

# GD54/74HC298, GD54/74HCT298

## QUAD 2-INPUT MULTIPLEXERS WITH OUTPUT LATCH

### General Description

These devices are identical in pinout to the 54/74LS298. They select one of two 4-bit words to be stored in the output latch according to clock timing. When the word select input is taken low word 1 (A<sub>1</sub>, B<sub>1</sub>, C<sub>1</sub> and D<sub>1</sub>) is presented to the inputs of the flip-flops, and when it is taken high word 2 (A<sub>2</sub>, B<sub>2</sub>, C<sub>2</sub> and D<sub>2</sub>) is presented to the inputs of the flip-flops. The selected word is clocked to the output terminals on the falling edge of the clock pulse. This device is the equivalent of a quad 2-input multiplexer followed by a 4-bit edge-triggered latch. These devices are characterized for operation over wide temperature ranges to meet industry and military specifications.

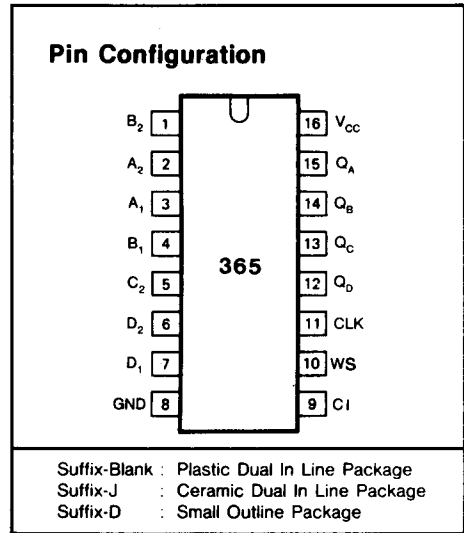
### Features

- Low Power consumption characteristic of CMOS devices
- Output drive capability: 10 LS TTL Loads Min.
- Operating speed superior to LS TTL
- Wide operating voltage range: for HC 2 to 6 volts  
for HCT 4.5 to 5.5 volts
- Low input current: 1μA Max.
- Low quiescent current: 80μA Max. (74HC)
- High noise immunity characteristic of CMOS
- Diode protection on all inputs

### Function Table

INPUTS		OUTPUTS			
WORD SELECT	CLOCK	Q <sub>A</sub>	Q <sub>B</sub>	Q <sub>C</sub>	Q <sub>D</sub>
L	↓	a1	b1	c1	d1
H	↓	a2	b2	c2	d2
X	H	Q <sub>A0</sub>	Q <sub>B0</sub>	Q <sub>C0</sub>	C <sub>D0</sub>

H = High level (steady state)  
 L = LOW level (steady state)  
 X = Irrelevant (any input, including transitions)  
 ↓ = transition from high to low level  
 a1, a2, etc. = the level of steady-state input at A1, A2, etc.  
 Q<sub>A0</sub>, Q<sub>B0</sub>, etc. = the level of Q<sub>A</sub>, Q<sub>B</sub>, etc. entered on the most-recent, ↓ transition of the clock input.



