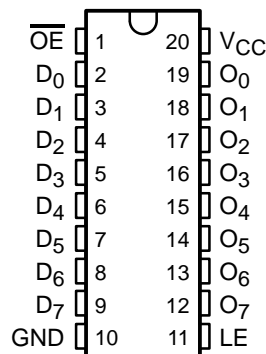


CY54FCT573T, CY74FCT573T
8-BIT LATCHES
WITH 3-STATE OUTPUTS
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- **Function and Pinout Compatible With FCT and F Logic**
- **Reduced V_{OH} (Typically = 3.3 V) Versions of Equivalent FCT Functions**
- **Edge-Rate Control Circuitry for Significantly Improved 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**
- **3-State Outputs**
- **CY54FCT573T**
 - 32-mA Output Sink Current
 - 12-mA Output Source Current
- **CY74FCT573T**
 - 64-mA Output Sink Current
 - 32-mA Output Source Current

CY54FCT573T . . . D PACKAGE
 CY74FCT573T . . . P, Q, OR SO PACKAGE
 (TOP VIEW)



description

The 'FCT573T devices consist of eight latches with 3-state outputs for bus-organized applications. When the latch-enable (LE) input is high, the flip-flops appear transparent to the data. Data that meets the required setup times are latched when LE transitions from high to low. Data appears on the bus when the output-enable (\overline{OE}) input is low. When \overline{OE} is high, the bus output is in the high-impedance state. In this mode, data can be entered into the latches. The 'FCT573T devices are identical to the 'FCT373T devices, except for the flow-through pinout of the 'FCT573T, which simplifies board design.

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.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



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CY54FCT573T, CY74FCT573T
8-BIT LATCHES
WITH 3-STATE OUTPUTS

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ORDERING INFORMATION

TA	PACKAGE†		SPEED (ns)	ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	QSOP – Q	Tape and reel	4.7	CY74FCT573CTQCT	FCT573C
	SOIC – SO	Tube	4.7	CY74FCT573CTSOC	FCT573C
		Tape and reel	4.7	CY74FCT573CTSOCT	
	DIP – P	Tube	5.2	CY74FCT573ATPC	CY74FCT573ATPC
	QSOP – Q	Tape and reel	5.2	CY74FCT573ATQCT	FCT573A
	SOIC – SO	Tube	5.2	CY74FCT573ATSOC	FCT573A
		Tape and reel	5.2	CY74FCT573ATSOCT	
	QSOP – Q	Tape and reel	8	CY74FCT573TQCT	FCT573
SOIC – SO	Tube	8	CY74FCT573TSOC	FCT573	
	Tape and reel	8	CY74FCT573TSOCT		
-55°C to 125°C	CDIP – D	Tube	8.5	CY54FCT573ATLMB	

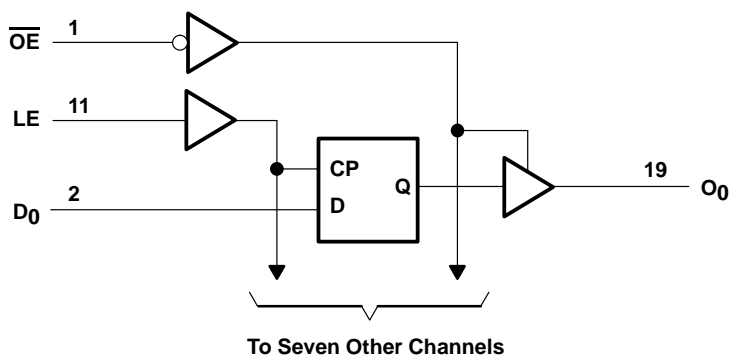
† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE

INPUTS			OUTPUT
\overline{OE}	LE	D	O
L	H	H	H
L	H	L	L
L	L	X	Q ₀
H	X	X	Z

H = High logic level, L = Low logic level,
 X = Don't care, Z = High-impedance state,
 Q_n = Previous state of flip flops (Q_{n-1})

logic diagram (positive logic)



CY54FCT573T, CY74FCT573T
8-BIT LATCHES
WITH 3-STATE OUTPUTS
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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): P package	69°C/W
Q package	68°C/W
SO package	58°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)

	CY54FCT573T			CY74FCT573T			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			32			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.

