RICOH

SOT23-5 3-MODE 200mA LDO REGULATOR

R1160X SERIES

■ OUTLINE

The R1160X Series are 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 (Under Mass Production) and SON-6 package(Under development), high density mounting of the ICs on boards is possible.

■ FEATURES

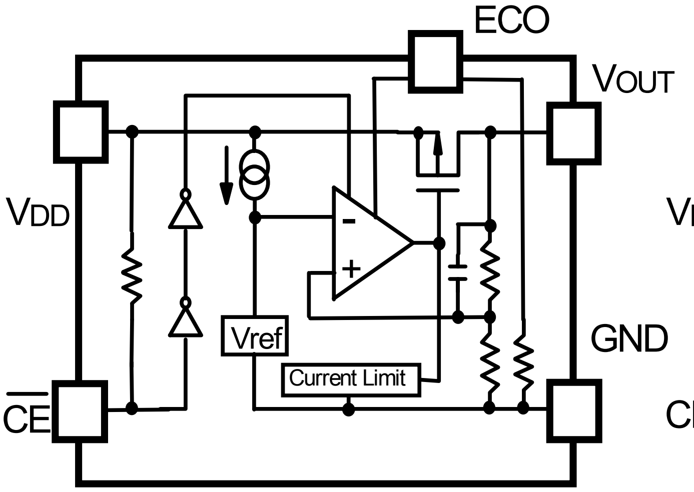
- Ultra-Low Supply Current.. TYP. 3.5µA(Low Power Mode, $V_{OUT} \leq 1.5V$),
.... TYP. 40µA (Fast Transient Mode)
- Standby Mode .... TYP. 0.1µA
- Low Dropout Voltage .... TYP. 0.30V(I_{OUT}=200mA Output Voltage=1.0V Type)
.... TYP. 0.20V(I_{OUT}=200mA Output Voltage=1.5V Type)
.... TYP. 0.14V(I_{OUT}=200mA Output Voltage=3.0V Type)
- High Ripple Rejection .... TYP. 70dB(f=1kHz, FT Mode)
- Low Temperature-Drift Coefficient of Output Voltage TYP. ±100ppm/°C
- Excellent Line Regulation .... TYP. 0.05%/V
- High Output Voltage Accuracy................................. ±2.0%(±3.0% at LP Mode)
- Small Package .... SOT-23-5(Super Mini-mold) under MP, SON6(Under Development)
- Output Voltage.. Stepwise setting with a step of 0.1V in the range of 0.8V to 3.3V is possible
- Input Voltage .... MIN. 1.4V
- Built-in fold-back protection circuit..........................TYP. 50mA (Current at short mode)

■ APPLICATIONS

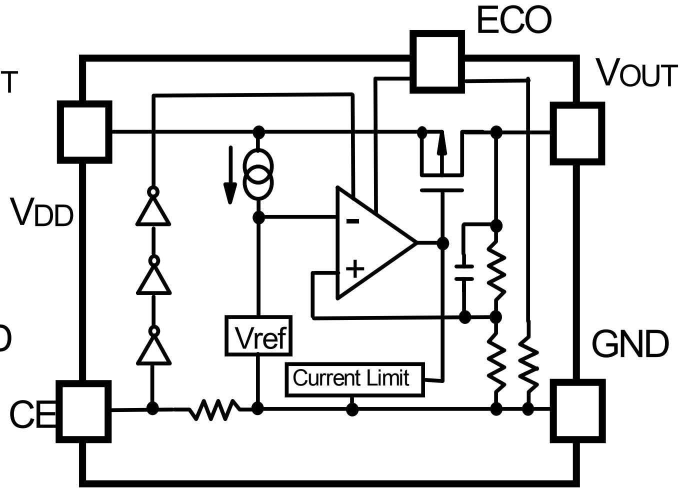
- Precision Voltage References.
- Power source for electrical appliances such as cameras, VCRs and hand-held communication equipment.
- Power source for battery-powered equipment.

■ BLOCK DIAGRAM

R1160XXX1A



R1160XXX1B



■ SELECTION GUIDE

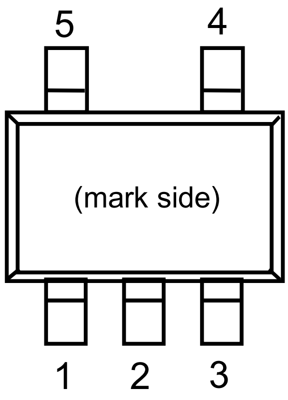
The output voltage, chip enable polarity, and the taping type for the ICs can be selected at the user's request. The selection can be available by designating the part number as shown below;

R1160XXX1X-XX ←Part Number
↑ ↑ ↑ ↑
a b c d

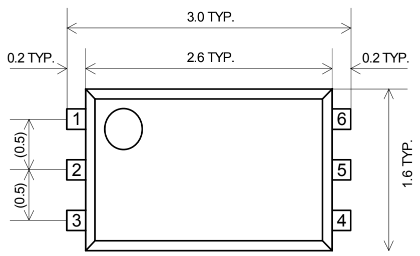
Code	Contents
a	Designation of Package Type : N:SOT-23-5 (Mini-mold) Under MP, D:SON6 (Under Development)
b	Setting Output Voltage (V_{OUT}) : Stepwise setting with a step of 0.1V in the range of 0.8V to 3.3V is possible.
c	Designation of Chip Enable Option : A:“L” active type. B:“H” active type.
d	Designation of Taping Type : Refer to Taping Specifications

■ PIN CONFIGURATIONS

SOT- 23 - 5



● SON6



■ PIN DESCRIPTIONS

Pin No.	Symbol	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

Pin No.	Symbol	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

■ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rating	Unit
Input Voltage	V_{IN}	6.5	V
Input Voltage(ECO Pin)	V_{ECO}	-0.3 ~ V_{IN}+0.3	V
Input Voltage($\overline{CE}$/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}	250	mA
Power Dissipation(SOT23-5)	P_D	250	mW
Power Dissipation(SON-6)	P_D	150	mW
Operating Temperature Range	Topt	-40 ~ 85	°C
Storage Temperature Range	Tstg	-55 ~ 125	°C

■ ELECTRICAL CHARACTERISTICS

● R1160XXX1A Topt=25°C

Symbol	Item	Conditions	MIN.	TYP.	MAX.	Unit
V_{OUT}	Output Voltage	V_{IN} = Set V_{OUT}+1V V_{ECO}=V_{IN} 1μA ≤ I_{OUT} ≤ 30mA(Note 1)	V_{OUT} ×0.98 (-30mV)		V_{OUT} ×1.02 (30mV)	V
		V_{IN} = Set V_{OUT}+1V V_{ECO}=GND 1μA ≤ I_{OUT} ≤ 30mA(Note 2)	V_{OUT} ×0.97 (-45mV)		V_{OUT} ×1.03 (45mV)	V
I_{OUT}	Output Current	V_{IN} - V_{OUT} = 0.5V V_{IN}≥1.5V, V_{OUT}≤1.0V	200			mA
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation(FT Mode)	V_{IN} = Set V_{OUT}+1V, V_{ECO}=V_{IN} 1mA ≤ I_{OUT} ≤ 200mA		20	40	mV
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation(LP Mode)	V_{IN} = Set V_{OUT}+1V, V_{ECO}=GND 1mA ≤ I_{OUT} ≤ 100mA		10	40	mV
V_{DIF}	Dropout Voltage	Refer to the ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE				
I_{SS1}	Supply Current(FT Mode)	V_{IN} = Set V_{OUT}+1V V_{ECO}=V_{IN}		40	70	μA
I_{SS2}	Supply Current(LP Mode)	V_{IN} = Set V_{OUT}+1V, V_{OUT} ≤ 1.5V, V_{ECO}=GND		3.5	6.0	μA
		V_{IN} = Set V_{OUT}+1V V_{OUT} ≥ 1.6V, V_{ECO}=GND		4.5	8.0	μA
Istandby	Supply Current (Standby)	V_{IN} = V_{CE} = Set V_{OUT}+1V		0.1	1.0	μA
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation(FT Mode)	Set V_{OUT}+0.5V ≤ V_{IN} ≤ 6V I_{OUT} = 30mA, V_{ECO}=V_{IN}		0.05	0.20	%/V
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation(LP Mode)	Set V_{OUT}+0.5V ≤ V_{IN} ≤ 6V I_{OUT} = 30mA, V_{ECO}=GND		0.10	0.30	%/V
RR	Ripple Rejection(FT Mode)	f = 1kHz, Ripple 0.2Vp-p V_{IN} = Set V_{OUT}+1V I_{OUT} = 30mA, V_{ECO}=V_{IN}		70		dB
V_{IN}	Input Voltage		1.4		6.0	V
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 30mA -40°C ≤ Topt ≤ 85°C		±100		ppm /°C
Ilim	Short Current Limit	V_{OUT} = 0V		50		mA
R_{PU}	$\overline{CE}$ Pull-up Resistance		2.0	5.0	14.0	MΩ
R_{PD}	ECO Pull-down Resistance		1.5	5.0	14.0	MΩ
V_{CEH}	$\overline{CE}$, ECO Input Voltage "H"		1.0		V_{IN}	V
V_{CEL}	$\overline{CE}$, ECO Input Voltage "L"		0.0		0.3	V

Note1: ±30mV tolerance for V_{OUT}≤1.5V.

Note2: ±45mV tolerance for V_{OUT}≤1.5V.

- R1160XXX1B

Topt=25°C

Symbol	Item	Conditions	MIN.	TYP.	MAX.	Unit
V_{OUT}	Output Voltage	V_{IN} = Set V_{OUT}+1V V_{ECO}=V_{IN} 1µA ≤ I_{OUT} ≤ 30mA(Note 1)	V_{OUT} ×0.98 (-30mV)		V_{OUT} ×1.02 (30mV)	V
		V_{IN} = Set V_{OUT}+1V V_{ECO}=GND 1µA ≤ I_{OUT} ≤ 30mA(Note 2)	V_{OUT} ×0.97 (-45mV)		V_{OUT} ×1.03 (45mV)	V
I_{OUT}	Output Current	V_{IN} - V_{OUT} = 0.5V V_{IN}≥1.5V, V_{OUT}≤1.0V	200			mA
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation(FT Mode)	V_{IN} = Set V_{OUT}+1V, V_{ECO}=V_{IN} 1mA ≤ I_{OUT} ≤ 200mA		20	40	mV
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation(LP Mode)	V_{IN} = Set V_{OUT}+1V, V_{ECO}=GND 1mA ≤ I_{OUT} ≤ 100mA		10	40	mV
V_{DIF}	Dropout Voltage	Refer to the ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE				
I_{SS1}	Supply Current(FT Mode)	V_{IN} = Set V_{OUT}+1V V_{ECO}=V_{IN}		40	70	µA
I_{SS2}	Supply Current(LP Mode)	V_{IN} = Set V_{OUT}+1V, V_{OUT} ≤ 1.5V, V_{ECO}=GND		3.5	6.0	µA
		V_{IN} = Set V_{OUT}+1V, V_{OUT} ≥ 1.6V, V_{ECO}=GND		4.5	8.0	µA
Istandby	Supply Current (Standby)	V_{IN} = Set V_{OUT}+1V, V_{CE}=GND		0.1	1.0	µA
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation(FT Mode)	Set V_{OUT}+0.5V ≤ V_{IN} ≤ 6V I_{OUT} = 30mA, V_{ECO}=V_{IN}		0.05	0.20	%/V
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation(LP Mode)	Set V_{OUT}+0.5V ≤ V_{IN} ≤ 6V I_{OUT} = 30mA, V_{ECO}=GND		0.10	0.30	%/V
RR	Ripple Rejection(FT Mode)	f = 1kHz, Ripple 0.2Vp-p V_{IN} = Set V_{OUT}+1V I_{OUT} = 30mA, V_{ECO}=V_{IN}		70		dB
V_{IN}	Input Voltage		1.4		6.0	V
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 30mA -40°C ≤ Topt ≤ 85°C		±100		ppm /°C
Ilim	Short Current Limit	V_{OUT} = 0V		50		mA
R_{PDC}	CE Pull-down Resistance		2.0	5.0	14.0	MΩ
R_{PDE}	ECO Pull-down Resistance		1.5	5.0	14.0	MΩ
V_{CEH}	CE, ECO Input Voltage "H"		1.0		V_{IN}	V
V_{CEL}	CE, ECO Input Voltage "L"		0.0		0.3	V

Note1: ±30mV tolerance for V_{OUT}≤1.5V.

Note2: ±45mV tolerance for V_{OUT}≤1.5V.

- ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE

Topt = 25°C

Output Voltage V_{OUT} (V)	Dropout Voltage V_{DIF} (V)		
	Condition	TYP.	MAX.
0.8 ≤ V_{OUT} ≤ 0.9	I_{OUT} = 200mA	0.40	0.70
1.0 ≤ V_{OUT} ≤ 1.4		0.30	0.50
1.5 ≤ V_{OUT} ≤ 2.5		0.20	0.30
2.6 ≤ V_{OUT}		0.14	0.20 (V_{ECO}="H") 0.25(V_{ECO}="L")

■ 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 2.2µF or more capacitor COUT 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.)

PCB Layout

Make VDD and GND line sufficient. When the impedance of these is high, it would be a cause of picking up the noise or unstable operation. Connect a capacitor with as much as 1.0µF capacitor between VDD and GND pin as close as possible. Set external components, especially output capacitor as close as possible to the ICs and make wiring shortest.

