

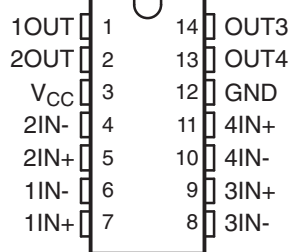
## QUAD DIFFERENTIAL COMPARATORS

Check for Samples: [LM139](#), [LM239](#), [LM339](#), [LM139A](#), [LM239A](#), [LM339A](#), [LM2901](#), [LM2901AV](#), [LM2901V](#)

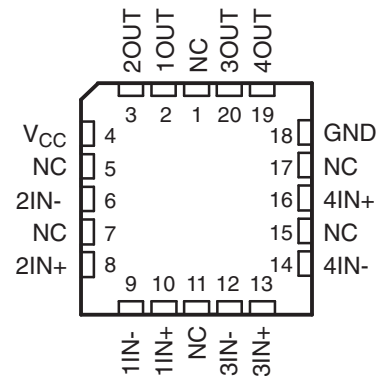
### FEATURES

- **Wide Supply Ranges**
  - **Single Supply:** 2 V to 36 V  
(Tested to 30 V for Non-V Devices and 32 V for V-Suffix Devices)
  - **Dual Supplies:**  $\pm 1$  V to  $\pm 18$  V  
(Tested to  $\pm 15$  V for Non-V Devices and  $\pm 16$  V for V-Suffix Devices)
- **Low Supply-Current Drain Independent of Supply Voltage:** 0.8 mA (Typ)
- **Low Input Bias Current:** 25 nA (Typ)
- **Low Input Offset Current:** 3 nA (Typ) (LM139)
- **Low Input Offset Voltage:** 2 mV (Typ)
- **Common-Mode Input Voltage Range Includes Ground**
- **Differential Input Voltage Range Equal to Maximum-Rated Supply Voltage:**  $\pm 36$  V
- **Low Output Saturation Voltage**
- **Output Compatible With TTL, MOS, and CMOS**

LM139, LM139A . . . D, J, OR W PACKAGE  
LM239 . . . D, N, OR PW PACKAGE  
LM239A . . . D PACKAGE  
LM339, LM339A . . . D, DB, N, NS, OR PW PACKAGE  
LM2901 . . . D, N, NS, OR PW PACKAGE  
(TOP VIEW)



LM139, LM139A . . . FK PACKAGE  
(TOP VIEW)



NC - No internal connection

### DESCRIPTION/ORDERING INFORMATION

These devices consist of four independent voltage comparators that are designed to operate from a single power supply over a wide range of voltages. Operation from dual supplies also is possible, as long as the difference between the two supplies is 2 V to 36 V, and  $V_{CC}$  is at least 1.5 V more positive than the input common-mode voltage. Current drain is independent of the supply voltage. The outputs can be connected to other open-collector outputs to achieve wired-AND relationships.

The LM139 and LM139A are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The LM239 and LM239A are characterized for operation from  $-25^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The LM339 and LM339A are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ . The LM2901, LM2901AV, and LM2901V are characterized for operation from  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ .



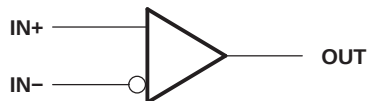
Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

Table 1. ORDERING INFORMATION<sup>(1)</sup>

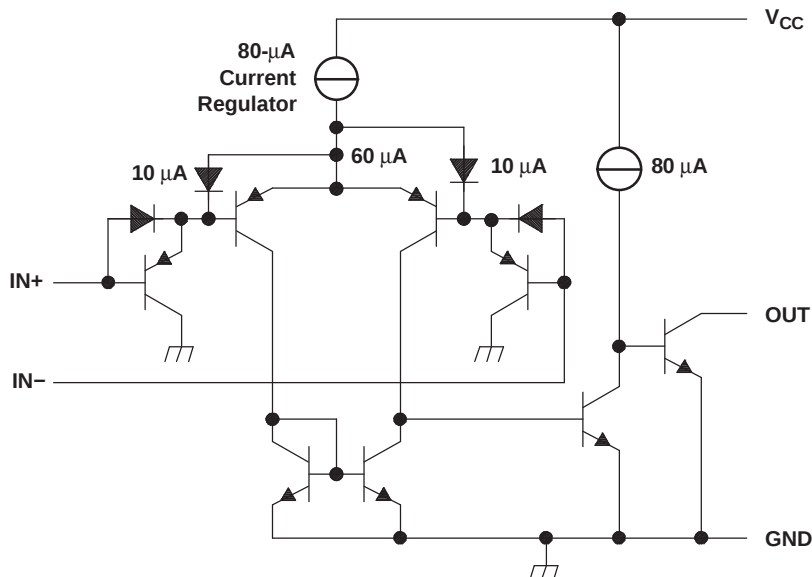
| T <sub>A</sub> | V <sub>IO</sub> max<br>AT 25°C | MAX V <sub>CC</sub> | PACKAGE <sup>(2)</sup> |              | ORDERABLE<br>PART NUMBER | TOP-SIDE<br>MARKING |
|----------------|--------------------------------|---------------------|------------------------|--------------|--------------------------|---------------------|
| 0°C to 70°C    | 5 mV                           | 30 V                | PDIP – N               | Tube of 25   | LM339N                   | LM339N              |
|                |                                |                     | SOIC – D               | Tube of 50   | LM339D                   | LM339               |
|                |                                |                     |                        | Reel of 2500 | LM339DR                  |                     |
|                |                                |                     |                        |              | LM339DRG3                |                     |
|                |                                |                     | SOP – NS               | Reel of 2000 | LM339NSR                 | LM339               |
|                |                                |                     | SSOP – DB              | Reel of 2000 | LM339DBR                 | LM339               |
|                | 2 mV                           | 30 V                | TSSOP – PW             | Tube of 90   | LM339PW                  | L339                |
|                |                                |                     |                        | Reel of 2000 | LM339PWRG3               |                     |
|                |                                |                     | PDIP – N               | Tube of 25   | LM339AN                  | LM339AN             |
|                |                                |                     | SOIC – D               | Tube of 50   | LM339AD                  | LM339A              |
|                |                                |                     |                        | Reel of 2500 | LM339ADR                 |                     |
|                |                                |                     | SOP – NS               | Reel of 2000 | LM339ANSR                | LM339A              |
| –25°C to 85°C  | 5 mV                           | 30 V                | PDIP – N               | Tube of 25   | LM239N                   | LM239N              |
|                |                                |                     |                        | Tube of 50   | LM239D                   | LM239               |
|                |                                |                     | SOIC – D               | Reel of 2500 | LM239DR                  |                     |
|                |                                |                     |                        |              | LM239DRG3                |                     |
|                | 2 mV                           | 30 V                | TSSOP – PW             | Tube of 90   | LM239PW                  | L239                |
|                |                                |                     |                        | Reel of 2000 | LM239PWR                 |                     |
|                |                                |                     | SOIC – D               | Tube of 50   | LM239AD                  | LM239A              |
|                |                                |                     |                        | Reel of 2500 | LM239ADR                 |                     |
| –40°C to 125°C | 7 mV                           | 30 V                | PDIP – N               | Tube of 25   | LM2901N                  | LM2901N             |
|                |                                |                     | SOIC – D               | Tube of 50   | LM2901D                  | LM2901              |
|                |                                |                     |                        | Reel of 2500 | LM2901DR                 |                     |
|                |                                |                     |                        |              | LM2901DRG3               |                     |
|                | 2 mV                           | 32 V                | SOP – NS               | Reel of 2000 | LM2901NSR                | LM2901              |
|                |                                |                     | TSSOP – PW             | Tube of 90   | LM2901PW                 | L2901               |
|                |                                |                     |                        | Reel of 2000 | LM2901PWRG3              |                     |
|                |                                |                     | SOIC – D               | Reel of 2500 | LM2901VQDR               | L2901V              |
|                |                                |                     | TSSOP – PW             | Reel of 2000 | LM2901VQPWR              | L2901V              |
|                |                                |                     | SOIC – D               | Reel of 2500 | LM2901AVQDR              | L2901AV             |
| –55°C to 125°C | 5 mV                           | 30 V                | TSSOP – PW             | Reel of 2000 | LM2901AVQPWR             | L2901AV             |
|                |                                |                     | CFP – W                | Tube of 25   | LM139W                   | LM139W              |
|                |                                |                     | CDIP – J               | Tube of 25   | LM139J                   | LM139J              |
|                |                                |                     | LCCC – FK              | Tube of 55   | LM139FK                  | LM139FK             |
|                | 2 mV                           | 30 V                | SOIC – D               | Tube of 50   | LM139D                   | LM139               |
|                |                                |                     |                        | Reel of 2500 | LM139DR                  |                     |
|                |                                |                     | CFP – W                | Tube of 25   | LM139AW                  | LM139AW             |
|                |                                |                     | CDIP – J               | Tube of 25   | LM139AJ                  | LM139AJ             |
|                |                                |                     | LCCC – FK              | Tube of 55   | LM139AFK                 | LM139AFK            |
|                |                                |                     | SOIC – D               | Tube of 50   | LM139AD                  | LM139AD             |
|                |                                |                     |                        | Reel of 2500 | LM139ADR                 |                     |

