PQ7RV4

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

■ Features

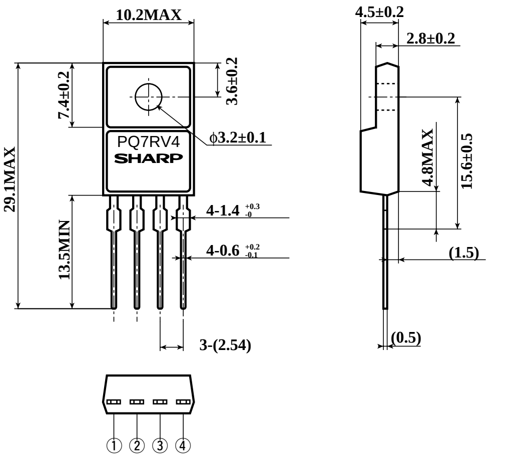
- Low power-loss
  (Dropout voltage : MAX.0.5V at Io=4.0A)
  (Dropout voltage : MAX.1.0V at Io=4.6A)
- TO-220 package
- 1.5V to 7V/4.6A output type
- Low operating voltage (Minimum operating voltage:3.0V)
- High-precision reference voltage type
  Reference voltage precision : ±2.0%
- Built-in overcurrent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

■ Applications

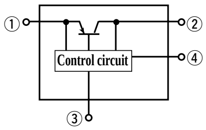
- Power supplies for various electronic equipment such as personal computers

■ Outline Dimensions

(Unit : mm)



Internal connection diagram



① DC input (V_{IN})
② DC output (V_O)
③ GND
④ Output adjustment terminal (V_{ADJ})

■ 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	W
*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),Io=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

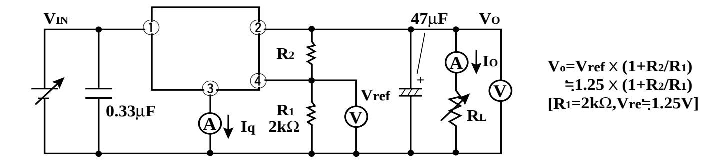


Fig.2 Test circuit for Ripple Rejection

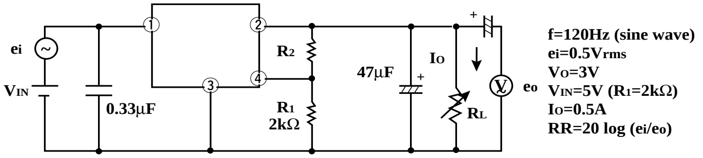
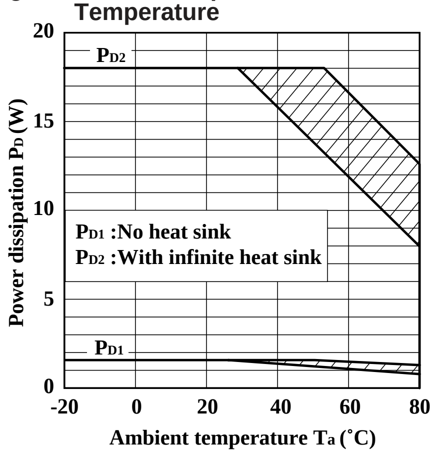


Fig.3 Power Dissipation vs. Ambient Temperature



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

Fig.4 Reference Voltage Deviation vs. Junction Temperature

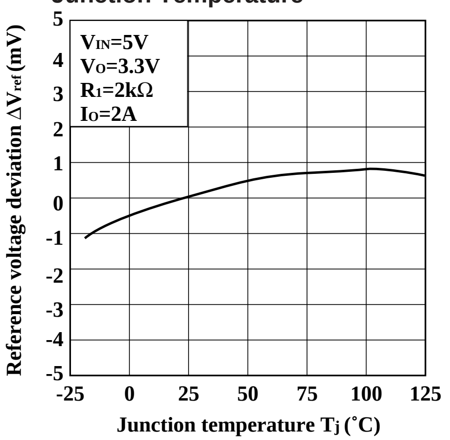


Fig.5 Relative Output Voltage vs. Output Current (Typical Value)

