

## Low Voltage 300mA LDO REGULATOR

NO.EA-116-090930

### OUTLINE

The R1131x Series are CMOS-based low voltage regulator ICs with output voltage range from 0.8V to 3.3V. The minimum operating voltage is 1.4V. Each of these voltage regulator ICs consists of a voltage reference unit, an error amplifier, resistors for setting output voltage, a current limit circuit, and a chip enable circuit.

To prevent the destruction by over current, current limit circuit is included. Standby mode realizes ultra small consumption current.

The output voltage of these ICs is internally fixed with high accuracy. Since the packages for these ICs are SOT-23-5, SON-6, and HSON-6, high density mounting of the ICs on boards is possible.

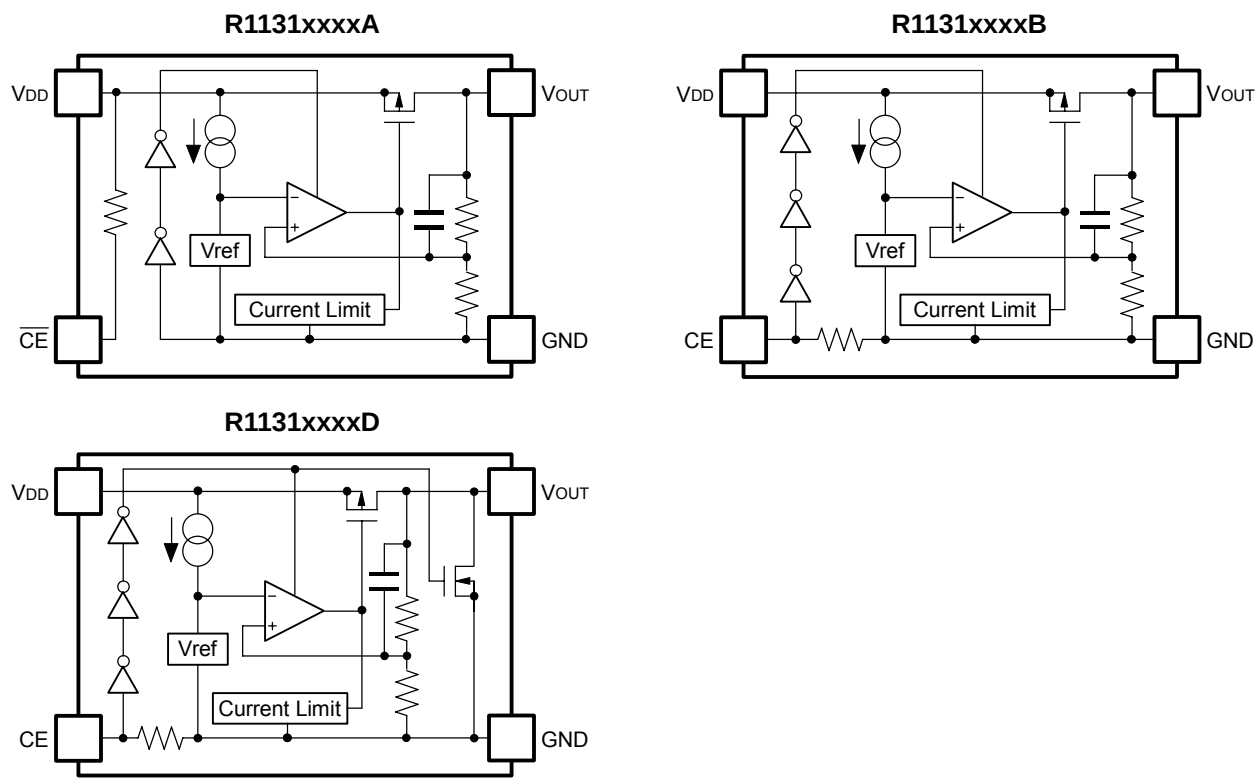
### FEATURES

- Supply Current ..... Typ. 80 $\mu$ A ( $V_{OUT} < 1.8V$ )  
Typ. 60 $\mu$ A ( $V_{OUT} \geq 1.8V$ )
- Standby Mode ..... Typ. 0.1 $\mu$ A
- Low Dropout Voltage ..... Typ. 0.48V ( $I_{OUT}=300mA$  Output Voltage=1.0V Type)  
Typ. 0.31V ( $I_{OUT}=300mA$  Output Voltage=1.5V Type)  
Typ. 0.23V ( $I_{OUT}=300mA$  Output Voltage=3.0V Type)
- Ripple Rejection ..... Typ. 65dB ( $f=1kHz$ )
- Low Temperature-Drift Coefficient of Output Voltage Typ.  $\pm 100ppm/^{\circ}C$
- Excellent Line Regulation ..... Typ. 0.01%/V
- Output Voltage Accuracy .....  $\pm 2.0\%$
- Packages ..... SOT-23-5, SON-6, HSON-6
- Output Voltage Range ..... 0.8V to 3.3V
- Input Voltage Range ..... 1.4V to 6.0V
- Built-in fold-back protection circuit ..... Typ. 50mA (Current at short mode)
- External Capacitors .....  $C_{IN}=C_{OUT}$ =Tantalum 1.0 $\mu$ F ( $V_{OUT} < 1.0V$ )  
 $C_{IN}=C_{OUT}$ =Ceramic 1.0 $\mu$ F ( $V_{OUT} \geq 1.0V$ )

### APPLICATIONS

- Precision Voltage References.
- Power source for electrical appliances such as cameras, VCRs and hand-held communication equipment.
- Power source for battery-powered equipment.

BLOCK DIAGRAM



SELECTION GUIDE

The output voltage, the chip enable polarity, auto discharge function\*, package type, and the taping type for the ICs can be selected at the user's request. The selection can be made with designating the part number as shown below;

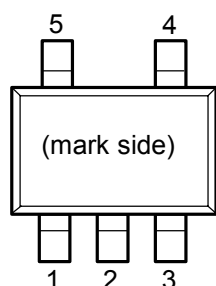
R1131xxxx-xx-x ←Part Number  
↑↑↑↑↑  
a b a'c d e

| Code  | Contents                                                                                                                                                                                             |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a, a' | Designation of Package Type:<br>R1131Nxx1x-xx: SOT-23-5<br>R1131Dxx1x-xx: SON-6,<br>R1131Dxx2x-xx: HSON-6                                                                                            |
| b     | Setting Output Voltage (V <sub>OUT</sub> ): 0.8V to 3.3V<br>(For Standard Voltage, please refer to MARK INFORMATION.)                                                                                |
| c     | Designation of Chip Enable Option:<br>A: "L" active type, without auto discharge function*.<br>B: "H" active type, without auto discharge function*.<br>D: "H" active, with auto discharge function* |
| d     | Designation of Taping Type: TR<br>Refer to Taping Specifications                                                                                                                                     |
| e     | Designation of composition of plating:<br>-F : Lead free solder plating (SOT-23-5, SON-6, HSON-6)                                                                                                    |

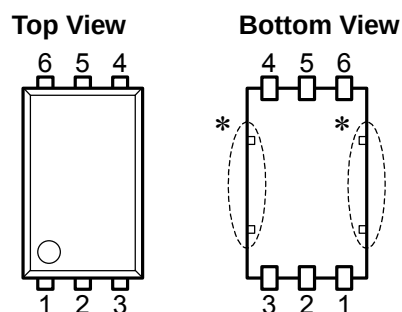
\*) When the mode is into standby with CE signal, auto discharge transistor turns on, and it makes the turn-off speed faster than normal type.

## PIN CONFIGURATIONS

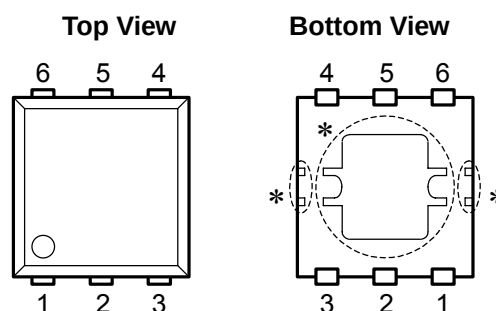
### ● SOT-23-5



### ● SON-6



### ● HSON-6



## PIN DESCRIPTIONS

### ● SOT-23-5

| Pin No | Symbol                | Pin Description |
|--------|-----------------------|-----------------|
| 1      | $V_{DD}$              | Input Pin       |
| 2      | GND                   | Ground Pin      |
| 3      | $\overline{CE}$ or CE | Chip Enable Pin |
| 4      | NC                    | No Connection   |
| 5      | $V_{OUT}$             | Output pin      |

### ● SON-6, HSON-6

| Pin No | Symbol                | Pin Description |
|--------|-----------------------|-----------------|
| 1      | $V_{DD}$              | Input Pin       |
| 2      | NC                    | No Connection   |
| 3      | $V_{OUT}$             | Output pin      |
| 4      | NC                    | No Connection   |
| 5      | GND                   | Ground Pin      |
| 6      | $\overline{CE}$ or CE | Chip Enable Pin |

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

## ABSOLUTE MAXIMUM RATINGS

| Symbol    | Item                                    | Rating               | Unit |
|-----------|-----------------------------------------|----------------------|------|
| $V_{IN}$  | Input Voltage                           | 6.5                  | V    |
| $V_{CE}$  | Input Voltage( $\overline{CE}$ /CE Pin) | −0.3 to 6.5          | V    |
| $V_{OUT}$ | Output Voltage                          | −0.3 to $V_{IN}+0.3$ | V    |
| $I_{OUT}$ | Output Current                          | 350                  | mA   |
| $P_D$     | Power Dissipation (SOT-23-5)*           | 420                  | mW   |
|           | Power Dissipation (SON-6)*              | 500                  |      |
|           | Power Dissipation (HSO-6)*              | 900                  |      |
| $T_{opt}$ | Operating Temperature Range             | −40 to 85            | °C   |
| $T_{stg}$ | Storage Temperature Range               | −55 to 125           | °C   |

\*) For Power Dissipation please refer to PACKAGE INFORMATION.

### ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause the permanent damages and may degrade the life time and safety for both device and system using the device in the field.

The functional operation at or over these absolute maximum ratings is not assured.

