

NL27WZ14

Dual Schmitt-Trigger Inverter

The NL27WZ14 is a high performance dual inverter with Schmitt-Trigger inputs operating from a 1.65 to 5.5 V supply.

Pin configuration and function are the same as the NL27WZ04, but the inputs have hysteresis and, with its Schmitt trigger function, the NL27WZ14 can be used as a line receiver which will receive slow input signals. The NL27WZ14 is capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. In addition, it has a greater noise margin than conventional inverters. The NL27WZ14 has hysteresis between the positive-going and the negative-going input thresholds (typically 1.0 V) which is determined internally by transistor ratios and is essentially insensitive to temperature and supply voltage variations.

- Designed for 1.65 V to 5.5 V V_{CC} Operation
- Over Voltage Tolerant Inputs and Outputs
- LVTTL Compatible - Interface Capability with 5 V TTL Logic with $V_{CC} = 3$ V
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Current Drive Capability is 24 mA at the Outputs
- Chip Complexity: FET = 72

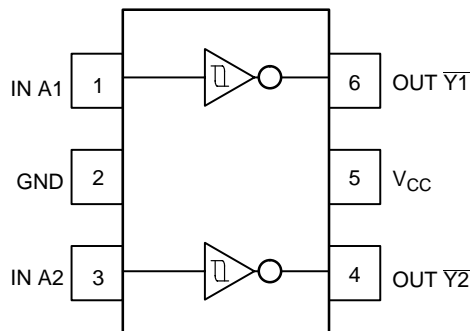


Figure 1. Pinout (Top View)



Figure 2. Logic Symbol



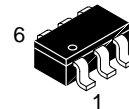
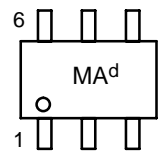
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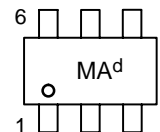


SC-88/SOT-363/SC70-6
DF SUFFIX
CASE 419B

MARKING DIAGRAMS



TSOP-6/SOT-23-6/SC59-6
DT SUFFIX
CASE 318G



MA = Device Marking
d = Date Code

PIN ASSIGNMENT

| Pin | Function |
|-----|----------------|
| 1 | IN A1 |
| 2 | GND |
| 3 | IN A2 |
| 4 | OUT Y2 |
| 5 | V_{CC} |
| 6 | OUT $\bar{Y}1$ |

FUNCTION TABLE

| A Input | \bar{Y} Output |
|---------|------------------|
| L | H |
| H | L |

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

NL27WZ14

MAXIMUM RATINGS

| Symbol | Characteristics | Value | Unit |
|------------------|---|------------------------------|------|
| V _{CC} | DC Supply Voltage | -0.5 to +7.0 | V |
| V _I | DC Input Voltage | -0.5 ≤ V _I ≤ +7.0 | V |
| V _O | DC Output Voltage Output in Z or LOW State (Note 1) | -0.5 ≤ V _O ≤ 7.0 | V |
| I _{IK} | DC Input Diode Current V _I < GND | -50 | mA |
| I _{OK} | DC Output Diode Current V _O < GND | -50 | mA |
| I _O | DC Output Sink Current | ±50 | mA |
| I _{CC} | DC Supply Current per Supply Pin | ±100 | mA |
| I _{GND} | DC Ground Current per Ground Pin | ±100 | mA |
| T _{STG} | Storage Temperature Range | -65 to +150 | °C |
| P _D | Power Dissipation in Still Air SC-88, TSOP-6 | 200 | mW |
| θ _{JA} | Thermal Resistance SC-88, TSOP-6 | 333 | °C/W |
| T _L | Lead Temperature, 1 mm from case for 10 s | 260 | °C |
| T _J | Junction Temperature under Bias | +150 | °C |
| V _{ESD} | ESD Withstand Voltage Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4) | > 2000 > 200 N/A | V |

Maximum Ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute maximum-rated conditions is not implied. Functional operation should be restricted to the Recommended Operating Conditions.

