

# 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.

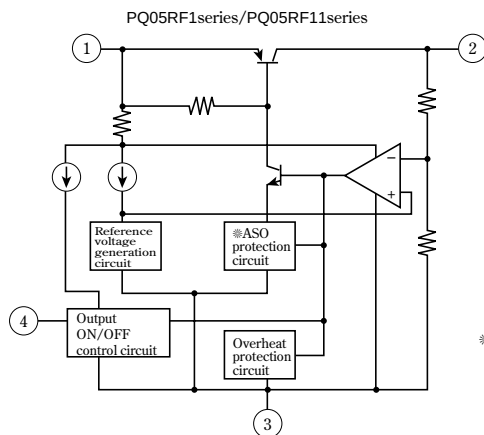
### Model Line-ups

| Output voltage                                           | 5Voutput | 9Voutput | 12Voutput |
|----------------------------------------------------------|----------|----------|-----------|
| 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

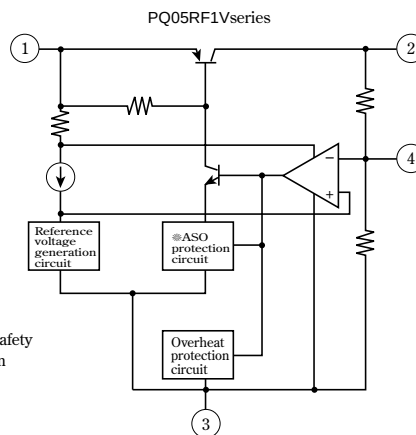
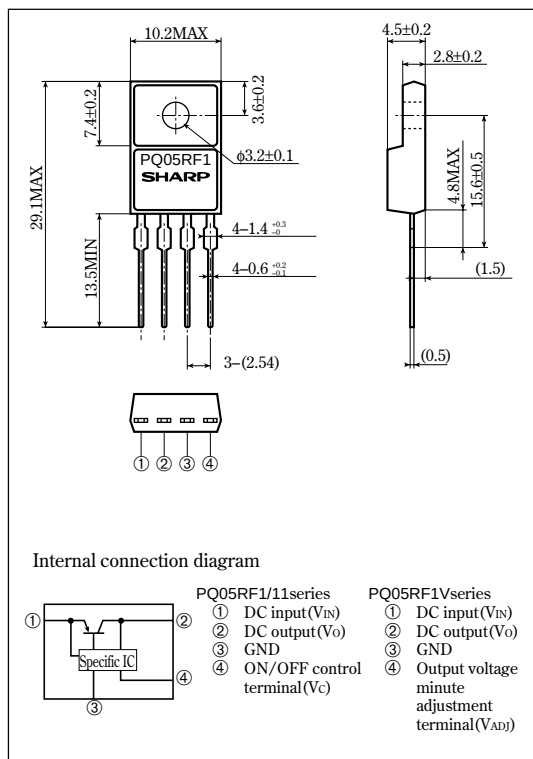
### Equivalent Circuit Diagram



※ASO : Area of Safety Operation

### Outline Dimensions

(Unit : mm)



•Please refer to the chapter " Handling Precautions ".

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## Absolute Maximum Ratings

(T<sub>a</sub>=25°C)

| Parameter                                  |                 | Symbol           | Rating        | Unit |
|--------------------------------------------|-----------------|------------------|---------------|------|
| *1 Input voltage                           |                 | V <sub>IN</sub>  | 35            | V    |
| *1 ON/OFF control terminal voltage         | PQ05RF1 series  | V <sub>C</sub>   | 35            | V    |
|                                            | PQ05RF11 series |                  |               |      |
| Output current                             |                 | I <sub>O</sub>   | 1             | A    |
| Power dissipation(No heat sink)            |                 | P <sub>D1</sub>  | 1.5           | W    |
| Power dissipation(With infinite heat sink) |                 | P <sub>D2</sub>  | 15            | W    |
| *2 Junction temperature                    |                 | T <sub>J</sub>   | 150           | °C   |
| Operating temperature                      |                 | T <sub>opr</sub> | −20 to +80    | °C   |
| Storage temperature                        |                 | T <sub>stg</sub> | −40 to +150   | °C   |
| Soldering temperature                      |                 | T <sub>sol</sub> | 260 (For 10s) | °C   |

\*1 All are open except GND and applicable terminals.

