Low Voltage Detector with built-in Delay Circuit

R3130N×××A/C, R3131N×××A/C

APPLICATION MANUAL

NO. EA-073-0012

Low Voltage Detector with built-in Delay Circuit

R3130N×××A/C, R3131N×××A/C

OUTLINE

R3130N/R3131N Series are low voltage detector ICs with built-in delay circuit, high Detector Threshold accuracy and ultra low supply current by CMOS process, which can be operated at low voltage.

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

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

R3130N Series output "L" at detection mode, while R3131N Series output "H".

Further, each of R3130N/R3131N Series embeds an output delay generator, when Supply Voltage crosses a setting detector threshold voltage from a low value to a higher value, during a setting delay time which is fixed in the IC, this IC keeps the reset condition.

Output Delay Time can be selected. (TYP. 240ms is standard.)

Two output types, Nch open drain type and CMOS type, are available.

Since the package for these ICs are SOT23-3 (Mini-mold) package, high density mounting of the ICs on board is possible.

FEATURES

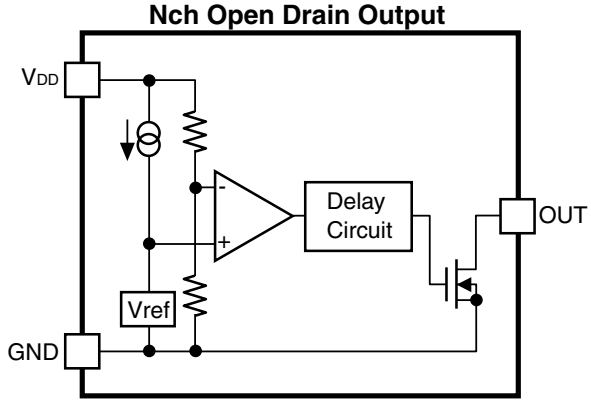
- Pin to Pin compatible with MAX 809/810 (R3130N××××: MAX 809, R3131N××××: MAX 810)
- Ultra-low supply Current ..... TYP. 1.25μA (R313×N27××: V_{DD}=3.0V)
- Operating Voltage Range ..... 1.0V to 6.0V (Topt=25°C)
- Detector Threshold ..... Setting with a step of 0.1V in the range of 1.6V to 4.8V is possible.
- Embedded Power on Reset Delay Time Circuit ..... Delay Time can be designated. Refer to Selection Guide.
- High Accuracy Detector Threshold ..... ±1.5%
- High Accuracy Output Delay Time ..... ±10.0%
- Low Temperature-Drift Coefficient of Detector Threshold ... TYP. ±100ppm/°C
- Two Output Types ..... Nch Open Drain and CMOS
- Small Package SOT-23-3

APPLICATIONS

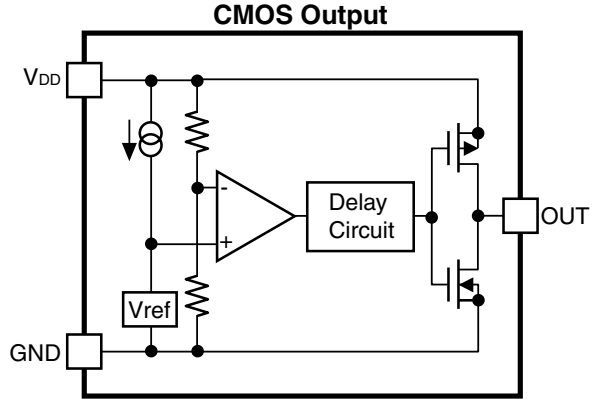
- CPU & Logic Circuit Reset
- Battery Checker
- Window Comparator
- Wave Shaping Circuit
- Battery Back-Up Circuit
- Power Failure Detector

BLOCK DIAGRAMS

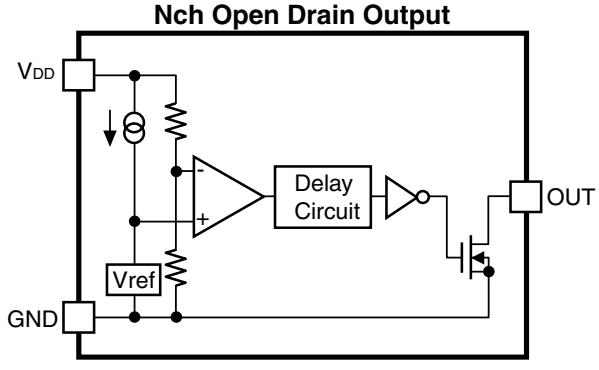
- **R3130Nxxx A**



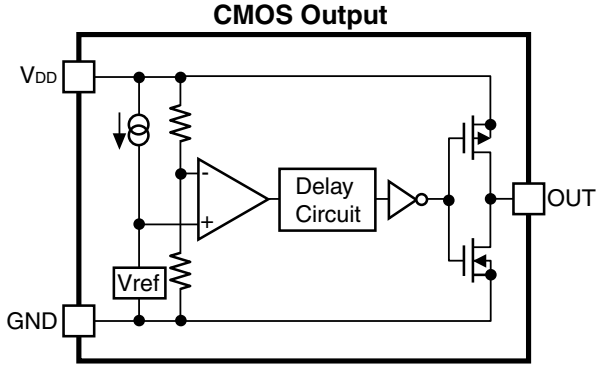
- **R3130Nxxx C**



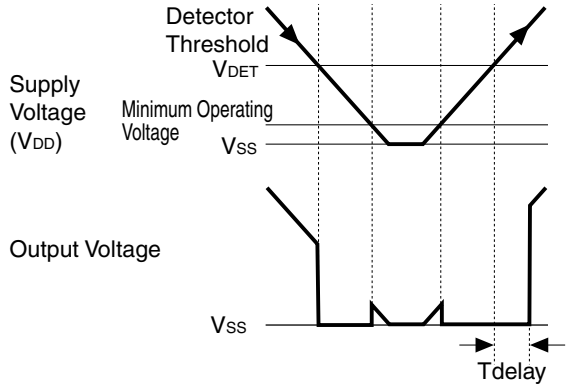
- **R3131Nxxx A**



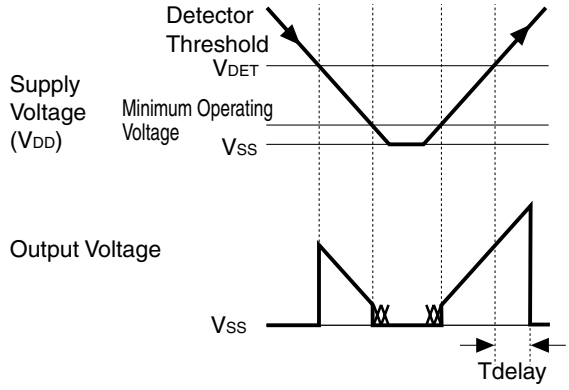
- **R3131Nxxx C**



TIMING CHART



R3130N Operation Diagram



R3131N Operation Diagram

- **Output Delay Operation**

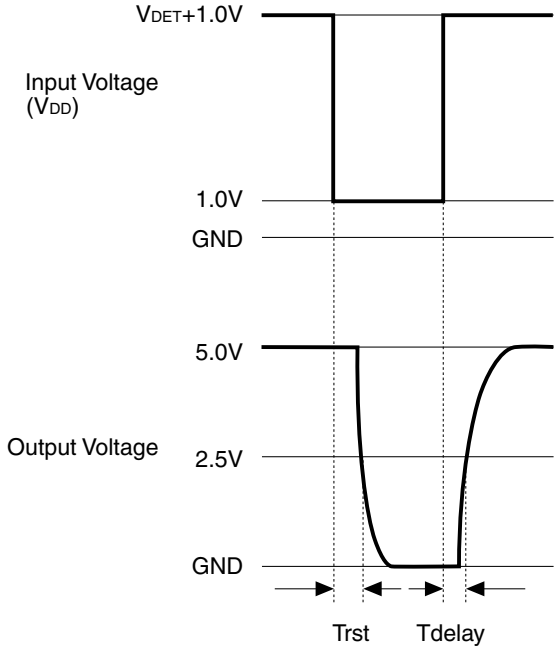
Output Delay Time, or Tdelay is specified as follows:

1. In the case of Nch Open Drain Output:

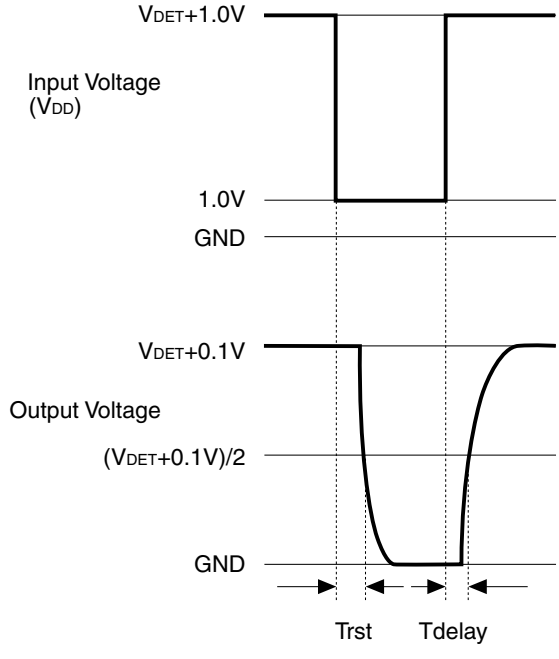
The time interval from rising edge of V_{DD} pulse (1.0V→(V_{DET})+0.1V) to the time at which the output reaches 2.5V under the condition that the output pin (OUT) is pulled up to 5V through a 470kΩ resistor.

2. In the case of CMOS Output

The time interval from rising edge of V_{DD} pulse (1.0V→(V_{DET})+0.1V) to the time at which the output reaches V_{DD}/2.



Nch Open Drain Output



CMOS Output

SELECTION GUIDE

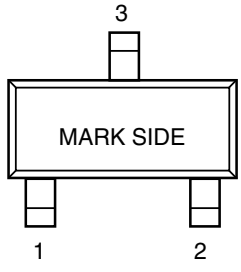
The detector threshold , the output type, and Output delay time of R3130N series can be designated at the user's request by specifying the part number as follows:

R3130N<u>××××</u>-<u>TR</u> ←Part Number
R3131N<u>××××</u>-<u>TR</u> ←Part Number
↑↑↑↑ ↑
a bcd e

Code	Contents
a	Setting Detector Threshold (V_{DET}) Stepwise setting with a step of 0.1V in the range of 1.6V to 4.8V is possible. The following 6 kinds of voltage are also standard. 2.63V, 2.93V, 3.08V, 4.00V, 4.40V, 4.65V
b	Selection of Output Delay Time E: 240ms (Standard) A: 50ms B: 100ms D: 200ms H: 400ms *A, B, D, H versions can be produced only for 6 kinds of standard voltage items.
c	Designation Output type A: Nch Open Drain C: CMOS
d	Description of last one digit of 6 kinds of standard voltage items.
e	Designation of Taping Direction (Refer to Taping Specification)

PIN CONFIGURATION

SOT-23-3



PIN DESCRIPTION

Pin No.	Symbol	Description
1	GND	Ground Pin
2	OUT	Output Pin R3130N: Output "L" at detection mode, Output "H" at release mode R3131N: Output "H" at detection mode, Output "L" at release mode
3	V_{DD}	Input Pin

ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating		Unit
V_{DD}	Supply Voltage	6.5		V
V_{OUT}	Output Voltage	CMOS	V_{SS}-0.3 to V_{DD}+0.3	V
		Nch	V_{SS}-0.3 to 6.5	V
I_{OUT}	Output Current	20		mA
P_D	Power Dissipation	150		mW
Topt	Operating Temperature Range	-40 to +85		°C
Tstg	Storage Temperature Range	-55 to +125		°C
Tsolder	Soldering Temperature	260°C, 10s		

ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings are threshold limit values that must not be exceeded even for a moment under any conditions.