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at [www.ti.com](http://www.ti.com).  
(2) Package drawings, thermal data, and symbolization are available at [www.ti.com/packaging](http://www.ti.com/packaging).

### SYMBOL (EACH COMPARATOR)



### SCHEMATIC (EACH COMPARATOR)



All current values shown are nominal.

## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

over operating free-air temperature range (unless otherwise noted)

|               |                                                                    | MIN  | MAX        | UNIT  |
|---------------|--------------------------------------------------------------------|------|------------|-------|
| $V_{CC}$      | Supply voltage <sup>(2)</sup>                                      |      | 36         | V     |
| $V_{ID}$      | Differential input voltage <sup>(3)</sup>                          |      | ±36        | V     |
| $V_I$         | Input voltage range (either input)                                 | –0.3 | 36         | V     |
| $V_O$         | Output voltage                                                     |      | 36         | V     |
| $I_O$         | Output current                                                     |      | 20         | mA    |
|               | Duration of output short circuit to ground <sup>(4)</sup>          |      | Unlimited  |       |
| $\theta_{JA}$ | Package thermal impedance, junction to free air <sup>(5) (6)</sup> |      | D package  | 86    |
|               |                                                                    |      | DB package | 96    |
|               |                                                                    |      | N package  | 80    |
|               |                                                                    |      | NS package | 76    |
|               |                                                                    |      | PW package | 113   |
| $\theta_{JC}$ | Package thermal impedance, junction to case <sup>(7) (8)</sup>     |      | FK package | 5.61  |
|               |                                                                    |      | J package  | 15.05 |
|               |                                                                    |      | W package  | 14.65 |
| $T_J$         | Operating virtual-junction temperature                             |      | 150        | °C    |
|               | Case temperature for 60 s                                          |      | FK package | 260   |
|               | Lead temperature 1,6 mm (1/16 in) from case for 60 s               |      | J package  | 300   |
| $T_{stg}$     | Storage temperature range                                          | –65  | 150        | °C    |

- (1) Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) All voltage values, except differential voltages, are with respect to network ground.
- (3) Differential voltages are at IN+ with respect to IN–.
- (4) Short circuits from outputs to  $V_{CC}$  can cause excessive heating and eventual destruction.
- (5) Maximum power dissipation is a function of  $T_J$  (max),  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_J \text{ (max)} - T_A)/\theta_{JA}$ . Operating at the absolute maximum  $T_J$  of 150°C can affect reliability.
- (6) The package thermal impedance is calculated in accordance with JESD 51-7.
- (7) Maximum power dissipation is a function of  $T_J$  (max),  $\theta_{JC}$ , and  $T_C$ . The maximum allowable power dissipation at any allowable case temperature is  $P_D = (T_J \text{ (max)} - T_C)/\theta_{JC}$ . Operating at the absolute maximum  $T_J$  of 150°C can affect reliability.
- (8) The package thermal impedance is calculated in accordance with MIL-STD-883.

## ELECTRICAL CHARACTERISTICS

at specified free-air temperature,  $V_{CC} = 5\text{ V}$  (unless otherwise noted)

| PARAMETER                                                | TEST CONDITIONS <sup>(1)</sup>                                                                     | $T_A$ <sup>(2)</sup>                 | LM139 |                        |      | LM139A |                        |      | UNIT |
|----------------------------------------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------|-------|------------------------|------|--------|------------------------|------|------|
|                                                          |                                                                                                    |                                      | MIN   | TYP                    | MAX  | MIN    | TYP                    | MAX  |      |
| $V_{IO}$ Input offset voltage                            | $V_{CC} = 5\text{ V to } 30\text{ V}$ ,<br>$V_{IC} = V_{ICR\text{ min}}$ ,<br>$V_O = 1.4\text{ V}$ | 25°C                                 |       | 2                      | 5    |        | 1                      | 2    | mV   |
|                                                          |                                                                                                    | Full range                           |       |                        | 9    |        |                        | 4    |      |
| $I_{IO}$ Input offset current                            | $V_O = 1.4\text{ V}$                                                                               | 25°C                                 |       | 3                      | 25   |        | 3                      | 25   | nA   |
|                                                          |                                                                                                    | Full range                           |       |                        | 100  |        |                        | 100  |      |
| $I_{IB}$ Input bias current                              | $V_O = 1.4\text{ V}$                                                                               | 25°C                                 |       | –25                    | –100 |        | –25                    | –100 | nA   |
|                                                          |                                                                                                    | Full range                           |       |                        | –300 |        |                        | –300 |      |
| $V_{ICR}$ Common-mode input-voltage range <sup>(3)</sup> |                                                                                                    | 25°C                                 |       | 0 to<br>$V_{CC} - 1.5$ |      |        | 0 to<br>$V_{CC} - 1.5$ |      | V    |
|                                                          |                                                                                                    | Full range                           |       | 0 to<br>$V_{CC} - 2$   |      |        | 0 to<br>$V_{CC} - 2$   |      |      |
| $A_{VD}$ Large-signal differential-voltage amplification | $V_{CC+} = \pm 7.5\text{ V}$ ,<br>$V_O = -5\text{ V to } 5\text{ V}$                               | 25°C                                 |       | 200                    |      | 50     | 200                    |      | V/mV |
| $I_{OH}$ High-level output current                       | $V_{ID} = 1\text{ V}$                                                                              | $V_{OH} = 5\text{ V}$<br>25°C        |       | 0.1                    |      |        | 0.1                    |      | nA   |
|                                                          |                                                                                                    | $V_{OH} = 30\text{ V}$<br>Full range |       |                        | 1    |        |                        | 1    | μA   |
| $V_{OL}$ Low-level output voltage                        | $V_{ID} = -1\text{ V}$ , $I_{OL} = 4\text{ mA}$                                                    | 25°C                                 |       | 150                    | 400  |        | 150                    | 400  | mV   |
|                                                          |                                                                                                    | Full range                           |       |                        | 700  |        |                        | 700  |      |
| $I_{OL}$ Low-level output current                        | $V_{ID} = -1\text{ V}$ , $V_{OL} = 1.5\text{ V}$                                                   | 25°C                                 |       | 6                      | 16   |        | 6                      | 16   | mA   |
| $I_{CC}$ Supply current (four comparators)               | $V_O = 2.5\text{ V}$ , No load                                                                     | 25°C                                 |       | 0.8                    | 2    |        | 0.8                    | 2    | mA   |

- (1) All characteristics are measured with zero common-mode input voltage, unless otherwise specified.
- (2) Full range (MIN to MAX) for LM139 and LM139A is –55°C to 125°C. All characteristics are measured with zero common-mode input voltage, unless otherwise specified.
- (3) The voltage at either input or common-mode should not be allowed to go negative by more than 0.3 V. The upper end of the common-mode voltage range is  $V_{CC+} - 1.5\text{ V}$ ; however, one input can exceed  $V_{CC}$ , and the comparator will provide a proper output state as long as the other input remains in the common-mode range. Either or both inputs can go to 30 V without damage.

