

# PQ05SZ5/PQ05SZ1 Series

Low Power-Loss Voltage Regulators (Built-in Reverse Voltage Protection Function)

## Features

- Low power-loss (Dropout voltage: MAX. 0.5V)
- Surface mount type package (Equivalent to SC-63)
- Built-in a function to prevent reverse voltage between input and output  
The diode to prevent reverse voltage between input and output is not necessary. (When  $V_{O-I} \leq 13V$ )

## Applications

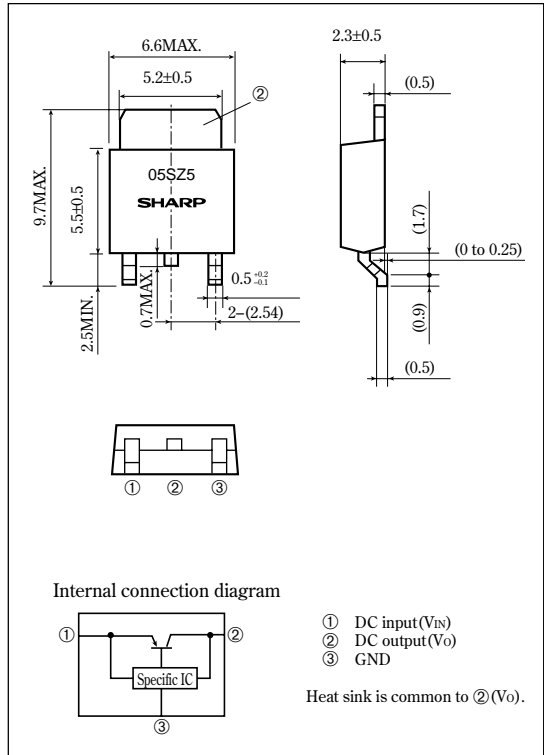
- Portable equipment
- Notebook PC

## Model Line-ups

		5V output	9V output	12V output
1A output	Output voltage precision: $\pm 5\%$	PQ05SZ5	PQ09SZ5	PQ12SZ5
	Output voltage precision: $\pm 2.5\%$	PQ05SZ1	PQ09SZ1	PQ12SZ1
	Output voltage precision: $\pm 5\%$	PQ05SZ11	PQ09SZ11	PQ12SZ11
	Output voltage precision: $\pm 2.5\%$	PQ05SZ11	PQ09SZ11	PQ12SZ11

## Outline Dimensions

(Unit : mm)



## Absolute Maximum Ratings (Ta=25°C, xx=05,09,12)

Parameter	Symbol	Conditions	Rating		Unit
			PQxxSZ5/51	PQxxSZ1/11	
Input voltage	$V_{IN}$	*1	24		V
Input-output reverse voltage	$V_{O-I}$	$V_{IN}=0V$	13		V
Output current	$I_O$		0.5	1.0	A
Power dissipation	$P_D$	Refer to Fig. 4*2	8		W
Junction temperature	$T_j$	*	150		°C
Operating temperature	$T_{opr}$		-20 to +80		°C
Storage temperature	$T_{stg}$		-40 to +150		°C
Soldering temperature	$T_{sol}$	For 10s	260		°C

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

\*2 With infinite heat sink.

\* Over heat protection may operate at  $T_j \geq 125^\circ C$

•Please refer to the chapter " Handling Precautions "

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Electrical Characteristics

(Tj=25°C, xx=05,09,12)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	
Output voltage	V <sub>O</sub>	*3	V <sub>IN</sub> =7V	4.75	5.0	5.25	V
			V <sub>IN</sub> =11V	8.55	9.0	9.45	
			V <sub>IN</sub> =14V	11.4	12.0	12.6	
			V <sub>IN</sub> =7V	4.88	5.0	5.12	
			V <sub>IN</sub> =11V	8.78	9.0	9.22	
			V <sub>IN</sub> =14V	11.7	12.0	12.3	
Load regulation	RegL	*4	-	0.2	2.0	%	
Line regulation	RegI	I <sub>O</sub> =5mA, *5	-	0.1	2.5	%	
Temperature coefficient of output voltage	TcV <sub>O</sub>	I <sub>O</sub> =5mA, Tj=0 to 125°C, *6	-	±0.01	-	%/°C	
Ripple rejection	RR	Refer to Fig. 2	45	60	-	dB	
Dropout voltage	V <sub>i-o</sub>	*7	I <sub>O</sub> =0.5A	-	0.2	0.5	V
			I <sub>O</sub> =0.3A				
Quiescent current	I <sub>q</sub>	I <sub>O</sub> =0A, *6	-	4.0	10.0	mA	

