

ULTRA SMALL PACKAGE VOLTAGE REGULATOR

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.

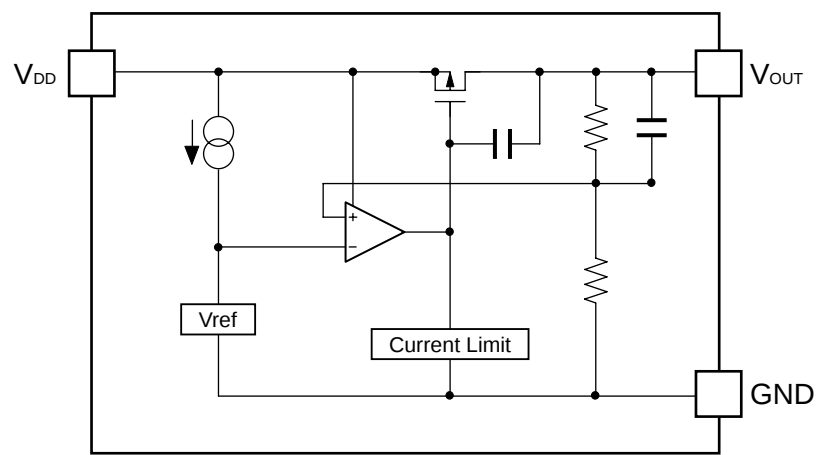
FEATURES

- Supply current Typ. $0.8\mu\text{A}$ ($V_{OUT}=1.0\text{V}$, $V_{DD}=3.0\text{V}$)
- Dropout Voltage Typ. 20mV ($I_{OUT}=1\text{mA}$, $V_{OUT}=3.0\text{V}$)
- Output Voltage 0.9V to 4.0V (0.1V 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. 40mA (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



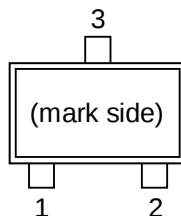
SELECTION GUIDE

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 INFORMATION.)				

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

$T_{opt}=25^{\circ}\text{C}$

Symbol	Item	Test Conditions	Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage	$V_{IN}=5.0\text{V}$ $10\mu\text{A} \leq I_{OUT} \leq 10\text{mA}$	2.940	3.000	3.060	V
I_{OUT}	Output Current	$V_{IN}=5.0\text{V}$	100			mA
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	$V_{IN}=5.0\text{V}$, $1\text{mA} \leq I_{OUT} \leq 50\text{mA}$		35	60	mV
V_{DIF}	Dropout Voltage	$I_{OUT}=1\text{mA}$		20	30	mV
I_{SS}	Supply Current	$V_{IN}=5.0\text{V}$		1.5	3.0	μA
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	$I_{OUT}=1\text{mA}$ Set $V_{OUT}+0.5\text{V} \leq V_{IN} \leq 6.0\text{V}$	-0.20		0.20	%/V
V_{IN}	Input Voltage				6.0	V
$\Delta V_{OUT}/\Delta T_{opt}$	Output Voltage Temperature Coefficient	$I_{OUT}=10\text{mA}$ $-40^{\circ}\text{C} \leq T_{opt} \leq 85^{\circ}\text{C}$		± 100		ppm/ $^{\circ}\text{C}$
I_{SC}	Short Current Limit	$V_{OUT}=0\text{V}$		40		mA

ELECTRICAL CHARACTERISTICS BY OUTPUT VOLTAGE

T_{opt}=25°C

Part Number	Output Voltage				Output Current			Load Regulation			Dropout Voltage		
	V _{OUT} [V]				I _{OUT} [mA]			ΔV _{OUT} /ΔI _{OUT} [mV]			V _{DIF} [mV]		
	Condi- tions	MIN.	TYP.	MAX.	Condi- tions	MIN.	TYP.	Condi- tions	TYP.	MAX.	Condi- tions	TYP.	MAX.
R1100D091C	V _{IN} - Set V _{OUT} =2.0V 10μA ≤ I _{OUT} ≤ 10mA	0.876	0.900	0.924	V _{IN} - Set V _{OUT} =2.0V	35		V _{IN} -Set V _{OUT} =2.0V 1mA ≤ I _{OUT} ≤ 20mA	7.5	20			
R1100D101C		0.976	1.000	1.024								380	750
R1100D111C		1.076	1.100	1.124								280	700
R1100D121C		1.176	1.200	1.224								200	600
R1100D131C		1.274	1.300	1.326								100	400
R1100D141C		1.372	1.400	1.428									
R1100D151C		1.470	1.500	1.530		65		V _{IN} -Set V _{OUT} =2.0V 1mA ≤ I _{OUT} ≤ 35mA	20	40	I _{OUT} =1mA	50	100
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									
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		V _{IN} -Set V _{OUT} =2.0V 1mA ≤ I _{OUT} ≤ 50mA	35	60			
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	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									

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	$I_{OUT}=10\text{mA}$ $-40^{\circ}\text{C} \leq T_{opt} \leq 85^{\circ}\text{C}$		± 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	μA
		$1.1\text{V} \leq V_{OUT} \leq 1.4\text{V}$			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)