1. I_O absolute maximum rating must be observed.
2. Tested to EIA/JESD22-A114-A
3. Tested to EIA/JESD22-A115-A
4. Tested to JESD22-C101-A

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Unit |
|-----------------|---|-------------|----------------------------------|------|
| V _{CC} | Supply Voltage Operating Data Retention Only | 2.3 1.5 | 5.5 5.5 | V |
| V _I | Input Voltage | 0 | 5.5 | V |
| V _O | Output Voltage (High or LOW State) | 0 | 5.5 | V |
| T _A | Operating Free-Air Temperature | -55 | +125 | °C |
| Δt/ΔV | Input Transition Rise or Fall Rate V _{CC} = 2.5 V ± 0.2 V V _{CC} = 3.0 V ± 0.3 V V _{CC} = 5.0 V ± 0.5 V | 0 0 0 | No Limit No Limit No Limit | ns/V |

NL27WZ14

DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Condition | V _{CC} (V) | T _A = 25°C | | | -40°C ≤ T _A ≤ 85°C | | -55°C ≤ T _A ≤ 125°C | | Unit |
|------------------|---|--|------------------------|-----------------------|-----------------|------|-------------------------------|------|--------------------------------|------|------|
| | | | | Min | Typ | Max | Min | Max | Min | Max | |
| V _{T+} | Positive Input Threshold Voltage | | 2.3 | 1.0 | 1.5 | 1.8 | 1.0 | 1.8 | 1.0 | 1.8 | V |
| | | | 2.7 | 1.2 | 1.7 | 2.0 | 1.2 | 2.0 | 1.2 | 2.0 | |
| | | | 3.0 | 1.3 | 1.9 | 2.2 | 1.3 | 2.2 | 1.3 | 2.2 | |
| | | | 4.5 | 1.9 | 2.7 | 3.1 | 1.9 | 3.1 | 1.9 | 3.1 | |
| | | | 5.5 | 2.2 | 3.3 | 3.6 | 2.2 | 3.6 | 2.2 | 3.6 | |
| V _{T-} | Negative Input Threshold Voltage | | 2.3 | 0.4 | 0.75 | 1.15 | 0.4 | 1.15 | 0.4 | 1.15 | V |
| | | | 2.7 | 0.5 | 0.87 | 1.4 | 0.5 | 1.4 | 0.5 | 1.4 | |
| | | | 3.0 | 0.6 | 1.0 | 1.5 | 0.6 | 1.5 | 0.6 | 1.5 | |
| | | | 4.5 | 1.0 | 1.5 | 2.0 | 1.0 | 2.0 | 1.0 | 2.0 | |
| | | | 5.5 | 1.2 | 1.9 | 2.3 | 1.2 | 2.3 | 1.2 | 2.3 | |
| V _H | Input Hysteresis Voltage | | 2.3 | 0.25 | 0.75 | 1.1 | 0.25 | 1.1 | 0.25 | 1.1 | V |
| | | | 2.7 | 0.3 | 0.83 | 1.15 | 0.3 | 1.15 | 0.3 | 1.15 | |
| | | | 3.0 | 0.4 | 0.93 | 1.2 | 0.4 | 1.2 | 0.4 | 1.2 | |
| | | | 4.5 | 0.6 | 1.2 | 1.5 | 0.6 | 1.5 | 0.6 | 1.5 | |
| | | | 5.5 | 0.7 | 1.4 | 1.7 | 0.7 | 1.7 | 0.7 | 1.7 | |
| V _{OH} | High-Level Output Voltage V _{IN} = V _{IH} or V _{IL} | I _{OH} = -100 μA | 1.65 to 5.5 | V _{CC} - 0.1 | V _{CC} | | V _{CC} - 0.1 | | V _{CC} - 0.1 | | V |
| | | I _{OH} = -3 mA | 1.65 | 1.29 | 1.52 | | 1.29 | | 1.29 | | |
| | | I _{OH} = -8 mA | 2.3 | 1.9 | 2.1 | | 1.9 | | 1.8 | | |
| | | I _{OH} = -12 mA | 2.7 | 2.2 | 2.4 | | 2.2 | | 2.1 | | |
| | | I _{OH} = -16 mA | 3.0 | 2.4 | 2.7 | | 2.4 | | 2.3 | | |
| | | I _{OH} = -24 mA | 3.0 | 2.3 | 2.5 | | 2.3 | | 2.2 | | |
| | | I _{OH} = -32 mA | 4.5 | 3.8 | 4.0 | | 3.8 | | 3.7 | | |
| V _{OL} | Low-Level Output Voltage V _{IN} = V _{IH} or V _{IL} | I _{OL} = 100 μA | 1.65 to 5.5 | | | 0.1 | | 0.1 | | 0.1 | V |
| | | I _{OL} = 4 mA | 1.65 | | 0.08 | 0.24 | | 0.24 | | 0.24 | |
| | | I _{OL} = 8 mA | 2.3 | | 0.2 | 0.3 | | 0.3 | | 0.4 | |
| | | I _{OL} = 12 mA | 2.7 | | 0.22 | 0.4 | | 0.4 | | 0.5 | |
| | | I _{OL} = 16 mA | 3.0 | | 0.28 | 0.4 | | 0.4 | | 0.5 | |
| | | I _{OL} = 24 mA | 3.0 | | 0.38 | 0.55 | | 0.55 | | 0.55 | |
| | | I _{OL} = 32 mA | 4.5 | | 0.42 | 0.55 | | 0.55 | | 0.65 | |
| I _{IN} | Input Leakage Current | V _{IN} = V _{CC} or GND | 0 to 5.5 | | | ±0.1 | | ±1.0 | | ±1.0 | μA |
| I _{OFF} | Power Off- Output Leakage Current | V _{OUT} = 5.5 V | 0 | | | 1 | | 10 | | 10 | μA |
| I _{CC} | Quiescent Supply Current | V _{IN} = V _{CC} or GND | 5.5 | | | 1 | | 10 | | 10 | μA |

