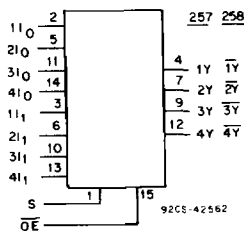


# CD54/74AC257, CD54/74AC258 CD54/74ACT257, CD54/74ACT258

## Quad 2-Input Multiplexer with 3-State Outputs

CD54/74AC/ACT257 - Non-Inverting Outputs

CD54/74AC/ACT258 - Inverting Outputs



FUNCTIONAL DIAGRAM

**Type Features:**

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

The RCA-CD54/74AC257 and CD54/74AC258 and the CD54/74ACT257 and CD54/74ACT258 are quad 2-input multiplexers with 3-state outputs. These devices use the RCA ADVANCED CMOS technology. Each of these devices selects four bits of data from two sources under the control of a common Select input (S). The Output Enable ( $\overline{OE}$ ) is active LOW. When  $\overline{OE}$  is HIGH, all of the outputs (Y or  $\overline{Y}$ ) are in the high-impedance state regardless of all other input conditions.

Moving data from two groups of registers to four common output buses is a common use of the CD54/74AC/ACT257 and CD54/74AC/ACT258. The state of the Select input determines the particular register from which the data comes. The CD54/74AC/ACT257 and CD54/74AC/ACT258 can also be used as function generators.

The CD74AC/ACT257 and CD74AC/ACT258 are supplied in 16-lead dual-in-line plastic packages (E suffix) and in 16-lead dual-in-line small-outline plastic packages (M suffix). Both package types are operable over the following temperature ranges: Commercial (0 to  $70^\circ\text{ C}$ ); Industrial ( $-40$  to  $+85^\circ\text{ C}$ ); and Extended Industrial/Military ( $-55$  to  $+125^\circ\text{ C}$ ).

The CD54AC/ACT257 and CD54AC/ACT258, available in chip form (H suffix), are operable over the  $-55$  to  $+125^\circ\text{ C}$  temperature range.

**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<sup>®</sup>/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<sup>®</sup> ICs
  - Drives 50-ohm transmission lines

<sup>®</sup>FAST is a Registered Trademark of Fairchild Semiconductor Corp.

FUNCTION TABLE

Output Enable	Select Input	Data Inputs		257 Outputs	258 Outputs
		$I_0$	$I_1$	Y	$\overline{Y}$
H	X	X	X	Z	Z
L	L	L	X	L	H
L	L	H	X	H	L
L	H	X	L	L	H
L	H	X	H	H	L

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

# CD54/74AC257, CD54/74AC258 CD54/74ACT257, CD54/74ACT258

**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)	$\pm 20$ mA
DC OUTPUT DIODE CURRENT, $I_{OK}$ (for $V_o < -0.5$ V or $V_o > V_{CC} + 0.5$ V)	$\pm 50$ 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)	$\pm 50$ mA
DC $V_{CC}$ or GROUND CURRENT ( $I_{CC}$ or $I_{GND}$ )	$\pm 100$ mA*
<b>POWER DISSIPATION PER PACKAGE (<math>P_D</math>):</b>	
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
<b>OPERATING-TEMPERATURE RANGE (<math>T_A</math>)</b>	-55 to $+125^\circ\text{C}$
<b>STORAGE TEMPERATURE (<math>T_{stg}</math>)</b>	-65 to $+150^\circ\text{C}$
<b>LEAD TEMPERATURE (DURING SOLDERING):</b>	
At distance $1/16 \pm 1/32$ in. ( $1.59 \pm 0.79$ 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  $\pm 25$  mA for each additional output.

**RECOMMENDED OPERATING CONDITIONS:**

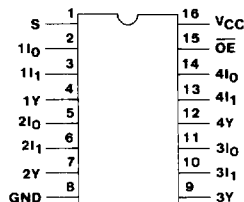
For maximum reliability, normal operating conditions should be selected so that operation is always within the following ranges:

CHARACTERISTICS	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 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, $dV/dt$ 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.