## ELECTRICAL CHARACTERISTICS

## • R1131xxxxA

T<sub>opt</sub>=25°C

| Symbol                                   | Item                                      | Conditions                                                                                                                                                     | Min.                             | Typ. | Max.  | Unit       |
|------------------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------|-------|------------|
| V <sub>OUT</sub>                         | Output Voltage                            | V <sub>IN</sub> =Set V <sub>OUT</sub> +1V<br>1μA ≤ I <sub>OUT</sub> ≤ 30mA                                                                                     | V <sub>OUT</sub> > 1.5V<br>×0.98 |      | ×1.02 | V          |
|                                          |                                           |                                                                                                                                                                | V <sub>OUT</sub> ≤ 1.5V<br>−30   |      | +30   | mV         |
| I <sub>OUT</sub>                         | Output Current                            | V <sub>IN</sub> −V <sub>OUT</sub> =1.0V                                                                                                                        | 300                              |      |       | mA         |
| ΔV <sub>OUT</sub> /<br>ΔI <sub>OUT</sub> | Load Regulation                           | V <sub>IN</sub> =Set V <sub>OUT</sub> +1V,<br>1mA ≤ I <sub>OUT</sub> ≤ 300mA                                                                                   |                                  | 40   | 70    | mV         |
| V <sub>DIF</sub>                         | Dropout Voltage                           | I <sub>OUT</sub> =300mA                                                                                                                                        | V <sub>OUT</sub> =0.8V           |      | 620   | 850        |
|                                          |                                           |                                                                                                                                                                | V <sub>OUT</sub> =0.9V           |      | 550   | 780        |
|                                          |                                           |                                                                                                                                                                | 1.0V ≤ V <sub>OUT</sub> < 1.5V   |      | 480   | 700        |
|                                          |                                           |                                                                                                                                                                | 1.5V ≤ V <sub>OUT</sub> < 2.6V   |      | 310   | 450        |
|                                          |                                           |                                                                                                                                                                | 2.6V ≤ V <sub>OUT</sub> ≤ 3.3V   |      | 230   | 350        |
| I <sub>SS1</sub>                         | Supply Current                            | V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, V <sub>OUT</sub> < 1.8V                                                                                             |                                  | 80   | 111   | μA         |
|                                          |                                           | V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, V <sub>OUT</sub> ≥ 1.8V                                                                                             |                                  | 60   | 90    | μA         |
| I <sub>standby</sub>                     | Standby Current                           | V <sub>IN</sub> =V <sub>CE</sub> =Set V <sub>OUT</sub> +1V                                                                                                     |                                  | 0.1  | 1.0   | μA         |
| ΔV <sub>OUT</sub> /<br>ΔV <sub>IN</sub>  | Line Regulation                           | I <sub>OUT</sub> =30mA<br>V <sub>OUT</sub> +0.5V ≤ V <sub>IN</sub> ≤ 6.0V (V <sub>OUT</sub> > 0.9V)<br>1.4V ≤ V <sub>IN</sub> ≤ 6.0V (V <sub>OUT</sub> ≤ 0.9V) |                                  | 0.01 | 0.15  | %/V        |
| RR                                       | Ripple Rejection                          | f=1kHz, Ripple 0.2Vp-p<br>V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, I <sub>OUT</sub> =30mA                                                                    |                                  | 65   |       | dB         |
| V <sub>IN</sub>                          | Input Voltage                             |                                                                                                                                                                | 1.4                              |      | 6.0   | V          |
| ΔV <sub>OUT</sub> /<br>ΔT <sub>opt</sub> | Output Voltage<br>Temperature Coefficient | I <sub>OUT</sub> =30mA<br>−40°C ≤ T <sub>opt</sub> ≤ 85°C                                                                                                      |                                  | ±100 |       | ppm<br>/°C |
| I <sub>lim</sub>                         | Short Current Limit                       | V <sub>OUT</sub> =0V                                                                                                                                           |                                  | 50   |       | mA         |
| R <sub>PU</sub>                          | $\overline{\text{CE}}$ Pull-up Resistance |                                                                                                                                                                | 1.87                             | 5.0  | 12.0  | MΩ         |
| V <sub>CEH</sub>                         | $\overline{\text{CE}}$ Input Voltage “H”  |                                                                                                                                                                | 1.0                              |      | 6.0   | V          |
| V <sub>CEL</sub>                         | $\overline{\text{CE}}$ Input Voltage “L”  |                                                                                                                                                                | 0                                |      | 0.3   | V          |
| en                                       | Output Noise                              | BW=10Hz to 100kHz                                                                                                                                              |                                  | 30   |       | μVrms      |

## 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.

## R1131x

### • R1131xxxxB/D

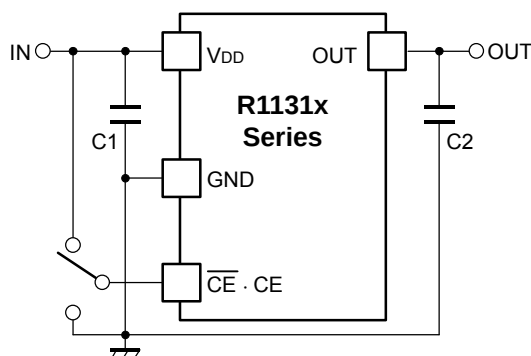
T<sub>opt</sub>=25°C

| Symbol                                   | Item                                                     | Conditions                                                                                                                                                     | Min.                             | Typ. | Max.  | Unit       |
|------------------------------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------|-------|------------|
| V <sub>OUT</sub>                         | Output Voltage                                           | V <sub>IN</sub> =Set V <sub>OUT</sub> +1V<br>1μA ≤ I <sub>OUT</sub> ≤ 30mA                                                                                     | V <sub>OUT</sub> > 1.5V<br>×0.98 |      | ×1.02 | V          |
|                                          |                                                          |                                                                                                                                                                | V <sub>OUT</sub> ≤ 1.5V<br>−30   |      | +30   | mV         |
| I <sub>OUT</sub>                         | Output Current                                           | V <sub>IN</sub> −V <sub>OUT</sub> =1.0V                                                                                                                        | 300                              |      |       | mA         |
| ΔV <sub>OUT</sub> /<br>ΔI <sub>OUT</sub> | Load Regulation                                          | V <sub>IN</sub> =Set V <sub>OUT</sub> +1V<br>1mA ≤ I <sub>OUT</sub> ≤ 300mA                                                                                    |                                  | 40   | 70    | mV         |
| V <sub>DIF</sub>                         | Dropout Voltage                                          | I <sub>OUT</sub> =300mA                                                                                                                                        | V <sub>OUT</sub> =0.8V           |      | 620   | 850        |
|                                          |                                                          |                                                                                                                                                                | V <sub>OUT</sub> =0.9V           |      | 550   | 780        |
|                                          |                                                          |                                                                                                                                                                | 1.0V ≤ V <sub>OUT</sub> < 1.5V   |      | 480   | 700        |
|                                          |                                                          |                                                                                                                                                                | 1.5V ≤ V <sub>OUT</sub> < 2.6V   |      | 310   | 450        |
|                                          |                                                          |                                                                                                                                                                | 2.6V ≤ V <sub>OUT</sub> ≤ 3.3V   |      | 230   | 350        |
| I <sub>SS1</sub>                         | Supply Current                                           | V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, V <sub>OUT</sub> < 1.8V                                                                                             |                                  | 80   | 111   | μA         |
|                                          |                                                          | V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, V <sub>OUT</sub> ≥ 1.8V                                                                                             |                                  | 60   | 90    | μA         |
| I <sub>standby</sub>                     | Standby Current                                          | V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, V <sub>CE</sub> =GND                                                                                                |                                  | 0.1  | 1.0   | μA         |
| ΔV <sub>OUT</sub> /<br>ΔV <sub>IN</sub>  | Line Regulation                                          | I <sub>OUT</sub> =30mA<br>V <sub>OUT</sub> +0.5V ≤ V <sub>IN</sub> ≤ 6.0V (V <sub>OUT</sub> > 0.9V)<br>1.4V ≤ V <sub>IN</sub> ≤ 6.0V (V <sub>OUT</sub> ≤ 0.9V) |                                  | 0.01 | 0.15  | %/V        |
| RR                                       | Ripple Rejection                                         | f=1kHz, Ripple 0.2Vp-p<br>V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, I <sub>OUT</sub> =30mA                                                                    |                                  | 65   |       | dB         |
| V <sub>IN</sub>                          | Input Voltage                                            |                                                                                                                                                                | 1.4                              |      | 6.0   | V          |
| ΔV <sub>OUT</sub> /<br>ΔT <sub>opt</sub> | Output Voltage<br>Temperature Coefficient                | I <sub>OUT</sub> =30mA<br>−40°C ≤ T <sub>opt</sub> ≤ 85°C                                                                                                      |                                  | ±100 |       | ppm<br>/°C |
| I <sub>lim</sub>                         | Short Current Limit                                      | V <sub>OUT</sub> =0V                                                                                                                                           |                                  | 50   |       | mA         |
| R <sub>PD</sub>                          | CE Pull-down Resistance                                  |                                                                                                                                                                | 1.87                             | 5.0  | 12.0  | MΩ         |
| V <sub>CEH</sub>                         | CE Input Voltage “H”                                     |                                                                                                                                                                | 1.0                              |      | 6.0   | V          |
| V <sub>CEL</sub>                         | CE Input Voltage “L”                                     |                                                                                                                                                                | 0                                |      | 0.3   | V          |
| en                                       | Output Noise                                             | BW=10Hz to 100kHz                                                                                                                                              |                                  | 30   |       | μVrms      |
| R <sub>LOW</sub>                         | Nch On Resistance for auto<br>discharge (D version only) | V <sub>CE</sub> =0V                                                                                                                                            |                                  | 60   |       | Ω          |

#### RECOMMENDED OPERATING CONDITIONS (ELECTRICAL CHARACTERISTICS)

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

## TYPICAL APPLICATION



### <External Components examples>

|    |             |                             |
|----|-------------|-----------------------------|
| C2 | 1.0 $\mu$ F | CM05X5R105K06AB (Kyocera)   |
| C2 | 1.0 $\mu$ F | C1005JBOJ105K (TDK)         |
| C2 | 1.0 $\mu$ F | GRM155B30J105KE18B (Murata) |

Output Capacitor; 1.0 $\mu$ F or more capacity ceramic Type

(If  $V_{OUT} < 1.0V$ , Tantalum Type is recommended)

Input Capacitor, 1.0 $\mu$ F or more capacity ceramic Type

## TECHNICAL NOTES

When using these ICs, consider the following points:

### Phase Compensation

In these ICs, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, be sure to use a 1.0 $\mu$ F or more capacitor  $C_{OUT}$  with good frequency characteristics and ESR (Equivalent Series Resistance).

(Note: If a tantalum capacitor is connected to the Output pin for phase compensation, if the ESR value of the capacitor is too large, the operation might be unstable. Because of this, test these ICs with as same external components as ones to be used on the PCB.)

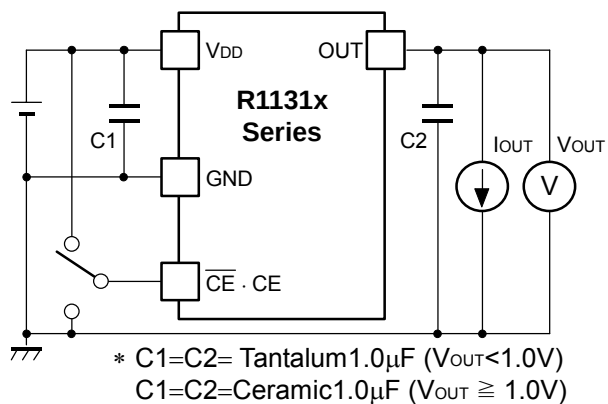
Chip capacitor characteristics of Bias dependence and Temperature characteristics may vary depending on its size, manufacturer, and part number.

### PCB Layout

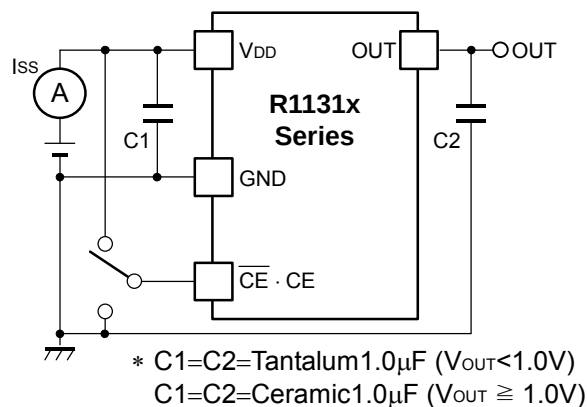
Make  $V_{DD}$  and GND lines sufficient. If their impedance is high, pick-up the noise or unstable operation may result. Connect a capacitor with as much as 1.0 $\mu$ F capacitor between  $V_{DD}$  and GND pin as close as possible.

