



SCCS059B - August 1994 - Revised September 2001

---

---

## 16-Bit Latched 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  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- $V_{CC} = 5\text{V} \pm 10\%$

#### *CY74FCT16543T Features:*

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

#### *CY74FCT162543T Features:*

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

#### *CY74FCT162H543T Features:*

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

### Functional Description

The CY74FCT16543T and CY74FCT162543T are 16-bit, high-speed, low power latched transceivers that are organized as two independent 8-bit D-type latched transceivers containing two sets of eight D-type latches with separate Latch Enable ( $\overline{\text{LEAB}}$ ,  $\overline{\text{LEAB}}$ ) and Output Enable ( $\overline{\text{OEAB}}$ ,  $\overline{\text{OEAB}}$ ) controls for each set to permit independent control of inputting and outputting in either direction of data flow. For data flow from A to B, for example, the A-to-B input Enable ( $\overline{\text{CEAB}}$ ) must be LOW in order to enter data from A or to take data from B as indicated in the truth table. With  $\overline{\text{CAEB}}$  LOW, a LOW signal on the A-to-B Latch Enable ( $\overline{\text{LEAB}}$ ) makes the A-to-B latches transparent; a subsequent LOW-to-HIGH transition of the  $\overline{\text{LEAB}}$  signal puts the A latches in the storage mode and their outputs no longer change with the A inputs. With  $\overline{\text{CEAB}}$  and  $\overline{\text{OEAB}}$  both LOW, the three-state B output buffers are active and reflect the data present at the output of the A latches. Control of data from B to A is similar, but uses  $\overline{\text{CEAB}}$ ,  $\overline{\text{LEAB}}$ , and  $\overline{\text{OEAB}}$  inputs flow-through pinout and small shrink packaging and in simplifying board design.

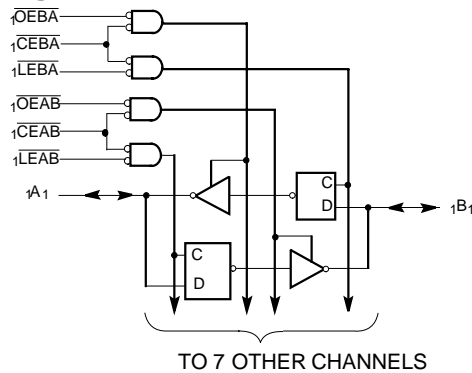
This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

The CY74FCT16543T is ideally suited for driving high-capacitance loads and low-impedance backplanes.

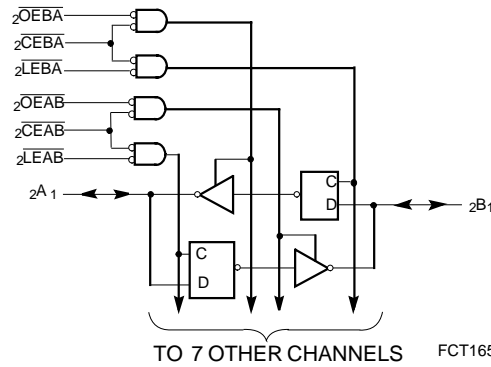
The CY74FCT162543T has 24-mA balanced output drivers with current limiting resistors in the outputs. This reduces the need for external terminating resistors and provides for minimal undershoot and reduced ground bounce. The CY74FCT162543T is ideal for driving transmission lines.

The CY74FCT162H543T 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.

### Logic Block Diagrams



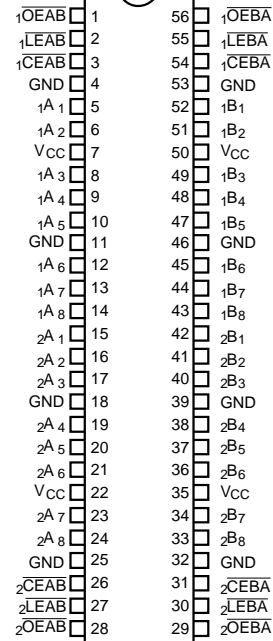
FCT16543T-1



FCT16543T-2

### Pin Configuration

Top View  
SSOP/TSSOP



FCT16543T-3

### Pin Description

Name	Description
OEAB	A-to-B Output Enable Input (Active LOW)
OEBA	B-to-A Output Enable Input (Active LOW)
CEAB	A-to-B Enable Input (Active LOW)
CEBA	B-to-A Enable Input (Active LOW)
LEAB	A-to-B Latch Enable Input (Active LOW)
LEBA	B-to-A Latch Enable Input (Active LOW)
A	A-to-B Data Inputs or B-to-A Three-State Outputs <sup>[9]</sup>
B	B-to-A Data Inputs or A-to-B Three-State Outputs <sup>[9]</sup>

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

Inputs			Latch Status	Output Buffers
CEAB	LEAB	OEAB	A to B	B
H	X	X	Storing	High Z
X	H	X	Storing	X
X	X	H	X	High Z
L	L	L	Transparent	Current A Inputs
L	H	L	Storing	Previous A Inputs <sup>[2]</sup>

### Maximum Ratings<sup>[3, 4]</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%

**Electrical Characteristics** Over the Operating Range

Parameter	Description	Test Conditions	Min.	Typ. <sup>[5]</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>[6]</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>[7]</sup>	V <sub>CC</sub> =Max., V <sub>OUT</sub> =GND	-80	-140	-200	mA
I <sub>O</sub>	Output Drive Current <sup>[7]</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>[8]</sup>			±1	μA

