

**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.

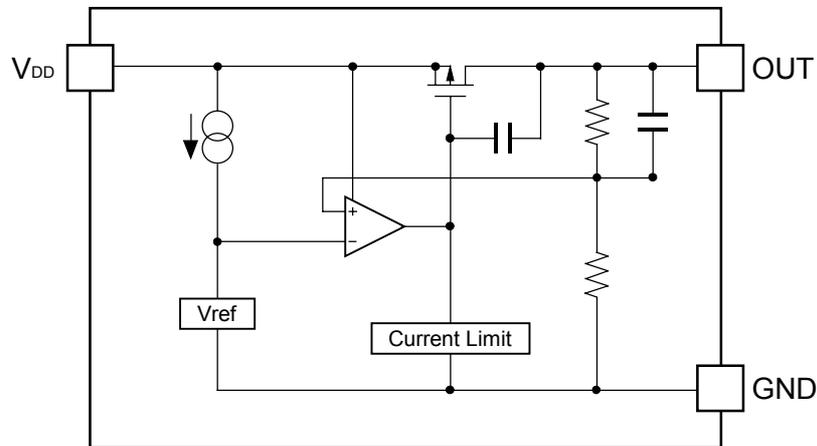
**FEATURES**

- Ultra-low supply current ..... Typ.  $0.8\mu\text{A}$  ( $V_{OUT}=1.0\text{V}, V_{DD}=3.0\text{V}$ )
- Dropout Voltage ..... Typ.  $20\text{mV}$  ( $I_{OUT}=1\text{mA}, V_{OUT}=3.0\text{V}$ )
- Low Temperature-Drift Coefficient of Detector Threshold .... Typ.  $\pm 100\text{ppm}/^\circ\text{C}$
- Excellent Line Regulation ..... Typ.  $0.05\%/V$
- High Accuracy Output Voltage .....  $\pm 2.0\%$  ( $1.2\text{V} \leq V_{OUT} \leq 4.0\text{V}$ ),  
 $\pm 24\text{mV}$  ( $V_{OUT} < 1.2\text{V}$ )
- 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.

**RICOH**

**R1100D****BLOCK DIAGRAMS****SELECTION GUIDE**

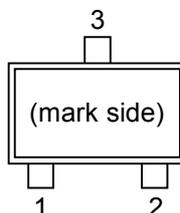
The output voltage, the active type, and the packing type for the ICs can be selected at the user's request. The selection can be made with designating the part number as shown below:

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
$T_{opt}$	Operating Temperature	-40 to +85	°C
$T_{stg}$	Storage Temperature	-55 to +125	°C
$T_{solder}$	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

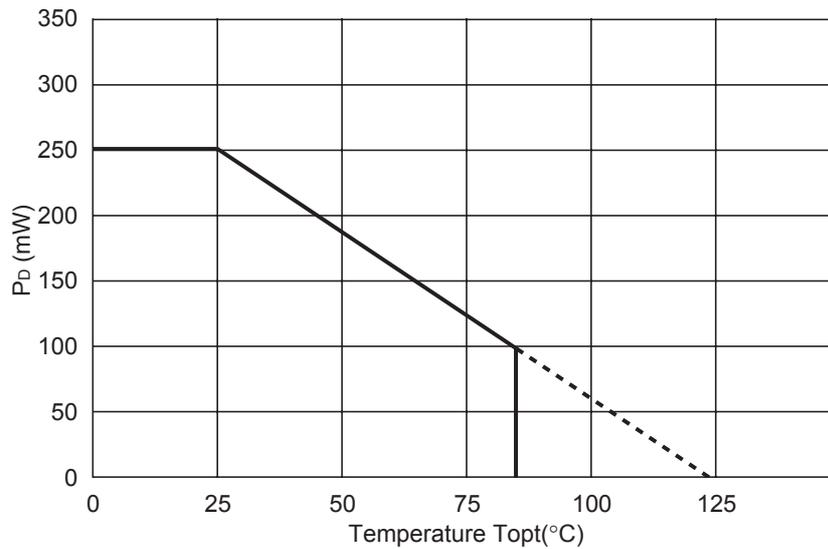
Environment: Mounted on board (Wind velocity 0m/s)

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.

