



**SN54147, SN54148, SN54LS147, SN54LS148**  
**SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148**  
**10-LINE TO 4-LINE AND 8-LINE TO 3-LINE PRIORITY ENCODERS**

SDLS053B – OCTOBER 1976 – REVISED MAY 2004

**description/ordering information**

These TTL encoders feature priority decoding of the inputs to ensure that only the highest-order data line is encoded. The '147 and 'LS147 devices encode nine data lines to four-line (8-4-2-1) BCD. The implied decimal zero condition requires no input condition, as zero is encoded when all nine data lines are at a high logic level. The '148 and 'LS148 devices encode eight data lines to three-line (4-2-1) binary (octal). Cascading circuitry (enable input EI and enable output EO) has been provided to allow octal expansion without the need for external circuitry. For all types, data inputs and outputs are active at the low logic level. All inputs are buffered to represent one normalized Series 54/74 or 54/74LS load, respectively.

**ORDERING INFORMATION**

| T <sub>A</sub> | PACKAGE†  |               | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|-----------|---------------|-----------------------|------------------|
| 0°C to 70°C    | PDIP – N  | Tube          | SN74LS148N            | SN74LS148N       |
|                | SOIC – D  | Tube          | SN74LS148D            | LS148            |
|                |           | Tape and reel | SN74LS148DR           |                  |
|                | SOP – NS  | Tape and reel | SN74LS148NSR          | 74LS148          |
| –55°C to 125°C | CDIP – J  | Tube          | SNJ54LS148J           | SNJ54LS148J      |
|                | CFP – W   | Tube          | SNJ54LS148W           | SNJ54LS148W      |
|                | LCCC – FK | Tube          | SNJ54LS148FK          | SNJ54LS148FK     |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

**FUNCTION TABLE – '147, 'LS147**

| INPUTS |   |   |   |   |   |   |   |   | OUTPUTS |   |   |   |
|--------|---|---|---|---|---|---|---|---|---------|---|---|---|
| 1      | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | D       | C | B | A |
| H      | H | H | H | H | H | H | H | H | H       | H | H | H |
| X      | X | X | X | X | X | X | X | L | L       | H | H | L |
| X      | X | X | X | X | X | X | L | H | L       | H | H | H |
| X      | X | X | X | X | X | L | H | H | H       | L | L | L |
| X      | X | X | X | L | H | H | H | H | H       | L | L | L |
| X      | X | X | L | H | H | H | H | H | H       | L | H | H |
| X      | X | L | H | H | H | H | H | H | H       | H | L | L |
| X      | L | H | H | H | H | H | H | H | H       | H | L | H |
| L      | H | H | H | H | H | H | H | H | H       | H | H | L |

H = high logic level, L = low logic level, X = irrelevant



**SN54147, SN54148, SN54LS147, SN54LS148**  
**SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148**  
**10-LINE TO 4-LINE AND 8-LINE TO 3-LINE PRIORITY ENCODERS**  
SDLS053B – OCTOBER 1976 – REVISED MAY 2004

FUNCTION TABLE – '148, 'LS148

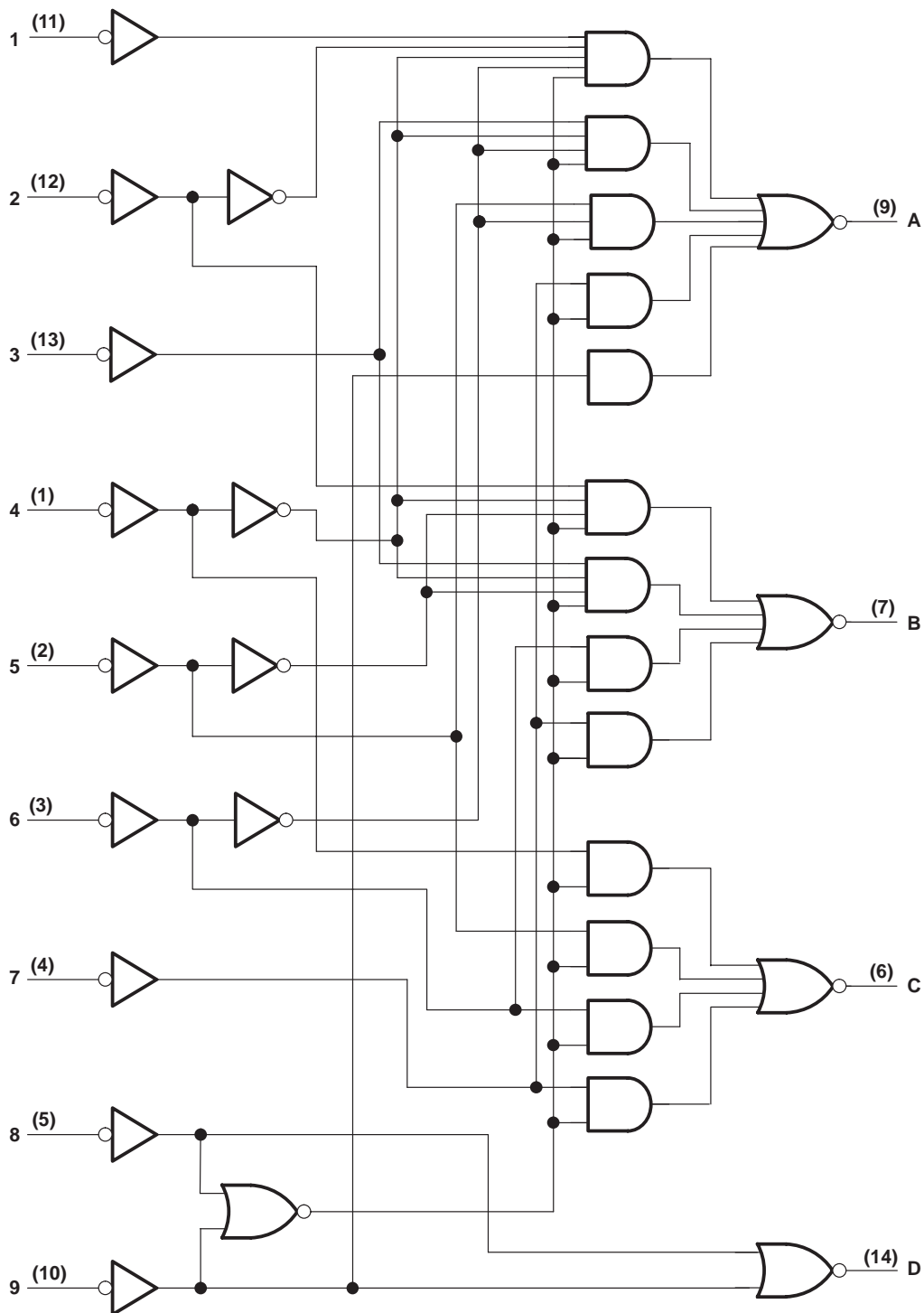
| EI | INPUTS |   |   |   |   |   |   |   | OUTPUTS |    |    |    |    |
|----|--------|---|---|---|---|---|---|---|---------|----|----|----|----|
|    | 0      | 1 | 2 | 3 | 4 | 5 | 6 | 7 | A2      | A1 | A0 | GS | EO |
| H  | X      | X | X | X | X | X | X | X | H       | H  | H  | H  | H  |
| L  | H      | H | H | H | H | H | H | H | H       | H  | H  | H  | L  |
| L  | X      | X | X | X | X | X | X | L | L       | L  | L  | L  | H  |
| L  | X      | X | X | X | X | X | L | H | L       | L  | H  | L  | H  |
| L  | X      | X | X | X | X | L | H | H | L       | H  | L  | L  | H  |
| L  | X      | X | X | L | H | H | H | H | H       | L  | L  | L  | H  |
| L  | X      | X | L | H | H | H | H | H | H       | L  | H  | L  | H  |
| L  | X      | L | H | H | H | H | H | H | H       | H  | L  | L  | H  |
| L  | L      | H | H | H | H | H | H | H | H       | H  | H  | L  | H  |

