

## Super low on resistance/Low voltage LDO

NO.EA-123-111027

### OUTLINE

The R1173x Series are CMOS-based positive voltage regulator ICs. The R1173x Series have features of super low dropout, 1A output current capability, and -3mV typical load regulation at 1A. Even the output voltage is set at 1.5V, on resistance of internal FET is typically  $0.32\Omega$ . Therefore, applications that require a large current at small dropout are suitable for the R1173x series. Low input voltage is acceptable and low output voltage can be set. The minimum input voltage is 1.4V, and the lowest set output voltage is 0.8V. Each of these ICs consists of a voltage reference unit, an error amplifier, resistor net for setting output voltage, a current limit circuit at over-current, a chip enable circuit, a thermal-shutdown circuit, and so on. A stand-by mode with ultra low consumption current can be realized with the chip enable pin. The output voltage types of R1173 are fixed one in the IC and adjustable one (R1173x001x).

Since the packages for these ICs are the SOT-89-5 package, HSON-6, or HSOP-6J, high density mounting of the ICs on boards is possible.

### FEATURES

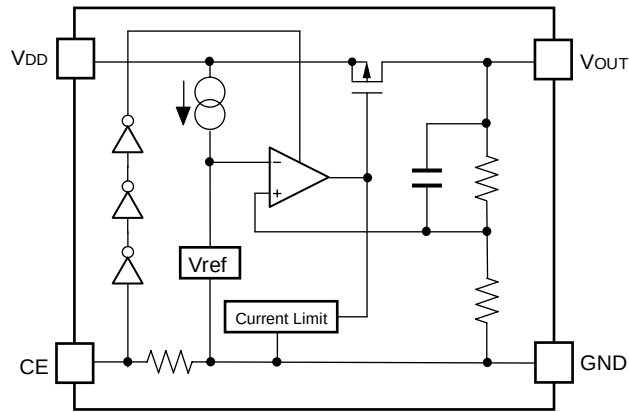
- Output Current ..... 1A
- Supply Current ..... Typ.  $60\mu\text{A}$
- Standby Current ..... Typ.  $0.1\mu\text{A}$
- Input Voltage Range ..... 1.4V to 6.0V
- Output Voltage Range ..... 0.8V to 5.0V (0.1V steps) (R1173xxx1)  
1.0V to  $V_{\text{IN}}$  (R1173x001)  
(For other voltages, please refer to MARK INFORMATION.)
- Dropout Voltage ..... Typ. 0.32V ( $V_{\text{OUT}}=1.5\text{V}$ ,  $I_{\text{OUT}}=1\text{A}$ )  
Typ. 0.18V ( $V_{\text{OUT}}=2.8\text{V}$ ,  $I_{\text{OUT}}=1\text{A}$ )
- Ripple Rejection ..... Typ. 70dB ( $V_{\text{OUT}}=2.8\text{V}$ )
- Output Voltage Accuracy .....  $\pm 2.0\%$
- Temperature-drift Coefficient of Output Voltage ..... Typ.  $\pm 100\text{ppm}/^\circ\text{C}$
- Line Regulation ..... Typ. 0.05%/V
- Load Regulation ..... Typ. -2mV ( $I_{\text{OUT}}=300\text{mA}$ )  
Typ. -3mV ( $I_{\text{OUT}}=1\text{A}$ )
- Packages ..... SOT-89-5, HSON-6, HSOP-6J
- Low inrush current at turning-on ..... Typ. 500mA
- Built-in Thermal Shutdown Circuit
- Built-in Current Limit Circuit ..... Typ. 250mA
- Output capacitors .....  $C_{\text{IN}}=\text{Ceramic } 4.7\mu\text{F}$   
 $C_{\text{OUT}}=\text{Tantalum } 4.7\mu\text{F}$  ( $V_{\text{OUT}} < 1.0\text{V}$ )  
 $C_{\text{OUT}}=\text{Ceramic } 4.7\mu\text{F}$  ( $V_{\text{OUT}} \geq 1.0\text{V}$ )

### APPLICATIONS

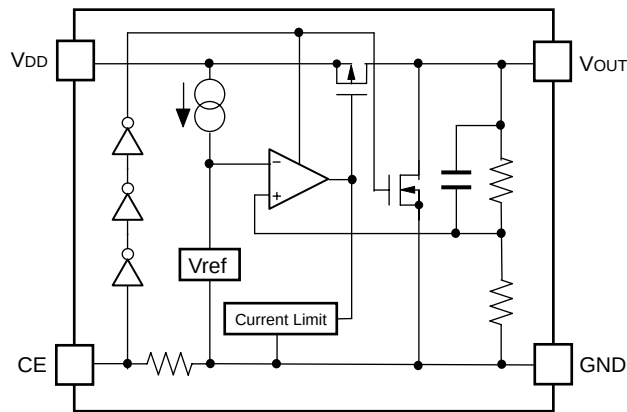
- Local Power source for Notebook PC.
- Local Power source for portable communication equipments, cameras, and videos.
- Local Power source for home appliances.

BLOCK DIAGRAMS

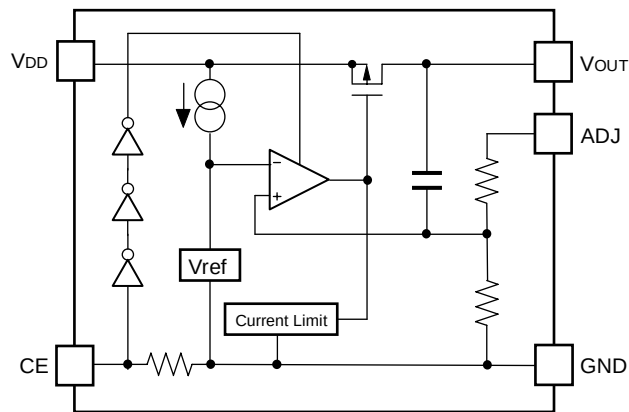
R1173xxx1B



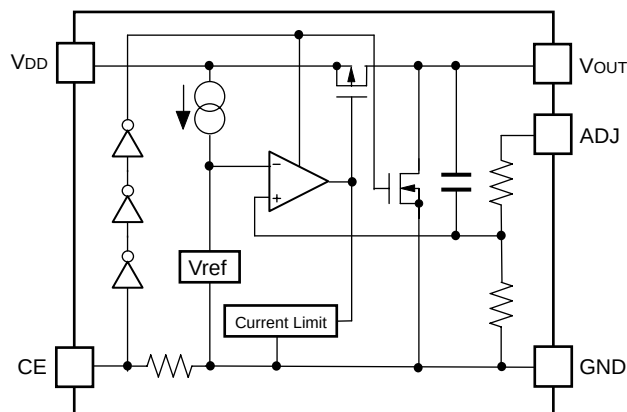
R1173xxx1D



R1173x001B



R1173x001D

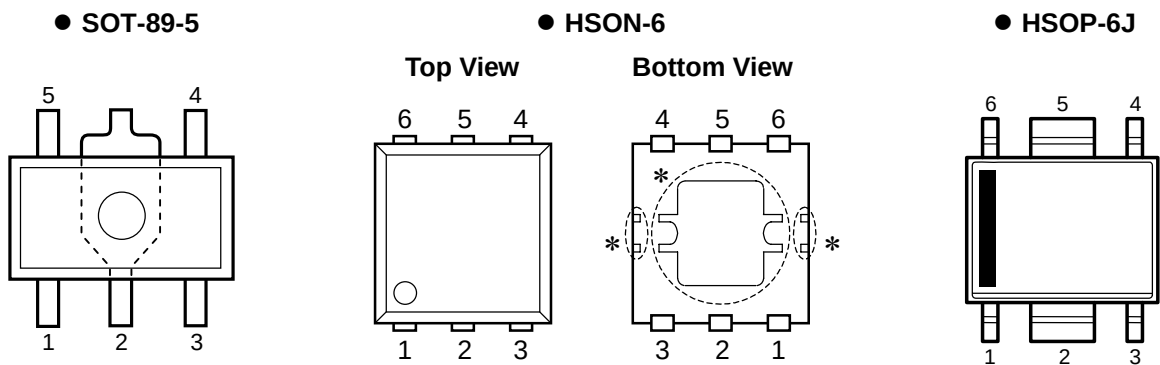


## SELECTION GUIDE

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

| Product Name                                                                                                                                                                                                                                                                                                                                                                                                                        | Package  | Quantity per Reel | Pb Free | Halogen Free |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------|---------|--------------|
| R1173Dxx1*-TR-FE                                                                                                                                                                                                                                                                                                                                                                                                                    | HSOP-6   | 3,000 pcs         | Yes     | Yes          |
| R1173Hxx1*-T1-FE                                                                                                                                                                                                                                                                                                                                                                                                                    | SOT-89-5 | 1,000 pcs         | Yes     | Yes          |
| R1173Sxx1*-E2-FE                                                                                                                                                                                                                                                                                                                                                                                                                    | HSOP-6J  | 1,000 pcs         | Yes     | Yes          |
| xx: The output voltage can be designated in the range from 0.8V(08) to 5.0V(50) in 0.1V steps.<br>External Setting Type: 00 (ADJ pin voltage is fixed at 1.0V.)<br>(For other voltages, please refer to MARK INFORMATION.)<br><br>* : The auto discharge function at off state are options as follows.<br>(B) "H" active, without auto discharge function at off state<br>(D) "H" active, with auto discharge function at off state |          |                   |         |              |

PIN CONFIGURATIONS



PIN DESCRIPTIONS

●SOT-89-5

| Pin No. | Symbol           | Description                  |
|---------|------------------|------------------------------|
| 1       | ADJ              | ADJUST Pin (R1173H001x)      |
|         | NC               | No Connection (R1173Hxx1x)   |
| 2       | GND              | Ground Pin                   |
| 3       | CE               | Chip Enable Pin ("H" Active) |
| 4       | V <sub>DD</sub>  | Input Pin                    |
| 5       | V <sub>OUT</sub> | Output Pin                   |

●HSON-6

| Pin No. | Symbol              | Description                  |
|---------|---------------------|------------------------------|
| 1       | V <sub>OUT</sub> *1 | Output Pin                   |
| 2       | V <sub>OUT</sub> *1 | Output Pin                   |
| 3       | ADJ                 | ADJUST Pin (R1173D001x)      |
|         | NC                  | No Connection (R1173Dxx1x)   |
| 4       | GND                 | Ground Pin                   |
| 5       | CE                  | Chip Enable Pin ("H" Active) |
| 6       | V <sub>DD</sub>     | Input Pin                    |

\*) Tab and tab suspension leads in the  parts are GND level.  
(They are connected to the reverse side of the IC.)  
The tab is better to be connected to the GND, but leaving it open is also acceptable.  
The tab suspension leads should be open and do not connect to other wires or land patterns.

\*1) The V<sub>OUT</sub> pin must be wired together when it is mounted on board.

## ●HSOP-6J

| Pin No. | Symbol            | Description                  |
|---------|-------------------|------------------------------|
| 1       | $V_{OUT}$         | Output Pin                   |
| 2       | GND* <sup>1</sup> | Ground Pin                   |
| 3       | ADJ               | ADJUST Pin (R1173S001x)      |
|         | NC                | No Connection (R1173Sxx1x)   |
| 4       | CE                | Chip Enable Pin ("H" Active) |
| 5       | GND* <sup>1</sup> | Ground Pin                   |
| 6       | $V_{DD}$          | Input Pin                    |

\*1) The GND pin must be wired together when it is mounted on board.

## ABSOLUTE MAXIMUM RATINGS

| Symbol    | Item                          | Rating               | Unit |
|-----------|-------------------------------|----------------------|------|
| $V_{IN}$  | Input Voltage                 | 6.5                  | V    |
| $V_{CE}$  | Input Voltage (CE Input Pin)  | −0.3 to 6.5          | V    |
| $V_{OUT}$ | Output Voltage                | −0.3 to $V_{IN}+0.3$ | V    |
| $P_D$     | Power Dissipation (SOT-89-5)* | 900                  | mW   |
|           | Power Dissipation (HSOP-6J)*  | 900                  |      |
|           | Power Dissipation (HSOP-6J)*  | 1700                 |      |
| $T_{opt}$ | Operating Temperature         | −40 to 85            | °C   |
| $T_{stg}$ | Storage Temperature           | −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.

