

RICOH

R1150H SERIES

VOLTAGE REGULATOR(with Wide Input Voltage Range) with RESET

NO.EA-081-0610

OUTLINE

The R1150H 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 R1150HxxxxA types includes also a chip enable circuit. The output of built-in voltage detector is Nch open drain type. The R1150HxxxxC/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, Output Voltage Accuracy is $\pm 2.0\%$, while Detector Threshold Accuracy is $\pm 2.5\%$. The R1150HxxxxA (with chip enable function) and C series can supervise input voltage by the built-in detector. R1150HxxxxB type can supervise SENSE pin voltage by the built-in detector. R1150HxxxxD type can supervise V_{OUT} voltage, or 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

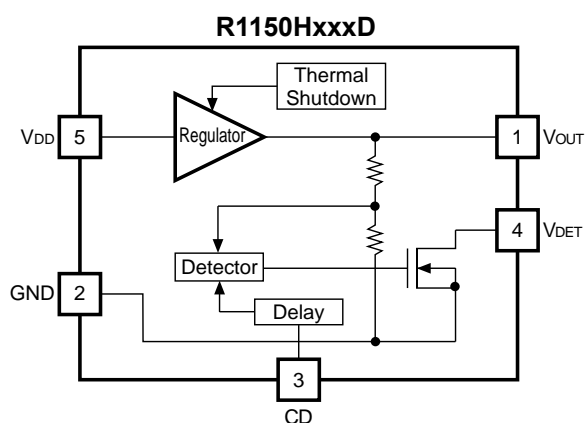
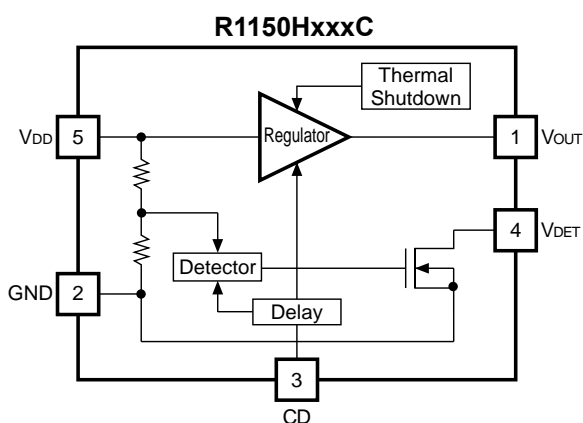
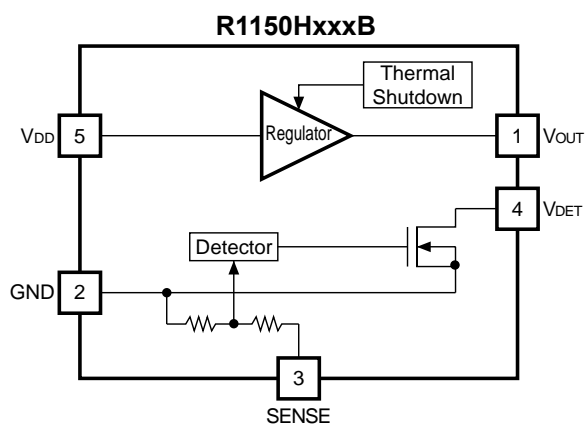
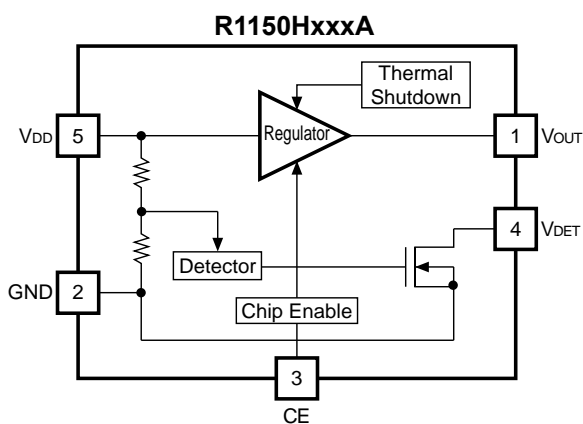
- Ultra-Low Supply Current..... Typ. $7.0\mu\text{A}$
- Input Voltage Max. 24.0V
- Output Voltage (VR)..... 2.1V to 14.0V
- Detector Threshold Voltage (V_{DET}) 2.3V to 15.0V
- High Output Voltage Accuracy $\pm 2.0\%$ (VR), $\pm 2.5\%$ (VD)
- Output Current Min. 150mA ($V_{OUT}=5.0\text{V}$)
- Small 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.

R1150H

BLOCK DIAGRAMS



SELECTION GUIDE

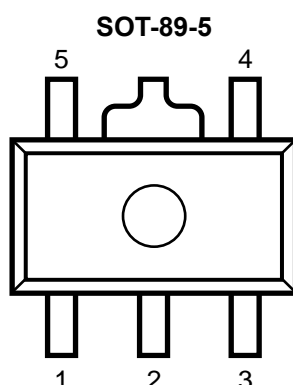
The output voltage and the usage of pin No.3 (as a kind of types in the R1150Hxxxx series) can be selected at the user's request. The selection can be made with designating the part number as follows;

R1150Hxxxx-T1-x ←Part Number

↑ ↑ ↑ ↑ ↑
 a b c d e

Code	Contents
a	Designation of package type; H: SOT-89-5
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)
e	Designation of composition of pin plating: -F: Lead free plating

PIN CONFIGURATION



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

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	26.0	V
V_{CE}	Input Voltage (CE Input Pin)*Note1	-0.3 ~ $V_{IN}+0.3$	V
V_{SENSE}	Input Voltage (SENSE Input Pin)*Note2	-0.3 ~ $V_{IN}+0.3$	V
V_{CD}	Input Voltage (CD Input Pin)*Note3	-0.3 ~ $V_{IN}+0.3$	V
V_{DED}	Output Voltage (V_{DET} Output Pin)	-0.3 ~ $V_{IN}+0.3$	V
V_{OUT}	Output Voltage	-0.3 ~ $V_{IN}+0.3$	V
I_{OUT1}	Output Current (VR)	250	mA
I_{OUT2}	Output Current (VD)	10	mA
P_D	Power Dissipation (SOT-89-5)*1	500	mW
T_{opt}	Operating Temperature	-40 ~ 85	°C
T_{stg}	Storage Temperature	-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

*1 For Power Dissipation, please refer to PACKAGE INFORMATION to be described.

R1150H**ELECTRICAL CHARACTERISTICS**• **R1150HxxxA**T_{opt}=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V _{IN}	Input Voltage				24.0	V
I _{SS1}	Supply Current 1	V _{IN} =V _{CE} V _{OUT} ≥(-V _{DET}):V _{IN} -V _{OUT} =2.0V V _{OUT} <(-V _{DET}):V _{IN} =(-V _{DET})+2.0V		7	14	μA
I _{SS2}	Supply Current 2	V _{DD} =24V, V _{CE} =0V	Refer to Supply Current 2 Table			
T _{SD}	Thermal Shutdown Temperature	Junction Temperature		150		°C
T _{SR}	Thermal Shutdown Released Temperature	Junction Temperature		120		°C

VR part

T_{opt}=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V _{OUT}	Output voltage	V _{IN} -V _{OUT} =2.0V, I _{OUT} =20mA	× 0.98		× 1.02	V
I _{OUT}	Output Current	V _{IN} -V _{OUT} =2.0V	Refer to Output Current Table			
ΔV _{OUT} /ΔI _{OUT}	Load Regulation	V _{IN} -V _{OUT} =2.0V 1mA ≤ I _{OUT} ≤ 40mA	Refer to Load Regulation Table			
ΔV _{OUT} /ΔV _{IN}	Line Regulation	V _{IN} -V _{OUT} =2.0V, I _{OUT} =20 mA V _{OUT} +1V ≤ V _{IN} ≤ 24V		0.05	0.15	%/V
V _{DIF}	Dropout Voltage	I _{OUT} =20mA	Refer to Dropout Voltage Table			
ΔV _{OUT} /ΔT _{opt}	Output Voltage Temperature Coefficient	V _{IN} -V _{OUT} =2.0V, I _{OUT} =20mA -40°C ≤ T _{opt} ≤ 85°C		±100		ppm/°C
I _{lim}	Short Current Limit	V _{OUT} =0V		45		mA
V _{CEH}	CE "H" Input Voltage		1.5		V _{IN}	V
V _{CEL}	CE "L" Input Voltage		0.00		0.25	V

V_{DET} partT_{opt}=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
-V _{DET}	Detector Threshold		× 0.975		× 1.025	V
V _{HYS}	Detector Threshold Hysteresis		-V _{DET} × 0.03	-V _{DET} × 0.05	-V _{DET} × 0.07	V
I _{DOUT}	Sink Current	V _{IN} =2.0V, V _{DET} =0.05V	0.15	0.20		μA
V _{DDL}	Minimum Operating Voltage	*Note 1		0.9	1.2	V
Δ-V _{DET} /ΔT _{opt}	Detector Threshold Temperature Coefficient	-40°C ≤ T _{opt} ≤ 85°C		±100		ppm/°C
t _{PLH}	Output Delay Time	*Note 2		0.5	1.0	ms

• R1150HxxxB

T_{opt}=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V _{IN}	Input Voltage				24.0	V
I _{SS}	Supply Current	V _{OUT} ≥ (-V _{DET}): V _{IN} =SENSE=V _{OUT} +2.0V V _{OUT} < (-V _{DET}): V _{IN} =SENSE=(-V _{DET})+2.0V		7	14	μA
T _{SD}	Thermal Shutdown Temperature	Junction Temperature		150		°C
T _{SR}	Thermal Shutdown Temperature	Junction Temperature		120		°C

VR part

T_{opt}=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V _{OUT}	Output voltage	V _{IN} -V _{OUT} =2.0V I _{OUT} =20mA	V _{SET} × 0.98	V _{SET}	V _{SET} × 1.02	V
I _{OUT}	Output Current	V _{IN} -V _{OUT} =2.0V	Refer to Output Current Table			
ΔV _{OUT} /ΔI _{OUT}	Load Regulation	V _{IN} -V _{OUT} =2.0V 1mA ≤ I _{OUT} ≤ 40mA	Refer to Load Regulation Table			
ΔV _{OUT} /ΔV _{IN}	Line Regulation	I _{OUT} =20mA V _{OUT} +1V ≤ V _{IN} ≤ 24V		0.05	0.15	%/V
V _{DIF}	Dropout Voltage	I _{OUT} =20mA	Refer to Dropout Voltage Table			
ΔV _{OUT} /ΔT _{opt}	Output Voltage Temperature Coefficient	V _{IN} -V _{OUT} =2.0V I _{OUT} =20mA -40°C ≤ T _{opt} ≤ 85°C		±100		ppm/°C
I _{lim}	Short Current Limit	V _{OUT} =0V		45		mA

V_{DET} partT_{opt}=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
-V _{DET}	Detector Threshold		V _{SET} × 0.975	V _{SET}	V _{SET} × 1.025	V
V _{HYS}	Detector Threshold Hysteresis		-V _{DET} × 0.03	-V _{DET} × 0.05	-V _{DET} × 0.07	V
I _{DOUT}	Sink Current	V _{IN} =SENSE=2.0V, V _{DS} =0.05V	0.17			mA
V _{DDL}	Minimum Operating Voltage	*Note 1		0.9	1.2	V
Δ-V _{DET} /ΔT _{opt}	Detector Threshold Temperature Coefficient	-40°C ≤ T _{opt} ≤ 85°C		±100		ppm/°C
t _{PLH}	Output Delay Time	*Note 2		1.0	1.5	ms

