300 mA LDO Regulator for Automotive Applications

NO.EC-078-140822

OUTLINE

The R1130x Series are CMOS-based voltage regulator (VR) ICs. VR function has features of high ripple rejection, low dropout voltage, high output voltage accuracy, and ultra-low supply current. Each of these ICs consists of a voltage reference unit, an error amplifier, resistors for setting output voltage, and a current limit circuit. Each of the R1130xxxxA/B type includes also a chip enable circuit.

The output voltage of the R1130xxxxC type is adjustable with external resistors.

The output voltage of R1130xxxxA/B is fixed in the IC. Low supply current by the merit of CMOS process and built-in transistors with low ON-resistance make low dropout voltage. These regulators in the R1130x Series are remarkable improvement on the current regulators in terms of ripple rejection, input transient response, and load transient response. Maximum Output Current is large for its compact size.

Since the package for these ICs is the SOT-89-5 package, high density mounting of the ICs on boards is possible.

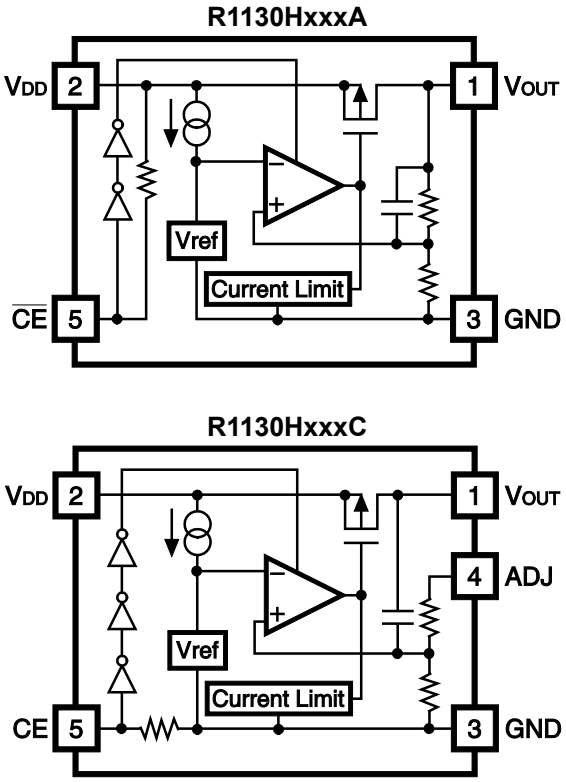
FEATURES

- Input Voltage Range (Maximum Rating) ..... 2.5V to 8.0V (9.0V)
- Supply Current ..... Typ. 50μA
- Standby Current ..... Typ. 0.1μA (VR) for A type
- Chip Enable Function ..... A Type: ”L” Active, B/C Type ”H” Active
- Ripple Rejection ..... Typ. 60dB (f=1kHz) (VR)
- Output Current ..... Min. 300mA (V_{IN}=V_{OUT}+1V)
- Output Voltage Accuracy ..... ±2.0%(VR) for A/B type,
  ±2.0% (Reference Voltage for adjustable VR) for C type
- Dropout Voltage ..... Typ. 0.2V (V_{OUT}=5.0V type) (VR)
- Output Voltage Range ..... 1.5V to 5.0V (0.1V steps)
  Externally specified with the ADJUST pin
  (Reference Voltage 1.8V : C Version)
- Temperature-drift Coefficient of Output Voltage ..... ±100ppm/°C
- Package SOT-89-5
- Built-in Current Limit Circuit
- Internal Phase Compensation (small output capacitance such as 0.1μF Ceramic can be used with.)

APPLICATIONS

- Power source for car accessories including car audio equipment, car navigation system, and ETC system.
- Power source for control units including EV inverter and charge control.

BLOCK DIAGRAMS



SELECTION GUIDE

The output voltage and CE pin polarity for the ICs can be selected at the user's request.

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R1130Hxx1∗-T1-#E	SOT-89-5	1,000 pcs	Yes	Yes

xx: The output voltage can be designated in the range from 1.5V(15) to 5.0V(50) in 0.1V steps.
(C Version is fixed at 00.)

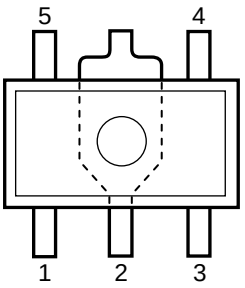
∗ : CE pin polarity options are as follows.
(A) "L" active
(B) "H" active
(C) "H" active, with ADJUST pin.

: Specify Automotive Class Code

	Operating Temperature Range	Guaranteed Specs Temperature Range	Screening
H	-40°C to 85°C	25°C	High and Low Temperature

PIN DESCRIPTIONS

● **SOT-89-5**



● **SOT-89-5**

Pin No.	Symbol	Description
1	V_{OUT}	Voltage Regulator Output Pin
2	V_{DD}	Input Pin
3	GND	Ground Pin
4	NC (A/B type)	No Connection
	ADJ (C type)	Adjustable Regulator feedback Input Pin (Connect to resistor voltage divider.)
5	$\overline{CE}$ (A type)or CE(B/D type)	Chip Enable Pin

ABSOLUTE MAXIMUM RATINGS

Symbol	Item			Rating	Unit
V_{IN}	Input Voltage			9.0	V
V_{CE}	Input Voltage ($\overline{CE}$ or CE Input Pin)			-0.3 to 9.0	V
V_{ADJ}	Input Voltage (ADJ Input Pin)			-0.3 to 9.0	V
V_{OUT}	Output Voltage			−0.3 to V_{IN}+0.3	V
I_{OUT}	Output Current			450	mA
P_D	Power Dissipation*	SOT-89-5	Standard Land Pattern	1125	mW
			High Wattage Land Pattern	1625	
Tj	Junction Temperature			−40 to 150	°C
Tstg	Storage Temperature Range			−55 to 150	°C

*) Refer to *PACKAGE INFORMATION* for detailed 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.

RECOMMENDED OPERATING CONDITIONS

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	2.5 to 8.0	V
Ta	Operating Temperature Range	-40 to 85	°C

RECOMMENDED OPERATING CONDITIONS

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.

ELECTRICAL CHARACTERISTICS

- **R1130xxxxA**

(Ta=25°C)

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
I_{SS1}	Supply Current 1	V_{IN}-V_{OUT}=1.0V,V_{IN}=GND		50	100	μA
Istandby	Standby Current	V_{IN}-V_{OUT}=1.0V,V_{IN}=V_{CE}		0.1	1.0	μA
V_{OUT}	Output Voltage	V_{IN}-V_{OUT}=1.0V 1mA ≦ I_{OUT} ≦ 80mA	V_{OUT}× 0.980	Set V_{OUT}	V_{OUT}× 1.020	V
I_{OUT1}	Output Current	Refer to the table of Input Voltage by Set Output Voltage	300			mA
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	V_{IN}-V_{OUT}=1.0V 1mA ≦ I_{OUT} ≦ 80mA		40	80	mV
V_{DIF}	Dropout Voltage	I_{OUT}=100mA	Refer to the *Product-specific Electrical Characteristics*			
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	I_{OUT}=80mA,Set V_{OUT}>2.0V: V_{OUT}+0.5V ≦ V_{IN} ≦ 8.0V Set $_{OUT}$ ≦ 1.9V: .5V ≦ V_{IN} ≦ 8.0V		0.1	0.2	%/V
I_{SC}	Short Current Limit	Set V_{OUT} ≦ 3.9V,V_{OUT} = 0V		70		mA
		Set V_{OUT}>4.0V,V_{OUT} = 0V		50		
R_{PU}	$\overline{CE}$ Pull-up Resistance		2.5	5.0	10.0	MΩ
V_{CEH}	$\overline{CE}$ Input Voltage “H”	V_{IN}=2.5V	1.5		V_{IN}	V
V_{CEL}	$\overline{CE}$ Input Voltage “L”	V_{IN}=2.5V	0.00		0.25	V

- **R1130xxxxB**

(Ta=25°C)

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
I_{SS1}	Supply Current 1	V_{IN}-V_{OUT}=1.0V, V_{IN}=V_{CE}		50	100	μA
Istandby	Standby Current	V_{IN}-V_{OUT}=1.0V, V_{IN}=GND		0.1		μA
V_{OUT}	Output Voltage	V_{IN}-V_{OUT}=1.0V 1mA ≦ I_{OUT} ≦ 80mA	V_{OUT}× 0.980	Set V_{OUT}	V_{OUT}× 1.020	V
I_{OUT1}	Output Current	Refer to the table of Input Voltage by Set Output Voltage	300			mA
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	V_{IN}-V_{OUT}=1.0V 1mA ≦ I_{OUT} ≦ 80mA		40	80	mV
V_{DIF}	Dropout Voltage	I_{OUT}=100mA	Refer to the *Product-specific Electrical Characteristics*			
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	I_{OUT}=80mA, Set V_{OUT}>2.0V: V_{OUT}+0.5V ≦ V_{IN} ≦ 8.0V Set V_{OUT} ≦ 1.9V: 2.5V ≦ V_{IN} ≦ 8.0V		0.1	0.2	%/V
I_{SC}	Short Current Limit	Set V_{OUT} ≦ 3.9V,V_{OUT} = 0V		70		mA
		Set V_{OUT} ≧ 4.0V,V_{OUT} = 0V		50		
R_{PD}	Pull-down Resistance for CE pin		2.5	5.0	10.0	MΩ
V_{CEH}	CE Input Voltage “H”	V_{IN}=2.5V	1.5		V_{IN}	V
V_{CEL}	CE Input Voltage “L”	V_{IN}=2.5V	0.00		0.25	V

