# PQxxxDNA1ZPH Series

Compact Surface Mount type
Low Power-Loss Voltage Regulators

## ■ Features

1.Output current : 1A
2.High isolation voltage VIN:MAX.24 V
3.Low dissipation current
(Dissipation current at no load: MAX. 8mA
Output OFF-state dissipation current: MAX.5μA)
4.Built-in ON/OFF function
5.Built-in overcurrent and overheat protection functions
6.Built-in ASO protection function
7.Ceramic capacitor compatible
8.RoHS directive compliant

## ■ Applications

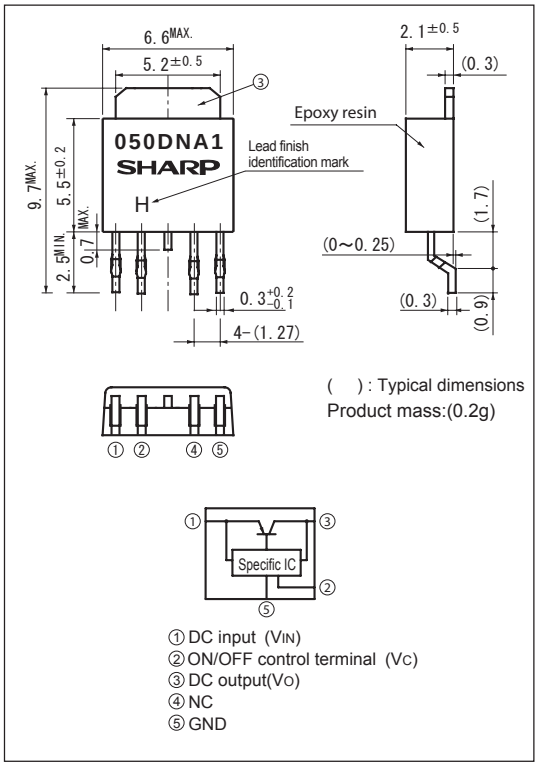
1.AV equipment
2.OA equipment

## ■ Model Line-up

| Output Voltage (TYP.) | Model No. |
|---|---|
| 3.3V | **PQ033DNA1ZPH** |
| 5.0V | **PQ050DNA1ZPH** |
| 8.0V | **PQ080DNA1ZPH** |
| 9.0V | **PQ090DNA1ZPH** |
| 12.0V | **PQ120DNA1ZPH** |

## ■ Outline Dimensions

(Unit : mm)




Lead finish:Lead-free solder plating
(Composition: Sn2Cu)

## ■ Absolute Maximum Ratings

(Ta=25°C)

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| *1 Input voltage | $V_{IN}$ | 24 | V |
| *1 Output control voltage | $V_C$ | 24 | V |
| Output current | $I_O$ | 1 | A |
| *2 Power dissipation | $P_D$ | 8 | W |
| *3 Junction temperature | $T_j$ | 150 | °C |
| Operating temperature | $T_{opr}$ | -40 to +85 | °C |
| Storage temperature | $T_{stg}$ | -40 to +150 | °C |
| Soldering temperature | $T_{sol}$ | 260(10s) | °C |

*1 All are open except GND and applicable terminals.
*2 $P_D$: With infinite heat sink
*3 Overheat protection may operate at Tj:125°C to 150°C

## ■ Electrical Characteristics

### (1) **PQ033DNA1ZPH**

(Unless otherwise specified,condition shall be $V_{IN}$=5V,$I_O$=0.5A,$V_C$=2.7V,Ta=25°C)

| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_O$ | - | 3.218 | 3.3 | 3.382 | V |
| Load regulation | RegL | $I_O$=5mA to 1A | - | 0.2 | 1.0 | % |
| Line regulation | RegI | $V_{IN}$=4 to 14V,$I_O$=5mA | - | 0.2 | 1.0 | % |
| Temperature coefficient of output voltage | $T_CV_O$ | Tj=0 to +125°C, $I_O$=5mA | - | ±0.01 | - | %/°C |
| Ripple rejection | RR | Refer to Fig.3 | - | 60 | - | dB |
| Dropout voltage | $V_{I-O}$ | $V_{IN}$=3.5V,$I_O$=0.5A | - | 0.2 | 0.5 | V |
| ※5 ON-state voltage for control | $V_{C(ON)}$ | - | 2.0 | - | - | V |
| ON-state current for control | $I_{C(ON)}$ | $V_C$=2.7V | - | - | 200 | µA |
| OFF-state voltage for control | $V_{C(OFF)}$ | - | - | - | 0.8 | V |
| OFF-state current for control | $I_{C(OFF)}$ | $V_C$=0.4V | - | - | 2 | µA |
| Quiescent current | $I_q$ | $I_O$=0A | - | 4 | 8 | mA |
| Output OFF-state dissipation current | $I_{qs}$ | $I_O$=0A, $V_C$=0.4V | - | - | 5 | µA |