R1150H• **R1150HxxxC**T_{opt}=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V _{IN}	Input Voltage				24.0	V
I _{SS1}	Supply Current	V _{OUT} ≥ (-V _{DET}): V _{IN} = V _{OUT} + 2.0V V _{OUT} < (-V _{DET}): V _{IN} = (-V _{DET}) + 2.0V		7	14	μA
T _{SD}	Thermal Shutdown Temperature	Junction Temperature		150		°C
T _{SR}	Thermal Shutdown Released Temperature	Junction Temperature		120		°C

VR part

T_{opt}=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V _{OUT}	Output voltage	V _{IN} -V _{OUT} =2.0V I _{OUT} =20mA	V _{SET} × 0.98	V _{SET}	V _{SET} × 1.02	V
I _{OUT}	Output Current	V _{IN} -V _{OUT} =2.0V	Refer to Output Current Table			
ΔV _{OUT} /ΔI _{OUT}	Load Regulation	V _{IN} -V _{OUT} =2.0V 1mA ≤ I _{OUT} ≤ 40mA	Refer to Load Regulation Table			
ΔV _{OUT} /ΔV _{IN}	Line Regulation	I _{OUT} =20mA V _{OUT} +1V ≤ V _{IN} ≤ 24V		0.05	0.15	%/V
V _{DIF}	Dropout Voltage	I _{OUT} =20mA	Refer to Dropout Voltage Table			
ΔV _{OUT} /ΔT _{opt}	Output Voltage Temperature Coefficient	V _{IN} -V _{OUT} =2.0V I _{OUT} =20mA -40°C ≤ T _{opt} ≤ 85°C		±100		ppm/°C
I _{lim}	Short Current Limit	V _{OUT} =0V		45		mA

V_{DET} partT_{opt}=25°C

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
-V _{DET}	Detector Threshold		V _{SET} × 0.975	V _{SET}	V _{SET} × 1.025	V
V _{HYS}	Detector Threshold Hysteresis		-V _{DET} × 0.03	-V _{DET} × 0.05	-V _{DET} × 0.07	V
I _{DOUT}	Sink Current	V _{IN} =2.0V, V _{DS} =0.05V	0.17			mA
V _{DDL}	Minimum Operating Voltage	*Note 1		0.9	1.2	V
Δ-V _{DET} /ΔT _{opt}	Detector Threshold Temperature Coefficient	-40°C ≤ T _{opt} ≤ 85°C		±100		ppm/°C
t _{PLH}	Output Delay Time	Cd=4.7nF, *Note 2	20	30	50	ms

• R1150HxxxD

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

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

VR part

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

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage	$V_{IN}-V_{OUT}=2.0\text{V}$ $I_{OUT}=20\text{mA}$	V_{SET} $\times 0.98$	V_{SET}	V_{SET} $\times 1.02$	V
I_{OUT}	Output Current	$V_{IN}-V_{OUT}=2.0\text{V}$	Refer to Output Current Table			
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	$V_{IN}-V_{OUT}=2.0\text{V}$ $1\text{mA} \leq I_{OUT} \leq 40\text{mA}$	Refer to Load Regulation Table			
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	$I_{OUT}=20\text{mA}$ $V_{OUT}+1\text{V} \leq V_{IN} \leq 24\text{V}$		0.05	0.15	%/V
$\Delta V_{OUT}/\Delta T_{opt}$	Output Voltage Temperature Coefficient	$V_{IN}-V_{OUT}=2.0\text{V}$ $I_{OUT}=20\text{mA}$ $-40^{\circ}\text{C} \leq T_{opt} \leq 85^{\circ}\text{C}$		± 100		ppm/ $^{\circ}\text{C}$
I_{lim}	Short Current Limit	$V_{OUT}=0\text{V}$		45		mA

V_{DET} part

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

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
$-V_{DET}$	Detector Threshold		V_{SET} $\times 0.975$	V_{SET}	V_{SET} $\times 1.025$	V
V_{HYS}	Detector Threshold Hysteresis		$-V_{DET}$ $\times 0.03$	$-V_{DET}$ $\times 0.05$	$-V_{DET}$ $\times 0.07$	V
I_{DOUT}	Sink Current	$V_{IN}=2.0\text{V}$, $V_{DS}=0.05\text{V}$	0.17			mA
V_{DDL}	Minimum Operating Voltage	*Note 1		0.9	1.2	V
$\Delta -V_{DET}/\Delta T_{opt}$	Detector Threshold Temperature Coefficient	$-40^{\circ}\text{C} \leq T_{opt} \leq 85^{\circ}\text{C}$		± 100		ppm/ $^{\circ}\text{C}$
t_{PD}	Output Delay Time	$C_d=4.7\text{nF}$, *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=470k Ω , Pull up Voltage=5V)

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

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- **Output Current (Topt=25°C)**

Output Voltage $V_{OUT}(V)$	Output Current (mA)
	Min.
$2.1V \leq V_{OUT} \leq 2.9V$	90
$3.0V \leq V_{OUT} \leq 4.0V$	120
$4.1V \leq V_{OUT} \leq 14.0V$	150

- **Load Regulation (Topt=25°C)**

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

- **Dropout Voltage (Topt=25°C)**

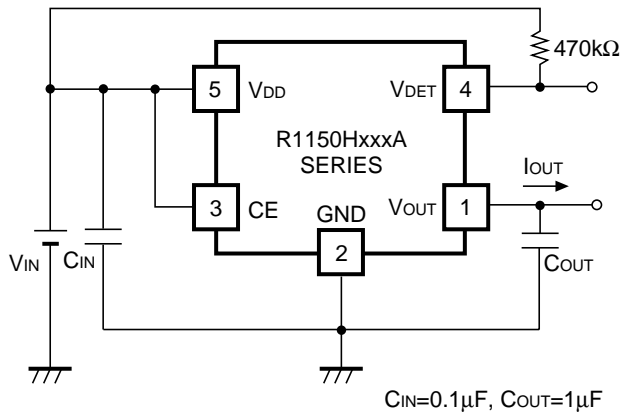
Output Voltage $V_{OUT}(V)$	Dropout Voltage (V)	
	Typ.	Max.
$2.1V \leq V_{OUT} \leq 2.4V$	0.40	0.60
$2.5V \leq V_{OUT} \leq 3.0V$	0.30	0.40
$3.1V \leq V_{OUT} \leq 7.0V$	0.25	0.35
$7.1V \leq V_{OUT} \leq 10.0V$	0.27	0.45
$10.1V \leq V_{OUT} \leq 14.0V$	0.30	0.50

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

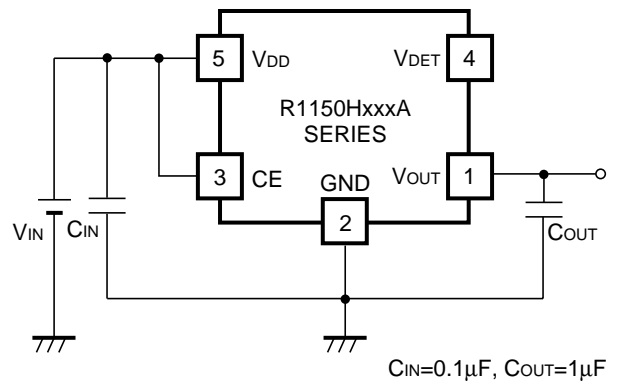
Detector Threshold Voltage $-V_{DET}(V)$	Supply Current (μA)	
	Typ.	Max.
$2.3V \leq V_{OUT} \leq 3.0V$	2.5	5.0
$3.1V \leq V_{OUT} \leq 15.0V$	3.0	6.0

TEST CIRCUITS

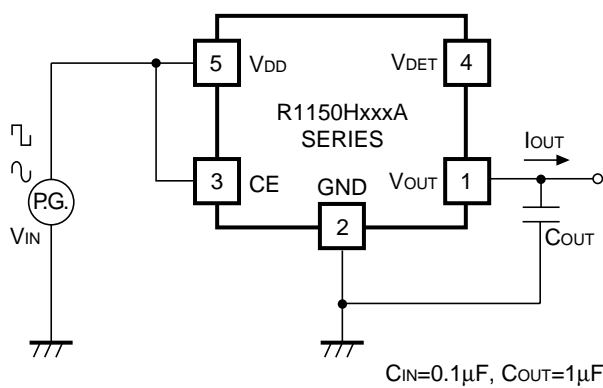
• R1150HxxxA



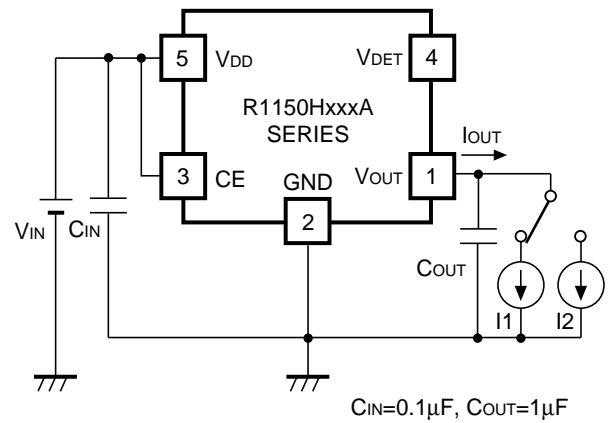
Standard Test Circuit



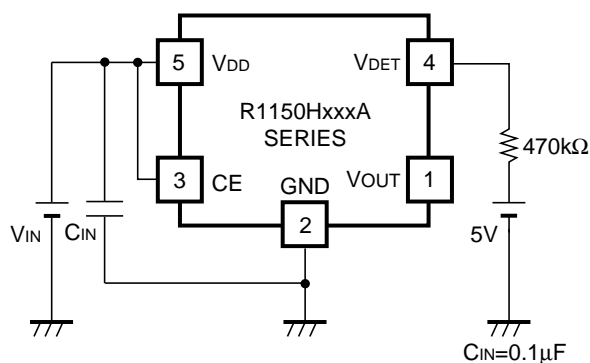
Supply Current Test Circuit



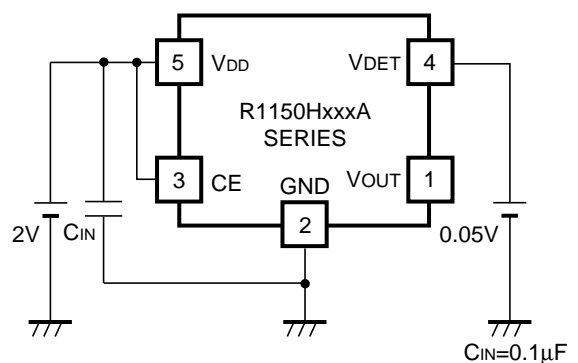
**Input Transient Response/
Ripple Rejection Test Circuit**



Load Transient Response Test Circuit



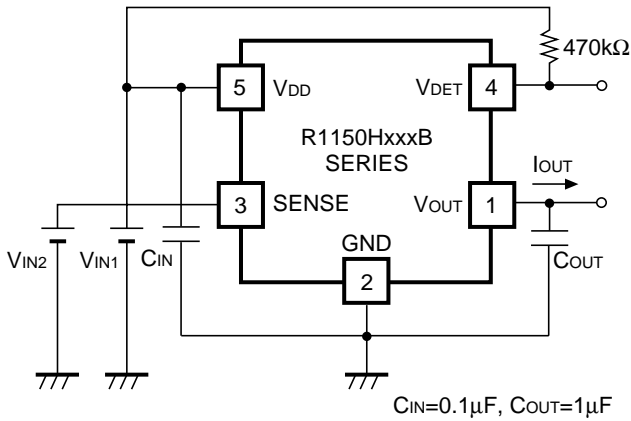
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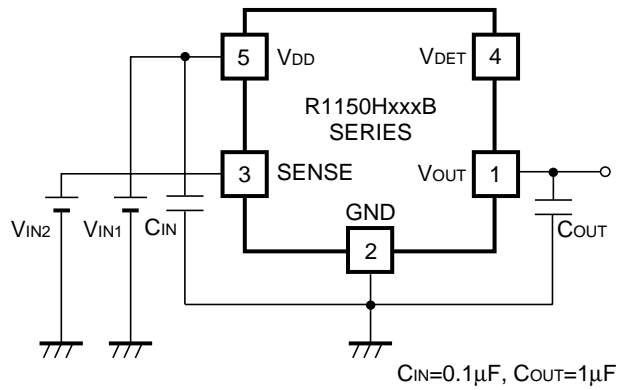
VDET Output Current Test Circuit