Moreover, such values for any items must not be reached simultaneously. Operation above these absolute maximum ratings may cause degradation or permanent damage to the device. These are just stress ratings and do not necessarily imply to guarantee operation below these limits.

ELECTRICAL CHARACTERISTICS

• **R3130N26××3-TR** [Topt=25°C]

Symbol	Item	Conditions	MIN.	TYP.	MAX.	Unit
V_{DDH}	Maximum Operating Voltage				6.0	V
V_{DDL} (*1)	Minimum Operating Voltage	I_{OL}=50μA		0.75	1.00	V
V_{DET}	Detector Threshold		2.591	2.630	2.669	V
I_{SS1}	Supply Current1	V_{DD}=6.00V		1.40	5.00	μA
I_{SS2}	Supply Current2	V_{DD}=2.73V		1.25	4.00	μA
I_{SS3}	Supply Current3	V_{DD}=2.53V		1.10	3.50	μA
V_{OH}	"H" Output Voltage	V_{DD}=2.73V, I_{OUT}=-500μA	0.8×V_{DD}	0.93×V_{DD}		V
V_{OL}	"L" Output Voltage	V_{DD}=2.53V, I_{OUT}=1.2mA		0.16	0.30	V
Tdelay (*2)	Output Delay Time for release	Refer to electrical characteristics by Output Delay Time for release				
ΔV_{DET}/ ΔTopt	Detector Threshold Temperature Coefficient	-40°C ≤ Topt ≤ 85°C		±100		ppm/ °C

• **R3130N29××3-TR** [Topt=25°C]

Symbol	Item	Conditions	MIN.	TYP.	MAX.	Unit
V_{DDH}	Maximum Operating Voltage				6.0	V
V_{DDL} (*1)	Minimum Operating Voltage	I_{OL}=50μA		0.75	1.00	V
V_{DET}	Detector Threshold		2.887	2.930	2.973	V
I_{SS1}	Supply Current1	V_{DD}=6.00V		1.40	5.00	μA
I_{SS2}	Supply Current2	V_{DD}=3.03V		1.25	4.00	μA
I_{SS3}	Supply Current3	V_{DD}=2.83V		1.10	3.50	μA
V_{OH}	"H" Output Voltage	V_{DD}=3.03V, I_{OUT}=-500μA	0.8×V_{DD}	0.93×V_{DD}		V
V_{OL}	"L" Output Voltage	V_{DD}=2.83V, I_{OUT}=1.2mA		0.16	0.30	V
Tdelay (*2)	Output Delay Time for release	Refer to electrical characteristics by Output Delay Time for release				
ΔV_{DET}/ ΔTopt	Detector Threshold Temperature Coefficient	-40°C ≤ Topt ≤ 85°C		±100		ppm/ °C

• **R3130N30××8-TR** [Topt=25°C]

Symbol	Item	Conditions	MIN.	TYP.	MAX.	Unit
V_{DDH}	Maximum Operating Voltage				6.0	V
V_{DDL} (*1)	Minimum Operating Voltage	I_{OL}=50μA		0.75	1.00	V
V_{DET}	Detector Threshold		3.034	3.080	3.126	V
I_{SS1}	Supply Current1	V_{DD}=6.00V		1.40	5.00	μA
I_{SS2}	Supply Current2	V_{DD}=3.18V		1.25	4.00	μA
I_{SS3}	Supply Current3	V_{DD}=2.98V		1.10	3.50	μA
V_{OH}	"H" Output Voltage	V_{DD}=3.18V, I_{OUT}=-500μA	0.8×V_{DD}	0.93×V_{DD}		V
V_{OL}	"L" Output Voltage	V_{DD}=2.98V, I_{OUT}=1.2mA		0.16	0.30	V
Tdelay (*2)	Output Delay Time for release	Refer to electrical characteristics by Output Delay Time for release				
ΔV_{DET}/ ΔTopt	Detector Threshold Temperature Coefficient	-40°C ≤ Topt ≤ 85°C		±100		ppm/ °C

• **R3130N40××-TR** [Topt=25°C]

Symbol	Item	Conditions	MIN.	TYP.	MAX.	Unit
V_{DDH}	Maximum Operating Voltage				6.0	V
V_{DDL} (*1)	Minimum Operating Voltage	I_{OL}=50μA		0.75	1.00	V
V_{DET}	Detector Threshold		3.940	4.000	4.060	V
I_{SS1}	Supply Current1	V_{DD}=6.00V		1.40	5.00	μA
I_{SS2}	Supply Current2	V_{DD}=4.10V		1.30	4.00	μA
I_{SS3}	Supply Current3	V_{DD}=3.90V		1.15	3.50	μA
V_{OH}	"H" Output Voltage	V_{DD}=4.10V, I_{OUT}=-800μA	0.8×V_{DD}	0.95×V_{DD}		V
V_{OL}	"L" Output Voltage	V_{DD}=3.90V, I_{OUT}=3.2mA		0.18	0.40	V
Tdelay (*2)	Output Delay Time for release	Refer to electrical characteristics by Output Delay Time for release				
ΔV_{DET}/ ΔTopt	Detector Threshold Temperature Coefficient	-40°C ≤ Topt ≤ 85°C		±100		ppm/ °C

• **R3130N44××-TR** [Topt=25°C]

Symbol	Item	Conditions	MIN.	TYP.	MAX.	Unit
V_{DDH}	Maximum Operating Voltage				6.0	V
V_{DDL} (*1)	Minimum Operating Voltage	I_{OL}=50μA		0.75	1.00	V
V_{DET}	Detector Threshold		4.334	4.400	4.466	V
I_{SS1}	Supply Current1	V_{DD}=6.00V		1.40	5.00	μA
I_{SS2}	Supply Current2	V_{DD}=4.50V		1.30	4.00	μA
I_{SS3}	Supply Current3	V_{DD}=4.30V		1.15	3.50	μA
V_{OH}	"H" Output Voltage	V_{DD}=4.50V, I_{OUT}=-800μA	0.8×V_{DD}	0.95×V_{DD}		V
V_{OL}	"L" Output Voltage	V_{DD}=4.30V, I_{OUT}=3.2mA		0.18	0.40	V
Tdelay (*2)	Output Delay Time for release	Refer to electrical characteristics by Output Delay Time for release				
ΔV_{DET}/ ΔTopt	Detector Threshold Temperature Coefficient	-40°C ≤ Topt ≤ 85°C		±100		ppm/ °C

• **R3130N46××5-TR** [Topt=25°C]

Symbol	Item	Conditions	MIN.	TYP.	MAX.	Unit
V_{DDH}	Maximum Operating Voltage				6.0	V
V_{DDL} (*1)	Minimum Operating Voltage	I_{OL}=50μA		0.75	1.00	V
V_{DET}	Detector Threshold		4.581	4.650	4.719	V
I_{SS1}	Supply Current1	V_{DD}=6.00V		1.40	5.00	μA
I_{SS2}	Supply Current2	V_{DD}=4.75V		1.30	4.00	μA
I_{SS3}	Supply Current3	V_{DD}=4.55V		1.15	3.50	μA
V_{OH}	"H" Output Voltage	V_{DD}=4.75V, I_{OUT}=-800μA	0.8×V_{DD}	0.95×V_{DD}		V
V_{OL}	"L" Output Voltage	V_{DD}=4.55V, I_{OUT}=3.2mA		0.18	0.40	V
Tdelay (*2)	Output Delay Time for release	Refer to electrical characteristics by Output Delay Time for release				
ΔV_{DET}/ ΔTopt	Detector Threshold Temperature Coefficient	-40°C ≤ Topt ≤ 85°C		±100		ppm/ °C

• **R3131N26××3-TR** [Topt=25°C]

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit
V_{DDH}	Maximum Operating Voltage					6.0	V
V_{DDL} (*3)	Minimum Operating Voltage	CMOS Output	I_{OH}=-10μA		0.90	1.00	V
		Nch Open Drain Output	V_{DS}=6.5V				
V_{DET}	Detector Threshold			2.591	2.630	2.669	V
I_{SS1}	Supply Current1	V_{DD}=6.00V			1.40	5.00	μA
I_{SS2}	Supply Current2	V_{DD}=2.73V			1.25	4.00	μA
I_{SS3}	Supply Current3	V_{DD}=2.53V			1.10	3.50	μA
V_{OH}	"H" Output Voltage	V_{DD}=2.73V, I_{OUT}=-500μA		0.8×V_{DD}	0.93×V_{DD}		V
V_{OL}	"L" Output Voltage	V_{DD}=2.53V, I_{OUT}=1.2mA			0.16	0.30	V
Tdelay (*2)	Output Delay Time for release	Refer to electrical characteristics by Output Delay Time for release					
ΔV_{DET}/ ΔTopt	Detector Threshold Temperature Coefficient	-40°C ≤ Topt ≤ 85°C			±100		ppm/ °C

• **R3131N29××3-TR** [Topt=25°C]

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit
V_{DDH}	Maximum Operating Voltage					6.0	V
V_{DDL} (*3)	Minimum Operating Voltage	CMOS Output	I_{OH}=-10μA		0.90	1.00	V
		Nch Open Drain Output	V_{DS}=6.5V				
V_{DET}	Detector Threshold			2.887	2.930	2.973	V
I_{SS1}	Supply Current1	V_{DD}=6.00V			1.40	5.00	μA
I_{SS2}	Supply Current2	V_{DD}=3.03V			1.25	4.00	μA
I_{SS3}	Supply Current3	V_{DD}=2.83V			1.10	3.50	μA
V_{OH}	"H" Output Voltage	V_{DD}=2.83V, I_{OUT}=-500μA		0.8×V_{DD}	0.93×V_{DD}		V
V_{OL}	"L" Output Voltage	V_{DD}=3.03V, I_{OUT}=1.2mA			0.16	0.30	V
Tdelay (*2)	Output Delay Time for release	Refer to electrical characteristics by Output Delay Time for release					
ΔV_{DET}/ ΔTopt	Detector Threshold Temperature Coefficient	-40°C ≤ Topt ≤ 85°C			±100		ppm/ °C

• **R3131N30××8-TR** [Topt=25°C]

