

## 150 mA 10 V LDO Regulator for Automotive Applications

NO. EC-245-200219

### OUTLINE

The RP171x is a LDO regulator featuring 150 mA output current. The RP171x offers the maximum input voltage of 10 V which makes it ideal for the use in car audio equipment, car navigation system and ETC system. The RP171x provides a supply current as low as Typ. 23  $\mu$ A and achieves fast-response characteristics.

The RP171x offers an output voltage as low as 1.2 V. Compared to existing high-speed lines, the RP171x provides excellent output voltage accuracy and output voltage temperature coefficient

Internally, the RP171x consists of a fold-back protection circuit and a thermal shutdown circuit. A standby mode with ultra low supply current has been realized by a chip enable function.

The RP171x is available in a 5-pin SOT-23-5 package with high power dissipation.

### FEATURES

- Input Voltage Range (Absolute Maximum Ratings).....2.6 V to 10 V (12 V)
- Operating Temperature .....-40°C to 105°C
- Supply Current .....Typ. 23  $\mu$ A ( $V_{IN} = V_{SET} + 1.0$  V)
- Standby Current ..... Typ. 0.1 $\mu$ A ( $V_{IN} = 10.0$  V, CE = "L")
- Output Voltage Range..... 1.2 V/1.5 V/1.8 V/2.5 V/2.8 V/3.0 V/3.3 V/3.4 V/5.0 V/6.0 V  
\* Contact Ricoh sales representatives for other voltages.
- Output Voltage Accuracy .....  $\pm 1.0\%$
- Output Voltage Temperature Coefficient..... Typ.  $\pm 80$  ppm/°C
- Line Regulation ..... Typ. 0.02%/V
- Dropout Voltage..... Typ. 0.4 V ( $I_{OUT} = 150$  mA,  $V_{SET} = 2.8$  V)
- Ripple Rejection ..... Typ. 70 dB (f = 1 kHz)
- Fold-back Protection Circuit ..... Typ. 40 mA
- Constant Slope Circuit (Soft-start Function)
- Thermal Shutdown Circuit..... Stops at 165°C
- Auto-discharge Function..... RP171xxxxD
- Package ..... SOT-23-5
- Ceramic Capacitor Compatible ..... 1.0  $\mu$ F or more

### APPLICATIONS

- Power supply for car audio equipment, car navigation system, ETC system, etc.
- Power supply for electronic control units such as EV inverter and battery charge control unit.

**SELECTION GUIDE**

The set output voltage, the auto-discharge function <sup>(1)</sup> and the automotive class are user-selectable options.

| Product Name     | Package  | Quantity per Reel | Pb Free | Halogen Free |
|------------------|----------|-------------------|---------|--------------|
| RP171Nxx1*-TR-#E | SOT-23-5 | 3,000 pcs         | Yes     | Yes          |

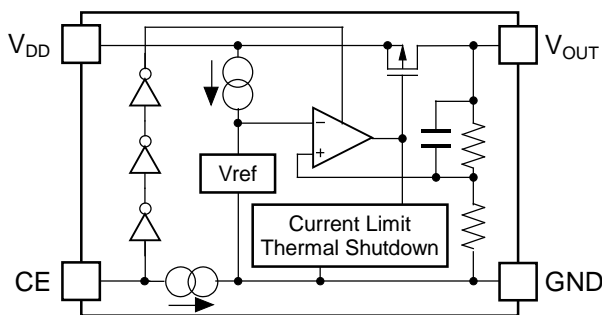
xx: Specify the set output voltage ( $V_{SET}$ ) within the range of  
 1.2 V / 1.5 V / 1.8 V / 2.5 V / 2.8 V / 3.0 V / 3.3 V / 3.4 V / 5.0 V / 6.0 V  
 \* Contact Ricoh sales representatives for other voltages.

\*: Select from (B) CE = Active-high without auto-discharge function or (D) CE = Active-high with Auto-discharge function.

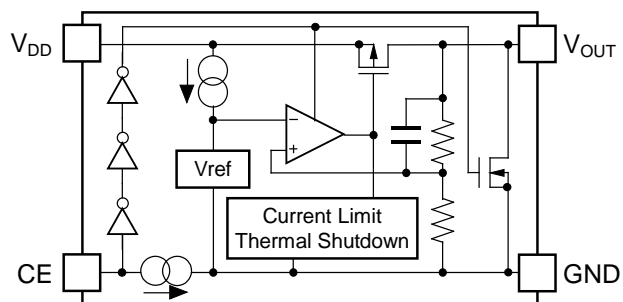
#: Select the quality class.

|   | Operating Temperature Range | Test Temperature |
|---|-----------------------------|------------------|
| A | -40°C to 105°C              | 25°C, High       |
| J | -40°C to 105°C              | Low, 25°C, High  |

**BLOCK DIAGRAM**



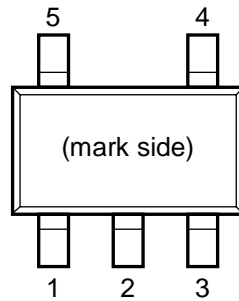
**RP171xxxxB Block Diagram**



**RP171xxxxD Block Diagram**

<sup>(1)</sup> Auto-discharge function quickly lowers the output voltage to 0 V by releasing the electrical charge accumulated in the external capacitor when the chip enable signal is switched from the active mode to the standby mode.

**PIN DESCRIPTION**



**SOT-23-5 Pin Configuration**

| Pin No. | Symbol | Description                  |
|---------|--------|------------------------------|
| 1       | VDD    | Input Pin                    |
| 2       | GND    | Ground Pin                   |
| 3       | CE     | Chip Enable Pin, Active-high |
| 4       | NC     | No Connection                |
| 5       | VOUT   | Output Pin                   |

**ABSOLUTE MAXIMUM RATINGS**

| Symbol    | Item                                                            | Rating                 | Unit |
|-----------|-----------------------------------------------------------------|------------------------|------|
| $V_{IN}$  | Input Voltage                                                   | 12                     | V    |
| $V_{CE}$  | Input Voltage (CE Pin)                                          | 12                     | V    |
| $V_{OUT}$ | Output Voltage                                                  | -0.3 to $V_{IN} + 0.3$ | V    |
| $I_{OUT}$ | Output Current                                                  | 330                    | mA   |
| $P_D$     | Power Dissipation <sup>(1)</sup><br>(SOT-23-5, JEDEC STD. 51-7) | 830                    | mW   |
| $T_j$     | Junction Temperature                                            | -40 to 150             | °C   |
| $T_{stg}$ | Storage Temperature Range                                       | -55 to 150             | °C   |

**ABSOLUTE MAXIMUM RATINGS**

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause permanent damage 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.

**RECOMMENDED OPERATING CONDITIONS**

| Symbol   | Item                        | Rating     | Unit |
|----------|-----------------------------|------------|------|
| $V_{IN}$ | Input Voltage               | 2.6 to 10  | V    |
| $T_a$    | Operating Temperature Range | -40 to 105 | °C   |

**RECOMMENDED OPERATING CONDITIONS**

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 they are used over such ratings by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

<sup>(1)</sup> Refer to *Power Dissipation* for detailed information.

## ELECTRICAL CHARACTERISTICS

$V_{IN} = V_{SET} + 1.0\text{ V}$ ,  $I_{OUT} = 1\text{ mA}$ , unless otherwise noted.

The specifications surrounded by   are guaranteed by design engineering at  $-40^{\circ}\text{C} \leq T_a \leq 105^{\circ}\text{C}$ .

### RP171x (-AE)

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

| Symbol                                  | Item                                              | Conditions                                                                                                                                           | Min.                                                              | Typ.                                                                                                             | Max.                                                                                | Unit                                                                                                            |    |
|-----------------------------------------|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|----|
| $V_{OUT}$                               | Output Voltage                                    | $1.5\text{ V} < V_{SET}$                                                                                                                             | $T_a = 25^{\circ}\text{C}$                                        | $V_{SET}$<br>$\times 0.99$                                                                                       |                                                                                     | $V_{SET}$<br>$\times 1.01$                                                                                      | V  |
|                                         |                                                   |                                                                                                                                                      | $-40^{\circ}\text{C} \leq T_a \leq 105^{\circ}\text{C}$           | <span style="border: 1px solid black; padding: 0 2px;"><math>V_{SET}</math><br/><math>\times 0.965</math></span> |                                                                                     | <span style="border: 1px solid black; padding: 0 2px;"><math>V_{SET}</math><br/><math>\times 1.03</math></span> |    |
|                                         |                                                   | $V_{SET} \leq 1.5\text{ V}$                                                                                                                          | $T_a = 25^{\circ}\text{C}$                                        | -15                                                                                                              |                                                                                     | 15                                                                                                              | mV |
|                                         |                                                   |                                                                                                                                                      | $-40^{\circ}\text{C} \leq T_a \leq 105^{\circ}\text{C}$           | <span style="border: 1px solid black; padding: 0 2px;">-53</span>                                                |                                                                                     | <span style="border: 1px solid black; padding: 0 2px;">45</span>                                                |    |
| $I_{OUT}$                               | Output Current                                    |                                                                                                                                                      | <span style="border: 1px solid black; padding: 0 2px;">150</span> |                                                                                                                  |                                                                                     | mA                                                                                                              |    |
| $\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$ | Load Regulation                                   | $0.1\text{ mA} \leq I_{OUT} \leq 150\text{ mA}$                                                                                                      |                                                                   | 5                                                                                                                | <span style="border: 1px solid black; padding: 0 2px;">45</span>                    | mV                                                                                                              |    |
| $V_{DIF}$                               | Dropout Voltage                                   | $I_{OUT} = 150\text{ mA}$                                                                                                                            | Refer to the <i>Product-specific Electrical Characteristics</i>   |                                                                                                                  |                                                                                     |                                                                                                                 |    |
| $I_{SS}$                                | Supply Current                                    | $I_{OUT} = 0\text{ mA}$                                                                                                                              |                                                                   | 23                                                                                                               | <span style="border: 1px solid black; padding: 0 2px;">45</span>                    | $\mu\text{A}$                                                                                                   |    |
| Istandby                                | Standby Current                                   | $V_{IN} = 10.0\text{ V}$ , $V_{CE} = \text{GND}$                                                                                                     |                                                                   | 0.1                                                                                                              | <span style="border: 1px solid black; padding: 0 2px;">1.2</span>                   | $\mu\text{A}$                                                                                                   |    |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN}}$  | Line Regulation                                   | $V_{SET} + 0.5\text{ V} \leq V_{IN} \leq 10.0\text{ V}$<br>Note: When $V_{OUT} \leq 2.1\text{ V}$ ,<br>$2.6\text{ V} \leq V_{IN} \leq 10.0\text{ V}$ |                                                                   | $\pm 0.0$<br>2                                                                                                   | <span style="border: 1px solid black; padding: 0 2px;"><math>\pm 0.25</math></span> | %/V                                                                                                             |    |
| $I_{SC}$                                | Short Current Limit                               | $V_{OUT} = 0\text{ V}$                                                                                                                               |                                                                   | 40                                                                                                               |                                                                                     | mA                                                                                                              |    |
| $I_{PD}$                                | CE Pull-down Current                              |                                                                                                                                                      |                                                                   | 0.30                                                                                                             |                                                                                     | $\mu\text{A}$                                                                                                   |    |
| $V_{CEH}$                               | CE Input Voltage "H"                              |                                                                                                                                                      | <span style="border: 1px solid black; padding: 0 2px;">1.7</span> |                                                                                                                  |                                                                                     | V                                                                                                               |    |
| $V_{CEL}$                               | CE Input Voltage "L"                              |                                                                                                                                                      |                                                                   |                                                                                                                  | <span style="border: 1px solid black; padding: 0 2px;">0.8</span>                   | V                                                                                                               |    |
| $T_{TSD}$                               | Thermal Shutdown Temperature                      | Junction Temperature                                                                                                                                 |                                                                   | 165                                                                                                              |                                                                                     | $^{\circ}\text{C}$                                                                                              |    |
| $T_{TSR}$                               | Thermal Shutdown Released Temperature             | Junction Temperature                                                                                                                                 |                                                                   | 110                                                                                                              |                                                                                     | $^{\circ}\text{C}$                                                                                              |    |
| $R_{LOW}$                               | Auto-discharge Nch Tr. ON Resistance (RP171xxxxD) | $V_{CE} = 0\text{ V}$ , $V_{IN} = 7.0\text{ V}$                                                                                                      |                                                                   | 250                                                                                                              |                                                                                     | $\Omega$                                                                                                        |    |

All test items listed under *ELECTRICAL CHARACTERISTICS* are done under the pulse load condition ( $T_j \approx T_a = 25^{\circ}\text{C}$ ).

