＊RP106N (SOT-23-5) is the non-promotion product. As of March in 2015.

RICOH

RP106x SERIES

# 0.8%ACCURACY 0.7V OUTPUT 400mA LDO REGULATOR

NO.EA-180-131017

## OUTLINE

The RP106x Series are low voltage 400mA voltage regulator. These ICs had been further improved of low-voltage capability compared with previous low-voltage product.

The input voltage is as low as Min. 1.0V and the output voltage can be set from 0.7V. The output voltage accuracy has been improved to ±0.8% and due to a built-in transistor with low on-resistance of 0.55Ω (at $V_{OUT}$=1.5V).

Each of these ICs consists of a voltage reference unit, an error amplifier, a resistor-net for voltage setting, and a current limit circuits for over-current for the destruction prevention by the over-current.

The CE pin can switch the regulator to standby mode. In addition to SOT-23-5 and SC-88A packages, a 0.69mm square WLCSP-4-P5 package and a 1.2mm square DFN(PLP)1212-6 are also available.

## FEATURES

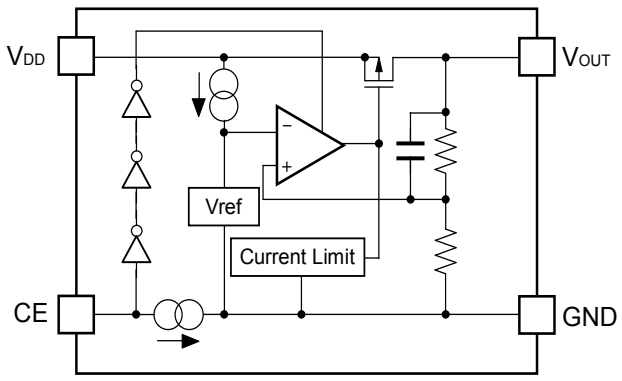
- Supply Current ..... Typ. 48μA
- Standby Current ..... Typ. 0.1μA
- Ripple Rejection ..... Typ. 60dB (f=10kHz)
- Input Voltage Range ..... 1.0V to 3.6V
- Output Voltage Range ..... 0.7V to 1.8V (0.1V steps)
  (For other voltages, please refer to MARK INFORMATIONS.)
- Output Voltage Accuracy ..... ±0.8% ($V_{OUT}$≥1.0V, $T_{opt}$=25°C)
- Temperature-Drift Coefficient of Output Voltage ... Typ. ±60ppm/°C
- Dropout Voltage ..... Typ. 0.22V ($V_{OUT}$=1.5V)
- Line Regulation ..... Typ. 0.10%/V
- Packages ..... WLCSP-4-P5, DFN(PLP)1212-6, SC-88A, SOT-23-5
- Built-in Fold Back Protection Circuit ..... Typ. 110mA (Current at short mode)
- Built-in Constant Slope Circuit
- Ceramic capacitors are recommended to be used with this IC .....1.0μF or more

## APPLICATIONS

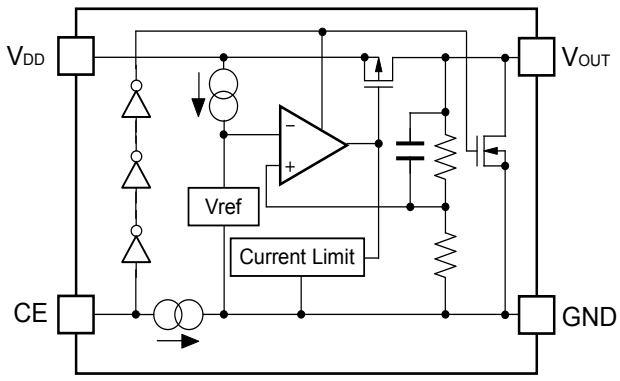
- Power source for portable communication equipment.
- Power source for electrical appliances such as cameras, VCRs and camcorders.
- Power source for battery-powered equipment.

# BLOCK DIAGRAMS

**RP106xxxxB**




**RP106xxxxD**




# SELECTION GUIDE

The output voltage, auto discharge function, package, and the taping type, etc. for the ICs can be selected at the user's request.

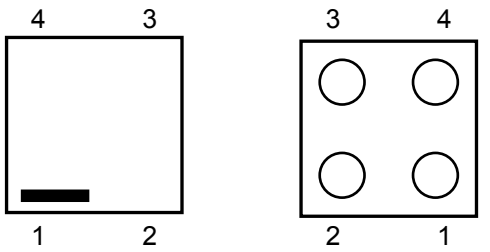
| Product Name | Package | Quantity per Reel | Pb Free | Halogen Free |
|---|---|---|---|---|
| RP106Zxx1∗-TR-F | WLCSP-4-P5 | 5,000 pcs | Yes | Yes |
| RP106Kxx1∗-TR | DFN(PLP)1212-6 | 5,000 pcs | Yes | Yes |
| RP106Qxx2∗-TR-FE | SC-88A | 3,000 pcs | Yes | Yes |
| RP106Nxx1∗-TR-FE | SOT-23-5 | 3,000 pcs | Yes | Yes |

xx : Setting Output Voltage ($V_{OUT}$) :
Fixed Type: 07 to 18 Stepwise setting with 0.1V increment in the range from 0.7V to 1.8V
Exception: 1.25V=RP106x12x∗5-xx
1.85V=RP106x18x∗5-xx

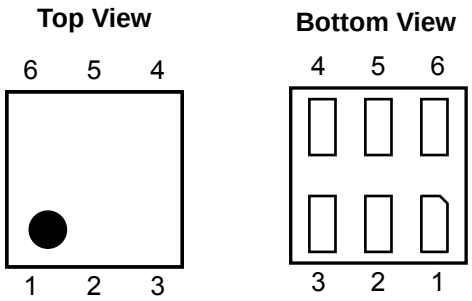
∗ : Designation of Active Type:
B:"H" Active, without auto discharge function at off state.
D:"H" Active, with auto discharge function at off state.

# PIN CONFIGURATIONS

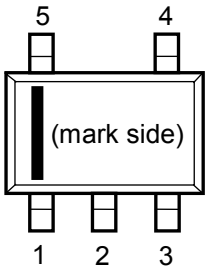
● **WLCSP-4-P5**



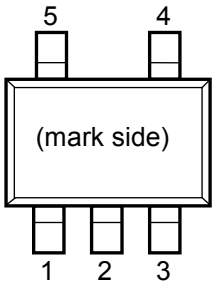

● **DFN(PLP)1212-6**




● **SC-88A**




● **SOT-23-5**




# PIN DESCRIPTIONS

● **WLCSP-4-P5**

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | $V_{DD}$ | Input Pin |
| 2 | CE | Chip Enable Pin ("H" Active) |
| 3 | GND | Ground Pin |
| 4 | $V_{OUT}$ | Output Pin |

● **DFN(PLP)1212-6**

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | NC | No Connection |
| 2 | GND | Ground Pin |
| 3 | CE | Chip Enable Pin ("H" Active) |
| 4 | $V_{DD}$ | Input Pin |
| 5 | NC | No Connection |
| 6 | $V_{OUT}$ | Output Pin |

● **SC-88A**

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | CE | Chip Enable Pin ("H" Active) |
| 2 | NC | No Connection |
| 3 | GND | Ground Pin |
| 4 | $V_{OUT}$ | Output Pin |
| 5 | $V_{DD}$ | Input Pin |

● **SOT-23-5**

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | $V_{DD}$ | Input Pin |
| 2 | GND | Ground Pin |
| 3 | CE | Chip Enable Pin ("H" Active) |
| 4 | NC | No Connection |
| 5 | $V_{OUT}$ | Output Pin |

# ABSOLUTE MAXIMUM RATINGS

| Symbol | Item | Rating | Unit |
|---|---|---|---|
| $V_{IN}$ | Input Voltage | 4.0 | V |
| $V_{CE}$ | Input Voltage (CE Pin) | −0.3 to 4.0 | V |
| $V_{OUT}$ | Output Voltage | −0.3 to $V_{IN}$+0.3 | V |
| $I_{OUT}$ | Output Current | 500 | mA |
| $P_D$ | Power Dissipation (WLCSP-4-P5)* | 278 | mW |
| | Power Dissipation (DFN(PLP)1212-6)* | 400 | |
| | Power Dissipation (SC-88A)* | 380 | |
| | Power Dissipation (SOT-23-5)* | 420 | |
| Topt | Operating Temperature Range | −40 to 85 | °C |
| Tstg | Storage Temperature Range | −55 to 125 | °C |

∗) For Power Dissipation, please refer to PACKAGE INFORMATION.

**ABSOLUTE MAXIMUM RATINGS**

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause the permanent damages and may degrade the life time and safety for both device and system using the device in the field. The functional operation at or over these absolute maximum ratings is not assured.

# ELECTRICAL CHARACTERISTICS

- **RP106x**

$V_{IN}$=Set $V_{OUT}$+1V, $I_{OUT}$=1mA, $C_{IN}$=$C_{OUT}$=1μF, unless otherwise noted.
The specifications surrounded by ☐ are guaranteed by Design Engineering at −40°C ≤ Topt ≤ 85°C.

Topt=25°C

| Symbol | Item | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_{OUT}$ | Output Voltage | Topt=25°C | $V_{OUT}$ ≥ 1.0V | ×0.992 | | ×1.008 | V |
| | | | $V_{OUT}$ < 1.0V | −8 | | 8 | mV |
| | | −40°C ≤ Topt ≤ 85°C | $V_{OUT}$ ≥ 1.0V | ☐×0.983 | | ☐×1.017 | V |
| | | | $V_{OUT}$ < 1.0V | ☐−17 | | ☐17 | mV |
| $I_{OUT}$ | Output Current | | | ☐400 | | | mA |
| $\Delta V_{OUT}/\Delta I_{OUT}$ | Load Regulation | 1mA ≤ $I_{OUT}$ ≤ 400mA | | | 25 | ☐45 | mV |
| $V_{DIF}$ | Dropout Voltage | Refer to the following table | | | | | |
| $I_{SS}$ | Supply Current | $I_{OUT}$=0mA | | | 48 | 75 | μA |
| $I_{standby}$ | Standby Current | $V_{CE}$=0V | | | 0.1 | 8.0 | μA |
| $\Delta V_{OUT}/\Delta V_{IN}$ | Line Regulation | Set $V_{OUT}$+0.5V ≤ $V_{IN}$ ≤ 3.6V<br>In case that Set $V_{OUT}$ < 0.8V,<br>1.3V ≤ $V_{IN}$ ≤ 3.6V | | | 0.10 | ☐0.25 | %/V |
| RR | Ripple Rejection | f=10kHz, Ripple 0.2Vp-p<br>$V_{IN}$=Set $V_{OUT}$+1V, $I_{OUT}$=30mA | | | 60 | | dB |
| $V_{IN}$ | Input Voltage* | | | ☐1.0 | | ☐3.6 | V |
| $\Delta V_{OUT}/\Delta Topt$ | Output Voltage Temperature Coefficient | −40°C ≤ Topt ≤ 85°C | | | ±60 | | ppm /°C |
| $I_{SC}$ | Short Current Limit | $V_{OUT}$=0V | | | 110 | | mA |
| $V_{CEH}$ | CE Input Voltage "H" | | | ☐0.9 | | | V |
| $V_{CEL}$ | CE Input Voltage "L" | | | | | ☐0.4 | V |
| en | Output Noise | BW=10Hz to 100kHz<br>$I_{OUT}$=30mA, $V_{OUT}$=0.7V | | | 30 | | μVrms |
| $R_{LOW}$ | Low Output Nch Tr. ON Resistance (of D version) | $V_{IN}$=2.0V, $V_{CE}$=0V | | | 43 | | Ω |

All test items listed under Electrical Characteristics are done under the pulse load condition (Tj≈Ta=25°C) except Output Noise, Ripple Rejection and Output Voltage Temperature Coefficient items.

The specifications surrounded by ☐ are guaranteed by Design Engineering at −40°C ≤ Topt ≤ 85°C.

