



SCCS056A - August 1994 - Revised October 2001

# CY74FCT16500T CY74FCT162500T

## 18-Bit Registered Transceivers

### Features

- FCT-C speed at 4.6 ns
- $I_{off}$  supports partial-power- mode operation
- Edge-rate control circuitry for significantly improved noise characteristics
- Typical output skew < 250 ps
- ESD > 2000V
- TSSOP (19.6-mil pitch) and SSOP (25-mil pitch) packages
- Industrial temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- $V_{CC} = 5V \pm 10\%$

#### CY74FCT16500T Features:

- 64 mA sink current, 32 mA source current
- Typical  $V_{OLP}$  (ground bounce) <1.0V at  $V_{CC} = 5V$ ,  $T_A = 25^{\circ}\text{C}$

#### CY74FCT162500T Features:

- Balanced 24 mA output drivers
- Reduced system switching noise
- Typical  $V_{OLP}$  (ground bounce) <0.6V at  $V_{CC} = 5V$ ,  $T_A = 25^{\circ}\text{C}$

### Functional Description

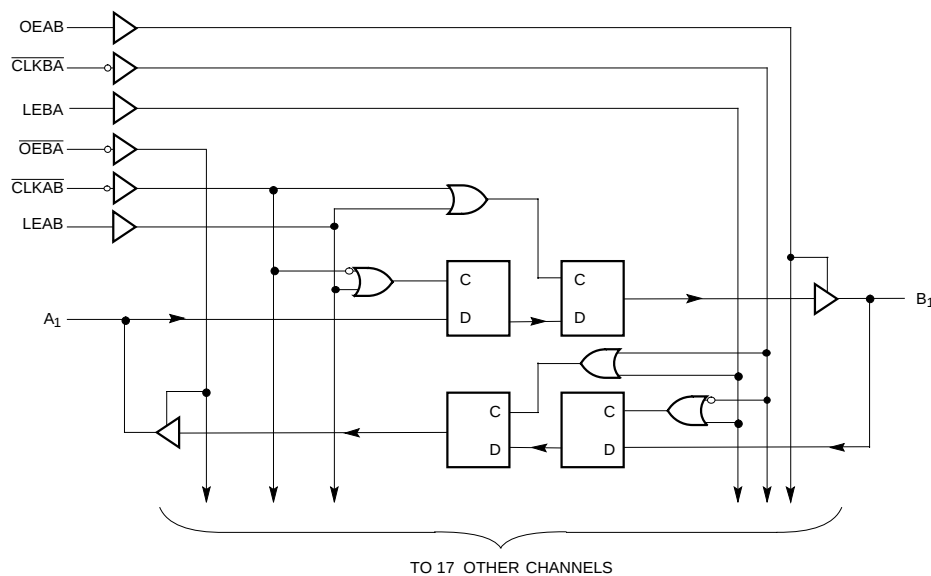
These 18-bit universal bus transceivers can be operated in transparent, latched, or clock modes by combining D-type latches and D-type flip-flops. Data flow in each direction is controlled by output-enable (OEAB and OEBA), latch enable (LEAB and LEBA), and clock inputs (CLKAB and CLKBA) inputs. For A-to-B data flow, the device operates in transparent mode when LEAB is HIGH. When LEAB is LOW, the A data is latched if CLKAB is held at a HIGH or LOW logic level. If LEAB is LOW, the A bus data is stored in the latch/flip-flop on the HIGH-to-LOW transition of CLKAB. OEAB performs the output enable function on the B port. Data flow from B-to-A is similar to that of A-to-B and is controlled by OEBA, LEBA, and CLKBA.

This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

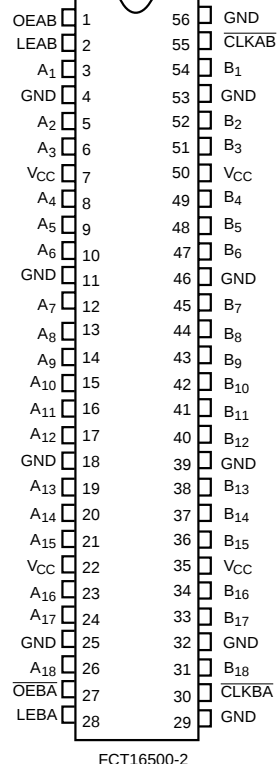
The CY74FCT16500T is ideally suited for driving high-capacitance loads and low-impedance backplanes.

