

FEATURES

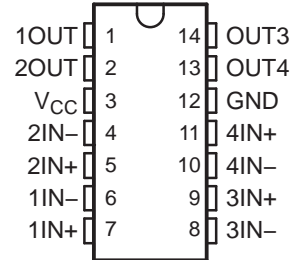
- **Single Supply or Dual Supplies**
- **Wide Range of Supply Voltage:**
 - Max Rating . . . 2 V to 36 V
 - Tested to 30 V . . . Non-V Devices
 - Tested to 32 V . . . V-Suffix Devices
- **Low Supply-Current Drain Independent of Supply Voltage . . . 0.8 mA Typ**
- **Low Input Bias Current . . . 25 nA 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 . . . ± 36 V**
- **Low Output Saturation Voltage**
- **Output Compatible With TTL, MOS, and CMOS**

DESCRIPTION/ORDERING INFORMATION

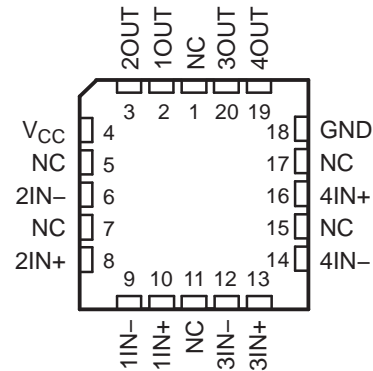
These devices consist of four independent voltage comparators that are designed to operate from a single power supply over a wide range of voltages. Operation from dual supplies also is possible, as long as the difference between the two supplies is 2 V to 36 V, and V_{CC} is at least 1.5 V more positive 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°C to 125°C . The LM239 and LM239A are characterized for operation from -25°C to 125°C . The LM339 and LM339A are characterized for operation from 0°C to 70°C . The LM2901, LM2901AV, and LM2901V are characterized for operation from -40°C to 125°C .

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



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.

**LM139, LM139A, LM239, LM239A
LM339, LM339A, LM2901, LM2901AV, LM2901V
QUAD DIFFERENTIAL COMPARATORS**

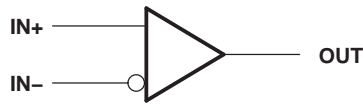
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ORDERING INFORMATION

