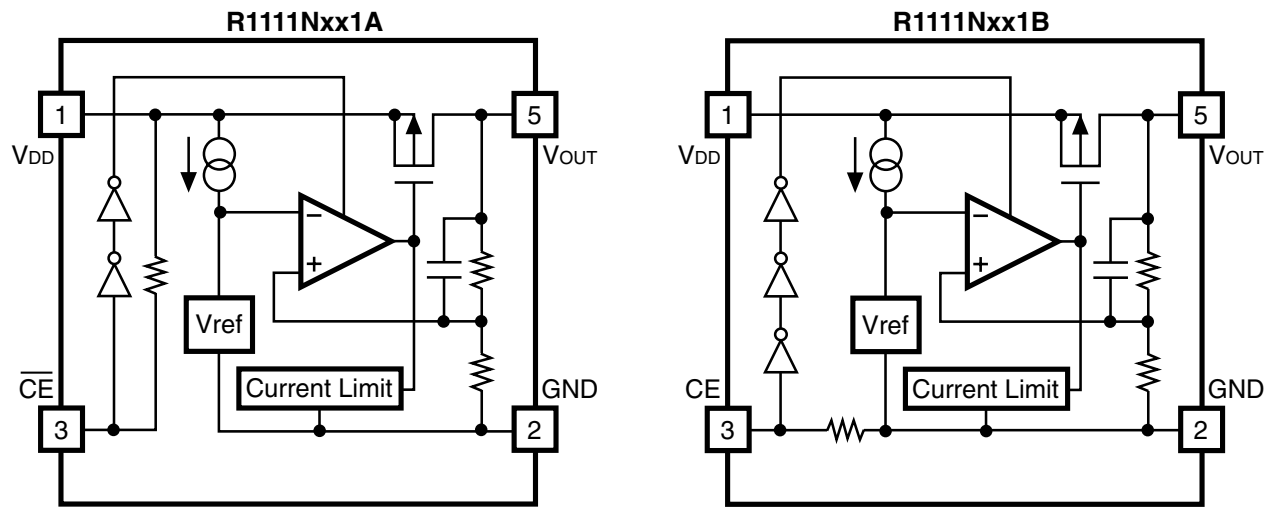


BLOCK DIAGRAM



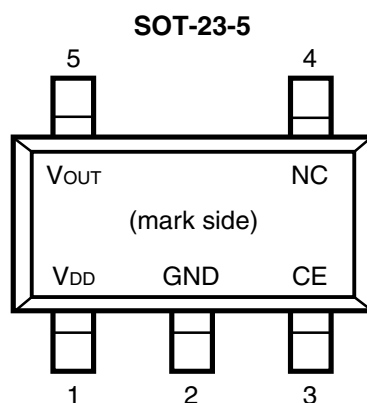
SELECTION GUIDE

The output voltage, the active type, the packing type, and the taping type for the ICs can be selected at the user's request. The selection can be made by designating the part number as shown below :

R1111xxx1x-xx ←Part Number
 ↑↑ ↑↑
 a b c d

Code	Contents
a	Designation of Package Type : N:SOT-23-5 (Mini-mold)
b	Setting Output Voltage (V _{OUT}) : Stepwise setting with a step of 0.1V in the range of 1.5V to 5.0V is possible.
c	Designation of Active Type : A :“L” active type B :“H” active type
d	Designation of Taping Type : Ex. TR, TL (refer to Taping Specifications ;TR type is the standard direction.)

PIN CONFIGURATION



PIN DESCRIPTION

Pin No.	Symbol	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

ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rating	Unit
Input Voltage	V_{IN}	9	V
Input Voltage($\overline{CE}$ or CE Pin)	V_{CE}	-0.3 ~ $V_{IN}+0.3$	V
Output Voltage	V_{OUT}	-0.3 ~ $V_{IN}+0.3$	V
Output Current	I_{OUT}	200	mA
Power Dissipation	P_D	250	mW
Operating Temperature Range	T_{opt}	-40 ~ 85	°C
Storage Temperature Range	T_{stg}	-55 ~ 125	°C

ELECTRICAL CHARACTERISTICS

• R1111Nxx1A

T_{opt} = 25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V _{OUT}	Output Voltage	V _{IN} = Set V _{OUT} + 1V 1mA ≤ I _{OUT} ≤ 30mA	V _{OUT} ×0.98		V _{OUT} ×1.02	V
I _{OUT}	Output Current	Refer to the ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE				
ΔV _{OUT} /ΔI _{OUT}	Load Regulation	V _{IN} = Set V _{OUT} + 1V 1mA ≤ I _{OUT} ≤ 80mA		12	40	mV
V _{DIF}	Dropout Voltage	Refer to the ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE				
I _{SS}	Supply Current	V _{IN} = Set V _{OUT} + 1V		35	70	μA
I _{standby}	Supply Current (Standby)	V _{IN} = V _{CE} = Set V _{OUT} + 1V		0.1	1.0	μA
ΔV _{OUT} /ΔV _{IN}	Line Regulation	Set V _{OUT} + 0.5V ≤ V _{IN} ≤ 8V I _{OUT} = 30mA		0.05	0.20	%/V
RR	Ripple Rejection	f = 1kHz, Ripple 0.5Vp-p V _{IN} = Set V _{OUT} + 1V		70		dB
V _{IN}	Input Voltage		2		8	V
ΔV _{OUT} /ΔT	Output Voltage Temperature Coefficient	I _{OUT} = 30mA -40°C ≤ T _{opt} ≤ 85°C		±100		ppm/°C
I _{lim}	Short Current Limit	V _{OUT} = 0V		50		mA
R _{PU}	$\overline{\text{CE}}$ Pull-up Resistance		2.5	5.0	10.0	MΩ
V _{CEH}	$\overline{\text{CE}}$ Input Voltage "H"		1.5		V _{IN}	V
V _{CEL}	$\overline{\text{CE}}$ Input Voltage "L"		0.00		0.25	V
en	Output Noise	BW = 10Hz ~ 100kHz		30		μVrms

• R1111Nxx1B

T_{opt} = 25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V _{OUT}	Output Voltage	V _{IN} = Set V _{OUT} + 1V 1mA ≤ I _{OUT} ≤ 30mA	V _{OUT} ×0.98		V _{OUT} ×1.02	V
I _{OUT}	Output Current	Refer to the ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE				
ΔV _{OUT} /ΔI _{OUT}	Load Regulation	V _{IN} = Set V _{OUT} + 1V 1mA ≤ I _{OUT} ≤ 80mA		12	40	mV
V _{DIF}	Dropout Voltage	Refer to the ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE				
I _{SS}	Supply Current	V _{IN} = Set V _{OUT} + 1V		35	70	μA
I _{standby}	Supply Current (Standby)	V _{IN} = Set V _{OUT} + 1V V _{CE} = GND		0.1	1.0	μA
ΔV _{OUT} /ΔV _{IN}	Line Regulation	Set V _{OUT} + 0.5V ≤ V _{IN} ≤ 8V I _{OUT} = 30mA		0.05	0.20	%/V
RR	Ripple Rejection	f = 1KHz, Ripple 0.5Vp-p V _{IN} = Set V _{OUT} + 1V		70		dB
V _{IN}	Input Voltage		2		8	V
ΔV _{OUT} /ΔT	Output Voltage Temperature Coefficient	I _{OUT} = 30mA -40°C ≤ T _{opt} ≤ 85°C		±100		ppm/°C
I _{lim}	Short Current Limit	V _{OUT} = 0V		50		mA
R _{PD}	CE Pull-down Resistance		2.5	5.0	10.0	MΩ
V _{CEH}	CE Input Voltage "H"		1.5		V _{IN}	V
V _{CEL}	CE Input Voltage "L"		0.00		0.25	V
en	Output Noise	BW = 10Hz ~ 100kHz		30		μVrms

ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE

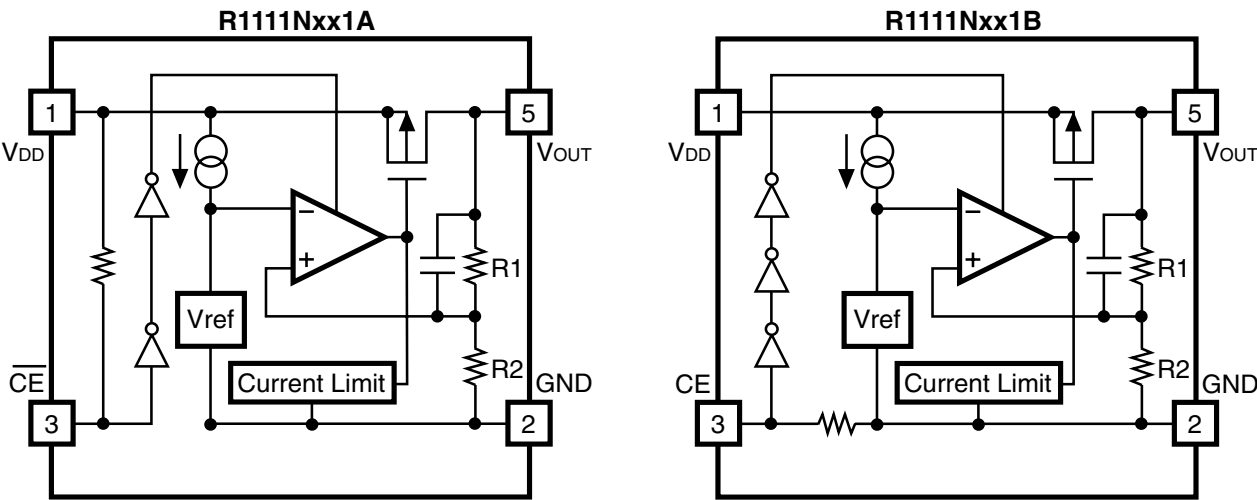
Topt = 25°C

Output Voltage	Output Current	
	IOUT (mA)	
	Condition	Min.
1.5 ≤ VOUT ≤ 1.7	VIN - VOUT = 1.0V	100
1.8 ≤ VOUT ≤ 5.0		150

Topt = 25°C

Output Voltage VOUT (V)	Dropout Voltage			
	VDIF (V)			
	Condition	Min.	Typ.	Max.
1.5	IOUT = 100mA	0.50		
1.6		0.40		
1.7		0.30		
1.8 ≤ VOUT ≤ 1.9			0.60	1.40
2.0 ≤ VOUT ≤ 2.4			0.35	0.70
2.5 ≤ VOUT ≤ 2.7			0.24	0.35
2.8 ≤ VOUT ≤ 3.3			0.20	0.30
3.4 ≤ VOUT ≤ 5.0			0.17	0.26

OPERATION



In these ICs, fluctuation of the output voltage, VOUT is detected by feed-back registers R1, R2, and the result is compared with a reference voltage by the error amplifier, so that a constant voltage is output. A current limit circuit for protection at short mode and a chip enable circuit, are included.



