

R1154Hxxxx series

■ OUTLINE

The R1154Hxxxx series are CMOS-based voltage regulator (VR) ICs. The R1154Hxxxxx has features of high output voltage accuracy and ultra-low supply current. A peak current limit circuit, a short current limit circuit, and a thermal shutdown circuit are built in the R1154Hxxxx series.

The regulator output voltage is fixed in the R1154HxxxB, while adjustable type is the R1154H001C. Output voltage accuracy is $\pm 2.0\%$.

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

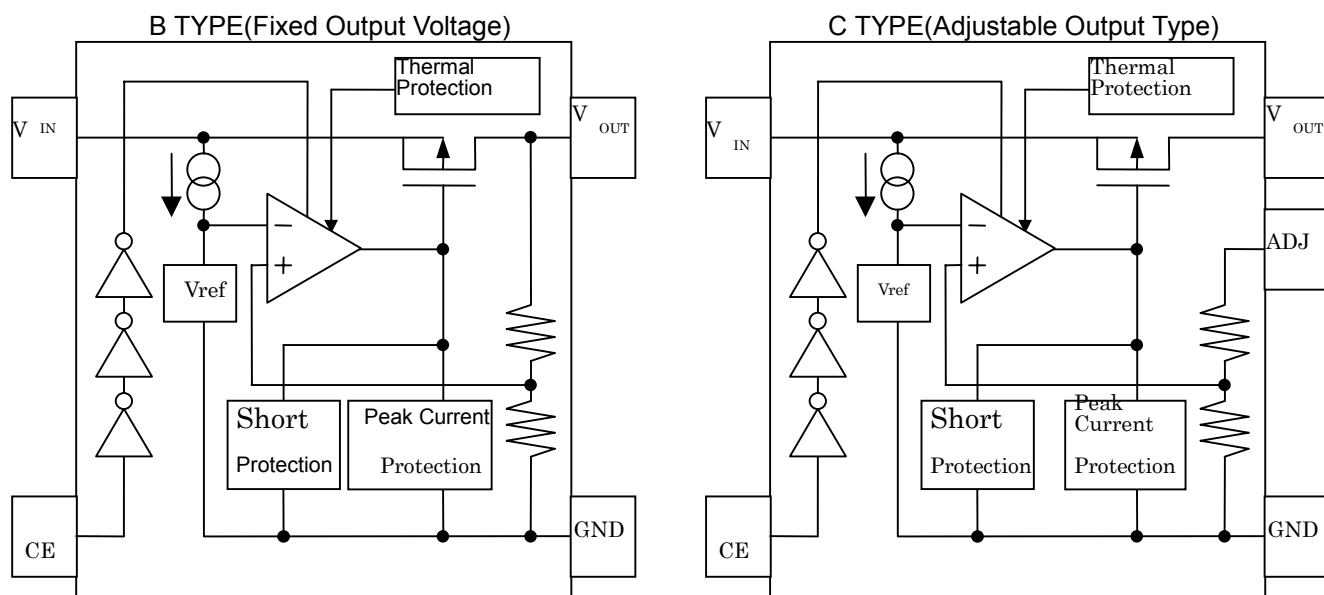
■ FEATURES

- Ultra-Low Supply Current..... Typ. $5.0\mu\text{A}$
- Standby Current..... Typ. $0.1\mu\text{A}$
- Input Voltage Max. 24V
- Wide Output Voltage Range Stepwise setting with a step of 0.1V in the range of 2.5V to 12.0V (xxxB) or adjustable in the range of 2.5V to V_{IN} or 24.0V (001C)
- High Output Voltage Accuracy..... $\pm 2.0\%$
- Output Current..... Min. 140mA ($V_{\text{IN}}=V_{\text{OUT}}+2\text{V}$; 2.5V Output type)
Min. 150mA ($V_{\text{IN}}=V_{\text{OUT}}+2\text{V}$; 3.0V Output type)
- Built-in Peak Current Limit Circuit, Short Current Limit Circuit, Thermal Shutdown Circuit

■ APPLICATIONS

- Power source for home appliances such as refrigerators, rice cookers, Electronic water warmers, etc.
- Power source for car audio equipment, car navigation system, and ETC system.
- Power source for notebook PCs, digital TVs, cordless phones, and LAN system.
- Power source for copiers, printers, facsimiles, and scanners.
- Power source for wireless equipment such as fish-finders, radar, RF unit, and transceivers.

■ BLOCK DIAGRAMS



■ SELECTION GUIDE

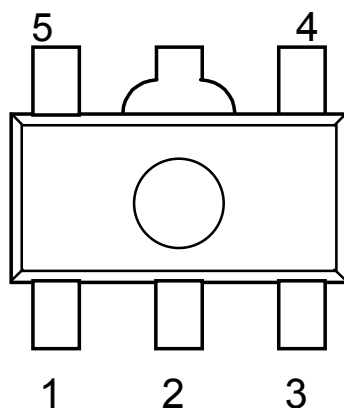
The output voltage can be selected at the user's request. The selection can be made with designating the part number as follows;

R1154XXXXX-XX ← Part Number

$\begin{matrix} \uparrow & \uparrow & \uparrow & \uparrow \\ a & b & c & d \end{matrix}$

| Code | Contents |
|------|--|
| a | Designation of package type; H: SOT89-5 |
| b | Designation of output voltage: Adjustable:00 (Reference voltage =2.5V) Fixed: Stepwise Setting in the range from 2.5V to 12.0V |
| c | Designation of Output Type; B: Fixed Output Type C: Adjustable Output Type |
| d | Designation of Taping Type; T1,T2(SOT89-5)<-description of the direction of taping (Refer to Taping Specifications) |

■ PIN CONFIGURATIONS



SOT-89-5

■ PIN DESCRIPTION

| Pin No. | Symbol | Description |
|---------|--------|---|
| 1 | VOUT | Voltage Regulator Output Pin |
| 2 | GND | Ground Pin |
| 3 | CE | Chip Enable Pin |
| 4 | NC/ADJ | B version: No Connection C version: Reference Voltage of Adjustable Output Pin |
| 5 | VDD | Input Pin |

■ ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | Rating | Unit |
|-----------------------------|------------------|-----------------------------|------|
| Input Voltage | V _{IN} | 26.0 | V |
| Input Voltage(CE Input Pin) | V _{CE} | -0.3 ~ V _{IN} +0.3 | V |
| Output Voltage | V _{OUT} | -0.3 ~ V _{IN} +0.3 | V |
| Output Voltage(ADJ Pin) | V _{ADJ} | -0.3 ~ V _{IN} +0.3 | V |
| Output Current | I _{OUT} | 250 | mA |
| Power Dissipation | PD | Internally Limited | |
| Operating Temperature | T _{opt} | -40 ~ +105 | °C |
| Storage Temperature | T _{stg} | -55 ~ +125 | °C |

■ ELECTRICAL CHARACTERISTICS

(T_{opt}=25°C)

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|--|--------------------------------------|--|------------------------------------|------|-----------------|--------|
| Input Voltage | V _{IN} | | | | 24.0 | V |
| Supply Current | I _{SS} | V _{IN} =V _{CE} V _{IN} -V _{OUT} =2.0V | | 5 | 10 | μA |
| Output Voltage | V _{OUT} | V _{IN} =V _{OUT} +2.0V | x0.98 | | x1.02 | V |
| Thermal Shutdown Temperature | T _{SD} | Junction Temperature | | 150 | | °C |
| Thermal Shutdown Released Temperature | T _{SR} | Junction Temperature | | 125 | | °C |
| Output Current | I _{OUT} | V _{IN} -V _{OUT} =2.0V | Refer to the Output Current Table | | | |
| Load Regulation | ΔV _{OUT} /ΔI _{OUT} | V _{IN} -V _{OUT} =2.0V 1mA≤I _{OUT} ≤40mA | Refer to the Load Regulation Table | | | |
| Line Regulation | ΔV _{OUT} /ΔV _{IN} | I _{OUT} =20mA V _{OUT} +1V≤V _{IN} ≤24V | | 0.05 | 0.20 | %/V |
| Dropout Voltage | V _{DIF} | I _{OUT} =20mA | Refer to the Dropout Voltage Table | | | |
| Output Voltage Temperature Coefficient | ΔV _{OUT} /ΔT _{opt} | V _{IN} -V _{OUT} =2.0V I _{OUT} =20mA -40°C ≤ T _{opt} ≤ 105°C | | ±100 | | ppm/°C |
| Short Current Limit | I _{LIM} | V _{OUT} =0V | | 45 | | mA |
| CE "H" Input Voltage | V _{CEH} | | 2.1 | | V _{IN} | V |
| CE "L" Input Voltage | V _{CEL} | | 0.0 | | 0.3 | V |

