

PQ1Xxx1M2ZP Series

■ Features

1. Compact surface mount package (2.9×1.6×1.1mm)
2. Low power-loss
(Dropout voltage:TYP. 0.11 V/MAX. 0.26V at $I_o=60\text{mA}$)
3. Possible to use a ceramic capacitor for an external smoothing capacitor
4. High ripple rejection (TYP. 70dB)
5. Low dissipation current
(Dissipation current at no load:TYP. 150 μA)
6. Built-in ON/OFF control function
(Dissipation current at OFF-state:MAX. 1 μA)
7. Built-in overcurrent and overheat protection functions

■ Applications

1. Cellular phones
2. Cordless phones
3. Personal information tools
4. Cameras/Camcoders
5. PCMCIA cards for notebook PCs

■ Model Line-up

Output Voltage (TYP.)	Model No.	Output Voltage (TYP.)	Model No.
2.5V	PQ1X251M2ZP	3.8V	PQ1X381M2ZP
2.8V	PQ1X281M2ZP	4.0V	PQ1X401M2ZP
3.0V	PQ1X301M2ZP	4.2V	PQ1X421M2ZP
3.3V	PQ1X331M2ZP	4.5V	PQ1X451M2ZP
3.6V	PQ1X361M2ZP	5.0V	PQ1X501M2ZP

■ Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Rating	Unit
*1 Input voltage	V_{IN}	9	V
*1 Output control voltage	V_C	9	V
Output current	I_o	300	mA
*2 Power dissipation	P_D	350	mW
*3 Junction temperature	T_j	150	°C
Operating temperature	T_{opr}	-30 to +80	°C
Storage temperature	T_{stg}	-55 to +150	°C
Soldering temperature	T_{sol}	260 (10s)	°C

*1 All are open except GND and applicable terminals, refer to Fig.3

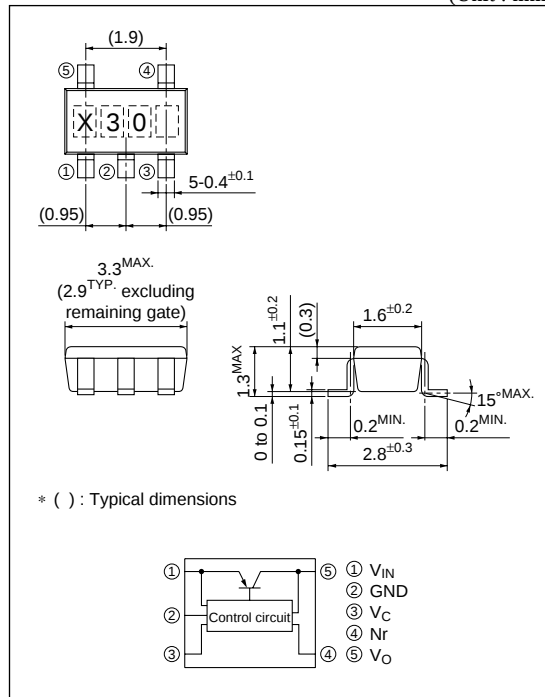
*2 At mounting PCB

*3 Overheat protection may operate at the condition T_j :125°C to 150°C

Compact, Low Output Current Low Power-Loss Voltage Regulators

■ Outline Dimensions

(Unit : mm)