## SWITCHING CHARACTERISTICS

 $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ 

| PARAMETER     | TEST CONDITIONS                                                                   | LM139<br>LM139A                       | UNIT |
|---------------|-----------------------------------------------------------------------------------|---------------------------------------|------|
|               |                                                                                   | TYP                                   |      |
| Response time | $R_L$ connected to 5 V through 5.1 kΩ,<br>$C_L = 15\text{ pF}$ <sup>(1) (2)</sup> | 100-mV input step with 5-mV overdrive | μs   |
|               |                                                                                   | TTL-level input step                  |      |

- (1)  $C_L$  includes probe and jig capacitance.
- (2) The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V.

## ELECTRICAL CHARACTERISTICS

at specified free-air temperature,  $V_{CC} = 5\text{ V}$  (unless otherwise noted)

| PARAMETER        |                                                 | TEST CONDITIONS <sup>(1)</sup>                                                                            |                        | T <sub>A</sub> <sup>(2)</sup> | LM239<br>LM339                |      | LM239A<br>LM339A              |      | UNIT |
|------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------|------------------------|-------------------------------|-------------------------------|------|-------------------------------|------|------|
|                  |                                                 |                                                                                                           |                        |                               | MIN                           | TYP  | MAX                           | MIN  |      |
| V <sub>IO</sub>  | Input offset voltage                            | V <sub>CC</sub> = 5 V to 30 V,<br>V <sub>IC</sub> = V <sub>ICR</sub> min,<br>V <sub>O</sub> = 1.4 V       |                        | 25°C                          | 2                             | 5    | 1                             | 3    | mV   |
|                  |                                                 |                                                                                                           |                        | Full range                    |                               | 9    |                               | 4    |      |
| I <sub>IO</sub>  | Input offset current                            | V <sub>O</sub> = 1.4 V                                                                                    |                        | 25°C                          | 5                             | 50   | 5                             | 50   | nA   |
|                  |                                                 |                                                                                                           |                        | Full range                    |                               | 150  |                               | 150  |      |
| I <sub>IB</sub>  | Input bias current                              | V <sub>O</sub> = 1.4 V                                                                                    |                        | 25°C                          | –25                           | –250 | –25                           | –250 | nA   |
|                  |                                                 |                                                                                                           |                        | Full range                    |                               | –400 |                               | –400 |      |
| V <sub>ICR</sub> | Common-mode input-voltage range <sup>(3)</sup>  |                                                                                                           |                        | 25°C                          | 0 to<br>V <sub>CC</sub> – 1.5 |      | 0 to<br>V <sub>CC</sub> – 1.5 |      | V    |
|                  |                                                 |                                                                                                           |                        | Full range                    | 0 to<br>V <sub>CC</sub> – 2   |      | 0 to<br>V <sub>CC</sub> – 2   |      |      |
| A <sub>VD</sub>  | Large-signal differential-voltage amplification | V <sub>CC</sub> = 15 V,<br>V <sub>O</sub> = 1.4 V to 11.4 V,<br>R <sub>L</sub> ≥ 15 kΩ to V <sub>CC</sub> |                        | 25°C                          | 50                            | 200  | 50                            | 200  | V/mV |
| I <sub>OH</sub>  | High-level output current                       | V <sub>ID</sub> = 1 V                                                                                     | V <sub>OH</sub> = 5 V  | 25°C                          | 0.1                           | 50   | 0.1                           | 50   | nA   |
|                  |                                                 |                                                                                                           | V <sub>OH</sub> = 30 V | Full range                    |                               | 1    |                               | 1    | μA   |
| V <sub>OL</sub>  | Low-level output voltage                        | V <sub>ID</sub> = –1 V,<br>I <sub>OL</sub> = 4 mA                                                         | 25°C                   | 150                           | 400                           | 150  | 400                           | mV   |      |
|                  |                                                 |                                                                                                           | Full range             |                               | 700                           |      | 700                           |      |      |
| I <sub>OL</sub>  | Low-level output current                        | V <sub>ID</sub> = –1 V,<br>V <sub>OL</sub> = 1.5 V                                                        | 25°C                   | 6                             | 16                            | 6    | 16                            | mA   |      |
| I <sub>CC</sub>  | Supply current<br>(four comparators)            | V <sub>O</sub> = 2.5 V,<br>No load                                                                        | 25°C                   | 0.8                           | 2                             | 0.8  | 2                             | mA   |      |

- (1) All characteristics are measured with zero common-mode input voltage, unless otherwise specified.  
(2) Full range (MIN to MAX) for LM239/LM239A is –25°C to 85°C, and for LM339/LM339A is 0°C to 70°C. All characteristics are measured with zero common-mode input voltage, unless otherwise specified.  
(3) The voltage at either input or common-mode should not be allowed to go negative by more than 0.3 V. The upper end of the common-mode voltage range is  $V_{CC+} - 1.5\text{ V}$ ; however, one input can exceed  $V_{CC}$ , and the comparator will provide a proper output state as long as the other input remains in the common-mode range. Either or both inputs can go to 30 V without damage.

## SWITCHING CHARACTERISTICS

$V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

| PARAMETER     | TEST CONDITIONS                                                                            | UNIT                                  |
|---------------|--------------------------------------------------------------------------------------------|---------------------------------------|
|               |                                                                                            |                                       |
| Response time | $R_L$ connected to 5 V through 5.1 k $\Omega$ ,<br>$C_L = 15\text{ pF}$ <sup>(1) (2)</sup> | 100-mV input step with 5-mV overdrive |
|               |                                                                                            | TTL-level input step                  |

- (1)  $C_L$  includes probe and jig capacitance.  
(2) The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V.