The CY74FCT162500T has 24-mA balanced output drivers with current limiting resistors in the outputs. This reduces the need for external terminating resistors and provides for minimal undershoot and reduced ground bounce. The CY74FCT162500T is ideal for driving transmission lines.

### Logic Block Diagram



### SSOP/TSSOP Top View



## Pin Summary

| Name  | Description                                      |
|-------|--------------------------------------------------|
| OEAB  | A-to-B Output Enable Input                       |
| OEBA  | B-to-A Output Enable Input (Active LOW)          |
| LEAB  | A-to-B Latch Enable Input                        |
| LEBA  | B-to-A Latch Enable Input                        |
| CLKAB | A-to-B Clock Input (Active LOW)                  |
| CLKBA | B-to-A Clock Input (Active LOW)                  |
| A     | A-to-B Data Inputs or B-to-A Three-State Outputs |
| B     | B-to-A Data Inputs or A-to-B Three-State Outputs |

## Function Table<sup>[1, 2]</sup>

| Inputs |      |       |   | Outputs          |
|--------|------|-------|---|------------------|
| OEAB   | LEAB | CLKAB | A | B                |
| L      | X    | X     | X | Z                |
| H      | H    | X     | L | L                |
| H      | H    | X     | H | H                |
| H      | L    | ⌋     | L | L                |
| H      | L    | ⌋     | H | H                |
| H      | L    | H     | X | B <sup>[3]</sup> |
| H      | L    | L     | X | B <sup>[4]</sup> |

## Electrical Characteristics Over the Operating Range

| Parameter        | Description                                             | Test Conditions                                             | Min. | Typ. <sup>[7]</sup> | Max. | Unit |
|------------------|---------------------------------------------------------|-------------------------------------------------------------|------|---------------------|------|------|
| V <sub>IH</sub>  | Input HIGH Voltage                                      |                                                             | 2.0  |                     |      | V    |
| V <sub>IL</sub>  | Input LOW Voltage                                       |                                                             |      |                     | 0.8  | V    |
| V <sub>H</sub>   | Input Hysteresis <sup>[8]</sup>                         |                                                             |      | 100                 |      | mV   |
| V <sub>IK</sub>  | Input Clamp Diode Voltage                               | V <sub>CC</sub> =Min., I <sub>IN</sub> =-18 mA              |      | -0.7                | -1.2 | V    |
| I <sub>IH</sub>  | Input HIGH Current                                      | V <sub>CC</sub> =Max., V <sub>I</sub> =V <sub>CC</sub>      |      |                     | ±1   | μA   |
| I <sub>IL</sub>  | Input LOW Current                                       | V <sub>CC</sub> =Max., V <sub>I</sub> =GND.                 |      |                     | ±1   | μA   |
| I <sub>OZH</sub> | High Impedance Output Current (Three-State Output pins) | V <sub>CC</sub> =Max., V <sub>OUT</sub> =2.7V               |      |                     | ±1   | μA   |
| I <sub>OZL</sub> | High Impedance Output Current (Three-State Output pins) | V <sub>CC</sub> =Max., V <sub>OUT</sub> =0.5V               |      |                     | ±1   | μA   |
| I <sub>OS</sub>  | Short Circuit Current <sup>[9]</sup>                    | V <sub>CC</sub> =Max., V <sub>OUT</sub> =GND                | -80  | -140                | -200 | mA   |
| I <sub>O</sub>   | Output Drive Current <sup>[9]</sup>                     | V <sub>CC</sub> =Max., V <sub>OUT</sub> =2.5V               | -50  |                     | -180 | mA   |
| I <sub>OFF</sub> | Power-Off Disable                                       | V <sub>CC</sub> =0V, V <sub>OUT</sub> ≤4.5V <sup>[10]</sup> |      |                     | ±1   | μA   |

