
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 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

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

| 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

Topt=25°C

| Part Number | Output Voltage | | | | Output Current | | | Load Regulation | | | Dropout Voltage | | | | | | | | |
|-------------|---|-------|-------|-------|---------------------------|------|------|--|------|------|-----------------|------|------|--|----|----|--|----|----|
| | Vout[V] | | | | Iout[mA] | | | $\Delta V_{OUT}/\Delta I_{OUT}$ [mV] | | | VdIF[mV] | | | | | | | | |
| | Condi- tions | MIN. | TYP. | MAX. | Condi- tions | MIN. | TYP. | Condi- tions | TYP. | MAX. | Condi- tions | TYP. | MAX. | | | | | | |
| R1100D091C | VIN- Set VOUT =2.0V 10μA ≤ IOUT ≤ 10mA | 0.876 | 0.900 | 0.924 | VIN- Set VOUT =2.0V | 35 | | VIN-Set VOUT =2.0V 1mA ≤ IOUT ≤ 20mA | 7.5 | 20 | | 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 | | | | | | | | 65 | | VIN-Set VOUT =2.0V 1mA ≤ IOUT ≤ 35mA | 20 | 40 | | 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 | | VIN-Set VOUT =2.0V 1mA ≤ IOUT ≤ 50mA | 35 | 60 | | 20 | 30 | | | | | | |
| 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 | | | | | | | | | | | | | | | | |
| 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)

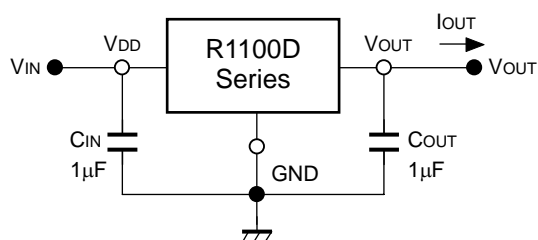
All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if when they are used over such conditions by momentary electronic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

OPERATION

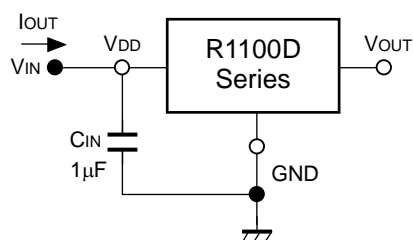
These ICs, the output voltage V_{OUT} is detected by Feedback Resistors, and the detected output voltage is compared with a reference voltage by the error amplifier, so that a constant voltage is output.

