RICOH

150mA LDO REGULATOR

R1180x SERIES

NO. EA-105-0504

OUTLINE

The R1180x Series are CMOS-based voltage regulator ICs with high output voltage accuracy, extremely low supply current, and low ON-resistance. Each of these ICs consists of a voltage reference unit, an error amplifier, resistor-net for voltage setting, a current limit circuit which prevents the destruction by excess current, and so on. The output voltage of these ICs is fixed with high accuracy. B version has a chip enable pin, therefore ultra-low consumption current standby mode can be realized with the pin.

Since the packages for these ICs are SOT-23-5 (R1180N Series), SC-82AB (R1180Q Series), and SON1612-6 (R1180D Series), therefore high density mounting of the ICs on boards is possible.

FEATURES

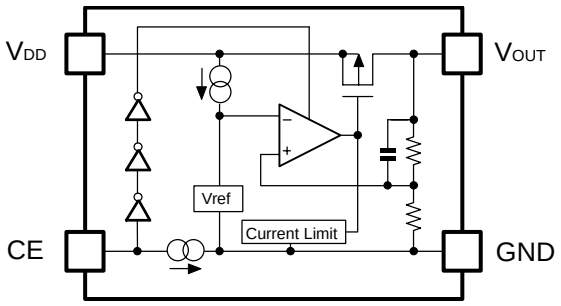
- Low Supply Current .....Typ. 1μA(Except the current through CE pull-down circuit)
- Standby Mode .....Typ. 0.1μA
- Low Dropout Voltage.....Typ. 0.25V (I_{OUT}=150mA 3.0V Output type)
- Low Temperature-Drift Coefficient of Output Voltage Typ. ±100ppm/°C
- Good Line Regulation .....Typ. 0.05%/V
- High Output Voltage Accuracy .....±2.0%
- Small Packages .....SOT-23-5(R1180N)/SC-82AB(R1180Q)/ SON1612-6 (R1180D)
- Output Voltage .....Stepwise setting with a step of 0.1V in the range of 1.2V to 3.6V is possible
- Built-in Fold Back Protection Circuit .....Typ. 40mA (Current at short mode)
- Ceramic capacitors are recommended to be used with this IC 0.1μF

APPLICATIONS

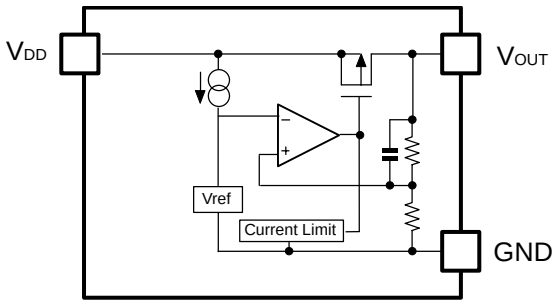
- Stable voltage reference.
- Power source for electrical appliances such as cameras, VCRs and camcorders.
- Power source for battery-powered equipment.

BLOCK DIAGRAMS

R1180xxx1B



R1180xxx1C



SELECTION GUIDE

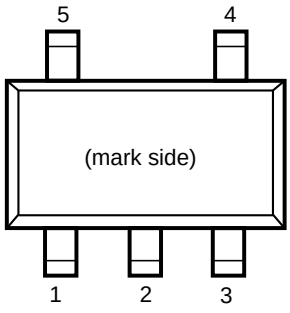
The output voltage, version, and the taping type for the ICs can be selected at the user's request.
The selection can be made with designating the part number as shown below:

R1180xxx1x-TR ←Part Number
↑ ↑ ↑ ↑
a b c d

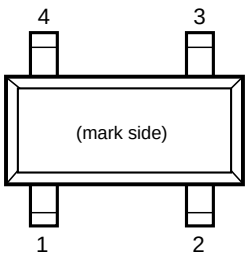
Code	Contents
a	Designation of Package Type : N: SOT-23-5 (Mini mold) Q: SC-82AB (Super-mini mold) D: SON1612-6
b	Setting Output Voltage (V_{OUT}) : Stepwise setting with a step of 0.1V in the range of 1.2V to 3.6V is possible.
c	Designation of Active Type : B : active high type C : without chip enable circuit
d	Designation of Taping Type : Ex. TR (refer to Taping Specifications; TR type is the standard direction.)

PIN CONFIGURATION

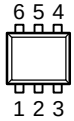
● **SOT-23-5**



● **SC-82AB**



● **SON1612-6**



PIN DESCRIPTIONS

- **SC-82AB (R1180Qxx1B/C)**

Pin No	Symbol	Pin Description
1	CE or NC	Chip Enable Pin or No Connection
2	GND	Ground Pin
3	V_{OUT}	Output pin
4	V_{DD}	Input Pin

- **SOT-23-5 (R1180Nxx1B/C)**

Pin No	Symbol	Pin Description
1	V_{DD}	Input Pin
2	GND	Ground Pin
3	CE or NC	Chip Enable Pin or No Connection
4	NC	No Connection
5	V_{OUT}	Output pin

- **SON1612-6 (R1180Dxx1B/C)**

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

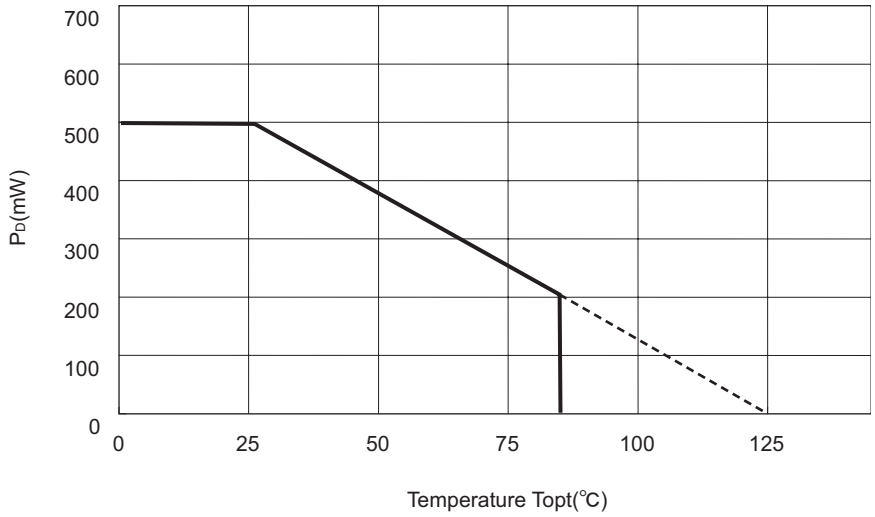
ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	6.5	V
V_{CE}	Input Voltage(CE Pin)	6.5	V
V_{OUT}	Output Voltage	−0.3 ~ V_{IN}+0.3	V
I_{OUT}	Output Current	180	mA
P_D	Power Dissipation(SC82-AB)	150	mW
	Power Dissipation(SOT23-5)	250	
	Power Dissipation(SON1612-6)	500*Note1	
Topt	Operating Temperature Range	−40 ~ 85	°C
Tstg	Storage Temperature Range	−55 ~ 125	°C

∗Note 1: This specification is at mounted on board.
P_D depends on conditions of mounting on board. This specification is based on the measurement at the condition below:

