RICOH

# R1131x SERIES

## Low Voltage 300mA LDO REGULATOR

NO.EA-116-120404

## 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 (Limited), and HSON-6 (Limited), high density mounting of the ICs on boards is possible.

## FEATURES

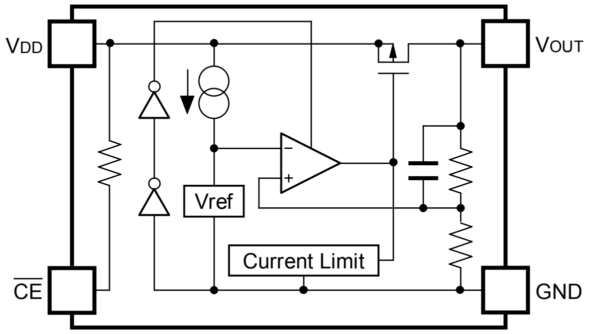
- Supply Current .................................................. Typ. 80μA ($V_{OUT} < 1.8V$)
  Typ. 60μA ($V_{OUT} \geq 1.8V$)
- Standby Mode .................................................. Typ. 0.1μA
- Dropout Voltage .................................................. Typ. 0.48V($I_{OUT}$=300mA 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)
- Temperature-Drift Coefficient of Output Voltage........ Typ. ±100ppm/°C
- Line Regulation .................................................. Typ. 0.01%/V
- Output Voltage Accuracy.................................. ±2.0%
- Output Voltage Range...................................... 0.8V to 3.3V (0.1V steps)
  (For other voltages, please refer to MARK INFORMATIONS.)
- Input Voltage Range ........................................ 1.4V to 6.0V
- Packages ........................................................ SOT-23-5, SON-6 (Limited), HSON-6 (Limited)
- Built-in fold-back protection circuit .................... Typ. 50mA (Current at short mode)
- External Capacitors.......................................... $C_{IN}$=$C_{OUT}$=Tantalum 1.0μF ($V_{OUT} < 1.0V$)
  $C_{IN}$=$C_{OUT}$=Ceramic 1.0μF ($V_{OUT} \geq 1.0V$)

## APPLICATIONS

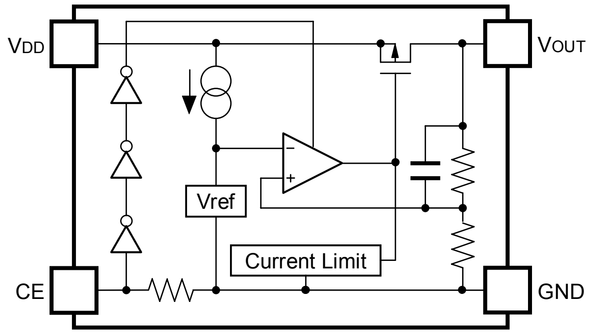
- Precision Voltage References.
- Power source for electrical appliances such as cameras, VCRs and hand-held communication equipment.
- Power source for battery-powered equipment.

# BLOCK DIAGRAM

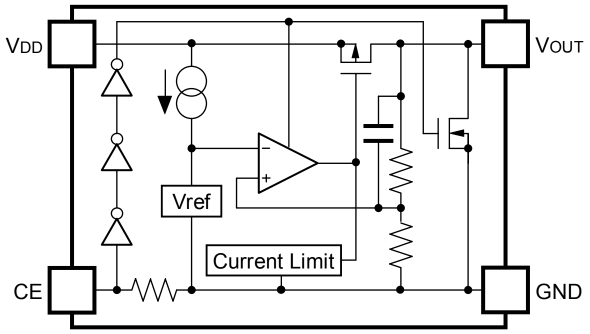
R1131xxxxA




R1131xxxxB




R1131xxxxD



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## SELECTION GUIDE

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

| Product Name | Package | Quantity per Reel | Pb Free | Halogen Free |
|---|---|---|---|---|
| R1131Nxx1∗-TR-FE | SOT-23-5 | 3,000 pcs | Yes | Yes |
| R1131Dxx1∗-TR-FE | SON-6 (Limited) | 3,000 pcs | Yes | Yes |
| R1131Dxx2∗-TR-FE | HSON-6 (Limited) | 3,000 pcs | Yes | Yes |

xx: The output voltage can be designated in the range from 0.8V(08) to 3.3V(33) in 0.1V steps.
(For other voltages, please refer to MARK INFORMATIONS.)

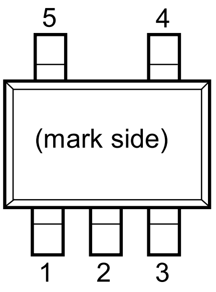
∗ : CE pin polarity and auto discharge function at off state are options as follows.
(A) "L" active, without auto discharge function at off state
(B) "H" active, without auto discharge function at off state
(D) "H" active, with auto discharge function at off state

**The products scheduled to be discontinued (be sold to limited customer) : "Limited"**

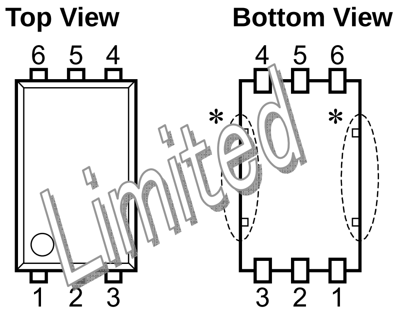
These products will be discontinued in the future. You can not select these products newly.
We will provide these products to the customer who has been using or has ordered them before.
But we recommend changing to other products as soon as possible.

# PIN CONFIGURATIONS

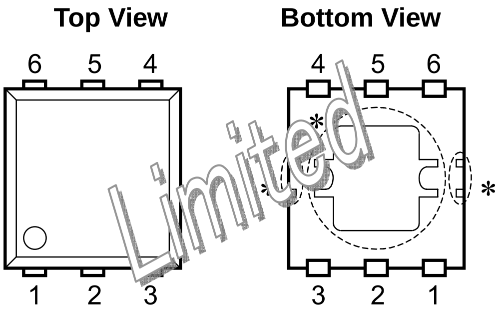
● SOT-23-5




● 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 (Limited), HSON-6 (Limited)**

| 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 be 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) (Limited)* | 500 | |
| | Power Dissipation (HSON-6) (Limited)* | 900 | |
| Topt | Operating Temperature Range | −40 to 85 | °C |
| Tstg | Storage Temperature Range | −55 to 125 | °C |

*) For Power Dissipation please refer to PACKAGE INFORMATION.

**ABSOLUTE MAXIMUM RATINGS**

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

# ELECTRICAL CHARACTERISTICS

- **R1131xxxxA**

Topt=25°C

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

- **R1131xxxxB/D**

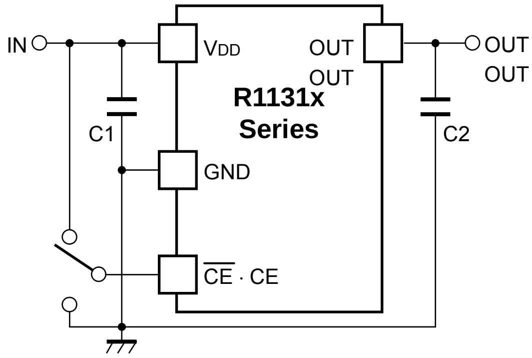
Topt=25°C

| Symbol | Item | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_{OUT}$ | Output Voltage | $V_{IN}$=Set $V_{OUT}$+1V<br>1µA ≤ $I_{OUT}$ ≤ 30mA | $V_{OUT}$ >1.5V | ×0.98 | | ×1.02 | V |
| | | | $V_{OUT}$ ≤ 1.5V | −30 | | +30 | mV |
| $I_{OUT}$ | Output Current | $V_{IN}$−$V_{OUT}$=1.0V | | 300 | | | mA |
| $\Delta V_{OUT}/\Delta I_{OUT}$ | Load Regulation | $V_{IN}$=Set $V_{OUT}$+1V<br>1mA ≤ $I_{OUT}$ ≤ 300mA | | | 40 | 70 | mV |
| $V_{DIF}$ | Dropout Voltage | $I_{OUT}$=300mA | $V_{OUT}$=0.8V | | 620 | 850 | mV |
| | | | $V_{OUT}$=0.9V | | 550 | 780 | |
| | | | 1.0V ≤ $V_{OUT}$ < 1.5V | | 480 | 700 | |
| | | | 1.5V ≤ $V_{OUT}$ < 2.6V | | 310 | 450 | |
| | | | 2.6V ≤ $V_{OUT}$ ≤ 3.3V | | 230 | 350 | |
| $I_{SS1}$ | Supply Current | $V_{IN}$=Set $V_{OUT}$+1V, $V_{OUT}$ < 1.8V | | | 80 | 111 | µA |
| | | $V_{IN}$=Set $V_{OUT}$+1V, $V_{OUT}$ ≥ 1.8V | | | 60 | 90 | µA |
| $I_{standby}$ | Standby Current | $V_{IN}$=Set $V_{OUT}$+1V, $V_{CE}$=GND | | | 0.1 | 1.0 | µA |
| $\Delta V_{OUT}/\Delta V_{IN}$ | Line Regulation | $I_{OUT}$=30mA<br>$V_{OUT}$+0.5V ≤ $V_{IN}$ ≤ 6.0V($V_{OUT}$ > 0.9V)<br>1.4V ≤ $V_{IN}$ ≤ 6.0V($V_{OUT}$ ≤ 0.9V) | | | 0.01 | 0.15 | %/V |
| RR | Ripple Rejection | f=1kHz, Ripple 0.2Vp-p<br>$V_{IN}$=Set $V_{OUT}$+1V, $I_{OUT}$=30mA | | | 65 | | dB |
| $V_{IN}$ | Input Voltage | | | 1.4 | | 6.0 | V |
| $\Delta V_{OUT}/\Delta T_{opt}$ | Output Voltage Temperature Coefficient | $I_{OUT}$=30mA<br>−40°C ≤ $T_{opt}$ ≤ 85°C | | | ±100 | | ppm /°C |
| $I_{SC}$ | Short Current Limit | $V_{OUT}$=0V | | | 50 | | mA |
| $R_{PD}$ | CE Pull-down Resistance | | | 1.87 | 5.0 | 12.0 | MΩ |
| $V_{CEH}$ | CE Input Voltage "H" | | | 1.0 | | 6.0 | V |
| $V_{CEL}$ | CE Input Voltage "L" | | | 0 | | 0.3 | V |
| en | Output Noise | BW=10Hz to 100kHz | | | 30 | | µVrms |
| $R_{LOW}$ | Nch On Resistance for auto discharge (D version only) | $V_{CE}$=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 1.0μF CM05X5R105K06AB (Kyocera)

C2 1.0μF C1005JBOJ105K (TDK)

C2 1.0μF GRM155B30J105KE18B (Murata)

Output Capacitor; 1.0μF or more capacity ceramic Type

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

Input Capacitor, 1.0μF 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 1.0μF 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.)

