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PQ05RA1/PQ05RA11 Series

OFF-state Low Dissipation Current 1A
Output, Low Power-Loss Voltage Regulators

■ General Description

The Sharp's PQ05RA1/PQ05RA11 series 4-terminal low power-loss voltage regulators provide 1A output and employ the compact full-mold package. The regulator has the overcurrent protection function and overheat protection function and built-in ON/OFF control function. It is characterized by reduced dissipation current in OFF-state. It serves best as series regulator for constant voltage power supply of battery drive devices.

■ Features

- (1) OFF-state low dissipation current
(I_{qs} : $1\mu A$, as compared to former model PQ05RF11/10⁴)
- (2) Built-in ON/OFF control function
- (3) Low power-loss (voltage difference between input and output : MAX. 0.5V)
- (4) Compact resin full-mold package

■ Model Line-ups

	5Voutput	9Voutput	12Voutput
Output voltage precision : $\pm 5\%$	PQ05RA1	PQ09RA1	PQ12RA1
Output voltage precision : $\pm 2.5\%$	PQ05RA11	PQ09RA11	PQ12RA11

■ Applications

Series power supply for OA and AV equipment

■ Absolute Maximum Ratings

($T_a = 25^\circ C$)

Parameter	Symbol	Rating	Unit
*1 Input voltage	V_{in}	35	V
*2 ON/OFF control terminal voltage	V_c	35	V
Output current	I_o	1	A
Power dissipation (no heat sink)	$Pd1$	1.5	W
Power dissipation (with infinite heat sink)	$Pd2$	15	W
*2 Junction temperature	T_j	150	$^\circ C$
Operating temperature	T_{opr}	-20 to +80	$^\circ C$
Storage temperature	T_{stg}	-40 to +150	$^\circ C$
*3 Soldering temperature	T_{sol}	260	$^\circ C$

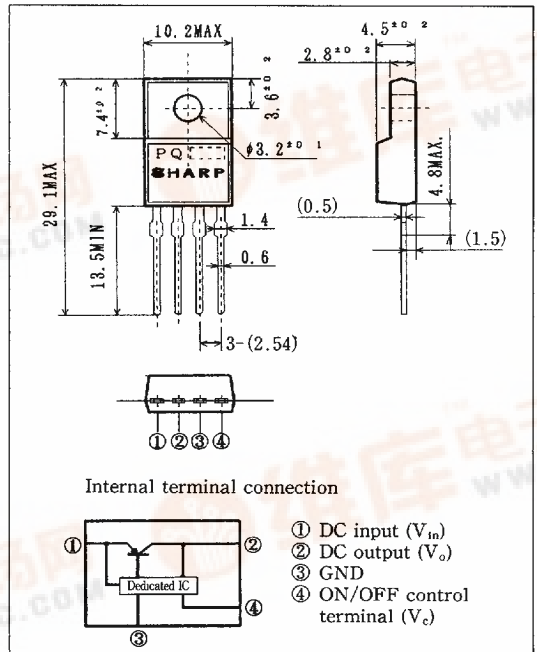
*1 All are open except GND and applicable terminals.

*2 Overheat protection operates at $T_j > 125^\circ C$

*3 For 10 s

■ Outline Dimensions

(Unit : mm)



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In the absence of confirmation by device specification sheets, SHARP takes no responsibility for any defects that occur in equipment using any of SHARP's devices, shown in catalogs, data books, etc. Contact SHARP in order to obtain the latest version of the device specification sheets before using any SHARP's device.

