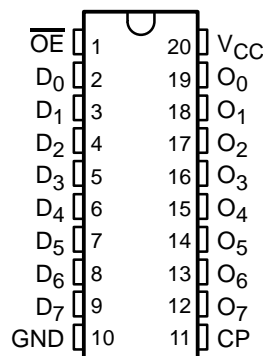


# CY54FCT574T, CY74FCT574T 8-BIT REGISTERS WITH 3-STATE OUTPUTS

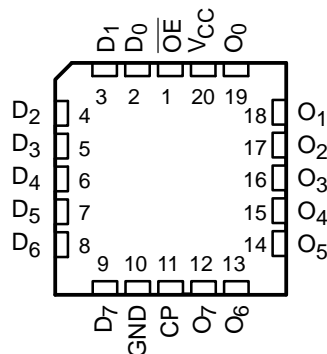
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- Function, Pinout, and Drive Compatible With FCT and F Logic
- Reduced  $V_{OH}$  (Typically = 3.3 V) Versions of Equivalent FCT Functions
- Edge-Rate Control Circuitry for Significantly Improved Noise Characteristics
- $I_{off}$  Supports Partial-Power-Down 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
- CY54FCT574T
  - 32-mA Output Sink Current
  - 12-mA Output Source Current
- CY74FCT574T
  - 64-mA Output Sink Current
  - 32-mA Output Source Current
- 3-State Outputs

CY54FCT574T . . . D PACKAGE  
CY74FCT574T . . . Q OR SO PACKAGE  
(TOP VIEW)



CY54FCT574T . . . L PACKAGE  
(TOP VIEW)



## description

The 'FCT574T 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 'FCT574T are identical to 'FCT374T, except for a flow-through pinout to simplify board design. The eight flip-flops in the 'FCT574T 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.



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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  
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**CY54FCT574T, CY74FCT574T**  
**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	CY74FCT574CTQCT	FCT574C
	SOIC – SO	Tube	5.2	CY74FCT574CTSOC	FCT574C
		Tape and reel	5.2	CY74FCT574CTSOCT	
	QSOP – Q	Tape and reel	6.5	CY74FCT574ATQCT	FCT574A
	SOIC – SO	Tube	6.5	CY74FCT574ATSOC	FCT574A
		Tape and reel	6.5	CY74FCT574ATSOCT	
	QSOP – Q	Tape and reel	10	CY74FCT574TQCT	FCT574
	SOIC – SO	Tube	10	CY74FCT574TSOC	FCT574
Tape and reel		10	CY74FCT574TSOCT		
-55°C to 125°C	CDIP – D	Tube	6.2	CY54FCT574CTDMB	
	CDIP – D	Tube	7.2	CY54FCT574ATDMB	
	LCC – L	Tube	7.2	CY54FCT574ATLMB	

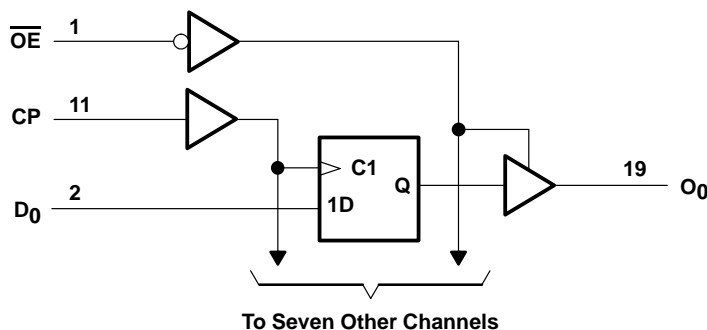
† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

**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)**



**absolute maximum ratings 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, $\theta_{JA}$ (see Note 1): 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)**

	CY54FCT574T			CY74FCT574T			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.