■ TEST CIRCUITS

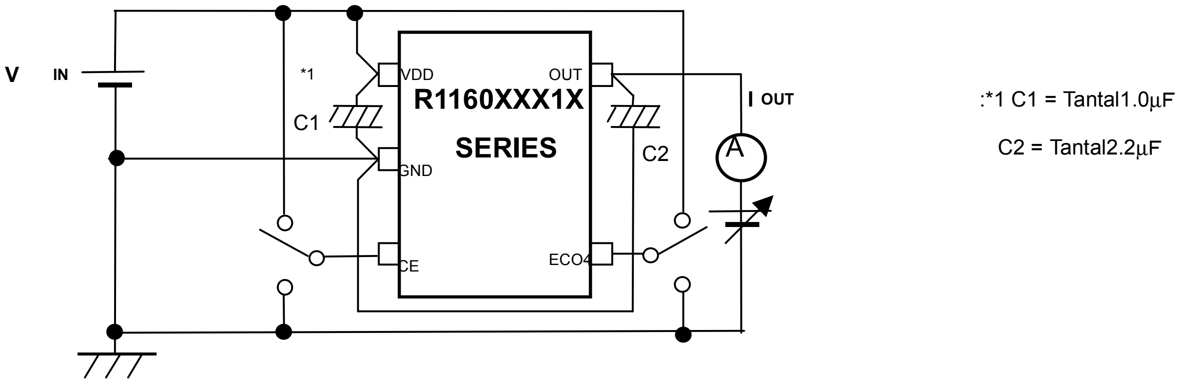


Fig.1 Output Voltage vs. Output Current Test Circuit

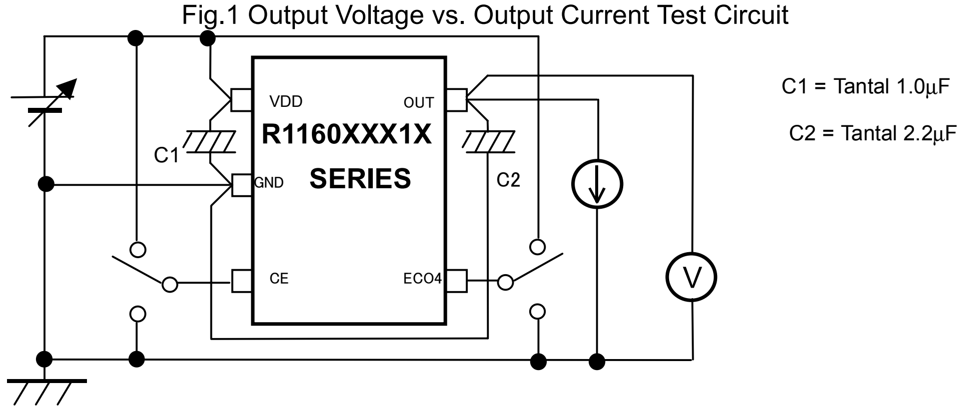


Fig.2 Output Voltage vs. Input Voltage Test Circuit

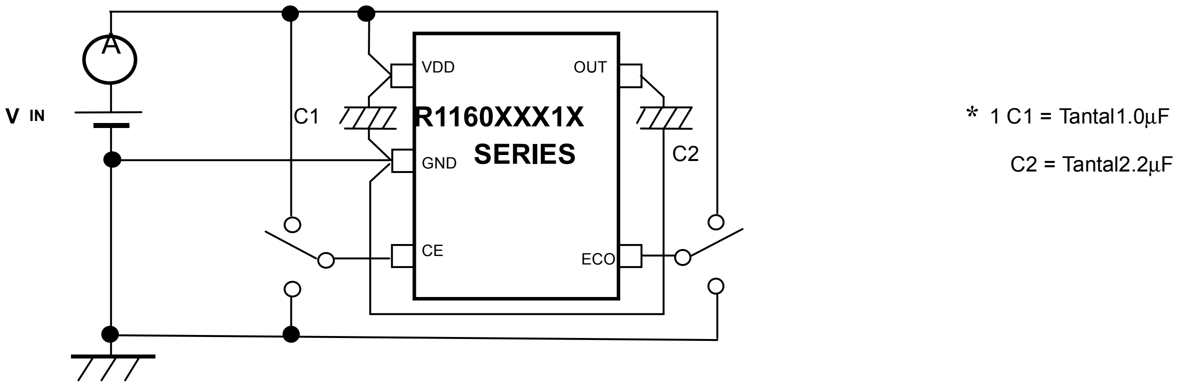


Fig.3 Supply Current vs. Input Voltage Test Circuit

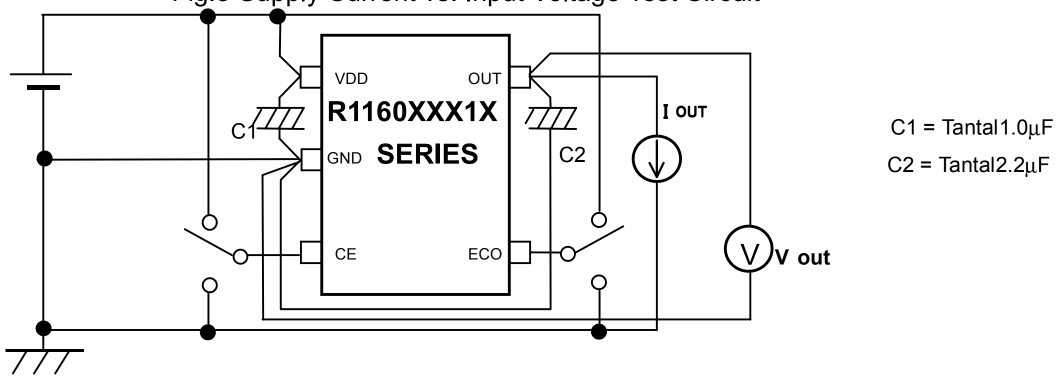


Fig.4 Output Voltage vs. Temperature Test Circuit

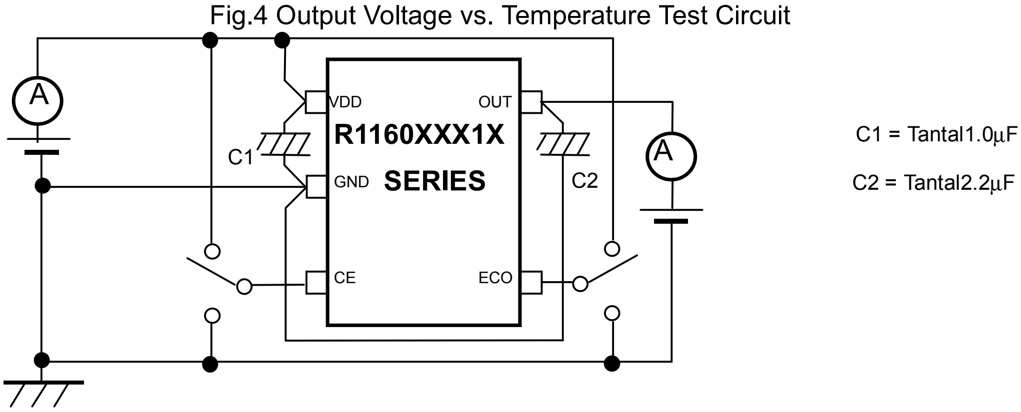


Fig.5 Supply Current vs. Temperature Test Circuit

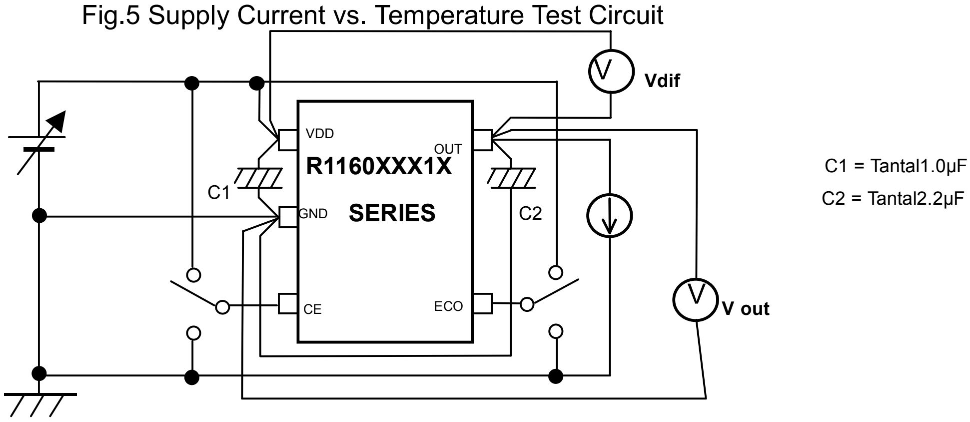
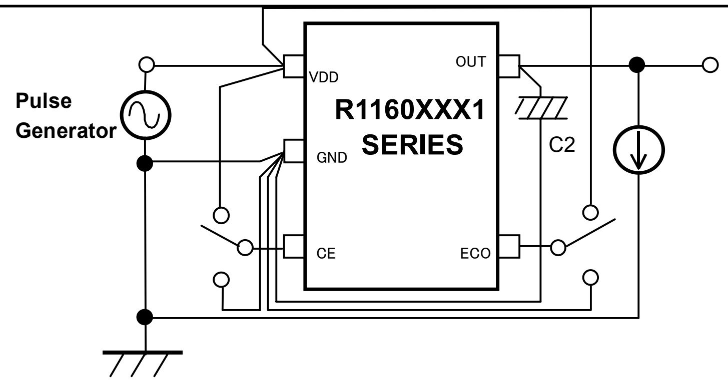
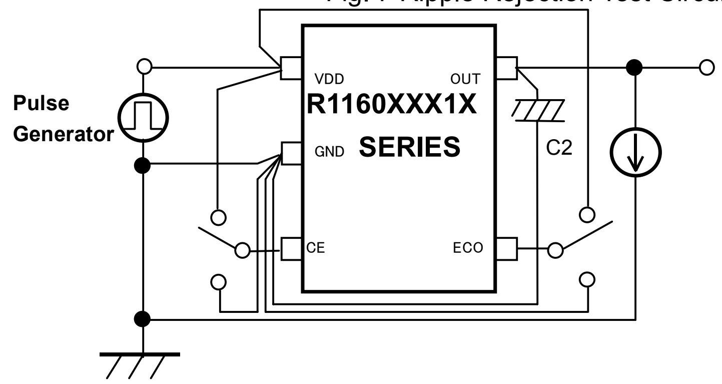


Fig. 6 Dropout Voltage vs. Output Current/ Set Output Voltage Test Circuit



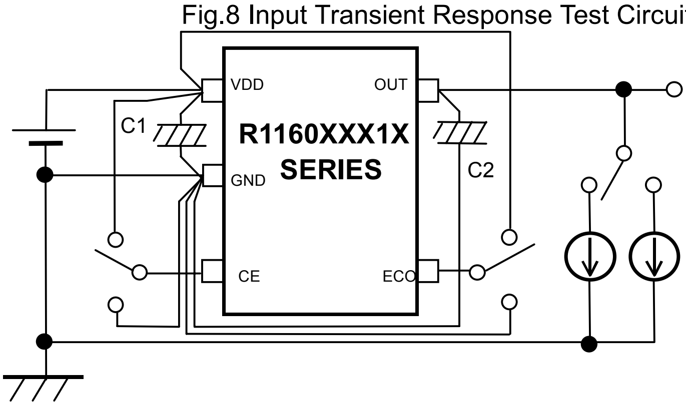
C2 = Tantalum Capacitor

Fig. 7 Ripple Rejection Test Circuit



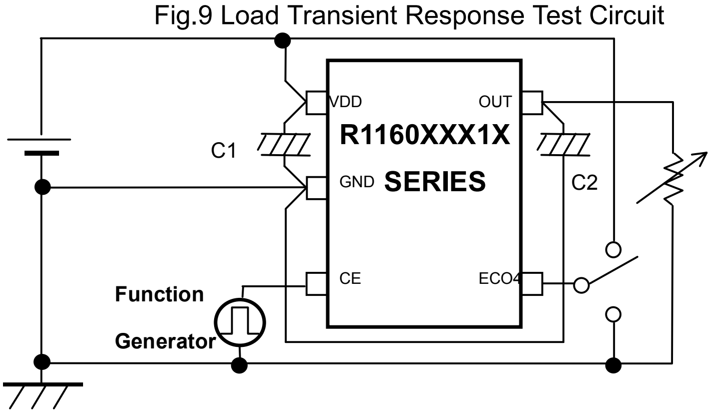
C2 = Tantalum Capacitor

Fig.8 Input Transient Response Test Circuit



C1 = Tantalum 1.0µF
C2 = Tantalum Capacitor

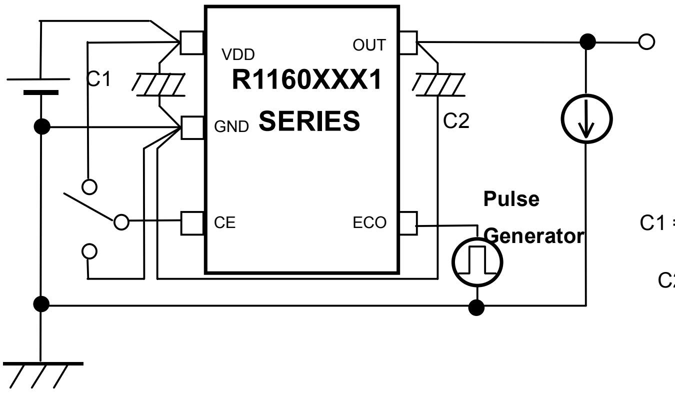
Fig.9 Load Transient Response Test Circuit



C1 = Tantal1.0µF

C2 = Tantal2.2µF

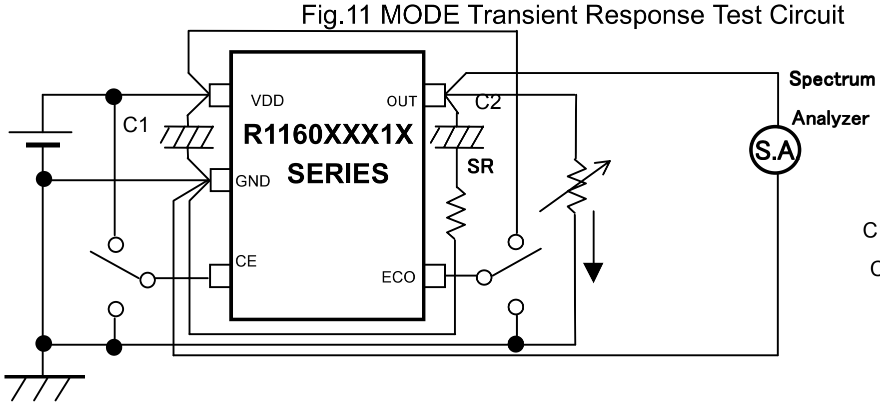
Fig.10 Turn on Speed with CE pin Test Circuit



C1 = Tantalum 1.0μF

C2 = Tantalum 2.2μF

Fig.11 MODE Transient Response Test Circuit

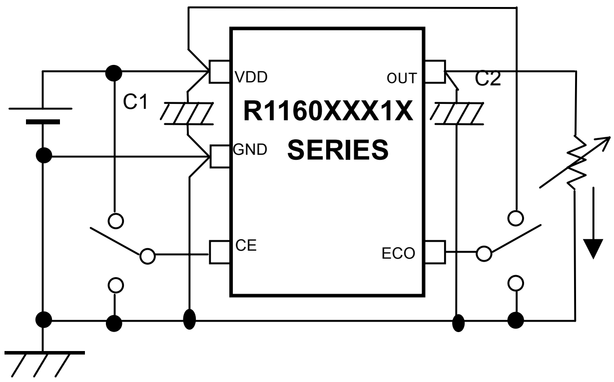


C1 = Ceramic 1.0μF

C2 = CeramicCapacitor

Fig.12 Output Noise Test Circuit(IOUT vs. ESR)

■ TYPICAL APPLICATION



C1 = 1.0μF

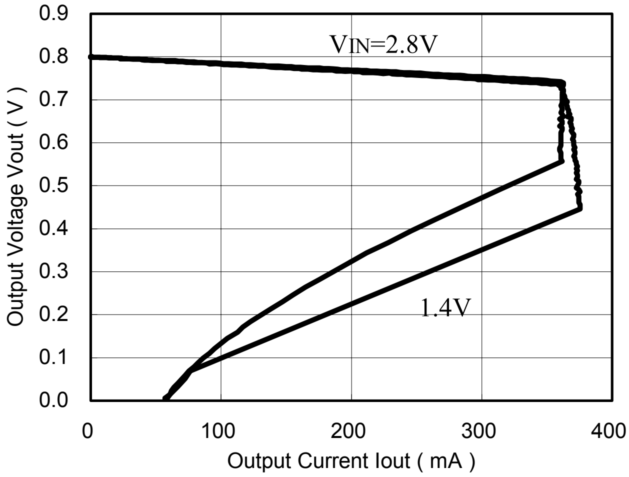
C2 = 2.2μF

(External Components)
Output Capacitor; Tantalum Type

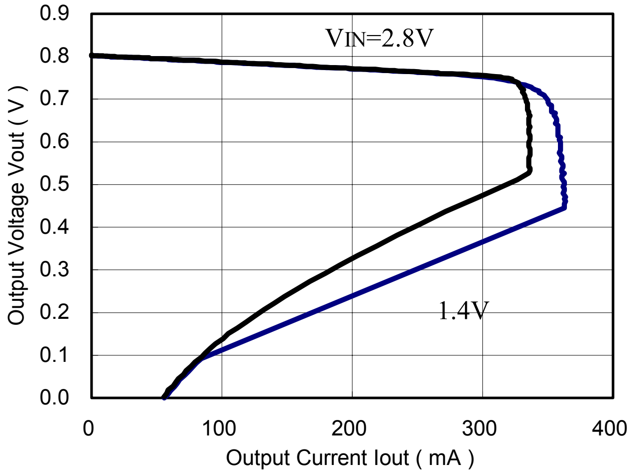
■ TYPICAL CHARACTERISTICS

1) Output Voltage vs. Output Current

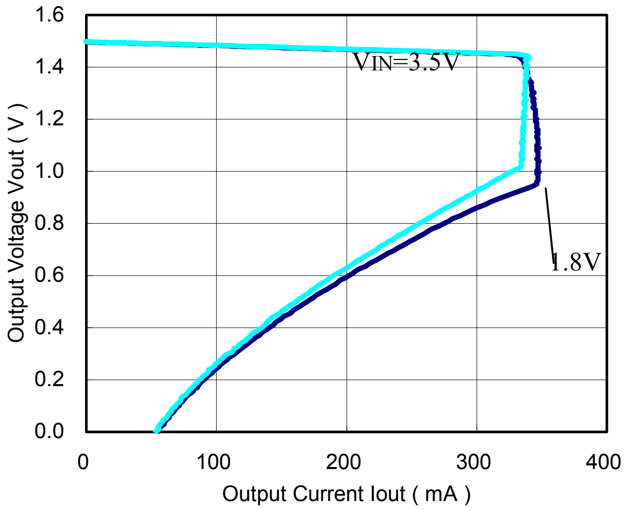
R1160X081X ECO=H



R1160X081X ECO=L



R1160X151X ECO=H



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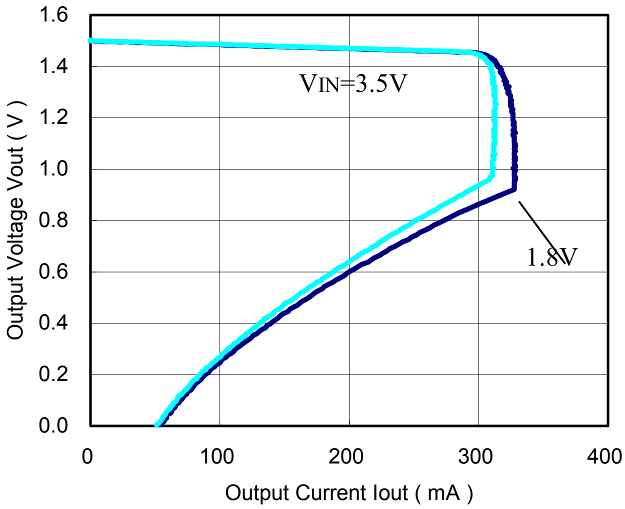
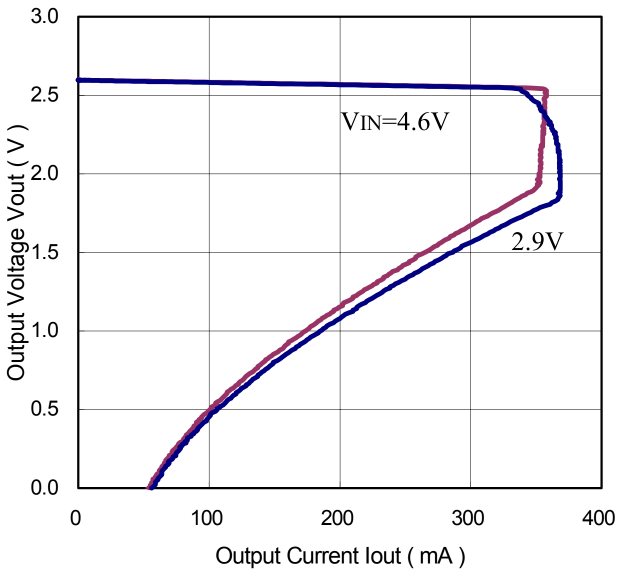


R1160X261X ECO=H



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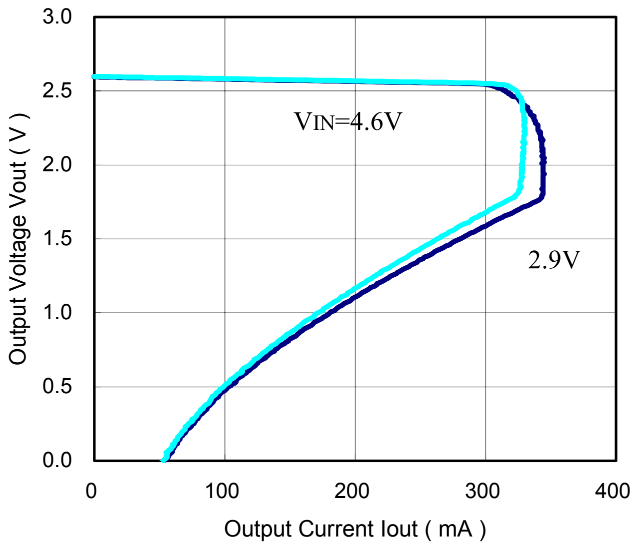

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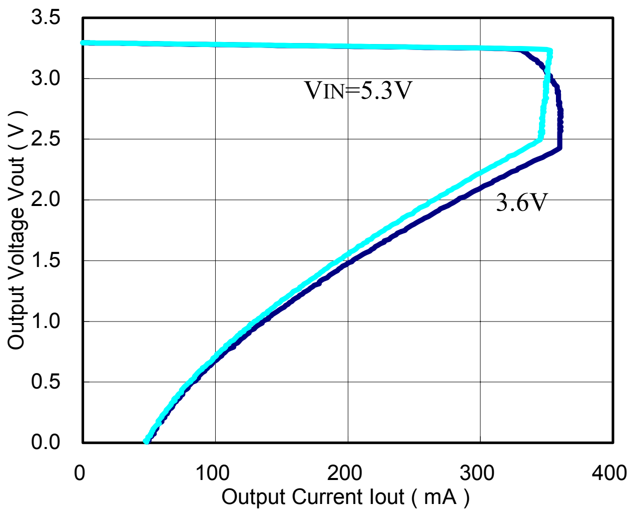