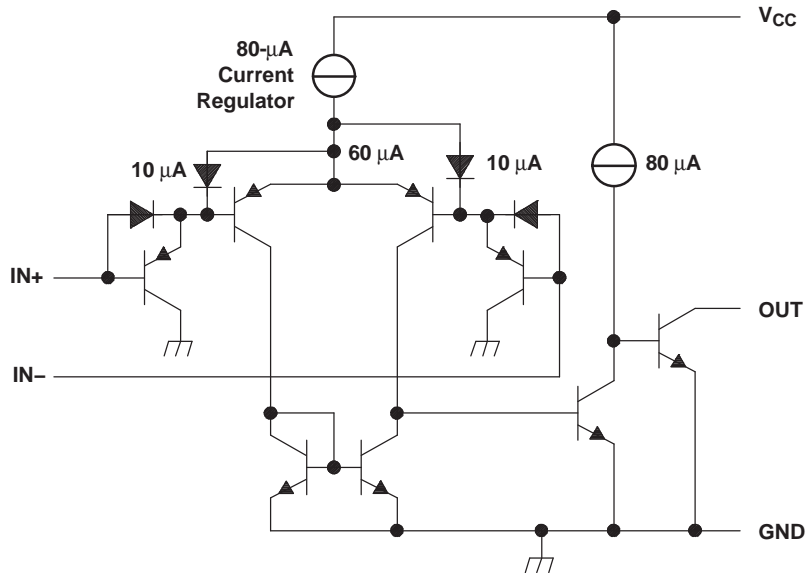
| T_A | $V_{IO,max}$ AT 25°C | MAX V_{CC} | PACKAGE ⁽¹⁾ | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|-------------------------|--------------|------------------------|--------------|--------------------------|---------------------|
| 0°C to 70°C | 5 mV | 30 V | PDIP – N | Tube of 25 | LM339N | LM339N |
| | | | SOIC – D | Tube of 50 | LM339D | LM339 |
| | | | | Reel of 2500 | LM339DR | |
| | | | SOP – NS | Reel of 2000 | LM339NSR | LM339 |
| | | | SSOP – DB | Reel of 2000 | LM339DBR | LM339 |
| | TSSOP – PW | Tube of 90 | LM339PW | L339 | | |
| | | Reel of 2000 | LM339PWR | | | |
| | 2 mV | 30 V | 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 | |
| SSOP – DB | | | Reel of 2000 | LM339ADBR | L339A | |
| TSSOP – PW | Tube of 90 | LM339APW | L339A | | | |
| | Reel of 2000 | LM339APWR | | | | |
| –25°C to 85°C | 5 mV | 30 V | PDIP – N | Tube of 25 | LM239N | LM239N |
| | | | SOIC – D | Tube of 50 | LM239D | LM239 |
| | | | | Reel of 2500 | LM239DR | |
| | TSSOP – PW | Tube of 90 | LM239PW | L239 | | |
| | | Reel of 2000 | LM239PWR | | | |
| 2 mV | 30 V | 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 | |
| | | | SOP – NS | Reel of 2000 | LM2901NSR | LM2901 |
| | TSSOP – PW | Tube of 90 | LM2901PW | L2901 | | |
| | | Reel of 2000 | LM2901PWR | | | |
| | 7 mV | 32 V | SOIC – D | Reel of 2500 | LM2901VQDR | L2901V |
| | | | TSSOP – PW | Reel of 2000 | LM2901VQPWR | L2901V |
| | 2 mV | 32 V | SOIC – D | Reel of 2500 | LM2901AVQDR | L2901AV |
| TSSOP – PW | | | Reel of 2000 | LM2901AVQPWR | L2901AV | |
| –55°C to 125°C | 5 mV | 30 V | CFP – W | Tube of 25 | LM139W | LM139W |
| | | | CDIP – J | Tube of 25 | LM139J | LM139J |
| | | | LCCC – FK | Tube of 55 | LM139FK | LM139FK |
| | | | SOIC – D | Tube of 50 | LM139D | LM139D |
| | Reel of 2500 | LM139DR | | | | |
| | 2 mV | 30 V | 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) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

SYMBOL (EACH COMPARATOR)



SCHEMATIC (EACH COMPARATOR)



All current values shown are nominal.

**LM139, LM139A, LM239, LM239A
LM339, LM339A, LM2901, LM2901AV, LM2901V
QUAD DIFFERENTIAL COMPARATORS**

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Absolute Maximum Ratings⁽¹⁾

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

| | | MIN | MAX | UNIT |
|---|--|------------|-------|------|
| V _{CC} | Supply voltage ⁽²⁾ | | 36 | V |
| V _{ID} | Differential input voltage ⁽³⁾ | | ±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 ⁽⁴⁾ | | Unlimited | | |
| θ _{JA} | Package thermal impedance ^{(5) (6)} | D package | 86 | °C/W |
| | | DB package | 96 | |
| | | N package | 80 | |
| | | NS package | 76 | |
| | | PW package | 113 | |
| θ _{JC} | Package thermal impedance ^{(7) (8)} | FK package | 5.61 | °C/W |
| | | J package | 15.05 | |
| | | W package | 14.65 | |
| T _J | Operating virtual junction temperature | | 150 | °C |
| | Case temperature for 60 s | FK package | 260 | °C |
| | Lead temperature 1,6 mm (1/16 in) from case for 60 s | J package | 300 | °C |
| 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), θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is P_D = (T_J (max) - T_A)/θ_{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), θ_{JC}, and T_C. The maximum allowable power dissipation at any allowable case temperature is P_D = (T_J (max) - T_C)/θ_{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 ⁽¹⁾ | T_A ⁽²⁾ | LM139 | | | LM139A | | | UNIT |
|--|---|------------------------|------------------------|------|------|------------------------|------|------|---------------|
| | | | MIN | TYP | MAX | MIN | TYP | MAX | |
| V_{IO} Input offset voltage | $V_{CC} = 5\text{ V to }30\text{ V}$, $V_{IC} = V_{ICR\text{ min}}$, $V_O = 1.4\text{ V}$ | 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 | | 25°C | 0 to $V_{CC} - 1.5$ | | | 0 to $V_{CC} - 1.5$ | | V | |
| | | Full range | 0 to $V_{CC} - 2$ | | | 0 to $V_{CC} - 2$ | | | |
| A_{VD} Large-signal differential-voltage amplification | $V_{CC+} = \pm 7.5\text{ V}$, $V_O = -5\text{ V to }5\text{ V}$ | 25°C | | 200 | | 50 | 200 | V/mV | |
| I_{OH} High-level output current | $V_{ID} = 1\text{ V}$ | $V_{OH} = 5\text{ V}$ | 25°C | | 0.1 | | 0.1 | nA | |
| | | $V_{OH} = 30\text{ V}$ | 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.