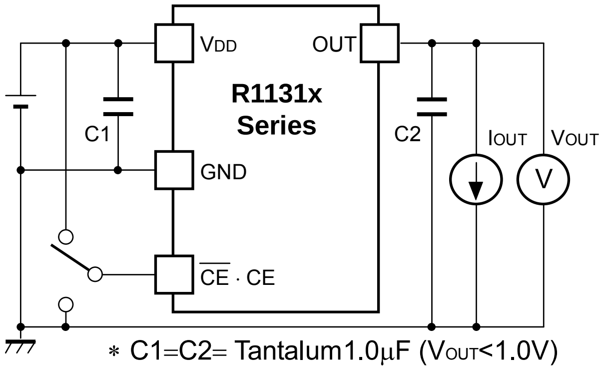
Chip capacitor characteristics of Bias dependence and Temperature characteristics may vary depending on its size, manufacturer, and part number.

**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 1.0μF capacitor between $V_{DD}$ and GND pin as close as possible.

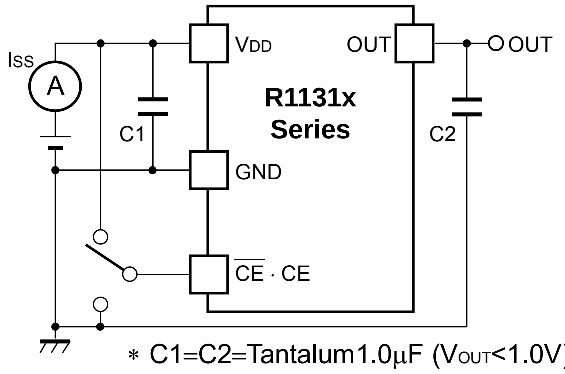
Set external components, especially the output capacitor, as close as possible to the ICs, and make wiring as short as possible.

# TEST CIRCUIT



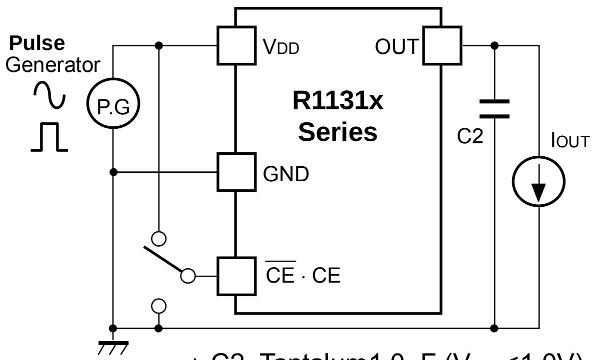

∗ C1=C2= Tantalum1.0µF ($V_{OUT}$<1.0V)
C1=C2=Ceramic1.0µF ($V_{OUT}$ ≧ 1.0V)

**Standard Test Circuit**



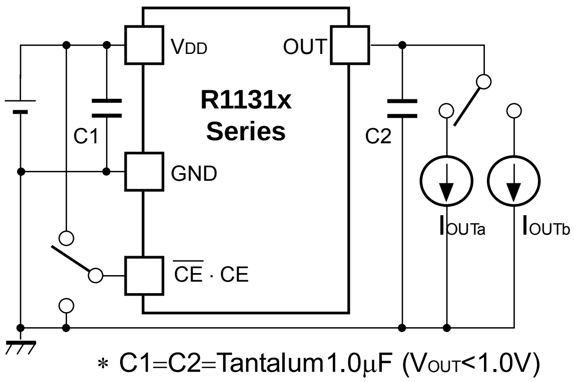

∗ C1=C2=Tantalum1.0µF ($V_{OUT}$<1.0V)
C1=C2=Ceramic1.0µF ($V_{OUT}$ ≧ 1.0V)

**Supply Current Test Circuit**



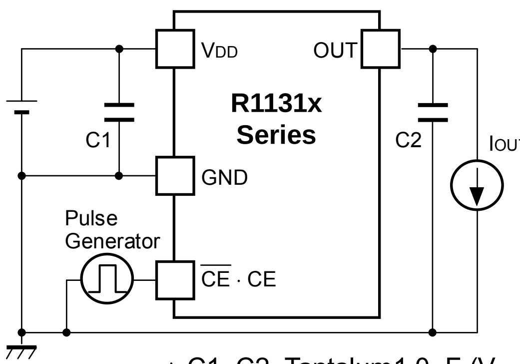

∗ C2=Tantalum1.0µF ($V_{OUT}$<1.0V)
C2=Ceramic1.0µF ($V_{OUT}$ ≧ 1.0V)

**Ripple Rejection, Line Transient Response Test Circuit**

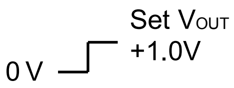



∗ C1=C2=Tantalum1.0µF ($V_{OUT}$<1.0V)
C1=C2=Ceramic1.0µF ($V_{OUT}$ ≧ 1.0V)

**Load Transient Response Test Circuit**




∗ Input signal waveform
to CE pin is shown below.



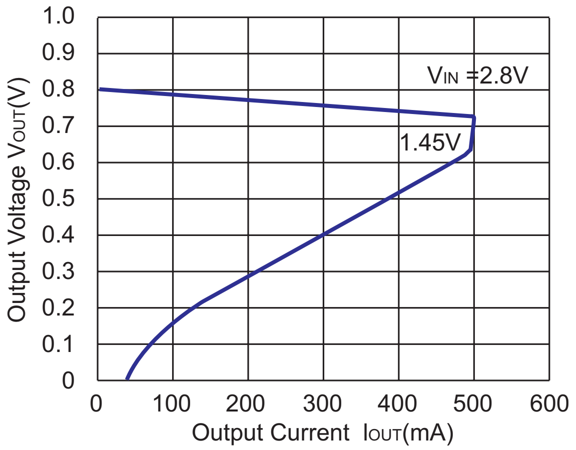

∗ C1=C2=Tantalum1.0µF ($V_{OUT}$<1.0V)
C1=C2=Ceramic1.0µF ($V_{OUT}$ ≧ 1.0V)