- **Dropout Voltage by Output Voltage**

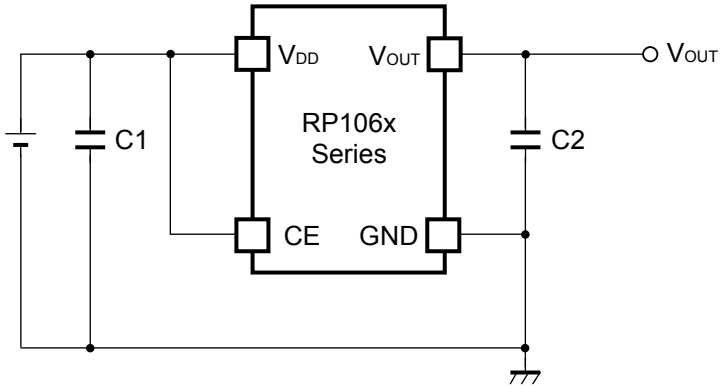
Topt=25°C

| Output Voltage $V_{OUT}$ (V) | Dropout Voltage $V_{DIF}$ (V) | | |
|---|---|---|---|
| | Condition | Typ. | Max. |
| 0.7 ≤ $V_{OUT}$ < 0.8 | $I_{OUT}$=400mA | 0.48 | 0.62 |
| 0.8 ≤ $V_{OUT}$ < 0.9 | | 0.40 | 0.54 |
| 0.9 ≤ $V_{OUT}$ < 1.0 | | 0.36 | 0.47 |
| 1.0 ≤ $V_{OUT}$ < 1.2 | | 0.32 | 0.45 |
| 1.2 ≤ $V_{OUT}$ < 1.5 | | 0.28 | 0.38 |
| 1.5 ≤ $V_{OUT}$ | | 0.22 | 0.31 |

**RECOMMENDED OPERATING CONDITIONS (ELECTRICAL CHARACTERISTICS)**

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if when they are used over such conditions by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

# TYPICAL APPLICATION




(External Components)
C1, C2 Ceramic 1.0μF MURATA: GRM155B31A105KE15

# TECHNICAL NOTES

When using these ICs, consider the following points:

**Phase Compensation**

In these ICs, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, use a capacitor C2 with 1.0μF or more.

If a tantalum capacitor is used, and its ESR (Equivalent Series Resistance) of C2 is large, the loop oscillation may result. Because of this, select C2 carefully considering its frequency characteristics.

**PCB Layout**

Make $V_{DD}$ and GND lines sufficient. If their impedance is high, noise pickup or unstable operation may result. Connect a capacitor C1 with a capacitance value as much as 1.0μF or more between $V_{DD}$ and GND pin, and as close as possible to the pins.

Set external components, especially the output capacitor C2, as close as possible to the ICs, and make wiring as short as possible.

**Impedance of Input pin**

CE pull-down constant current circuit is built in the RP106x.

However, if the CE pin is floating and the wiring is long, the malfunction may occur by noise. Therefore, fully evaluation on the actual PCB is necessary.

# CONSTANT SLOPE CIRCUITS

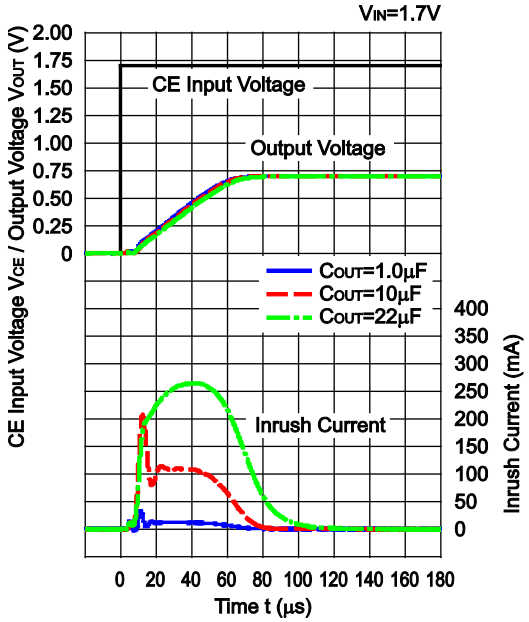
The RP106x Series is equipped with a constant slope circuit as a soft-start circuit, which allows the output voltage to start up gradually when the CE is turned on.

The constant slope circuit minimizes the inrush current at the start-up and also prevents the overshoot of the output voltage.

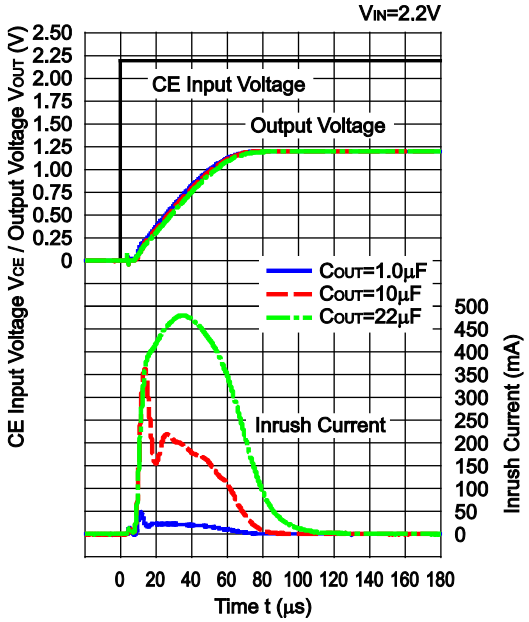
The capacitor to create the start-up slope is built in the IC that does not require any external components. The start-up time and the start-up slope angle are fixed inside the IC. For more details, please refer to the graph 15 of “Inrush Current Characteristics Example”.

**Inrush Current Characteristics Example (C1=1.0µF, Topt=25ºC)**

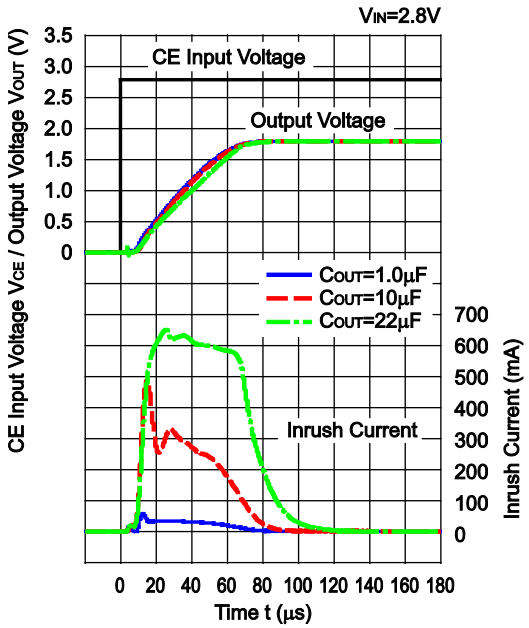
**RP106x07xB/D**




**RP106x12xB/D**




**RP106x18xB/D**



# PACKAGE INFORMATION

- **Power Dissipation (WLCSP-4-P5)**

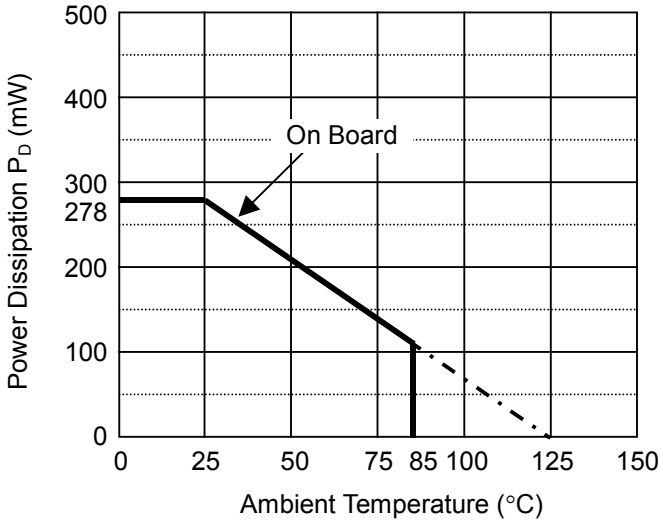
Power Dissipation ($P_D$) depends on conditions of mounting on board. This specification is based on the measurement at the condition below:

* Measurement Conditions

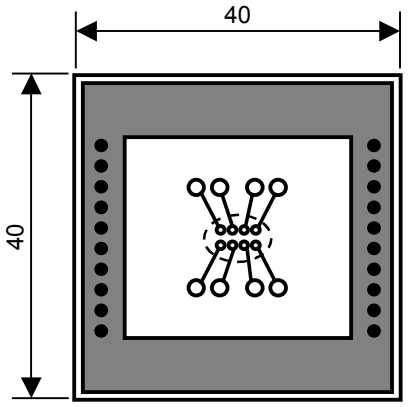
| | Standard Land Pattern |
|---|---|
| Environment | Mounting on Board (Wind velocity=0m/s) |
| Board Material | Glass cloth epoxy plastic (Double sided) |
| Board Dimensions | 40mm × 40mm × 1.6mm |
| Copper Ratio | Top side : Approx. 50% , Back side : Approx. 50% |
| Through-hole | ϕ 0.5mm × 28pcs |

* Measurement Result (Ta=25°C, Tjmax=125°C)

| | Standard Land Pattern |
|---|---|
| Power Dissipation | 278mW |
| Thermal Resistance | θja = (125–25°C)/0.278W = 360°C/W |
| | θjc = 46°C/W |



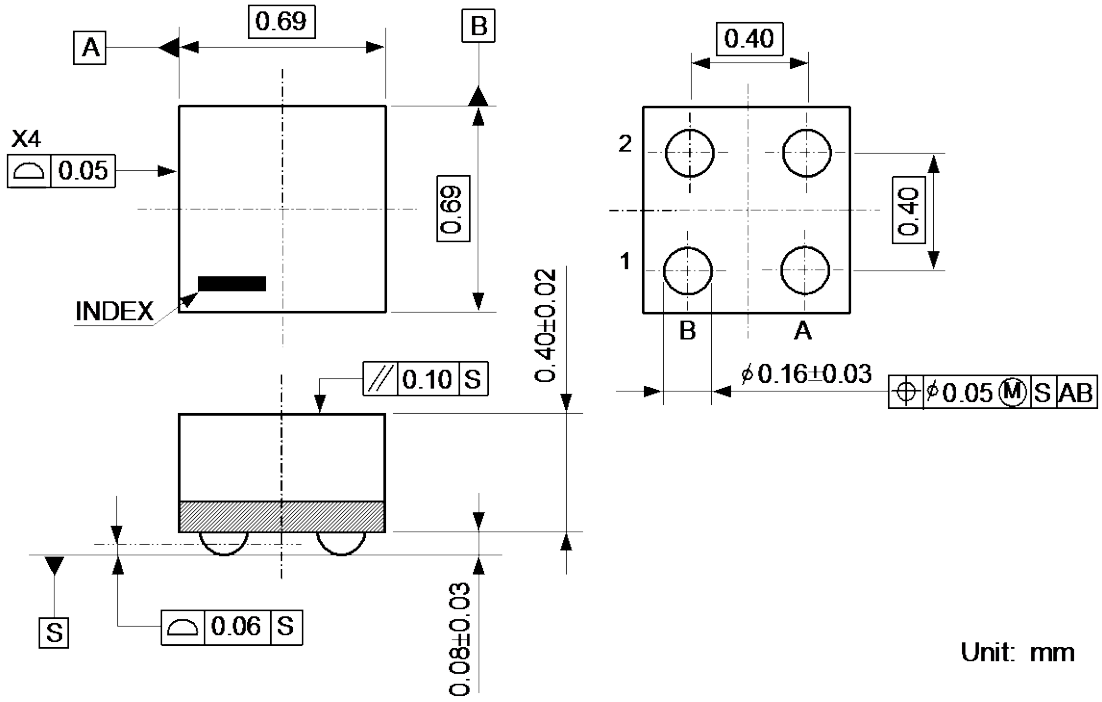

**Power Dissipation**




**Measurement Board Pattern**

IC Mount Aria (Unit : mm)

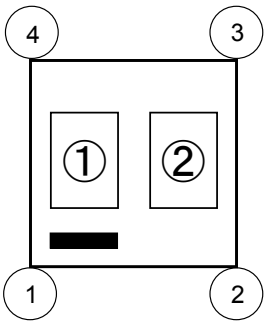
- **Package Dimensions (WLCSP-4-P5)**




Unit: mm

- **Mark Specification (WLCSP-4-P5)**

①② : Lot No. ..... Alphanumeric serial number.



