PQ30VB11

Variable Output Low Power-Loss Voltage Regulator (Built-in Overheat Shut-Down Function)

■ Features

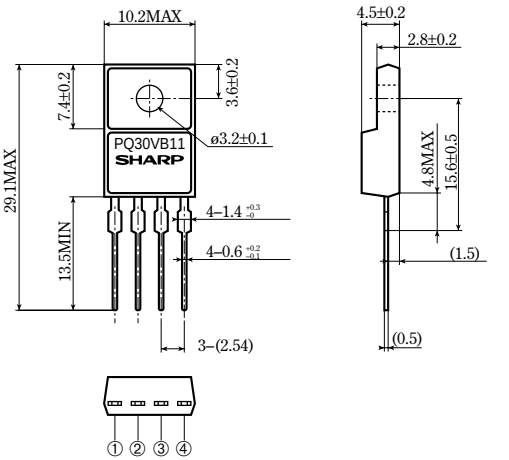
- Compact resin full-mold package
- Low power-loss (Dropout voltage: MAX. 0.5V)
- Overheat shut-down function (keep shut-down output until power-on again)
- Variable output voltage (Setting range: 1.5 to 30V)
- Overcurrent protection type
- High-precision output type (Reference voltage precision: ±2.0%)

■ Applications

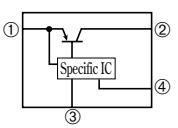
- Series power supply for TVs and VCRs
- Switching power supply

■ Outline Dimensions

(Unit : mm)



Internal connection diagram



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

■ Absolute Maximum Ratings

(T_a=25°C)

Parameter	Symbol	Rating	Unit
※1 Input voltage	V_{IN}	35	V
※1 Output adjustment terminal voltage	V_{ADJ}	7	V
Output current	I_O	1	A
Power dissipation (No heat sink)	P_{D1}	1.25	W
Power dissipation (With infinite heat sink)	P_{D2}	12.5	W
※2 Junction temperature	T_j	150	°C
Operating temperature	T_{opr}	–20 to +80	°C
Storage temperature	T_{atg}	–40 to +150	°C
※3 Soldering temperature	T_{sol}	260	°C

※1 All are open except GND and applicable terminals.
※2 Overheat shut-down function operates at T_j>=110°C.
※3 For 10s

• Please refer to the chapter " Handling Precautions ".

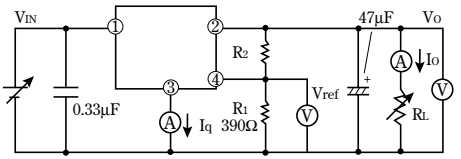
■ Electrical Characteristics

(Unless otherwise specified, condition shall be V_{IN}=15V, V_O=10V, I_O=0.5A, R_1=390Ω, T_a=25°C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input voltage	V_{IN}	–	4.5	–	35	V
Output voltage	V_O	–	1.5	–	30	V
Load regulation	R_{egL}	I_O=5mA to 1A	–	0.3	1.0	%
Line regulation	R_{egI}	V_{IN}=11 to 28V	–	0.5	2.5	%
Ripple rejection	RR	Refer to Fig. 2	45	55	–	dB
Reference voltage	V_{ref}		1.225	1.25	1.275	V
Temperature coefficient of reference voltage	T_cV_{ref}	T_j=0 to 125°C, I_O=5mA	–	±1.0	–	%
Dropout voltage	V_{I-O}	※4, I_O=0.5A	–	–	0.5	V
Quiescent current	I_q	I_O=0	–	–	7	mA
Overheat shut-down temperature	T_{sd}		110	130	150	°C

