VOLTAGE REGULATOR (with Wide Input Voltage Range) with RESET
R1150Hxxxx series

■ OUTLINE

The R1150Hxxxx series are CMOS-based voltage regulator (VR) ICs equipped with a voltage detector (V_{DET}). VR function of the R1150Hxxxx has features of low dropout voltage, high output voltage accuracy, and ultra-low supply current. Each of the R1150HxxxA types includes also a chip enable circuit. The output of built-in voltage detector is Nch open drain type. The R1150HxxxC/D types have a pin for connecting external capacitor to set a certain reset delay time instead of chip enable control pin.

The regulator output voltage and the detector threshold voltage are fixed in the IC. The output voltage accuracy is ±2.0%, while the detector threshold accuracy is ±2.5%. The R1150HxxxA (with chip enable function) and C series can supervise input voltage by the built-in detector. R1150HxxxB type can supervise SENSE pin voltage by the built-in detector. R1150HxxxD type can supervise V_{OUT} voltage, or the regulator output voltage of this IC itself.

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

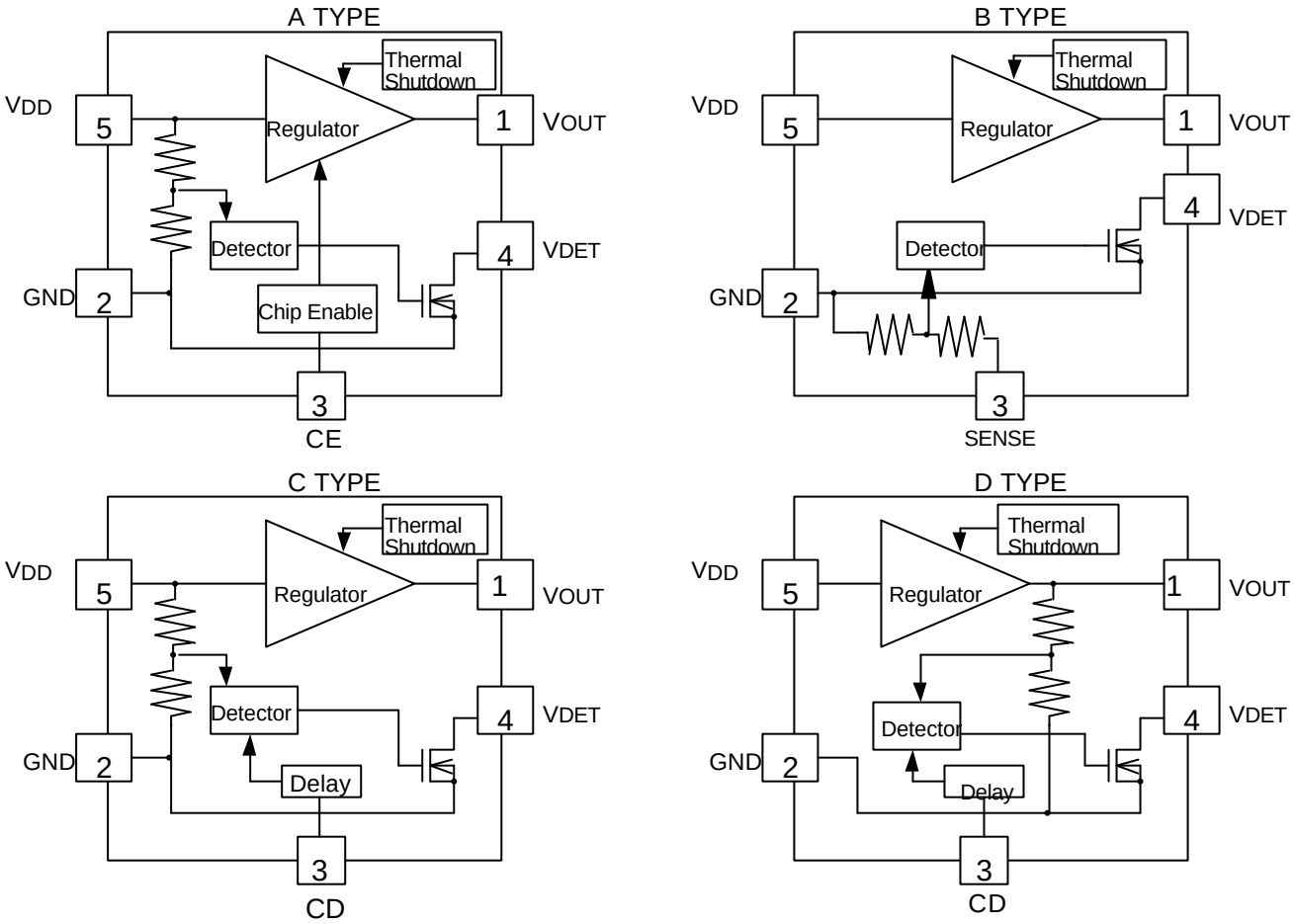
■ FEATURES

- ●Ultra-Low Supply Current • • • • • • • • Typ. 7μA
- ●Input Voltage • • • • • • • • • • • • • • • Max. 24V
- ●Output Voltage (VR) • • • • • • • • • • • • Stepwise setting with a step of 0.1V in the range of 2.1V to 14.0V
- ●Detector Threshold Voltage (V_{DET}) • • • • • • Stepwise setting with a step of 0.1V in the range of 2.3V to 15.0V
- ●High Output Voltage Accuracy • • • • ±2.0%(VR) ±2.5%(VD)
- ●Output Current • • • • • • • • • • • • Min. 150mA(V_{OUT}=5V)
- ●Small Package • • • • • • • • • • • • • • • • SOT-89-5
- ●Built-in Current Limit Circuit, Thermal Shutdown Circuit (VR)
- ●Monitoring V_{DD} voltage • • • • • • • • • A/C type
  Monitoring Sense Pin ($_{SENSE}$) voltage • • • • • • • • • B type
  Monitoring V_{OUT} Pin voltage • • • • • • • • • D type

■ APPLICATIONS

- ●Power source and Reset circuit for cameras, videos and mobile telecommunication equipment.
- ●Power source and Reset circuit for battery-operated equipment.
- ●Power source and Reset circuit for home appliances.

■ BLOCK DIAGRAMS



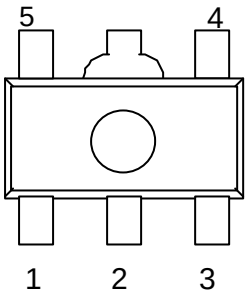
■ SELECTION GUIDE

The output voltage and the usage of pin No.3 (as a kind of types in the R1150Hxxxx series) can be selected at the user's request. The selection can be made with designating the part number as follows;

R1150HXXXX-XX ← Part Number
↑ ↑ ↑ ↑
a b c d

Code	Contents
a	Designation of package type; H : SOT89-5
b	Serial Number for Voltage Setting
c	Designation of option; A: Built-in Chip Enable Circuit (V_{DET} supervises V_{IN} level.) B: V_{DET} supervises SENSE pin. C: Used with an external capacitor for setting output delay time of V_{DET}. (V_{DET} supervises V_{IN}.) D: Used with an external capacitor for setting output delay time of V_{DET}. (V_{DET} supervises V_{OUT}.)
d	Designation of Taping Type; (Refer to Taping Specifications)

■ PIN CONFIGURATION



SOT-89-5

■ PIN DESCRIPTION

Pin No.	Symbol	Description
1	V_{OUT}	Voltage Regulator Output Pin
2	GND	Ground Pin
3	CE(A type)	Chip Enable Pin
	SENSE(B type)	Sense Pin for Voltage Detector
	CD(C/D type)	Pin for External Capacitor for Setting Output Delay of Voltage Detector
4	V_{DET}	Voltage Detector 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)*Note1	V_{CE}	-0.3 ~ V_{IN}+0.3	V
Input Voltage(SENSE Input Pin)*Note2	V_{SENSE}	-0.3 ~ V_{IN}+0.3	V
Input Voltage(CD Input Pin)*Note3	V_{CD}	-0.3 ~ V_{IN}+0.3	V
Output Voltage(V_{DET} Output Pin)	V_{DET}	-0.3 ~ V_{IN}+0.3	V
Output Voltage	V_{OUT}	-0.3 ~ V_{IN}+0.3	V
Output Current(VR)	I_{OUT1}	300	mA
Output Current(V_{DET})	I_{OUT2}	10	mA
Power Dissipation	P_D	Internal Limited	
Operating Temperature	Topt	-40 ~ 85	°C
Storage Temperature	Tstg	-55 ~ 125	°C

*Note1: This item is for A Version.
*Note2: This item is for B Version
*Note3: This item is for C/D Version

■ ELECTRICAL CHARACTERISTICS

●R1150HxxxA

(Topt=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}				24.0	V
Supply Current 1	I_{SS1}	$V_{IN}=V_{CE}$ $V_{OUT} \geq (-V_{DET})$: $V_{IN}-V_{OUT}=2.0V$ $V_{OUT} < (-V_{DET})$: $V_{IN}=(-V_{DET})+2.0V$		7	14	µA
Supply Current 2	Iss2	V_{DD}=24V, V_{CE}=0V	Refer to Supply Current 2 Table			
Thermal Shutdown Temperature	T_{SD}	Junction Temperature		150		°C
Thermal Shutdown Released Temperature	T_{SR}	Junction Temperature		120		°C

VR part

(Topt=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output voltage	V_{OUT}	$V_{IN}-V_{OUT}=2.0V$ I_{OUT}=20mA	x0.98		x1.02	V
Output Current	I_{OUT}	$V_{IN}-V_{OUT}=2.0V$	Refer to Output Current Table			
Load Regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	$V_{IN}-V_{OUT}=2.0V$ $1mA \leq I_{OUT} \leq 40mA$	Refer to Load Regulation Table			
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	$V_{IN}-V_{OUT}=2.0V$ I_{OUT}=20mA $V_{OUT}+1V \leq V_{IN} \leq 24V$		0.05	0.15	%/V
Dropout Voltage	V_{DIF}	I_{OUT}=20mA	Refer to Dropout Voltage Table			
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$V_{IN}-V_{OUT}=2.0V$ I_{OUT}=20mA -40°C ≤ Topt ≤ 85°C		±100		ppm /°C
Short Current Limit	I_{LIM}	V_{OUT}=0V		45		mA
CE "H" Input Voltage	V_{CEH}		1.5		V_{IN}	V
CE "L" Input Voltage	V_{CEL}		0		0.25	V

V_{DET} part

(Topt=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Detector Threshold	$-V_{DET}$		x0.975		x1.025	V
Detector Threshold Hysteresis	V_{HYS}		$-V_{DET}$ x0.03	$-V_{DET}$ x0.05	$-V_{DET}$ x0.07	V
Sink Current	I_{DOUT}	V_{IN}=2.0V, V_{DET}=0.05V	0.15	0.20		µA
Minimum Operating Voltage	V_{DDL}	*Note 1		0.9	1.2	V
Detector Threshold Temperature Coefficient	$\Delta -V_{DET}/\Delta T$	-40°C≤Topt≤85°C		±100		ppm /°C
Output Delay Time	t_{PLH}	*Note 2		0.5	1.0	ms

●R1150HxxxB

(Topt=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}				24.0	V
Supply Current	I_{SS}	$V_{OUT} \geq (-V_{DET})$: V_{IN}=SENSE =V_{OUT}+2.0V $V_{OUT} < (-V_{DET})$: V_{IN}=SENSE =$(-V_{DET})$+2.0V		7	14	µA
Thermal Shutdown Temperature	T_{SD}	Junction Temperature		150		°C
Thermal Shutdown Released Temperature	T_{SR}	Junction Temperature		120		°C

VR part

(Topt=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output voltage	V_{OUT}	V_{IN}-V_{OUT}=2.0V I_{OUT}=20mA	V_{SET} x0.98	V_{SET}	V_{SET} x1.02	V
Output Current	I_{OUT}	V_{IN}-V_{OUT}=2.0V	Refer to Output Current Table			
Load regulation	ΔV_{OUT}/ ΔI_{OUT}	V_{IN}-V_{OUT}=2.0V 1mA≤I_{OUT}≤40mA	Refer to Load Regulation Table			
Line regulation	ΔV_{OUT}/ ΔV_{IN}	I_{OUT}=20mA V_{OUT}+1V≤V_{IN}≤24V		0.05	0.15	%/V
Dropout Voltage	V_{DIF}	I_{OUT}=20mA	Refer to Dropout Voltage Table			
Output Voltage Temperature Coefficient	ΔV_{OUT}/ ΔT	V_{IN}-V_{OUT}=2.0V I_{OUT}=20mA -40°C≤Topt≤85°C		±100		ppm /°C
Short Current Limit	I_{LIM}	V_{OUT}=0V		45		mA

