

LOW NOISE 150mA LDO REGULATOR

NO.EA-204-131023

OUTLINE

The RP109x Series are CMOS-based voltage regulator ICs with high output voltage accuracy, extremely low supply current, low ON-resistance, and high ripple rejection. Each of these ICs consists of a voltage reference unit, an error amplifier, a resistor-net for voltage setting, a current limit circuit and a chip enable circuit.

These ICs perform with low dropout voltage and a chip enable function which prolong the battery life.

The line transient response and load transient response of the RP109x Series are excellent, thus these ICs are very suitable for the power supply for hand-held communication equipment. RP109x Series contributes to the downsizing of the hand-held equipment because it can use the 0.1 μ F ceramic capacitor.

In addition to SOT-23-5, SC-88A and DFN1010-4 packages, a 0.8mm square ultra compact DFN(PLP)0808-4 package is also available.

FEATURES

- Supply Current Typ. 50 μ A
- Standby Mode Typ. 0.1 μ A
- Dropout Voltage..... Typ. 0.25V ($I_{OUT}=150\text{mA}$, $V_{OUT}=2.5\text{V}$)
- Ripple Rejection Typ. 75dB ($f=1\text{kHz}$, $V_{OUT}=2.5\text{V}$)
- Temperature-Drift Coefficient of Output Voltage Typ. $\pm 100\text{ppm}/^\circ\text{C}$ ($V_{OUT}<1.8\text{V}$)
Typ. $\pm 30\text{ppm}/^\circ\text{C}$ ($V_{OUT}\geq 1.8\text{V}$)
- Line Regulation Typ. 0.02%/V
- Output Voltage Accuracy $\pm 1.0\%$
- Packages..... DFN(PLP)0808-4, DFN1010-4, SC-88A, SOT-23-5
- Input Voltage Range..... 1.4V to 5.25V
- Output Voltage Range..... 0.8V to 3.6V (0.1V steps)
(For other voltages, please refer to MARK INFORMATION.)
- Built-in Fold Back Protection Circuit..... Typ. 40mA (Current at short mode)
- Ceramic capacitors are recommended to be used with this IC 0.1 μ F or more

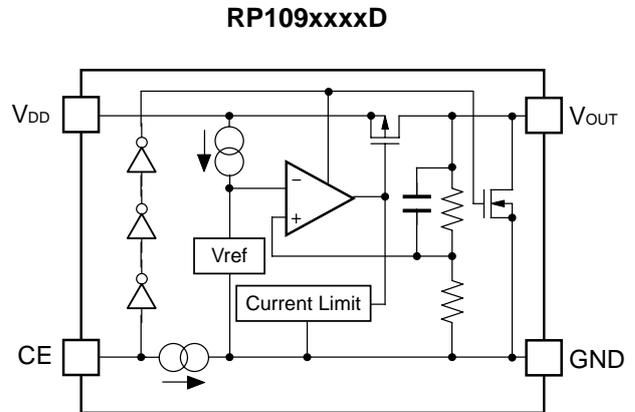
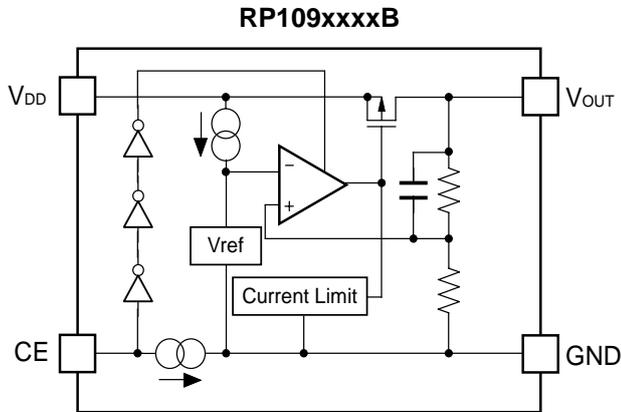
APPLICATIONS

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

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BLOCK DIAGRAMS



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 |
|------------------|----------------|-------------------|---------|--------------|
| RP109Kxx1*-TR | DFN(PLP)0808-4 | 10,000 pcs | Yes | Yes |
| RP109Lxx1*-TR | DFN1010-4 | 10,000 pcs | Yes | Yes |
| RP109Qxx2*-TR-FE | SC-88A | 3,000 pcs | Yes | Yes |
| RP109Nxx1*-TR-FE | SOT-23-5 | 3,000 pcs | Yes | Yes |

xx: Specify the set output voltage (V_{SET}) within the range of 0.8V to 3.6 in 0.1V steps.

The second decimal point of V_{SET} is described as below.

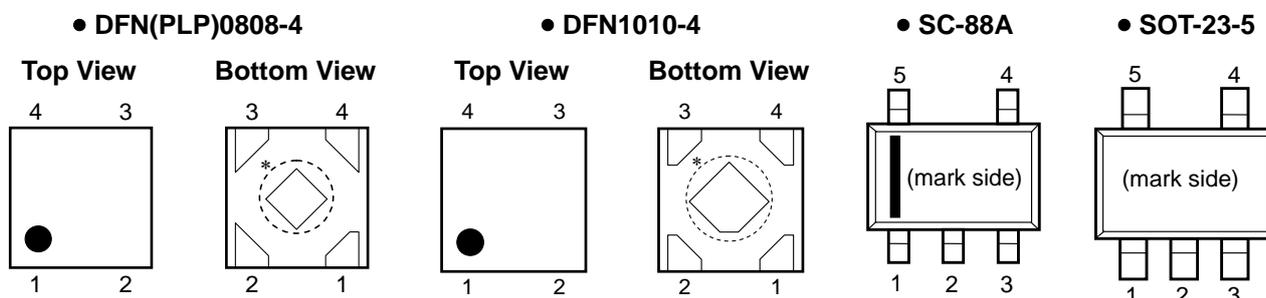
1.25V: RP109x12x*5

1.85V: RP109x18x*5

2.85V: RP109x28x*5

*: Select the polarity of the CE pin from (B) "H" active without auto-discharge function or (D) "H" active with auto-discharge function.

PIN CONFIGURATIONS



PIN DESCRIPTIONS

• DFN(PLP)0808-4 / DFN1010-4

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

*) Tab is GND level. (They are connected to the reverse side of this IC.)

The tab is better to be connected to the GND, but leaving it open is also acceptable.

• SC-88A

| Pin No | Symbol | Pin 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 | Pin 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 |

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ABSOLUTE MAXIMUM RATINGS

| Symbol | Item | Rating | Unit |
|-----------|-------------------------------------|----------------------|------|
| V_{IN} | Input Voltage | 6.0 | V |
| V_{CE} | Input Voltage (CE Pin) | -0.3 to 6.0 | V |
| V_{OUT} | Output Voltage | -0.3 to $V_{IN}+0.3$ | V |
| I_{OUT} | Output Current | 180 | mA |
| P_D | Power Dissipation* (DFN(PLP)0808-4) | 286 | mW |
| | Power Dissipation* (DFN1010-4) | 400 | |
| | Power Dissipation* (SC-88A) | 380 | |
| | Power Dissipation* (SOT-23-5) | 420 | |
| T_a | Operating Temperature Range | -40 to 85 | °C |
| T_{stg} | 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

● RP109xxxxB/D

$V_{IN}=V_{SET}+1.0V$ ($V_{OUT}>1.5$), $V_{IN}=2.5V$ ($V_{OUT}\leq 1.5V$), $I_{OUT}=1mA$, $C_{IN}=C_{OUT}=0.1\mu F$, unless otherwise noted.

The specifications surrounded by are guaranteed by Design Engineering at $-40^{\circ}C \leq T_a \leq 85^{\circ}C$.

RP109x Series

($T_a=25^{\circ}C$)

| Symbol | Item | Conditions | Min. | Typ. | Max. | Unit | | |
|---|---|---|---|---|--|-------------------|---|----|
| V_{OUT} | Output Voltage | $T_a = 25^{\circ}C$ | $V_{SET} \geq 1.8V$ | x 0.99 | | x 1.01 | V | |
| | | | $V_{SET} < 1.8V$ | | -18 | | +18 | mV |
| | | $-40^{\circ}C \leq T_a \leq 85^{\circ}C$ | $V_{SET} \geq 1.8V$ | x 0.985 | | | x 1.015 | V |
| | | | $V_{SET} < 1.8V$ | | -50 | | +50 | mV |
| I_{OUT} | Output Current | | 150 | | | mA | | |
| $\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$ | Load Regulation | $1mA \leq I_{OUT} \leq 150mA$ | | 5 | 30 | mV | | |
| V_{DIF} | Dropout Voltage | Please see <i>Dropout Voltage</i> on the next page. | | | | | | |
| I_{SS} | Supply Current | $I_{OUT} = 0mA$ | | 50 | 70 | μA | | |
| $I_{standby}$ | Supply Current (Standby Mode) | $V_{CE} = 0V$ | | 0.1 | 1.0 | μA | | |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN}}$ | Line Regulation | $V_{SET}+0.5V \leq V_{IN} \leq 5.25V$ $V_{IN} \geq 1.4V$ | | 0.02 | 0.10 | %/V | | |
| RR | Ripple Rejection | f = 1kHz Ripple 0.2Vp-p $V_{IN} = V_{SET} + 1.0V$ $I_{OUT} = 30mA$ | | 75 | | dB | | |
| V_{IN} | Input Voltage ^{*1} | | 1.4 | | 5.25 | V | | |
| $\frac{\Delta V_{OUT}}{\Delta T_a}$ | Output Voltage Temperature Coefficient | $-40^{\circ}C \leq T_a \leq 85^{\circ}C$ | $V_{SET} \geq 1.8V$ | | ± 30 | ppm / $^{\circ}C$ | | |
| | | | $V_{SET} < 1.8V$ | | ± 100 | | | |
| I_{SC} | Short Current Limit | $V_{OUT} = 0V$ | | 40 | | mA | | |
| I_{PD} | CE Pull-down Current | | | 0.3 | 0.6 | μA | | |
| V_{CEH} | CE Input Voltage "H" | | 1.0 | | | V | | |
| V_{CEL} | CE Input Voltage "L" | | | | 0.4 | V | | |
| en | Output Noise | BW = 10Hz to 100kHz | $V_{SET} \geq 1.8V$ | | 20 x V_{SET} | μV_{rms} | | |
| | | | $V_{SET} < 1.8V$ | | 40 x V_{SET} | | | |
| R_{LOW} | Nch On Resistance for Auto-discharge (D Version Only) | $V_{IN} = 4.0V$ $V_{CE} = 0V$ | | 60 | | Ω | | |

All test items listed under *Electrical Characteristics* are done under the pulse load condition ($T_j \approx T_a = 25^{\circ}C$) except Output Noise, Ripple Rejection, and Output Voltage Temperature Coefficient.

^{*1} Maximum input voltage is 5.25V. If, for any reason the input voltage exceeds 5.25V, it has to be no more than 5.5V, and total operating time should be within 500 hours.

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The specifications surrounded by are guaranteed by Design Engineering at $-40^{\circ}\text{C} \leq T_a \leq 85^{\circ}\text{C}$.

Dropout Voltage

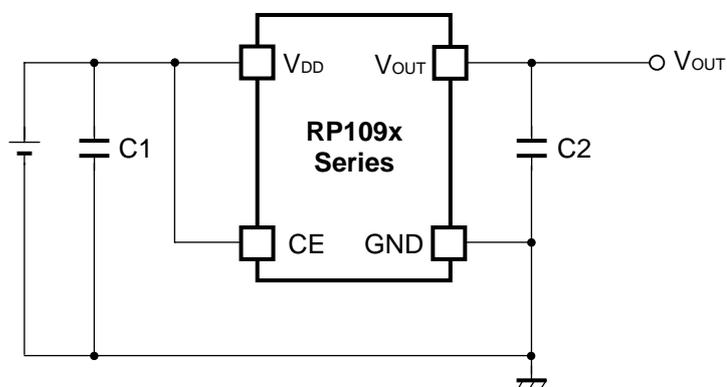
(Ta=25°C)

| Set Output Voltage V_{SET} (V) | Dropout Voltage V_{DIF} (V) | | |
|--|---|-------|-------|
| | Condition | Typ. | Max. |
| $V_{\text{SET}} = 0.8$ | $I_{\text{OUT}} = 150\text{mA}$ | 0.700 | 1.000 |
| $V_{\text{SET}} = 0.9$ | | 0.620 | 0.910 |
| $1.0 \leq V_{\text{SET}} < 1.2$ | | 0.560 | 0.820 |
| $1.2 \leq V_{\text{SET}} < 1.4$ | | 0.470 | 0.670 |
| $1.4 \leq V_{\text{SET}} < 1.8$ | | 0.390 | 0.540 |
| $1.8 \leq V_{\text{SET}} < 2.1$ | | 0.330 | 0.480 |
| $2.1 \leq V_{\text{SET}} < 2.5$ | | 0.280 | 0.400 |
| $2.5 \leq V_{\text{SET}} < 3.0$ | | 0.250 | 0.350 |
| $3.0 \leq V_{\text{SET}} \leq 3.6$ | | 0.230 | 0.320 |

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)

C2 0.1 μ F MURATA: GRM155B31C104KA87B

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 0.1 μ F or more and good ESR (Equivalent Series Resistance).

(Note: If additional ceramic capacitors are connected with parallel to the output pin with an output capacitor for phase compensation, the operation might be unstable. Because of this, test these ICs with as same external components as ones to be used on the PCB.)

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 0.1 μ F 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.

PACKAGE INFORMATION

• Power Dissipation (DFN (PLP) 0808-4)

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

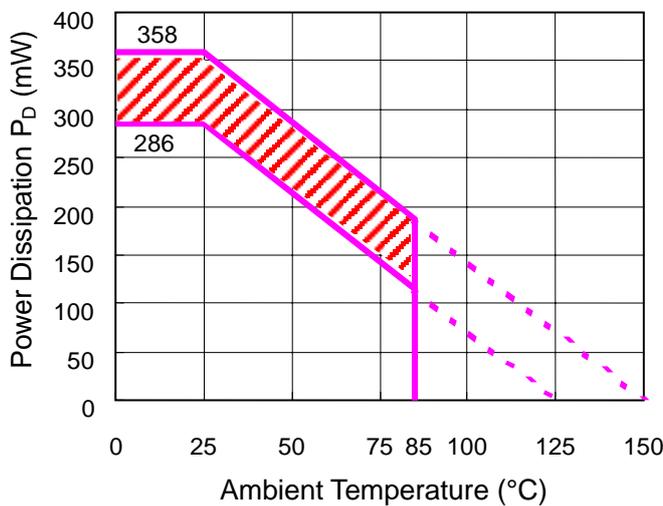
Measurement Conditions:

| | 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-holes | φ 0.5mm × 24pcs |

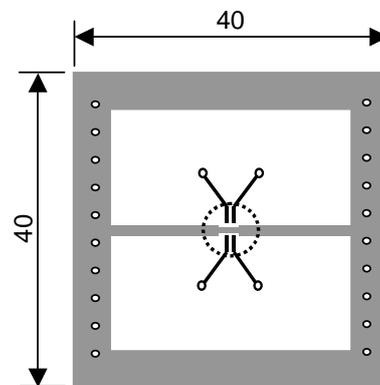
Measurement Results:

($T_a=25^\circ\text{C}$)

| | Standard Land Pattern |
|--------------------|--|
| Power Dissipation | 286mW ($T_{j\text{max}}=125^\circ\text{C}$) 358mW ($T_{j\text{max}}=150^\circ\text{C}$) |
| Thermal Resistance | $\theta_{ja} = (125-25^\circ\text{C})/0.286\text{W} = 350^\circ\text{C/W}$ |
| | $\theta_{jc} = 90^\circ\text{C/W}$ |



Power Dissipation



Measurement Board Pattern

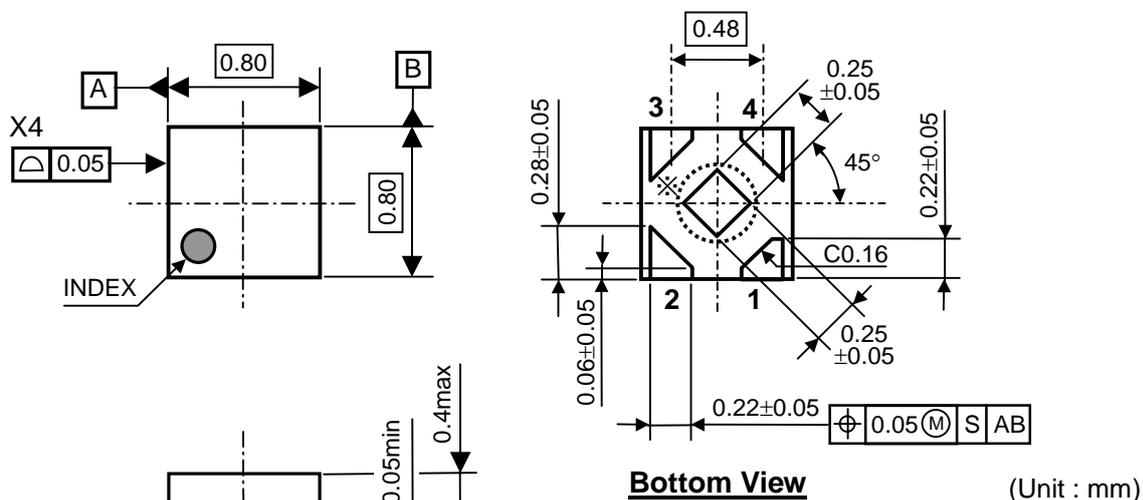
○ IC Mount Area (Unit: mm)

The above graph shows the Power Dissipation of the package under the conditions of $T_{j\text{max}}=125^\circ\text{C}$ and $T_{j\text{max}}=150^\circ\text{C}$.

The operation of the IC within the shaded range in the graph might have an affect on the IC's lifetime. The operation time of the IC must be remained within the time limit described in the table below.

| Operating Time | Estimated Years (Operating 4 hours/day) |
|----------------|--|
| 13,000 hours | 9 years |

• Package Dimensions (DFN (PLP) 0808-4)

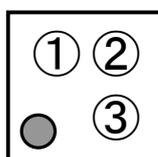


※) Tab is GND level. (They are connected to the reverse side of this IC.)
The tab is better to be connected to the GND, but leaving it open is also acceptable.

• Mark Specification (DFN (PLP) 0808-4)

①: Product Code ... Refer to “RP109K Series Mark Specification Table”.

