

PQ05RF1 Series

1A Output Low Power-Loss Voltage Regulators

Features

- Compact resin full-mold package
- Low power-loss (Dropout voltage : MAX.0.5V)
- Built-in ON/OFF control terminal (PQ05RF1/PQ05RF11 series)
- Built-in output voltage minute adjustment terminal (Critical rate of ripple rejection is improved.) (PQ05RF1V series)
- Lead forming type (PQ05RF1A/1B series) is also available.

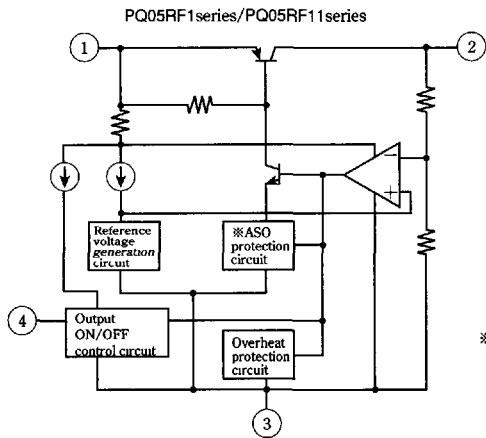
Model Line-ups

| Output voltage | 5V _{output} | 9V _{output} | 12V _{output} |
|-----------------------------------------------------------|----------------------|----------------------|-----------------------|
| Output voltage precision: ±5% | PQ05RF1 | PQ09RF1 | PQ12RF1 |
| Output voltage precision: ±2.5% | PQ05RF11 | PQ09RF11 | PQ12RF11 |
| Minute adjustment (Output voltage adjustment range: ±10%) | PQ05RF1V | PQ09RF1V | PQ12RF1V |

Applications

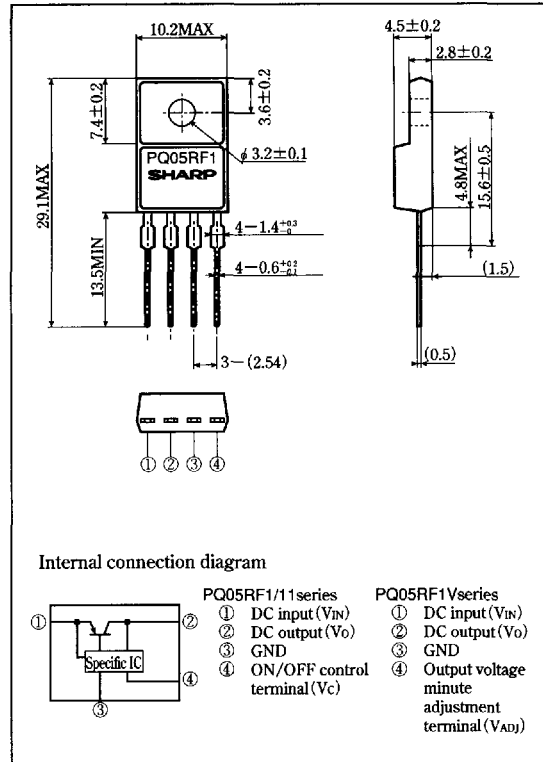
- Seris power supply for various electronic equipment such as VCRs and musical instruments

Equivalent Circuit Diagram



Outline Dimensions

(Unit : mm)



※ASO : Area of Safety Operation

· Please refer to the chapter "Handling Precautions".