\*3 PQxxSZ1/11 Series:I<sub>O</sub>=0.5A

PQxxSZ5/51 Series:I<sub>O</sub>=0.3A

\*4 PQ05SZ1/11:V<sub>IN</sub>=7V, I<sub>O</sub>=5mA to 1.0A PQ05SZ5/51:V<sub>IN</sub>=7V, I<sub>O</sub>=5mA to 0.5A  
 PQ09SZ1/11:V<sub>IN</sub>=11V, I<sub>O</sub>=5mA to 1.0A PQ09SZ5/51:V<sub>IN</sub>=11V, I<sub>O</sub>=5mA to 0.5A  
 PQ12SZ1/11:V<sub>IN</sub>=14V, I<sub>O</sub>=5mA to 1.0A PQ12SZ5/51:V<sub>IN</sub>=14V, I<sub>O</sub>=5mA to 0.5A

\*5 PQ05SZ1/11/5/51:V<sub>IN</sub>=6 to 16V

PQ09SZ1/11/5/51:V<sub>IN</sub>=10 to 20V

PQ12SZ1/11/5/51:V<sub>IN</sub>=13 to 23V

\*6 PQ05SZ1/11/5/51:V<sub>IN</sub>=7V

PQ09SZ1/11/5/51:V<sub>IN</sub>=11V

PQ12SZ1/11/5/51:V<sub>IN</sub>=14V

\*7 Input voltage shall be the value when output voltage is 95% in comparison with the initial value.

Fig.1 Test Circuit

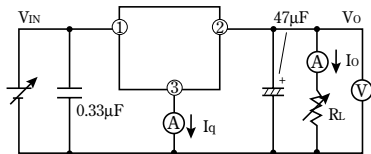
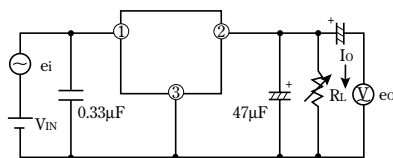
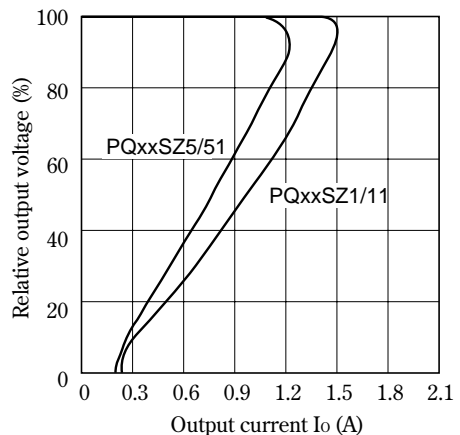


Fig.2 Test Circuit of Ripple Rejection

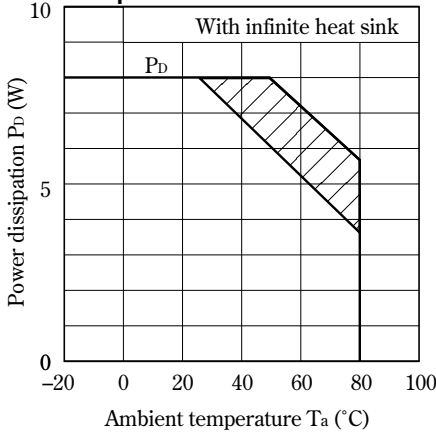


f=120Hz (sine wave)  
 ei(rms)=0.5V  
 V<sub>IN</sub>= 7V (PQ05SZ1/11/5/51)  
 V<sub>IN</sub>=11V (PQ09SZ1/11/5/51)  
 V<sub>IN</sub>=14V (PQ12SZ1/11/5/51)  
 I<sub>O</sub>=0.3A  
 RR=20 log(ei(rms)/eo(rms))

