PQ05TZ51/PQ05TZI 1 Series

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

■ Features

- Low power-loss (Dropout voltage : MAX 0.5V)
- Surface mount type package (Equivalent to EIAJ SC-63)
- Both the 0.5A output PQ05TZ51 series and the 1A output PQ05TZ1 1 series have high-precision output (* 2.5%)

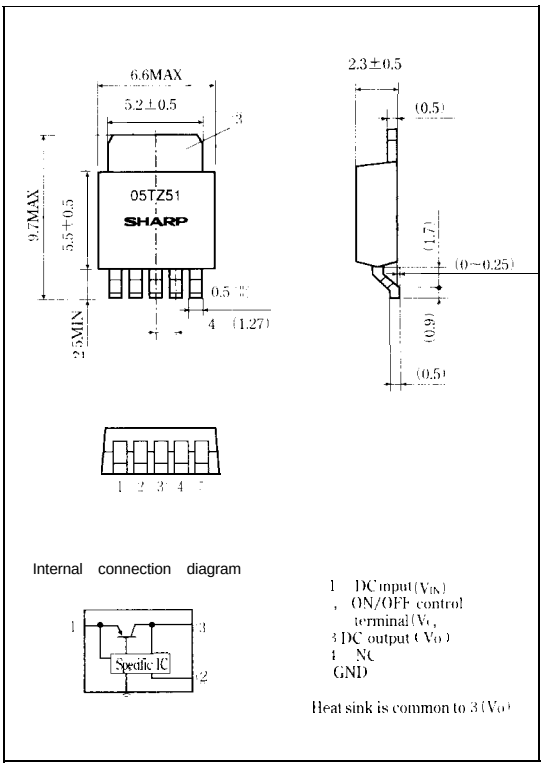
. Low dissipation current at OFF-state (Iqs : MAX.5 μA)

. Built-in [) N/OFF control function

❑ Model Line-ups

Output voltage		5V Output	9V Output	12V Output
0.5A Output	Output voltage precision::±2.5%	PQ05TZ51	PQ09TZ51	PQ12TZ51
1.0A Output	Output voltage precision:±25%	PQ05TZ11	PQ09TZ11	PQ12TZ11

■ Outline Dimensions (Unit: mm)



■ Absolute Maximum Ratings (xx=05,09,12, Ta=25℃)

Parameter	Symbol	Rating		Unit
		PQxxTZ51	PQxxTZ11	
*1 Input voltage	VIN	24		V
*1 Output control voltage	VC	24		V
output current	IO	0.5	1.0	A
*2 Power dissipation	PD	8		W
*3 Junction temperature	Tj	150		℃
Operating temperature	Topr	-20 to +80		℃
Storage temperature	Tstg	-40 to +150		℃
Soldering temperature	Tsol	260 (For 10s)		℃

*1 All are open except GND and applicable terminals.

*2 With infinite heat sink.

*3 Overheat protection may operate at 125℃≦Tj≦150℃

· Please refer to the chapter "Handling Precautions

■ Electrical Characteristics

(Unless otherwise specified, V_C=2.7V, T_a=25°C)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output voltage	PQ05TZ51/11	V_O	*3, *4	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		$R_{eg}L$	*3, *4	—	0.2	2.0	%
Line regulation		$R_{eg}I$	I_O=5mA, *8		0.1	2.5	%
Temperature coefficient of output voltage		T_cV_O	*3, I_O=5mA, T_j=0 to 125°C		±0.01		%/°C
Ripple rejection		RR	Refer to Fig. 2	45	60		dB
Dropout voltage		V_{I-O}	*7, *5		0.2	0.5	V
ON-state voltage for control		V_C (ON)	*3, *6, *7	2.0			V
ON-state current for control		I_C (ON)	*3, *7			200	μA
OFF-state voltage for control		V_C (OFF)	*3			0.8	V
OFF-state current for control		I_C (OFF)	*3, V_C=0.4V			10	μA
Quiescent current		I_q	*3, I_O=0A		4	10	mA
output OFF-state dissipation current		I_{qs}	*3, V_C=0.4V, I_O=0A			5	μA

*3 PQ05TZ51/11: V_{IN}=7V
PQ09TZ51/11: V_{IN}=11V
PQ12TZ51/11: V_{IN}=14V

*4 PQxxTZ51: I_O=5mA to 0.5A, PQxxTZ51: I_O=5mA to 1.0A

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

*6 In case of opening control terinal 2, output voltage turns off.

*7 PQxxTZ51: I_O=0.3A, PQxxTZ11 I_O=0.5A

*8 **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

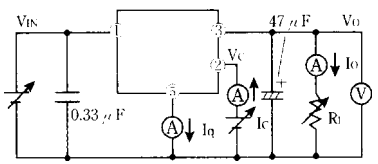
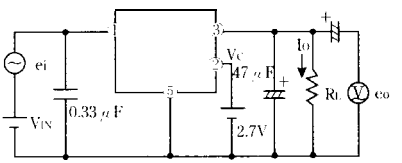
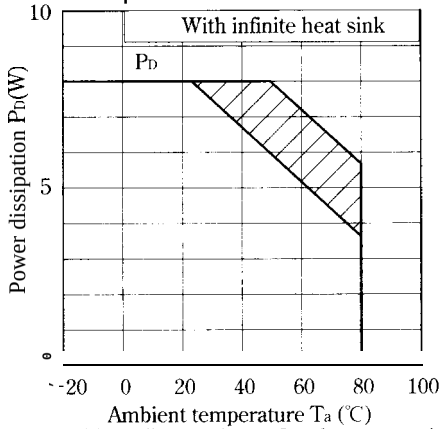


Fig. 2 Test Circuit of Ripple Rejection



f= 120 Hz (sine wave)
ei=0.5Vrms
V_{IN}= 7V (PQ05TZ51/111
V_{IN}=11V (PQ09TZ51/11)
V_{IN}=14V (PQ12TZ51/11)
I_O=0.3A
RR=20log(ei/eo)

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) (xx = 05,09,12)

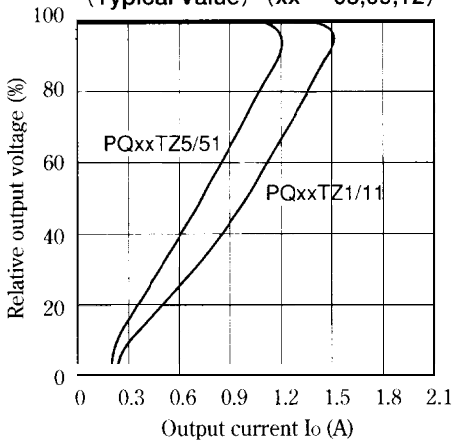


Fig. 5 Output Voltage Deviation vs. Junction Temperature (PQ05TZ51/11)