- **RP106Z Series marking list table (WLCSP-4-P5)**

RP106ZxxxB

| Product Name | $V_{SET}$ |
|---|---|
| RP106Z071B | 0.7V |
| RP106Z081B | 0.8V |
| RP106Z091B | 0.9V |
| RP106Z101B | 1.0V |
| RP106Z111B | 1.1V |
| RP106Z121B | 1.2V |
| RP106Z131B | 1.3V |
| RP106Z141B | 1.4V |
| RP106Z151B | 1.5V |
| RP106Z161B | 1.6V |
| RP106Z171B | 1.7V |
| RP106Z181B | 1.8V |
| RP106Z121B5 | 1.25V |
| RP106Z181B5 | 1.85V |

RP106ZxxxD

| Product Name | $V_{SET}$ |
|---|---|
| RP106Z071D | 0.7V |
| RP106Z081D | 0.8V |
| RP106Z091D | 0.9V |
| RP106Z101D | 1.0V |
| RP106Z111D | 1.1V |
| RP106Z121D | 1.2V |
| RP106Z131D | 1.3V |
| RP106Z141D | 1.4V |
| RP106Z151D | 1.5V |
| RP106Z161D | 1.6V |
| RP106Z171D | 1.7V |
| RP106Z181D | 1.8V |
| RP106Z121D5 | 1.25V |
| RP106Z181D5 | 1.85V |

- **Power Dissipation (DFN(PLP)1212-6)**

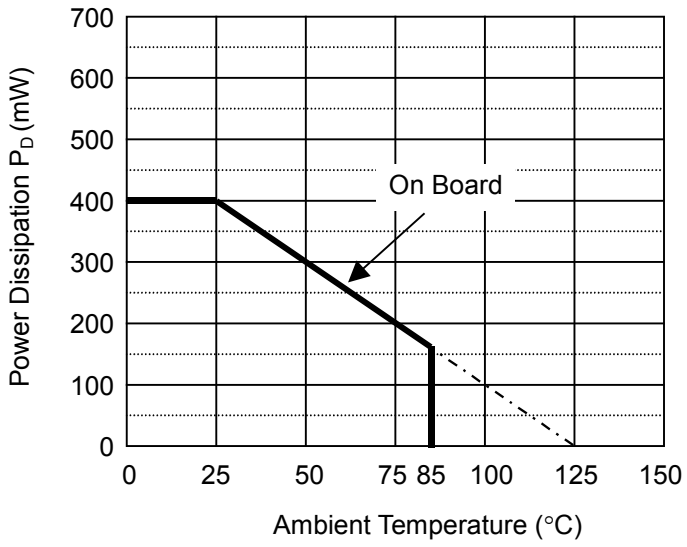
Power Dissipation ($P_D$) depends on conditions of mounting on board. This specification is based on the measurement at the condition below:

Measurement Conditions

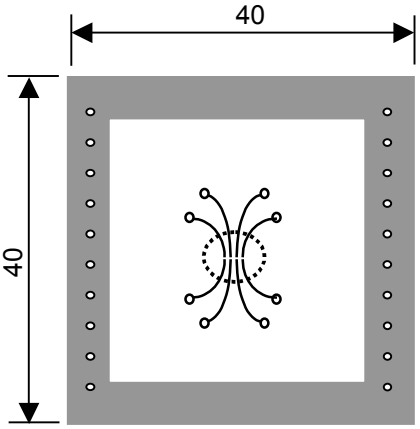
| | Standard Test Land Pattern |
|---|---|
| Environment | Mounting on Board (Wind velocity=0m/s) |
| Board Material | Glass cloth epoxy plastic (Double sided) |
| Board Dimensions | 40mm×40mm×1.6mm |
| Copper Ratio | Top side: Approx. 50%, Back side: Approx. 50% |
| Through-holes | ϕ 0.54mm×28pcs |

Measurement Result (Ta=25°C, Tjmax=125°C)

| | Standard Test Land Pattern |
|---|---|
| Power Dissipation | 400mW |
| Thermal Resistance | θja=(125-25°C)/0.4W=250°C/W |
| | θjc=67 °C/W |



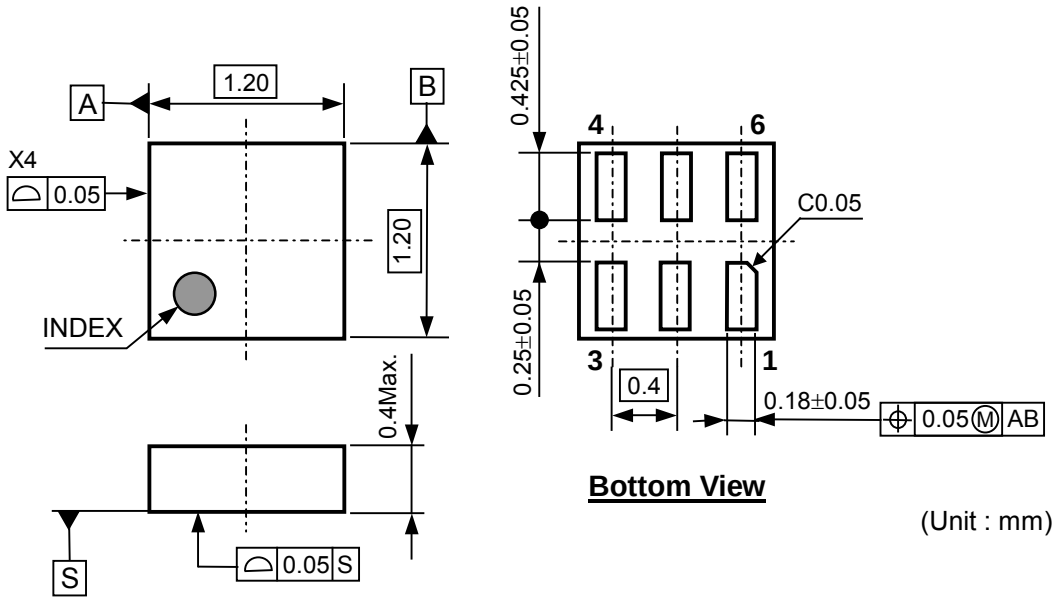

**Power Dissipation**




**Measurement Board Pattern**

IC Mount Area Unit : mm

- **Package Dimensions (DFN(PLP)1212-6)**

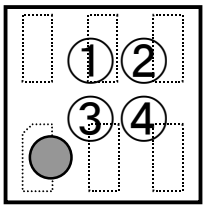



(Unit : mm)

- **Mark Specification (DFN(PLP)1212-6)**

①② : Product Code.....Refer to the marking list table

③④ : Lot No.....Alphanumeric serial number.



- **RP106K Series marking list table (DFN(PLP)1212-6)**

RP106KxxxB

| Product Name | ①② | $V_{SET}$ |
|---|---|---|
| RP106K071B | NA | 0.7V |
| RP106K081B | NB | 0.8V |
| RP106K091B | NC | 0.9V |
| RP106K101B | ND | 1.0V |
| RP106K111B | NE | 1.1V |
| RP106K121B | NF | 1.2V |
| RP106K131B | NG | 1.3V |
| RP106K141B | NH | 1.4V |
| RP106K151B | NJ | 1.5V |
| RP106K161B | NK | 1.6V |
| RP106K171B | NL | 1.7V |
| RP106K181B | NM | 1.8V |
| RP106K121B5 | NP | 1.25V |
| RP106K181B5 | NQ | 1.85V |

RP106KxxxD

| Product Name | ①② | $V_{SET}$ |
|---|---|---|
| RP106K071D | PA | 0.7V |
| RP106K081D | PB | 0.8V |
| RP106K091D | PC | 0.9V |
| RP106K101D | PD | 1.0V |
| RP106K111D | PE | 1.1V |
| RP106K121D | PF | 1.2V |
| RP106K131D | PG | 1.3V |
| RP106K141D | PH | 1.4V |
| RP106K151D | PJ | 1.5V |
| RP106K161D | PK | 1.6V |
| RP106K171D | PL | 1.7V |
| RP106K181D | PM | 1.8V |
| RP106K121D5 | PP | 1.25V |
| RP106K181D5 | PQ | 1.85V |

- **Power Dissipation (SC-88A)**

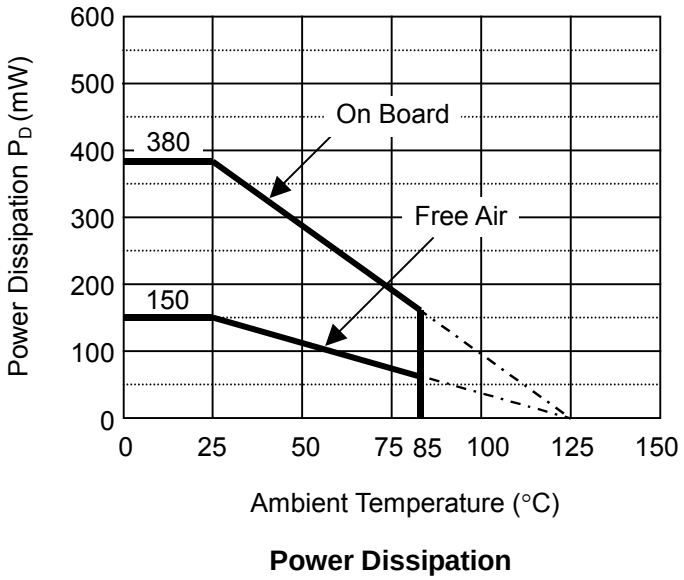
Power Dissipation ($P_D$) depends on conditions of mounting on board. This specification is based on the measurement at the condition below;

Measurement Conditions

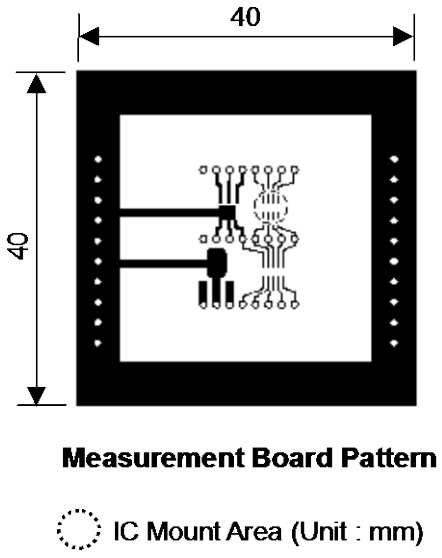
| | **Standard Land Pattern** |
|---|---|
| Environment | Mounting on Board (Wind velocity=0m/s) |
| Board Material | Glass cloth epoxy plastic (Double Layers) |
| Board Dimensions | 40mm×40mm×1.6mm |
| Copper Ratio | Top side: Approx. 50%, Back side: Approx. 50% |
| Through-hole | ϕ0.5mm×44pcs |

Measurement Result (Ta=25°C, Tjmax=125°C)

| | **Standard Land Pattern** | **Free Air** |
|---|---|---|
| Power Dissipation | 380mW | 150mW |
| Thermal Resistance | θja=(125-25°C)/0.38W=263°C/W | θja=(125-25°C)/0.15W=667°C/W |
| | θjc=75°C/W | - |



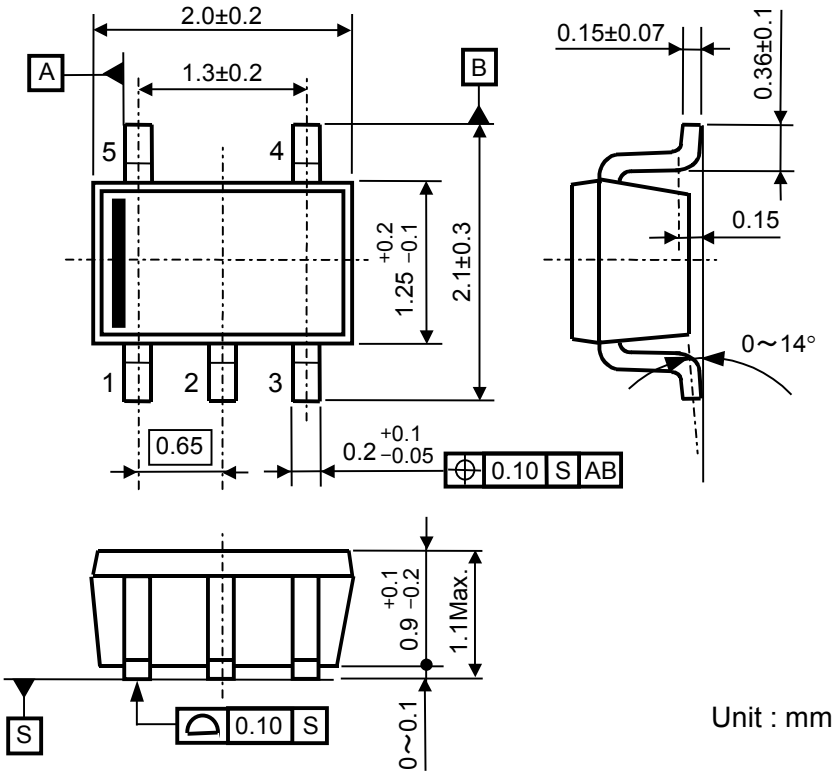

**Power Dissipation**




**Measurement Board Pattern**

IC Mount Area (Unit : mm)

- **Package Dimensions (SC-88A)**

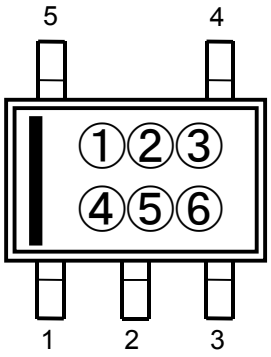



Unit : mm

- **Mark Specification (SC-88A)**

①②③④ : Product Code.....Refer to the marking list table

⑤⑥ : Lot No.....Alphanumeric serial number.



