

# MC74LVX132

## Quad 2-Input NAND Schmitt Trigger

The MC74LVX132 is an advanced high speed CMOS Schmitt NAND trigger fabricated with silicon gate CMOS technology.

Pin configuration and function are the same as the MC74LVX00, but the inputs have hysteresis.

The internal circuit is composed of multiple stages, including a buffer output which provides high noise immunity and stable output. The inputs tolerate voltages up to 7.0 V, allowing the interface of 5.0 V systems to 3.0 V systems.

### Features

- High Speed:  $t_{PD} = 5.8$  ns (Typ) at  $V_{CC} = 3.3$  V
- Low Power Dissipation:  $I_{CC} = 2$   $\mu$ A (Max) at  $T_A = 25^\circ$ C
- Power Down Protection Provided on Inputs
- Low Noise:  $V_{OLP} = 0.5$  V (Max)
- Pin and Function Compatible with Other Standard Logic Families
- Latchup Performance Exceeds 300 mA
- ESD Performance: Human Body Model > 2000 V; Machine Model > 200 V
- These Devices are Pb-Free and are RoHS Compliant

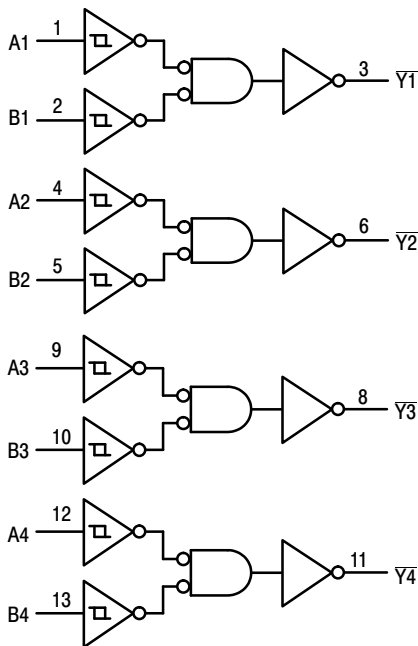


Figure 1. Logic Diagram

### FUNCTION TABLE

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



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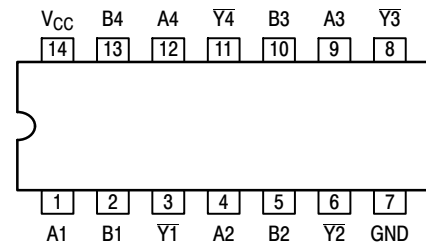


SOIC-14 NB  
D SUFFIX  
CASE 751A



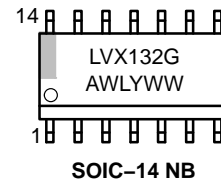
TSSOP-14  
DT SUFFIX  
CASE 948G

### PIN ASSIGNMENT

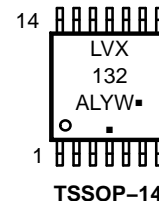


14-Lead (Top View)

### MARKING DIAGRAMS



SOIC-14 NB



TSSOP-14

LVX132 = Specific Device Code  
A = Assembly Location  
WL, L = Wafer Lot  
Y = Year  
WW, W = Work Week  
G or ■ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

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

# MC74LVX132

## MAXIMUM RATINGS

| Symbol               | Parameter   | Value                         | Unit |
|----------------------|---|-------------------------------|------|
| V <sub>CC</sub>      | DC Supply Voltage   | -0.5 to +7.0                  | V    |
| V <sub>IN</sub>      | DC Input Voltage  | -0.5 to +7.0                  | V    |
| V <sub>OUT</sub>     | DC Output Voltage   | -0.5 to V <sub>CC</sub> + 0.5 | V    |
| I <sub>IK</sub>      | DC Input Diode Current<br>V <sub>I</sub> < GND  | -20                           | mA   |
| I <sub>OK</sub>      | DC Output Diode Current<br>V <sub>O</sub> < GND   | ±20                           | mA   |
| I <sub>OUT</sub>     | DC Output Sink Current  | ±25                           | mA   |
| I <sub>CC</sub>      | DC Supply Current per Supply Pin  | ±50                           | mA   |
| T <sub>STG</sub>     | Storage Temperature Range   | -65 to +150                   | °C   |
| T <sub>L</sub>       | Lead Temperature, 1 mm from Case for 10 Seconds   | 260                           | °C   |
| T <sub>J</sub>       | Junction Temperature under Bias   | +150                          | °C   |
| θ <sub>JA</sub>      | Thermal Resistance<br>SOIC<br>TSSOP   | 250                           | °C/W |
| P <sub>D</sub>       | Power Dissipation in Still Air at 85°C<br>SOIC<br>TSSOP   | 250                           | mW   |
| MSL                  | Moisture Sensitivity  | Level 1                       |      |
| F <sub>R</sub>       | Flammability Rating<br>Oxygen Index: 30% – 35%  | UL 94-V0 @ 0.125 in           |      |
| V <sub>ESD</sub>     | ESD Withstand Voltage<br>Human Body Model (Note 1)<br>Machine Model (Note 2)<br>Charged Device Model (Note 3) | > 2000<br>> 200<br>N/A        | V    |
| I <sub>Latchup</sub> | Latchup Performance<br>Above V <sub>CC</sub> and Below GND at 85°C (Note 4)                                   | ±300                          | mA   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Tested to EIA/JESD22-A114-A.
2. Tested to EIA/JESD22-A115-A.
3. Tested to JESD22-C101-A.
4. Tested to EIA/JESD78.

