∗R1131Dxx2 (HSON-6) is the discontinued product. As of June in 2016.

RICOH

R1131x SERIES

Low Voltage 300mA LDO REGULATOR

NO.EA-116-130530

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

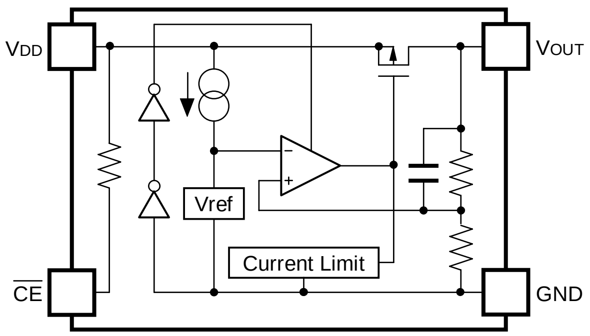
- Supply Current .... Typ. 80µA ($V_{OUT} < 1.8V$)
  Typ. 60µA ($V_{OUT} \geq 1.8V$)
- Standby Mode .... Typ. 0.1µA
- Dropout Voltage .... Typ. 0.48V(I_{OUT}=300mA Output Voltage=1.0V Type)
  Typ. 0.31V(I_{OUT}=300mA Output Voltage=1.5V Type)
  Typ. 0.23V(I_{OUT}=300mA Output Voltage=3.0V Type)
- Ripple 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, HSON-6
- 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

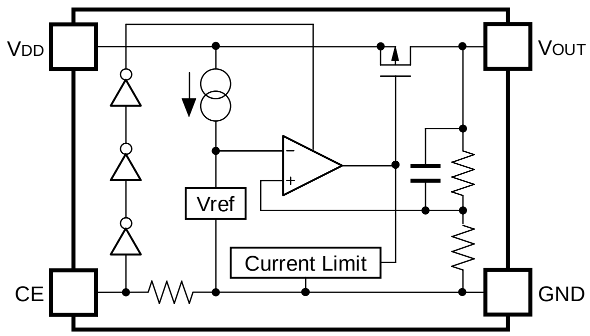
- Precision Voltage References.
- Power source for electrical appliances such as cameras, VCRs and hand-held communication equipment.
- Power source for battery-powered equipment.

BLOCK DIAGRAM

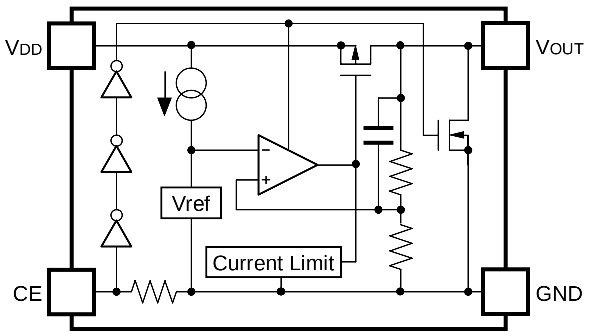
R1131xxxxA



R1131xxxxB



R1131xxxxD



SELECTION GUIDE

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

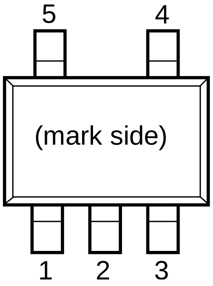
Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R1131Nxx1∗-TR-FE	SOT-23-5	3,000 pcs	Yes	Yes
R1131Dxx1∗-TR-FE	SON-6	3,000 pcs	Yes	Yes
R1131Dxx2∗-TR-FE	HSON-6	3,000 pcs	Yes	Yes

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.)

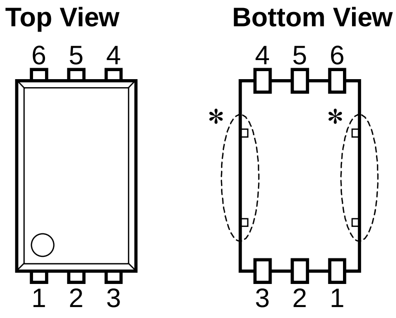
∗ : CE pin polarity and auto discharge function at off state are options as follows.
(A) "L" active, without auto discharge function at off state
(B) "H" active, without auto discharge function at off state
(D) "H" active, with auto discharge function at off state

PIN CONFIGURATIONS

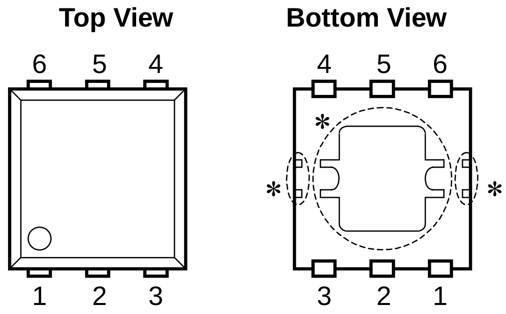
● SOT-23-5



● 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 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) *	500	
	Power Dissipation (HSON-6) *	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 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, 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
Istandby	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 V_{OUT}+0.5V ≤ V_{IN} ≤ 6.0V (V_{OUT} > 0.9V) 1.4V ≤ V_{IN} ≤ 6.0V (V_{OUT} ≤ 0.9V)			0.01	0.15	%/V
RR	Ripple Rejection	f=1kHz, Ripple 0.2Vp-p V_{IN}=Set V_{OUT}+1V, I_{OUT}=30mA			65		dB
V_{IN}	Input Voltage			1.4		6.0	V
$\Delta V_{OUT}/\Delta Topt$	Output Voltage Temperature Coefficient	I_{OUT}=30mA −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**

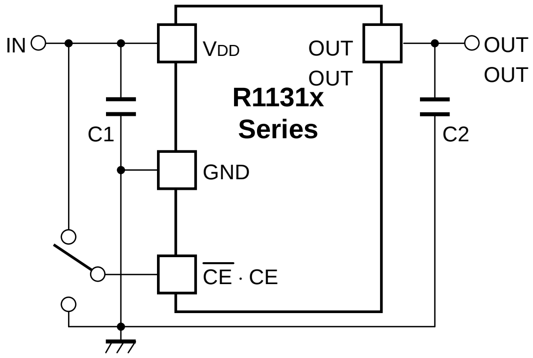
Topt=25°C

<table>
<tr><th>Symbol</th><th>Item</th><th colspan="2">Conditions</th><th>Min.</th><th>Typ.</th><th>Max.</th><th>Unit</th></tr>
<tr><td rowspan="2">V_{OUT}</td><td rowspan="2">Output Voltage</td><td rowspan="2">V_{IN}=Set V_{OUT}+1V
1μA ≤ I_{OUT} ≤ 30mA</td><td>V_{OUT} >1.5V</td><td>×0.98</td><td></td><td>×1.02</td><td>V</td></tr>
<tr><td>V_{OUT} ≤ 1.5V</td><td>−30</td><td></td><td>+30</td><td>mV</td></tr>
<tr><td>I_{OUT}</td><td>Output Current</td><td colspan="2">V_{IN}−V_{OUT}=1.0V</td><td>300</td><td></td><td></td><td>mA</td></tr>
<tr><td>ΔV_{OUT}/ ΔI_{OUT}</td><td>Load Regulation</td><td colspan="2">V_{IN}=Set V_{OUT}+1V
1mA ≤ I_{OUT} ≤ 300mA</td><td></td><td>40</td><td>70</td><td>mV</td></tr>
<tr><td rowspan="5">V_{DIF}</td><td rowspan="5">Dropout Voltage</td><td rowspan="5">I_{OUT}=300mA</td><td>V_{OUT}=0.8V</td><td></td><td>620</td><td>850</td><td rowspan="5">mV</td></tr>
<tr><td>V_{OUT}=0.9V</td><td></td><td>550</td><td>780</td></tr>
<tr><td>1.0V ≤ V_{OUT} < 1.5V</td><td></td><td>480</td><td>700</td></tr>
<tr><td>1.5V ≤ V_{OUT} < 2.6V</td><td></td><td>310</td><td>450</td></tr>
<tr><td>2.6V ≤ V_{OUT} ≤ 3.3V</td><td></td><td>230</td><td>350</td></tr>
<tr><td rowspan="2">I_{SS1}</td><td rowspan="2">Supply Current</td><td colspan="2">V_{IN}=Set V_{OUT}+1V, V_{OUT} < 1.8V</td><td></td><td>80</td><td>111</td><td>μA</td></tr>
<tr><td colspan="2">V_{IN}=Set V_{OUT}+1V, V_{OUT} ≥ 1.8V</td><td></td><td>60</td><td>90</td><td>μA</td></tr>
<tr><td>Istandby</td><td>Standby Current</td><td colspan="2">V_{IN}=Set V_{OUT}+1V, V_{CE}=GND</td><td></td><td>0.1</td><td>1.0</td><td>μA</td></tr>
<tr><td>ΔV_{OUT}/ ΔV_{IN}</td><td>Line Regulation</td><td colspan="2">I_{OUT}=30mA
V_{OUT}+0.5V ≤ V_{IN} ≤ 6.0V(V_{OUT} > 0.9V)
1.4V ≤ V_{IN} ≤ 6.0V(V_{OUT} ≤ 0.9V)</td><td></td><td>0.01</td><td>0.15</td><td>%/V</td></tr>
<tr><td>RR</td><td>Ripple Rejection</td><td colspan="2">f=1kHz, Ripple 0.2Vp-p
V_{IN}=Set V_{OUT}+1V, I_{OUT}=30mA</td><td></td><td>65</td><td></td><td>dB</td></tr>
<tr><td>V_{IN}</td><td>Input Voltage</td><td colspan="2"></td><td>1.4</td><td></td><td>6.0</td><td>V</td></tr>
<tr><td>ΔV_{OUT}/ ΔTopt</td><td>Output Voltage Temperature Coefficient</td><td colspan="2">I_{OUT}=30mA
−40°C ≤ Topt ≤ 85°C</td><td></td><td>±100</td><td></td><td>ppm /°C</td></tr>
<tr><td>I_{SC}</td><td>Short Current Limit</td><td colspan="2">V_{OUT}=0V</td><td></td><td>50</td><td></td><td>mA</td></tr>
<tr><td>R_{PD}</td><td>CE Pull-down Resistance</td><td colspan="2"></td><td>1.87</td><td>5.0</td><td>12.0</td><td>MΩ</td></tr>
<tr><td>V_{CEH}</td><td>CE Input Voltage “H”</td><td colspan="2"></td><td>1.0</td><td></td><td>6.0</td><td>V</td></tr>
<tr><td>V_{CEL}</td><td>CE Input Voltage “L”</td><td colspan="2"></td><td>0</td><td></td><td>0.3</td><td>V</td></tr>
<tr><td>en</td><td>Output Noise</td><td colspan="2">BW=10Hz to 100kHz</td><td></td><td>30</td><td></td><td>μVrms</td></tr>
<tr><td>R_{LOW}</td><td>Nch On Resistance for auto discharge (D version only)</td><td colspan="2">V_{CE}=0V</td><td></td><td>60</td><td></td><td>Ω</td></tr>
</table>

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 $V_{OUT} < 1.0$V, 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.)