R1150H

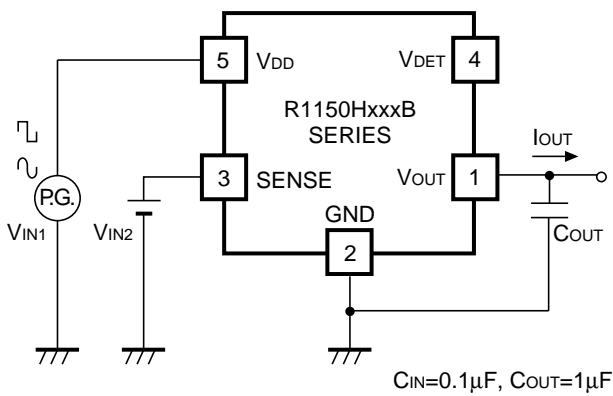
• R1150HxxxB



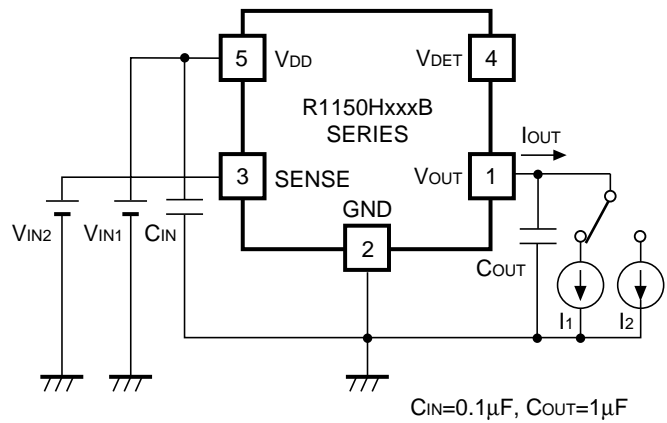
Standard Test Circuit



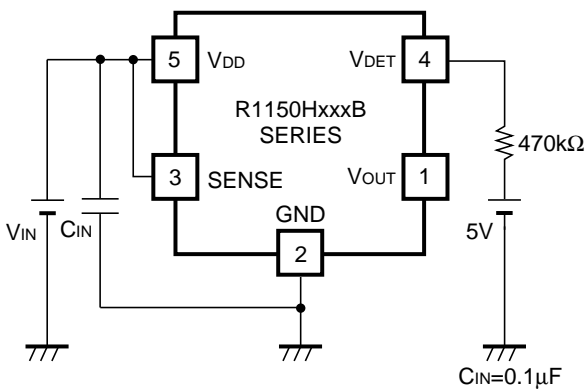
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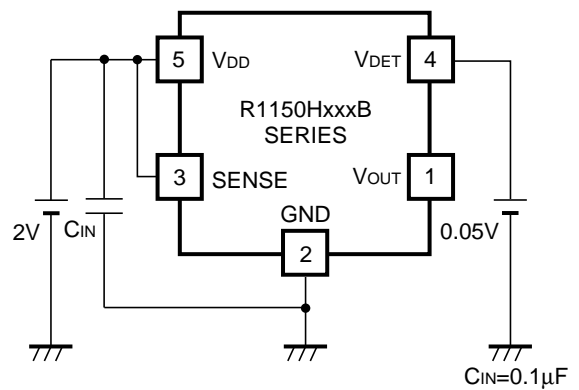
**Input Transient Response/
Ripple Rejection Test Circuit**



Load Transient Response Test Circuit

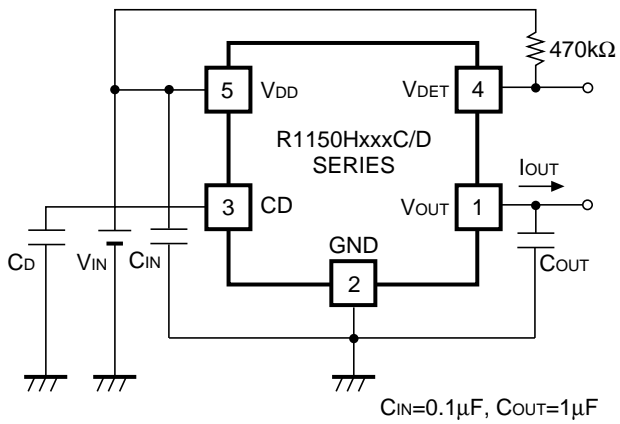


VDET Minimum Operating Voltage Test Circuit

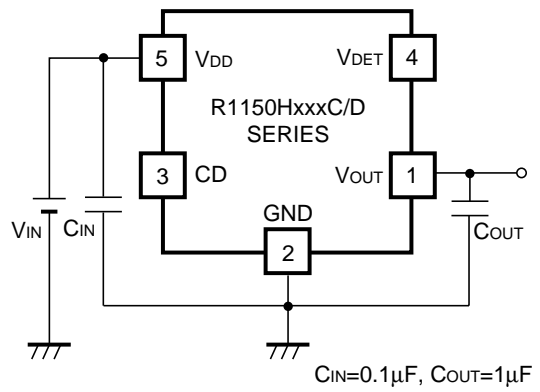


VDET Output Current Test Circuit

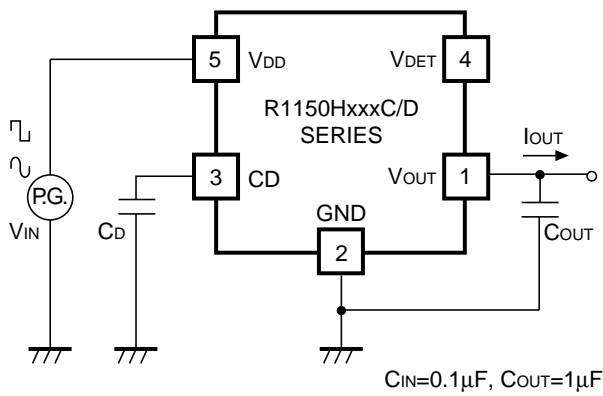
• R1150HxxxC/D



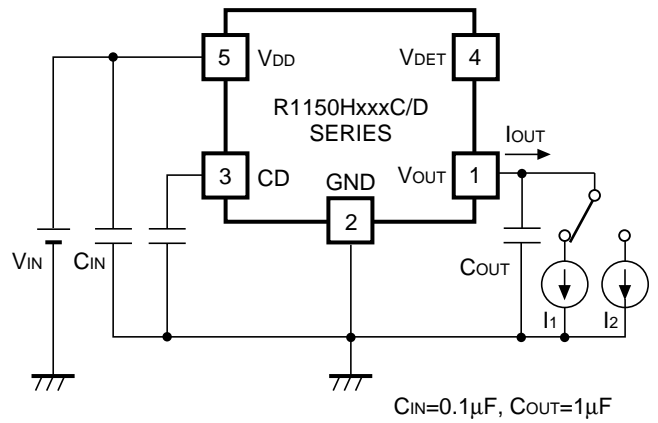
Standard Test Circuit



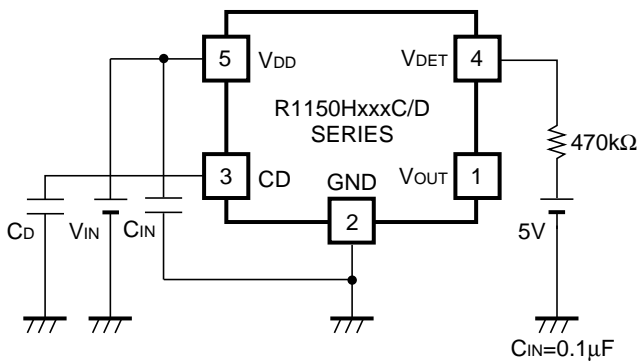
Supply Current Test Circuit



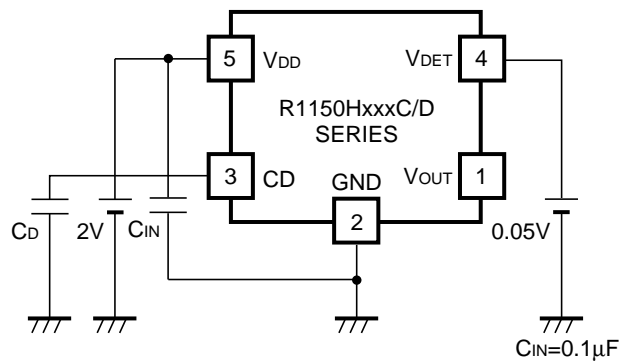
Input Transient Response/
Ripple Rejection Test Circuit



Load Transient Response Test Circuit



VDET Minimum Operating Voltage Test Circuit

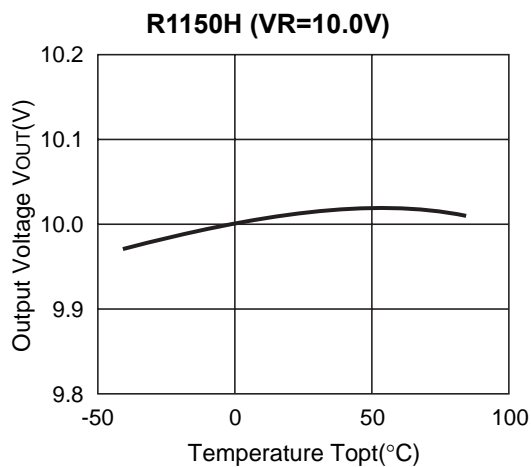
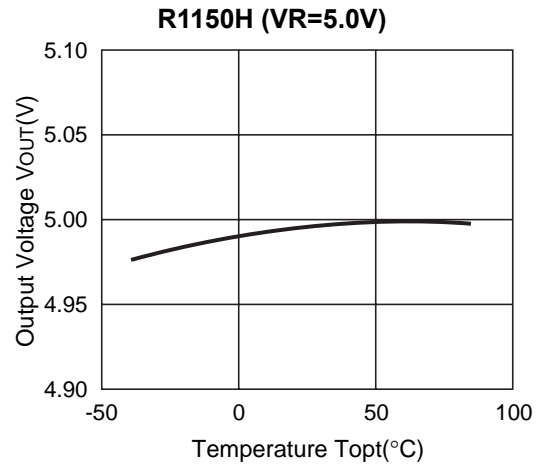
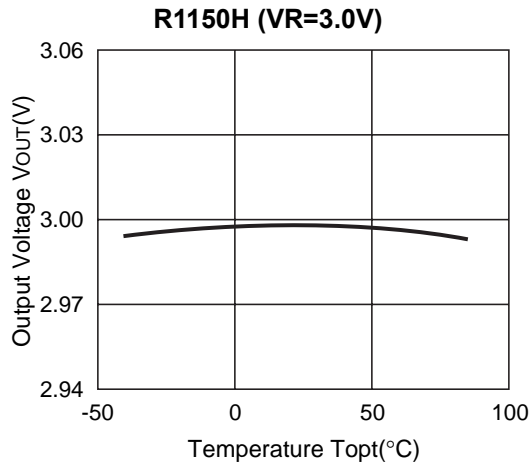


