

NCS3402

Dual Nano-power Open Drain Output Comparator

The NCS3402 is a nano-power comparator consuming only 470 nA per channel supply current, which make this device ideal for battery power and wireless handset applications.

The NCS3402 has a minimum operating supply voltage of 2.7 V over the extended industrial temperature range ($T_A = -40^{\circ}\text{C}$ to 125°C), while having an input common-mode range of -0.1 to $V_{CC} + 5$ V.

The ultra low supply current makes the NCS3402 an ideal choice for battery powered and portable applications where quiescent current is the primary concern. Reverse battery protection guards the amplifier from an over-current condition due to improper battery installation. For harsh environments, the inputs can be taken 5 V above the positive supply rail without damage to the device.

Features

- Low Supply Current / 470 nA/Per Channel
 - ◆ Input Common-Mode Range exceeds the rails
 - ◆ -0.1 V to $V_{CC} + 5$ V
- Supply Voltage Range / 2.5 V to 16 V
- Reverse Battery Protection Up to 18 V
- Open Drain CMOS Output Stage
- Specified Temperature Range
 - ◆ -40°C to 125°C
- This is a Pb-Free Device

Typical Applications

- Voltage Sense Circuit
- PSU Monitoring Circuit
- Wireless Handsets
- Portable Medical Equipment



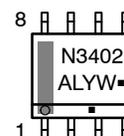
ON Semiconductor®

<http://onsemi.com>

MARKING DIAGRAMS



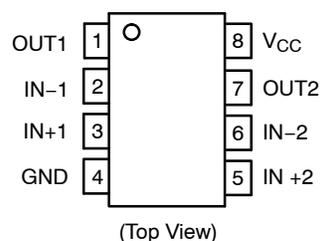
SOIC-8
D SUFFIX
CASE 751



A = Assembly Location
L = Wafer Lot
Y = Year
W = Work Week
▪ = Pb-Free Package

(Note: Microdot may be in either location)

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

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PIN FUNCTION DESCRIPTION

Pin No.	Pin Name	Description
1	OUT1	Channel 1 Output
2	IN-1	Channel 1 Inverting Input
3	IN+2	Channel 2 Non-Inverting Input
4	GND	Ground
5	IN+2	Channel 2 Non-Inverting Input
6	IN-2	Channel 2 Inverting Input
7	OUT2	Channel 2 Output
8	V _{CC}	Power Supply

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Supply Voltage	V _{CC}	17	V
Differential Input Voltage	V _{ID}	±20	V
Input Voltage Range (Notes 1 and 2)	V _{IN}	0 to V _{CC} + 5	V
Input Current Range	I _{IN}	±10	mA
Output Current Range	I _O	±10	mA
Operating Free-Air Temperature Range	T _A	-40 to +125	°C
Maximum Junction Temperature	T _J	150	°C
Storage Temperature Range	T _{STG}	-65 to 150	°C
Lead Temperature 1.6 mm (1/16 inch) from case for 10 seconds	T _{SLD}	260	°C

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. All voltage values, except differential voltages, are respect to GND
2. Input voltage range is limited to 20V or V_{CC} +5 V whichever is smaller

ESD RATINGS

Rating	Symbol	Value	Unit
Human Body Model	HBM	2000	V
Machine Model	MM	200	

THERMAL CHARACTERISTICS

Rating	Symbol	Value	Unit
Thermal Characteristics Thermal Resistance, Junction-to-Air SOIC8	R _{θJA}	176	°C/W

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Max	Unit	
Supply voltage	V _{CC}	Single supply	2.7	16	V
		Split supply	±1.35	±8	
Common-mode input voltage range	V _{ICR}	-0.1	V _{CC} +5	V	
Operating free-air temperature	T _A	-40	125	°C	

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DC PERFORMANCE ELECTRICAL CHARACTERISTICS AT SPECIFIED OPERATING FREE-AIR TEMPERATURE,

$V_{CC} = 2.7\text{ V}, 5\text{ V}, 15\text{ V}$ (unless otherwise noted)

Parameter	Symbol	Testing Conditions	T_A	Min	Typ	Max	Unit
Input offset voltage	V_{IO}	$V_{IC} = V_{CC}/2, R_S = 50\ \Omega, R_P = 1\text{ M}\Omega$	25°C		250	3600	μV
			Full range			4400	
Offset voltage drift	αV_{IO}		25°C		3		$\mu\text{V}/^\circ\text{C}$
Common-mode rejection ratio	CMRR	$V_{IC} = 0\text{ to }2.7\text{ V}, R_S = 50\ \Omega$	25°C	55	72		dB
			Full range	50			
		$V_{IC} = 0\text{ to }5\text{ V}, R_S = 50\ \Omega$	25°C	60	76		
			Full range	55			
		$V_{IC} = 0\text{ to }15\text{ V}, R_S = 50\ \Omega$	25°C	65	88		
			Full range	60			
Large-signal differential voltage amplification	A_{VD}	$R_P = 1\text{ M}\Omega$	25°C		1000		V/mV

INPUT/OUTPUT CHARACTERISTICS SPECIFIED OPERATING FREE-AIR TEMPERATURE,

$V_{CC} = 2.7\text{ V}, 5\text{ V}, 15\text{ V}$ (unless otherwise noted)