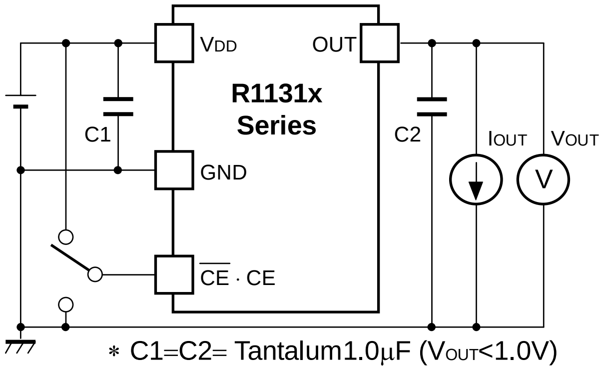
Chip capacitor characteristics of Bias dependence and Temperature characteristics may vary depending on its size, manufacturer, and part number.

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.

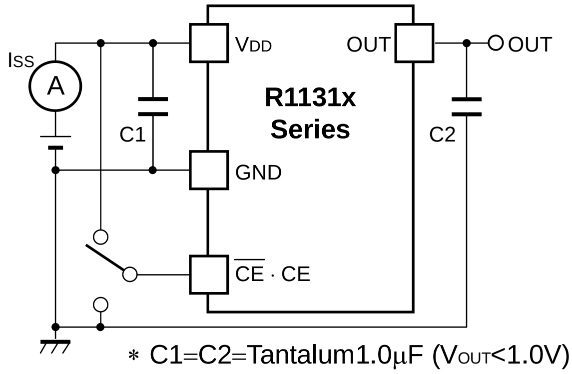
Set external components, especially the output capacitor, as close as possible to the ICs, and make wiring as short as possible.

TEST CIRCUIT



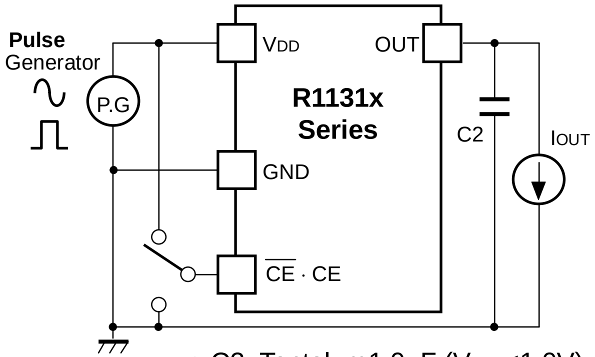
* C1=C2= Tantalum1.0µF (V_{OUT}<1.0V)
C1=C2=Ceramic1.0µF (V_{OUT} ≧ 1.0V)

Standard Test Circuit



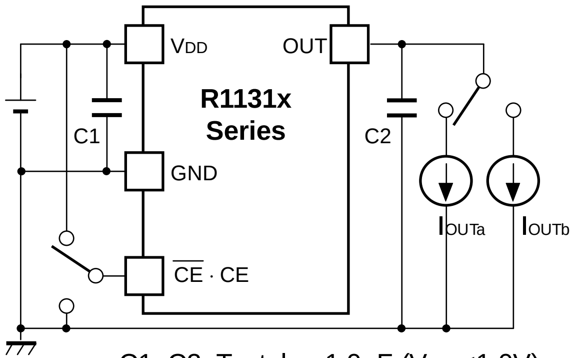
* C1=C2=Tantalum1.0µF (V_{OUT}<1.0V)
C1=C2=Ceramic1.0µF (V_{OUT} ≧ 1.0V)

Supply Current Test Circuit



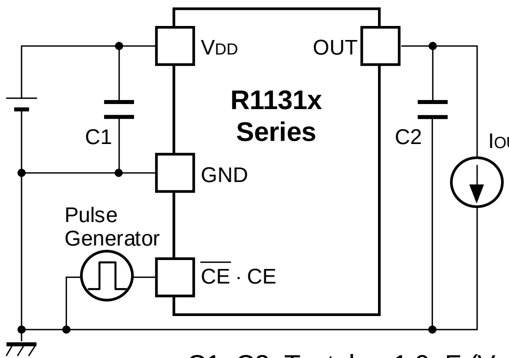
* C2=Tantalum1.0µF (V_{OUT}<1.0V)
C2=Ceramic1.0µF (V_{OUT} ≧ 1.0V)

Ripple Rejection, Line Transient Response Test Circuit

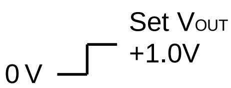


* C1=C2=Tantalum1.0µF (V_{OUT}<1.0V)
C1=C2=Ceramic1.0µF (V_{OUT} ≧ 1.0V)

Load Transient Response Test Circuit



* Input signal waveform
to CE pin is shown below.

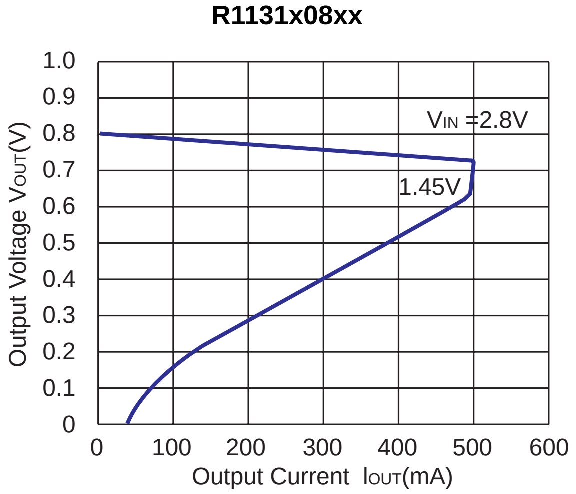


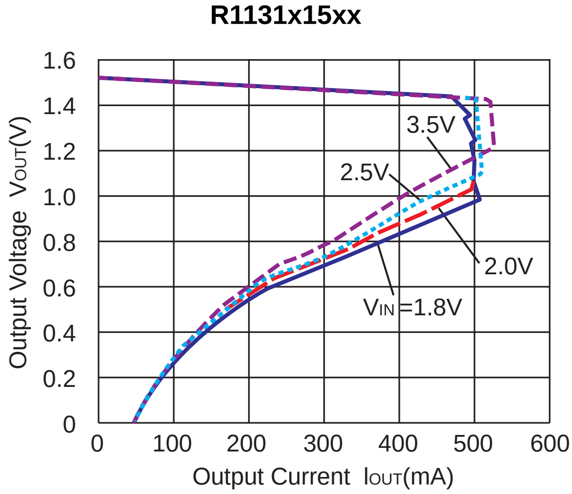
* C1=C2=Tantalum1.0µF (V_{OUT}<1.0V)
C1=C2=Ceramic1.0µF (V_{OUT} ≧ 1.0V)