**R1100D****ELECTRICAL CHARACTERISTICS**• **R1100D301C**

Topt=25°C

Symbol	Item	Test Conditions	Min.	Typ.	Max.	Unit
$V_{OUT}$	Output Voltage	$V_{IN}=5.0V$ $10\mu A \leq I_{OUT} \leq 10mA$	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	$V_{IN}=5.0V, 1mA \leq I_{OUT} \leq 50mA$		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	$\mu A$
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	$I_{OUT}=1mA$ $V_{OUT}+0.5V \leq V_{IN} \leq 6.0V$	-0.20		0.20	%/V
$V_{IN}$	Input Voltage				6.0	V
$\Delta V_{OUT}/\Delta T$	Output Voltage Temperature Coefficient	$I_{OUT}=10mA$ $-40^{\circ}C \leq T_{opt} \leq 85^{\circ}C$		$\pm 100$		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			
	V <sub>OUT</sub> [V]				I <sub>OUT</sub> [mA]			ΔV <sub>OUT</sub> /ΔI <sub>OUT</sub> [mV]			V <sub>DIF</sub> [mV]			
	Condi- tions	MIN.	TYP.	MAX.	Condi- tions	MIN.	TYP.	Condi- tions	TYP.	MAX.	Condi- tions	TYP.	MAX.	
R1100D091C	V <sub>IN</sub> -V <sub>OUT</sub> =2.0V  10μA ≧ I <sub>OUT</sub> ≧ 10mA	0.876	0.900	0.924	V <sub>IN</sub> - V <sub>OUT</sub> =2.0V	35		V <sub>IN</sub> -V <sub>OUT</sub> =2.0V  1mA ≧ I <sub>OUT</sub> ≧ 20mA	7.5	20				
R1100D101C		0.976	1.000	1.024										
R1100D111C		1.076	1.100	1.124										
R1100D121C		1.176	1.200	1.224										
R1100D131C		1.274	1.300	1.326										
R1100D141C		1.372	1.400	1.428										
R1100D151C		1.470	1.500	1.530										
R1100D161C		1.568	1.600	1.632										
R1100D171C		1.666	1.700	1.734										
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		65		V <sub>IN</sub> -V <sub>OUT</sub> =2.0V  1mA ≧ I <sub>OUT</sub> ≧ 35mA	20	40				
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											
R1100D311C	3.038	3.100	3.162	100		V <sub>IN</sub> -V <sub>OUT</sub> =2.0V  1mA ≧ I <sub>OUT</sub> ≧ 50mA	35	60						
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	3.570											
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											

**R1100D****ELECTRICAL CHARACTERISTICS**

(Common characteristics)

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

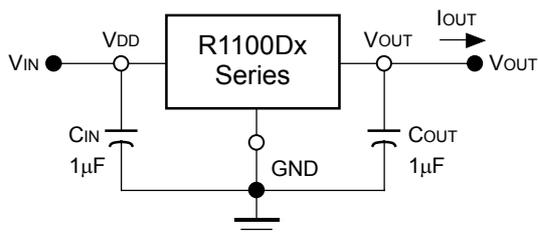
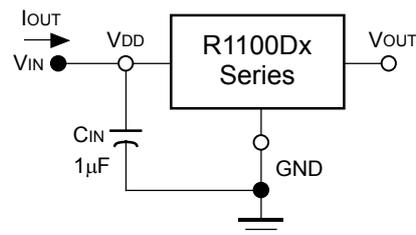
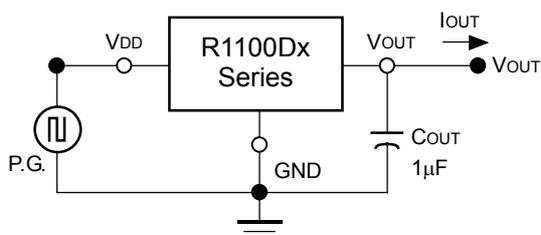
**ELECTRICAL CHARACTERISTICS BY OUTPUT VOLTAGE**

