

# PQ1R30 Series

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

## Features

- Compact surface mount package(3.4 x 2.2 x 1.2mm)
- Low power-loss  
(Dropout voltage: TYP.0.16V / MAX. 0.26V at  $I_o=60\text{mA}$ )
- High ripple rejection(TYP.55dB)
- Low current operation type  
(Dissipation current at no load: TYP. 170 $\mu\text{A}$ )
- Built-in ON/OFF control function  
(Dissipation current at OFF-state: MAX. 0.1 $\mu\text{A}$ )
- Overcurrent, overheat protection functions

## Applications

- Cellular phones
- Cordless phones
- Personal information tools(PDA)
- Cameras / Camcoders
- PCMCIA cards for notebook PCs

## Model Line-ups

| Output Voltage | Model No. | Output Voltage | Model No. |
|----------------|-----------|----------------|-----------|
| 2.2V           | PQ1R22    | 3.4V           | PQ1R34    |
| 2.5V           | PQ1R25    | 3.6V           | PQ1R36    |
| 2.7V           | PQ1R27    | 3.8V           | PQ1R38    |
| 2.8V           | PQ1R28    | 4.0V           | PQ1R40    |
| 2.9V           | PQ1R29    | 4.7V           | PQ1R47    |
| 3.0V           | PQ1R30    | 4.9V           | PQ1R49    |
| 3.1V           | PQ1R31    | 5.0V           | PQ1R50    |
| 3.3V           | PQ1R33    | 5.2V           | PQ1R52    |

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

## Absolute Maximum Ratings

( $T_a=25^\circ\text{C}$ )

| Parameter                          | Symbol    | Rating        | Unit             |
|------------------------------------|-----------|---------------|------------------|
| *1 Input voltage                   | $V_{IN}$  | 16            | V                |
| *1 ON/OFF control terminal voltage | $V_C$     | 16            | V                |
| Output current                     | $I_o$     | 240           | mA               |
| *2 Power dissipation               | $P_D$     | 400           | mW               |
| *3 Junction temperature            | $T_j$     | 150           | $^\circ\text{C}$ |
| Operating temperature              | $T_{opr}$ | -30 to +80    | $^\circ\text{C}$ |
| Storage temperature                | $T_{stg}$ | -55 to +150   | $^\circ\text{C}$ |
| Soldering temperature              | $T_{sol}$ | 260 (For 10s) | $^\circ\text{C}$ |

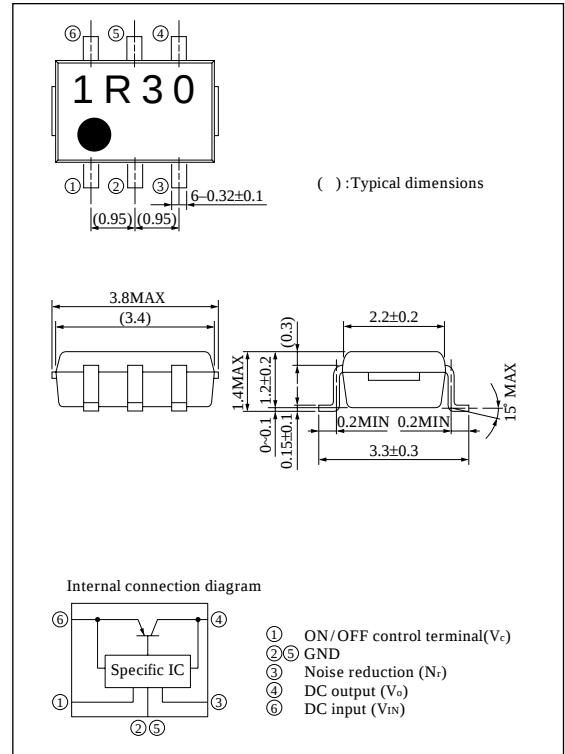
\*1 All are open except GND and applicable terminals.

\*2 At surface-mounted condition

\*3 Overheat protection may operate at  $125 \leq T_j < 150^\circ\text{C}$ .

## Outline Dimensions

(Unit : mm)



• Please refer to the chapter "Handling Precautions".