■ Electrical Characteristics

(Unless otherwise specified, $V_{IN}=V_O(TYP)+1.0V$, $I_O=30mA$, $V_C=1.8V$, $T_a=25^{\circ}C$)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output voltage	V_O	—	Refer to the following table.1			V
*4 Output peak current	I_{Op}	—	180	300	—	mA
Recommended output current	—	—	—	—	150	mA
Load regulation	R_{egL1}	$I_O=5$ to 60mA	—	10	50	mV
	R_{egL2}	$I_O=5$ to 100mA	—	20	100	mV
	R_{egL3}	$I_O=5$ to 150mA	—	40	160	mV
Line regulation	R_{egI}	$V_{IN}=V_O(TYP)+1V$ to $V_O(TYP)+6V(MAX. 9.0V)$	—	3.0	20	mV
Temperature coefficient of output voltage	TcV_O	$I_O=10mA$, $T_J=-25$ to $+75^{\circ}C$	—	0.05	—	mV/ $^{\circ}C$
Ripple rejection	RR	Refer to Fig.2	—	70	—	dB
Output noise voltage	$V_{no(rms)}$	$10Hz < f < 100kHz$, $C_n=0.1\mu F$, $I_O=30mA$	Refer to the following table.2			μV
Dropout voltage	V_{I-o1}	$I_O=60mA$ *5	—	0.11	0.26	V
	V_{I-o2}	$I_O=150mA$ *5	—	0.20	0.4	
*6 ON-state voltage for control	$V_C(ON)$	—	1.8	—	—	V
ON-state current for control	$I_C(ON)$	$V_C=1.8V$	—	5	30	μA
OFF-state voltage for control	$V_C(OFF)$	—	—	—	0.4	V
Quiescent current	I_q	$I_O=0mA$	—	150	200	μA
Output OFF-state consumption current	I_{qs}	$V_C=0.2V$	—	—	1	μA

*4 Output current shall be the value when output voltage lowers 0.3V from the voltage at $I_O=30mA$

*5 Input voltage when output voltage falls 0.1V from that at $V_{IN}=V_O(TYP)+1.0V$.

*6 In case that the control terminal (③ pin) is non-connection, output voltage should be OFF state.

Table.1 Output Voltage Line-up

($V_{IN}=V_O(TYP)+1.0V$, $I_O=30mA$, $V_C=1.8V$, $T_a=25^{\circ}C$)

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1X251M2ZP	V_O	2.440	2.5	2.560	V
PQ1X281M2ZP	V_O	2.740	2.8	2.860	V
PQ1X301M2ZP	V_O	2.940	3.0	3.060	V
PQ1v331M2ZP	V_O	3.234	3.3	3.366	V
PQ1X361M2ZP	V_O	3.528	3.6	3.672	V
PQ1X381M2ZP	V_O	3.724	3.8	3.876	V
PQ1X401M2ZP	V_O	3.920	4.0	4.080	V
PQ1X421M2ZP	V_O	4.116	4.2	4.284	V
PQ1X451M2ZP	V_O	4.410	4.5	4.590	V
PQ1X501M2ZP	V_O	4.900	5.0	5.100	V

Table.2 Output Noise Voltage Line-up

($V_{IN}=V_O(TYP)+1.0V$, $I_O=30mA$, $V_C=1.8V$, $C_n=0.1\mu F$, $10Hz < f < 100kHz$, $T_a=25^{\circ}C$)

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1X251M2ZP	$V_{no(rms)}$	—	25	—	μV
PQ1X281M2ZP	$V_{no(rms)}$	—	25	—	μV
PQ1X301M2ZP	$V_{no(rms)}$	—	30	—	μV
PQ1X331M2ZP	$V_{no(rms)}$	—	30	—	μV
PQ1X361M2ZP	$V_{no(rms)}$	—	35	—	μV
PQ1X381M2ZP	$V_{no(rms)}$	—	35	—	μV
PQ1X401M2ZP	$V_{no(rms)}$	—	40	—	μV
PQ1X421M2ZP	$V_{no(rms)}$	—	40	—	μV
PQ1X451M2ZP	$V_{no(rms)}$	—	45	—	μV
PQ1X501M2ZP	$V_{no(rms)}$	—	50	—	μV