V_{DET} part

(Topt=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Detector Threshold	$-V_{DET}$		V_{SET} x0.975	V_{SET}	V_{SET} x1.025	V
Detector Threshold Hysteresis	V_{HYS}		$-V_{DET}$ x0.03	$-V_{DET}$ x0.05	$-V_{DET}$ x0.07	V
Sink Current	I_{DOUT}	V_{IN}=SENSE=2.0V, V_{DS}=0.05V	0.17			mA
Minimum Operating Voltage	V_{DDL}	*Note 1		0.9	1.2	V
Detector Threshold Temperature Coefficient	Δ-V_{DET}/ ΔT	-40°C≤Topt≤85°C		±100		ppm /°C
Output Delay Time	t_{PLH}	*Note 2		1.0	1.5	ms

●R1150HxxxC

(Topt=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input voltage	V_{IN}				24.0	V
Supply Current	I_{SS}	$V_{OUT} \geq (-V_{DET})$: V_{IN}=V_{OUT}+2.0V $V_{OUT} < (-V_{DET})$: V_{IN}=$(-V_{DET})$+2.0V		7	14	µA
Thermal Shutdown Temperature	T_{SD}	Junction Temperature		150		°C
Thermal Shutdown Released Temperature	T_{SR}	Junction Temperature		120		°C

VR part (Topt=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_{OUT}	$V_{IN}=V_{OUT}+2V$, $I_{OUT}=20mA$	V_{SET} x0.98	V_{SET}	V_{SET} x1.02	V
Output Current	I_{OUT}	$V_{IN}-V_{OUT}=2.0V$	Refer to Output Current Table			
Load regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	$V_{IN}-V_{OUT}=2.0V$ $1mA\leq I_{OUT}\leq 40mA$	Refer to Load Regulation Table			
Line regulation	$\Delta V_{OUT}/\Delta V_{IN}$	$I_{OUT}=20mA$ $V_{OUT}+1V\leq V_{IN}\leq 24V$		0.05	0.15	%/V
Dropout Voltage	V_{DIF}	$I_{OUT}=20mA$	Refer to Dropout Voltage Table			
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$V_{IN}-V_{OUT}=2.0V$ $I_{OUT}=20mA$ $-40°C\leq Topt\leq 85°C$		±100		ppm /°C
Short Current Limit	I_{LIM}	$V_{OUT}=0V$		45		mA

V_{DET} part (Topt=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Detector Threshold	$-V_{DET}$		V_{SET} x0.975	V_{SET}	V_{SET} x1.025	V
Detector Threshold Hysteresis	V_{HYS}		$-V_{DET}$ x0.03	$-V_{DET}$ x0.05	$-V_{DET}$ x0.07	V
Sink Current	I_{DOUT}	$V_{IN}=2.0V$, $V_{DS}=0.05V$	0.17			mA
Minimum Operating Voltage	V_{DDL}	*Note 1		0.9	1.2	V
Detector Threshold Temperature Coefficient	$\Delta-V_{DET}/\Delta T$	-40°C ≤Topt≤ 85°C		±100		ppm /°C
Output Delay Time	t_{PLH}	Cd=4.7nF, *Note 2	20	30	50	ms

●R1150HxxxD

(Topt=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}				24.0	V
Supply Current	I_{SS}	$V_{IN}-V_{OUT}=2.0V$		7	14	µA
Thermal Shutdown Temperature	T_{SD}			150		°C
Thermal Shutdown Released Temperature	T_{SR}	Junction Temperature		120		°C

VR part (Topt=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output voltage	V_{OUT}	$V_{IN}-V_{OUT}=2.0V$ $I_{OUT}=20mA$	V_{SET} x0.98	V_{SET}	V_{SET} x1.02	V
Output Current	I_{OUT1}	$V_{IN}-V_{OUT}=2.0V$	Refer to Output Current Table			
Load regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	$V_{IN}-V_{OUT}=2.0V$ $1mA\leq I_{OUT}\leq 40mA$	Refer to Load Regulation Table			
Line regulation	$\Delta V_{OUT}/\Delta V_{IN}$	$I_{OUT}=20mA$ $V_{OUT}+1V\leq V_{IN}\leq 24V$		0.05	0.15	%/V
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$V_{IN}-V_{OUT}=2.0V$ $I_{OUT}=20mA$ $-40°C\leq Topt\leq 85°C$		±100		ppm /°C
Short Current Limit	I_{LIM}	$V_{OUT}=0V$		45		mA

V_{DET} part (Topt=25°C)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Detector Threshold	$-V_{DET}$		V_{SET} x0.975	V_{SET}	V_{SET} x1.025	V
Detector Threshold Hysteresis	V_{HYS}		$-V_{DET}$ x0.03	$-V_{DET}$ x0.05	$-V_{DET}$ x0.07	V
Sink Current	I_{DOUT}	V_{IN}=2.0V, V_{DS}=0.05V	0.17			mA
Minimum Operating Voltage	V_{DDL}	*Note 1		0.9	1.2	V
Detector Threshold Temperature Coefficient	$\Delta-V_{DET}/\Delta T$	-40°C≤Topt≤85°C		±100		ppm /°C
Output Delay Time	t_{PD}	Cd=4.7nF, *Note 2	20	30	50	ms
Release Margin		V_{OUT}-0.2-($-V_{DET}$)-V_{HYS}	50			mV

Note 1) This item means V_{DD} Voltage when Output Voltage is equal or less than 0.1V(Pull-up Resistor=470kΩ, Pull up Voltage=5V

Note 2) V_{DET} pin is pulled up to V_{DD} via 470kΩ. tpLH means time interval from rising edge of V_{DD} from ($-V_{DET}$)-2.0V to ($-V_{DET}$)+2.0V to the point of Output Voltage being 80% of pull-up voltage.

●Output Current (Topt=25°C)

Output Voltage V_{OUT}(V)	Output Current (mA)
	Min.
2.1V≤V_{OUT}≤2.9V	90
3.0V≤V_{OUT}≤4.0V	120
4.1V≤V_{OUT}≤14V	150

●Load Regulation (Topt=25°C)

Output Voltage V_{OUT}(V)	Load Regulation (mV)	
	Typ.	Max.
2.1V≤V_{OUT}≤3.0V	15	35
3.1V≤V_{OUT}≤5.0V	25	45
5.1V≤V_{OUT}≤10.0V	40	65
10.1V≤V_{OUT}≤14.0V	50	80

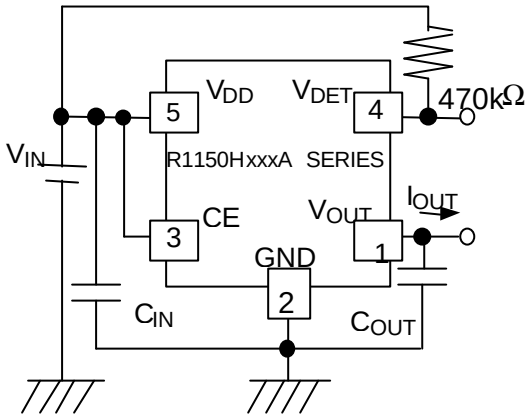
●Dropout Voltage (Topt=25°C)

Output Voltage V_{OUT}(V)	Dropout Voltage (V)	
	Typ.	Max.
2.1V≤V_{OUT}≤2.4V	0.40	0.60
2.5V≤V_{OUT}≤3.0V	0.30	0.40
3.1V≤V_{OUT}≤7.0V	0.25	0.35
7.1V≤V_{OUT}≤10.0V	0.27	0.45
10.1V≤V_{OUT}≤14.0V	0.30	0.50

●Supply Current 2(Off state with CE) (Topt=25°C)

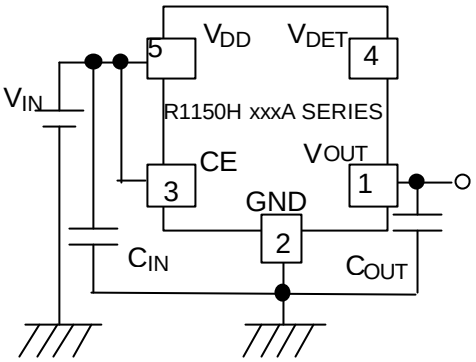
Detector Threshold Voltage -V_{DET}(V)	Supply Current(μA)	
	Typ.	Max.
2.3V≤(-V_{DET})≤3.0V	2.5	5.0
3.1V≤(-V_{DET})≤15.0V	3.0	6.0

