

TYPES SN54ALS677, SN54ALS678, SN74ALS677, SN74ALS678 ADDRESS COMPARATORS

D2661, JUNE 1982—REVISED DECEMBER 1983

- 'ALS677 is a 16-bit to 4-Bit Comparator with Enable
- 'ALS678 is a 16-Bit to 4-Bit Comparator with Latch
- Package Options Include Both Plastic and Ceramic Chip Carriers in Addition to Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

description

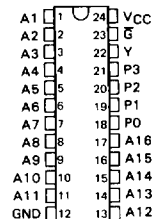
The 'ALS677 and 'ALS678 address comparators simplify addressing of memory boards and/or other peripheral devices. The four P inputs are normally hard wired with a preprogrammed address. An internal decoder determines what input information applied to the 16 A inputs must be low or high to cause a low state at the output (Y). For example, a positive-logic bit combination of 0111 (decimal 7) at the P input determines that inputs A1 through A7 must be low and that inputs A8 through A16 must be high to cause the output to go low. Equality of the address applied at the A inputs to the preprogrammed address is indicated by the output being low.

The 'ALS677 features an enable input (G). When G is low, the device is enabled. When G is high, the device is disabled and the output is high regardless of the A and P inputs. The 'ALS678 features a transparent latch and a latch enable input (C). When C is high, the device is in the transparent mode. When C is low, the previous logic state of Y is latched.

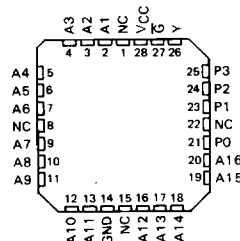
The SN54ALS677 and SN54ALS678 are characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ALS677 and SN74ALS678 are characterized for operation from 0°C to 70°C .

SN54ALS677 . . . JT PACKAGE
SN74ALS677 . . . NT PACKAGE

(TOP VIEW)

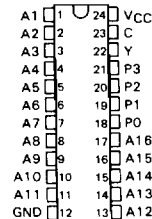


SN54ALS677 . . . FH PACKAGE
SN74ALS677 . . . FN PACKAGE



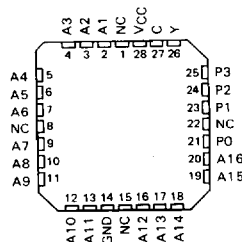
SN54ALS678 . . . JT PACKAGE
SN74ALS678 . . . NT PACKAGE

(TOP VIEW)



SN54ALS678 . . . FH PACKAGE
SN74ALS678 . . . FN PACKAGE

(TOP VIEW)



2

ALS AND AS CIRCUITS

TYPES SN54ALS677, SN54ALS678, SN74ALS677, SN74ALS678
ADDRESS COMPARATORS

FUNCTION TABLE

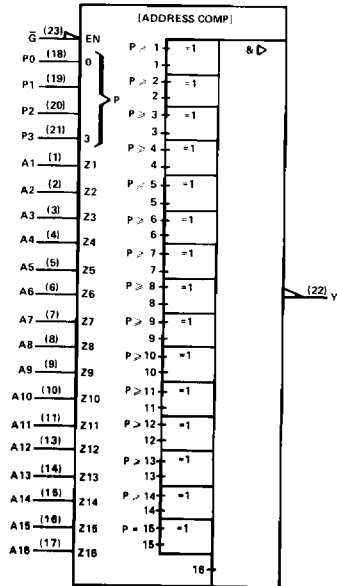
'ALS677 \bar{G}	'ALS678 C	INPUTS COMMON TO 'ALS677 AND 'ALS678																OUTPUT Y				
		P3	P2	P1	P0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12		A13	A14	A15	A16
L	H	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L
L	H	L	L	L	H	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L
L	H	L	L	H	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	L
L	H	L	L	H	H	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	L
L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	L
L	H	L	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
L	H	L	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
H	L	All other combinations																				H
		'ALS677: Any combination																				H
		'ALS678: Any combination																				Latched

