

Low Voltage Detector with Built-in Delay Circuit for Automotive Applications

NO.EC-209-140227

OUTLINE

R3134x is a CMOS-based voltage detector ICs with built-in delay circuit, high detector threshold accuracy, and ultra low supply current, which can operate at low voltage.

The IC can be used as system reset generators, and each of these ICs consists of a voltage reference, a comparator, and resistors for setting voltage detector threshold, an output driver transistor, manual reset circuit, and an output delay generator.

Detector threshold is fixed internally with high accuracy and requires no adjustment. When a supply voltage crosses a setting detector threshold voltage from a high value to a lower value, this IC generates reset signal.

R3134x outputs "L" at its detect.

Since R3134x embeds an output delay generator, during a setting 240ms delay time, which is fixed in the IC, this IC keeps the reset condition after they are released. Released conditions will be kept for the delay time from when a supply voltage crosses a setting detector threshold voltage from a low value to a higher value, or from when the manual reset signal is released. Two output types of Nch open drain type and CMOS type are available. R3134x supports a SOT-23-5 package.

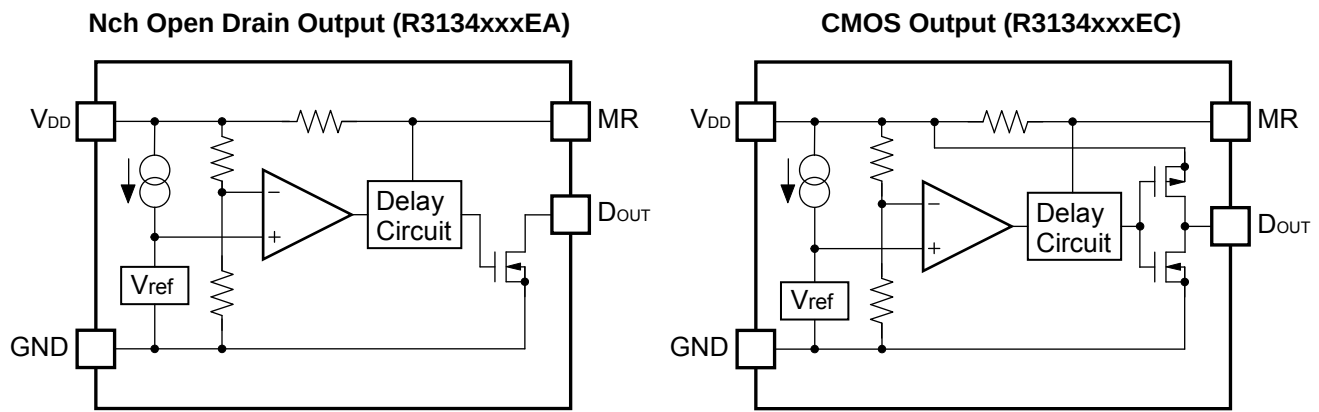
FEATURES

- Operating Voltage Range (Maximum Rating) 0.75V to 6.0V (6.5V)
- Supply Current Typ. 0.8 μ A (R3134x27Ex, V_{DD} = 3.0V)
- Detector Threshold Range 1.0V to 5.0V (0.1V steps)
Further, 2.32V, 2.63V, 2.93V, 3.08V, 4.38V, and 4.63V can be provided as standard.
- Detector Threshold Accuracy $\pm 1.8\%$
- Temperature-Drift Coefficient of Detector Threshold Typ. ± 100 ppm/ $^{\circ}$ C
- Built-in Delay Time Circuit Typ. 240ms
- Output Delay Time Accuracy $\pm 15\%$
- Output Types Nch Open Drain and CMOS
- Package SOT-23-5

APPLICATIONS

- Power source for car accessories including car audio equipment, car navigation system, and ETC system.

BLOCK DIAGRAMS



SELECTION GUIDE

The package type, the detector threshold, the output type and the taping type for the IC can be selected at the users' request.

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R3134NxxE*(y)-TR-#E	SOT-23-5	3,000 pcs	Yes	Yes

xx: The detector threshold ($-V_{DET}$) can be designated in the range from 1.0V(10) to 5.0V(50) in 0.1V steps.
y: If the detector threshold includes the 3rd digit, indicate the digit of 0.01V.
(Example) If the detector threshold is 2.63V, R3134x26E*3-TR-x

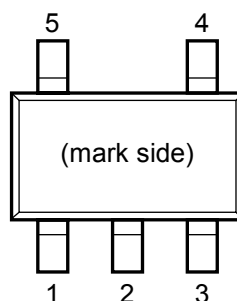
* : Designation of Output Type
(A) Nch Open Drain
(C) CMOS

: Specify Automotive Class Code

	Operating Temperature Range	Guaranteed Specs Temperature Range	Screening
A	-40°C to 85°C	25°C	High temperature

PIN DESCRIPTIONS

• SOT-23-5



SOT-23-5

Pin No.	Symbol	Description
1	D _{OUT}	Output Pin ("L" at detection)
2	V _{DD}	Input Pin
3	GND	Ground Pin
4	MR	Manual Reset Input Pin*
5	NC	No Connection

* MR pin is active at "L" input. Pulled up via 1MΩ (Typ.). If MR pin is not necessary, open this node, or connect it to V_{DD}.

ABSOLUTE MAXIMUM RATINGS

Symbol	Item		Rating	Unit
V_{DD}	Supply Voltage		6.5	V
V_{OUT}	Output Voltage (Nch Open Drain Output)		$V_{SS}-0.3$ to 6.5	V
	Output Voltage (CMOS Output)		$V_{SS}-0.3$ to $V_{DD}+0.3$	
V_{MR}	Input Voltage		$V_{SS}-0.3$ to $V_{DD}+0.3$	V
I_{OUT}	Output Current		20	mA
P_D	Power Dissipation (SOT-23-5)* ¹	Standard Land Pattern	525	mW
T_a	Operating Temperature Range		-40 to 150	°C
T_{stg}	Storage Temperature Range		-55 to 150	°C

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

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause the permanent damages and may degrade the life time 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}	Supply Voltage	0.85 to 6.00	V
T_a	Operating Temperature Range	-40 to 85	°C

RECOMMENDED OPERATING CONDITIONS

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

ELECTRICAL CHARACTERISTICS

The specification in ☐ is checked and guaranteed by design engineering at $-40^{\circ}\text{C} \leq T_a \leq 85^{\circ}\text{C}$.

• R3134x

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

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
V _{DET}	Detector Threshold			V _{DET} ×0.982		V _{DET} ×1.018	V
I _{SS1}	Supply Current1	V _{DD} =V _{DET} −0.1V, I _{OUT} =0A				2.0	μA
I _{SS2}	Supply Current2	V _{DD} =V _{DET} +0.1V, I _{OUT} =0A				2.0	μA
I _{SS3}	Supply Current3	V _{DD} =6V, I _{OUT} =0A	V _{DET} < 1.6V			3.6	μA
			1.6 ≤ V _{DET} < 2.7V			3.0	
			2.7V ≤ V _{DET}			2.5	
V _{DD}	Operating Voltage	Ta=25°C		0.75		6.00	V
		−40°C ≤ Ta ≤ 85°C		0.85		6.00	
V _{OH}	"H" Output Voltage	Refer to the following table					
V _{OL}	"L" Output Voltage	Refer to the following table					
V _{IH}	MR pin "H" Input Voltage	V _{DD} ≥ V _{DET} +0.1V		0.75×V _{DD}			V
V _{IL}	MR pin "L" Input Voltage	V _{DD} ≥ V _{DET} +0.1V				0.2×V _{DD}	V
R _{MR}	MR pin pull-up Resistance	Ta=25°C		0.5	1.0	4.0	MΩ
treset	Output Delay Time for detect* ¹	V _{DD} =V _{DET} → V _{DET} −0.1V			15		μs
tdelay	Output Delay Time for release	V _{DD} =0.8V→ V _{DET} +1.0		204	240	276	ms

All of unit are tested and specified under load conditions such that $T_j \approx T_a = 25^{\circ}\text{C}$.

*¹ Guaranteed by design, not mass production tested.

R3134N

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"H" Output Voltage (V_{OH}) Table

(Ta=25°C)

Products	Detector Threshold V_{DET} (V)	"H" Output Voltage V_{OH} (V)			
		Conditions	Min.	Typ.	Max.
R3134xxxEC	$V_{DET} < 1.2V$	$V_{DD}=V_{DET}+0.1V$, $I_{OH}=50\mu A$	$0.8 \times V_{DD}$		
	$1.2V \leq V_{DET} < 2.0V$	$V_{DD}=V_{DET}+0.1V$, $I_{OH}=150\mu A$			
	$2.0V \leq V_{DET} < 3.1V$	$V_{DD}=V_{DET}+0.1V$, $I_{OH}=500\mu A$			
	$3.1V \leq V_{DET}$	$V_{DD}=V_{DET}+0.1V$, $I_{OH}=800\mu A$			

V_{DET} is a set value.

"L" Output Voltage (V_{OL}) Table

(Ta=25°C)

Products	Detector Threshold V_{DET} (V)	"L" Output Voltage V_{OL} (V)			
		Conditions	Min.	Typ.	Max.
R3134xxxEx	$V_{DET} < 1.2V$	$V_{DD}=V_{DET}-0.1V$, $I_{OL}=200\mu A$			0.04
	$1.2V \leq V_{DET} < 2.0V$	$V_{DD}=V_{DET}-0.1V$, $I_{OL}=750\mu A$			0.06
	$2.0V \leq V_{DET} < 3.1V$	$V_{DD}=V_{DET}-0.1V$, $I_{OL}=1.2mA$			0.05
	$3.1V \leq V_{DET}$	$V_{DD}=V_{DET}-0.1V$, $I_{OL}=3.2mA$			0.06

V_{DET} is a set value.

