

1:4 Clock Fanout Buffer

Features

- Low-voltage operation
- $V_{DD} = 3.3V$
- 1:4 Fanout
- Single-input configurable for
 - LVDS, LVPECL, or LVTTTL
 - Four differential pairs of LVDS outputs
- Drives 50- or 100-ohm load (selectable)
- Low input capacitance
- 85 ps typical output-to-output skew
- <4 ns typical propagation delay
- Does not exceed Bellcore 802.3 standards
- Operation at \Rightarrow 350 MHz – 700 Mbps
- Industrial versions available
- Packages available include TSSOP/SOIC

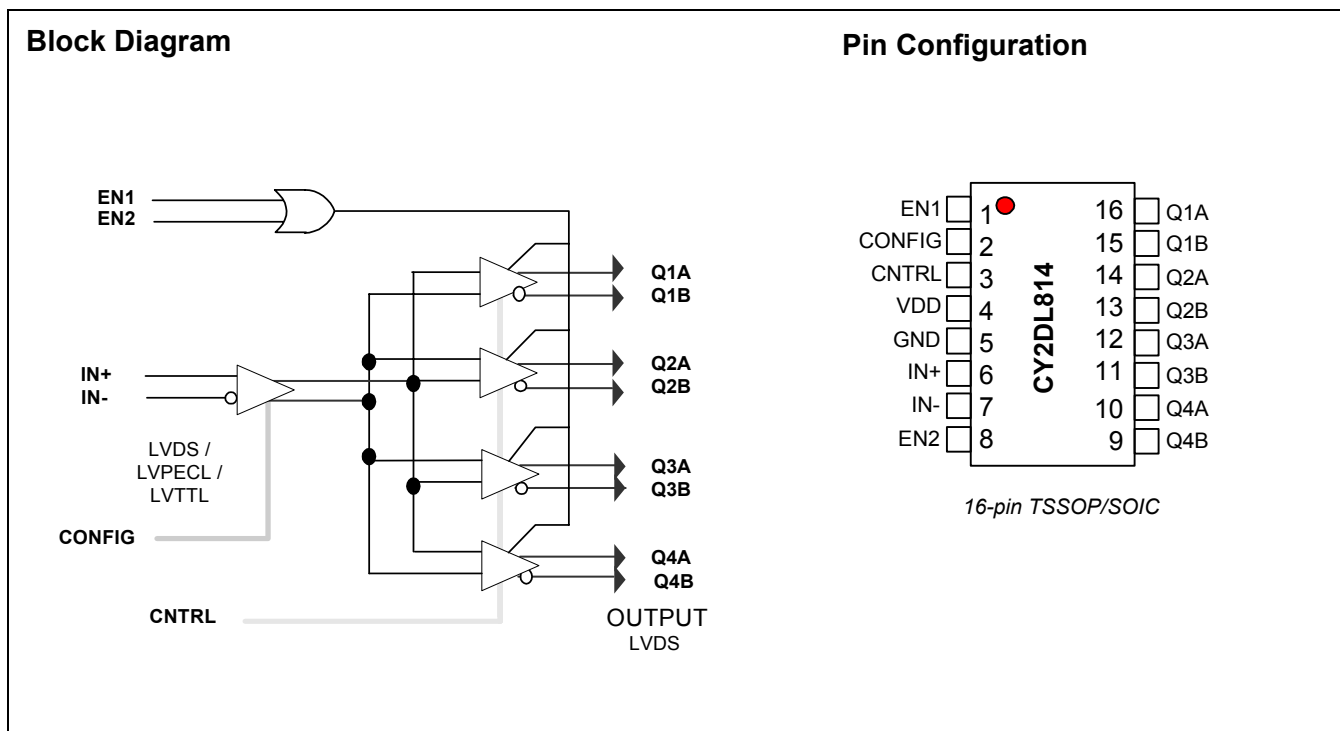
Description

The Cypress CY2 series of network circuits is produced using advanced 0.35-micron CMOS technology, achieving the industry's fastest logic.

