



**THE DATASHEET OF
CY74FCT374CTQCT**

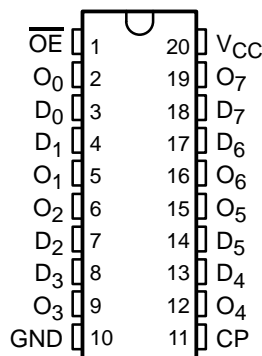


CY54FCT374T, CY74FCT374T 8-BIT REGISTERS WITH 3-STATE OUTPUTS

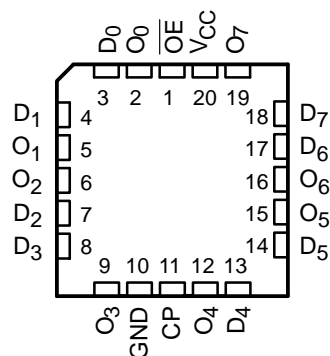
SCCS022A – MAY 1994 – REVISED OCTOBER 2001

- 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
- Matched Rise and Fall Times
- Fully Compatible With TTL Input and Output Logic Levels
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)
- Edge-Triggered D-Type Inputs
- 250-MHz Typical Switching Rate
- CY54FCT374T
 - 32-mA Output Sink Current
 - 12-mA Output Source Current
- CY74FCT374T
 - 64-mA Output Sink Current
 - 32-mA Output Source Current
- 3-State Outputs

CY54FCT374T . . . D PACKAGE
CY74FCT374T . . . P, Q, OR SO PACKAGE
(TOP VIEW)



CY54FCT374T . . . L PACKAGE
(TOP VIEW)



description

The 'FCT374T devices are high-speed, low-power, octal D-type flip-flops, featuring separate D-type inputs for each flip-flop. These devices have 3-state outputs for bus-oriented applications. A buffered clock (CP) and output-enable (\overline{OE}) inputs are common to all flip-flops. The eight flip-flops in the 'FCT374T store the state of their individual D inputs that meet the setup-time and hold-time requirements on the low-to-high CP transition. When \overline{OE} is low, the contents of the eight flip-flops are available at the outputs. When \overline{OE} is high, the outputs are in the high-impedance state. The state of \overline{OE} does not affect the state of the flip-flops.

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.

 **TEXAS
INSTRUMENTS**

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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

CY54FCT374T, CY74FCT374T

8-BIT REGISTERS

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	5.2	CY74FCT374CTQCT	FCT374C
	SOIC – SO	Tube	5.2	CY74FCT374CTSOC	FCT374C
		Tape and reel	5.2	CY74FCT374CTSOCT	
	DIP – P	Tube	6.5	CY74FCT374ATPC	CY74FCT374ATPC
	QSOP – Q	Tape and reel	6.5	CY74FCT374ATQCT	FCT374A
	SOIC – SO	Tube	6.5	CY74FCT374ATSOC	FCT374A
		Tape and reel	6.5	CY74FCT374ATSOCT	
	QSOP – Q	Tape and reel	10	CY74FCT374TQCT	FCT374
SOIC – SO	Tube	10	CY74FCT374TSOC	FCT374	
	Tape and reel	10	CY74FCT374TSOCT		
-55°C to 125°C	CDIP – D	Tube	6.2	CY54FCT374CTDMB	
	LCC – L	Tube	6.2	CY54FCT374CTLMB	
	CDIP – D	Tube	7.2	CY54FCT374ATDMB	
	LCC – L	Tube	7.2	CY54FCT374ATLMB	
	CDIP – D	Tube	11	CY54FCT374TDMB	
	LCC – L	Tube	11	CY54FCT374TLMB	

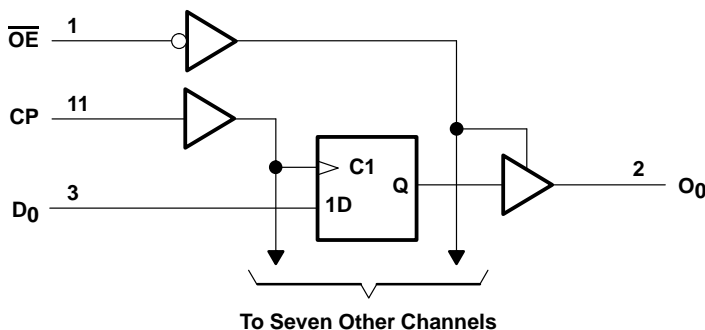
† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE

INPUTS			OUTPUT
D	CP	\overline{OE}	O
H	↑	L	H
L	↑	L	L
X	X	H	Z

H = High logic level, L = Low logic level,
 X = Don't care, Z = High-impedance state,
 ↑ = Low-to-high clock transition

logic diagram (positive logic)



CY54FCT374T, CY74FCT374T
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WITH 3-STATE OUTPUTS

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

PARAMETER	TEST CONDITIONS	CY54FCT374T			CY74FCT374T			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} = 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 _{off}	V _{CC} = 0 V, V _{OUT} = 4.5 V			±1			±1	μA
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 _{OZH}	V _{CC} = 5.5 V, V _{IN} = 2.7 V			10				μA
	V _{CC} = 5.25 V, V _{IN} = 2.7 V						10	
I _{OZL}	V _{CC} = 5.5 V, V _{IN} = 0.5 V			-10				μA
	V _{CC} = 5.25 V, V _{IN} = 0.5 V						-10	
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	

† 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



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8-BIT REGISTERS
WITH 3-STATE OUTPUTS

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

PARAMETER	TEST CONDITIONS		CY54FCT374T		CY74FCT374T		UNIT	
			MIN	TYP†	MAX	MIN		TYP†
I_{CCD}^{\ddagger}	V _{CC} = 5.5 V, Outputs open, One bit 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 bit 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		
I_C	V _{CC} = 5.5 V, f ₀ = 10 MHz, Outputs open, $\overline{OE} = GND$	One bit switching at f ₁ = 5 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	3.4			
		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	1.6	3.2			
			V _{IN} = 3.4 V or GND	3.9	12.2			
	V _{CC} = 5.25 V, f ₀ = 10 MHz, Outputs open, $\overline{OE} = GND$	One bit switching at f ₁ = 5 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		3.4
		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			1.6		3.2
			V _{IN} = 3.4 V or GND			3.9		12.2
C _i			5	10	5	10	pF	
C _o			9	12	9	12	pF	

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

‡ This parameter is derived for use in total power-supply calculations.

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

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.



CY54FCT374T, CY74FCT374T
8-BIT REGISTERS
WITH 3-STATE OUTPUTS

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

		CY54FCT374T		CY54FCT374AT		CY54FCT374CT		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t _w	Pulse duration, CP high or low	7		6		6		ns
t _{su}	Setup time, data before CP↑	2		2		2		ns
t _h	Hold time, data after CP↑	1.5		1.5		1.5		ns

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

		CY74FCT374T		CY74FCT374AT		CY74FCT374CT		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t _w	Pulse duration, CP high or low	7		5		5		ns
t _{su}	Setup time, data before CP↑	2		2		2		ns
t _h	Hold time, data after CP↑	1.5		1.5		1.5		ns