VDET Output Current Test Circuit

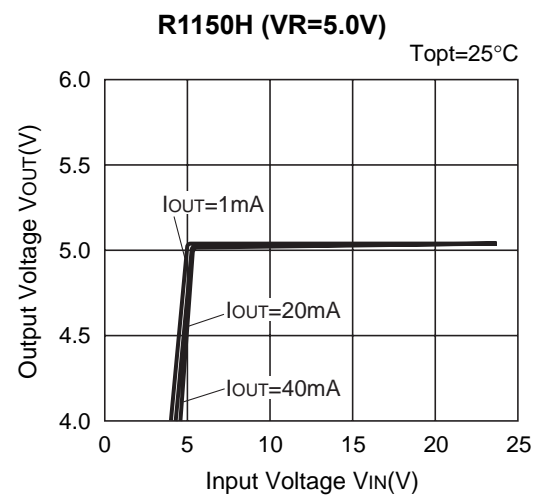
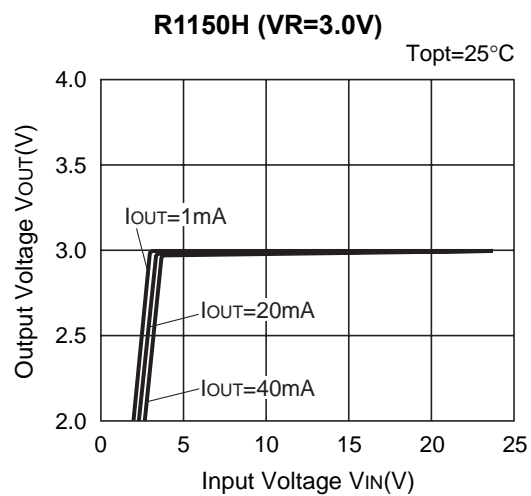
R1150H

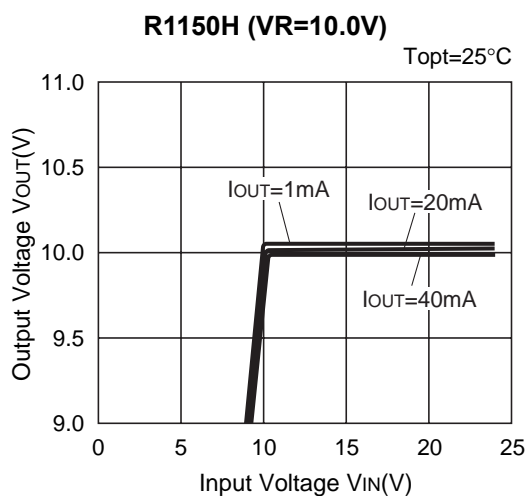
TYPICAL CHARACTERISTICS

1) Output Voltage vs. Temperature

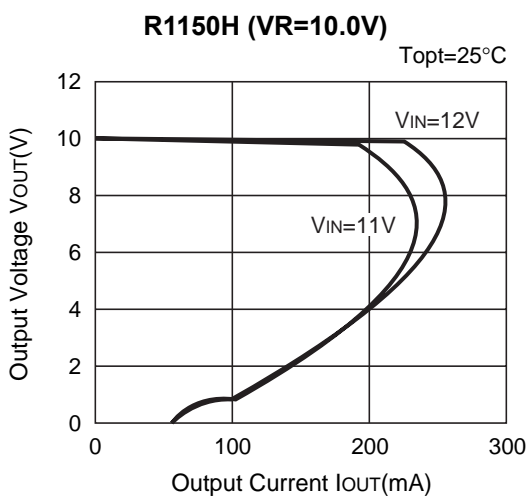
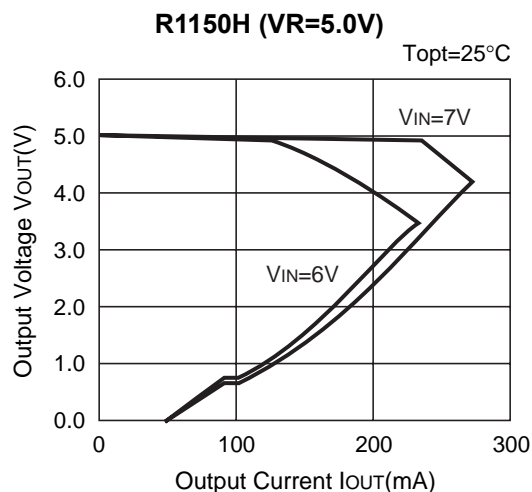
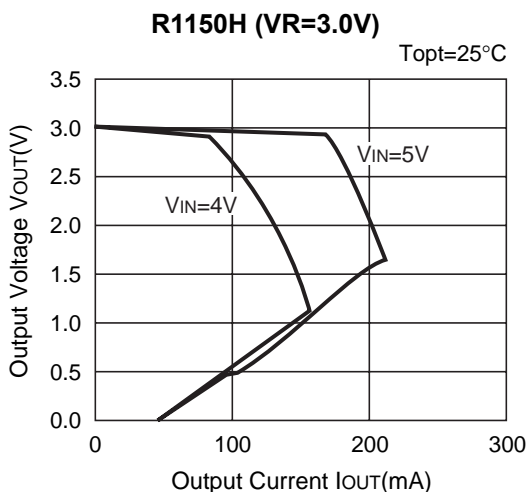


2) Input Voltage vs. Output Voltage



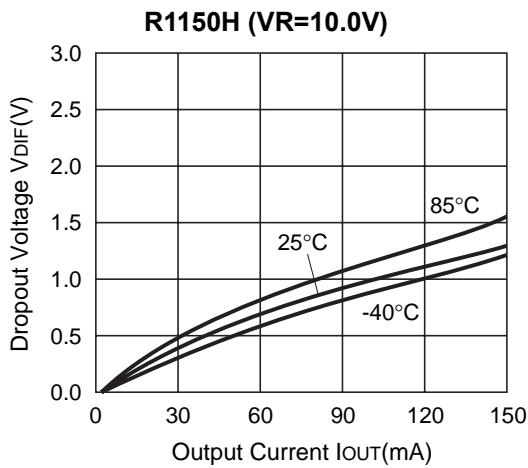
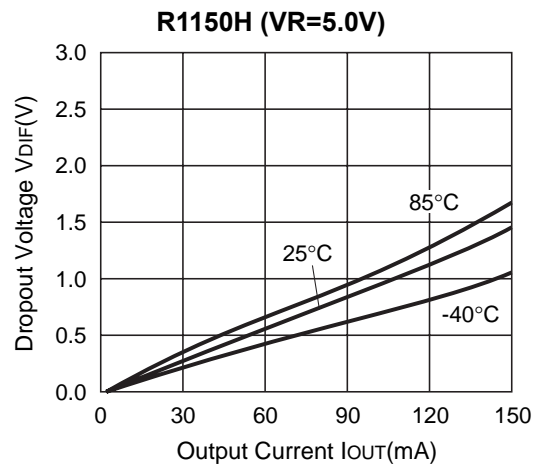
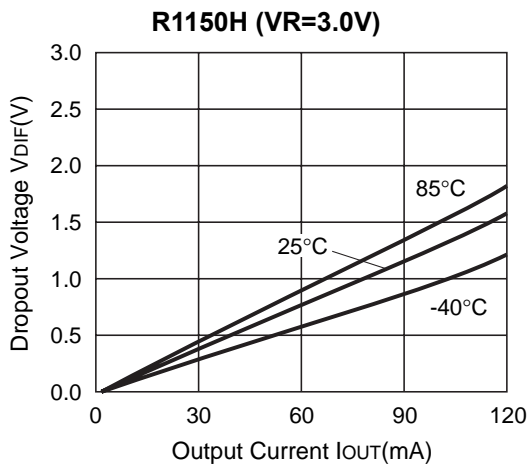


3) Output Voltage vs. Output Current

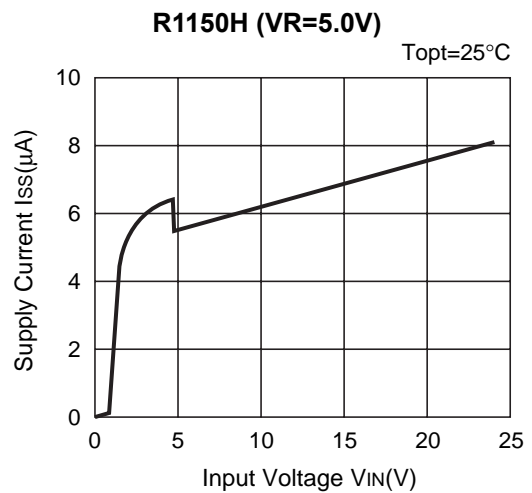
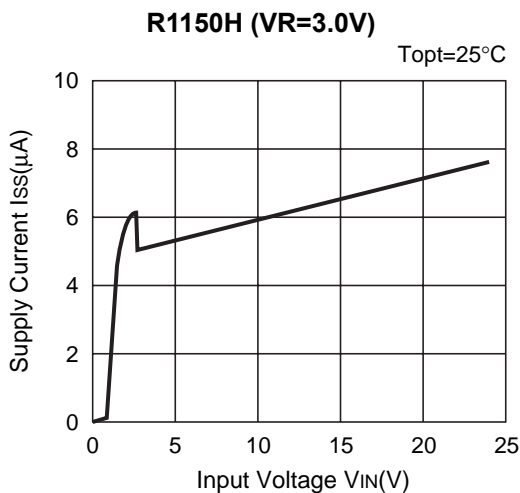


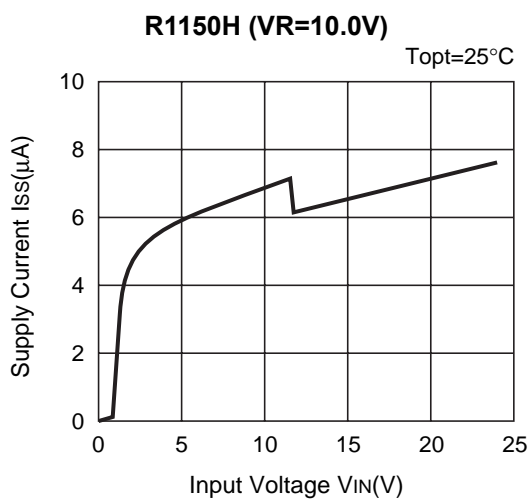
R1150H

4) Dropout Voltage vs. Output Current

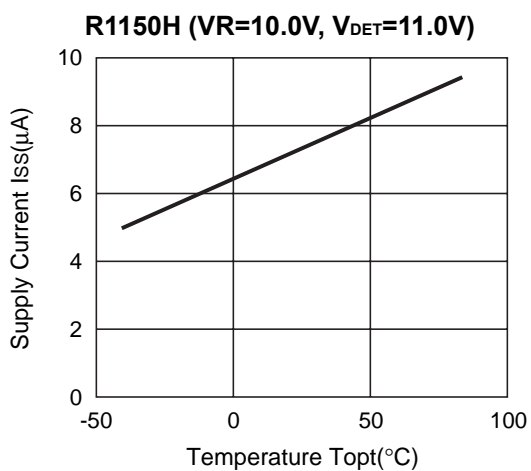
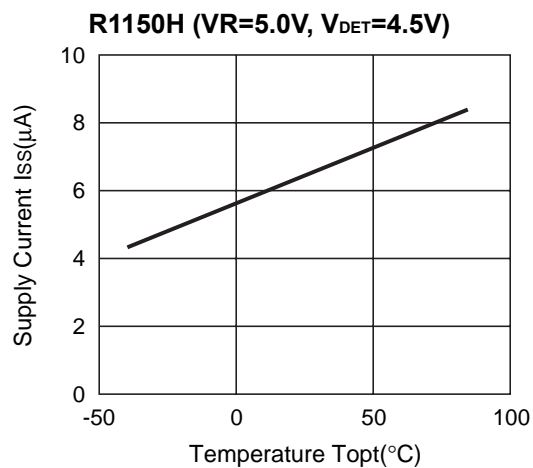
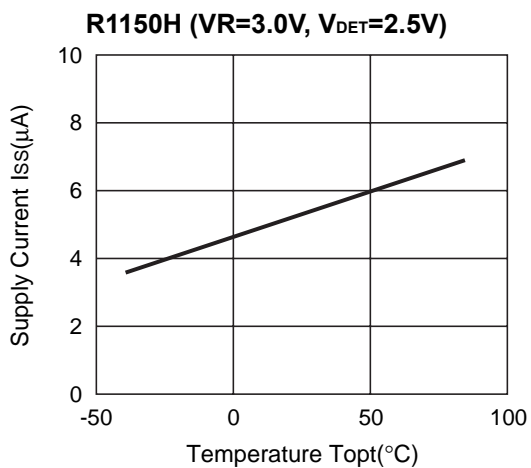


