

N-CHANNEL MOS FIELD EFFECT TRANSISTOR

FOR SWITCHING

DESCRIPTION

The μ PA1870B is a switching device which can be driven directly by a 2.5 V power source.

The μ PA1870B 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.

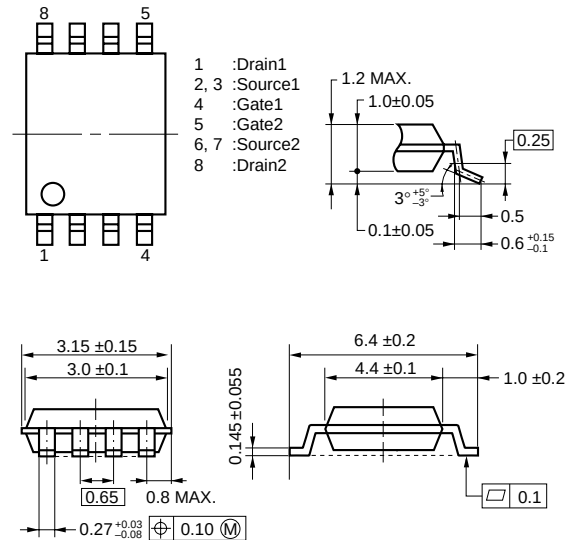
FEATURES

- 2.5 V drive available
- Low on-state resistance
 $R_{DS(on)1} = 16.0 \text{ m}\Omega$ TYP. ($V_{GS} = 4.5 \text{ V}$, $I_D = 3.0 \text{ A}$)
 $R_{DS(on)2} = 16.5 \text{ m}\Omega$ TYP. ($V_{GS} = 4.0 \text{ V}$, $I_D = 3.0 \text{ A}$)
 $R_{DS(on)3} = 20.0 \text{ m}\Omega$ TYP. ($V_{GS} = 2.5 \text{ V}$, $I_D = 3.0 \text{ A}$)
- Built-in G-S protection diode against ESD

ORDERING INFORMATION

PART NUMBER	PACKAGE
μ PA1870BGR-9JG	Power TSSOP8

PACKAGE DRAWING (Unit: mm)



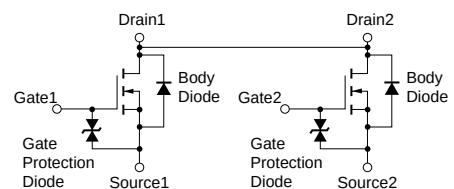
ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	20.0	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	± 12.0	V
Drain Current (DC) ^{Note 1}	$I_{D(DC)}$	± 6.0	A
Drain Current (pulse) ^{Note 2}	$I_{D(pulse)}$	± 80.0	A
Total Power Dissipation ^{Note 1}	P_T	2.0	W
Channel Temperature	T_{ch}	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	$-55 \text{ to } +150$	$^\circ\text{C}$

Notes 1. Mounted on ceramic substrate of $50 \text{ cm}^2 \times 1.1 \text{ mm}$

2. $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1\%$

EQUIVALENT CIRCUIT



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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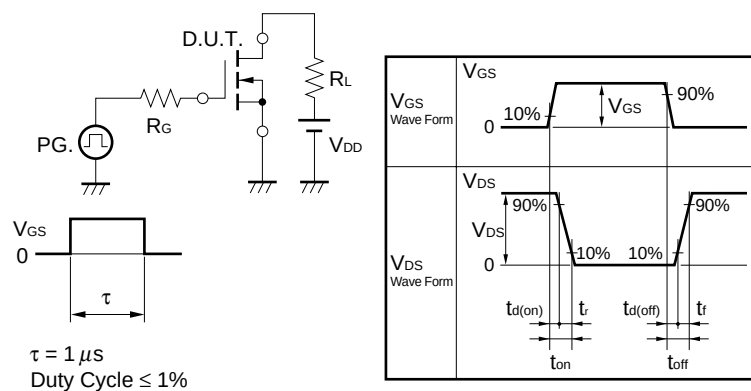
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ELECTRICAL CHARACTERISTICS (T_A = 25°C)

