

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  $\mu$ PA1902 is a switching device, which can be driven directly by a 4.5 V power source.

This  $\mu$ PA1902 features a low on-state resistance and excellent switching characteristics, and is suitable for applications such as power management switch of portable machine and so on.

FEATURES

- 4.5 V drive available
  - Low on-state resistance
- $R_{DS(on)1} = 17 \text{ m}\Omega \text{ TYP. (} V_{GS} = 10 \text{ V, } I_D = 3.5 \text{ A)}$   
 $R_{DS(on)2} = 22 \text{ m}\Omega \text{ TYP. (} V_{GS} = 4.5 \text{ V, } I_D = 3.5 \text{ A)}$

ORDERING INFORMATION

PART NUMBER	PACKAGE
$\mu$ PA1902TE	SC-95 (Mini Mold Thin Type)

Marking: TY

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

Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	30	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 20$	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 7.0$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 28$	A
Total Power Dissipation	$P_{T1}$	0.2	W
Total Power Dissipation <sup>Note2</sup>	$P_{T2}$	2.0	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$

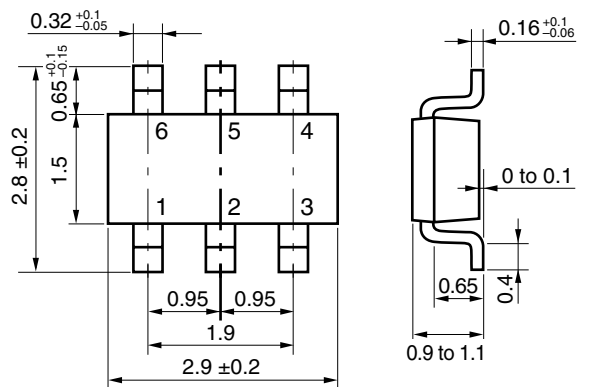
- Notes** 1.  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$   
 2. Mounted on FR-4 board of 50 mm x 50 mm x 1.6 mm,  $t \leq 5 \text{ sec}$ .

**Remark** Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

**Caution** This product is electrostatic-sensitive device due to low ESD capability and should be handled with caution for electrostatic discharge. (It does not have built-in G-S protection diode.)  
 When this product actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

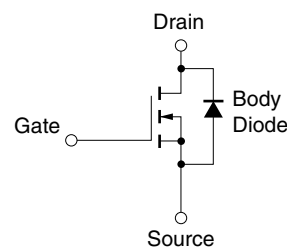
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PACKAGE DRAWING (Unit: mm)



- 1, 2, 5, 6: Drain  
 3 : Gate  
 4 : Source

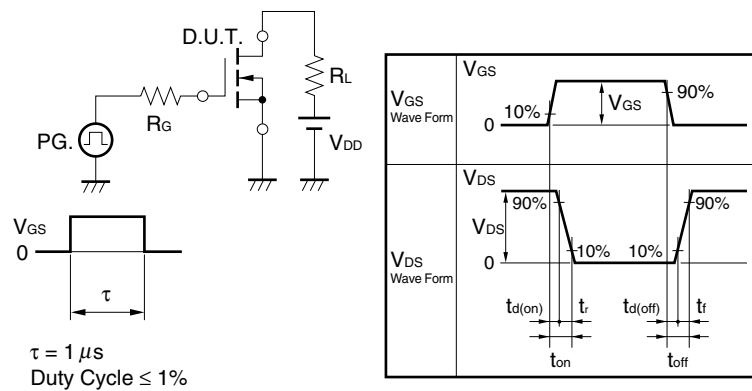
EQUIVALENT CIRCUIT



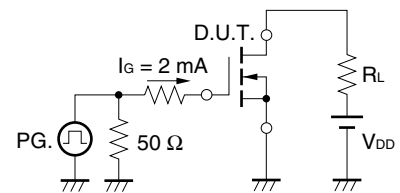
**ELECTRICAL CHARACTERISTICS (Ta = 25°C)**

