PQxxxEZ5MZ Series/ PQxxxEZ01Z Series

SC-63 Package, Low Voltage Operation, Low Power-Loss Voltage Regulator

■ Features

1. Low voltage operation (Minimum operating voltage:2.35V)
   2.5V input → available 1.5 to 1.8V
2. Low dissipation current
   Dissipation current at no load:MAX.2mA
   (Conventional model:MAX.10mA)
   OFF-state dissipation current:MAX.5μA
3. Fixed output and variable output are available
4. SC-63 package

■ Applications

1. Peripheral equipment of personal computers
2. Power supplies for various electronic equipment such as DVD player or STB

■ Model Line-up

Output current (I_O)	Package type	Output voltage (V_O) 1.5V	1.8V	2.5V
0.5A	Taping	PQ015EZ5MZP	PQ018EZ5MZP	PQ025EZ5MZP
	Sleeve	PQ015EZ5MZZ	PQ018EZ5MZZ	PQ025EZ5MZZ
1A	Taping	PQ015EZ01ZP	PQ018EZ01ZP	PQ025EZ01ZP
	Sleeve	PQ015EZ01ZZ	PQ018EZ01ZZ	PQ025EZ01ZZ
		3V	3.3V	
0.5A	Taping	PQ030EZ5MZP	PQ033EZ5MZP	
	Sleeve	PQ030EZ5MZZ	PQ033EZ5MZZ	
1A	Taping	PQ030EZ01ZP	PQ033EZ01ZP	
	Sleeve	PQ030EZ01ZZ	PQ033EZ01ZZ	

■ Absolute Maximum Ratings

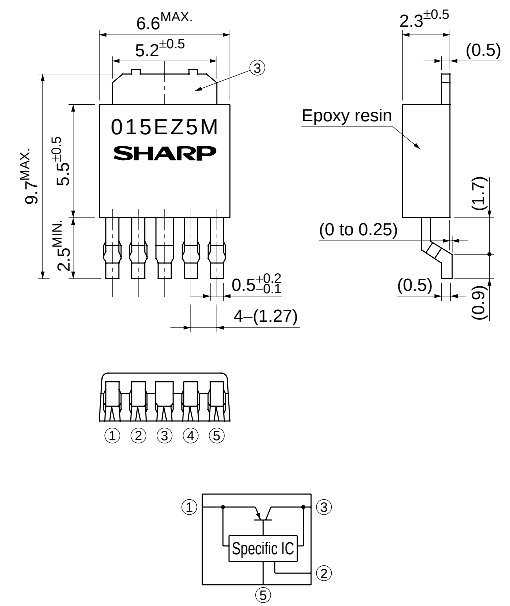
(Ta=25°C)

Parameter		Symbol	Rating	Unit
Input voltage		V_{IN}	10	V
*1 Output control voltage		V_C	10	V
Output current	PQxxxEZ5MZ Series	I_O	0.5	A
	PQxxxEZ01Z Series		1	
*2 Power dissipation		P_D	8	W
*3 Junction temperature		T_j	150	˚C
Operating temperature		T_{opr}	–40 to +85	˚C
Storage temperature		T_{stg}	–40 to +150	˚C
Soldering temperature		T_{sol}	260 (10s)	˚C

*1 All are open except GND and applicable terminals
*2 P_D:With infinite heat sink
*3 Overheat protection may operate at the condition Tj=125˚C to 150˚C

■ Outline Dimensions

(Unit : mm)



① DC input (V_{IN})
② ON/OFF control (V_C)
③ DC output (V_O)
④ NC
⑤ GND

❋ (　) : Typical dimensions

■ Electrical Characteristics

(Unless otherwise specified, condition shall be V_{IN}=V_O(TYP.)+1V, I_O=0.3A,V_C=2.7V, Ta=25˚C (**PQxxxEZ5MZ**))
(Unless otherwise specified, condition shall be V_{IN}=V_O(TYP.)+1V, I_O=0.5A,V_C=2.7V, Ta=25˚C (**PQxxxEZ01Z**))

Parameter		Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input voltage range		V_{IN}	–	Refer to below table			V
Output voltage		V_O	–	Refer to below table			V
Load regulation	**PQxxxEZ5MZ**	$R_{eg}L$	I_O=5mA to 0.5A	–	0.2	2	%
	PQxxxEZ01Z		I_O=5mA to 1A				
Line regulation		$R_{eg}I$	V_{IN}=V_O(TYP.)+1V to V_O(TYP.)+6V, I_O=5mA	–	0.1	1	%
Output voltage temperature coefficient		T_CV_O	T_j=0 to 125˚C, I_O=5mA	–	±0.01	–	%/˚C
Ripple Rejection		RR	Refer to Fig.2	45	60	–	dB
*4 Dropout voltage	**PQxxxEZ5MZ**	V_{I-O}	*5 I_O=0.3A	–	0.2	0.5	V
	PQxxxEZ01Z		*5 I_O=0.5A				
*6 Output on control voltage		$V_{C (ON)}$	–	2	–	–	V
Output on control current		$I_{C (ON)}$	–	–	–	200	µA
Output off control voltage		$V_{C (OFF)}$	–	–	–	0.8	V
Output off control current		$I_{C (OFF)}$	V_C=0.4V	–	–	2	µA
Quiescent current		I_q	I_O=0A	–	1	2	mA
Output OFF-state consumption current		I_{qs}	I_O=0A, V_C=0.4V	–	–	5	µA

*4 Applied **PQ030EZ5MZ**, **PQ033EZ5MZ**
*5 Input voltage when output voltage falls 0.95V_O by input voltage falling down
*6 In case of opening control terminal ②, output voltage turns off

