RICOH

ULTRA SMALL PACKAGE VOLTAGE REGULATOR

R1100D SERIES

NO. EA-117-0506

OUTLINE

The R1100D Series are CMOS-based voltage regulator ICs with high accuracy output voltage and ultra-low supply current developed. Each of these ICs consists of a driver transistor, a voltage reference unit, an error amplifier, resistors for setting output voltage and a current limit circuit.

The output voltage of these ICs is fixed with high accuracy.

Even if V_{OUT} is shorted to the GND, the included current limit circuit protects the ICs from the destruction.

Since the package for these ICs is SON1408-3, high density mounting of the ICs on boards is possible.

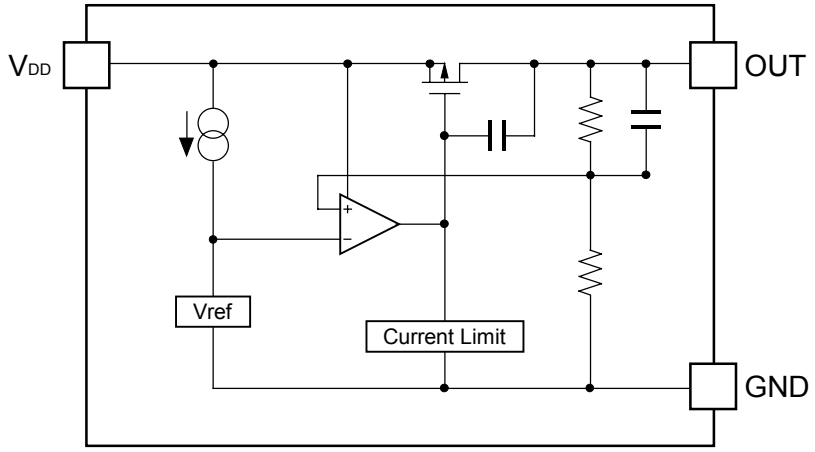
FEATURES

- Ultra-low supply current ..... Typ. 0.8μA (V_{OUT}=1.0V,V_{DD}=3.0V)
- Dropout Voltage ..... Typ. 20mV (I_{OUT}=1mA,V_{OUT}=3.0V)
- Low Temperature-Drift Coefficient of Detector Threshold .... Typ. ±100ppm/°C
- Excellent Line Regulation ..... Typ. 0.05%/V
- High Accuracy Output Voltage ..... ±2.0%(1.2V ≦ V_{OUT} ≦ 4.0V),
  ±24mV(V_{OUT} <1.2V)
- Ultra-Small Package SON1408-3
- Built-in Current Limit Circuit

APPLICATIONS

- Power source for battery-powered equipment.
- Power source for cameras, VCRs, camcorders, hand-held audio instruments and hand-held communication equipment.
- Precision voltage references.

BLOCK DIAGRAMS



SELECTION GUIDE

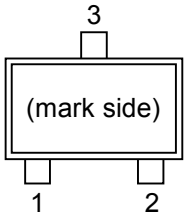
The output voltage, the active type, and the packing type for the ICs can be selectied at the user's request. The selection can be made with designating the part number as shown below:

R1100xxx1C-xx ←Part Number
↑ ↑ ↑↑ ↑
a b cd e

Code	Contents
a	Designation of Package Type D: SON1408-3
b	Setting Output Voltage (V_{OUT}): Stepwise setting with a step of 0.1V in the range of 0.9V to 4.0V is possible.
c	1 : Fixed
d	C : Fixed
e	Designation of Taping Type: TR (Refer to Taping Specifications)

PIN CONFIGURATION

● **SON1408-3**



PIN DESCRIPTION

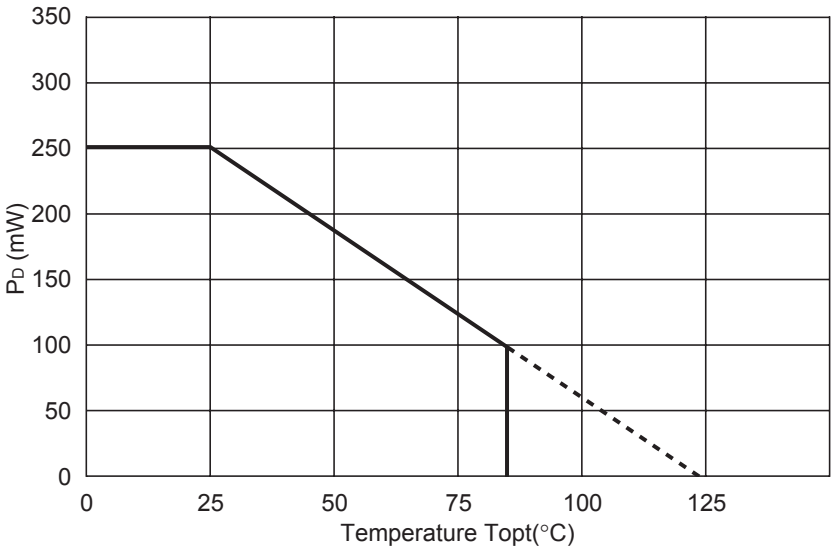
● **SON1408-3**

Pin No.	Symbol	Description
1	V_{OUT}	Output Pin
2	V_{DD}	Input Pin
3	GND	Ground Pin

ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating	Unit
V_{IN}	Supply Voltage	6.5	V
V_{OUT}	Output Voltage	V_{SS}–0.3 to V_{IN}+0.3	V
I_{OUT}	Output Current	180	mA
P_D	Power Dissipation (SON1408-3)*Note1	250	mW
Topt	Operating Temperature	−40 to +85	°C
Tstg	Storage Temperature	−55 to +125	°C
Tsolder	Soldering Temperature	260°C, 10s	

∗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%
Tab (3pin) pattern width is same as lead width and connected to GND plane.



