

CD74AC257, CD74ACT257, CD74ACT258

Quad 2-Input Multiplexer with Three-State Outputs

Features

- CD74AC257, CD74ACT257 Non-Inverting Outputs
 - CD74ACT258 Inverting Outputs
 - Buffered Inputs
 - Typical Propagation Delay
 - 4.4ns at $V_{CC} = 5V$, $T_A = 25^{\circ}C$, $C_L = 50pF$
 - Exceeds 2kV ESD Protection MIL-STD-883, Method 3015
 - SCR-Latchup-Resistant CMOS Process and Circuit Design
 - Speed of Bipolar FAST™/AS/S with Significantly Reduced Power Consumption
 - Balanced Propagation Delays
 - AC Types Feature 1.5V to 5.5V Operation and Balanced Noise Immunity at 30% of the Supply
 - $\pm 24mA$ Output Drive Current
 - Fanout to 15 FAST™ ICs
- Drives 50 Ω Transmission Lines

Description

The CD74AC257, CD74ACT257 and CD74ACT258 are quad 2-input multiplexers with three-state outputs that utilize the Harris Advanced CMOS Logic 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.

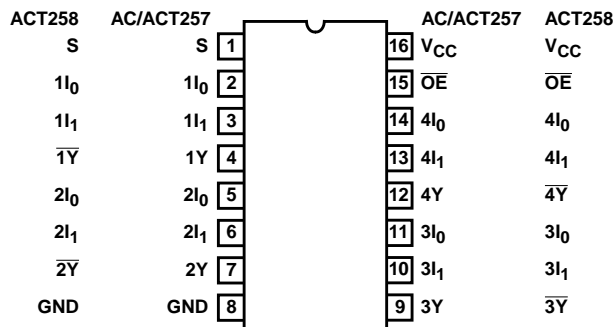
Moving data from two groups of registers to four common output buses is a common use of the CD74AC257, CD74ACT257 and CD74ACT258. The state of the Select input determines the particular register from which the data comes. The CD74AC257, CD74ACT257 and CD74ACT258 can also be used as function generators.

Ordering Information

PART NUMBER	TEMP. RANGE ($^{\circ}C$)	PACKAGE	PKG. NO.
CD74AC257E	0 to 70 $^{\circ}C$, -40 to 85, -55 to 125	16 Ld PDIP	E16.3
CD74ACT257E	0 to 70 $^{\circ}C$, -40 to 85, -55 to 125	16 Ld PDIP	E16.3
CD74ACT258E	0 to 70 $^{\circ}C$, -40 to 85, -55 to 125	16 Ld PDIP	E16.3
CD74AC257M	0 to 70 $^{\circ}C$, -40 to 85, -55 to 125	16 Ld SOIC	M16.15
CD74ACT257M	0 to 70 $^{\circ}C$, -40 to 85, -55 to 125	16 Ld SOIC	M16.15
CD74ACT258M	0 to 70 $^{\circ}C$, -40 to 85, -55 to 125	16 Ld SOIC	M16.15

Pinout

CD74AC257, CD74ACT257, CD74ACT258
(PDIP, SOIC)
TOP VIEW

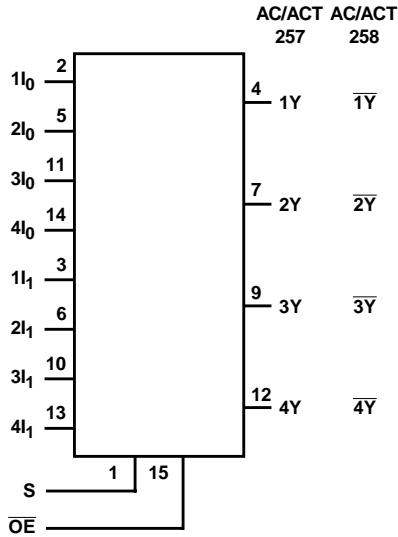


NOTES:

1. When ordering, use the entire part number. Add the suffix 96 to obtain the variant in the tape and reel.
2. Wafer and die for this part number is available which meets all electrical specifications. Please contact your local sales office or Harris customer service for ordering information.

