

36 V Input Voltage Detector with Delay Function for Automotive Applications

NO.EC-373-150310

OUTLINE

The R3120N is a CMOS-based 36 V input (absolute maximum ratings: 50 V) voltage detector (VD) provided with high detector threshold accuracy and ultra-low supply current. Internally, the R3120N consists of a voltage reference unit, a hysteresis comparator, a resistor net for setting output voltage and an output driver transistor. The R3120NxxxA is equipped with a C_D pin and the R3120NxxxE is equipped with a SENSE pin.

The supply current of IC is only 3.3 μ A. The detector threshold range is 2.3 V to 12 V, and the detector threshold accuracy is 1.5%. The output type is Nch. open drain "L" output.

The R3120N is available in a 5-pin SOT-23-5 package. Use of this package achieves high-density mounting on boards.

FEATURES

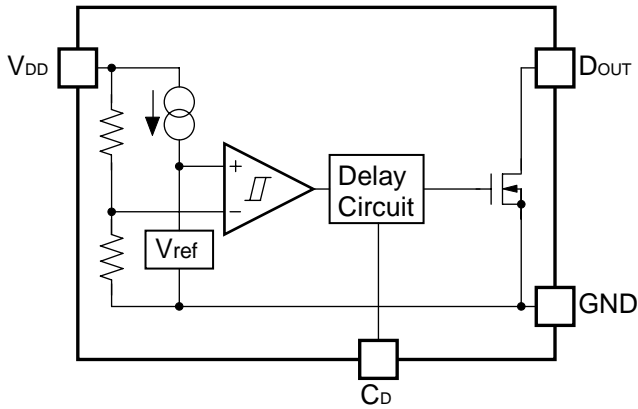
- Operating Voltage Range (Maximum Rating)R3120NxxxA: 1.2 V to 36.0 V (50.0V)
R3120NxxxE: 2.1 V to 6.0 V (7.0V)
- Operating Temperature Range.....-40°C to 105°C
- Supply CurrentTyp. 3.3 μ A
- Detector Threshold Range2.3 V to 12.0 V (0.1 V steps)
- Detector Threshold Accuracy..... \pm 1.5% (T_a=25°C)
- Detector Threshold Temperature Coefficient Typ. \pm 100 ppm / °C
- Release Output Delay Time..... R3120NxxxA : Typ.85 ms (at C_D=0.01 μ F)
- Release Output Delay Time Accuracy.....R3120NxxxA : -50% to 80%
- Output Type.....Nch. Open Drain
- PackageSOT-23-5

APPLICATIONS

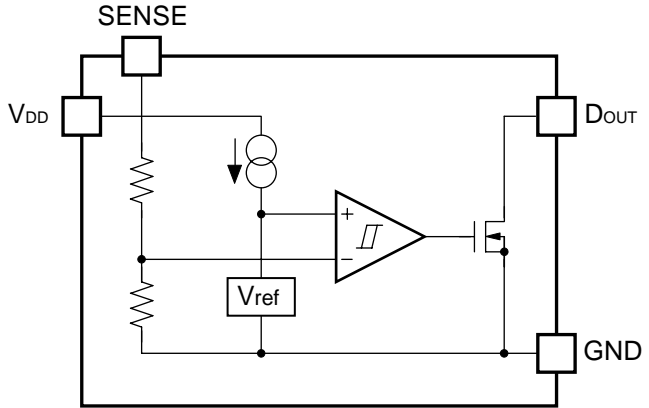
- Voltage monitoring for car accessories including car audios, car navigation systems, ETC systems.

BLOCK DIAGRAMS

R3120NxxxA



R3120NxxxE



SELECTION GUIDE

The detector threshold and the voltage detection type are user selectable options.

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R3120Nxxx*-TR-#E	SOT-23-5	3,000 pcs	Yes	Yes

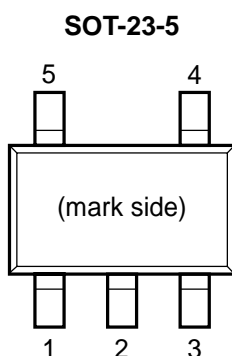
xxx : Specify the set detector threshold ($-V_{SET}$) in the range of 2.3 V (023) to 12.0 V (120) in 0.1 V steps.

*: Select the voltage detection type from the following;
 A: with C_D pin type
 E: with SENSE pin type

#: Specify the automotive class code.

	Operating Temperature Range	Guaranteed Specs Temperature Range	Screening
A	-40°C to 105°C	25°C	High Temperatures

PIN CONFIGURATIONS



Pin No.	Symbol	Description
1	V_{DD}	Input Pin
2	GND* ¹	Ground Pin
3	GND* ¹	Ground Pin
4	D_{OUT}	Output Pin ("L" active at detection)
5	C_D	Release Output Delay Set Pin (R3120NxxxA)
	SENSE	VD Voltage SENSE Pin (R3120NxxxE)

*¹ No.2 and No.3 pins must be wired to the GND plane when mounted on board.

ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating	Unit	
V _{DD}	Supply Voltage (R3120NxxxA)	-0.3 to 50.0	V	
	Supply Voltage (R3120NxxxE)	-0.3 to 7.0	V	
V _{DOUT}	D _{OUT} Pin Output Voltage	-0.3 to 7.0	V	
V _{CD}	C _D Pin Output Voltage (R3120NxxxA)	-0.3 to 7.0	V	
V _{SENSE}	SENSE Pin Input Voltage (R3120NxxxE)	-0.3 to 50.0	V	
I _{OUT}	D _{OUT} Pin Output Current	20	mA	
P _D	Power Dissipation (SOT-23-5) *1	Standard Land Pattern	420	mW
T _j	Junction Temperature	-40 to 125	°C	
T _{stg}	Storage Temperature	-55 to 125	°C	

*1 Please refer to *PACKAGE INFORMATION* for detailed information.

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause the permanent damages and may degrade the lifetime and safety for both device and system using the device in the field. The functional operation at or over these absolute maximum ratings are not assured.

RECOMMENDED OPERATING CONDITIONS

Symbol	Item	Rating	Unit
V _{DD}	Operating Voltage (R3120NxxxA)	1.25 to 36	V
	Operating Voltage (R3120NxxxE)	2.1 to 6	V
V _{SENSE}	SENSE Pin Input Voltage (R3120NxxxE)	0 to 36	V
T _a	Operating Temperature Range	-40 to 105	°C

RECOMMENDED OPERATING CONDITIONS

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if when they are used over such conditions by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

ELECTRICAL CHARACTERISTICS

$C_D = 1000$ pF, pulled-up to 5 V with 100 k Ω , unless otherwise specified.

The specifications surrounded by are guaranteed by design engineering at $-40^\circ\text{C} \leq T_a \leq 105^\circ\text{C}$.

R3120NxxxA

($T_a = 25^\circ\text{C}$)

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
$-V_{DET}$	Detector Threshold	V_{DD} pin	$T_a = 25^\circ\text{C}$	x 0.985		x 1.015	V
			$-40^\circ\text{C} \leq T_a \leq 105^\circ\text{C}$	x 0.970		x 1.020	
V_{HYS}	Detector Threshold Hysteresis			3.5	5	6.5	%
I_{SS}	Supply Current	$V_{DD} = -V_{SET} - 0.1$ V			3.3	5.6	μA
		$V_{DD} = -V_{SET} + 1.0$ V			3.3	5.5	
V_{DDL}	Minimum Operating Voltage*	$T_a = 25^\circ\text{C}$				1.2	V
		$-40^\circ\text{C} \leq T_a \leq 105^\circ\text{C}$				1.25	
I_{OUT}	Output Current (Nch Driver Output Pin)	$V_{DD} = 1.5$ V, $V_{DS} = 0.05$ V		230			μA
		2.3 V $\leq -V_{SET} < 2.6$ V	$V_{DD} = 2.2$ V $V_{DS} = 0.5$ V	2.8			mA
		2.6 V $\leq -V_{SET} < 3.0$ V	$V_{DD} = 2.5$ V $V_{DS} = 0.5$ V	3.3			
		3.0 V $\leq -V_{SET}$	$V_{DD} = 2.9$ V $V_{DS} = 0.5$ V	3.5			
I_{LEAK}	Nch. Driver Leakage Current	$V_{DD} = 36$ V, $V_{DS} = 6.0$ V				0.2	μA
t_{delay}	Release Output Delay Time	$V_{DD} = 1.5$ V $\rightarrow -V_{SET} + 2.0$ V $C_D = 0.01$ μF		45	85	150	ms

All test items listed under Electrical Characteristics are done under the pulse load condition ($T_J \approx T_a = 25^\circ\text{C}$).

* The value is the minimum operating voltage when the output voltage is 0.1 V or less at detection.

(The pull-up resistance; 100 k Ω , the pull-up voltage; 5.0 V)

R3120N

NO.EC-373-150310

$C_D = 1000 \text{ pF}$, pulled-up to 5 V with 100 k Ω , unless otherwise specified.

The specifications surrounded by are guaranteed by design engineering at $-40^\circ\text{C} \leq T_a \leq 105^\circ\text{C}$.