ELECTRICAL CHARACTERISTICS

- **R1100D301C**

Topt=25°C

Symbol	Item	Test Conditions	Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage	V_{IN}=5.0V 10μA ≦ I_{OUT} ≦ 10mA	2.940	3.000	3.060	V
I_{OUT}	Output Current	V_{IN}=5.0V	100			mA
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	V_{IN}=5.0V, 1mA ≦ I_{OUT} ≦ 50mA		35	60	mV
V_{DIF}	Dropout Voltage	I_{OUT}=1mA		20	30	mV
I_{SS}	Supply Current	V_{IN}=5.0V		1.5	3.0	μA
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	I_{OUT}=1mA V_{OUT}+0.5V ≦ V_{IN} ≦ 6.0V	−0.20		0.20	%/V
V_{IN}	Input Voltage				6.0	V
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT}=10mA −40°C ≦ Topt ≦ 85°C		±100		ppm/°C
I_{LIM}	Short Current Limit	V_{OUT}=0V		40		mA

ELECTRICAL CHARACTERISTICS BY OUTPUT VOLTAGE

Topt=25°C

Part Number	Output Voltage				Output Current			Load Regulation			Dropout Voltage		
	VOUT[V]				IOUT[mA]			ΔVOUT/ΔIOUT[mV]			VDIF[mV]		
	Condi-tions	MIN.	TYP.	MAX.	Condi-tions	MIN.	TYP.	Condi-tions	TYP.	MAX.	Condi-tions	TYP.	MAX.
R1100D091C	VIN-VOUT =2.0V 10μA ≦ IOUT ≦ 10mA	0.876	0.900	0.924	VIN-VOUT =2.0V	35		VIN-VOUT =2.0V 1mA ≦ IOUT ≦ 20mA	7.5	20	IOUT =1mA	380	750
R1100D101C		0.976	1.000	1.024								280	700
R1100D111C		1.076	1.100	1.124								200	600
R1100D121C		1.176	1.200	1.224									
R1100D131C		1.274	1.300	1.326								100	400
R1100D141C		1.372	1.400	1.428									
R1100D151C		1.470	1.500	1.530		65		VIN-VOUT =2.0V 1mA ≦ IOUT ≦ 35mA	20	40		50	100
R1100D161C		1.568	1.600	1.632									
R1100D171C		1.666	1.700	1.734								25	50
R1100D181C		1.764	1.800	1.836									
R1100D191C		1.862	1.900	1.938									
R1100D201C		1.960	2.000	2.040									
R1100D211C		2.058	2.100	2.142									
R1100D221C		2.156	2.200	2.244									
R1100D231C		2.254	2.300	2.346									
R1100D241C		2.352	2.400	2.448									
R1100D251C		2.450	2.500	2.550									
R1100D261C		2.548	2.600	2.652									
R1100D271C		2.646	2.700	2.754									
R1100D281C		2.744	2.800	2.856									
R1100D291C		2.842	2.900	2.958									
R1100D301C		2.940	3.000	3.060		100		VIN-VOUT =2.0V 1mA ≦ IOUT ≦ 50mA	35	60		20	30
R1100D311C		3.038	3.100	3.162									
R1100D321C		3.136	3.200	3.264									
R1100D331C		3.234	3.300	3.366									
R1100D341C		3.332	3.400	3.468									
R1100D351C		3.430	3.500	2.570									
R1100D361C		3.528	3.600	3.672									
R1100D371C		3.626	3.700	3.774									
R1100D381C		3.724	3.800	3.876									
R1100D391C		3.822	3.900	3.978									
R1100D401C		3.920	4.000	4.080									

ELECTRICAL CHARACTERISTICS

(Common characteristics)

Symbol	Item	Test Conditions	Min.	Typ.	Max.	Unit
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	I_{OUT}=1mA SET V_{OUT}+0.5V ≦ V_{IN} ≦ 6V	-0.20		0.20	%/V
V_{IN}	Input Voltage		(1.2)		6.0	V
$\Delta V_{OUT}/\Delta Topt$	Output Voltage Temperature Coefficient	I_{OUT}=10mA –40°C ≦ Topt ≦ 85°C		±100		ppm/°C
I_{LIM}	Short Current Limit	V_{OUT}=0V		40		mA

ELECTRICAL CHARACTERISTICS BY OUTPUT VOLTAGE

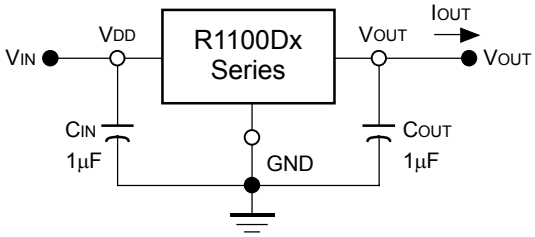
Symbol	Item	Output Voltage	Conditions	Min.	Typ.	Max.	Unit
I_{SS}	Supply Current	0.9V ≦ V_{OUT} ≦ 1.0V	V_{IN}=SET V_{OUT}+2.0V		0.8	1.8	μA
		1.1V ≦ V_{OUT} ≦ 1.4V			1.0	2.4	
		1.5V ≦ V_{OUT} ≦ 2.0V			1.2	2.7	
		2.1V ≦ V_{OUT} ≦ 4.0V			1.5	3.0	

OPERATION

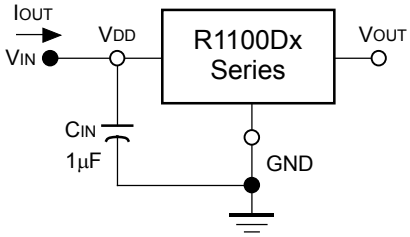
these ICs, the output voltage V_{OUT} is detected by Feedback Registers, and the detected output voltage is compare with a reference voltage by the error amplifier, so that a constant voltage is output.

