

# 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<sup>®</sup> control terminal (PQ05RF1/PQ05RF1 1 series)
- Built-in output voltage minute adjustment terminal (Critical rate of ripple rejection is improved.) (PQ05RF1 V series)
- Lead forming type (PQ05RF1 A/B series) is also available.

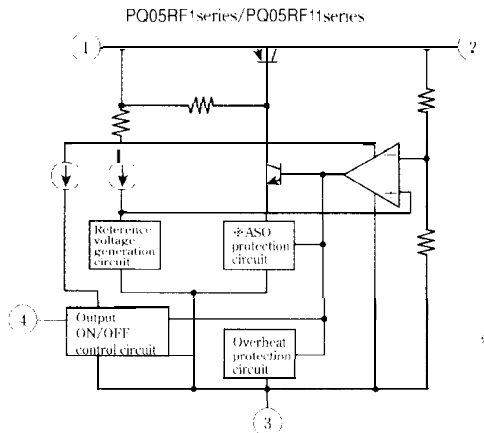
## Model Line-ups

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

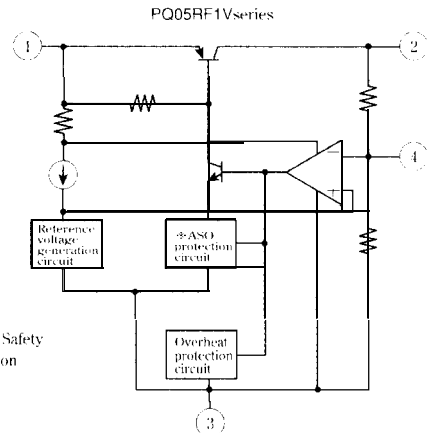
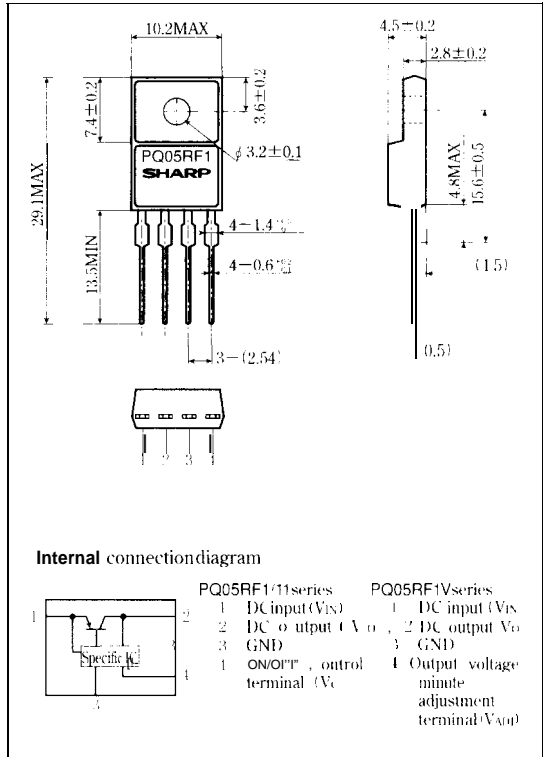
- Seris power supply for various electronic equipment such as VCRs and musical instruments

## Equivalent Circuit Diagram



## Outline Dimensions

(Unit : mm)



\* Please refer to the chapter "Handling Precautions"

■ 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>I</sub>	35
	PQ05RF1 1 series		
output current	I <sub>O</sub>	1	A
Power dissipation (No heat sink)	P <sub>DI</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>OP</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<sup>\*\*3</sup>)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	
Output voltage	V <sub>O</sub>		PQ05RF1/PQ05RF1V	4.75	5.0	5.25	v
			PQ09RF1/PQ09RF1V	8.55	9.0	9.45	
			PQ12RF1/PQ12RF1 v	11.4	12.0	12.6	
			PQ05RF1 1	4.88	5.0	5.12	
			PQ09RF1 1	8.78	9.0	9.22	
			PQ12RF1 1	11.7	12.0	12.3	
Load regulation	R <sub>regL</sub>	I <sub>O</sub> =5mA to 1A		0.1	2.0	%	
Line regulation	R <sub>regI</sub>	*4		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		±0.02		%/°C	
Ripple rejection	RR	Refer to Fig. 2.	PQ05RF1/PQ05RF1 1 series	45	55		dB
			PQ05RF1V series	55			
Droput voltage	V <sub>DO</sub>	*5			0.5	v	
ON-state voltage for control	V <sub>C(ON)</sub>	PQ05RF1/PQ05RF1 1 series	2.0 *6			v	
ON-state current for control	I <sub>C(ON)</sub>	PQ05RF1/PQ05RF1 1 series			20	μA	
OFF-state voltage for control	V <sub>C(OFF)</sub>	PQ05RF1/PQ05RF1 1 Series			0.8	v	
OFF-state current for control	I <sub>C(OFF)</sub>	PQ05RF1/PQ05RF1 1 series			-0.4	mA	
Quiescent current	I <sub>q</sub>	I <sub>O</sub> =0			10	mA	
output voltage minute adjustment characteristics	V <sub>O(ADJ)</sub>		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<sub>IN</sub>=7V, PQ09RF1 series:V<sub>IN</sub>=15V, PQ12RF1 series:V<sub>IN</sub>=18V