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

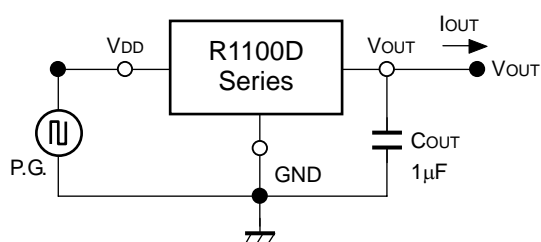
TEST CIRCUITS



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

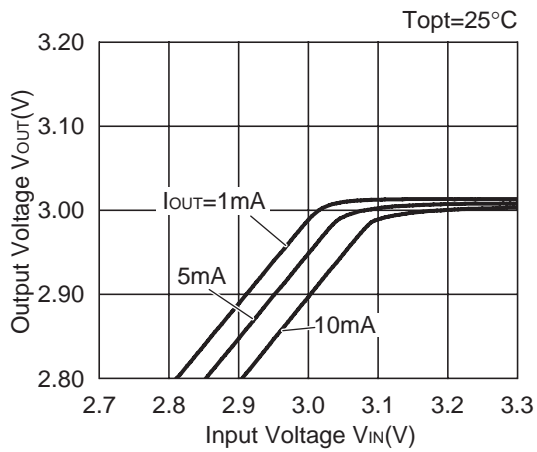
R1100D091C



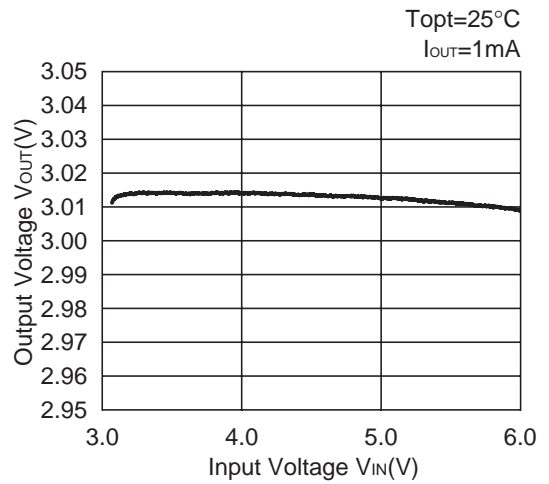
R1100D091C



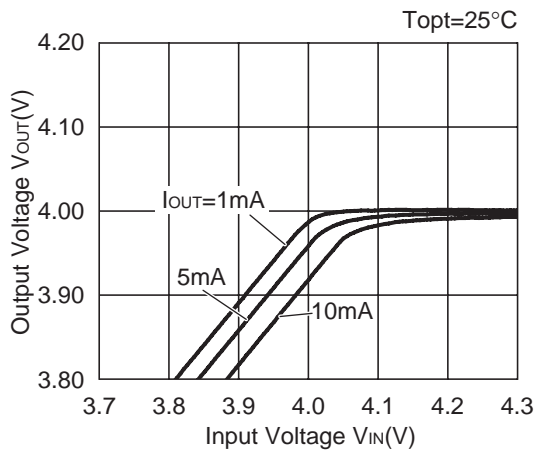
R1100D301C



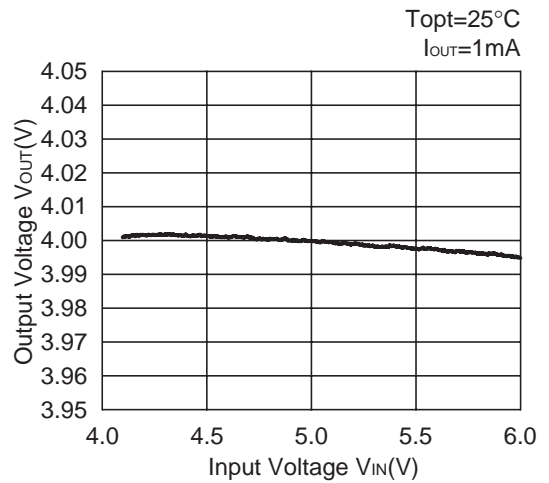
R1100D301C



R1100D401C

