PQ05TZ51/11 PQ05TZ5U/1U Series

Low Power-Loss Voltage Regulators with OFF-state Low Dissipation Current

■ General Description

Sharp's PQ05TZ51/PQ05TZ11 series low power-loss voltage regulators provide 0.5A (PQ05TZ51) or 1A (PQ05TZ11) output and employ a miniature, high-efficiency heat radiation package suitable for surface mounting. Ideal for compact equipment, portable equipment, microprocessor-controlled equipment and remote-controlled equipment, these multi-function regulators have built-in overcurrent protection and overheating protection.

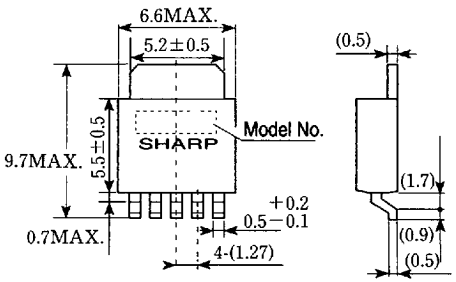
■ Features

(1) Low power-loss (voltage difference between input and output : MAX. 0.5V)
(2) Surface mount type package
(3) Both the 0.5A output PQ05TZ51 series and the 1A output PQ05TZ11 series have high-precision outputs (±2.5%)
(4) Low dissipation current when OFF-state (Iqs : MAX. 5μA)
(5) Built-in ON/OFF control function
(6) Tape-packaged type (PQ05TZ5U/PQ05TZ1U) is also available.

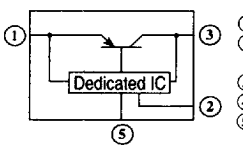
■ Model Line-ups

		5V output	9V output	12V output
0.5A output	High-precision model (output voltage precision ±2.5%)	PQ05TZ51	PQ09TZ51	PQ12TZ51
1.0A output	High-precision model (output voltage precision ±2.5%)	PQ05TZ11	PQ09TZ11	PQ12TZ11

■ Outline Dimensions (Unit : mm)



Internal connection diagram



① DC input (Vin)
② ON/OFF control terminal (V_c)
③ DC output (V_o)
④ NC
⑤ GND

Heat sink common with terminal ③(Vo)

■ Absolute Maximum Ratings (XX=05, 09, 12, Ta=25°C)

Parameter	Symbol	Conditions	Rating		Unit
			PQXXTZ51	PQXXTZ11	
*1Input voltage	V_{in}		24		V
*1Output control voltage	V_c		24		V
Output current	I_o		0.5	1.0	A
*2Power dissipation	P_d	Refer to Fig.1	8		W
*3Junction 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
*3 There are cases that overheat protection operates at 125°C<Tj<150°C

■ Electrical Characteristics

Vc=2.7V unless otherwise specified.

Parameter		Symbol	Conditions	Min.	Typ.	Max.	Unit
Output voltage	PQ05TZ51/11	V_o	*4, *8	4.88	5.0	5.12	V
	PQ09TZ51/11			8.78	9.0	9.22	
	PQ12TZ51/11			11.7	12.0	12.3	
Load regulation		$R_{eg}L$	*4, *5	—	0.2	2.0	%
Line regulation		$R_{eg}I$	I_o=5mA, *9	—	0.1	2.5	%
Temperature coefficient of output voltage		T_cV_o	*4, I_o=5mA, T_j=0 to 125℃	—	±0.01	—	%/℃
Ripple rejection		RR	Test circuit shown in Fig.2	45	60	—	dB
Dropout voltage		V_{I-O}	*8, *6	—	0.2	0.5	V
ON-state voltage for control		$V_{C(on)}$	*4, *7, *8	2.0	—	—	V
ON-state current for control		$I_{C(on)}$	*4, *8	—	—	200	μA
OFF-state voltage for control		$V_{C(off)}$	*4	—	—	0.8	V
OFF-state current for control		$I_{C(off)}$	*4, V_C=0.4V	—	—	10	μA
Quiescent current		I_q	*4, I_o=0A	—	4	10	mA
Output OFF-state dissipation current		I_{qs}	*4, V_c=0.4V, I_o=0A	—	—	5	μA

