

To our customers,

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## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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N-CHANNEL MOS FIELD EFFECT TRANSISTOR  
FOR SWITCHING

DESCRIPTION

The  $\mu$ PA1804 is a switching device which can be driven directly by a 4.5 V power source.

The  $\mu$ PA1804 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.

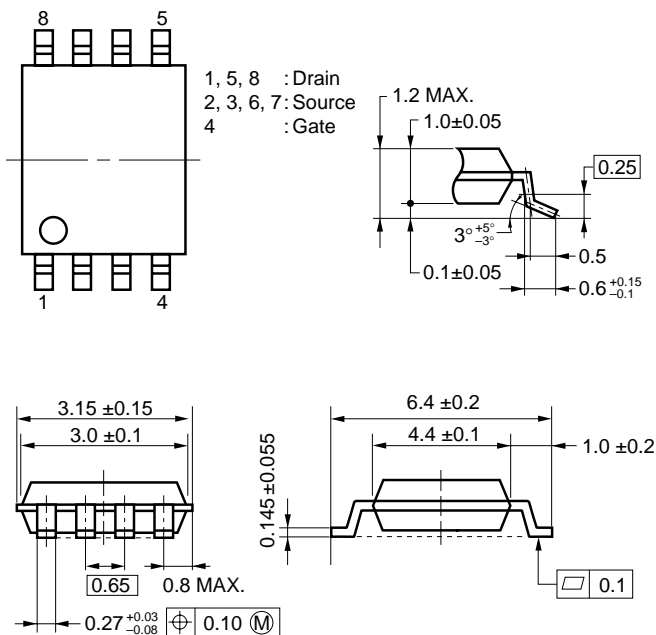
FEATURES

- Can be driven by a 4.5 V power source
- Low on-state resistance  
 $R_{DS(on)1} = 23 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 4.0 \text{ A)}$   
 $R_{DS(on)2} = 32 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 4.0 \text{ A)}$
- Built-in G-S protection diode against ESD

ORDERING INFORMATION

PART NUMBER	PACKAGE
$\mu$ PA1804GR-9JG	Power TSSOP8

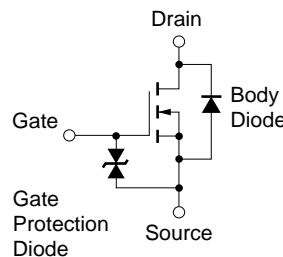
PACKAGE DRAWING (Unit : mm)



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

Drain to Source Voltage	V <sub>DSS</sub>	30	V
Gate to Source Voltage	V <sub>GSS</sub>	±20	V
Drain Current (DC)	I <sub>D(DC)</sub>	±8.0	A
Drain Current (pulse) <sup>Note1</sup>	I <sub>D(pulse)</sub>	±32	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

EQUIVALENT CIRCUIT



- Notes**
1.  $PW \leq 10 \mu s$ , Duty Cycle  $\leq 1\%$
  2. Mounted on ceramic substrate of  $5000 \text{ mm}^2 \times 1.1 \text{ mm}$

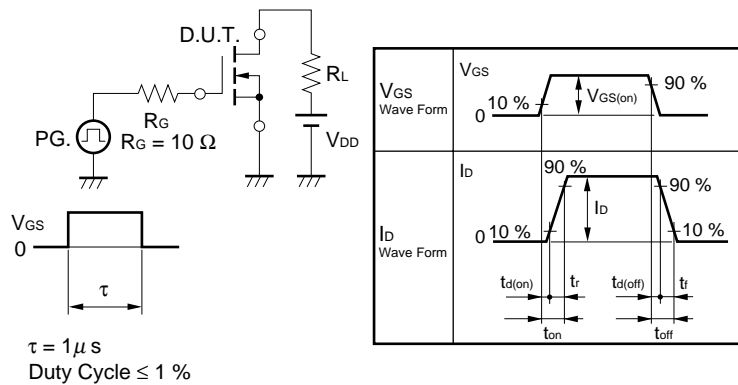
**Remark** The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

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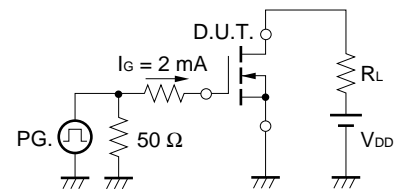
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