∗Measurement Conditions

Environment: Mounted on board (Wind velocity 0m/s)
Board Material: FR-4 (2-layer)
Board dimensions : 40mm × 40mm × t1.6mm
Copper Area : 50%



ELECTRICAL CHARACTERISTICS

- **R1180xxx1B/R1180xxx1C**

Topt=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage	V_{IN} = Set V_{OUT}+1V 1μA ≦ I_{OUT} ≦ 30mA	V_{OUT} ×0.980		V_{OUT} ×1.020	V
I_{OUT}	Output Current	V_{IN} - V_{OUT} = 1.0V	150			mA
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	V_{IN} = Set V_{OUT}+1V 1μA ≦ I_{OUT} ≦ 150mA		20	40	mV
V_{DIF}	Dropout Voltage	Refer to the ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE				
I_{SS}	Supply Current	V_{IN} = Set V_{OUT}+1V, I_{OUT}=0mA		1.0	1.5	μA
Istandby	Supply Current (Standby)	V_{IN} = Set V_{OUT}+1V V_{CE} = GND(B version)		0.1	1.0	μA
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	Set V_{OUT}+0.5V ≦ V_{IN} ≦ 6.0V I_{OUT} = 30mA		0.05	0.20	%/V
V_{IN}	Input Voltage		1.7		6.0	V
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 30mA −40°C ≦ Topt ≦ 85°C		±100		ppm /°C
I_{LIM}	Short Current Limit	V_{OUT} = 0V		40		mA
I_{PD}	CE Pull-down Constant Current	(R1180xxx1B)		0.35		μA
V_{CEH}	CE Input Voltage “H”	(R1180xxx1B)	1.2		6.0	V
V_{CEL}	CE Input Voltage “L”	(R1180xxx1B)	0.0		0.3	V

- **ELECTRICAL CHARACTERISTICS by OUTPUT VOLTAGE**

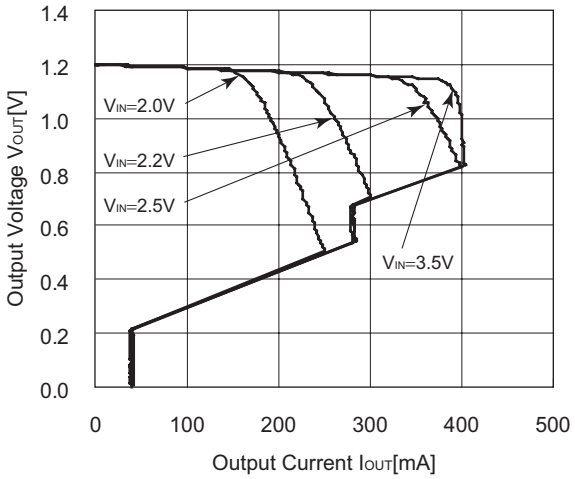
Topt = 25°C

Output Voltage V_{OUT} (V)	Dropout Voltage		
	V_{DIF} (V)		
	Condition	Typ.	Max.
1.2 ≦ V_{OUT} < 1.3	I_{OUT} = 150mA	0.85	1.20
1.3 ≦ V_{OUT} < 1.4		0.75	1.10
1.4 ≦ V_{OUT} < 1.5		0.65	1.00
1.5 ≦ V_{OUT} < 1.7		0.60	0.90
1.7 ≦ V_{OUT} < 1.9		0.50	0.75
1.9 ≦ V_{OUT} < 2.1		0.40	0.65
2.1 ≦ V_{OUT} < 2.8		0.35	0.55
2.8 ≦ V_{OUT} ≦ 3.6		0.25	0.40

TYPICAL CHARACTERISTICS

1) Output Voltage vs. Output Current (Topt=25°C)

R1180x121x



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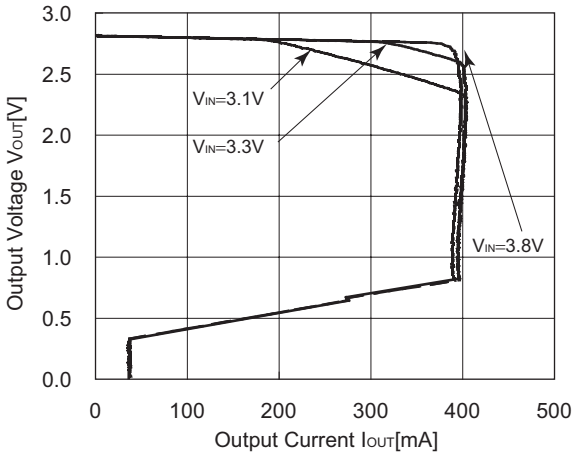

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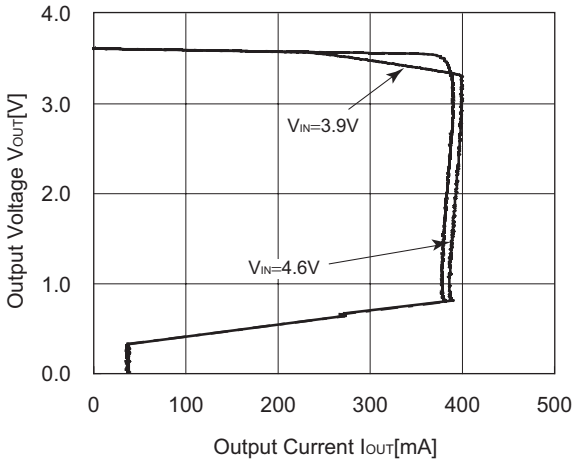
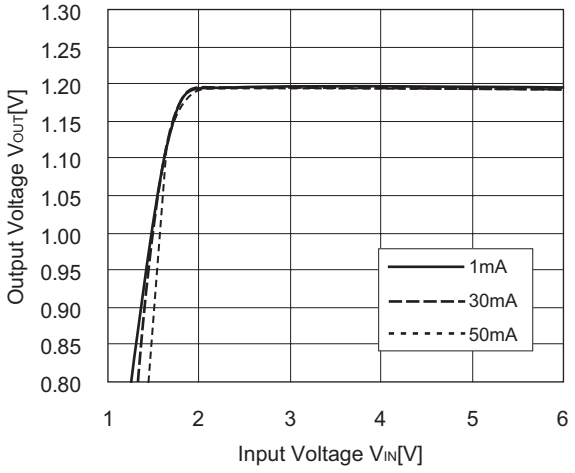


2) Output Voltage vs. Input Voltage (Topt=25°C)

R1180x121x



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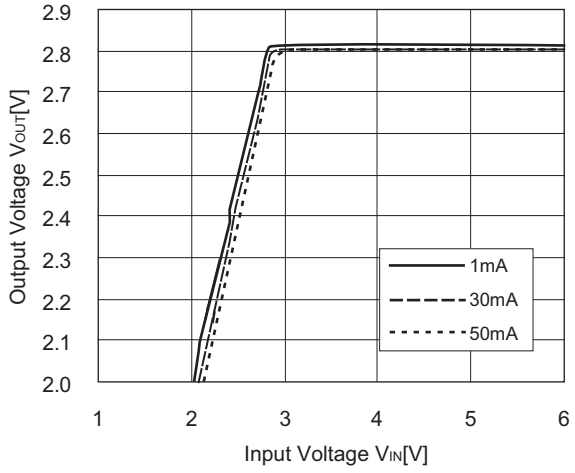