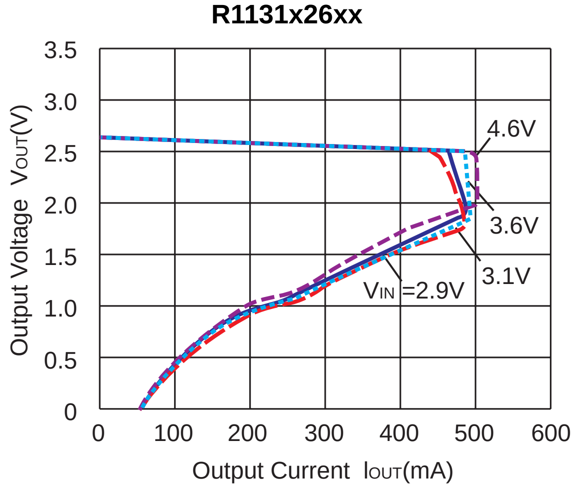
Turn on Speed with CE pin Test Circuit

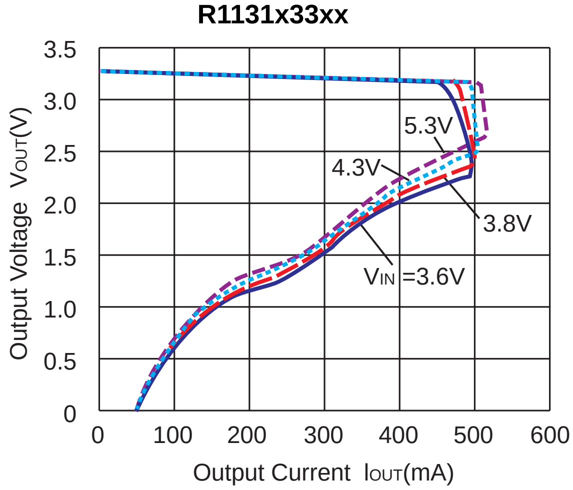
TYPICAL CHARACTERISTICS

1) Output Voltage vs. Output Current

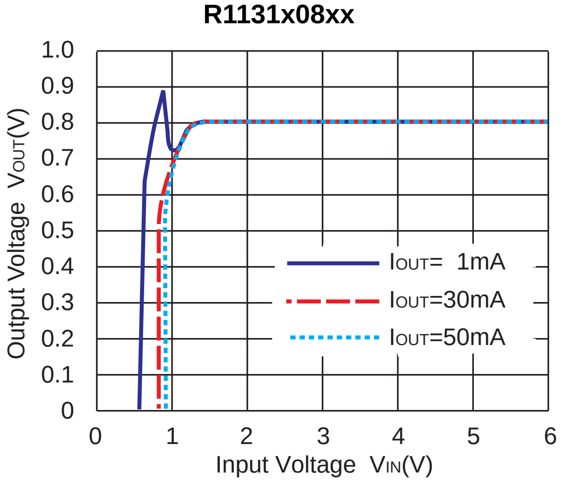


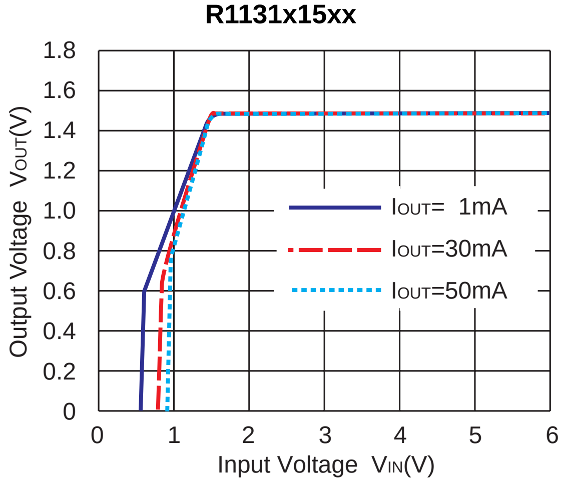




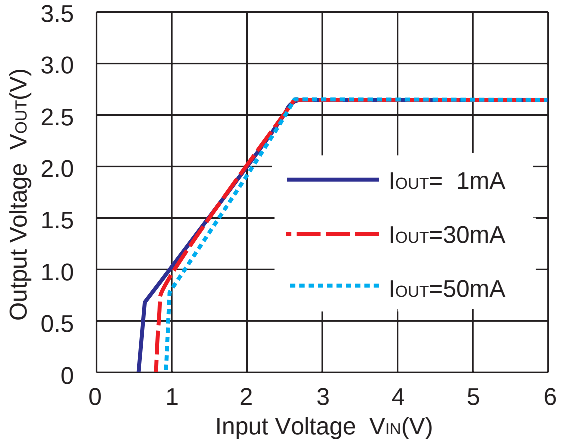


2) Output Voltage vs. Input Voltage

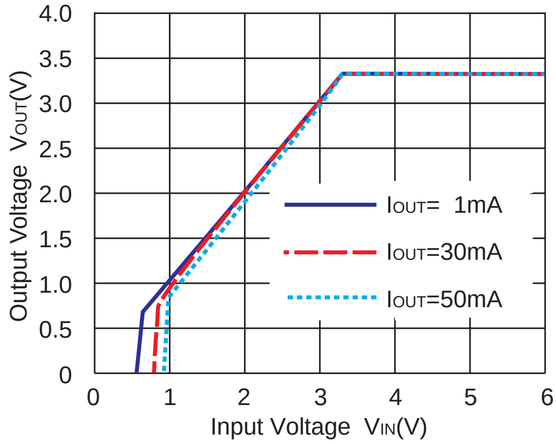




R1131x26xx

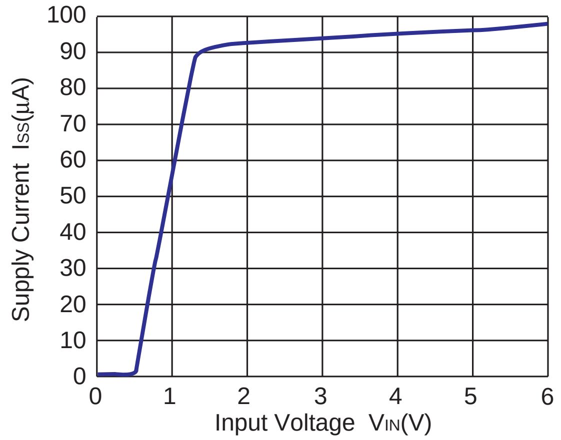


R1131x33xx

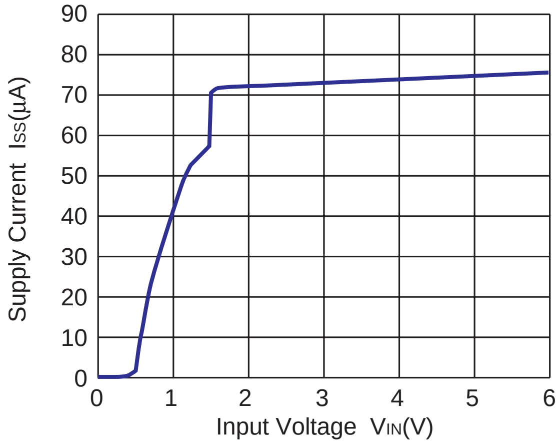


3) Supply Current vs. Input Voltage

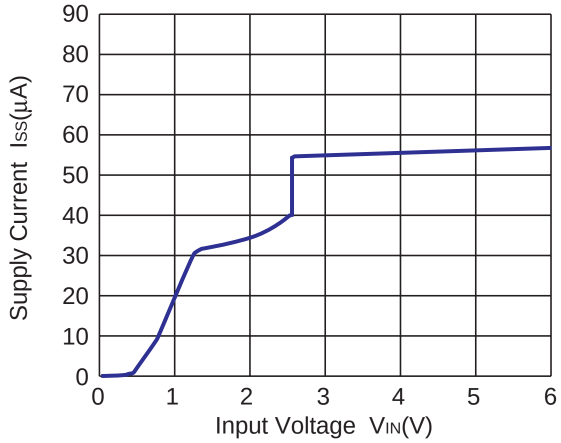
R1131x08xx



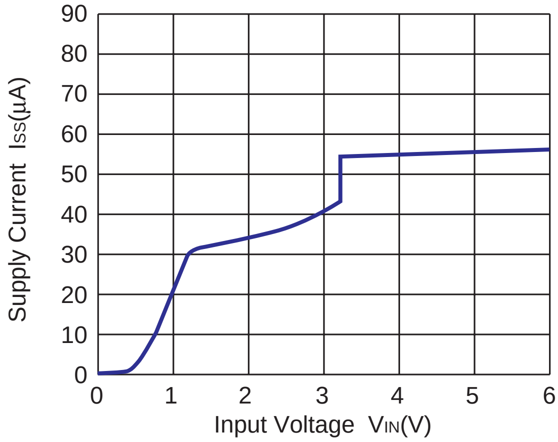
R1131x15xx



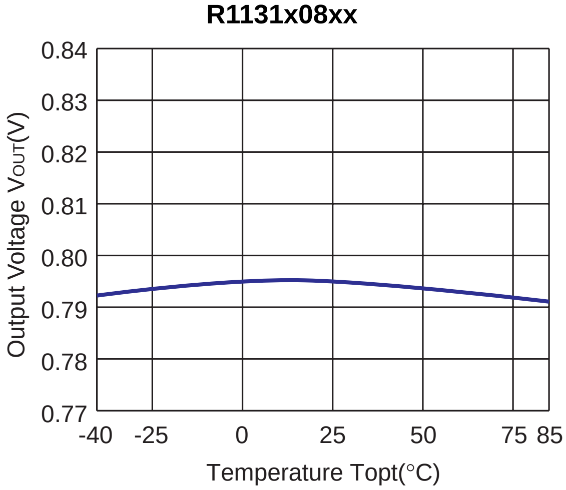
R1131x26xx

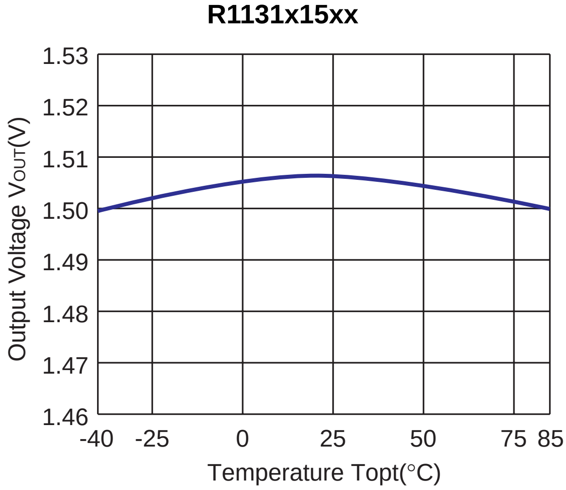


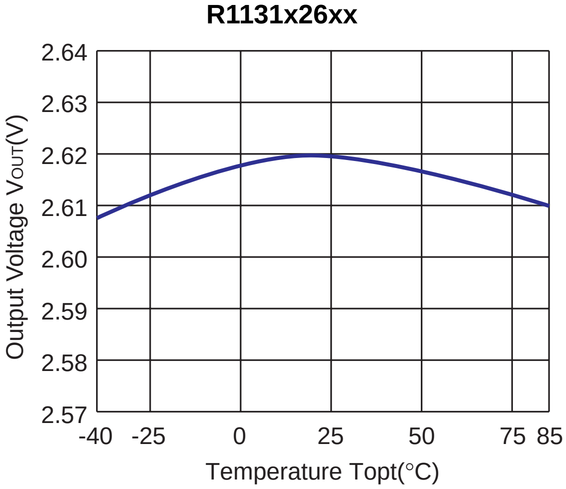
R1131x33xx