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$			1.0	μA
Gate Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			±100	nA
Gate Cut-off Voltage	$V_{GS(off)}$	$V_{DS} = 10\text{ V}, I_D = 1.0\text{ mA}$	1.5	2.0	2.5	V
Forward Transfer Admittance	$ y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 3.5\text{ A}$	3.0			S
Drain to Source On-state Resistance	$R_{DS(on)1}$	$V_{GS} = 10\text{ V}, I_D = 3.5\text{ A}$		17	22	mΩ
	$R_{DS(on)2}$	$V_{GS} = 4.5\text{ V}, I_D = 3.5\text{ A}$		22	30	mΩ
Input Capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}$		780		pF
Output Capacitance	$C_{oss}$	$V_{GS} = 0\text{ V}$		180		pF
Reverse Transfer Capacitance	$C_{rss}$	$f = 1\text{ MHz}$		120		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, I_D = 1.0\text{ A}$		16		ns
Rise Time	$t_r$	$V_{GS} = 10\text{ V}$		10		ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 6.0\ \Omega$		108		ns
Fall Time	$t_f$			56		ns
Total Gate Charge	$Q_G$	$V_{DD} = 15\text{ V}$		8.0		nC
Gate to Source Charge	$Q_{GS}$	$V_{GS} = 5.0\text{ V}$		2.7		nC
Gate to Drain Charge	$Q_{GD}$	$I_D = 7.0\text{ A}$		3.4		nC
Body Diode Forward Voltage	$V_{F(S-D)}$	$I_F = 7.0\text{ A}, V_{GS} = 0\text{ V}$		0.84		V

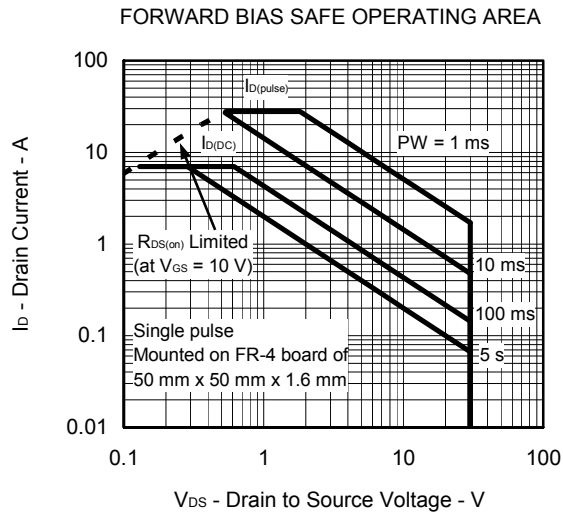
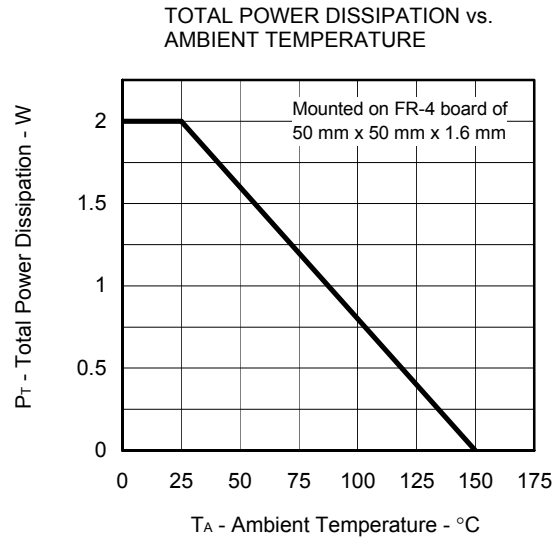
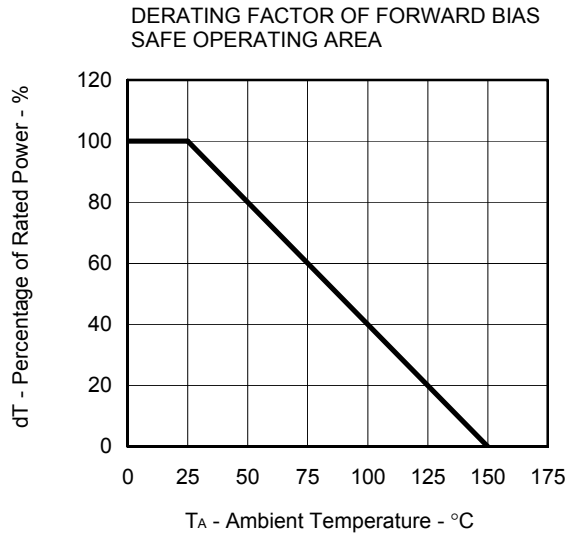
**TEST CIRCUIT 1 SWITCHING TIME**