②③: Lot Number ... Alphanumeric Serial Number



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• RP109K Series Mark Specification Table (DFN(PLP)0808-4)**RP109Kxx1B**

| Product Name | ① | V _{SET} |
|--------------|---|------------------|
| RP109K081B | A | 0.8V |
| RP109K091B | A | 0.9V |
| RP109K101B | A | 1.0V |
| RP109K111B | A | 1.1V |
| RP109K121B | A | 1.2V |
| RP109K131B | A | 1.3V |
| RP109K141B | A | 1.4V |
| RP109K151B | A | 1.5V |
| RP109K161B | A | 1.6V |
| RP109K171B | A | 1.7V |
| RP109K181B | A | 1.8V |
| RP109K191B | A | 1.9V |
| RP109K201B | A | 2.0V |
| RP109K211B | A | 2.1V |
| RP109K221B | A | 2.2V |
| RP109K231B | A | 2.3V |
| RP109K241B | A | 2.4V |
| RP109K251B | A | 2.5V |
| RP109K261B | A | 2.6V |
| RP109K271B | A | 2.7V |
| RP109K281B | A | 2.8V |
| RP109K291B | A | 2.9V |
| RP109K301B | A | 3.0V |
| RP109K311B | A | 3.1V |
| RP109K321B | A | 3.2V |
| RP109K331B | A | 3.3V |
| RP109K341B | A | 3.4V |
| RP109K351B | A | 3.5V |
| RP109K361B | A | 3.6V |
| RP109K121B5 | A | 1.25V |
| RP109K181B5 | A | 1.85V |
| RP109K281B5 | A | 2.85V |

RP109Kxx1D

| Product Name | ① | V _{SET} |
|--------------|---|------------------|
| RP109K081D | A | 0.8V |
| RP109K091D | A | 0.9V |
| RP109K101D | A | 1.0V |
| RP109K111D | A | 1.1V |
| RP109K121D | A | 1.2V |
| RP109K131D | A | 1.3V |
| RP109K141D | A | 1.4V |
| RP109K151D | A | 1.5V |
| RP109K161D | A | 1.6V |
| RP109K171D | A | 1.7V |
| RP109K181D | A | 1.8V |
| RP109K191D | A | 1.9V |
| RP109K201D | A | 2.0V |
| RP109K211D | A | 2.1V |
| RP109K221D | A | 2.2V |
| RP109K231D | A | 2.3V |
| RP109K241D | A | 2.4V |
| RP109K251D | A | 2.5V |
| RP109K261D | A | 2.6V |
| RP109K271D | A | 2.7V |
| RP109K281D | A | 2.8V |
| RP109K291D | A | 2.9V |
| RP109K301D | A | 3.0V |
| RP109K311D | A | 3.1V |
| RP109K321D | A | 3.2V |
| RP109K331D | A | 3.3V |
| RP109K341D | A | 3.4V |
| RP109K351D | A | 3.5V |
| RP109K361D | A | 3.6V |
| RP109K121D5 | A | 1.25V |
| RP109K181D5 | A | 1.85V |
| RP109K281D5 | A | 2.85V |

● **Power Dissipation (DFN1010-4)**

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

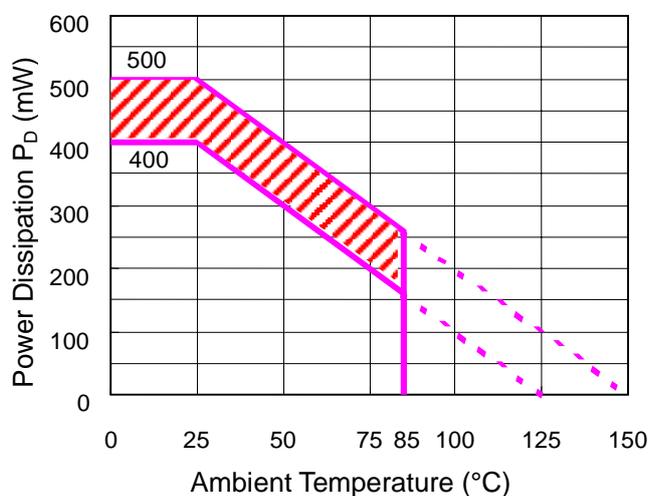
Measurement Conditions:

| | 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-holes | φ 0.54mm × 24pcs |

Measurement Results:

($T_a=25^{\circ}\text{C}$)

| | Standard Land Pattern |
|--------------------|--|
| Power Dissipation | 400mW ($T_{jmax}=125^{\circ}\text{C}$) 500mW ($T_{jmax}=150^{\circ}\text{C}$) |
| Thermal Resistance | $\theta_{ja} = (125-25^{\circ}\text{C})/0.4\text{W} = 250^{\circ}\text{C/W}$ $\theta_{jc} = 67^{\circ}\text{C/W}$ |

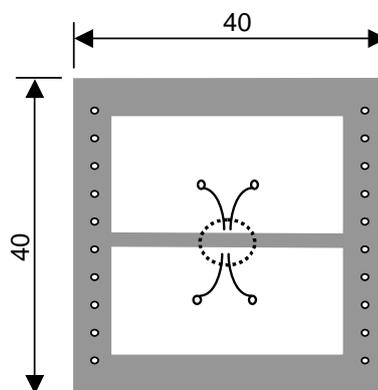


Power Dissipation

The above graph shows the Power Dissipation of the package under the conditions of $T_{jmax}=125^{\circ}\text{C}$ and $T_{jmax}=150^{\circ}\text{C}$.

The operation of the IC within the shaded range in the graph might have an affect on the IC's lifetime. The operation time of the IC must be remained within the time limit described in the table below.

| Operating Time | Estimated Years (Operating 4 hours/day) |
|-----------------------|--|
| 13,000 hours | 9 years |



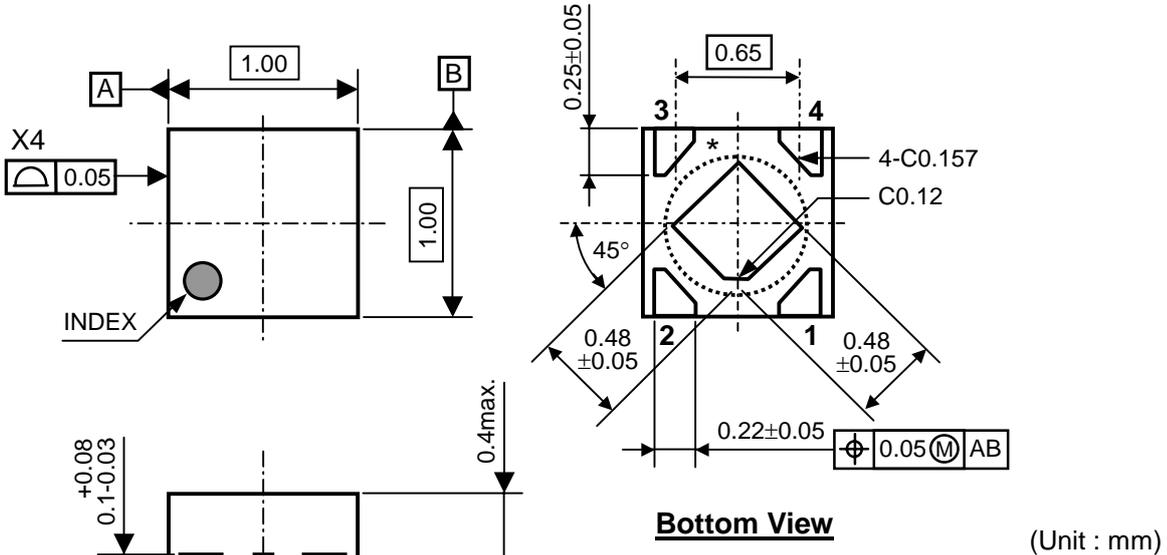
Measurement Board Pattern

○ IC Mount Area (Unit: mm)

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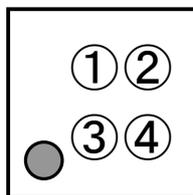
• **Package Dimensions (DFN1010-4)**



*) Tab is GND level. (They are connected to the reverse side of this IC.)
The tab is better to be connected to the GND, but leaving it open is also acceptable.

• **Mark Specification (DFN1010-4)**

- ①②: Product Code ... Refer to "RP109L Series Mark Specification Table".
- ③④: Lot Number ... Alphanumeric Serial Number



● RP109L Series Mark Specification Table (DFN1010-4)

RP109Lxx1B

| Product Name | ①② | V _{SET} |
|--------------|----|------------------|
| RP109L081B | C0 | 0.8V |
| RP109L091B | C1 | 0.9V |
| RP109L101B | C2 | 1.0V |
| RP109L111B | C3 | 1.1V |
| RP109L121B | C4 | 1.2V |
| RP109L131B | C5 | 1.3V |
| RP109L141B | C6 | 1.4V |
| RP109L151B | C7 | 1.5V |
| RP109L161B | C8 | 1.6V |
| RP109L171B | C9 | 1.7V |
| RP109L181B | D0 | 1.8V |
| RP109L191B | D1 | 1.9V |
| RP109L201B | D2 | 2.0V |
| RP109L211B | D3 | 2.1V |
| RP109L221B | D4 | 2.2V |
| RP109L231B | D5 | 2.3V |
| RP109L241B | D6 | 2.4V |
| RP109L251B | D7 | 2.5V |
| RP109L261B | D8 | 2.6V |
| RP109L271B | D9 | 2.7V |
| RP109L281B | E0 | 2.8V |
| RP109L291B | E1 | 2.9V |
| RP109L301B | E2 | 3.0V |
| RP109L311B | E3 | 3.1V |
| RP109L321B | E4 | 3.2V |
| RP109L331B | E5 | 3.3V |
| RP109L341B | E6 | 3.4V |
| RP109L351B | E7 | 3.5V |
| RP109L361B | E8 | 3.6V |
| RP109L121B5 | E9 | 1.25V |
| RP109L181B5 | J0 | 1.85V |
| RP109L281B5 | J1 | 2.85V |

RP109Lxx1D

| Product Name | ①② | V _{SET} |
|--------------|----|------------------|
| RP109L081D | F0 | 0.8V |
| RP109L091D | F1 | 0.9V |
| RP109L101D | F2 | 1.0V |
| RP109L111D | F3 | 1.1V |
| RP109L121D | F4 | 1.2V |
| RP109L131D | F5 | 1.3V |
| RP109L141D | F6 | 1.4V |
| RP109L151D | F7 | 1.5V |
| RP109L161D | F8 | 1.6V |
| RP109L171D | F9 | 1.7V |
| RP109L181D | G0 | 1.8V |
| RP109L191D | G1 | 1.9V |
| RP109L201D | G2 | 2.0V |
| RP109L211D | G3 | 2.1V |
| RP109L221D | G4 | 2.2V |
| RP109L231D | G5 | 2.3V |
| RP109L241D | G6 | 2.4V |
| RP109L251D | G7 | 2.5V |
| RP109L261D | G8 | 2.6V |
| RP109L271D | G9 | 2.7V |
| RP109L281D | H0 | 2.8V |
| RP109L291D | H1 | 2.9V |
| RP109L301D | H2 | 3.0V |
| RP109L311D | H3 | 3.1V |
| RP109L321D | H4 | 3.2V |
| RP109L331D | H5 | 3.3V |
| RP109L341D | H6 | 3.4V |
| RP109L351D | H7 | 3.5V |
| RP109L361D | H8 | 3.6V |
| RP109L121D5 | H9 | 1.25V |
| RP109L181D5 | K0 | 1.85V |
| RP109L281D5 | K1 | 2.85V |

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• 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:

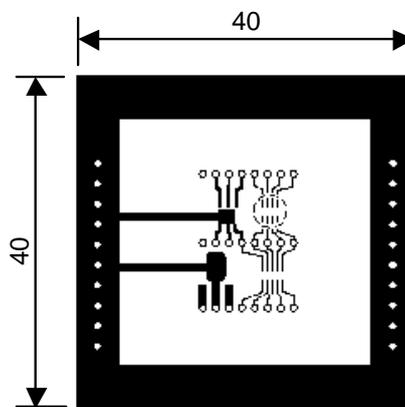
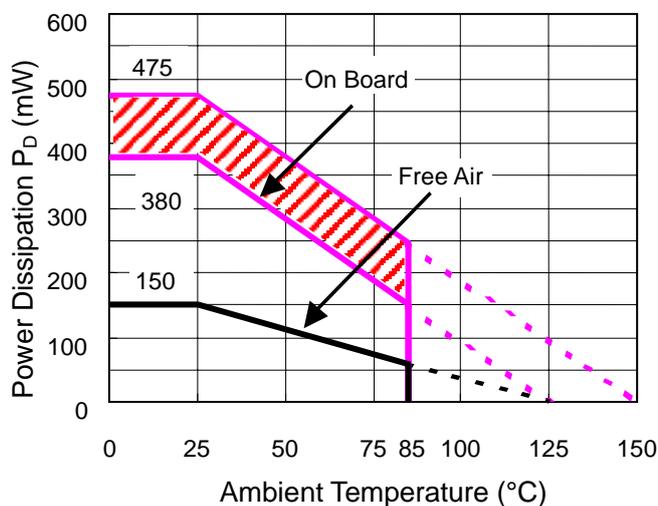
Measurement Conditions:

| | 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 Results:

($T_a=25^\circ\text{C}$)

| | Standard Land Pattern | Free Air |
|--------------------|---|--|
| Power Dissipation | 380mW ($T_{j\max}=125^\circ\text{C}$) 475mW ($T_{j\max}=150^\circ\text{C}$) | 150mW |
| Thermal Resistance | $\theta_{ja}=(125-25^\circ\text{C})/0.38\text{W}=263^\circ\text{C/W}$ $\theta_{jc}=75^\circ\text{C/W}$ | $\theta_{ja}=(125-25^\circ\text{C})/0.15\text{W}=667^\circ\text{C/W}$ - |



Measurement Board Pattern

⊙ IC Mount Area (Unit: mm)

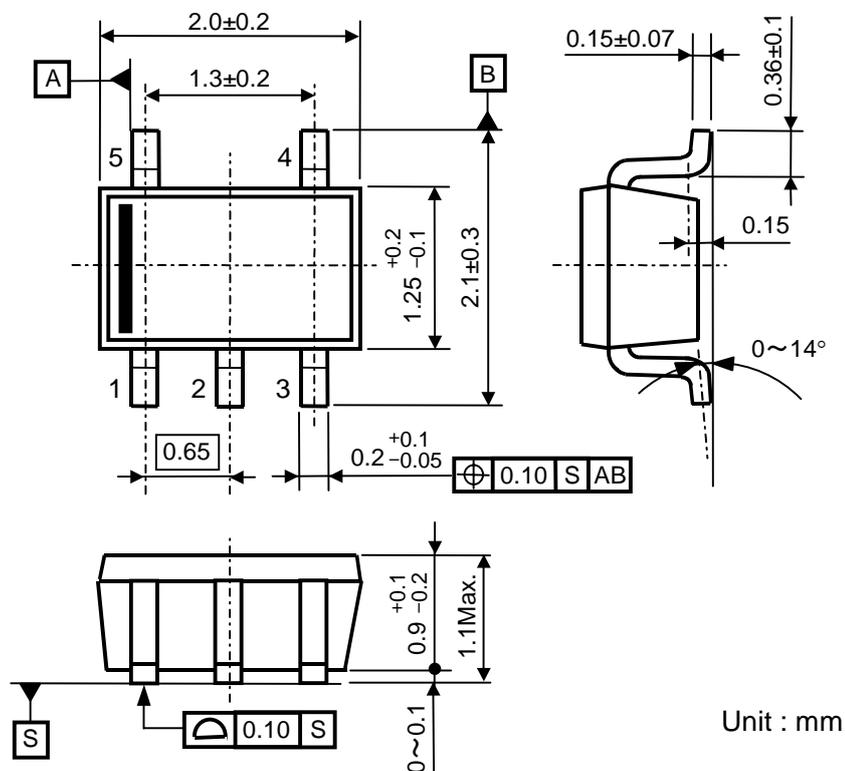
Power Dissipation

The above graph shows the Power Dissipation of the package under the conditions of $T_{j\max}=125^\circ\text{C}$ and $T_{j\max}=150^\circ\text{C}$.

The operation of the IC within the shaded range in the graph might have an affect on the IC's lifetime. The operation time of the IC must be remained within the time limit described in the table below.

| Operating Time | Estimated Years (Operating 4 hours/day) |
|----------------|--|
| 13,000 hours | 9 years |

● Package Dimensions (SC-88A)

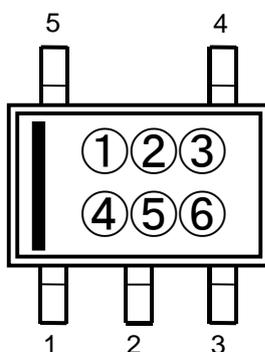


Unit : mm

● Mark Specification (SC-88A)

①②③④: Product Code ... Refer to "RP109Q Series Mark Specification Table".

⑤⑥: Lot Number ... Alphanumeric Serial Number



RP109x

NO.EA-204-131023

● **RP109Q Series Mark Specification Table (SC-88A)****RP109Qxx2B**

| Product Name | ①②③④ | V _{SET} |
|--------------|-------------|------------------|
| RP109Q082B | AE08 | 0.8V |
| RP109Q092B | AE09 | 0.9V |
| RP109Q102B | AE10 | 1.0V |
| RP109Q112B | AE11 | 1.1V |
| RP109Q122B | AE12 | 1.2V |
| RP109Q132B | AE13 | 1.3V |
| RP109Q142B | AE14 | 1.4V |
| RP109Q152B | AE15 | 1.5V |
| RP109Q162B | AE16 | 1.6V |
| RP109Q172B | AE17 | 1.7V |
| RP109Q182B | AE18 | 1.8V |
| RP109Q192B | AE19 | 1.9V |
| RP109Q201B | AE20 | 2.0V |
| RP109Q212B | AE21 | 2.1V |
| RP109Q222B | AE22 | 2.2V |
| RP109Q232B | AE23 | 2.3V |
| RP109Q242B | AE24 | 2.4V |
| RP109Q252B | AE25 | 2.5V |
| RP109Q262B | AE26 | 2.6V |
| RP109Q272B | AE27 | 2.7V |
| RP109Q282B | AE28 | 2.8V |
| RP109Q292B | AE29 | 2.9V |
| RP109Q302B | AE30 | 3.0V |
| RP109Q312B | AE31 | 3.1V |
| RP109Q322B | AE32 | 3.2V |
| RP109Q332B | AE33 | 3.3V |
| RP109Q342B | AE34 | 3.4V |
| RP109Q352B | AE35 | 3.5V |
| RP109Q362B | AE36 | 3.6V |
| RP109Q122B5 | AE37 | 1.25V |
| RP109Q182B5 | AE38 | 1.85V |
| RP109Q282B5 | AE39 | 2.85V |

RP109Qxx2D

| Product Name | ①②③④ | V _{SET} |
|--------------|-------------|------------------|
| RP109Q082D | AF08 | 0.8V |
| RP109Q092D | AF09 | 0.9V |
| RP109Q102D | AF10 | 1.0V |
| RP109Q112D | AF11 | 1.1V |
| RP109Q122D | AF12 | 1.2V |
| RP109Q132D | AF13 | 1.3V |
| RP109Q142D | AF14 | 1.4V |
| RP109Q152D | AF15 | 1.5V |
| RP109Q162D | AF16 | 1.6V |
| RP109Q172D | AF17 | 1.7V |
| RP109Q182D | AF18 | 1.8V |
| RP109Q192D | AF19 | 1.9V |
| RP109Q202D | AF20 | 2.0V |
| RP109Q212D | AF21 | 2.1V |
| RP109Q222D | AF22 | 2.2V |
| RP109Q232D | AF23 | 2.3V |
| RP109Q242D | AF24 | 2.4V |
| RP109Q252D | AF25 | 2.5V |
| RP109Q262D | AF26 | 2.6V |
| RP109Q272D | AF27 | 2.7V |
| RP109Q282D | AF28 | 2.8V |
| RP109Q292D | AF29 | 2.9V |
| RP109Q302D | AF30 | 3.0V |
| RP109Q312D | AF31 | 3.1V |
| RP109Q322D | AF32 | 3.2V |
| RP109Q332D | AF33 | 3.3V |
| RP109Q342D | AF34 | 3.4V |
| RP109Q352D | AF35 | 3.5V |
| RP109Q362D | AF36 | 3.6V |
| RP109Q122D5 | AF37 | 1.25V |
| RP109Q182D5 | AF38 | 1.85V |
| RP109Q282D5 | AF39 | 2.85V |

● **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.)