The Cypress CY2DL814 fanout buffer features a single LVDS-, LVPECL-, or LVTTTL-compatible input and four LVDS output pairs.

Designed for data-communication clock management applications, the fanout from a single input reduces loading on the input clock.

The CY2DL814 is ideal for both level translations from single ended to LVDS and/or for the distribution of LVDS-based clock signals. The Cypress CY2DL814 has configurable input and output functions. The input can be selectable for LVPECL/LVTTTL or LVDS signals while the output driver's support standard and high drive LVDS. Drive either a 50-ohm or 100-ohm line with a single part number/device.



Pin Description

| Pin Number | Pin Name | Pin Standard Interface | Description |
|---------------------------|---|------------------------|---|
| 6,7 | IN+, IN- | Configurable | Differential input pair or single line. LVPECL default. See config below. |
| 3 | CNTRL | LVTTL/LVCMOS | Converts into a High drive driver from a standard LVDS. Standard drive (logic = 0) B/High drive/Bus (logic = 1) |
| 2 | CONFIG | LVTTL/LVCMOS | Converts inputs (IN ⁺ /IN ⁻), (EN, EN#) from the default LVPECL/LVDS (logic = 0) To LVTTL/LVCMOS (logic = 1) |
| 1,8 | EN1, EN2 | LVTTL/LVCMOS | Enable/disable logic. See <i>Table 1</i> below for details. |
| 16,15,14,13 12,11,10,9 | Q1A, Q1B, Q2A, Q2B, Q3A, Q3B, Q4A, Q4B | LDVS | Differential outputs. |
| 4 | V _{DD} | POWER | Positive supply voltage |
| 5 | G _{ND} | POWER | Ground |

Maximum Ratings^[1, 2]

| | | | |
|--|------------------|------------------------|---------------------------------|
| Storage Temperature: | -65°C to + 150°C | (Outputs only) | -0.3V to V _{DD} + 0.3V |
| Ambient Temperature:..... | -40°C to +85°C | DC Input Voltage | -0.3V to V _{DD} + 0.3V |
| Supply Voltage to Ground Potential (Inputs and V _{CC} only)..... | -0.3V to 4.6V | DC Output Voltage..... | -0.3V to V _{DD} + 0.9V |
| Supply Voltage to Ground Potential | | Power Dissipation..... | 0.75W |

Table 1. EN1 EN2 Function Table–Differential Input Mode

| Enable Logic | | Input | | Outputs | |
|--------------|-----|-------|-----|---------|-----|
| EN1 | EN2 | IN+ | IN- | QnA | QnB |
| H | X | H | L | H | L |
| H | X | L | H | L | H |
| X | L | H | L | H | L |
| X | L | L | H | L | H |
| L | H | X | X | Z | Z |

Table 2. Output Drive Control for Standard and Bus/B/High Drive B

| CNTRL Pin 3 Binary Value | Drive STD | Impedance | Output Voltage Value |
|--------------------------|------------------|-----------|--------------------------------------|
| 0 | Standard | 100 ohm | V ₀ = V _{output} |
| | | 50 ohm | V = 1/2 * V ₀ |
| 1 | High Drive/Bus/B | 100 ohm | V = 2 * V ₀ |
| | | 50 ohm | V = V ₀ |

Notes:

- Stresses greater than those listed under absolute maximum ratings may cause permanent damage to the device. This is intended to be a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
- Multiple Supplies: The voltage on any input or I/O pin cannot exceed the power pin during power-up. Power supply sequencing is NOT required.

