

# MOS FIELD EFFECT TRANSISTOR

# $\mu$ PA1874B

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

#### DESCRIPTION

The  $\mu$  PA1874B is a switching device, which can be driven directly by a 2.5 V power source.

The  $\mu$  PA1874B 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

- 2.5 V drive available
- Low on-state resistance
  - $R_{DS(on)1} = 14.0 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 4.0 \text{ A)}$
  - $R_{DS(on)2} = 14.5 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.0 \text{ V, } I_D = 4.0 \text{ A)}$
  - $R_{DS(on)3} = 16.5 \text{ m}\Omega \text{ MAX. (} V_{GS} = 3.1 \text{ V, } I_D = 4.0 \text{ A)}$
  - $R_{DS(on)4} = 19.5 \text{ m}\Omega \text{ MAX. (} V_{GS} = 2.5 \text{ V, } I_D = 4.0 \text{ A)}$
- Built-in G-S protection diode against ESD

#### ORDERING INFORMATION

PART NUMBER	PACKAGE
$\mu$ PA1874BGR-9JG	Power TSSOP8

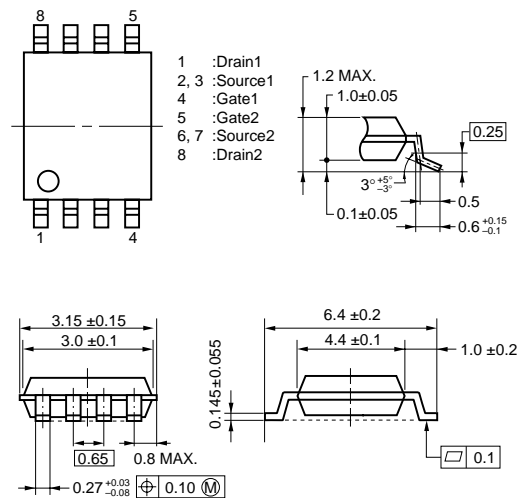
#### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C)

Drain to Source Voltage (V <sub>GS</sub> = 0 V)	V <sub>DSS</sub>	30.0	V
Gate to Source Voltage (V <sub>DS</sub> = 0 V)	V <sub>GSS</sub>	±12.0	V
Drain Current (DC) <sup>Note 1</sup>	I <sub>D(DC)</sub>	±8.0	A
Drain Current (pulse) <sup>Note 2</sup>	I <sub>D(pulse)</sub>	±80.0	A
Total Power Dissipation <sup>Note 1</sup>	P <sub>T</sub>	2.0	W
Channel Temperature	T <sub>ch</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C

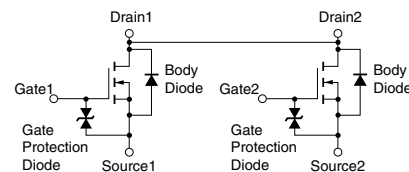
- Notes**
1. Mounted on ceramic board of 50 cm<sup>2</sup> x 1.1 mm
  2. PW ≤ 10 μs, Duty Cycle ≤ 1%

**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



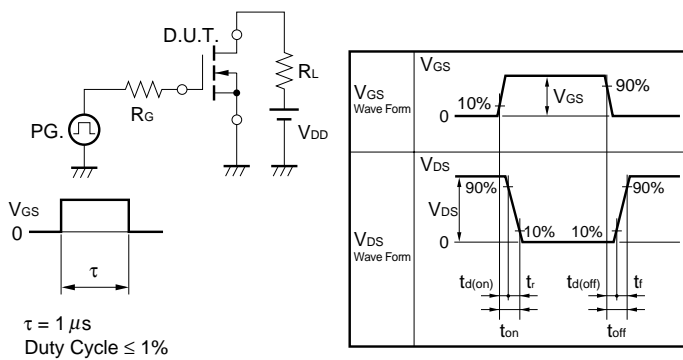
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**ELECTRICAL CHARACTERISTICS (TA = 25°C)**