### Notes:

- H = HIGH Voltage Level. L = LOW Voltage Level. X = Don't Care. Z = HIGH Impedance. ⌋ = HIGH-to-LOW Transition.
- A-to-B data flow is shown, B-to-A data flow is similar but uses OEBA, LEBA, and CLKBA.
- Output level before the indicated steady-state input conditions were established.
- Output level before the indicated steady-state input conditions were established, provided that CLKAB was LOW before LEAB went LOW.
- Operation beyond the limits set forth may impair the useful life of the device. Unless otherwise noted, these limits are over the operating free-air temperature range.
- Unused inputs must always be connected to an appropriate logic voltage level, preferably either V<sub>CC</sub> or ground.
- Typical values are at V<sub>CC</sub>=5.0V, T<sub>A</sub>=+25°C ambient.
- This parameter is specified but not tested.
- Not more than one output should be shorted at a time. Duration of short should not exceed one second. The use of high-speed test apparatus and/or sample and hold techniques are preferable in order to minimize internal chip heating and more accurately reflect operational values. Otherwise prolonged shorting of a high output may raise the chip temperature well above normal and thereby cause invalid readings in other parametric tests. In any sequence of parameter tests, I<sub>OS</sub> tests should be performed last.
- Tested at +25°C.

## Maximum Ratings<sup>[5, 6]</sup>

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature ..... Com'l -55°C to +125°C

Ambient Temperature with  
Power Applied ..... Com'l -55°C to +125°C

DC Input Voltage ..... -0.5V to +7.0V

DC Output Voltage ..... -0.5V to +7.0V

DC Output Current  
(Maximum Sink Current/Pin) ..... -60 to +120 mA

Power Dissipation ..... 1.0W

Static Discharge Voltage ..... >2001V  
(per MIL-STD-883, Method 3015)

## Operating Range

| Range      | Ambient Temperature | V <sub>CC</sub> |
|------------|---------------------|-----------------|
| Industrial | -40°C to +85°C      | 5V ± 10%        |

**Output Drive Characteristics for CY74FCT16500T**

| Parameter       | Description         | Test Conditions                                | Min. | Typ. <sup>[7]</sup> | Max. | Unit |
|-----------------|---------------------|------------------------------------------------|------|---------------------|------|------|
| V <sub>OH</sub> | Output HIGH Voltage | V <sub>CC</sub> =Min., I <sub>OH</sub> =-3 mA  | 2.5  | 3.5                 |      | V    |
|                 |                     | V <sub>CC</sub> =Min., I <sub>OH</sub> =-15 mA | 2.4  | 3.5                 |      |      |
|                 |                     | V <sub>CC</sub> =Min., I <sub>OH</sub> =-32 mA | 2.0  | 3.0                 |      |      |
| V <sub>OL</sub> | Output LOW Voltage  | V <sub>CC</sub> =Min., I <sub>OL</sub> =64 mA  |      | 0.2                 | 0.55 | V    |

**Output Drive Characteristics for CY74FCT162500T**

| Parameter        | Description                        | Test Conditions                                                                                   | Min. | Typ. <sup>[7]</sup> | Max. | Unit |
|------------------|------------------------------------|---------------------------------------------------------------------------------------------------|------|---------------------|------|------|
| I <sub>ODL</sub> | Output LOW Current <sup>[9]</sup>  | V <sub>CC</sub> =5V, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>OUT</sub> =1.5V | 60   | 115                 | 150  | mA   |
| I <sub>ODH</sub> | Output HIGH Current <sup>[9]</sup> | V <sub>CC</sub> =5V, V <sub>IN</sub> =V <sub>IH</sub> or V <sub>IL</sub> , V <sub>OUT</sub> =1.5V | -60  | -115                | -150 | mA   |
| V <sub>OH</sub>  | Output HIGH Voltage                | V <sub>CC</sub> =Min., I <sub>OH</sub> =-24 mA                                                    | 2.4  | 3.3                 |      | V    |
| V <sub>OL</sub>  | Output LOW Voltage                 | V <sub>CC</sub> =Min., I <sub>OL</sub> =24 mA                                                     |      | 0.3                 | 0.55 | V    |