\*4 PQ05RF1/PQ05RF1 1, PQ05RF1V V<sub>IN</sub>=6 to 12V

PQ09RF1/PQ09RF1 1/PQ09RF1V:V<sub>IN</sub>=10 to 25V

PQ12RF1/PQ12RF1 1/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  $\bar{\phi}$ , output voltage turns 0V (PQ05RF1/PQ05RF1 1 series)

Fig. 1 Test Circuit

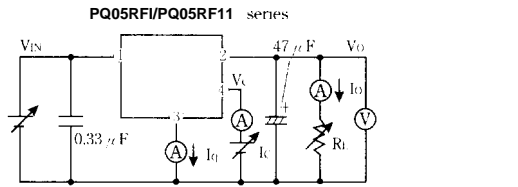


Fig. 2 Test Circuit of Ripple Rejection

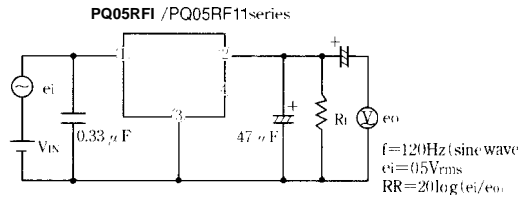
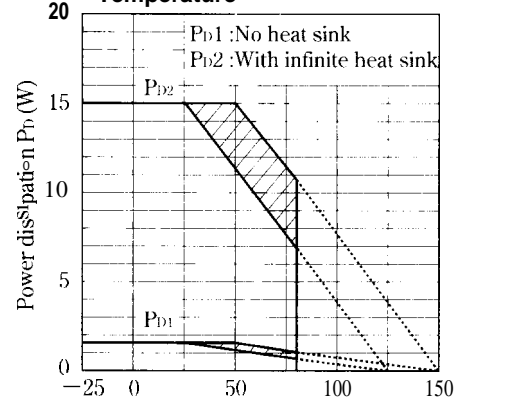


Fig. 3 Power Dissipation vs. Ambient Temperature



Note) oblique line portion : Overheat protection may operate in this area,

Fig. 5 Output Voltage Minute Adjustment Characteristics (PQ05RF1V)

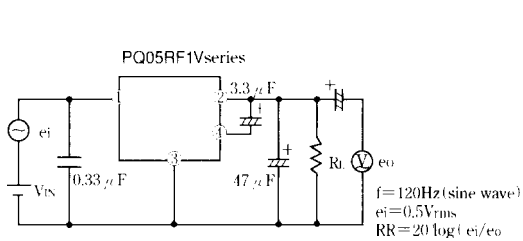
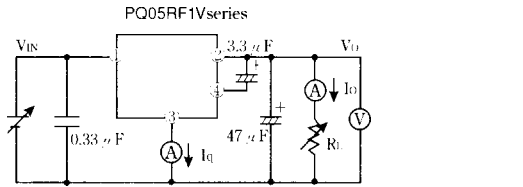
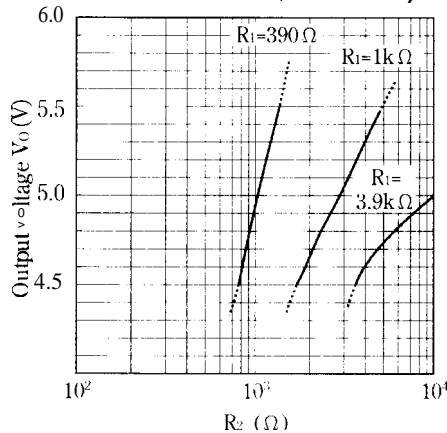


