

# 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  $V_{O-i} < 13V$ )

## ■ Applications

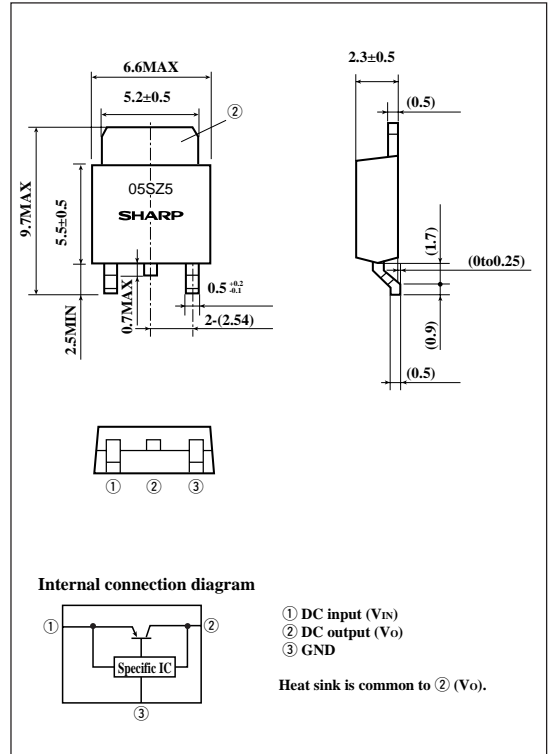
- Portable equipment
- Notebook PC

## ■ Model Line-ups

	5V output	9V output	12V output	
0.5A output	Output voltage precision:±5%	PQ05SZ5	PQ09SZ5	PQ12SZ5
	Output voltage precision:±2.5%	PQ05SZ51	PQ09SZ51	PQ12SZ51
1A output	Output voltage precision:±5%	PQ05SZ1	PQ09SZ1	PQ12SZ1
	Output voltage precision:±2.5%	PQ05SZ11	PQ09SZ11	PQ12SZ11

## ■ Outline Dimensions

(Unit : mm)



## ■ Absolute Maximum Ratings

( $T_a=25^{\circ}C$ ,  $xx=05,09,12$ )

( $xx:05,09,12$ )

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		$^{\circ}C$
Operating temperature	$T_{opr}$		-20 to +80		$^{\circ}C$
Storage temperature	$T_{stg}$		-40 to +150		$^{\circ}C$
Soldering temperature	$T_{sol}$	For 10s	260		$^{\circ}C$

\*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 ”.

■ Electrical Characteristics

(T<sub>j</sub>=25°C, xx=05,09,12)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output voltage	PQ05SZ1/5	V <sub>O</sub>	V <sub>IN</sub> =7V	4.75	5.0	5.25	V
	PQ09SZ1/5		V <sub>IN</sub> =11V	8.55	9.0	9.45	
	PQ12SZ1/5		V <sub>IN</sub> =14V	11.4	12.0	12.6	
	PQ05SZ11/51		V <sub>IN</sub> =7V	4.88	5.0	5.12	
	PQ09SZ11/51		V <sub>IN</sub> =11V	8.78	9.0	9.22	
	PQ12SZ11/51		V <sub>IN</sub> =14V	11.7	12.0	12.3	
Load regulation		R <sub>egL</sub>	<sup>*4</sup>	-	0.2	2.0	%
Line regulation		R <sub>egI</sub>	I <sub>O</sub> =5mA, <sup>*5</sup>	-	0.1	2.5	%
Temperature coefficient of output voltage		T <sub>C</sub> V <sub>O</sub>	I <sub>O</sub> =5mA, T <sub>j</sub> =0 to 125°C, <sup>*6</sup>	-	±0.01	-	%/°C
Ripple rejection		RR	Refer to Fig. 2	45	60	-	dB
Dropout voltage	PQxxSZ1/11	V <sub>i-o</sub>	I <sub>O</sub> =0.5A	-	0.2	0.5	V
	PQxxSZ5/51		I <sub>O</sub> =0.3A				
Quiescent current		I <sub>q</sub>	I <sub>O</sub> =0A, <sup>*6</sup>	-	4.0	10.0	mA