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

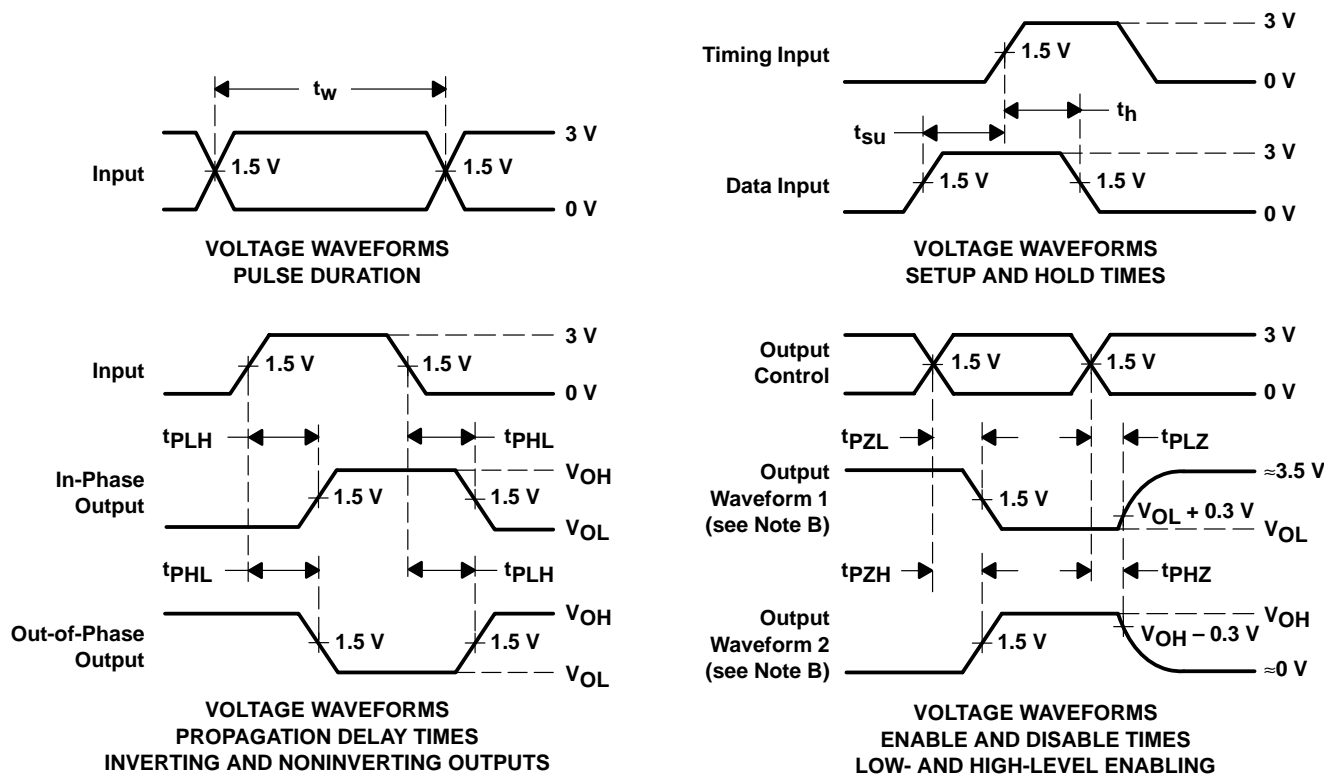
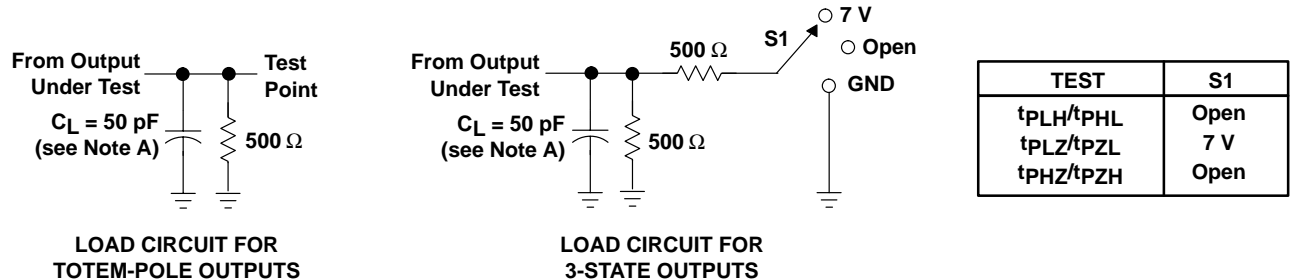
PARAMETER	FROM (INPUT)	TO (OUTPUT)	CY54FCT374T		CY54FCT374AT		CY54FCT374CT		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	CP	O	2	11	2	7.2	2	6.2	ns
t _{PHL}			2	11	2	7.2	2	6.2	
t _{PZH}	\overline{OE}	O	1.5	14	1.5	7.5	1.5	6.2	ns
t _{PZL}			1.5	14	1.5	7.5	1.5	6.2	
t _{PHZ}	\overline{OE}	O	1.5	8	1.5	6.5	1.5	5.7	ns
t _{PLZ}			1.5	8	1.5	6.5	1.5	5.7	