## Logic Diagram

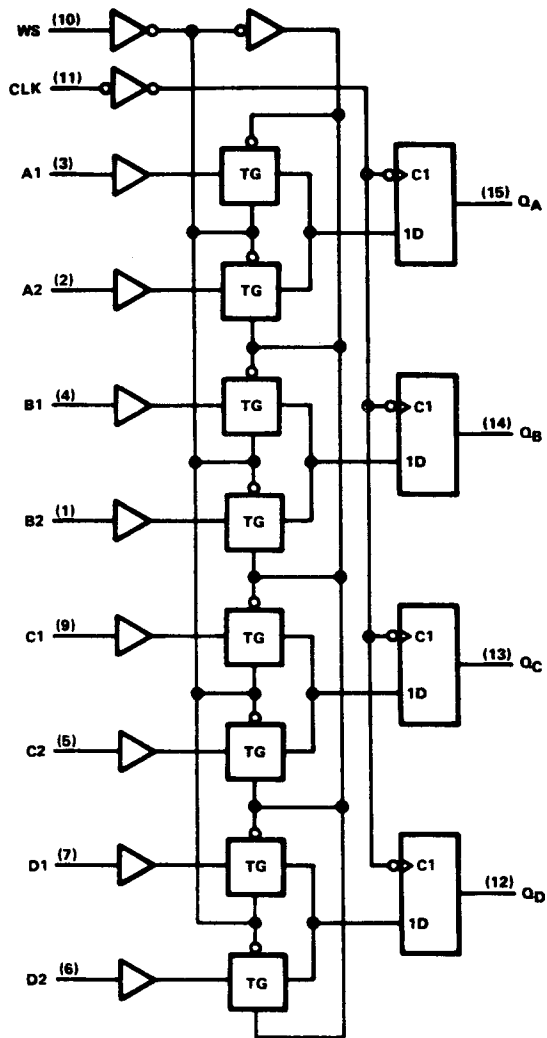


Fig. 1 Logic diagram

**Absolute Maximum Ratings**

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CC}$	DC Supply voltage		-0.5	+7	V
$I_{IK}, I_{OK}$	DC input or output diode current	for $V_I < -0.5$ or $V_I > V_{CC} + 0.5V$		20	mA
$I_O$	DC output source or sink current	for $-0.5V < V_O < V_{CC} + 0.5V$		25	mA
$I_{CC}$	DC $V_{CC}$ or GND current			50	mA
$T_{stg}$	Storage temperature range		-65	150	°C
$P_D$	Power dissipation per package	above +70°C: derate linearly with 8mW/K		500	mW
$T_L$	Lead temperature	At distance 1/16 ± 1/32 in. from case for 60 sec(CERAMIC) 10 sec(PLASTIC)		300 260	°C

**Recommended Operating Conditions**

CHARACTERISTIC	LIMITS		UNITS
	MIN.	MAX.	
Supply-Voltage Range $V_{CC}$ : GD54/74HC Types GD54/74HCT Types	2 4.5	6 5.5	V
DC Input or Output Voltage $V_I, V_O$	0	$V_{CC}$	V
Operating Temperature $T_A$ : GD74 Types GD54 Types	-40 -55	+85 +125	°C
Input Rise and Fall times $t_r, t_f$ : GD54/74HC Types at 2V at 4.5V at 6V GD54/74HCT Types at 4.5 V		1000 500 400 500	ns

DC Electrical Characteristics for HC

SYMBOL	PARAMETER	TEST CONDITION	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			GD74HC298		GD54HC298		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.		
V <sub>IH</sub>	HIGH level Voltage		2.0	1.5			1.5		1.5		V	
			4.5	3.15			3.15		3.15			
			6.0	4.2			4.2		4.2			
V <sub>IL</sub>	LOW level input voltage		2.0			0.3		0.3		0.3	V	
			4.5			0.9		0.9		0.9		
			6.0			1.2		1.2		1.2		
V <sub>OH</sub>	HIGH level output voltage	V <sub>IN</sub> = V <sub>IH</sub>	I <sub>OH</sub> = -20μA	2.0	1.9	2.0		1.9		1.9	V	
				4.5	4.4	4.5		4.4		4.4		
				6.0	5.9	6.0		5.9		5.9		
		or V <sub>IL</sub>	I <sub>OH</sub> = -4mA I <sub>OH</sub> = -5.2mA	4.5	3.98	4.3		3.84		3.7		
				6.0	5.48	5.2		5.34		5.2		
V <sub>OL</sub>	LOW level output voltage	V <sub>IN</sub> = V <sub>IH</sub>	I <sub>OL</sub> = 20μA	2.0			0.1		0.1		V	
				4.5			0.1		0.1			0.1
				6.0			0.1		0.1			0.1
		or V <sub>IL</sub>	I <sub>OL</sub> = 4mA I <sub>OL</sub> = 5.2mA	4.5		0.17	0.26		0.33			0.4
				6.0		0.15	0.26		0.33			0.4
I <sub>IN</sub>	Input leakage Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	6.0			0.1		1.0		1.0	μA	
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND I <sub>out</sub> = 0μA	6.0			8		80		160	μA	

DC Electrical Characteristics for HCT

SYMBOL	PARAMETER	TEST CONDITION	V <sub>CC</sub> (V)	T <sub>A</sub> = 25°C			GD74HCT298		GD54HCT298		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.		
V <sub>IH</sub>	HIGH level input Voltage		4.5 to 5.5	2.0			2.0		2.0		V	
V <sub>IL</sub>	LOW level input voltage		4.5 to 5.5			0.8		0.8		0.8	V	
V <sub>OH</sub>	HIGH level output voltage	V <sub>IN</sub> = V <sub>IH</sub>	I <sub>OH</sub> = -20μA	4.5	4.4	4.5		4.4		4.4	V	
				4.5	3.98	4.3		3.84		3.7		
				6.0								
		or V <sub>IL</sub>	I <sub>OH</sub> = -4mA	4.5			0.1		0.1			0.1
				4.5		0.17	0.26		0.33			0.4
				6.0								
I <sub>IN</sub>	Input leakage Current	V <sub>IN</sub> = V <sub>CC</sub> or GND	5.5			0.1		1.0		1.0	μA	
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = V <sub>CC</sub> or GND I <sub>out</sub> = 0μA	5.5			8		80		160	μA	