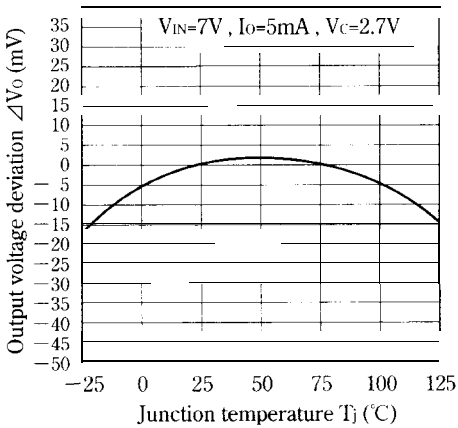


Fig. 6 Output Voltage Deviation vs. Junction Temperature (PQ09TZ51/11)

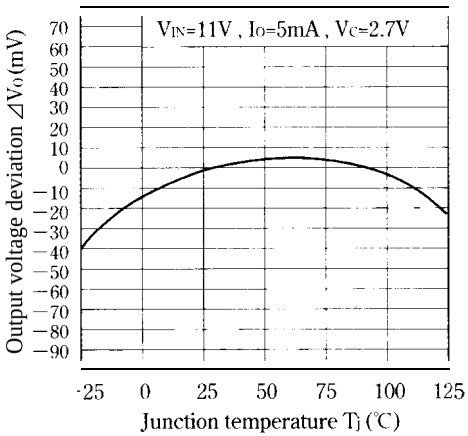


Fig. 7 Output Voltage Deviation vs. Junction Temperature (PQ12TZ51/11)

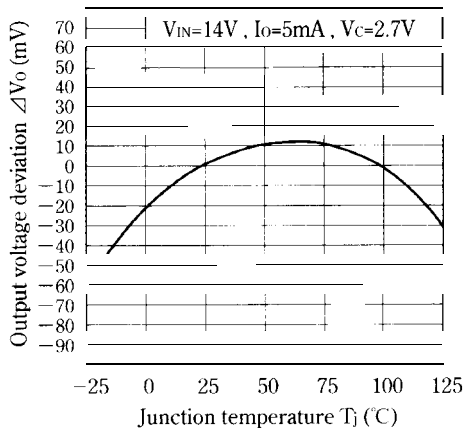


Fig. 8 Output Voltage vs. Input Voltage (PQ05TZ51)

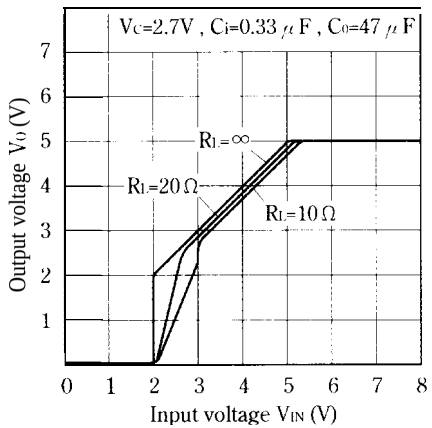


Fig. 9 Output Voltage vs. Input Voltage (Typical Value) (PQ09TZ51)

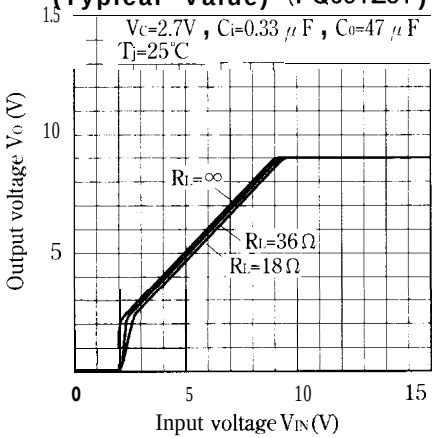


Fig.1O Output Voltage vs. Input Voltage (Typical Value) (PQ12TZ51)

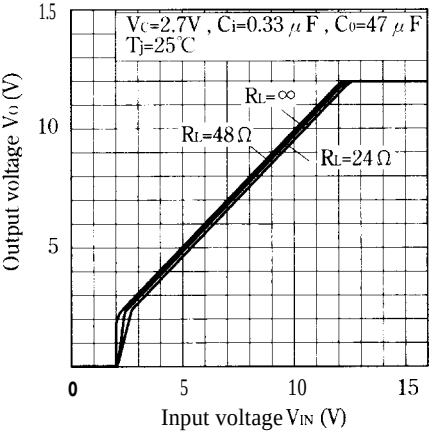


Fig.11 Output Voltage vs. Input Voltage (Typical Value) (PQ05TZ11)

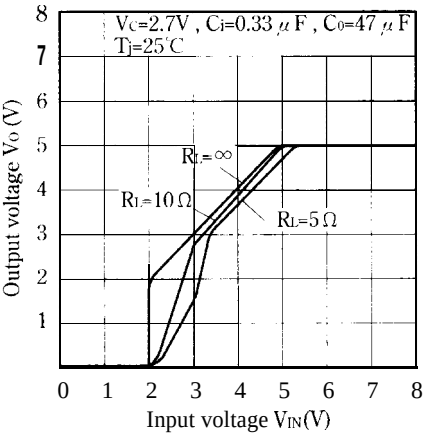


Fig.12 Output Voltage vs. Input Voltage (PQ09T211)

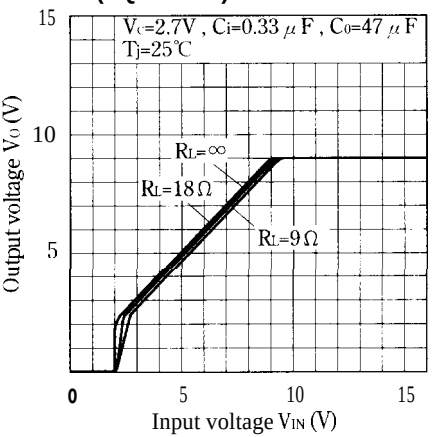


Fig.13 Output Voltage vs. Input Voltage (PQ12TZ1 1)

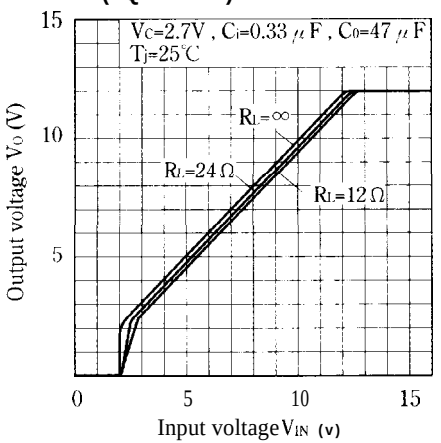


Fig.14 Dropout Voltage vs. Junction Temperature (PQ05TZ51/PQ09TZ51/PQ12TZ51)

