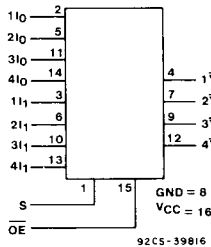


CD54/74HC258 CD54/74HCT258

High-Speed CMOS Logic



Quad 2-Input Multiplexer with 3-State Inverting Outputs

Type Features:

- Buffered inputs
- Typical CD54/74HC258 propagation delay = 7 ns @ $V_{CC} = 5\text{ V}$, $C_L = 15\text{ pF}$, $T_A = 25^\circ\text{ C}$

FUNCTIONAL DIAGRAM

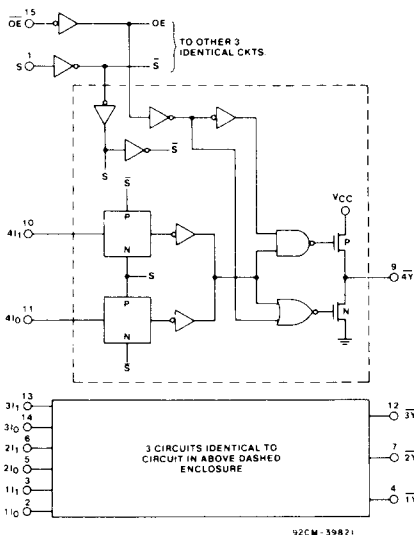
The RCA-CD54/74HC258 and CD54/74HCT258 are quad 2-input multiplexers which select four bits of data from two sources under the control of a common Select input (S). The Output Enable input (\overline{OE}) is active LOW. When \overline{OE} is HIGH, all of the outputs ($\overline{1Y}$ - $4Y$) are in the high impedance state regardless of all other input conditions.

Moving data from two groups of registers to four common output busses is a common use of the 258. The state of the Select input determines the particular register from which the data comes. It can also be used as a function generator.

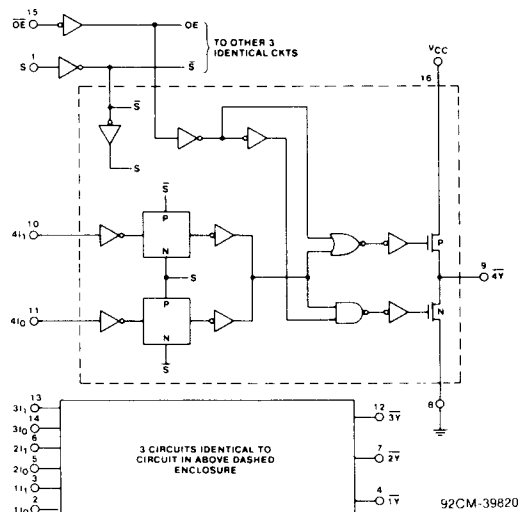
The CD54HC/HCT258 are supplied in 16-lead hermetic dual-in-line ceramic packages (F suffix). The CD74HC/HCT258 are supplied in 16-lead dual-in-line plastic packages (E suffix) and in 16-lead dual-in-line surface mount plastic packages (M suffix). Both types are also available in chip form (H suffix).

Family Features:

- Fanout (Over Temperature Range):
Standard Outputs - 10 LSTTL Loads
Bus Driver Outputs - 15 LSTTL Loads
- Wide Operating Temperature Range:
CD74HC/HCT/HCU: -40 to $+85^\circ\text{ C}$
- Balanced Propagation Delay and Transition Times
- Significant Power Reduction Compared to LSTTL Logic ICs
- Alternate Source is Philips/Signetics
- CD54HC/CD74HC Types:
2 to 6 V Operation
High Noise Immunity:
 $N_{IL} = 30\%$, $N_{IH} = 30\%$ of V_{CC} ; @ $V_{CC} = 5\text{ V}$
- CD54HCT/CD74HCT Types:
4.5 to 5.5 V Operation
Direct LSTTL Input Logic Compatibility
 $V_{IL} = 0.8\text{ V Max.}$, $V_{IH} = 2\text{ V Min.}$
CMOS Input Compatibility
 $I_i \leq 1\text{ }\mu\text{A}$ @ V_{OL} , V_{OH}



CD54/74HC258 Logic Diagram



CD54/74HCT258 Logic Diagram

CD54/74HC258 CD54/74HCT258

MAXIMUM RATINGS, Absolute-Maximum Values:

DC SUPPLY-VOLTAGE, (V_{CC}):
 (Voltages referenced to ground) -0.5 to + 7 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) ± 20 mA