■ TEST CIRCUITS



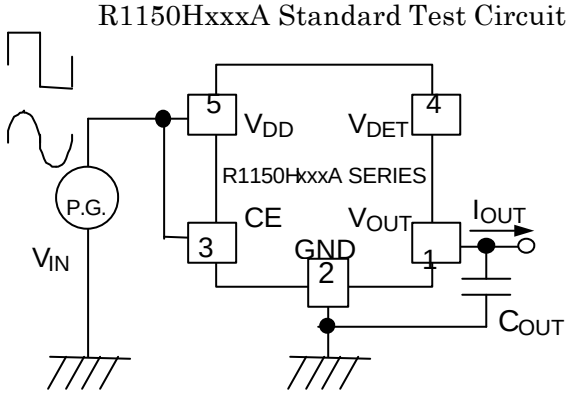
C_{IN}=0.1μF,C_{OUT}=1μF

R1150HxxxA Standard Test Circuit



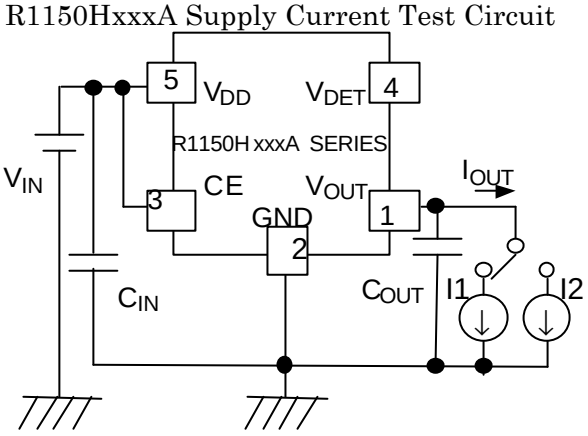
C_{IN}=0.1μF,C_{OUT}=1μF

R1150HxxxA Supply Current Test Circuit



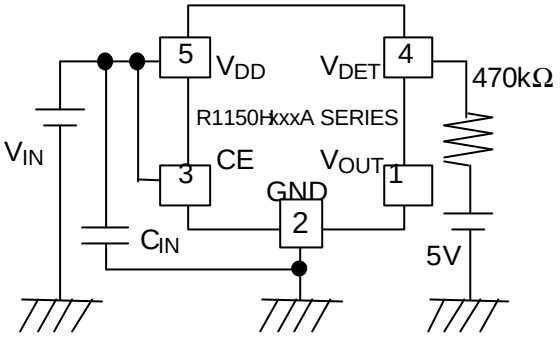
C_{IN}=0.1uF,C_{OUT}=1uF

R1150HxxxA Input Transient Response / Ripple RejectionTest Circuit



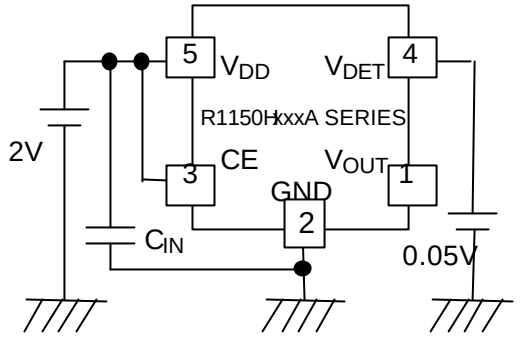
C_{IN}=0.1uF,C_{OUT}=1uF

R1150HxxxA Load Transient Response Test Circuit



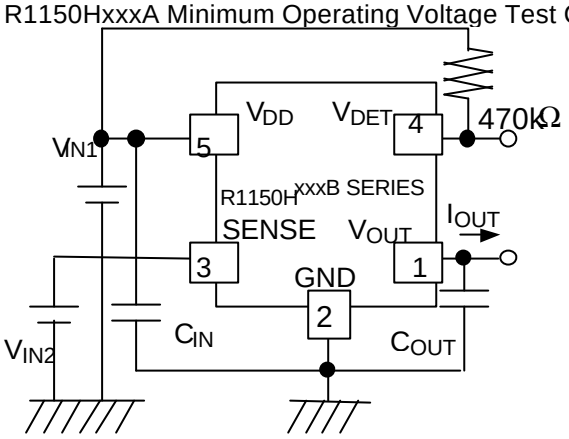
C_{IN}=0.1µF

R1150HxxxA Minimum Operating Voltage Test Circuit



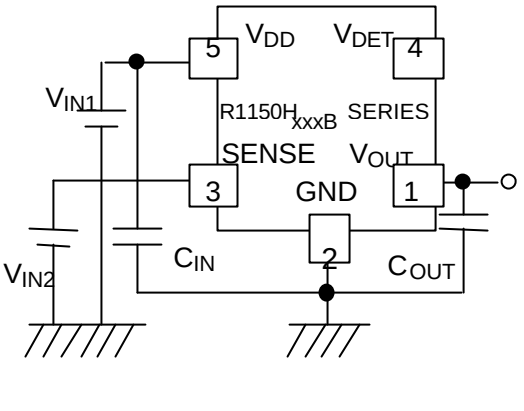
C_{IN}=0.1µF

R1150HxxxA V_{DET} Output Current Test Circuit



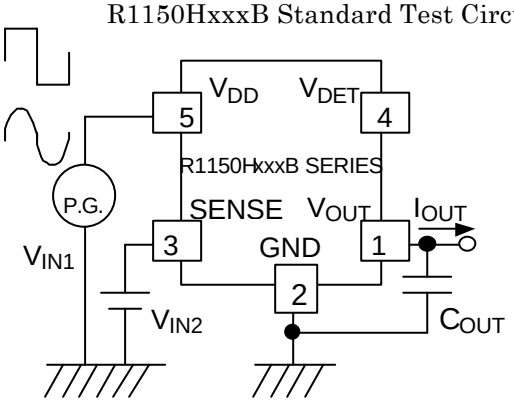
C_{IN}=0.1µF,C_{OUT}=1µF

R1150HxxxB Standard Test Circuit



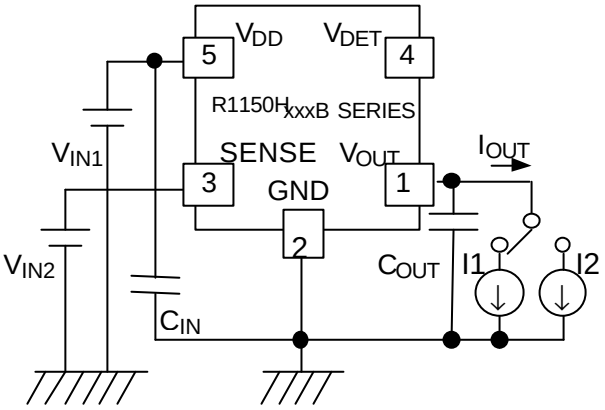
C_{IN}=0.1uF,C_{OUT}=1µF

R1150HxxxB Supply Current Test Circuit



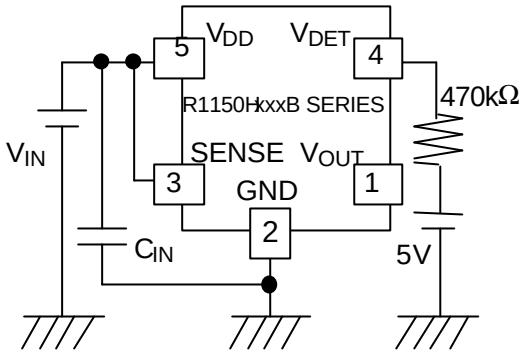
C_{IN}=0.1µF,C_{OUT}=1µF

R1150HxxxB Input Transient Response, Ripple Rejection Test Circuit



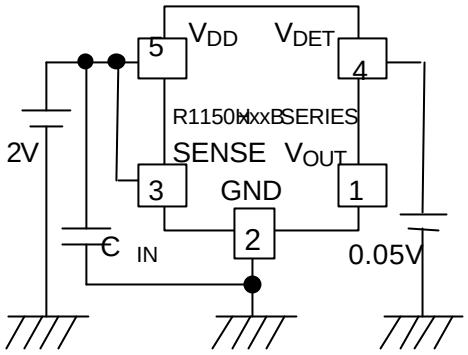
C_{IN}=0.1µF,C_{OUT}=1µF

R1150HxxxB Load Transient Response Test Circuit



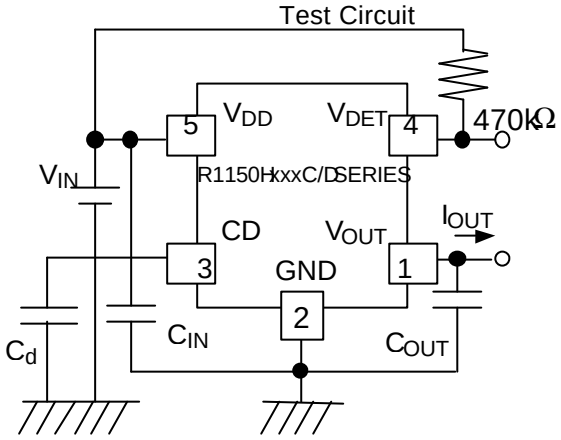
C_{IN}=0.1μF

R1150HxxxB V_{DET} Minimum Operating Voltage



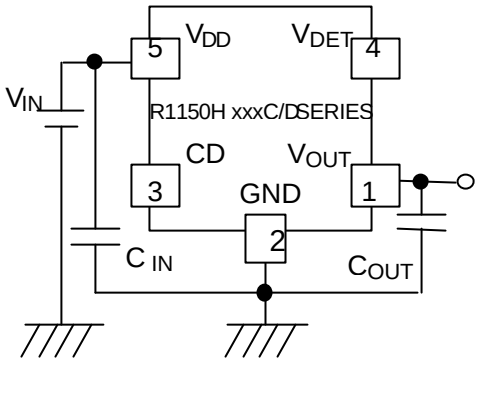
C_{IN}=0.1μF

R1150HxxxB V_{DET} Output Current Test Circuit



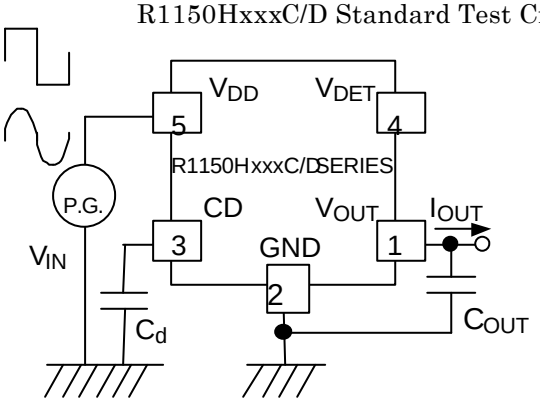
C_{IN}=0.1μF, C_{OUT}=1μF

R1150HxxxC/D Standard Test Circuit



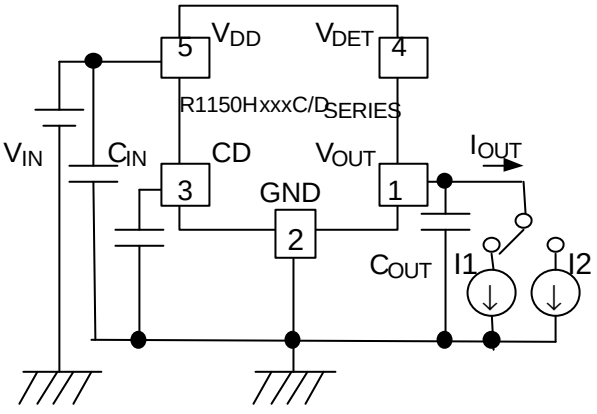
C_{IN}=0.1μF, C_{OUT}=1μF

R1150HxxxC/D Supply Current Test Circuit



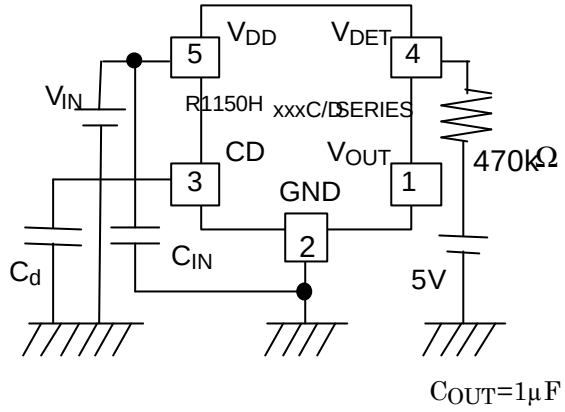
C_{IN}=0.1uF, C_{OUT}=1uF

R1150HxxxC/D Input Transient Response / Ripple Rejection Test Circuit

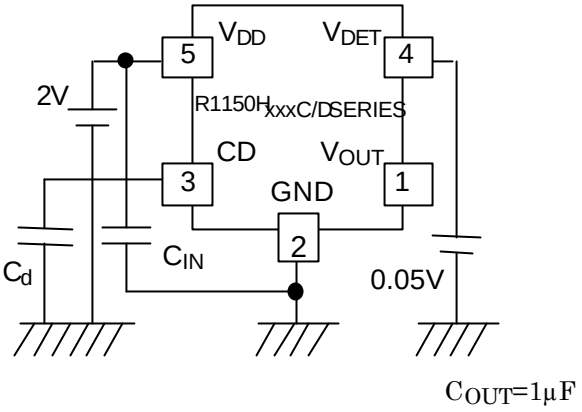


C_{IN}=0.1uF, C_{OUT}=1uF

R1150HxxxC/D Load Transient Response Test Circuit



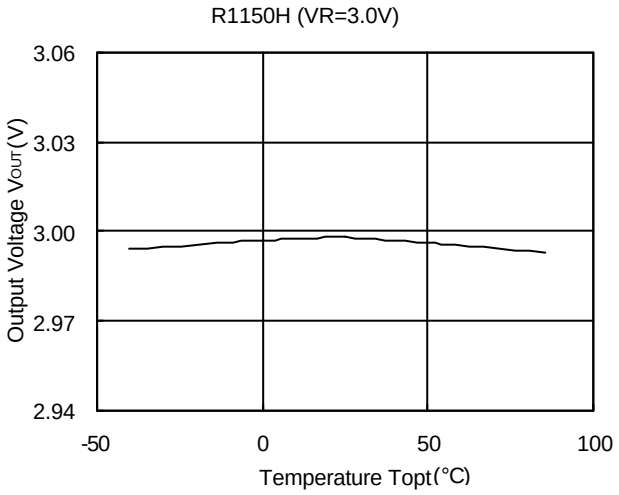
R1150HxxxC/D V_{DET} Minimum Operating Voltage Test Circuit

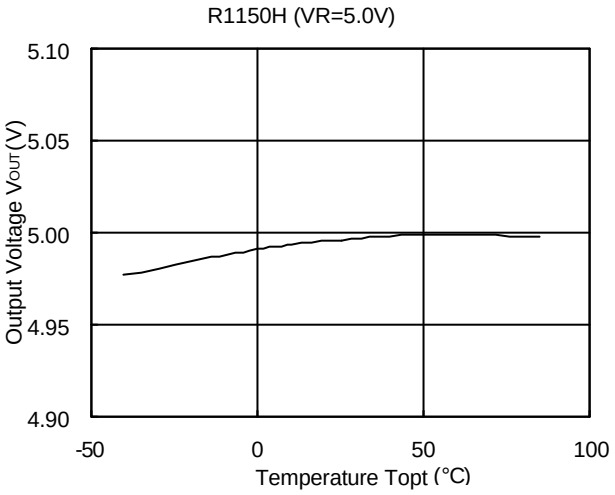


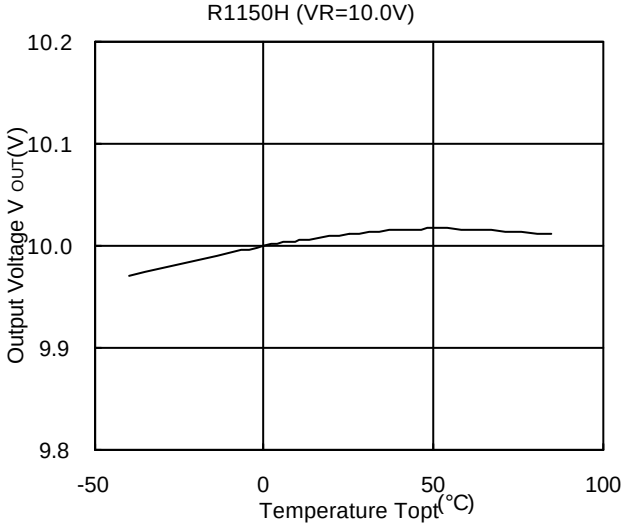
R1150HxxxC/D V_{DET} Output Current Test Circuit

