PQ7RV4

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

■ Features

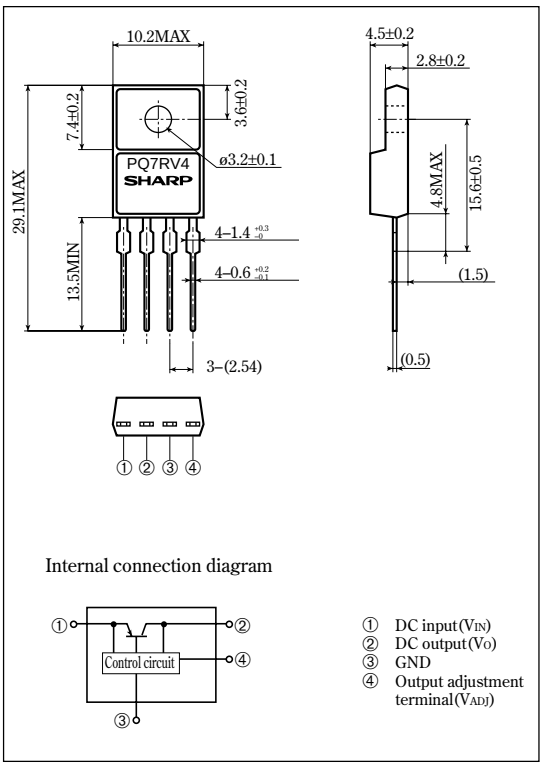
- Low power-loss
  (Dropout voltage: MAX.0.5V at Io=4.0A)
  (Dropout voltage: MAX.1.0V at Io=4.6A)
- TO-220 package
- 1.5V to 7V/4.6A output type
- Low operating voltage(Minimum operating voltage: 3.0V)
- High-precision reference voltage type
  Reference voltage precision: ±2.0%
- Built-in ON/OFF control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

■ Applications

- Power supplies for various electronic equipment such as personal computers

■ Outline Dimensions

(Unit : mm)



■ Absolute Maximum Ratings

(Ta=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<=Tj<=150˚C.

• Please refer to the chapter " Handling Precautions ".

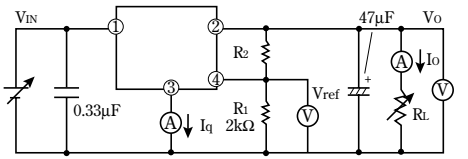
■ Electrical Characteristics

(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	$R_{eg}L$	I_O=5mA to 4.6A	–	0.5	2.0	%
Line regulation	$R_{eg}I$	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	Refer to Fig. 2	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

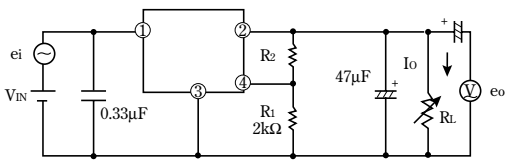
※4 Input voltage shall be the value when output voltage is 95% in comparison with the initial value.

Fig. 1 Test Circuit



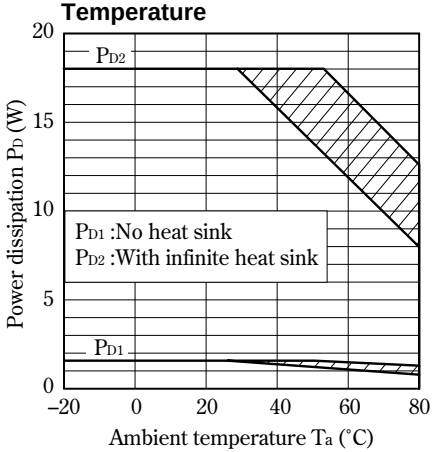
$V_o = V_{ref} \times (1 + R_2/R_1)$
[R_1=2kΩ, V_{ref} Nearly=1.25V]

Fig. 2 Test circuit for Ripple Rejection



f=120Hz(sine wave)
ei(rms)=0.5V
V_O=3V
V_{IN}=5V (R_1=2kΩ)
I_O=0.5A
RR=20 log($e_{i(rms)}/e_{o(rms)}$)

