

CD74HCT574-Q1

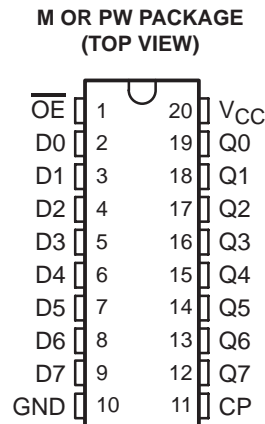
HIGH-SPEED CMOS LOGIC OCTAL D-TYPE FLIP-FLOP 3-STATE, POSITIVE-EDGE TRIGGERED

SCLS570A – FEBRUARY 2004 – REVISED APRIL 2008

- Qualified for Automotive Applications
- Buffered Inputs
- Common 3-State Output-Enable Control
- 3-State Outputs
- Bus-Line Driving Capability
- Typical Propagation Delay (Clock to Q):
15 ns at $V_{CC} = 5\text{ V}$, $C_L = 15\text{ pF}$, $T_A = 25^\circ\text{C}$
- Fanout (Over Temperature Range)
 - Standard Outputs . . . 10 LSTTL Loads
 - Bus Driver Outputs . . . 15 LSTTL Loads
- Balanced Propagation Delay and Transition Times
- Significant Power Reduction Compared to LSTTL Logic ICs
- V_{CC} Voltage = 4.5 V to 5.5 V
- Direct LSTTL Input Logic Compatibility, $V_{IL} = 0.8\text{ V (Max)}$, $V_{IH} = 2\text{ V (Min)}$
- CMOS Input Compatibility, $I_I \leq 1\ \mu\text{A}$ at V_{OL} , V_{OH}

description/ordering information

The CD74HCT574 is an octal D-type flip-flop with 3-state outputs and the capability to drive 15 LSTTL loads. The eight edge-triggered flip-flops enter data into their registers on the low-to-high transition of the clock (CP). The output enable (\overline{OE}) controls the 3-state outputs and is independent of the register operation. When \overline{OE} is high, the outputs are in the high-impedance state.



ORDERING INFORMATION†

| T _A | PACKAGE‡ | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|------------|---------------|-----------------------|------------------|
| | SOIC – M | Tape and reel | | |
| –40°C to 125°C | SOIC – M | Tape and reel | CD74HCT574QM96Q1 | HCT574Q |
| | TSSOP – PW | Tape and reel | CD74HCT574QPWRQ1 | HCT574Q |

† For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at <http://www.ti.com>.

‡ Package drawings, thermal data, and symbolization are available at <http://www.ti.com/packaging>.



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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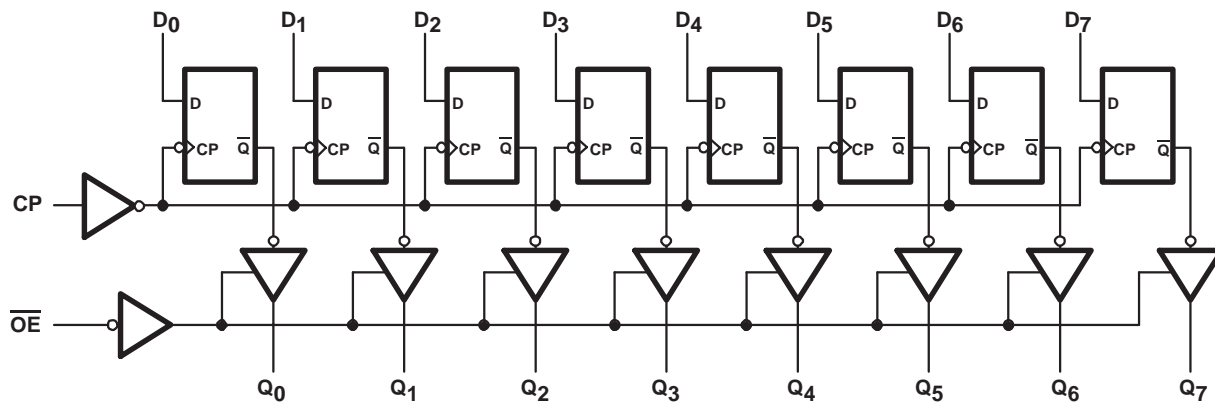
SCLS570A – FEBRUARY 2004 – REVISED APRIL 2008