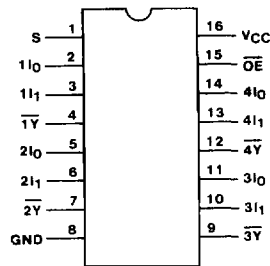
9

**TERMINAL ASSIGNMENT DIAGRAMS**



92CS-38420R1

CD54/74AC/ACT257



92CS-39815

CD54/74AC/ACT258

# CD54/74AC257, CD54/74AC258 CD54/74ACT257, CD54/74ACT258

STATIC ELECTRICAL CHARACTERISTICS: AC Series

CHARACTERISTICS	TEST CONDITIONS		V <sub>CC</sub> (V)	AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C						UNITS
				+25		-40 to +85		-55 to +125		
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
High-Level Input Voltage V <sub>IH</sub>			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 <sub>IL</sub>			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 <sub>OH</sub>	V <sub>IH</sub> or V <sub>IL</sub>	-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 <sub>OL</sub>	V <sub>IH</sub> or V <sub>IL</sub>	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 <sub>I</sub>	V <sub>CC</sub> or GND		5.5	—	±0.1	—	±1	—	±1	μA
3-State Leakage Current I <sub>oz</sub>	V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND		5.5	—	±0.5	—	±5	—	±10	μA
Quiescent Supply Current, MSI I <sub>CC</sub>	V <sub>CC</sub> 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.

# CD54/74AC257, CD54/74AC258 CD54/74ACT257, CD54/74ACT258

**STATIC ELECTRICAL CHARACTERISTICS: ACT Series**

CHARACTERISTICS	TEST CONDITIONS		V <sub>CC</sub> (V)	AMBIENT TEMPERATURE (T <sub>A</sub> ) - °C						UNITS	
	V <sub>I</sub> (V)	I <sub>O</sub> (mA)		+25		-40 to +85		-55 to +125			
				MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
High-Level Input Voltage	V <sub>IH</sub>		4.5 to 5.5	2	—	2	—	2	—	V	
Low-Level Input Voltage	V <sub>IL</sub>		4.5 to 5.5	—	0.8	—	0.8	—	0.8	V	
High-Level Output Voltage	V <sub>OH</sub>	V <sub>IH</sub> or V <sub>IL</sub> #, *	-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 <sub>OL</sub>	V <sub>IH</sub> or V <sub>IL</sub> #, *	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 <sub>I</sub>	V <sub>CC</sub> or GND	5.5	—	±0.1	—	±1	—	±1	μA	
3-State Leakage Current	I <sub>oz</sub>	V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND	5.5	—	±0.5	—	±5	—	±10	μA	
Quiescent Supply Current, MSI	I <sub>CC</sub>	V <sub>CC</sub> or GND	0	5.5	—	8	—	80	—	160	μA
Additional Quiescent Supply Current per Input Pin TTL Inputs High 1 Unit Load	ΔI <sub>CC</sub>	V <sub>CC</sub> -2.1	4.5 to 5.5	—	2.4	—	2.8	—	3	mA	

9

#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 TABLE**

INPUT	UNIT LOAD*
Data	0.83
S	1.27
$\overline{OE}$	1.27

\*Unit load is ΔI<sub>CC</sub> limit specified in Static Characteristics Chart, e.g., 2.4 mA max. @ 25°C.

# CD54/74AC257, CD54/74AC258 CD54/74ACT257, CD54/74ACT258

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: $I_n$ to Y	257	$t_{PLH}$ $t_{PHL}$	1.5	—	106	—	117	ns
			3.3*	3.3	11.8	3.3	13	
S to Y	257	$t_{PLH}$ $t_{PHL}$	5†	2.4	8.5	2.3	9.3	ns
			1.5	—	153	—	168	
$\overline{OE}$ to Y	257	$t_{PLH}$ $t_{PHL}$	3.3	4.8	17.1	4.7	18.8	ns
			5	3.5	12.2	3.4	13.4	
$\overline{OE}$ to Y	257	$t_{PLZ}$ $t_{PHZ}$ $t_{PZL}$ $t_{PZH}$	1.5	—	167	—	184	ns
			3.3	5.3	18.7	5.2	20.6	
$I_n$ to $\overline{Y}$	258	$t_{PLH}$ $t_{PHL}$	5	3.8	13.4	3.7	14.7	ns
			1.5	—	91	—	100	
S to $\overline{Y}$	258	$t_{PLH}$ $t_{PHL}$	3.3	2.9	10.2	2.8	11.2	ns
			5	2.1	7.3	2	8	
$\overline{OE}$ to $\overline{Y}$	258	$t_{PLH}$ $t_{PHL}$	1.5	—	153	—	168	ns
			3.3	4.8	17.1	4.7	18.8	
$\overline{OE}$ to $\overline{Y}$	258	$t_{PLH}$ $t_{PHL}$	5	3.5	12.2	3.4	13.4	ns
			1.5	—	167	—	184	
$\overline{OE}$ to $\overline{Y}$	258	$t_{PLZ}$ $t_{PHZ}$ $t_{PZL}$ $t_{PZH}$	3.3	5.3	18.7	5.2	20.6	ns
			5	3.8	13.4	3.7	14.7	
Power Dissipation Capacitance	$C_{PD}\S$	—	130 Typ.		130 Typ.		pF	
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: $I_n$ to Y	257	$t_{PLH}$ $t_{PHL}$	5†	2.8	9.7	2.7	10.7	ns
			1.5	—	153	—	168	
S to Y	257	$t_{PLH}$ $t_{PHL}$	5	4	14	3.9	15.4	ns
			1.5	—	153	—	168	
$\overline{OE}$ to Y	257	$t_{PLH}$ $t_{PHL}$	3.3	4.8	17.1	4.7	18.8	ns
			5	3.5	12.2	3.4	13.4	
$\overline{OE}$ to Y	257	$t_{PLZ}$ $t_{PHZ}$ $t_{PZL}$ $t_{PZH}$	1.5	—	167	—	184	ns
			3.3	5.3	18.7	5.2	20.6	
$I_n$ to $\overline{Y}$	258	$t_{PLH}$ $t_{PHL}$	5	3.8	13.4	3.7	14.7	ns
			1.5	—	91	—	100	
S to $\overline{Y}$	258	$t_{PLH}$ $t_{PHL}$	3.3	2.9	10.2	2.8	11.2	ns
			5	2.1	7.3	2	8	
$\overline{OE}$ to $\overline{Y}$	258	$t_{PLH}$ $t_{PHL}$	1.5	—	153	—	168	ns
			3.3	4.8	17.1	4.7	18.8	
$\overline{OE}$ to $\overline{Y}$	258	$t_{PLH}$ $t_{PHL}$	5	3.5	12.2	3.4	13.4	ns
			1.5	—	167	—	184	
$\overline{OE}$ to $\overline{Y}$	258	$t_{PLZ}$ $t_{PHZ}$ $t_{PZL}$ $t_{PZH}$	3.3	5.3	18.7	5.2	20.6	ns
			5	3.8	13.4	3.7	14.7	
Power Dissipation Capacitance	$C_{PD}\S$	—	130 Typ.		130 Typ.		pF	
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

$\S C_{PD}$  is used to determine the dynamic power consumption per multiplexer.

For AC Series:  $P_D = C_{PD} V_{CC}^2 f_i + \Sigma (C_L V_{CC}^2 f_o)$

For ACT Series:  $P_D = C_{PD} V_{CC}^2 f_i + \Sigma (C_L V_{CC}^2 f_o) + V_{CC} \Delta I_{CC}$

where  $f_i$  = input frequency  
 $f_o$  = output frequency  
 $C_L$  = output load capacitance  
 $V_{CC}$  = supply voltage.

# CD54/74AC257, CD54/74AC258 CD54/74ACT257, CD54/74ACT258

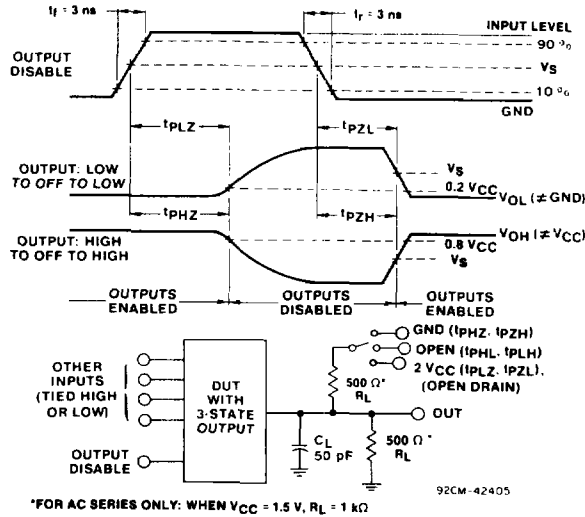


Fig. 1 - Three-state propagation delay waveforms and test circuit.

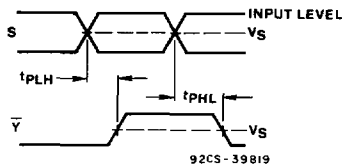


Fig. 2 - Select to output propagation delays (AC:ACT258).

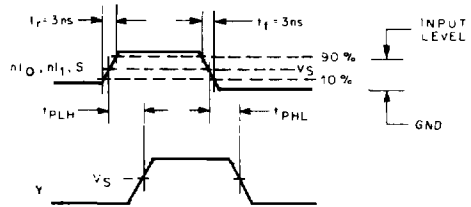


Fig. 3 - Inputs or select to output propagation delays (AC:ACT257).

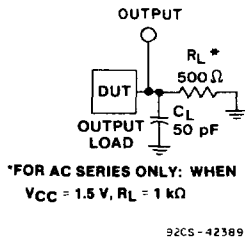


Fig. 4 - Test circuit.

	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 $V_{CC}$