- **RP106Q Series marking list table (SC-88A)**

RP106QxxxB

| Product Name | ①②③④ | $V_{SET}$ |
|---|---|---|
| RP106Q072B | Q 0 0 1 | 0.7V |
| RP106Q082B | Q 0 0 2 | 0.8V |
| RP106Q092B | Q 0 0 3 | 0.9V |
| RP106Q102B | Q 0 0 4 | 1.0V |
| RP106Q112B | Q 0 0 5 | 1.1V |
| RP106Q122B | Q 0 0 6 | 1.2V |
| RP106Q132B | Q 0 0 7 | 1.3V |
| RP106Q142B | Q 0 0 8 | 1.4V |
| RP106Q152B | Q 0 0 9 | 1.5V |
| RP106Q162B | Q 0 1 0 | 1.6V |
| RP106Q172B | Q 0 1 1 | 1.7V |
| RP106Q182B | Q 0 1 2 | 1.8V |
| RP106Q122B5 | Q 0 1 4 | 1.25V |
| RP106Q182B5 | Q 0 1 5 | 1.85V |

RP106QxxxD

| Product Name | ①②③④ | $V_{SET}$ |
|---|---|---|
| RP106Q072D | R 0 0 1 | 0.7V |
| RP106Q082D | R 0 0 2 | 0.8V |
| RP106Q092D | R 0 0 3 | 0.9V |
| RP106Q102D | R 0 0 4 | 1.0V |
| RP106Q112D | R 0 0 5 | 1.1V |
| RP106Q122D | R 0 0 6 | 1.2V |
| RP106Q132D | R 0 0 7 | 1.3V |
| RP106Q142D | R 0 0 8 | 1.4V |
| RP106Q152D | R 0 0 9 | 1.5V |
| RP106Q162D | R 0 1 0 | 1.6V |
| RP106Q172D | R 0 1 1 | 1.7V |
| RP106Q182D | R 0 1 2 | 1.8V |
| RP106Q122D5 | R 0 1 4 | 1.25V |
| RP106Q182D5 | R 0 1 5 | 1.85V |

## • Power Dissipation (SOT-23-5)

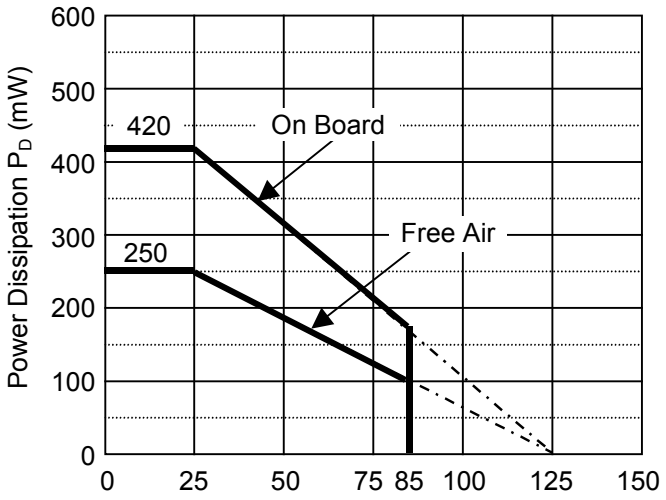
Power Dissipation ($P_D$) depends on conditions of mounting on board. This specification is based on the measurement at the condition below:
(Power Dissipation (SOT-23-5) is substitution of SOT-23-6.)

Measurement Conditions

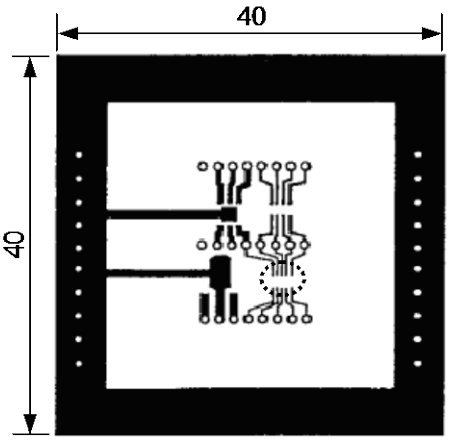
| | Standard Test Land Pattern |
|---|---|
| Environment | Mounting on Board (Wind velocity=0m/s) |
| Board Material | Glass cloth epoxy plastic (Double sided) |
| Board Dimensions | 40mm×40mm×1.6mm |
| Copper Ratio | Top side: Approx. 50%, Back side: Approx. 50% |
| Through-holes | ϕ 0.5mm×44pcs |

Measurement Result (Ta=25°C, Tjmax=125°C)

| | Standard Land Pattern | Free Air |
|---|---|---|
| Power Dissipation | 420mW | 250mW |
| Thermal Resistance | θja=(125-25°C)/0.42W=238°C/W | 400°C/W |



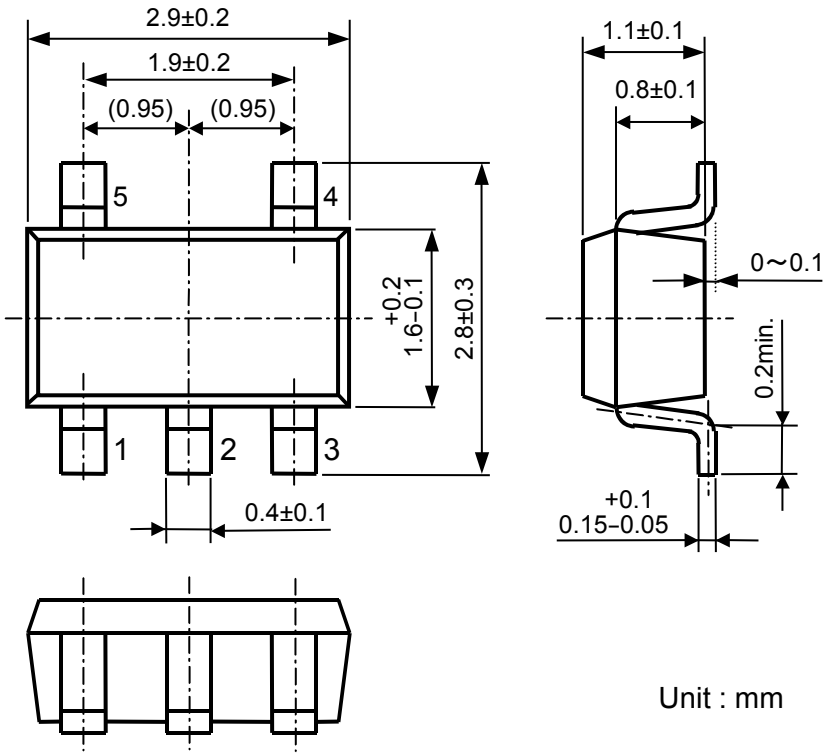

**Power Dissipation**




**Measurement Board Pattern**

IC Mount Area (Unit: mm)

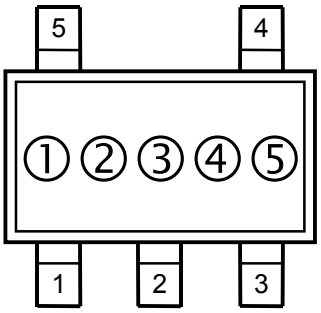
- **Package Dimensions (SOT-23-5)**




Unit : mm

- **Mark Specification (SOT-23-5)**

①②③: Product Code.....Refer to the marking list table
④⑤ : Lot No.....Alphanumeric serial number.



- **RP106N Series marking list table (SOT-23-5)**

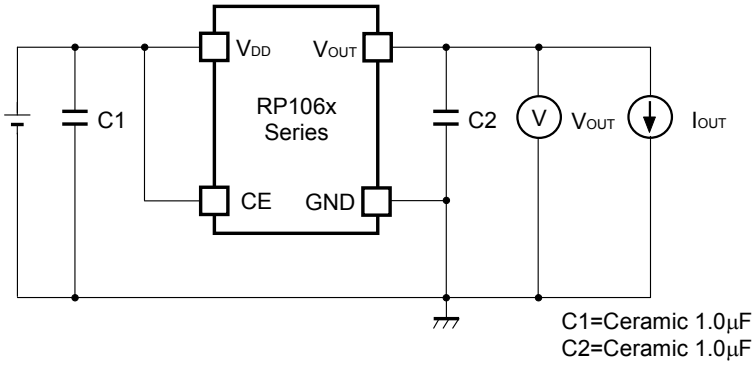
RP106NxxxB

| Product Name | ①②③ | $V_{SET}$ |
|---|---|---|
| RP106N071B | C A A | 0.7V |
| RP106N081B | C A B | 0.8V |
| RP106N091B | C A C | 0.9V |
| RP106N101B | C A D | 1.0V |
| RP106N111B | C A E | 1.1V |
| RP106N121B | C A F | 1.2V |
| RP106N131B | C A G | 1.3V |
| RP106N141B | C A H | 1.4V |
| RP106N151B | C A J | 1.5V |
| RP106N161B | C A K | 1.6V |
| RP106N171B | C A L | 1.7V |
| RP106N181B | C A M | 1.8V |
| RP106N121B5 | C A P | 1.25V |
| RP106N181B5 | C A Q | 1.85V |

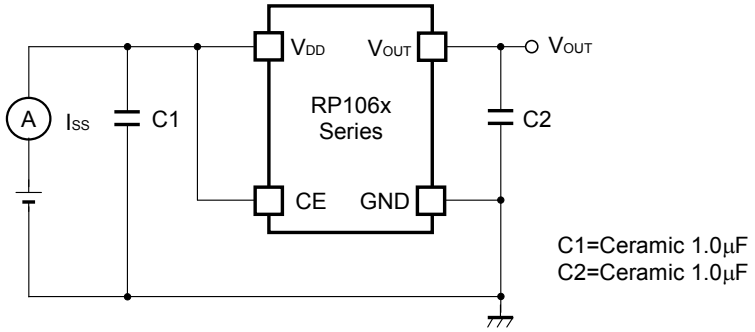
RP106NxxxD

| Product Name | ①②③ | $V_{SET}$ |
|---|---|---|
| RP106N071D | C B A | 0.7V |
| RP106N081D | C B B | 0.8V |
| RP106N091D | C B C | 0.9V |
| RP106N101D | C B D | 1.0V |
| RP106N111D | C B E | 1.1V |
| RP106N121D | C B F | 1.2V |
| RP106N131D | C B G | 1.3V |
| RP106N141D | C B H | 1.4V |
| RP106N151D | C B J | 1.5V |
| RP106N161D | C B K | 1.6V |
| RP106N171D | C B L | 1.7V |
| RP106N181D | C B M | 1.8V |
| RP106N121D5 | C B P | 1.25V |
| RP106N181D5 | C B Q | 1.85V |

