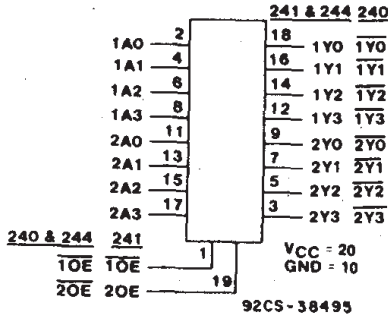


CD54/74AC240/241/244 CD54/74ACT240/241/244



Data sheet acquired from Harris Semiconductor
SCHS287



FUNCTIONAL DIAGRAM & TERMINAL ASSIGNMENT

Octal Buffer/Line Drivers, 3-State

- CD54/74AC/ACT240 - Inverting
- CD54/74AC/ACT241 - Non-Inverting
- CD54/74AC/ACT244 - Non-Inverting

Type Features:

- Buffered inputs
- Typical propagation delay:
3.6 ns @ $V_{CC} = 5V, T_A = 25^\circ C, C_L = 50 pF$

Family Features:

- Exceeds 2-kV ESD Protection - MIL-STD-883, Method 3015
- SCR-Latch-up-resistant CMOS process and circuit design
- Speed of bipolar FAST*/AS/S with significantly reduced power consumption
- Balanced propagation delays
- AC types feature 1.5-V to 5.5-V operation and balanced noise immunity at 30% of the supply
- $\pm 24\text{-mA}$ output drive current
 - Fanout to 15 FAST* ICs
 - Drives 50-ohm transmission lines

*FAST is a Registered Trademark of Fairchild Semiconductor Corp.

The RCA CD54/74AC240, CD54/74AC241, and CD54/74AC-244 and the CD54/74ACT240, CD54/74ACT241, and CD54/74ACT244 3-state octal buffer/line drivers use the RCA ADVANCED CMOS technology. The CD54/74AC/ACT240 and CD54/74AC/ACT244 have active-LOW output enables ($10\bar{E}$, $20\bar{E}$). The CD54/74AC/ACT241 has one active-LOW ($10\bar{E}$) and one active-HIGH ($20E$) output enable.

The CD74AC240, CD74AC241, and CD74AC244 and the CD74ACT240, CD74ACT241, and CD74ACT244 are supplied in 20-lead dual-in-line plastic packages (E suffix) and in 20-lead dual-in-line small-outline plastic packages (M suffix). Both package types are operable over the following temperature ranges: Commercial (0 to $70^\circ C$); Industrial (-40 to $+85^\circ C$); and Extended Industrial/Military (-55 to $+125^\circ C$).

The CD54AC240, CD54AC241, and CD54AC244 and the CD54ACT240, CD54ACT241, and CD54ACT244, available in chip form (H suffix), are operable over the -55 to $+125^\circ C$ temperature range.

TRUTH TABLES

| INPUTS | | OUTPUT | |
|------------------------|---|--------|--|
| $10\bar{E}, 20\bar{E}$ | A | Y | |
| L | L | H | |
| L | H | L | |
| H | X | Z | |

(AC/ACT240)

| INPUTS | | OUTPUT | |
|------------------------|---|--------|--|
| $10\bar{E}, 20\bar{E}$ | A | Y | |
| L | L | L | |
| L | H | H | |
| H | X | Z | |

(AC/ACT244)

| INPUTS | | OUTPUT | INPUTS | | OUTPUT |
|-------------|----|--------|--------|----|--------|
| $10\bar{E}$ | 1A | 1Y | 20E | 2A | 2Y |
| L | L | L | L | X | Z |
| L | H | H | H | L | L |
| H | X | Z | H | H | H |

(AC/ACT241)

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
Z = HIGH Impedance

This data sheet is applicable to the CD54/74AC240, CD54ACT240, CD54AC241, and CD54/74ACT241. The CD74AC241 was not acquired from Harris Semiconductor. See SCHS244 for information on the CD74ACT240, CD74AC244, and CD74ACT244.