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> = ±16 V, V <sub>DS</sub> = 0 V			±10	μA
Gate to Source Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.0	2.1	2.5	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 4.0 A	3	8.7		S
Drain to Source On-state Resistance	R <sub>DS(on)1</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 4.0 A		18	23	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 4.0 A		24	32	mΩ
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		761		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		258		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		99		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 15 V		24		ns
Rise Time	t <sub>r</sub>	I <sub>D</sub> = 4.0 A		83		ns
Turn-off Delay Time	t <sub>d(off)</sub>	V <sub>GS(on)</sub> = 10 V		46		ns
Fall Time	t <sub>f</sub>	R <sub>G</sub> = 10 Ω		29		ns
Total Gate Charge	Q <sub>G</sub>	V <sub>DS</sub> = 24 V		13.5		nC
Gate to Source Charge	Q <sub>GS</sub>	I <sub>D</sub> = 8.0 A		2.4		nC
Gate to Drain Charge	Q <sub>GD</sub>	V <sub>GS</sub> = 10 V		3.7		nC
Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 8.0 A, V <sub>GS</sub> = 0 V		0.86		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 8.0 A, V <sub>GS</sub> = 0 V		27		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		16		nC

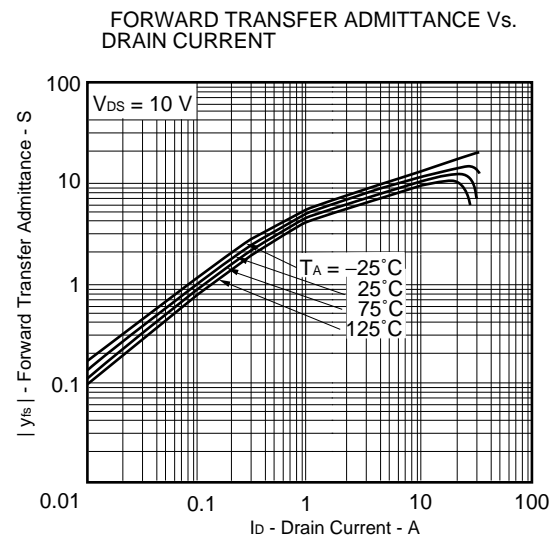
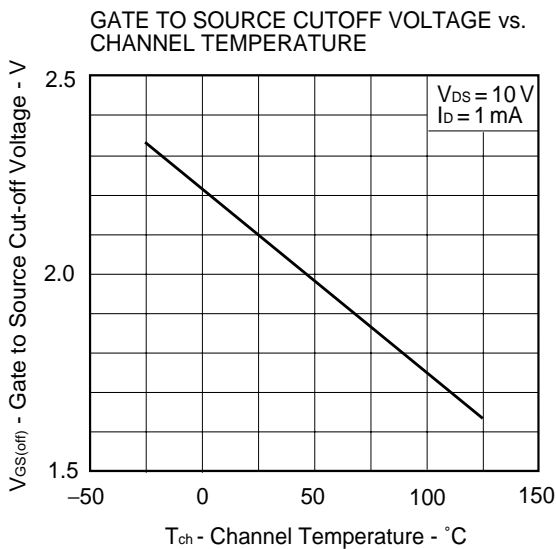
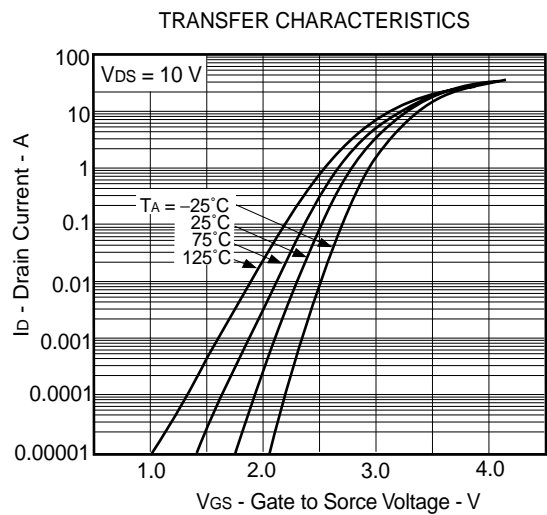
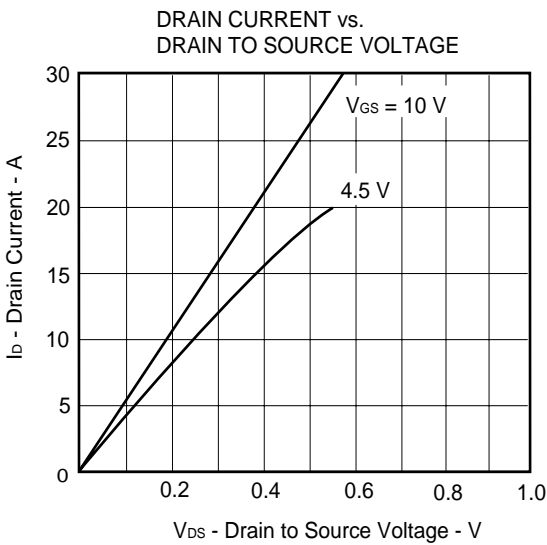
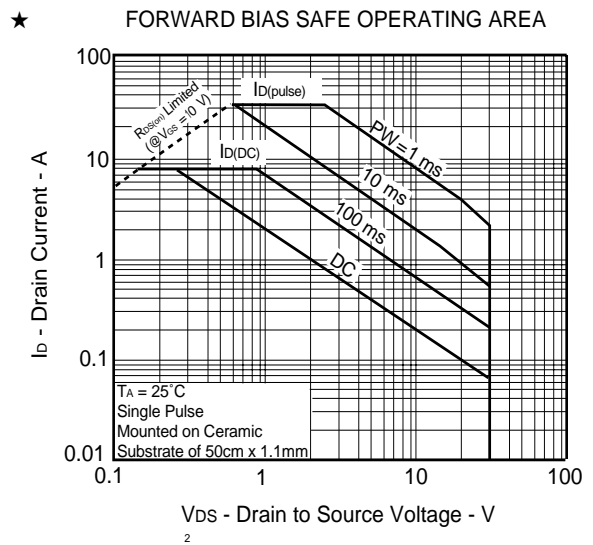
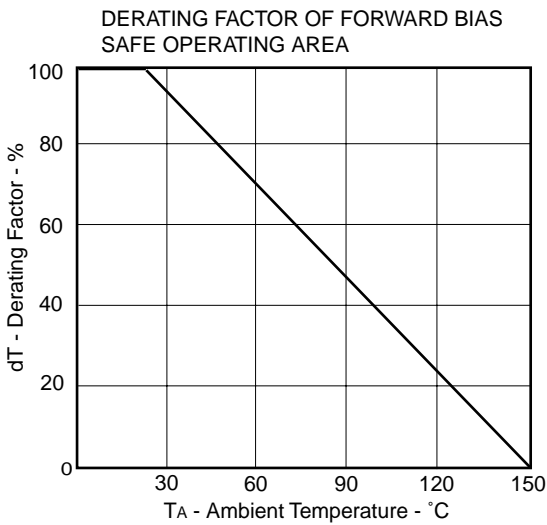
**TEST CIRCUIT 1 SWITCHING TIME**

