

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

#### DESCRIPTION

The  $\mu$ PA1820 is a switching device which can be driven directly by a 2.5 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

- 2.5 V drive available
- Low on-state resistance  
 $R_{DS(on)1} = 8.6 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 6.0 \text{ A)}$   
 $R_{DS(on)2} = 8.8 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.0 \text{ V, } I_D = 6.0 \text{ A)}$   
 $R_{DS(on)3} = 12 \text{ m}\Omega \text{ MAX. (} V_{GS} = 2.5 \text{ V, } I_D = 6.0 \text{ A)}$
- Built-in G-S protection diode against ESD

#### ORDERING INFORMATION

PART NUMBER	PACKAGE
$\mu$ PA1820GR-9JG	Power TSSOP8

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

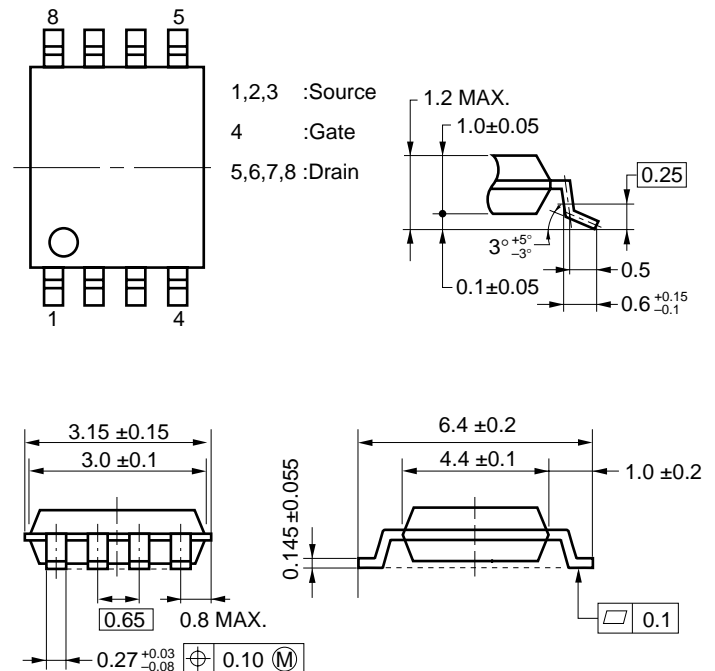
Drain to Source Voltage (V <sub>GS</sub> = 0 V)	V <sub>DSS</sub>	20	V
Gate to Source Voltage (V <sub>DS</sub> = 0 V)	V <sub>GSS</sub>	±12	V
Drain Current (DC)	I <sub>D(DC)</sub>	±12	A
Drain Current (pulse) <sup>Note1</sup>	I <sub>D(pulse)</sub>	±48	A
Total Power Dissipation <sup>Note2</sup>	P <sub>T</sub>	2.0	W
Channel Temperature	T <sub>ch</sub>	150	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C

- Notes 1.** PW ≤ 10 μs, Duty Cycle ≤ 1%  
**2.** Mounted on ceramic substrate of 5000 mm<sup>2</sup> x 1.1 mm

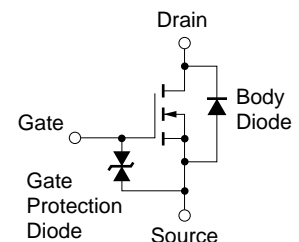
**Remark** The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

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

#### PACKAGE DRAWING (Unit: mm)



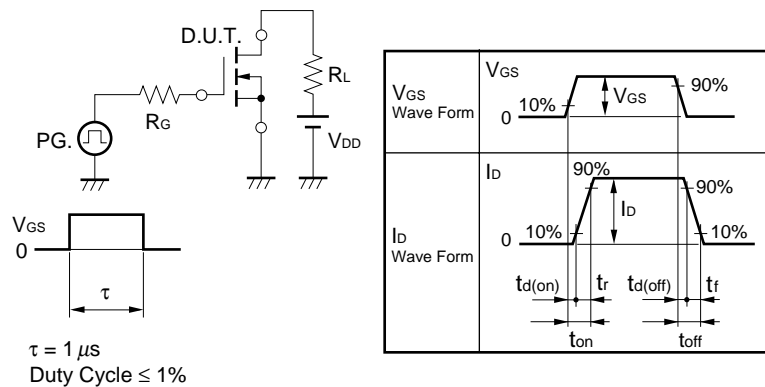
#### EQUIVALENT CIRCUIT



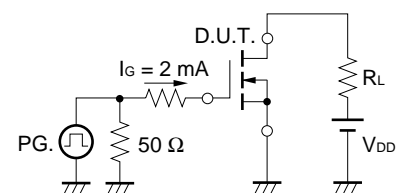
**ELECTRICAL CHARACTERISTICS (TA = 25°C)**

