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## ULTRA SMALL PACKAGE VOLTAGE REGULATOR

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NO.EA-117-111018

### 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.

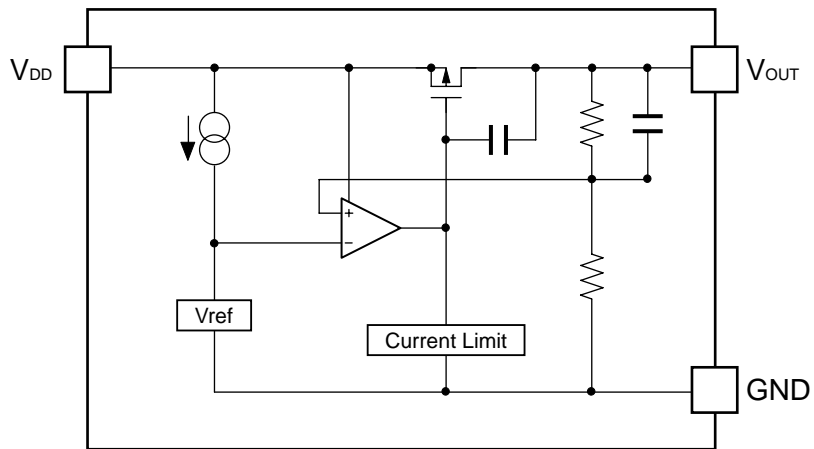
### FEATURES

- Supply current ..... Typ.  $0.8\mu\text{A}$  ( $V_{OUT}=1.0\text{V}$ ,  $V_{DD}=3.0\text{V}$ )
- Dropout Voltage ..... Typ.  $20\text{mV}$  ( $I_{OUT}=1\text{mA}$ ,  $V_{OUT}=3.0\text{V}$ )
- Output Voltage .....  $0.9\text{V}$  to  $4.0\text{V}$  ( $0.1\text{V}$  steps)  
(For other voltages, please refer to MARK INFORMATION.)
- Output Voltage Accuracy .....  $\pm 2.0\%$  ( $1.2\text{V} \leq V_{OUT} \leq 4.0\text{V}$ ),  
 $\pm 24\text{mV}$  ( $V_{OUT} < 1.2\text{V}$ )
- Temperature-Drift Coefficient of Output Voltage ..... Typ.  $\pm 100\text{ppm}/^\circ\text{C}$
- Line Regulation ..... Typ.  $0.05\%/V$
- Package ..... SON1408-3
- Built-in Fold Back Protection Circuit ..... Typ.  $40\text{mA}$  (Current at short mode)
- Ceramic capacitors are recommended to be used with this IC .....  $0.1\mu\text{F}$  or more

### 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 DIAGRAM



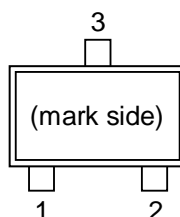
## SELECTION GUIDE

The output voltage for the ICs can be selected at the user's request.

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R1100Dxx1C-TR-F	SON1408-3	9,000 pcs	Yes	Yes
xx: The output voltage can be designated in the range from 0.9V(09) to 4.0V(40) in 0.1V steps. (For other voltages, please refer to MARK INFORMATIONS.)				

## PIN CONFIGURATION

### ● SON1408-3



## PIN DESCRIPTION

### ● SON1408-3

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

## ABSOLUTE MAXIMUM RATINGS

(GND=0V)

Symbol	Item	Rating	Unit
$V_{IN}$	Input 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)	250	mW
$T_{opt}$	Operating Temperature Range	-40 to 85	°C
$T_{stg}$	Storage Temperature Range	-55 to~ 125	°C

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

### ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause the permanent damages and may degrade the life time and safety for both device and system using the device in the field.

The functional operation at or over these absolute maximum ratings is not assured.

## ELECTRICAL CHARACTERISTICS

## • R1100D301C

T<sub>opt</sub>=25°C

Symbol	Item	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>OUT</sub>	Output Voltage	V <sub>IN</sub> =5.0V 10μA ≤ I <sub>OUT</sub> ≤ 10mA	2.940	3.000	3.060	V
I <sub>OUT</sub>	Output Current	V <sub>IN</sub> =5.0V	100			mA
ΔV <sub>OUT</sub> /ΔI <sub>OUT</sub>	Load Regulation	V <sub>IN</sub> =5.0V, 1mA ≤ I <sub>OUT</sub> ≤ 50mA		35	60	mV
V <sub>DIF</sub>	Dropout Voltage	I <sub>OUT</sub> =1mA		20	30	mV
I <sub>SS</sub>	Supply Current	V <sub>IN</sub> =5.0V		1.5	3.0	μA
ΔV <sub>OUT</sub> /ΔV <sub>IN</sub>	Line Regulation	I <sub>OUT</sub> =1mA Set V <sub>OUT</sub> +0.5V ≤ V <sub>IN</sub> ≤ 6.0V	-0.20		0.20	%/V
V <sub>IN</sub>	Input Voltage				6.0	V
ΔV <sub>OUT</sub> /ΔT <sub>opt</sub>	Output Voltage Temperature Coefficient	I <sub>OUT</sub> =10mA -40°C ≤ T <sub>opt</sub> ≤ 85°C		±100		ppm/ °C
I <sub>SC</sub>	Short Current Limit	V <sub>OUT</sub> =0V		40		mA