**Turn on Speed with CE pin Test Circuit**

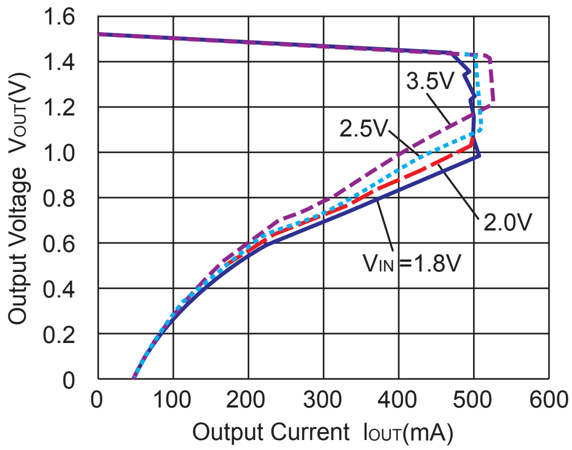
# TYPICAL CHARACTERISTICS

## 1) Output Voltage vs. Output Current

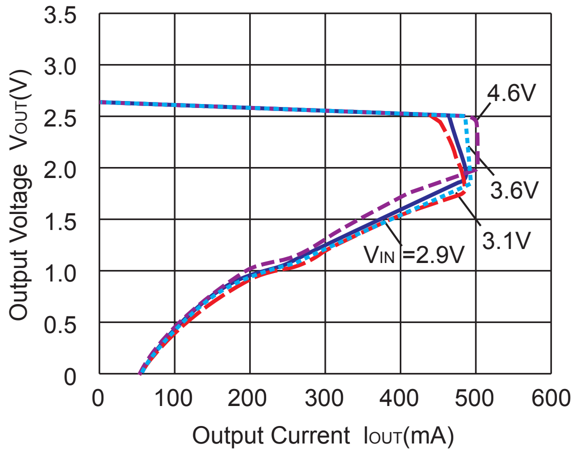
**R1131x08xx**



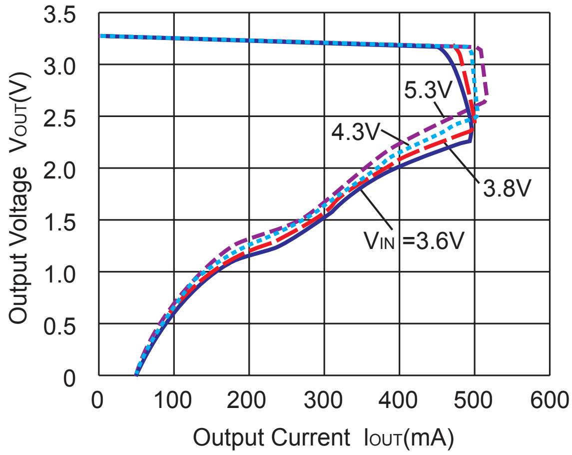

**R1131x15xx**




**R1131x26xx**

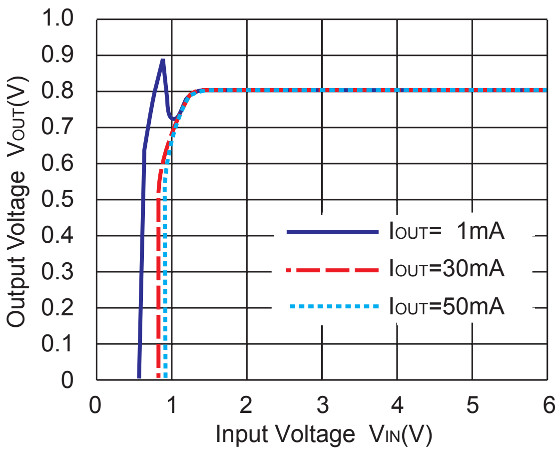



**R1131x33xx**

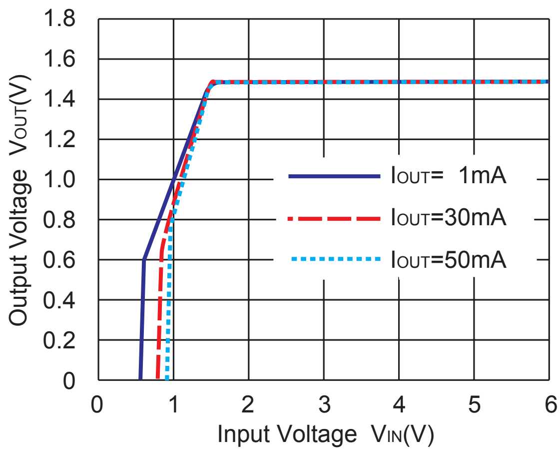



## 2) Output Voltage vs. Input Voltage

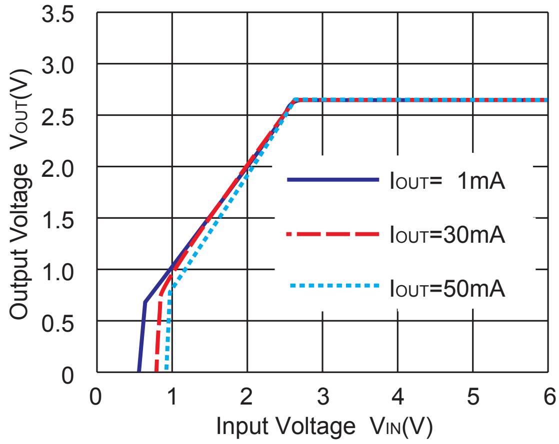
**R1131x08xx**



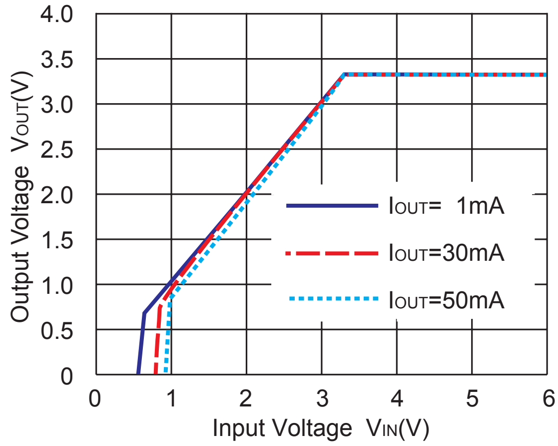

**R1131x15xx**



**R1131x26xx**

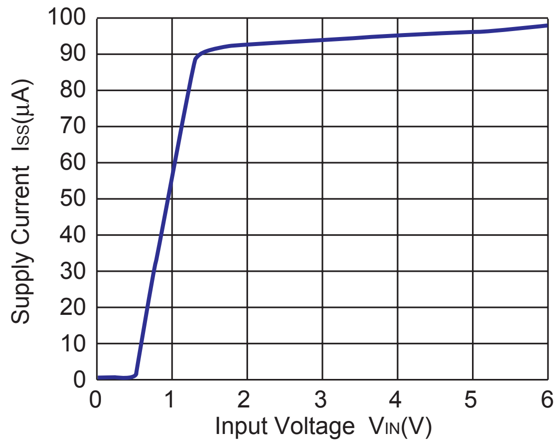



**R1131x33xx**

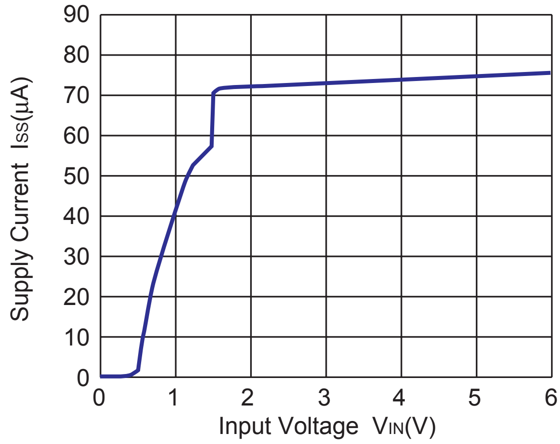



### 3) Supply Current vs. Input Voltage

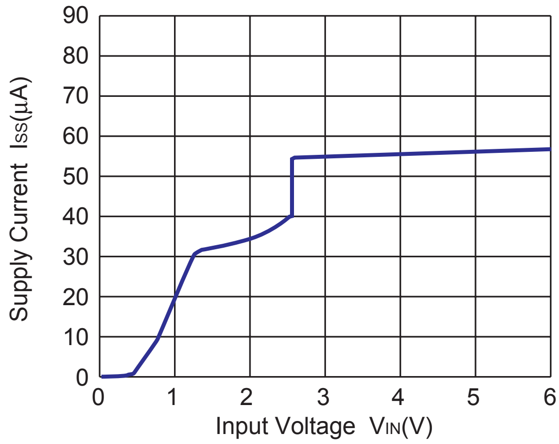
**R1131x08xx**



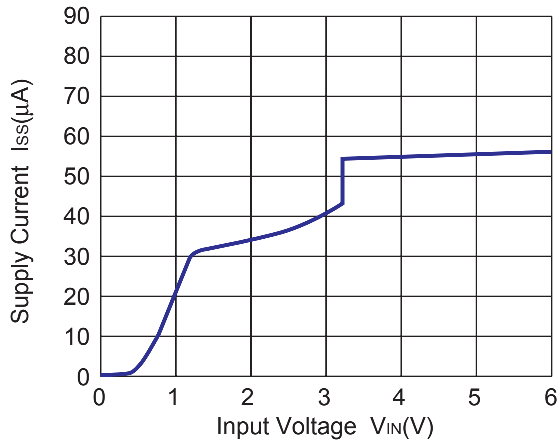

**R1131x15xx**




**R1131x26xx**

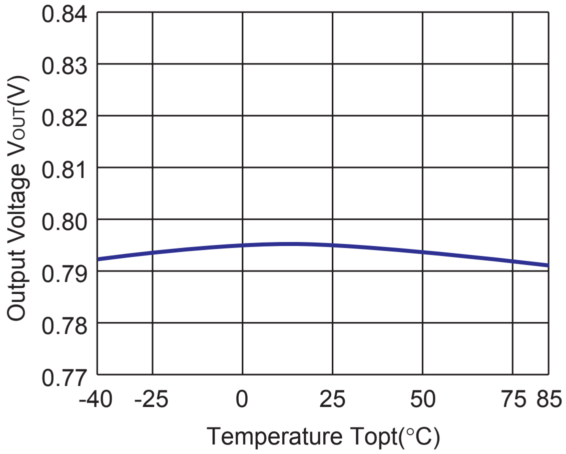



**R1131x33xx**

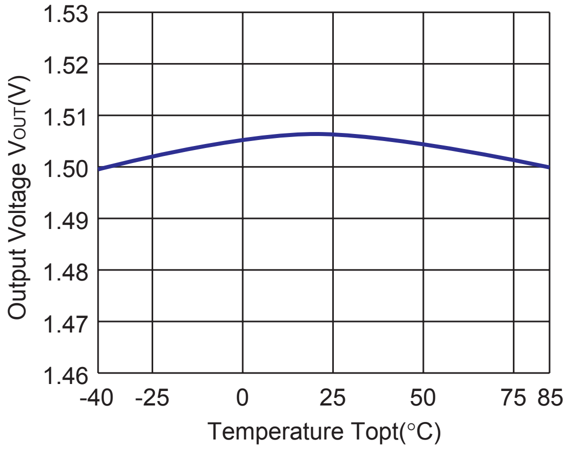


## 4) Output Voltage vs. Temperature

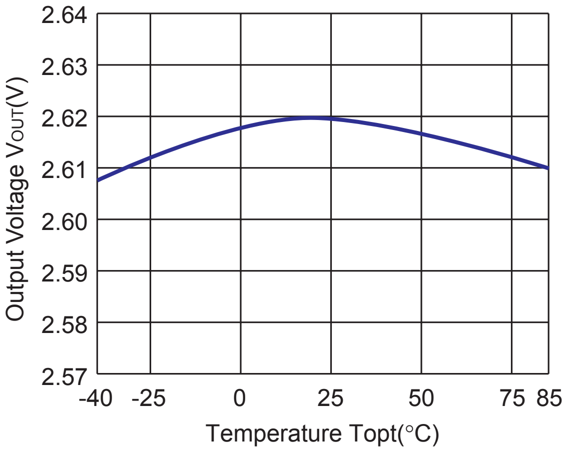
**R1131x08xx**



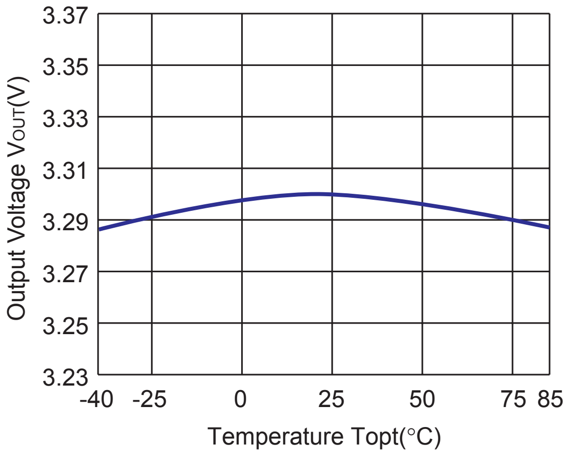