H = high logic level, L = low logic level, X = irrelevant

**SN54147, SN54148, SN54LS147, SN54LS148  
 SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148  
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SDLS053B - OCTOBER 1976 - REVISED MAY 2004

**'147, 'LS147 logic diagram (positive logic)**



Pin numbers shown are for D, J, N, and W packages.

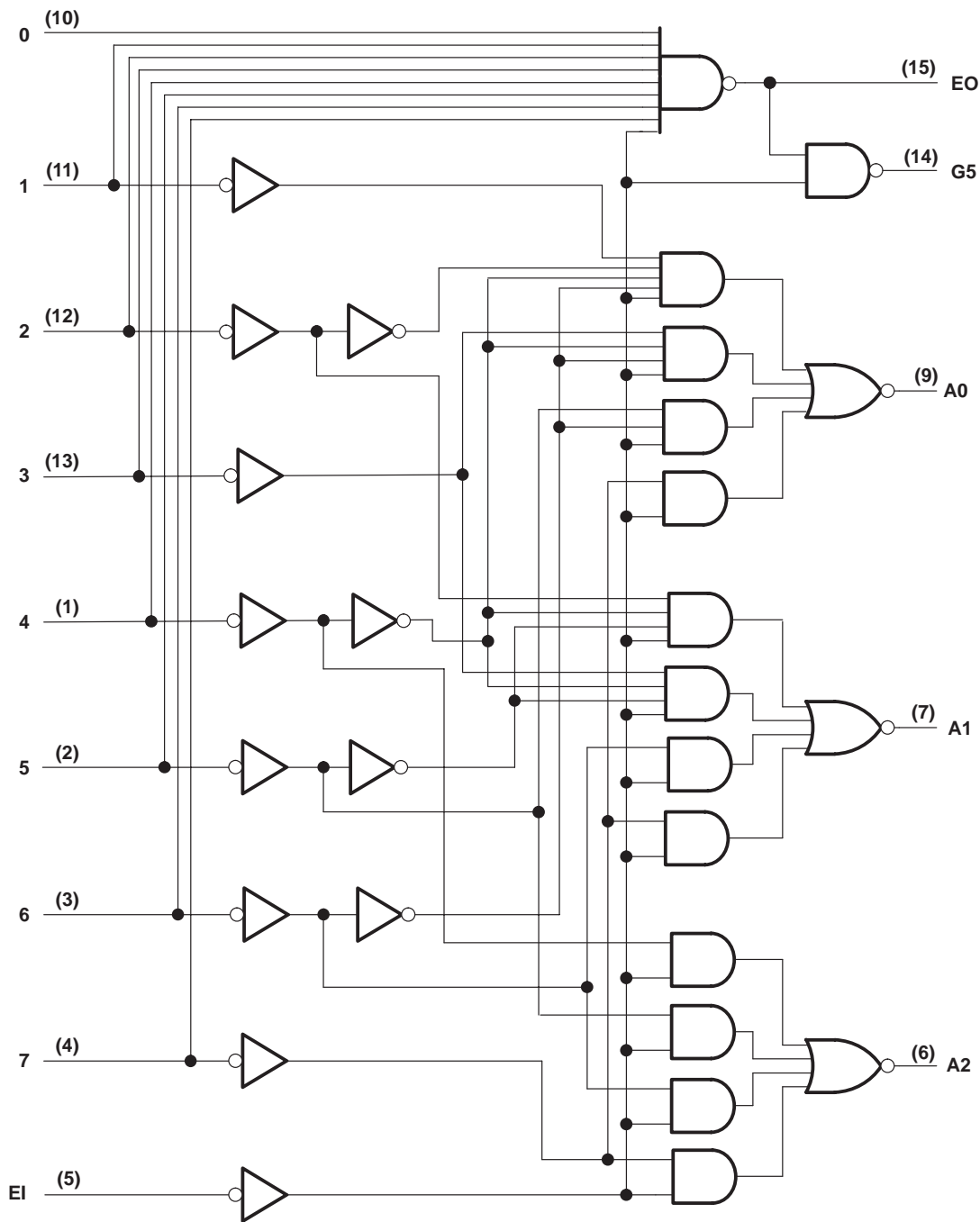


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**SN54147, SN54148, SN54LS147, SN54LS148  
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SDLS053B - OCTOBER 1976 - REVISED MAY 2004

'148, 'LS148 logic diagram (positive logic)



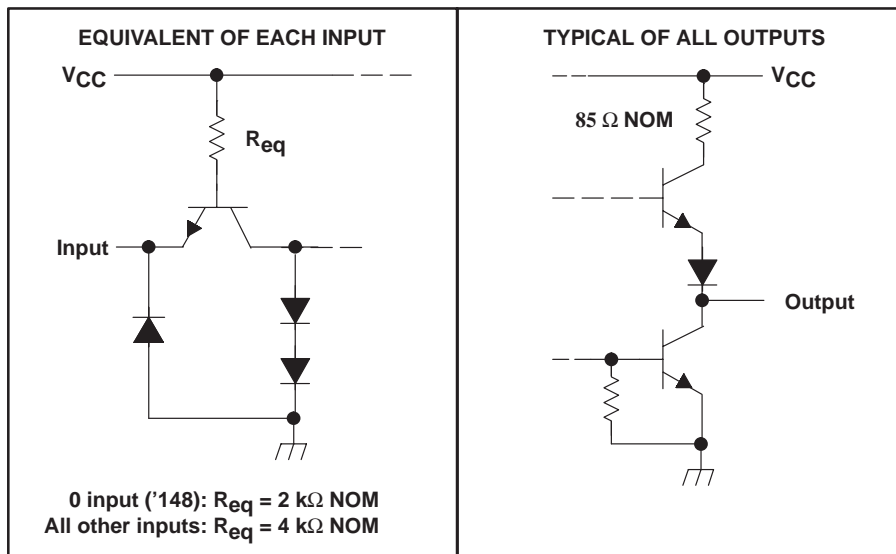
Pin numbers shown are for D, J, N, NS, and W packages.

