

# NCP304, NCP305

## Voltage Detector Series

The NCP304 and NCP305 series are second generation ultra-low current voltage detectors. These devices are specifically designed for use as reset controllers in portable microprocessor based systems where extended battery life is paramount.

Each series features a highly accurate undervoltage detector with hysteresis which prevents erratic system reset operation as the comparator threshold is crossed.

The NCP304 series consists of complementary output devices that are available with either an active high or active low reset output. The NCP305 series has an open drain N-Channel output with an active low reset output.

The NCP304 and NCP305 device series are available in the SC-82AB package with standard undervoltage thresholds. Additional thresholds that range from 0.9 V to 4.9 V in 100 mV steps can be manufactured.

### Features

- Quiescent Current of 1.0  $\mu$ A Typical
- High Accuracy Undervoltage Threshold of 2.0%
- Wide Operating Voltage Range of 0.8 V to 10 V
- Complementary or Open Drain Reset Output
- Active Low or Active High Reset Output
- Pb-Free Packages are Available\*

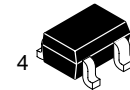
### Typical Applications

- Microprocessor Reset Controller
- Low Battery Detection
- Power Fail Indicator
- Battery Backup Detection



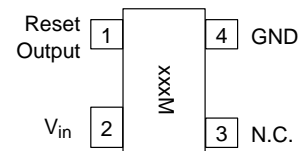
**ON Semiconductor®**

<http://onsemi.com>



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**SC-82AB**  
**SQ SUFFIX**  
**CASE 419C**

### PIN CONNECTIONS AND MARKING DIAGRAM



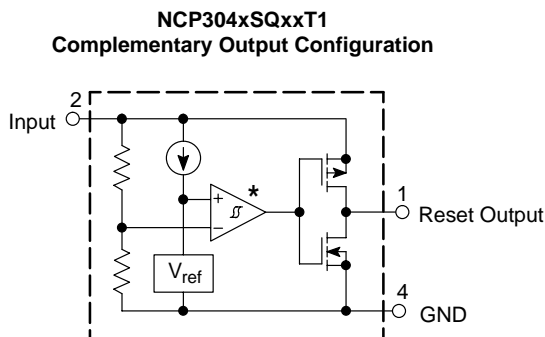
(Top View)

xxx = Specific Device Code  
M = Date Code

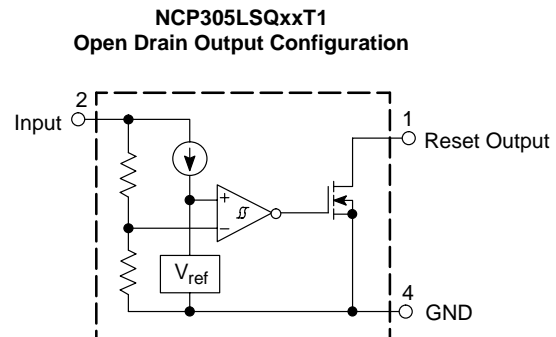
### ORDERING INFORMATION

See detailed ordering and shipping information in the ordering information section on page 19 of this data sheet.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



This device contains 38 active transistors.



This device contains 37 active transistors.

\* The representative block diagram depicts active low reset output 'L' suffix devices. The comparator input is interchanged for the active high output 'H' suffix devices.

**Figure 1. Representative Block Diagrams**

# NCP304, NCP305

## MAXIMUM RATINGS (Note 1)

Rating	Symbol	Value	Unit
Input Power Supply Voltage (Pin 2)	$V_{in}$	12	V
Output Voltage (Pin 1) Complementary, NCP304 N-Channel Open Drain, NCP305	$V_{OUT}$	-0.3 to $V_{in}+0.3$ -0.3 to 12	V
Output Current (Pin 1) (Note 2)	$I_{OUT}$	70	mA
Thermal Resistance Junction to Air	$R_{\theta JA}$	285	°C/W
Operating Junction Temperature Range	$T_J$	-40 to +125	°C
Storage Temperature Range	$T_{stg}$	-55 to +150	°C
Latch-up Performance Positive Negative	$I_{LATCH-UP}$	500 170	mA

- This device series contains ESD protection and exceeds the following tests:  
Human Body Model 2000 V per MIL-STD-883, Method 3015.  
Machine Model Method 200 V.
- The maximum package power dissipation limit must not be exceeded.

$$P_D = \frac{T_{J(max)} - T_A}{R_{\theta JA}}$$

## ELECTRICAL CHARACTERISTICS (For all values $T_A = 25^\circ\text{C}$ , unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>NCP304/5 - 0.9</b>					
Detector Threshold (Pin 2, $V_{in}$ Decreasing)	$V_{DET-}$	0.882	0.900	0.918	V
Detector Threshold Hysteresis (Pin 2, $V_{in}$ Increasing)	$V_{HYS}$	0.027	0.045	0.063	V
Supply Current (Pin 2) ( $V_{in} = 0.8\text{ V}$ ) ( $V_{in} = 2.9\text{ V}$ )	$I_{in}$	- -	0.8 -	2.4 3.0	$\mu\text{A}$
Maximum Operating Voltage (Pin 2)	$V_{in(max)}$	-	-	10	V
Minimum Operating Voltage (Pin 2) ( $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ )	$V_{in(min)}$	- -	0.55 0.65	0.70 0.80	V
Reset Output Current (Pin 1, Active Low 'L' Suffix Devices)  Nch Sink Current, NCP304, NCP305 ( $V_{OUT} = 0.05\text{V}$ , $V_{in} = 0.70\text{V}$ ) ( $V_{OUT} = 0.50\text{V}$ , $V_{in} = 0.85\text{V}$ )  Pch Source Current, NCP304 ( $V_{OUT} = 2.4\text{V}$ , $V_{in} = 4.5\text{V}$ )	$I_{OUT}$	0.01 0.05  1.0	0.05 0.50  2.0	- -  -	mA
Reset Output Current (Pin 1, Active High 'H' Suffix Devices)  Nch Sink Current, NCP304, NCP305 ( $V_{OUT} = 0.5\text{ V}$ , $V_{in} = 1.5\text{ V}$ )  Pch Source Current, NCP304 ( $V_{OUT} = 0.4\text{ V}$ , $V_{in} = 0.7\text{ V}$ ) ( $V_{OUT} = \text{GND}$ , $V_{in} = 0.8\text{ V}$ )	$I_{OUT}$	1.05  0.011 0.014	2.5  0.04 0.08	-  - -	mA
Propagation Delay Input to Output (Figure 2)  Complementary Output NCP304 Series Output Transition, High to Low (Note 3) Output Transition, Low to High (Note 3)	$t_{pHL}$ $t_{pLH}$	- -	18 6.0	- 60	$\mu\text{s}$

- In the case of CMOS Output Type: The time interval between the rising edge of  $V_{DD}$  input pulse from 0.7 V to  $(+V_{DET}) + 2.0\text{ V}$  and output voltage level becoming to  $V_{DD}/2$ . In the case of NCH Open Drain Output Type: Output pin is pulled up with a resistance of 470 k $\Omega$  to 5.0 V, the time interval between the rising edge of  $V_{DD}$  input pulse from 0.7 V to  $(+V_{DET}) + 2.0\text{ V}$  and output voltage level becoming to 2.5.

# NCP304, NCP305

**ELECTRICAL CHARACTERISTICS (continued)** (For all values  $T_A = 25^\circ\text{C}$ , unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>NCP304/5 – 0.9</b>					
N-Channel Open Drain NCP305 Series Output Transition, High to Low (Note 3)	$t_{pHL}$	–	18	–	
Output Transition, Low to High (Note 3)	$t_{pLH}$	–	–	100	
<b>NCP304/5 – 1.8</b>					
Detector Threshold (Pin 2, $V_{in}$ Decreasing)	$V_{DET-}$	1.764	1.80	1.836	V
Detector Threshold Hysteresis (Pin 2, $V_{in}$ Increasing)	$V_{HYS}$	0.054	0.090	0.126	V
Supply Current (Pin 2) ( $V_{in} = 1.7\text{ V}$ ) ( $V_{in} = 3.8\text{ V}$ )	$I_{in}$	– –	0.8 1.0	2.4 3.0	$\mu\text{A}$
Maximum Operating Voltage (Pin 2)	$V_{in(max)}$	–	–	10	V
Minimum Operating Voltage (Pin 2) ( $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ )	$V_{in(min)}$	– –	0.55 0.65	0.70 0.80	V
Reset Output Current (Pin 1, Active Low 'L' Suffix Devices)  Nch Sink Current, NCP304, NCP305 ( $V_{OUT} = 0.05\text{V}$ , $V_{in} = 0.70\text{V}$ ) ( $V_{OUT} = 0.50\text{V}$ , $V_{in} = 1.5\text{V}$ )  Pch Source Current, NCP304 ( $V_{OUT} = 2.4\text{V}$ , $V_{in} = 4.5\text{V}$ )	$I_{OUT}$	 0.01 1.0  1.0	 0.05 2.0  2.0	 – –  –	 mA
Reset Output Current (Pin 1, Active High 'H' Suffix Devices)  Nch Sink Current, NCP304, NCP305 ( $V_{OUT} = 0.5\text{ V}$ , $V_{in} = 5.0\text{ V}$ )  Pch Source Current, NCP304 ( $V_{OUT} = 0.4\text{ V}$ , $V_{in} = 0.7\text{ V}$ ) ( $V_{OUT} = \text{GND}$ , $V_{in} = 1.5\text{ V}$ )	$I_{OUT}$	 6.3  0.011 0.525	 11  0.04 0.6	 –  – –	 mA
Propagation Delay Input to Output (Figure 2)  Complementary Output NCP304 Series Output Transition, High to Low (Note 3) Output Transition, Low to High (Note 3)  N-Channel Open Drain NCP305 Series Output Transition, High to Low (Note 3) Output Transition, Low to High (Note 3)	$t_{pHL}$ $t_{pLH}$  $t_{pHL}$ $t_{pLH}$	 – –  – –	 14 15  14 –	 – 60  – 100	 $\mu\text{s}$
<b>NCP304/5 – 2.0</b>					
Detector Threshold (Pin 2, $V_{in}$ Decreasing)	$V_{DET-}$	1.960	2.00	2.040	V
Detector Threshold Hysteresis (Pin 2, $V_{in}$ Increasing)	$V_{HYS}$	0.06	0.10	0.14	V
Supply Current (Pin 2) ( $V_{in} = 1.9\text{ V}$ ) ( $V_{in} = 4.0\text{ V}$ )	$I_{in}$	– –	0.9 1.1	2.7 3.3	$\mu\text{A}$
Maximum Operating Voltage (Pin 2)	$V_{in(max)}$	–	–	10	V
Minimum Operating Voltage (Pin 2) ( $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ )	$V_{in(min)}$	– –	0.55 0.65	0.70 0.80	V
Reset Output Current (Pin 1, Active Low 'L' Suffix Devices)  Nch Sink Current, NCP304, NCP305 ( $V_{OUT} = 0.05\text{V}$ , $V_{in} = 0.70\text{V}$ ) ( $V_{OUT} = 0.50\text{V}$ , $V_{in} = 1.5\text{V}$ )  Pch Source Current, NCP304 ( $V_{OUT} = 2.4\text{V}$ , $V_{in} = 4.5\text{V}$ )	$I_{OUT}$	 0.01 1.0  1.0	 0.05 2.0  2.0	 – –  –	 mA

3. In the case of CMOS Output Type: The time interval between the rising edge of  $V_{DD}$  input pulse from 0.7 V to  $(+V_{DET}) + 2.0\text{ V}$  and output voltage level becoming to  $V_{DD}/2$ . In the case of  $N_{CH}$  Open Drain Output Type: Output pin is pulled up with a resistance of 470 k $\Omega$  to 5.0 V, the time interval between the rising edge of  $V_{DD}$  input pulse from 0.7 V to  $(+V_{DET}) + 2.0\text{ V}$  and output voltage level becoming to 2.5.

