

## 3-MODE 200mA LDO REGULATOR

NO.EA-083-0607

### OUTLINE

The R1160x Series consist of CMOS-based voltage regulator ICs with high output voltage accuracy, low supply current, and low ON-resistance. 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.

These ICs perform with low dropout voltage and a chip enable function. To prevent the destruction by over current, current limit circuit is included. The R1160x Series have 3-mode. One is standby mode with CE or standby control pin. Other two modes are realized with ECO pin™. Fast Transient Mode (FT mode) and Low Power Mode (LP mode) are alternative with ECO pin™. Consumption current is reduced to 1/10 at Low Power Mode compared with Fast Transient Mode. Output voltage is maintained between FT mode and LP mode.

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

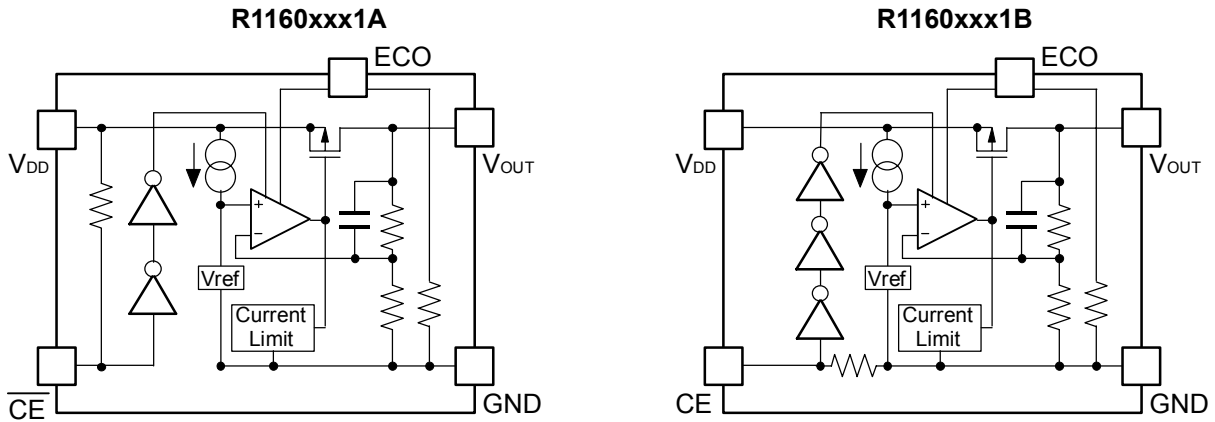
### FEATURES

- Ultra-Low Supply Current..... Typ. 3.5μA (Low Power Mode,  $V_{OUT} \leq 1.5V$ )  
Typ. 40μA (Fast Transient Mode)
- Standby Mode ..... Typ. 0.1μA
- Low Dropout Voltage..... Typ. 0.30V ( $I_{OUT}=200mA$  3.0V Output Voltage=1.0V Type)  
Typ. 0.20V ( $I_{OUT}=200mA$  3.0V Output Voltage=1.5V Type)  
Typ. 0.14V ( $I_{OUT}=200mA$  3.0V Output Voltage=3.0V Type)
- High Ripple Rejection ..... Typ. 70dB (f=1kHz, FT Mode)
- Low Temperature-Drift Coefficient of Output Voltage Typ.  $\pm 100ppm/^{\circ}C$
- Excellent Line Regulation ..... Typ. 0.05%/V
- High Output Voltage Accuracy .....  $\pm 2.0%$  ( $\pm 3.0%$  at LP Mode)
- Output Voltage ..... 0.8V to 3.3V
- Input Voltage ..... Min. 1.4V
- Built-in Fold Back Protection Circuit ..... Typ. 50mA (Current at short mode)
- Small Packages ..... SOT-23-5 (Super Mini-mold), SON-6

### 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 DIAGRAMS



## SELECTION GUIDE

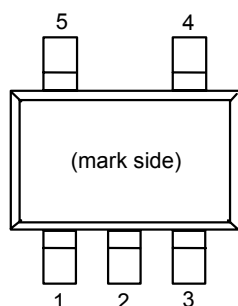
The output voltage, chip enable polarity, and the taping type for the ICs can be selected at the user's request. The selection can be available by designating the part number as shown below;

R1160xxx1x-xx-x ← Part Number  
 ↑ ↑ ↑ ↑ ↑  
 a b c d e

Code	Contents
a	Designation of Package Type : N: SOT-23-5 (Mini mold) D: SON-6
b	Setting Output Voltage ( $V_{OUT}$ ) : Stepwise setting with a step of 0.1V in the range of 0.8V to 3.3V is possible.
c	Designation of Chip Enable Option : A: "L" active type. B: "H" active type.
d	Designation of Taping Type : Refer to Taping Specifications; TR type is the standard direction.
e	Designation of composition of pin plating -F: Lead free plating (SOT-23-5,SON-6)

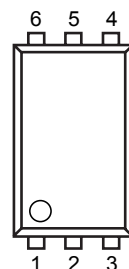
## PIN CONFIGURATION

SOT-23-5

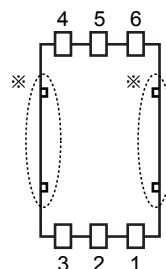


SON-6

Top View



Bottom View




## 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	ECO	MODE alternative pin
5	$V_{OUT}$	Output pin

### SON-6

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

\* Tab in the  parts have GND level.  
(They are connected to the reverse side of this IC.)  
Do not connect to other wires or land patterns.

## ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating	Unit
$V_{IN}$	Input Voltage	6.5	V
$V_{ECO}$	Input Voltage ( ECO Pin)	6.5	V
$V_{CE}$	Input Voltage ( $\overline{CE}$ or CE Pin)	6.5	V
$V_{OUT}$	Output Voltage	-0.3 ~ $V_{IN}+0.3$	V
$I_{OUT}$	Output Current	250	mA
$P_D$	Power Dissipation (SOT-23-5)*	420	mW
	Power Dissipation (SON-6)*	500	mW
$T_{opt}$	Operating Temperature Range	-40 ~ 85	°C
$T_{stg}$	Storage Temperature Range	-55 ~ 125	°C

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

## ELECTRICAL CHARACTERISTICS

## • R1160xxx1A

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, V <sub>ECO</sub> =V <sub>IN</sub> 1μA ≤ I <sub>OUT</sub> ≤ 30mA *1	×0.980 (-30mV)		×1.020 (30mV)	V
		V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, V <sub>ECO</sub> =GND 1μA ≤ I <sub>OUT</sub> ≤ 30mA *2	×0.970 (-45mV)		×1.030 (45mV)	V
I <sub>OUT</sub>	Output Current	V <sub>IN</sub> -V <sub>OUT</sub> =0.5V V <sub>IN</sub> ≥ 1.5V, V <sub>OUT</sub> ≤ 1.0V	200			mA
ΔV <sub>OUT</sub> /ΔI <sub>OUT</sub>	Load Regulation(FT Mode)	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, V <sub>ECO</sub> =V <sub>IN</sub> 1mA ≤ I <sub>OUT</sub> ≤ 200mA		20	40	mV
	Load Regulation(LP Mode)	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, V <sub>ECO</sub> =GND 1mA ≤ I <sub>OUT</sub> ≤ 100mA		10	40	mV
V <sub>DIF</sub>	Dropout Voltage	Refer to the ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE				
I <sub>SS1</sub>	Supply Current (FT Mode)	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V V <sub>ECO</sub> =V <sub>IN</sub> , I <sub>OUT</sub> =0mA		40	70	μA
I <sub>SS2</sub>	Supply Current (LP Mode)	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, I <sub>OUT</sub> =0mA V <sub>OUT</sub> ≤ 1.5V, V <sub>ECO</sub> =GND		3.5	6.0	μA
		V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, I <sub>OUT</sub> =0mA V <sub>OUT</sub> ≥ 1.6V, V <sub>ECO</sub> =GND		4.5	8.0	μA
I <sub>standby</sub>	Supply Current (Standby)	V <sub>IN</sub> =V <sub>CE</sub> =Set V <sub>OUT</sub> +1V V <sub>ECO</sub> =GND		0.1	1.0	μA
ΔV <sub>OUT</sub> /ΔV <sub>IN</sub>	Line Regulation (FT Mode)	Set V <sub>OUT</sub> +0.5V ≤ V <sub>IN</sub> ≤ 6.0V I <sub>OUT</sub> =30mA, V <sub>ECO</sub> =V <sub>IN</sub> ,		0.05	0.20	%/V
	Line Regulation (LP Mode)	Set V <sub>OUT</sub> +0.5V ≤ V <sub>IN</sub> ≤ 6.0V I <sub>OUT</sub> =30mA, V <sub>ECO</sub> =GND		0.10	0.30	%/V
RR	Ripple Rejection (FT Mode)	f=1kHz, Ripple 0.2Vp-p V <sub>IN</sub> =Set V <sub>OUT</sub> +1V I <sub>OUT</sub> =30mA, V <sub>ECO</sub> =V <sub>IN</sub>		70		dB
V <sub>IN</sub>	Input Voltage		1.4		6.0	V
ΔV <sub>OUT</sub> /ΔT <sub>opt</sub>	Output Voltage Temperature Coefficient	I <sub>OUT</sub> =30mA -40°C ≤ T <sub>opt</sub> ≤ 85°C		±100		ppm/°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		2.0	5.0	14.0	MΩ
R <sub>PD</sub>	ECO Pull-down Resistance		1.5	5.0	14.0	MΩ
V <sub>CEH</sub>	$\overline{\text{CE}}$ , ECO Input Voltage "H"		1.0		6.0	V
V <sub>CEL</sub>	$\overline{\text{CE}}$ , ECO Input Voltage "L"		0.0		0.3	V

\*1 : ±30mV Tolerance for V<sub>OUT</sub> ≤ 1.5V\*2 : ±45mV Tolerance for V<sub>OUT</sub> ≤ 1.5V

## ● R1160xxx1B

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, V <sub>ECO</sub> =V <sub>IN</sub> 1μA ≤ I <sub>OUT</sub> ≤ 30mA *1	×0.980 (-30mV)		×1.020 (30mV)	V
		V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, V <sub>ECO</sub> =GND 1μA ≤ I <sub>OUT</sub> ≤ 30mA *2	×0.970 (-45mV)		×1.030 (45mV)	V
I <sub>OUT</sub>	Output Current	V <sub>IN</sub> -V <sub>OUT</sub> =0.5V V <sub>IN</sub> ≥ 1.5V, V <sub>OUT</sub> ≤ 1.0V	200			mA
ΔV <sub>OUT</sub> /ΔI <sub>OUT</sub>	Load Regulation(FT Mode)	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, V <sub>ECO</sub> =V <sub>IN</sub> 1mA ≤ I <sub>OUT</sub> ≤ 200mA		20	40	mV
	Load Regulation(LP Mode)	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, V <sub>ECO</sub> =GND 1mA ≤ I <sub>OUT</sub> ≤ 100mA		10	40	mV
V <sub>DIF</sub>	Dropout Voltage	Refer to the ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE				
I <sub>SS1</sub>	Supply Current (FT Mode)	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V V <sub>ECO</sub> =V <sub>IN</sub> , I <sub>OUT</sub> =0mA		40	70	μA
I <sub>SS2</sub>	Supply Current (LP Mode)	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, I <sub>OUT</sub> =0mA V <sub>OUT</sub> ≤ 1.5V, V <sub>ECO</sub> =GND		3.5	6.0	μA
		V <sub>IN</sub> =Set V <sub>OUT</sub> +1V, I <sub>OUT</sub> =0mA V <sub>OUT</sub> ≥ 1.6V, V <sub>ECO</sub> =GND		4.5	8.0	μA
I <sub>standby</sub>	Supply Current (Standby)	V <sub>IN</sub> =Set V <sub>OUT</sub> +1V V <sub>CE</sub> =GND, V <sub>ECO</sub> =GND		0.1	1.0	μA
ΔV <sub>OUT</sub> /ΔV <sub>IN</sub>	Line Regulation (FT Mode)	Set V <sub>OUT</sub> +0.5V ≤ V <sub>IN</sub> ≤ 6.0V I <sub>OUT</sub> =30mA, V <sub>ECO</sub> =V <sub>IN</sub> ,		0.05	0.20	%/V
	Line Regulation (LP Mode)	Set V <sub>OUT</sub> +0.5V ≤ V <sub>IN</sub> ≤ 6.0V I <sub>OUT</sub> =30mA, V <sub>ECO</sub> =GND		0.10	0.30	%/V
RR	Ripple Rejection (FT Mode)	f=1kHz, Ripple 0.2Vp-p V <sub>IN</sub> =Set V <sub>OUT</sub> +1V I <sub>OUT</sub> =30mA, V <sub>ECO</sub> =V <sub>IN</sub>		70		dB
V <sub>IN</sub>	Input Voltage		1.4		6.0	V
ΔV <sub>OUT</sub> /ΔT <sub>opt</sub>	Output Voltage Temperature Coefficient	I <sub>OUT</sub> =30mA -40°C ≤ T <sub>opt</sub> ≤ 85°C		±100		ppm/°C
I <sub>lim</sub>	Short Current Limit	V <sub>OUT</sub> =0V		50		mA
R <sub>PDCE</sub>	CE Pull-down Resistance		2.0	5.0	14.0	MΩ
R <sub>PDE</sub>	ECO Pull-down Resistance		1.5	5.0	14.0	MΩ
V <sub>CEH</sub>	CE, ECO Input Voltage "H"		1.0		6.0	V
V <sub>CEL</sub>	CE, ECO Input Voltage "L"		0.0		0.3	V

\*1 : ±30mV Tolerance for V<sub>OUT</sub> ≤ 1.5V\*2 : ±45mV Tolerance for V<sub>OUT</sub> ≤ 1.5V

• ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE

T<sub>opt</sub>=25°C

Output Voltage V <sub>OUT</sub> (V)	Dropout Voltage V <sub>DIF</sub> (V)		
	Condition	Typ.	Max.
0.8 ≤ V <sub>OUT</sub> < 0.9	I <sub>OUT</sub> =200mA	0.40	0.70
1.0 ≤ V <sub>OUT</sub> < 1.4		0.30	0.50
1.5 ≤ V <sub>OUT</sub> < 2.5		0.20	0.30
2.6 ≤ V <sub>OUT</sub>		0.20 (V <sub>ECO</sub> ="H") 0.25 (V <sub>ECO</sub> ="L")	