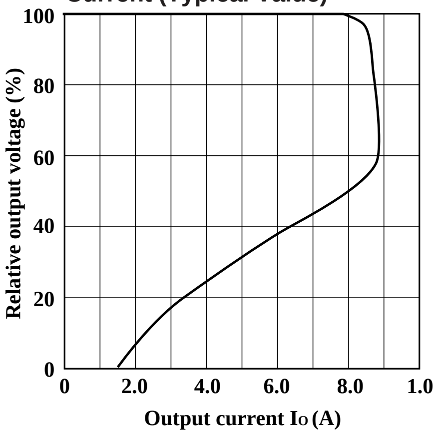


Fig.6 Output Voltage vs. Input Voltage

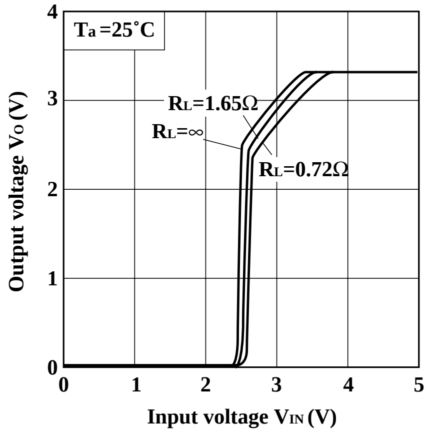


Fig.7 Circuit Operating Current vs. Input Voltage

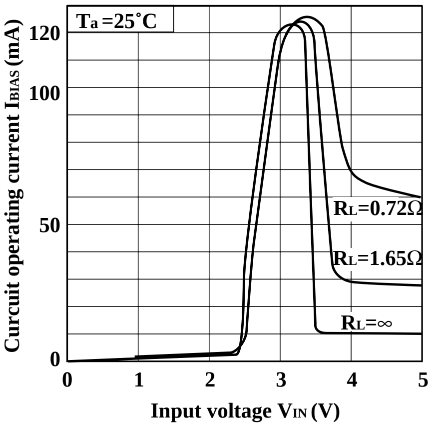


Fig.8 Dropout Voltage vs. Junction Temperature

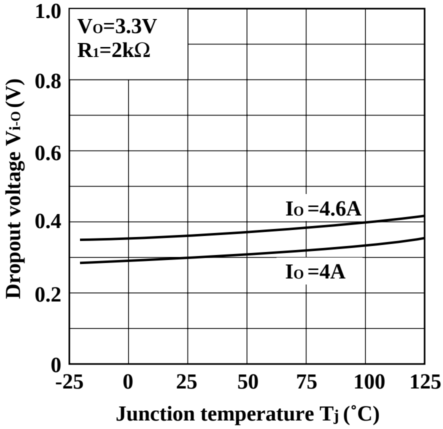


Fig.9 Quiescent Current vs. Junction Temperature

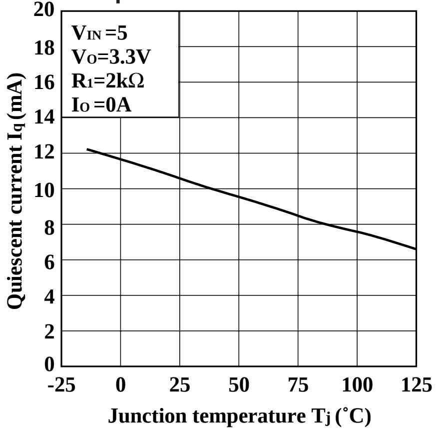
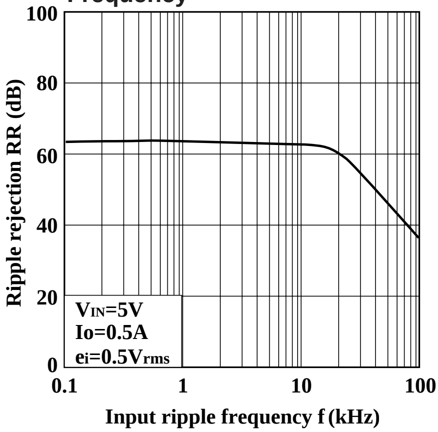
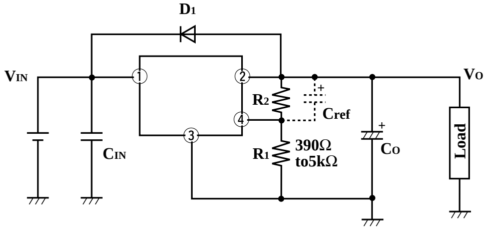


Fig.10 Ripple Rejection vs. Input Ripple Frequency



■ 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.

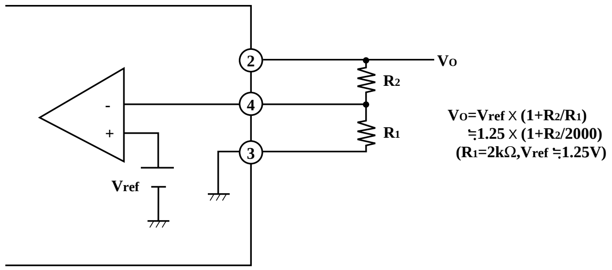
C_{ref} : This device is necessary when it is required to enhance the ripple rejection or to delay the output start-up time. Otherwise, it is not necessary.
(Care must be taken since C_{ref} may raise the gain,facilitating oscillation.)
* The output start-up time si proportional to $C_{ref} \times R_2$.

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.

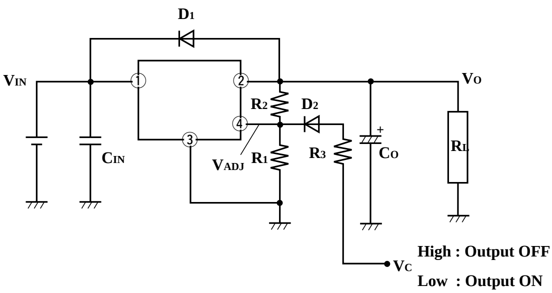
R_1,R_2 : These devices are necessary to set the output voltage. The output voltage V_O is given by the following formula:
$V_O = V_{ref} \times (1+R_2/R_1)$
(Vref is 1.25V TYP)
The standard value of R_1 is 2kΩ. But value up to 390Ω to 5kΩ does not cause any trouble.

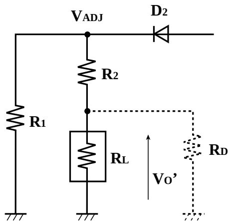
■ Asjustment of Output Voltage

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