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

**OPERATION**

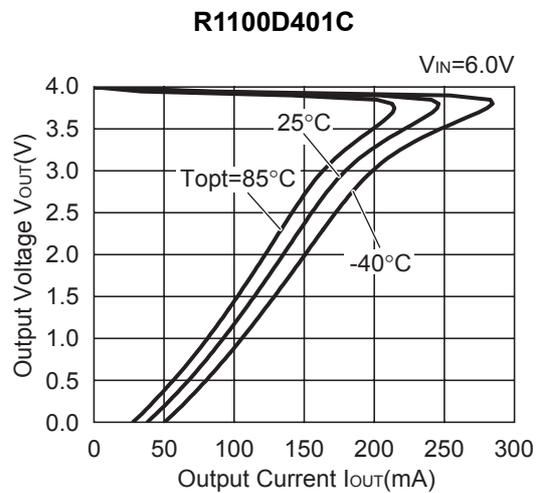
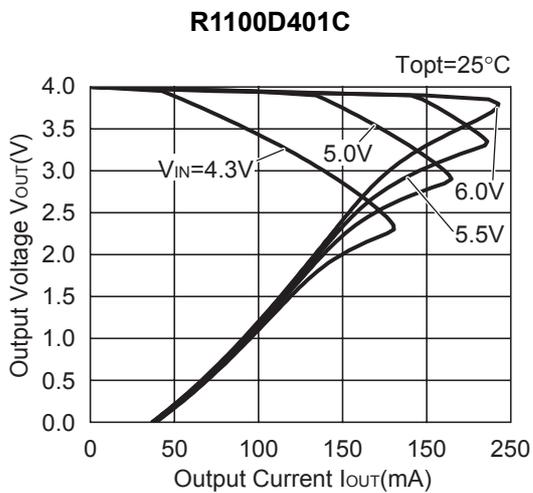
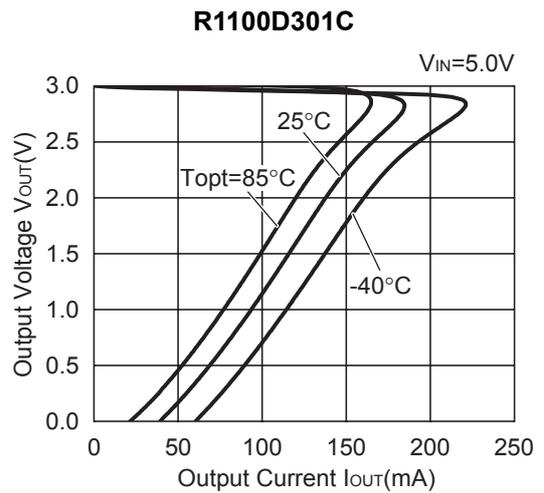
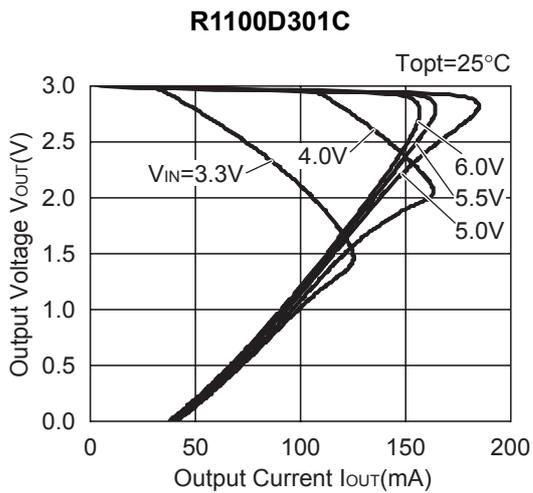
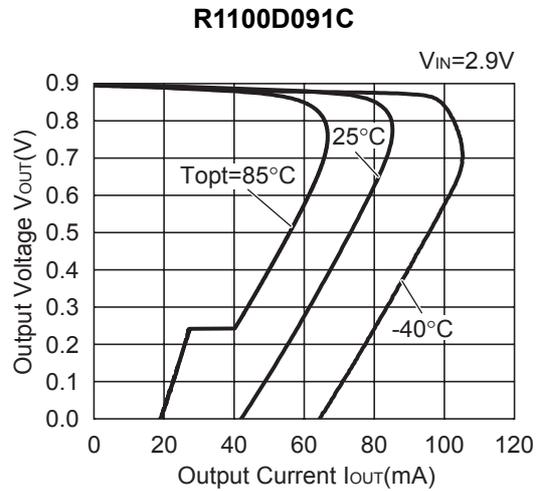
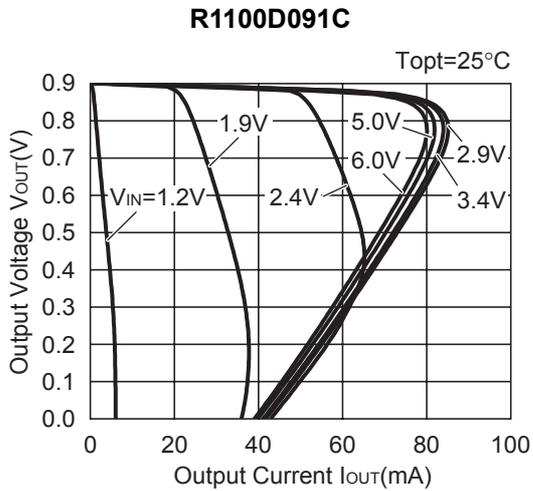
these ICs, the output voltage  $V_{OUT}$  is detected by Feedback Registers, and the detected output voltage is compared with a reference voltage by the error amplifier, so that a constant voltage is output.