**SN54147, SN54148, SN54LS147, SN54LS148  
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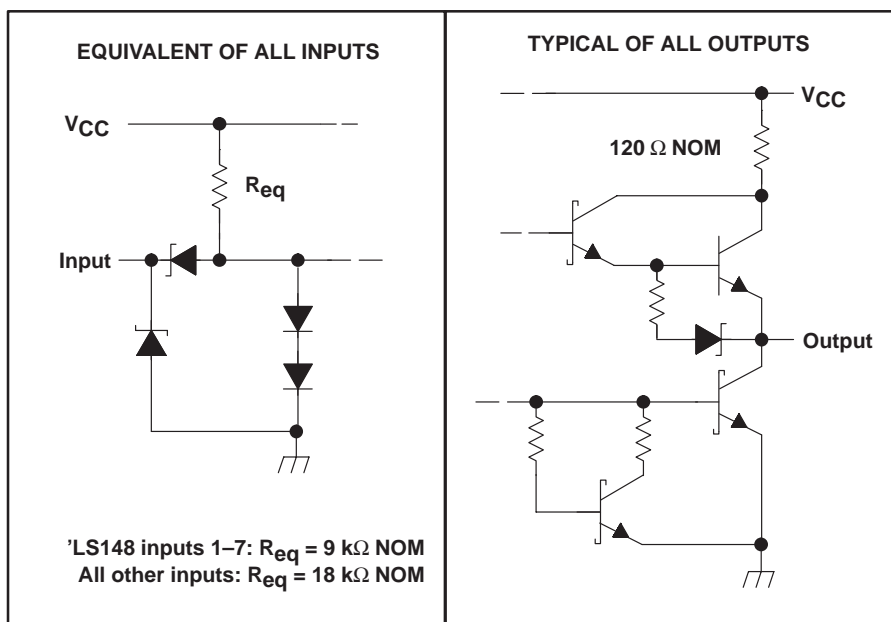
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**schematics of inputs and outputs**

'147, '148



'LS147, 'LS148



**SN54147, SN54148, SN54LS147, SN54LS148  
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SDLS053B – OCTOBER 1976 – REVISED MAY 2004

**absolute maximum ratings over operating free-air temperature (unless otherwise noted)†**

|   |                |
|---|----------------|
| Supply voltage, $V_{CC}$ (see Note 1)                           | 7 V            |
| Input voltage, $V_I$ : '147, '148                               | 5.5 V          |
| 'LS147, 'LS148  | 7 V            |
| Inter-emitter voltage: '148 only (see Note 2)                   | 5.5 V          |
| Package thermal impedance $\theta_{JA}$ (see Note 3): D package | 73°C/W         |
| N package   | 67°C/W         |
| NS package  | 64°C/W         |
| Storage temperature range, $T_{Stg}$                            | –65°C to 150°C |

† 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.

- NOTES:
1. Voltage values, except inter-emitter voltage, are with respect to the network ground terminal.
  2. This is the voltage between two emitters of a multiple-emitter transistor. For '148 circuits, this rating applies between any two of the eight data lines, 0 through 7.
  3. The package thermal impedance is calculated in accordance with JESD 51-7.

**recommended operating conditions (see Note 4)**

|                                      | SN54' |     |      | SN74' |     |      | SN54LS' |     |      | SN74LS' |     |      | UNIT |
|--------------------------------------|-------|-----|------|-------|-----|------|---------|-----|------|---------|-----|------|------|
|                                      | MIN   | NOM | MAX  | MIN   | NOM | MAX  | MIN     | NOM | MAX  | MIN     | NOM | MAX  |      |
| $V_{CC}$ Supply voltage              | 4.5   | 5   | 5.5  | 4.75  | 5   | 5.25 | 4.5     | 5   | 5.5  | 4.75    | 5   | 5.25 | V    |
| $I_{OH}$ High-level output current   |       |     | –800 |       |     | –800 |         |     | –400 |         |     | –400 | μA   |
| $I_{OL}$ Low-level output current    |       |     | 16   |       |     | 16   |         |     | 4    |         |     | 8    | mA   |
| $T_A$ Operating free-air temperature | –55   |     | 125  | 0     |     | 70   | –55     |     | 125  | 0       |     | 70   | °C   |

NOTE 4: All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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SDLS053B – OCTOBER 1976 – REVISED MAY 2004

**electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)**

| PARAMETER       |  | TEST CONDITIONS†   | '147  |      |      | '148 |      |      | UNIT |
|-----------------|--|--|---|------|------|------|------|------|------|
|                 |  |  | MIN   | TYP‡ | MAX  | MIN  | TYP‡ | MAX  |      |
| V <sub>IH</sub> | High-level input voltage               |  | 2   |      |      | 2    |      |      | V    |
| V <sub>IL</sub> | Low-level input voltage                |  |   |      | 0.8  |      |      | 0.8  | V    |
| V <sub>IK</sub> | Input clamp voltage                    | V <sub>CC</sub> = MIN, I <sub>I</sub> = -12 mA   |   |      | -1.5 |      |      | -1.5 | V    |
| V <sub>OH</sub> | High-level output voltage              | V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V, V <sub>IH</sub> = 2 V, I <sub>OH</sub> = -800 μA | 2.4   | 3.3  |      | 2.4  | 3.3  |      | V    |
| V <sub>OL</sub> | Low-level output voltage               | V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 16 mA   |   | 0.2  | 0.4  |      | 0.2  | 0.4  | V    |
| I <sub>I</sub>  | Input current at maximum input voltage | V <sub>CC</sub> = MIN, V <sub>I</sub> = 5.5 V  |   |      | 1    |      |      | 1    | mA   |
| I <sub>IH</sub> | High-level input current               | 0 input  |   |      |      |      |      | 40   | μA   |
|                 |  | Any input except 0   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.4 V |      | 40   |      |      | 80   |      |
| I <sub>IL</sub> | Low-level input current                | 0 input  |   |      |      |      |      | -1.6 | mA   |
|                 |  | Any input except 0   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V |      | -1.6 |      |      | -3.2 |      |
| I <sub>OS</sub> | Short-circuit output current§          | V <sub>CC</sub> = MAX  | -35   |      | -85  | -35  |      | -85  | mA   |
| I <sub>CC</sub> | Supply current                         | V <sub>CC</sub> = MAX (See Note 5)   | Condition 1                                   | 50   | 70   | 40   | 60   |      | mA   |
|                 |  |  | Condition 2                                   | 42   | 62   | 35   | 55   |      |      |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

§ Not more than one output should be shorted at a time.