■ TYPICAL CHARACTERICS

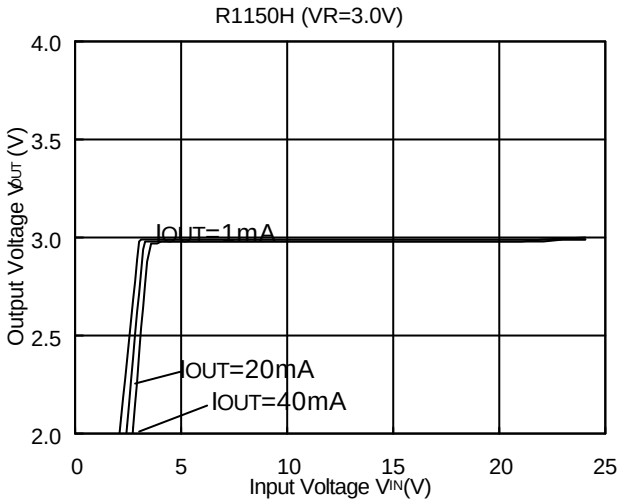
1) Output Voltage vs. Temperature

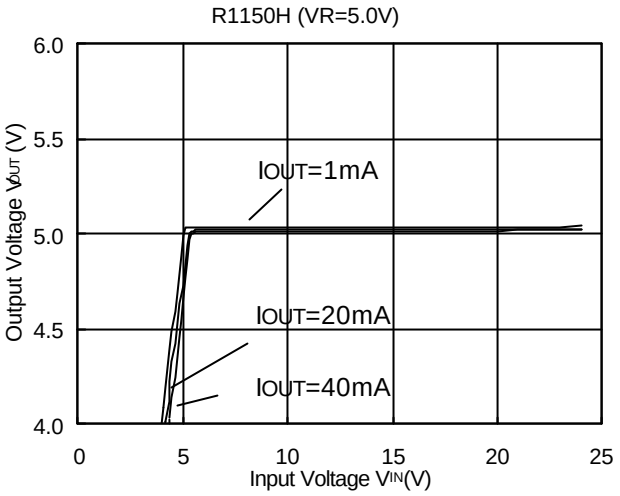


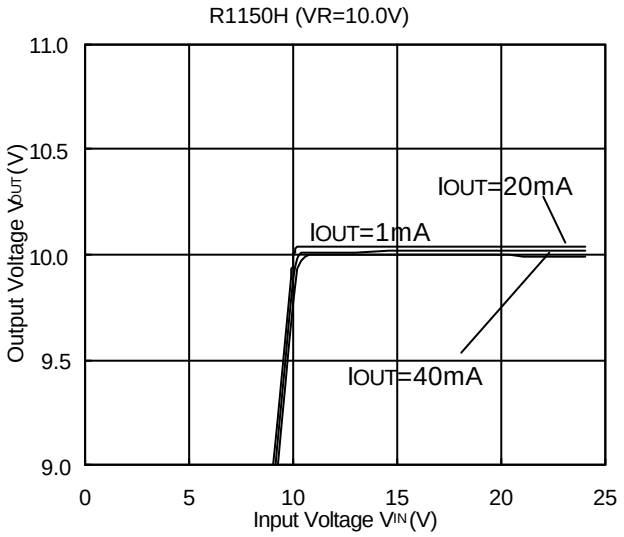




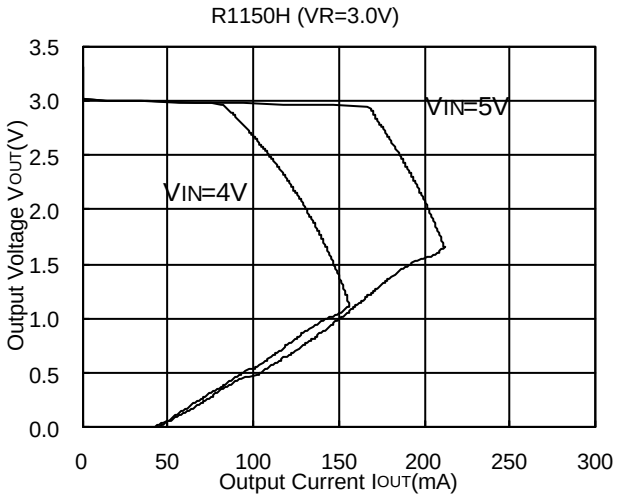
2) Input Voltage vs. Output Voltage (Topt=25°C)

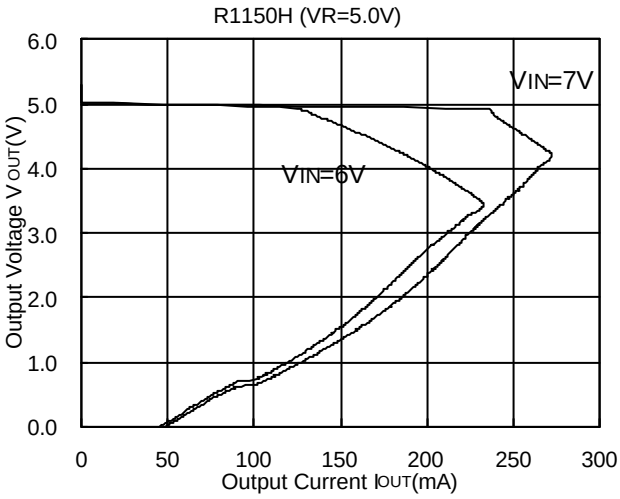


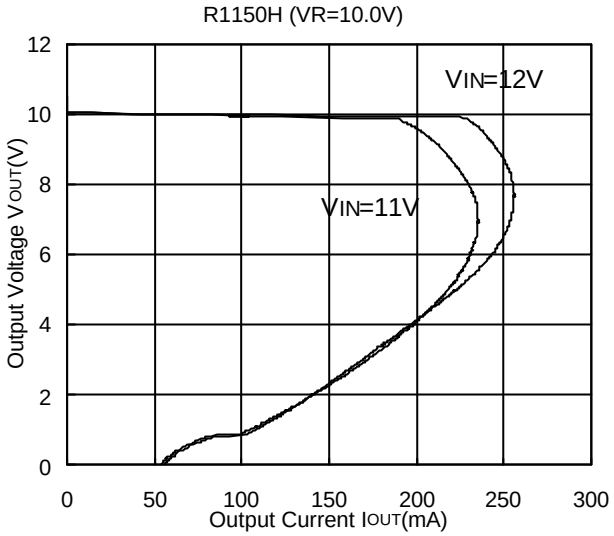




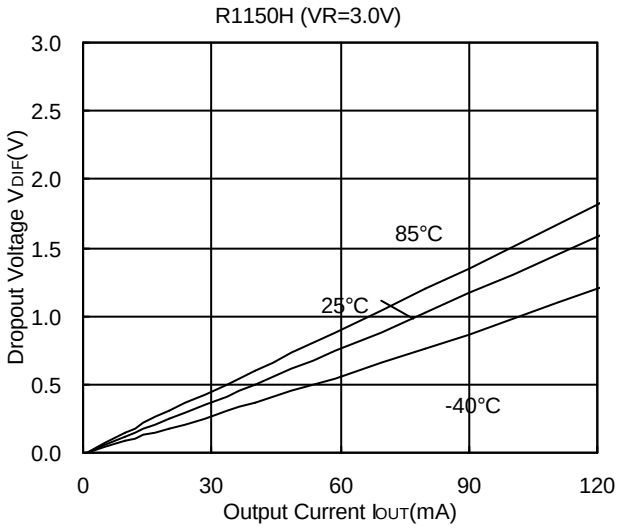
3) Output Voltage vs. Output Current(Topt=25°C)

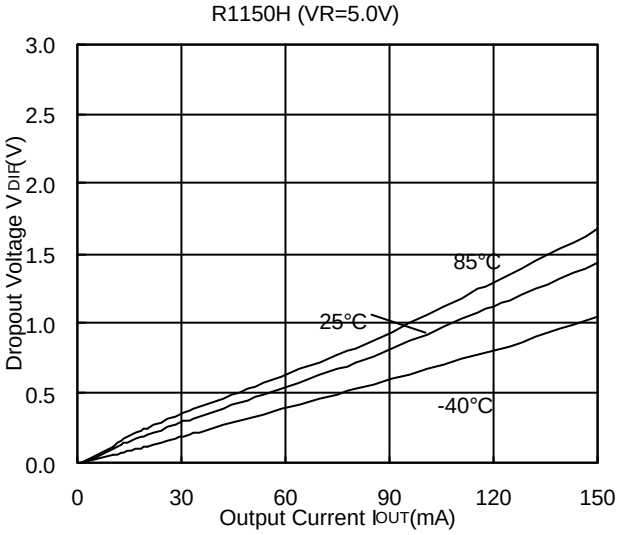


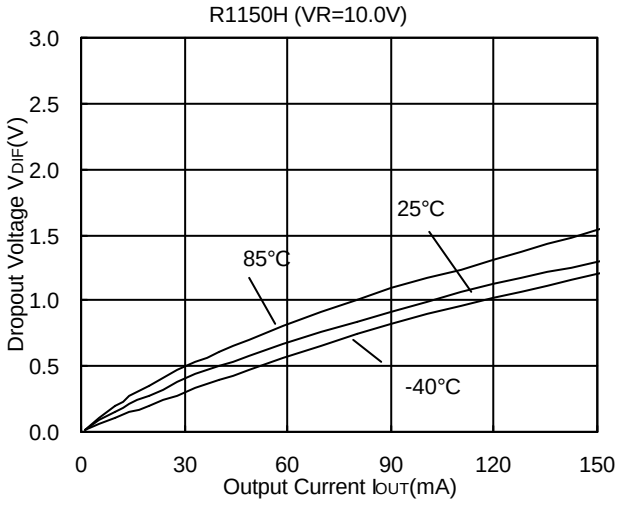




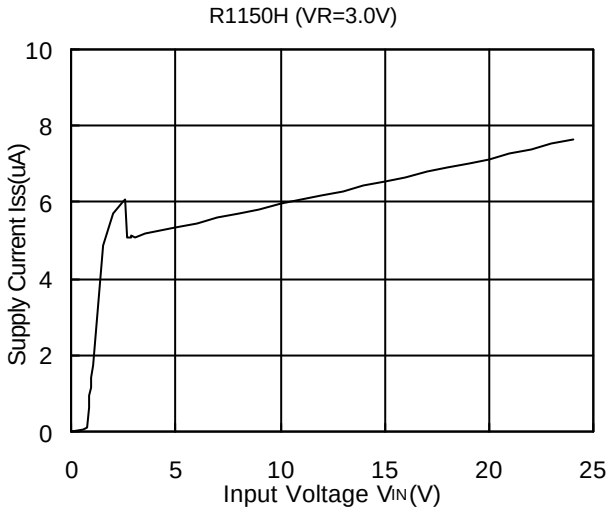
4) Dropout Voltage vs. Output Current

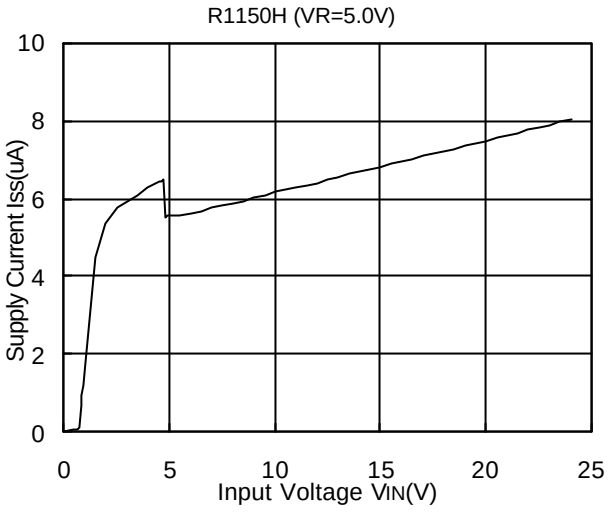


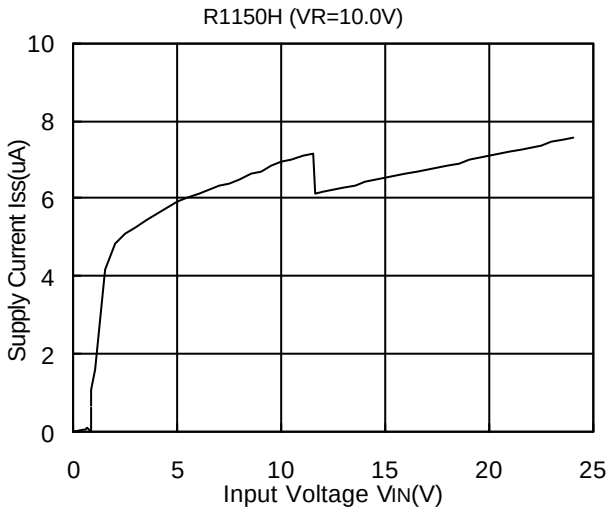




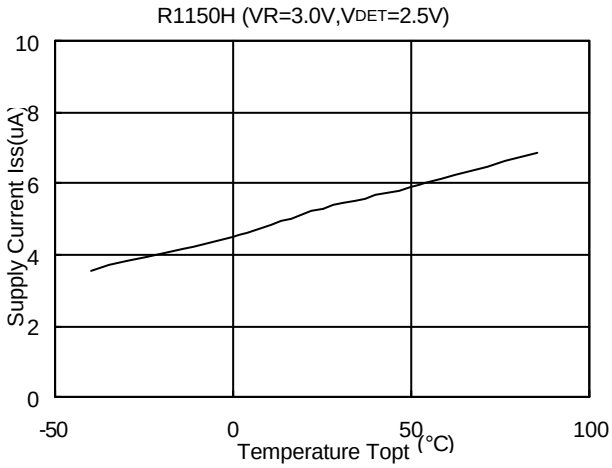
5)Supply Current vs. Input Voltage (Topt=25°C)

