

# 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          | $V_{IN}$  | 16          | V    |
| *1 Output control voltage | $V_C$     | 16          | 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

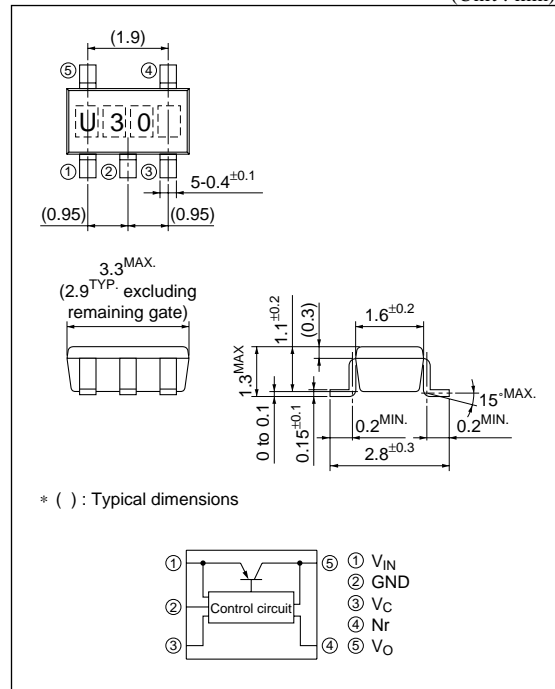
\*2 At mounting PCB

\*3 Overheat protection may operate at the condition  $T_j:125^\circ\text{C}$  to  $150^\circ\text{C}$

## 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 $60\text{mA}$   | —                              | 10   | 50   | mV                         |
|  | $R_{egL2}$           | $I_O=5$ to $100\text{mA}$  | —                              | 20   | 100  | mV                         |
|  | $R_{egL3}$           | $I_O=5$ to $150\text{mA}$  | —                              | 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 | —    | $\text{mV}/^\circ\text{C}$ |
| 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

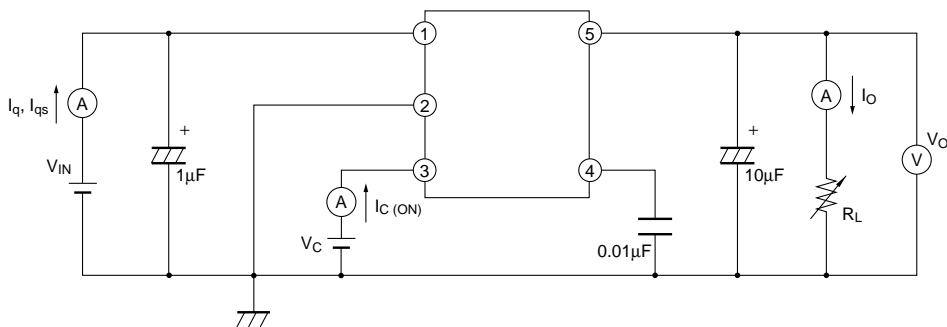


Fig.2 Test Circuit for Ripple Rejection

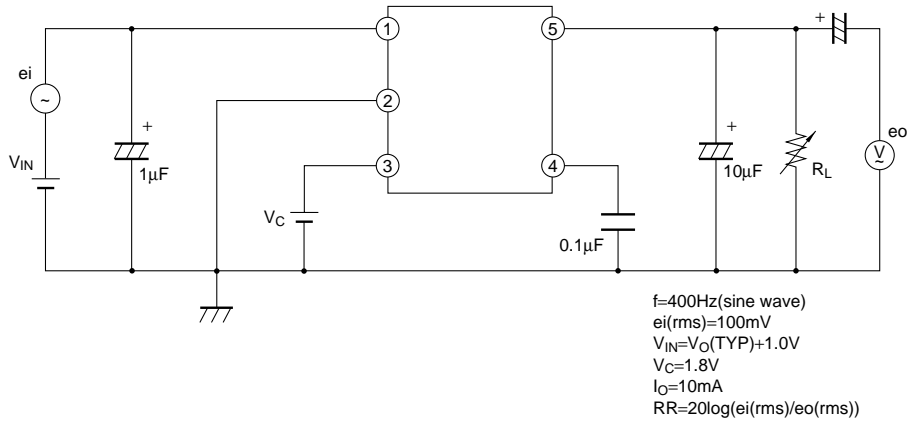


Fig.3 Power Dissipation vs. Ambient Temperature

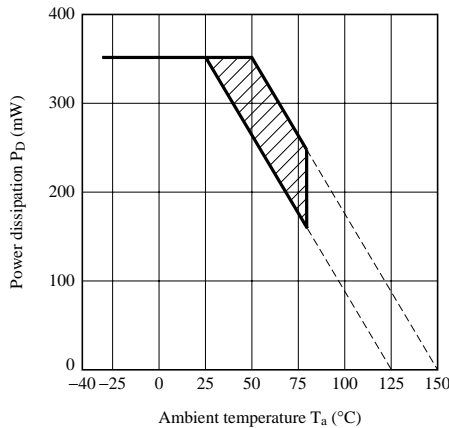


Fig.4 Overcurrent Protection Characteristics (Typical Value)