**RP171N**

NO. EC-245-200219

 $V_{IN} = V_{SET} + 1.0 \text{ V}$ ,  $I_{OUT} = 1 \text{ mA}$ , unless otherwise noted.**RP171x (-JE)**( $-40^{\circ}\text{C} \leq T_a \leq 105^{\circ}\text{C}$ )

| Symbol                                  | Item                                              | Conditions                                                                                                                                                | Min.                                                            | Typ.                        | Max.       | Unit                       |    |
|-----------------------------------------|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------|------------|----------------------------|----|
| $V_{OUT}$                               | Output Voltage                                    | $1.5 \text{ V} < V_{SET}$                                                                                                                                 | $T_a = 25^{\circ}\text{C}$                                      | $V_{SET}$<br>$\times 0.99$  |            | $V_{SET}$<br>$\times 1.01$ | V  |
|                                         |                                                   |                                                                                                                                                           | $-40^{\circ}\text{C} \leq T_a \leq 105^{\circ}\text{C}$         | $V_{SET}$<br>$\times 0.965$ |            | $V_{SET}$<br>$\times 1.03$ |    |
|                                         |                                                   | $V_{SET} \leq 1.5 \text{ V}$                                                                                                                              | $T_a = 25^{\circ}\text{C}$                                      | -15                         |            | 15                         | mV |
|                                         |                                                   |                                                                                                                                                           | $-40^{\circ}\text{C} \leq T_a \leq 105^{\circ}\text{C}$         | -53                         |            | 45                         |    |
| $I_{OUT}$                               | Output Current                                    |                                                                                                                                                           | 150                                                             |                             |            | mA                         |    |
| $\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$ | Load Regulation                                   | $0.1 \text{ mA} \leq I_{OUT} \leq 150 \text{ mA}$                                                                                                         |                                                                 | 5                           | 45         | mV                         |    |
| $V_{DIF}$                               | Dropout Voltage                                   | $I_{OUT} = 150 \text{ mA}$                                                                                                                                | Refer to the <i>Product-specific Electrical Characteristics</i> |                             |            |                            |    |
| $I_{SS}$                                | Supply Current                                    | $I_{OUT} = 0 \text{ mA}$                                                                                                                                  |                                                                 | 23                          | 45         | $\mu\text{A}$              |    |
| Istandby                                | Standby Current                                   | $V_{IN} = 10.0 \text{ V}$ , $V_{CE} = \text{GND}$                                                                                                         |                                                                 | 0.1                         | 1.2        | $\mu\text{A}$              |    |
| $\frac{\Delta V_{OUT}}{\Delta V_{IN}}$  | Line Regulation                                   | $V_{SET} + 0.5 \text{ V} \leq V_{IN} \leq 10.0 \text{ V}$<br>Note: When $V_{OUT} \leq 2.1 \text{ V}$ ,<br>$2.6 \text{ V} \leq V_{IN} \leq 10.0 \text{ V}$ |                                                                 | $\pm 0.0$<br>2              | $\pm 0.25$ | %/V                        |    |
| $I_{SC}$                                | Short Current Limit                               | $V_{OUT} = 0 \text{ V}$                                                                                                                                   |                                                                 | 40                          |            | mA                         |    |
| $I_{PD}$                                | CE Pull-down Current                              |                                                                                                                                                           |                                                                 | 0.30                        |            | $\mu\text{A}$              |    |
| $V_{CEH}$                               | CE Input Voltage "H"                              |                                                                                                                                                           | 1.7                                                             |                             |            | V                          |    |
| $V_{CEL}$                               | CE Input Voltage "L"                              |                                                                                                                                                           |                                                                 |                             | 0.8        | V                          |    |
| $T_{TSD}$                               | Thermal Shutdown Temperature                      | Junction Temperature                                                                                                                                      |                                                                 | 165                         |            | $^{\circ}\text{C}$         |    |
| $T_{TSR}$                               | Thermal Shutdown Released Temperature             | Junction Temperature                                                                                                                                      |                                                                 | 110                         |            | $^{\circ}\text{C}$         |    |
| $R_{LOW}$                               | Auto-discharge Nch Tr. ON Resistance (RP171xxxxD) | $V_{CE} = 0 \text{ V}$ , $V_{IN} = 7.0 \text{ V}$                                                                                                         |                                                                 | 250                         |            | $\Omega$                   |    |

製品別電気的特性表

□で示した値は、 $-40^{\circ}\text{C} \leq T_a \leq 105^{\circ}\text{C}$ での設計保証値です。

RP171xxxxB/D (-AE)

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

| 製品名        | $V_{\text{OUT}}$ (V)<br>( $T_a = 25^{\circ}\text{C}$ ) |       |       | $V_{\text{OUT}}$ (V)<br>( $-40^{\circ}\text{C} \leq T_a \leq 105^{\circ}\text{C}$ ) |       |        | $V_{\text{DIF}}$ (V)<br>( $I_{\text{OUT}} = 150 \text{ mA}$ ) |        |
|------------|--------------------------------------------------------|-------|-------|-------------------------------------------------------------------------------------|-------|--------|---------------------------------------------------------------|--------|
|            | MIN.                                                   | TYP.  | MAX.  | MIN.                                                                                | TYP.  | MAX.   | TYP.                                                          | MAX.   |
| RP171x121x | 1.185                                                  | 1.200 | 1.215 | □1.147                                                                              | 1.200 | □1.245 | -                                                             | □1.405 |
| RP171x151x | 1.485                                                  | 1.500 | 1.515 | □1.447                                                                              | 1.500 | □1.545 | -                                                             | □1.105 |
| RP171x181x | 1.782                                                  | 1.800 | 1.818 | □1.737                                                                              | 1.800 | □1.854 | -                                                             | □0.805 |
| RP171x251x | 2.475                                                  | 2.500 | 2.525 | □2.413                                                                              | 2.500 | □2.575 | 0.400                                                         | □0.600 |
| RP171x281x | 2.772                                                  | 2.800 | 2.828 | □2.702                                                                              | 2.800 | □2.884 |                                                               |        |
| RP171x301x | 2.970                                                  | 3.000 | 3.030 | □2.895                                                                              | 3.000 | □3.090 | 0.300                                                         | □0.500 |
| RP171x331x | 3.267                                                  | 3.300 | 3.333 | □3.185                                                                              | 3.300 | □3.399 |                                                               |        |
| RP171x341x | 3.366                                                  | 3.400 | 3.434 | □3.281                                                                              | 3.400 | □3.502 |                                                               |        |
| RP171x501x | 4.950                                                  | 5.000 | 5.050 | □4.825                                                                              | 5.000 | □5.150 | 0.250                                                         | □0.420 |
| RP171x601x | 5.940                                                  | 6.000 | 6.060 | □5.790                                                                              | 6.000 | □6.180 |                                                               |        |

RP171xxxxB/D (-JE)

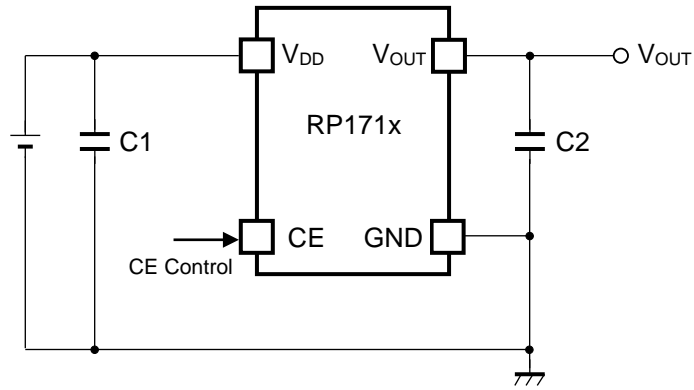
( $-40^{\circ}\text{C} \leq T_a \leq 105^{\circ}\text{C}$ )

| 製品名        | $V_{\text{OUT}}$ (V)<br>( $T_a = 25^{\circ}\text{C}$ ) |       |       | $V_{\text{OUT}}$ (V)<br>( $-40^{\circ}\text{C} \leq T_a \leq 105^{\circ}\text{C}$ ) |       |       | $V_{\text{DIF}}$ (V)<br>( $I_{\text{OUT}} = 150 \text{ mA}$ ) |       |
|------------|--------------------------------------------------------|-------|-------|-------------------------------------------------------------------------------------|-------|-------|---------------------------------------------------------------|-------|
|            | MIN.                                                   | TYP.  | MAX.  | MIN.                                                                                | TYP.  | MAX.  | TYP.                                                          | MAX.  |
| RP171x121x | 1.185                                                  | 1.200 | 1.215 | 1.147                                                                               | 1.200 | 1.245 | -                                                             | 1.405 |
| RP171x151x | 1.485                                                  | 1.500 | 1.515 | 1.447                                                                               | 1.500 | 1.545 | -                                                             | 1.105 |
| RP171x181x | 1.782                                                  | 1.800 | 1.818 | 1.737                                                                               | 1.800 | 1.854 | -                                                             | 0.805 |
| RP171x251x | 2.475                                                  | 2.500 | 2.525 | 2.413                                                                               | 2.500 | 2.575 | 0.400                                                         | 0.600 |
| RP171x281x | 2.772                                                  | 2.800 | 2.828 | 2.702                                                                               | 2.800 | 2.884 |                                                               |       |
| RP171x301x | 2.970                                                  | 3.000 | 3.030 | 2.895                                                                               | 3.000 | 3.090 | 0.300                                                         | 0.500 |
| RP171x331x | 3.267                                                  | 3.300 | 3.333 | 3.185                                                                               | 3.300 | 3.399 |                                                               |       |
| RP171x341x | 3.366                                                  | 3.400 | 3.434 | 3.281                                                                               | 3.400 | 3.502 |                                                               |       |
| RP171x501x | 4.950                                                  | 5.000 | 5.050 | 4.825                                                                               | 5.000 | 5.150 | 0.250                                                         | 0.420 |
| RP171x601x | 5.940                                                  | 6.000 | 6.060 | 5.790                                                                               | 6.000 | 6.180 |                                                               |       |

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**RP171N**NO. EC-245-200219

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**APPLICATION INFORMATION****TYPICAL APPLICATION****RP171x Typical Application****External Components**

| Symbol                 | Description                                              |
|------------------------|----------------------------------------------------------|
| C2 (C <sub>OUT</sub> ) | 1.0 $\mu$ F, Ceramic Capacitor, MURATA GRM155B31A105KE15 |



**EQUIVALENT SERIES RESISTANCE (ESR) vs. OUTPUT CURRENT ( $I_{OUT}$ )**

Ceramic type output capacitor is recommended for the RP171x; however, the other output capacitors with low ESR also can be used. 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**

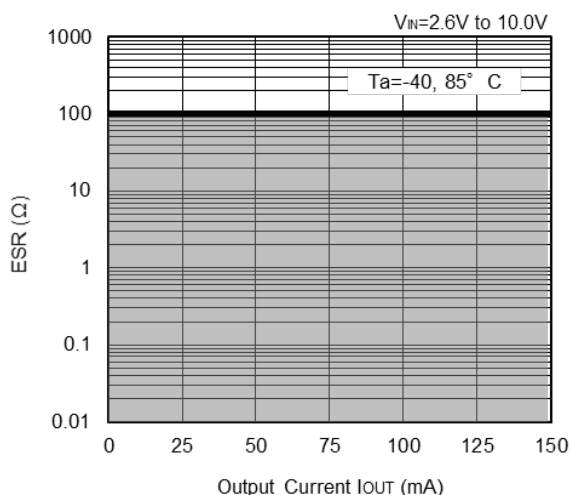
Noise Frequency Band: 10 Hz to 2 MHz

Measurement Temperature:  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$

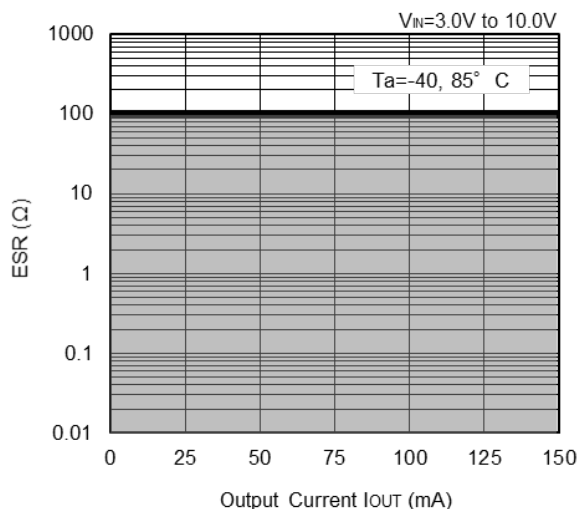
Hatched area: Noise level below  $40 \mu\text{V}$  (Avg.).