5) Supply Current vs. Input Voltage



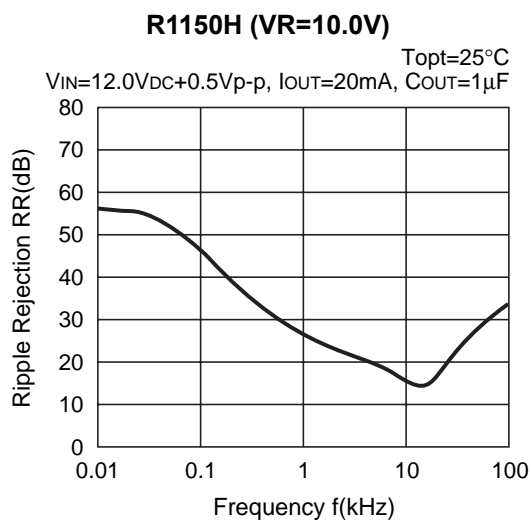
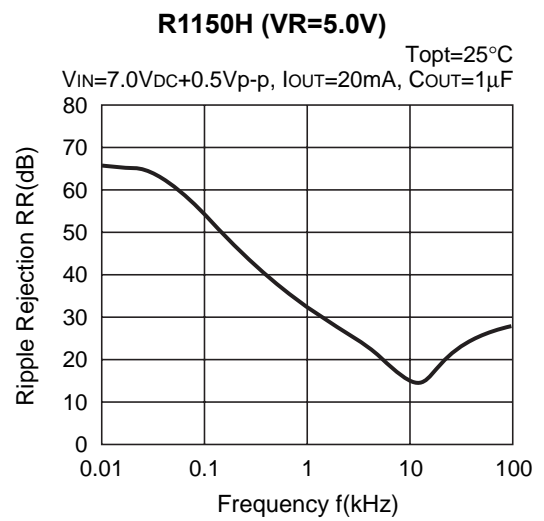
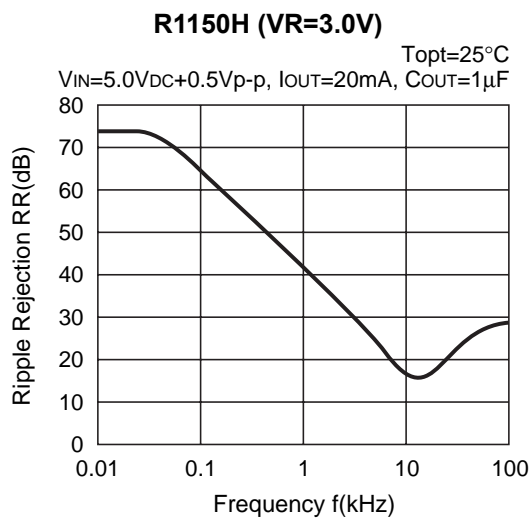


6) Supply Current vs. Temperature



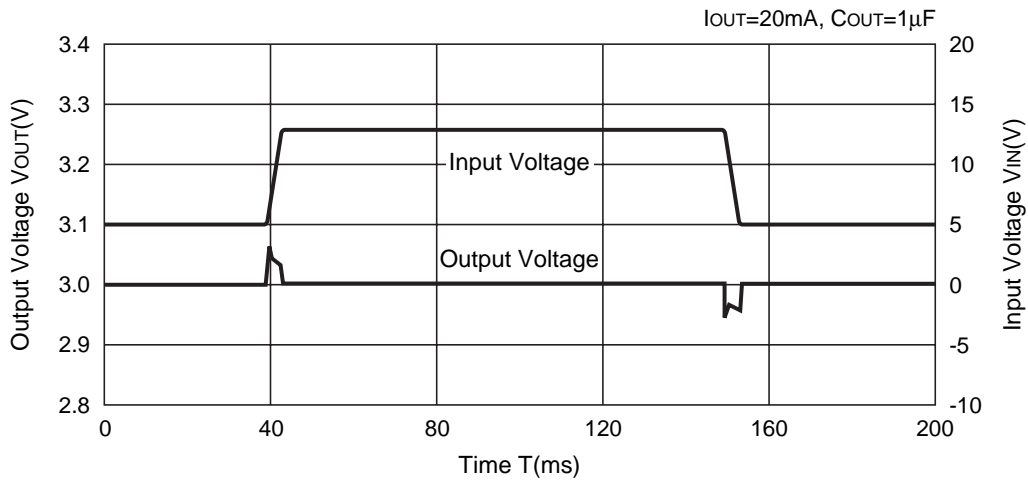
R1150H

7) Ripple Rejection vs. Frequency

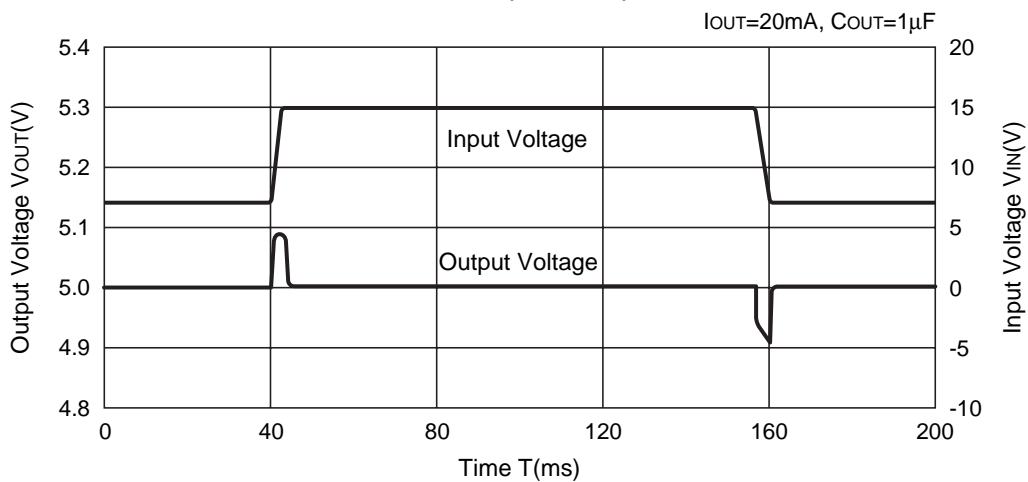


8) Input Transient Response

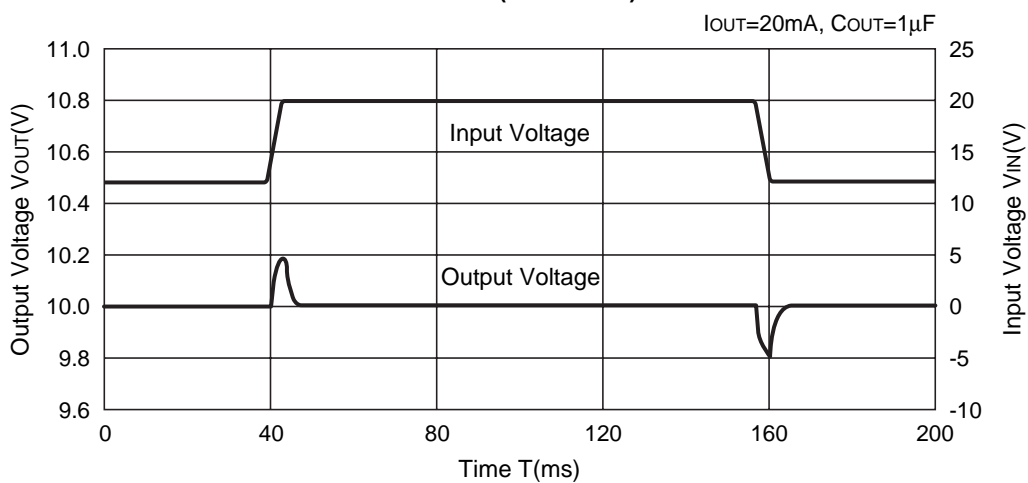
R1150H (VR=3.0V)



R1150H (VR=5.0V)



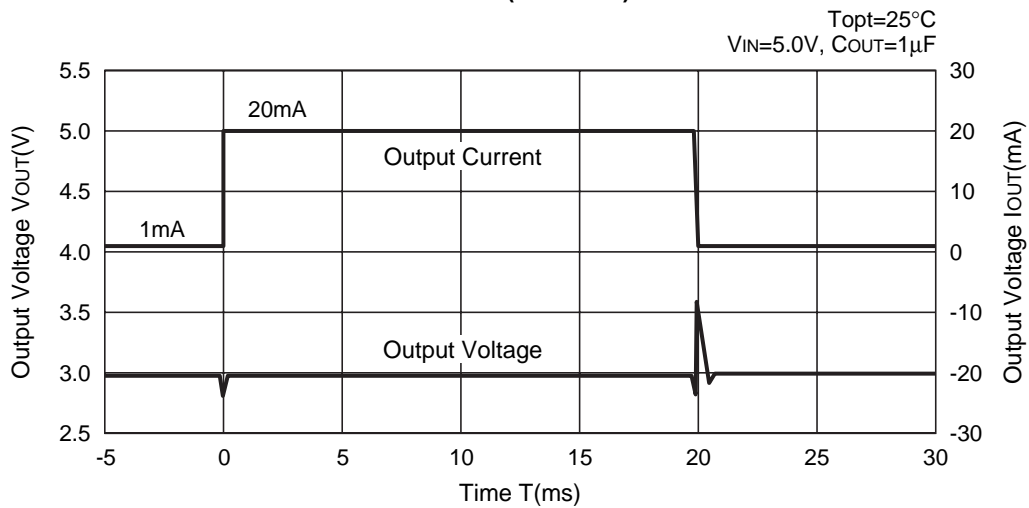
R1150H (VR=10.0V)



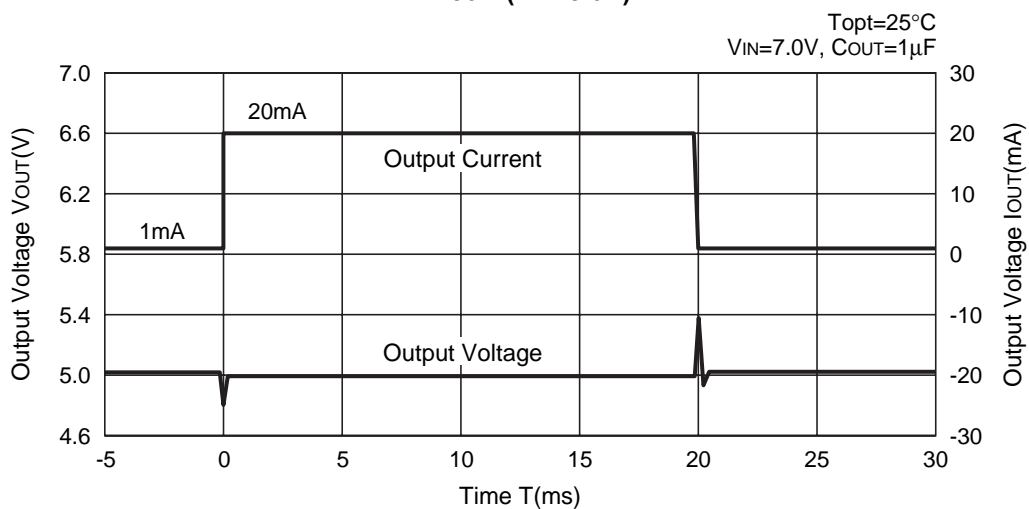
R1150H

9) Load Transient Response

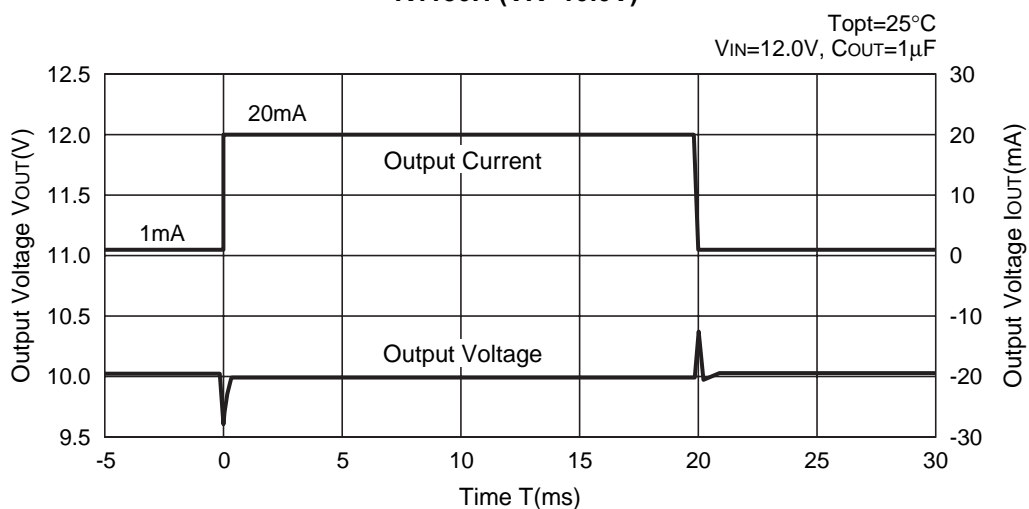
R1150H (VR=3.0V)