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

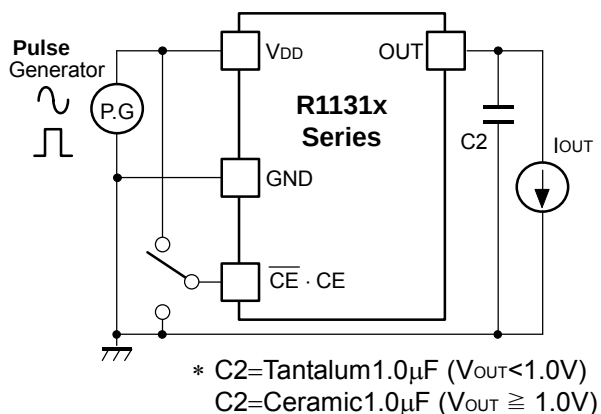
## TEST CIRCUIT



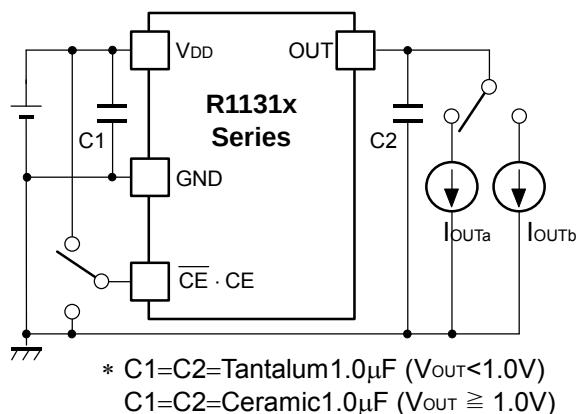
Standard Test Circuit



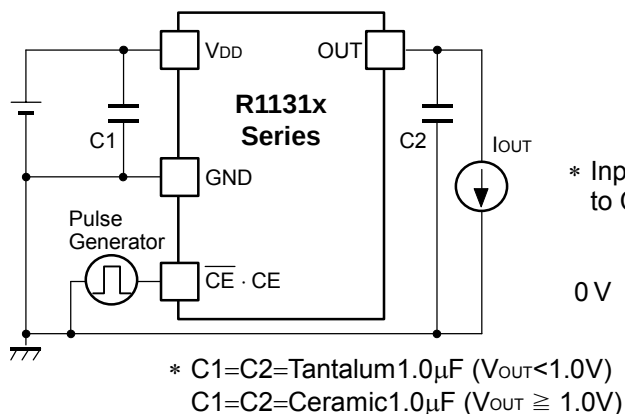
Supply Current Test Circuit



Ripple Rejection, Line Transient Response Test Circuit



Load Transient Response Test Circuit



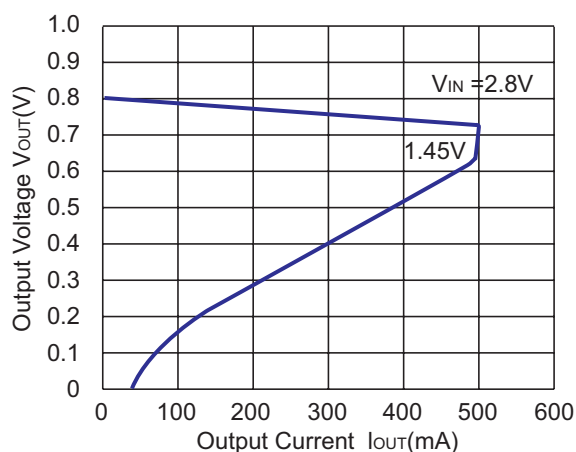
Turn on Speed with CE pin Test Circuit

\* Input signal waveform to CE pin is shown below.  
 Set  $V_{\text{OUT}}$   
 0V +1.0V

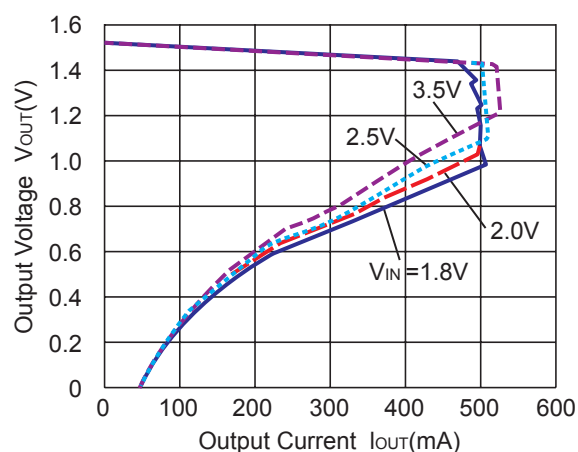
## TYPICAL CHARACTERISTICS

### 1) Output Voltage vs. Output Current

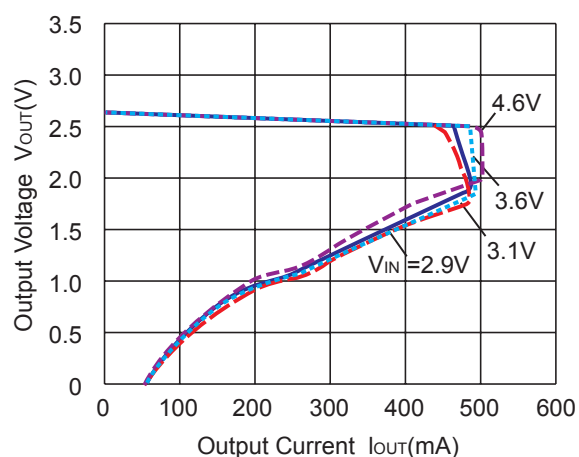
R1131x08xx



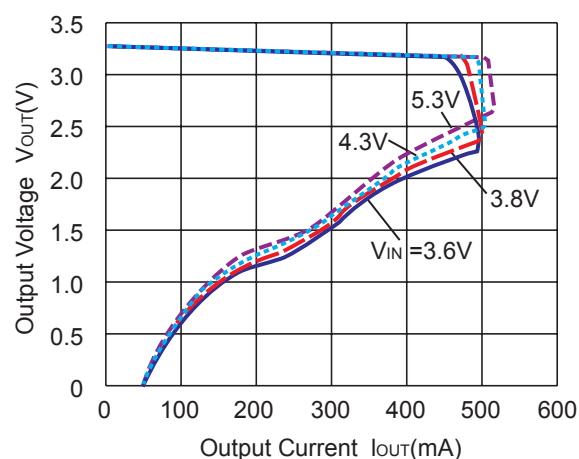
R1131x15xx



R1131x26xx

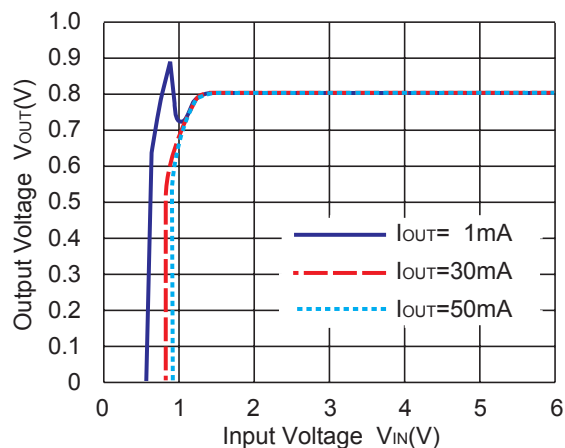


R1131x33xx

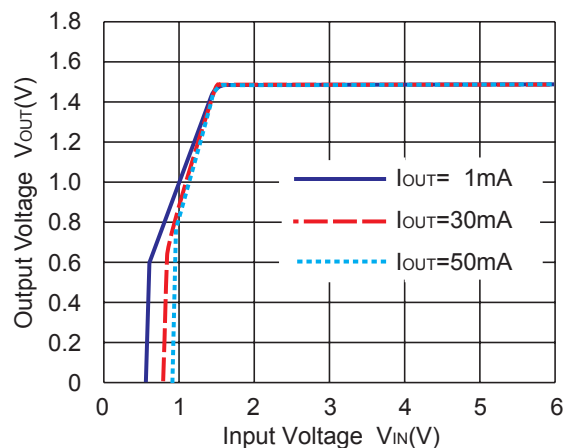


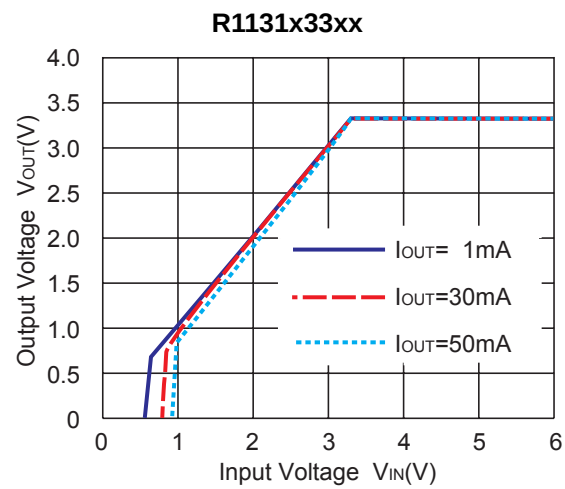
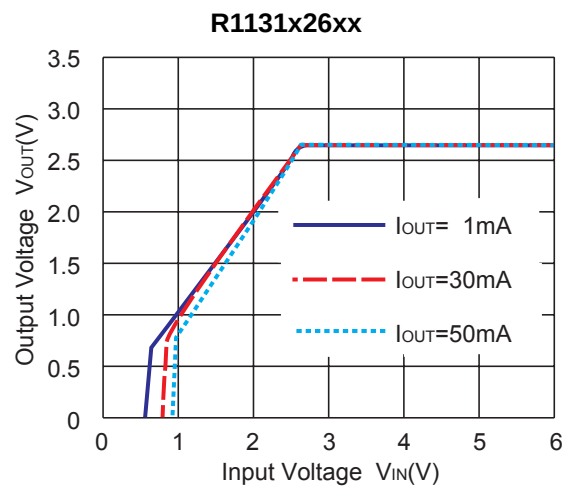
### 2) Output Voltage vs. Input Voltage

R1131x08xx

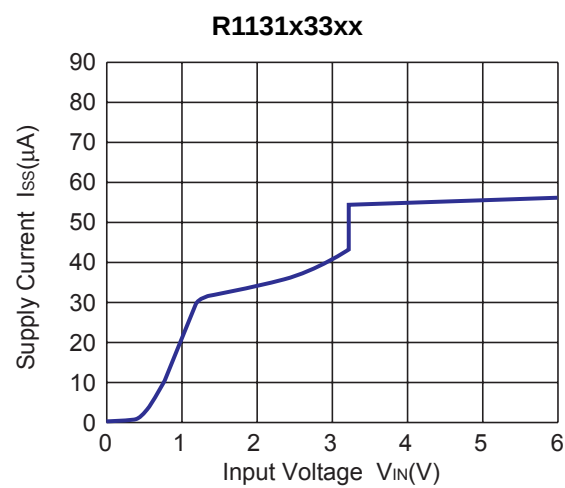
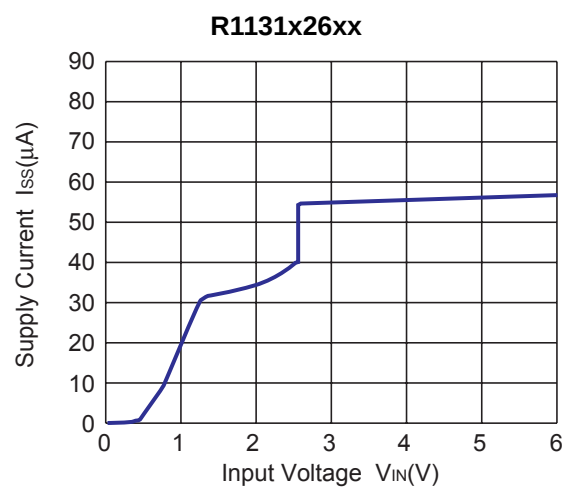
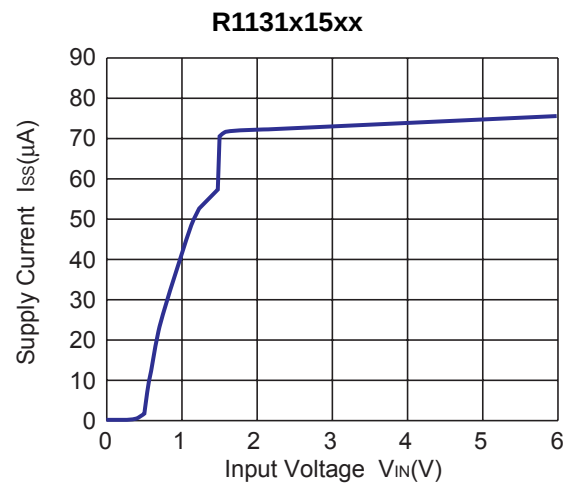
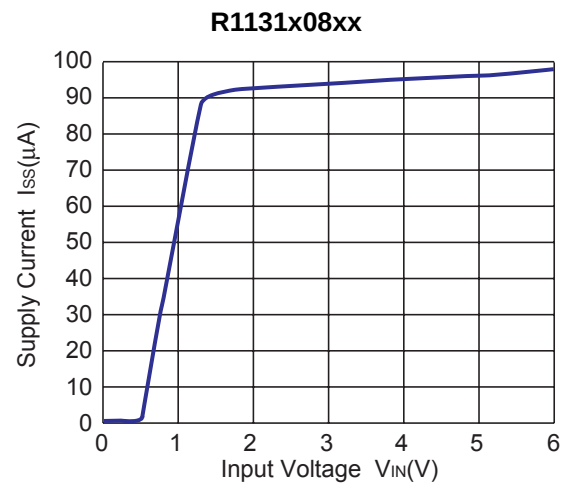