A current limit circuit against short protection and a chip enable circuit are included.

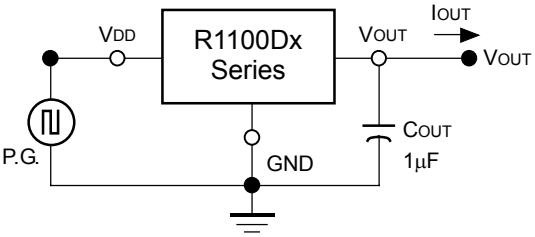
TEST CIRCUITS



Standard Test Circuit



Test Circuit for Supply Current

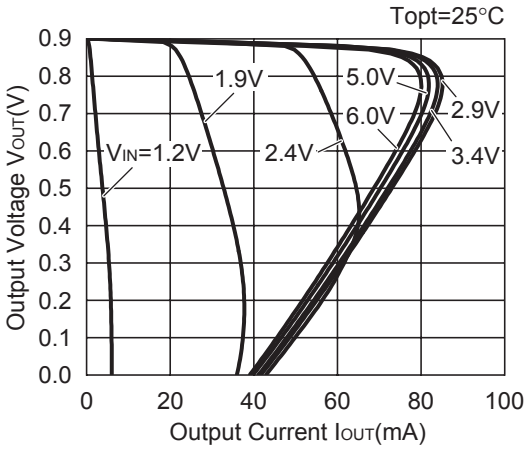


Test Circuit for Line Transient Response

TYPICAL CHARACTERISTICS

1) Output Voltage vs. Output Current

R1100D091C



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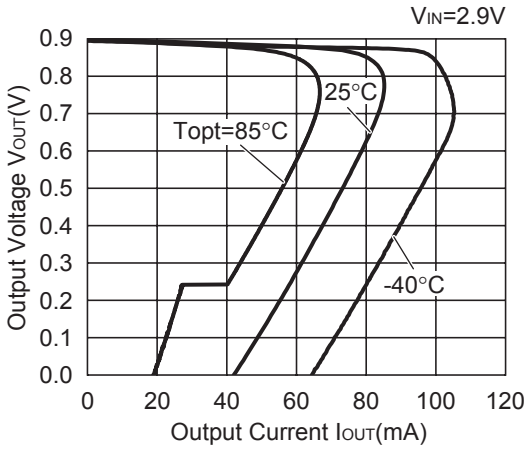

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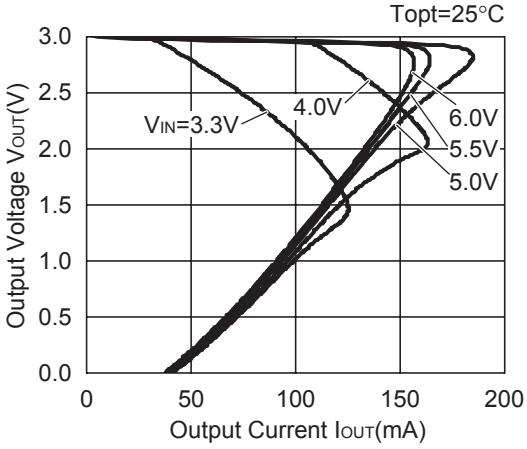

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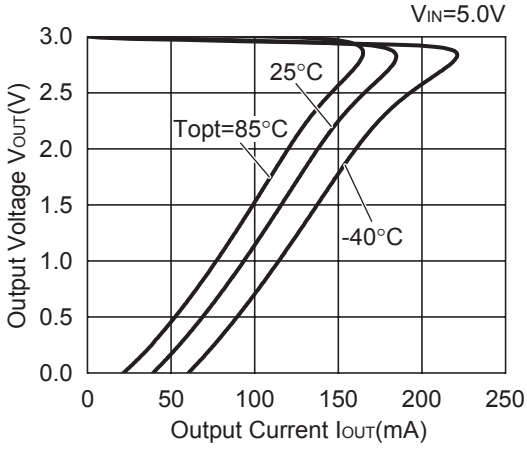

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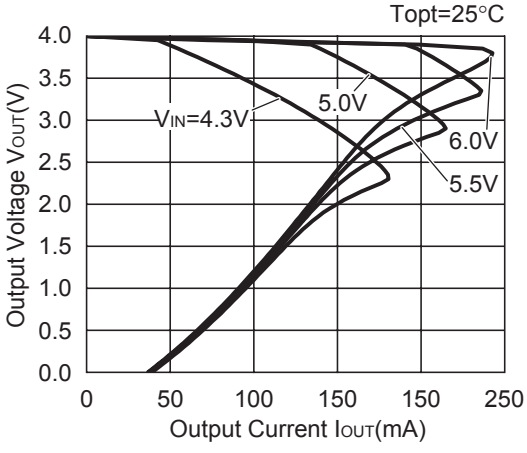