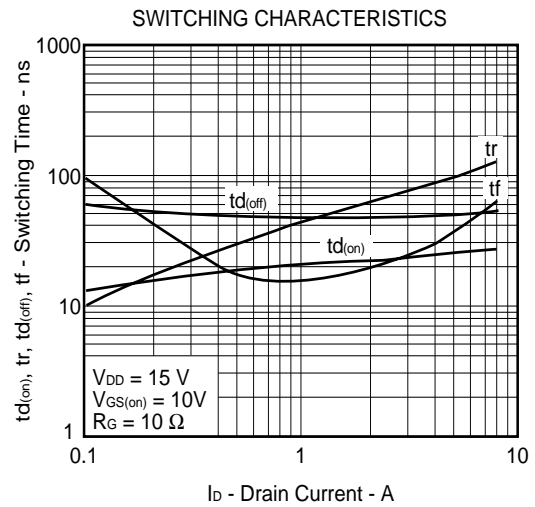
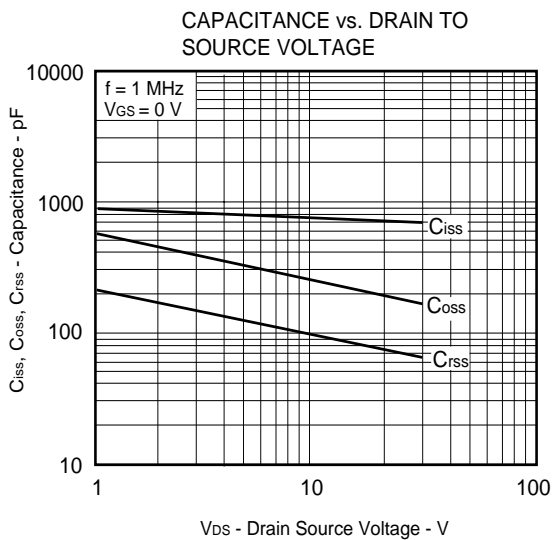
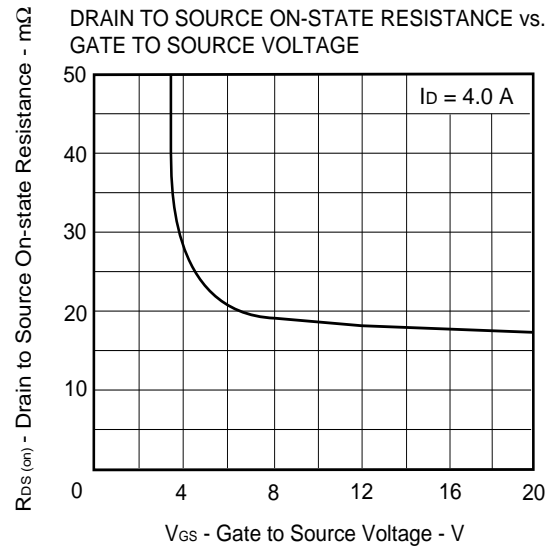
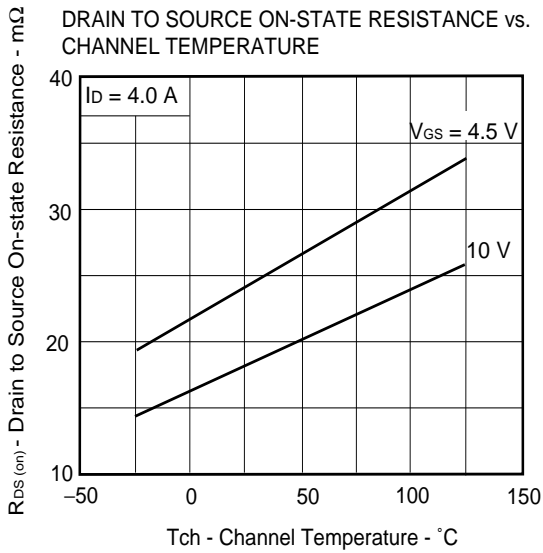
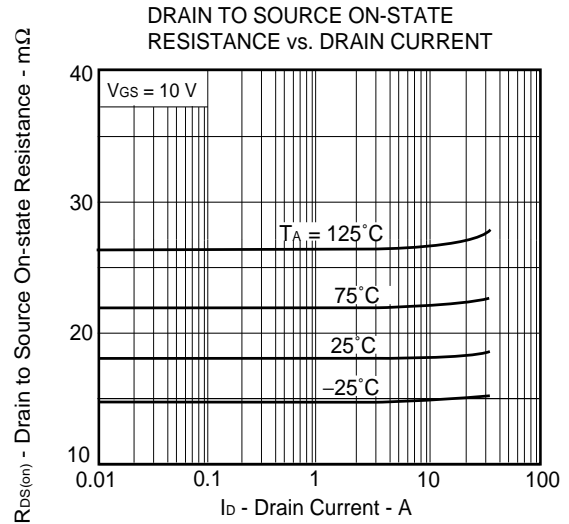
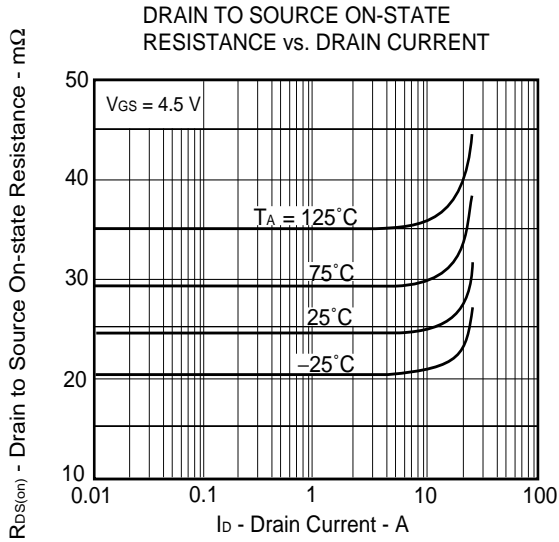


