

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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**Phase-out/Discontinued**

**SWITCHING  
N-CHANNEL POWER MOS FET  
INDUSTRIAL USE**

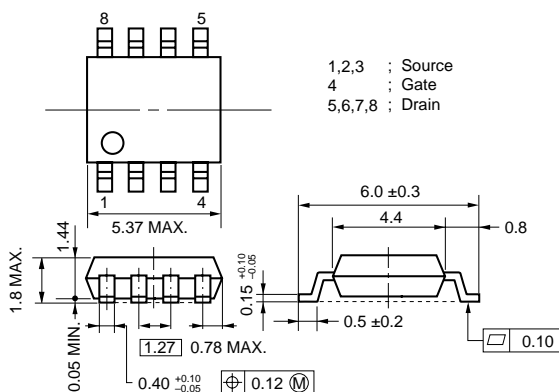
**DESCRIPTION**

The μPA1701A is N-Channel MOS Field Effect Transistor designed for power management applications and Li-ion battery application.

**FEATURES**

- 2.5 V gate drive and low on-resistance  
 $R_{DS(on)1} = 27m\Omega$  (MAX.) ( $V_{GS} = 4.0$  V,  $I_D = 3.5$  A)  
 $R_{DS(on)2} = 40m\Omega$  (MAX.) ( $V_{GS} = 2.5$  V,  $I_D = 3.5$  A)
- Low  $C_{iss}$  :  $C_{iss} = 1040$  pF (TYP.)
- Built-in G-S protection diode
- Small and surface mount package (Power SOP8)

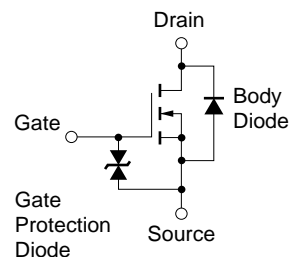
**PACKAGE DRAWING (Unit : mm)**



**ORDERING INFORMATION**

PART NUMBER	PACKAGE
μPA1701AG	Power SOP8

**EQUIVALENT CIRCUIT**



**ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ , All terminals are connected.)**

Drain to Source Voltage ( $V_{GS} = 0$ V)	$V_{DSS}$	30	V
Gate to Source Voltage ( $V_{DS} = 0$ V)	$V_{GSS}$	±12	V
Drain Current (DC)	$I_{D(DC)}$	±7.0	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	±28	A
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ ) <sup>Note2</sup>	$P_T$	2.0	W
Channel Temperature	$T_{ch}$	150	°C
Storage Temperature	$T_{stg}$	-55 to + 150	°C

- Notes 1.**  $PW \leq 10 \mu s$ , Duty Cycle  $\leq 1 \%$   
**2.** Mounted on ceramic substrate of  $1200 \text{ mm}^2 \times 1.7 \text{ mm}$

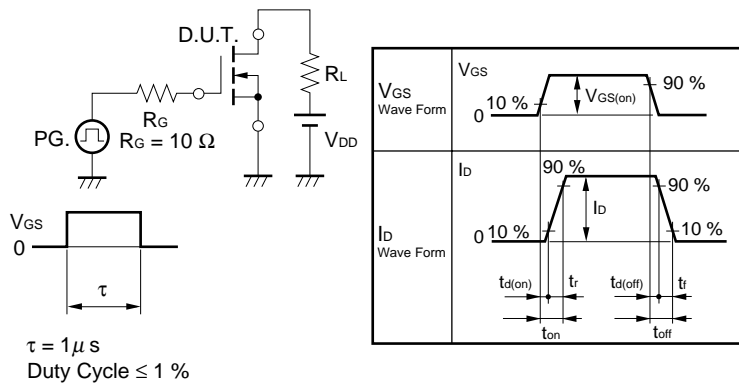
**Remark** The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

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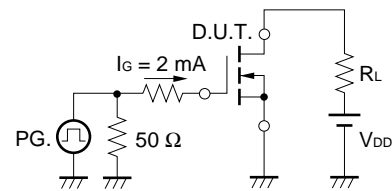
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C )**

