

# NCS2200 Series, NCS2200A

## Low Voltage Comparators

The NCS2200 Series is an industry first sub-one volt, low power comparator family. These devices consume only 10  $\mu$ A of supply current. They are guaranteed to operate at a low voltage of 0.85 V which allows them to be used in systems that require less than 1.0 V and are fully operational up to 6.0 V which makes them convenient for use in both 3.0 V and 5.0 V systems. Additional features include no output phase inversion with overdriven inputs, internal hysteresis, which allows for clean output switching, and rail-to-rail input and output performance. The NCS2200 Series is available in the tiny SOT-23-5 package. There are four options featuring two industry standard pinouts. Additionally, the NCS2200 and NCS2202 are available in the SC70-5 package. The NCS2200 is also available in the tiny DFN 2x2.2 package. The NCS2200A is available in UDFN 1.2x1.0 package. (Table 1)

### Features

- Operating Voltage of 0.85 V to 6.0 V
- Rail-to-Rail Input/Output Performance
- Low Supply Current of 10  $\mu$ A
- No Phase Inversion with Overdriven Input Signals
- Glitchless Transitioning in or out of Tri-State Mode
- Complementary or Open Drain Output Configuration
- Internal Hysteresis
- Propagation Delay of 1.1  $\mu$ s
- Pb-Free Packages are Available

### Typical Applications

- Single Cell NiCd/NiMH Battery Powered Applications
- Cellular Telephones
- Alarm and Security Systems
- Personal Digital Assistants

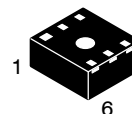


**ON Semiconductor®**

<http://onsemi.com>



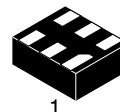
SOT-23-5 (TSOP-5)  
SN SUFFIX  
CASE 483



DFN 2x2.2  
SQL SUFFIX  
CASE 488



SC70-5  
SQ SUFFIX  
CASE 419A



UDFN 1.2x1.0  
MU SUFFIX  
CASE 517AA

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 12 of this data sheet.

### DEVICE MARKING INFORMATION

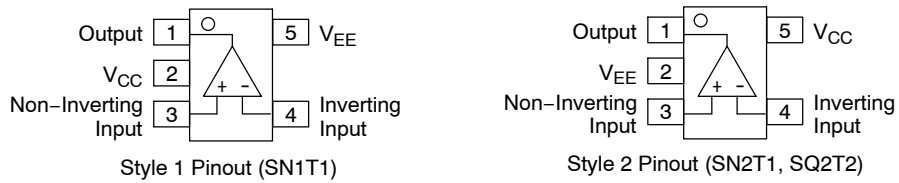
See general marking information in the device marking section on page 13 of this data sheet.

# NCS2200 Series, NCS2200A

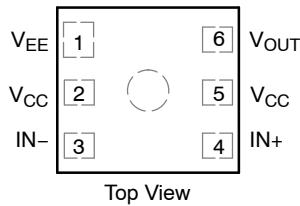
**Table 1. Comparator Selector Guide**

Output Type	Device	Package	Pinout Style
Complementary	NCS2200SN1T1	SOT-23-5	1
Complementary	NCS2200SN2T1	SOT-23-5	2
Complementary	NCS2200SQ2T2	SC70-5	2
Open Drain	NCS2202SN1T1	SOT-23-5	1
Open Drain	NCS2202SQ1T2	SC70-5	1
Open Drain	NCS2202SN2T1	SOT-23-5	2
Open Drain	NCS2202SQ2T2	SC70-5	2
Complementary	NCS2200SQLT1	DFN, 2x2.2	N/A
Complementary	NCS2200AMUT1	UDFN, 1.2x1.0	N/A

### PIN CONNECTIONS



**Figure 1. SOT-23-5 (NCS2200, NCS2202), SC70-5 (NCS2200, NCS2202)**



**Figure 2. DFN 2x2.2 (NCS2200)  
UDFN 1.2x1.0 (NCS2200A)**

## NCS2200 Series, NCS2200A

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Supply Voltage Range ( $V_{CC}$ to $V_{EE}$ )	$V_S$	6.0	V
Non-inverting/Inverting Input to $V_{EE}$	–	–0.2 to ( $V_{CC} + 0.2$ )	V
Operating Junction Temperature	$T_J$	150	°C
Operating Ambient Temperature	$T_A$	–40 to +105	°C
Storage Temperature Range	$T_{stg}$	–65 to +150	°C
Output Short Circuit Duration Time (Note 1)	$t_S$	Indefinite	s
ESD Tolerance (Note 2)	–		V
NCS2200			
Human Body Model		2000	
Machine Model		200	
NCS2202			
Human Body Model		1000	
Machine Model		200	
NCS2200A			
Human Body Model		1900	
Machine Model		200	
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$		°C/W
TSOP-5		238	
DFN (Note 3)		215	
SC70-5		283	
UDFN		350	

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. The maximum package power dissipation limit must not be exceeded.

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

2. ESD data available upon request.
3. For more information, refer to application note, AND8080/D.

## NCS2200 Series, NCS2200A

**ELECTRICAL CHARACTERISTICS** (For all values  $V_{CC} = 0.85\text{ V}$  to  $6.0\text{ V}$ ,  $V_{EE} = 0\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , unless otherwise noted.) (Note 4)