# NCP304, NCP305

**ELECTRICAL CHARACTERISTICS (continued)** (For all values  $T_A = 25^\circ\text{C}$ , unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>NCP304/5 – 2.0</b>					
Reset Output Current (Pin 1, Active High 'H' Suffix Devices)	$I_{OUT}$				mA
Nch Sink Current, NCP304, NCP305 ( $V_{OUT} = 0.5\text{ V}$ , $V_{in} = 5.0\text{ V}$ )		6.3	11	–	
Pch Source Current, NCP304 ( $V_{OUT} = 0.4\text{ V}$ , $V_{in} = 0.7\text{ V}$ ) ( $V_{OUT} = \text{GND}$ , $V_{in} = 1.5\text{ V}$ )		0.011 0.525	0.04 0.6	– –	
Propagation Delay Input to Output (Figure 2)					$\mu\text{s}$
Complementary Output NCP304 Series Output Transition, High to Low (Note 3) Output Transition, Low to High (Note 3)	$t_{pHL}$ $t_{pLH}$	– –	13 15	– 60	
N-Channel Open Drain NCP305 Series Output Transition, High to Low (Note 3) Output Transition, Low to High (Note 3)	$t_{pHL}$ $t_{pLH}$	– –	13 –	– 100	

## NCP304/5 – 2.7

Detector Threshold (Pin 2, $V_{in}$ Decreasing)	$V_{DET-}$	2.646	2.700	2.754	V
Detector Threshold Hysteresis (Pin 2, $V_{in}$ Increasing)	$V_{HYS}$	0.081	0.135	0.189	V
Supply Current (Pin 2) ( $V_{in} = 2.6\text{ V}$ ) ( $V_{in} = 4.7\text{ V}$ )	$I_{in}$	– –	0.9 1.1	2.7 3.3	$\mu\text{A}$
Maximum Operating Voltage (Pin 2)	$V_{in(max)}$	–	–	10	V
Minimum Operating Voltage (Pin 2) ( $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ )	$V_{in(min)}$	– –	0.55 0.65	0.70 0.80	V
Reset Output Current (Pin 1, Active Low 'L' Suffix Devices)	$I_{OUT}$				mA
Nch Sink Current, NCP304, NCP305 ( $V_{OUT} = 0.05\text{ V}$ , $V_{in} = 0.70\text{ V}$ ) ( $V_{OUT} = 0.50\text{ V}$ , $V_{in} = 1.5\text{ V}$ )		0.01 1.0	0.05 2.0	– –	
Pch Source Current, NCP304 ( $V_{OUT} = 2.4\text{ V}$ , $V_{in} = 4.5\text{ V}$ )		1.0	2.0	–	
Reset Output Current (Pin 1, Active High 'H' Suffix Devices)	$I_{OUT}$				mA
Nch Sink Current, NCP304, NCP305 ( $V_{OUT} = 0.5\text{ V}$ , $V_{in} = 5.0\text{ V}$ )		6.3	11	–	
Pch Source Current, NCP304 ( $V_{OUT} = 0.4\text{ V}$ , $V_{in} = 0.7\text{ V}$ ) ( $V_{OUT} = \text{GND}$ , $V_{in} = 1.5\text{ V}$ )		0.011 0.525	0.04 0.6	– –	
Propagation Delay Input to Output (Figure 2)					$\mu\text{s}$
Complementary Output NCP304 Series Output Transition, High to Low (Note 3) Output Transition, Low to High (Note 3)	$t_{pHL}$ $t_{pLH}$	– –	12 19	– 60	
N-Channel Open Drain NCP305 Series Output Transition, High to Low (Note 3) Output Transition, Low to High (Note 3)	$t_{pHL}$ $t_{pLH}$	– –	12 –	– 100	

## NCP304/5 – 3.0

Detector Threshold (Pin 2, $V_{in}$ Decreasing)	$V_{DET-}$	2.94	3.00	3.06	V
Detector Threshold Hysteresis (Pin 2, $V_{in}$ Increasing)	$V_{HYS}$	0.09	0.15	0.21	V

3. In the case of CMOS Output Type: The time interval between the rising edge of  $V_{DD}$  input pulse from 0.7 V to  $(+V_{DET}) + 2.0\text{ V}$  and output voltage level becoming to  $V_{DD}/2$ . In the case of  $N_{CH}$  Open Drain Output Type: Output pin is pulled up with a resistance of 470 k $\Omega$  to 5.0 V, the time interval between the rising edge of  $V_{DD}$  input pulse from 0.7 V to  $(+V_{DET}) + 2.0\text{ V}$  and output voltage level becoming to 2.5.

# NCP304, NCP305

## ELECTRICAL CHARACTERISTICS (continued) (For all values $T_A = 25^\circ\text{C}$ , unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>NCP304/5 – 3.0</b>					
Supply Current (Pin 2) ( $V_{in} = 2.87\text{ V}$ ) ( $V_{in} = 5.0\text{ V}$ )	$I_{in}$	– –	1.0 1.2	3.0 3.6	$\mu\text{A}$
Maximum Operating Voltage (Pin 2)	$V_{in(max)}$	–	–	10	V
Minimum Operating Voltage (Pin 2) ( $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ )	$V_{in(min)}$	– –	0.55 0.65	0.70 0.80	V
Reset Output Current (Pin 1, Active Low 'L' Suffix Devices)  Nch Sink Current, NCP304, NCP305 ( $V_{OUT} = 0.05\text{V}$ , $V_{in} = 0.70\text{V}$ ) ( $V_{OUT} = 0.50\text{V}$ , $V_{in} = 1.5\text{V}$ )  Pch Source Current, NCP304 ( $V_{OUT} = 2.4\text{V}$ , $V_{in} = 4.5\text{V}$ )	$I_{OUT}$	0.01 1.0 1.0	0.05 2.0 2.0	– – –	mA
Reset Output Current (Pin 1, Active High 'H' Suffix Devices)  Nch Sink Current, NCP304, NCP305 ( $V_{OUT} = 0.5\text{ V}$ , $V_{in} = 5.0\text{ V}$ )  Pch Source Current, NCP304 ( $V_{OUT} = 0.4\text{ V}$ , $V_{in} = 0.7\text{ V}$ ) ( $V_{OUT} = \text{GND}$ , $V_{in} = 1.5\text{ V}$ )	$I_{OUT}$	6.3 0.011 0.525	11 0.04 0.6	– – –	mA
Propagation Delay Input to Output (Figure 2)  Complementary Output NCP304 Series Output Transition, High to Low (Note 3) Output Transition, Low to High (Note 3)  N-Channel Open Drain NCP305 Series Output Transition, High to Low (Note 3) Output Transition, Low to High (Note 3)	$t_{pHL}$ $t_{pLH}$  $t_{pHL}$ $t_{pLH}$	– – – –	12 19 12 –	– 60 – 100	$\mu\text{s}$

### NCP304/5 – 4.5

Detector Threshold (Pin 2, $V_{in}$ Decreasing)	$V_{DET-}$	4.410	4.500	4.590	V
Detector Threshold Hysteresis (Pin 2, $V_{in}$ Increasing)	$V_{HYS}$	0.135	0.225	0.315	V
Supply Current (Pin 2) ( $V_{in} = 4.34\text{ V}$ ) ( $V_{in} = 6.5\text{ V}$ )	$I_{in}$	– –	– –	3.0 3.9	$\mu\text{A}$
Maximum Operating Voltage (Pin 2)	$V_{in(max)}$	–	–	10	V
Minimum Operating Voltage (Pin 2) ( $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ )	$V_{in(min)}$	– –	0.55 0.65	0.70 0.80	V
Reset Output Current (Pin 1, Active Low 'L' Suffix Devices)  Nch Sink Current, NCP304, NCP305 ( $V_{OUT} = 0.05\text{V}$ , $V_{in} = 0.70\text{V}$ ) ( $V_{OUT} = 0.50\text{V}$ , $V_{in} = 1.5\text{V}$ )  Pch Source Current, NCP304 ( $V_{OUT} = 5.9\text{V}$ , $V_{in} = 8.0\text{V}$ )	$I_{OUT}$	0.01 1.0 1.5	0.05 2.0 3.0	– – –	mA
Reset Output Current (Pin 1, Active High 'H' Suffix Devices)  Nch Sink Current, NCP304, NCP305 ( $V_{OUT} = 0.5\text{ V}$ , $V_{in} = 5.0\text{ V}$ )  Pch Source Current, NCP304 ( $V_{OUT} = 0.4\text{ V}$ , $V_{in} = 0.7\text{ V}$ ) ( $V_{OUT} = \text{GND}$ , $V_{in} = 1.5\text{ V}$ )	$I_{OUT}$	6.3 0.011 0.525	11 0.04 0.6	– – –	mA

3. In the case of CMOS Output Type: The time interval between the rising edge of  $V_{DD}$  input pulse from 0.7 V to  $(+V_{DET}) + 2.0\text{ V}$  and output voltage level becoming to  $V_{DD}/2$ . In the case of  $N_{CH}$  Open Drain Output Type: Output pin is pulled up with a resistance of 470 k $\Omega$  to 5.0 V, the time interval between the rising edge of  $V_{DD}$  input pulse from 0.7 V to  $(+V_{DET}) + 2.0\text{ V}$  and output voltage level becoming to 2.5.