C1, C2: Ceramic  $1.0 \mu\text{F}$  (Murata, GRM155B31A105KE)

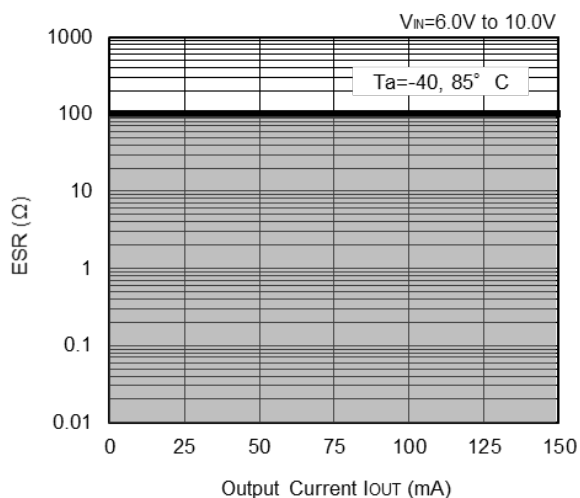
**RP171x12xx**



**RP171x30xx**



**RP171x60xx**



## TECHNICAL NOTES

### Phase Compensation

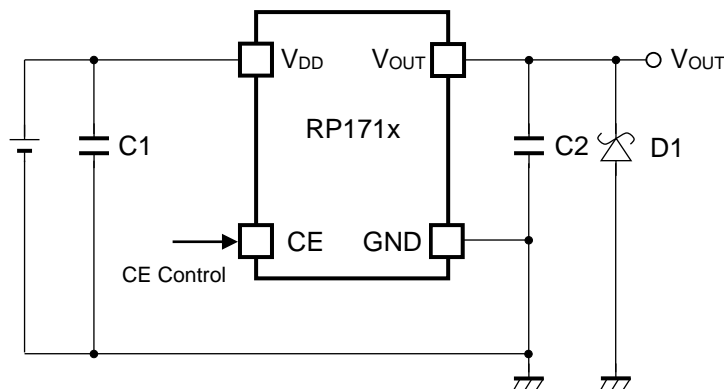
In the RP171x, phase compensation is provided to secure stable operation even when the load current is varied. For this purpose, use a 1.0  $\mu\text{F}$  or more output capacitor (C2) with good frequency characteristics and proper ESR (Equivalent Series Resistance).

In case of using a tantalum type capacitor and the ESR value of the capacitor is large, the output might be unstable. Evaluate the circuit including consideration of frequency characteristics.

### PCB Layout

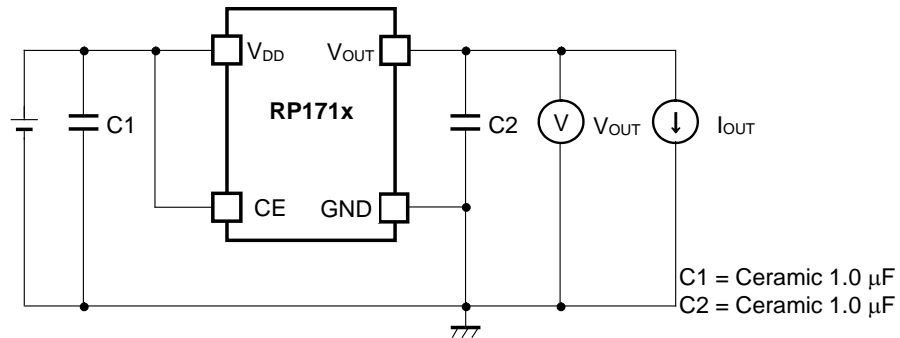
Ensure the  $V_{\text{DD}}$  and GND lines are sufficiently robust. If their impedance is too high, noise pickup or unstable operation may result. Connect a 1.0  $\mu\text{F}$  or more output capacitor (C1) with suitable values between the  $V_{\text{DD}}$  and GND pins, and as close as possible to the pins.

### TYPICAL APPLICATION FOR IC CHIP BREAKDOWN PREVENTION

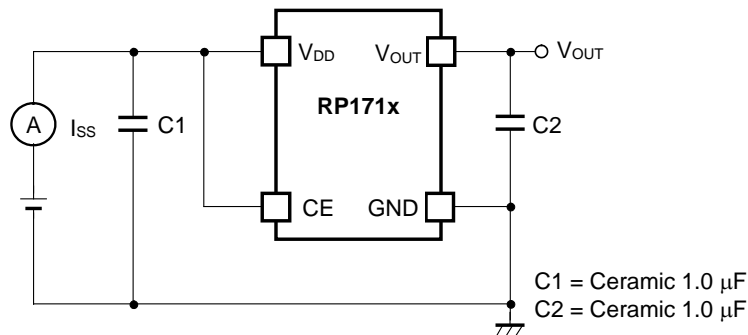


When a sudden surge of electrical current travels along the  $V_{\text{OUT}}$  pin and GND due to a short-circuit, electrical resonance of a circuit involving an output capacitor (C2) and a short circuit inductor generates a negative voltage and may damage the device or the load devices. Connecting a schottky diode (D1) between the  $V_{\text{OUT}}$  pin and GND has the effect of preventing damage to them.

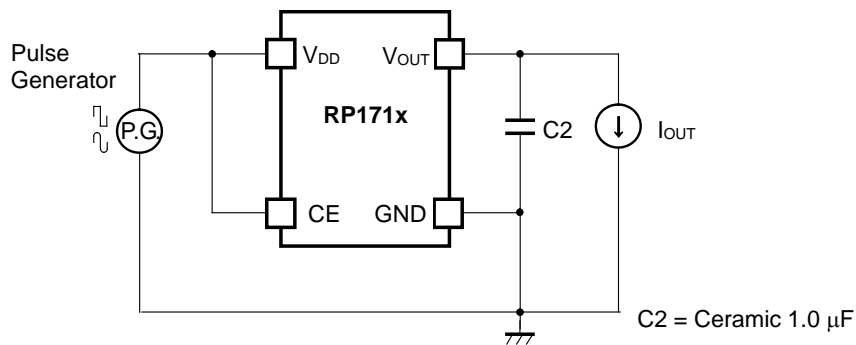
TEST CIRCUITS



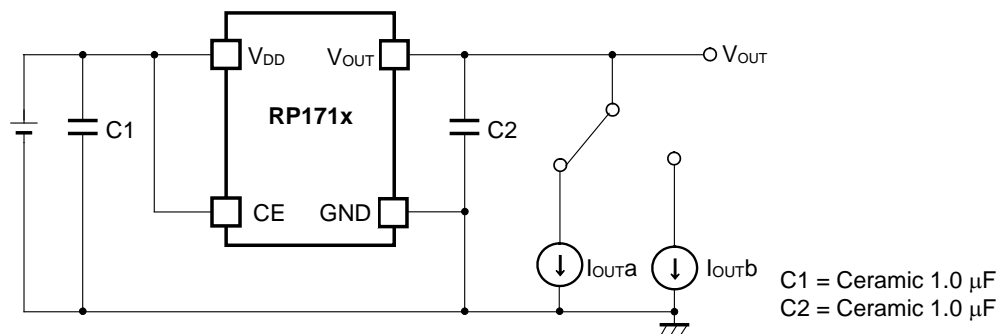
Basic Test Circuit



Test Circuit for Supply Current



Test Circuit for Ripple Rejection

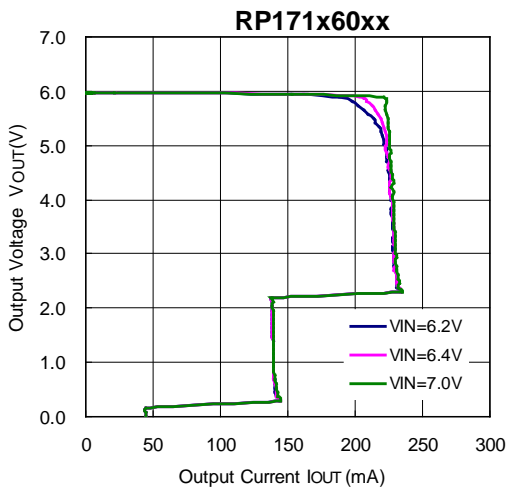
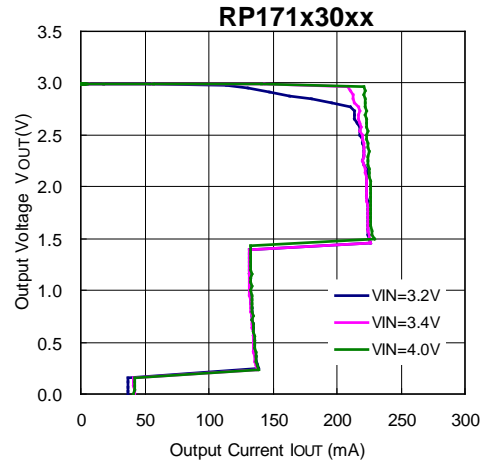
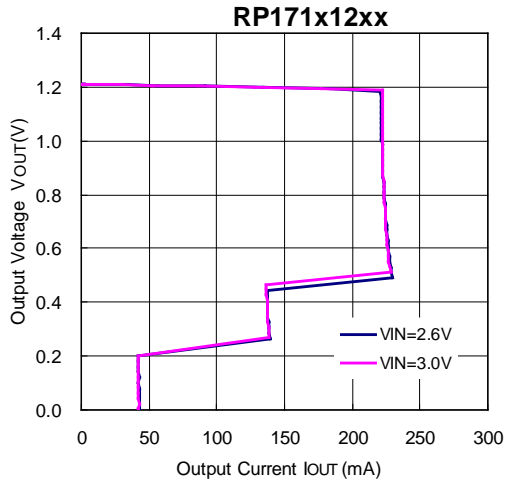


Test Circuit for Load Transient Response

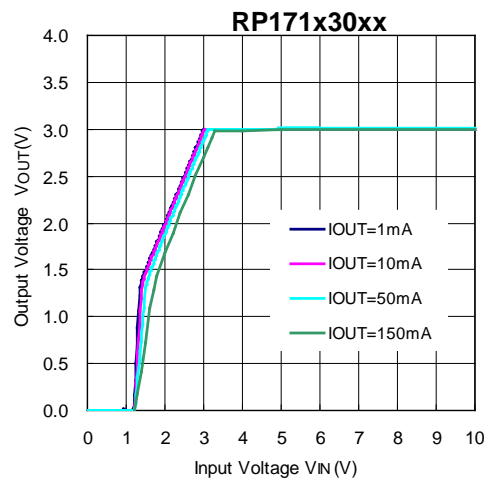
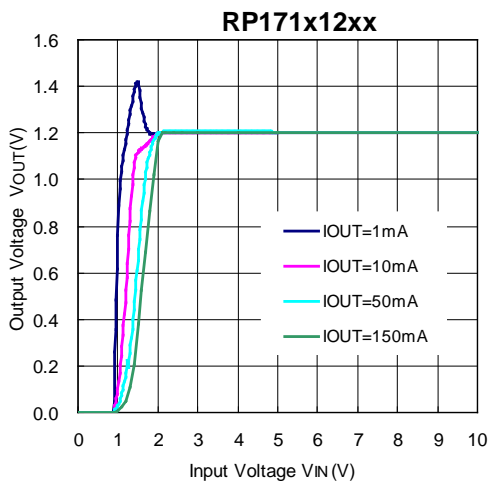
### TYPICAL CHARACTERISTICS

