

# PQ05RD21 Series/PQ3RD23

2.0A Output Type Low Power-Loss Voltage Regulator

## Features

- Low power-loss (Dropout voltage: MAX 0.5V at  $I_o=2.0A$ )
- 2.0A output type
- Compact resin package (equivalent to TO-220)
- Available 3.3V/5V/9V/12V output type
- Output voltage precision:  $\pm 3.0\%$
- Built-in ON/OFF control function
- Built in overcurrent, overheat protection functions, ASO protection circuit.
- Lead forming type is also available.

## Applications

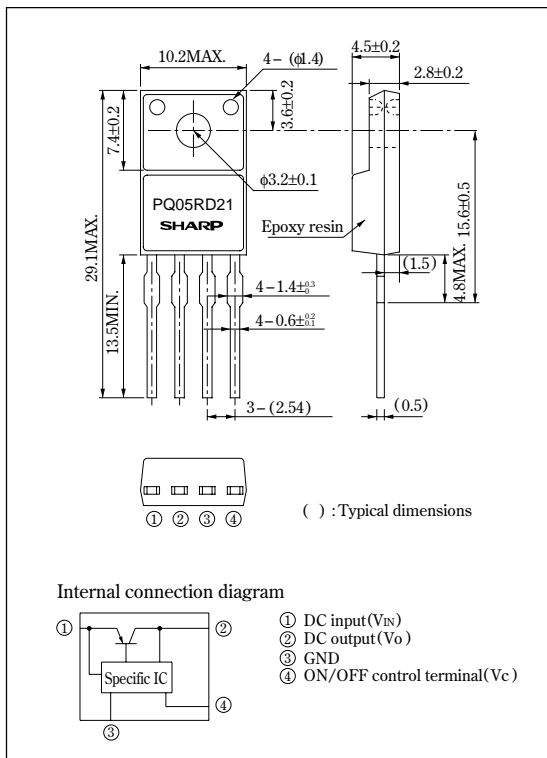
- Power supplies for various electronic equipment such as AV, OA equipment

## Model Line-ups

	2.0A output
3.3V output	PQ3RD23
5.0V output	PQ05RD21
9.0V output	PQ09RD21
12.0V output	PQ12RD21

## Outline Dimensions

(Unit : mm)



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(T<sub>a</sub>=25°C)

Parameter	Symbol	Rating	Unit
*1 Input voltage	V <sub>IN</sub>	20	V
*1 ON/OFF control terminal voltage	V <sub>C</sub>	20	V
Output current	I <sub>o</sub>	2.0	A
*2 Power dissipation	P <sub>D1</sub>	1.4	W
	P <sub>D2</sub>	15	W
*3 Junction temperature	T <sub>j</sub>	150	°C
Operating temperature	T <sub>opr</sub>	-20 to +80	°C
Storage temperature	T <sub>stg</sub>	-40 to +150	°C
Soldering temperature	T <sub>sol</sub>	260 (For 10s)	°C

\*1 All are open except GND and applicable terminals.

\*2 P<sub>D1</sub>: No heat sink, P<sub>D2</sub>: With infinite heat sink

\*3 Overheat protection may operate at 125 ≤ T<sub>j</sub> ≤ 150°C.

• Please refer to the chapter " Handling Precautions ".

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Electrical Characteristics

(Unless otherwise specified,  $I_o=1.0A$ ,  $T_a=25^\circ C$ )

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	
Output voltage	$V_o$	#4	PQ3RD23	3.201	3.3	3.399	V
			PQ05RD21	4.85	5.0	5.15	
			PQ09RD21	8.73	9.0	9.27	
			PQ12RD21	11.64	12.0	12.36	
Load regulation	$RegL$	$I_o=5mA$ to $2.0A$ , #4	—	0.1	2.0	%	
Line regulation	$RegI$	#5, $I_o=5mA$	PQ3RD23	—	0.1	2.5	%
			PQ05RD21 series	—	0.5	2.5	
Temperature coefficient of output voltage	$TcV_o$	$T_j=0$ to $125^\circ C$ , $I_o=5mA$	—	$\pm 0.02$	—	%/ $^\circ C$	
Ripple rejection	RR	Refer to Fig.2	45	55	—	dB	
Dropout voltage	$V_{i-o}$	#6, $I_o=2A$	—	—	0.5	V	
#7 ON-state voltage for control	$V_{C(ON)}$	#4	2.0	—	—	V	
ON-state current for control	$I_{C(ON)}$	$V_C=2.7V$ , #4	—	—	20	$\mu A$	
OFF-state voltage for control	$V_{C(OFF)}$	#4	—	—	0.8	V	
OFF-state current for control	$I_{C(OFF)}$	$V_C=0.4V$ , #4	—	—	-0.4	mA	
Quiescent current	$I_q$	$I_o=0A$ , #4	—	—	10	mA	