*4 PQ05TZ51/11:V_{in}=7V
PQ09TZ51/11:V_{in}=11V
PQ12TZ51/11:V_{in}=14V
*5 $PQ_{xx}TZ51$:I_o=5mA to 0.5A, $PQ_{xx}TZ11$:I_o=5mA to 1.0A
*6 The input voltage is the value when the output voltage is 0.95 Vo.
*7 The output voltage is OFF when control terminal ② is open.
*8 $PQ_{xx}TZ51$:I_o=0.3A, $PQ_{xx}TZ11$:I_o=0.5A
*9 PQ05TZ51/11:V_{in}=6V to 16V
PQ09TZ51/11:V_{in}=10V to 20V
PQ12TZ51/11:V_{in}=13V to 23V

Fig. 1 Test Circuit

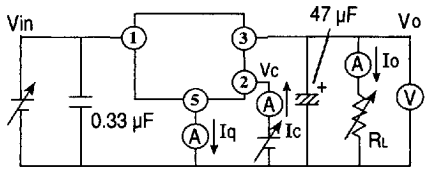
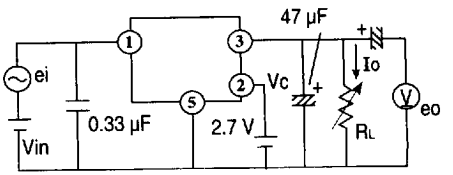
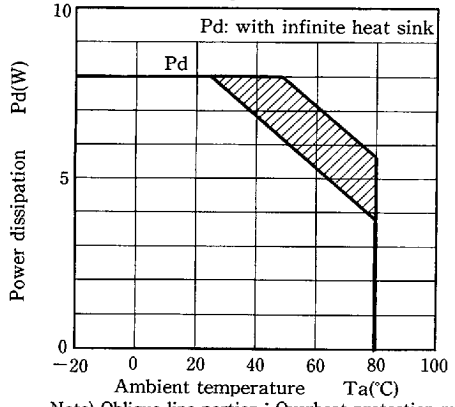


Fig. 2 Test Circuit of Ripple Rejection



f=120Hz (sine wave)
ei=0.5Vrms
Vin=7V (PQ05TZ51/11)
Vin=11V (PQ09TZ51/11)
Vin=14V (PQ12TZ51/11)
I_o=0.3A
RR=20 log (ei/eo)

Fig. 3 Power Dissipation vs. Ambient Temperature



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

Fig. 4 Overcurrent Protection Characteristics (Typical value) (XX=05, 09, 12)

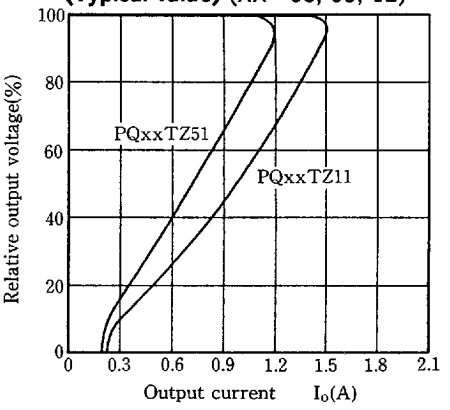


Fig. 5 Output Voltage Deviation vs. Junction Temperature (PQ05TZ51/11)

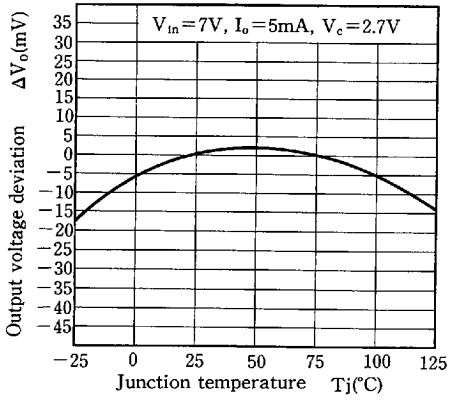


Fig. 6 Output Voltage Deviation vs. Junction Temperature (PQ09TZ51/11)