TEST CIRCUITS

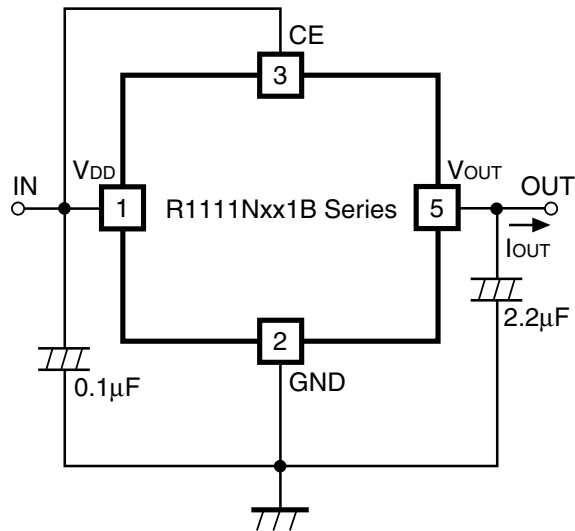


Fig.1 Standard test Circuit

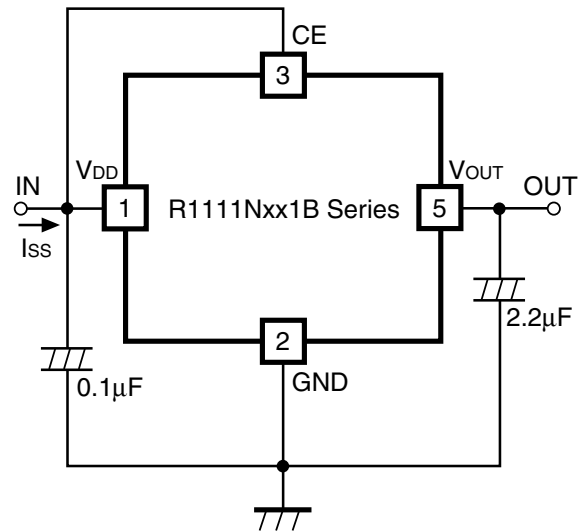


Fig.2 Supply Current Test Circuit

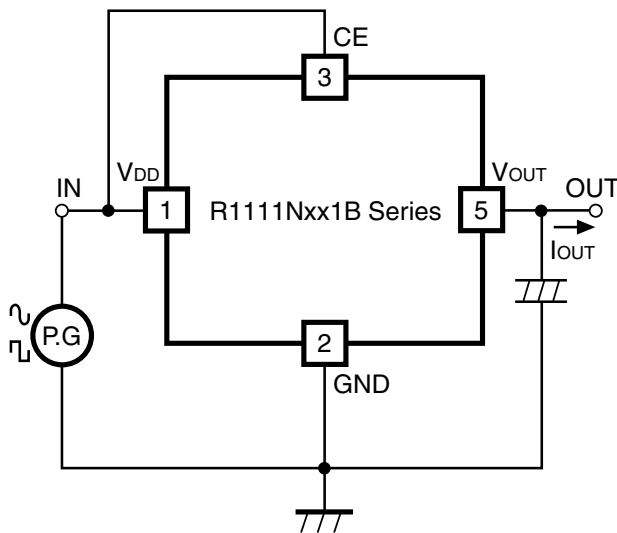


Fig.3 Ripple Rejection, Line Transient Response Test Circuit

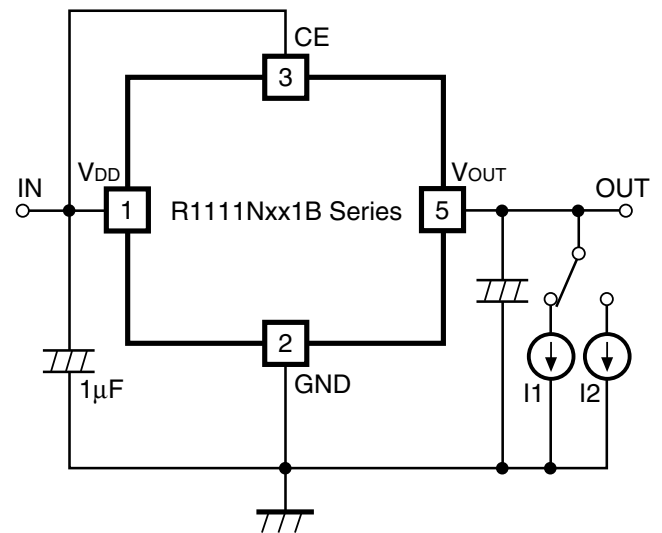
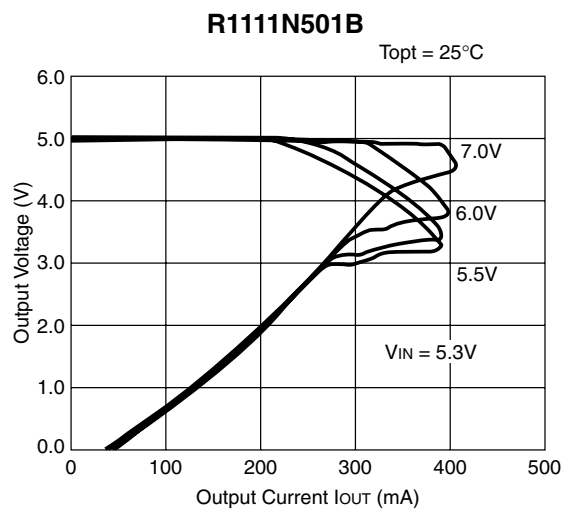
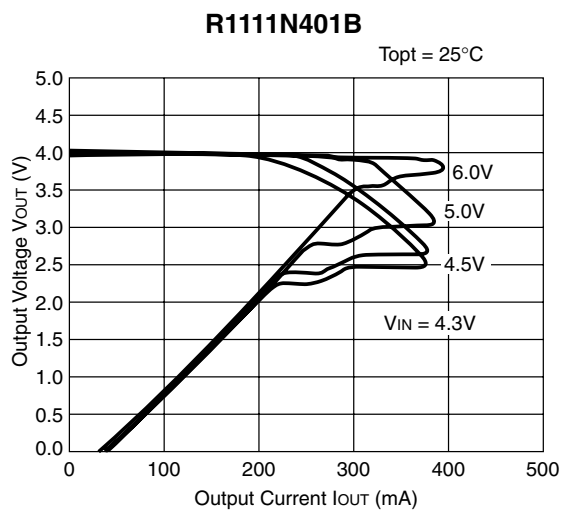
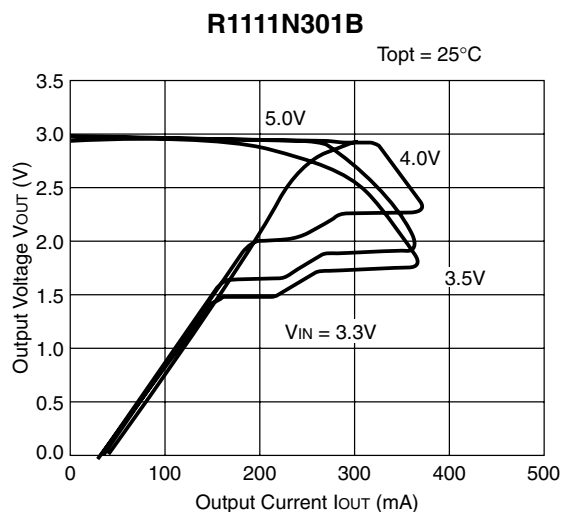
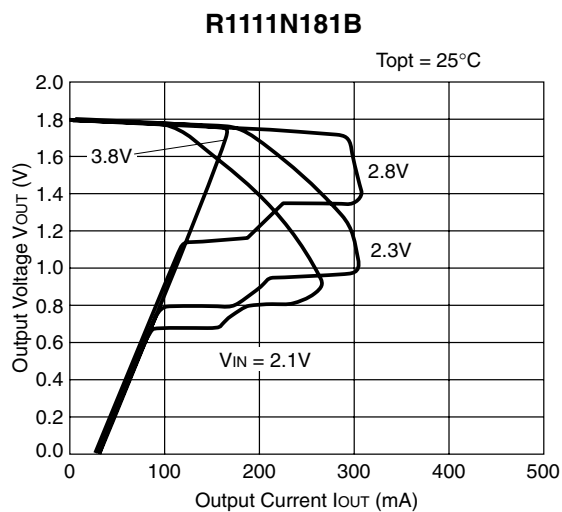


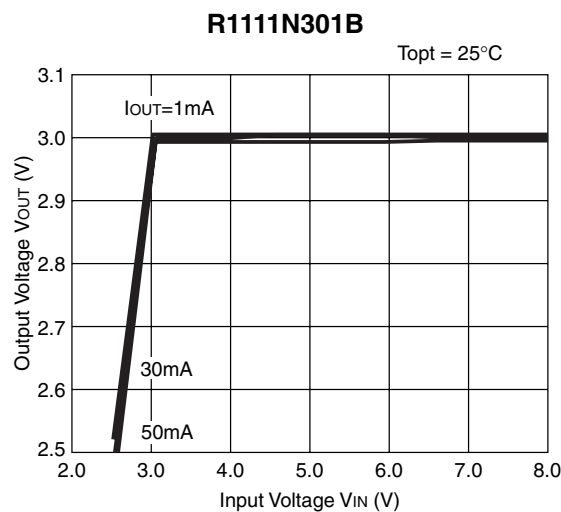
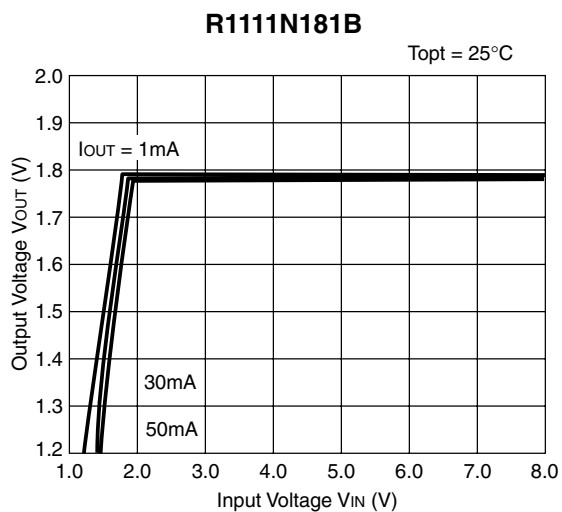
Fig.4 Load Transient Response Test Circuit

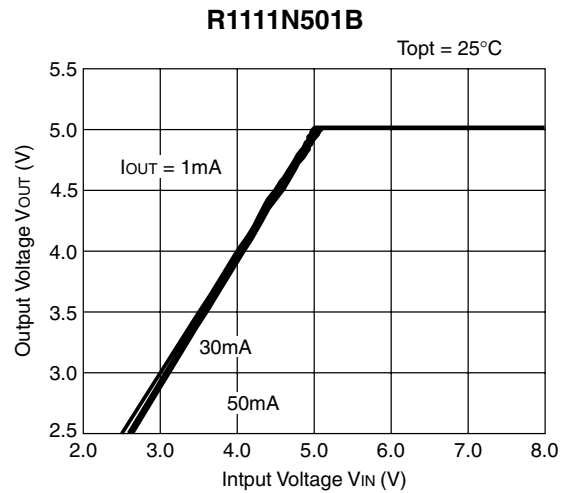
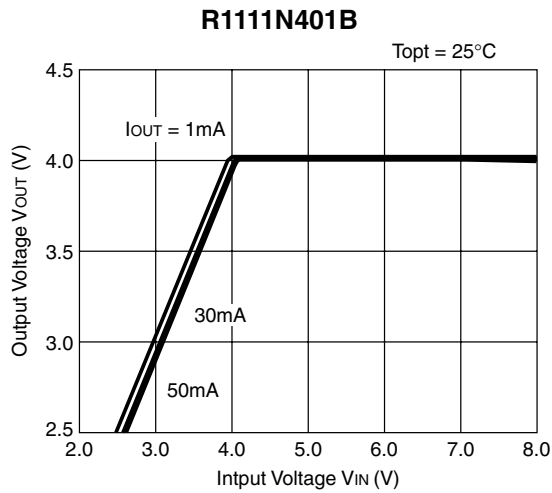
TYPICAL CHARACTERISTICS