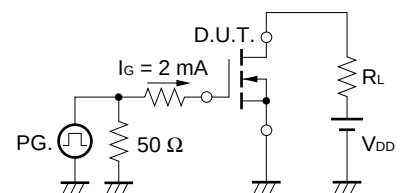
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 20.0 V, V _{GS} = 0 V			1.0	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±12.0 V, V _{DS} = 0 V			±10.0	μA
Gate Cut-off Voltage	V _{GS(off)}	V _{DS} = 10.0 V, I _D = 1.0 mA	0.5	1.0	1.5	V
Forward Transfer Admittance ^{Note}	y _{fs}	V _{DS} = 10.0 V, I _D = 3.0 A	5			S
Drain to Source On-state Resistance ^{Note}	R _{DS(on)1}	V _{GS} = 4.5 V, I _D = 3.0 A	12.0	16.0	20.0	mΩ
	R _{DS(on)2}	V _{GS} = 4.0 V, I _D = 3.0 A	13.0	16.5	21.0	mΩ
	R _{DS(on)3}	V _{GS} = 2.5 V, I _D = 3.0 A	15.0	20.0	27.0	mΩ
Input Capacitance	C _{iss}	V _{DS} = 10.0 V		720		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V		166		pF
Reverse Transfer Capacitance	C _{rss}	f = 1.0 MHz		125		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = 10.0 V, I _D = 3.0 A		48		ns
Rise Time	t _r	V _{GS} = 4.0 V		245		ns
Turn-off Delay Time	t _{d(off)}	R _G = 10 Ω		315		ns
Fall Time	t _f			305		ns
Total Gate Charge	Q _G	V _{DD} = 16.0 V		8.0		nC
Gate to Source Charge	Q _{GS}	I _D = 6.0 A		1.7		nC
Gate to Drain Charge	Q _{GD}	V _{GS} = 4.0 V		3.5		nC
Body Diode Forward Voltage ^{Note}	V _{F(S-D)}	I _F = 6.0 A, V _{GS} = 0 V		0.8		V
Reverse Recovery Time	t _{rr}	I _F = 6.0 A, V _{GS} = 0 V		295		ns
Reverse Recovery Charge	Q _{rr}	di/dt = 50 A/μs		450		nC

Note Pulsed: PW ≤ 350 μs, Duty Cycle ≤ 2%

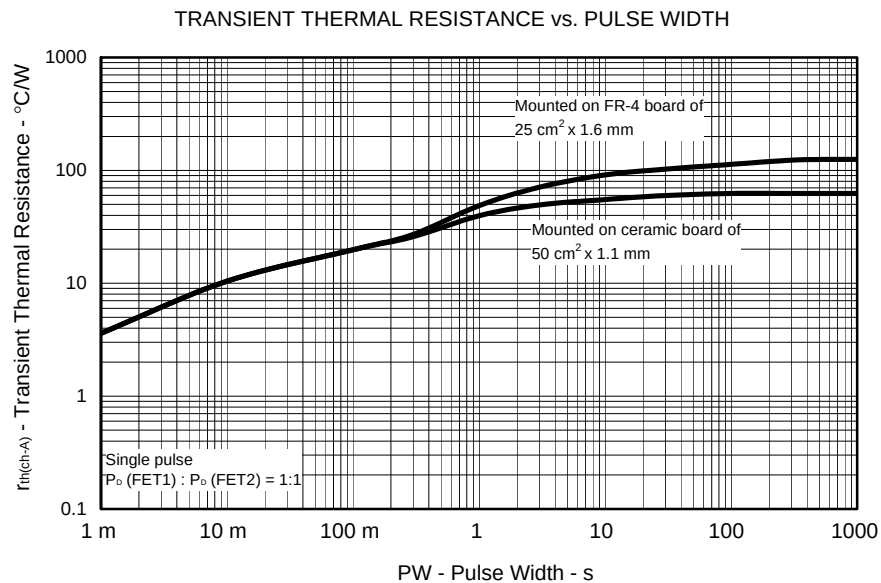
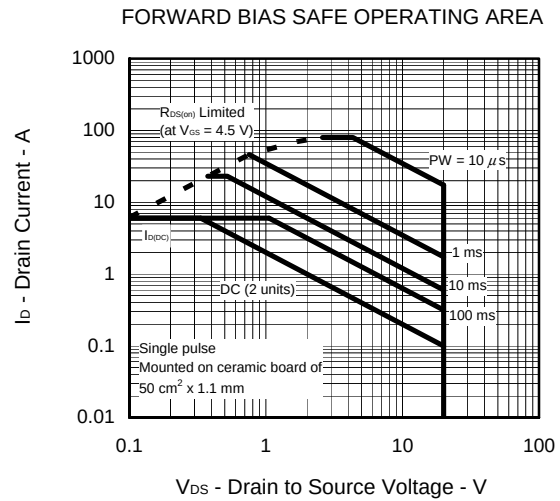
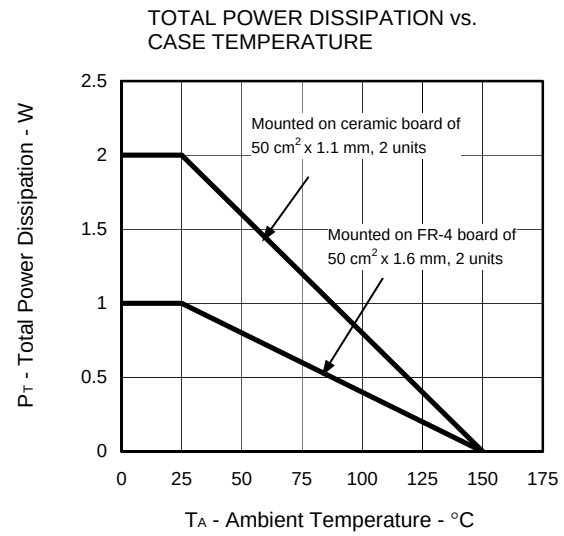
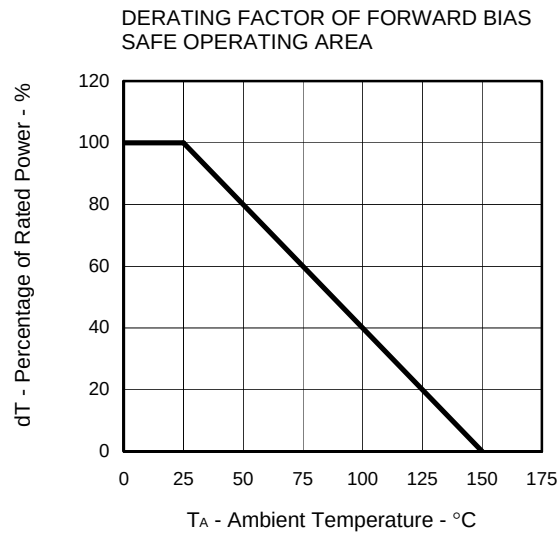
TEST CIRCUIT 1 SWITCHING TIME