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	R <sub>DS(on)1</sub>	V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 3.5 A		19	27	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 3.5 A		25	40	mΩ
Gate to Source Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	0.5	0.9	1.5	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 3.5 A	6.0	13		S
Drain Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V			10	μA
Gate to Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±12 V, V <sub>DS</sub> = 0 V			±10	μA
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V		1040		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		340		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1 MHz		150		pF
Turn-on Delay Time	t <sub>d(on)</sub>	I <sub>D</sub> = 3.5 A		25		ns
Rise Time	t <sub>r</sub>	V <sub>GS(on)</sub> = 4.0 V		120		ns
Turn-off Delay Time	t <sub>d(off)</sub>	V <sub>DD</sub> = 15 V		73		ns
Fall Time	t <sub>f</sub>	R <sub>G</sub> = 10 Ω		77		ns
Total Gate Charge	Q <sub>G</sub>	I <sub>D</sub> = 7.0 A		13.2		nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>DD</sub> = 24 V		1.8		nC
Gate to Drain Charge	Q <sub>GD</sub>	V <sub>GS</sub> = 4.0 V		5.8		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 7.0 A, V <sub>GS</sub> = 0 V		0.77		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 7.0 A, V <sub>GS</sub> = 0 V		31		ns
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100 A/μs		58		nC

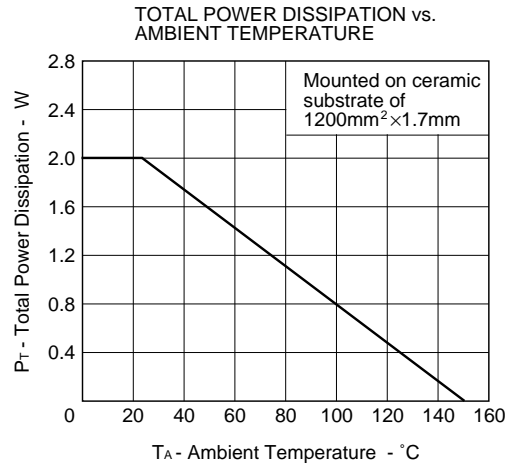
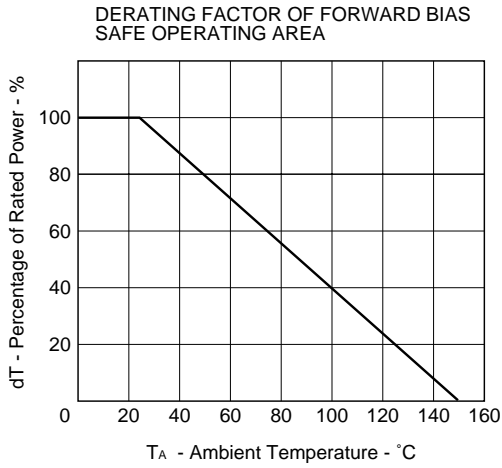
**TEST CIRCUIT 1 SWITCHING TIME**



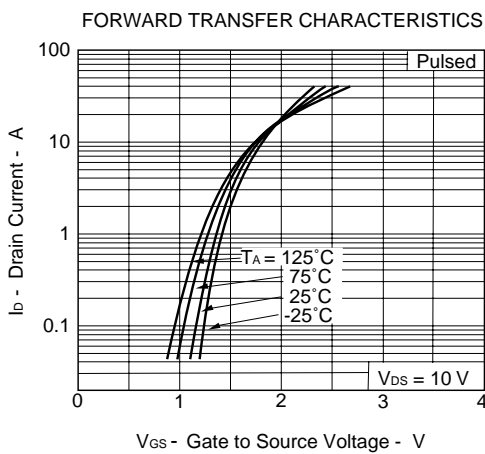
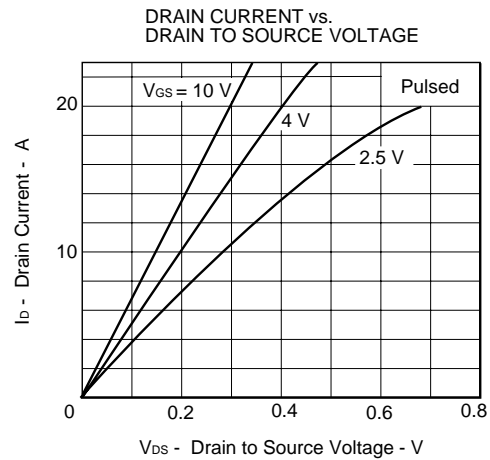
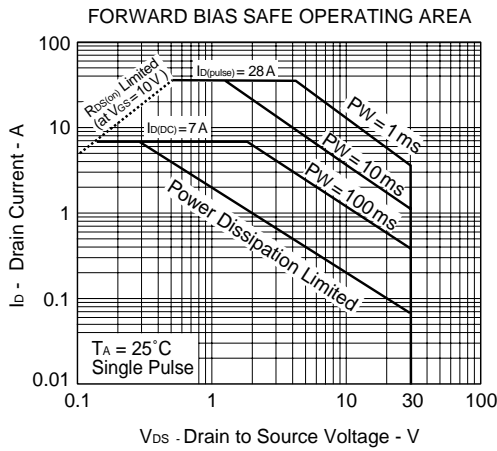
**TEST CIRCUIT 2 GATE CHARGE**



