PQ1Txx1M2ZP Series

Low Output Current, Compact Surface Mount Type Low Power-Loss Voltage Regulators

■ Features

1. Compact surface mount package (2.9×1.6×1.1mm)
2. Low power-loss
   (Dropout voltage:TYP. 0.10 V/MAX. 0.15V at I_O=60mA/V_O=3.0V)
3. High ripple rejection (TYP. 70dB)
4. Low current operation type
   (Dissipation current at no load:TYP. 35μA)
5. Built-in ON/OFF control function
   (Dissipation current at OFF-state:MAX. 1μA)
6. Low voltage operation type
   (Input voltage:MIN. 1.8V)
7. Overcurrent protection functions

*It is available for every 0.1V(1.8V to 5.5V)

■ Applications

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

■ Model Line-up

Output Voltage (TYP.)	Model No.	Output Voltage (TYP.)	Model No.
1.8V	**PQ1T181M2ZP**	3.3V	**PQ1T331M2ZP**
2.5V	**PQ1T251M2ZP**	3.5V	**PQ1T351M2ZP**
2.7V	**PQ1T271M2ZP**	3.6V	**PQ1T361M2ZP**
2.8V	**PQ1T281M2ZP**	3.8V	**PQ1T381M2ZP**
3.0V	**PQ1T301M2ZP**	4.0V	**PQ1T401M2ZP**
3.2V	**PQ1T321M2ZP**	5.0V	**PQ1T501M2ZP**

■ Absolute Maximum Ratings

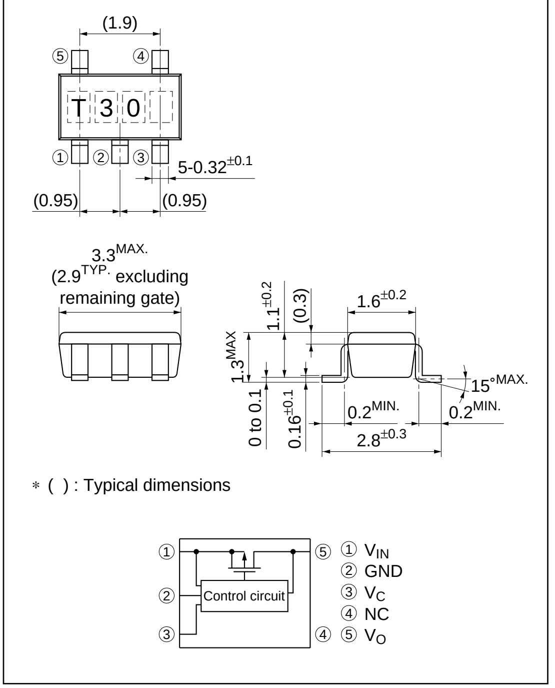
(Ta=25°C)

Parameter	Symbol	Rating	Unit
*1 Input voltage	V_{IN}	9	V
*1 Output control voltage	V_C	0 to V_{IN}	V
Output current	I_O	400	mA
*2 Power dissipation	P_D	350	mW
Junction temperature	T_j	125	˚C
Operating temperature	T_{opr}	–40 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
*2 At mounting PCB

■ Outline Dimensions

(Unit : mm)



■ Electrical Characteristics

(Unless otherwise specified, V_{IN}=V_O(TYP)+1.0V, I_O=30mA, V_C=1.8V, Ta=25˚C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output voltage	V_O	–	Refer to the following table.1			V
*3 Output peak current	I_{op}	–	310	370	–	mA
Recommended output current	–	–	–	–	150	mA
Load regulation	$R_{eg}L1$	I_O=5 to 80mA	–	6	36	mV
	$R_{eg}L2$	I_O=5 to 150mA	–	12	80	mV
	$R_{eg}L3$	I_O=5 to 300mA	–	25	150	mV
Line regulation	$R_{eg}I$	V_{IN}=V_O(TYP)+1V to V_O(TYP)+6V(MAX. 9.0V)	–	0.02	0.15	%/V
Temperature coefficient of output voltage	T_CV_O	I_O=10mA, T_j=–25 to +75˚C	–	±50	–	ppm/˚C
*4 Ripple rejection	RR	Refer to Fig.2	–	70	–	dB
*4 Output noise voltage	$V_{no\ (rms)}$	10Hz<f<100kHz, I_O=30mA	–	60	–	μV
Dropout voltage	$V_{I-O}1$	I_O=60mA *5	Refer to the following table.2			V
	$V_{I-O}2$	I_O=150mA *5	Refer to the following table.3			
	$V_{I-O}3$	I_O=300mA *5	Refer to the following table.4			
*6 ON-state voltage for control	$V_{C\ (ON)}$	–	1.8	–	–	V
ON-state current for control	$I_{C\ (ON)}$	V_{IN}=V_C=9.0V	–	2	4	μA
OFF-state voltage for control	$V_{C\ (OFF)}$	–	–	–	0.8	V
Quiescent current	I_q	I_O=0mA	–	35	65	μA
Output OFF-state consumption current	I_{qs}	V_C=0.2V	–	–	1	μA