**R1131x15xx**




**R1131x26xx**

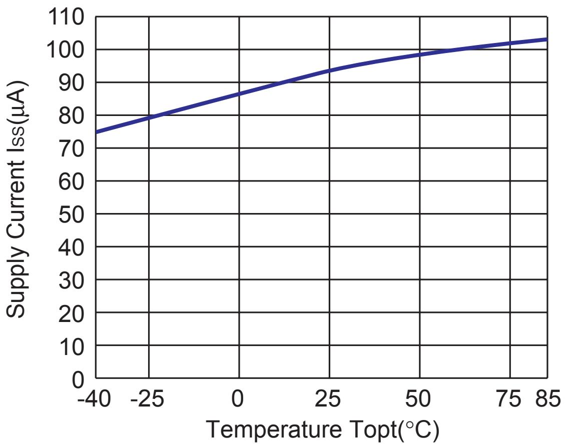



**R1131x33xx**

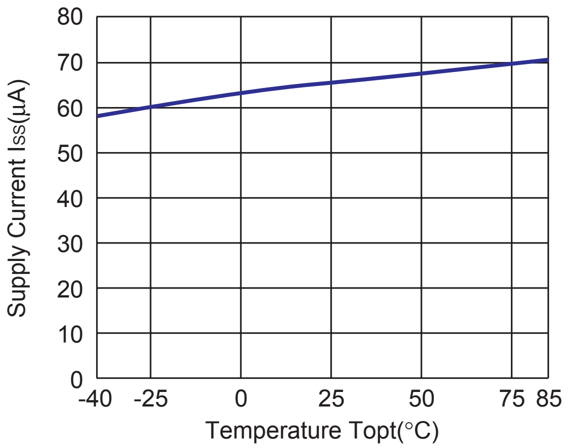



## 5) Supply Current vs. Temperature

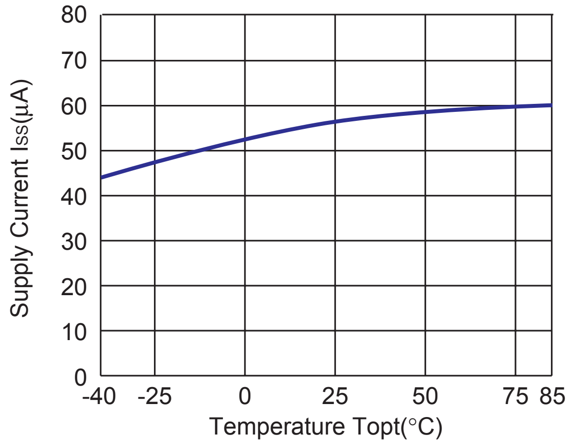
**R1131x08xx**



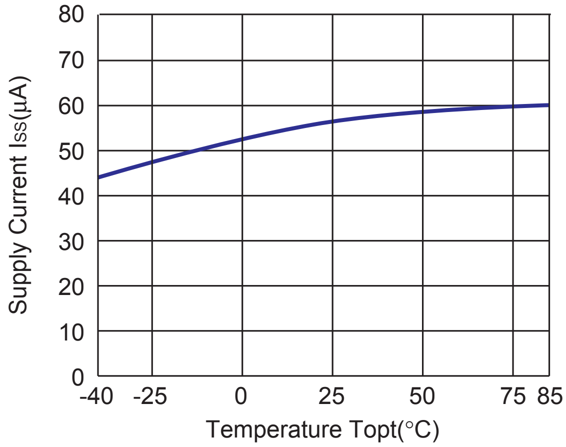

**R1131x15xx**



**R1131x26xx**

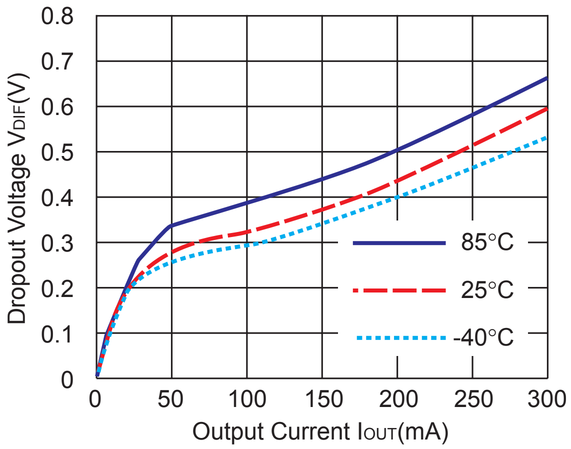



**R1131x33xx**

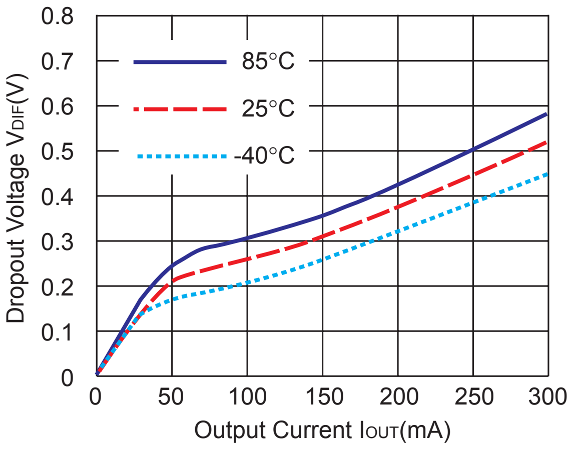



## 6) Dropout Voltage vs. Output Current

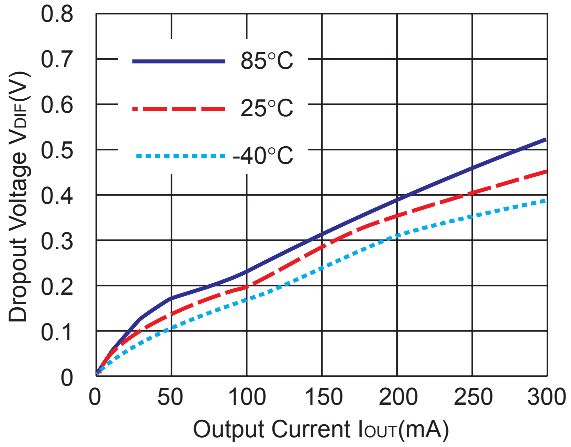
**R1131x08xx**



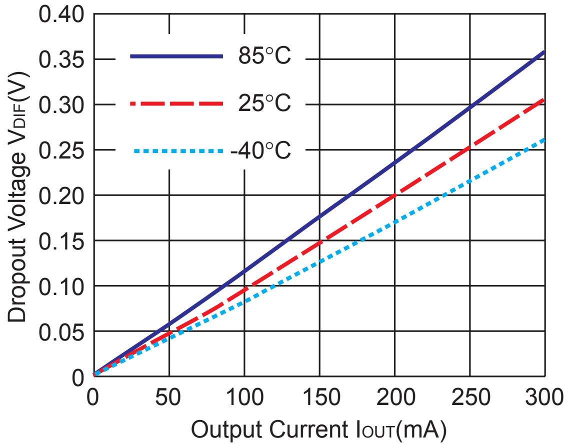

**R1131x09xx**



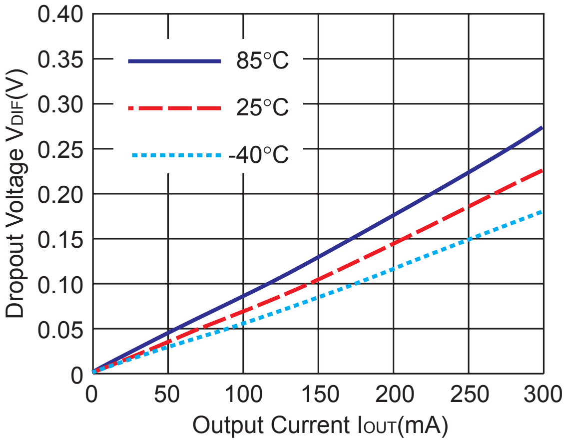

**R1131x10xx**



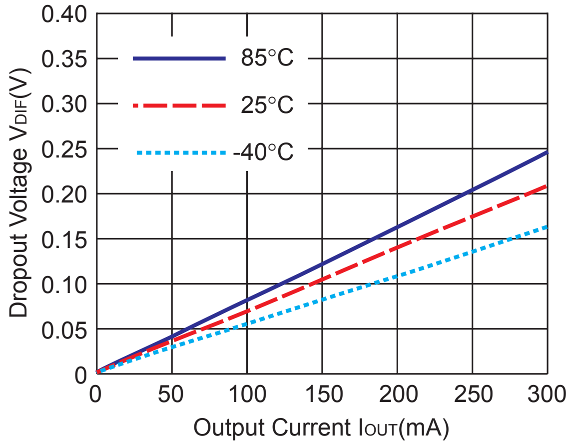

**R1131x15xx**



R1131x26xx

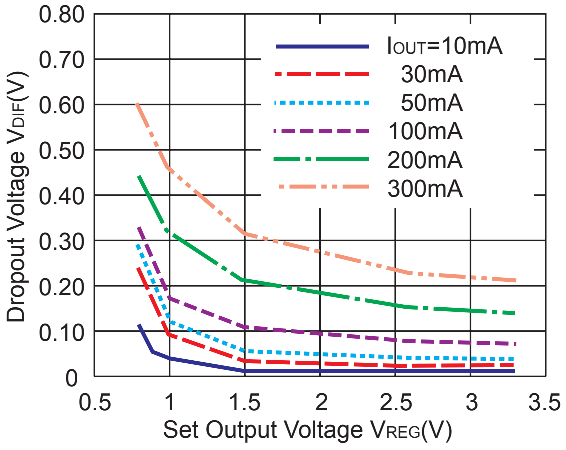



R1131x33xx



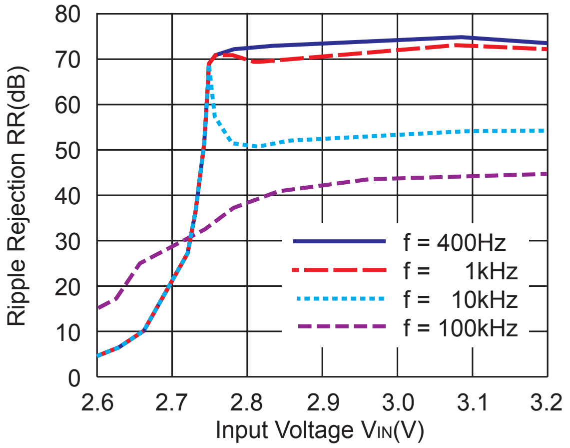

### 7) Dropout Voltage vs. Set Output Voltage (Topt=25°C)

R1131xxx1x

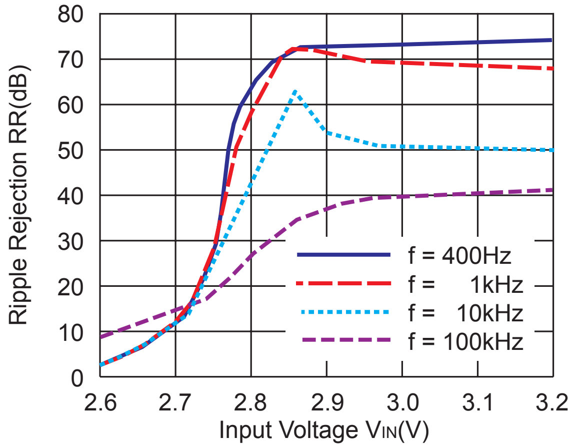



### 8) Ripple Rejection vs. Input Bias (Topt=25°C CIN=none, COUT=Ceramic 1.0µF Ripple 0.2VP-P)

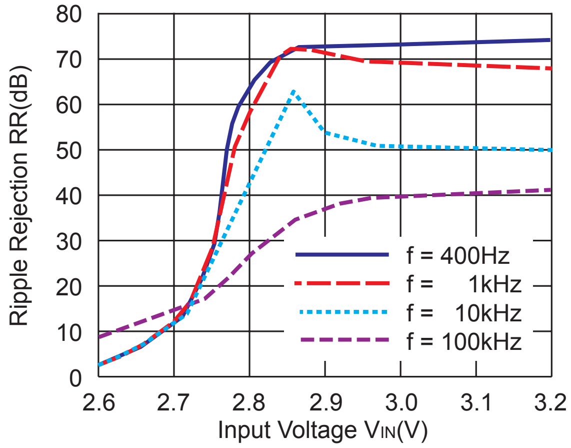
R1131x26xx (IOUT=1mA)




R1131x26xx (IOUT=30mA)