Electrical Characteristics

(Unless otherwise specified condition shall be $V_c=2.7V$, $I_o=0.5A$, $T_a=25^\circ C$ *4)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output voltage	PQ05RA1	—	4.75	5.0	5.25	V
	PQ09RA1		8.55	9.0	9.45	
	PQ12RA1		11.4	12.0	12.6	
	PQ05RA11		4.88	5.0	5.12	
	PQ09RA11		8.78	9.0	9.22	
	PQ12RA11		11.7	12.0	12.3	
Load regulation	R_{egL}	$I_o=5mA$ to $1.0A$	—	0.1	2.0	%
Line regulation	R_{egI}	*5	—	0.2	2.5	%
Temperature coefficient of output voltage	$T_c V_o$	$T_j=0$ to $125^\circ C$	—	± 0.004	—	%/ $^\circ C$
Ripple rejection	RR	Refer to Fig. 2	45	55	—	dB
Dropout voltage	V_{1-o}	*6	—	—	0.5	V
ON-state voltage for control	$V_{c(on)}$	—	2.0	—	—	V
ON-state current for control	$I_{c(on)}$	—	—	—	200	μA
*7OFF-state voltage for control	$V_{c(off)}$	—	—	—	0.8	V
OFF-state current for control	$I_{c(off)}$	$V_c=0.4V$	—	—	2	μA
Quiescent current	I_q	$I_o=0A$, $V_{in}=35V$	—	—	8	mA
Output OFF-state consumption current	I_{qs}	$I_o=0A$, $V_{in}=35V$, $V_c=0.4V$	—	—	1	μA

*4 PQ05RA1 series : $V_{in}=7V$, PQ09RA1 series : $V_{in}=11V$, PQ12RA1 series : $V_{in}=14V$

*5 PQ05RA1/PQ05RA11 : $V_{in}=6$ to $16V$

PQ09RA1/PQ09RA11 : $V_{in}=10$ to $20V$

PQ12RA1/PQ12RA11 : $V_{in}=13$ to $23V$

*6 Input voltage shall be the value when output voltage is 95% in comparison with the initial value.

*7 In case of opening control terminal, output voltage turns off.

Fig. 1 Test Circuit

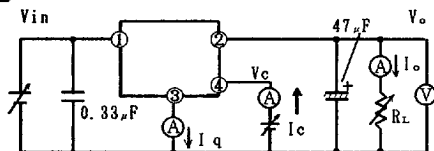
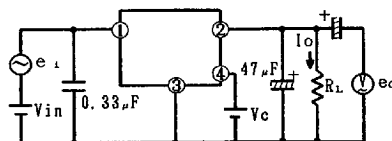


Fig. 2 Test Circuit of Ripple Rejection



$f=120Hz$ (sine wave)

$e_i=0.5V_{rms}$

$RR=20\log(e_i/e_o)$

Fig. 3 Power Dissipation vs. Ambient Temperature

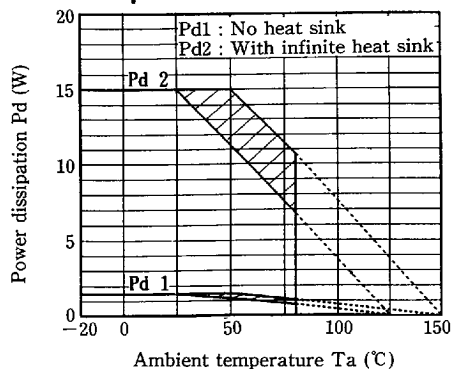


Fig. 4 Overcurrent Protection Characteristics (Typical value)

