NCS2372

Operational Amplifier, 1.0 A, Dual

The NCS2372 is a monolithic circuit intended for use as a power operational amplifier in a wide range of applications, including servo amplifiers and power supplies. No deadband crossover distortion provides better performance for driving coils.

Features

- Output Current to 1.0 A
- Slew Rate of 1.3 V/μs
- Wide Bandwidth of 1.1 MHz
- Internal Thermal Shutdown
- Single or Split Supply Operation
- Excellent Gain and Phase Margins
- Common Mode Input Includes Ground
- Zero Deadband Crossover Distortion
- These Devices are Pb−Free and are RoHS Compliant

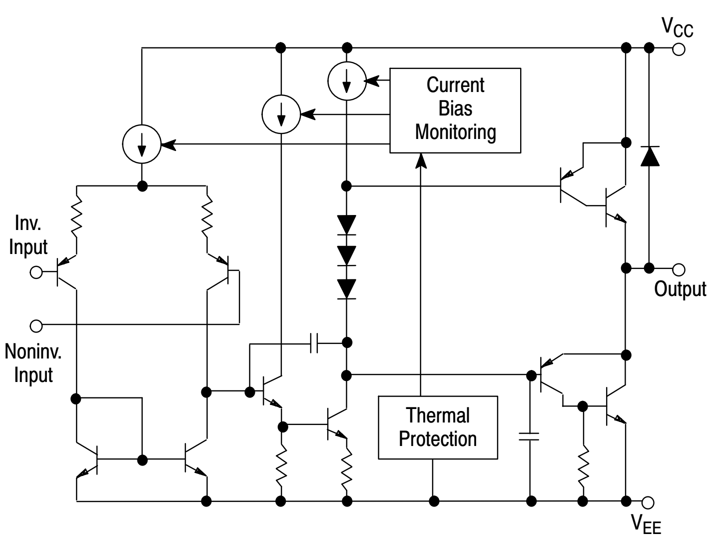

Figure 1. Representative Block Diagram

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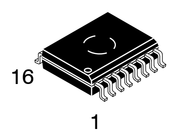
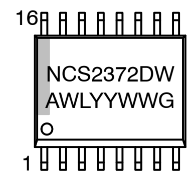
MARKING DIAGRAM



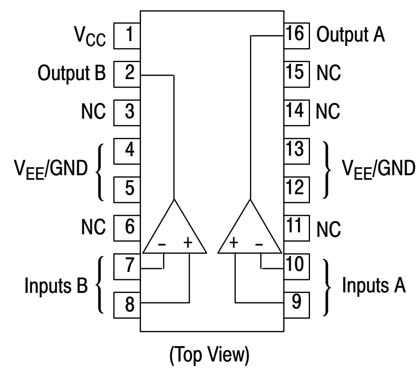
SOIC−16W
DW SUFFIX
CASE 751G



A	= Assembly Location
WL	= Wafer Lot
YY	= Year
WW	= Work Week
G	= Pb−Free Package

PIN CONNECTIONS

SOIC−16W



ORDERING INFORMATION

Device	Package	Shipping†
NCS2372DWR2G	SOIC−16W (Pb−Free)	1000/Tape & Reel

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

July, 2013 − Rev. 1
Publication Order Number:
NCS2372/D

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Supply Voltage (from V_{CC} to V_{EE})	V_S	40	V
Input Differential Voltage Range	V_{IDR}	Note 1	V
Input Voltage Range	V_{IR}	Note 1	V
Junction Temperature (Note 2)	T_J	+150	°C
Operating Temperature Range	T_A	−40 to +125	°C
Storage Temperature Range	T_{stg}	−55 to +150	°C
DC Output Current	I_O	1.0	A
Peak Output Current (Nonrepetitive) > 1 ms Duration < 1 ms Duration (Note 3)	$I_{(max)}$	 1.5 2.0	A
Thermal Resistance, Junction−to−Air	$R_{\theta JA}$	80	°C/W
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	12	°C/W

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. Either or both input voltages should not exceed the magnitude of V_{CC} or V_{EE}.
2. Power dissipation must be considered to ensure maximum junction temperature (T_J) is not exceeded.
3. When driving inductive loads, negative flyback voltage/current excursions may need to be constrained with Schottky diodes to protect the output drivers.