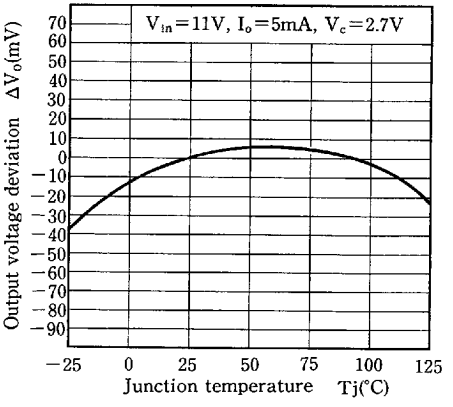


Fig. 7 Output Voltage Deviation vs. Junction Temperature (PQ12TZ51/11)

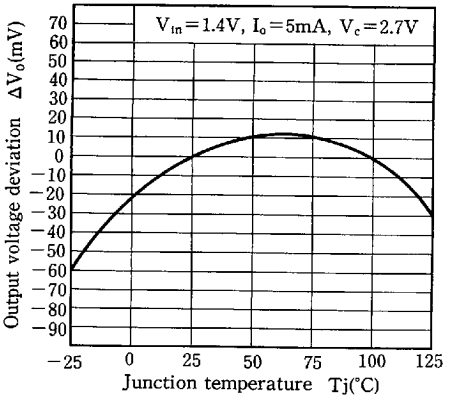


Fig. 8 Output Voltage vs. Input Voltage (PQ05TZ51)

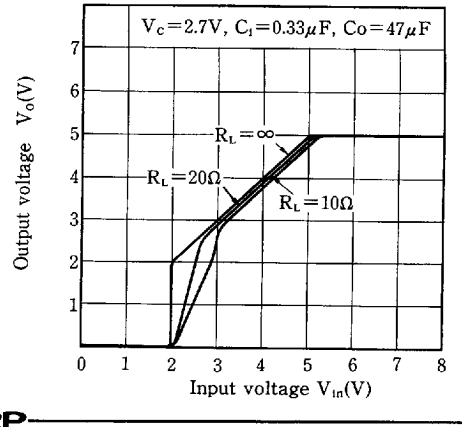


Fig. 9 Output Voltage vs. Input Voltage (Typical value) (PQ09TZ51)

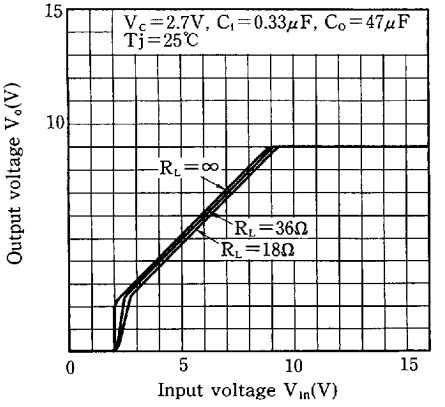


Fig. 10 Output Voltage vs. Input Voltage (Typical value) (PQ12TZ51)

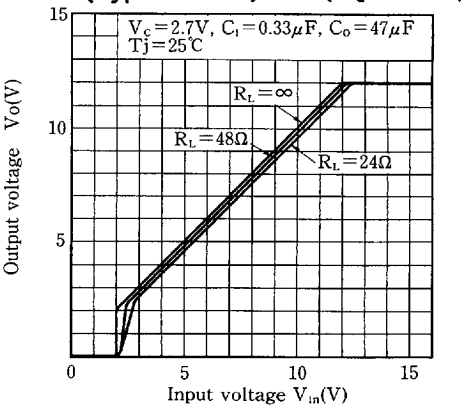


Fig. 11 Output Voltage vs. Input Voltage (Typical value) (PQ05TZ11)