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit
V_{DDH}	Maximum Operating Voltage					6.0	V
V_{DDL} (*3)	Minimum Operating Voltage	CMOS Output	I_{OH}=-10μA		0.90	1.00	V
		Nch Open Drain Output	V_{DS}=6.5V				
V_{DET}	Detector Threshold			3.034	3.080	3.126	V
I_{SS1}	Supply Current1	V_{DD}=6.00V			1.40	5.00	μA
I_{SS2}	Supply Current2	V_{DD}=3.18V			1.25	4.00	μA
I_{SS3}	Supply Current3	V_{DD}=2.98V			1.10	3.50	μA
V_{OH}	"H" Output Voltage	V_{DD}=2.98V, I_{OUT}=-500μA		0.8×V_{DD}	0.93×V_{DD}		V
V_{OL}	"L" Output Voltage	V_{DD}=3.18V, I_{OUT}=1.2mA			0.16	0.30	V
Tdelay (*2)	Output Delay Time for release	Refer to electrical characteristics by Output Delay Time for release					
ΔV_{DET}/ ΔTopt	Detector Threshold Temperature Coefficient	-40°C ≤ Topt ≤ 85°C			±100		ppm/ °C

• **R3131N40××-TR** [Topt=25°C]

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit
V_{DDH}	Maximum Operating Voltage					6.0	V
V_{DDL} (*3)	Minimum Operating Voltage	CMOS Output	I_{OH}=-10μA		0.90	1.00	V
		Nch Open Drain Output	V_{DS}=6.5V				
V_{DET}	Detector Threshold			3.940	4.000	4.060	V
I_{SS1}	Supply Current1	V_{DD}=6.00V			1.40	5.00	μA
I_{SS2}	Supply Current2	V_{DD}=3.90V			1.30	4.00	μA
I_{SS3}	Supply Current3	V_{DD}=4.10V			1.15	3.50	μA
V_{OH}	"H" Output Voltage	V_{DD}=3.90V, I_{OUT}=-800μA		0.8×V_{DD}	0.95×V_{DD}		V
V_{OL}	"L" Output Voltage	V_{DD}=4.10V, I_{OUT}=3.2mA			0.18	0.40	V
Tdelay (*2)	Output Delay Time for release	Refer to electrical characteristics by Output Delay Time for release					
ΔV_{DET}/ ΔTopt	Detector Threshold Temperature Coefficient	-40°C ≤ Topt ≤ 85°C			±100		ppm/ °C

• **R3131N44××-TR** [Topt=25°C]

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit
V_{DDH}	Maximum Operating Voltage					6.0	V
V_{DDL} (*3)	Minimum Operating Voltage	CMOS Output	I_{OH}=-10μA		0.90	1.00	V
		Nch Open Drain Output	V_{DS}=6.5V				
V_{DET}	Detector Threshold			4.334	4.400	4.466	V
I_{SS1}	Supply Current1	V_{DD}=6.00V			1.40	5.00	μA
I_{SS2}	Supply Current2	V_{DD}=4.50V			1.30	4.00	μA
I_{SS3}	Supply Current3	V_{DD}=4.30V			1.15	3.50	μA
V_{OH}	"H" Output Voltage	V_{DD}=4.30V, I_{OUT}=-800μA		0.8×V_{DD}	0.95×V_{DD}		V
V_{OL}	"L" Output Voltage	V_{DD}=4.50V, I_{OUT}=3.2mA			0.18	0.40	V
Tdelay (*2)	Output Delay Time for release	Refer to electrical characteristics by Output Delay Time for release					
ΔV_{DET}/ ΔTopt	Detector Threshold Temperature Coefficient	-40°C ≤ Topt ≤ 85°C			±100		ppm/ °C

• **R3131N46××5-TR** [Topt=25°C]

Symbol	Item	Conditions		MIN.	TYP.	MAX.	Unit
V_{DDH}	Maximum Operating Voltage					6.0	V
V_{DDL} (*3)	Minimum Operating Voltage	CMOS Output	I_{OH}=-10μA		0.90	1.00	V
		Nch Open Drain Output	V_{DS}=6.5V				
V_{DET}	Detector Threshold			4.581	4.650	4.719	V
I_{SS1}	Supply Current1	V_{DD}=6.00V			1.40	5.00	μA
I_{SS2}	Supply Current2	V_{DD}=4.75V			1.30	4.00	μA
I_{SS3}	Supply Current3	V_{DD}=4.55V			1.15	3.50	μA
V_{OH}	"H" Output Voltage	V_{DD}=4.55V, I_{OUT}=-800μA		0.8×V_{DD}	0.95×V_{DD}		V
V_{OL}	"L" Output Voltage	V_{DD}=4.75V, I_{OUT}=3.2mA			0.18	0.40	V
Tdelay (*2)	Output Delay Time for release	Refer to electrical characteristics by Output Delay Time for release					
ΔV_{DET}/ ΔTopt	Detector Threshold Temperature Coefficient	-40°C ≤ Topt ≤ 85°C			±100		ppm/ °C

*1) Supply Voltage when Output Voltage becomes equal or less than 0.3V. (As for Nch Open Drain Output type, pull-up resistor is 470kΩ, pull-up voltage is 5.0V.

*2) Time interval of rising edge of V_{DD} which is set from 1.0V to V_{DET}+1.0V, and the point of which Output voltage reaches to 50% of final voltage.

*3) CMOS Output type; Supply Voltage when Output Voltage becomes equal or more than 0.8×V_{DD}.
Nch Open Drain type; Supply Voltage when off leakage current becomes equal or less than 0.1μA.

ELECTRICAL CHARACTERISTICS BY OUTPUT DELAY TIME

[Topt=25°C]

Part Number	Test Condition	Output Delay Time (Tdelay)			Unit
		MIN.	TYP.	MAX.	
R313×N××A×	V_{DD}=1.0V to V_{DET}+1.0V	45	50	55	ms
R313×N××B×		90	100	110	
R313×N××D×		180	200	220	
R313×N××E×		216	240	264	
R313×N××H×		360	400	440	

ELECTRICAL CHARACTERISTICS BY DETECTOR THRESHOLD

- **R3130N16EA/C to R3130N48EA/C**

Part Number	Detector Threshold			Supply Current 1			Supply Current 2			Supply Current 3		
	V_{DET} (V)			I_{SS1} (μA)			I_{SS2} (μA)			I_{SS3} (μA)		
	MIN.	TYP.	MAX.	Condition	TYP.	MAX.	Condition	TYP.	MAX.	Condition	TYP.	MAX.
R3130N16EA/C	1.576	1.600	1.624	V_{DD}=6.0V	1.40	5.00	V_{DD}=V_{DET} +0.1V	1.20	4.00	V_{DD}=V_{DET} -0.1V	1.00	3.50
R3130N17EA/C	1.675	1.700	1.725									
R3130N18EA/C	1.773	1.800	1.827									
R3130N19EA/C	1.872	1.900	1.928									
R3130N20EA/C	1.970	2.000	2.030									
R3130N21EA/C	2.069	2.100	2.131									
R3130N22EA/C	2.167	2.200	2.233									
R3130N23EA/C	2.266	2.300	2.334									
R3130N24EA/C	2.364	2.400	2.436					1.25			1.10	
R3130N25EA/C	2.463	2.500	2.537									
R3130N26EA/C	2.561	2.600	2.639									
R3130N27EA/C	2.660	2.700	2.740									
R3130N28EA/C	2.758	2.800	2.842									
R3130N29EA/C	2.857	2.900	2.943									
R3130N30EA/C	2.955	3.000	3.045									
R3130N31EA/C	3.054	3.100	3.146									
R3130N32EA/C	3.152	3.200	3.248									
R3130N33EA/C	3.251	3.300	3.349									
R3130N34EA/C	3.349	3.400	3.451									
R3130N35EA/C	3.448	3.500	3.552									
R3130N36EA/C	3.546	3.600	3.654					1.30			1.15	
R3130N37EA/C	3.645	3.700	3.755									
R3130N38EA/C	3.743	3.800	3.857									
R3130N39EA/C	3.842	3.900	3.958									
R3130N40EA/C	3.940	4.000	4.060									
R3130N41EA/C	4.039	4.100	4.161									
R3130N42EA/C	4.137	4.200	4.263									
R3130N43EA/C	4.236	4.300	4.364									
R3130N44EA/C	4.334	4.400	4.466									
R3130N45EA/C	4.433	4.500	4.567									
R3130N46EA/C	4.531	4.600	4.669									
R3130N47EA/C	4.630	4.700	4.770									
R3130N48EA/C	4.728	4.800	4.872									

Topt=25°C

"H" Output Voltage			"L" Output Voltage			Minimum Operating Voltage		Output Delay Time			Detector Threshold Temperature Coefficient	
V_{OH} (V)			V_{OL} (V)			V_{DDL} (V)		Tdelay (ms)			$\Delta V_{DET}/\Delta Topt$ (pm/°C)	
Condition	MIN.	TYP.	Condition	TYP.	MAX.	TYP.	MAX.	MIN.	TYP.	MAX.	Condition	TYP.
$V_{DD}=V_{DET}$ +0.1V I_{OH}= -150μA	0.80× V_{DD}	0.95× V_{DD}	$V_{DD}=V_{DET}$ -0.1V, I_{OL}=1.2mA	0.16	0.30	*1 0.75	*1 1.00	216	240	264	-40°C ≤ Topt ≤ 85°C	±100
$V_{DD}=V_{DET}$ +0.1V I_{OH}= -500μA	0.80× V_{DD}	0.93× V_{DD}										
$V_{DD}=V_{DET}$ +0.1V I_{OH}= -800μA	0.80× V_{DD}	0.95× V_{DD}	$V_{DD}=V_{DET}$ -0.1V, I_{OL}=3.2mA	0.18	0.40							

*1 describes V_{DD} Voltage when Output Voltage becomes equal or less than 0.3V.

- **R3131N16EA/C to R3131N48EA/C**

Part Number	Detector Threshold			Supply Current 1			Supply Current 2			Supply Current 3		
	V_{DET} (V)			I_{SS1} (µA)			I_{SS2} (µA)			I_{SS3} (µA)		
	MIN.	TYP.	MAX.	Condition	TYP.	MAX.	Condition	TYP.	MAX.	Condition	TYP.	MAX.
R3131N16EA/C	1.576	1.600	1.624	V_{DD}=6.0V	1.40	5.00	V_{DD}=V_{DET} +0.1V	1.20	4.00	V_{DD}=V_{DET} -0.1V	1.00	3.50
R3131N17EA/C	1.675	1.700	1.725									
R3131N18EA/C	1.773	1.800	1.827									
R3131N19EA/C	1.872	1.900	1.928									
R3131N20EA/C	1.970	2.000	2.030									
R3131N21EA/C	2.069	2.100	2.131									
R3131N22EA/C	2.167	2.200	2.233									
R3131N23EA/C	2.266	2.300	2.334									
R3131N24EA/C	2.364	2.400	2.436					1.25			1.10	
R3131N25EA/C	2.463	2.500	2.537									
R3131N26EA/C	2.561	2.600	2.639									
R3131N27EA/C	2.660	2.700	2.740									
R3131N28EA/C	2.758	2.800	2.842									
R3131N29EA/C	2.857	2.900	2.943									
R3131N30EA/C	2.955	3.000	3.045									
R3131N31EA/C	3.054	3.100	3.146									
R3131N32EA/C	3.152	3.200	3.248									
R3131N33EA/C	3.251	3.300	3.349									
R3131N34EA/C	3.349	3.400	3.451									
R3131N35EA/C	3.448	3.500	3.552									
R3131N36EA/C	3.546	3.600	3.654					1.30			1.15	
R3131N37EA/C	3.645	3.700	3.755									
R3131N38EA/C	3.743	3.800	3.857									
R3131N39EA/C	3.842	3.900	3.958									
R3131N40EA/C	3.940	4.000	4.060									
R3131N41EA/C	4.039	4.100	4.161									
R3131N42EA/C	4.137	4.200	4.263									
R3131N43EA/C	4.236	4.300	4.364									
R3131N44EA/C	4.334	4.400	4.466									
R3131N45EA/C	4.433	4.500	4.567									
R3131N46EA/C	4.531	4.600	4.669									
R3131N47EA/C	4.630	4.700	4.770									
R3131N48EA/C	4.728	4.800	4.872									