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

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

<sup>\*4</sup> 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

<sup>\*5</sup> 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

<sup>\*6</sup> 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

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

Fig.1 Test Circuit

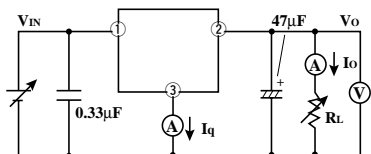
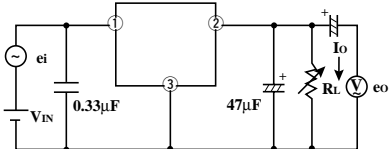


Fig.2 Test Circuit of Ripple Rejection



f=120Hz (sine wave)

e<sub>i</sub>=0.5V<sub>rms</sub>

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 (e<sub>i</sub>/e<sub>o</sub>)

Fig.3 Overcurrent Protection Characteristics(Typical Value)

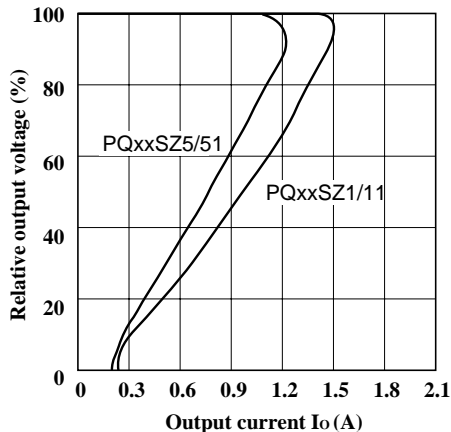
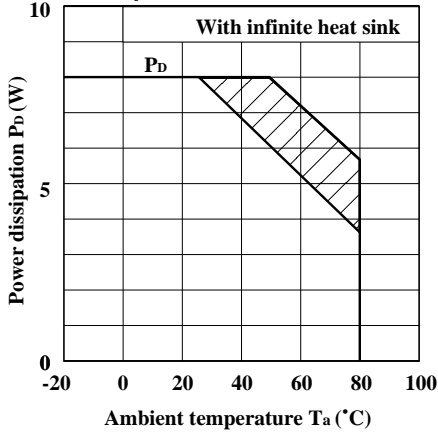


Fig.4 Power Dissipation vs. Ambient Temperature



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

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

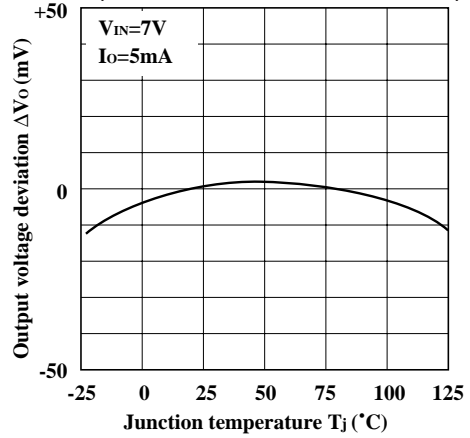


Fig.6 Output Voltage Deviation vs. Junction Temperature (PQ09SZ1/PQ09SZ11/PQ09SZ5/PQ09SZ51)

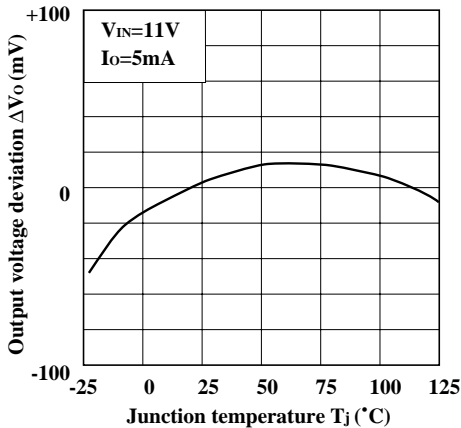


Fig.7 Output Voltage Deviation vs. Junction Temperature (PQ12SZ1/PQ12SZ11/PQ12SZ5/PQ12SZ51)

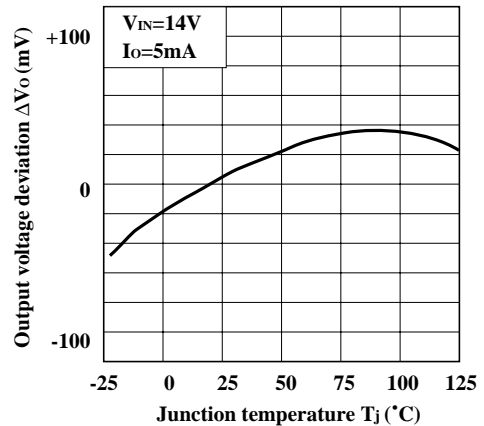


Fig.8 Output Voltage vs. Input Voltage (PQ05SZ1/PQ05SZ11)