DC ELECTRICAL CHARACTERISTICS (V_{CC} = +15 V, V_{EE} = –15 V, R_L connected to ground, T_A = –40° to +125°C.)

Characteristics	Symbol	Min	Typ	Max	Unit
Input Offset Voltage (V_{CM} = 0) T_A = +25°C T_A, T_{low} to T_{high}	V_{IO}	 – –	 1.0 –	 15 20	mV
Average Temperature Coefficient of Offset Voltage	$\Delta V_{IO}/\Delta T$	–	20	–	µV/°C
Input Bias Current (V_{CM} = 0)	I_{IB}	–	100	500	nA
Input Offset Current (V_{CM} = 0)	I_{IO}	–	10	50	nA
Large Signal Voltage Gain V_O = ±10 V, R_L = 2.0 k	A_{VOL}	30	100	–	V/mV
Output Voltage Swing (I_L = 100 mA) T_A = +25°C T_A = T_{low} to T_{high} T_A = +25°C T_A = T_{low} to T_{high}	V_{OH} V_{OL}	 14.0 13.9 – –	 14.2 – –14.2 –	 – – –14.0 –13.9	V
Output Voltage Swing (I_L = 1.0 A) V_{CC} = +24 V, V_{EE} = 0 V, T_A = +25°C V_{CC} = +24 V, V_{EE} = 0 V, T_A = T_{low} to T_{high} V_{CC} = +24 V, V_{EE} = 0 V, T_A = +25°C V_{CC} = +24 V, V_{EE} = 0 V, T_A = T_{low} to T_{high}	V_{OH} V_{OL}	 22.5 22.5 – –	 22.7 – 1.3 –	 – – 1.5 1.6	V
Input Common Mode Voltage Range T_A = +25°C T_A = T_{low} to T_{high}	V_{ICR}	 V_{EE} to (V_{CC} –1.0) V_{EE} to (V_{CC} –1.3)			V
Common Mode Rejection Ratio (R_S = 10 k)	CMRR	70	90	–	dB
Power Supply Rejection Ratio (R_S = 100 Ω)	PSRR	70	90	–	dB
Power Supply Current T_A = +25°C T_A = T_{low} to T_{high}	I_D	 – –	 8.0 –	 10 14	mA

AC ELECTRICAL CHARACTERISTICS (V_{CC} = +15 V, V_{EE} = –15 V, R_L connected to ground, T_A = +25°C, unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Slew Rate (V_{in} = –10 V to +10 V, R_L = 2.0 k, C_L = 100 pF) A_V = –1.0, T_A = T_{low} to T_{high}	SR	1.0	1.4	–	V/µs
Gain Bandwidth Product (f = 100 kHz, C_L = 100 pF, R_L = 2.0 k) T_A = 25°C T_A = T_{low} to T_{high}	GBW	 0.9 0.7	 1.4 –	 – –	MHz
Phase Margin T_J = T_{low} to T_{high} R_L = 2.0 k, C_L = 100 pF	ϕ_m	–	65	–	Degrees
Gain Margin R_L = 2.0 k, C_L = 100 pF	A_m	–	15	–	dB
Equivalent Input Noise Voltage R_S = 100 Ω, f = 1.0 to 100 kHz	e_n	–	22	–	$nV/\sqrt{Hz}$
Total Harmonic Distortion A_V = –1.0, R_L = 50 Ω, V_O = 0.5 VRMS, f = 1.0 kHz	THD	–	0.02	–	%

NOTE**:** In case V_{EE} is disconnected before V_{CC}, a diode between V_{EE} and Ground is recommended to avoid damaging the device.