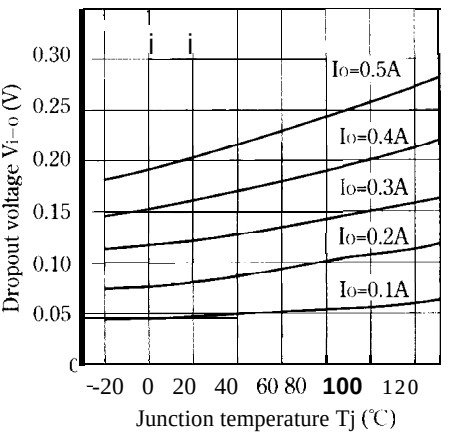


Fig.15 Dropout Voltage vs. Junction Temperature (PQ05TzI1/PQ09TZ11/PQ12TZ11)

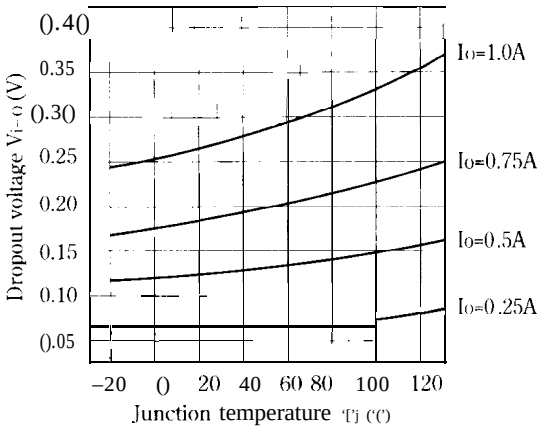


Fig.16 Circuit Operating Current vs. Input Voltage (PQ05TZ51)

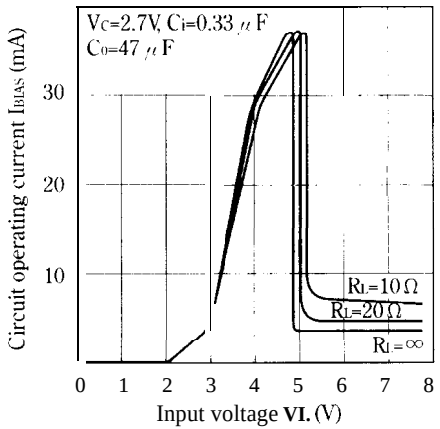


Fig.17 Circuit Operating Current vs. Input Voltage (PQ09TZ51)

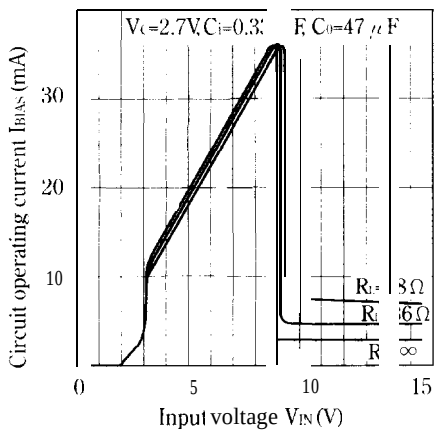


Fig.18 Circuit Operating Current vs. Input Voltage (PQ12TZ51)

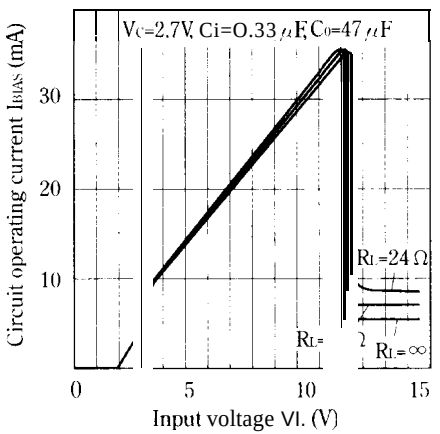


Fig.19 Circuit Operating Current vs. Input Voltage (PQ05TZ11)

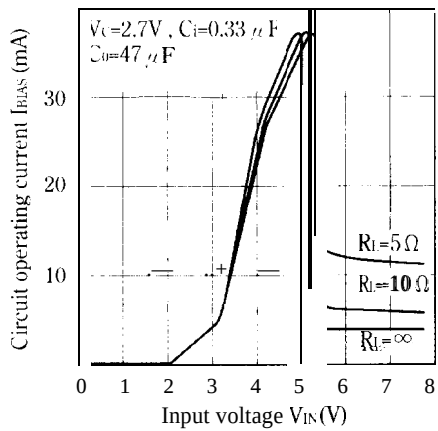


Fig.20 Circuit Operating Current vs. Input Voltage (PQ09TZ11)

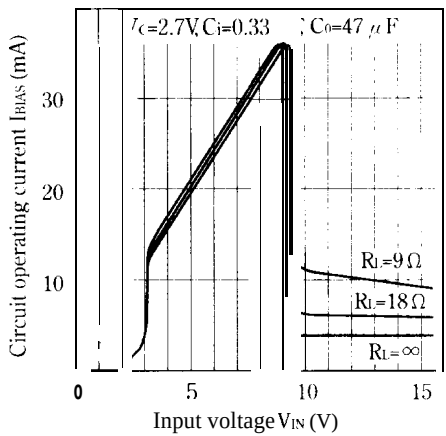


Fig.21 Circuit Operating Current vs. Input Voltage (PQ12TZ1 1)

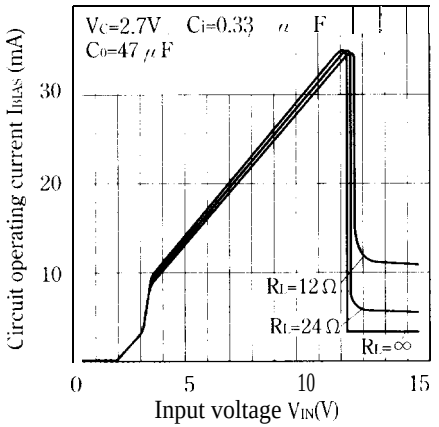


Fig.22 Quiescent Current vs. Junction Temperature

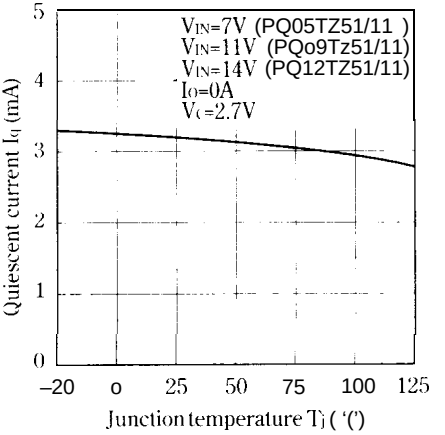


Fig.23 Ripple Rejection vs. Input Ripple Frequency (PQ05TZ51/PQ09TZ51/PQ12TZ51)