#4 PQ3RD23: $V_{IN}=5V$ , PQ05RD21: $V_{IN}=7V$ , PQ09RD21: $V_{IN}=11V$ , PQ12RD21:  $V_{IN}=14V$

#5 PQ3RD23: $V_{IN}=4$  to  $10V$ , PQ05RD21: $V_{IN}=6$  to  $12V$ , PQ09RD21: $V_{IN}=10$  to  $16V$ , PQ12RD21:  $V_{IN}=13$  to  $19V$

#6 Input voltage shall be the value when output voltage is 95% in comparison with the initial value. PQ3RD23: $V_{IN}=3.7V$

#7 In case of opening control terminal ④, output voltage turns on.

Fig. 1 Test Circuit

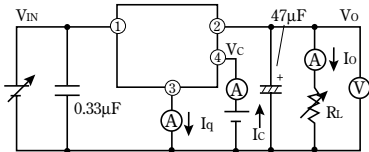
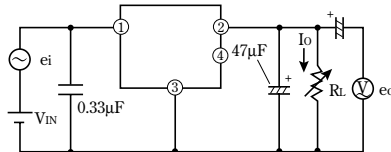
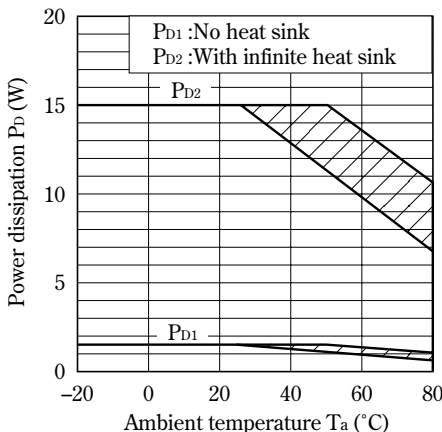


Fig. 2 Test Circuit of Ripple Rejection



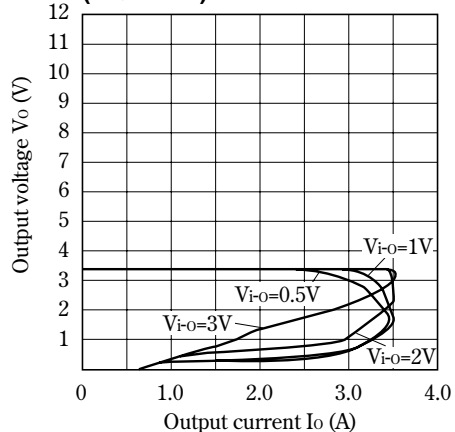
$f=120Hz$  (sine wave)  
 $e_i(rms)=0.5V$   
 $V_{IN}=5V$  (PQ3RD23)  
 $7V$  (PQ05RD21)  
 $11V$  (PQ09RD21)  
 $14V$  (PQ12RD21)  
 $I_o=0.5A$   
 $RR=20 \log (e_i(rms)/e_o(rms))$

Fig. 3 Power Dissipation vs. Ambient Temperature

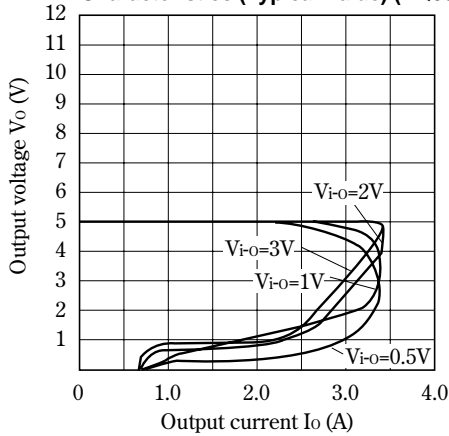


Note) Oblique line portion : Overheat protection may operate in this area.