Fig.3 Overcurrent Protection Characteristics (Typical Value)

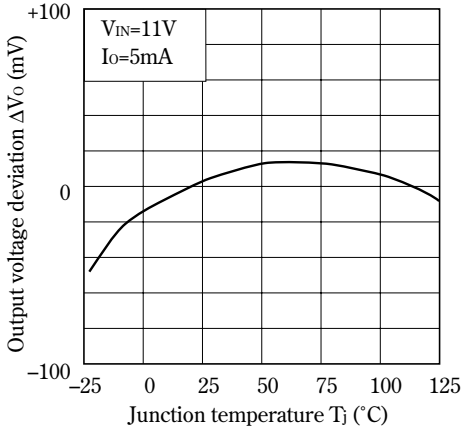


**Fig.4 Power Dissipation vs. Ambient Temperature**

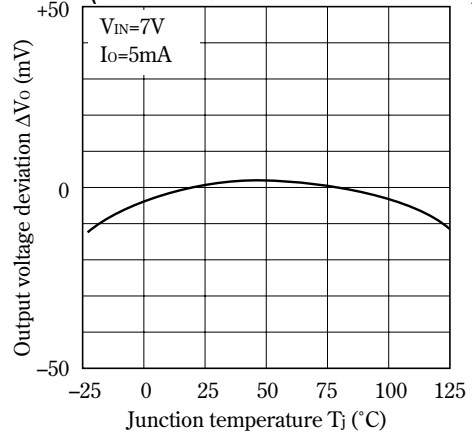


Note) Oblique line portion: Overheat protection may operate in this area.

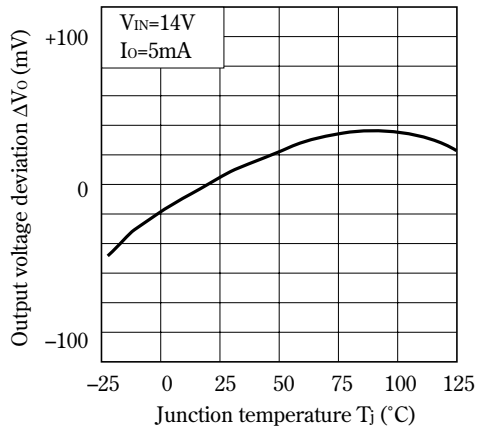
**Fig.6 Output Voltage Deviation vs. Junction Temperature (PQ09SZ1/PQ09SZ11/PQ09SZ5/PQ09SZ51)**



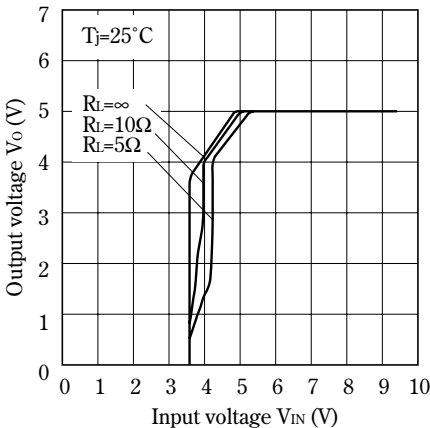
**Fig.5 Output Voltage Deviation vs. Junction Temperature (PQ05SZ1/PQ05SZ11/PQ05SZ5/PQ05SZ51)**



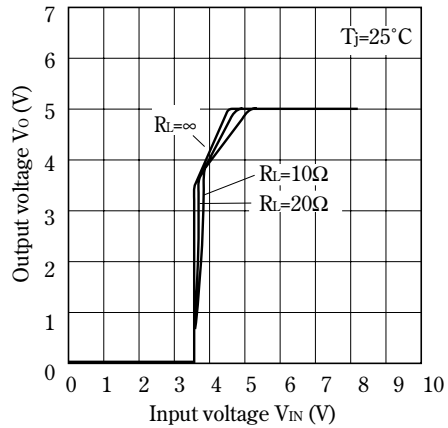
**Fig.7 Output Voltage Deviation vs. Junction Temperature (PQ12SZ1/PQ12SZ11/PQ12SZ5/PQ12SZ51)**