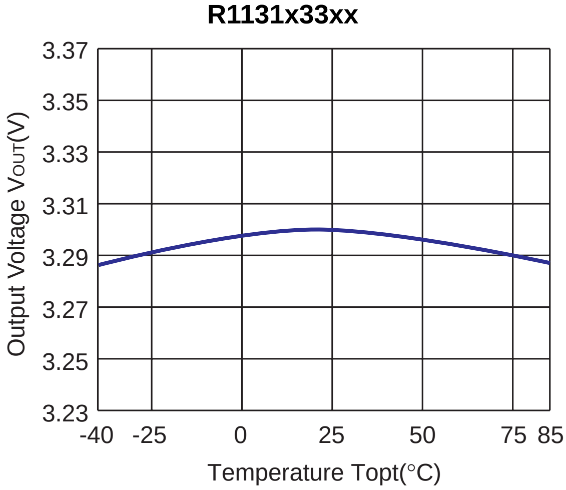


4) Output Voltage vs. Temperature

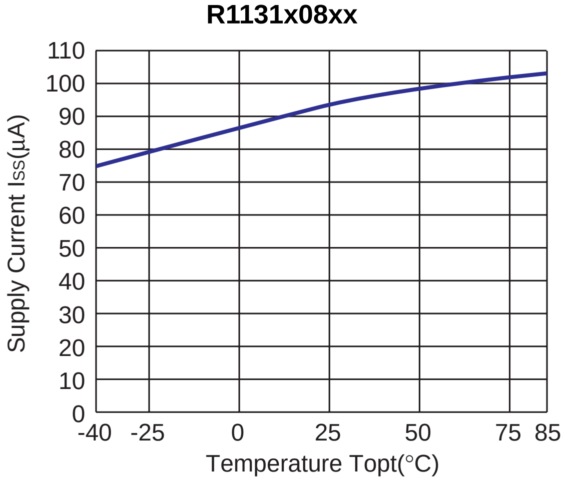


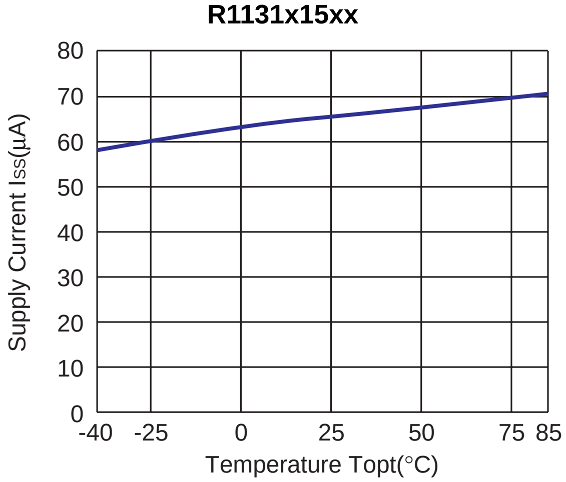




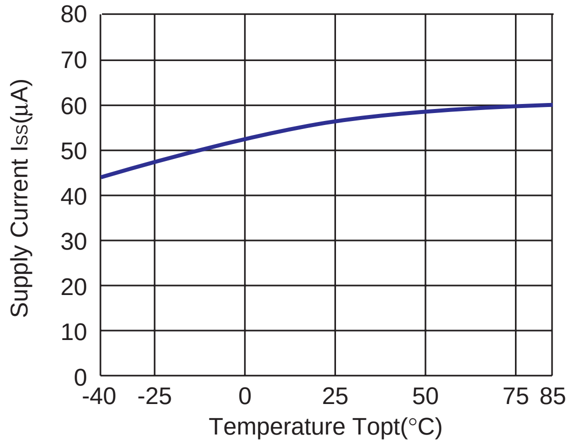


5) Supply Current vs. Temperature

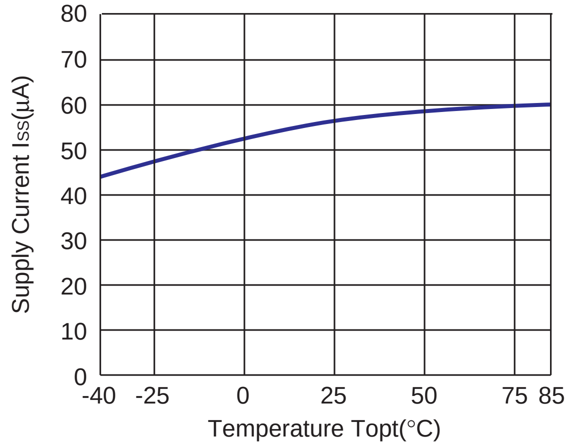




R1131x26xx

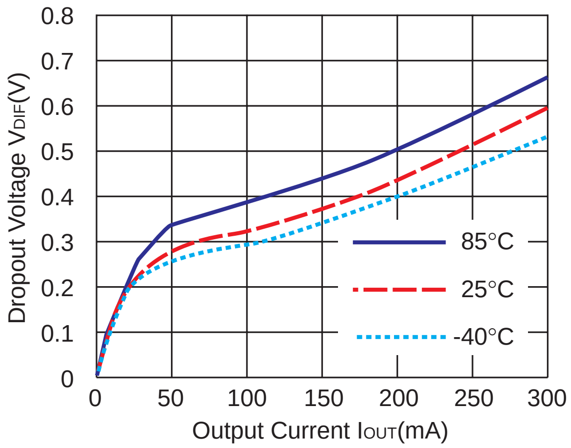


R1131x33xx

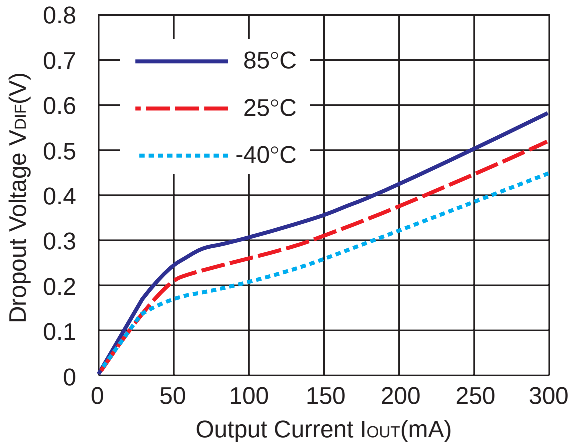


6) Dropout Voltage vs. Output Current

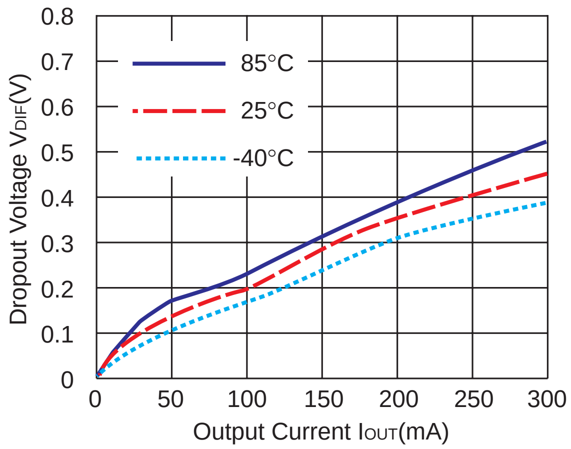
R1131x08xx



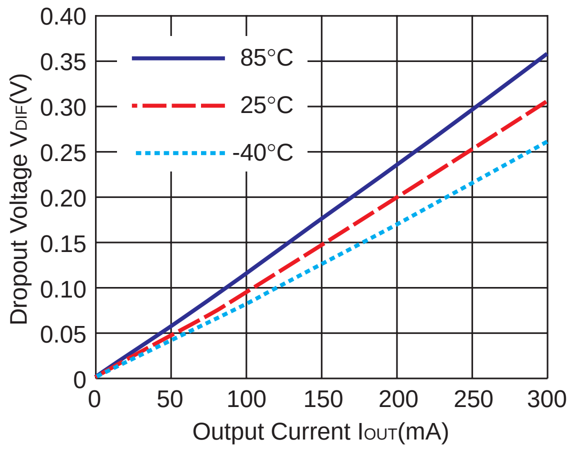
R1131x09xx

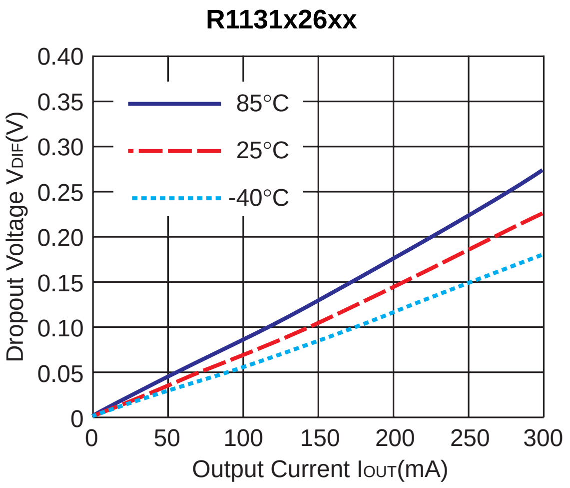


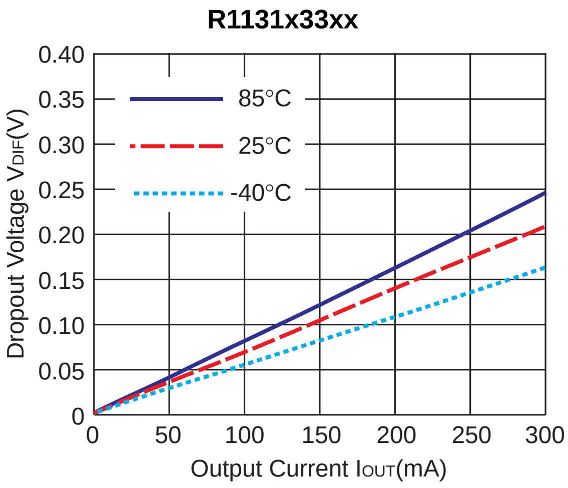
R1131x10xx



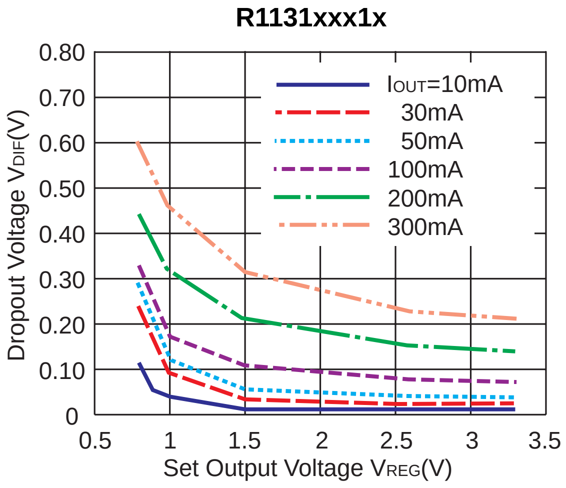
R1131x15xx



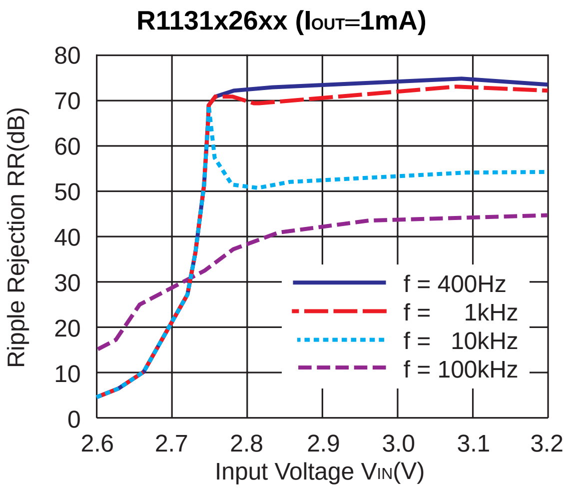


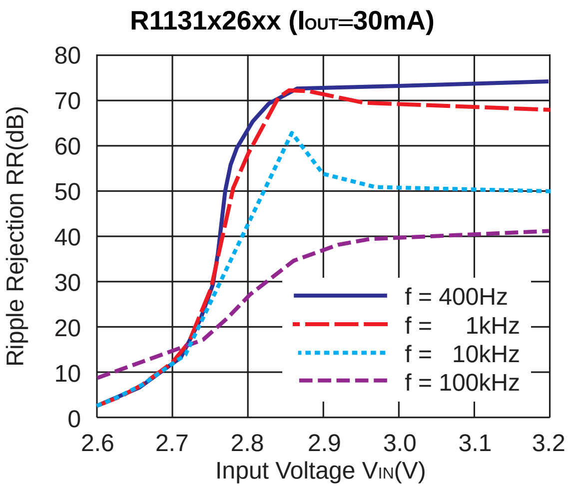


7) Dropout Voltage vs. Set Output Voltage (Topt=25°C)

