

NCS2372

1.0 A Output Current, Dual Power Operational Amplifiers

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/ μ s
- 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

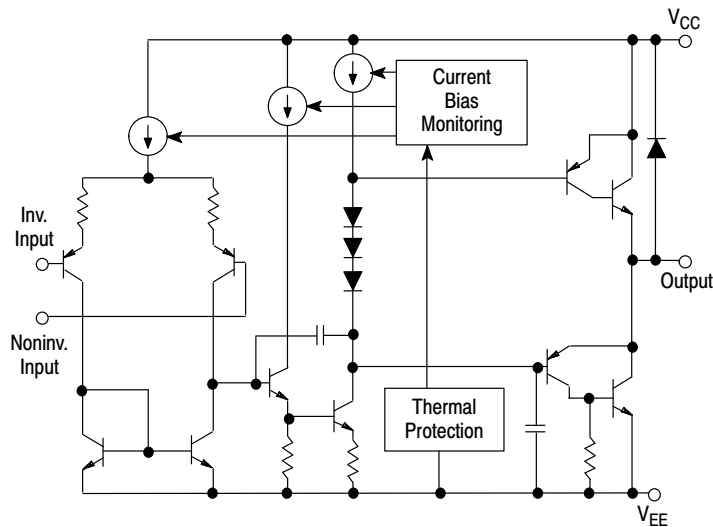


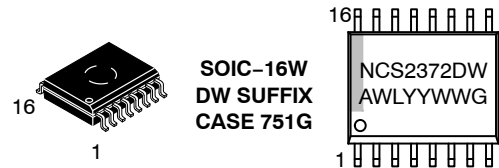
Figure 1. Representative Block Diagram



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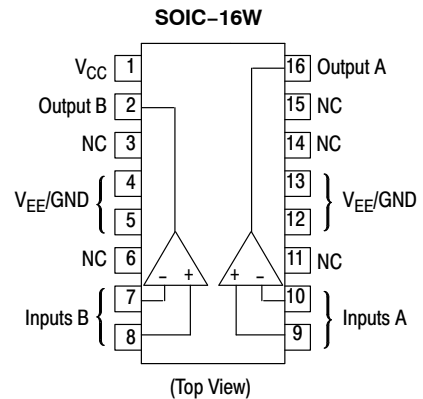
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MARKING DIAGRAM



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

PIN CONNECTIONS



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.

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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.

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DC ELECTRICAL CHARACTERISTICS ($V_{CC} = +15\text{ V}$, $V_{EE} = -15\text{ V}$, R_L connected to ground, $T_A = -40^\circ$ to $+125^\circ\text{C}$.)

| Characteristics | Symbol | Min | Typ | Max | Unit |
|---|--------------------------|--|-----------|---------------------|------------------------------|
| Input Offset Voltage ($V_{CM} = 0$) $T_A = +25^\circ\text{C}$ 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 | - | $\mu\text{V}/^\circ\text{C}$ |
| 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 $V_O = \pm 10\text{ V}$, $R_L = 2.0\text{ k}$ | A_{VOL} | 30 | 100 | - | V/mV |
| Output Voltage Swing ($I_L = 100\text{ mA}$) $T_A = +25^\circ\text{C}$ $T_A = T_{low}$ to T_{high} $T_A = +25^\circ\text{C}$ $T_A = T_{low}$ to T_{high} | V_{OH} V_{OL} | 14.0 13.9 | 14.2 - | - -14.0 -13.9 | V |
| Output Voltage Swing ($I_L = 1.0\text{ A}$) $V_{CC} = +24\text{ V}$, $V_{EE} = 0\text{ V}$, $T_A = +25^\circ\text{C}$ $V_{CC} = +24\text{ V}$, $V_{EE} = 0\text{ V}$, $T_A = T_{low}$ to T_{high} $V_{CC} = +24\text{ V}$, $V_{EE} = 0\text{ V}$, $T_A = +25^\circ\text{C}$ $V_{CC} = +24\text{ V}$, $V_{EE} = 0\text{ V}$, $T_A = T_{low}$ to T_{high} | V_{OH} V_{OL} | 22.5 22.5 | 22.7 - | - 1.5 1.6 | V |
| Input Common Mode Voltage Range $T_A = +25^\circ\text{C}$ $T_A = T_{low}$ to T_{high} | V_{ICR} | V_{EE} to $(V_{CC} - 1.0)$ V_{EE} to $(V_{CC} - 1.3)$ | | | V |
| Common Mode Rejection Ratio ($R_S = 10\text{ k}$) | CMRR | 70 | 90 | - | dB |
| Power Supply Rejection Ratio ($R_S = 100\ \Omega$) | PSRR | 70 | 90 | - | dB |
| Power Supply Current $T_A = +25^\circ\text{C}$ $T_A = T_{low}$ to T_{high} | I_D | - | 8.0 | 10 14 | mA |

