

18-Bit Registered Transceivers

Features

- I_{off} supports partial-power-down 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°C to $+85^{\circ}\text{C}$
- $V_{CC} = 5\text{V} \pm 10\%$

CY74FCT16501T Features:

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

CY74FCT162501T Features:

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

CY74FCT162H501T Features:

- Bus hold retains last active state
- Eliminates the need for external pull-up or pull-down resistors

Functional Description

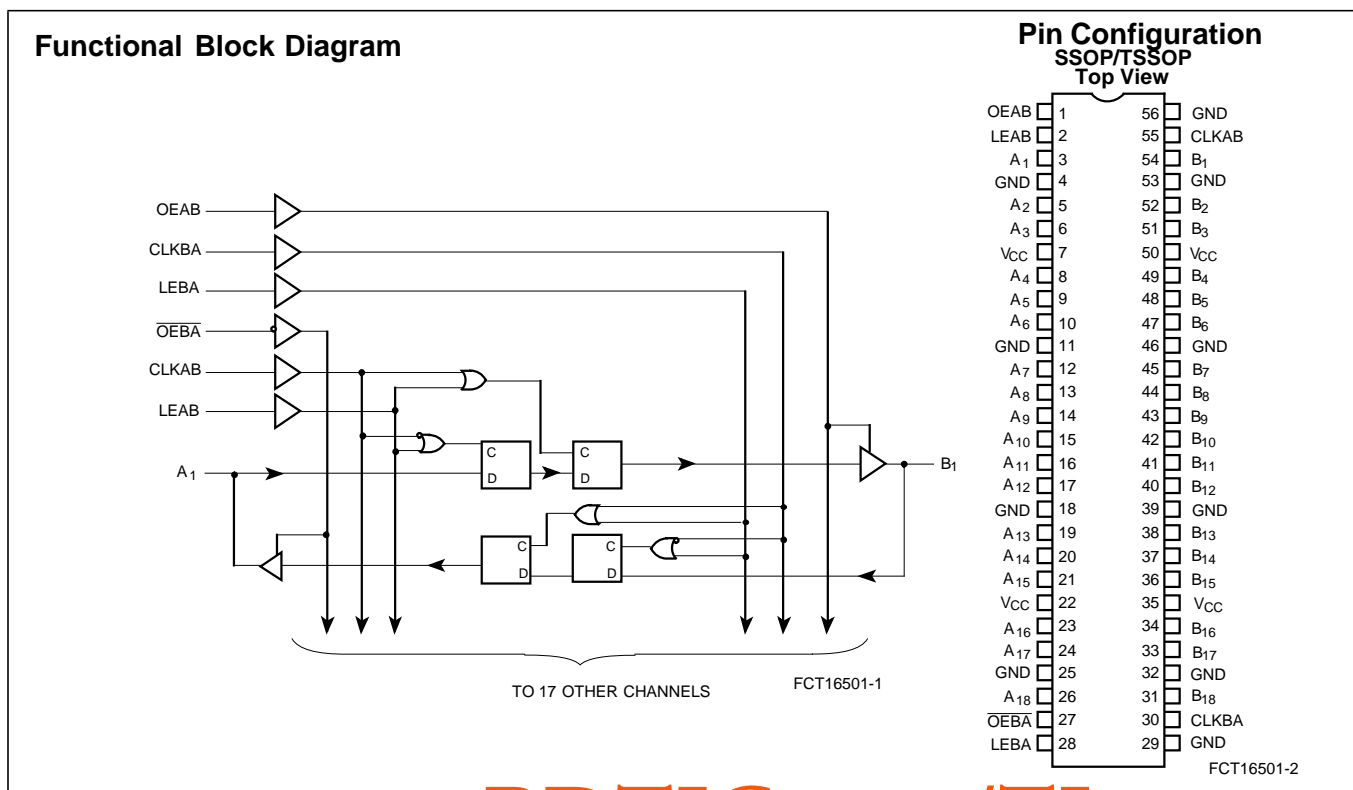
These 18-bit universal bus transceivers can be operated in transparent, latched or clock modes by combining D-type latches and D-type flip-flops. Data flow in each direction is controlled by output enable (OEAB and OEBA), latch enable (LEAB and LEBA), and clock inputs (CLKAB and CLKBA). For A-to-B data 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 LOW-to-HIGH 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 CY74FCT16501T is ideally suited for driving high-capacitance loads and low-impedance backplanes.

THE CY74FCT162501T 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 CY74FCT162501T is ideal for driving transmission lines.

The CY74FCT162H501T is a 24-mA balanced output part, that has "bus hold" on the data inputs. The device retains the input's last state whenever the input goes to high impedance. This eliminates the need for pull-up/down resistors and prevents floating inputs.



Pin Description

| 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 |
| CLKBA | B-to-A Clock Input |
| A | A-to-B Data Inputs or B-to-A Three-State Outputs ^[1] |
| B | B-to-A Data Inputs or A-to-B Three-State Outputs ^[1] |

Function Table^[2, 3]

| Inputs | | | | Outputs | |
|--------|------|-------|---|---------|------------------|
| OEAB | LEAB | CLKAB | A | B | |
| L | X | X | X | X | Z |
| H | H | X | L | L | L |
| H | H | X | H | H | H |
| H | L | ┐ | L | L | L |
| H | L | ┐ | H | H | H |
| H | L | L | X | X | B ^[4] |
| H | L | H | X | X | B ^[5] |

Notes:

- On the 74FCT162H501T these pins have bus hold.
- A-to-B data flow is shown. B-to-A data flow is similar but uses OEBA, LEBA, and CLKBA.
- H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care
Z = High-impedance
┐ = LOW-to-HIGH Transition
- 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 HIGH 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_{CC} or ground.