※5 In case of opening control terminal ②, output voltage turns off

### (2) **PQ050DNA1ZPH**

(Unless otherwise specified,condition shall be $V_{IN}$=7V,$I_O$=0.5A,$V_C$=2.7V,Ta=25°C)

| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_O$ | - | 4.875 | 5.0 | 5.125 | V |
| Load regulation | RegL | $I_O$=5mA to 1A | - | 0.2 | 1.0 | % |
| Line regulation | RegI | $V_{IN}$=6 to 16V,$I_O$=5mA | - | 0.2 | 1.0 | % |
| Temperature coefficient of output voltage | $T_CV_O$ | Tj=0 to +125°C, $I_O$=5mA | - | ±0.01 | - | %/°C |
| Ripple rejection | RR | Refer to Fig.3 | - | 60 | - | dB |
| Dropout voltage | $V_{I-O}$ | ※4,$I_O$=0.5A | - | 0.2 | 0.5 | V |
| ※5 ON-state voltage for control | $V_{C(ON)}$ | - | 2.0 | - | - | V |
| ON-state current for control | $I_{C(ON)}$ | $V_C$=2.7V | - | - | 200 | µA |
| OFF-state voltage for control | $V_{C(OFF)}$ | - | - | - | 0.8 | V |
| OFF-state current for control | $I_{C(OFF)}$ | $V_C$=0.4V | - | - | 2 | µA |
| Quiescent current | $I_q$ | $I_O$=0A | - | 4 | 8 | mA |
| Output OFF-state dissipation current | $I_{qs}$ | $I_O$=0A, $V_C$=0.4V | - | - | 5 | µA |

※4 Input voltage shall be the value when output voltage is 95% in comparison with the initial value.
※5 In case of opening control terminal ②, output voltage turns off

### (3) **PQ080DNA1ZPH**

(Unless otherwise specified,condition shall be $V_{IN}$=10V,$I_O$=0.5A,$V_C$=2.7V,Ta=25°C)

| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_O$ | - | 7.8 | 8.0 | 8.2 | V |
| Load regulation | RegL | $I_O$=5mA to 1A | - | 0.2 | 1.0 | % |
| Line regulation | RegI | $V_{IN}$=9 to 19V,$I_O$=5mA | - | 0.2 | 1.0 | % |
| Temperature coefficient of output voltage | $T_CV_O$ | Tj=0 to +125°C, $I_O$=5mA | - | ±0.01 | - | %/°C |
| Ripple rejection | RR | Refer to Fig.3 | - | 60 | - | dB |
| Dropout voltage | $V_{I-O}$ | ※4,$I_O$=0.5A | - | 0.2 | 0.5 | V |
| ※5 ON-state voltage for control | $V_{C(ON)}$ | - | 2.0 | - | - | V |
| ON-state current for control | $I_{C(ON)}$ | $V_C$=2.7V | - | - | 200 | µA |
| OFF-state voltage for control | $V_{C(OFF)}$ | - | - | - | 0.8 | V |
| OFF-state current for control | $I_{C(OFF)}$ | $V_C$=0.4V | - | - | 2 | µA |
| Quiescent current | $I_q$ | $I_O$=0A | - | 4 | 8 | mA |
| Output OFF-state dissipation current | $I_{qs}$ | $I_O$=0A, $V_C$=0.4V | - | - | 5 | µA |

※4 Input voltage shall be the value when output voltage is 95% in comparison with the initial value.
※5 In case of opening control terminal ②, output voltage turns off