R1131x15xx



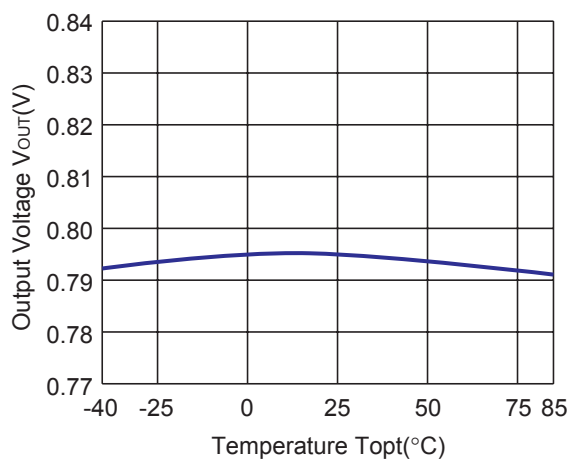


**3) Supply Current vs. Input Voltage**

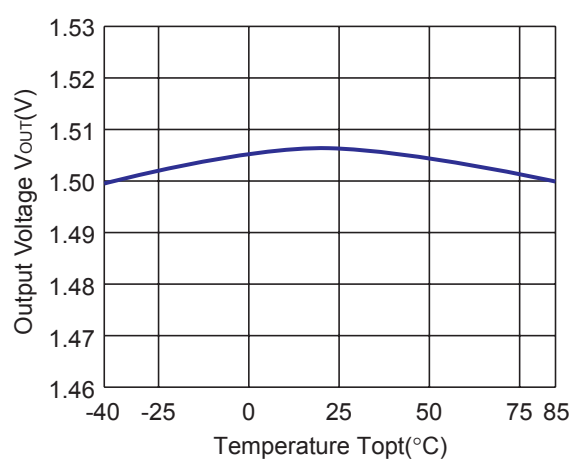


#### 4) Output Voltage vs. Temperature

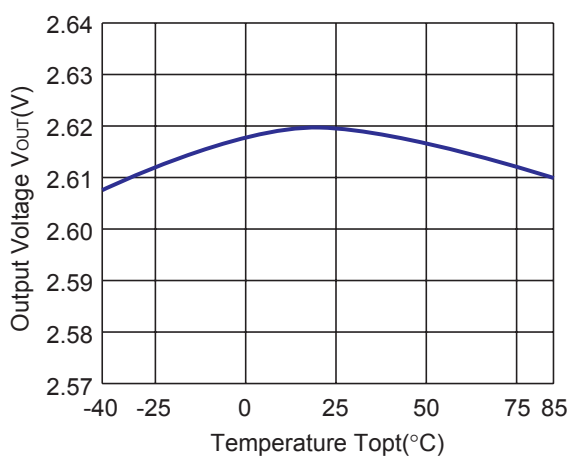
R1131x08xx



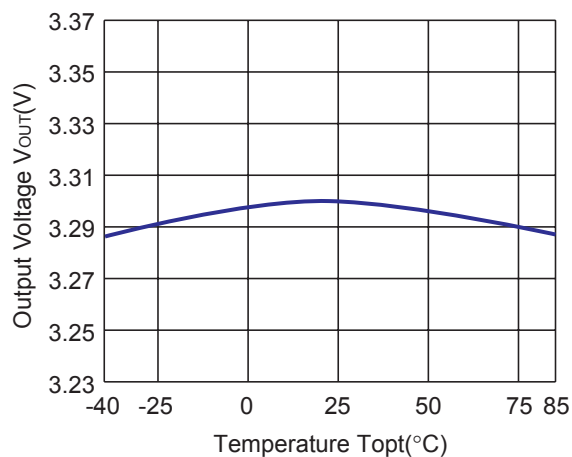
R1131x15xx



R1131x26xx

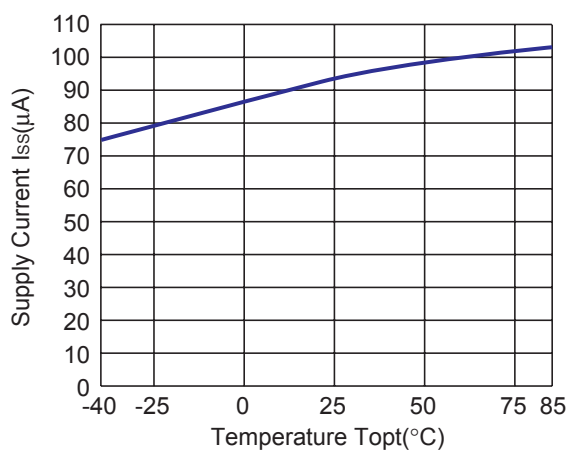


R1131x33xx

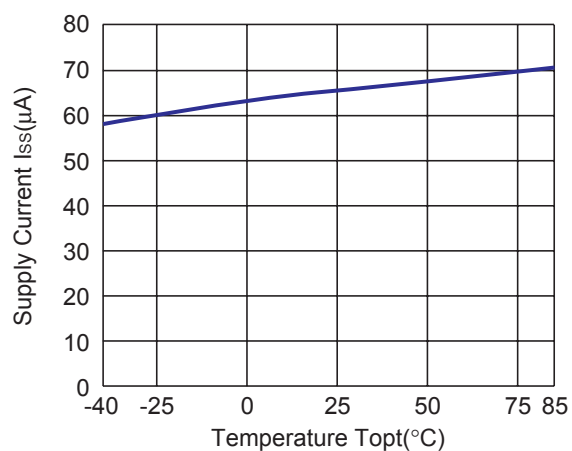


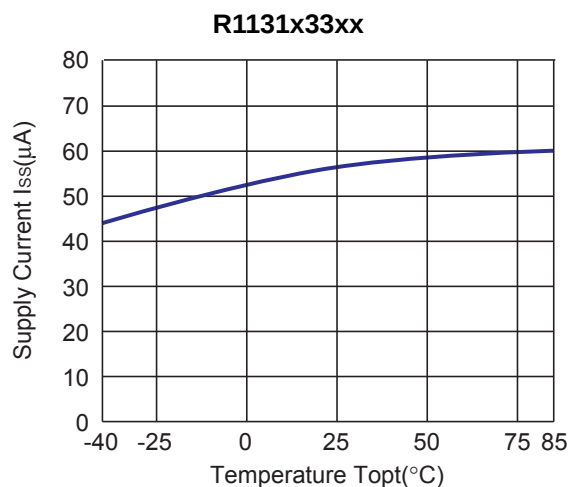
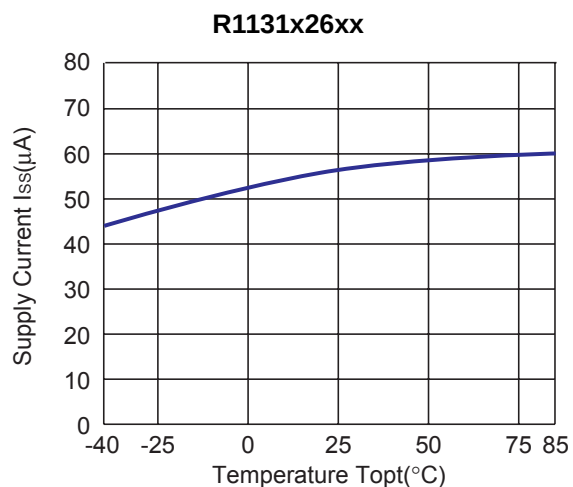
#### 5) Supply Current vs. Temperature

R1131x08xx

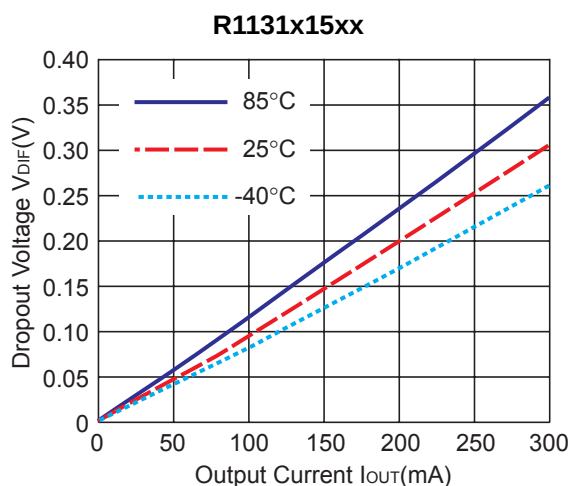
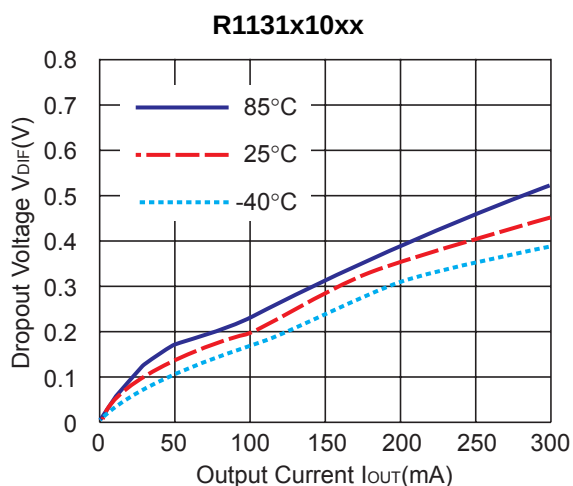
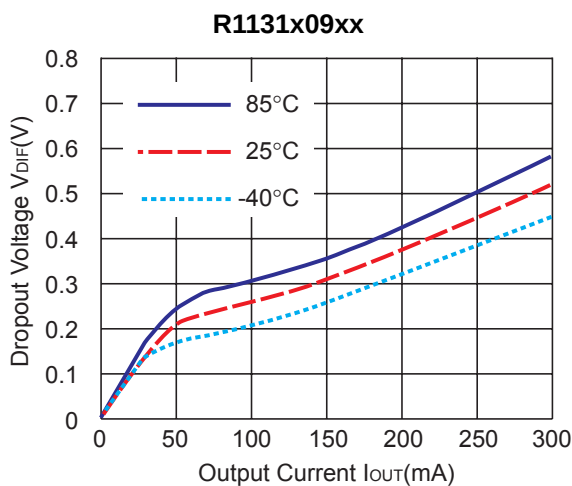
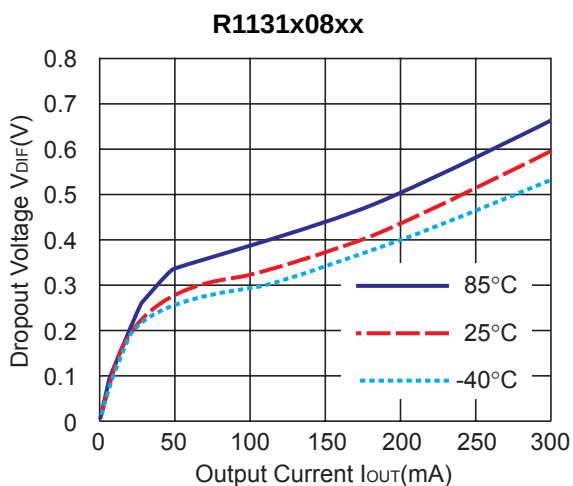


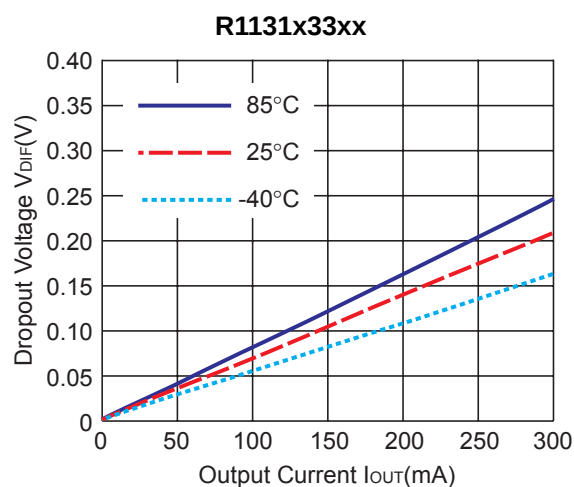
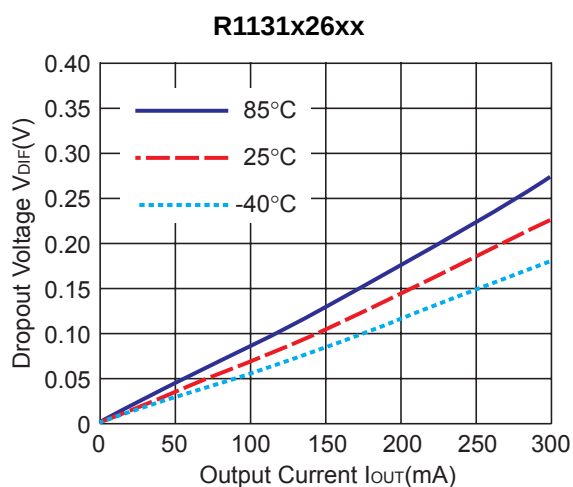
R1131x15xx