CY54FCT573T, CY74FCT573T

8-BIT LATCHES

WITH 3-STATE OUTPUTS

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

PARAMETER	TEST CONDITIONS	CY54FCT573T		CY74FCT573T		UNIT	
		MIN	TYP†	MAX	MIN		TYP†
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} = 32 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		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, Outputs open, One input switching at 50% duty cycle, \overline{OE} = GND, V _{IN} ≤ 0.2 V or V _{IN} ≥ V _{CC} - 0.2 V	0.06	0.12			mA/MHz	
	V _{CC} = 5.25 V, Outputs open, One input switching at 50% duty cycle, \overline{OE} = GND, 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.



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

PARAMETER	TEST CONDITIONS			CY54FCT573T		CY74FCT573T		UNIT
				MIN	TYP†	MAX	MIN	
I _C #	V _{CC} = 5.5 V, Outputs open, OE = GND, LE = 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 _{IN} = 3.4 V or GND	3.3	10.6			
	V _{CC} = 5.25 V, Outputs open, OE = GND, LE = 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	
			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 _{IN} = 3.4 V or GND			3.3	10.6	
C _i			6	10	6	10	pF	
C _o			8	12	8	12	pF	

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

I_C = I_{CC} + ΔI_{CC} × D_H × N_T + I_{CCD} (f₀/2 + f₁ × N₁)

Where:

I_C = Total supply current

I_{CC} = Power-supply current with CMOS input levels

ΔI_{CC} = 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

I_{CCD} = 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 I_{CC} formula.

timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

		CY54FCT573T		CY54FCT573AT		UNIT
		MIN	MAX	MIN	MAX	
t _w	Pulse duration, LE high	6		6		ns
t _{su}	Setup time, data before LE↑	2		2		ns
t _h	Hold time, data after LE↑	1.5		1.5		ns

timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

		CY74FCT573T		CY74FCT573AT		CY74FCT573CT		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t _w	Pulse duration, LE high	6		5		5		ns
t _{su}	Setup time, data before LE↑	2		2		2		ns
t _h	Hold time, data after LE↑	1.5		1.5		1.5		ns

CY54FCT573T, CY74FCT573T

8-BIT LATCHES

WITH 3-STATE OUTPUTS

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

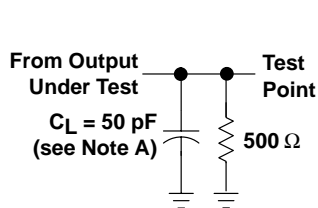
PARAMETER	FROM (INPUT)	TO (OUTPUT)	CY54FCT573AT		UNIT
			MIN	MAX	
t _{PLH}	D	O	1.5	5.6	ns
t _{PHL}			1.5	5.6	
t _{PLH}	LE	O	2	9.8	ns
t _{PHL}			2	9.8	
t _{PZH}	\overline{OE}	O	1.5	7.5	ns
t _{PZL}			1.5	7.5	
t _{PHZ}	\overline{OE}	O	1.5	6.5	ns
t _{PLZ}			1.5	6.5	

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

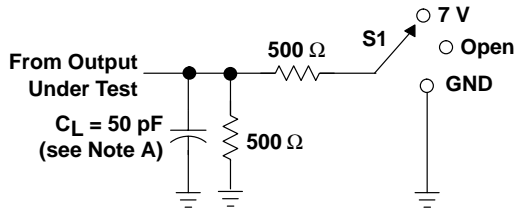
PARAMETER	FROM (INPUT)	TO (OUTPUT)	CY74FCT573T		CY74FCT573AT		CY74FCT573CT		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	D	O	1.5	8	1.5	5.2	1.5	4.7	ns
t _{PHL}			1.5	8	1.5	5.2	1.5	4.7	
t _{PLH}	LE	O	2	13	2	8.5	2	5.5	ns
t _{PHL}			2	13	2	8.5	2	5.5	
t _{PZH}	\overline{OE}	O	1.5	12	1.5	6.5	1.5	5.5	ns
t _{PZL}			1.5	12	1.5	6.5	1.5	5.5	
t _{PHZ}	\overline{OE}	O	1.5	7.5	1.5	5.5	1.5	5	ns
t _{PLZ}			1.5	7.5	1.5	5.5	1.5	5	



PARAMETER MEASUREMENT INFORMATION

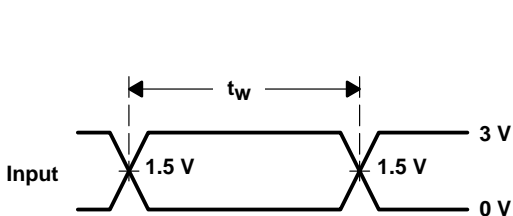


LOAD CIRCUIT FOR
 TOTEM-POLE OUTPUTS

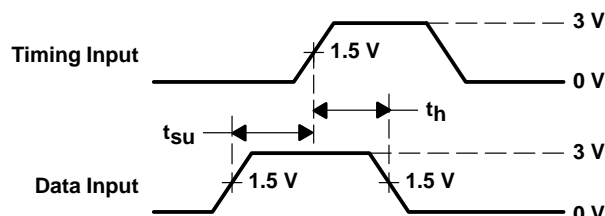


LOAD CIRCUIT FOR
 3-STATE OUTPUTS

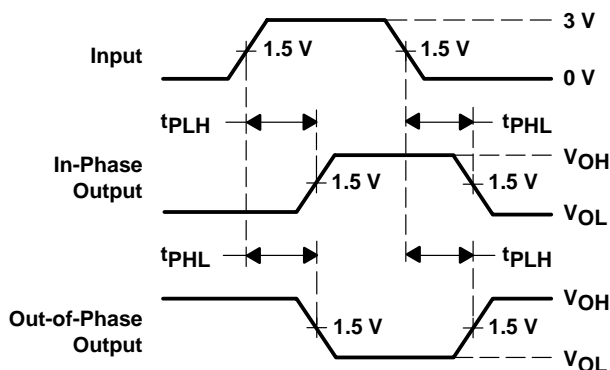
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	Open



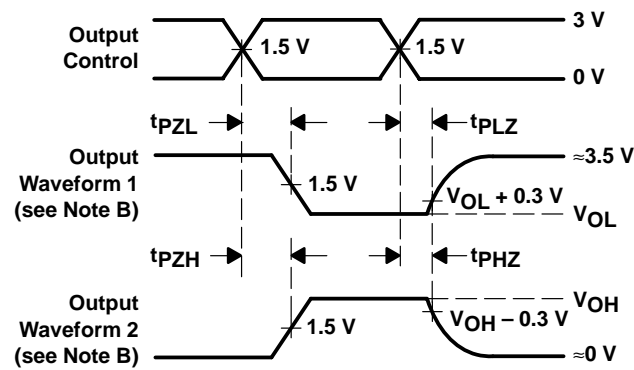
VOLTAGE WAVEFORMS
 PULSE DURATION



VOLTAGE WAVEFORMS
 SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
 PROPAGATION DELAY TIMES
 INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
 ENABLE AND DISABLE TIMES
 LOW- AND HIGH-LEVEL ENABLING

- NOTES: A. C_L includes probe and jig capacitance.
 B. 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.
 C. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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
5962-9223801MRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9223801MR A	Samples
5962-9223802M2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9223802M2A CY54FCT 573ATLMB	Samples
CY54FCT573ATLMB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9223802M2A CY54FCT 573ATLMB	Samples
CY74FCT573ATPC	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	CY74FCT573ATPC	Samples
CY74FCT573ATQCT	ACTIVE	SSOP	DBQ	20	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT573A	Samples
CY74FCT573ATQCTE4	ACTIVE	SSOP	DBQ	20	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT573A	Samples
CY74FCT573ATSOC	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT573A	Samples
CY74FCT573ATSOCT	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT573A	Samples
CY74FCT573CTQCT	ACTIVE	SSOP	DBQ	20	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT573C	Samples
CY74FCT573CTQCTG4	ACTIVE	SSOP	DBQ	20	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT573C	Samples
CY74FCT573CTSOC	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT573C	Samples
CY74FCT573CTSOCG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT573C	Samples
CY74FCT573TQCT	ACTIVE	SSOP	DBQ	20	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT573	Samples
CY74FCT573TSOC	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT573	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.

OBSELETE: 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.

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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
CY74FCT573ATQCT	SSOP	DBQ	20	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
CY74FCT573ATSOCT	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
CY74FCT573CTQCT	SSOP	DBQ	20	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
CY74FCT573TQCT	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)
CY74FCT573ATQCT	SSOP	DBQ	20	2500	367.0	367.0	38.0
CY74FCT573ATSOCT	SOIC	DW	20	2000	367.0	367.0	45.0
CY74FCT573CTQCT	SSOP	DBQ	20	2500	367.0	367.0	38.0
CY74FCT573TQCT	SSOP	DBQ	20	2500	367.0	367.0	38.0

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