## ELECTRICAL CHARACTERISTICS BY OUTPUT VOLTAGE

T<sub>opt</sub>=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> - Set V <sub>OUT</sub> =2.0V	0.876	0.900	0.924	V <sub>IN</sub> - Set V <sub>OUT</sub> =2.0V	35		V <sub>IN</sub> -Set V <sub>OUT</sub> =2.0V  1mA ≤ I <sub>OUT</sub> ≤ 20mA	7.5	20	I <sub>OUT</sub> =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								100	400
R1100D131C		1.274	1.300	1.326									
R1100D141C		1.372	1.400	1.428								50	100
R1100D151C		1.470	1.500	1.530									
R1100D161C		1.568	1.600	1.632								25	50
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									
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		100							
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										
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	V <sub>IN</sub> -Set V <sub>OUT</sub> =2.0V  1mA ≤ I <sub>OUT</sub> ≤ 50mA	35	60	20	30					
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	$I_{OUT}=1\text{mA}$ 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/ °C
$I_{SC}$	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	

### RECOMMENDED OPERATING CONDITIONS (ELECTRICAL CHARACTERISTICS)

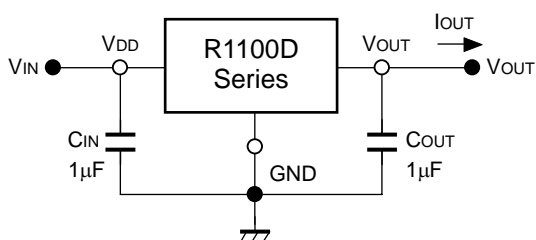
All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if when they are used over such conditions by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

## OPERATION

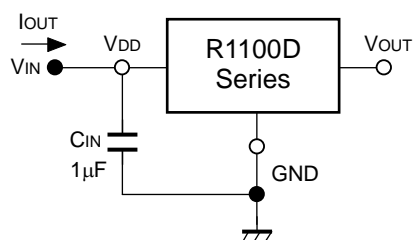
These ICs, the output voltage  $V_{OUT}$  is detected by Feedback Resistors, and the detected output voltage is compared with a reference voltage by the error amplifier, so that a constant voltage is output.