AC ELECTRICAL CHARACTERISTICS (Input t_r = t_f = 3.0 ns)

| Symbol | Parameter | Condition | V _{CC} (V) | T _A = 25°C | | | -40°C ≤ T _A ≤ 85°C | | -55°C ≤ T _A ≤ 125°C | | Unit |
|---|---|---|---------------------|-----------------------|-----|-----|-------------------------------|-----|--------------------------------|-----|------|
| | | | | Min | Typ | Max | Min | Max | Min | Max | |
| t _{PLH} t _{PHL} | Propagation Delay Input A to Y (Figure 3 and 4) | R _L = 1 MΩ, C _L = 15 pF | 2.5 ± 0.2 | 1.8 | 4.3 | 7.4 | 1.8 | 8.1 | 1.8 | 9.1 | ns |
| R _L = 1 MΩ, C _L = 15 pF | | 3.3 ± 0.3 | 1.5 | 3.3 | 5.0 | 1.5 | 5.5 | 1.5 | 6.5 | | |
| R _L = 500 Ω, C _L = 50 pF | | | 1.8 | 4.0 | 6.0 | 1.8 | 6.6 | 1.8 | 7.6 | | |
| R _L = 1 MΩ, C _L = 15 pF R _L = 500 Ω, C _L = 50 pF | | 5.0 ± 0.5 | 1.0 | 2.7 | 4.1 | 1.0 | 4.5 | 1.0 | 5.5 | | |
| | | | | 1.2 | 3.2 | 4.9 | 1.2 | 5.4 | 1.2 | 6.4 | |

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Condition | Typical | Unit |
|-----------------|--|--|------------|------|
| C _{IN} | Input Capacitance | V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | 2.5 | pF |
| C _{PD} | Power Dissipation Capacitance (Note 5) | 10 MHz, V _{CC} = 3.3 V, V _I = 0 V or V _{CC} 10 MHz, V _{CC} = 5.0 V, V _I = 0 V or V _{CC} | 11 12.5 | pF |

5. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I_{CC(OPR)} = C_{PD} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no-load dynamic power consumption; P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.