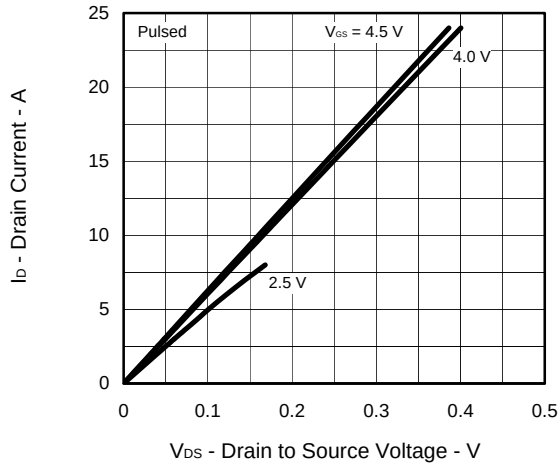
TEST CIRCUIT 2 GATE CHARGE



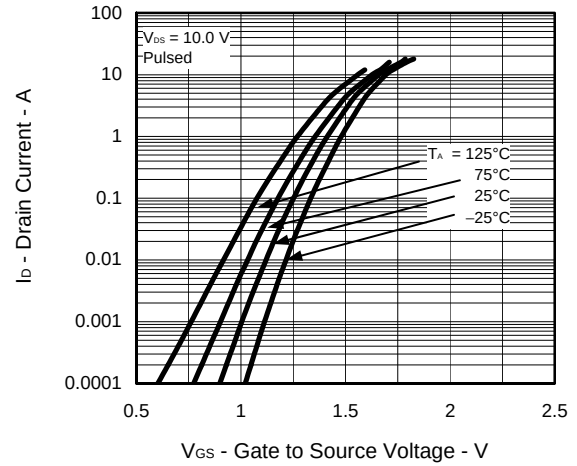
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)



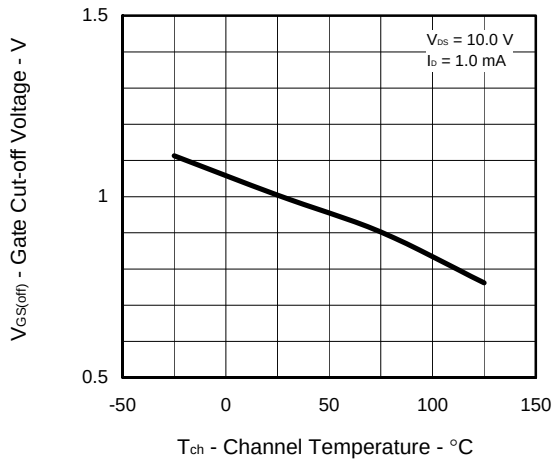
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