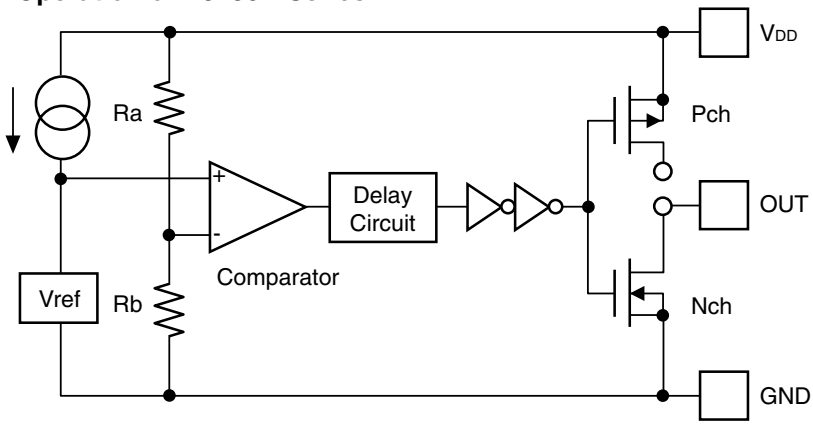
Topt=25°C

"H" Output Voltage			"L" Output Voltage			Minimum Operating Voltage		Output Delay Time			Detector Threshold Temperature Coefficient	
V_{OH} (V)			V_{OL} (V)			V_{DDL} (V)		Tdelay (ms)			$\Delta V_{DET}/\Delta Topt$ (ppm/°C)	
Condition	MIN.	TYP.	Condition	TYP.	MAX.	TYP.	MAX.	MIN.	TYP.	MAX.	Condition	TYP.
$V_{DD}=V_{DET}$ -0.1V I_{OH}= -150μA	0.80× V_{DD}	0.95× V_{DD}	$V_{DD}=V_{DET}$ +0.1V, I_{OL}=1.2mA	0.16	0.30	*2 0.90	*2 1.00	216	240	264	-40°C ≤ Topt ≤ 85°C	±100
$V_{DD}=V_{DET}$ -0.1V I_{OH}= -500μA	0.80× V_{DD}	0.93× V_{DD}										
$V_{DD}=V_{DET}$ -0.1V I_{OH}= -800μA	0.80× V_{DD}	0.95× V_{DD}	$V_{DD}=V_{DET}$ +0.1V, I_{OL}=3.2mA	0.18	0.40							

*2 CMOS Output Type; describes V_{DD} voltage when Output Voltage becomes equal or more than V_{DD}×0.8V
Nch Open Drain Output Type; describes V_{DD} voltage when Off-leakage Current becomes equal or less than 0.1μA.

OPERATION

- **Operation of R3130N Series**



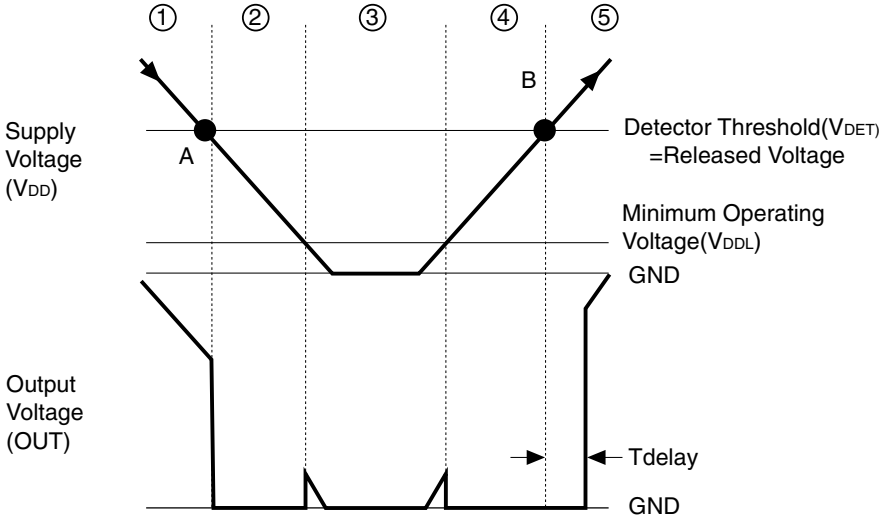
Block Diagram

- CMOS Output Type

  OUT pin is connected to the drain of Nch Tr. and Pch Tr. in this IC.

- Nch Open Drain Output Type

  OUT pin is connected to the drain of Nch Tr. in this IC. (OUT pin should be pulled up to V_{DD} or an external voltage level.)



Operating Diagram

In the above diagram,

① Output Voltage becomes equal to supply voltage (Nch Open Drain Output Type; equal to pull-up Voltage).

② When Supply Voltage is down to the detector threshold level (Point A), Vref ≥ V_{DD}× Rb/(Ra+Rb) is true. Then, Output of the comparator is reversed, thus output voltage becomes equal to GND level.

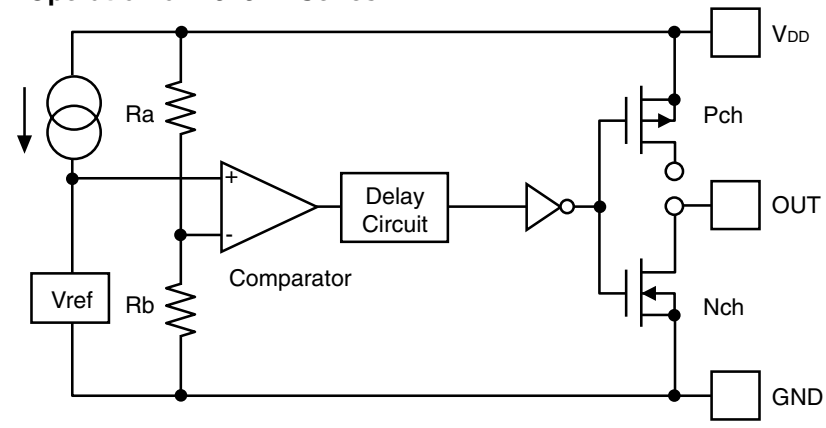
③ When Supply Voltage is lower than minimum operating voltage, Output of transistor is indefinite, therefore Output is also indefinite.

④ Output Voltage is equal to GND level.

⑤ When Supply voltage is higher than Released Voltage (Point B), Vref ≤ V_{DD}× Rb/(Ra+Rb) is true. Then Output of the comparator is reversed, thus Output Voltage becomes equal to Supply Voltage (Nch Open Drain Output Type; equal to pull-up voltage).

* There is no hysteresis range between Detector threshold and Released Voltage.

- **Operation of R3131N Series**



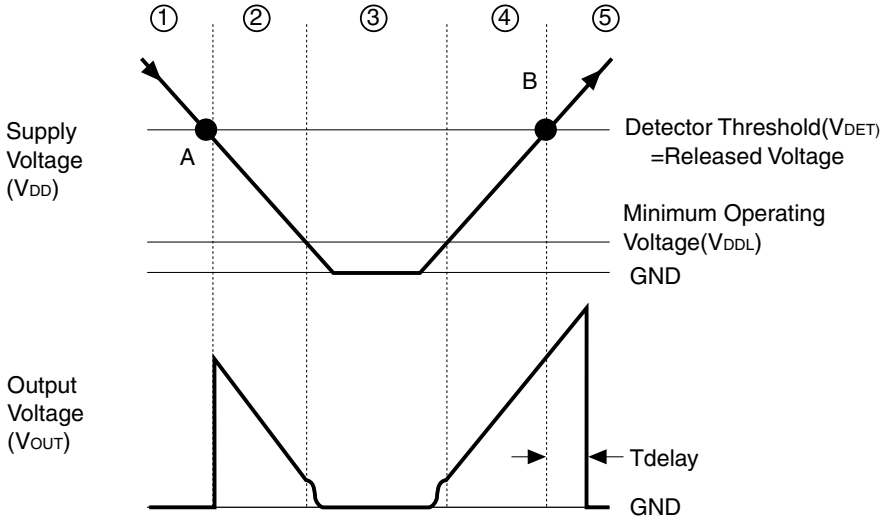
Block Diagram

- CMOS Output Type

  OUT pin is connected to the drain of Nch Tr. and Pch Tr. in this IC.

- Nch Open Drain Output Type: I

  OUT pin is connected to the drain of Nch Tr. in this IC. (OUT pin should be pulled up to V_{DD} or an external voltage level.)



Operation Diagram

In the above diagram,

① Output Voltage becomes equal to GND level.

② When Supply Voltage is down to the detector threshold level (Point A), Vref ≥V_{DD}× Rb/(Ra+Rb) is true. Then, Output of the comparator is reversed, thus output voltage becomes equal to Supply Voltage (Nch Open Drain Output type; equal to pull-up Voltage).

③ When Supply Voltage is lower than minimum operating voltage, Output of transistor is indefinite, therefore Output is also indefinite.(Nch Open Drain Output type; Output voltage level is equal to pull-up voltage.)

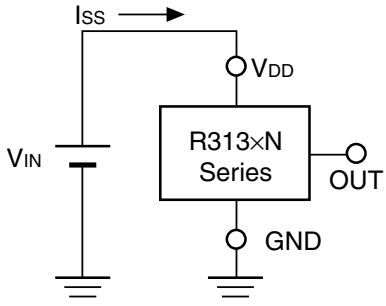
④ Output Voltage is equal to Supply Voltage. (Nch Open Drain Output type; equal to pull-up Voltage.)

⑤ When Supply voltage is higher than Released Voltage (Point B), Vref ≤ V_{DD}× Rb/(Ra+Rb) is true. Then Output of the comparator is reversed, thus Output Voltage becomes equal to GND level after the output delay time.

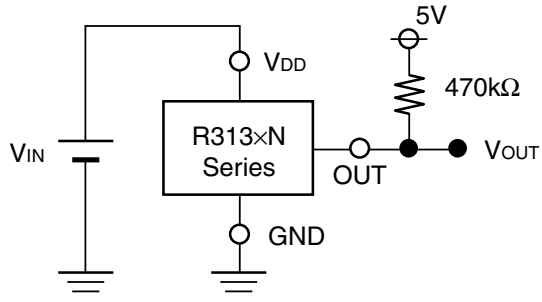
* There is no hysteresis range between Detector threshold and Released Voltage.