1) Output Voltage vs. Output Current

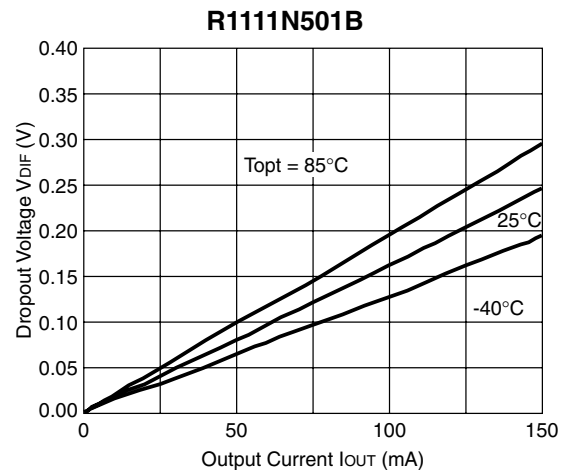
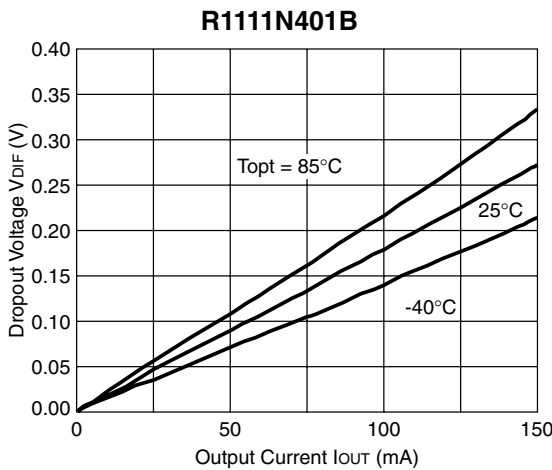
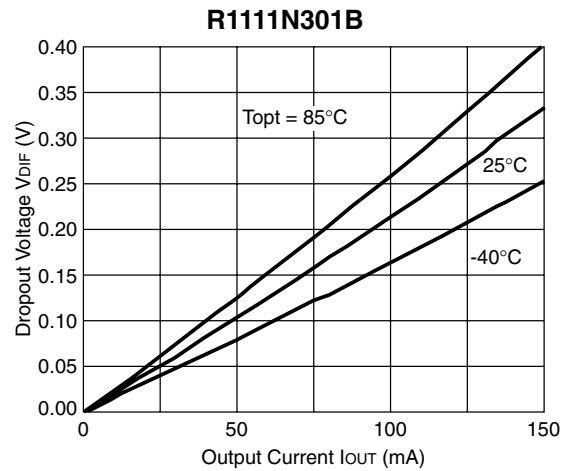
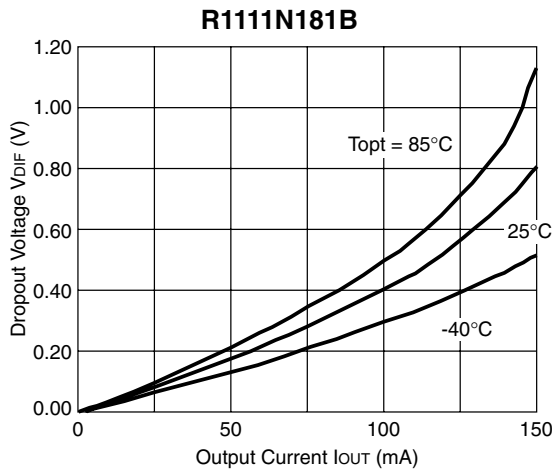


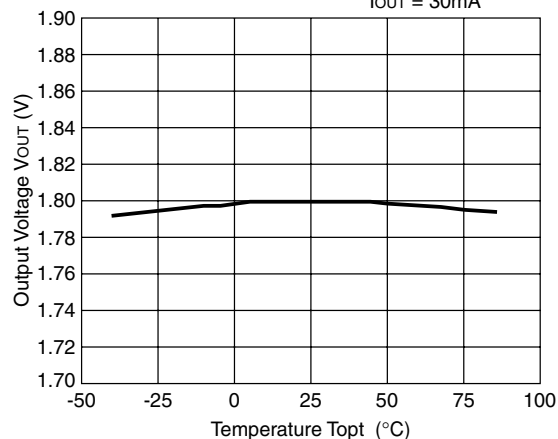
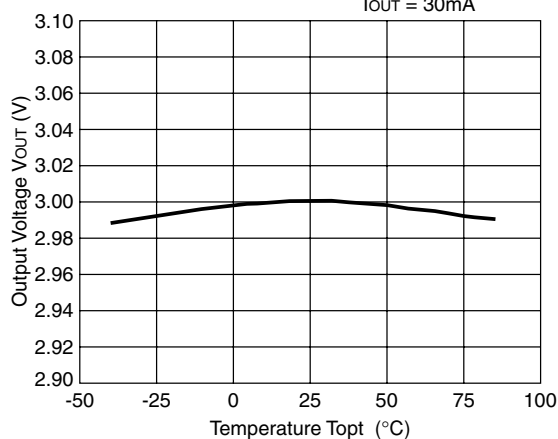
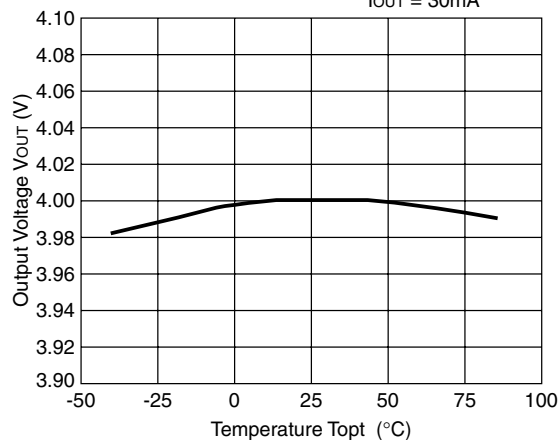
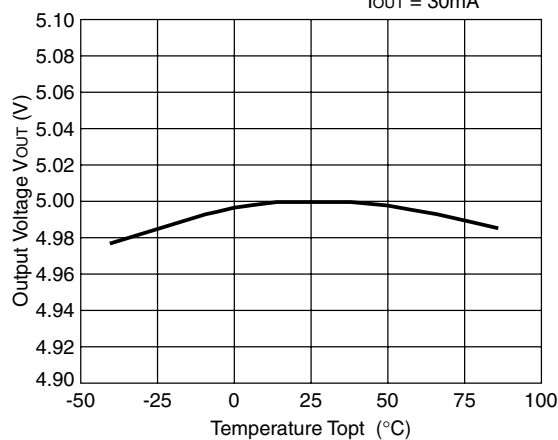
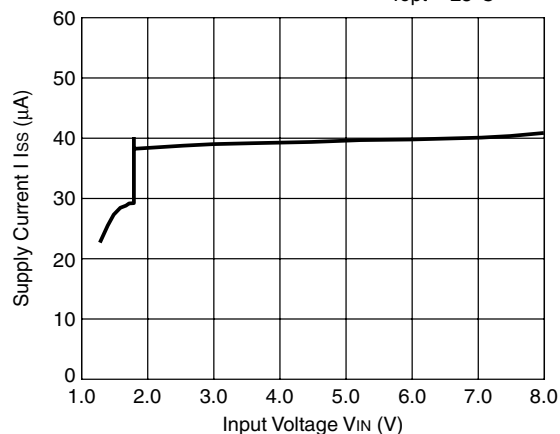
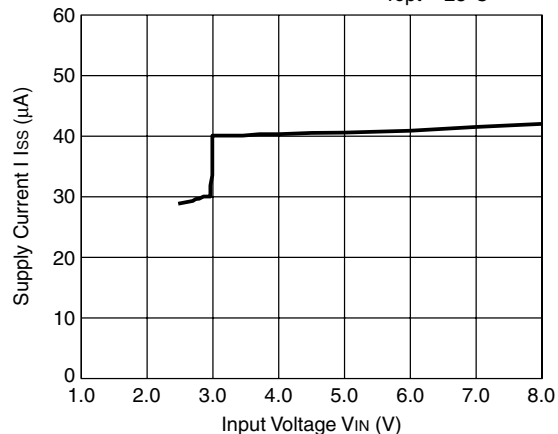
2) Output Voltage vs. Input Voltage