Table 3. Input Receiver Configuration for Differential or LVTTTL/LVCMOS

| CONFIG Pin 2 Binary Value | Input Receiver Family | Input Receiver Type |
|---------------------------|-----------------------|--|
| 1 | LVTTTL in LVCMOS | Single-ended, Non-inverting, Inverting, Void of Bias Resistors |
| 0 | LVDS | Low-voltage Differential Signaling |
| | LVPECL | Low-voltage Pseudo (Positive) Emitter Coupled Logic |

Table 4. Function Control of the TTL Input Logic Used to Accept or Invert the Input Signal

| LVTTTL/LVCMOS Input Logic | | | |
|---------------------------|-----------|-------------|--------------------------------|
| Input Condition | | Input Logic | Output Logic Q Pins, Q1A or Q1 |
| Ground | IN- Pin 7 | | |
| | IN+ Pin 6 | Input | True |
| V _{CC} | IN- Pin 7 | | |
| | IN+ Pin 6 | Input | Invert |
| Ground | IN+ Pin 6 | | |
| | IN- Pin 7 | Input | True |
| V _{CC} | IN+ Pin 6 | | |
| | IN- Pin 7 | Input | Invert |

Table 5. Power Supply Characteristics

| Parameter | Description | Test Conditions | Min. | Typ. | Max. | Unit |
|------------------|------------------------------|---|------|------|------|--------|
| I _{CCD} | Dynamic Power Supply Current | V _{DD} = Max. Input toggling 50% Duty Cycle, Outputs Open | | 1.5 | 2.0 | mA/MHz |
| I _C | Total Power Supply Current | V _{DD} = Max. Input toggling 50% Duty Cycle, Outputs Open f _L =100 MHz | | 90 | 100 | mA |

Table 6. D.C Electrical Characteristics: 3.3V–LVDS Input

| Parameter | Description | Conditions | | Min. | Typ. | Max. | Unit |
|-----------------|--|--|-----------------------------------|---------------------|----------------------------|------|------|
| V _{ID} | Magnitude of Differential Input Voltage | | | 100 | | 600 | mV |
| V _{IC} | Common-mode of Differential Input Voltage V _{ID} (min. and max.) | | | V _{ID} /2 | 2.4–(V _{ID} /2) | | V |
| V _{IH} | Input High Voltage | Guaranteed Logic High Level | Config/Cntrl Pins | 2 | | | V |
| V _{IL} | Input Low Voltage | Guaranteed Logic Low Level | | | | 0.8 | V |
| I _{IH} | Input High Current | V _{DD} = Max. | V _{IN} = V _{DD} | | ±10 | ±20 | μA |
| I _{IL} | Input Low Current | V _{DD} = Max. | V _{IN} = V _{SS} | | ±10 | ±20 | μA |
| I _I | Input High Current | V _{DD} = Max., V _{IN} = V _{DD} (max.) | | | | ±20 | μA |

Table 7. D.C Electrical Characteristics: 3.3V–LVPECL Input

| Parameter | Description | Conditions | | Min. | Typ. | Max. | Unit |
|-----------------|--------------------------------|--|-----------------------------------|------|------|------|------|
| V _{ID} | Differential Input Voltage p-p | Guaranteed Logic High Level | | 400 | | 2600 | mV |
| V _{CM} | Common-mode Voltage | | | 1.65 | | 2.25 | V |
| I _{IH} | Input High Current | V _{DD} = Max. | V _{IN} = V _{DD} | | ±10 | ±20 | μA |
| I _{IL} | Input Low Current | V _{DD} = Max. | V _{IN} = V _{SS} | | ±10 | ±20 | μA |
| I _I | Input High Current | V _{DD} = Max., V _{IN} = V _{DD} (Max.) | | | | ±20 | μA |

Table 8. D.C Electrical Characteristics: 3.3V–LVTTTL/LVCMOS Input

| Parameter | Description | Conditions | | Min. | Typ. | Max. | Unit |
|-----------------|---------------------|--|------------------------|------|------|------|------|
| V _{IH} | Input High Voltage | Guaranteed Logic High Level | | 2 | | | V |
| V _{IL} | Input Low Voltage | Guaranteed Logic Low Level | | | | 0.8 | V |
| I _{IH} | Input High Current | V _{DD} = Max. | V _{IN} = 2.7V | | | 1 | μA |
| I _{IL} | Input Low Current | V _{DD} = Max. | V _{IN} = 0.5V | | | -1 | μA |
| I _I | Input High Current | V _{DD} = Max., V _{IN} = V _{DD} (Max.) | | | | 20 | μA |
| V _{IK} | Clamp Diode Voltage | V _{DD} = Min., I _{IN} = -18 mA | | | -0.7 | -1.2 | V |
| V _H | Input Hysteresis | | | | 80 | | mV |