■ Input Voltage Range

(Unless otherwise specified, condition shall be I_O=0.3A,V_C=2.7V, Ta=25˚C (**PQxxxEZ5MZ**))
(Unless otherwise specified, condition shall be I_O=0.5A,V_C=2.7V, Ta=25˚C (**PQxxxEZ01Z**))

Model No.	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
PQ015EZ5MZ/PQ015EZ01Z	V_{IN}	–	2.35	–	10	V
PQ018EZ5MZ/PQ018EZ01Z	V_{IN}	–	2.35	–	10	V
PQ025EZ5MZ/PQ025EZ01Z	V_{IN}	–	V_O+5	–	10	V
PQ030EZ5MZ/PQ030EZ01Z	V_{IN}	–	V_O+5	–	10	V
PQ033EZ5MZ/PQ033EZ01Z	V_{IN}	–	V_O+5	–	10	V

■ Output Voltage Range

(Unless otherwise specified, condition shall be V_{IN}=V_O(TYP.)+1V, I_O=0.3A,V_C=2.7V, Ta=25˚C (**PQxxxEZ5MZ**))
(Unless otherwise specified, condition shall be V_{IN}=V_O(TYP.)+1V, I_O=0.5A,V_C=2.7V, Ta=25˚C (**PQxxxEZ01Z**))

Model No.	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
PQ015EZ5MZ/PQ015EZ01Z	V_O	–	1.45	1.5	1.55	V
PQ018EZ5MZ/PQ018EZ01Z	V_O	–	1.75	1.8	1.85	V
PQ025EZ5MZ/PQ025EZ01Z	V_O	–	2.438	2.5	2.562	V
PQ030EZ5MZ/PQ030EZ01Z	V_O	–	2.925	3	3.075	V
PQ033EZ5MZ/PQ033EZ01Z	V_O	–	3.218	3.3	3.382	V

Fig.1 Standard Test Circuit

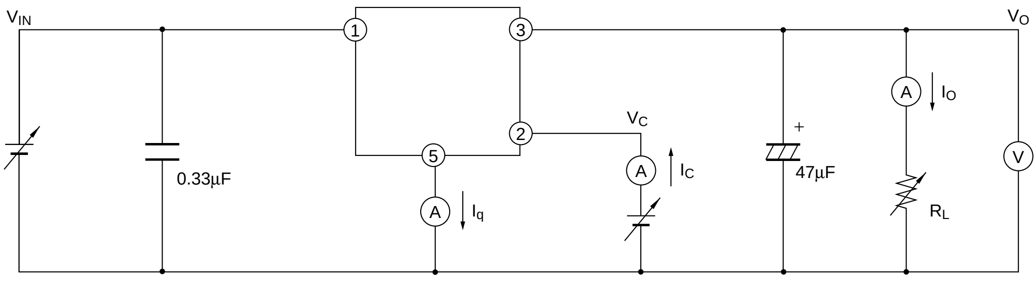
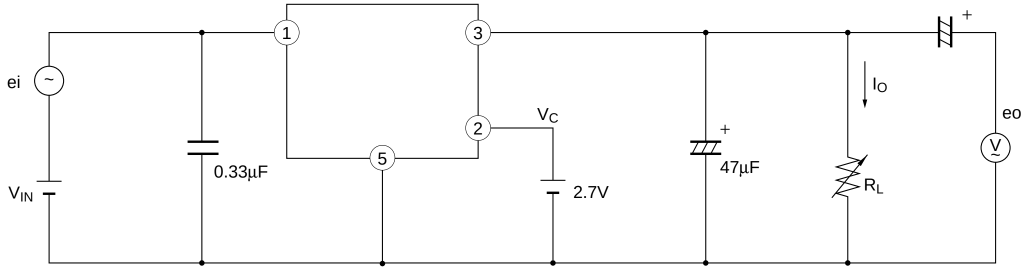
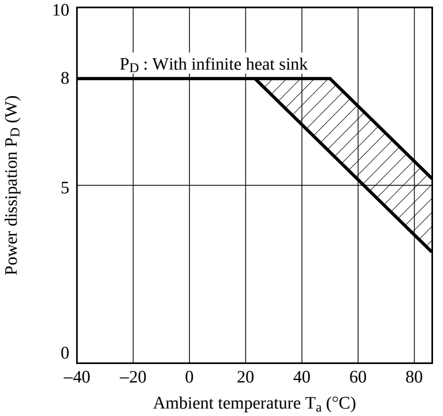


Fig.2 Test Circuit for Ripple Rejection



f=120Hz (sine wave)
ei(rms)=0.5V
V_{IN}=V_O(TYP)+2V
I_O=0.3A
RR=20log (ei(rms)/eo(rms))

Fig.3 Power Dissipation vs. Ambient Temperature



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

Fig.4 Overcurrent Protection Characteristics (PQ015EZ5MZ)

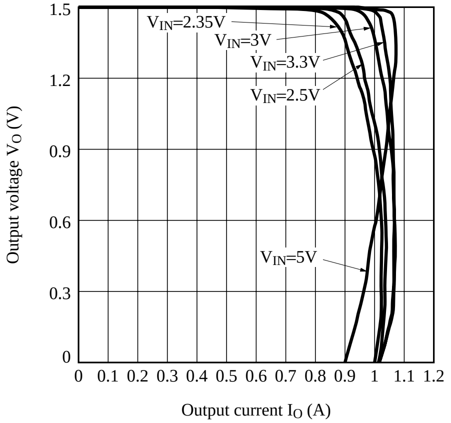


Fig.5 Overcurrent Protection Characteristics (PQ018EZ5MZ)