TEST CIRCUITS

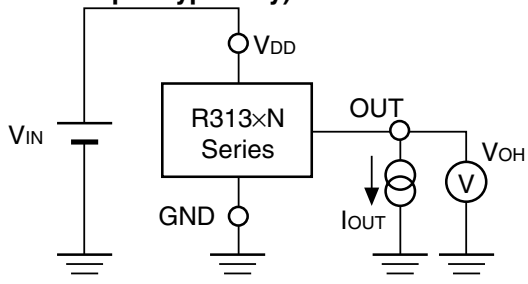
- **Test Circuit for Supply Current**



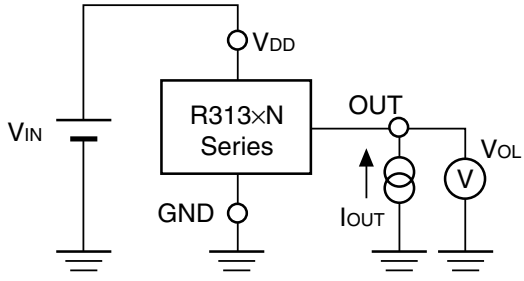
- **Test Circuit for Detector Threshold**
  (CMOS Output type; pull-up part is not necessary.)



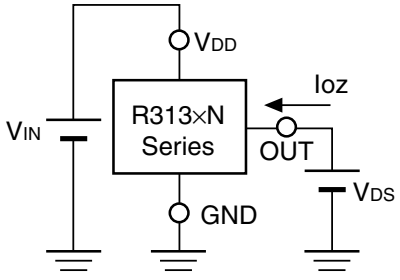
- **Test Circuit for "H" Output Voltage**
  (CMOS Output Type only)



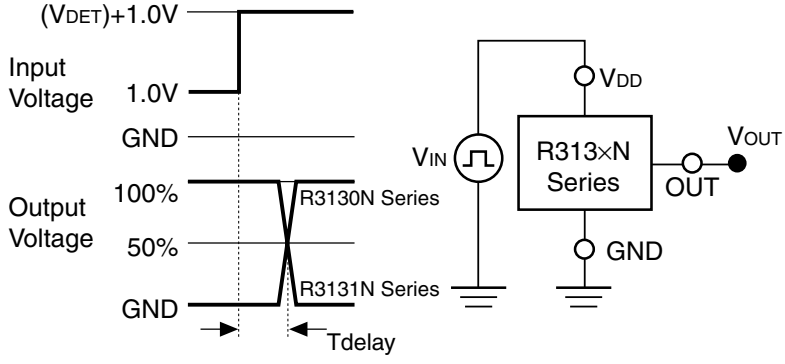
- **Test Circuit for "L" Output Voltage**



- **Test Circuit for Off Leakage Current**



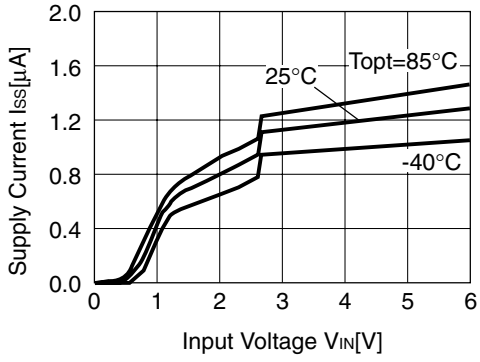
- **Test Circuit for Output Delay Time**
  (CMOS Output type; pull-up is not necessary.)