DETECTOR THRESHOLD SPECIFICATIONS BY PART NUMBER

● R3134x

Part Number	Operating Voltage				Detector Threshold			Supply Current 1		
	V _{DD} [V]				V _{DET} [V]			I _{SS1} [μA]		
	Conditions	Min.	Conditions	Min.	Min.	Typ.	Max.	Conditions	Typ.	Max.
R3134x23Ex2	Ta=25°C	0.75	−40°C ≤ Ta ≤ 85°C	0.85	2.278	2.320	2.362	V _{DD} =V _{DET} −0.1V I _{OUT} =0A	0.8	2.0
R3134x26Ex3					2.583	2.630	2.677		0.9	
R3134x29Ex3					2.877	2.930	2.983			
R3134x30Ex8					3.025	3.080	3.135			
R3134x43Ex8					4.301	4.380	4.459			
R3134x46Ex3					4.547	4.630	4.713			
R3134x10Ex	Ta=25°C	0.75	−40°C ≤ Ta ≤ 85°C	0.85	0.982	1.000	1.018	V _{DD} =V _{DET} −0.1V I _{OUT} =0A	0.8	2.0
R3134x11Ex					1.080	1.100	1.120			
R3134x12Ex					1.178	1.200	1.222			
R3134x13Ex					1.277	1.300	1.323			
R3134x14Ex					1.375	1.400	1.425			
R3134x15Ex					1.473	1.500	1.527			
R3134x16Ex					1.571	1.600	1.629			
R3134x17Ex					1.669	1.700	1.731			
R3134x18Ex					1.768	1.800	1.832			
R3134x19Ex					1.866	1.900	1.934			
R3134x20Ex					1.964	2.000	2.036			
R3134x21Ex					2.062	2.100	2.138			
R3134x22Ex					2.160	2.200	2.240			
R3134x23Ex					2.259	2.300	2.341			
R3134x24Ex					2.357	2.400	2.443			
R3134x25Ex					2.455	2.500	2.545			
R3134x26Ex					2.553	2.600	2.647			
R3134x27Ex					2.651	2.700	2.749			
R3134x28Ex					2.750	2.800	2.850			
R3134x29Ex					2.848	2.900	2.952			
R3134x30Ex					2.946	3.000	3.054			
R3134x31Ex					3.044	3.100	3.156			
R3134x32Ex					3.142	3.200	3.258			
R3134x33Ex					3.241	3.300	3.359			
R3134x34Ex					3.339	3.400	3.461			
R3134x35Ex					3.437	3.500	3.563			
R3134x36Ex					3.535	3.600	3.665			
R3134x37Ex					3.633	3.700	3.767			
R3134x38Ex					3.732	3.800	3.868			
R3134x39Ex					3.830	3.900	3.970			
R3134x40Ex					3.928	4.000	4.072			
R3134x41Ex					4.026	4.100	4.174			
R3134x42Ex					4.124	4.200	4.276			
R3134x43Ex					4.223	4.300	4.377			
R3134x44Ex	4.321	4.400	4.479							
R3134x45Ex	4.419	4.500	4.581							
R3134x46Ex	4.517	4.600	4.683							
R3134x47Ex	4.615	4.700	4.785							
R3134x48Ex	4.714	4.800	4.886							
R3134x49Ex	4.812	4.900	4.988							
R3134x50Ex	4.910	5.000	5.090							

Supply Current 2			Supply Current 3			"H" Output Voltage		
Iss2 [μA]			Iss3 [μA]			VoH [V]		
Conditions	Typ.	Max.	Conditions	Typ.	Max.	Conditions	Min.	
VDD=VDET+0.1V IOUT=0A	0.8	2.0	VDD=6.0V IOUT=0A	1.2	3.0	VDD=VDET+0.1V IOH=500μA	0.8× VDD	
				1.0	2.5	VDD=VDET+0.1V IOH=800μA		
VDD=VDET+0.1V IOUT=0A	0.8	2.0	VDD=6.0V IOUT=0A	1.4	3.6	VDD=VDET+0.1V IOH=50μA	0.8× VDD	
						VDD=VDET+0.1V IOH=150μA		
					1.2	3.0		VDD=VDET+0.1V IOH=500μA
				1.0				2.5
					0.8			

Part Number	"L" Output Voltage		MR pin "H" Input Voltage		MR pin "L" Input Voltage		MR pin pull-up resistance			
	V _{OL} [V]		V _{IH} [V]		V _{IL} [V]		R _{MR} [MΩ]			
	Conditions	Max.	Conditions	Min.	Conditions	Max.	Conditions	Min.	Typ.	Max.
R3134x23Ex2	V _{DD} =V _{DET} -0.1V I _{OL} =1.2mA	0.05	V _{DD} ≥ V _{DET} +0.1	0.75× V _{DD}	V _{DD} ≥ V _{DET} +0.1	0.2× V _{DD}	Ta=25°C	0.5	1.0	4.0
R3134x26Ex3										
R3134x29Ex3										
R3134x30Ex8										
R3134x43Ex8	V _{DD} =V _{DET} -0.1V I _{OL} =3.2mA	0.06	V _{DD} ≥ V _{DET} +0.1	0.75× V _{DD}	V _{DD} ≥ V _{DET} +0.1	0.2× V _{DD}	Ta=25°C	0.5	1.0	4.0
R3134x46Ex3										
R3134x10Ex	V _{DD} =V _{DET} -0.1V I _{OL} =200μA	0.04								
R3134x11Ex										
R3134x12Ex	V _{DD} =V _{DET} -0.1V I _{OL} =750μA	0.06								
R3134x13Ex										
R3134x14Ex										
R3134x15Ex										
R3134x16Ex										
R3134x17Ex										
R3134x18Ex										
R3134x19Ex										
R3134x20Ex	V _{DD} =V _{DET} -0.1V I _{OL} =1.2mA	0.05								
R3134x21Ex										
R3134x22Ex										
R3134x23Ex										
R3134x24Ex										
R3134x25Ex										
R3134x26Ex										
R3134x27Ex										
R3134x28Ex										
R3134x29Ex										
R3134x30Ex										
R3134x31Ex	V _{DD} =V _{DET} -0.1V I _{OL} =3.2mA	0.06								
R3134x32Ex										
R3134x33Ex										
R3134x34Ex										
R3134x35Ex										
R3134x36Ex										
R3134x37Ex										
R3134x38Ex										
R3134x39Ex										
R3134x40Ex										
R3134x41Ex										
R3134x42Ex										
R3134x43Ex										
R3134x44Ex										
R3134x45Ex										
R3134x46Ex										
R3134x47Ex										
R3134x48Ex										
R3134x49Ex										
R3134x50Ex										

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Output Delay Time for Release				Detector Threshold Temperature Coefficient	
tdelay [ms]				$\Delta V_{DET}/\Delta T_a$ [ppm/°C]	
Conditions	Min.	Typ.	Max.	Conditions	Typ.
$V_{DD}=0.8V \rightarrow$ $V_{DET}=1.0V$ $T_a=25^\circ C$	204	240	276	$-40^\circ C \leq T_a \leq 85^\circ C$	± 100
$V_{DD}=0.8V \rightarrow$ $V_{DET}=1.0V$ $T_a=25^\circ C$	204	240	276	$-40^\circ C \leq T_a \leq 85^\circ C$	± 100

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 VDD 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.

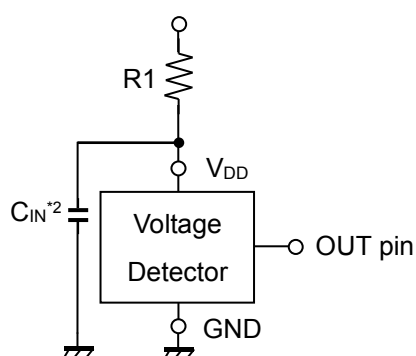


Figure A

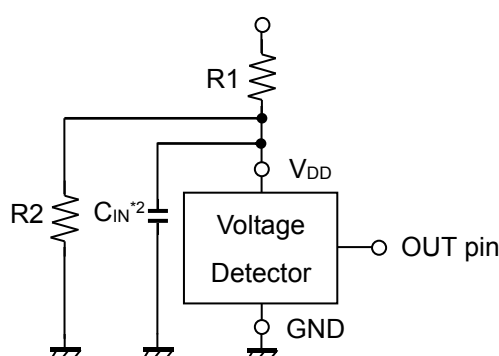
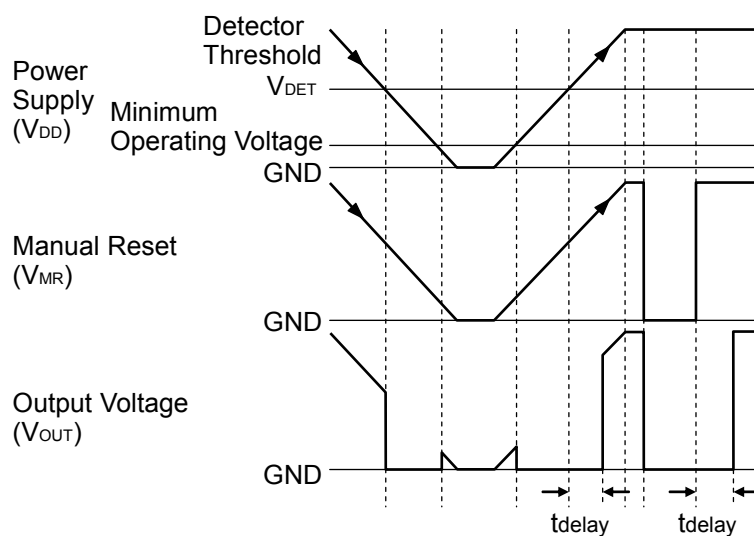


Figure B

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

^{*2} Note the bias dependence of capacitors.