## ELECTRICAL CHARACTERISTICS

at specified free-air temperature,  $V_{CC} = 5\text{ V}$  (unless otherwise noted)

| PARAMETER        |                                                 | TEST CONDITIONS <sup>(1)</sup>                                                                                    |                                                      | T <sub>A</sub> <sup>(2)</sup> | LM2901                        |     |      | UNIT |
|------------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------|-------------------------------|-----|------|------|
|                  |                                                 |                                                                                                                   |                                                      |                               | MIN                           | TYP | MAX  |      |
| V <sub>IO</sub>  | Input offset voltage                            | V <sub>IC</sub> = V <sub>ICR</sub> min,<br>V <sub>O</sub> = 1.4 V,<br>V <sub>CC</sub> = 5 V to MAX <sup>(3)</sup> | Non-A devices                                        | 25°C                          | 2                             |     | 7    | mV   |
|                  |                                                 |                                                                                                                   |                                                      | Full range                    | 15                            |     |      |      |
|                  |                                                 | A-suffix devices                                                                                                  | 25°C                                                 | 1                             |                               | 2   |      |      |
|                  |                                                 |                                                                                                                   | Full range                                           | 4                             |                               |     |      |      |
| I <sub>IO</sub>  | Input offset current                            | V <sub>O</sub> = 1.4 V                                                                                            |                                                      | 25°C                          | 5                             |     | 50   | nA   |
|                  |                                                 |                                                                                                                   |                                                      | Full range                    | 200                           |     |      |      |
| I <sub>IB</sub>  | Input bias current                              | V <sub>O</sub> = 1.4 V                                                                                            |                                                      | 25°C                          | –25                           |     | –250 | nA   |
|                  |                                                 |                                                                                                                   |                                                      | Full range                    | –500                          |     |      |      |
| V <sub>ICR</sub> | Common-mode input-voltage range <sup>(4)</sup>  |                                                                                                                   |                                                      | 25°C                          | 0 to<br>V <sub>CC</sub> – 1.5 |     | V    |      |
|                  |                                                 |                                                                                                                   |                                                      | Full range                    | 0 to<br>V <sub>CC</sub> – 2   |     |      |      |
| A <sub>VD</sub>  | Large-signal differential-voltage amplification | V <sub>CC</sub> = 15 V, V <sub>O</sub> = 1.4 V to 11.4 V,<br>R <sub>L</sub> ≥ 15 kΩ to V <sub>CC</sub>            |                                                      | 25°C                          | 25                            | 100 | V/mV |      |
| I <sub>OH</sub>  | High-level output current                       | V <sub>ID</sub> = 1 V                                                                                             | V <sub>OH</sub> = 5 V                                | 25°C                          | 0.1                           |     | 50   | nA   |
|                  |                                                 |                                                                                                                   | V <sub>OH</sub> = V <sub>CC</sub> MAX <sup>(3)</sup> | Full range                    | 1                             |     | μA   |      |
| V <sub>OL</sub>  | Low-level output voltage                        | V <sub>ID</sub> = –1 V,<br>I <sub>OL</sub> = 4 mA                                                                 | Non-V devices                                        | 25°C                          | 150                           |     | 500  | mV   |
|                  |                                                 |                                                                                                                   | V-suffix devices                                     |                               | 150                           |     | 400  |      |
|                  |                                                 |                                                                                                                   | All devices                                          | Full range                    | 700                           |     |      |      |
| I <sub>OL</sub>  | Low-level output current                        | V <sub>ID</sub> = –1 V,                                                                                           | V <sub>OL</sub> = 1.5 V                              | 25°C                          | 6                             | 16  | mA   |      |
| I <sub>CC</sub>  | Supply current<br>(four comparators)            | V <sub>O</sub> = 2.5 V,<br>No load                                                                                | V <sub>CC</sub> = 5 V                                | 25°C                          | 0.8                           |     | 2    | mA   |
|                  |                                                 |                                                                                                                   | V <sub>CC</sub> = MAX <sup>(3)</sup>                 |                               | 1                             |     | 2.5  |      |

(1) All characteristics are measured with zero common-mode input voltage, unless otherwise specified.

(2) Full range (MIN to MAX) for LM2901 is –40°C to 125°C. All characteristics are measured with zero common-mode input voltage, unless otherwise specified.

(3)  $V_{CC} \text{ MAX} = 30\text{ V}$  for non-V devices, and 32 V for V-suffix devices

(4) The voltage at either input or common-mode should not be allowed to go negative by more than 0.3 V. The upper end of the common-mode voltage range is  $V_{CC+} - 1.5\text{ V}$ ; however, one input can exceed  $V_{CC}$ , and the comparator will provide a proper output state as long as the other input remains in the common-mode range. Either or both inputs can go to  $V_{CC} \text{ MAX}$  without damage.

## SWITCHING CHARACTERISTICS

 $V_{CC} = 5\text{ V, } T_A = 25^\circ\text{C}$ 

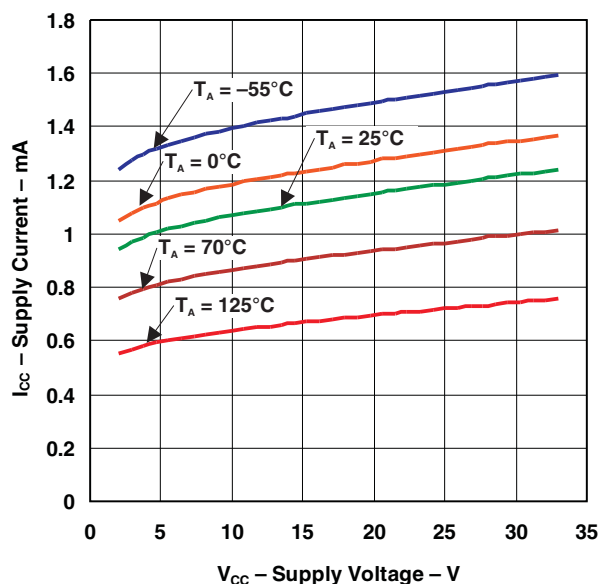
| PARAMETER     | TEST CONDITIONS                                                                              |                                       | LM2901 | UNIT          |
|---------------|----------------------------------------------------------------------------------------------|---------------------------------------|--------|---------------|
|               |                                                                                              |                                       | TYP    |               |
| Response time | $R_L$ connected to 5 V through 5.1 k $\Omega$ ,<br>$C_L = 15\text{ pF}^{(1)} \text{ }^{(2)}$ | 100-mV input step with 5-mV overdrive | 1.3    | $\mu\text{s}$ |
|               |                                                                                              | TTL-level input step                  | 0.3    |               |

(1)  $C_L$  includes probe and jig capacitance.

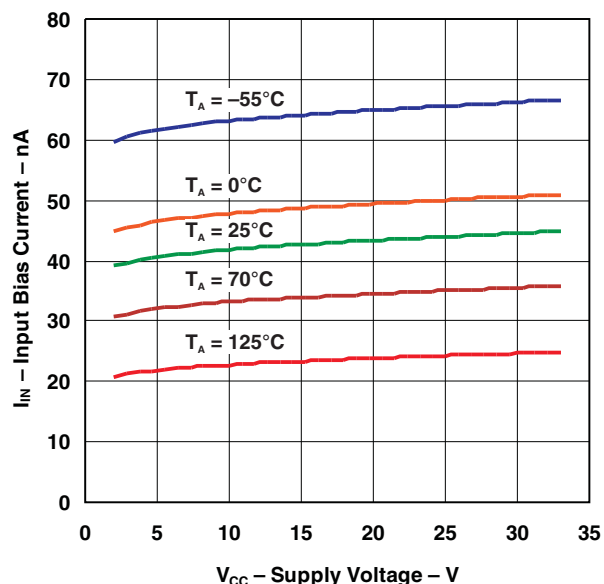
(2) The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V.