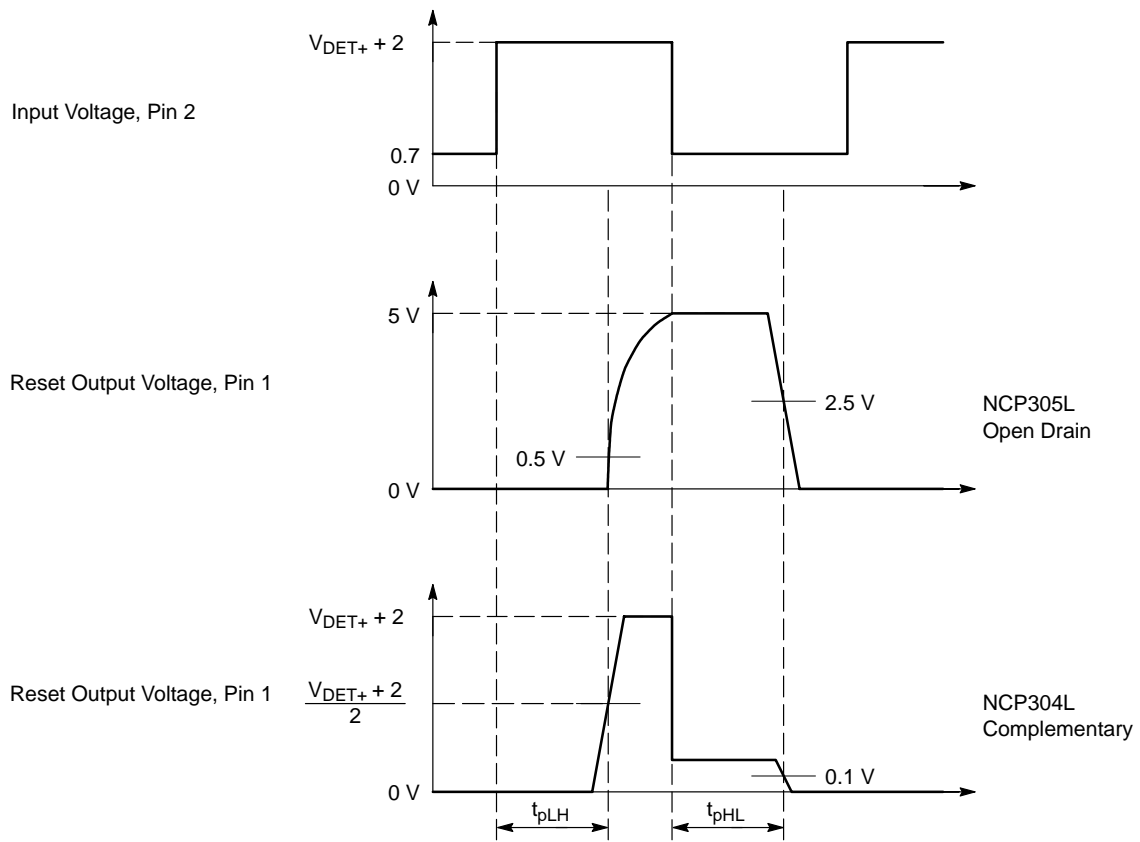
# NCP304, NCP305

## ELECTRICAL CHARACTERISTICS (continued) (For all values $T_A = 25^\circ\text{C}$ , unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>NCP304/5 – 4.5</b>					
Propagation Delay Input to Output (Figure 2)					$\mu\text{s}$
Complementary Output NCP304 Series					
Output Transition, High to Low (Note 3)	$t_{pHL}$	–	10	–	
Output Transition, Low to High (Note 3)	$t_{pLH}$	–	21	60	
N-Channel Open Drain NCP305 Series					
Output Transition, High to Low (Note 3)	$t_{pHL}$	–	10	–	
Output Transition, Low to High (Note 3)	$t_{pLH}$	–	–	100	
<b>NCP304/5 – 4.7</b>					
Detector Threshold (Pin 2, $V_{in}$ Decreasing)	$V_{DET-}$	4.606	4.70	4.794	V
Detector Threshold Hysteresis (Pin 2, $V_{in}$ Increasing)	$V_{HYS}$	0.141	0.235	0.329	V
Supply Current (Pin 2)	$I_{in}$				$\mu\text{A}$
( $V_{in} = 4.54\text{ V}$ )		–	1.1	3.0	
( $V_{in} = 6.7\text{ V}$ )		–	1.3	3.9	
Maximum Operating Voltage (Pin 2)	$V_{in(max)}$	–	–	10	V
Minimum Operating Voltage (Pin 2)	$V_{in(min)}$	–	0.55	0.70	V
( $T_A = -40^\circ\text{C}$ to $85^\circ\text{C}$ )		–	0.65	0.80	
Reset Output Current (Pin 1, Active Low 'L' Suffix Devices)	$I_{OUT}$				mA
Nch Sink Current, NCP304, NCP305					
( $V_{OUT} = 0.05\text{ V}$ , $V_{in} = 0.70\text{ V}$ )		0.01	0.05	–	
( $V_{OUT} = 0.50\text{ V}$ , $V_{in} = 1.5\text{ V}$ )		1.0	2.0	–	
Pch Source Current, NCP304					
( $V_{OUT} = 5.9\text{ V}$ , $V_{in} = 8.0\text{ V}$ )		1.5	3.0	–	
Reset Output Current (Pin 1, Active High 'H' Suffix Devices)	$I_{OUT}$				mA
Nch Sink Current, NCP304, NCP305					
( $V_{OUT} = 0.5\text{ V}$ , $V_{in} = 5.0\text{ V}$ )		6.3	11	–	
Pch Source Current, NCP304					
( $V_{OUT} = 0.4\text{ V}$ , $V_{in} = 0.7\text{ V}$ )		0.011	0.04	–	
( $V_{OUT} = \text{GND}$ , $V_{in} = 1.5\text{ V}$ )		0.525	0.6	–	
Propagation Delay Input to Output (Figure 2)					$\mu\text{s}$
Complementary Output NCP304 Series					
Output Transition, High to Low (Note 3)	$t_{pHL}$	–	10	–	
Output Transition, Low to High (Note 3)	$t_{pLH}$	–	21	60	
N-Channel Open Drain NCP305 Series					
Output Transition, High to Low (Note 3)	$t_{pHL}$	–	10	–	
Output Transition, Low to High (Note 3)	$t_{pLH}$	–	–	100	

3. In the case of CMOS Output Type: The time interval between the rising edge of  $V_{DD}$  input pulse from 0.7 V to  $(+V_{DET}) + 2.0\text{ V}$  and output voltage level becoming to  $V_{DD}/2$ . In the case of  $N_{CH}$  Open Drain Output Type: Output pin is pulled up with a resistance of 470 k $\Omega$  to 5.0 V, the time interval between the rising edge of  $V_{DD}$  input pulse from 0.7 V to  $(+V_{DET}) + 2.0\text{ V}$  and output voltage level becoming to 2.5.

## NCP304, NCP305



NCP304 and NCP305 series are measured with a 10 pF capacitive load. NCP305 has an additional 470 k pullup resistor connected from the reset output to +5.0 V. The reset output voltage waveforms are shown for the active low 'L' devices. The upper detector threshold,  $V_{DET+}$  is the sum of the lower detector threshold,  $V_{DET-}$  plus the input hysteresis,  $V_{HYS}$ .

**Figure 2. Propagation Delay Measurement Conditions**

# NCP304, NCP305

**Table 1. ELECTRICAL CHARACTERISTIC TABLE FOR 0.9 – 4.9 V**

NCP304 Series	Detector Threshold			Detector Threshold Hysteresis			Supply Current		Nch Sink Current		Pch Source Current		
							V <sub>in</sub> Low	V <sub>in</sub> High	V <sub>in</sub> Low	V <sub>in</sub> High			
Part Number	V <sub>DET-</sub> (V)			V <sub>HYS</sub> (V)			I <sub>in</sub> (μA) (1)	I <sub>in</sub> (μA) (2)	I <sub>OUT</sub> (mA) (3)	I <sub>OUT</sub> (mA) (4)	I <sub>OUT</sub> (mA) (5)		
	Min	Typ	Max	Min	Typ	Max	Typ	Typ	Typ	Typ	Typ		
NCP304LSQ09T1	0.882	0.9	0.918	0.027	0.045	0.063	0.8	0.9	0.05	0.5	2.0		
NCP304LSQ10T1	0.980	1.0	1.020	0.030	0.050	0.070							
NCP304LSQ11T1	1.078	1.1	1.122	0.033	0.055	0.077							
NCP304LSQ12T1	1.176	1.2	1.224	0.036	0.060	0.084							
NCP304LSQ13T1	1.274	1.3	1.326	0.039	0.065	0.091							
NCP304LSQ14T1	1.372	1.4	1.428	0.042	0.070	0.098							
NCP304LSQ15T1	1.470	1.5	1.530	0.045	0.075	0.105							
NCP304LSQ16T1	1.568	1.6	1.632	0.048	0.080	0.112							
NCP304LSQ17T1	1.666	1.7	1.734	0.051	0.085	0.119							
NCP304LSQ18T1	1.764	1.8	1.836	0.054	0.090	0.126							
NCP304LSQ19T1	1.862	1.9	1.938	0.057	0.095	0.133							
NCP304LSQ20T1	1.960	2.0	2.040	0.060	0.100	0.140				0.9		1.1	2.0
NCP304LSQ21T1	2.058	2.1	2.142	0.063	0.105	0.147							
NCP304LSQ22T1	2.156	2.2	2.244	0.066	0.110	0.154							
NCP304LSQ23T1	2.254	2.3	2.346	0.069	0.115	0.161							
NCP304LSQ24T1	2.352	2.4	2.448	0.072	0.120	0.168							
NCP304LSQ25T1	2.450	2.5	2.550	0.075	0.125	0.175							
NCP304LSQ26T1	2.548	2.6	2.652	0.078	0.130	0.182							
NCP304LSQ27T1	2.646	2.7	2.754	0.081	0.135	0.189							
NCP304LSQ28T1	2.744	2.8	2.856	0.084	0.140	0.196							
NCP304LSQ29T1	2.842	2.9	2.958	0.087	0.145	0.203							
NCP304LSQ30T1	2.940	3.0	3.060	0.090	0.150	0.210	1.0	1.2	2.0				
NCP304LSQ31T1	3.038	3.1	3.162	0.093	0.155	0.217							
NCP304LSQ32T1	3.136	3.2	3.264	0.096	0.160	0.224							
NCP304LSQ33T1	3.234	3.3	3.366	0.099	0.165	0.231							
NCP304LSQ34T1	3.332	3.4	3.468	0.102	0.170	0.238							
NCP304LSQ35T1	3.430	3.5	3.570	0.105	0.175	0.245							
NCP304LSQ36T1	3.528	3.6	3.672	0.108	0.180	0.252							
NCP304LSQ37T1	3.626	3.7	3.774	0.111	0.185	0.259							
NCP304LSQ38T1	3.724	3.8	3.876	0.114	0.190	0.266							
NCP304LSQ39T1	3.822	3.9	3.978	0.117	0.195	0.273							
NCP304LSQ40T1	3.920	4.0	4.080	0.120	0.200	0.280				1.1	1.3	3.0	
NCP304LSQ41T1	4.018	4.1	4.182	0.123	0.205	0.287							
NCP304LSQ42T1	4.116	4.2	4.284	0.126	0.210	0.294							
NCP304LSQ43T1	4.214	4.3	4.386	0.129	0.215	0.301							
NCP304LSQ44T1	4.312	4.4	4.488	0.132	0.220	0.308							
NCP304LSQ45T1	4.410	4.5	4.590	0.135	0.225	0.315							
NCP304LSQ46T1	4.508	4.6	4.692	0.138	0.230	0.322							
NCP304LSQ47T1	4.606	4.7	4.794	0.141	0.235	0.329							
NCP304LSQ48T1	4.704	4.8	4.896	0.144	0.240	0.336							
NCP304LSQ49T1	4.802	4.9	4.998	0.147	0.245	0.343							

4. Condition 1: 0.9 – 2.9 V, V<sub>in</sub> = V<sub>DET-</sub> – 0.10 V; 3.0 – 3.9 V, V<sub>in</sub> = V<sub>DET-</sub> – 0.13 V; 4.0 – 4.9 V, V<sub>in</sub> = V<sub>DET-</sub> – 0.16 V
5. Condition 2: 0.9 – 4.9 V, V<sub>in</sub> = V<sub>DET-</sub> + 2.0 V
6. Condition 3: 0.9 – 4.9 V, V<sub>in</sub> = 0.7 V, V<sub>OUT</sub> = 0.05 V, Active Low 'L' Suffix Devices
7. Condition 4: 0.9 – 1.0 V, V<sub>in</sub> = 0.85 V, V<sub>OUT</sub> = 0.5 V; 1.1 – 1.5 V, V<sub>in</sub> = 1.0 V, V<sub>OUT</sub> = 0.5 V; 1.6 – 4.9 V, V<sub>in</sub> = 1.5 V, V<sub>OUT</sub> = 0.5 V, Active Low 'L' Suffix Devices
8. Condition 5: 0.9 – 3.9 V, V<sub>in</sub> = 4.5 V, V<sub>OUT</sub> = 2.4 V; 4.0 – 4.9 V, V<sub>in</sub> = 8.0 V, V<sub>OUT</sub> = 5.9 V, Active Low 'L' Suffix Devices