**SHARP**

## Electrical Characteristics

(Unless otherwise specified, \*4  $I_o=30\text{mA}$ ,  $V_c=1.8\text{V}$ ,  $T_a=25^\circ\text{C}$ )

| Parameter                                 | Symbol              | Conditions                                                               | MIN.                          | TYP. | MAX. | Unit                |
|-------------------------------------------|---------------------|--------------------------------------------------------------------------|-------------------------------|------|------|---------------------|
| Output voltage                            | $V_o$               | —                                                                        | Refer to the following table. |      |      | V                   |
| Output current                            | $I_o$               | *5                                                                       | 180                           | 240  | —    | mA                  |
| Recommended output current                | —                   | —                                                                        | —                             | —    | 150  | mA                  |
| Load regulation                           | $R_{\text{regL}}$   | $I_o=5\text{mA}$ to $60\text{mA}$                                        | —                             | 10   | 50   | mV                  |
|                                           |                     | $I_o=5\text{mA}$ to $100\text{mA}$                                       | —                             | 20   | 100  |                     |
|                                           |                     | $I_o=5\text{mA}$ to $150\text{mA}$                                       | —                             | 40   | 160  |                     |
| Line regulation                           | $R_{\text{regI}}$   | $V_i=V_o(\text{TYP})+1\text{V}$ 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 | —    | %/ $^\circ\text{C}$ |
| Ripple rejection                          | RR                  | —                                                                        | —                             | 55   | —    | dB                  |
| Output noise voltage                      | $V_{\text{no}}$     | $10\text{Hz}<f<100\text{kHz}$ , $C_n=0.1\mu\text{F}$ , $I_o=30\text{mA}$ | Refer to the following table. |      |      | $\mu\text{Vrms}$    |
| Dropout voltage                           | $V_{i-o}(1)$        | $I_o=60\text{mA}$ , *6                                                   | —                             | 0.16 | 0.26 | V                   |
|                                           | $V_{i-o}(2)$        | $I_o=150\text{mA}$ , *6                                                  | —                             | 0.29 | 0.4  |                     |
| *7 ON-state voltage for control           | $V_{c(\text{ON})}$  | —                                                                        | 1.8                           | —    | —    | V                   |
| ON-state current for control              | $I_{c(\text{ON})}$  | $V_c=1.8\text{V}$                                                        | —                             | 12   | 30   | $\mu\text{A}$       |
| OFF-state voltage for control             | $V_{c(\text{OFF})}$ | —                                                                        | —                             | —    | 0.6  | V                   |
| Quiescent current                         | $I_q$               | $I_o=0\text{mA}$                                                         | —                             | 170  | 350  | $\mu\text{A}$       |
| Output OFF-state dissipation current      | $I_{\text{qs}}$     | $V_{\text{IN}}=8\text{V}$ , $V_c=0.4\text{V}$                            | —                             | —    | 0.1  | $\mu\text{A}$       |
| Response time(Rise time)                  | $T_r$               | $I_o=30\text{mA}$ , $V_c=0 \rightarrow 1.8\text{V}$                      | —                             | 0.3  | —    | ms                  |
| Noise control terminal voltage            | —                   | —                                                                        | —                             | 1.25 | —    | V                   |

\*4  $V_{\text{IN}}=V_o(\text{TYP})+1.0\text{V}$ \*5 Output current shall be the value when output voltage lowers 0.3V from the voltage at  $I_o=30\text{mA}$ .\*6 Dropout voltage when output voltage lowers 5% from the voltage at  $V_{\text{IN}}=V_o+1\text{V}$ .

\*7 In case that the control terminal ① is non-connection, output voltage should be OFF-state.