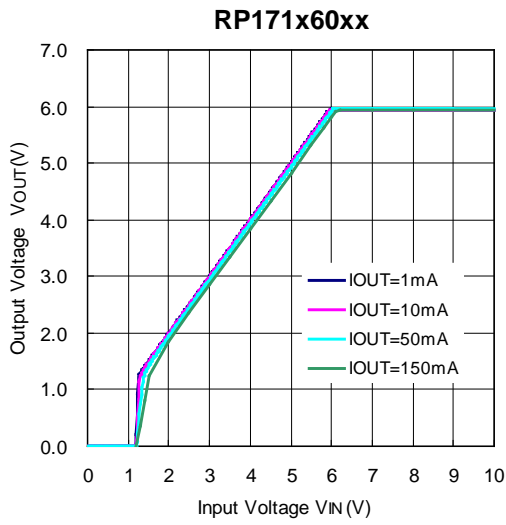
Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

#### 1) Output voltage vs. Output Current (Ta = 25°C)

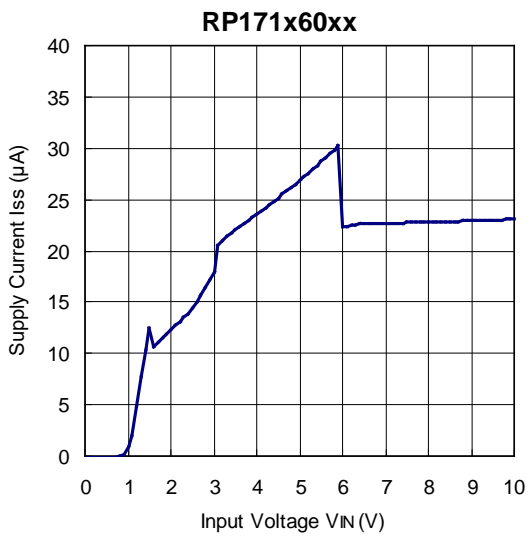
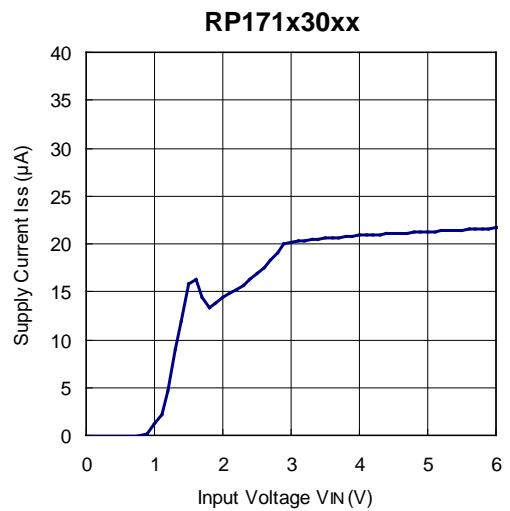
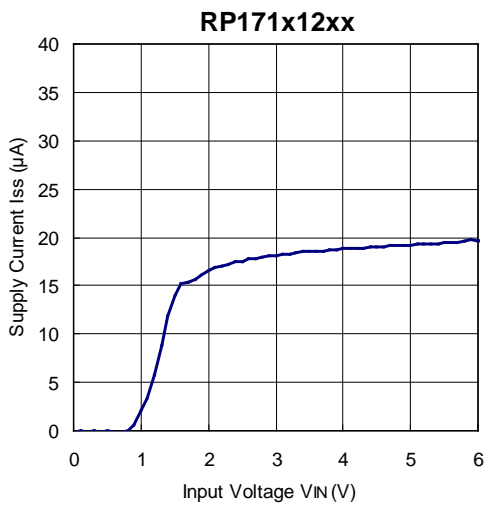


#### 2) Output Voltage vs. Input Voltage (Ta = 25°C)





**3) Supply Current vs. Input Voltage ( $T_a = 25^\circ\text{C}$ )**

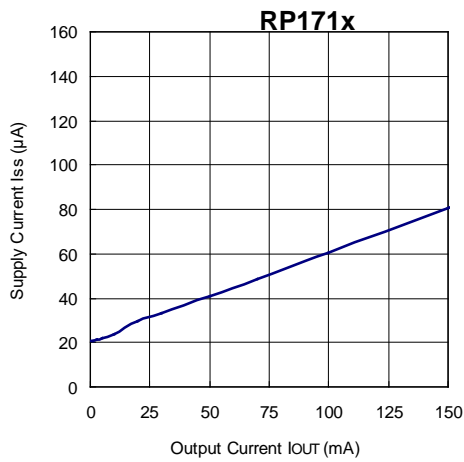
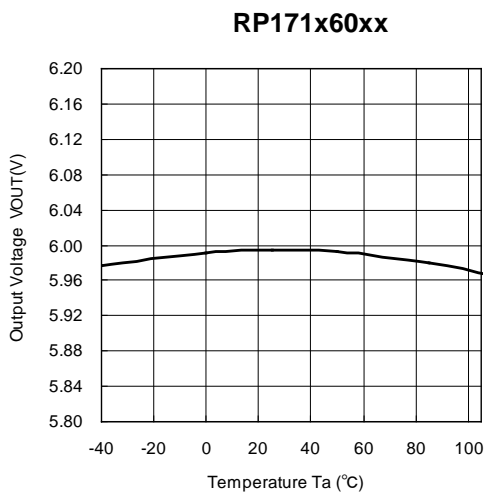
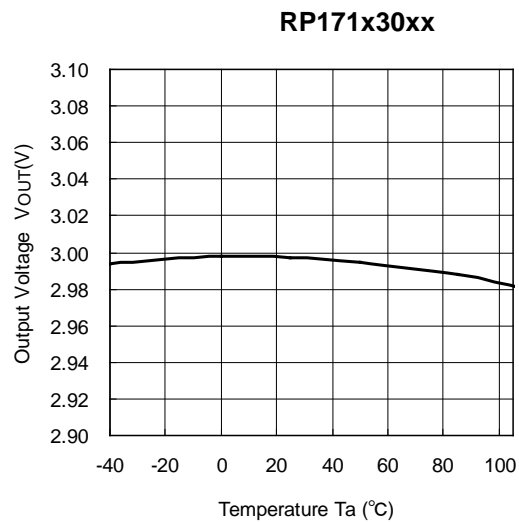
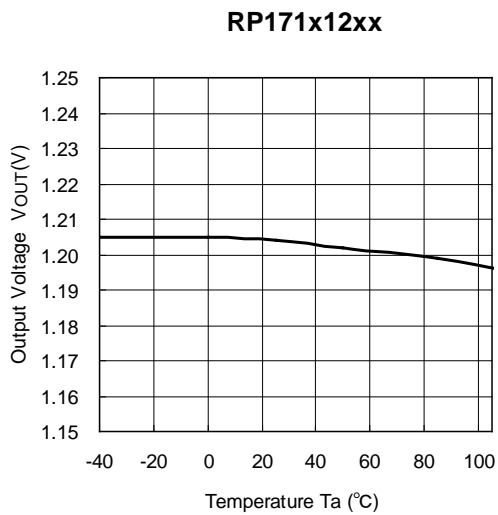


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**RP171N**

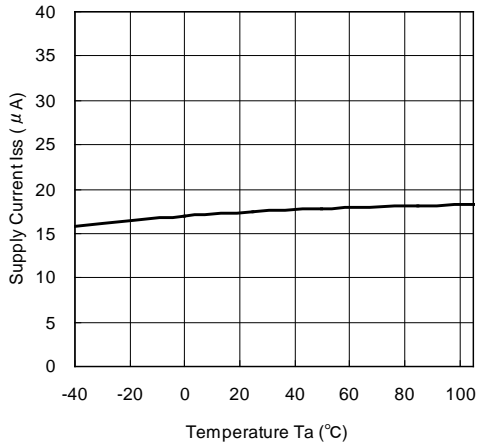
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NO. EC-245-200219

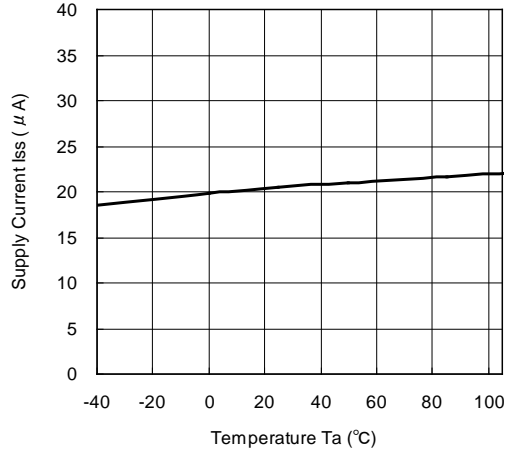
**4) Supply Current vs. Output Current (Ta = 25°C)****5) Output Voltage vs. Temperature**