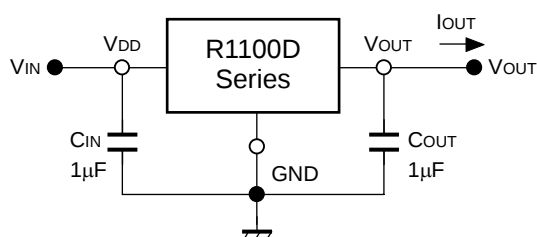
All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if when they are used over such conditions by momentary electronic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

OPERATION

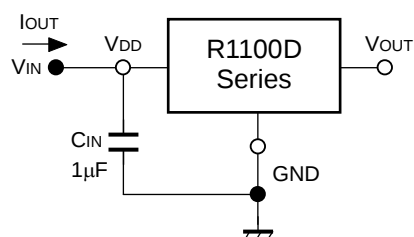
These ICs, the output voltage V_{OUT} is detected by Feedback Resistors, and the detected output voltage is compare with a reference voltage by the error amplifier, so that a constant voltage is output.

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

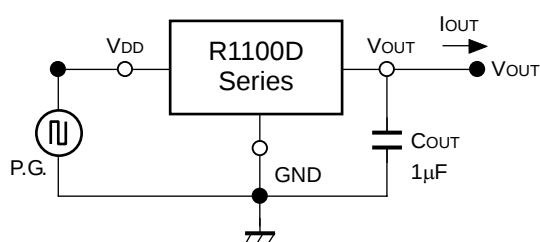
TEST CIRCUITS



Standard Test Circuit



Test Circuit for Supply Current



Test Circuit for Line Transient Response

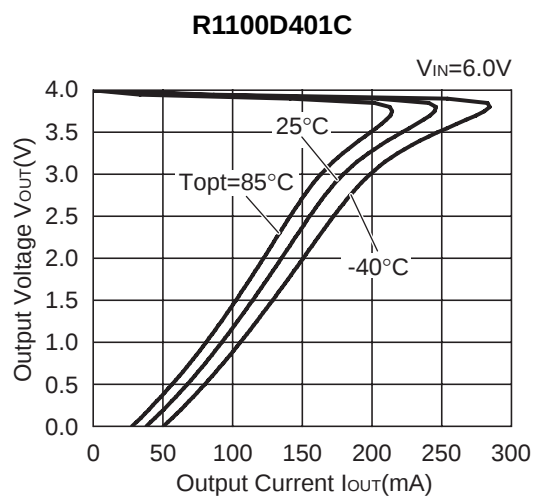
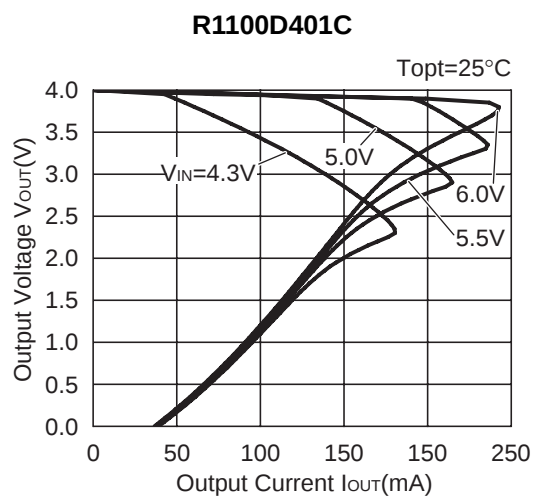
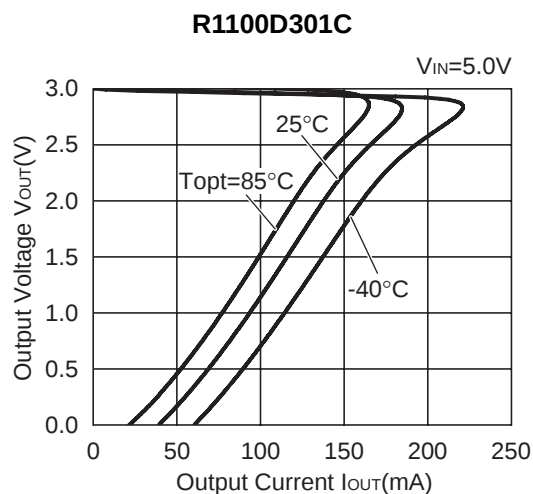
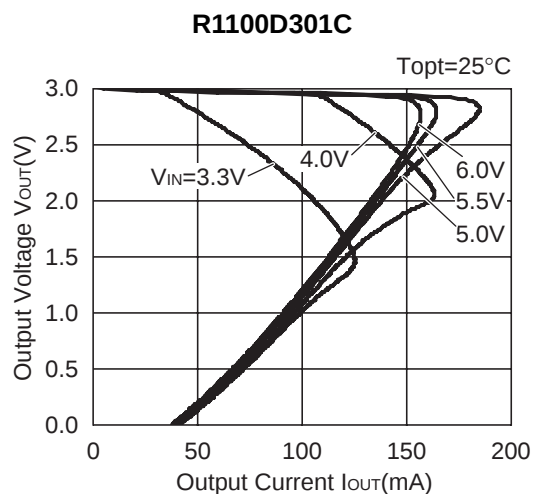
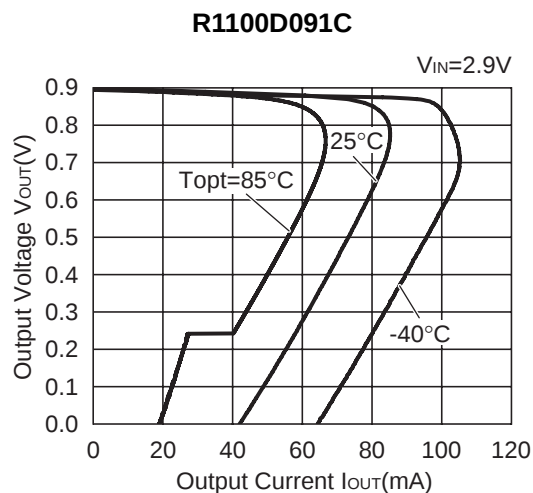
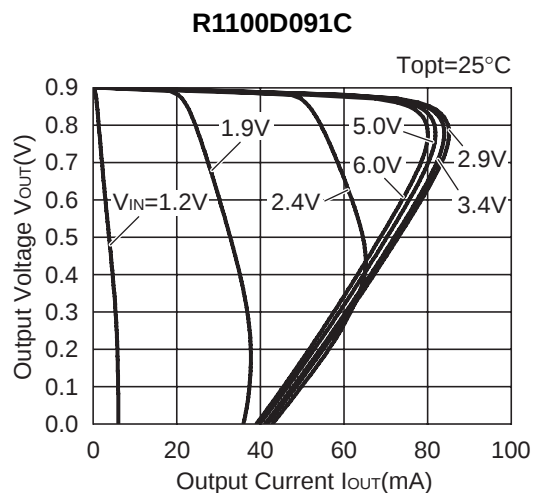
TECHNICAL NOTES