## Output Voltage Line-ups

 $(V_{\text{IN}}=V_o(\text{TYP})+1.0\text{V}$ ,  $I_o=30\text{mA}$ ,  $V_c=1.8\text{V}$ ,  $T_a=25^\circ\text{C}$ )

| Model No. | Symbol | MIN.  | TYP. | MAX.  | Unit |
|-----------|--------|-------|------|-------|------|
| PQ1R22    | $V_o$  | 2.120 | 2.2  | 2.280 | V    |
| PQ1R25    | $V_o$  | 2.420 | 2.5  | 2.580 | V    |
| PQ1R27    | $V_o$  | 2.620 | 2.7  | 2.780 | V    |
| PQ1R28    | $V_o$  | 2.720 | 2.8  | 2.880 | V    |
| PQ1R29    | $V_o$  | 2.820 | 2.9  | 2.980 | V    |
| PQ1R30    | $V_o$  | 2.920 | 3.0  | 3.080 | V    |
| PQ1R31    | $V_o$  | 3.020 | 3.1  | 3.180 | V    |
| PQ1R33    | $V_o$  | 3.215 | 3.3  | 3.385 | V    |
| PQ1R34    | $V_o$  | 3.315 | 3.4  | 3.485 | V    |
| PQ1R36    | $V_o$  | 3.510 | 3.6  | 3.690 | V    |
| PQ1R38    | $V_o$  | 3.705 | 3.8  | 3.895 | V    |
| PQ1R40    | $V_o$  | 3.900 | 4.0  | 4.100 | V    |
| PQ1R47    | $V_o$  | 4.580 | 4.7  | 4.820 | V    |
| PQ1R49    | $V_o$  | 4.775 | 4.9  | 5.025 | V    |
| PQ1R50    | $V_o$  | 4.875 | 5.0  | 5.125 | V    |
| PQ1R52    | $V_o$  | 5.070 | 5.2  | 5.330 | V    |

## Output Noise Voltage Line-ups

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

| Model No. | Symbol          | MIN. | TYP. | MAX. | Unit             |
|-----------|-----------------|------|------|------|------------------|
| PQ1R22    | $V_{\text{no}}$ | —    | 20   | —    | $\mu\text{Vrms}$ |
| PQ1R25    | $V_{\text{no}}$ | —    | 25   | —    | $\mu\text{Vrms}$ |
| PQ1R27    | $V_{\text{no}}$ | —    | 25   | —    | $\mu\text{Vrms}$ |
| PQ1R28    | $V_{\text{no}}$ | —    | 25   | —    | $\mu\text{Vrms}$ |
| PQ1R29    | $V_{\text{no}}$ | —    | 25   | —    | $\mu\text{Vrms}$ |
| PQ1R30    | $V_{\text{no}}$ | —    | 30   | —    | $\mu\text{Vrms}$ |
| PQ1R31    | $V_{\text{no}}$ | —    | 30   | —    | $\mu\text{Vrms}$ |
| PQ1R33    | $V_{\text{no}}$ | —    | 30   | —    | $\mu\text{Vrms}$ |
| PQ1R34    | $V_{\text{no}}$ | —    | 30   | —    | $\mu\text{Vrms}$ |
| PQ1R36    | $V_{\text{no}}$ | —    | 35   | —    | $\mu\text{Vrms}$ |
| PQ1R38    | $V_{\text{no}}$ | —    | 35   | —    | $\mu\text{Vrms}$ |
| PQ1R40    | $V_{\text{no}}$ | —    | 40   | —    | $\mu\text{Vrms}$ |
| PQ1R47    | $V_{\text{no}}$ | —    | 45   | —    | $\mu\text{Vrms}$ |
| PQ1R49    | $V_{\text{no}}$ | —    | 45   | —    | $\mu\text{Vrms}$ |
| PQ1R50    | $V_{\text{no}}$ | —    | 50   | —    | $\mu\text{Vrms}$ |
| PQ1R52    | $V_{\text{no}}$ | —    | 50   | —    | $\mu\text{Vrms}$ |

Fig. 1 Test Circuit

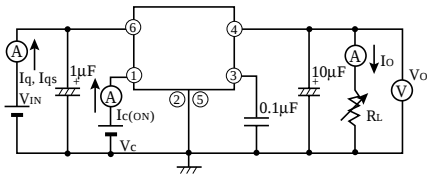
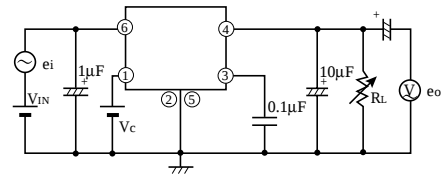
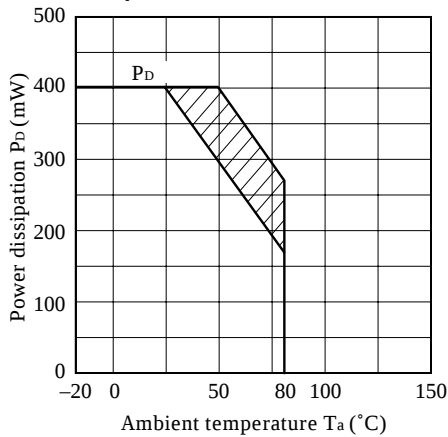