## (4) **PQ090DNA1ZPH**

(Unless otherwise specified,condition shall be $V_{IN}$=11V,$I_O$=0.5A,$V_C$=2.7V,Ta=25°C)

| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_O$ | - | 8.775 | 9.0 | 9.225 | V |
| Load regulation | RegL | $I_O$=5mA to 1A | - | 0.2 | 1.0 | % |
| Line regulation | RegI | $V_{IN}$=10 to 20V,$I_O$=5mA | - | 0.2 | 1.0 | % |
| Temperature coefficient of output voltage | $T_CV_O$ | Tj=0 to +125°C, $I_O$=5mA | - | ±0.01 | - | %/°C |
| Ripple rejection | RR | Refer to Fig.3 | - | 60 | - | dB |
| Dropout voltage | $V_{I-O}$ | ※4,$I_O$=0.5A | - | 0.2 | 0.5 | V |
| ※5 ON-state voltage for control | $V_{C(ON)}$ | - | 2.0 | - | - | V |
| ON-state current for control | $I_{C(ON)}$ | $V_C$=2.7V | - | - | 200 | µA |
| OFF-state voltage for control | $V_{C(OFF)}$ | - | - | - | 0.8 | V |
| OFF-state current for control | $I_{C(OFF)}$ | $V_C$=0.4V | - | - | 2 | µA |
| Quiescent current | $I_q$ | $I_O$=0A | - | 4 | 8 | mA |
| Output OFF-state dissipation current | $I_{qs}$ | $I_O$=0A, $V_C$=0.4V | - | - | 5 | µA |

※4 Input voltage shall be the value when output voltage is 95% in comparison with the initial value.
※5 In case of opening control terminal ②, output voltage turns off

## (5) **PQ120DNA1ZPH**

(Unless otherwise specified,condition shall be $V_{IN}$=14V,$I_O$=0.5A,$V_C$=2.7V,Ta=25°C)

| Parameter | Symbol | Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Output voltage | $V_O$ | - | 11.7 | 12.0 | 12.3 | V |
| Load regulation | RegL | $I_O$=5mA to 1A | - | 0.2 | 1.0 | % |
| Line regulation | RegI | $V_{IN}$=13 to 23V,$I_O$=5mA | - | 0.2 | 1.0 | % |
| Temperature coefficient of output voltage | $T_CV_O$ | Tj=0 to +125°C, $I_O$=5mA | - | ±0.01 | - | %/°C |
| Ripple rejection | RR | Refer to Fig.3 | - | 60 | - | dB |
| Dropout voltage | $V_{I-O}$ | ※4,$I_O$=0.5A | - | 0.2 | 0.5 | V |
| ※5 ON-state voltage for control | $V_{C(ON)}$ | - | 2.0 | - | - | V |
| ON-state current for control | $I_{C(ON)}$ | $V_C$=2.7V | - | - | 200 | µA |
| OFF-state voltage for control | $V_{C(OFF)}$ | - | - | - | 0.8 | V |
| OFF-state current for control | $I_{C(OFF)}$ | $V_C$=0.4V | - | - | 2 | µA |
| Quiescent current | $I_q$ | $I_O$=0A | - | 4 | 8 | mA |
| Output OFF-state dissipation current | $I_{qs}$ | $I_O$=0A, $V_C$=0.4V | - | - | 5 | µA |

※4 Input voltage shall be the value when output voltage is 95% in comparison with the initial value.
※5 In case of opening control terminal ②, output voltage turns off