● Output Current (T_{opt}=25°C)

| Output Voltage V _{OUT} (V) | Output Current(mA) | |
|--|--------------------|--|
| | Min. | |
| 2.5≤V _{OUT} ≤2.9 | 140 | |
| 3.0≤V _{OUT} ≤12.0 | 150 | |

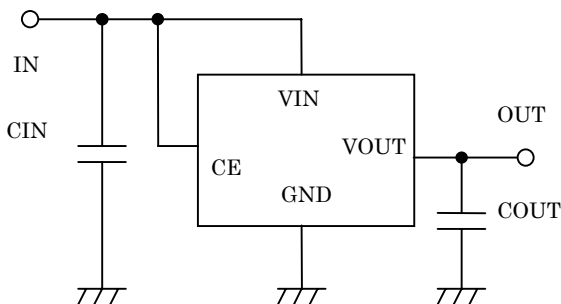
● Load Regulation (T_{opt}=25°C)

| Output Voltage V _{OUT} (V) | Load Regulation (mV) | |
|--|----------------------|------|
| | Typ. | Max. |
| 2.5≤V _{OUT} ≤5.0 | 20 | 75 |
| 5.1≤V _{OUT} ≤12.0 | 40 | 115 |

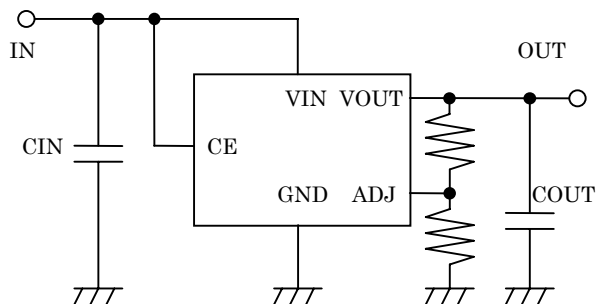
● Dropout Voltage (T_{opt}=25°C)

| Output Voltage V _{OUT} (V) | Dropout Voltage (V) | |
|--|---------------------|------|
| | Typ. | Max. |
| 2.5≤V _{OUT} ≤7.0 | 0.20 | 0.40 |
| 7.1≤V _{OUT} ≤10.0 | 0.25 | 0.50 |
| 10.1≤V _{OUT} ≤12.0 | 0.30 | 0.55 |

■ TYPICAL APPLICATIONS



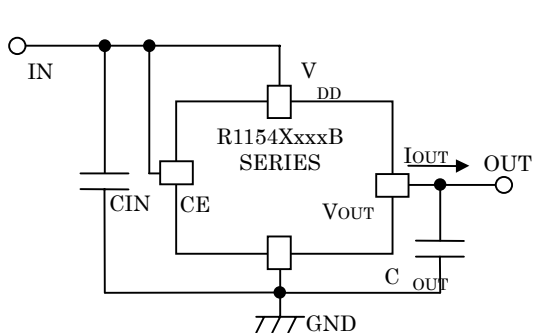
Fixed Output Voltage Type



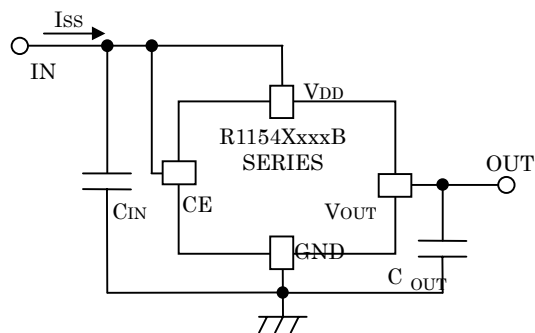
Adjustable Type

RICOH

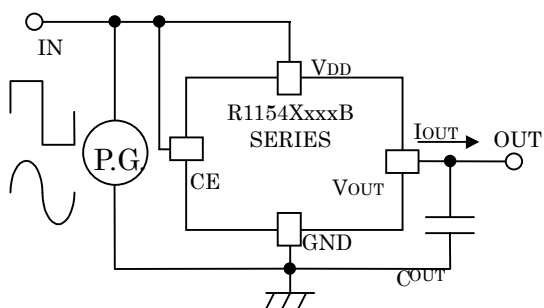
■ TEST CIRCUITS



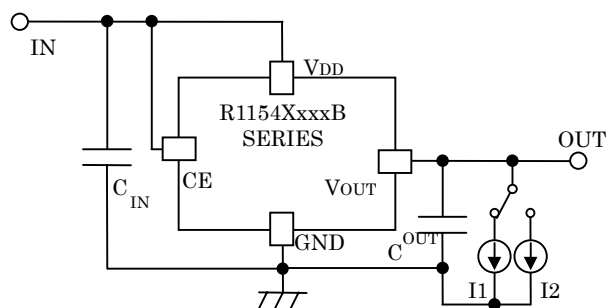
R1154XxxxB Standard Test Circuit



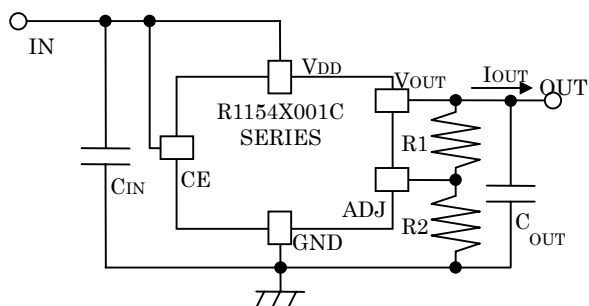
R1154XxxxB Supply Current Test Circuit



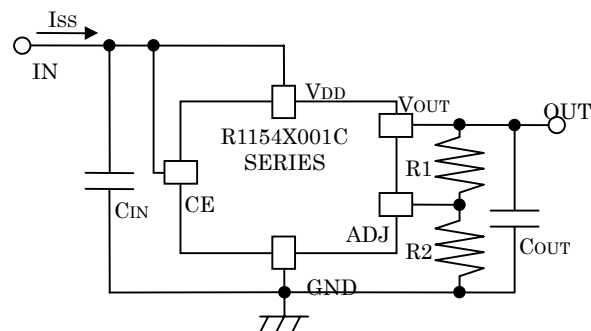
R1154XxxxB
Input Transient Response Test Circuit