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

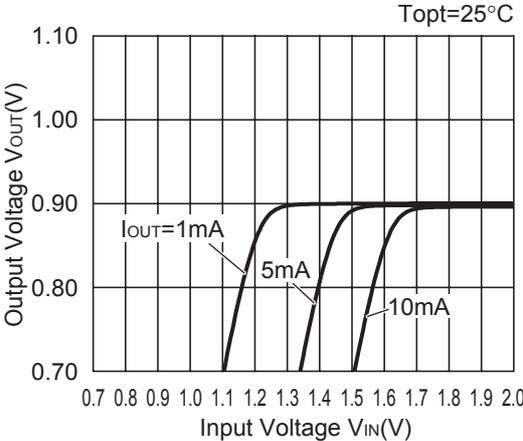
## 1) Output Voltage vs. Output Current



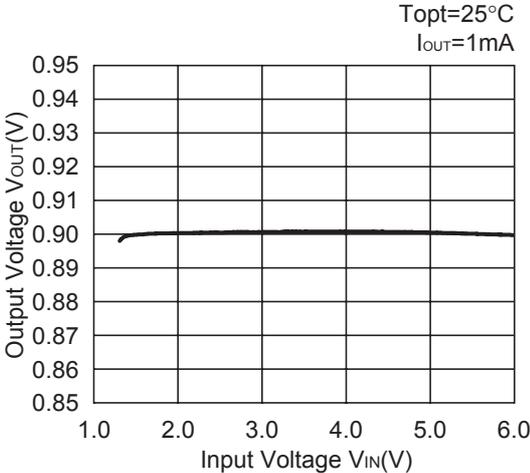
**R1100D**

**2) Output Voltage vs. Input Voltage**

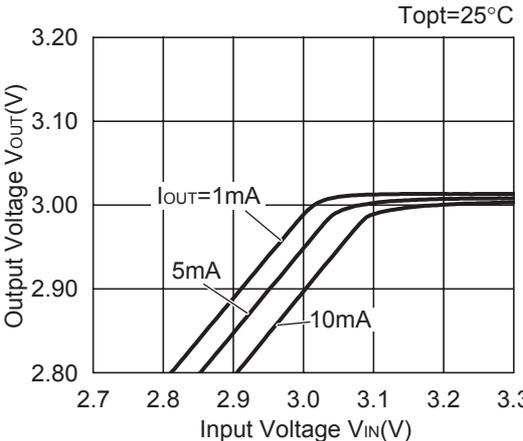
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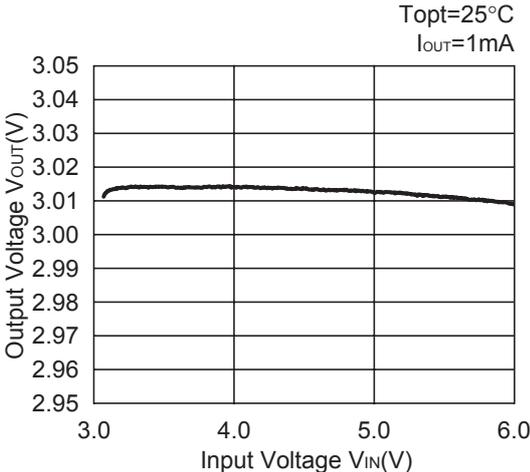
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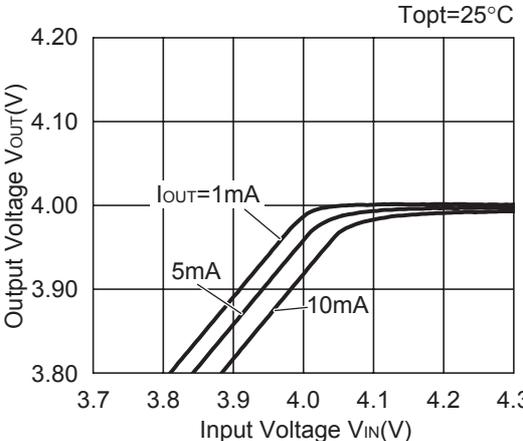
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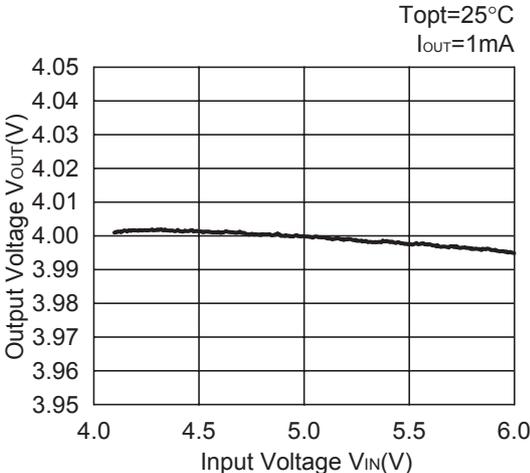
**R1100D301C**



**R1100D401C**

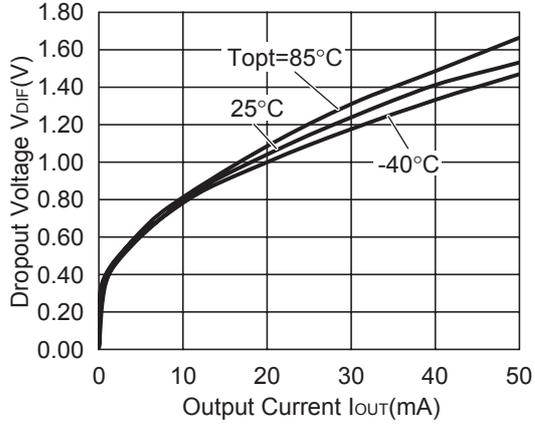


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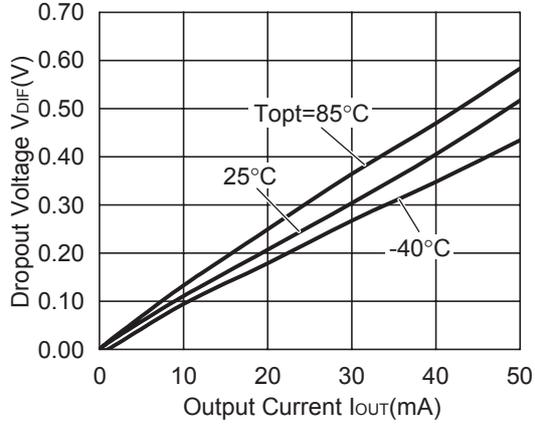