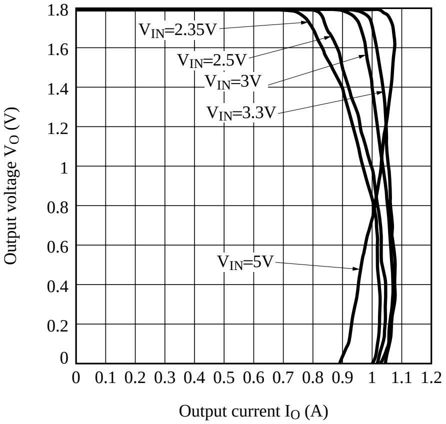


Fig.6 Overcurrent Protection Characteristics (PQ025EZ5MZ)

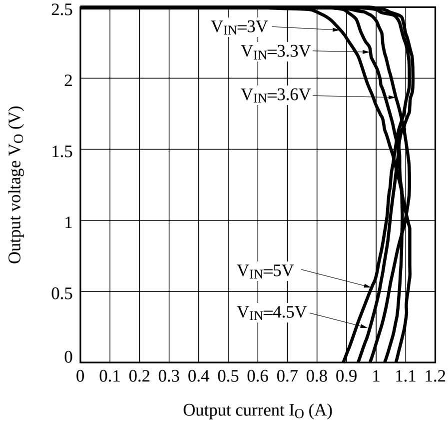


Fig.7 Overcurrent Protection Characteristics (PQ030EZ5MZ)

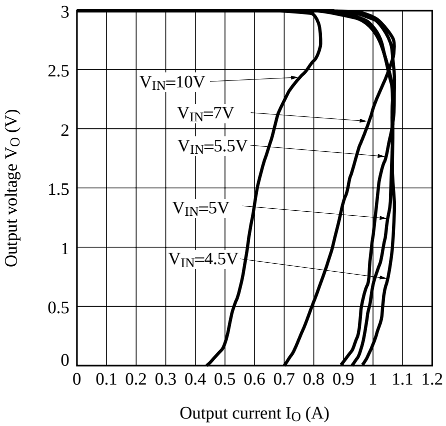


Fig.8 Overcurrent Protection Characteristics (PQ033EZ5MZ)

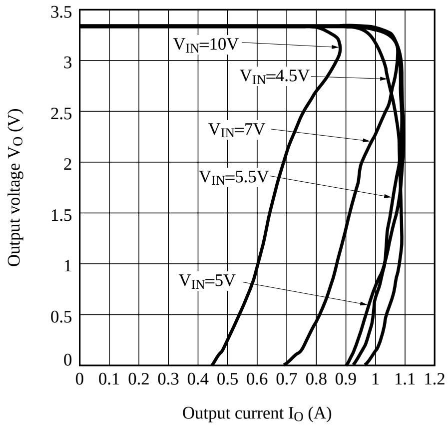


Fig.9 Overcurrent Protection Characteristics (PQ015EZ01Z)

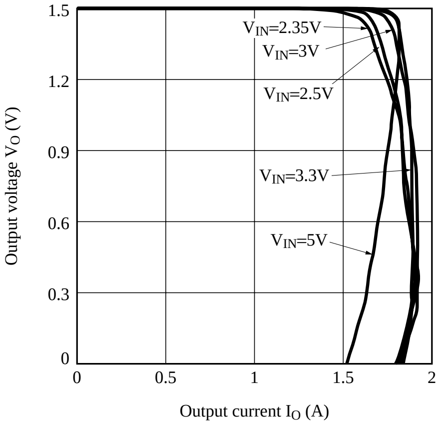


Fig.10 Overcurrent Protection Characteristics (PQ018EZ01Z)

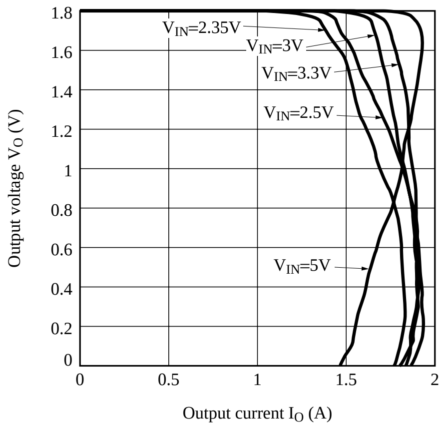


Fig.11 Overcurrent Protection Characteristics (PQ025EZ01Z)

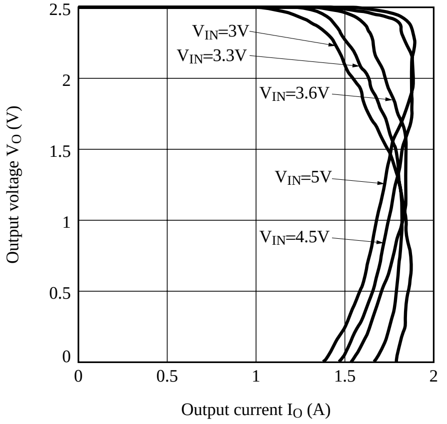


Fig.12 Overcurrent Protection Characteristics (PQ030EZ01Z)

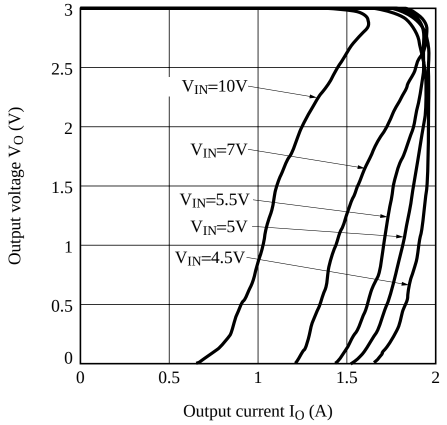


Fig.13 Overcurrent Protection Characteristics (PQ033EZ01Z)