Switching Characteristics

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

| PARAMETER | TEST CONDITIONS | LM139 LM139A | UNIT | |
|---------------|---|---------------------------------------|------|---------------|
| | | TYP | | |
| Response time | R_L connected to 5 V through 5.1 k Ω , $C_L = 15\text{ pF}$ ⁽¹⁾⁽²⁾ | 100-mV input step with 5-mV overdrive | 1.3 | μs |
| | | 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.

**LM139, LM139A, LM239, LM239A
LM339, LM339A, LM2901, LM2901AV, LM2901V
QUAD DIFFERENTIAL COMPARATORS**

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Electrical Characteristics

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

| PARAMETER | TEST CONDITIONS ⁽¹⁾ | T_A ⁽²⁾ | LM239 LM339 | | | LM239A LM339A | | | UNIT | |
|--|--|------------------------|---------------------|--------|-----|---------------------|--------|-----|------|---------------|
| | | | MIN | TYP | MAX | MIN | TYP | MAX | | |
| V_{IO} Input offset voltage | $V_{CC} = 5\text{ V to }30\text{ V}$, $V_{IC} = V_{ICR\text{ min}}$, $V_O = 1.4\text{ V}$ | 25°C | 2 5 | | | 1 3 | | | mV | |
| | | Full range | | | | 4 | | | | |
| I_{IO} Input offset current | $V_O = 1.4\text{ V}$ | 25°C | 5 50 | | | 5 50 | | | nA | |
| | | Full range | | | | 150 | | | | |
| I_{IB} Input bias current | $V_O = 1.4\text{ V}$ | 25°C | –25 –250 | | | –25 –250 | | | nA | |
| | | Full range | | | | –400 | | | | |
| V_{ICR} Common-mode input-voltage range | | 25°C | 0 to $V_{CC} - 1.5$ | | | 0 to $V_{CC} - 1.5$ | | | V | |
| | | Full range | 0 to $V_{CC} - 2$ | | | 0 to $V_{CC} - 2$ | | | | |
| A_{VD} Large-signal differential-voltage amplification | $V_{CC} = 15\text{ V}$, $V_O = 1.4\text{ V to }11.4\text{ V}$, $R_L \geq 15\text{ k}\Omega\text{ to }V_{CC}$ | 25°C | 50 200 | | | 50 200 | | | V/mV | |
| I_{OH} High-level output current | $V_{ID} = 1\text{ V}$ | $V_{OH} = 5\text{ V}$ | 25°C | 0.1 50 | | | 0.1 50 | | | nA |
| | | $V_{OH} = 30\text{ V}$ | Full range | | | | 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 | | | | |
| 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 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.

Switching Characteristics

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

| PARAMETER | TEST CONDITIONS | LM239 LM239A LM339 LM339A | | UNIT |
|---------------|---|---------------------------------------|--|------|
| | | TYP | | |
| Response time | R_L connected to 5 V through 5.1 k Ω , $C_L = 15\text{ pF}$ ⁽¹⁾⁽²⁾ | 100-mV input step with 5-mV overdrive | | 1.3 |
| | | 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.