AC ELECTRICAL CHARACTERISTICS ($V_{CC} = +15\text{ V}$, $V_{EE} = -15\text{ V}$, R_L connected to ground, $T_A = +25^\circ\text{C}$, unless otherwise noted.)

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

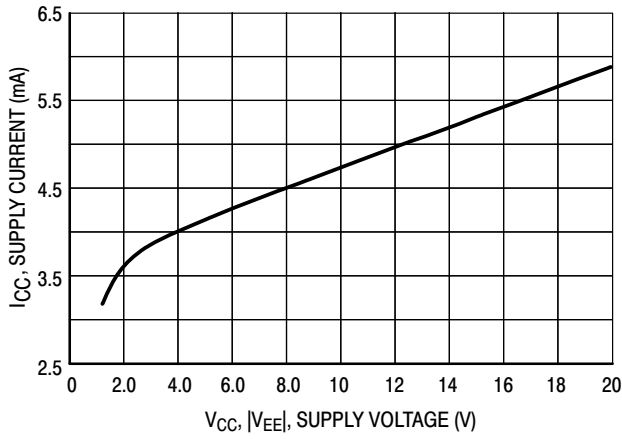


Figure 2. Supply Current versus Supply Voltage with No Load

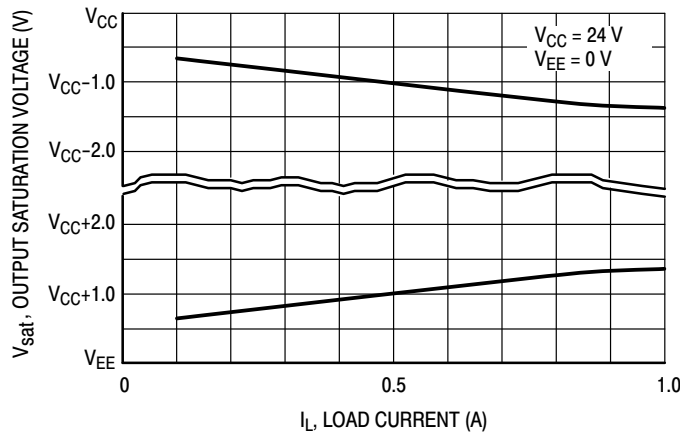


Figure 3. Output Saturation Voltage versus Load Current

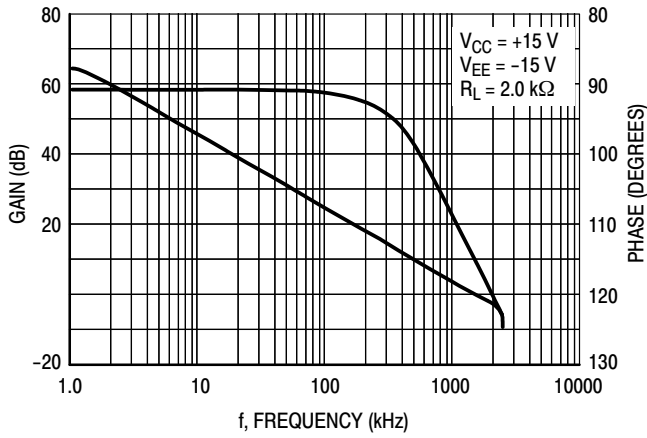


Figure 4. Voltage Gain and Phase versus Frequency

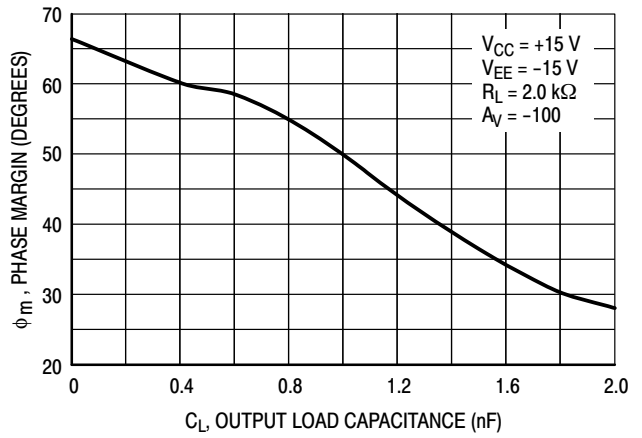


Figure 5. Phase Margin versus Output Load Capacitance