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

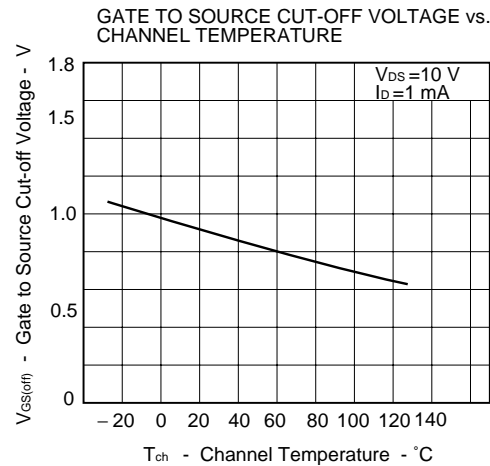
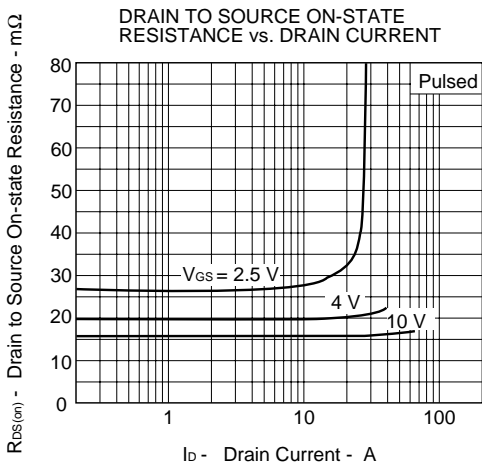
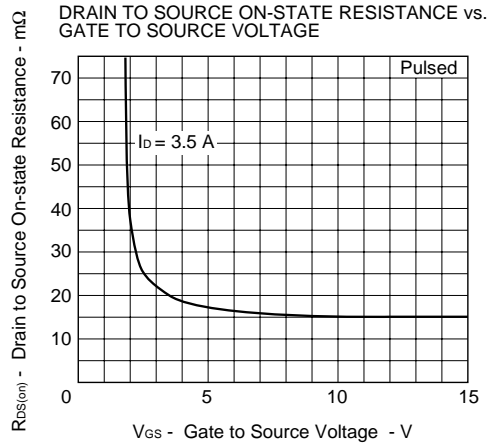
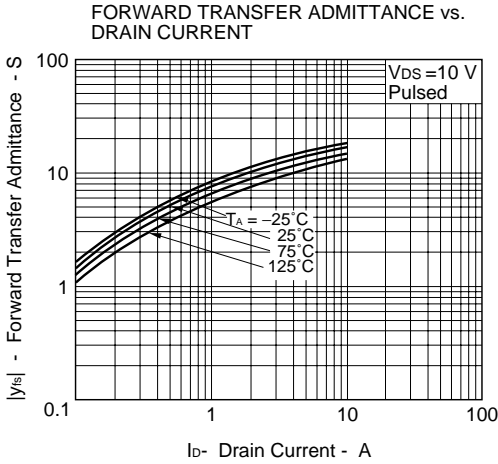
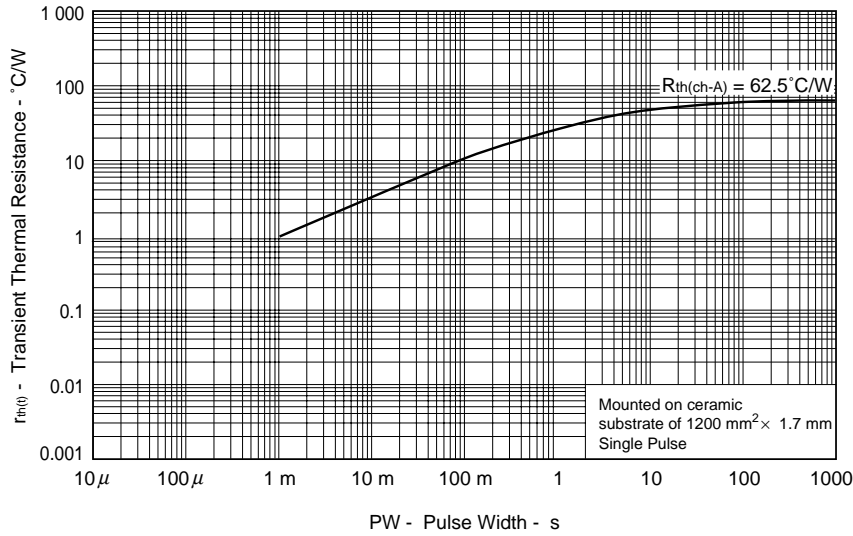