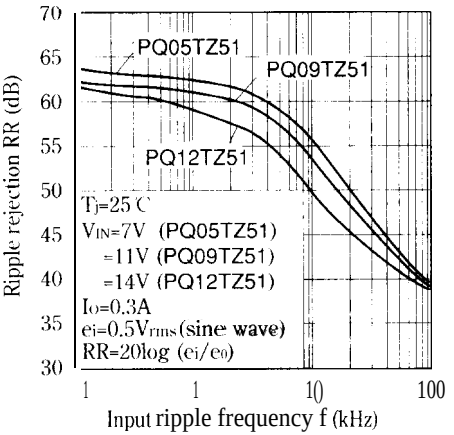


Fig.24 Ripple Rejection vs. Input Ripple Frequency (PQ05T211/pQo9Tz1 l/pQl2T211)

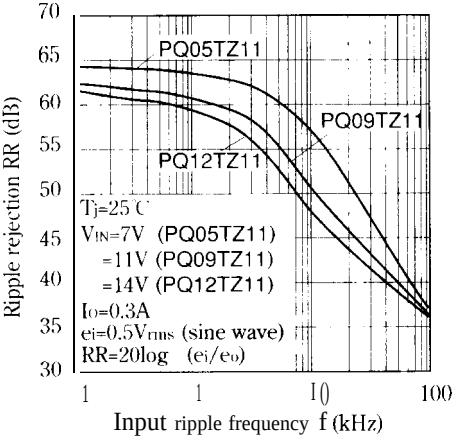


Fig.25 Ripple Rejection vs. Output Current (PQ05TZ51/PQ09TZ51/PQ12TZ51)

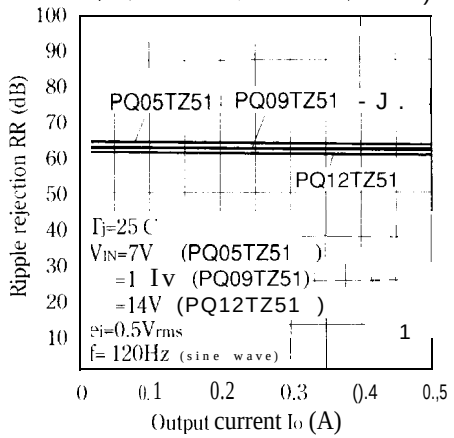


Fig.26 Ripple Rejection vs. Output Current (pQ05T211/pQo9Tz1 l/pQl2T211)

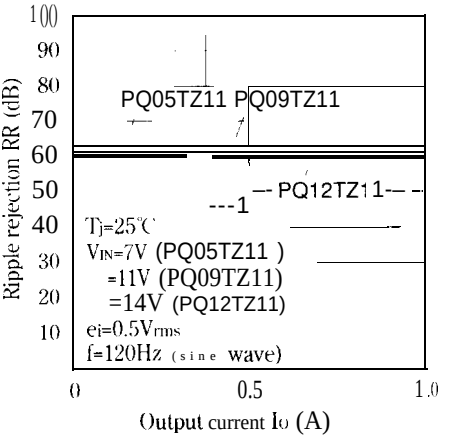


Fig.27 Output Peak Current vs. Dropout Voltage (PQ05TZ51/PQ09TZ51/PQ12Tz51)

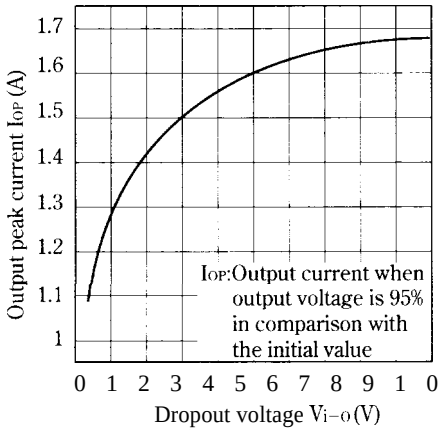


Fig.28 Output Peak Current vs. Dropout Voltage (PQ05TZ11/PQ09TZ11/PQ12Tz11)

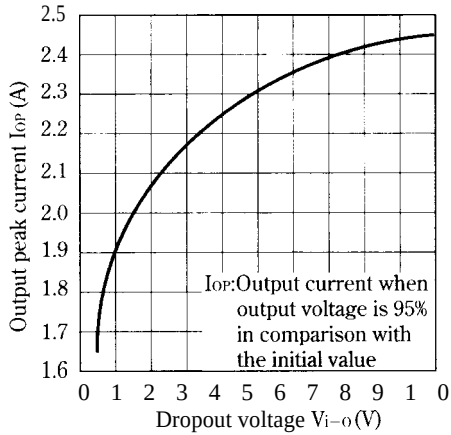


Fig.29 Output Peak Current vs. Junction Temperature (PQ05TZ51/PQ09TZ51/PQ12TZ51)

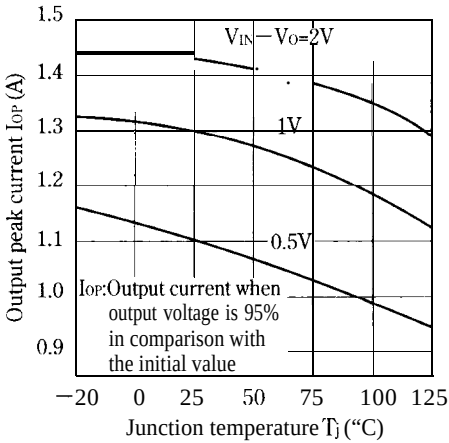


Fig.30 Output Peak Current vs. Junction Temperature (PQ05TZ11/PQ09TZ11/PQ12TZ11)

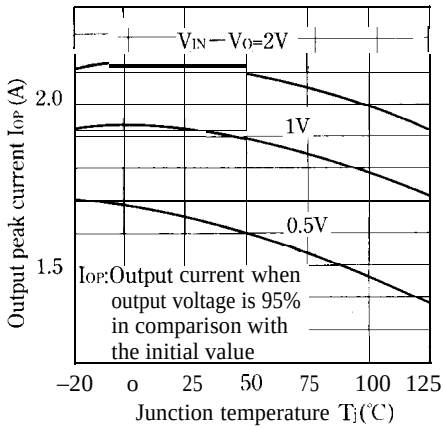
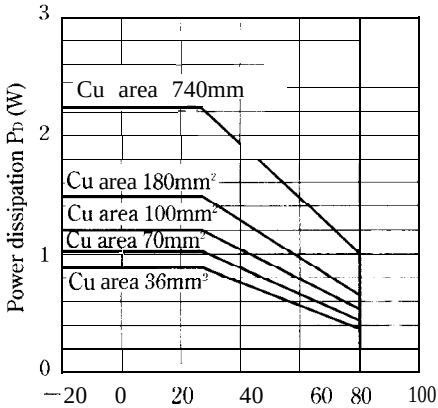
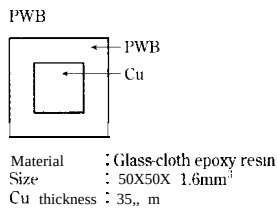