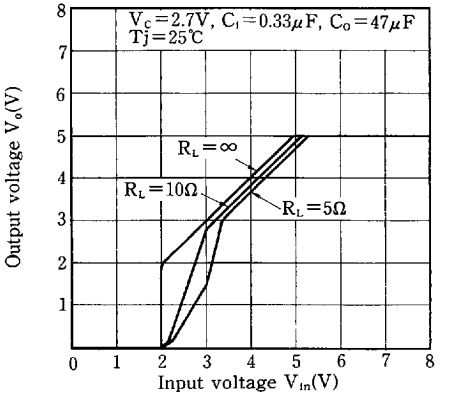


Fig. 12 Output Voltage vs. Input Voltage (PQ09TZ11)

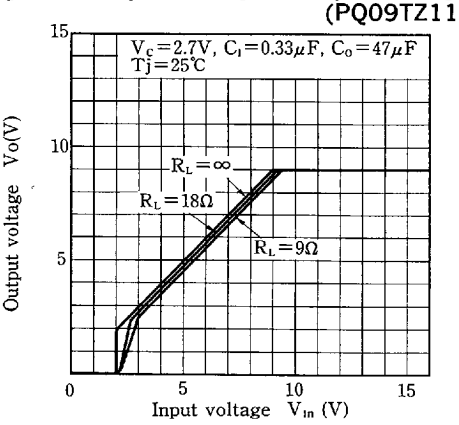


Fig. 13 Output Voltage vs. Input Voltage (PQ12TZ11)

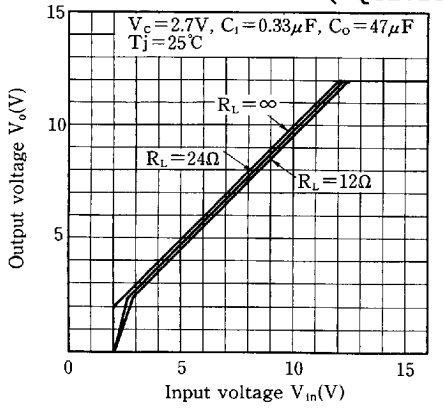


Fig. 14 Dropout Voltage vs. Junction Temperature (PQ05TZ51/PQ09TZ51/PQ12TZ51)

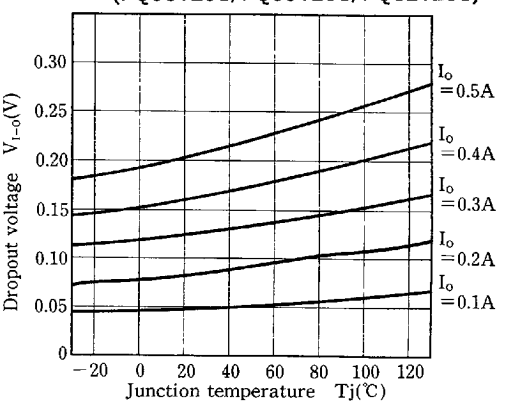


Fig. 15 Dropout Voltage vs. Junction Temperature (PQ05TZ11/PQ09TZ11/PQ12TZ11)

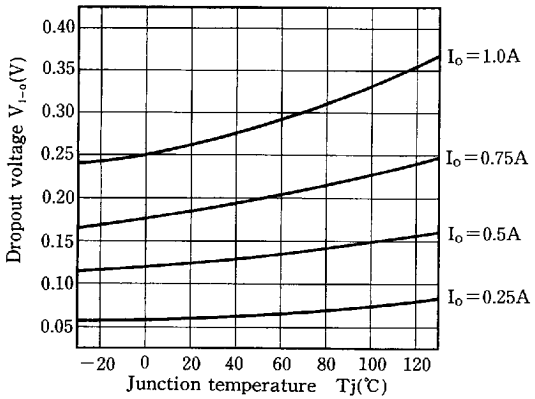


Fig. 16 Circuit Operating Current vs. Input Voltage (PQ05TZ51)