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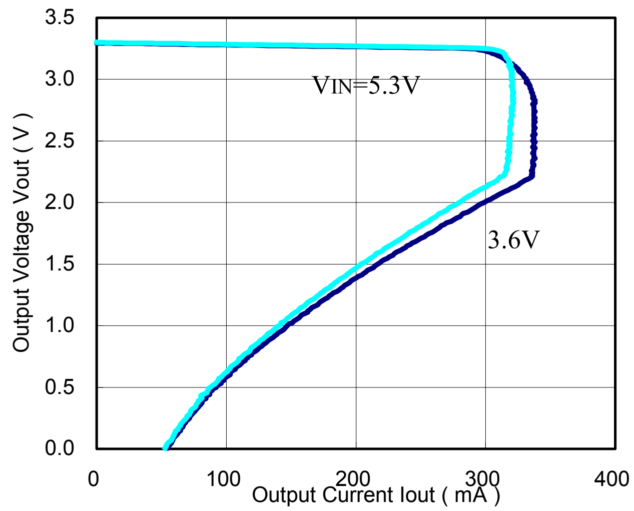
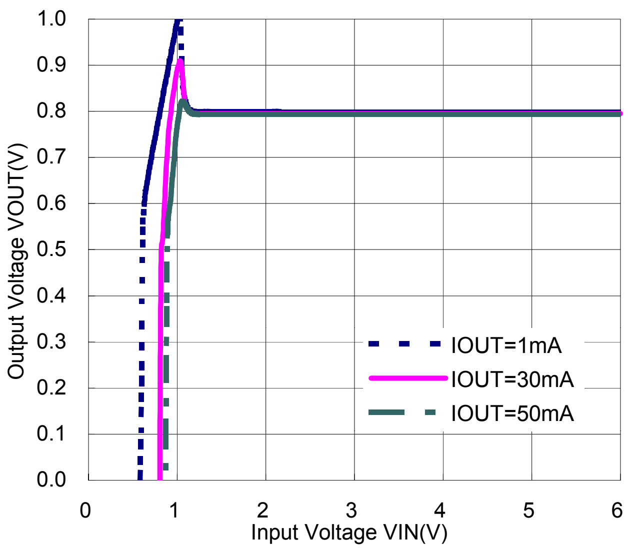


2) Output Voltage vs. Input Voltage

R1160X081X ECO=H



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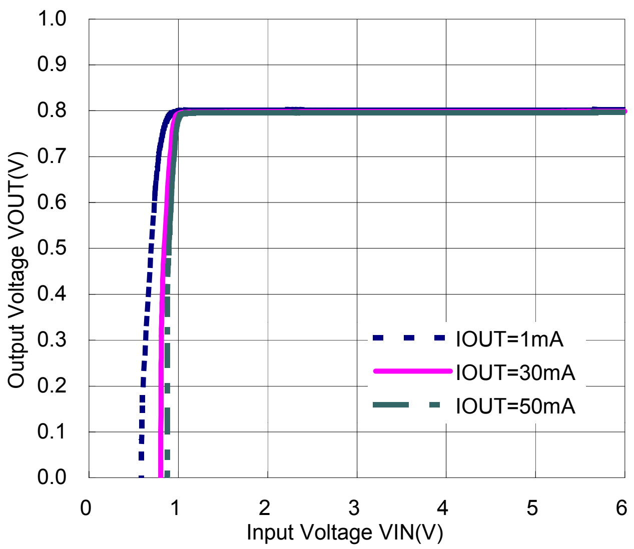

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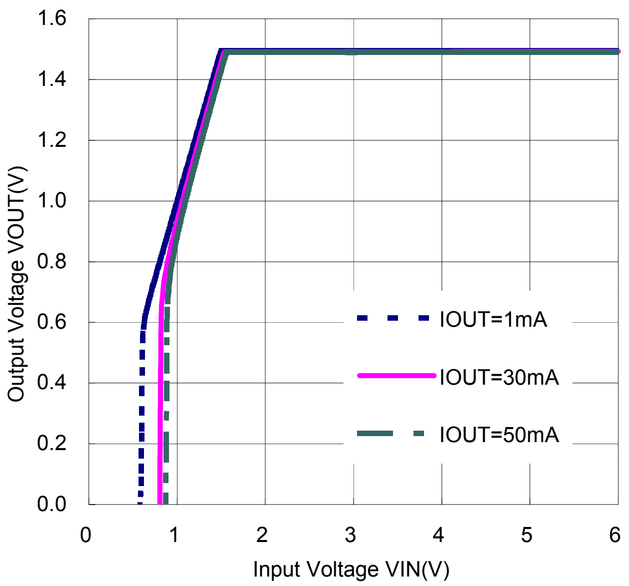

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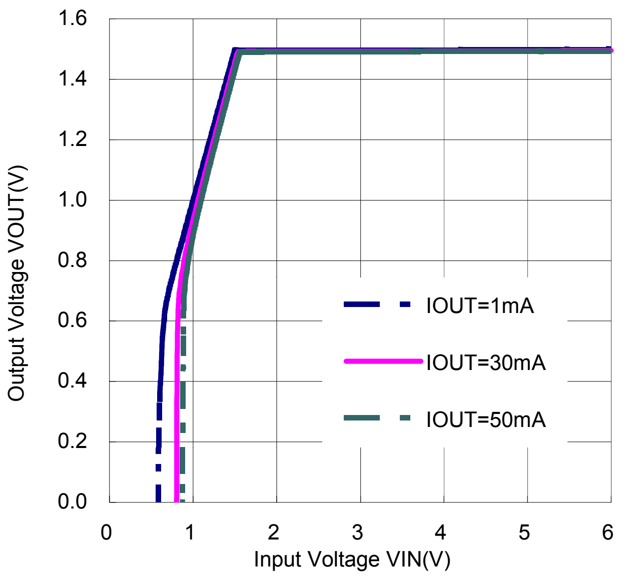

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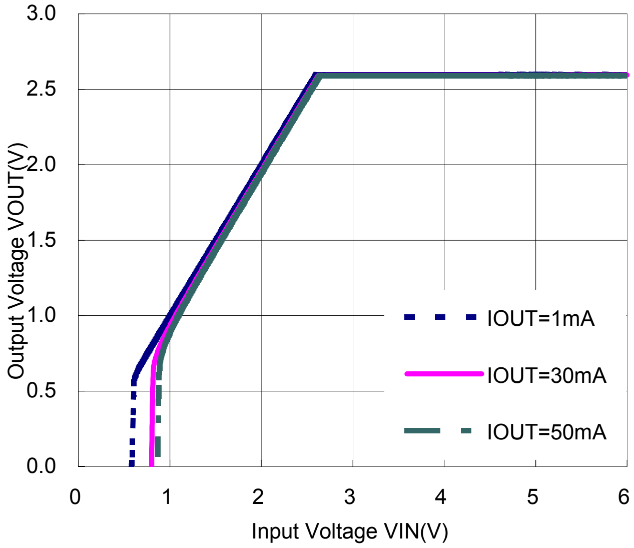

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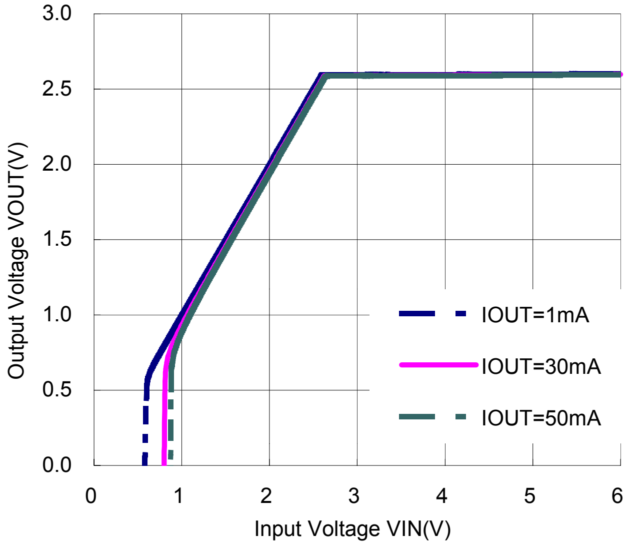

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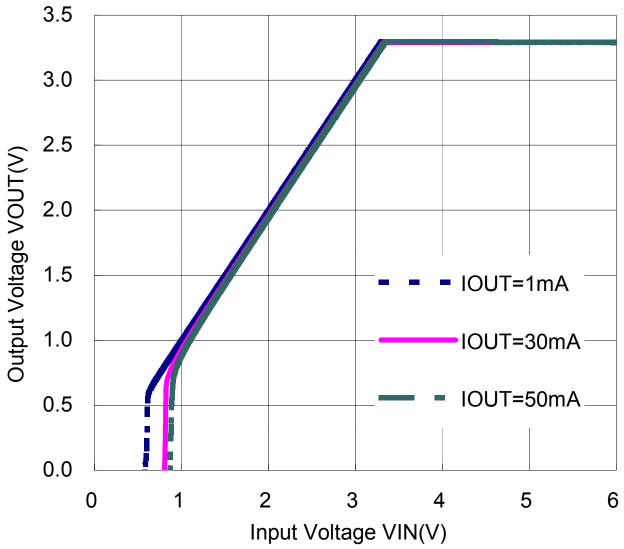

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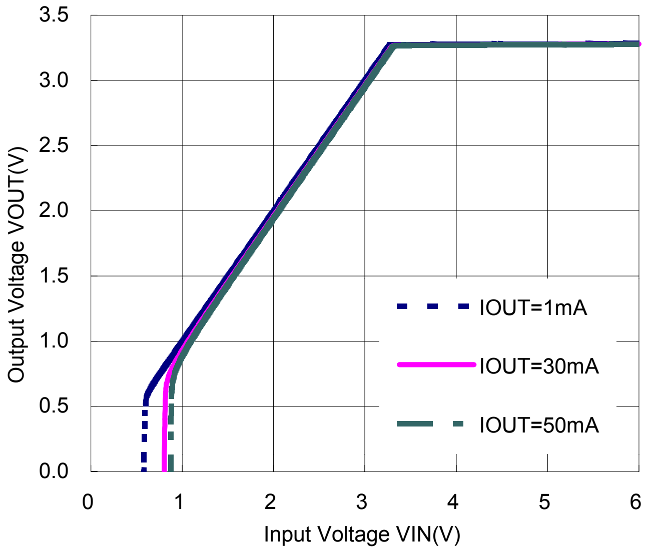

3) Supply Current vs. Input Voltage

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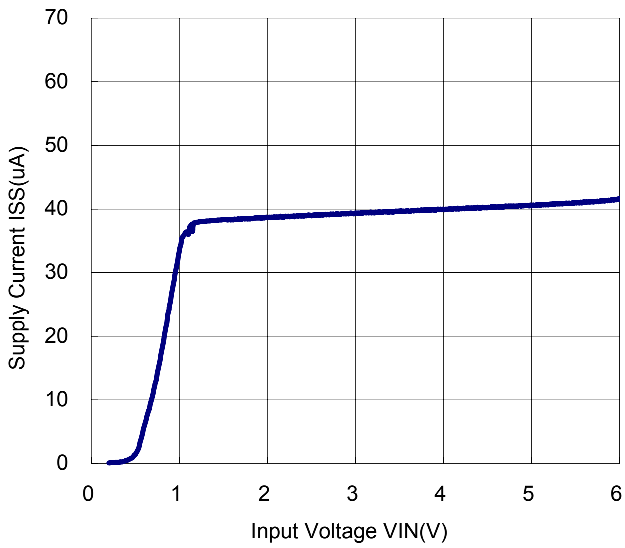

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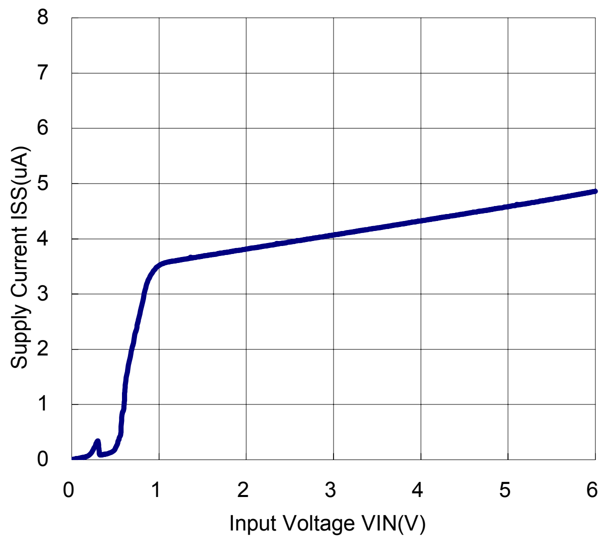

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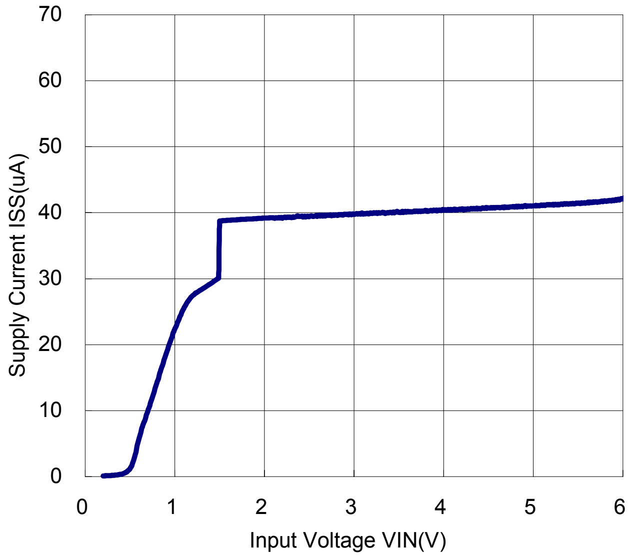
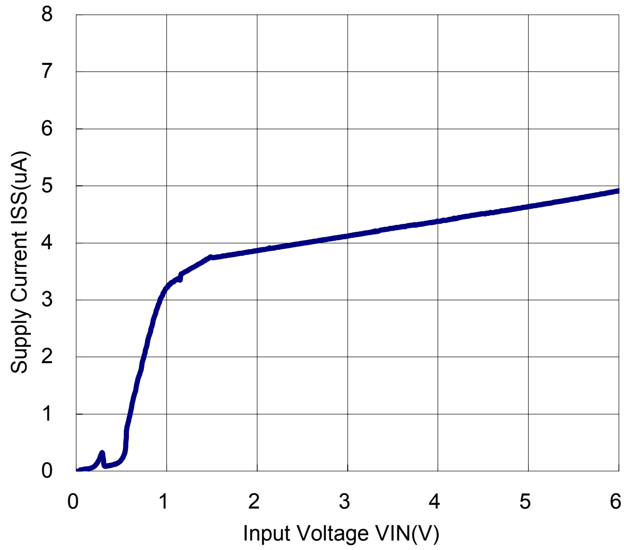
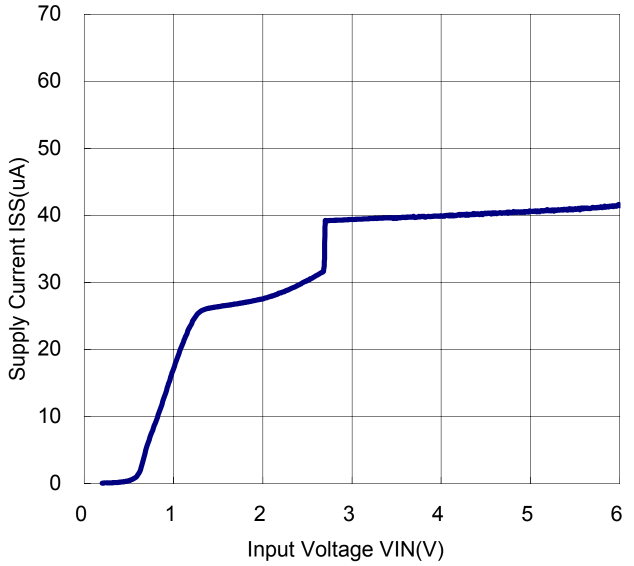