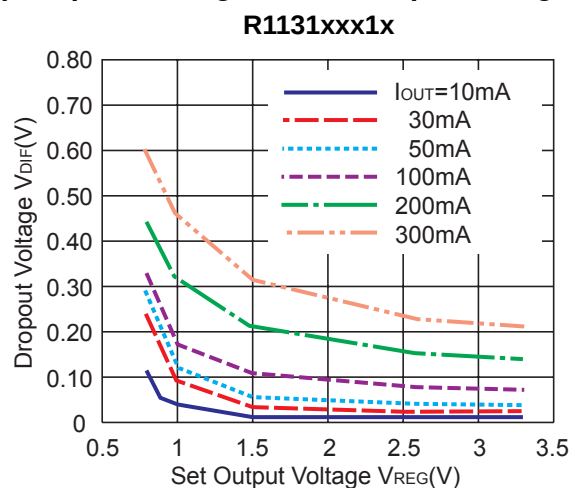


## 6) Dropout Voltage vs. Output Current

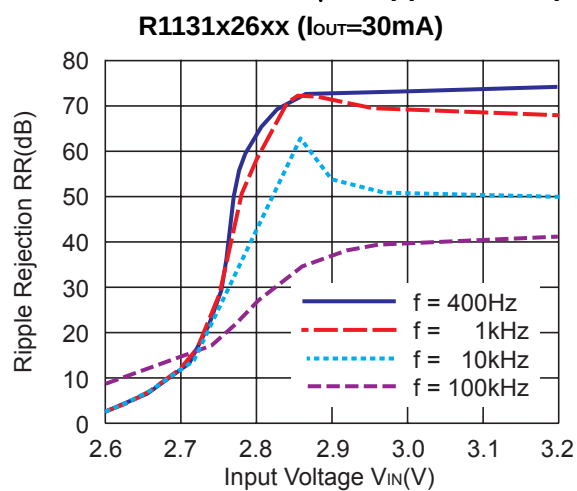
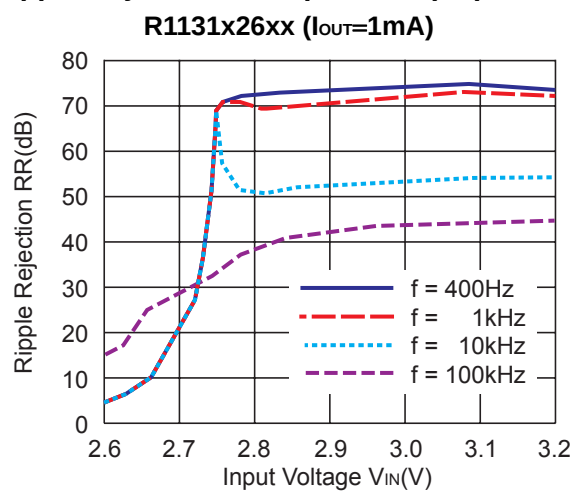


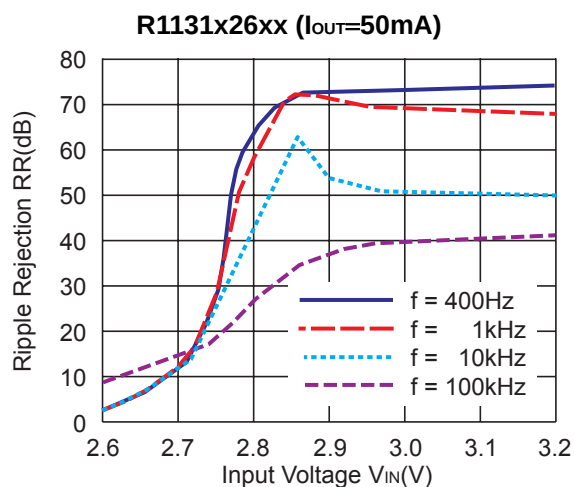


## 7) Dropout Voltage vs. Set Output Voltage (T<sub>opt</sub>=25°C)

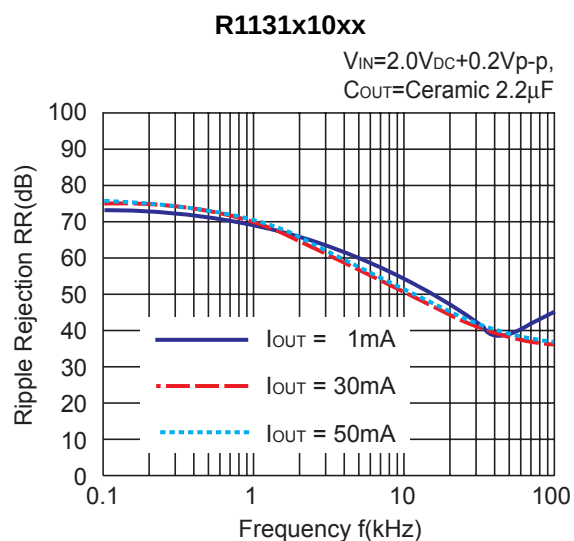
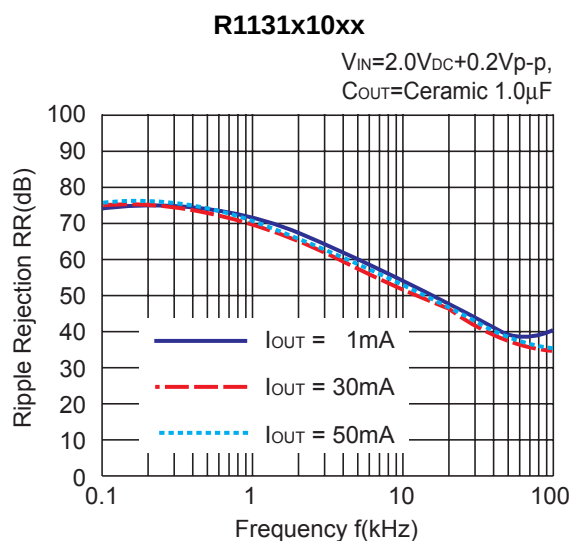
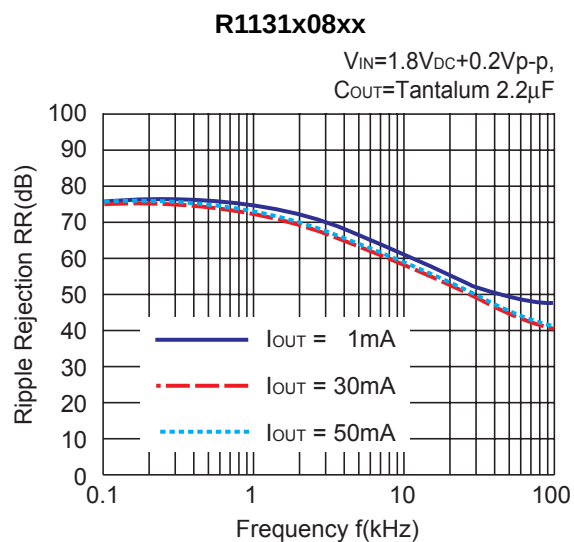
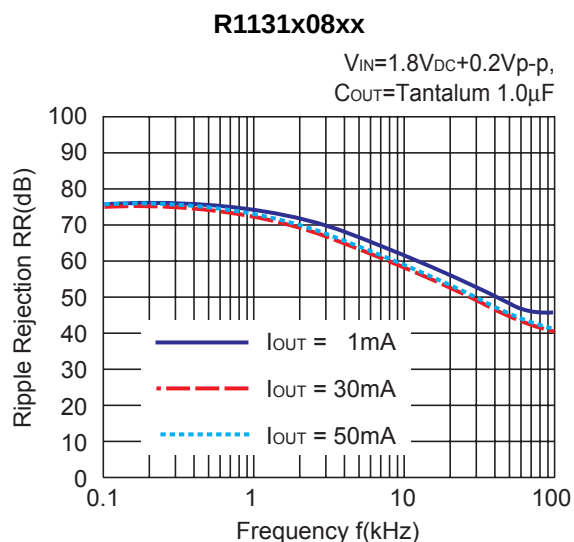


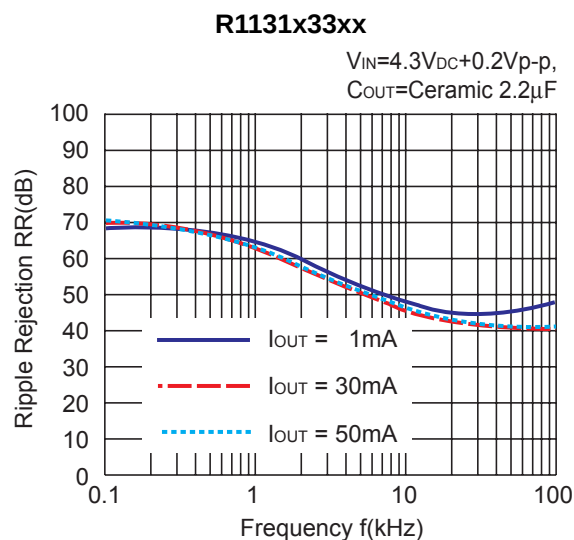
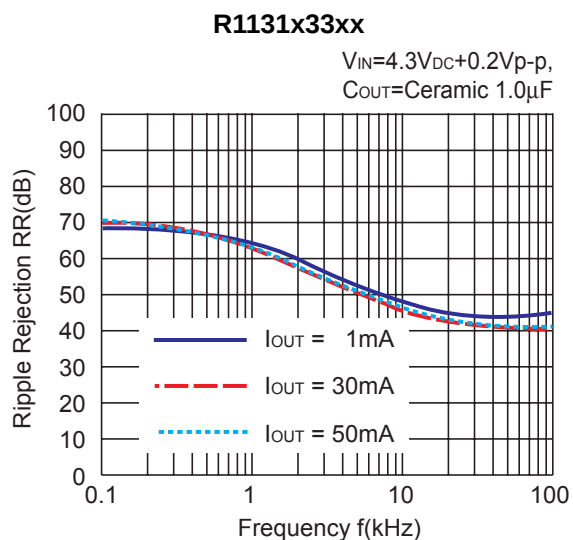
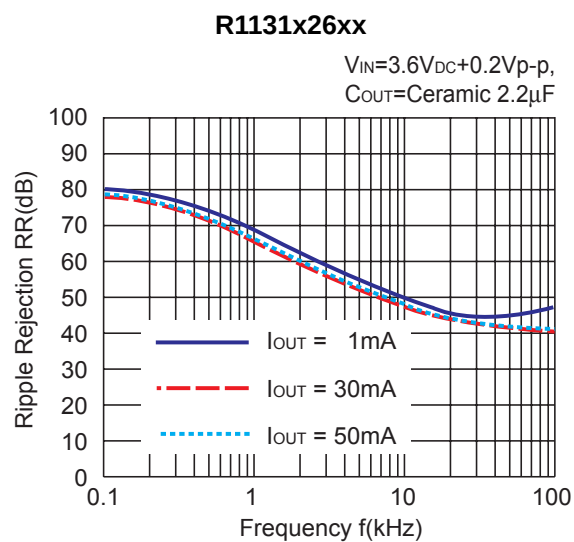
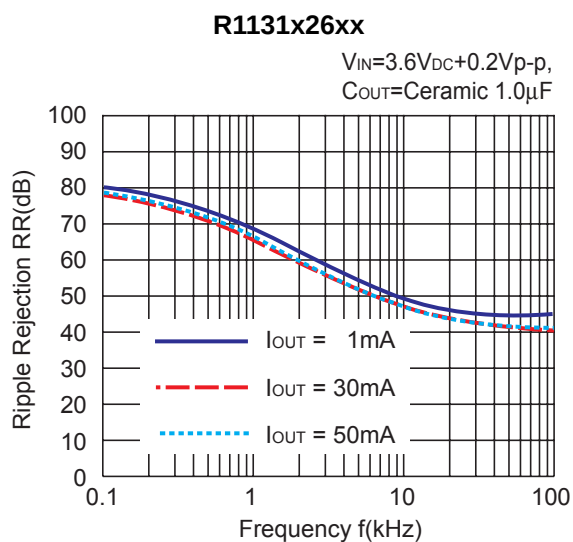
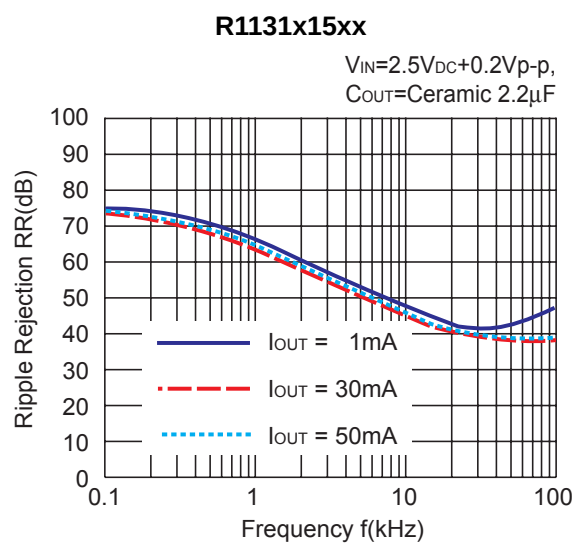
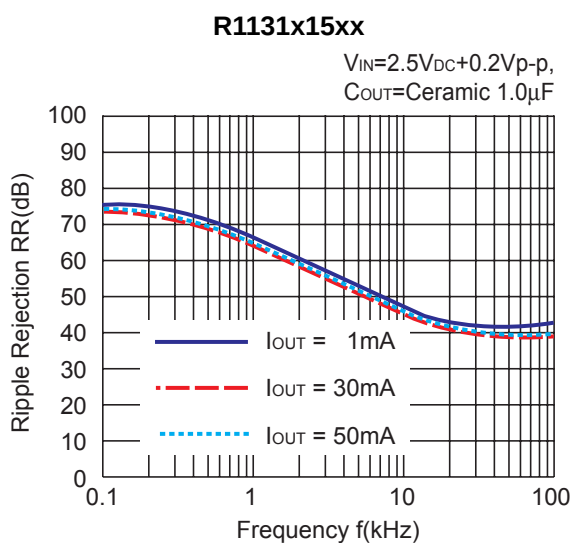
## 8) Ripple Rejection vs. Input Bias (T<sub>opt</sub>=25°C C<sub>IN</sub>=none, C<sub>OUT</sub>=Ceramic 1.0μF Ripple 0.2V<sub>P-P</sub>)

