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# PQ7RV4

Variable Output (1.5 to 7V), 4.6A Output Low Power-loss Voltage Regulator

## ■ Features

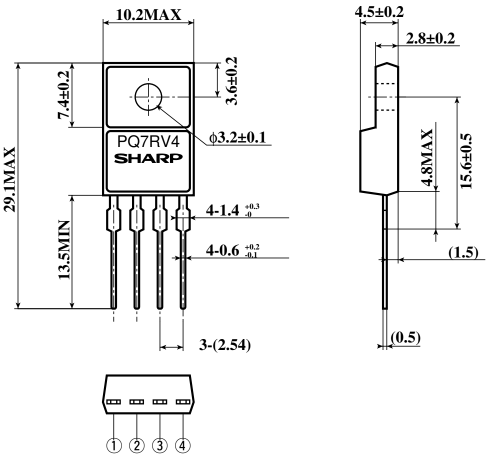
- Low power-loss
  (Dropout voltage : MAX.0.5V at Io=4.0A)
  (Dropout voltage : MAX.1.0V at Io=4.6A)
- TO-220 package
- 1.5V to 7V/4.6A output type
- Low operating voltage (Minimum operating voltage:3.0V)
- High-precision reference voltage type
  Reference voltage precision : ±2.0%
- Built-in overcurrent protection, overheat protection function

## ■ Applications

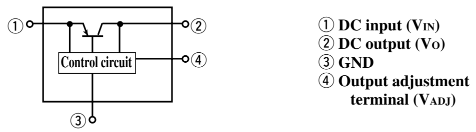
- Power supplies for various electronic equipment such as personal computers

## ■ Outline Dimensions

(Unit : mm)




**Internal connection diagram**




## ■ Absolute Maximum Ratings

($T_a$=25˚C)

| | Parameter | Symbol | Rating | Unit |
|---|---|---|---|---|
| *1 | Input voltage | $V_{IN}$ | 10 | V |
| *1 | ON/OFF control terminal voltage | $V_{ADJ}$ | 5 | V |
| | Output current | $I_O$ | 4.6 | A |
| *2 | Power dissipation | $P_{D1}$ | 1.8 | W |
| | | $P_{D2}$ | 18 | |
| *3 | Junction temperature | $T_j$ | 150 | ˚C |
| | Operating temperature | $T_{opr}$ | -20 to +80 | ˚C |
| | Storage temperature | $T_{stg}$ | -40 to +150 | ˚C |
| | Soldering temperature | $T_{sol}$ | 260 (For 10s) | ˚C |

*1 All are open except GND and applicable terminals.

*2 $P_{D1}$: No heat sink, $P_{D2}$: With infinite heat sink

*3 Overheat protection may operate at 125<=$T_j$<=150˚C.

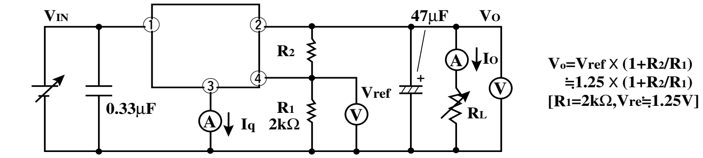
## ■ Electrical Characteristics

(Unless otherwise specified, conditions shall be $V_{IN}$=5V, $V_O$=3.3V($R_1$=2kΩ), $I_O$=2.0A, $T_a$=25˚C)

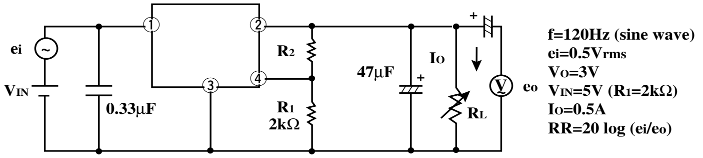
| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Input voltage | $V_{IN}$ | - | 3.0 | - | 10.0 | V |
| Output voltage | $V_O$ | - | 1.5 | - | 7.0 | V |
| Load regulation | $R_{egL}$ | $I_O$=5mA to 4.6A | - | 0.5 | 2.0 | % |
| Line regulation | $R_{egI}$ | $V_{IN}$=4 to 10V | - | 0.5 | 2.5 | % |
| Reference voltage | $V_{ref}$ | - | 1.225 | 1.25 | 1.275 | V |
| Temperature coefficient of reference voltage | $T_CV_{ref}$ | $T_j$=0 to125˚C | - | ±0.01 | - | %/˚C |
| Ripple rejection | RR | - | 45 | 55 | - | dB |
| Dropout voltage(1) | $V_{i-O(1)}$ | *4, $I_O$=4.0A | - | - | 0.5 | V |
| Dropout voltage(2) | $V_{i-O(2)}$ | *4, $I_O$=4.6A | - | - | 1.0 | V |
| Quiescent current | $I_q$ | $I_O$=0A | - | - | 17 | mA |

*4 Input voltage shall be the value when output voltage is 95% in comparison with the initial value.