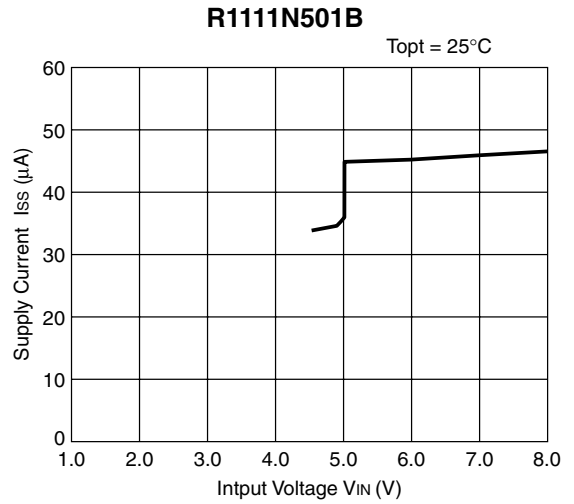
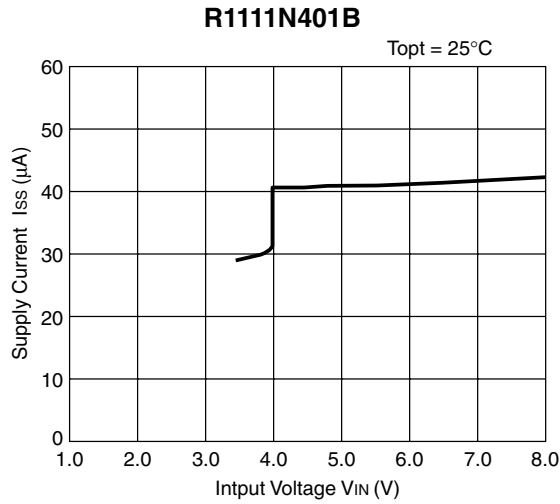




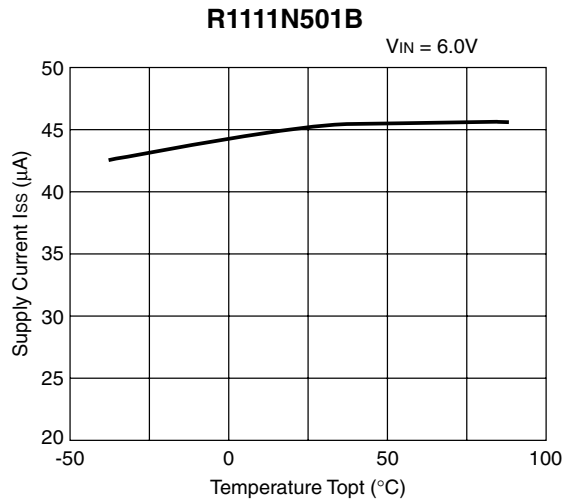
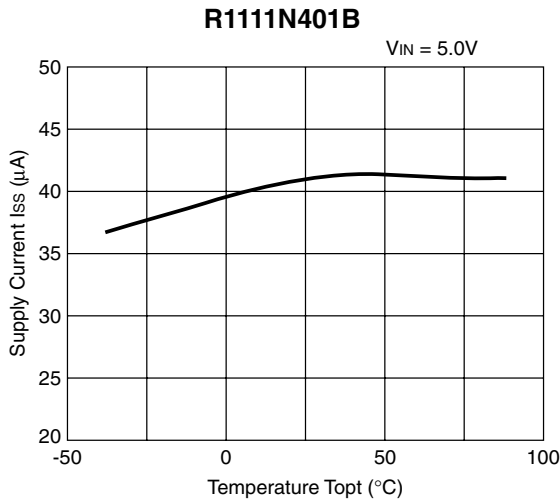
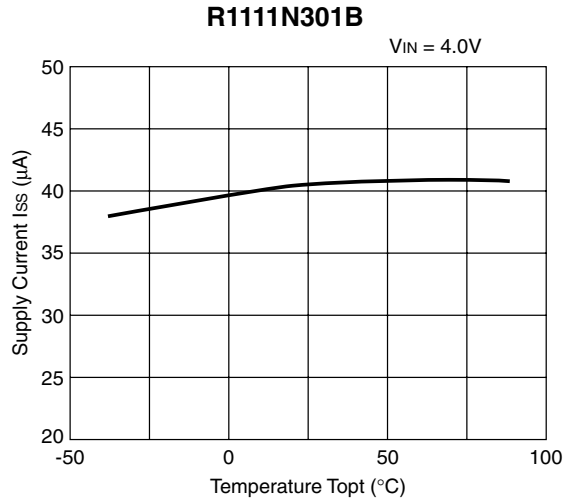
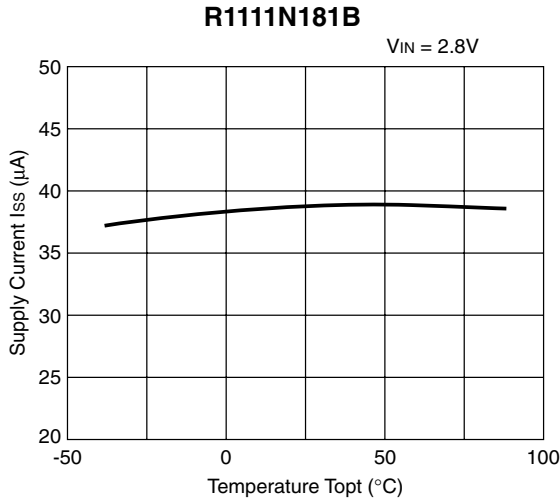
3) Dropout Voltage vs. Output Current