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

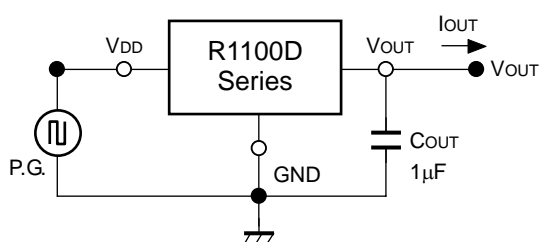
## TEST CIRCUITS



**Standard Test Circuit**



**Test Circuit for Supply Current**



**Test Circuit for Line Transient Response**

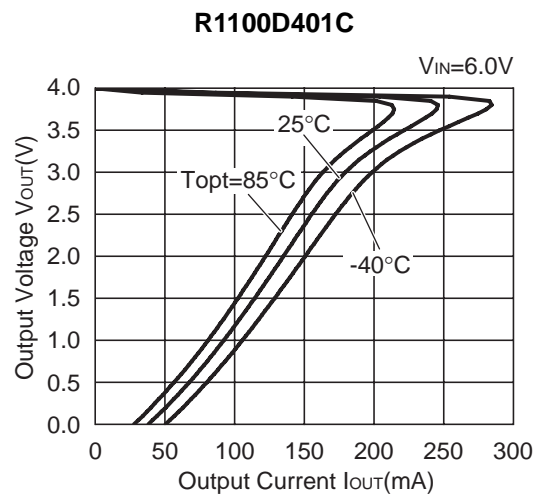
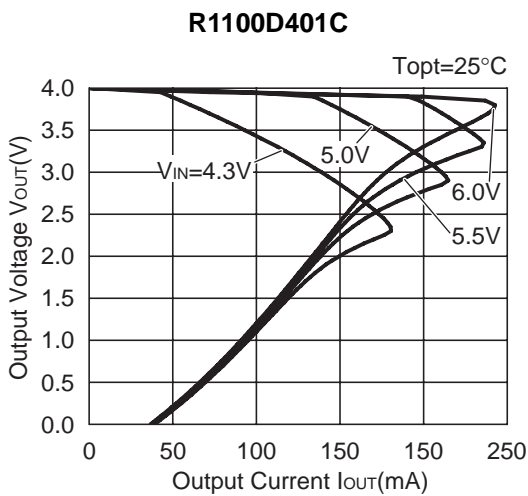
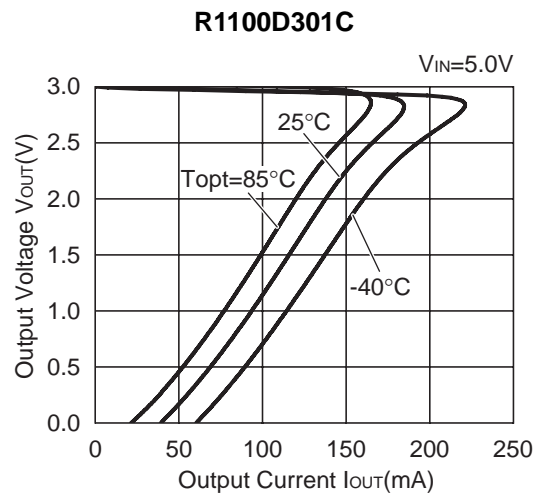
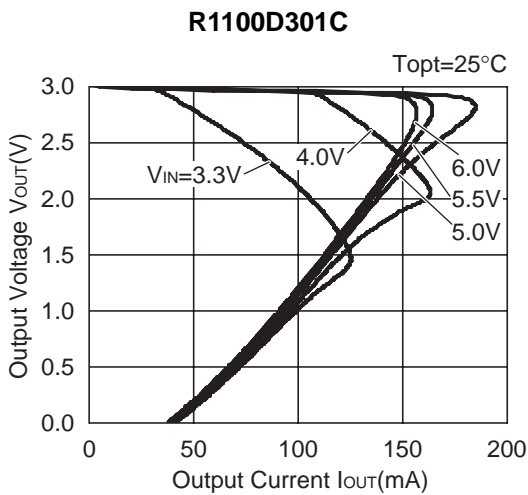
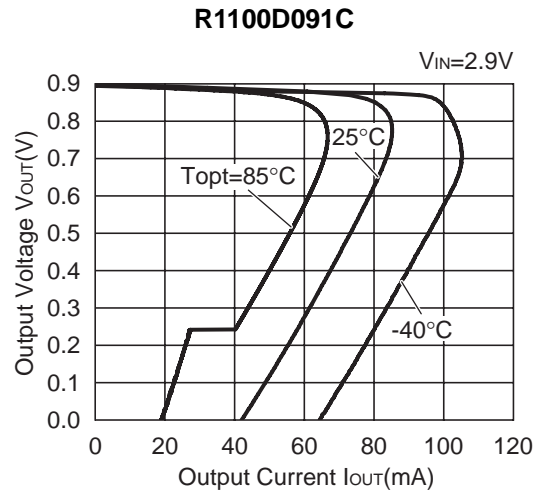
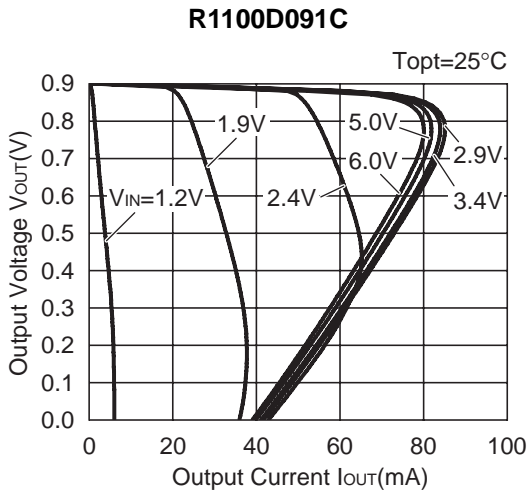
## TECHNICAL NOTES

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

## TYPICAL CHARACTERISTICS

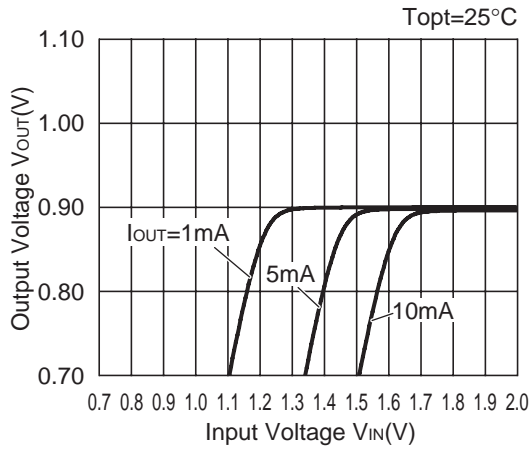
### 1) Output Voltage vs. Output Current