Fig.1 Example of application

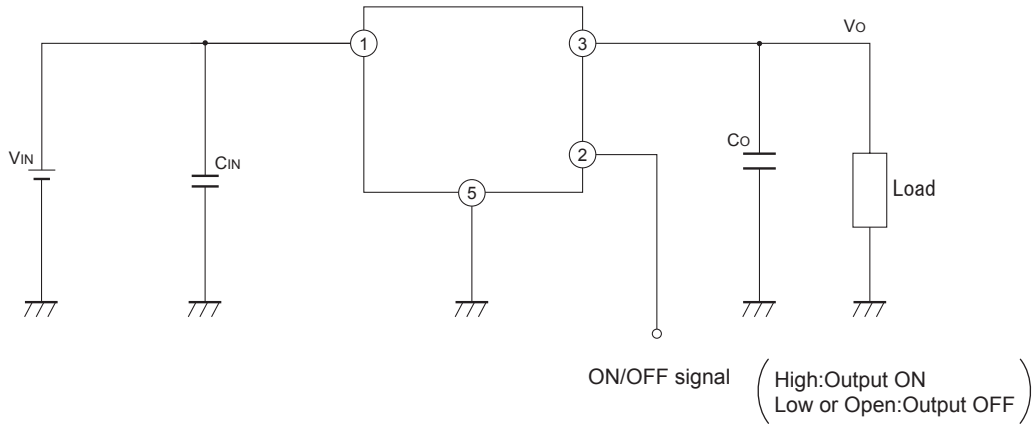


Fig.2 Test Circuit

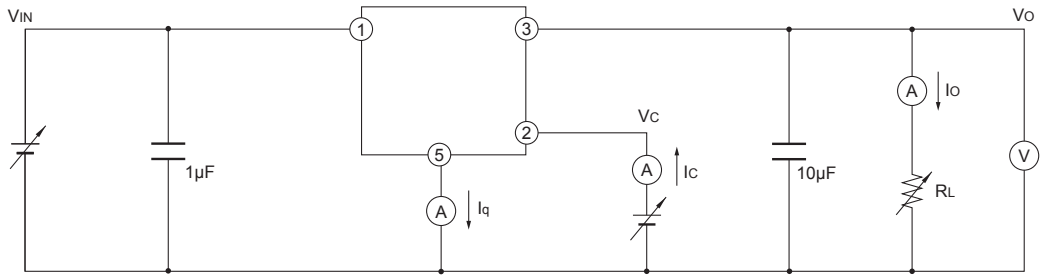
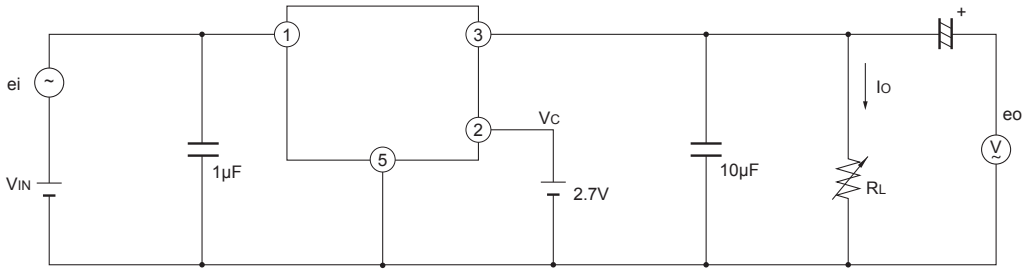
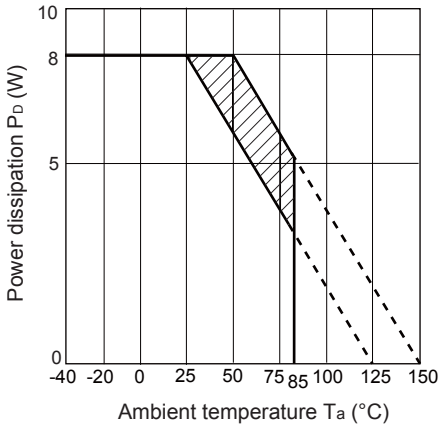



Fig.3 Test Circuit for Ripple Rejection




f=120Hz(sine wave)
ei(rms)=0.5V
$V_{IN}$= 5V (PQ033DNA1ZPH)
7V (PQ050DNA1ZPH)
10V (PQ080DNA1ZPH)
11V (PQ090DNA1ZPH)
14V (PQ120DNA1ZPH)
$I_O$=0.3A
RR=20log(ei(rms)/eo(rms))

Fig.4 Power Dissipation vs. Ambient Temperature




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

Fig.5 Overcurrent Protection Characteristics (**PQ033DNA1ZPH**)

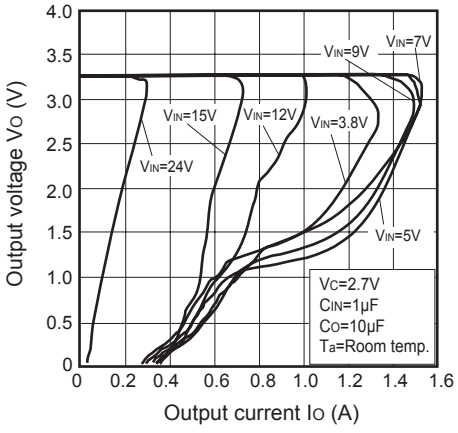


Fig.6 Overcurrent Protection Characteristics (**PQ050DNA1ZPH**)