TIMING CHART



R3134x Operating Diagram

DEFINITION OF OUTPUT DELAY TIME

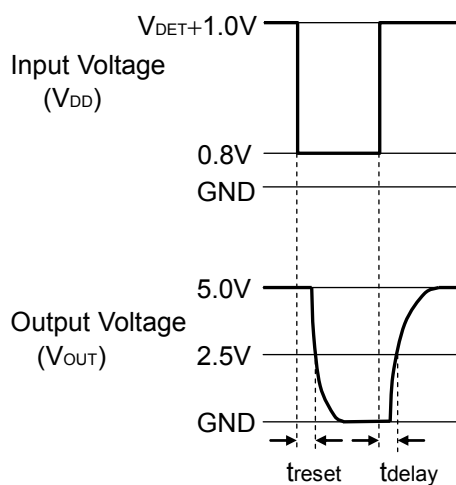
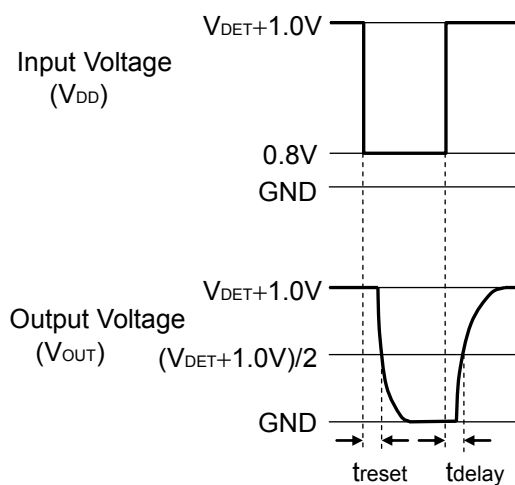
Output Delay Time (t_{delay}) is specified as follows:

1. In the case of Nch Open Drain Output:

The time interval from rising edge of V_{DD} pulse 0.8V to $V_{DET}+1.0V$ to the time at which the output reaches 2.5V under the condition that the output pin (D_{OUT}) is pulled up to 5V through a 470k Ω resistor.

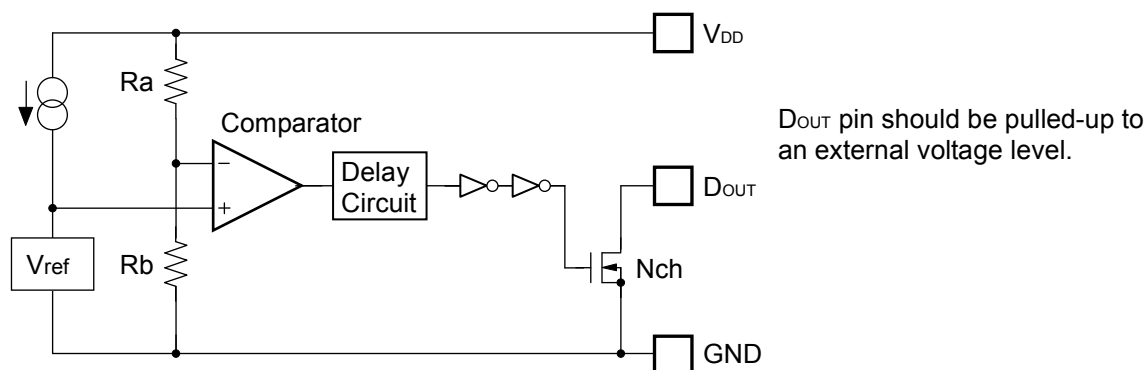
2. In the case of CMOS Output:

The time interval between the rising edge of V_{DD} pulse (0.8V to $V_{DET}+1.0V$) and the output's reach time to $(V_{DET}+1.0V)/2$.

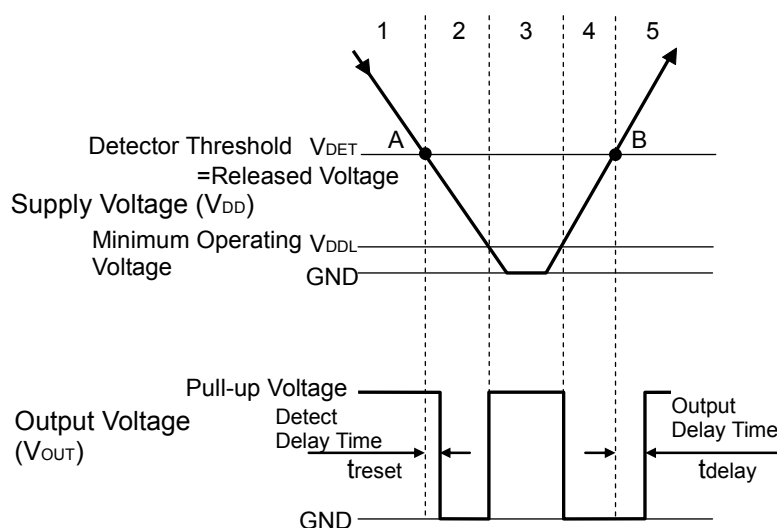
Nch Open Drain Output
(R3134xxxEA)CMOS Output
(R3134xxxEC)

OPERATION

• R3134xxxEA



Block Diagram



Operation Diagram

Explanation

Step 1. The output voltage is equal to the pull-up voltage.

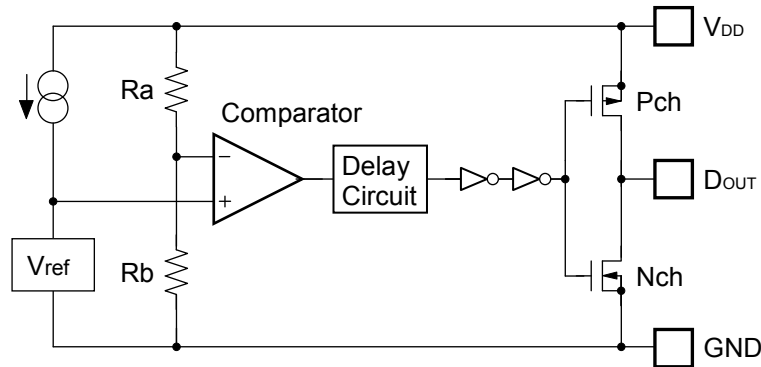
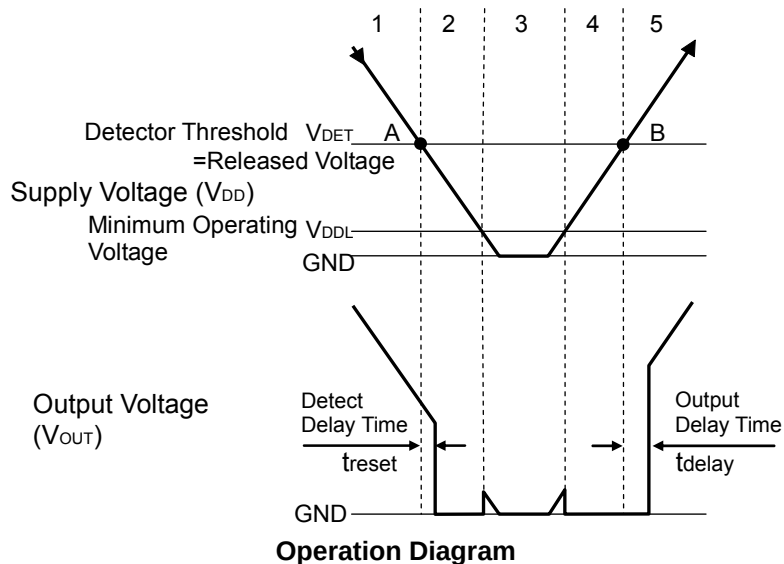
Step 2. At Point "A", $V_{ref} \geq V_{DD} \times R_b / (R_a + R_b)$ is true, as a result, the output of comparator is reversed from "L" to "H", therefore the output voltage becomes the GND level. The voltage level of Point A means a detector threshold voltage (V_{DET}).

Step 3. When the supply voltage is lower than the minimum operating voltage, the operation of the output transistor becomes indefinite. The output voltage is equal to the pull-up voltage.

Step 4. The output voltage is equal to the GND level.

Step 5. At Point "B", $V_{ref} \leq V_{DD} \times R_b / (R_a + R_b)$ is true, as a result, the output of comparator is reversed from "H" to "L", then the output voltage is equal to the pull-up voltage. The voltage level of Point B means a released voltage (V_{DET}).

*) There is no hysteresis range between the detector threshold and the released voltage.

• R3134xxxEC

Block Diagram

Operation Diagram
Explanation

Step 1. The output voltage is equal to the supply voltage (V_{DD}).