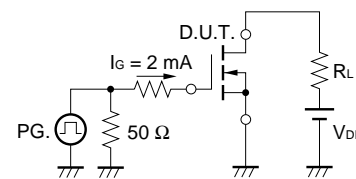
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 30.0\text{ V}, V_{GS} = 0\text{ V}$			1.0	$\mu\text{A}$
Gate Leakage Current	$I_{GSS}$	$V_{GS} = \pm 12.0\text{ V}, V_{DS} = 0\text{ V}$			$\pm 10.0$	$\mu\text{A}$
Gate Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = 10.0\text{ V}, I_D = 1.0\text{ mA}$	0.50	1.00	1.50	V
Forward Transfer Admittance <sup>Note</sup>	$ y_{fs} $	$V_{DS} = 10.0\text{ V}, I_D = 4.0\text{ A}$	5			S
Drain to Source On-state Resistance <sup>Note</sup>	$R_{DS(on)1}$	$V_{GS} = 4.5\text{ V}, I_D = 4.0\text{ A}$	9.0	11.5	14.0	m $\Omega$
	$R_{DS(on)2}$	$V_{GS} = 4.0\text{ V}, I_D = 4.0\text{ A}$	9.5	12.0	14.5	m $\Omega$
	$R_{DS(on)3}$	$V_{GS} = 3.1\text{ V}, I_D = 4.0\text{ A}$	10.0	13.0	16.5	m $\Omega$
	$R_{DS(on)4}$	$V_{GS} = 2.5\text{ V}, I_D = 4.0\text{ A}$	11.0	15.0	19.5	m $\Omega$
Input Capacitance	$C_{iss}$	$V_{DS} = 10.0\text{ V}$		930		pF
Output Capacitance	$C_{oss}$	$V_{GS} = 0\text{ V}$		170		pF
Reverse Transfer Capacitance	$C_{rss}$	$f = 1.0\text{ MHz}$		120		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 10.0\text{ V}, I_D = 4.0\text{ A}$		46		ns
Rise Time	$t_r$	$V_{GS} = 4.0\text{ V}$		230		ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 10\ \Omega$		260		ns
Fall Time	$t_f$			250		ns
Total Gate Charge	$Q_G$	$V_{DD} = 24.0\text{ V}$		10.0		nC
Gate to Source Charge	$Q_{GS}$	$V_{GS} = 4.0\text{ V}$		2.0		nC
Gate to Drain Charge	$Q_{GD}$	$I_D = 8.0\text{ A}$		4.5		nC
Body Diode Forward Voltage <sup>Note</sup>	$V_{F(S-D)}$	$I_F = 8.0\text{ A}, V_{GS} = 0\text{ V}$		0.82		V
Reverse Recovery Time	$t_{rr}$	$I_F = 8.0\text{ A}, V_{GS} = 0\text{ V}$		150		ns
Reverse Recovery Charge	$Q_{rr}$	$di/dt = 50\text{ A}/\mu\text{s}$		80		nC

**Note** Pulsed:  $PW \leq 350\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$

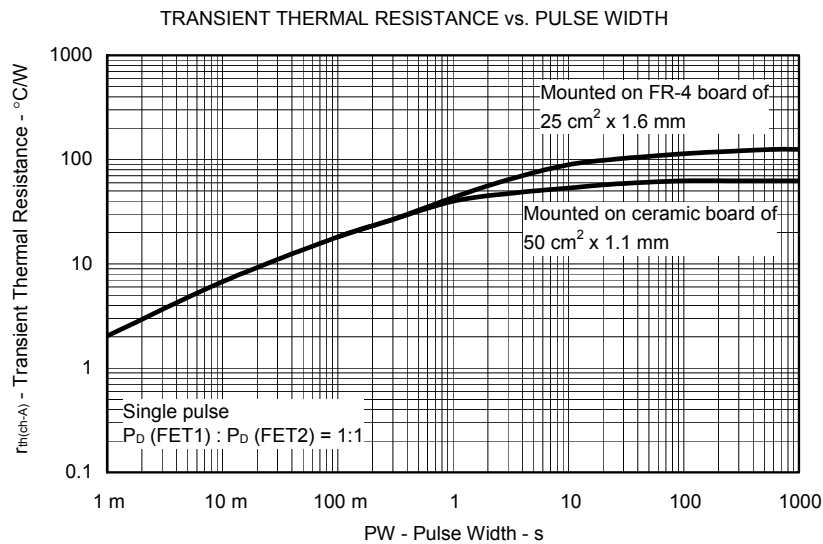
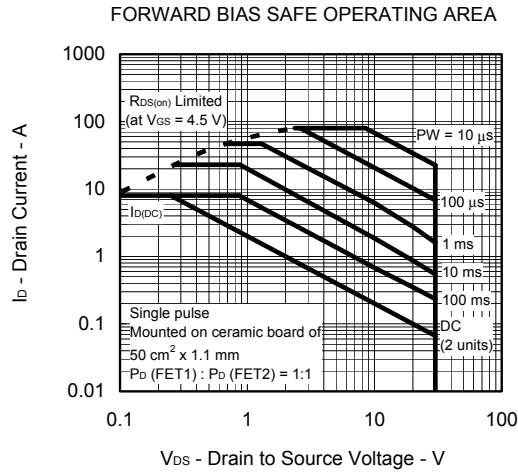
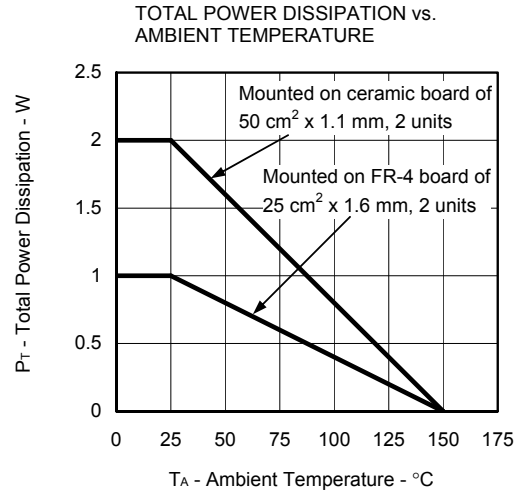
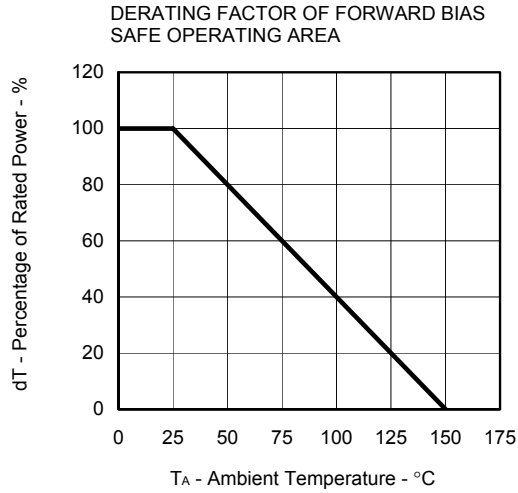
**TEST CIRCUIT 1 SWITCHING TIME**