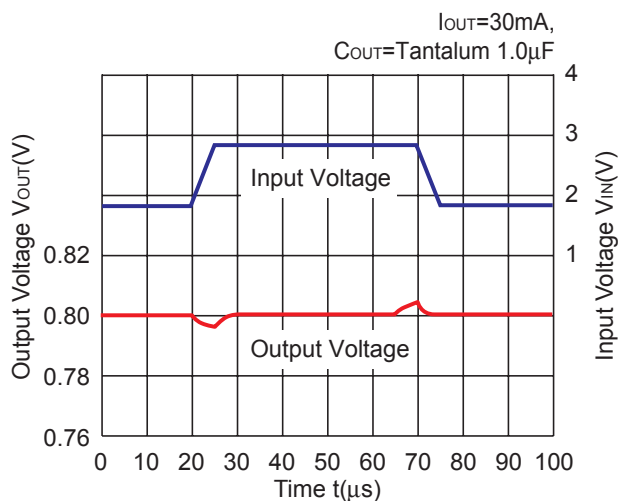
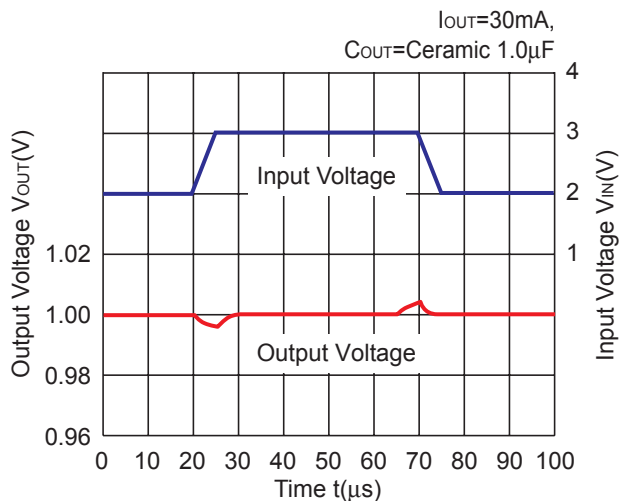
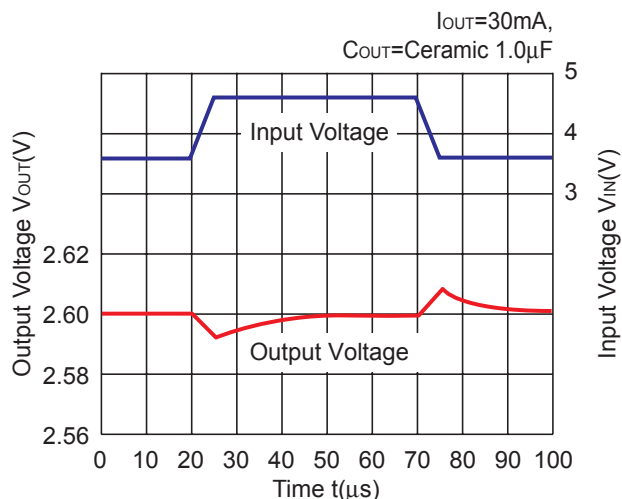




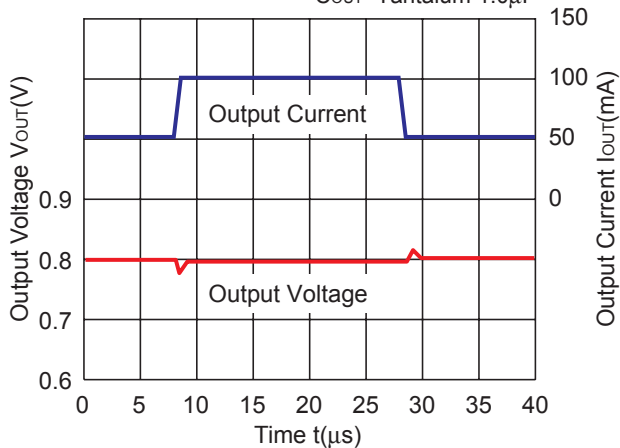
### 9) Ripple Rejection vs. Frequency ( $C_{IN}=none$ )



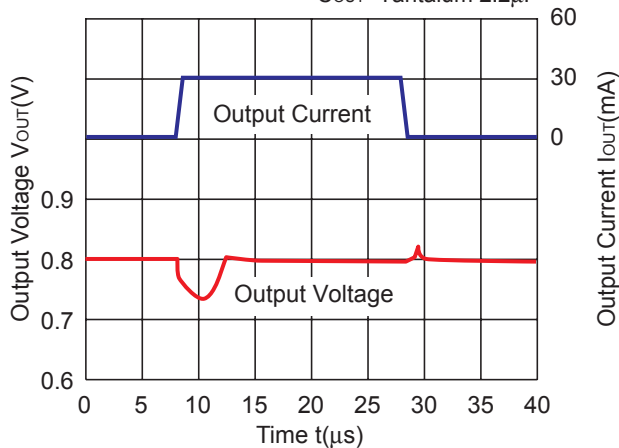


**10) Input Transient Response ( $C_{IN}=none$ ,  $t_r=t_f=5\mu s$ )**
**R1131x08xx**

**R1131x10x**

**R1131x26xx**

**11) Load Transient Response ( $t_r=t_f=0.5\mu s$ )**
**R1131x08xx**

$V_{IN}=1.8V$   $C_{IN}=Tantalum\ 1.0\mu F$ ,  
 $C_{OUT}=Tantalum\ 1.0\mu F$

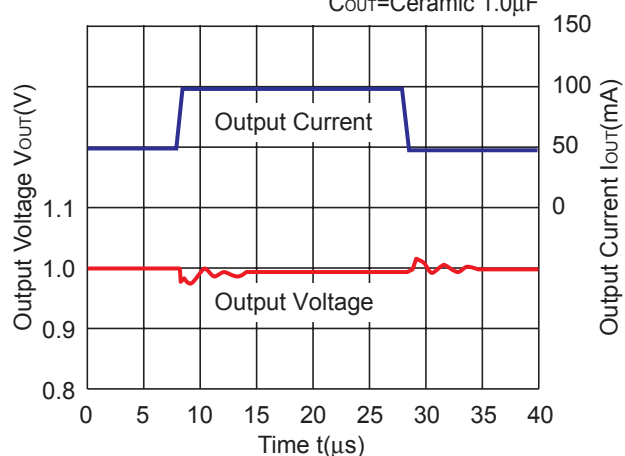

**R1131x08xx**

$V_{IN}=1.8V$   $C_{IN}=Tantalum\ 1.0\mu F$ ,  
 $C_{OUT}=Tantalum\ 2.2\mu F$

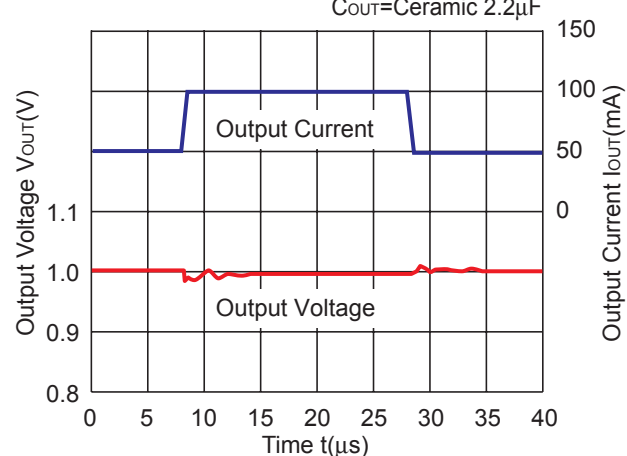


**R1131x10xx**

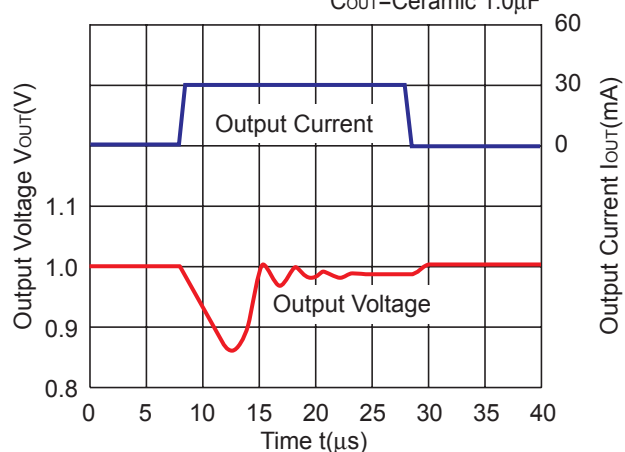
$V_{IN}=2.0V$   $C_{IN}$ =Ceramic  $1.0\mu F$ ,  
 $C_{OUT}$ =Ceramic  $1.0\mu F$

**R1131x10xx**

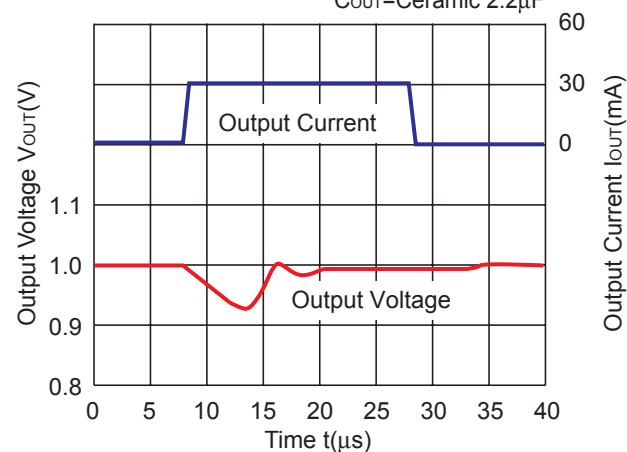
$V_{IN}=2.0V$   $C_{IN}$ =Ceramic  $1.0\mu F$ ,  
 $C_{OUT}$ =Ceramic  $2.2\mu F$