**Capacitance<sup>[8]</sup>** (T<sub>A</sub> = +25°C, f = 1.0 MHz)

| Parameter        | Description        | Test Conditions       | Typ. <sup>[7]</sup> | Max. | Unit |
|------------------|--------------------|-----------------------|---------------------|------|------|
| C <sub>IN</sub>  | Input Capacitance  | V <sub>IN</sub> = 0V  | 4.5                 | 6.0  | pF   |
| C <sub>OUT</sub> | Output Capacitance | V <sub>OUT</sub> = 0V | 5.5                 | 8.0  | pF   |

**Power Supply Characteristics**

| Parameter        | Description                                      | Test Conditions                                                                                                                                                                                                              | Typ. <sup>[7]</sup> | Max.                 | Unit   |
|------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------------|--------|
| I <sub>CC</sub>  | Quiescent Power Supply Current                   | V <sub>CC</sub> =Max.<br>V <sub>IN</sub> ≤0.2V,<br>V <sub>IN</sub> ≥V <sub>CC</sub> -0.2V                                                                                                                                    | 5                   | 500                  | μA     |
| ΔI <sub>CC</sub> | Quiescent Power Supply Current (TTL inputs HIGH) | V <sub>CC</sub> =Max.<br>V <sub>IN</sub> =3.4V <sup>[11]</sup>                                                                                                                                                               | 0.5                 | 1.5                  | mA     |
| I <sub>CCD</sub> | Dynamic Power Supply Current <sup>[12]</sup>     | V <sub>CC</sub> =Max., One Input Toggling, 50% Duty Cycle, Outputs Open, OEAB=OEBA=V <sub>CC</sub> or GND<br>V <sub>IN</sub> =V <sub>CC</sub> or V <sub>IN</sub> =GND                                                        | 75                  | 120                  | μA/MHz |
| I <sub>C</sub>   | Total Power Supply Current <sup>[13]</sup>       | V <sub>CC</sub> =Max., f <sub>0</sub> =10 MHz (CLKAB), f <sub>1</sub> =5 MHz, 50% Duty Cycle, Outputs Open, One Bit Toggling, OEAB=OEBA=V <sub>CC</sub> LEAB=GND<br>V <sub>IN</sub> =V <sub>CC</sub> or V <sub>IN</sub> =GND | 0.8                 | 1.7                  | mA     |
|                  |                                                  | V <sub>IN</sub> =3.4V or V <sub>IN</sub> =GND                                                                                                                                                                                | 1.3                 | 3.2                  | mA     |
|                  |                                                  | V <sub>CC</sub> =Max., f <sub>0</sub> =10 MHz, f <sub>1</sub> =2.5 MHz, 50% Duty Cycle, Outputs Open, Eighteen Bits Toggling, OEAB=OEBA=V <sub>CC</sub> LEAB=GND<br>V <sub>IN</sub> =V <sub>CC</sub> or V <sub>IN</sub> =GND | 3.8                 | 6.5 <sup>[14]</sup>  | mA     |
|                  |                                                  | V <sub>IN</sub> =3.4V or V <sub>IN</sub> =GND                                                                                                                                                                                | 8.5                 | 20.8 <sup>[14]</sup> | mA     |

**Notes:**

11. Per TTL driven input (V<sub>IN</sub>=3.4V); all other inputs at V<sub>CC</sub> or GND.
12. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
13.  $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$   
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_0/2 + f_1 N_1)$   
 I<sub>CC</sub> = Quiescent Current with CMOS input levels  
 ΔI<sub>CC</sub> = Power Supply Current for a TTL HIGH input (V<sub>IN</sub>=3.4V)  
 D<sub>H</sub> = Duty Cycle for TTL inputs HIGH  
 N<sub>T</sub> = Number of TTL inputs at D<sub>H</sub>  
 I<sub>CCD</sub> = Dynamic Current caused by an input transition pair (HLH or LHL)  
 f<sub>0</sub> = Clock frequency for registered devices, otherwise zero  
 f<sub>1</sub> = Input signal frequency  
 N<sub>1</sub> = Number of inputs changing at f<sub>1</sub>  
 All currents are in milliamps and all frequencies are in megahertz.
14. Values for these conditions are examples of the I<sub>CC</sub> formula. These limits are specified but not tested.