6) Supply Current vs. Temperature

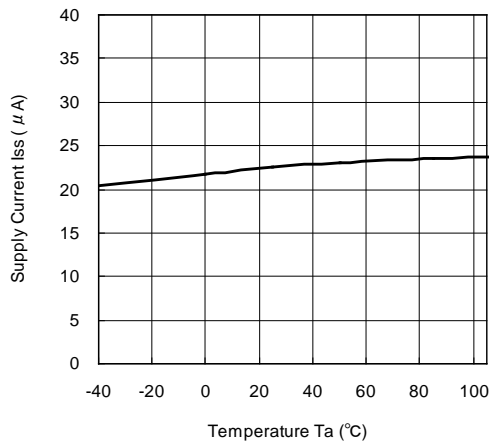
RP171x12xx



RP171x30xx

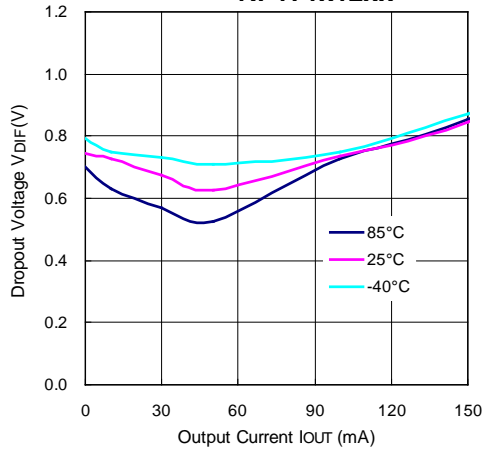


RP171x60xx

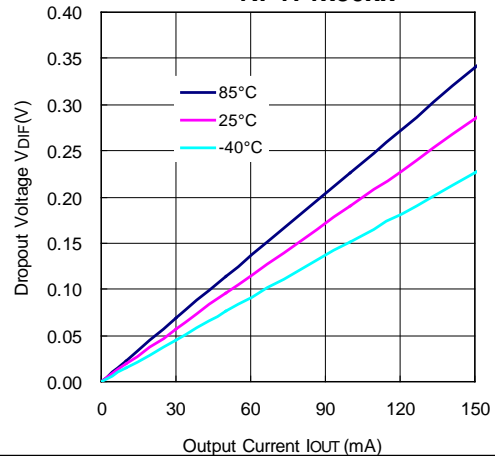


7) Dropout Voltage vs. Output Current

RP171x12xx



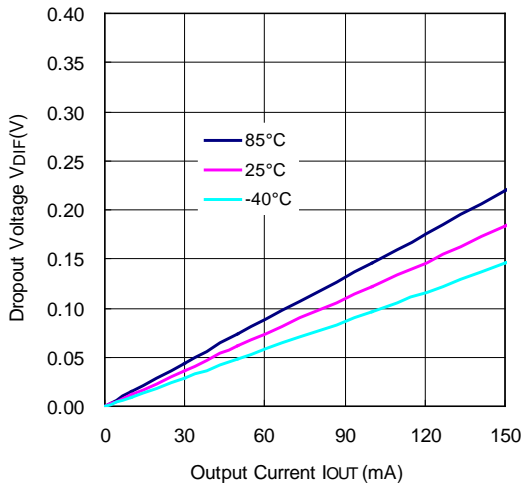
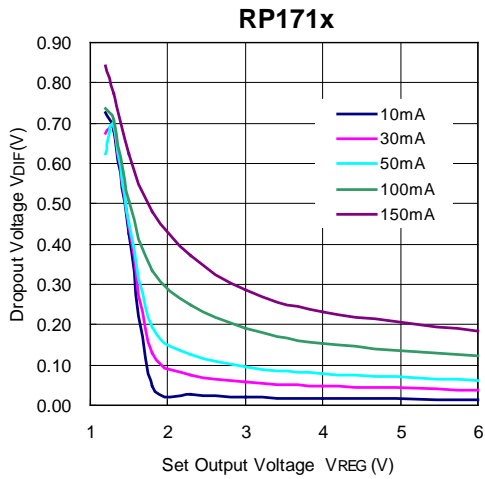
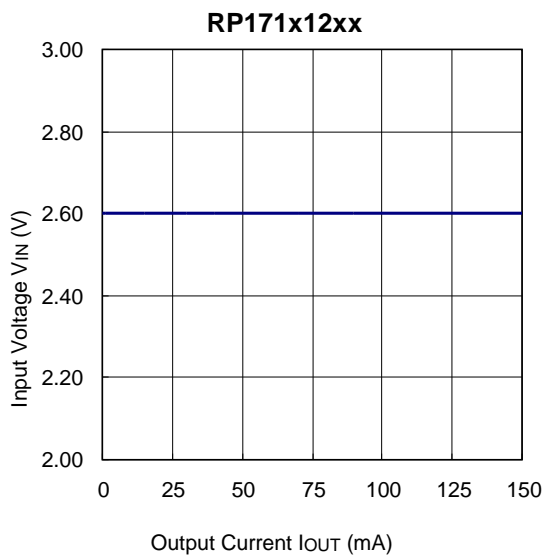
RP171x30xx



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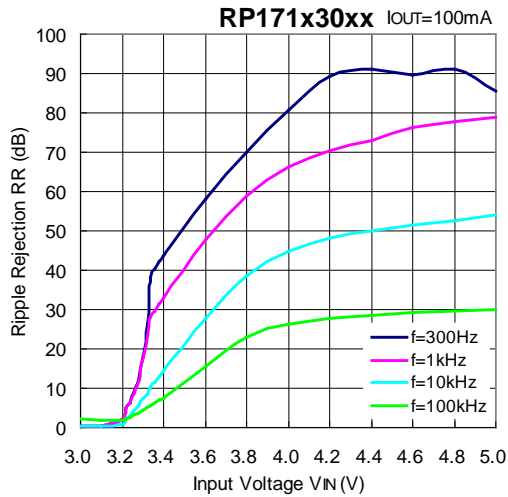
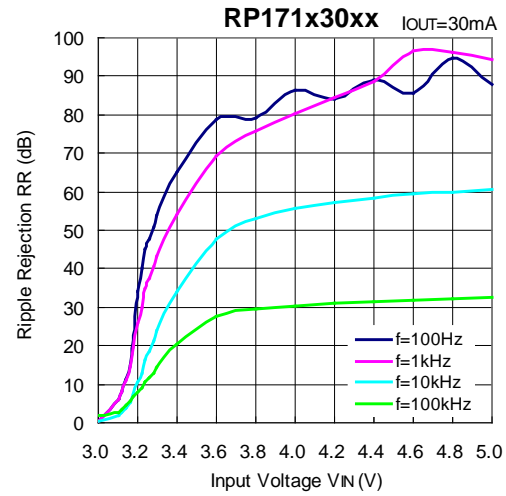
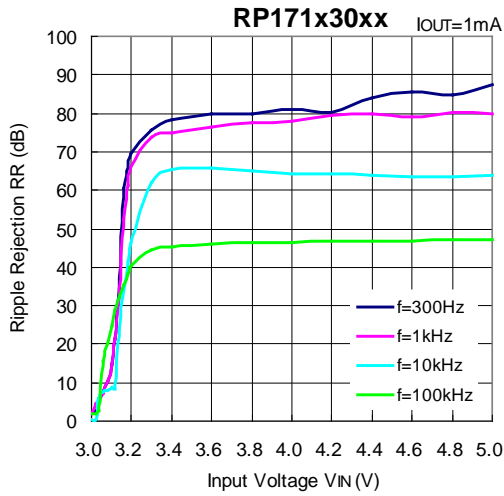
**RP171N**NO. EC-245-200219

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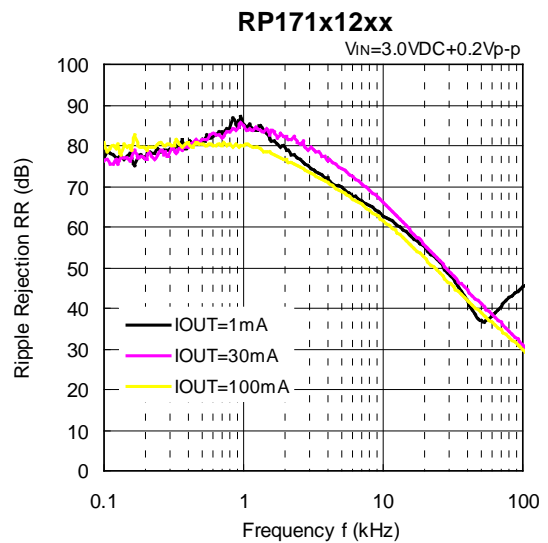
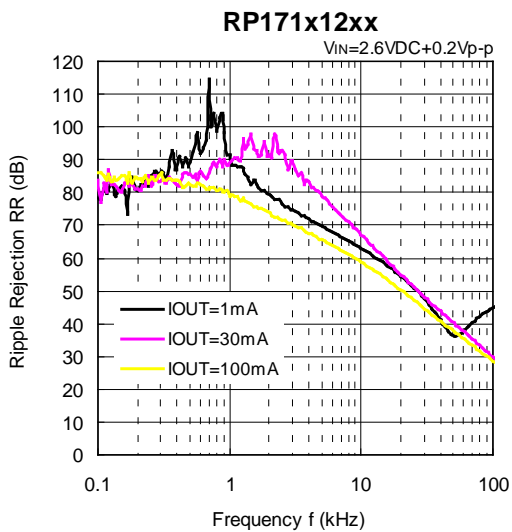
**RP171x60xx****8) Dropout Voltage vs. Set Output Voltage ( $T_a = 25^\circ\text{C}$ )****9) Minimum Operating Voltage**



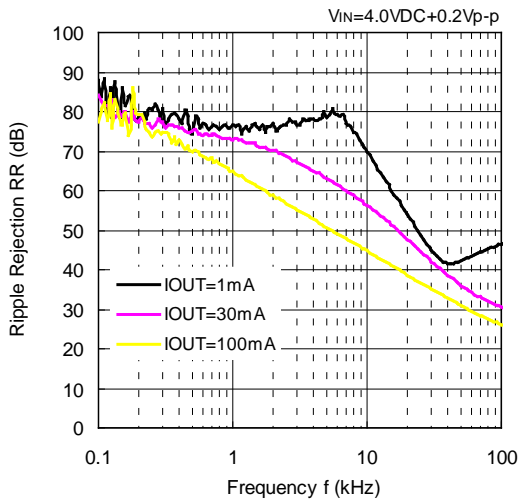
10) Ripple Rejection vs. Input Bias Voltage (C1 = none, C2 = Ceramic 1.0  $\mu$ F, Ripple = 0.2 Vp-p, Ta = 25°C)



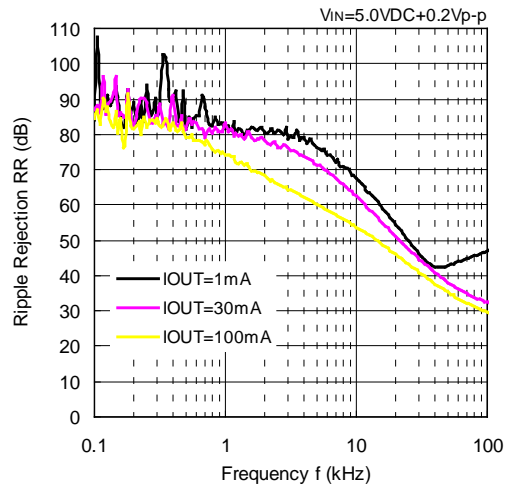
11) Ripple Rejection vs. Frequency (C1 = none, C2 = Ceramic 1.0  $\mu$ F, Ta = 25°C)



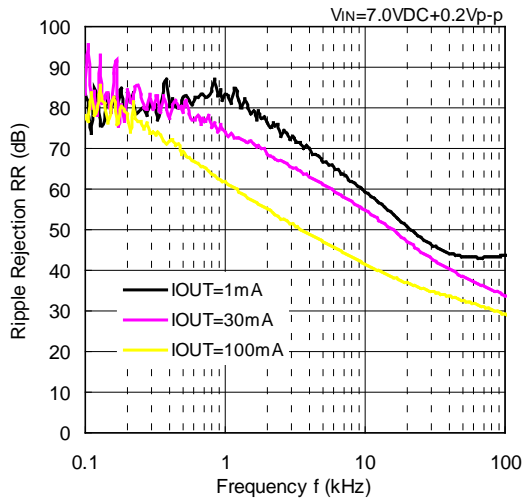
RP171x30xx



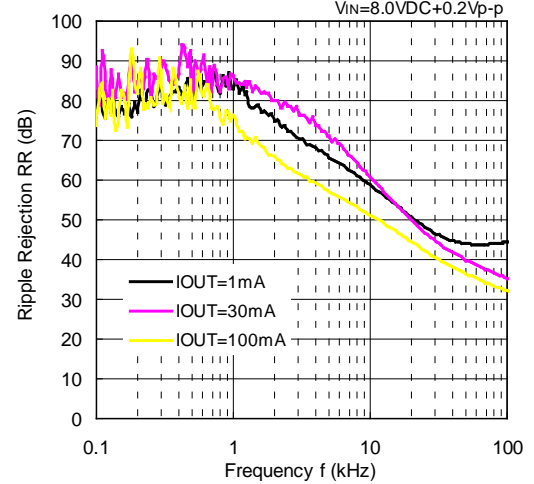
RP171x30xx



RP171x60xx

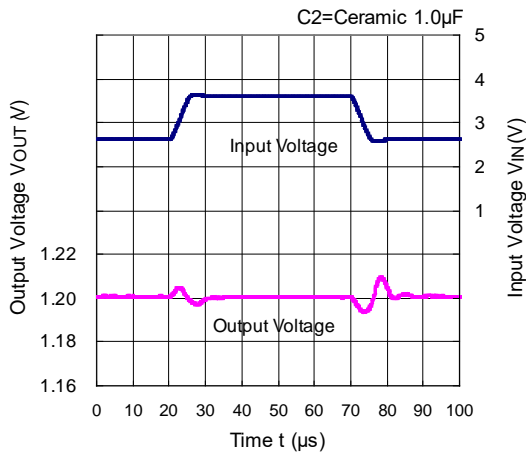


RP171x60xx

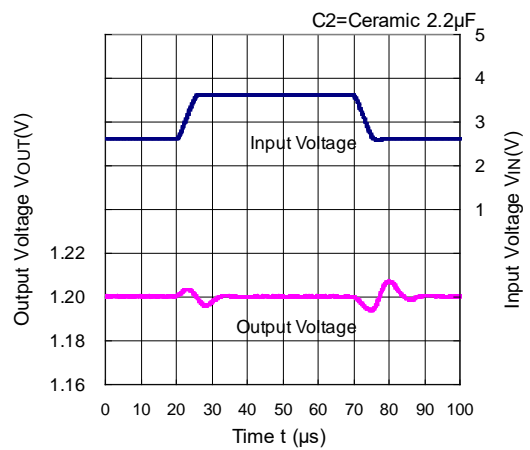


12) Input Transient Response (C1 = none, IOUT = 30 mA, tr = tf = 5μs, Ta = 25°C)