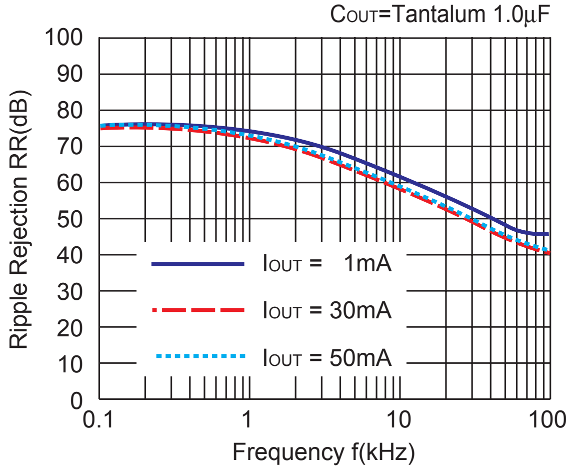
**R1131x26xx ($I_{OUT}$=50mA)**




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

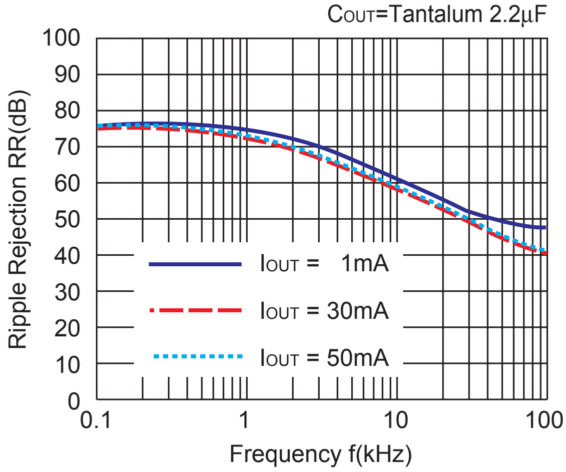
**R1131x08xx**

$V_{IN}$=1.8$V_{DC}$+0.2Vp-p,
$C_{OUT}$=Tantalum 1.0µF



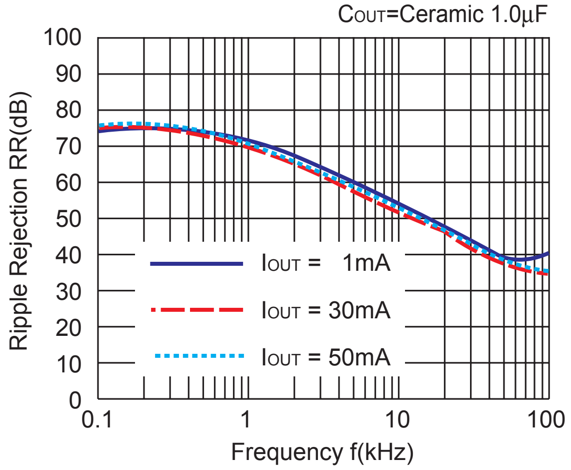

**R1131x08xx**

$V_{IN}$=1.8$V_{DC}$+0.2Vp-p,
$C_{OUT}$=Tantalum 2.2µF



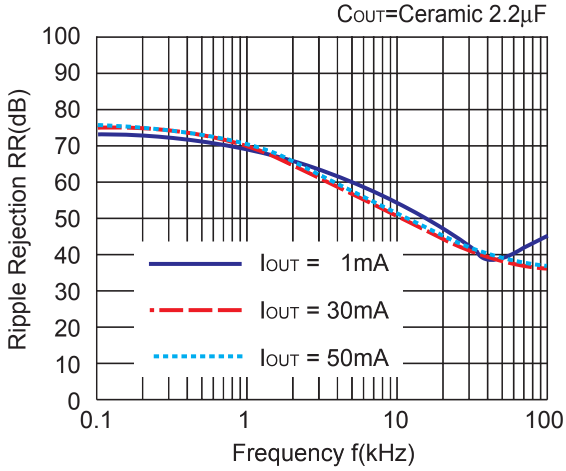

**R1131x10xx**

$V_{IN}$=2.0$V_{DC}$+0.2Vp-p,
$C_{OUT}$=Ceramic 1.0µF



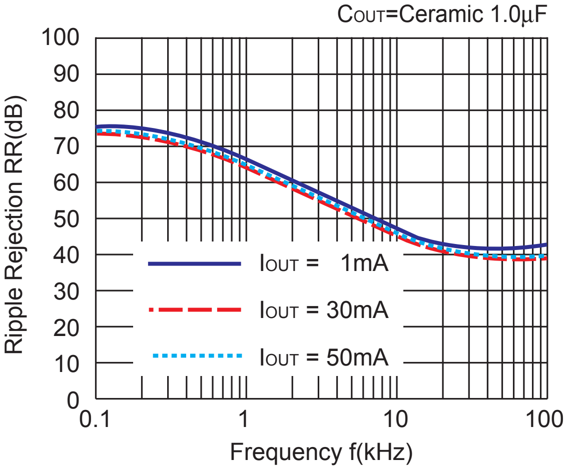

**R1131x10xx**

$V_{IN}$=2.0$V_{DC}$+0.2Vp-p,
$C_{OUT}$=Ceramic 2.2µF



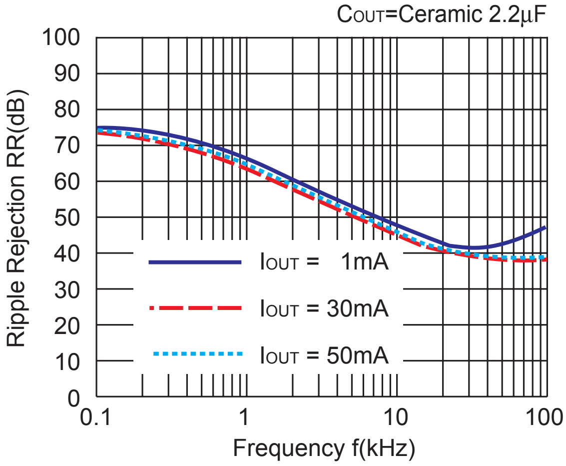
**R1131x15xx**

$V_{IN}$=2.5$V_{DC}$+0.2Vp-p, $C_{OUT}$=Ceramic 1.0µF



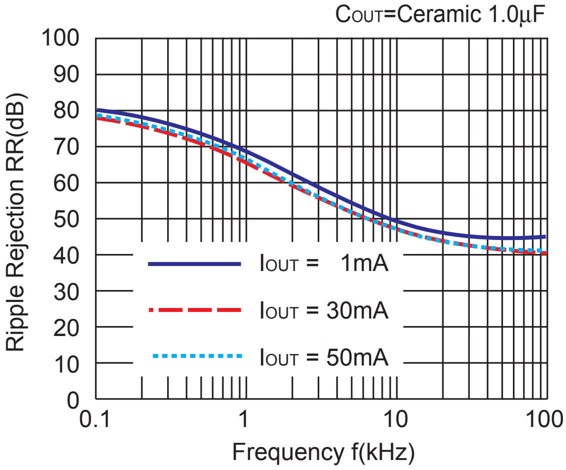

**R1131x15xx**

$V_{IN}$=2.5$V_{DC}$+0.2Vp-p, $C_{OUT}$=Ceramic 2.2µF



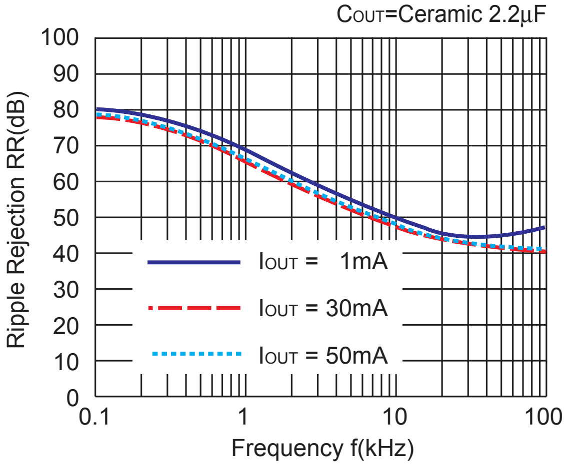

**R1131x26xx**

$V_{IN}$=3.6$V_{DC}$+0.2Vp-p, $C_{OUT}$=Ceramic 1.0µF



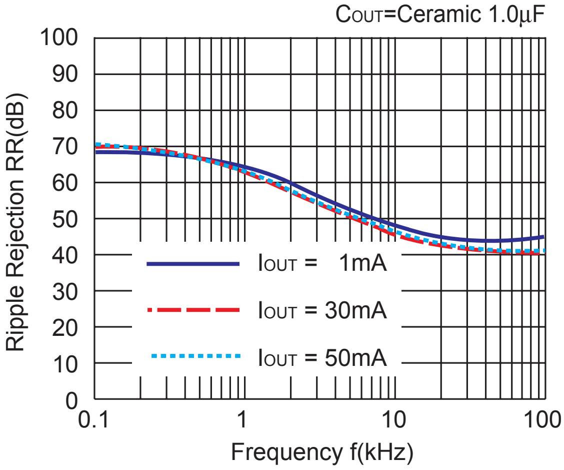

**R1131x26xx**

$V_{IN}$=3.6$V_{DC}$+0.2Vp-p, $C_{OUT}$=Ceramic 2.2µF



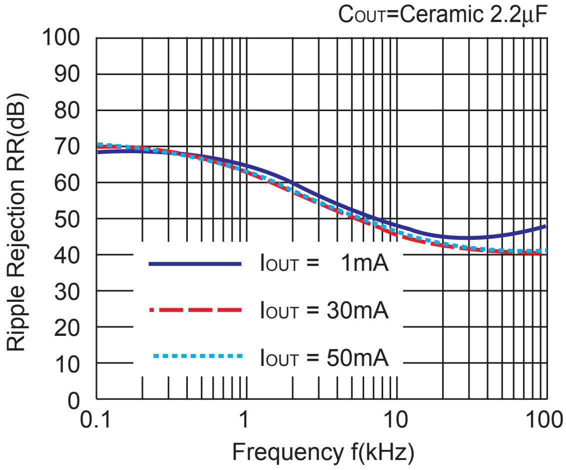

**R1131x33xx**

$V_{IN}$=4.3$V_{DC}$+0.2Vp-p, $C_{OUT}$=Ceramic 1.0µF




**R1131x33xx**

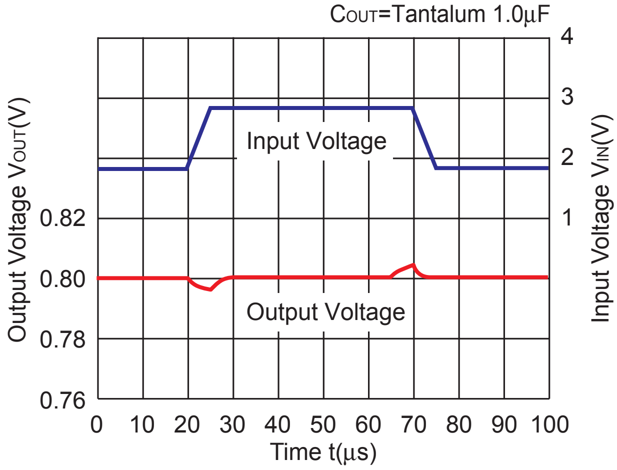
$V_{IN}$=4.3$V_{DC}$+0.2Vp-p, $C_{OUT}$=Ceramic 2.2µF