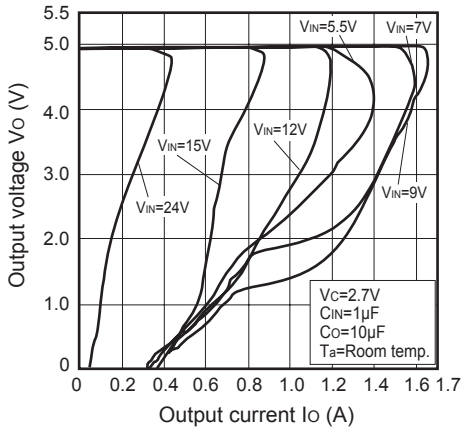



Fig.7 Overcurrent Protection Characteristics (**PQ090DNA1ZPH**)

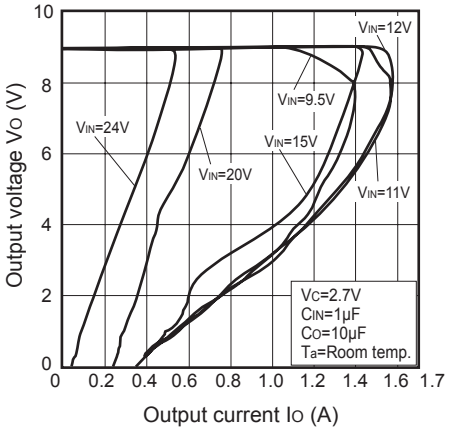



Fig.8 Overcurrent Protection Characteristics (**PQ120DNA1ZPH**)

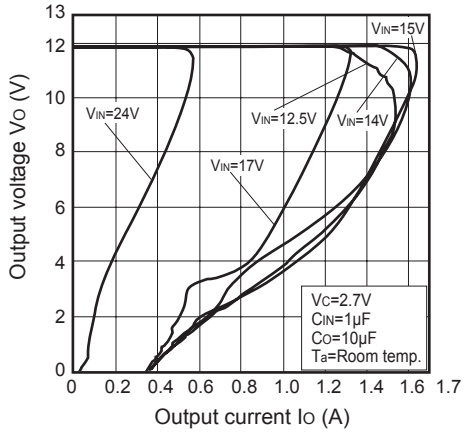



Fig.9 Output Voltage vs. Ambient Temperature (**PQ120DNA1ZPH)**

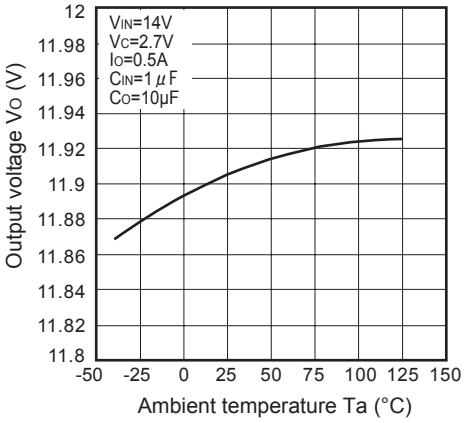



Fig.10 Output Voltage vs. Input Voltage (**PQ120DNA1ZPH**)

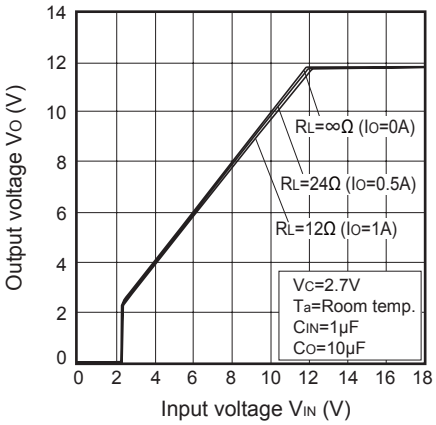



Fig.11 Circuit Operating Current vs. Input Voltage (**PQ120DNA1ZPH**)

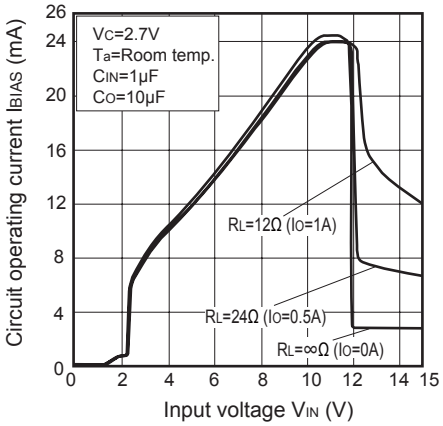


Fig.12 Quiescent Current vs. Ambient Temperature (**PQ120DNA1ZPH**)