■ Absolute Maximum Ratings (T_a=25°C)

| Parameter | Symbol | Rating | Unit |
|---------------------------------------------|------------------|---------------|------|
| *1 Input voltage | V _{IN} | 35 | V |
| *1 ON/OFF control terminal voltage | PQ05RF1 series | 35 | V |
| | PQ05RF11 series | | |
| Output current | I _o | 1 | A |
| Power dissipation (No heat sink) | P _{D1} | 1.5 | W |
| Power dissipation (With infinite heat sink) | P _{D2} | 15 | W |
| *2 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 Overheat protection may operate at 125 ≤ T_j ≤ 150°C

■ Electrical Characteristics (Unless otherwise specified, condition shall be I_o=0.5A, T_a=25°C, *3)

| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit | |
|--------------------------------------------------|---------------------|----------------------------|-------------------------|-------|------|------|----|
| Output voltage | V _o | — | PQ05RF1/PQ05RF1V | 4.75 | 5.0 | 5.25 | V |
| | | | PQ09RF1/PQ09RF1V | 8.55 | 9.0 | 9.45 | |
| | | | PQ12RF1/PQ12RF1V | 11.4 | 12.0 | 12.6 | |
| | | | PQ05RF11 | 4.88 | 5.0 | 5.12 | |
| | | | PQ09RF11 | 8.78 | 9.0 | 9.22 | |
| | | | PQ12RF11 | 11.7 | 12.0 | 12.3 | |
| Load regulation | RegL | I _o =5mA to 1A | — | 0.1 | 2.0 | % | |
| Line regulation | RegI | *4 | — | 0.5 | 2.5 | % | |
| Temperature coefficient of output voltage | TcV _o | T _j =0 to 125°C | — | ±0.02 | — | %/°C | |
| Ripple rejection | RR | Refer to Fig. 2. | PQ05RF1/PQ05RF11 series | 45 | 55 | — | dB |
| | | | PQ05RF1V series | 55 | — | — | |
| Dropout voltage | V _{r-o} | *5 | — | — | 0.5 | V | |
| ON-state voltage for control | V _{c(ON)} | — | 2.0 *6 | — | — | V | |
| ON-state current for control | I _{c(ON)} | V _c =2.7V | — | — | 20 | μA | |
| OFF-state voltage for control | V _{c(OFF)} | — | — | — | 0.8 | V | |
| OFF-state current for control | I _{c(OFF)} | V _c =0.4V | — | — | -0.4 | mA | |
| Quiescent current | I _q | I _o =0 | — | — | 10 | mA | |
| Output voltage minute adjustment characteristics | V _{o(ADJ)} | — | PQ05RF1V | 4.5 | 5.0 | 5.5 | V |
| | | | PQ09RF1V | 8.1 | 9.0 | 9.9 | |
| | | | PQ12RF1V | 10.8 | 12.0 | 13.2 | |

*3 PQ05RF1 series:V_{IN}=7V, PQ09RF1 series V_{IN}=15V, PQ12RF1 series V_{IN}=18V

*4 PQ05RF1/PQ05RF11/PQ05RF1V V_{IN}=6 to 12V

PQ09RF1/PQ09RF11/PQ09RF1V V_{IN}=10 to 25V

PQ12RF1/PQ12RF11/PQ12RF1V V_{IN}=13 to 29V

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

*6 In case of opening control terminal ④, output voltage turns on. (PQ05RF1/PQ05RF11 series)

Fig. 1 Test Circuit

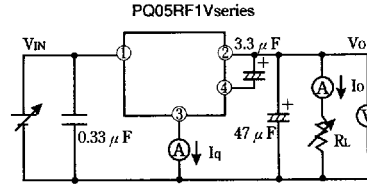
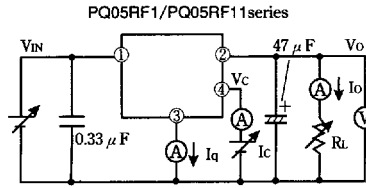