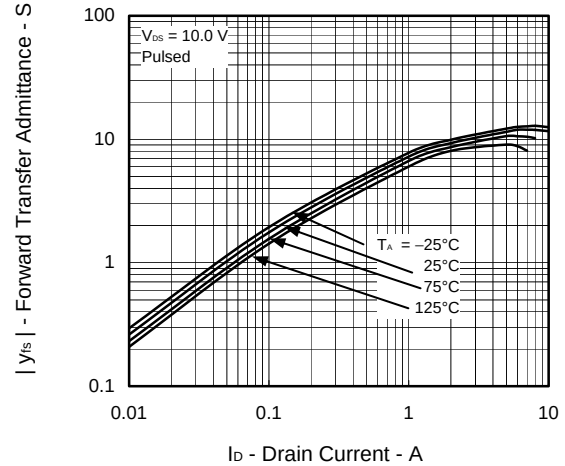
FORWARD TRANSFER CHARACTERISTICS



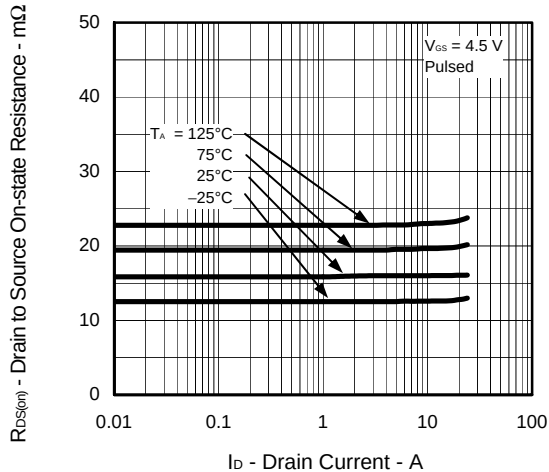
GATE CUT-OFF VOLTAGE vs.
CHANNEL TEMPERATURE



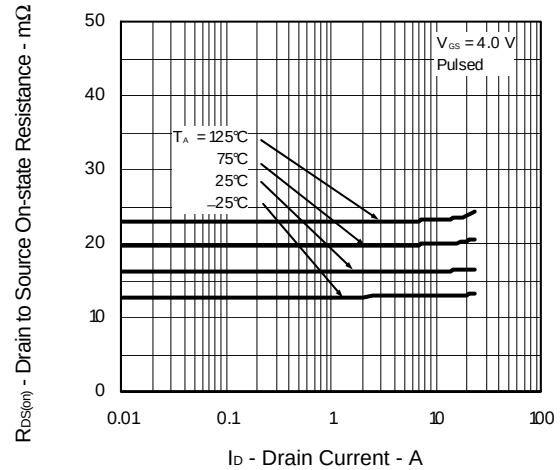
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



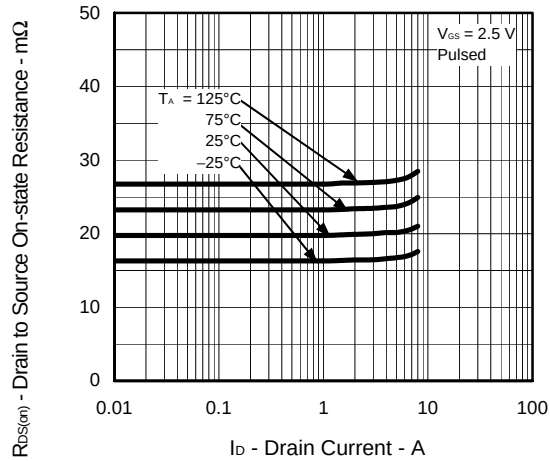
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



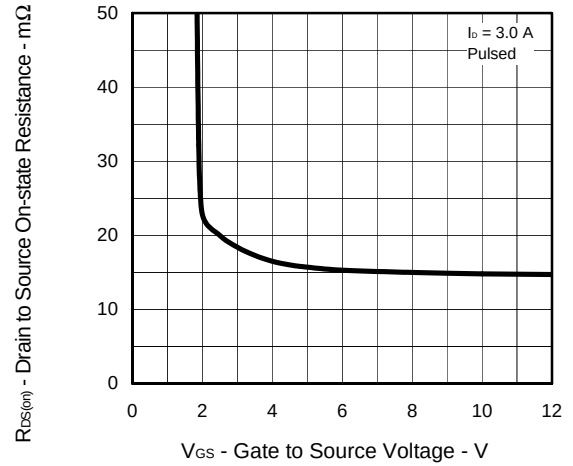
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