TEST CIRCUITS

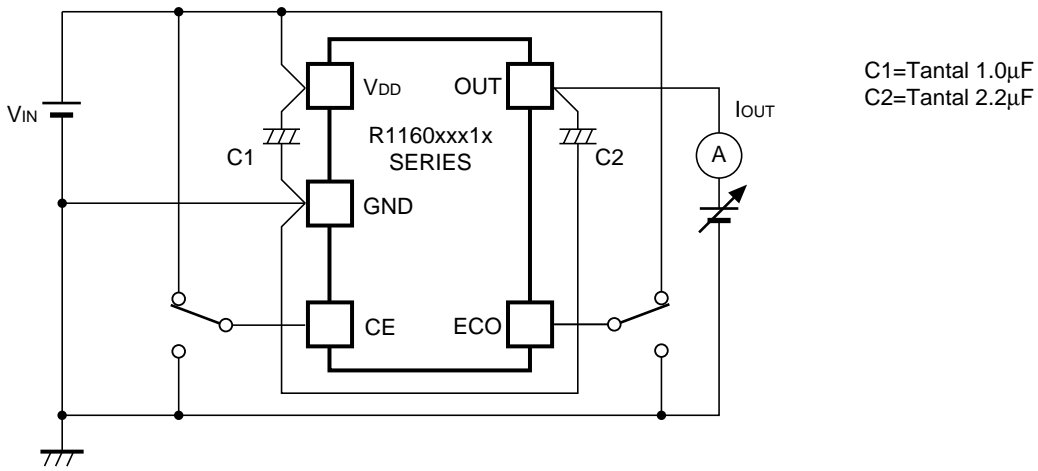


Fig.1 Output Voltage vs. Output Current Test Circuit

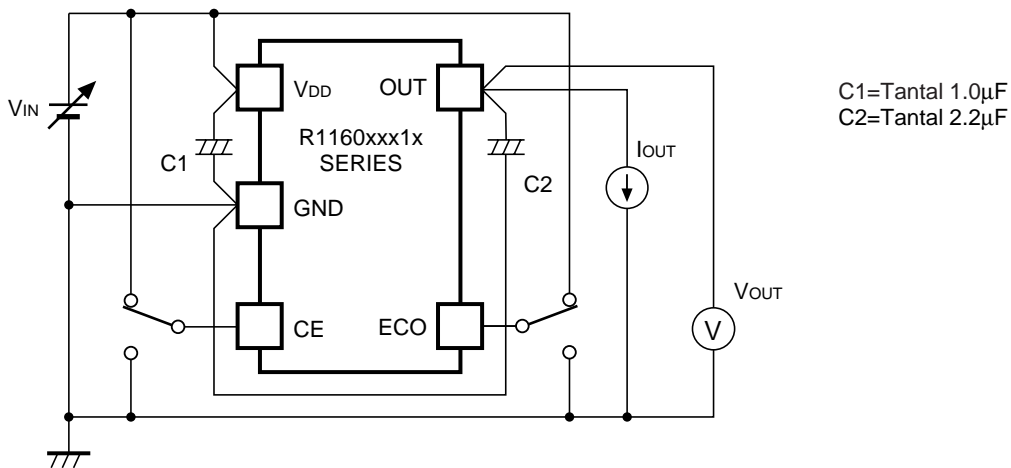


Fig.2 Output Voltage vs. Input Voltage Test Circuit

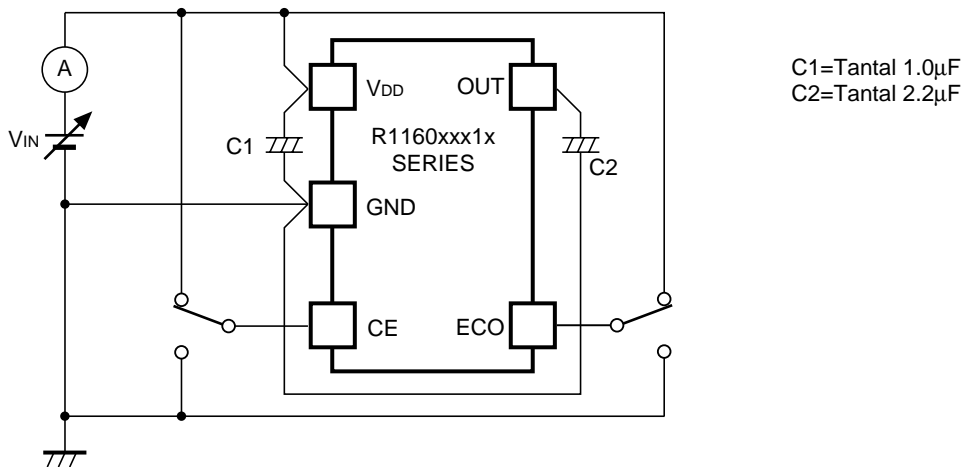


Fig.3 Supply Current vs. Input Voltage Test Circuit

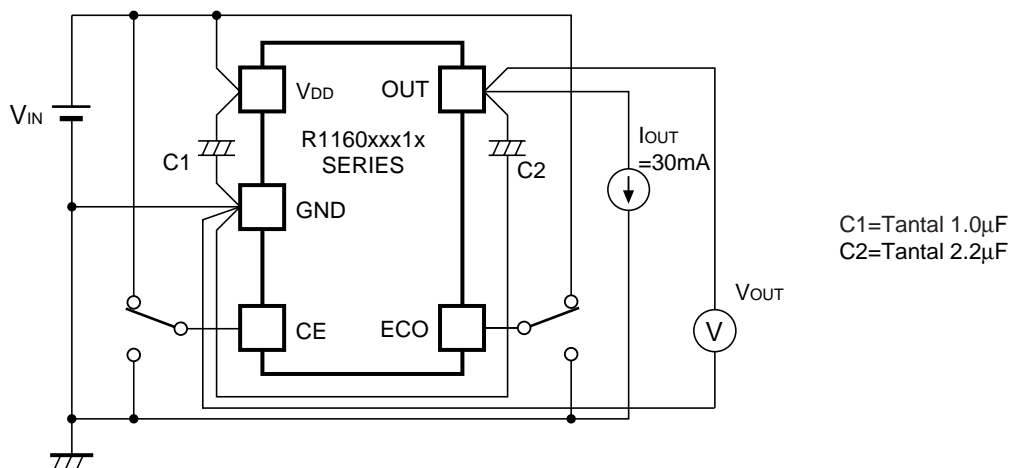


Fig.4 Output Voltage vs. Temperature Test Circuit

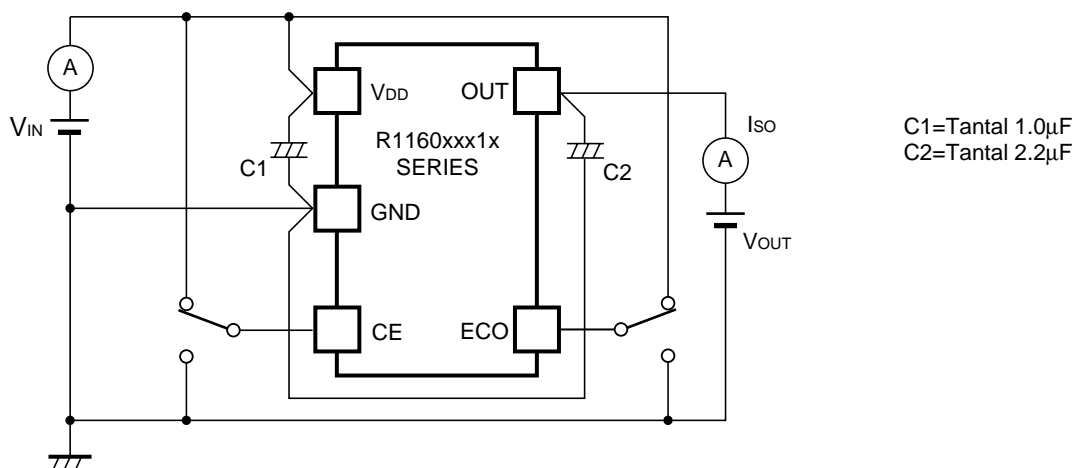


Fig.5 Supply Current vs. Temperature Test Circuit

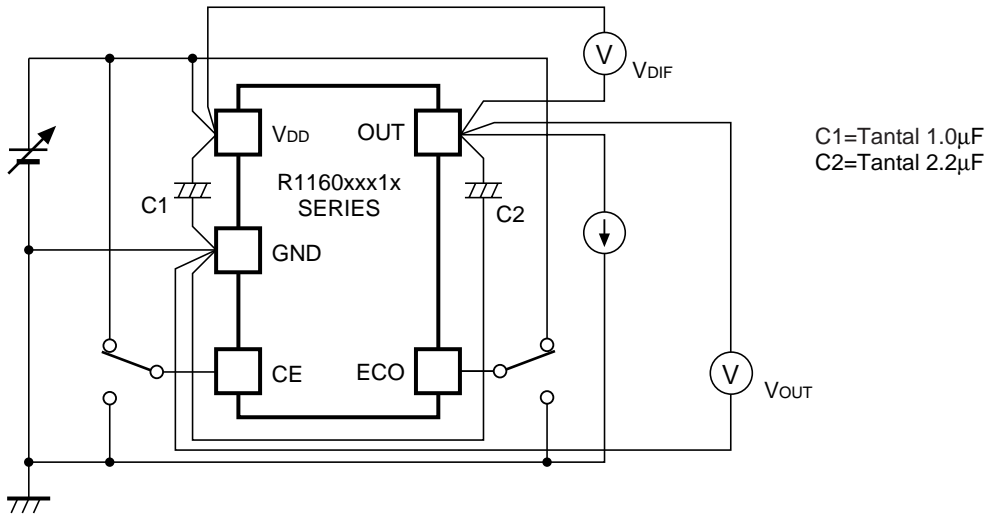


Fig. 6 Dropout Voltage vs. Output Current/ Set Output Voltage Test Circuit

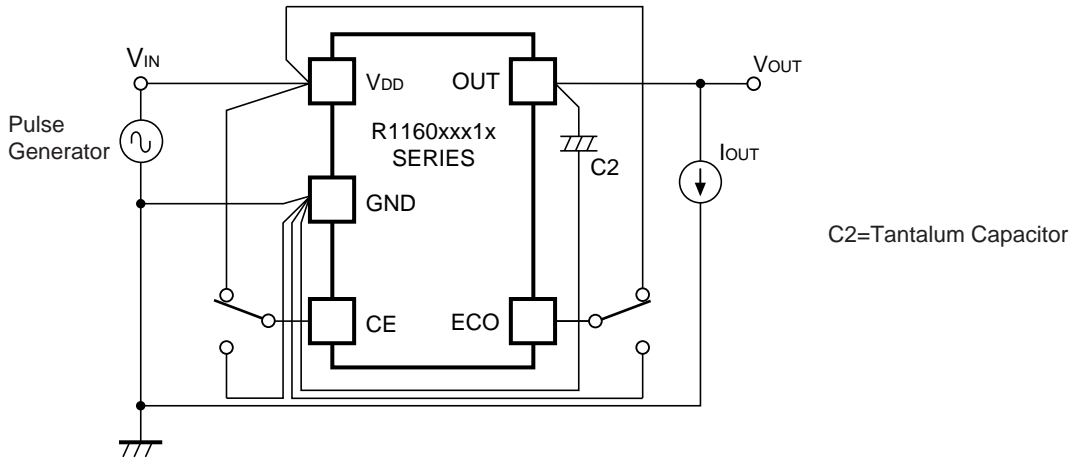


Fig. 7 Ripple Rejection Test Circuit

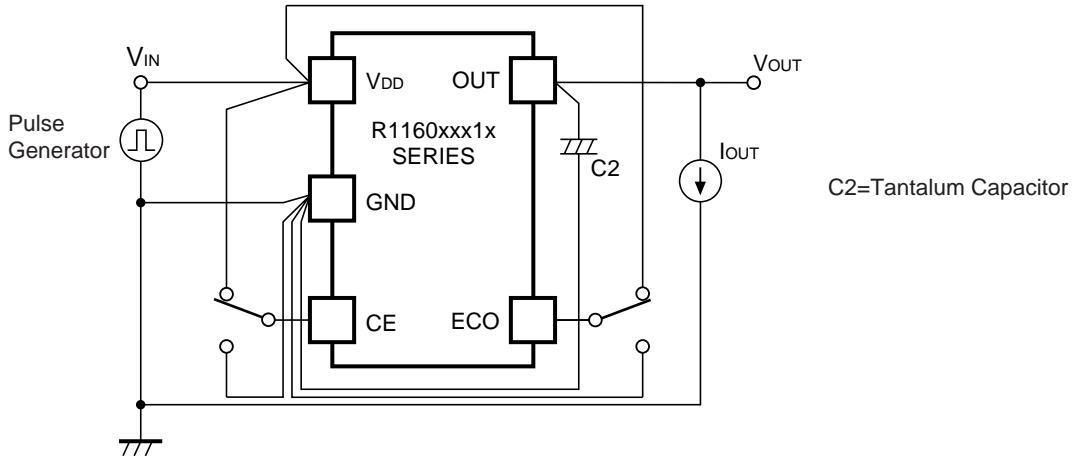
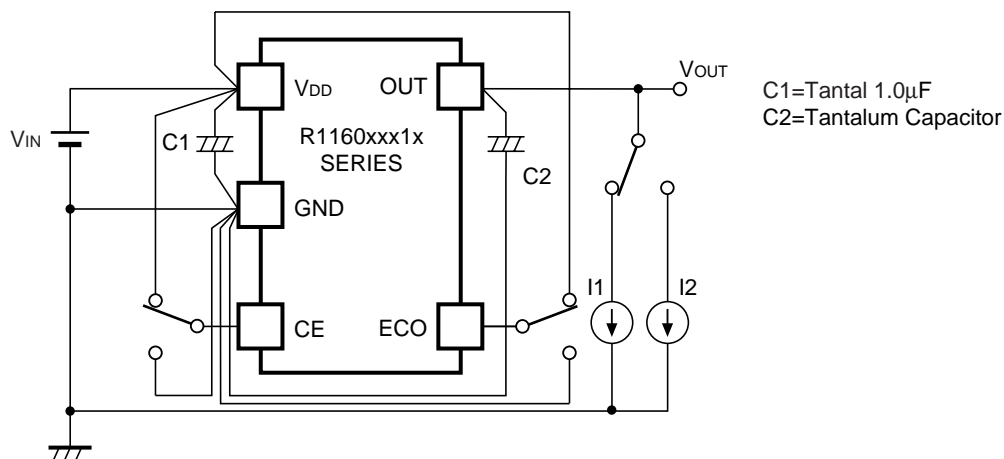
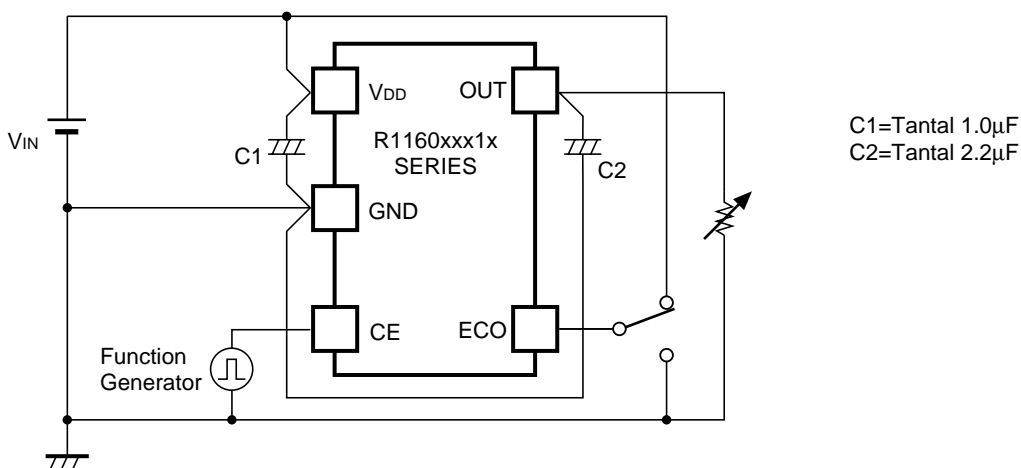


Fig.8 Input Transient Response Test Circuit

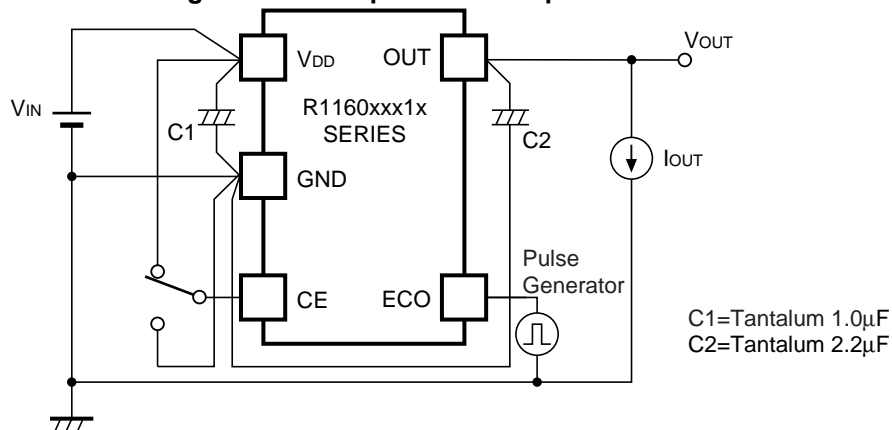




**Fig.9 Load Transient Response Test Circuit**



**Fig.10 Turn on Speed with CE pin Test Circuit**



**Fig.11 MODE Transient Response Test Circuit**

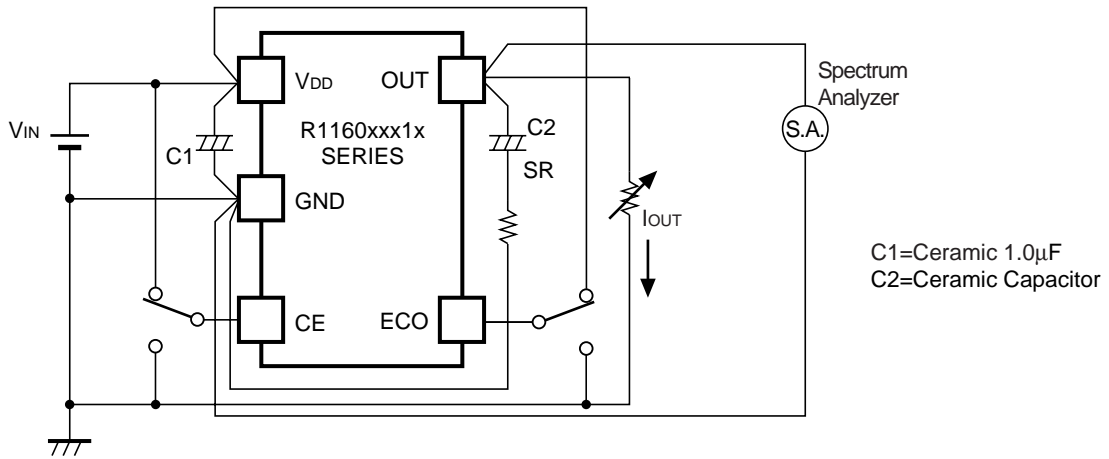
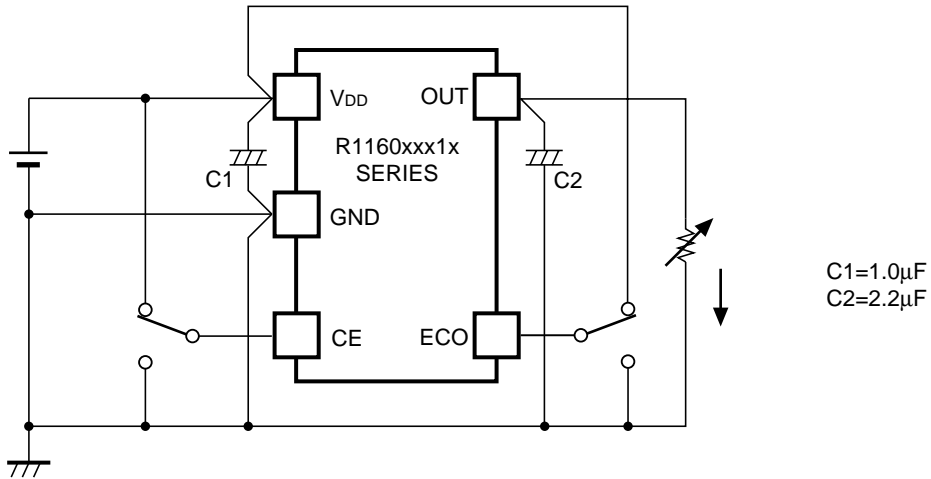


Fig.12 Output Noise Test Circuit (  $I_{out}$  vs. ESR )