## RECOMMENDED OPERATING CONDITIONS

| Symbol          | Parameter   | Min | Max  | Unit |
|-----------------|---|-----|------|------|
| V <sub>CC</sub> | Supply Voltage  | 2.0 | 3.6  | V    |
| V <sub>I</sub>  | Input Voltage<br>(Note 5)   | 0   | 5.5  | V    |
| V <sub>O</sub>  | Output Voltage<br>(HIGH or LOW State)                                 | 0   | 5.5  | V    |
| T <sub>A</sub>  | Operating Free-Air Temperature  | -40 | +125 | °C   |
| Δt/ΔV           | Input Transition Rise or Fall Rate<br>V <sub>CC</sub> = 3.0 V ± 0.3 V | 0   | 100  | ns/V |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

5. Unused inputs may not be left open. All inputs must be tied to a high- or low-logic input voltage level.

# MC74LVX132

## DC ELECTRICAL CHARACTERISTICS

| Symbol          | Parameter  | Test Conditions                          | V <sub>CC</sub><br>V | T <sub>A</sub> = 25°C |      |      | T <sub>A</sub> = ≤ 85°C |      | T <sub>A</sub> = ≤ 125°C |      | Unit |
|-----------------|--|--|----------------------|-----------------------|------|------|-------------------------|------|--------------------------|------|------|
|                 |  |  |                      | Min                   | Typ  | Max  | Min                     | Max  | Min                      | Max  |      |
| V <sub>T+</sub> | Positive Threshold Voltage<br>(Figure 4)   |  | 2.0                  | 1.15                  | 1.31 | 1.60 | 1.15                    | 1.60 | 1.15                     | 1.60 | V    |
|                 |  |  | 3.0                  | 1.50                  | 1.82 | 2.25 | 1.50                    | 2.25 | 1.50                     | 2.25 |      |
|                 |  |  | 3.6                  | 1.70                  | 2.12 | 2.60 | 1.70                    | 2.60 | 1.70                     | 2.60 |      |
| V <sub>T-</sub> | Negative Threshold Voltage<br>(Figure 4)   |  | 2.0                  | 0.30                  | 0.64 | 0.9  | 0.30                    | 0.90 | 0.30                     | 0.90 | V    |
|                 |  |  | 3.0                  | 0.75                  | 1.13 | 1.45 | 0.75                    | 1.45 | 0.75                     | 1.45 |      |
|                 |  |  | 3.6                  | 1.00                  | 1.46 | 1.90 | 1.00                    | 1.90 | 1.00                     | 1.90 |      |
| V <sub>H</sub>  | Hysteresis Voltage<br>(Figure 4)   |  | 2.0                  | 0.30                  | 0.70 | 1.30 | 0.30                    | 1.30 | 0.30                     | 1.30 | V    |
|                 |  |  | 3.0                  | 0.30                  | 0.76 | 1.50 | 0.30                    | 1.50 | 0.30                     | 1.50 |      |
|                 |  |  | 3.6                  | 0.35                  | 0.69 | 1.60 | 0.35                    | 1.60 | 0.35                     | 1.60 |      |
| V <sub>OH</sub> | Minimum High-Level Output<br>Voltage<br>V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> | I <sub>OH</sub> = - 50 μA                | 2.0                  | 1.9                   | 2.0  |      | 1.9                     |      | 1.9                      |      | V    |
|                 |  | I <sub>OH</sub> = - 50 μA                | 3.0                  | 2.9                   | 3.0  |      | 2.9                     |      | 2.9                      |      |      |
|                 |  | I <sub>OH</sub> = - 4 mA                 | 3.0                  | 2.58                  |      |      | 2.48                    |      | 2.34                     |      |      |
| V <sub>OL</sub> | Maximum Low-Level Output<br>Voltage<br>V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>  | I <sub>OL</sub> = 50 μA                  | 2.0                  |                       | 0.0  | 0.1  |                         | 0.1  |                          | 0.1  | V    |
|                 |  | I <sub>OL</sub> = 50 μA                  | 3.0                  |                       | 0.0  | 0.1  |                         | 0.1  |                          | 0.1  |      |
|                 |  | I <sub>OL</sub> = 4 mA                   | 3.0                  |                       |      | 0.36 |                         | 0.44 |                          | 0.52 |      |
| I <sub>in</sub> | Maximum Input Leakage<br>Current   | V <sub>in</sub> = 5.5 V or<br>GND        | 3.6                  |                       |      | ±0.1 |                         | ±1.0 |                          | ±1.0 | μA   |
| I <sub>CC</sub> | Maximum Quiescent Supply<br>Current  | V <sub>in</sub> = V <sub>CC</sub> or GND | 3.6                  |                       |      | 2.0  |                         | 20   |                          | 20   | μA   |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## AC ELECTRICAL CHARACTERISTICS (Input t<sub>r</sub> = t<sub>f</sub> = 3.0ns)

