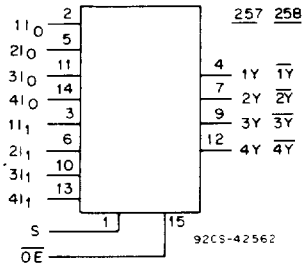
CD54/74AC257, CD54/74AC258
CD54/74ACT257, CD54/74ACT258



FUNCTIONAL DIAGRAM

Quad 2-Input Multiplexer with 3-State Outputs

CD54/74AC/ACT257 - Non-Inverting Outputs
CD54/74AC/ACT258 - Inverting Outputs

Type Features:

- *Buffered inputs*
- *Typical propagation delay:*
  4.4 ns @ V_{CC} = 5 V, T_A = 25° C, C_L = 50 pF

The Harris 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 Harris 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 package (E suffix); in 16-lead dual-in-line small-outline plastic package (M suffix); and 16 lead dual-in-line shrink small-outline plastic package (SM suffix). All package types are operable over the following temperature ranges: Commercial (0° to 70°C); Industrial (-40°C to 85°C); and Extended Industrial/Military (-55°C to 125°C).

All types are available in chip form (H suffix), are operable over the -55°C to 125°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*/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*
- *± 24-mA output drive current*
  - *Fanout to 15 FAST* ICs*
  - *Drives 50-ohm transmission lines*

*FAST is a Registered Trademark of Fairchild Semiconductor Corp.

FUNCTION TABLE

Output Enable	Select Input	Data Inputs		257 Outputs	258 Outputs
$\overline{OE}$	S	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) ..... ±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°C (PACKAGE TYPE E) ..... 500 mW
For T_A = +100 to +125°C (PACKAGE TYPE E) ..... Derate Linearly at 8 mW/°C to 300 mW
For T_A = -55 to +70°C (PACKAGE TYPE M) ..... 400 mW
For T_A = +70 to +125°C (PACKAGE TYPE M) ..... Derate Linearly at 6 mW/°C to 70 mW
OPERATING-TEMPERATURE RANGE (T_A) ..... -55 to +125°C
STORAGE TEMPERATURE (T_{stg}) ..... -65 to +150°C
LEAD TEMPERATURE (DURING SOLDERING):
At distance 1/16 ± 1/32 in. (1.59 ± 0.79 mm) from case for 10 s maximum ..... +265°C
Unit inserted into PC board min. thickness 1/16 in. (1.59 mm) with solder contacting lead tips only ..... +300°C

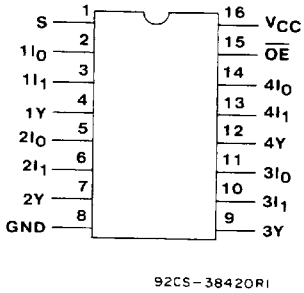
*For up to 4 outputs per device; add ± 25 mA for each additional output.

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

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

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

TERMINAL ASSIGNMENT DIAGRAMS



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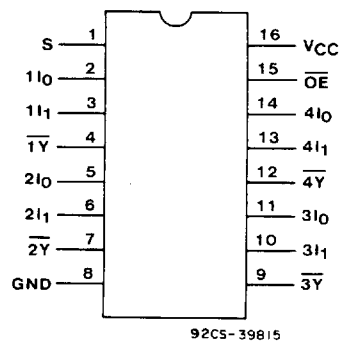
CD54/74AC/ACT257



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CD54/74AC/ACT258

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

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	—	—	—	
		-50	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	—	—	
		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

#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_{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 TABLE