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$			1.0	μA
Gate Leakage Current	$I_{GSS}$	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0\text{ V}$			±10	μA
Gate Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = 10\text{ V}, I_D = 1.0\text{ mA}$	0.5	1.0	1.5	V
Forward Transfer Admittance	$ y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 6.0\text{ A}$	11	21.5		S
Drain to Source On-state Resistance	$R_{DS(on)1}$	$V_{GS} = 4.5\text{ V}, I_D = 6.0\text{ A}$		6.8	8.6	mΩ
	$R_{DS(on)2}$	$V_{GS} = 4.0\text{ V}, I_D = 6.0\text{ A}$		7.0	8.8	mΩ
	$R_{DS(on)3}$	$V_{GS} = 2.5\text{ V}, I_D = 6.0\text{ A}$		8.7	12	mΩ
Input Capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}$		2020		pF
Output Capacitance	$C_{oss}$	$V_{GS} = 0\text{ V}$		600		pF
Reverse Transfer Capacitance	$C_{rss}$	$f = 1.0\text{ MHz}$		430		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, I_D = 6.0\text{ A}$		18		ns
Rise Time	$t_r$	$V_{GS} = 4.0\text{ V}$		56		ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 10\ \Omega$		75		ns
Fall Time	$t_f$			52		ns
Total Gate Charge	$Q_G$	$V_{DD} = 16\text{ V}$		27		nC
Gate to Source Charge	$Q_{GS}$	$V_{GS} = 4.0\text{ V}$		2.6		nC
Gate to Drain Charge	$Q_{GD}$	$I_D = 12\text{ A}$		13		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	$I_F = 12\text{ A}, V_{GS} = 0\text{ V}$		0.81		V
Reverse Recovery Time	$t_{rr}$	$I_F = 12\text{ A}, V_{GS} = 0\text{ V}$		61		ns
Reverse Recovery Charge	$Q_{rr}$	$di/dt = 100\text{ A}/\mu\text{s}$		40		nC