Fig. 2 Test Circuit of Ripple Rejection

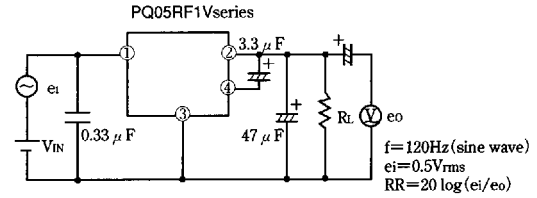
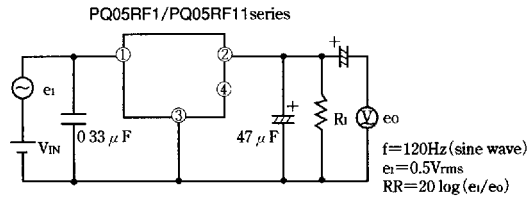
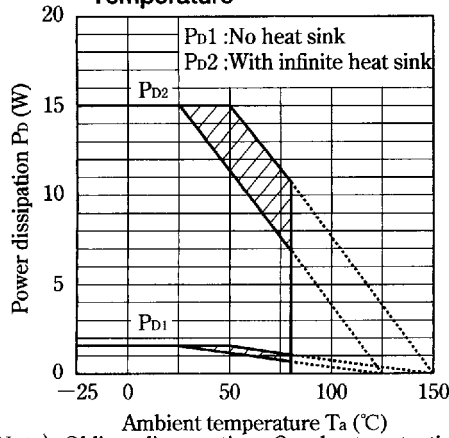


Fig. 3 Power Dissipation vs. Ambient Temperature



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

Fig. 4 Overcurrent Protection Characteristics (Typical Value)

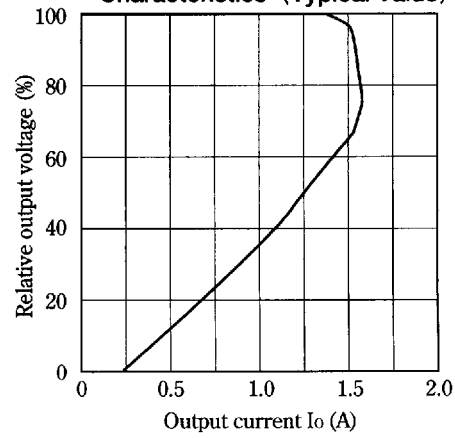


Fig. 5 Output Voltage Minute Adjustment Characteristics (PQ05RF1V)

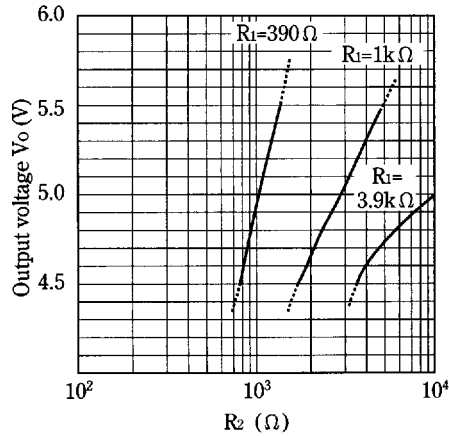


Fig. 6 Output Voltage Minute Adjustment Characteristics (PQ09RF1V)

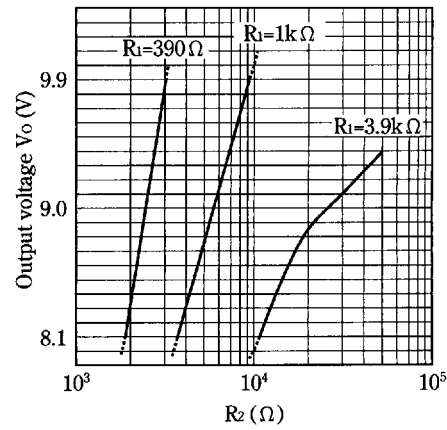


Fig. 7 Output Voltage Minute Adjustment Characteristics (PQ12RF1V)

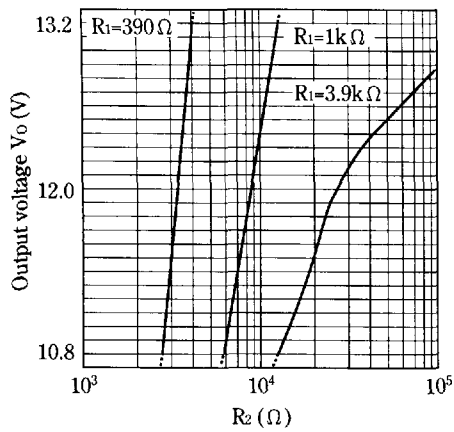


Fig. 8 Output Voltage Deviation vs. Junction Temperature (PQ05RF1/PQ05RF11/PQ05RF1V)