Electrical Characteristics

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

| PARAMETER | TEST CONDITIONS ⁽¹⁾ | | T_A ⁽²⁾ | LM2901 | | | UNIT |
|--|---|-------------------------|------------------------------------|-----------------------------|------|------|---------------|
| | | | | MIN | TYP | MAX | |
| V_{IO} Input offset voltage | $V_{IC} = V_{ICR\text{ min}}$, $V_O = 1.4\text{ V}$, $V_{CC} = 5\text{ V to MAX}^{(3)}$ | Non-A devices | 25°C | 2 | 7 | mV | |
| | | | Full range | 15 | | | |
| | | A-suffix devices | 25°C | 1 | 2 | | |
| | | | Full range | 4 | | | |
| I_{IO} Input offset current | $V_O = 1.4\text{ V}$ | | 25°C | 5 | 50 | nA | |
| | | | Full range | 200 | | | |
| I_{IB} Input bias current | $V_O = 1.4\text{ V}$ | | 25°C | -25 | -250 | nA | |
| | | | Full range | -500 | | | |
| V_{ICR} Common-mode input-voltage range | | | 25°C | 0 to $V_{CC} - 1.5$ | | V | |
| | | | Full range | 0 to $V_{CC} - 2$ | | | |
| A_{VD} Large-signal differential-voltage amplification | $V_{CC} = 15\text{ V}$, $V_O = 1.4\text{ V to } 11.4\text{ V}$, $R_L \geq 15\text{ k}\Omega\text{ to } V_{CC}$ | | 25°C | 25 | 100 | V/mV | |
| I_{OH} High-level output current | $V_{ID} = 1\text{ V}$ | | $V_{OH} = 5\text{ V}$ | 25°C | 0.1 | 50 | nA |
| | | | $V_{OH} = V_{CC}\text{ MAX}^{(3)}$ | Full range | 1 | | μA |
| V_{OL} Low-level output voltage | $V_{ID} = -1\text{ V}$, $I_{OL} = 4\text{ mA}$ | | 25°C | Non-V devices | 150 | 500 | mV |
| | | | | V-suffix devices | 150 | 400 | |
| | | | | All devices | 700 | | |
| I_{OL} Low-level output current | $V_{ID} = -1\text{ V}$, | $V_{OL} = 1.5\text{ V}$ | 25°C | 6 | 16 | mA | |
| I_{CC} Supply current (four comparators) | $V_O = 2.5\text{ V}$, No load | | 25°C | $V_{CC} = 5\text{ V}$ | 0.8 | 2 | mA |
| | | | | $V_{CC} = \text{MAX}^{(3)}$ | 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

Switching Characteristics

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

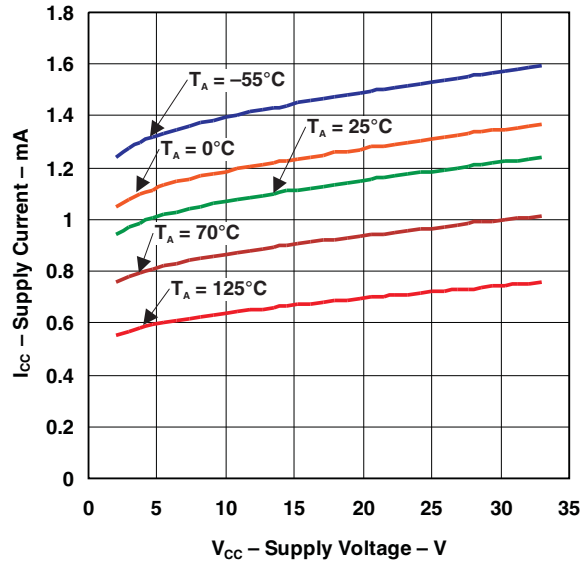
| PARAMETER | TEST CONDITIONS | | LM2901 | UNIT |
|---------------|---|---------------------------------------|--------|---------------|
| | | | TYP | |
| Response time | R_L connected to 5 V through $5.1\text{ k}\Omega$, $C_L = 15\text{ pF}^{(1)(2)}$ | 100-mV input step with 5-mV overdrive | 1.3 | μs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

 (1) C_L includes probe and jig capacitance.

