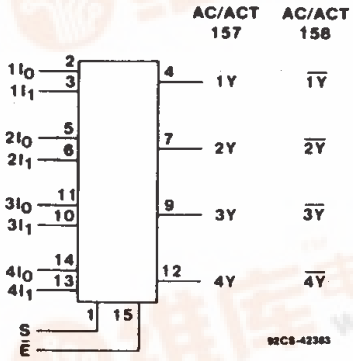
CD54/74AC157, CD54/74AC158
CD54/74ACT157, CD54/74ACT158

TEXAS INSTRUMENTS

Data sheet acquired from Harris Semiconductor
SCHS283



FUNCTIONAL DIAGRAM

Quad 2-Input Multiplexers

AC/ACT157 - Non-Inverting
AC/ACT158 - Inverting

Type Features:

- *Buffered inputs*
- *Typical propagation delay (AC/ACT158): 3.8 ns @ V_{CC} = 5 V, T_A = 25°C, C_L = 50 pF*

The RCA CD54/74AC157, -158 and CD54/74ACT157, -158 quad 2-input multiplexers use the RCA ADVANCED CMOS technology. Both circuits can select four bits of data from two sources under the control of a common select input (S). The Enable input ($\overline{E}$) is active LOW. When $\overline{E}$ is HIGH, all of the outputs of the 158 are forced HIGH and in the 157, all of the outputs are forced LOW, regardless of all other input conditions.

The CD74AC/ACT157 and CD74AC/ACT158 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°C); Industrial (-40 to +85°C); and Extended Industrial/Military (-55 to +125°C).

The CD54AC157, -158 and CD54ACT157, -158, available in chip form (H suffix), are operable over the -55 to +125°C temperature range.

Family Features:

- *Exceeds 2-kV 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 1.5-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*

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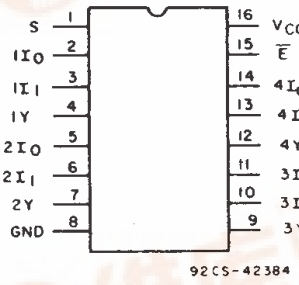
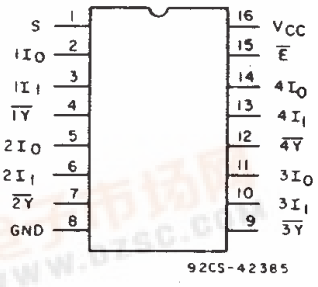
TRUTH TABLE

Enable	Select Input	Data Inputs		Output	
				157	158
$\overline{E}$	S	I_0	I_1	Y	$\overline{Y}$
H	X	X	X	L	H
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, L = Low level, X = Don't care



CD54/74AC/ACT157



CD54/74AC/ACT158

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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:

CHARACTERISTIC	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.

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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
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.

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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
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*	
	157	158
I (All)	0.37	0.37
$\overline{E}$	0.83	0.83
S	1.33	1.33

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

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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: Data to Output	(157)	t_{PLH} t_{PHL}	1.5 3.3* 5†	— 3.2 2.2	97 10.8 7.7	— 3 2.1	106 11.9 8.5	ns
$\overline{\text{Enable}}$ to Output	(157)	t_{PLH} t_{PHL}	1.5 3.3 5	— 5.1 3.6	154 17.2 12.3	— 4.7 3.4	169 18.9 13.5	ns
Select to Output	(157)	t_{PLH} t_{PHL}	1.5 3.3 5	— 5.4 3.8	164 18.5 13.2	— 5.1 3.6	180 20.3 14.5	ns
Data to Output	(158)	t_{PLH} t_{PHL}	1.5 3.3 5	— 3 2.2	91 12.8 7.3	— 2.8 2	100 11.2 8	ns
$\overline{\text{Enable}}$ to Output	(158)	t_{PLH} t_{PHL}	1.5 3.3 5	— 4.5 3.2	135 15.2 10.8	— 4.2 3	149 16.7 11.9	ns
Select to Output	(158)	t_{PLH} t_{PHL}	1.5 3.3 5	— 4.9 3.5	147 16.5 11.7	— 4.5 3.2	161 18.1 12.9	ns
Power Dissipation Capacitance	(157) (158)	C_{PD}§	—	156 Typ. 149 Typ.		156 Typ. 149 Typ.		pF
Input Capacitance		C_I	—	—	10	—	10	pF

SWITCHING CHARACTERISTIS: 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: Data to Output	(157)	t_{PLH} t_{PHL}	5†	2.5	8.6	2.4	9.5	ns
$\overline{\text{Enable}}$ to Output	(157)	t_{PLH} t_{PHL}	5	3.6	12.3	3.4	13.5	ns
Select to Output	(157)	t_{PLH} t_{PHL}	5	3.8	13.2	3.6	14.5	ns
Data to Output	(158)	t_{PLH} t_{PHL}	5	2.4	8.4	2.3	9.2	ns
$\overline{\text{Enable}}$ to Output	(158)	t_{PLH} t_{PHL}	5	3.3	11.3	3.1	12.4	ns
Select to Output	(158)	t_{PLH} t_{PHL}	5	3.6	12.3	3.4	13.5	ns
Power Dissipation Capacitance	(157) (158)	C_{PD}§	—	156 Typ. 149 Typ.		156 Typ. 149 Typ.		pF
Input Capacitance		C_I	—	—	10	—	10	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 function.
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

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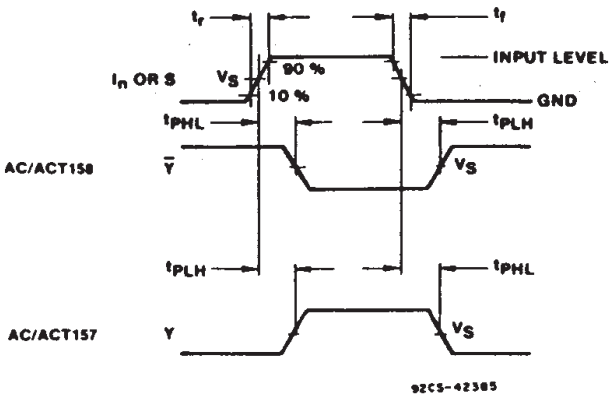

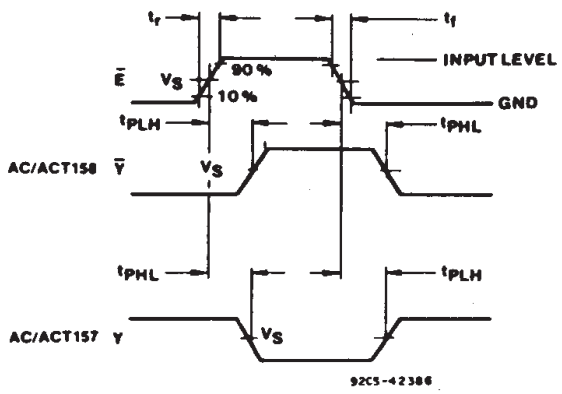

	CD54/74AC	CD54/74ACT
Input Level	V_{CC}	3 V
Input Switching Voltage, V_S	0.5 V_{CC}	1.5 V
Output Switching Voltage, V_S	0.5 V_{CC}	0.5 V_{CC}

Fig. 3 - Inputs or select to output propagation delays.

Fig. 4 - $\overline{\text{Enable}}$ to output propagation delays.

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