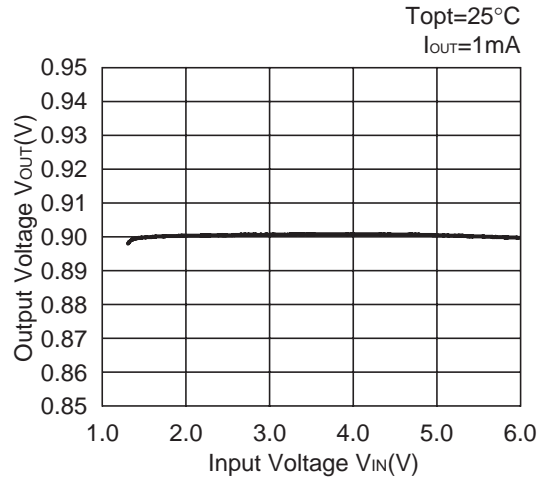


2) Output Voltage vs. Input Voltage

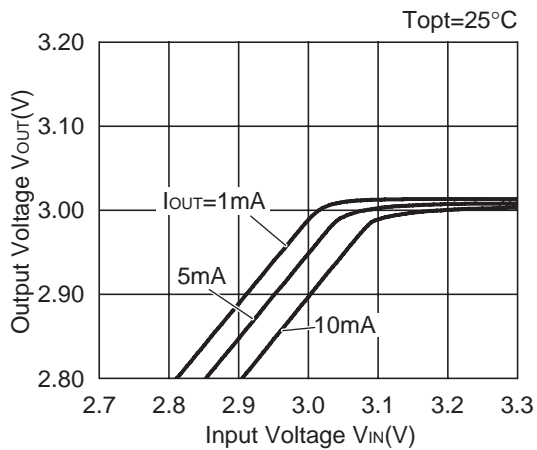
R1100D091C



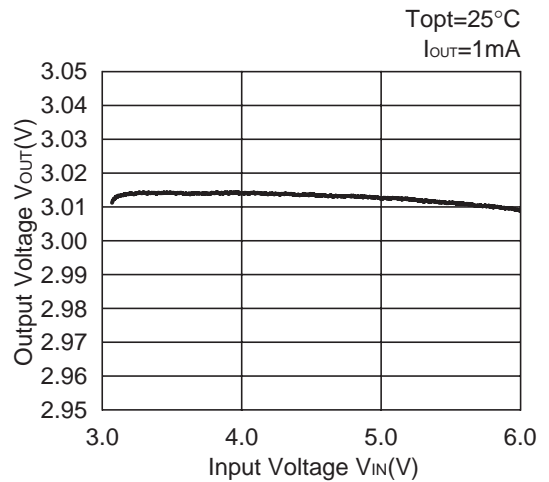
R1100D091C



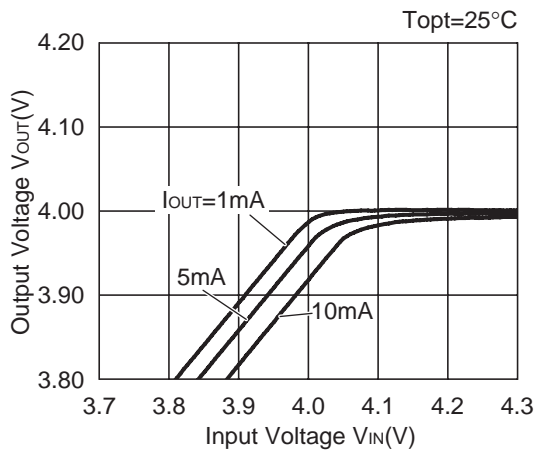
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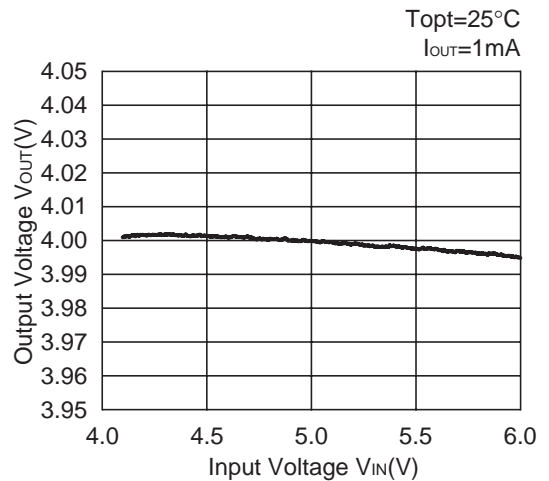
R1100D301C



R1100D401C

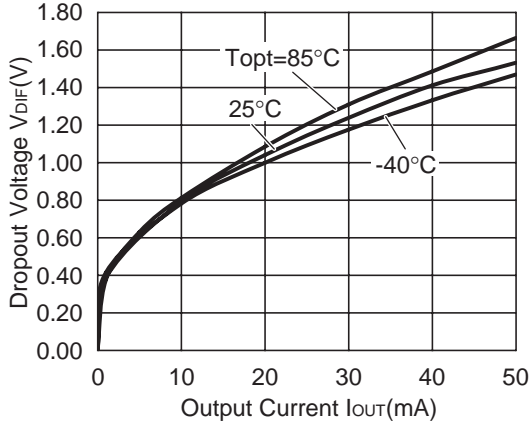


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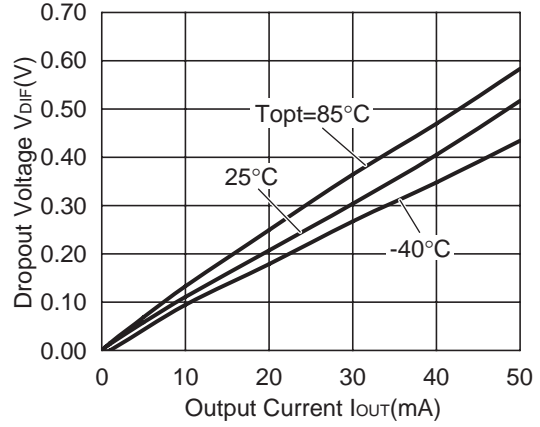