FUNCTION TABLE

| INPUTS | | | OUTPUT |
|-----------------|----|---|----------------|
| \overline{OE} | CP | D | Q |
| L | ↑ | H | H |
| L | ↑ | L | L |
| L | L | X | Q ₀ |
| H | X | X | Z |

NOTE: H = High voltage level (steady state)
 L = Low voltage level (steady state)
 X = Don't care
 ↑ = Transition from low to high level
 Q₀ = Level before the indicated steady-state conditions were established
 Z = High-impedance state

logic diagram (positive logic)



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SCLS570A – FEBRUARY 2004 – REVISED APRIL 2008

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

| | |
|---|----------------|
| Supply voltage range, V_{CC} (see Note 1) | –0.5 V to 7 V |
| Input clamp current, I_{IK} ($V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V) | ±20 mA |
| Output clamp current, I_{OK} ($V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V) | ±20 mA |
| Drain current per output, I_O ($V_O > -0.5$ V or $V_O < V_{CC} + 0.5$ V) | ±35 mA |
| Output source or sink current per output, I_O ($V_O > -0.5$ V or $V_O < V_{CC} + 0.5$ V) | ±25 mA |
| Continuous current through V_{CC} or GND, I_{CC} | ±50 mA |
| Package thermal impedance, θ_{JA} (see Note 2): M package | 58°C/W |
| PW package | 69°C/W |
| Maximum junction temperature, T_J | 150°C |
| Lead temperature (during soldering): | |
| At distance $1/16 \pm 1/32$ inch ($1,59 \pm 0,79$ mm) from case for 10 s max | 300°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.

- NOTES: 1. All voltages referenced to GND unless otherwise specified.
2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

| | | MIN | MAX | UNIT | |
|----------|---------------------------------------|-----------------------------|----------|------|----|
| V_{CC} | Supply voltage | 4.5 | 5.5 | V | |
| V_{IH} | High-level input voltage | $V_{CC} = 4.5$ V to 5.5 V | | V | |
| V_{IL} | Low-level input voltage | $V_{CC} = 4.5$ V to 5.5 V | | V | |
| V_I | Input voltage | 0 | V_{CC} | V | |
| V_O | Output voltage | 0 | V_{CC} | V | |
| t_t | Input transition (rise and fall) time | $V_{CC} = 2$ V | 0 | 1000 | ns |
| | | $V_{CC} = 4.5$ V | 0 | 500 | |
| | | $V_{CC} = 6$ V | 0 | 400 | |
| T_A | Operating free-air temperature | –40 | 125 | °C | |

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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SCLS570A – FEBRUARY 2004 – REVISED APRIL 2008

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

| PARAMETER | TEST CONDITIONS | I _O (mA) | V _{CC} | T _A = 25°C | | | T _A = -40°C TO 125°C | | UNIT |
|------------------|---|------------------------|----------------------|-----------------------|------|------|------------------------------------|-----|------|
| | | | | MIN | TYP | MAX | MIN | MAX | |
| V _{OH} | V _I = V _{IH} or V _{IL} | CMOS loads | -0.02 | 4.5 V | 4.4 | | 4.4 | | V |
| | | TTL loads | -6 | 4.5 V | 3.98 | | 3.7 | | |
| V _{OL} | V _I = V _{IH} or V _{IL} | CMOS loads | 0.02 | 4.5 V | | | 0.1 | | V |
| | | TTL loads | 6 | 4.5 V | | | 0.26 | | |
| I _I | V _I = V _{CC} or GND | 0 | 5.5 V | | | ±0.1 | | ±1 | μA |
| I _{OZ} | V _I = V _{IL} or V _{IH} , V _O = V _{CC} or GND | | 6 V | | | ±0.5 | | ±10 | μA |
| I _{CC} | V _I = V _{CC} or GND | 0 | 5.5 V | | | 8 | | 160 | μA |
| ΔI _{CC} | V _I = V _{CC} - 2.1 V, See Note 4 | | 4.5 V to 5.5 V | | 100 | 360 | | 490 | μA |
| C _{IN} | C _L = 50 pF | | | | | 10 | | 10 | pF |
| C _{OUT} | 3-state | | | | | 20 | | 20 | pF |

NOTE 4: For dual-supply systems, theoretical worst-case (V_I = 2.4 V, V_{CC} = 5.5 V) specification is 1.8 mA.