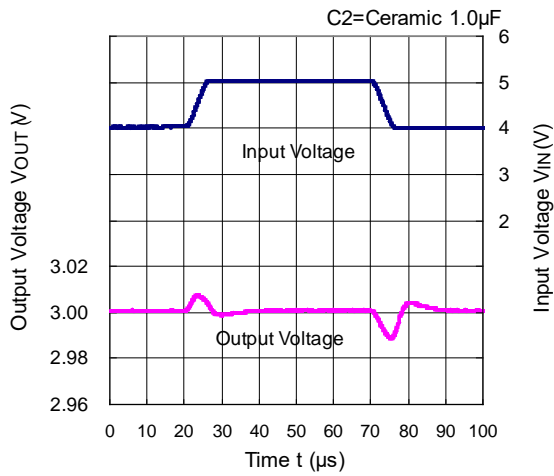
RP171x12xx



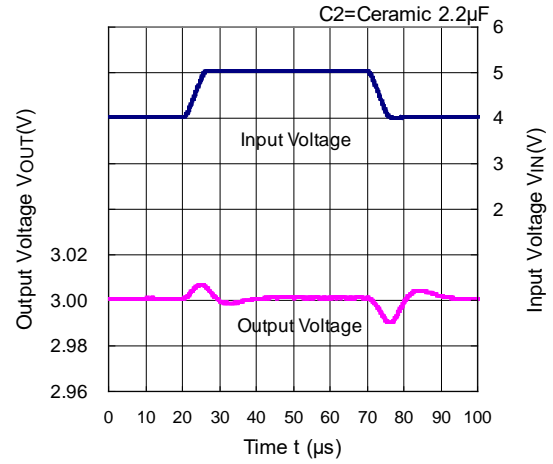
RP171x12xx



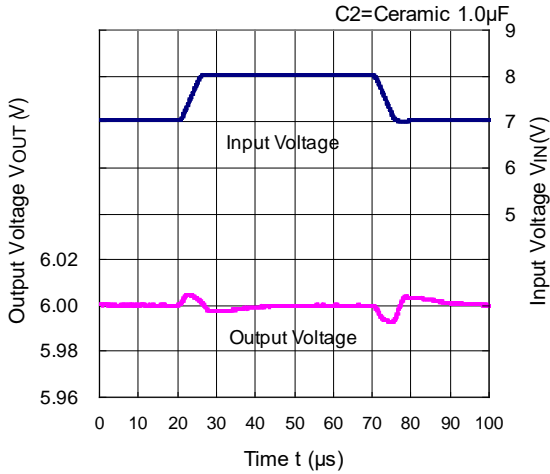
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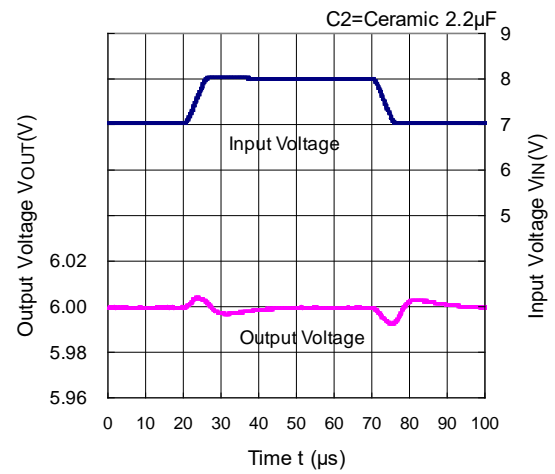
RP171x30xx



RP171x60xx

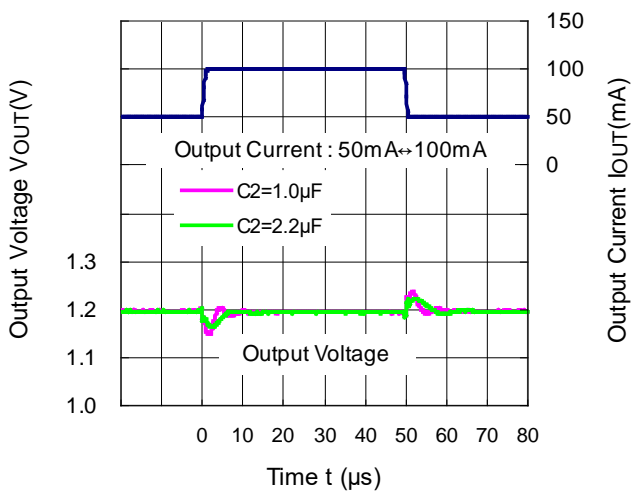


RP171x60xx

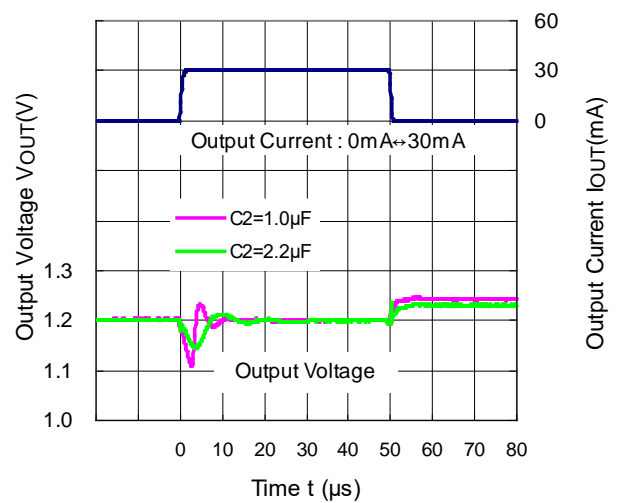


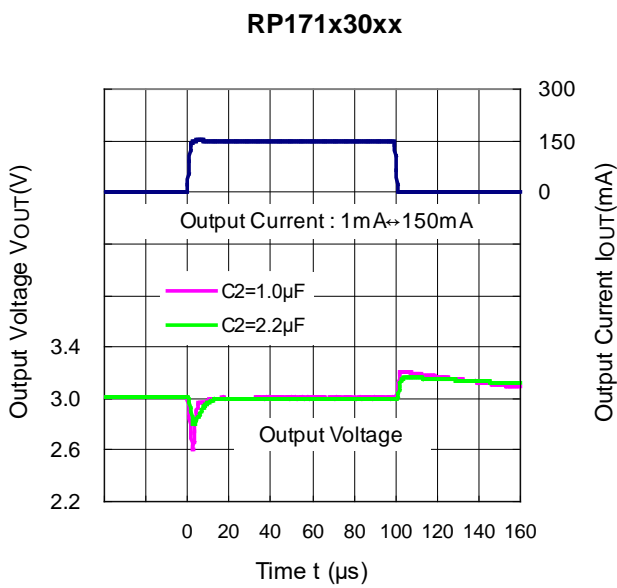
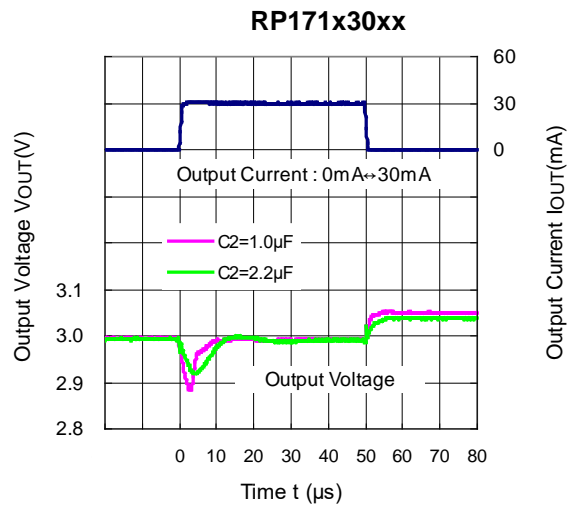
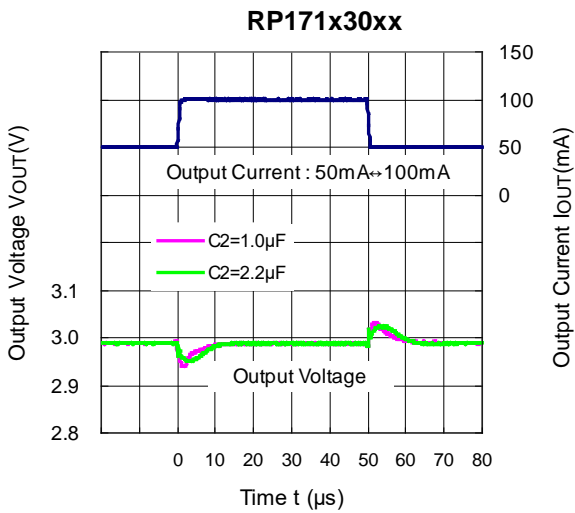
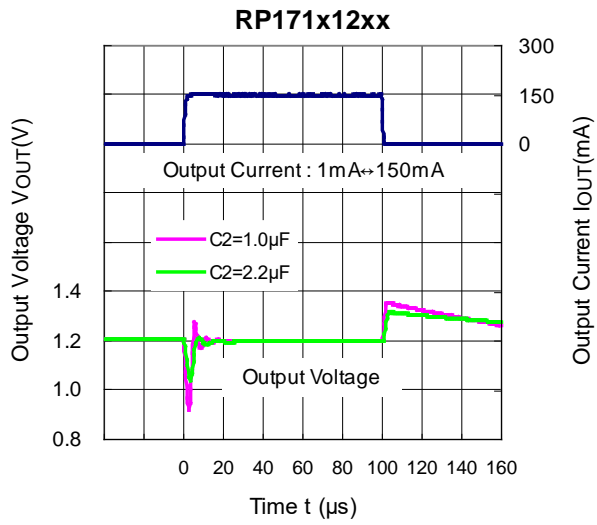
13) Load Transient Response (C1 = Ceramic 1.0  $\mu$ F,  $t_r = t_f = 500$  ns,  $T_a = 25^\circ\text{C}$ )