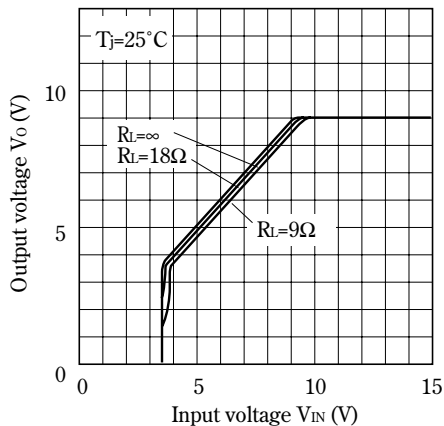
**Fig.8 Output Voltage vs. Input Voltage (PQ05SZ1/PQ05SZ11)**



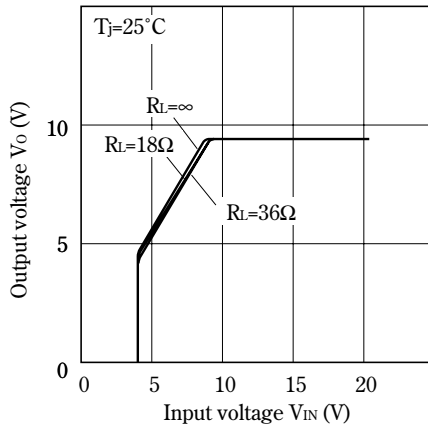
**Fig.9 Output Voltage vs. Input Voltage (PQ05SZ5/PQ05SZ51)**



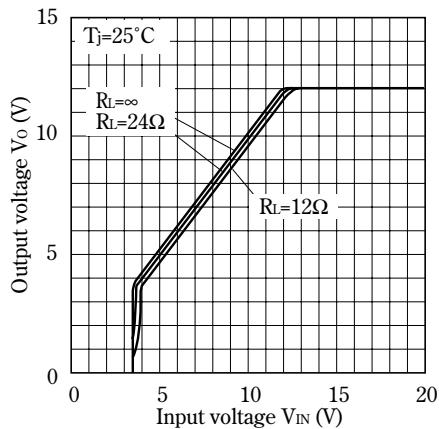
**Fig.10 Output Voltage vs. Input Voltage (PQ09SZ1/PQ09SZ11)**



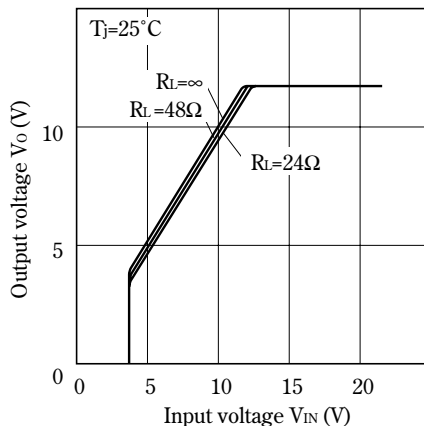
**Fig.11 Output Voltage vs. Input Voltage (PQ09SZ5/PQ09SZ51)**



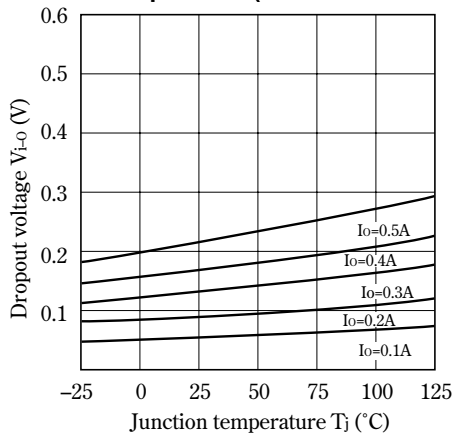
**Fig.12 Output Voltage vs. Input Voltage (PQ12SZ1/PQ12SZ11)**



