150mA VOLTAGE REGULATOR (Wide Input Voltage Range)

R1154Xxxxx series

■ OUTLINE

The R1154Xxxxx series are CMOS-based voltage regulator (VR) ICs. The R1154Xxxxxx 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 R1154Xxxxx series.

The regulator output voltage is fixed in the R1154XxxxB, while adjustable type is the R1154X001C (Under Development). Output voltage accuracy is ±2.0%.

Since the packages for these ICs are the SOT-89-5 package with which high density mounting of the ICs on boards is possible and SC-84-5 (Under Development) with large power dissipation.

■ FEATURES

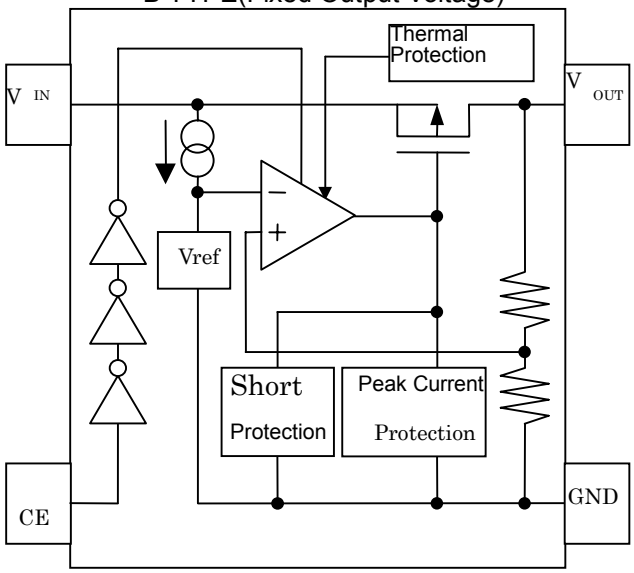
- ●Ultra-Low Supply Current• • • • • • • • Typ. 5.0μA
- ●Standby Current• • • • • • • • Typ. 0.1μA
- ●Input Voltage • • • • • • • • • • • • • • • • Max. 24V
- ●Wide Output Voltage Range • • • • • Stepwise setting with a step of 0.1V in the range of 2.5V to 12.0V (xxxB) or adjustable in the range of 2.5V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

■ APPLICATIONS

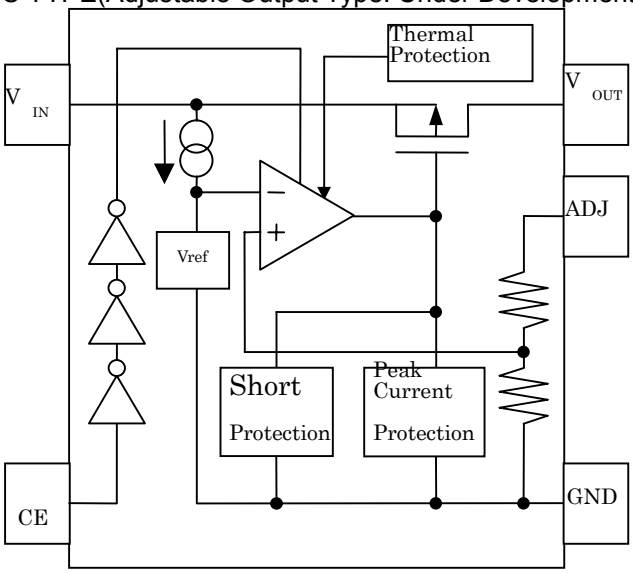
- ●Power source for home appliances such as refrigerators, rice cookers, Electronic water warmers, etc.
- ●Power source for car audio equipment, car navigation system, and ETC system.
- ●Power source for notebook PCs, digital TVs, cordless phones, and LAN system.
- ●Power source for copiers, printers,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

■ BLOCK DIAGRAMS

B TYPE(Fixed Output Voltage)



C TYPE(Adjustable Output Type: Under Development)



■ SELECTION GUIDE

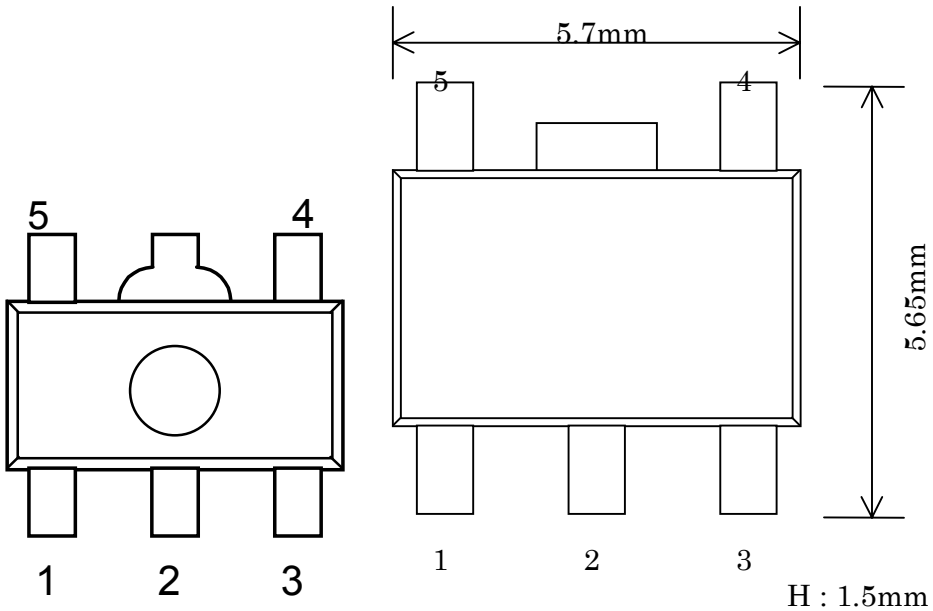
The output voltage can be selected at the user's request. The selection can be made with designating the part number as follows;

R1154XXXXX-XX ← Part Number

a b c d

Code	Contents
a	Designation of package type; H: SOT89-5 U: SC-84-5(Under Development)
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),T2(SC-84-5:Under Development) <-description of the direction of taping (Refer to Taping Specifications)

■ PIN CONFIGURATIONS



SOT-89-5 SC-84-5

■ PIN DESCRIPTION

Pin No.	Symbol	Description
1	V_{OUT}	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	V_{DD}	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	P_D	Internally Limited	
Operating Temperature	T_{opt}	-40 ~ +105	°C
Storage Temperature	T_{stg}	-55 ~ +125	°C

■ ELECTRICAL CHARACTERISTICS

(Topt=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	$\Delta V_{OUT}/\Delta I_{OUT}$	$V_{IN}-V_{OUT}=2.0V$ $1mA \le I_{OUT} \le 40mA$	Refer to the Load Regulation Table			
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	$I_{OUT}=20mA$ $V_{OUT}+1V \le V_{IN} \le 24V$		0.05	0.20	%/V
Dropout Voltage	V_{DIF}	$I_{OUT}=20mA$	Refer to the Dropout Voltage Table			
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta Topt$	$V_{IN}-V_{OUT}=2.0V$ $I_{OUT}=20mA$ $-40°C \le Topt \le 105°C$		±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 (Topt=25°C)

Output Voltage V_{OUT}(V)	Output Current(mA)
	Min.
$2.5 \le V_{OUT} \le 2.9$	140
$3.0 \le V_{OUT} \le 12.0$	150

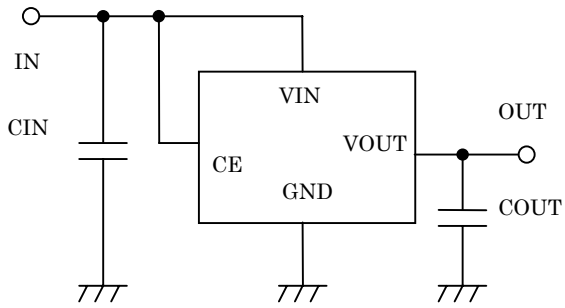
● Load Regulation (Topt=25°C)