Characteristics	Symbol	NCS2200 Series			Unit
		Min	Typ	Max	
Input Hysteresis $T_A = 25^\circ\text{C}$	$V_{HYS}$	2.0	8.0	20	mV
Input Offset Voltage $V_{CC} = 0.85\text{ V}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 3.0\text{ V}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 6.0\text{ V}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$	$V_{IO}$	-10 -12	0.5 -	+10 +12	mV
Common Mode Voltage Range	$V_{CM}$	-	$V_{EE}$ to $V_{CC}$	-	V
Output Leakage Current (NCS2202) $V_{CC} = 6.0\text{ V}$	$I_{LEAK}$	-	3.3	-	nA
Output Short-Circuit Sourcing or Sinking ( $V_{out} = \text{GND}$ )	$I_{SC}$	-	70	-	mA
Common Mode Rejection Ratio $V_{CM} = V_{CC}$	CMRR	53	65	-	dB
Input Bias Current	$I_{IB}$	-	1.0	-	pA
Power Supply Rejection Ratio $\Delta V_S = 2.575\text{ V}$	PSRR	45	55	-	dB
Supply Current $V_{CC} = 0.85\text{ V}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 3.0\text{ V}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 6.0\text{ V}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$	$I_{CC}$	-	10 -	15 17	$\mu\text{A}$
Output Voltage High (NCS2200) $V_{CC} = 0.85\text{ V}$ , $I_{source} = 0.5\text{ mA}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 3.0\text{ V}$ , $I_{source} = 3.0\text{ mA}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 6.0\text{ V}$ , $I_{source} = 5.0\text{ mA}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$	$V_{OH}$	$V_{CC} - 0.2$ $V_{CC} - 0.225$ $V_{CC} - 0.2$ $V_{CC} - 0.25$ $V_{CC} - 0.2$ $V_{CC} - 0.25$	$V_{CC} - 0.10$ - $V_{CC} - 0.12$ - $V_{CC} - 0.12$ -	- - - -	V
Output Voltage Low $V_{CC} = 0.85\text{ V}$ , $I_{sink} = 0.5\text{ mA}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 3.0\text{ V}$ , $I_{sink} = 3.0\text{ mA}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 6.0\text{ V}$ , $I_{sink} = 5.0\text{ mA}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$	$V_{OL}$	-	$V_{EE} + 0.10$ - $V_{EE} + 0.12$ - $V_{EE} + 0.12$ -	$V_{EE} + 0.2$ $V_{EE} + 0.225$ $V_{EE} + 0.2$ $V_{EE} + 0.25$ $V_{EE} + 0.2$ $V_{EE} + 0.25$	V
Propagation Delay 20 mV Overdrive, $C_L = 15\text{ pF}$	$t_{PHL}$ $t_{PLH}$	-	0.7 1.1	- -	$\mu\text{s}$
Output Fall Time $V_{CC} = 6.0\text{ V}$ , $C_L = 50\text{ pF}$	$t_{FALL}$	-	20	-	ns
Output Rise Time $V_{CC} = 6.0\text{ V}$ , $C_L = 50\text{ pF}$	$t_{RISE}$	-	16	-	ns
Powerup Time	$t_{PU}$	-	35	-	$\mu\text{s}$

4. The limits over the extended temperature range are guaranteed by design only.

## NCS2200 Series, NCS2200A

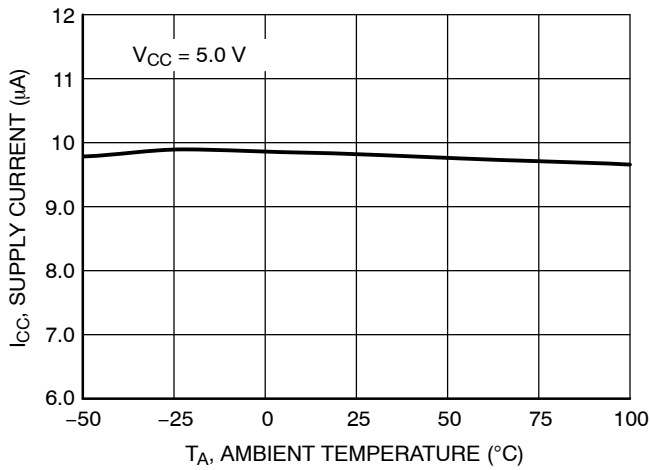
**ELECTRICAL CHARACTERISTICS** (For all values  $V_{CC} = 0.85\text{ V}$  to  $6.0\text{ V}$ ,  $V_{EE} = 0\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , unless otherwise noted.) (Note 5)

Characteristics	Symbol	NCS2200A			Unit
		Min	Typ	Max	
Input Hysteresis $T_A = 25^\circ\text{C}$	$V_{HYS}$	2.0	4.5	20	mV
Input Offset Voltage $V_{CC} = 0.85\text{ V}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 3.0\text{ V}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 6.0\text{ V}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$	$V_{IO}$	-10 -12	0.5 -	+10 +12	mV
Common Mode Voltage Range	$V_{CM}$	-	$V_{EE}$ to $V_{CC}$	-	V
Output Short-Circuit Sourcing or Sinking ( $V_{out} = \text{GND}$ )	$I_{SC}$	-	60	-	mA
Common Mode Rejection Ratio $V_{CM} = V_{CC}$	CMRR	53	70	-	dB
Input Bias Current	$I_{IB}$	-	1.0	-	pA
Power Supply Rejection Ratio $\Delta V_S = 2.575\text{ V}$	PSRR	45	80	-	dB
Supply Current $V_{CC} = 0.85\text{ V}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 3.0\text{ V}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 6.0\text{ V}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$	$I_{CC}$	-	7.5 -	15 17	$\mu\text{A}$
Output Voltage High $V_{CC} = 0.85\text{ V}$ , $I_{source} = 0.5\text{ mA}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 3.0\text{ V}$ , $I_{source} = 3.0\text{ mA}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 6.0\text{ V}$ , $I_{source} = 5.0\text{ mA}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$	$V_{OH}$	$V_{CC} - 0.25$ $V_{CC} - 0.275$	$V_{CC} - 0.10$ -	-	V
Output Voltage Low $V_{CC} = 0.85\text{ V}$ , $I_{sink} = 0.5\text{ mA}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 3.0\text{ V}$ , $I_{sink} = 3.0\text{ mA}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$ $V_{CC} = 6.0\text{ V}$ , $I_{sink} = 5.0\text{ mA}$ $T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C}$ to $105^\circ\text{C}$	$V_{OL}$	-	$V_{EE} + 0.10$ -	$V_{EE} + 0.25$ $V_{EE} + 0.275$	V
Propagation Delay 20 mV Overdrive, $C_L = 15\text{ pF}$	$t_{PHL}$ $t_{PLH}$	-	0.5 0.5	-	$\mu\text{s}$
Output Fall Time $V_{CC} = 6.0\text{ V}$ , $C_L = 50\text{ pF}$ (Note 6)	$t_{FALL}$	-	20	-	ns
Output Rise Time $V_{CC} = 6.0\text{ V}$ , $C_L = 50\text{ pF}$ (Note 6)	$t_{RISE}$	-	16	-	ns