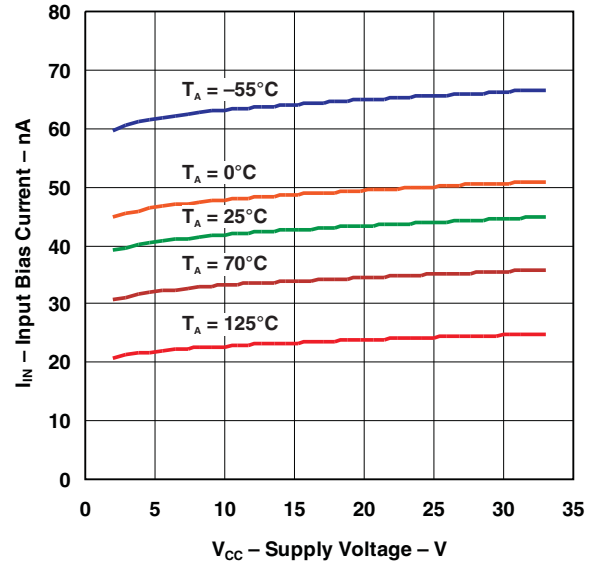
 (2) The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V .

TYPICAL CHARACTERISTICS

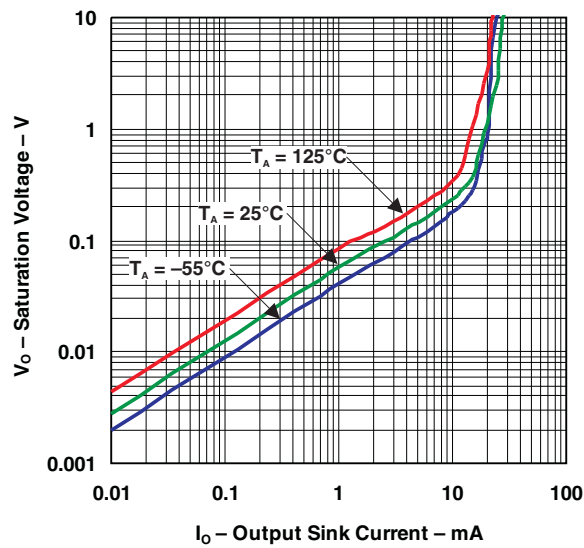
SUPPLY CURRENT
 VS
 SUPPLY VOLTAGE



INPUT BIAS CURRENT
 VS
 SUPPLY VOLTAGE

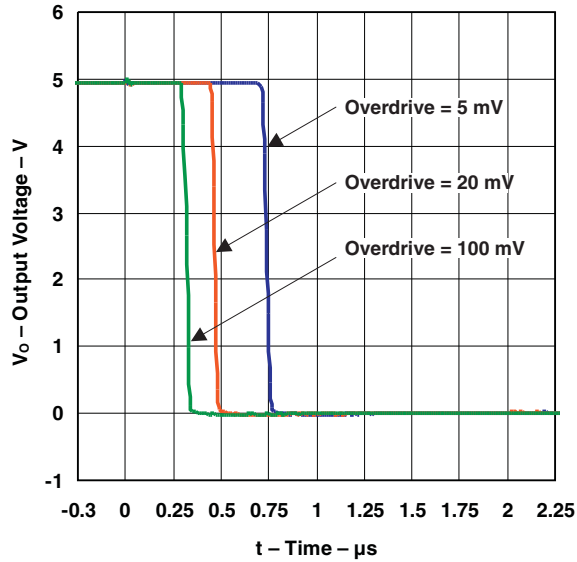


OUTPUT SATURATION VOLTAGE

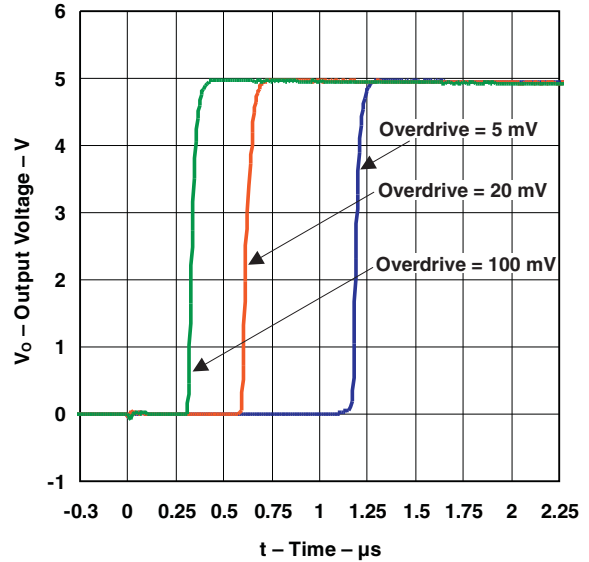


TYPICAL CHARACTERISTICS (continued)