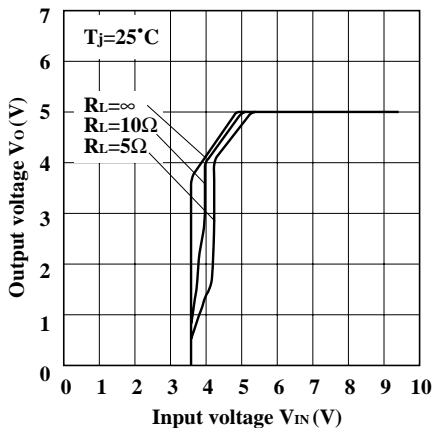


Fig.9 Output Voltage vs. Input Voltage (PQ05SZ5/PQ05SZ51)

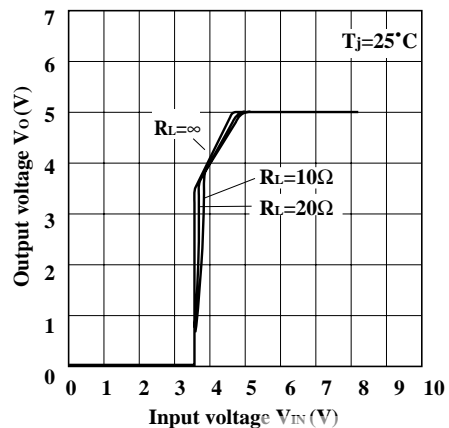


Fig.10 Output Voltage vs. Input Voltage (PQ09SZ1/PQ09SZ11)

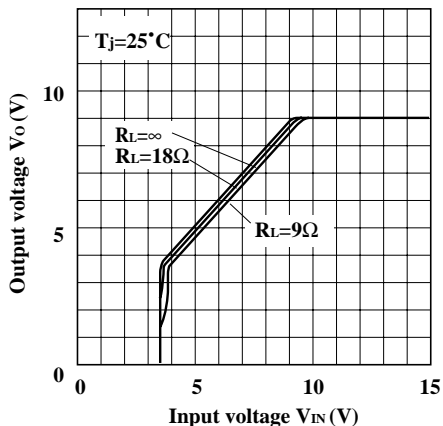


Fig.11 Output Voltage vs. Input Voltage (PQ09SZ5/PQ09SZ51)

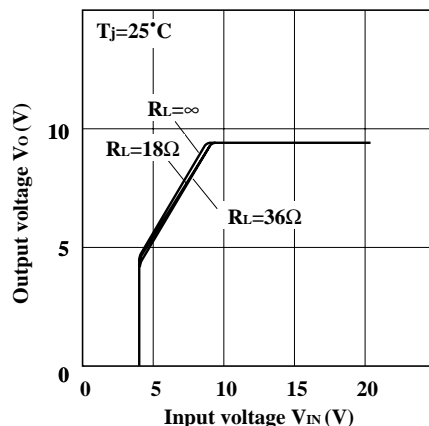


Fig.12 Output Voltage vs. Input Voltage (PQ12SZ1/PQ12SZ11)

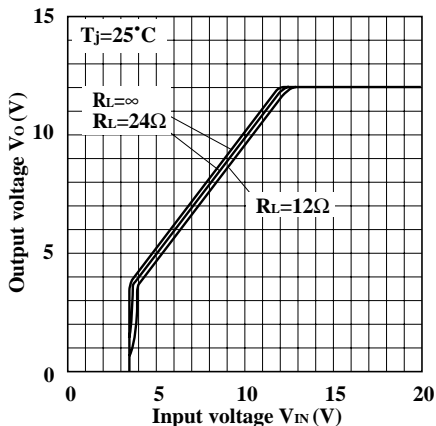


Fig.13 Output Voltage vs. Input Voltage (PQ12SZ5/PQ12SZ51)