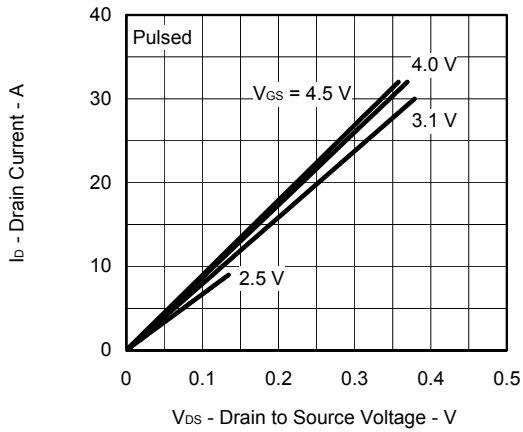
**TEST CIRCUIT 2 GATE CHARGE**



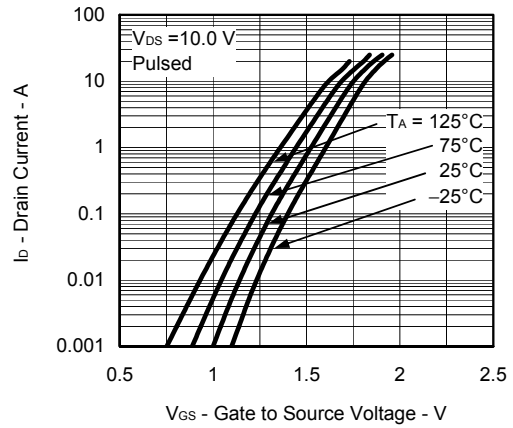
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



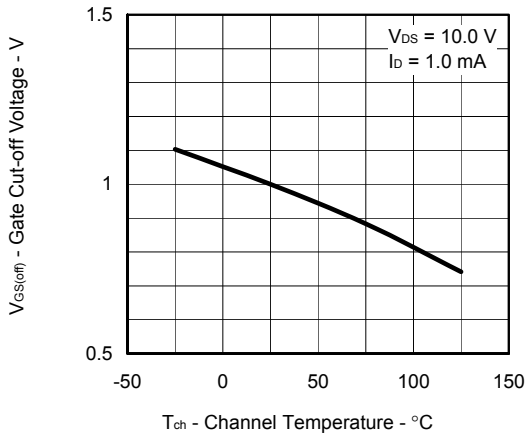
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