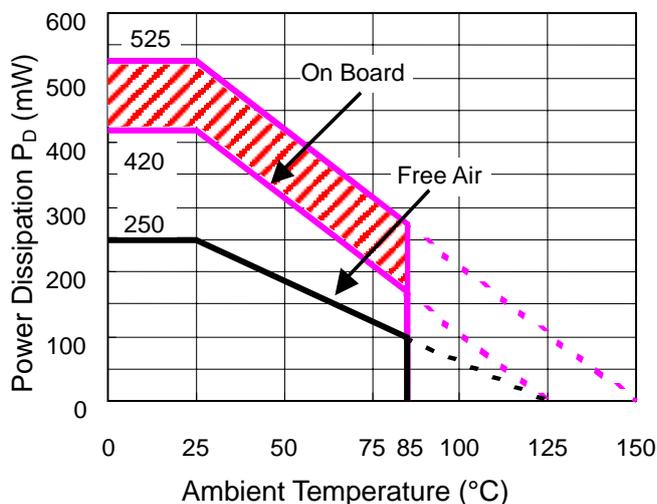
Measurement Conditions:

| | Standard 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 |

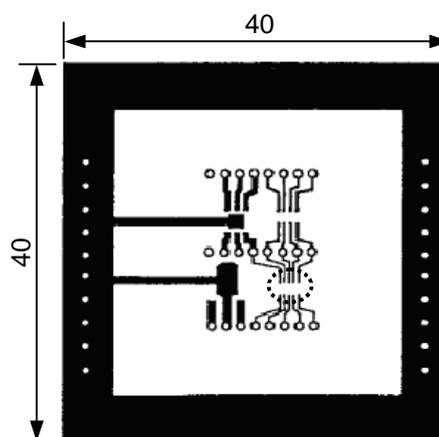
Measurement Results:

($T_a=25^\circ\text{C}$)

| | Standard Land Pattern | Free Air |
|--------------------|--|------------------------|
| Power Dissipation | 420mW ($T_{jmax}=125^\circ\text{C}$) 525mW ($T_{jmax}=150^\circ\text{C}$) | 250mW |
| Thermal Resistance | $\theta_{ja} = (125-25^\circ\text{C})/0.42\text{W} = 238^\circ\text{C/W}$ | 400 $^\circ\text{C/W}$ |



Power Dissipation



Measurement Board Pattern

○ IC Mount Area (Unit: mm)

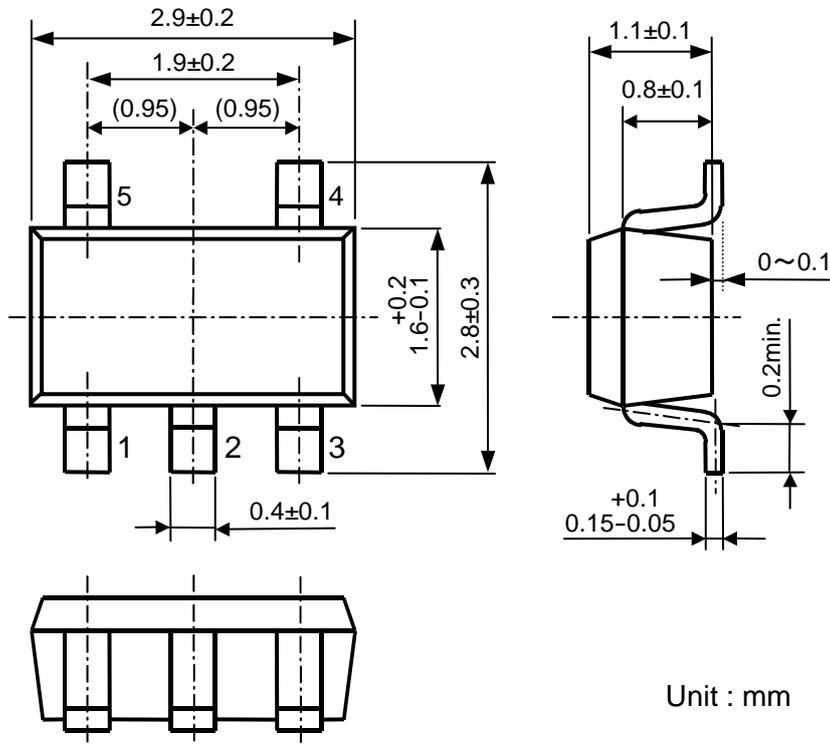
The above graph shows the Power Dissipation of the package under the conditions of $T_{jmax}=125^\circ\text{C}$ and $T_{jmax}=150^\circ\text{C}$.

The operation of the IC within the shaded range in the graph might have an affect on the IC's lifetime. The operation time of the IC must be remained within the time limit described in the table below.

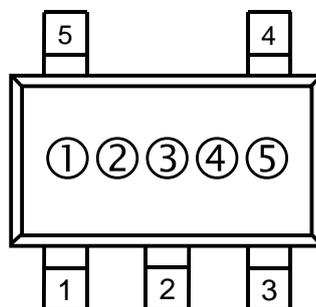
| Operating Time | Estimated Years (Operating 4 hours/day) |
|-----------------------|--|
| 13,000 hours | 9 years |

RP109x

NO.EA-204-131023

• Package Dimensions (SOT-23-5)**• Mark Specification (SOT-23-5)**①②③: Product Code ... Refer to "RP109N Mark Specification Table".

④⑤: Lot Number ... Alphanumeric Serial Number



● RP109N Series Mark Specification Table (SOT-23-5)

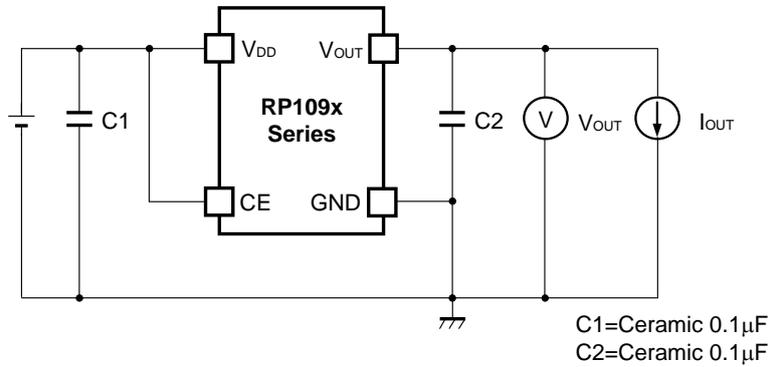
RP109Nxx1B

| Product Name | ①②③ | V _{SET} |
|--------------|------------|------------------|
| RP109N081B | NAA | 0.8V |
| RP109N091B | NAB | 0.9V |
| RP109N101B | NAC | 1.0V |
| RP109N111B | NAD | 1.1V |
| RP109N121B | NAE | 1.2V |
| RP109N131B | NAF | 1.3V |
| RP109N141B | NAG | 1.4V |
| RP109N151B | NAH | 1.5V |
| RP109N161B | NAJ | 1.6V |
| RP109N171B | NAK | 1.7V |
| RP109N181B | NAL | 1.8V |
| RP109N191B | NAM | 1.9V |
| RP109N201B | NAN | 2.0V |
| RP109N211B | NAP | 2.1V |
| RP109N221B | NAQ | 2.2V |
| RP109N231B | NAR | 2.3V |
| RP109N241B | NAS | 2.4V |
| RP109N251B | NAT | 2.5V |
| RP109N261B | NAU | 2.6V |
| RP109N271B | NAV | 2.7V |
| RP109N281B | NAW | 2.8V |
| RP109N291B | NAX | 2.9V |
| RP109N301B | NAY | 3.0V |
| RP109N311B | NAZ | 3.1V |
| RP109N321B | PAA | 3.2V |
| RP109N331B | PAB | 3.3V |
| RP109N341B | PAC | 3.4V |
| RP109N351B | PAD | 3.5V |
| RP109N361B | PAE | 3.6V |
| RP109N121B5 | PAF | 1.25V |
| RP109N181B5 | PAG | 1.85V |
| RP109N281B5 | PAH | 2.85V |

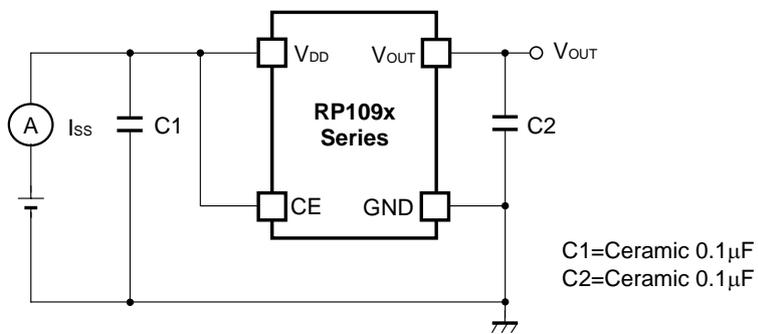
RP109Nxx1D

| Product Name | ①②③ | V _{SET} |
|--------------|------------|------------------|
| RP109N081D | NBA | 0.8V |
| RP109N091D | NBB | 0.9V |
| RP109N101D | NBC | 1.0V |
| RP109N111D | NBD | 1.1V |
| RP109N121D | NBE | 1.2V |
| RP109N131D | NBF | 1.3V |
| RP109N141D | NBG | 1.4V |
| RP109N151D | NBH | 1.5V |
| RP109N161D | NBJ | 1.6V |
| RP109N171D | NBK | 1.7V |
| RP109N181D | NBL | 1.8V |
| RP109N191D | NBM | 1.9V |
| RP109N201D | NBN | 2.0V |
| RP109N211D | NBP | 2.1V |
| RP109N221D | NBQ | 2.2V |
| RP109N231D | NBR | 2.3V |
| RP109N241D | NBS | 2.4V |
| RP109N251D | NBT | 2.5V |
| RP109N261D | NBU | 2.6V |
| RP109N271D | NBV | 2.7V |
| RP109N281D | NBW | 2.8V |
| RP109N291D | NBX | 2.9V |
| RP109N301D | NBY | 3.0V |
| RP109N311D | NBZ | 3.1V |
| RP109N321D | PBA | 3.2V |
| RP109N331D | PBB | 3.3V |
| RP109N341D | PBC | 3.4V |
| RP109N351D | PBD | 3.5V |
| RP109N361D | PBE | 3.6V |
| RP109N121D5 | PBF | 1.25V |
| RP109N181D5 | PBG | 1.85V |
| RP109N281D5 | PBH | 2.85V |

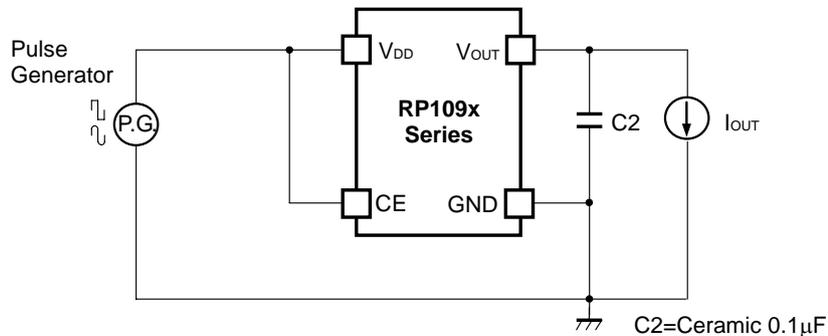
TEST CIRCUITS



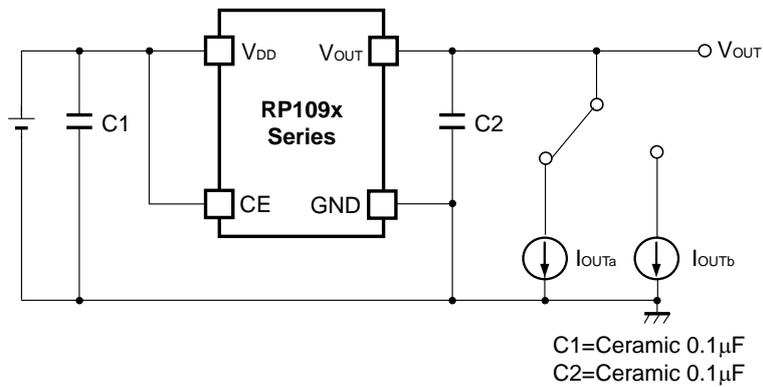
Basic Test Circuit



Test Circuit for Supply Current



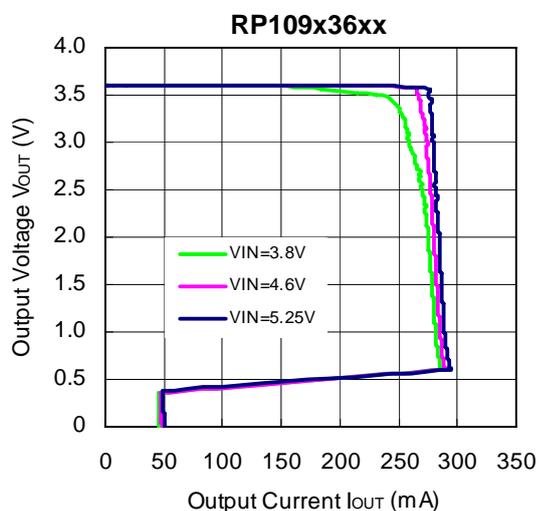
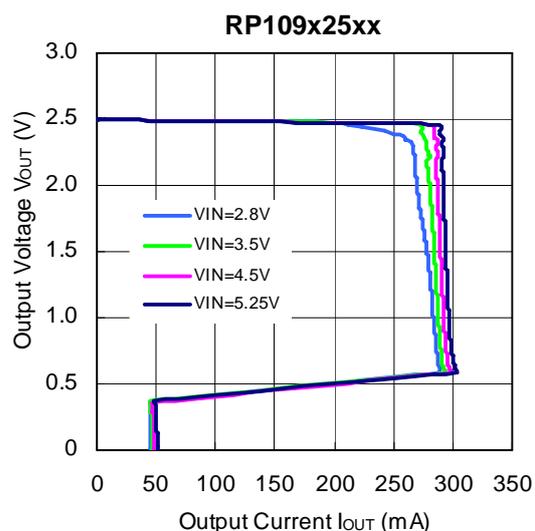
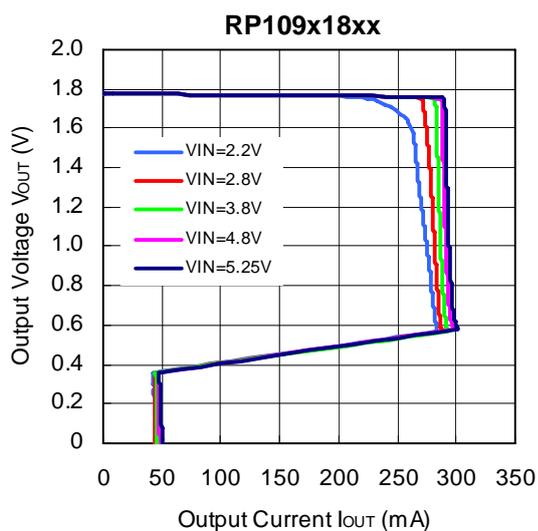
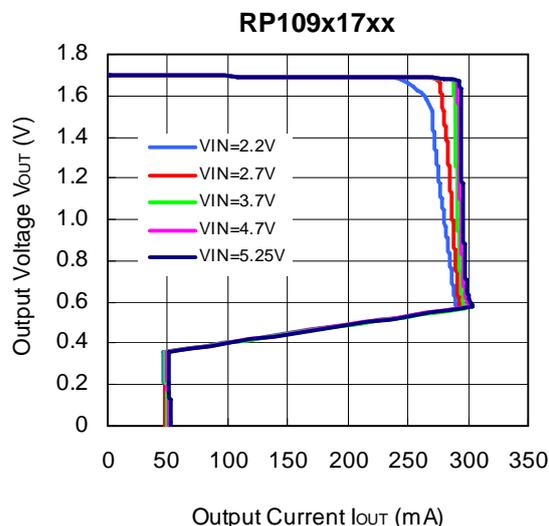
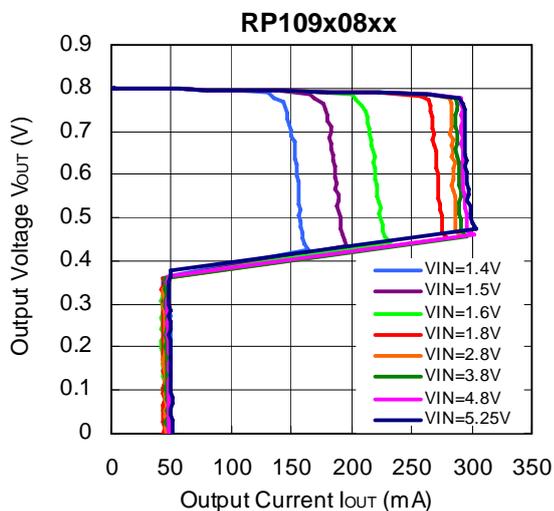
Test Circuit for Ripple Rejection



Test Circuit for Load Transient Response

TYPICAL CHARACTERISTICS

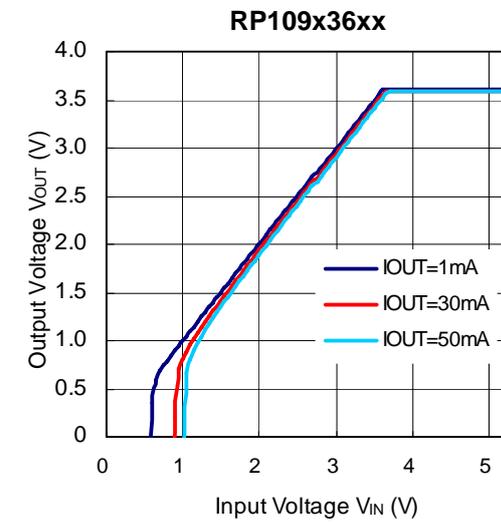
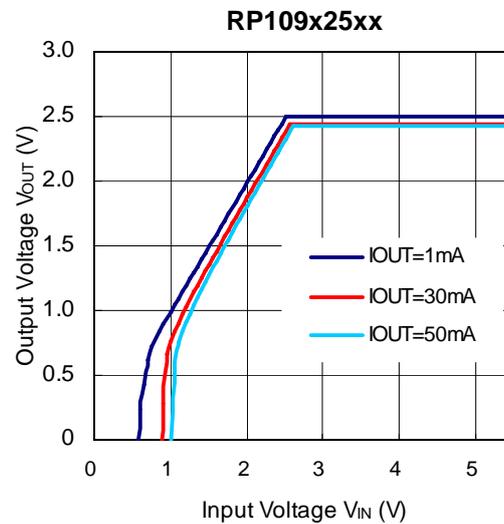
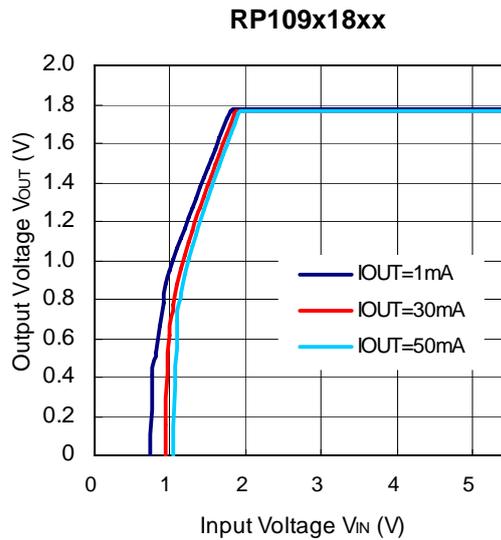
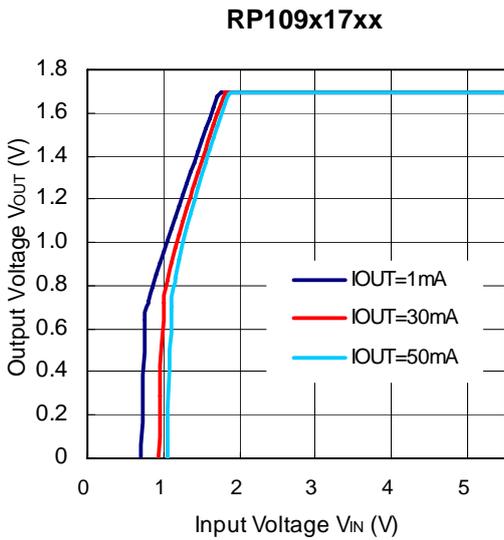
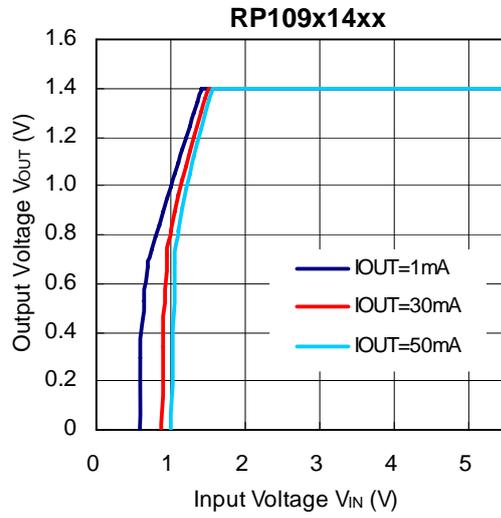
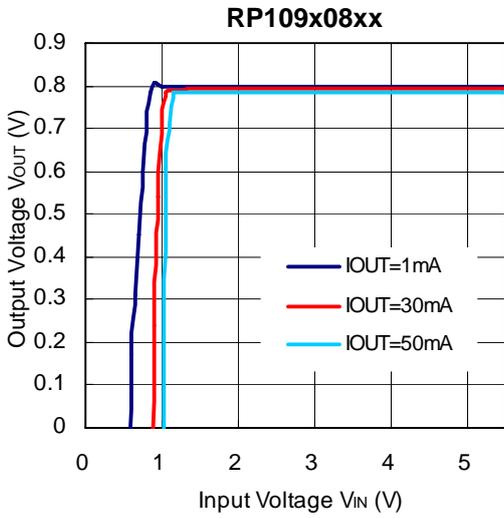
1) Output Voltage vs. Output Current (C1=0.1μF, C2=0.1μF, T_{opt}=25°C)