CD54/74AC240/241/244 CD54/74ACT240/241/244

MAXIMUM RATINGS, Absolute-Maximum Values:

| | |
|--|---|
| DC SUPPLY-VOLTAGE (V_{CC}) | -0.5 to 6 V |
| DC INPUT DIODE CURRENT, I_{IK} (for $V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V) | ± 20 mA |
| DC OUTPUT DIODE CURRENT, I_{OK} (for $V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V) | ± 50 mA |
| DC OUTPUT SOURCE OR SINK CURRENT per Output Pin, I_O (for $V_O > -0.5$ V or $V_O < V_{CC} + 0.5$ V) | ± 50 mA |
| DC V_{CC} or GROUND CURRENT (I_{CC} or I_{GND}) | ± 100 mA* |
| POWER DISSIPATION PER PACKAGE (P_D): | |
| For $T_A = -55$ to $+100^\circ\text{C}$ (PACKAGE TYPE E) | 500 mW |
| For $T_A = +100$ to $+125^\circ\text{C}$ (PACKAGE TYPE E) | Derate Linearly at 8 mW/ $^\circ\text{C}$ to 300 mW |
| For $T_A = -55$ to $+70^\circ\text{C}$ (PACKAGE TYPE M) | 400 mW |
| For $T_A = +70$ to $+125^\circ\text{C}$ (PACKAGE TYPE M) | Derate Linearly at 6 mW/ $^\circ\text{C}$ to 70 mW |
| OPERATING-TEMPERATURE RANGE (T_A) | -55 to $+125^\circ\text{C}$ |
| STORAGE TEMPERATURE (T_{stg}) | -65 to $+150^\circ\text{C}$ |
| LEAD TEMPERATURE (DURING SOLDERING): | |
| At distance $1/16 \pm 1/32$ in. (1.59 ± 0.79 mm) from case for 10 s maximum | $+265^\circ\text{C}$ |
| Unit inserted into PC board min. thickness $1/16$ in. (1.59 mm) with solder contacting lead tips only | $+300^\circ\text{C}$ |

*For up to 4 outputs per device; add ± 25 mA for each additional output.

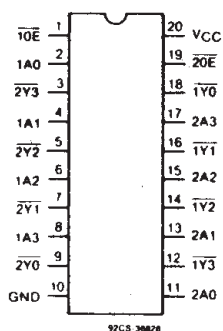
RECOMMENDED OPERATING CONDITIONS:

For maximum reliability, normal operating conditions should be selected so that operation is always within the following ranges:

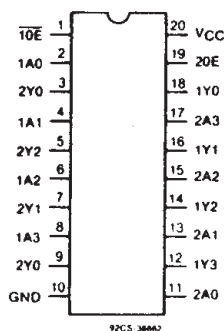
| CHARACTERISTIC | LIMITS | | UNITS |
|---|-------------|----------------|----------------------|
| | MIN. | MAX. | |
| Supply-Voltage Range, V_{CC} *: (For $T_A =$ Full Package-Temperature Range) AC Types ACT Types | 1.5 4.5 | 5.5 5.5 | V |
| DC Input or Output Voltage, V_I, V_O | 0 | V_{CC} | V |
| Operating Temperature, T_A | -55 | $+125$ | $^\circ\text{C}$ |
| Input Rise and Fall Slew Rate, dt/dv at 1.5 V to 3 V (AC Types) at 3.6 V to 5.5 V (AC Types) at 4.5 V to 5.5 V (ACT Types) | 0 0 0 | 50 20 10 | ns/V ns/V ns/V |

*Unless otherwise specified, all voltages are referenced to ground.