## TYPICAL CHARACTERISTICS

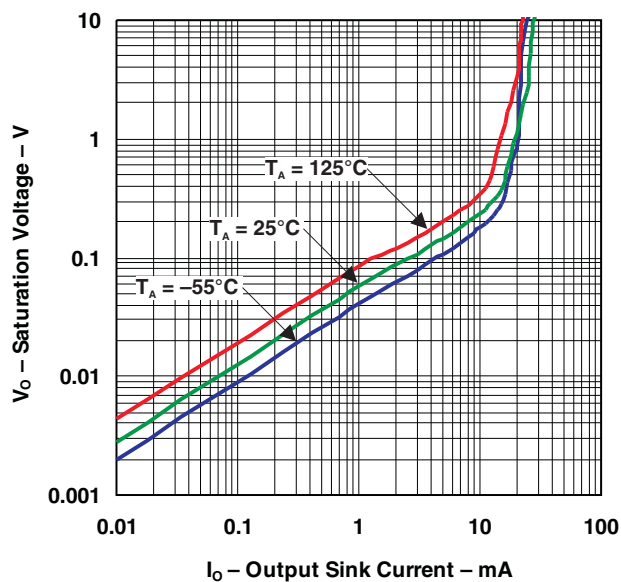
SUPPLY CURRENT  
vs  
SUPPLY VOLTAGE



INPUT BIAS CURRENT  
vs  
SUPPLY VOLTAGE

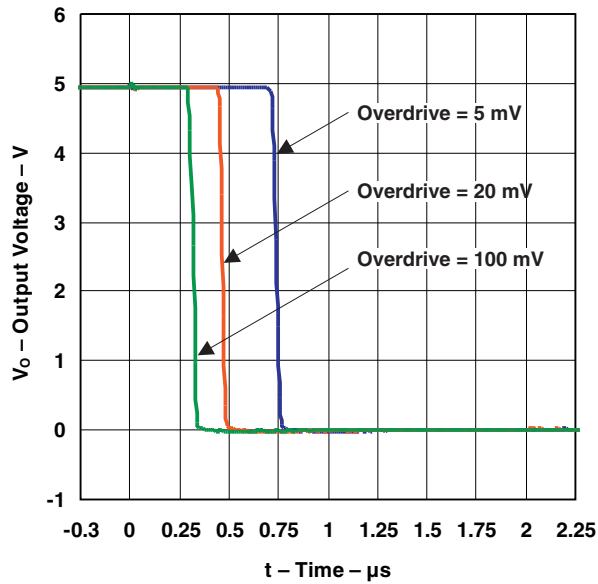


OUTPUT SATURATION VOLTAGE

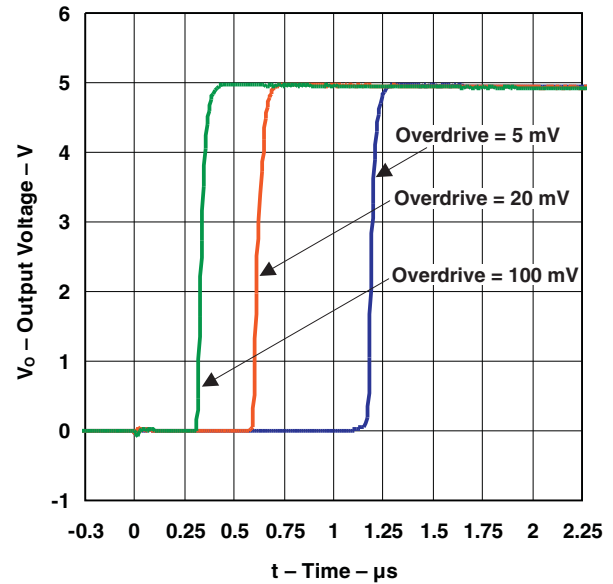


## TYPICAL CHARACTERISTICS (continued)

RESPONSE TIME FOR VARIOUS OVERDRIVES  
NEGATIVE TRANSITION



RESPONSE TIME FOR VARIOUS OVERDRIVES  
POSITIVE TRANSITION



## REVISION HISTORY

| Changes from Revision R (July 2010) to Revision S | Page              |
|---------------------------------------------------|-------------------|
| • Updated ORDERING INFORMATION table. ....        | <a href="#">2</a> |

**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup>    | Lead/<br>Ball Finish | MSL Peak Temp <sup>(3)</sup> | Samples<br>(Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| 5962-7700801VCA  | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                        | A42                  | N / A for Pkg Type           |                             |
| 5962-87739012A   | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                        | Call TI              | Call TI                      |                             |
| 5962-8773901CA   | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                        | Call TI              | Call TI                      |                             |
| 5962-8773901DA   | ACTIVE                | CFP          | W               | 14   | 1           | TBD                        | Call TI              | Call TI                      |                             |
| 5962-9673802V9B  | ACTIVE                | XCEPT        | KGD             | 0    | 100         | TBD                        | Call TI              | N / A for Pkg Type           |                             |
| 5962-9673802VCA  | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                        | A42                  | N / A for Pkg Type           |                             |
| 77008012A        | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                        | Call TI              | Call TI                      |                             |
| 7700801CA        | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                        | Call TI              | Call TI                      |                             |
| 7700801DA        | ACTIVE                | CFP          | W               | 14   | 1           | TBD                        | Call TI              | Call TI                      |                             |
| JM38510/11201BCA | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                        | A42                  | N / A for Pkg Type           |                             |
| LM139AD          | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM139ADG4        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM139ADR         | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM139ADRG4       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM139AFKB        | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                        | POST-PLATE           | N / A for Pkg Type           |                             |
| LM139AJ          | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                        | A42                  | N / A for Pkg Type           |                             |
| LM139AJB         | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                        | A42                  | N / A for Pkg Type           |                             |
| LM139AN          | OBSOLETE              | PDIP         | N               | 14   |             | TBD                        | Call TI              | Call TI                      |                             |
| LM139AW          | ACTIVE                | CFP          | W               | 14   | 1           | TBD                        | A42                  | N / A for Pkg Type           |                             |
| LM139AWB         | ACTIVE                | CFP          | W               | 14   | 1           | TBD                        | A42                  | N / A for Pkg Type           |                             |
| LM139D           | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM139DG4         | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM139DR          | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM139DRG4        | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup>    | Lead/<br>Ball Finish | MSL Peak Temp <sup>(3)</sup> | Samples<br>(Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| LM139FK          | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                        | POST-PLATE           | N / A for Pkg Type           |                             |
| LM139FKB         | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                        | POST-PLATE           | N / A for Pkg Type           |                             |
| LM139J           | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                        | A42                  | N / A for Pkg Type           |                             |
| LM139JB          | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                        | A42                  | N / A for Pkg Type           |                             |
| LM139N           | OBSOLETE              | PDIP         | N               | 14   |             | TBD                        | Call TI              | Call TI                      |                             |
| LM139W           | ACTIVE                | CFP          | W               | 14   | 1           | TBD                        | A42                  | N / A for Pkg Type           |                             |
| LM139WB          | ACTIVE                | CFP          | W               | 14   | 1           | TBD                        | A42                  | N / A for Pkg Type           |                             |
| LM239AD          | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239ADE4        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239ADG4        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239ADR         | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239ADRE4       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239ADRG4       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239AN          | OBSOLETE              | PDIP         | N               | 14   |             | TBD                        | Call TI              | Call TI                      |                             |
| LM239D           | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239DE4         | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239DG4         | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239DR          | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239DRE4        | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239DRG3        | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU SN                | Level-1-260C-UNLIM           |                             |
| LM239DRG4        | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239N           | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)             | CU NIPDAU            | N / A for Pkg Type           |                             |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup>    | Lead/<br>Ball Finish | MSL Peak Temp <sup>(3)</sup> | Samples<br>(Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| LM239NE4         | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)             | CU NIPDAU            | N / A for Pkg Type           |                             |
| LM239PW          | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239PWE4        | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239PWG4        | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239PWR         | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239PWRE4       | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM239PWRG4       | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901AVQDR      | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901AVQDRG4    | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901AVQPWR     | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901AVQPWRG4   | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901D          | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901DE4        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901DG4        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901DR         | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901DRE4       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901DRG3       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU SN                | Level-1-260C-UNLIM           |                             |
| LM2901DRG4       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901N          | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)             | CU NIPDAU            | N / A for Pkg Type           |                             |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup>    | Lead/<br>Ball Finish | MSL Peak Temp <sup>(3)</sup> | Samples<br>(Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| LM2901NE4        | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)             | CU NIPDAU            | N / A for Pkg Type           |                             |
| LM2901NSR        | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901NSRE4      | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901NSRG4      | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901PW         | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901PWE4       | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901PWG4       | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901PWLE       | OBSOLETE              | TSSOP        | PW              | 14   |             | TBD                        | Call TI              | Call TI                      |                             |
| LM2901PWR        | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901PWRE4      | ACTIVE                | TSSOP        | PW              | 14   |             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901PWRG3      | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU SN                | Level-1-260C-UNLIM           |                             |
| LM2901PWRG4      | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901QD         | OBSOLETE              | SOIC         | D               | 14   |             | TBD                        | Call TI              | Call TI                      |                             |
| LM2901QN         | OBSOLETE              | PDIP         | N               | 14   |             | TBD                        | Call TI              | Call TI                      |                             |
| LM2901VQDR       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901VQDRG4     | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901VQPWR      | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM2901VQPWRG4    | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339AD          | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup>    | Lead/<br>Ball Finish | MSL Peak Temp <sup>(3)</sup> | Samples<br>(Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| LM339ADBR        | ACTIVE                | SSOP         | DB              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339ADBRG4      | ACTIVE                | SSOP         | DB              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339ADE4        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339ADG4        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339ADR         | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339ADRE4       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339ADRG4       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339AN          | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)             | CU NIPDAU            | N / A for Pkg Type           |                             |
| LM339ANE4        | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)             | CU NIPDAU            | N / A for Pkg Type           |                             |
| LM339ANSR        | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339ANSRG4      | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339APW         | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339APWE4       | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339APWG4       | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339APWR        | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339APWRE4      | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339APWRG4      | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339D           | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339DBLE        | OBSOLETE              | SSOP         | DB              | 14   |             | TBD                        | Call TI              | Call TI                      |                             |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup>    | Lead/<br>Ball Finish | MSL Peak Temp <sup>(3)</sup> | Samples<br>(Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| LM339DBR         | ACTIVE                | SSOP         | DB              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339DBRE4       | ACTIVE                | SSOP         | DB              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339DBRG4       | ACTIVE                | SSOP         | DB              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339DE4         | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339DG4         | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339DR          | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339DRE4        | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339DRG3        | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU SN                | Level-1-260C-UNLIM           |                             |
| LM339DRG4        | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339N           | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)             | CU NIPDAU            | N / A for Pkg Type           |                             |
| LM339NE3         | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)             | CU SN                | N / A for Pkg Type           |                             |
| LM339NE4         | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)             | CU NIPDAU            | N / A for Pkg Type           |                             |
| LM339NSLE        | OBSOLETE              | SO           | NS              | 14   |             | TBD                        | Call TI              | Call TI                      |                             |
| LM339NSR         | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339NSRG4       | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339PW          | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339PWE4        | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339PWG4        | ACTIVE                | TSSOP        | PW              | 14   | 90          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339PWLE        | OBSOLETE              | TSSOP        | PW              | 14   |             | TBD                        | Call TI              | Call TI                      |                             |
| LM339PWR         | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/<br>Ball Finish | MSL Peak Temp <sup>(3)</sup> | Samples<br>(Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|----------------------|------------------------------|-----------------------------|
| LM339PWRE4       | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339PWRG3       | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU SN                | Level-1-260C-UNLIM           |                             |
| LM339PWRG4       | ACTIVE                | TSSOP        | PW              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU            | Level-1-260C-UNLIM           |                             |
| LM339Y           | OBSOLETE              |              |                 | 0    |             | TBD                     | Call TI              | Call TI                      |                             |
| M38510/11201BCA  | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42                  | N / A for Pkg Type           |                             |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