## 10) Input Transient Response (CIN=none, tr=tf=5µs)

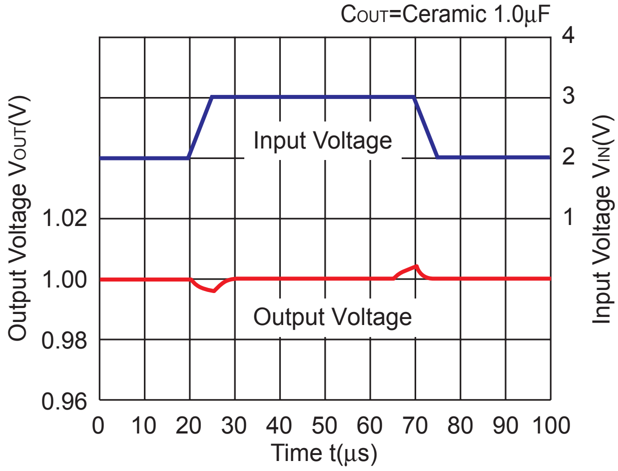
**R1131x08xx**

IOUT=30mA,
COUT=Tantalum 1.0µF



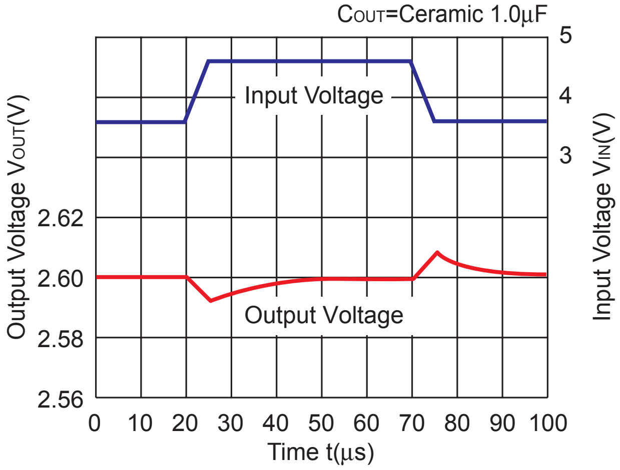

**R1131x10x**

IOUT=30mA,
COUT=Ceramic 1.0µF




**R1131x26xx**

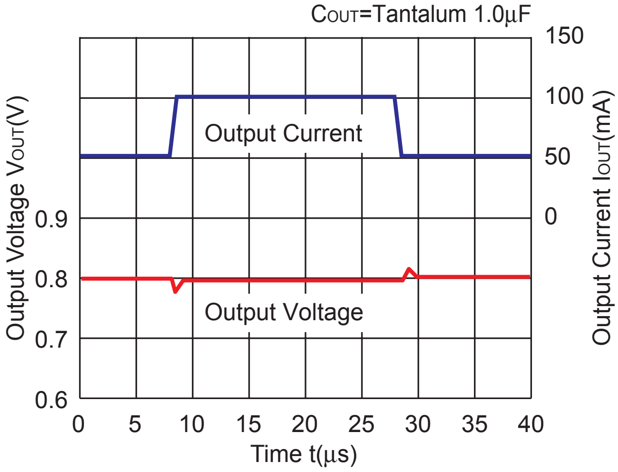
IOUT=30mA,
COUT=Ceramic 1.0µF




## 11) Load Transient Response (tr=tf=0.5µs)

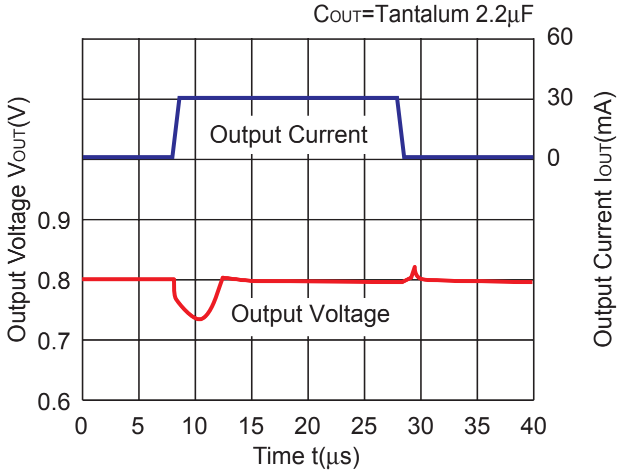
**R1131x08xx**

VIN=1.8V CIN=Tantalum 1.0µF,
COUT=Tantalum 1.0µF



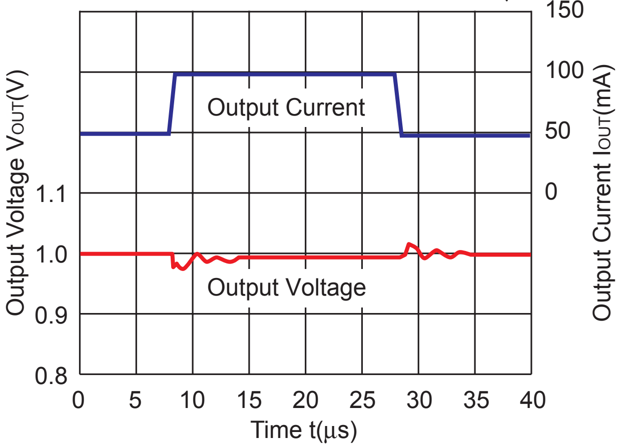

**R1131x08xx**

VIN=1.8V CIN=Tantalum 1.0µF,
COUT=Tantalum 2.2µF



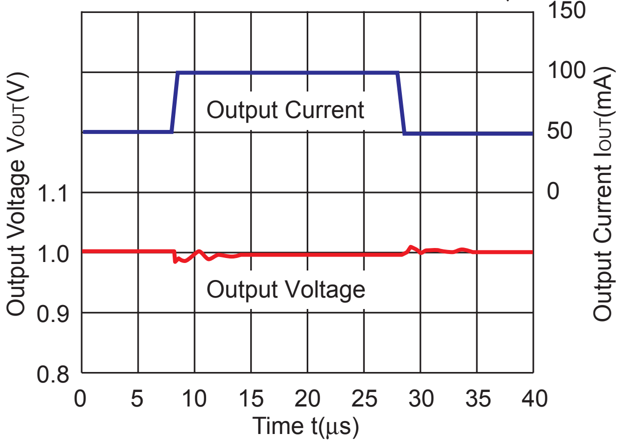
**R1131x10xx**

$V_{IN}$=2.0V $C_{IN}$=Ceramic 1.0µF, $C_{OUT}$=Ceramic 1.0µF



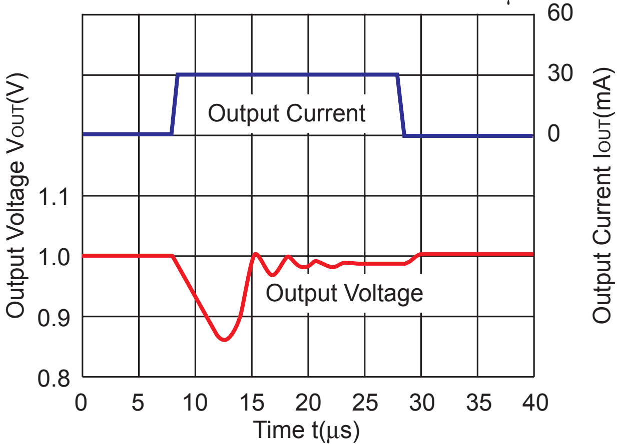

**R1131x10xx**

$V_{IN}$=2.0V $C_{IN}$=Ceramic 1.0µF, $C_{OUT}$=Ceramic 2.2µF



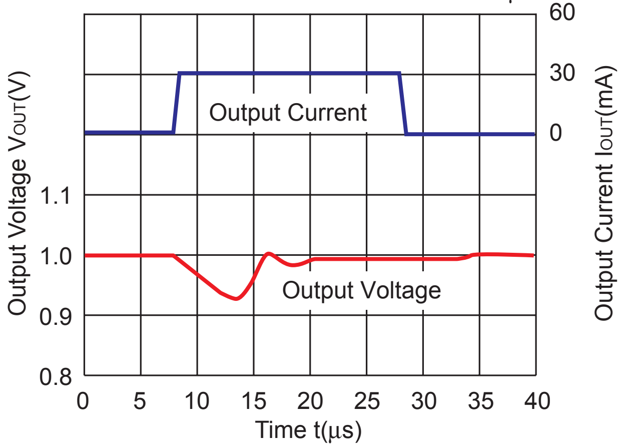

**R1131x10xx**

$V_{IN}$=2.0V $C_{IN}$=Ceramic 1.0µF, $C_{OUT}$=Ceramic 1.0µF



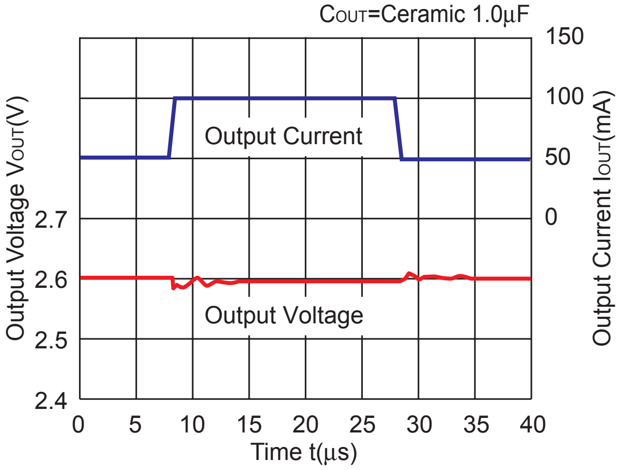

**R1131x10xx**

$V_{IN}$=2.0V $C_{IN}$=Ceramic 1.0µF, $C_{OUT}$=Ceramic 2.2µF



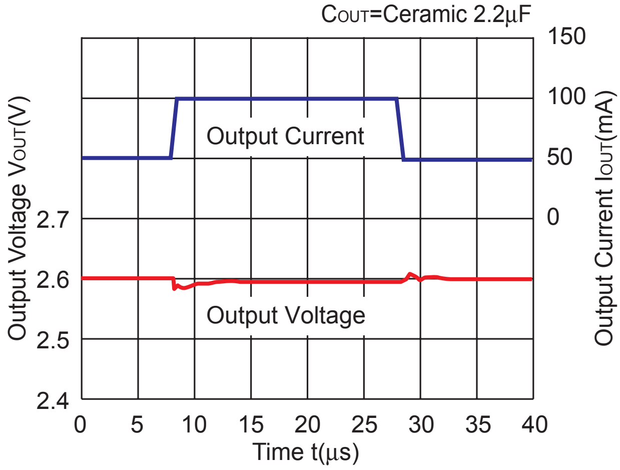

**R1131x26xx**

$V_{IN}$=3.6V $C_{IN}$=Ceramic 1.0µF, $C_{OUT}$=Ceramic 1.0µF