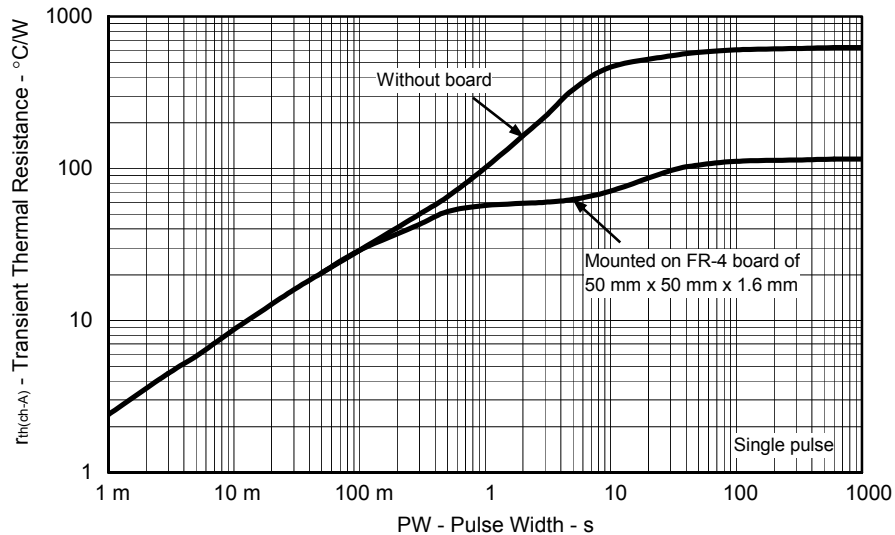
**TEST CIRCUIT 2 GATE CHARGE**



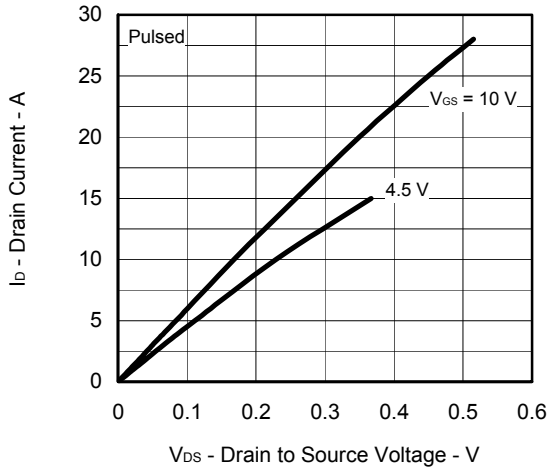
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



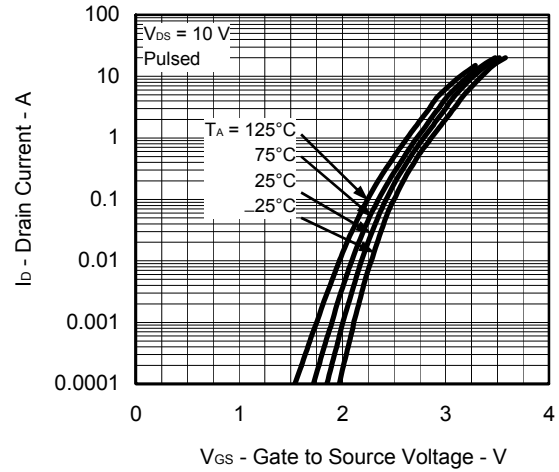
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



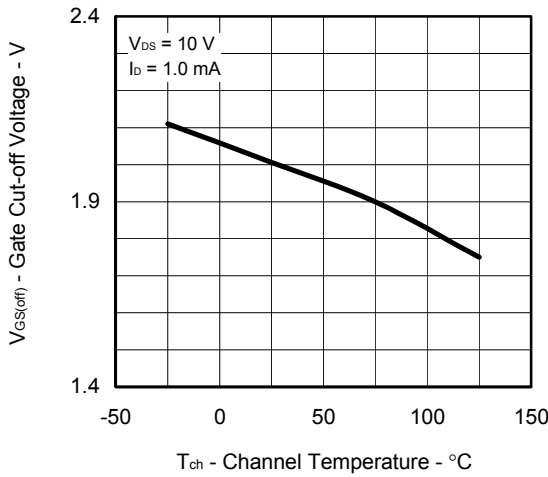
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