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

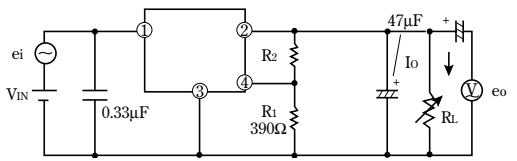
Fig. 1 Test Circuit



$$V_O = V_{ref} \times \left(1 + \frac{R_2}{R_1}\right)$$

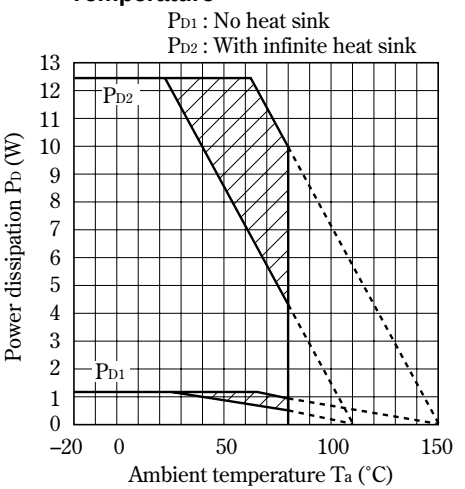
[R_1=390Ω, V_{ref} Nearly=1.25V]

Fig. 2 Test Circuit of Ripple Rejection



I_O=0.5A
f=120Hz(sine wave)
ei(rms)=0.5V
RR=20 log(ei(rms)/eo(rms))

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)