R3120NxxxE

(Ta = 25°C)

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
$-V_{\text{DET}}$	Detector Threshold	SENSE pin $V_{\text{DD}} = 6 \text{ V}$	Ta = 25°C	x 0.985		x 1.015	V
			$-40^\circ\text{C} \leq T_a \leq 105^\circ\text{C}$	x 0.970		x 1.020	
V_{HYS}	Detector Threshold Hysteresis	$V_{\text{DD}} = 6 \text{ V}$		3.5	5	6.5	%
I_{SS}	Supply Current	$V_{\text{DD}} = 6 \text{ V}, V_{\text{SENSE}} = -V_{\text{SET}} - 0.1 \text{ V}$			3.3	5.5	μA
		$V_{\text{DD}} = 6 \text{ V}, V_{\text{SENSE}} = -V_{\text{SET}} + 1.0 \text{ V}$			3.3	5.5	
V_{DDL}	Minimum Operating Voltage*					2.1	V
R_{SENSE}	SENSE Resistance			4.5		120	M Ω
I_{OUT}	Output Current (Nch. Driver Output Pin)	$V_{\text{SENSE}} < -V_{\text{DET}}$	$V_{\text{DD}} = 2.1 \text{ V}$ $V_{\text{DS}} = 0.05 \text{ V}$	420			μA
		$V_{\text{SENSE}} < -V_{\text{DET}}$	$V_{\text{DD}} = 2.2 \text{ V}$ $V_{\text{DS}} = 0.5 \text{ V}$	2.8			mA
I_{LEAK}	Nch. Driver Leakage Current	$V_{\text{DD}} = 6 \text{ V}, V_{\text{SENSE}} = 36 \text{ V}, V_{\text{DS}} = 6.0 \text{ V}$				0.2	μA
t_{PLH}	Release Output Delay Time	$V_{\text{DD}} = 6 \text{ V}$ $V_{\text{SENSE}} = 1.5 \text{ V} \rightarrow -V_{\text{SET}} + 2.0 \text{ V}$			15		μs

All test items listed under Electrical Characteristics are done under the pulse load condition ($T_j = T_a = 25^\circ\text{C}$).

* The value is the minimum operating voltage to define V_{DOUT} .

Product-specific Electric Characteristics

The specifications surrounded by are guaranteed by design engineering at $-40^{\circ}\text{C} \leq T_a \leq 105^{\circ}\text{C}$.

R3120NxxxA/E

Product Name	-V _{DET} [V] (T _a = 25°C)			-V _{DET} [V] (-40°C ≤ T _a ≤ 105°C)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
R3120N023x	2.266	2.300	2.334	2.231	2.300	2.346
R3120N024x	2.364	2.400	2.436	2.328	2.400	2.448
R3120N025x	2.463	2.500	2.537	2.425	2.500	2.550
R3120N026x	2.561	2.600	2.639	2.522	2.600	2.652
R3120N027x	2.660	2.700	2.740	2.619	2.700	2.754
R3120N028x	2.758	2.800	2.842	2.716	2.800	2.856
R3120N029x	2.857	2.900	2.943	2.813	2.900	2.958
R3120N030x	2.955	3.000	3.045	2.910	3.000	3.060
R3120N031x	3.054	3.100	3.146	3.007	3.100	3.162
R3120N032x	3.152	3.200	3.248	3.104	3.200	3.264
R3120N033x	3.251	3.300	3.349	3.201	3.300	3.366
R3120N034x	3.349	3.400	3.451	3.298	3.400	3.468
R3120N035x	3.448	3.500	3.552	3.395	3.500	3.570
R3120N036x	3.546	3.600	3.654	3.492	3.600	3.672
R3120N037x	3.645	3.700	3.755	3.589	3.700	3.774
R3120N038x	3.743	3.800	3.857	3.686	3.800	3.876
R3120N039x	3.842	3.900	3.958	3.783	3.900	3.978
R3120N040x	3.940	4.000	4.060	3.880	4.000	4.080
R3120N041x	4.039	4.100	4.161	3.977	4.100	4.182
R3120N042x	4.137	4.200	4.263	4.074	4.200	4.284
R3120N043x	4.236	4.300	4.364	4.171	4.300	4.386
R3120N044x	4.334	4.400	4.466	4.268	4.400	4.488
R3120N045x	4.433	4.500	4.567	4.365	4.500	4.590
R3120N046x	4.531	4.600	4.669	4.462	4.600	4.692
R3120N047x	4.630	4.700	4.770	4.559	4.700	4.794
R3120N048x	4.728	4.800	4.872	4.656	4.800	4.896
R3120N049x	4.827	4.900	4.973	4.753	4.900	4.998
R3120N050x	4.925	5.000	5.075	4.850	5.000	5.100
R3120N051x	5.024	5.100	5.176	4.947	5.100	5.202
R3120N052x	5.122	5.200	5.278	5.044	5.200	5.304
R3120N053x	5.221	5.300	5.379	5.141	5.300	5.406
R3120N054x	5.319	5.400	5.481	5.238	5.400	5.508
R3120N055x	5.418	5.500	5.582	5.335	5.500	5.610
R3120N056x	5.516	5.600	5.684	5.432	5.600	5.712
R3120N057x	5.615	5.700	5.785	5.529	5.700	5.814
R3120N058x	5.713	5.800	5.887	5.626	5.800	5.916
R3120N059x	5.812	5.900	5.988	5.723	5.900	6.018
R3120N060x	5.910	6.000	6.090	5.820	6.000	6.120
R3120N061x	6.009	6.100	6.191	5.917	6.100	6.222
R3120N062x	6.107	6.200	6.293	6.014	6.200	6.324
R3120N063x	6.206	6.300	6.394	6.111	6.300	6.426
R3120N064x	6.304	6.400	6.496	6.208	6.400	6.528
R3120N065x	6.403	6.500	6.597	6.305	6.500	6.630
R3120N066x	6.501	6.600	6.699	6.402	6.600	6.732
R3120N067x	6.600	6.700	6.800	6.499	6.700	6.834
R3120N068x	6.698	6.800	6.902	6.596	6.800	6.936
R3120N069x	6.797	6.900	7.003	6.693	6.900	7.038

R3120N

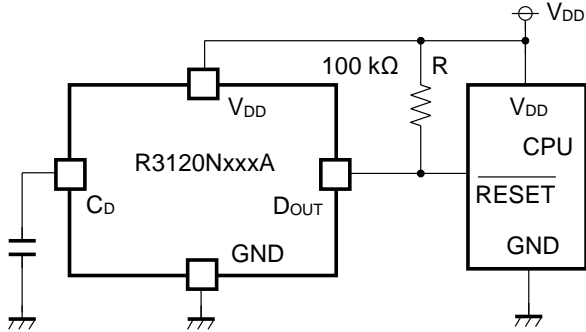
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The specifications surrounded by are guaranteed by design engineering at $-40^{\circ}\text{C} \leq T_a \leq 105^{\circ}\text{C}$.

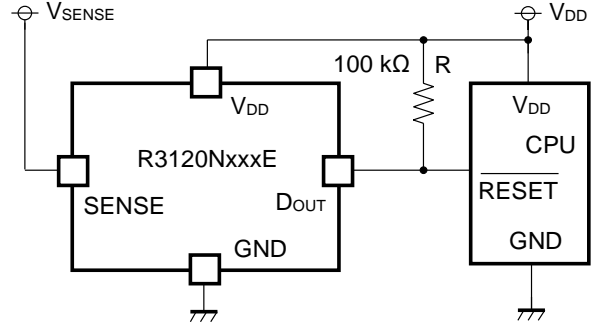
Product Name	-V _{DET} [V] (T _a = 25°C)			-V _{DET} [V] (-40°C ≤ T _a ≤ 105°C)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
R3120N070x	6.895	7.000	7.105	6.790	7.000	7.140
R3120N071x	6.994	7.100	7.206	6.887	7.100	7.242
R3120N072x	7.092	7.200	7.308	6.984	7.200	7.344
R3120N073x	7.191	7.300	7.409	7.081	7.300	7.446
R3120N074x	7.289	7.400	7.511	7.178	7.400	7.548
R3120N075x	7.388	7.500	7.612	7.275	7.500	7.650
R3120N076x	7.486	7.600	7.714	7.372	7.600	7.752
R3120N077x	7.585	7.700	7.815	7.469	7.700	7.854
R3120N078x	7.684	7.800	7.917	7.567	7.800	7.956
R3120N079x	7.782	7.900	8.018	7.663	7.900	8.058
R3120N080x	7.880	8.000	8.120	7.760	8.000	8.160
R3120N081x	7.979	8.100	8.221	7.858	8.100	8.262
R3120N082x	8.078	8.200	8.323	7.955	8.200	8.364
R3120N083x	8.176	8.300	8.424	8.052	8.300	8.466
R3120N084x	8.274	8.400	8.526	8.148	8.400	8.568
R3120N085x	8.373	8.500	8.627	8.246	8.500	8.670
R3120N086x	8.472	8.600	8.729	8.343	8.600	8.772
R3120N087x	8.570	8.700	8.830	8.440	8.700	8.874
R3120N088x	8.669	8.800	8.932	8.537	8.800	8.976
R3120N089x	8.767	8.900	9.033	8.634	8.900	9.078
R3120N090x	8.866	9.000	9.135	8.731	9.000	9.180
R3120N091x	8.964	9.100	9.236	8.828	9.100	9.282
R3120N092x	9.063	9.200	9.338	8.925	9.200	9.384
R3120N093x	9.161	9.300	9.439	9.022	9.300	9.486
R3120N094x	9.260	9.400	9.541	9.119	9.400	9.588
R3120N095x	9.358	9.500	9.642	9.216	9.500	9.690
R3120N096x	9.457	9.600	9.744	9.313	9.600	9.792
R3120N097x	9.555	9.700	9.845	9.410	9.700	9.894
R3120N098x	9.654	9.800	9.947	9.507	9.800	9.996
R3120N099x	9.752	9.900	10.048	9.604	9.900	10.098
R3120N100x	9.850	10.000	10.150	9.700	10.000	10.200
R3120N101x	9.949	10.100	10.251	9.797	10.100	10.302
R3120N102x	10.047	10.200	10.353	9.894	10.200	10.404
R3120N103x	10.146	10.300	10.454	9.991	10.300	10.506
R3120N104x	10.244	10.400	10.556	10.088	10.400	10.608
R3120N105x	10.343	10.500	10.657	10.185	10.500	10.710
R3120N106x	10.441	10.600	10.759	10.282	10.600	10.812
R3120N107x	10.540	10.700	10.860	10.379	10.700	10.914
R3120N108x	10.638	10.800	10.962	10.476	10.800	11.016
R3120N109x	10.737	10.900	11.063	10.573	10.900	11.118
R3120N110x	10.835	11.000	11.165	10.670	11.000	11.220
R3120N111x	10.934	11.100	11.266	10.767	11.100	11.322
R3120N112x	11.032	11.200	11.368	10.864	11.200	11.424
R3120N113x	11.131	11.300	11.469	10.961	11.300	11.526
R3120N114x	11.229	11.400	11.571	11.058	11.400	11.628
R3120N115x	11.328	11.500	11.672	11.155	11.500	11.730
R3120N116x	11.426	11.600	11.774	11.252	11.600	11.832
R3120N117x	11.525	11.700	11.875	11.349	11.700	11.934
R3120N118x	11.623	11.800	11.977	11.446	11.800	12.036
R3120N119x	11.722	11.900	12.078	11.543	11.900	12.138
R3120N120x	11.820	12.000	12.180	11.640	12.000	12.240