HCT input loading

| TYPE | INPUT | UNIT LOADS† |
|------|------------------------|-------------|
| '574 | D0-D7 | 0.4 |
| | CP | 0.75 |
| | $\overline{\text{OE}}$ | 0.6 |

†Unit load is ΔI_{CC} limit specified in electrical characteristics table, e.g., 360 μA max at 25°C.

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

| PARAMETER | DESCRIPTION | V _{CC} | T _A = 25°C | | T _A = -40°C TO 125°C | | UNIT |
|------------------|--------------------------------|-----------------|-----------------------|-----|------------------------------------|-----|------|
| | | | MIN | MAX | MIN | MAX | |
| f _{max} | Maximum clock frequency | 4.5 V | 30 | | 20 | | MHz |
| t _w | Clock pulse duration | 4.5 V | 16 | | 24 | | ns |
| t _{su} | Setup time, data before clock↑ | 4.5 V | 12 | | 18 | | ns |
| t _h | Hold time, data after clock↑ | 4.5 V | 5 | | 5 | | ns |



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SCLS570A – FEBRUARY 2004 – REVISED APRIL 2008

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

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE | V _{CC} | T _A = 25°C | | | T _A = -40°C TO 125°C | | UNIT |
|------------------|------------------------|-------------|------------------------|-----------------|-----------------------|-----|-----|---------------------------------|-----|------|
| | | | | | MIN | TYP | MAX | MIN | MAX | |
| t _{pd} | CP | Q | C _L = 50 pF | 4.5 V | | | 33 | | 50 | ns |
| | | | C _L = 15 pF | 5 V | | 15 | | | | |
| t _{dis} | $\overline{\text{OE}}$ | Q | C _L = 50 pF | 4.5 V | | | | 28 | 42 | ns |
| | | | C _L = 15 pF | 5 V | | 11 | | | | |
| t _{en} | $\overline{\text{OE}}$ | Q | C _L = 50 pF | 4.5 V | | | | 30 | 45 | ns |
| | | | C _L = 15 pF | 5 V | | 12 | | | | |
| t _f | | Q | C _L = 50 pF | 4.5 V | | | | 12 | 18 | ns |
| f _{max} | CP | | C _L = 15 pF | 5 V | | | 60 | | | MHz |

operating characteristics, V_{CC} = 5 V, T_A = 25°C, input t_r, t_f = 6 ns

| PARAMETER | | TYP | UNIT |
|-----------------|--|-----|------|
| C _{pd} | Power dissipation capacitance (see Note 5) | 47 | pF |

NOTE 5: C_{pd} is used to determine the dynamic power consumption (P_D), per package.

$$P_D = (C_{PD} \times V_{CC}^2 \times f_I) + \Sigma (C_L \times V_{CC}^2 \times f_O)$$