**RESPONSE TIME FOR VARIOUS OVERDRIVES
NEGATIVE TRANSITION**



**RESPONSE TIME FOR VARIOUS OVERDRIVES
POSITIVE TRANSITION**



PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|--|
| 5962-7700801VCA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| 5962-87739012A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| 5962-8773901CA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| 5962-8773901DA | ACTIVE | CFP | W | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| 77008012A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| 7700801CA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| 7700801DA | ACTIVE | CFP | W | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| JM38510/11201BCA | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| LM139AD | ACTIVE | SOIC | D | 14 | 50 | TBD | CU NIPDAU | Level-3-245C-168 HR |
| LM139ADR | ACTIVE | SOIC | D | 14 | 2500 | Pb-Free (RoHS) | CU NIPDAU | Level-2-250C-1 YEAR/ Level-1-235C-UNLIM |
| LM139AFKB | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| LM139AJ | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| LM139AJB | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| LM139AN | OBSOLETE | PDIP | N | 14 | | TBD | Call TI | Call TI |
| LM139AW | ACTIVE | CFP | W | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| LM139AWB | ACTIVE | CFP | W | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| LM139D | ACTIVE | SOIC | D | 14 | 50 | TBD | CU NIPDAU | Level-1-220C-UNLIM |
| LM139DR | ACTIVE | SOIC | D | 14 | 2500 | TBD | CU NIPDAU | Level-1-220C-UNLIM |
| 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 SNPB | N / A for Pkg Type |
| LM139JB | ACTIVE | CDIP | J | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| LM139N | OBSOLETE | PDIP | N | 14 | | TBD | Call TI | Call TI |
| LM139W | ACTIVE | CFP | W | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| LM139WB | ACTIVE | CFP | W | 14 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| LM239AD | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM239ADE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM239ADR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM239ADRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & 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 & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM239DE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM239DG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM239DR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM239DRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|--|
| LM239DRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & 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 |
| LM239NE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| LM239PW | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM239PWE4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM239PWR | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM239PWRE4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM2901AVQDR | ACTIVE | SOIC | D | 14 | 2500 | Pb-Free (RoHS) | CU NIPDAU | Level-2-250C-1 YEAR/ Level-1-235C-UNLIM |
| LM2901AVQPWR | ACTIVE | TSSOP | PW | 14 | 2000 | TBD | CU NIPDAU | Level-1-250C-UNLIM |
| LM2901D | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM2901DE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM2901DG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM2901DR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM2901DRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM2901DRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & 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 |
| LM2901NE4 | ACTIVE | PDIP | N | 14 | 25 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| LM2901NSR | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM2901NSRE4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM2901PW | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM2901PWE4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM2901PWG4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & 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 & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM2901PWRE4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM2901PWRG4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM2901QD | OBSOLETE | SOIC | D | 14 | | TBD | Call TI | Call TI |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|--|
| LM2901QN | OBSOLETE | PDIP | N | 14 | | TBD | Call TI | Call TI |
| LM2901VQDR | ACTIVE | SOIC | D | 14 | 2500 | Pb-Free (RoHS) | CU NIPDAU | Level-2-250C-1 YEAR/ Level-1-235C-UNLIM |
| LM2901VQPWR | ACTIVE | TSSOP | PW | 14 | 2000 | TBD | CU NIPDAU | Level-1-250C-UNLIM |
| LM339AD | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339ADBR | ACTIVE | SSOP | DB | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339ADBRG4 | ACTIVE | SSOP | DB | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339ADE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339ADG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339ADR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339ADRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339ADRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & 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 & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339ANSRG4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339APW | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339APWE4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339APWR | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339APWRE4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339D | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339DBLE | OBSOLETE | SSOP | DB | 14 | | TBD | Call TI | Call TI |
| LM339DBR | ACTIVE | SSOP | DB | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339DBRE4 | ACTIVE | SSOP | DB | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339DE4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339DG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339DR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339DRE4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| LM339DRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & 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 |
| 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 & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339NSRG4 | ACTIVE | SO | NS | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339PW | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339PWE4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339PWG4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & 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 & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| LM339PWRE4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | 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 |

⁽¹⁾ 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.