Output Voltage V_{OUT}(V)	Load Regulation (mV)	
	Typ.	Max.
$2.5 \le V_{OUT} \le 5.0$	20	75
$5.1 \le V_{OUT} \le 12.0$	40	115

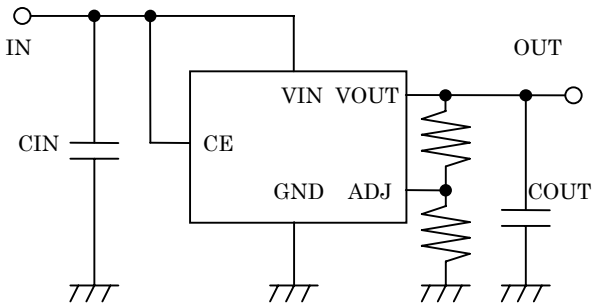
● Dropout Voltage (Topt=25°C)

Output Voltage V_{OUT}(V)	Dropout Voltage (V)	
	Typ.	Max.
$2.5 \le V_{OUT} \le 7.0$	0.20	0.40
$7.1 \le V_{OUT} \le 10.0$	0.25	0.50
$10.1 \le V_{OUT} \le 12.0$	0.30	0.55

■ TYPICAL APPLICATIONS

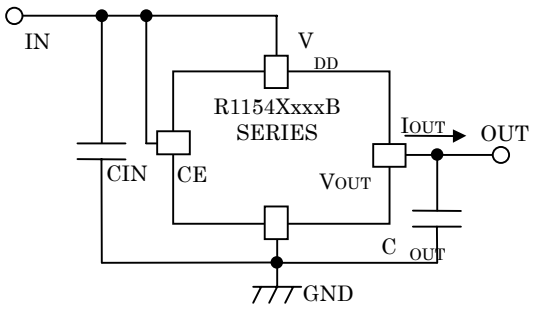


Fixed Output Voltage Type

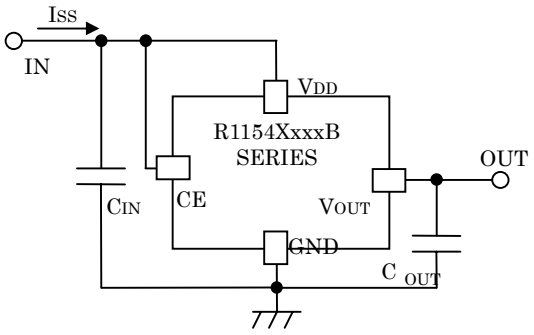


Adjustable Type (Under Development)

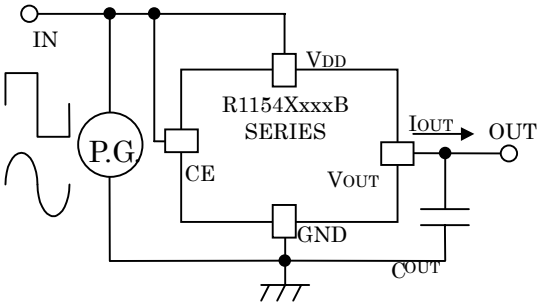
■ TEST CIRCUITS



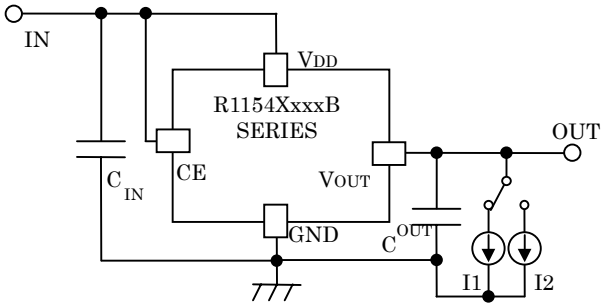
R1154XxxxB Standard Test Circuit



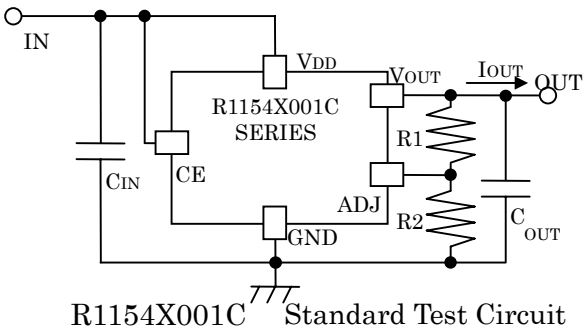
R1154XxxxB Supply Current Test Circuit



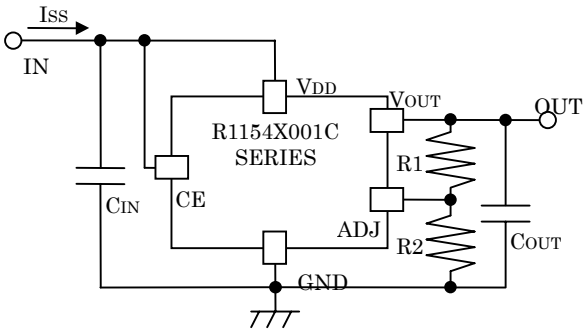
R1154XxxxB
Input Transient Response Test Circuit