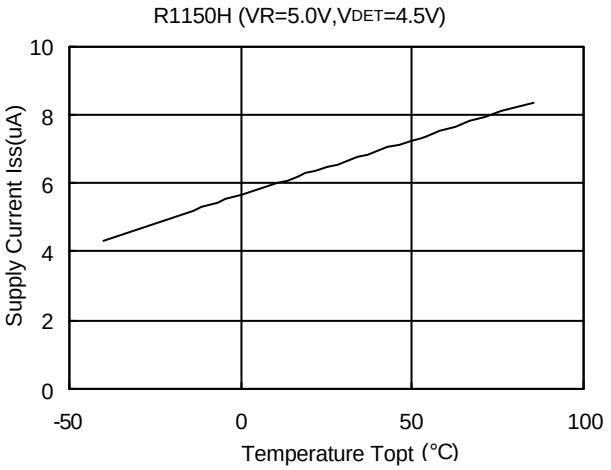




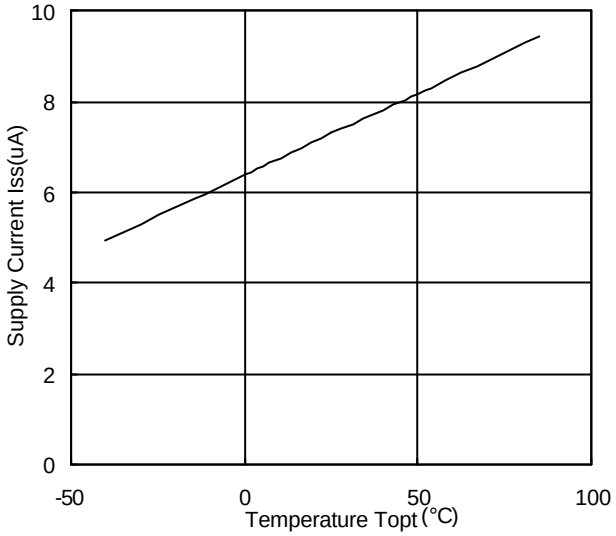


6)Supply Current vs. Temperature





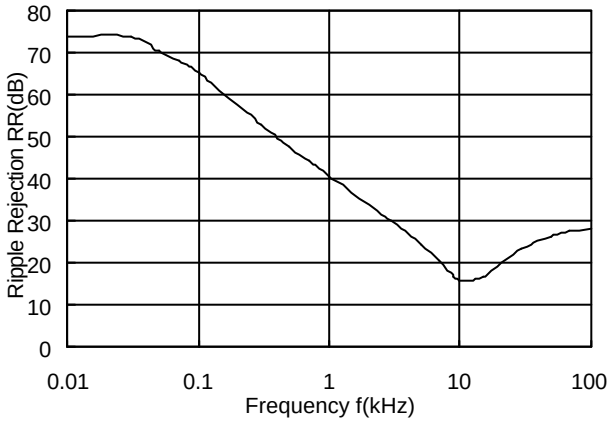
R1150H (VR=10.0V, V_{DET}=11.0V)



7)Ripple Rejection vs. Frequency (Topt=25°C)

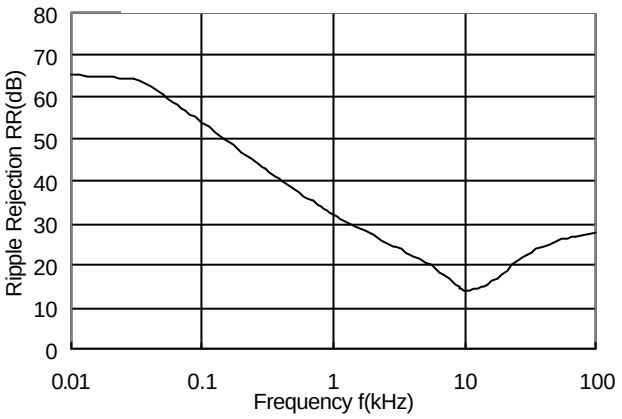
R1150H (VR=3.0V)

V_{IN}=5.0V_{DC}+0.5V_{P-P}, I_{OUT}=20mA, C_{OUT}=1uF



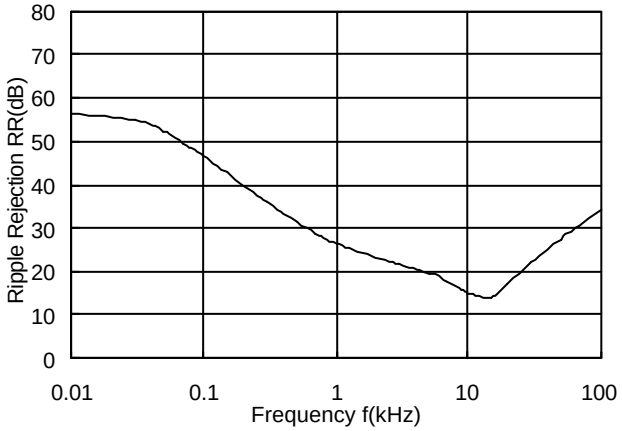
R1150H (VR=5.0V)

V_{IN}=7.0V_{DC}+0.5V_{P-P}, I_{OUT}=20mA, C_{OUT}=1uF

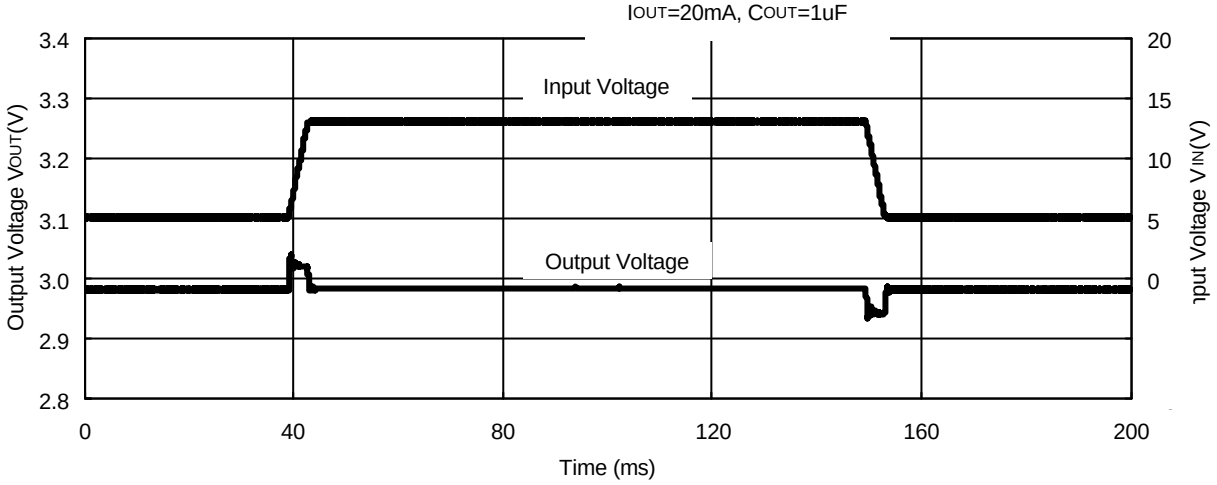


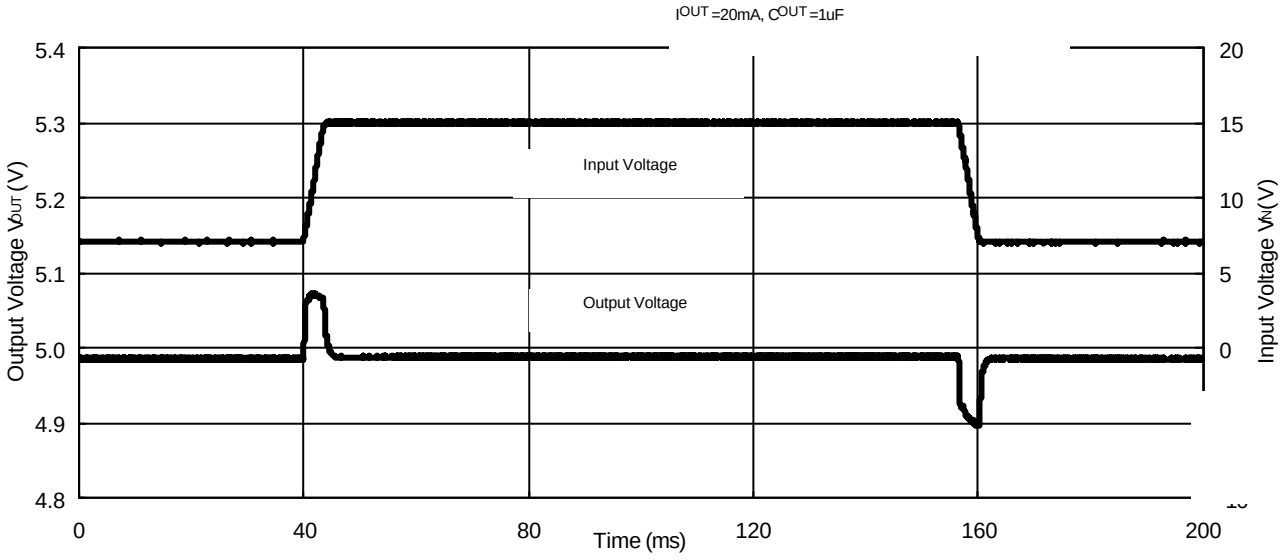
R1150H (VR=10.0V)

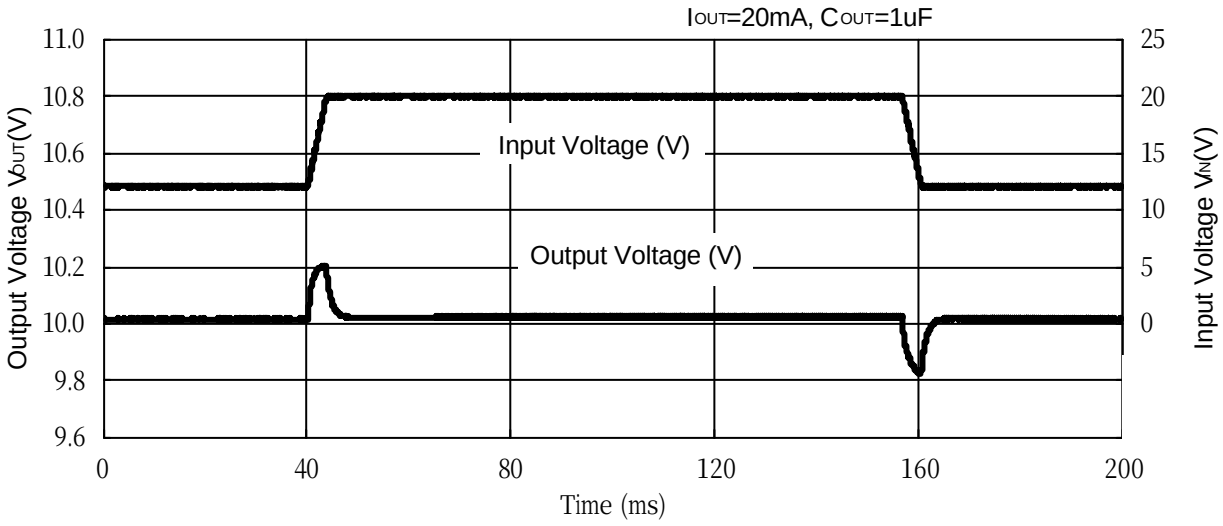
V_{IN}=12.0V_{DC}+0.5V_{P-P}, I_{OUT}=20mA, C_{OUT}=1uF



