

# PQ1Uxx1M2ZP Series

## ■ Features

1. Compact surface mount package (2.9×1.6×1.1mm)
  2. Low power-loss  
(Dropout voltage:TYP. 0.11 V at  $I_o=60\text{mA}$ )
  3. High ripple rejection (TYP. 60dB)
  4. Built-in ON/OFF control function  
(Dissipation current at OFF-state:MAX. 1 $\mu\text{A}$ )
  6. Overcurrent, overheat 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.   |
|-----------------------|-------------|-----------------------|-------------|
| 2.5V                  | PQ1U251M2ZP | 3.5V                  | PQ1U351M2ZP |
| 2.8V                  | PQ1U281M2ZP | 3.6V                  | PQ1U361M2ZP |
| 3.0V                  | PQ1U301M2ZP | 3.8V                  | PQ1U381M2ZP |
| 3.3V                  | PQ1U331M2ZP | 4.0V                  | PQ1U401M2ZP |
| 3.4V                  | PQ1U341M2ZP | 5.0V                  | PQ1U501M2ZP |

## ■ Absolute Maximum Ratings (Ta=25°C)

| Parameter                 | Symbol           | Rating      | Unit |
|---------------------------|------------------|-------------|------|
| *1 Input voltage          | V <sub>IN</sub>  | 16          | V    |
| *1 Output control voltage | V <sub>C</sub>   | 16          | V    |
| Output current            | I <sub>o</sub>   | 300         | mA   |
| *2 Power dissipation      | P <sub>D</sub>   | 350         | mW   |
| *3 Junction temperature   | T <sub>j</sub>   | 150         | °C   |
| Operating temperature     | T <sub>opr</sub> | -30 to +80  | °C   |
| Storage temperature       | T <sub>stg</sub> | -55 to +150 | °C   |
| Soldering temperature     | T <sub>sol</sub> | 260 (10s)   | °C   |

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

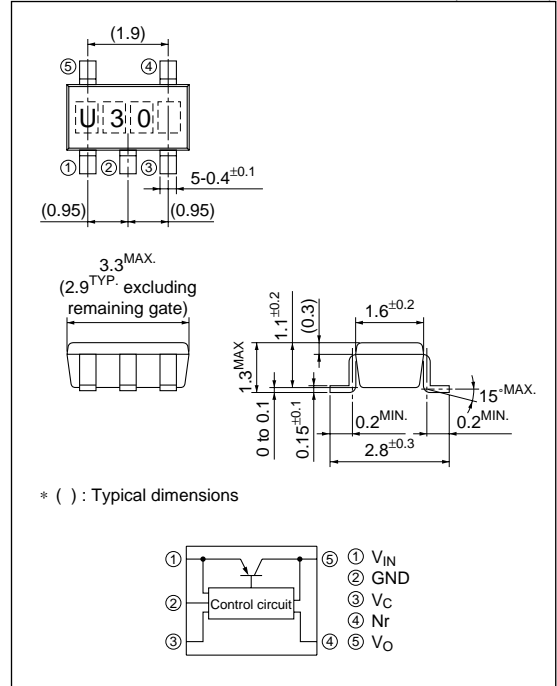
\*2 At mounting PCB

\*3 Overheat protection may operate at the condition T<sub>j</sub>:125°C to 150°C

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

### ■ Outline Dimensions

(Unit : mm)



## ■ Electrical Characteristics

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

| Parameter                                  | Symbol               | Conditions   | MIN.                           | TYP. | MAX. | Unit                 |
|--|----------------------|--|--------------------------------|------|------|----------------------|
| Output voltage                             | $V_O$                | —  | Refer to the following table.1 |      |      | V                    |
| <sup>*4</sup> 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   | —                              | 30   | 160  | mV                   |
| Line regulation                            | $R_{egI}$            | $V_{IN}=V_O(\text{TYP})+1\text{V}$ to $V_O(\text{TYP})+6\text{V}$        | —                              | 3.0  | 20   | mV                   |
| Temperature coefficient of output voltage  | $T_cV_O$             | $I_O=10\text{mA}$ , $T_j=-25$ to $+75^\circ\text{C}$                     | —                              | 0.05 | —    | mV/ $^\circ\text{C}$ |
| Ripple rejection                           | RR                   | Refer to Fig.2   | —                              | 70   | —    | dB                   |
| Output noise voltage                       | $V_{no(\text{rms})}$ | $10\text{Hz}<f<100\text{kHz}$ , $C_n=0.1\mu\text{F}$ , $I_O=30\text{mA}$ | Refer to the following table.2 |      |      | $\mu\text{V}$        |
| Dropout voltage                            | $V_{I-o1}$           | $I_O=60\text{mA}$ <sup>*5</sup>  | —                              | 0.11 | 0.26 | V                    |
|  | $V_{I-o2}$           | $I_O=150\text{mA}$ <sup>*5</sup>   | —                              | 0.20 | 0.4  |                      |
| <sup>*6</sup> ON-state voltage for control | $V_{C(\text{ON})}$   | —  | 1.8                            | —    | —    | V                    |
| ON-state current for control               | $I_{C(\text{ON})}$   | $V_C=1.8\text{V}$  | —                              | 5    | 30   | $\mu\text{A}$        |
| OFF-state voltage for control              | $V_{C(\text{OFF})}$  | —  | —                              | —    | 0.4  | V                    |
| Quiescent current                          | $I_q$                | $I_O=0\text{mA}$   | —                              | 130  | 200  | $\mu\text{A}$        |
| Output OFF-state dissipation current       | $I_{qs}$             | $V_C=0.2\text{V}$  | —                              | —    | 1    | $\mu\text{A}$        |