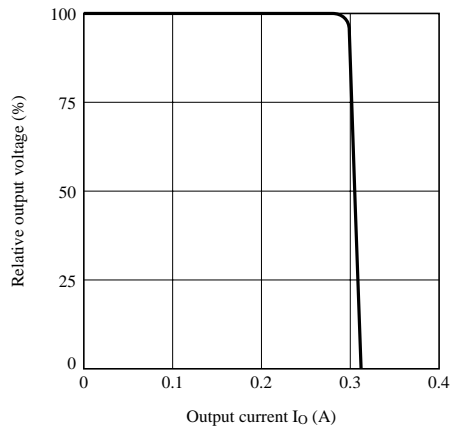


Fig.5 Output Voltage Fluctuation vs. Junction Temperature (PQ1U281M2ZP)(Typical Value)

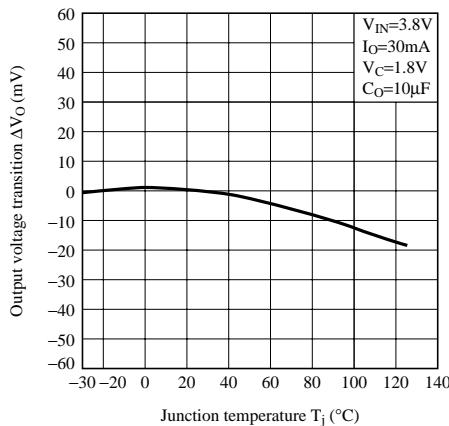
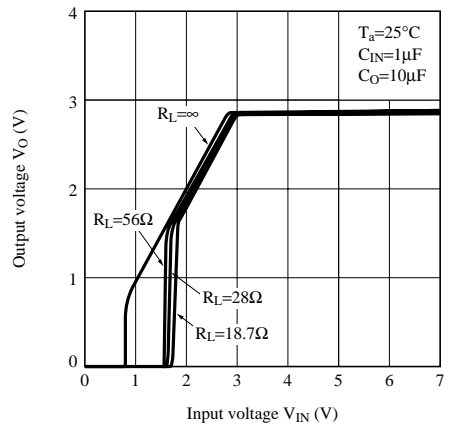
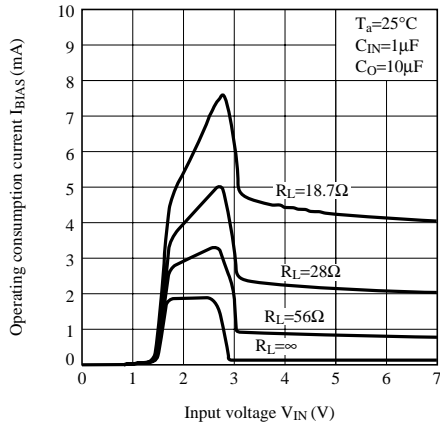


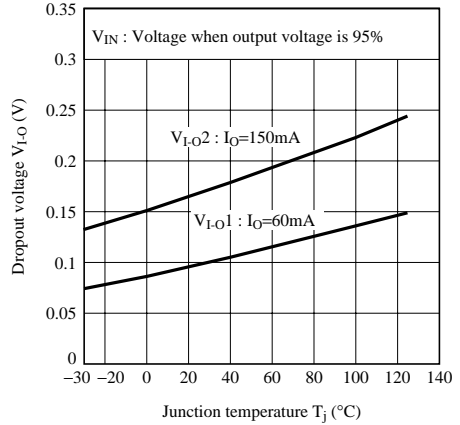
Fig.6 Output Voltage vs. Input Voltage (PQ1U281M2ZP)(Typical Value)