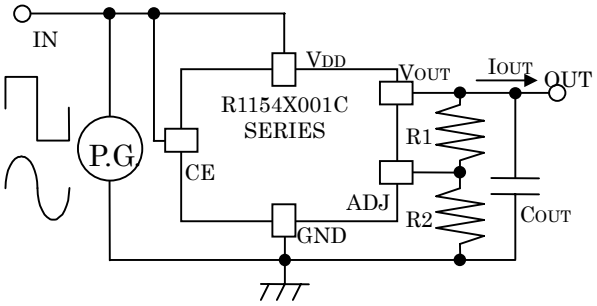
R1154XxxxB
Load Regulation Test Circuit



R1154X001C Standard Test Circuit

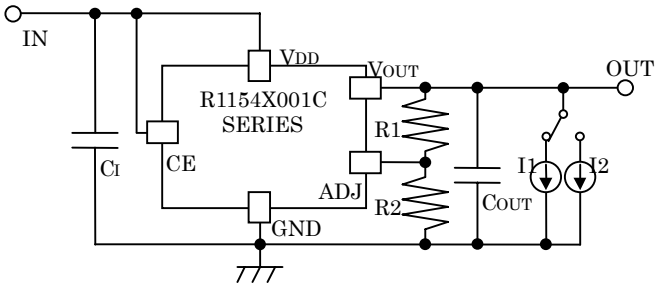


R1154X001C Supply Current Test Circuit



R1154X001C

Input Transient Response Test Circuit

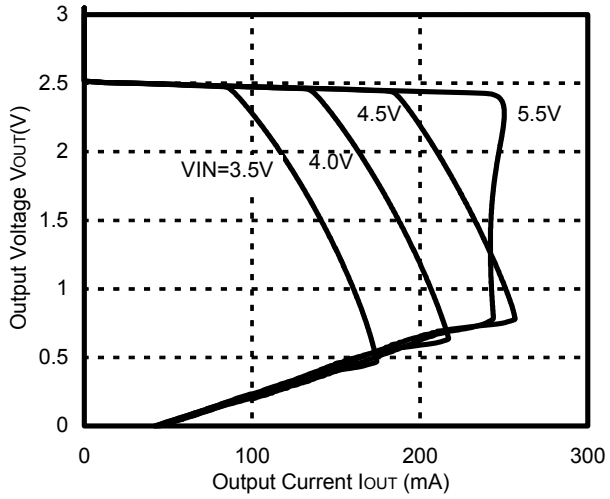


R1154X001C Load Transient Response Test Circuit

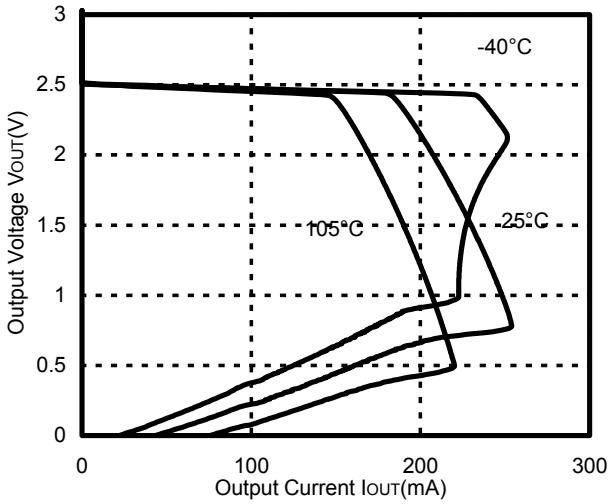
■ TYPICAL CHARACTERICS

1) Output Voltage vs. Output Current

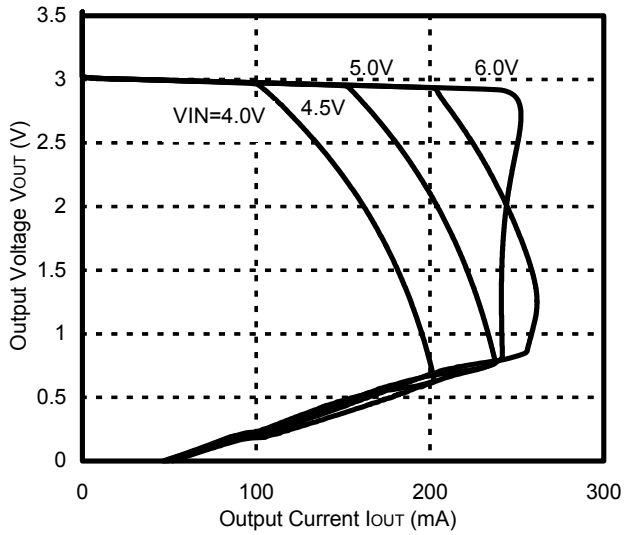
R1154H025B Topt=25°C



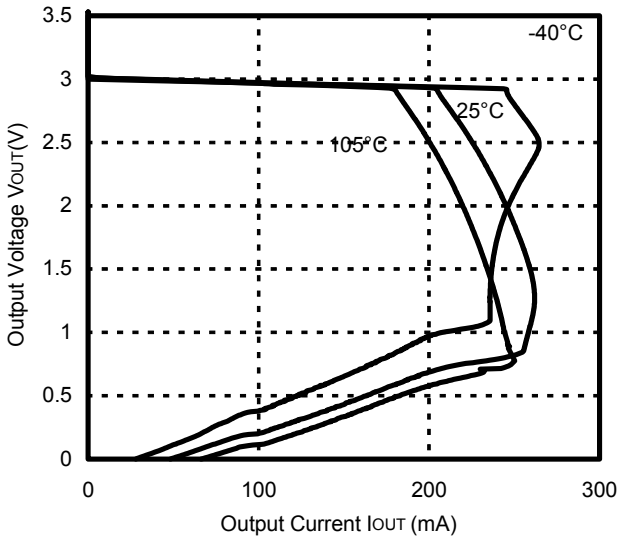
R1154H025B VIN=4.5V



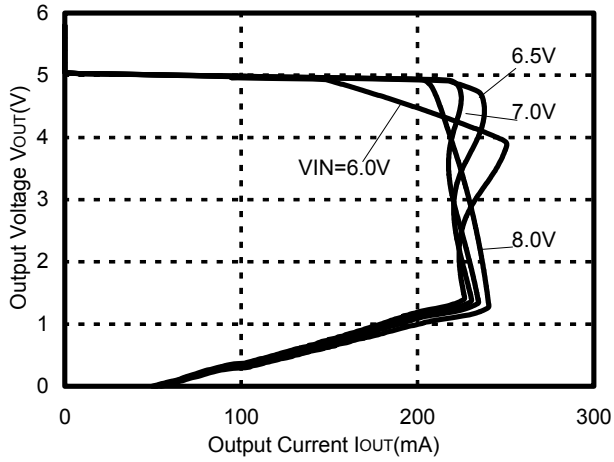