## 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.

## ELECTRICAL CHARACTERISTICS

## • R1173xxxxB/D (Fixed Output Voltage Type)

T<sub>opt</sub>=25°C

| Symbol                                   | Item                                               | Conditions                                                                                                                                                                                                                                              |                         | Min.  | Typ.     | Max.  | Unit       |
|------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------|----------|-------|------------|
| V <sub>IN</sub>                          | Input Voltage                                      |                                                                                                                                                                                                                                                         |                         | 1.4   |          | 6.0   | V          |
| I <sub>SS</sub>                          | Supply Current                                     | V <sub>IN</sub> −V <sub>OUT</sub> =1.0V, V <sub>CE</sub> =V <sub>IN</sub> , I <sub>OUT</sub> =0A                                                                                                                                                        |                         |       | 60       | 100   | μA         |
| I <sub>standby</sub>                     | Standby Current                                    | V <sub>IN</sub> = 6.0V, V <sub>CE</sub> =0V                                                                                                                                                                                                             |                         |       | 0.1      | 1.0   | μA         |
| V <sub>OUT</sub>                         | Output voltage                                     | V <sub>IN</sub> −V <sub>OUT</sub> =1.0V<br>I <sub>OUT</sub> =100mA                                                                                                                                                                                      | V <sub>OUT</sub> >1.5V  | ×0.98 |          | ×1.02 | V          |
|                                          |                                                    |                                                                                                                                                                                                                                                         | V <sub>OUT</sub> ≤ 1.5V | −30   |          | +30   | mV         |
| ΔV <sub>OUT</sub> /<br>ΔI <sub>OUT</sub> | Load regulation                                    | V <sub>IN</sub> −V <sub>OUT</sub> =0.3V, 1mA ≤ I <sub>OUT</sub> ≤ 300mA<br>If V <sub>OUT</sub> ≤ 1.1V, then V <sub>IN</sub> =1.4V                                                                                                                       |                         | −15   | −2       | 15    | mV         |
|                                          |                                                    | V <sub>IN</sub> −V <sub>OUT</sub> =0.3V, 1mA ≤ I <sub>OUT</sub> ≤ 1A<br>If V <sub>OUT</sub> ≤ 1.1V, then V <sub>IN</sub> =1.7V                                                                                                                          |                         |       | −3       |       |            |
| V <sub>DIF</sub>                         | Dropout Voltage                                    | Refer to the following table                                                                                                                                                                                                                            |                         |       |          |       |            |
| ΔV <sub>OUT</sub> /<br>ΔV <sub>IN</sub>  | Line regulation                                    | I <sub>OUT</sub> =100mA, V <sub>OUT</sub> +0.5V ≤ V <sub>IN</sub> ≤ 6.0V<br>If V <sub>OUT</sub> ≤ 0.9V, 1.4V ≤ V <sub>IN</sub> ≤ 6.0V                                                                                                                   |                         |       | 0.05     | 0.20  | %/V        |
| RR                                       | Ripple Rejection                                   | f=1kHz (V <sub>OUT</sub> ≤ 4.0V)<br>f=1kHz (V <sub>OUT</sub> >4.0V)<br>Ripple 0.5Vp-p, V <sub>IN</sub> −V <sub>OUT</sub> =1.0V, I <sub>OUT</sub> =100mA<br>If V <sub>OUT</sub> ≤ 1.2V, V <sub>IN</sub> −V <sub>OUT</sub> =1.5V, I <sub>OUT</sub> =100mA |                         |       | 70<br>60 |       | dB         |
| ΔV <sub>OUT</sub> /<br>ΔT <sub>opt</sub> | Output Voltage<br>Temperature Coefficient          | I <sub>OUT</sub> =100mA,<br>−40°C ≤ T <sub>opt</sub> ≤ 85°C                                                                                                                                                                                             |                         |       | ±100     |       | ppm/<br>°C |
| I <sub>LIM</sub>                         | Output Current                                     | V <sub>IN</sub> −V <sub>OUT</sub> =1.0V                                                                                                                                                                                                                 |                         | 1     |          |       | A          |
| I <sub>SC</sub>                          | Short Current Limit                                | V <sub>OUT</sub> =0V                                                                                                                                                                                                                                    |                         |       | 250      |       | mA         |
| R <sub>PD</sub>                          | Pull-down resistance<br>for CE pin                 |                                                                                                                                                                                                                                                         |                         | 1.9   | 5.0      | 15.0  | MΩ         |
| V <sub>CEH</sub>                         | CE Input Voltage "H"                               |                                                                                                                                                                                                                                                         |                         | 1.0   |          | 6.0   | V          |
| V <sub>CEL</sub>                         | CE Input Voltage "L"                               |                                                                                                                                                                                                                                                         |                         | 0     |          | 0.4   | V          |
| T <sub>TSD</sub>                         | Thermal Shutdown Detector<br>Threshold Temperature | Junction Temperature                                                                                                                                                                                                                                    |                         |       | 150      |       | °C         |
| T <sub>TSR</sub>                         | Thermal Shutdown<br>Released Temperature           | Junction Temperature                                                                                                                                                                                                                                    |                         |       | 120      |       | °C         |
| en                                       | Output Noise                                       | BW=10Hz to 100kHz                                                                                                                                                                                                                                       |                         |       | 30       |       | μVrms      |

## • Dropout Voltage by Output Voltage

T<sub>opt</sub>=25°C

| Output Voltage<br>V <sub>OUT</sub> (V) | Dropout Voltage V <sub>DIF</sub> (V) |      |                      |
|----------------------------------------|--------------------------------------|------|----------------------|
|                                        | I <sub>OUT</sub> =300mA              |      | I <sub>OUT</sub> =1A |
|                                        | Typ.                                 | Max. | Typ.                 |
| 0.8 ≤ V <sub>OUT</sub> < 0.9           | 0.33                                 | 0.57 | 0.72                 |
| 0.9 ≤ V <sub>OUT</sub> < 1.0           | 0.22                                 | 0.47 | 0.64                 |
| 1.0 ≤ V <sub>OUT</sub> < 1.5           | 0.18                                 | 0.32 | 0.56                 |
| 1.5 ≤ V <sub>OUT</sub> < 2.6           | 0.10                                 | 0.15 | 0.32                 |
| 2.6 ≤ V <sub>OUT</sub>                 | 0.05                                 | 0.10 | 0.18                 |

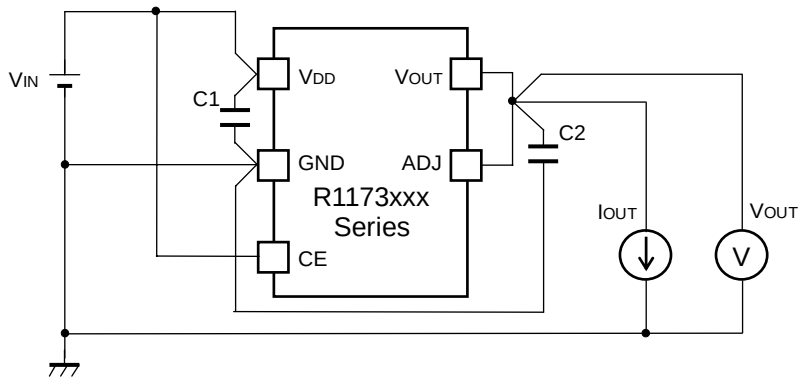
● R1173x001B/D (Adjustable Output Voltage Type)

T<sub>opt</sub>=25°C

| Symbol                                   | Item                                               | Conditions                                                                                                      | Min.  | Typ.  | Max.            | Unit   |
|------------------------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------|-------|-----------------|--------|
| V <sub>IN</sub>                          | Input Voltage                                      |                                                                                                                 | 1.4   |       | 6.0             | V      |
| I <sub>SS</sub>                          | Supply Current                                     | V <sub>OUT</sub> =V <sub>ADJ</sub> , V <sub>IN</sub> =2.0, V <sub>CE</sub> =V <sub>IN</sub>                     |       | 60    | 100             | μA     |
| I <sub>standby</sub>                     | Standby Current                                    | V <sub>IN</sub> =6.0V, V <sub>CE</sub> =0V                                                                      |       | 0.1   | 1.0             | μA     |
| V <sub>OUT</sub>                         | Reference Voltage for Adjustable Voltage Regulator | V <sub>OUT</sub> =V <sub>ADJ</sub> , V <sub>IN</sub> =2.0V<br>I <sub>OUT</sub> =100mA                           | 0.970 | 1.000 | 1.030           | V      |
| RV <sub>OUT</sub>                        | Output Voltage Range                               |                                                                                                                 | 1.0   |       | V <sub>IN</sub> | V      |
| ΔV <sub>OUT</sub> /<br>ΔI <sub>OUT</sub> | Load regulation                                    | V <sub>IN</sub> =1.4V<br>1mA ≤ I <sub>OUT</sub> ≤ 300mA                                                         | -15   | -2    | 15              | mV     |
|                                          |                                                    | V <sub>IN</sub> =1.7V<br>1mA ≤ I <sub>OUT</sub> ≤ 1A                                                            |       | -3    |                 |        |
| V <sub>DIF</sub>                         | Dropout Voltage                                    | V <sub>OUT</sub> =V <sub>ADJ</sub><br>I <sub>OUT</sub> =300mA                                                   |       | 0.18  | 0.32            | V      |
|                                          |                                                    | I <sub>OUT</sub> =1A                                                                                            |       | 0.56  |                 |        |
| ΔV <sub>OUT</sub> /<br>ΔV <sub>IN</sub>  | Line regulation                                    | V <sub>OUT</sub> =V <sub>ADJ</sub> , I <sub>OUT</sub> =100mA<br>1.5V ≤ V <sub>IN</sub> ≤ 6.0V                   |       | 0.05  | 0.20            | %/V    |
| RR                                       | Ripple Rejection                                   | f=1kHz Ripple 0.5Vp-p,<br>V <sub>OUT</sub> =V <sub>ADJ</sub> , V <sub>IN</sub> =2.5V<br>I <sub>OUT</sub> =100mA |       | 70    |                 | dB     |
| ΔV <sub>OUT</sub> /<br>ΔT <sub>opt</sub> | Output Voltage Temperature Coefficient             | I <sub>OUT</sub> =100mA<br>-40°C ≤ T <sub>opt</sub> ≤ 85°C                                                      |       | ±100  |                 | ppm/°C |
| I <sub>LIM</sub>                         | Output Current                                     | V <sub>OUT</sub> =V <sub>ADJ</sub> , V <sub>IN</sub> =2.0                                                       | 1     |       |                 | A      |
| I <sub>SC</sub>                          | Short Current Limit                                | V <sub>OUT</sub> =V <sub>ADJ</sub> =0V                                                                          |       | 250   |                 | mA     |
| R <sub>PD</sub>                          | Pull-down resistance for CE pin                    |                                                                                                                 | 1.9   | 5.0   | 15.0            | MΩ     |
| V <sub>CEH</sub>                         | CE Input Voltage "H"                               |                                                                                                                 | 1.0   |       | 6.0             | V      |
| V <sub>CEL</sub>                         | CE Input Voltage "L"                               |                                                                                                                 | 0     |       | 0.4             | V      |
| T <sub>TSD</sub>                         | Thermal Shutdown Detector Threshold Temperature    | Junction Temperature                                                                                            |       | 150   |                 | °C     |
| T <sub>TSR</sub>                         | Thermal Shutdown Released Temperature              | Junction Temperature                                                                                            |       | 120   |                 | °C     |
| en                                       | Output Noise                                       | BW=10Hz to 100kHz                                                                                               |       | 30    |                 | μVrms  |

# Technical Notes on External Components and Typical Application

(Refer to the example of typical application)



Example of the typical application of R1173x (Fixed Output Type)

## Phase Compensation

In these ICs, phase compensation is made with the output capacitor for securing stable operation even if the load current is varied. For this purpose, use as much as a capacitor as C2. Recommendation value is as follows:

## Mounting on PCB

Make  $V_{DD}$  and GND lines sufficient. If their impedance is high, a current flows, the noise picked up or unstable operation may result. Further use a  $4.7\mu\text{F}$  or more value capacitor between  $V_{DD}$  pin and GND pin as close as possible.

Set an Output capacitor between  $V_{OUT}$  pin and GND pin for phase compensation as close as possible.

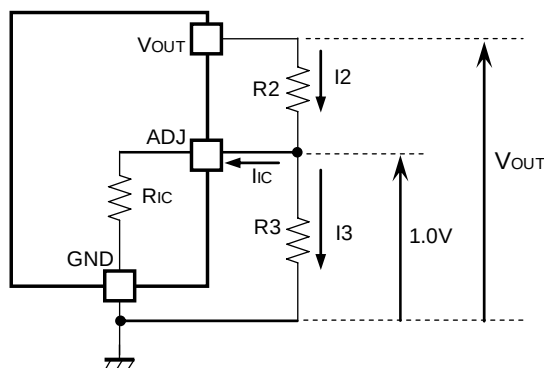
| Output Voltage                   | C2 recommendation value           | Components Recommendation            |                                 |
|----------------------------------|-----------------------------------|--------------------------------------|---------------------------------|
| $V_{OUT} < 1.0\text{V}$          | Tantalum $4.7\mu\text{F}$ or more |                                      |                                 |
| $1.0 \leq V_{OUT} < 3.3\text{V}$ | Ceramic $4.7\mu\text{F}$ or more  | Kyocera $4.7\mu\text{F}$ (1608)      | Part Number: CM105X5R475M06AB   |
|                                  |                                   | Murata $4.7\mu\text{F}$ (1608)       | Part Number: GRM188R60J475KE19B |
|                                  |                                   | Murata $10\mu\text{F}$ (1608)        | Part Number: GRM188B30G106ME46B |
| $3.3\text{V} \leq V_{OUT}$       | Ceramic $4.7\mu\text{F}$ or more  | Kyocera $4.7\mu\text{F}$ (thin 2012) | Part Number: CT21X5R475M06AB    |
|                                  |                                   | Murata $10\mu\text{F}$ (1608)        | Part Number: GRM188B30G106ME46B |

If you use a tantalum type capacitor and ESR value of the capacitor is large, output might be unstable. Evaluate your circuit with considering frequency characteristics.

Depending on the capacitor size, manufacturer, and part number, the bias characteristics and temperature characteristics are different. Evaluate the circuit with actual using capacitors.



## Technical Notes on Output Voltage Setting of Adjustable Output type (R1173x001x)



The Output Voltage may be adjustable for any output voltage between its 1.0V reference and its  $V_{DD}$  setting level. An external pair of resistors is required, as shown above.

The complete equation for the output voltage is described step by step as follows;

$$I_2 = I_{IC} + I_3 \dots\dots\dots (1)$$

$$I_3 = 1.0/R_3 \dots\dots\dots (2)$$

Thus,

$$I_2 = I_{IC} + 1.0/R_3 \dots\dots\dots (3)$$

Therefore,

$$V_{OUT} = 1.0 + R_2 \times I_2 \dots\dots\dots (4)$$

Put Equation (3) into Equation (4), then

$$\begin{aligned} V_{OUT} &= 1.0 + R_2(I_{IC} + 1.0/R_3) \\ &= 1.0(1 + R_2/R_3) + R_2 \times I_{IC} \dots\dots\dots (5) \end{aligned}$$

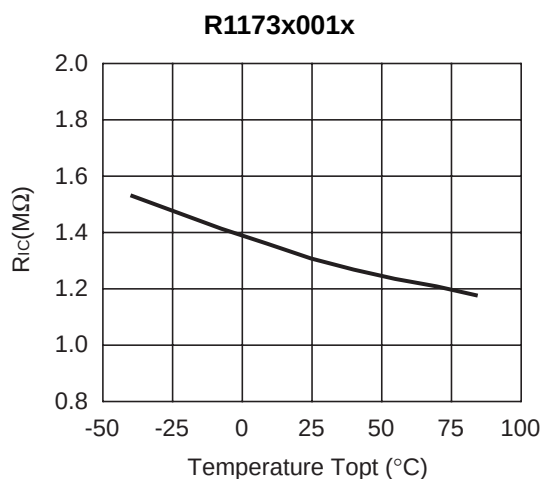
In 2nd term, or  $R_2 \times I_{IC}$  will produce an error in  $V_{OUT}$ .