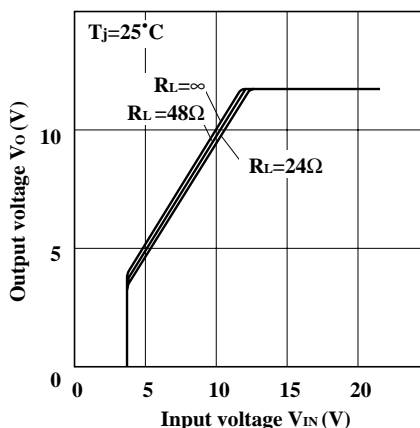


Fig.14-a Dropout Voltage vs. Junction Temperature (PQ05SZ5/51 Series)

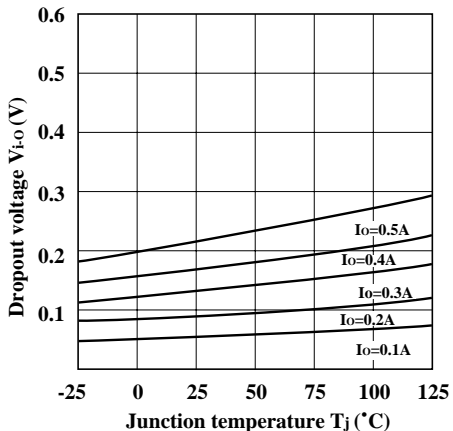


Fig.14-b Dropout Voltage vs. Junction Temperature (PQ05SZ1/11 Series)

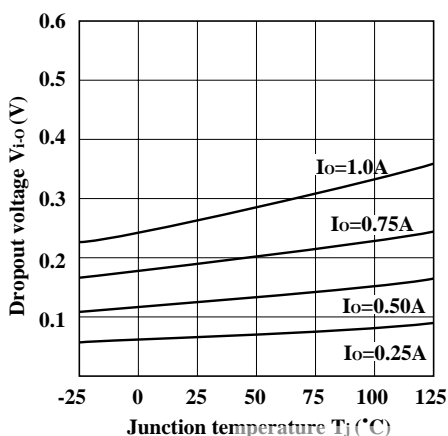


Fig.15 Circuit Operating Current vs. Input Voltage (PQ05SZ1/PQ05SZ11)

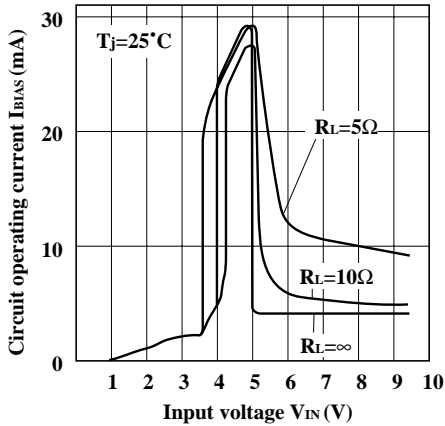


Fig.16 Circuit Operating Current vs. Input Voltage (PQ05SZ5/PQ05SZ51)

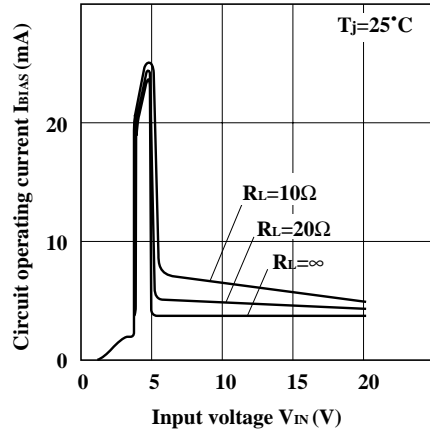


Fig.17 Circuit Operating Current vs. Input Voltage (PQ09SZ1/PQ09SZ11)

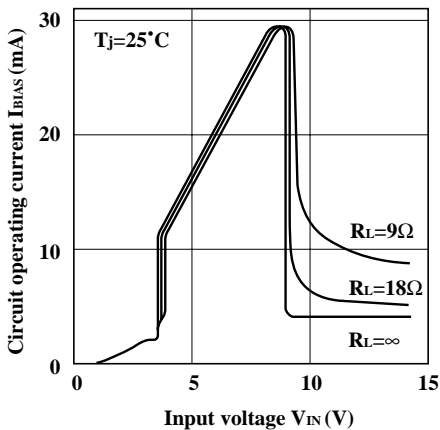


Fig.18 Circuit Operating Current vs. Input Voltage (PQ09SZ5/PQ09SZ51)