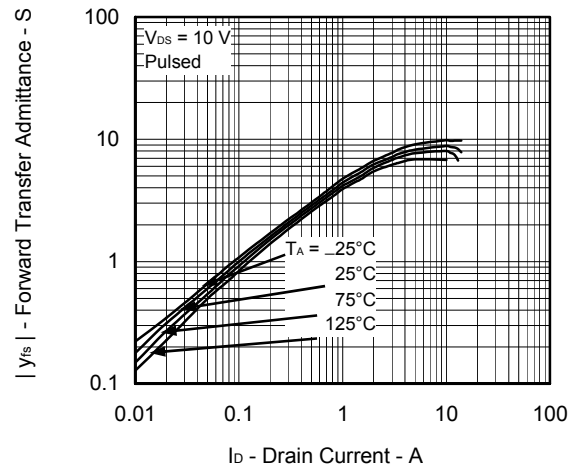
FORWARD TRANSFER CHARACTERISTICS



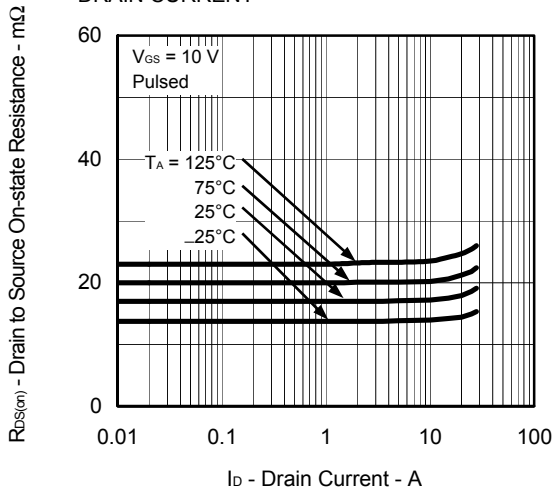
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



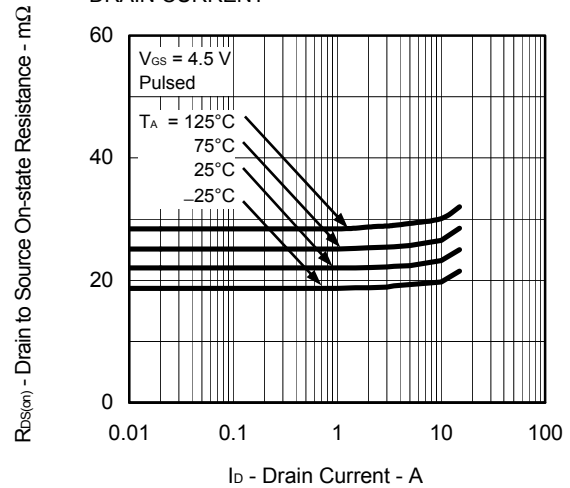
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



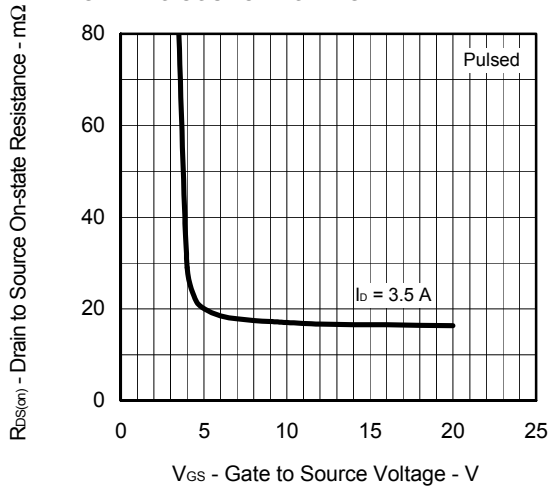
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