TYPICAL APPLICATION CIRCUITS

When using a shared input voltage between R3120N and CPU

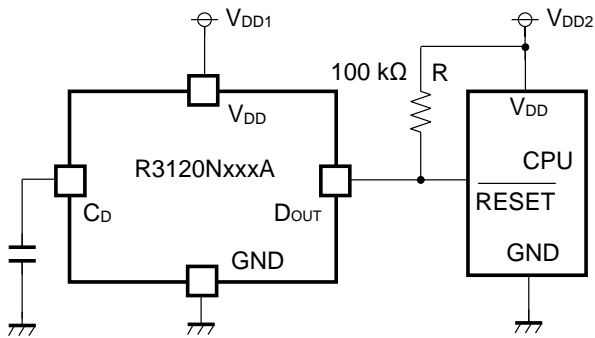


R3120NxxxA Typical Application Circuit

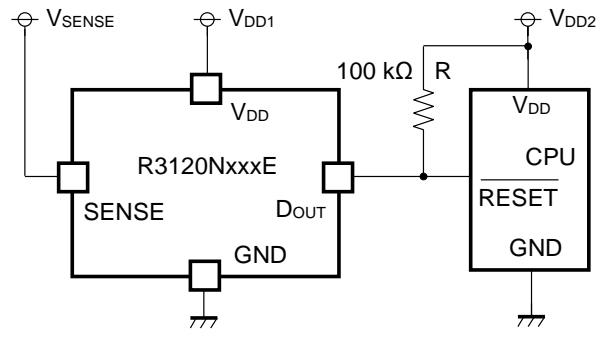


R3120NxxxE Typical Application Circuit

When using different input voltages between R3120N and CPU



R3120NxxxA Typical Application Circuit



R3120NxxxE Typical Application Circuit

TECHNICAL NOTES

When connecting resistors to the device's input pin

When connecting a resistor (R1) to an input of this device, the input voltage decreases by [Device's Consumption Current] x [Resistance Value] only. And, the cross conduction current*¹, which occurs when changing from the detecting state to the release state, is decreased the input voltage by [Cross Conduction Current] x [Resistance Value] only. And then, this device will enter the re-detecting state if the input voltage reduction is larger than the difference between the detector voltage and the released voltage.

When the input resistance value is large and the V_{DD} is gone up at mildly in the vicinity of the released voltage, repeating the above operation may result in the occurrence of output.

As shown in Figure A/B, set R1 to become 100kΩ or less as a guide, and connect C_{IN} of 0.1μF and more to between the input pin and GND. Besides, make evaluations including temperature properties under the actual usage condition, with using the evaluation board like this way. As result, make sure that the cross conduction current has no problem.

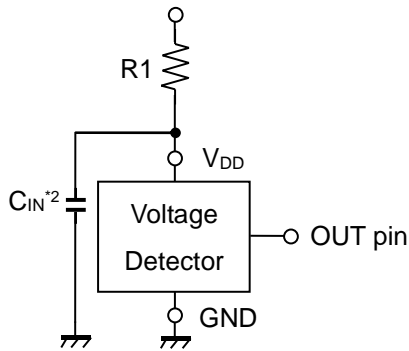


Figure A

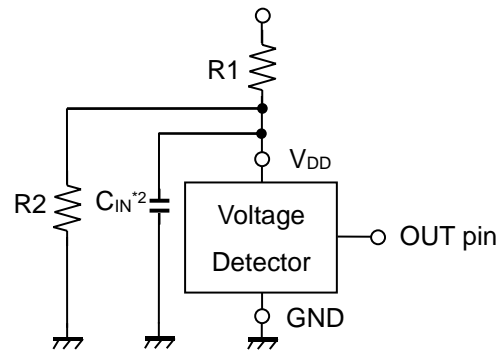


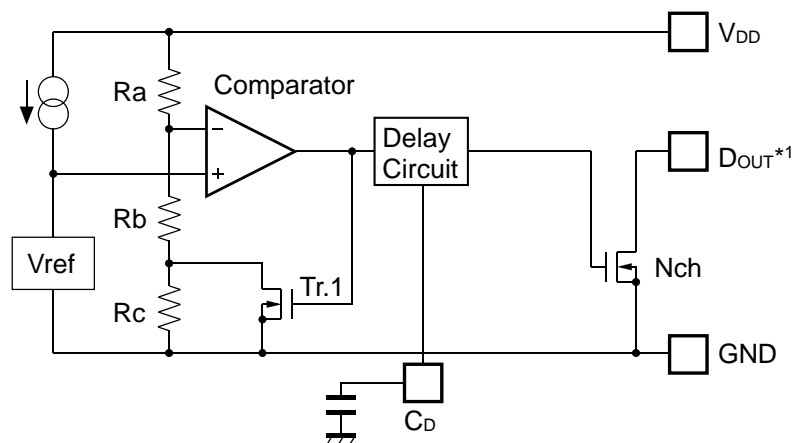
Figure B

*¹ In the CMOS output type, a charging current for OUT pin is included.

*² Note the bias dependence of capacitors.

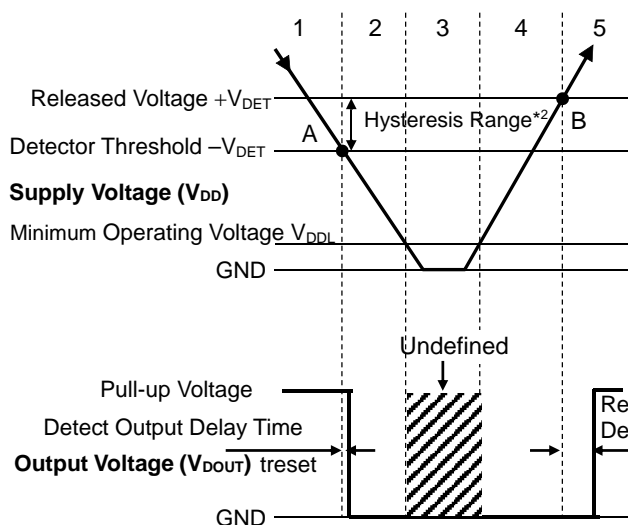
OPERATING DESCRIPTIONS

R3120NxxxA (C_D Pin Type)



Block Diagram with External Capacitors

*1 The D_{OUT} pin should be pulled-up to an external voltage level.



Operating Conditions	1	2	3	4	5
Comparator (-) Pin Input Voltage	I	II	II	II	I
Comparator Output	L	H	Undefined	H	L
Tr.1	OFF	ON	Undefined	ON	OFF
Output Tr. (Nch)	OFF	ON	Undefined	ON	OFF

$$I \quad \frac{R_b + R_c}{R_a + R_b + R_c} \times V_{DD}$$

$$II \quad \frac{R_b}{R_a + R_b} \times V_{DD}$$

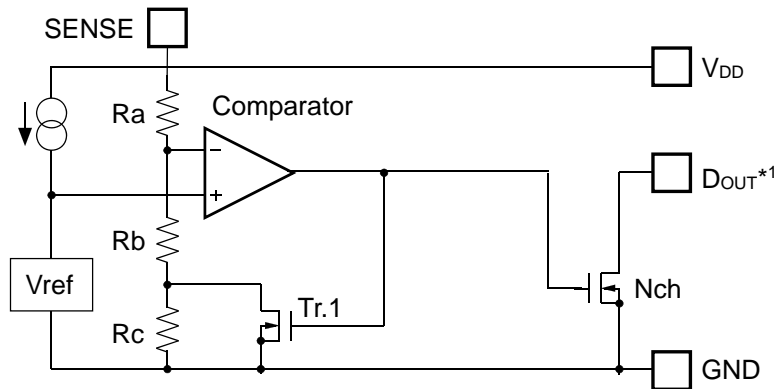
Operation Diagram

*2 Hysteresis is a voltage differential between the released voltage and the detector threshold.

OPERATING CONDITIONS

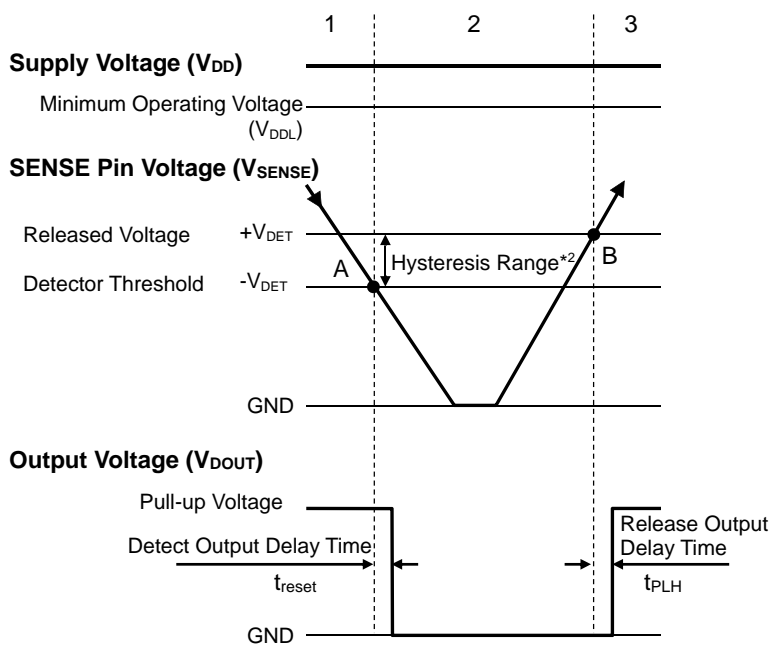
1. The output voltage is equal to the pull-up voltage.
2. At A point, $V_{ref} \geq V_{DD} \times (R_b + R_c) / (R_a + R_b + R_c)$ is true. So, the comparator output voltage will be reversed from "L" to "H". As a result, the output voltage will be "L".
3. If the supply voltage remains lower than the minimum operating voltage, the output V_{OUT} will be undefined.
4. The "L" voltage is output.
5. At B point, $V_{ref} \leq V_{DD} \times R_b / (R_a + R_b)$ is true. So, the comparator output voltage will be reversed from "H" to "L". As a result, output voltage will be equal to the pull-up voltage.