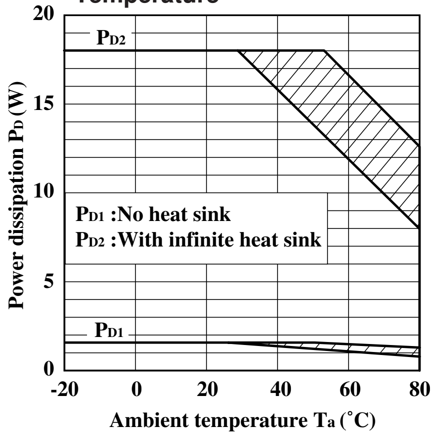
### Fig.1 Test Circuit




### Fig.2 Test circuit for Ripple Rejection




### Fig.3 Power Dissipation vs. Ambient Temperature




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

### Fig.4 Reference Voltage Deviation vs. Junction Temperature

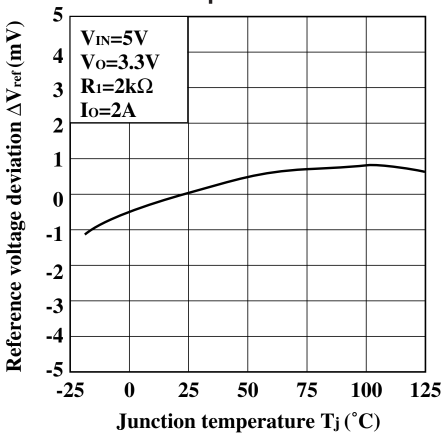


Fig.5 Relative Output Voltage vs. Output Current (Typical Value)