*3 Output current shall be the value when output voltage lowers 0.3V from the voltage at I_O=30mA
Temperature coefficient of Output peak current:Around 1.3mA/˚C
(In case of low temperature, current work is lower.)
*4 Typical value of 3.0V output type
*5 Input voltage when output voltage falls 0.1V from that at Vin=Vo(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, Ta=25°C)

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1T181M2ZP	V_O	1.770	1.8	1.830	V
PQ1T251M2ZP	V_O	2.462	2.5	2.538	V
PQ1T271M2ZP	V_O	2.659	2.7	2.741	V
PQ1T281M2ZP	V_O	2.758	2.8	2.842	V
PQ1T301M2ZP	V_O	2.955	3.0	3.045	V
PQ1T321M2ZP	V_O	3.152	3.2	3.248	V
PQ1T331M2ZP	V_O	3.250	3.3	3.350	V
PQ1T351M2ZP	V_O	3.447	3.5	3.553	V
PQ1T361M2ZP	V_O	3.546	3.6	3.654	V
PQ1T381M2ZP	V_O	3.743	3.8	3.857	V
PQ1T401M2ZP	V_O	3.940	4.0	4.060	V
PQ1T501M2ZP	V_O	4.925	5.0	5.075	V

Table.2 Dropout voltage Line-up(I_O=60mA)

(V_{IN}:(*5), V_C=1.8V, I_O=60mA, Ta=25°C)

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1T181M2ZP	$V_{i-o}1$	–	0.17	0.35	V
PQ1T251M2ZP	$V_{i-o}1$	–	0.13	0.18	V
PQ1T271M2ZP	$V_{i-o}1$	–	0.12	0.17	V
PQ1T281M2ZP	$V_{i-o}1$	–	0.11	0.16	V
PQ1T301M2ZP	$V_{i-o}1$	–	0.10	0.15	V
PQ1T321M2ZP	$V_{i-o}1$	–	0.10	0.14	V
PQ1T331M2ZP	$V_{i-o}1$	–	0.10	0.14	V
PQ1T351M2ZP	$V_{i-o}1$	–	0.09	0.14	V
PQ1T361M2ZP	$V_{i-o}1$	–	0.09	0.13	V
PQ1T381M2ZP	$V_{i-o}1$	–	0.09	0.13	V
PQ1T401M2ZP	$V_{i-o}1$	–	0.08	0.12	V
PQ1T501M2ZP	$V_{i-o}1$	–	0.07	0.10	V

*5 Input voltage when output voltage falls 0.1V from that at Vin=Vo(TYP)+1.0V.

Table.3 Dropout voltage Line-up(I_O=150mA)

(V_{IN}:(*5), V_C=1.8V, I_O=150mA, Ta=25°C)

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1T181M2ZP	$V_{i\text{-}o}2$	−	0.40	0.68	V
PQ1T251M2ZP	$V_{i\text{-}o}2$	−	0.31	0.43	V
PQ1T271M2ZP	$V_{i\text{-}o}2$	−	0.28	0.40	V
PQ1T281M2ZP	$V_{i\text{-}o}2$	−	0.27	0.39	V
PQ1T301M2ZP	$V_{i\text{-}o}2$	−	0.25	0.37	V
PQ1T321M2ZP	$V_{i\text{-}o}2$	−	0.24	0.35	V
PQ1T331M2ZP	$V_{i\text{-}o}2$	−	0.24	0.35	V
PQ1T351M2ZP	$V_{i\text{-}o}2$	−	0.23	0.34	V
PQ1T361M2ZP	$V_{i\text{-}o}2$	−	0.22	0.33	V
PQ1T381M2ZP	$V_{i\text{-}o}2$	−	0.22	0.32	V
PQ1T401M2ZP	$V_{i\text{-}o}2$	−	0.21	0.31	V
PQ1T501M2ZP	$V_{i\text{-}o}2$	−	0.18	0.27	V

*5 Input voltage when output voltage falls 0.1V from that at Vin=Vo(TYP)+1.0V.