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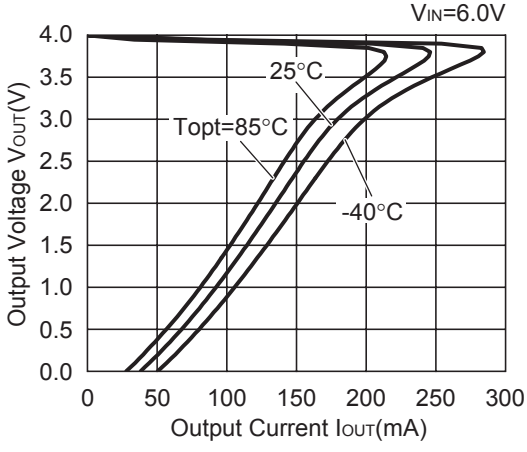
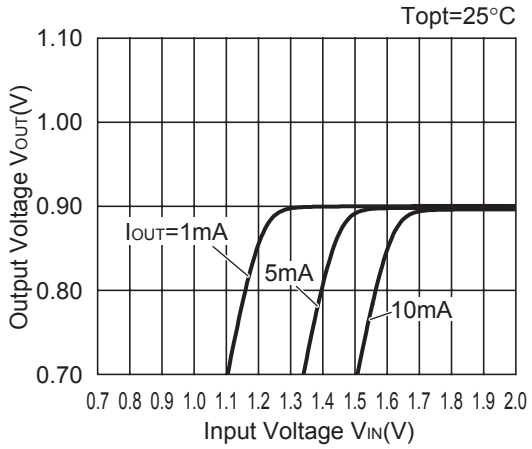


2) Output Voltage vs. Input Voltage

R1100D091C



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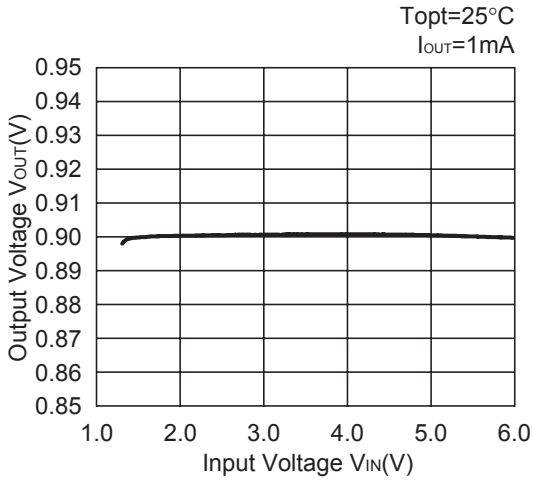

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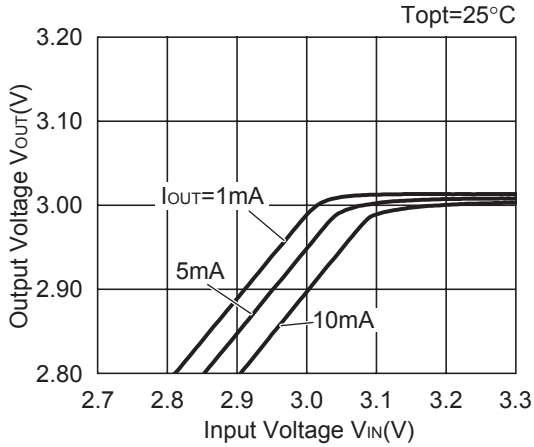

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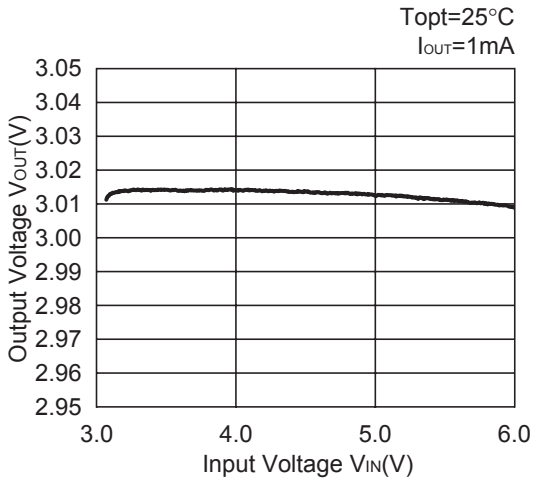

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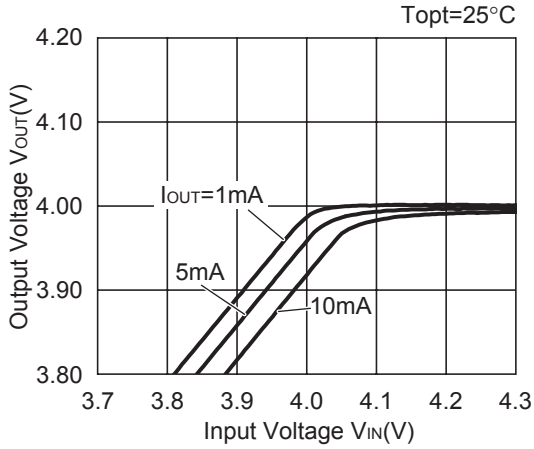