In Equation (5),

$$I_{IC} = 1.0/R_{IC} \dots\dots\dots (6)$$

$$\begin{aligned} R_2 \times I_{IC} &= R_2 \times 1.0/R_{IC} \\ &= 1.0 \times R_2/R_{IC} \dots\dots\dots (7) \end{aligned}$$

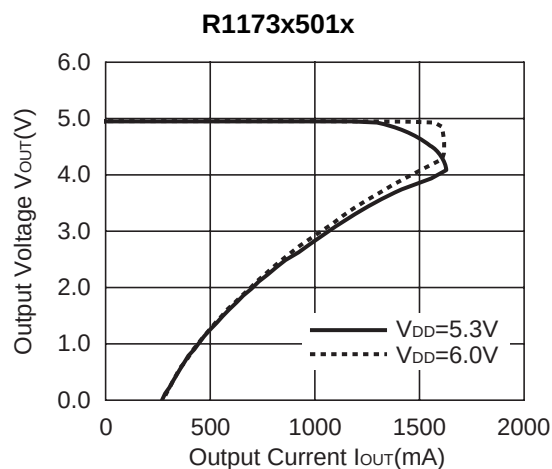
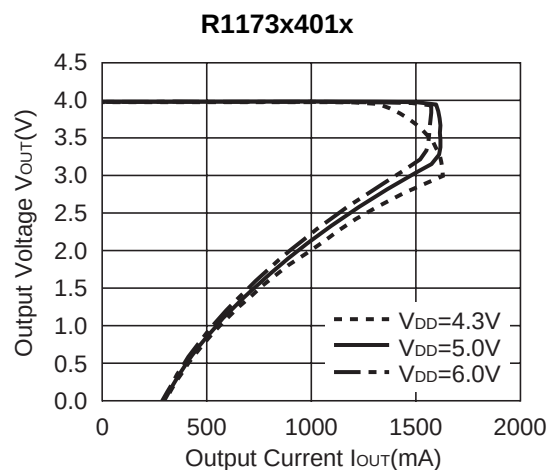
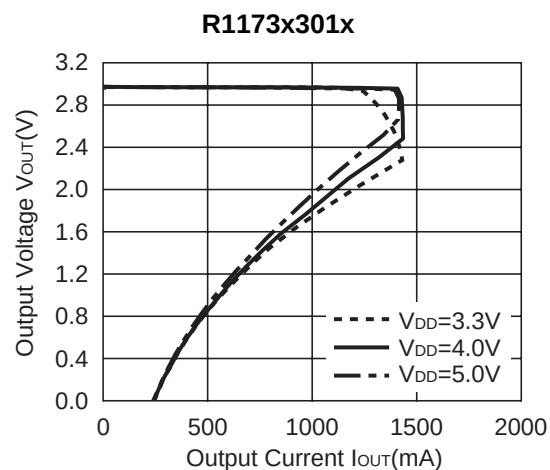
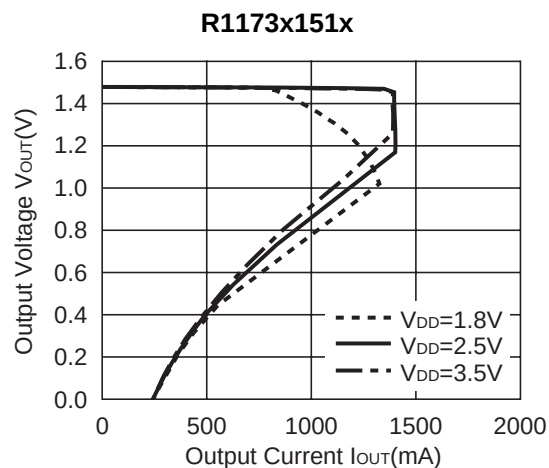
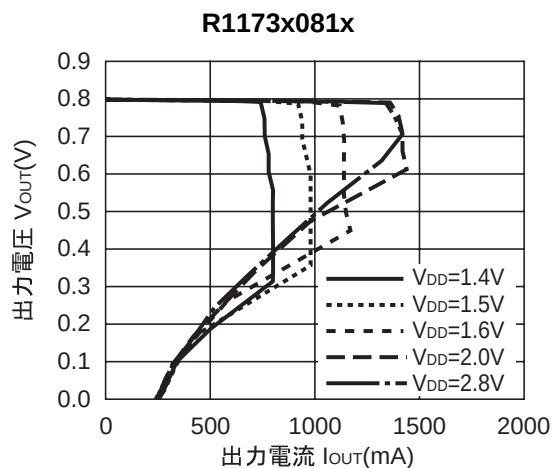
For better accuracy, choosing  $R_2 (<< R_{IC})$  reduces this error.



\*) The graph is a typical characteristic, please evaluate the circuit with an actual condition.

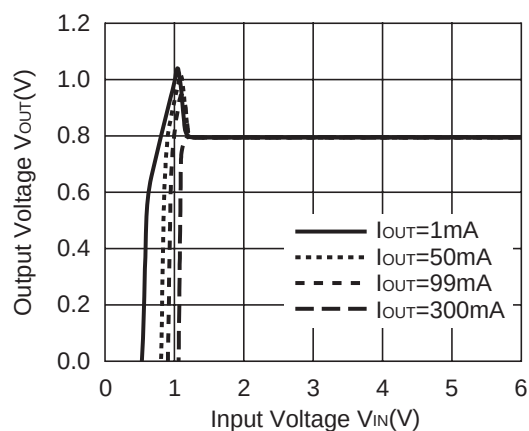
## TYPICAL CHARACTERISTICS

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

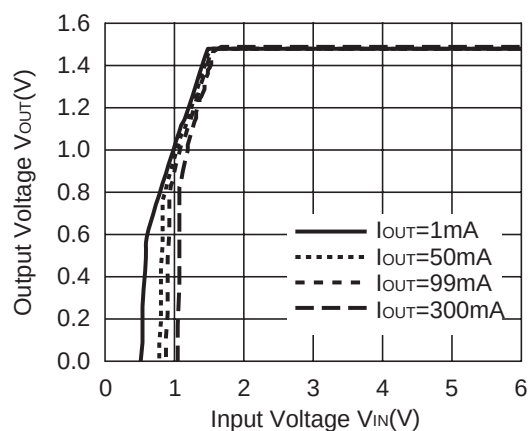


2) Output Voltage vs. Input Voltage ( $T_{opt}=25^{\circ}\text{C}$ )

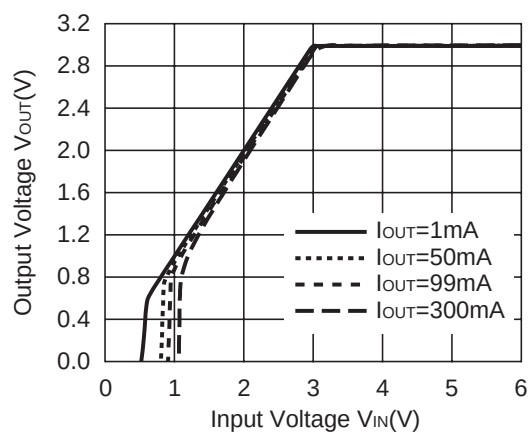
R1173x081x



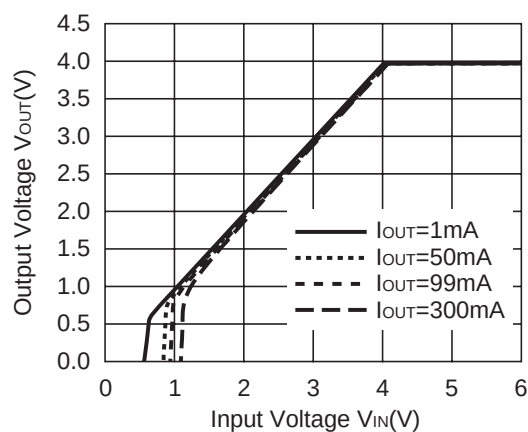
R1173x151x



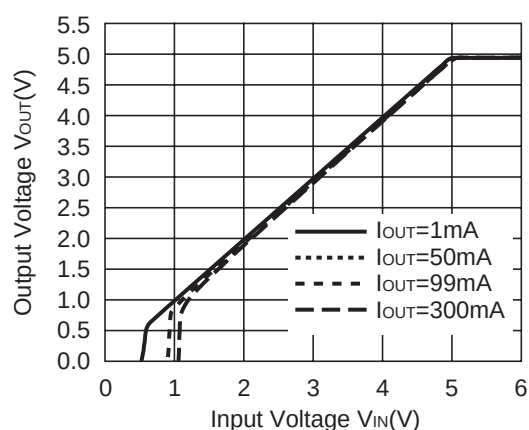
R1173x301x



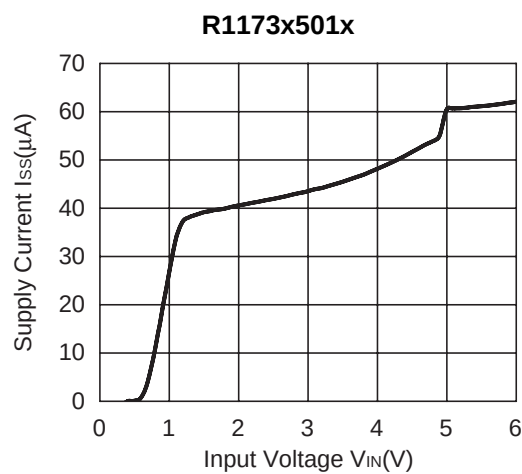
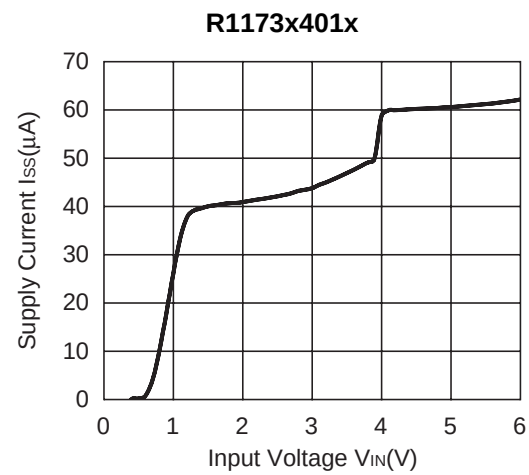
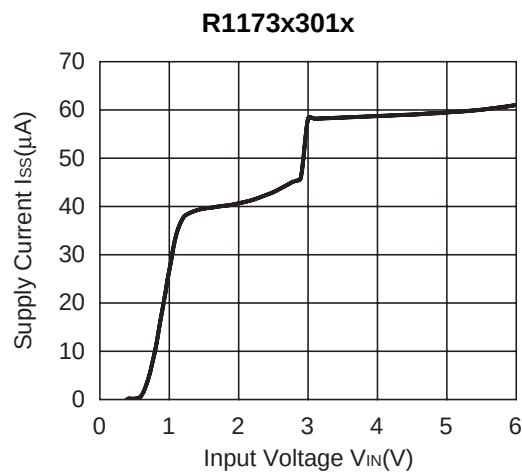
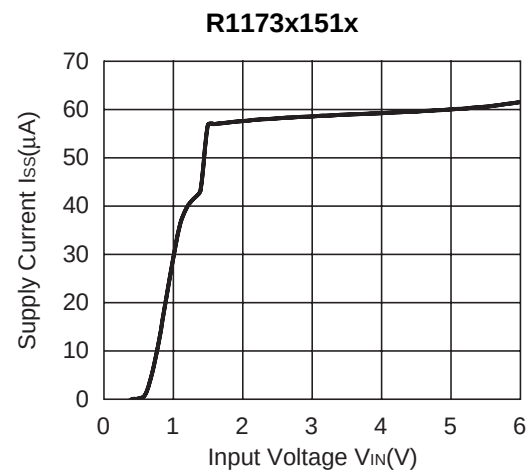
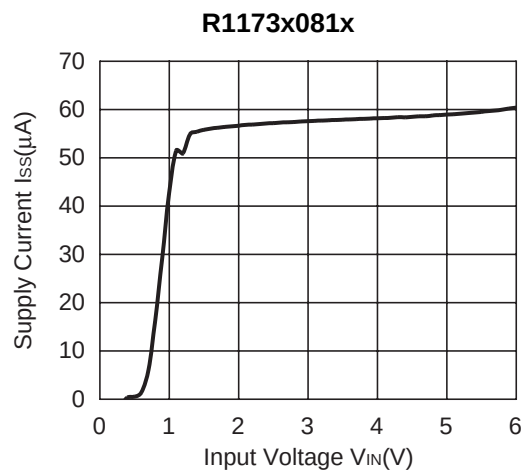
R1173x401x