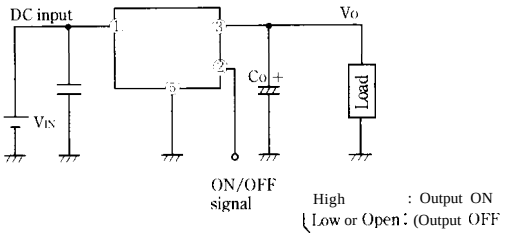
Fig.31 Power Dissipation vs. Ambient Temperature (Typical Value)





■ ON/OFF Operation

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



■ Model Line-ups for Tape-packaged Products

	Sleeve-packaged products		‘rape-packaged products	
Output current	Standard type	High-precsion output type	Standard type	High-precsion output type
0.5A output	—	PQ05TZ51 Series	—	PQ05TZ5U Series
1.0A output	—	PQ05TZ11 Series	—	PQ05TZI U Series

■ Electrical Characteristics

(Unless otherwise specified, V_C=2.7V, T_a=25°C)

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output voltage	PQ05TZ51/11	V_O	*3, *4	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		$R_{eg}L$	*3, *4	—	0.2	2.0	%
Line regulation		$R_{eg}I$	I_O=5mA, *8		0.1	2.5	%
Temperature coefficient of output voltage		T_cV_O	*3, I_O=5mA, T_j=0 to 125°C		±0.01		%/°C
Ripple rejection		RR	Refer to Fig. 2	45	60		dB
Dropout voltage		V_{I-O}	*7, *5		0.2	0.5	V
ON-state voltage for control		V_C (ON)	*3, *6, *7	2.0			V
ON-state current for control		I_C (ON)	*3, *7			200	μA
OFF-state voltage for control		V_C (OFF)	*3			0.8	V
OFF-state current for control		I_C (OFF)	*3, V_C=0.4V			10	μA
Quiescent current		I_q	*3, I_O=0A		4	10	mA
output OFF-state dissipation current		I_{qs}	*3, V_C=0.4V, I_O=0A			5	μA

*3 PQ05TZ51/11: V_{IN}=7V
PQ09TZ51/11: V_{IN}=11V
PQ12TZ51/11: V_{IN}=14V

*4 PQxxTZ51: I_O=5mA to 0.5A, PQxxTZ51: I_O=5mA to 1.0A

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*6 In case of opening control terinal 2, output voltage turns off.

*7 PQxxTZ51: I_O=0.3A, PQxxTZ11 I_O=0.5A

*8 **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

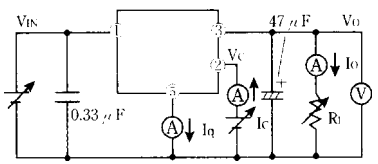
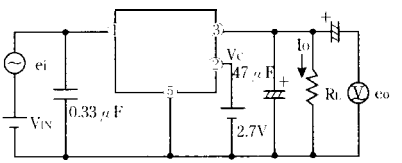
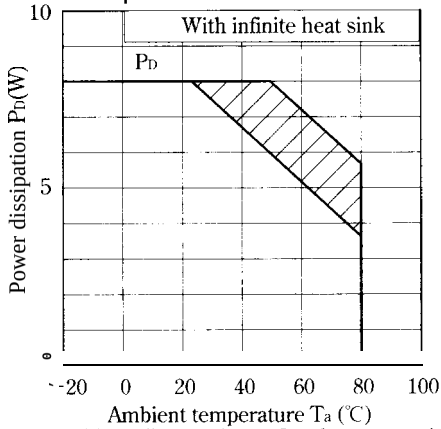


Fig. 2 Test Circuit of Ripple Rejection



f= 120 Hz (sine wave)
ei=0.5Vrms
V_{IN}= 7V (PQ05TZ51/111
V_{IN}=11V (PQ09TZ51/11)
V_{IN}=14V (PQ12TZ51/11)
I_O=0.3A
RR=20log(ei/eo)

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) (xx = 05,09,12)

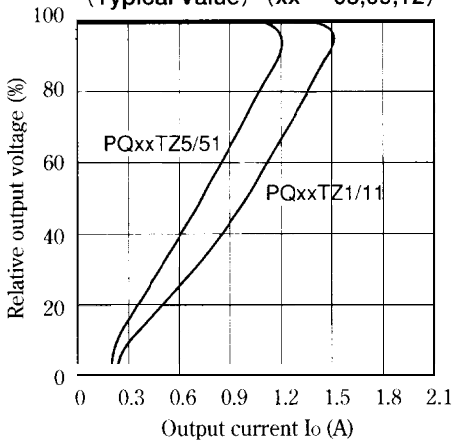


Fig. 5 Output Voltage Deviation vs. Junction Temperature (PQ05TZ51/11)

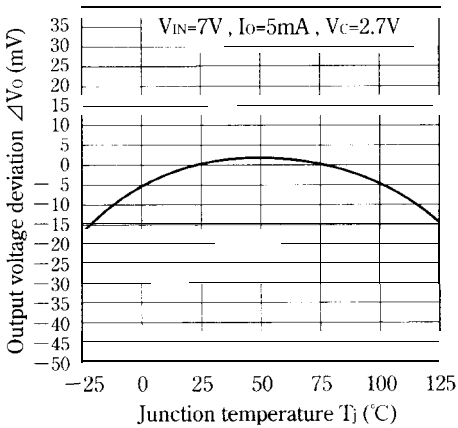


Fig. 6 Output Voltage Deviation vs. Junction Temperature (PQ09TZ51/11)

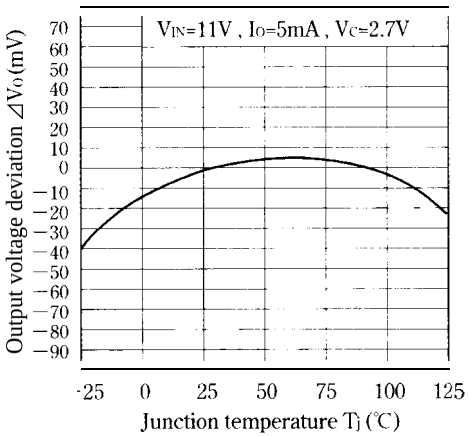


Fig. 7 Output Voltage Deviation vs. Junction Temperature (PQ12TZ51/11)