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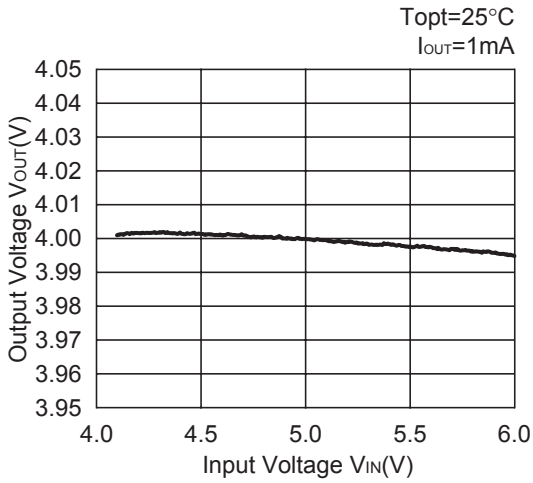
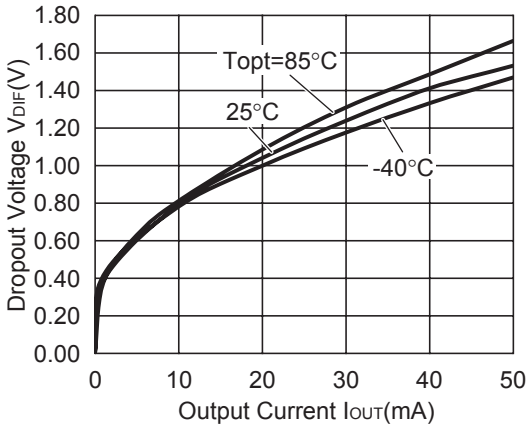


3) Dropout Voltage vs. Output Current

R1100D091C



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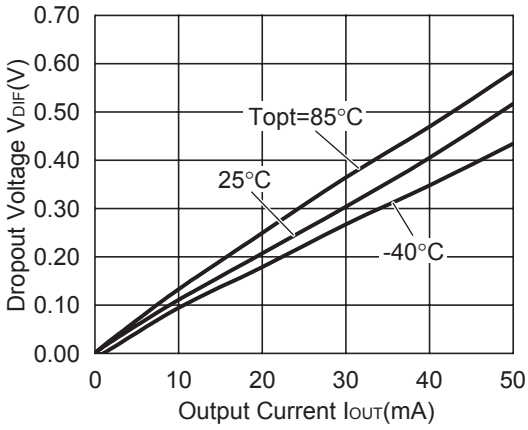

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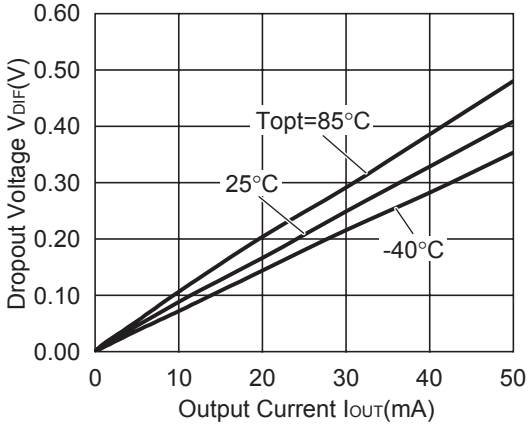
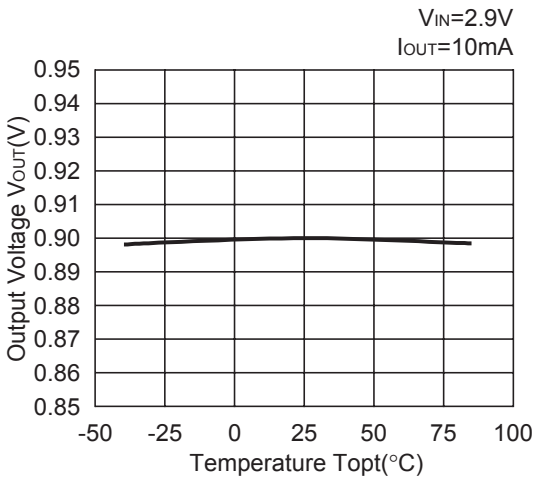


4) Output Voltage vs. Temperature

R1100D091C



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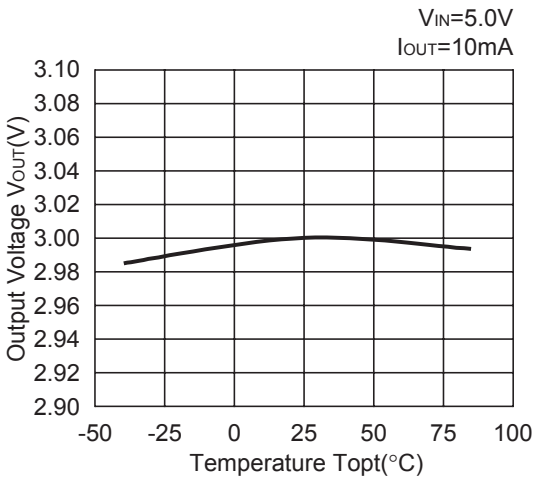

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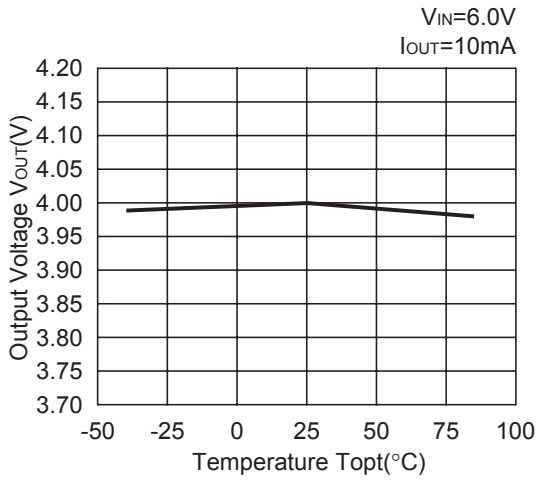
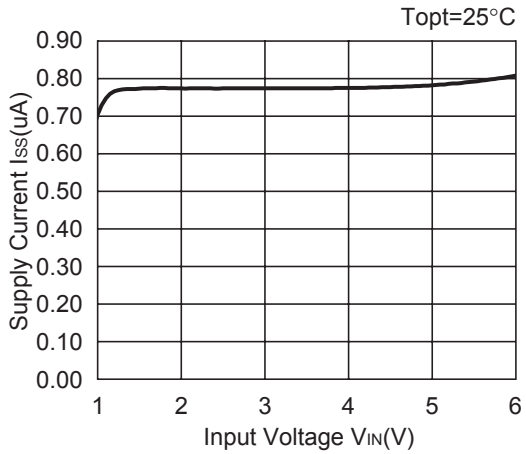