R3120NxxxE (SENSE Pin Type)



Block Diagram with External Capacitors

*1 The DOUT pin should be pulled-up to an external voltage level.



Operating Conditions	1	2	3
Comparator (-) Pin Input Voltage	I	II	I
Comparator Output	L	H	L
Tr.1	OFF	ON	OFF
Output Tr. (Nch)	OFF	ON	OFF

$$I \quad \frac{Rb + Rc}{Ra + Rb + Rc} \times V_{SENSE}$$

$$II \quad \frac{Rb}{Ra + Rb} \times V_{SENS}$$

Operation Diagram

*2 Hysteresis is a voltage differential between the released voltage and the detector threshold.

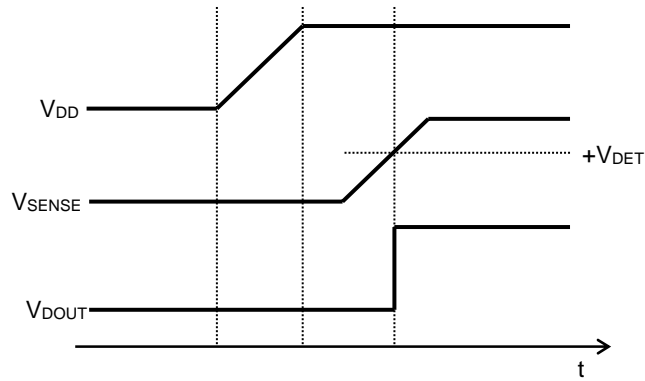
OPERATING CONDITIONS

1. The SENSE pin voltage is higher than the detector threshold; the output voltage is equal to the pull-up voltage.
2. At A point, $V_{ref} \geq V_{SENSE} \times (Rb + Rc) / (Ra + Rb + Rc)$ is true. So, the comparator output voltage will be reversed from "L" to "H". As a result, the output voltage will be "L". If the supply voltage remains higher than the minimum operating voltage, the output voltage will stay in "L".
3. At B point, $V_{ref} \leq V_{SENSE} \times Rb / (Ra + Rb)$ is true. So, the comparator output voltage will be reversed from "H" to "L". As a result, output voltage will be equal to the pull-up voltage.

POWER SEQUENCE

The R3120NxxxE can supervise the voltage of the SENSE pin. Regarding the power-on sequence, the SENSE pin must be powered on after the power-on to the V_{DD} pin, as shown below.

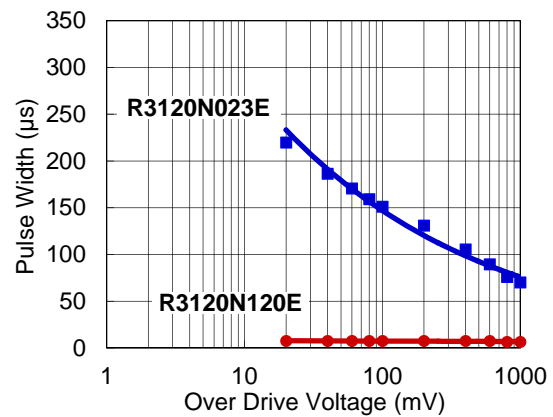
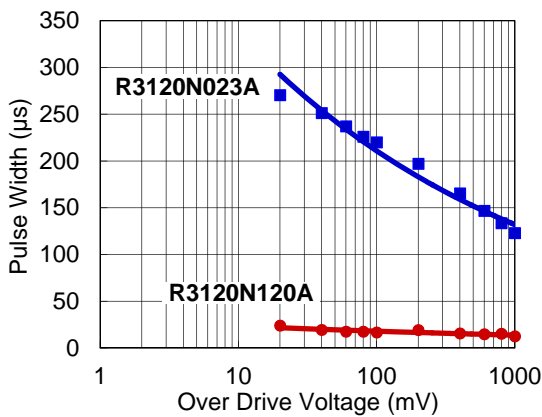
If the SENSE pin voltage is equal or more than the released voltage (+V_{DET}), D_{OUT} pin becomes "H". Besides, a voltage beyond V_{DD} pin is also acceptable to SENSE pin.



Power-On Timing Diagram

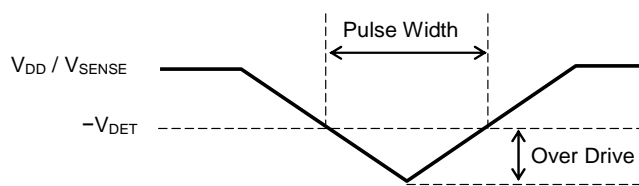
GLITCH DETECTION by V_{DD}, SENSE PINS

The following graphs are the released conditions when a pulse voltage less than or equal to the detector threshold (-V_{DET}) is applied to V_{DD} (R3120NxxxA) / V_{SENSE} (R3120NxxxE) pin during the release operation. This graph indicates the maximum pulse condition. If a pulse increased in width and voltage is applied to V_{DD} (R3120NxxxA) / V_{SENSE} (R3120NxxxE), the reset signal may occur.



R3120NxxxA Pulse Width vs. Over Drive Voltage

R3120NxxxE Pulse Width vs. Over Drive Voltage

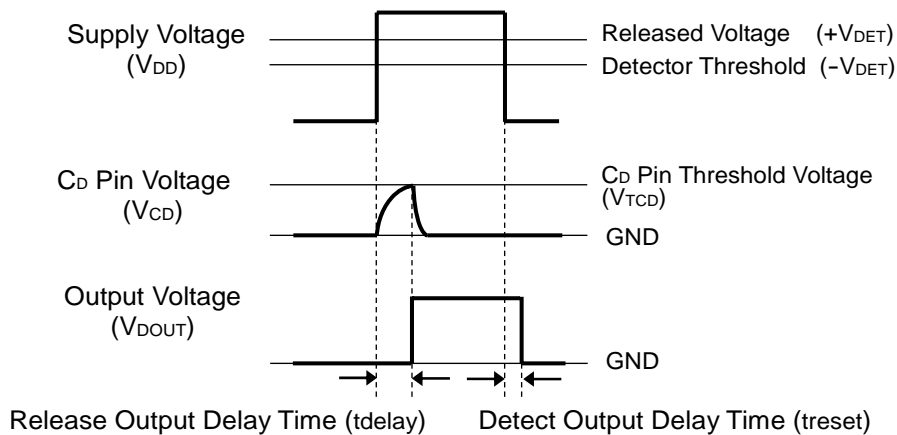


V_{DD} / V_{SENSE} Input Waveform

TIMING CHART

When the operating voltage higher than the released voltage is applied to V_{DD} pin, charge to an external capacitor starts, then C_D pin voltage (V_{CD}) increases. The output voltage maintains the released output until V_{CD} reaches the threshold voltage of the release output delay pin (V_{TCD}). And when V_{CD} is over V_{TCD} , the output voltage is inverted from the detected output to the released output. That is, the charged external capacitor starts discharging.

When the operating voltage lower than the detector threshold is applied to V_{DD} pin, the detect output delay time, which is the time until the output voltage is inverted from “H” to “L”, remains constant independent of the external capacitor.

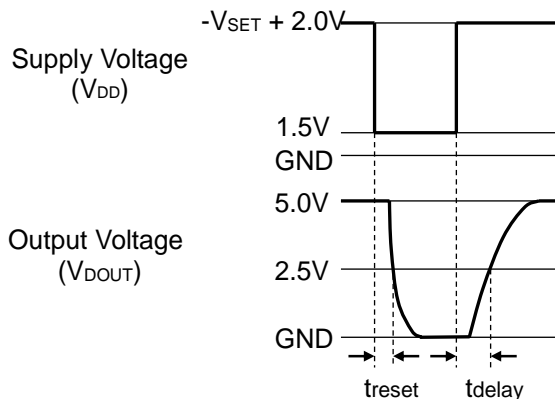


Delay Timing Diagram

RELEASE OUTPUT DELAY TIME (t_{delay})

Release Output Delay Time (t_{delay}) indicates the time between the instance when V_{DD} shift from “1.5 V” to “ $-V_{SET} + 2.0 V$ ” by the application of a pulse voltage and the instance when the output voltage reaches 2.5 V after pulled up the output pin (D_{OUT}) to 5.0 V with a resistor of 100 k Ω .

This is given by the expression $t_{delay} (s) = 8.5 \times 10^6 \times C_D (F)$, where $C_D (F)$ represents capacitance of the external capacitor.



R3120NxxxA

PACKAGE INFORMATION

POWER DISSIPATION (SOT-23-5)

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

(Power Dissipation (SOT-23-5) is substitution of SOT-23-6.)