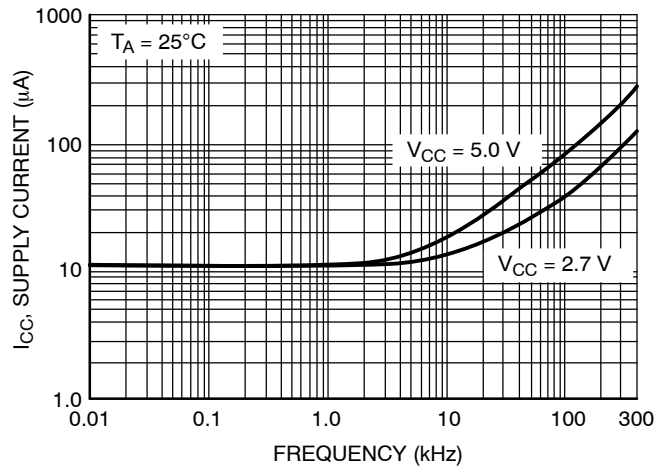
5. The limits over the extended temperature range are guaranteed by design only.

6. Input signal: 1 kHz, squarewave signal with 10 ns edge rate.

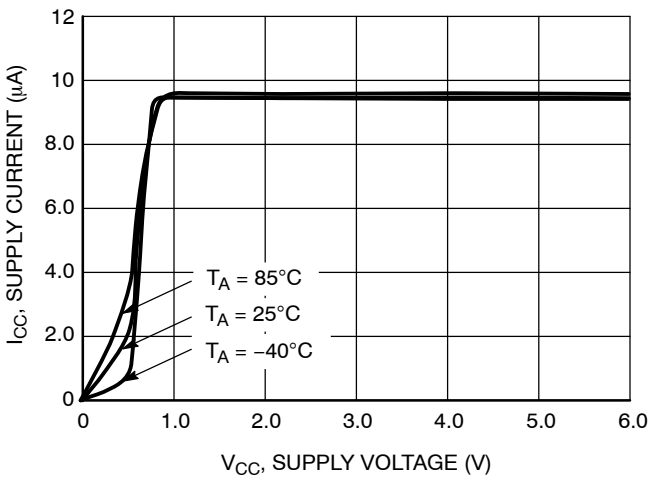
# NCS2200 Series, NCS2200A



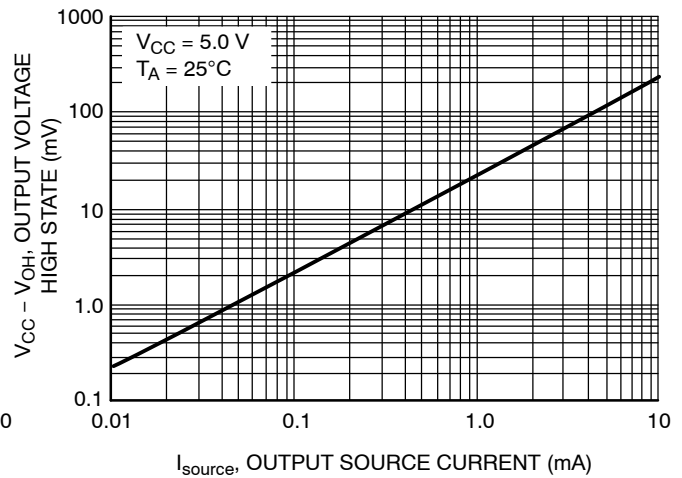
**Figure 1. NCS2200 Series Supply Current versus Temperature**



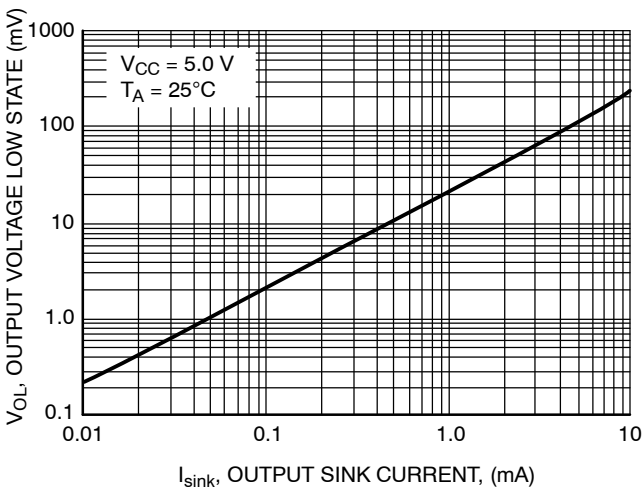
**Figure 2. NCS2200 Series Supply Current versus Output Transition Frequency**



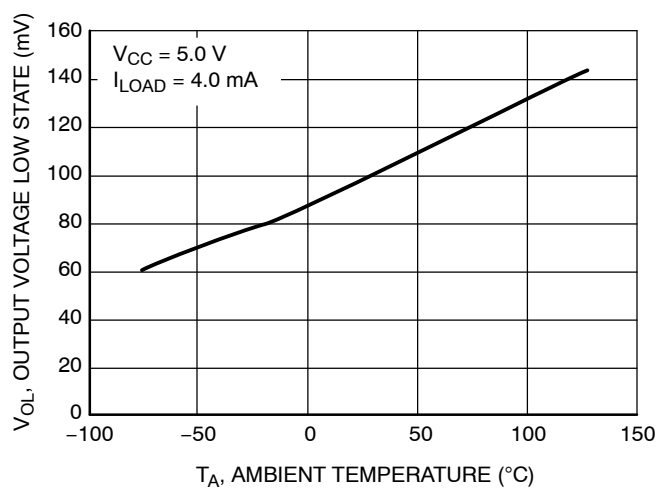
**Figure 3. NCS2200 Series Supply Current versus Supply Voltage**