**CY54FCT574T, CY74FCT574T**  
**8-BIT REGISTERS**  
**WITH 3-STATE OUTPUTS**

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

PARAMETER	TEST CONDITIONS	CY54FCT574T			CY74FCT574T			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
V <sub>IK</sub>	V <sub>CC</sub> = 4.5 V, I <sub>IN</sub> = -18 mA		-0.7	-1.2				V
	V <sub>CC</sub> = 4.75 V, I <sub>IN</sub> = -18 mA					-0.7	-1.2	
V <sub>OH</sub>	V <sub>CC</sub> = 4.5 V, I <sub>OH</sub> = -12 mA	2.4	3.3					V
	V <sub>CC</sub> = 4.75 V	I <sub>OH</sub> = -32 mA			2			
		I <sub>OH</sub> = -15 mA				2.4	3.3	
V <sub>OL</sub>	V <sub>CC</sub> = 4.5 V, I <sub>OL</sub> = 32 mA		0.3	0.55				V
	V <sub>CC</sub> = 4.75 V, I <sub>OL</sub> = 64 mA					0.3	0.55	
V <sub>hys</sub>	All inputs		0.2			0.2		V
I <sub>I</sub>	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = V <sub>CC</sub>			5				μA
	V <sub>CC</sub> = 5.25 V, V <sub>IN</sub> = V <sub>CC</sub>						5	
I <sub>IH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 2.7 V			±1				μA
	V <sub>CC</sub> = 5.25 V, V <sub>IN</sub> = 2.7 V						±1	
I <sub>IL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 0.5 V			±1				μA
	V <sub>CC</sub> = 5.25 V, V <sub>IN</sub> = 0.5 V						±1	
I <sub>off</sub>	V <sub>CC</sub> = 0 V, V <sub>OUT</sub> = 4.5 V			±1			±1	μA
I <sub>OS</sub> ‡	V <sub>CC</sub> = 5.5 V, V <sub>OUT</sub> = 0 V	-60	-120	-225				mA
	V <sub>CC</sub> = 5.25 V, V <sub>OUT</sub> = 0 V				-60	-120	-225	
I <sub>OZH</sub>	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 2.7 V			10				μA
	V <sub>CC</sub> = 5.25 V, V <sub>IN</sub> = 2.7 V						10	
I <sub>OZL</sub>	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 0.5 V			-10				μA
	V <sub>CC</sub> = 5.25 V, V <sub>IN</sub> = 0.5 V						-10	
I <sub>CC</sub>	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> ≤ 0.2 V, V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2 V		0.1	0.2				mA
	V <sub>CC</sub> = 5.25 V, V <sub>IN</sub> ≤ 0.2 V, V <sub>IN</sub> ≥ V <sub>CC</sub> - 0.2 V					0.1	0.2	
ΔI <sub>CC</sub>	V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 3.4 V§, f <sub>1</sub> = 0, Outputs open		0.5	2				mA
	V <sub>CC</sub> = 5.25 V, V <sub>IN</sub> = 3.4 V§, f <sub>1</sub> = 0, Outputs open					0.5	2	

† Typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 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<sub>OS</sub> tests should be performed last.

§ Per TTL-driven input (V<sub>IN</sub> = 3.4 V); all other inputs at V<sub>CC</sub> or GND