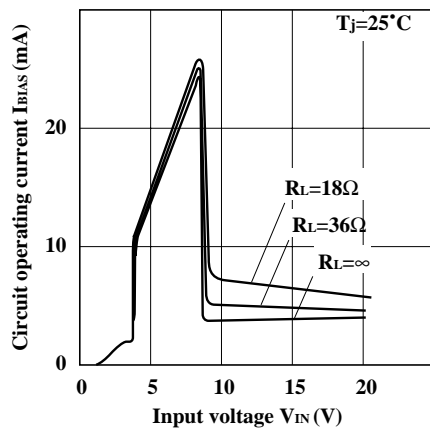


Fig.19 Circuit Operating Current vs. Input Voltage (PQ12SZ1/PQ12SZ11)

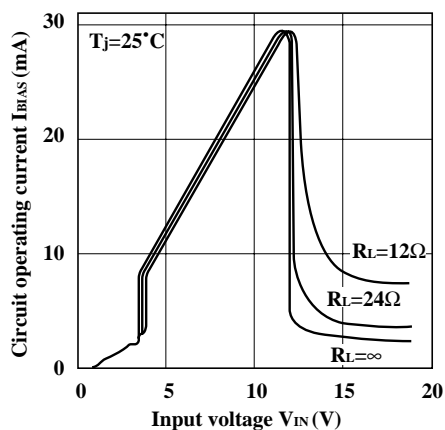


Fig.20 Circuit Operating Current vs. Input Voltage (PQ12SZ5/PQ12SZ51)

