

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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P-CHANNEL MOS FIELD EFFECT TRANSISTOR  
 FOR SWITCHING

DESCRIPTION

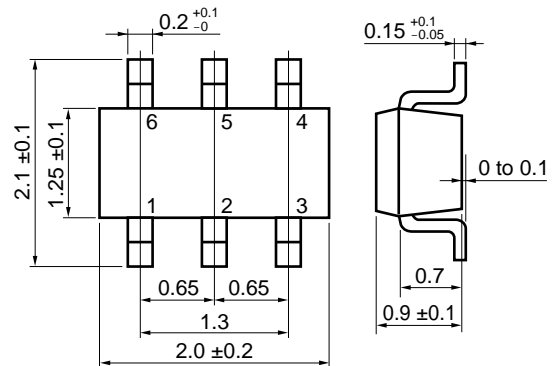
The  $\mu$  PA678TB is a switching device, which can be driven directly by a 2.5 V power source.

The  $\mu$  PA678TB 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  
 $R_{DS(on)1} = 1.45 \Omega$  MAX. ( $V_{GS} = -4.5$  V,  $I_D = -0.20$  A)  
 $R_{DS(on)2} = 1.55 \Omega$  MAX. ( $V_{GS} = -4.0$  V,  $I_D = -0.20$  A)  
 $R_{DS(on)3} = 2.98 \Omega$  MAX. ( $V_{GS} = -2.5$  V,  $I_D = -0.15$  A)
- Two MOS FET circuits in same size package as SC-70

PACKAGE DRAWING (Unit: mm)



ORDERING INFORMATION

PART NUMBER	PACKAGE
$\mu$ PA678TB	SC-88 (SSP)

Marking: XA

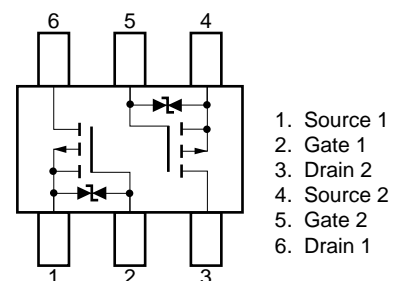
ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

Drain to Source Voltage ( $V_{GS} = 0$ V)	$V_{DSS}$	-20	V
Gate to Source Voltage ( $V_{DS} = 0$ V)	$V_{GSS}$	$\mp 12$	V
Drain Current (DC)	$I_{D(DC)}$	$\mp 0.25$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\mp 1.00$	A
Total Power Dissipation (2 units) <sup>Note2</sup>	$P_T$	0.2	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  $2500 \text{ mm}^2 \times 1.1 \text{ mm}$

**Caution** This product is electrostatic-sensitive device due to low ESD capability and should be handled with caution for electrostatic discharge.  
 $V_{ESD} = \pm 100$  V TYP. ( $C = 200$  pF,  $R = 0 \Omega$ , Single pulse)

PIN CONNECTION (Top View)



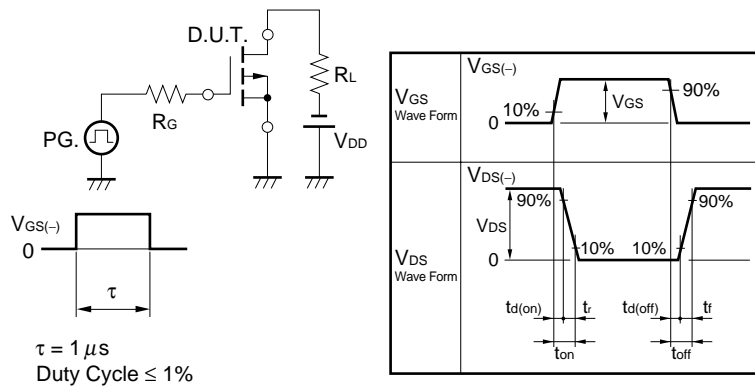
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**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