Fig. 2 Test Circuit of Ripple Rejection



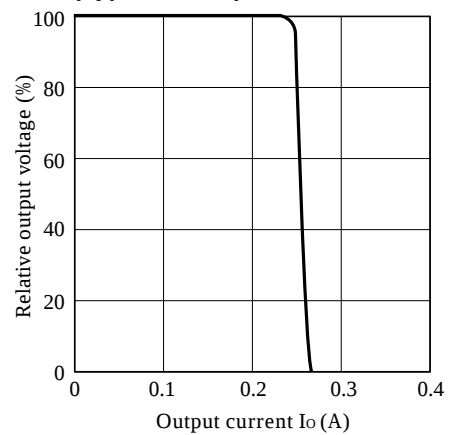
$f=400\text{Hz (sine wave)}$   
 $e_i=100\text{mV}_{\text{rms}}$   
 $V_{\text{IN}}=V_o(\text{Typ})+1.0\text{V}$   
 $I_o=10\text{mA}$   
 $\text{RR}=20 \log(e_i/e_o)$

Fig. 3 Power Dissipation vs. Ambient Temperature



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

Fig. 4 Overcurrent Protection Characteristics (Typical Value)



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

Fig. 5 Output Voltage Deviation vs. Junction Temperature (PQ1R30) (Typical Value)

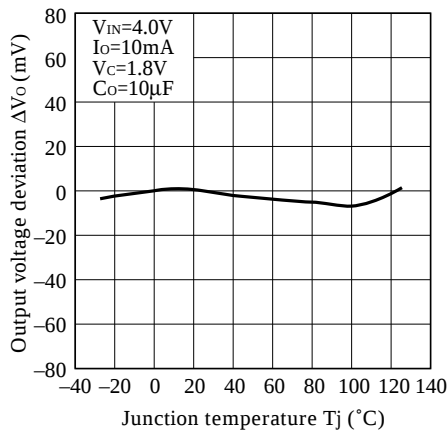
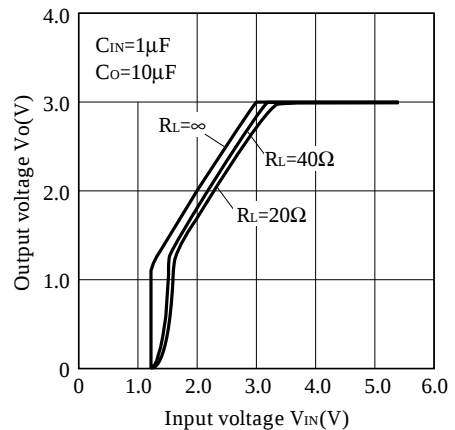
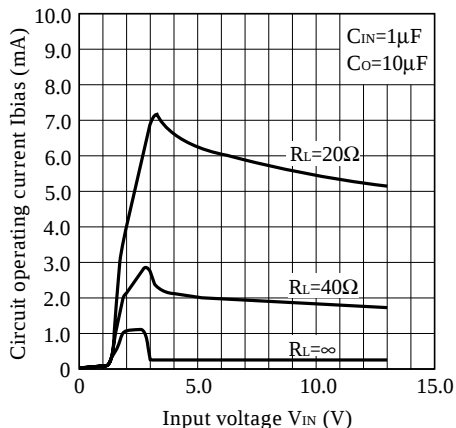