**TYPICAL APPLICATION**

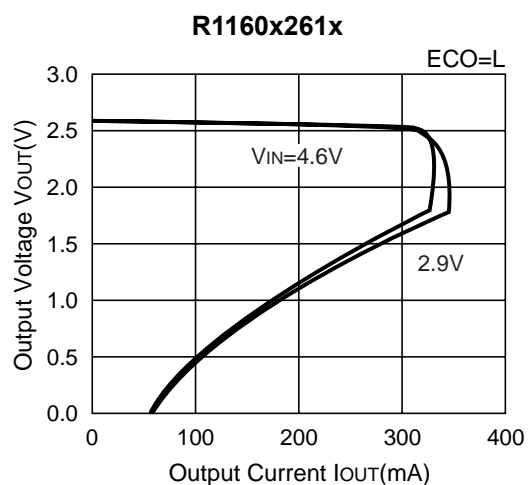
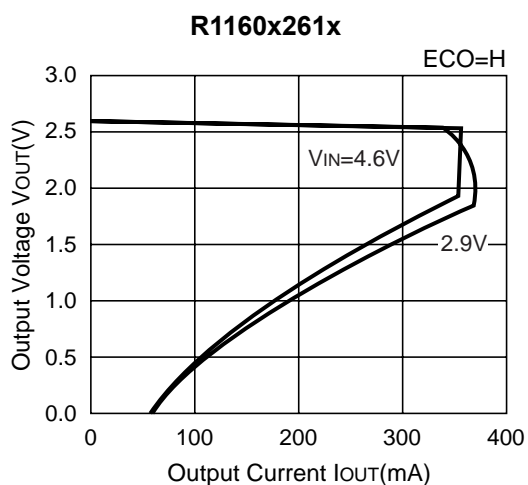
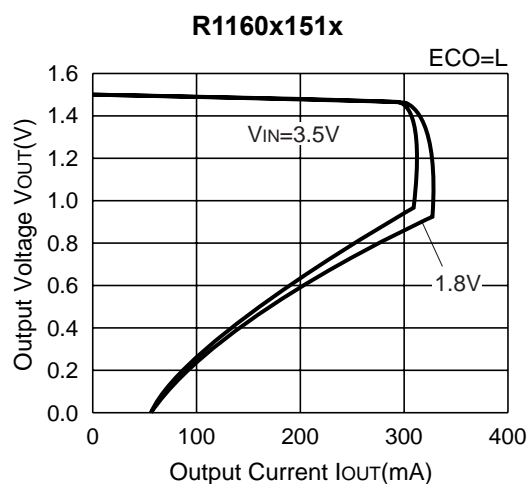
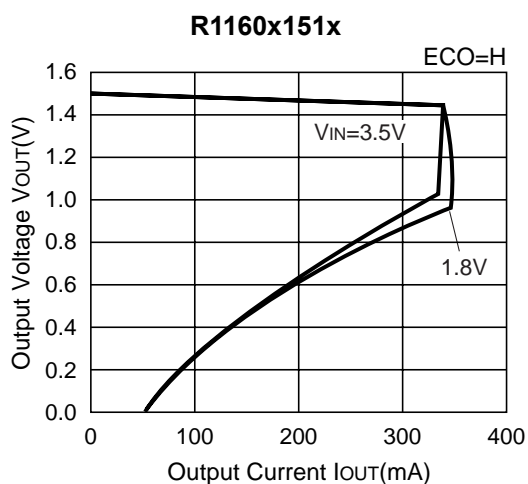
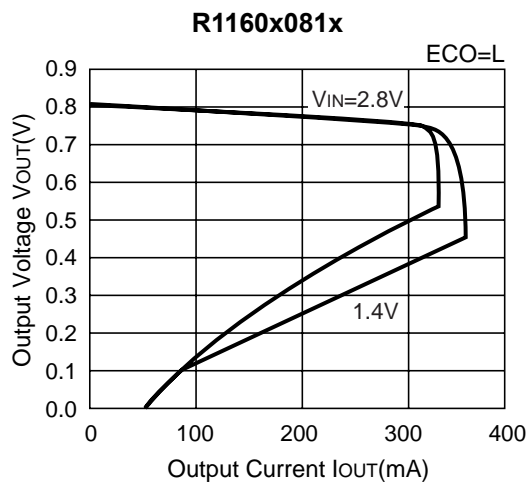
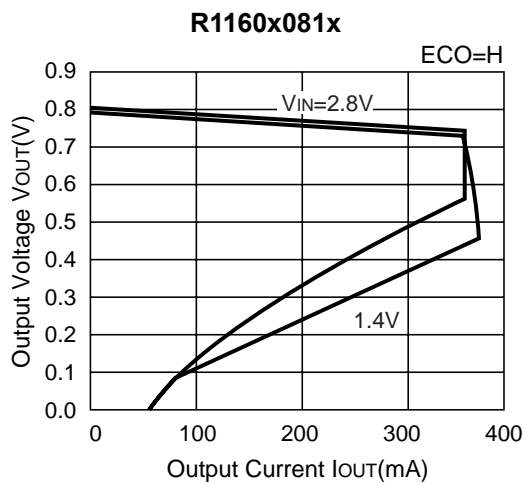


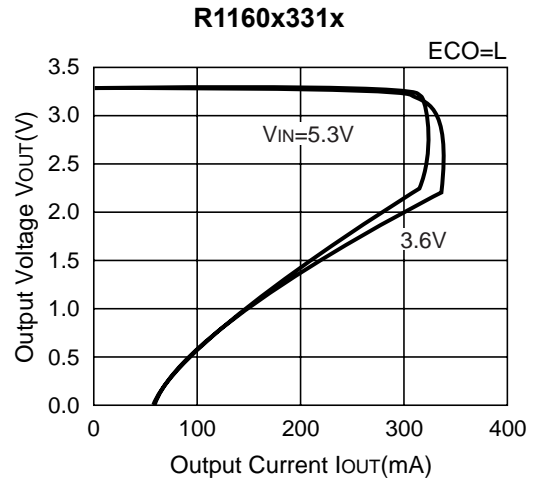
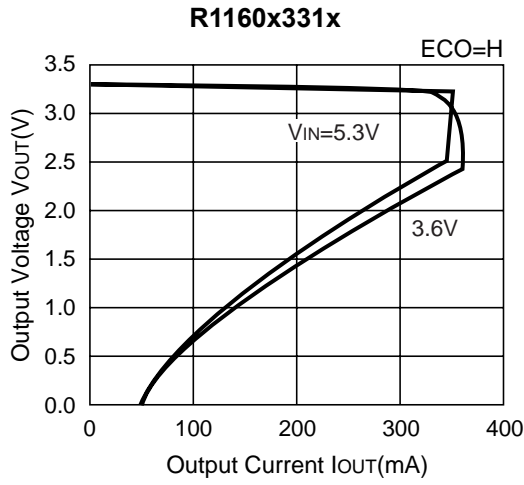
(External Components)

- C1: Ceramic Capacitor 1 $\mu$ F
- C2: Tantalum Capacitor 2.2 $\mu$ F

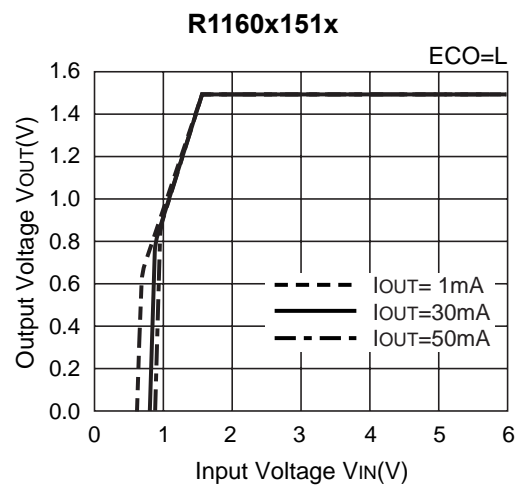
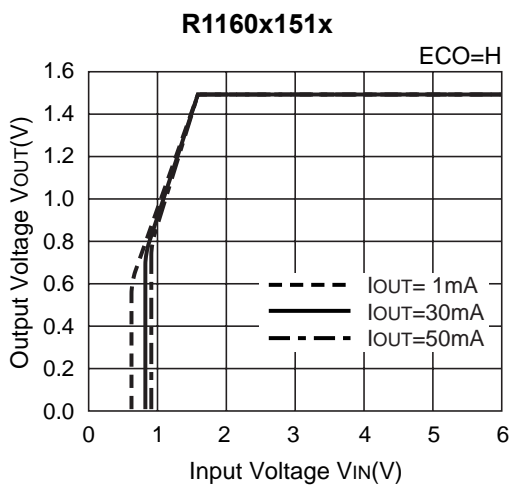
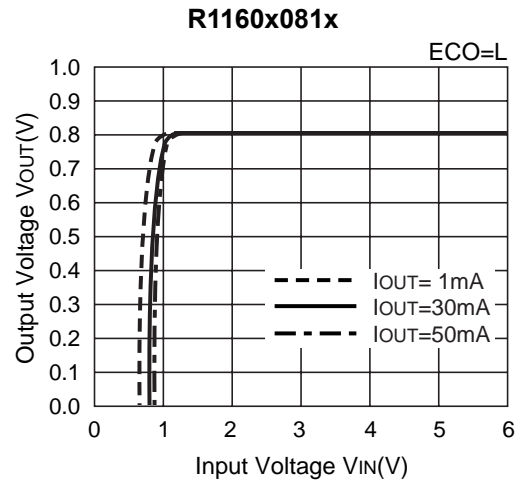
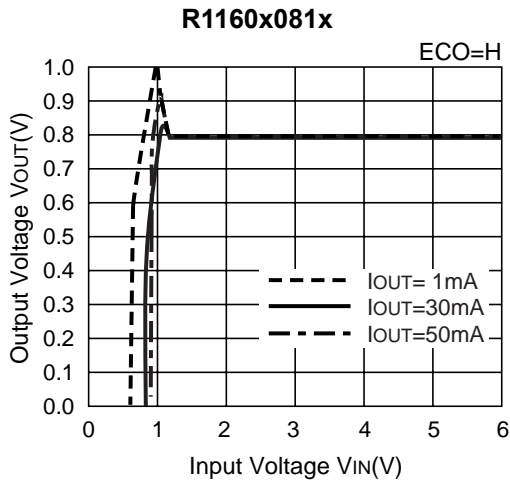
## TYPICAL CHARACTERISTICS

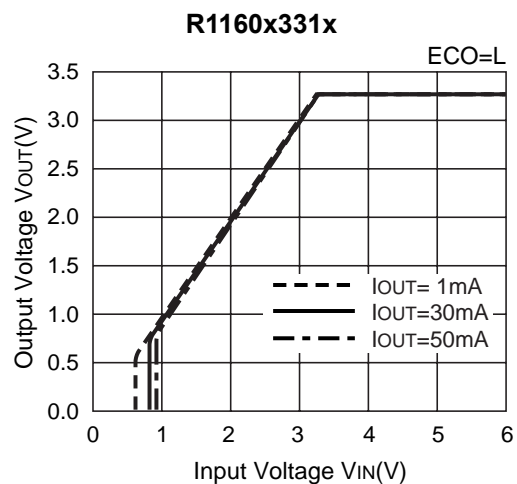
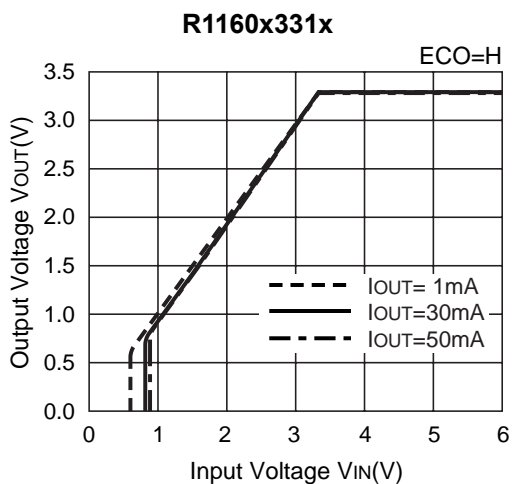
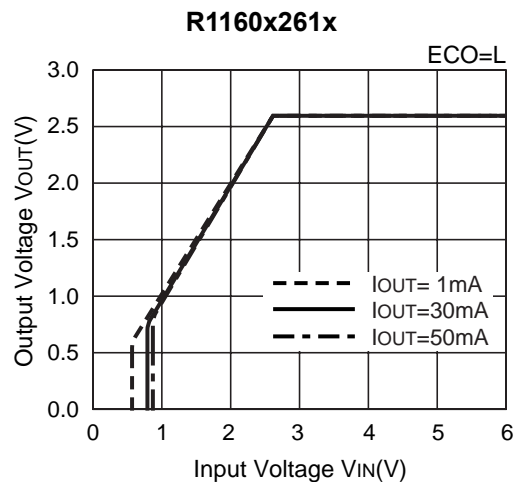
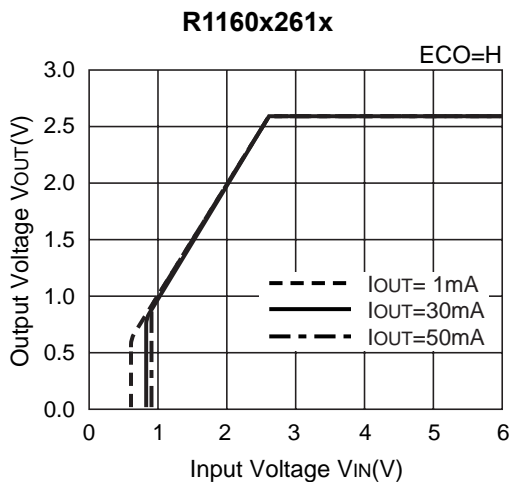
### 1) Output Voltage vs. Output Current



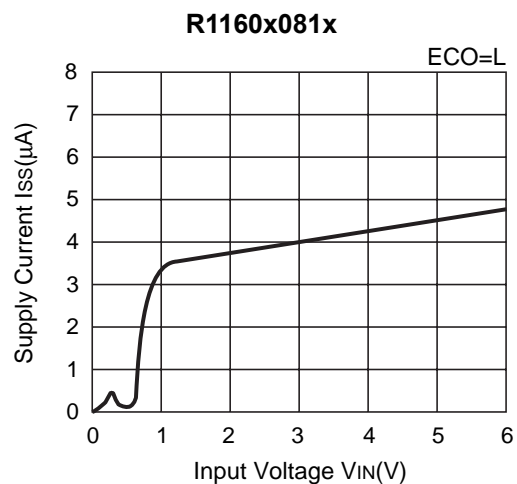
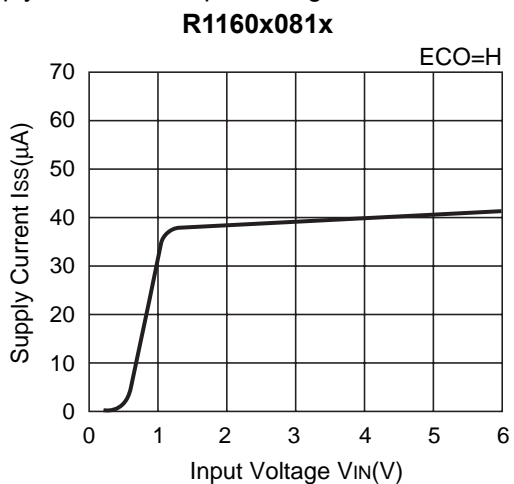


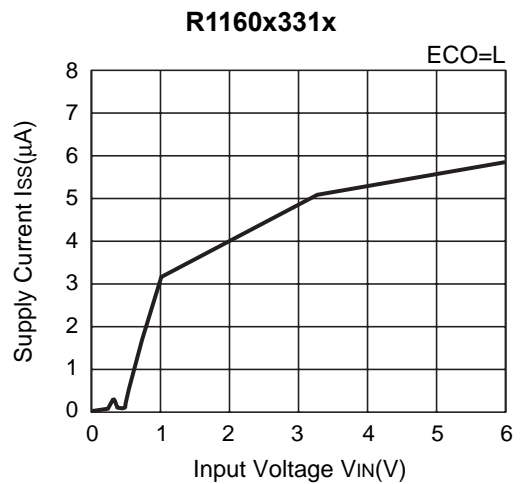
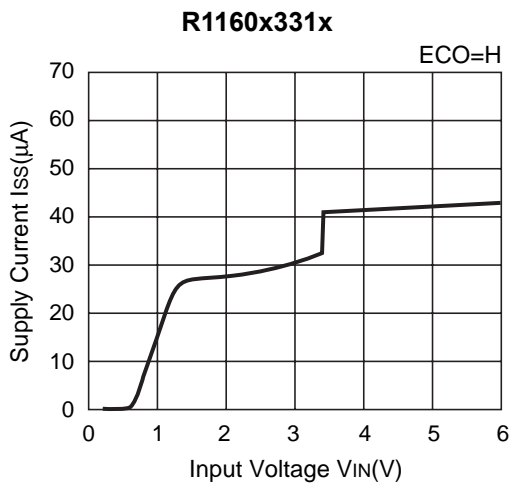
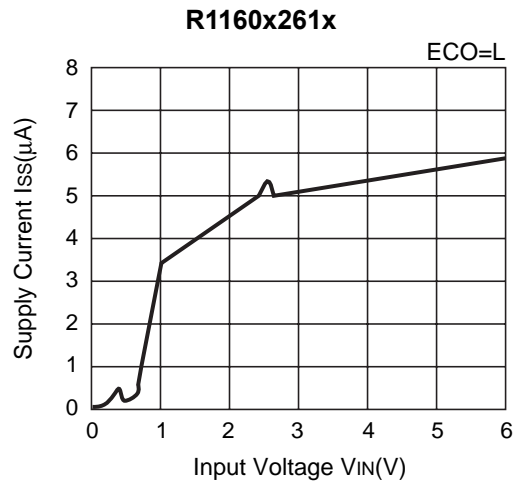
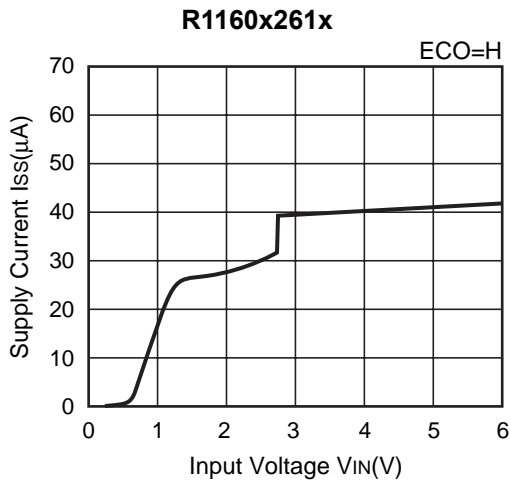
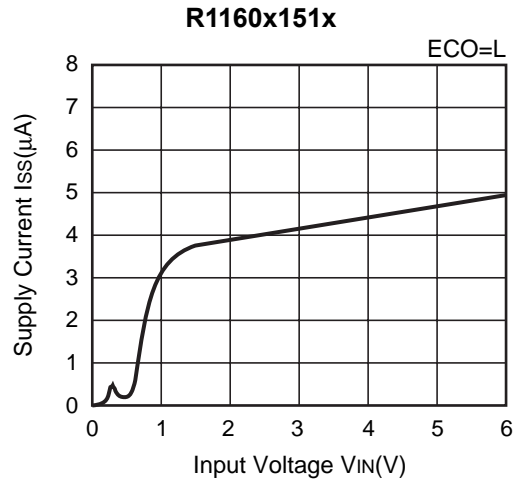
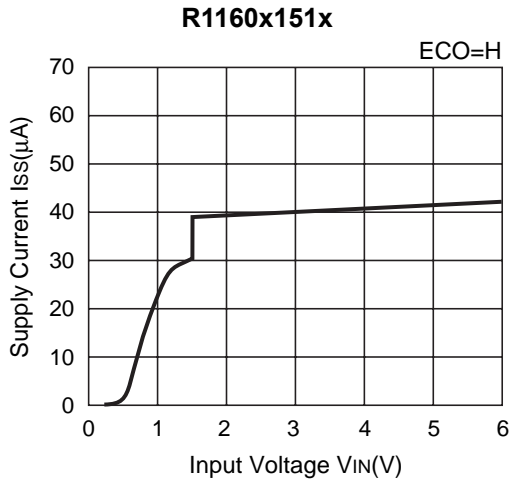
2) Output Voltage vs. Input Voltage