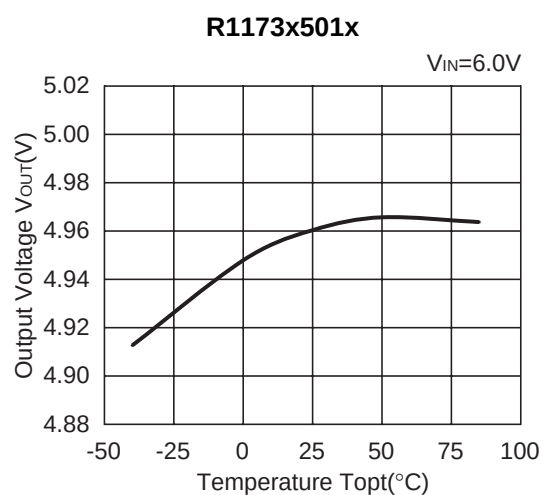
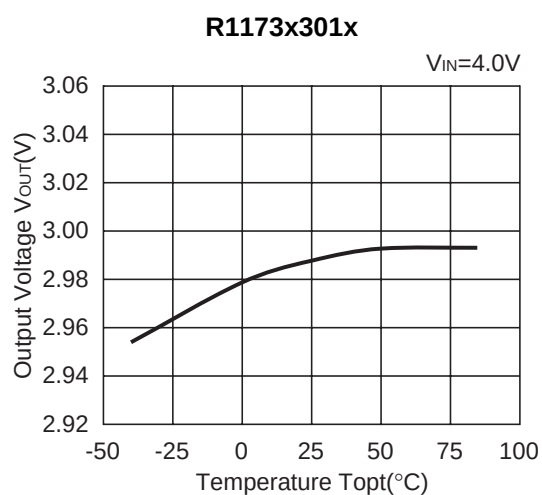
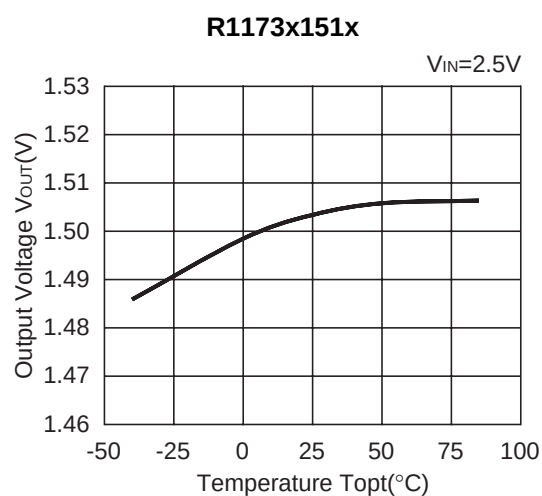
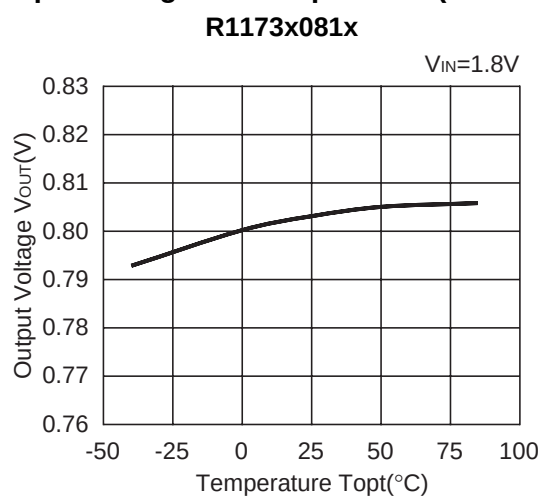
R1173x501x



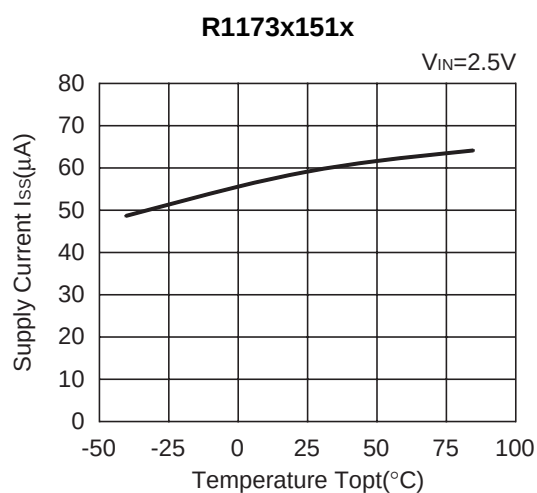
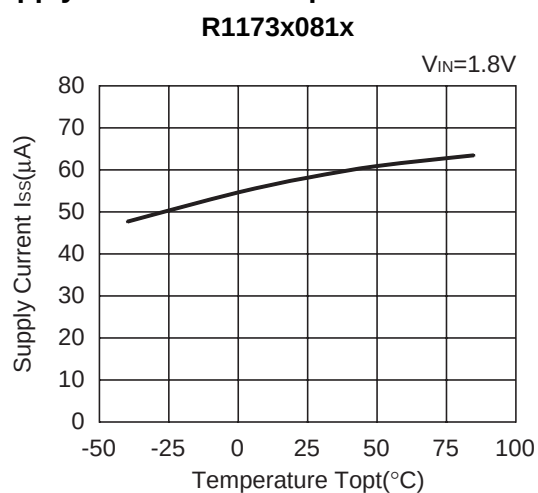
3) Dropout Voltage vs. Output Current (Topt=25°C)

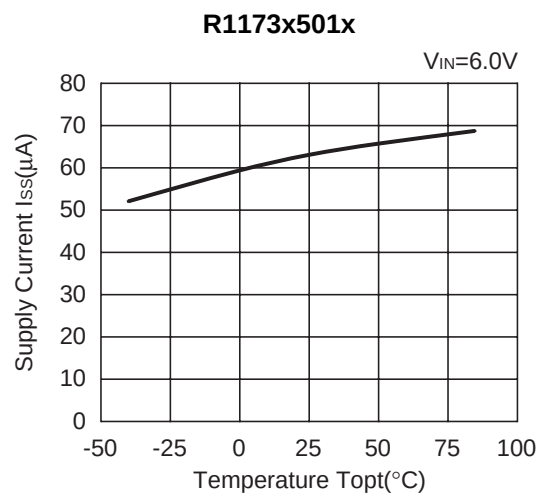
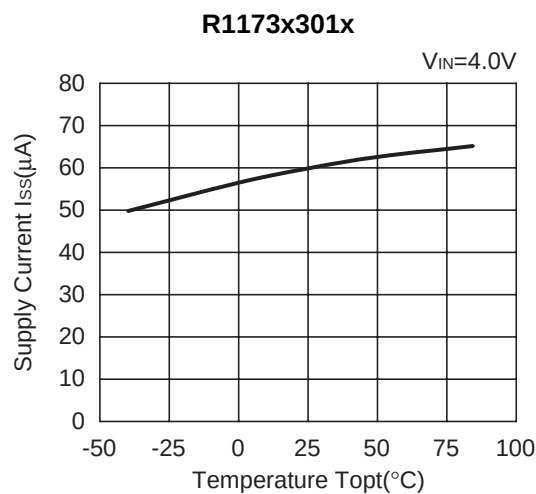


#### 4) Output Voltage vs. Temperature ( $I_{OUT}=100mA$ )

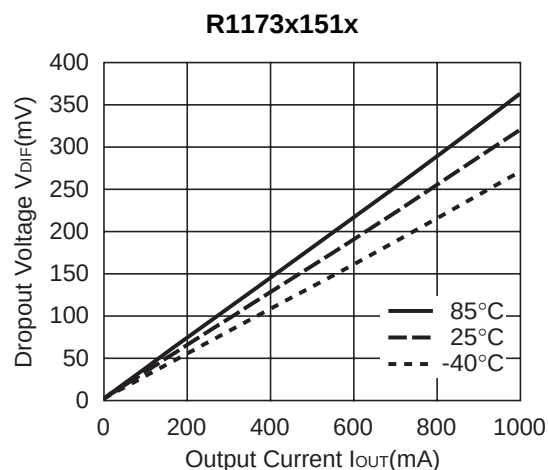
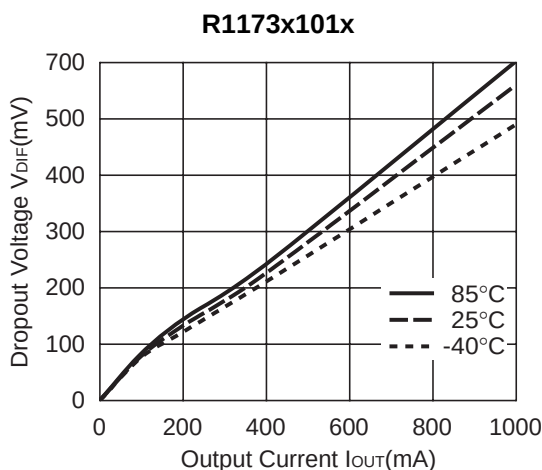
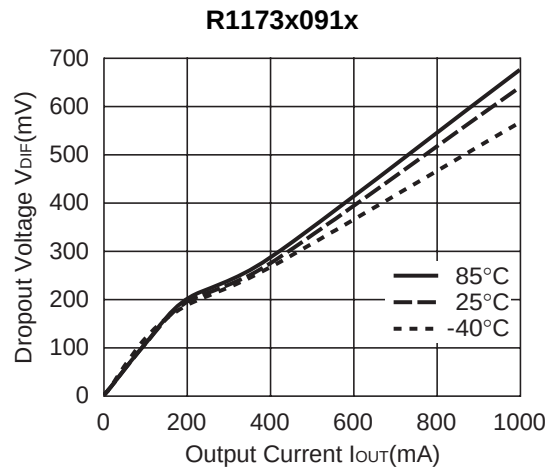
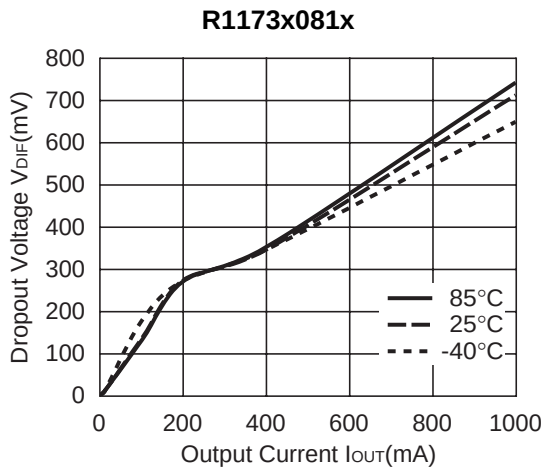


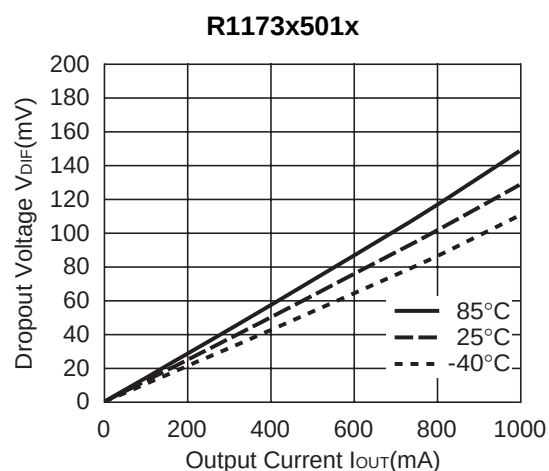
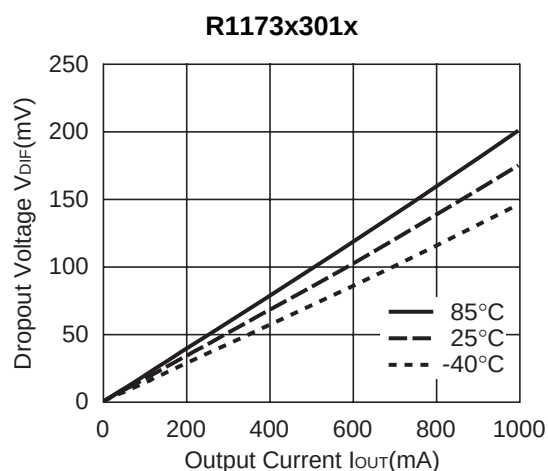
#### 5) Supply Current vs. Temperature



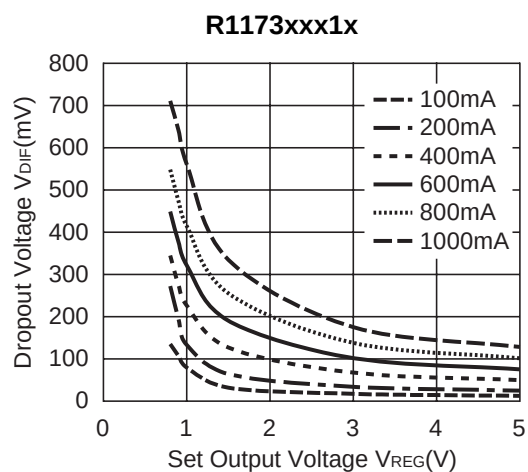


**6) Dropout Voltage vs. Output Current**

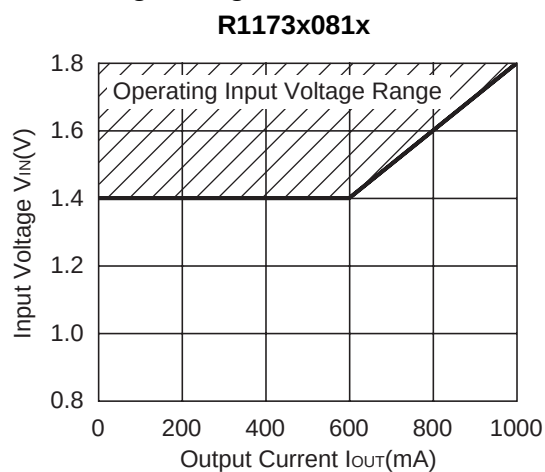




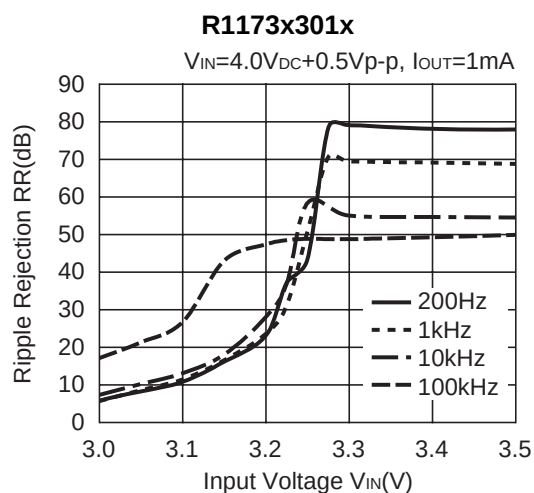
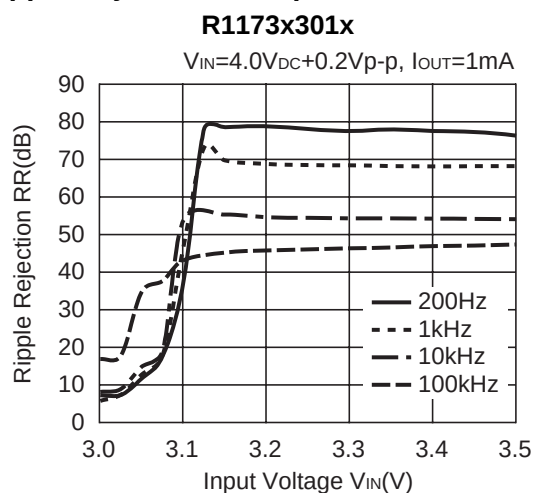
### 7) Dropout Voltage vs. Set Output Voltage