NOTE 5: For '147, I<sub>CC</sub> (Condition 1) is measured with input 7 grounded, other inputs and outputs open; I<sub>CC</sub> (Condition 2) is measured with all inputs and outputs open. For '148, I<sub>CC</sub> (Condition 1) is measured with inputs 7 and EI grounded, other inputs and outputs open; I<sub>CC</sub> (Condition 2) is measured with all inputs and outputs open.

**SN54147, SN74147 switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see Figure 1)**

| PARAMETER        | FROM (INPUT) | TO (OUTPUT) | WAVEFORM            | TEST CONDITIONS                                   | MIN | TYP | MAX | UNIT |
|------------------|--------------|-------------|---------------------|---|-----|-----|-----|------|
| t <sub>PLH</sub> | Any          | Any         | In-phase output     | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 400 Ω |     | 9   | 14  | ns   |
| t <sub>PHL</sub> |              |             |                     |   |     | 7   | 11  |      |
| t <sub>PLH</sub> | Any          | Any         | Out-of-phase output |   |     | 13  | 19  | ns   |
| t <sub>PHL</sub> |              |             |                     |   |     | 12  | 19  |      |





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SDLS053B – OCTOBER 1976 – REVISED MAY 2004

**SN54148, SN74148 switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$  (see Figure 1)**

| PARAMETER†       | FROM (INPUT) | TO (OUTPUT)   | WAVEFORM            | TEST CONDITIONS                                   | MIN | TYP | MAX | UNIT |
|------------------|--------------|---------------|---------------------|---|-----|-----|-----|------|
| t <sub>PLH</sub> | 1–7          | A0, A1, or A2 | In-phase output     | C <sub>L</sub> = 15 pF,<br>R <sub>L</sub> = 400 Ω | 10  | 15  | ns  |      |
| t <sub>PHL</sub> |              |               |                     |   |     |     |     |      |
| t <sub>PLH</sub> | 1–7          | A0, A1, or A2 | Out-of-phase output |   | 12  | 19  | ns  |      |
| t <sub>PHL</sub> |              |               |                     |   |     |     |     | 6    |
| t <sub>PLH</sub> | 0–7          | EO            | Out-of-phase output |   | 14  | 25  | ns  |      |
| t <sub>PHL</sub> |              |               |                     |   |     |     |     | 18   |
| t <sub>PLH</sub> | 0–7          | GS            | In-phase output     |   | 14  | 25  | ns  |      |
| t <sub>PHL</sub> |              |               |                     |   |     |     |     | 10   |
| t <sub>PLH</sub> | EI           | A0, A1, or A2 | In-phase output     |   | 10  | 15  | ns  |      |
| t <sub>PHL</sub> |              |               |                     |   |     |     |     | 8    |
| t <sub>PLH</sub> | EI           | GS            | In-phase output     |   | 10  | 15  | ns  |      |
| t <sub>PHL</sub> |              |               |                     |   |     |     |     | 10   |
| t <sub>PLH</sub> | EI           | EO            | In-phase output     |   | 10  | 15  | ns  |      |
| t <sub>PHL</sub> |              |               |                     |   |     |     |     | 17   |

† t<sub>PLH</sub> = propagation delay time, low-to-high-level output.  
t<sub>PHL</sub> = propagation delay time, high-to-low-level output.

**electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)**

| PARAMETER       |  | TEST CONDITIONS†  | SN54LS'                                       |      | SN74LS' |      | UNIT |      |
|-----------------|--|---|---|------|---------|------|------|------|
|                 |  |   | MIN   | TYP‡ | MAX     | MIN  |      | TYP‡ |
| V <sub>IH</sub> | High-level input voltage               |   | 2   |      | 2       |      | V    |      |
| V <sub>IL</sub> | Low-level input voltage                |   |   | 0.7  |         | 0.8  | V    |      |
| V <sub>IK</sub> | Input clamp voltage                    | V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA                                      |   | -1.5 |         | -1.5 | V    |      |
| V <sub>OH</sub> | High-level output voltage              | V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V, I <sub>OH</sub> = -400 μA           | 2.5   | 3.4  | 2.7     | 3.4  | V    |      |
| V <sub>OL</sub> | Low-level output voltage               | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, V <sub>IL</sub> = V <sub>IL</sub> MAX | I <sub>OL</sub> = 4 mA                        |      | 0.25    | 0.4  | V    |      |
|                 |  |   | I <sub>OL</sub> = 8 mA                        |      |         | 0.35 |      | 0.5  |
| I <sub>I</sub>  | Input current at maximum input voltage | 'LS148 inputs 1–7   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V   |      | 0.2     |      | 0.2  | mA   |
|                 |  | All other inputs  |   |      | 0.1     |      | 0.1  |      |
| I <sub>IH</sub> | High-level input current               | 'LS148 inputs 1–7   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V |      | 40      |      | 40   | μA   |
|                 |  | All other inputs  |   |      | 20      |      | 20   |      |
| I <sub>IL</sub> | Low-level input current                | 'LS148 inputs 1–7   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V |      | -0.8    |      | -0.8 | mA   |
|                 |  | All other inputs  |   |      | -0.4    |      | -0.4 |      |
| I <sub>OS</sub> | Short-circuit output current§          | V <sub>CC</sub> = MAX   | -20   | -100 | -20     | -100 | mA   |      |
| I <sub>CC</sub> | Supply current                         | V <sub>CC</sub> = MAX (See Note 6)  | Condition 1                                   |      | 12      | 20   | mA   |      |
|                 |  |   | Condition 2                                   |      | 10      | 17   |      |      |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

§ Not more than one output should be shorted at a time.

NOTE 6: For 'LS147, I<sub>CC</sub> (Condition 1) is measured with input 7 grounded, other inputs and outputs open; I<sub>CC</sub> (Condition 2) is measured with all inputs and outputs open. For 'LS148, I<sub>CC</sub> (Condition 1) is measured with inputs 7 and EI grounded, other inputs and outputs open; I<sub>CC</sub> (Condition 2) is measured with all inputs and outputs open.