# NCP304, NCP305

**Table 2. ELECTRICAL CHARACTERISTIC TABLE FOR 0.9 – 4.9 V**

NCP304 Series	Detector Threshold			Detector Threshold Hysteresis			Supply Current		Nch Sink Current	Pch Source Current	
							V <sub>in</sub> Low	V <sub>in</sub> High		V <sub>in</sub> Low	V <sub>in</sub> High
Part Number	V <sub>DET-</sub> (V)			V <sub>HYS</sub> (V)			I <sub>in</sub> (μA) (1)	I <sub>in</sub> (μA) (2)	I <sub>OUT</sub> (mA) (3)	I <sub>OUT</sub> (mA) (4)	I <sub>OUT</sub> (mA) (5)
	Min	Typ	Max	Min	Typ	Max	Typ	Typ	Typ	Typ	Typ
NCP304HSQ09T1	0.882	0.9	0.918	0.027	0.045	0.063	0.8	0.9	2.5	0.04	0.08
NCP304HSQ10T1	0.980	1.0	1.020	0.030	0.050	0.070					
NCP304HSQ11T1	1.078	1.1	1.122	0.033	0.055	0.077					
NCP304HSQ12T1	1.176	1.2	1.224	0.036	0.060	0.084					
NCP304HSQ13T1	1.274	1.3	1.326	0.039	0.065	0.091					
NCP304HSQ14T1	1.372	1.4	1.428	0.042	0.070	0.098					
NCP304HSQ15T1	1.470	1.5	1.530	0.045	0.075	0.105					
NCP304HSQ16T1	1.568	1.6	1.632	0.048	0.080	0.112					
NCP304HSQ17T1	1.666	1.7	1.734	0.051	0.085	0.119					
NCP304HSQ18T1	1.764	1.8	1.836	0.054	0.090	0.126					
NCP304HSQ19T1	1.862	1.9	1.938	0.057	0.095	0.133					
NCP304HSQ20T1	1.960	2.0	2.040	0.060	0.100	0.140					
NCP304HSQ21T1	2.058	2.1	2.142	0.063	0.105	0.147					
NCP304HSQ22T1	2.156	2.2	2.244	0.066	0.110	0.154					
NCP304HSQ23T1	2.254	2.3	2.346	0.069	0.115	0.161					
NCP304HSQ24T1	2.352	2.4	2.448	0.072	0.120	0.168					
NCP304HSQ25T1	2.450	2.5	2.550	0.075	0.125	0.175					
NCP304HSQ26T1	2.548	2.6	2.652	0.078	0.130	0.182					
NCP304HSQ27T1	2.646	2.7	2.754	0.081	0.135	0.189					
NCP304HSQ28T1	2.744	2.8	2.856	0.084	0.140	0.196					
NCP304HSQ29T1	2.842	2.9	2.958	0.087	0.145	0.203					
NCP304HSQ30T1	2.940	3.0	3.060	0.090	0.150	0.210					
NCP304HSQ31T1	3.038	3.1	3.162	0.093	0.155	0.217					
NCP304HSQ32T1	3.136	3.2	3.264	0.096	0.160	0.224					
NCP304HSQ33T1	3.234	3.3	3.366	0.099	0.165	0.231					
NCP304HSQ34T1	3.332	3.4	3.468	0.102	0.170	0.238					
NCP304HSQ35T1	3.430	3.5	3.570	0.105	0.175	0.245					
NCP304HSQ36T1	3.528	3.6	3.672	0.108	0.180	0.252					
NCP304HSQ37T1	3.626	3.7	3.774	0.111	0.185	0.259					
NCP304HSQ38T1	3.724	3.8	3.876	0.114	0.190	0.266					
NCP304HSQ39T1	3.822	3.9	3.978	0.117	0.195	0.273					
NCP304HSQ40T1	3.920	4.0	4.080	0.120	0.200	0.280					
NCP304HSQ41T1	4.018	4.1	4.182	0.123	0.205	0.287					
NCP304HSQ42T1	4.116	4.2	4.284	0.126	0.210	0.294					
NCP304HSQ43T1	4.214	4.3	4.386	0.129	0.215	0.301					
NCP304HSQ44T1	4.312	4.4	4.488	0.132	0.220	0.308					
NCP304HSQ45T1	4.410	4.5	4.590	0.135	0.225	0.315					
NCP304HSQ46T1	4.508	4.6	4.692	0.138	0.230	0.322					
NCP304HSQ47T1	4.606	4.7	4.794	0.141	0.235	0.329					
NCP304HSQ48T1	4.704	4.8	4.896	0.144	0.240	0.336					
NCP304HSQ49T1	4.802	4.9	4.998	0.147	0.245	0.343					

9. Condition 1: 0.9 – 2.9 V, V<sub>in</sub> = V<sub>DET-</sub> – 0.10 V; 3.0 – 3.9 V, V<sub>in</sub> = V<sub>DET-</sub> – 0.13 V; 4.0 – 4.9 V, V<sub>in</sub> = V<sub>DET-</sub> – 0.16 V  
 10. Condition 2: 0.9 – 4.9 V, V<sub>in</sub> = V<sub>DET-</sub> + 2.0 V  
 11. Condition 3: 0.9 – 1.4 V, V<sub>in</sub> = 1.5 V, V<sub>OUT</sub> = 0.5 V; 1.5 – 4.9 V, V<sub>in</sub> = 5.0 V, V<sub>OUT</sub> = 0.5 V, Active High 'H' Suffix Devices  
 12. Condition 4: 0.9 – 4.9 V, V<sub>in</sub> = 0.7 V, V<sub>OUT</sub> = 0.4 V, Active High 'H' Suffix Devices  
 13. Condition 5: 0.9 – 1.0 V, V<sub>in</sub> = 0.8 V, V<sub>OUT</sub> = GND; 1.1 – 1.5 V, V<sub>in</sub> = 1.0 V, V<sub>OUT</sub> = GND; 1.6 – 4.9 V, V<sub>in</sub> = 1.5 V, V<sub>OUT</sub> = GND, Active High 'H' Suffix Devices

# NCP304, NCP305

**Table 3. ELECTRICAL CHARACTERISTIC TABLE FOR 0.9 – 4.9 V**

NCP305 Series	Detector Threshold			Detector Threshold Hysteresis			Supply Current		Nch Sink Current			
							V <sub>in</sub> Low	V <sub>in</sub> High	V <sub>in</sub> Low	V <sub>in</sub> High		
Part Number	V <sub>DET-</sub> (V)			V <sub>HYS</sub> (V)			I <sub>in</sub> (μA) (1)	I <sub>in</sub> (μA) (2)	I <sub>OUT</sub> (mA) (3)	I <sub>OUT</sub> (mA) (4)		
	Min	Typ	Max	Min	Typ	Max	Typ	Typ	Typ	Typ		
NCP305LSQ09T1	0.882	0.9	0.918	0.027	0.045	0.063	0.8	0.9	0.05	0.5		
NCP305LSQ10T1	0.980	1.0	1.020	0.030	0.050	0.070						
NCP305LSQ11T1	1.078	1.1	1.122	0.033	0.055	0.077						
NCP305LSQ12T1	1.176	1.2	1.224	0.036	0.060	0.084						
NCP305LSQ13T1	1.274	1.3	1.326	0.039	0.065	0.091						
NCP305LSQ14T1	1.372	1.4	1.428	0.042	0.070	0.098						
NCP305LSQ15T1	1.470	1.5	1.530	0.045	0.075	0.105						
NCP305LSQ16T1	1.568	1.6	1.632	0.048	0.080	0.112						
NCP305LSQ17T1	1.666	1.7	1.734	0.051	0.085	0.119						
NCP305LSQ18T1	1.764	1.8	1.836	0.054	0.090	0.126						
NCP305LSQ19T1	1.862	1.9	1.938	0.057	0.095	0.133						
NCP305LSQ20T1	1.960	2.0	2.040	0.060	0.100	0.140						
NCP305LSQ21T1	2.058	2.1	2.142	0.063	0.105	0.147	0.9	1.1	2.0			
NCP305LSQ22T1	2.156	2.2	2.244	0.066	0.110	0.154						
NCP305LSQ23T1	2.254	2.3	2.346	0.069	0.115	0.161						
NCP305LSQ24T1	2.352	2.4	2.448	0.072	0.120	0.168						
NCP305LSQ25T1	2.450	2.5	2.550	0.075	0.125	0.175						
NCP305LSQ26T1	2.548	2.6	2.652	0.078	0.130	0.182						
NCP305LSQ27T1	2.646	2.7	2.754	0.081	0.135	0.189						
NCP305LSQ28T1	2.744	2.8	2.856	0.084	0.140	0.196						
NCP305LSQ29T1	2.842	2.9	2.958	0.087	0.145	0.203						
NCP305LSQ30T1	2.940	3.0	3.060	0.090	0.150	0.210						
NCP305LSQ31T1	3.038	3.1	3.162	0.093	0.155	0.217						
NCP305LSQ32T1	3.136	3.2	3.264	0.096	0.160	0.224				1.0	1.2	
NCP305LSQ33T1	3.234	3.3	3.366	0.099	0.165	0.231						
NCP305LSQ34T1	3.332	3.4	3.468	0.102	0.170	0.238						
NCP305LSQ35T1	3.430	3.5	3.570	0.105	0.175	0.245						
NCP305LSQ36T1	3.528	3.6	3.672	0.108	0.180	0.252						
NCP305LSQ37T1	3.626	3.7	3.774	0.111	0.185	0.259						
NCP305LSQ38T1	3.724	3.8	3.876	0.114	0.190	0.266						
NCP305LSQ39T1	3.822	3.9	3.978	0.117	0.195	0.273						
NCP305LSQ40T1	3.920	4.0	4.080	0.120	0.200	0.280						
NCP305LSQ41T1	4.018	4.1	4.182	0.123	0.205	0.287						
NCP305LSQ42T1	4.116	4.2	4.284	0.126	0.210	0.294	1.1	1.3				
NCP305LSQ43T1	4.214	4.3	4.386	0.129	0.215	0.301						
NCP305LSQ44T1	4.312	4.4	4.488	0.132	0.220	0.308						
NCP305LSQ45T1	4.410	4.5	4.590	0.135	0.225	0.315						
NCP305LSQ46T1	4.508	4.6	4.692	0.138	0.230	0.322						
NCP305LSQ47T1	4.606	4.7	4.794	0.141	0.235	0.329						
NCP305LSQ48T1	4.704	4.8	4.896	0.144	0.240	0.336						
NCP305LSQ49T1	4.802	4.9	4.998	0.147	0.245	0.343						

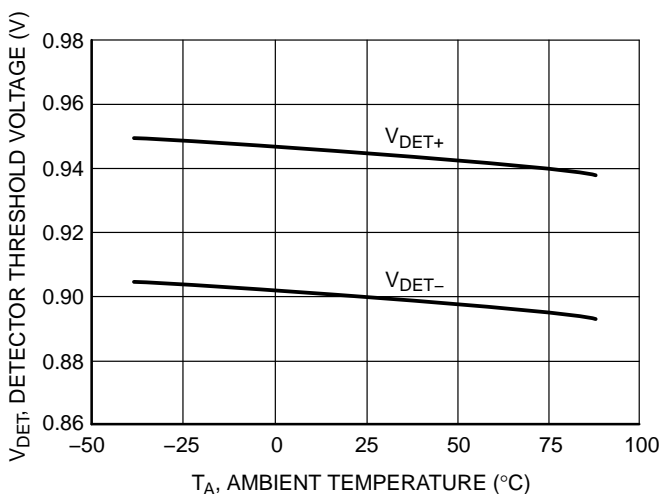
14. Condition 1: 0.9 – 2.9 V, V<sub>in</sub> = V<sub>DET-</sub> – 0.10 V; 3.0 – 3.9 V, V<sub>in</sub> = V<sub>DET-</sub> – 0.13 V; 4.0 – 4.9 V, V<sub>in</sub> = V<sub>DET-</sub> – 0.16 V