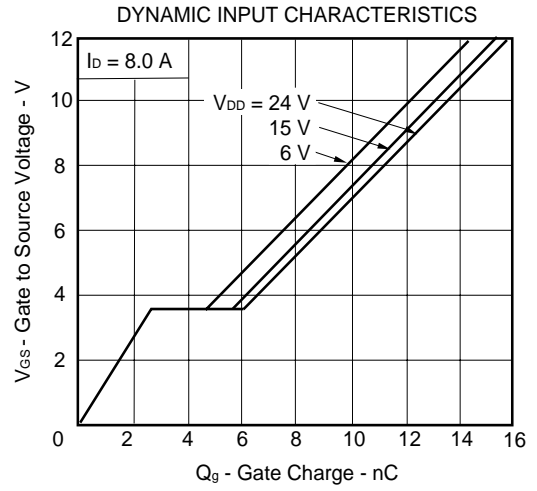
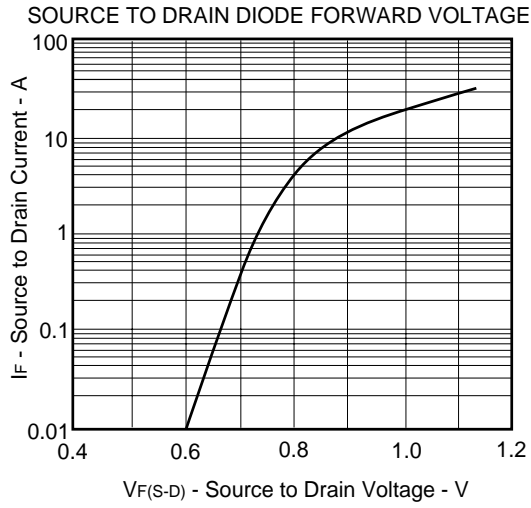
**TEST CIRCUIT 2 GATE CHARGE**



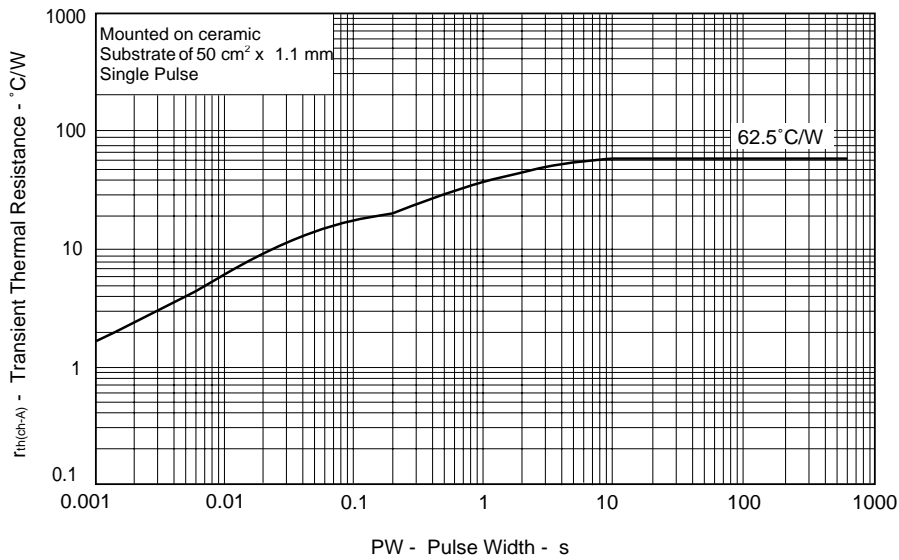
TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )







★ TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



[MEMO]



[MEMO]

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