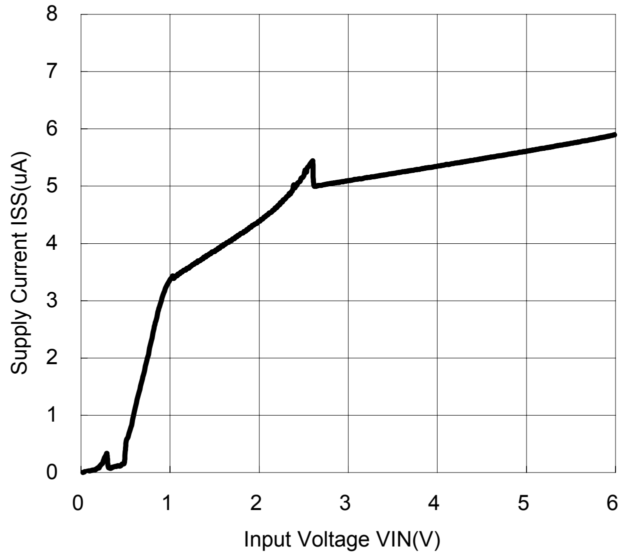
R1160X151X ECO=L



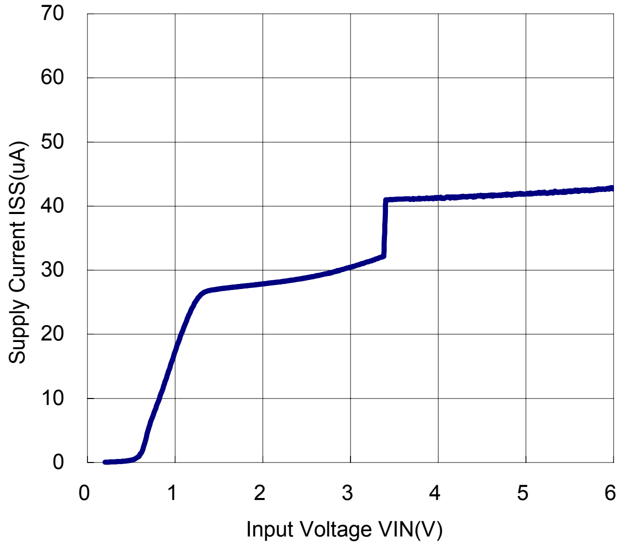
R1160X261X ECO=H



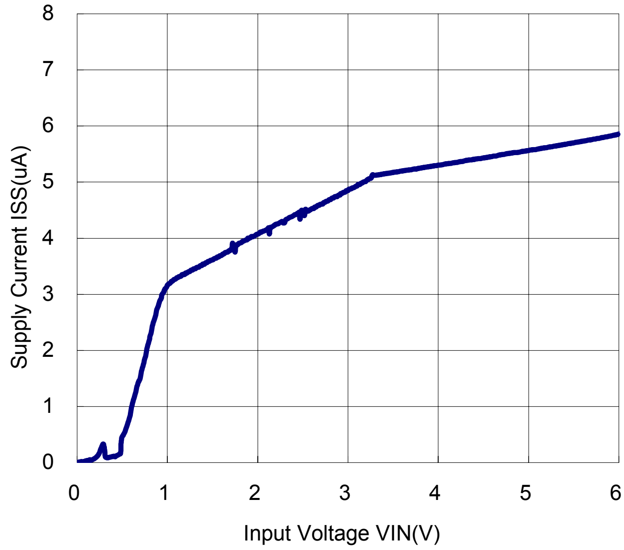
R1160X261X ECO=L



R1160X331X ECO=H

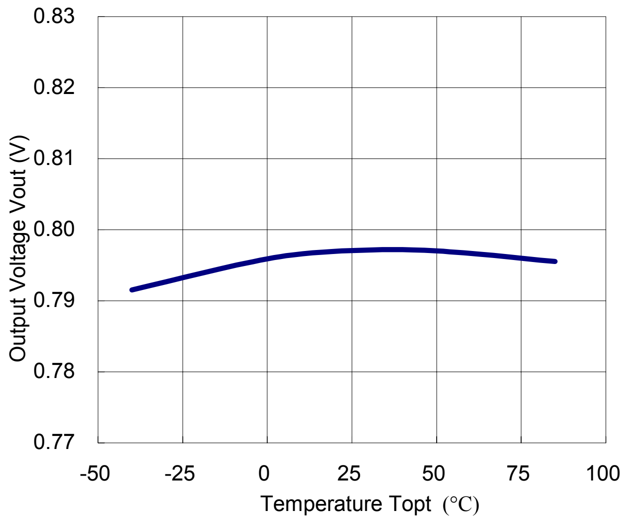


R1160X331X ECO=L

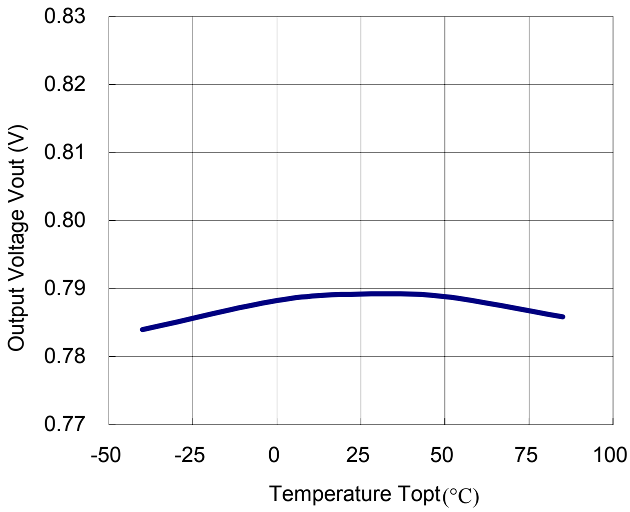


4) Output Voltage vs. Temperature

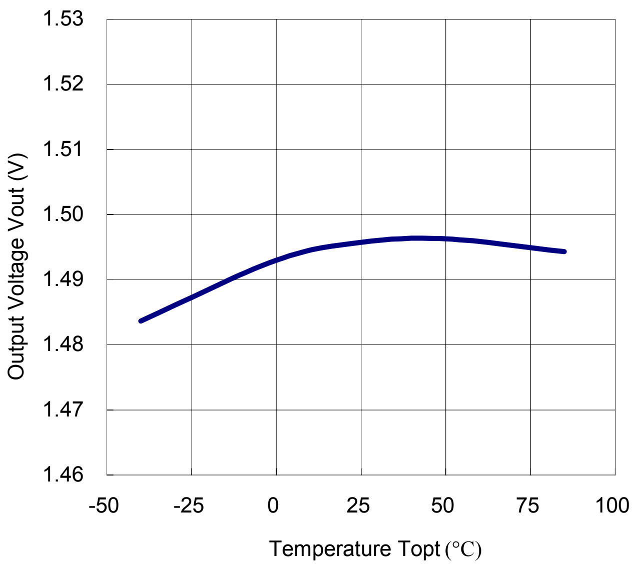
R1160X081X ECO=H



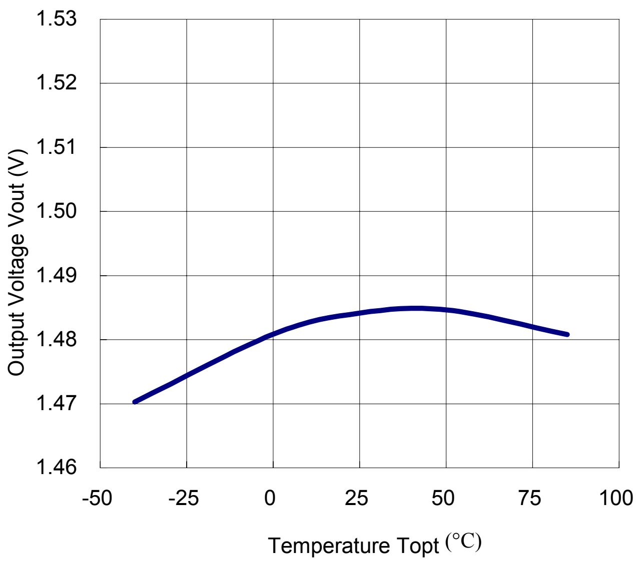
R1160X081X ECO=L



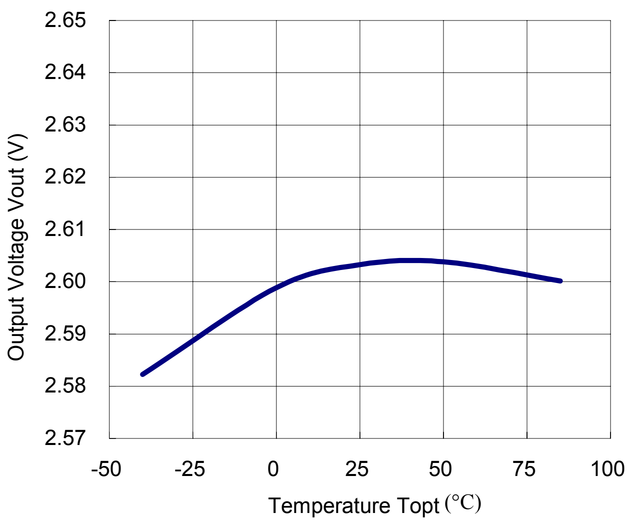
R1160X151X ECO=H



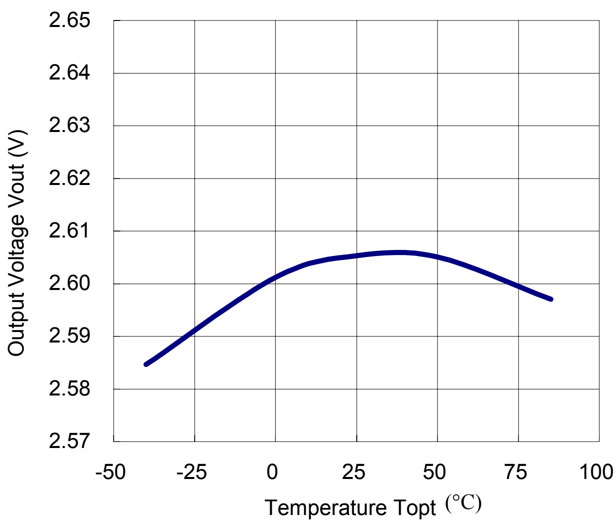
R1160X151X ECO=L



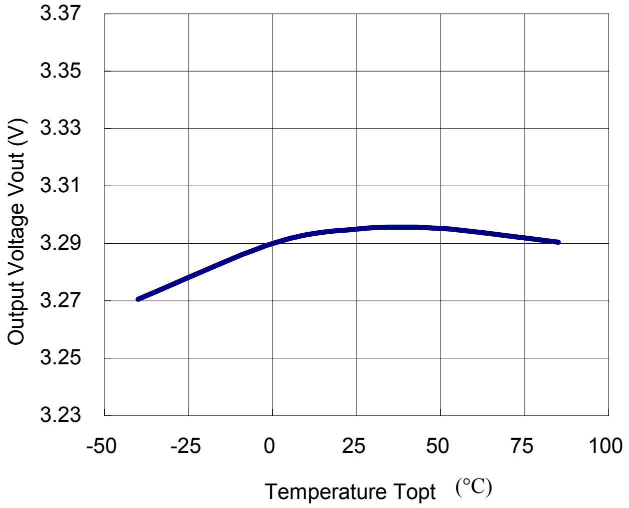
R1160X261X ECO=H



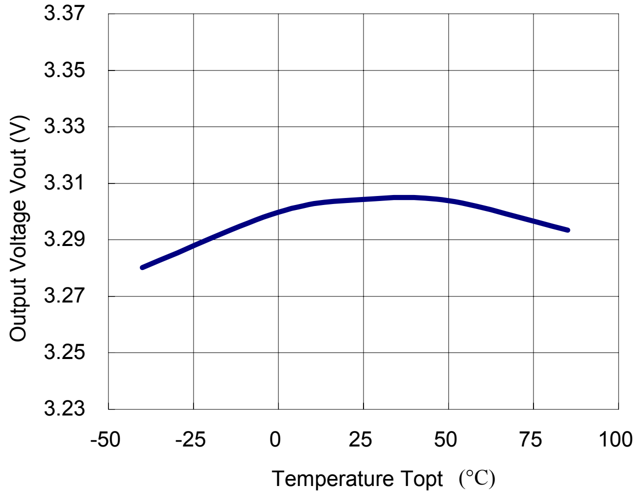
R1160X261X ECO=L



R1160X331X ECO=H

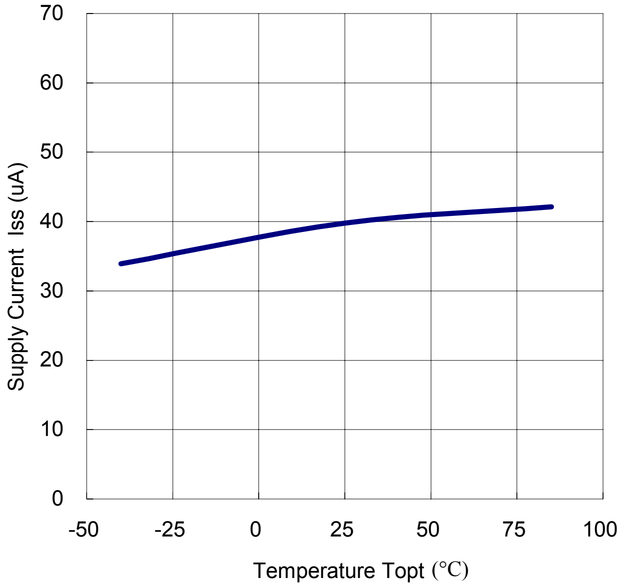


R1160X331X ECO=L

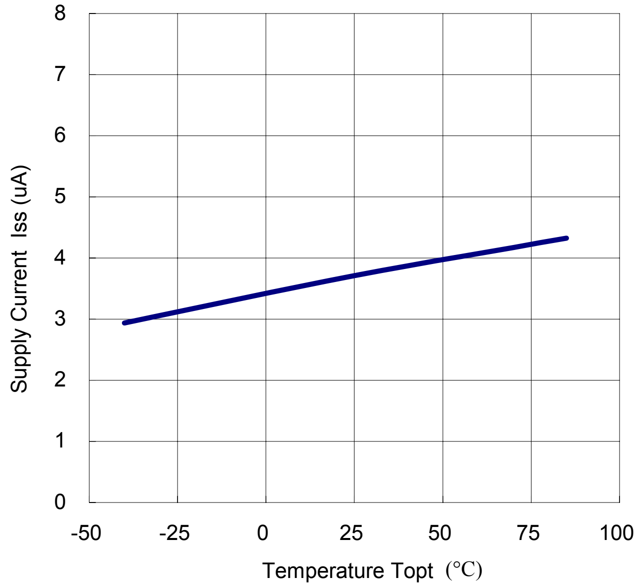


5) Supply Current vs. Temperature

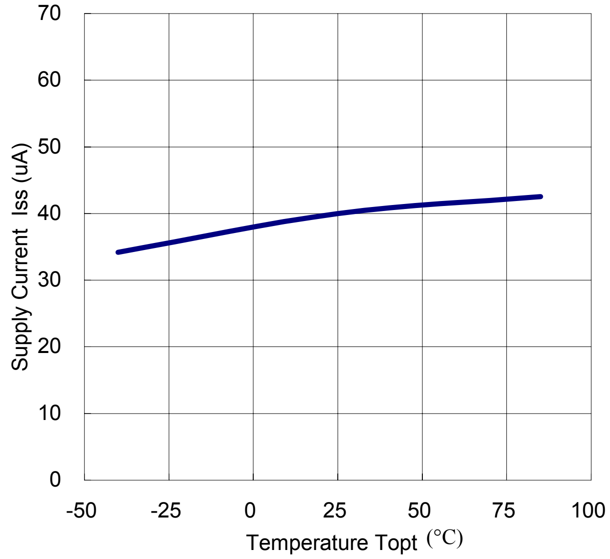
R1160X081X ECO=H



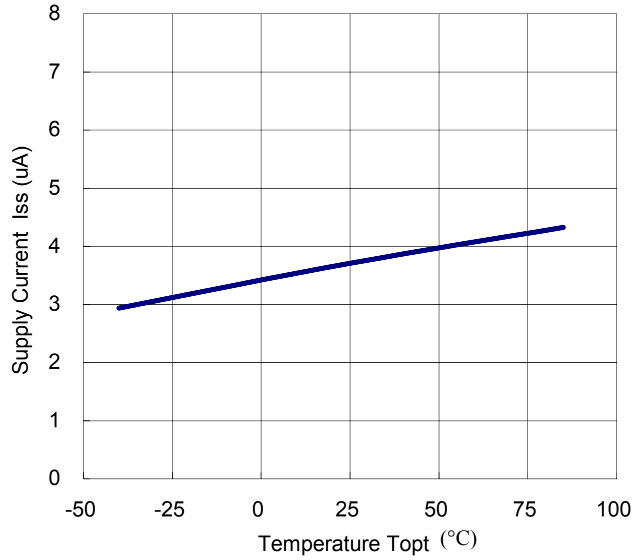
R1160X081X ECO=L

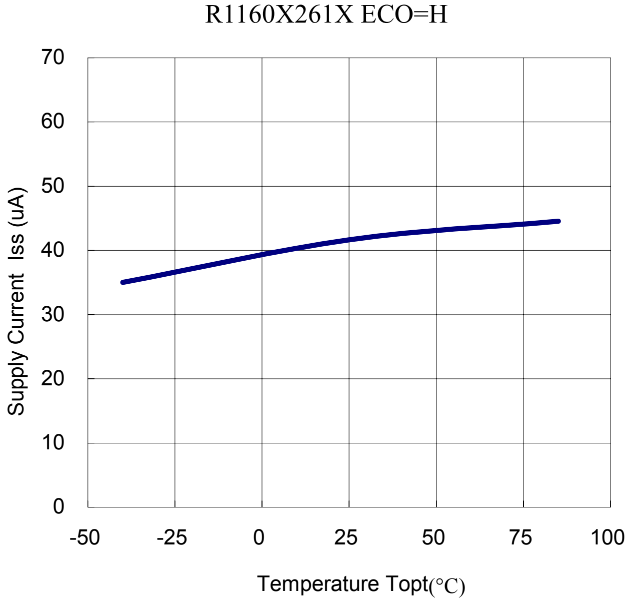


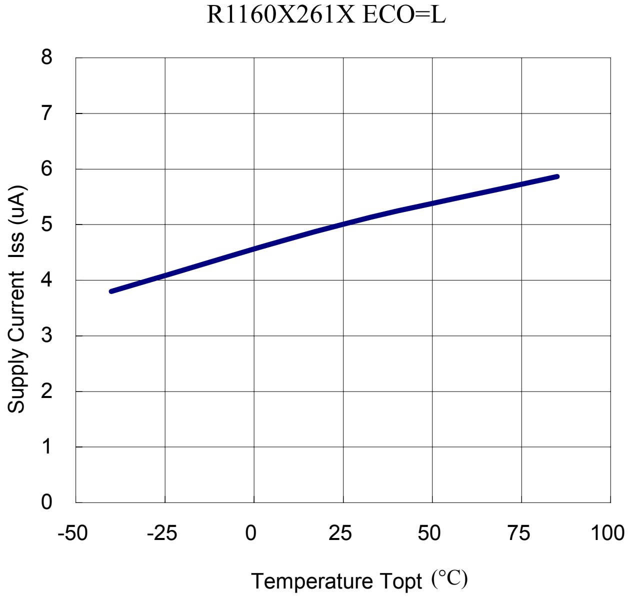
R1160X151X ECO=H

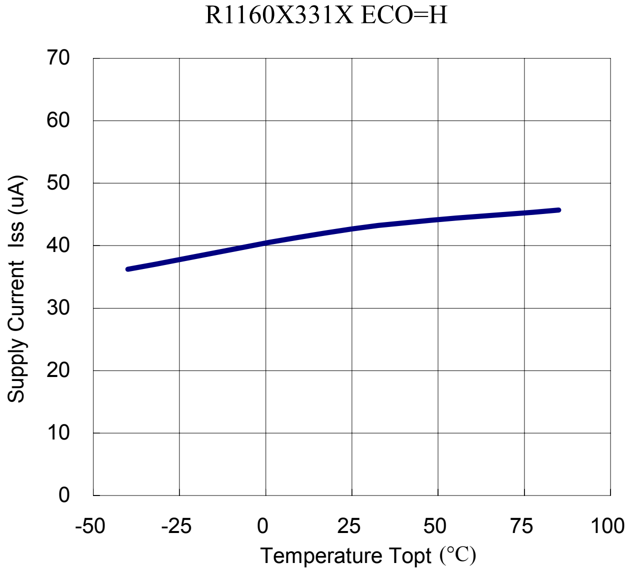