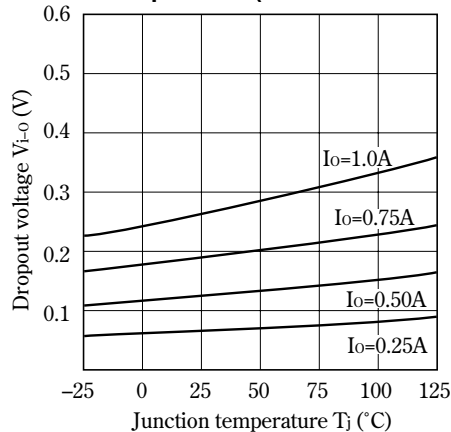
**Fig.13 Output Voltage vs. Input Voltage (PQ12SZ5/PQ12SZ51)**



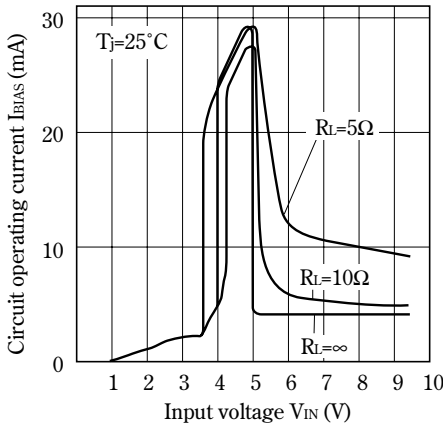
**Fig.14-a Dropout Voltage vs. Junction Temperature (PQ05SZ5/51 Series)**



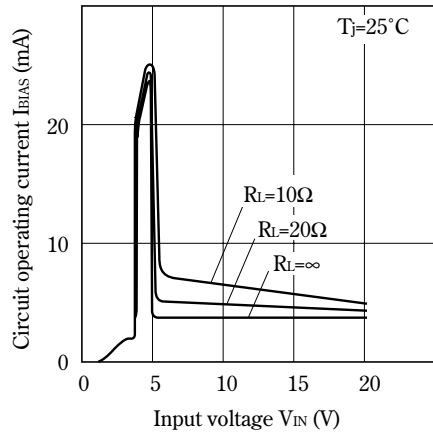
**Fig.14-b Dropout Voltage vs. Junction Temperature (PQ05SZ1/11 Series)**



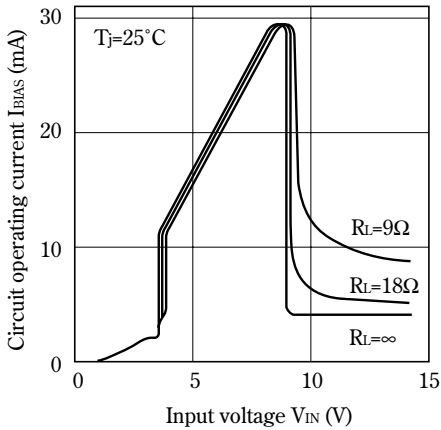
**Fig.15 Circuit Operating Current vs. Input Voltage (PQ05SZ1/PQ05SZ11)**



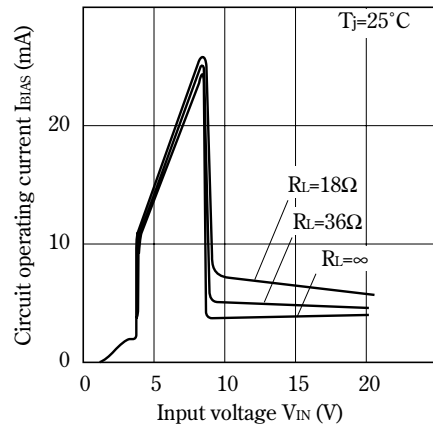
**Fig.16 Circuit Operating Current vs. Input Voltage (PQ05SZ5/PQ05SZ51)**



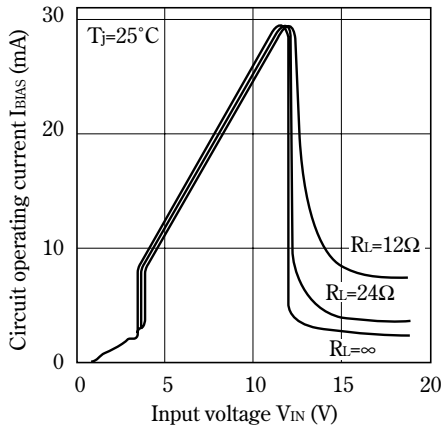
**Fig.17 Circuit Operating Current vs. Input Voltage (PQ09SZ1/PQ09SZ11)**