Input Voltage by Set Output Voltage

(Ta = 25°C)

Output Voltage V_{OUT} (V)	Input Voltage (V)
1.5 ≦ V_{OUT} ≦ 1.9	V_{IN}=V_{OUT}+1.5V
2.0 ≦ V_{OUT} ≦ 2.7	V_{IN}=V_{OUT}+1.3V
2.8 ≦ V_{OUT} ≦ 5.0	V_{IN}=V_{OUT}+1.0V

Product-specific Electrical Characteristics

(Ta=25°C)

Product Name	V_{OUT} [V]			V_{DIF} [V]	
	MIN.	TYP.	MAX.	TYP.	MAX.
R1130H151x	1.470	1.500	1.530	1.00	1.05
R1130H161x	1.568	1.600	1.632	0.90	0.95
R1130H171x	1.666	1.700	1.734	0.80	0.85
R1130H181x	1.764	1.800	1.836	0.70	0.75
R1130H191x	1.862	1.900	1.938	0.60	0.65
R1130H201x	1.960	2.000	2.040	0.50	0.60
R1130H211x	2.058	2.100	2.142	0.40	0.55
R1130H221x	2.156	2.200	2.244	0.30	0.49
R1130H231x	2.254	2.300	2.346		
R1130H241x	2.352	2.400	2.448		
R1130H251x	2.450	2.500	2.550		
R1130H261x	2.548	2.600	2.652	0.25	0.34
R1130H271x	2.646	2.700	2.754		
R1130H281x	2.744	2.800	2.856		
R1130H291x	2.842	2.900	2.958		
R1130H301x	2.940	3.000	3.060		
R1130H311x	3.038	3.100	3.162		
R1130H321x	3.136	3.200	3.264		
R1130H331x	3.234	3.300	3.366		
R1130H341x	3.332	3.400	3.468	0.20	0.28
R1130H351x	3.430	3.500	3.570		
R1130H361x	3.528	3.600	3.672		
R1130H371x	3.626	3.700	3.774		
R1130H381x	3.724	3.800	3.876		
R1130H391x	3.822	3.900	3.978		
R1130H401x	3.920	4.000	4.080		
R1130H411x	4.018	4.100	4.182		
R1130H421x	4.116	4.200	4.284		
R1130H431x	4.214	4.300	4.386		
R1130H441x	4.312	4.400	4.488		
R1130H451x	4.410	4.500	4.590		
R1130H461x	4.508	4.600	4.692		
R1130H471x	4.606	4.700	4.794		
R1130H481x	4.704	4.800	4.896		
R1130H491x	4.802	4.900	4.998		
R1130H501x	4.900	5.000	5.100		

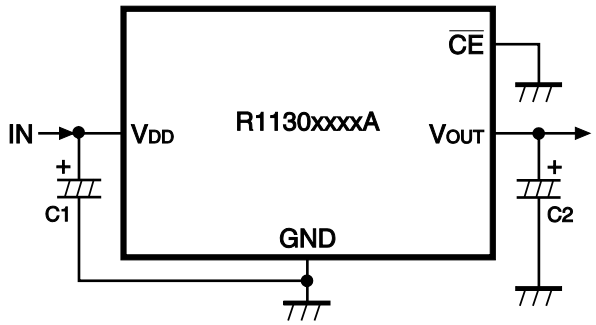
- **R1130xxxxC**

(Ta=25°C)

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
I_{SS1}	Supply Current	V_{IN}-V_{OUT}=1.0V, V_{IN}=V_{CE}		50	100	μA
Istandby	Standby Current	V_{IN}-V_{OUT}=1.0V, V_{IN}=GND		0.1	1.0	μA
V_{OUT}	Reference Voltage for Adjustable Voltage Regulator	V_{OUT}=V_{ADJ}, V_{IN}-V_{OUT}=1.0V I_{OUT}=80mA	1.764	1.800	1.836	V
I_{OUT1}	Output Current	V_{OUT}=V_{ADJ}, V_{IN}-V_{OUT}=1.5V	300			mA
R_{VOUT}	Output Voltage Range		1.800		5.000	V
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	V_{IN}=2.5V, V_{OUT}=V_{ADJ} 1mA ≦ I_{OUT} ≦ 80mA		40	80	mV
V_{DIF}	Dropout Voltage	I_{OUT}=100mA, V_{OUT}=V_{ADJ}		0.70	0.75	V
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	I_{OUT}=80mA, V_{OUT}=V_{ADJ} 2.5V ≦ V_{IN} ≦ 8.0V		0.1	0.2	%/V
I_{SC}	Short Current Limit	V_{OUT} = 0V		70		mA
R_{PD}	Pull-down Resistance for CE pin		1.77	5.0	20	MΩ
V_{CEH}	CE Input Voltage “H”	V_{IN}=2.5V	1.5		V_{IN}	V
V_{CEL}	CE Input Voltage “L”	V_{IN}=2.5V	0.00		0.25	V

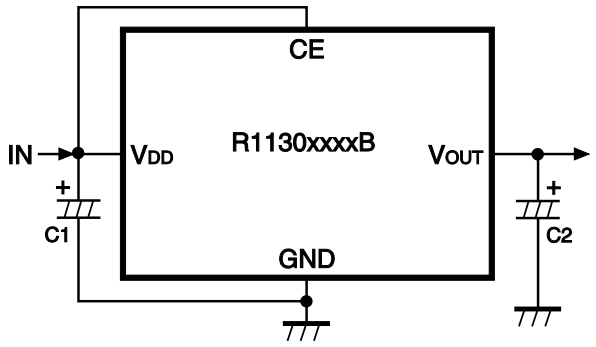
TYPICAL APPPLICATION

R1130xxxxA



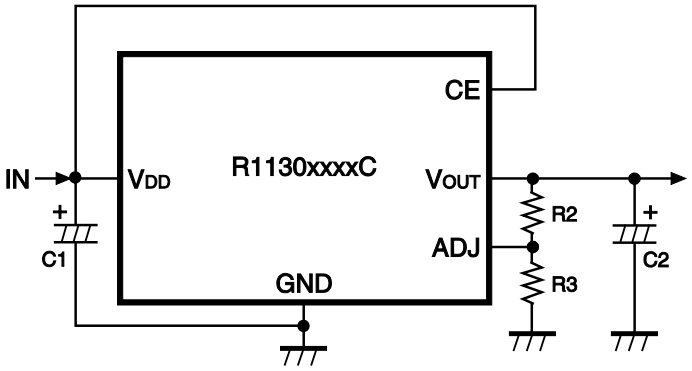
C1=C2=0.1µF

R1130xxxxB



C1=C2=0.1µF

R1130xxxxC



C1=C2=0.1µF, R2, R3: Refer to the Technical Notes on Output Voltage setting of C type.

TECHNICAL NOTES

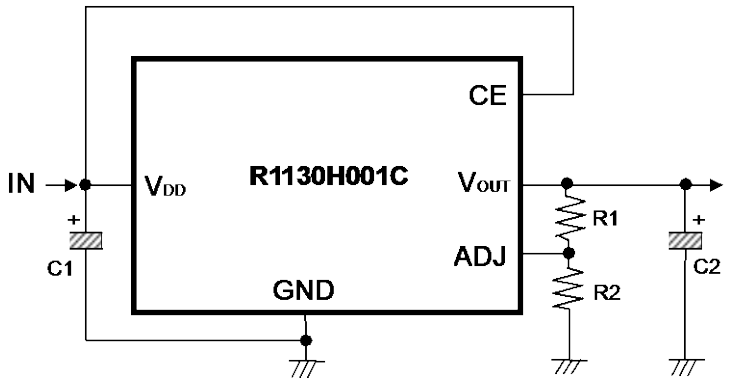
Phase Compensation

In this IC, phase compensation is made for securing stable operation even if the load current is varied. This device would have a constant voltage without capacitor C1 and C2, but be sure to use about 0.1 to 1 μF capacitor for stable operation. Set the capacitor as close as possible to the IC, and make wiring as short as possible.

PCB Layout

Make V_{DD} and GND lines sufficient. If their impedance is high, pick-up the noise or unstable operation may result. Connect a capacitor with a suitable value between V_{DD} and GND as close as possible.

Typical Application

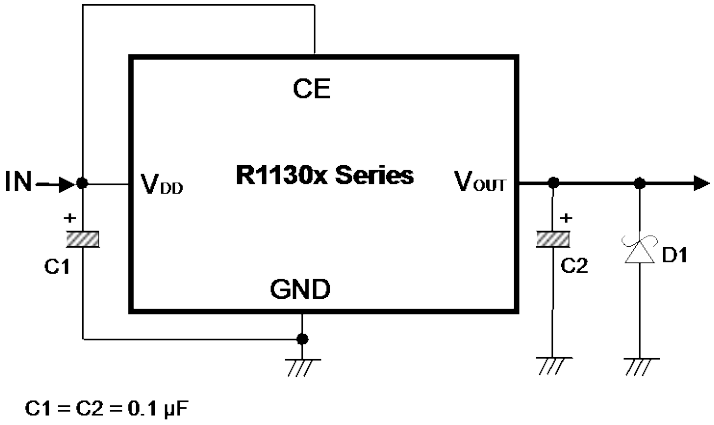


R1=Optional, R2=10K to 100KΩ, C1=0.1μF, C1=1.0μF

Control (Driver) Transistor

In R1130H001C, a PchMOS transistor is used as a current control transistor. If the output current is about 10 μA or less in an application, the output voltage may increase due to the leak current of the control transistor.