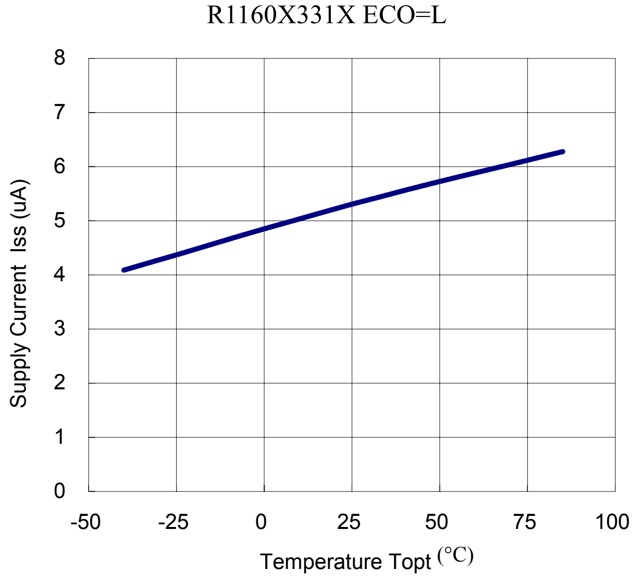
R1160X151X ECO=L



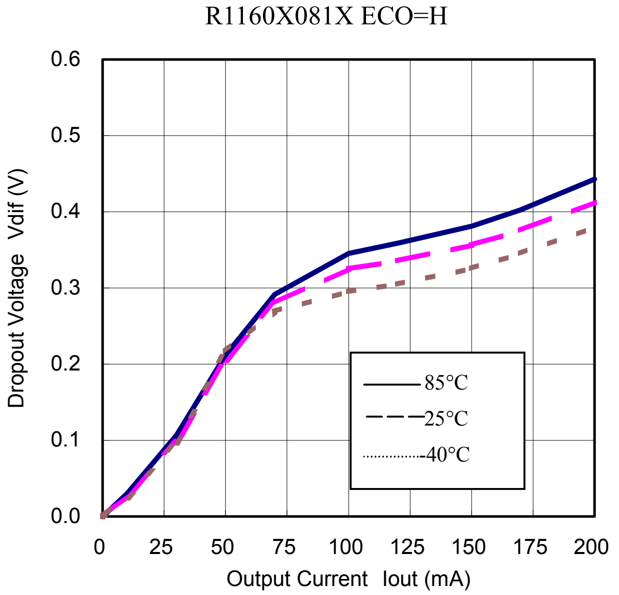


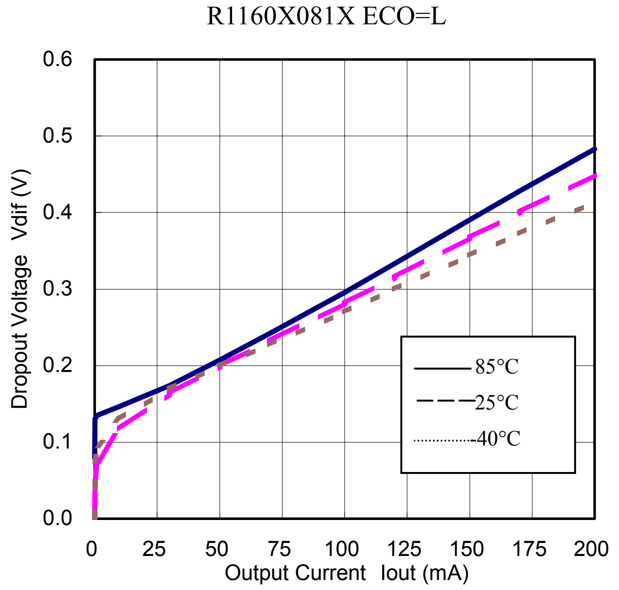




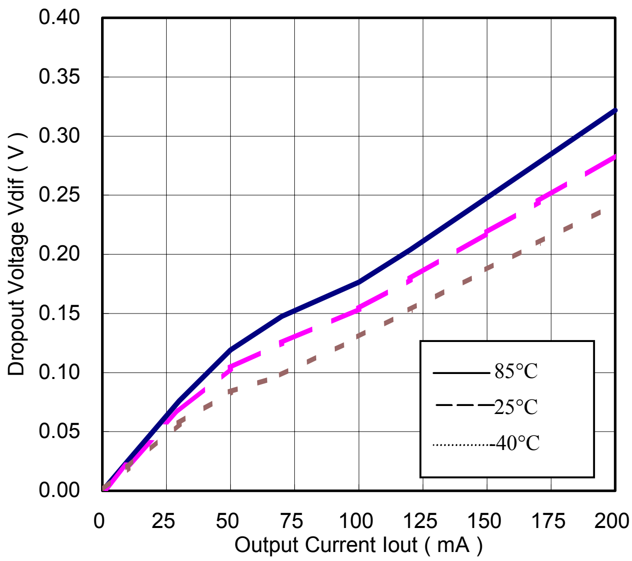


6) Dropout Voltage vs. Output Current

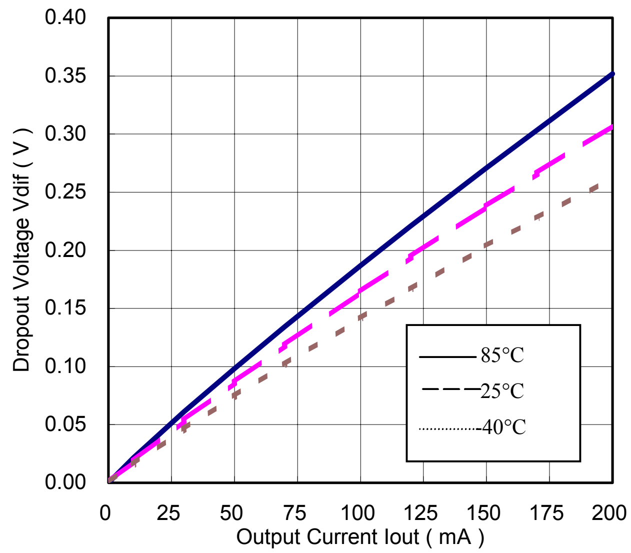




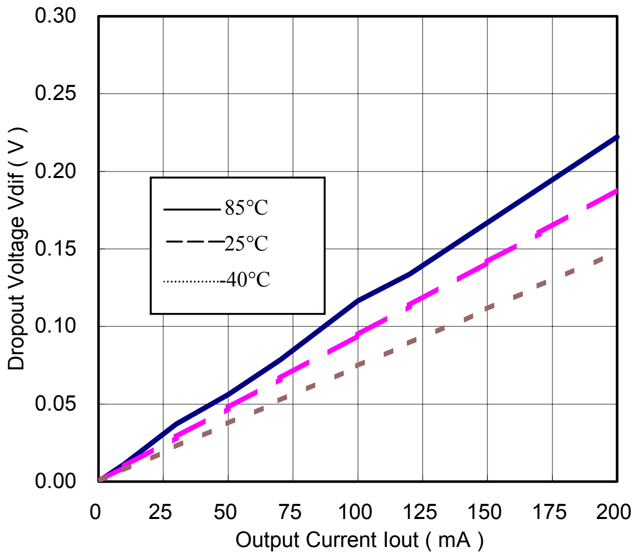
R1160X101X ECO=H



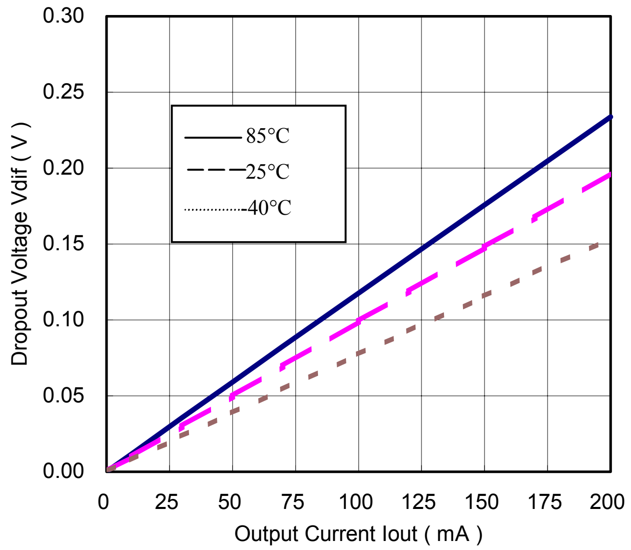
R1160X101X ECO=L



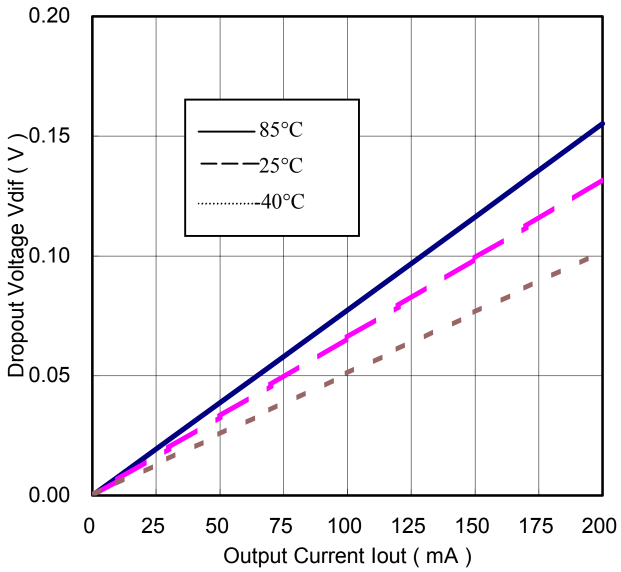
R1160X151X ECO=H



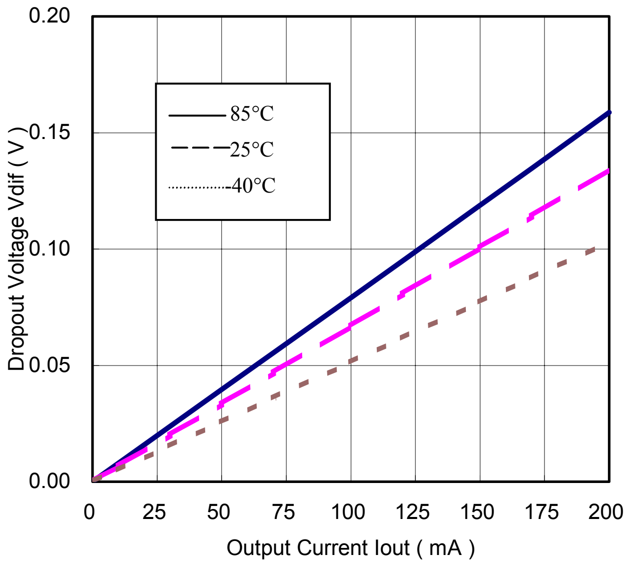
R1160X151X ECO=L



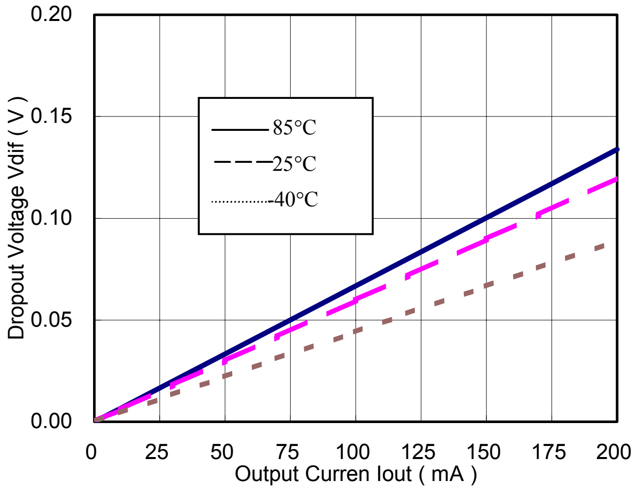
R1160X261X ECO=H



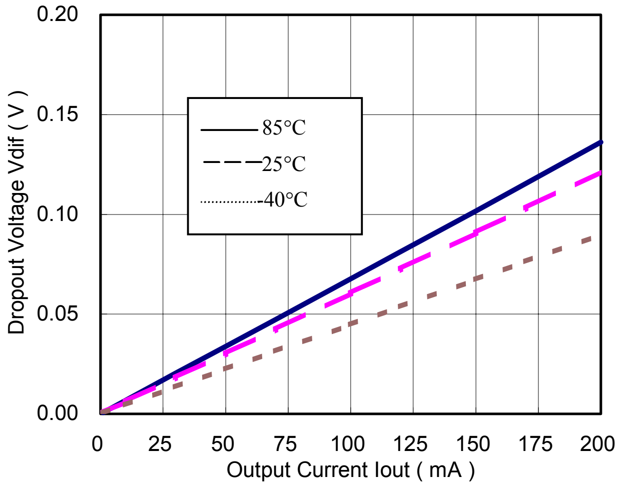
R1160X261X ECO=L



R1160X331X ECO=H

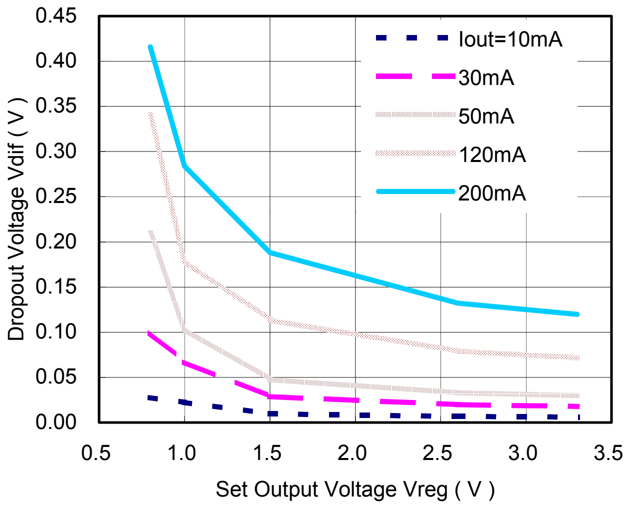


R1160X331X ECO=L

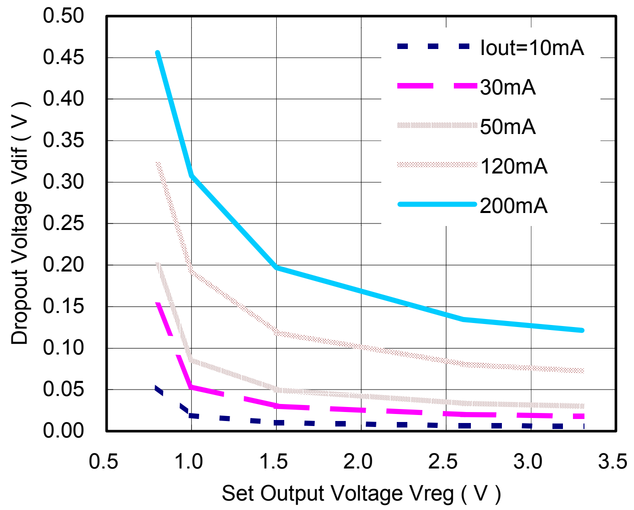


7) Dropout Voltage vs. Set Output Voltage (Topt=25°C)

R1160XXX1X ECO=H

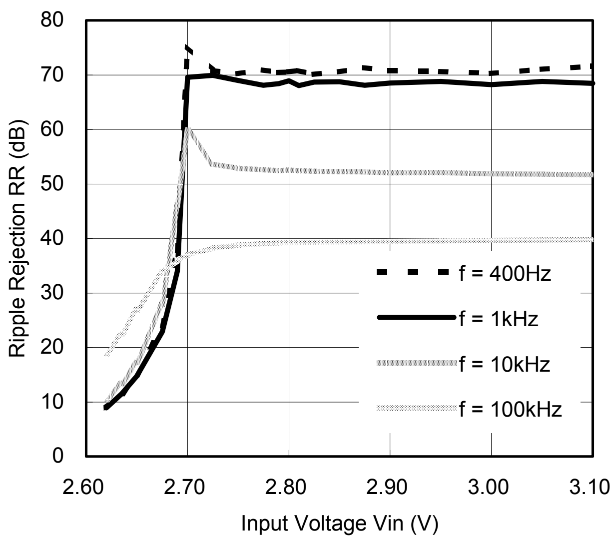


R1160XXX1X ECO=L

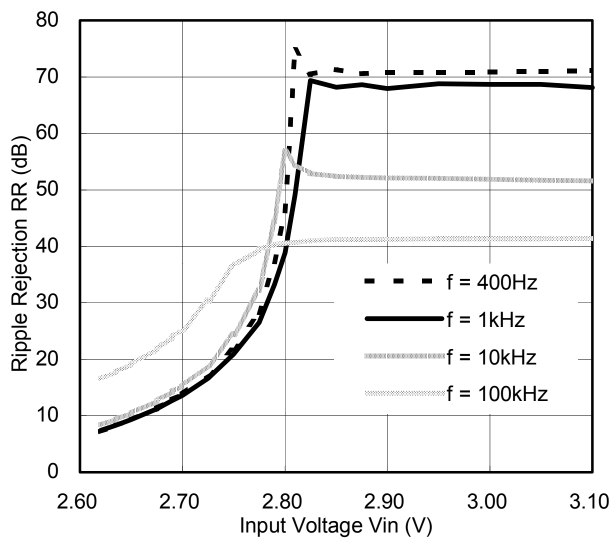


8) Ripple Rejection vs. Input Bias (Topt=25°C)

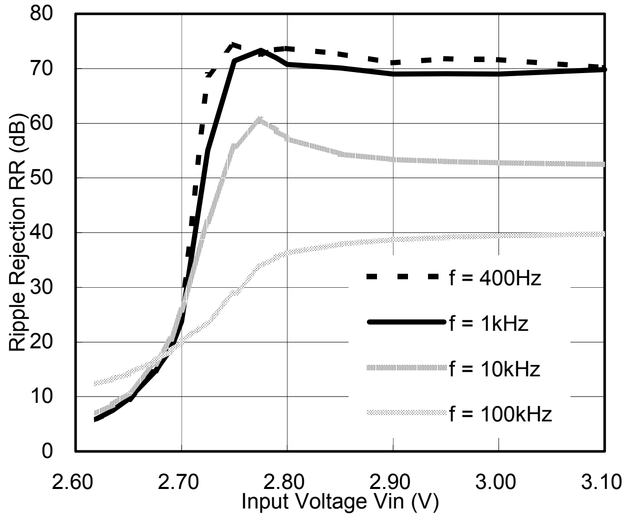
R1160X261X Ripple 0.2VP-P
Iout=1mA CIN; none COUT=Tantal2.2µF