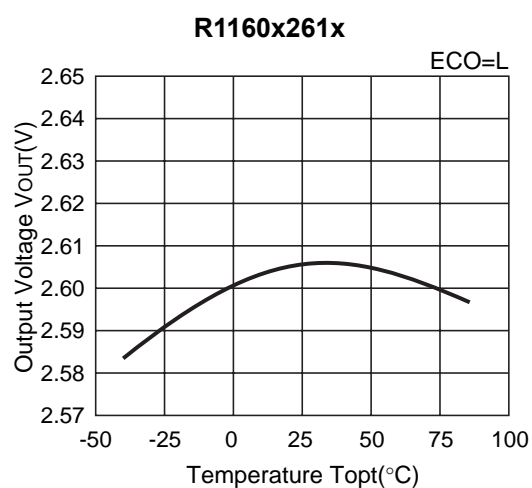
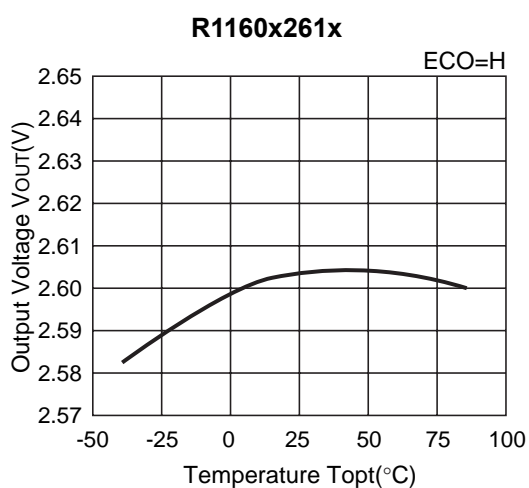
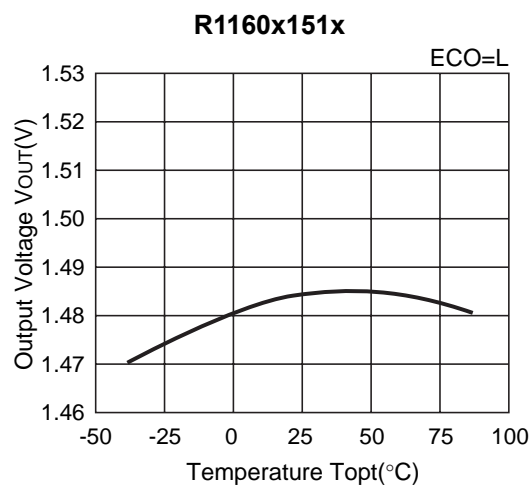
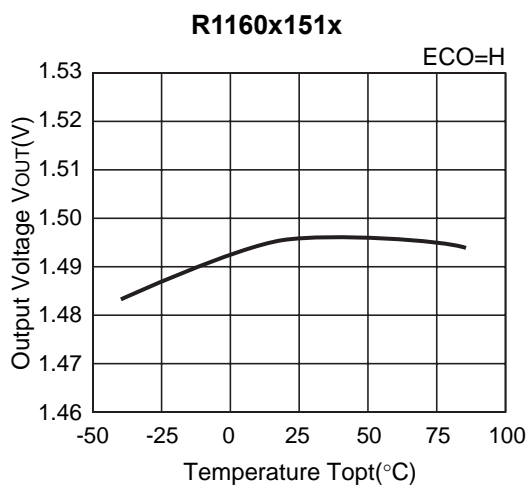
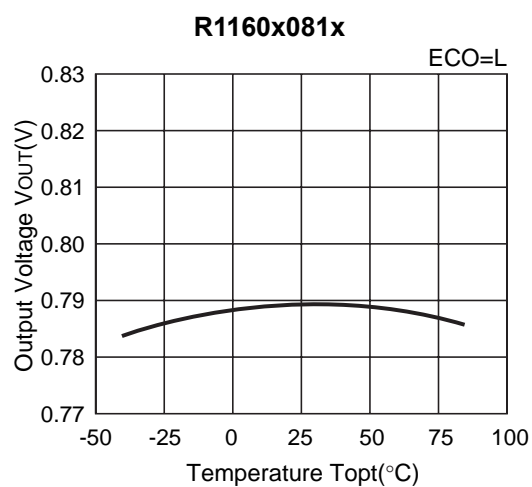
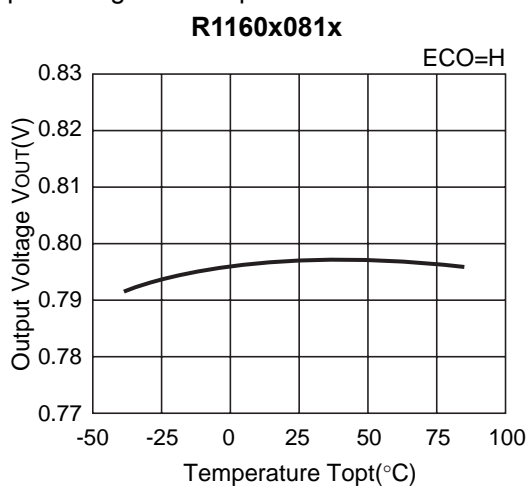


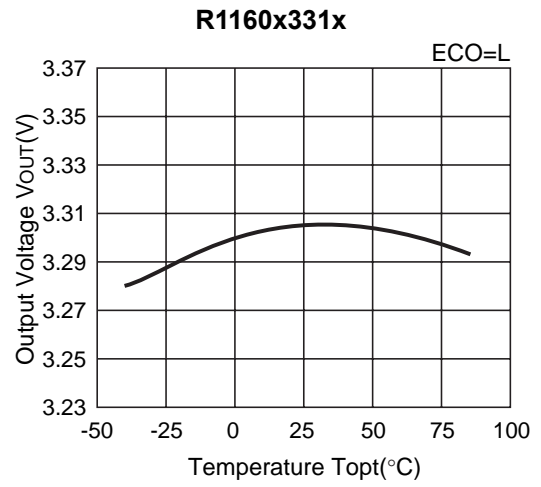
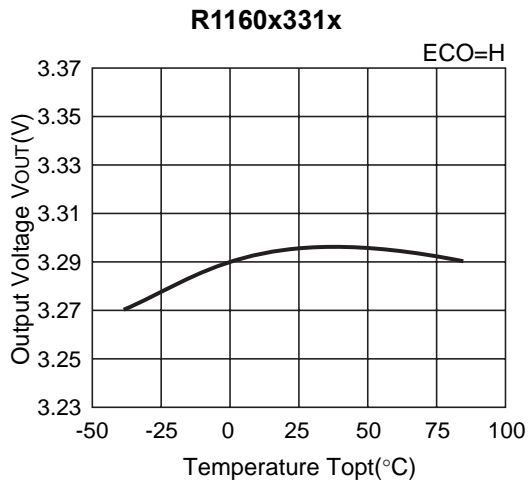
3) Supply Current vs. Input Voltage



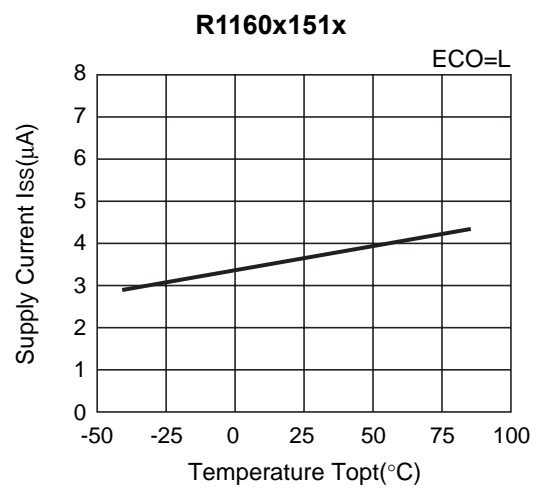
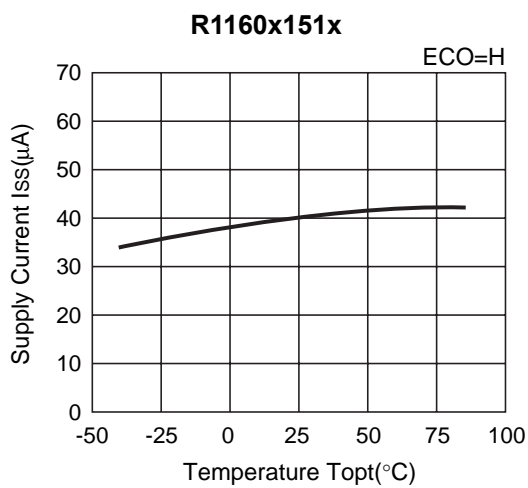
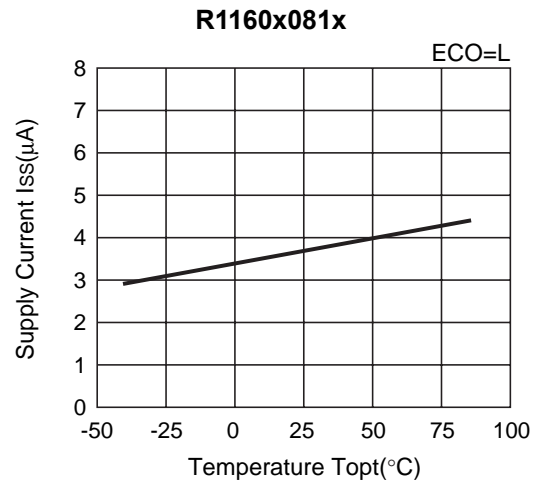
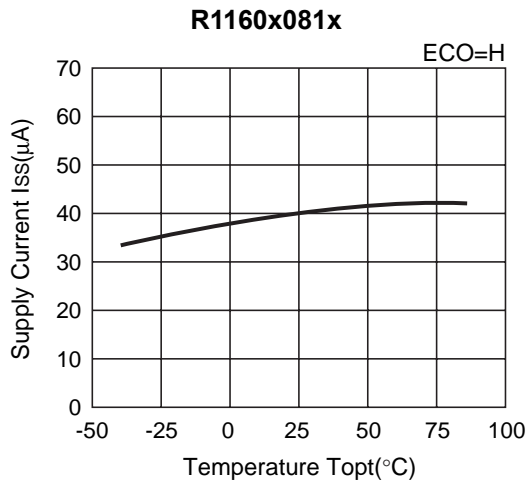


## 4) Output Voltage vs. Temperature

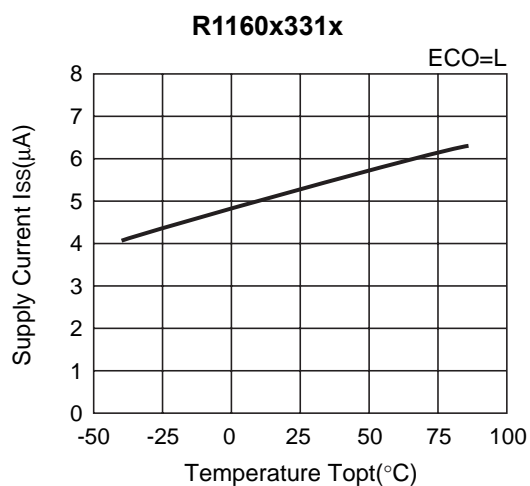
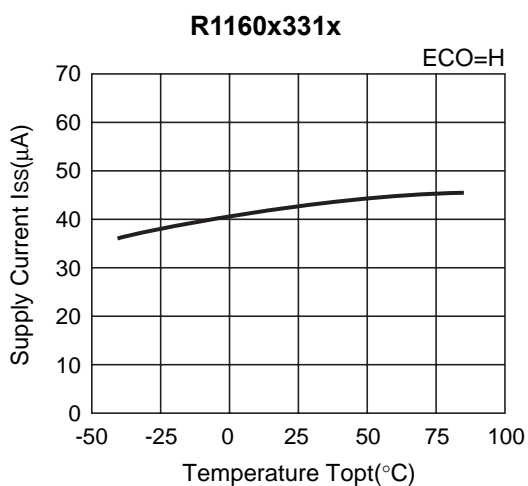
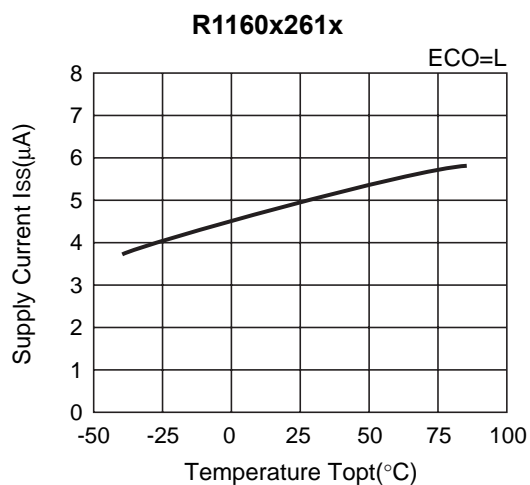
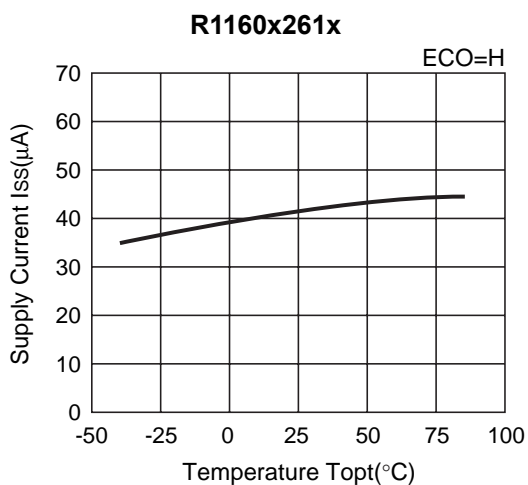




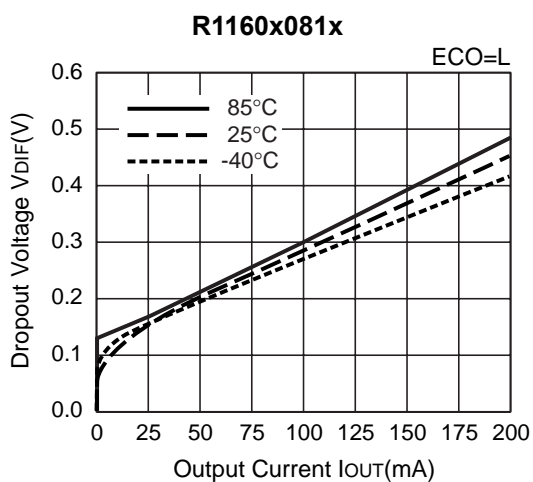
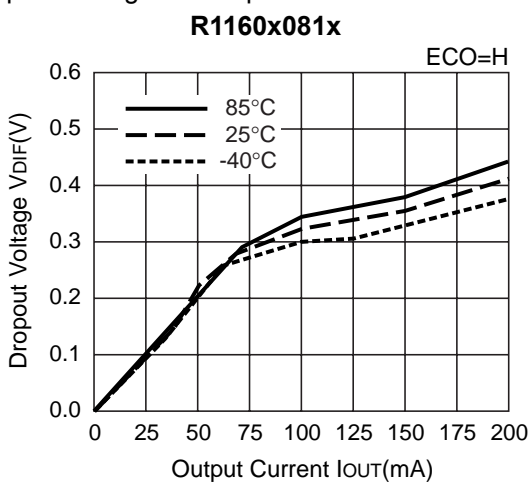
5) Supply Current vs. Input Voltage