3) Dropout Voltage vs. Output Current

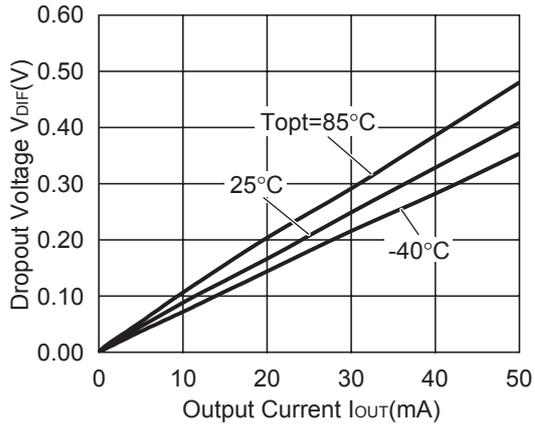
R1100D091C



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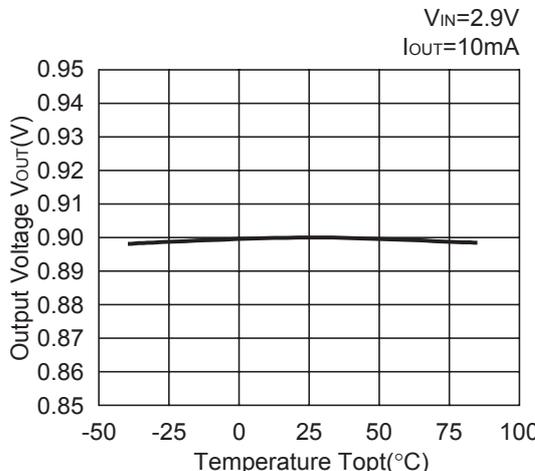


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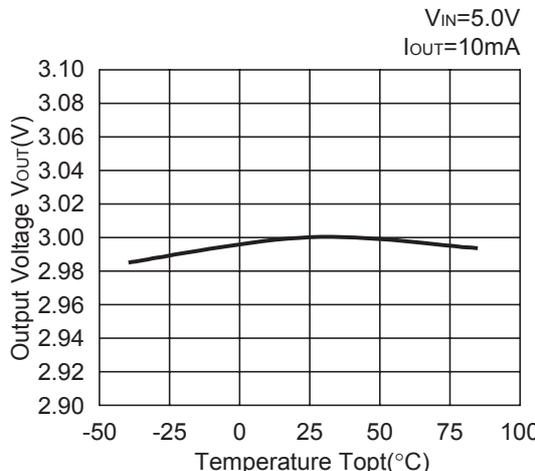


4) Output Voltage vs. Temperature

R1100D091C

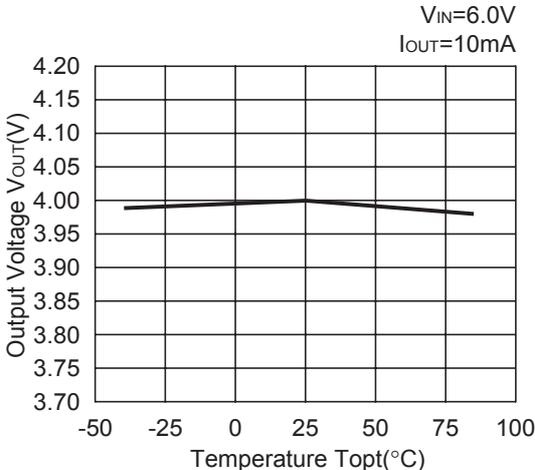


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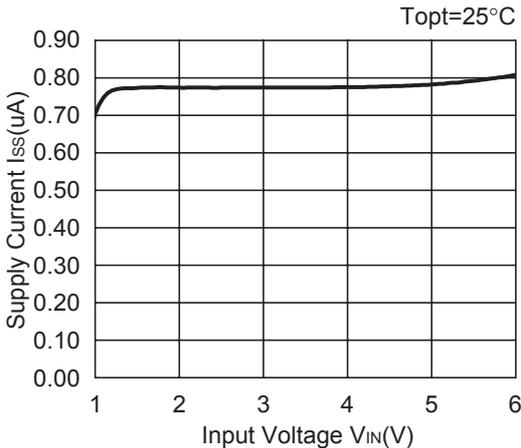
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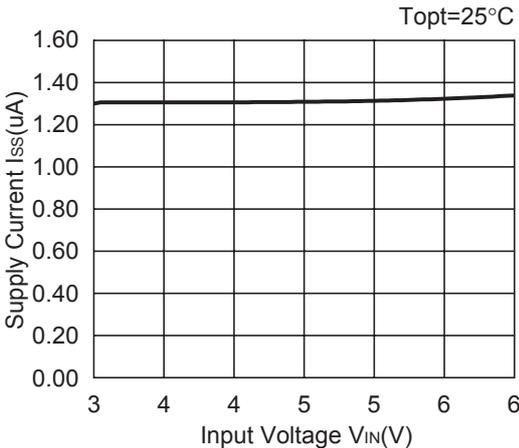