**Switching Characteristics** Over the Operating Range<sup>[15]</sup>

| Parameter              | Description                                        | CY74FCT162500AT |      | CY74FCT16500CT/<br>CY74FCT162500CT |      | Unit | Fig. No. <sup>[16]</sup> |
|------------------------|----------------------------------------------------|-----------------|------|------------------------------------|------|------|--------------------------|
|                        |                                                    | Min.            | Max. | Min.                               | Max. |      |                          |
| $f_{MAX}$              | CLKAB or CLKBA frequency                           |                 | 150  |                                    | 150  | MHz  |                          |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>A to B or B to A              | 1.5             | 5.1  | 1.5                                | 4.6  | ns   | 1, 3                     |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>LEBA to A, LEAB to B          | 1.5             | 5.6  | 1.5                                | 5.3  | ns   | 1, 5                     |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>CLKBA to A, CLKAB to B        | 1.5             | 5.6  | 1.5                                | 5.3  | ns   | 1, 5                     |
| $t_{PZH}$<br>$t_{PZL}$ | Output Enable Time<br>OEBA to A, OEAB to B         | 1.5             | 6.0  | 1.5                                | 5.4  | ns   | 1, 7, 8                  |
| $t_{PHZ}$<br>$t_{PLZ}$ | Output Disable Time<br>OEBA to A, OEAB to B        | 1.5             | 5.6  | 1.5                                | 5.2  | ns   | 1, 7, 8                  |
| $t_{SU}$               | Set-Up Time, HIGH or LOW<br>A to CLKAB, B to CLKBA | 3.0             |      | 3.0                                |      | ns   | 9                        |
| $t_H$                  | Hold Time, HIGH or LOW<br>A to CLKAB, B to CLKBA   | 0               |      | 0                                  |      | ns   | 9                        |
| $t_{SU}$               | Set-Up Time, HIGH or LOW<br>A to LEAB, B to LEBA   | Clock HIGH      | 3.0  |                                    | 3.0  | ns   | 4                        |
|                        |                                                    | Clock LOW       | 1.5  |                                    | 1.5  | ns   | 4                        |
| $t_H$                  | Hold Time, HIGH or LOW<br>A to LEAB, B to LEBA     | 1.5             |      | 1.5                                |      | ns   | 4                        |
| $t_W$                  | LEAB or LEBA Pulse Width HIGH                      | 3.0             |      | 2.5                                |      | ns   | 5                        |
| $t_W$                  | CLKAB or CLKBA Pulse Width HIGH or LOW             | 3.0             |      | 3.0                                |      | ns   | 5                        |
| $t_{SK(O)}$            | Output Skew <sup>[17]</sup>                        |                 | 0.5  |                                    | 0.5  | ns   |                          |

**Ordering Information CY74FCT16500T**

| Speed (ns) | Ordering Code          | Package Name | Package Type            | Operating Range |
|------------|------------------------|--------------|-------------------------|-----------------|
| 4.6        | CY74FCT16500CTPACT     | Z56          | 56-Lead (240-Mil) TSSOP | Industrial      |
|            | CY74FCT16500CTPVC/PVCT | O56          | 56-Lead (300-Mil) SSOP  |                 |

**Ordering Information CY74FCT162500T**

| Speed (ns) | Ordering Code      | Package Name | Package Type           | Operating Range |
|------------|--------------------|--------------|------------------------|-----------------|
| 4.6        | CY74FCT162500CTPVC | O56          | 56-Lead (300-Mil) SSOP | Industrial      |
|            | 74FCT162500CTPVCT  | O56          | 56-Lead (300-Mil) SSOP |                 |
| 5.1        | CT74FCT162500ATPVC | O56          | 56-Lead (300-Mil) SSOP | Industrial      |
|            | 74FCT162500ATPVCT  | O56          | 56-Lead (300-Mil) SSOP |                 |

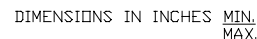
**Notes:**

15. Minimum limits are specified but not tested on Propagation Delays.

16. See "Parameter Measurement Information" in the General Information section.

17. Skew between any two outputs of the same package switching in the same direction. This parameter is ensured by design.