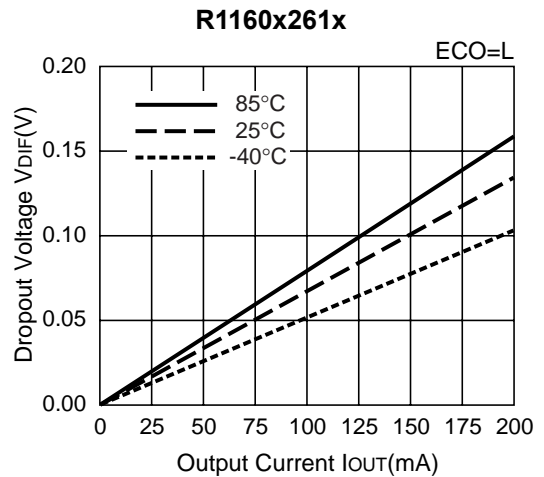
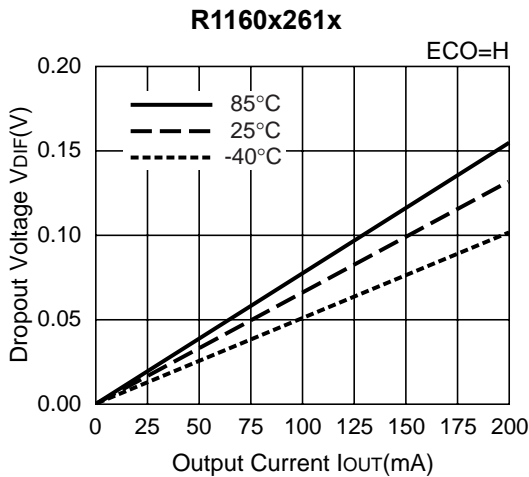
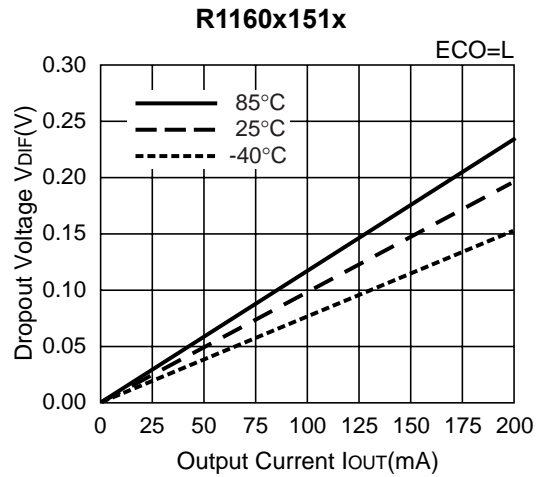
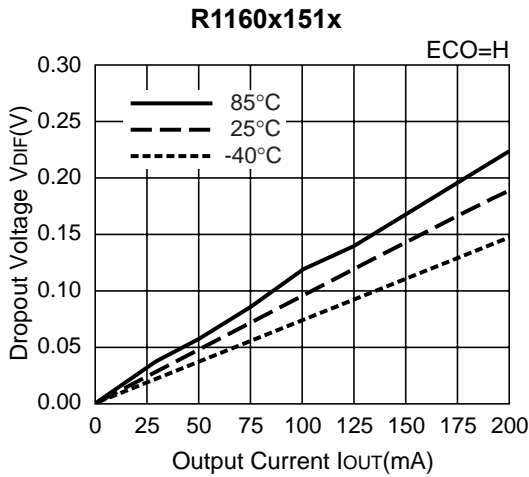
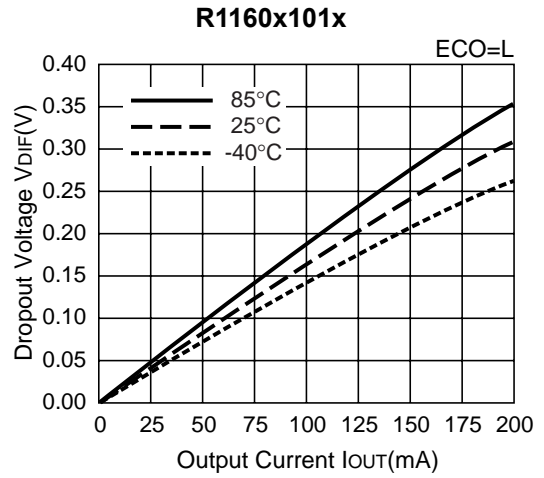
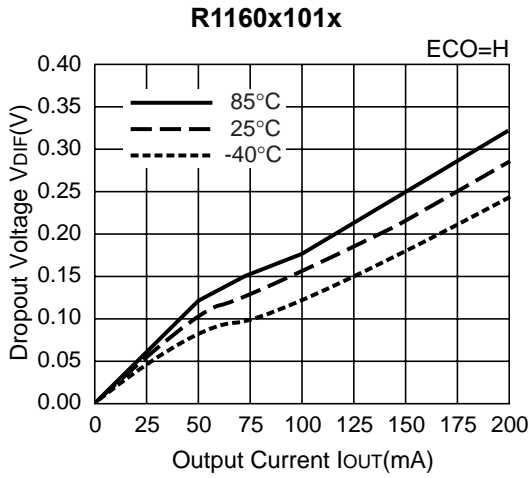


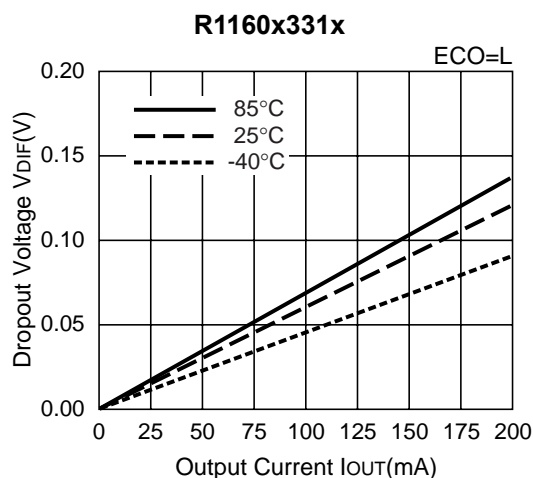
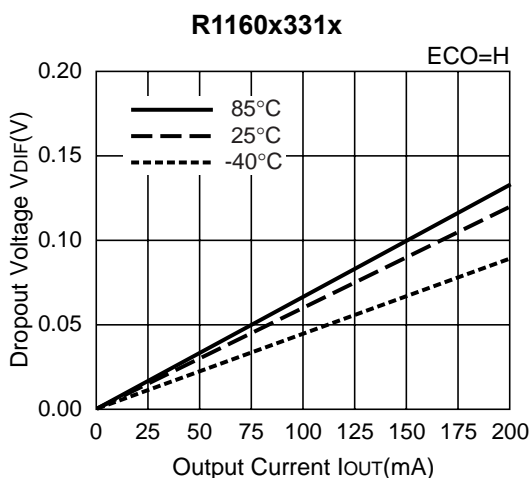




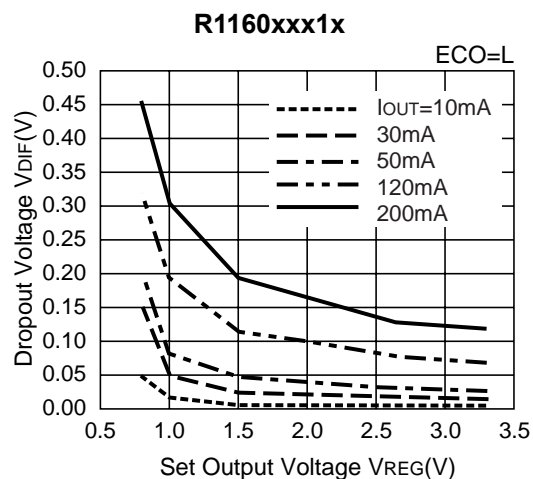
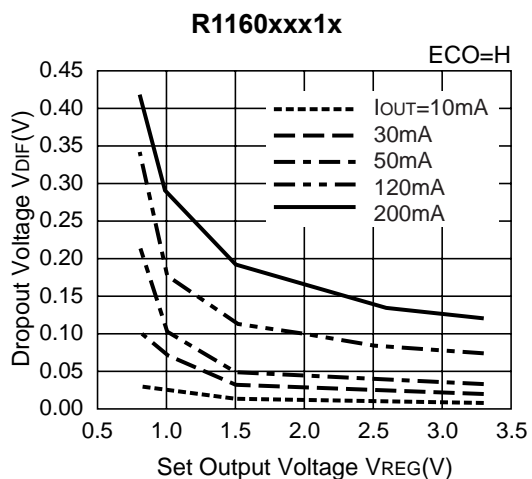
6) Dropout Voltage vs. Output Current



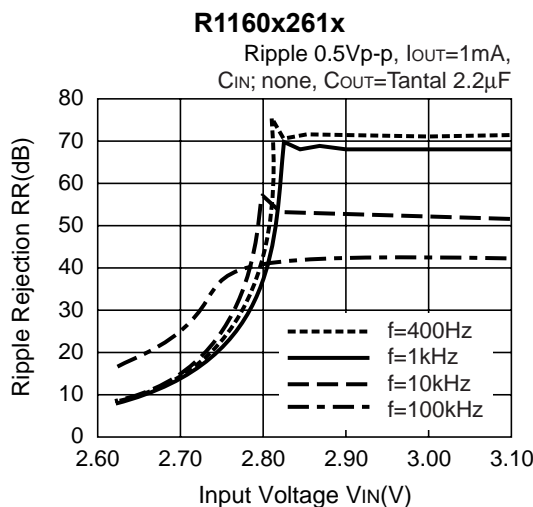
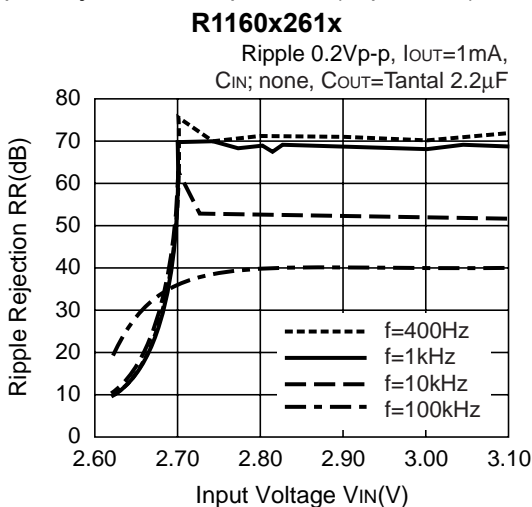


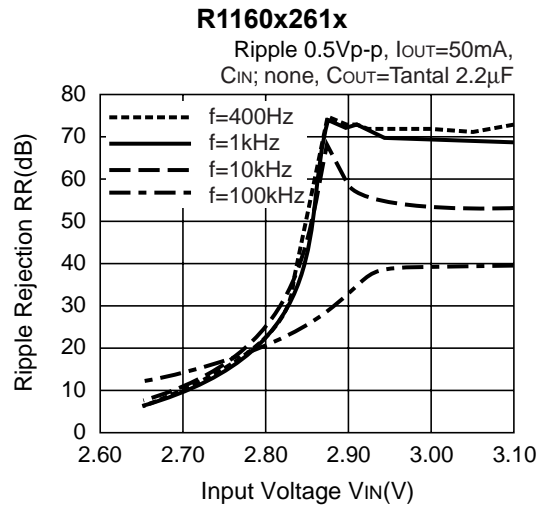
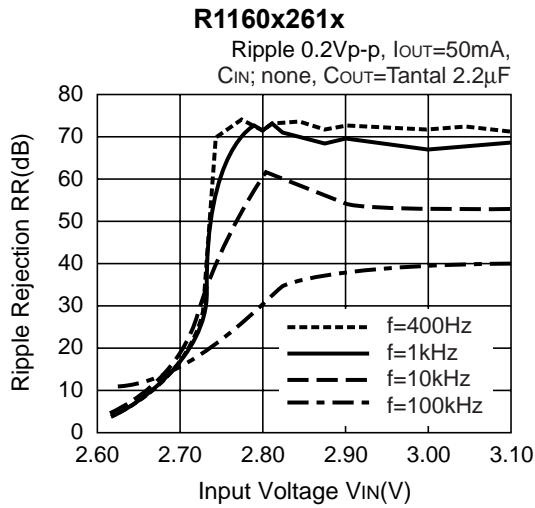
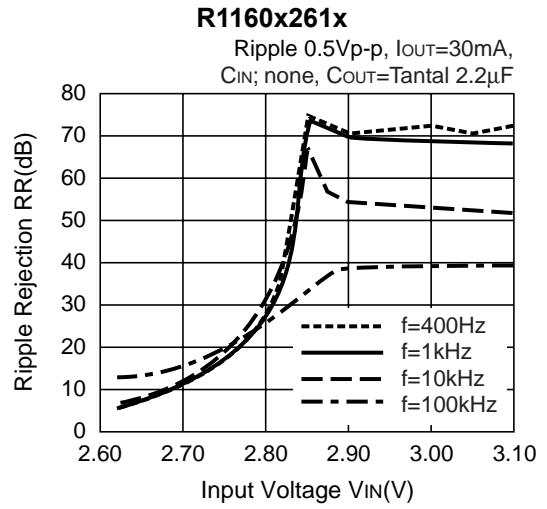
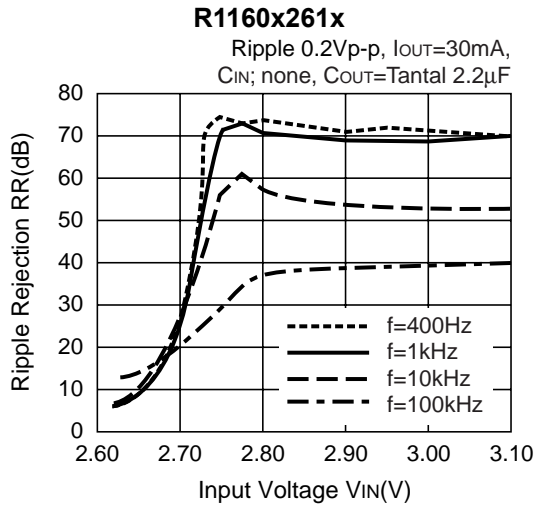


7) Dropout Voltage vs. Set Output Voltage ( $T_{opt}=25^{\circ}\text{C}$ )

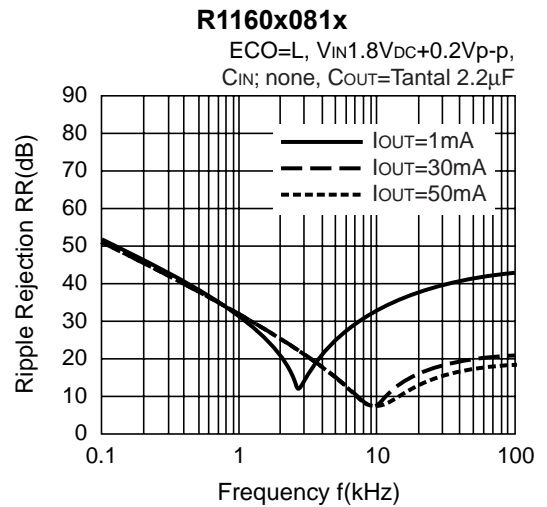
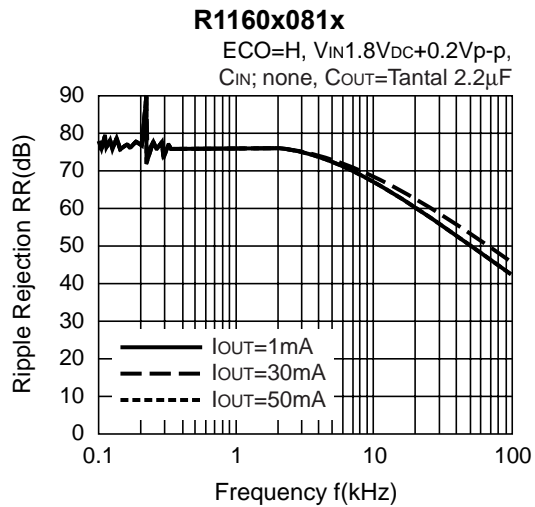