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.

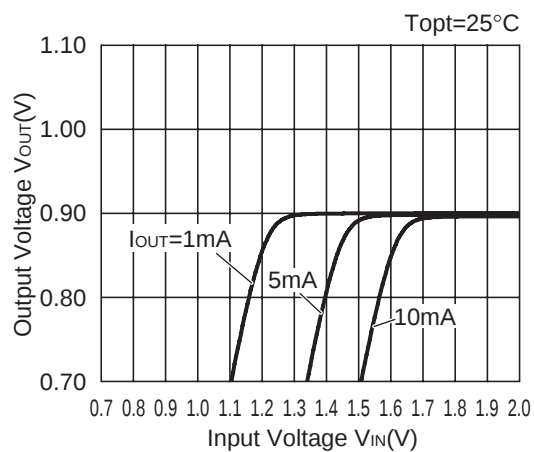
TYPICAL CHARACTERISTICS

1) Output Voltage vs. Output Current

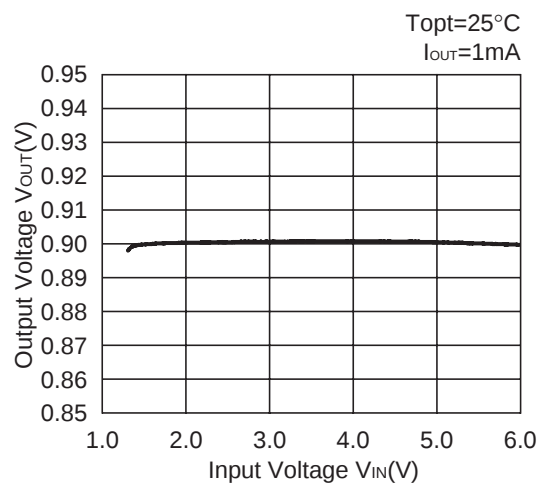


2) Output Voltage vs. Input Voltage

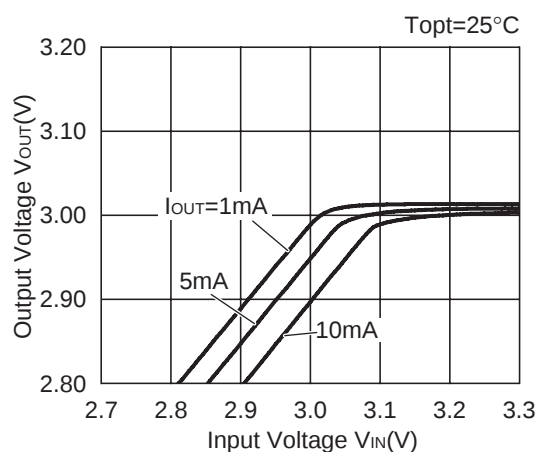
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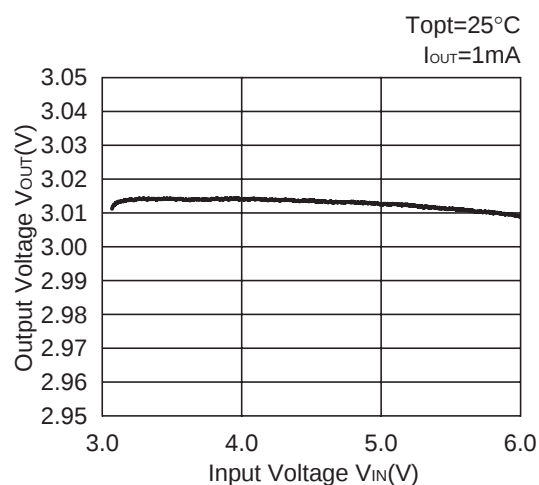
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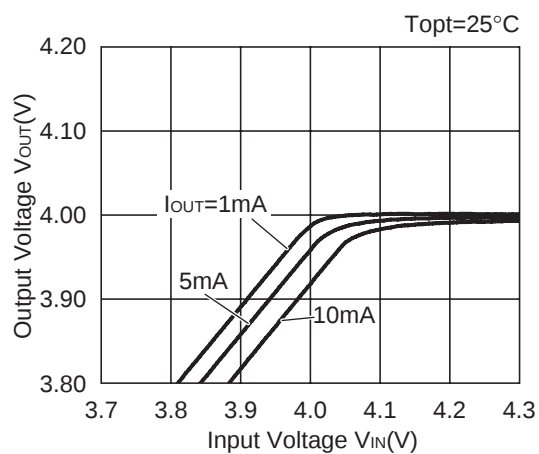