5) Supply Current vs. Input Voltage

R1100D091C



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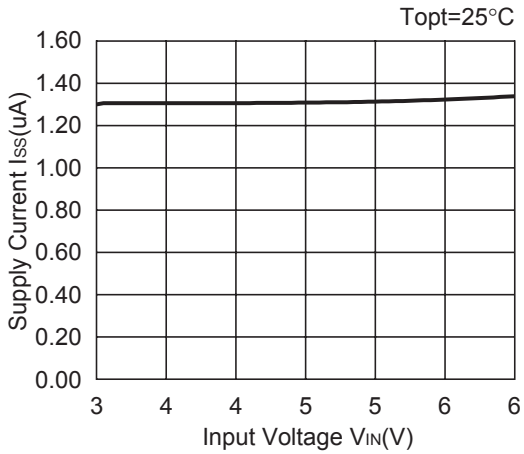

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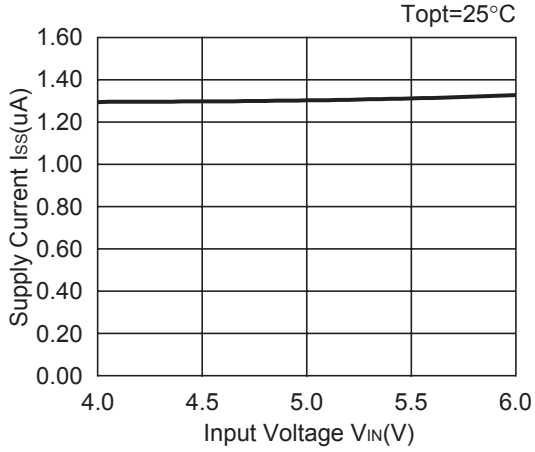
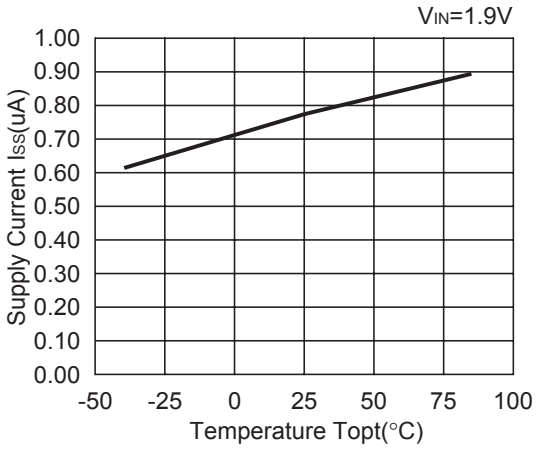


6) Supply Current vs. Temperature

R1100D091C



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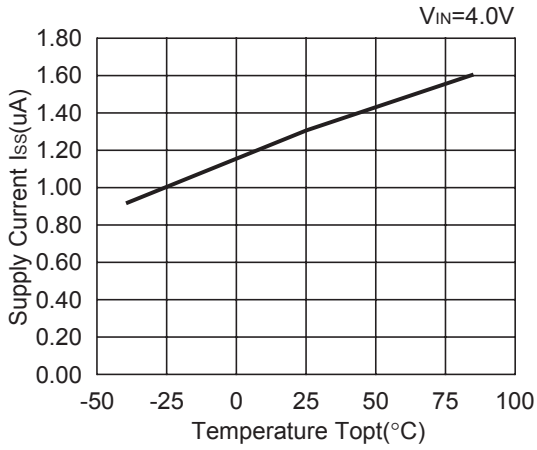

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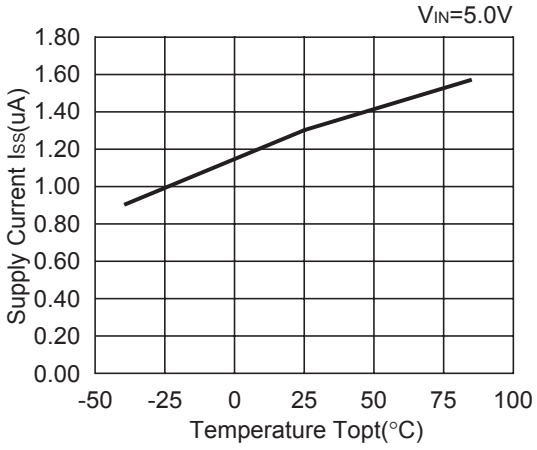
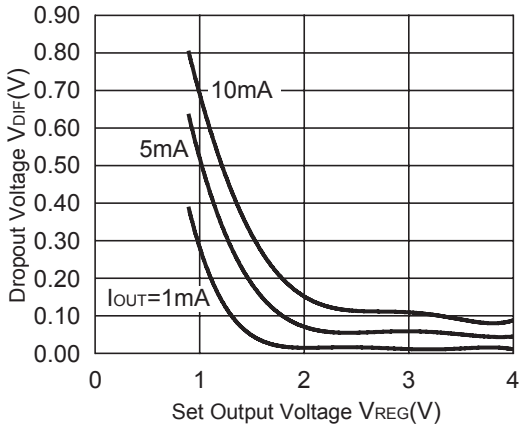