**R1131x10xx**

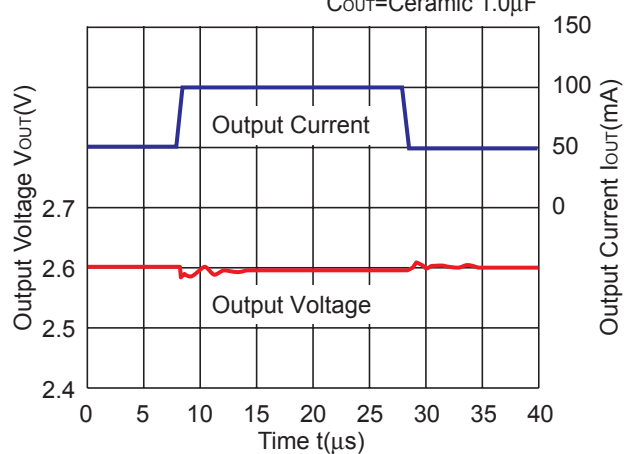
$V_{IN}=2.0V$   $C_{IN}$ =Ceramic  $1.0\mu F$ ,  
 $C_{OUT}$ =Ceramic  $1.0\mu F$

**R1131x10xx**

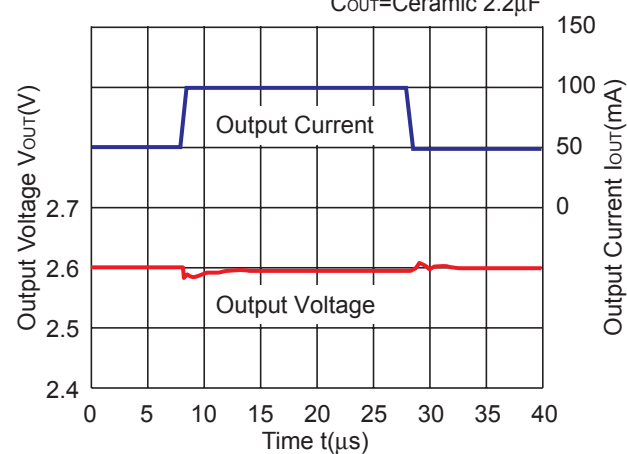
$V_{IN}=2.0V$   $C_{IN}$ =Ceramic  $1.0\mu F$ ,  
 $C_{OUT}$ =Ceramic  $2.2\mu F$

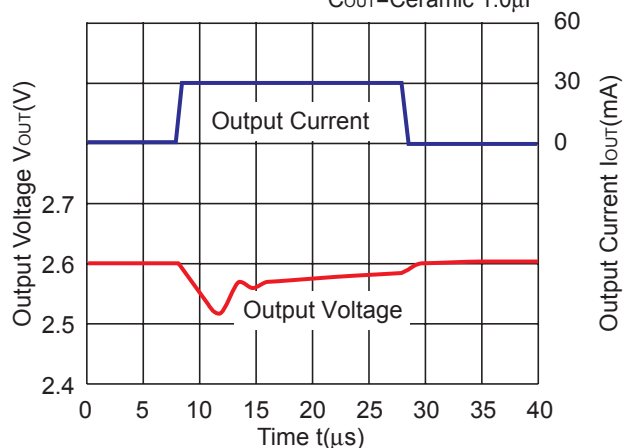
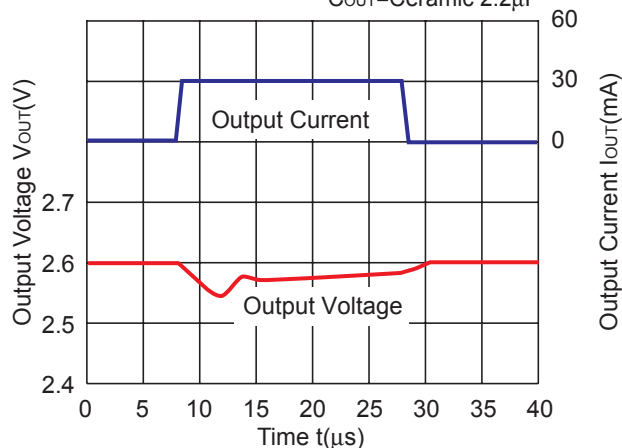
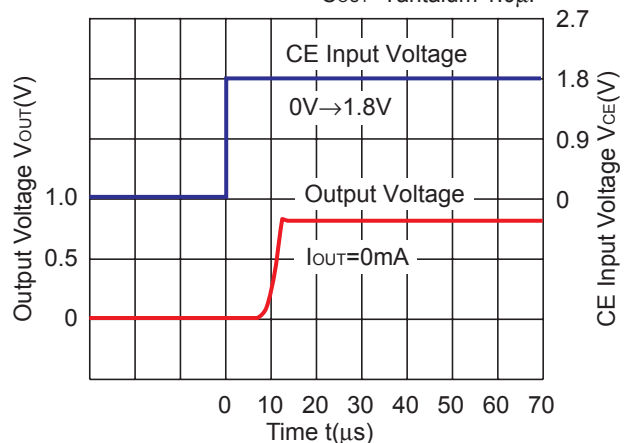
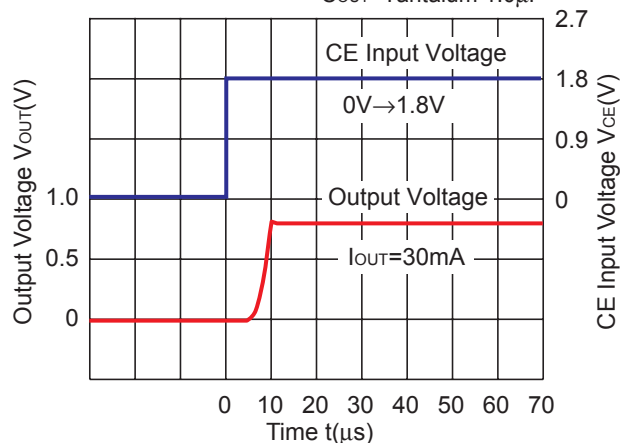
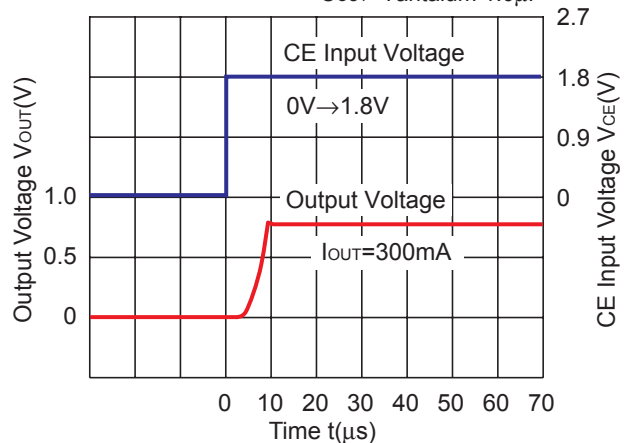
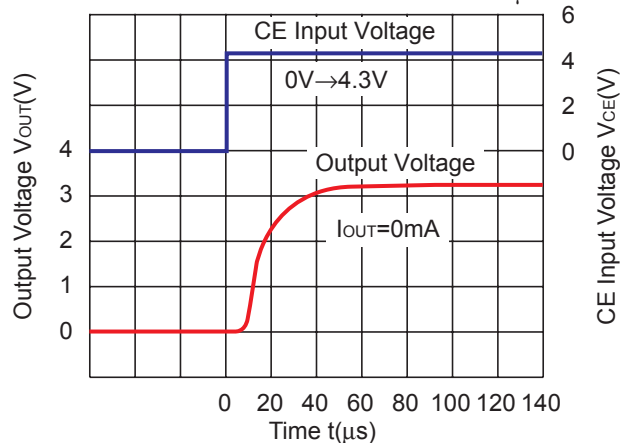
**R1131x26xx**

$V_{IN}=3.6V$   $C_{IN}$ =Ceramic  $1.0\mu F$ ,  
 $C_{OUT}$ =Ceramic  $1.0\mu F$

**R1131x26xx**

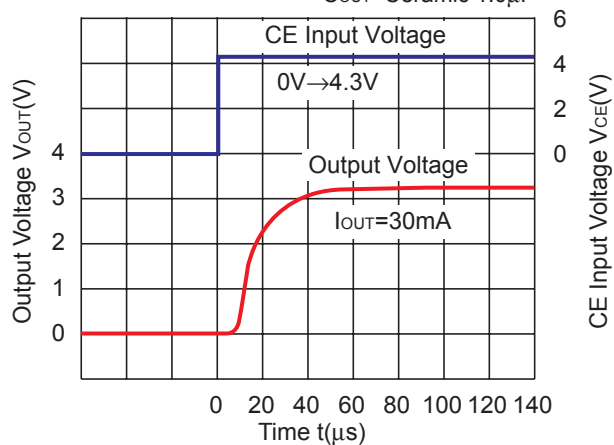
$V_{IN}=3.6V$   $C_{IN}$ =Ceramic  $1.0\mu F$ ,  
 $C_{OUT}$ =Ceramic  $2.2\mu F$



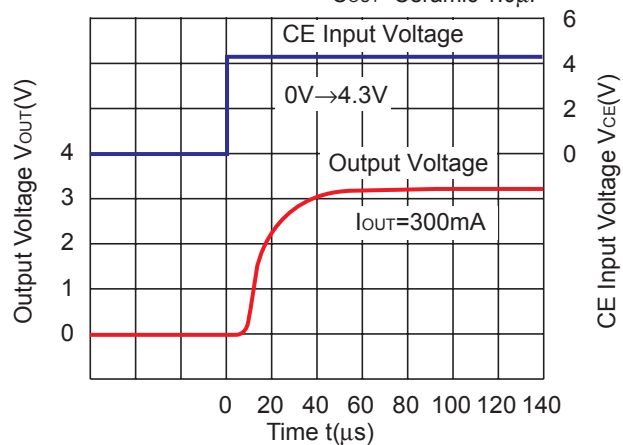
**R1131x26xx**
 $V_{IN}=3.6V$   $C_{IN}$ =Ceramic  $1.0\mu F$ ,  
 $C_{OUT}$ =Ceramic  $1.0\mu F$ 

**R1131x26xx**
 $V_{IN}=3.6V$   $C_{IN}$ =Ceramic  $1.0\mu F$ ,  
 $C_{OUT}$ =Ceramic  $2.2\mu F$ 

**12) Turn on speed with CE pin**
**R1131x08xx**
 $V_{IN}=1.8V$   $C_{IN}$ =Tantalum  $1.0\mu F$ ,  
 $C_{OUT}$ =Tantalum  $1.0\mu F$ 

**R1131x08xx**
 $V_{IN}=1.8V$   $C_{IN}$ =Tantalum  $1.0\mu F$ ,  
 $C_{OUT}$ =Tantalum  $1.0\mu F$ 

**R1131x08xx**
 $V_{IN}=1.8V$   $C_{IN}$ =Tantalum  $1.0\mu F$ ,  
 $C_{OUT}$ =Tantalum  $1.0\mu F$ 

**R1131x33xx**
 $V_{IN}=4.3V$   $C_{IN}$ =Ceramic  $1.0\mu F$ ,  
 $C_{OUT}$ =Ceramic  $1.0\mu F$ 


**R1131x33xx (ECO=H)**

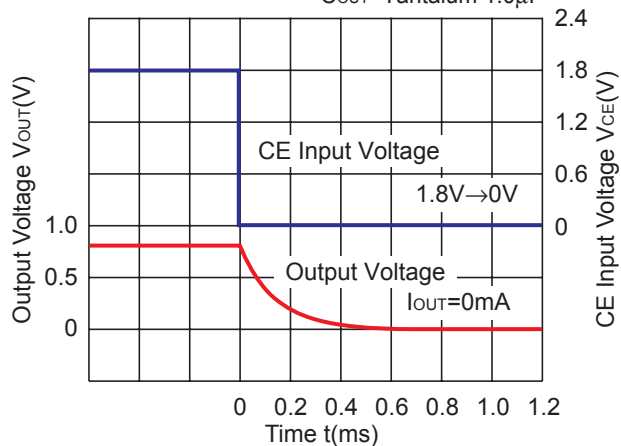
$V_{IN}=4.3V$   $C_{IN}$ =Ceramic  $1.0\mu F$ ,  
 $C_{OUT}$ =Ceramic  $1.0\mu F$