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

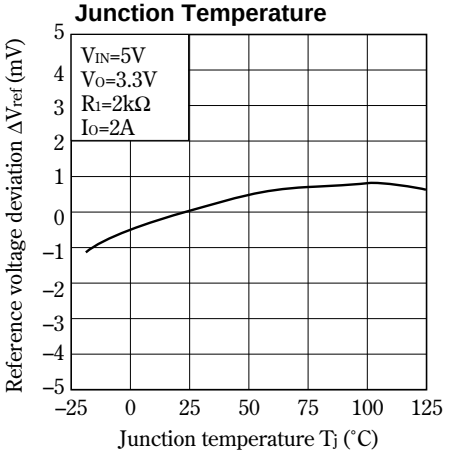


Fig. 5 Relative Output Voltage vs. Output Current (Typical Value)

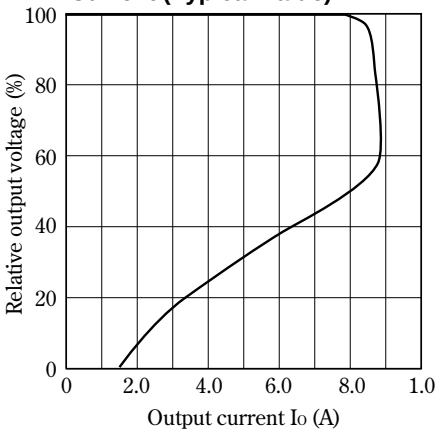


Fig. 6 Output Voltage vs. Input Voltage

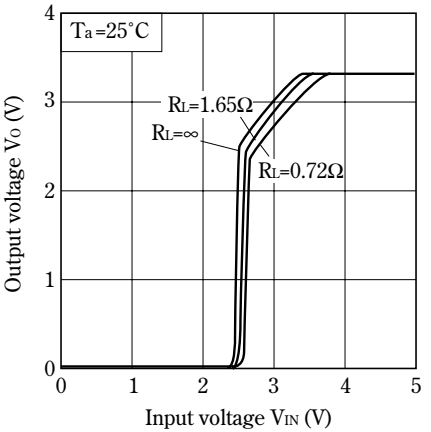


Fig. 7 Circuit Operating Current vs. Input Voltage

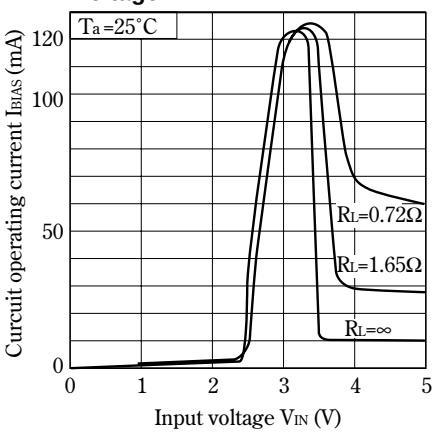


Fig. 8 Dropout Voltage vs. Junction Temperature

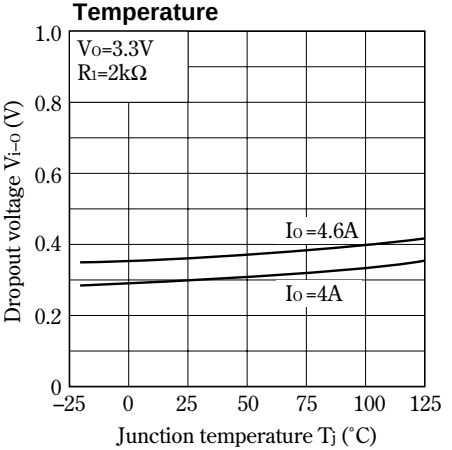


Fig. 9 Quiescent Current vs. Junction Temperature

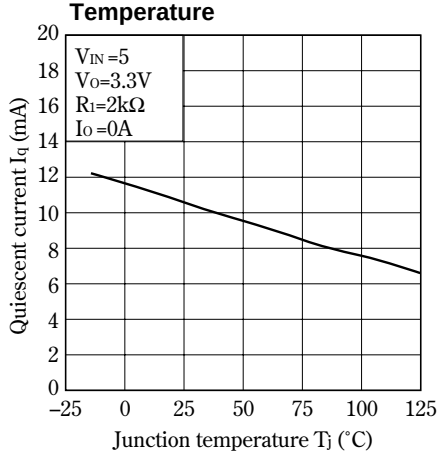
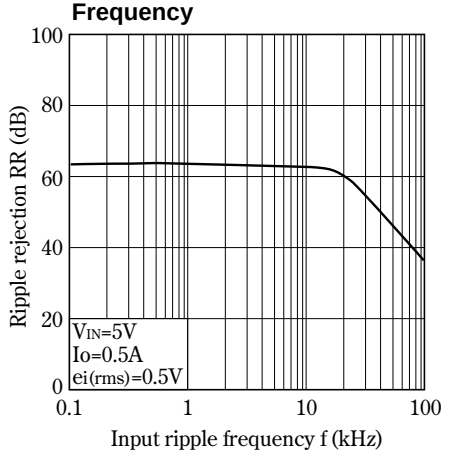
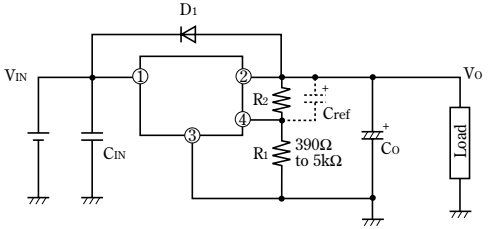


Fig.10 Ripple Rejection vs. Input Ripple Frequency



■ 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.

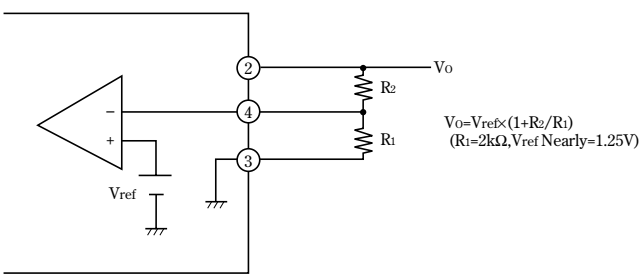