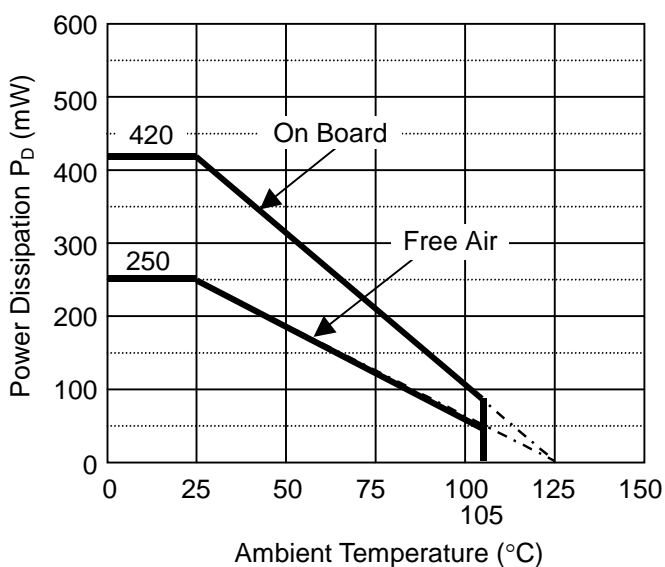
* Measurement Conditions

	Standard Test Land Pattern
Environment	Mounting on Board (Wind velocity=0m/s)
Board Material	Glass cloth epoxy plastic (Double sided)
Board Dimensions	40mm*40mm*1.6mm
Copper Ratio	Top side: Approx. 50%, Back side: Approx. 50%
Through-holes	ϕ 0.5mm * 44pcs

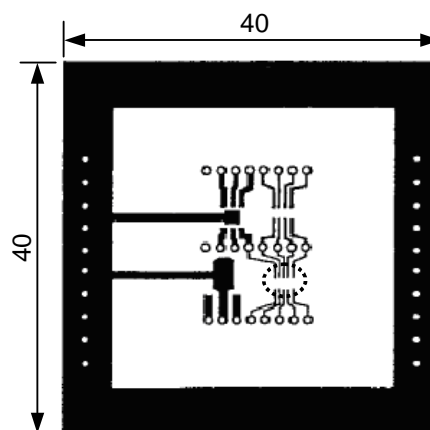
* Measurement Result:

($T_a=25^\circ\text{C}$, $T_{j\text{max}}=125^\circ\text{C}$)

	Standard Land Pattern	Free Air
Power Dissipation	420mW	250mW
Thermal Resistance	$\theta_{ja} = (125-25^\circ\text{C})/0.42\text{W} = 238^\circ\text{C/W}$	400 $^\circ\text{C/W}$



Power Dissipation



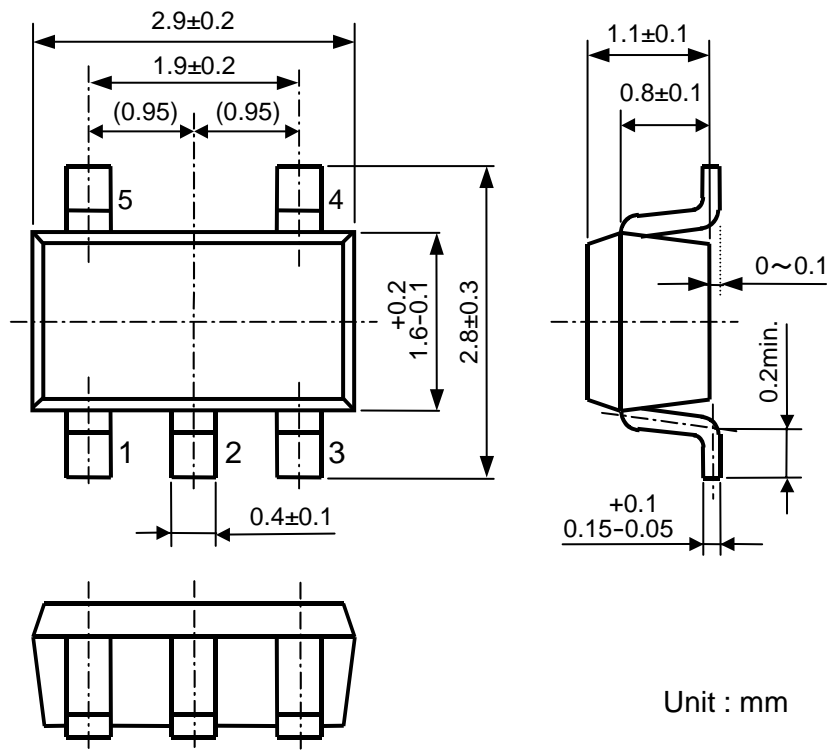
Measurement Board Pattern

 IC Mount Area (Unit: mm)

R3120N

NO.EC-373-150310

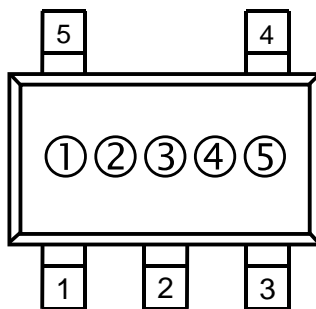
PACKAGE DIMENSIONS (SOT-23-5)



Unit : mm

MARK SPECIFICATION (SOT-23-5)

- ①②③ : Product Code ... **Refer to MARK SPECIFICATION TABLE**
- ④⑤ : Lot No. ... Alphanumeric Serial Number



MARK SPECIFICATION TABLE (SOT-23-5)

R3120NxxxA

Product Name	①②③	Set Voltage	Product Name	①②③	Set Voltage
R3120N023A	C U 0	2.3 V	R3120N080A	C Z 7	8.0 V
R3120N024A	C U 1	2.4 V	R3120N081A	C Z 8	8.1 V
R3120N025A	C U 2	2.5 V	R3120N082A	C Z 9	8.2 V
R3120N026A	C U 3	2.6 V	R3120N083A	DA 0	8.3 V
R3120N027A	C U 4	2.7 V	R3120N084A	DA 1	8.4 V
R3120N028A	C U 5	2.8 V	R3120N085A	DA 2	8.5 V
R3120N029A	C U 6	2.9 V	R3120N086A	DA 3	8.6 V
			R3120N087A	DA 4	8.7 V
R3120N030A	C U 7	3.0 V	R3120N088A	DA 5	8.8 V
R3120N031A	C U 8	3.1 V	R3120N089A	DA 6	8.9 V
R3120N032A	C U 9	3.2 V			
R3120N033A	C V 0	3.3 V	R3120N090A	DA 7	9.0 V
R3120N034A	C V 1	3.4 V	R3120N091A	DA 8	9.1 V
R3120N035A	C V 2	3.5 V	R3120N092A	DA 9	9.2 V
R3120N036A	C V 3	3.6 V	R3120N093A	DB 0	9.3 V
R3120N037A	C V 4	3.7 V	R3120N094A	DB 1	9.4 V
R3120N038A	C V 5	3.8 V	R3120N095A	DB 2	9.5 V
R3120N039A	C V 6	3.9 V	R3120N096A	DB 3	9.6 V
			R3120N097A	DB 4	9.7 V
R3120N040A	C V 7	4.0 V	R3120N098A	DB 5	9.8 V
R3120N041A	C V 8	4.1 V	R3120N099A	DB 6	9.9 V
R3120N042A	C V 9	4.2 V			
R3120N043A	C W 0	4.3 V	R3120N100A	DB 7	10.0 V
R3120N044A	C W 1	4.4 V	R3120N101A	DB 8	10.1 V
R3120N045A	C W 2	4.5 V	R3120N102A	DB 9	10.2 V
R3120N046A	C W 3	4.6 V	R3120N103A	DC 0	10.3 V
R3120N047A	C W 4	4.7 V	R3120N104A	DC 1	10.4 V
R3120N048A	C W 5	4.8 V	R3120N105A	DC 2	10.5 V
R3120N049A	C W 6	4.9 V	R3120N106A	DC 3	10.6 V
			R3120N107A	DC 4	10.7 V
R3120N050A	C W 7	5.0 V	R3120N108A	DC 5	10.8 V
R3120N051A	C W 8	5.1 V	R3120N109A	DC 6	10.9 V
R3120N052A	C W 9	5.2 V			
R3120N053A	C X 0	5.3 V	R3120N110A	DC 7	11.0 V
R3120N054A	C X 1	5.4 V	R3120N111A	DC 8	11.1 V
R3120N055A	C X 2	5.5 V	R3120N112A	DC 9	11.2 V
R3120N056A	C X 3	5.6 V	R3120N113A	DD 0	11.3 V
R3120N057A	C X 4	5.7 V	R3120N114A	DD 1	11.4 V
R3120N058A	C X 5	5.8 V	R3120N115A	DD 2	11.5 V
R3120N059A	C X 6	5.9 V	R3120N116A	DD 3	11.6 V
			R3120N117A	DD 4	11.7 V
R3120N060A	C X 7	6.0 V	R3120N118A	DD 5	11.8 V
R3120N061A	C X 8	6.1 V	R3120N119A	DD 6	11.9 V
R3120N062A	C X 9	6.2 V			
R3120N063A	C Y 0	6.3 V	R3120N120A	DD 7	12.0 V
R3120N064A	C Y 1	6.4 V			
R3120N065A	C Y 2	6.5 V			
R3120N066A	C Y 3	6.6 V			
R3120N067A	C Y 4	6.7 V			
R3120N068A	C Y 5	6.8 V			
R3120N069A	C Y 6	6.9 V			
R3120N070A	C Y 7	7.0 V			
R3120N071A	C Y 8	7.1 V			
R3120N072A	C Y 9	7.2 V			
R3120N073A	C Z 0	7.3 V			
R3120N074A	C Z 1	7.4 V			
R3120N075A	C Z 2	7.5 V			
R3120N076A	C Z 3	7.6 V			
R3120N077A	C Z 4	7.7 V			
R3120N078A	C Z 5	7.8 V			
R3120N079A	C Z 6	7.9 V			