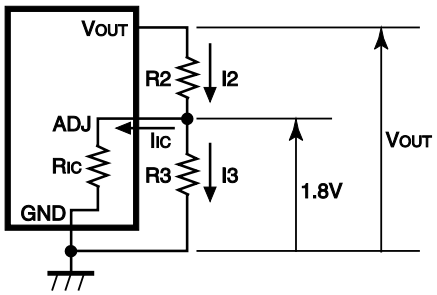
TYPICAL APPLICATION FOR IC CHIP BREAKDOWN PREVENTION



When a sudden surge of electrical current travels along the V_{OUT} pin and GND due to a short-circuit, electrical resonance of a circuit involving an output capacitor (C2) and a short circuit inductor generates a negative voltage and may damage the device or the load devices. Connecting a schottky diode (D1) between the V_{OUT} pin and GND has the effect of preventing damage to them.

APPENDIX

* Technical Notes on Output Voltage Setting of C type



Adjustable Regulator (C type)

The Output Voltage of Regulator in R1130xxxxC may be adjustable for any output voltage between its 1.8V reference and its V_{DD} setting level. An external pair of resistors is required, as shown in Figure 1.

The complete equation for the output voltage is described step by step as follows;

$$I2=I_{IC}+I3 \quad \cdots\cdots (1)$$

$$I3=1.8/R3 \quad \cdots\cdots (2)$$

Thus,

$$I2=I_{IC}+1.8/R3 \quad \cdots\cdots (3)$$

Therefore,

$$V_{OUT}=1.8+R2\times I2 \quad \cdots\cdots (4)$$

Put Equation (3) into Equation (4), then

$$V_{OUT}=1.8+R2\times(I_{IC}+1.8/R3)$$

$$=1.8\times(1+R2/R3)+R2\times I_{IC} \quad \cdots\cdots (5)$$

In 2nd term, or $R2\times I_{IC}$ will produce an error in V_{OUT}.

In Equation (5),

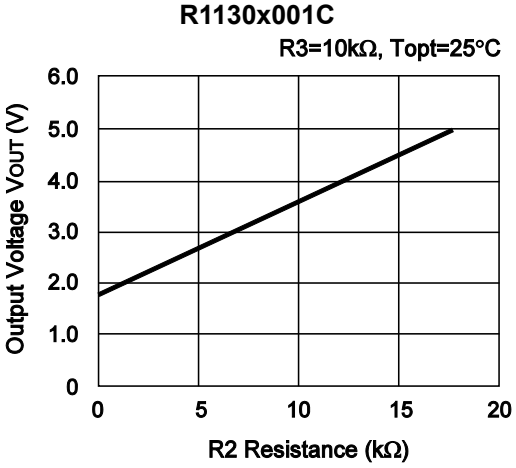
$$I_{IC}=1.8/R_{IC} \quad \cdots\cdots (6)$$

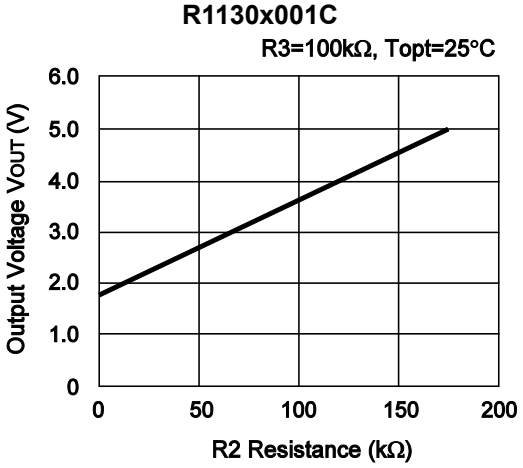
$$R2\times I_{IC}=R2\times 1.8/R_{IC}$$

$$=1.8\times R2/R_{IC} \quad \cdots\cdots (7)$$

For better accuracy, choosing R2 ($<<R_{IC}$) reduces this error.

* Adjustable Resistor Dependence of Output Voltage





PACKAGE INFORMATION

POWER DISSIPATION (SOT-89-5)

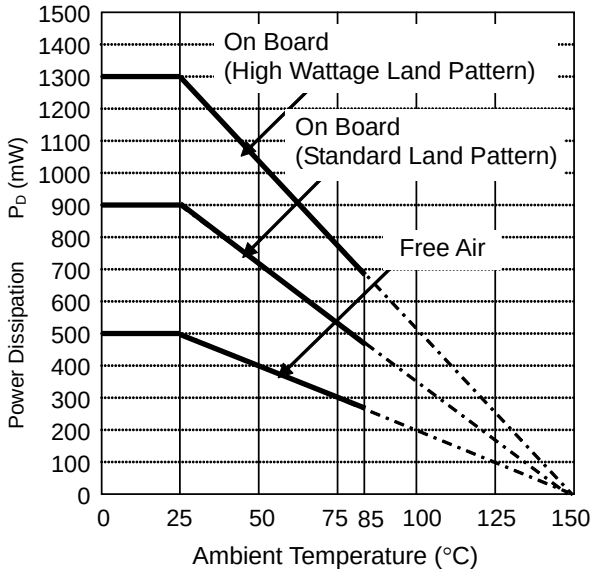
Power Dissipation (P_D) depends on conditions of mounting on board. This specification is based on the measurement at the condition below:

Measurement Conditions

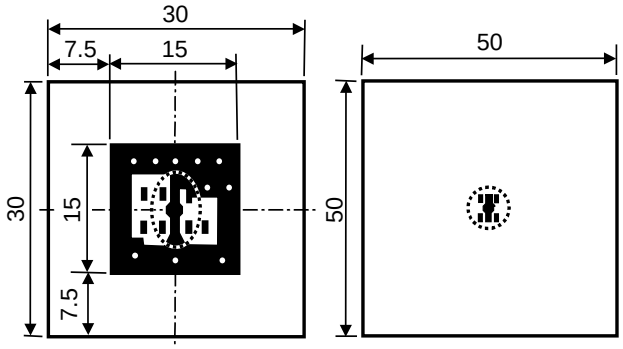
	High Wattage Land Pattern	Standard Land Pattern
Environment	Mounting on Board (Wind velocity=0m/s)	Mounting on Board (Wind velocity=0m/s)
Board Material	Glass cloth epoxy plastic (Double sided)	Glass cloth epoxy plastic (Double sided)
Board Dimensions	30mm × 30mm × 1.6mm	50mm × 50mm × 1.6mm
Copper Ratio	Top side : Approx. 20% , Back side : Approx. 100%	Top side : Approx. 10% , Back side : Approx. 100%
Through-hole	ϕ0.85mm × 10pcs	-

Measurement Result (Ta=25°C, Tjmax=150°C)

	High Wattage Land Pattern	Standard Land Pattern	Free Air
Power Dissipation	1625mW	1125mW	625mW
Thermal Resistance	77°C/W	111°C/W	200°C/W



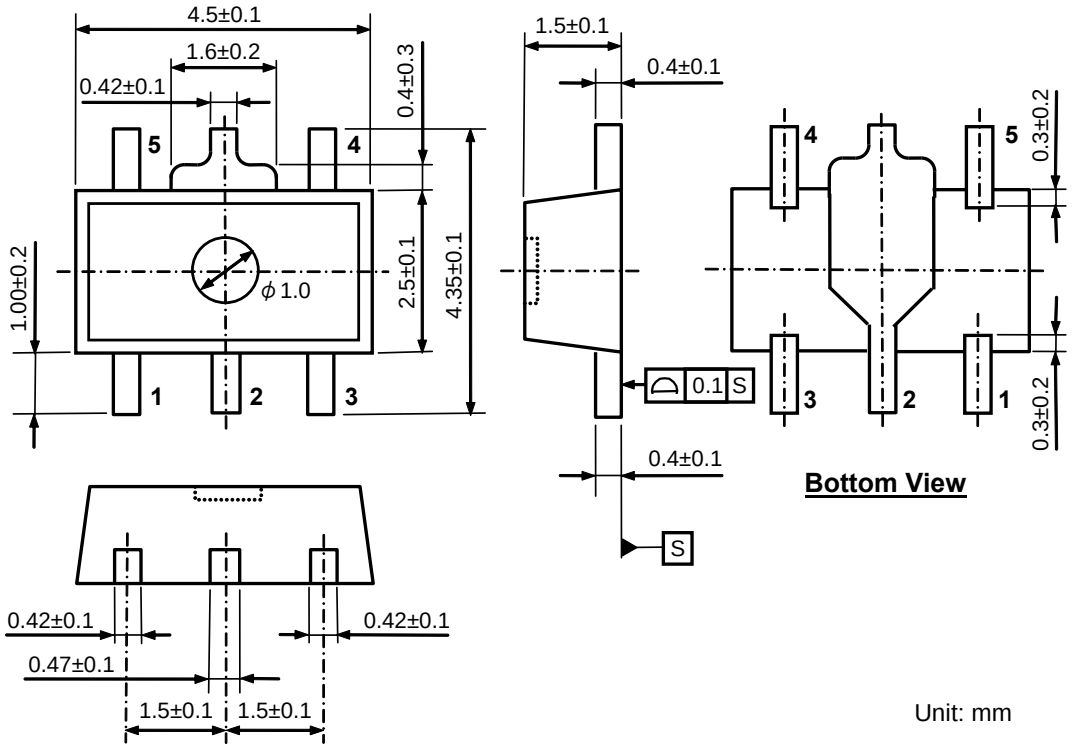
Power Dissipation



Measurement Board Pattern

IC Mount Area (Unit : mm)

PACKAGE DIMENSIONS (SOT-89-5)