Table.4 Dropout voltage Line-up(I_O=300mA)

(V_{IN}:(*5), V_C=1.8V, I_O=300mA, Ta=25°C)

Model No.	Symbol	MIN.	TYP.	MAX.	Unit
PQ1T181M2ZP	$V_{i\text{-}o}3$	−	0.64	0.85	V
PQ1T251M2ZP	$V_{i\text{-}o}3$	−	0.54	0.74	V
PQ1T271M2ZP	$V_{i\text{-}o}3$	−	0.52	0.72	V
PQ1T281M2ZP	$V_{i\text{-}o}3$	−	0.51	0.71	V
PQ1T301M2ZP	$V_{i\text{-}o}3$	−	0.50	0.70	V
PQ1T321M2ZP	$V_{i\text{-}o}3$	−	0.48	0.68	V
PQ1T331M2ZP	$V_{i\text{-}o}3$	−	0.47	0.67	V
PQ1T351M2ZP	$V_{i\text{-}o}3$	−	0.46	0.65	V
PQ1T361M2ZP	$V_{i\text{-}o}3$	−	0.45	0.64	V
PQ1T381M2ZP	$V_{i\text{-}o}3$	−	0.44	0.62	V
PQ1T401M2ZP	$V_{i\text{-}o}3$	−	0.43	0.60	V
PQ1T501M2ZP	$V_{i\text{-}o}3$	−	0.35	0.50	V

*5 Input voltage when output voltage falls 0.1V from that at Vin=Vo(TYP)+1.0V.

Fig.1 Standard Test Circuit

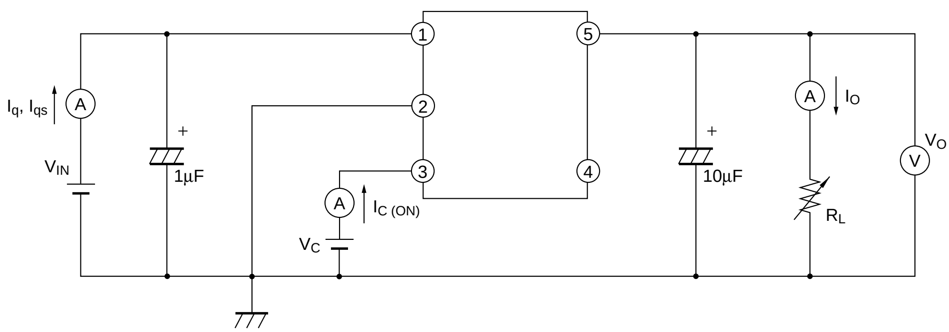
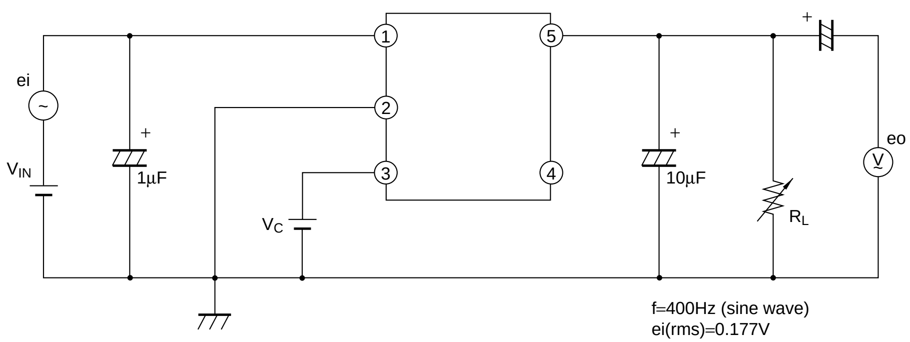


Fig.2 Test Circuit for Ripple Rejection



f=400Hz (sine wave)
ei(rms)=0.177V
V_{IN}=V_O(TYP)+1.0V
V_C=1.8V
I_O=10mA
RR=20log(ei(rms)/eo(rms))