Fig.1 Standard Test Circuit

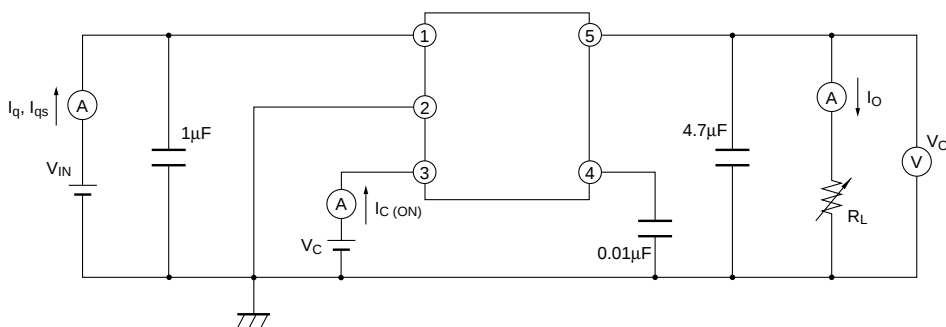


Fig.2 Test Circuit for Ripple Rejection

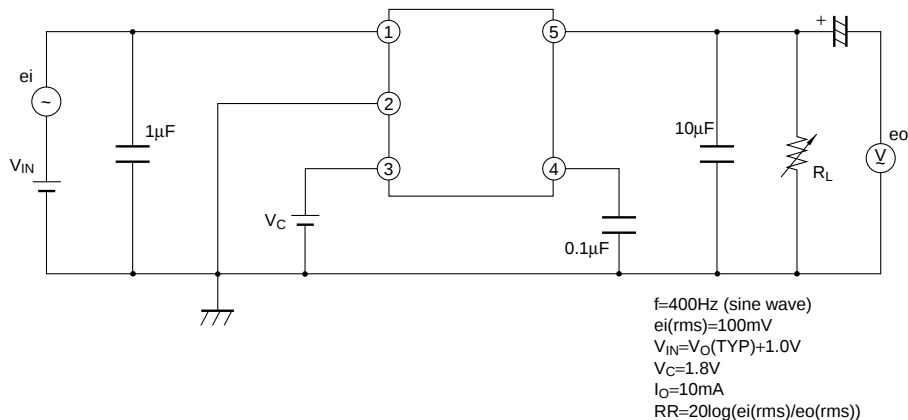


Fig.3 Power Dissipation vs. Ambient Temperature

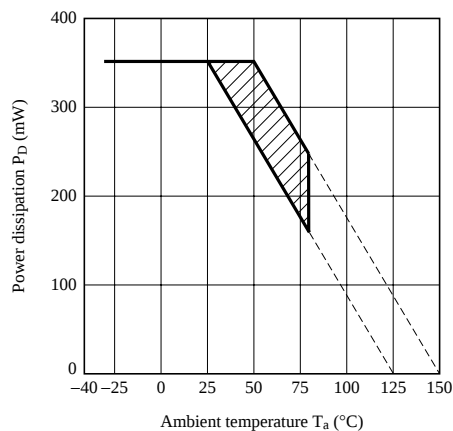


Fig.4 Overcurrent Protection Characteristics (Typical Value)

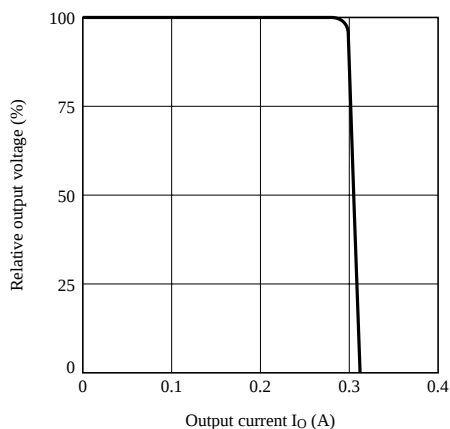


Fig.5 Output Voltage Fluctuation vs. Junction Temperature (PQ1X301M2ZP)(Typical Value)