3) Dropout Voltage vs. Output Current

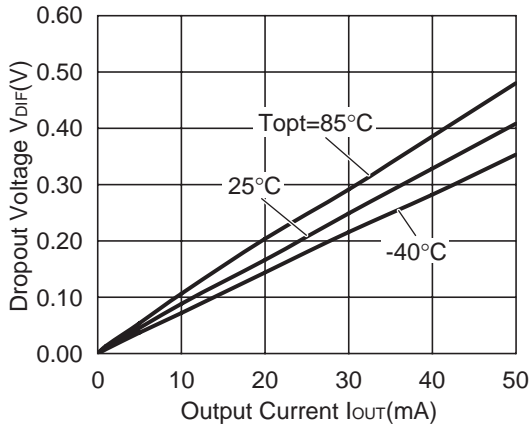
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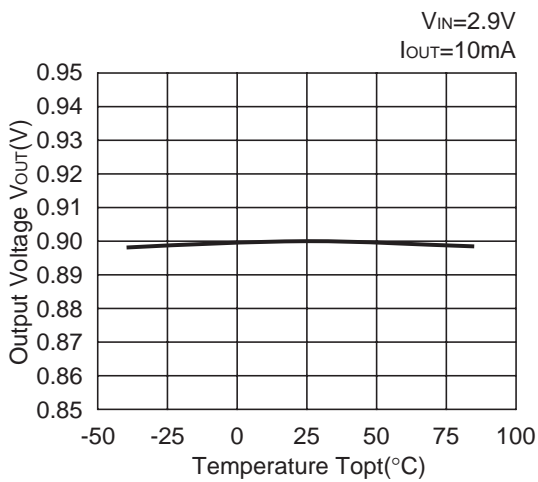


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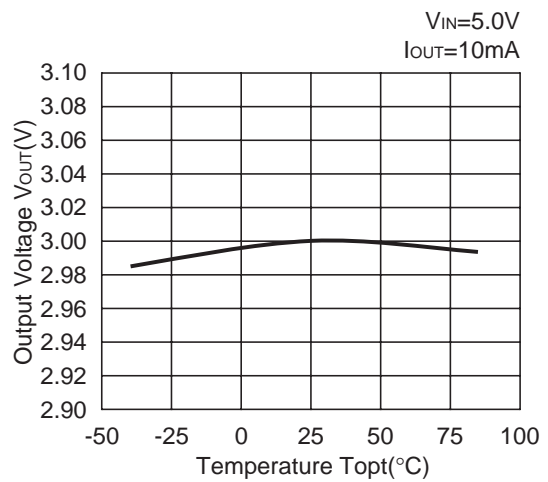


4) Output Voltage vs. Temperature

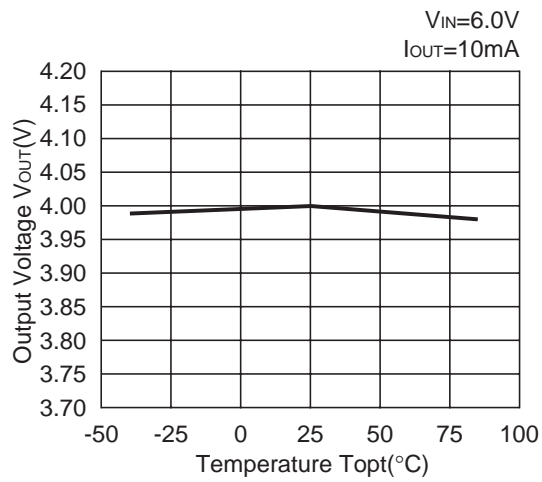
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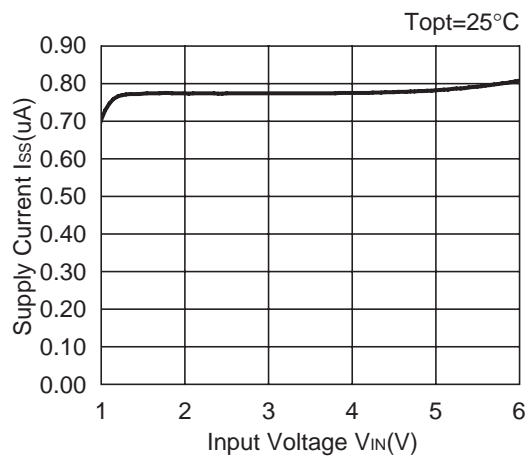


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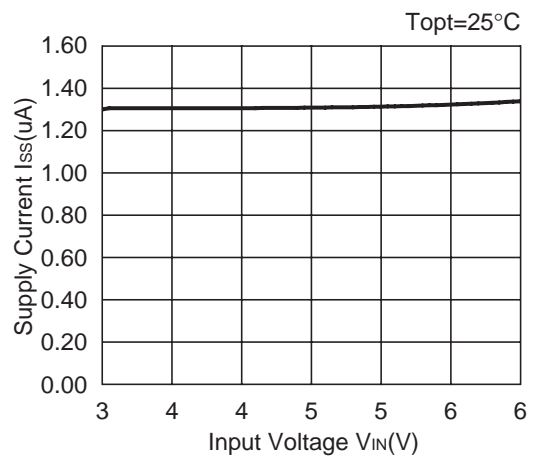