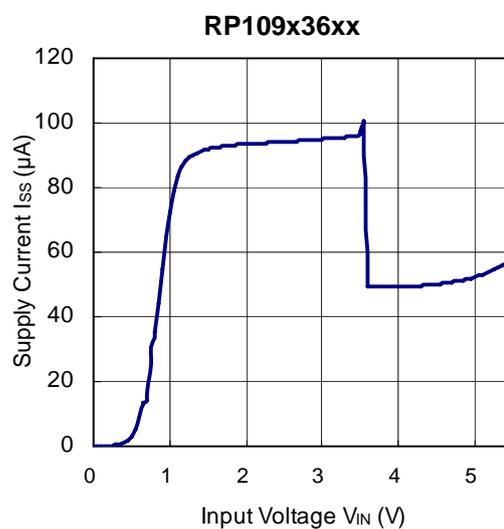
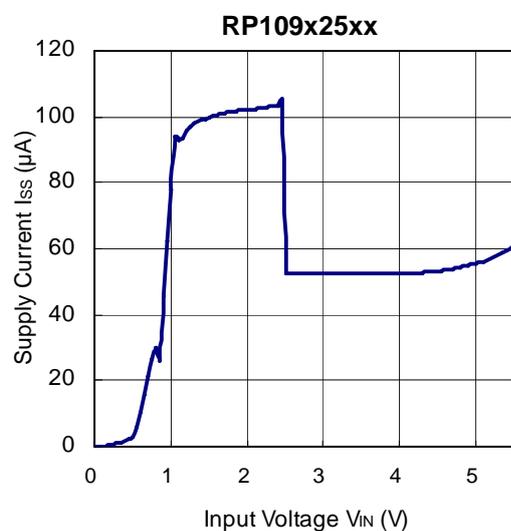
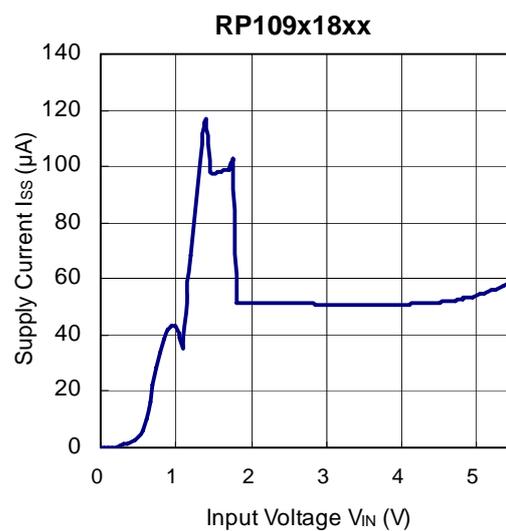
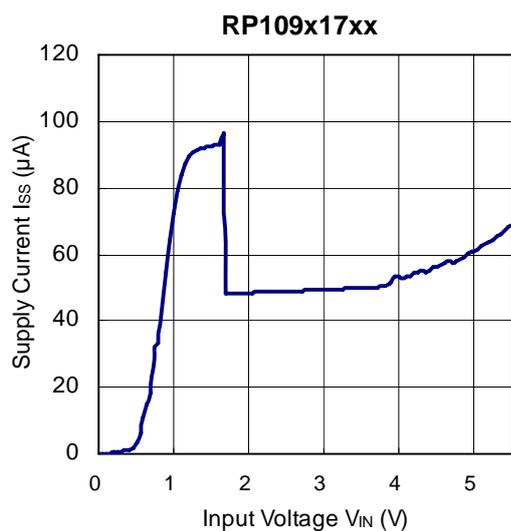
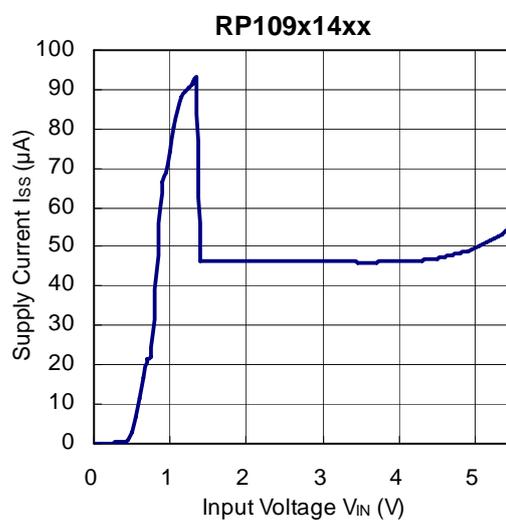
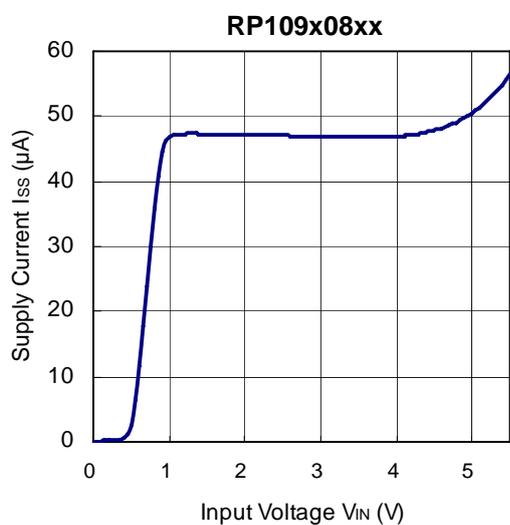
RP109x

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2) Output Voltage vs. Input Voltage ($C1=0.1\mu\text{F}$, $C2=0.1\mu\text{F}$, $T_{opt}=25^\circ\text{C}$)



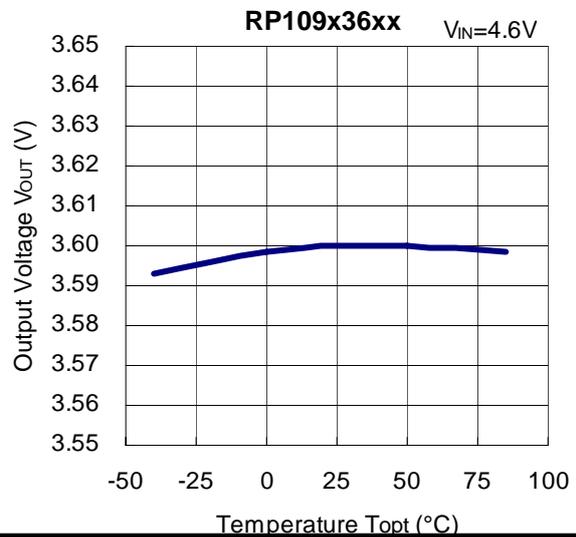
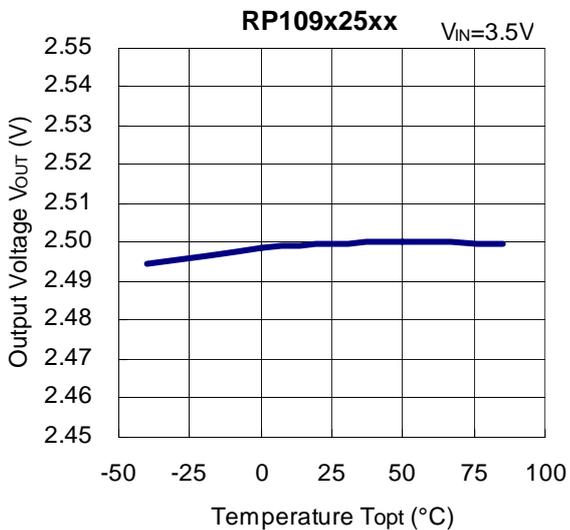
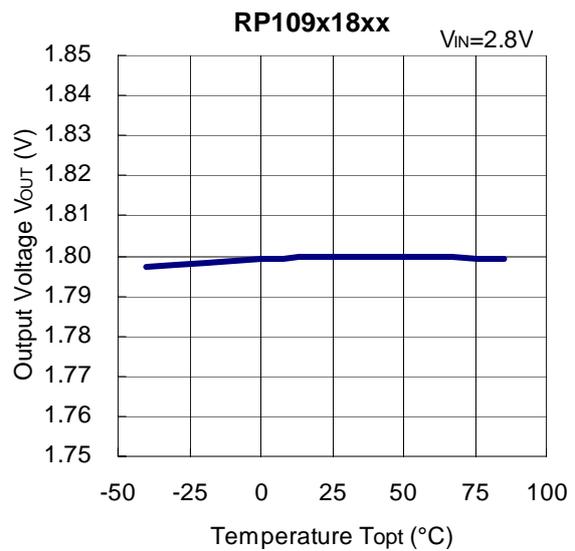
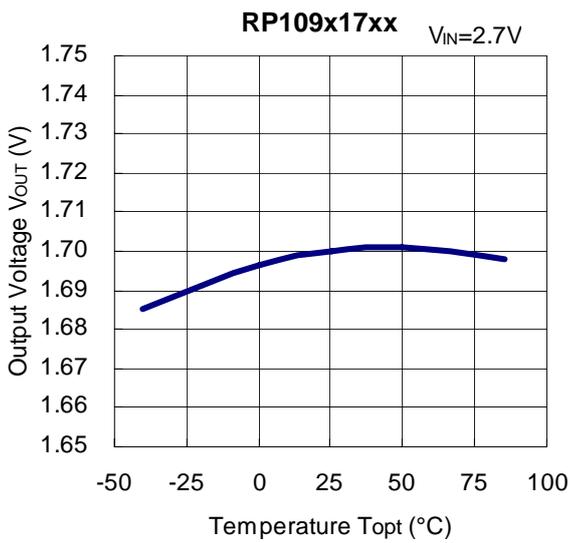
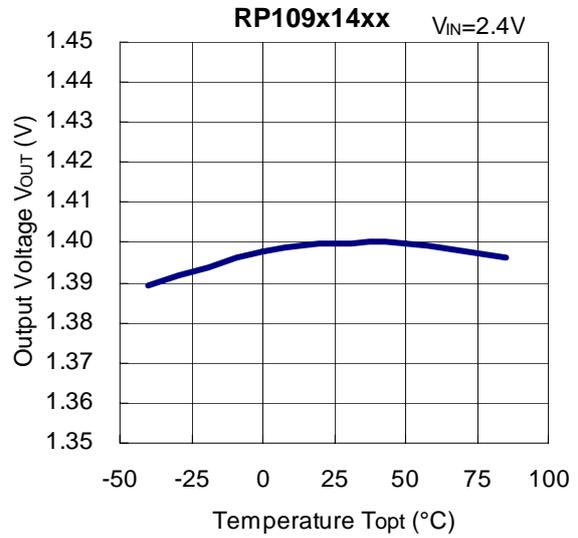
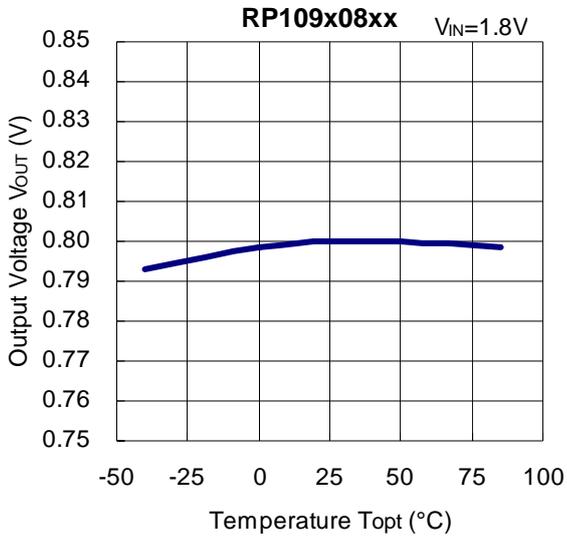
3) Supply Current vs. Input Voltage (C1=0.1μF, C2=0.1μF, T_{opt}=25°C)



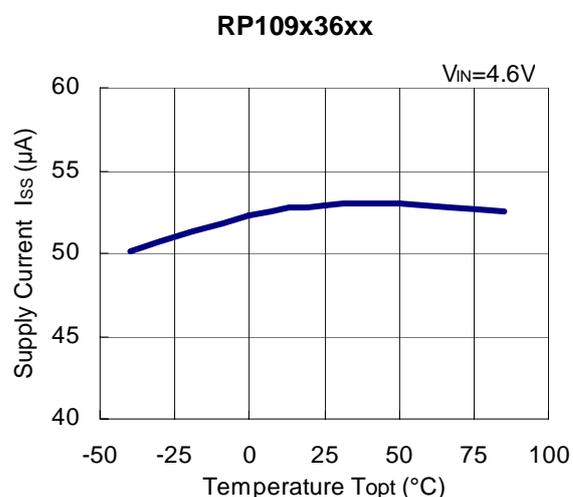
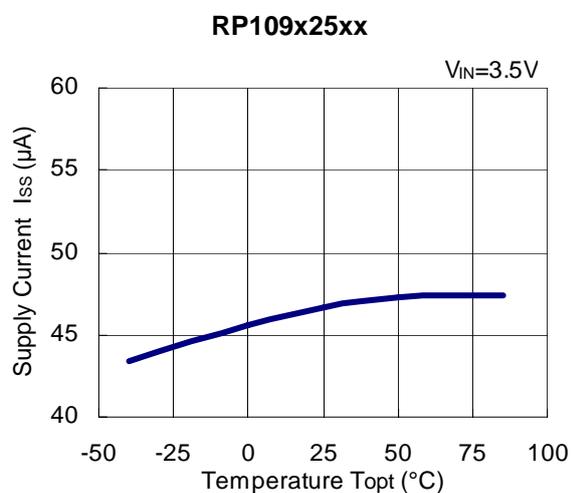
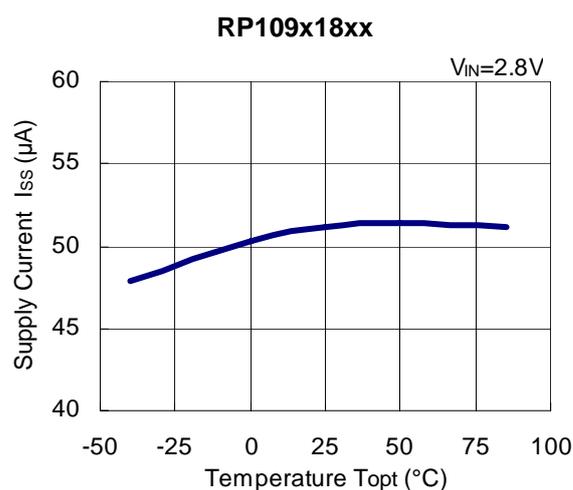
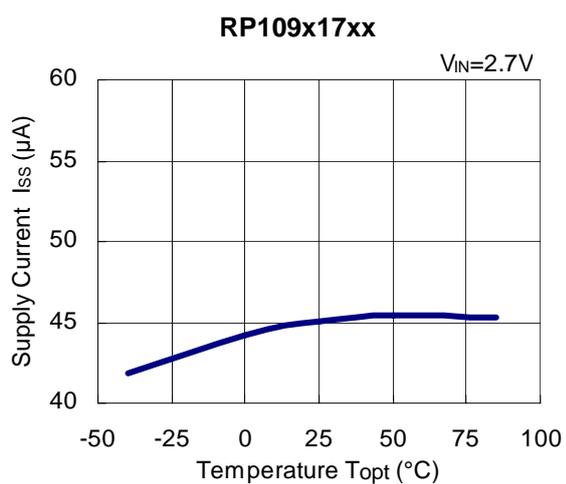
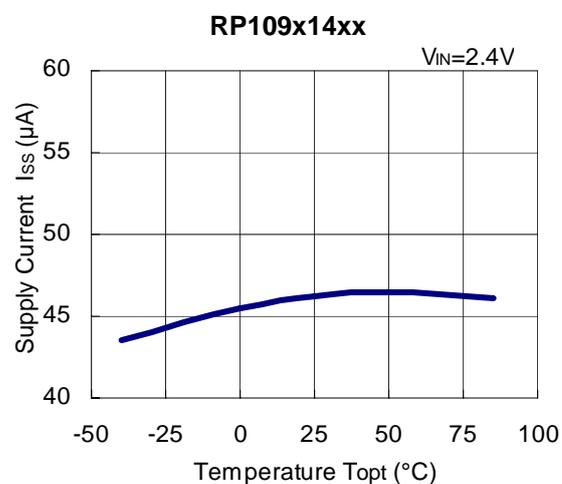
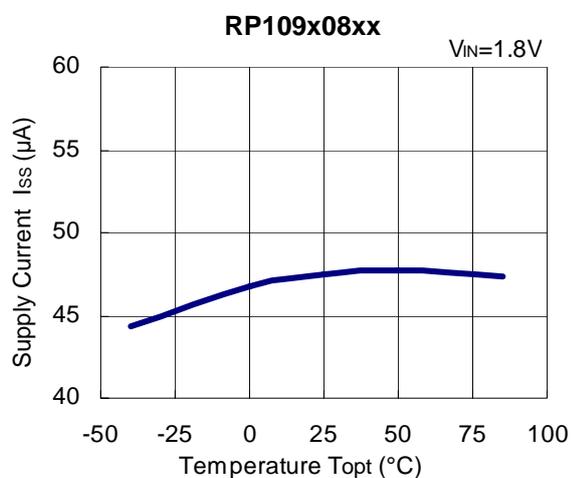
RP109x

NO.EA-204-131023

4) Output Voltage vs. Temperature (C1=0.1μF, C2=0.1μF, I_{OUT}=1mA)



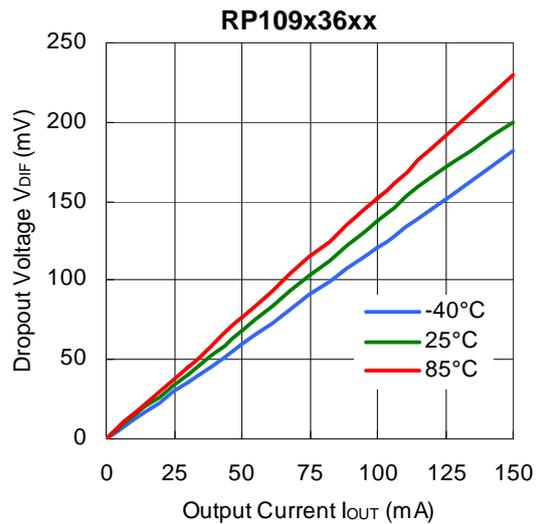
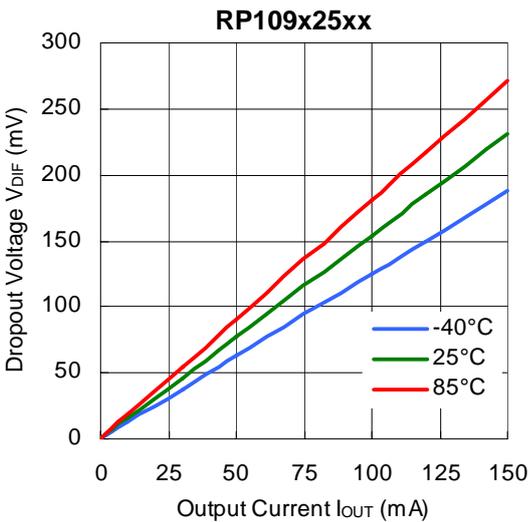
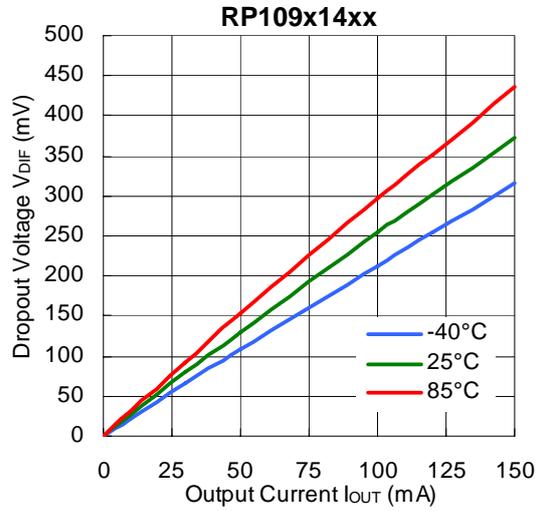
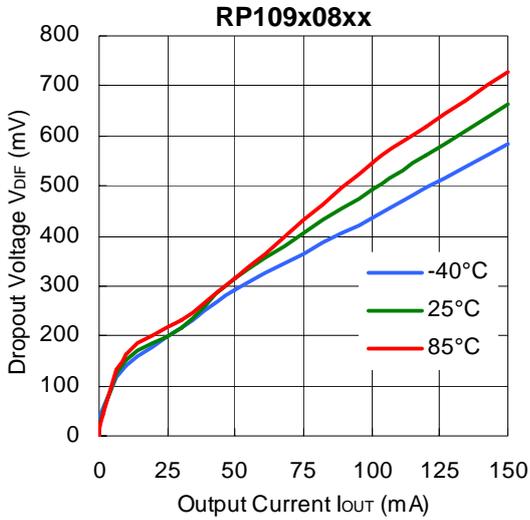
5) Supply Current vs. Temperature (C1=0.1μF, C2=0.1μF, I_{OUT}=0mA)