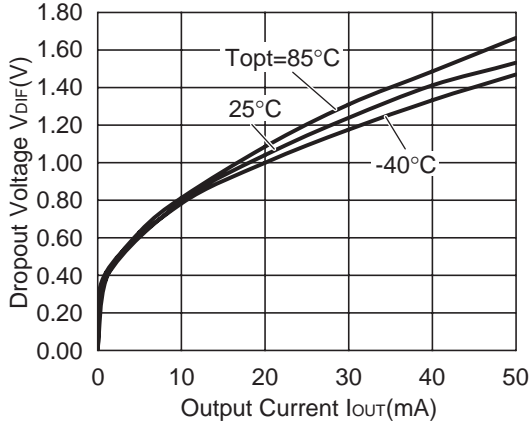


R1100D401C

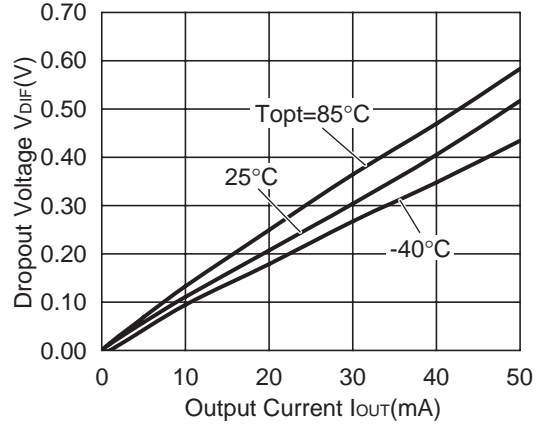


3) Dropout Voltage vs. Output Current

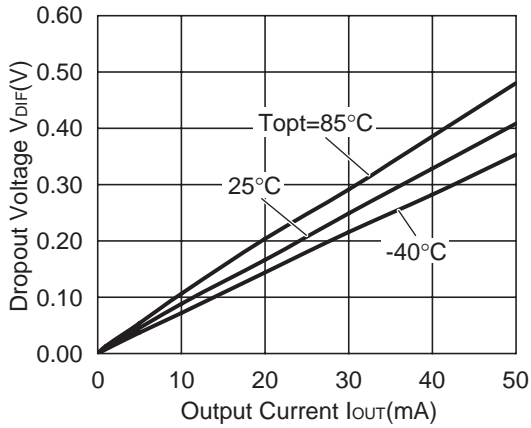
R1100D091C



R1100D301C

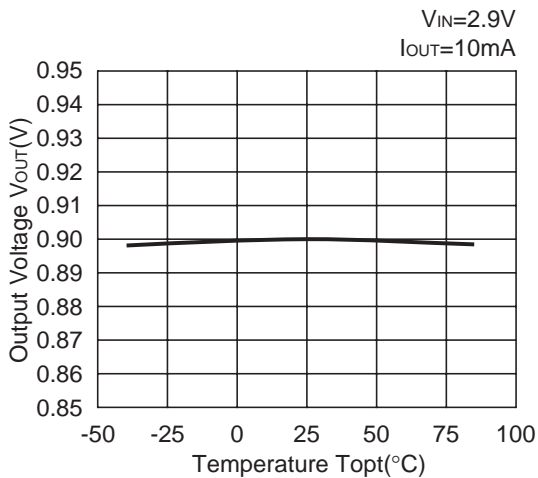


R1100D401C

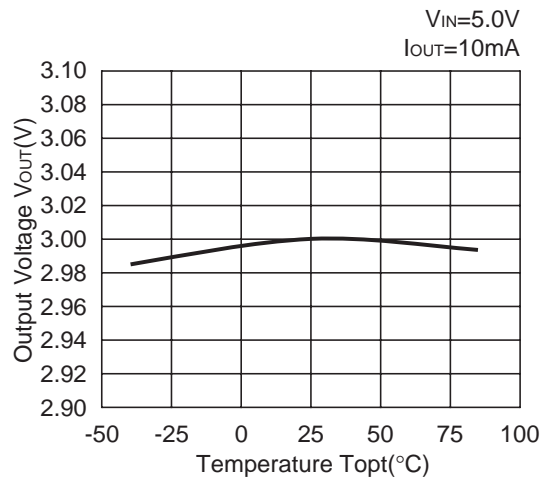


4) Output Voltage vs. Temperature

R1100D091C



R1100D301C



R1100D401C