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SDLS053B – OCTOBER 1976 – REVISED MAY 2004

**SN54LS147, SN74LS147 switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$  (see Figure 2)**

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | WAVEFORM            | TEST CONDITIONS                                    | MIN | TYP | MAX | UNIT |
|-----------|--------------|-------------|---------------------|--|-----|-----|-----|------|
| $t_{PLH}$ | Any          | Any         | In-phase output     | $C_L = 15\text{ pF}$ ,<br>$R_L = 2\text{ k}\Omega$ | 12  | 18  | ns  |      |
| $t_{PHL}$ |              |             |                     |  | 12  | 18  |     |      |
| $t_{PLH}$ | Any          | Any         | Out-of-phase output |  | 21  | 33  | ns  |      |
| $t_{PHL}$ |              |             |                     |  | 15  | 23  |     |      |

**SN54LS148, SN74LS148 switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$  (see Figure 2)**

| PARAMETER† | FROM (INPUT) | TO (OUTPUT)   | WAVEFORM            | TEST CONDITIONS                                    | MIN | TYP | MAX | UNIT |
|------------|--------------|---------------|---------------------|--|-----|-----|-----|------|
| $t_{PLH}$  | 1–7          | A0, A1, or A2 | In-phase output     | $C_L = 15\text{ pF}$ ,<br>$R_L = 2\text{ k}\Omega$ | 14  | 18  | ns  |      |
| $t_{PHL}$  |              |               |                     |  | 15  | 25  |     |      |
| $t_{PLH}$  | 1–7          | A0, A1, or A2 | Out-of-phase output |  | 20  | 36  | ns  |      |
| $t_{PHL}$  |              |               |                     |  | 16  | 29  |     |      |
| $t_{PLH}$  | 0–7          | EO            | Out-of-phase output |  | 7   | 18  | ns  |      |
| $t_{PHL}$  |              |               |                     |  | 25  | 40  |     |      |
| $t_{PLH}$  | 0–7          | GS            | In-phase output     |  | 35  | 55  | ns  |      |
| $t_{PHL}$  |              |               |                     |  | 9   | 21  |     |      |
| $t_{PLH}$  | EI           | A0, A1, or A2 | In-phase output     |  | 16  | 25  | ns  |      |
| $t_{PHL}$  |              |               |                     |  | 12  | 25  |     |      |
| $t_{PLH}$  | EI           | GS            | In-phase output     |  | 12  | 17  | ns  |      |
| $t_{PHL}$  |              |               |                     |  | 14  | 36  |     |      |
| $t_{PLH}$  | EI           | EO            | In-phase output     |  | 12  | 21  | ns  |      |
| $t_{PHL}$  |              |               |                     |  | 23  | 35  |     |      |

†  $t_{PLH}$  = propagation delay time, low-to-high-level output

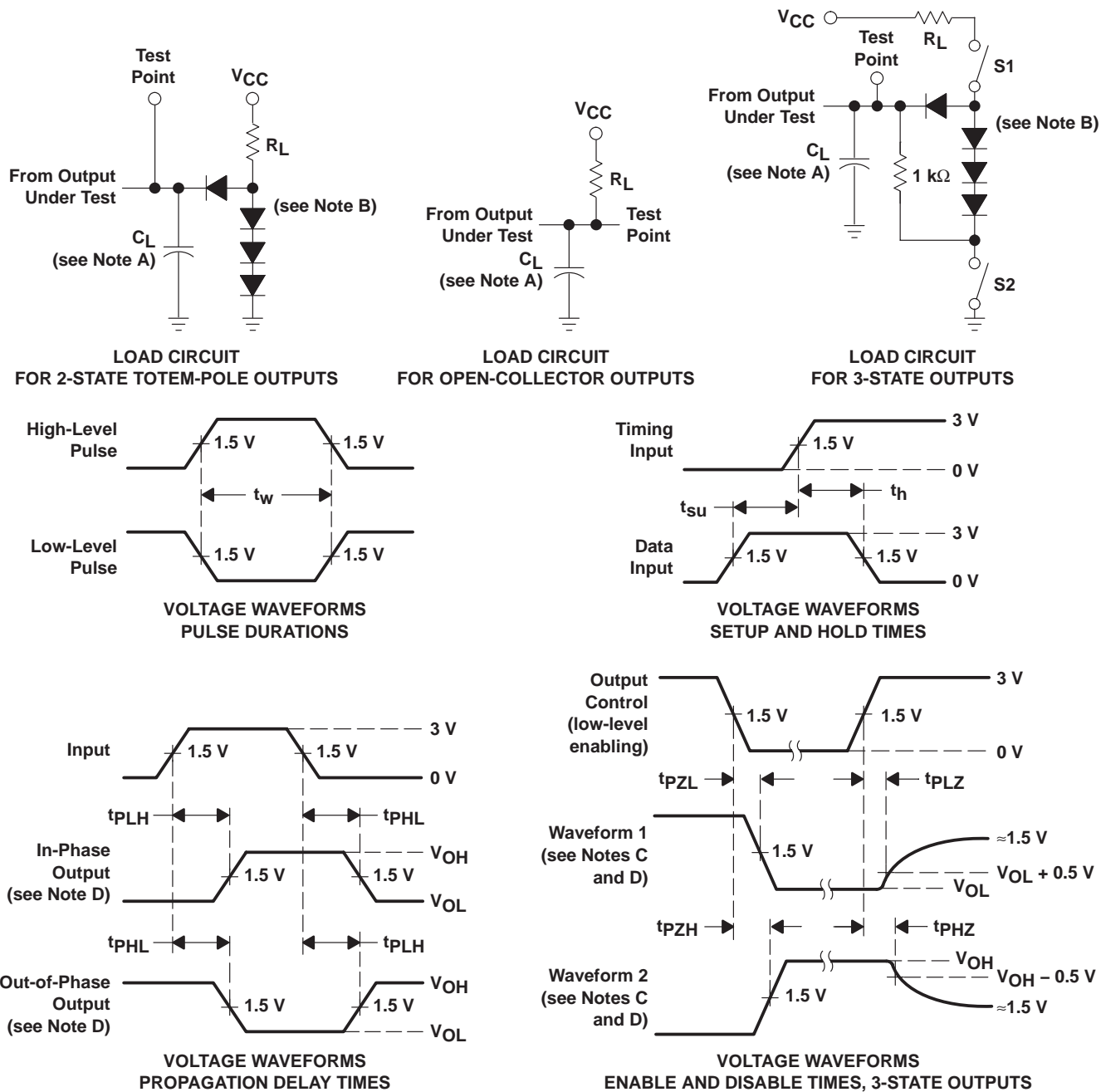
$t_{PHL}$  = propagation delay time, high-to-low-level output



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SDLS053B – OCTOBER 1976 – REVISED MAY 2004