**Notes:**

1. A-to-B data flow shown; B-to-A flow control is the same, except using  $\overline{CEBA}$ ,  $\overline{LEBA}$ , and  $\overline{OEBA}$ .
2. Data prior to  $\overline{LEAB}$  LOW-to-HIGH Transition  
H = HIGH Voltage Level. L = LOW Voltage Level.  
X = Don't Care. Z = High Impedance.
3. 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.
4. Unused inputs must always be connected to an appropriate logic voltage level, preferably either V<sub>CC</sub> or ground.
5. Typical values are at V<sub>CC</sub>= 5.0V, T<sub>A</sub>= +25°C ambient.
6. This parameter is specified but not tested.
7. 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.
8. Tested at +25°C.
9. On the 74FCT162H543T, these pins have bus hold.

**Output Drive Characteristics for CY74FCT16543T**

Parameter	Description	Test Conditions	Min.	Typ. <sup>[5]</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 CY74FCT162543T, CY74FCT162H543T**

Parameter	Description	Test Conditions	Min.	Typ. <sup>[5]</sup>	Max.	Unit
I <sub>ODL</sub>	Output LOW Current <sup>[7]</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>[7]</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>[6]</sup> (T<sub>A</sub> = +25°C, f = 1.0 MHz)**

Parameter	Description	Test Conditions	Typ. <sup>[5]</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>[5]</sup>	Max.	Unit	
I <sub>CC</sub>	Quiescent Power Supply Current	V <sub>CC</sub> =Max. V <sub>IN</sub> ≤0.2V, 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. V <sub>IN</sub> =3.4V <sup>[10]</sup>	0.5	1.5	mA	
I <sub>CCD</sub>	Dynamic Power Supply Current <sup>[11]</sup>	V <sub>CC</sub> =Max., One Input Toggling, 50% Duty Cycle, Outputs Open, $\overline{OE}$ =GND	60	100	μA/MHz	
I <sub>C</sub>	Total Power Supply Current <sup>[12]</sup>	V <sub>CC</sub> =Max., f <sub>1</sub> =10 MHz, 50% Duty Cycle, Outputs Open, One Bit Toggling, $\overline{OE}$ =GND	V <sub>IN</sub> =V <sub>CC</sub> or V <sub>IN</sub> =GND	0.6	1.5	mA
			V <sub>IN</sub> =3.4V or V <sub>IN</sub> =GND	0.9	2.3	mA
		V <sub>CC</sub> =Max., f <sub>1</sub> =2.5 MHz, 50% Duty Cycle, Outputs Open, Sixteen Bits Toggling, $\overline{OE}$ =GND	V <sub>IN</sub> =V <sub>CC</sub> or V <sub>IN</sub> =GND	2.4	4.5 <sup>[13]</sup>	mA
			V <sub>IN</sub> =3.4V or V <sub>IN</sub> =GND	6.4	16.5 <sup>[13]</sup>	mA

**Notes:**

- Per TTL driven input (V<sub>IN</sub>=3.4V); all other inputs at V<sub>CC</sub> or GND.
- This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
- $$I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$$

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

$$I_{\text{CC}} = \text{Quiescent Current with CMOS input levels}$$

$$\Delta I_{\text{CC}} = \text{Power Supply Current for a TTL HIGH input (V}_{\text{IN}}=3.4\text{V)}$$

$$D_H = \text{Duty Cycle for TTL inputs HIGH}$$

$$N_T = \text{Number of TTL inputs at } D_H$$

$$I_{\text{CCD}} = \text{Dynamic Current caused by an input transition pair (HLH or LHL)}$$

$$f_0 = \text{Clock frequency for registered devices, otherwise zero}$$

$$f_1 = \text{Input signal frequency}$$

$$N_1 = \text{Number of inputs changing at } f_1$$

All currents are in milliamps and all frequencies are in megahertz.
- 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>[14]</sup>

Parameter	Description	CY74FCT16543T CY74FCT162543T		CY74FCT16543AT CY74FCT162543AT		Unit	Fig. No. <sup>[15]</sup>
		Min.	Max.	Min.	Max.		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Transparent Mode A to B or B to A	1.5	8.5	1.5	6.5	ns	1, 3
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay LEBA to A, LEAB to B	1.5	12.5	1.5	8.0	ns	1, 5
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time OEBA or OEAB to A or B CEBA or CEAB to A or B	1.5	12.0	1.5	9.0	ns	1, 7, 8
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time OEBA or OEAB to A or B CEBA or CEAB to A or B	1.5	9.0	1.5	7.5	ns	1, 7, 8
t <sub>SU</sub>	Set-up Time HIGH or LOW A or B to LEAB or LEBA	2.0	—	2.0	—	ns	4
t <sub>H</sub>	Hold Time HIGH or LOW A or B to LEAB or LEBA	2.0	—	2.0	—	ns	4
t <sub>W</sub>	$\overline{LEBA}$ or $\overline{LEAB}$ Pulse Width LOW	4.0	—	4.0	—	ns	5
t <sub>SK(O)</sub>	Output Skew <sup>[16]</sup>	—	0.5	—	0.5	ns	—