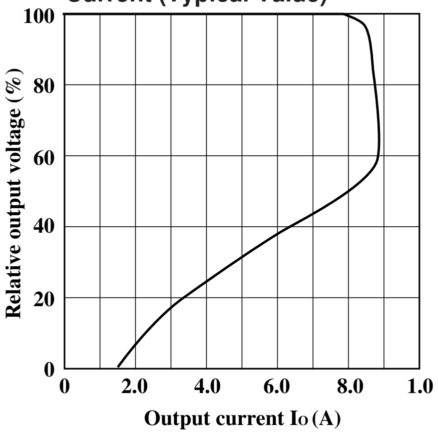



Fig.6 Output Voltage vs. Input Voltage

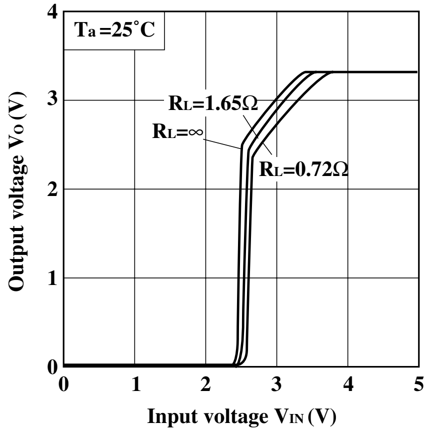



Fig.7 Circuit Operating Current vs. Input Voltage

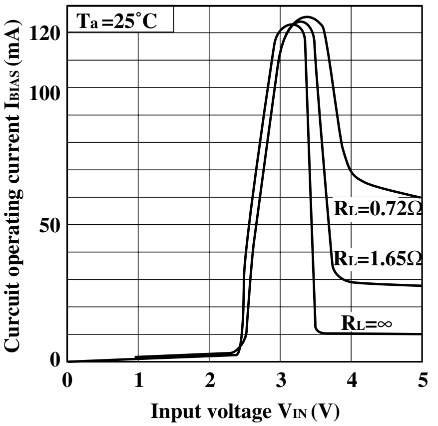



Fig.8 Dropout Voltage vs. Junction Temperature

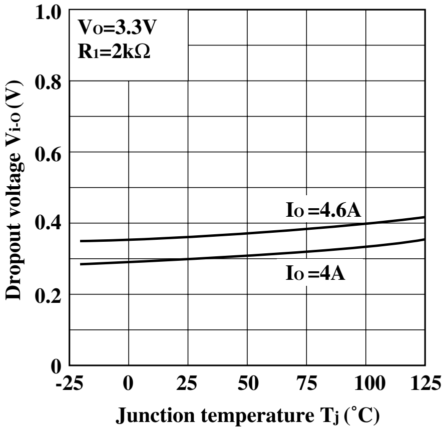



Fig.9 Quiescent Current vs. Junction Temperature

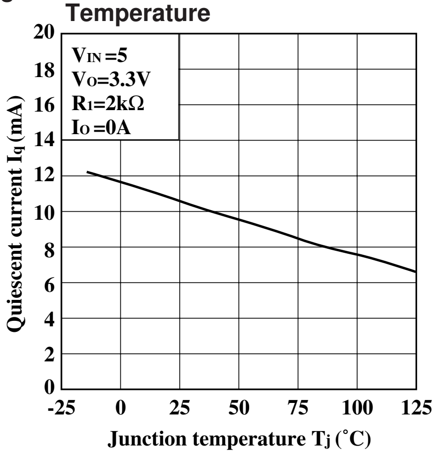
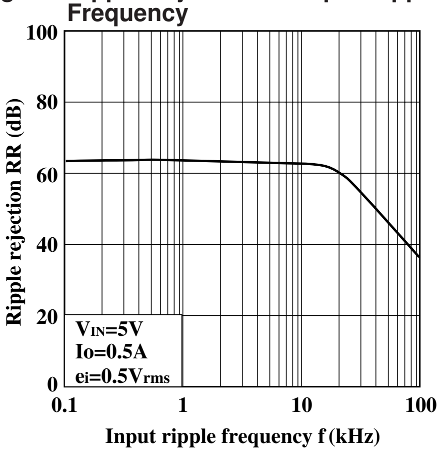
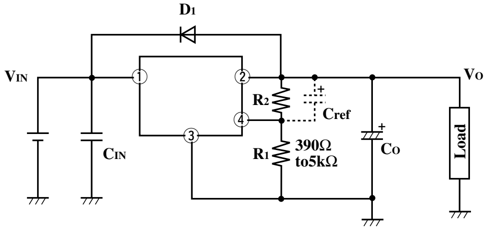



Fig.10 Ripple Rejection vs. Input Ripple Frequency



## ■ Standard Connection




$D_1$ : This device is necessary to protect the element from damage when reverse voltage may be applied to the regulator in case of input short-circuiting.

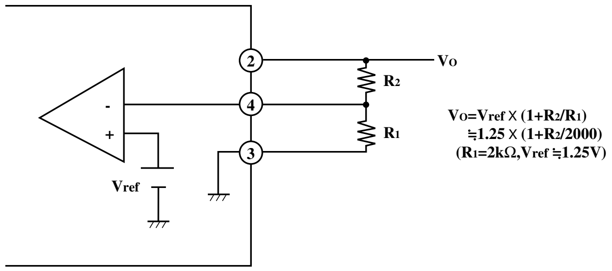
$C_{ref}$ : This device is necessary when it is required to enhance the ripple rejection or to delay the output start-up time. Otherwise, it is not necessary.
(Care must be taken since $C_{ref}$ may raise the gain,facilitating oscillation.)
* The output start-up time si proportional to $C_{ref} \times R_2$.

$C_{IN}$,$C_O$ : Be sure to mount the devices $C_{IN}$ and $C_O$ as close to the device terminal as possible so as to prevent oscillation.
The standard specification of $C_{IN}$ and $C_O$ is 0.33μF and 47μF, respectively. However, adjust them as necessary after checking.

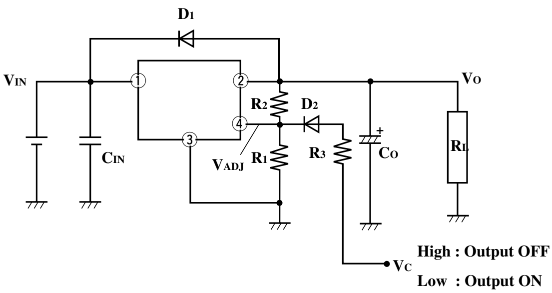
$R_1$,$R_2$ : These devices are necessary to set the output voltage. The output voltage $V_O$ is given by the following formula:
$V_O = Vref \times (1+R_2/R_1)$
(Vref is 1.25V TYP)
The standard value of $R_1$ is 2kΩ. But value up to 390Ω to 5kΩ does not cause any trouble.

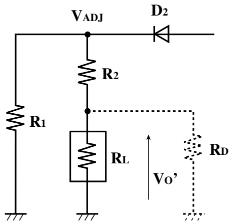
## ■ Asjustment of Output Voltage

Output voltage is able to set (1.5V to 7V) when resistors $R_1$,$R_2$ are attached to ②, ③, ④ terminals. As for the external resistors to set output voltage, refer to the following figure.




## ■ ON/OFF Operation




Equivalent Circuit
in OFF-state

ON/OFF operation is available by mounting externally $D_2$ and $R_3$.

When $V_{ADJ}$ is forcibly raised above $V_{ref}$ (1.25V TYP) by applying the external signal,the output is turned off (pass transistor of regulator is turned off). When the output is OFF, $V_{ADJ}$ must be higher than $V_{ref}$ MAX., and at the same time must be lower than maximum rating 5V.

In OFF-state, the load current flows to RL from $V_{ADJ}$ through $R_2$. Therefore the value of $R_2$ must be as high as possible.

In OFF state, as shown below,voltage

$V_O' = V_{ADJ} \times R_L / (R_L + R_2)$

occurs at the load. OFF-state equivalent circuit $R_1$ up to 5kΩ is allowed.

Select as high value of $R_L$ and $R_2$ as possible in thisrange. In some case, as output voltage is getting lower ($V_O$<1V), impedance of load resistance rises. In such condition, it is sometimes impossible to obtain the minimum value of $V_O'$. So add the dummy resistance indicated by $R_D$ in the figure to the circuit parallel to the load.

## NOTICE