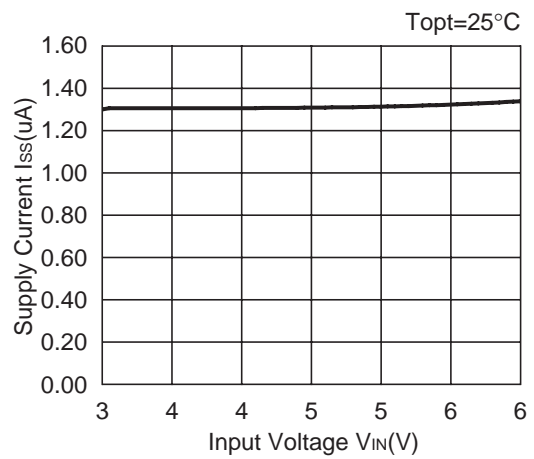


5) Supply Current vs. Input Voltage

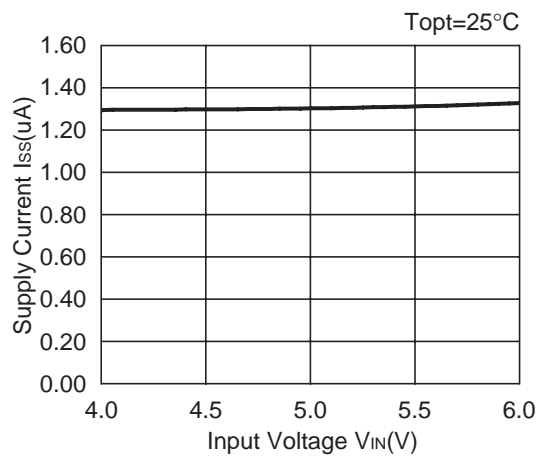
R1100D091C



R1100D301C



R1100D401C

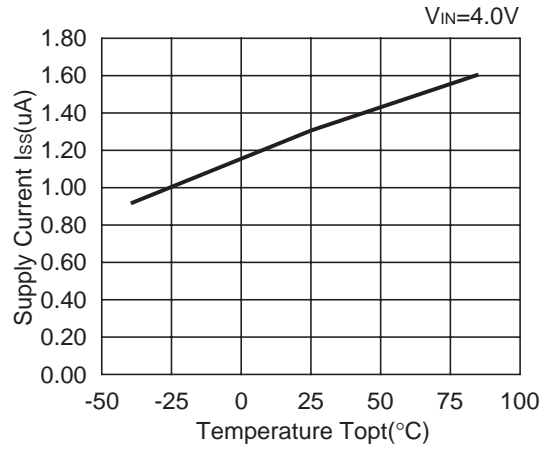


6) Supply Current vs. Temperature

R1100D091C



R1100D301C

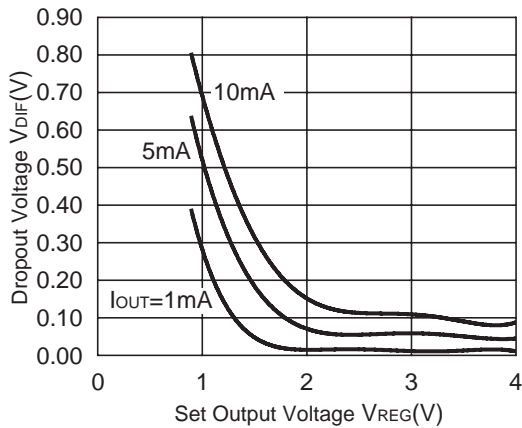


R1100D401C



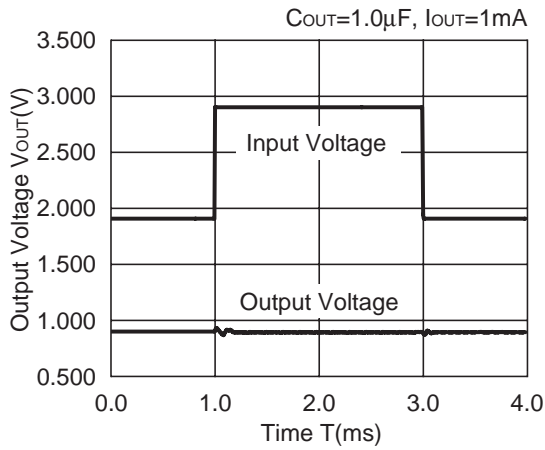
7) Dropout Voltage vs. Set Output Voltage