**5) Supply Current vs. Input Voltage**

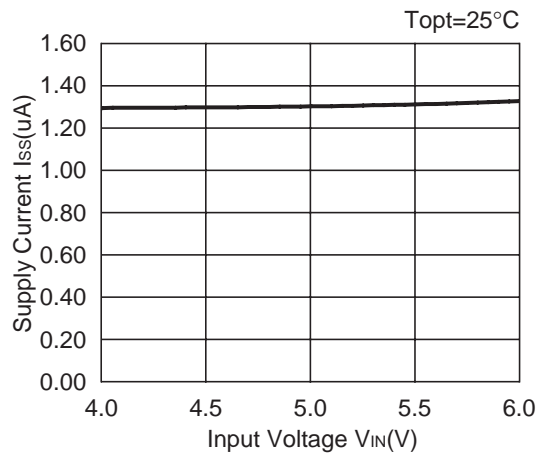
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**R1100D301C**

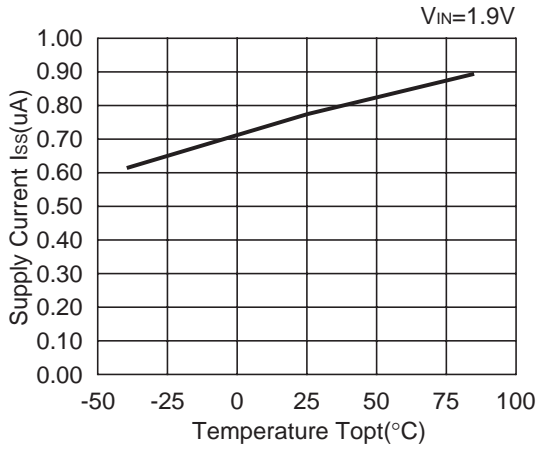


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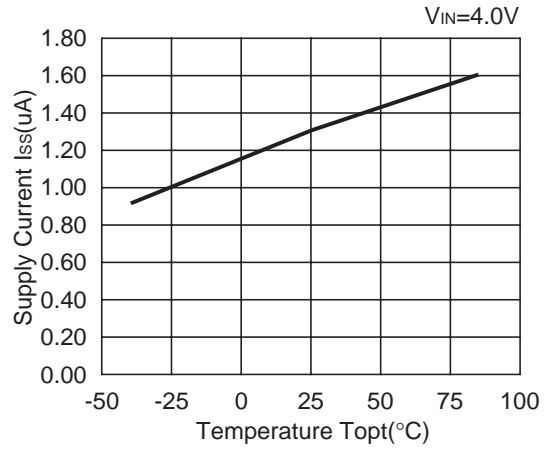


6) Supply Current vs. Temperature

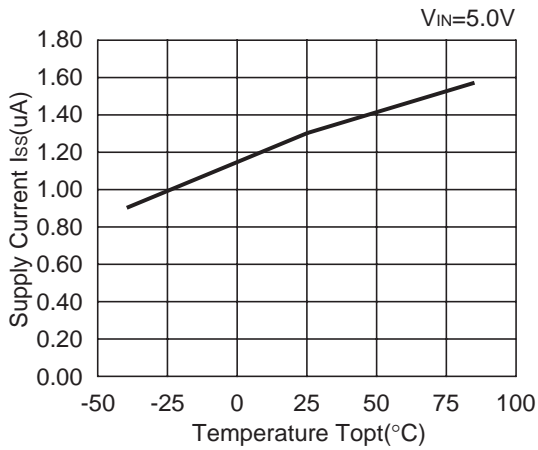
R1100D091C



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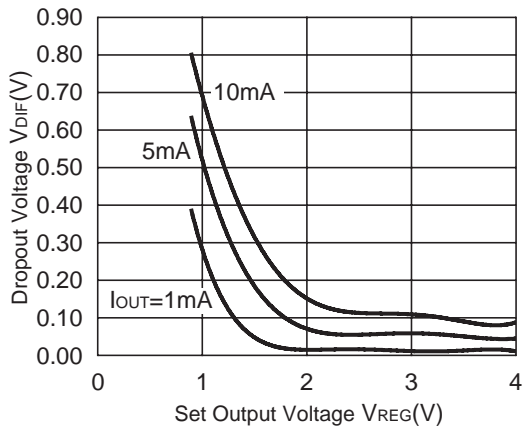


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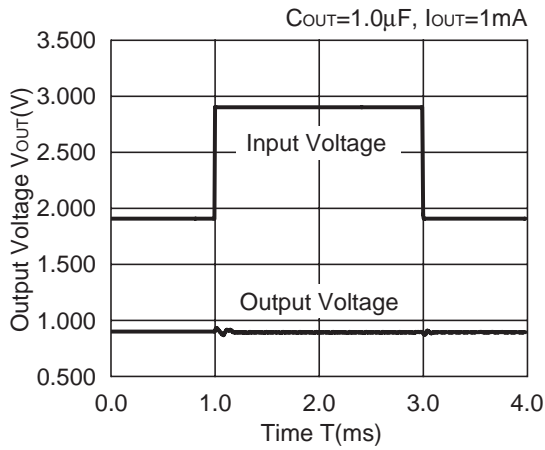
7) Dropout Voltage vs. Set Output Voltage