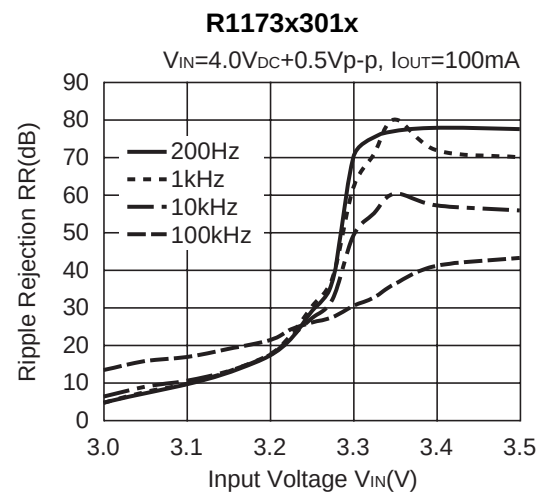
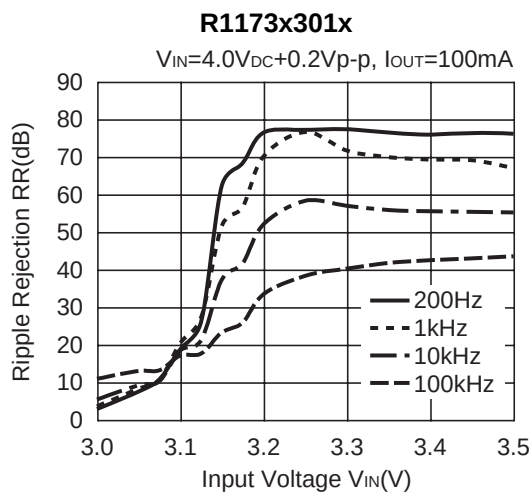
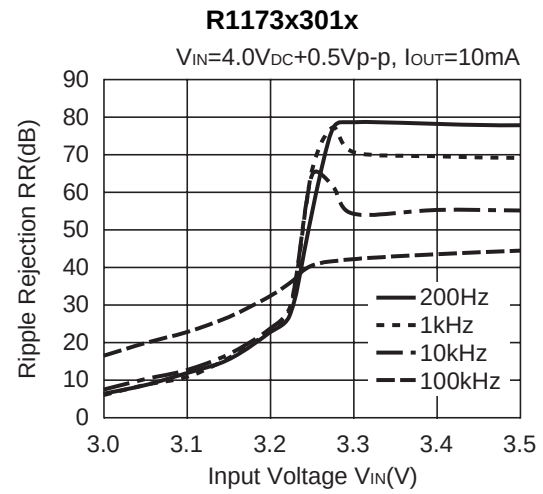
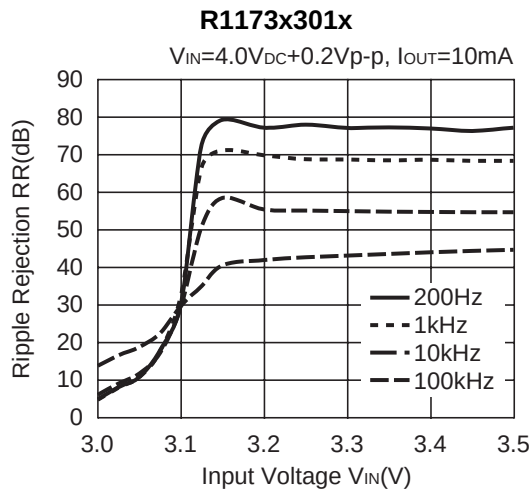


### 8) 0.8V Output type, Operating Input Voltage Range

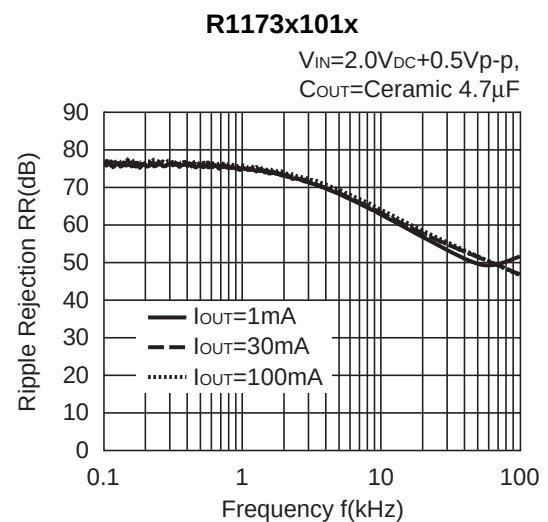
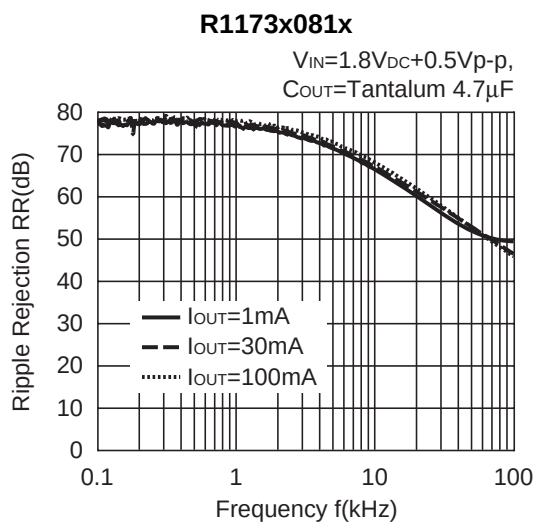


### 9) Ripple Rejection vs. Input Bias

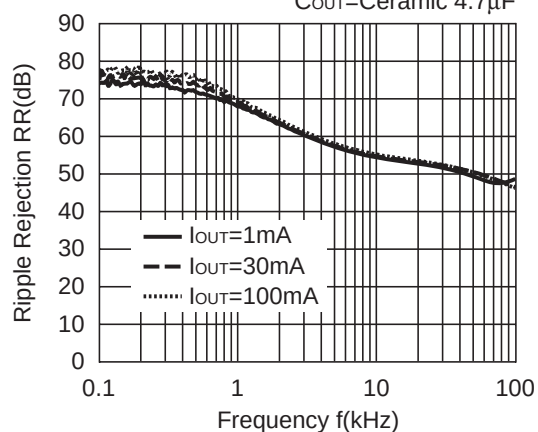
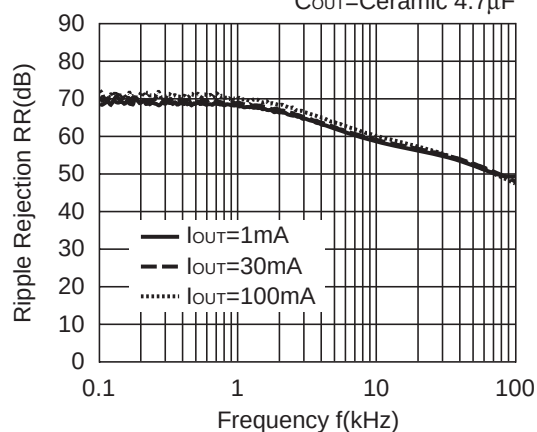
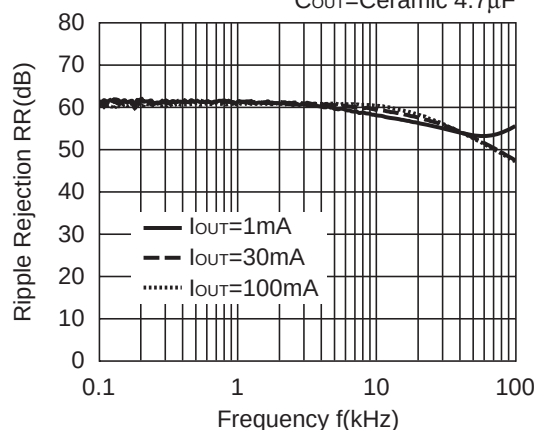
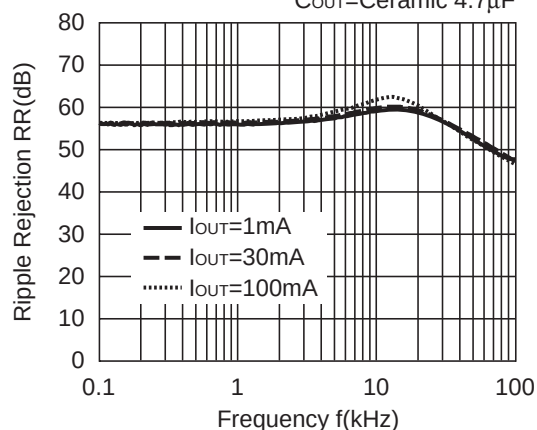




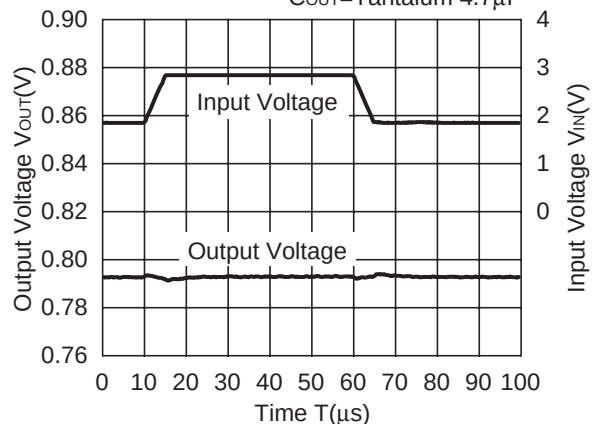
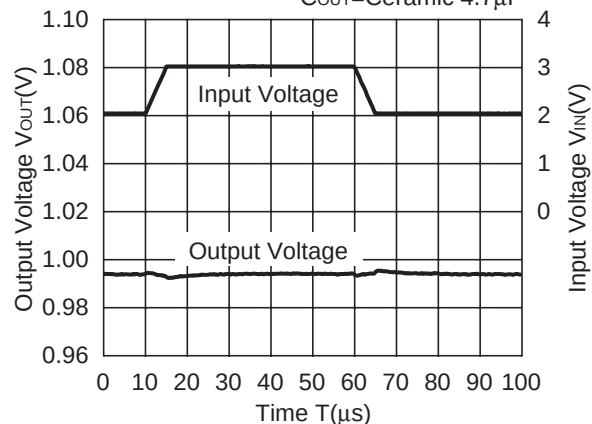
## 10) Ripple Rejection vs. Frequency

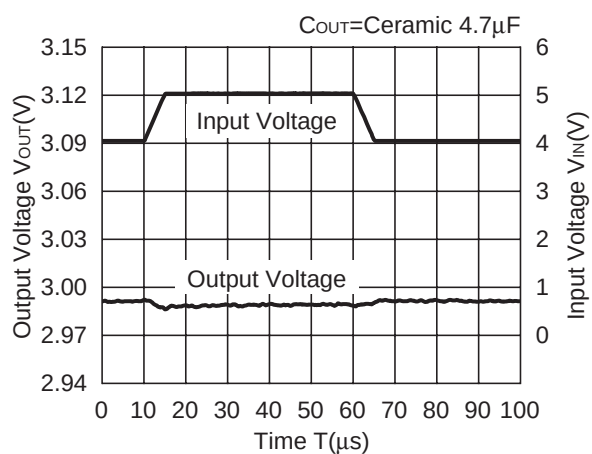
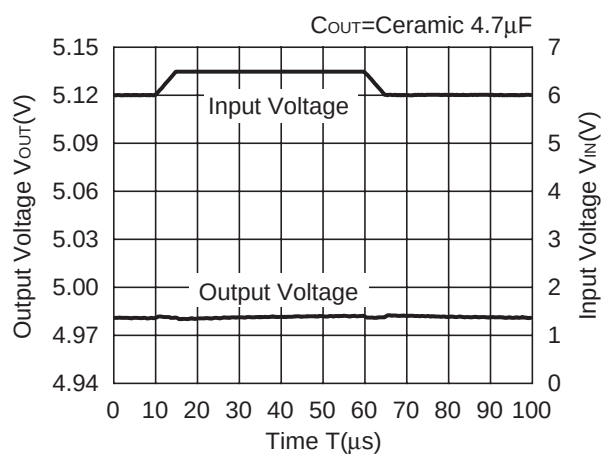