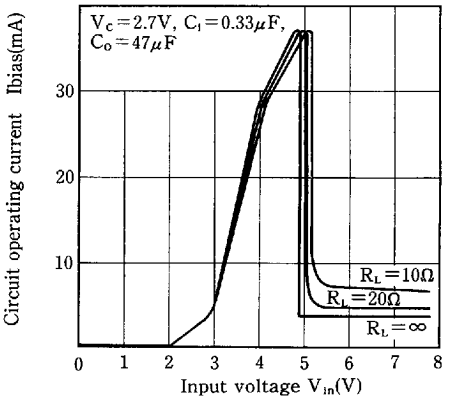


Fig. 17 Circuit Operating Current vs. Input Voltage (PQ09TZ51)

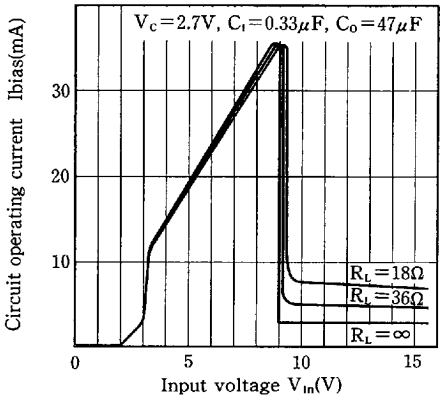


Fig. 18 Circuit Operating Current vs. Input Voltage (PQ12TZ51)

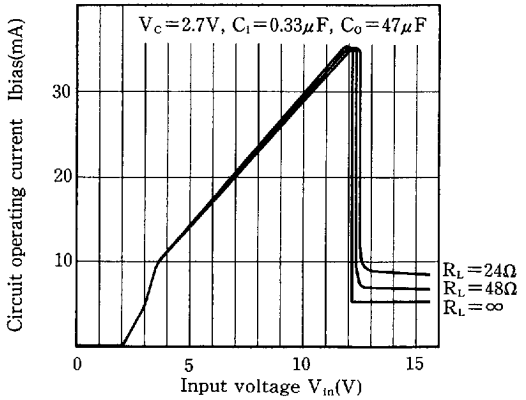


Fig. 19 Circuit Operating Current vs. Input Voltage (PQ05TZ11)

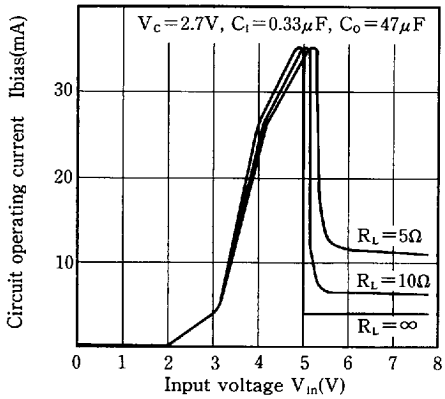


Fig. 20 Circuit Operating Current vs. Input Voltage (PQ09TZ11)

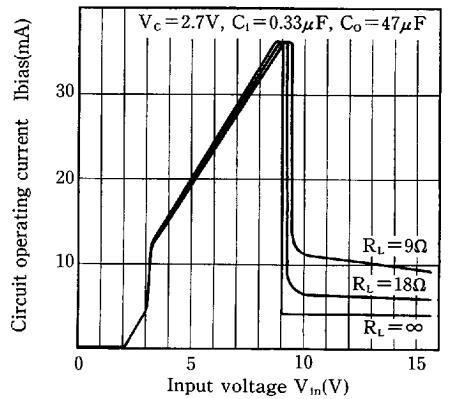


Fig. 21 Circuit Operating Current vs. Input Voltage (PQ12TZ11)