R3120N

NO.EC-373-150310

R3120NxxxE

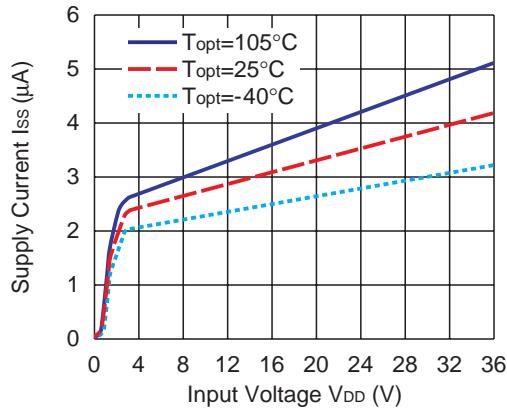
Product Name	①②③	Set Voltage	Product Name	①②③	Set Voltage
R3120N023E	DD 8	2.3 V	R3120N080E	DK 5	8.0 V
R3120N024E	DD 9	2.4 V	R3120N081E	DK 6	8.1 V
R3120N025E	DE 0	2.5 V	R3120N082E	DK 7	8.2 V
R3120N026E	DE 1	2.6 V	R3120N083E	DK 8	8.3 V
R3120N027E	DE 2	2.7 V	R3120N084E	DK 9	8.4 V
R3120N028E	DE 3	2.8 V	R3120N085E	DL 0	8.5 V
R3120N029E	DE 4	2.9 V	R3120N086E	DL 1	8.6 V
			R3120N087E	DL 2	8.7 V
R3120N030E	DE 5	3.0 V	R3120N088E	DL 3	8.8 V
R3120N031E	DE 6	3.1 V	R3120N089E	DL 4	8.9 V
R3120N032E	DE 7	3.2 V			
R3120N033E	DE 8	3.3 V	R3120N090E	DL 5	9.0 V
R3120N034E	DE 9	3.4 V	R3120N091E	DL 6	9.1 V
R3120N035E	DF 0	3.5 V	R3120N092E	DL 7	9.2 V
R3120N036E	DF 1	3.6 V	R3120N093E	DL 8	9.3 V
R3120N037E	DF 2	3.7 V	R3120N094E	DL 9	9.4 V
R3120N038E	DF 3	3.8 V	R3120N095E	DM 0	9.5 V
R3120N039E	DF 4	3.9 V	R3120N096E	DM 1	9.6 V
			R3120N097E	DM 2	9.7 V
R3120N040E	DF 5	4.0 V	R3120N098E	DM 3	9.8 V
R3120N041E	DF 6	4.1 V	R3120N099E	DM 4	9.9 V
R3120N042E	DF 7	4.2 V			
R3120N043E	DF 8	4.3 V	R3120N100E	DM 5	10.0 V
R3120N044E	DF 9	4.4 V	R3120N101E	DM 6	10.1 V
R3120N045E	DG 0	4.5 V	R3120N102E	DM 7	10.2 V
R3120N046E	DG 1	4.6 V	R3120N103E	DM 8	10.3 V
R3120N047E	DG 2	4.7 V	R3120N104E	DM 9	10.4 V
R3120N048E	DG 3	4.8 V	R3120N105E	DN 0	10.5 V
R3120N049E	DG 4	4.9 V	R3120N106E	DN 1	10.6 V
			R3120N107E	DN 2	10.7 V
R3120N050E	DG 5	5.0 V	R3120N108E	DN 3	10.8 V
R3120N051E	DG 6	5.1 V	R3120N109E	DN 4	10.9 V
R3120N052E	DG 7	5.2 V			
R3120N053E	DG 8	5.3 V	R3120N110E	DN 5	11.0 V
R3120N054E	DG 9	5.4 V	R3120N111E	DN 6	11.1 V
R3120N055E	DH 0	5.5 V	R3120N112E	DN 7	11.2 V
R3120N056E	DH 1	5.6 V	R3120N113E	DN 8	11.3 V
R3120N057E	DH 2	5.7 V	R3120N114E	DN 9	11.4 V
R3120N058E	DH 3	5.8 V	R3120N115E	DP 0	11.5 V
R3120N059E	DH 4	5.9 V	R3120N116E	DP 1	11.6 V
			R3120N117E	DP 2	11.7 V
R3120N060E	DH 5	6.0 V	R3120N118E	DP 3	11.8 V
R3120N061E	DH 6	6.1 V	R3120N119E	DP 4	11.9 V
R3120N062E	DH 7	6.2 V			
R3120N063E	DH 8	6.3 V	R3120N120E	DP 5	12.0 V
R3120N064E	DH 9	6.4 V			
R3120N065E	DJ 0	6.5 V			
R3120N066E	DJ 1	6.6 V			
R3120N067E	DJ 2	6.7 V			
R3120N068E	DJ 3	6.8 V			
R3120N069E	DJ 4	6.9 V			
R3120N070E	DJ 5	7.0 V			
R3120N071E	DJ 6	7.1 V			
R3120N072E	DJ 7	7.2 V			
R3120N073E	DJ 8	7.3 V			
R3120N074E	DJ 9	7.4 V			
R3120N075E	DK 0	7.5 V			
R3120N076E	DK 1	7.6 V			
R3120N077E	DK 2	7.7 V			
R3120N078E	DK 3	7.8 V			
R3120N079E	DK 4	7.9 V			

TYPICAL CHARACTERISTICS

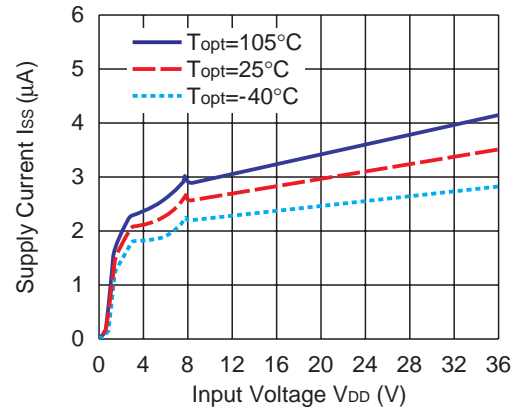
Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

1) Supply Current vs. Input Voltage

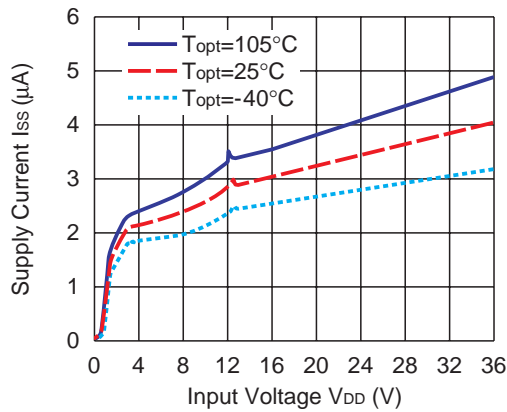
R3120N023A



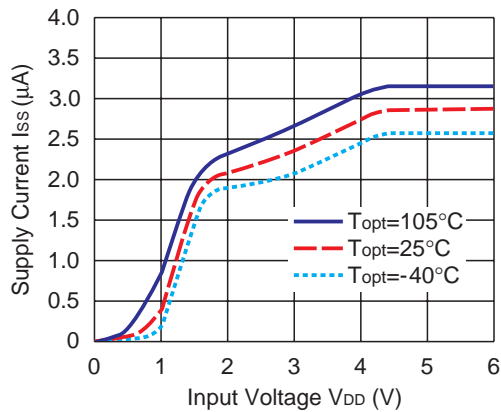
R3120N077A



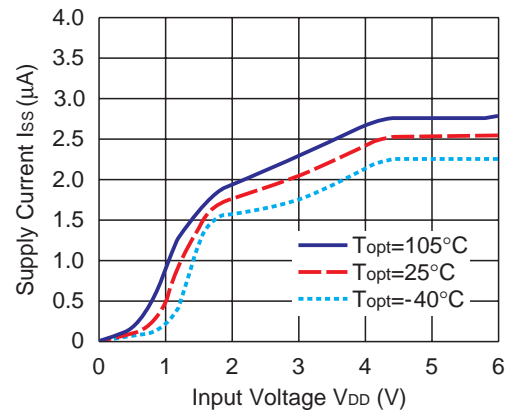
R3120N120A



R3120NxxxE (at release)

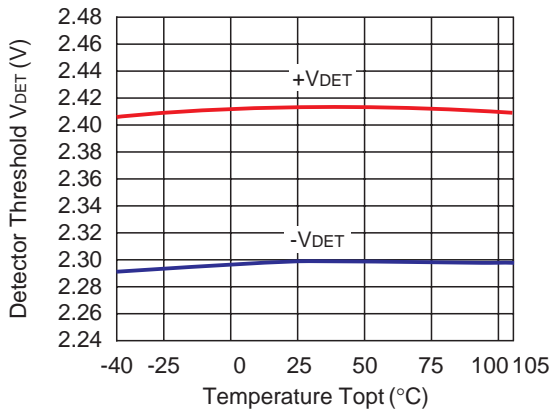


R3120NxxxE (at detecting)