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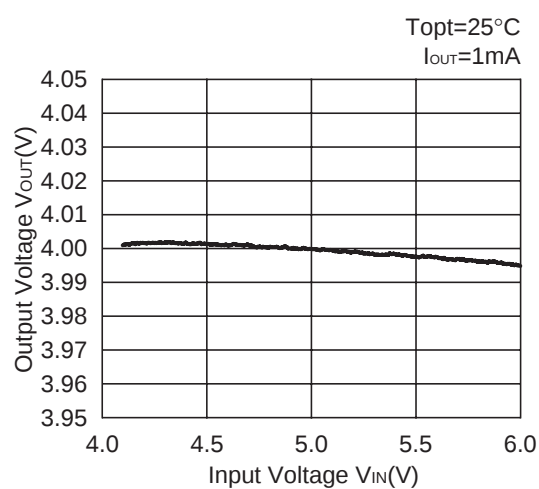
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R1100D401C

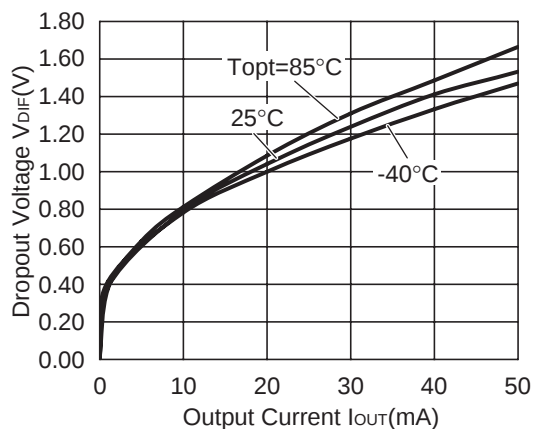


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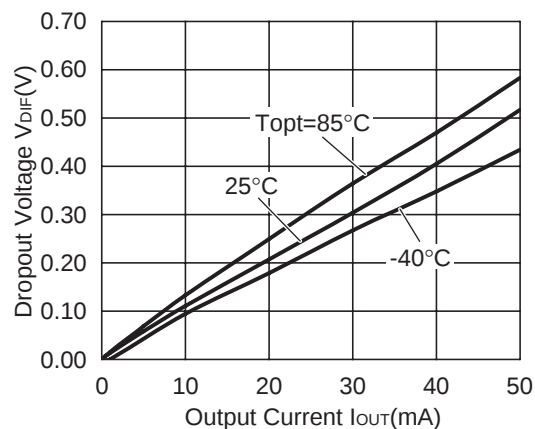


3) Dropout Voltage vs. Output Current

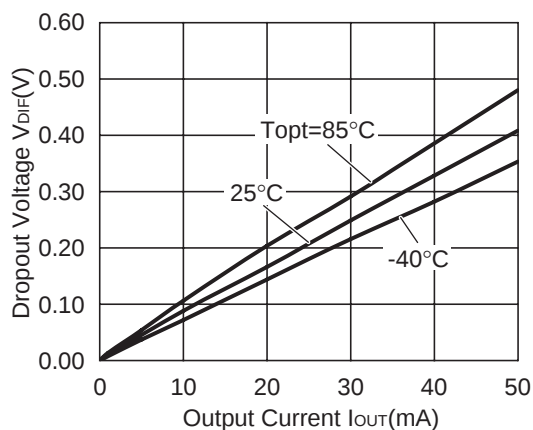
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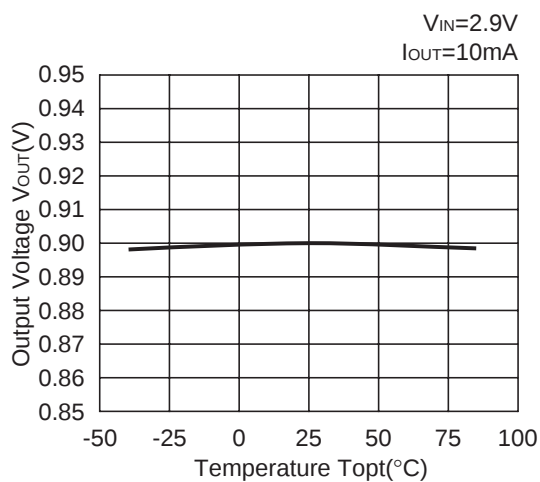