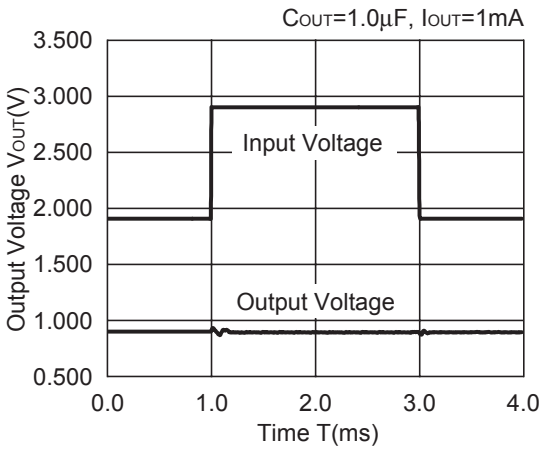
7) Dropout Voltage vs. Set Output Voltage

R1100Dxx1C



8) Line Transient Response

R1100D091C



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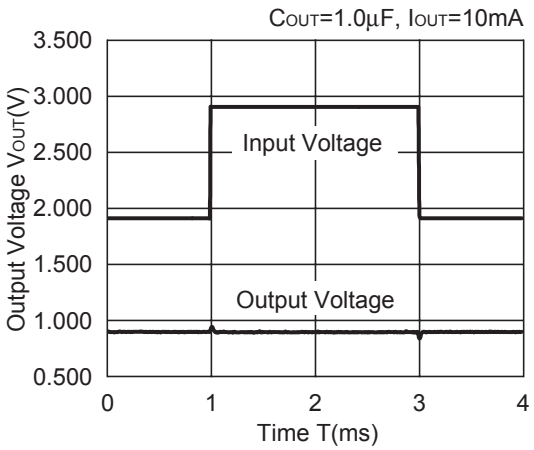

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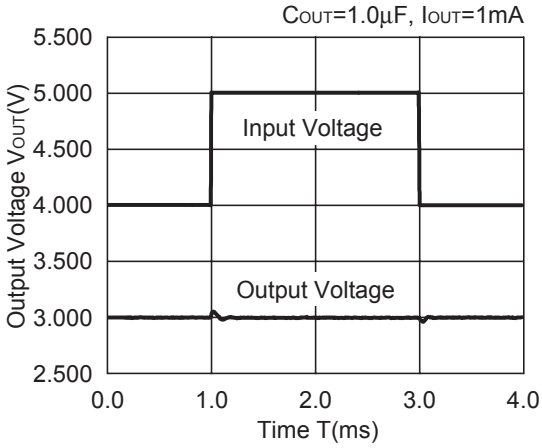

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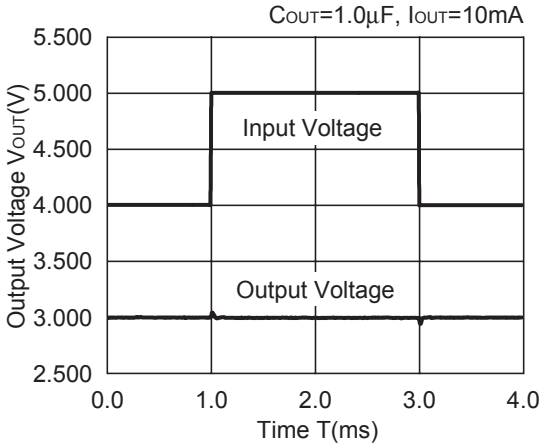

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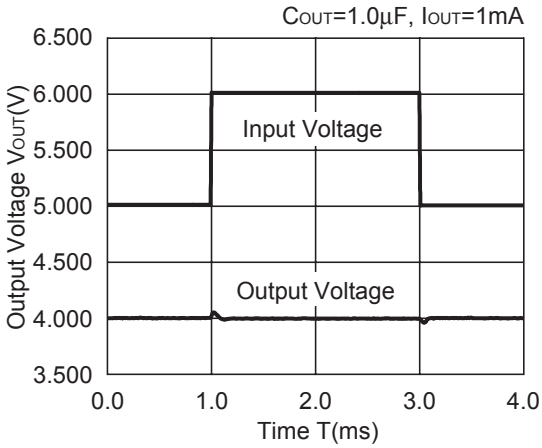

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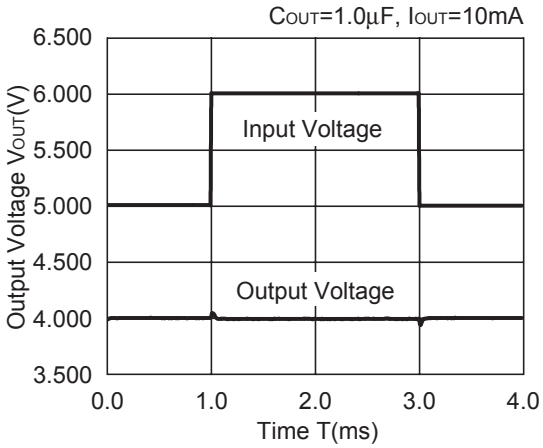
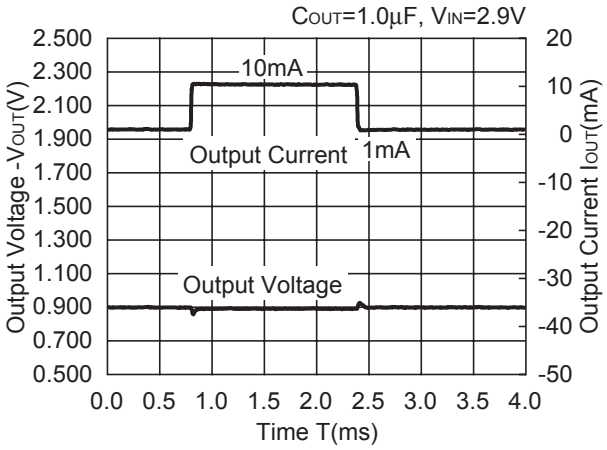