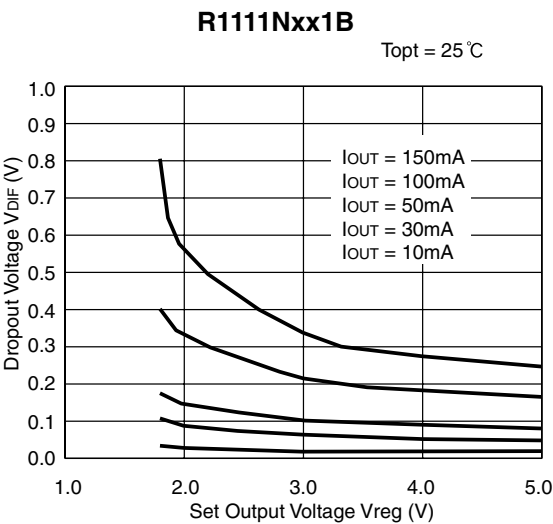
4) Output Voltage vs. Temperature
R1111N181B
 $V_{IN} = 2.8V$
 $I_{OUT} = 30mA$

R1111N301B
 $V_{IN} = 4.0V$
 $I_{OUT} = 30mA$

R1111N401B
 $V_{IN} = 5.0V$
 $I_{OUT} = 30mA$

R1111N501B
 $V_{IN} = 6.0V$
 $I_{OUT} = 30mA$

5) Supply Current vs. Input Voltage
R1111N181B
 $T_{top} = 25^{\circ}C$

R1111N301B
 $T_{top} = 25^{\circ}C$




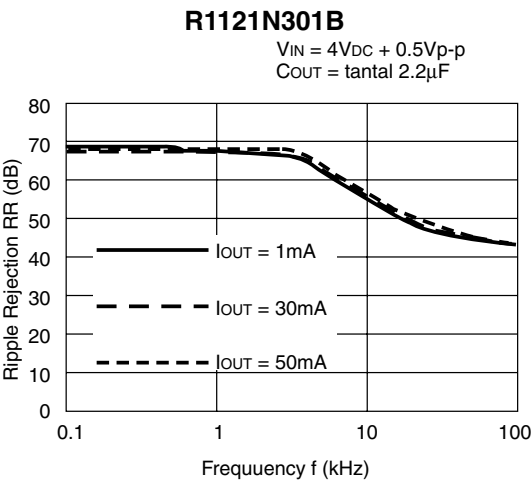
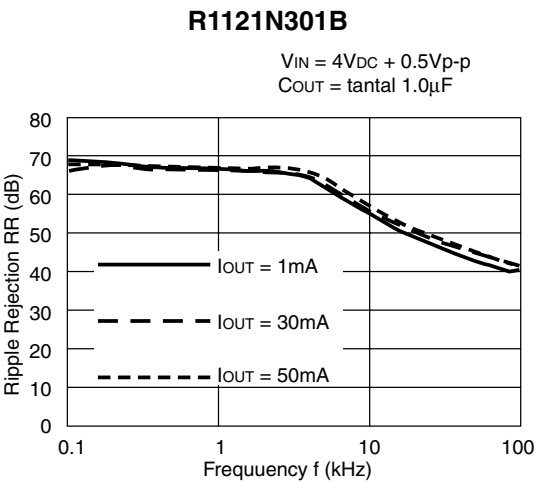
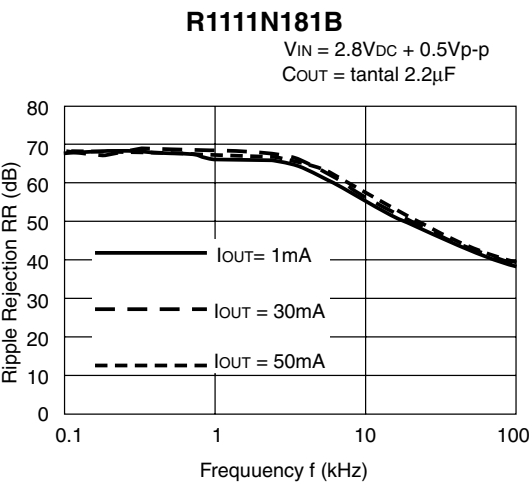
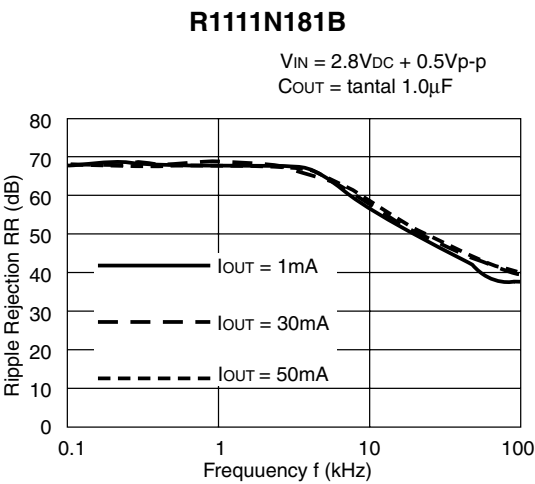
6) Supply Current vs. Temperature



7) Dropout Voltage vs. Set Output Voltage

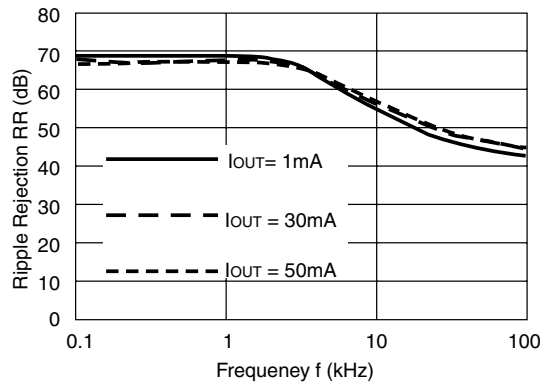


8) Ripple Rejection vs. Frequency

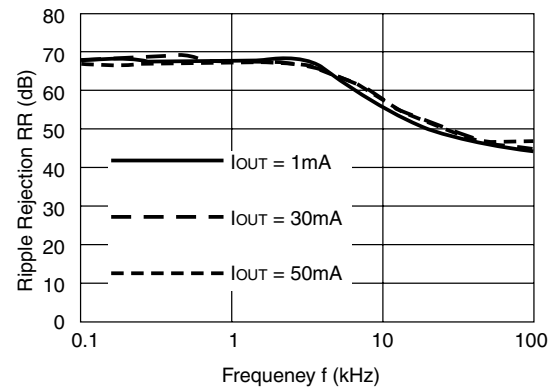


R1111N401B

$V_{IN} = 5.0V_{DC} + 0.5V_{p-p}$
 $C_{OUT} = \text{tantal } 1.0\mu F$

**R1111N401B**

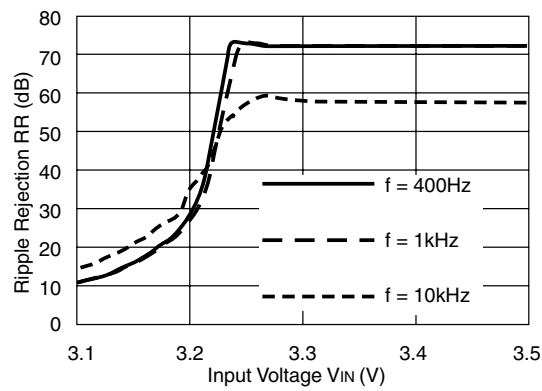
$V_{IN} = 5.0V_{DC} + 0.5V_{p-p}$
 $C_{OUT} = \text{tantal } 2.2\mu F$