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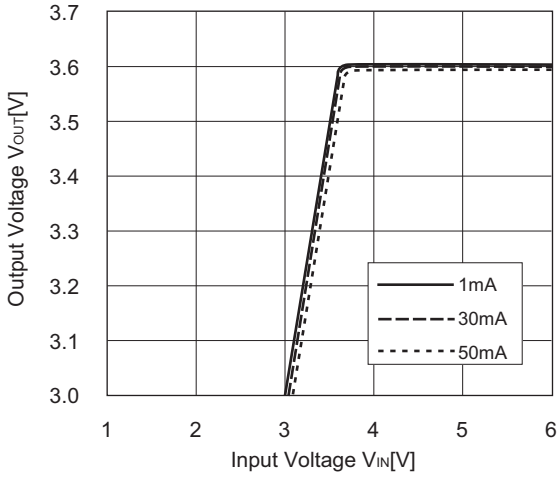
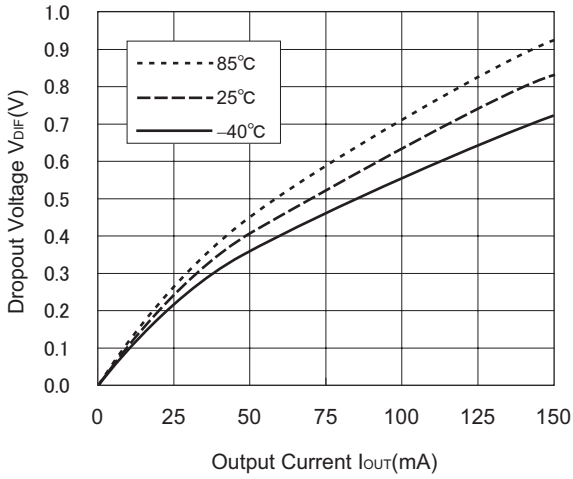


3) Dropout Voltage vs. Output Current

R1180x121x



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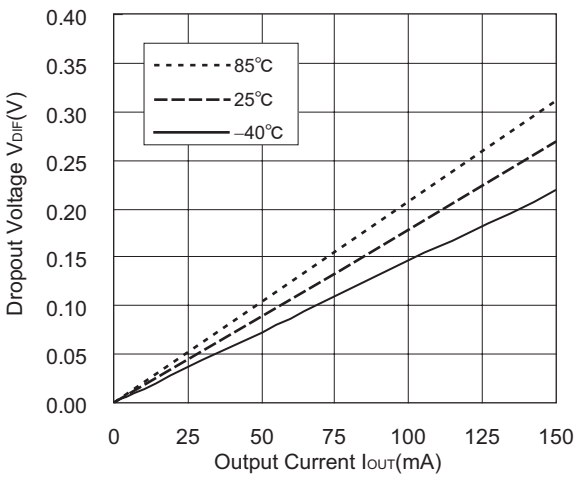

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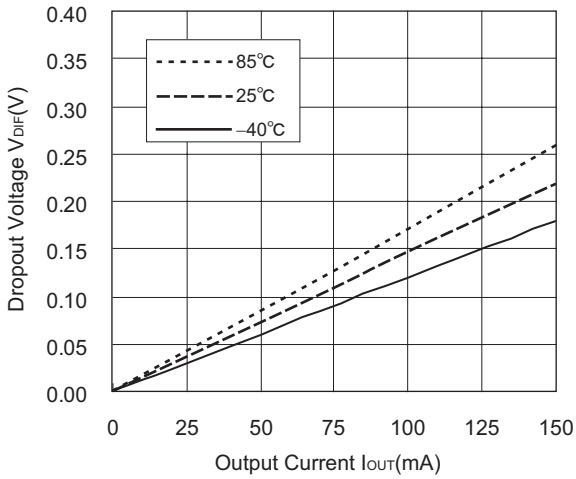
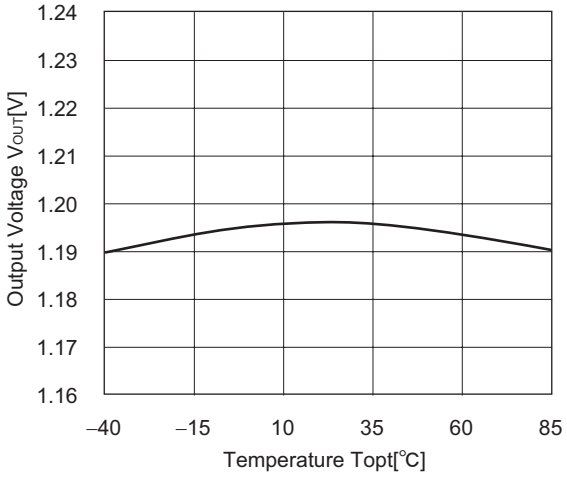
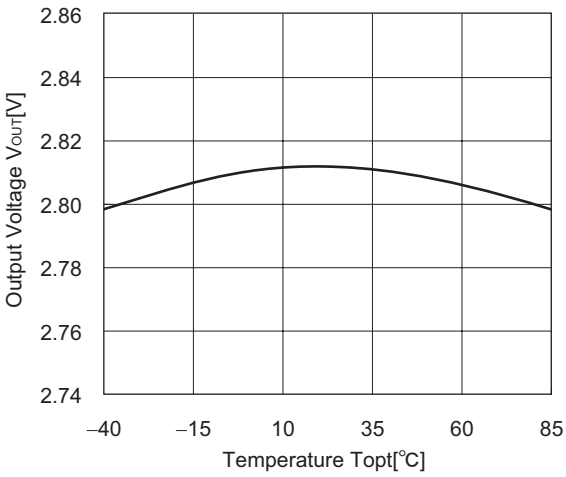


4) Output Voltage vs. Temperature (I_{OUT}=30mA)

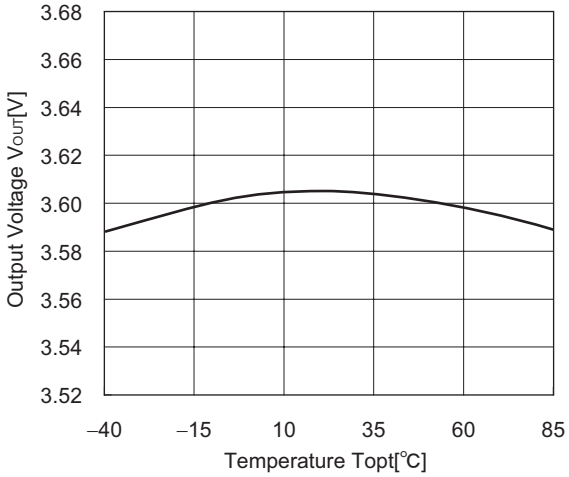
R1180x121x (V_{IN}=2.2V)



R1180x281x (V_{IN}=3.8V)