Fig. 4 Overcurrent Protection Characteristics (Typical Value)

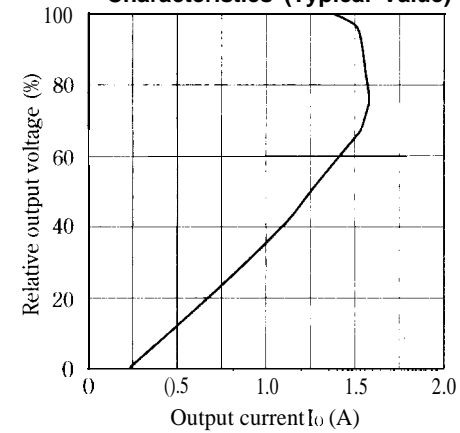
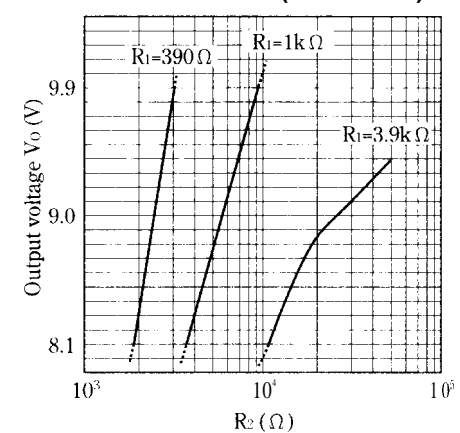
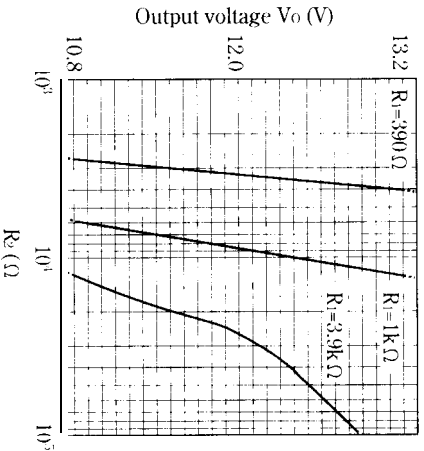


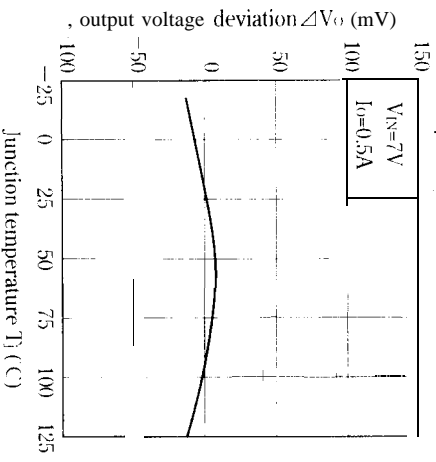
Fig. 6 Output Voltage Minute Adjustment Characteristics (PQ09RF1V)



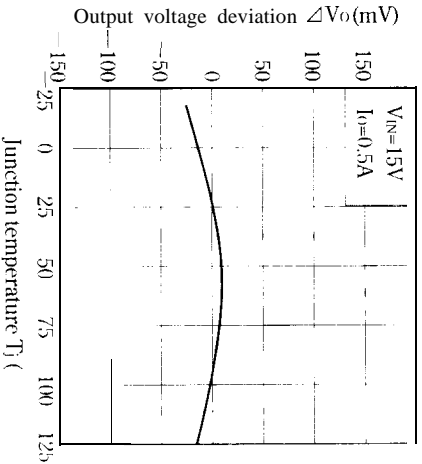
**Fig. 7** Output Voltage Minute Adjustment Characteristics (PQ12RF1V)



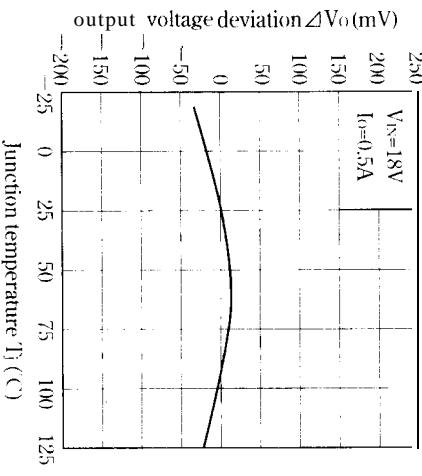
**Fig. 8** Output Voltage Deviation vs. Junction Temperature (PQ05RF1/PQ05RF1/PQ05RF1V)