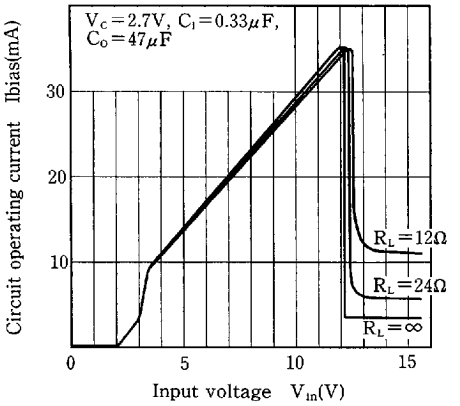


Fig. 22 Quiescent Current vs. Junction Temperature

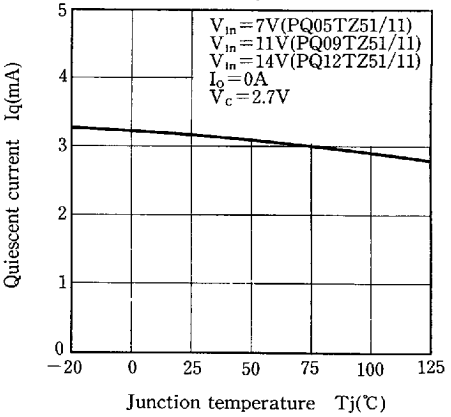


Fig. 23 Ripple Rejection vs. Input Ripple Frequency (PQ05TZ51/PQ09TZ51/PQ12TZ51)

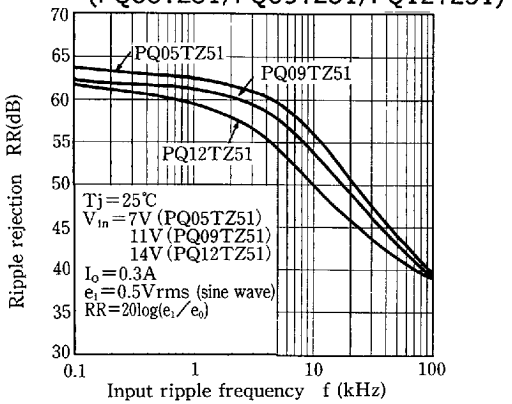


Fig. 24 Ripple Rejection vs. Input Ripple Frequency (PQ05TZ11/PQ09TZ11/PQ12TZ11)

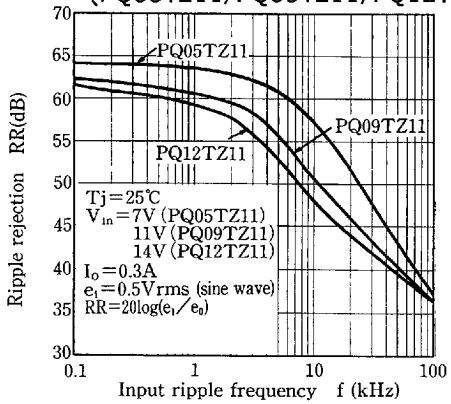


Fig. 25 Ripple Rejection vs. Input Ripple Frequency (PQ05TZ51/PQ09TZ51/PQ12TZ51)

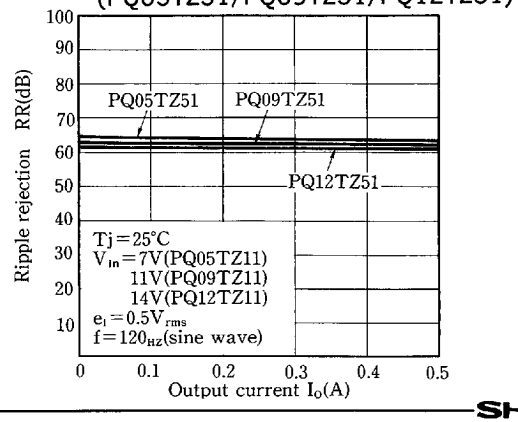


Fig. 26 Ripple Rejection vs. Input Ripple Frequency (PQ05TZ11/PQ09TZ11/PQ12TZ11)