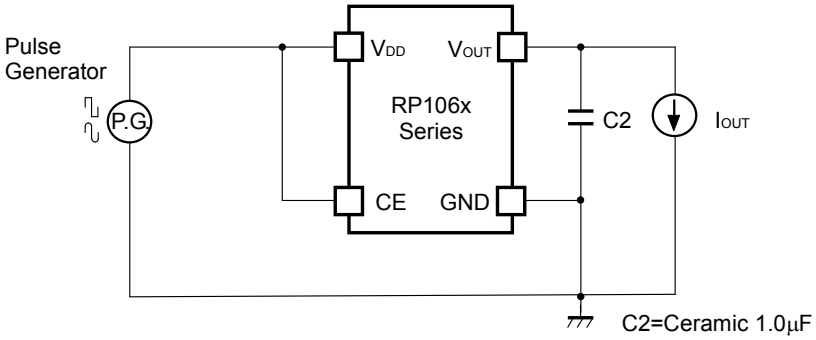
# TEST CIRCUITS



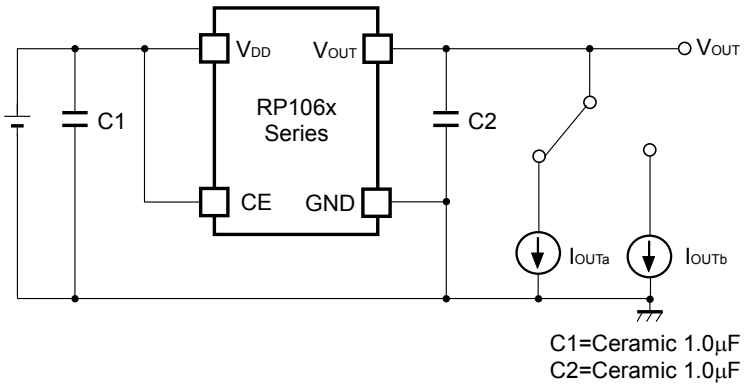

**Basic Test Circuit**




**Supply Current Test Circuit**




**Ripple Rejection Test Circuit**

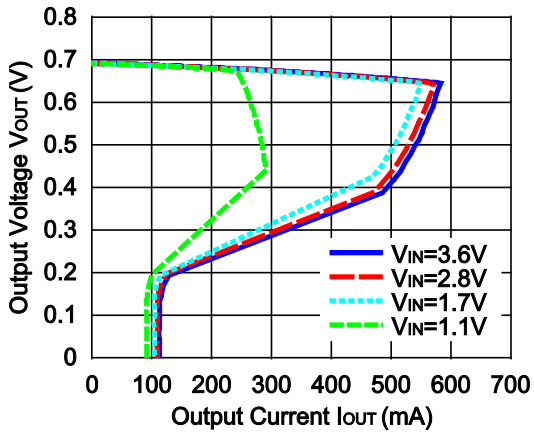



**Load Transient Response Test Circuit**

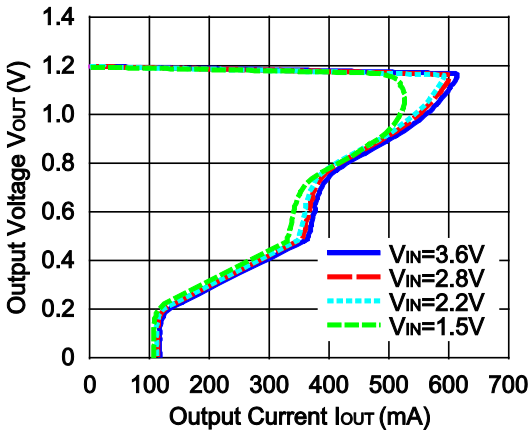
# TYPICAL CHARACTERISTICS

## 1) Output Voltage vs. Output Current (Topt=25°C)

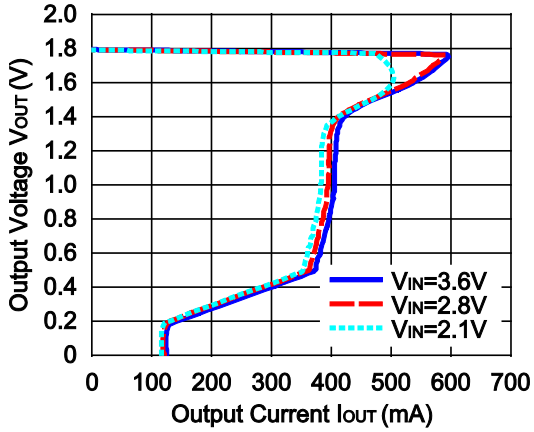
**RP106x07xx**




**RP106x12xx**

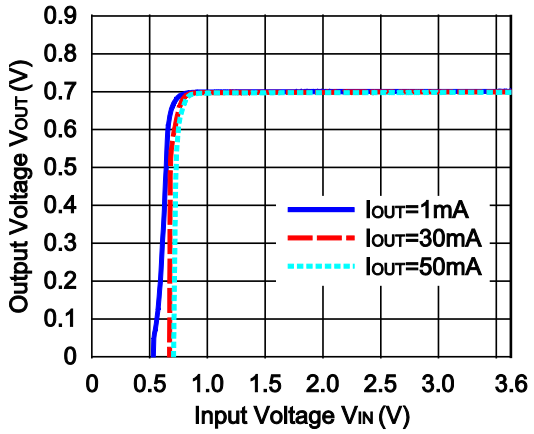



**RP106x18xx**

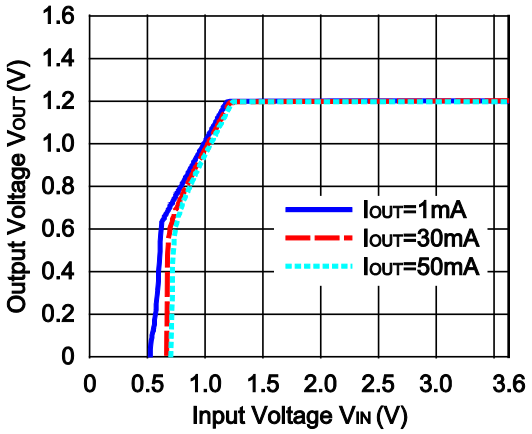



## 2) Output Voltage vs. Input Voltage (Topt=25°C)

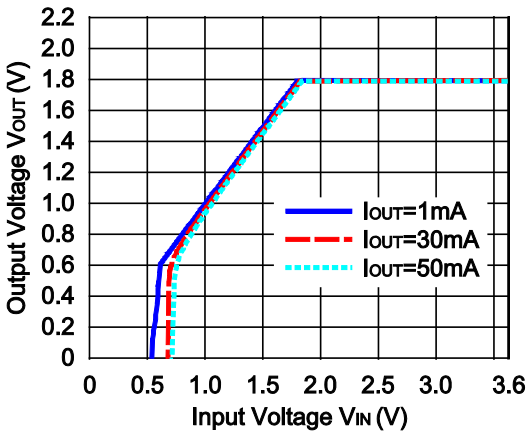
**RP106x07xx**




**RP106x12xx**

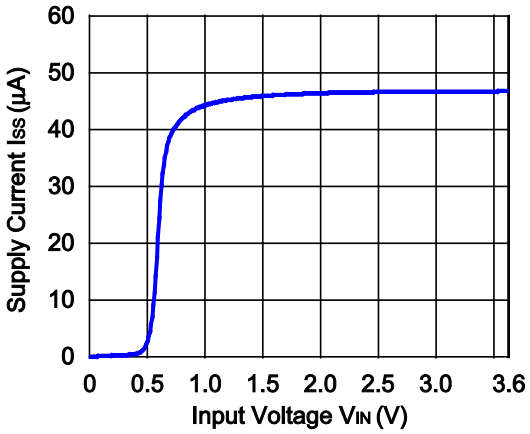


**RP106x18xx**

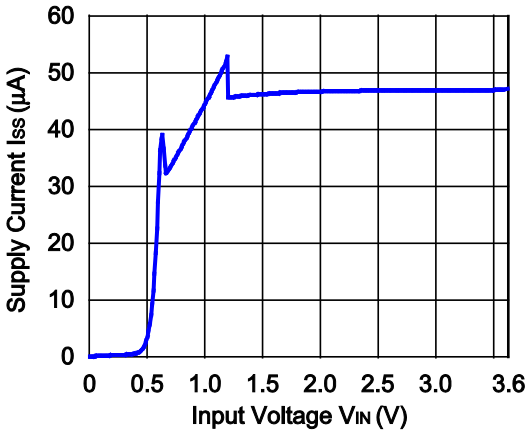



### 3) Supply Current vs. Input Voltage (Topt=25°C)

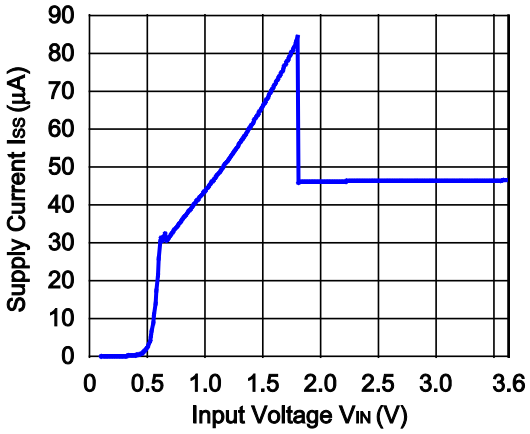
**RP106x07xx**




**RP106x12xx**

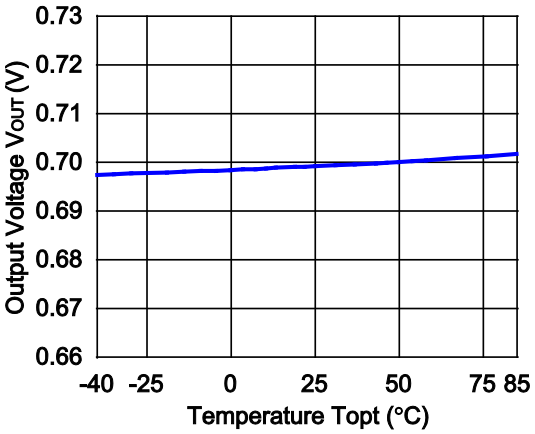



**RP106x18xx**

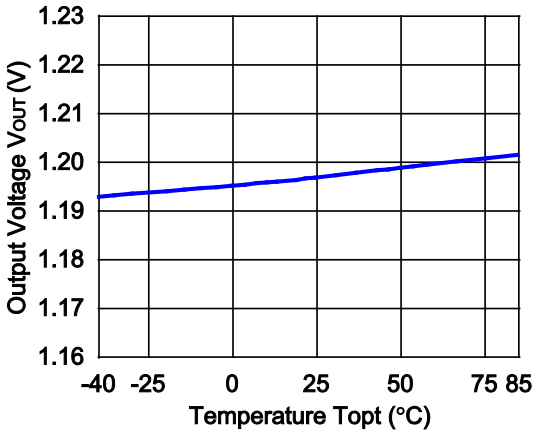


### 4) Output Voltage vs. Temperature

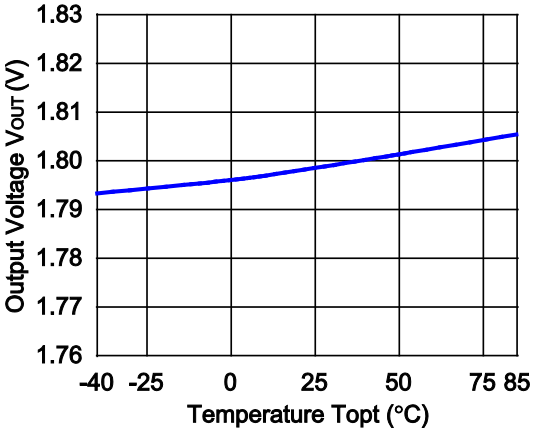
RP106x07xx




RP106x12xx

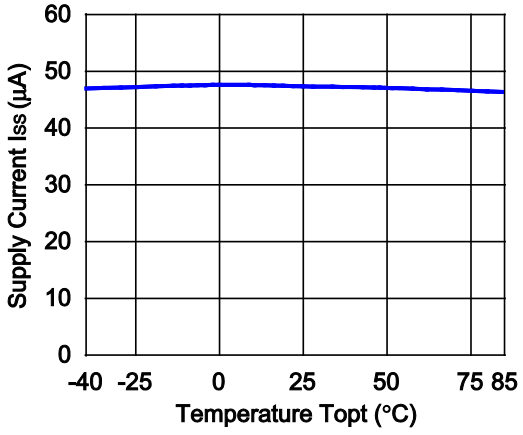



RP106x18xx

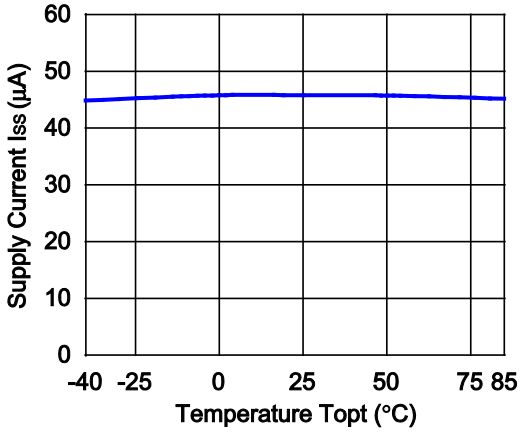