Table 9. D.C Electrical Characteristics: 3.3V–LVDS OUTPUT

| Parameter | Description | Conditions | | Min. | Typ. | Max. | Unit |
|------------------|---|--|--------------|------|------|------|------|
| I _{VOD} | Differential output voltage p-p | V _{DD} = 3.3V, V _{IN} = V _{IH} or V _{IL} | RL = 100 ohm | 0.25 | - | 0.45 | V |
| VOC(SS) | Steady-state common-mode output voltage | | | - | - | 226 | mV |
| Delta VOC(SS) | Change in VOC(SS) between logic states | | | -50 | 3 | 50 | mV |
| VOC(PP) | Peak to peak common mode output voltage | | | - | - | 150 | mV |
| I _{OS} | Output short circuit | QA = 0V or QB = 0V | | - | - | -20 | mA |
| V _{oh} | Output voltage high | | | - | - | 1475 | mV |
| V _{ol} | Output voltage low | | | 925 | - | - | mV |

Table 10.AC Parameters

| Parameter | Description | Conditions | | Min. | Typ. | Max. | Unit |
|-----------|--|---|-----------------------------|------|------|------|------|
| Rise Time | Pin control (pin 3) logic is "FALSE" defaulting to 100 ohm output drivers. Differential 20% to 80% | CL=10 pF RL and CL to GND 3 CL = C _{intrinsic} and C _{external} | RL = 100 ohm | - | - | 1.4 | ns |
| Fall Time | | | | - | - | 1.4 | ns |
| Rise Time | Pin control (pin 3) logic is "True" defaulting to 50 ohm output drivers. Differential 20% to 80% | CL=10 pF RL and CL to GND 3 CL = C _{intrinsic} and C _{external} | RL = 50 ohm Output boost | - | 350 | 600 | ps |
| Fall Time | | | | - | 350 | 600 | ps |

Table 11.AC Switching Characteristics @ 3.3 V (V_{DD} = 3.3V ±5%, Temperature = -40°C to +85°C)

| Parameter | Description | Conditions | Min. | Typ. | Max. | Unit |
|--|---|--------------------------|------|-------|------|------|
| IN [+,-] to Q[A,B] Data and Clock Speed | | | | | | |
| t _{PLH} | Propagation Delay – Low to High | V _{OD} = 100 mV | 3 | 4 | 5 | ns |
| t _{PHL} | Propagation Delay – High to Low | | 3 | 4 | 5 | ns |
| T _{pd} | Propagation Delay | | 3 | 4 | 5 | ns |
| IN [1,2] to Q[A,B] Control Speed | | | | | | |
| T _{Pe} | Enable (EN) to functional operation | | - | - | 6 | ns |
| T _{pd} | Functional operation to Disable | | - | - | 5 | ns |
| Q[A,B] Output Skews | | | | | | |
| t _{SK(0)} | Output Skew: Skew between outputs of the same package (in phase) | | - | 0.085 | 0.2 | ns |
| t _{SK(p)} | Pulse Skew: Skew between opposite transitions of the same output (t _{PHL} -t _{PLH}) | | - | 0.2 | - | ns |
| t _{SK(t)} | Package Skew: Skew between outputs of different packages at the same power supply voltage, temperature and package type. Same input signal level and output load. | V _{ID} = 100 mV | - | - | 1 | ns |