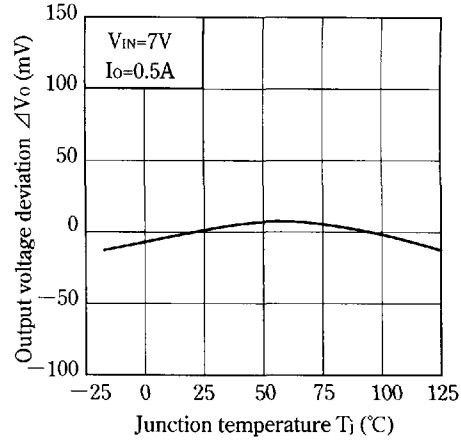


Fig. 9 Output Voltage Deviation vs. Junction Temperature (PQ09RF1/PQ09RF11/PQ09RF1V)

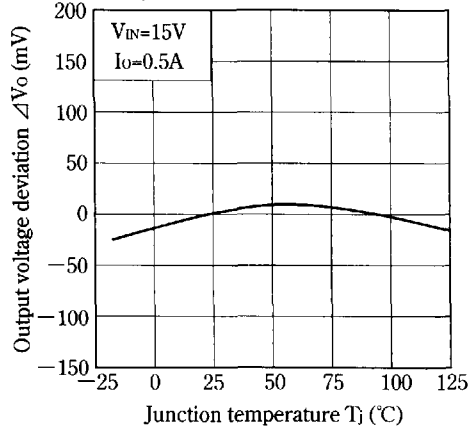


Fig.10 Output Voltage Deviation vs. Junction Temperature (PQ12RF1/PQ12RF11/PQ12RF1V)

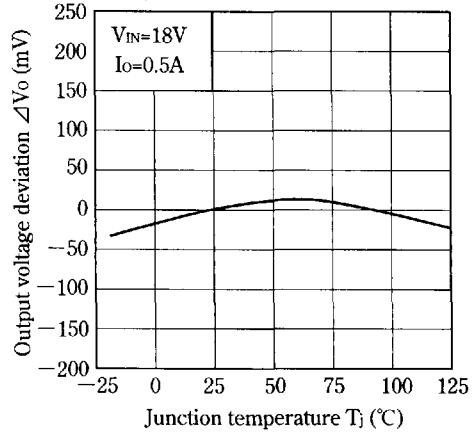


Fig.11 Output Voltage vs. Input Voltage (PQ05RF1/PQ05RF11/PQ05RF1V)

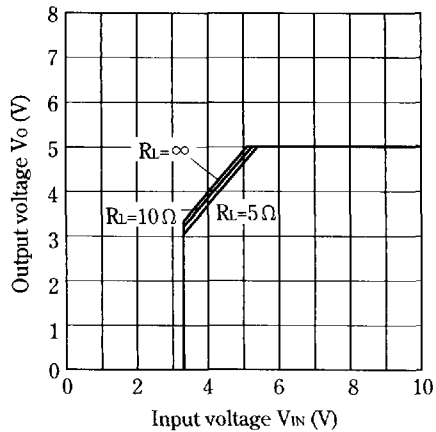


Fig.12 Output Voltage vs. Input Voltage (PQ09RF1/PQ09RF11/PQ09RF1V)