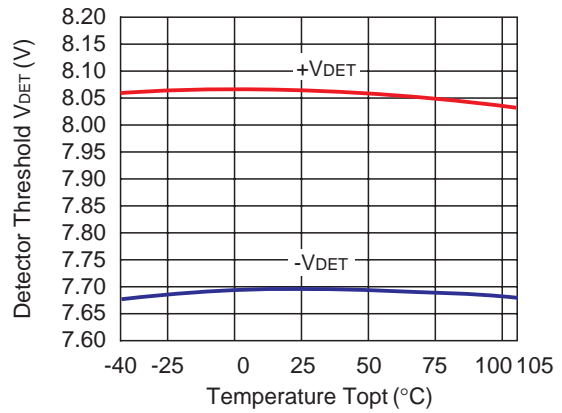


2) Detector Threshold vs. Temperature

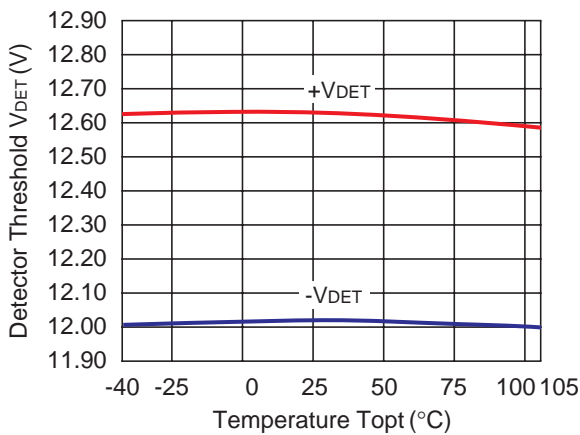
R3120N023A/E



R3120N077A/E

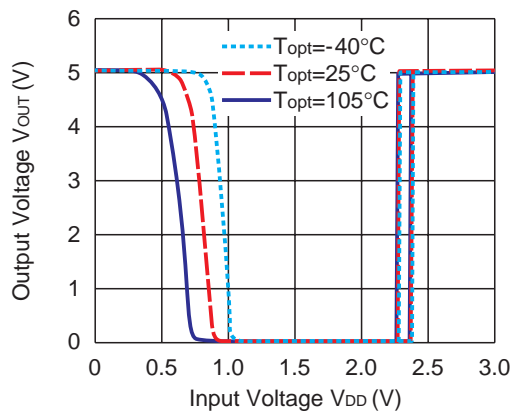


R3120N120A/E

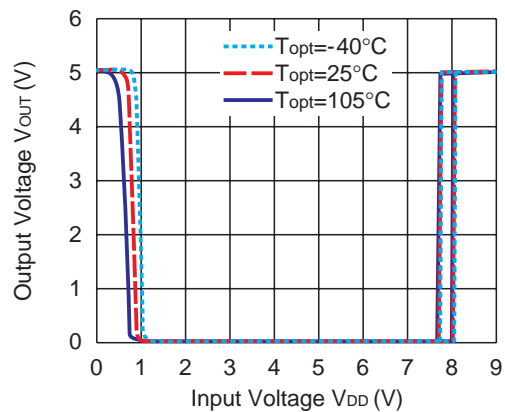


3) Output Voltage vs. Input Voltage

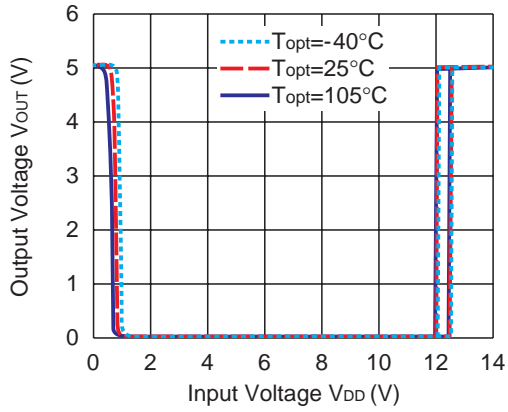
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R3120N077A/E

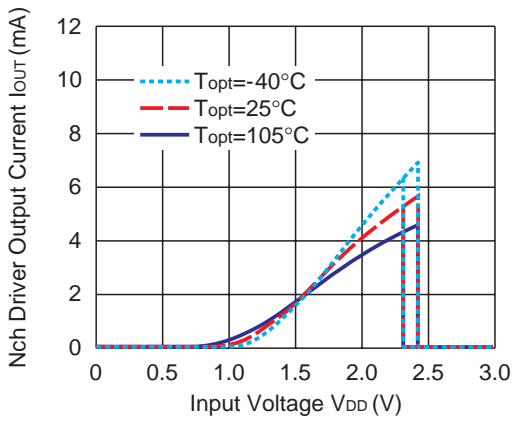


R3120N120A/E

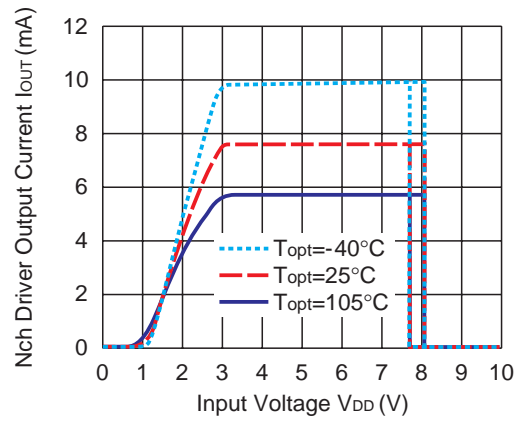


4) Nch. Driver Output Current vs. Input Voltage

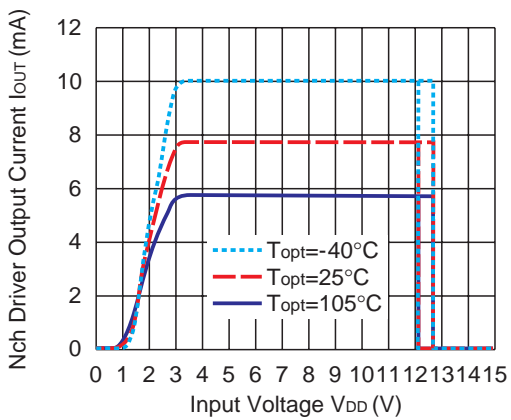
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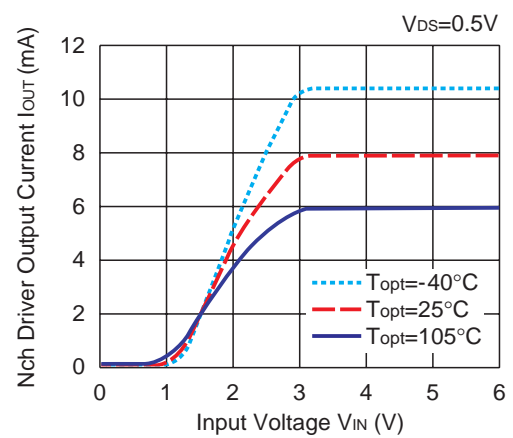
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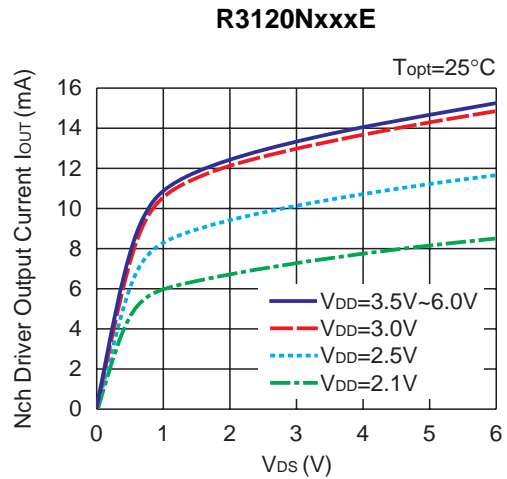
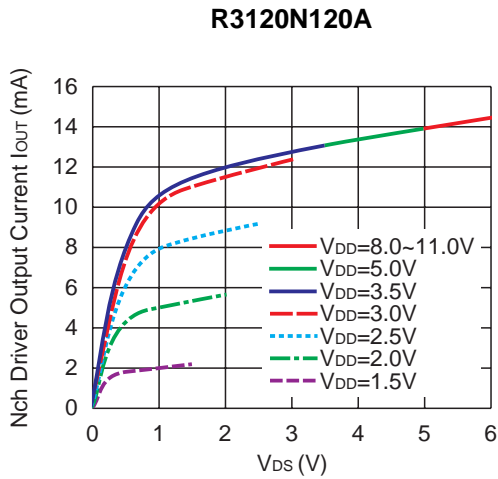
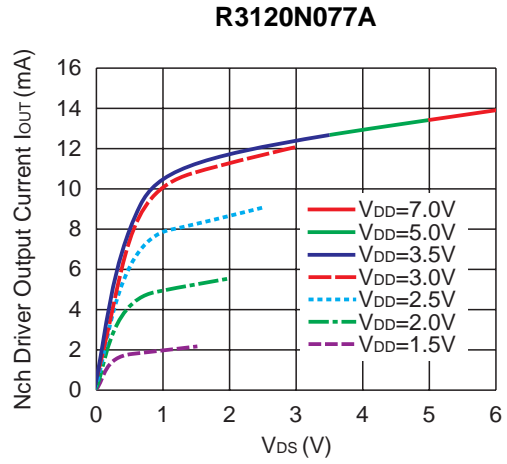
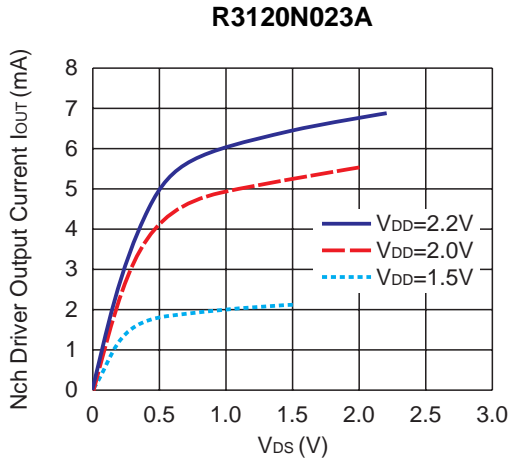
R3120N120A



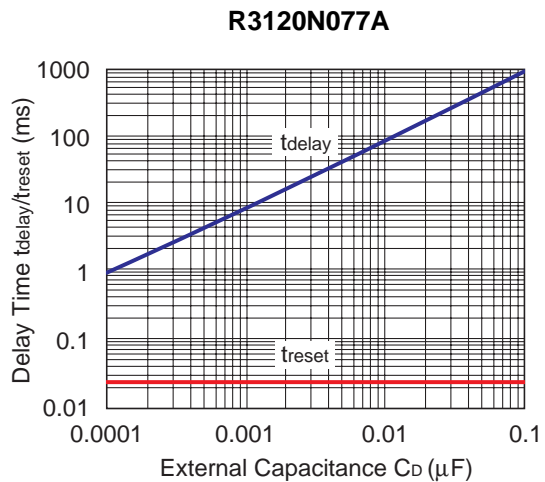
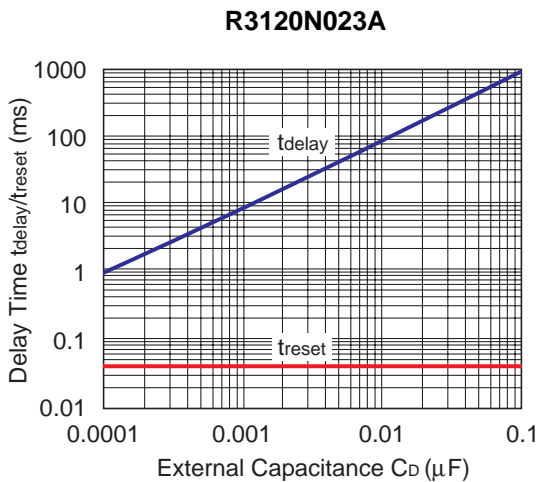
R3120NxxxE