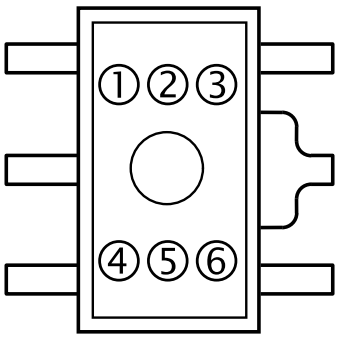
Unit: mm

SOT-89-5 Package Dimensions

MARK SPECIFICATION (SOT-89-5)

①②③④: Product Code … **Refer to *MARK SPECIFICATION TABLE (SOT-89-5)***

⑤⑥: Lot Number … Alphanumeric Serial Number



SOT-89-5 Mark Specification

MARK SPECIFICATION TABLE (SOT-89-5)

R1130Hxx1A

Product Name	①②③④	V_{SET}
R1130H151A	C 1 5 A	1.5 V
R1130H161A	C 1 6 A	1.6 V
R1130H171A	C 1 7 A	1.7 V
R1130H181A	C 1 8 A	1.8 V
R1130H191A	C 1 9 A	1.9 V
R1130H201A	C 2 0 A	2.0 V
R1130H211A	C 2 1 A	2.1 V
R1130H221A	C 2 2 A	2.2 V
R1130H231A	C 2 3 A	2.3 V
R1130H241A	C 2 4 A	2.4 V
R1130H251A	C 2 5 A	2.5 V
R1130H261A	C 2 6 A	2.6 V
R1130H271A	C 2 7 A	2.7 V
R1130H281A	C 2 8 A	2.8 V
R1130H291A	C 2 9 A	2.9 V
R1130H301A	C 3 0 A	3.0 V
R1130H311A	C 3 1 A	3.1 V
R1130H321A	C 3 2 A	3.2 V
R1130H331A	C 3 3 A	3.3 V
R1130H341A	C 3 4 A	3.4 V
R1130H351A	C 3 5 A	3.5 V
R1130H361A	C 3 6 A	3.6 V
R1130H371A	C 3 7 A	3.7 V
R1130H381A	C 3 8 A	3.8 V
R1130H391A	C 3 9 A	3.9 V
R1130H401A	C 4 0 A	4.0 V
R1130H411A	C 4 1 A	4.1 V
R1130H421A	C 4 2 A	4.2 V
R1130H431A	C 4 3 A	4.3 V
R1130H441A	C 4 4 A	4.4 V
R1130H451A	C 4 5 A	4.5 V
R1130H461A	C 4 6 A	4.6 V
R1130H471A	C 4 7 A	4.7 V
R1130H481A	C 4 8 A	4.8 V
R1130H491A	C 4 9 A	4.9 V
R1130H501A	C 5 0 A	5.0 V

R1130Hxx1B

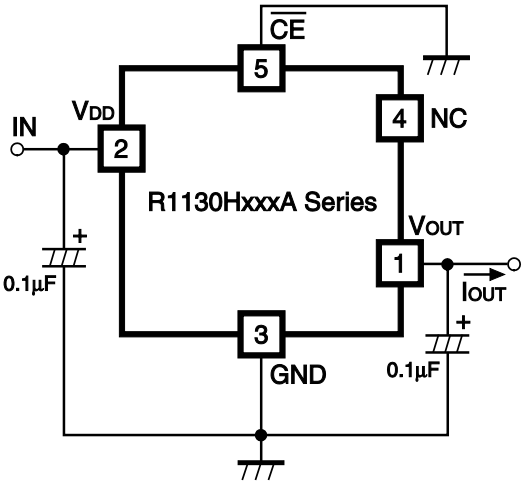
Product Name	①②③④	V_{SET}
R1130H151B	C 1 5 B	1.5 V
R1130H161B	C 1 6 B	1.6 V
R1130H171B	C 1 7 B	1.7 V
R1130H181B	C 1 8 B	1.8 V
R1130H191B	C 1 9 B	1.9 V
R1130H201B	C 2 0 B	2.0 V
R1130H211B	C 2 1 B	2.1 V
R1130H221B	C 2 2 B	2.2 V
R1130H231B	C 2 3 B	2.3 V
R1130H241B	C 2 4 B	2.4 V
R1130H251B	C 2 5 B	2.5 V
R1130H261B	C 2 6 B	2.6 V
R1130H271B	C 2 7 B	2.7 V
R1130H281B	C 2 8 B	2.8 V
R1130H291B	C 2 9 B	2.9 V
R1130H301B	C 3 0 B	3.0 V
R1130H311B	C 3 1 B	3.1 V
R1130H321B	C 3 2 B	3.2 V
R1130H331B	C 3 3 B	3.3 V
R1130H341B	C 3 4 B	3.4 V
R1130H351B	C 3 5 B	3.5 V
R1130H361B	C 3 6 B	3.6 V
R1130H371B	C 3 7 B	3.7 V
R1130H381B	C 3 8 B	3.8 V
R1130H391B	C 3 9 B	3.9 V
R1130H401B	C 4 0 B	4.0 V
R1130H411B	C 4 1 B	4.1 V
R1130H421B	C 4 2 B	4.2 V
R1130H431B	C 4 3 B	4.3 V
R1130H441B	C 4 4 B	4.4 V
R1130H451B	C 4 5 B	4.5 V
R1130H461B	C 4 6 B	4.6 V
R1130H471B	C 4 7 B	4.7 V
R1130H481B	C 4 8 B	4.8 V
R1130H491B	C 4 9 B	4.9 V
R1130H501B	C 5 0 B	5.0 V

R1130H001C
(Adjustable Output Voltage Type)

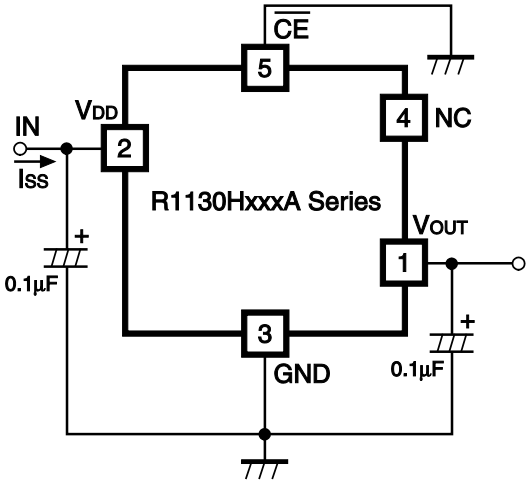
Product Name	①②③④	V_{SET}
R1130H001C	C 0 1 C	-

TEST CIRCUITS (Pin number is applied to R1130H Series)