Maximum Ratings^[6, 7]

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

Storage Temperature -55°C to +125°C

Ambient Temperature with Power Applied..... -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 _{CC} |
|------------|---------------------|-----------------|
| Industrial | -40°C to +85°C | 5V ± 10% |

Electrical Characteristics Over the Operating Range

| Parameter | Description | Test Conditions | Min. | Typ. ^[8] | Max. | Unit |
|--|--|---|--|---------------------|------|------|
| V _{IH} | Input HIGH Voltage | | 2.0 | | | V |
| V _{IL} | Input LOW Voltage | | | | 0.8 | V |
| V _H | Input Hysteresis ^[9] | | | 100 | | mV |
| V _{IK} | Input Clamp Diode Voltage | V _{CC} =Min., I _{IN} =-18 mA | | -0.7 | -1.2 | V |
| I _{IH} | Input HIGH Current | Standard | V _{CC} =Max., V _I =V _{CC} | | ±1 | μA |
| | | Bus Hold | | | ±100 | |
| I _{IL} | Input LOW Current | Standard | V _{CC} =Max., V _I =GND | | ±1 | μA |
| | | Bus Hold | | | ±100 | μA |
| I _{BBH} I _{BBL} | Bus Hold Sustain Current on Bus Hold Input ^[10] | V _{CC} =Min., V _I =2.0V | -50 | | | μA |
| | | | V _I =0.8V | +50 | | |
| I _{BHHO} I _{BHLO} | Bus Hold Overdrive Current on Bus Hold Input ^[10] | V _{CC} =Max., V _I =1.5V | | | TBD | mA |
| I _{OZH} | High Impedance Output Current (Three-State Output pins) | V _{CC} =Max., V _{OUT} =2.7V | | | ±1 | μA |
| I _{OZL} | High Impedance Output Current (Three-State Output pins) | V _{CC} =Max., V _{OUT} =0.5V | | | ±1 | μA |
| I _{OS} | Short Circuit Current ^[11] | V _{CC} =Max., V _{OUT} =GND | -80 | -140 | -200 | mA |
| I _O | Output Drive Current ^[11] | V _{CC} =Max., V _{OUT} =2.5V | -50 | | -180 | mA |
| I _{OFF} | Power-Off Disable | V _{CC} =0V, V _{OUT} ≤4.5V ^[12] | | | ±1 | μA |

Output Drive Characteristics for CY74FCT16501T

| Parameter | Description | Test Conditions | Min. | Typ. ^[8] | Max. | Unit |
|-----------------|---------------------|--|------|---------------------|------|------|
| V _{OH} | Output HIGH Voltage | V _{CC} =Min., I _{OH} =-3 mA | 2.5 | 3.5 | | V |
| | | V _{CC} =Min., I _{OH} =-15 mA | 2.4 | 3.5 | | |
| | | V _{CC} =Min., I _{OH} =-32 mA | 2.0 | 3.0 | | |
| V _{OL} | Output LOW Voltage | V _{CC} =Min., I _{OL} =64 mA | | 0.2 | 0.55 | V |

Output Drive Characteristics for CY74FCT162501T, CY74FCT162H501T

| Parameter | Description | Test Conditions | Min. | Typ. ^[8] | Max. | Unit |
|------------------|-------------------------------------|---|------|---------------------|------|------|
| I _{ODL} | Output LOW Current ^[11] | V _{CC} =5V, V _{IN} =V _{IH} or V _{IL} , V _{OUT} =1.5V | 60 | 115 | 150 | mA |
| I _{ODH} | Output HIGH Current ^[11] | V _{CC} =5V, V _{IN} =V _{IH} or V _{IL} , V _{OUT} =1.5V | -60 | -115 | -150 | mA |
| V _{OH} | Output HIGH Voltage | V _{CC} =Min., I _{OH} =-24 mA | 2.4 | 3.3 | | V |
| V _{OL} | Output LOW Voltage | V _{CC} =Min., I _{OL} =24 mA | | 0.3 | 0.55 | V |

Notes:

- Typical values are at V_{CC}= 5.0V, T_A= +25°C ambient.
- This parameter is specified but not tested.
- Pins with bus hold are described in Pin Description.
- 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_{OS} tests should be performed last.
- Tested at +25°C.

Capacitance^[9] ($T_A = +25^\circ\text{C}$, $f = 1.0\text{ MHz}$)

| Parameter | Description | Test Conditions | Typ. ^[8] | Max. | Unit |
|-----------|--------------------|-----------------|---------------------|------|------|
| C_{IN} | Input Capacitance | $V_{IN} = 0V$ | 4.5 | 6.0 | pF |
| C_{OUT} | Output Capacitance | $V_{OUT} = 0V$ | 5.5 | 8.0 | pF |

Power Supply Characteristics

| Sym. | Parameter | Test Conditions ^[13] | Min. | Typ. ^[8] | Max. | Unit |
|-----------------|--|--|---|---------------------|----------------------|--------------------------|
| I_{CC} | Quiescent Power Supply Current | $V_{CC} = \text{Max.}$ $V_{IN} \leq 0.2V$ $V_{IN} \geq V_{CC} - 0.2V$ | — | 5 | 500 | μA |
| ΔI_{CC} | Quiescent Power Supply Current TTL inputs HIGH | $V_{CC} = \text{Max.}$, $V_{IN} = 3.4V$ ^[14] | — | 0.5 | 1.5 | mA |
| I_{CCD} | Dynamic Power Supply Current ^[15] | $V_{CC} = \text{Max.}$, Outputs Open OEAB= $\overline{\text{OEBA}} = V_{CC}$ or GND One Input Toggling, 50% Duty Cycle | — | 75 | 120 | $\mu\text{A}/\text{MHz}$ |
| I_C | Total Power Supply Current ^[16] | $V_{CC} = \text{Max.}$, Outputs Open $f_0 = 10\text{MHz}$ (CLKAB) 50% Duty Cycle OEAB= $\overline{\text{OEBA}} = V_{CC}$ LEAB = GND, One Bit Toggling $f_1 = 5\text{MHz}$, 50% Duty Cycle | — | 0.8 | 1.7 | mA |
| | | $V_{IN} = V_{CC}$ or $V_{IN} = \text{GND}$ | — | 1.3 | 3.2 | |
| | | $V_{CC} = \text{Max.}$, Outputs Open $f_0 = 10\text{MHz}$ (CLKAB) 50% Duty Cycle OEAB= $\overline{\text{OEBA}} = V_{CC}$ LEAB=GND Eighteen Bits Toggling $f_1 = 2.5\text{MHz}$, 50% Duty Cycle | $V_{IN} = V_{CC}$ or $V_{IN} = \text{GND}$ | — | 3.8 | 6.5 ^[17] |
| | | $V_{IN} = 3.4V$ or $V_{IN} = \text{GND}$ | — | 8.5 | 20.8 ^[17] | |