15. Condition 2: 0.9 – 4.9 V, V<sub>in</sub> = V<sub>DET-</sub> + 2.0 V

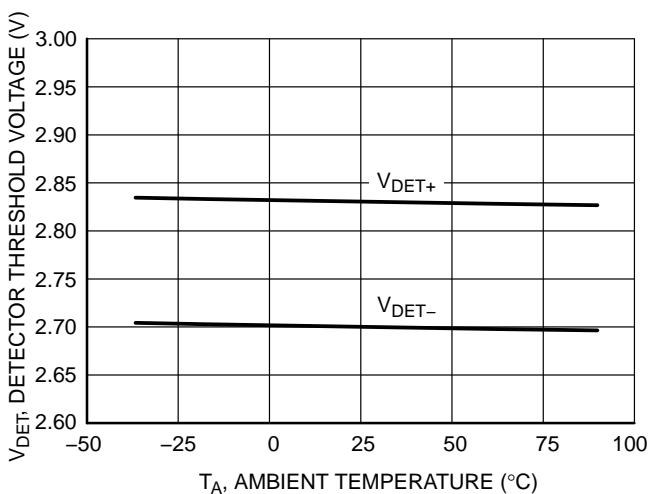
16. Condition 3: 0.9 – 4.9 V, V<sub>in</sub> = 0.7 V, V<sub>OUT</sub> = 0.05 V, Active Low 'L' Suffix Devices

17. Condition 4: 0.9 – 1.0 V, V<sub>in</sub> = 0.85 V, V<sub>OUT</sub> = 0.5 V; 1.1 – 1.5 V, V<sub>in</sub> = 1.0 V, V<sub>OUT</sub> = 0.5 V; 1.6 – 4.9 V, V<sub>in</sub> = 1.5 V, V<sub>OUT</sub> = 0.5 V, Active Low 'L' Suffix Devices

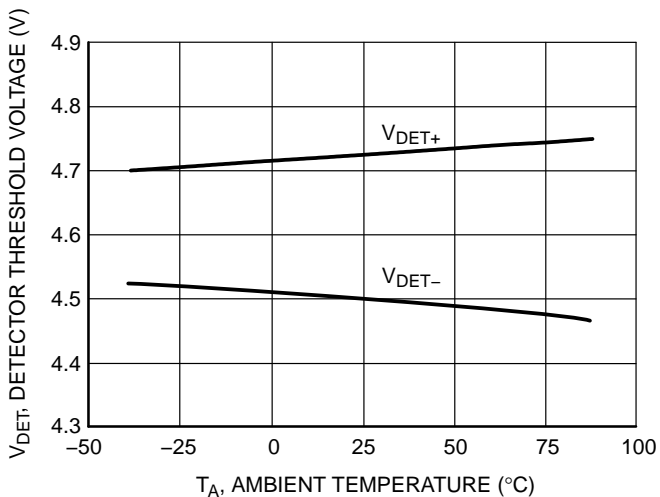
# NCP304, NCP305



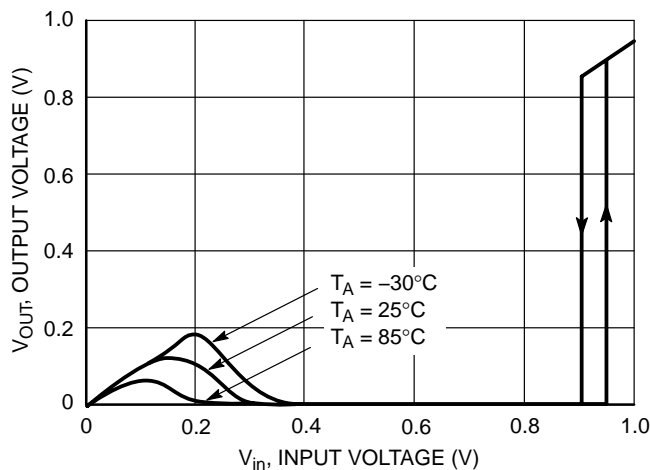
**Figure 3. NCP304/5 Series 0.9 V Detector Threshold Voltage vs. Temperature**



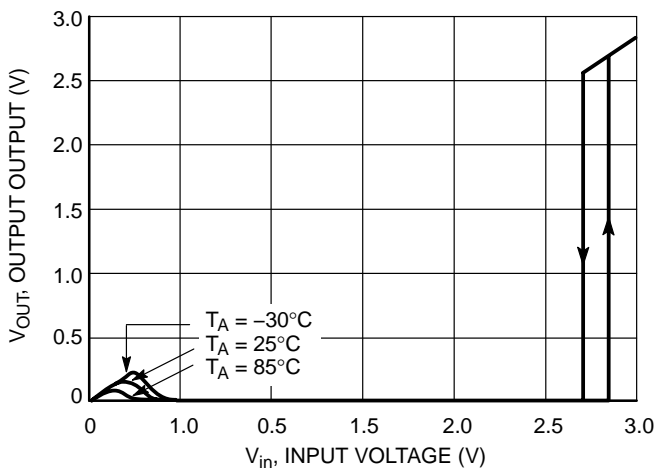
**Figure 4. NCP304/5 Series 2.7 V Detector Threshold Voltage vs. Temperature**



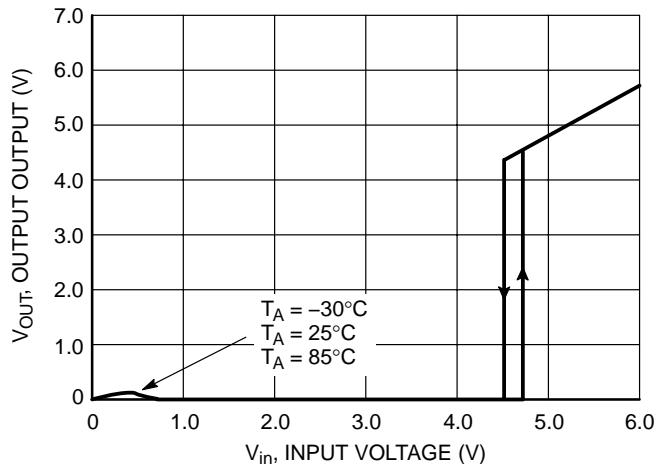
**Figure 5. NCP304/5 Series 4.5 V Detector Threshold Voltage vs. Temperature**



**Figure 6. NCP304L/5L Series 0.9 V Reset Output Voltage vs. Input Voltage**

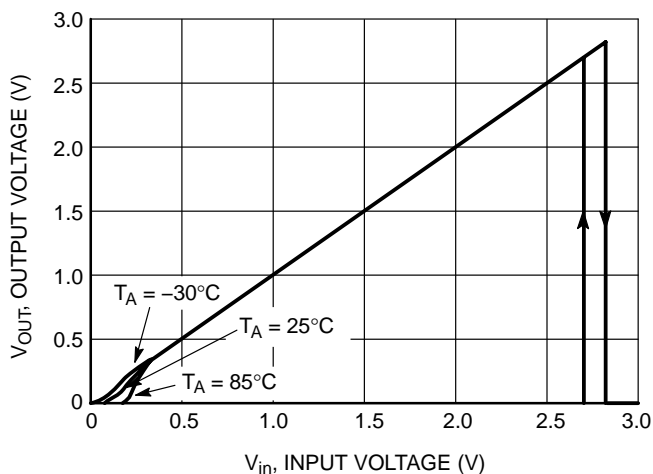


**Figure 7. NCP304L/5L Series 2.7 V Reset Output Voltage vs. Input Voltage**

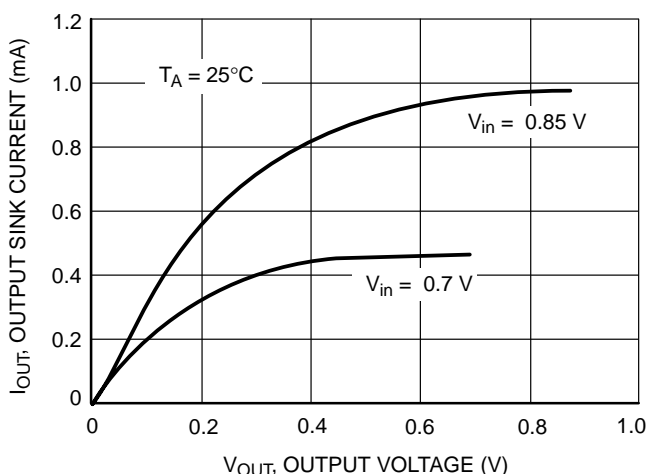


**Figure 8. NCP304L/5L Series 4.5 V Reset Output Voltage vs. Input Voltage**

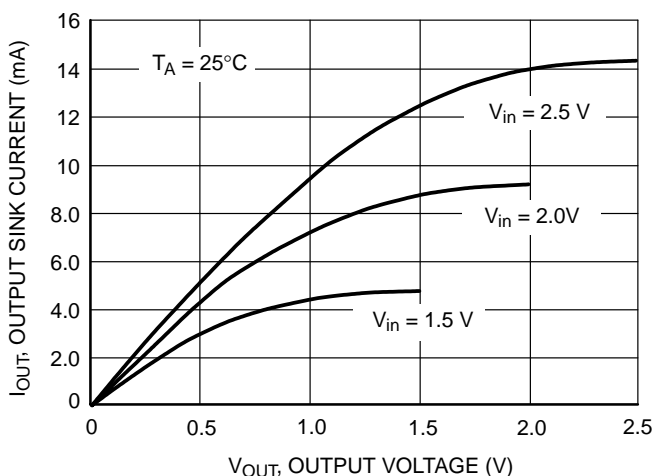
# NCP304, NCP305



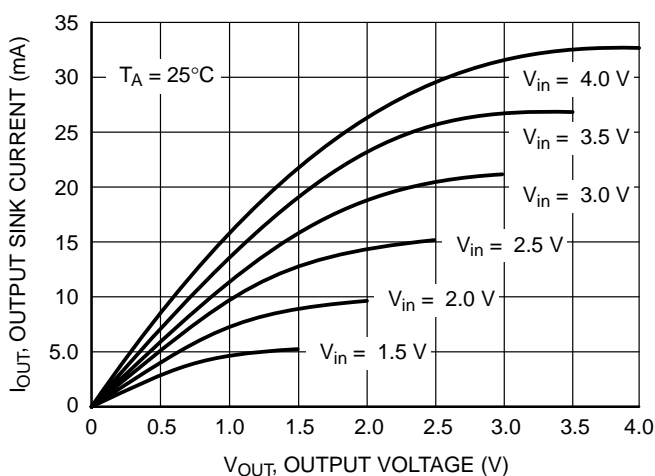
**Figure 9. NCP304H/5H Series 2.7 V Reset Output Voltage vs. Input Voltage**



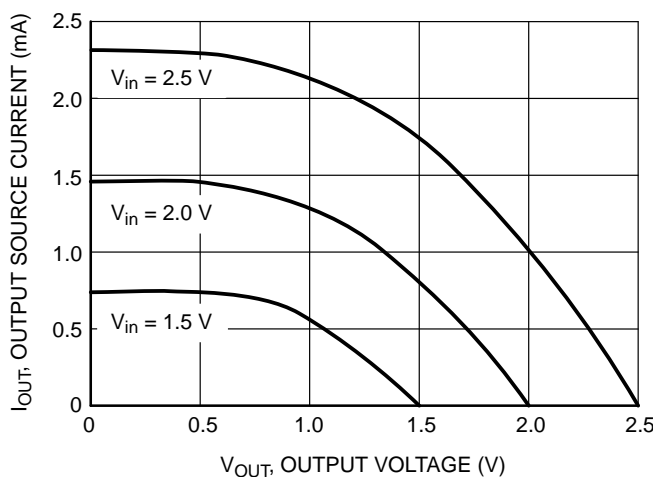
**Figure 10. NCP304H/5L Series 0.9 V Reset Output Sink Current vs. Output Voltage**