<sup>\*4</sup> Output current shall be the value when output voltage lowers 0.3V from the voltage at  $I_O=30\text{mA}$

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

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

### Table.1 Output Voltage Line-up

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

| Model No.   | Symbol | MIN.  | TYP. | MAX.  | Unit |
|-------------|--------|-------|------|-------|------|
| PQ1U251M2ZP | $V_O$  | 2.440 | 2.5  | 2.560 | V    |
| PQ1U281M2ZP | $V_O$  | 2.740 | 2.8  | 2.860 | V    |
| PQ1U301M2ZP | $V_O$  | 2.940 | 3.0  | 3.060 | V    |
| PQ1U331M2ZP | $V_O$  | 3.234 | 3.3  | 3.366 | V    |
| PQ1U341M2ZP | $V_O$  | 3.332 | 3.4  | 3.468 | V    |
| PQ1U351M2ZP | $V_O$  | 3.430 | 3.5  | 3.570 | V    |
| PQ1U361M2ZP | $V_O$  | 3.528 | 3.6  | 3.672 | V    |
| PQ1U381M2ZP | $V_O$  | 3.724 | 3.8  | 3.876 | V    |
| PQ1U401M2ZP | $V_O$  | 3.920 | 4.0  | 4.080 | V    |
| PQ1U501M2ZP | $V_O$  | 4.900 | 5.0  | 5.100 | V    |

### Table.2 Output Noise Voltage Line-up

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

| Model No.   | Symbol               | MIN. | TYP. | MAX. | Unit |
|-------------|----------------------|------|------|------|------|
| PQ1U251M2ZP | $V_{no(\text{rms})}$ | —    | 25   | —    | V    |
| PQ1U281M2ZP | $V_{no(\text{rms})}$ | —    | 25   | —    | V    |
| PQ1U301M2ZP | $V_{no(\text{rms})}$ | —    | 30   | —    | V    |
| PQ1U331M2ZP | $V_{no(\text{rms})}$ | —    | 30   | —    | V    |
| PQ1U341M2ZP | $V_{no(\text{rms})}$ | —    | 30   | —    | V    |
| PQ1U351M2ZP | $V_{no(\text{rms})}$ | —    | 35   | —    | V    |
| PQ1U361M2ZP | $V_{no(\text{rms})}$ | —    | 35   | —    | V    |
| PQ1U381M2ZP | $V_{no(\text{rms})}$ | —    | 35   | —    | V    |
| PQ1U401M2ZP | $V_{no(\text{rms})}$ | —    | 40   | —    | V    |
| PQ1U501M2ZP | $V_{no(\text{rms})}$ | —    | 50   | —    | V    |