R1100Dxx1C

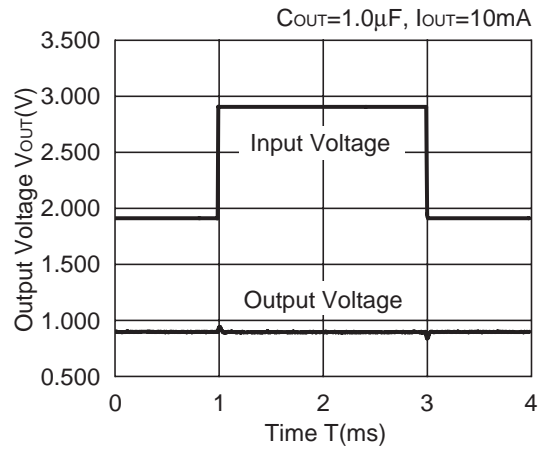


8) Line Transient Response

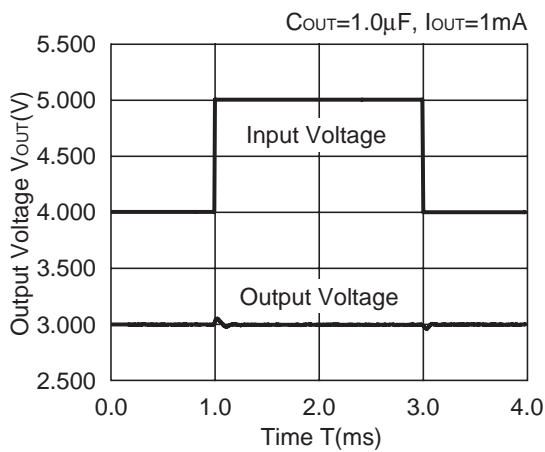
R1100D091C



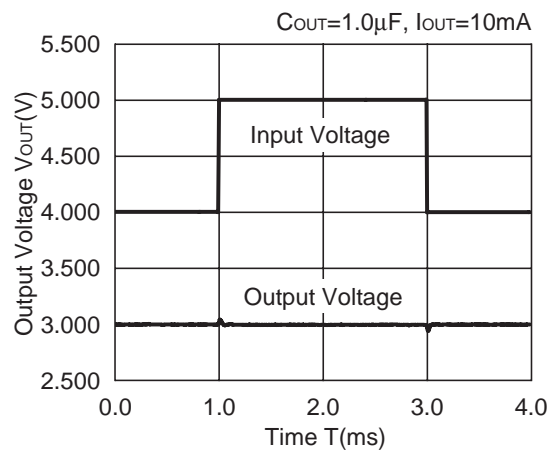
R1100D091C



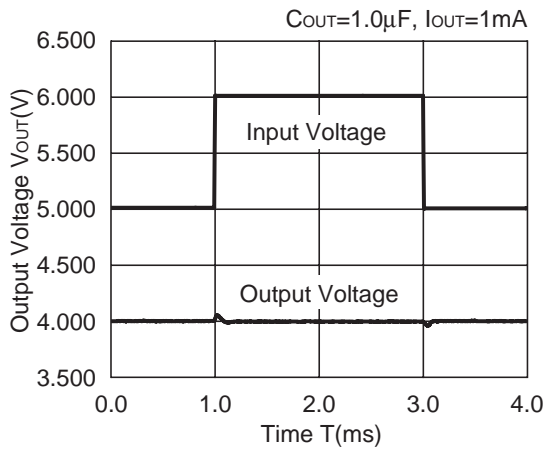
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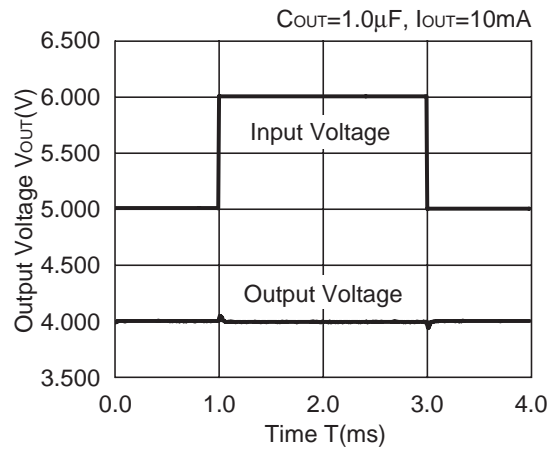
R1100D301C