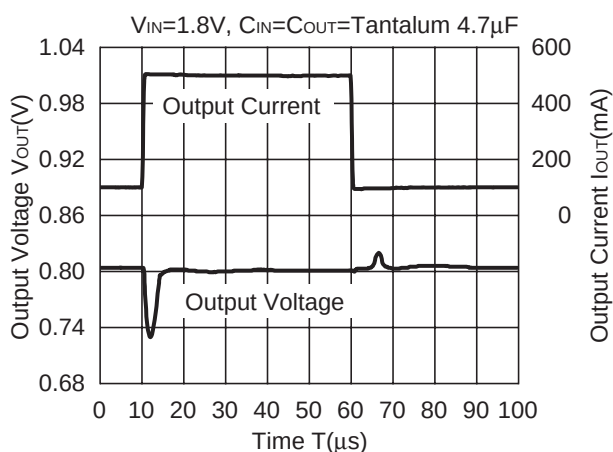
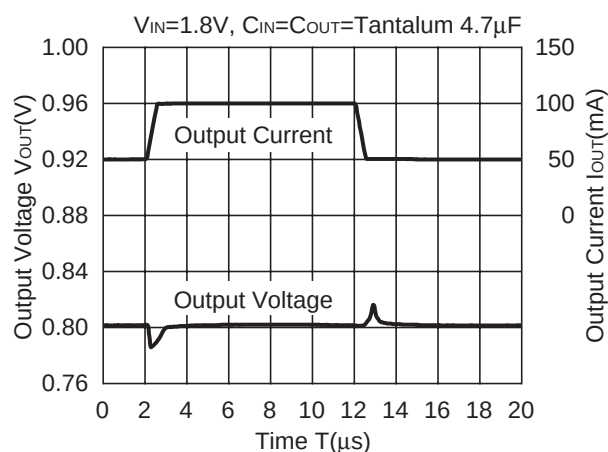
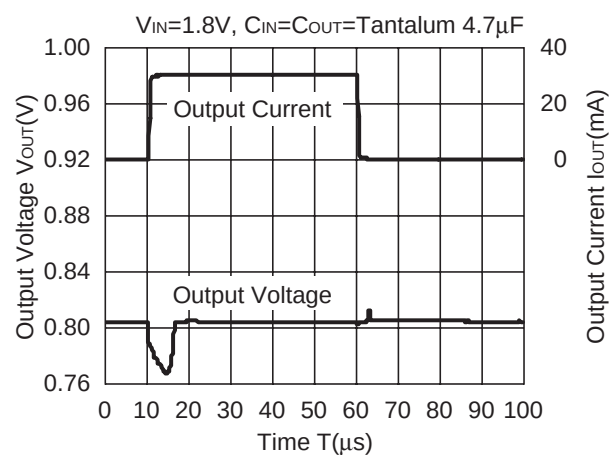
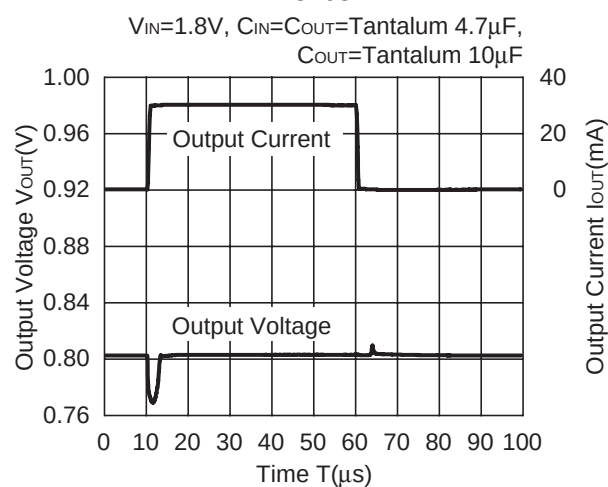
**R1173x301x**
 $V_{IN}=4.0V_{DC}+0.5V_{p-p}$ ,  
 $C_{OUT}=\text{Ceramic } 4.7\mu F$ 
**R1173x401x**
 $V_{IN}=5.0V_{DC}+0.5V_{p-p}$ ,  
 $C_{OUT}=\text{Ceramic } 4.7\mu F$ 
**R1173x451x**
 $V_{IN}=5.5V_{DC}+0.5V_{p-p}$ ,  
 $C_{OUT}=\text{Ceramic } 4.7\mu F$ 
**R1173x501x**
 $V_{IN}=6.0V_{DC}+0.5V_{p-p}$ ,  
 $C_{OUT}=\text{Ceramic } 4.7\mu F$ 


# 11) Line Transient Response ( $T_r=T_f=5\mu s$ , $I_{OUT}=100\text{mA}$ )

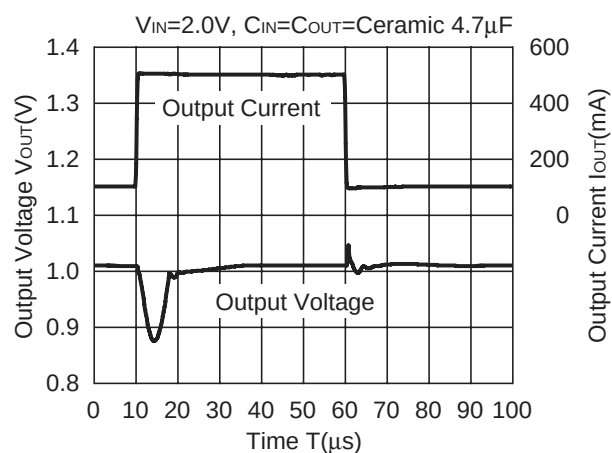
**R1173x081x**
 $C_{OUT}=\text{Tantalum } 4.7\mu F$ 
**R1173x101x**
 $C_{OUT}=\text{Ceramic } 4.7\mu F$ 


**R1173x301x**

**R1173x501x**


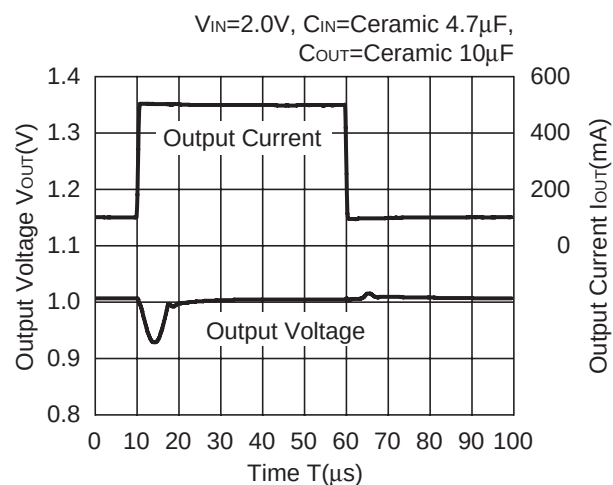
## 12) Load Transient Response ( $T_r=T_f=500$ ns)

**R1173x081x**

**R1173x081x**

**R1173x081x**

**R1173x081x**


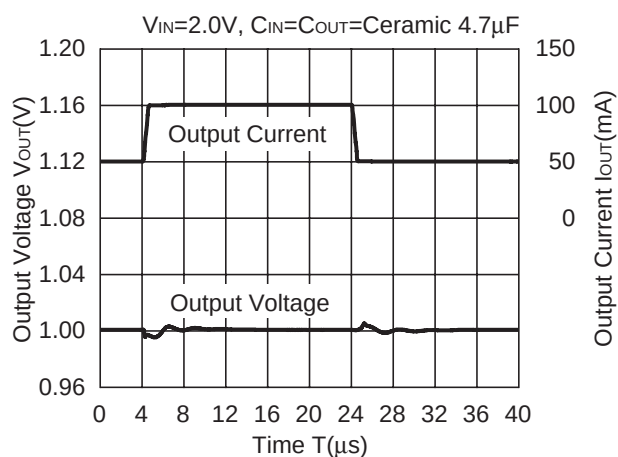
R1173x101x



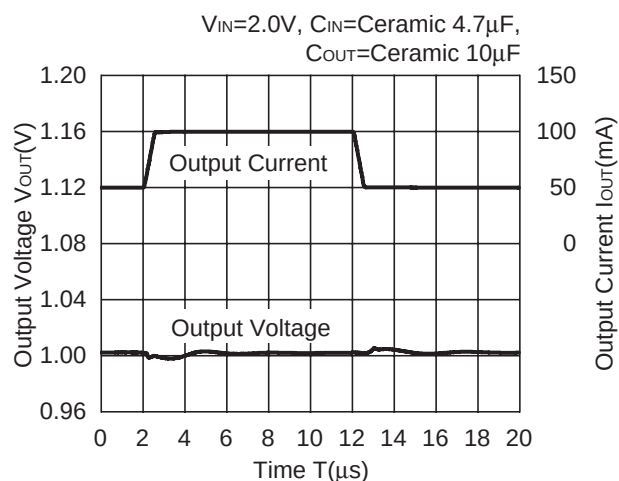
R1173x101x



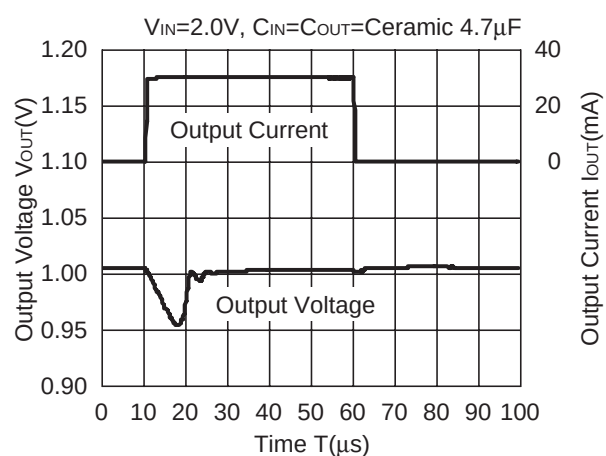
R1173x101x



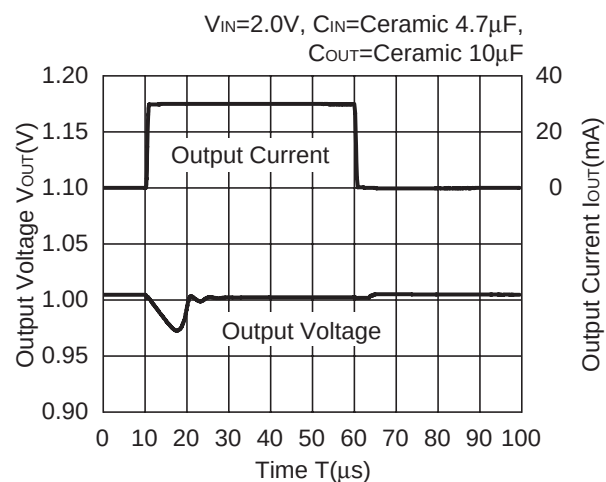
R1173x101x



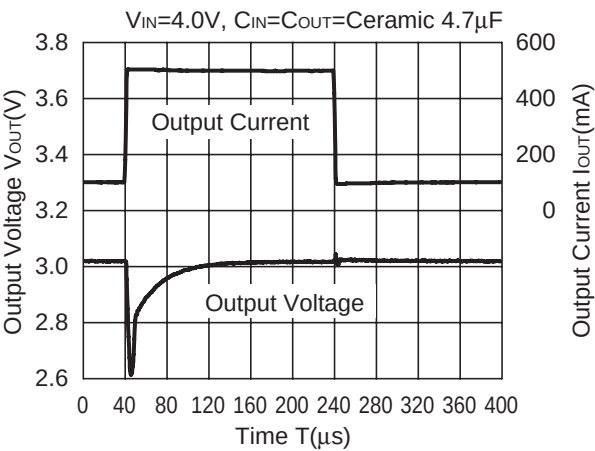
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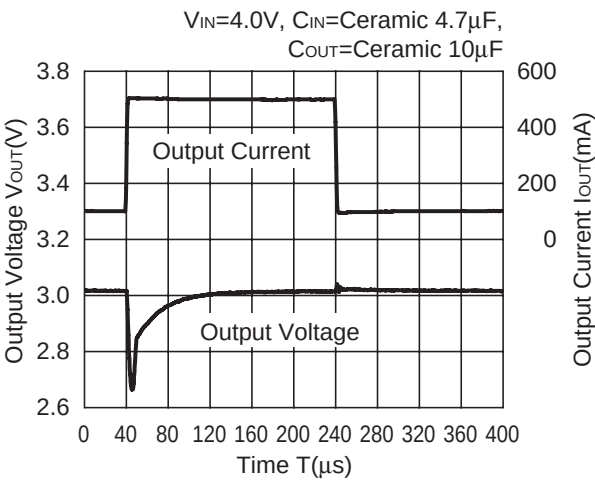
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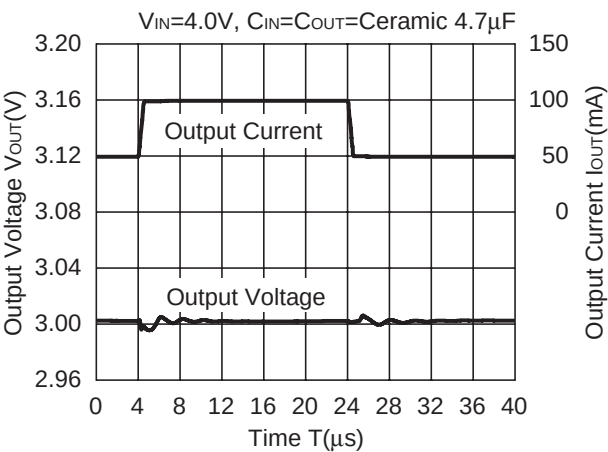
R1173x301x



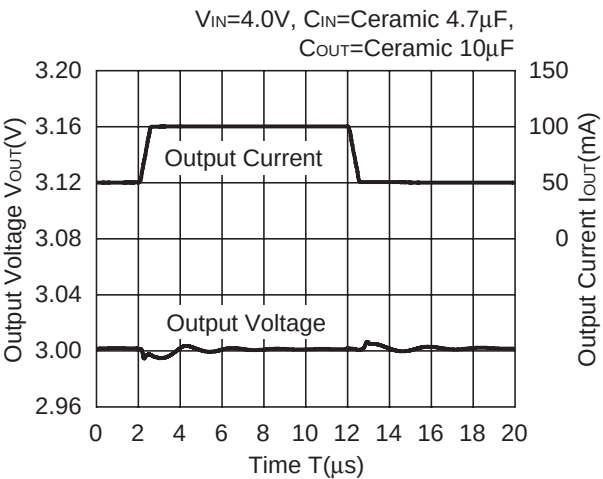
R1173x301x



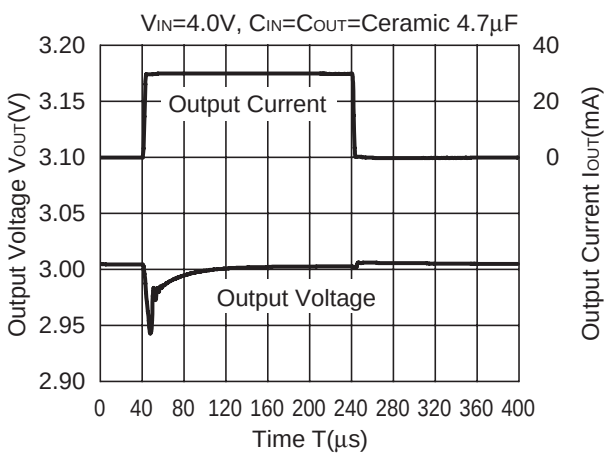
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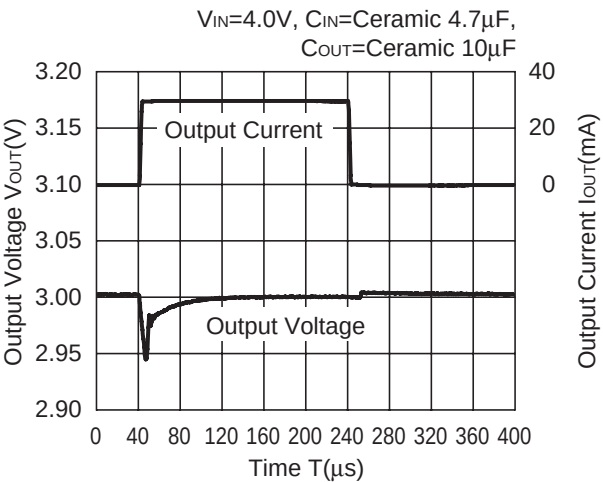
R1173x301x