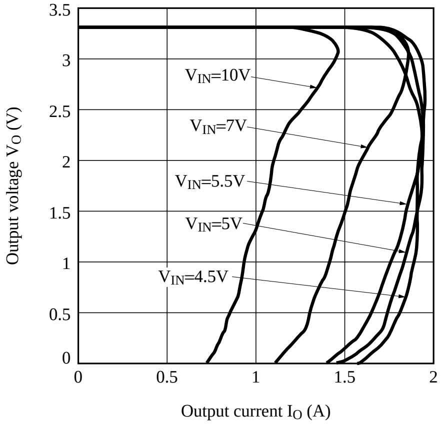


Fig.14 Output Voltage vs. Ambient Temperature (PQ015EZ5MZ/PQ015EZ01Z)

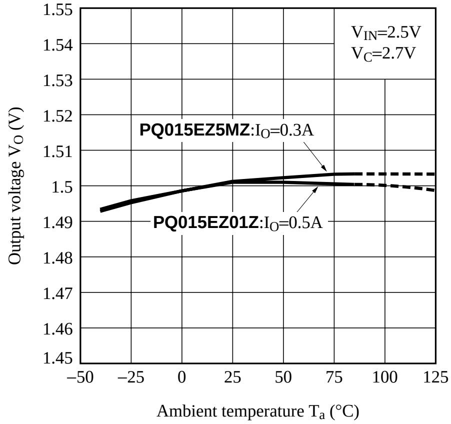


Fig.15 Output Voltage vs. Ambient Temperature (PQ018EZ5MZ/PQ018EZ01Z)

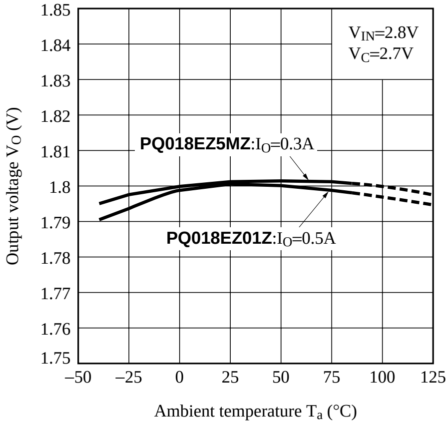


Fig.16 Output Voltage vs. Ambient Temperature (PQ025EZ5MZ/PQ025EZ01Z)

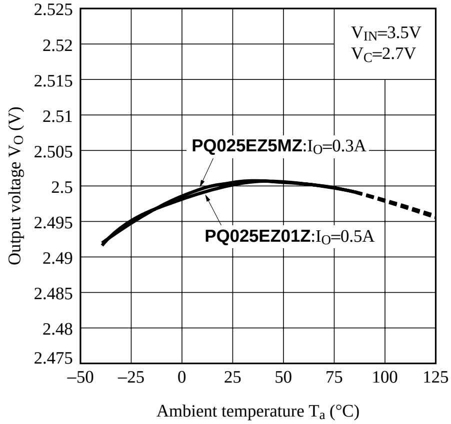


Fig.17 Output Voltage vs. Ambient Temperature (PQ030EZ5MZ/PQ030EZ01Z)

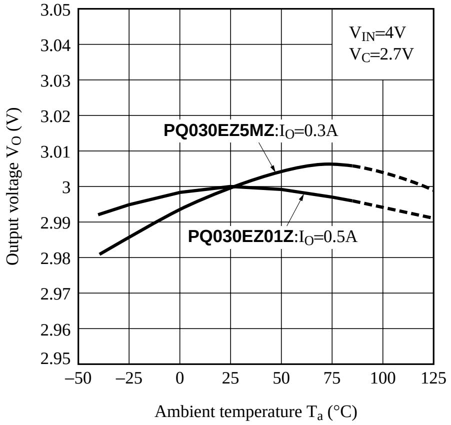


Fig.18 Output Voltage vs. Ambient Temperature (PQ033EZ5MZ/PQ033EZ01Z)

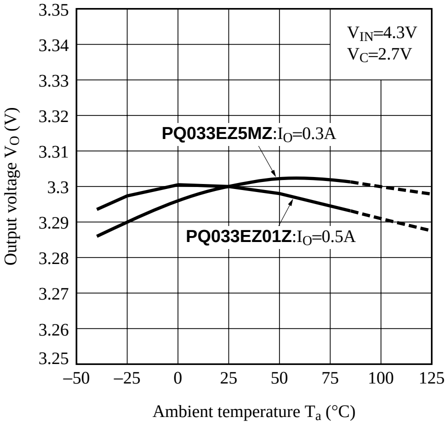


Fig.19 Output Voltage vs. Input Voltage (PQ015EZ5MZ)

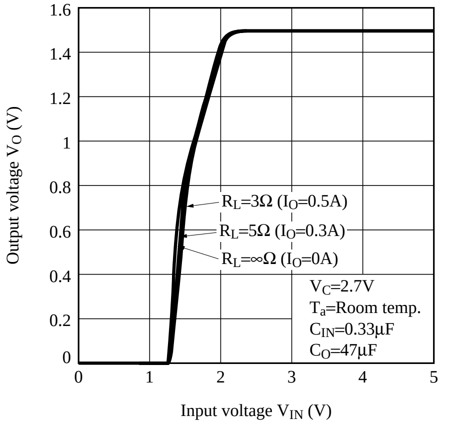


Fig.20 Output Voltage vs. Input Voltage (PQ018EZ5MZ)