C_{ref} : This device is necessary when it is required to enhance the ripple rejection or to delay the output start-up time. Otherwise, it is not necessary.
(Care must be taken since C_{ref} may raise the gain,facilitating oscillation.)
❋ The output start-up time si proportional to $C_{ref} \times R_2$.

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.

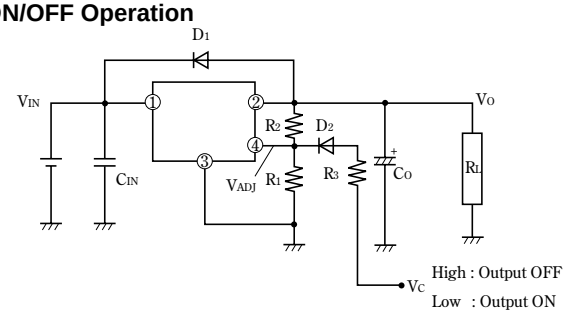
R_1,R_2 : These devices are necessary to set the output voltage. The output voltage V_O is given by the following formula:
$V_O = V_{ref} \times (1 + R_2/R_1)$
(V_{ref} is 1.25V TYP)
The standard value of R_1 is 2kΩ. But value up to 390Ω to 5kΩ does not cause any trouble.

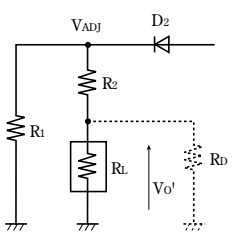
■ Setting of Output Voltage

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 figure below.



■ 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.

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