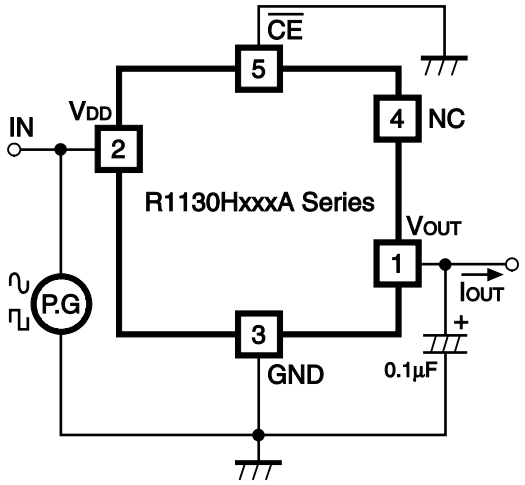
- **R1130HxxxA**



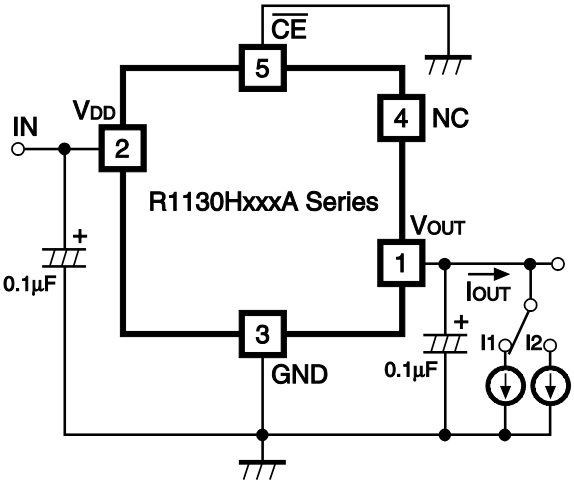
Standard test Circuit



Supply Current Test Circuit

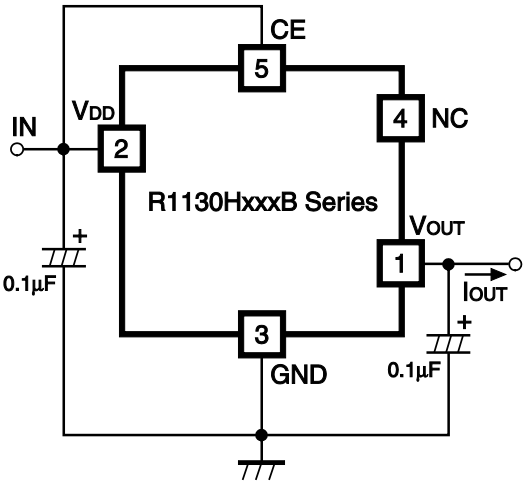


Ripple Rejection, Line Transient Response Test Circuit

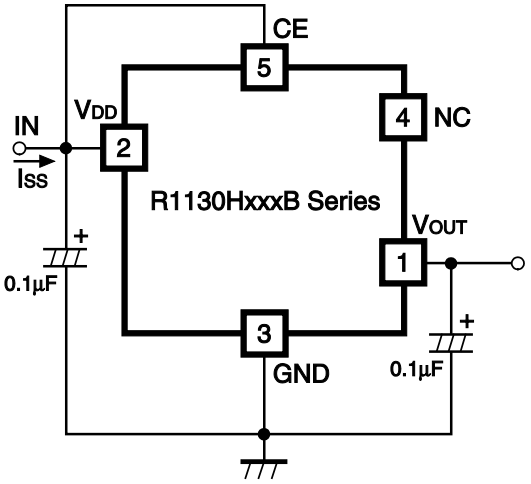


Load Transient Response Test Circuit

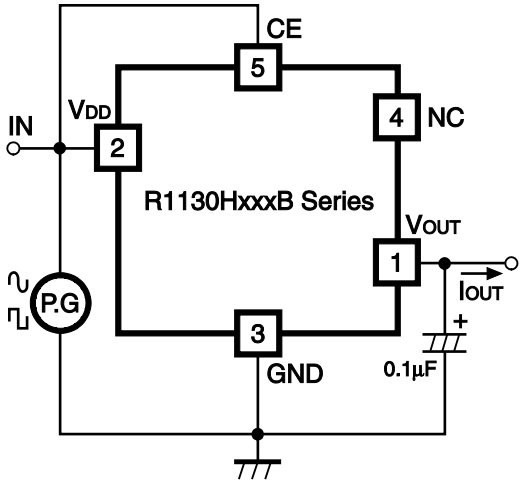
- **R1130HxxxB**



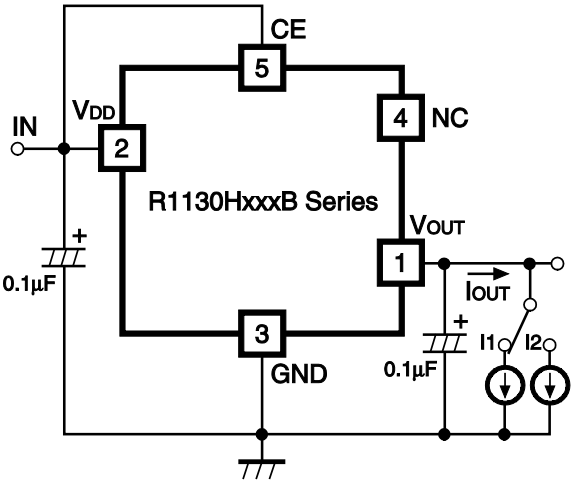
Standard test Circuit



Supply Current Test Circuit

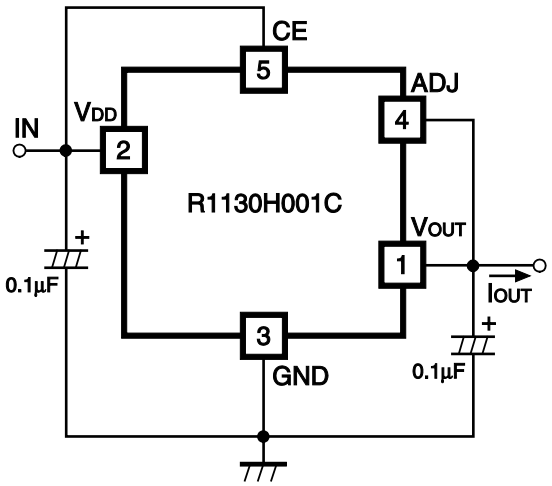


Test Circuit for Ripple Rejection and Input Transient Response

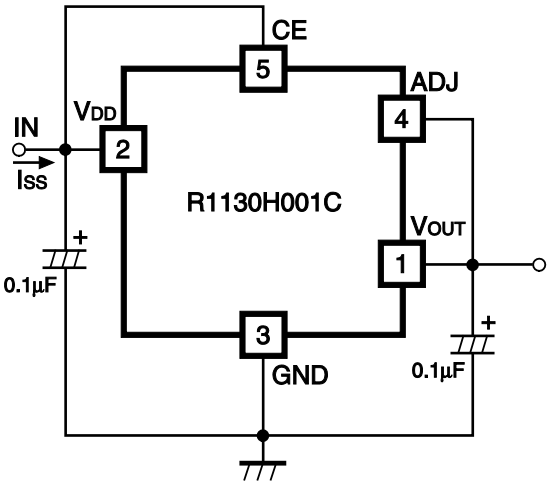


Test Circuit for Load Transient Response

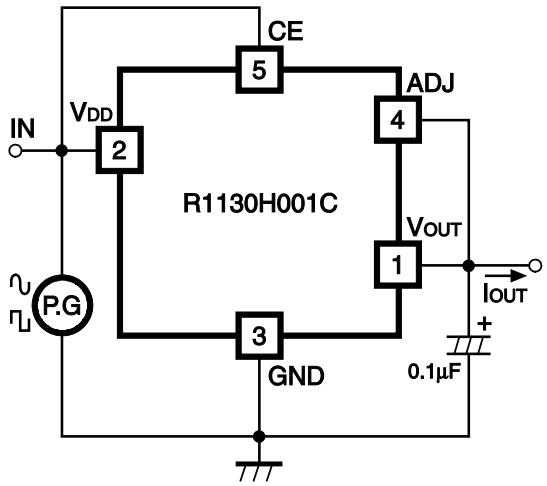
- **R1130H001C**



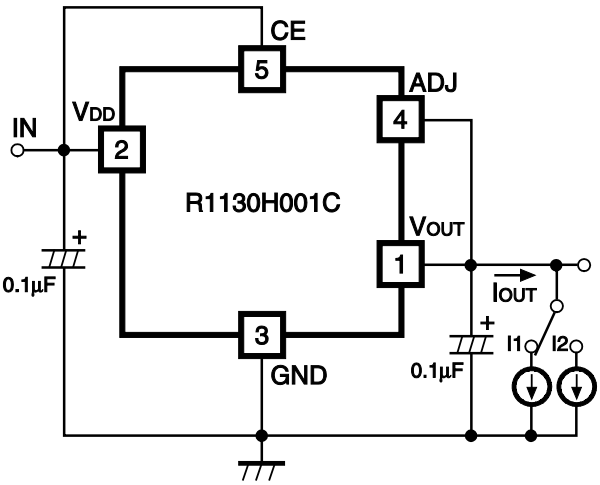
Standard test Circuit



Test Circuit Supply Current



Test Circuit for Ripple Rejection and Input Transient Response



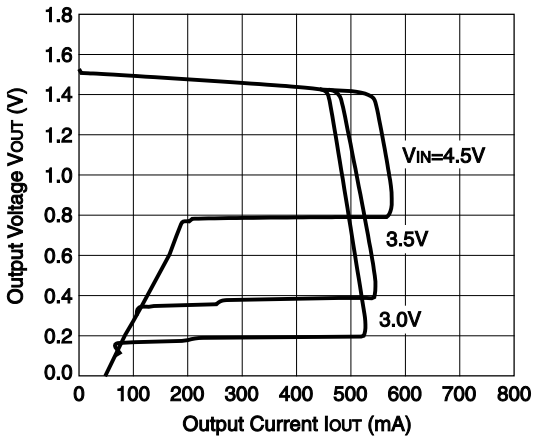
Test Circuit for Load Transient Response

TYPICAL CHARACTERISTICS

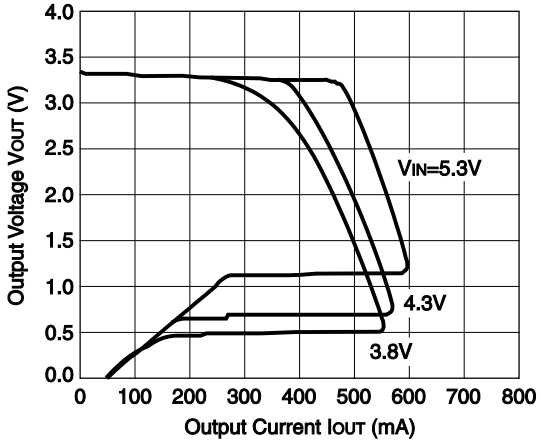
Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

1) Output Voltage vs. Output Current (Ta=25°C)