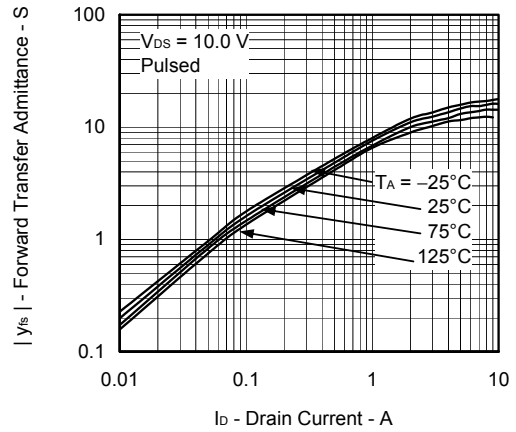
FORWARD TRANSFER CHARACTERISTICS



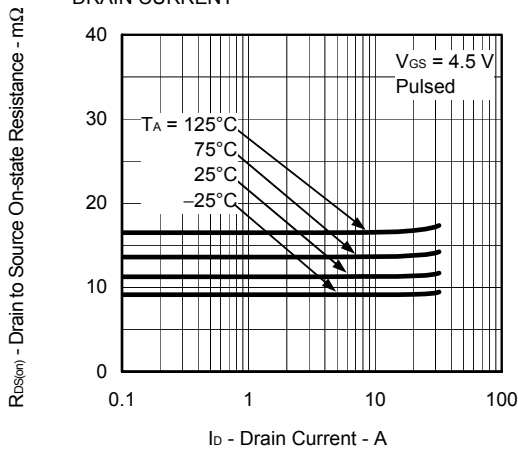
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



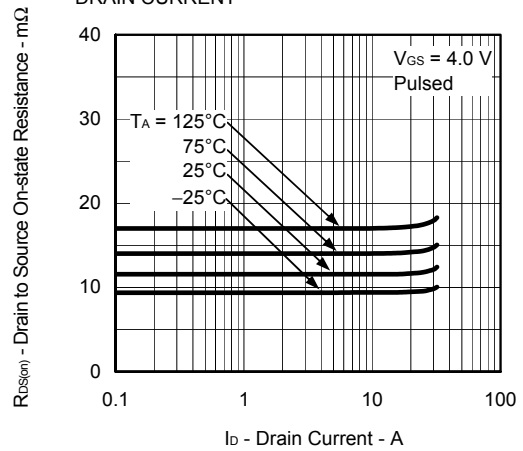
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT

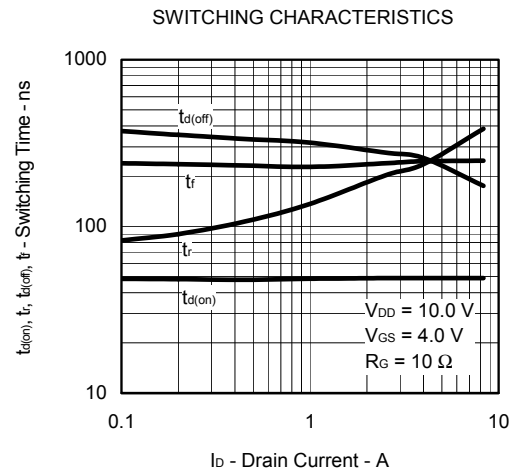
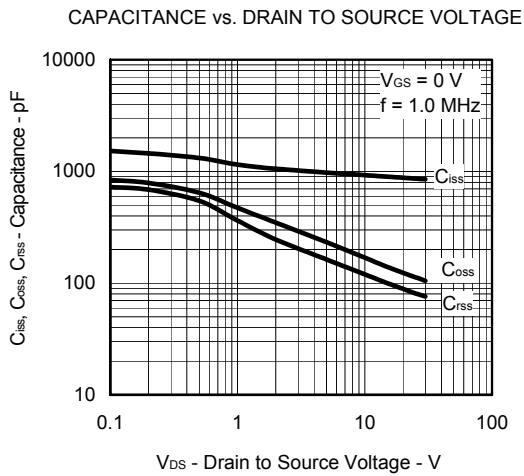
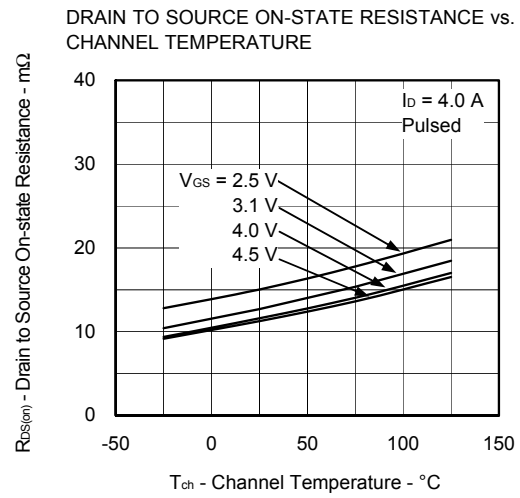
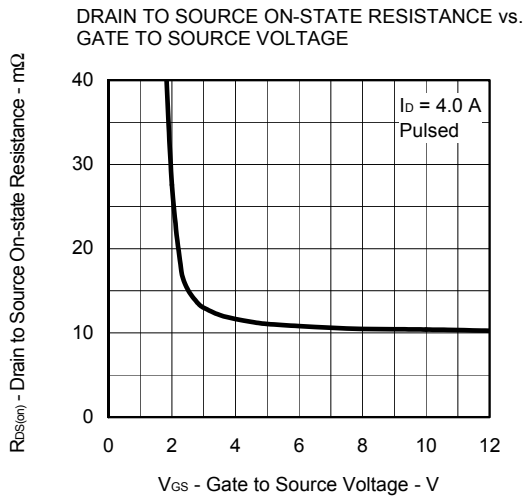
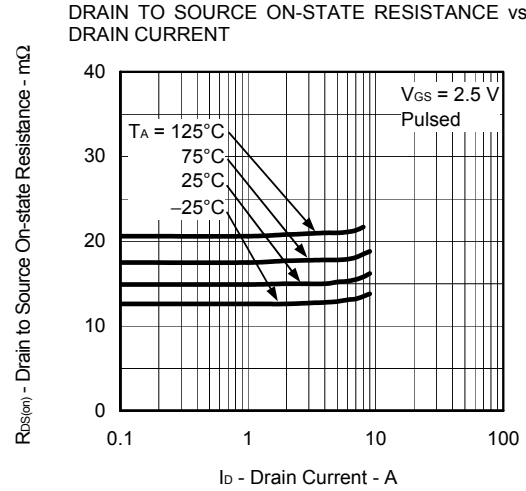
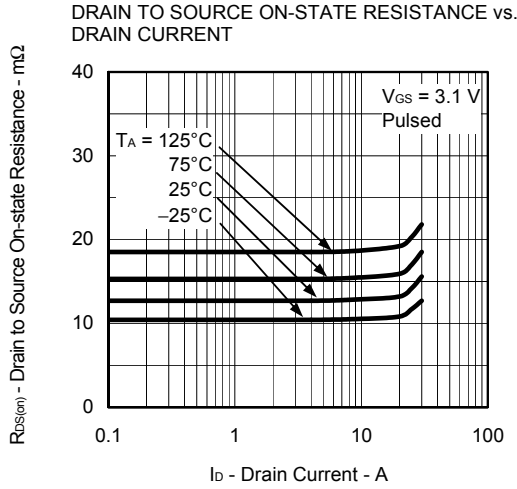


DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT

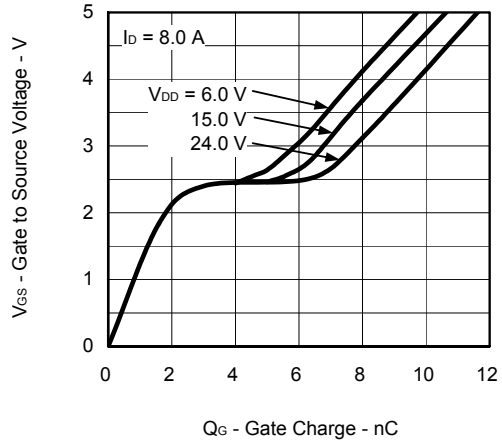


DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT

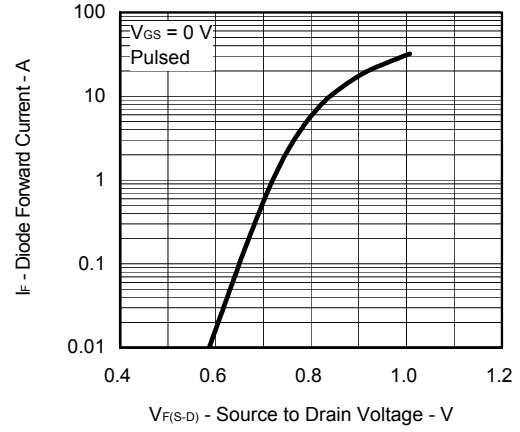




DYNAMIC INPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



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