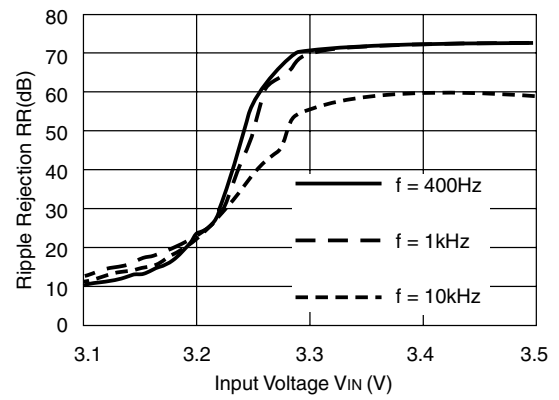
9) Ripple Rejection vs. Input Voltage (DC bias)

R1111N301B

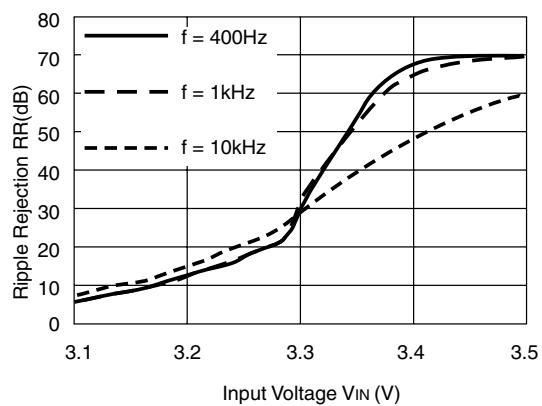
$I_{OUT} = 1mA$
 $C_{OUT} = 2.2\mu F$

**R1111N301B**

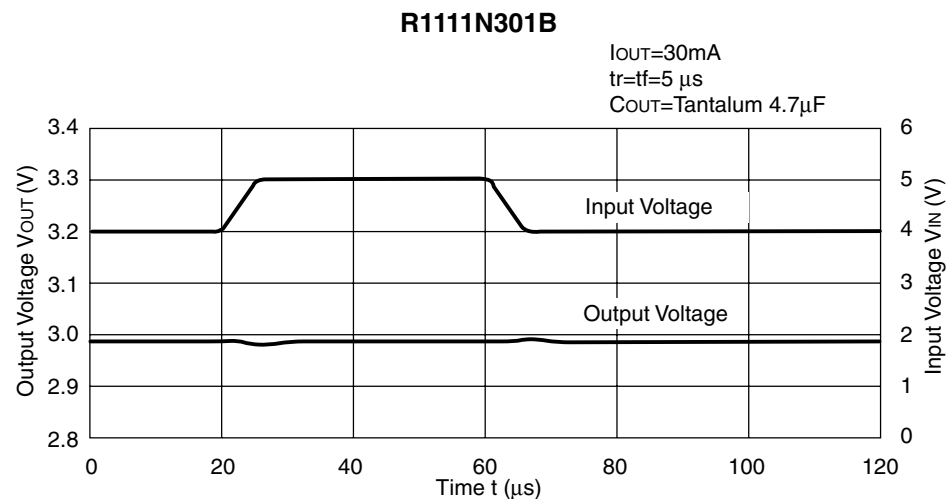
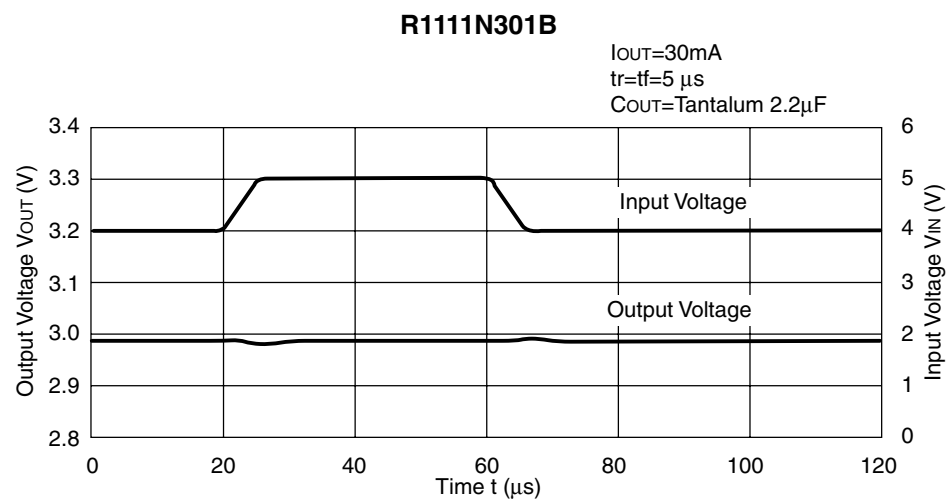
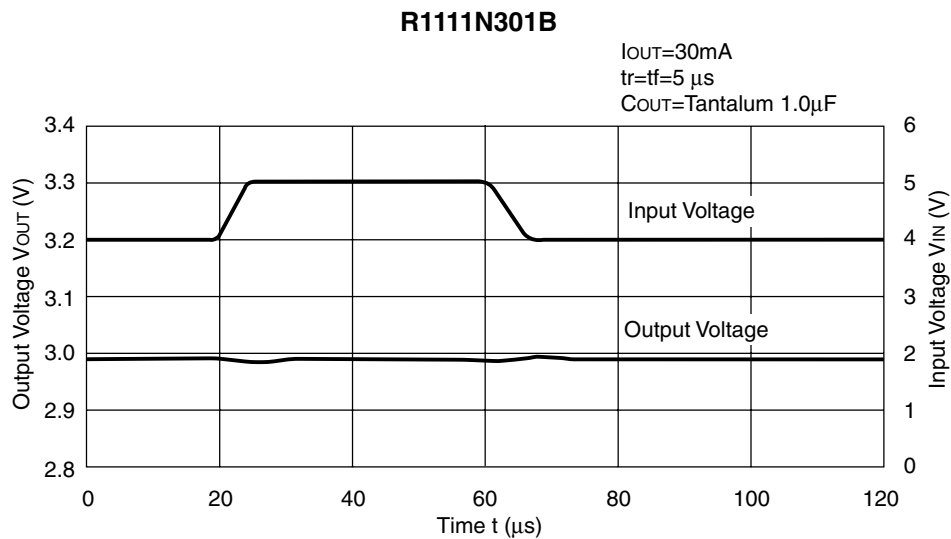
$I_{OUT} = 10mA$
 $C_{OUT} = 2.2\mu F$