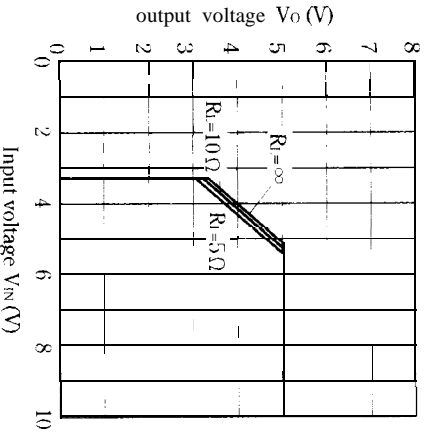
**Fig. 9** Output Voltage Deviation vs. Junction Temperature (PQ09RF1/PQ09RF1/PQ09RF1V)



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



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



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

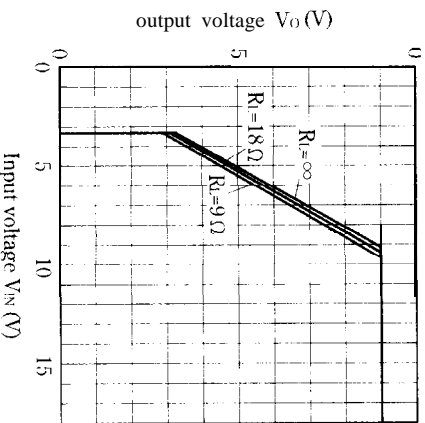


Fig.13 Output Voltage vs. Input Voltage (PQ12RF1/PQ1 2RF1 1/PQ12RF1V)

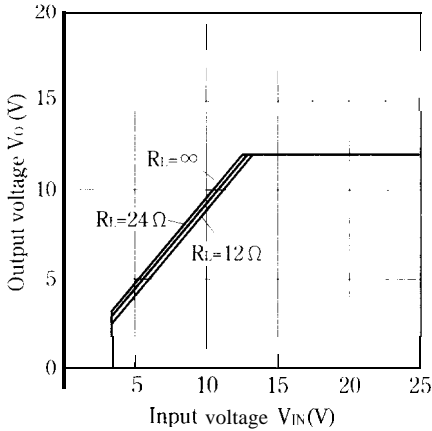


Fig.14 Circuit Operating Current vs. Input Voltage (PQ05RF1/PQ05RF11/PQ05RF1v)

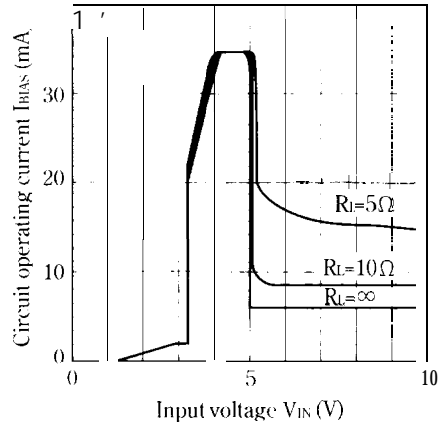


Fig.15 Circuit Operating Current vs. Input Voltage (PQ09RF1/PQ09RF11/PQ09RF1V)

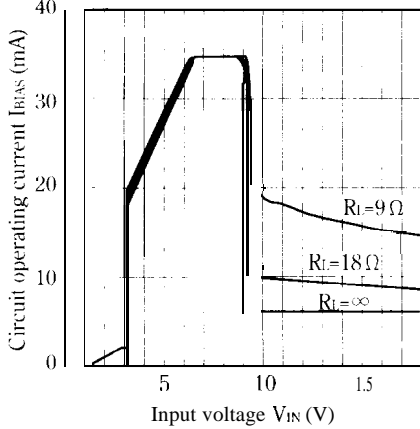


Fig.16 Circuit Operating Current vs. Input Voltage (PQ12RF1/PQ1 2RF1 1/PQ12RF1V)