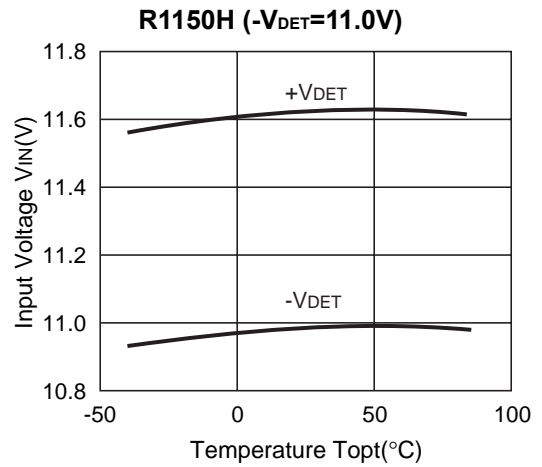
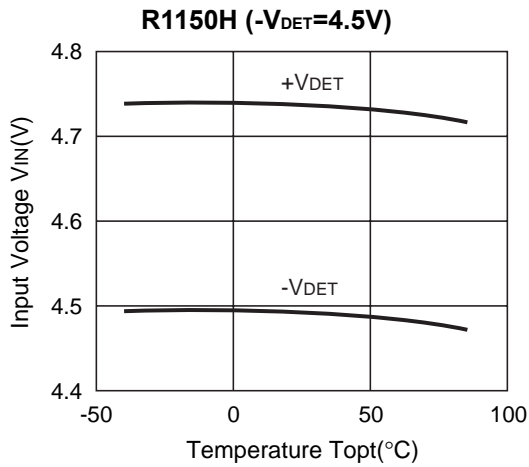
R1150H (VR=5.0V)



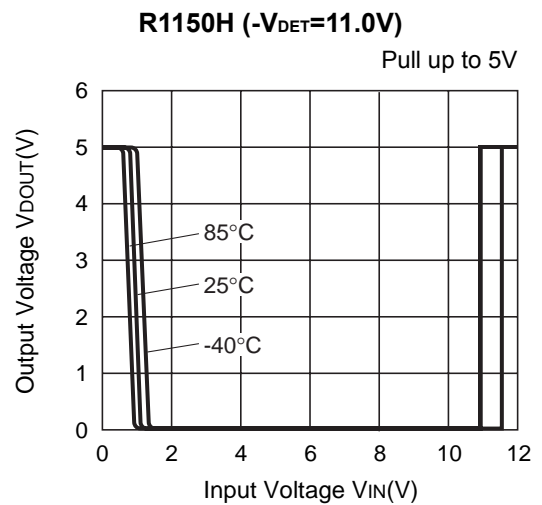
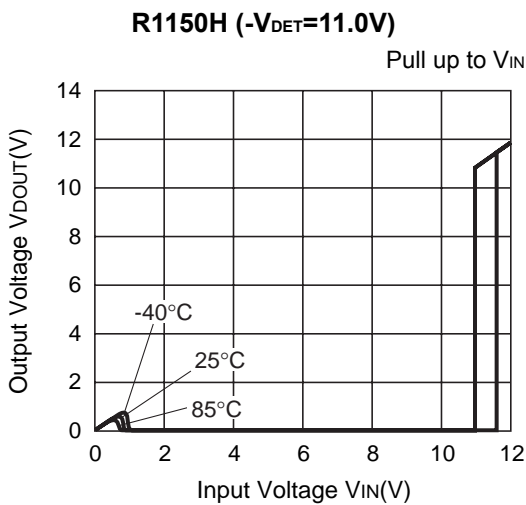
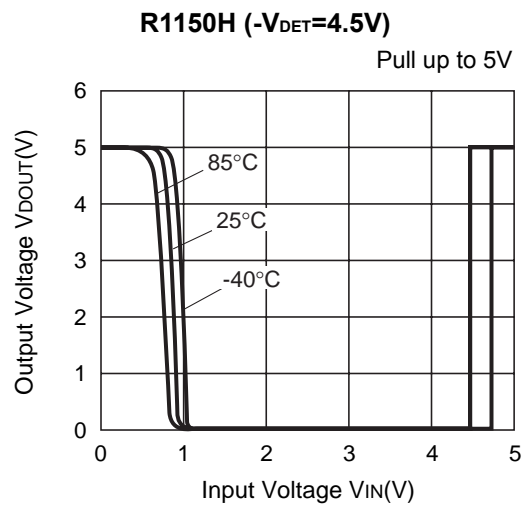
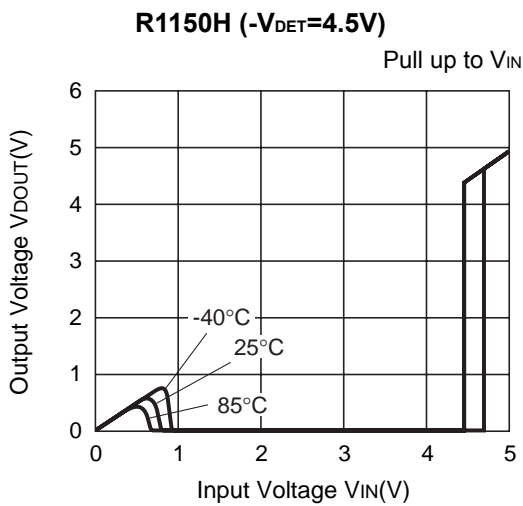
R1150H (VR=10.0V)



10) Detector Threshold vs. Temperature

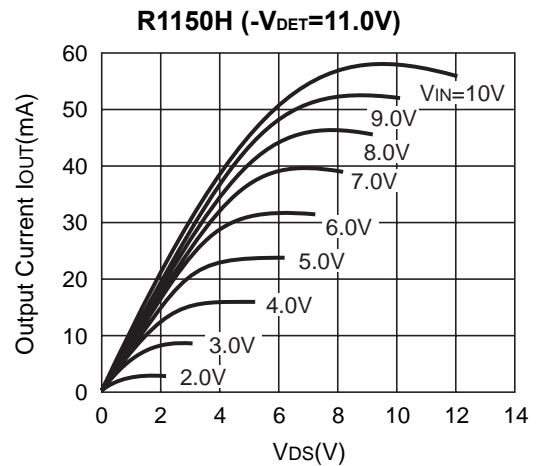
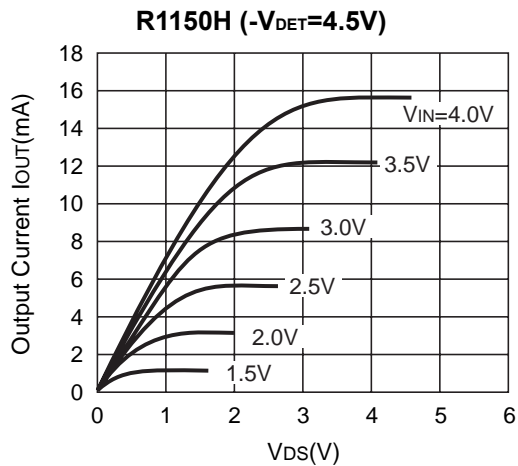


11) Detector Threshold vs. Input Voltage

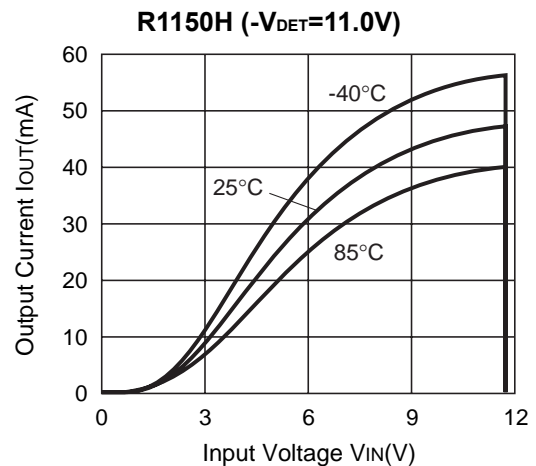
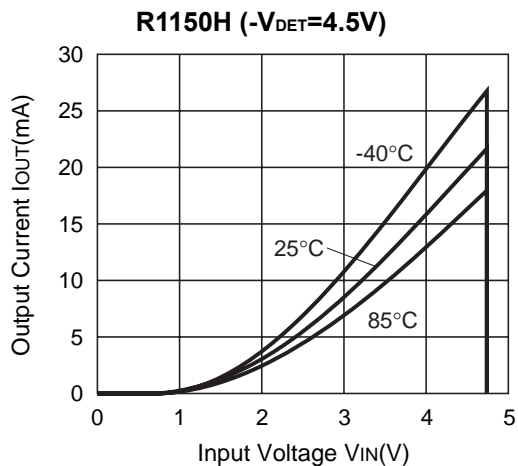


R1150H

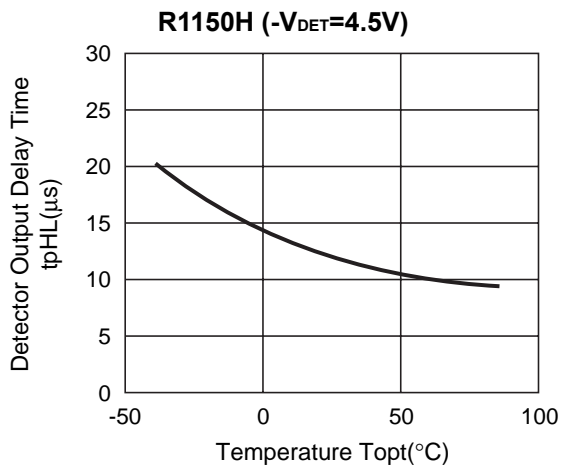
12) Nch Driver Output Current vs. V_{DS}



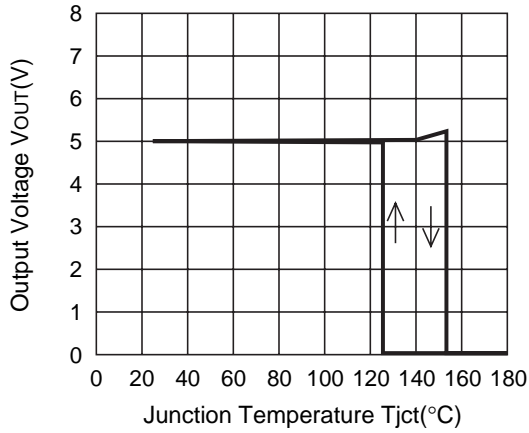
13) Nch Driver Output Current vs. Input Voltage