**PARAMETER MEASUREMENT INFORMATION**  
**SERIES 54/74 DEVICES**



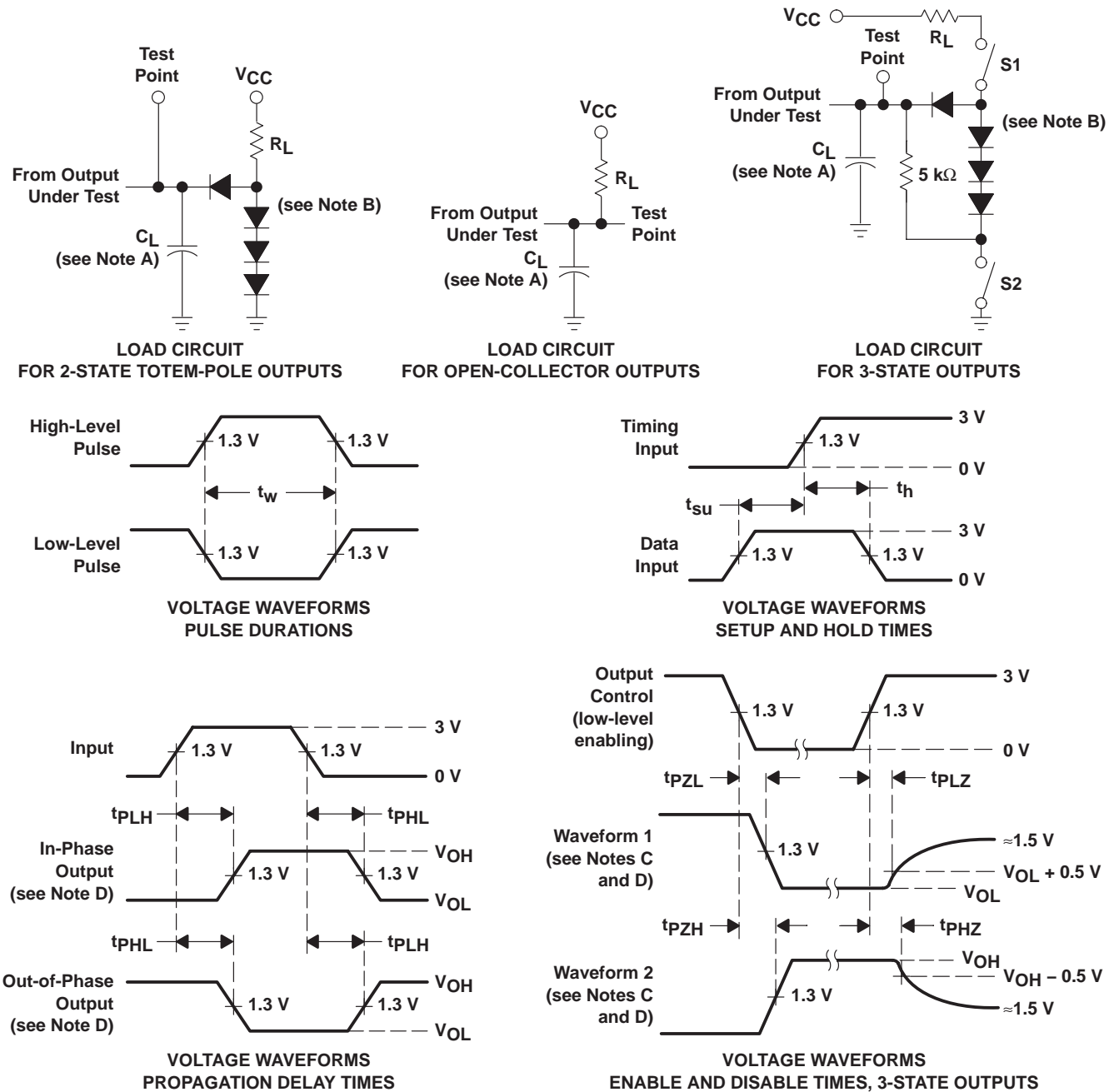
- NOTES:
- A.  $C_L$  includes probe and jig capacitance.
  - B. All diodes are 1N3064 or equivalent.
  - C. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
  - D. S1 and S2 are closed for  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_{PHZ}$ , and  $t_{PZL}$ ; S1 is open, and S2 is closed for  $t_{PZH}$ ; S1 is closed, and S2 is open for  $t_{PZL}$ .
  - E. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_0 \approx 50 \Omega$ ;  $t_r$  and  $t_f \leq 7$  ns for Series 54/74 devices and  $t_r$  and  $t_f \leq 2.5$  ns for Series 54S/74S devices.
  - F. The outputs are measured one at a time, with one input transition per measurement.

**Figure 1. Load Circuits and Voltage Waveforms**

**SN54147, SN54148, SN54LS147, SN54LS148  
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SDLS053B – OCTOBER 1976 – REVISED MAY 2004