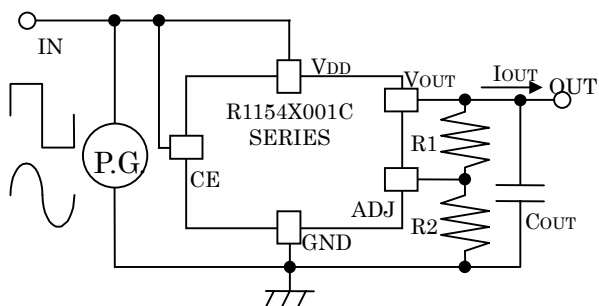
R1154XxxxB
Load Regulation Test Circuit



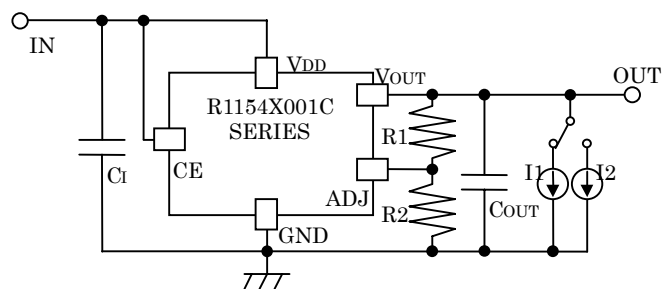
R1154X001C Standard Test Circuit



R1154X001C Supply Current Test Circuit



R1154X001C
Input Transient Response Test Circuit

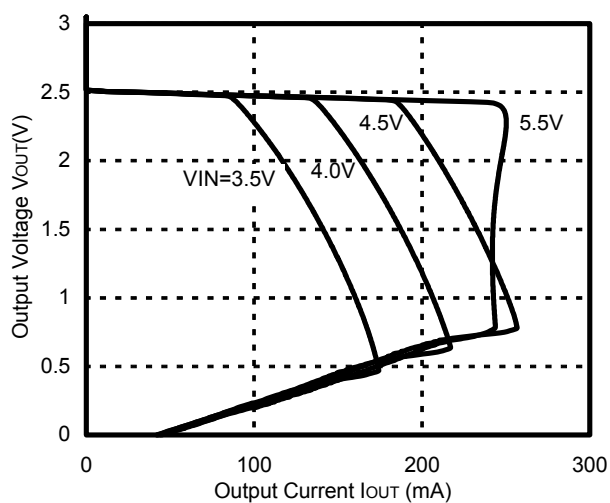


R1154X001C Load Transient Response Test Circuit

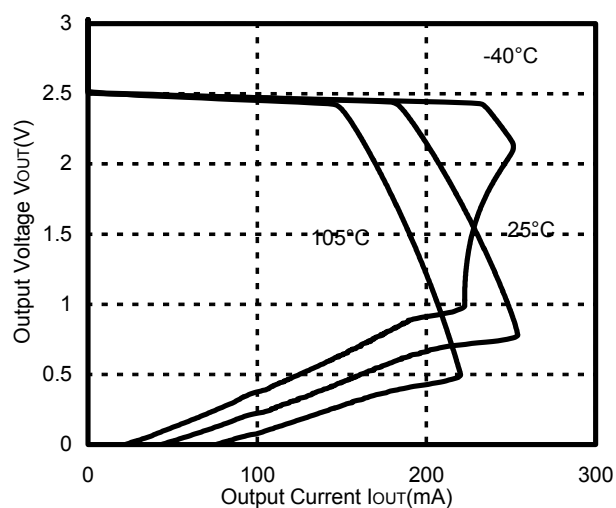
■ TYPICAL CHARACTERISTICS

1) Output Voltage vs. Output Current

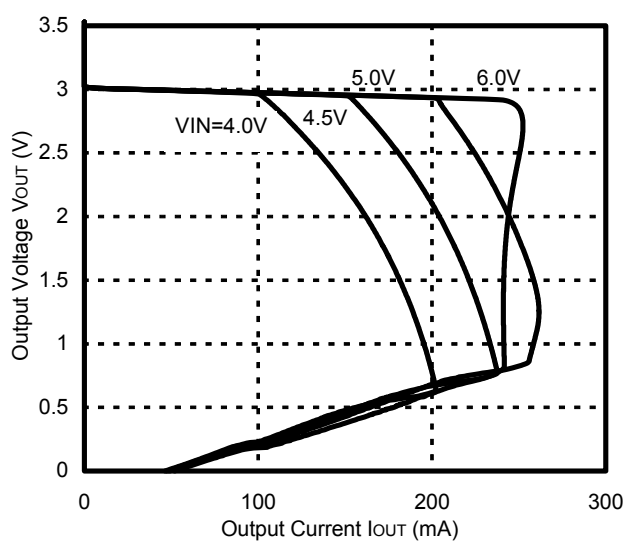
R1154H025B $T_{opt}=25^{\circ}\text{C}$



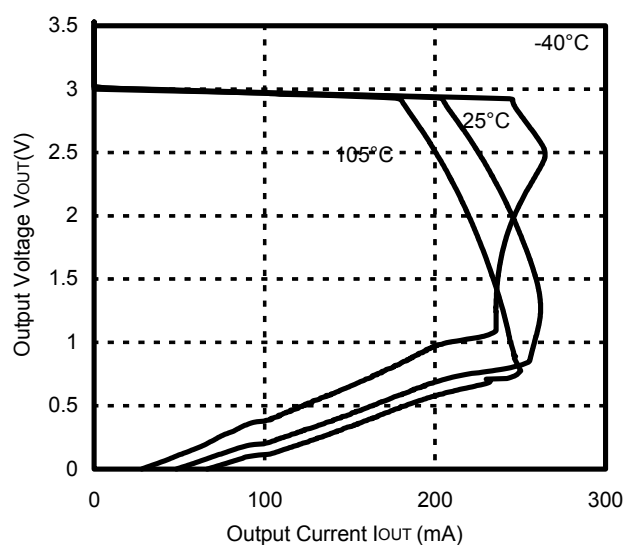
R1154H025B $V_{IN}=4.5\text{V}$

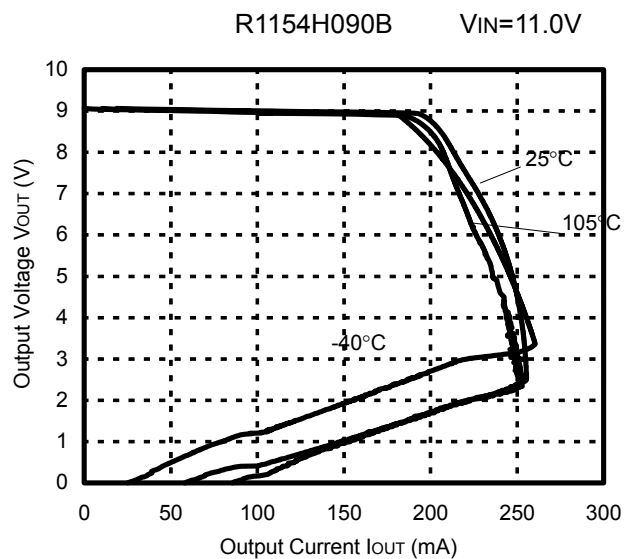
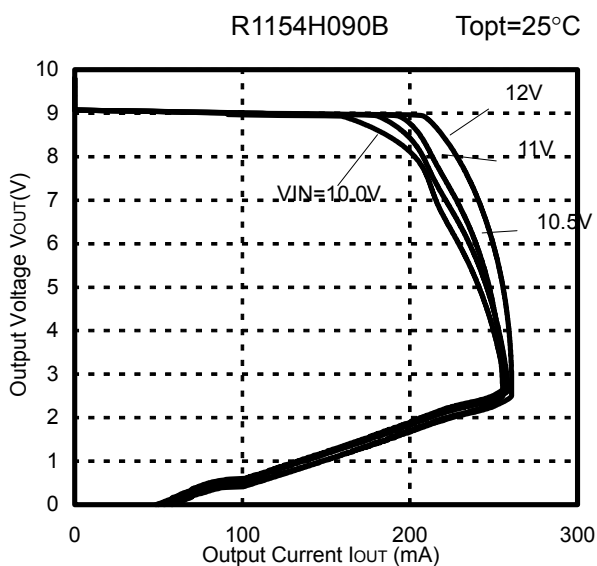
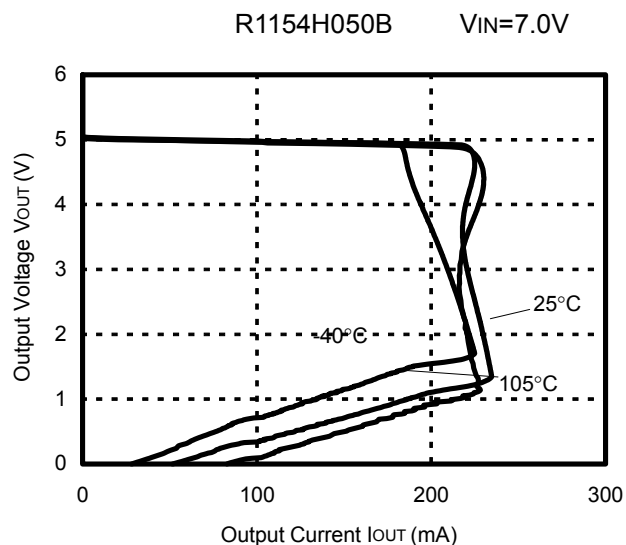
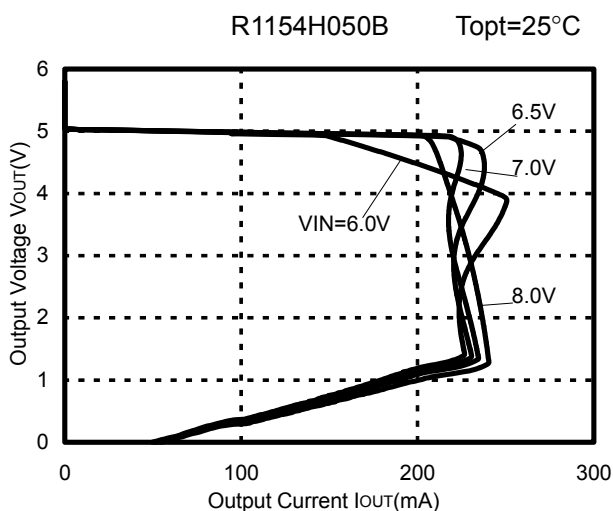