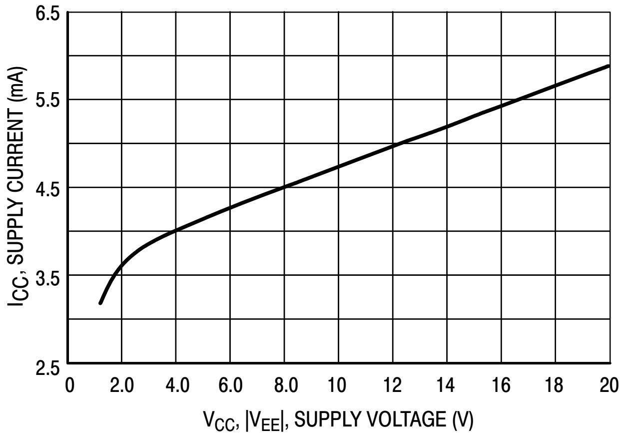


Figure 2. Supply Current versus Supply Voltage with No Load

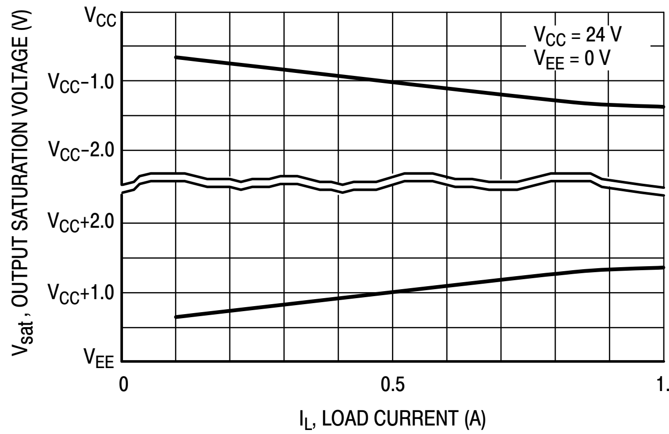


Figure 3. Output Saturation Voltage versus Load Current

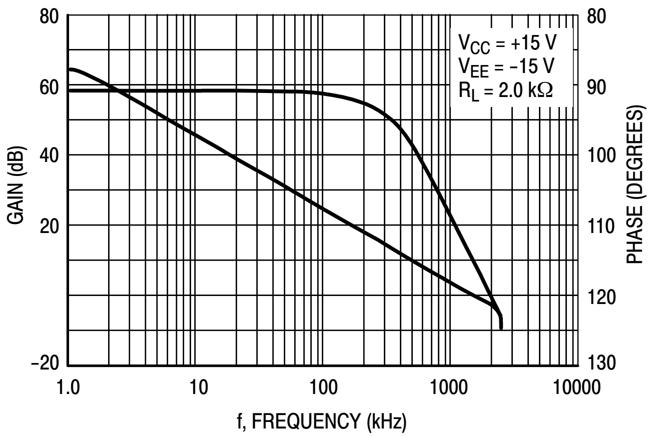


Figure 4. Voltage Gain and Phase versus Frequency

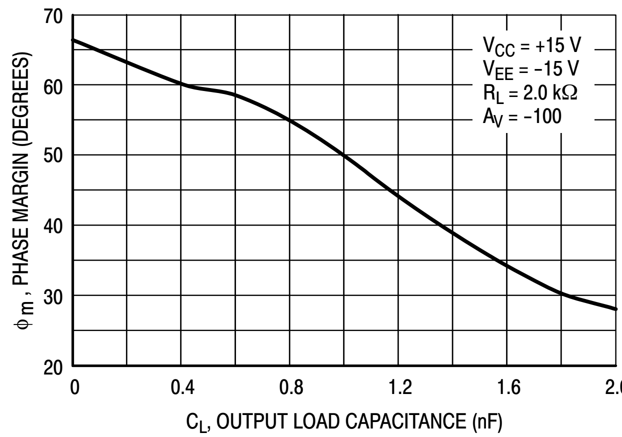


Figure 5. Phase Margin versus Output Load Capacitance

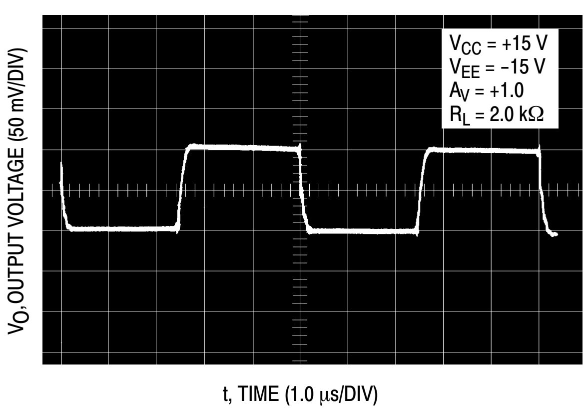


Figure 6. Small Signal Transient Response