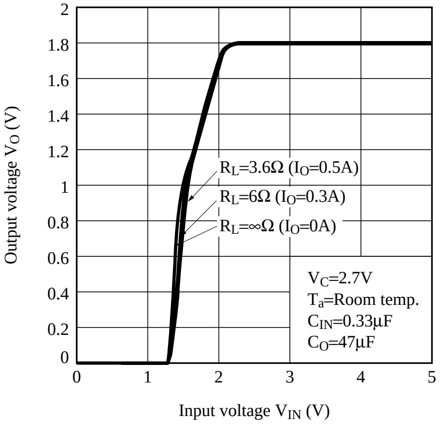


Fig.21 Output Voltage vs. Input Voltage (PQ025EZ5MZ)

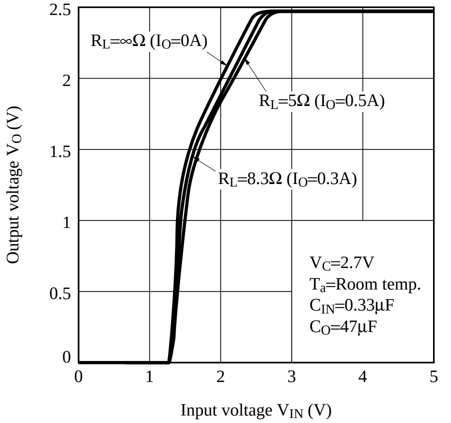


Fig.22 Output Voltage vs. Input Voltage (PQ030EZ5MZ)

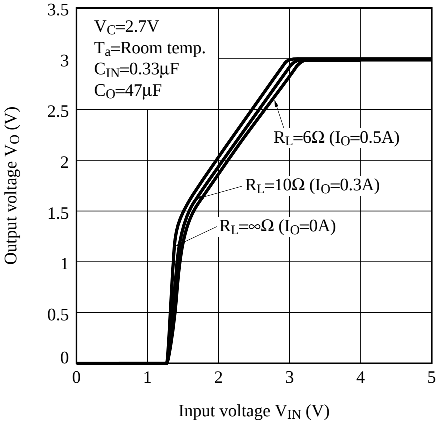


Fig.23 Output Voltage vs. Input Voltage (PQ033EZ5MZ)

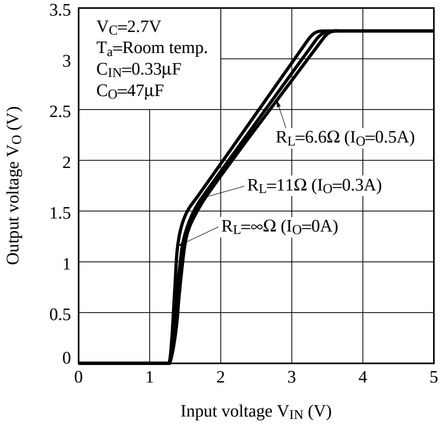


Fig.24 Output Voltage vs. Input Voltage (PQ015EZ01Z)

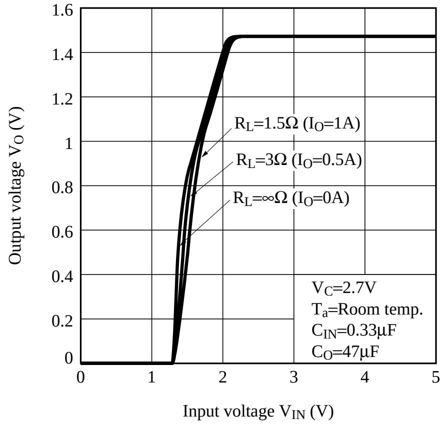


Fig.25 Output Voltage vs. Input Voltage (PQ018EZ01Z)

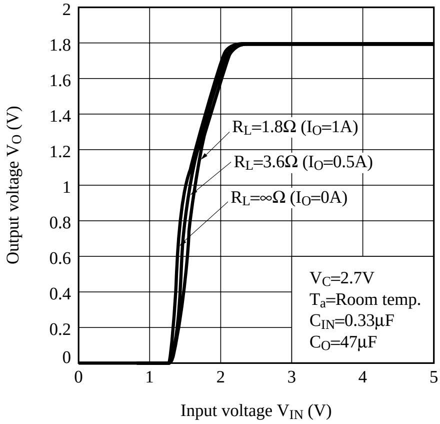


Fig.26 Output Voltage vs. Input Voltage (PQ025EZ01Z)

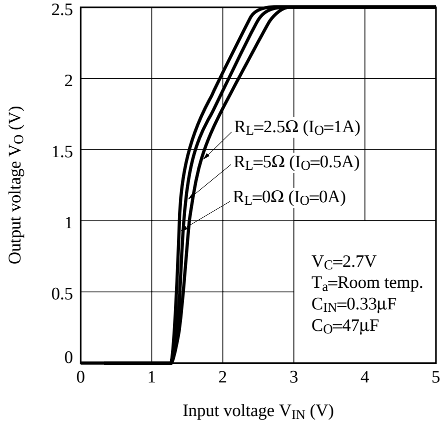


Fig.27 Output Voltage vs. Input Voltage (PQ030EZ01Z)

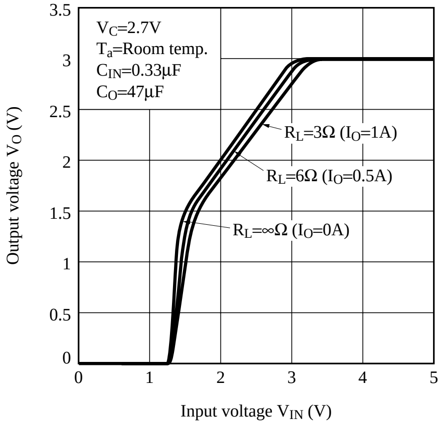


Fig.28 Output Voltage vs. Input Voltage (PQ033EZ01Z)