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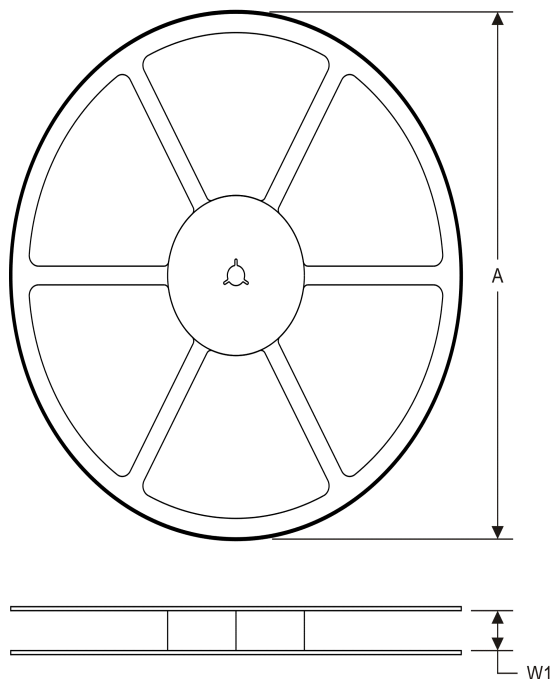
**OTHER QUALIFIED VERSIONS OF LM139, LM139-SP, LM239A, LM2901, LM2901AV, LM2901V :**

• Catalog: [LM139](#)

- Automotive: [LM239A-Q1](#), [LM2901-Q1](#), [LM2901AV-Q1](#), [LM2901V-Q1](#)
- Enhanced Product: [LM239A-EP](#)
- Space: [LM139-SP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**TAPE DIMENSIONS**


|    |                                                           |
|----|-----------------------------------------------------------|
| A0 | Dimension designed to accommodate the component width     |
| B0 | Dimension designed to accommodate the component length    |
| K0 | Dimension designed to accommodate the component thickness |
| W  | Overall width of the carrier tape                         |
| P1 | Pitch between successive cavity centers                   |

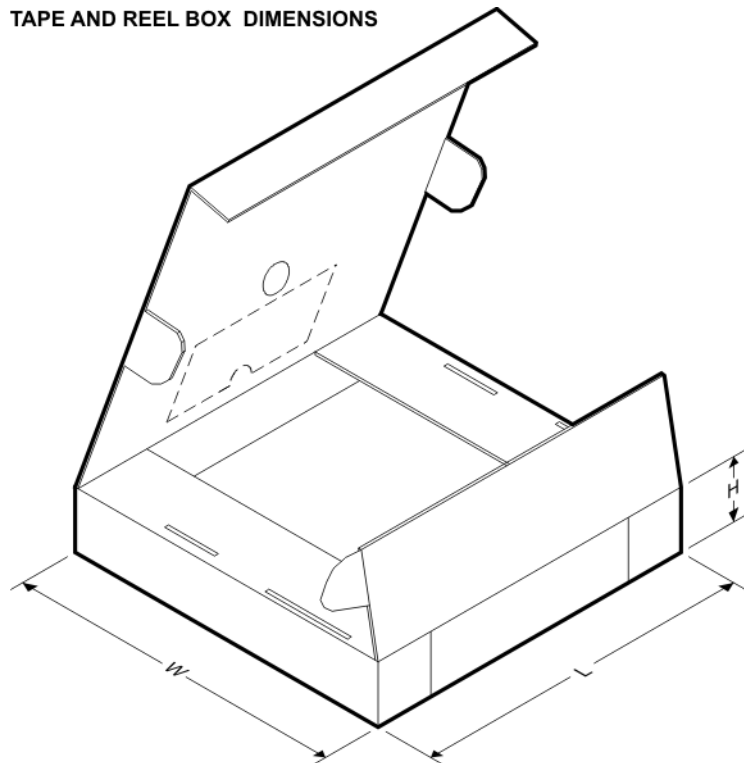
**TAPE AND REEL INFORMATION**

\*All dimensions are nominal

| Device       | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| LM139ADR     | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM139DR      | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM239ADR     | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM239ADR     | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM239DR      | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM239DR      | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM239DRG4    | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM239DRG4    | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM239PWR     | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| LM2901AVQPWR | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| LM2901DR     | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM2901DR     | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM2901DRG4   | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM2901DRG4   | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM2901NSR    | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| LM2901PWR    | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| LM2901PWR    | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 7.0     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| LM2901PWRG3  | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 7.0     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |

| Device      | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| LM2901PWRG4 | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| LM2901VQPWR | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| LM339ADBR   | SSOP         | DB              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 6.6     | 2.5     | 12.0    | 16.0   | Q1            |
| LM339ADR    | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM339ADR    | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM339ANSR   | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| LM339APWR   | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| LM339DBR    | SSOP         | DB              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 6.6     | 2.5     | 12.0    | 16.0   | Q1            |
| LM339DR     | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM339DR     | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM339DRG4   | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM339DRG4   | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| LM339NSR    | SO           | NS              | 14   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| LM339PWR    | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| LM339PWR    | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 7.0     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| LM339PWRG3  | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 7.0     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| LM339PWRG4  | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device       | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| LM139ADR     | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| LM139DR      | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| LM239ADR     | SOIC         | D               | 14   | 2500 | 333.2       | 345.9      | 28.6        |
| LM239ADR     | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| LM239DR      | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| LM239DR      | SOIC         | D               | 14   | 2500 | 333.2       | 345.9      | 28.6        |
| LM239DRG4    | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| LM239DRG4    | SOIC         | D               | 14   | 2500 | 333.2       | 345.9      | 28.6        |
| LM239PWR     | TSSOP        | PW              | 14   | 2000 | 367.0       | 367.0      | 35.0        |
| LM2901AVQPWR | TSSOP        | PW              | 14   | 2000 | 367.0       | 367.0      | 35.0        |
| LM2901DR     | SOIC         | D               | 14   | 2500 | 333.2       | 345.9      | 28.6        |
| LM2901DR     | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| LM2901DRG4   | SOIC         | D               | 14   | 2500 | 333.2       | 345.9      | 28.6        |
| LM2901DRG4   | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| LM2901NSR    | SO           | NS              | 14   | 2000 | 367.0       | 367.0      | 38.0        |
| LM2901PWR    | TSSOP        | PW              | 14   | 2000 | 367.0       | 367.0      | 35.0        |
| LM2901PWR    | TSSOP        | PW              | 14   | 2000 | 364.0       | 364.0      | 27.0        |
| LM2901PWRG3  | TSSOP        | PW              | 14   | 2000 | 364.0       | 364.0      | 27.0        |
| LM2901PWRG4  | TSSOP        | PW              | 14   | 2000 | 367.0       | 367.0      | 35.0        |
| LM2901VQPWR  | TSSOP        | PW              | 14   | 2000 | 367.0       | 367.0      | 35.0        |
| LM339ADBR    | SSOP         | DB              | 14   | 2000 | 367.0       | 367.0      | 38.0        |
| LM339ADR     | SOIC         | D               | 14   | 2500 | 333.2       | 345.9      | 28.6        |
| LM339ADR     | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| LM339ANSR    | SO           | NS              | 14   | 2000 | 367.0       | 367.0      | 38.0        |
| LM339APWR    | TSSOP        | PW              | 14   | 2000 | 367.0       | 367.0      | 35.0        |
| LM339DBR     | SSOP         | DB              | 14   | 2000 | 367.0       | 367.0      | 38.0        |
| LM339DR      | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| LM339DR      | SOIC         | D               | 14   | 2500 | 333.2       | 345.9      | 28.6        |
| LM339DRG4    | SOIC         | D               | 14   | 2500 | 333.2       | 345.9      | 28.6        |
| LM339DRG4    | SOIC         | D               | 14   | 2500 | 367.0       | 367.0      | 38.0        |
| LM339NSR     | SO           | NS              | 14   | 2000 | 367.0       | 367.0      | 38.0        |
| LM339PWR     | TSSOP        | PW              | 14   | 2000 | 367.0       | 367.0      | 35.0        |
| LM339PWR     | TSSOP        | PW              | 14   | 2000 | 364.0       | 364.0      | 27.0        |
| LM339PWRG3   | TSSOP        | PW              | 14   | 2000 | 364.0       | 364.0      | 27.0        |
| LM339PWRG4   | TSSOP        | PW              | 14   | 2000 | 367.0       | 367.0      | 35.0        |

J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



| PINS **<br>DIM | 14                     | 16                     | 18                     | 20                     |
|----------------|------------------------|------------------------|------------------------|------------------------|
| A              | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC |
| B MAX          | 0.785<br>(19,94)       | .840<br>(21,34)        | 0.960<br>(24,38)       | 1.060<br>(26,92)       |
| B MIN          | —                      | —                      | —                      | —                      |
| C MAX          | 0.300<br>(7,62)        | 0.300<br>(7,62)        | 0.310<br>(7,87)        | 0.300<br>(7,62)        |
| C MIN          | 0.245<br>(6,22)        | 0.245<br>(6,22)        | 0.220<br>(5,59)        | 0.245<br>(6,22)        |

