

PQ05RF2/21/2V Series

2A Output, Low Power-Loss Voltage Regulators

■ Features

- Low power-loss (Dropout voltage: MAX. 0.5V)
- Compact resin full-mold package.
- Built-in ON/OFF control terminal (PQ05RF2/PQ05RF21 series)
- Built-in output voltage minute adjustment terminal (ripple rejection is improved) (PQ05RF2V series)

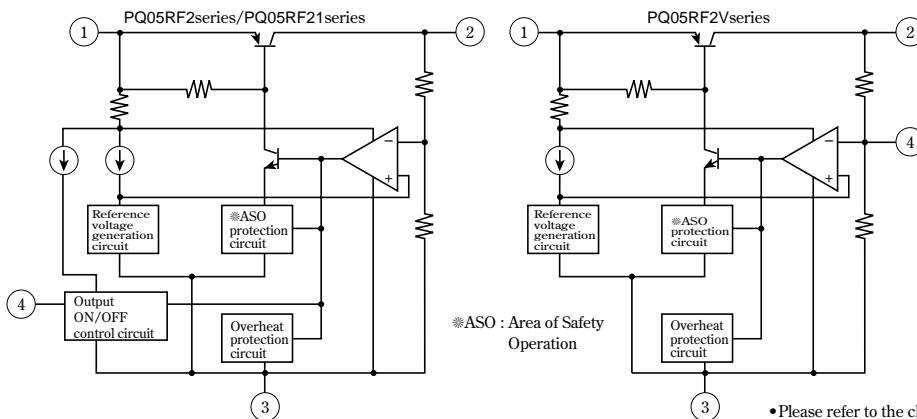
■ Model Line-ups

| Output voltage | 5V Output | 9V Output | 12V Output | 15V Output |
|--|-----------|-----------|------------|------------|
| Output voltage precision:±5% | PQ05RF2 | PQ09RF2 | PQ12RF2 | PQ15RF2 |
| Output voltage precision:±2.5% | PQ05RF21 | PQ09RF21 | PQ12RF21 | PQ15RF21 |
| Minute adjustment (Output voltage adjustment range:±10%) | PQ05RF2V | PQ09RF2V | PQ12RF2V | PQ15RF2V |

■ Applications

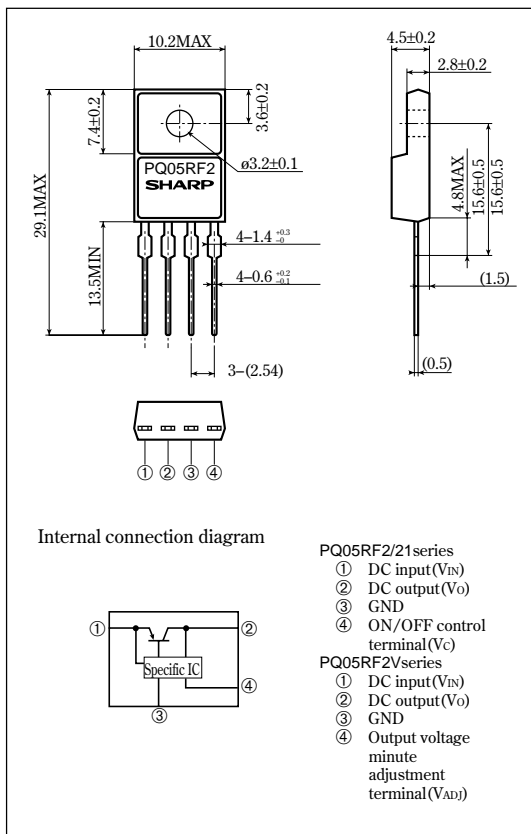
- Series power supply for various electronic equipment such as VCRs, electronic music instruments

■ Equivalent Circuit Diagram



■ Outline Dimensions

(Unit : mm)