Table 12. High Frequency Parametrics

| Parameter | Description | Conditions | Min. | Typ. | Max. | Unit |
|-----------|--------------------------------------|--|------|------|------|------|
| Fmax | Maximum frequency $V_{DD} = 3.3V$ | 50% duty cycle $t_W(50-50)$ Standard Load Circuit. | – | – | 400 | MHz |
| Fmax(20) | Maximum frequency $V_{DD} = 3.3V$ | 20% duty cycle $t_W(50-50)$ LVPECL Input $V_{IN} = V_{IH}(\text{Max.})/V_{IL}(\text{Min.})$ $V_{OUT} = V_{OH}(\text{Min.})/V_{OL}(\text{Max.})$ (Limit) | – | – | 200 | MHz |
| TW | Minimum pulse $V_{DD} = 3.3V$ | LVPECL Input $V_{IN} = V_{IH}(\text{Max.})/V_{IL}(\text{Min.})$ F= 100 MHz $V_{OUT} = V_{OH}(\text{Min.})/V_{OL}(\text{Max.})$ (Limit) | 1 | – | – | ns |

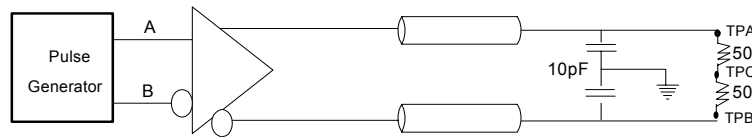
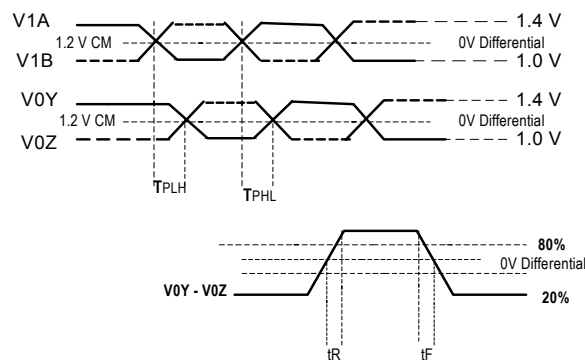
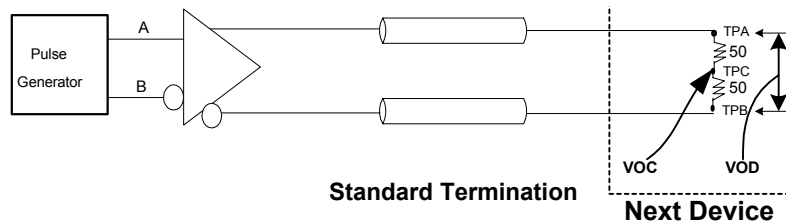
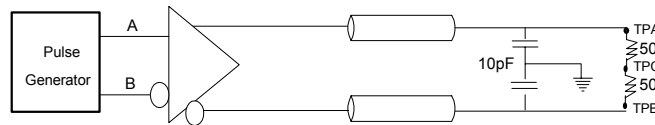
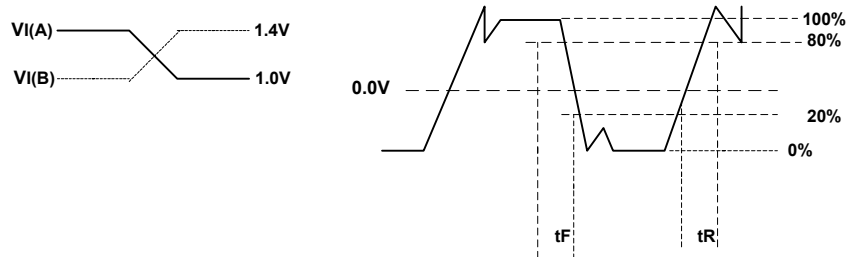
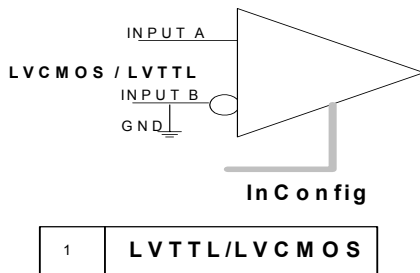
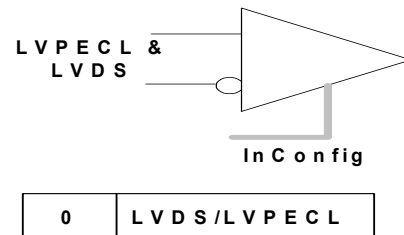