R1154H030B $T_{opt}=25^{\circ}\text{C}$

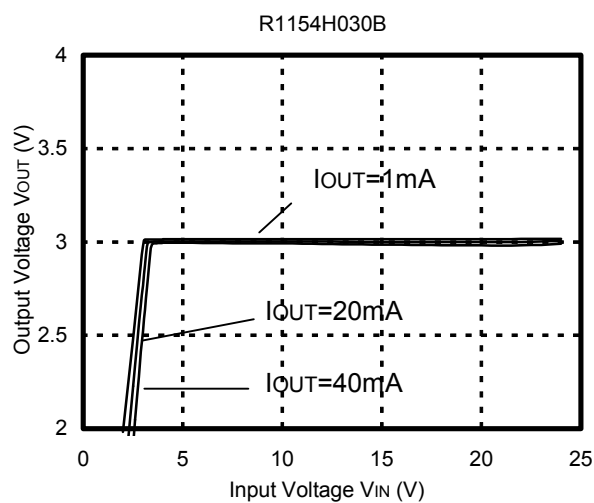
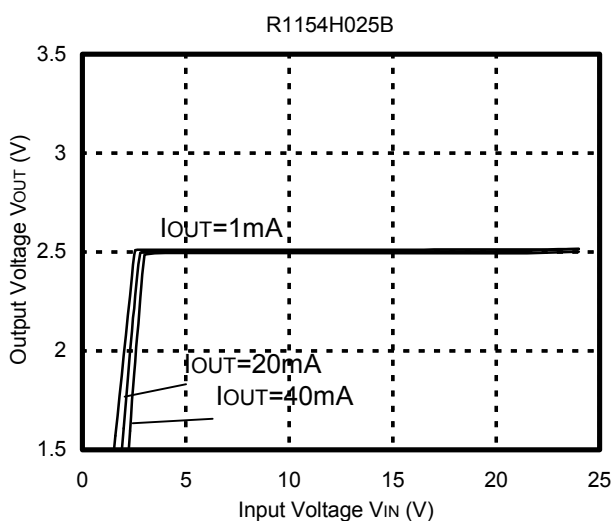


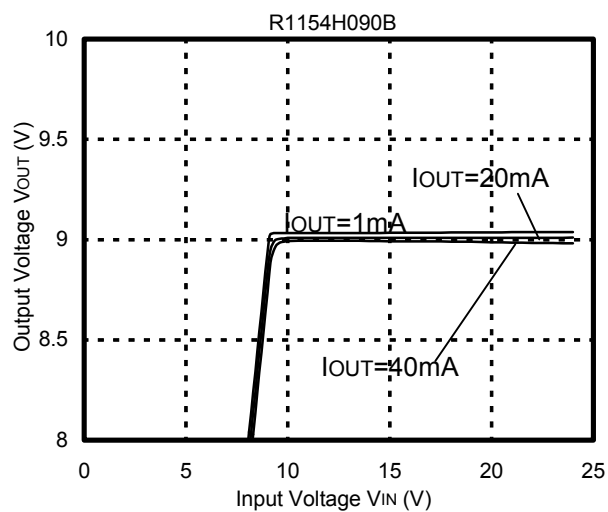
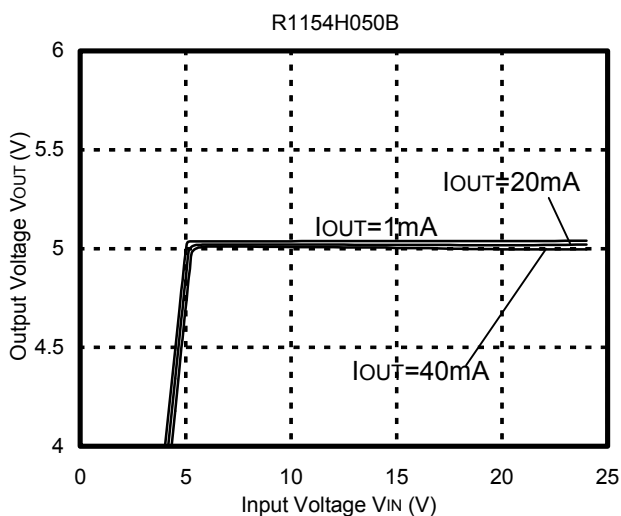
R1154H030B $V_{IN}=5.0\text{V}$



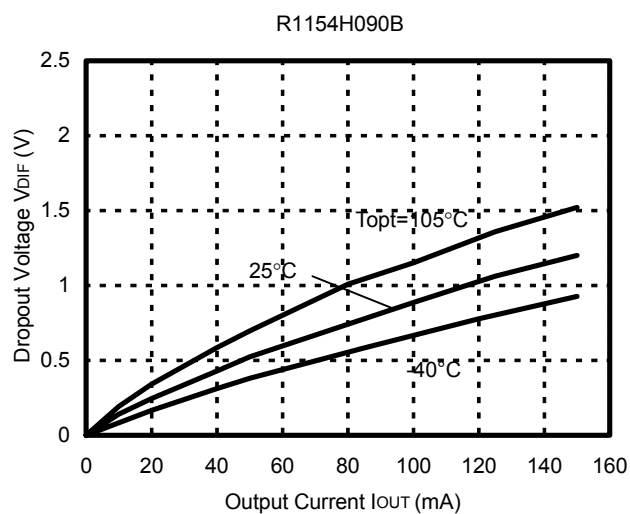
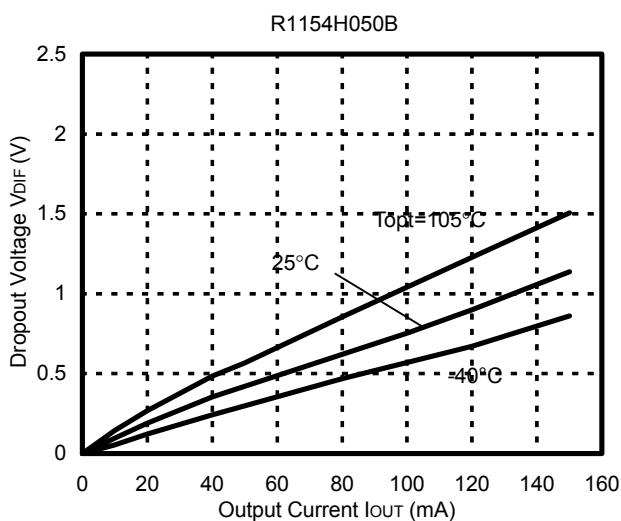
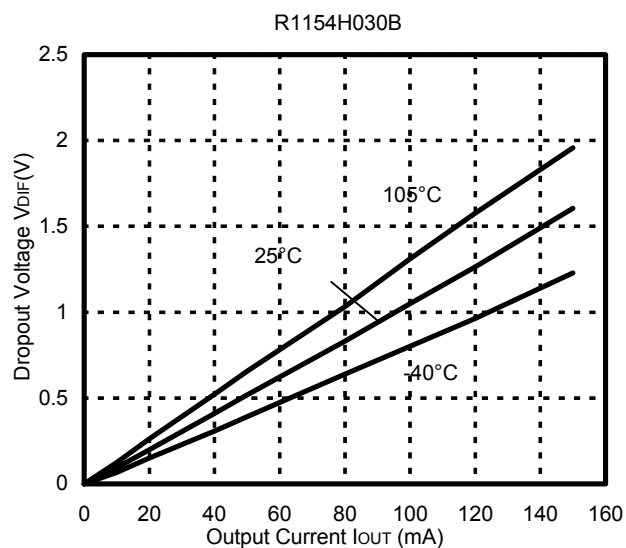
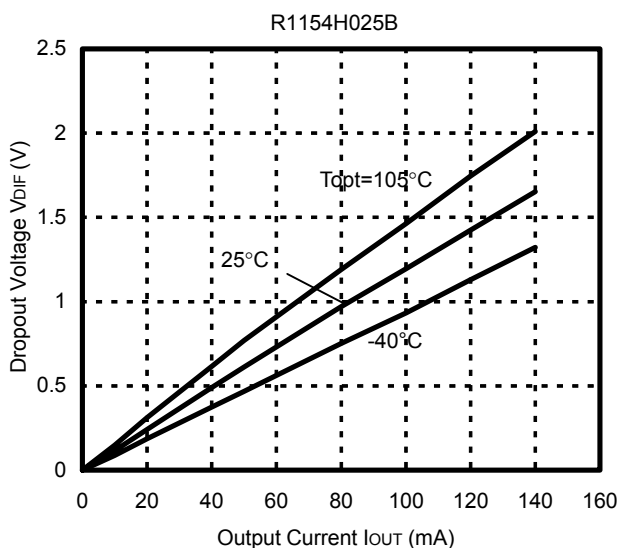


