

# SN54ALS1640A, SN74ALS1640A, SN54ALS1645A, SN74ALS1645A OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

D2661, DECEMBER 1982—REVISED MAY 1986

- Bidirectional Bus Transceivers in High-Density 20-Pin Packages
- Lower-Power Versions of 'ALS640 Series
- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs
- Dependable Texas Instruments Quality and Reliability

## description

These octal bus transceivers are designed for asynchronous two-way communication between data buses. The devices transmit data from the A bus to the B bus or from the B bus to the A bus depending upon the level at the direction control (DIR) input. The enable input ( $\bar{G}$ ) can be used to disable the device so the buses are effectively isolated. The 'ALS1640A features inverting logic, while the 'ALS1645A features noninverting logic.

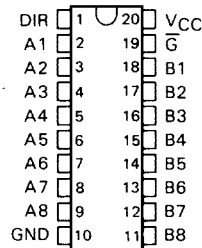
The -1 versions of the SN74ALS' parts are identical to the standard versions except that the recommended maximum  $I_{OL}$  is increased to 24 milliamperes. There are no -1 versions of the SN54ALS' parts.

The SN54ALS' family is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS' family is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

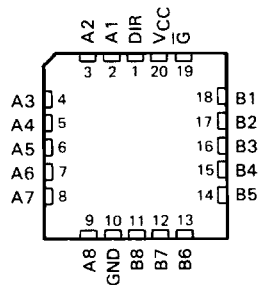
FUNCTION TABLE

CONTROL INPUTS	OPERATION	
	'ALS1640A	'ALS1645A
$\bar{G}$ L	$\bar{B}$ data to A bus	B data to A Bus
L H	$\bar{A}$ data to B bus	A data to Bus
H X	Isolation	Isolation

SN54ALS' . . . J PACKAGE  
SN74ALS' . . . DW OR N PACKAGE  
(TOP VIEW)

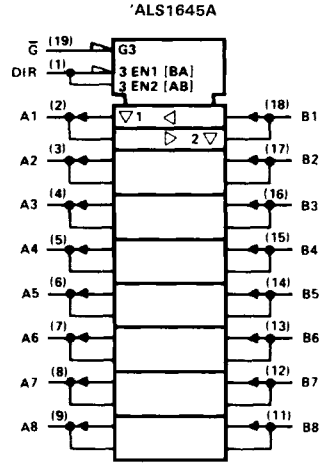
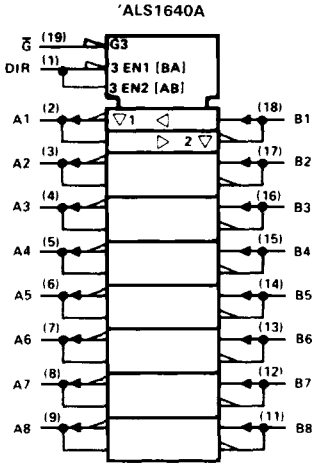


SN54' . . . FK PACKAGE  
(TOP VIEW)



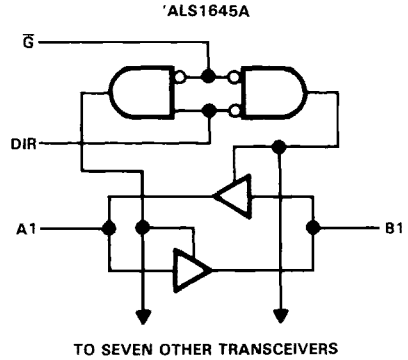
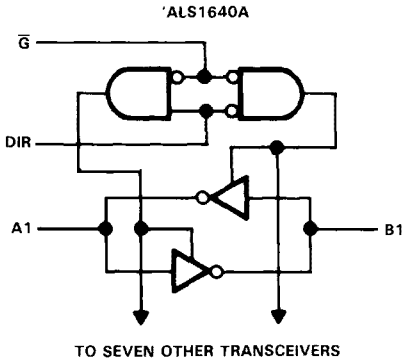
**SN54ALS1640A, SN74ALS1640A, SN54ALS1645A, SN74ALS164A**  
**OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS**

logic symbols<sup>†</sup>



<sup>†</sup>These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagrams (positive logic)



**2 ALS and AS Circuits**

# SN54ALS1640A, SN54ALS1645A SN74ALS1640A, SN74ALS1645A OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTS

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

Supply voltage, $V_{CC}$ .....	7 V
Input voltage All inputs .....	7 V
I/O ports .....	5.5 V
Operating free-air temperature range: SN54ALS1640A, SN54ALS1645A .....	-55°C to 125°C
SN74ALS1640A, SN74ALS1645A .....	0°C to 70°C
Storage temperature range .....	-65°C to 150°C