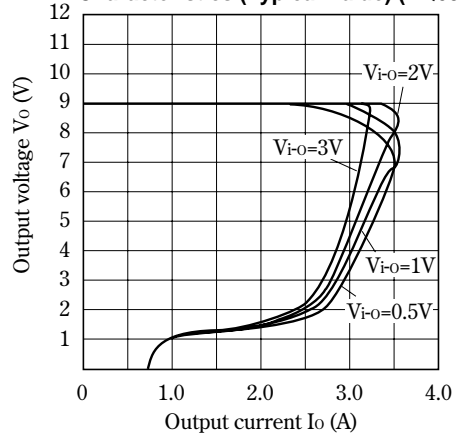
Fig. 4 Overcurrent Protection Characteristics (Typical Value) (PQ3RD23)



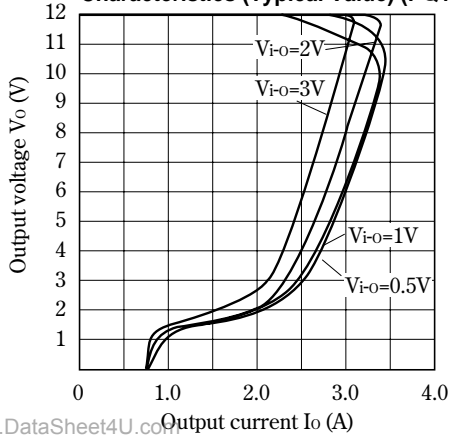
**Fig. 5 Overcurrent Protection Characteristics (Typical Value) (PQ05RD21)**



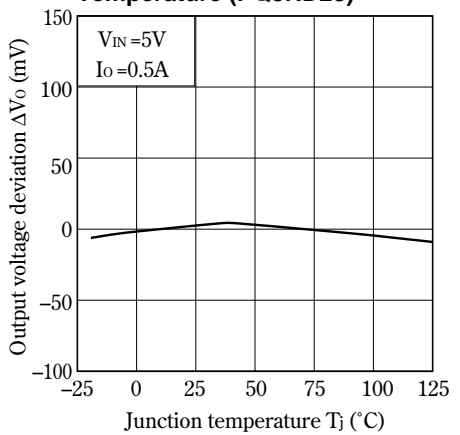
**Fig. 6 Overcurrent Protection Characteristics (Typical Value) (PQ09RD21)**



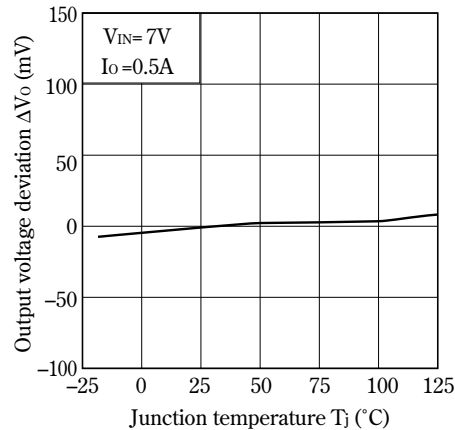
**Fig. 7 Overcurrent Protection Characteristics (Typical Value) (PQ12RD21)**



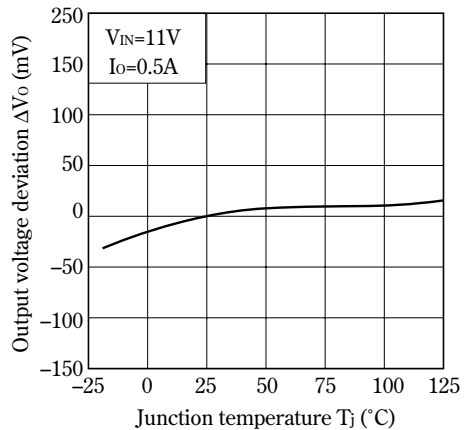
**Fig. 8 Output Voltage Deviation vs. Junction Temperature (PQ3RD23)**



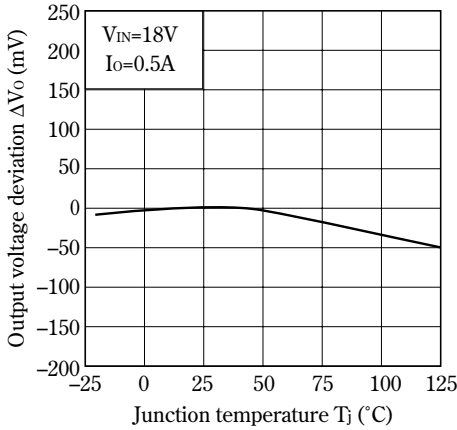
**Fig. 9 Output Voltage Deviation vs. Junction Temperature (PQ05RD21)**