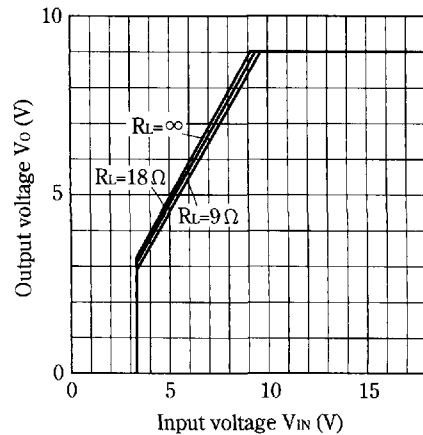


Fig.13 Output Voltage vs. Input Voltage (PQ12RF1/PQ12RF11/PQ12RF1V)

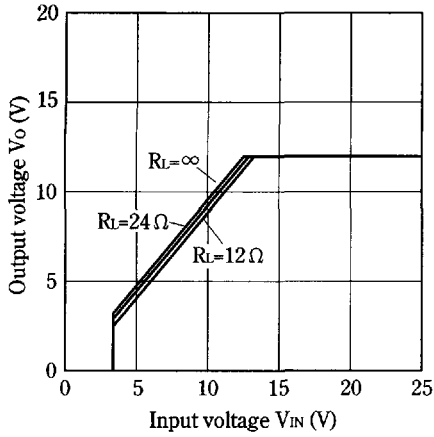


Fig.14 Circuit Operating Current vs. Input Voltage (PQ05RF1/PQ05RF11/PQ05RF1V)

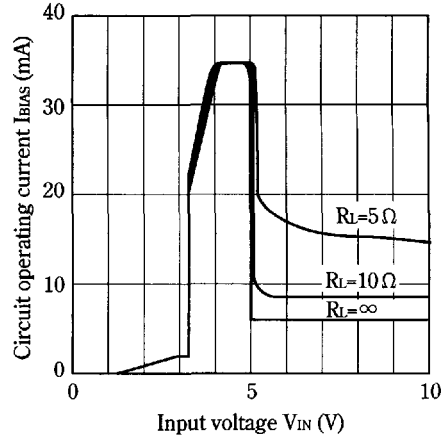


Fig.15 Circuit Operating Current vs. Input Voltage (PQ09RF1/PQ09RF11/PQ09RF1V)

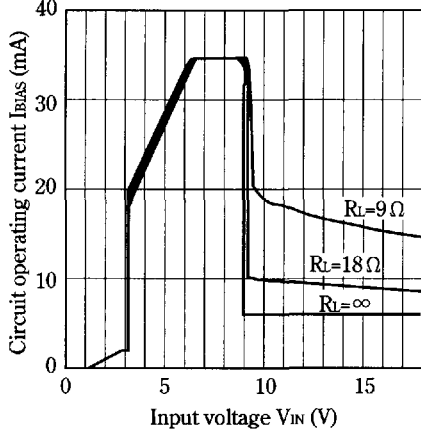


Fig.16 Circuit Operating Current vs. Input Voltage (PQ12RF1/PQ12RF11/PQ12RF1V)