Parameter	Description	CY74FCT16543CT CY74FCT162543CT CY74FCT162H543CT		Unit	Fig. No. <sup>[15]</sup>
		Min.	Max.		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Transparent Mode A to B or B to A	1.5	5.1	ns	1, 3
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay LEBA to A, LEAB to B	1.5	5.6	ns	1, 5
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time OEBA or OEAB to A or B CEBA or CEAB to A or B	1.5	7.8	ns	1, 7, 8
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time OEBA or OEAB to A or B CEBA or CEAB to A or B	1.5	6.5	ns	1, 7, 8
t <sub>SU</sub>	Set-up Time HIGH or LOW A or B to $\overline{LEAB}$ or $\overline{LEBA}$	2.0	—	ns	4
t <sub>H</sub>	Hold Time HIGH or LOW A or B to $\overline{LEAB}$ or $\overline{LEBA}$	2.0	—	ns	4
t <sub>W</sub>	$\overline{LEBA}$ or $\overline{LEAB}$ Pulse Width LOW	4.0	—	ns	5
t <sub>SK(O)</sub>	Output Skew <sup>[16]</sup>	—	0.5	ns	—

**Notes:**

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

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

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

**Ordering Information CY74FCT16543**

Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
5.1	CY74FCT16543CTPVC/PVCT	O56	56-Lead (300-Mil) SSOP	Industrial
6.5	CY74FCT16543ATPACT	Z56	56-Lead (240-Mil) TSSOP	Industrial
8.5	CY74FCT16543TPVC/PVCT	O56	56-Lead (300-Mil) SSOP	Industrial

**Ordering Information CY74FCT162543**

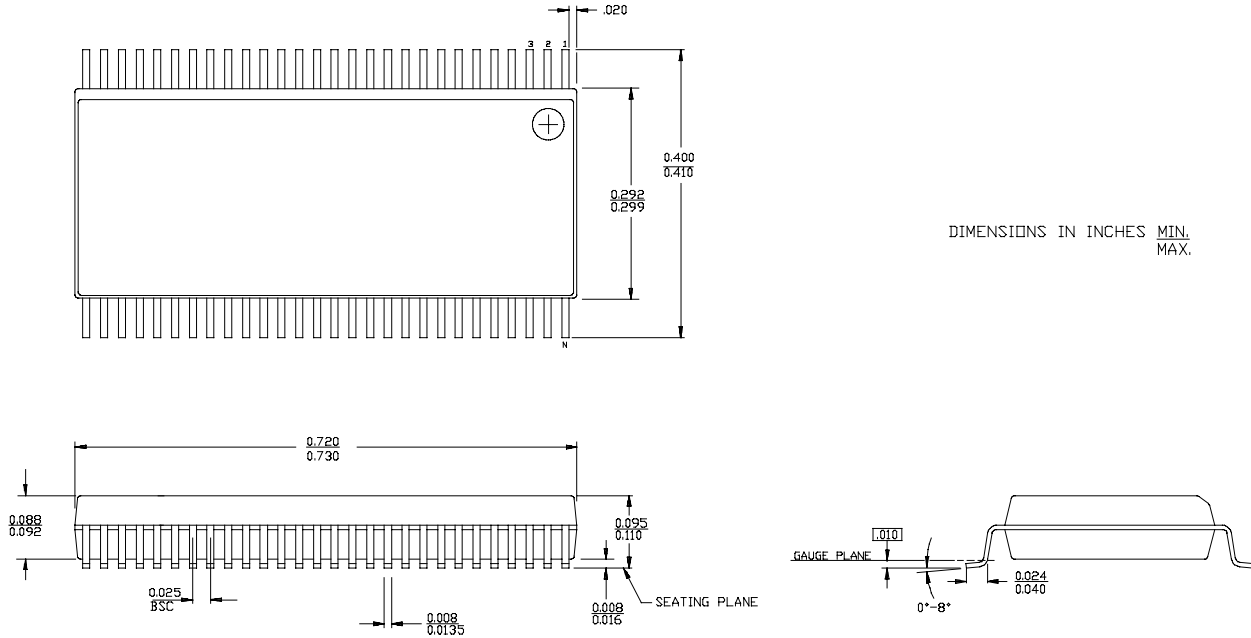
Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
5.1	74FCT162543CTPACT	Z56	56-Lead (240-Mil) TSSOP	Industrial
	CY74FCT162543CTPVC	O56	56-Lead (300-Mil) SSOP	
	74FCT162543CTPVCT	O56	56-Lead (300-Mil) SSOP	
6.5	74FCT162543ATPACT	Z56	56-Lead (240-Mil) TSSOP	Industrial
8.5	CY74FCT162543TPVC/PVCT	O56	56-Lead (300-Mil) SSOP	Industrial