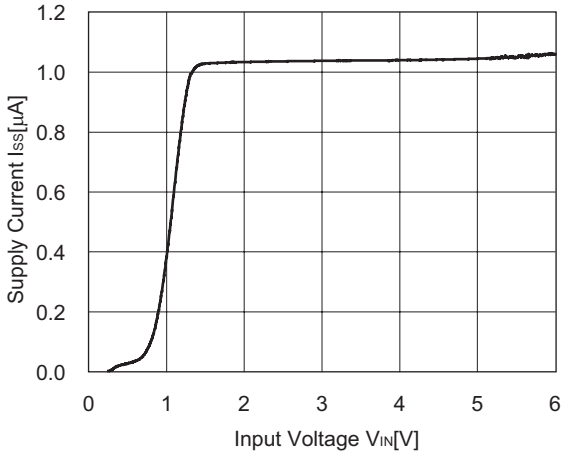


R1180x361x (V_{IN}=4.6V)



5) Supply Current vs. Input Voltage (Topt=25°C)

R1180x121x



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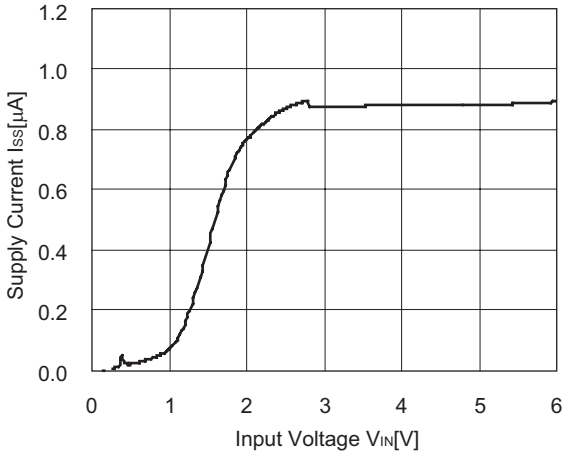

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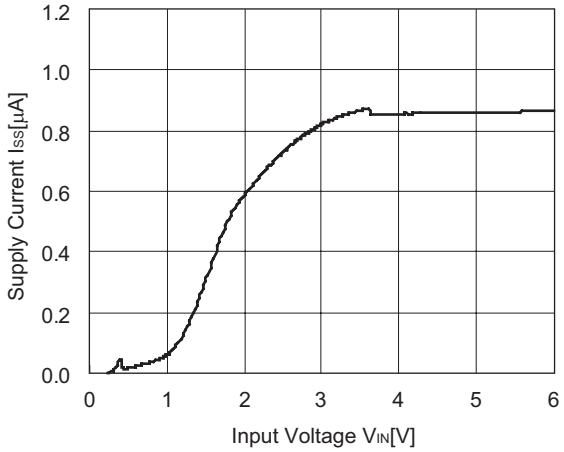
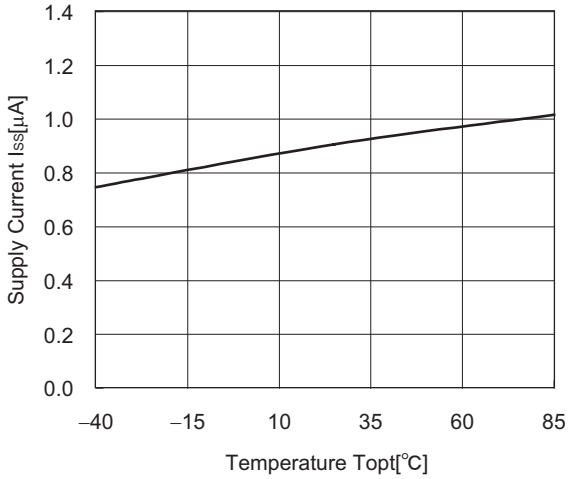
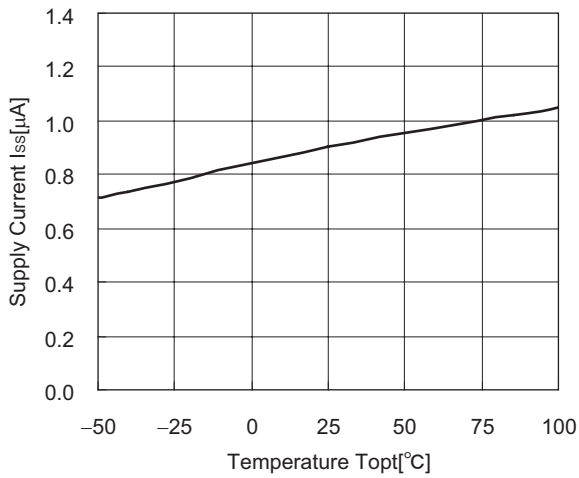


6) Supply Current vs. Temperature

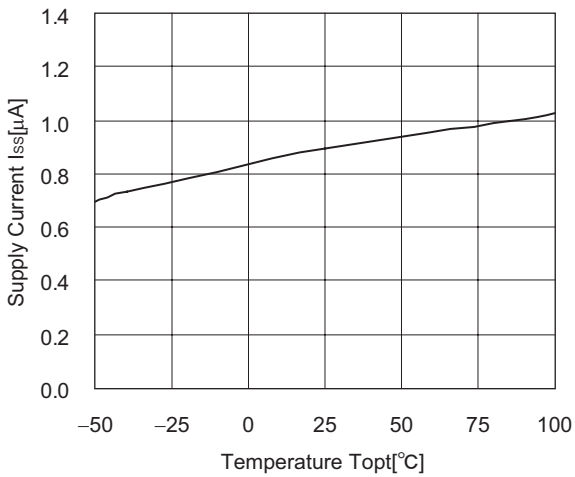
R1180x121x(V_{IN}=2.2V)



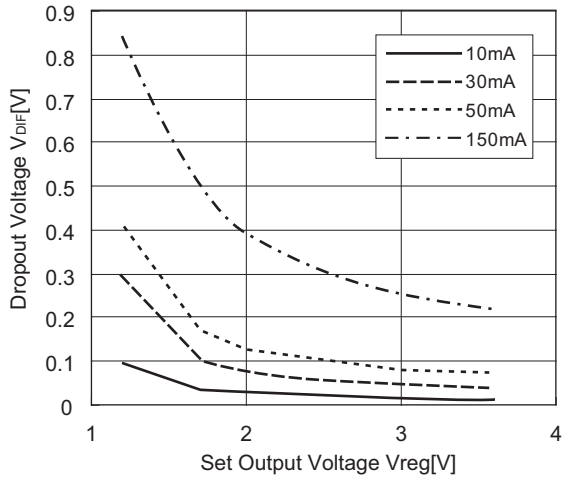
R1180x281x(V_{IN}=3.8V)



R1180x361x(V_{IN}=4.6V)

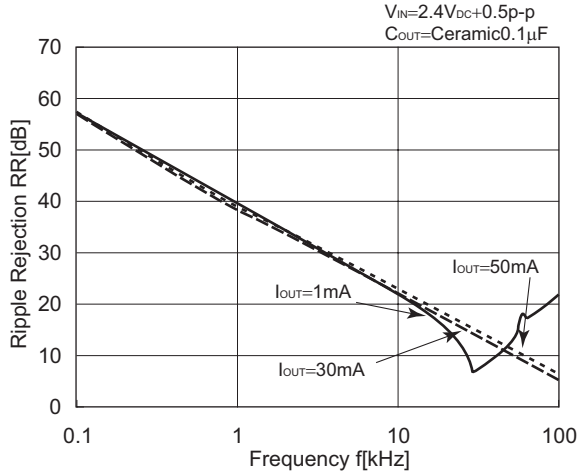


7) Dropout Voltage vs. Set Output Voltage (Topt=25°C)