### 5) Supply Current vs. Temperature

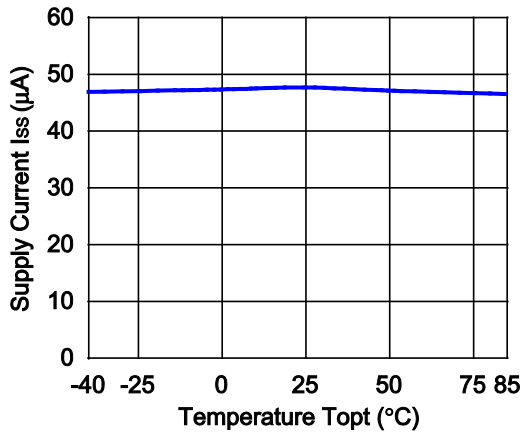
RP106x07xx




RP106x12xx

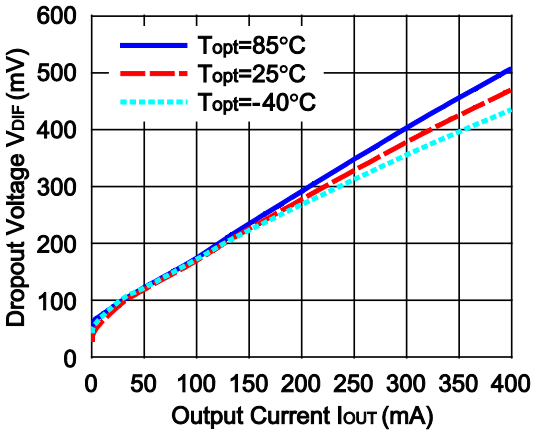


**RP106x18xx**

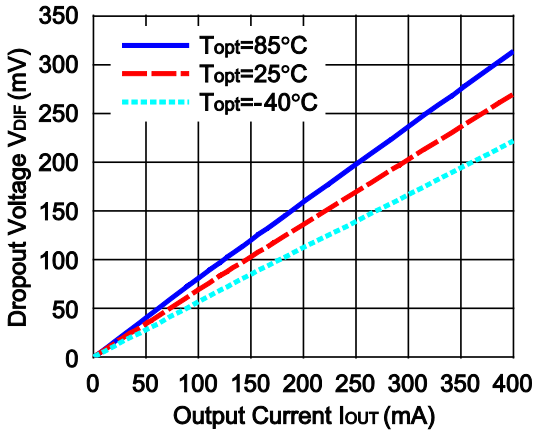



### 6) Dropout Voltage vs. Output Current

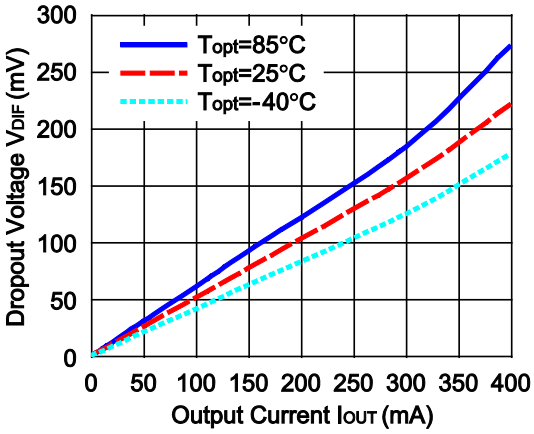
**RP106x07xx**



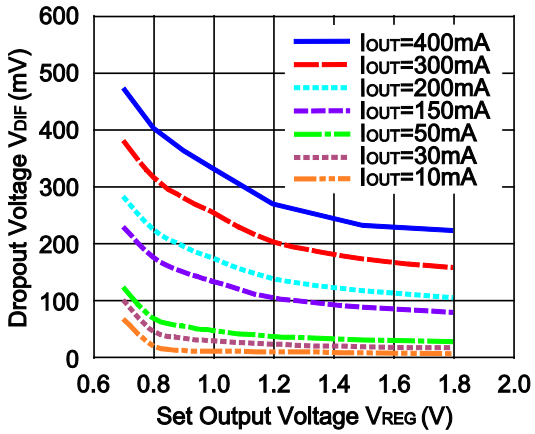

**RP106x12xx**



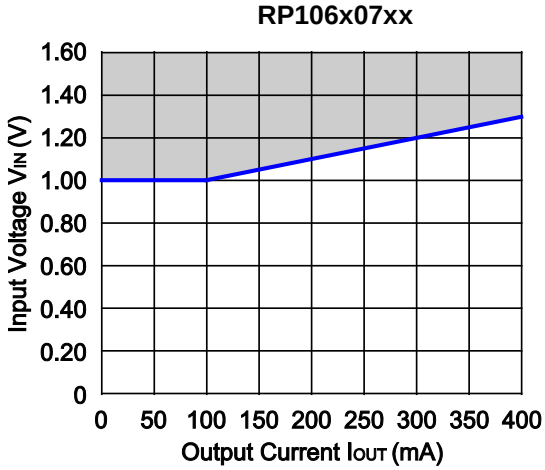

**RP106x18xx**



### 7) Dropout Voltage vs Set Output Voltage (Topt=25°C)

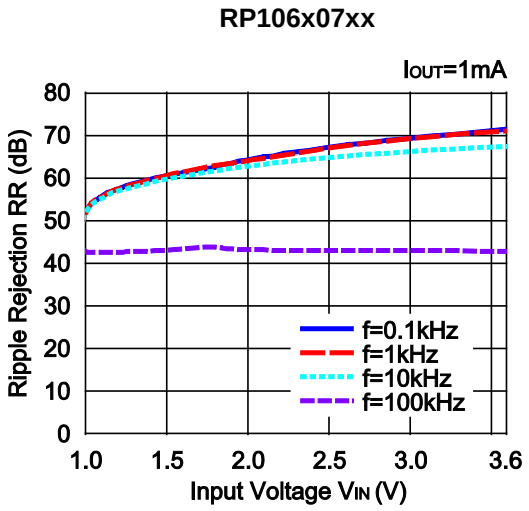


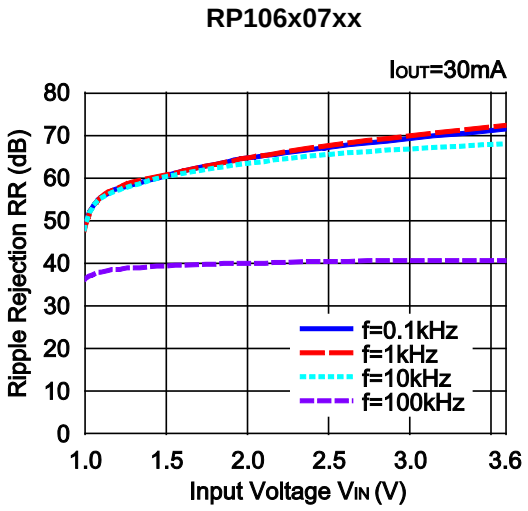

### 8) Minimum Operating Voltage



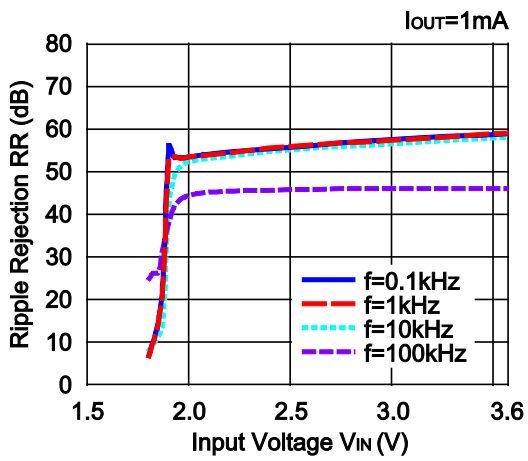

Hatched area is avaiable
for 0.7V output

### 9) Ripple Rejection vs. Input Bias Voltage (C1=none, C2=1.0µF, Ripple=0.2Vp-p, Topt=25°C)

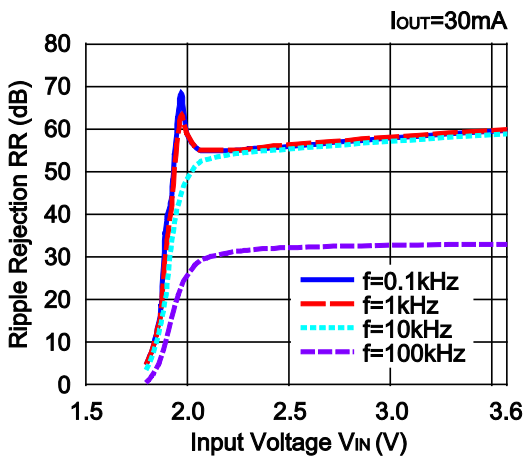


**RP106x18xx**

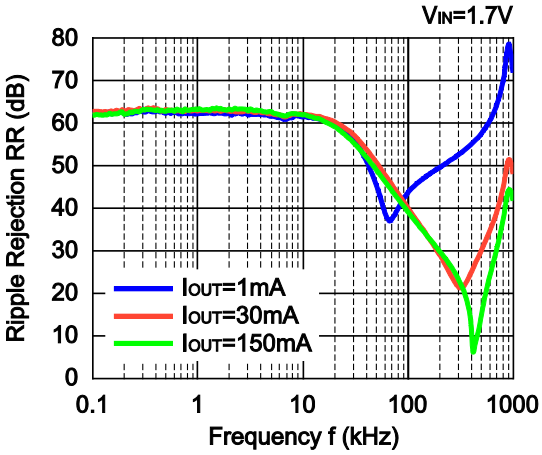



**RP106x18xx**

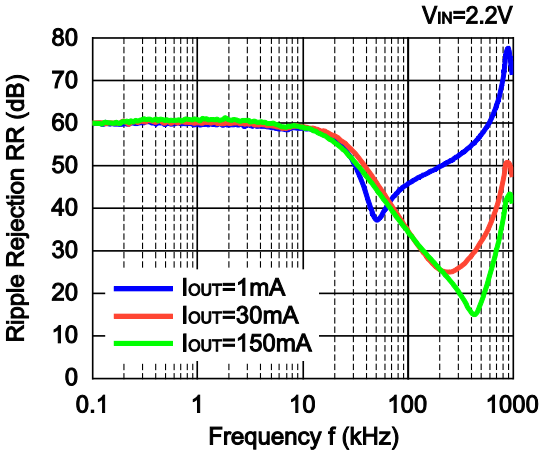



**10) Ripple Rejection vs. Frequency (C1=none, C2=1.0µF, Ripple=0.1Vp-p, Topt=25°C)**

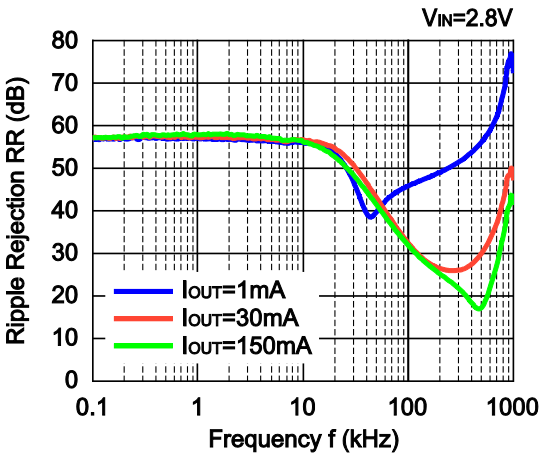
**RP106x07xx**




**RP106x12xx**

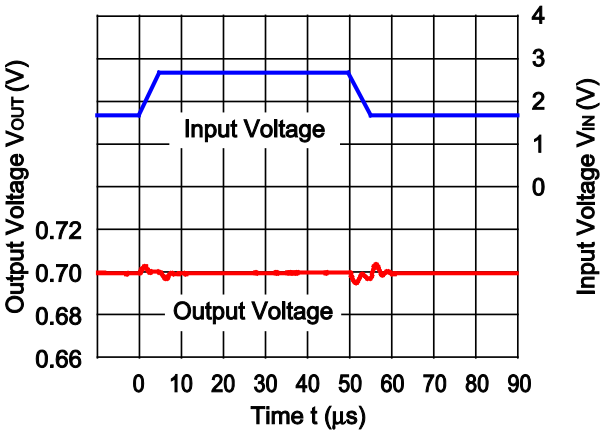



**RP106x18xx**

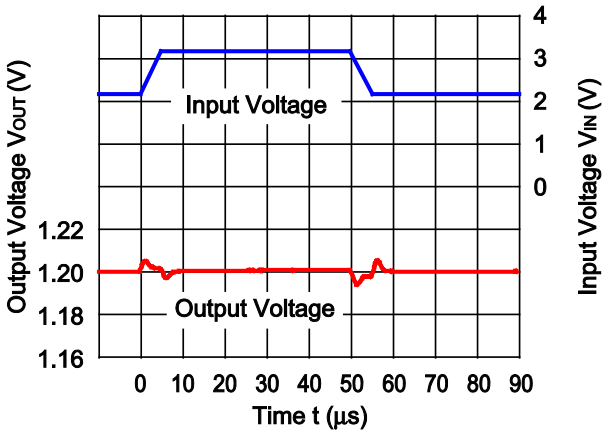


### 11) Input Transient Response (C1=none, C2=1.0µF, $I_{OUT}$=30mA, tr=tf=5µs, Topt=25°C)

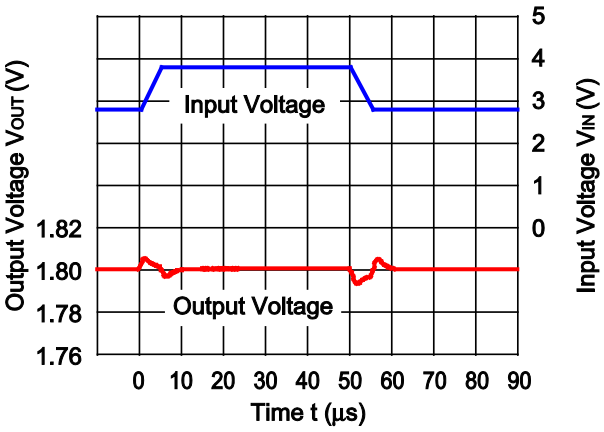