R1154H030B Topt=25°C



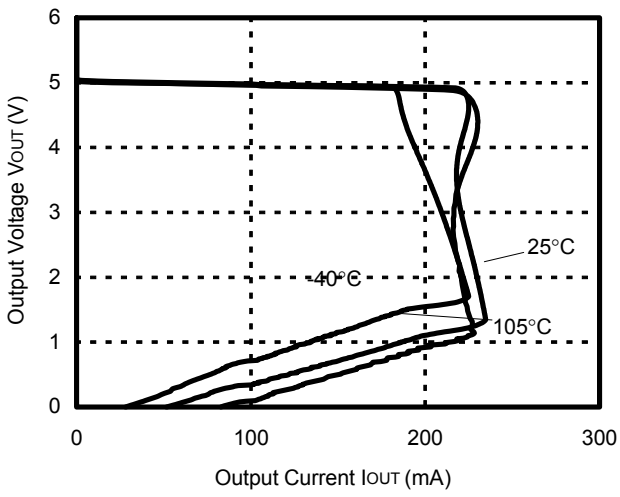
R1154H030B VIN=5.0V



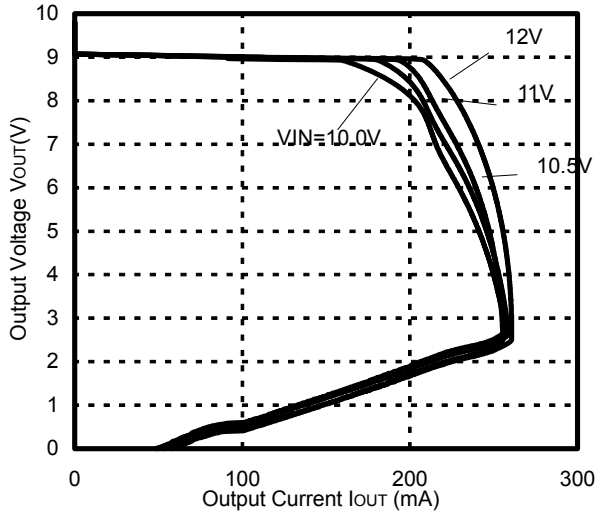
R1154H050B Topt=25°C



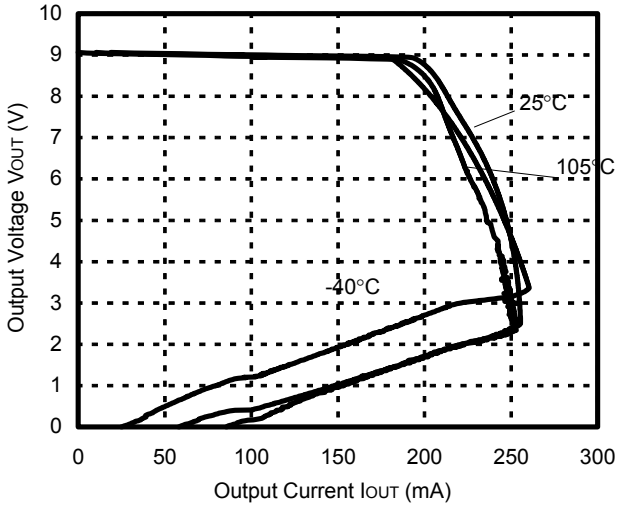
R1154H050B VIN=7.0V



R1154H090B Topt=25°C

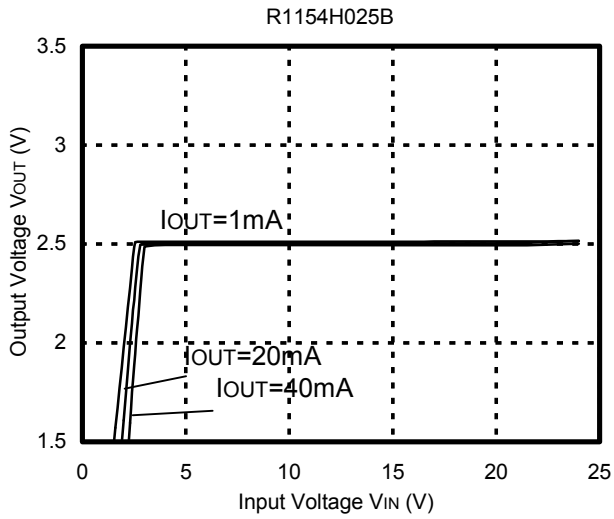


R1154H090B VIN=11.0V



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

R1154H025B



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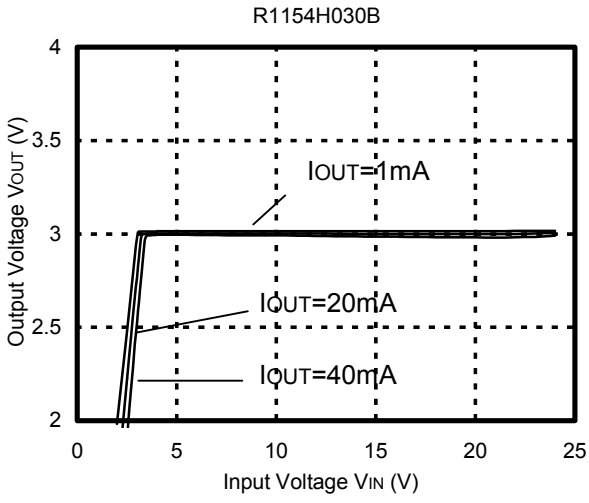
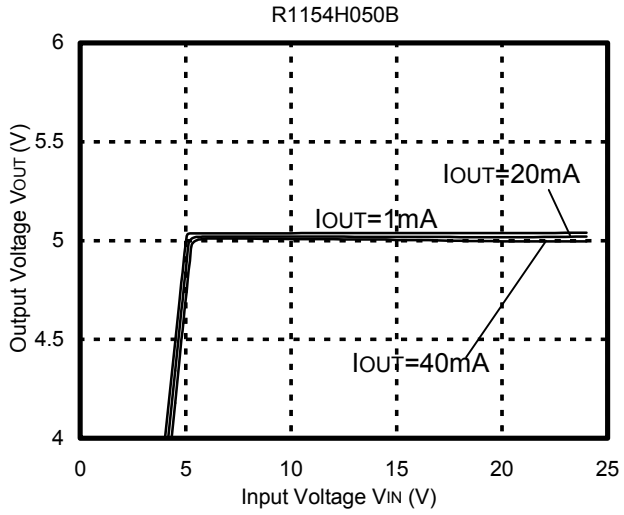
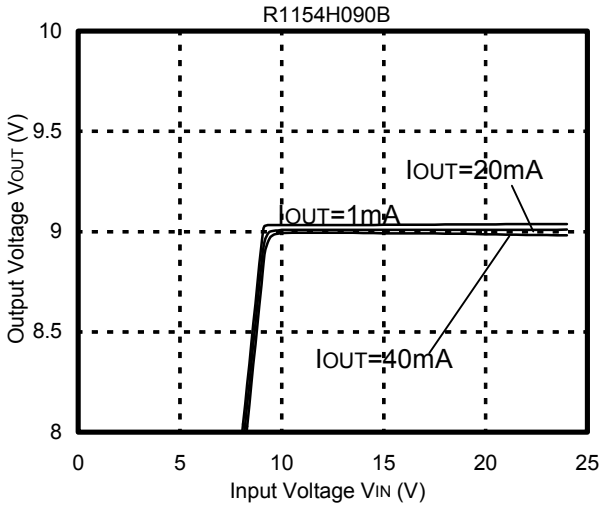
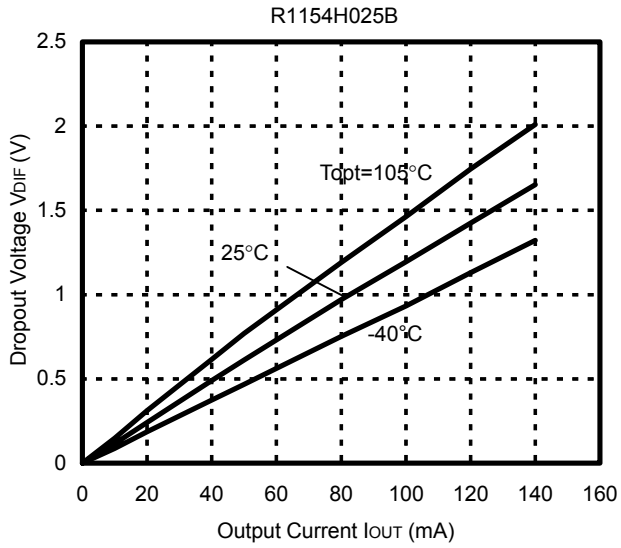
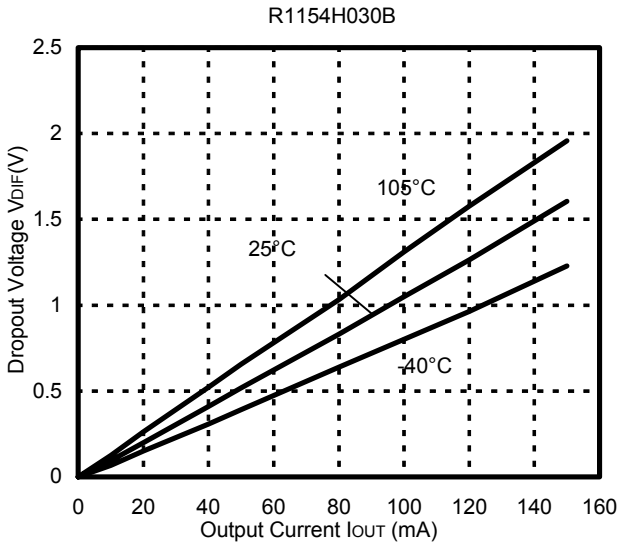


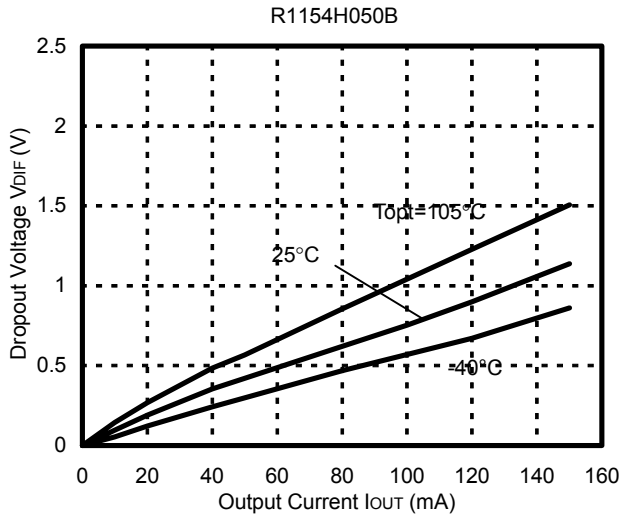


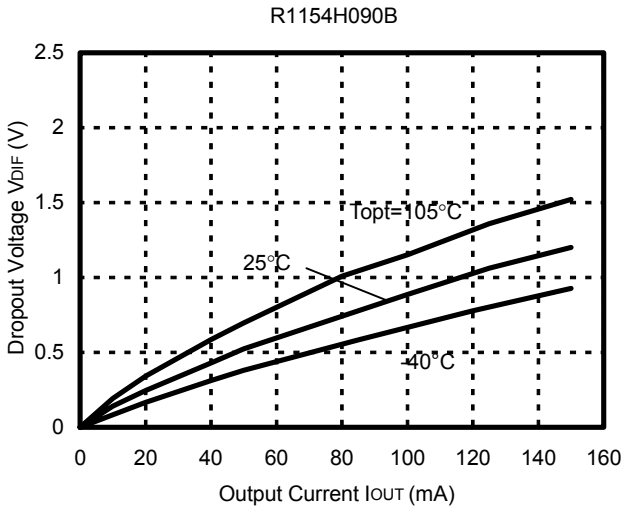


3) Dropout Voltage vs. Output Current

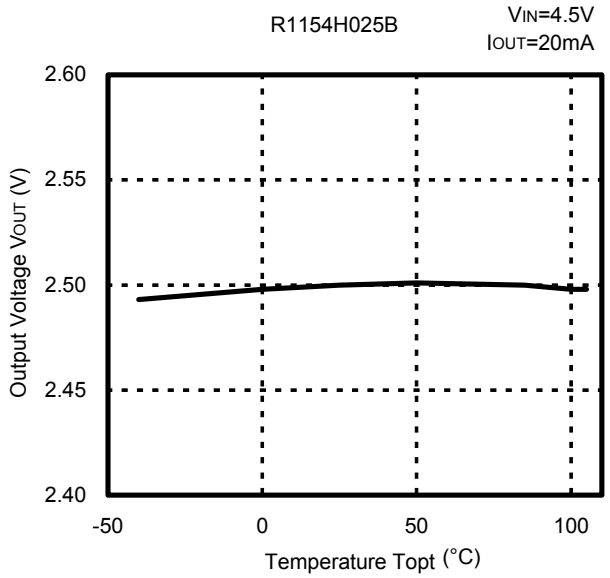


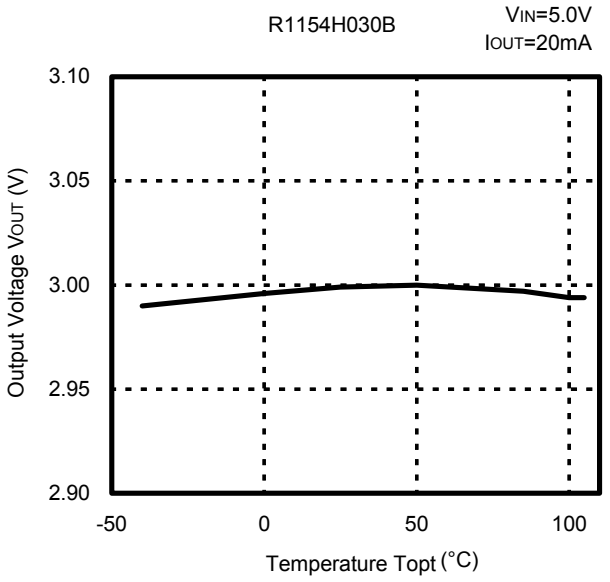


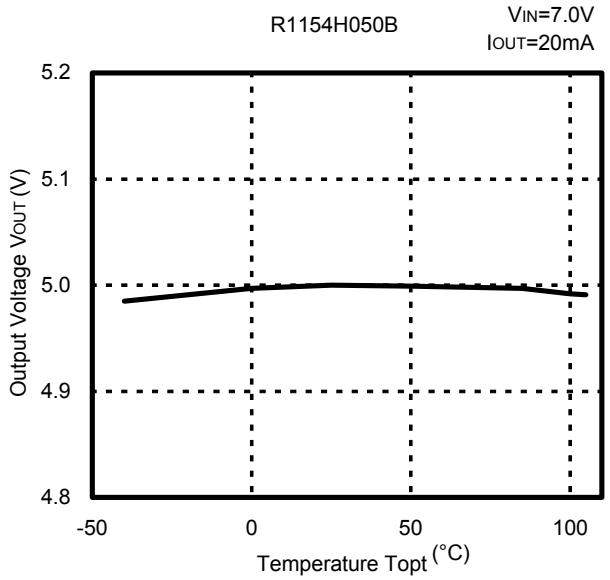


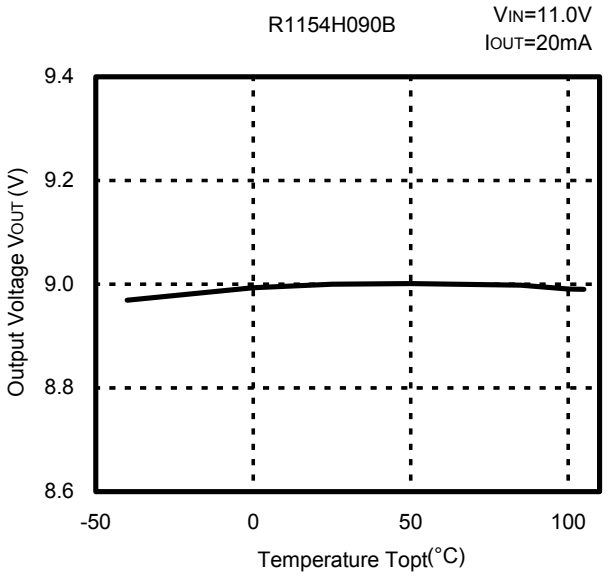


4) Output Voltage vs. Temperature

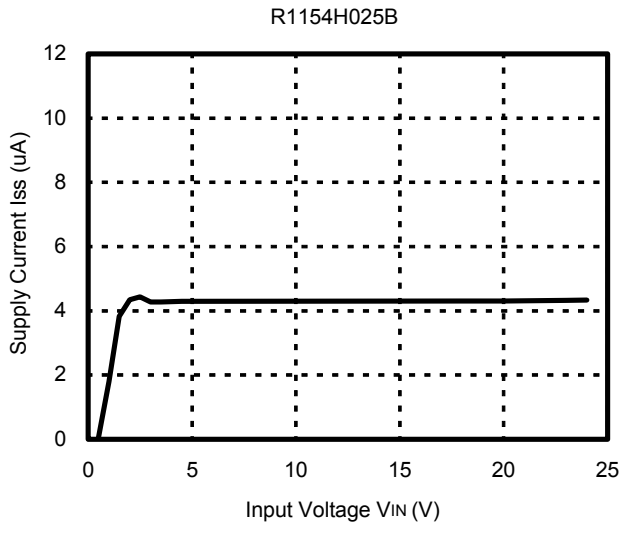


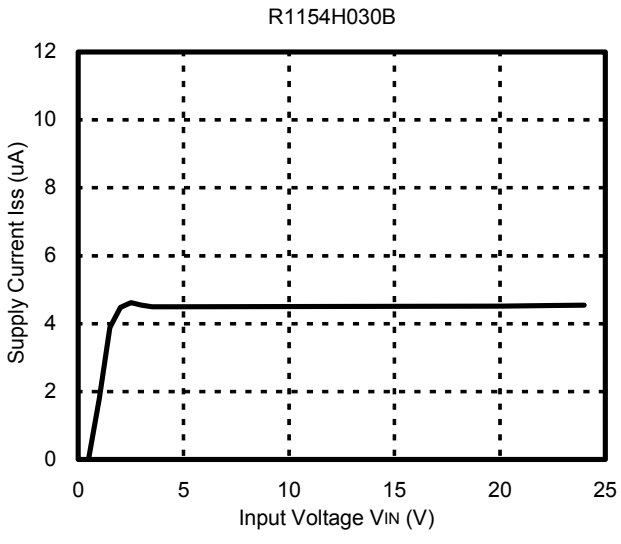


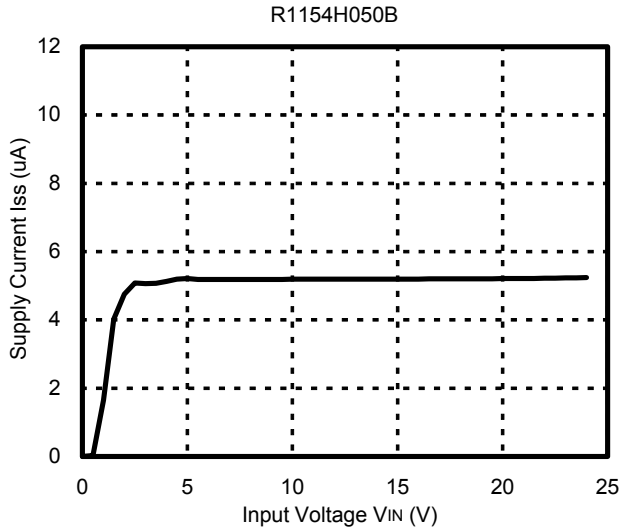


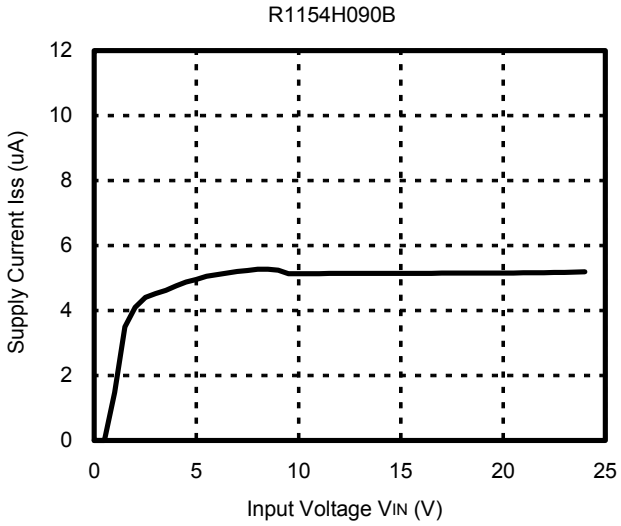


5)Supply Current vs. Input Voltage (Topt=25°C)

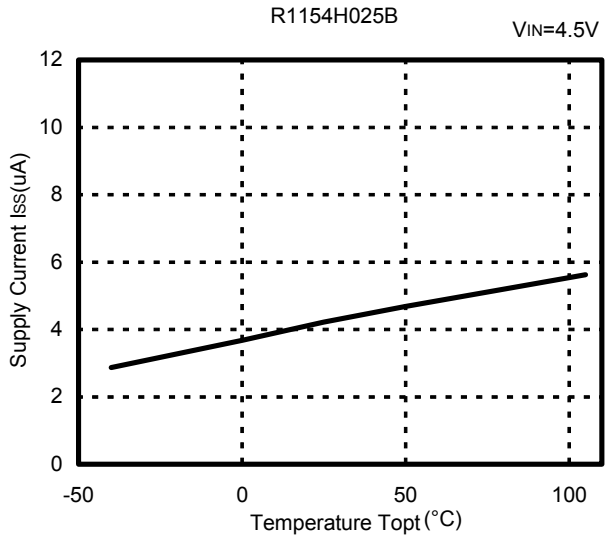


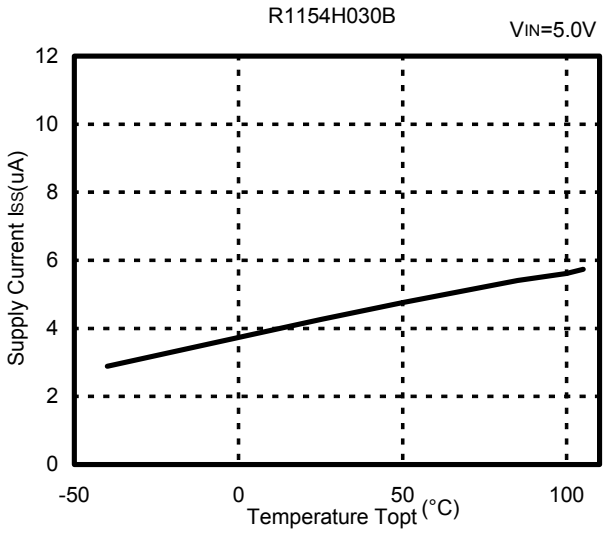


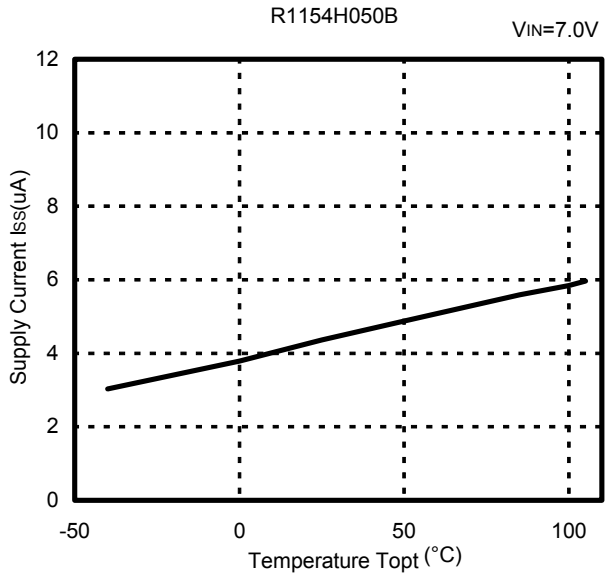


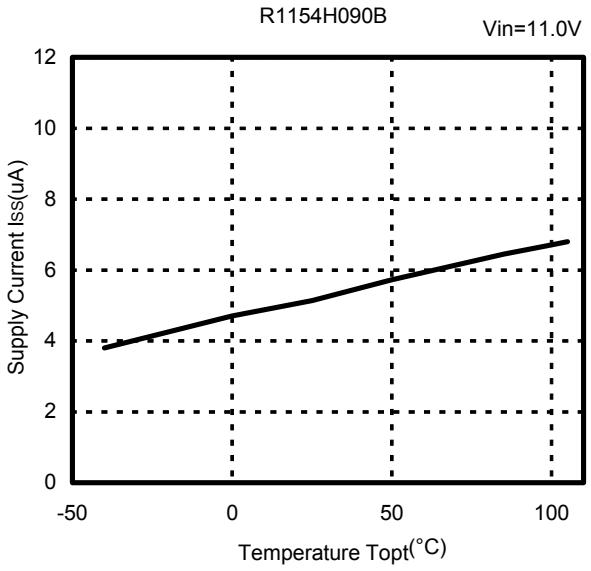


6)Supply Current vs. Temperature



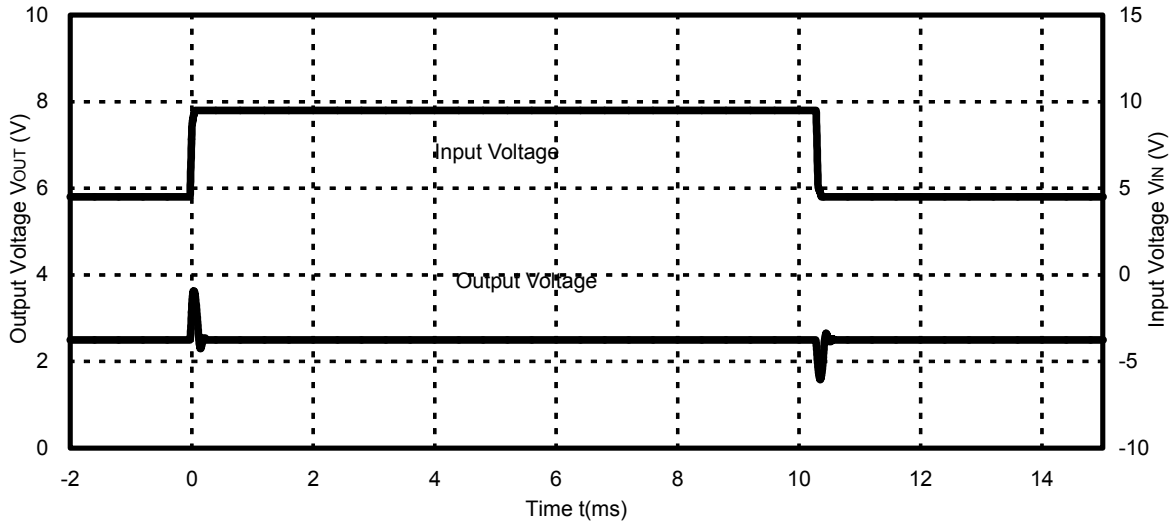




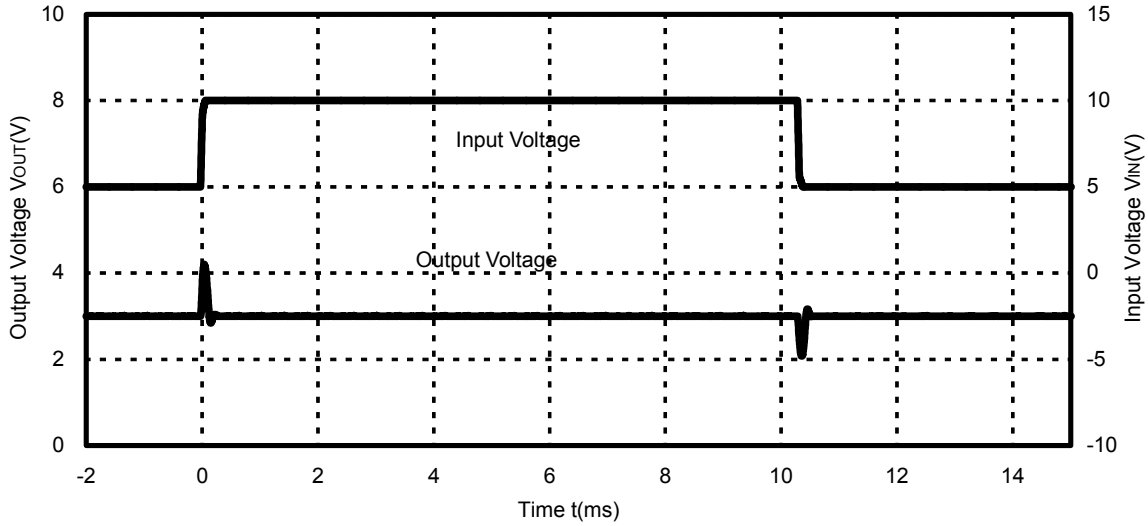


7) Input Transient Response (I_{OUT}=20mA, C_{OUT}=0.1uF, Topt=25°C)

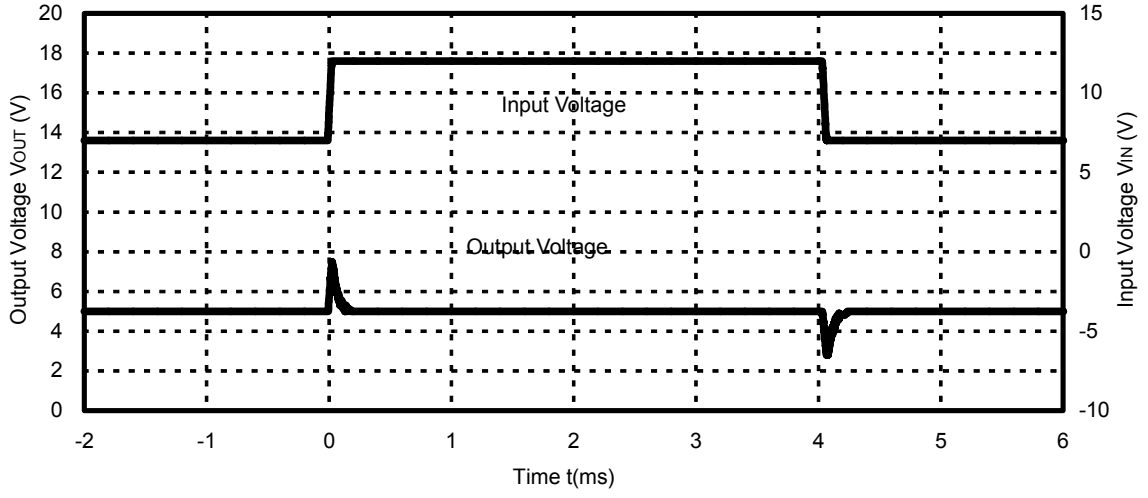
R1154H025B

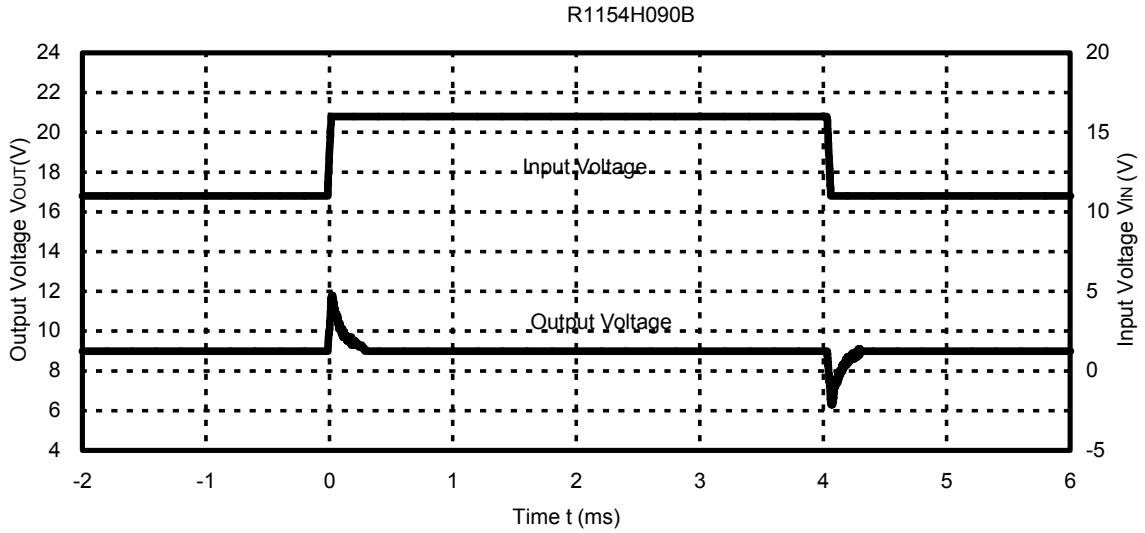


R1154H030B

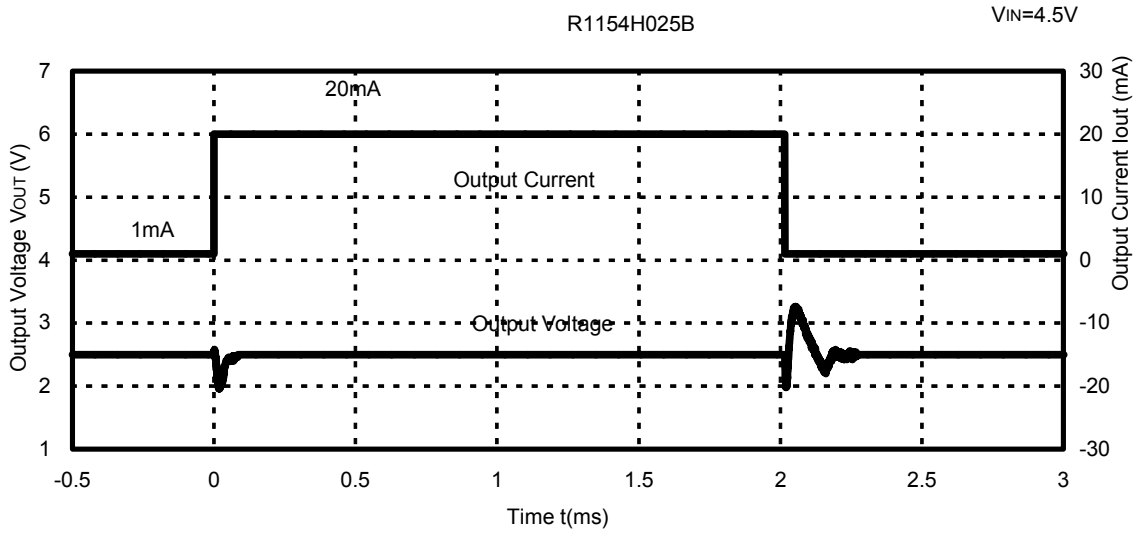


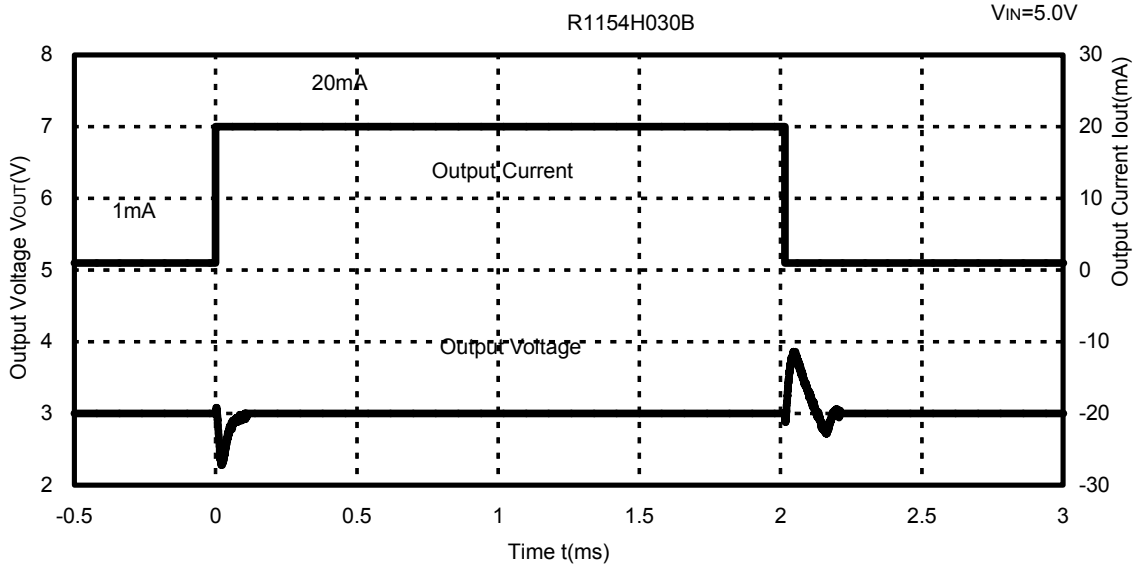
R1154H050B

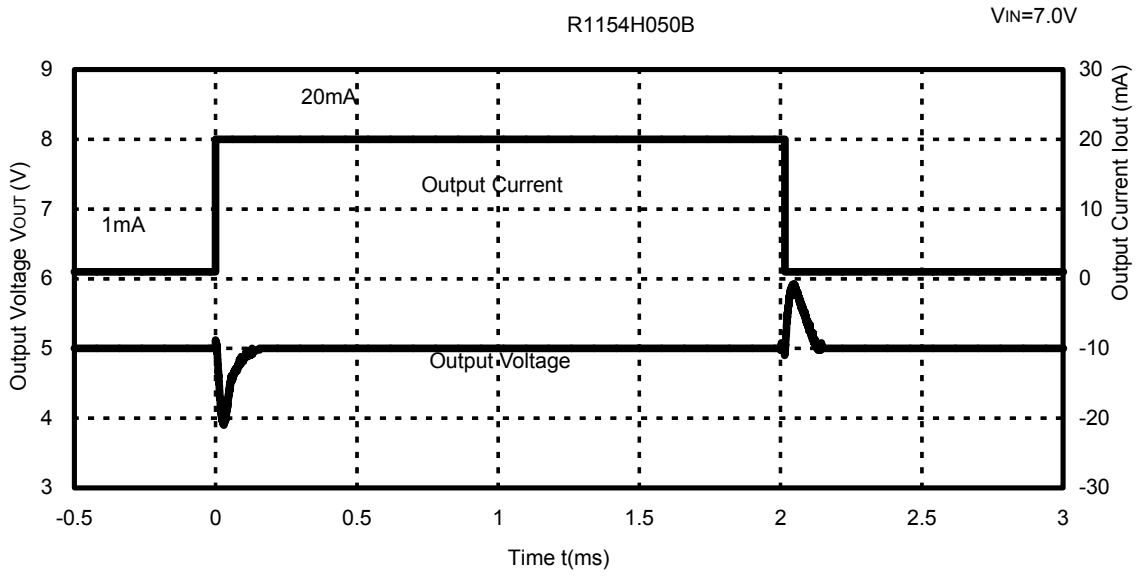


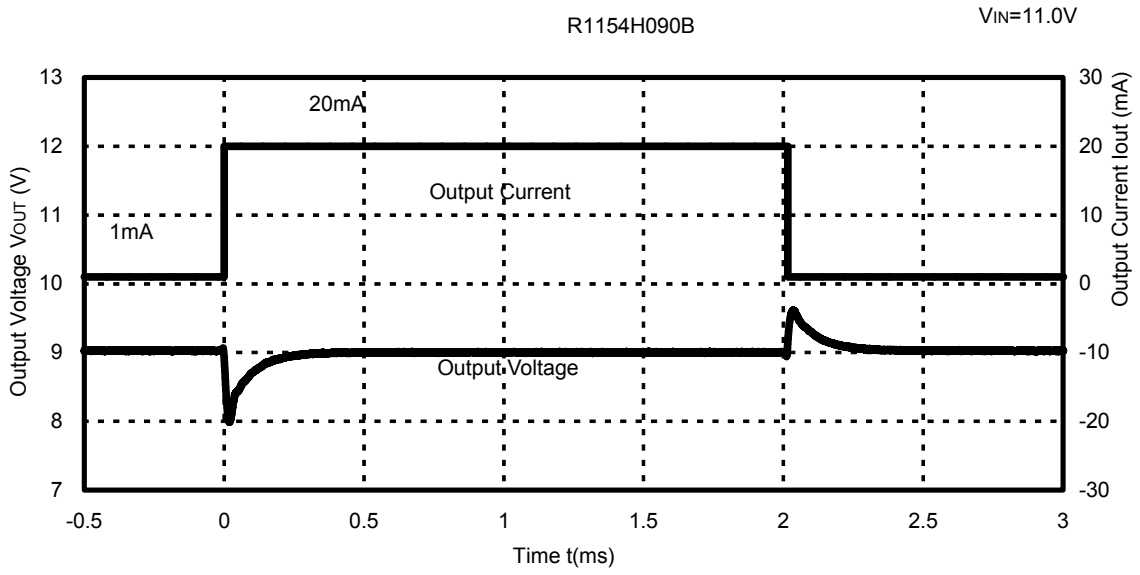


8)Load Transient Response(COUT=0.1uF , Topt=25°C)







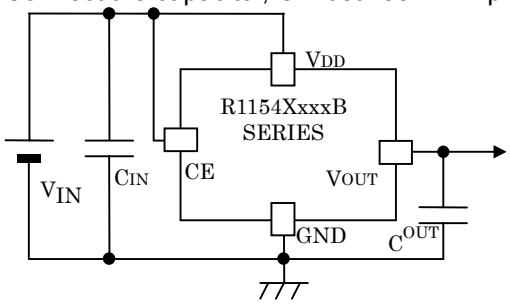


■ TECHNICAL NOTES

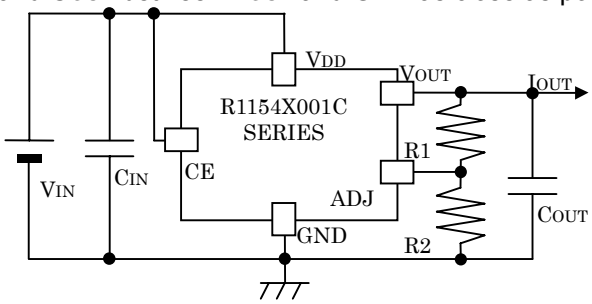
Phase Compensation

Phase Compensation of the R1154 Series has been made internally for stable operation even though the load current would vary. Therefore, without the capacitors, CIN and COUT, the output voltage is regulated, however, for more stable operation, use capacitors as CIN and COUT. Especially, if the input line is long and impedance is high, CIN is necessary, moreover, if you use COUT, 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, CIN between VDD pin and GND pin and COUT between VOUT 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.