NL27WZ14

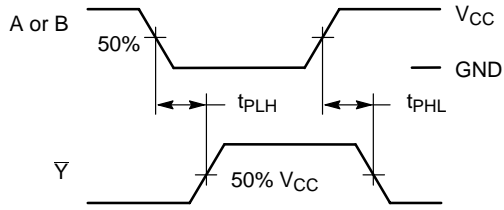
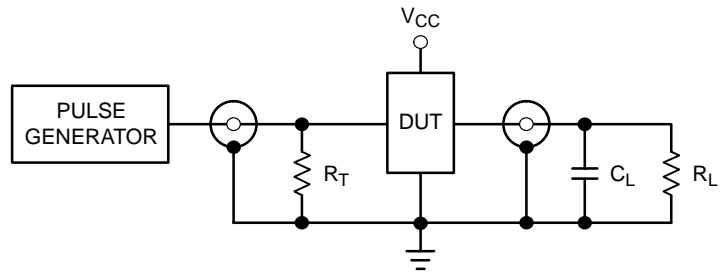


Figure 3. Switching Waveforms



$R_T = C_L$ or equivalent (includes jog and probe capacitance)
 $R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

Figure 4. Test Circuit

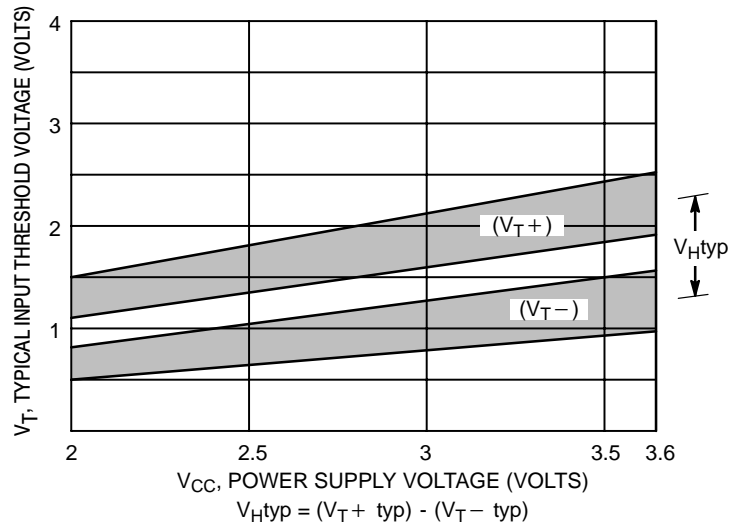
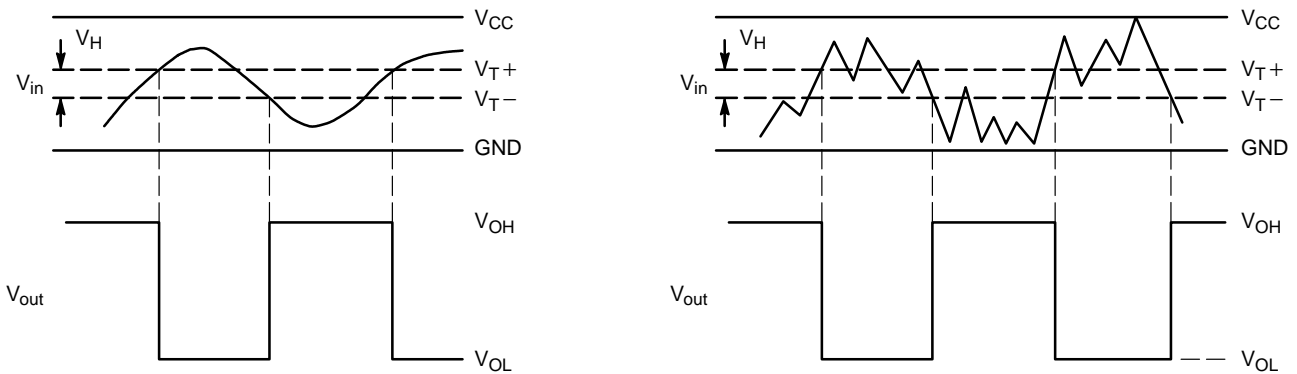