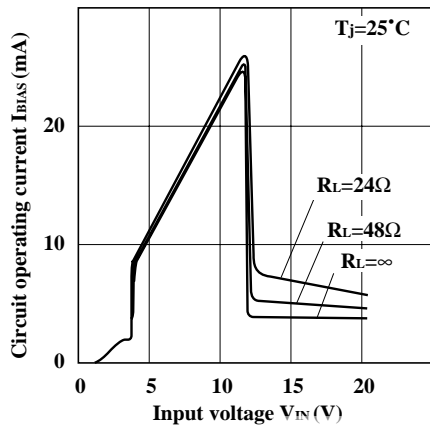


Fig.21 Quiescent Current vs. Junction Temperature

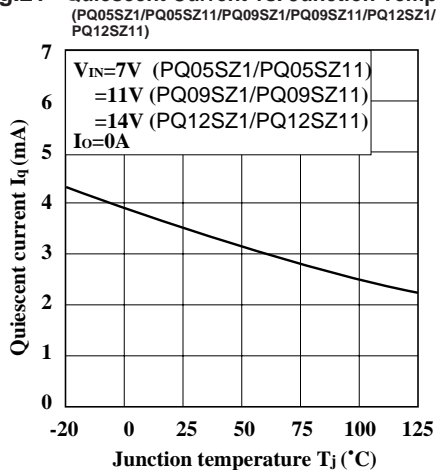


Fig.22 Ripple Rejection vs. Input Ripple Frequency

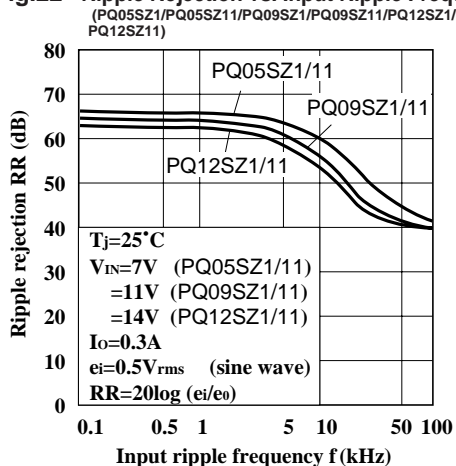


Fig.23 Ripple Rejection vs. Input Ripple Frequency

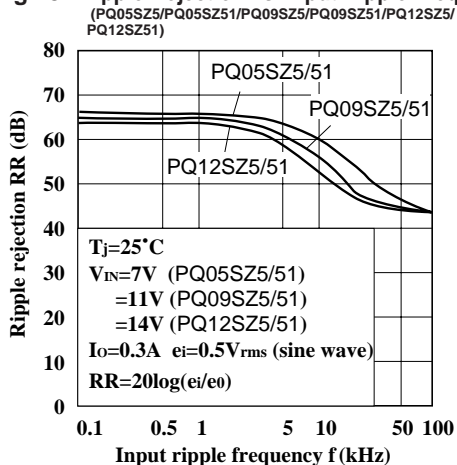


Fig.24 Ripple Rejection vs. Output Current

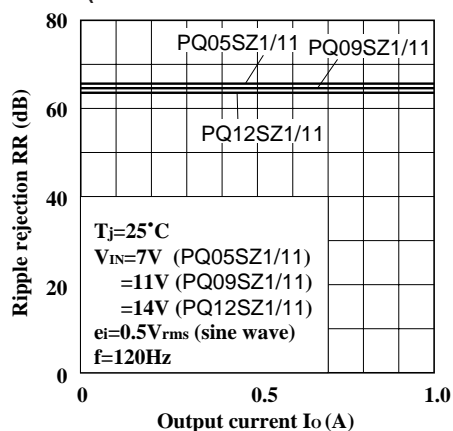


Fig.25 Ripple Rejection vs. Output Current

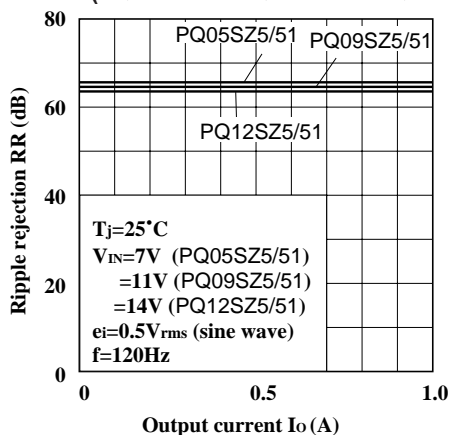


Fig.26 Input-Output Reverse Current vs. Input-Output Reverse Voltage

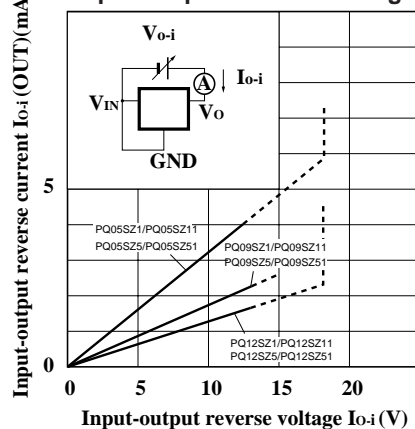


Fig.27 Power Dissipation vs. Ambient Temperature (Typical Value)

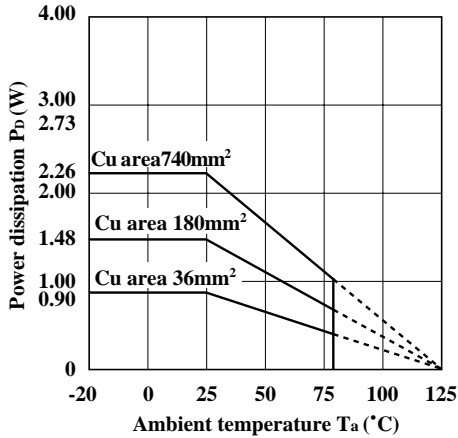
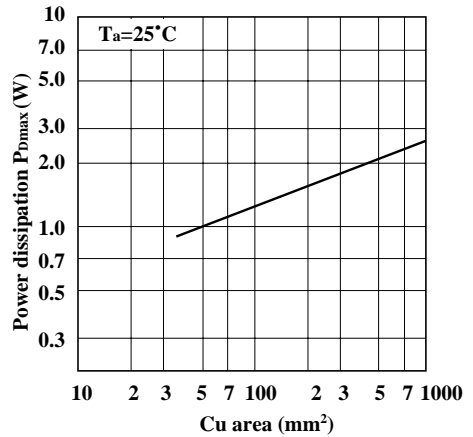
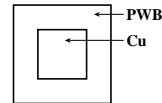


Fig.28 Power Dissipation vs. Cu Area



PWB



Material : Glass-cloth epoxy resin  
 Size : 50X50X1.6mm<sup>3</sup>  
 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