**Figure 4. NCS2200 Output Voltage High State versus Output Source Current**

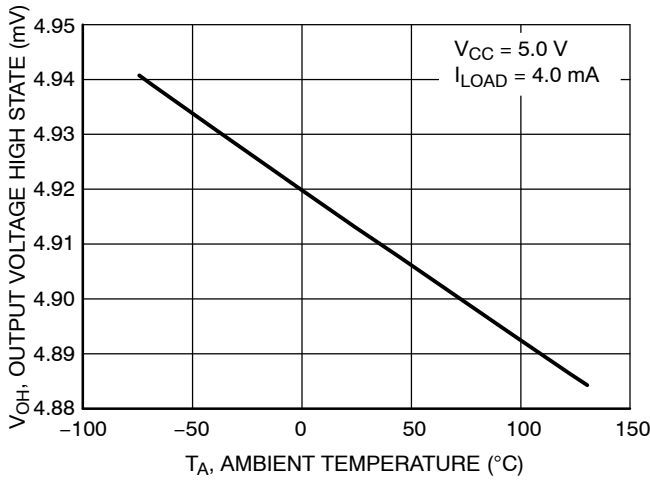


**Figure 5. NCS2200 Series Output Voltage Low State versus Output Sink Current**

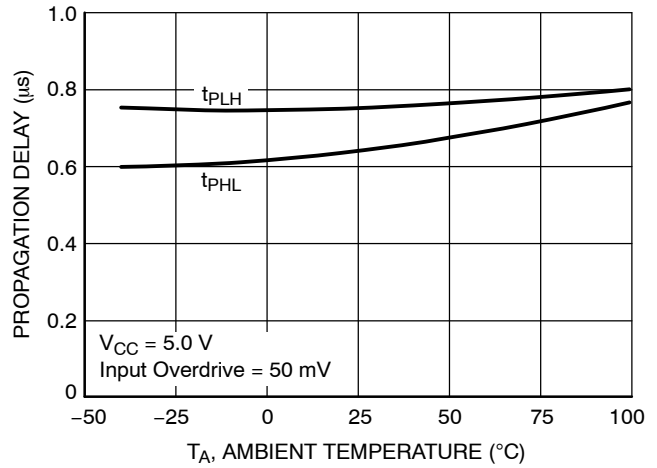


**Figure 6. NCS2200 Series Output Voltage Low State versus Temperature**

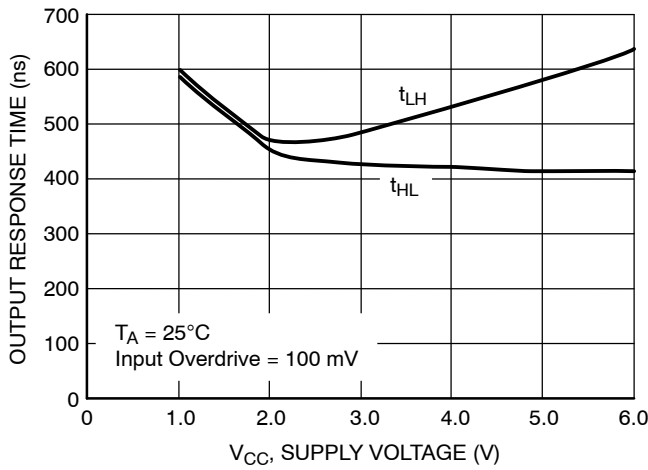
# NCS2200 Series, NCS2200A



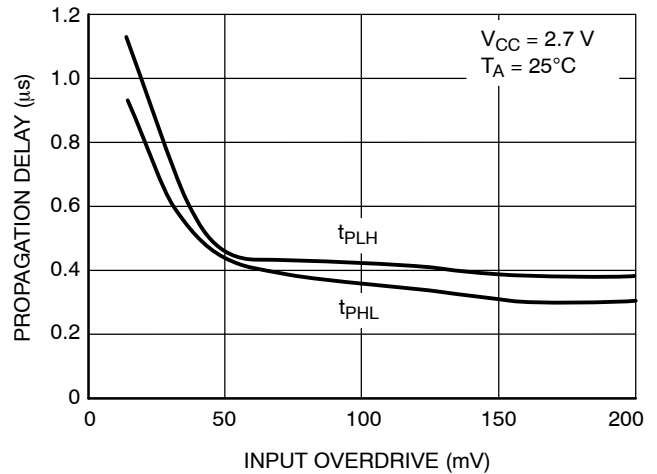
**Figure 7. NCS2200 Series Output Voltage High State versus Temperature**



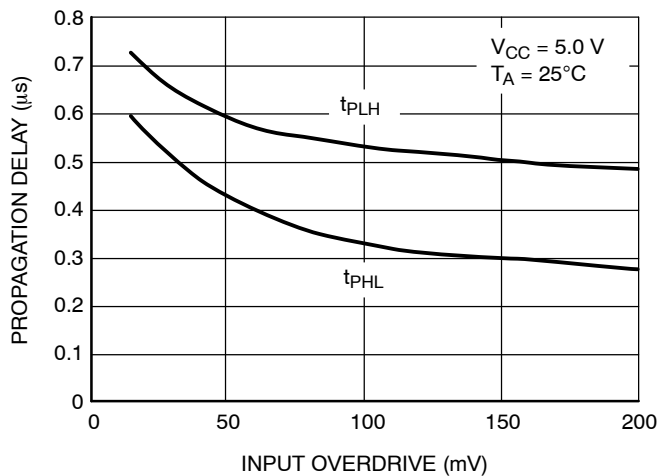
**Figure 8. NCS2200 Series Propagation Delay versus Temperature**



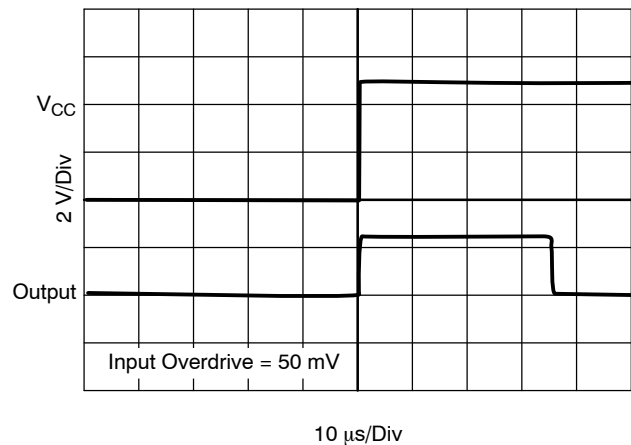
**Figure 9. NCS2200 Series Output Response Time versus Supply Voltage**