R1100Dxx1C

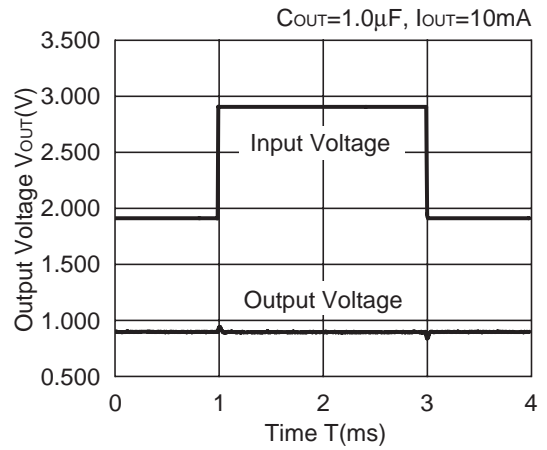


8) Line Transient Response

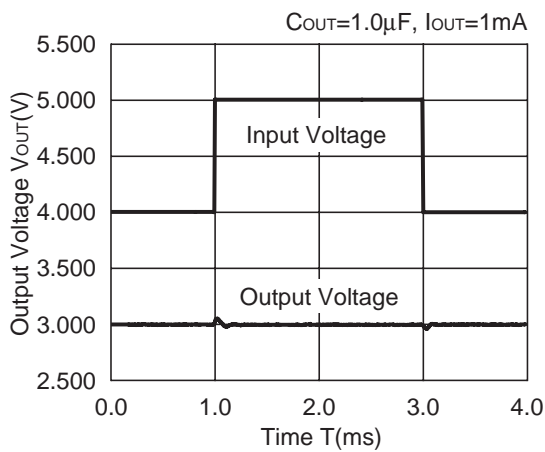
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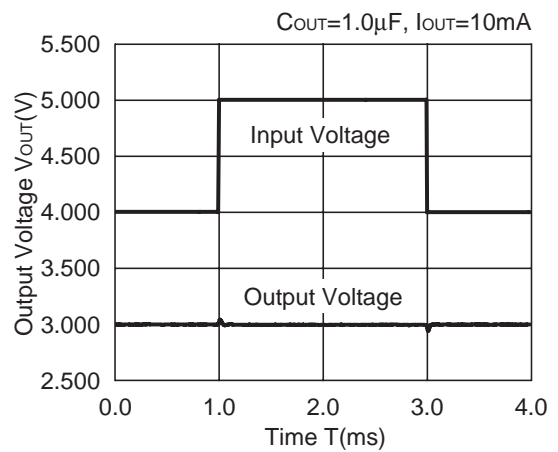
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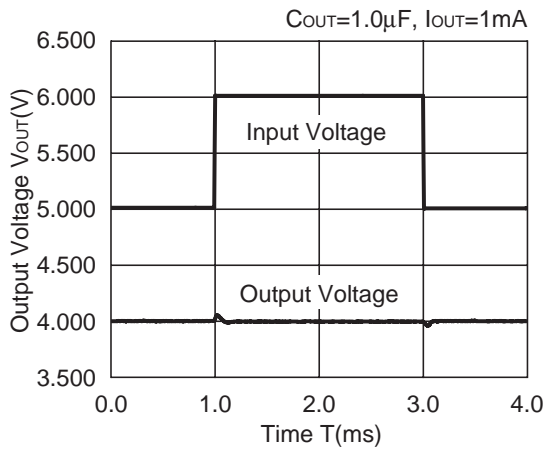
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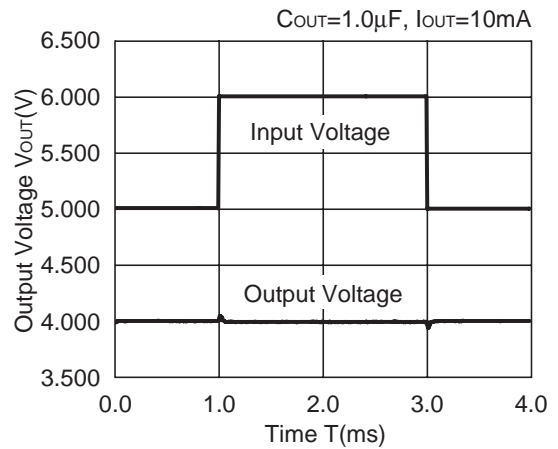
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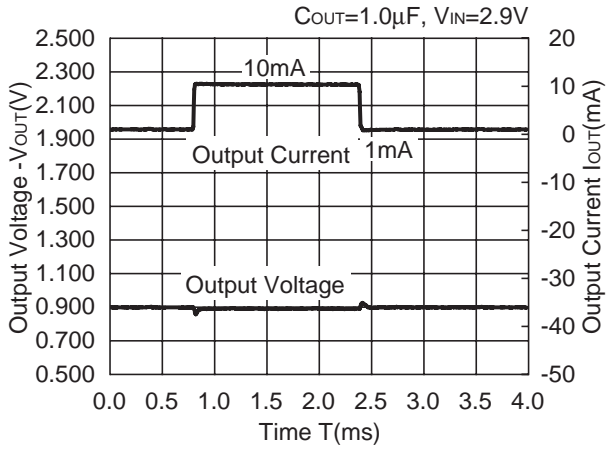