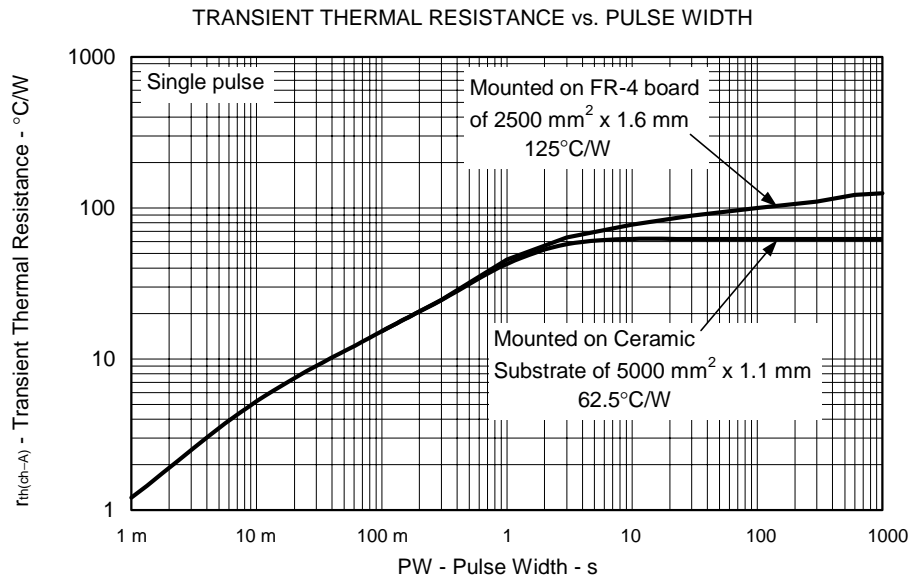
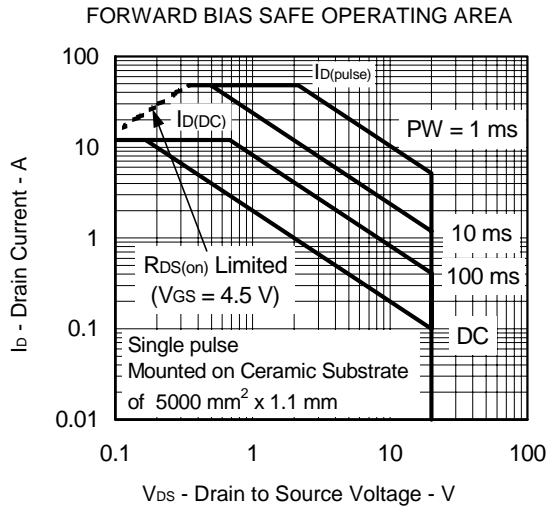
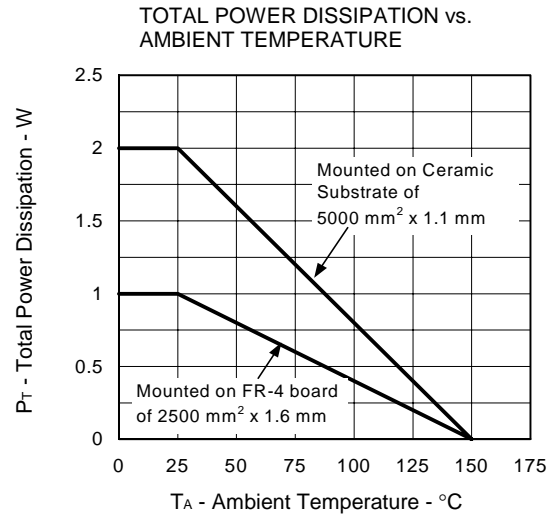
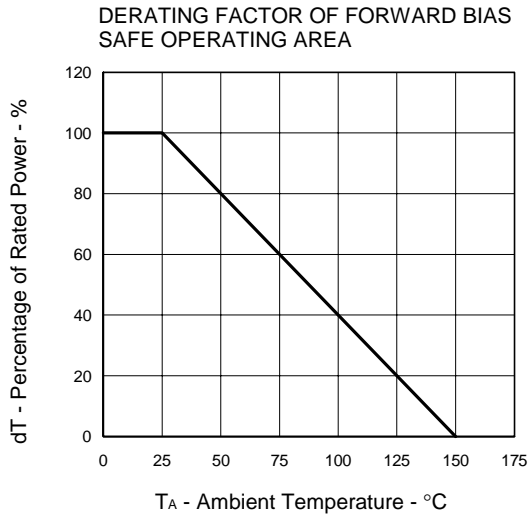
**TEST CIRCUIT 1 SWITCHING TIME**