logic symbols

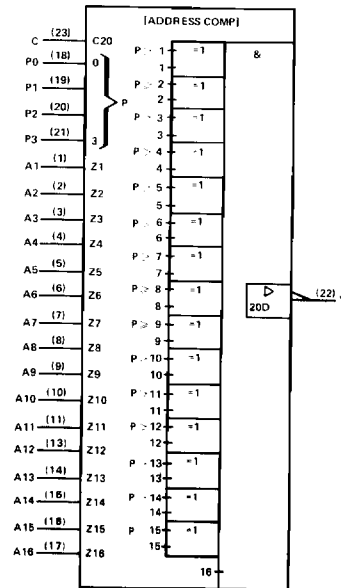
2

ALS AND AS CIRCUITS

'ALS677



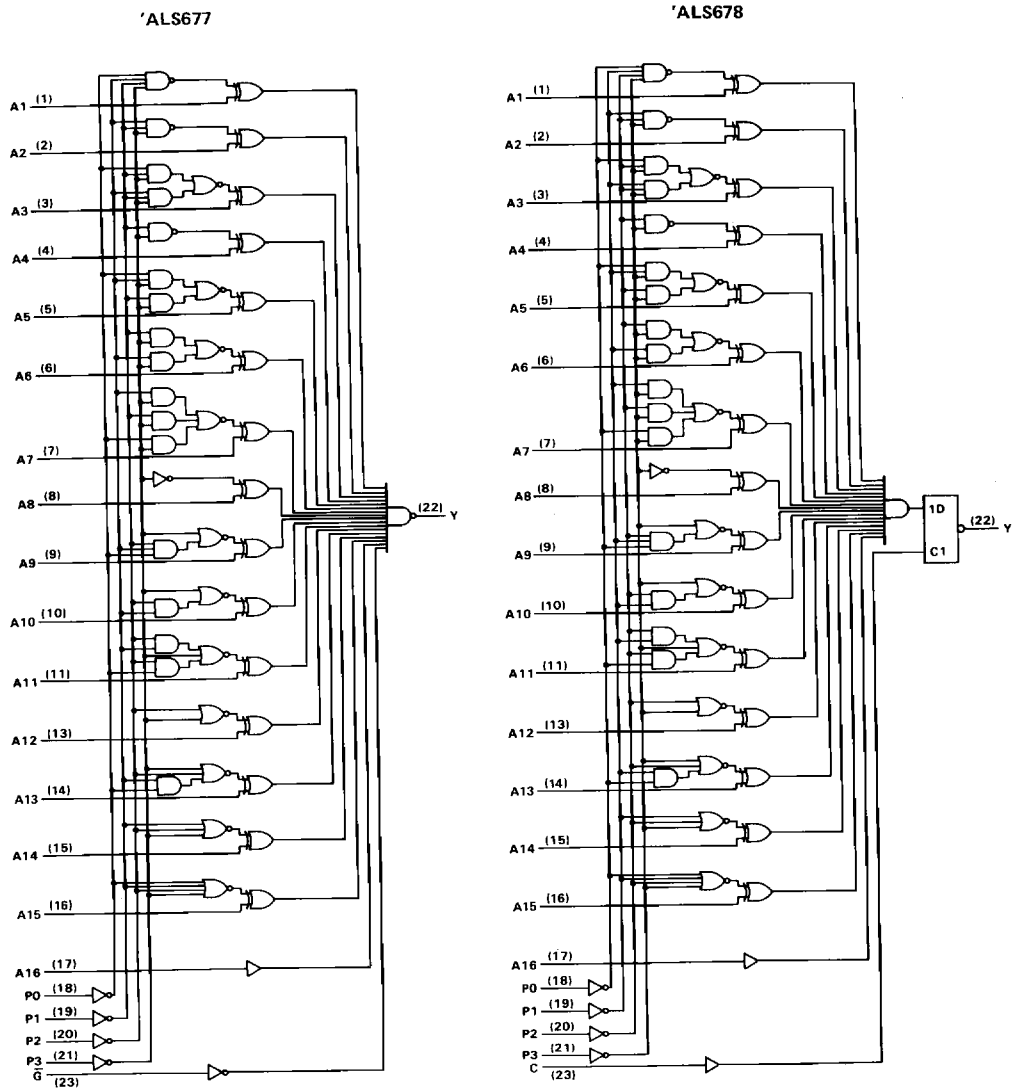
'ALS678



Pin numbers shown are for JT and NT packages.

TYPES SN54ALS677, SN54ALS678, SN74ALS677, SN74ALS678,
ADDRESS COMPARATORS

logic diagrams (positive logic)



2

ALS AND AS CIRCUITS

Pin numbers shown are for JT and NT packages.

TYPES SN54ALS677, SN54ALS678, SN74ALS677, SN74ALS678 ADDRESS COMPARATORS

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC}	7 V
Input voltage	7 V
Operating free-air temperature range: SN54ALS677, SN54ALS678	-55 °C to 125 °C
SN74ALS677, SN74ALS678	0 °C to 70 °C
Storage temperature range	-65 °C to 150 °C

recommended operating conditions

	SN54ALS677 SN54ALS678			SN74ALS677 SN74ALS678			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC} Supply voltage	4.5	5	5.5	4.5	5	5.5	V
V_{IH} High-level input voltage	2			2			V
V_{IL} Low-level input voltage			0.8			0.8	V
I_{OH} High-level output current			-1			-2.6	mA
I_{OL} Low-level output current			12			24	mA
T_A Operating free-air temperature	-55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	SN54ALS677 SN54ALS678			SN74ALS677 SN74ALS678			UNIT
		MIN	TYP [†]	MAX	MIN	TYP [†]	MAX	
		V_{IK}	$V_{CC} = 4.5 \text{ V}, I_I = -18 \text{ mA}$			-1.5		
V_{OH}	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}, I_{OH} = -0.4 \text{ mA}$	$V_{CC}-2$		$V_{CC}-2$				V
	$V_{CC} = 4.5 \text{ V}, I_{OH} = -1 \text{ mA}$	2.4	3.3					
	$V_{CC} = 4.5 \text{ V}, I_{OH} = -2.6 \text{ mA}$				2.4	3.2		
V_{OL}	$V_{CC} = 4.5 \text{ V}, I_{OL} = 12 \text{ mA}$	0.25	0.4		0.25	0.4	V	
	$V_{CC} = 4.5 \text{ V}, I_{OL} = 24 \text{ mA}$				0.35	0.5		
I_I	$V_{CC} = 5.5 \text{ V}, V_I = 7 \text{ V}$			0.1			0.1	mA
I_{IH}	$V_{CC} = 5.5 \text{ V}, V_I = 2.7 \text{ V}$			20			20	μA
I_{IL}	$V_{CC} = 5.5 \text{ V}, V_I = 0.4 \text{ V}$			-0.1			-0.1	mA
I_O^{\ddagger}	$V_{CC} = 5.5 \text{ V}, V_O = 2.25 \text{ V}$			-30		-112		mA
I_{CC}	$V_{CC} = 5.5 \text{ V}$	'ALS677	21	33		21	33	mA
		'ALS678		17		17		

