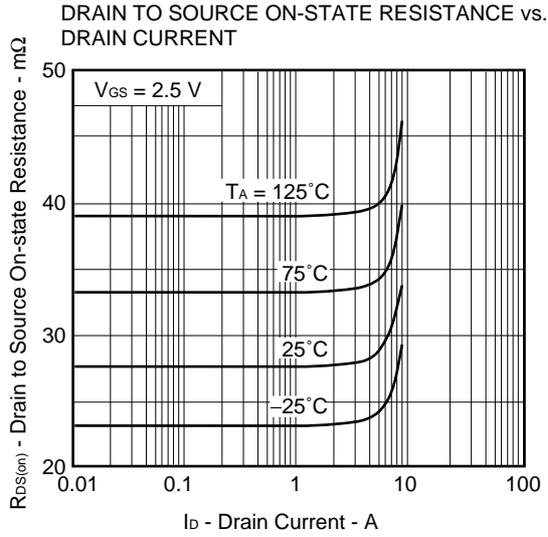


## TEST CIRCUIT 2 GATE CHARGE

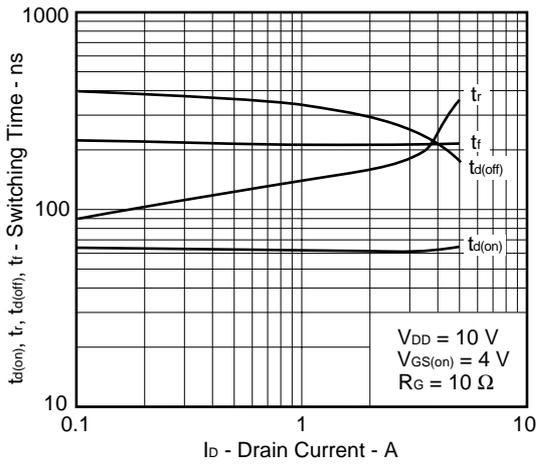


TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

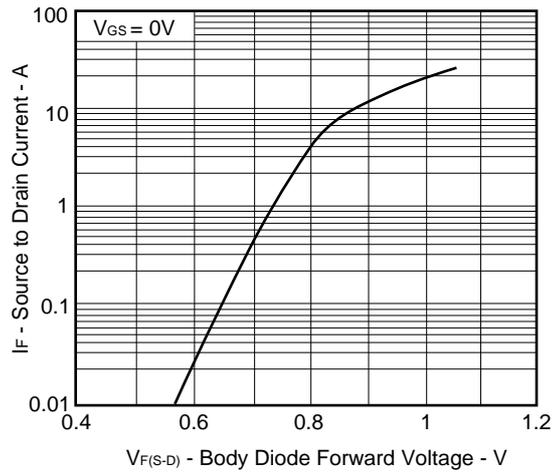




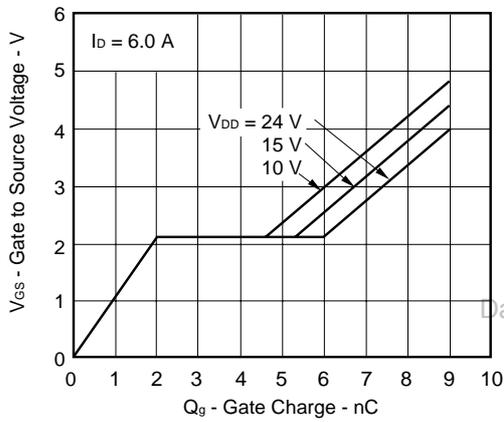
SWITCHING CHARACTERISTICS



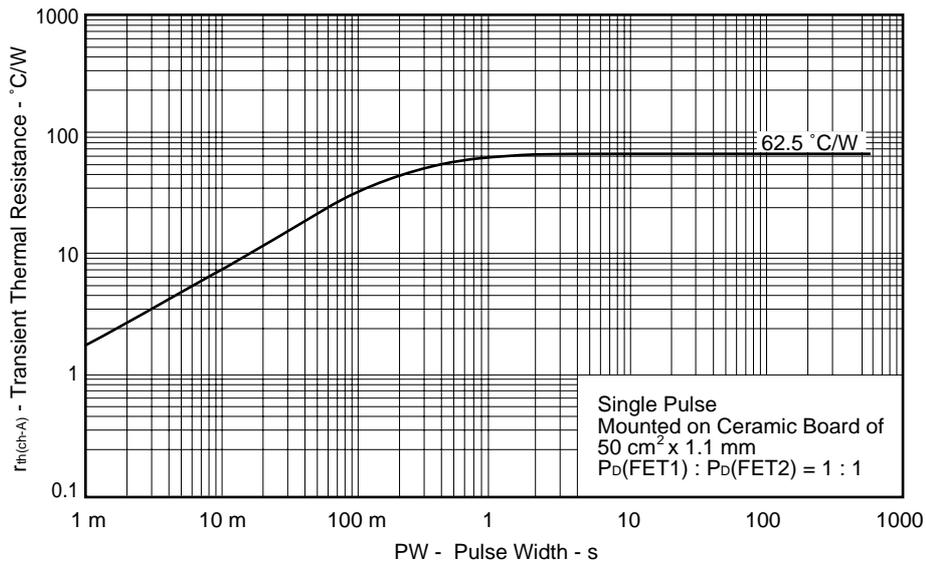
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



DYNAMIC INPUT CHARACTERISTICS



★ TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



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