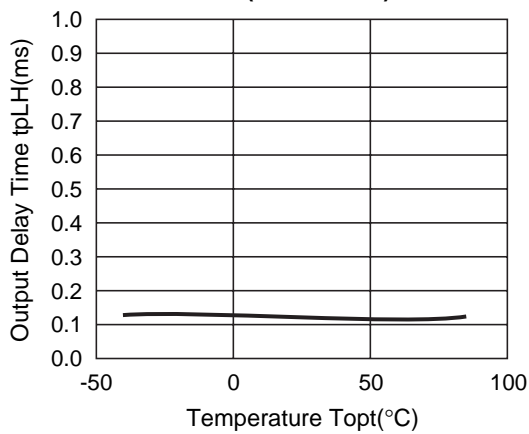
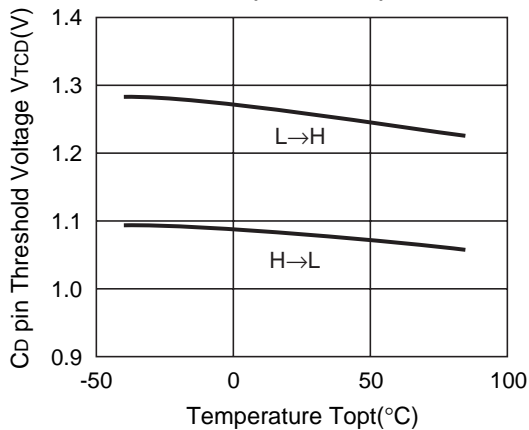
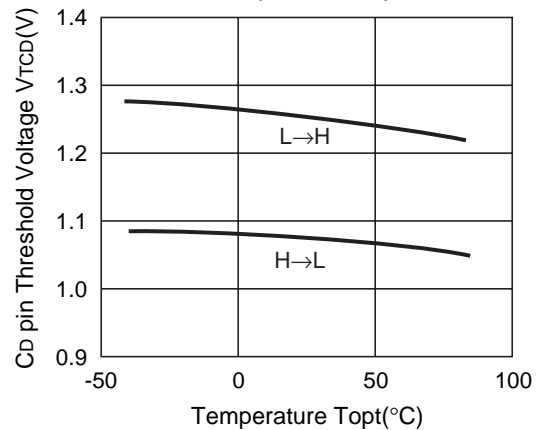
14) Detector Output Delay Time vs. Temperature



15) Thermal Shutdown Temperature vs. Output Voltage

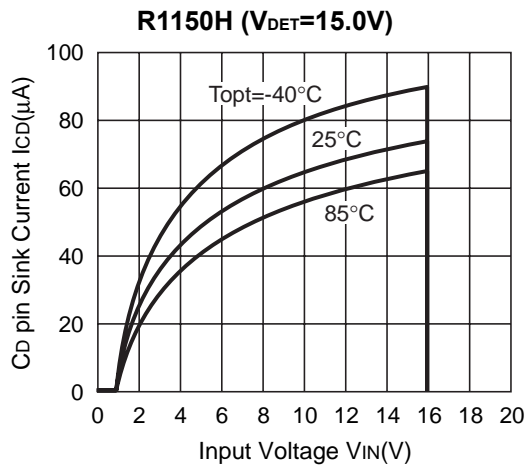
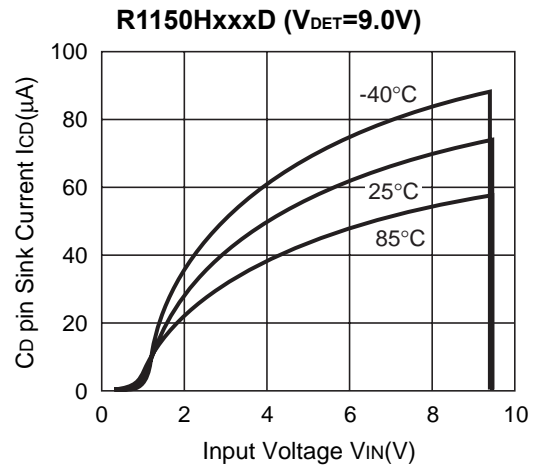
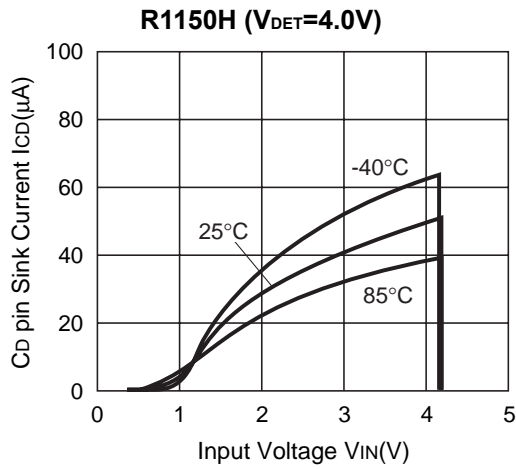
R1150H (VR=5.0V) $V_{IN}=10V, I_{OUT}=1mA$ 

16) Output Delay Time vs. Temperature

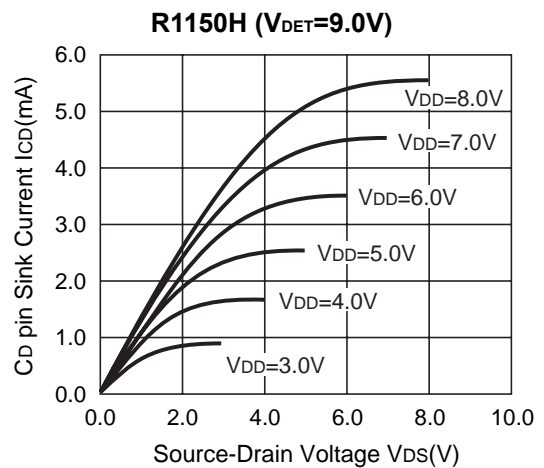
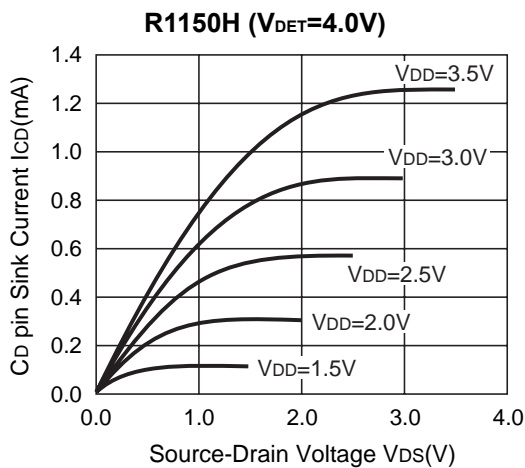
R1150H ($-V_{DET}=4.5V$)17) C_D pin Threshold Voltage vs. Temperature**R1150H ($V_{DET}=4.0V$)****R1150H ($V_{DET}=9.0V$)**

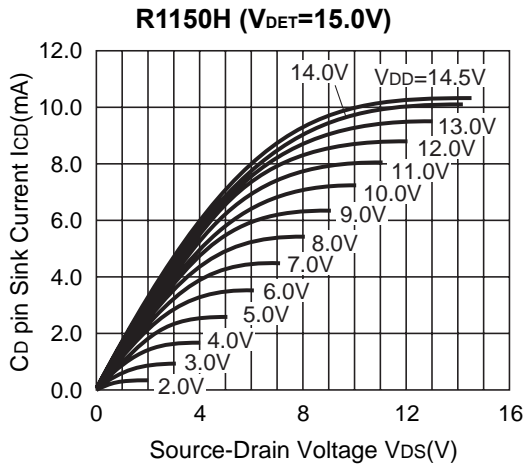
R1150H

18) C_D pin Sink Current vs. Input Voltage

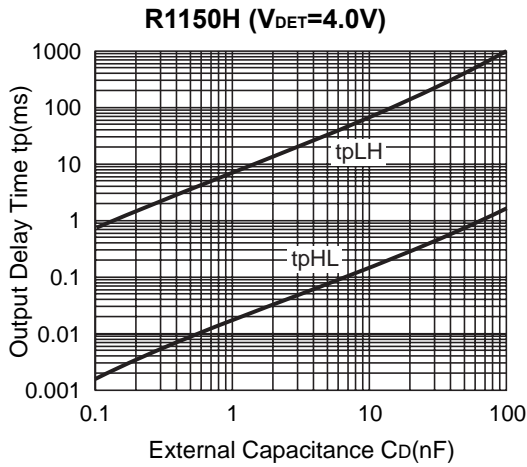


19) C_D pin Sink Current vs. V_{DS}

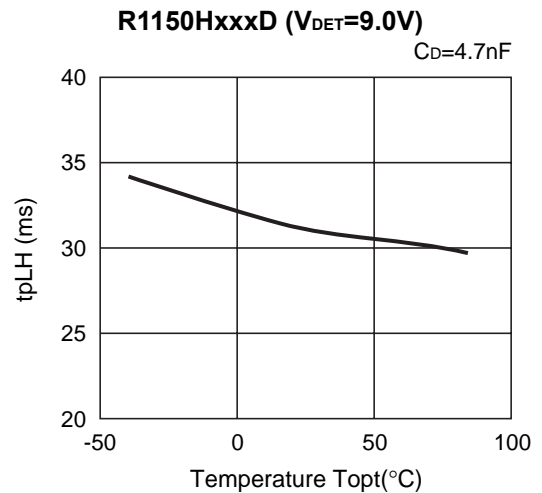
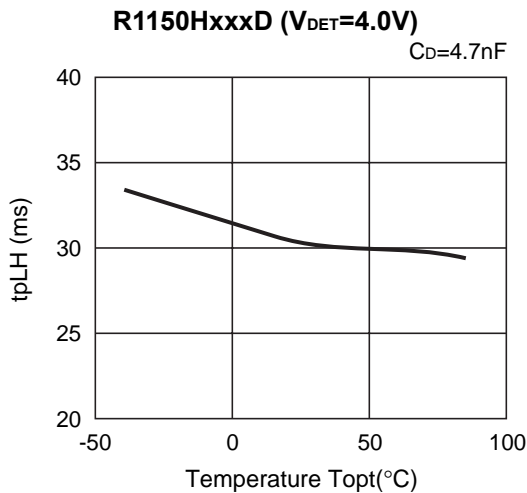




20) Output Delay Time vs. External Capacitance



21) tpLH vs. Temperature



R1150H

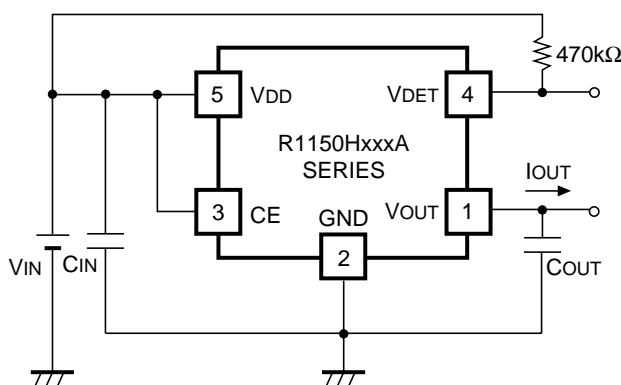
TECHNICAL NOTES

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 0.1 μ F or more capacitors as C_{IN} and C_{OUT} . 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