### 56-Lead Shrunk Small Outline Package O56



0.0098

3 2 1

0.313  
0.325

0.236  
0.244

N

DIMENSIONS IN INCHES MIN.  
MAX.

0.547  
0.555

0.0433  
MAX.

0.0335  
0.0374

0.0197  
BSC

0.0067  
0.011

0.002  
0.006

SEATING PLANE

0.25  
REF.

0°-8°

0.020  
0.030

**PACKAGING INFORMATION**

| Orderable Device   | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|--------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 74FCT162500ATPVCG4 | ACTIVE                | SSOP         | DL              | 56   |             | TBD                     | Call TI          | Call TI                      |
| 74FCT162500CTPVCG4 | ACTIVE                | SSOP         | DL              | 56   |             | TBD                     | Call TI          | Call TI                      |
| 74FCT162500CTPVCT  | ACTIVE                | SSOP         | DL              | 56   | 1000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| 74FCT16500CTPACTE4 | ACTIVE                | TSSOP        | DGG             | 56   |             | TBD                     | Call TI          | Call TI                      |
| 74FCT16500CTPACTG4 | ACTIVE                | TSSOP        | DGG             | 56   |             | TBD                     | Call TI          | Call TI                      |
| 74FCT16500CTPVCG4  | ACTIVE                | SSOP         | DL              | 56   | 20          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| 74FCT16500CTPVCTG4 | ACTIVE                | SSOP         | DL              | 56   | 1000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CY74FCT16500CTPVC  | ACTIVE                | SSOP         | DL              | 56   | 20          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| CY74FCT16500CTPVCT | ACTIVE                | SSOP         | DL              | 56   | 1000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| FCT162500ATPVCTG4  | ACTIVE                | SSOP         | DL              | 56   |             | TBD                     | Call TI          | Call TI                      |
| FCT162500CTPVCTG4  | ACTIVE                | SSOP         | DL              | 56   | 1000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

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

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

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

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

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

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

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

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

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

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

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

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

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**TAPE AND REEL INFORMATION**


\*All dimensions are nominal

| Device             | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|--------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| 74FCT162500CTPVCT  | SSOP         | DL              | 56   | 1000 | 330.0              | 32.4               | 11.35   | 18.67   | 3.1     | 16.0    | 32.0   | Q1            |
| CY74FCT16500CTPVCT | SSOP         | DL              | 56   | 1000 | 330.0              | 32.4               | 11.35   | 18.67   | 3.1     | 16.0    | 32.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device             | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|--------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| 74FCT162500CTPVCT  | SSOP         | DL              | 56   | 1000 | 346.0       | 346.0      | 49.0        |
| CY74FCT16500CTPVCT | SSOP         | DL              | 56   | 1000 | 346.0       | 346.0      | 49.0        |