Notes:

13. For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.

14. Per TTL driven input ($V_{IN} = 3.4V$); all other inputs at V_{CC} or GND.

15. This parameter is not directly testable, but is derived for use in Total Power Supply.

$$I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$$

$$I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_0/2 + f_1 N_1)$$

I_{CC} = Quiescent Current with CMOS input levels
 ΔI_{CC} = Power Supply Current for a TTL HIGH input ($V_{IN} = 3.4V$)
 D_H = Duty Cycle for TTL inputs HIGH
 N_T = Number of TTL inputs at D_H
 I_{CCD} = Dynamic Current caused by an input transition pair (HLH or LHL)
 f_0 = Clock frequency for registered devices, otherwise zero
 f_1 = Input signal frequency
 N_1 = Number of inputs changing at f_1

All currents are in milliamps and all frequencies are in megahertz.

17. Values for these conditions are examples of the I_{CC} formula. These limits are specified but not tested.

Switching Characteristics Over the Operating Range^[18]

| Parameter | Description | CY74FCT16501AT CY74FCT162501AT | | CY74FCT162501CT CY74FCT162H501CT | | Unit | Fig. No. ^[19] | |
|--------------------------------------|---|-----------------------------------|------|-------------------------------------|------|------|--------------------------|---|
| | | Min. | Max. | Min. | Max. | | | |
| f _{MAX} | CLKAB or CLKBA frequency ^[20] | — | 150 | — | 150 | MHz | — | |
| t _{PLH} t _{PHL} | Propagation Delay A to B or B to A | 1.5 | 5.1 | 1.5 | 4.6 | ns | 1,3 | |
| t _{PLH} t _{PHL} | Propagation Delay LEBA to A, LEAB to B | 1.5 | 5.6 | 1.5 | 5.3 | ns | 1,5 | |
| t _{PLH} t _{PHL} | Propagation Delay CLKBA to A, CLKAB to B | 1.5 | 5.6 | 1.5 | 5.3 | ns | 1,5 | |
| t _{PZH} t _{PZL} | Output Enable Time OEBA to A, OEAB to B | 1.5 | 6.0 | 1.5 | 5.6 | ns | 1,7,8 | |
| t _{PHZ} t _{PLZ} | Output Disable Time 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 A to CLKAB, B to CLKBA | 3.0 | — | 3.0 | — | ns | 4 | |
| t _H | Hold Time HIGH or LOW A to CLKAB, B to CLKBA | 0 | — | 0 | — | ns | 4 | |
| t _{SU} | Set-Up Time, HIGH or LOW A to LEAB, B to LEBA | Clock LOW | 3.0 | — | 3.0 | — | ns | 4 |
| | | Clock HIGH | 1.5 | — | 1.5 | — | ns | 4 |
| t _H | Hold Time, HIGH or LOW, A to LEAB, B to LEBA | 1.5 | — | 1.5 | — | ns | 4 | |
| t _W | LEAB or LEBA Pulse Width HIGH ^[20] | 3.0 | — | 3.0 | — | ns | 5 | |
| t _W | CLKAB or CLKBA Pulse Width HIGH or LOW ^[20] | 3.0 | — | 3.0 | — | ns | 5 | |
| t _{SK(O)} | Output Skew ^[21] | — | 0.5 | — | 0.5 | ns | — | |

Notes:

18. Minimum limits are specified, but not tested, on propagation delays.

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

20. This parameter is guaranteed but not tested.

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

Ordering Information CY74FCT16501T

| Speed (ns) | Ordering Code | Package Name | Package Type | Operating Range |
|------------|------------------------|--------------|------------------------|-----------------|
| 5.1 | CY74FCT16501ATPVC/PVCT | O56 | 56-Lead (300-Mil) SSOP | Industrial |