**5) Supply Current vs. Input Voltage**

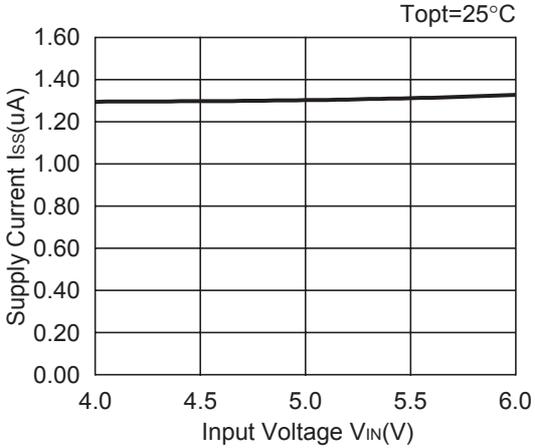
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**R1100D301C**

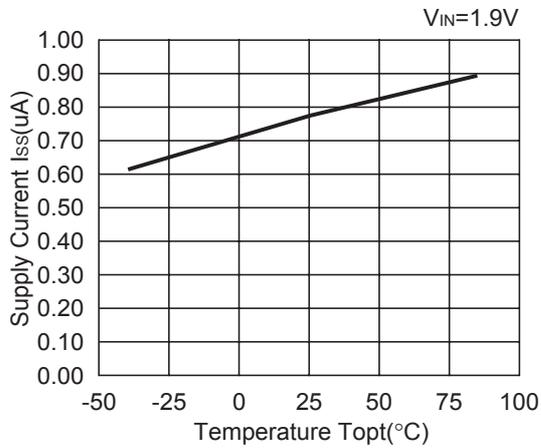


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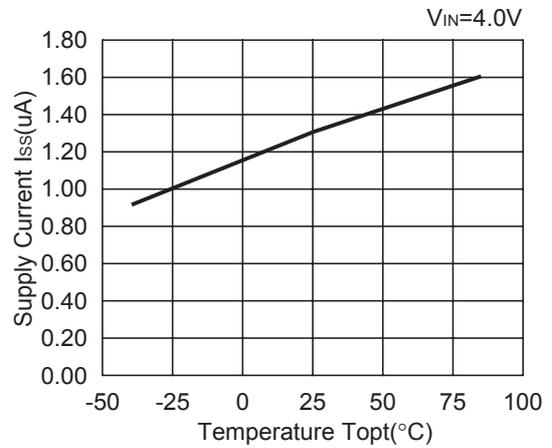


**6) Supply Current vs. Temperature**

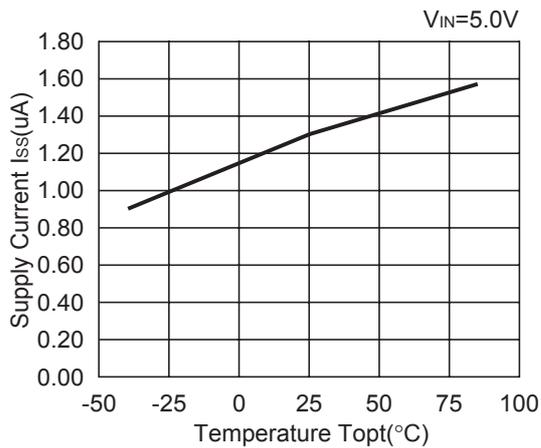
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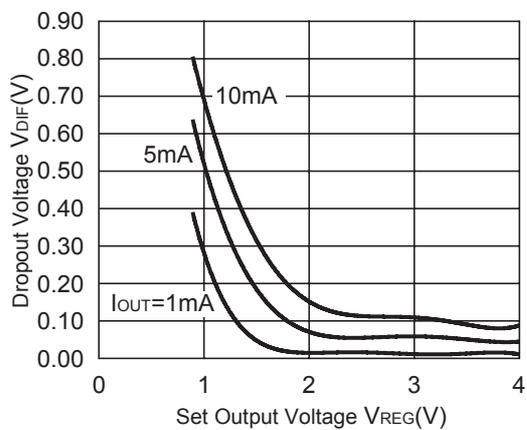