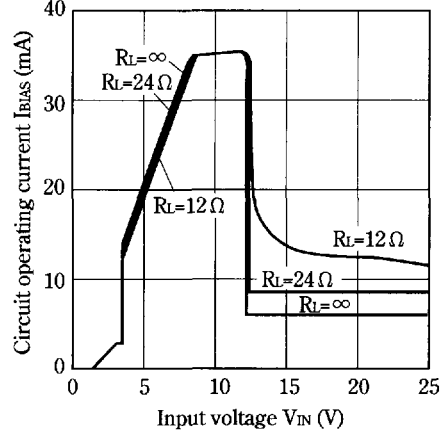


Fig.17 Dropout Voltage vs. Junction Temperature

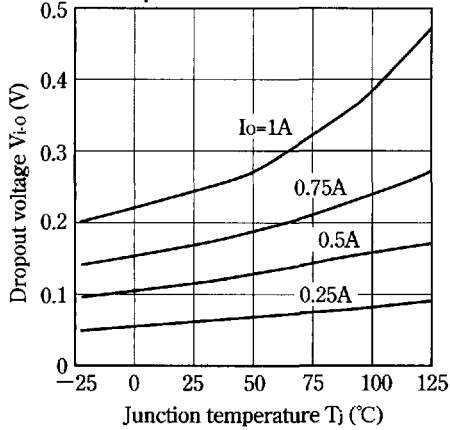


Fig.18 Quiescent Current vs. Junction Temperature

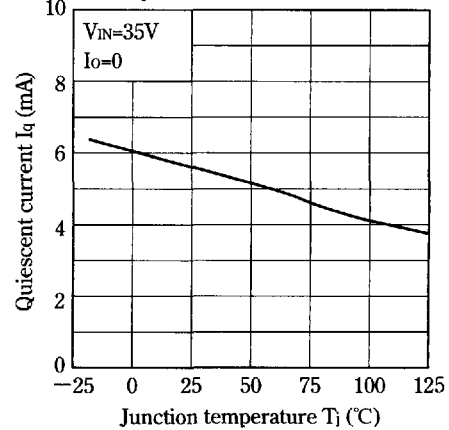


Fig.19 Ripple Rejection vs. Input Ripple Frequency
(PQ05RF1/PQ05RF11/PQ09RF1/PQ09RF11/PQ12RF1/PQ12RF11)

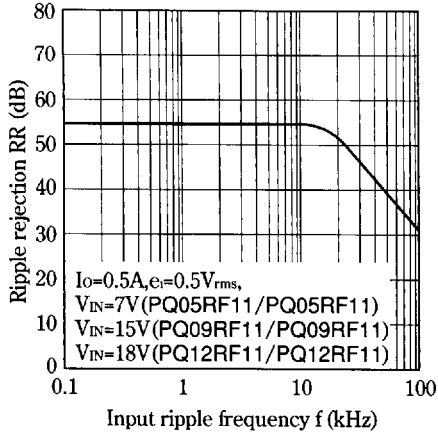


Fig.20 Ripple Rejection vs. Input Ripple Frequency
(PQ05RF1V/PQ09RF1V/PQ12RF1V)

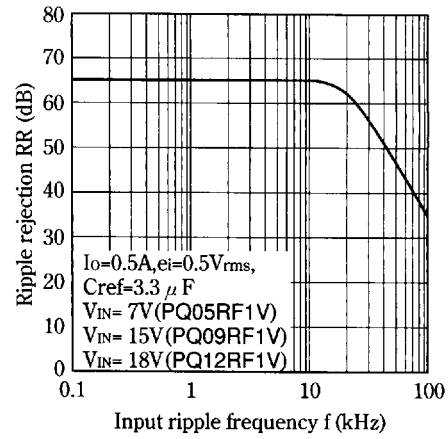
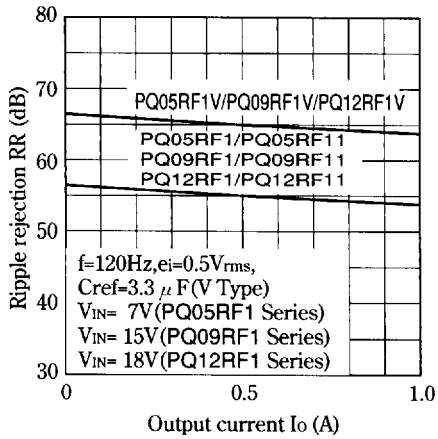
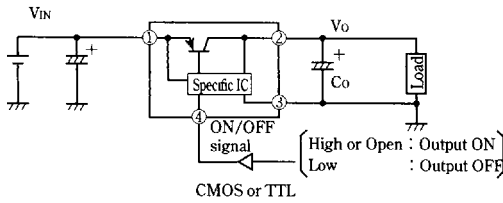