Figure 5. Typical Input Threshold, V_{T+} , V_{T-} versus Power Supply Voltage



(a) A Schmitt-Trigger Squares Up Inputs With Slow Rise and Fall Times

(b) A Schmitt-Trigger Offers Maximum Noise Immunity

Figure 6. Typical Schmitt-Trigger Applications

NL27WZ14

DEVICE ORDERING INFORMATION

| Device Order Number | Device Nomenclature | | | | | | | Package Type (Name/SOT#/Common Name) | Tape and Reel Size |
|---------------------|---------------------|--------------------------|-----------------------|------------|-----------------|----------------|--------------------|---|----------------------|
| | Circuit Indicator | No. of Gates per Package | Temp Range Identifier | Technology | Device Function | Package Suffix | Tape & Reel Suffix | | |
| NL27WZ14DFT2 | NL | 2 | 7 | WZ | 14 | DF | T2 | SC-88/SOT-363 /SC70-6 | 178 mm 3000 Units |
| NL27WZ14DTT1 | NL | 2 | 7 | WZ | 14 | DT | T1 | TSOP-6/SOT-23-6 /SC59-6 | 178 mm 3000 Units |

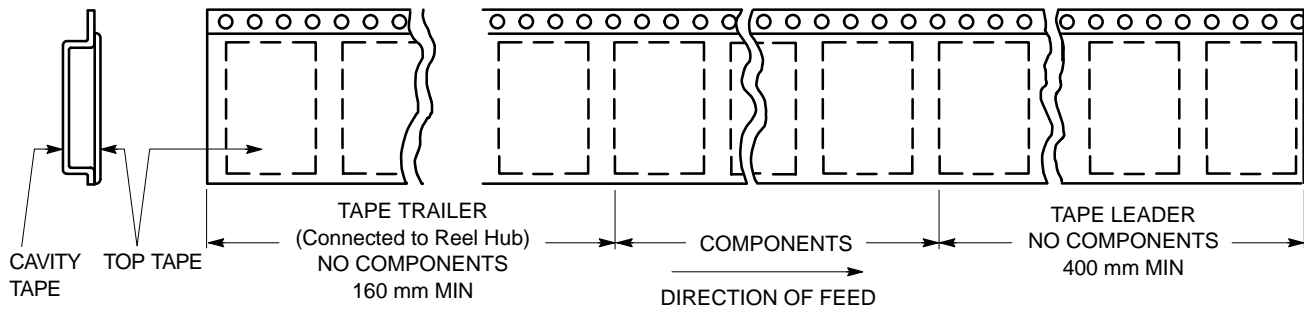


Figure 7. Tape Ends for Finished Goods

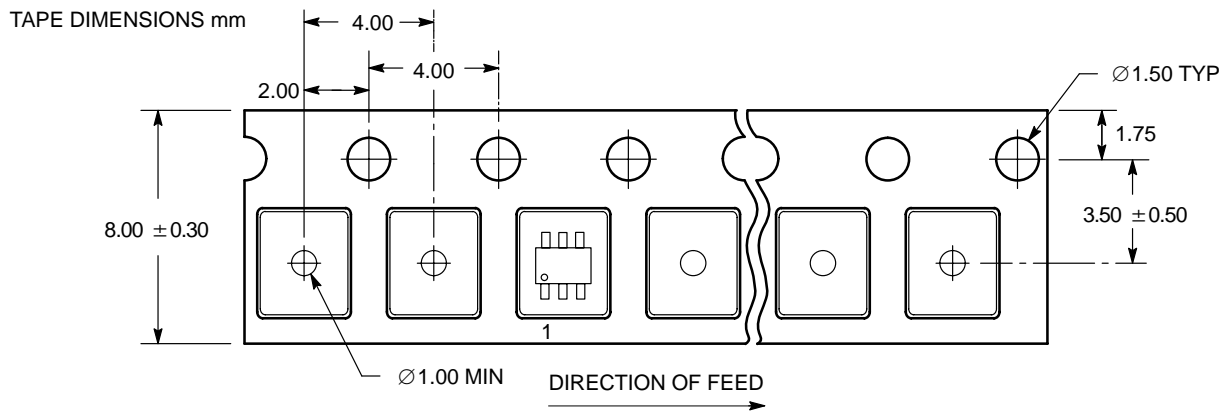


Figure 8. SC70-6/SC-88/SOT-363 DFT2 and SOT23-6/TSOP-6/SC59-6 DTT1 Reel Configuration/Orientation