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

R1180x121x



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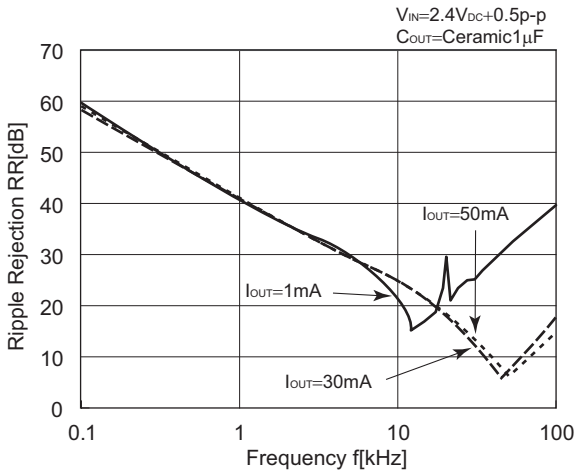

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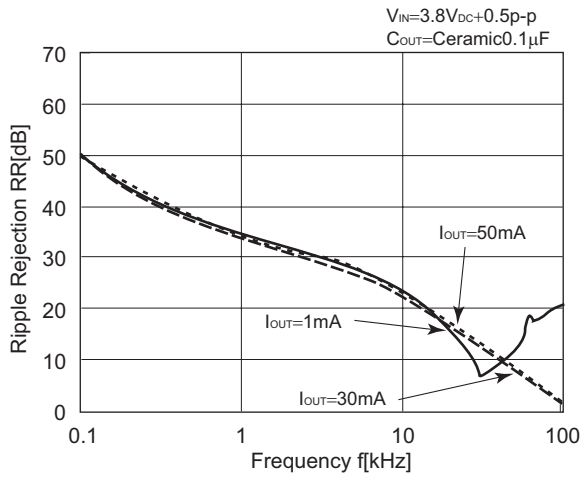

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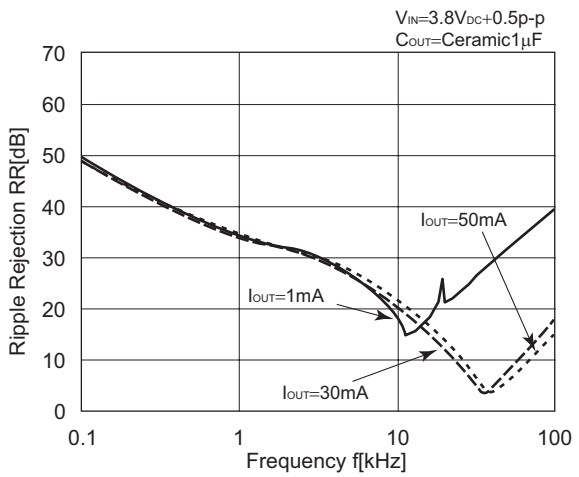

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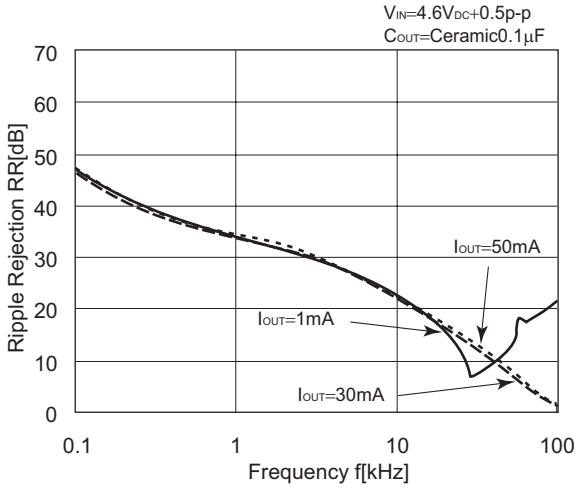

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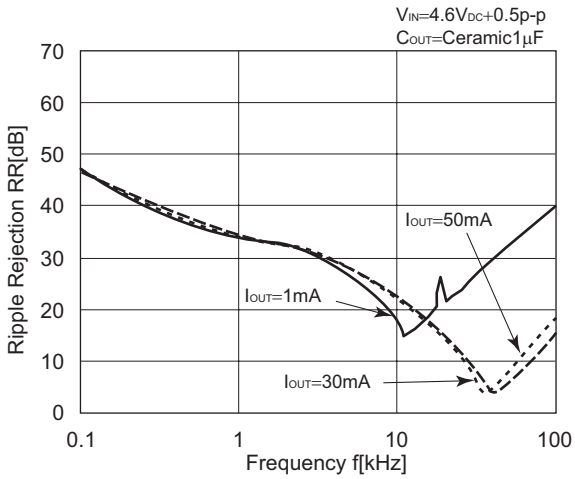
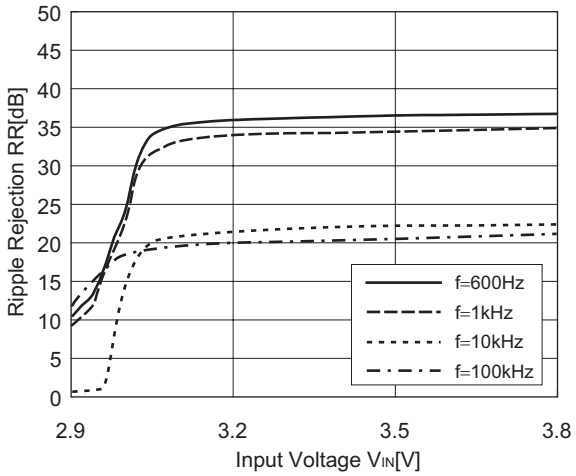
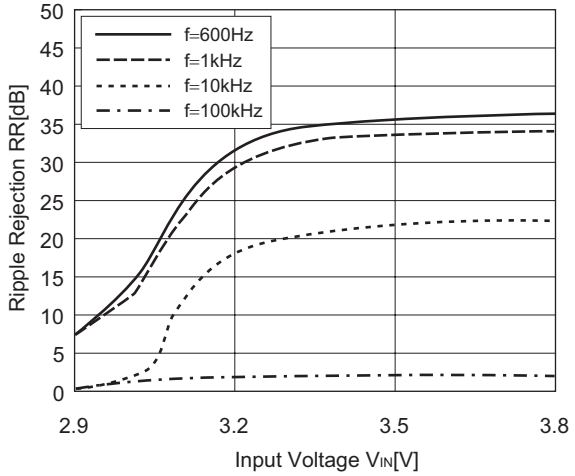


9) Ripple Rejection vs. Input Bias Voltage (Topt=25°C, CIN=none, COUT=ceramic0.1μF)

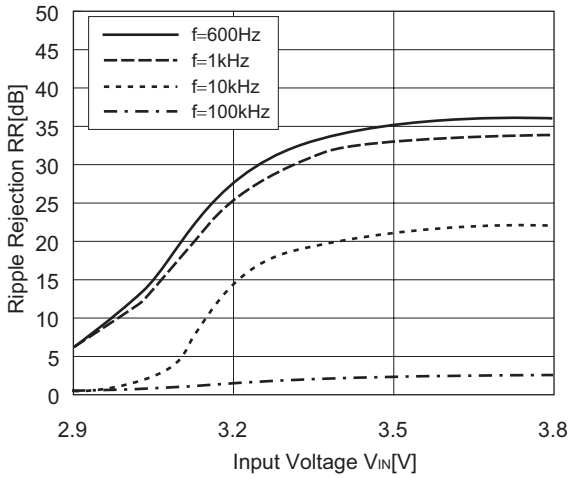
R1180x281x(IOUT=1mA)