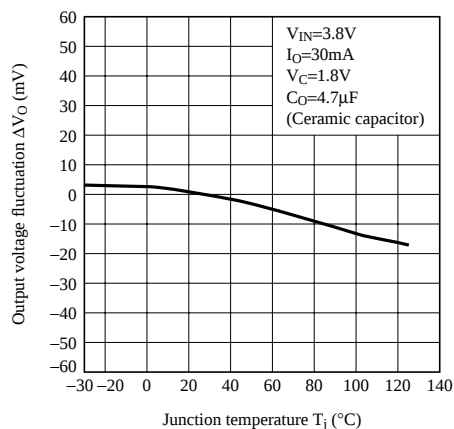


Fig.6 Output Voltage vs. Input Voltage (PQ1X301M2ZP)(Typical Value)

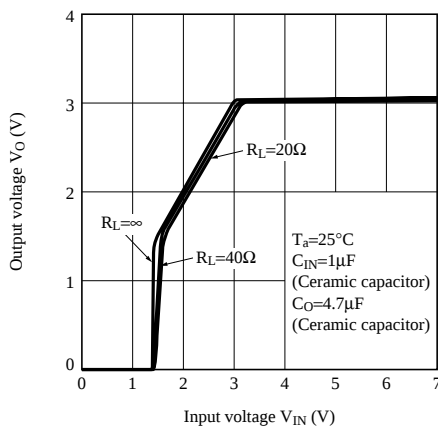


Fig.7 Operating Consumption Current vs. Input Voltage (PQ1X301M2ZP)(Typical Value)

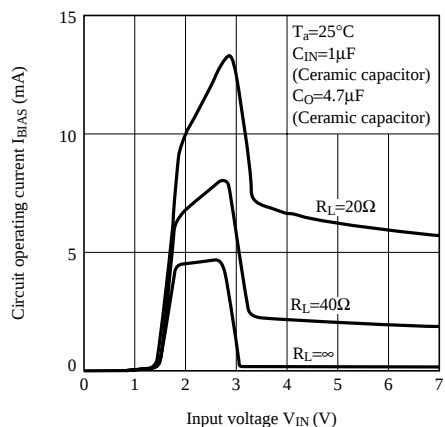


Fig.8 Dropout Voltage vs. Junction Temperature (PQ1X301M2ZP)(Typical Value)

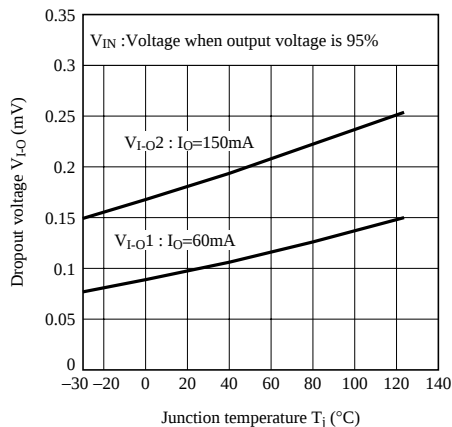


Fig.9 Quiescent Current vs. Junction Temperature (Typical Value)

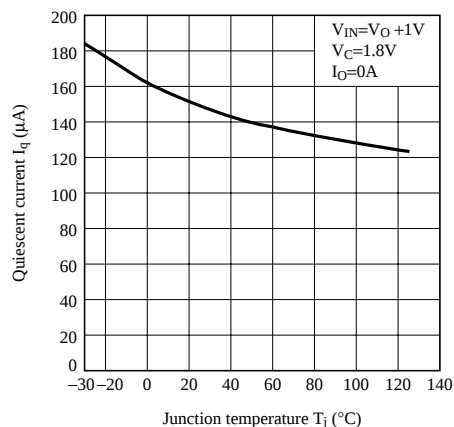


Fig.10 Ripple Rejection vs. Input Frequency (PQ1X281M2ZP)(Typical Value)