⁽²⁾ 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)

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

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J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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



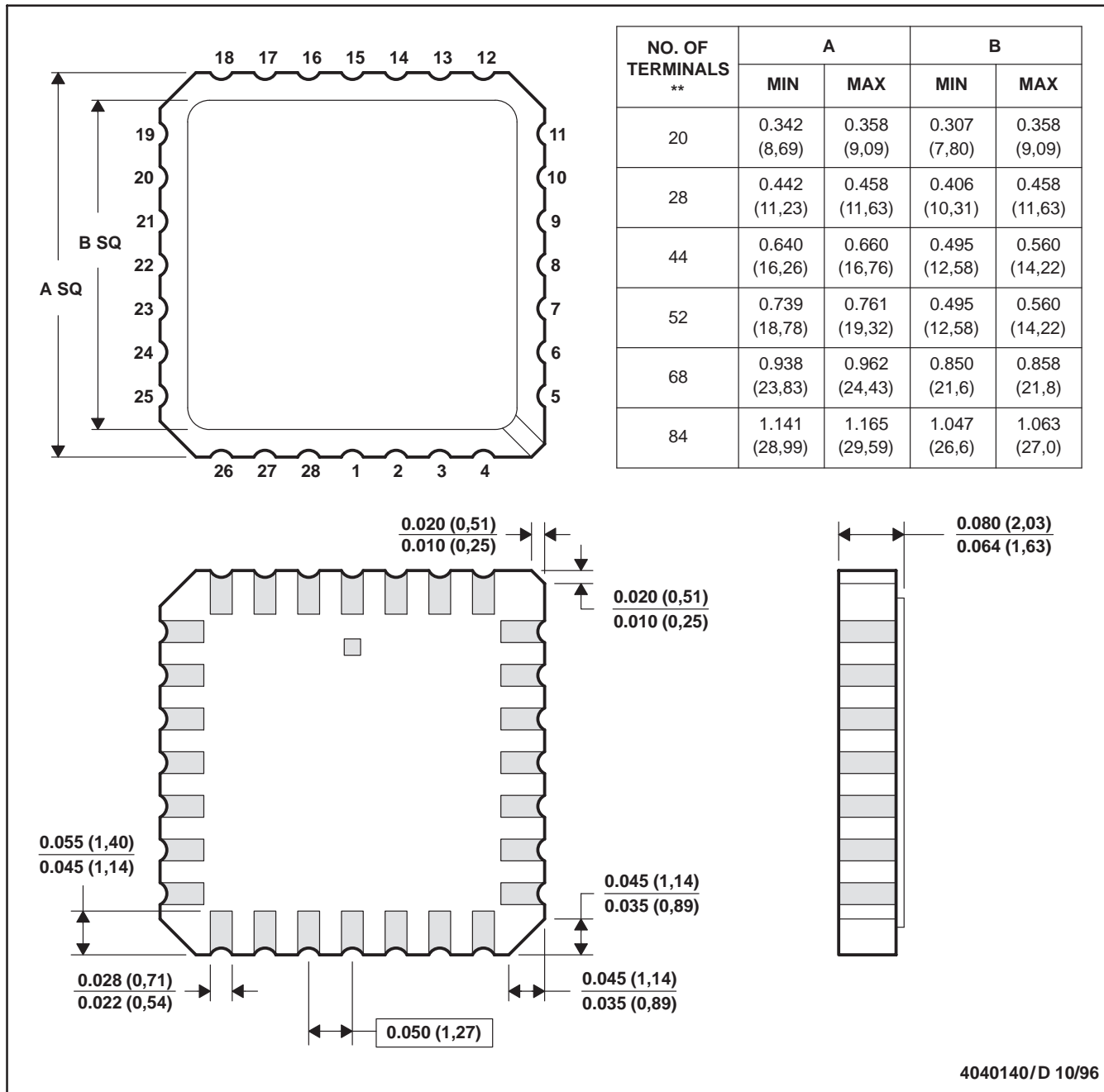
4040083/F 03/03

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

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a metal lid.
 - D. The terminals are gold plated.
 - E. Falls within JEDEC MS-004