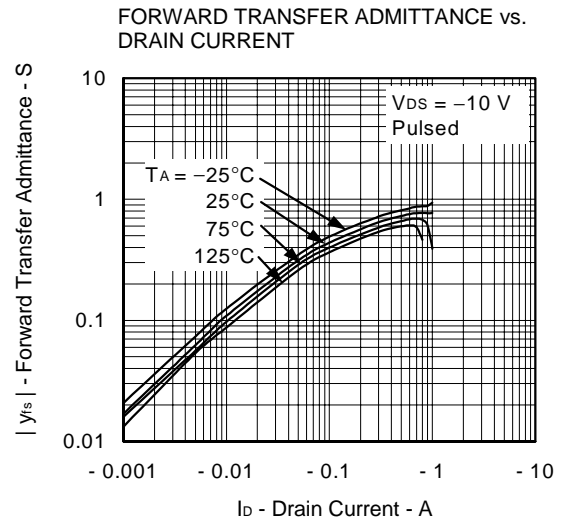
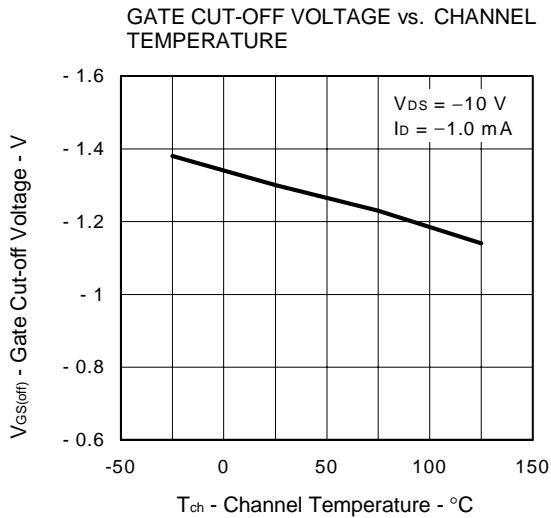
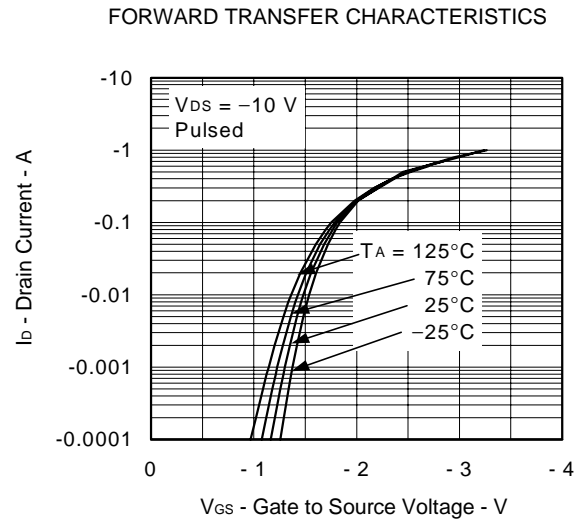
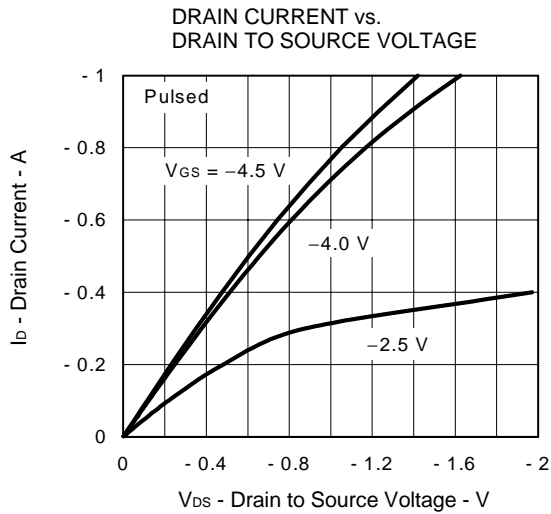
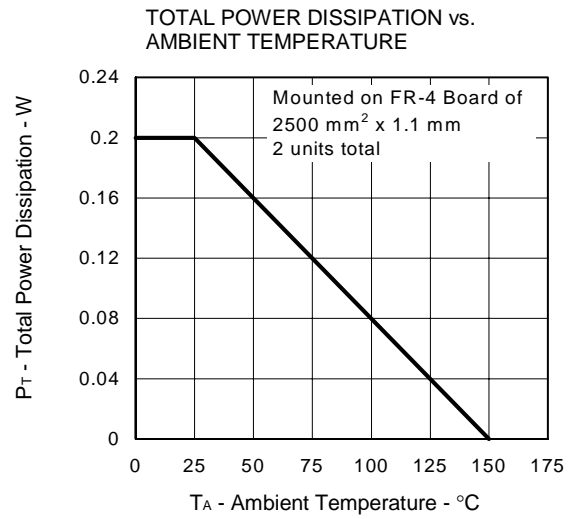
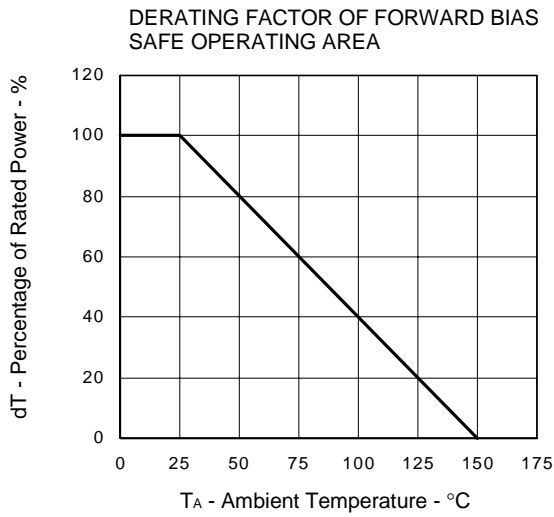
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = -20.0 V, V <sub>GS</sub> = 0 V			-1.0	μA
Gate Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±12.0 V, V <sub>DS</sub> = 0 V			±10	μA
Gate Cut-off Voltage <sup>Note</sup>	V <sub>GS(off)</sub>	V <sub>DS</sub> = -10.0 V, I <sub>D</sub> = -1.0 mA	-0.8	-1.3	-1.8	V
Forward Transfer Admittance <sup>Note</sup>	y <sub>fs</sub>	V <sub>DS</sub> = -10.0 V, I <sub>D</sub> = -0.20 A	0.2	0.6		S
Drain to Source On-state Resistance <sup>Note</sup>	R <sub>DS(on)1</sub>	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -0.20 A		1.17	1.45	Ω
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = -4.0 V, I <sub>D</sub> = -0.20 A		1.25	1.55	Ω
	R <sub>DS(on)3</sub>	V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -0.15 A		2.25	2.98	Ω
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = -10.0 V		29		pF
Output Capacitance	C <sub>oss</sub>	V <sub>GS</sub> = 0 V		15		pF
Reverse Transfer Capacitance	C <sub>rss</sub>	f = 1.0 MHz		3		pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = -10.0 V, I <sub>D</sub> = -0.20 A		23		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = -4.0 V		39		ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 10 Ω		50		ns
Fall Time	t <sub>f</sub>			33		ns
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 0.25 A, V <sub>GS</sub> = 0 V		0.88		V