**Figure 10. NCS2200 Series Propagation Delay versus Input Overdrive**

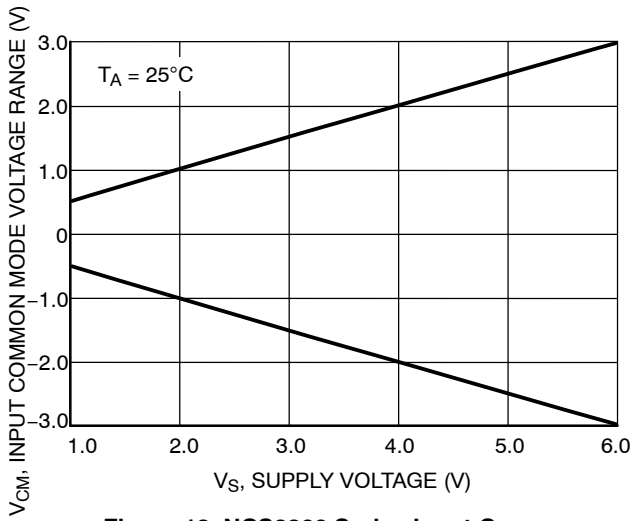


**Figure 11. NCS2200 Series Propagation Delay versus Input Overdrive**

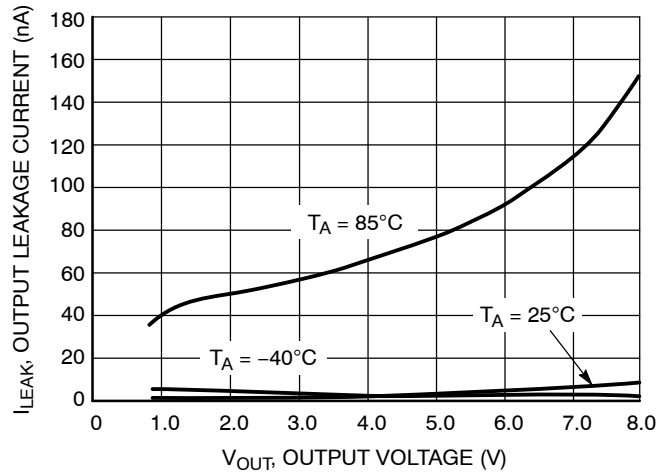


**Figure 12. NCS2200 Series Powerup Delay**

# NCS2200 Series, NCS2200A



**Figure 13. NCS2200 Series Input Common Mode Voltage Range versus Supply Voltage**



**Figure 14. NCS2202 Output Leakage Current versus Output Voltage**



## NCS2200 Series, NCS2200A

### OPERATING DESCRIPTION

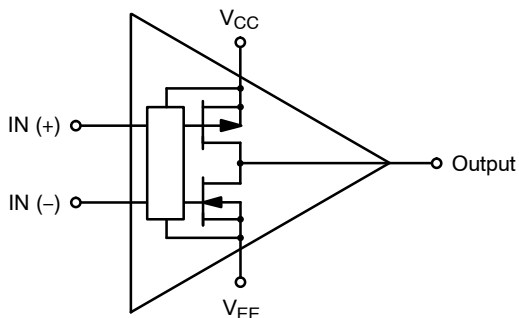
The NCS2200 Series is an industry first sub-one volt, low power comparator family. This series is designed for rail-to-rail input and output performance. These devices consume only 10  $\mu$ A of supply current while achieving a typical propagation delay of 1.1  $\mu$ s at a 20 mV input overdrive. Figures 10 and 11 show propagation delay with various input overdrives. This comparator family is guaranteed to operate at a low voltage of 0.85 V up to 6.0 V. This is accomplished by the use of a modified analog CMOS process that implements depletion MOSFET devices. The common-mode input voltage range extends 0.1 V beyond the upper and lower rail without phase inversion or other adverse effects. This series is available in the SOT-23-5

package. Additionally, the NCS2200 device is available in the tiny DFN 2x2.2 package and the SC70-5 package. NCS2200A is available in UDFN package.

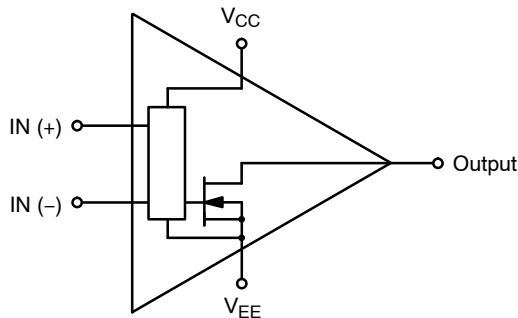
### Output Stage

The NCS2200 has a complementary P and N Channel output stage that has capability of driving a rail-to-rail output swing with a load ranging up to 5.0 mA. It is designed such that shoot-through current is minimized while switching. This feature eliminates the need for bypass capacitors under most circumstances.

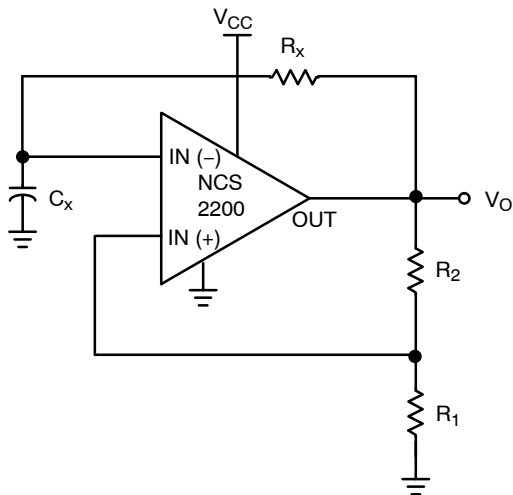
The NCS2202 has an open drain N-channel output stage that can be pulled up to 6.0 V (max) with an external resistor. This facilitates mixed voltage system applications.