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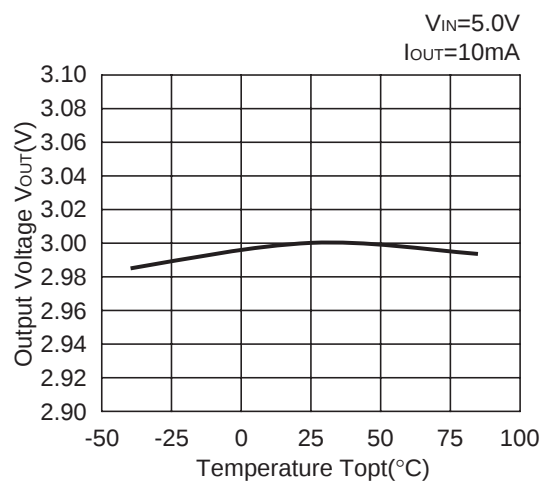


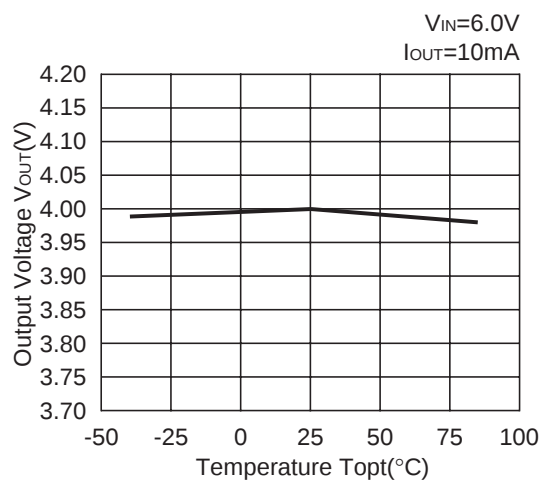
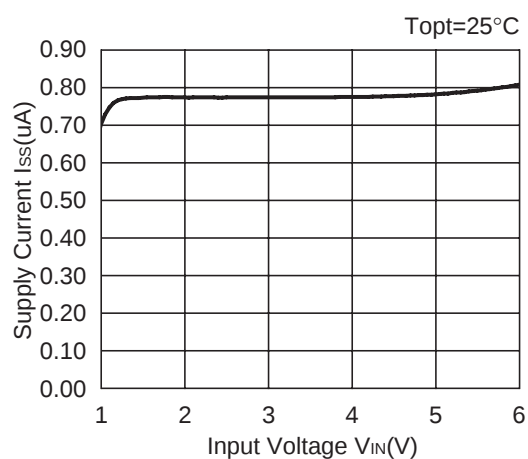
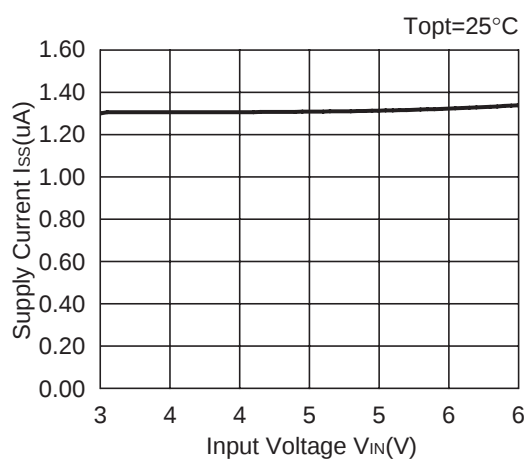
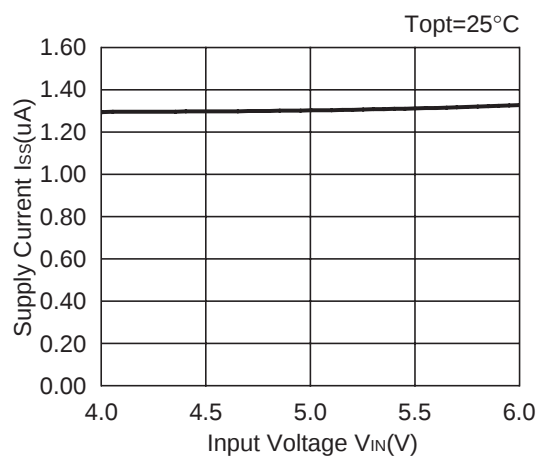
4) Output Voltage vs. Temperature