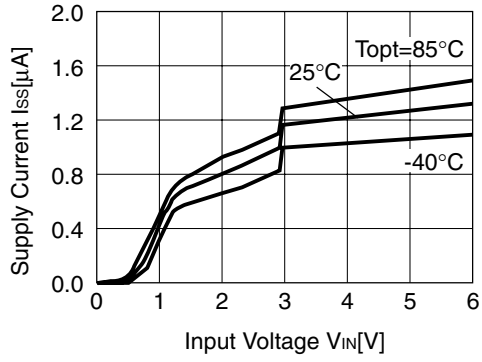
TYPICAL CHARACTERISTICS

1) Supply Current vs. Input Voltage

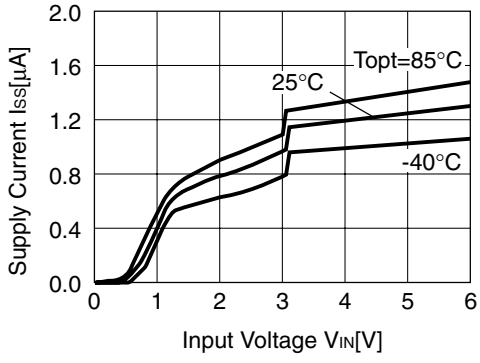
R3130N26××3
R3131N26××3



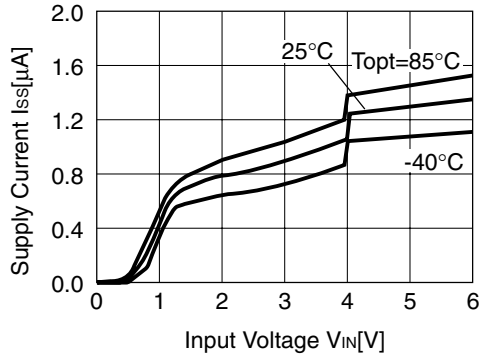
R3130N29××3
R3131N29××3



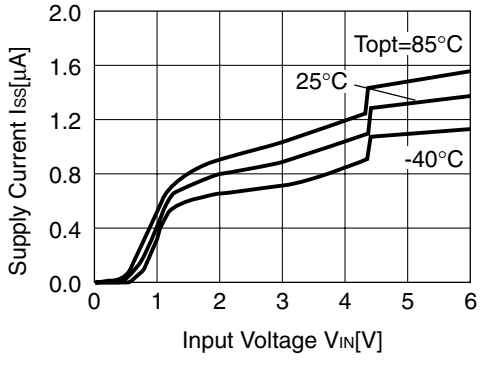
R3130N30××8
R3131N30××8



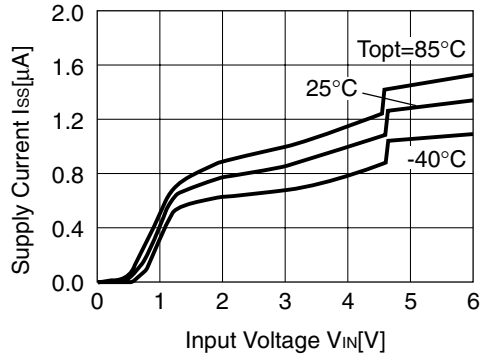
R3130N40××
R3131N40××



R3130N44××
R3131N44××



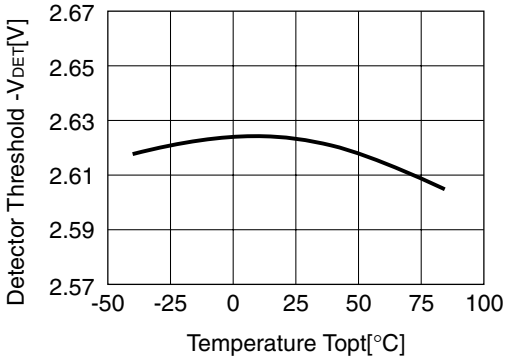
R3130N46××5
R3131N46××5



2) Detector Threshold vs. Temperature

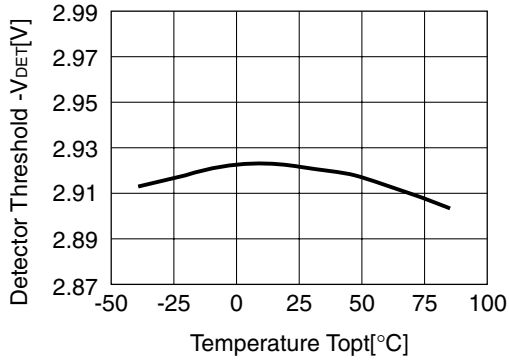
R3130N26××3

R3131N26××3



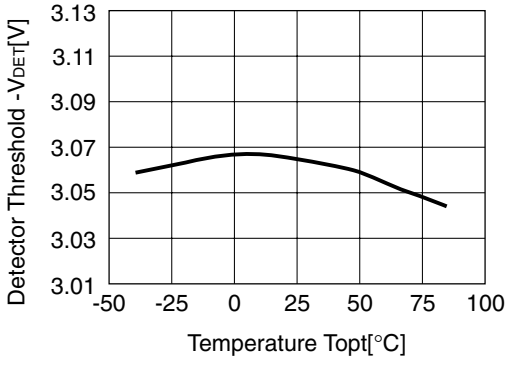
R3130N29××3

R3131N29××3



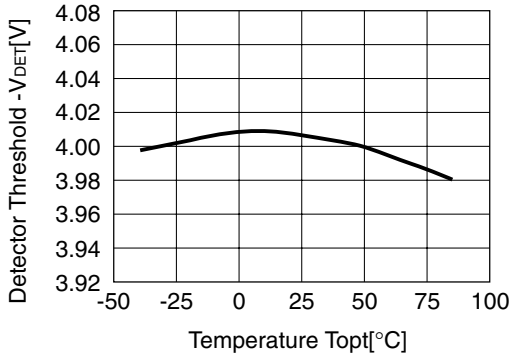
R3130N30××8

R3131N30××8



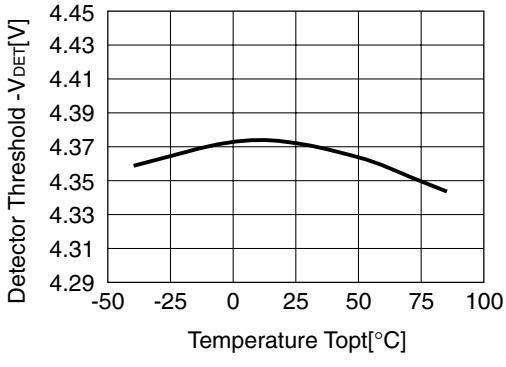
R3130N40××

R3131N40××



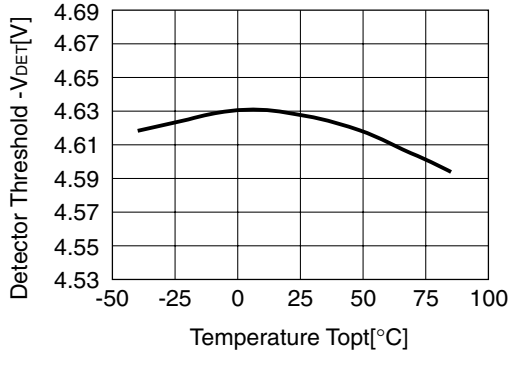
R3130N44××

R3131N44××



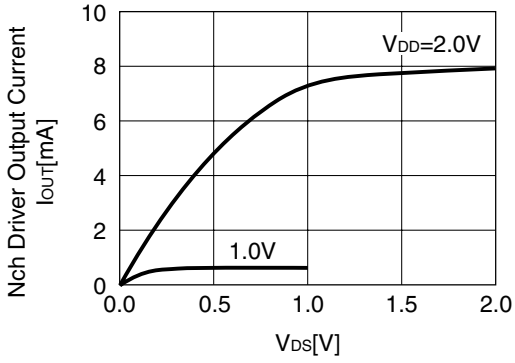
R3130N46××5

R3131N46××5

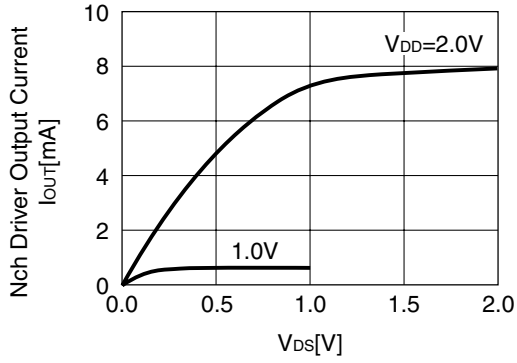


3) Nch Driver Output Current vs. V_{DS}

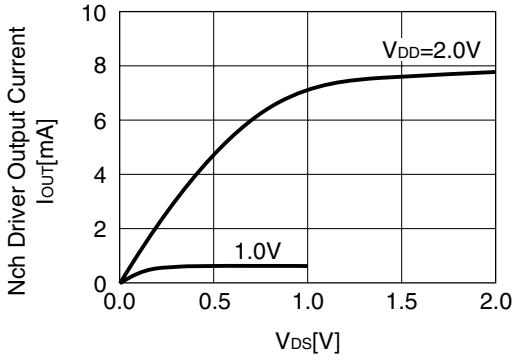
R3130N26××3



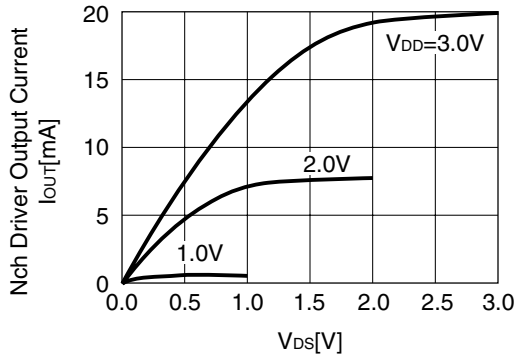
R3130N29××3



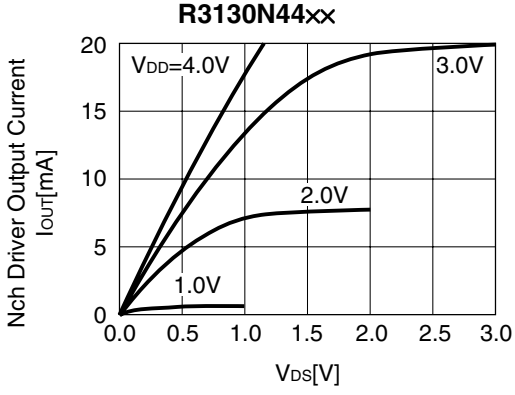
R3130N30××8



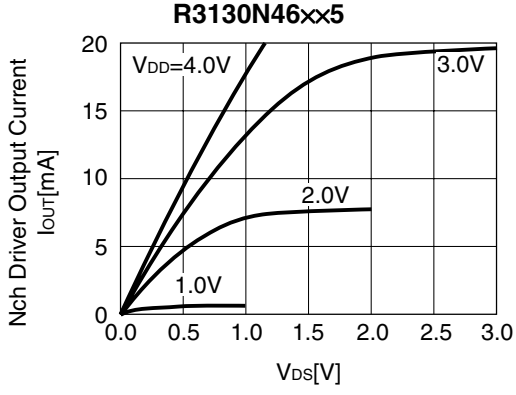
R3130N40××



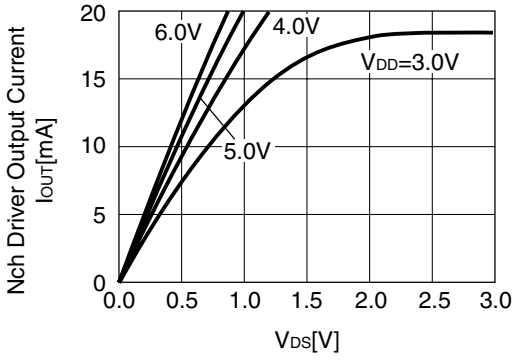
R3130N44××



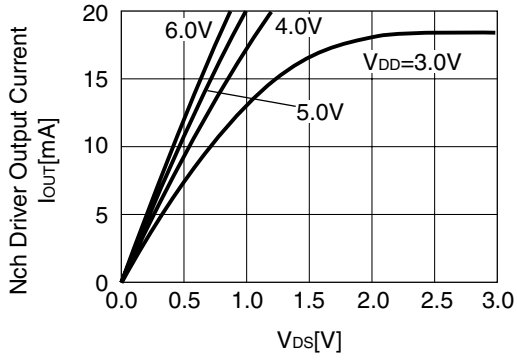
R3130N46××5



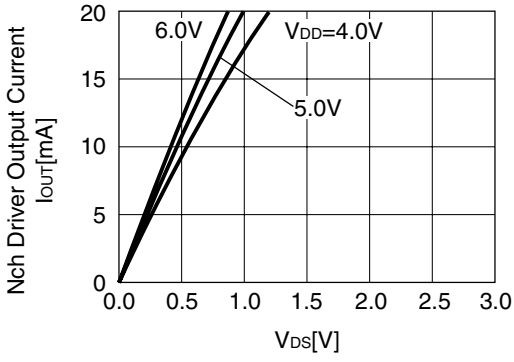
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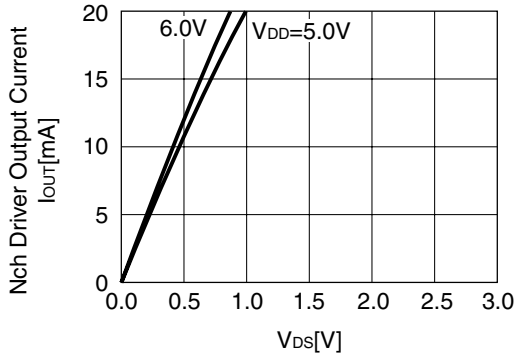
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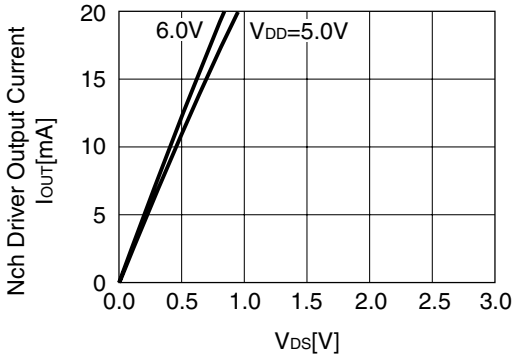
R3131N30××8



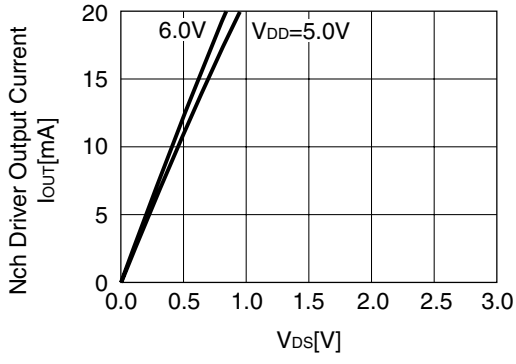
R3131N40××



R3131N44××

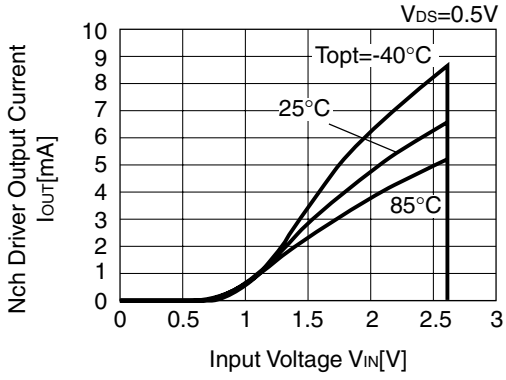


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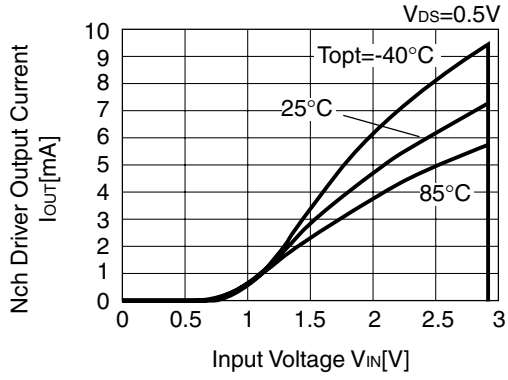


4) Nch Driver Output Current vs. Input Voltage

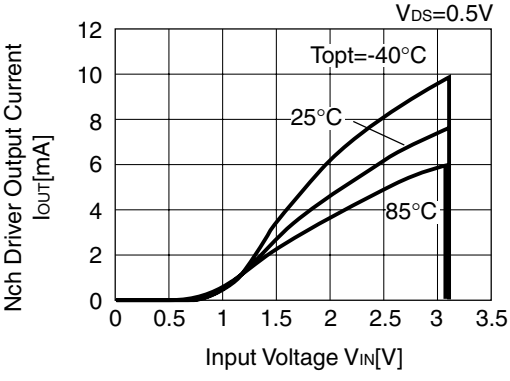
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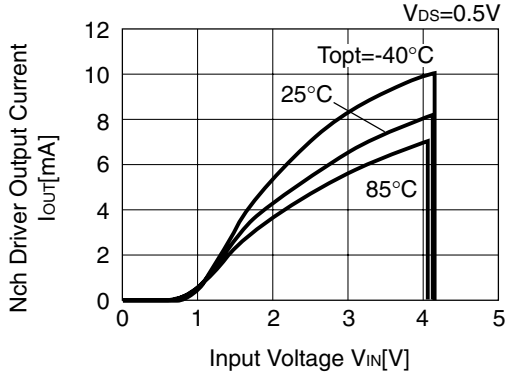
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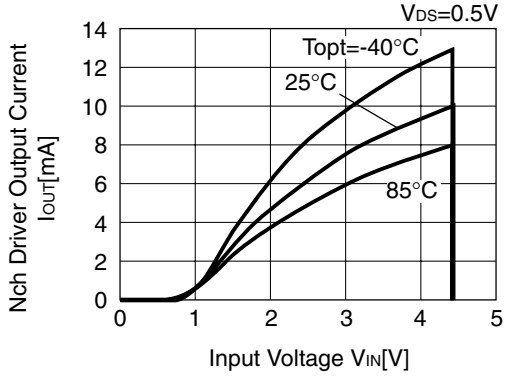
R3130N30××8