R1180x281x(IOUT=30mA)

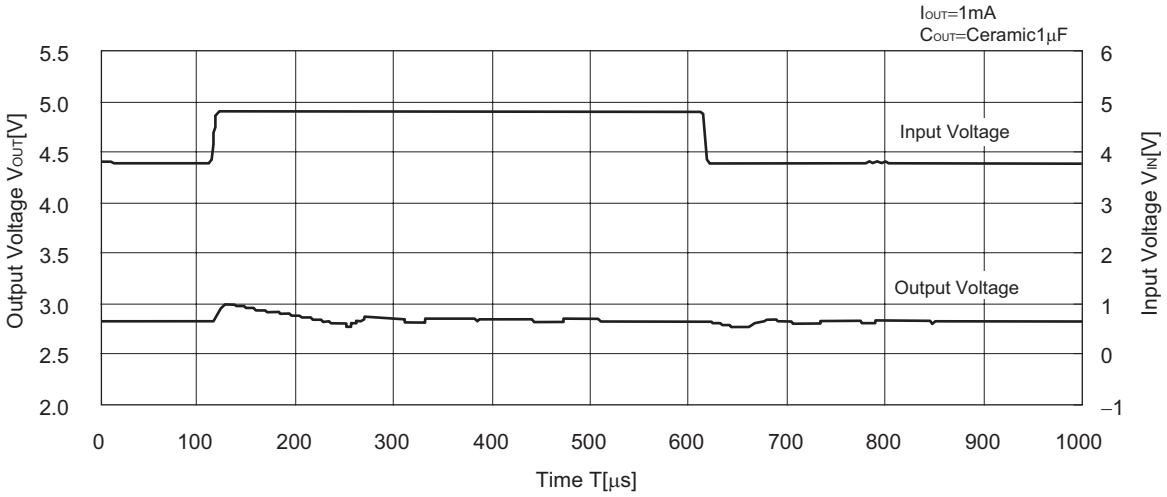


R1180x281x(IOUT=50mA)



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

R1180x281x



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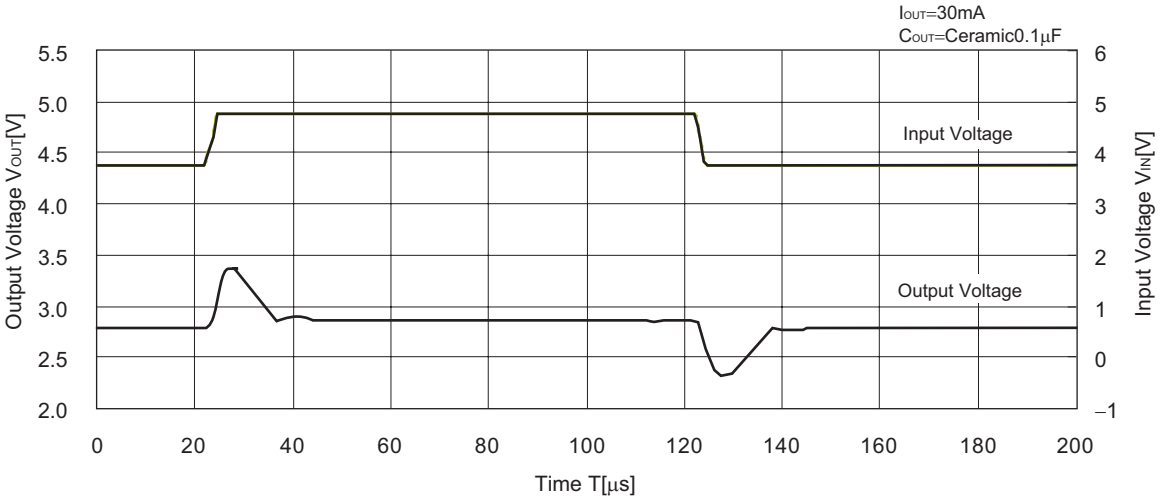

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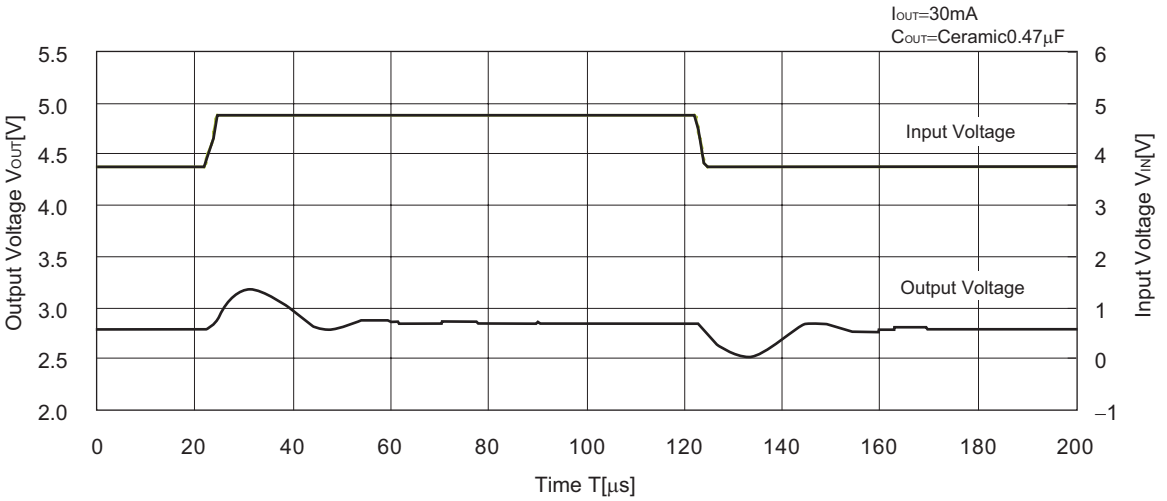