Step 2. At Point "A", $V_{ref} \geq V_{DD} \times R_b / (R_a + R_b)$ is true, as a result, the output of comparator is reversed from "L" to "H", therefore the output voltage becomes the GND level. The voltage level of Point A means a detector threshold voltage (V_{DET}).

Step 3. When the supply voltage is lower than the minimum operating voltage, the operation of the output transistor becomes indefinite.

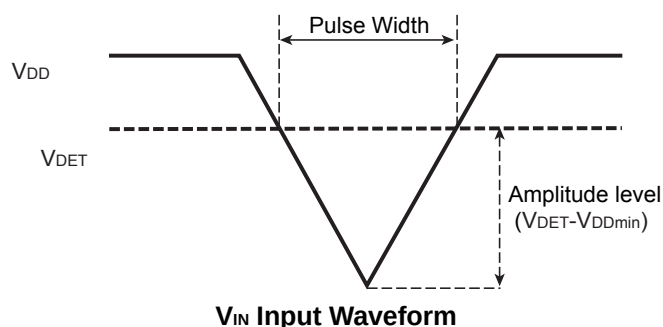
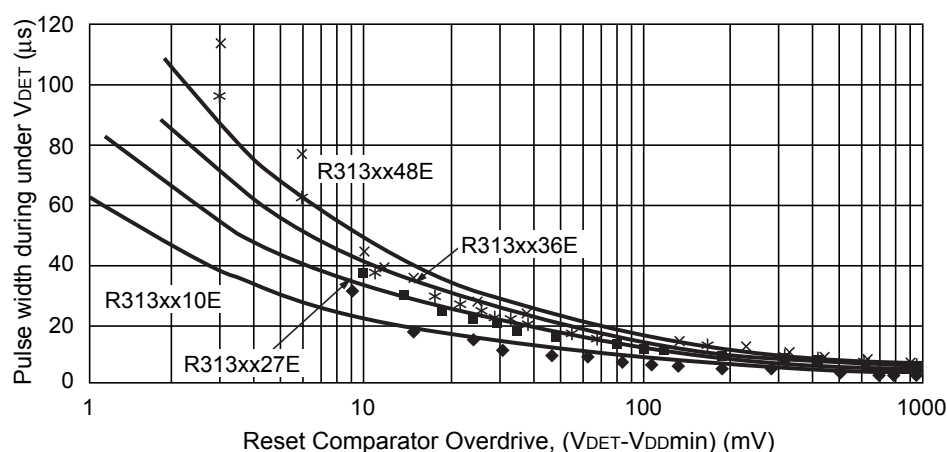
Step 4. The output voltage is equal to the GND level.

Step 5. At Point "B", $V_{ref} \leq V_{DD} \times R_b / (R_a + R_b)$ is true, as a result, the output of comparator is reversed from "H" to "L", then the output voltage is equal to the supply voltage (V_{DD}). The voltage level of Point B means a released voltage (V_{DET}).

*) There is no hysteresis range between the detector threshold and the released voltage.

Detector Operation vs. glitch input voltage to the V_{DD} pin

When the IC is released and a large pulse (glitch) crosses the detector threshold is forced, the IC may not maintain the released condition. The amplitude of the pulse ($V_{DET}-V_{DDmin}$) and the pulse width the IC can maintain the released level is described in the graph as follows:



The graph above shows the condition for the maximum transient duration without generating a reset. If the larger amplitude or larger pulse width noise than the graph may be on the V_{DD} , the reset signal may be generated.

PACKAGE INFORMATION

• Power Dissipation (SOT-23-5)

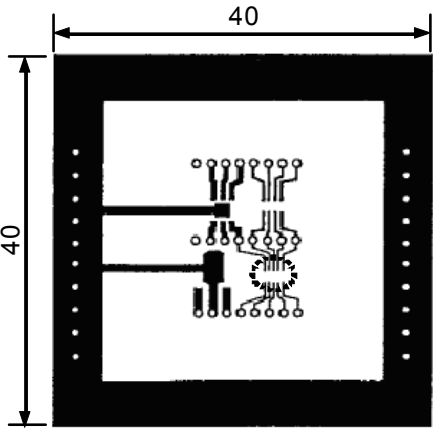
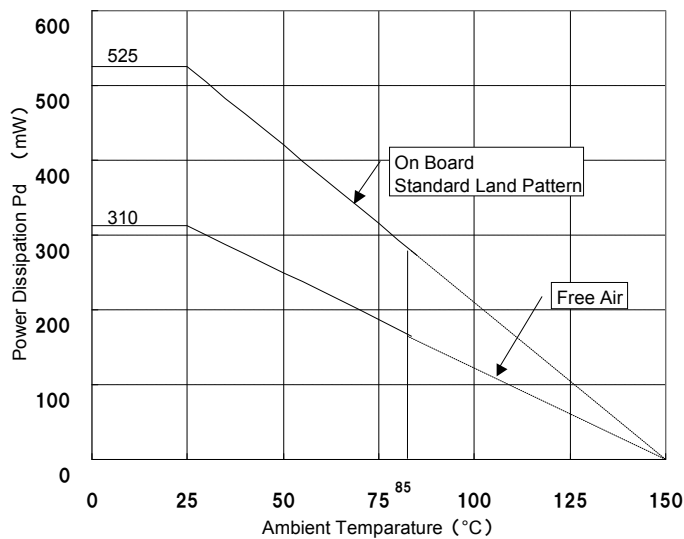
Power Dissipation (P_D) depends on conditions of mounting on board. This specification is based on the measurement at the condition below:

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 x 40mm x1.6mm
Copper Ratio	Top side: Approx. 50%, Back side: Approx. 50%
Through-holes	φ 0.5mm x 44pcs

Measurement Result (Ta=25°C, Tjmax=150°C)

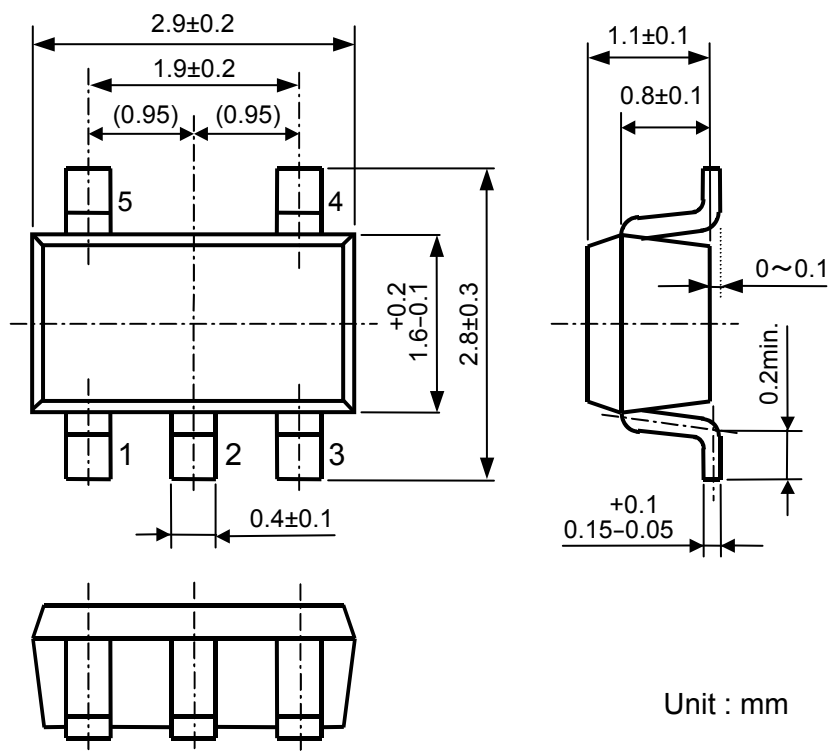
	Standard Test Land Pattern	Free Air
Power Dissipation	525mW	310mW
Thermal Resistance	$\theta_{ja} = (150-25^{\circ}\text{C})/0.525\text{W} = 238^{\circ}\text{C/W}$	400°C/W



Measurement Board Pattern

○ IC Mount Area (Unit: mm)

Package Dimensions (SOT-23-5)

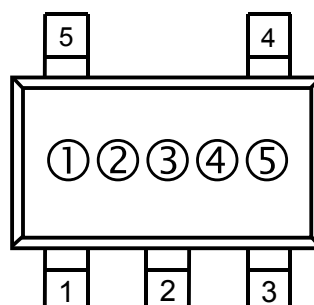


SOT-23-5 Package Dimensions

Mark Specifications (SOT-23-5)

①②③: Product Code ... Refer to "Mark Specification Table"

④⑤: Lot Number ... Alphanumeric Serial Number



SOT-23-5 Mark Specifications

R3134N

NO.EC-209-140227

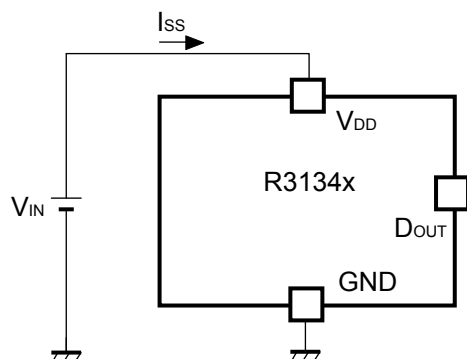
R3134N Mark Specification Table (SOT-23-5)**R3134Nxx1A**