**Figure 15. NCS2200SNxT1/NCS2200A Complementary Output Configuration**



**Figure 16. NCS2202SNxT1 Open Drain Output Configuration**

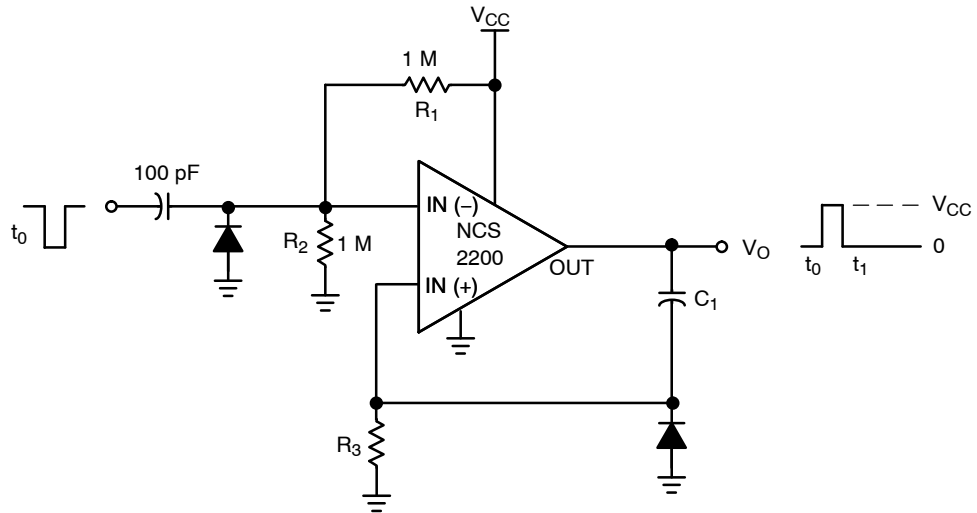


The oscillation frequency can be programmed as follows:

$$f = \frac{1}{T} = \frac{1}{2.2 R_x C_x}$$

**Figure 17. Schmitt Trigger Oscillator**

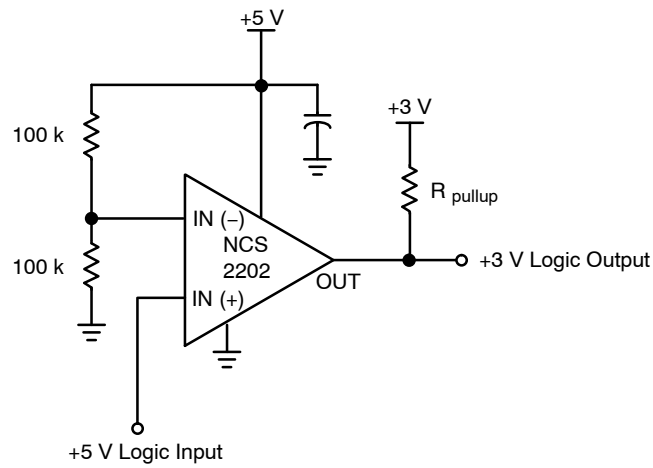
## NCS2200 Series, NCS2200A



The resistor divider  $R_1$  and  $R_2$  can be used to set the magnitude of the input pulse. The pulse width is set by adjusting  $C_1$  and  $R_3$ .

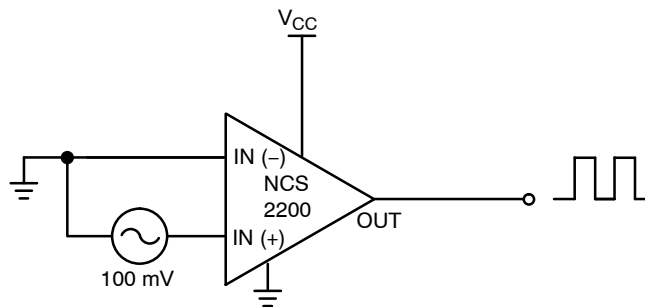
**Figure 18. One-Shot Multivibrator**

## NCS2200 Series, NCS2200A



This circuit converts 5 V logic to 3 V logic. Using the NCS2202/3 allows for full 5 V logic swing without creating overvoltage on the 3 V logic input.

**Figure 19. Logic Level Translator**



**Figure 20. Zero-Crossing Detector**

## NCS2200 Series, NCS2200A

### ORDERING INFORMATION

Device	Pinout Style	Output Type	Package	Shipping†
NCS2200AMUT1G	N/A	Complementary	UDFN (Pb-Free)	3000 / Tape & Reel
NCS2200SN1T1	1	Complementary	SOT-23-5 (TSOP-5)	3000 / Tape & Reel
NCS2200SN1T1G	1	Complementary	SOT-23-5 (TSOP-5) (Pb-Free)	3000 / Tape & Reel
NCS2200SN2T1	2	Complementary	SOT-23-5 (TSOP-5)	3000 / Tape & Reel
NCS2200SN2T1G	2	Complementary	SOT-23-5 (TSOP-5) (Pb-Free)	3000 / Tape & Reel
NCS2200SQ2T2	2	Complementary	SC70-5	3000 / Tape & Reel
NCS2200SQ2T2G	2	Complementary	SC70-5 (Pb-Free)	3000 / Tape & Reel
NCS2200SQLT1	N/A	Complementary	DFN, 2x2.2	3000 / Tape & Reel
NCS2200SQLT1G	N/A	Complementary	DFN, 2x2.2 (Pb-Free)	3000 / Tape & Reel
NCS2202SN1T1	1	Open Drain	SOT-23-5 (TSOP-5)	3000 / Tape & Reel
NCS2202SN1T1G	1	Open Drain	SOT-23-5 (TSOP-5) (Pb-Free)	3000 / Tape & Reel
NCS2202SQ1T2G	1	Open Drain	SC70-5 (Pb-Free)	3000 / Tape & Reel
NCS2202SN2T1	2	Open Drain	SOT-23-5 (TSOP-5)	3000 / Tape & Reel
NCS2202SN2T1G	2	Open Drain	SOT-23-5 (TSOP-5) (Pb-Free)	3000 / Tape & Reel
NCS2202SQ2T2G	2	Open Drain	SC70-5 (Pb-Free)	3000 / Tape & Reel

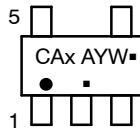
This device contains 93 active transistors.

†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.

# NCS2200 Series, NCS2200A

## MARKING DIAGRAMS

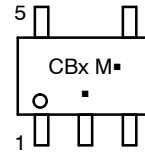
**SOT-23-5  
(TSOP-5)  
SN SUFFIX  
CASE 483**



- x = I for NCS2200SN1T1
- J for NCS2200SN2T1
- M for NCS2202SN1T1
- N for NCS2202SN2T1
- A = Assembly Location
- Y = Year
- W = Work Week
- = Pb-Free Package

(Note: Microdot may be in either location)

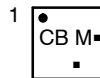
**SC70-5  
SQ SUFFIX  
CASE 419A**



- CBx = Specific Device Code
- x = A for NCS2200SQ2T2
- D for NCS2202SQ1T2G
- E for NCS2202SQ2T2G
- M = Date Code\*
- = Pb-Free Package

(Note: Microdot may be in either location)  
\*Date Code orientation, position, and underbar may vary depending upon manufacturing location.