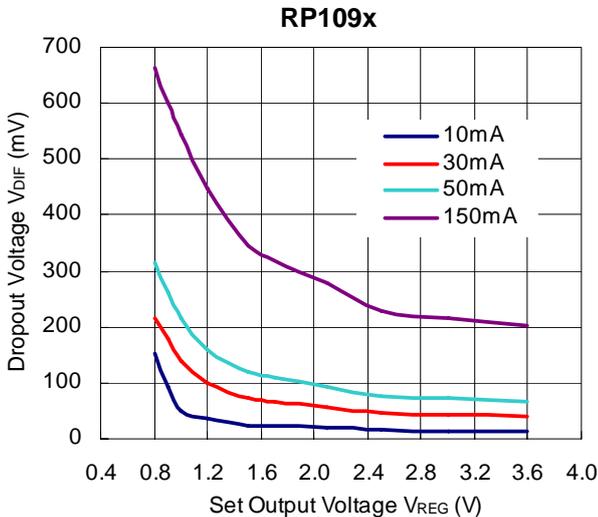
RP109x

NO.EA-204-131023

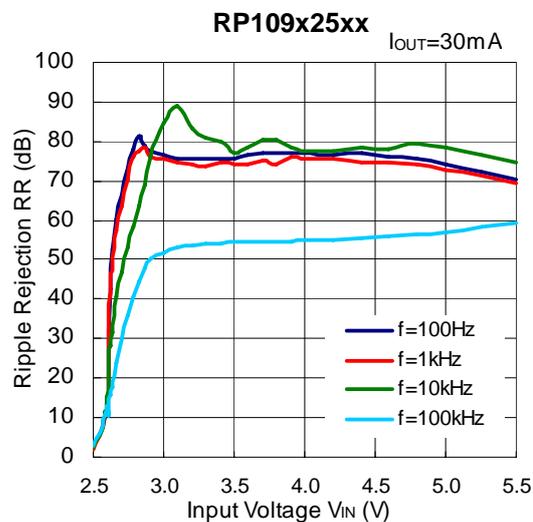
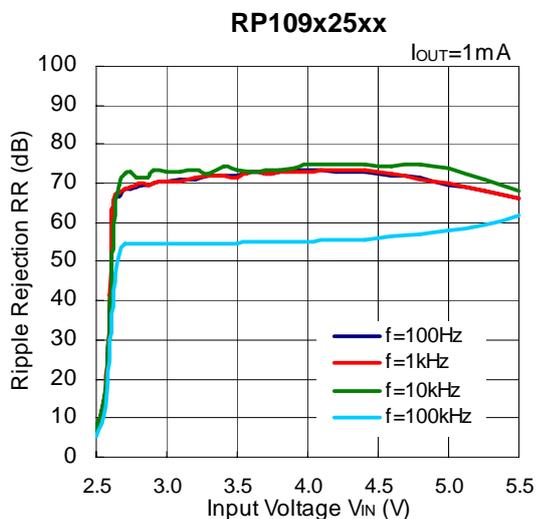
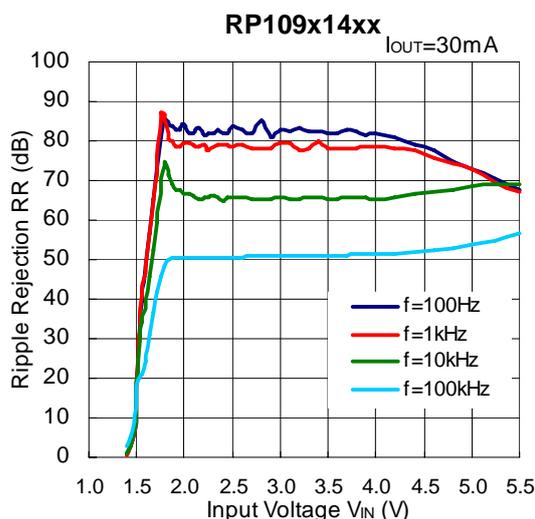
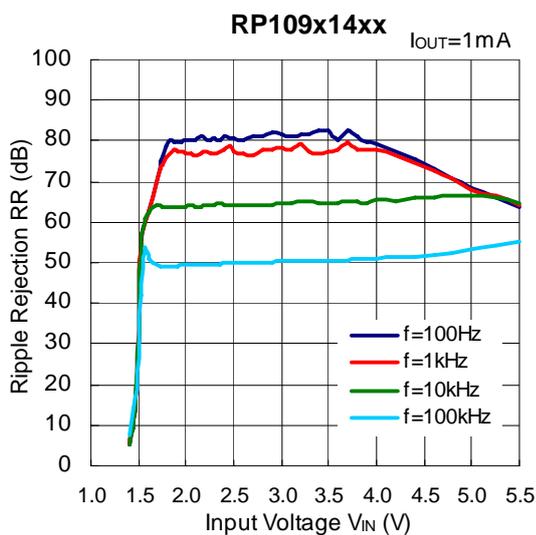
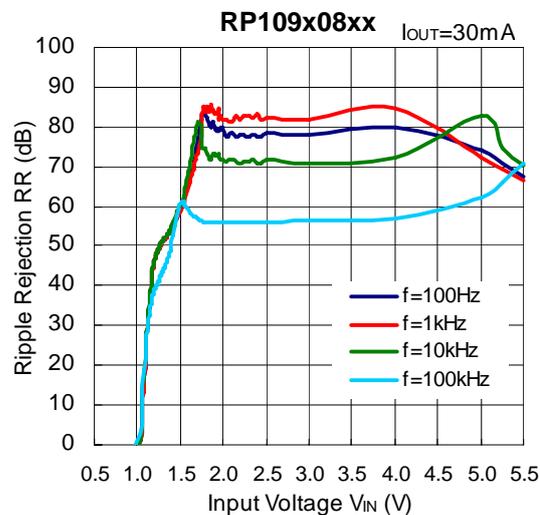
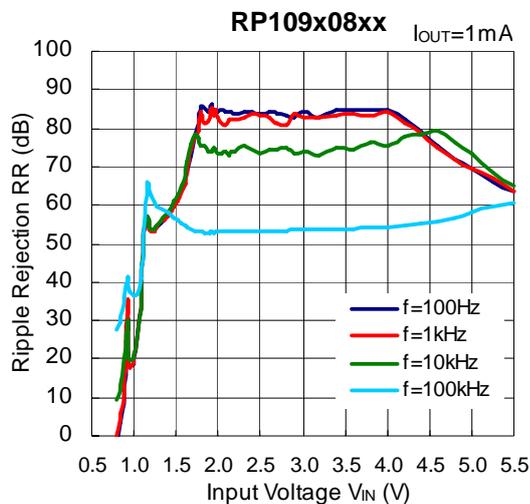
6) Dropout Voltage vs. Output Current (C1=0.1μF, C2=0.1μF)



7) Dropout Voltage vs. Set Output Voltage (C1=0.1μF, C2=0.1μF, $T_{opt}=25^{\circ}C$)

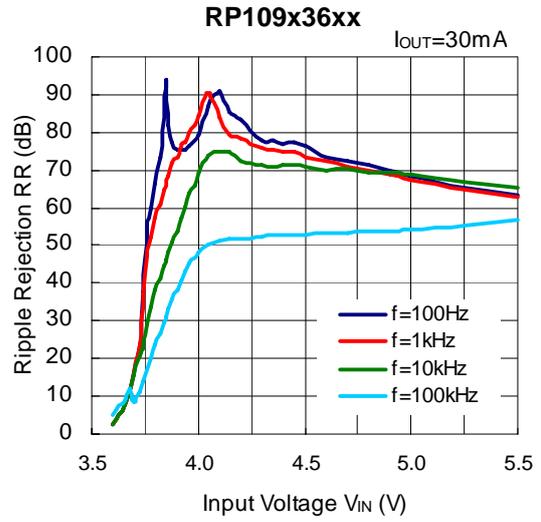
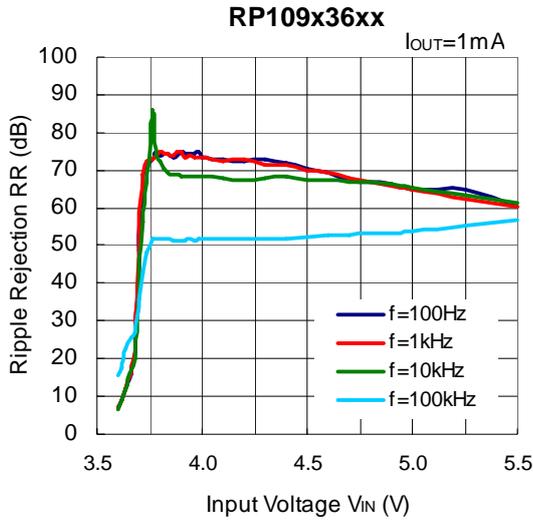


8) Ripple Rejection vs. Input Bias Voltage (C1=none, C2=0.1μF, Ripple=0.2Vp-p, T_{opt}=25°C)

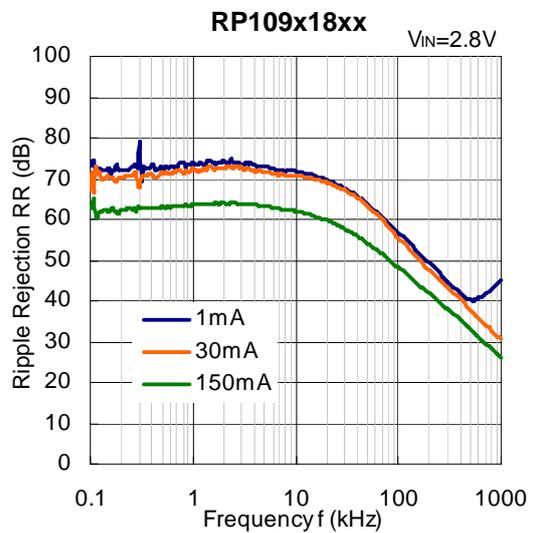
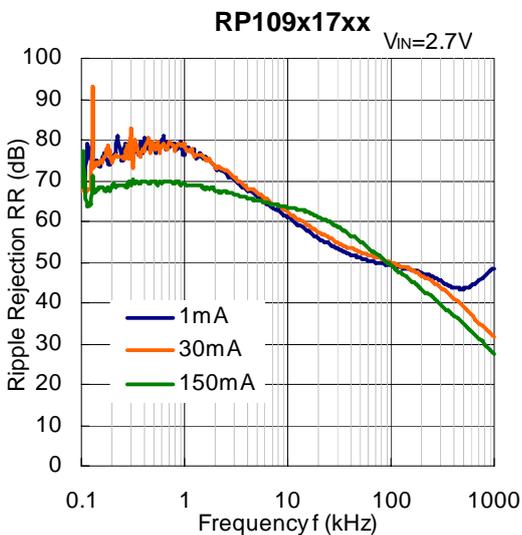
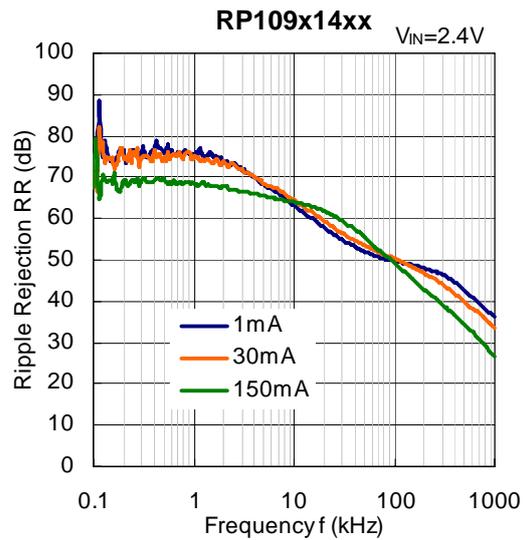
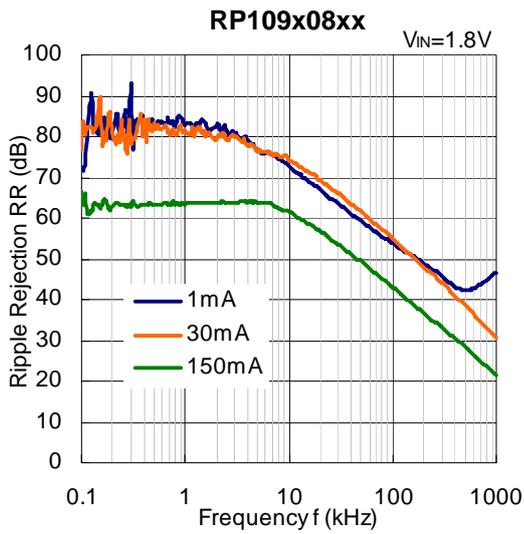


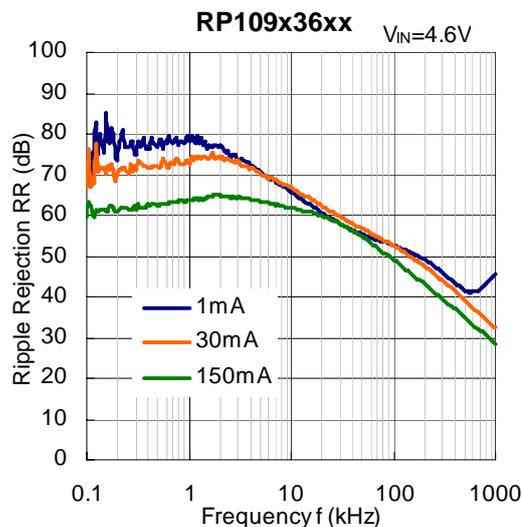
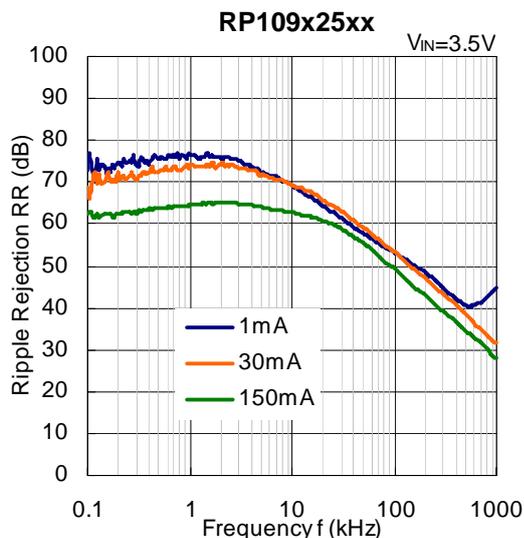
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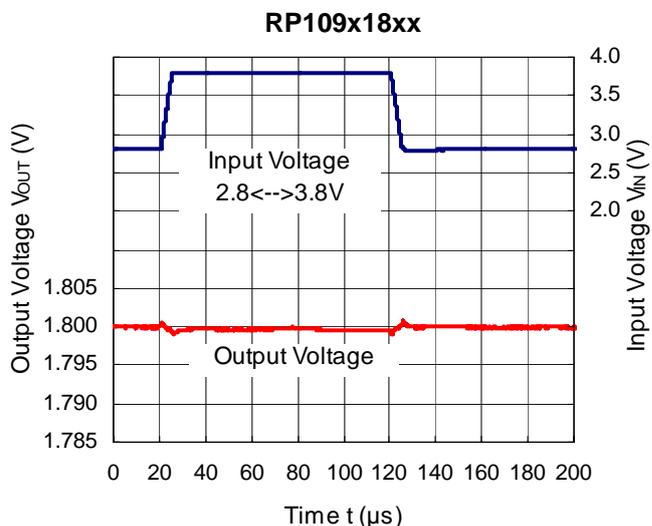
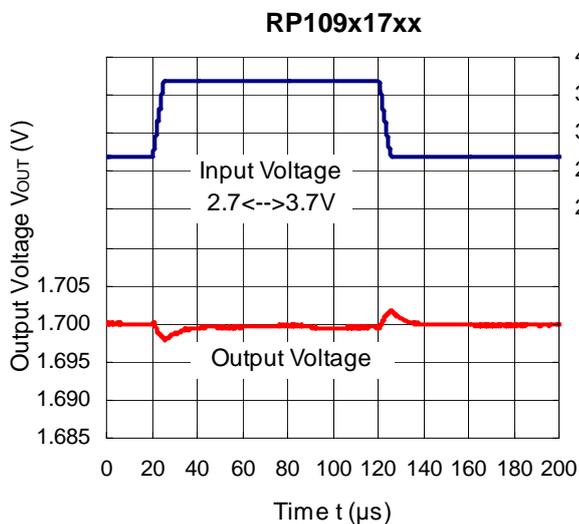
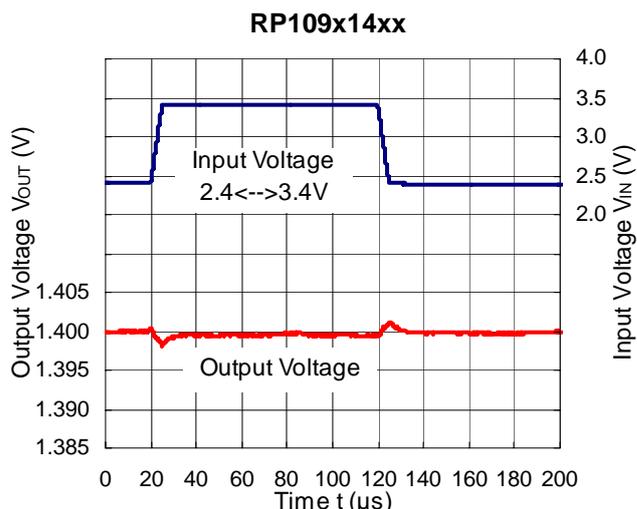
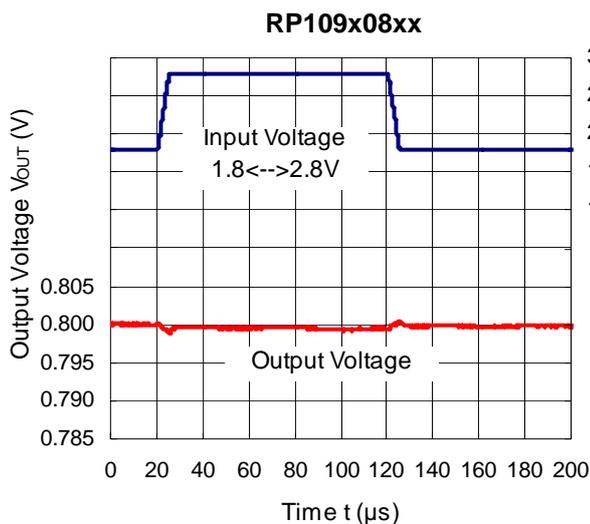


9) Ripple Rejection vs. Frequency ($C1=\text{none}$, $C2=0.1\mu\text{F}$, Ripple=0.2Vp-p)