f_I = input frequency

f_O = output frequency

C_L = output load capacitance

V_{CC} = supply voltage

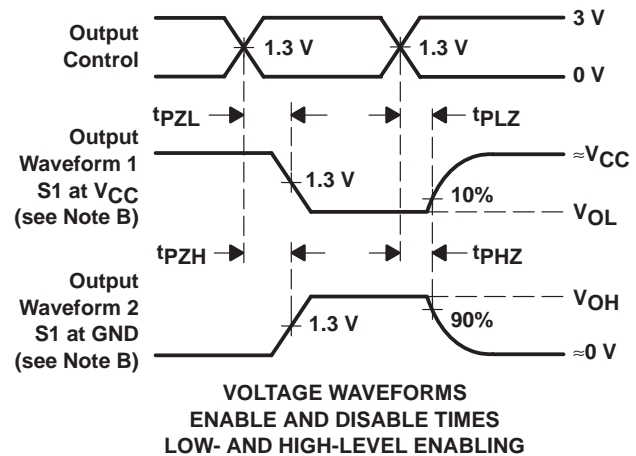
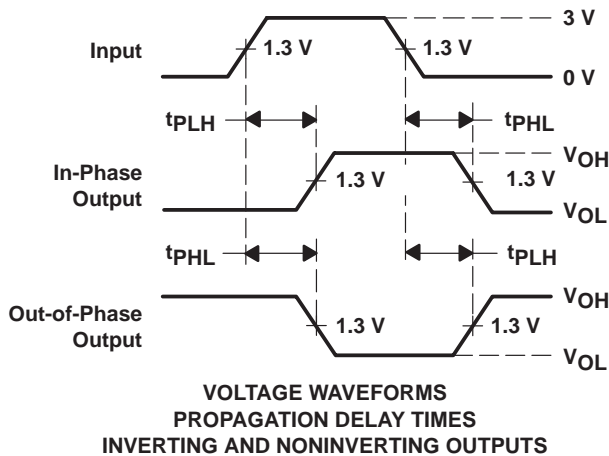
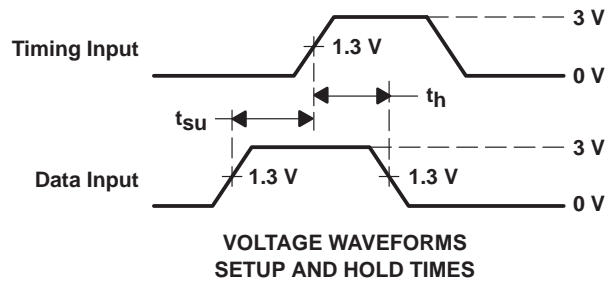
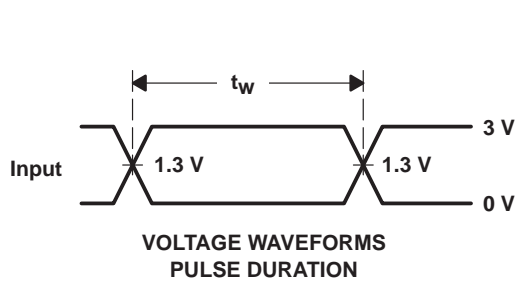
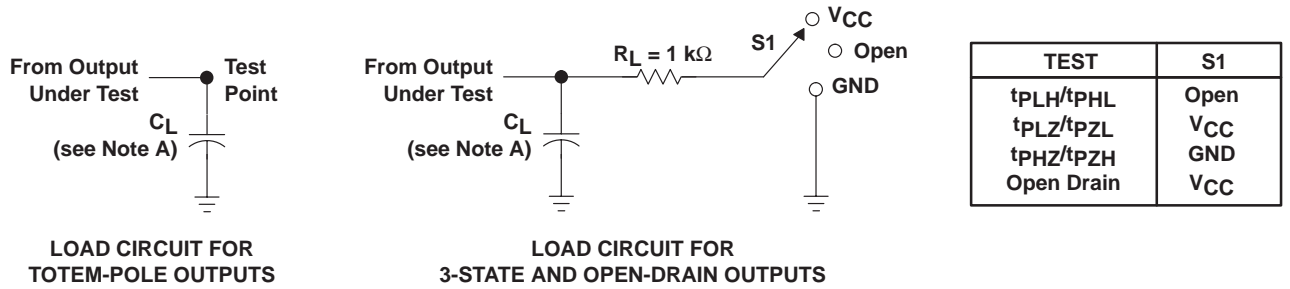
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SCLS570A – FEBRUARY 2004 – REVISED APRIL 2008

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. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 6\text{ ns}$, $t_f \leq 6\text{ ns}$.
 - D. The outputs are measured one at a time, with one input transition per measurement.
 - E. All parameters and waveforms are not applicable to all devices.
 - F. t_{PLH} and t_{PHL} are the same as t_{pd} .
 - G. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - H. t_{PZH} and t_{PZL} are the same as t_{en} .

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 | MSL Peak Temp (3) | Samples (Requires Login) |
|--------------------|---------------|--------------|-----------------|------|-------------|-------------------------|------------------|----------------------|-----------------------------|
| CD74HCT574QM96G4Q1 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| CD74HCT574QM96Q1 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| CD74HCT574QPWRG4Q1 | ACTIVE | TSSOP | PW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| CD74HCT574QPWRQ1 | OBSOLETE | TSSOP | PW | 20 | | TBD | Call TI | Call TI | |

(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.

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OTHER QUALIFIED VERSIONS OF CD74HCT574-Q1 :

- Catalog: [CD74HCT574](#)
- Enhanced Product: [CD74HCT574-EP](#)
- Military: [CD54HCT574](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - Falls within JEDEC MS-013 variation AC.

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



4209202-4/E 07/11

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Refer to IPC7351 for alternate board design.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



4040064-5/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate design.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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