RP171x12xx

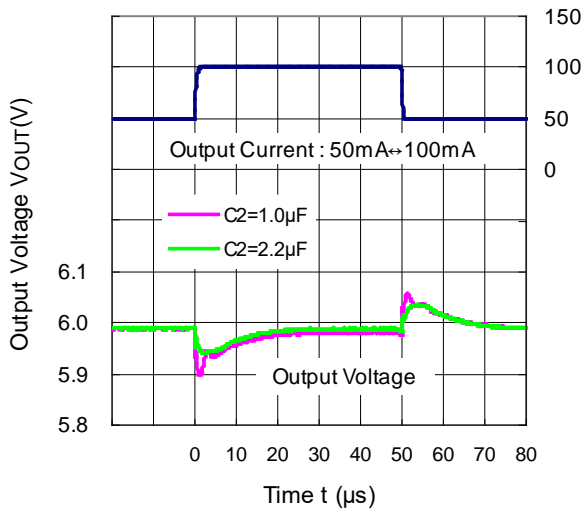


RP171x12xx

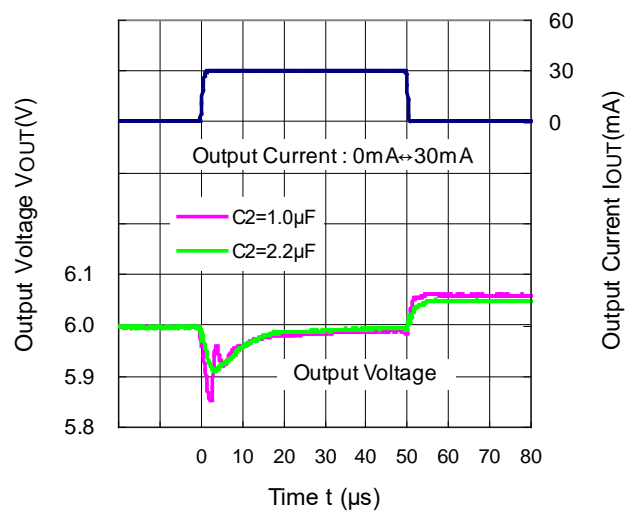




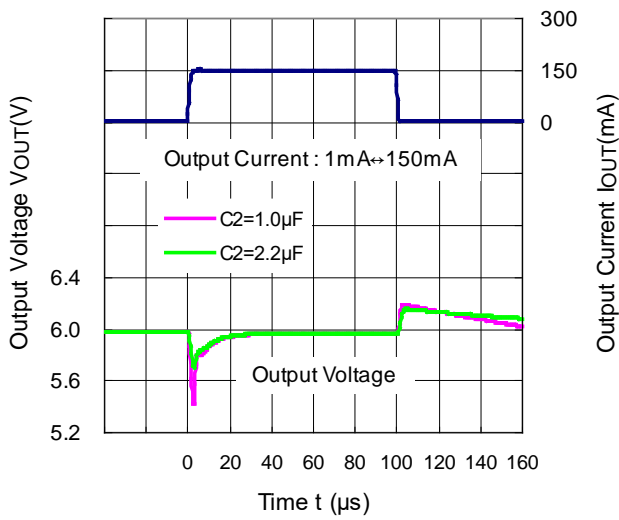
RP171x60xx



RP171x60xx



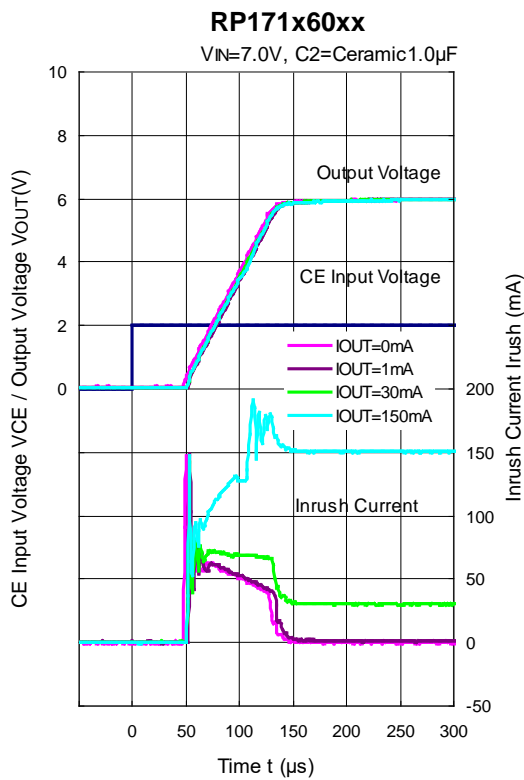
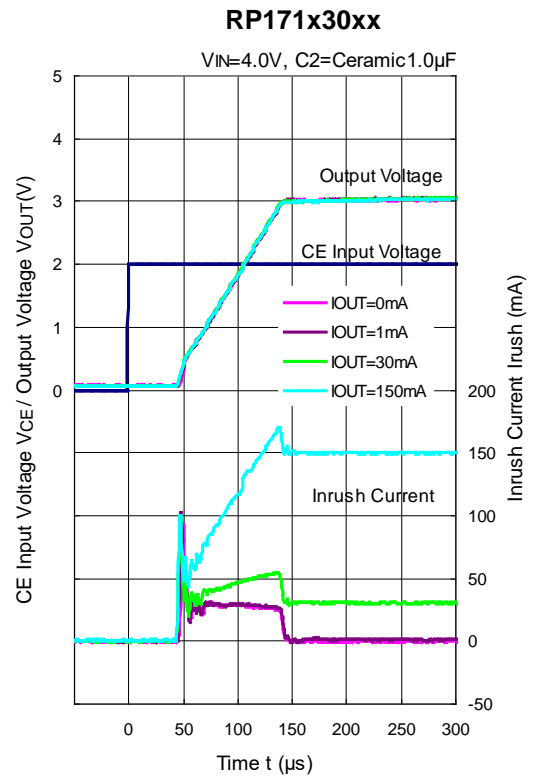
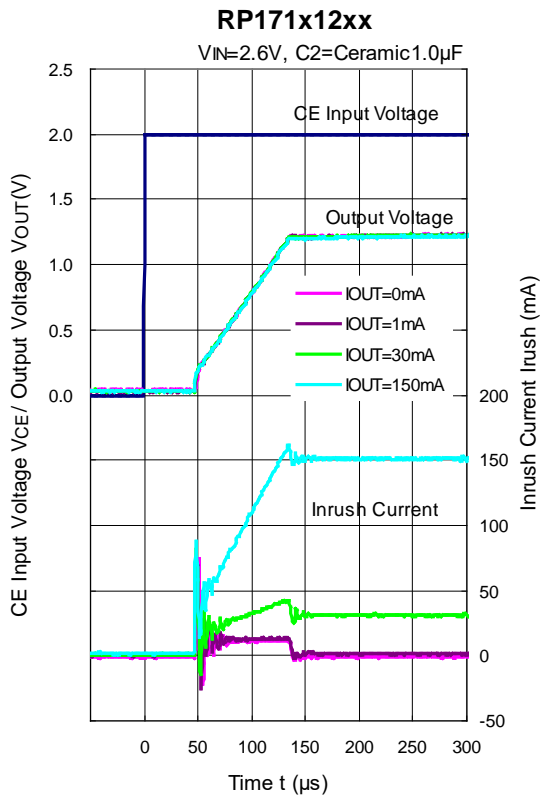
RP171x60xx



# RP171N

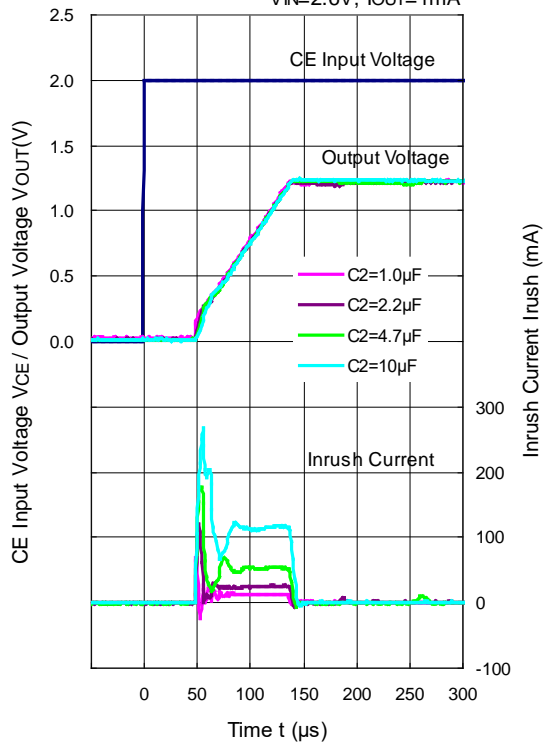
NO. EC-245-200219

## 14) Turn On Speed with CE pin (C1 = Ceramic 1.0 $\mu$ F, Ta = 25°C)



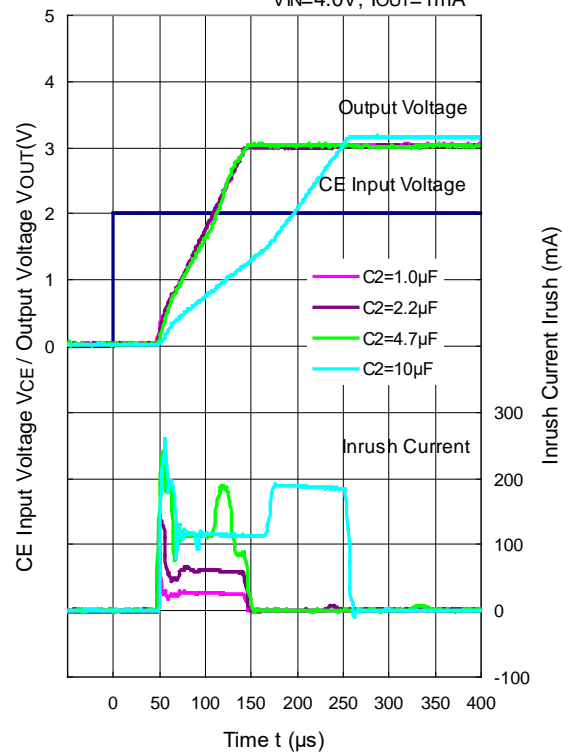
**RP171x12xx**

V<sub>IN</sub>=2.6V, I<sub>OUT</sub>=1mA



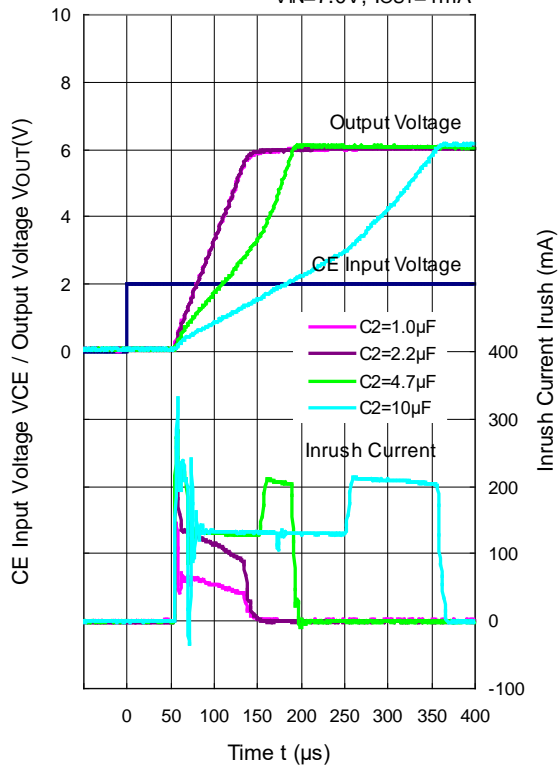
**RP171x30xx**

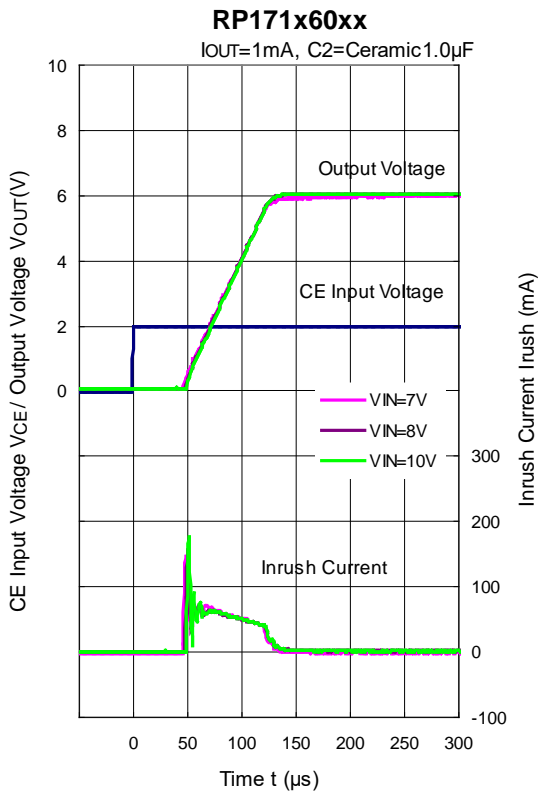
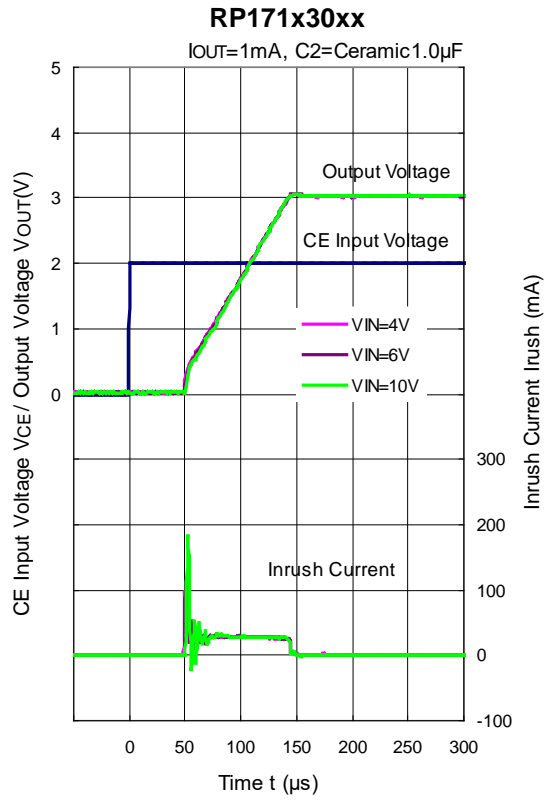
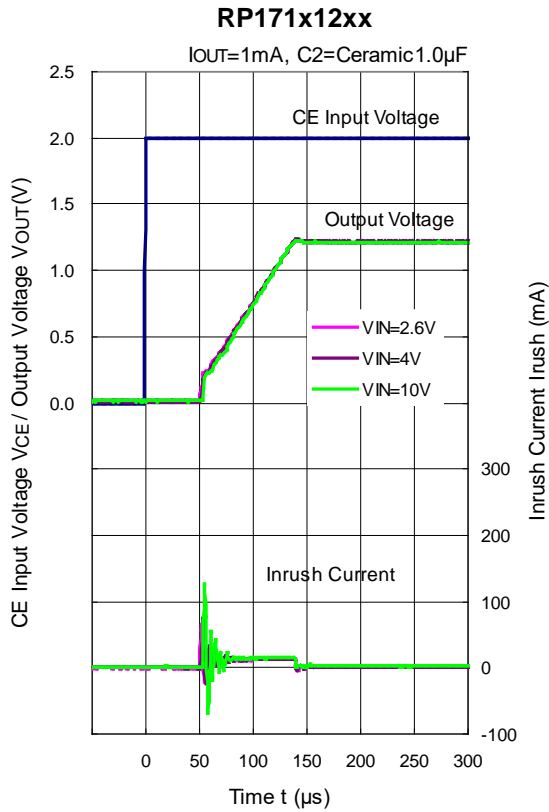
V<sub>IN</sub>=4.0V, I<sub>OUT</sub>=1mA