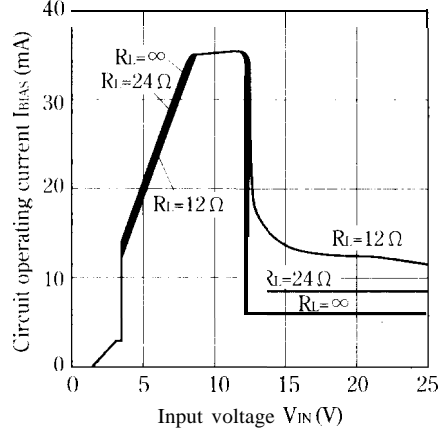


Fig.17 Dropout Voltage vs. Junction Temperature

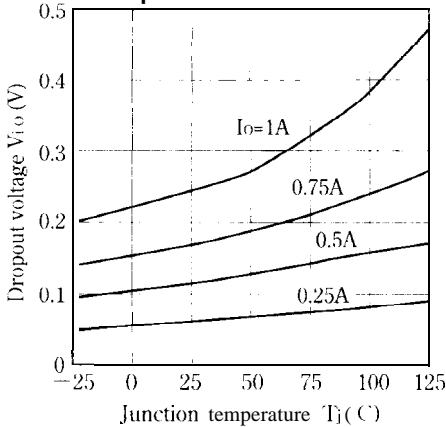


Fig.18 Quiescent Current vs. Junction Temperature

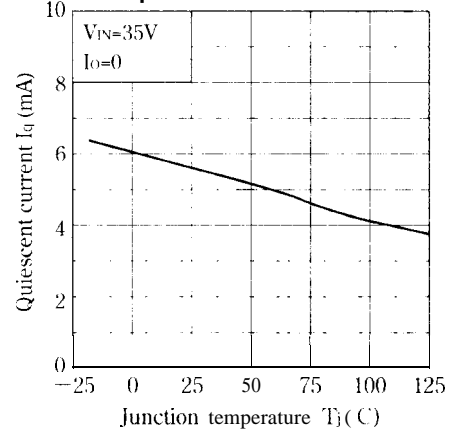


Fig.19 Ripple Rejection vs. Input Ripple Frequency  
(PQ05RF1/PQ05RF11/PQ09RF1/PQ09RF11/pQ12RF1/pQ12RF11)

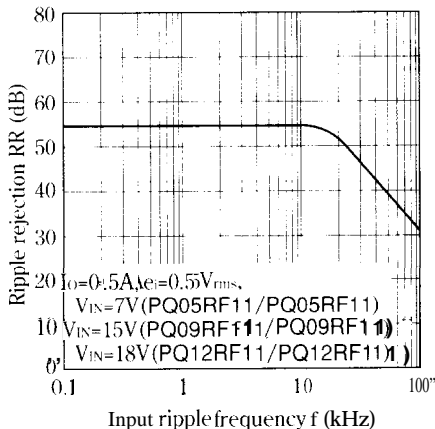


Fig.20 Ripple Rejection vs. Input Ripple Frequency  
(PQ05RF1V/PQ09RF1 V/PQ12RF1V)

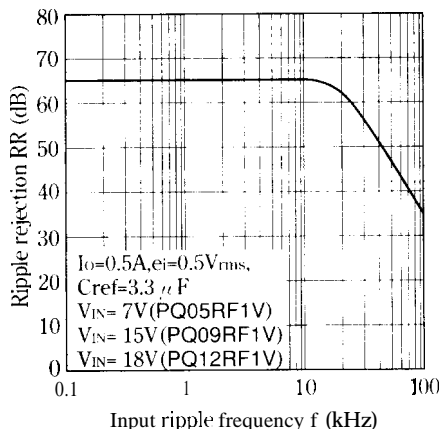
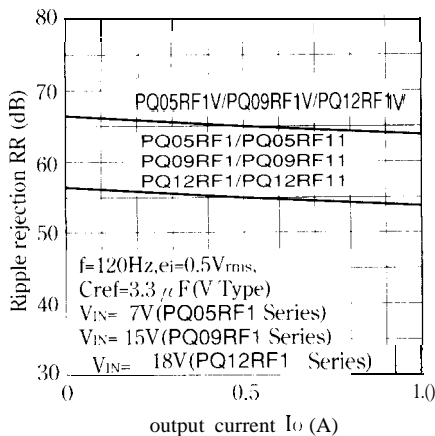
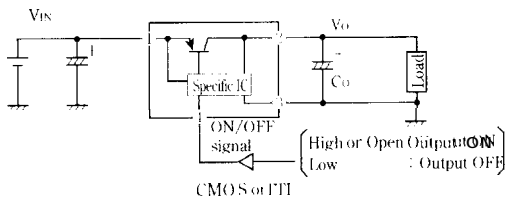