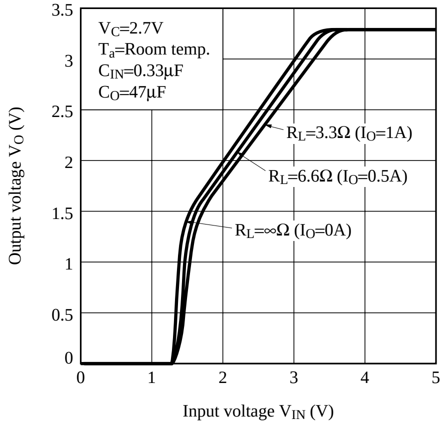


Fig.29 Circuit Operating Current vs. Input Voltage (PQ015EZ5MZ)

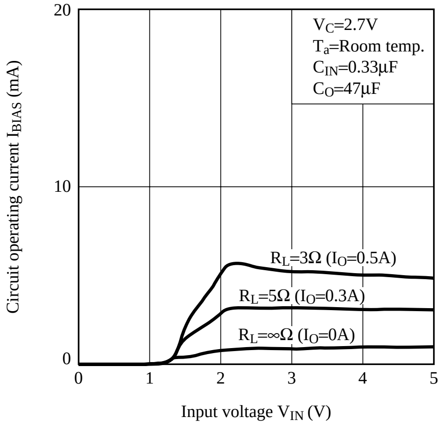


Fig.30 Circuit Operating Current vs. Input Voltage (PQ018EZ5MZ)

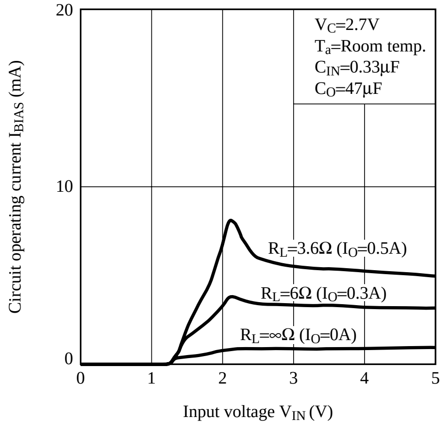


Fig.31 Circuit Operating Current vs. Input Voltage (PQ025EZ5MZ)

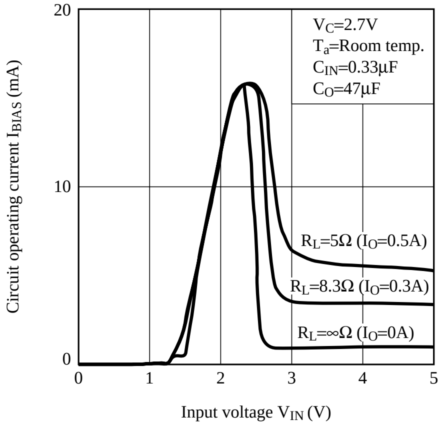


Fig.32 Circuit Operating Current vs. Input Voltage (PQ030EZ5MZ)

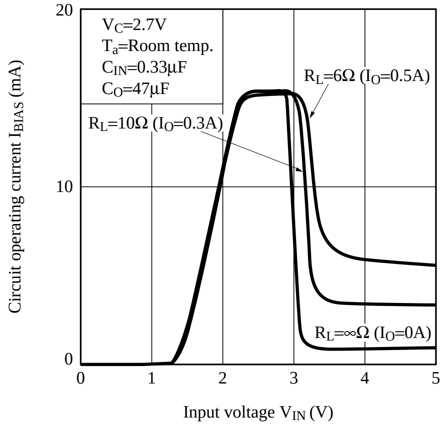


Fig.33 Circuit Operating Current vs. Input Voltage (PQ033EZ5MZ)

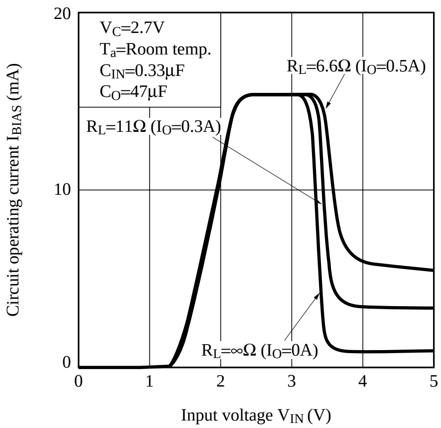


Fig.34 Circuit Operating Current vs. Input Voltage (PQ015EZ01Z)

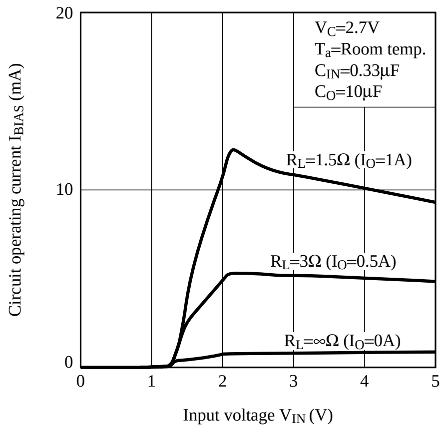


Fig.35 Circuit Operating Current vs. Input Voltage (PQ018EZ01Z)

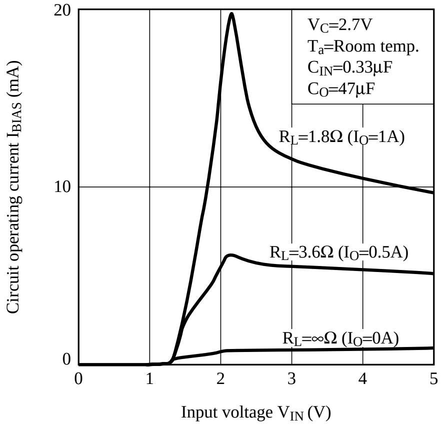


Fig.36 Circuit Operating Current vs. Input Voltage (PQ025EZ01Z)