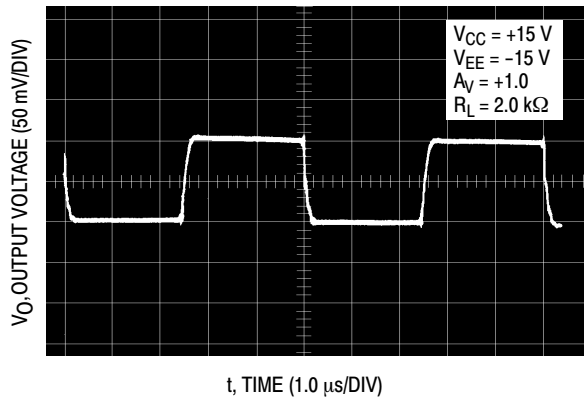


Figure 6. Small Signal Transient Response

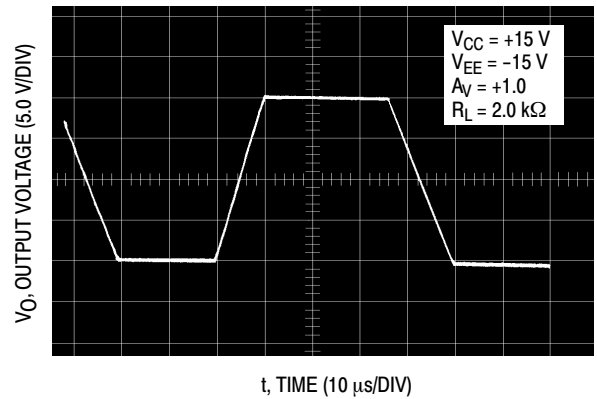


Figure 7. Large Signal Transient Response

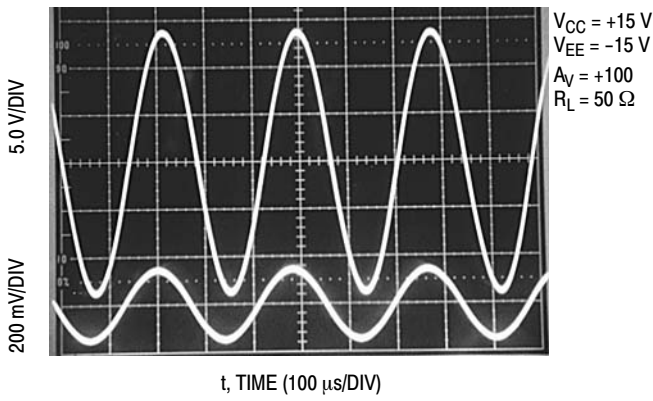


Figure 8. Sine Wave Response

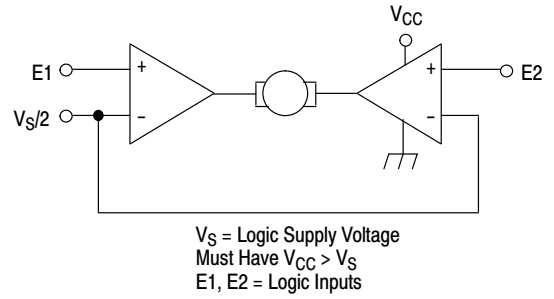
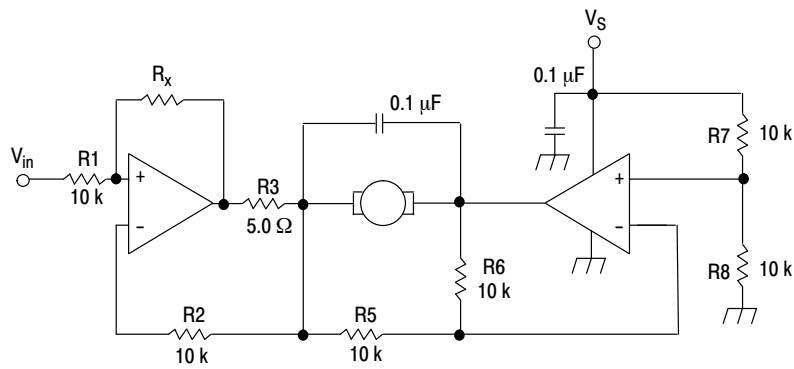


Figure 9. Bidirectional DC Motor Control with Microprocessor-Compatible Inputs



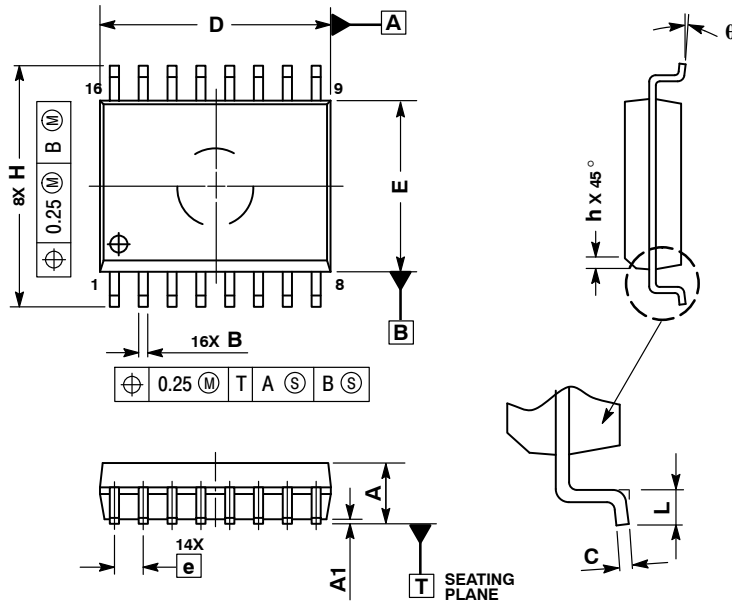
For circuit stability, ensure that $R_x > \frac{2R_3 \cdot R_1}{R_M}$ where, R_M = internal resistance of motor.
 The voltage available at the terminals of the motor is: $V_M = 2(V_1 - \frac{V_S}{2}) + |R_{O1}| \cdot I_M$
 where, $|R_{O1}| = \frac{2R_3 \cdot R_1}{R_x}$ and I_M is the motor current.

Figure 10. Bidirectional Speed Control of DC Motors

NCS2372

PACKAGE DIMENSIONS

SOIC-16 WB CASE 751G-03 ISSUE D

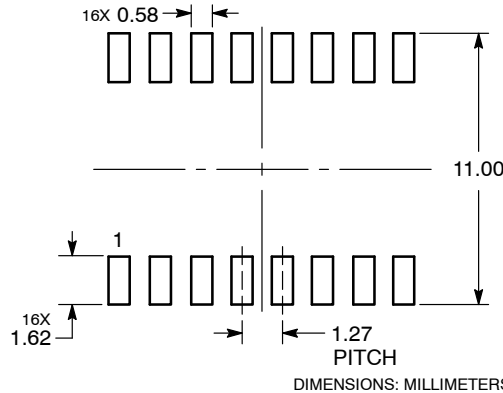


NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE 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.

| DIM | MILLIMETERS | |
|-----|-------------|-------|
| | 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*



*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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