Fig.21 Ripple Rejection vs. Output Current

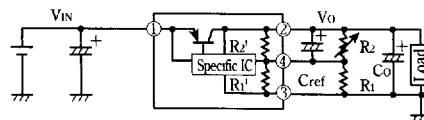


Typical Application

PQ05RF1/PQ05RF11 Series



PQ05RF1V Series



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

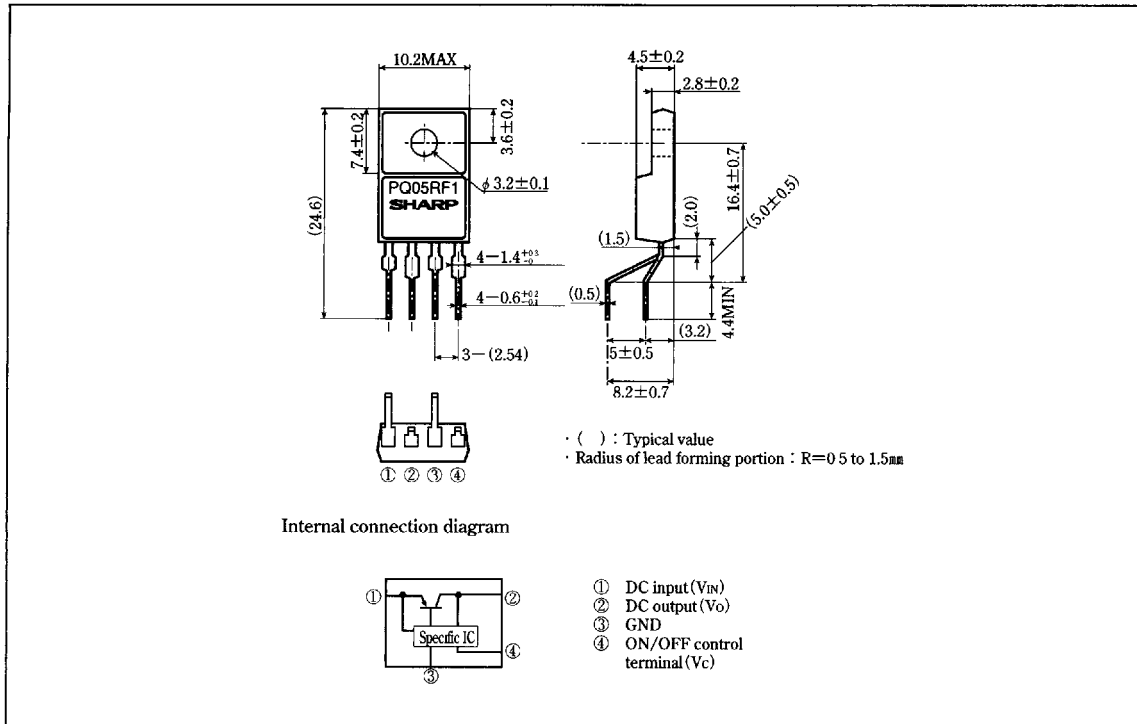
$V_{ref} \approx 1.26V, R_1' \approx 390\Omega$
 PQ05RF1V : $R_2' \approx 1.16k\Omega$
 PQ09RF1V : $R_2' \approx 2.40k\Omega$
 PQ12RF1V : $R_2' \approx 3.32k\Omega$
 (Note) R_1' and R_2' are built in a specific IC

■ Model Line-ups for Lead Forming Type

| Output voltage | 5V output | 9V output | 12V output |
|---------------------------------------|-----------|-----------|------------|
| Output voltage precision: $\pm 5\%$ | PQ05RF1A | PQ09RF1A | PQ12RF1A |
| Output voltage precision: $\pm 2.5\%$ | PQ05RF1B | PQ09RF1B | PQ12RF1B |

■ Outline Dimensions (PQ05RF1A/PQ05RF1B series)

(Unit : mm)



Note) The value absolute maximum ratings and electrical characteristics is same as ones of PQ05RF1/11 series.

■ Precautions for Use

(1) Minute adjustment of output voltage (PQ05RF1V series)

If the external resistor is attached to the terminals ②, ③ and ④, minute adjustment of output voltage is possible.

(Refer to the example of basic circuit (PQ05RF1V series) and Fig.5 to 7.)