DC DRAIN CURRENT, PER OUTPUT (I_o) (FOR -0.5 V $< V_o < V_{CC} + 0.5$ V) ± 35 mA

DC V_{CC} OR GROUND CURRENT (I_{CC}) ± 70 mA

POWER DISSIPATION PER PACKAGE (P_D):
 For $T_A = -40$ to $+60^\circ$ C (PACKAGE TYPE E) 500 mW
 For $T_A = +60$ to $+85^\circ$ C (PACKAGE TYPE E) Derate Linearly at 8 mW/ $^\circ$ C to 300 mW
 For $T_A = -55$ to $+100^\circ$ C (PACKAGE TYPE F, H) 500 mW
 For $T_A = +100$ to $+125^\circ$ C (PACKAGE TYPE F, H) Derate Linearly at 8 mW/ $^\circ$ C to 300 mW
 For $T_A = -40$ to $+70^\circ$ C (PACKAGE TYPE M) 400 mW
 For $T_A = +70$ to $+125^\circ$ C (PACKAGE TYPE M) Derate Linearly at 6 mW/ $^\circ$ C to 70 mW

OPERATING-TEMPERATURE RANGE (T_A):
 PACKAGE TYPE F, H -55 to $+125^\circ$ C
 PACKAGE TYPE E, M -40 to $+85^\circ$ C

STORAGE TEMPERATURE (T_{STG}) -65 to $+150^\circ$ C

LEAD TEMPERATURE (DURING SOLDERING):
 At distance $1/16 \pm 1/32$ in. (1.59 ± 0.79 mm) from case for 10 s max. $+265^\circ$ C
 Unit inserted into a PC Board (min. thickness $1/16$ in., 1.59 mm) with solder contacting lead tips only $+300^\circ$ C

RECOMMENDED OPERATING CONDITIONS:

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

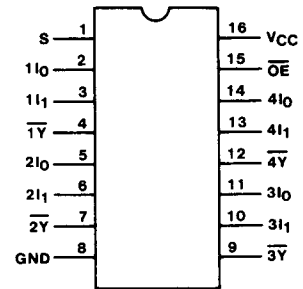
| CHARACTERISTIC | LIMITS | | UNITS |
|--|-------------|--------------------|------------|
| | MIN. | MAX. | |
| Supply-Voltage Range (For $T_A =$ Full Package-Temperature Range) V_{CC} .* CD54/74HC Types CD54/74HCT Types | 2 4.5 | 6 5.5 | V |
| DC Input or Output Voltage V_i, V_o | 0 | V_{CC} | V |
| Operating Temperature T_A : CD74 Types CD54 Types | -40 -55 | +85 +125 | $^\circ$ C |
| Input Rise and Fall Times t_r, t_f at 2 V at 4.5 V at 6 V | 0 0 0 | 1000 500 400 | ns |

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

FUNCTION TABLE

| Output Enable | Select Input | Data Inputs | | Output |
|-----------------|--------------|-------------|-------|----------------|
| \overline{OE} | S | I_0 | I_1 | \overline{Y} |
| H | X | X | X | Z |
| L | L | L | X | H |
| L | L | H | X | L |
| L | H | X | L | H |
| L | H | X | H | L |

H = High level voltage
 L = Low level voltage
 X = Don't care.
 Z = High impedance (off) state