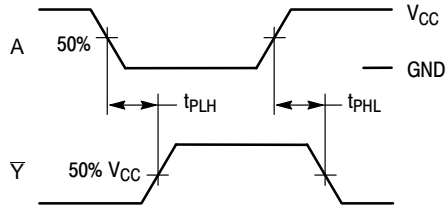
| Symbol                                   | Parameter  | Test Conditions                                       | T <sub>A</sub> = 25°C |      |      | T <sub>A</sub> = ≤ 85°C |      | T <sub>A</sub> = ≤ 125°C |      | Unit |
|--|--|---|-----------------------|------|------|-------------------------|------|--------------------------|------|------|
|  |  |   | Min                   | Typ  | Max  | Min                     | Max  | Min                      | Max  |      |
| t <sub>PLH</sub> ,<br>t <sub>PHL</sub>   | Maximum Propagation<br>Delay,<br>A or B to $\bar{Y}$ | V <sub>CC</sub> = 2.7V    C <sub>L</sub> = 15pF       |                       | 7.0  | 11.0 | 1.0                     | 13.0 | 1.0                      | 15.0 | ns   |
|  |  | C <sub>L</sub> = 50pF                                 |                       | 10.0 | 16.0 | 1.0                     | 18.7 | 1.0                      | 20.0 |      |
| t <sub>OSSL</sub> ,<br>t <sub>OSLH</sub> | Output to Output Skew<br>(Note 6)                    | V <sub>CC</sub> = 3.3 ± 0.3V    C <sub>L</sub> = 15pF |                       | 5.8  | 10.6 | 1.0                     | 12.5 | 1.0                      | 14.5 | ns   |
|  |  | C <sub>L</sub> = 50pF                                 |                       | 8.3  | 15.4 | 1.0                     | 17.5 | 1.0                      | 19.5 |      |
| C <sub>in</sub>                          | Maximum Input<br>Capacitance                         |   |                       | 4    | 10   |                         | 10   |                          | 10   | pF   |
| C <sub>PD</sub>                          | Power Dissipation Capacitance (Note 6)               | <b>Typical @ 25°C, V<sub>CC</sub> = 5.0 V</b>         |                       |      |      |                         |      |                          |      | pF   |
|  |  | 11  |                       |      |      |                         |      |                          |      |      |

6. C<sub>PD</sub> 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<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>in</sub> + I<sub>CC</sub>/4 (per gate). C<sub>PD</sub> is used to determine the no-load dynamic power consumption; P<sub>D</sub> = C<sub>PD</sub> • V<sub>CC</sub><sup>2</sup> • f<sub>in</sub> + I<sub>CC</sub> • V<sub>CC</sub>.

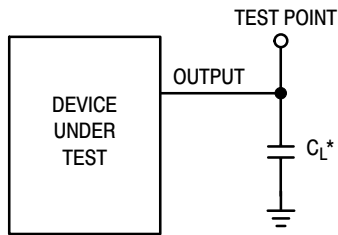
## NOISE CHARACTERISTICS (Input t<sub>r</sub> = t<sub>f</sub> = 3.0ns, C<sub>L</sub> = 50pF, V<sub>CC</sub> = 5.0 V)

| Symbol           | Characteristic                               | T <sub>A</sub> = 25°C |      | Unit |
|------------------|--|-----------------------|------|------|
|                  |  | Typ                   | Max  |      |
| V <sub>OLP</sub> | Quiet Output Maximum Dynamic V <sub>OL</sub> | 0.3                   | 0.5  | V    |
| V <sub>OLV</sub> | Quiet Output Minimum Dynamic V <sub>OL</sub> | -0.3                  | -0.5 | V    |
| V <sub>IHD</sub> | Minimum High Level Dynamic Input Voltage     |                       | 2.0  | V    |
| V <sub>ILD</sub> | Maximum Low Level Dynamic Input Voltage      |                       | 0.8  | V    |