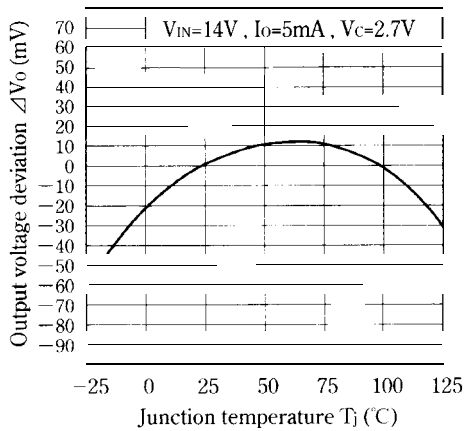


Fig. 8 Output Voltage vs. Input Voltage (PQ05TZ51)

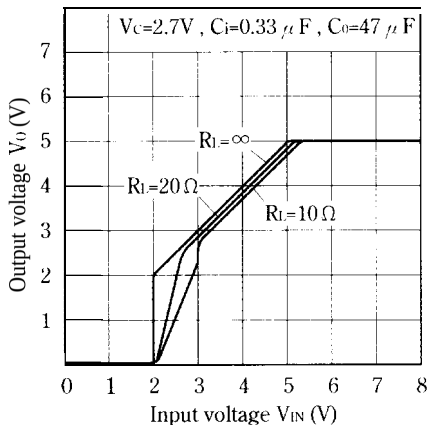


Fig. 9 Output Voltage vs. Input Voltage (Typical Value) (PQ09TZ51)

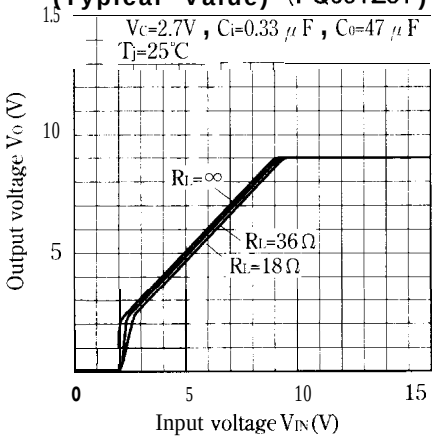


Fig.1O Output Voltage vs. Input Voltage (Typical Value) (PQ12TZ51)

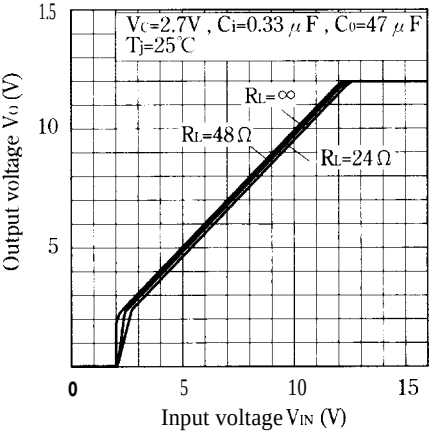


Fig.11 Output Voltage vs. Input Voltage (Typical Value) (PQ05TZ11)

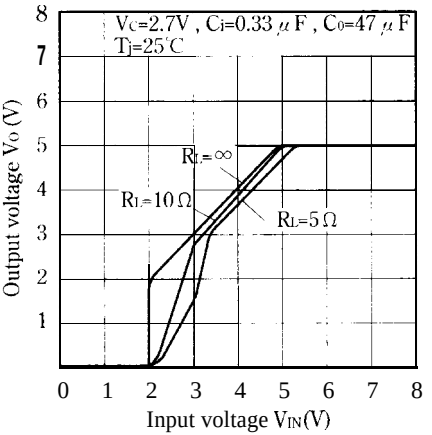


Fig.12 Output Voltage vs. Input Voltage (PQ09T211)

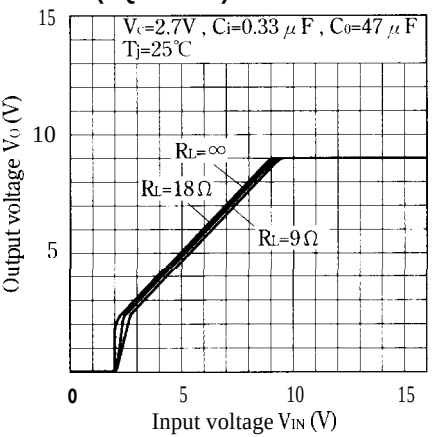


Fig.13 Output Voltage vs. Input Voltage (PQ12TZ1 1)

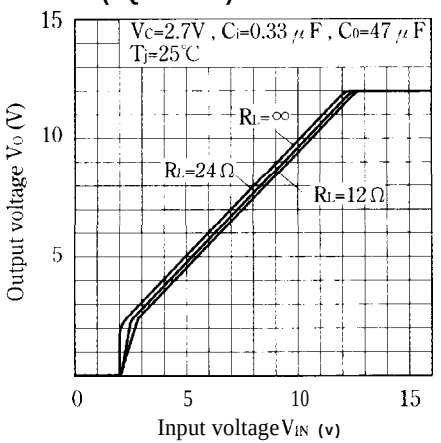


Fig.14 Dropout Voltage vs. Junction Temperature (PQ05TZ51/PQ09TZ51/PQ12TZ51)

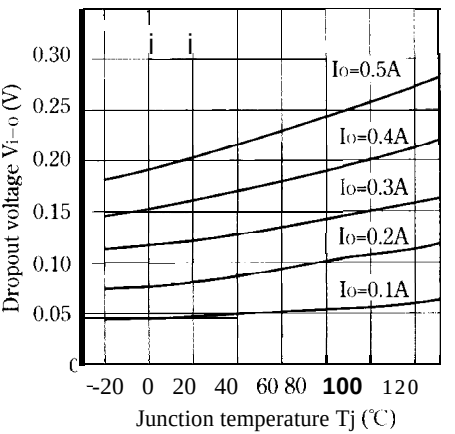


Fig.15 Dropout Voltage vs. Junction Temperature (PQ05TzI1/PQ09TZ11/PQ12TZ11)

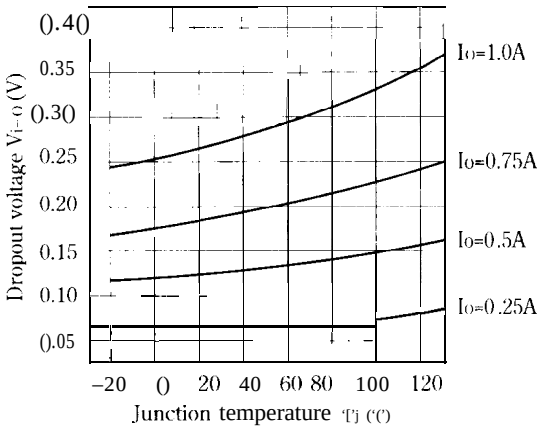


Fig.16 Circuit Operating Current vs. Input Voltage (PQ05TZ51)