NL27WZ14

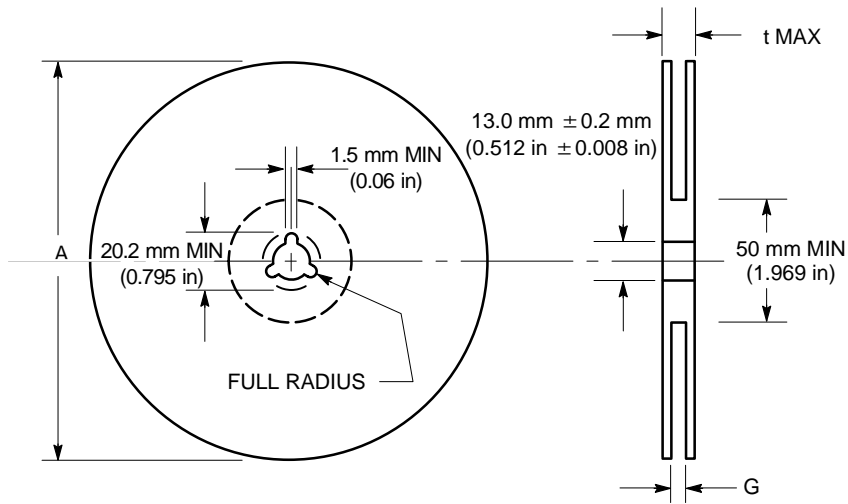


Figure 9. Reel Dimensions

REEL DIMENSIONS

| Tape Size | T and R Suffix | A Max | G | t Max |
|-----------|----------------|------------------|---|----------------------|
| 8 mm | T1, T2 | 178 mm (7 in) | 8.4 mm, + 1.5 mm, -0.0 (0.33 in + 0.059 in, -0.00) | 14.4 mm (0.56 in) |

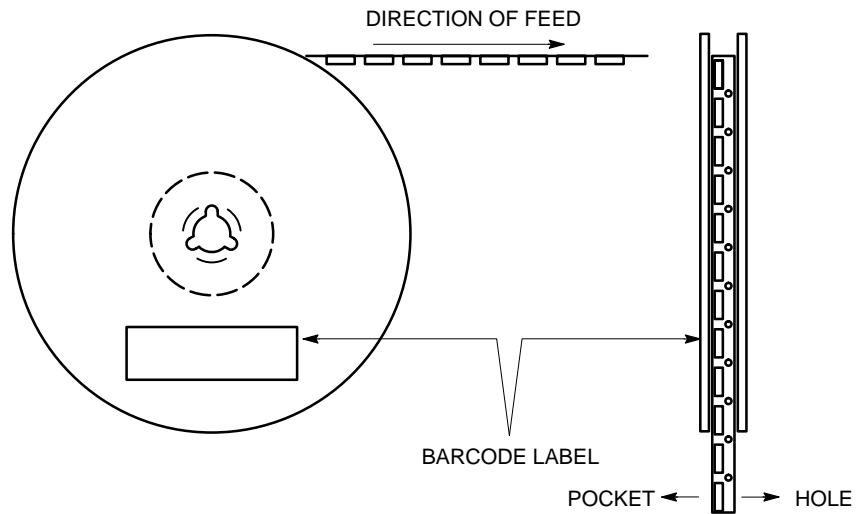
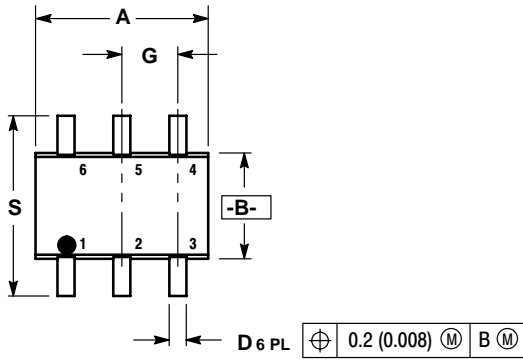