2) Input Voltage vs. Output Voltage ($T_{opt}=25^{\circ}\text{C}$)

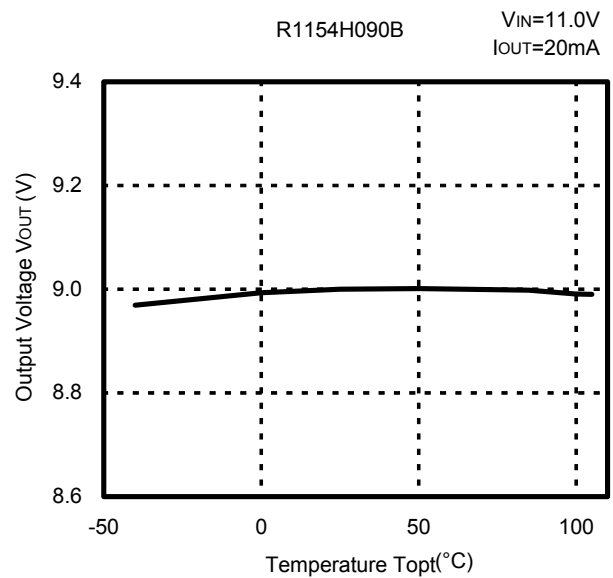
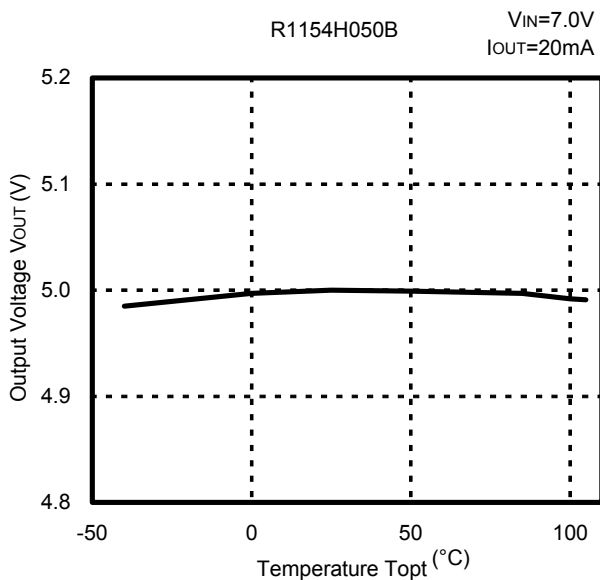
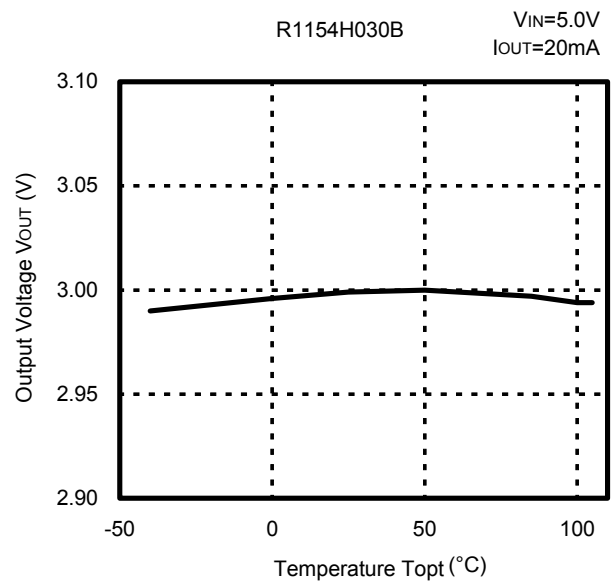
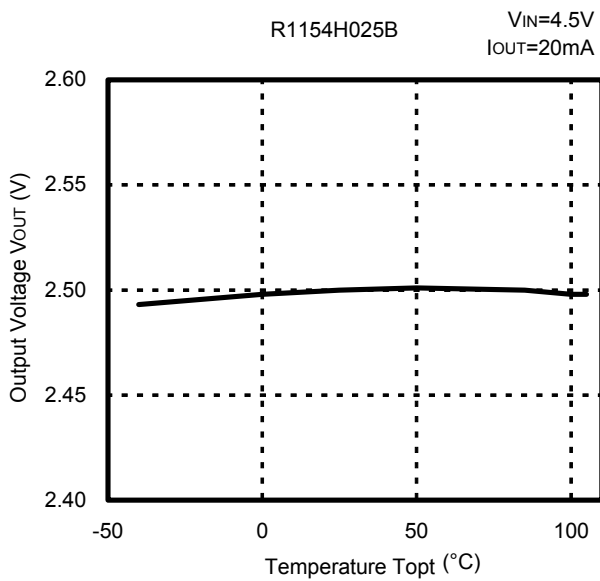




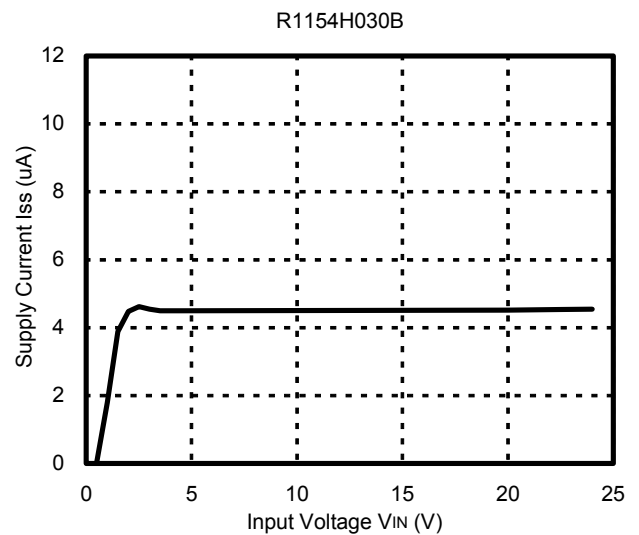
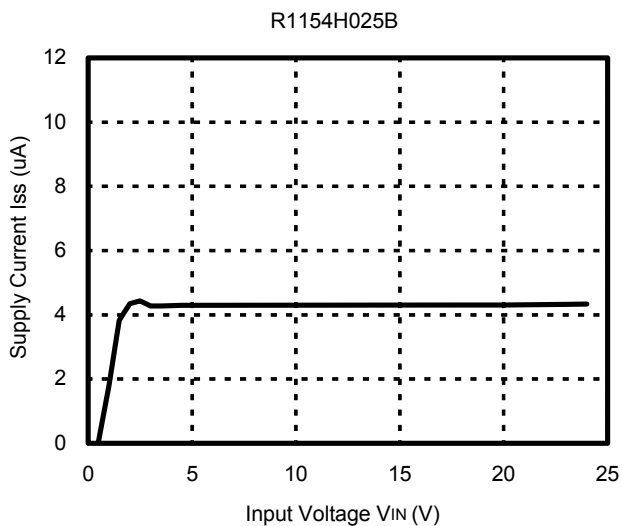
3) Dropout Voltage vs. Output Current