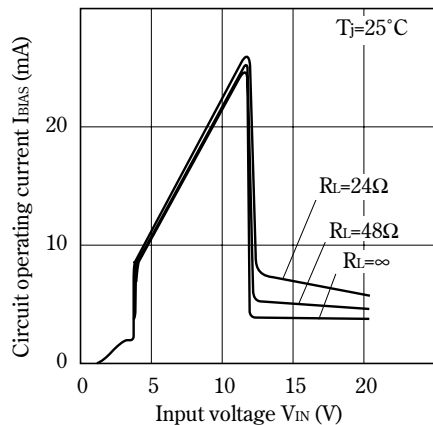
**Fig.18 Circuit Operating Current vs. Input Voltage (PQ09SZ5/PQ09SZ51)**



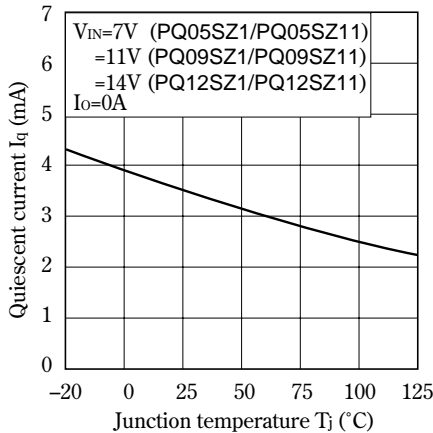
**Fig.19 Circuit Operating Current vs. Input Voltage (PQ12SZ1/PQ12SZ11)**



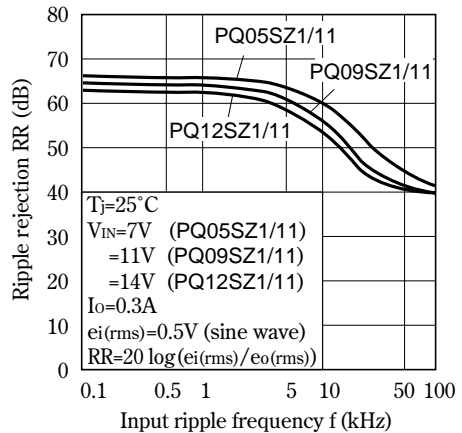
**Fig.20 Circuit Operating Current vs. Input Voltage (PQ12SZ5/PQ12SZ51)**



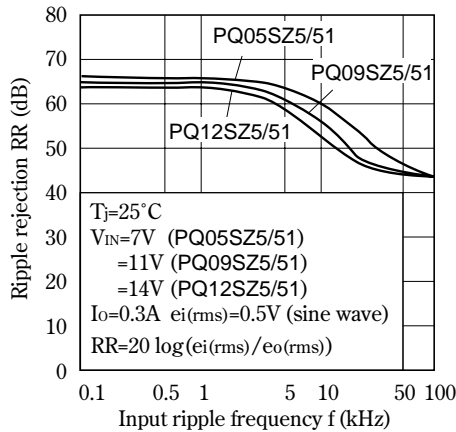
**Fig.21 Quiescent Current vs. Junction Temperature**  
(PQ05SZ1/PQ05SZ11/PQ09SZ1/PQ09SZ11/PQ12SZ1/PQ12SZ11)



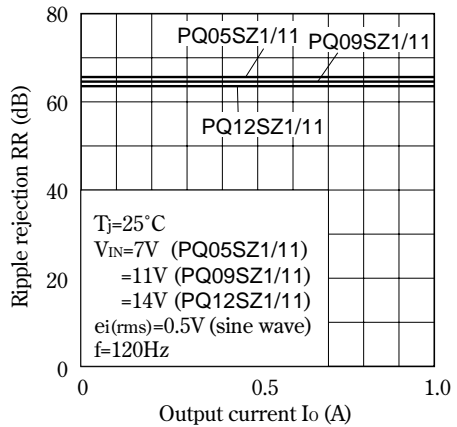
**Fig.22 Ripple Rejection vs. Input Ripple Frequency**  
(PQ05SZ1/PQ05SZ11/PQ09SZ1/PQ09SZ11/PQ12SZ1/PQ12SZ11)