**R1131x33xx (ECO=L)**

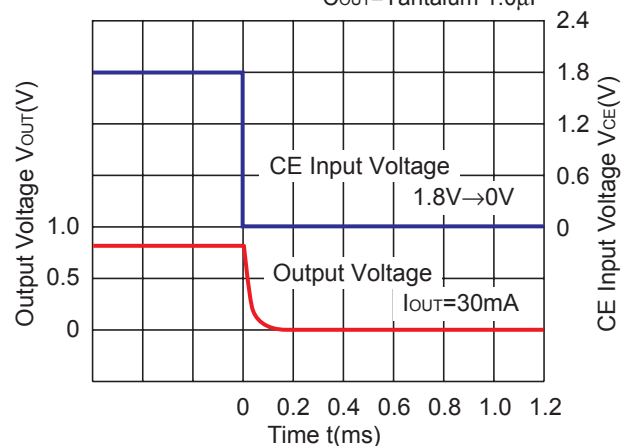
$V_{IN}=4.3V$   $C_{IN}$ =Ceramic  $1.0\mu F$ ,  
 $C_{OUT}$ =Ceramic  $1.0\mu F$

**13) Turn-off Speed with CE****R1131x08xD**

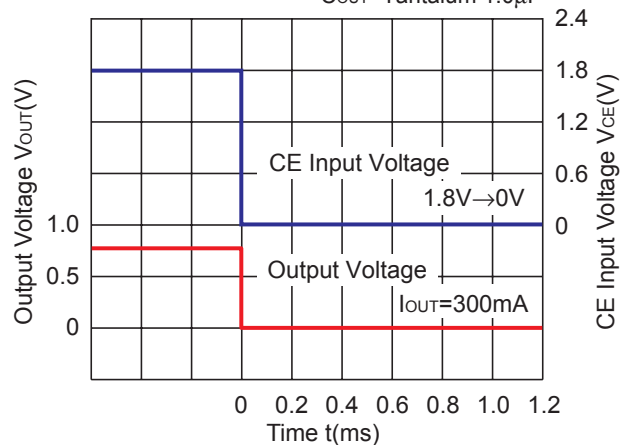
$V_{IN}=1.8V$   $C_{IN}$ =Tantalum  $1.0\mu F$ ,  
 $C_{OUT}$ =Tantalum  $1.0\mu F$

**R1131x08xD**

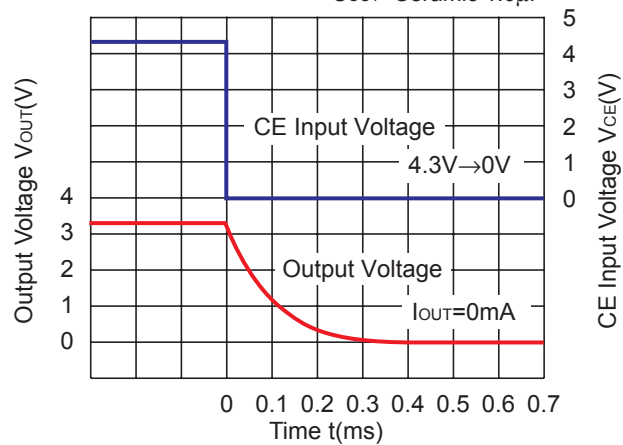
$V_{IN}=1.8V$   $C_{IN}$ =Tantalum  $1.0\mu F$ ,  
 $C_{OUT}$ =Tantalum  $1.0\mu F$

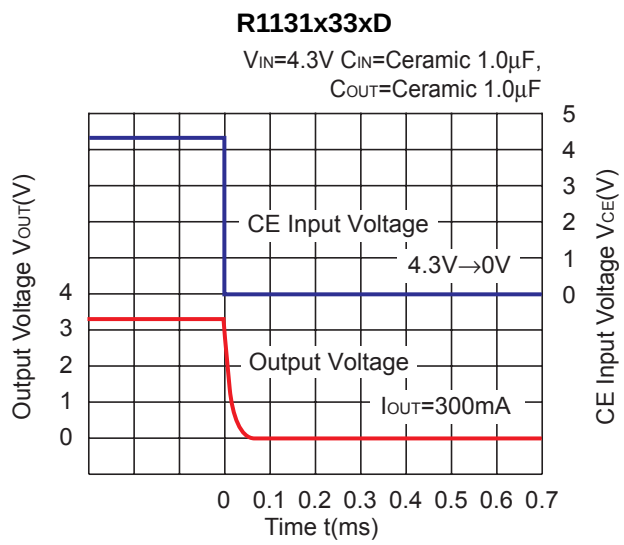
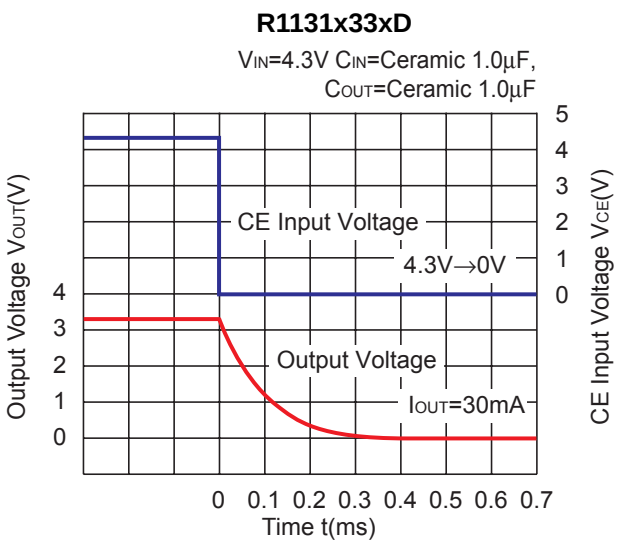
**R1131x08xD**

$V_{IN}=1.8V$   $C_{IN}$ =Tantalum  $1.0\mu F$ ,  
 $C_{OUT}$ =Tantalum  $1.0\mu F$

**R1131x33xD**

$V_{IN}=4.3V$   $C_{IN}$ =Ceramic  $1.0\mu F$ ,  
 $C_{OUT}$ =Ceramic  $1.0\mu F$





## ESR vs. Output Current

When using these ICs, consider the following points:

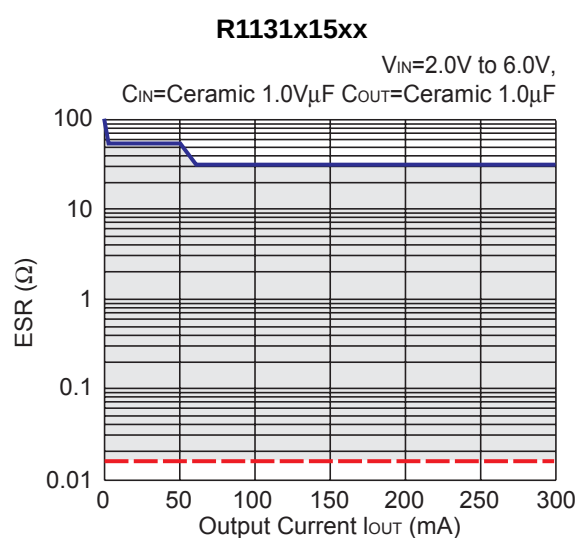
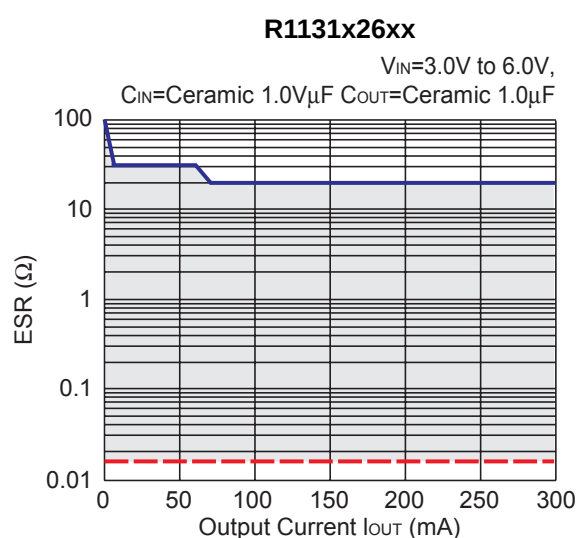
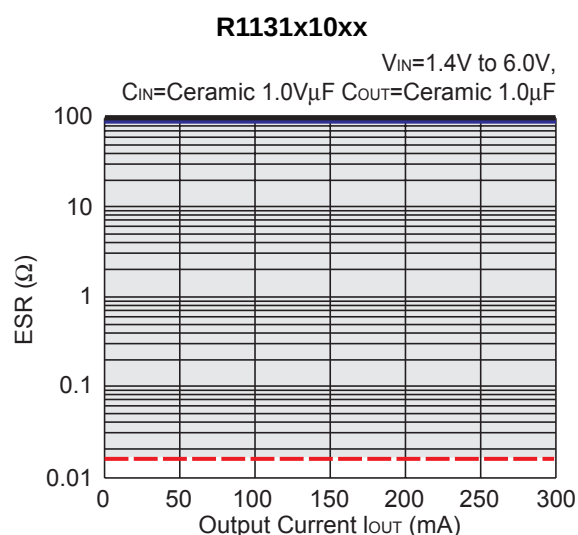
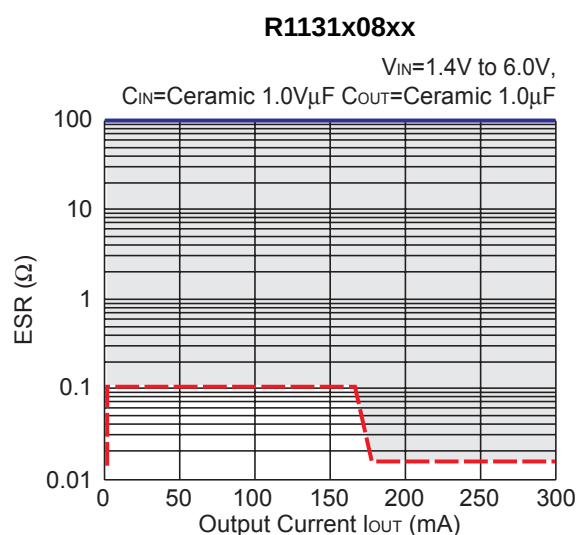
In these ICs, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, be sure to use a capacitor  $C_{OUT}$  with good frequency characteristics and ESR (Equivalent Series Resistance) of which is in the range described as follows:

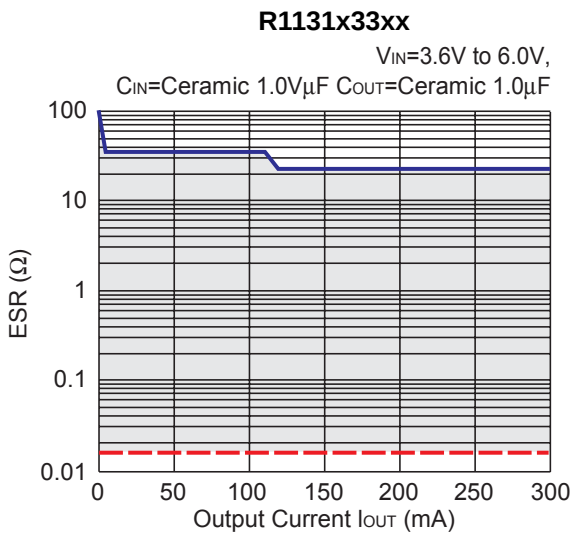
The relations between  $I_{OUT}$  (Output Current) and ESR of Output Capacitor are shown below.

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

### <Test conditions>

- (1) Frequency band: 10Hz to 2MHz
- (2) Temperature: 25°C







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