CD74AC257, CD74ACT257, CD74ACT258

Functional Diagram



TRUTH 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

CD74AC257, CD74ACT257, CD74ACT258

Absolute Maximum Ratings

DC Supply Voltage, V_{CC}	-0.5V to 6V
DC Input Diode Current, I_{IK}	
For $V_I < -0.5V$ or $V_I > V_{CC} + 0.5V$	$\pm 20mA$
DC Output Diode Current, I_{OK}	
For $V_O < -0.5V$ or $V_O > V_{CC} + 0.5V$	$\pm 50mA$
DC Output Source or Sink Current per Output Pin, I_O	
For $V_O > -0.5V$ or $V_O < V_{CC} + 0.5V$	$\pm 50mA$
DC V_{CC} or Ground Current, I_{CC} or I_{GND} (Note 3)	$\pm 100mA$

Thermal Information

Thermal Resistance (Typical, Note 5)	θ_{JA} ($^{\circ}C/W$)
PDIP Package	—
SOIC Package	—
Maximum Junction Temperature (Plastic Package)	$150^{\circ}C$
Maximum Storage Temperature Range	$-65^{\circ}C$ to $150^{\circ}C$
Maximum Lead Temperature (Soldering 10s)	$300^{\circ}C$

Operating Conditions

Temperature Range, T_A	$-55^{\circ}C$ to $125^{\circ}C$
Supply Voltage Range, V_{CC} (Note 4)	
AC Types	1.5V to 5.5V
ACT Types	4.5V to 5.5V
DC Input or Output Voltage, V_I , V_O	0V to V_{CC}
Input Rise and Fall Slew Rate, dt/dv	
AC Types, 1.5V to 3V	50ns (Max)
AC Types, 3.6V to 5.5V	20ns (Max)
ACT Types, 4.5V to 5.5V	10ns (Max)

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTES:

3. For up to 4 outputs per device, add $\pm 25mA$ for each additional output.
4. Unless otherwise specified, all voltages are referenced to ground.
5. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

DC Electrical Specifications

PARAMETER	SYMBOL	TEST CONDITIONS		V_{CC} (V)	25 $^{\circ}C$		-40 $^{\circ}C$ TO 85 $^{\circ}C$		-55 $^{\circ}C$ TO 125 $^{\circ}C$		UNITS	
		V_I (V)	I_O (mA)		MIN	MAX	MIN	MAX	MIN	MAX		
												V_I (V)
AC TYPES												
High Level Input Voltage	V_{IH}	-	-	1.5	1.2	-	1.2	-	1.2	-	V	
				3	2.1	-	2.1	-	2.1	-	V	
				5.5	3.85	-	3.85	-	3.85	-	V	
Low Level Input Voltage	V_{IL}	-	-	1.5	-	0.3	-	0.3	-	0.3	V	
				3	-	0.9	-	0.9	-	0.9	V	
				5.5	-	1.65	-	1.65	-	1.65	V	
High Level Output Voltage	V_{OH}	V_{IH} or V_{IL}	-0.05	-0.05	1.5	1.4	-	1.4	-	1.4	-	V
			-0.05	-0.05	3	2.9	-	2.9	-	2.9	-	V
			-0.05	-0.05	4.5	4.4	-	4.4	-	4.4	-	V
			-4	-4	3	2.58	-	2.48	-	2.4	-	V
			-24	-24	4.5	3.94	-	3.8	-	3.7	-	V
			-75 (Note 6, 7)	-75	5.5	-	-	3.85	-	-	-	V
			-50 (Note 6, 7)	-50	5.5	-	-	-	-	3.85	-	V

CD74AC257, CD74ACT257, CD74ACT258

DC Electrical Specifications (Continued)

PARAMETER	SYMBOL	TEST CONDITIONS		V _{CC} (V)	25°C		-40°C TO 85°C		-55°C TO 125°C		UNITS
		V _I (V)	I _O (mA)		MIN	MAX	MIN	MAX	MIN	MAX	
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	V
			0.05	4.5	-	0.1	-	0.1	-	0.1	V
			12	3	-	0.36	-	0.44	-	0.5	V
			24	4.5	-	0.36	-	0.44	-	0.5	V
			75 (Note 6, 7)	5.5	-	-	-	1.65	-	-	V
			50 (Note 6, 7)	5.5	-	-	-	-	-	1.65	V
Input Leakage Current	I _I	V _{CC} or GND	-	5.5	-	±0.1	-	±1	-	±1	µA
Three-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
ACT TYPES											
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	-	V
			-75 (Note 6, 7)	5.5	-	-	3.85	-	-	-	V
			-50 (Note 6, 7)	5.5	-	-	-	-	3.85	-	V
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	V
			75 (Note 6, 7)	5.5	-	-	-	1.65	-	-	V
			50 (Note 6, 7)	5.5	-	-	-	-	-	1.65	V
Input Leakage Current	I _I	V _{CC} or GND	-	5.5	-	±0.1	-	±1	-	±1	µA
Three-State or 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 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

NOTES:

- 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 50Ω transmission-line-drive capability at 85°C, 75Ω at 125°C.