# MC74LVX132

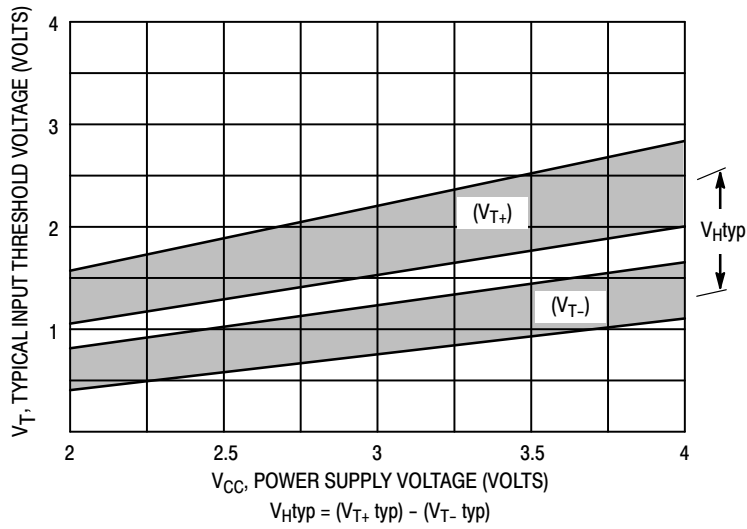


**Figure 2. Switching Waveforms**



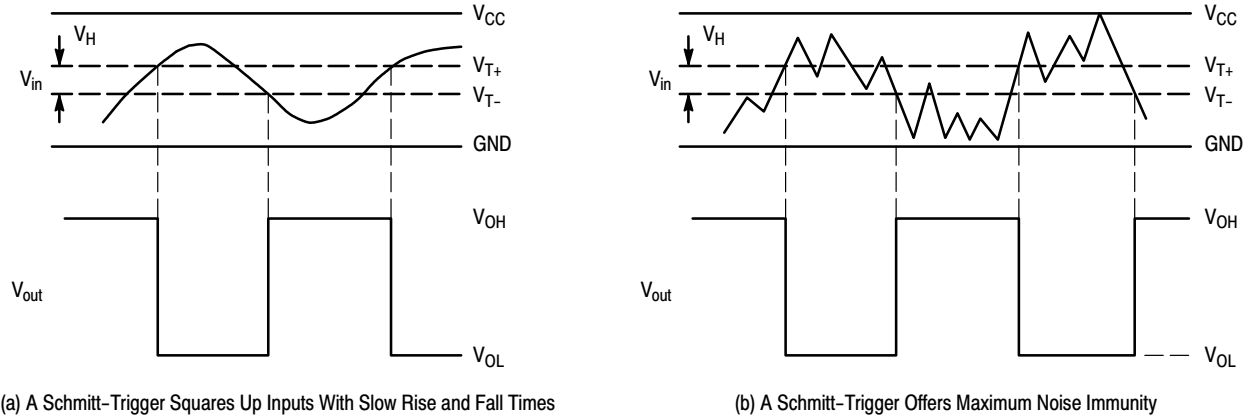
\*Includes all probe and jig capacitance

**Figure 3. Test Circuit**

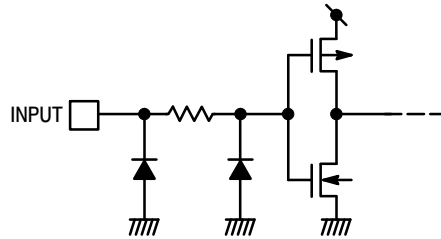


**Figure 4. Typical Input Threshold,  $V_{T+}$ ,  $V_{T-}$  versus Power Supply Voltage**

# MC74LVX132



**Figure 5. Typical Schmitt-Trigger Applications**



**Figure 6. Input Equivalent Circuit**

## ORDERING INFORMATION

| Device          | Package                 | Shipping†        |
|-----------------|-------------------------|------------------|
| MC74LVX132DR2G  | SOIC-14 NB<br>(Pb-Free) | 2500 Tape & Reel |
| MC74LVX132DTG   | TSSOP-14<br>(Pb-Free)   | 96 Units / Rail  |
| MC74LVX132DTR2G | TSSOP-14<br>(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.