[†]All typical values are at $V_{CC} = 5 \text{ V}, T_A = 25 \text{ °C}$.

[‡]The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS} .

Additional information on these products can be obtained from the factory as it becomes available.

2
ALS AND AS CIRCUITS

**TYPES SN54ALS677, SN54ALS678, SN74ALS677, SN74ALS678,
ADDRESS COMPARATORS**

ALS677 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V,}$ $C_L = 50 \text{ pF,}$ $R_L = 500 \Omega,$ $T_A = \text{MIN to MAX}$				UNIT
			SN54ALS677		SN74ALS677		
			MIN	MAX	MIN	MAX	
t_{PLH}	Any P	Y	4	28	4	25	ns
t_{PHL}			8	40	8	35	
t_{PLH}	Any A	Y	5	26	5	22	ns
t_{PHL}			5	35	5	30	
t_{PLH}	\bar{G}	Y	3	15	3	13	ns
t_{PHL}			5	30	5	25	

ALS678 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V,}$ $C_L = 50 \text{ pF,}$ $R_L = 500 \Omega,$ $T_A = \text{MIN to MAX}$					UNIT
			SN54ALS678			SN74ALS678		
			MIN	TYP†	MAX	MIN	TYP†	
t_{PLH}	Any P	Y	18			18		ns
t_{PHL}			18			18		
t_{PLH}	Any A	Y	14			14		ns
t_{PHL}			14			14		
t_{PLH}	C	Y	14			14		ns
t_{PHL}			14			14		

†All typical values are at $V_{CC} = 5 \text{ V, } T_A = 25^\circ\text{C.}$

NOTE 1: For load circuit and voltage waveforms, see page 1-12.

ALS AND AS CIRCUITS 2

Additional information on these products can be obtained from the factory as it becomes available.

TYPES SN54ALS677, SN54ALS678, SN74ALS677, SN74ALS678 ADDRESS COMPARATORS

TYPICAL APPLICATION INFORMATION

The 'ALS677 and 'ALS678 can be wired to recognize any one of $2^{16} - 1$ addresses. The number of "lows" in the address determines the input pattern for the P inputs. Then those system address lines that are low in the address to be recognized are connected to the lowest numbered A inputs of the address comparator and the system address lines that are high are connected to the highest numbered A inputs.

For example, assume the comparator is to enable a device when the 16-bit system address is:

A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
H	H	L	L	H	H	L	L	H	H	L	L	H	H	H	H

Since the address contains 6 lows and 10 highs, the following connections are made:

P3 to 0 V, P2 to V_{CC} , P1 to V_{CC} , and P0 to 0 V.

System address lines A13, A12, A9, A8, A5, and A4 to comparator inputs A1 through A6 in any convenient order.

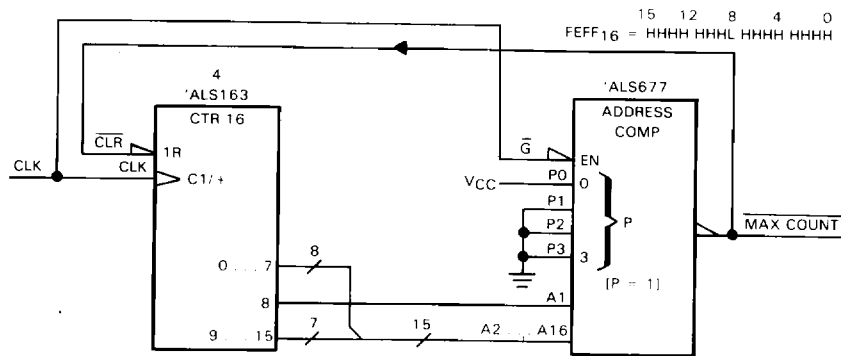
The remaining ten system address lines to comparator inputs A7 through A16 in any convenient order.

The output provides an active-low enabling signal.

The following circuit is a modulo-N synchronous counter. The 'ALS163 is connected to provide a low-level clear signal when $N = \text{FEFF}_{16}$.

2

ALS AND AS CIRCUITS



MODULO-N SYNCHRONOUS COUNTER