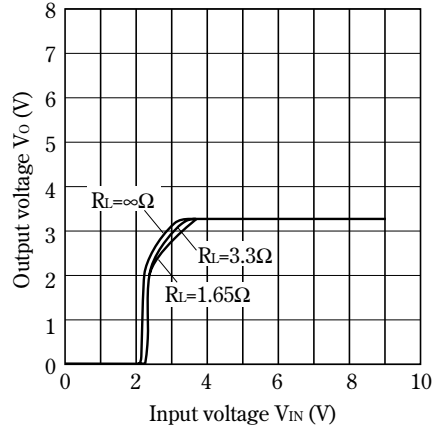
**Fig. 10 Output Voltage Deviation vs. Junction Temperature (PQ09RD21)**



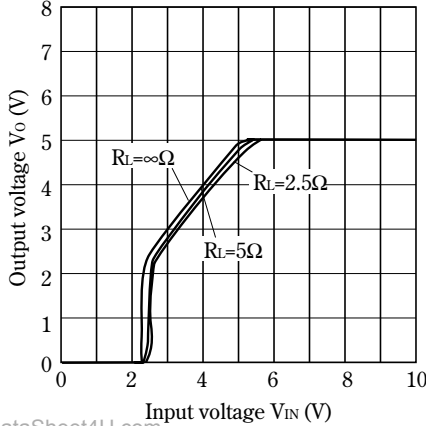
**Fig.11 Output Voltage Deviation vs. Junction Temperature (PQ12RD21)**



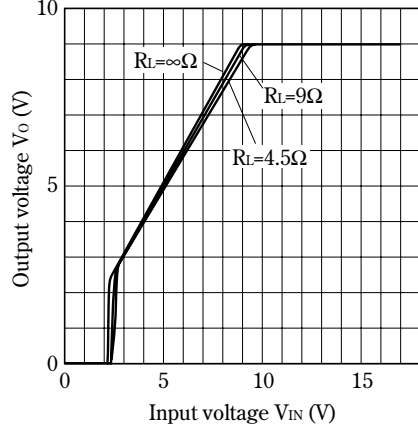
**Fig.12 Output Voltage vs. Input Voltage (PQ3RD23)**



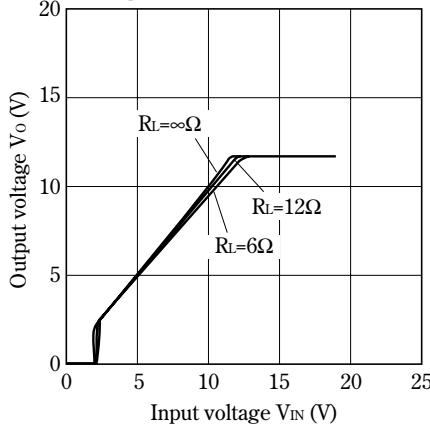
**Fig.13 Output Voltage vs. Input Voltage (PQ05RD21)**



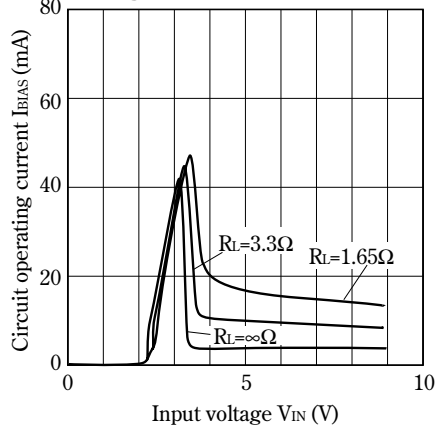
**Fig.14 Output Voltage vs. Input Voltage (PQ09RD21)**



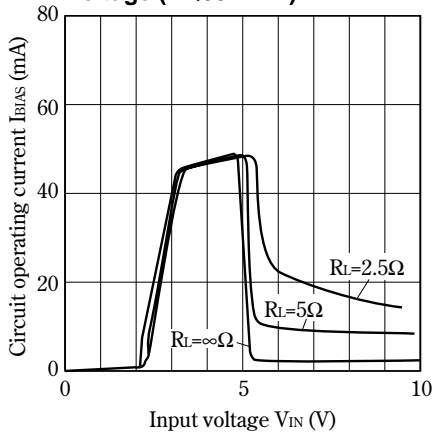
**Fig.15 Output Voltage vs. Input Voltage (PQ12RD21)**