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

## PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN

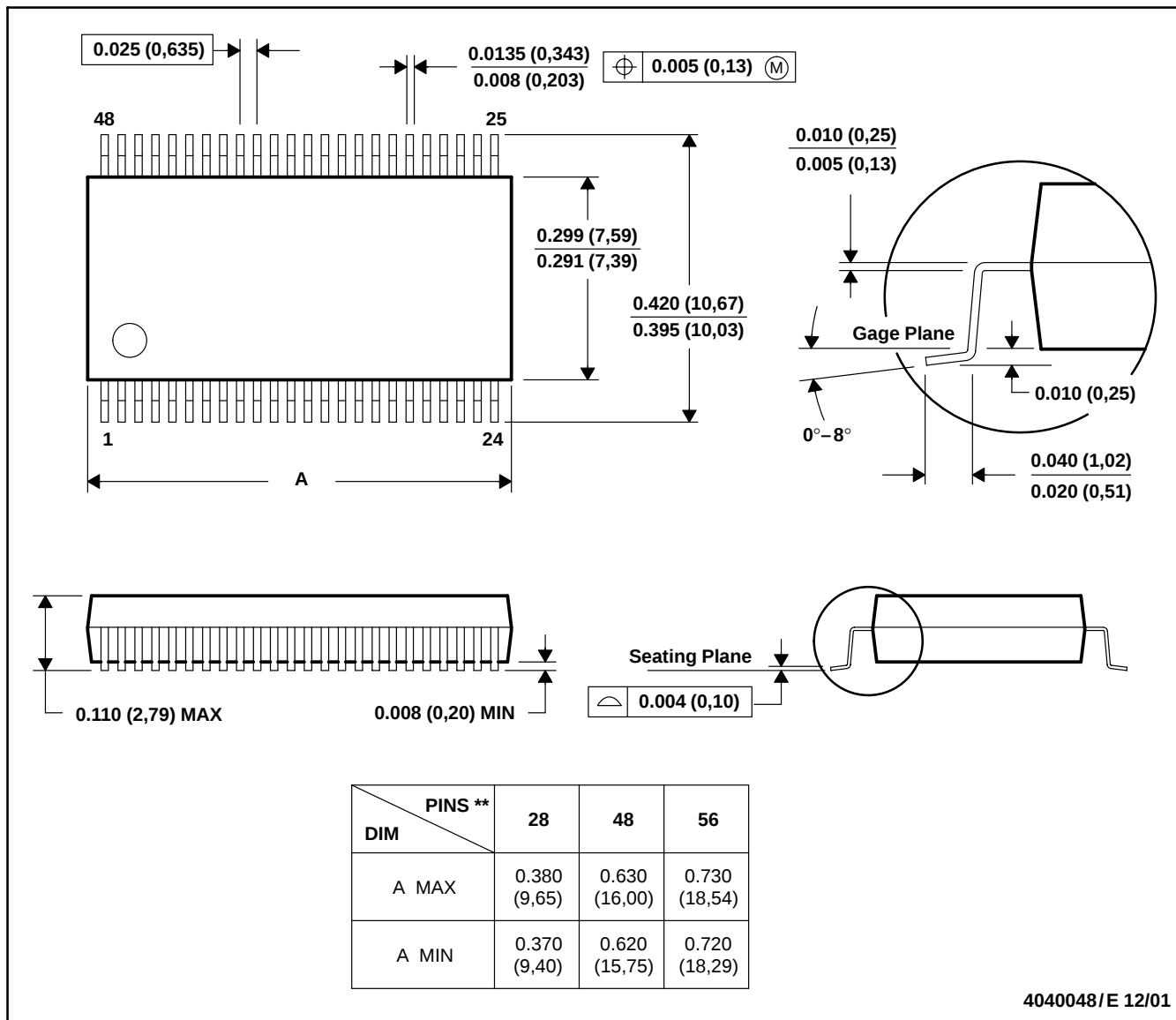


- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

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

PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).  
 D. Falls within JEDEC MO-118

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| DLP® Products               | <a href="http://www.dlp.com">www.dlp.com</a>                       |
| DSP                         | <a href="http://dsp.ti.com">dsp.ti.com</a>                         |
| Clocks and Timers           | <a href="http://www.ti.com/clocks">www.ti.com/clocks</a>           |
| Interface                   | <a href="http://interface.ti.com">interface.ti.com</a>             |
| Logic                       | <a href="http://logic.ti.com">logic.ti.com</a>                     |
| Power Mgmt                  | <a href="http://power.ti.com">power.ti.com</a>                     |
| Microcontrollers            | <a href="http://microcontroller.ti.com">microcontroller.ti.com</a> |
| RFID                        | <a href="http://www.ti-rfid.com">www.ti-rfid.com</a>               |
| RF/IF and ZigBee® Solutions | <a href="http://www.ti.com/lprf">www.ti.com/lprf</a>               |

### Applications

|                    |                                                                          |
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