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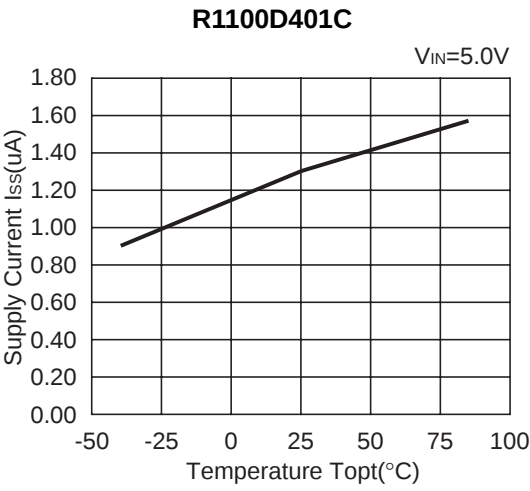
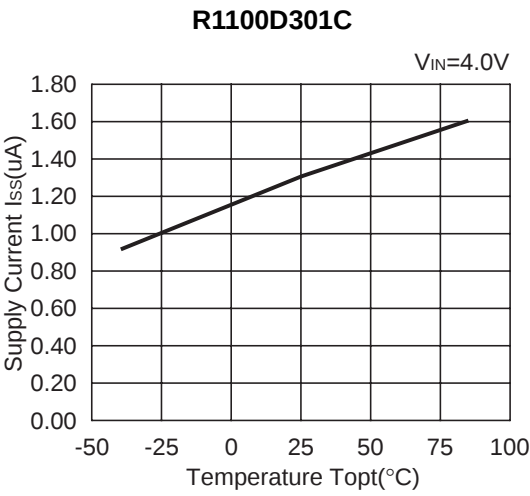
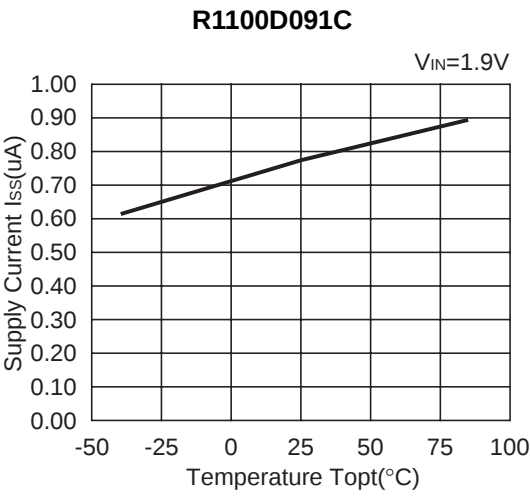


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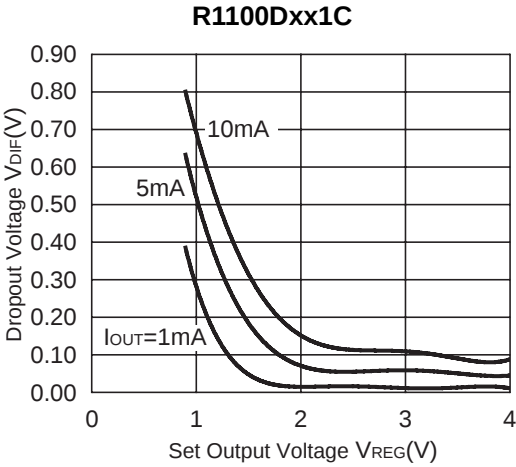


R1100D401C**5) Supply Current vs. Input Voltage****R1100D091C****R1100D301C****R1100D401C**