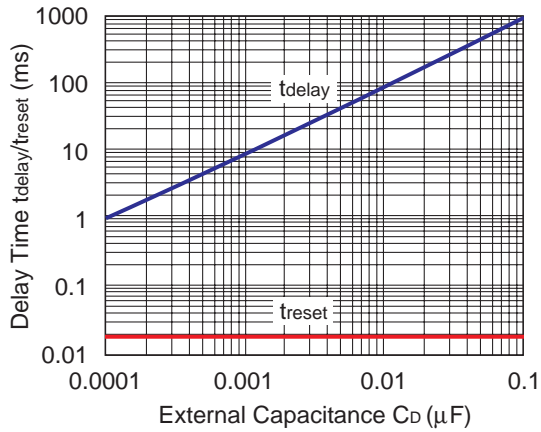
5) Nch. Driver Output Current vs. V_{DS}



6) Delay Time vs. External Capacitor for C_D Pin ($T_a = 25^{\circ}C$)

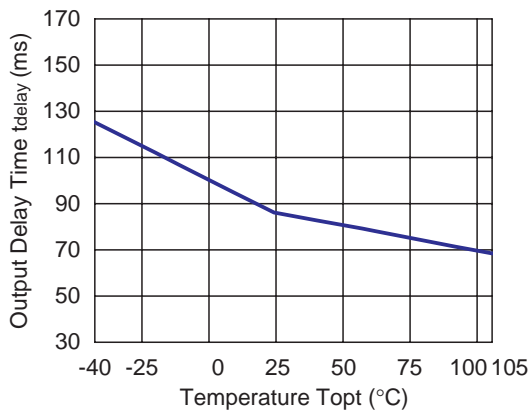


R3120N120A

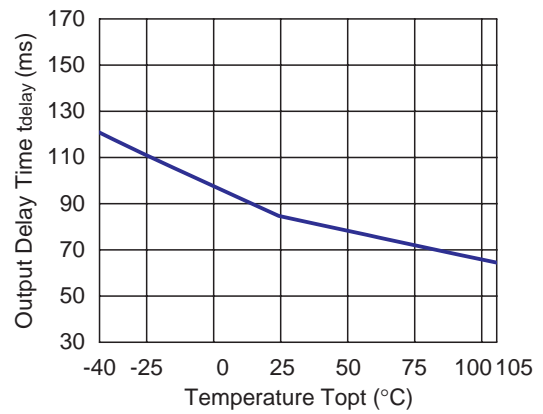


7) Release Output Delay Time vs. Temperature ($C_D = 0.01\mu F$)

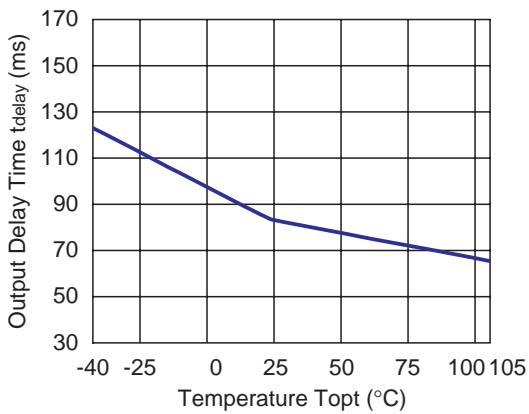
R3120N023A



R3120N077A

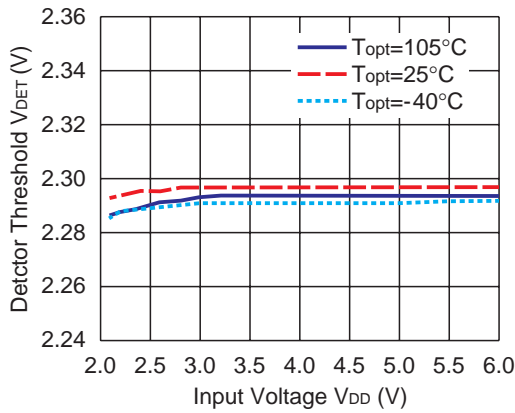


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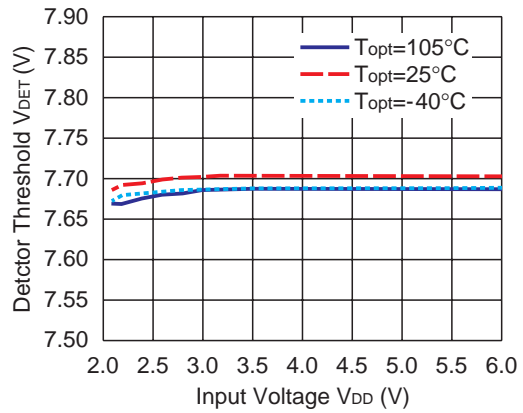


8) Detector Threshold vs. Input Voltage

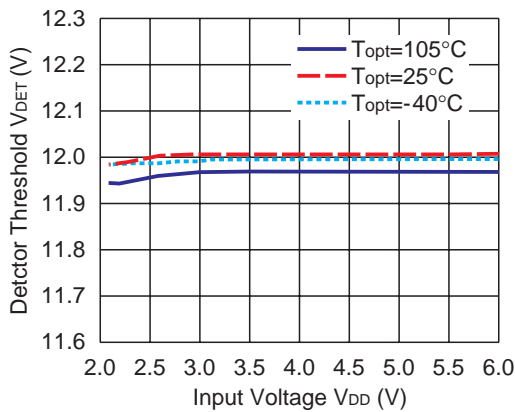
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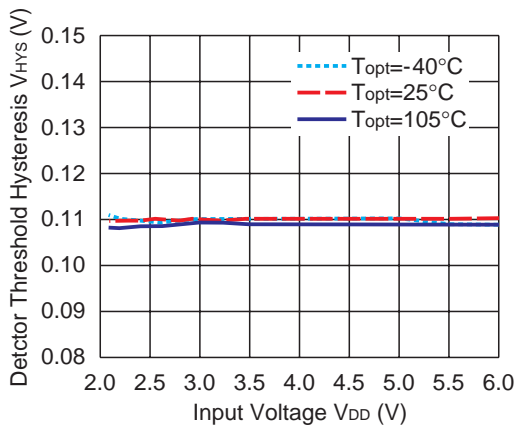


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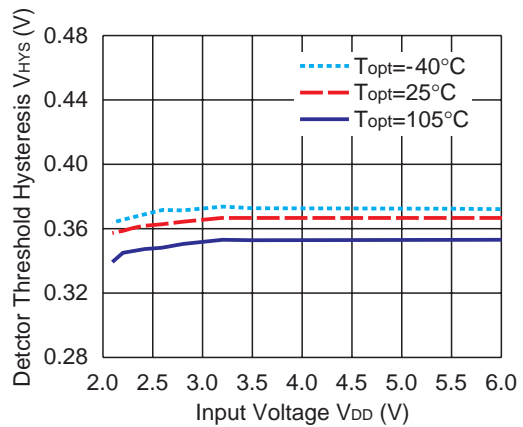


9) Hysteresis Range vs. Input Voltage

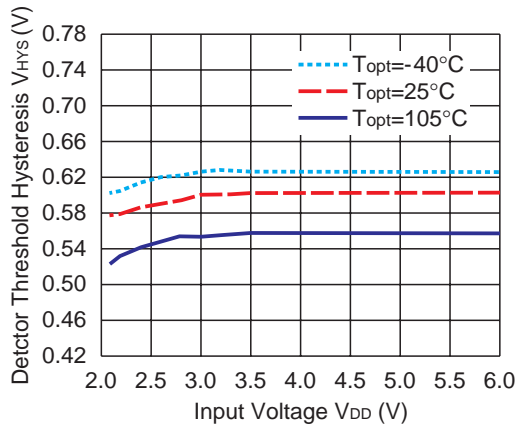
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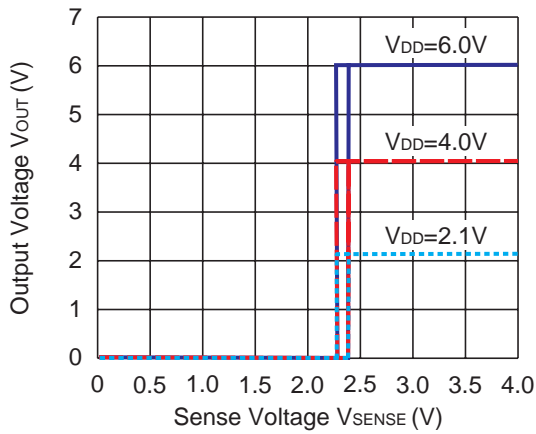


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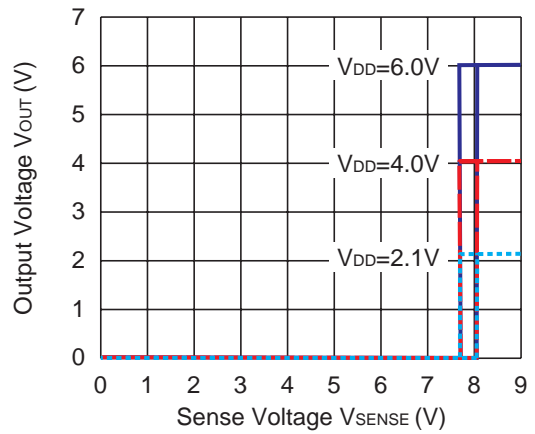


10) Output Voltage vs. SENSE Pin Input Voltage (Ta = 25°C, D_{OUT}: pulled-up to V_{DD} with 100 k Λ)

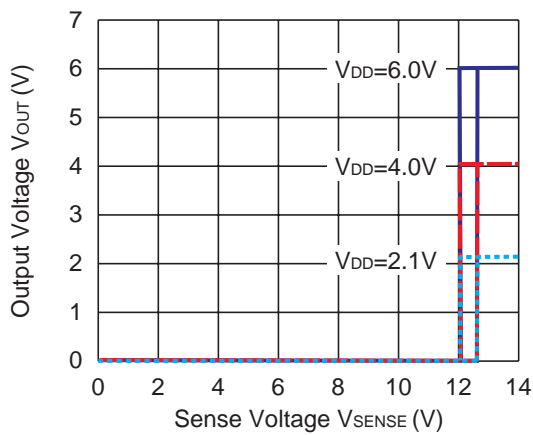
R3120N023E



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R3120N120E





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