**PARAMETER MEASUREMENT INFORMATION  
SERIES 54LS/74LS DEVICES**



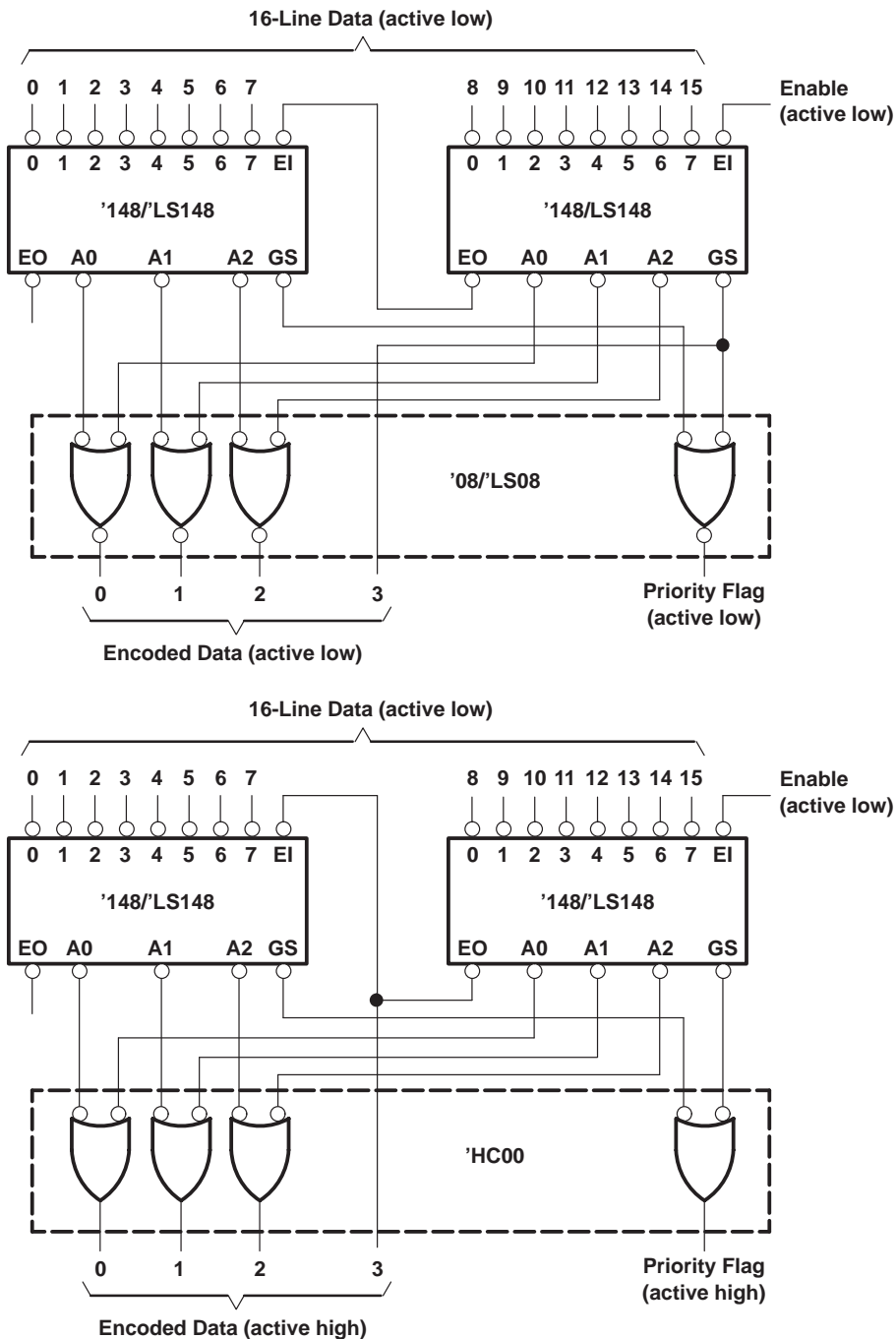
- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. All diodes are 1N3064 or equivalent.  
 C. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.  
 D. S1 and S2 are closed for  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_{PHZ}$ , and  $t_{PZL}$ ; S1 is open, and S2 is closed for  $t_{PZH}$ ; S1 is closed, and S2 is open for  $t_{PZL}$ .  
 E. Phase relationships between inputs and outputs have been chosen arbitrarily for these examples.  
 F. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O \approx 50 \Omega$ ,  $t_r \leq 1.5$  ns,  $t_f \leq 2.6$  ns.  
 G. The outputs are measured one at a time, with one input transition per measurement.

**Figure 2. Load Circuits and Voltage Waveforms**

**SN54147, SN54148, SN54LS147, SN54LS148  
SN74147, SN74148 (TIM9907), SN74LS147, SN74LS148  
10-LINE TO 4-LINE AND 8-LINE TO 3-LINE PRIORITY ENCODERS**

SDLS053B – OCTOBER 1976 – REVISED MAY 2004

**APPLICATION INFORMATION**



**Figure 3. Priority Encoder for 16 Bits**

Because the '147/LS147 and '148/LS148 devices are combinational logic circuits, wrong addresses can appear during input transients. Moreover, for the '148/LS148 devices, a change from high to low at EI can cause a transient low on GS when all inputs are high. This must be considered when strobing the outputs.

**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5)       | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|------------------|----------------------|--------------|-------------------------------|-------------------------|
| 78027012A        | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE       | N / A for Pkg Type   | -55 to 125   | 78027012A<br>SNJ54LS<br>148FK | <a href="#">Samples</a> |
| 7802701EA        | ACTIVE        | CDIP         | J                  | 16   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | 7802701EA<br>SNJ54LS148J      | <a href="#">Samples</a> |
| 7802701FA        | ACTIVE        | CFP          | W                  | 16   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | 7802701FA<br>SNJ54LS148W      | <a href="#">Samples</a> |
| JM38510/36001B2A | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE       | N / A for Pkg Type   | -55 to 125   | JM38510/<br>36001B2A          | <a href="#">Samples</a> |
| JM38510/36001BEA | ACTIVE        | CDIP         | J                  | 16   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | JM38510/<br>36001BEA          | <a href="#">Samples</a> |
| JM38510/36001BFA | ACTIVE        | CFP          | W                  | 16   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | JM38510/<br>36001BFA          | <a href="#">Samples</a> |
| M38510/36001B2A  | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE       | N / A for Pkg Type   | -55 to 125   | JM38510/<br>36001B2A          | <a href="#">Samples</a> |
| M38510/36001BEA  | ACTIVE        | CDIP         | J                  | 16   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | JM38510/<br>36001BEA          | <a href="#">Samples</a> |
| M38510/36001BFA  | ACTIVE        | CFP          | W                  | 16   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | JM38510/<br>36001BFA          | <a href="#">Samples</a> |
| SN54148J         | OBSOLETE      | CDIP         | J                  | 16   |                | TBD                        | Call TI          | Call TI              | -55 to 125   |                               |                         |
| SN54LS148J       | ACTIVE        | CDIP         | J                  | 16   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | SN54LS148J                    | <a href="#">Samples</a> |
| SN74147N         | OBSOLETE      | PDIP         | N                  | 16   |                | TBD                        | Call TI          | Call TI              | 0 to 70      |                               |                         |
| SN74148J         | OBSOLETE      | CDIP         | J                  | 16   |                | TBD                        | Call TI          | Call TI              | 0 to 70      |                               |                         |
| SN74148N         | OBSOLETE      | PDIP         | N                  | 16   |                | TBD                        | Call TI          | Call TI              | 0 to 70      |                               |                         |
| SN74148N3        | OBSOLETE      | PDIP         | N                  | 16   |                | TBD                        | Call TI          | Call TI              | 0 to 70      |                               |                         |
| SN74LS147DR      | OBSOLETE      | SOIC         | D                  | 16   |                | TBD                        | Call TI          | Call TI              | 0 to 70      |                               |                         |
| SN74LS147N       | OBSOLETE      | PDIP         | N                  | 16   |                | TBD                        | Call TI          | Call TI              | 0 to 70      |                               |                         |
| SN74LS148D       | ACTIVE        | SOIC         | D                  | 16   | 40             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS148                         | <a href="#">Samples</a> |
| SN74LS148DE4     | ACTIVE        | SOIC         | D                  | 16   | 40             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS148                         | <a href="#">Samples</a> |
| SN74LS148DG4     | ACTIVE        | SOIC         | D                  | 16   | 40             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS148                         | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan<br>(2)         | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5)       | Samples                 |
|------------------|---------------|--------------|-----------------|------|-------------|-------------------------|------------------|----------------------|--------------|-------------------------------|-------------------------|
| SN74LS148DR      | ACTIVE        | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS148                         | <a href="#">Samples</a> |
| SN74LS148DRE4    | ACTIVE        | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS148                         | <a href="#">Samples</a> |
| SN74LS148DRG4    | ACTIVE        | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS148                         | <a href="#">Samples</a> |
| SN74LS148J       | OBSOLETE      | CDIP         | J               | 16   |             | TBD                     | Call TI          | Call TI              | 0 to 70      |                               |                         |
| SN74LS148N       | ACTIVE        | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS148N                    | <a href="#">Samples</a> |
| SN74LS148N3      | OBSOLETE      | PDIP         | N               | 16   |             | TBD                     | Call TI          | Call TI              | 0 to 70      |                               |                         |
| SN74LS148NE4     | ACTIVE        | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS148N                    | <a href="#">Samples</a> |
| SN74LS148NSR     | ACTIVE        | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS148                       | <a href="#">Samples</a> |
| SN74LS148NSRE4   | ACTIVE        | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS148                       | <a href="#">Samples</a> |
| SN74LS148NSRG4   | ACTIVE        | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS148                       | <a href="#">Samples</a> |
| SNJ54148J        | OBSOLETE      | CDIP         | J               | 16   |             | TBD                     | Call TI          | Call TI              | -55 to 125   |                               |                         |
| SNJ54148W        | OBSOLETE      | CFP          | W               | 16   |             | TBD                     | Call TI          | Call TI              | -55 to 125   |                               |                         |
| SNJ54LS148FK     | ACTIVE        | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type   | -55 to 125   | 78027012A<br>SNJ54LS<br>148FK | <a href="#">Samples</a> |
| SNJ54LS148J      | ACTIVE        | CDIP         | J               | 16   | 1           | TBD                     | A42              | N / A for Pkg Type   | -55 to 125   | 7802701EA<br>SNJ54LS148J      | <a href="#">Samples</a> |
| SNJ54LS148W      | ACTIVE        | CFP          | W               | 16   | 1           | TBD                     | A42              | N / A for Pkg Type   | -55 to 125   | 7802701FA<br>SNJ54LS148W      | <a href="#">Samples</a> |