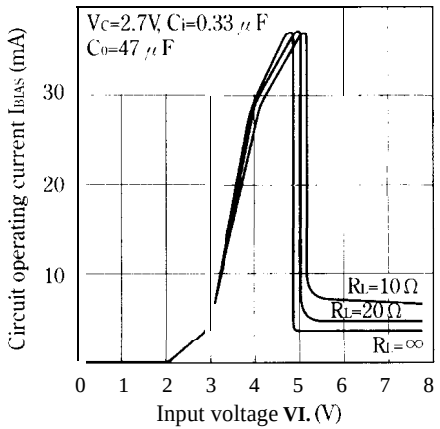


Fig.17 Circuit Operating Current vs. Input Voltage (PQ09TZ51)

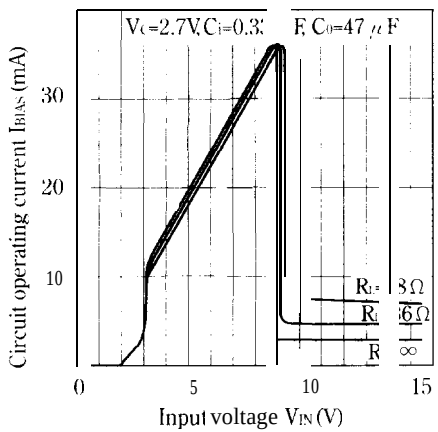


Fig.18 Circuit Operating Current vs. Input Voltage (PQ12TZ51)

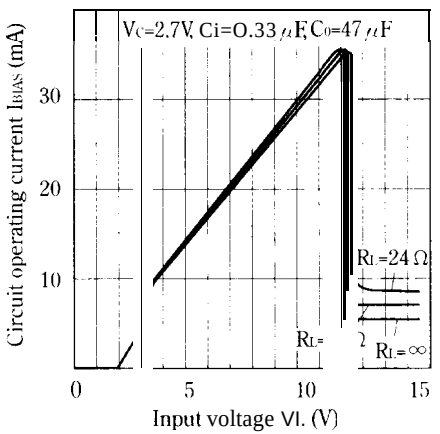


Fig.19 Circuit Operating Current vs. Input Voltage (PQ05TZ11)

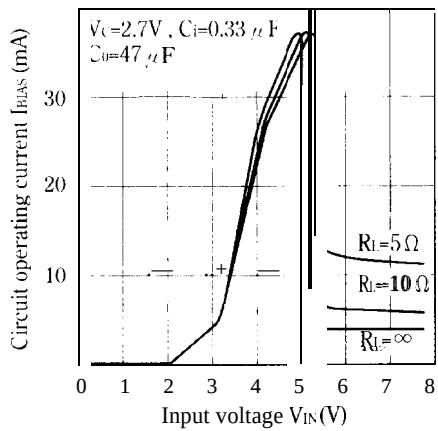


Fig.20 Circuit Operating Current vs. Input Voltage (PQ09TZ11)

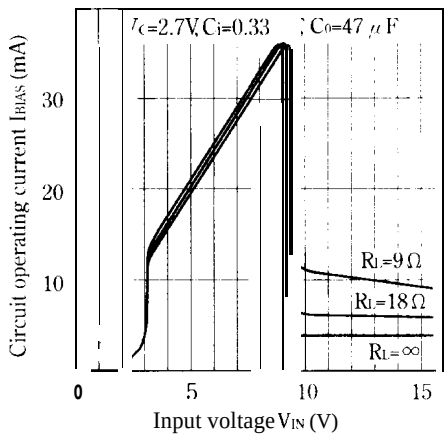


Fig.21 Circuit Operating Current vs. Input Voltage (PQ12TZ1 1)

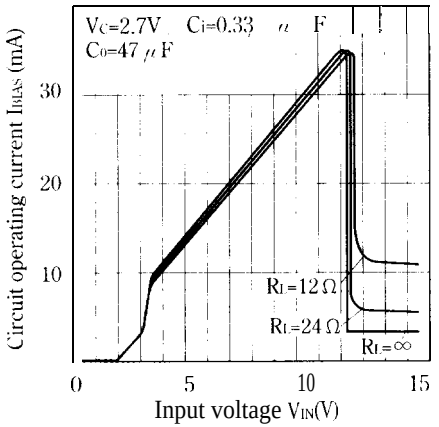


Fig.22 Quiescent Current vs. Junction Temperature

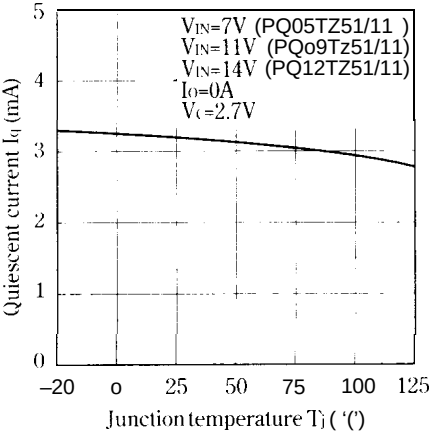


Fig.23 Ripple Rejection vs. Input Ripple Frequency (PQ05TZ51/PQ09TZ51/PQ12TZ51)

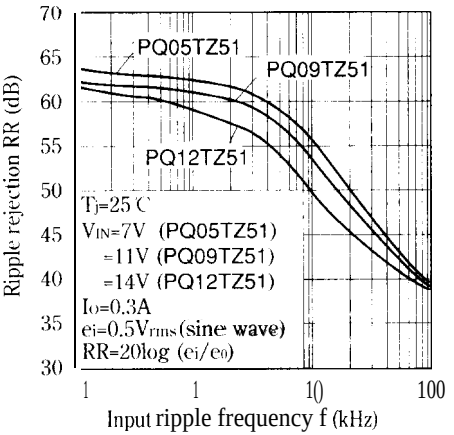


Fig.24 Ripple Rejection vs. Input Ripple Frequency (PQ05T211/pQo9Tz1 l/pQl2T211)

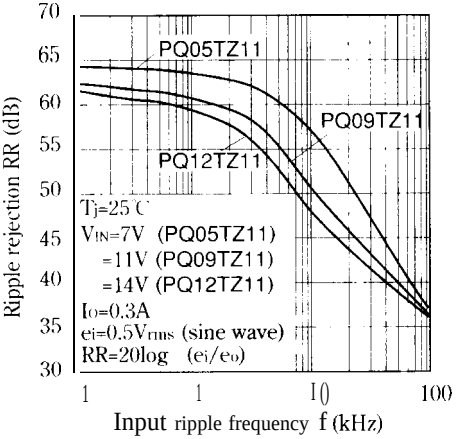


Fig.25 Ripple Rejection vs. Output Current (PQ05TZ51/PQ09TZ51/PQ12TZ51)