**Ordering Information CY74FCT162H543T**

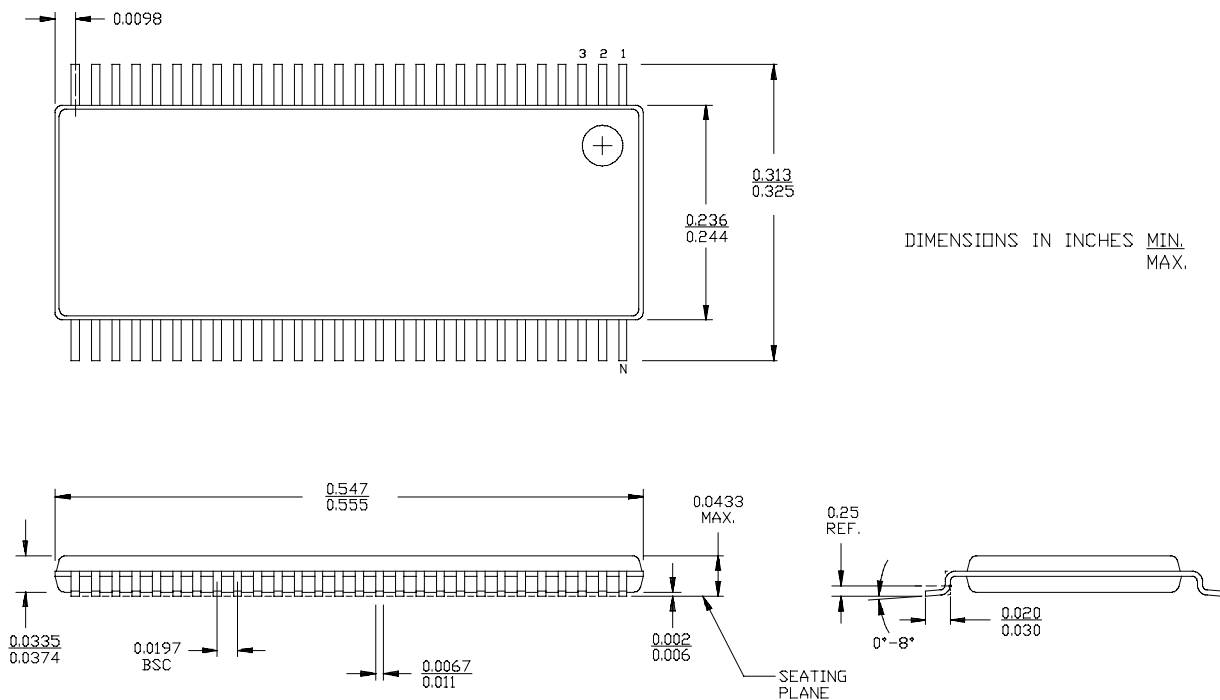
Speed (ns)	Ordering Code	Package Name	Package Type	Operating Range
5.1	74FCT162H543CTPACT	Z56	56-Lead (240-Mil) TSSOP	Industrial

**Package Diagrams**

**56-Lead Shrunk Small Outline Package O56**



**56-Lead Thin Shrunk Small Outline Package Z56**



**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>
74FCT162543ATPACT	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT162543CTPACT	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT162543CTPVCG4	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT162543CTPVCT	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT162543ETPACT	OBSOLETE	TSSOP	DGG	56		TBD	Call TI	Call TI
74FCT162543ETPVCT	OBSOLETE	SSOP	DL	56		TBD	Call TI	Call TI
74FCT162543TPVCG4	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT162543TPVCTG4	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT162H543CTPACT	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT16543ATPACTE4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT16543ATPACTG4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT16543CTPVCG4	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT16543CTPVCTG4	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT16543TPVCG4	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
74FCT16543TPVCTG4	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT162543CTPVC	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT162543ETPAC	OBSOLETE	TSSOP	DGG	56		TBD	Call TI	Call TI
CY74FCT162543ETPVC	OBSOLETE	SSOP	DL	56		TBD	Call TI	Call TI
CY74FCT162543TPVC	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT162543TPVCT	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT16543ATPACT	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT16543CTPVC	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT16543CTPVCT	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CY74FCT16543ETPAC	OBSOLETE	TSSOP	DGG	56		TBD	Call TI	Call TI
CY74FCT16543ETPACT	OBSOLETE	TSSOP	DGG	56		TBD	Call TI	Call TI
CY74FCT16543ETPVC	OBSOLETE	SSOP	DL	56		TBD	Call TI	Call TI
CY74FCT16543ETPVCT	OBSOLETE	SSOP	DL	56		TBD	Call TI	Call TI
CY74FCT16543TPVC	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM



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>
CY74FCT16543TPVCT	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
FCT162543ATPACTE4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
FCT162543ATPACTG4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
FCT162543CTPACTE4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
FCT162543CTPACTG4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
FCT162543CTPVCTG4	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
FCT162H543CTPACTE4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
FCT162H543CTPACTG4	ACTIVE	TSSOP	DGG	56	2000	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.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**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
74FCT162543ATPACT	TSSOP	DGG	56	2000	330.0	24.4	8.6	15.6	1.8	12.0	24.0	Q1
74FCT162543CTPACT	TSSOP	DGG	56	2000	330.0	24.4	8.6	15.6	1.8	12.0	24.0	Q1
74FCT162543CTPVCT	SSOP	DL	56	1000	330.0	32.4	11.35	18.67	3.1	16.0	32.0	Q1
74FCT162H543CTPACT	TSSOP	DGG	56	2000	330.0	24.4	8.6	15.6	1.8	12.0	24.0	Q1
CY74FCT162543TPVCT	SSOP	DL	56	1000	330.0	32.4	11.35	18.67	3.1	16.0	32.0	Q1
CY74FCT16543ATPACT	TSSOP	DGG	56	2000	330.0	24.4	8.6	15.6	1.8	12.0	24.0	Q1
CY74FCT16543CTPVCT	SSOP	DL	56	1000	330.0	32.4	11.35	18.67	3.1	16.0	32.0	Q1
CY74FCT16543TPVCT	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)
74FCT162543ATPACT	TSSOP	DGG	56	2000	346.0	346.0	41.0
74FCT162543CTPACT	TSSOP	DGG	56	2000	346.0	346.0	41.0
74FCT162543CTPVCT	SSOP	DL	56	1000	346.0	346.0	49.0
74FCT162H543CTPACT	TSSOP	DGG	56	2000	346.0	346.0	41.0
CY74FCT162543TPVCT	SSOP	DL	56	1000	346.0	346.0	49.0
CY74FCT16543ATPACT	TSSOP	DGG	56	2000	346.0	346.0	41.0
CY74FCT16543CTPVCT	SSOP	DL	56	1000	346.0	346.0	49.0
CY74FCT16543TPVCT	SSOP	DL	56	1000	346.0	346.0	49.0