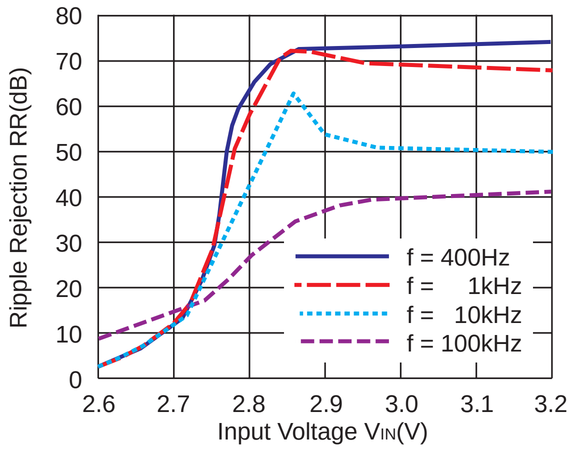


8) Ripple Rejection vs. Input Bias (Topt=25°C C_{IN}=none, C_{OUT}=Ceramic 1.0µF Ripple 0.2V_{P-P})



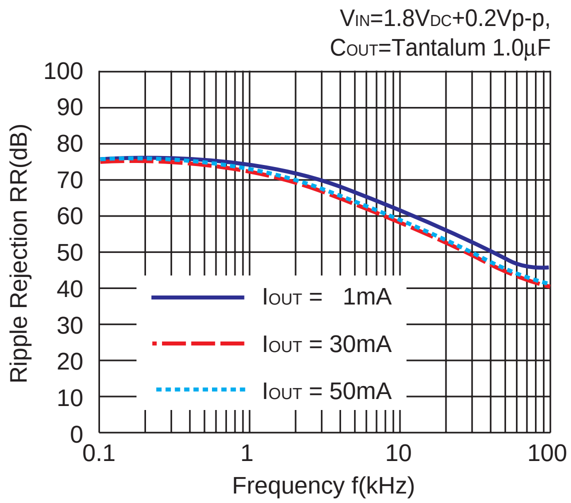


R1131x26xx (I_{OUT}=50mA)

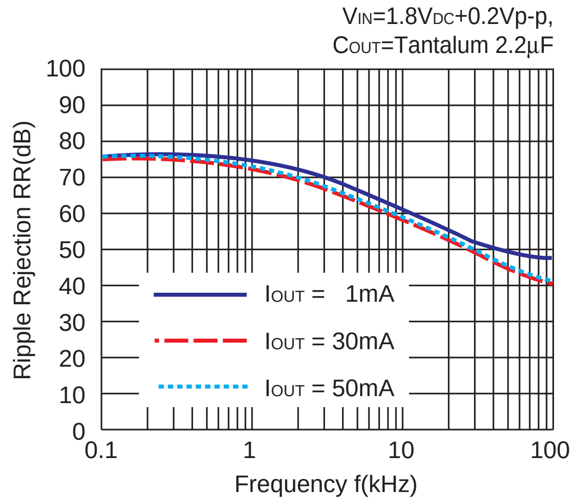


9) Ripple Rejection vs. Frequency (C_{IN}=none)

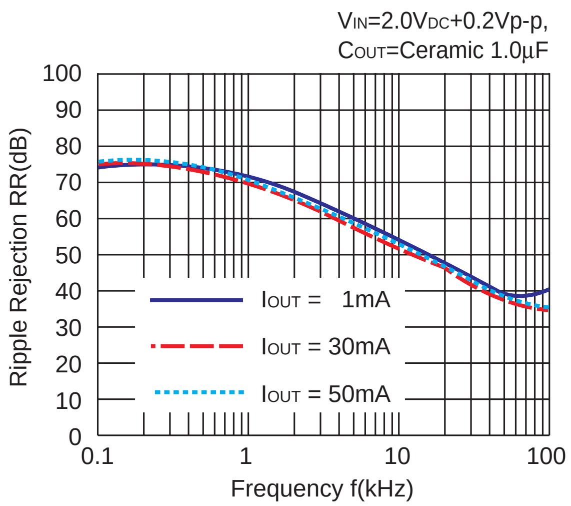
R1131x08xx



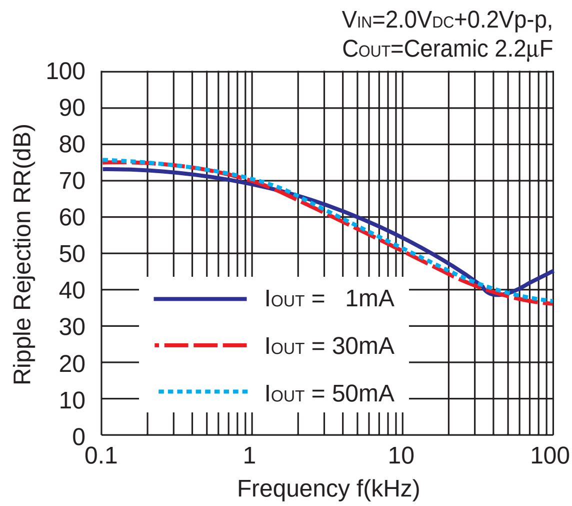
R1131x08xx



R1131x10xx

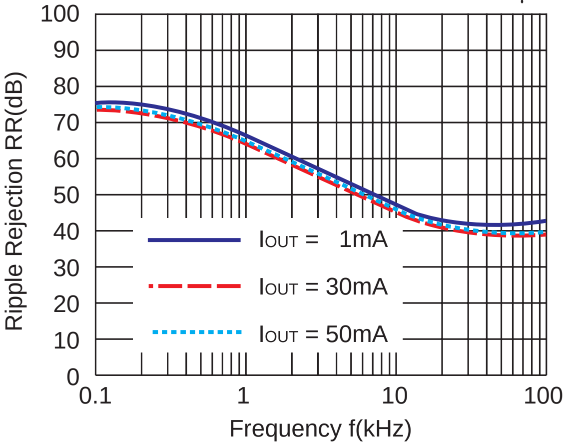


R1131x10xx



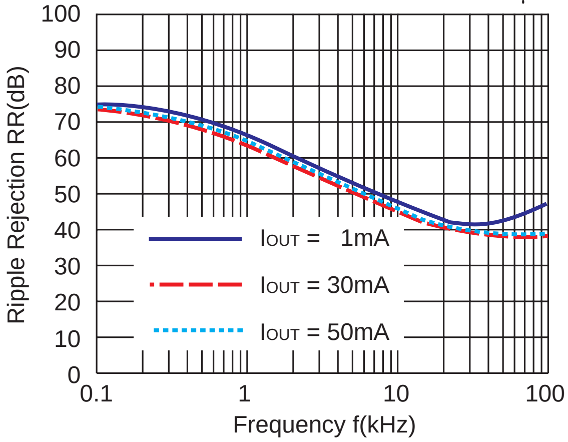
R1131x15xx

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



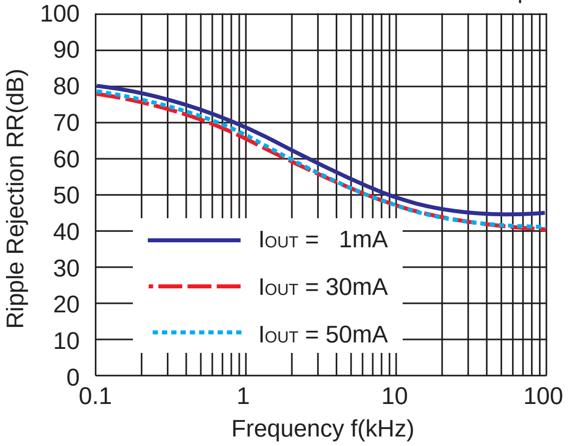
R1131x15xx

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



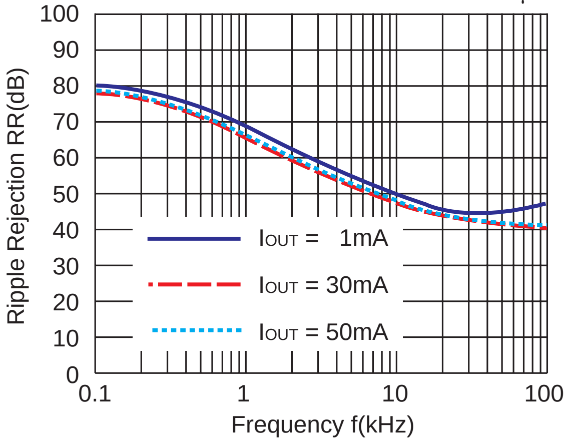
R1131x26xx

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



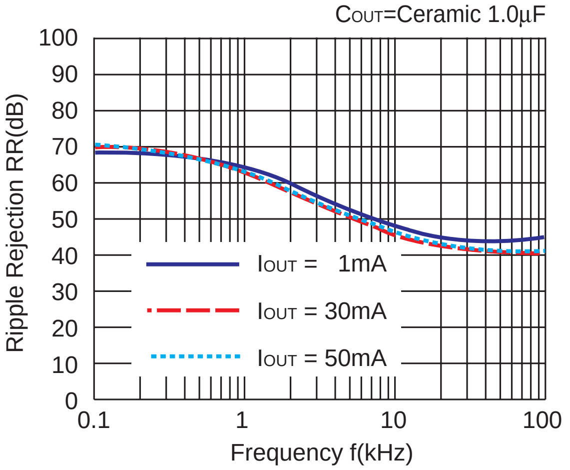
R1131x26xx

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



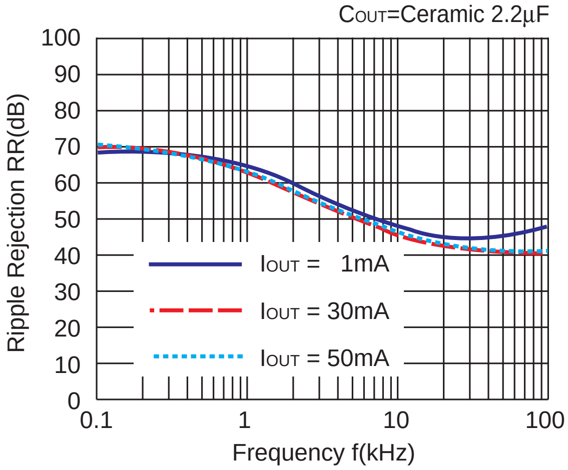
R1131x33xx

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



R1131x33xx

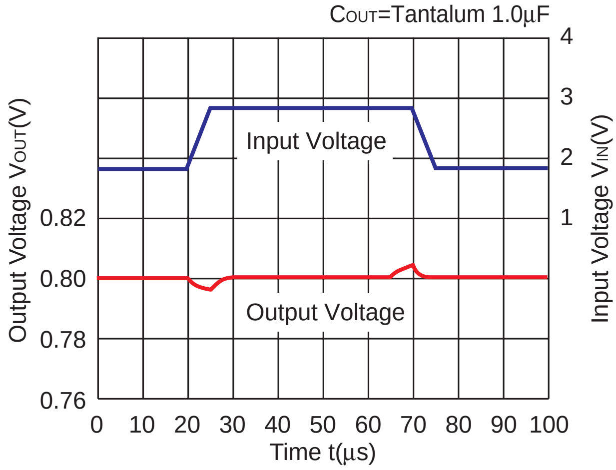
V_{IN}=4.3V_{DC}+0.2Vp-p,
C_{OUT}=Ceramic 2.2µF