Ordering Information CY74FCT162501T

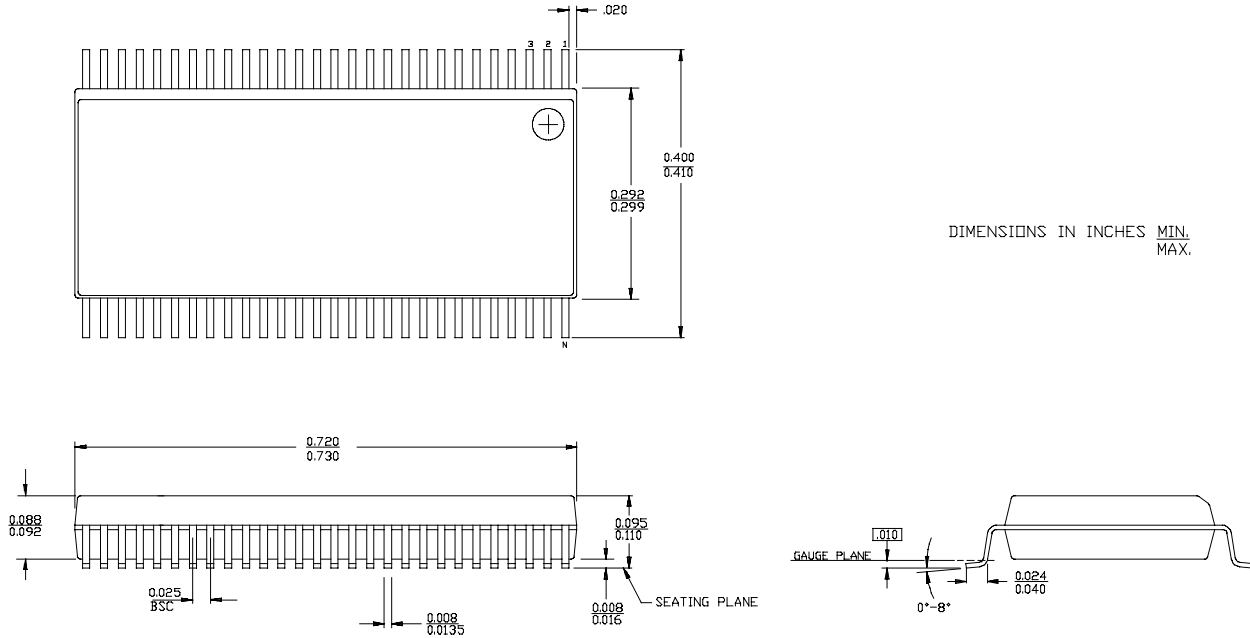
| Speed (ns) | Ordering Code | Package Name | Package Type | Operating Range |
|------------|--------------------|--------------|-------------------------|-----------------|
| 4.6 | 74FCT162501CTPACT | Z56 | 56-Lead (240-Mil) TSSOP | Industrial |
| | CY74FCT162501CTPVC | O56 | 56-Lead (300-Mil) SSOP | |
| | 74FCT162501CTPVCT | O56 | 56-Lead (300-Mil) SSOP | |
| 5.1 | 74FCT162501ATPACT | Z56 | 56-Lead (240-Mil) TSSOP | Industrial |
| | CY74FCT162501ATPVC | O56 | 56-Lead (300-Mil) SSOP | |
| | 74FCT162501ATPVCT | O56 | 56-Lead (300-Mil) SSOP | |

Ordering Information CY74FCT162H501T

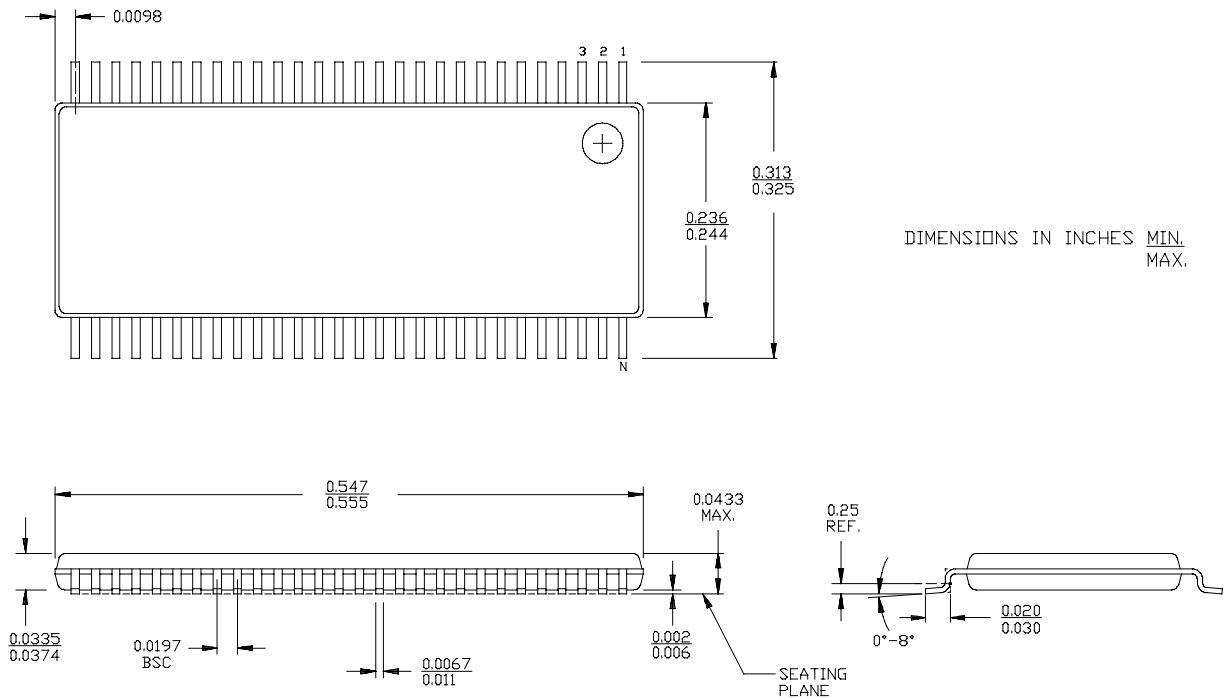
| Speed (ns) | Ordering Code | Package Name | Package Type | Operating Range |
|------------|------------------------|--------------|-------------------------|-----------------|
| 4.6 | 74FCT162H501CTPACT | Z56 | 56-Lead (240-Mil) TSSOP | Industrial |
| | 74FCT162H501CTPVC/PVCT | O56 | 56-Lead (300-Mil) SSOP | |