Fig.3 Power Dissipation vs. Ambient Temperature

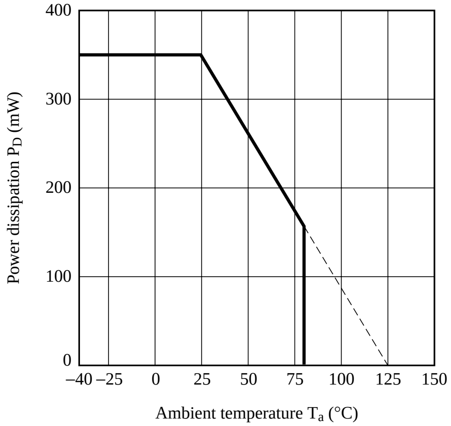


Fig.4 Overcurrent Protection Characteristics (Typical Value)

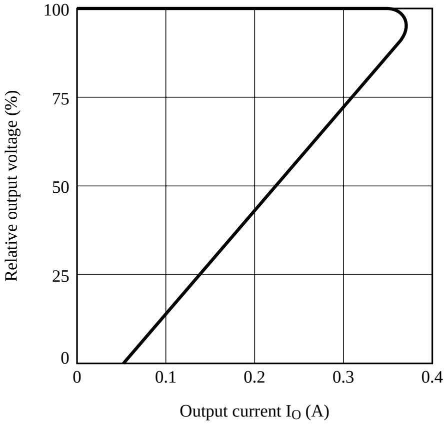


Fig.5 Output Voltage Fluctuation vs. Junction Temperature (PQ1T301M2ZP)(Typical Value)

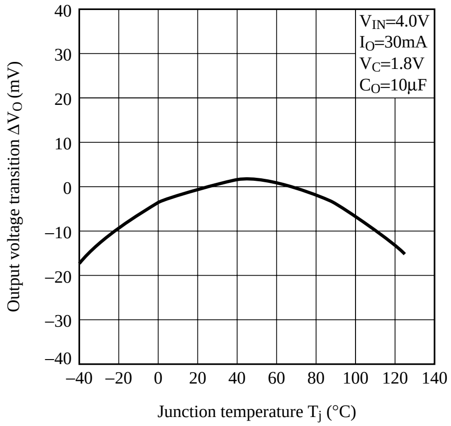


Fig.6 Output Voltage vs. Input Voltage (PQ1T301M2ZP)(Typical Value)

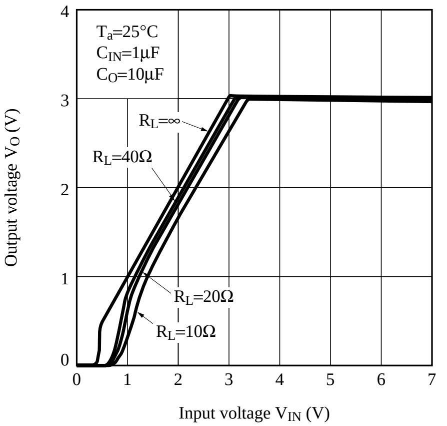


Fig.7 Circuit Operating Current vs. Input Voltage (PQ1T301M2ZP)(Typical Value)

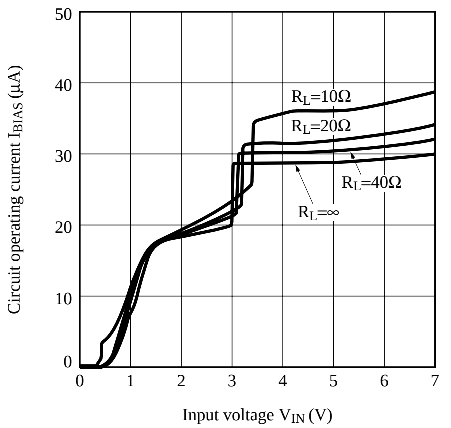


Fig.8 Dropout Voltage vs. Junction Temperature (PQ1T301M2ZP)(Typical Value)

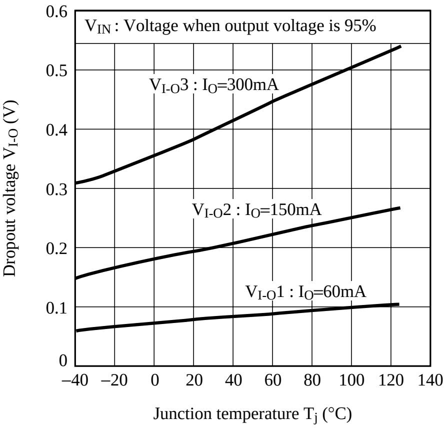


Fig.9 Quiescent Current vs. Junctiion Temperature (Typical Value)