Product Name	① ② ③	V _{SET}
R3134N10EA	S 0 A	1.0V
R3134N11EA	S 0 B	1.1V
R3134N12EA	S 0 C	1.2V
R3134N13EA	S 0 D	1.3V
R3134N14EA	S 0 E	1.4V
R3134N15EA	S 0 F	1.5V
R3134N16EA	S 0 G	1.6V
R3134N17EA	S 0 H	1.7V
R3134N18EA	S 0 J	1.8V
R3134N19EA	S 0 K	1.9V
R3134N20EA	S 0 L	2.0V
R3134N21EA	S 0 M	2.1V
R3134N22EA	S 0 N	2.2V
R3134N23EA	S 0 P	2.3V
R3134N24EA	S 0 R	2.4V
R3134N25EA	S 0 S	2.5V
R3134N26EA	S 0 T	2.6V
R3134N27EA	S 0 U	2.7V
R3134N28EA	S 0 V	2.8V
R3134N29EA	S 0 W	2.9V
R3134N30EA	S 0 X	3.0V
R3134N31EA	S 0 Y	3.1V
R3134N32EA	S 0 Z	3.2V
R3134N33EA	T 0 A	3.3V
R3134N34EA	T 0 B	3.4V
R3134N35EA	T 0 C	3.5V
R3134N36EA	T 0 D	3.6V
R3134N37EA	T 0 E	3.7V
R3134N38EA	T 0 F	3.8V
R3134N39EA	T 0 G	3.9V
R3134N40EA	T 0 H	4.0V
R3134N41EA	T 0 J	4.1V
R3134N42EA	T 0 K	4.2V
R3134N43EA	T 0 L	4.3V
R3134N44EA	T 0 M	4.4V
R3134N45EA	T 0 N	4.5V
R3134N46EA	T 0 P	4.6V
R3134N47EA	T 0 R	4.7V
R3134N48EA	T 0 S	4.8V
R3134N49EA	T 0 T	4.9V
R3134N50EA	T 0 U	5.0V
R3134N23EA2	T 0 V	2.32V
R3134N26EA3	T 0 W	2.63V
R3134N29EA3	T 0 X	2.93V
R3134N30EA8	T 0 Y	3.08V
R3134N43EA8	T 0 Z	4.38V
R3134N46EA3	U 0 A	4.63V

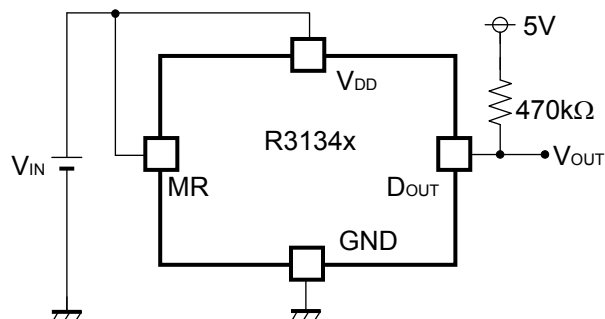
R3134Nxx1C

Product Name	① ② ③	V _{SET}
R3134N10EC	S 1 A	1.0V
R3134N11EC	S 1 B	1.1V
R3134N12EC	S 1 C	1.2V
R3134N13EC	S 1 D	1.3V
R3134N14EC	S 1 E	1.4V
R3134N15EC	S 1 F	1.5V
R3134N16EC	S 1 G	1.6V
R3134N17EC	S 1 H	1.7V
R3134N18EC	S 1 J	1.8V
R3134N19EC	S 1 K	1.9V
R3134N20EC	S 1 L	2.0V
R3134N21EC	S 1 M	2.1V
R3134N22EC	S 1 N	2.2V
R3134N23EC	S 1 P	2.3V
R3134N24EC	S 1 R	2.4V
R3134N25EC	S 1 S	2.5V
R3134N26EC	S 1 T	2.6V
R3134N27EC	S 1 U	2.7V
R3134N28EC	S 1 V	2.8V
R3134N29EC	S 1 W	2.9V
R3134N30EC	S 1 X	3.0V
R3134N31EC	S 1 Y	3.1V
R3134N32EC	S 1 Z	3.2V
R3134N33EC	T 1 A	3.3V
R3134N34EC	T 1 B	3.4V
R3134N35EC	T 1 C	3.5V
R3134N36EC	T 1 D	3.6V
R3134N37EC	T 1 E	3.7V
R3134N38EC	T 1 F	3.8V
R3134N39EC	T 1 G	3.9V
R3134N40EC	T 1 H	4.0V
R3134N41EC	T 1 J	4.1V
R3134N42EC	T 1 K	4.2V
R3134N43EC	T 1 L	4.3V
R3134N44EC	T 1 M	4.4V
R3134N45EC	T 1 N	4.5V
R3134N46EC	T 1 P	4.6V
R3134N47EC	T 1 R	4.7V
R3134N48EC	T 1 S	4.8V
R3134N49EC	T 1 T	4.9V
R3134N50EC	T 1 U	5.0V
R3134N23EC2	T 1 V	2.32V
R3134N26EC3	T 1 W	2.63V
R3134N29EC3	T 1 X	2.93V
R3134N30EC8	T 1 Y	3.08V
R3134N43EC8	T 1 Z	4.38V
R3134N46EC3	U 1 A	4.63V

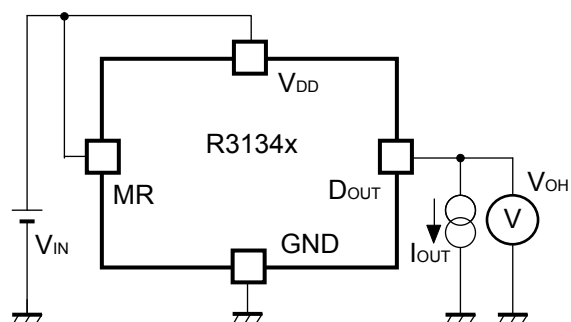
TEST CIRCUITS



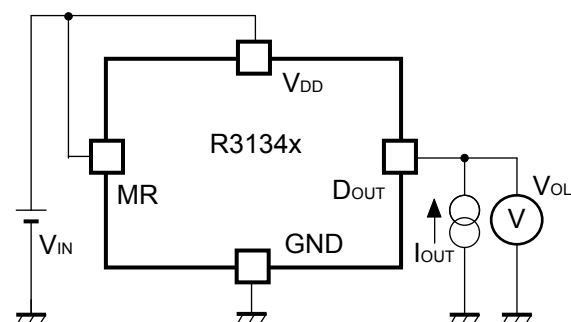
Supply Current Test Circuit



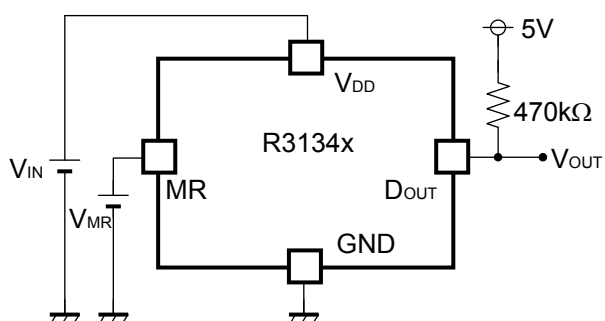
Detector Threshold Test Circuit
(Pull-up circuit is not necessary for CMOS Output type.)



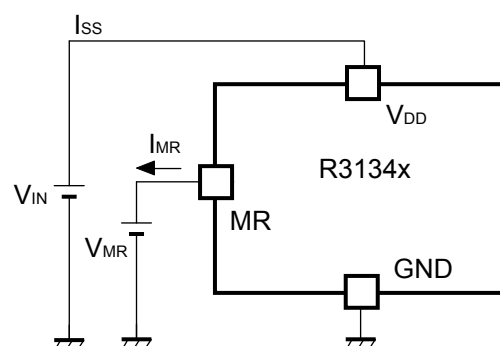
"H" Output Voltage Test Circuit
(CMOS Output Type only)



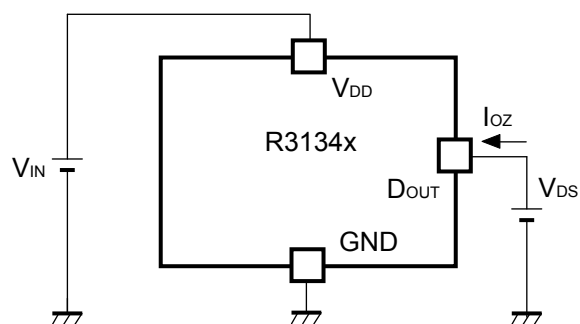
"L" Output Voltage Test Circuit



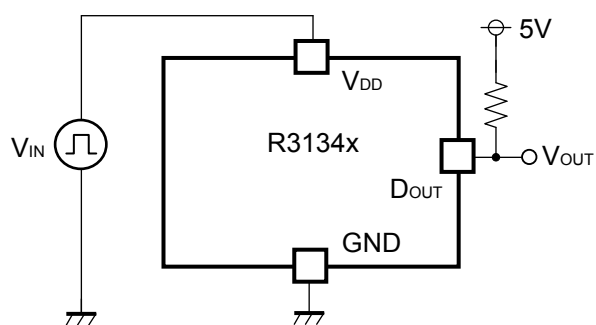
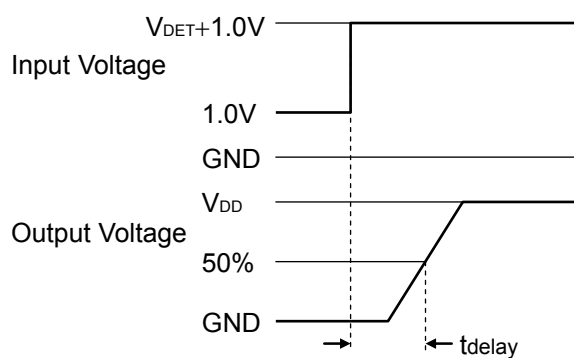
MR pin Input Voltage Test Circuit
(Pull-up circuit is not necessary for CMOS Output type.)