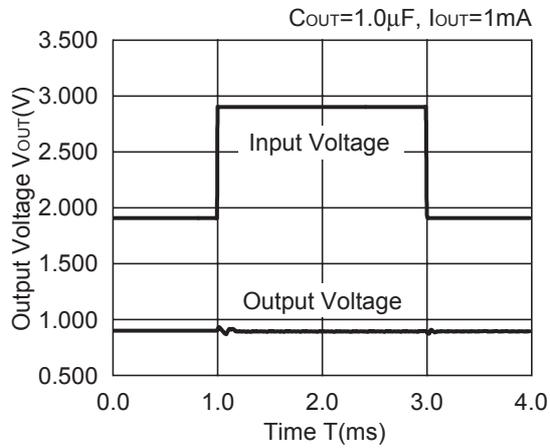
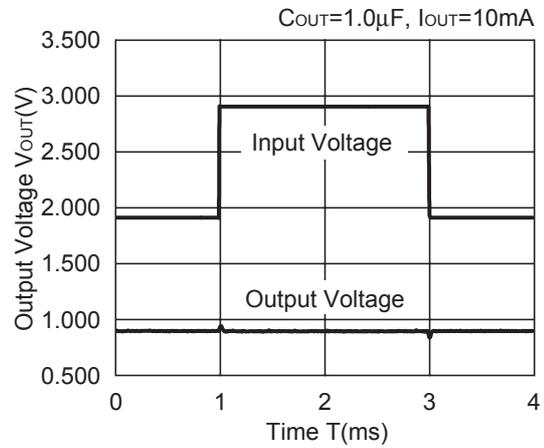
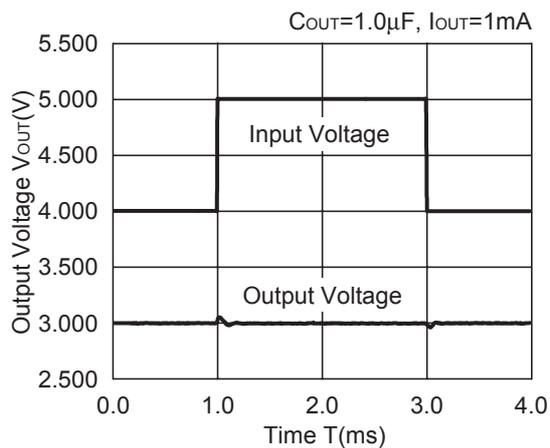
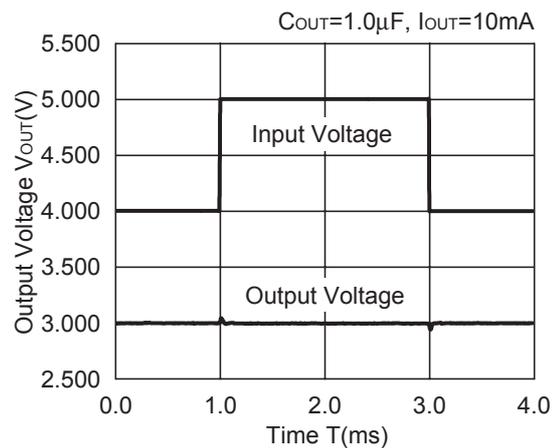
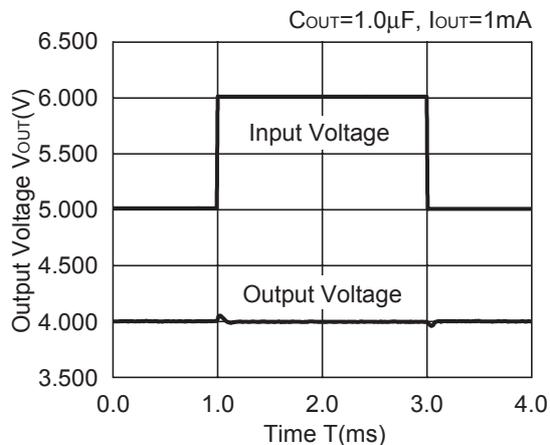
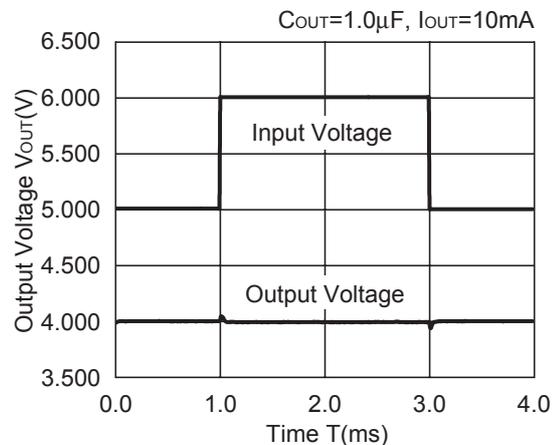
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**7) Dropout Voltage vs. Set Output Voltage**