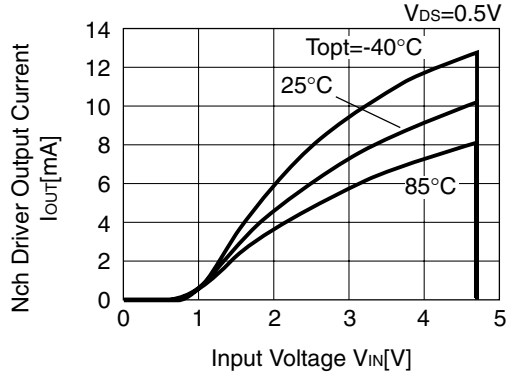
R3130N40××



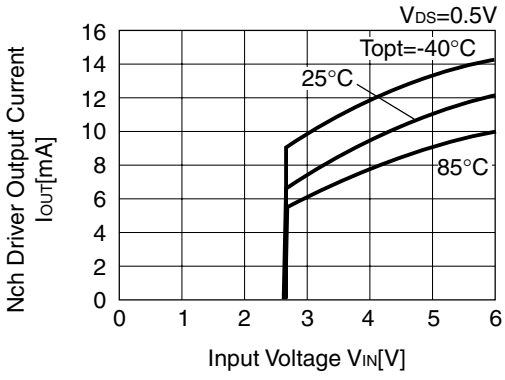
R3130N44××



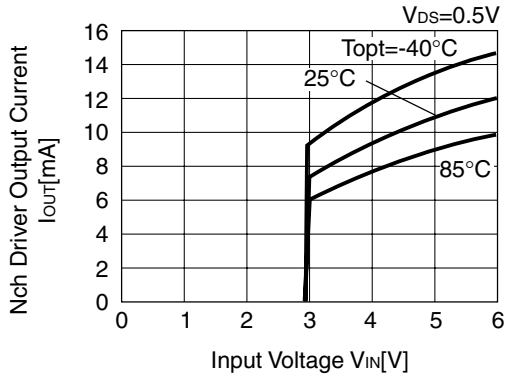
R3130N46××5



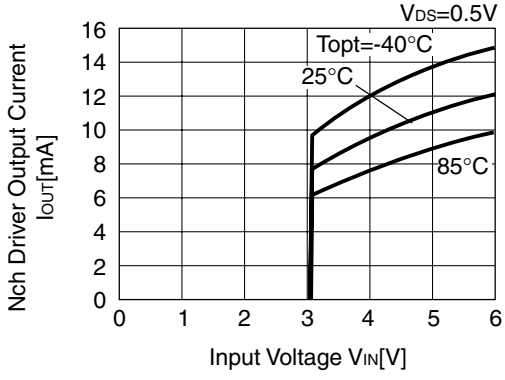
R3131N26xx3



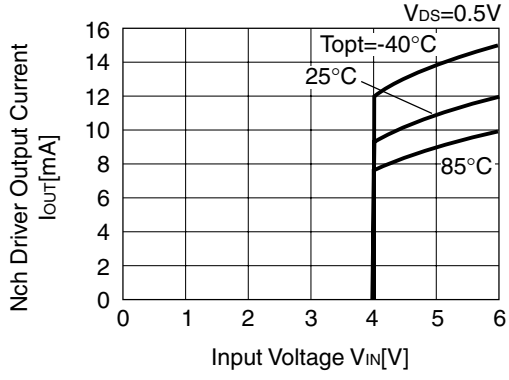
R3131N29xx3



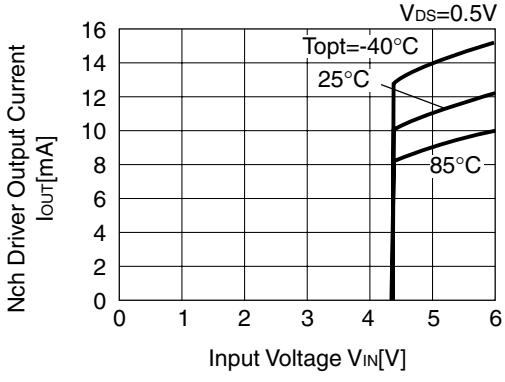
R3131N30xx8



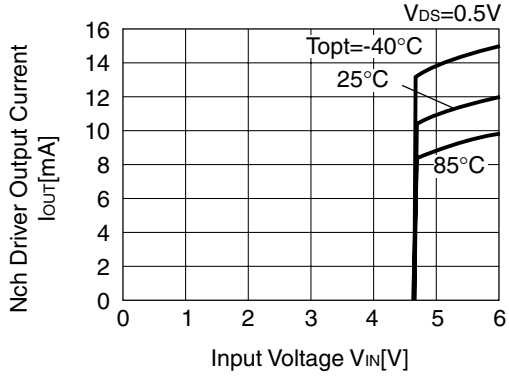
R3131N40xx



R3131N44xx

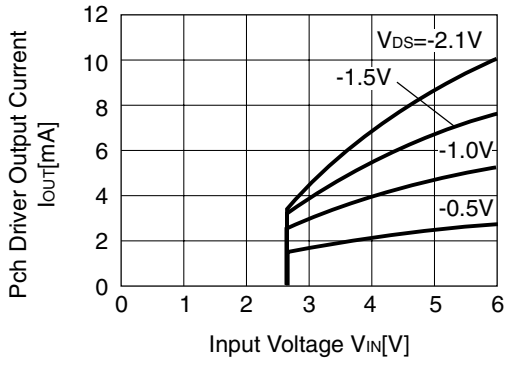


R3131N46xx5

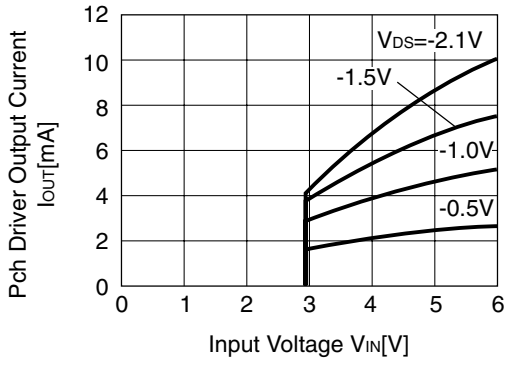


5) Pch Driver Output Current vs. Input Voltage

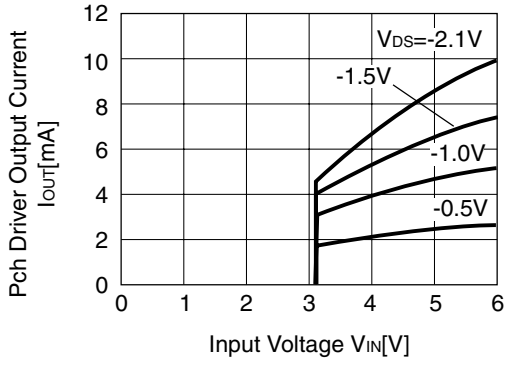
R3130N26××3



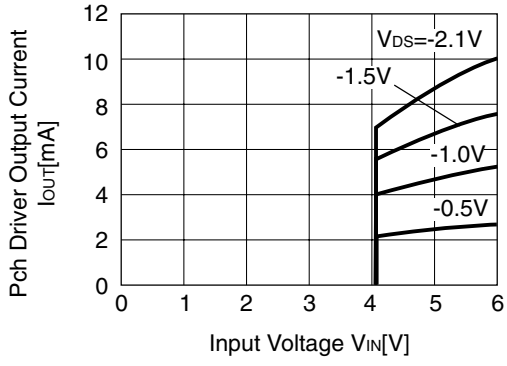
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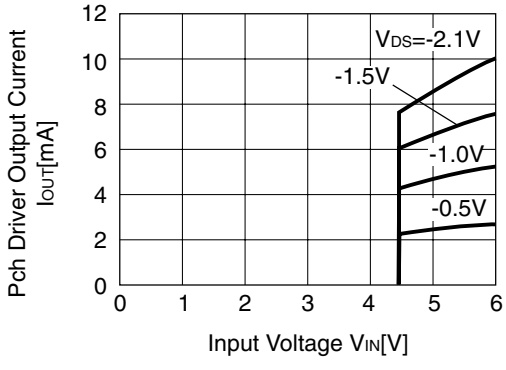
R3130N30××8



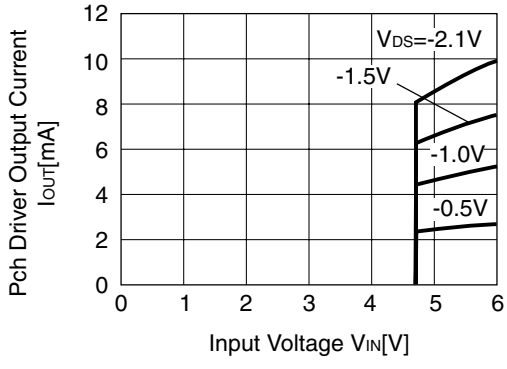
R3130N40××



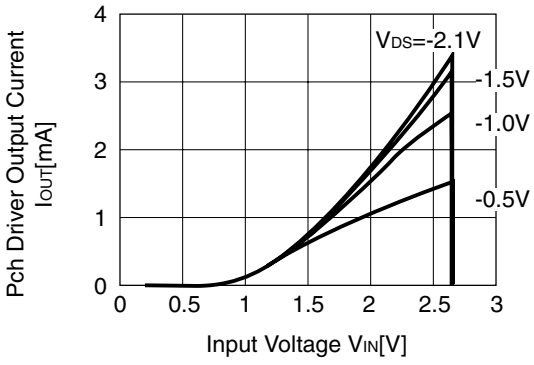
R3130N44××



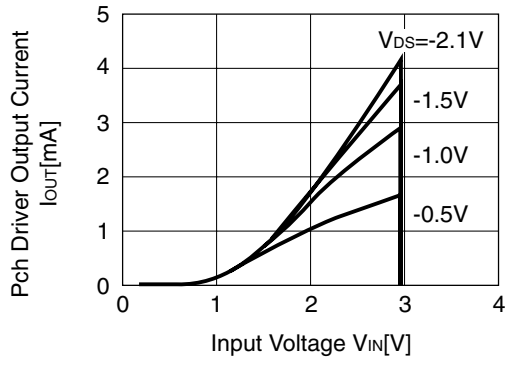
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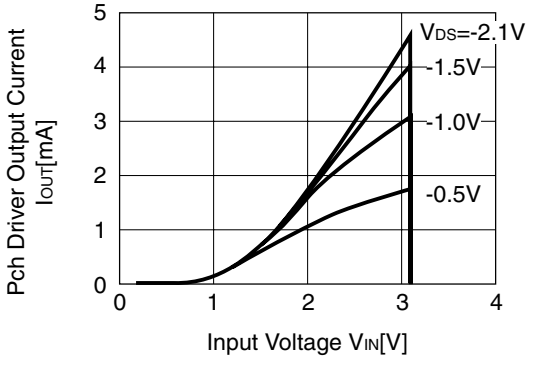
R3131N26××3



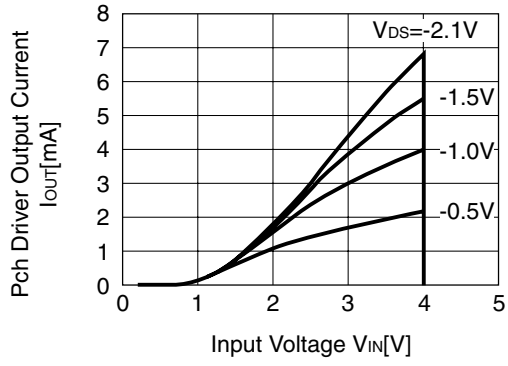
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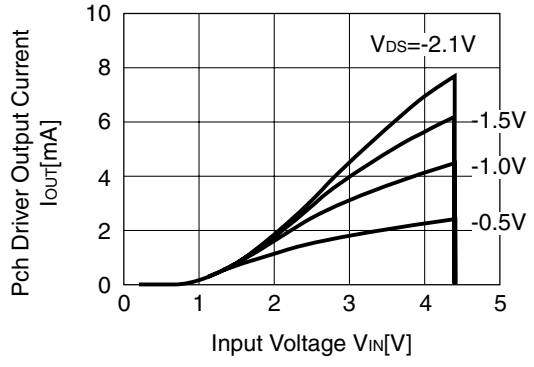
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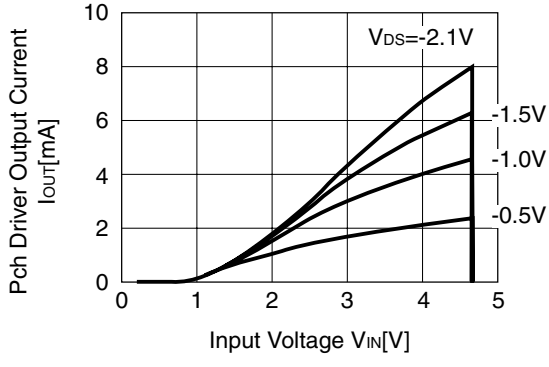
R3131N40××