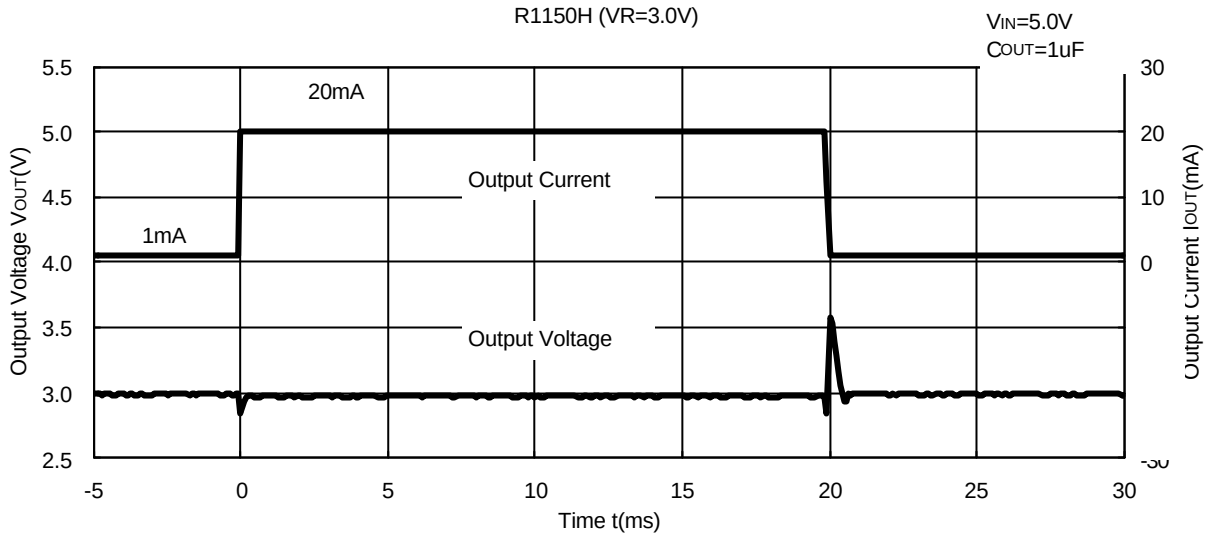
8) Input Transient Response

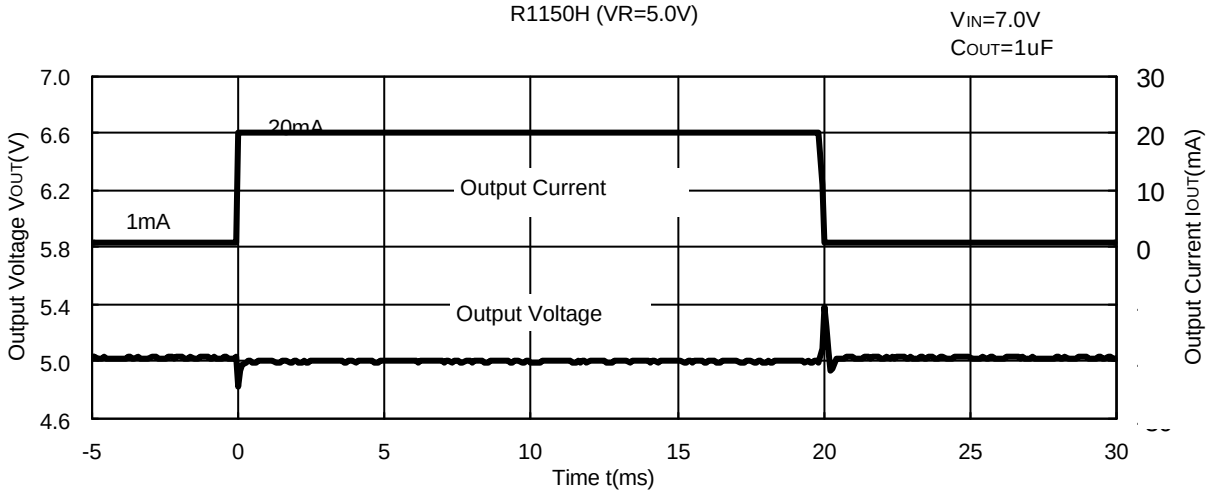


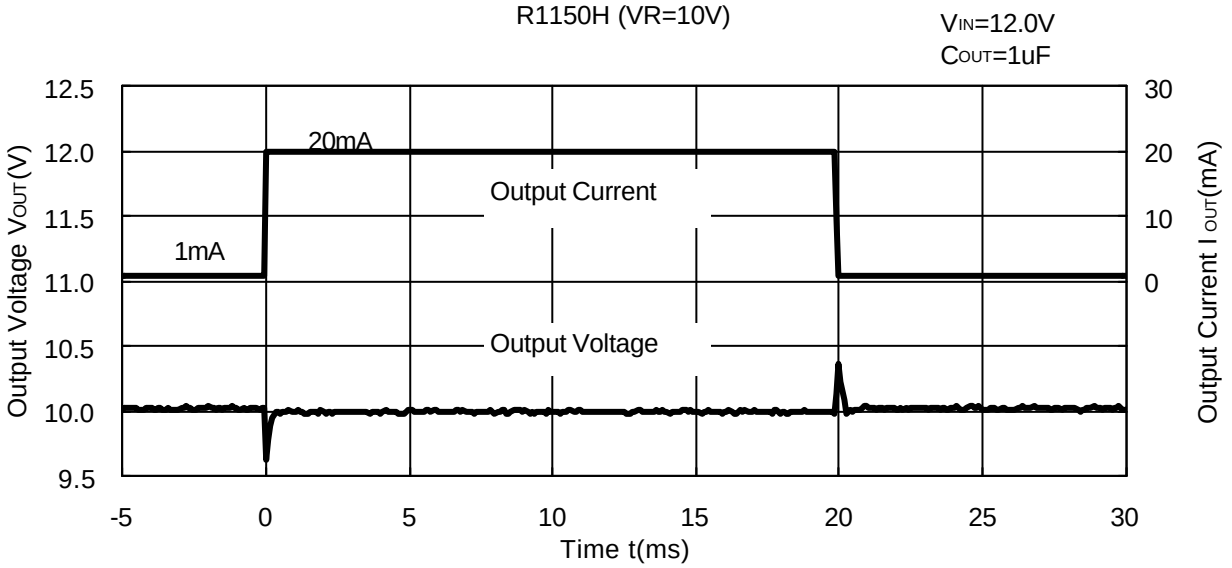




9)Load Transient Response(Topt=25°C)

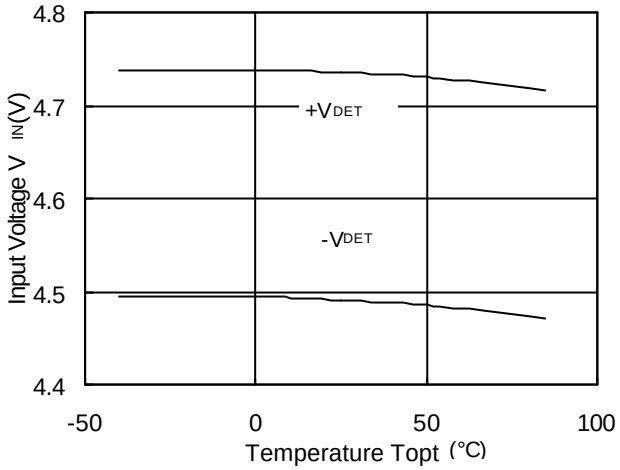




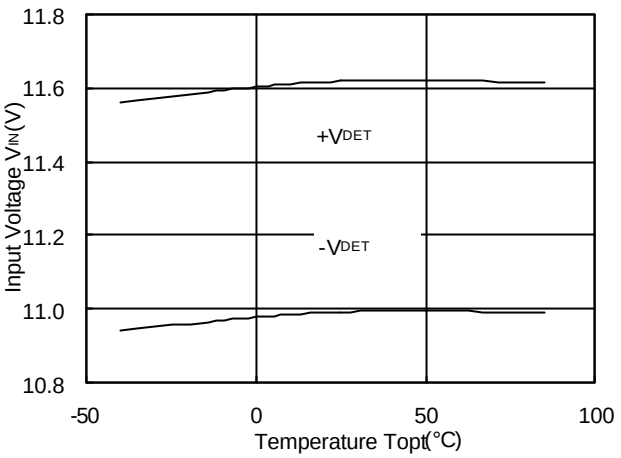


10)Detector Threshold vs. Temperature

R1150H (-V_{DET}=4.5V)

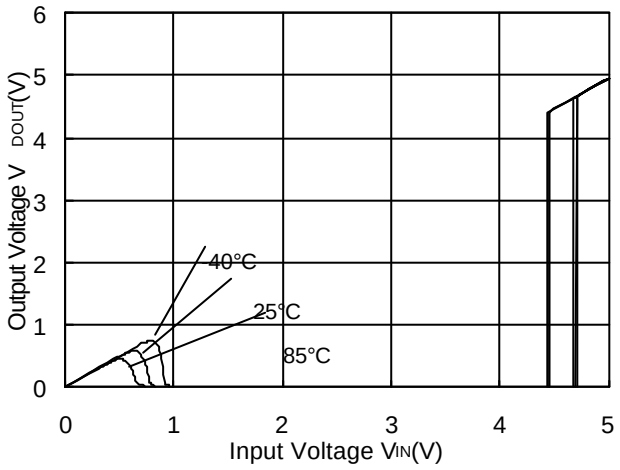


R1150H (-V_{DET}=11.0V)

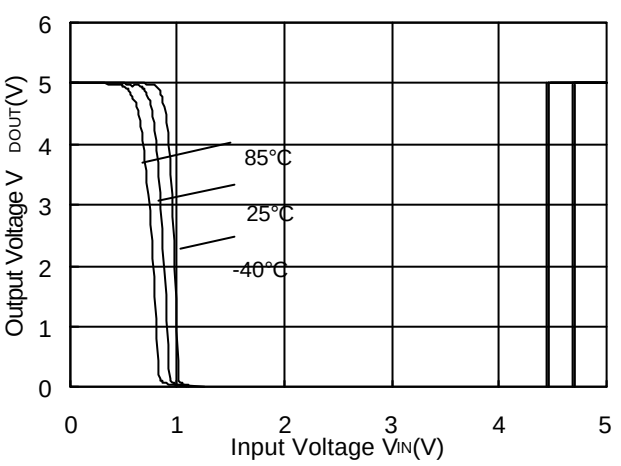


11)Detector Threshold vs. Input Voltage

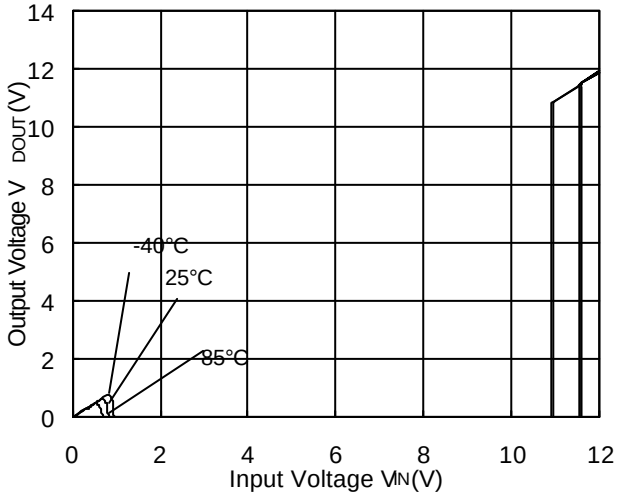
R1150H (-V_{DET}=4.5V)