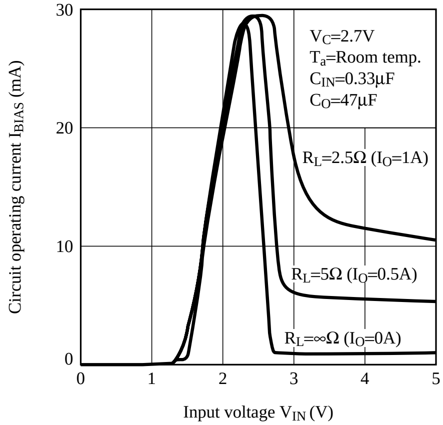


Fig.37 Circuit Operating Current vs. Input Voltage (PQ030EZ01Z)

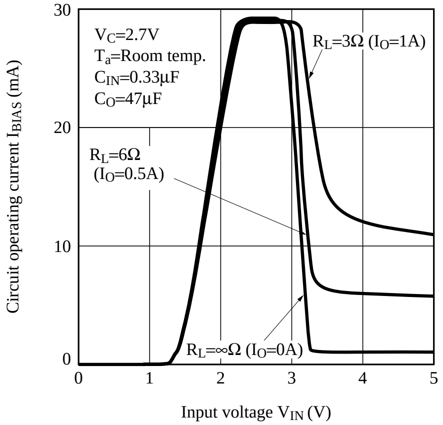


Fig.38 Circuit Operating Current vs. Input Voltage (PQ033EZ01Z)

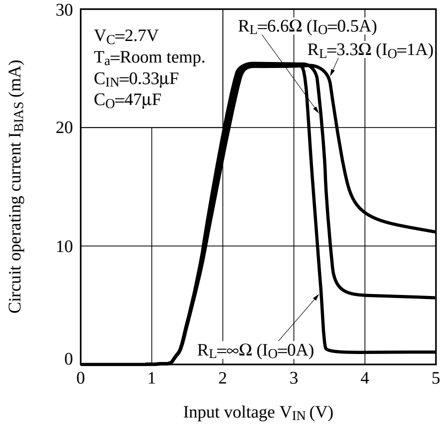


Fig.39 Quiescent Current vs. Ambient Temperature (PQxxxEZ5MZ/PQxxxEZ01Z)

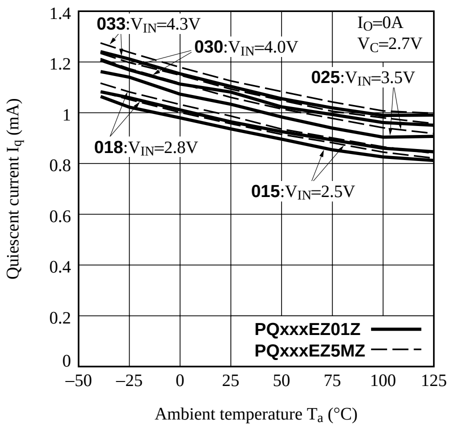


Fig.40 Dropout Voltage vs. Ambient Temperature (PQxxxEZ5MZ/PQxxxEZ01Z)

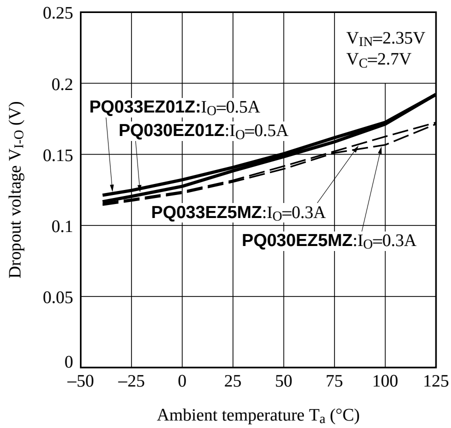


Fig.41 Ripple Rejection vs. Input Ripple Frequency (PQxxxEZ5MZ/PQxxxEZ01Z)

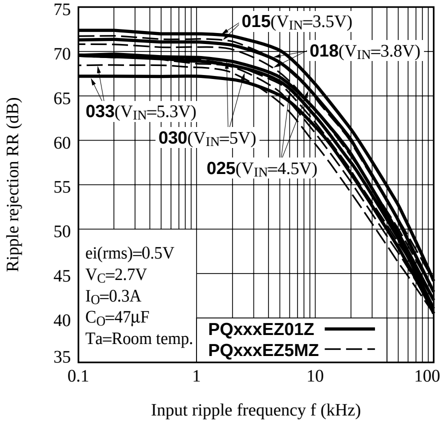


Fig.42 Ripple Rejection vs. Output Current (PQxxxEZ5MZ/PQxxxEZ01Z)