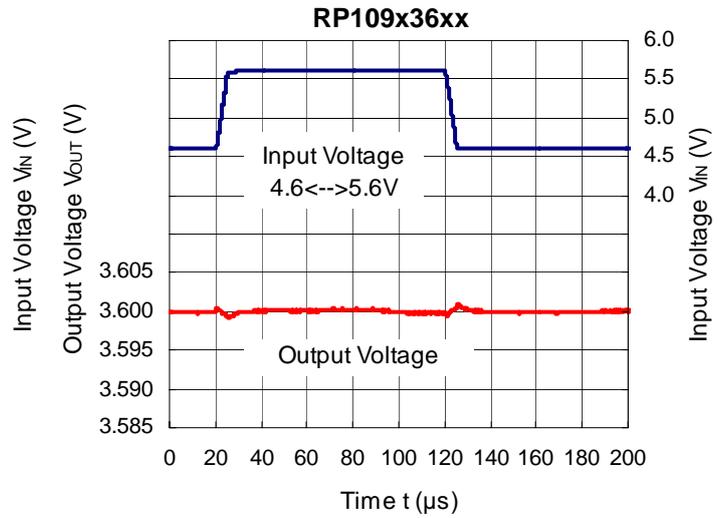
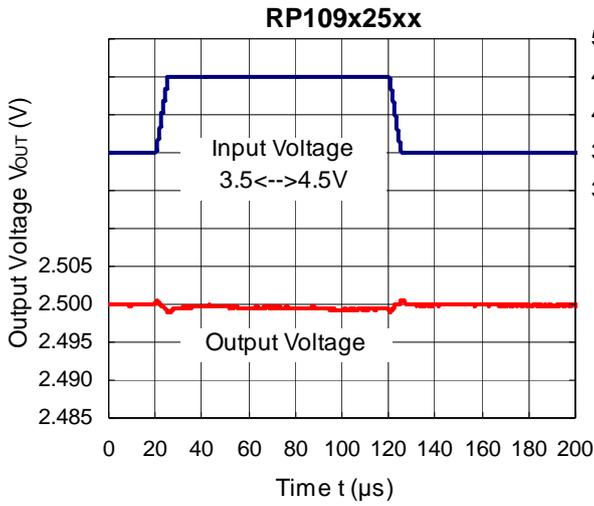


10) Input Transient Response ($C1=none$, $C2=0.1\mu F$, $I_{OUT}=30mA$, $t_r=t_f=5\mu s$, $T_{opt}=25^\circ C$)

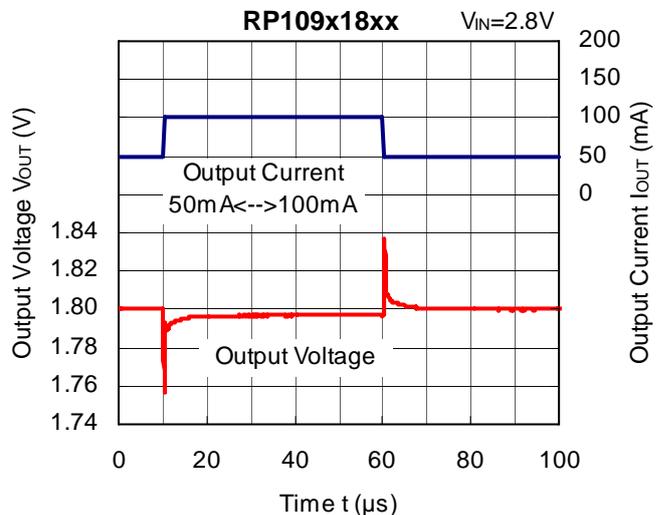
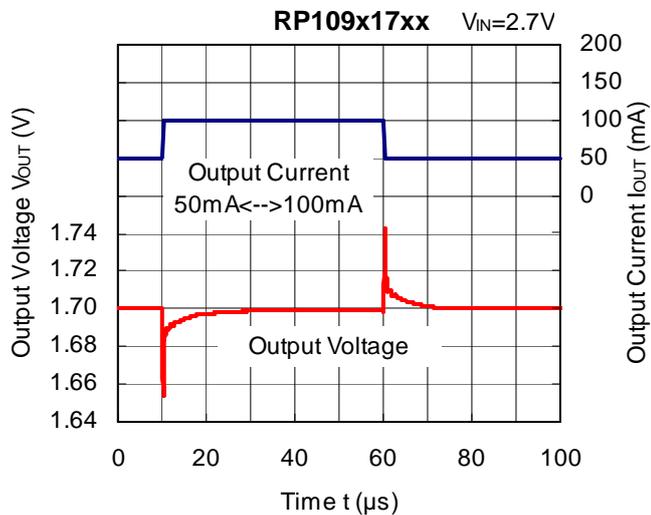
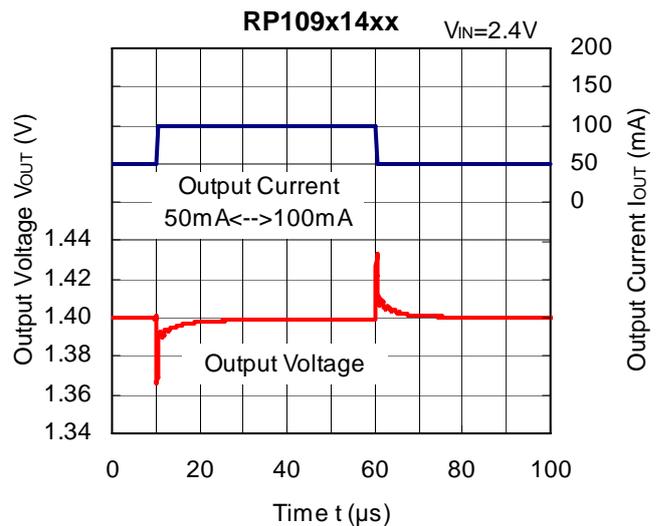
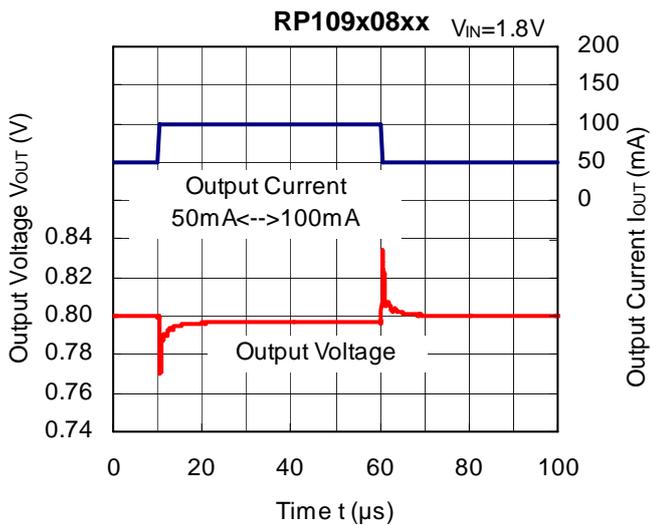


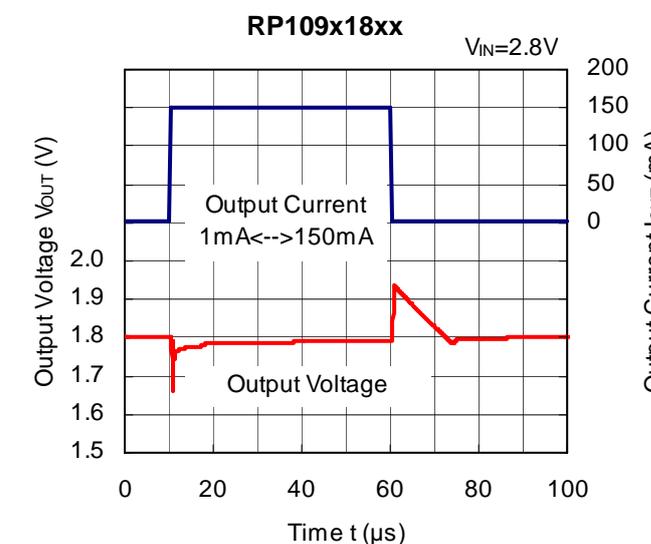
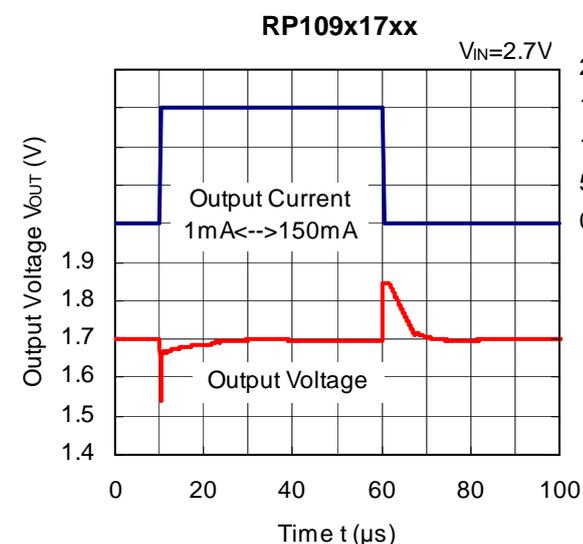
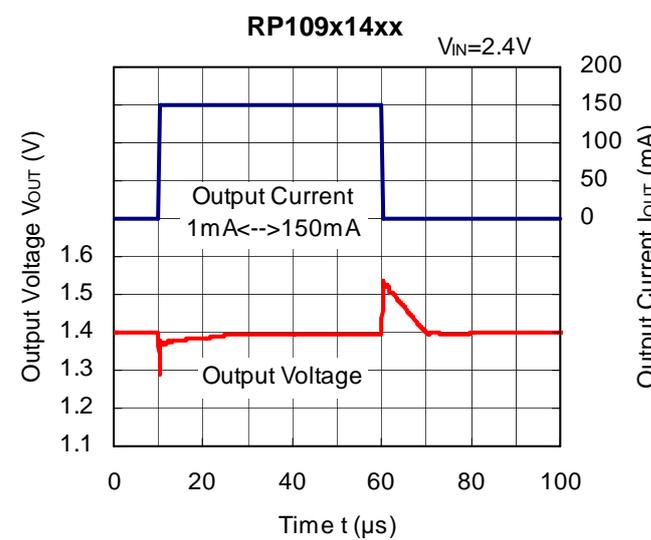
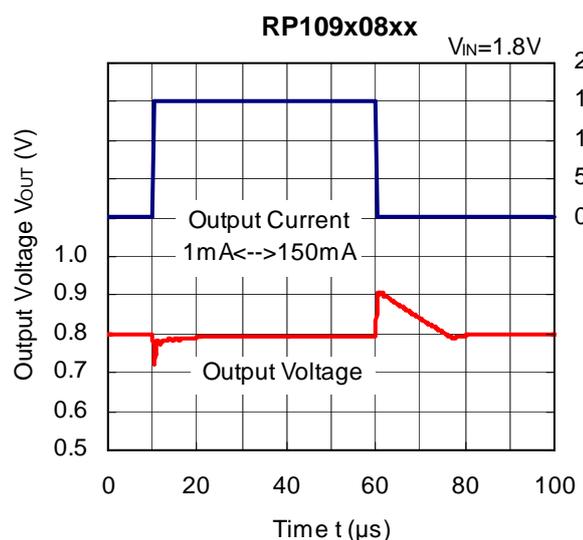
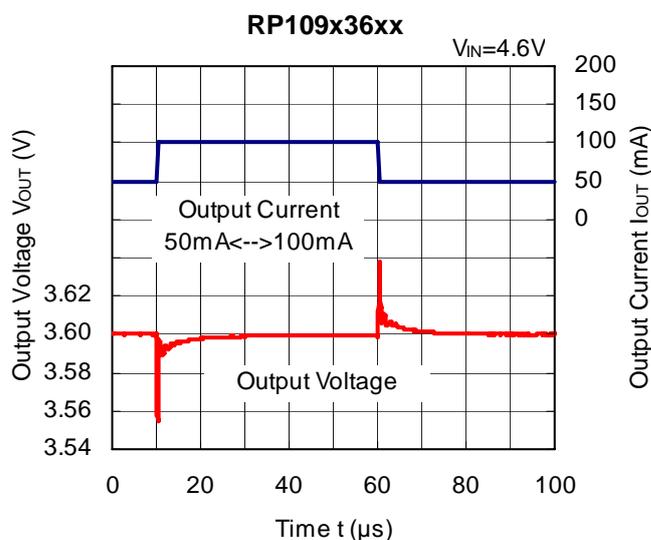
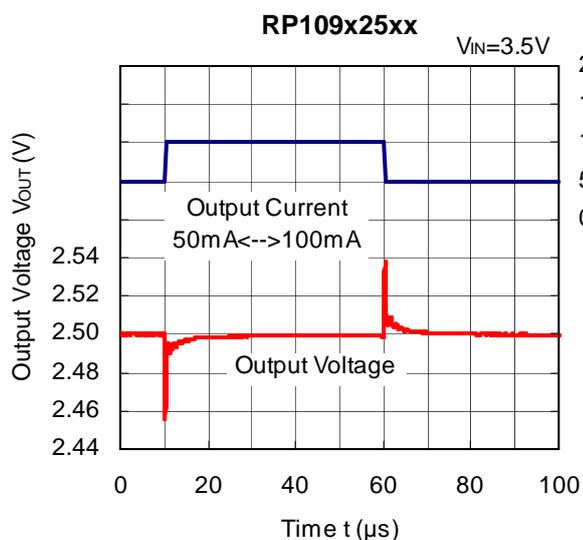
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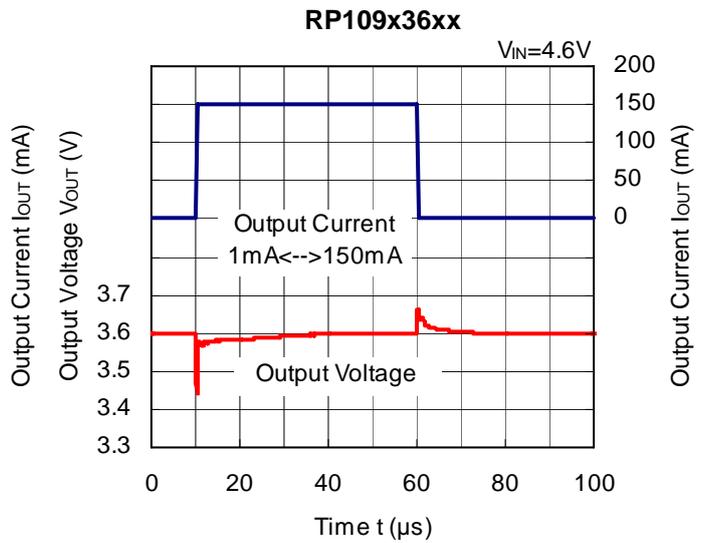
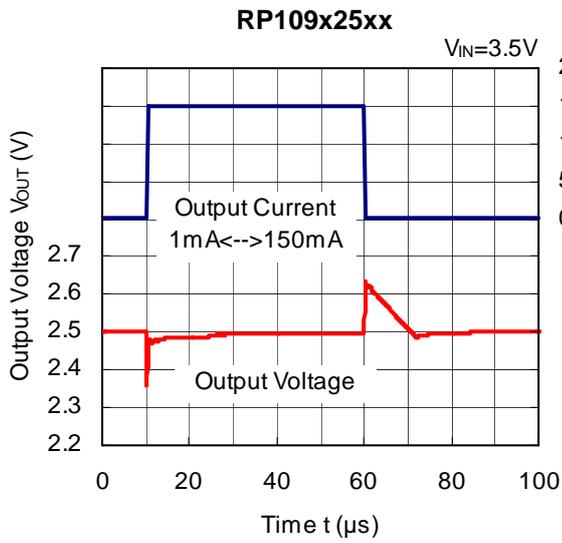
11) Load Transient Response ($C_1=0.1\mu\text{F}$, $C_2=0.1\mu\text{F}$, $t_r=t_f=5\mu\text{s}$, $T_{opt}=25^\circ\text{C}$)



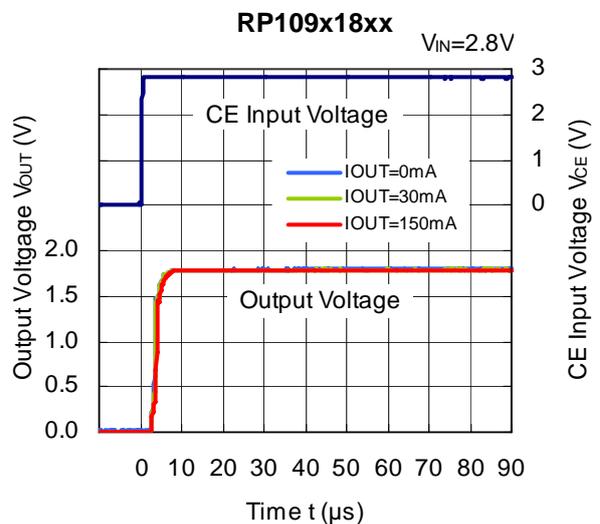
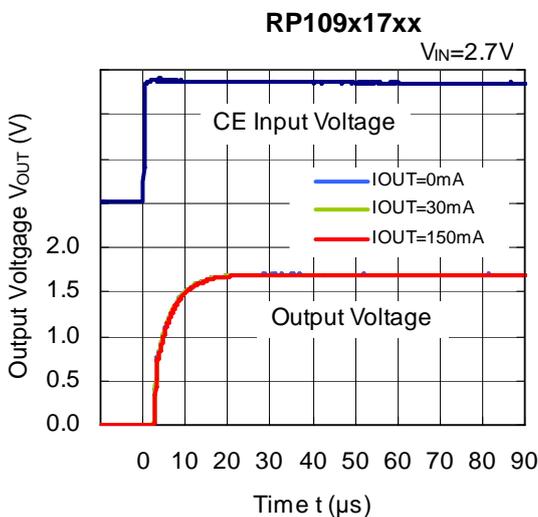
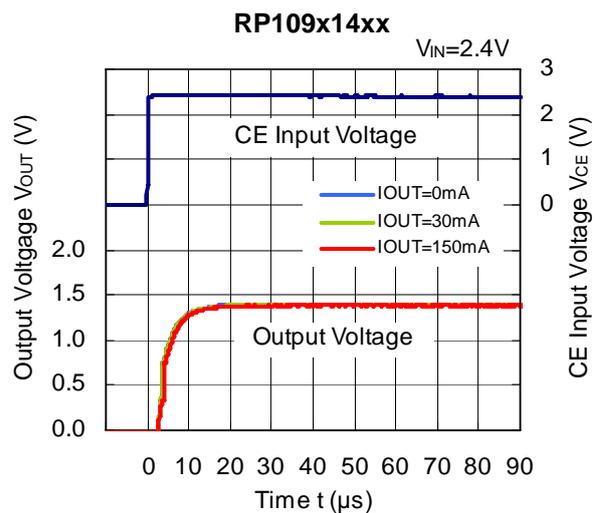
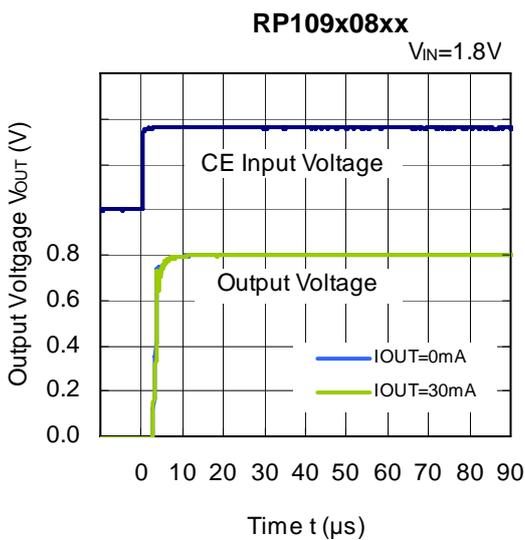