## recommended operating conditions

		SN54ALS1640A SN54ALS1645A			SN74ALS1640A SN74ALS1645A			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	0.7			0.8			V
$I_{OH}$	High-level output current	-12			-15			mA
$I_{OL}$	Low-level output current	8			16			mA
					24 <sup>†</sup>			
$T_A$	Operating free-air temperature	-55			125			°C

<sup>†</sup>The 24-mA limit applies only to the -1 versions and only if  $V_{CC}$  is maintained between 4.75 V and 5.25 V.

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

PARAMETER	TEST CONDITIONS	SN54ALS1640A SN54ALS1645A		SN74ALS1640A SN74ALS1645A		UNIT
		MIN	TYP <sup>‡</sup> MAX	MIN	TYP <sup>‡</sup> MAX	
$V_{IK}$	$V_{CC} = 4.5$ V, $I_I = -18$ mA	-1.5		-1.5		V
$V_{OH}$	$V_{CC} = 4.5$ V to 5.5 V, $I_{OH} = -0.4$ mA	$V_{CC} - 2$		$V_{CC} - 2$		V
	$V_{CC} = 4.5$ V, $I_{OH} = -3$ mA	2.4	3.2	2.4	3.2	
	$V_{CC} = 4.5$ V, $I_{OH} = -12$ mA	2				
	$V_{CC} = 4.5$ V, $I_{OH} = -15$ mA			2		
$V_{OL}$	$V_{CC} = 4.5$ V, $I_{OL} = 8$ mA	0.25	0.4	0.25	0.4	V
	$V_{CC} = 4.5$ V, $I_{OL} = 16$ mA			0.35	0.5	
	$V_{CC} = 4.75$ V, $I_{OL} = 24$ mA (-1 Versions)			0.35	0.5	
$I_I$	Control inputs	0.1		0.1		mA
	A or B ports	0.1		0.1		
$I_{IH}$	Control inputs	20		20		μA
	A or B ports <sup>§</sup>	20		20		
$I_{IL}$	Control inputs	-0.1		-0.1		mA
	A or B ports <sup>§</sup>	-0.1		-0.1		
$I_O$ <sup>¶</sup>	$V_{CC} = 5.5$ V, $V_O = 2.25$ V	-30	-112	-30	-112	mA
$I_{CC}$	'ALS1640A	18	35	18	32	mA
	'ALS1645A	25	40	25	36	

<sup>‡</sup>All typical values are at  $V_{CC} = 5$  V,  $T_A = 25^\circ$ C.

<sup>§</sup>For I/O ports, the parameters  $I_{IH}$  and  $I_{IL}$  include the off-state output current.

<sup>¶</sup>The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .

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ALS and AS Circuits

**SN54ALS1640A, SN74ALS1640A, SN54ALS1645A, SN74ALS1645A**  
**OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS**

**ALS1640A switching characteristics (see Note 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V,}$ $C_L = 50 \text{ pF,}$ $R_1 = 500 \Omega,$ $R_2 = 500 \Omega,$ $T_A = \text{MIN to MAX}$				UNIT
			SN54ALS1640A		SN74ALS1640A		
			MIN	MAX	MIN	MAX	
$t_{PLH}$	A or B	B or A	5	17	5	15	ns
$t_{PHL}$			2	13	2	10	
$t_{PZH}$	$\bar{G}$	A or B	5	23	5	20	ns
$t_{PZL}$			5	25	5	22	
$t_{PHZ}$	$\bar{G}$	A or B	2	12	2	10	ns
$t_{PLZ}$			5	16	5	13	

**ALS1645A switching characteristics (see Note 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V,}$ $C_L = 50 \text{ pF,}$ $R_1 = 500 \Omega,$ $R_2 = 500 \Omega,$ $T_A = \text{MIN to MAX}$				UNIT
			SN54ALS1645A		SN74ALS1645A		
			MIN	MAX	MIN	MAX	
$t_{PLH}$	A or B	B or A	2	15	2	13	ns
$t_{PHL}$			2	15	2	13	
$t_{PZH}$	$\bar{G}$	A or B	8	28	8	25	ns
$t_{PZL}$			8	28	8	25	
$t_{PHZ}$	$\bar{G}$	A or B	2	14	2	12	ns
$t_{PLZ}$			3	22	3	18	

NOTE 1: Load circuit and voltage waveforms are shown in Section 1.