### Fig.1 Standard Test Circuit

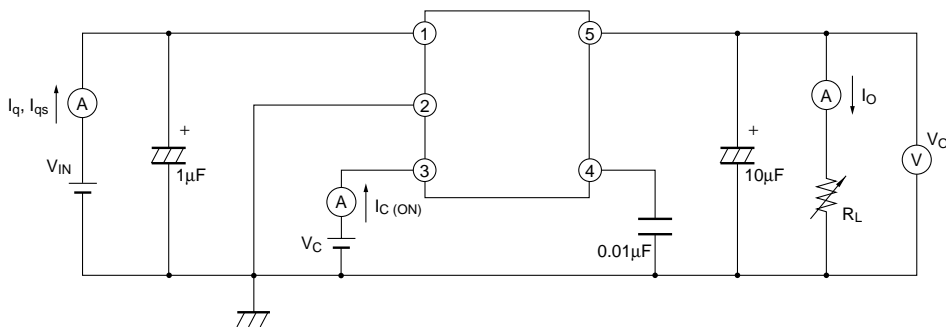


Fig.2 Test Circuit for Ripple Rejection

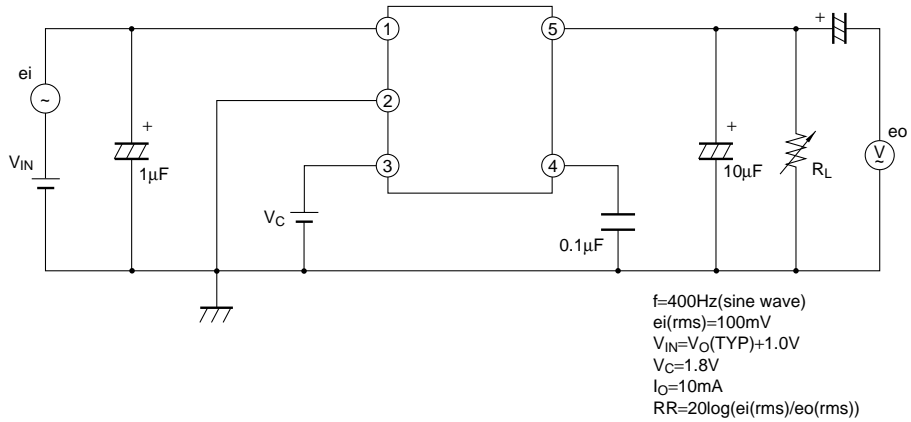


Fig.3 Power Dissipation vs. Ambient Temperature

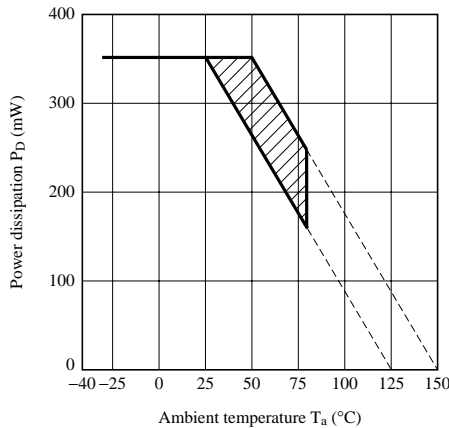


Fig.4 Overcurrent Protection Characteristics (Typical Value)

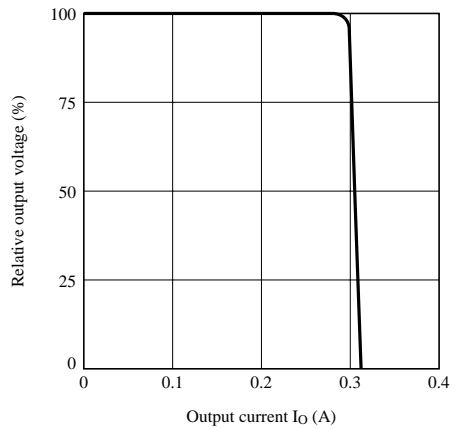


Fig.5 Output Voltage Fluctuation vs. Junction Temperature (PQ1U281M2ZP)(Typical Value)

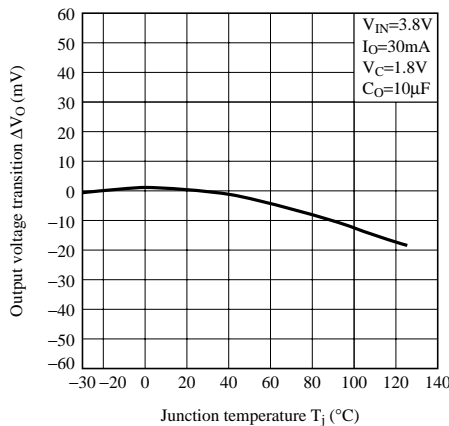
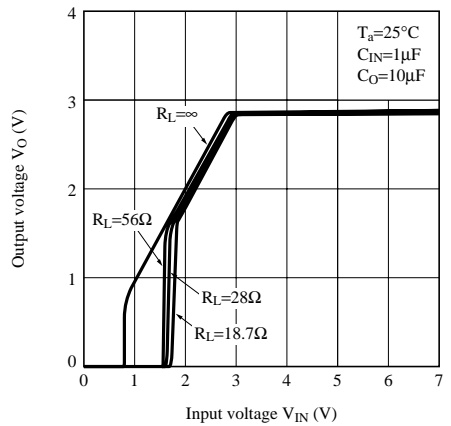
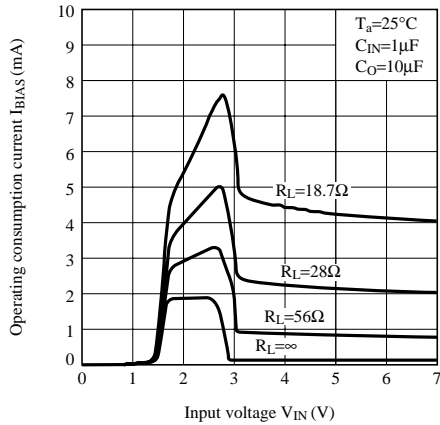