Figure 10. Reel Winding Direction

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PACKAGE DIMENSIONS

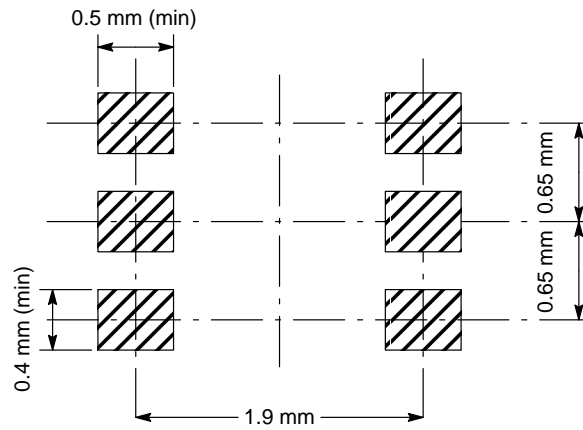
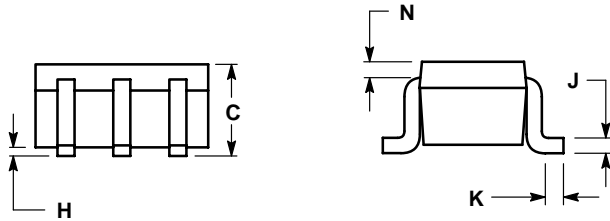
SC70-6/SC-88/SOT-363
 DF SUFFIX
 CASE 419B-02
 ISSUE P



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

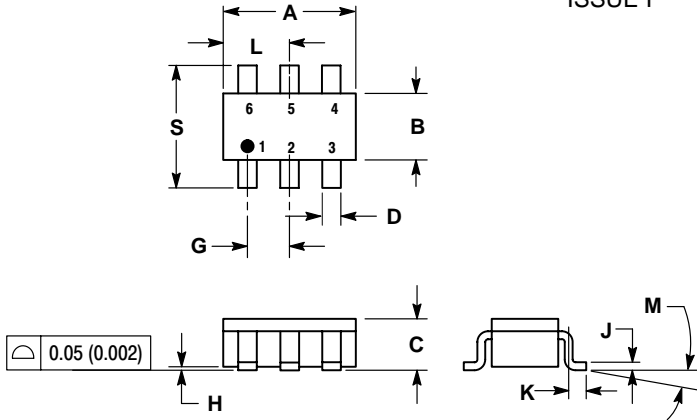
| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.071 | 0.087 | 1.80 | 2.20 |
| B | 0.045 | 0.053 | 1.15 | 1.35 |
| C | 0.031 | 0.043 | 0.80 | 1.10 |
| D | 0.004 | 0.012 | 0.10 | 0.30 |
| G | 0.026 BSC | | 0.65 BSC | |
| H | --- | 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 |



NL27WZ14

PACKAGE DIMENSIONS

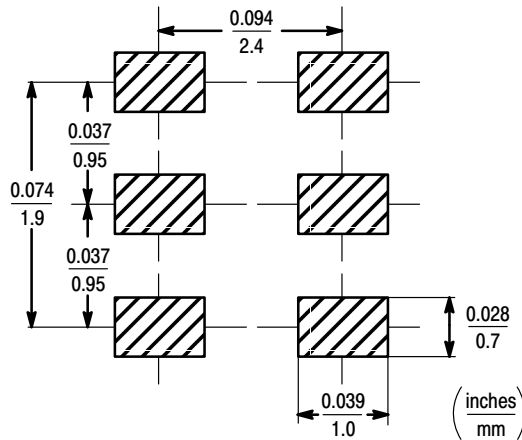
SOT23-6/TSOP-6/SC59-6
DT SUFFIX
CASE 318G-02
ISSUE I




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
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.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|--------|--------|
| | MIN | MAX | MIN | MAX |
| A | 2.90 | 3.10 | 0.1142 | 0.1220 |
| B | 1.30 | 1.70 | 0.0512 | 0.0669 |
| C | 0.90 | 1.10 | 0.0354 | 0.0433 |
| D | 0.25 | 0.50 | 0.0098 | 0.0197 |
| G | 0.85 | 1.05 | 0.0335 | 0.0413 |
| H | 0.013 | 0.100 | 0.0005 | 0.0040 |
| J | 0.10 | 0.26 | 0.0040 | 0.0102 |
| K | 0.20 | 0.60 | 0.0079 | 0.0236 |
| L | 1.25 | 1.55 | 0.0493 | 0.0610 |
| M | 0° | 10° | 0° | 10° |
| S | 2.50 | 3.00 | 0.0985 | 0.1181 |



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