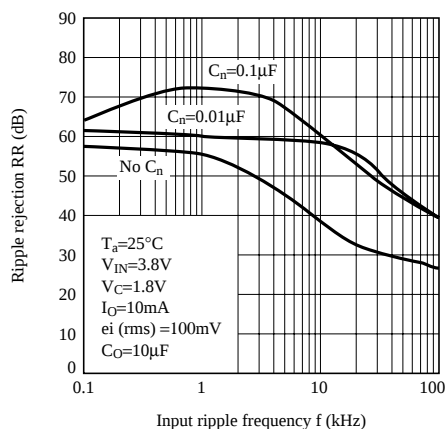


Fig.11 Dropout Voltage vs. Output Current

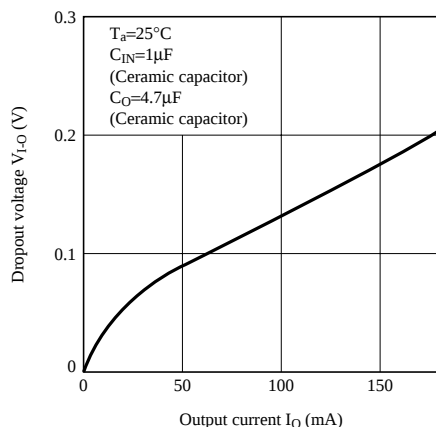
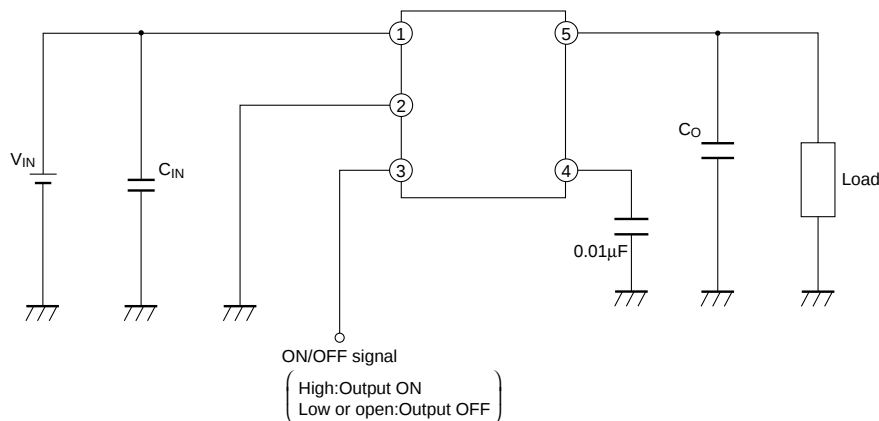


Fig.12 Example of Application



1. External connection

- (1) Please perform shortest wiring for connection between C_O or C_{IN} and the individual terminal. There is case that oscillation occurs easily by kinds of capacity capacity and how to wire. Before you use this device, you should confirm output voltage in your actual using conditions.
- (2) The input terminal for ON/OFF output control is compatible with LS-TTL, and direct driving by TTL or C-MOS standard logic (RCA 4000 series) is also available.
- (3) If voltage is applied under the conditions that the device pin is connected divergently or reversely, the deterioration of characteristics or damage may occur. Never allow improper mounting.
- (4) If voltage exceeding the voltage of DC input terminal ① is applied to the output terminal ⑤, the element may be damaged. Especially when the DC input terminal ① is short-circuited to the GND in ordinary operating state, charges accumulated in the output capacitor C_O flow to the input side, causing damage to the element. In this case, connect the ordinary silicon diode as shown in the figure.

2. Thermal protection design

Maximum power dissipation of devices is obtained by the following equation.

$$P_D = V_{IN} \times I_{IN} - V_O \times I_O$$

When ambient temperature T_a and power dissipation P_D (MAX.) during operation are determined, use a heat sink which allows the element to operate 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 electro static 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 static electricity from 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 solder dip basin with a minimum leak current (isolation resistance $10M\Omega$ or more) from the commercial power supply.
Also the solder dip basin must be grounded.

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