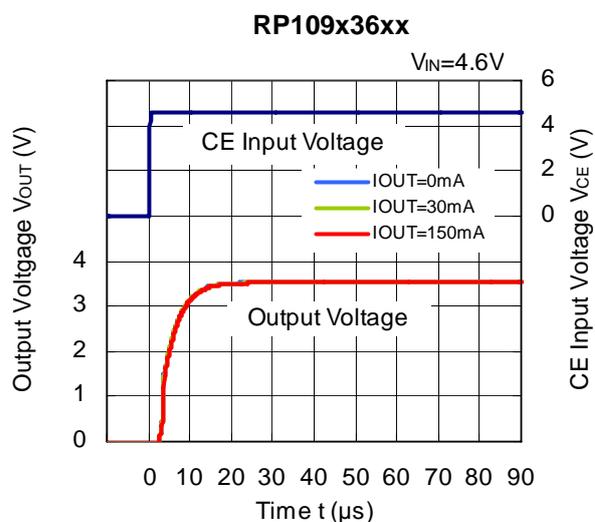
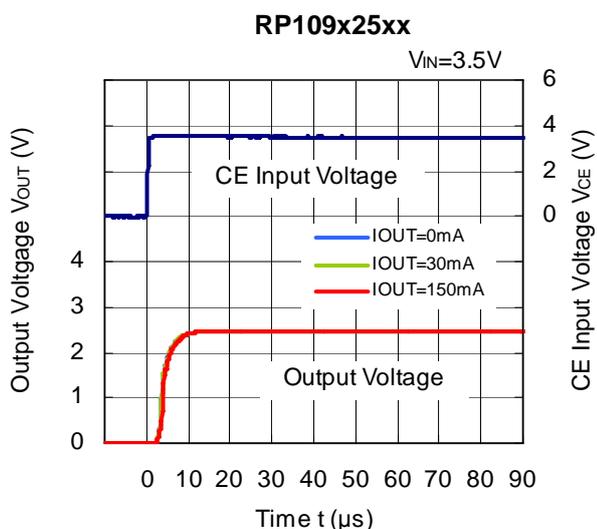
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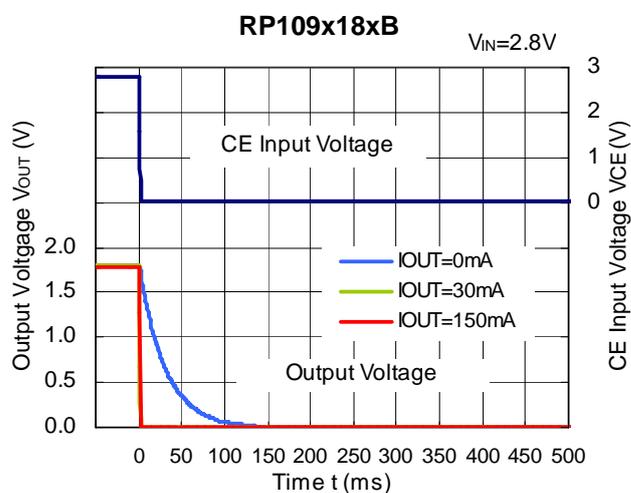
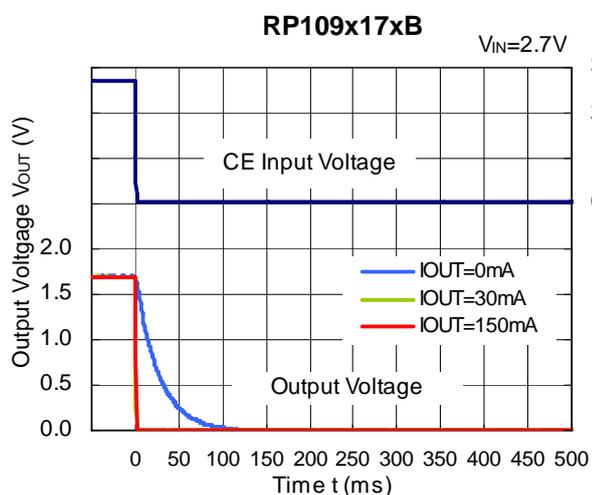
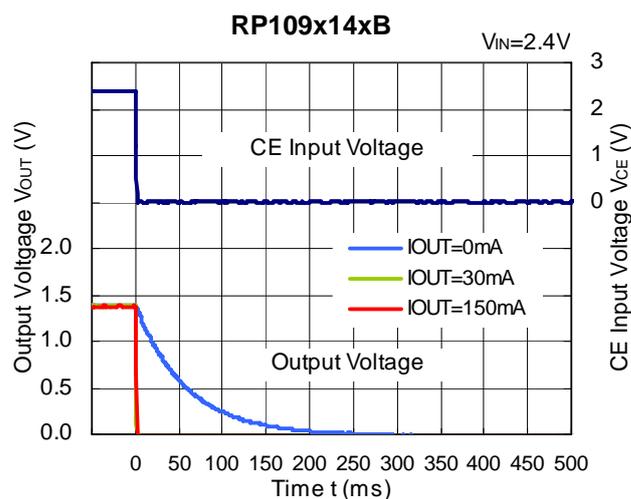
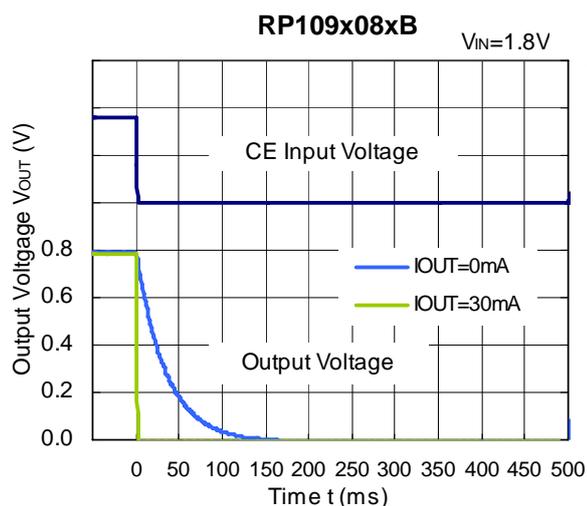


12) Turn On Speed with CE pin (C1=0.1μF, C2=0.1μF, T_{opt}=25°C)



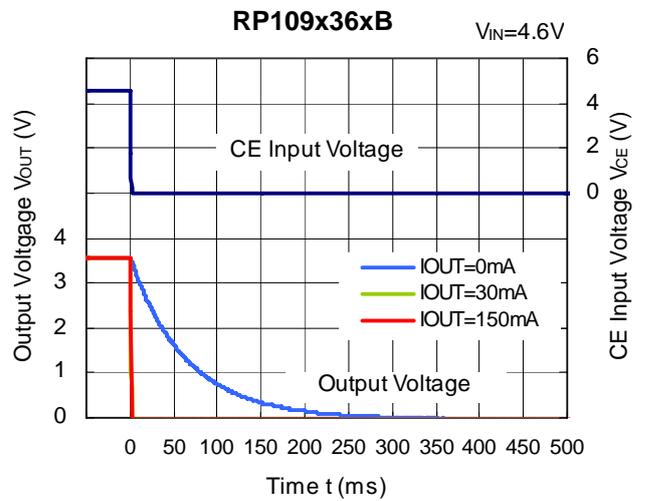
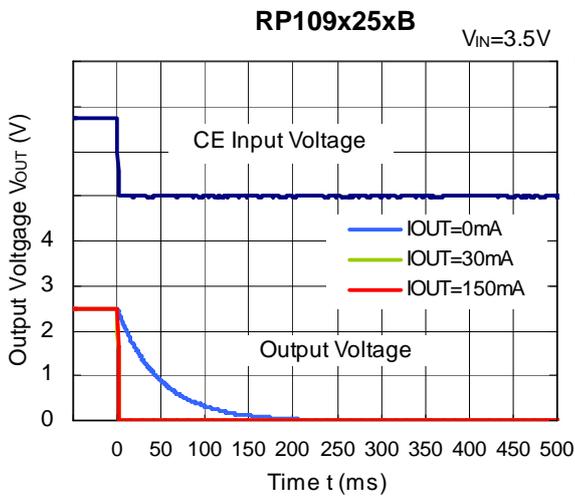


13) Turn Off Speed with CE pin (B Version) ($C1=0.1\mu F$, $C2=0.1\mu F$, $T_{opt}=25^{\circ}C$)

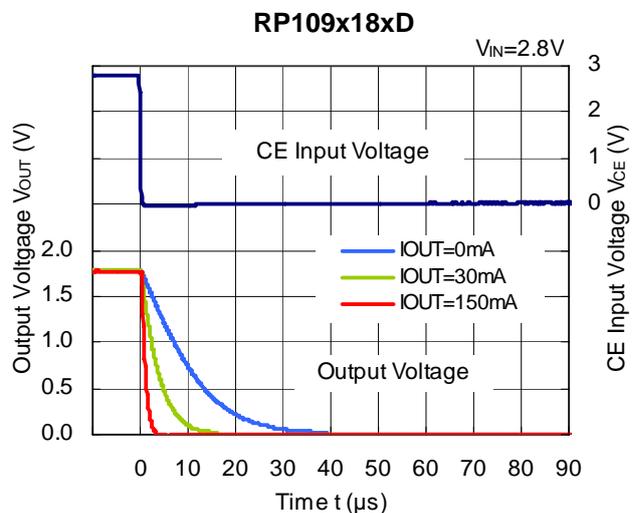
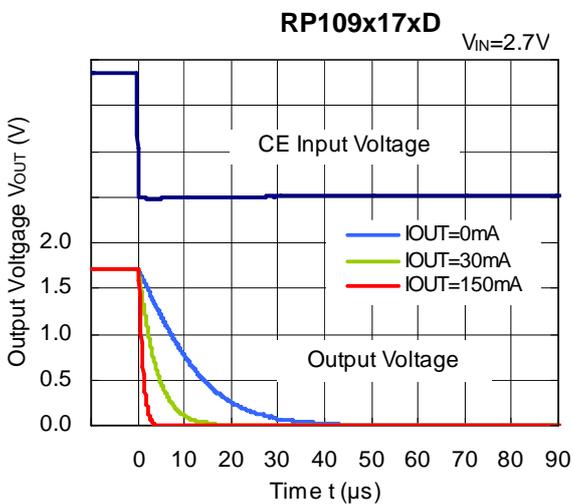
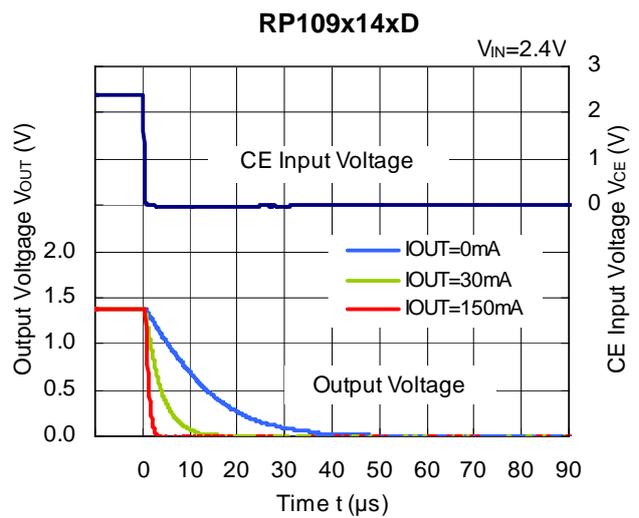
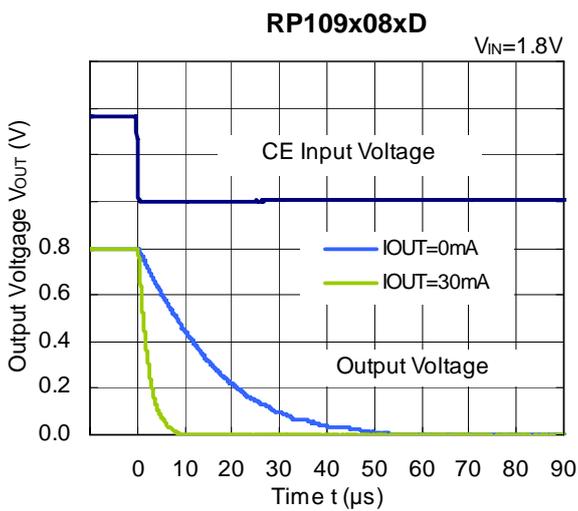


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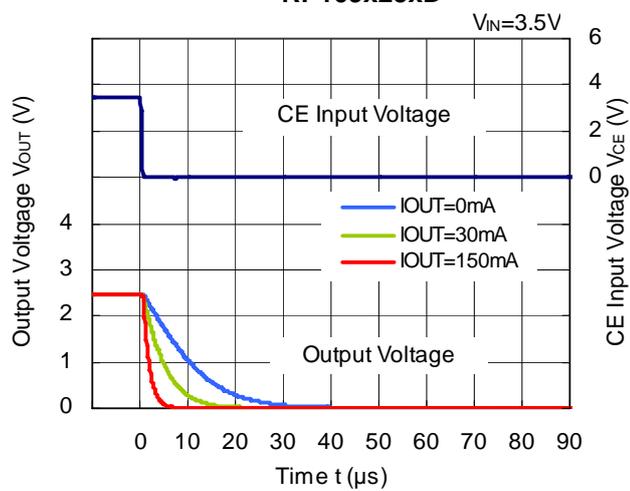
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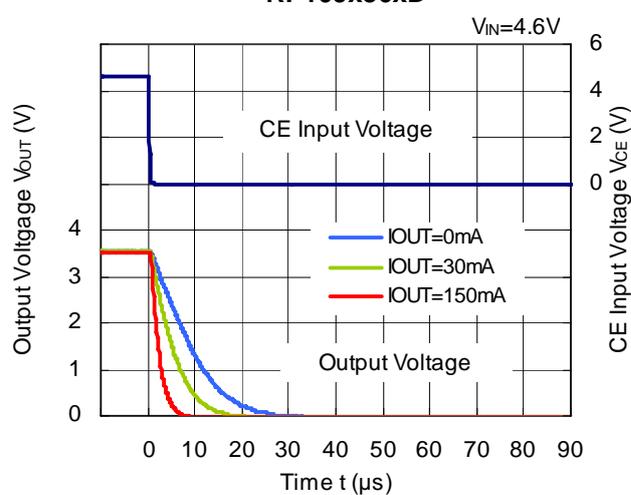
14) Turn Off Speed with CE pin (D Version) (C1=0.1μF, C2=0.1μF, T_{opt}=25°C)



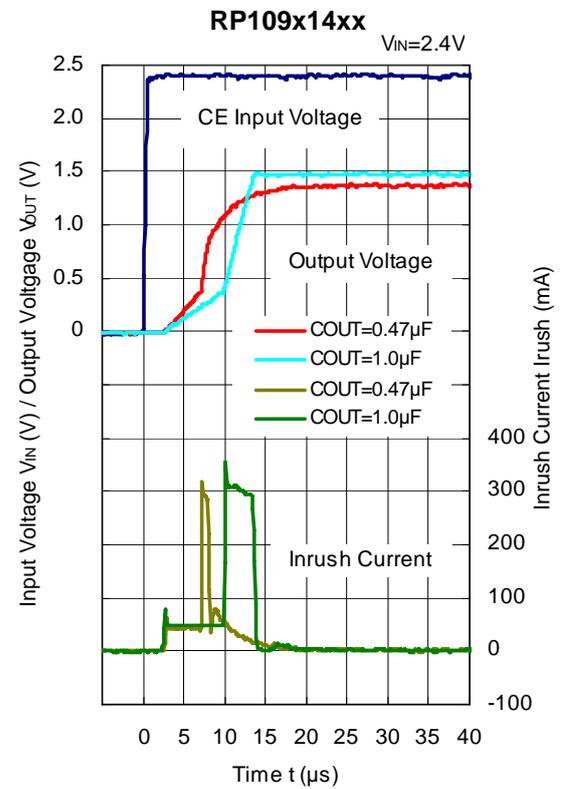
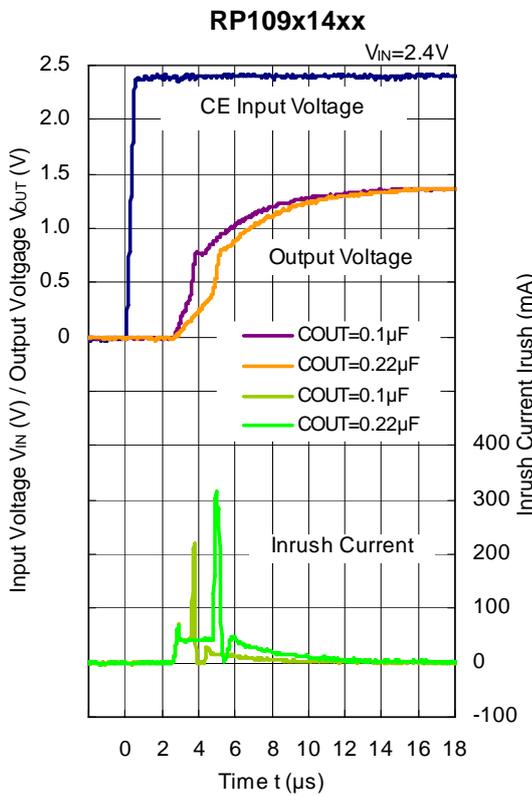
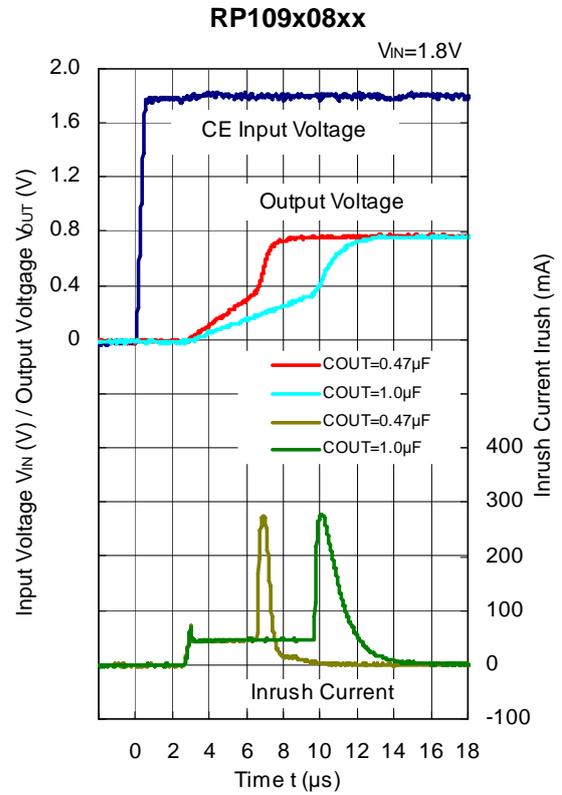
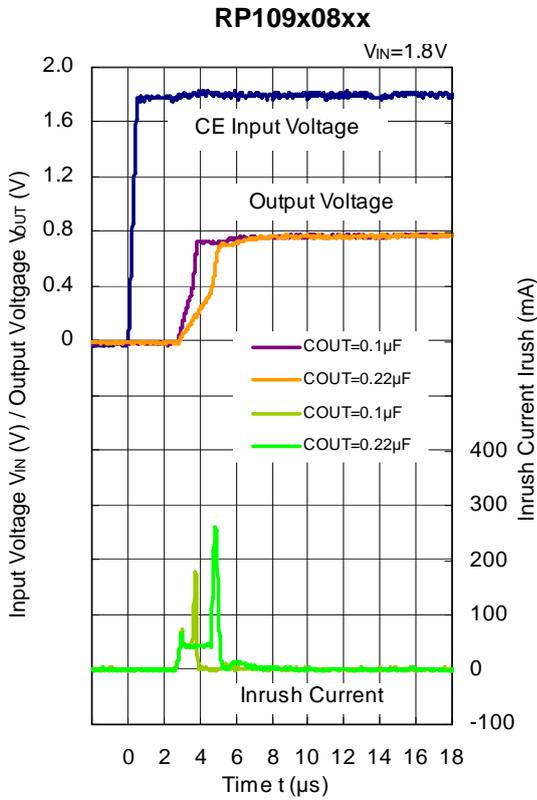
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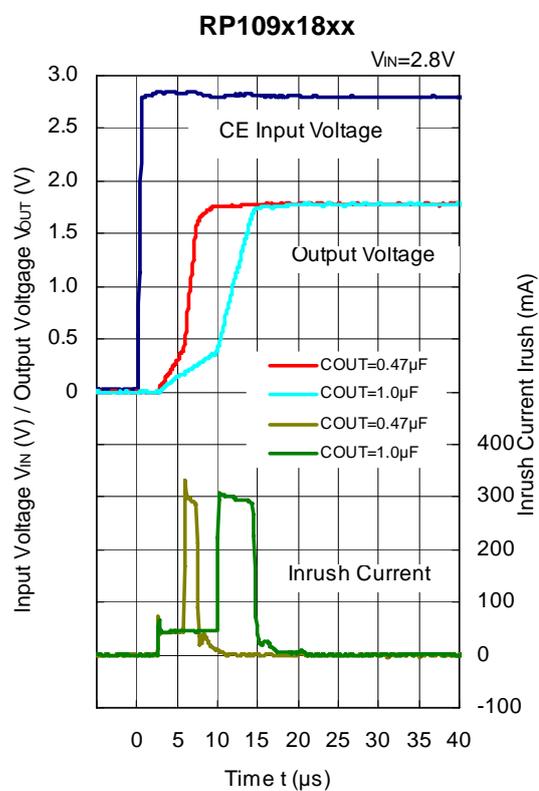
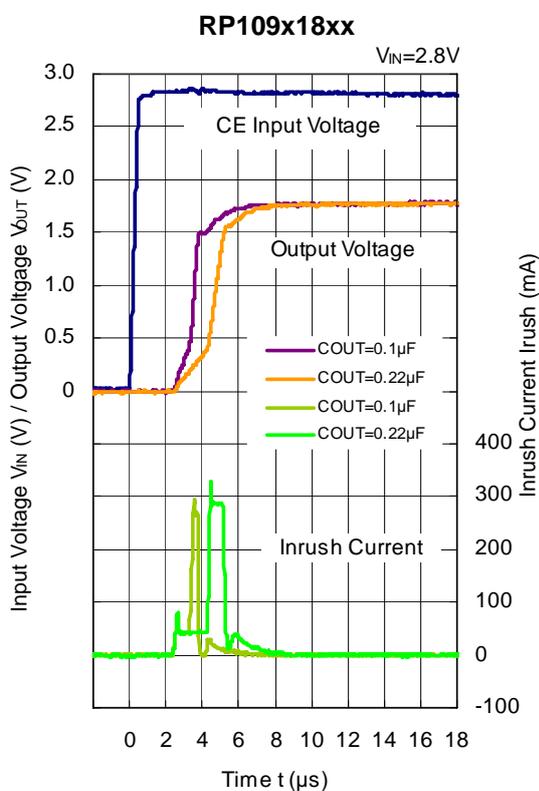
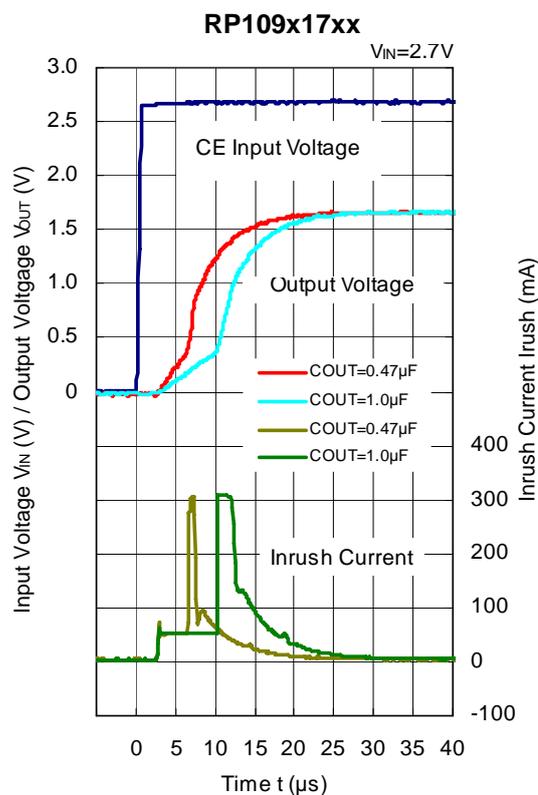
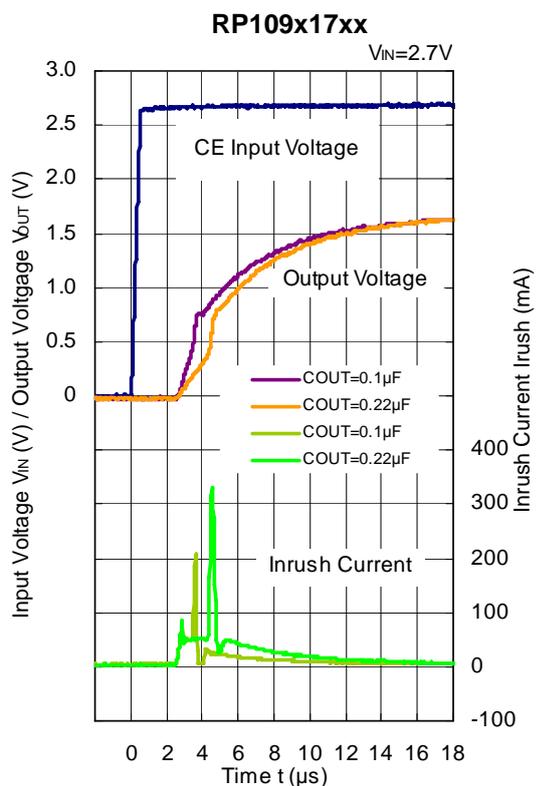