MR pin Pull-up Resistance Test Circuit



Off Leakage Current Test Circuit



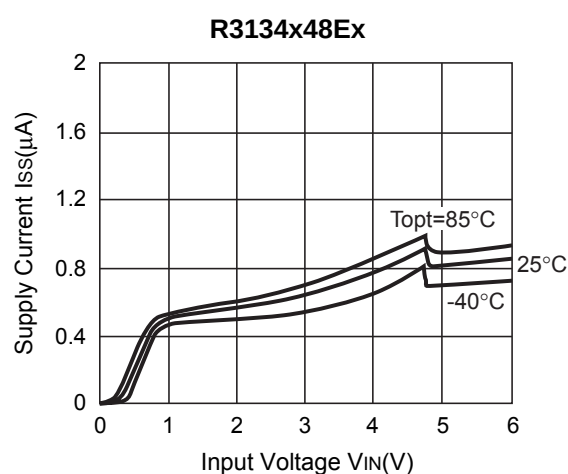
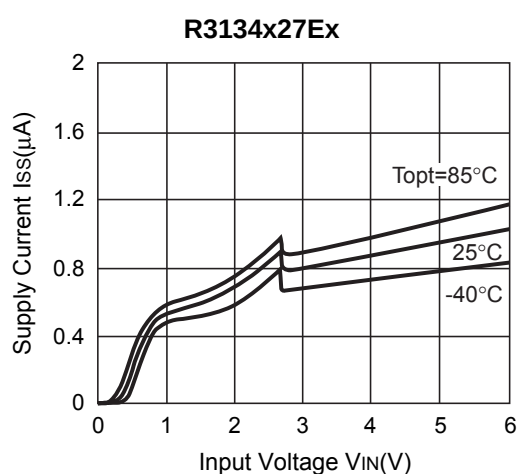
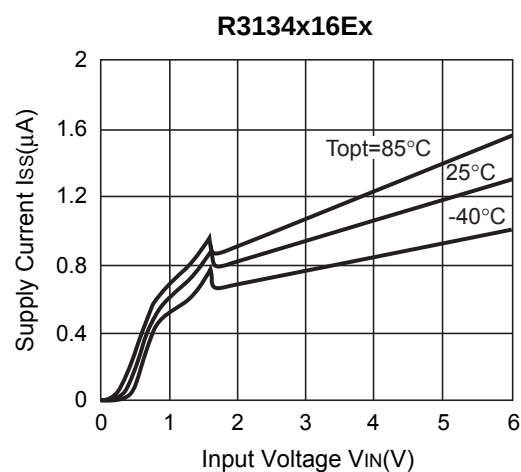
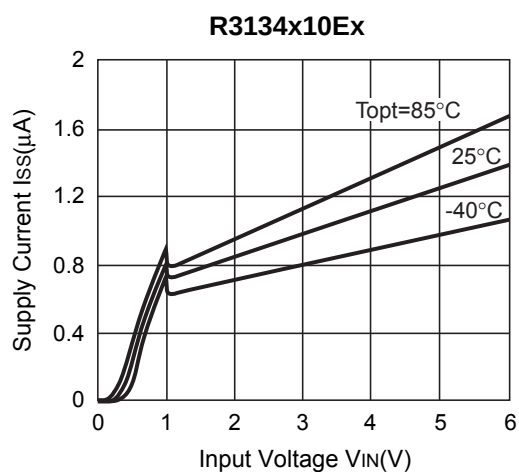
Output Delay Time Test Circuit

(Pull-up circuit is not necessary for CMOS Output type.)

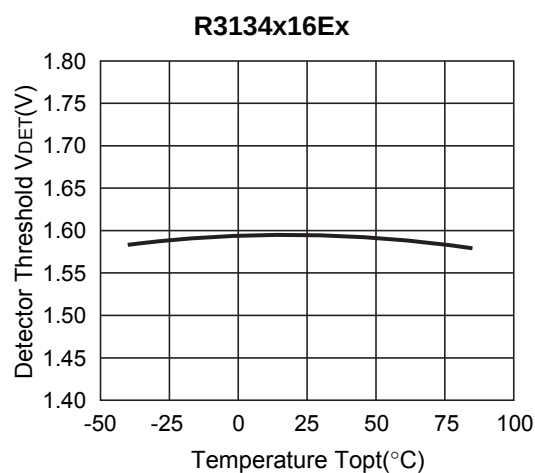
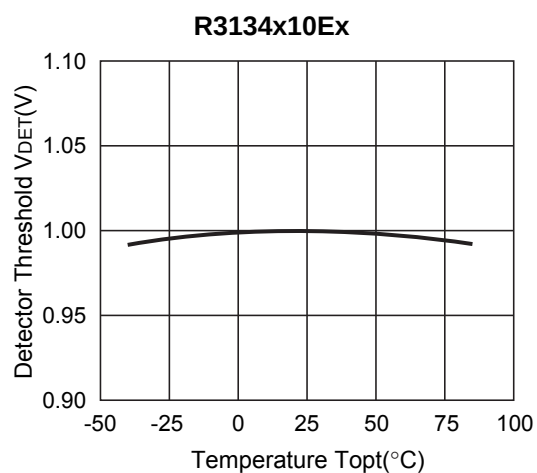
TYPICAL CHARACTERISTICS

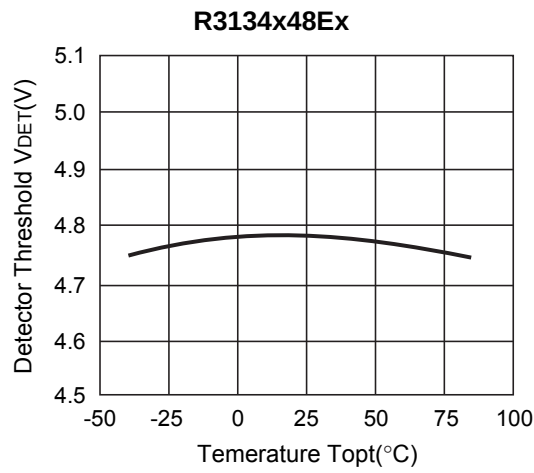
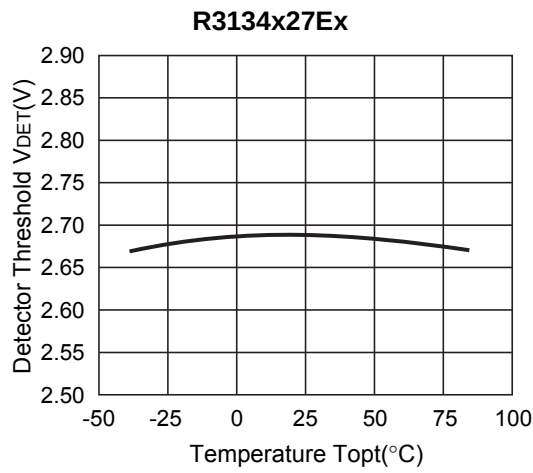
Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

1) Supply Current vs. Input Voltage

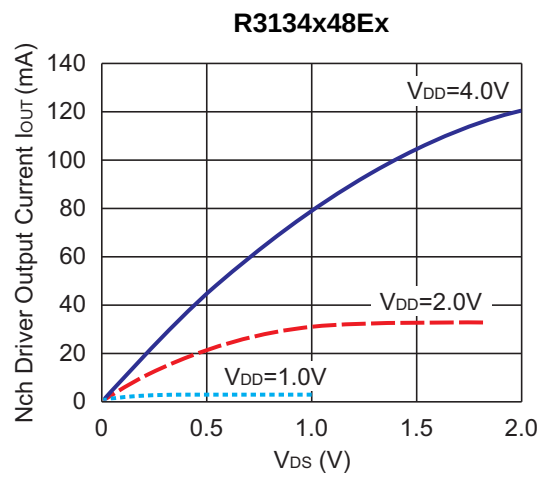
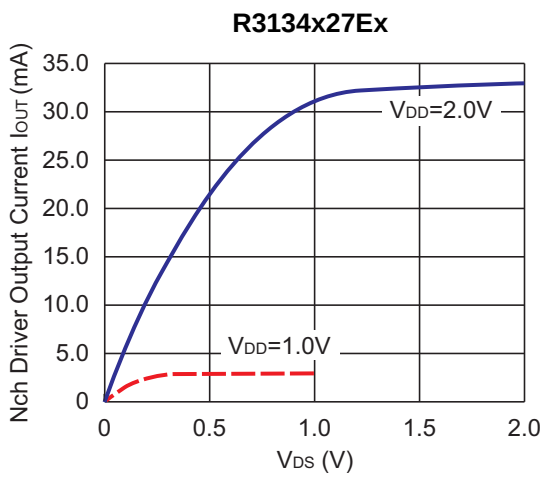
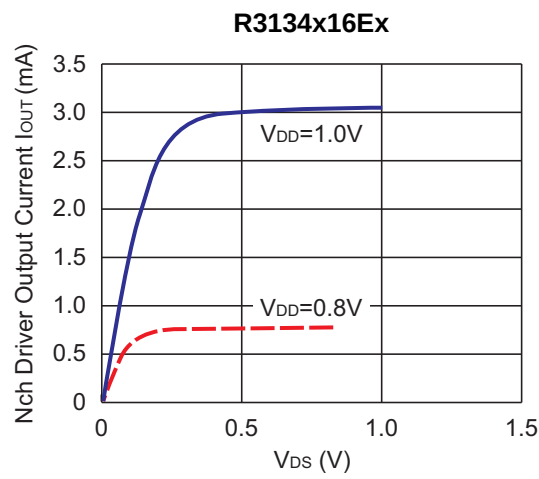
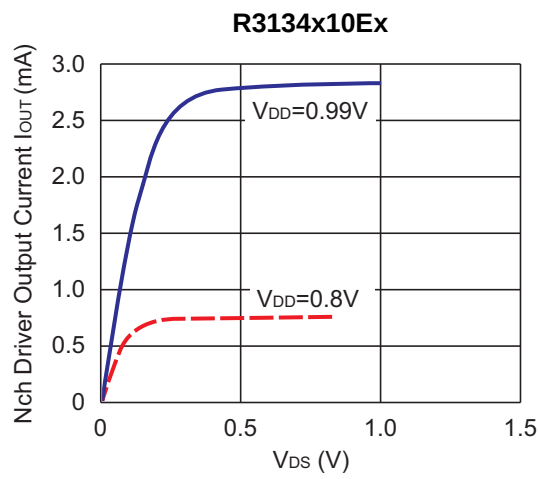