6) Supply Current vs. Temperature

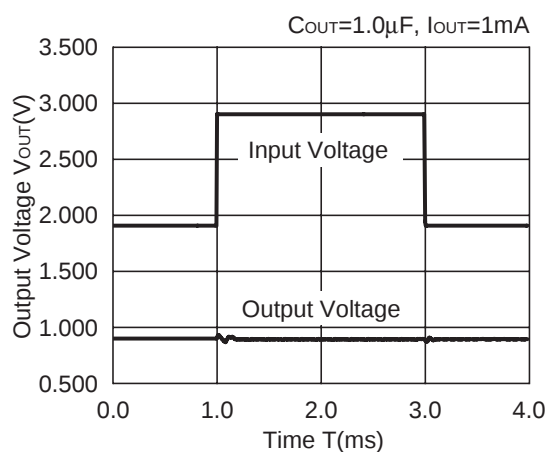


7) Dropout Voltage vs. Set Output Voltage

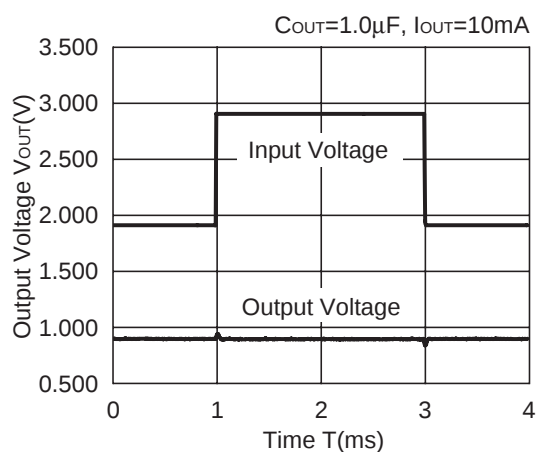


8) Line Transient Response

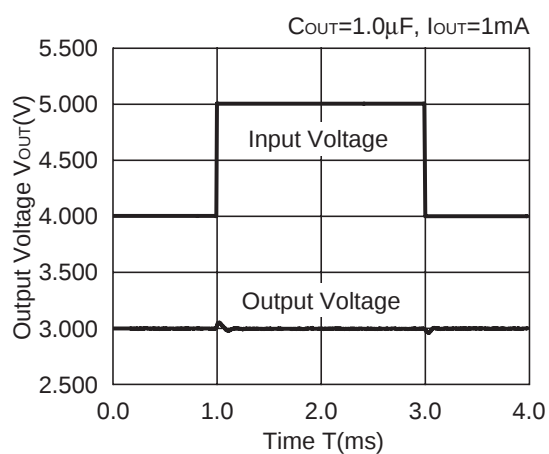
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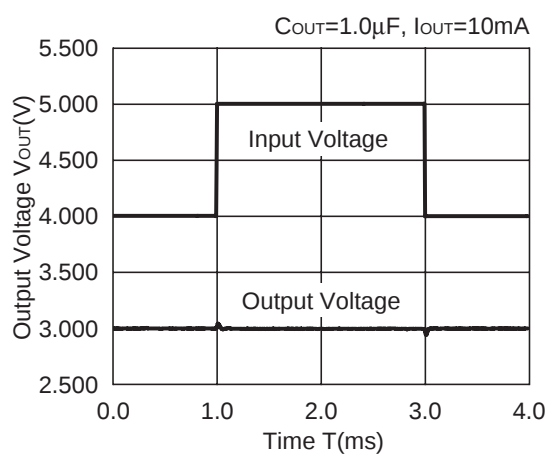
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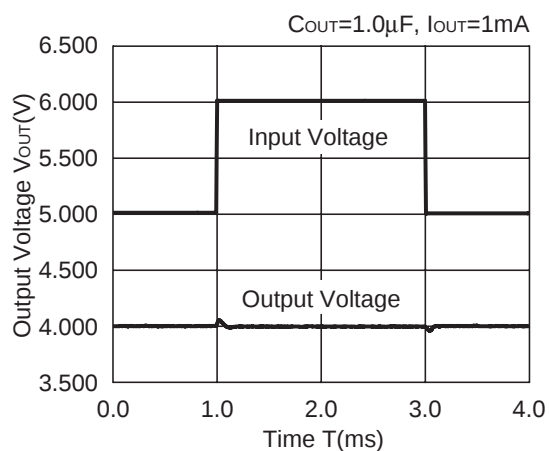
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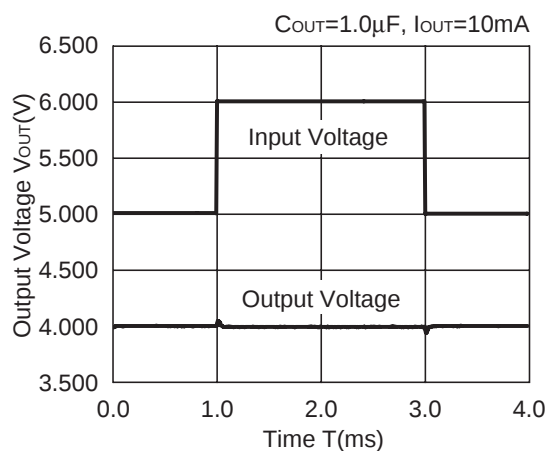
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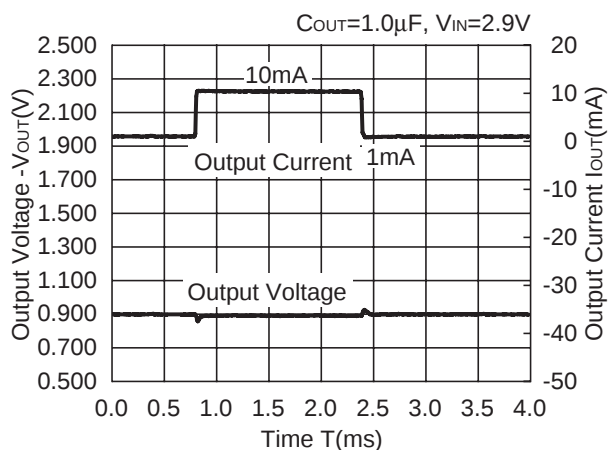


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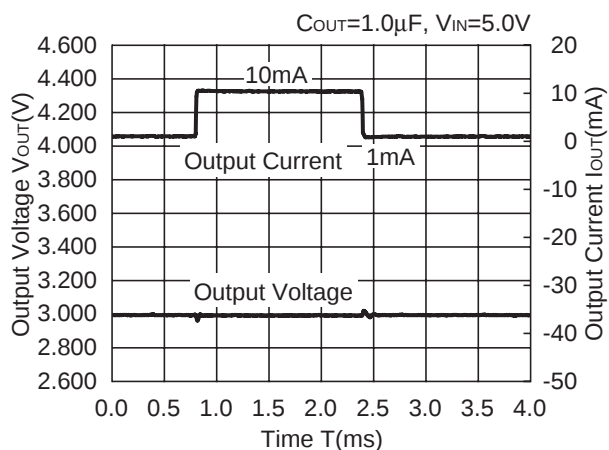