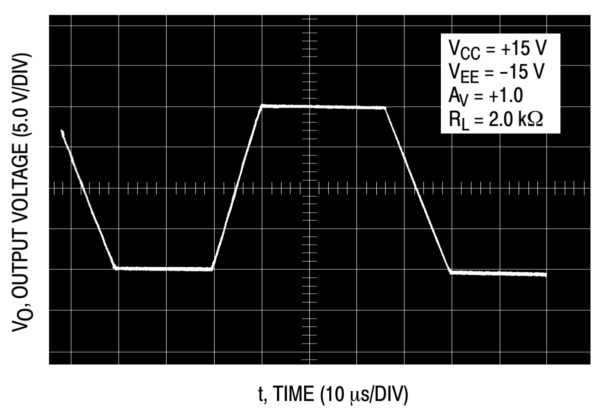


Figure 7. Large Signal Transient Response

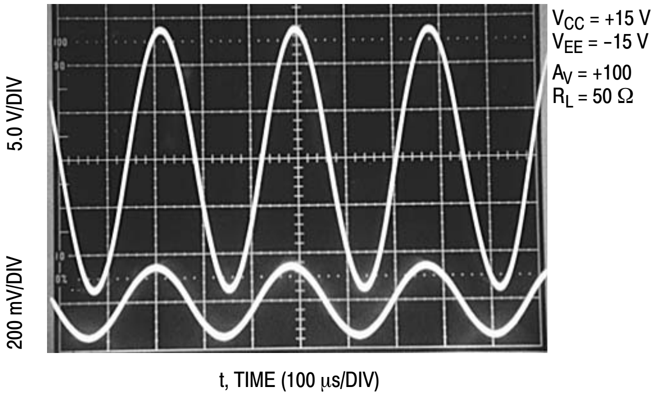


Figure 8. Sine Wave Response

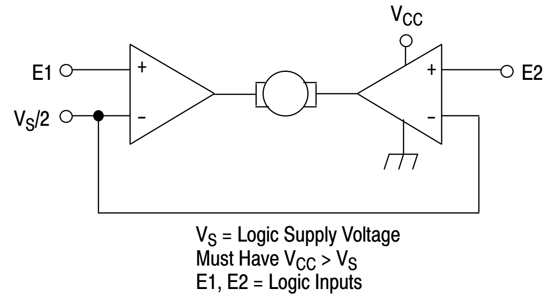
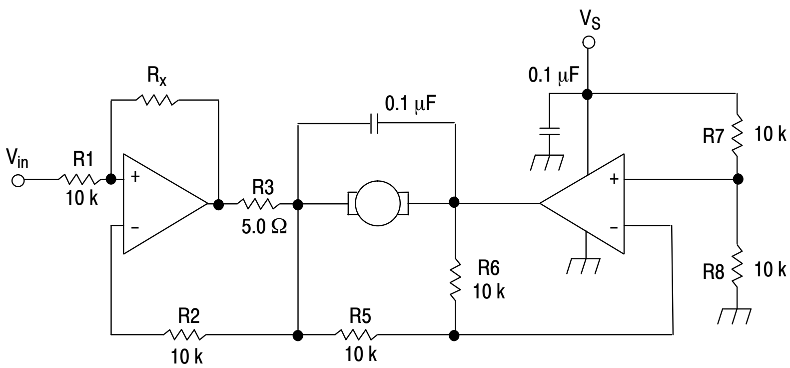


Figure 9. Bidirectional DC Motor Control with Microprocessor−Compatible Inputs

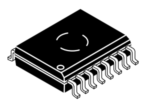


For circuit stability, ensure that $R_x > \frac{2R3 \cdot R1}{R_M}$ where, R_M = internal resistance of motor.