**RP171x60xx**

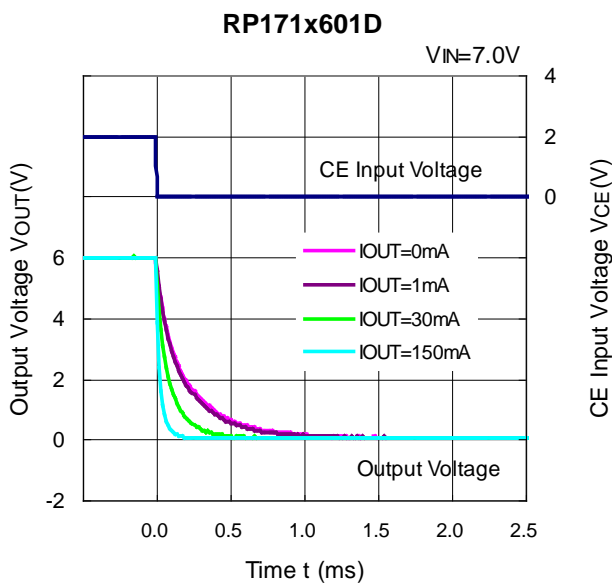
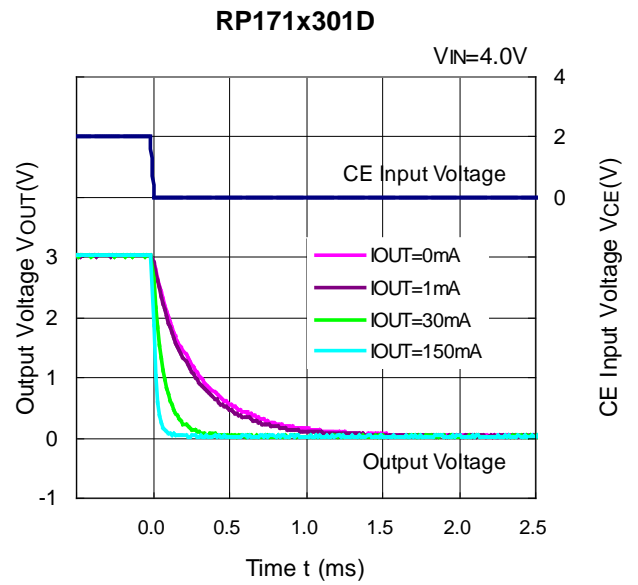
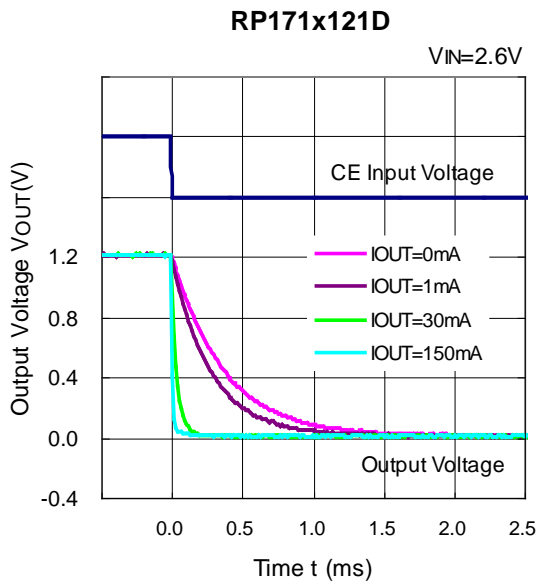
V<sub>IN</sub>=7.0V, I<sub>OUT</sub>=1mA







15) Turn Off Speed with CE pin (RP171xxxxD) (C1 = C2 = Ceramic 1.0  $\mu$ F, Ta = 25°C)



The power dissipation of the package is dependent on PCB material, layout, and environmental conditions. The following measurement conditions are based on JEDEC STD. 51-7.

**Measurement Conditions**

| Item             | Measurement Conditions                                                                                                                                                                       |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Environment      | Mounting on Board (Wind Velocity = 0 m/s)                                                                                                                                                    |
| Board Material   | Glass Cloth Epoxy Plastic (Four-Layer Board)                                                                                                                                                 |
| Board Dimensions | 76.2 mm × 114.3 mm × 0.8 mm                                                                                                                                                                  |
| Copper Ratio     | Outer Layer (First Layer): Less than 95% of 50 mm Square<br>Inner Layers (Second and Third Layers): Approx. 100% of 50 mm Square<br>Outer Layer (Fourth Layer): Approx. 100% of 50 mm Square |
| Through-holes    | φ 0.3 mm × 7 pcs                                                                                                                                                                             |

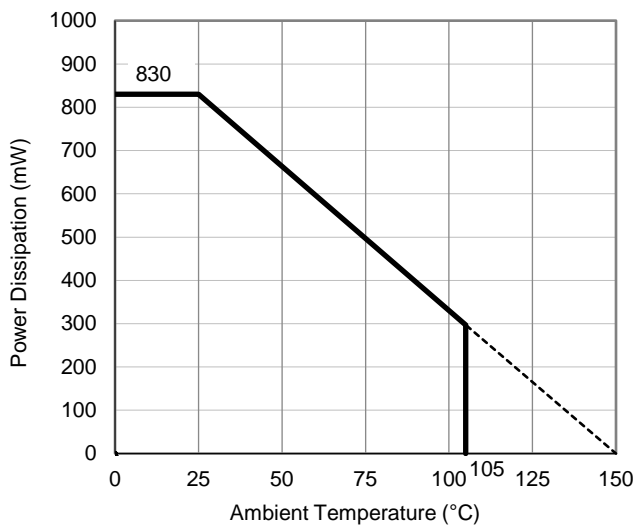
**Measurement Result**

(Ta = 25°C, Tjmax = 150°C)

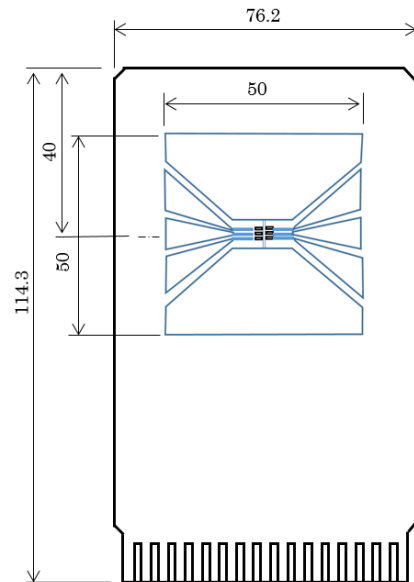
| Item                                     | Measurement Result |
|------------------------------------------|--------------------|
| Power Dissipation                        | 830 mW             |
| Thermal Resistance (θja)                 | θja = 150°C/W      |
| Thermal Characterization Parameter (ψjt) | ψjt = 51°C/W       |

θja: Junction-to-Ambient Thermal Resistance

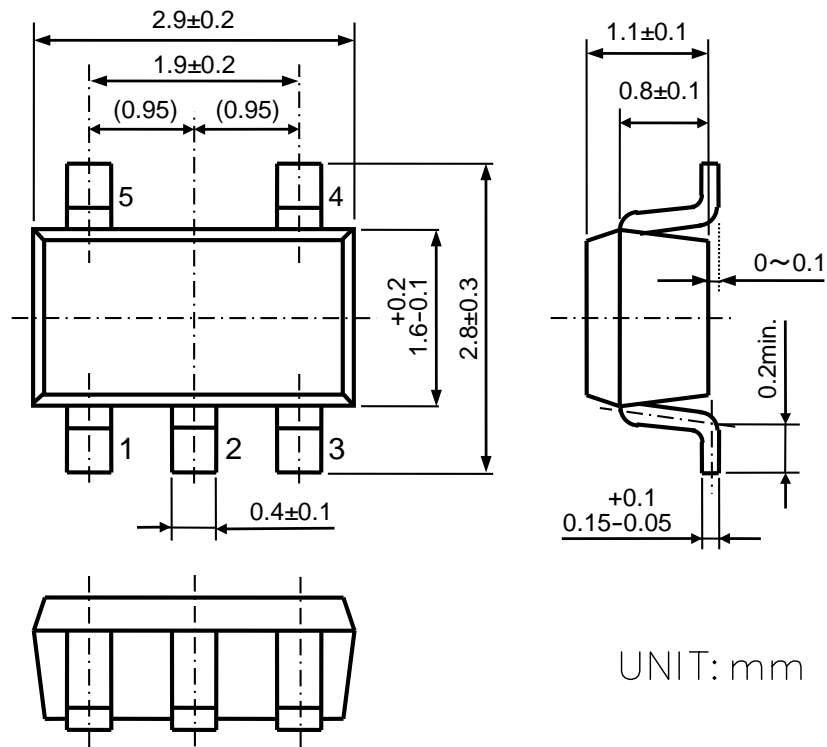
ψjt: Junction-to-Top Thermal Characterization Parameter



**Power Dissipation vs. Ambient Temperature**



**Measurement Board Pattern**



UNIT: mm

SOT-23-5 Package Dimensions



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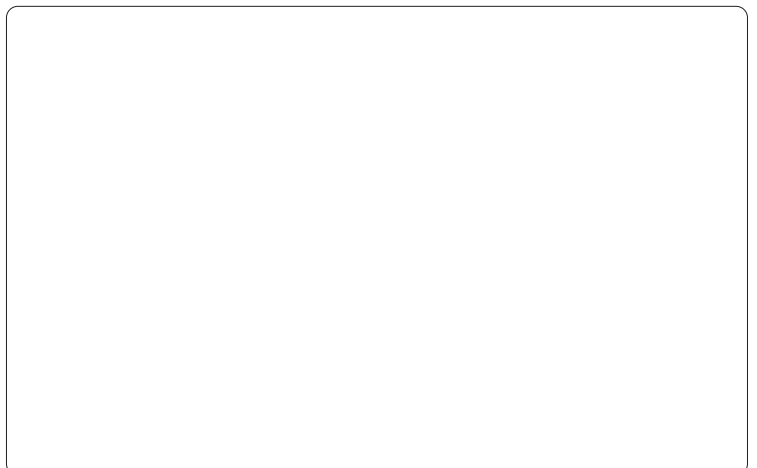
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