10) Input Transient Response (C_{IN}=none, tr=tf=5µs)

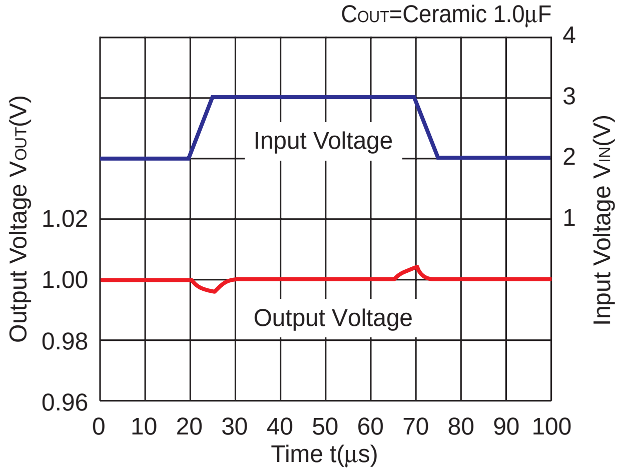
R1131x08xx

I_{OUT}=30mA,
C_{OUT}=Tantalum 1.0µF



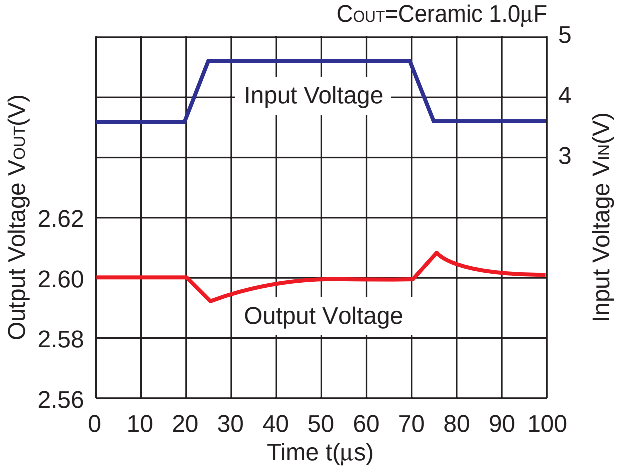
R1131x10x

I_{OUT}=30mA,
C_{OUT}=Ceramic 1.0µF



R1131x26xx

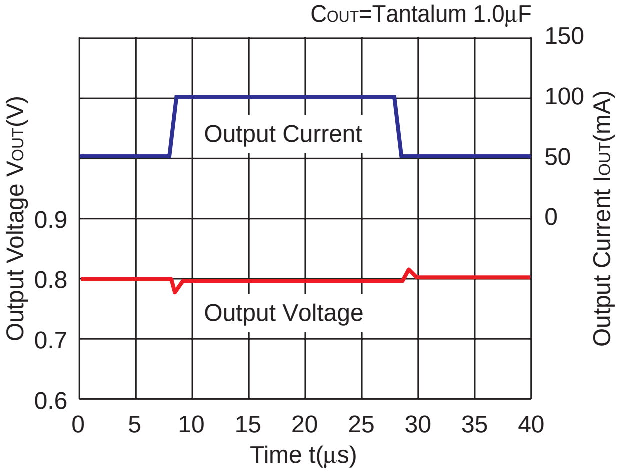
I_{OUT}=30mA,
C_{OUT}=Ceramic 1.0µF



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

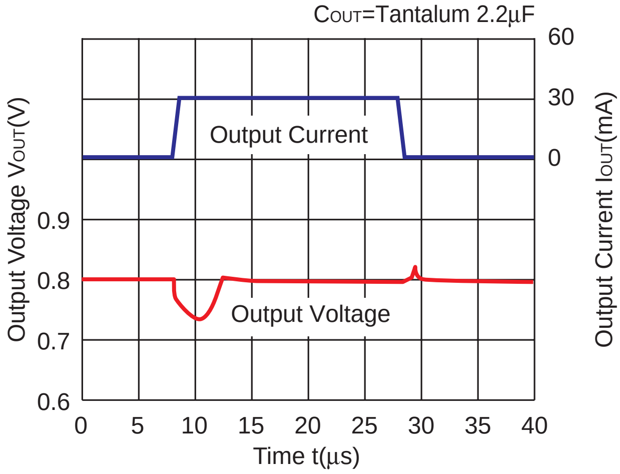
R1131x08xx

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



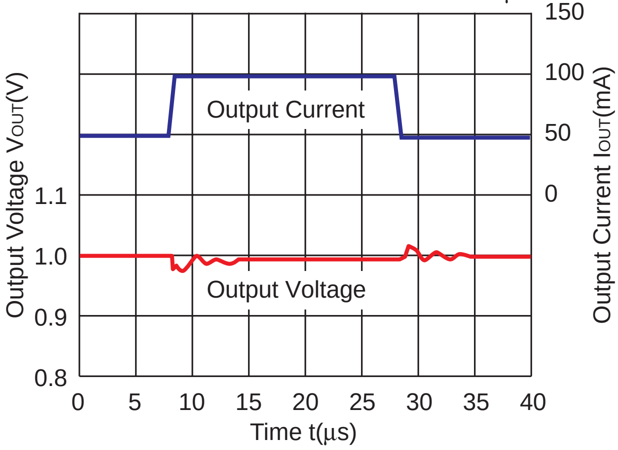
R1131x08xx

V_{IN}=1.8V C_{IN}=Tantalum 1.0µF,
C_{OUT}=Tantalum 2.2µF



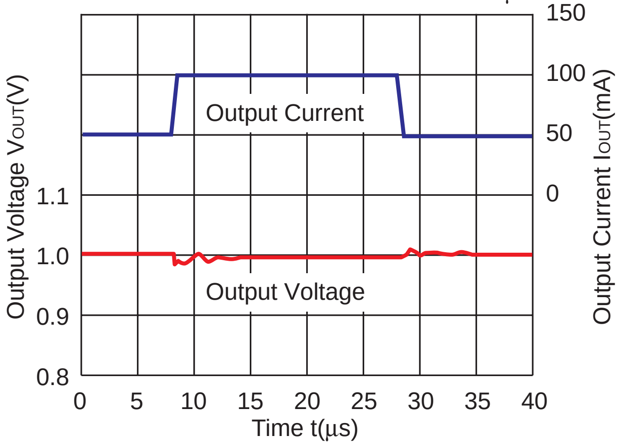
R1131x10xx

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



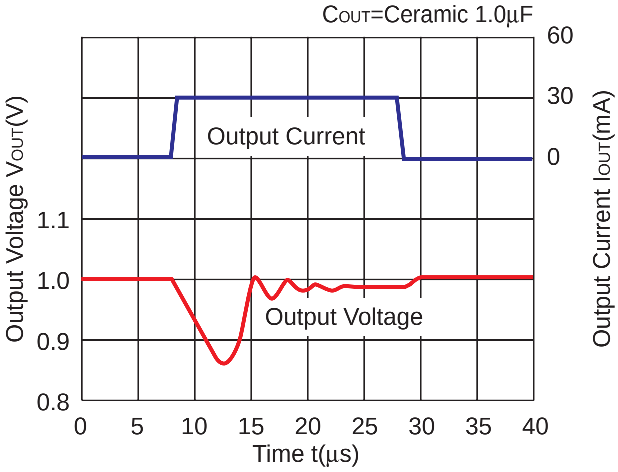
R1131x10xx

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