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

PARAMETER	TEST CONDITIONS		CY54FCT574T		CY74FCT574T		UNIT	
			MIN	TYP†	MAX	MIN		TYP†
$I_{CCD}^{\ddagger}$	$V_{CC} = 5.5\text{ V}$ , Outputs open, One bit switching at 50% duty cycle, $\overline{OE} = \text{GND}$ , $V_{IN} \leq 0.2\text{ V}$ or $V_{IN} \geq V_{CC} - 0.2\text{ V}$		0.06	0.12			mA/ MHz	
	$V_{CC} = 5.25\text{ V}$ , Outputs open, One bit switching at 50% duty cycle, $\overline{OE} = \text{GND}$ , $V_{IN} \leq 0.2\text{ V}$ or $V_{IN} \geq V_{CC} - 0.2\text{ V}$				0.06	0.12		
$I_C$	$V_{CC} = 5.5\text{ V}$ , $f_0 = 10\text{ MHz}$ , Outputs open, $\overline{OE} = \text{GND}$	One bit switching at $f_1 = 5\text{ MHz}$ at 50% duty cycle	$V_{IN} \leq 0.2\text{ V}$ or $V_{IN} \geq V_{CC} - 0.2\text{ V}$	0.7	1.4		mA	
			$V_{IN} = 3.4\text{ V}$ or GND	1.2	3.4			
		Eight bits switching at $f_1 = 2.5\text{ MHz}$ at 50% duty cycle	$V_{IN} \leq 0.2\text{ V}$ or $V_{IN} \geq V_{CC} - 0.2\text{ V}$	1.6	3.2			
			$V_{IN} = 3.4\text{ V}$ or GND	3.9	12.2			
	$V_{CC} = 5.25\text{ V}$ , $f_0 = 10\text{ MHz}$ , Outputs open, $\overline{OE} = \text{GND}$	One bit switching at $f_1 = 5\text{ MHz}$ at 50% duty cycle	$V_{IN} \leq 0.2\text{ V}$ or $V_{IN} \geq V_{CC} - 0.2\text{ V}$			0.7		1.4
			$V_{IN} = 3.4\text{ V}$ or GND			1.2		3.4
		Eight bits switching at $f_1 = 2.5\text{ MHz}$ at 50% duty cycle	$V_{IN} \leq 0.2\text{ V}$ or $V_{IN} \geq V_{CC} - 0.2\text{ V}$			1.6		3.2
			$V_{IN} = 3.4\text{ V}$ or GND			3.9		12.2
$C_i$			5	10	5	10	pF	
$C_o$			9	12	9	12	pF	

† Typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

‡ 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

$\Delta I_{CC}$  = Power-supply current for a TTL high input ( $V_{IN} = 3.4\text{ V}$ )

$D_H$  = 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)

$f_0$  = Clock frequency for registered devices, otherwise zero

$f_1$  = Input signal frequency

$N_1$  = Number of inputs changing at  $f_1$

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

|| Values for these conditions are examples of the  $I_{CC}$  formula.

# CY54FCT574T, CY74FCT574T

## 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)

		CY54FCT574T		CY54FCT574AT		CY54FCT574CT		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>w</sub>	Pulse duration, CP high or low	7		6		6		ns
t <sub>su</sub>	Setup time, data before CP↑	2		2		2		ns
t <sub>h</sub>	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)

		CY74FCT574T		CY74FCT574AT		CY74FCT574CT		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>w</sub>	Pulse duration, CP high or low	7		5		5		ns
t <sub>su</sub>	Setup time, data before CP↑	2		2		2		ns
t <sub>h</sub>	Hold time, data after CP↑	1.5		1.5		1.5		ns