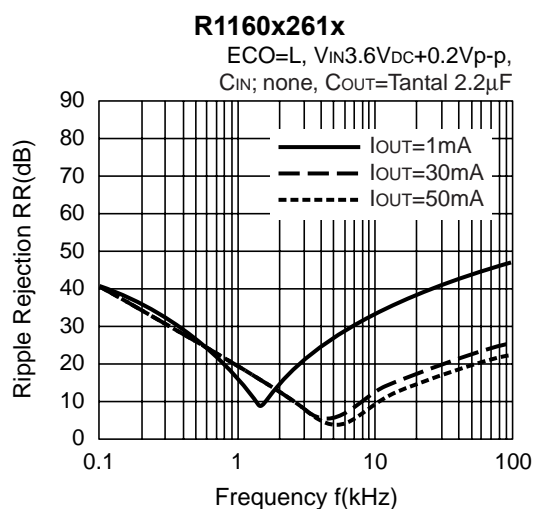
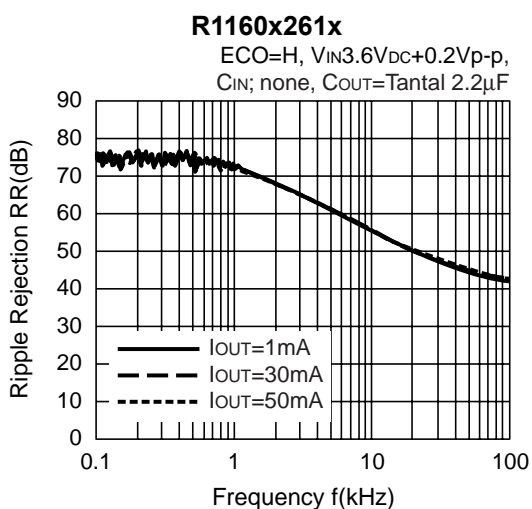
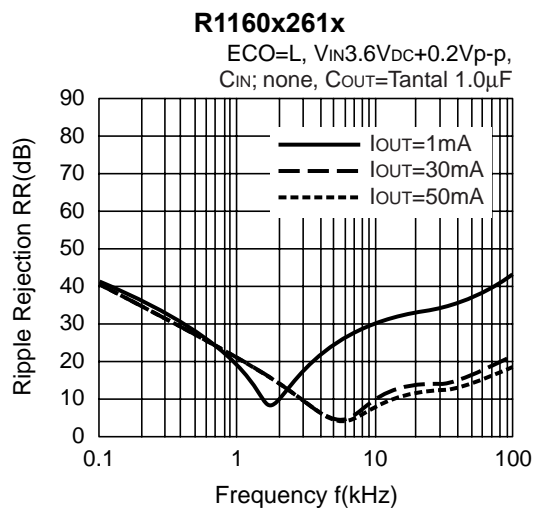
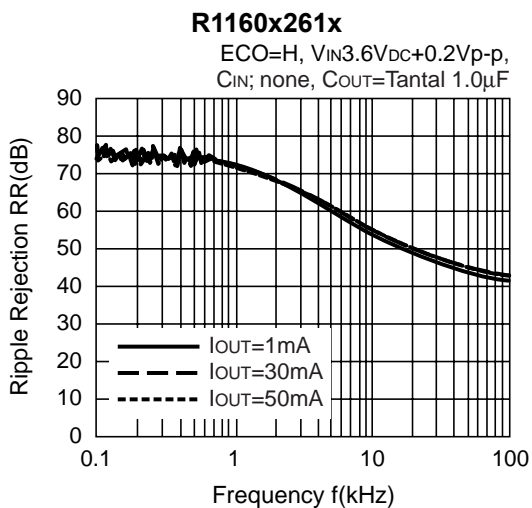
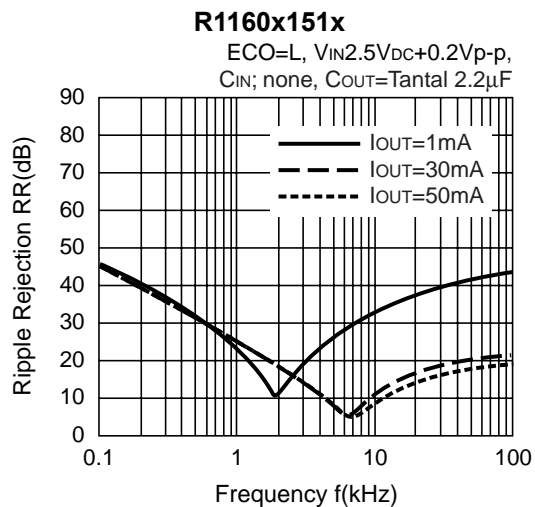
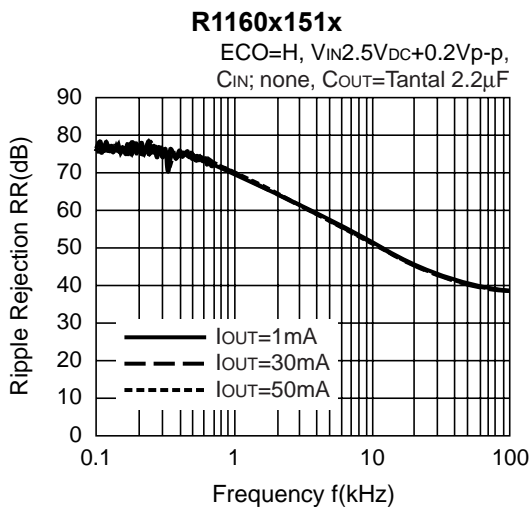
8) Ripple Rejection vs. Input Bias ( $T_{opt}=25^{\circ}\text{C}$ )

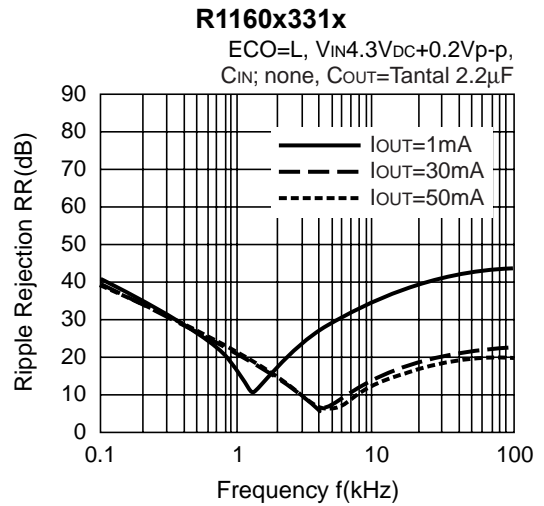
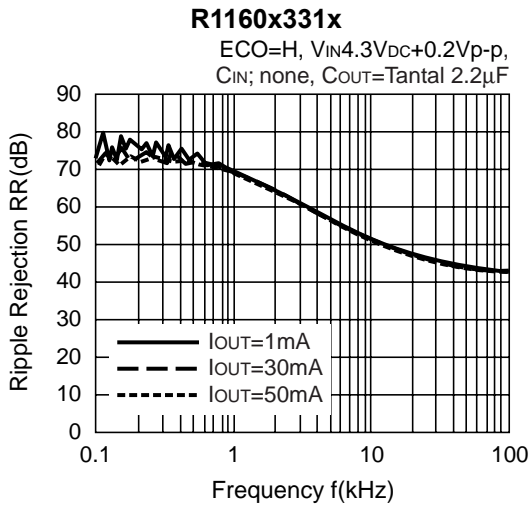
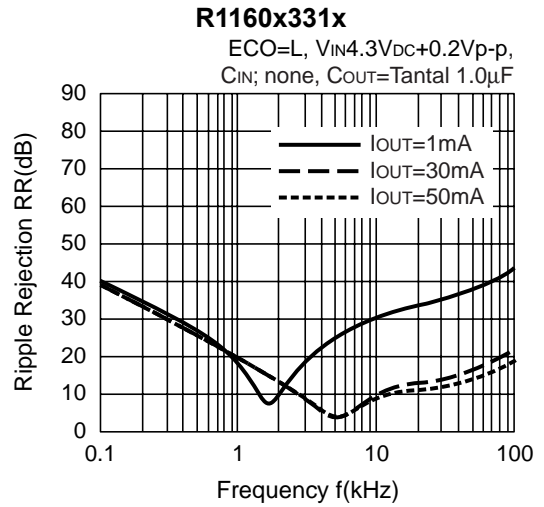
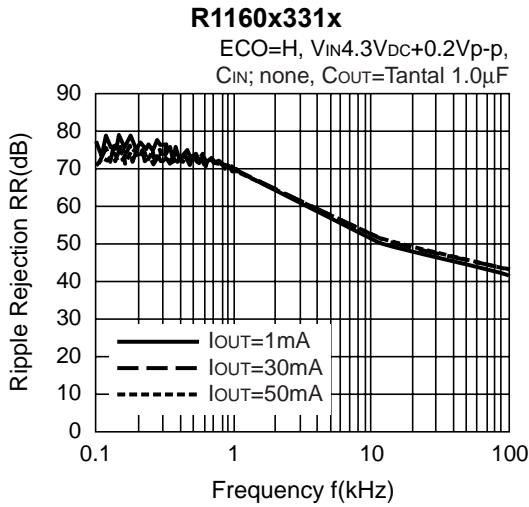




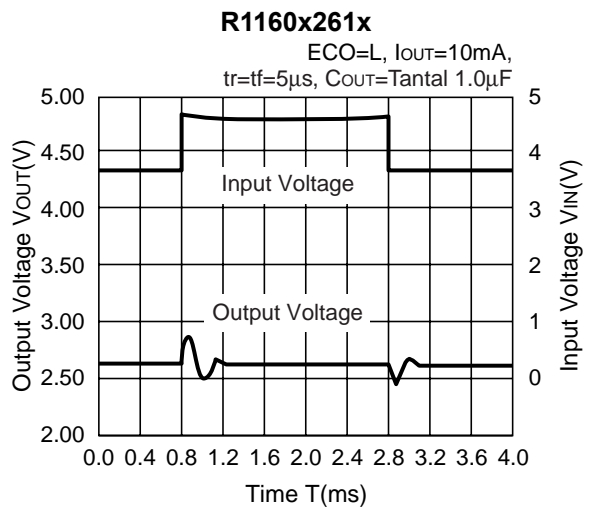
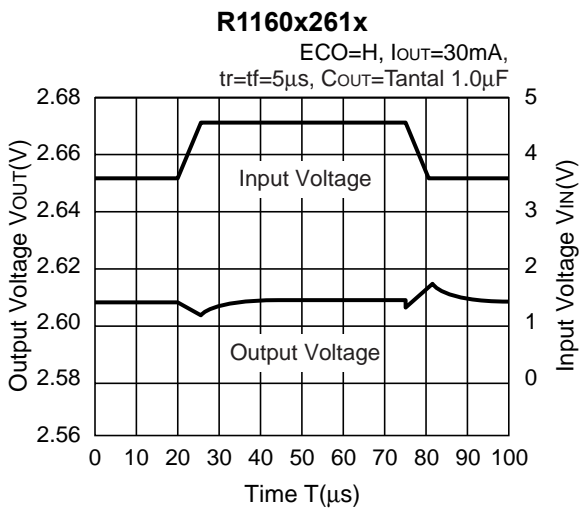
9) Ripple Rejection vs. Frequency



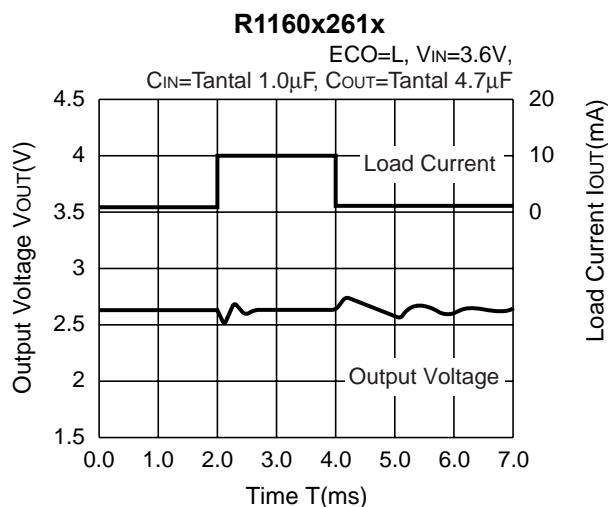
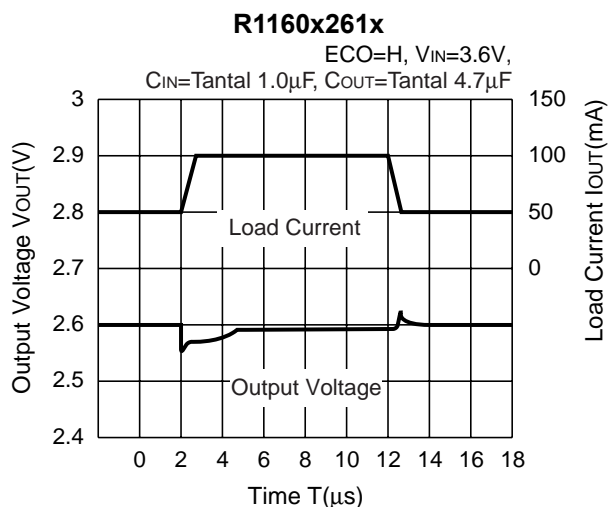
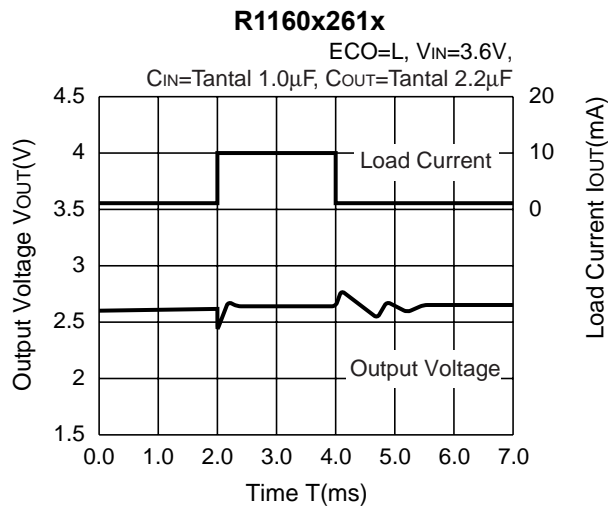
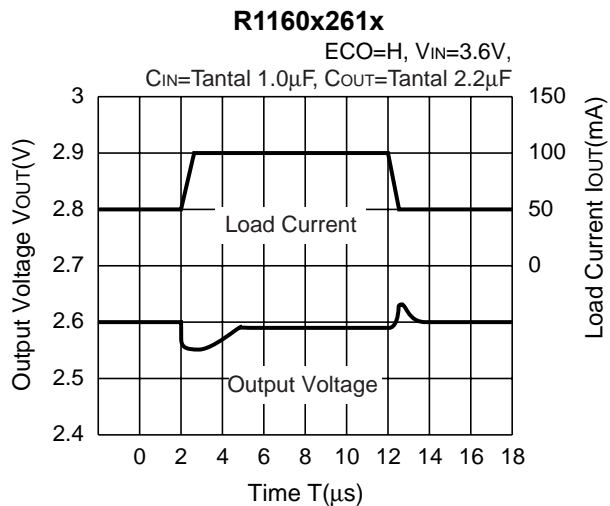
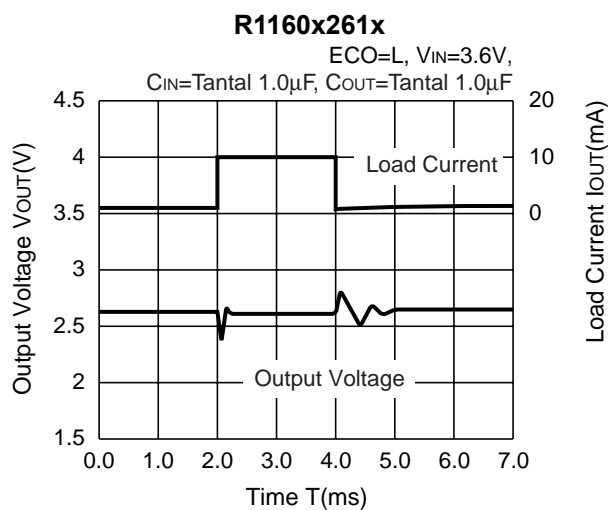
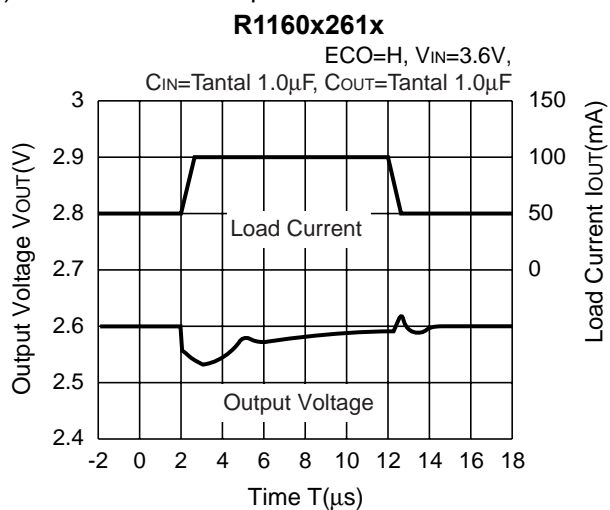