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

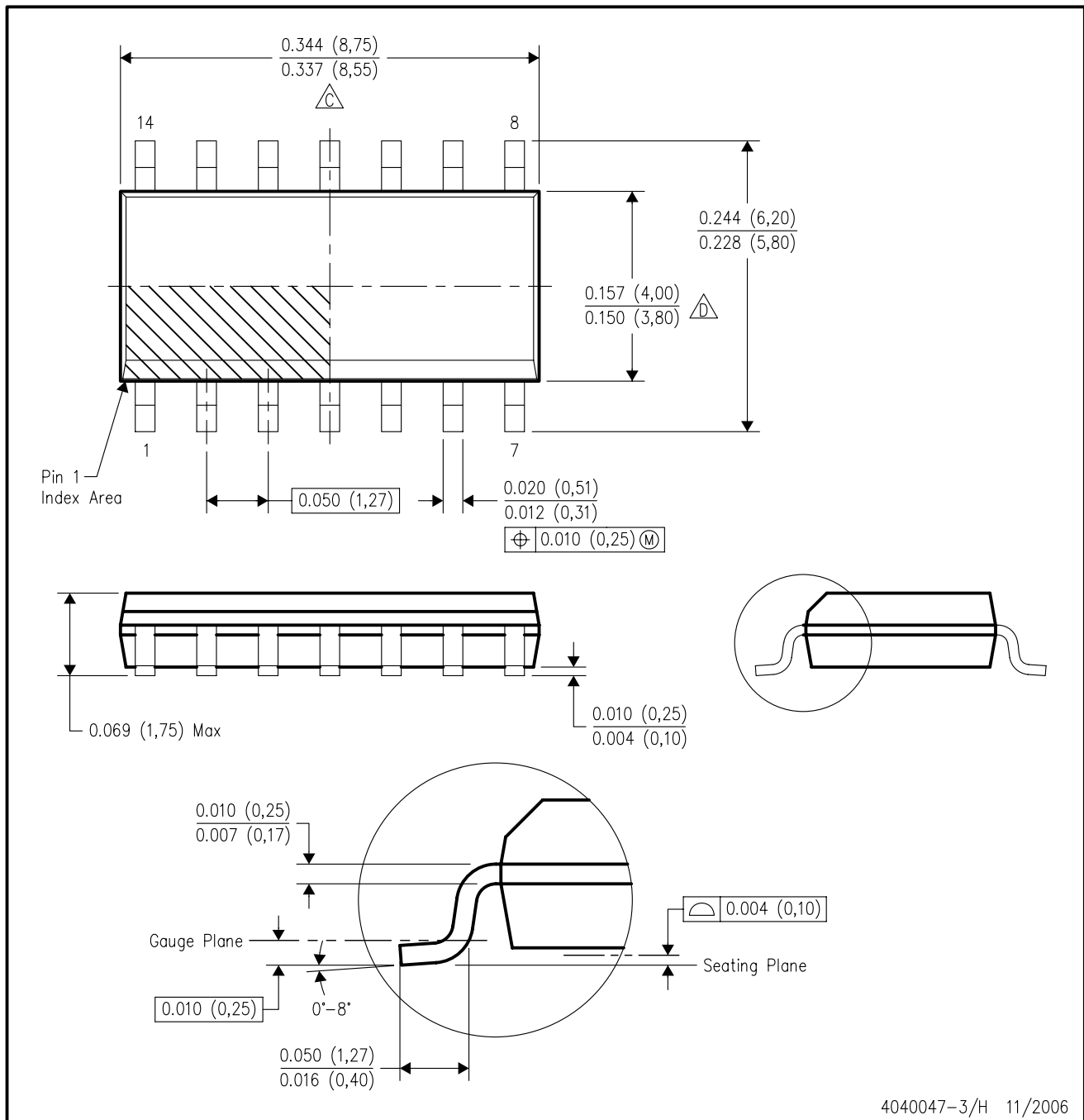
16 PINS SHOWN



- 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 PACKAGE



4040047-3/H 11/2006

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
 - $\triangle D$ Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
 - E. Reference JEDEC MS-012 variation AB.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-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.

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

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- 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-153

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