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 1:1

SOIC-14 NB  
CASE 751A-03  
ISSUE L

DATE 03 FEB 2016



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 1.35        | 1.75 | 0.054     | 0.068 |
| A1  | 0.10        | 0.25 | 0.004     | 0.010 |
| A3  | 0.19        | 0.25 | 0.008     | 0.010 |
| b   | 0.35        | 0.49 | 0.014     | 0.019 |
| D   | 8.55        | 8.75 | 0.337     | 0.344 |
| E   | 3.80        | 4.00 | 0.150     | 0.157 |
| e   | 1.27 BSC    |      | 0.050 BSC |       |
| H   | 5.80        | 6.20 | 0.228     | 0.244 |
| h   | 0.25        | 0.50 | 0.010     | 0.019 |
| L   | 0.40        | 1.25 | 0.016     | 0.049 |
| M   | 0°          | 7°   | 0°        | 7°    |

SOLDERING 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.

GENERIC MARKING DIAGRAM\*



- XXXXXX = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- Y = 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. Some products may not follow the Generic Marking.

STYLES ON PAGE 2

|                  |             |  |
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**SOIC-14**  
**CASE 751A-03**  
**ISSUE L**

DATE 03 FEB 2016

STYLE 1:  
 PIN 1. COMMON CATHODE  
 2. ANODE/CATHODE  
 3. ANODE/CATHODE  
 4. NO CONNECTION  
 5. ANODE/CATHODE  
 6. NO CONNECTION  
 7. ANODE/CATHODE  
 8. ANODE/CATHODE  
 9. ANODE/CATHODE  
 10. NO CONNECTION  
 11. ANODE/CATHODE  
 12. ANODE/CATHODE  
 13. NO CONNECTION  
 14. COMMON ANODE

STYLE 2:  
 CANCELLED

STYLE 3:  
 PIN 1. NO CONNECTION  
 2. ANODE  
 3. ANODE  
 4. NO CONNECTION  
 5. ANODE  
 6. NO CONNECTION  
 7. ANODE  
 8. ANODE  
 9. ANODE  
 10. NO CONNECTION  
 11. ANODE  
 12. ANODE  
 13. NO CONNECTION  
 14. COMMON CATHODE

STYLE 4:  
 PIN 1. NO CONNECTION  
 2. CATHODE  
 3. CATHODE  
 4. NO CONNECTION  
 5. CATHODE  
 6. NO CONNECTION  
 7. CATHODE  
 8. CATHODE  
 9. CATHODE  
 10. NO CONNECTION  
 11. CATHODE  
 12. CATHODE  
 13. NO CONNECTION  
 14. COMMON ANODE

STYLE 5:  
 PIN 1. COMMON CATHODE  
 2. ANODE/CATHODE  
 3. ANODE/CATHODE  
 4. ANODE/CATHODE  
 5. ANODE/CATHODE  
 6. NO CONNECTION  
 7. COMMON ANODE  
 8. COMMON CATHODE  
 9. ANODE/CATHODE  
 10. ANODE/CATHODE  
 11. ANODE/CATHODE  
 12. ANODE/CATHODE  
 13. NO CONNECTION  
 14. COMMON ANODE

STYLE 6:  
 PIN 1. CATHODE  
 2. CATHODE  
 3. CATHODE  
 4. CATHODE  
 5. CATHODE  
 6. CATHODE  
 7. CATHODE  
 8. ANODE  
 9. ANODE  
 10. ANODE  
 11. ANODE  
 12. ANODE  
 13. ANODE  
 14. ANODE

STYLE 7:  
 PIN 1. ANODE/CATHODE  
 2. COMMON ANODE  
 3. COMMON CATHODE  
 4. ANODE/CATHODE  
 5. ANODE/CATHODE  
 6. ANODE/CATHODE  
 7. ANODE/CATHODE  
 8. ANODE/CATHODE  
 9. ANODE/CATHODE  
 10. ANODE/CATHODE  
 11. COMMON CATHODE  
 12. COMMON ANODE  
 13. ANODE/CATHODE  
 14. ANODE/CATHODE

STYLE 8:  
 PIN 1. COMMON CATHODE  
 2. ANODE/CATHODE  
 3. ANODE/CATHODE  
 4. NO CONNECTION  
 5. ANODE/CATHODE  
 6. ANODE/CATHODE  
 7. COMMON ANODE  
 8. COMMON ANODE  
 9. ANODE/CATHODE  
 10. ANODE/CATHODE  
 11. NO CONNECTION  
 12. ANODE/CATHODE  
 13. ANODE/CATHODE  
 14. COMMON CATHODE

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