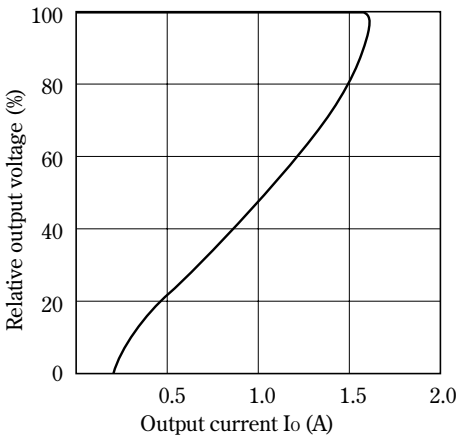


Fig. 5 Output Voltage Adjustment Characteristics

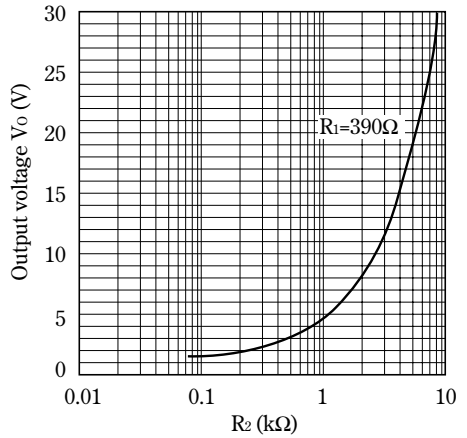


Fig. 6 Output Voltage vs. Input Voltage

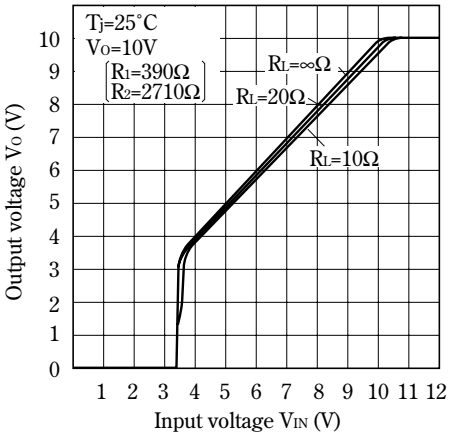


Fig. 7 Dropout Voltage vs. Junction Temperature

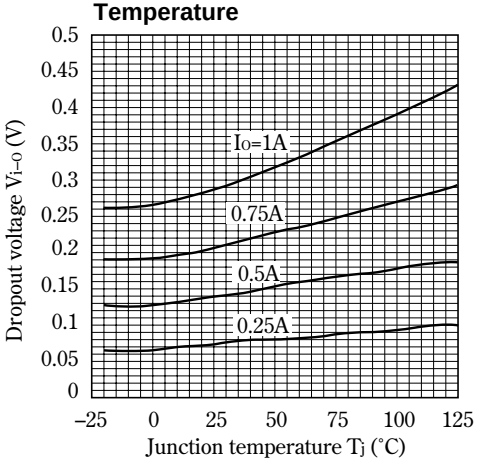


Fig. 8 Circuit Operating Current vs. Input Voltage

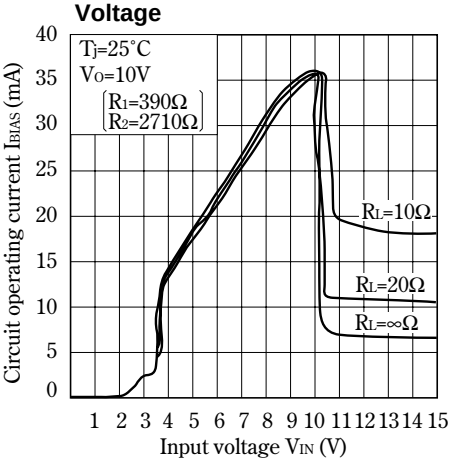
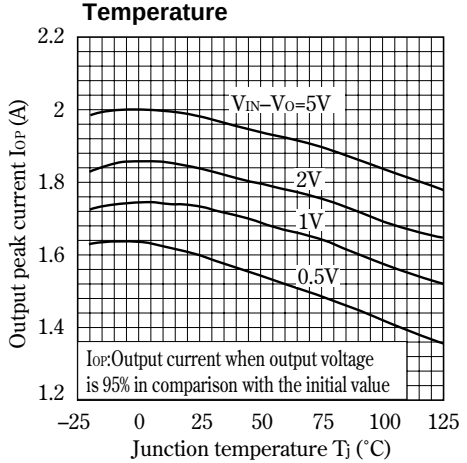
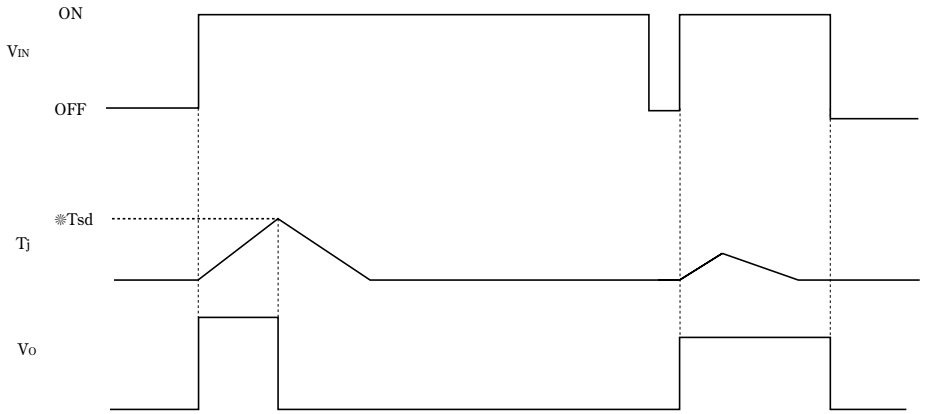


Fig. 9 Output Peak Current vs. Junction Temperature

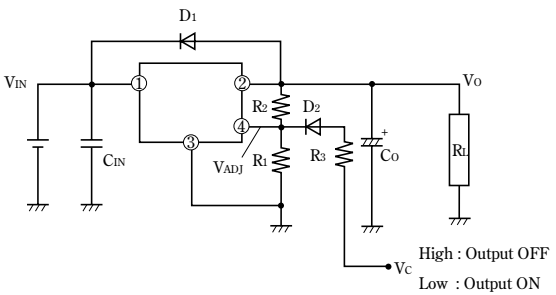


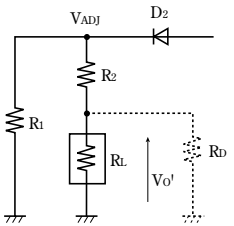
■ Overheat Shut-down Characteristics



※ Tsd : Overheat shut-down temperature (Tj>=110°C)
1 Overheat shut-down operates at Tj=Tsd and output OFF-state is maintained.
2 OFF-state is kept until VIN is once turned off.

■ 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 then V_{ref} MAX., and at the same time must be lower than maximum rating 7V.
  In OFF-state, the load current flows to R_L from V_{ADJ} through R_2. Therefore the value of R_2 must be as high as possible.
- Following voltage is applied to the load at OFF-state.
  $V_O' = V_{ADJ} \times R_L / (R_L + R_2)$ (Refer to the above right figure.)
  occurs at the load. OFF-state equivalent circuit R_1 up to 10kΩ is allowed. Select as high value of R_L and R_2 as possible in this range. In some case, as output voltage is getting lower (V_O<1V), impedance of load resistance rises. In such condition, it is sometime 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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