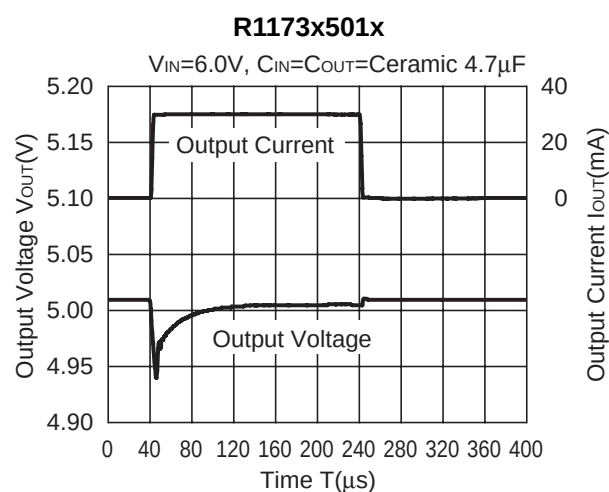
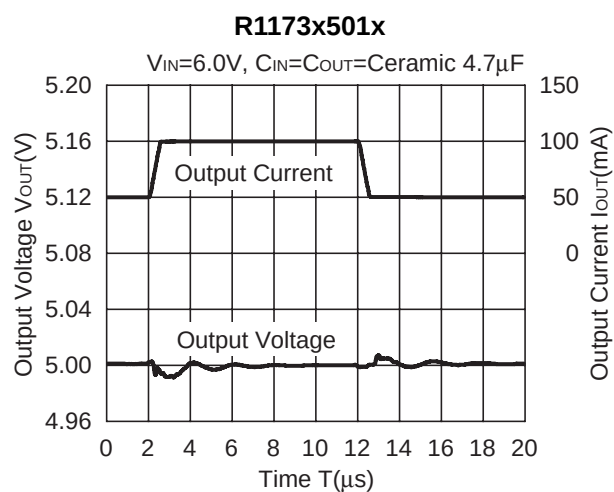
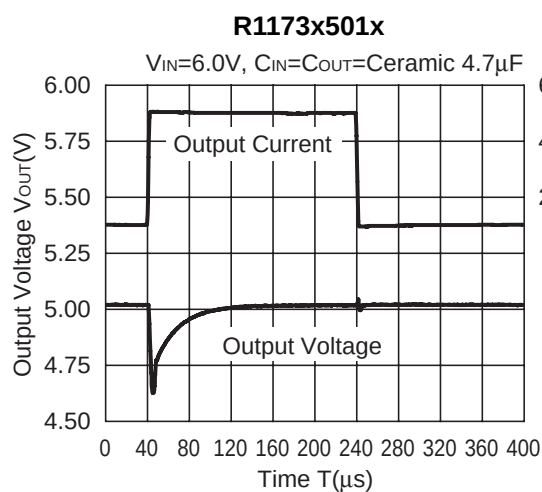


R1173x301x

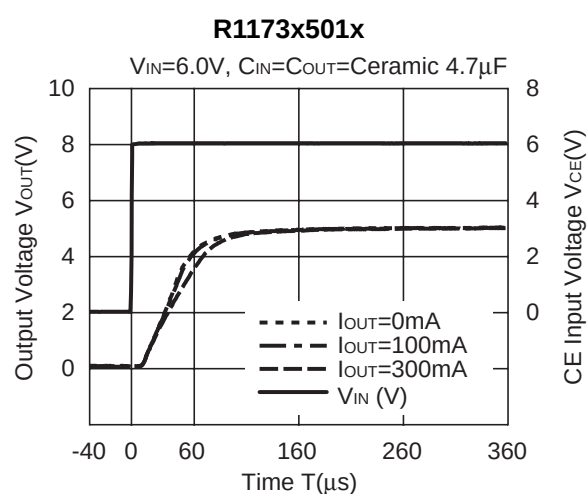
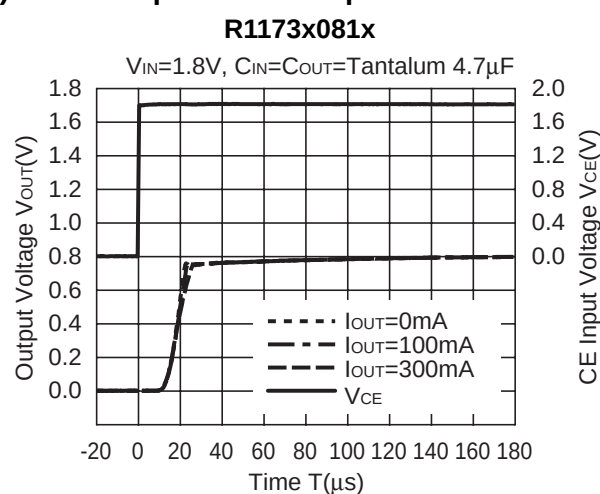


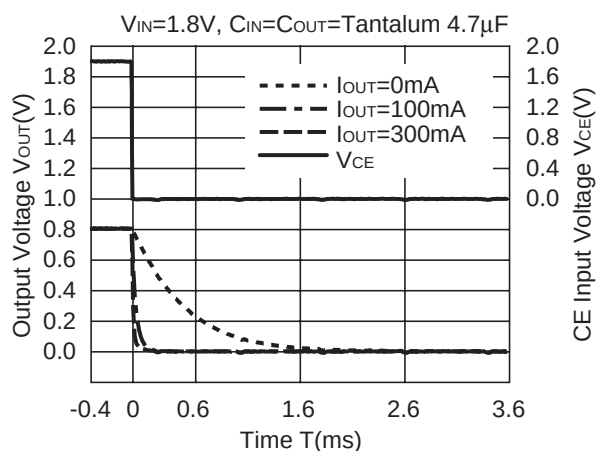
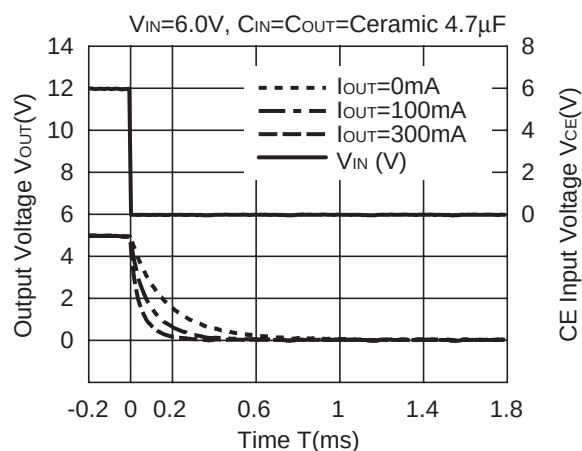
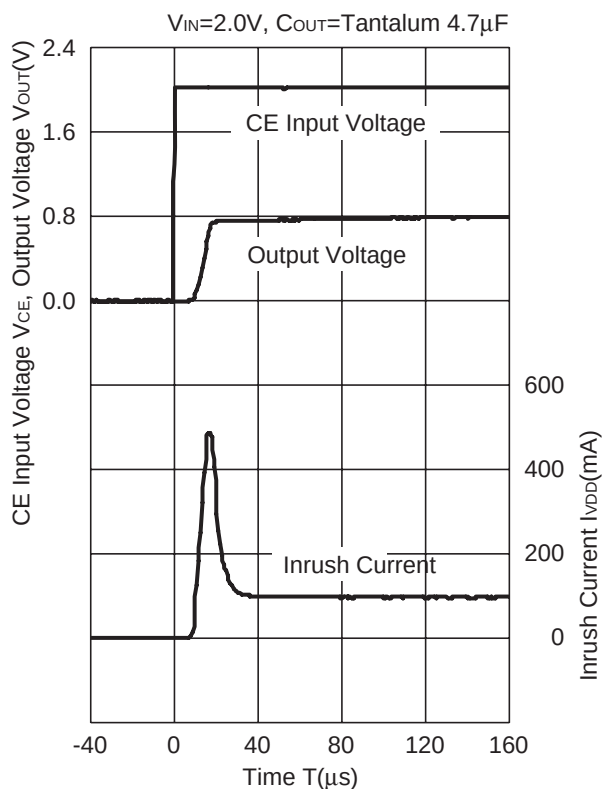
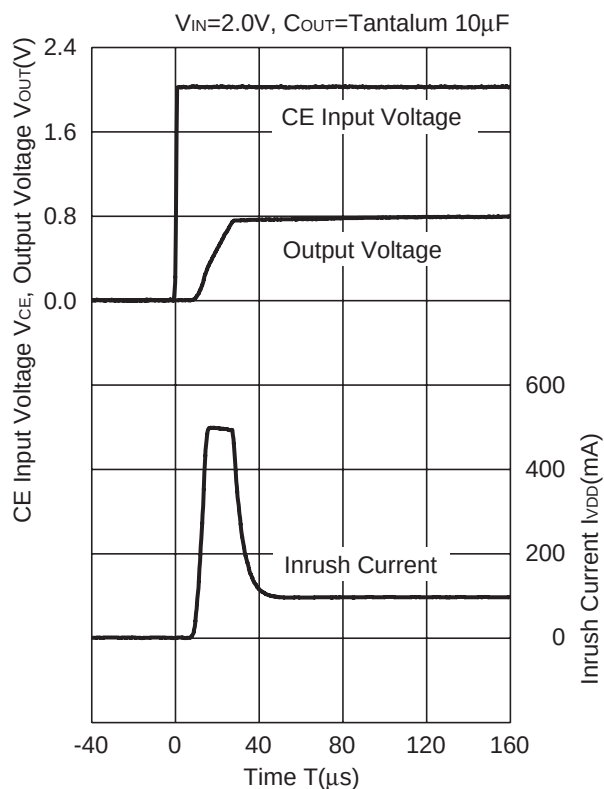
R1173x301x

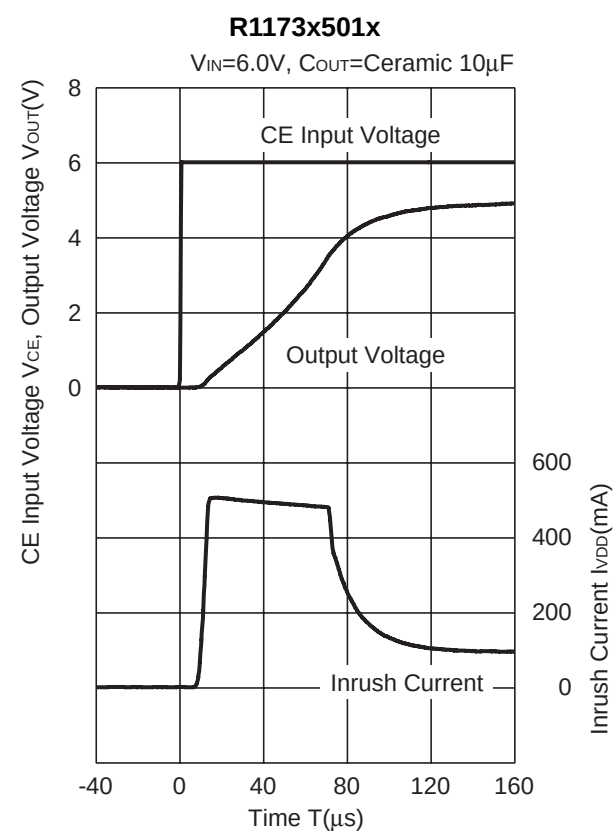
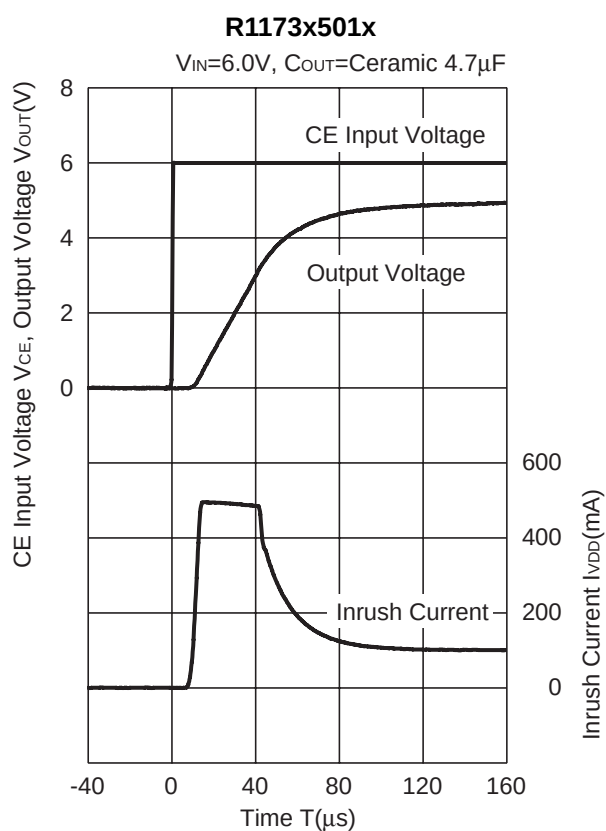
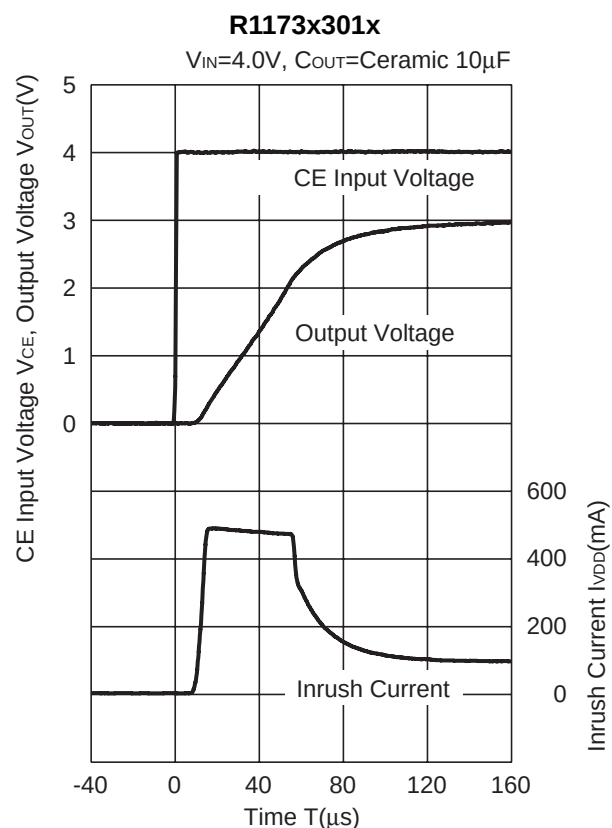
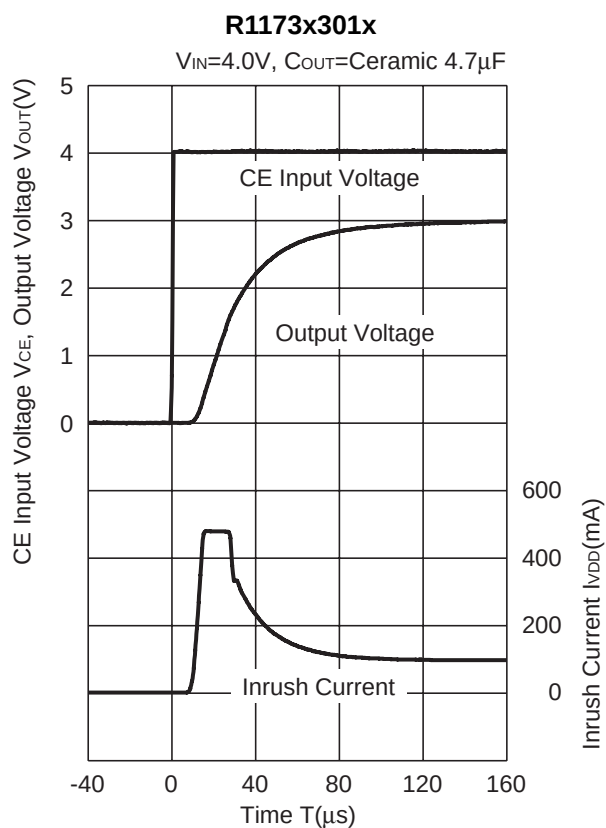