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

PLASTIC SMALL-OUTLINE PACKAGE

48 PINS SHOWN

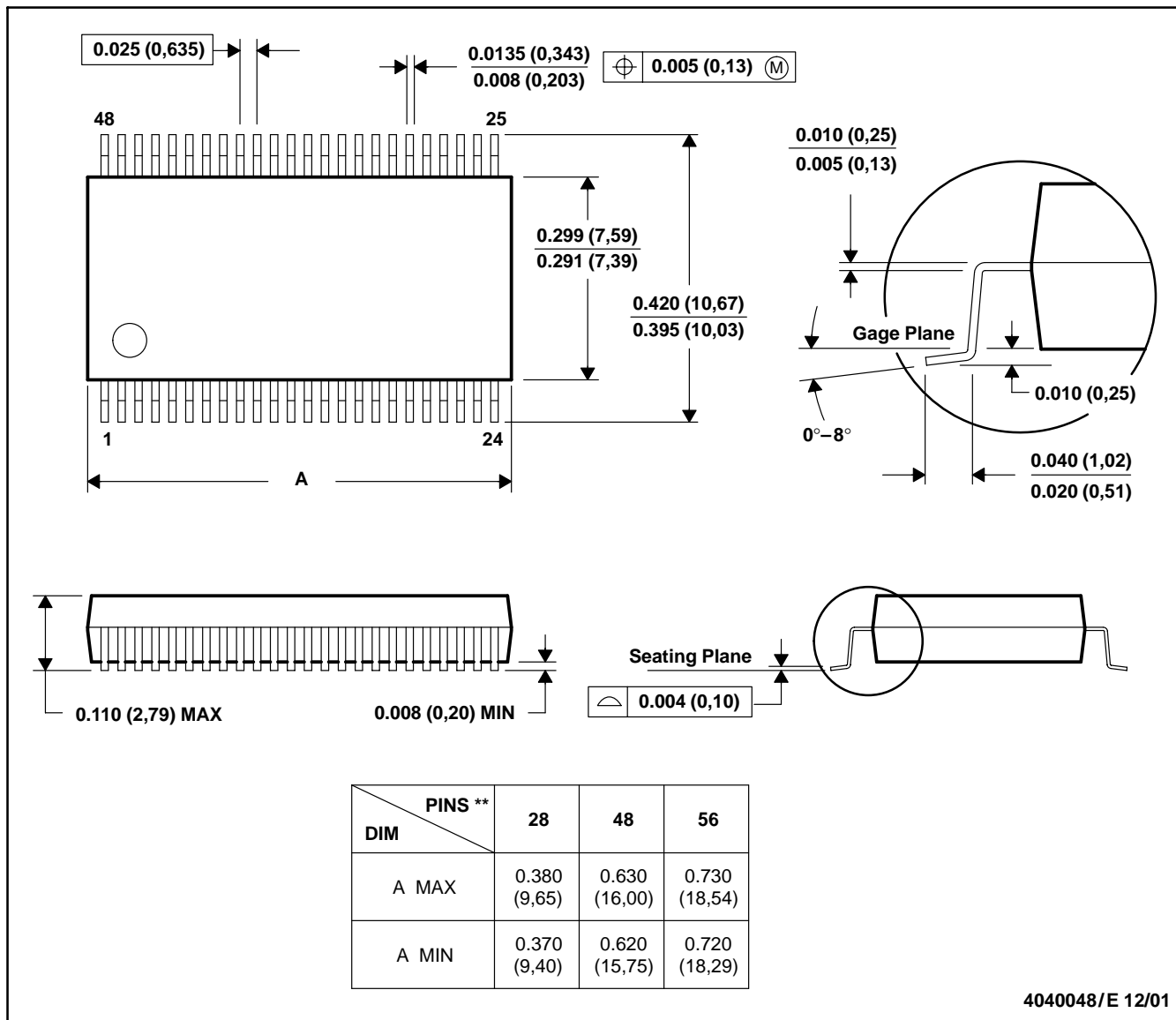


- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

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

**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
74FCT162543ATPACT	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT162543A	<a href="#">Samples</a>
74FCT162543CTPACT	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT162543C	<a href="#">Samples</a>
74FCT162543CTPVCG4	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT162543C	<a href="#">Samples</a>
74FCT162543ETPACT	OBSOLETE	TSSOP	DGG	56		TBD	Call TI	Call TI	-40 to 85		
74FCT162543ETPVCT	OBSOLETE	SSOP	DL	56		TBD	Call TI	Call TI	-40 to 85		
74FCT162543TPVCTG4	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT162543	<a href="#">Samples</a>
74FCT16543ATPACTG4	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT16543A	<a href="#">Samples</a>
74FCT16543TPVCTG4	OBSOLETE	SSOP	DL	56		TBD	Call TI	Call TI	-40 to 85		
CY74FCT162543CTPVC	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT162543C	<a href="#">Samples</a>
CY74FCT162543ETPAC	OBSOLETE	TSSOP	DGG	56		TBD	Call TI	Call TI	-40 to 85		
CY74FCT162543ETPVC	OBSOLETE	SSOP	DL	56		TBD	Call TI	Call TI	-40 to 85		
CY74FCT162543TPVC	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT162543	<a href="#">Samples</a>
CY74FCT162543TPVCT	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT162543	<a href="#">Samples</a>
CY74FCT16543ATPACT	ACTIVE	TSSOP	DGG	56	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT16543A	<a href="#">Samples</a>
CY74FCT16543CTPVC	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT16543C	<a href="#">Samples</a>
CY74FCT16543CTPVCT	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT16543C	<a href="#">Samples</a>
CY74FCT16543ETPAC	OBSOLETE	TSSOP	DGG	56		TBD	Call TI	Call TI	-40 to 85		
CY74FCT16543ETPACT	OBSOLETE	TSSOP	DGG	56		TBD	Call TI	Call TI	-40 to 85		
CY74FCT16543ETPVC	OBSOLETE	SSOP	DL	56		TBD	Call TI	Call TI	-40 to 85		
CY74FCT16543ETPVCT	OBSOLETE	SSOP	DL	56		TBD	Call TI	Call TI	-40 to 85		
CY74FCT16543TPVC	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT16543	<a href="#">Samples</a>

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
CY74FCT16543TPVCT	OBSOLETE	SSOP	DL	56		TBD	Call TI	Call TI	-40 to 85		

(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.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**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
74FCT162543ATPACT	TSSOP	DGG	56	2000	330.0	24.4	8.6	15.6	1.8	12.0	24.0	Q1
74FCT162543CTPACT	TSSOP	DGG	56	2000	330.0	24.4	8.6	15.6	1.8	12.0	24.0	Q1
CY74FCT162543TPVCT	SSOP	DL	56	1000	330.0	32.4	11.35	18.67	3.1	16.0	32.0	Q1
CY74FCT16543ATPACT	TSSOP	DGG	56	2000	330.0	24.4	8.6	15.6	1.8	12.0	24.0	Q1
CY74FCT16543CTPVCT	SSOP	DL	56	1000	330.0	32.4	11.35	18.67	3.1	16.0	32.0	Q1