92CS-39015

TERMINAL ASSIGNMENT

CD54/74HC258 CD54/74HCT258

STATIC ELECTRICAL CHARACTERISTICS

| CHARACTERISTIC | CD74HC258/CD54HC258 | | | | | | | | | | CD74HCT258/CD54HCT258 | | | | | | | | | | UNITS | |
|---|--|---|----------------------|-----------------|--------------|--------|---------------|--------------|----------------|------------|--|--|-------------------|--------|------------|---------------|----------|----------------|----------|--------|-------|---|
| | TEST CONDITIONS | | | 74HC/54HC TYPES | | | 74HC TYPE | | 54HC TYPE | | TEST CONDITIONS | | 74HCT/54HCT TYPES | | | 74HCT TYPE | | 54HCT TYPE | | | | |
| | V _I V | I _O mA | V _{CC} V | +25°C | | | -40/ +85°C | | -55/ +125°C | | V _I V | V _{CC} V | +25°C | | | -40/ +85°C | | -55/ +125°C | | | | |
| | | | | Min | Typ | Max | Min | Max | Min | Max | | | Min | Typ | Max | Min | Max | Min | Max | | | |
| High-Level Input Voltage V _{IH} | | | 2 | 1.5 | — | — | 1.5 | — | 1.5 | — | — | 4.5 | to | 2 | — | — | 2 | — | 2 | — | V | |
| | | | 4.5 | 3.15 | — | — | 3.15 | — | 3.15 | — | | 5.5 | | | | | | | | | | |
| | | | 6 | 4.2 | — | — | 4.2 | — | 4.2 | — | | | | | | | | | | | | |
| Low-Level Input Voltage V _{IL} | | | 2 | — | — | 0.5 | — | 0.5 | — | 0.5 | — | 4.5 | to | — | — | 0.8 | — | 0.8 | — | 0.8 | V | |
| | | | 4.5 | — | — | 1.35 | — | 1.35 | — | 1.35 | — | | | | | | | | | | | |
| | | | 6 | — | — | 1.8 | — | 1.8 | — | 1.8 | — | 5.5 | | | | | | | | | | |
| High-Level Output Voltage V _{OH} | V _{IL} or V _{IH} | -0.02 | 2 | 1.9 | — | — | 1.9 | — | 1.9 | — | V _{IL} or V _{IH} | V _{IL} or V _{IH} | 4.5 | 4.4 | — | — | 4.4 | — | 4.4 | — | V | |
| CMOS Loads | | | 4.5 | 4.4 | — | — | 4.4 | — | 4.4 | — | | | 5.5 | | | | | | | | | |
| TTL Loads (Bus Driver) | V _{IL} or V _{IH} | | -6 -7.8 | 4.5 6 | 3.98 5.48 | — — | — — | 3.84 5.34 | — — | 3.7 5.2 | — — | | | 4.5 | 3.98 | — | — | 3.84 | — | 3.7 | — | V |
| Low-Level Output Voltage V _{OL} | V _{IL} or V _{IH} | 0.02 | 2 | — | — | 0.1 | — | 0.1 | — | 0.1 | V _{IL} or V _{IH} | V _{IL} or V _{IH} | 4.5 | — | — | 0.1 | — | 0.1 | — | 0.1 | — | V |
| CMOS Loads | | | 4.5 | — | — | 0.1 | — | 0.1 | — | 0.1 | — | | | 5.5 | | | | | | | | |
| TTL Loads (Bus Driver) | V _{IL} or V _{IH} | | 6 7.8 | 4.5 6 | — — | — — | 0.26 0.26 | — — | 0.33 0.33 | — — | 0.4 0.4 | | | 4.5 | — | — | 0.26 | — | 0.33 | — | 0.4 | V |
| Input Leakage Current I _I | V _{CC} or Gnd | | 6 | — | — | ±0.1 | — | ±1 | — | ±1 | Any Voltage Between V _{CC} & Grid | | 5.5 | — | — | ±0.1 | — | ±1 | — | ±1 | μA | |
| Quiescent Device Current I _{CC} | V _{CC} or Gnd | 0 | 6 | — | — | 8 | — | 80 | — | 160 | V _{CC} or Gnd | | 5.5 | — | — | 8 | — | 80 | — | 160 | μA | |
| Additional Quiescent Device Current per input pin: 1 unit load ΔI _{CC} * | | | | | | | | | | | V _{CC} -2.1 | | 4.5 to 5.5 | — — | 100 360 | — — | 450 — | — — | 490 — | — — | μA | |
| 3-State leakage current I _{OZ} | V _{IL} or V _{IH} | V _O = V _{CC} or Gnd | 6 | — | — | ±0.5 | — | ±5 | — | ±10 | V _{IL} or V _{IH} | | 5.5 | — | — | ±0.5 | — | ±5 | — | ±10 | μA | |

*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 Table

| Input | Unit Loads* |
|-------|-------------|
| Data | 0.5 |
| S | 1.5 |
| OE | 1.5 |

*Unit Load is ΔI_{CC} limit specified in Static Characteristic Chart, e.g., 360 μA max. @ 25°C.

CD54/74HC258 CD54/74HCT258

SWITCHING CHARACTERISTICS (V_{CC} = 5 V, T_A = 25°C, Input t_r, t_f = 6 ns)

| CHARACTERISTIC | CL (pF) | TYPICAL | | UNITS |
|--|-----------------------------------|---------|-------|-------|
| | | HC | HCT | |
| nI _O , nI _I , to \bar{Y} | t _{PHL} t _{PLH} | 15 | 7 11 | ns |
| \overline{OE} to \bar{Y} | t _{PZL} t _{PZH} | 15 | 11 11 | ns |
| | t _{PLZ} t _{PHZ} | 15 | 12 12 | ns |
| S to \bar{Y} | t _{PHL} t _{PLH} | 15 | 11 14 | ns |
| Power Dissipation Capacitance* | C _{PD} | — | 49 49 | pF |

*C_{PD} is used to determine the dynamic power consumption, per multiplexer.