**RP106x07xx**




**RP106x12xx**




**RP106x18xx**




### 12) Load Transient Response (C1=C2=1.0µF, tr=tf=5µs, Topt=25°C)

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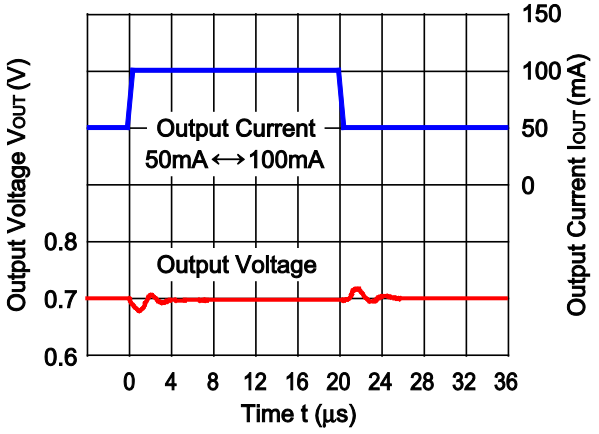


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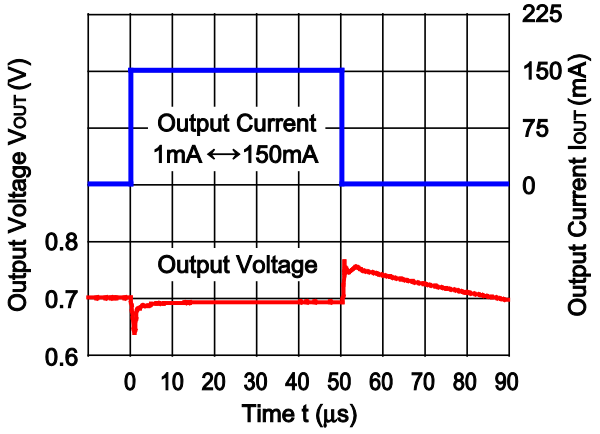

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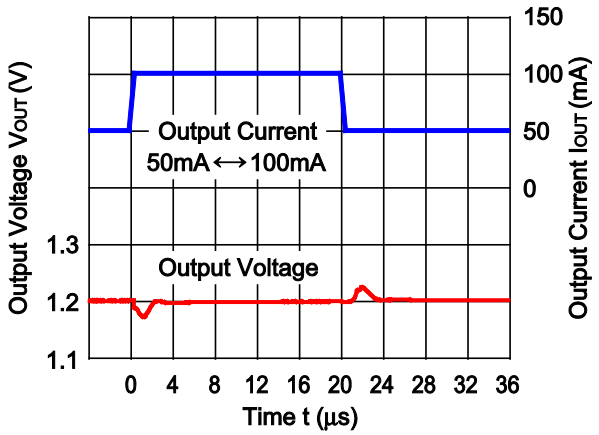


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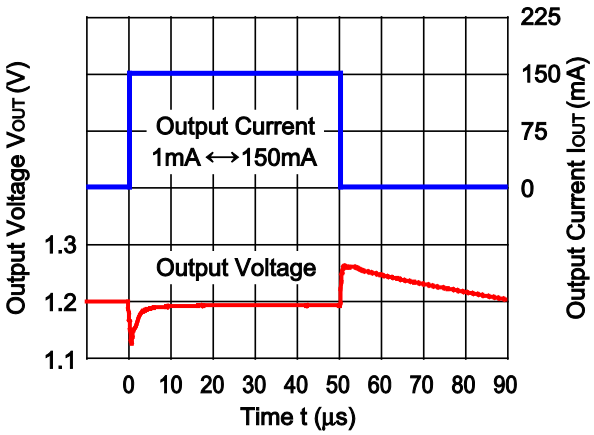


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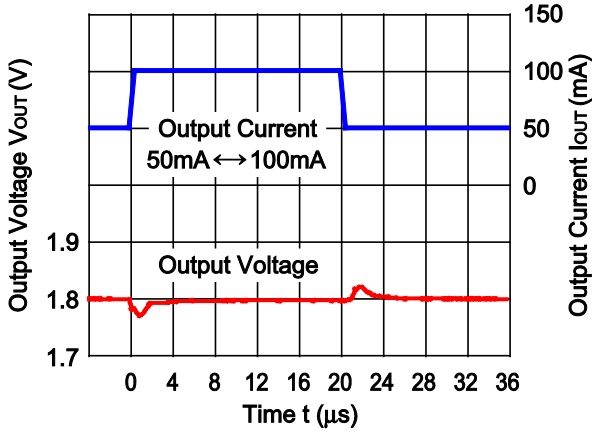


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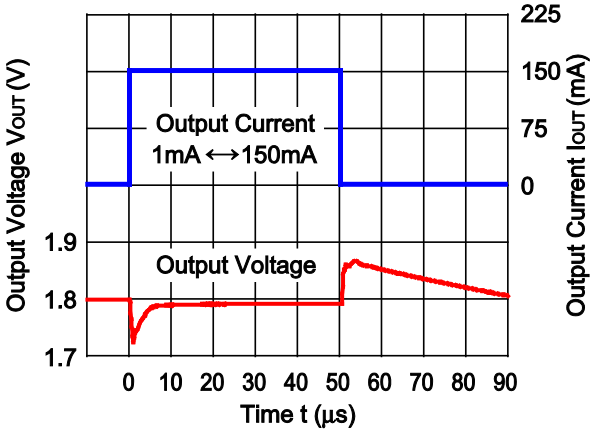


## 13) Turn On Speed with CE pin (C1=C2=1.0µF, Topt=25°C)

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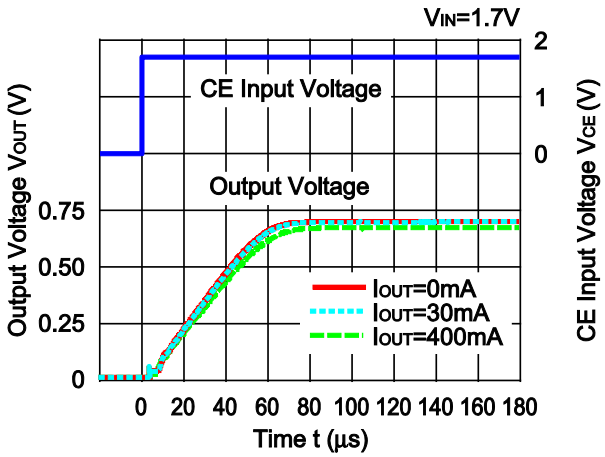


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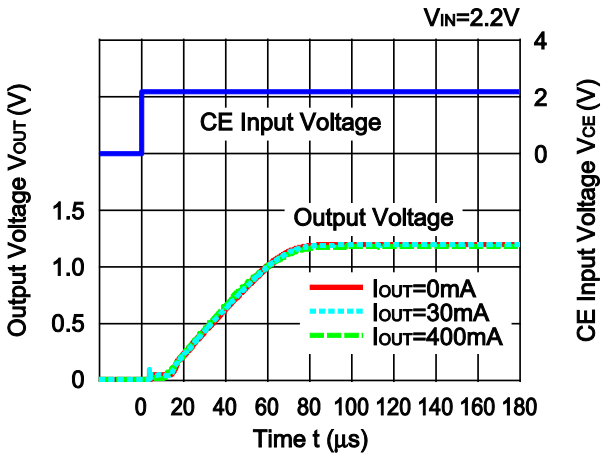

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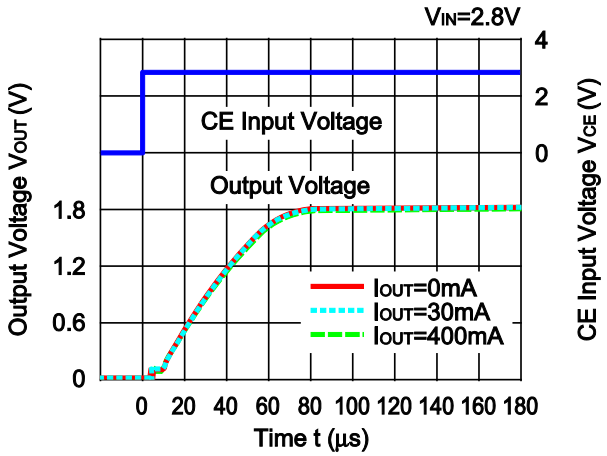
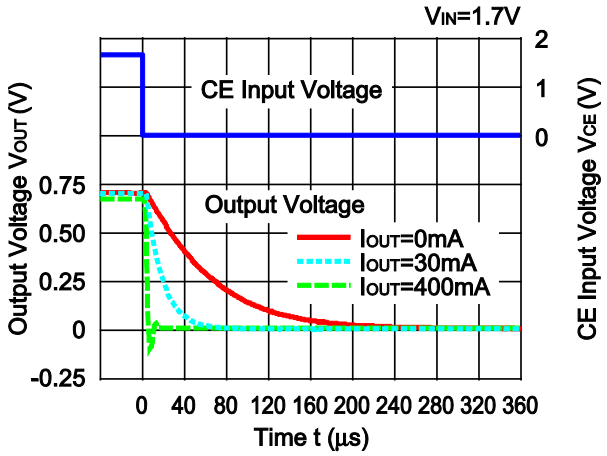



### 14) Turn Off Speed with CE pin (C1=C2=1.0µF, Topt=25°C)

RP106x07xx

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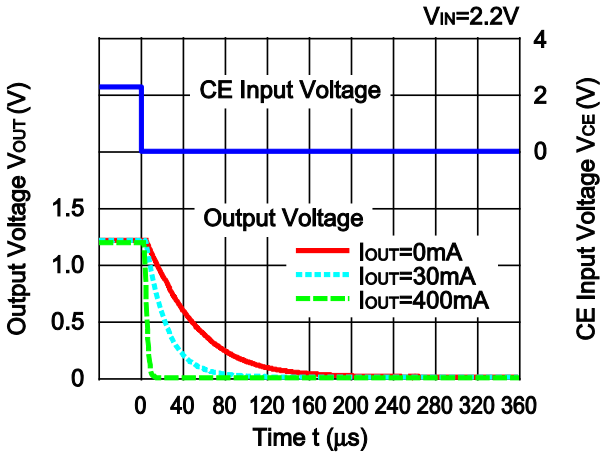