Package Diagrams

56-Lead Shrunk Small Outline Package O56



56-Lead Thin Shrunk Small Outline Package Z56



PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|--------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 74FCT162501ATPVCT | ACTIVE | SSOP | DL | 56 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| 74FCT162501CTPACT | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| 74FCT162501CTPVCT | ACTIVE | SSOP | DL | 56 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| 74FCT162501ETPACT | OBSOLETE | TSSOP | DGG | 56 | | TBD | Call TI | Call TI |
| 74FCT162501ETPVCT | OBSOLETE | SSOP | DL | 56 | | TBD | Call TI | Call TI |
| 74FCT162H501CTPACT | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| 74FCT162H501CTPVC | ACTIVE | SSOP | DL | 56 | 20 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| 74FCT162H501ETPAC | OBSOLETE | TSSOP | DGG | 56 | | TBD | Call TI | Call TI |
| 74FCT162H501ETPACT | OBSOLETE | TSSOP | DGG | 56 | | TBD | Call TI | Call TI |
| 74FCT162H501ETPVC | OBSOLETE | SSOP | DL | 56 | | TBD | Call TI | Call TI |
| 74FCT162H501ETPVCT | OBSOLETE | SSOP | DL | 56 | | TBD | Call TI | Call TI |
| 74FCT16501ATPVCG4 | ACTIVE | SSOP | DL | 56 | 20 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CY74FCT162501ETPAC | OBSOLETE | TSSOP | DGG | 56 | | TBD | Call TI | Call TI |
| CY74FCT162501ETPVC | OBSOLETE | SSOP | DL | 56 | | TBD | Call TI | Call TI |
| CY74FCT16501ATPVC | ACTIVE | SSOP | DL | 56 | 20 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| CY74FCT16501ETPAC | OBSOLETE | TSSOP | DGG | 56 | | TBD | Call TI | Call TI |
| CY74FCT16501ETPACT | OBSOLETE | TSSOP | DGG | 56 | | TBD | Call TI | Call TI |
| CY74FCT16501ETPVC | OBSOLETE | SSOP | DL | 56 | | TBD | Call TI | Call TI |
| CY74FCT16501ETPVCT | OBSOLETE | SSOP | DL | 56 | | TBD | Call TI | Call TI |
| FCT162501ATPVCTG4 | ACTIVE | SSOP | DL | 56 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| FCT162501CTPACTE4 | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| FCT162501CTPACTG4 | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| FCT162501CTPVCTG4 | ACTIVE | SSOP | DL | 56 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| FCT162H501CTPACTE4 | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| FCT162H501CTPACTG4 | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| FCT162H501CTPVCG4 | ACTIVE | SSOP | DL | 56 | 20 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

⁽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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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 |
|--------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| 74FCT162501ATPVCT | SSOP | DL | 56 | 1000 | 330.0 | 32.4 | 11.35 | 18.67 | 3.1 | 16.0 | 32.0 | Q1 |
| 74FCT162501CTPACT | TSSOP | DGG | 56 | 2000 | 330.0 | 24.4 | 8.6 | 15.6 | 1.8 | 12.0 | 24.0 | Q1 |
| 74FCT162501CTPVCT | SSOP | DL | 56 | 1000 | 330.0 | 32.4 | 11.35 | 18.67 | 3.1 | 16.0 | 32.0 | Q1 |
| 74FCT162H501CTPACT | TSSOP | DGG | 56 | 2000 | 330.0 | 24.4 | 8.6 | 15.6 | 1.8 | 12.0 | 24.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS

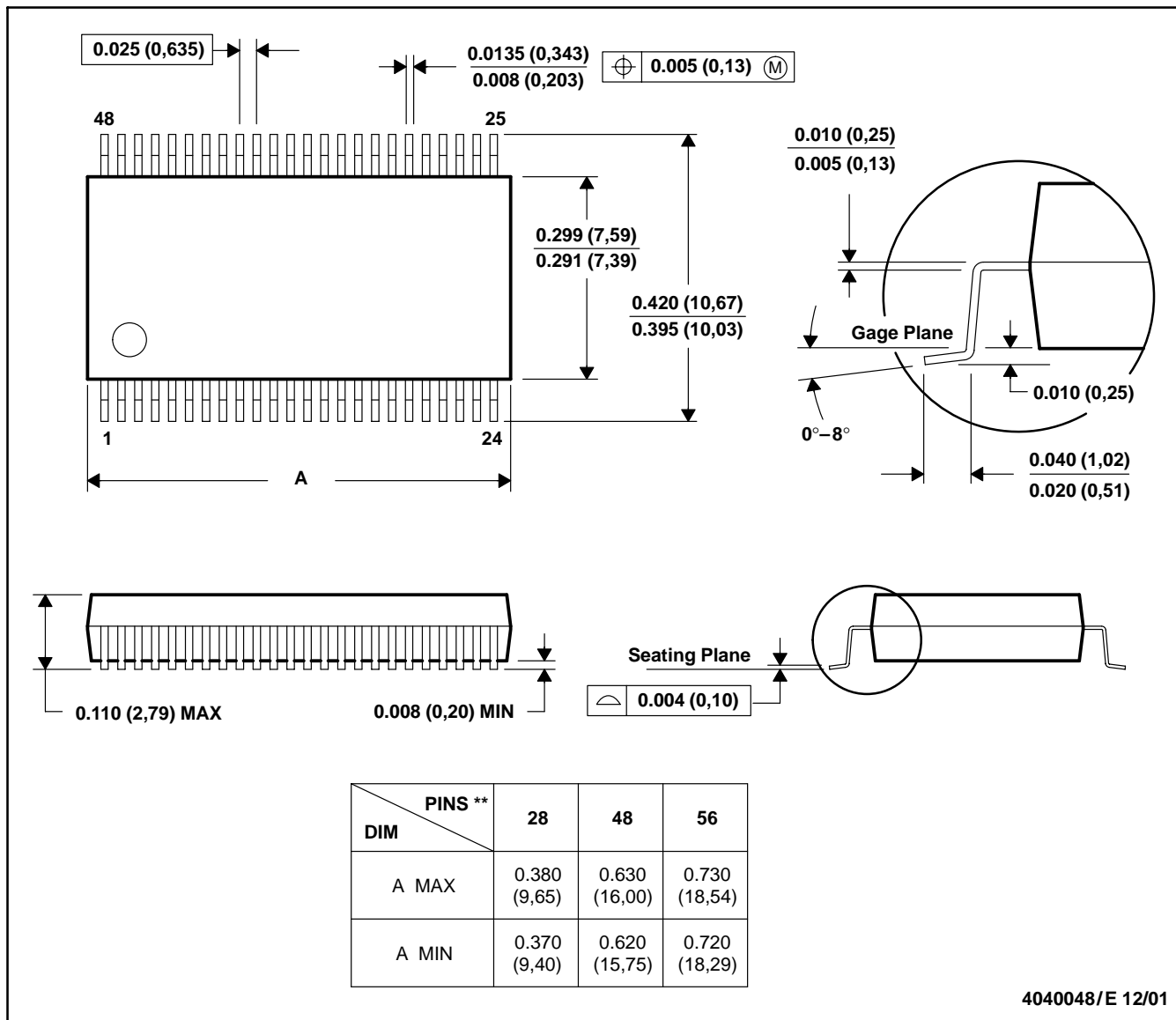

*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|--------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| 74FCT162501ATPVCT | SSOP | DL | 56 | 1000 | 346.0 | 346.0 | 49.0 |
| 74FCT162501CTPACT | TSSOP | DGG | 56 | 2000 | 346.0 | 346.0 | 41.0 |
| 74FCT162501CTPVCT | SSOP | DL | 56 | 1000 | 346.0 | 346.0 | 49.0 |
| 74FCT162H501CTPACT | TSSOP | DGG | 56 | 2000 | 346.0 | 346.0 | 41.0 |

DL (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN

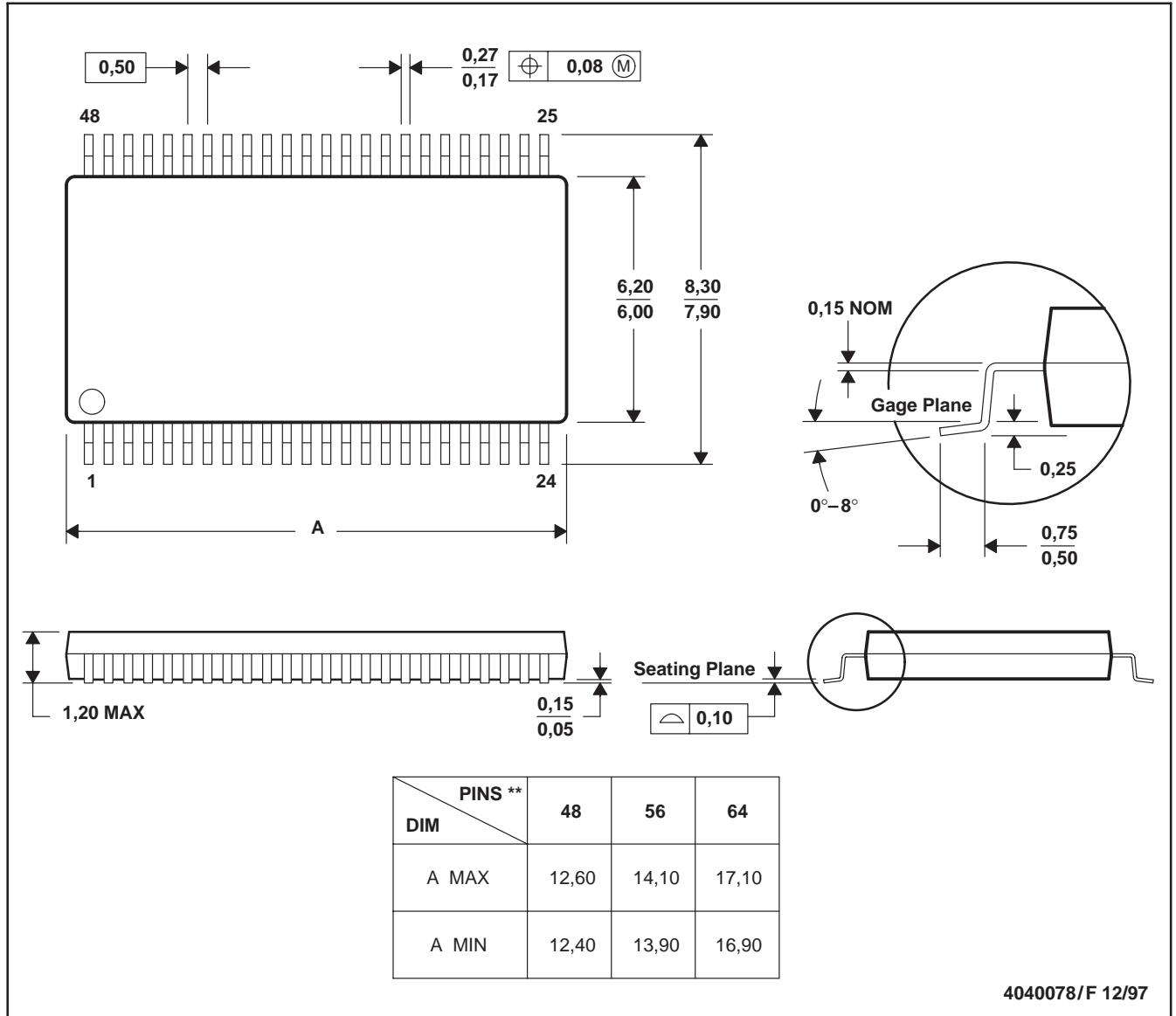


- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 D. Falls within JEDEC MO-118