\*2 Overheat protection may operate at 125<=T<sub>J</sub><=150°C

## Electrical Characteristics

(Unless otherwise specified, condition shall be I<sub>O</sub>=0.5A, T<sub>a</sub>=25°C, \*3)

| Parameter                                        |                         | Symbol                        | Conditions                                      | MIN.   | TYP.  | MAX. | Unit |
|--------------------------------------------------|-------------------------|-------------------------------|-------------------------------------------------|--------|-------|------|------|
| Output voltage                                   | PQ05RF1/PQ05RF1V        | V <sub>O</sub>                | —                                               | 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                                  |                         | R <sub>egL</sub>              | I <sub>O</sub> =5mA to 1A                       | —      | 0.1   | 2.0  | %    |
| Line regulation                                  |                         | R <sub>egI</sub>              | *4, I <sub>O</sub> =5mA                         | —      | 0.5   | 2.5  | %    |
| Temperature coefficient of output voltage        |                         | T <sub>C</sub> V <sub>O</sub> | T <sub>J</sub> =0 to 125°C, I <sub>O</sub> =5mA | —      | ±0.02 | —    | %/°C |
| Ripple rejection                                 | PQ05RF1/PQ05RF11 series | RR                            | Refer to Fig. 2.                                | 45     | 55    | —    | dB   |
|                                                  | PQ05RF1V series         |                               |                                                 | 55     | —     | —    |      |
| Dropout voltage                                  |                         | V <sub>FO</sub>               | *5                                              | —      | —     | 0.5  | V    |
| ON-state voltage for control                     | PQ05RF1/PQ05RF11 series | V <sub>C(ON)</sub>            | —                                               | 2.0 *6 | —     | —    | V    |
| ON-state current for control                     | PQ05RF1/PQ05RF11 series | I <sub>C(ON)</sub>            | V <sub>C</sub> =2.7V                            | —      | —     | 20   | μA   |
| OFF-state voltage for control                    | PQ05RF1/PQ05RF11 series | V <sub>C(OFF)</sub>           | —                                               | —      | —     | 0.8  | V    |
| OFF-state current for control                    | PQ05RF1/PQ05RF11 series | I <sub>C(OFF)</sub>           | V <sub>C</sub> =0.4V                            | —      | —     | −0.4 | mA   |
| Quiescent current                                |                         | I <sub>q</sub>                | I <sub>O</sub> =0                               | —      | —     | 10   | mA   |
| Output voltage minute adjustment characteristics | PQ05RF1V                | V <sub>O(ADJ)</sub>           | —                                               | 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<sub>IN</sub>=7V, PQ09RF1 series:V<sub>IN</sub>=15V, PQ12RF1 series:V<sub>IN</sub>=18V\*4 PQ05RF1/PQ05RF11/PQ05RF1V:V<sub>IN</sub>=6 to 12VPQ09RF1/PQ09RF11/PQ09RF1V:V<sub>IN</sub>=10 to 25VPQ12RF1/PQ12RF11/PQ12RF1V:V<sub>IN</sub>=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

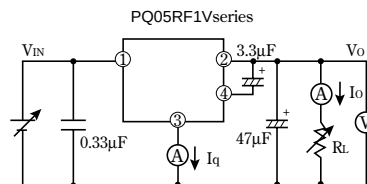
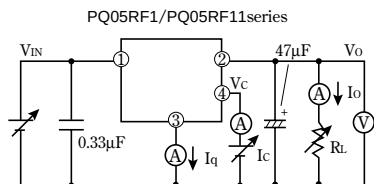


Fig.2 Test Circuit of Ripple Rejection

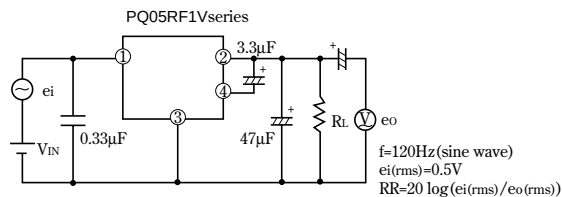
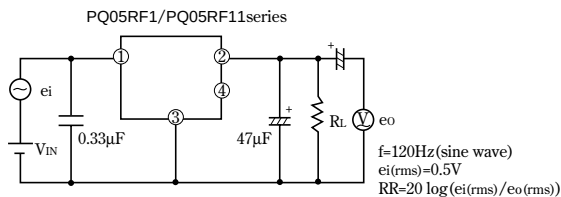
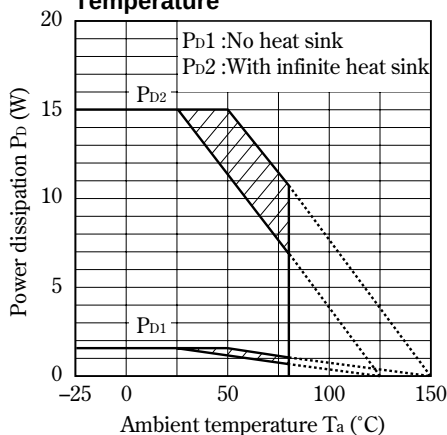