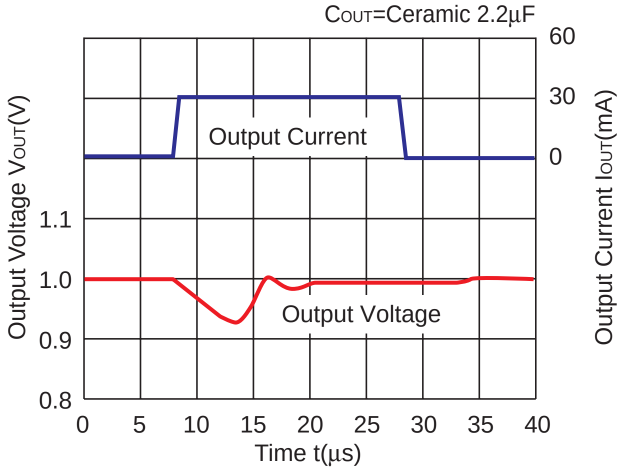
R1131x10xx

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



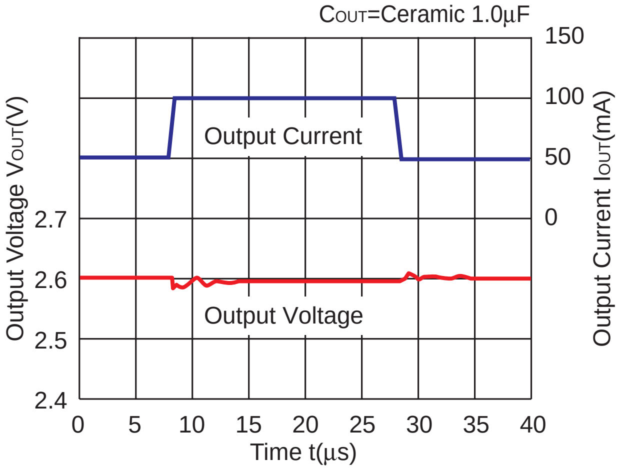
R1131x10xx

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



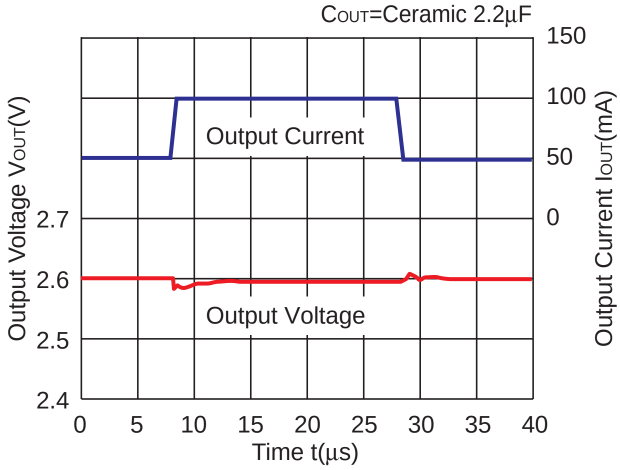
R1131x26xx

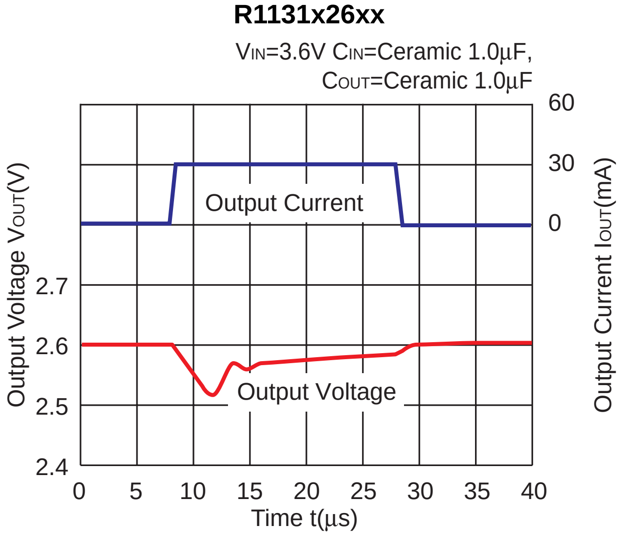
V_{IN}=3.6V C_{IN}=Ceramic 1.0µF,
C_{OUT}=Ceramic 1.0µF

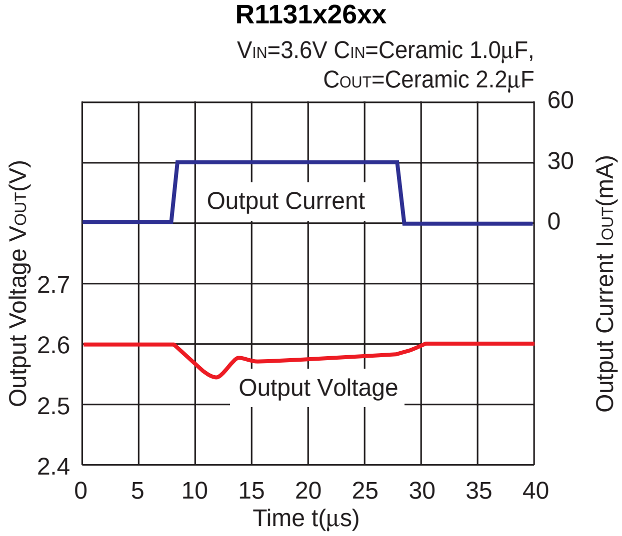


R1131x26xx

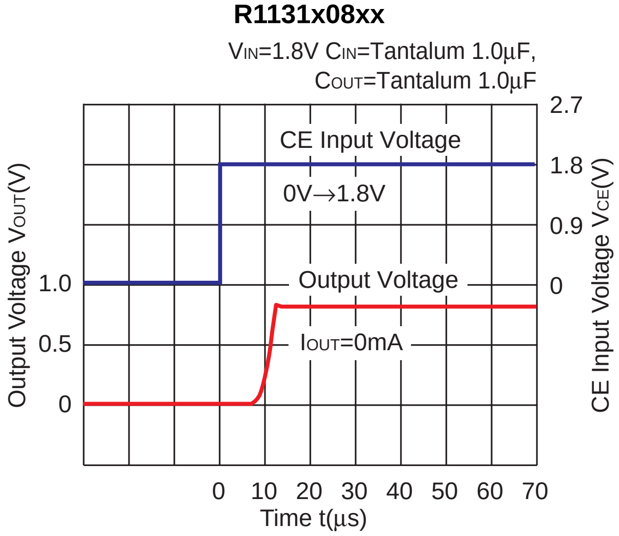
V_{IN}=3.6V C_{IN}=Ceramic 1.0µF,
C_{OUT}=Ceramic 2.2µF

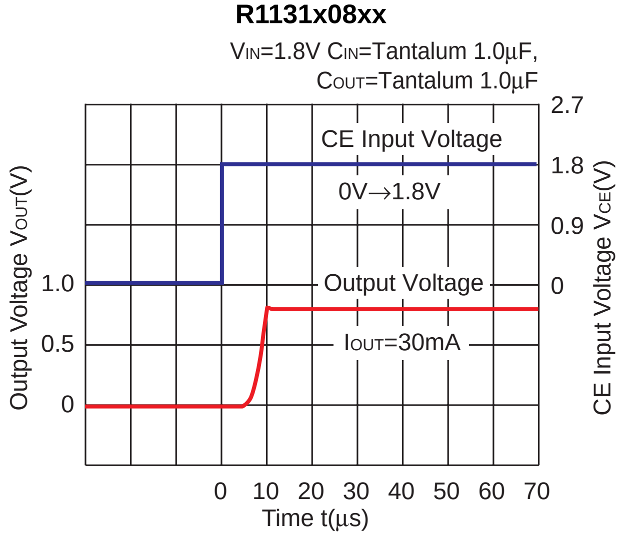


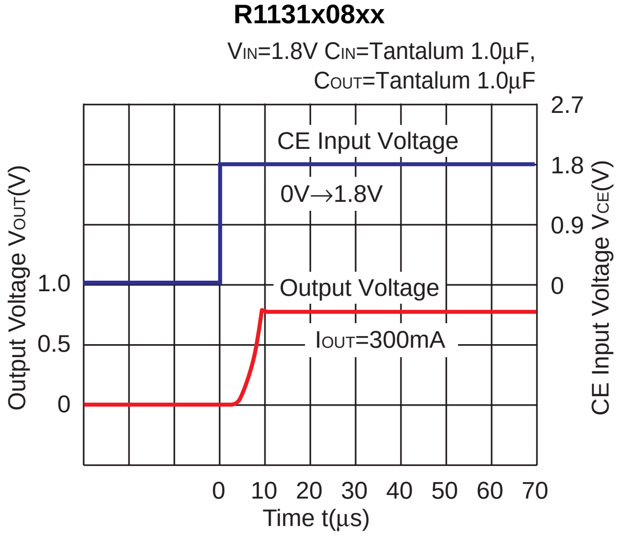


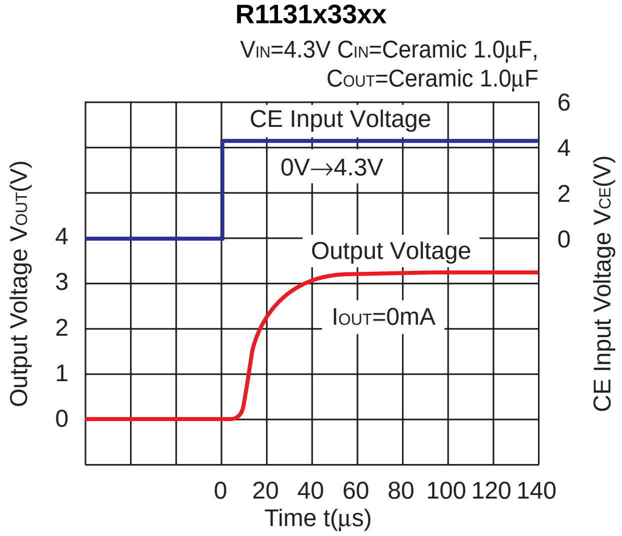


12) Turn on speed with CE pin



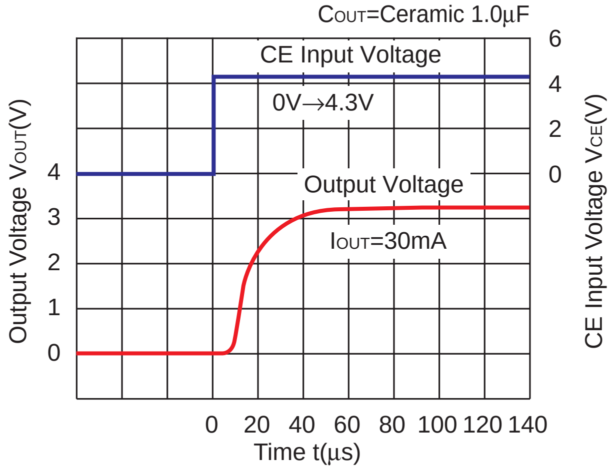






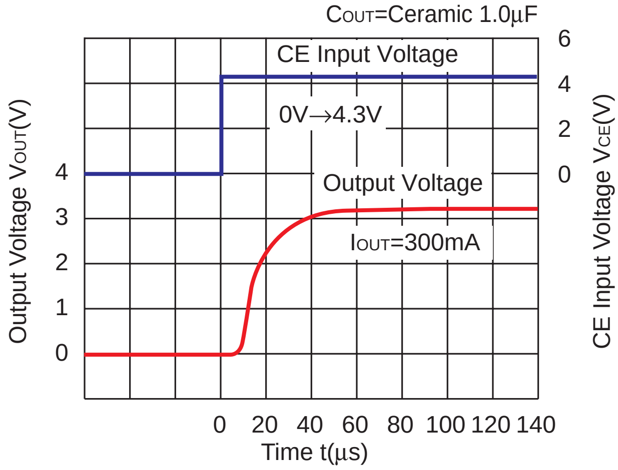
R1131x33xx (ECO=H)

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



R1131x33xx (ECO=L)