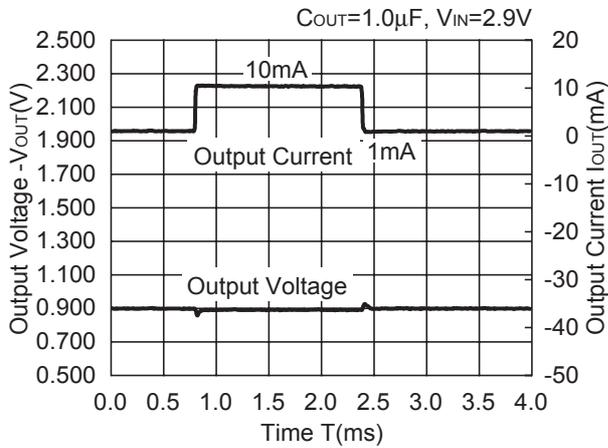
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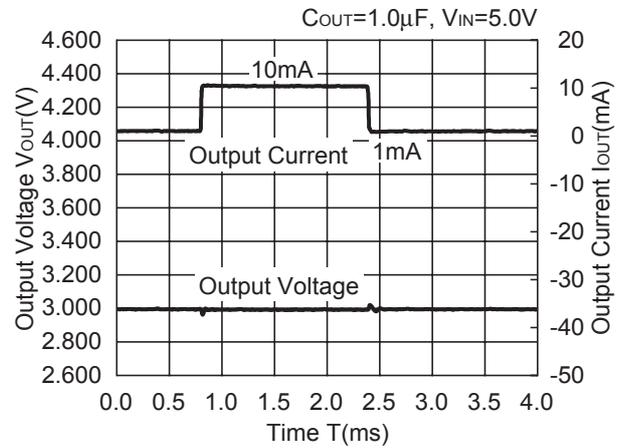
**R1100D****8) Line Transient Response****R1100D091C****R1100D091C****R1100D301C****R1100D301C****R1100D401C****R1100D401C**

**9) Load Transient Response**

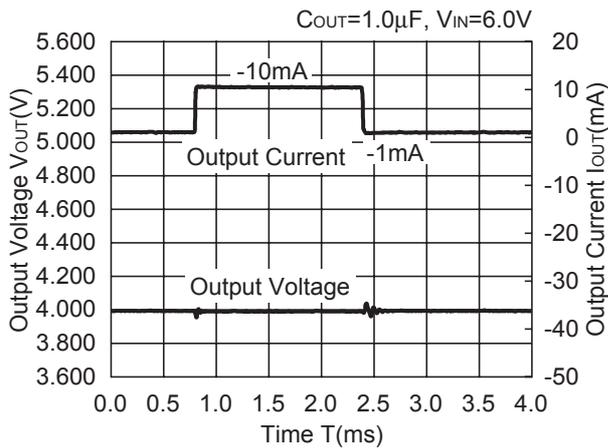
**R1100D091C**



**R1100D301C**

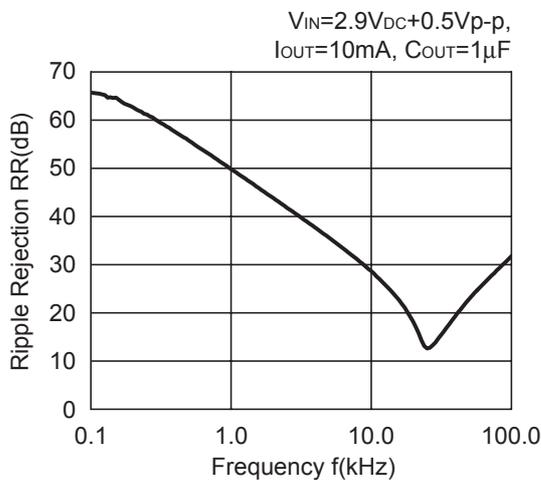


**R1100D401C**

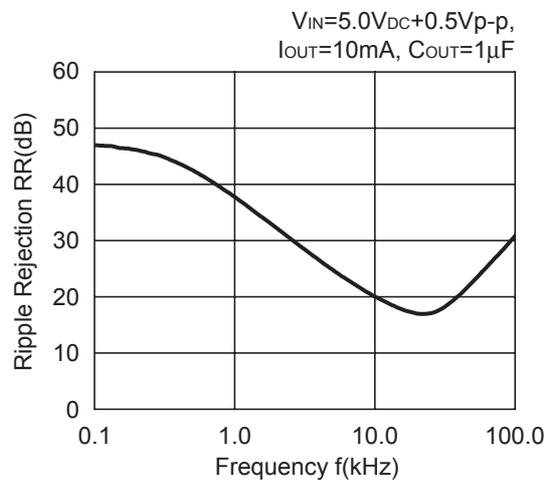


**10) Ripple Rejection vs. Frequency**

**R1100D091C**

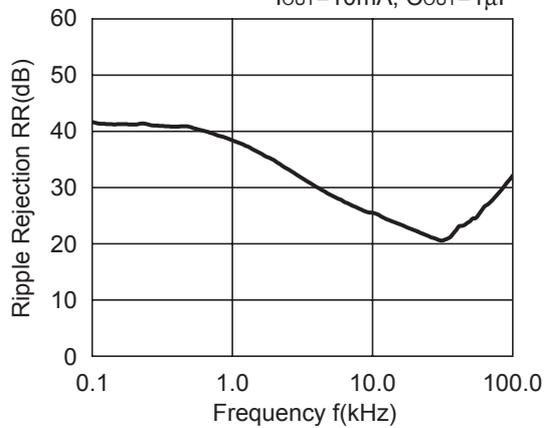


**R1100D301C**



**R1100D****R1100D401C**

$V_{IN}=5.5V_{DC}+0.5V_{p-p}$ ,  
 $I_{OUT}=10mA$ ,  $C_{OUT}=1\mu F$

**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  $0.1\mu F$  to  $2.2\mu F$  between input/output pins and GND pin as close as possible.