**Note** Pulsed: PW ≤ 350 μs, Duty cycle ≤ 2%

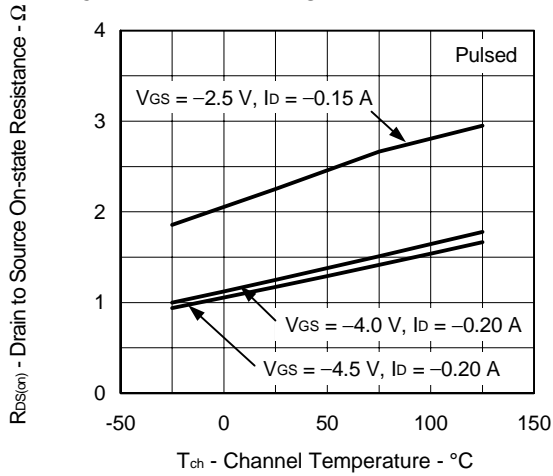
**TEST CIRCUIT SWITCHING TIME**



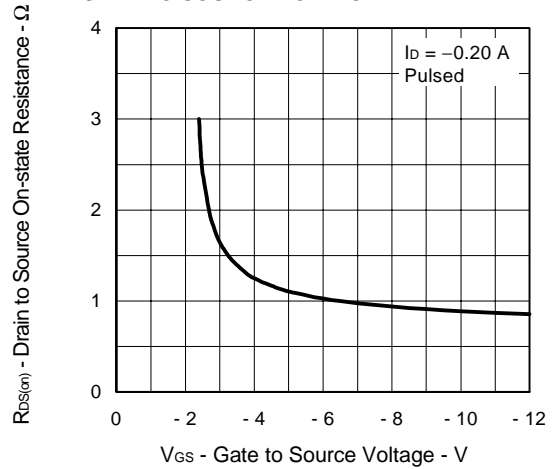
TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ )



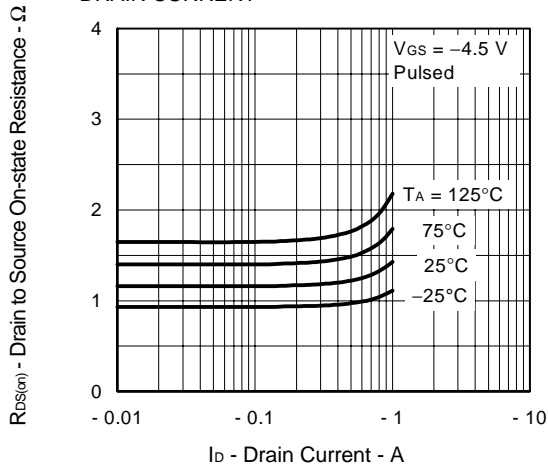
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