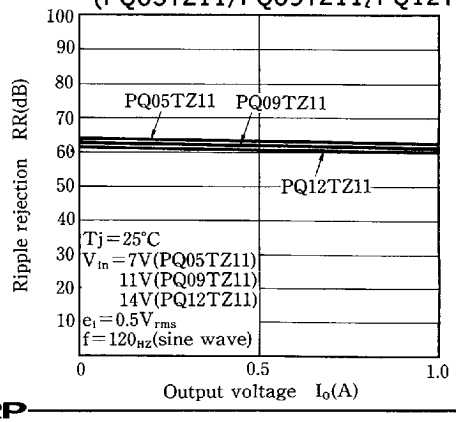


Fig. 27 Output Peak Current vs. Dropout Voltage (PQ05TZ51/PQ09TZ51/PQ12TZ51)

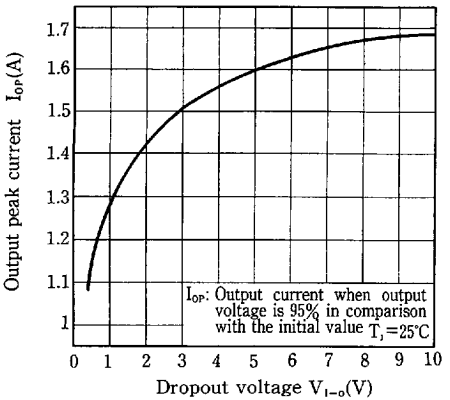


Fig. 28 Output Peak Current vs. Dropout Voltage (PQ05TZ11/PQ09TZ11/PQ12TZ11)

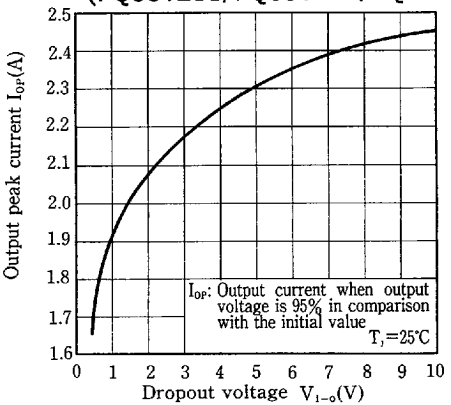


Fig. 29 Output Peak Current vs. Junction Temperature (PQ05TZ51/PQ09TZ51/PQ12TZ51)

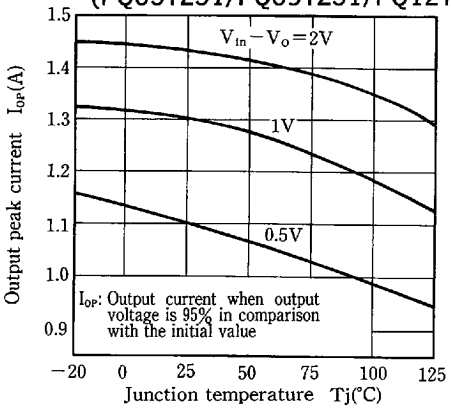


Fig. 30 Output Peak Current vs. Junction Temperature (PQ05TZ11/PQ09TZ11/PQ12TZ11)