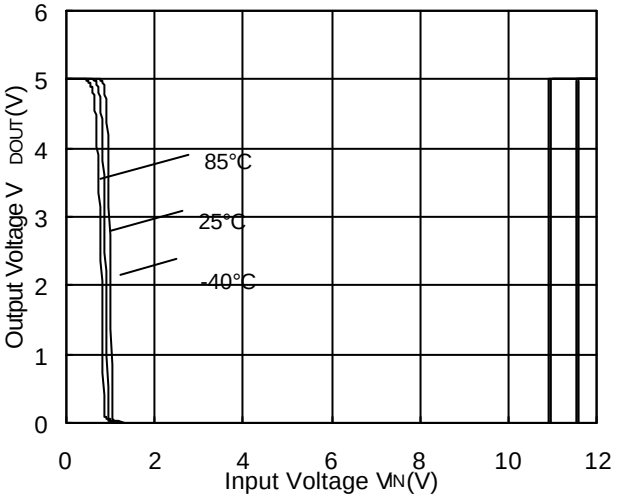
R1150H (-V_{DET}=4.5V)



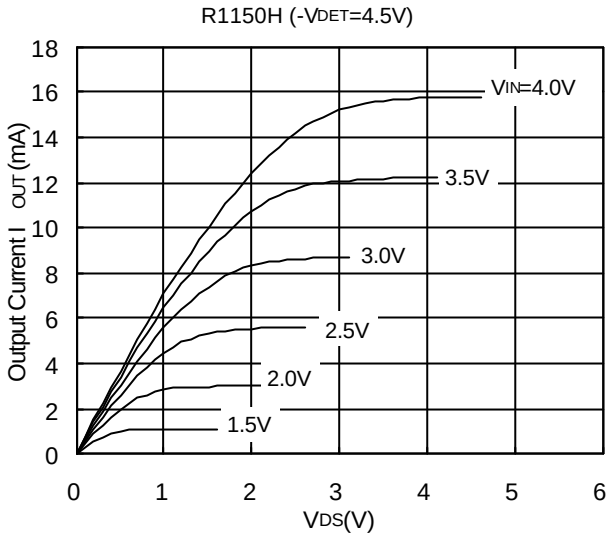
R1150H (-V_{DET}=11.0V)

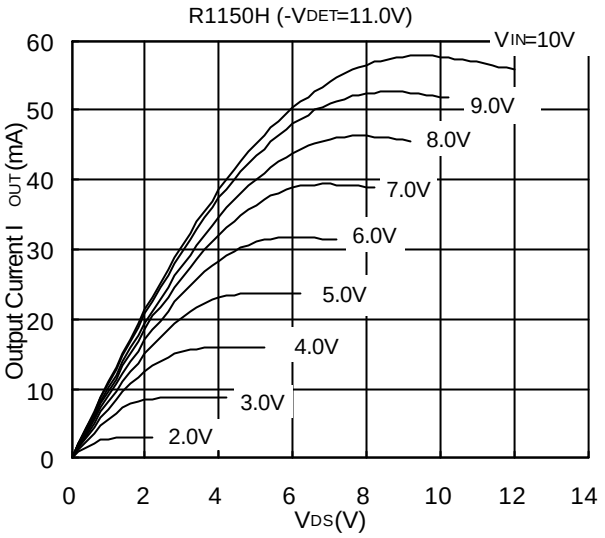


R1150H (-V_{DET}=11.0V)

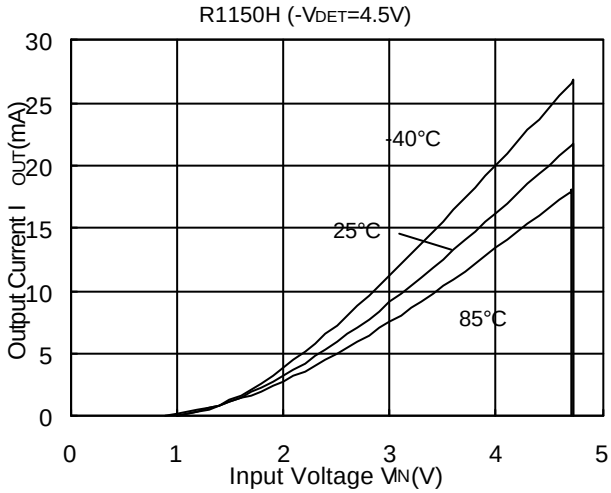


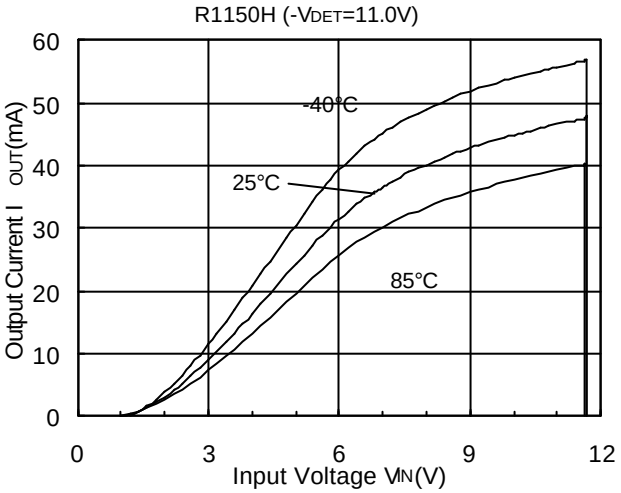
12) Nch Driver Output Current vs. V_{DS}



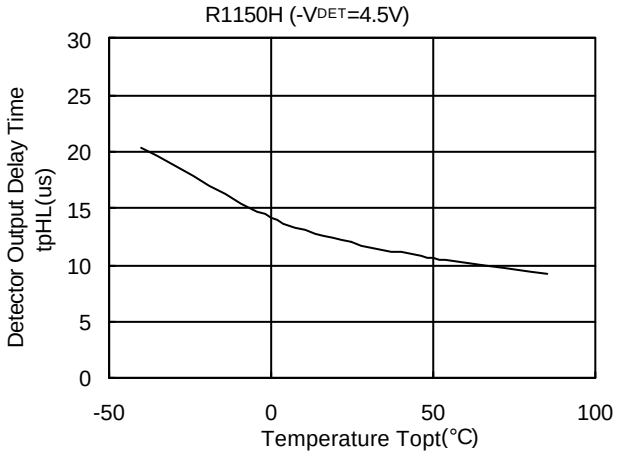


13) Nch Driver Output Current vs. Input Voltage

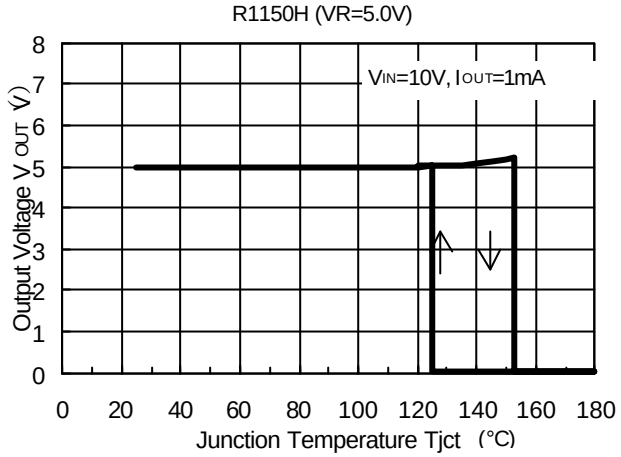




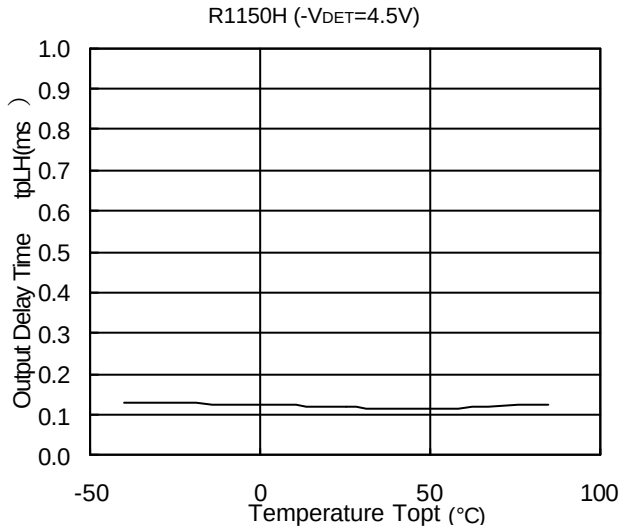
14) Detector Output Delay Time vs. Temperature



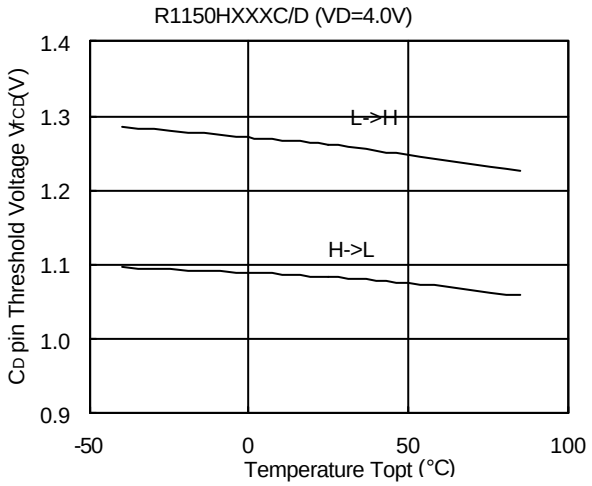
15)Thermal Shutdown Temperature vs. Output Voltage

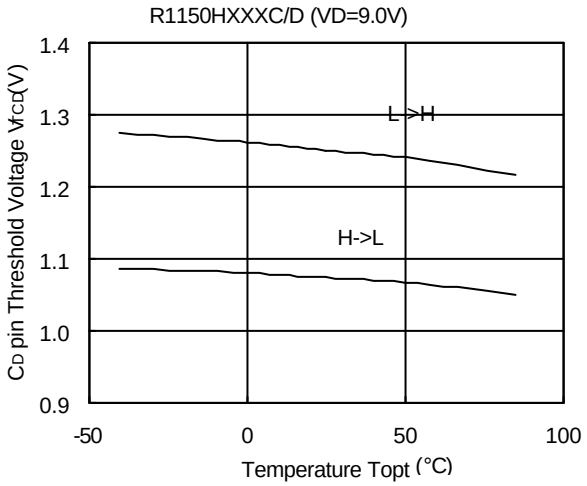


16)Output Delay Time vs. Temperature

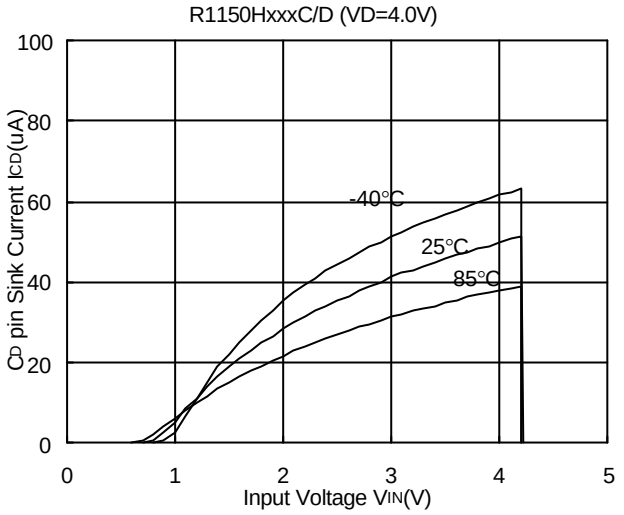


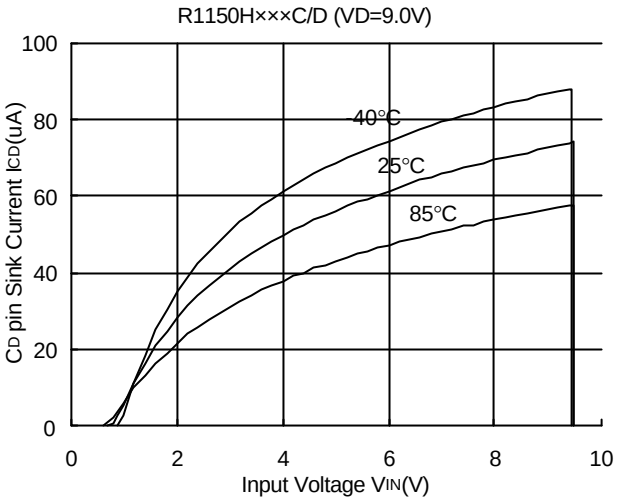
17)CD pin Threshold Voltage vs. Temperature