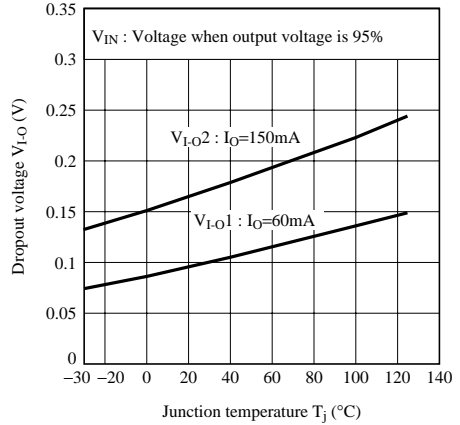
Fig.6 Output Voltage vs. Input Voltage (PQ1U281M2ZP)(Typical Value)



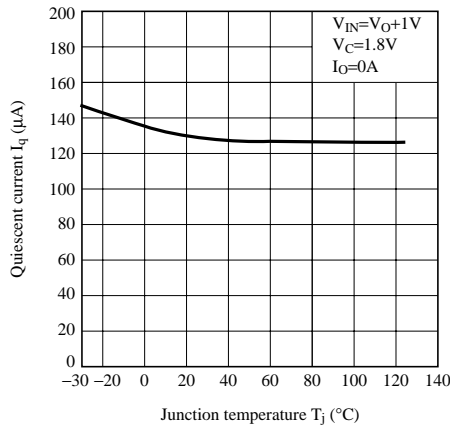
**Fig.7 Operating Consumption Current vs. Input Voltage (PQ1U281M2ZP)(Typical Value)**



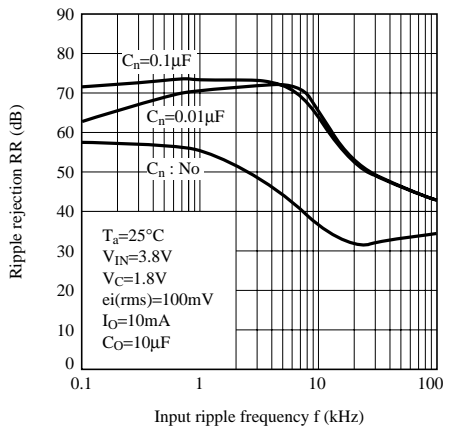
**Fig.8 Dropout Voltage vs. Junction Temperature (PQ1U281M2ZP)(Typical Value)**



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



**Fig.10 Ripple Rejection vs. Input Frequency (PQ1U281M2ZP)(Typical Value)**



**Fig.11 Dropout Voltage vs. Output Current**

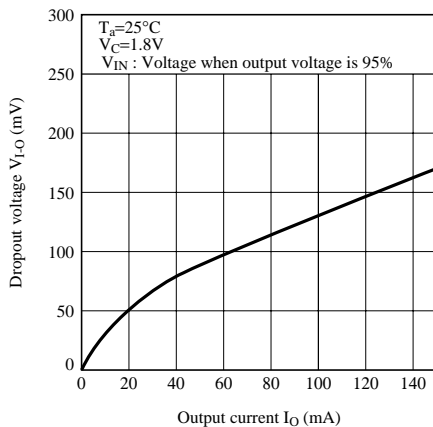
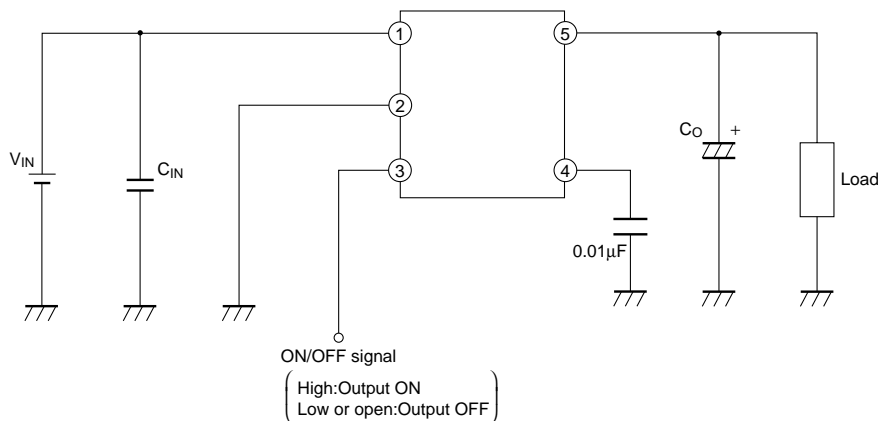


Fig.12 Example of Application



### 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.

### 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 (Electro Static 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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