**TAPE AND REEL BOX DIMENSIONS**

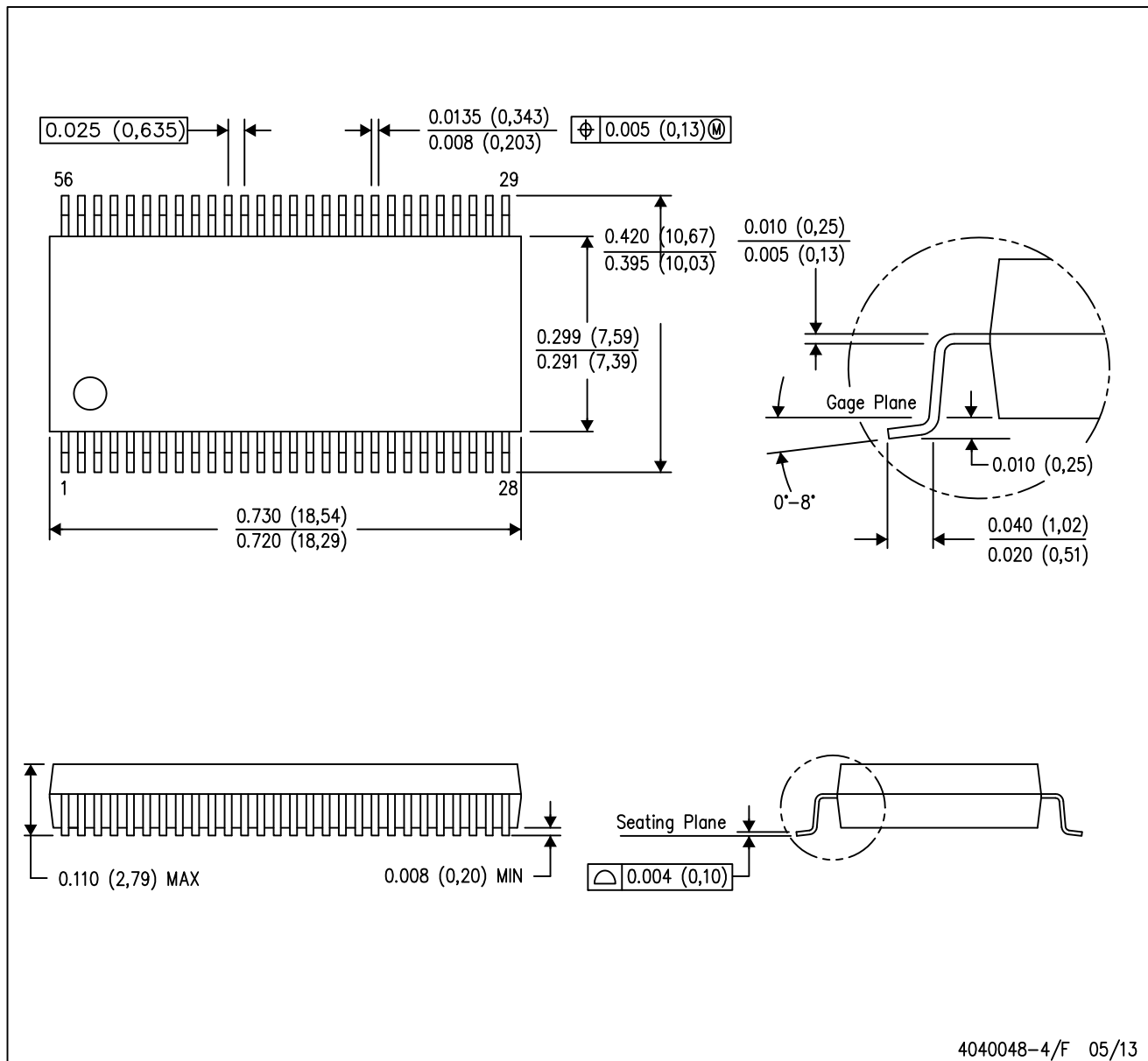

\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
74FCT162543ATPACT	TSSOP	DGG	56	2000	367.0	367.0	45.0
74FCT162543CTPACT	TSSOP	DGG	56	2000	367.0	367.0	45.0
CY74FCT162543TPVCT	SSOP	DL	56	1000	367.0	367.0	55.0
CY74FCT16543ATPACT	TSSOP	DGG	56	2000	367.0	367.0	45.0
CY74FCT16543CTPVCT	SSOP	DL	56	1000	367.0	367.0	55.0

# MECHANICAL DATA

DL (R-PDSO-G56)

PLASTIC SMALL-OUTLINE PACKAGE



- 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

PowerPAD is a trademark of Texas Instruments.