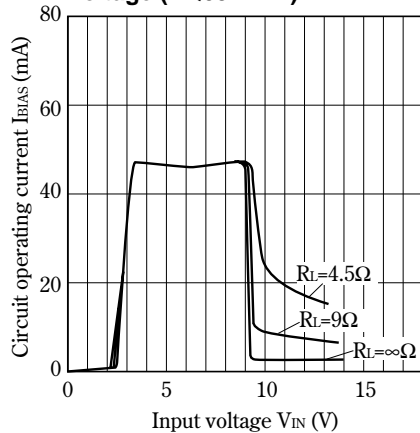
**Fig.16 Circuit Operating Current vs. Input Voltage (PQ3RD23)**



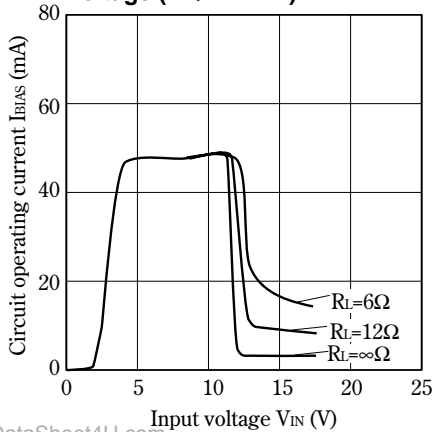
**Fig.17 Circuit Operating Current vs. Input Voltage (PQ05RD21)**



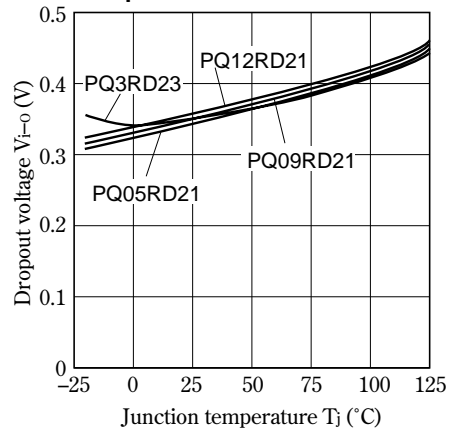
**Fig.18 Circuit Operating Current vs. Input Voltage (PQ09RD21)**



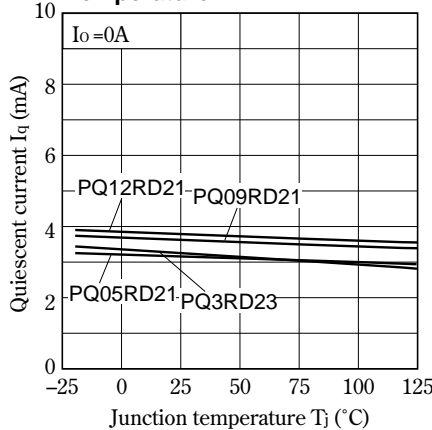
**Fig.19 Circuit Operating Current vs. Input Voltage (PQ12RD21)**



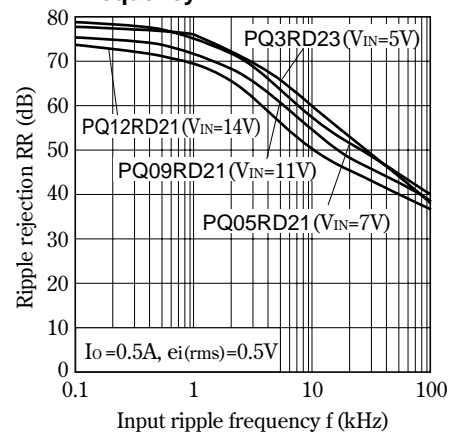
**Fig.20 Dropout Voltage vs. Junction Temperature**



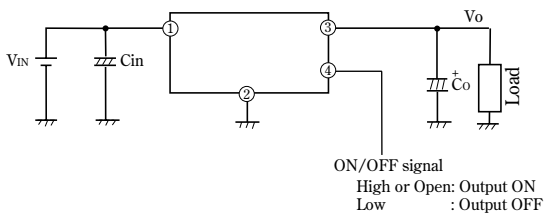
**Fig.21 Quiescent Current vs. Junction Temperature**



**Fig.22 Ripple Rejection vs. Input Ripple Frequency**



■ ON/OFF Operation



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