### 13) Turn-on speed with CE pin control



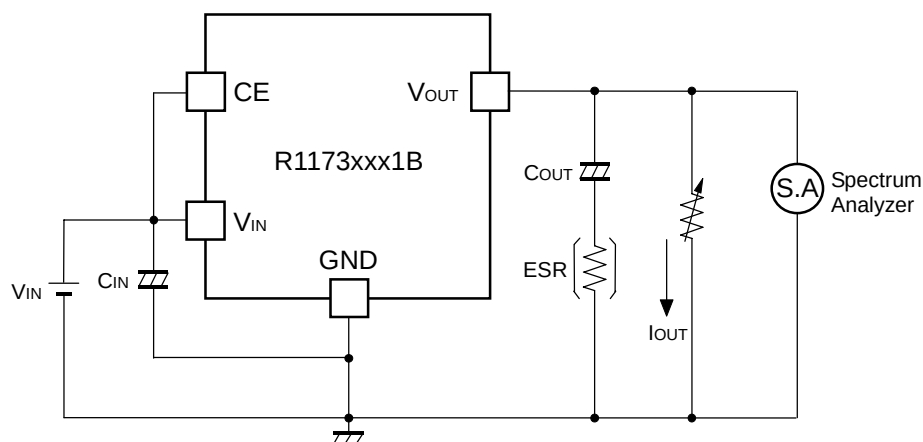
**14) Turn-off speed with CE pin control**
**R1173x081D**

**R1173x501D**

**15) Inrush Current**
**R1173x081x**

**R1173x081x**




## 16) Stable Area: ESR limit vs. Load current

0.8V to 3.3V Output type :  $C_{OUT}=4.7\mu F$  (Kyocera CM105X5R475M06AB)

5.0V Output type :  $C_{OUT}=4.7\mu F$  (Kyocera CT21X5R475K06AB)

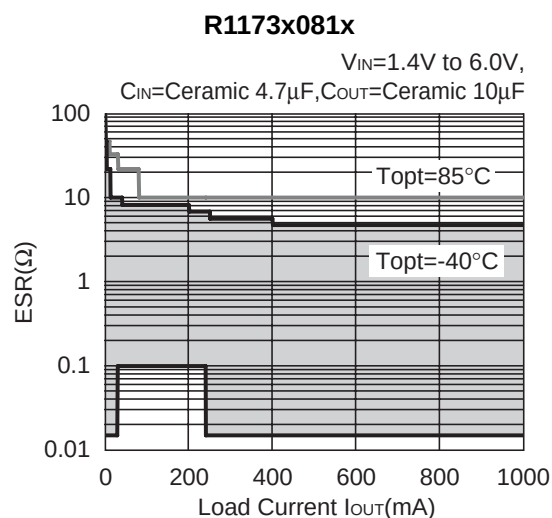
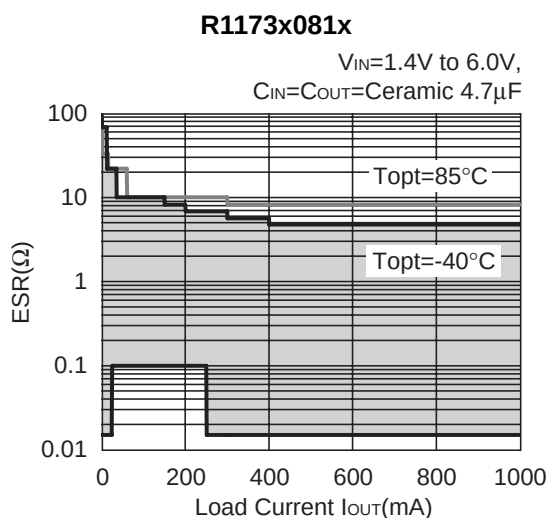


Measurement Conditions

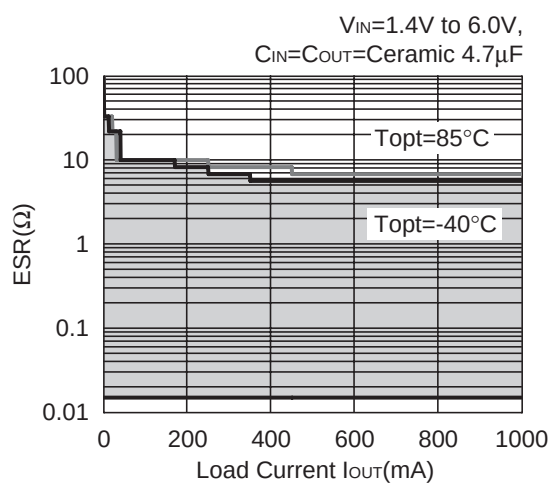
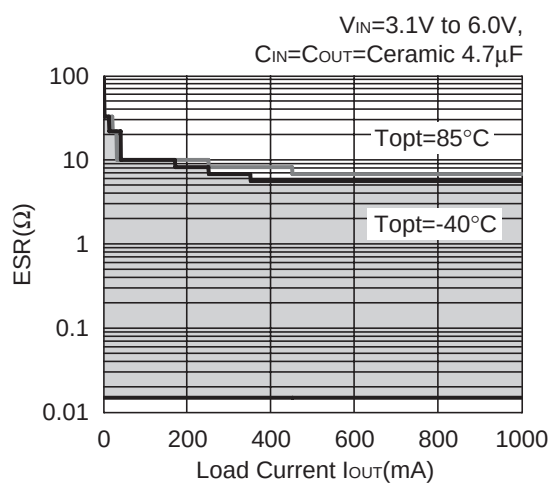
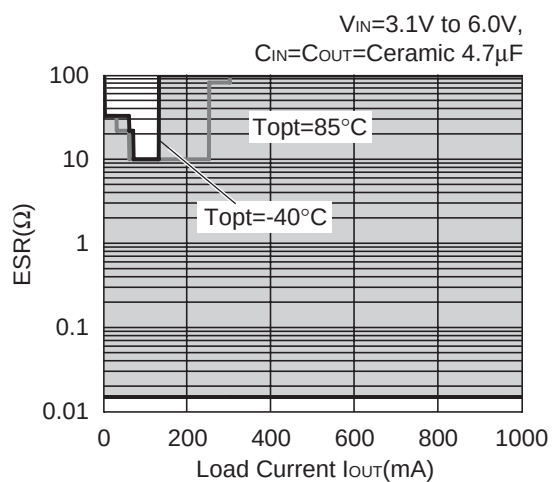
- $V_{IN}=V_{OUT}+1V$
- Frequency=10Hz to 1MHz
- $T_{opt}=25^{\circ}C$

As an output capacitor for this IC, Ceramic capacitor is recommendable. However, other low ESR type capacitor can be used with this IC.

For your reference, noise level is tested, and if the noise level is  $40\mu V$  or less than  $40\mu V$ , the ESR values are plotted as stable area. Upper limit is described in the next five graphs, or ESR vs. Output Current. (Hatched area is the stable area.)





**R1173x101x****R1173x301x****R1173x501x**



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|                                         |                                          |                                         |                                         |                                         |
|-----------------------------------------|------------------------------------------|-----------------------------------------|-----------------------------------------|-----------------------------------------|
| <a href="#"><u>R1173S001B-E2-FE</u></a> | <a href="#"><u>R1173S001D-E2-FE</u></a>  | <a href="#"><u>R1173S331B-E2-FE</u></a> | <a href="#"><u>R1173S331D-E2-FE</u></a> | <a href="#"><u>R1173S251B-E2-FE</u></a> |
| <a href="#"><u>R1173S301D-E2-FE</u></a> | <a href="#"><u>R1173S181B-E2-FE</u></a>  | <a href="#"><u>R1173S121D-E2-FE</u></a> | <a href="#"><u>R1173H001B-T1-FE</u></a> | <a href="#"><u>R1173S121B-E2-FE</u></a> |
| <a href="#"><u>R1173H001D-T1-FE</u></a> | <a href="#"><u>R1173H331D-T1-FE</u></a>  | <a href="#"><u>R1173H081D-T1-FE</u></a> | <a href="#"><u>R1173H251D-T1-FE</u></a> | <a href="#"><u>R1173H181D-T1-FE</u></a> |
| <a href="#"><u>R1173H331B-T1-FE</u></a> | <a href="#"><u>R1173D001B-TR-FE</u></a>  | <a href="#"><u>R1173H101B-T1-FE</u></a> | <a href="#"><u>R1173H281D-T1-FE</u></a> | <a href="#"><u>R1173D001D-TR-FE</u></a> |
| <a href="#"><u>R1173H101D-T1-FE</u></a> | <a href="#"><u>R1173D251D-TR-FE</u></a>  | <a href="#"><u>R1173H121D-T1-FE</u></a> | <a href="#"><u>R1173H411D-T1-FE</u></a> | <a href="#"><u>R1173H251B-T1-FE</u></a> |
| <a href="#"><u>R1173H121B-T1-FE</u></a> | <a href="#"><u>R1173D331D-TR-FE</u></a>  | <a href="#"><u>R1173S191B-E2-FE</u></a> | <a href="#"><u>R1173D331B-TR-FE</u></a> | <a href="#"><u>R1173D081B-TR-FE</u></a> |
| <a href="#"><u>R1173D081D-TR-FE</u></a> | <a href="#"><u>R1173D101B-TR-FE</u></a>  | <a href="#"><u>R1173D101D-TR-FE</u></a> | <a href="#"><u>R1173D121B-TR-FE</u></a> | <a href="#"><u>R1173D121D-TR-FE</u></a> |
| <a href="#"><u>R1173S301B-E2-FE</u></a> | <a href="#"><u>R1173S321D-E2-FE</u></a>  | <a href="#"><u>R1173S451B-E2-FE</u></a> | <a href="#"><u>R1173S501B-E2-FE</u></a> | <a href="#"><u>R1173S501D-E2-FE</u></a> |
| <a href="#"><u>R1173S151B-E2-FE</u></a> | <a href="#"><u>R1173S181D5-E2-FE</u></a> | <a href="#"><u>R1173S181D-E2-FE</u></a> | <a href="#"><u>R1173S251D-E2-FE</u></a> | <a href="#"><u>R1173S261B-E2-FE</u></a> |
| <a href="#"><u>R1173S281D-E2-FE</u></a> | <a href="#"><u>R1173H221D-T1-FE</u></a>  | <a href="#"><u>R1173H301D-T1-FE</u></a> | <a href="#"><u>R1173H501D-T1-FE</u></a> | <a href="#"><u>R1173S101B-E2-FE</u></a> |
| <a href="#"><u>R1173S111D-E2-FE</u></a> | <a href="#"><u>R1173S121B5-E2-FE</u></a> | <a href="#"><u>R1173D411D-TR-FE</u></a> | <a href="#"><u>R1173D421D-TR-FE</u></a> | <a href="#"><u>R1173D451D-TR-FE</u></a> |
| <a href="#"><u>R1173D501D-TR-FE</u></a> | <a href="#"><u>R1173H081B-T1-FE</u></a>  | <a href="#"><u>R1173H151D-T1-FE</u></a> | <a href="#"><u>R1173D141B-TR-FE</u></a> | <a href="#"><u>R1173D181D-TR-FE</u></a> |
| <a href="#"><u>R1173D251B-TR-FE</u></a> | <a href="#"><u>R1173D281D-TR-FE</u></a>  | <a href="#"><u>R1173D301D-TR-FE</u></a> | <a href="#"><u>R1173D381D-TR-FE</u></a> |                                         |