(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.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

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**OTHER QUALIFIED VERSIONS OF SN54147, SN54148, SN54LS147, SN54LS148, SN74147, SN74148, SN74LS147, SN74LS148 :**

● Catalog: [SN74147](#), [SN74148](#), [SN74LS147](#), [SN74LS148](#)

● Military: [SN54147](#), [SN54148](#), [SN54LS147](#), [SN54LS148](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications



## TAPE AND REEL INFORMATION



### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



\*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 |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LS148DR | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |

TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device      | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LS148DR | SOIC         | D               | 16   | 2500 | 333.2       | 345.9      | 28.6        |

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

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



| DIM \ PINS ** | 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)        |

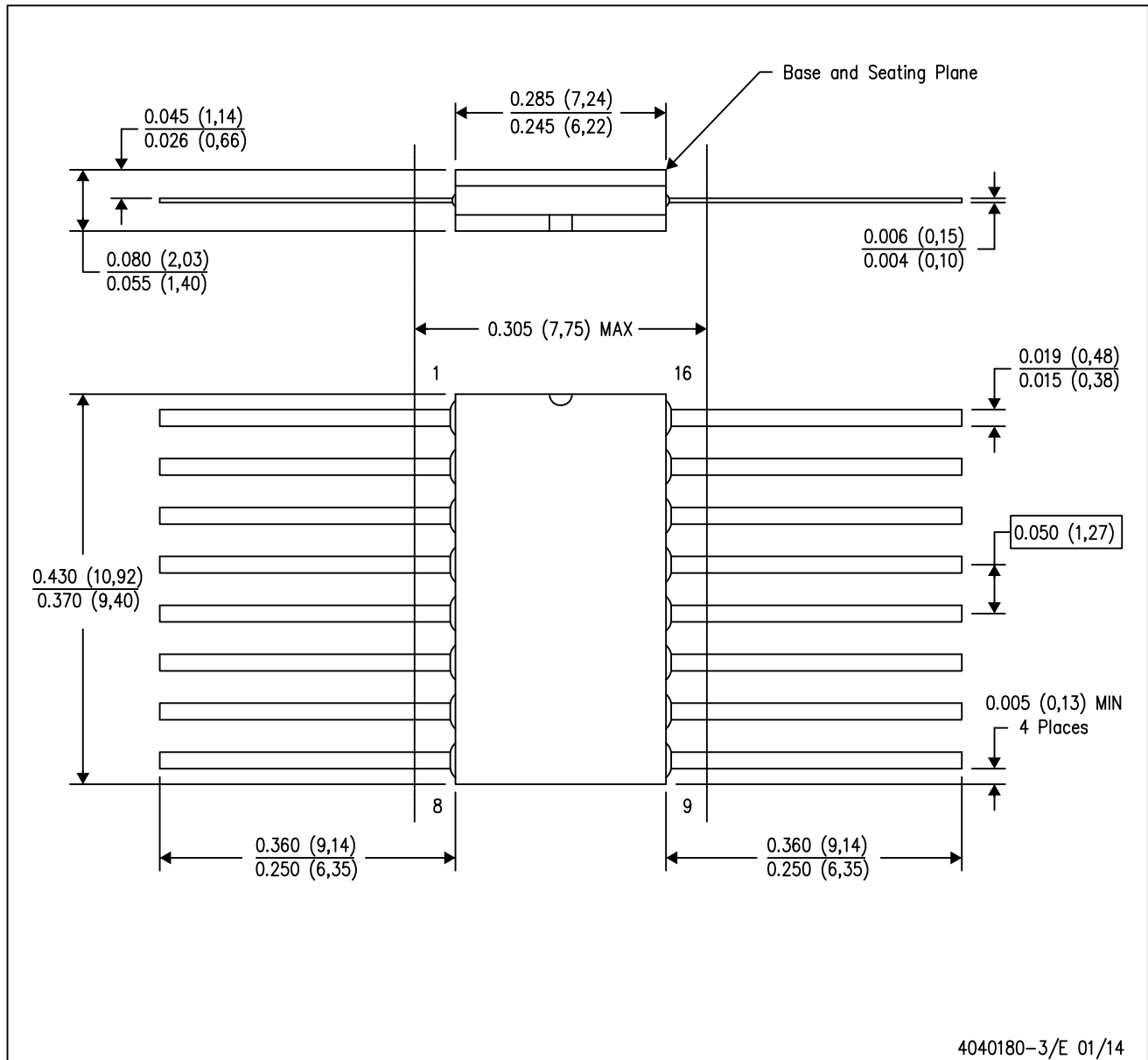


4040083/F 03/03

- NOTES:
- 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.

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK



- 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 ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within MIL STD 1835 GDFP2-F16 and JEDEC MO-092AC

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

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



| NO. OF TERMINALS ** | 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\*\*)

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-G16)

PLASTIC SMALL OUTLINE



4040047-6/M 06/11

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  -  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
  -  Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
  - E. Reference JEDEC MS-012 variation AC.

D (R-PDSO-G16)

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



- 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.

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