CD74AC257, CD74ACT257, CD74ACT258

ACT Input Load Table

INPUT	UNIT LOAD
Data	0.83
S	1.27
OE	1.27

NOTE: Unit load is ΔI_{CC} limit specified in DC Electrical Specifications Table, e.g., 2.4mA max at 25°C.

Switching Specifications Input $t_r, t_f = 3ns, C_L = 50pF$ (Worst Case)

PARAMETER	SYMBOL	V _{CC} (V)	-40°C TO 85°C			-55°C TO 125°C			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
ACT TYPES									
Propagation Delay, In to Y CD74AC/ACT257	t _{PLH} , t _{PHL}	1.5	-	-	106	-	-	117	ns
		3.3 (Note 9)	3.3	-	11.8	3.3	-	13	ns
		5 (Note 10)	2.4	-	8.5	2.3	-	9.3	ns
Propagation Delay, S to Y CD74AC/ACT257	t _{PLH} , t _{PHL}	1.5	-	-	153	-	-	168	ns
		3.3	4.8	-	17.1	4.7	-	18.8	ns
		5	3.5	-	12.2	3.4	-	13.4	ns
Propagation Delay, OE to Y CD74AC/ACT257	t _{PLZ} , t _{PHZ} , t _{PZL} , t _{PZH}	1.5	-	-	167	-	-	184	ns
		3.3	5.3	-	18.7	5.2	-	20.6	ns
		5	3.8	-	13.4	3.7	-	14.7	ns
Propagation Delay, In to Y CD74AC/ACT258	t _{PLH} , t _{PHL}	1.5	-	-	91	-	-	100	ns
		3.3	2.9	-	10.2	2.8	-	11.2	ns
		5	2.1	-	7.3	2	-	8	ns
Propagation Delay, S to Y CD74AC/ACT258	t _{PLH} , t _{PHL}	1.5	-	-	153	-	-	168	ns
		3.3	4.8	-	17.1	4.7	-	18.8	ns
		5	3.5	-	12.2	3.4	-	13.4	ns
Propagation Delay, OE to Y CD74AC/ACT258	t _{PLZ} , t _{PHZ} , t _{PZL} , t _{PZH}	1.5	-	-	167	-	-	184	ns
		3.3	5.3	-	18.7	5.2	-	20.6	ns
		5	3.8	-	13.4	3.7	-	14.7	ns
Three-State Output Capacitance	C _O	-	-	-	15	-	-	15	pF
Input Capacitance	C _I	-	-	-	10	-	-	10	pF
Power Dissipation Capacitance	C _{PD} (Note 11)	-	-	130	-	-	130	-	pF
ACT TYPES									
Propagation Delay, In to Y CD74AC/ACT257	t _{PLH} , t _{PHL}	5 (Note 10)	2.8	-	9.7	2.7	-	10.7	ns
Propagation Delay, S to Y CD74AC/ACT257	t _{PLH} , t _{PHL}	5	4	-	14	3.9	-	15.4	ns

CD74AC257, CD74ACT257, CD74ACT258

Switching Specifications Input $t_r, t_f = 3\text{ns}$, $C_L = 50\text{pF}$ (Worst Case) (Continued)

PARAMETER	SYMBOL	V_{CC} (V)	-40°C TO 85°C			-55°C TO 125°C			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
Propagation Delay, \overline{OE} to Y CD74AC/ACT257	$t_{PLZ}, t_{PHZ}, t_{PZL}, t_{PZH}$	5	4.1	-	14.6	4	-	16.1	ns
Propagation Delay, In to \overline{Y} CD74AC/ACT258	t_{PLH}, t_{PHL}	5	2.4	-	8.5	2.3	-	9.3	ns
Propagation Delay, S to Y CD74AC/ACT258	t_{PLH}, t_{PHL}	5	4	-	14	3.9	-	15.4	ns
Propagation Delay, \overline{OE} to Y CD74AC/ACT258	$t_{PLZ}, t_{PHZ}, t_{PZL}, t_{PZH}$	5	4.1	-	14.6	4	-	16.1	ns
Three-State Output Capacitance	C_O	-	-	-	15	-	-	15	pF
Input Capacitance	C_I	-	-	-	10	-	-	10	pF
Power Dissipation Capacitance	C_{PD} (Note 11)	-	-	130	-	-	130	-	pF