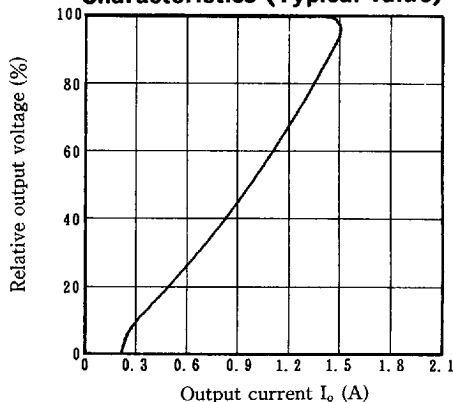


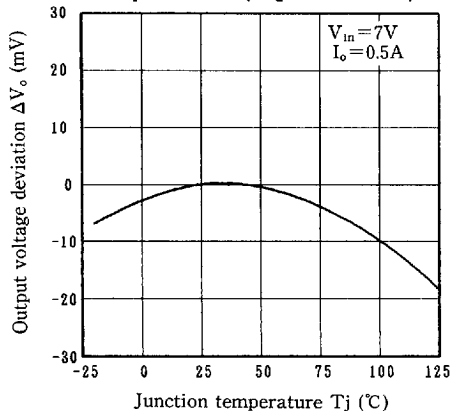
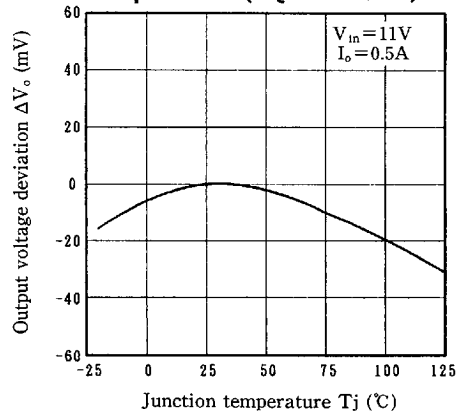
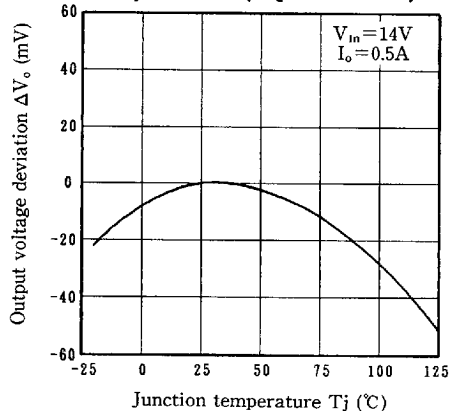
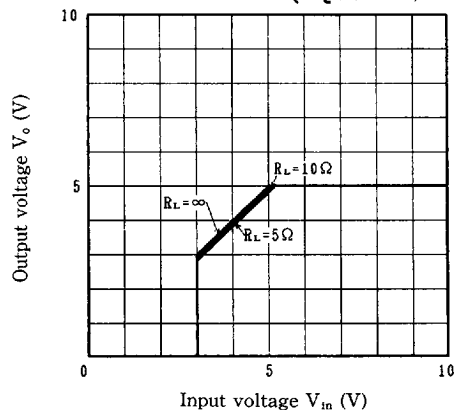
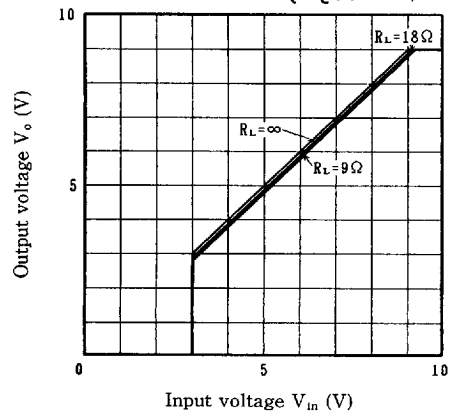
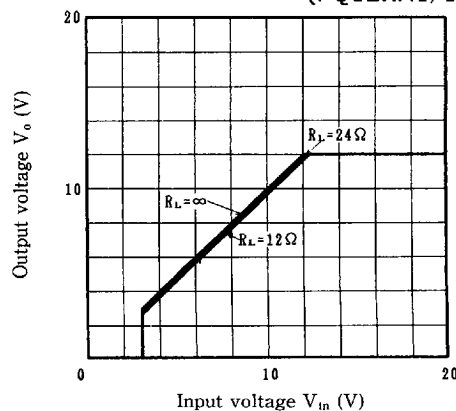
Fig. 5 Output Voltage Deviation vs. Junction Temperature (PQ05RA1/11)**Fig. 6 Output Voltage Deviation vs. Junction Temperature (PQ09RA1/11)****Fig. 7 Output Voltage Deviation vs. Junction Temperature (PQ12RA1/11)****Fig. 8 Output Voltage vs. Input Voltage (PQ05RA1/11)****Fig. 9 Output Voltage vs. Input Voltage (PQ09RA1/11)****Fig. 10 Output Voltage vs. Input Voltage (PQ12RA1/11)**