**DFN6 2x2.2  
SQL SUFFIX  
CASE 488**

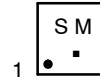


- CB = Specific Device Code
- M = Date Code\*
- = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code overbar and underbar may vary depending upon manufacturing location.

**UDFN6 1.2x1.0  
MU SUFFIX  
CASE 517AA**



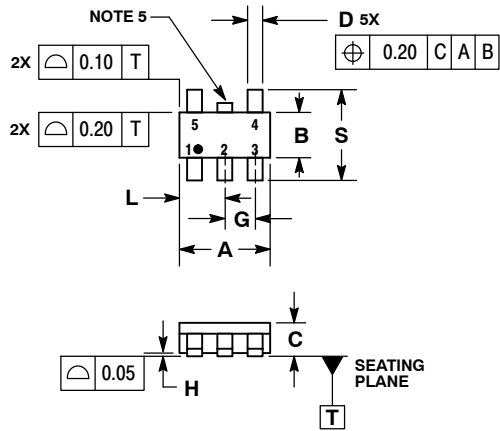
(Top View)

- S = Specific Device Code
- M = Date Code
- = Pb-Free Package

# NCS2200 Series, NCS2200A

## PACKAGE DIMENSIONS

SOT-23-5 / TSOP-5 / SC59-5  
 SN SUFFIX  
 PLASTIC PACKAGE  
 CASE 483-02  
 ISSUE H

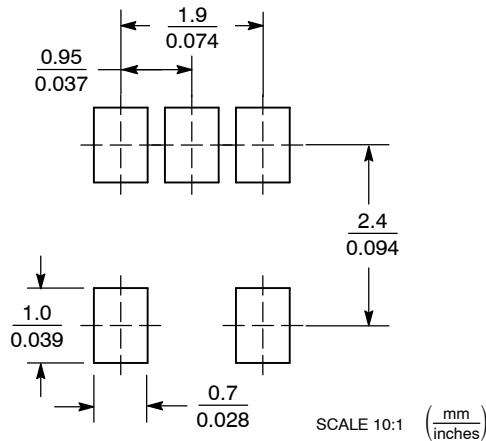


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. OPTIONAL CONSTRUCTION: AN ADDITIONAL TRIMMED LEAD IS ALLOWED IN THIS LOCATION. TRIMMED LEAD NOT TO EXTEND MORE THAN 0.2 FROM BODY.

DIM	MILLIMETERS	
	MIN	MAX
A	3.00	BSC
B	1.50	BSC
C	0.90	1.10
D	0.25	0.50
G	0.95	BSC
H	0.01	0.10
J	0.10	0.26
K	0.20	0.60
L	1.25	1.55
M	0°	10°
S	2.50	3.00

### SOLDERING FOOTPRINT\*

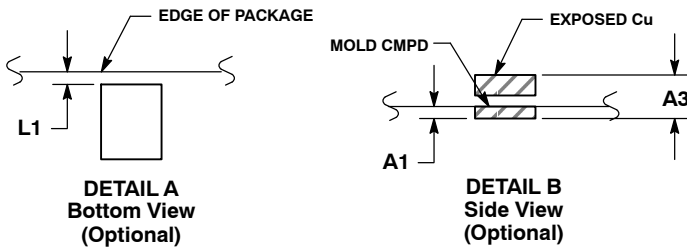
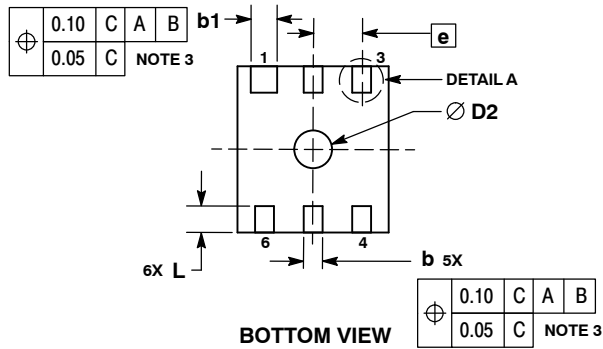
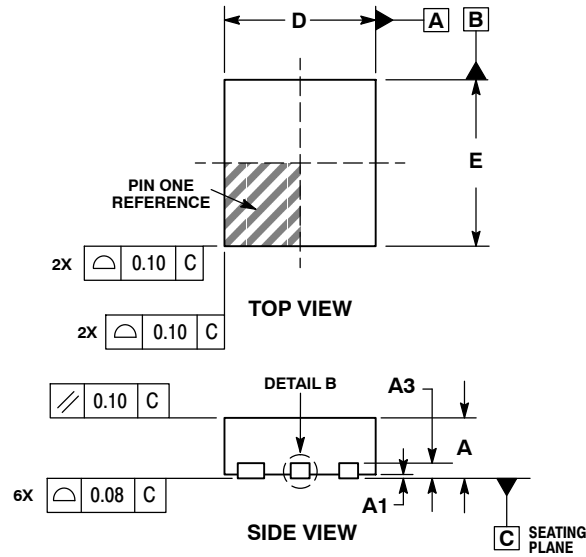


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# NCS2200 Series, NCS2200A

## PACKAGE DIMENSIONS

DFN6, 2x2.2  
SQL SUFFIX  
CASE 488-03  
ISSUE G

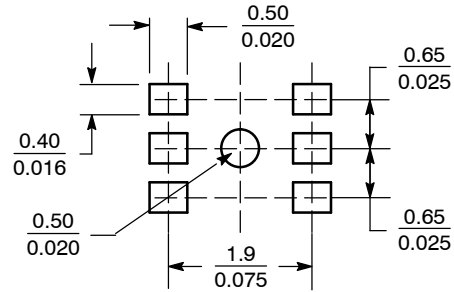


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
5. TERMINAL b MAY HAVE MOLD COMPOUND MATERIAL ALONG SIDE EDGE.
6. DETAILS A AND B SHOW OPTIONAL VIEWS FOR END OF TERMINAL LEAD AT EDGE OF PACKAGE AND SIDE EDGE OF PACKAGE.

DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.80	0.90	1.00
A1	0.00	0.03	0.05
A3	0.20 REF		
b	0.20	0.25	0.30
b1	0.30	0.35	0.40
D	2.00 BSC		
D2	0.40	0.50	0.60
E	2.20 BSC		
e	0.65 BSC		
L	0.30	0.35	0.40
L1	0.00	0.05	0.10

**SOLDERING FOOTPRINT\***



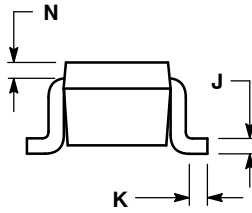
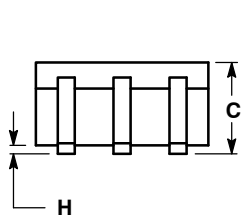
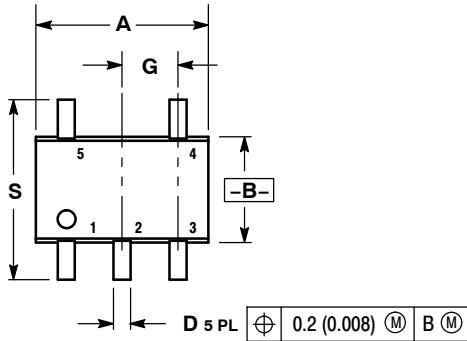
SCALE 10:1

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

# NCS2200 Series, NCS2200A

## PACKAGE DIMENSIONS

SC70-5/SC88A (SOT-353)  
SQ SUFFIX  
CASE 419A-02  
ISSUE J

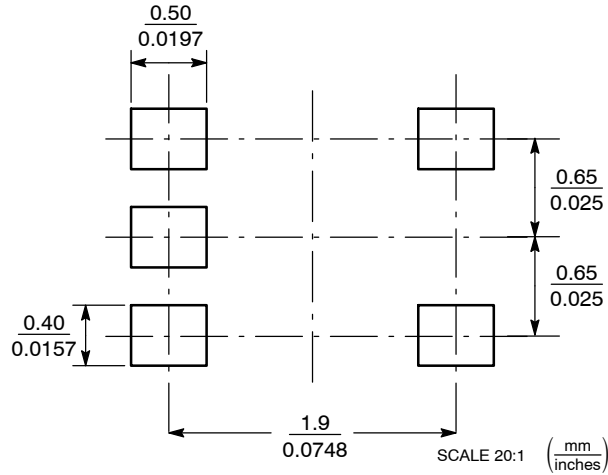


NOTES:

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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

### SOLDERING FOOTPRINT\*



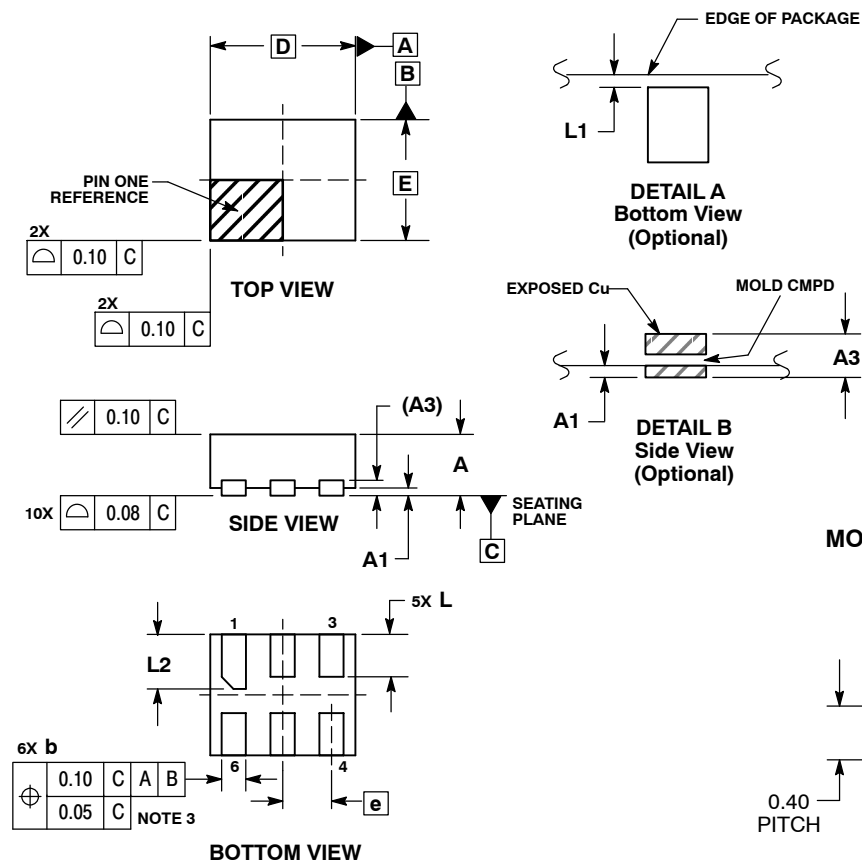
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



# NCS2200 Series, NCS2200A

## PACKAGE DIMENSIONS

UDFN6, 1.2x1.0, 0.4P  
CASE 517AA-01  
ISSUE C

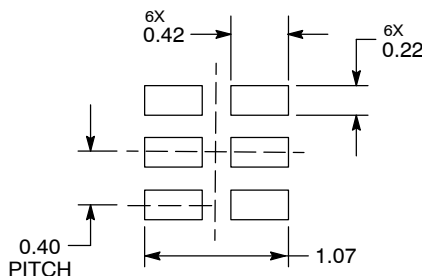


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

MILLIMETERS		
DIM	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.127	REF
b	0.15	0.25
D	1.20	BSC
E	1.00	BSC
e	0.40	BSC
L	0.30	0.40
L1	0.00	0.15
L2	0.40	0.50

### MOUNTING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

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

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

### PUBLICATION ORDERING INFORMATION

#### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free  
USA/Canada  
Europe, Middle East and Africa Technical Support:  
Phone: 421 33 790 2910  
Japan Customer Focus Center  
Phone: 81-3-5773-3850

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative