

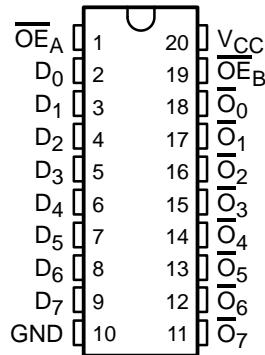
- Function, Pinout, and Drive Compatible With FCT and F Logic
- Reduced V_{OH} (Typically = 3.3 V) Versions of Equivalent FCT Functions
- Edge-Rate Control Circuitry for Significantly Improved Noise Characteristics
- I_{off} Supports Partial-Power-Down Mode Operation
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)
- Matched Rise and Fall Times
- Fully Compatible With TTL Input and Output Logic Levels
- CY54FCT540T
 - 48-mA Output Sink Current
 - 12-mA Output Source Current
- CY74FCT540T
 - 64-mA Output Sink Current
 - 32-mA Output Source Current
- 3-State Outputs

description

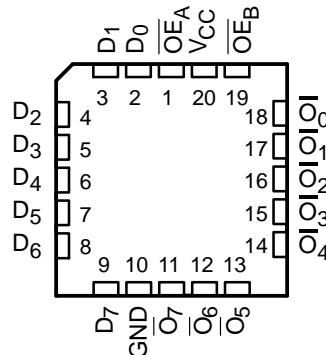
The 'FCT540T inverting buffers/line drivers can be employed as memory address drivers, clock drivers, and bus-oriented transmitters/receivers. These devices provide speed and drive capabilities equivalent to their fastest bipolar-logic counterparts, while reducing power dissipation. The input and output voltage levels allow direct interface with TTL, NMOS, and CMOS devices without external components.

These devices are 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.

CY54FCT540T . . . D PACKAGE
CY74FCT540T . . . Q PACKAGE
(TOP VIEW)



CY54FCT540T . . . L PACKAGE
(TOP VIEW)



ORDERING INFORMATION

| T _A | PACKAGE [†] | SPEED (ns) | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|----------------------|------------|-----------------------|------------------|
| -40°C to 85°C | QSOP – Q | 4.1 | CY74FCT540CTQCT | FCT540C |
| -55°C to 125°C | CDIP – D | 4.7 | CY54FCT540CTDMB | |
| | LCC – L | 4.7 | CY54FCT540CTLMB | |

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



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**CY54FCT540T, CY74FCT540T
8-BIT BUFFERS/LINE DRIVERS
WITH 3-STATE OUTPUTS**

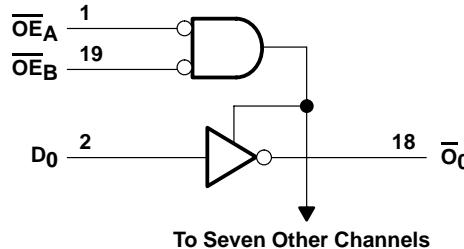
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FUNCTION TABLE

| INPUTS | | | OUTPUT |
|-------------------|-------------------|---|----------------|
| \overline{OE}_A | \overline{OE}_B | D | \overline{O} |
| L | L | L | H |
| L | L | H | L |
| H | H | X | Z |

H = High logic level, L = Low logic level,
X = Don't care, Z = High-impedance state

logic diagram (positive logic)



absolute maximum rating over operating free-air temperature range (unless otherwise noted)†

| | | |
|--|-------|----------------|
| Supply voltage range to ground potential | | -0.5 V to 7 V |
| DC input voltage range | | -0.5 V to 7 V |
| DC output voltage range | | -0.5 V to 7 V |
| DC output current (maximum sink current/pin) | | 120 mA |
| Package thermal impedance, θ_{JA} (see Note 1): Q package | | 68°C/W |
| Ambient temperature range with power applied, T_A | | -65°C to 135°C |
| Storage temperature range, T_{stg} | | -65°C to 150°C |

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 2)

| | | CY54FCT540T | | | CY74FCT540T | | | UNIT |
|-----------------|--------------------------------|-------------|-----|-----|-------------|-----|------|------|
| | | MIN | NOM | MAX | MIN | NOM | MAX | |
| V _{CC} | Supply voltage | 4.5 | 5 | 5.5 | 4.75 | 5 | 5.25 | V |
| V _{IH} | High-level input voltage | 2 | | | 2 | | | V |
| V _{IL} | Low-level input voltage | | | 0.8 | | | 0.8 | V |
| I _{OH} | High-level output current | | | -12 | | | -32 | mA |
| I _{OL} | Low-level output current | | | 48 | | | 64 | mA |
| T _A | Operating free-air temperature | -55 | | 125 | -40 | | 85 | °C |

NOTE 2: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

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

| PARAMETER | TEST CONDITIONS | CY54FCT540T | | | CY74FCT540T | | | UNIT |
|-------------------------------|--|--------------------------|------------------|------|-------------|------------------|------|------------|
| | | MIN | TYP [†] | MAX | MIN | TYP [†] | MAX | |
| V _{IK} | V _{CC} = 4.5 V, I _{IN} = -18 mA | | -0.7 | -1.2 | | | | V |
| | V _{CC} = 4.75 V, I _{IN} = -18 mA | | | | | -0.7 | -1.2 | |
| V _{OH} | V _{CC} = 4.5 V, I _{OH} = -12 mA | 2.4 | 3.3 | | | | | V |
| | V _{CC} = 4.75 V | I _{OH} = -32 mA | | | 2 | | | |
| | | I _{OH} = -15 mA | | | 2.4 | 3.3 | | |
| V _{OL} | V _{CC} = 4.5 V, I _{OL} = 48 mA | 0.3 | 0.55 | | | | | V |
| | V _{CC} = 4.75 V, I _{OL} = 64 mA | | | | 0.3 | 0.55 | | |
| V _{hys} | All inputs | 0.2 | | | 0.2 | | | V |
| I _I | V _{CC} = 5.5 V, V _{IN} = V _{CC} | | 5 | | | | | μA |
| | V _{CC} = 5.25 V, V _{IN} = V _{CC} | | | | | | 5 | |
| I _{IH} | V _{CC} = 5.5 V, V _{IN} = 2.7 V | ±1 | | | | | | μA |
| | V _{CC} = 5.25 V, V _{IN} = 2.7 V | | | | | | ±1 | |
| I _{IL} | V _{CC} = 5.5 V, V _{IN} = 0.5 V | ±1 | | | | | | μA |
| | V _{CC} = 5.25 V, V _{IN} = 0.5 V | | | | | | ±1 | |
| I _{OZH} | V _{CC} = 5.5 V, V _{OUT} = 2.7 V | 10 | | | | | | μA |
| | V _{CC} = 5.25 V, V _{OUT} = 2.7 V | | | | 10 | | | |
| I _{OZL} | V _{CC} = 5.5 V, V _{OUT} = 0.5 V | -10 | | | | | | μA |
| | V _{CC} = 5.25 V, V _{OUT} = 0.5 V | | | | -10 | | | |
| I _{OS} [‡] | V _{CC} = 5.5 V, V _{OUT} = 0 V | -60 | -120 | -225 | | | | mA |
| | V _{CC} = 5.25 V, V _{OUT} = 0 V | | | | -60 | -120 | -225 | |
| I _{off} | V _{CC} = 0 V, V _{OUT} = 4.5 V | ±1 | | | ±1 | | | μA |
| I _{CC} | V _{CC} = 5.5 V, V _{IN} ≤ 0.2 V, V _{IN} ≥ V _{CC} - 0.2 V | 0.1 | 0.2 | | | | | mA |
| | V _{CC} = 5.25 V, V _{IN} ≤ 0.2 V, V _{IN} ≥ V _{CC} - 0.2 V | | | | 0.1 | 0.2 | | |
| ΔI _{CC} | V _{CC} = 5.5 V, V _{IN} = 3.4 V [§] , f ₁ = 0, Outputs open | 0.5 | 2 | | | | | mA |
| | V _{CC} = 5.25 V, V _{IN} = 3.4 V [§] , f ₁ = 0, Outputs open | | | | 0.5 | 2 | | |
| I _{CCD} [¶] | V _{CC} = 5.5 V, 50% duty cycle, Outputs open, One bit switching at f ₁ = 10 MHz, OE _A = OE _B = GND or OE _A = GND and OE _B = V _{CC} , V _{IN} ≤ 0.2 V or V _{IN} ≥ V _{CC} - 0.2 V | 0.06 | 0.12 | | | | | mA/ MHz |
| | V _{CC} = 5.25 V, 50% duty cycle, Outputs open, One bit switching at f ₁ = 10 MHz, OE _A = OE _B = GND or OE _A = GND and OE _B = V _{CC} , V _{IN} ≤ 0.2 V or V _{IN} ≥ V _{CC} - 0.2 V | | | | 0.06 | 0.12 | | |

[†] Typical values are at V_{CC} = 5 V, T_A = 25°C.

[‡] 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 to minimize internal chip heating and more accurately reflect operational values. Otherwise, prolonged shorting of a high output can raise the chip temperature well above normal and cause invalid readings in other parametric tests. In any sequence of parameter tests, I_{OS} tests should be performed last.

[§] Per TTL-driven input (V_{IN} = 3.4 V); all other inputs at V_{CC} or GND

[¶] This parameter is derived for use in total power-supply calculations.

**CY54FCT540T, CY74FCT540T
8-BIT BUFFERS/LINE DRIVERS
WITH 3-STATE OUTPUTS**

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

| PARAMETER | TEST CONDITIONS | CY54FCT540T | | | CY74FCT540T | | | UNIT |
|----------------|---|--|---|-----|-------------|------|------|------|
| | | MIN | TYP† | MAX | MIN | TYP† | MAX | |
| IC# | V _{CC} = 5.5 V, Outputs open, OE _A = OE _B = GND or OE _A = GND and OE _B = V _{CC} | One bit switching at f ₁ = 10 MHz at 50% duty cycle | V _{IN} ≤ 0.2 V or V _{IN} ≥ V _{CC} – 0.2 V | 0.7 | 1.4 | | | mA |
| | | | V _{IN} = 3.4 V or GND | 1 | 2.4 | | | |
| | | Eight bits switching at f ₁ = 2.5 MHz at 50% duty cycle | V _{IN} ≤ 0.2 V or V _{IN} ≥ V _{CC} – 0.2 V | 1.3 | 2.6 | | | |
| | V _{CC} = 5.25 V, Outputs open, OE _A = OE _B = GND or OE _A = GND and OE _B = V _{CC} | One bit switching at f ₁ = 10 MHz at 50% duty cycle | V _{IN} = 3.4 V or GND | 3.3 | 10.6 | | | |
| | | | V _{IN} ≤ 0.2 V or V _{IN} ≥ V _{CC} – 0.2 V | | | 0.7 | 1.4 | |
| | | Eight bits switching at f ₁ = 2.5 MHz at 50% duty cycle | V _{IN} ≤ 0.2 V or V _{IN} ≥ V _{CC} – 0.2 V | | | 1.3 | 2.6 | |
| C _i | | | | | | 3.3 | 10.6 | |
| C _o | | | | | | 9 | 12 | pF |

† Typical values are at V_{CC} = 5 V, T_A = 25°C.

IC = ICC + ΔICC × DH × N_T + ICCD (f₀/2 + f₁ × N₁)

Where:

IC = Total supply current

ICC = Power-supply current with CMOS input levels

ΔICC = Power-supply current for a TTL high input (V_{IN} = 3.4 V)

D_H = Duty cycle for TTL inputs high

N_T = Number of TTL inputs at D_H

ICCD = Dynamic current caused by an input transition pair (HLH or LHL)

f₀ = Clock frequency for registered devices, otherwise zero

f₁ = Input signal frequency

N₁ = Number of inputs changing at f₁

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

|| Values for these conditions are examples of the ICC formula.

**CY54FCT540T, CY74FCT540T
8-BIT BUFFERS/LINE DRIVERS
WITH 3-STATE OUTPUTS**

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switching characteristics over operating free-air temperature range (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | CY54FCT540CT | | UNIT |
|------------------|-----------------|----------------|--------------|-----|------|
| | | | MIN | MAX | |
| t _{PLH} | D | O | 1.5 | 4.7 | ns |
| t _{PHL} | | | 1.5 | 4.7 | |
| t _{PZH} | OE | O | 1.5 | 6.5 | ns |
| t _{PZL} | | | 1.5 | 6.5 | |
| t _{PHZ} | OE | O | 1.5 | 5.7 | ns |
| t _{PLZ} | | | 1.5 | 5.7 | |

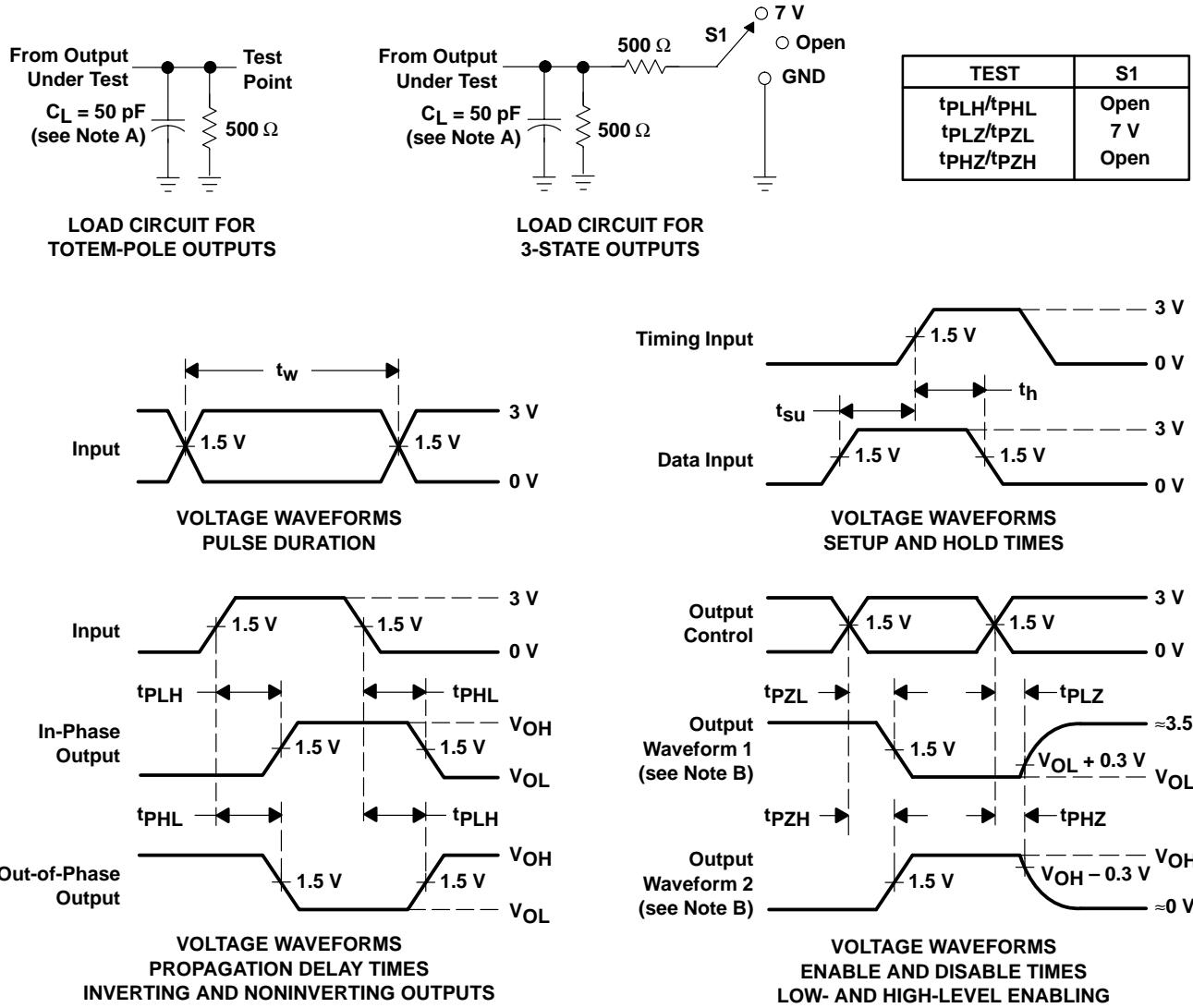
switching characteristics over operating free-air temperature range (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | CY74FCT540CT | | UNIT |
|------------------|-----------------|----------------|--------------|-----|------|
| | | | MIN | MAX | |
| t _{PLH} | D | O | 1.5 | 4.1 | ns |
| t _{PHL} | | | 1.5 | 4.1 | |
| t _{PZH} | OE | O | 1.5 | 5.8 | ns |
| t _{PZL} | | | 1.5 | 5.8 | |
| t _{PHZ} | OE | O | 1.5 | 5.2 | ns |
| t _{PLZ} | | | 1.5 | 5.2 | |

CY54FCT540T, CY74FCT540T 8-BIT BUFFERS/LINE DRIVERS WITH 3-STATE OUTPUTS

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PARAMETER MEASUREMENT INFORMATION



NOTES:

- C_L includes probe and jig capacitance.
- Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
- The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

| Orderable part number | Status (1) | Material type (2) | Package Pins | Package qty Carrier | RoHS (3) | Lead finish/ Ball material (4) | MSL rating/ Peak reflow (5) | Op temp (°C) | Part marking (6) |
|-----------------------|---------------|----------------------|-----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| 5962-9222006MRA | Active | Production | CDIP (J) 20 | 20 TUBE | No | SNPB | N/A for Pkg Type | -55 to 125 | 5962-9222006MR A |
| CY74FCT540CTQCT | Active | Production | SSOP (DBQ) 20 | 2500 LARGE T&R | Yes | NIPDAU | Level-2-260C-1 YEAR | -40 to 85 | FCT540C |
| CY74FCT540CTQCT.B | Active | Production | SSOP (DBQ) 20 | 2500 LARGE T&R | Yes | NIPDAU | Level-2-260C-1 YEAR | -40 to 85 | FCT540C |

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

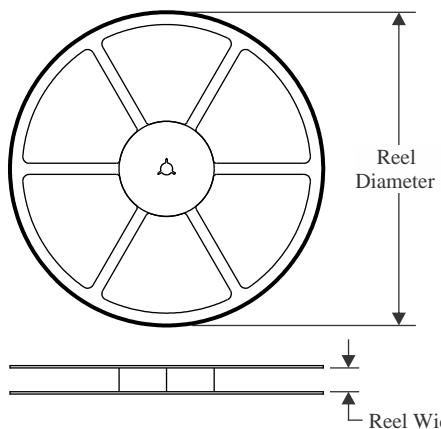
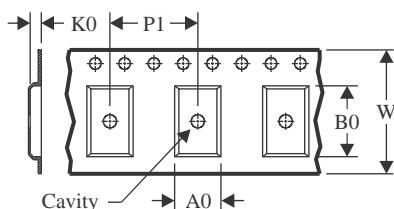
⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

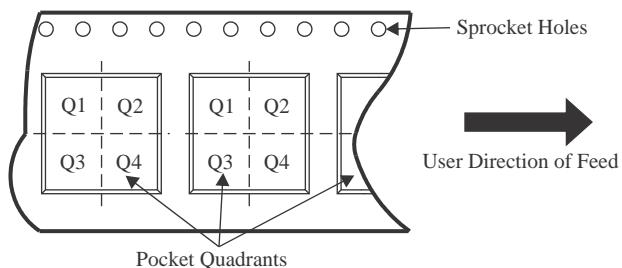
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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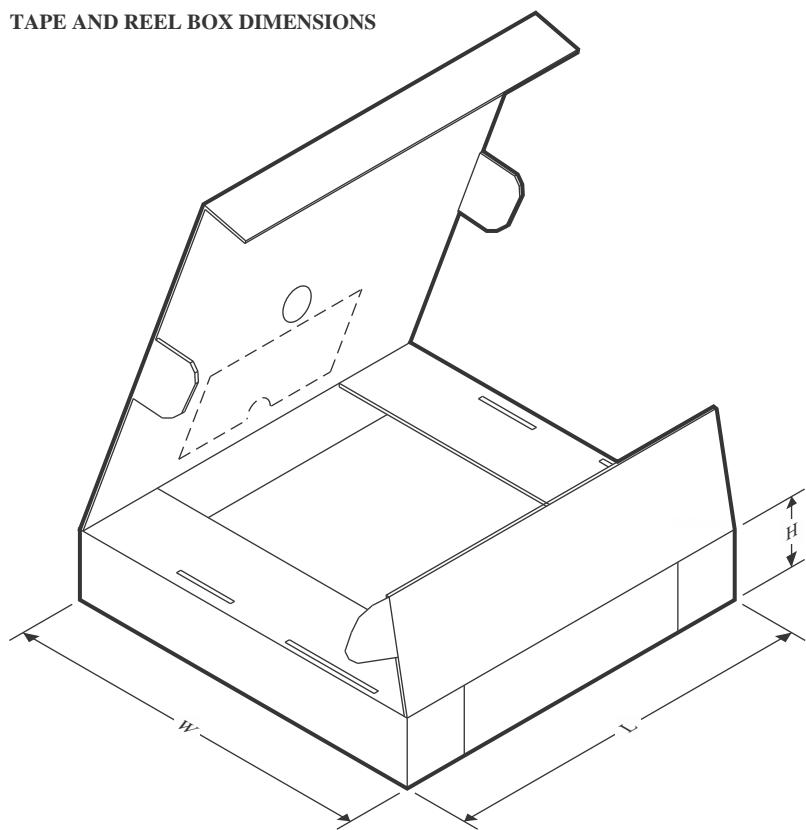
TAPE AND REEL INFORMATION
REEL DIMENSIONS

TAPE DIMENSIONS


| | |
|----|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

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 |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CY74FCT540CTQCT | SSOP | DBQ | 20 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CY74FCT540CTQCT | SSOP | DBQ | 20 | 2500 | 353.0 | 353.0 | 32.0 |

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