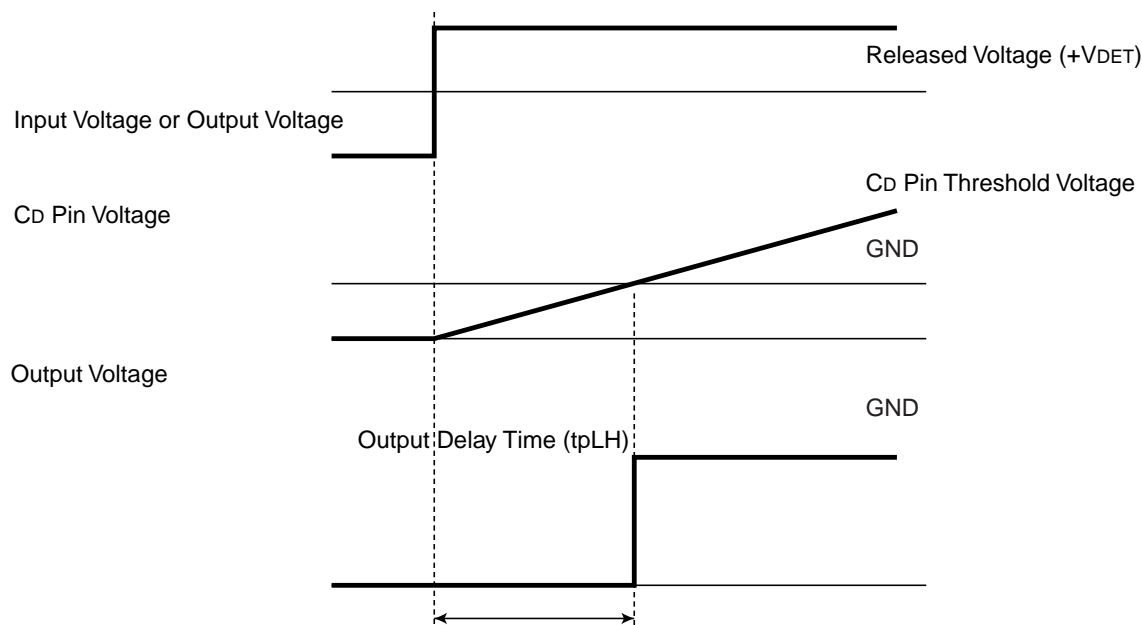
Thermal shutdown function is included in the R1150HxxxA/B/C/D Series, when the junction temperature is equal or more than +150°C (Typ.), the operation of regulator would stop. After that, when the junction temperature is equal or less than +120°C (Typ.), the operation of regulator would restart. Unless 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".



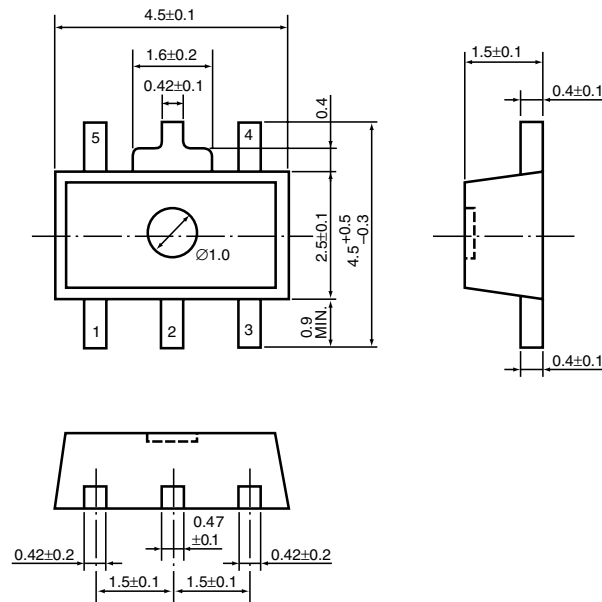
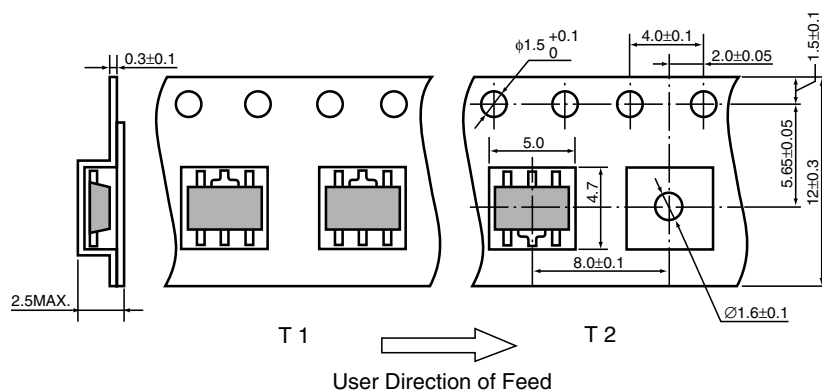
Output delay time for release voltage detector can be calculated with the next formula:
 $tpLH = 1.25/200 \times 10^9 \times C$ (sec)

Input Transient Response

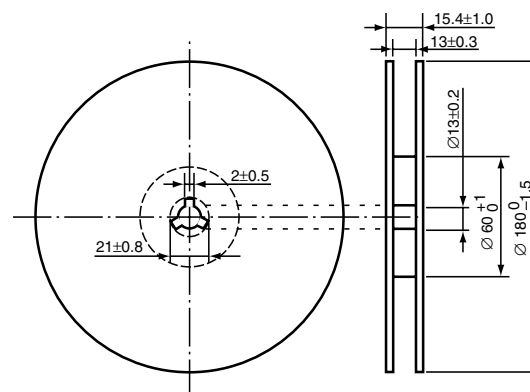
If input transient is $0.12V/\mu s$ or faster, the output response may be extremely worse than normal operation. In that case, add a capacitor between V_{IN} and GND, and make the transient speed of V_{IN} slower than $0.12V/\mu s$.

PACKAGE INFORMATION**PE-SOT-89-5-0512**• **SOT-89-5**

Unit: mm

PACKAGE DIMENSIONS**TAPING SPECIFICATION (T1: Standard Type)****TAPING REEL DIMENSIONS**

(1reel=1000pcs)

**RICOH**

PACKAGE INFORMATION**PE-SOT-89-5-0512****POWER DISSIPATION (SOT-89-5)**

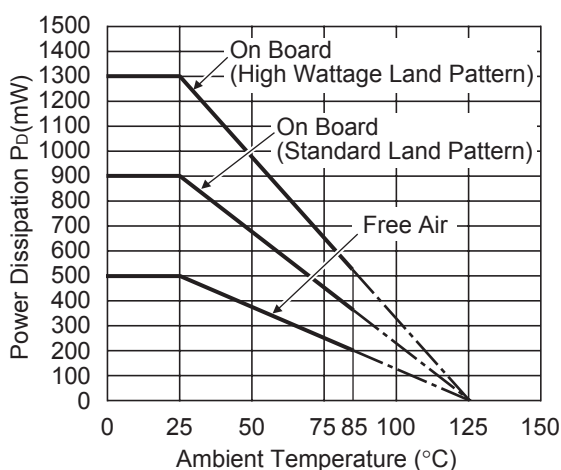
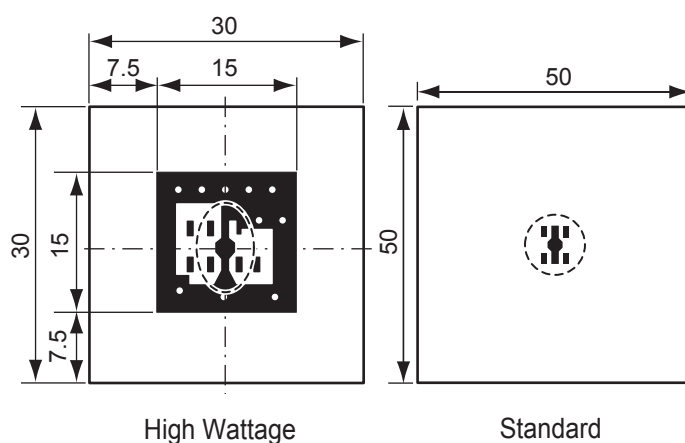
This specification is at mounted on board. Power Dissipation (P_D) depends on conditions of mounting on board. This specification is based on the measurement at the condition below:

Measurement Conditions

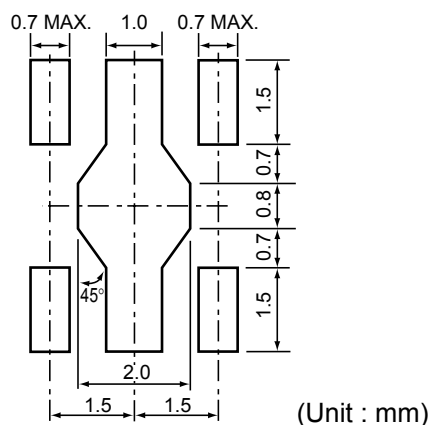
	High Wattage Land Pattern	Standard Land Pattern
Environment	Mounting on Board (Wind velocity=0m/s)	Mounting on Board (Wind velocity=0m/s)
Board Material	Glass cloth epoxy plastic (Double sided)	Glass cloth epoxy plastic (Double sided)
Board Dimensions	30mm × 30mm × 1.6mm	50mm × 50mm × 1.6mm
Copper Ratio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

Measurement Result(T_{opt}=25°C, T_{jmax}=125°C)

	High Wattage Land Pattern	Standard Land Pattern	Free Air
Power Dissipation	1300mW	900mW	500mW
Thermal Resistance	77°C/W	111°C/W	200°C/W

**Power Dissipation****Measurement Board Pattern**

○ IC Mount Area (Unit : mm)

RECOMMENDED LAND PATTERN (SOT-89-5)

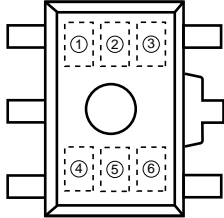
(Unit : mm)

MARK INFORMATIONS

ME-R1150H-0610

R1150H SERIES MARK SPECIFICATION

• SOT-89-5



- ① : D (fixed)
 ②, ③ : Setting Voltage } (refer to Part Number vs. Product Code)
 ④ : Type (A,B,C,D)
 ⑤, ⑥ : Lot Number

• Part Number vs. Product Code

Part Number	Product Code			
	①	②	③	④
R1150H001A	D	0	1	A
R1150H002A	D	0	2	A
R1150H003A	D	0	3	A
R1150H006A	D	0	6	A
R1150H010A	D	1	0	A
R1150H011A	D	1	1	A
R1150H012A	D	1	2	A
R1150H013A	D	1	3	A
R1150H014A	D	1	4	A
R1150H015A	D	1	5	A
R1150H019A	D	1	9	A
R1150H021A	D	2	1	A
R1150H023A	D	2	3	A
R1150H027A	D	2	7	A
R1150H029A	D	2	9	A
R1150H033A	D	3	3	A
R1150H039A	D	3	9	A
R1150H040A	D	4	0	A
R1150H042A	D	4	2	A

Part Number	Product Code			
	①	②	③	④
R1150H002B	D	0	2	B
R1150H003B	D	0	3	B
R1150H004B	D	0	4	B
R1150H005B	D	0	5	B
R1150H006B	D	0	6	B
R1150H021B	D	2	1	B
R1150H024B	D	2	4	B
R1150H025B	D	2	5	B
R1150H035B	D	3	5	B
R1150H036B	D	3	6	B
R1150H037B	D	3	7	B
R1150H038B	D	3	8	B

Part Number	Product Code			
	①	②	③	④
R1150H007C	D	0	7	C
R1150H008C	D	0	8	C
R1150H009C	D	0	9	C
R1150H020C	D	2	0	C
R1150H041C	D	4	1	C

Part Number	Product Code			
	①	②	③	④
R1150H002D	D	0	2	D
R1150H016D	D	1	6	D
R1150H017D	D	1	7	D
R1150H018D	D	1	8	D
R1150H020D	D	2	0	D
R1150H022D	D	2	2	D
R1150H026D	D	2	6	D
R1150H028D	D	2	8	D
R1150H030D	D	3	0	D
R1150H031D	D	3	1	D