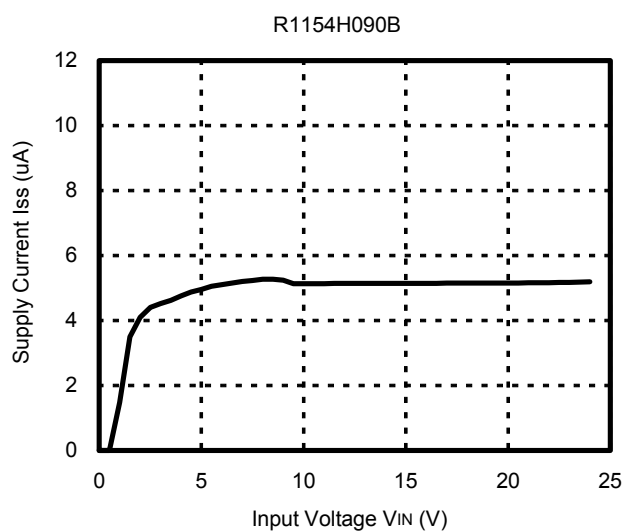
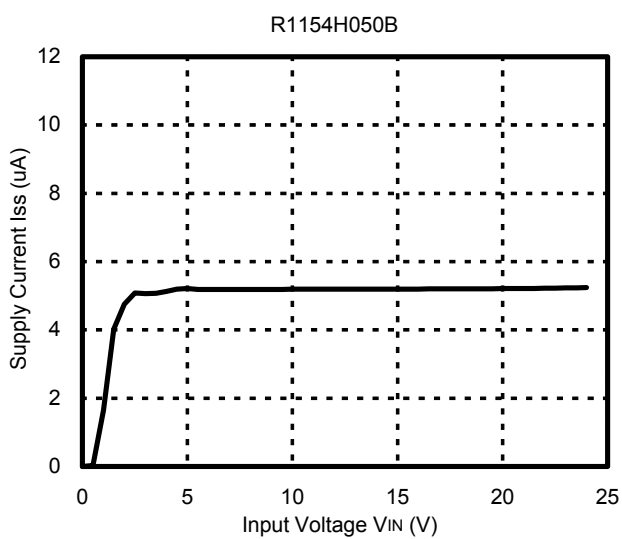


4) Output Voltage vs. Temperature

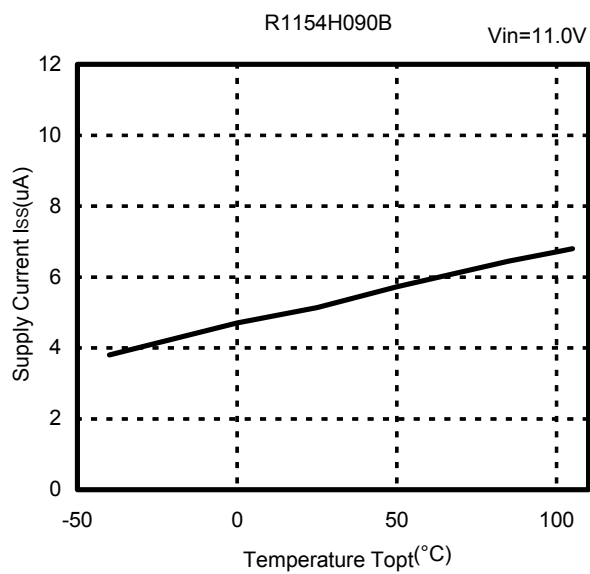
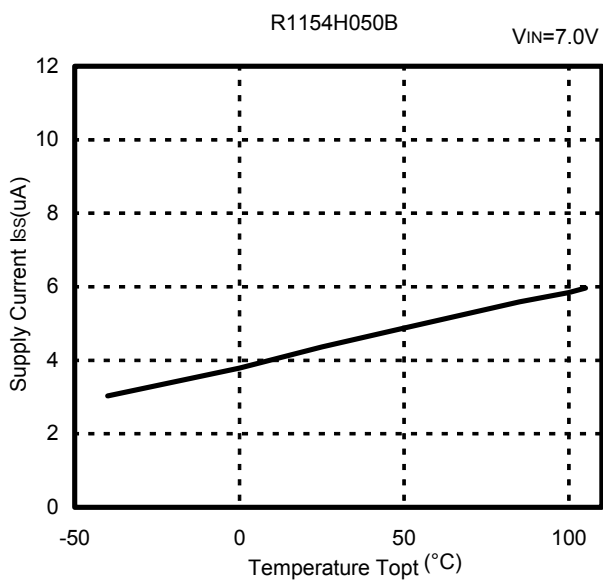
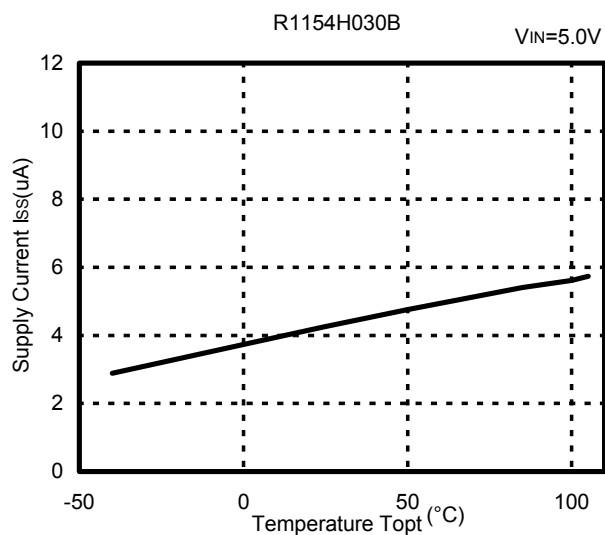
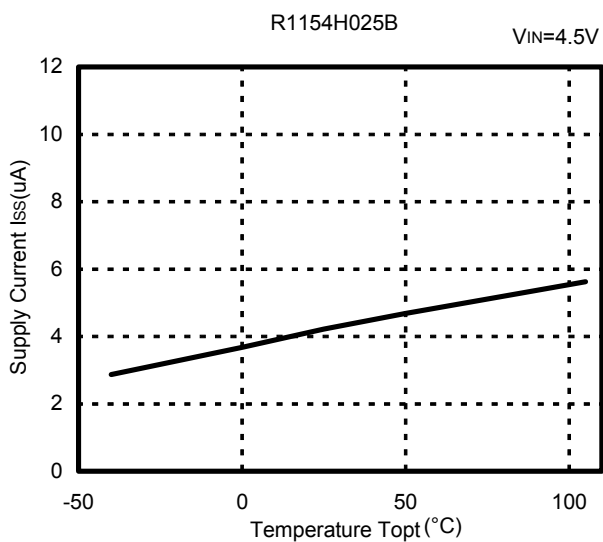


5) Supply Current vs. Input Voltage ($T_{opt}=25^{\circ}C$)