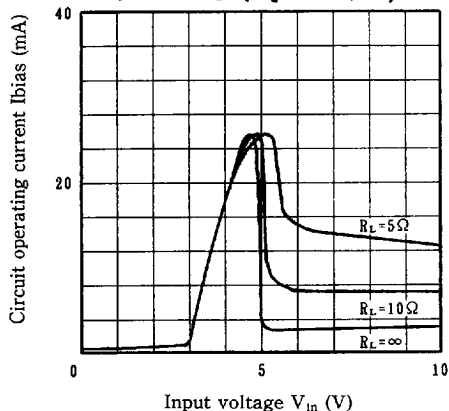
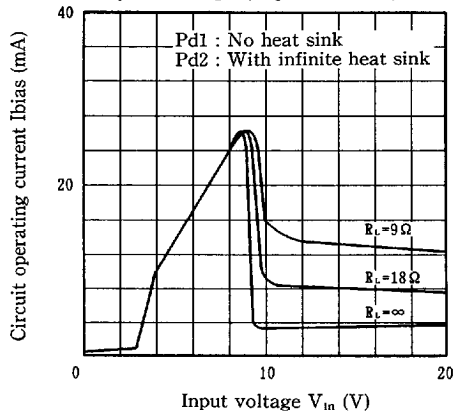
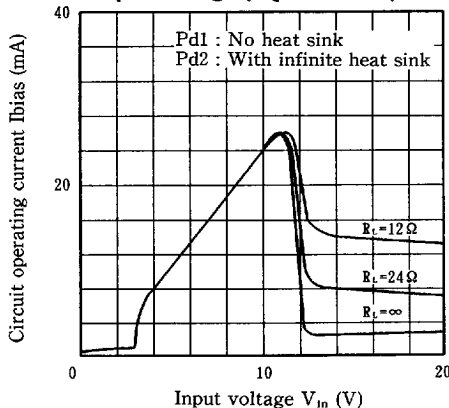
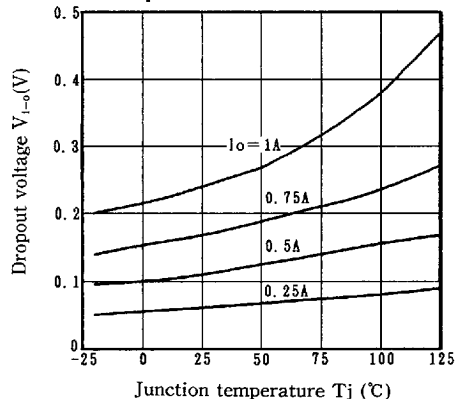
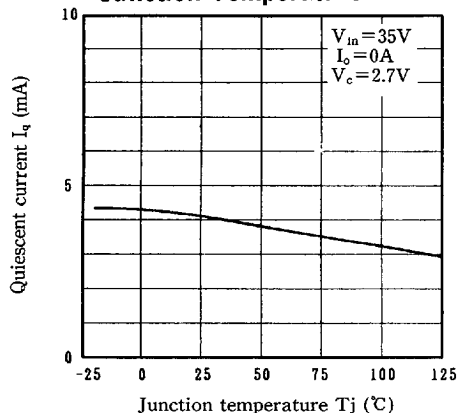
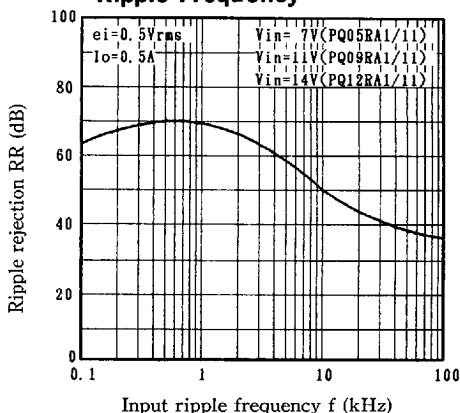
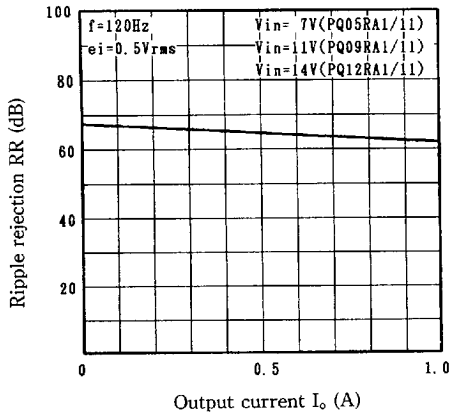
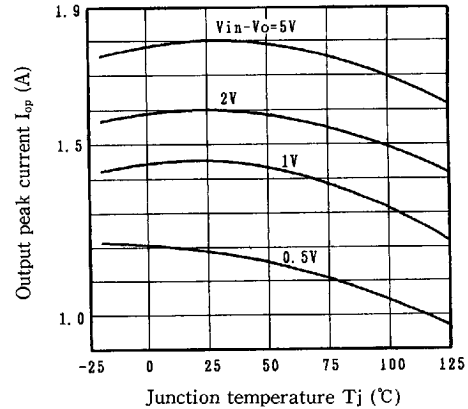
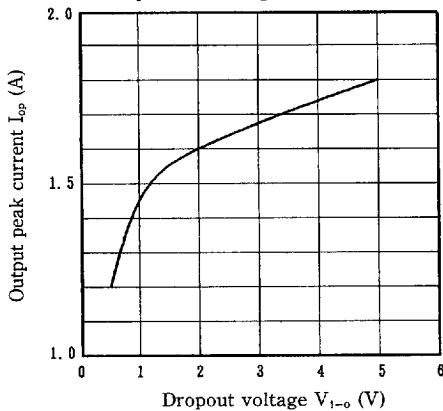
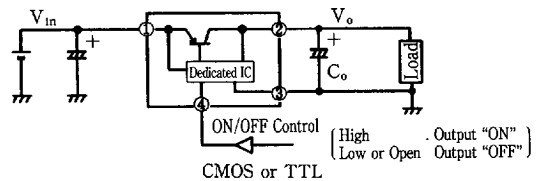
Fig. 11 Circuit Operating Current vs. Input Voltage (PQ05RA1/11)**Fig. 12 Circuit Operating Current vs. Input Voltage (PQ09RA1/11)****Fig. 13 Circuit Operating Current vs. Input Voltage (PQ12RA1/11)****Fig. 14 Dropout Voltage vs. Junction Temperature****Fig. 15 Quiescent Current vs. Junction Temperature****Fig. 16 Ripple Rejection vs. Input Ripple Frequency**

Fig. 17 Ripple Rejection vs. Output Current**Fig. 18 Output Peak Current vs. Junction Temperature****Fig. 19 Output Peak Current vs. Dropout Voltage****Typical Application****Precautions for Use**

If voltage exceeding voltage of DC input terminal ① is applied to the output terminal ②, the element may be broken. Especially, when the DC input terminal ① is short-circuited to GND in ordinary operating state, the output terminal voltage is higher than the voltage of DC input terminal, charges accumulated in the output capacitor C_o flow to the input side, causing damage to the element. In this case connect the ordinary silicon diode as shown in the figure.

Note:

The specification is subject to change for improvement.

Cares when handling:

Be sure to observe the requirements described in the specification and data book.