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

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/ Ball Finish | MSL Peak Temp ⁽³⁾ | Samples (Requires Login) |
|--------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|---|
| 74FCT162501ATPVCT | ACTIVE | SSOP | DL | 56 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Contact TI Distributor or Sales Office |
| 74FCT162501CTPACT | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Purchase Samples |
| 74FCT162501CTPVCT | ACTIVE | SSOP | DL | 56 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Purchase Samples |
| 74FCT162501ETPACT | OBSOLETE | TSSOP | DGG | 56 | | TBD | Call TI | Call TI | Samples Not Available |
| 74FCT162501ETPVCT | OBSOLETE | SSOP | DL | 56 | | TBD | Call TI | Call TI | Samples Not Available |
| 74FCT162H501CTPACT | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Contact TI Distributor or Sales Office |
| 74FCT162H501CTPVC | ACTIVE | SSOP | DL | 56 | 20 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Purchase Samples |
| 74FCT162H501ETPAC | OBSOLETE | TSSOP | DGG | 56 | | TBD | Call TI | Call TI | Samples Not Available |
| 74FCT162H501ETPACT | OBSOLETE | TSSOP | DGG | 56 | | TBD | Call TI | Call TI | Samples Not Available |
| 74FCT162H501ETPVC | OBSOLETE | SSOP | DL | 56 | | TBD | Call TI | Call TI | Samples Not Available |
| 74FCT162H501ETPVCT | OBSOLETE | SSOP | DL | 56 | | TBD | Call TI | Call TI | Samples Not Available |
| 74FCT16501ATPVCG4 | ACTIVE | SSOP | DL | 56 | 20 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Purchase Samples |
| CY74FCT162501ETPAC | OBSOLETE | TSSOP | DGG | 56 | | TBD | Call TI | Call TI | Samples Not Available |
| CY74FCT162501ETPVC | OBSOLETE | SSOP | DL | 56 | | TBD | Call TI | Call TI | Samples Not Available |
| CY74FCT16501ATPVC | ACTIVE | SSOP | DL | 56 | 20 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Purchase Samples |
| CY74FCT16501ETPAC | OBSOLETE | TSSOP | DGG | 56 | | TBD | Call TI | Call TI | Samples Not Available |
| CY74FCT16501ETPACT | OBSOLETE | TSSOP | DGG | 56 | | TBD | Call TI | Call TI | Samples Not Available |
| CY74FCT16501ETPVC | OBSOLETE | SSOP | DL | 56 | | TBD | Call TI | Call TI | Samples Not Available |
| CY74FCT16501ETPVCT | OBSOLETE | SSOP | DL | 56 | | TBD | Call TI | Call TI | Samples Not Available |
| FCT162501ATPVCTG4 | ACTIVE | SSOP | DL | 56 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Contact TI Distributor or Sales Office |
| FCT162501CTPACTE4 | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Purchase Samples |
| FCT162501CTPACTG4 | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Purchase Samples |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/ Ball Finish | MSL Peak Temp ⁽³⁾ | Samples (Requires Login) |
|--------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|-------------------|------------------------------|--|
| FCT162501CTPVCTG4 | ACTIVE | SSOP | DL | 56 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Purchase Samples |
| FCT162H501CTPACTE4 | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Contact TI Distributor or Sales Office |
| FCT162H501CTPACTG4 | ACTIVE | TSSOP | DGG | 56 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Contact TI Distributor or Sales Office |
| FCT162H501CTPVCG4 | ACTIVE | SSOP | DL | 56 | 20 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | Purchase Samples |

⁽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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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 |
|--------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| 74FCT162501ATPVCT | SSOP | DL | 56 | 1000 | 330.0 | 32.4 | 11.35 | 18.67 | 3.1 | 16.0 | 32.0 | Q1 |
| 74FCT162501CTPACT | TSSOP | DGG | 56 | 2000 | 330.0 | 24.4 | 8.6 | 15.6 | 1.8 | 12.0 | 24.0 | Q1 |
| 74FCT162501CTPVCT | SSOP | DL | 56 | 1000 | 330.0 | 32.4 | 11.35 | 18.67 | 3.1 | 16.0 | 32.0 | Q1 |
| 74FCT162H501CTPACT | TSSOP | DGG | 56 | 2000 | 330.0 | 24.4 | 8.6 | 15.6 | 1.8 | 12.0 | 24.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS

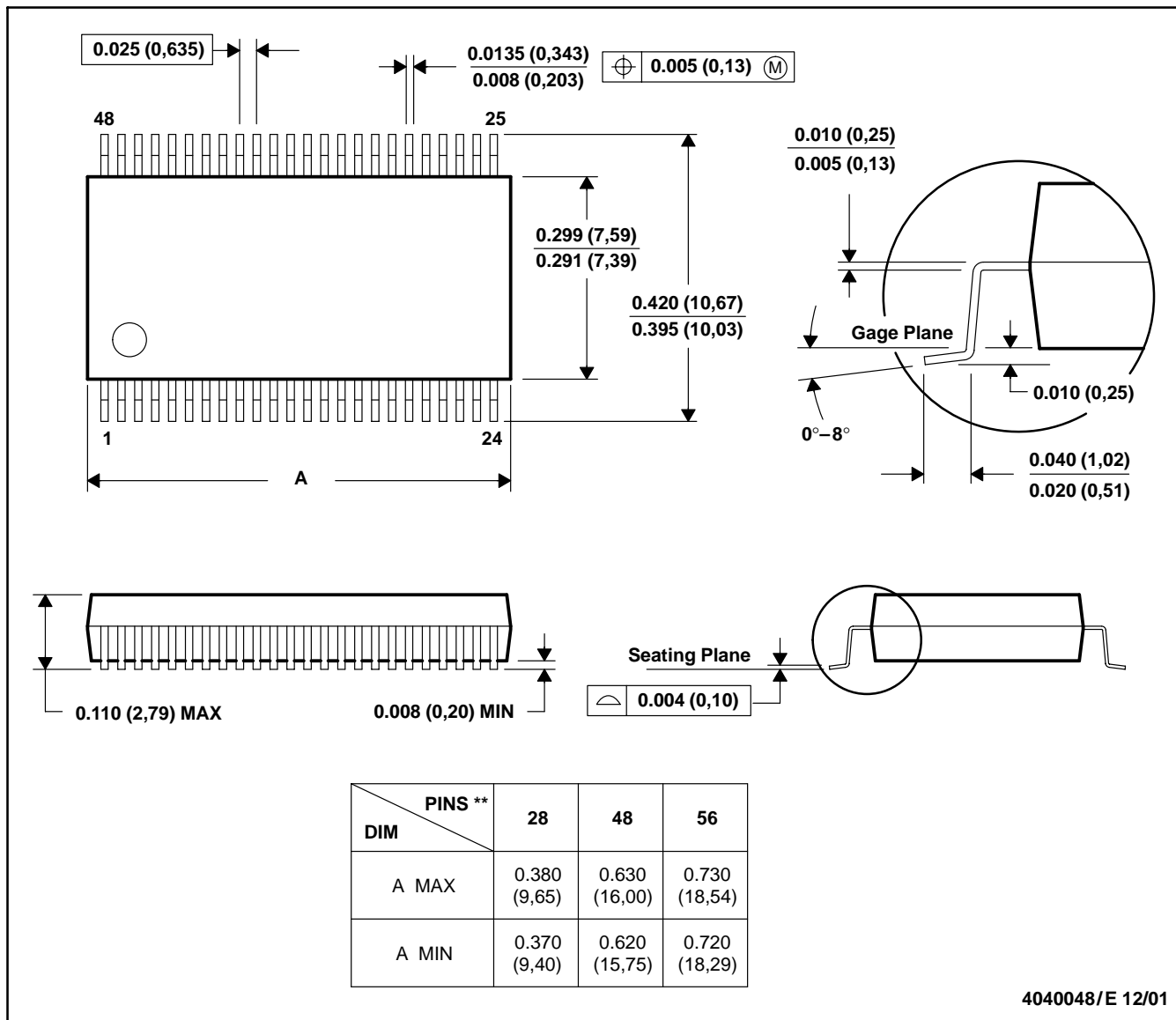

*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|--------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| 74FCT162501ATPVCT | SSOP | DL | 56 | 1000 | 346.0 | 346.0 | 49.0 |
| 74FCT162501CTPACT | TSSOP | DGG | 56 | 2000 | 346.0 | 346.0 | 41.0 |
| 74FCT162501CTPVCT | SSOP | DL | 56 | 1000 | 346.0 | 346.0 | 49.0 |
| 74FCT162H501CTPACT | TSSOP | DGG | 56 | 2000 | 346.0 | 346.0 | 41.0 |

DL (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN

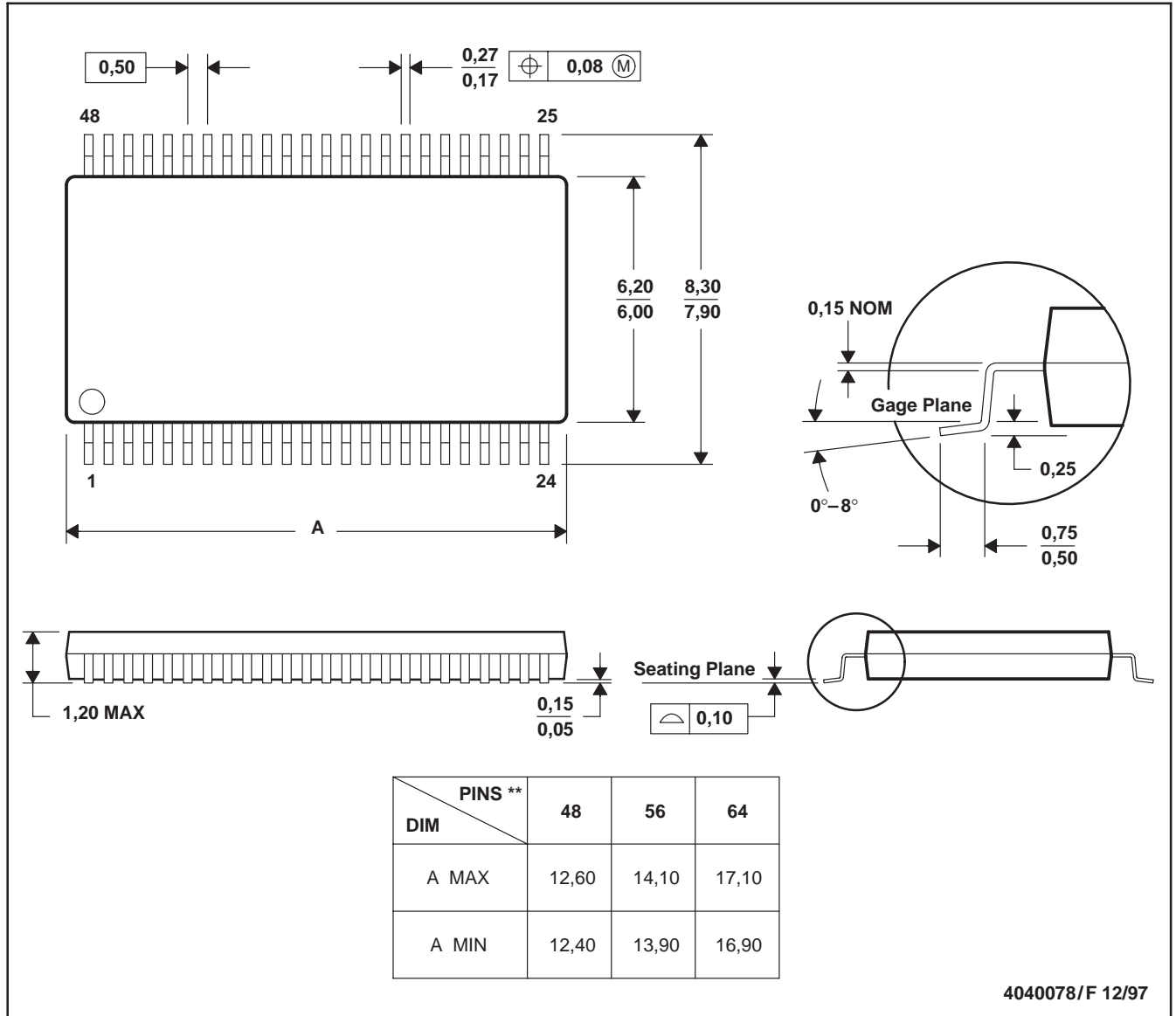


- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 D. Falls within JEDEC MO-118

DGG (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN



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