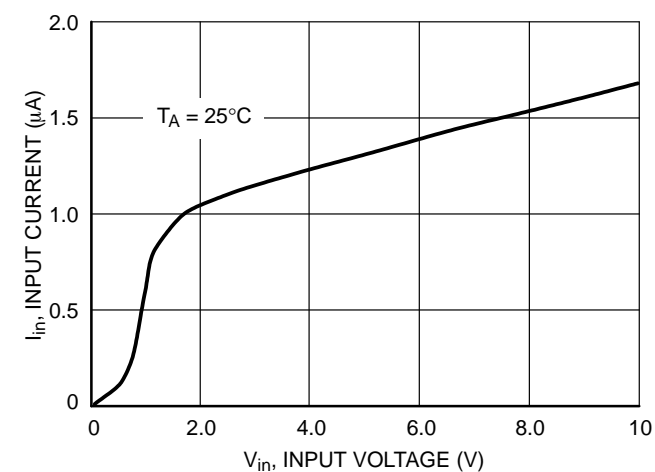
**Figure 11. NCP304H/5L Series 2.7 V Reset Output Sink Current vs. Output Voltage**



**Figure 12. NCP304H/5L Series 4.5 V Reset Output Sink Current vs. Output Voltage**

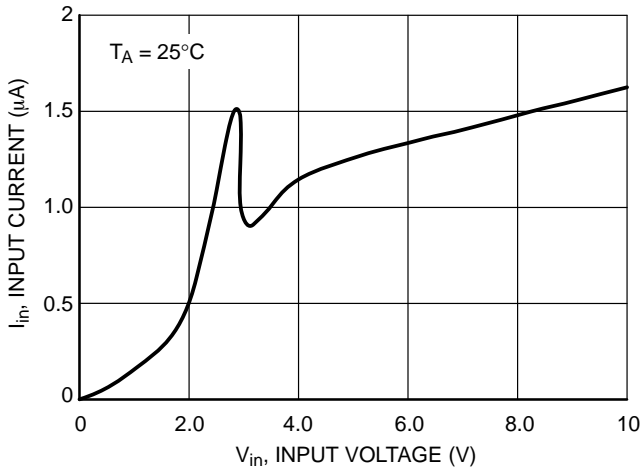


**Figure 13. NCP304H Series 2.7 V Reset Output Source Current vs. Output Voltage**

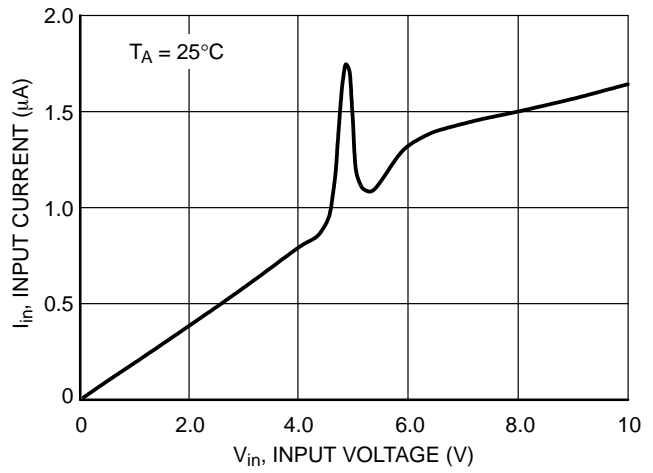


**Figure 14. NCP304/5 Series 0.9 V Input Current vs. Input Voltage**

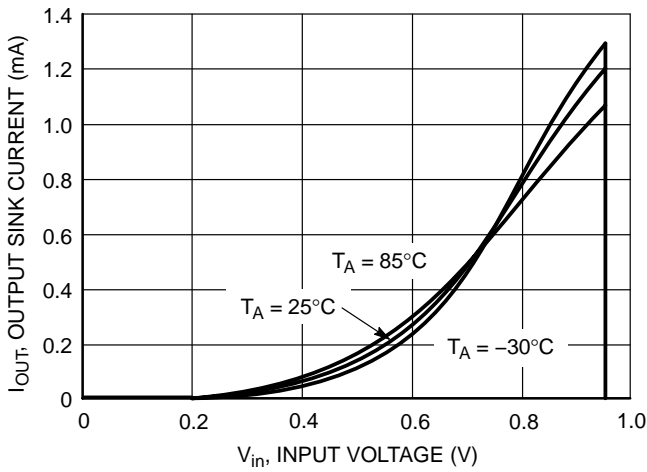
# NCP304, NCP305



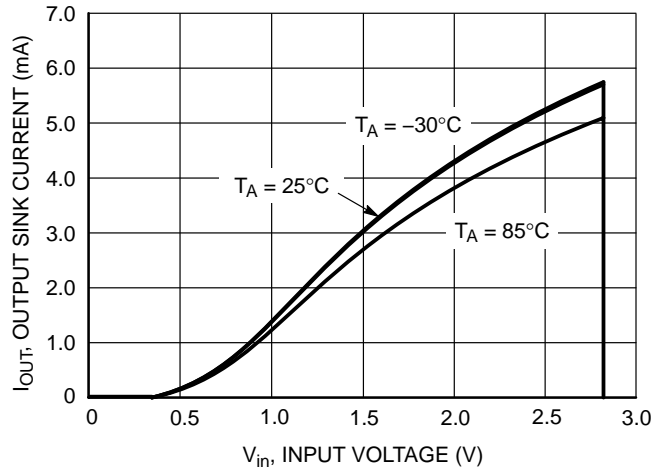
**Figure 15. NCP304/5 Series 2.7 V Input Current vs. Input Voltage**



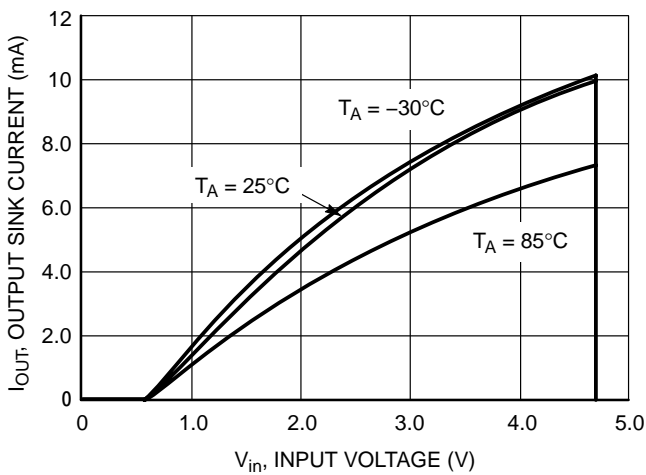
**Figure 16. NCP304/5 Series 4.5 V Input Current vs. Input Voltage**



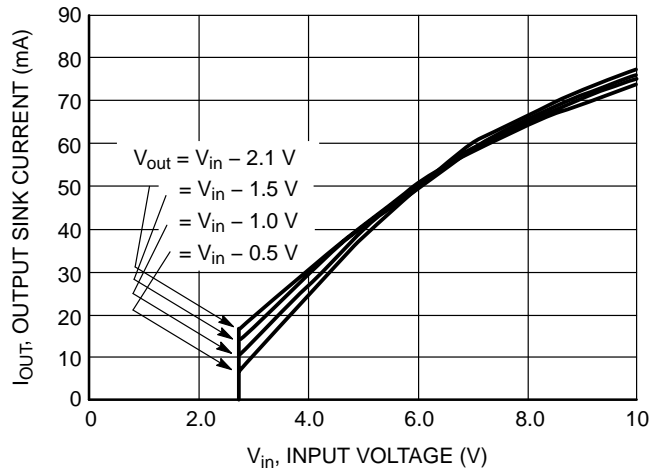
**Figure 17. NCP304H/5L Series 0.9 V Reset Output Sink Current vs. Input Voltage**



**Figure 18. NCP304H/5L Series 2.7 V Reset Output Sink Current vs. Input Voltage**

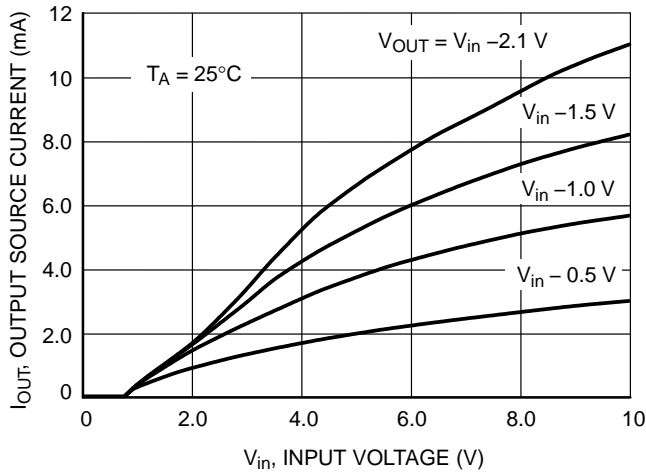


**Figure 19. NCP304H/5L Series 4.5 V Reset Output Sink Current vs. Input Voltage**

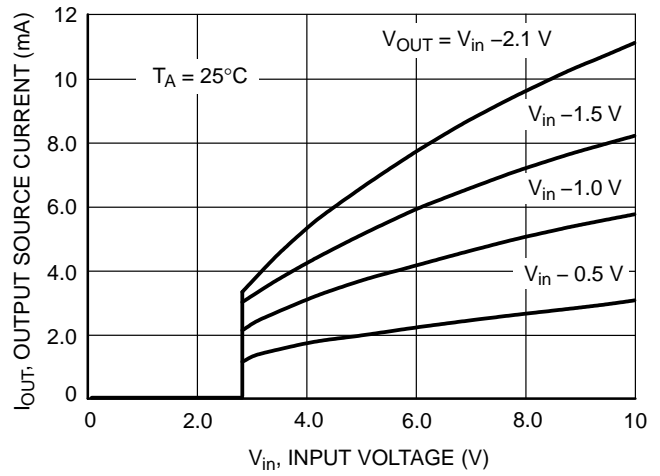


**Figure 20. NCP304H/5H Series 2.7 V Reset Output Sink Current vs. Input Voltage**

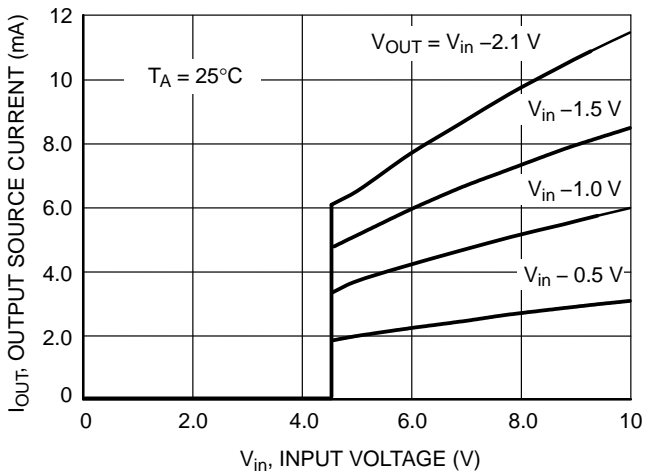
# NCP304, NCP305



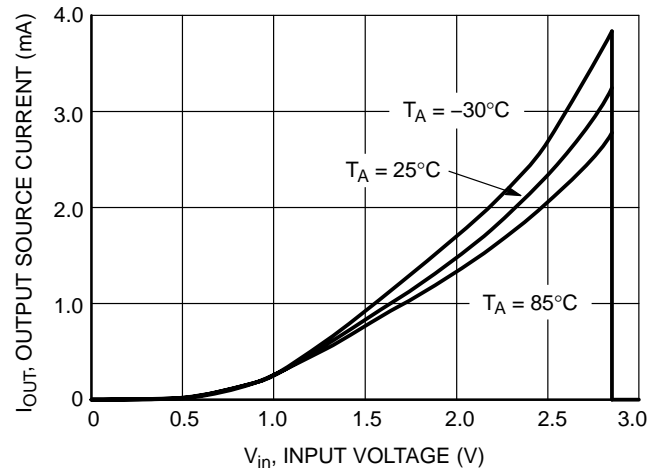
**Figure 21. NCP304H Series 0.9 V**  
Reset Output Source Current vs. Input Voltage