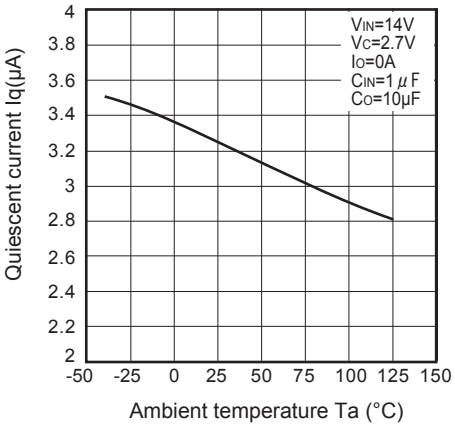



Fig.13 Dropout Voltage vs. Ambient Temperature (**PQ120DNA1ZPH**)

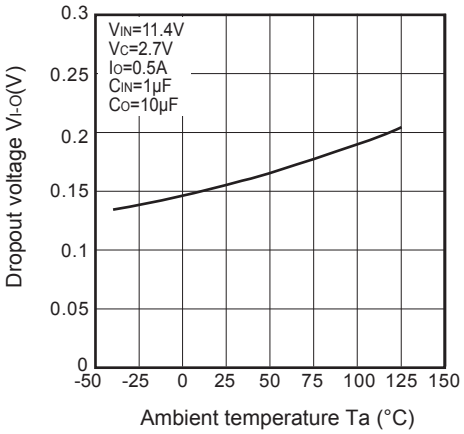



Fig.14 Ripple Rejection vs. Input Ripple Frequency (**PQ120DNA1ZPH**)

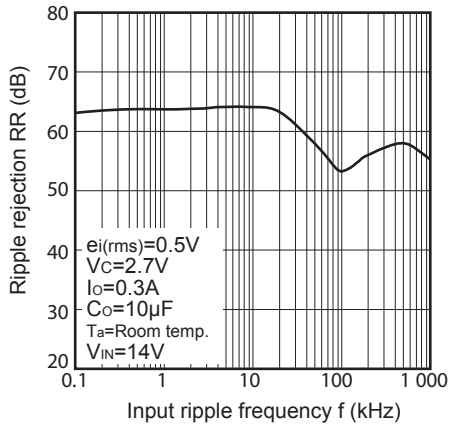



Fig.15 Ripple Rejection vs. Output Current (**PQ120DNA1ZPH**)

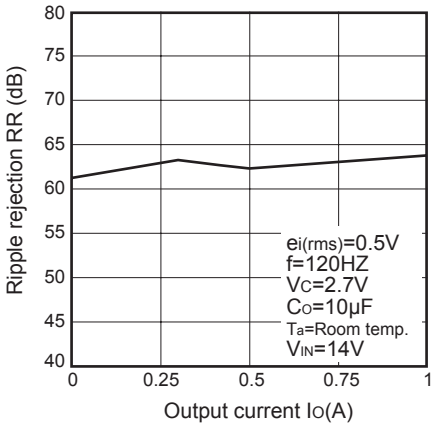
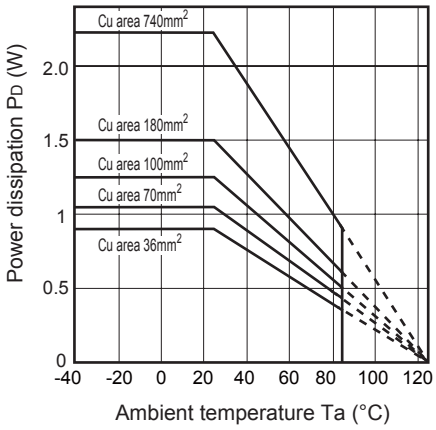
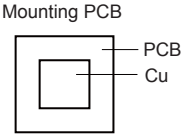



Fig.16 Power Dissipation vs. Ambient Temperature (Typical Value)




Mounting PCB




Material : Glass-cloth epoxy resin
Size : 50×50×1.6mm
Cu thickness : 35μm