Fig.3 Power Dissipation vs. Ambient Temperature



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

Fig.4 Overcurrent Protection Characteristics (Typical Value)

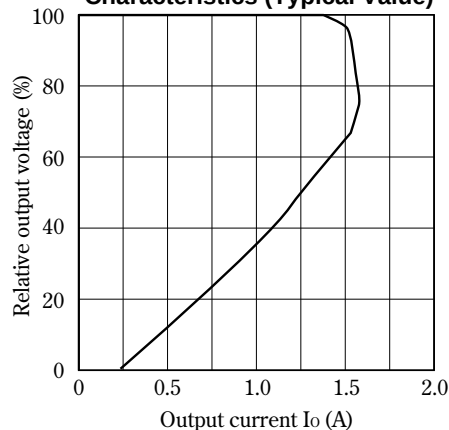


Fig.5 Output Voltage Minute Adjustment Characteristics (PQ05RF1V)

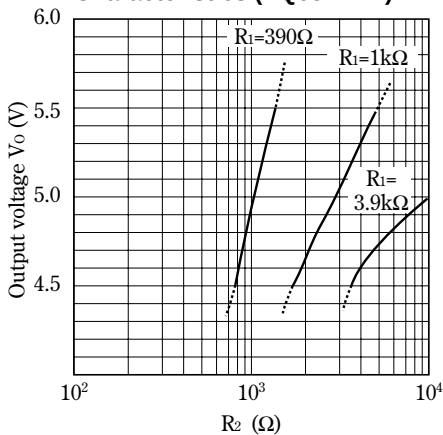
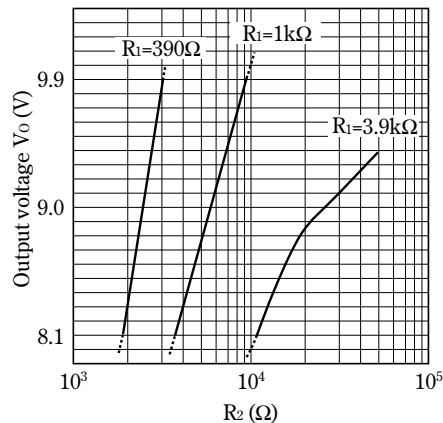
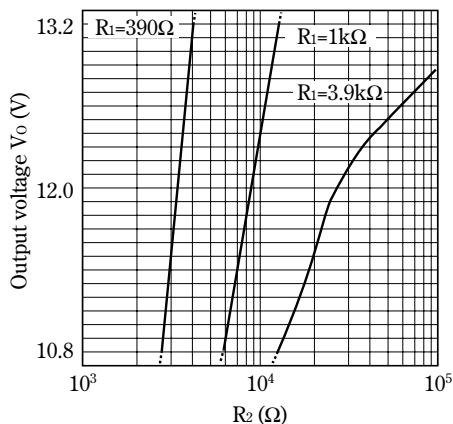


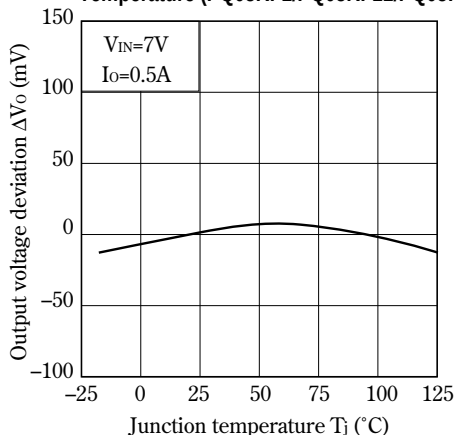
Fig.6 Output Voltage Minute Adjustment Characteristics (PQ09RF1V)



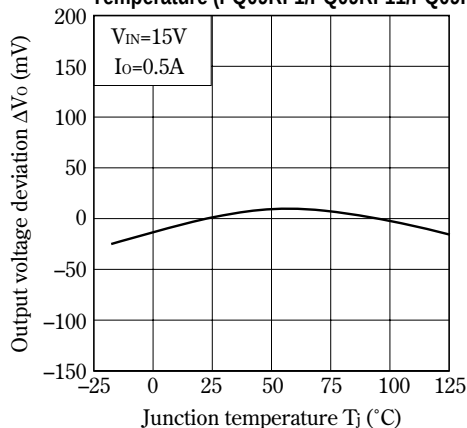
**Fig.7 Output Voltage Minute Adjustment Characteristics (PQ12RF1V)**



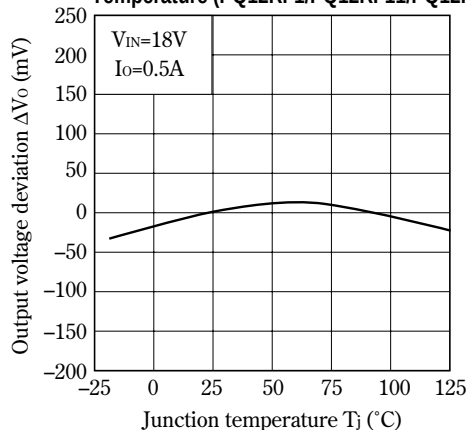
**Fig.8 Output Voltage Deviation vs. Junction Temperature (PQ05RF1/PQ05RF11/PQ05RF1V)**



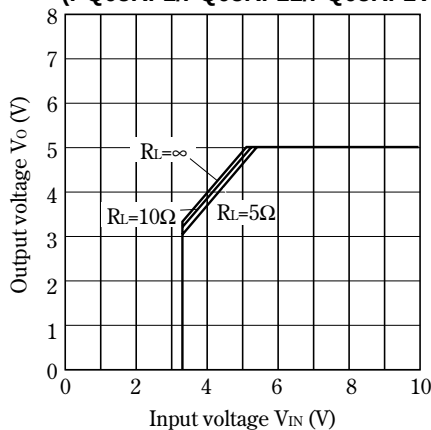
**Fig.9 Output Voltage Deviation vs. Junction Temperature (PQ09RF1/PQ09RF11/PQ09RF1V)**



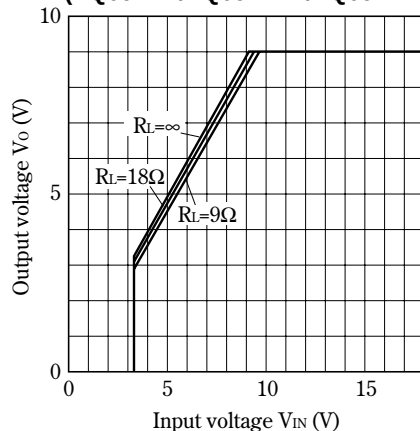
**Fig.10 Output Voltage Deviation vs. Junction Temperature (PQ12RF1/PQ12RF11/PQ12RF1V)**



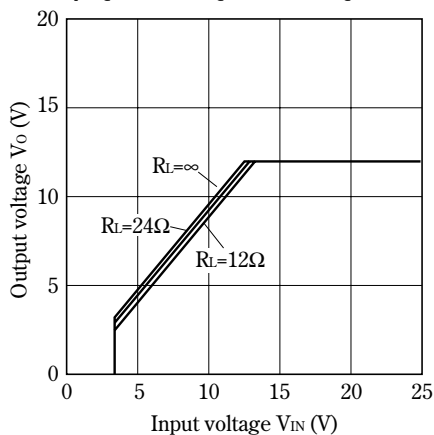
**Fig.11 Output Voltage vs. Input Voltage (PQ05RF1/PQ05RF11/PQ05RF1V)**



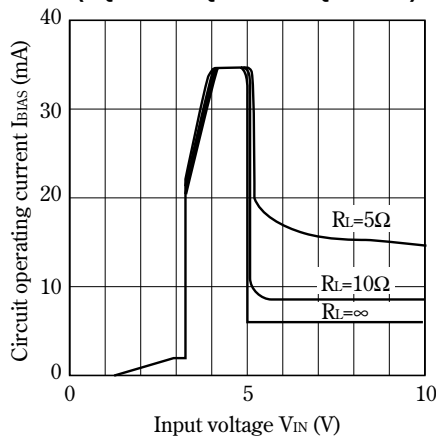
**Fig.12 Output Voltage vs. Input Voltage (PQ09RF1/PQ09RF11/PQ09RF1V)**



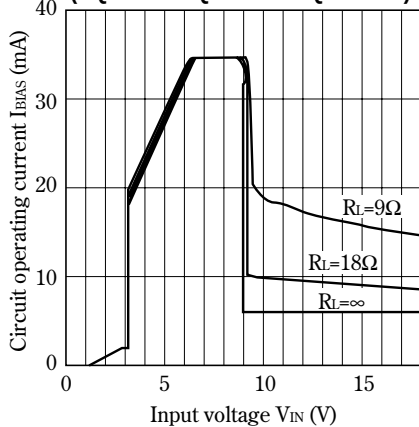
**Fig.13 Output Voltage vs. Input Voltage**  
(PQ12RF1/PQ12RF11/PQ12RF1V)



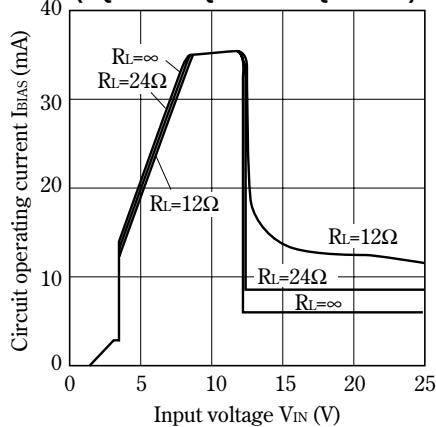
**Fig.14 Circuit Operating Current vs. Input Voltage**  
(PQ05RF1/PQ05RF11/PQ05RF1V)



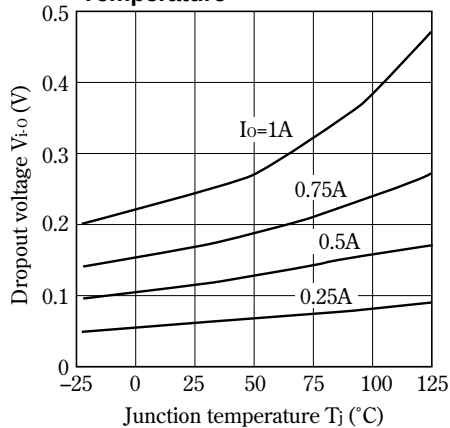
**Fig.15 Circuit Operating Current vs. Input Voltage**  
(PQ09RF1/PQ09RF11/PQ09RF1V)



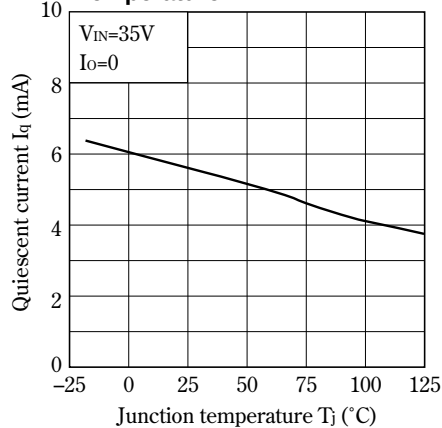
**Fig.16 Circuit Operating Current vs. Input Voltage**  
(PQ12RF1/PQ12RF11/PQ12RF1V)

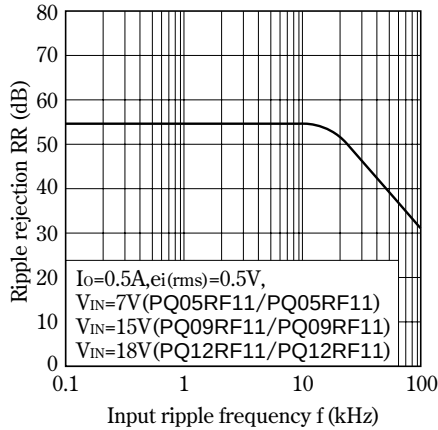
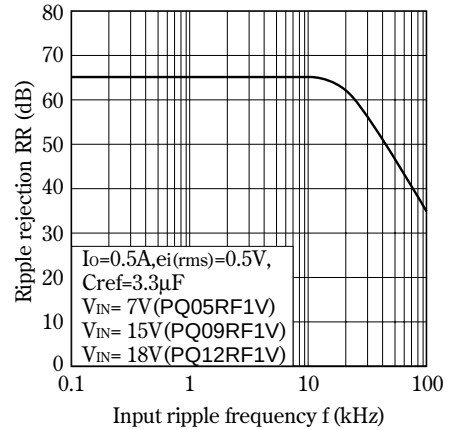
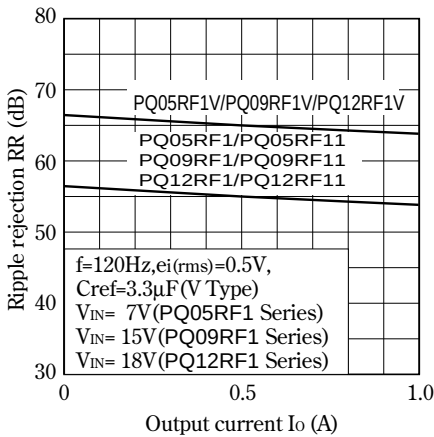


**Fig.17 Dropout Voltage vs. Junction Temperature**



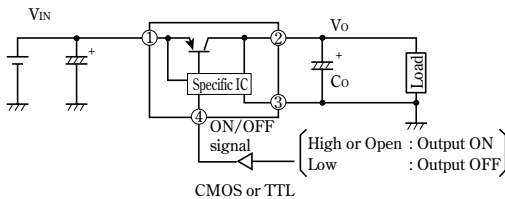
**Fig.18 Quiescent Current vs. Junction Temperature**



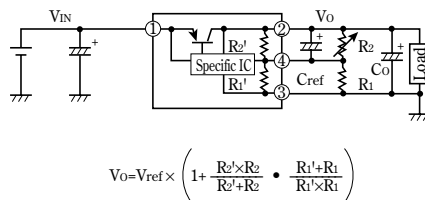
**Fig.19 Ripple Rejection vs. Input Ripple Frequency**  
(PQ05RF1/PQ05RF11/PQ09RF1/PQ09RF11/PQ12RF1/PQ12RF11)**Fig.20 Ripple Rejection vs. Input Ripple Frequency**  
(PQ05RF1V/PQ09RF1V/PQ12RF1V)**Fig.21 Ripple Rejection vs. Output Current**

## Typical Application

PQ05RF1/PQ05RF11 Series



PQ05RF1V Series



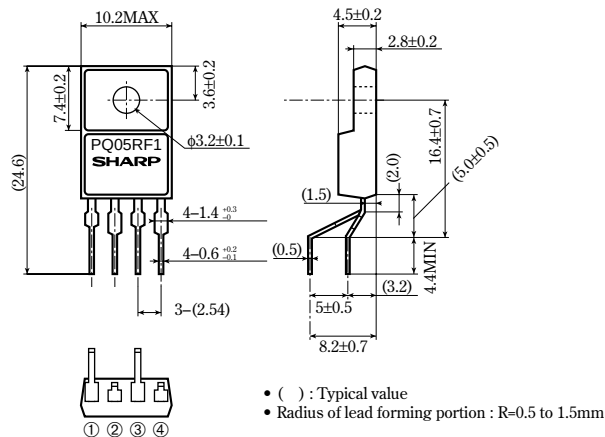
$V_{ref}$  Nearly=1.26V,  $R_1'$  Nearly=390Ω  
PQ05RF1V :  $R_2'$  Nearly=1.16kΩ  
PQ09RF1V :  $R_2'$  Nearly=2.40kΩ  
PQ12RF1V :  $R_2'$  Nearly=3.32kΩ  
(Note)  $R_1'$  and  $R_2'$  are built in a specific IC.

### ■ Model Line-ups for Lead Forming Type

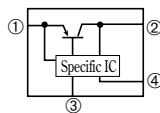
| Output voltage                 | 5V output | 9V output | 12V output |
|--------------------------------|-----------|-----------|------------|
| Output voltage precision:±5%   | PQ05RF1A  | PQ09RF1A  | PQ12RF1A   |
| Output voltage precision:±2.5% | PQ05RF1B  | PQ09RF1B  | PQ12RF1B   |

### ■ Outline Dimensions (PQ05RF1A/PQ05RF1B series)

(Unit : mm)



### Internal connection diagram



- ① DC input( $V_{IN}$ )
- ② DC output( $V_O$ )
- ③ GND
- ④ ON/OFF control terminal( $V_C$ )

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.)

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