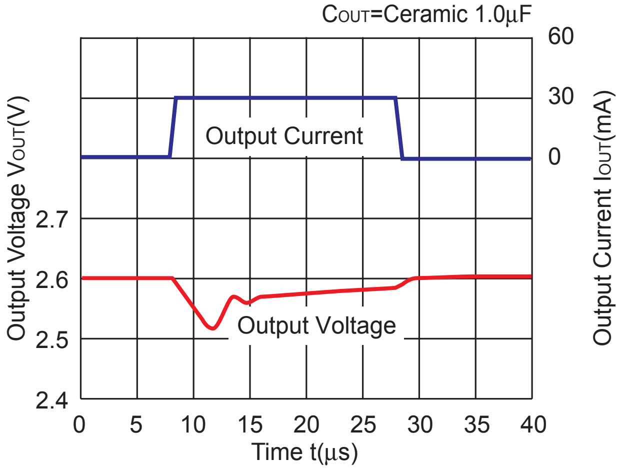

**R1131x26xx**

$V_{IN}$=3.6V $C_{IN}$=Ceramic 1.0µF, $C_{OUT}$=Ceramic 2.2µF



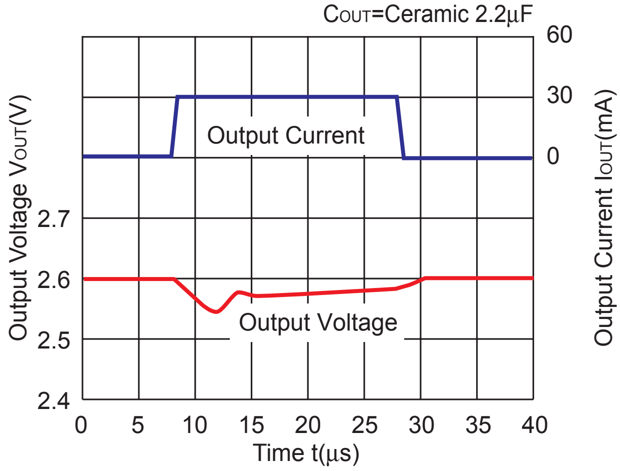
**R1131x26xx**

$V_{IN}$=3.6V $C_{IN}$=Ceramic 1.0µF,
$C_{OUT}$=Ceramic 1.0µF




**R1131x26xx**

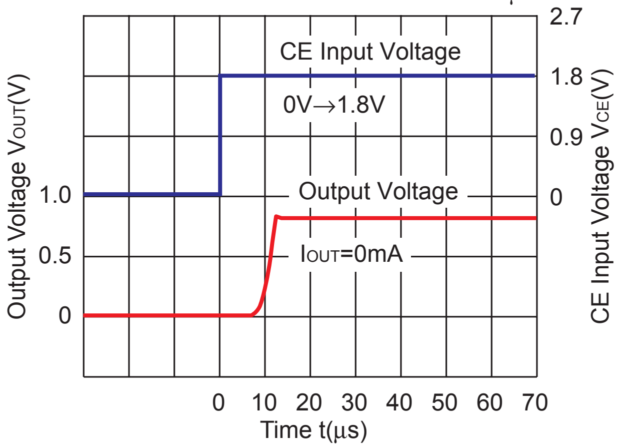
$V_{IN}$=3.6V $C_{IN}$=Ceramic 1.0µF,
$C_{OUT}$=Ceramic 2.2µF




## 12) Turn on speed with CE pin

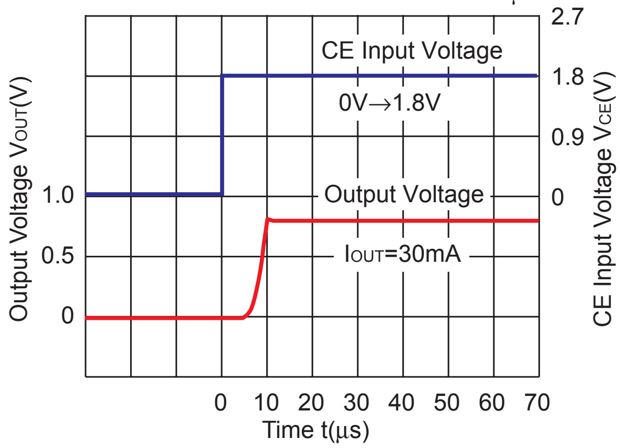
**R1131x08xx**

$V_{IN}$=1.8V $C_{IN}$=Tantalum 1.0µF,
$C_{OUT}$=Tantalum 1.0µF



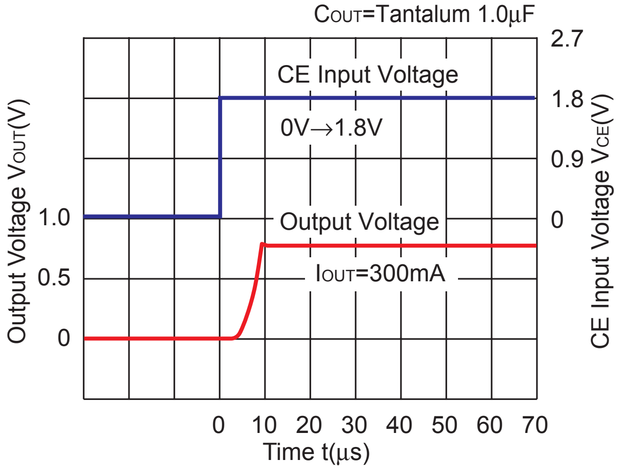

**R1131x08xx**

$V_{IN}$=1.8V $C_{IN}$=Tantalum 1.0µF,
$C_{OUT}$=Tantalum 1.0µF



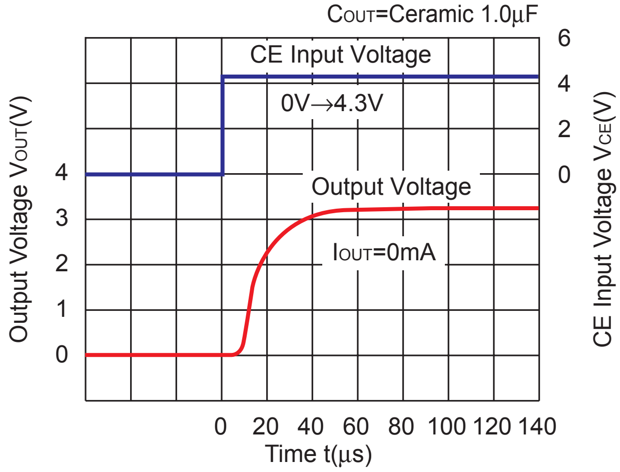

**R1131x08xx**

$V_{IN}$=1.8V $C_{IN}$=Tantalum 1.0µF,
$C_{OUT}$=Tantalum 1.0µF



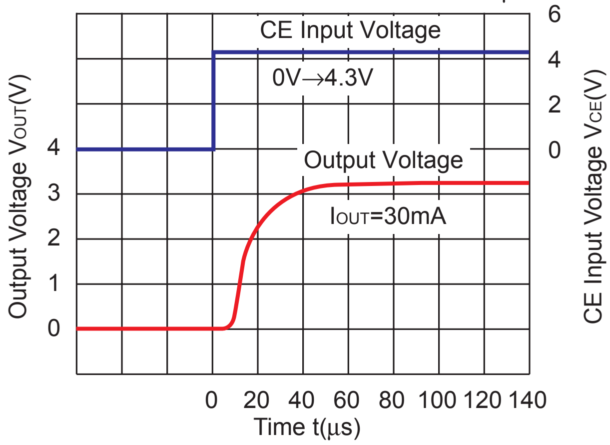

**R1131x33xx**

$V_{IN}$=4.3V $C_{IN}$=Ceramic 1.0µF,
$C_{OUT}$=Ceramic 1.0µF



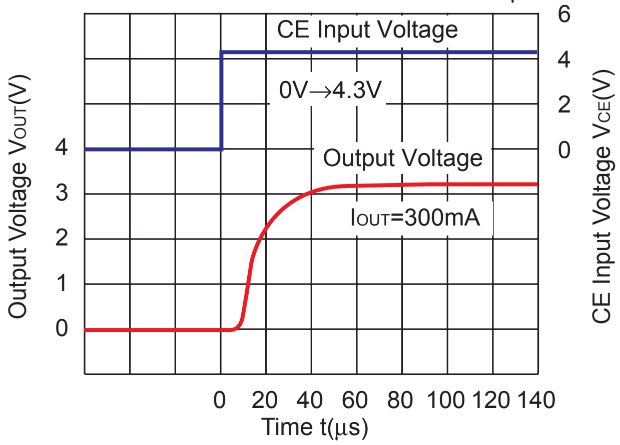
**R1131x33xx (ECO=H)**

$V_{IN}$=4.3V $C_{IN}$=Ceramic 1.0µF,
$C_{OUT}$=Ceramic 1.0µF




**R1131x33xx (ECO=L)**

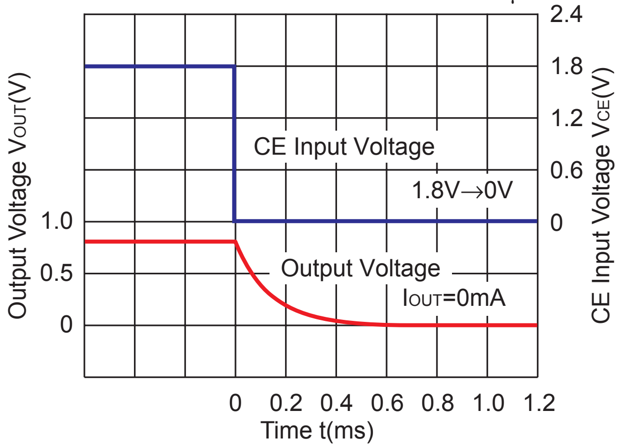
$V_{IN}$=4.3V $C_{IN}$=Ceramic 1.0µF,
$C_{OUT}$=Ceramic 1.0µF