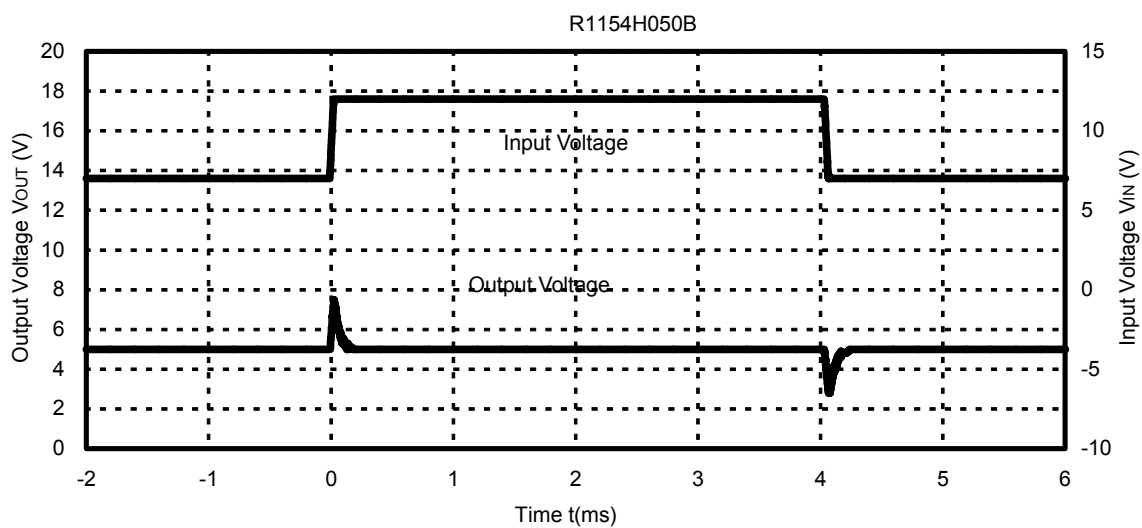
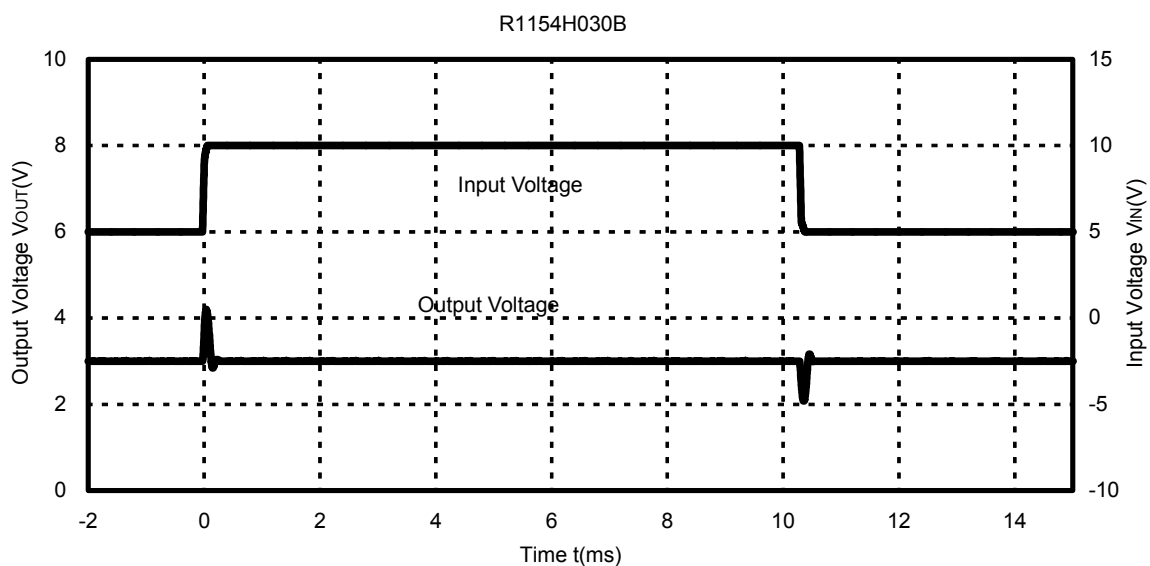
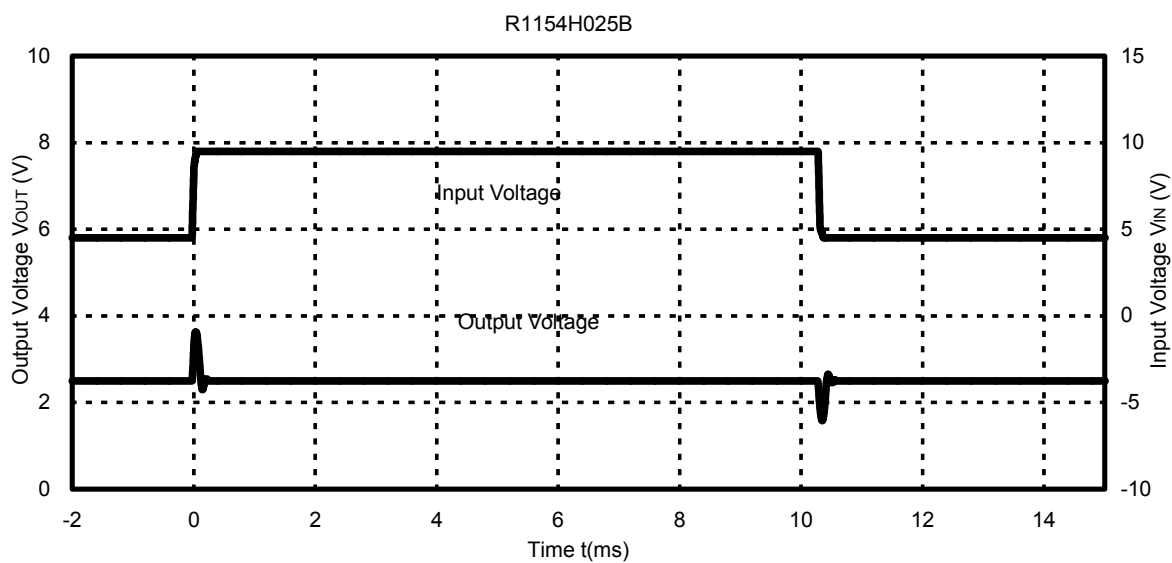


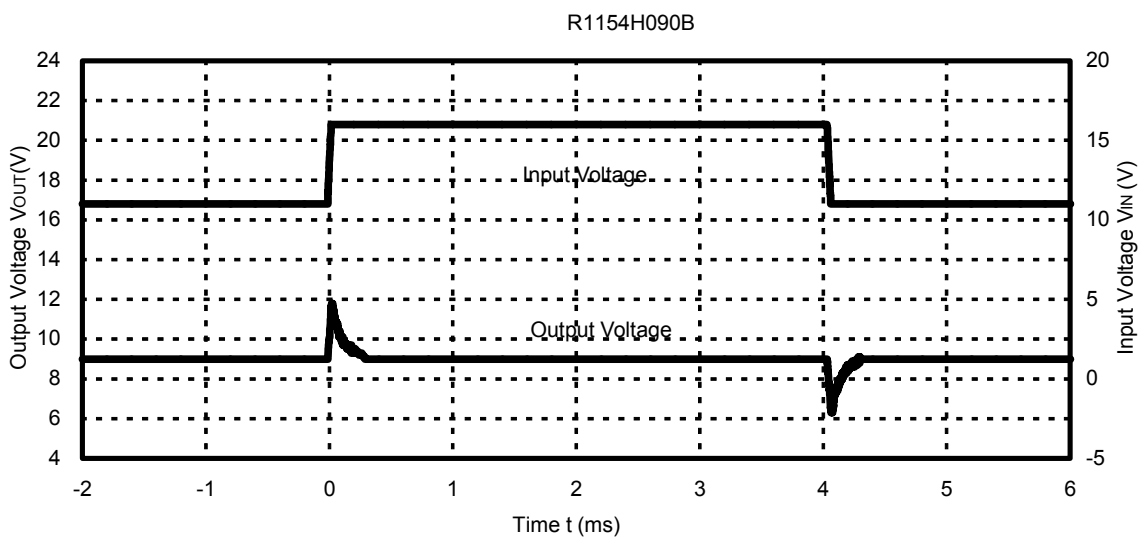


6) Supply Current vs. Temperature

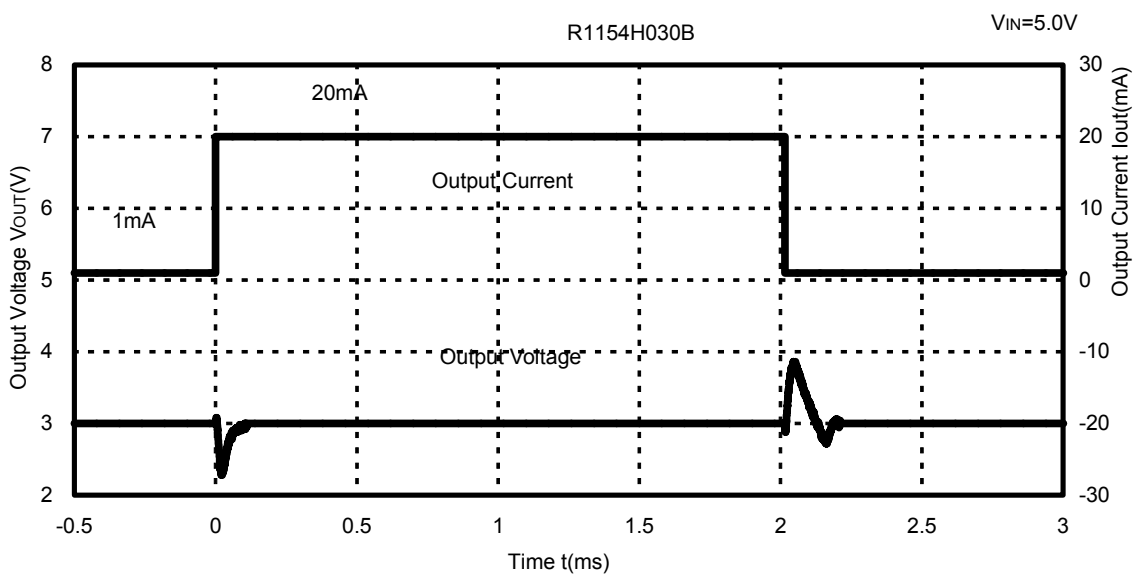
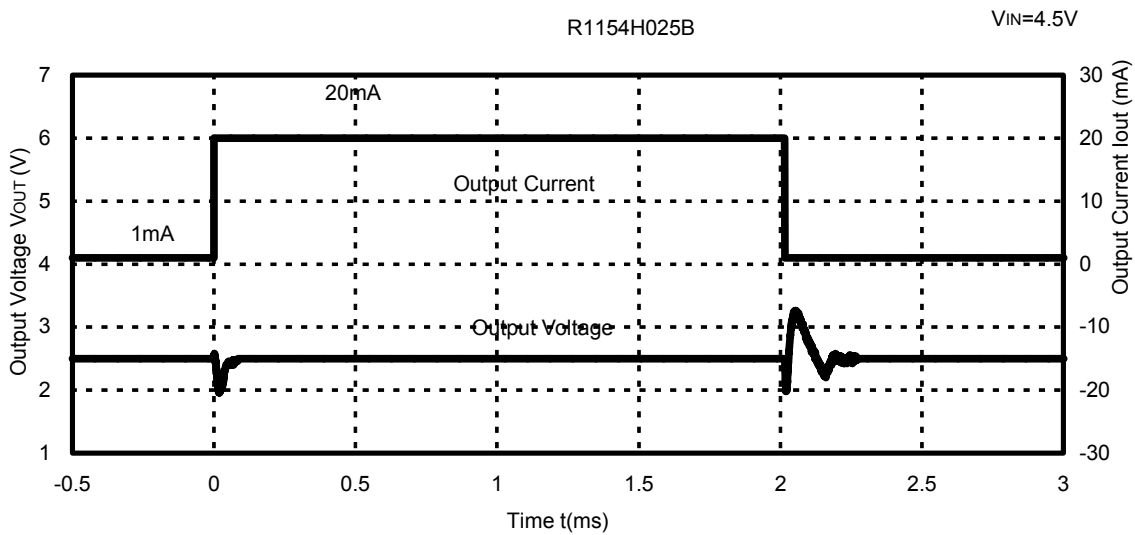


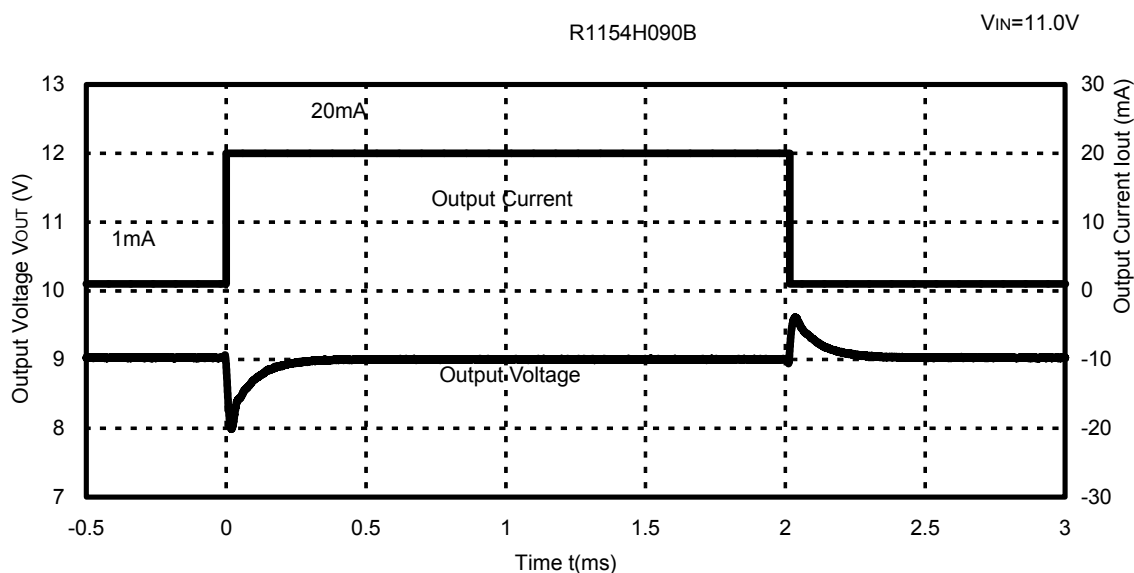
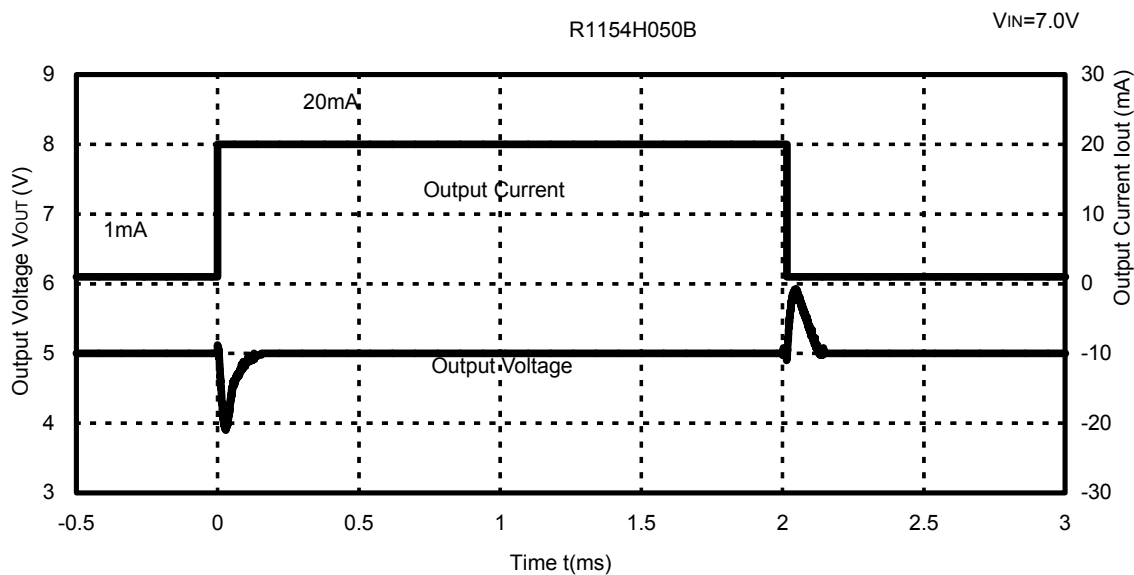
7) Input Transient Response ($I_{OUT}=20mA$, $C_{OUT}=0.1\mu F$, $T_{opt}=25^{\circ}C$)





8) Load Transient Response($C_{OUT}=0.1\mu F$, $T_{opt}=25^{\circ}C$)



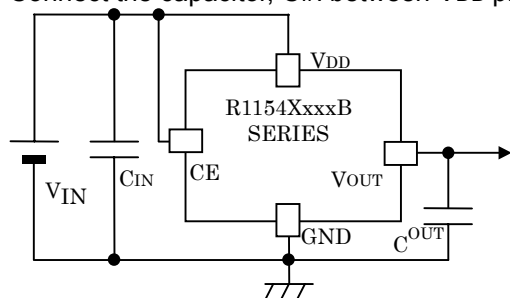


■ TECHNICAL NOTES

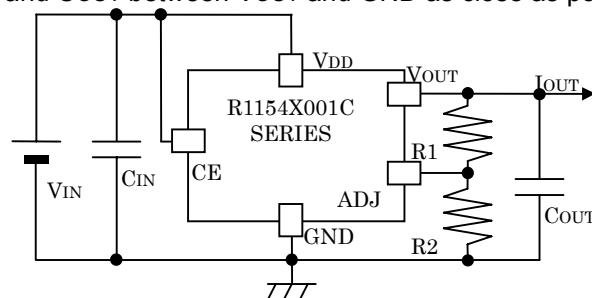
Phase Compensation

Phase Compensation of the R1154 Series has been made internally for stable operation even though the load current would vary. Therefore, without the capacitors, C_{IN} and C_{OUT}, the output voltage is regulated, however, for more stable operation, use capacitors as C_{IN} and C_{OUT}. Especially, if the input line is long and impedance is high, C_{IN} is necessary, moreover, if you use C_{OUT}, transient response will be improved. Recommended value is in the range from 0.1μF to 2.2μF. Wiring should be made as short as possible.

Connect the capacitor, C_{IN} between V_{DD} pin and GND pin and C_{OUT} between V_{OUT} and GND as close as possible.



R1154XxxxB Typical Application



R1154XxxxC Typical Application

Thermal Shutdown

Thermal shutdown function is included in the R1154 Series, if the junction temperature is equal or more than +150°C (Typ.), the operation of regulator would stop. After that, when the junction temperature is equal or less than +125°C (Typ.), the operation of regulator would restart. Unless the cause of rising temperature would remove, the regulator repeats on and off, and output waveform would be like consecutive pulses.

Chip Enable Circuit

Do not make voltage level of chip enable pin keep floating level, or in between V_{IH} and V_{IL} . Unless otherwise, Output voltage would be unstable or indefinite, or unexpected current would flow internally.