Timing Requirements for HC:  $t_r=t_f=6ns$   $C_L=50$  pF

SYMBOL	PARAMETER		V <sub>CC</sub> (V)	T <sub>A</sub> =25°C			GD74HC298		GD54HC298		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
t <sub>w</sub>	Pulse width	CLK high or low	2.0	75			95		115		ns
			4.5	15			19		23		
			6.0	13			16		20		
t <sub>su</sub>	Setup time	WS, Data before CLK ↓	2.0	80			105		115		ns
			4.5	16			21		25		
			6.0	14			18		21		
t <sub>h</sub>	Hold time	WS, Data after CLK ↓	2.0	0			0		0		ns
			4.5	0			0		0		
			6.0	0			0		0		

AC Characteristics for HC:  $t_r=t_f=6ns$   $C_L=50$  pF

SYMBOL	PARAMETER		V <sub>CC</sub> (V)	T <sub>A</sub> =25°C			GD74HC298		GD54HC298		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
f <sub>max</sub>	Maximum Clock Pulse Frequency		2.0	6.5			5.5		4.3		MHz
			4.5	33			27		22		
			6.0	38			31		25		
t <sub>PLH</sub> / t <sub>PHL</sub>	Propagation Delay Time CLK to Q <sub>n</sub>		2.0		46	120		155		190	ns
			4.5		15	25		31		38	
			6.0		12	21		21		31	
t <sub>TLH</sub> / t <sub>THL</sub>	Output Transition Time		2.0		19	75		95		110	ns
			4.5		7	15		19		22	
			6.0		6	13		16		19	

AC Waveforms

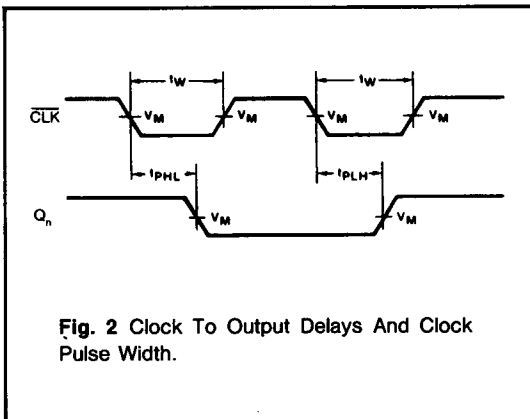


Fig. 2 Clock To Output Delays And Clock Pulse Width.

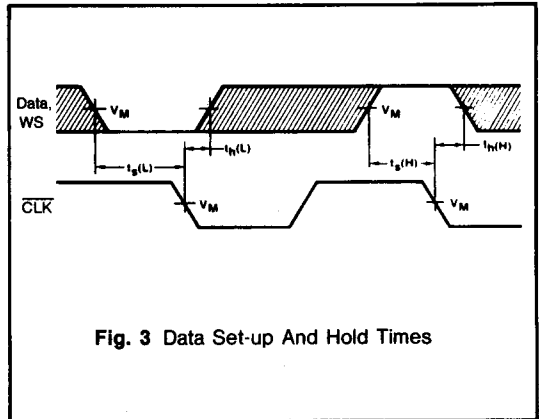


Fig. 3 Data Set-up And Hold Times

Note to AC waveforms

- (1) HC : V<sub>M</sub>=50%; V<sub>L</sub>=GND to V<sub>CC</sub>.
- HCT : V<sub>M</sub>=1.3V; V<sub>L</sub>=GND to 3V.

## Timing Requirements for HCT: $t_r=t_f=6\text{ns}$ $C_L=50\text{ pF}$

SYMBOL	PARAMETER		$V_{CC}$ (V)	$T_A=25^\circ\text{C}$			GD74HCT298		GD54HCT298		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
$t_w$	Pulse width	CLK high or low	4.5	19			23		27	ns	
$t_{su}$	Setup time	WS, Data before CLK $\downarrow$	4.5	17			21		26	ns	
$t_h$	Hold time	WS, Data after CLK $\downarrow$	4.5	17			21		26	ns	

## AC Characteristics for HCT: $t_r=t_f=6\text{ns}$ $C_L=50\text{ pF}$

SYMBOL	PARAMETER		$V_{CC}$ (V)	$T_A=25^\circ\text{C}$			GD74HCT298		GD54HCT298		UNIT
				MIN.	TYP.	MAX.	MIN.	MAX.	MIN.	MAX.	
$f_{max}$	Maximum Clock Pulse Frequency		4.5	30			26		20	MHz	
$t_{PLH}/$ $t_{PHL}$	Propagation Delay Time CLK to $Q_n$		4.5		19	29	35		42	ns	
$t_{TLH}/$ $t_{THL}$	Output Transition Time		4.5		7	15	19		22	ns	

## Typical Clear, Shift, and Clear Sequences