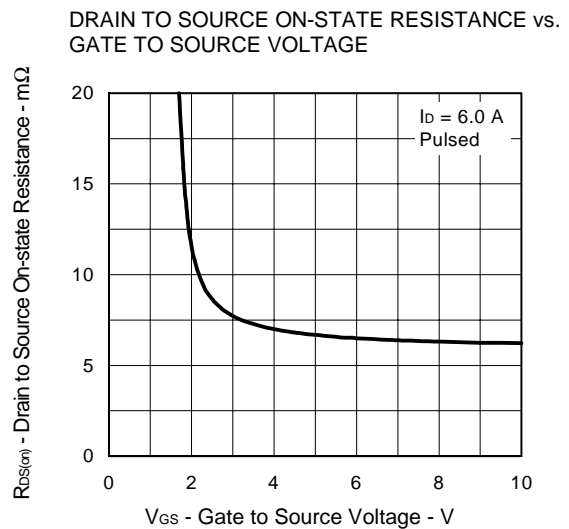
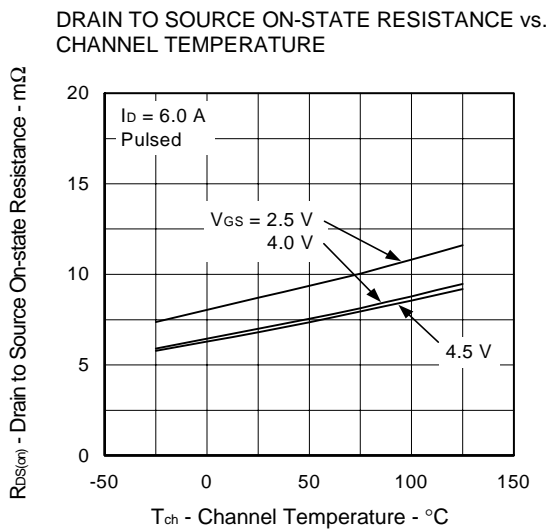
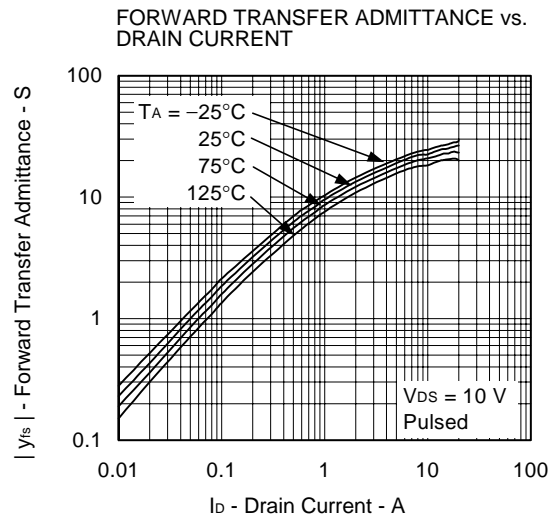
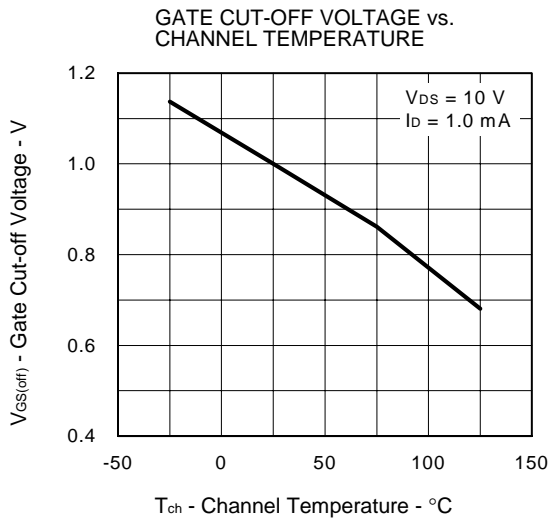
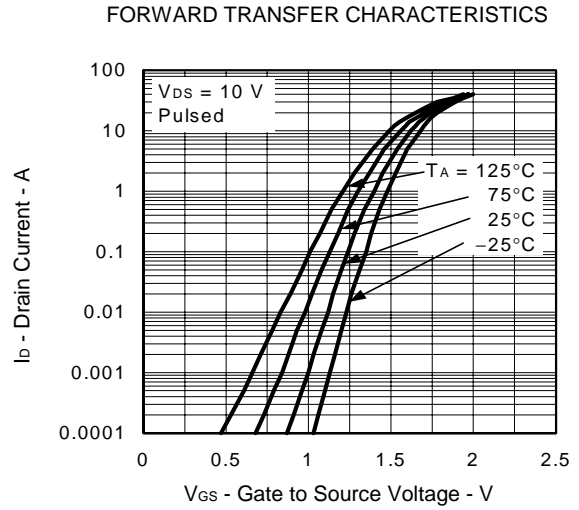
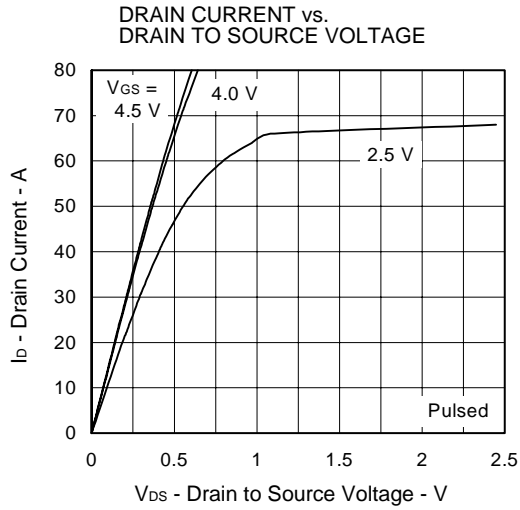