2) Detector Threshold vs. Temperature

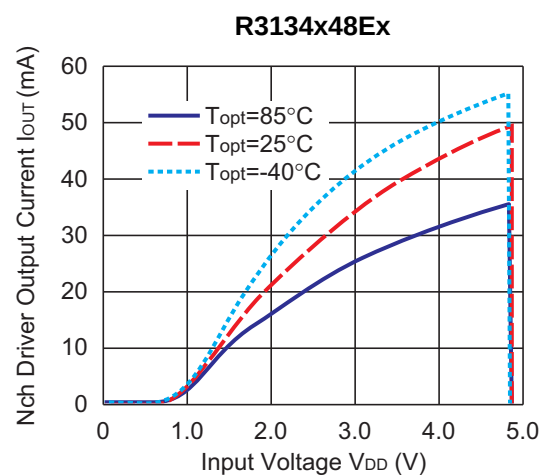
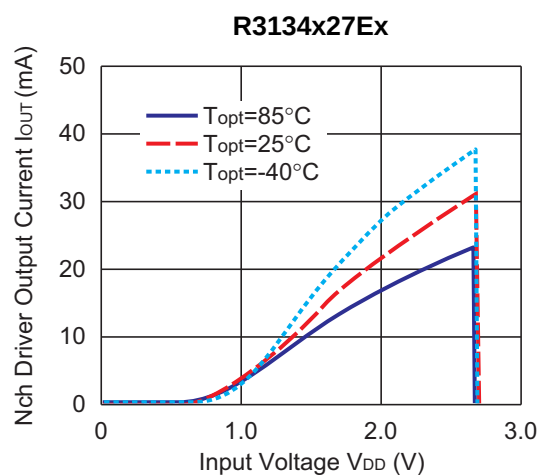
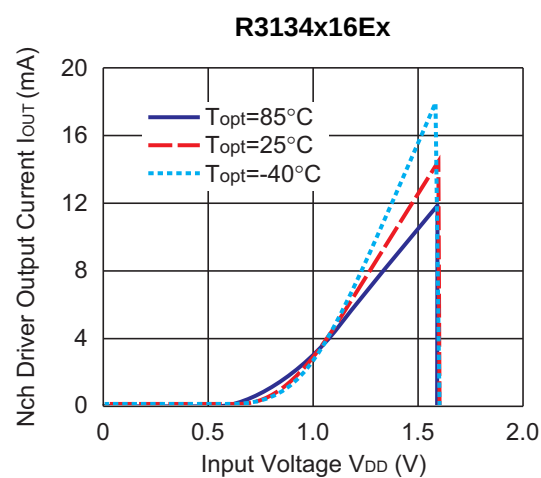
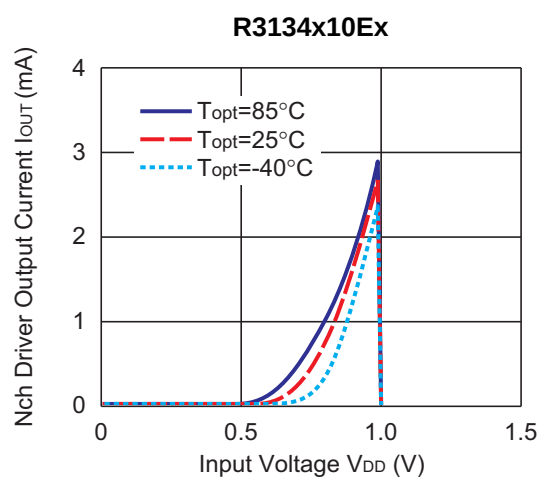
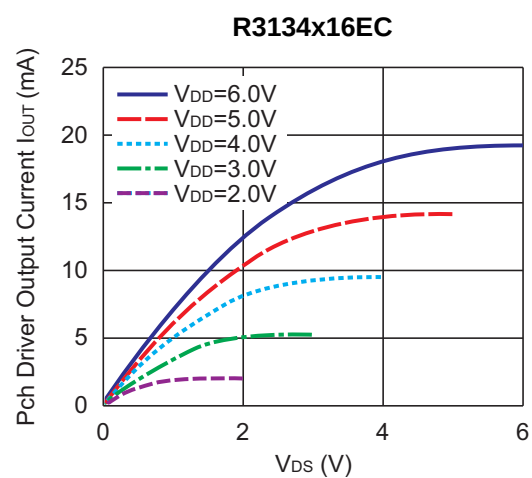
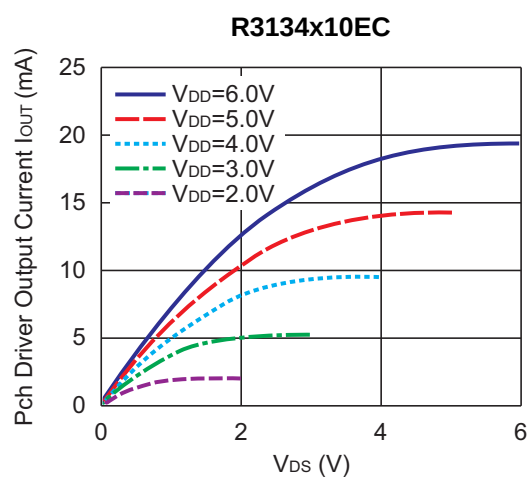


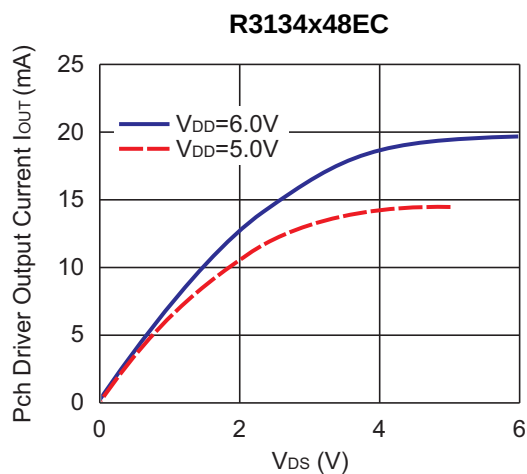
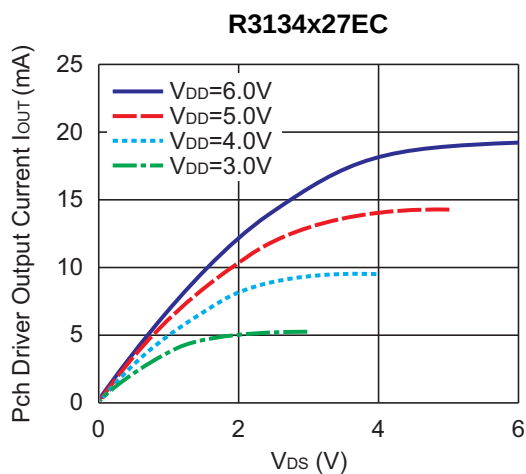


3) Nch Driver Output Current vs. V_{DS} ($T_a=25^{\circ}\text{C}$)