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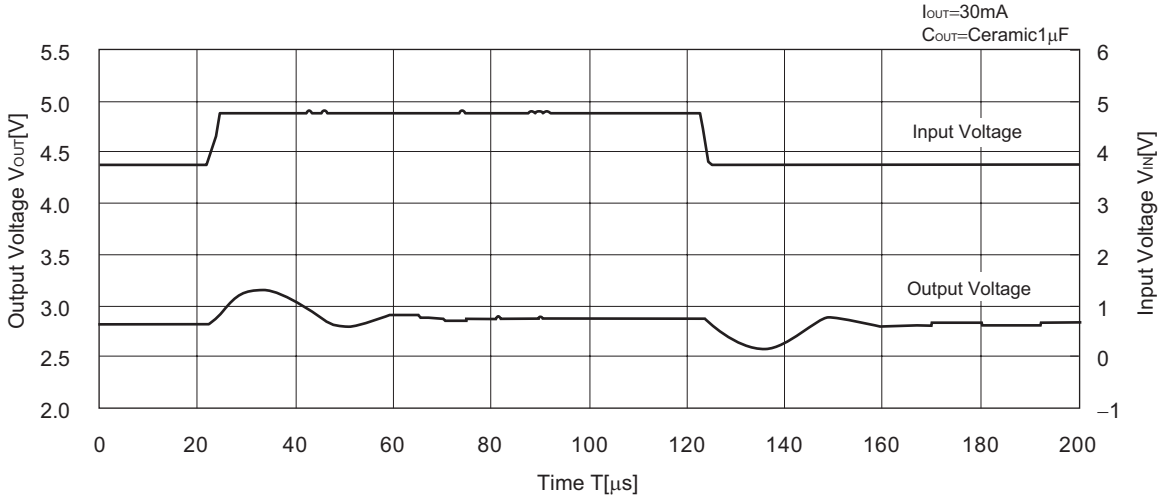
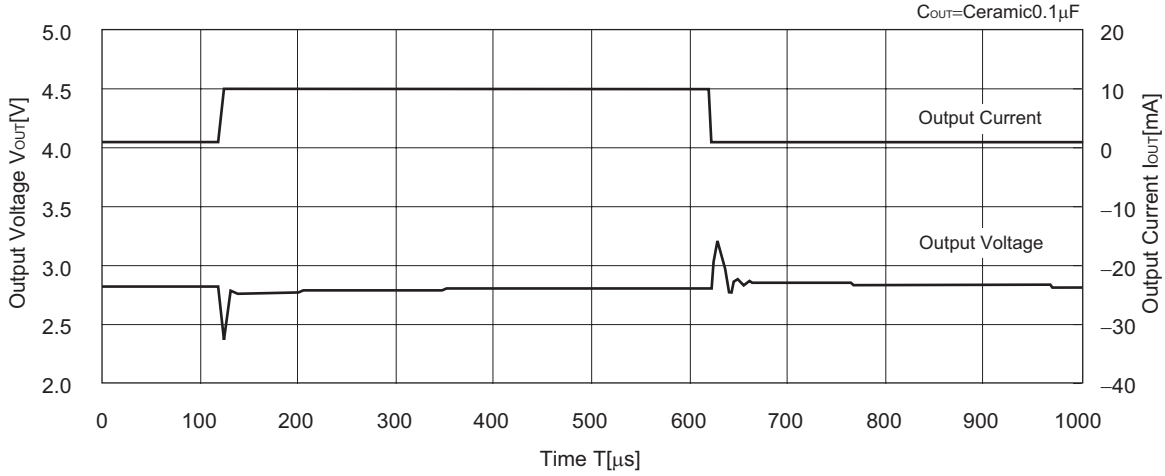


11) Load Transient Response (tr=tf=0.5μs V_{IN}=3.8V)

R1180x281x



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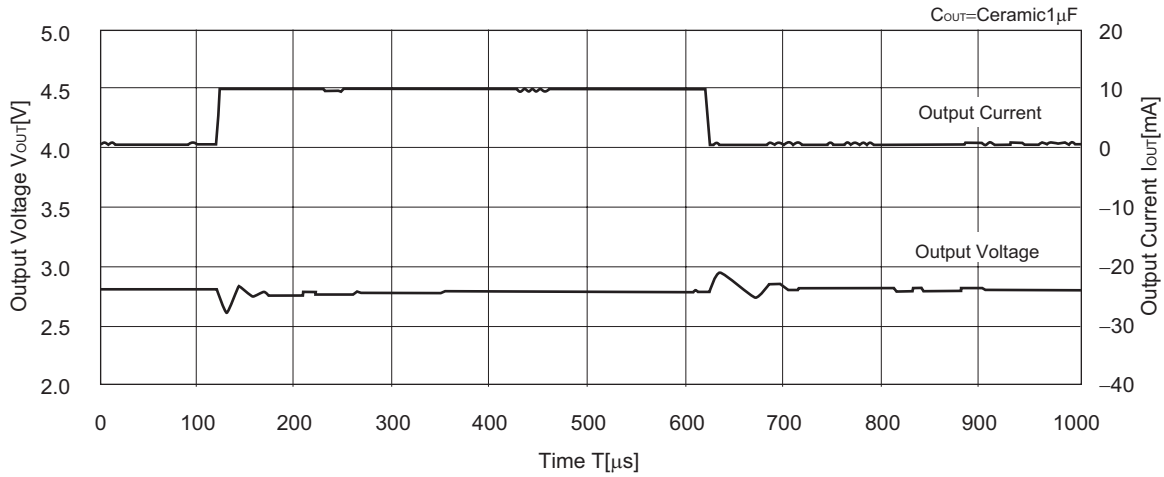