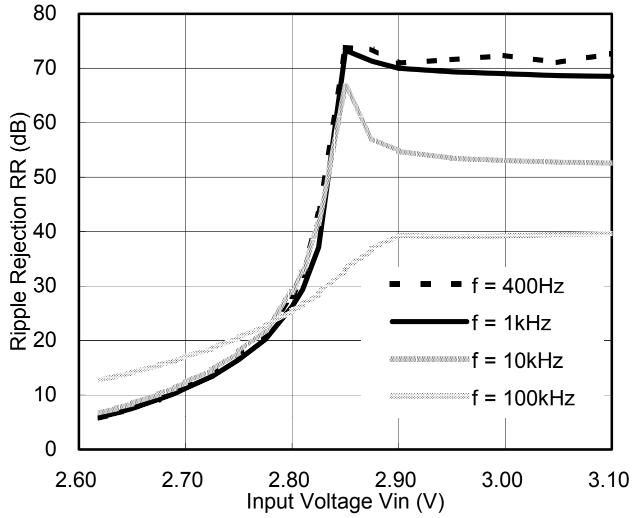
R1160X261X Ripple 0.5Vp-p
Iout=1mA CIN; none COUT=Tantal2.2µF



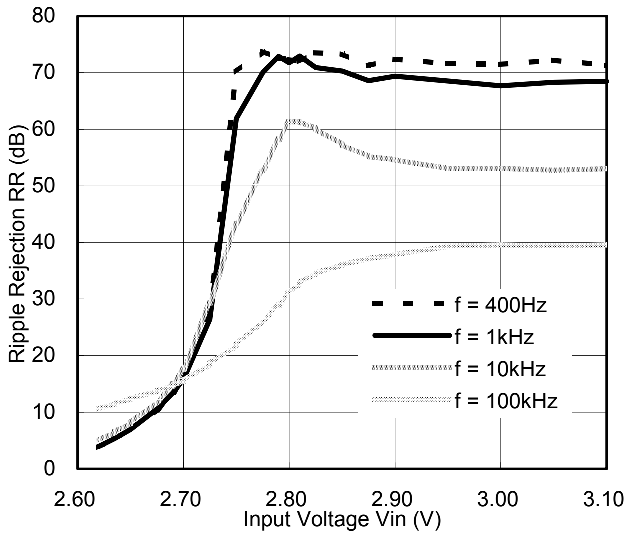
R1160X261X Ripple 0.2Vp-p
Iout=30mA CIN; none COUT=Tantal2.2µF



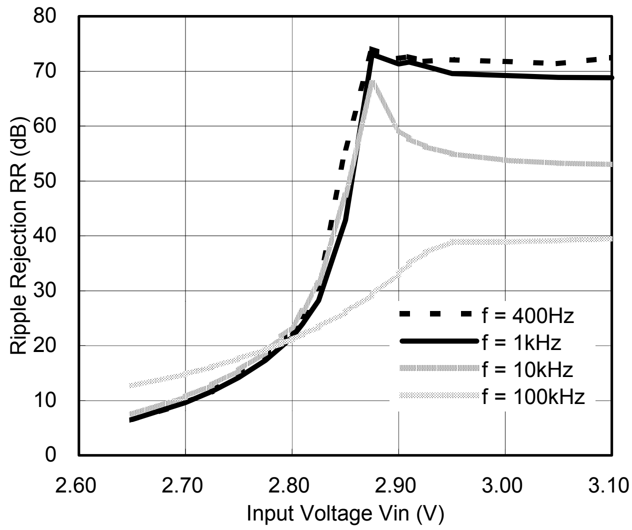
R1160X261X Ripple 0.5Vp-p
Iout=30mA CIN; none COUT=Tantal2.2µF



R1160X261X Ripple 0.2Vp-p
Iout=50mA CIN; none COUT=Tantal2.2µF

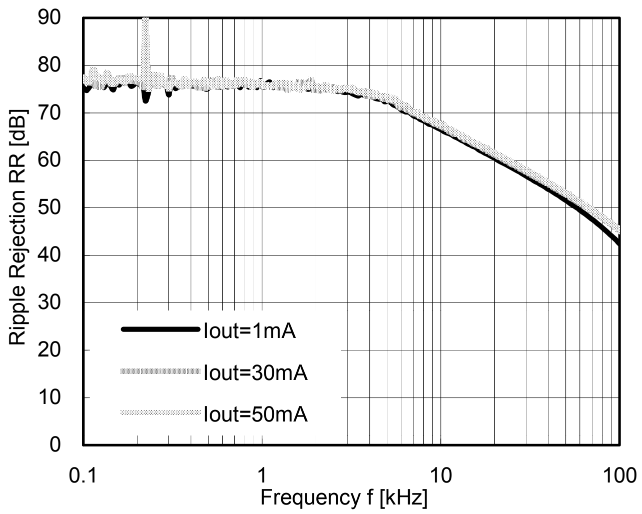


R1160X261X Ripple 0.5Vp-p
Iout=50mA CIN; none COUT=Tantal2.2µF

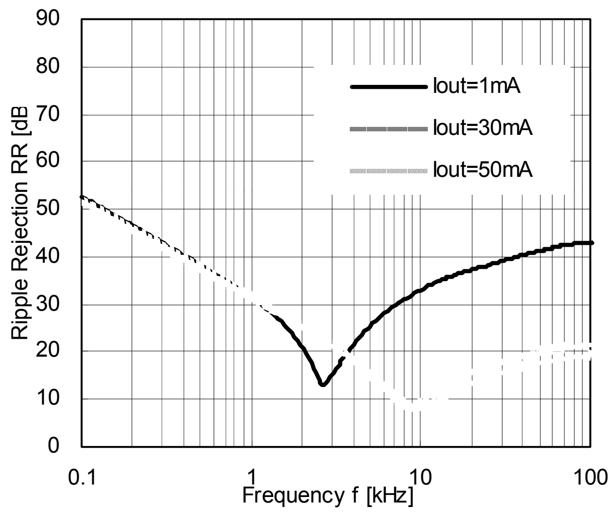


9) Ripple Rejection vs. Frequency

R1160X081X ECO=H
VIN=1.8VDC+0.2Vp-p, CIN; none,COUT=tantal2.2µF

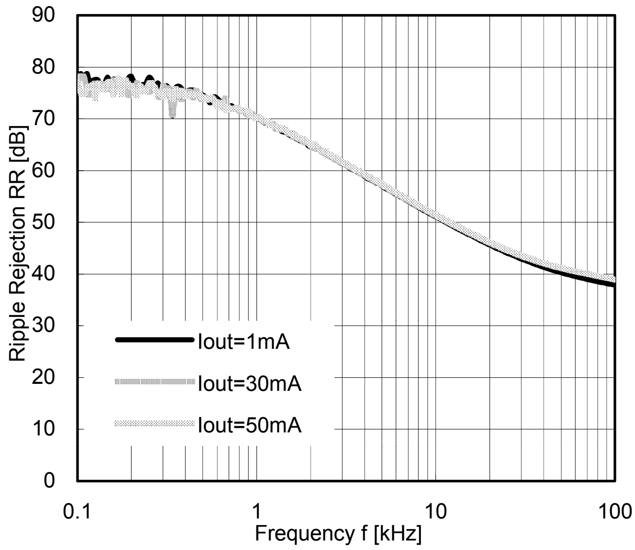


R1160X081X ECO=L
VIN=1.8VDC+0.2Vp-p, CIN; none,COUT=tantal2.2µF



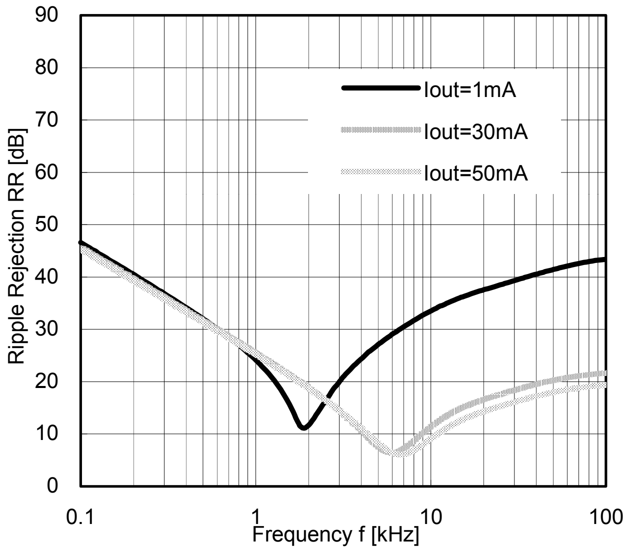
R1160X151X ECO=H

VIN=2.5VDC+0.2Vp-p, CIN; none,COUT=tantal2.2µF



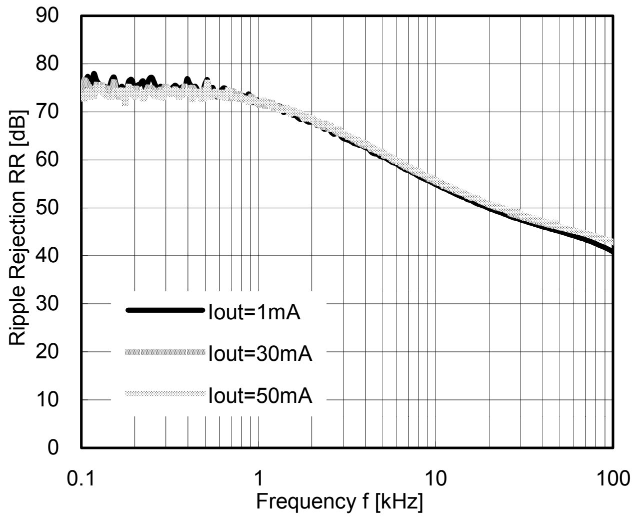
R1160X151X ECO=L

VIN=2.5VDC+0.2Vp-p, CIN; none,COUT=tantal2.2µF



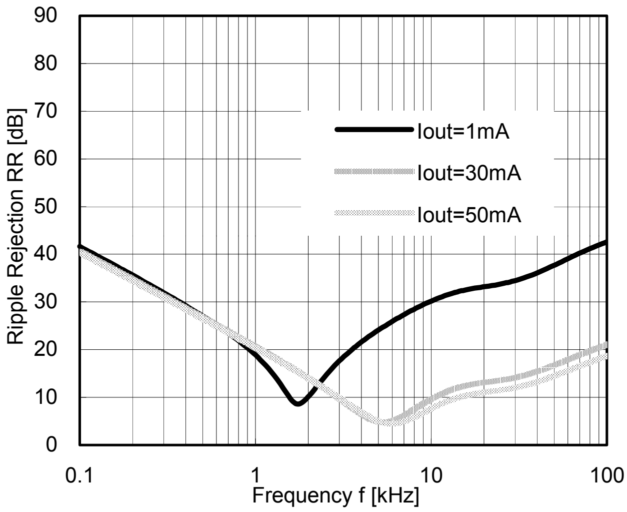
R1160X261X ECO=H

VIN=3.6VDC+0.2Vp-p, CIN; none,COUT=tantal1.0µF



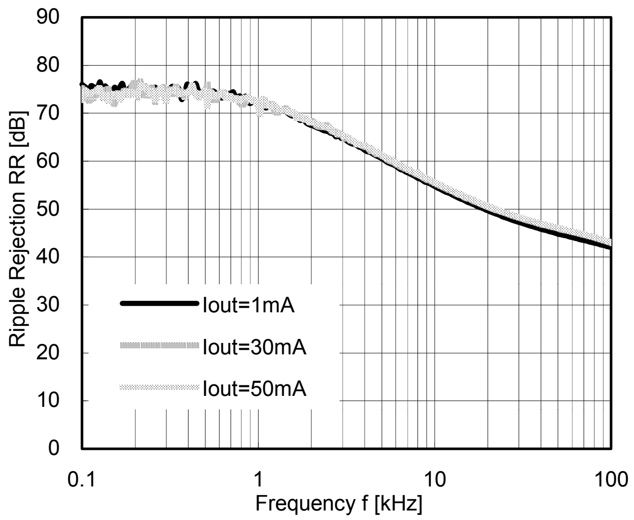
R1160X261X ECO=L

VIN=3.6VDC+0.2Vp-p, CIN; none,COUT=tantal1.0µF



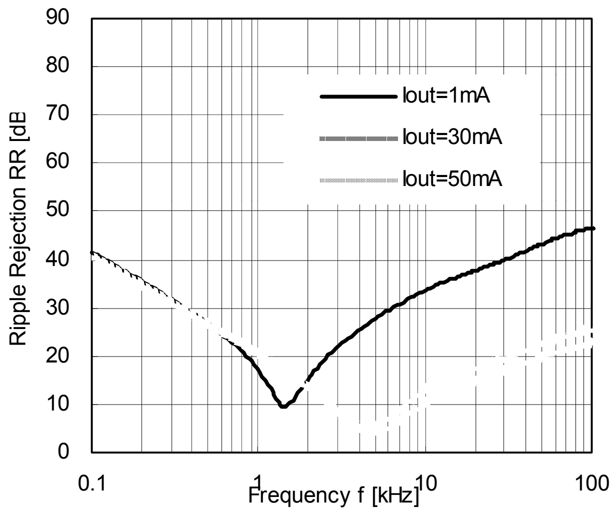
R1160X261X ECO=H

VIN=3.6VDC+0.2Vp-p, CIN; none,COUT=tantal2.2µF

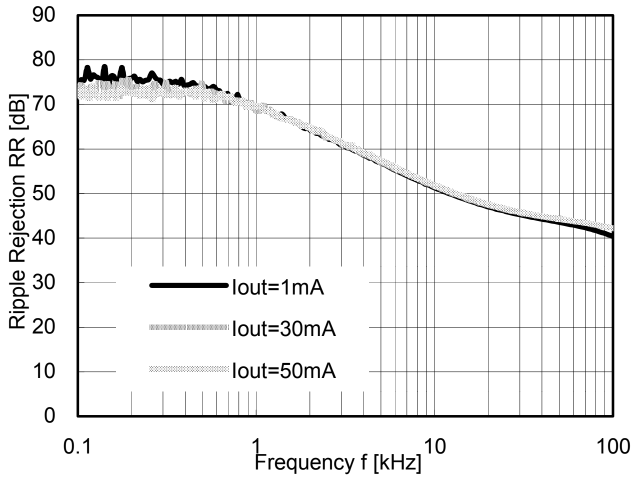


R1160X261X ECO=L

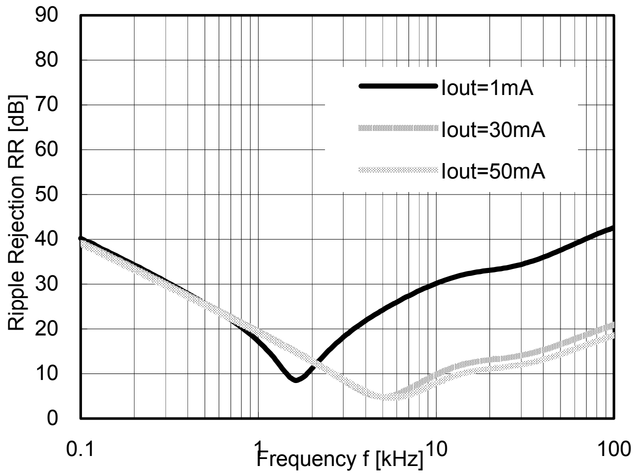
VIN=3.6VDC+0.2Vp-p, CIN; none,COUT=tantal2.2µF



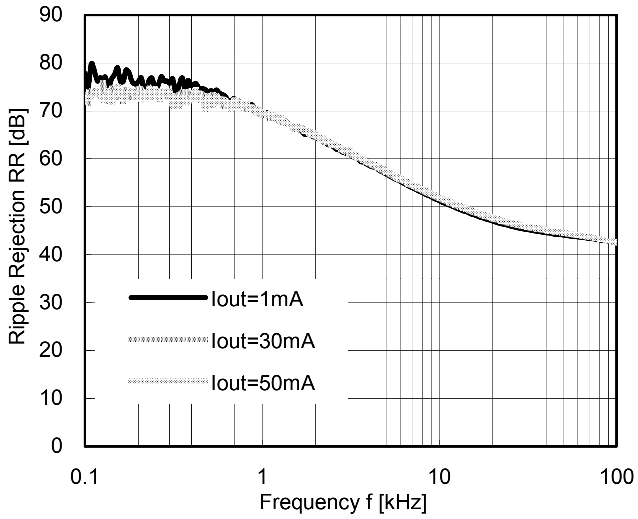
R1160X331X ECO=H
VIN=4.3VDC+0.2Vp-p, CIN; none,COUT=tantal1.0μF



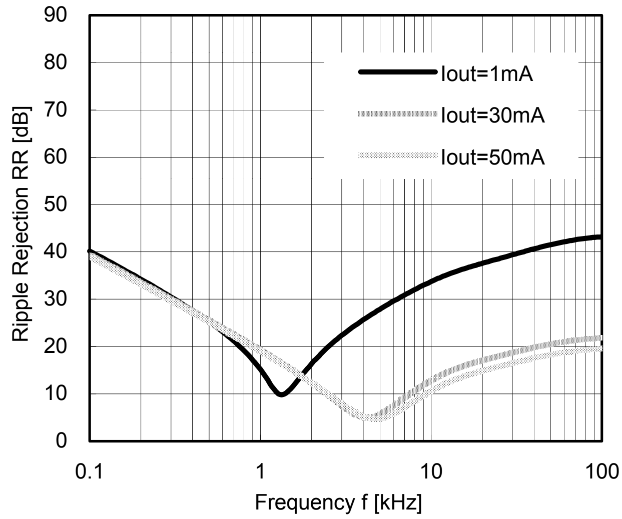
R1160X331X ECO=L
VIN=4.3VDC+0.2Vp-p, CIN; none,COUT=tantal1.0μF