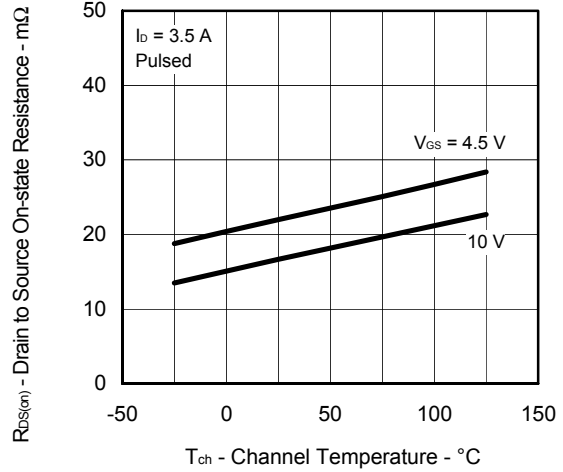
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



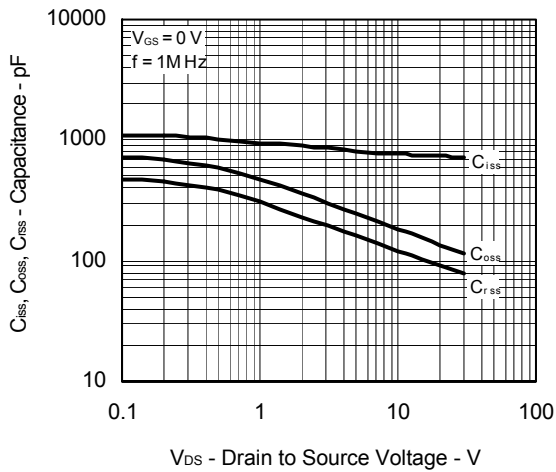
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



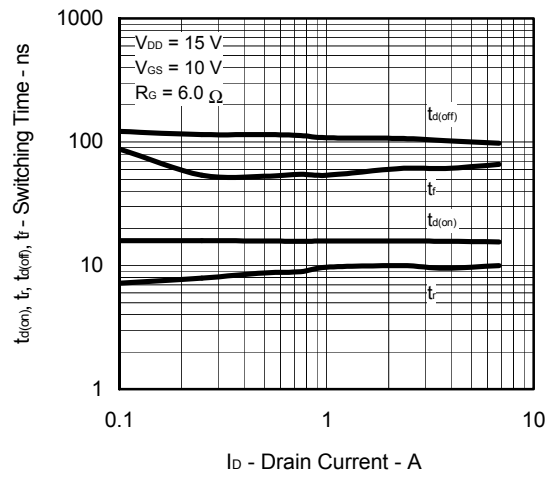
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



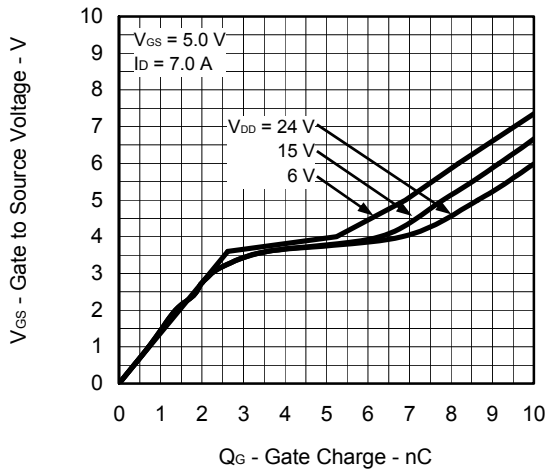
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



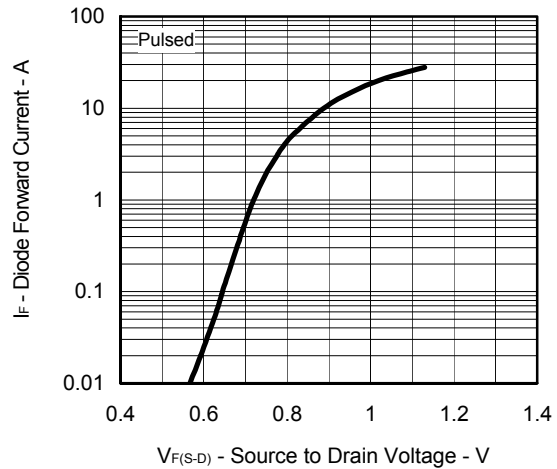
SWITCHING CHARACTERISTICS



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



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