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

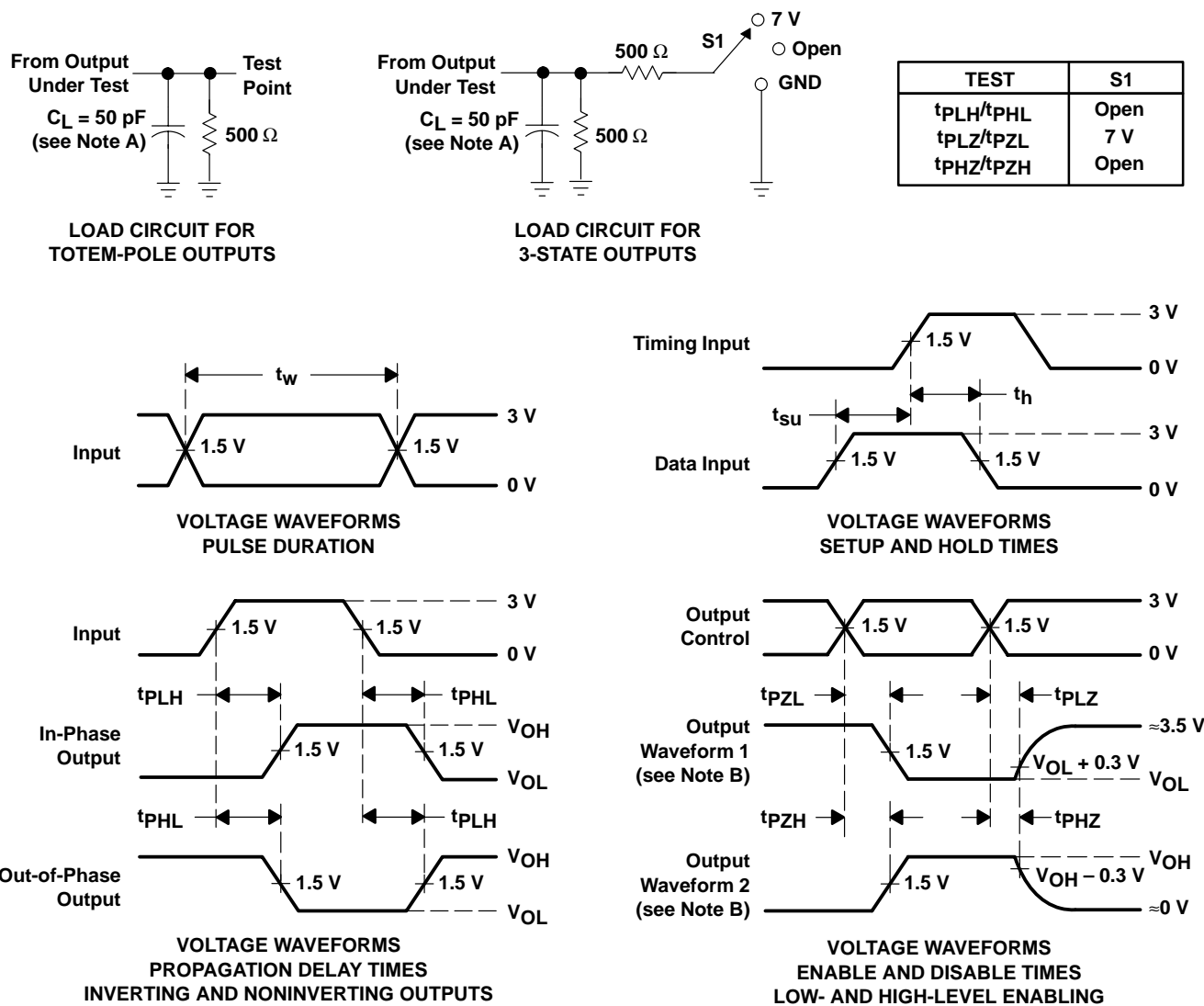
PARAMETER	FROM (INPUT)	TO (OUTPUT)	CY54FCT574T		CY54FCT574AT		CY54FCT574CT		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	CP	O	2	11	2	7.2	2	6.2	ns
t <sub>PHL</sub>			2	11	2	7.2	2	6.2	
t <sub>PZH</sub>	$\overline{OE}$	O	1.5	14	1.5	7.5	1.5	6.2	ns
t <sub>PZL</sub>			1.5	14	1.5	7.5	1.5	6.2	
t <sub>PHZ</sub>	$\overline{OE}$	O	1.5	8	1.5	6.5	1.5	5.7	ns
t <sub>PLZ</sub>			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)	CY74FCT574T		CY74FCT574AT		CY74FCT574CT		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	CP	O	2	10	2	6.5	2	5.2	ns
t <sub>PHL</sub>			2	10	2	6.5	2	5.2	
t <sub>PZH</sub>	$\overline{OE}$	O	1.5	12.5	1.5	6.5	1.5	5.5	ns
t <sub>PZL</sub>			1.5	12.5	1.5	6.5	1.5	5.5	
t <sub>PHZ</sub>	$\overline{OE}$	O	1.5	8	1.5	5.5	1.5	5	ns
t <sub>PLZ</sub>			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

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