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

*Unit load is ΔI_{CC} 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 ns, C_L = 50 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 3.3* 5†	— 3.3 2.4	106 11.8 8.5	— 3.3 2.3	117 13 9.3	ns
S to Y	257	t_{PLH} t_{PHL}	1.5 3.3 5	— 4.8 3.5	153 17.1 12.2	— 4.7 3.4	168 18.8 13.4	ns
$\overline{OE}$ to Y	257	t_{PLZ} t_{PHZ} t_{PZL} t_{PZH}	1.5 3.3 5	— 5.3 3.8	167 18.7 13.4	— 5.2 3.7	184 20.6 14.7	ns
I_n to $\overline{Y}$	258	t_{PLH} t_{PHL}	1.5 3.3 5	— 2.9 2.1	91 10.2 7.3	— 2.8 2	100 11.2 8	ns
S to $\overline{Y}$	258	t_{PLH} t_{PHL}	1.5 3.3 5	— 4.8 3.5	153 17.1 12.2	— 4.7 3.4	168 18.8 13.4	ns
$\overline{OE}$ to $\overline{Y}$	258	t_{PLZ} t_{PHZ} t_{PZL} t_{PZH}	1.5 3.3 5	— 5.3 3.8	167 18.7 13.4	— 5.2 3.7	184 20.6 14.7	ns
Power Dissipation Capacitance		C_{PD}§	—	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 ns, C_L = 50 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
S to Y	257	t_{PLH} t_{PHL}	5	4	14	3.9	15.4	ns
$\overline{OE}$ to Y	257	t_{PLZ} t_{PHZ} t_{PZL} t_{PZH}	5	4.1	14.6	4	16.1	ns
I_n to $\overline{Y}$	258	t_{PLH} t_{PHL}	5	2.4	8.5	2.3	9.3	ns
S to $\overline{Y}$	258	t_{PLH} t_{PHL}	5	4	14	3.9	15.4	ns
$\overline{OE}$ to $\overline{Y}$	258	t_{PLZ} t_{PHZ} t_{PZL} t_{PZH}	5	4.1	14.6	4	16.1	ns
Power Dissipation Capacitance		C_{PD}§	—	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

§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

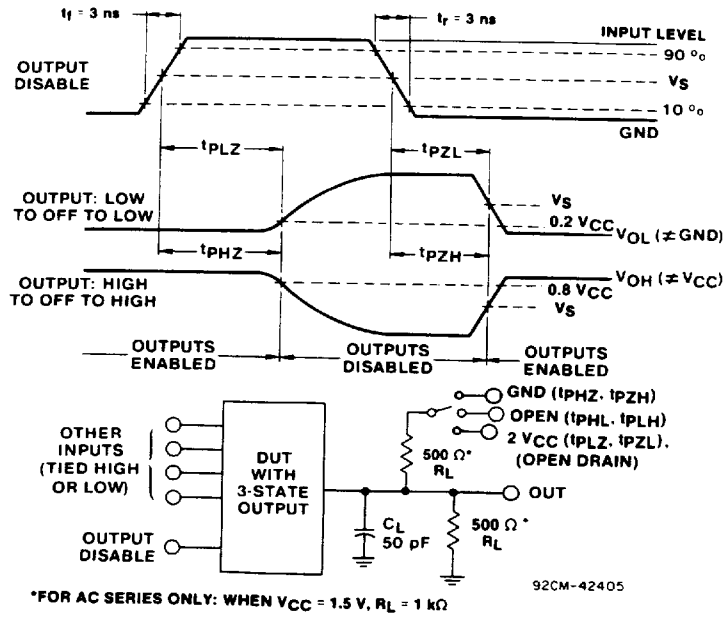

Fig. 1 - Three-state propagation delay waveforms and test circuit.

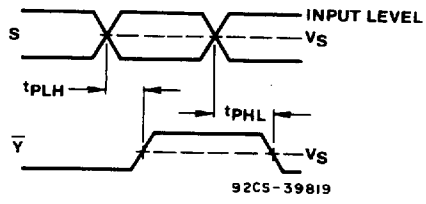

Fig. 2 - Select to output propagaton delays (AC/ACT258).

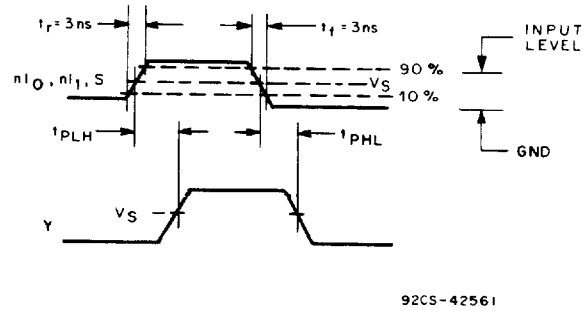

Fig. 3 - Inputs or select to output propagation delays (AC/ACT257).

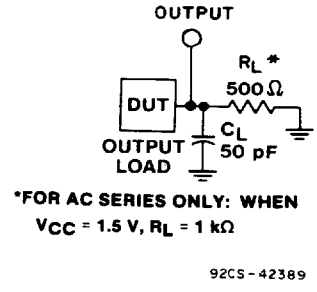

Fig. 4 - Test circuit.

	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}