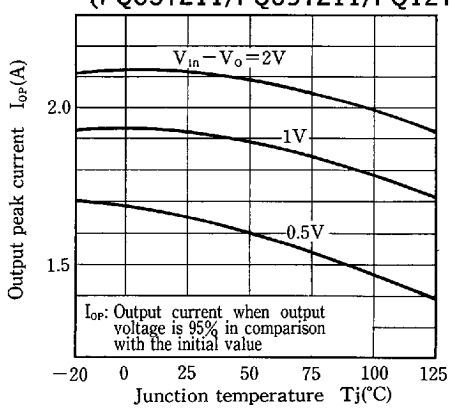
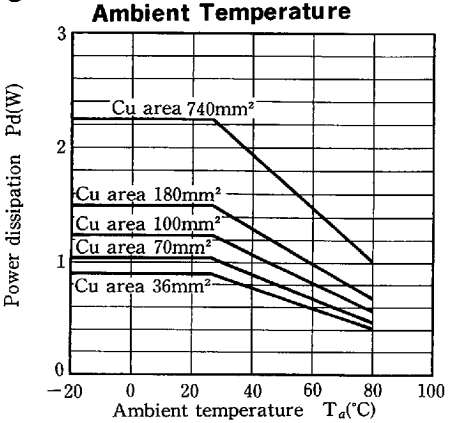
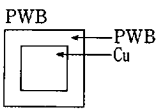


Fig. 31 Power Dissipation vs. Ambient Temperature

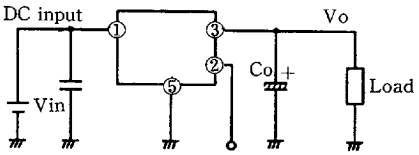




Material	Glass cloth epoxy resin
Size	50×50×1.6mm
Cu thickness	35μm

■ ON/OFF Operation

As shown the figure, ON/OFF control is available.



ON/OFF Signal { High : Output ON / Low or Open : Output OFF }

■ Taping Specifications

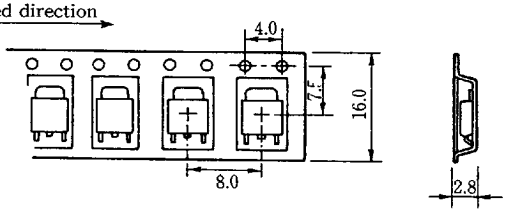
Model Line-ups

	Sleeve-packaged products		Tape-packaged products	
	Standard type	High-precision output type	Standard type	High-precision output type
1A output		PQ05TZ11 Series		PQ05TZ1U Series
0.5A output		PQ05TZ51 Series		PQ05TZ5U Series

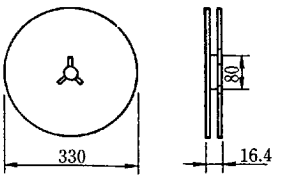
Note) The value of absolute maximum ratings and electrical characteristics is same as ones of sleeve packaged products. (PQ05TZ51/11)

Package form : 3,000pcs./reel (ϕ330 reel)

Tape feed direction



(Unit; mm)



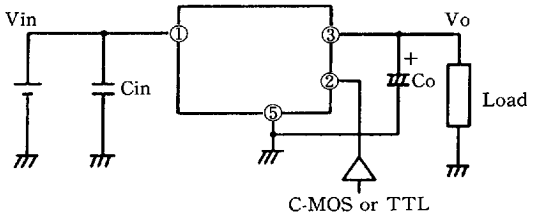
· Material for tape: polystyrene

Equivalent to EIAJ standard (RC-1009B)
EIAJ RC-1009B-TE1608L

Equivalent to EIAJ standard (RC-1009B)
EIAJ RC-1009B-R33

※ As for detailed specification, refer to each specification sheet.

■ Precautions for Use



(1) The connecting wiring of Co and Cin to terminals and connection wiring to fin must be as short as possible. Especially, it is recommended to use the tantalum capacitor as Co if it is used at low temperature.

(2) ON/OFF control terminal ② is compatible with LS-TTL. It enables to directly drive by TTL or C-MOS standard logic (RCA4000 series). If ON/OFF control terminal is not used, it is recommended to directly connect applicable terminal with input terminal.

(3) If voltage is applied when the mounting is improper, such as deviation of element pin, the characteristics deterioration and damage may occur. Never allow improper mounting.

Note:
The specification is subject to change partially without notice for its improvement.
Cares when handling:
Be sure to observe the requirements described in the specification and data book.