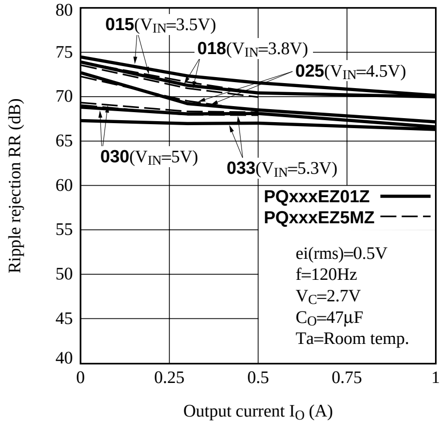


Fig.43 Example of Application

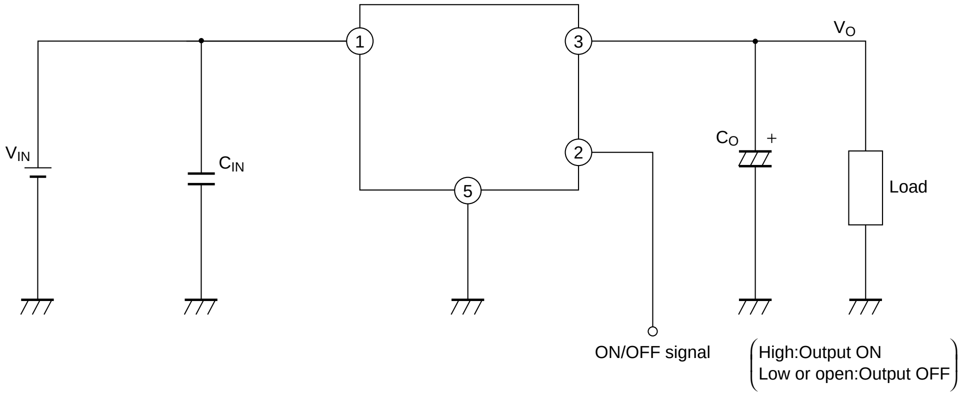
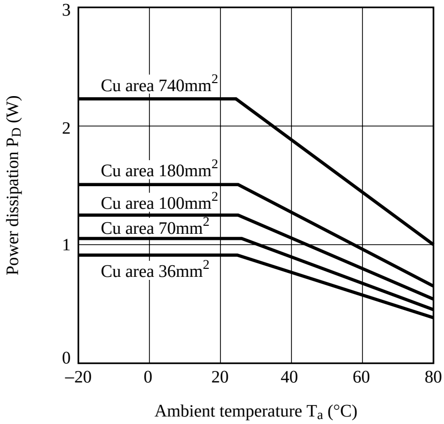
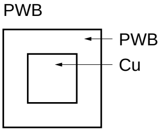


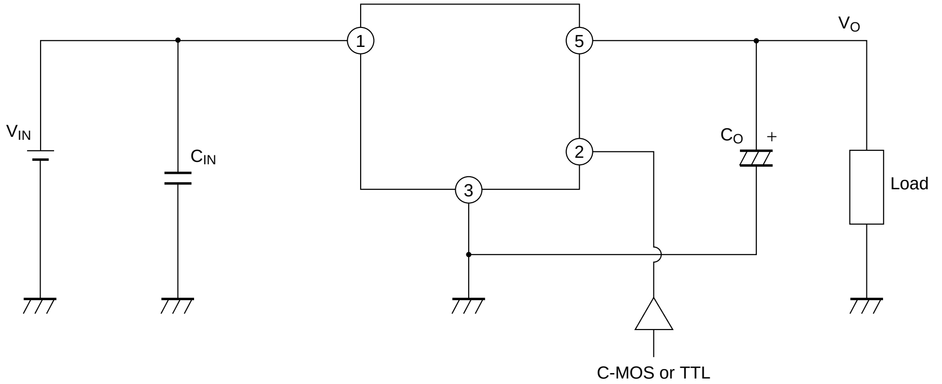
Fig.44 Power Dissipation vs. Ambient Temperature (Typical Value)





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

■ Precautions for Use



1. External connection
   (1) The connecting wiring of C_O, C_{IN} and each terminal, fin portion must be as short as possible. It may oscillate by type, value and wiring condition of capacitor. Confirm the output wareform in actual using condition beforehand.
   (2) ON/OFF control terminal ② is compatible with LS-TTL. It enables to be direcrly driven by TTL or C-MOS standard logic (RCA4000 series).
   (3) If voltage is applied under the conditions that device pin is connected divergently or reversely, the deterioration of characteristics or damage may occur. Never allow improper mounting.
2. Thermal protection design
   Maximum power dissipation of devices is obtained by the following equation.
   $P_D=I_O\times(V_{IN}-V_O)+V_{IN}\times I_q$
   When ambient temperature T_a and power dissipation P_D (MAX.) during operation are determined, operate element within the safety operation area specified by the derating curve. Insufficient radiation gives an unfavorable influence to the normal operation and reliability of the device.
   In the external area of the safety operation area shown by the derating curve, the overheat protection circuit may operate to shut-down output. However please avoid keeping such condition for a long time.
3. ESD (Electrostatic Sensitivity Discharge)
   Be careful not to apply electrostatic discharge to the device since this device employs a bipolar IC and may be damaged by electro static discharge. Followings are some methods against excessive voltage caused by electro static discharge.
   (1) Human body must be grounded to discharge the electro charge which is charged in the body or cloth.
   (2) Anything that is in contact with the device such as workbench, inserter, or measuring instrument must be grounded.
   (3) Use a soldering dip basin with a minimum leak current (isolation resistance 10MΩ or more) from the AC power supply line. Also the soldering dip basin must be grounded.

NOTICE

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(i) The devices in this publication are designed for use in general electronic equipment designs such as:
— Personal computers
— Office automation equipment
— Telecommunication equipment [terminal]
— Test and measurement equipment
— Industrial control
— Audio visual equipment
— Consumer electronics

(ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection with equipment that requires higher reliability such as:
— Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
— Traffic signals
— Gas leakage sensor breakers
— Alarm equipment
— Various safety devices, etc.

(iii) SHARP devices shall not be used for or in connection with equipment that requires an extremely high level of reliability and safety such as:
— Space applications
— Telecommunication equipment [trunk lines]
— Nuclear power control equipment
— Medical and other life support equipment (e.g., scuba).

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