Standard Termination

Figure 1. Differential Receiver to Driver Propagation Delay and Driver Transition Time^[3, 4, 5, 6]

Standard Termination
Next Device

Figure 2. Test Circuit and Voltage Definitions for the Driver Common-mode Output Voltage^[3, 4, 5, 6]
Notes:

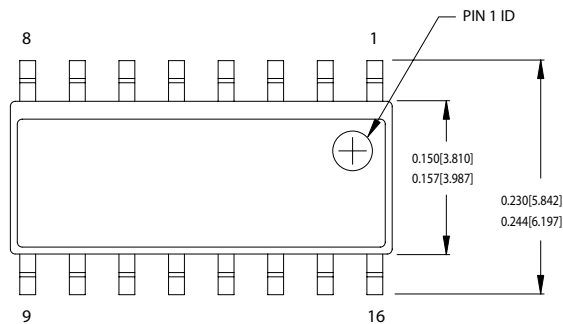
- All input pulses are supplied by a frequency generator with the following characteristics: t_R and $t_F \leq 1$ ns; pulse rate = 50 Mpps; pulse width = 10 ± 0.2 ns.
- $R_L = 50 \text{ ohm} \pm 1\%$ $Z_{line} = 50 \text{ ohm}$ 6".
- CL includes instrumentation and fixture capacitance within 6 mm of the UT.
- TPA and B are used for prop delay and Rise/Fall measurements. TPC is used for VOC measurements only and is otherwise connected to V_{DD-2} .


Standard Termination

Figure 3. Test Circuit and Voltage Definitions for the Differential Output Signal^[3, 4, 5, 6]

Figure 4. LVCMOS/LVTTL Single-ended Input Value^[7]

Figure 5. LVPECL or LVDS Differential Input Value^[8]
Ordering Information

| Part Number | Package Type | Product Flow |
|------------------|----------------------------|---------------------------|
| CY2DL814ZI | 16-pin TSSOP | Industrial, -40°C to 85°C |
| CY2DL814ZIT | 16-pin TSSOP–Tape and Reel | Industrial, -40°C to 85°C |
| CY2DL814SI | 16-pin SOIC | Industrial, -40°C to 85°C |
| CY2DL814SIT | 16-pin SOIC–Tape and Reel | Industrial, -40°C to 85°C |
| CY2DL814ZC | 16-pin TSSOP | Commercial, 0°C to 70 °C |
| CY2DL814ZCT | 16-pin TSSOP–Tape and Reel | Commercial, 0°C to 70 °C |
| CY2DL814SC | 16-pin SOIC | Commercial, 0°C to 70 °C |
| CY2DL814SCT | 16-pin SOIC–Tape and Reel | Commercial, 0°C to 70 °C |
| Lead-free | | |
| CY2DL814ZXI | 16-pin TSSOP | Industrial, -40°C to 85°C |
| CY2DL814ZXIT | 16-pin TSSOP–Tape and Reel | Industrial, -40°C to 85°C |
| CY2DL814SXI | 16-pin SOIC | Industrial, -40°C to 85°C |
| CY2DL814SXIT | 16-pin SOIC–Tape and Reel | Industrial, -40°C to 85°C |
| CY2DL814ZXC | 16-pin TSSOP | Commercial, 0°C to 70 °C |
| CY2DL814ZXCT | 16-pin TSSOP–Tape and Reel | Commercial, 0°C to 70 °C |
| CY2DL814SXC | 16-pin SOIC | Commercial, 0°C to 70 °C |
| CY2DL814SXCT | 16-pin SOIC–Tape and Reel | Commercial, 0°C to 70 °C |