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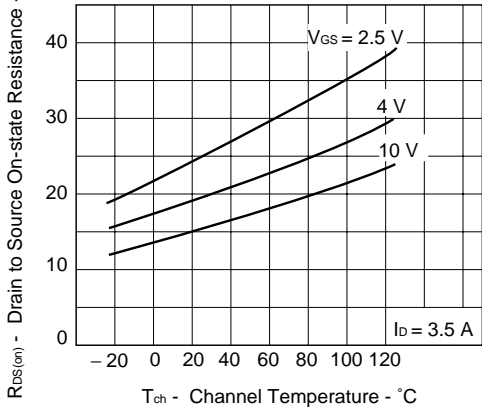


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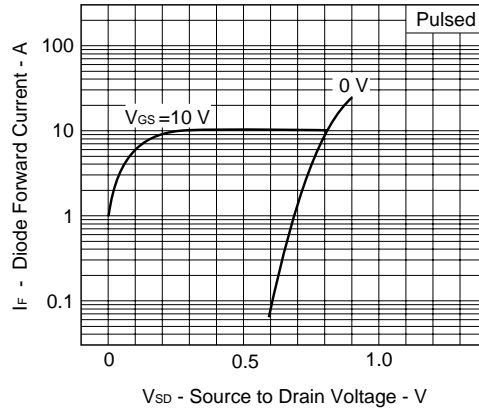
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



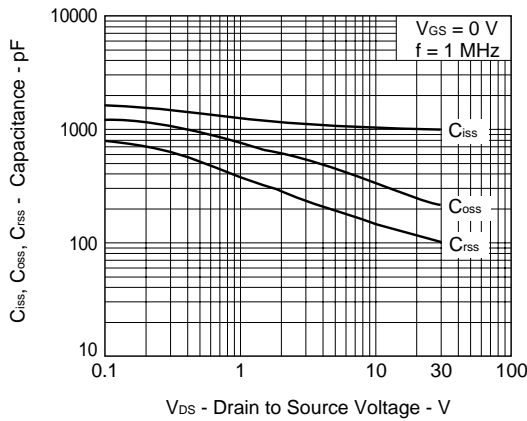
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



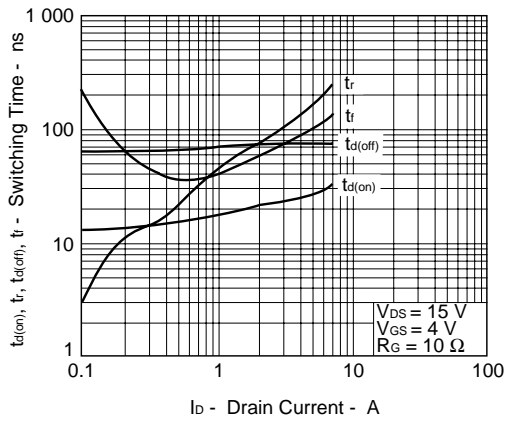
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



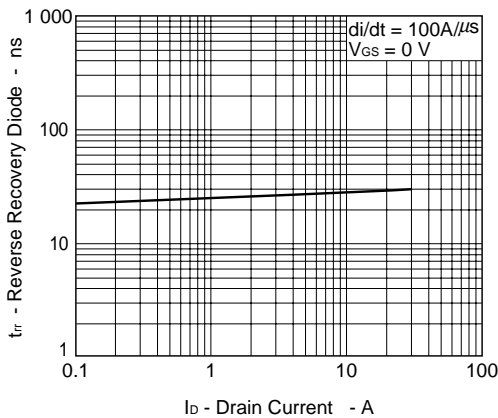
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



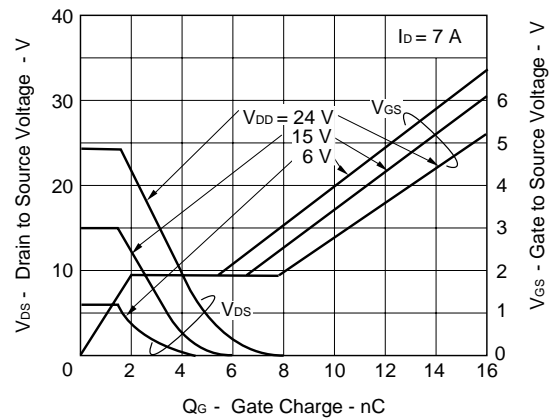
SWITCHING CHARACTERISTICS



REVERSE RECOVERY TIME vs. DRAIN CURRENT



DYNAMIC INPUT/OUTPUT CHARACTERISTICS



[MEMO]



[MEMO]

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