R3131N44××

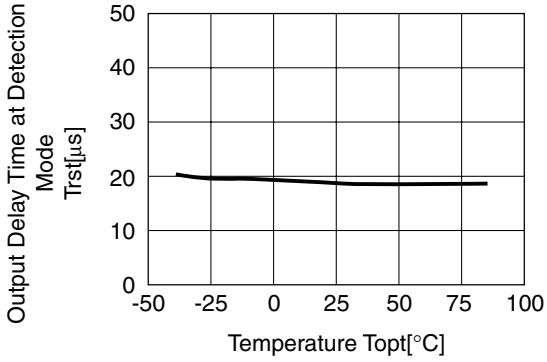


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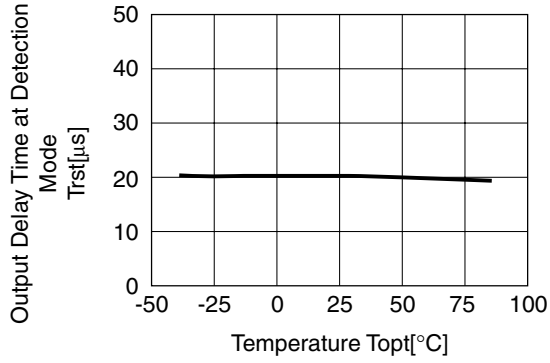


6) Output Delay Time at Detection Mode vs. Temperature

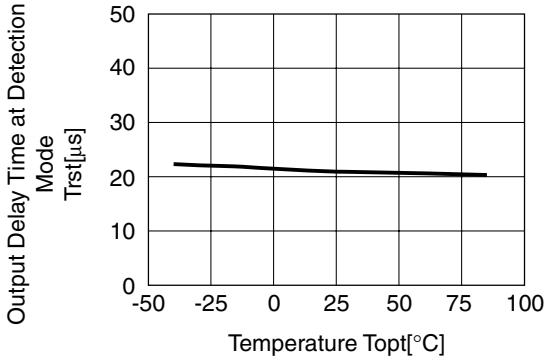
R3130N26××3
R3131N26××3



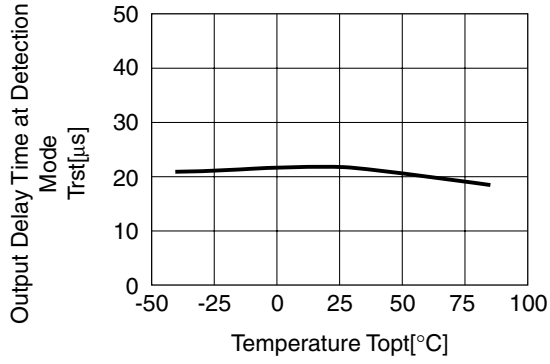
R3130N29××3
R3131N29××3



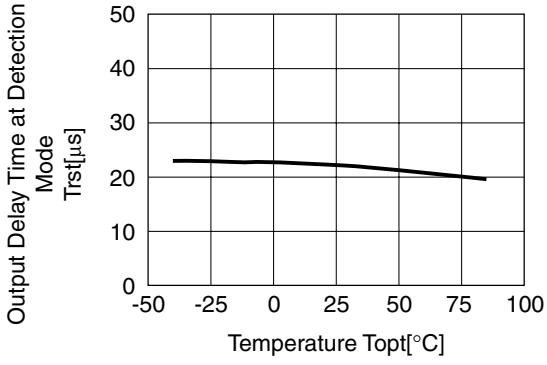
R3130N30××8
R3131N30××8



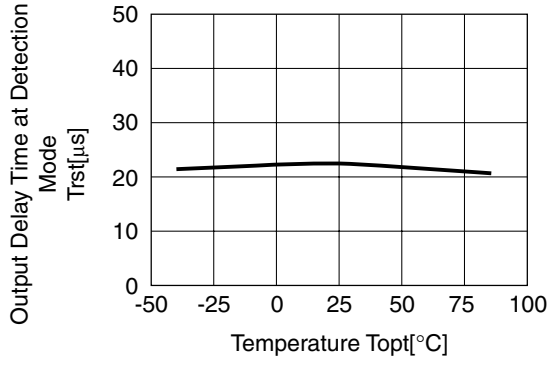
R3130N40××
R3131N40××



R3130N44××
R3131N44××



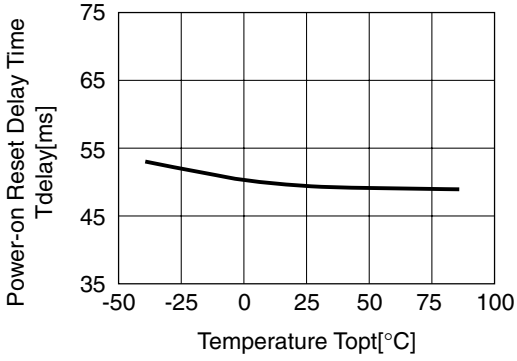
R3130N46××5
R3131N46××5



7) Power-on Reset Delay Time vs. Temperature

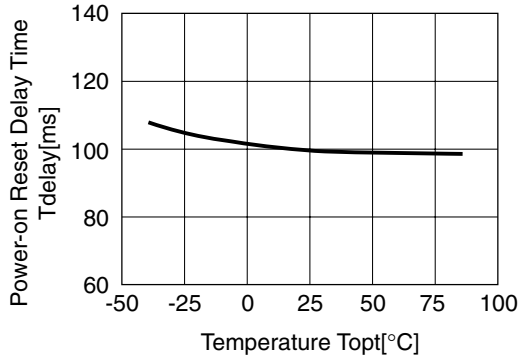
R3130Nxx Ax

R3131Nxx Ax



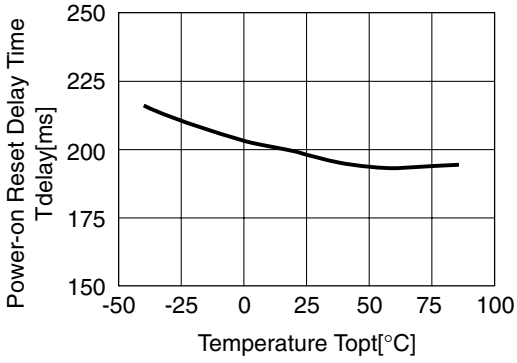
R3130Nxx Bx

R3131Nxx Bx



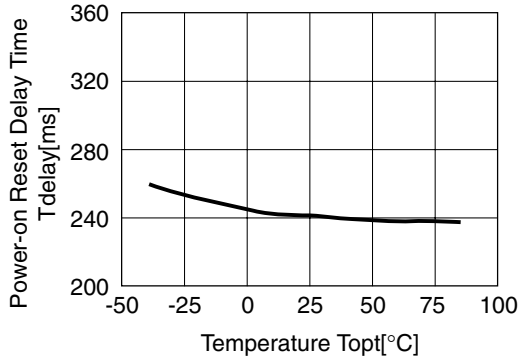
R3130Nxx Dx

R3131Nxx Dx



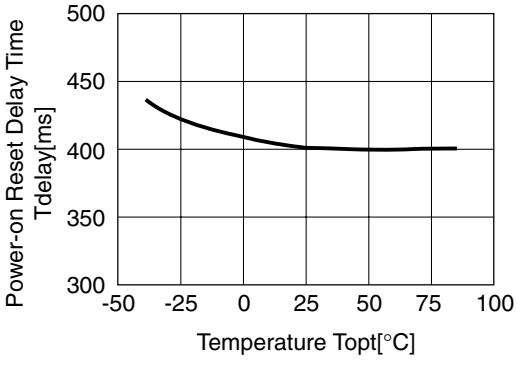
R3130Nxx Ex

R3131Nxx Ex



R3130Nxx Hx

R3131Nxx Hx



TECHNICAL NOTES

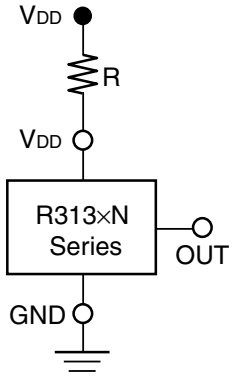


Figure A

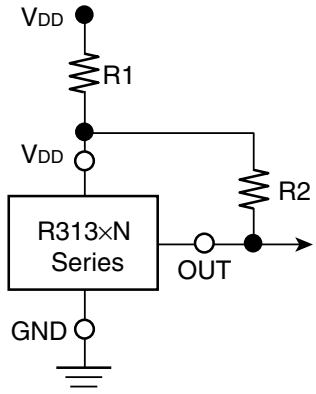
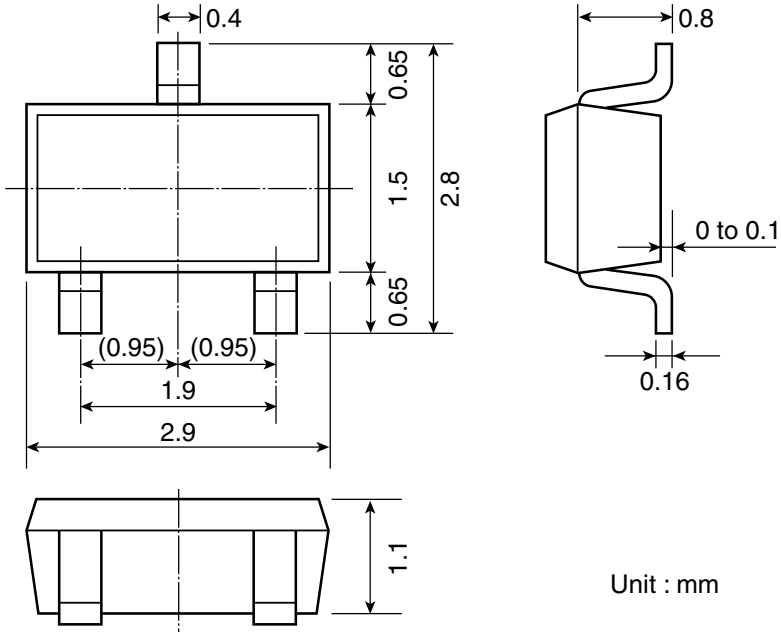


Figure B

As shown wiring in Figure A and Figure B may cause unstable operation by through-type current at detection of all types of R313×N Series. And Detector Threshold may shift because of voltage drop by consumption current of this IC itself.

PACKAGE DIMENSIONS



Unit : mm

OCEAN CHIPS
Океан Электроники
Поставка электронных компонентов

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «**JONHON**», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «**FORSTAR**».

AVIC JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

FORSTAR®

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