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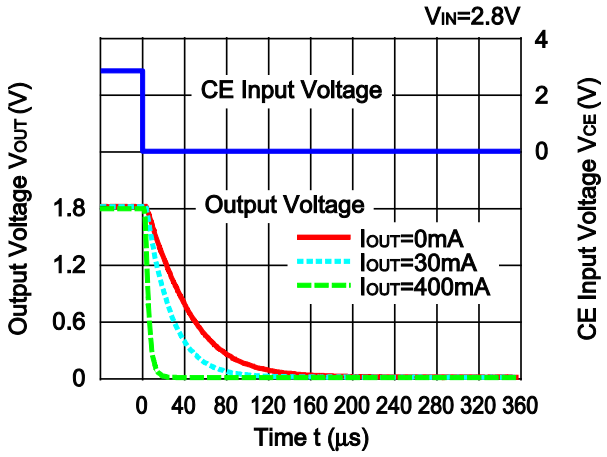
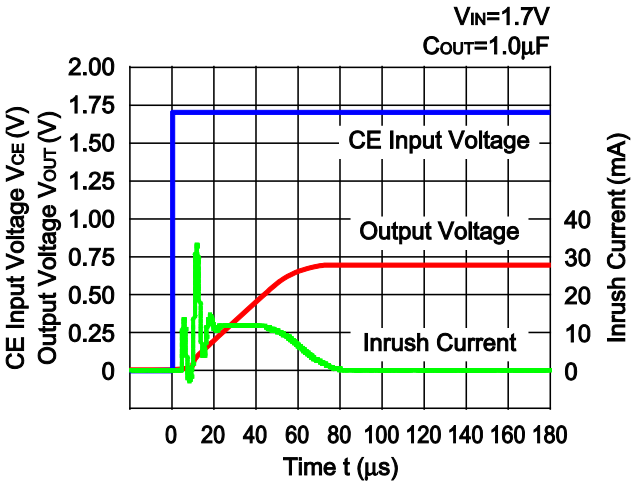


### 15) Inrush Current at Start up (C1=1.0µF, Topt=25°C)

**RP106x07xx**

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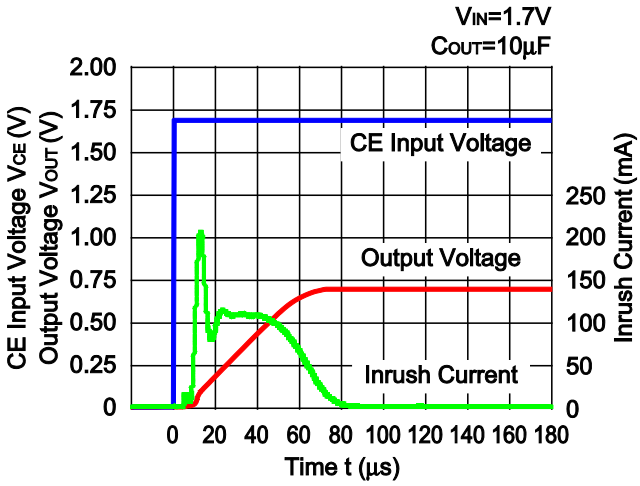


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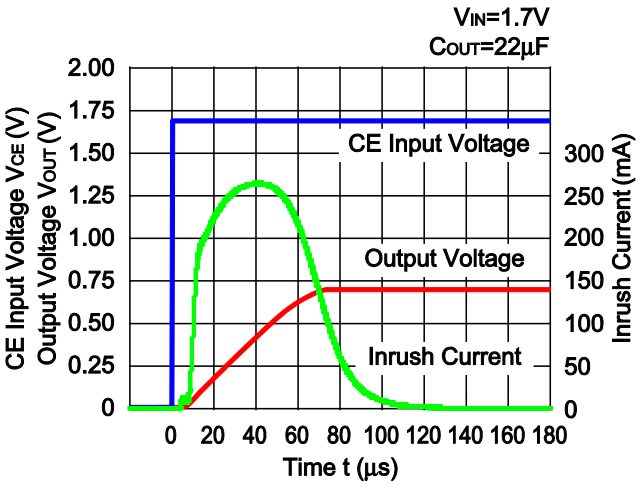


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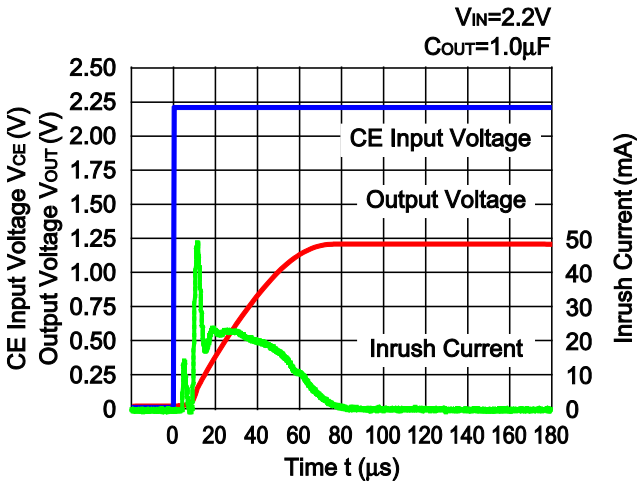


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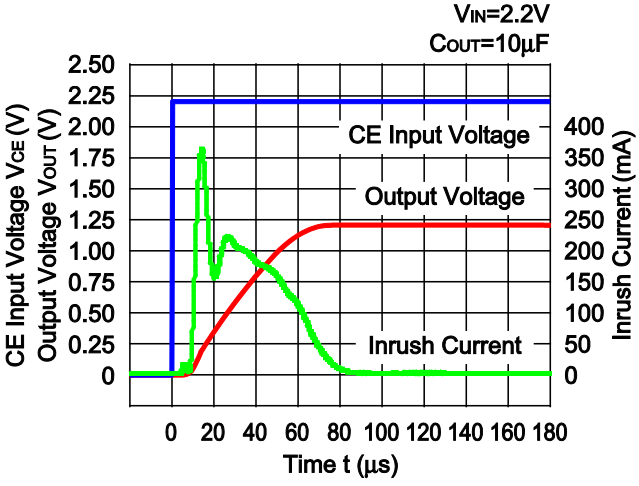


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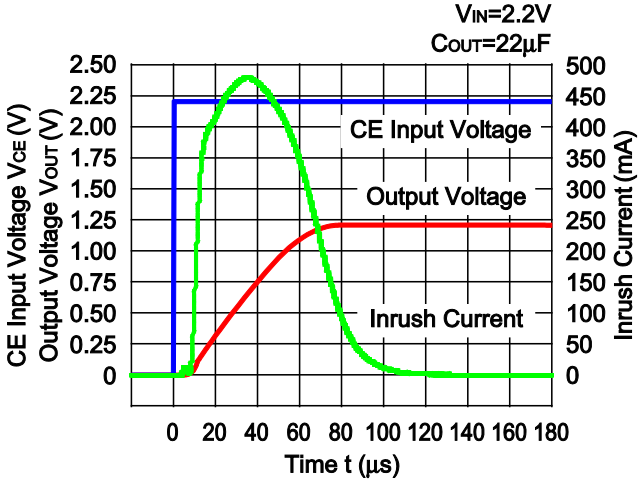

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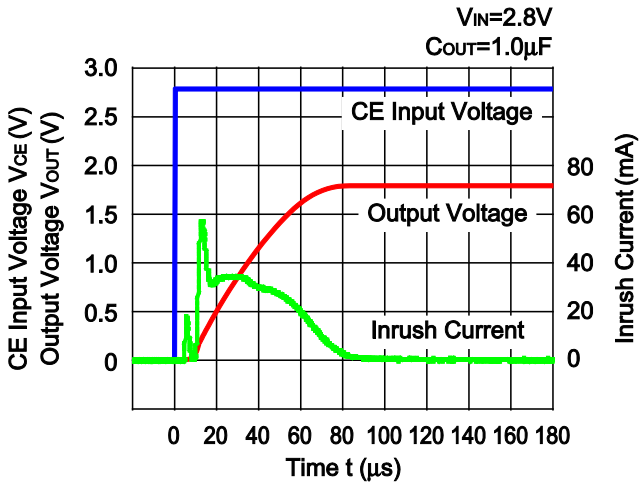


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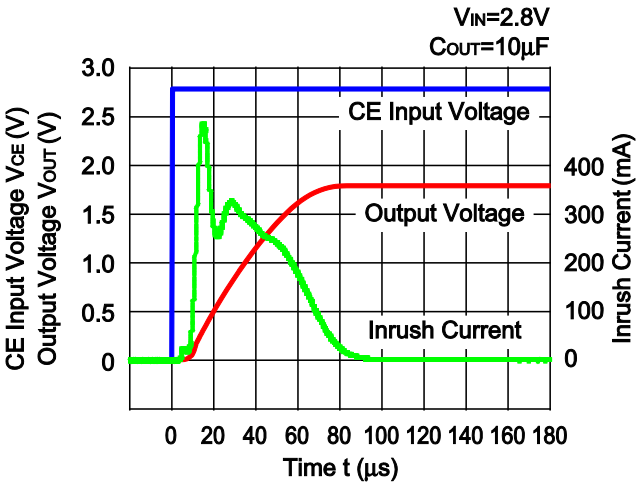


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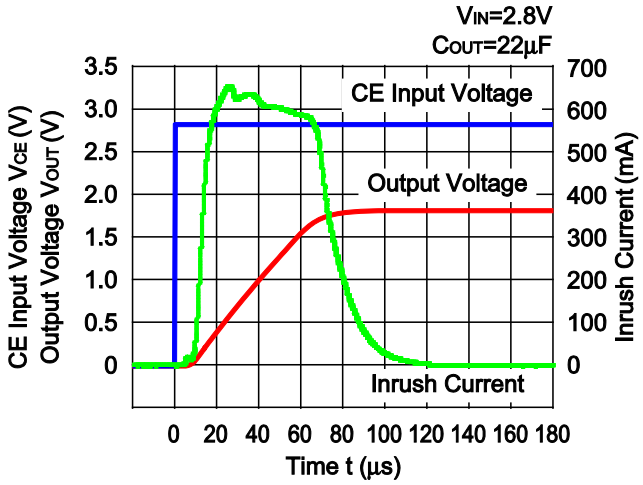


# ESR vs. Output Current

When using these ICs, consider the following points:

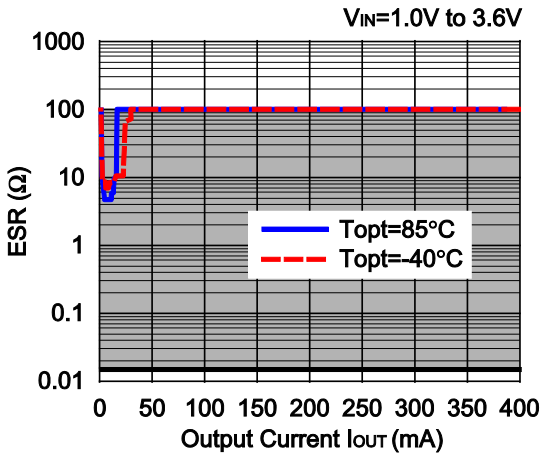
The relations between $I_{OUT}$ (Output Current) and ESR of an output capacitor are shown below.
The conditions when the white noise level is under 40μV (Avg.) are marked as the hatched area in the graph.

**Measurement conditions**

Frequency Band: 10Hz to 3MHz
Temperature : –40°C to 85°C
C1, C2 : 1.0μF MURATA GRM155B31A105KE15

If other than ceramic capacitors such as tantalum, the ESR of the capacitor might be higher than expected. This graph shows the stable area with ESR limit. In the actual evaluation, we used Murata GRM155B31A105KE15, therefore, bias characteristics of the same kind of ceramic capacitors are considered.

**RP106x07xx**

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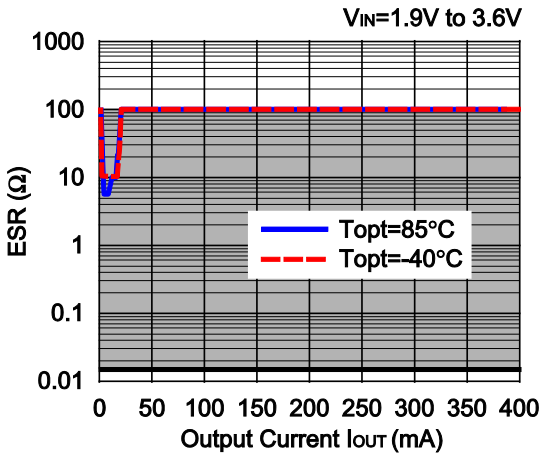

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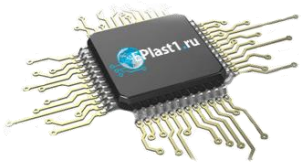


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