10) Input Transient Response



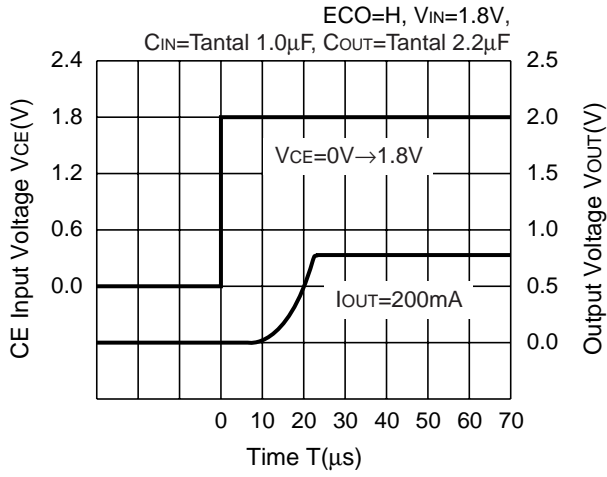
11) Load Transient Response



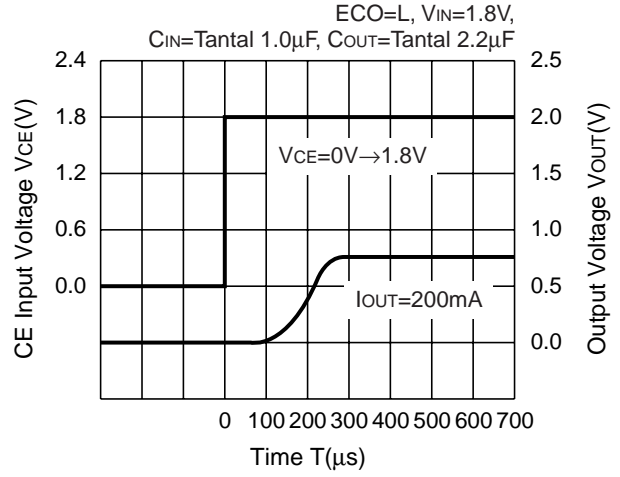
# R1160x

12) Turn on speed with CE pin

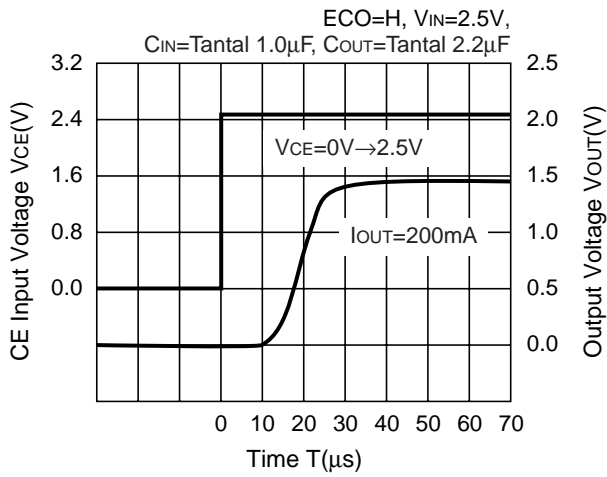
**R1160x081B**



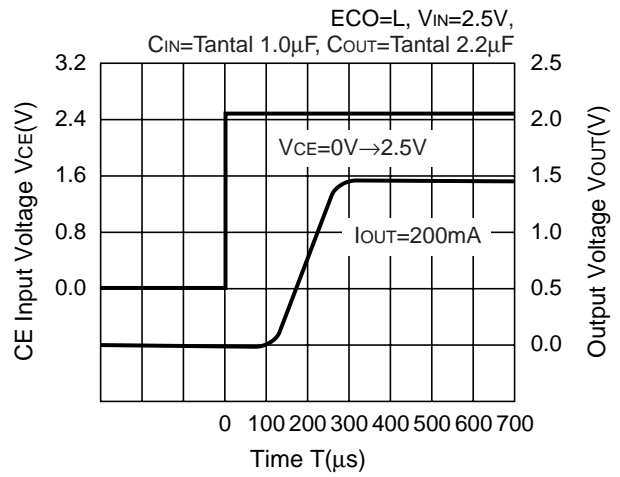
**R1160x081B**



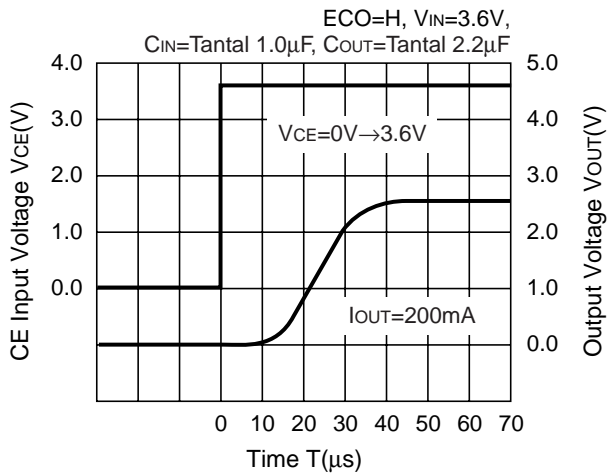
**R1160x151B**



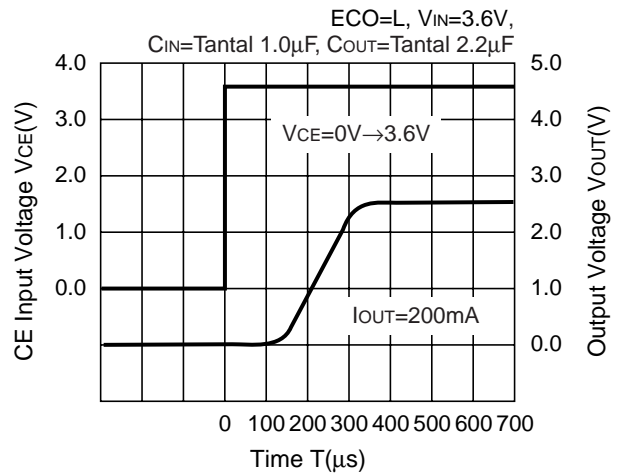
**R1160x151B**



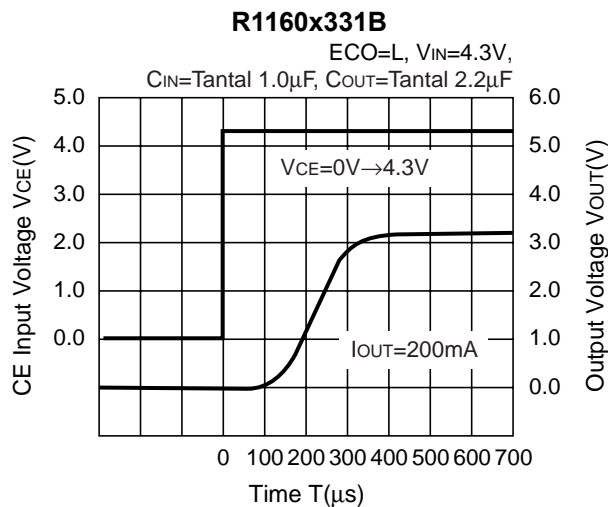
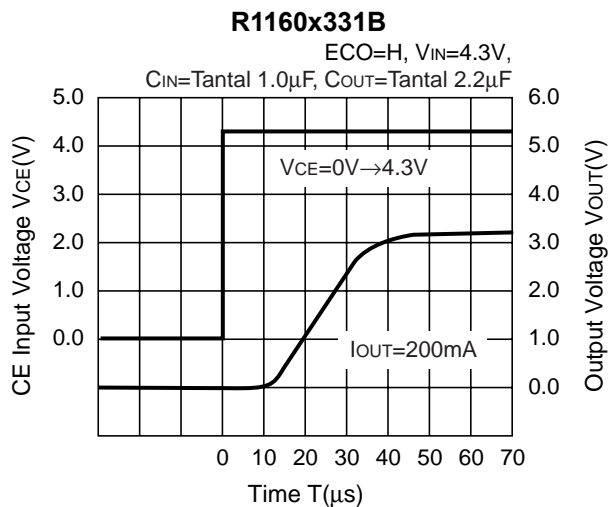
**R1160x261B**



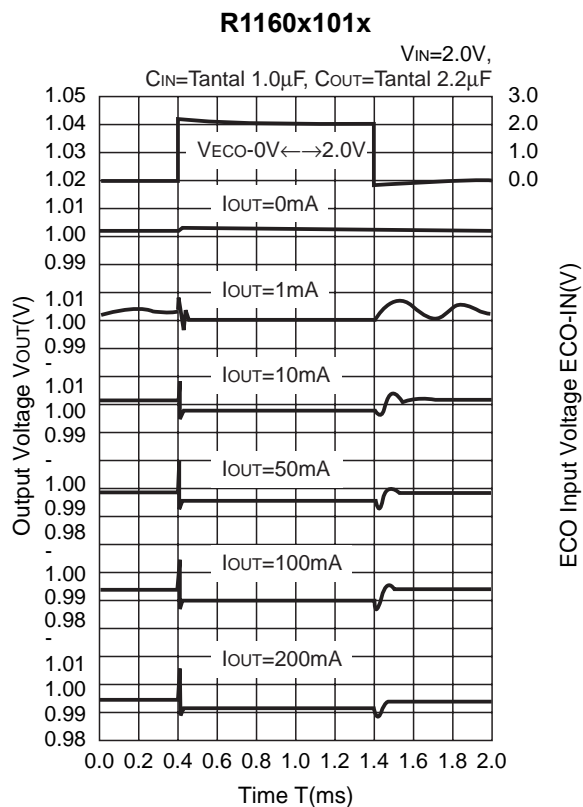
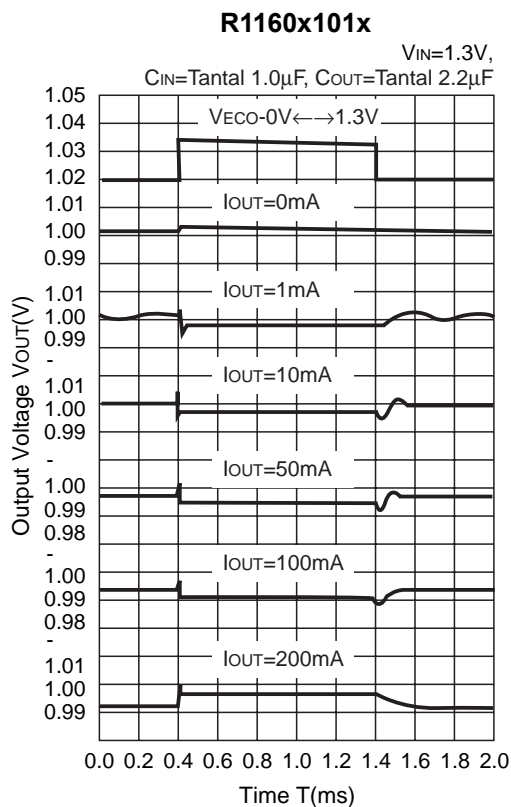
**R1160x261B**

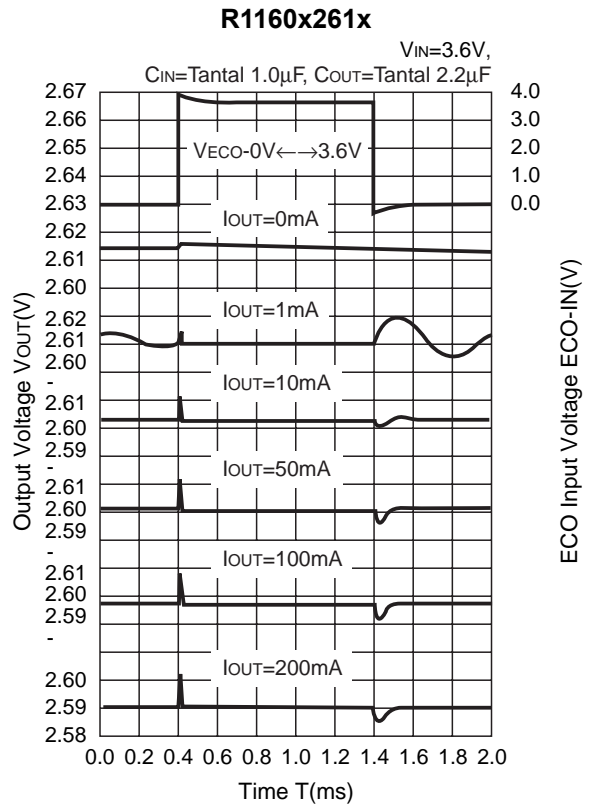
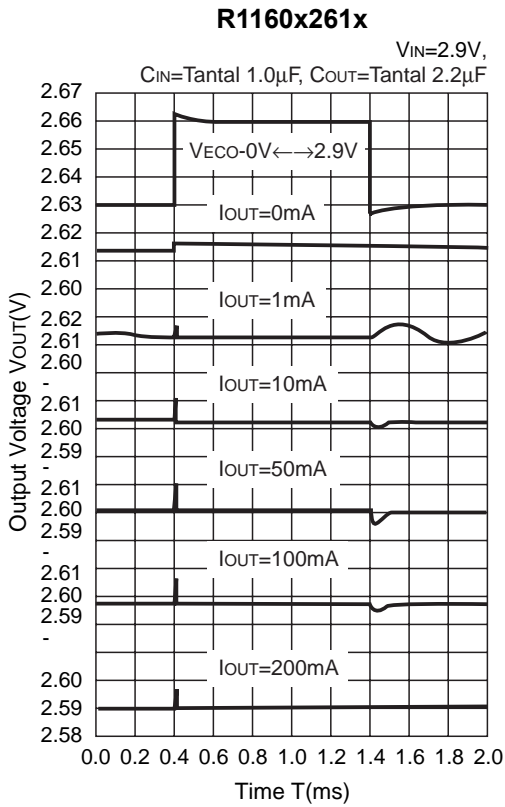




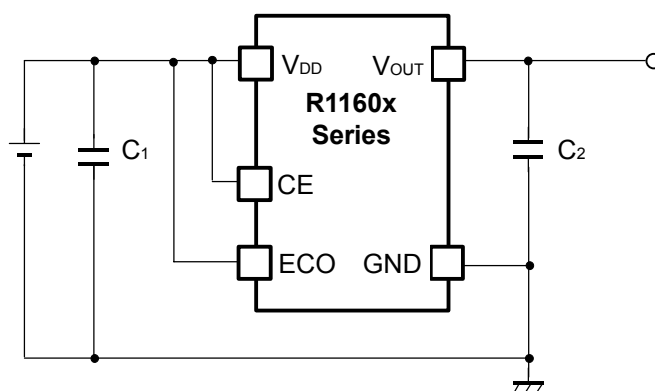


13) Output Voltage at Mode alternative point





## TECHNICAL NOTES



(External Components)

C1: Ceramic Capacitor 1 $\mu$ F

C2: Tantalum Capacitor 2.2 $\mu$ F

When using these ICs, consider the following points:

### 1. Mounting on PCB

Make  $V_{DD}$  and GND lines sufficient. If their impedance is high, noise pickup or unstable operation may result. Connect a capacitor with a capacitance value as much as 1.0 $\mu$ F or more as  $C_1$  between  $V_{DD}$  and GND pin, and as close as possible to the pins.

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

### 2. Phase Compensation

In these ICs, phase compensation is made for securing stable operation even if the output current is varied. For this purpose, be sure to use a 2.2 $\mu$ F or more capacitor  $C_{OUT}$  with good frequency characteristics and ESR (Equivalent Series Resistance).

(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 same external components as ones to be used on the PCB.)

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

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

## ESR vs. Output Current

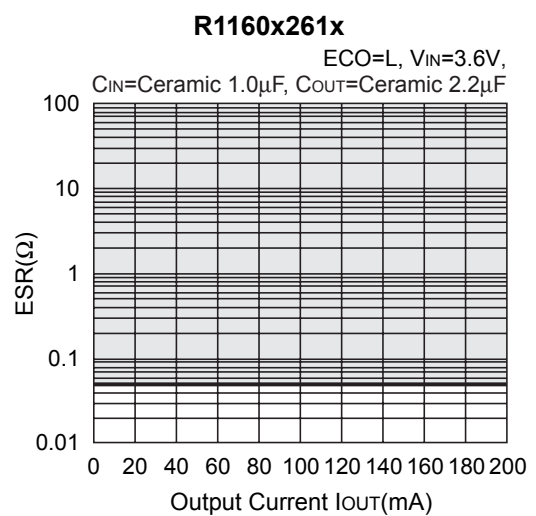
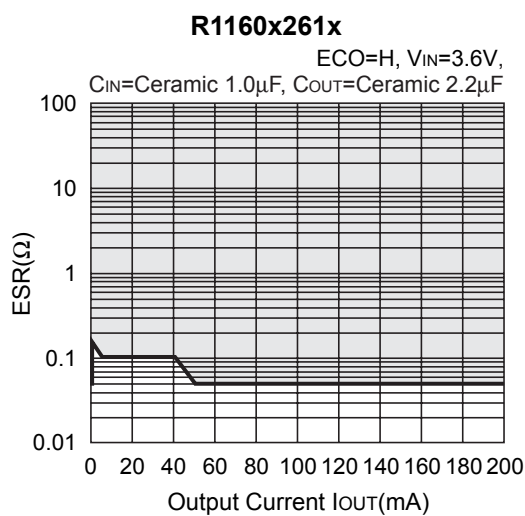
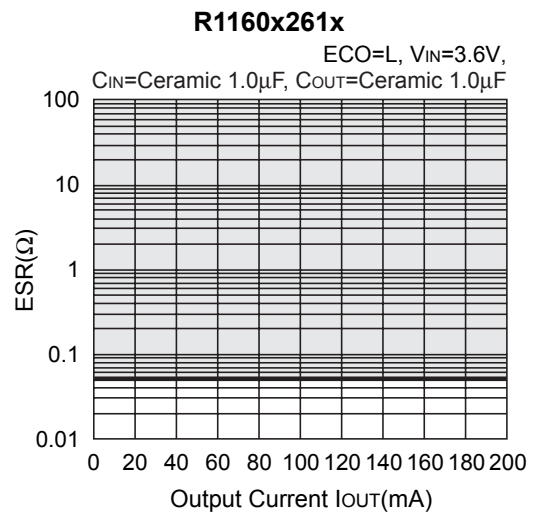
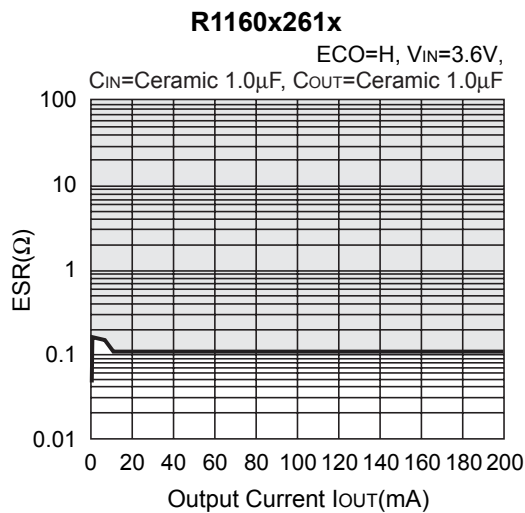
When using these ICs, consider the following points:

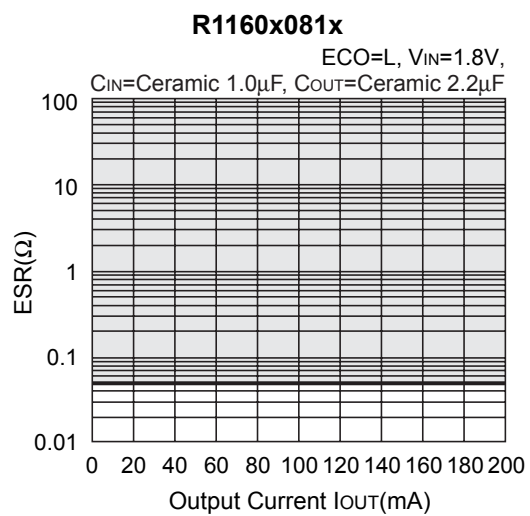
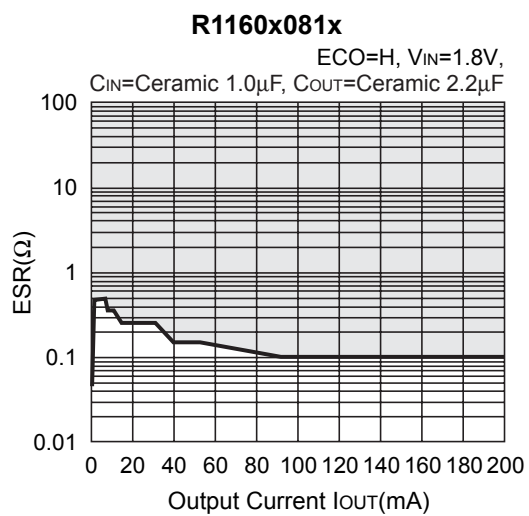
In these ICs, phase compensation is made for securing stable operation even if the Output Current is varied. For this purpose, be sure to use a capacitor  $C_{OUT}$  with good frequency characteristics and ESR (Equivalent Series Resistance) in the range described as follows:

The relations between  $I_{OUT}$  (Output Current) and ESR of Output Capacitor are shown below. The conditions when the white noise level is under  $40\mu\text{V}$  (Avg.) are marked as the hatched area in the graph.