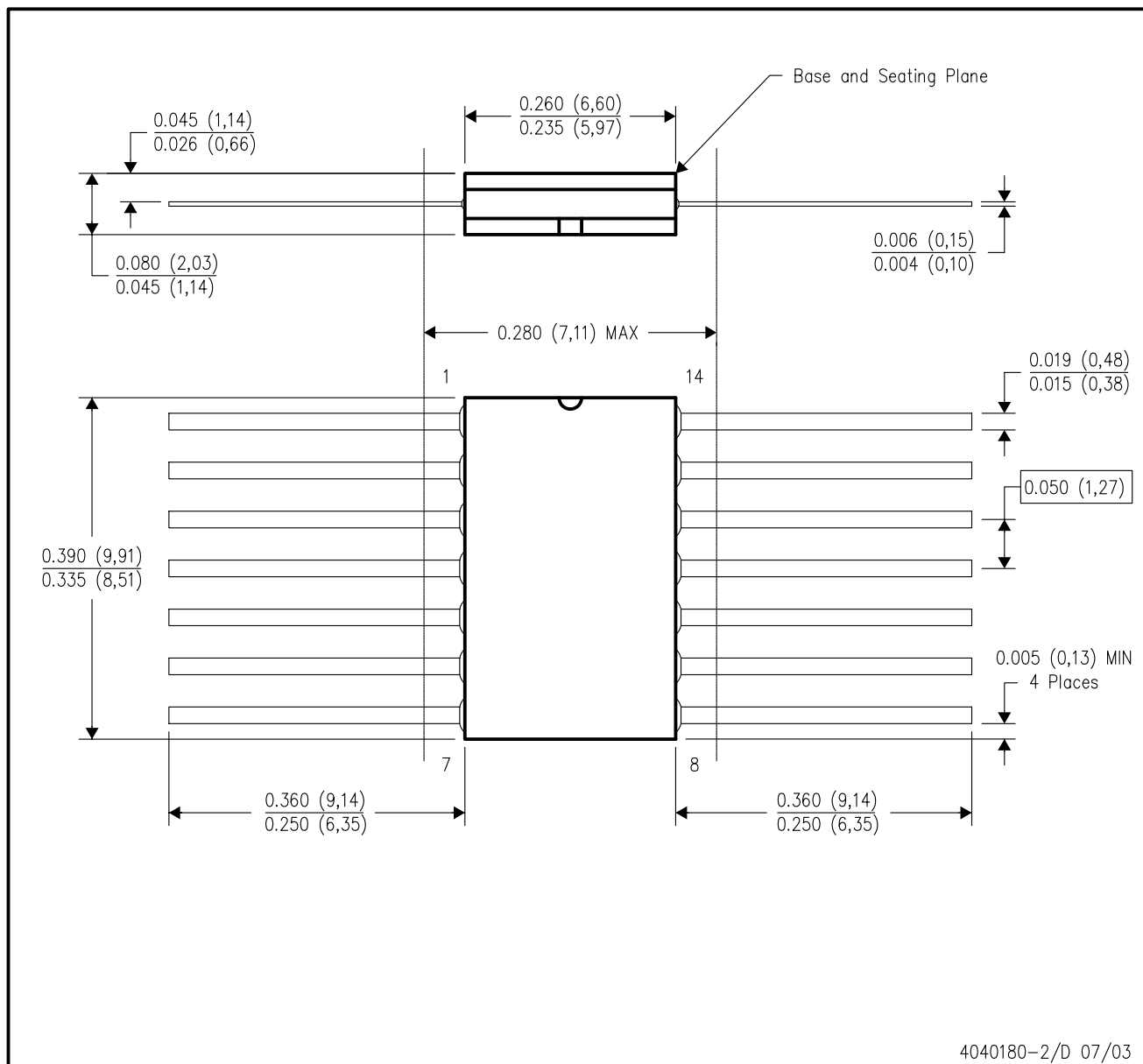


4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only.
  - Falls within MIL STD 1835 GDFP1-F14 and JEDEC MO-092AB

FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



| NO. OF<br>TERMINALS<br>** | A                |                  | B                |                  |
|---------------------------|------------------|------------------|------------------|------------------|
|                           | MIN              | MAX              | MIN              | MAX              |
| 20                        | 0.342<br>(8,69)  | 0.358<br>(9,09)  | 0.307<br>(7,80)  | 0.358<br>(9,09)  |
| 28                        | 0.442<br>(11,23) | 0.458<br>(11,63) | 0.406<br>(10,31) | 0.458<br>(11,63) |
| 44                        | 0.640<br>(16,26) | 0.660<br>(16,76) | 0.495<br>(12,58) | 0.560<br>(14,22) |
| 52                        | 0.740<br>(18,78) | 0.761<br>(19,32) | 0.495<br>(12,58) | 0.560<br>(14,22) |
| 68                        | 0.938<br>(23,83) | 0.962<br>(24,43) | 0.850<br>(21,6)  | 0.858<br>(21,8)  |
| 84                        | 1.141<br>(28,99) | 1.165<br>(29,59) | 1.047<br>(26,6)  | 1.063<br>(27,0)  |



4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - Falls within JEDEC MS-004

## N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **             | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| DIM                 |                  |                  |                  |                  |
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
| A MIN               | 0.745<br>(18,92) | 0.745<br>(18,92) | 0.850<br>(21,59) | 0.940<br>(23,88) |
| MS-001<br>VARIATION | AA               | BB               | AC               | AD               |



14/18 Pin Only  
20 Pin vendor option

4040049/E 12/2002

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - The 20 pin end lead shoulder width is a vendor option, either half or full width.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4040047-5/M 06/11

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G14)

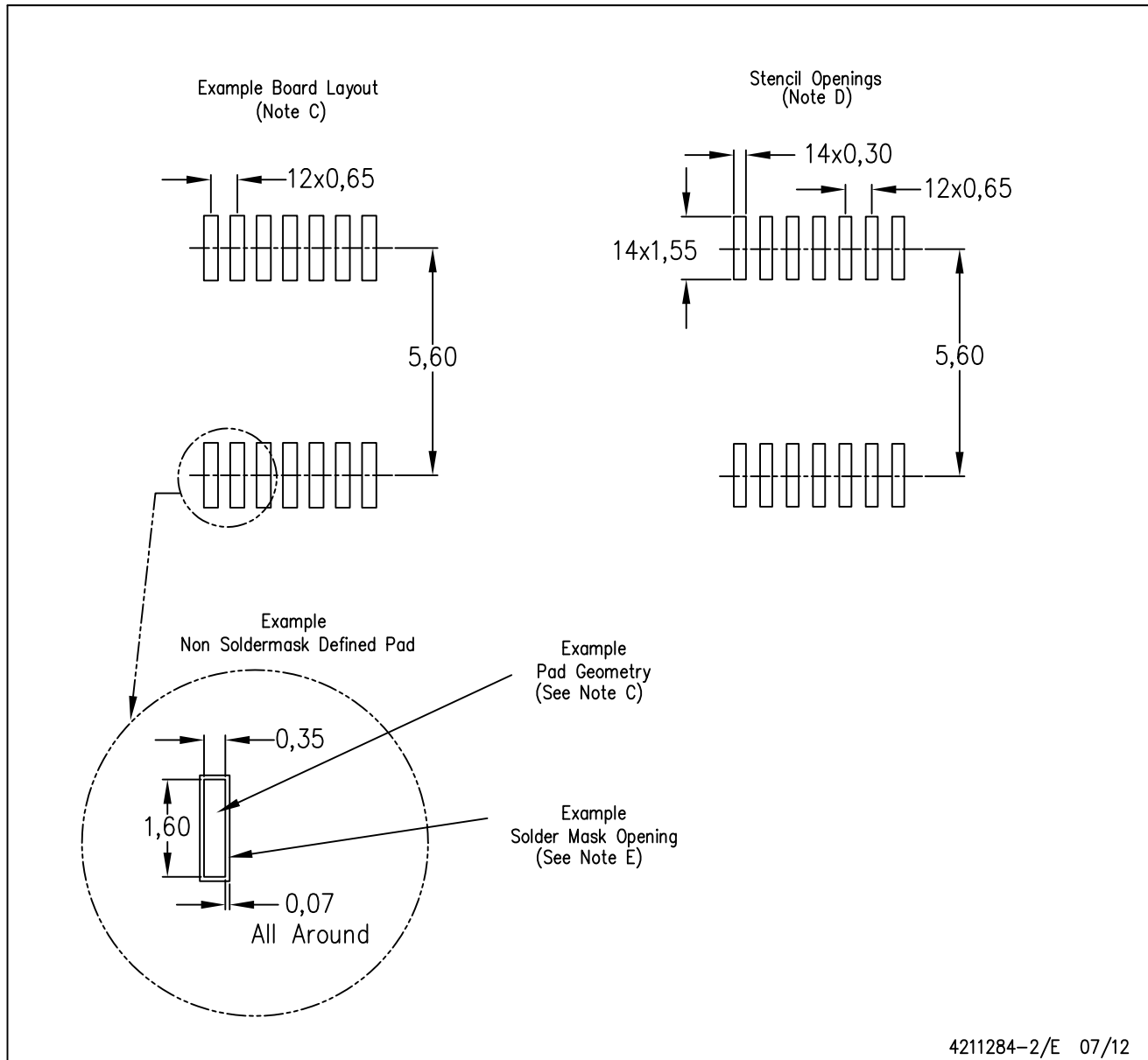
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



| DIM \ PINS ** | 14    | 16    | 20    | 24    |
|---------------|-------|-------|-------|-------|
| A MAX         | 10,50 | 10,50 | 12,90 | 15,30 |
| A MIN         | 9,90  | 9,90  | 12,30 | 14,70 |

4040062/C 03/03

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

## DB (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

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| RFID                   | <a href="http://www.ti-rfid.com">www.ti-rfid.com</a>                                 |
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|                               |                                                                                          |
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