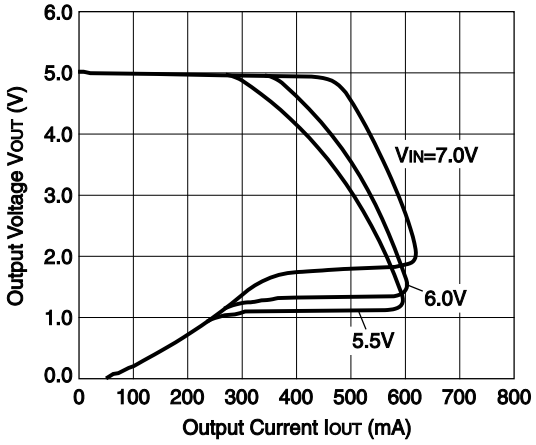
R1130x151B



R1130x331B

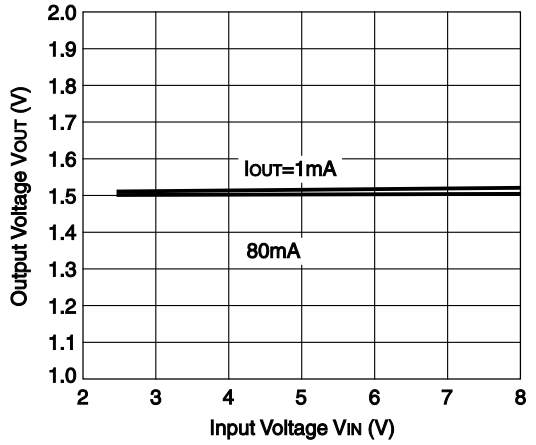


R1130x501B

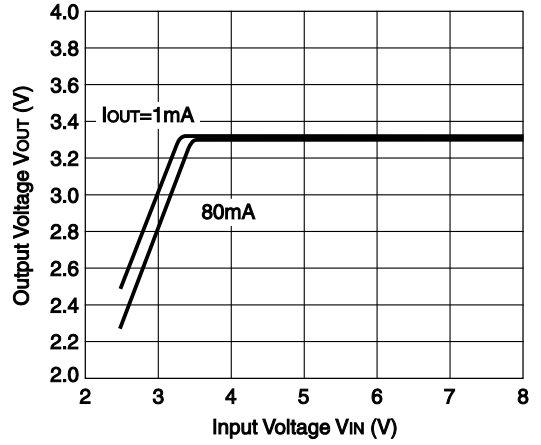


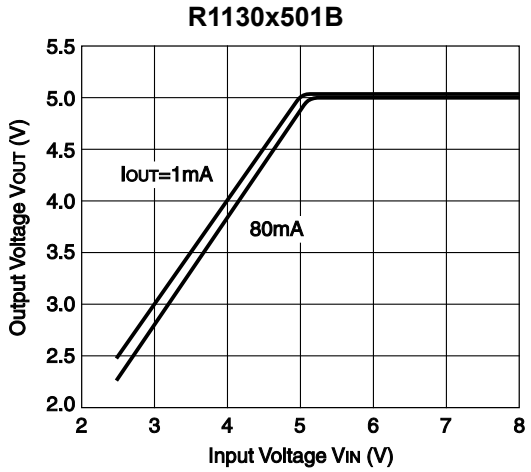
2) Input Voltage vs. Output Voltage (Ta=25°C)

R1130x151B

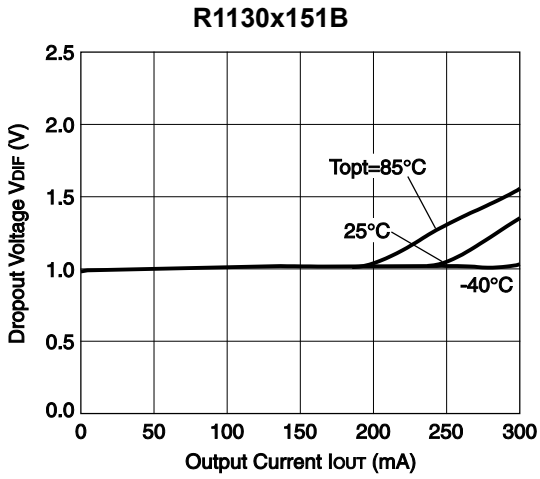


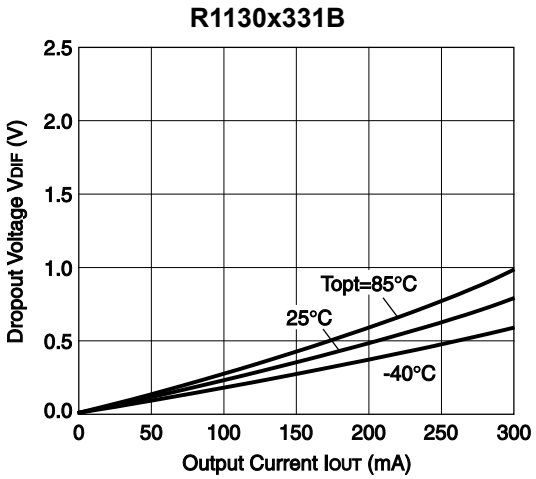
R1130x331B

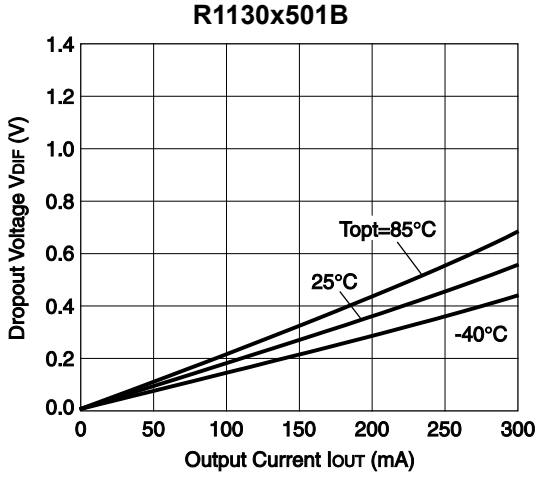




3) Dropout Voltage vs. Output Current

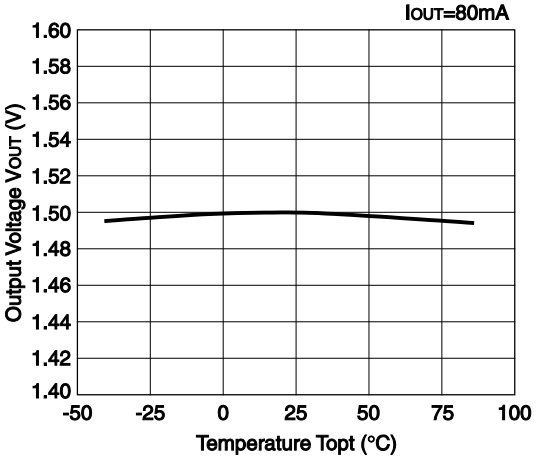




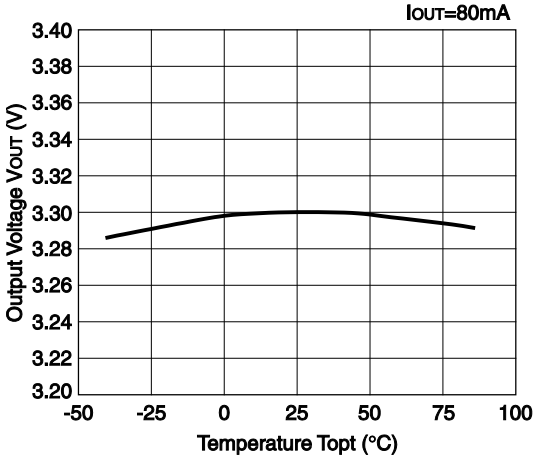


4) Output Voltage vs. Temperature

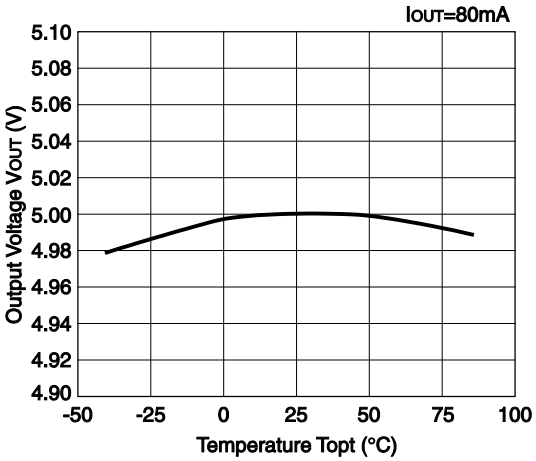
R1130x151B



R1130x331B

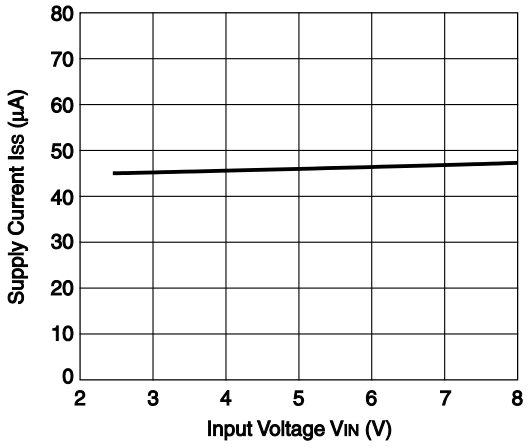


R1130x501B

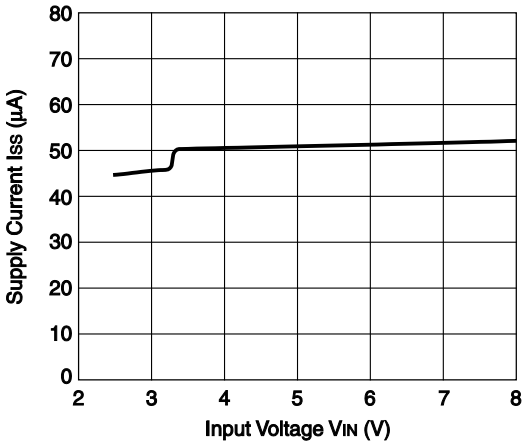


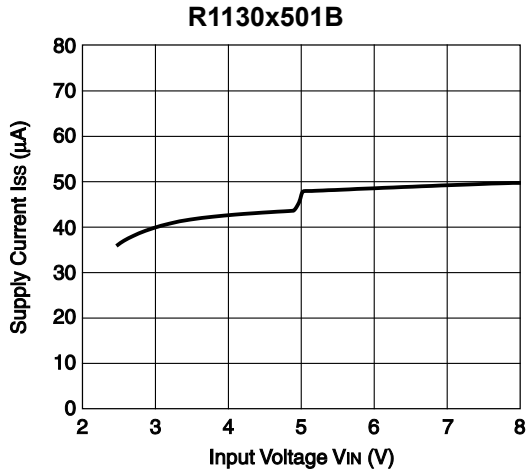
5) Supply Current vs. Input Voltage (Ta=25°C)