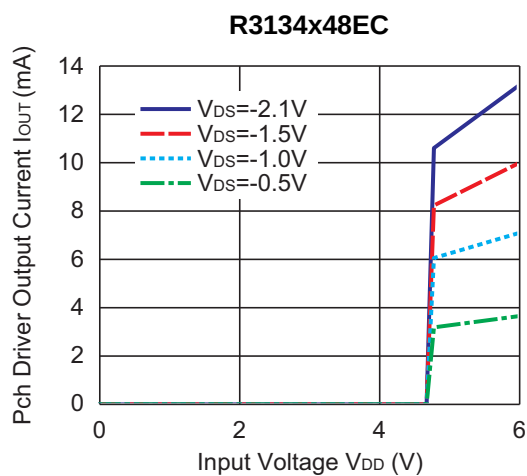
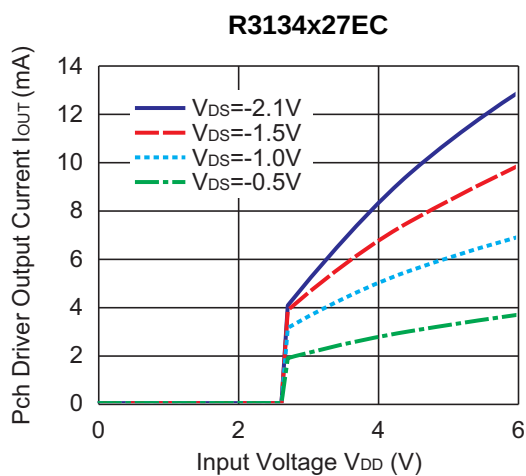
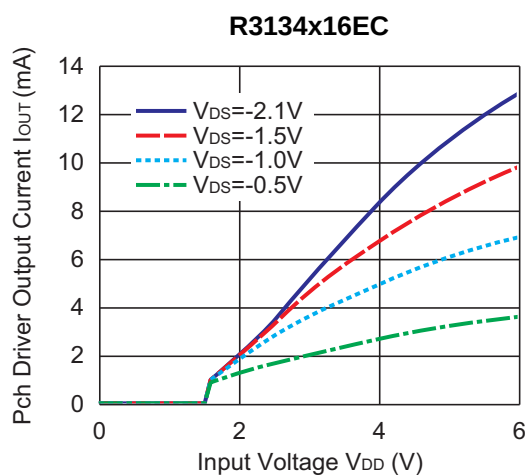
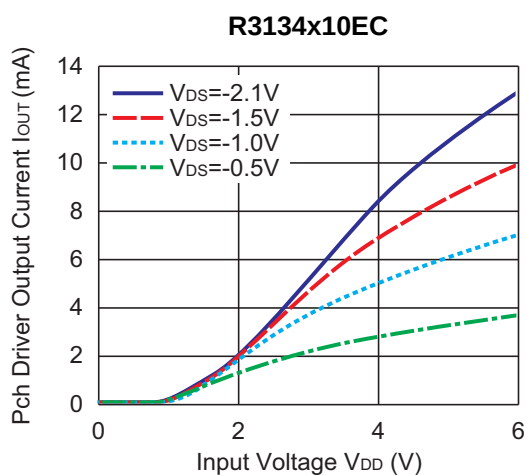


4) Nch Driver Output Current vs. Input Voltage

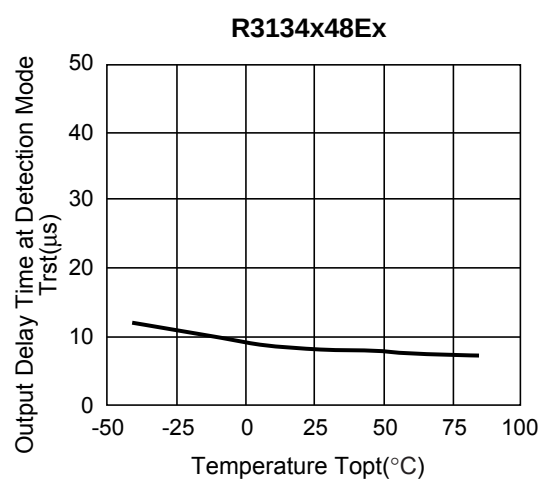
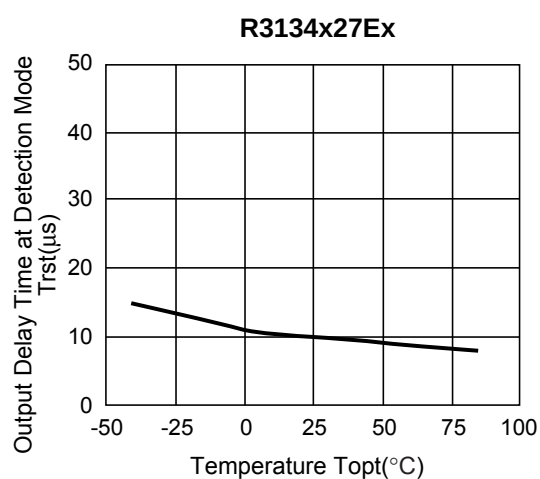
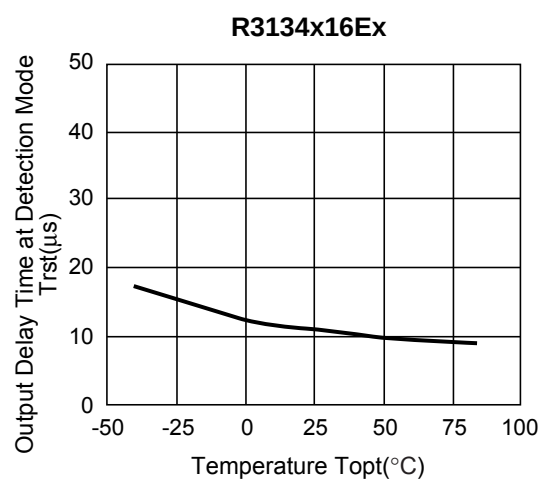
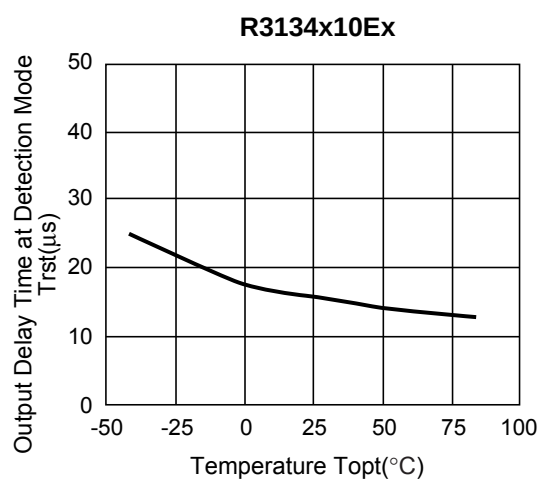
5) Pch Driver Output Current vs. V_{DS} 



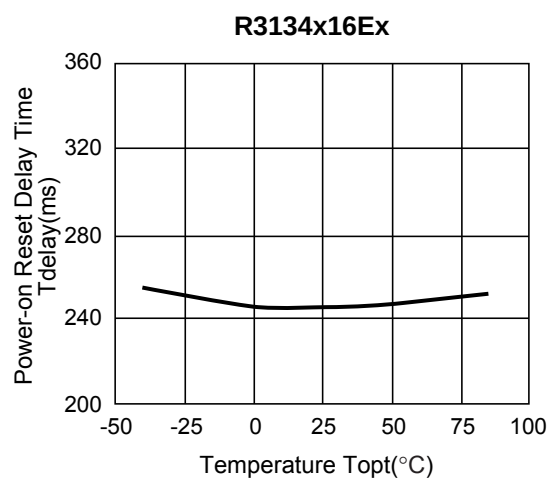
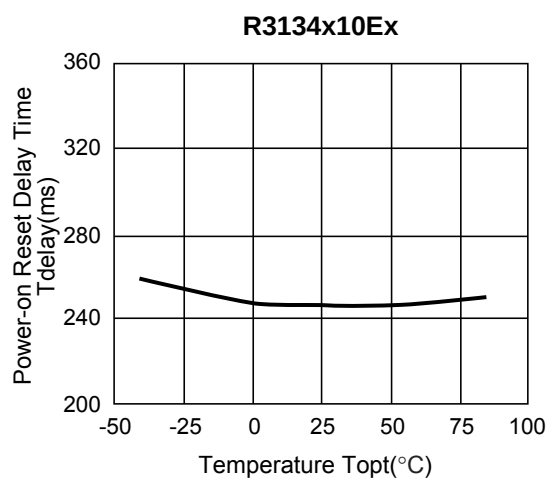
6) Pch Driver Output Current vs. Input Voltage

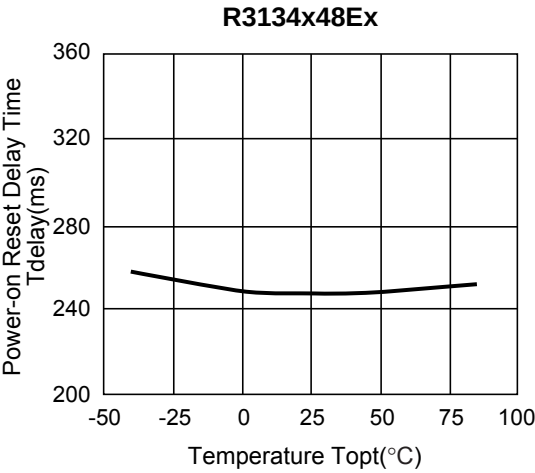
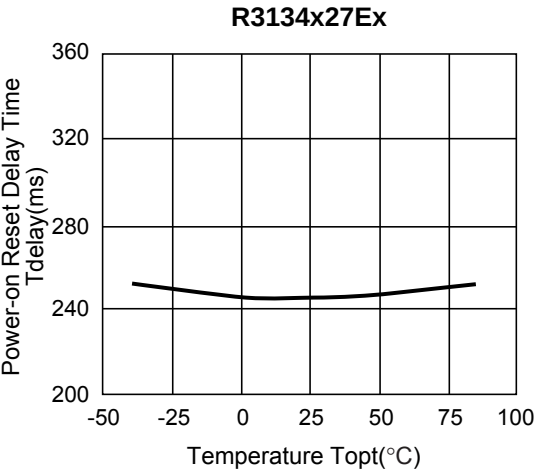


7) Output Delay Time at Detection Mode vs. Temperature



8) Power-on Reset Delay Time vs. Temperature







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