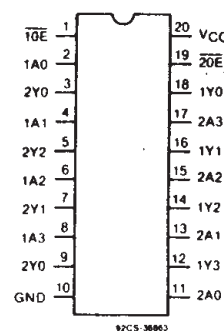
9



**CD54/74AC, ACT240 TYPES
TERMINAL ASSIGNMENT**



**CD54/74AC, ACT241 TYPES
TERMINAL ASSIGNMENT**



**CD54/74AC, ACT244 TYPES
TERMINAL ASSIGNMENT**

Technical Data

CD54/74AC240/241/244
CD54/74ACT240/241/244

STATIC ELECTRICAL CHARACTERISTICS: AC Series

| CHARACTERISTICS | TEST CONDITIONS | | V _{CC} (V) | AMBIENT TEMPERATURE (T _A) - °C | | | | | | UNITS |
|--|--|------------------------|------------------------|--|------|------------|------|-------------|------|-------|
| | | | | +25 | | -40 to +85 | | -55 to +125 | | |
| | V _I (V) | I _O (mA) | | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | |
| High-Level Input Voltage V _{IH} | | | 1.5 | 1.2 | — | 1.2 | — | 1.2 | — | V |
| | | | 3 | 2.1 | — | 2.1 | — | 2.1 | — | |
| | | | 5.5 | 3.85 | — | 3.85 | — | 3.85 | — | |
| Low-Level Input Voltage V _{IL} | | | 1.5 | — | 0.3 | — | 0.3 | — | 0.3 | V |
| | | | 3 | — | 0.9 | — | 0.9 | — | 0.9 | |
| | | | 5.5 | — | 1.65 | — | 1.65 | — | 1.65 | |
| High-Level Output Voltage V _{OH} | V _{IH} or V _{IL} | -0.05 | 1.5 | 1.4 | — | 1.4 | — | 1.4 | — | V |
| | | -0.05 | 3 | 2.9 | — | 2.9 | — | 2.9 | — | |
| | | -0.05 | 4.5 | 4.4 | — | 4.4 | — | 4.4 | — | |
| | | -4 | 3 | 2.58 | — | 2.48 | — | 2.4 | — | |
| | | -24 | 4.5 | 3.94 | — | 3.8 | — | 3.7 | — | |
| | | #, * | -75 | 5.5 | — | — | 3.85 | — | — | |
| Low-Level Output Voltage V _{OL} | V _{IH} or V _{IL} | 0.05 | 1.5 | — | 0.1 | — | 0.1 | — | 0.1 | V |
| | | 0.05 | 3 | — | 0.1 | — | 0.1 | — | 0.1 | |
| | | 0.05 | 4.5 | — | 0.1 | — | 0.1 | — | 0.1 | |
| | | 12 | 3 | — | 0.36 | — | 0.44 | — | 0.5 | |
| | | 24 | 4.5 | — | 0.36 | — | 0.44 | — | 0.5 | |
| | | #, * | 75 | 5.5 | — | — | 1.65 | — | — | |
| Input Leakage Current I _I | V _{CC} or GND | | 5.5 | — | ±0.1 | — | ±1 | — | ±1 | μA |
| | | | | | | | | | | |
| 3-State Leakage Current I _{OZ} | V _{IH} or V _{IL} | | 5.5 | — | ±0.5 | — | ±5 | — | ±10 | μA |
| | | | | | | | | | | |
| Quiescent Supply Current, MSI I _{CC} | V _{CC} or GND | 0 | 5.5 | — | 8 | — | 80 | — | 160 | μA |

#Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.

*Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

CD54/74AC240/241/244 CD54/74ACT240/241/244

STATIC ELECTRICAL CHARACTERISTICS: ACT Series

| CHARACTERISTICS | TEST CONDITIONS | | V _{CC} (V) | AMBIENT TEMPERATURE (T _A) - °C | | | | | | UNITS |
|---|--|------------------------|------------------------|--|------|------------|------|-------------|------|-------|
| | | | | +25 | | -40 to +85 | | -55 to +125 | | |
| | V _I (V) | I _O (mA) | | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | |
| High-Level Input Voltage V _{IH} | | | 4.5 to 5.5 | 2 | — | 2 | — | 2 | — | V |
| Low-Level Input Voltage V _{IL} | | | 4.5 to 5.5 | — | 0.8 | — | 0.8 | — | 0.8 | V |
| High-Level Output Voltage V _{OH} | V _{IH} or V _{IL} #, * | -0.05 | 4.5 | 4.4 | — | 4.4 | — | 4.4 | — | V |
| | | -24 | 4.5 | 3.94 | — | 3.8 | — | 3.7 | — | |
| | | -75 | 5.5 | — | — | 3.85 | — | — | — | |
| | | -50 | 5.5 | — | — | — | — | 3.85 | — | |
| Low-Level Output Voltage V _{OL} | V _{IH} or V _{IL} #, * | 0.05 | 4.5 | — | 0.1 | — | 0.1 | — | 0.1 | V |
| | | 24 | 4.5 | — | 0.36 | — | 0.44 | — | 0.5 | |
| | | 75 | 5.5 | — | — | — | 1.65 | — | — | |
| | | 50 | 5.5 | — | — | — | — | — | 1.65 | |
| Input Leakage Current I _I | V _{CC} or GND | | 5.5 | — | ±0.1 | — | ±1 | — | ±1 | μA |
| 3-State Leakage Current I _{OZ} | V _{IH} or V _{IL} V _O = V _{CC} or GND | | 5.5 | — | ±0.5 | — | ±5 | — | ±10 | μA |
| Quiescent Supply Current, MSI I _{CC} | V _{CC} or GND | 0 | 5.5 | — | 8 | — | 80 | — | 160 | μA |
| Additional Quiescent Supply Current per Input Pin TTL Inputs High 1 Unit Load ΔI _{CC} | V _{CC} -2.1 | | 4.5 to 5.5 | — | 2.4 | — | 2.8 | — | 3 | mA |

#Test one output at a time for a 1-second maximum duration. Measurement is made by forcing current and measuring voltage to minimize power dissipation.

*Test verifies a minimum 50-ohm transmission-line-drive capability at +85°C, 75 ohms at +125°C.

ACT INPUT LOADING TABLES

| CD54/74ACT240 | |
|---------------|-------------|
| INPUT | UNIT LOADS* |
| nA0 - A3 | 1.42 |
| 10E | 0.83 |
| 20E | 0.83 |

| CD54/74ACT241 | |
|---------------|-------------|
| INPUT | UNIT LOADS* |
| nA0 - A3 | 0.5 |
| 10E | 0.83 |
| 20E | 1.67 |

| CD54/74ACT244 | |
|---------------|-------------|
| INPUT | UNIT LOADS* |
| nA0 - A3 | 0.5 |
| 10E | 0.83 |
| 20E | 0.83 |

*Unit load is ΔI_{CC} limit specified in Static Characteristics Chart, e.g., 2.4 mA max. @ 25°C.

Technical Data

CD54/74AC240/241/244
CD54/74ACT240/241/244

SWITCHING CHARACTERISTICS: AC Series; $t_r, t_f = 3 \text{ ns}$, $C_L = 50 \text{ pF}$

| CHARACTERISTICS | SYMBOL | V_{CC} (V) | AMBIENT TEMPERATURE (T_A) - °C | | | | UNITS |
|--|----------------------------|-------------------|------------------------------------|---------------------|--------------------|--------------------|-------|
| | | | -40 to +85 | | -55 to +125 | | |
| | | | MIN. | MAX. | MIN. | MAX. | |
| Propagation Delays: Data to Outputs AC240 | t_{PLH} t_{PHL} | 1.5 3.3* 5† | — 2.6 1.9 | 82 9.2 6.5 | — 2.5 1.8 | 90 10.1 7.2 | ns |
| AC241, 244 | t_{PLH} t_{PHL} | 1.5 3.3 5 | — 3 2.2 | 93 10.5 7.5 | — 2.9 2.1 | 103 11.5 8.2 | ns |
| Output Enable Times | t_{PZL} t_{PZH} | 1.5 3.3 5 | — 4.6 3.1 | 136 16.4 10.9 | — 4.5 3 | 150 18 12 | ns |
| Output Disable Times | t_{PLZ} t_{PHZ} | 1.5 3.3 5 | — 3.9 3.1 | 136 13.6 10.9 | — 3.8 3 | 150 15 12 | ns |
| Power Dissipation Capacitance AC240 AC241, 244 | $C_{PD}\S$ | — — | 65 Typ. 71 Typ. | | 65 Typ. 71 Typ. | | pF |
| Min. (Valley) V_{OH} During Switching of Other Outputs (Output Under Test Not Switching) | V_{OHV} See Fig. 1 | 5 | 4 Typ. @ 25°C | | | | V |
| Max. (Peak) V_{OL} During Switching of Other Outputs (Output Under Test Not Switching) | V_{OLP} See Fig. 1 | 5 | 1 Typ. @ 25°C | | | | V |
| Input Capacitance | C_i | — | — | 10 | — | 10 | pF |
| 3-State Output Capacitance | C_o | — | — | 15 | — | 15 | pF |