**Figure 22. NCP304H Series 2.7 V**  
Reset Output Source Current vs. Input Voltage



**Figure 23. NCP304H Series 4.5 V**  
Reset Output Source Current vs. Input Voltage



**Figure 24. NCP304H Series 2.7 V**  
Reset Output Source Current vs. Input Voltage

# NCP304, NCP305

## OPERATING DESCRIPTION

The NCP304 and NCP305 series devices are second generation ultra-low current voltage detectors. Figures 25 and 26 show a timing diagram and a typical application. Initially consider that input voltage  $V_{in}$  is at a nominal level and it is greater than the voltage detector upper threshold ( $V_{DET+}$ ), and the reset output (Pin 1) will be in the high state for active low devices, or in the low state for active high devices. If there is a power interruption and  $V_{in}$  becomes significantly deficient, it will fall below the lower detector threshold ( $V_{DET-}$ ). This sequence of events causes the Reset output to be in the low state for active low devices, or in the

high state for active high devices. After completion of the power interruption,  $V_{in}$  will again return to its nominal level and become greater than the  $V_{DET+}$ . The voltage detector has built-in hysteresis to prevent erratic reset operation as the comparator threshold is crossed.

Although these device series are specifically designed for use as reset controllers in portable microprocessor based systems, they offer a cost-effective solution in numerous applications where precise voltage monitoring is required. Figure 26 through Figure 32 shows various application examples.

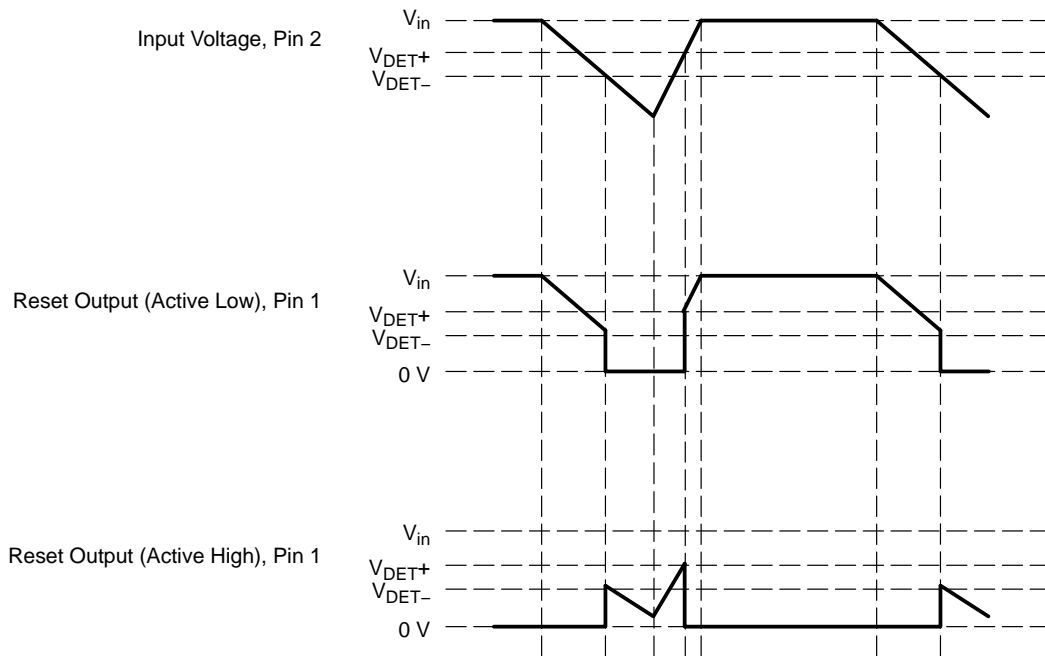


Figure 25. Timing Waveforms

# NCP304, NCP305

## APPLICATION CIRCUIT INFORMATION

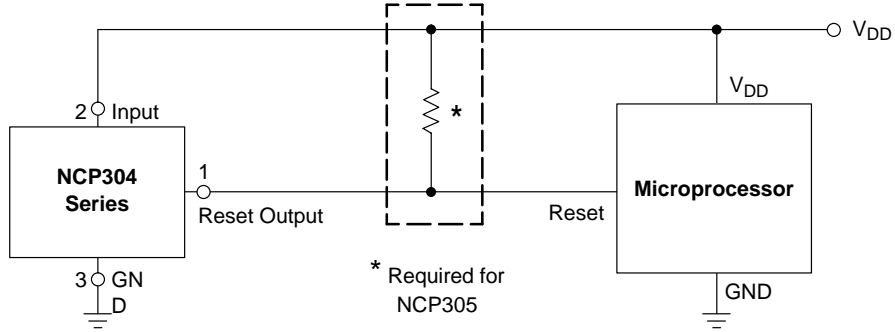


Figure 26. Microprocessor Reset Circuit

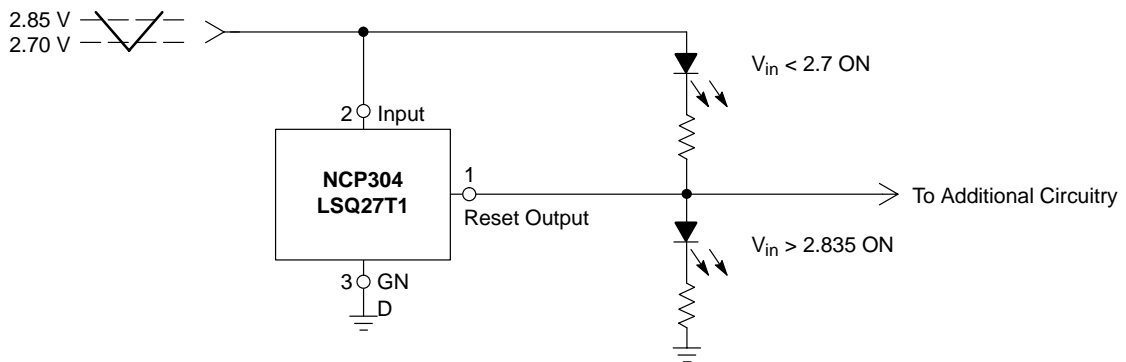


Figure 27. Battery Charge Indicator

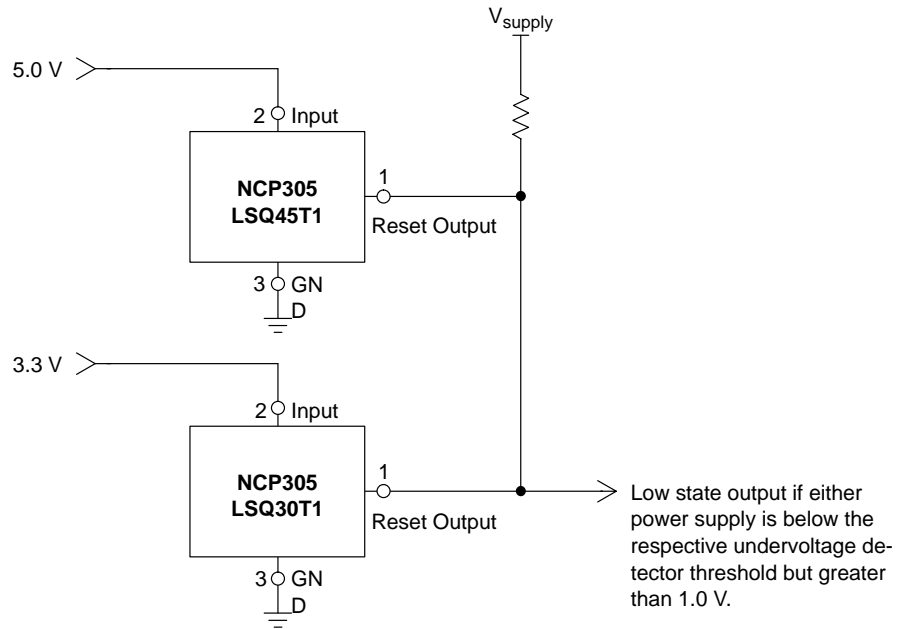
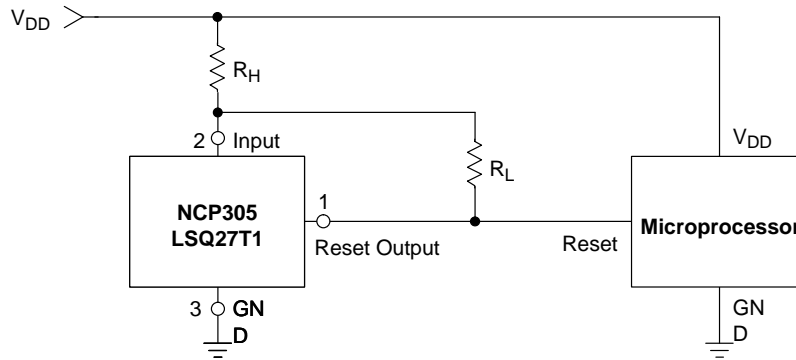


Figure 28. Dual Power Supply Undervoltage Supervision



## NCP304, NCP305



**Figure 29. Microprocessor Reset Circuit with Additional Hysteresis**

Comparator hysteresis can be increased with the addition of resistor  $R_H$ . The hysteresis equations have been simplified and do not account for the change of input current  $I_{in}$  as  $V_{in}$  crosses the comparator threshold. The internal resistance,  $R_{in}$  is simply calculated using  $I_{in} = 0.26 \mu A$  at 2.6 V.