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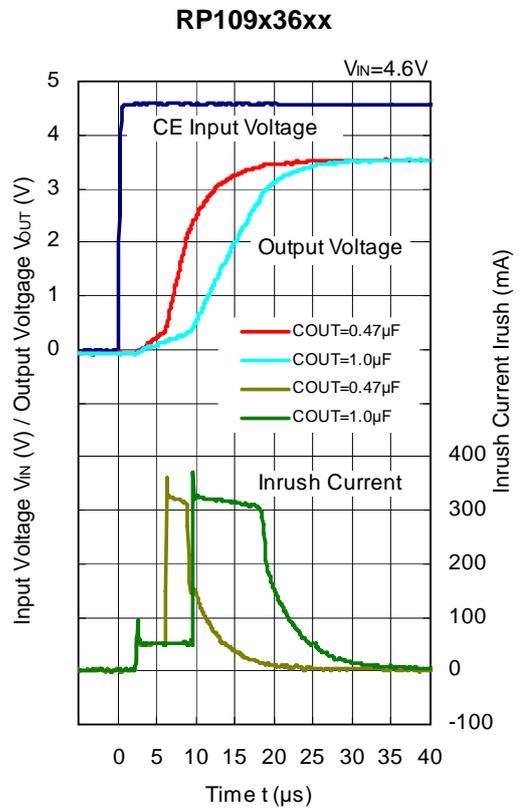
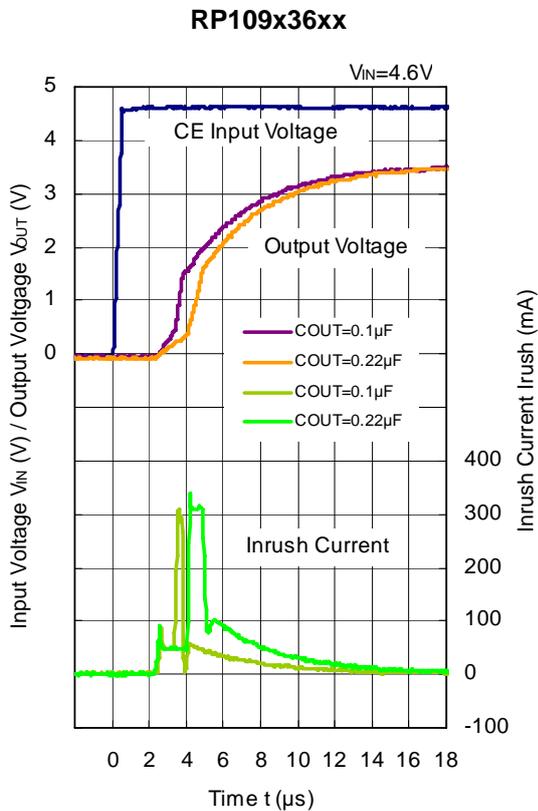
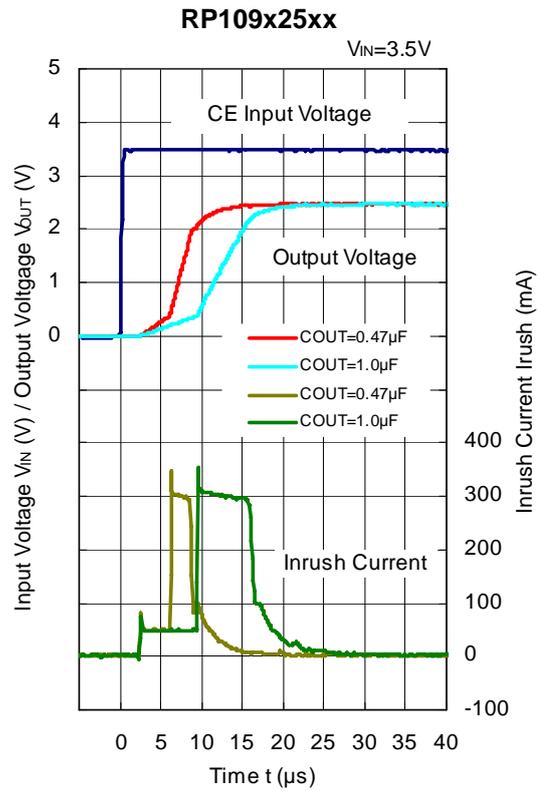
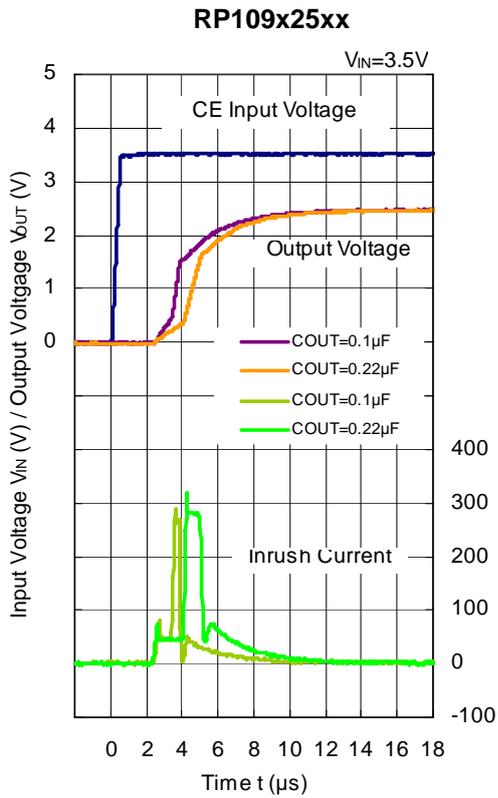
15) Inrush Current ($C_1=4.7\mu\text{F}$, $I_{OUT}=0\text{mA}$, $T_{opt}=25^\circ\text{C}$)



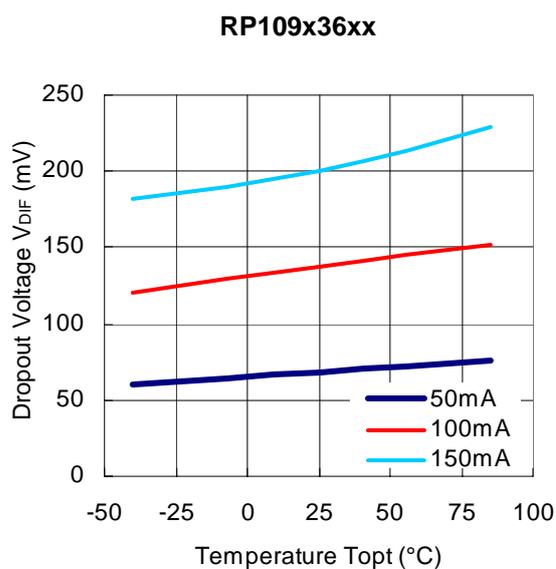
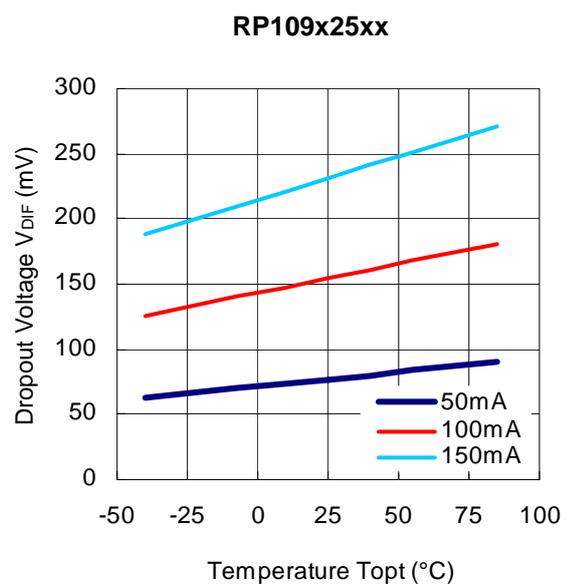
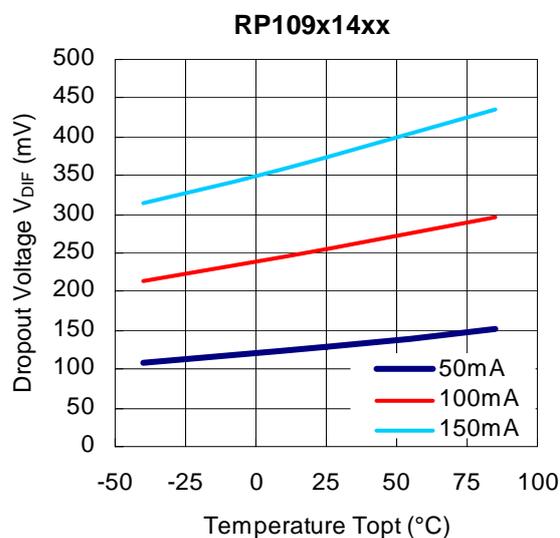
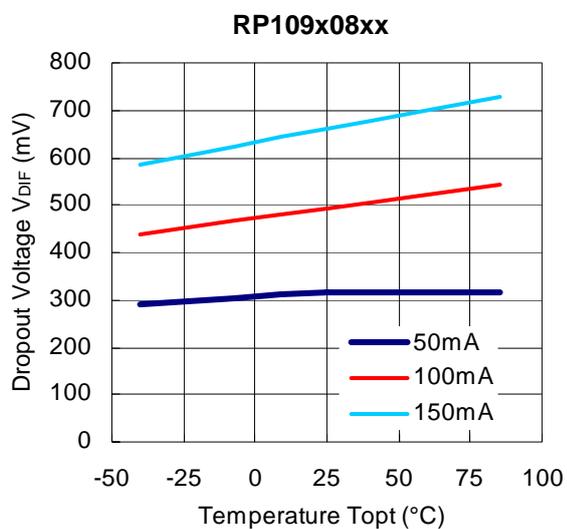


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16) Dropout Voltage vs. Temperature (C1=0.1μF, C2=0.1μF)



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.

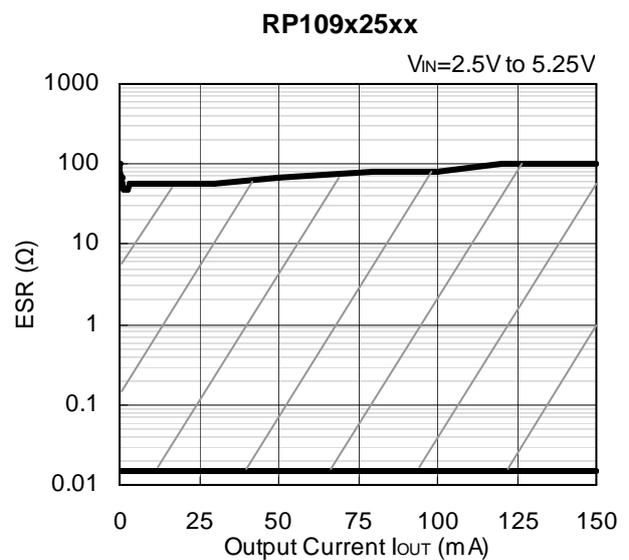
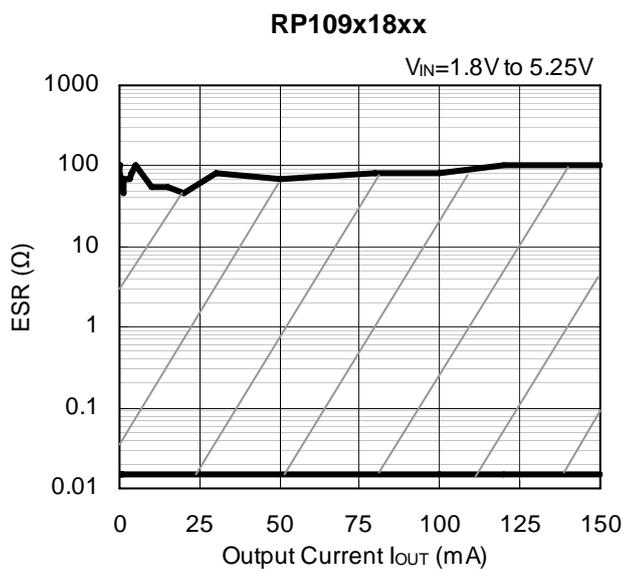
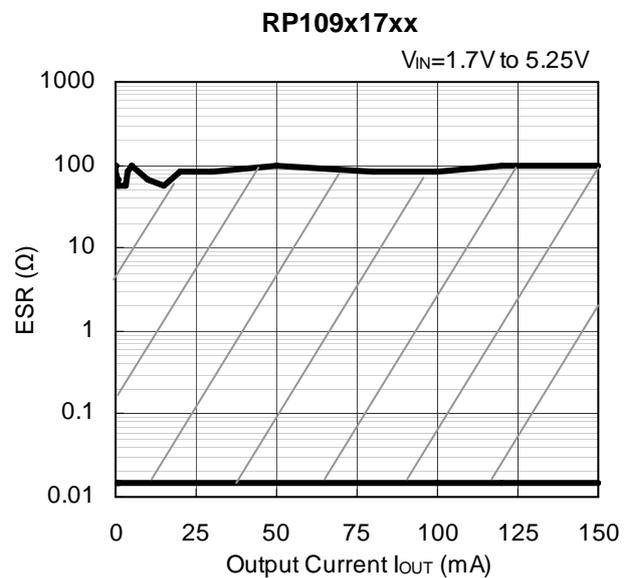
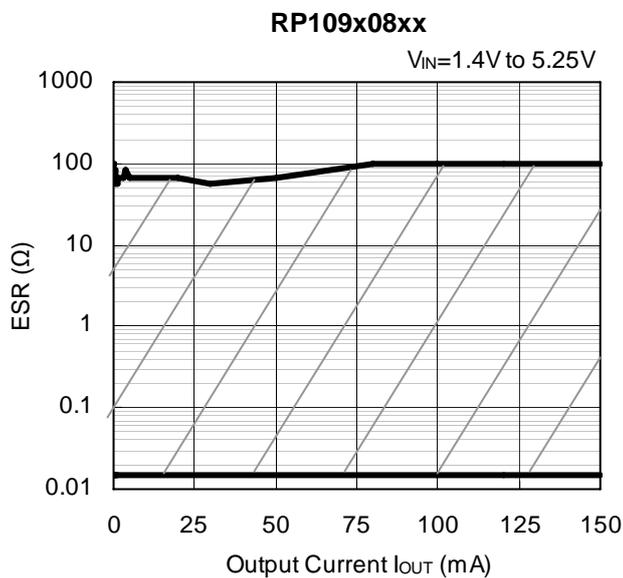
The conditions when the white noise level is under $40\mu\text{V}$ (Avg.) are marked as the hatched area in the graph.

Measurement conditions

Frequency Band : 10Hz to 2MHz

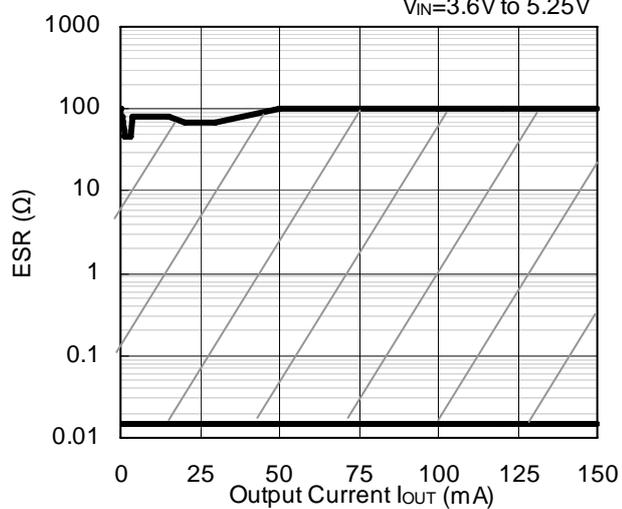
Temperature : -40°C to 85°C

C1, C2 : Ceramic $0.1\mu\text{F}$



RP109x36xx

$V_{IN}=3.6V$ to $5.25V$





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Ricoh Electronics:

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Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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Факс: 8 (812) 320-02-42

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