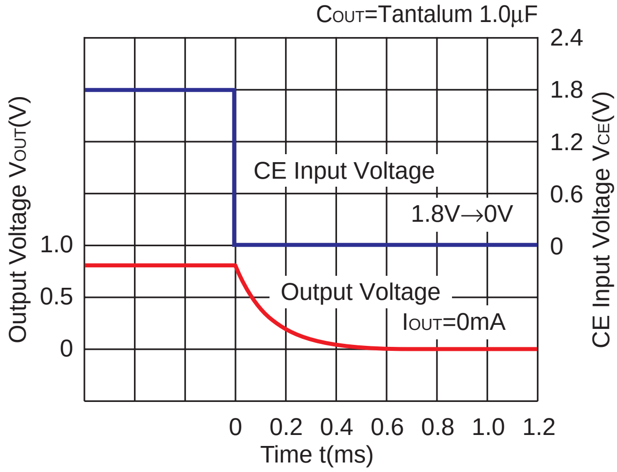
V_{IN}=4.3V C_{IN}=Ceramic 1.0μF,
C_{OUT}=Ceramic 1.0μF



13) Turn-off Speed with CE

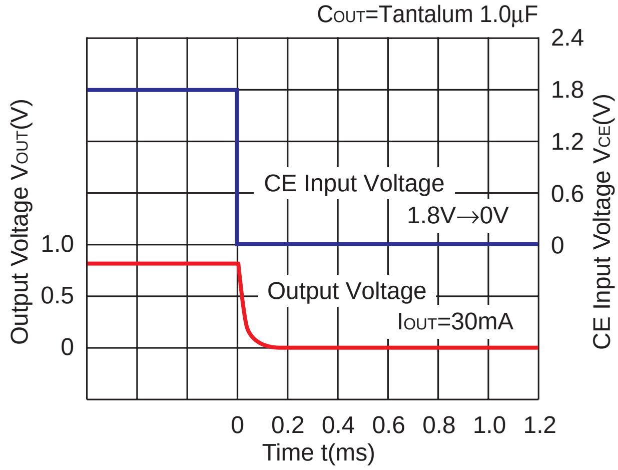
R1131x08xD

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



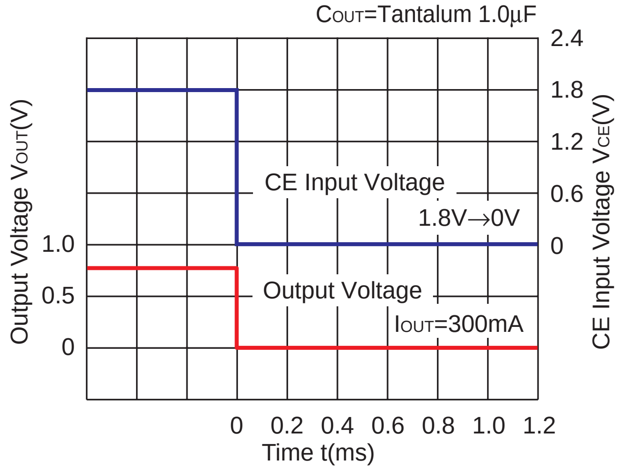
R1131x08xD

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



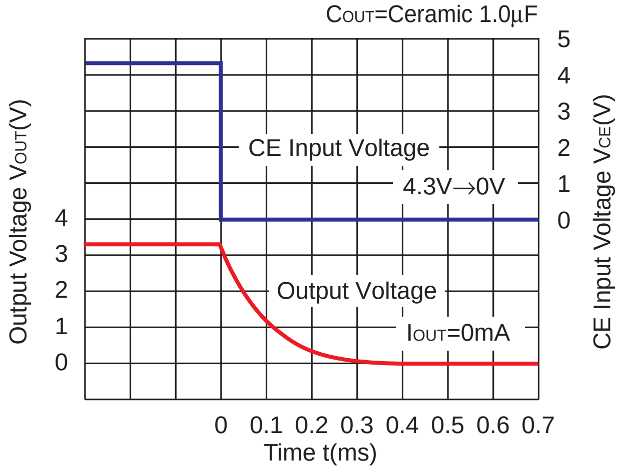
R1131x08xD

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



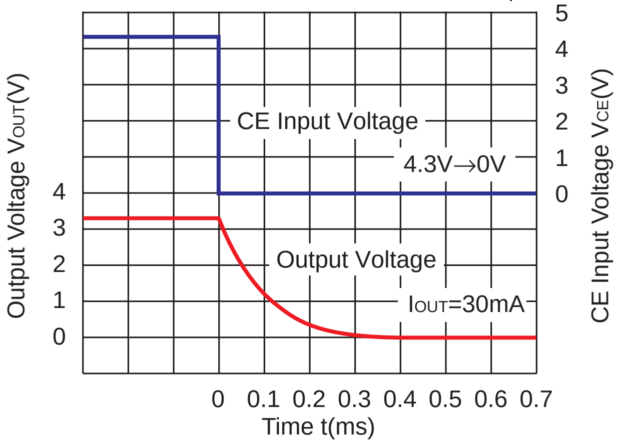
R1131x33xD

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



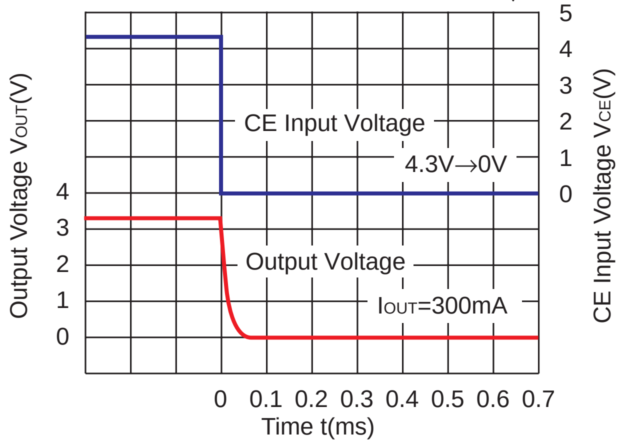
R1131x33xD

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



R1131x33xD

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



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.

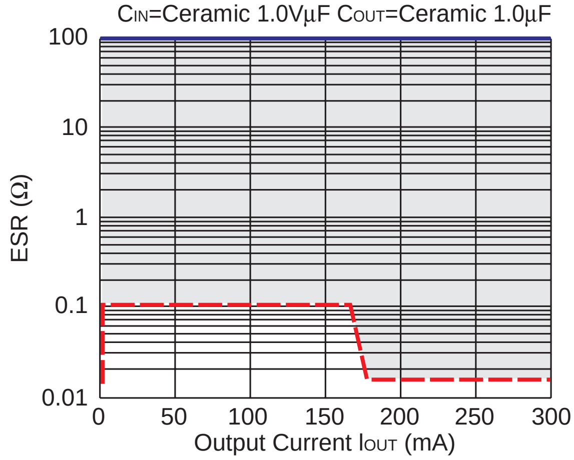
The conditions when the white noise level is under 40µV(Avg.) are marked as the hatched area in the graph.

<Test conditions>

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

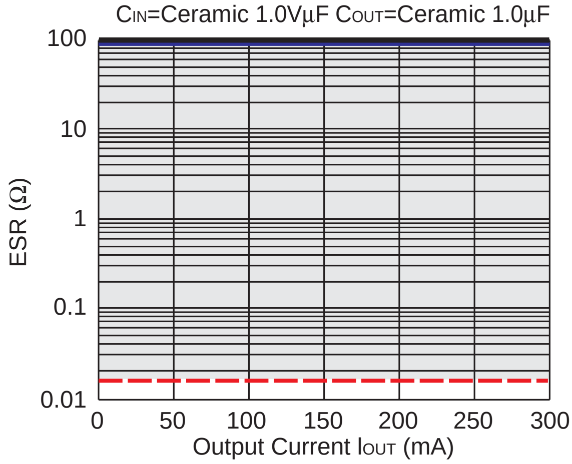
R1131x08xx

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



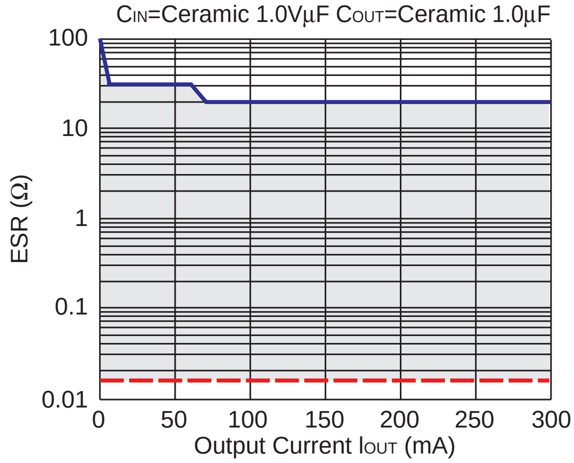
R1131x10xx

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



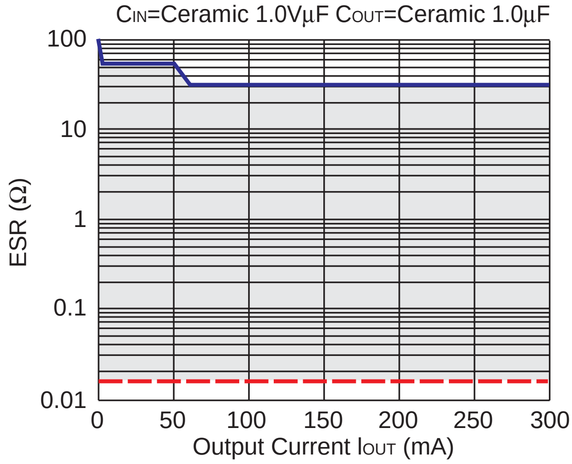
R1131x26xx

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

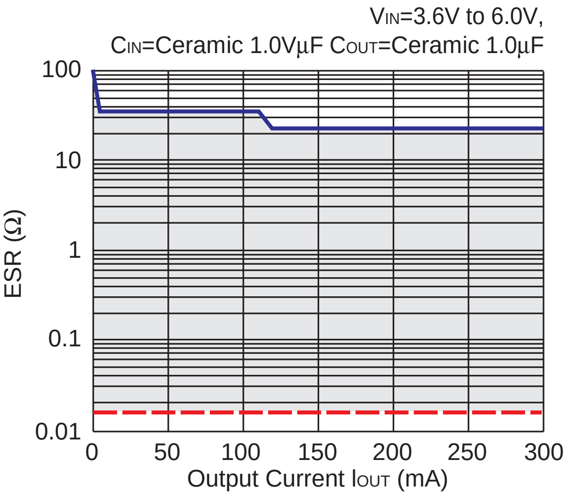


R1131x15xx

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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Halogen Free

Ricoh is committed to reducing the environmental loading materials in electrical devices with a view to contributing to the protection of human health and the environment.
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