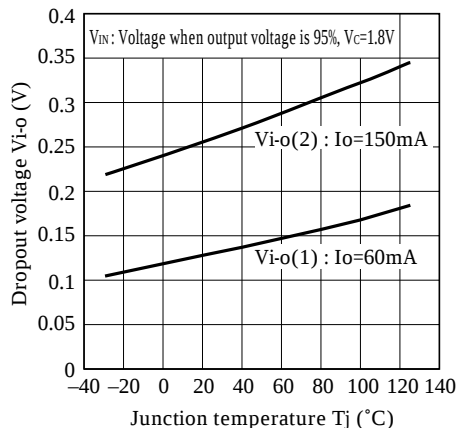
Fig. 6 Output Voltage vs. Input Voltage (PQ1R30) (Typical Value)



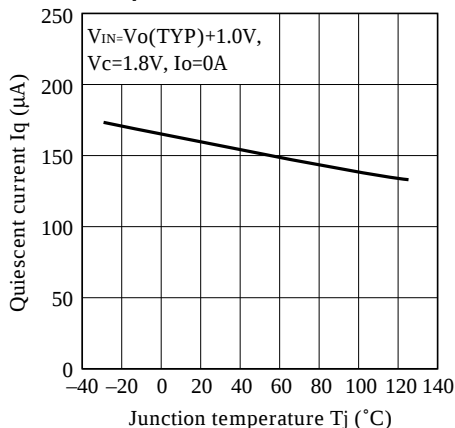
**Fig. 7 Circuit Operating Current vs. Input Voltage (PQ1R30) (Typical Value)**



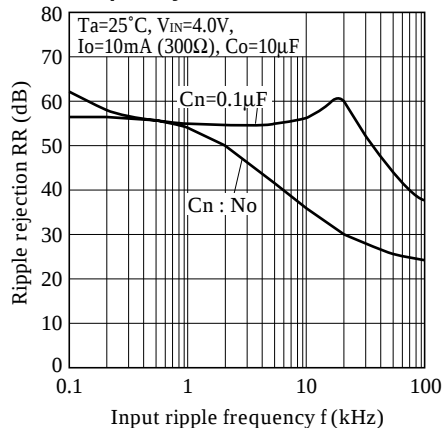
**Fig. 8 Dropout Voltage vs. Junction Temperature (PQ1R30) (Typical Value)**



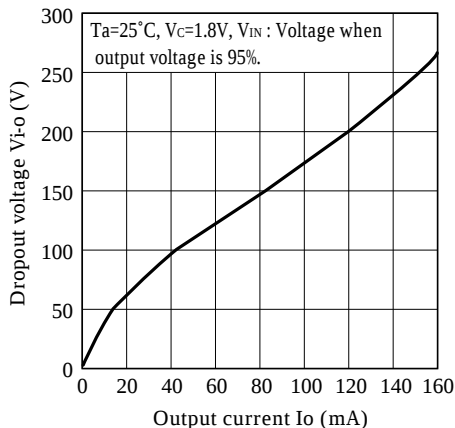
**Fig. 9 Quiescent Current vs. Junction Temperature**



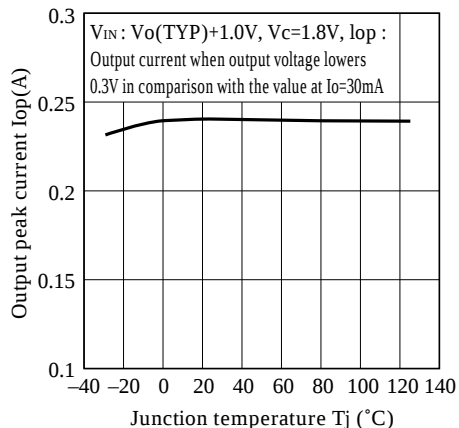
**Fig.10 Ripple Rejection vs. Input Ripple Frequency**



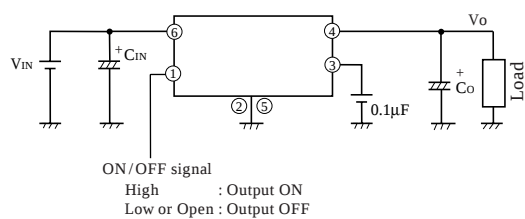
**Fig.11 Dropout Voltage vs. Output Current**



**Fig.12 Output Peak Current vs. Junction Temperature**



## ■ Typical Application



### 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.