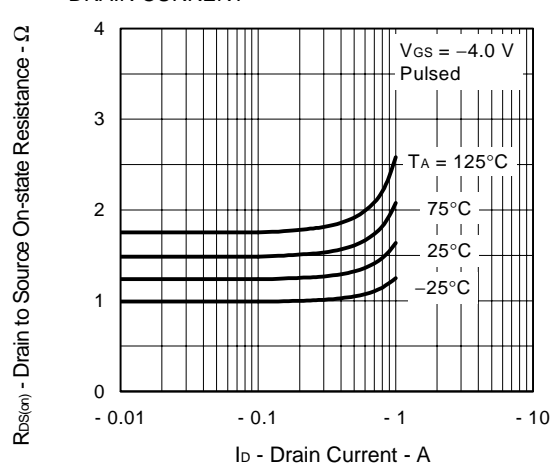
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



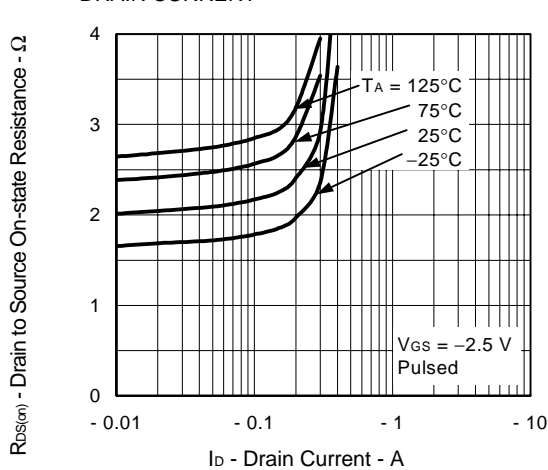
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



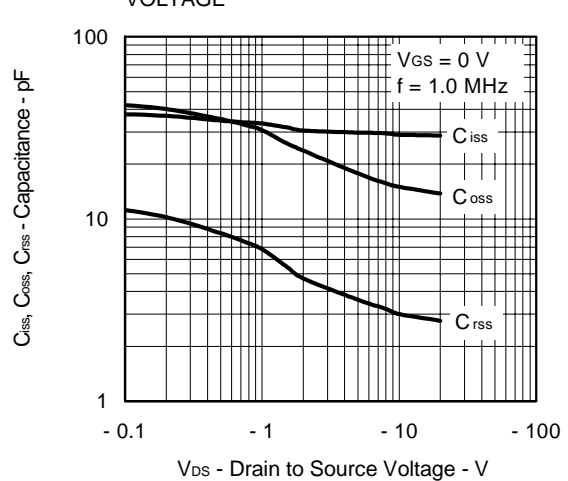
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



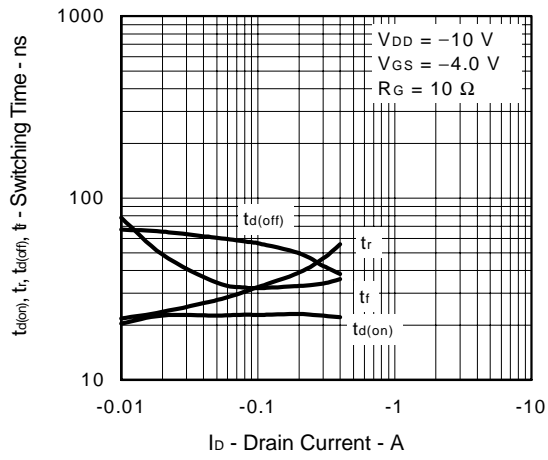
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



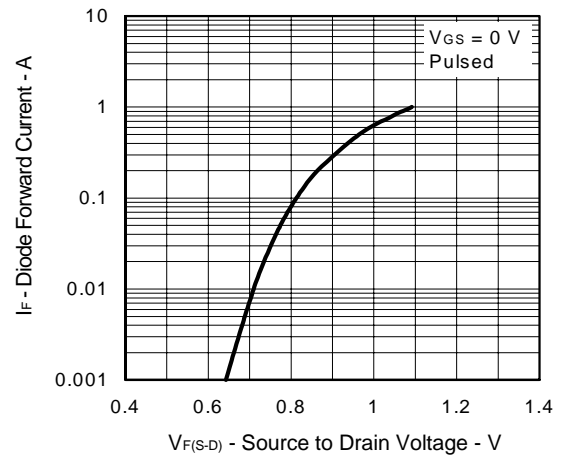
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



SWITCHING CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE



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