R1130x151B

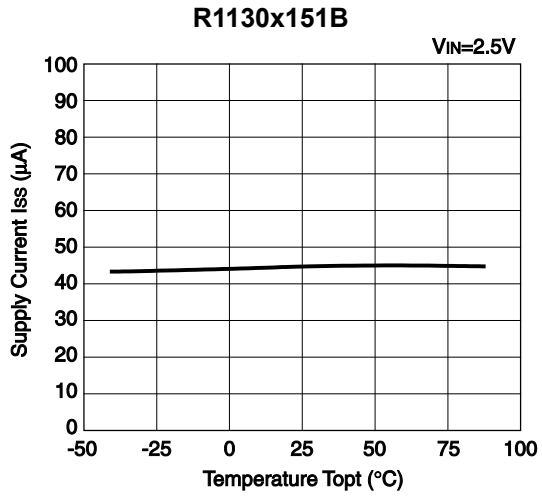


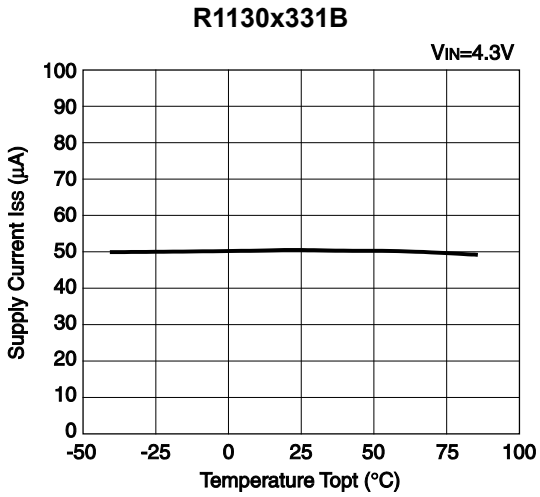
R1130x331B

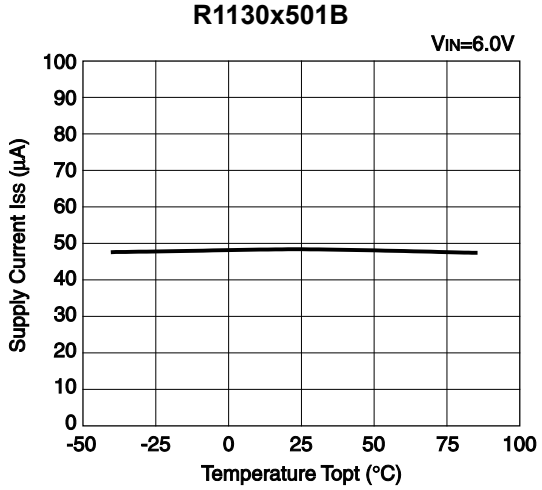




6) Supply Current vs. Temperature

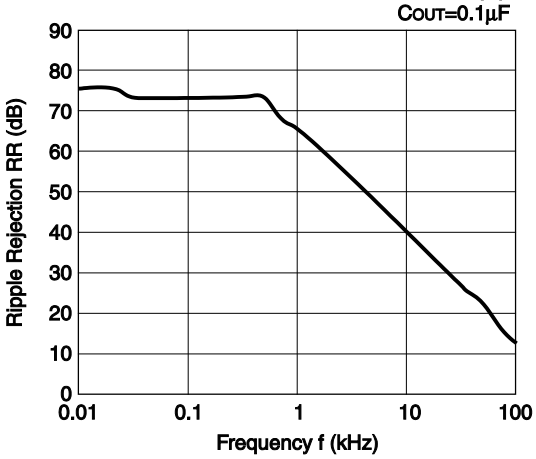




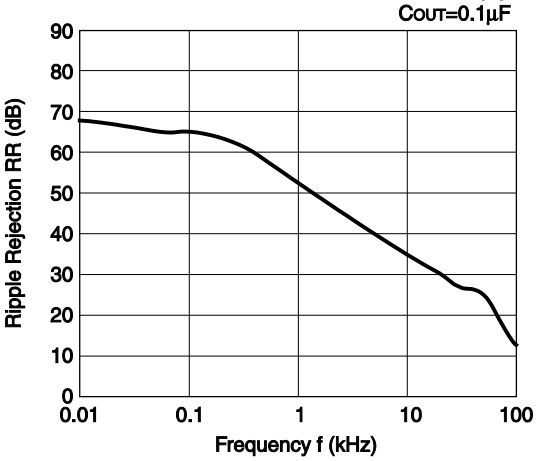


7) Ripple Rejection vs. Frequency

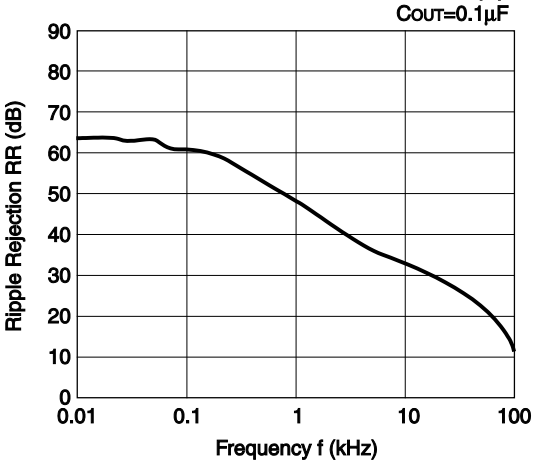
R1130x151B



R1130x331B

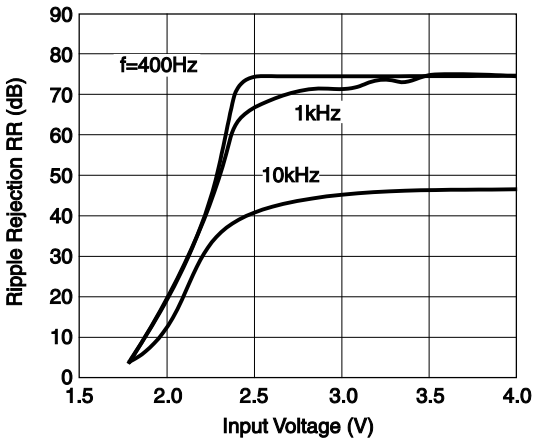


R1130x501B

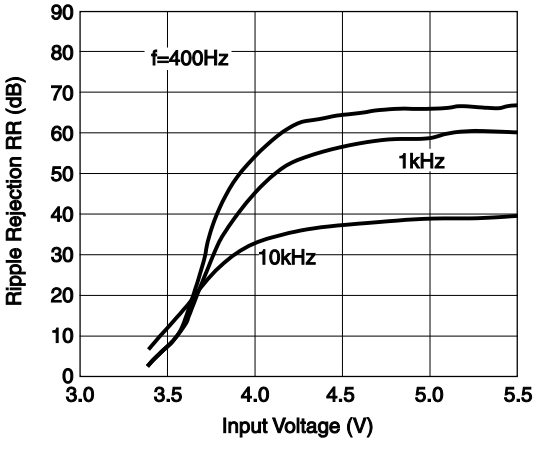


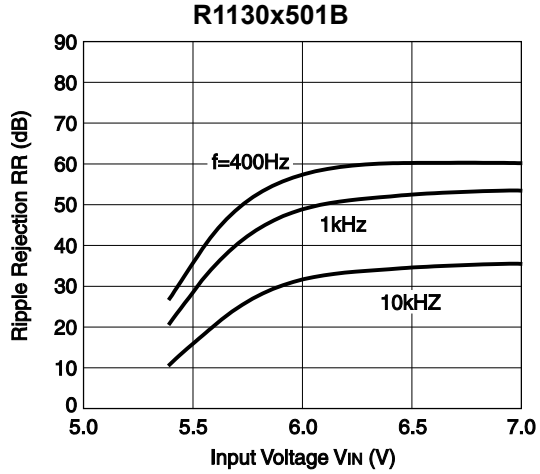
8) Ripple Rejection vs. Input Voltage

R1130x151B

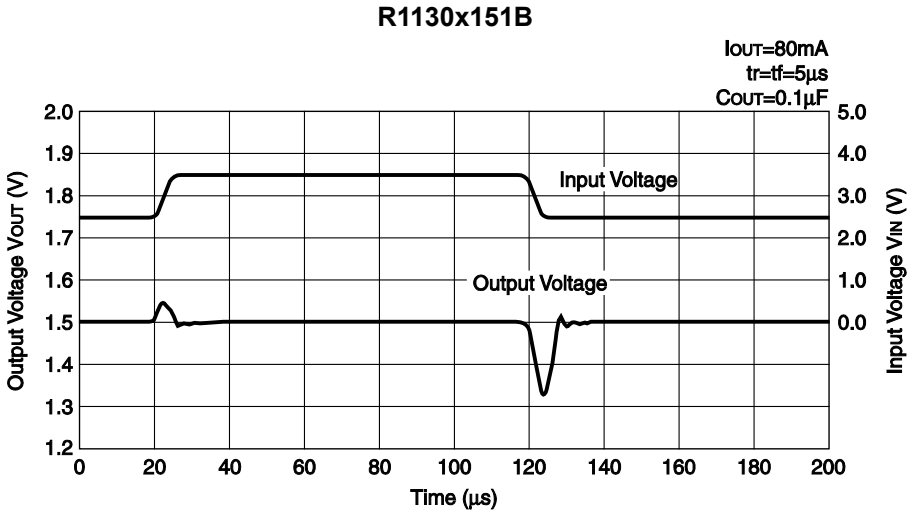


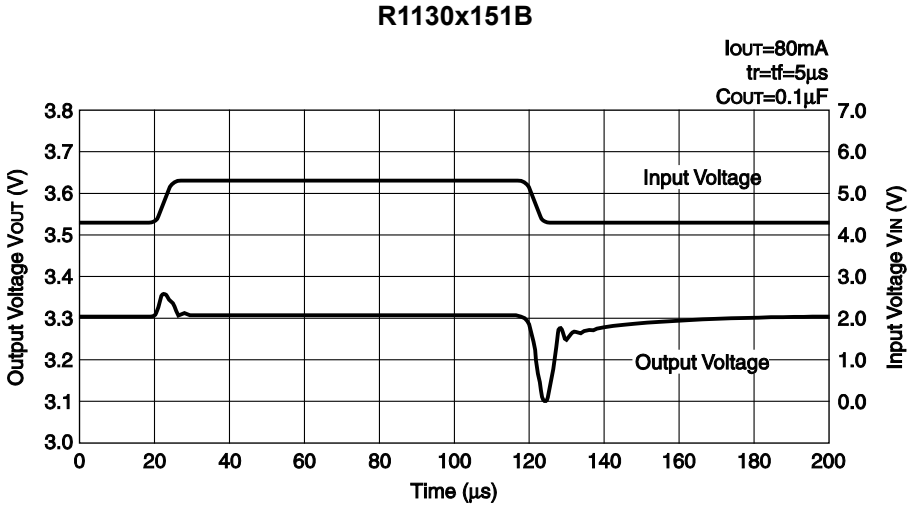
R1130x331B



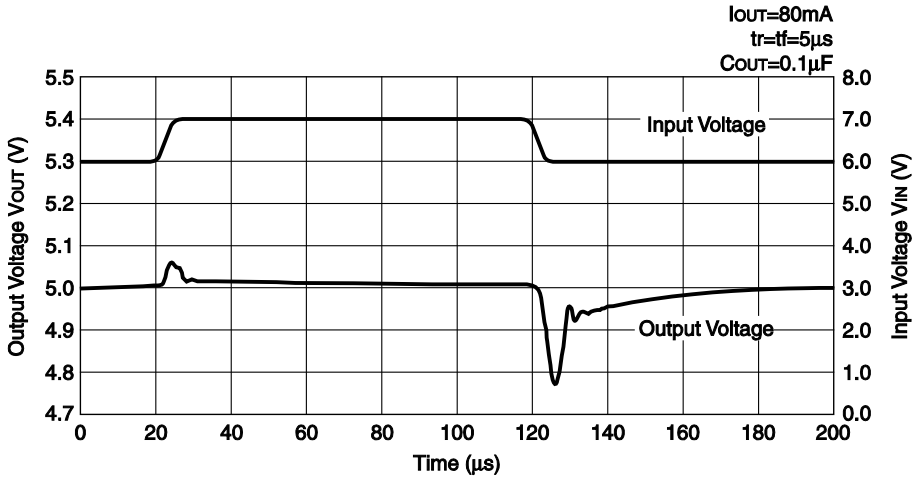


9) Input Transient Response



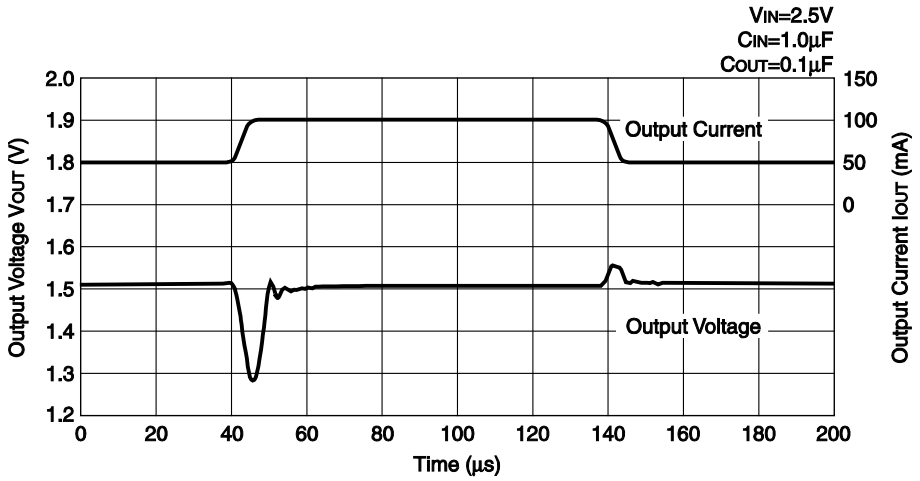


R1130x501B

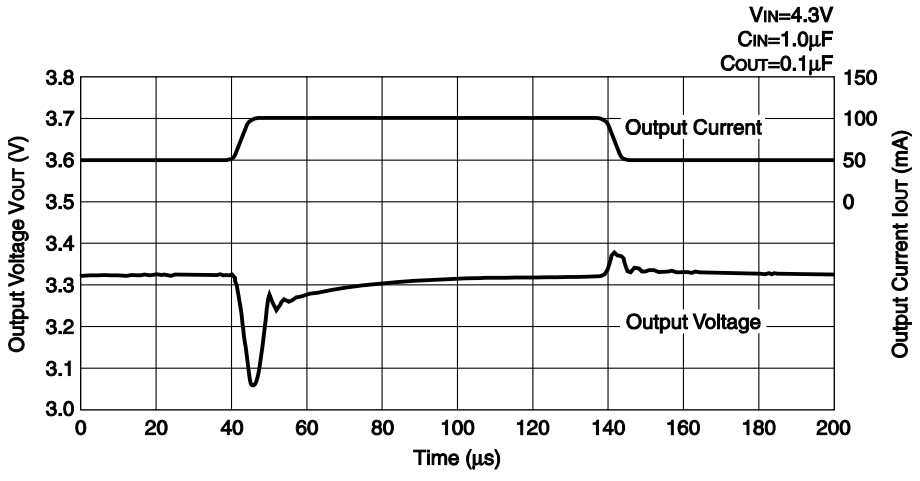


10) Load Transient Response

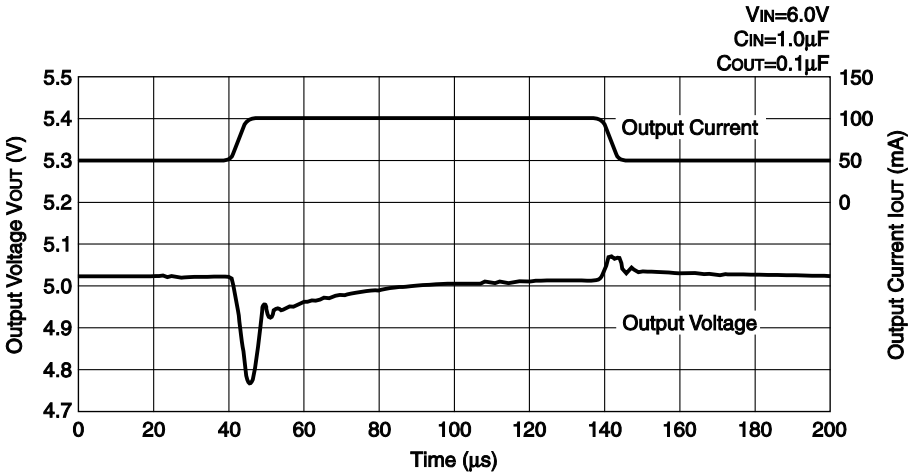
R1130x151B



R1130x331B



R1130x501B


VIN=6.0V
CIN=1.0µF
COUT=0.1µF
Output Current
Output Voltage
Output Voltage VOUT (V)
Output Current IOUT (mA)
Time (µs)
5.5
5.4
5.3
5.2
5.1
5.0
4.9
4.8
4.7
150
100
50
0
0
20
40
60
80
100
120
140
160
180
200

1. The products and the product specifications described in this document are subject to change or discontinuation of production without notice for reasons such as improvement. Therefore, before deciding to use the products, please refer to our sales representatives for the latest information thereon.
2. The materials in this document may not be copied or otherwise reproduced in whole or in part without prior written consent of our company.
3. Please be sure to take any necessary formalities under relevant laws or regulations before exporting or otherwise taking out of your country the products or the technical information described herein.