The voltage available at the terminals of the motor is: $V_M = 2\left(V_1 - \frac{V_S}{2}\right) + |R_o| \cdot I_M$

where, $|R_o| = \frac{2R3 \cdot R1}{R_x}$ and I_M is the motor current.

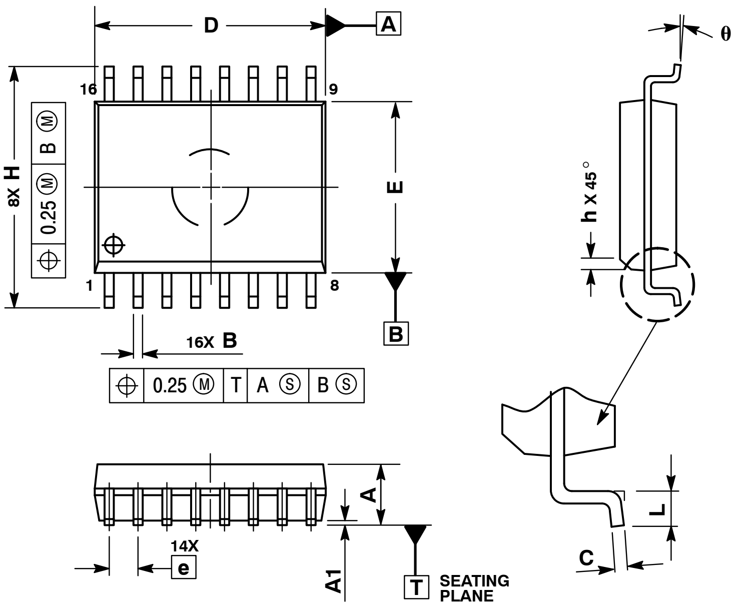
Figure 10. Bidirectional Speed Control of DC Motors



SCALE 1:1

SOIC−16 WB
CASE 751G−03
ISSUE D

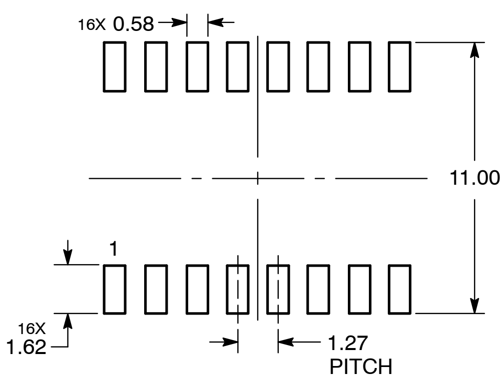
DATE 12 FEB 2013



NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INLCUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF THE B DIMENSION AT MAXIMUM MATERIAL CONDITION.

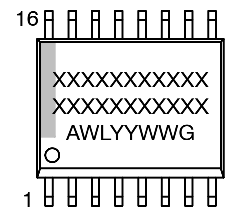
	MILLIMETERS	
DIM	MIN	MAX
A	2.35	2.65
A1	0.10	0.25
B	0.35	0.49
C	0.23	0.32
D	10.15	10.45
E	7.40	7.60
e	1.27 BSC	
H	10.05	10.55
h	0.25	0.75
L	0.50	0.90
q	0 °	7 °

SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
YY = Year
WW = Work Week
G = Pb−Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “ ▪”, may or may not be present.

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DESCRIPTION:	SOIC−16 WB	PAGE 1 OF 1

PUBLICATION ORDERING INFORMATION

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