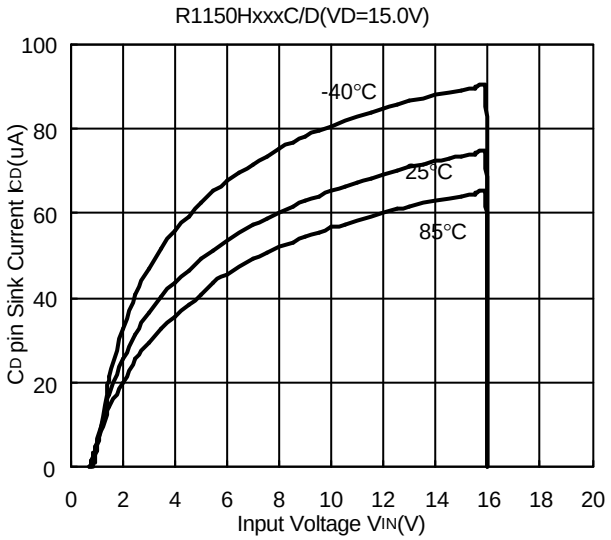




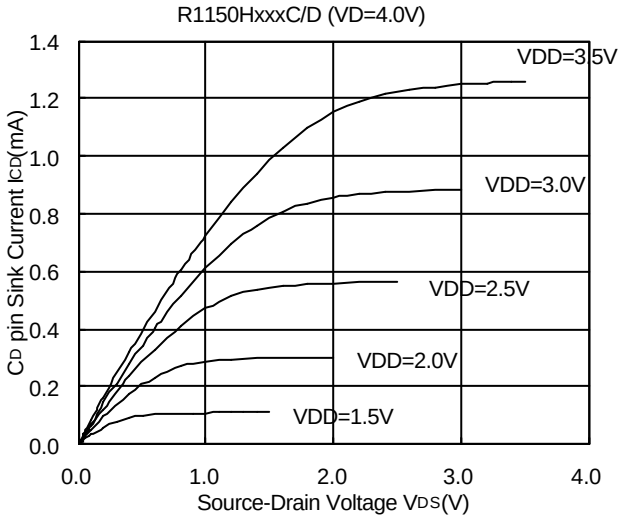
18)C_D pin Sink Current vs. Input Voltage

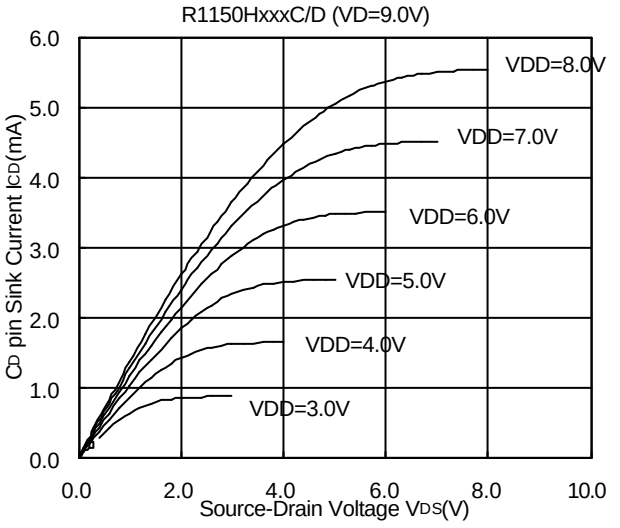


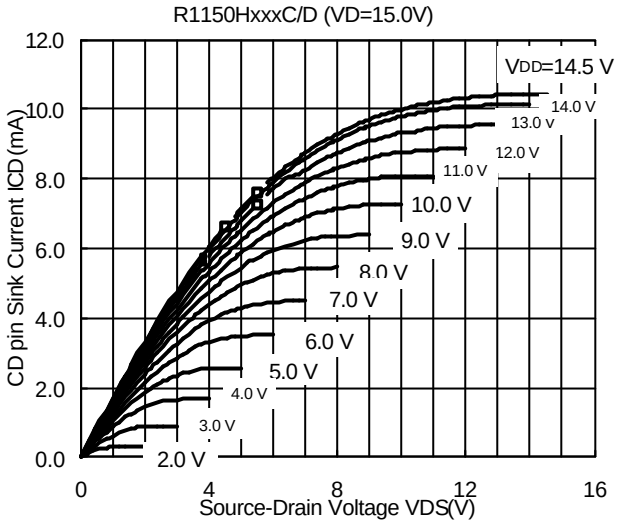




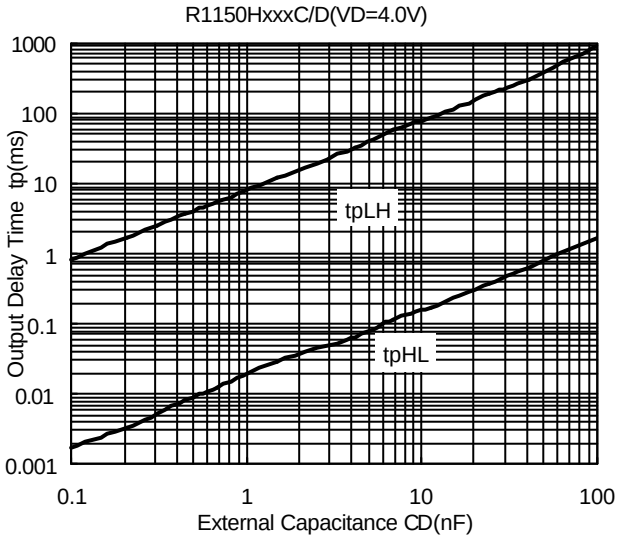
19)CD pin Sink Current vs. V_{DS}



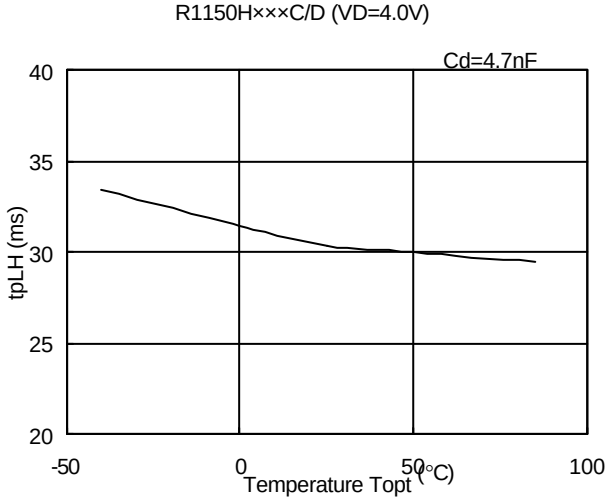


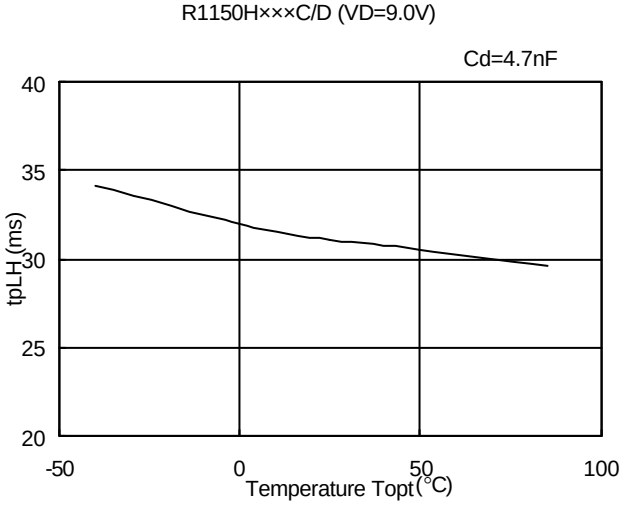


20)Output Delay Time vs. External Capacitance



21)tpLH vs. Temperature

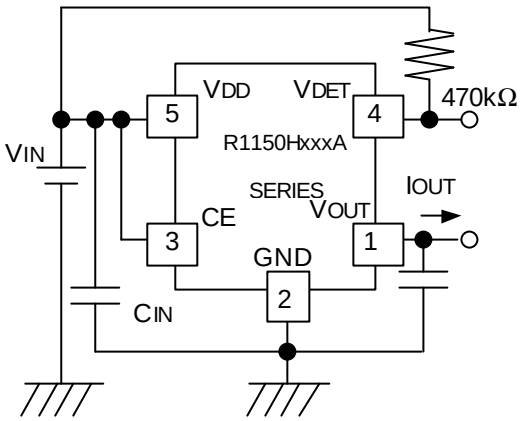




■ TECHNICAL NOTES

Phase Compensation
Phase Compensation of the R1150H Series has been made internally for stable operation even though the load current would vary. Therefore, without the capacitors, C_{IN} and C_{OUT}, Output Voltage is regulated, but for more stable operation, use capacitors as C_{IN} and C_{OUT}. Recommended value is in the range from 0.1µF to 1.0µF. Wiring should be made as short as possible.

PCB layout
Current flows into wiring for V_{DD} or GND, thus, if the impedance of the wiring is rather high, it may cause of making noise or unstable operation, thus width and pattern should be enough wide to avoid such problems. Connect the capacitor, C_{IN} between V_{DD} pin and GND pin as close as possible.

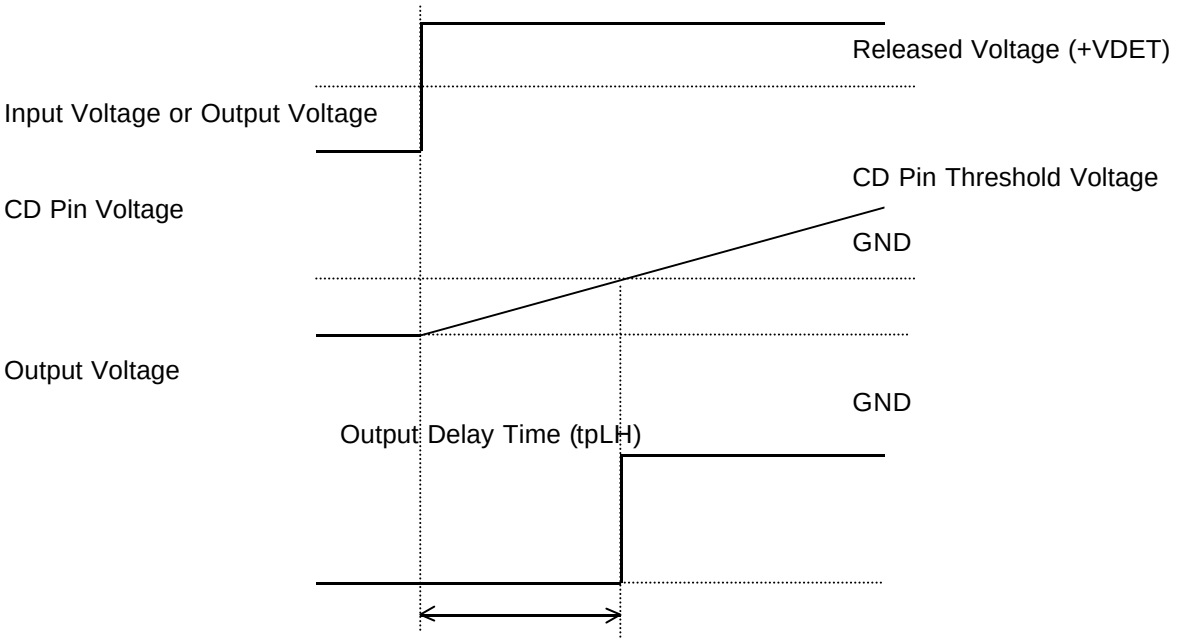


R1150HxxxA Typical Application

Thermal Shutdown
Thermal shutdown function is included in the R1150HxxxA/B/C/D Series, when 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 +120°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.

Output Delay Time for Release V_{DET}
In the R1150Hxx1C/D can set an output delay time for release voltage detector with connecting a capacitor to C_D pin. When an input voltage (in the case of R1150Hxx1C) or an output voltage (in the case of R1150Hxx1D) surpasses the release voltage of its voltage detector (+V_{DET}), the capacitor which is connected to C_D pin is started to be charged, as a result, C_D pin voltage rises. When the C_D pin voltage surpasses C_D pin threshold voltage, the output voltage of the voltage detector outputs “H”.



Output delay time for release voltage detector can be calaculated with the next formula:

$tpLH=1.25/(200\times10^{-9})\times C$ (sec)