9) Load Transient Response

R1100D091C



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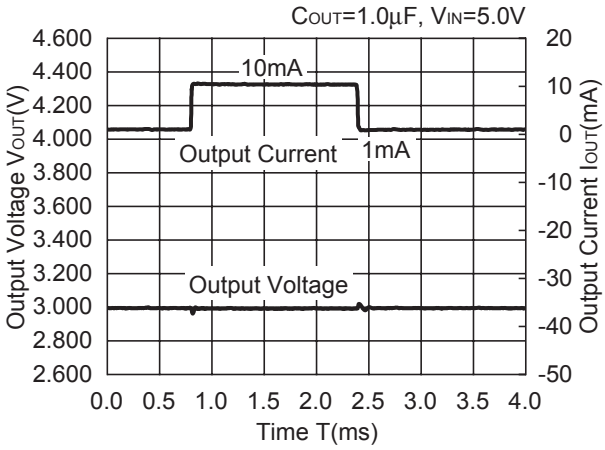
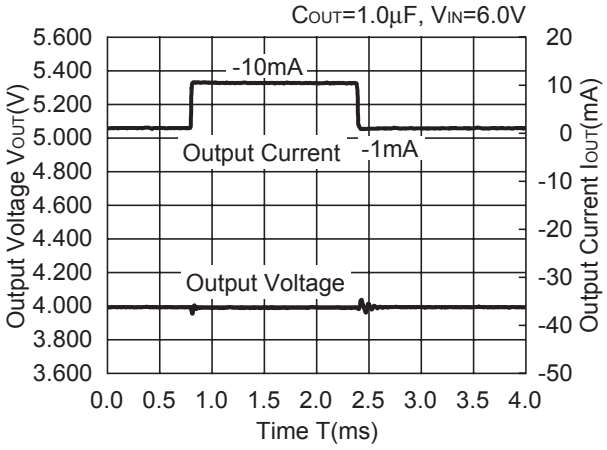
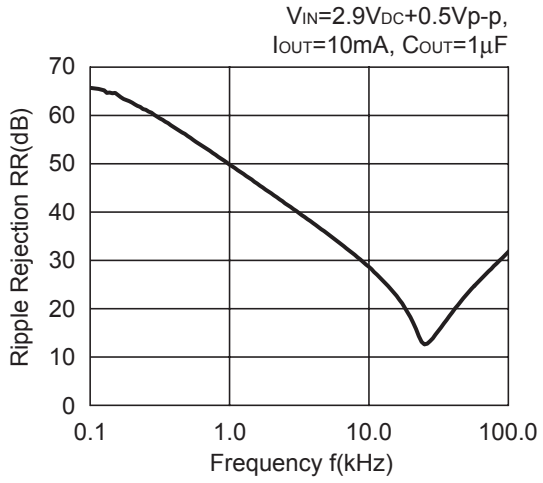


R1100D401C

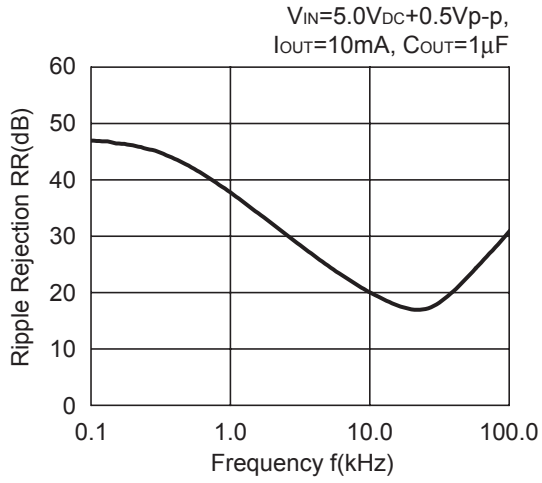


10) Ripple Rejection vs. Frequency

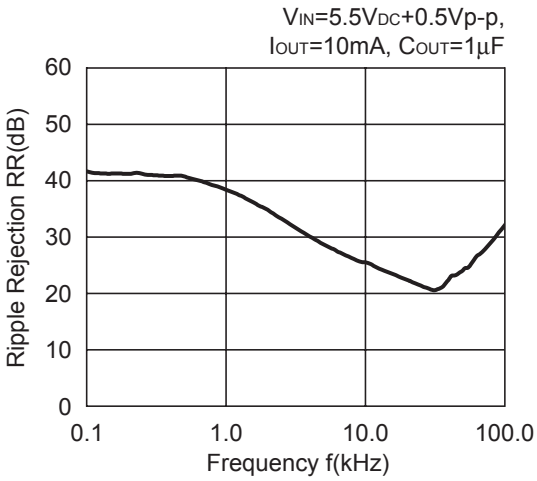
R1100D091C



R1100D301C



R1100D401C



TYPICAL APPLICATION

In R1100D Series, a constant voltage can be obtained without using capacitors. However, when the wire connected V_{IN} is long, use a capacitor. Output noise can be reduced with using capacitor.

Insert capacitors with the capacitance of 0.1μF to 2.2μF between input/output pins and GND pin as close as possible.