SWITCHING CHARACTERISTICS: ACT Series; $t_r, t_f = 3 \text{ ns}$, $C_L = 50 \text{ pF}$

| CHARACTERISTICS | SYMBOL | V_{CC} (V) | AMBIENT TEMPERATURE (T_A) - °C | | | | UNITS |
|--|----------------------------|-----------------|------------------------------------|------|--------------------|------|-------|
| | | | -40 to +85 | | -55 to +125 | | |
| | | | MIN. | MAX. | MIN. | MAX. | |
| Propagation Delays: Data to Outputs ACT240 | t_{PLH} t_{PHL} | 5† | 2.3 | 7.8 | 2.2 | 8.6 | ns |
| ACT241, 244 | t_{PLH} t_{PHL} | 5 | 2.5 | 8.7 | 2.4 | 9.6 | ns |
| Output Enable Times | t_{PZL} t_{PZH} | 5 | 3.5 | 12.2 | 3.4 | 13.4 | ns |
| Output Disable Times | t_{PLZ} t_{PHZ} | 5 | 3.5 | 12.2 | 3.4 | 13.4 | ns |
| Power Dissipation Capacitance ACT240 ACT241, 244 | $C_{PD}\S$ | — — | 65 Typ. 71 Typ. | | 65 Typ. 71 Typ. | | pF |
| Min. (Valley) V_{OH} During Switching of Other Outputs (Output Under Test Not Switching) | V_{OHV} See Fig. 1 | 5 | 4 Typ. @ 25°C | | | | V |
| Max. (Peak) V_{OL} During Switching of Other Outputs (Output Under Test Not Switching) | V_{OLP} See Fig. 1 | 5 | 1 Typ. @ 25°C | | | | V |
| Input Capacitance | C_i | — | — | 10 | — | 10 | pF |
| 3-State Output Capacitance | C_o | — | — | 15 | — | 15 | pF |

*3.3 V: min. is @ 3.6 V
 max. is @ 3 V

†5 V: min. is @ 5.5 V
 max. is @ 4.5 V

‡ C_{PD} is used to determine the dynamic power consumption, per package.

For AC series: $P_D = V_{CC}^2 f_i (C_{PD} + C_L)$

For ACT series: $P_D = V_{CC}^2 f_i (C_{PD} + C_L) + V_{CC} \Delta I_{CC}$ where f_i = input frequency

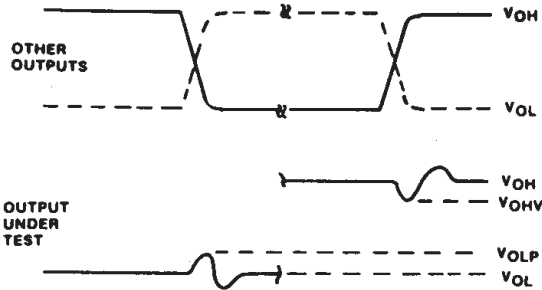
C_L = output load capacitance

V_{CC} = supply voltage.