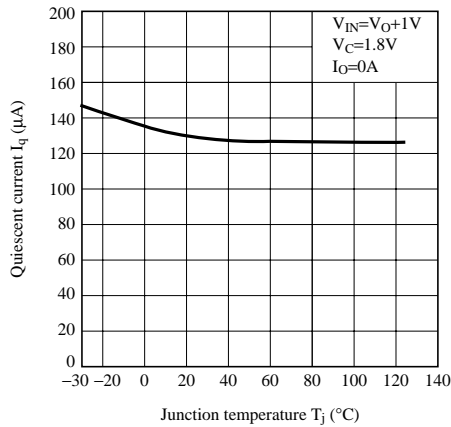
**Fig.7 Operating Consumption Current vs. Input Voltage (PQ1U281M2ZP)(Typical Value)**



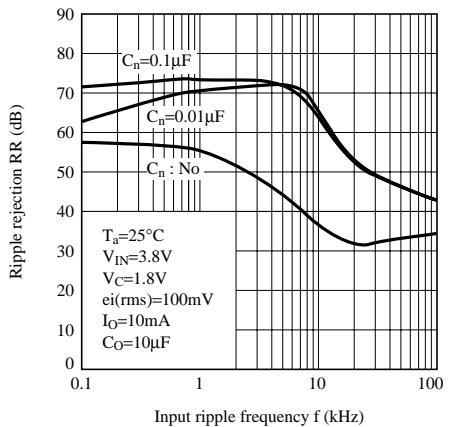
**Fig.8 Dropout Voltage vs. Junction Temperature (PQ1U281M2ZP)(Typical Value)**



**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**

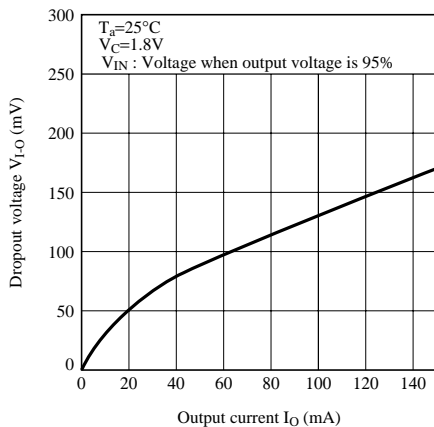
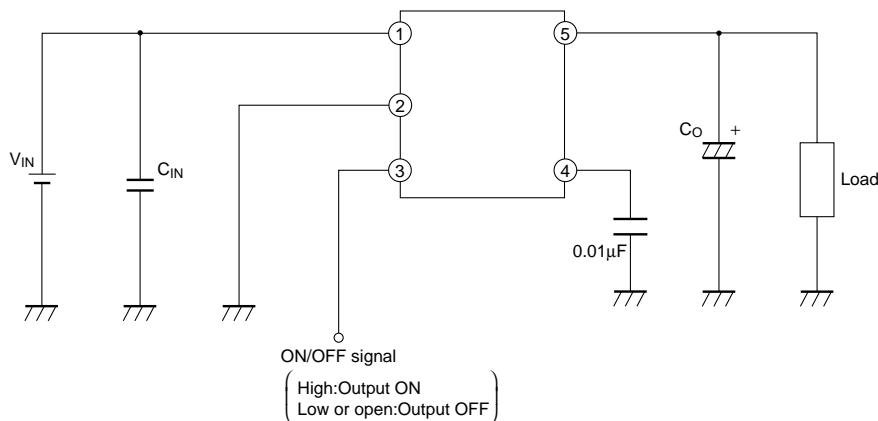


Fig.12 Example of Application



### 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.

### NOTICE

- The circuit application examples in this publication are provided to explain representative applications of SHARP devices and are not intended to guarantee any circuit design or license any intellectual property rights. SHARP takes no responsibility for any problems related to any intellectual property right of a third party resulting from the use of SHARP's devices.
- Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device. SHARP reserves the right to make changes in the specifications, characteristics, data, materials, structure, and other contents described herein at any time without notice in order to improve design or reliability. Manufacturing locations are also subject to change without notice.
- Observe the following points when using any devices in this publication. SHARP takes no responsibility for damage caused by improper use of the devices which does not meet the conditions and absolute maximum ratings to be used specified in the relevant specification sheet nor meet the following conditions:
  - (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).
- Contact a SHARP representative in advance when intending to use SHARP devices for any "specific" applications other than those recommended by SHARP or when it is unclear which category mentioned above controls the intended use.
- If the SHARP devices listed in this publication fall within the scope of strategic products described in the Foreign Exchange and Foreign Trade Control Law of Japan, it is necessary to obtain approval to export such SHARP devices.
- This publication is the proprietary product of SHARP and is copyrighted, with all rights reserved. Under the copyright laws, no part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, for any purpose, in whole or in part, without the express written permission of SHARP. Express written permission is also required before any use of this publication may be made by a third party.
- Contact and consult with a SHARP representative if there are any questions about the contents of this publication.