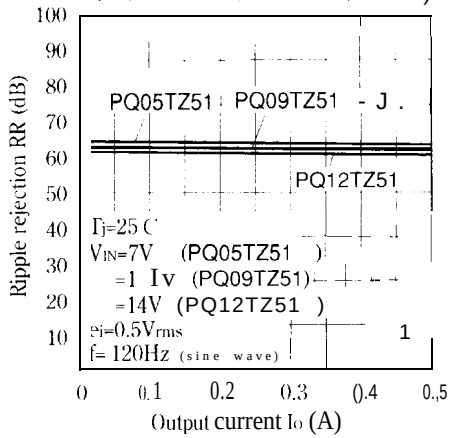


Fig.26 Ripple Rejection vs. Output Current (pQ05T211/pQo9Tz1 l/pQl2T211)

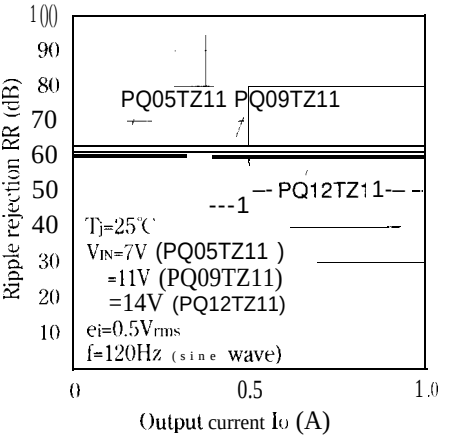


Fig.27 Output Peak Current vs. Dropout Voltage (PQ05TZ51/PQ09TZ51/PQ12Tz51)

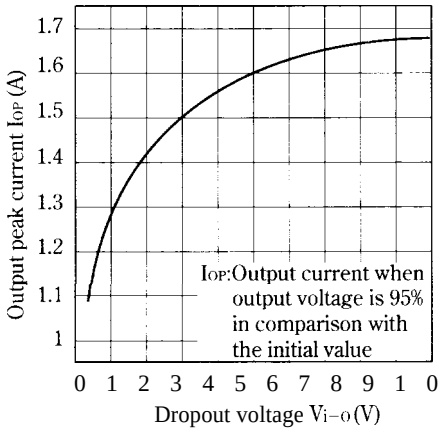


Fig.28 Output Peak Current vs. Dropout Voltage (PQ05TZ11/PQ09TZ11/PQ12Tz11)

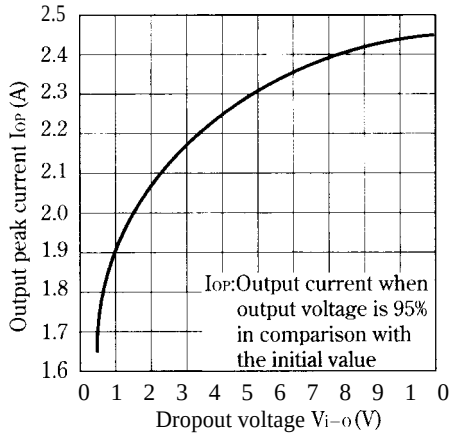


Fig.29 Output Peak Current vs. Junction Temperature (PQ05TZ51/PQ09TZ51/PQ12TZ51)

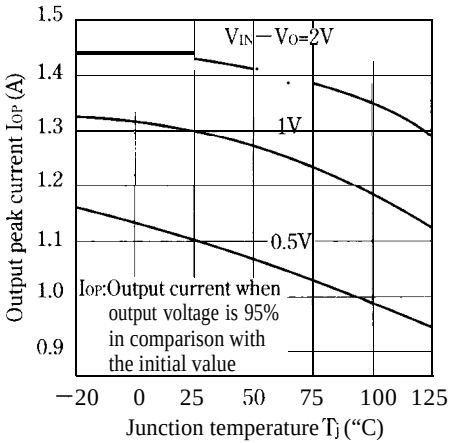


Fig.30 Output Peak Current vs. Junction Temperature (PQ05TZ11/PQ09TZ11/PQ12TZ11)

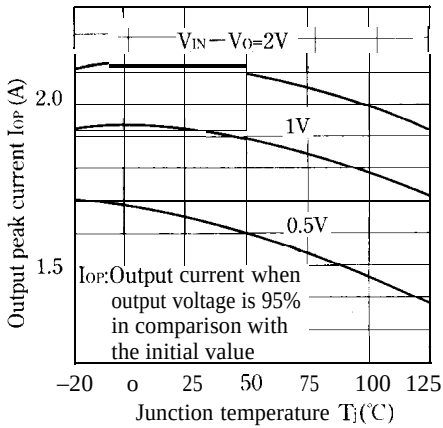
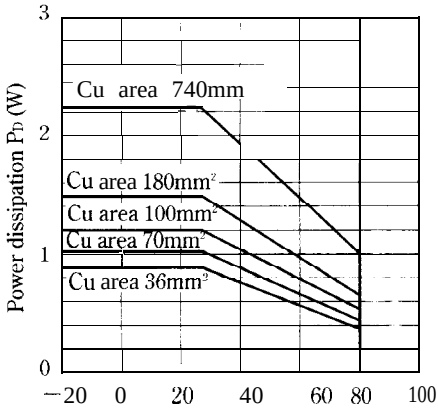
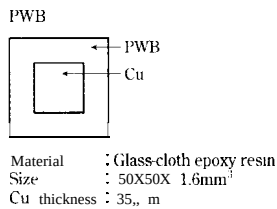


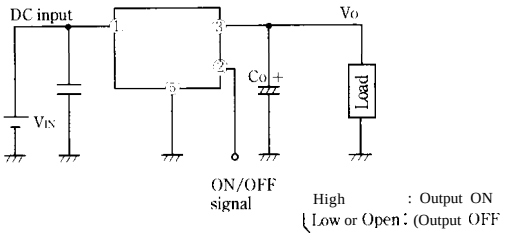
Fig.31 Power Dissipation vs. Ambient Temperature (Typical Value)





■ ON/OFF Operation

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



■ Model Line-ups for Tape-packaged Products

	Sleeve-packaged products		‘rape-packaged products	
Output current	Standard type	High-precsion output type	Standard type	High-precsion output type
0.5A output	—	PQ05TZ51 Series	—	PQ05TZ5U Series
1.0A output	—	PQ05TZ11 Series	—	PQ05TZI U Series