• 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 | PQ05RF2 series | 35 | V |
| | PQ05RF21 series | | |
| Output current | I _o | 2 | A |
| Power dissipation (No heat sink) | P _{D1} | 1.5 | W |
| Power dissipation (With infinite heat sink) | P _{D2} | 18 | 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=1A, T_a=25°C, *3)

| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit | |
|---|----------------------|-------------------------------------|------------------------|-------|------|-------|----|
| Output voltage | V _o | - | PQ05RF2/PQ05RF2V | 4.75 | 5.0 | 5.25 | V |
| | | | PQ09RF2/PQ09RF2V | 8.55 | 9.0 | 9.45 | |
| | | | PQ12RF2/PQ12RF2V | 11.4 | 12.0 | 12.6 | |
| | | | PQ15RF2/PQ15RF2V | 14.25 | 15.0 | 15.75 | |
| | | | PQ05RF21 | 4.88 | 5.0 | 5.12 | |
| | | | PQ09RF21 | 8.78 | 9.0 | 9.22 | |
| | | | PQ12RF21 | 11.7 | 12.0 | 12.3 | |
| | | | PQ15RF21 | 14.63 | 15.0 | 15.37 | |
| Load regulation | R _{egL} | I _o =5mA to 2A | - | 0.5 | 2.0 | % | |
| Line regulation | R _{egI} | *4 | - | 0.5 | 2.5 | % | |
| Temperature coefficient of output voltage | TcV _o | T _j =0 to 125°C | - | ±0.02 | - | %/°C | |
| Ripple rejection | RR | I _o =0.5A Refer to Fig.2 | PQ05RF2/PQ05RF21Series | 45 | 55 | - | dB |
| | | | PQ05RF2VSeries | 55 | - | - | dB |
| Dropout voltage | V _{f-o} | *5, I _o =2A | - | - | 0.5 | V | |
| ON-state voltage for control | V _{C (ON)} | - | 2.0 *6 | - | - | V | |
| ON-state current for current | 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 range | V _{o (ADJ)} | - | PQ05RF2V | 4.5 | 5.0 | 5.5 | V |
| | | | PQ09RF2V | 8.1 | 9.0 | 9.9 | |
| | | | PQ12RF2V | 10.8 | 12.0 | 13.2 | |
| | | | PQ15RF2V | 13.5 | 15.0 | 16.5 | |

*3 PQ05RF2 Series: V_{IN}=7V, PQ09RF2 Series: V_{IN}=15V, PQ12RF2 Series: V_{IN}=18V, PQ15RF2 Series: V_{IN}=23V

*4 PQ05RF2/PQ05RF21/PQ05RF2V: V_{IN}=6 to 12V PQ09RF2/PQ09RF21/PQ09RF2V: V_{IN}=10 to 25V

PQ12RF2/PQ12RF21/PQ12RF2V: V_{IN}=13 to 29V PQ15RF2/PQ15RF21/PQ15RF2V: V_{IN}=16 to 32V

*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 @, output voltage turns on. (PQ05RF2/PQ05RF21 Series)

Fig. 1 Test Circuit

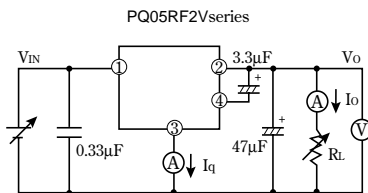
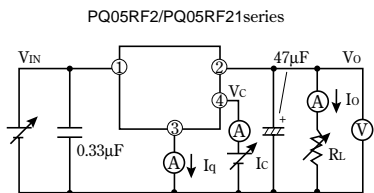


Fig. 2 Test Circuit of Ripple Rejection

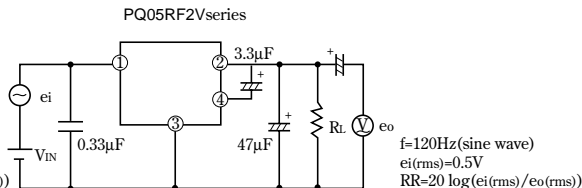
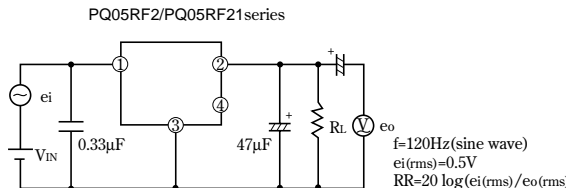
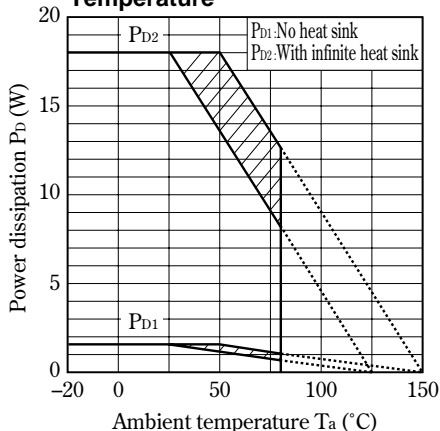