**R1111N301B**

$I_{OUT} = 50mA$
 $C_{OUT} = 2.2\mu F$



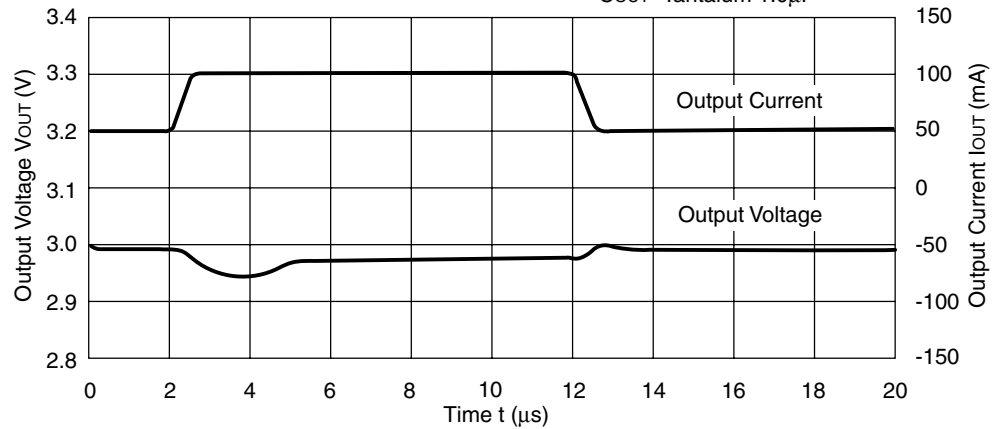
10) Line Transient Response



11) Load Transient Response

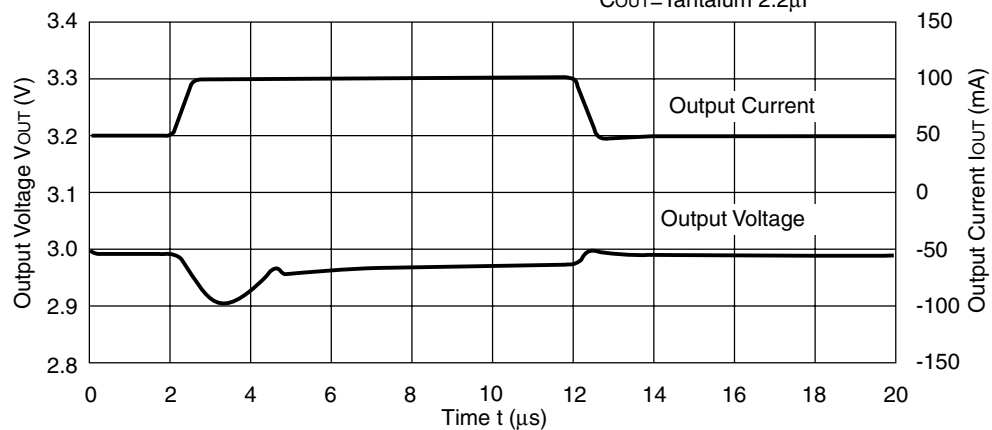
R1111N301B

$V_{IN}=4V$
 $C_{IN}=\text{Tantalum } 1\mu F$
 $C_{OUT}=\text{Tantalum } 1.0\mu F$



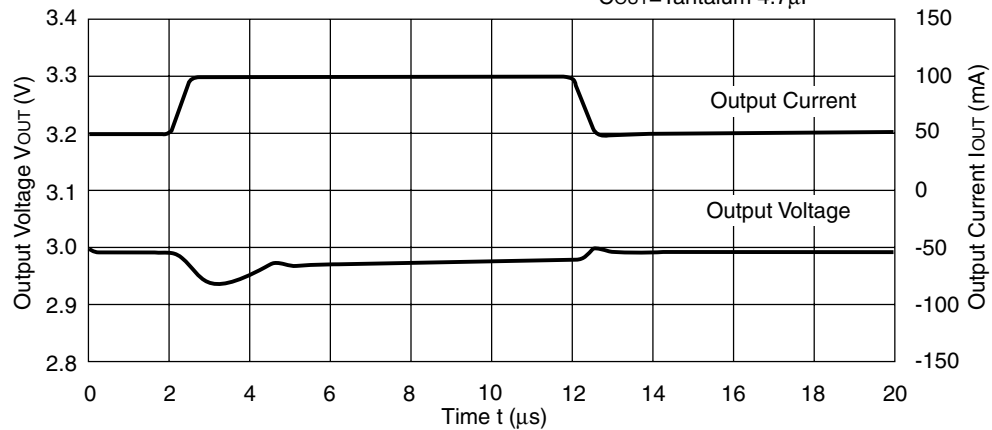
R1111N301B

$V_{IN}=4V$
 $C_{IN}=\text{Tantalum } 1\mu F$
 $C_{OUT}=\text{Tantalum } 2.2\mu F$



R1111N301B

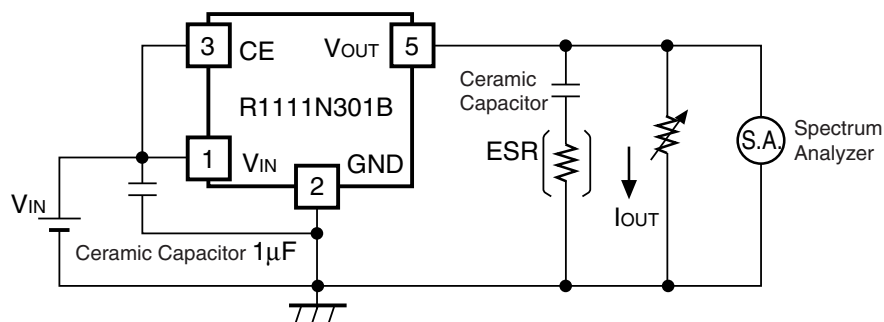
$V_{IN}=4V$
 $C_{IN}=\text{Tantalum } 1\mu F$
 $C_{OUT}=\text{Tantalum } 4.7\mu F$



TECHNICAL NOTES

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:



Measuring Circuit for white noise; R1111N301B

The relationship between I_{OUT} (output current) and ESR of output capacitor is shown in the graphs below. The conditions when the white noise level is under 40μV (Avg.) are indicated by the hatched area in the graph.

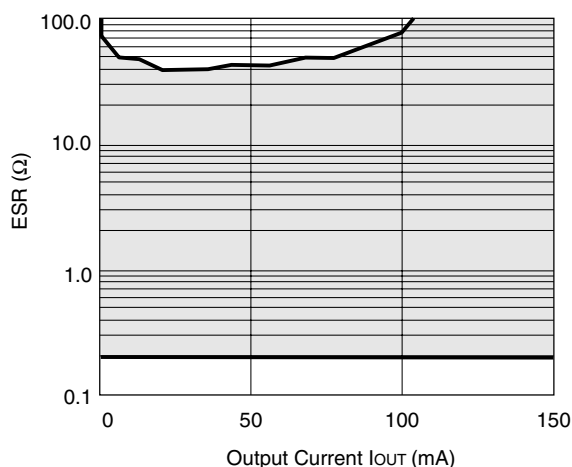
(note: When the additional ceramic capacitors are connected to the output pin with output capacitor for phase compensation, the operation might be unstable. Because of this, test these ICs with as the same external components as the ones to be used on the PCB.)

<measuring conditions>

- (1) $V_{IN}=4V$
- (2) Frequency band: 10Hz to 1MHz
- (3) Temperature: 25°C

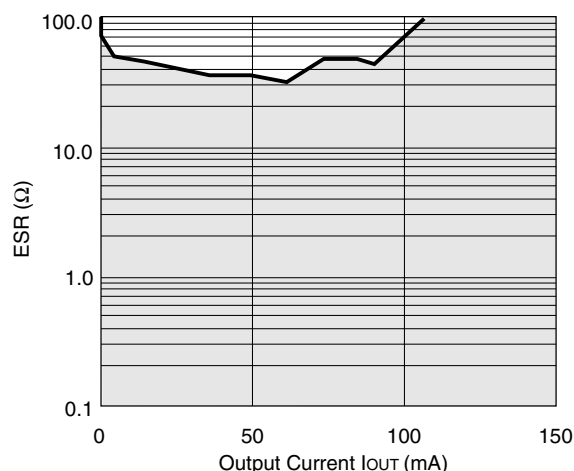
R1111N301B

Ceramic 1.0μF



R1111N301B

Ceramic 2.2μF



- Make V_{DD} and GND lines sufficient. If their impedance is high, noise pick up or incorrect operation may result.
- Connect the capacitor with a capacitance of $1\mu\text{F}$ or more between V_{DD} and GND 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.

TYPICAL APPLICATION