R1160X331X ECO=H
VIN=4.3VDC+0.2Vp-p, CIN; none,COUT=tantal2.2μF

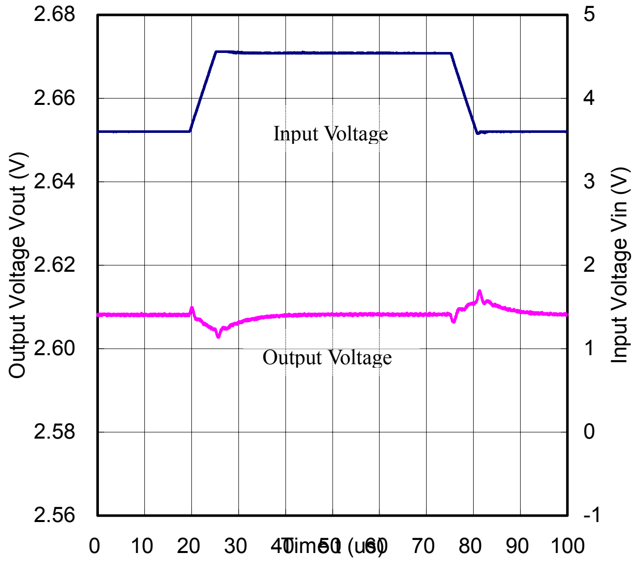


R1160X331X ECO=L
VIN=4.3VDC+0.2Vp-p, CIN; none,COUT=tantal2.2μF

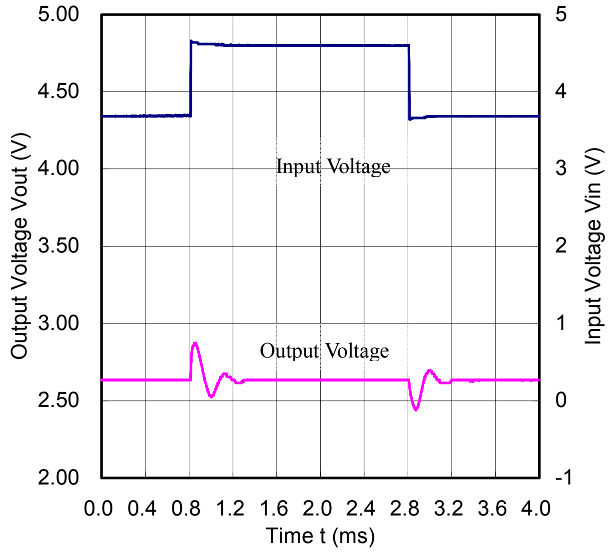


10) Input Transient Response

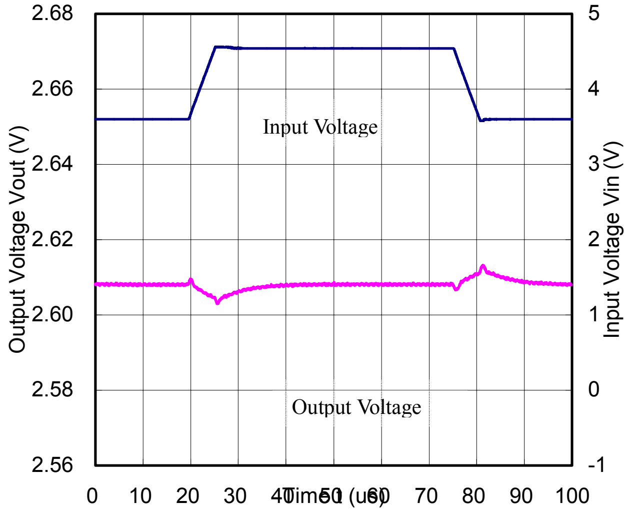
R1160X261X ECO=H
IOUT=30mA, tr=tf=5μs, COUT=tantal1.0μF



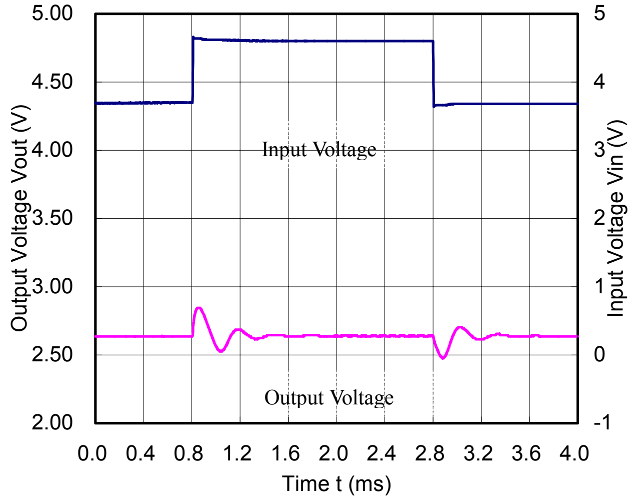
R1160X261X ECO=L
IOUT=10mA, tr=tf=5μs, COUT=tantal1.0μF



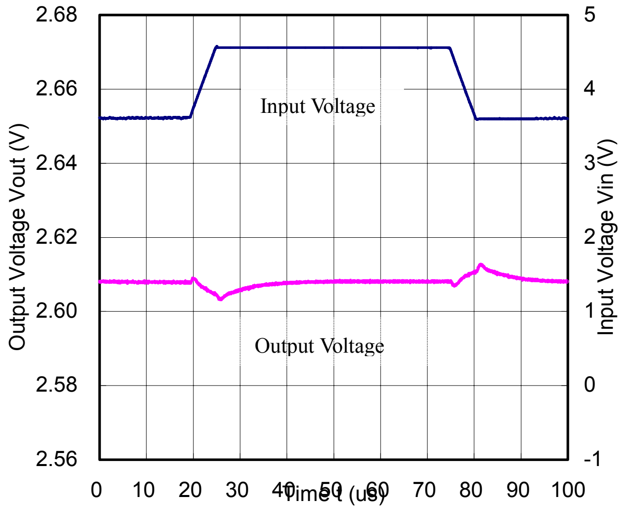
R1160X261X ECO=H
IOUT=30mA, tr=tf=5µs, COUT= tantal 2.2µF



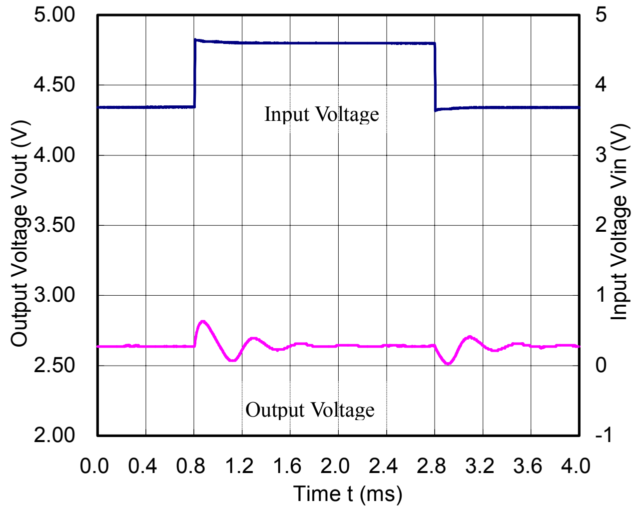
R1160X261X ECO=L
IOUT=10mA, tr=tf=5µs, COUT= tantal 2.2µF



R1160X261X ECO=H
IOUT=30mA, tr=tf=5µs, COUT= tantal 4.7µF

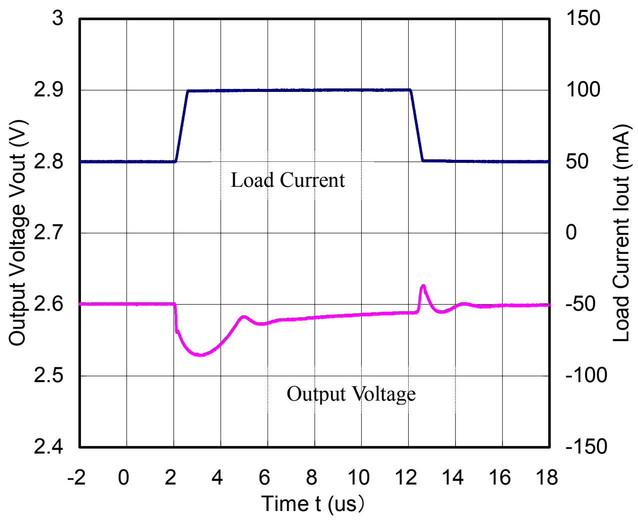


R1160X261X ECO=L
IOUT=10mA, tr=tf=5µs, COUT= tantal 4.7µF

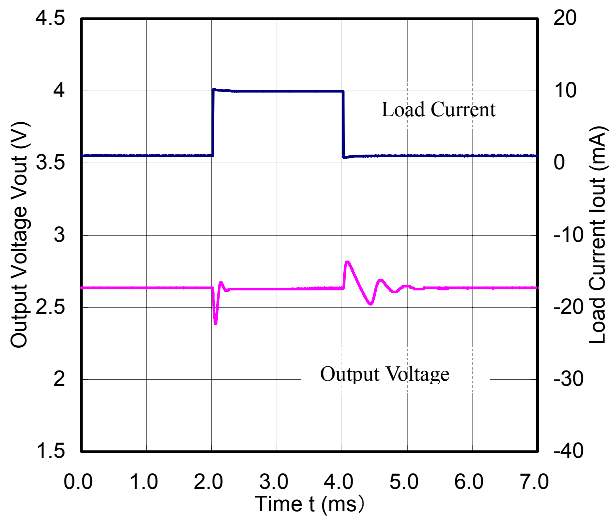


11) Load Transient Response

R1160X261X ECO=H
VIN=3.6V, CIN=Tantal 1.0µF, COUT= Tantal 1.0µF

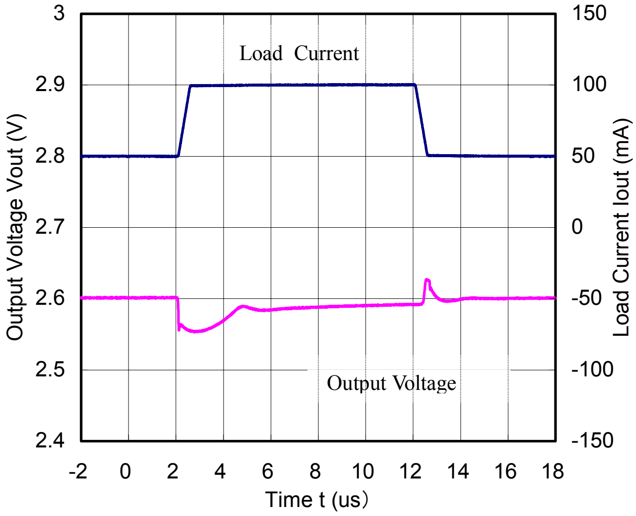


R1160X261X ECO=L
VIN=3.6V, CIN=Tantal 1.0µF, COUT= Tantal 1.0µF



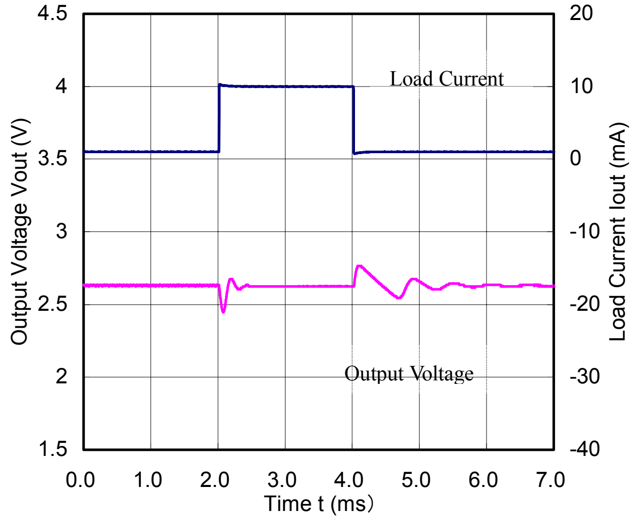
R1160X261X ECO=H

VIN=3.6V, CIN=tantal 1.0µF, COUT= tantal 2.2µF



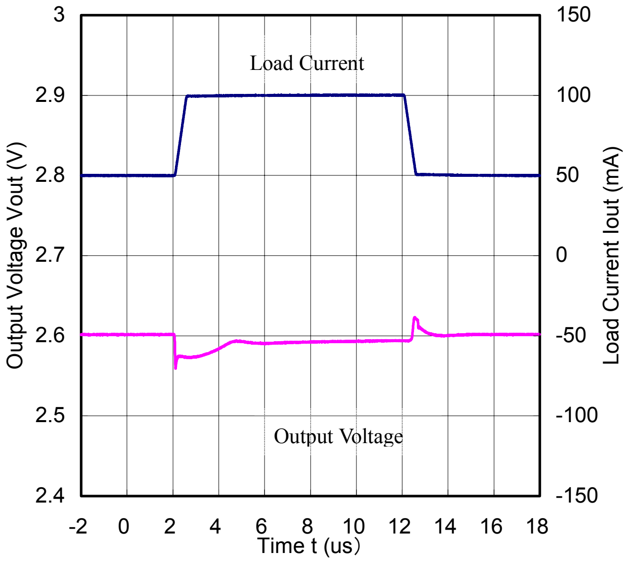
R1160X261X ECO=L

VIN=3.6V, CIN=tantal 1.0µF, COUT= tantal 2.2µF



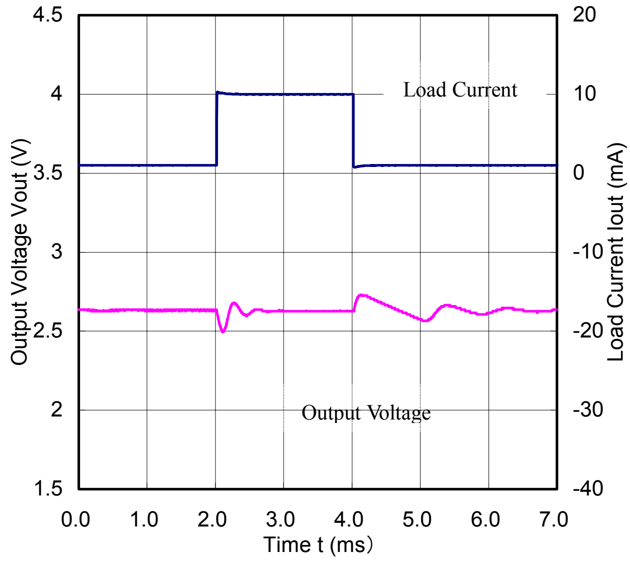
R1160X261X ECO=H

VIN=3.6V, CIN=tantal 1.0µF, COUT= tantal 4.7µF



R1160X261X ECO=L

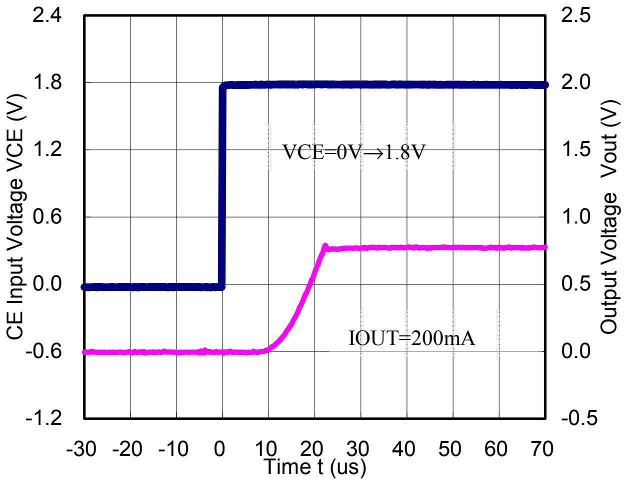
VIN=3.6V, CIN=tantal 1.0µF, COUT= tantal 4.7µF



12)Turn on speed with CE pin

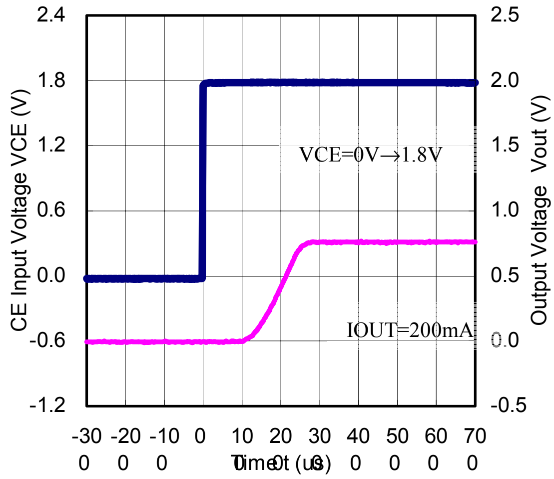
R1160X081B ECO=H

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

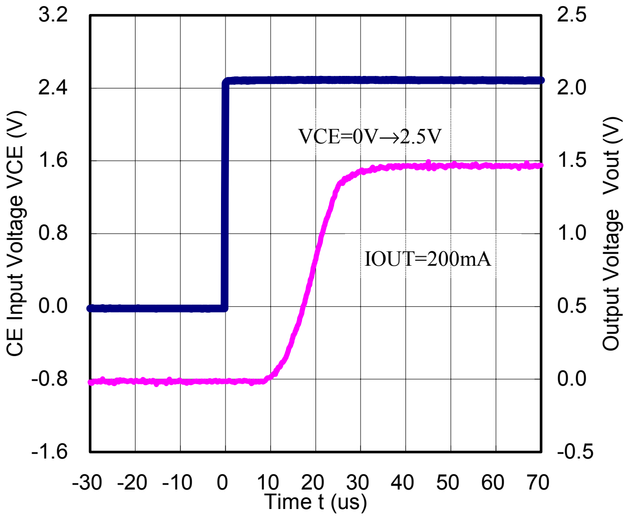


R1160X081B ECO=L

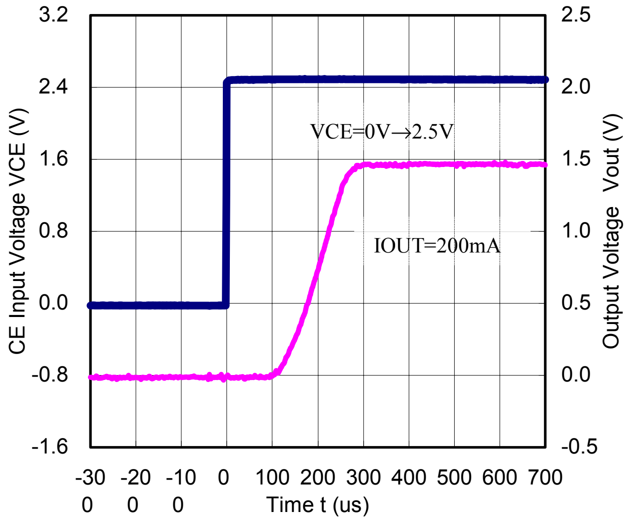
VIN=1.8V, CIN=tantal 1.0µF, COUT= tantal 2.2µF