$P_D = V_{CC} \cdot f_i (C_{PD} + C_L)$ where: f_i = input frequency
C_L = output load capacitance
V_{CC} = supply voltage

SWITCHING CHARACTERISTICS (C_L = 50 pF, Input t_r, t_f = 6 ns)

| CHARACTERISTIC | V _{CC} | 25°C | | | | -40°C to +85°C | | | | -55°C to +125°C | | | | UNITS | |
|--|------------------|------|------|------|------|----------------|------|-------|------|-----------------|------|-------|------|-------|----|
| | | HC | | HCT | | 74HC | | 74HCT | | 54HC | | 54HCT | | | |
| | | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | | |
| Propagation Delay, nI _O , nI _I , to \bar{Y} (Fig. 2) | t _{PLH} | 2 | — | 95 | — | — | — | 120 | — | — | — | 145 | — | — | ns |
| | t _{PHL} | 4.5 | — | 19 | — | 27 | — | 24 | — | 34 | — | 29 | — | 41 | |
| | | 6 | — | 15 | — | — | — | 20 | — | — | — | 25 | — | — | |
| Propagation Delay S to \bar{Y} (Fig. 3) | t _{PLH} | 2 | — | 140 | — | — | — | 175 | — | — | — | 210 | — | — | ns |
| | t _{PHL} | 4.5 | — | 28 | — | 34 | — | 35 | — | 43 | — | 42 | — | 51 | |
| | | 6 | — | 24 | — | — | — | 30 | — | — | — | 36 | — | — | |
| Propagation Delay \overline{OE} to \bar{Y} (Fig. 4) | t _{PZL} | 2 | — | 140 | — | — | — | 175 | — | — | — | 210 | — | — | ns |
| | t _{PZH} | 4.5 | — | 28 | — | 28 | — | 35 | — | 35 | — | 42 | — | 42 | |
| | | 6 | — | 24 | — | — | — | 30 | — | — | — | 36 | — | — | |
| Propagation Delay \overline{OE} to \bar{Y} (Fig. 4) | t _{PLZ} | 2 | — | 150 | — | — | — | 190 | — | — | — | 225 | — | — | ns |
| | t _{PHZ} | 4.5 | — | 30 | — | 30 | — | 38 | — | 38 | — | 45 | — | 45 | |
| | | 6 | — | 26 | — | — | — | 33 | — | — | — | 38 | — | — | |
| Output Transition Time (Fig. 2) | t _{TLH} | 2 | — | 60 | — | — | — | 75 | — | — | — | 90 | — | — | ns |
| | t _{THL} | 4.5 | — | 12 | — | 12 | — | 15 | — | 15 | — | 18 | — | 18 | |
| | | 6 | — | 10 | — | — | — | 13 | — | — | — | 15 | — | — | |
| Input Capacitance | C _i | | — | 10 | — | 10 | — | 10 | — | 10 | — | 10 | — | 10 | pF |
| 3-State Output Capacitance | C _O | | — | 20 | — | 20 | — | 20 | — | 20 | — | 20 | — | 20 | pF |

CD54/74HC258 CD54/74HCT258

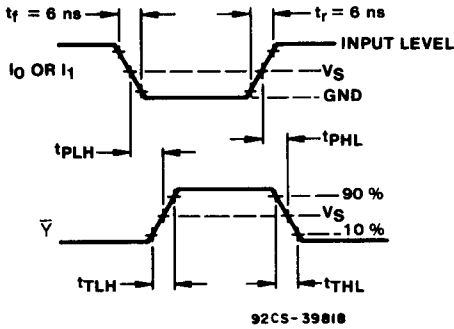


Fig. 2 - Select to output delays.

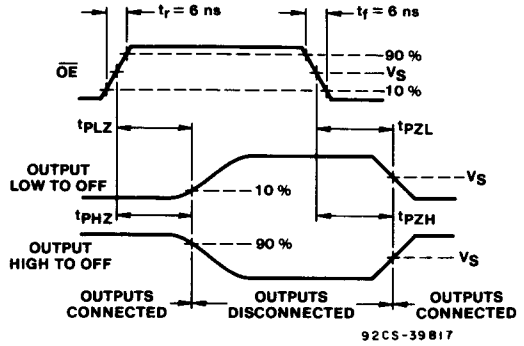


Fig. 4 - Output Enable to output propagation delays.

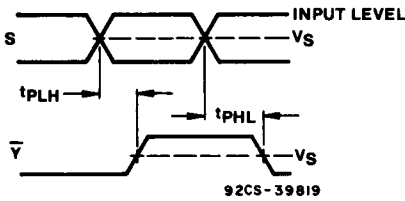


Fig. 3 - Select to output propagation delays.

| | 54/74HC | 54/74HCT |
|--------------------------|--------------|----------|
| Input Level | V_{CC} | 3V |
| Switching Voltage, V_s | 50% V_{CC} | 1.3 V |