### 13) Turn-off Speed with CE

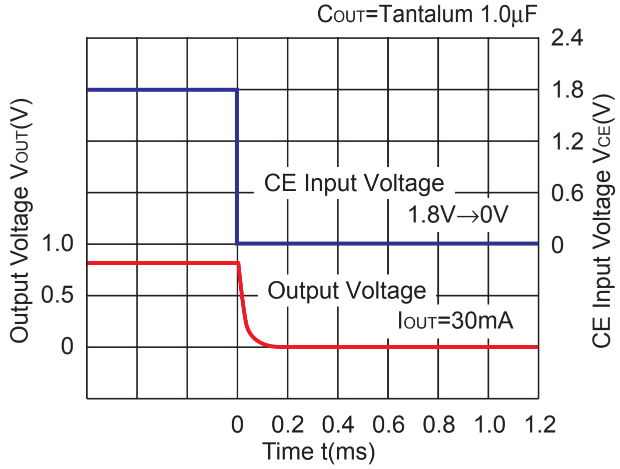
**R1131x08xD**

$V_{IN}$=1.8V $C_{IN}$=Tantalum 1.0µF,
$C_{OUT}$=Tantalum 1.0µF



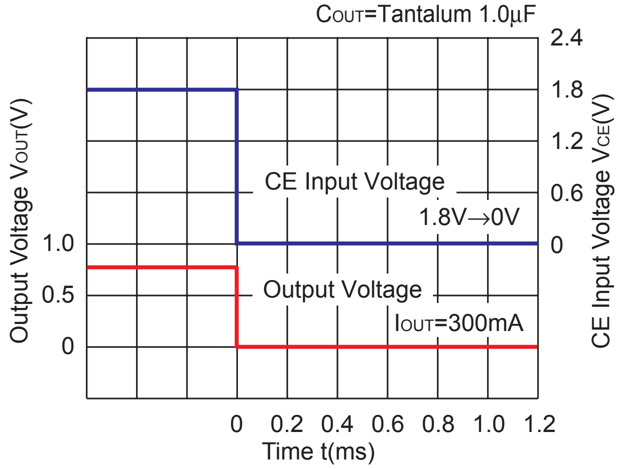

**R1131x08xD**

$V_{IN}$=1.8V $C_{IN}$=Tantalum 1.0µF,
$C_{OUT}$=Tantalum 1.0µF



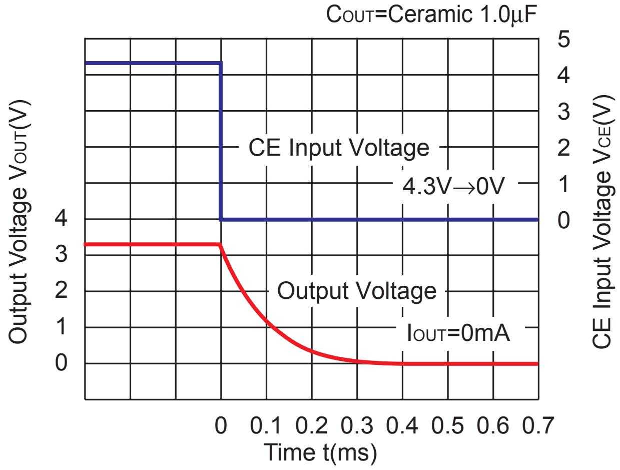

**R1131x08xD**

$V_{IN}$=1.8V $C_{IN}$=Tantalum 1.0µF,
$C_{OUT}$=Tantalum 1.0µF

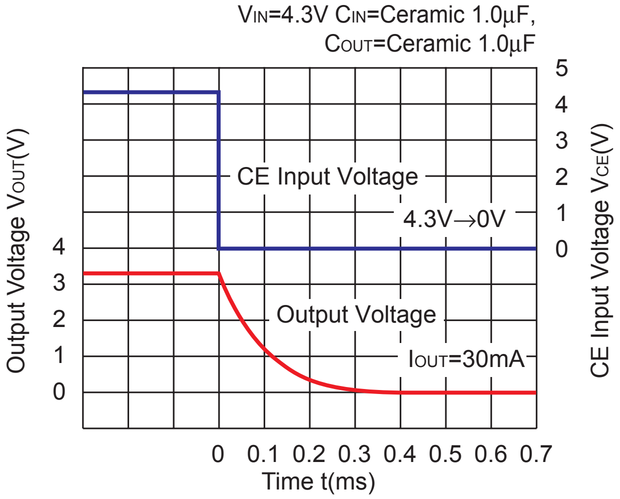



**R1131x33xD**

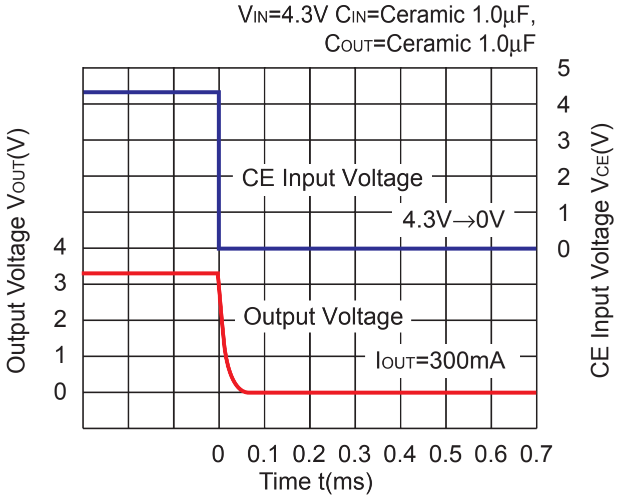
$V_{IN}$=4.3V $C_{IN}$=Ceramic 1.0µF,
$C_{OUT}$=Ceramic 1.0µF



R1131x33xD




R1131x33xD



## 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 40μV(Avg.) are marked as the hatched area in the graph.

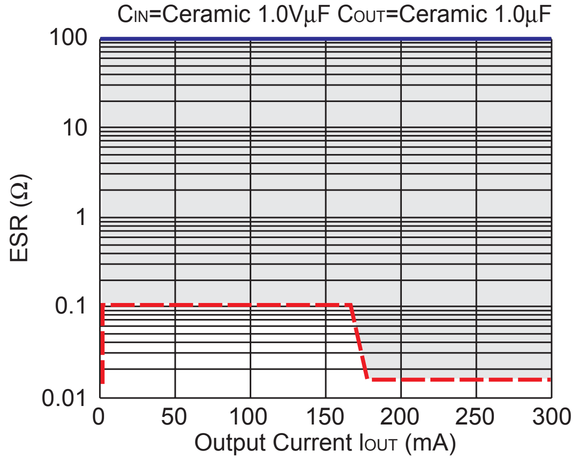
**<Test conditions>**

(1) Frequency band: 10Hz to 2MHz

(2) Temperature: 25°C

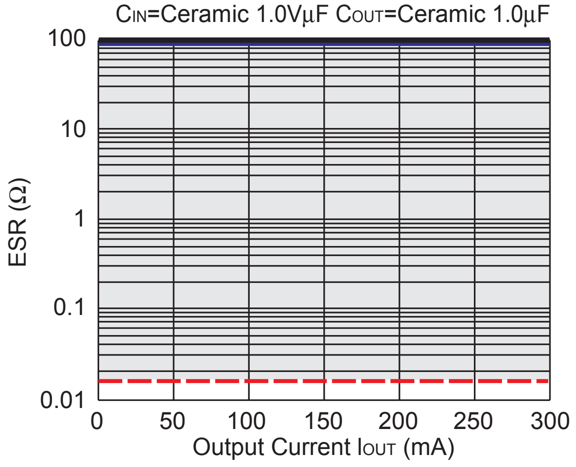
**R1131x08xx**

$V_{IN}$=1.4V to 6.0V,
$C_{IN}$=Ceramic 1.0VμF $C_{OUT}$=Ceramic 1.0μF



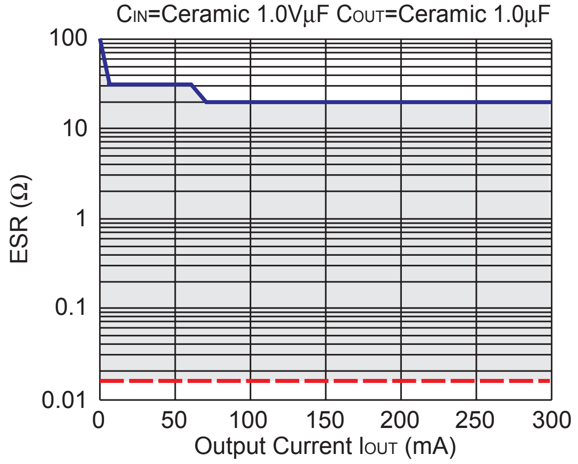

**R1131x10xx**

$V_{IN}$=1.4V to 6.0V,
$C_{IN}$=Ceramic 1.0VμF $C_{OUT}$=Ceramic 1.0μF



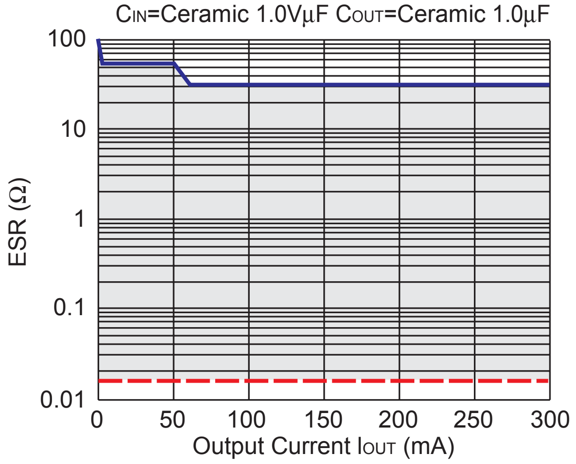

**R1131x26xx**

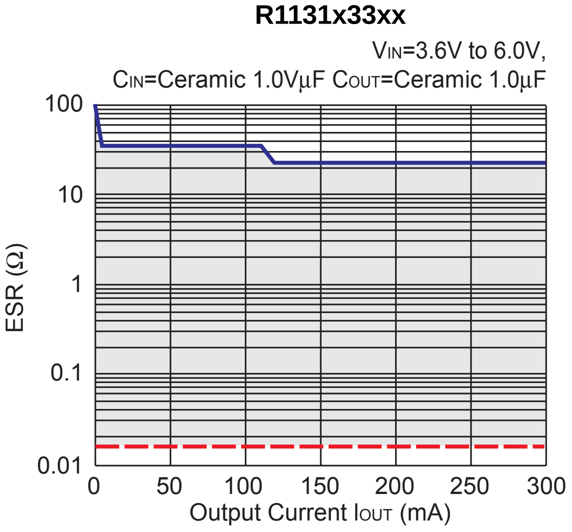
$V_{IN}$=3.0V to 6.0V,
$C_{IN}$=Ceramic 1.0VμF $C_{OUT}$=Ceramic 1.0μF




**R1131x15xx**

$V_{IN}$=2.0V to 6.0V,
$C_{IN}$=Ceramic 1.0VμF $C_{OUT}$=Ceramic 1.0μF




R1131x33xx
VIN=3.6V to 6.0V,
CIN=Ceramic 1.0VμF COUT=Ceramic 1.0μF
100
10
1
0.1
0.01
ESR (Ω)
0
50
100
150
200
250
300
Output Current IOUT (mA)

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5. The products listed in this document are intended and designed for use as general electronic components in standard applications (office equipment, telecommunication equipment, measuring instruments, consumer electronic products, amusement equipment etc.). Those customers intending to use a product in an application requiring extreme quality and reliability, for example, in a highly specific application where the failure or misoperation of the product could result in human injury or death (aircraft, spacevehicle, nuclear reactor control system, traffic control system, automotive and transportation equipment, combustion equipment, safety devices, life support system etc.) should first contact us.
6. We are making our continuous effort to improve the quality and reliability of our products, but semiconductor products are likely to fail with certain probability. In order to prevent any injury to persons or damages to property resulting from such failure, customers should be careful enough to incorporate safety measures in their design, such as redundancy feature, firecontainment feature and fail-safe feature. We do not assume any liability or responsibility for any loss or damage arising from misuse or inappropriate use of the products.
7. Anti-radiation design is not implemented in the products described in this document.
8. Please contact Ricoh sales representatives should you have any questions or comments concerning the products or the technical information.

# RICOH COMPANY, LTD.　Electronic Devices Company

日本経営品質賞 1999年度受賞

**■Ricoh presented with the Japan Management Quality Award for 1999.**
Ricoh continually strives to promote customer satisfaction, and shares the achievements of its management quality improvement program with people and society.

**■Ricoh awarded ISO 14001 certification.**
The Ricoh Group was awarded ISO 14001 certification, which is an international standard for environmental management systems, at both its domestic and overseas production facilities. Our current aim is to obtain ISO 14001 certification for all of our business offices.

RoHS Compliant

Ricoh completed the organization of the Lead-free production for all of our products. After Apr. 1, 2006, we will ship out the lead free products only. Thus, all products that will be shipped from now on comply with RoHS Directive.

## http://www.ricoh.com/LSI/

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