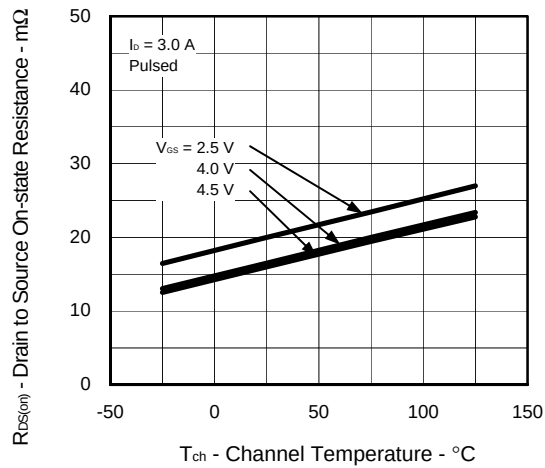
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



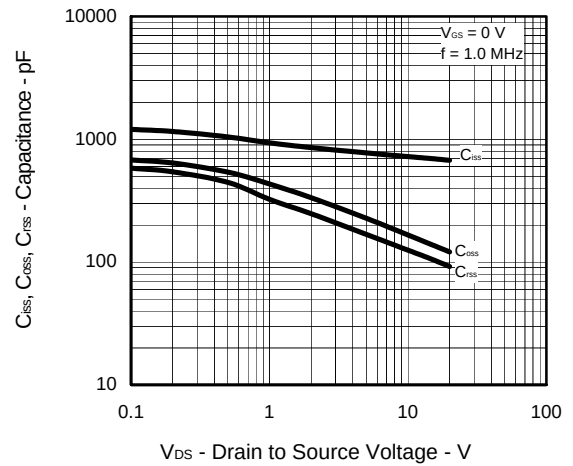
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



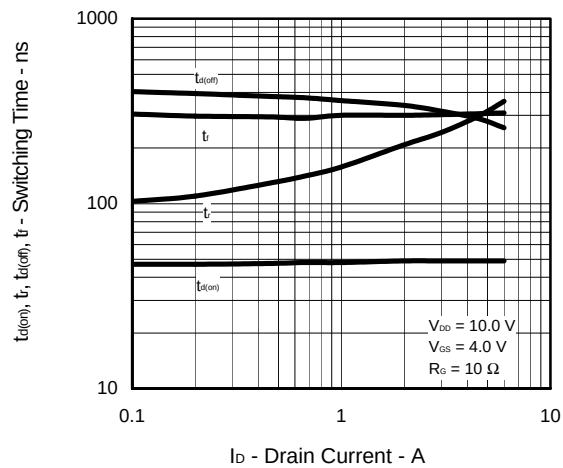
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



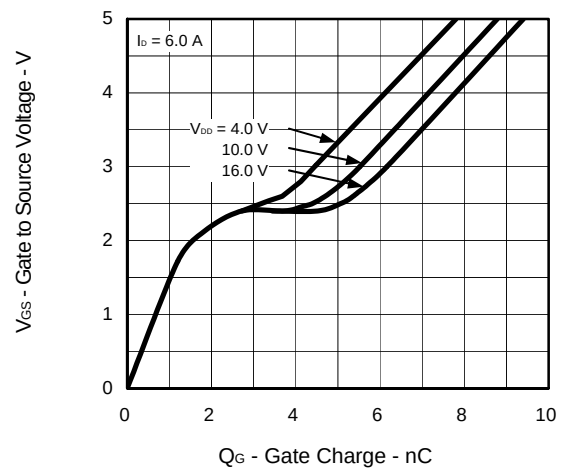
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE

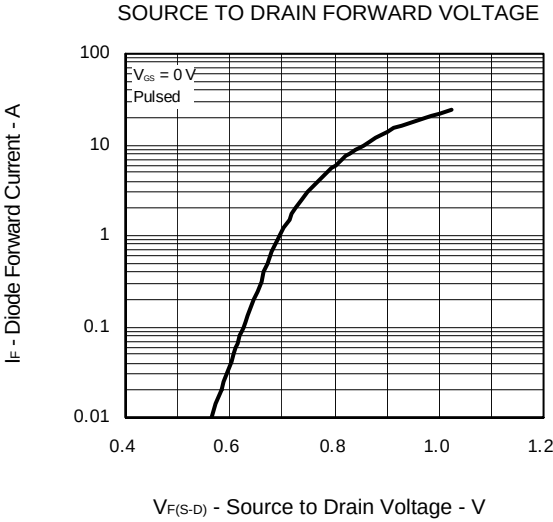


SWITCHING CHARACTERISTICS



DYNAMIC INPUT CHARACTERISTICS





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