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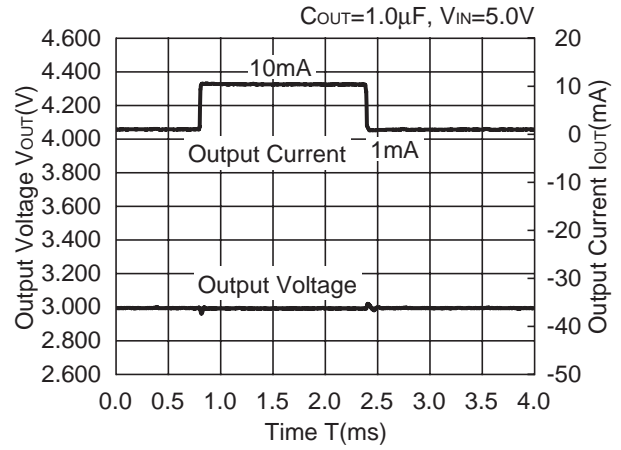


9) Load Transient Response

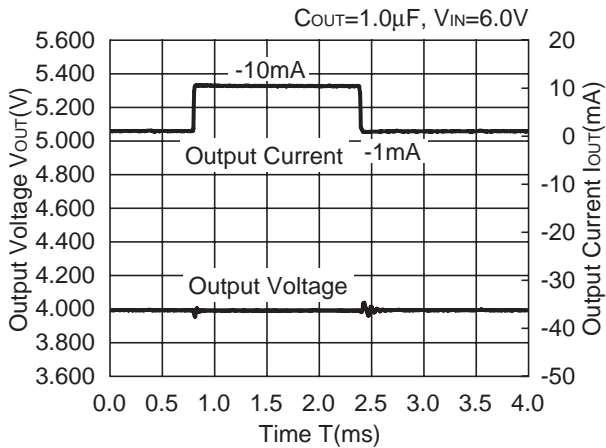
R1100D091C



R1100D301C

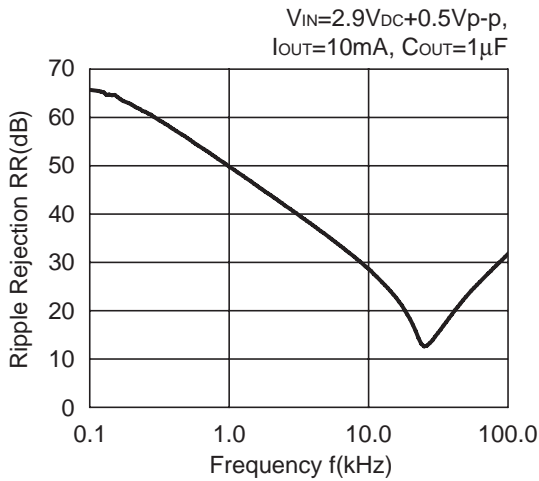


R1100D401C

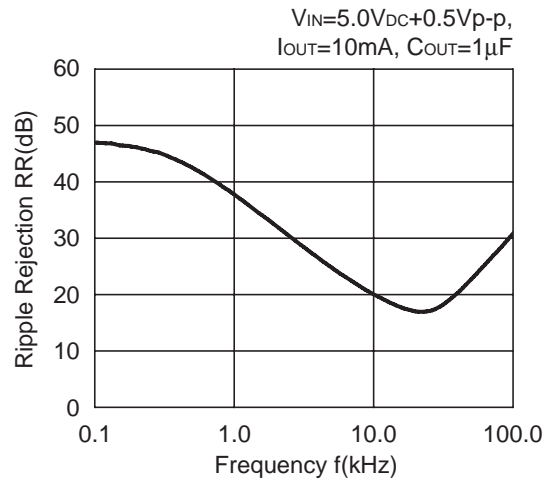


10) Ripple Rejection vs. Frequency

R1100D091C

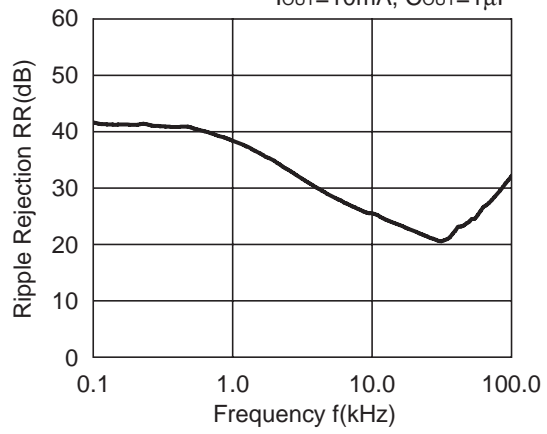


R1100D301C



**R1100D401C**

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





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