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	CY74FCT374T		CY74FCT374AT		CY74FCT374CT		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	CP	O	2	10	2	6.5	2	5.2	ns
t _{PHL}			2	10	2	6.5	2	5.2	
t _{PZH}	\overline{OE}	O	1.5	12.5	1.5	6.5	1.5	5.5	ns
t _{PZL}			1.5	12.5	1.5	6.5	1.5	5.5	
t _{PHZ}	\overline{OE}	O	1.5	8	1.5	5.5	1.5	5	ns
t _{PLZ}			1.5	8	1.5	5.5	1.5	5	



PARAMETER MEASUREMENT INFORMATION



- 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
5962-9221802M2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9221802M2A CY54FCT 374TLMB	Samples
5962-9221802MRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9221802MR A CY54FCT374TDMB	Samples
5962-9221804M2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9221804M2A CY54FCT 374ATLMB	Samples
5962-9221804MRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9221804MR A CY54FCT374ATDM B	Samples
5962-9221806M2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9221806M2A CY54FCT 374CTLMB	Samples
5962-9222203M2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9222203M2A CY54FCT 574ATLMB	Samples
5962-9222203MRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9222203MR A	Samples
5962-9222205MRA	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9222205MR A	Samples
CY54FCT374ATDMB	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9221804MR A CY54FCT374ATDM B	Samples
CY54FCT374ATLMB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type		5962- 9221804M2A CY54FCT 374ATLMB	Samples
CY54FCT374CTLMB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9221806M2A	Samples

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
										CY54FCT 374CTLMB	
CY54FCT374TDMB	ACTIVE	CDIP	J	20	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9221802MR A CY54FCT374TDMB	Samples
CY54FCT374TLMB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9221802M2A CY54FCT 374TLMB	Samples
CY54FCT574ATLMB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 922203M2A CY54FCT 574ATLMB	Samples
CY74FCT374ATPC	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	-40 to 85	CY74FCT374ATPC	Samples
CY74FCT374ATQCT	ACTIVE	SSOP	DBQ	20	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT374A	Samples
CY74FCT374ATSOC	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT374A	Samples
CY74FCT374ATSOCT	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT374A	Samples
CY74FCT374CTSOC	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT374C	Samples
CY74FCT374TQCT	ACTIVE	SSOP	DBQ	20	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT374	Samples
CY74FCT374TSOC	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT374	Samples
CY74FCT574ATQCT	ACTIVE	SSOP	DBQ	20	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT574A	Samples
CY74FCT574ATSOC	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT574A	Samples
CY74FCT574CTQCT	ACTIVE	SSOP	DBQ	20	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT574C	Samples
CY74FCT574CTSOC	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT574C	Samples
CY74FCT574TQCT	ACTIVE	SSOP	DBQ	20	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT574	Samples

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
CY74FCT574TQCTG4	ACTIVE	SSOP	DBQ	20	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	FCT574	Samples
CY74FCT574TSOC	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 85	FCT574	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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(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
CY74FCT374ATQCT	SSOP	DBQ	20	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
CY74FCT374ATSOCT	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
CY74FCT374TQCT	SSOP	DBQ	20	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
CY74FCT574ATQCT	SSOP	DBQ	20	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
CY74FCT574CTQCT	SSOP	DBQ	20	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
CY74FCT574TQCT	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)
CY74FCT374ATQCT	SSOP	DBQ	20	2500	367.0	367.0	38.0
CY74FCT374ATSOCT	SOIC	DW	20	2000	367.0	367.0	45.0
CY74FCT374TQCT	SSOP	DBQ	20	2500	367.0	367.0	38.0
CY74FCT574ATQCT	SSOP	DBQ	20	2500	367.0	367.0	38.0
CY74FCT574CTQCT	SSOP	DBQ	20	2500	367.0	367.0	38.0
CY74FCT574TQCT	SSOP	DBQ	20	2500	367.0	367.0	38.0

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