<Test conditions>

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

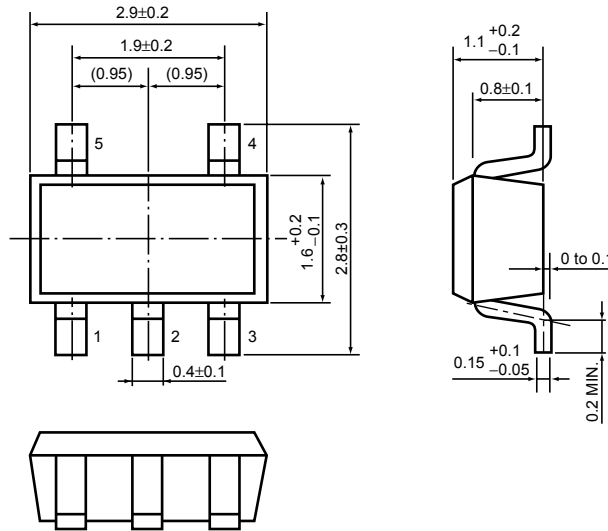




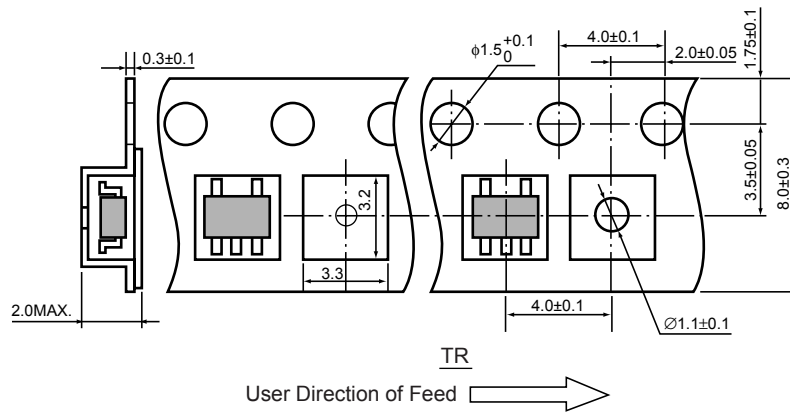
- SOT-23-5 (SC-74A)

Unit: mm

PACKAGE DIMENSIONS

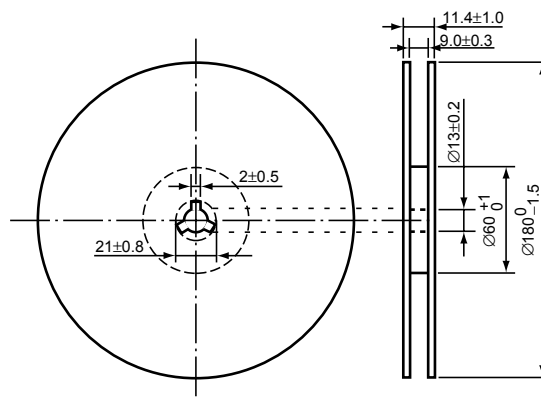


TAPING SPECIFICATION



TAPING REEL DIMENSIONS

(1reel=3000pcs)



### POWER DISSIPATION (SOT-23-5)

This specification is at mounted on board. Power Dissipation ( $P_D$ ) depends on conditions of mounting on board.

This specification is based on the measurement at the condition below:

(Power Dissipation (SOT-23-5) is substitution of SOT-23-6.)

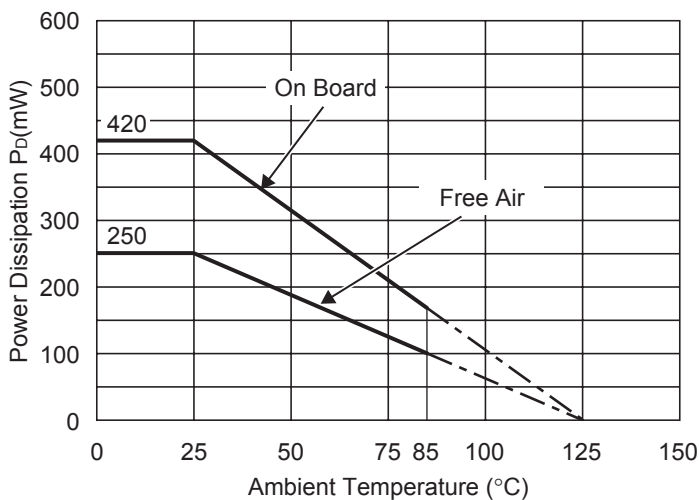
Measurement Conditions

	Standard Land Pattern
Environment	Mounting on Board (Wind velocity=0m/s)
Board Material	Glass cloth epoxy plactic (Double sided)
Board Dimensions	40mm × 40mm × 1.6mm
Copper Ratio	Top side : Approx. 50% , Back side : Approx. 50%
Through-hole	φ0.5mm × 44pcs

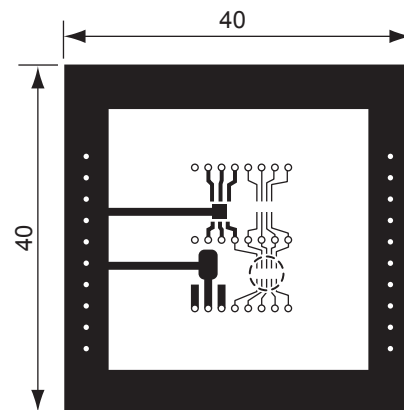
Measurement Result

( $T_{opt}=25^{\circ}C, T_{jmax}=125^{\circ}C$ )

	Standard Land Pattern	Free Air
Power Dissipation	420mW	250mW
Thermal Resistance	$\theta_{ja}=(125-25^{\circ}C)/0.42W=263^{\circ}C/W$	400 $^{\circ}C/W$



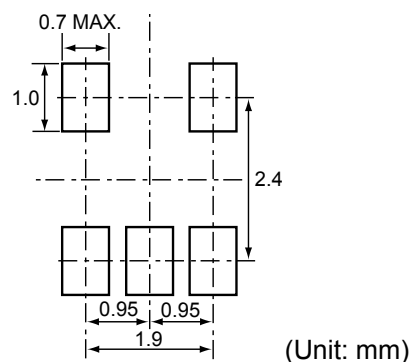
Power Dissipation



Measurement Board Pattern

○ IC Mount Area Unit : mm

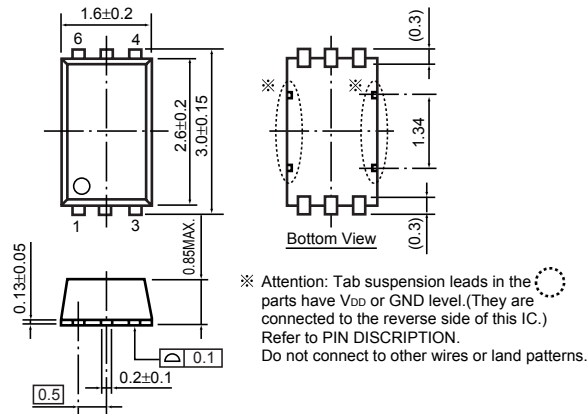
### RECOMMENDED LAND PATTERN



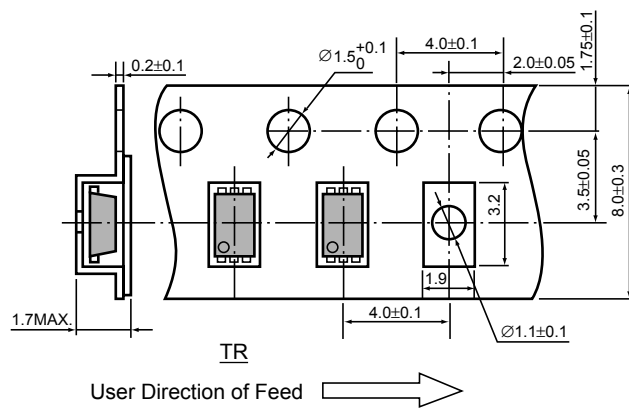
• SON-6

Unit: mm

PACKAGE DIMENSIONS

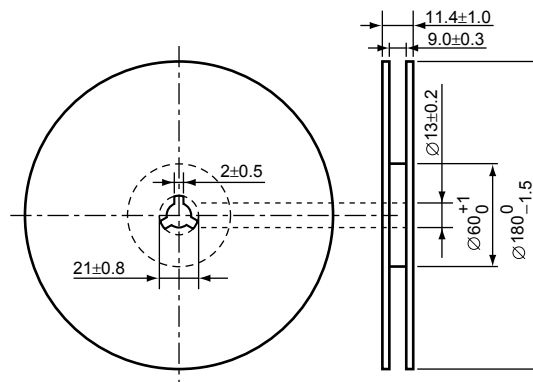


TAPING SPECIFICATION



TAPING REEL DIMENSIONS

(1reel=3000pcs)





## POWER DISSIPATION (SON-6)

This specification is at mounted on board. Power Dissipation ( $P_D$ ) depends on conditions of mounting on board. This specification is based on the measurement at the condition below:

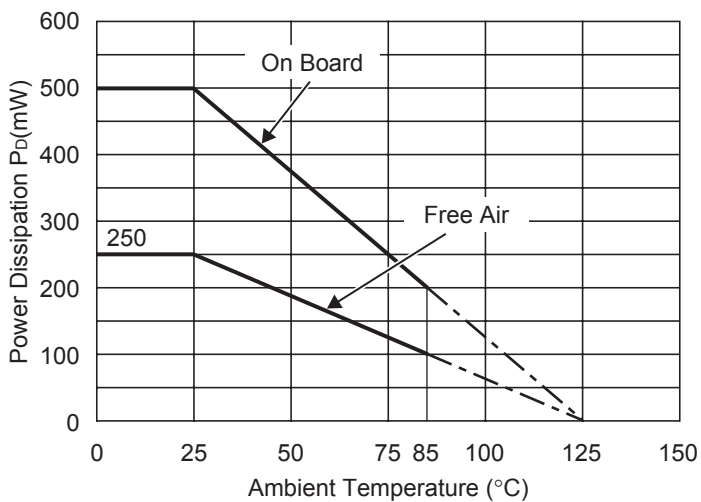
### Measurement Conditions

	Standard Land Pattern
Environment	Mounting on Board (Wind velocity=0m/s)
Board Material	Glass cloth epoxy plactic (Double sided)
Board Dimensions	40mm × 40mm × 1.6mm
Copper Ratio	Top side : Approx. 50% , Back side : Approx. 50%
Through-hole	φ0.5mm × 44pcs

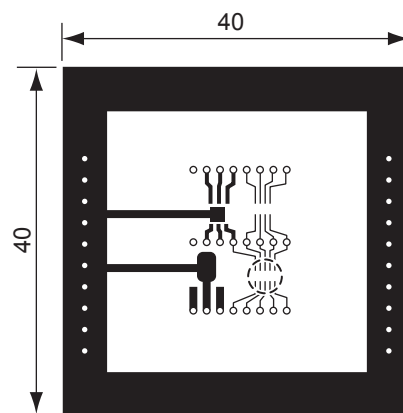
### Measurement Result

( $T_{opt}=25^{\circ}C, T_{jmax}=125^{\circ}C$ )

	Standard Land Pattern	Free Air
Power Dissipation	500mW	250mW
Thermal Resistance	$\theta_{ja}=(125-25^{\circ}C)/0.5W=200^{\circ}C/W$	-



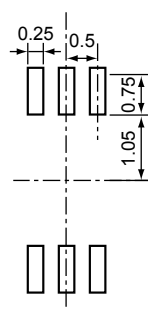
Power Dissipation



Measurement Board Pattern

○ IC Mount Area (Unit : mm)

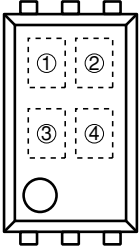
## RECOMMENDED LAND PATTERN



(Unit: mm)

## R1160D SERIES MARK SPECIFICATION

● SON-6



①, ② : Product Code (refer to Part Number vs. Product Code)

③, ④ : Lot Number

● Part Number vs. Product Code

Part Number	Product Code	
	①	②
R1160D081A	A	8
R1160D091A	A	9
R1160D101A	B	0
R1160D111A	B	1
R1160D121A	B	2
R1160D131A	B	3
R1160D141A	B	4
R1160D151A	B	5
R1160D161A	B	6
R1160D171A	B	7
R1160D181A	B	8
R1160D191A	B	9
R1160D201A	C	0
R1160D211A	C	1
R1160D221A	C	2

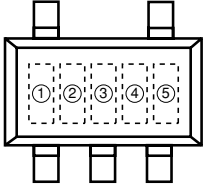
Part Number	Product Code	
	①	②
R1160D231A	C	3
R1160D241A	C	4
R1160D251A	C	5
R1160D261A	C	6
R1160D271A	C	7
R1160D281A	C	8
R1160D291A	C	9
R1160D301A	D	0
R1160D311A	D	1
R1160D321A	D	2
R1160D331A	D	3
R1160D281A5	A	0
R1160D131A5	A	1
R1160D111A5	A	2

Part Number	Product Code	
	①	②
R1160D081B	E	8
R1160D091B	E	9
R1160D101B	F	0
R1160D111B	F	1
R1160D121B	F	2
R1160D131B	F	3
R1160D141B	F	4
R1160D151B	F	5
R1160D161B	F	6
R1160D171B	F	7
R1160D181B	F	8
R1160D191B	F	9
R1160D201B	G	0
R1160D211B	G	1
R1160D221B	G	2

Part Number	Product Code	
	①	②
R1160D231B	G	3
R1160D241B	G	4
R1160D251B	G	5
R1160D261B	G	6
R1160D271B	G	7
R1160D281B	G	8
R1160D291B	G	9
R1160D301B	H	0
R1160D311B	H	1
R1160D321B	H	2
R1160D331B	H	3
R1160D281B5	E	0
R1160D131B5	E	1
R1160D111B5	E	2
R1160D181B5	E	3

**R1160N SERIES MARK SPECIFICATION**

● SOT-23-5 (SC-74A)



①, ②, ③ : Product Code (refer to Part Number vs. Product Code)

④, ⑤ : Lot Number

● Part Number vs. Product Code

Part Number	Product Code		
	①	②	③
R1160N081A	0	0	8
R1160N091A	0	0	9
R1160N101A	0	1	0
R1160N111A	0	1	1
R1160N121A	0	1	2
R1160N131A	0	1	3
R1160N141A	0	1	4
R1160N151A	0	1	5
R1160N161A	0	1	6
R1160N171A	0	1	7
R1160N181A	0	1	8
R1160N191A	0	1	9
R1160N201A	0	2	0
R1160N211A	0	2	1
R1160N221A	0	2	2

Part Number	Product Code		
	①	②	③
R1160N231A	0	2	3
R1160N241A	0	2	4
R1160N251A	0	2	5
R1160N261A	0	2	6
R1160N271A	0	2	7
R1160N281A	0	2	8
R1160N291A	0	2	9
R1160N301A	0	3	0
R1160N311A	0	3	1
R1160N321A	0	3	2
R1160N331A	0	3	3
R1160N281A5	0	0	0
R1160N131A5	0	0	1
R1160N111A5	0	0	2

Part Number	Product Code		
	①	②	③
R1160N081B	1	0	8
R1160N091B	1	0	9
R1160N101B	1	1	0
R1160N111B	1	1	1
R1160N121B	1	1	2
R1160N131B	1	1	3
R1160N141B	1	1	4
R1160N151B	1	1	5
R1160N161B	1	1	6
R1160N171B	1	1	7
R1160N181B	1	1	8
R1160N191B	1	1	9
R1160N201B	1	2	0
R1160N211B	1	2	1
R1160N221B	1	2	2

Part Number	Product Code		
	①	②	③
R1160N231B	1	2	3
R1160N241B	1	2	4
R1160N251B	1	2	5
R1160N261B	1	2	6
R1160N271B	1	2	7
R1160N281B	1	2	8
R1160N291B	1	2	9
R1160N301B	1	3	0
R1160N311B	1	3	1
R1160N321B	1	3	2
R1160N331B	1	3	3
R1160N281B5	1	0	0
R1160N131B5	1	0	1
R1160N111B5	1	0	2