NOTES:

8. Limits tested 100%.
9. 3.3V Min is at 3.6V, Max is at 3V.
10. 5V Min is at 5.5V, Max is at 4.5V.
11. C_{PD} is used to determine the dynamic power consumption per multiplexer.
 AC: $P_D = C_{PD} V_{CC}^2 f_i + \sum (C_L V_{CC}^2 f_o)$
 ACT: $P_D = C_{PD} V_{CC}^2 f_i + \sum (C_L V_{CC}^2 f_o) + V_{CC} \Delta I_{CC}$ where f_i = input frequency, f_o = output frequency, C_L = output load capacitance, V_{CC} = supply voltage.

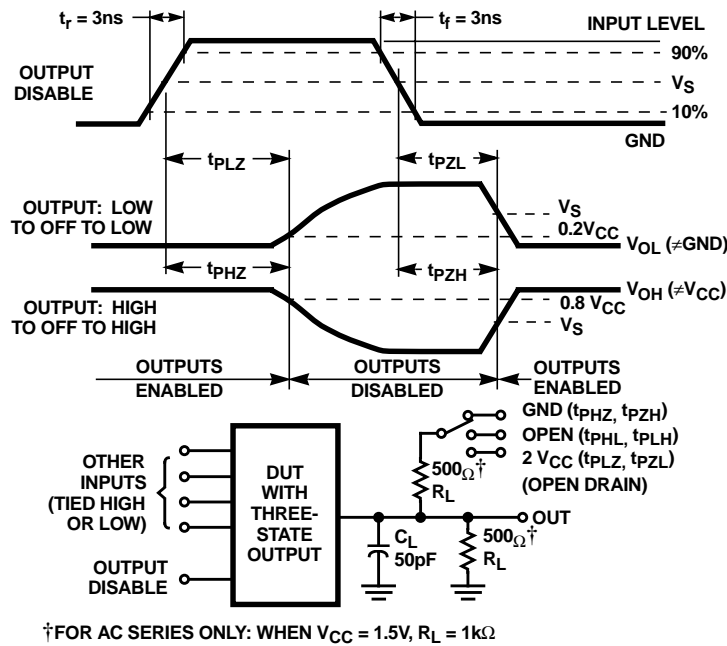


FIGURE 1. THREE-STATE PROPAGATION DELAY TIMES AND TEST CIRCUIT

CD74AC257, CD74ACT257, CD74ACT258

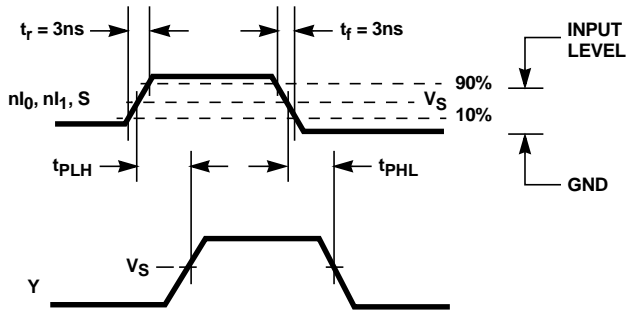


FIGURE 2. INPUTS OR SELECT TO OUTPUT PROPAGATION DELAYS (AC/ACT257)

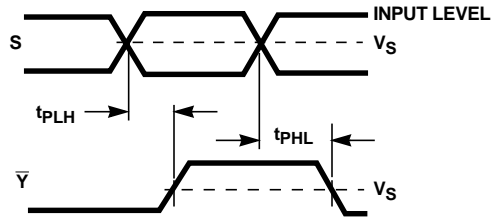
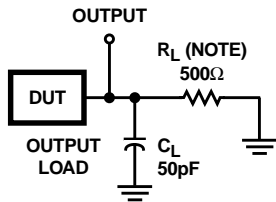


FIGURE 3. SELECT TO OUTPUT PROPAGATION DELAYS (ACT258)



NOTE: For AC Series Only: When $V_{CC} = 1.5V$, $R_L = 1k\Omega$.

	CD74AC	CD74ACT
Input Level	V_{CC}	3V
Input Switching Voltage, V_S	$0.5 V_{CC}$	1.5V
Output Switching Voltage, V_S	$0.5 V_{CC}$	$0.5 V_{CC}$

FIGURE 4. PROPAGATION DELAY TIMES

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.