Technical Data

CD54/74AC240/241/244 CD54/74ACT240/241/244

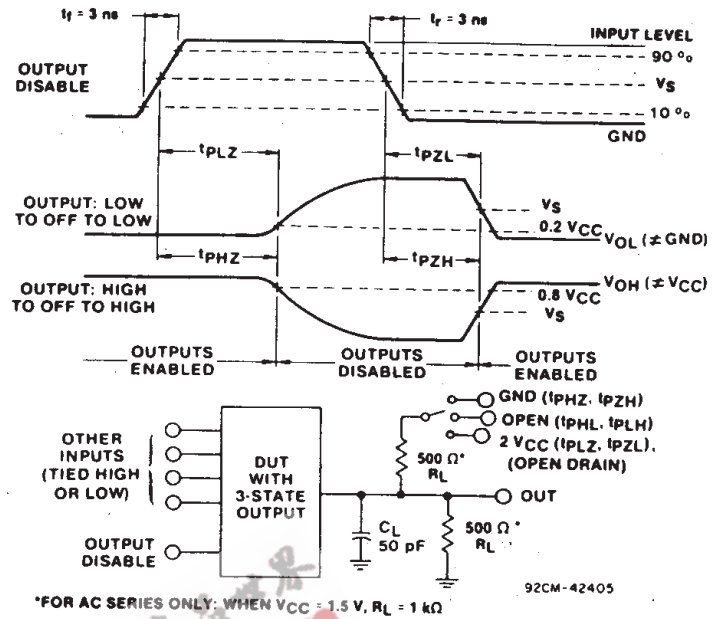
PARAMETER MEASUREMENT INFORMATION



NOTES:

1. V_{OHV} AND V_{OLP} ARE MEASURED WITH RESPECT TO A GROUND REFERENCE NEAR THE OUTPUT UNDER TEST.
2. INPUT PULSES HAVE THE FOLLOWING CHARACTERISTICS: $PRR \leq 1$ MHz, $t_r = 3$ ns, $t_f = 3$ ns, SKEW 1 ns.
3. R.F. FIXTURE WITH 700-MHz DESIGN RULES REQUIRED. IC SHOULD BE SOLDERED INTO TEST BOARD AND BYPASSED WITH $0.1 \mu\text{F}$ CAPACITOR. SCOPE AND PROBES REQUIRE 700-MHz BANDWIDTH.

92CS-42406

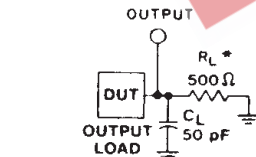


92CM-42405

*FOR AC SERIES ONLY: WHEN $V_{CC} = 1.5$ V, $R_L = 1$ k Ω

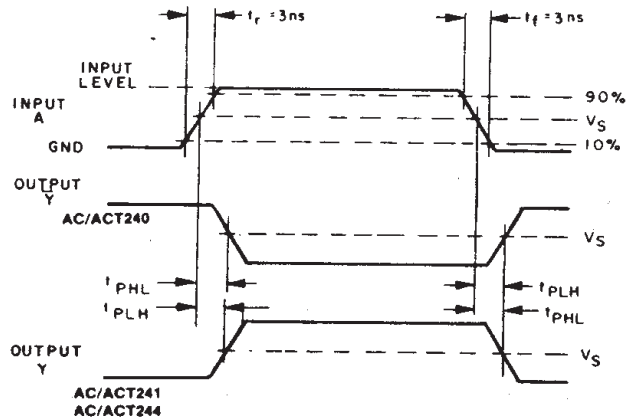
Fig. 1 - Simultaneous switching transient waveforms.

Fig. 2 - Three-state propagation delay times and test circuit.



*FOR AC SERIES ONLY: WHEN $V_{CC} = 1.5$ V, $R_L = 1$ k Ω

92CS-42389



92CS-42407

Fig. 3 - Propagation delay times and test circuit.

| | CD54/74AC | CD54/74ACT |
|---------------------------------|--------------|--------------|
| Input Level | V_{CC} | 3 V |
| Input Switching Voltage, V_S | $0.5 V_{CC}$ | 1.5 V |
| Output Switching Voltage, V_S | $0.5 V_{CC}$ | $0.5 V_{CC}$ |

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