Fig.21 Ripple Rejection vs. Output Current

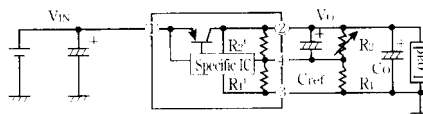


Typical Application

PQ05RF1/PQ05RF11 Series



PQ05RF1V Series



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

$V_{ref} \approx 1.26V, R_1' \approx 390\Omega$   
 PQ05RF1V :  $R_2' \approx 1.16k\Omega$   
 PQ09RF1V :  $R_2' \approx 2.40k\Omega$   
 PQ12RF1V :  $R_2' \approx 3.32k\Omega$

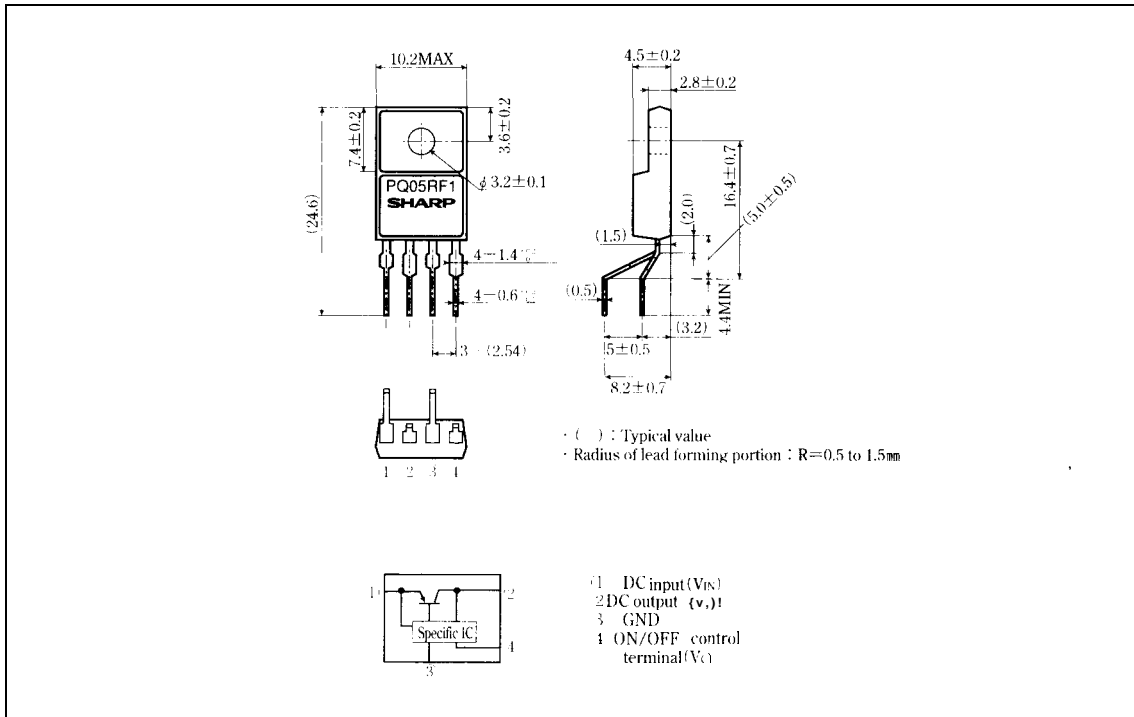
(Note)  $R_1'$  and  $R_2'$  are built in a specific IC.

Model Line-ups for Lead Forming Type

output voltage	5V output	9V output	12V output
Output voltage precision: $\pm 5\%$	PQ05RF1A	PQ09RF1 A	PQ12RF1A
output voltage precision: $+2.5\%$	PQ05RF1B	PQ09RF1B	PQ12RF1B

Outline Dimensions (PQ05RF1A/PQ05RF1 B 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 ( PQ05RF1 V series)

[f 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 (PQ05RF1 V series) and Fig.5 to 7.)