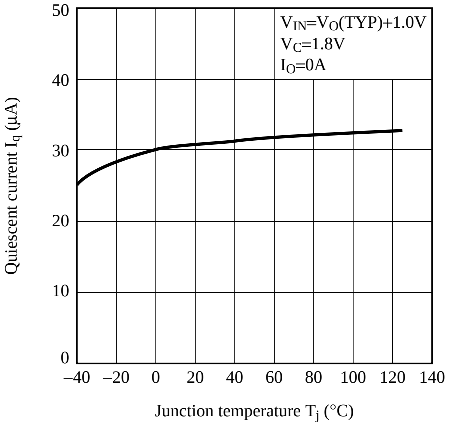


Fig.10 Ripple Rejection vs. Input Frequency

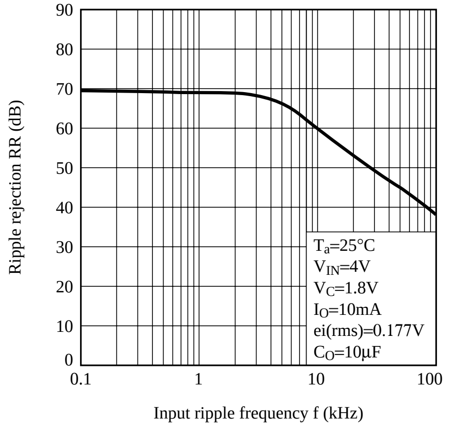


Fig.11 Dropout Voltage vs. Output Current (PQ1T301M2ZP)

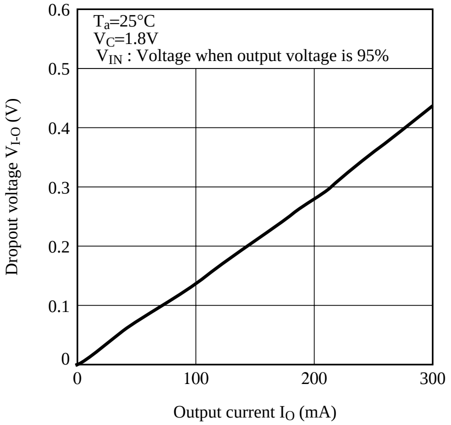
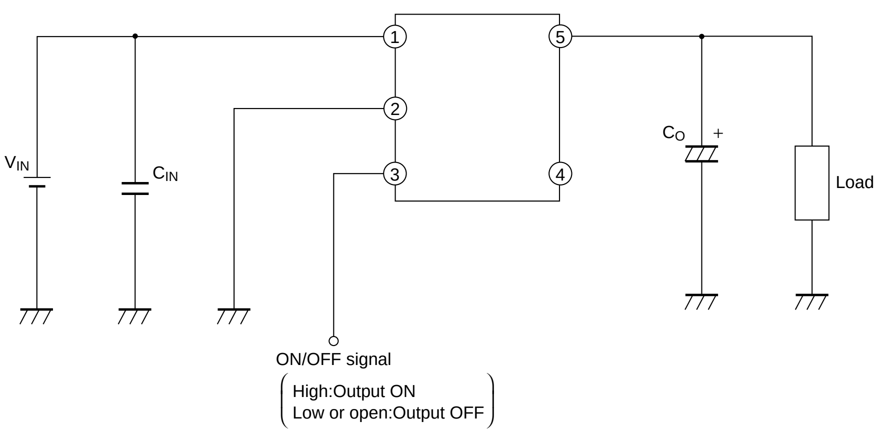


Fig.12 Example of Application



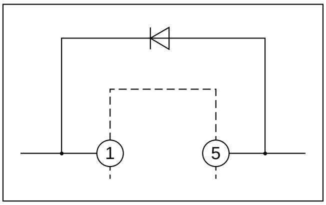
1. External connection

(1) Please perform shortest wiring for connection between C_O or Cin 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 Co 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.

These devices are without built-in overheat protection function.

3. ESD (Electro Static Discharge)

Be careful not to apply electro static discharge to the device since this device employs a CMOS 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 10MΩ or more) from the commercial power supply. Also the solder dip basin must be grounded.

NOTICE