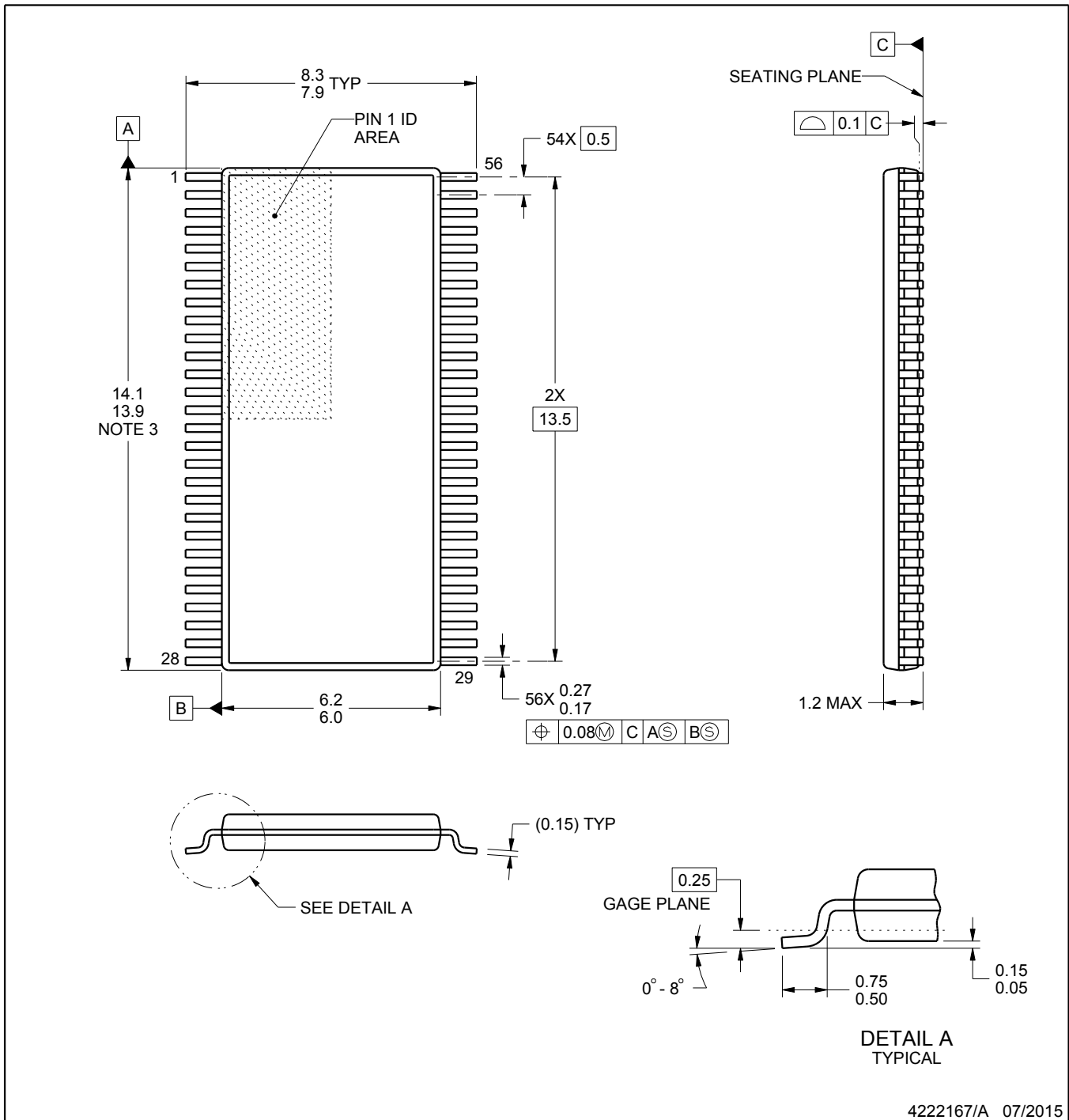
# DGG0056A



# PACKAGE OUTLINE

## TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



**NOTES:**

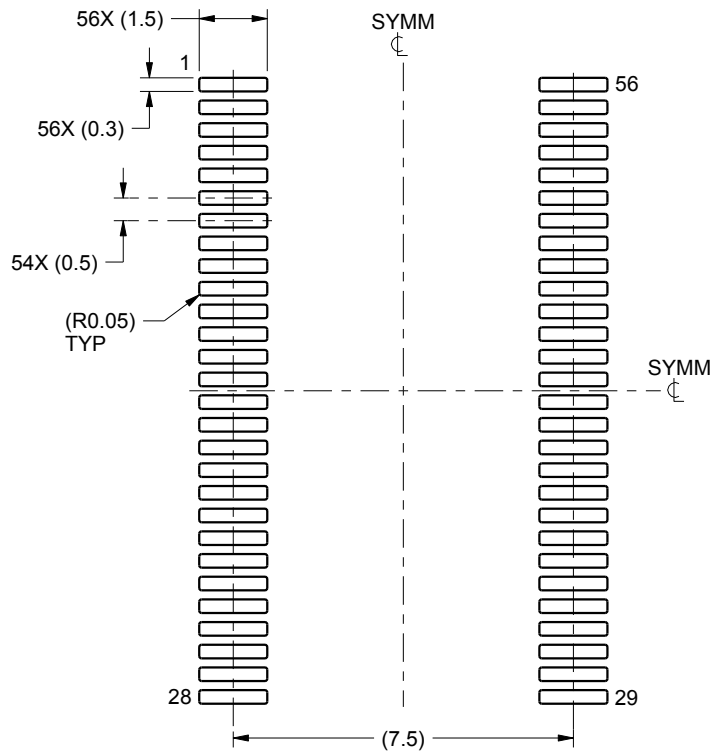
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. Reference JEDEC registration MO-153.

# EXAMPLE BOARD LAYOUT

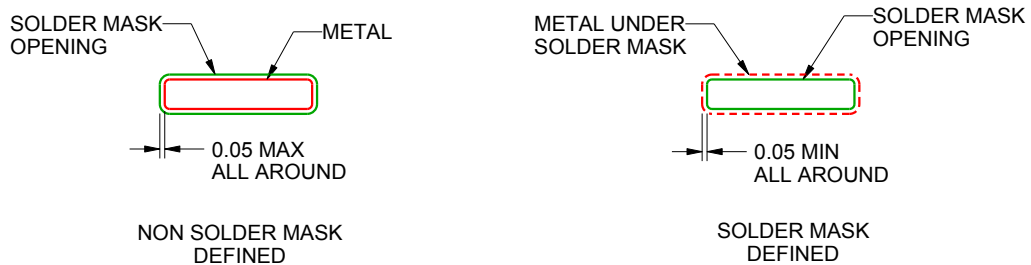
DGG0056A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
SCALE:6X



SOLDER MASK DETAILS

4222167/A 07/2015

NOTES: (continued)

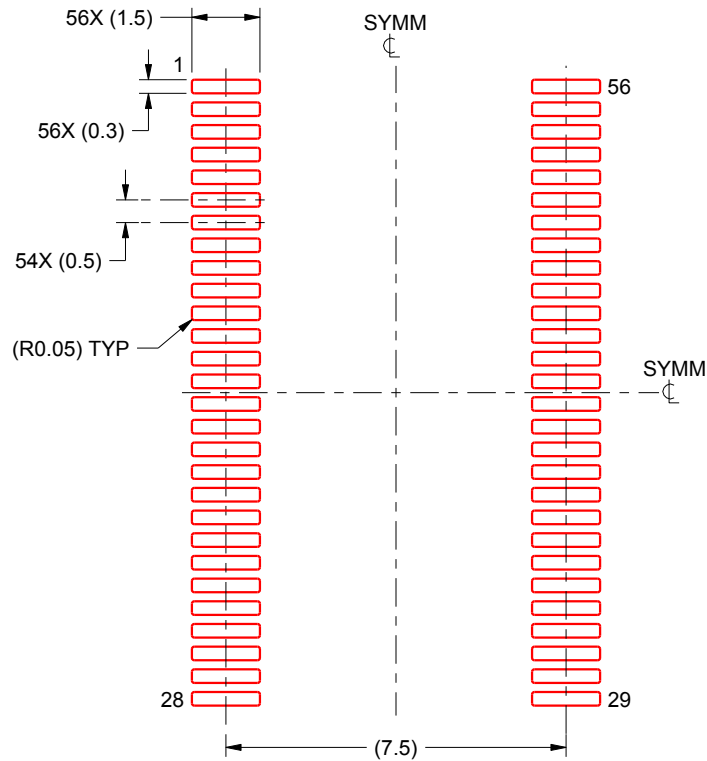
- 5. Publication IPC-7351 may have alternate designs.
- 6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DGG0056A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:6X

4222167/A 07/2015

NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

### Products

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
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>
OMAP Applications Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>

### Applications

Automotive and Transportation	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Energy and Lighting	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Space, Avionics and Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>

### TI E2E Community

[e2e.ti.com](http://e2e.ti.com)