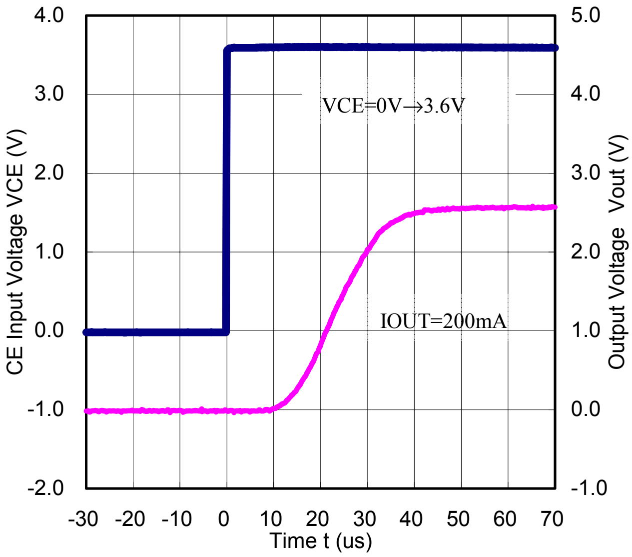
R1160X151B ECO=H
VIN=2.5V, CIN=tantal 1.0µF, COUT= tantal 2.2µF



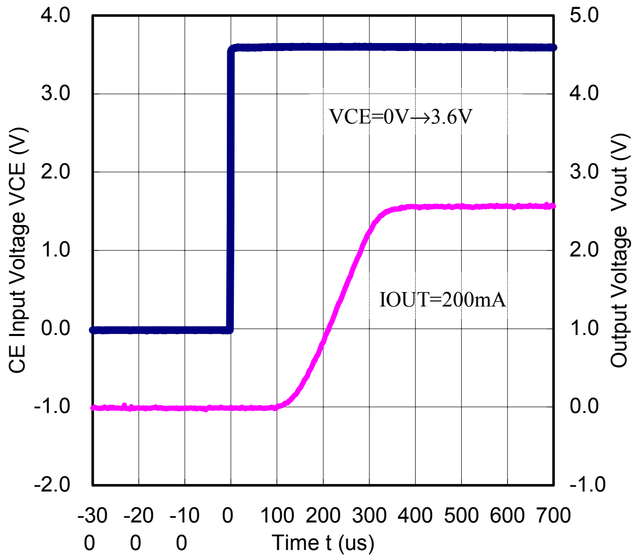
R1160X151B ECO=L
VIN=2.5V, CIN=tantal 1.0µF, COUT= tantal 2.2µF



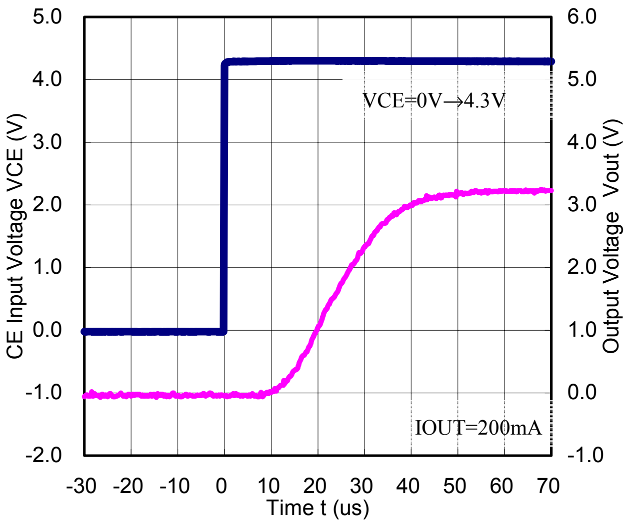
R1160X261B ECO=H
VIN=3.6V, CIN=tantal 1.0µF, COUT= tantal 2.2µF



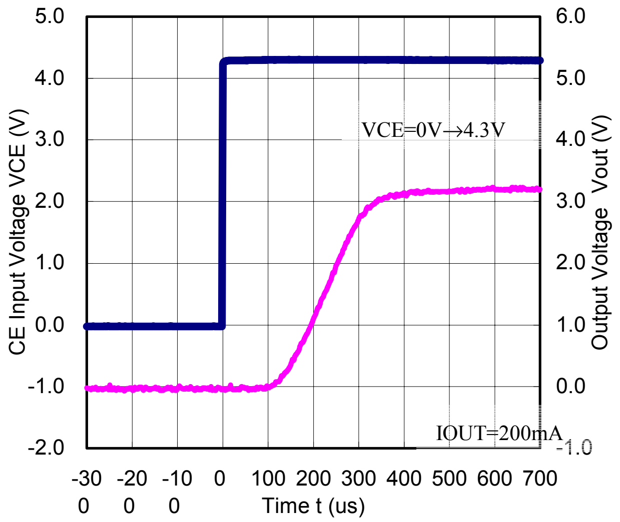
R1160X261B ECO=L
VIN=3.6V, CIN=tantal 1.0µF, COUT= tantal 2.2µF



R1160X331B ECO=H
VIN=4.3V, CIN=tantal 1.0µF, COUT= tantal 2.2µF



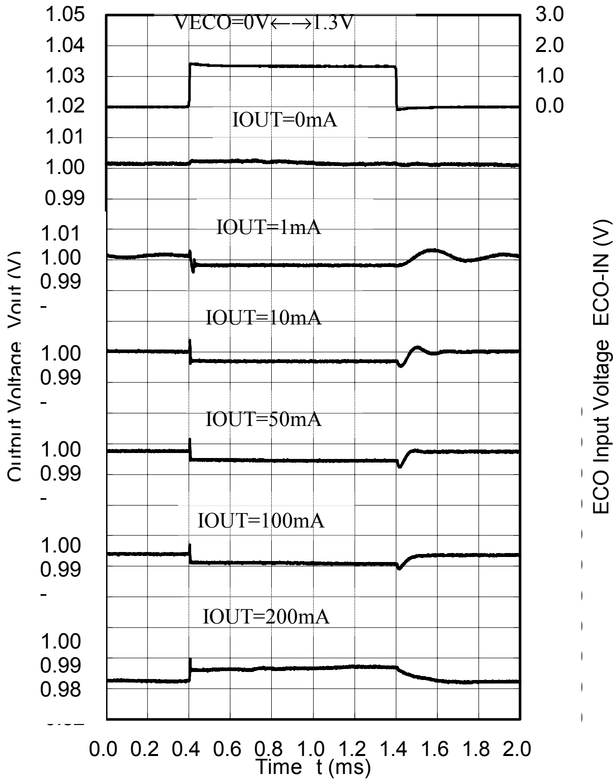
R1160X331B ECO=L
VIN=4.3V, CIN=tantal 1.0µF, COUT= tantal 2.2µF



13)Output Voltage at Mode alternative point

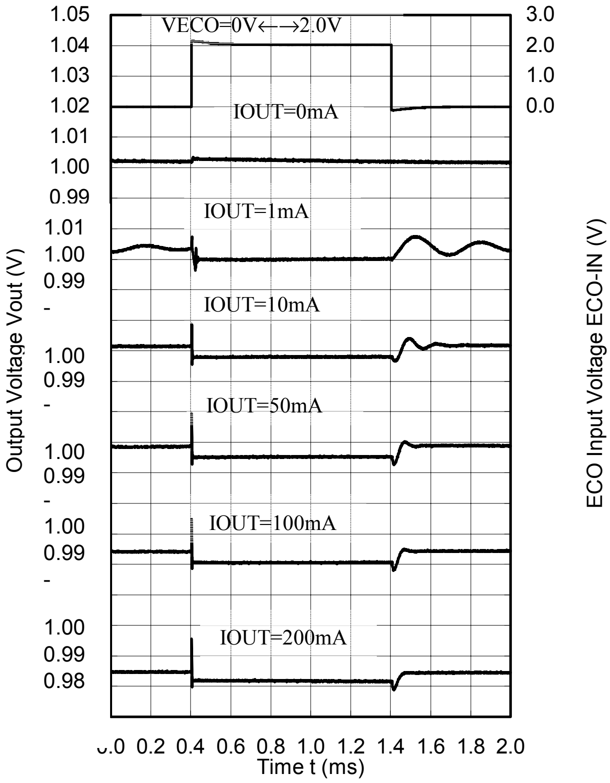
R1160X101X

V_{IN}=1.3V, C_{IN}=tantal 1.0µF, C_{OUT}= tantal 2.2µF



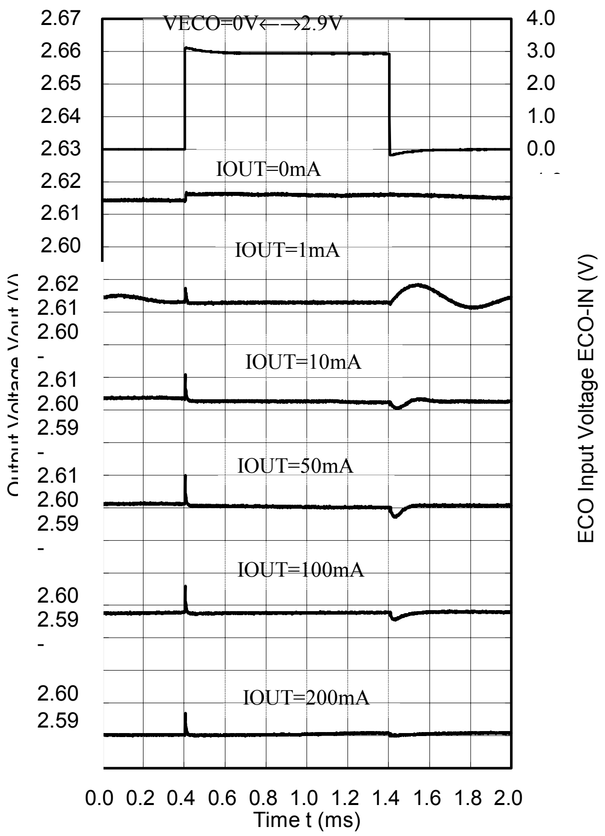
R1160X101X

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



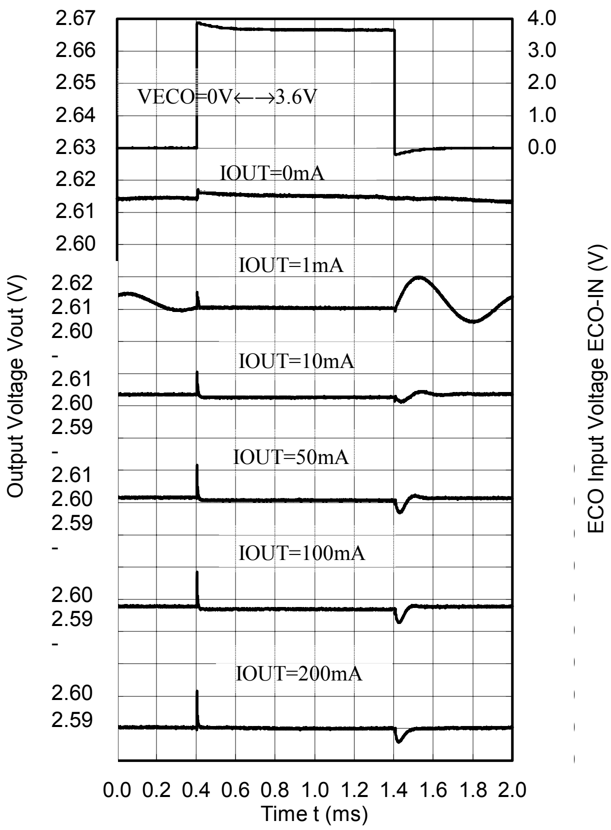
R1160X261X

V_{IN}=2.9V, C_{IN}=tantal 1.0µF, C_{OUT}= tantal 2.2µF



R1160X261X

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



■ TECHNICAL NOTES

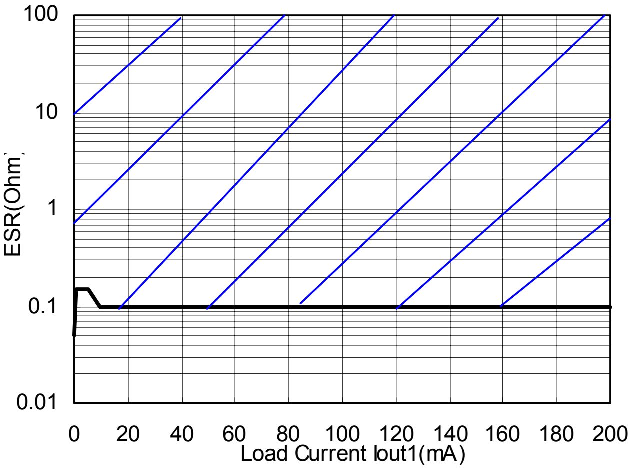
When using these ICs, consider the following points:
In these ICs, phase compensation is made for securing stable operation even if the load current is varied. For this purpose, be sure to use a capacitor C_{OUT} with good frequency characteristics and ESR (Equivalent Series Resistance) of which is in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

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.

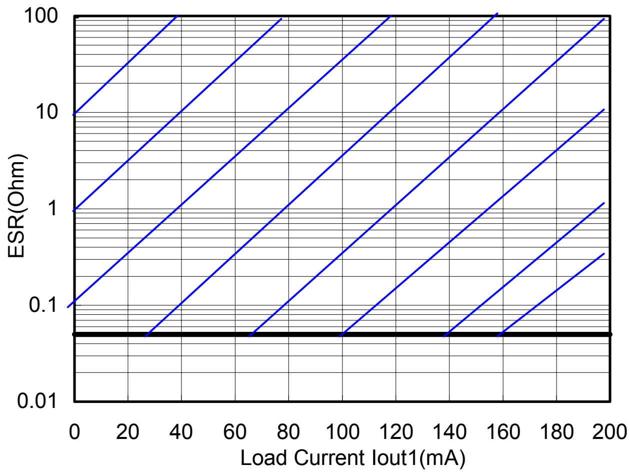
<Test conditions>

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

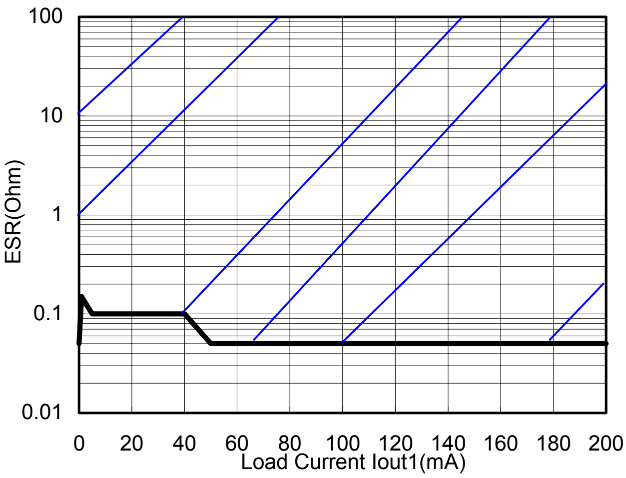
R1160X261X ECO=H
V_{IN}=3.6V, C_{IN}=Ceramic 1.0µF, C_{OUT}= Ceramic 1.0µF



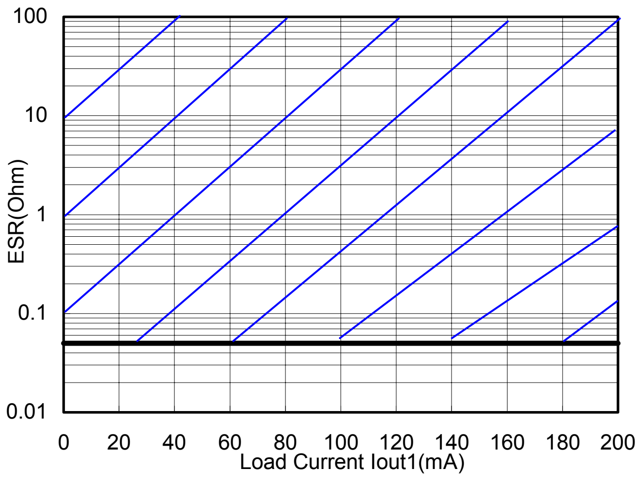
R1160X261X ECO=L
V_{IN}=3.6V, C_{IN}=Ceramic 1.0µF, C_{OUT}= Ceramic 1.0µF



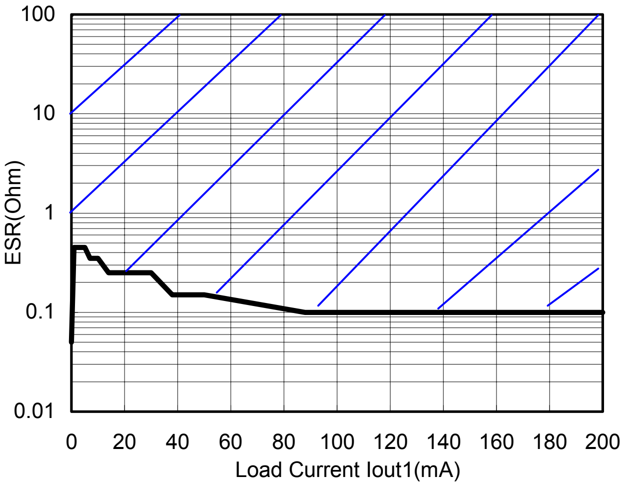
R1160X261X ECO=H
V_{IN}=3.6V, C_{IN}=Ceramic 1.0µF, C_{OUT}= Ceramic 2.2µF



R1160X261X ECO=L
V_{IN}=3.6V, C_{IN}=Ceramic 1.0µF, C_{OUT}= Ceramic 2.2µF



R1160X081X ECO=H
V_{IN}=1.8V, C_{IN}=Ceramic 1.0µF, C_{OUT}= Ceramic 2.2µF



R1160X081X ECO=L
V_{IN}=1.8V, C_{IN}=Ceramic 1.0µF, C_{OUT}= Ceramic 2.2µF