$V_{in}$  Decreasing:

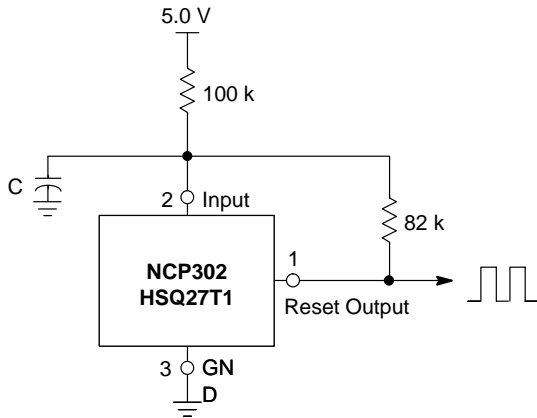
$$V_{th} = \left( \frac{R_H}{R_{in}} + 1 \right) (V_{DET-})$$

$V_{in}$  Increasing:

$$V_{th} = \left( \frac{R_H}{R_{in} \parallel R_L} + 1 \right) (V_{DET-} + V_{HYS})$$

$$V_{HYS} = V_{in \text{ Increasing}} - V_{in \text{ Decreasing}}$$

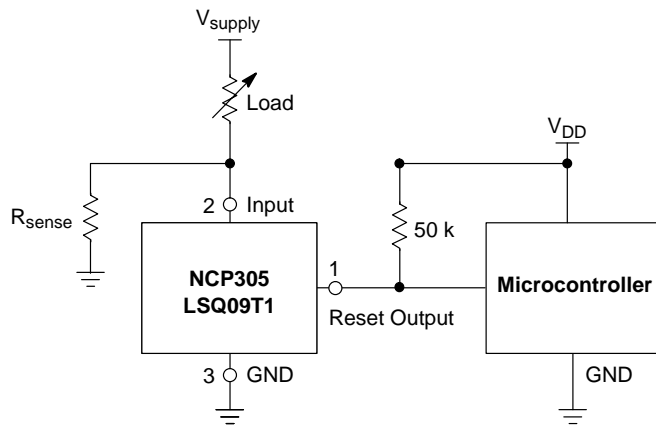
Test Data				
$V_{th}$ Decreasing (mV)	$V_{th}$ Increasing (mV)	$V_{HYS}$ (mV)	$R_H$ ( $\Omega$ )	$R_L$ (k $\Omega$ )
2.70	2.84	0.135	0	–
2.70	2.87	0.17	100	10
2.70	2.88	0.19	100	6.8
2.70	2.91	0.21	100	4.3
2.70	2.90	0.20	220	10
2.70	2.94	0.24	220	6.8
2.70	2.98	0.28	220	4.3
2.70	2.70	0.27	470	10
2.70	3.04	0.34	470	6.8
2.70	3.15	0.35	470	4.3



Test Data		
C ( $\mu F$ )	$f_{OSC}$ (kHz)	$I_Q$ ( $\mu A$ )
0.01	2590	21.77
0.1	490	21.97
1.0	52	22.07

**Figure 30. Simple Clock Oscillator**

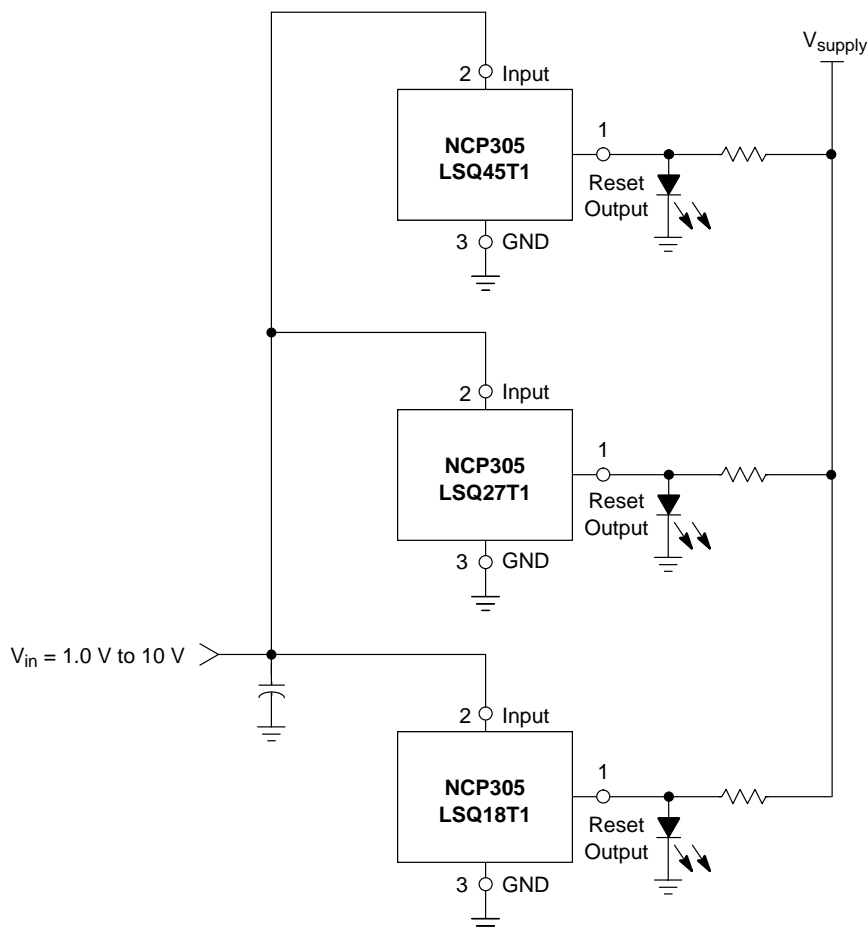
## NCP304, NCP305



This circuit monitors the current at the load. As current flows through the load, a voltage drop with respect to ground appears across  $R_{sense}$  where  $V_{sense} = I_{load} * R_{sense}$ . The following conditions apply:

If:	Then:
$I_{Load} < V_{DET-} / R_{sense}$	Reset Output = 0 V
$I_{Load} \geq (V_{DET-} + V_{HYS}) / R_{sense}$	Reset Output = $V_{DD}$

Figure 31. Microcontroller Systems Load Sensing



A simple voltage monitor can be constructed by connecting several voltage detectors as shown above. Each LED will sequentially turn on when the respective voltage detector threshold ( $V_{DET-} + V_{HYS}$ ) is exceeded. Note that detector thresholds ( $V_{DET-}$ ) that range from 0.9 V to 4.9 V in 100 mV steps can be manufactured.

Figure 32. LED Bar Graph

# NCP304, NCP305

## ORDERING INFORMATION

Device	Threshold Voltage	Output Type	Reset	Marking	Package	Shipping <sup>†</sup>
NCP304LSQ09T1	0.9	CMOS	Active Low	SHG	SC82	3000 / Tape & Reel (7 inch Reel)
NCP304LSQ18T1	1.8			SGX	SC82	
NCP304LSQ20T1	2.0			SGV	SC82	
NCP304LSQ23T1	2.3			SGR	SC82	
NCP304LSQ27T1	2.7			SGN	SC82	
NCP304LSQ30T1	3.0			SGJ	SC82	
NCP304LSQ30T1G	3.0			SGJ	SC82 (Pb-Free)	
NCP304LSQ33T1	3.3			SGG	SC82	
NCP304LSQ40T1	4.0			SFY	SC82	
NCP304LSQ42T1	4.2			SFU	SC82	
NCP304LSQ45T1	4.5			SFS	SC82	
NCP304LSQ46T1	4.6			SFR	SC82	
NCP304LSQ47T1	4.7			SFQ	SC82	
NCP304HSQ09T1	0.9			CMOS	Active High	
NCP304HSQ18T1	1.8	SNZ	SC82			
NCP304HSQ20T1	2.0	SOB	SC82			
NCP304HSQ27T1	2.7	SOI	SC82			
NCP304HSQ29T1	2.9	SOK	SC82			
NCP304HSQ29T1G	2.9	SOK	SC82 (Pb-Free)			
NCP304HSQ30T1	3.0	SOL	SC82			
NCP304HSQ45T1	4.5	SPA	SC82			
NCP304HSQ47T1	4.7	SPC	SC82			
NCP304HSQ47T1G	4.7	SPC	SC82 (Pb-Free)			3000 / Tubes
NCP305LSQ09T1	0.9	Open Drain	Active Low	SIZ	SC82	3000 / Tape & Reel (7 inch Reel)
NCP305LSQ11T1	1.1			SIX	SC82	
NCP305LSQ15T1	1.5			SIS	SC82	
NCP305LSQ16T1	1.6			SIR	SC82	
NCP305LSQ16T1G	1.6			SIR	SC82 (Pb-Free)	
NCP305LSQ18T1	1.8			SIP	SC82	
NCP305LSQ20T1	2.0			SIN	SC82	
NCP305LSQ22T1	2.2			SIK	SC82	
NCP305LSQ23T1	2.3			SIJ	SC82	
NCP305LSQ24T1	2.4			SII	SC82	
NCP305LSQ25T1	2.5			SIH	SC82	

NOTE: The ordering information lists standard undervoltage thresholds with active low outputs. Additional active low threshold devices, ranging from 0.9 V to 4.9 V in 100 mV increments and NCP304 active high output devices, ranging from 0.9 V to 4.9 V in 100 mV increments can be manufactured. Contact your ON Semiconductor representative for availability. The electrical characteristics of these additional devices are shown in Tables 1 and 2.

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

## NCP304, NCP305

### ORDERING INFORMATION

Device	Threshold Voltage	Output Type	Reset	Marking	Package	Shipping <sup>†</sup>
NCP305LSQ27T1	2.7	Open Drain	Active Low	SIF	SC82	3000 / Tape & Reel (7 inch Reel)
NCP305LSQ27T1G	2.7			SIF	SC82 (Pb-Free)	
NCP305LSQ28T1	2.8			SIE	SC82	
NCP305LSQ29T1	2.9			SID	SC82	
NCP305LSQ30T1	3.0			SIC	SC82	
NCP305LSQ30T1G	3.0			SIC	SC82 (Pb-Free)	
NCP305LSQ31T1	3.1			SIB	SC82	
NCP305LSQ32T1	3.2			SIA	SC82	
NCP305LSQ33T1	3.3			SHZ	SC82	
NCP305LSQ34T1	3.4			SHY	SC82	
NCP305LSQ36T1	3.6			SHX	SC82	
NCP305LSQ36T1G	3.6			SHX	SC82 (Pb-Free)	
NCP305LSQ37T1G	3.7			SHX	SC82 (Pb-Free)	
NCP305LSQ40T1	4.0			SHR	SC82	
NCP305LSQ45T1	4.5			SHL	SC82	
NCP305LSQ45T1G	4.5			SHL	SC82 (Pb-Free)	
NCP305LSQ47T1	4.7			SHJ	SC82	
NCP305LSQ49T1	4.9			SHH	SC82	

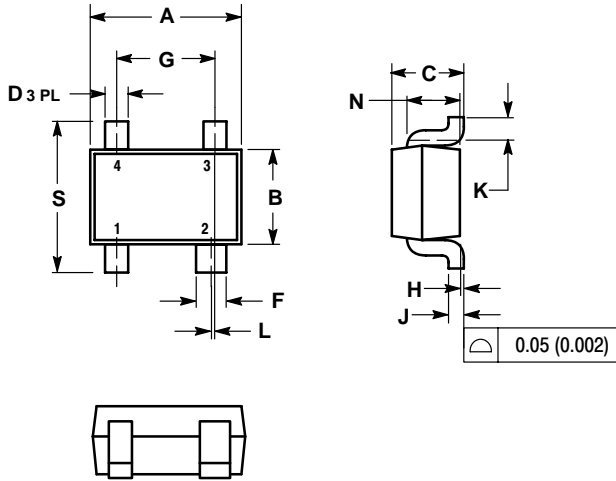
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<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# NCP304, NCP305

## PACKAGE DIMENSIONS

SC-82AB  
SQ SUFFIX  
CASE 419C-02  
ISSUE C



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. 419C-01 OBSOLETE. NEW STANDARD IS 419C-02.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.8	2.2	0.071	0.087
B	1.15	1.35	0.045	0.053
C	0.8	1.1	0.031	0.043
D	0.2	0.4	0.008	0.016
F	0.3	0.5	0.012	0.020
G	1.1	1.5	0.043	0.059
H	0.0	0.1	0.000	0.004
J	0.10	0.26	0.004	0.010
K	0.1	---	0.004	---
L	0.05 BSC		0.002 BSC	
N	0.2 REF		0.008 REF	
S	1.8	2.4	0.07	0.09

# NCP304, NCP305

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