Input offset current (Note 3)	I_{IO}	$V_{IC} = V_{CC}/2, R_P = 1\text{ M}\Omega, R_S = 50\ \Omega$	25°C		20	100	pA
			Full range			1000	
Input bias current (Note 3)	I_{IB}		25°C		80	250	pA
			Full range			3000	
Differential input resistance	R_{ID}	$V_{in} = V_{CC}/2$	25°C		300		$\text{M}\Omega$
High-impedance output leakage current	I_{OZ}	$V_{IC} = V_{CC}/2, V_O = V_{CC}, V_{ID} = 1\text{ V}$	25°C		50		pA
Low-level output voltage	V_{OL}	$V_{IC} = V_{CC}/2, I_{OL} = 2\ \mu\text{A}, V_{ID} = -1\text{ V}$	25°C		8		mV
			25°C		80	200	
				Full range			

POWER SUPPLY SPECIFIED OPERATING FREE-AIR TEMPERATURE, $V_{CC} = 2.7\text{ V}, 5\text{ V}, 15\text{ V}$ (unless otherwise noted)

Supply current (per channel)	I_{CC}	$R_P = \text{No pullup}$	Output state low	25°C		470	550	nA
				Full range			750	
			Output state high	25°C		560	640	
				Full range			950	
Power supply rejection ratio	PSRR	$V_{IC} = V_{CC}/2, \text{ No load}$	$V_{CC} = 2.7\text{ V to }5\text{ V}$	25°C	75	100	dB	
				Full range	70			
			$V_{CC} = 5\text{ V to }15\text{ V}$	25°C	85	105		
				Full range	80			

3. Guaranteed by design or characterization.

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DC PERFORMANCE ELECTRICAL CHARACTERISTICS AT SPECIFIED OPERATING FREE-AIR TEMPERATURE,

$V_{CC} = 2.7\text{ V}, 5\text{ V}, 15\text{ V}$ (unless otherwise noted)

Parameter	Symbol	Testing Conditions	T_A	Min	Typ	Max	Unit
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SWITCHING CHARACTERISTICS AT RECOMMENDED OPERATING CONDITIONS,

$V_{CC} = 2.7\text{ V}, 5\text{ V}, 15\text{ V}, T_A = 25^\circ\text{C}$ (unless otherwise noted)

Propagation delay time, low-to-high-level	$t_{(PLH)}$	f = 10 kHz, VSTEP = 100 mV, $R_P = 1\text{ M}\Omega$, $C_L = 10\text{ pF}$	Overdrive = 2 mV	25°C		220		μs
			Overdrive = 10 mV			85		
			Overdrive = 50 mV			30		
Propagation delay time, high-to-low-level output	$t_{(PHL)}$		Overdrive = 2 mV	25°C		250		
			Overdrive = 10 mV			55		
			Overdrive = 50 mV			18		
Fall time	tf	$R_P = 1\text{ M}\Omega, C_L = 10\text{ pF}$	25°C		5		μs	

ORDERING INFORMATION

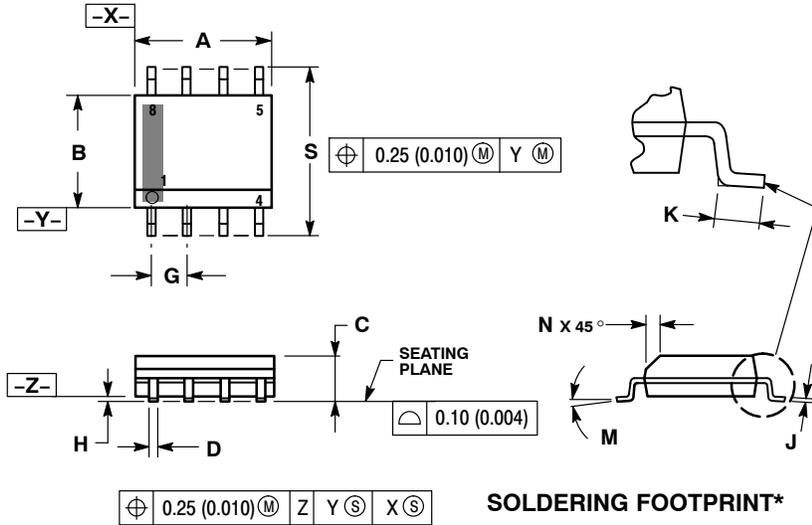
Device	Package	Shipping [†]
NCS3402DR2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel

[†]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.

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PACKAGE DIMENSIONS

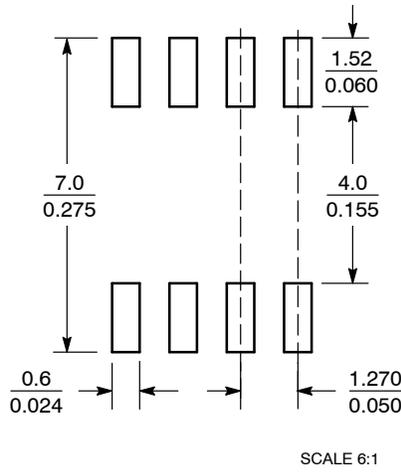
SOIC-8 NB
CASE 751-07
ISSUE AK



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244



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

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