Fig. 3 Power Dissipation vs. Ambient Temperature



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

Fig. 4 Overcurrent Protection Characteristics (Typical value)

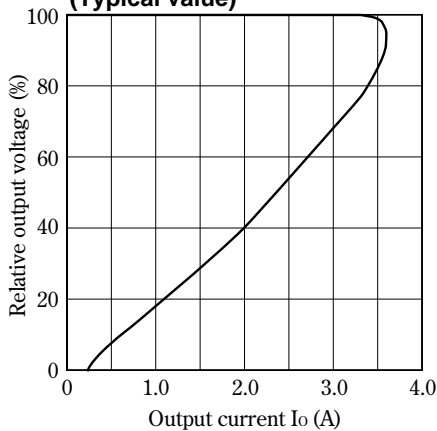


Fig. 5 Output Voltage Minute Adjustment Characteristics (PQ05RF2V)

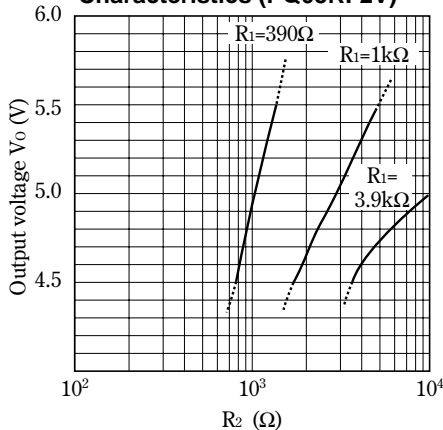


Fig. 6 Output Voltage Minute Adjustment Characteristics (PQ09RF2V)

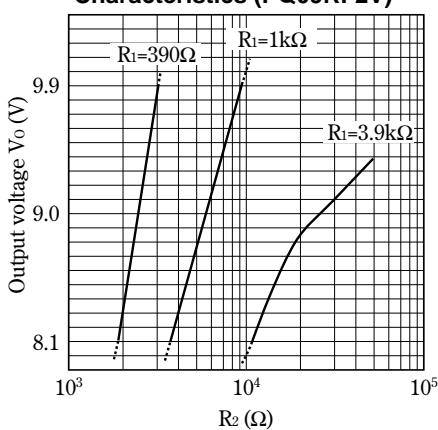


Fig. 7 Output Voltage Minute Adjustment Characteristics (PQ12RF2V)

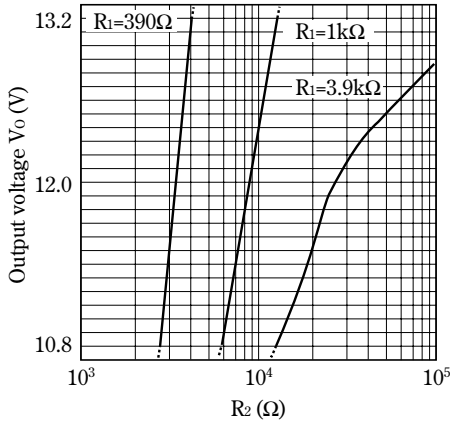


Fig. 8 Output Voltage Minute Adjustment Characteristics (PQ15RF2V)

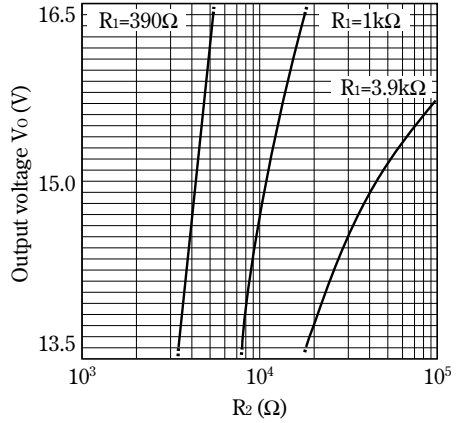


Fig. 9 Output Voltage Deviation vs. Junction Temperature (PQ05RF2/PQ05RF21/PQ05RF2V)

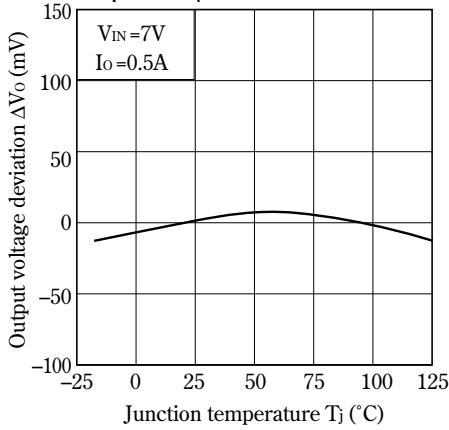


Fig.10 Output Voltage Deviation vs. Junction Temperature (PQ09RF2/PQ09RF21/PQ09RF2V)

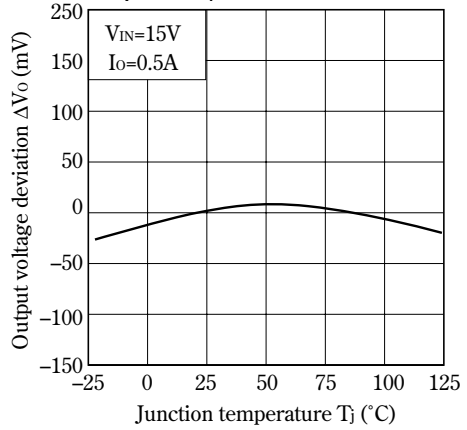


Fig.11 Output Voltage Deviation vs. Junction Temperature (PQ12RF2/PQ12RF21/PQ12RF2V)

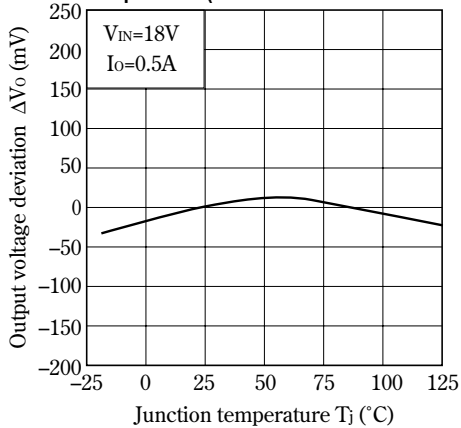


Fig.12 Output Voltage Deviation vs. Junction Temperature (PQ15RF2/PQ15RF21/PQ15RF2V)

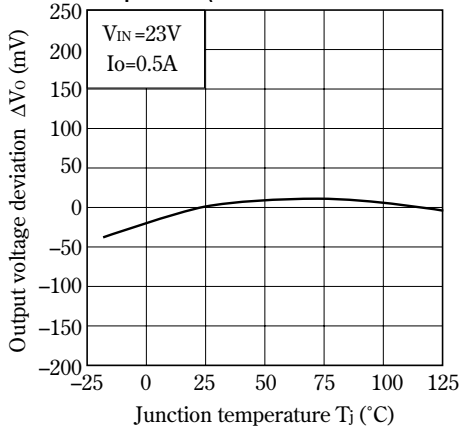


Fig.13 Output Voltage vs. Input Voltage (PQ05RF2/PQ05RF21/PQ05RF2V)

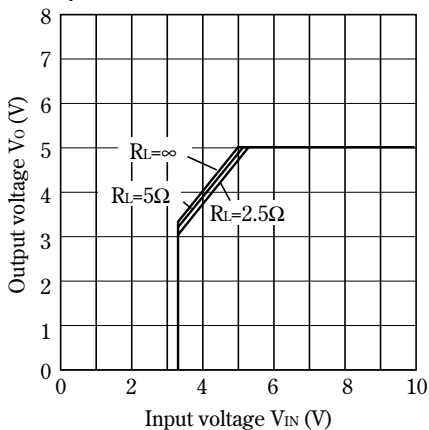


Fig.14 Output Voltage vs. Input Voltage (PQ09RF2/PQ09RF21/PQ09RF2V)

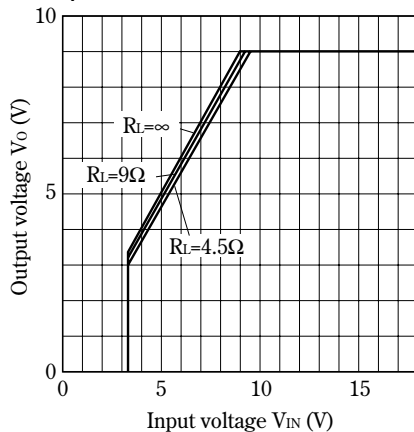


Fig.15 Output Voltage vs. Input Voltage (PQ12RF2/PQ12RF21/PQ12RF2V)

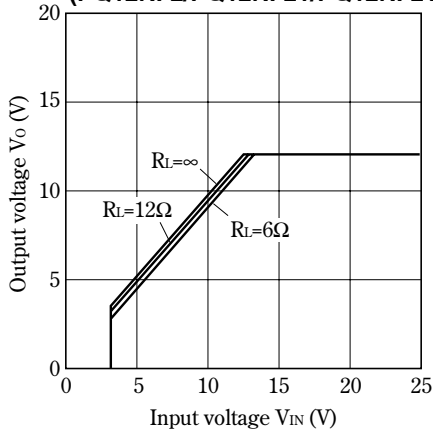


Fig.16 Output Voltage vs. Input Voltage (PQ15RF2/PQ15RF21/PQ15RF2V)

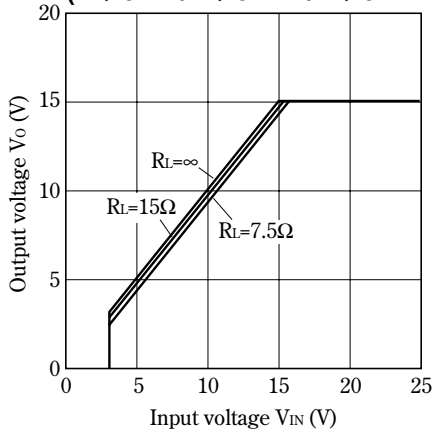


Fig.17 Circuit Operating Current vs. Input Voltage (PQ05RF2/PQ05RF21/PQ05RF2V)

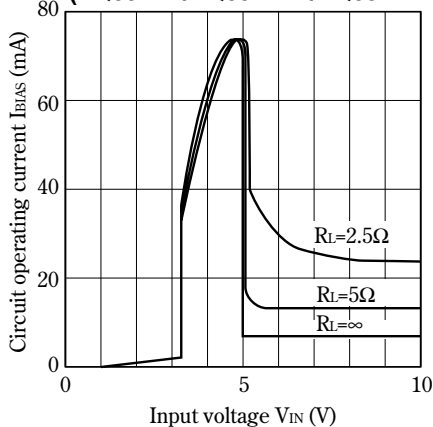


Fig.18 Circuit Operating Current vs. Input Voltage (PQ09RF2/PQ09RF21/PQ09RF2V)

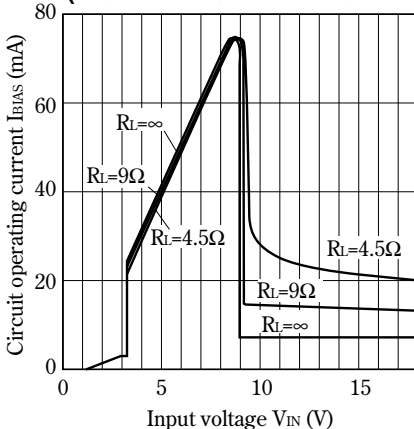


Fig.19 Circuit Operating Current vs. Input Voltage (PQ12RF2/PQ12RF21/PQ12RF2V)

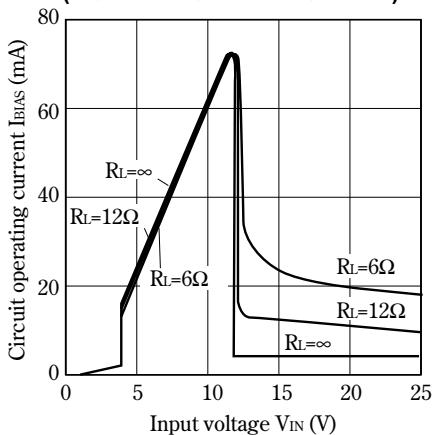


Fig.20 Circuit Operating Current vs. Input Voltage (PQ15RF2/PQ15RF21/PQ15RF2V)

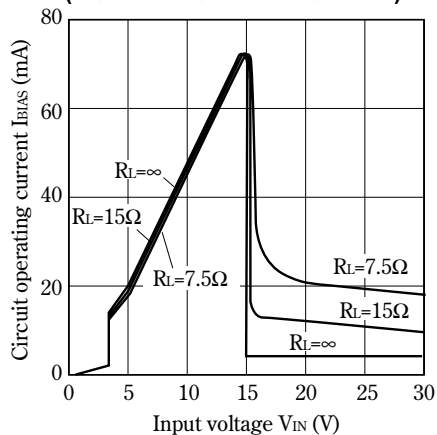


Fig.21 Dropout Voltage vs. Junction Temperature

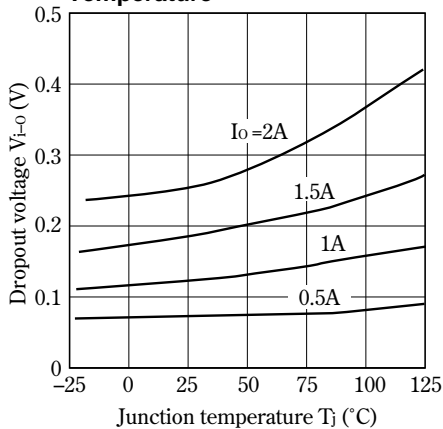


Fig.22 Quiescent Current vs. Junction Temperature

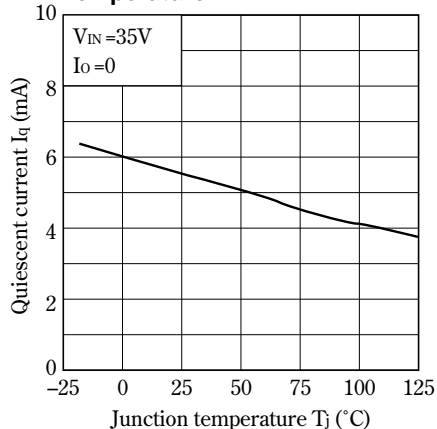


Fig.23 Ripple Rejection vs. Input Ripple Frequency (PQ05RF2/PQ05RF21/PQ09RF2/PQ09RF21/PQ12RF2/PQ12RF21/PQ15RF2/PQ15RF21)

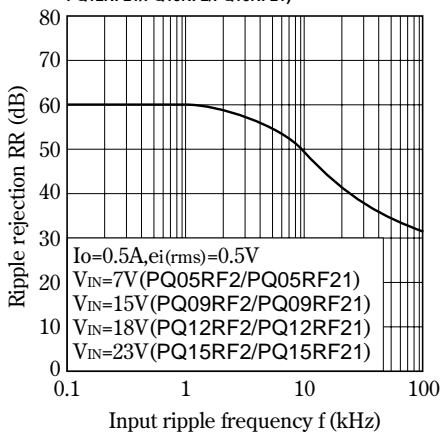


Fig.24 Ripple Rejection vs. Input Ripple Frequency (PQ05RF2V/PQ09RF2V/PQ12RF2V/PQ15RF2V)

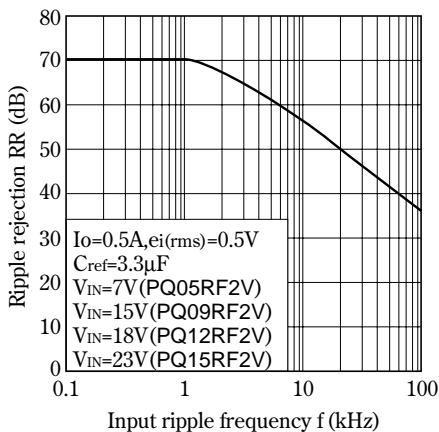
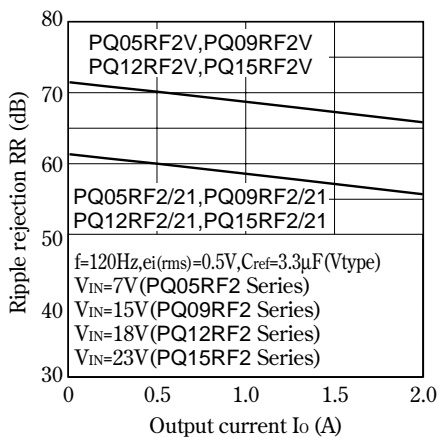
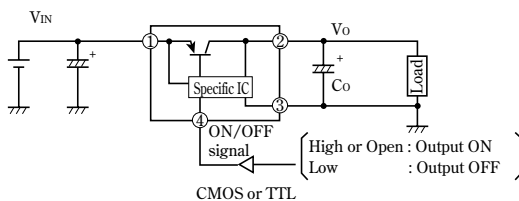


Fig.25 Ripple Rejection vs. Output Current

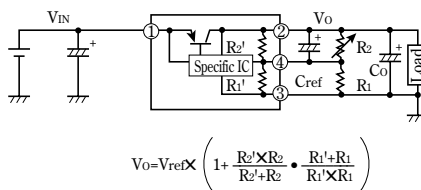


■ Typical Application

PQ05RF2/PQ05RF21 Series



PQ05RF2V Series



V_{ref} Nearly=1.26V, R_1' Nearly=390Ω
 PQ05RF2V : R_2' Nearly=1.16kΩ
 PQ09RF2V : R_2' Nearly=2.40kΩ
 PQ12RF2V : R_2' Nearly=3.32kΩ
 PQ15RF2V : R_2' Nearly=4.45kΩ

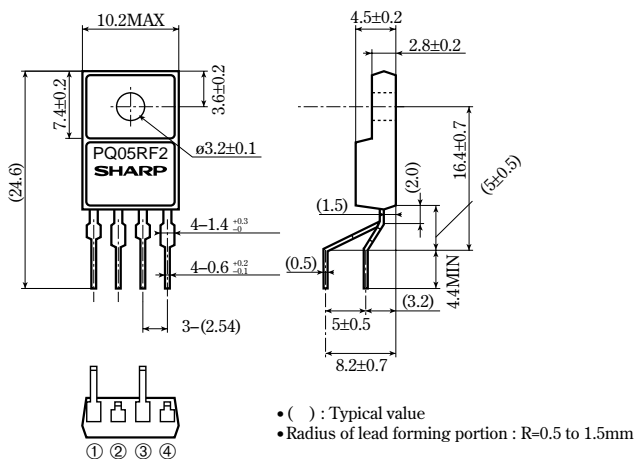
(Note) R_1' and R_2' are built in a specific IC.

■ Model Line-ups for Lead Forming Type

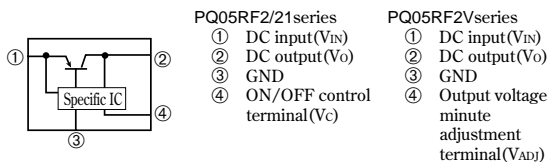
| Output voltage | 5V Output | 9V Output | 12V Output | 15V Output |
|--------------------------------|-----------|-----------|------------|------------|
| Output voltage precision:±5% | PQ05RF2A | PQ09RF2A | PQ12RF2A | PQ15RF2A |
| Output voltage precision:±2.5% | PQ05RF2B | PQ09RF2B | PQ12RF2B | PQ15RF2B |

Outline Dimensions (PQ05RF2A/PQ05RF2B Series)

(Unit : mm)



Internal connection diagram



Note) The value of absolute maximum ratings and electrical characteristics is same as ones of PQ05RF2/21series.

Precautions for Use

(1) Minute adjustment of output voltage (PQ05RF2V 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 (PQ05RF2V series) and Fig.5 to 8.)