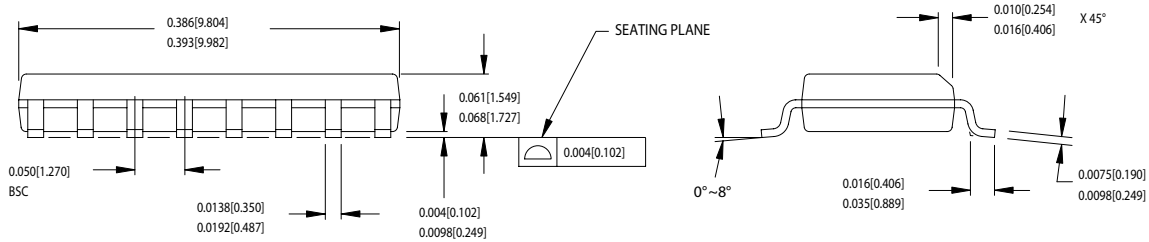
Notes:

- LVCMOS/LVTTL single ended input value. Ground either input: when on the B side then non-inversion takes place. If A side is grounded, the signal becomes the complement of the input on B side. See *Table 4*.
- LVPECL or LVDS differential input value.

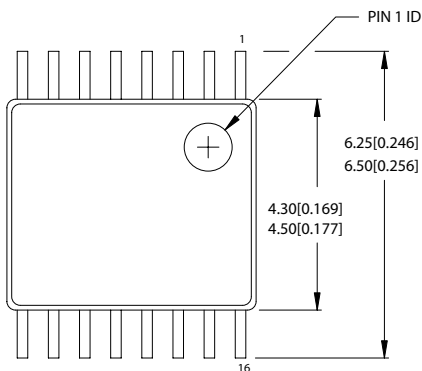
Package Drawing and Dimensions
16-Lead (150-Mil) SOIC S16.15


DIMENSIONS IN INCHES[MM] MIN. MAX.
REFERENCE JEDEC MS-012
PACKAGE WEIGHT 0.15gms

| PART # | |
|---------|----------------|
| S16.15 | STANDARD PKG. |
| SZ16.15 | LEAD FREE PKG. |

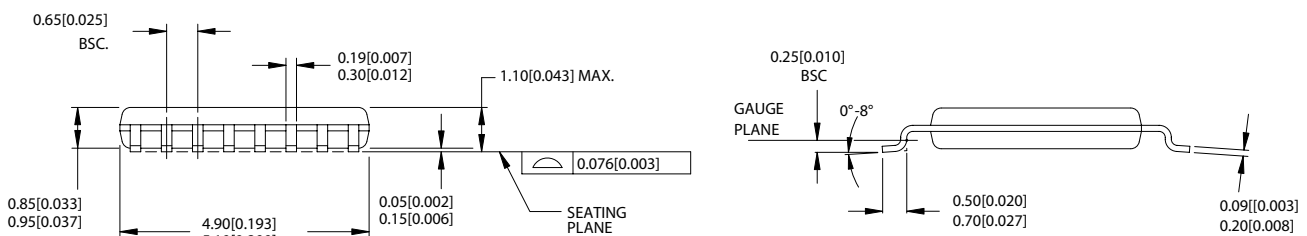


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16-lead TSSOP 4.40 mm Body Z16.173


DIMENSIONS IN MM[INCHES] MIN. MAX.
REFERENCE JEDEC MO-153
PACKAGE WEIGHT 0.05 gms

| PART # | |
|----------|----------------|
| Z16.173 | STANDARD PKG. |
| ZZ16.173 | LEAD FREE PKG. |



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Document Number: 38-07057

| REV. | ECN NO. | Issue Date | Orig. of Change | Description of Change |
|------|---------|------------|-----------------|---|
| ** | 115362 | 07/10/02 | EHX | New Data Sheet |
| *A | 122744 | 12/14/02 | RBI | Added power up requirements to maximum ratings information. |
| *B | 384077 | See ECN | RGL | Added Lead-free devices Added typical values |