9) Load Transient Response

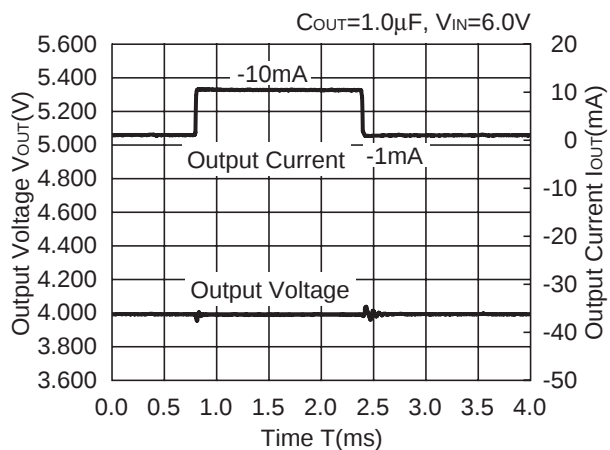
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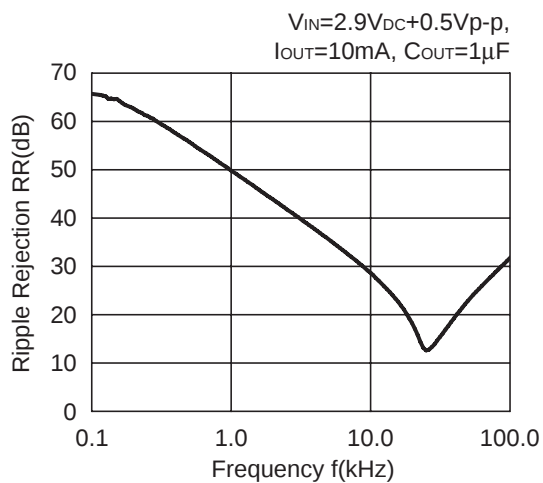


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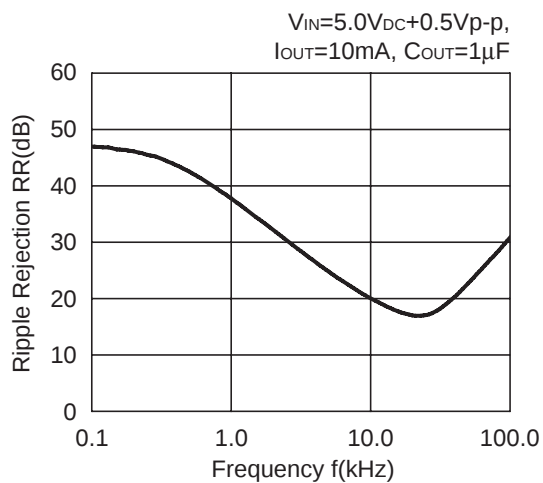


10) Ripple Rejection vs. Frequency

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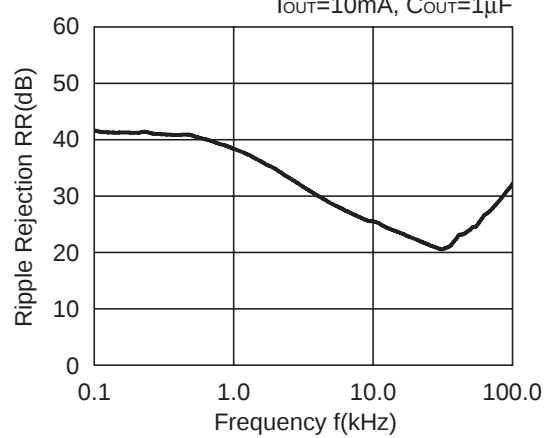


R1100D301C



R1100D401C

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





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Sales & Support Offices

RICOH ELECTRONIC DEVICES CO., LTD.

Higashi-Shinagawa Office (International Sales)

3-32-3, Higashi-Shinagawa, Shinagawa-ku, Tokyo 140-8655, Japan
Phone: +81-3-5479-2857 Fax: +81-3-5479-0502

RICOH EUROPE (NETHERLANDS) B.V.

Semiconductor Support Centre

Prof. W.H. Keesomlaan 1, 1183 DJ Amstelveen, The Netherlands
Phone: +31-20-5474-309

RICOH ELECTRONIC DEVICES KOREA CO., LTD.

3F, Haesung Bldg. 504, Teheran-ro, Gangnam-gu, Seoul, 135-725, Korea
Phone: +82-2-2135-5700 Fax: +82-2-2051-5713

RICOH ELECTRONIC DEVICES SHANGHAI CO., LTD.

Room 403, No.2 Building, No.690 Bilbo Road, Pu Dong New District, Shanghai 201203,
People's Republic of China
Phone: +86-21-5027-3200 Fax: +86-21-5027-3299

RICOH ELECTRONIC DEVICES CO., LTD.

Taipei office

Room 109, 10F-1, No.51, Hengyang Rd., Taipei City, Taiwan (R.O.C.)
Phone: +886-2-2313-1621/1622 Fax: +886-2-2313-1623

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