R1100D401C



R1100D401C

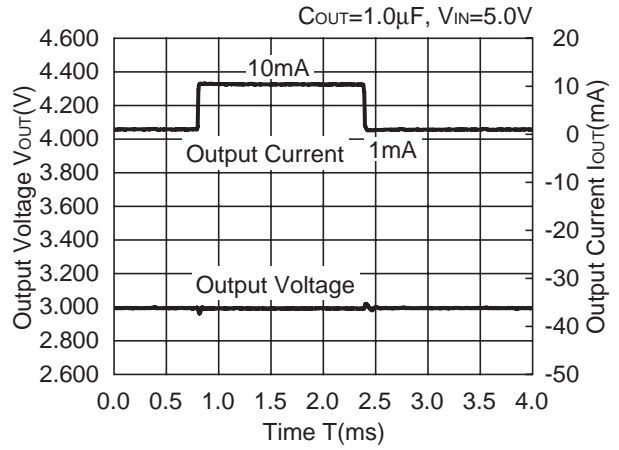


9) Load Transient Response

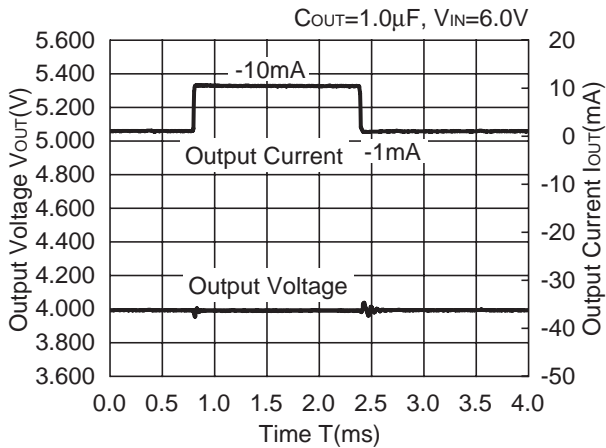
R1100D091C



R1100D301C

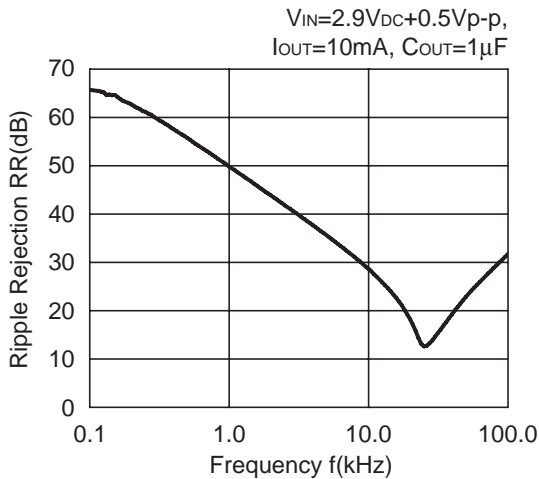


R1100D401C

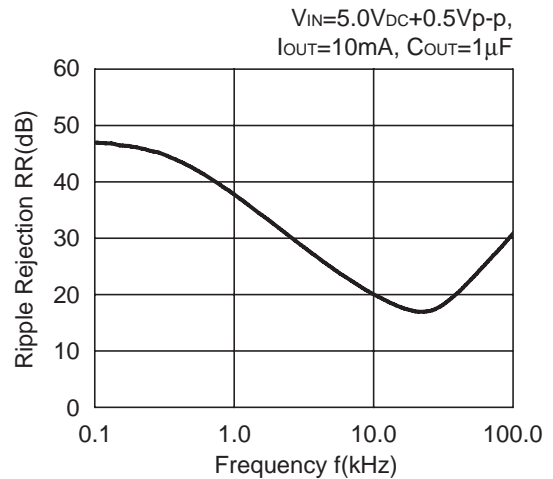


10) Ripple Rejection vs. Frequency

R1100D091C

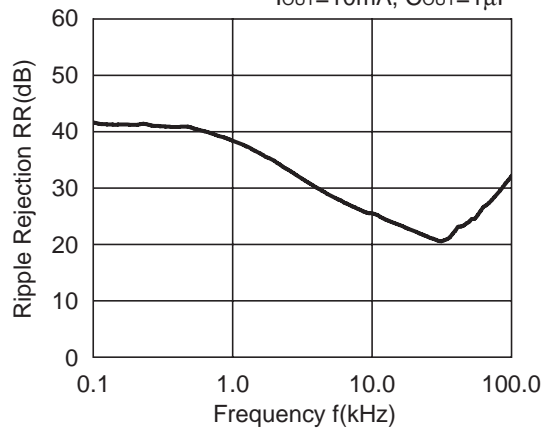


R1100D301C



R1100D401C

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





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