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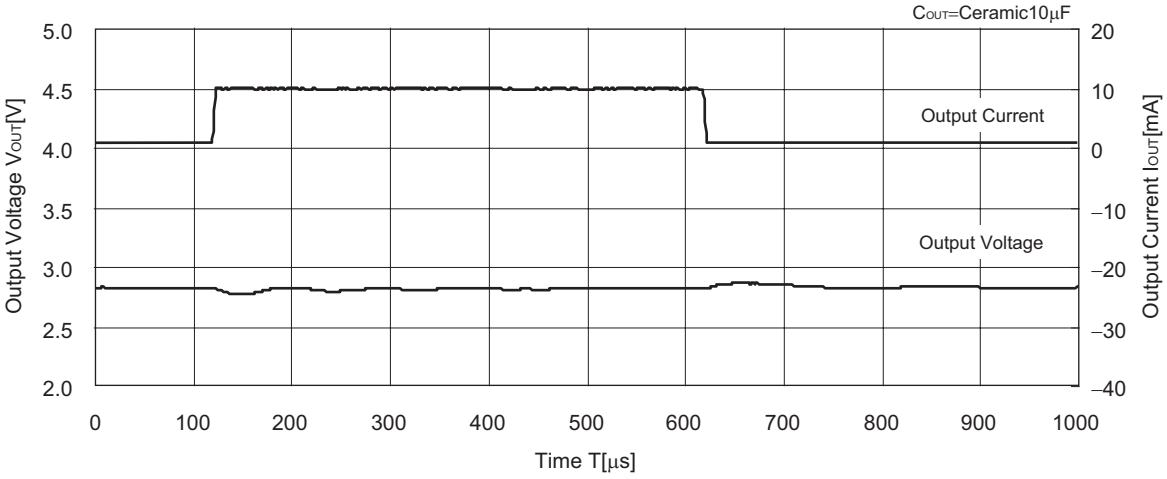
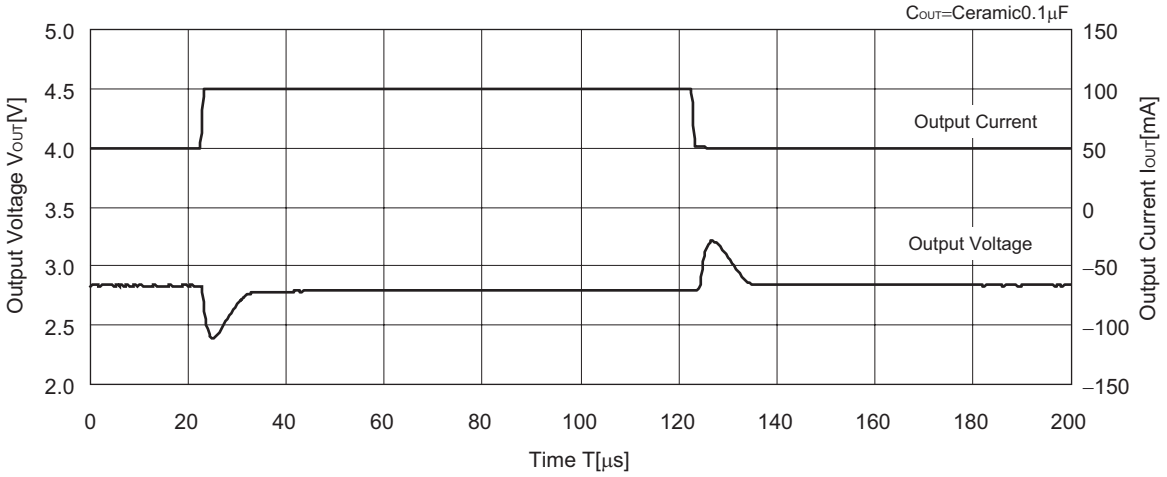
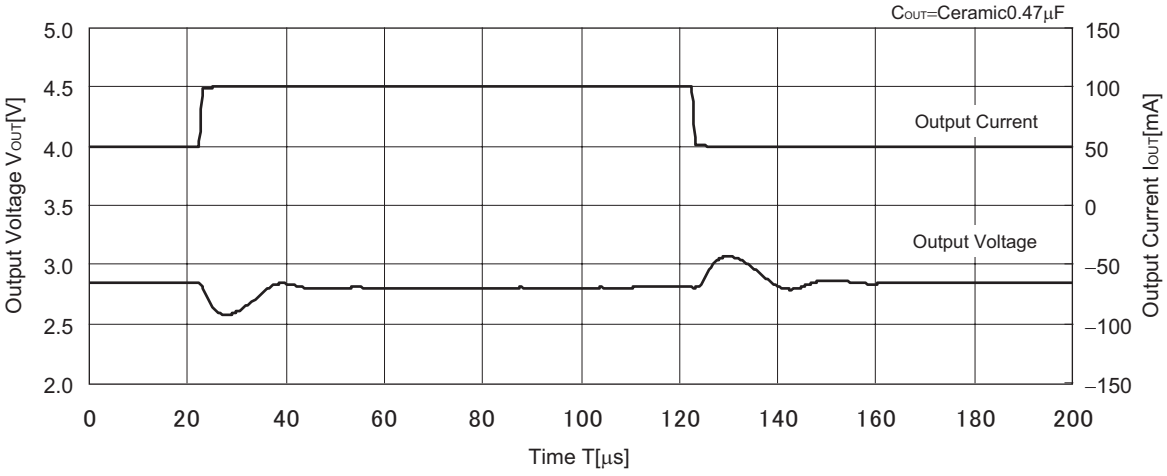


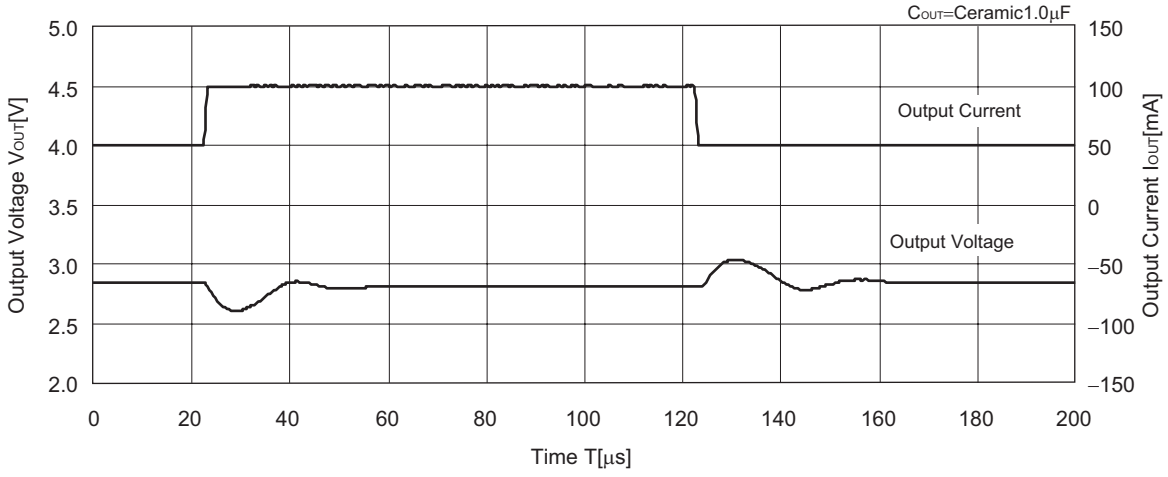
R1180x281x



R1180x281x

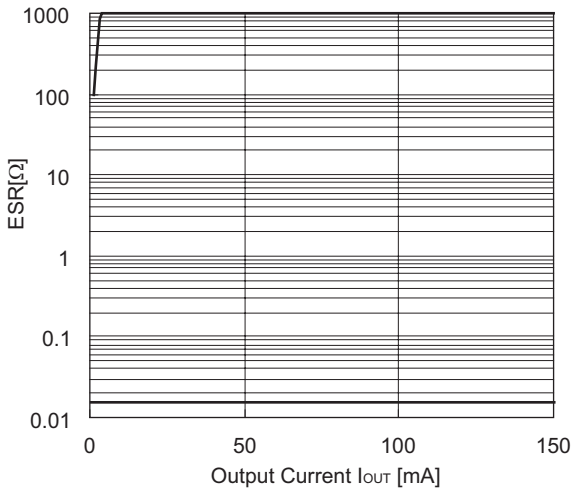


R1180x281x

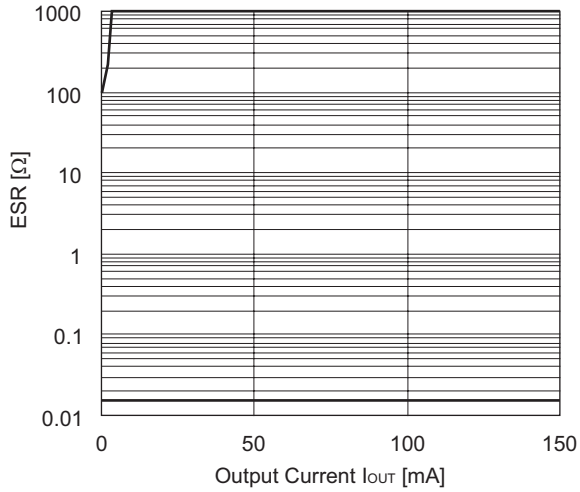


12) ESR vs. Output Current

R1180x121x(CIN =Ceramic 1.0µA, COUT =Ceramic 0.1µF)



R1180x281x(CIN =Ceramic 1.0µA, COUT =Ceramic 0.1µF)



The relations between I_{OUT} (Output Current) and ESR of an output capacitor are shown above. The conditions when the white noise level is under 40µV (Avg.) are marked as the hatched area in the graph.

<Measurement conditions>
(1) $V_{IN}=V_{OUT}+1V$
(2) Frequency Band: 10Hz to 2MHz (BW=30Hz)
(3) Temperature: −40°C to 85°C