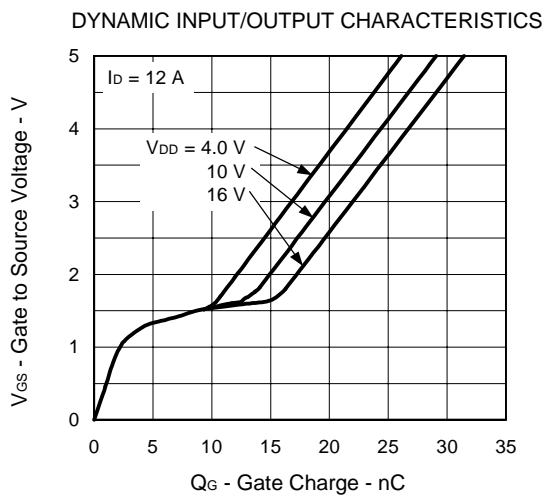
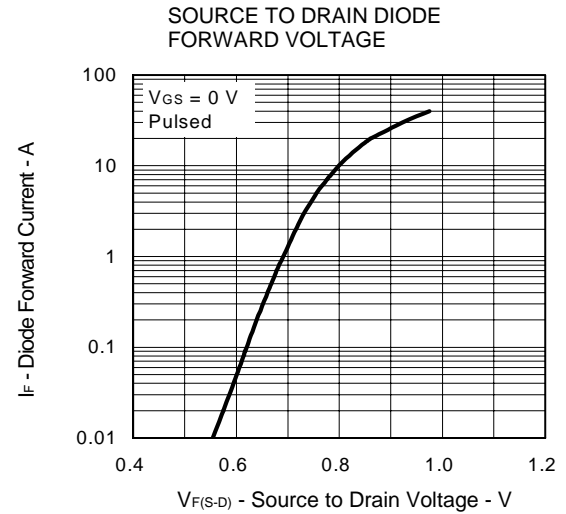
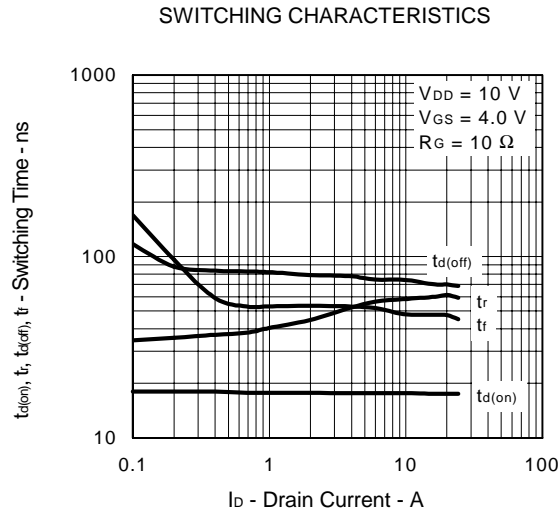
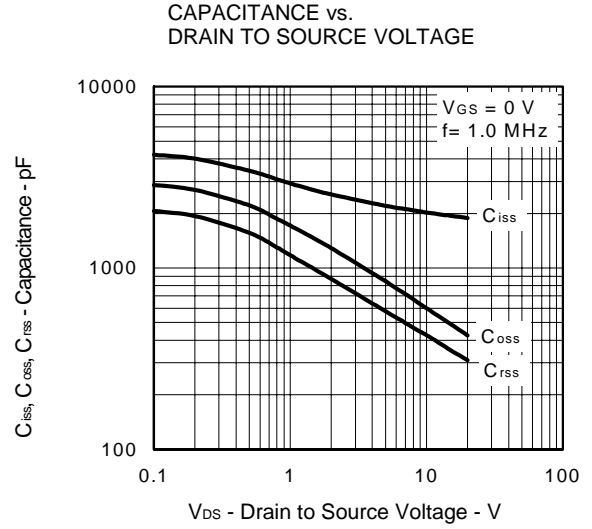
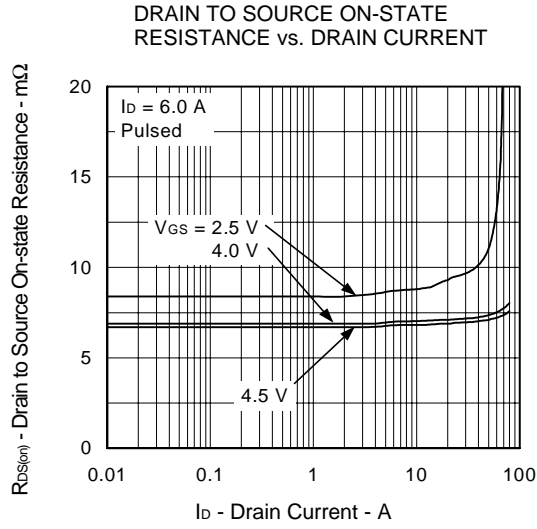
**TEST CIRCUIT 2 GATE CHARGE**



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







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