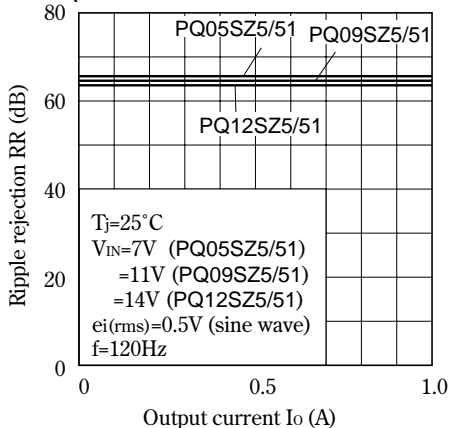
**Fig.23 Ripple Rejection vs. Input Ripple Frequency**  
(PQ05SZ5/PQ05SZ51/PQ09SZ5/PQ09SZ51/PQ12SZ5/PQ12SZ51)



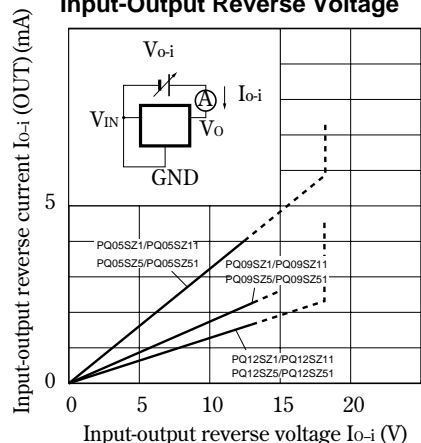
**Fig.24 Ripple Rejection vs. Output Current**  
(PQ05SZ1/11/ PQ09SZ1/11/ PQ12SZ1/11)



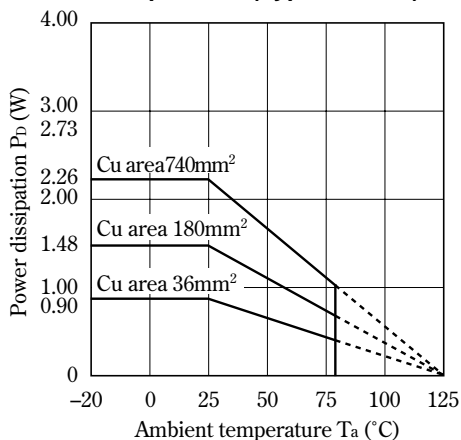
**Fig.25 Ripple Rejection vs. Output Current**  
(PQ05SZ5/51/ PQ09SZ5/51/ PQ12SZ5/51)



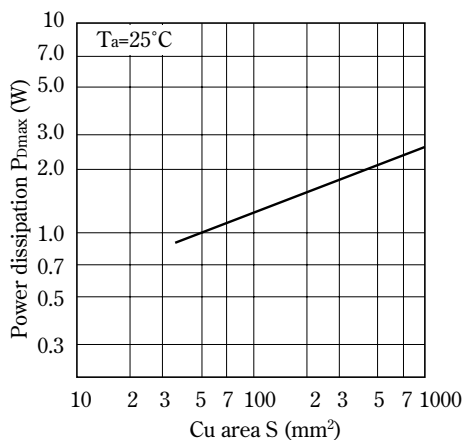
**Fig.26 Input-Output Reverse Current vs. Input-Output Reverse Voltage**



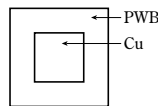
**Fig.27 Power Dissipation vs. Ambient Temperature (Typical Value)**



**Fig.28 Power Dissipation vs. Cu Area**



PWB



Material : Glass-cloth epoxy resin  
 Size : 50×50×1.6mm  
 Cu thickness : 35μm

■ Model Line-ups for Tape-packaged Products

Output current	Sleeve-packaged products		Tape-packaged products	
	Standard type	High-precision output type	Standard type	High-precision output type
0.5A output	PQ05SZ5 Series	PQ05SZ51 Series	PQ05SZ5T Series	PQ05SZ5U Series
1.0A output	PQ05SZ1 Series	PQ05SZ11 Series	PQ05SZ1T Series	PQ05SZ1U Series

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