4. The technical information described in this document shows typical characteristics of and example application circuits for the products. The release of such information is not to be construed as a warranty of or a grant of license under our company's or any third party's intellectual property rights or any other rights.
5. The products in this document are designed for automotive applications. However, when using the products for automotive applications, please make sure to contact our sales representative in advance due to confirming the quality level.
6. We are making our continuous effort to improve the quality and reliability of our products, but semiconductor products are likely to fail with certain probability. In order to prevent any injury to persons or damages to property resulting from such failure, customers should be careful enough to incorporate safety measures in their design, such as redundancy feature, fire containment feature and fail-safe feature. We do not assume any liability or responsibility for any loss or damage arising from misuse or inappropriate use of the products.
7. Anti-radiation design is not implemented in the products described in this document.
8. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
9. WLCSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
10. There can be variation in the marking when different AOI (Automated Optical Inspection) equipment is used. In the case of recognizing the marking characteristic with AOI, please contact our sales or our distributor before attempting to use AOI.
11. Please contact our sales representatives should you have any questions or comments concerning the products or the technical information.

NISSHINBO

Nisshinbo Micro Devices Inc.

Official website
https://www.nisshinbo-microdevices.co.jp/en/

Purchase information
https://www.nisshinbo-microdevices.co.jp/en/buy/