

# TYPES SN54ALS1640A, SN54ALS1645A, SN54ALS1641 THRU SN54ALS1644 SN74ALS1640A, SN74ALS1645A, SN74ALS1641 THRU SN74ALS1644

## OCTAL BUS TRANSCEIVERS

D2661, DECEMBER 1982—REVISED DECEMBER 1983

- Bidirectional Bus Transceivers in High-Density 20-Pin Packages
- Lower-Power Versions of 'ALS640 Series
- Choice of True or Inverting Logic
- Choice of 3-State or Open-Collector Outputs
- Package Options Include Both Plastic and Ceramic Chip Carriers in Addition to Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

DEVICE	OUTPUT	LOGIC
'ALS1640A	3-State	Inverting
'ALS1641	Open-Collector	True
'ALS1642	Open-Collector	Inverting
'ALS1643	3-State	True and Inverting
'ALS1644	Open-Collector	True and Inverting
'ALS1645A	3-State	True

### 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.

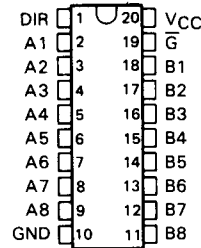
The -1 versions of the SN74ALS' parts are identical to the standard versions except that the recommended maximum  $I_{OL}$  is increased to 24 milliamperes. There are no -1 versions of the SN54ALS' parts.

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  $70^{\circ}\text{C}$ .

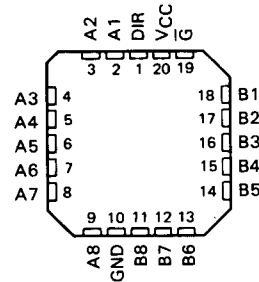
FUNCTION TABLE

CONTROL INPUTS	OPERATION		
	'ALS1640A 'ALS1642	'ALS1641 'ALS1645A	'ALS1643 'ALS1644
L L	$\bar{B}$ data to A bus	B data to A bus	B data to A bus
L H	$\bar{A}$ data to B bus	A data to B bus	$\bar{A}$ data to B bus
H X	Isolation	Isolation	Isolation

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



SN54' . . . FH PACKAGE  
SN74' . . . FN PACKAGE  
(TOP VIEW)

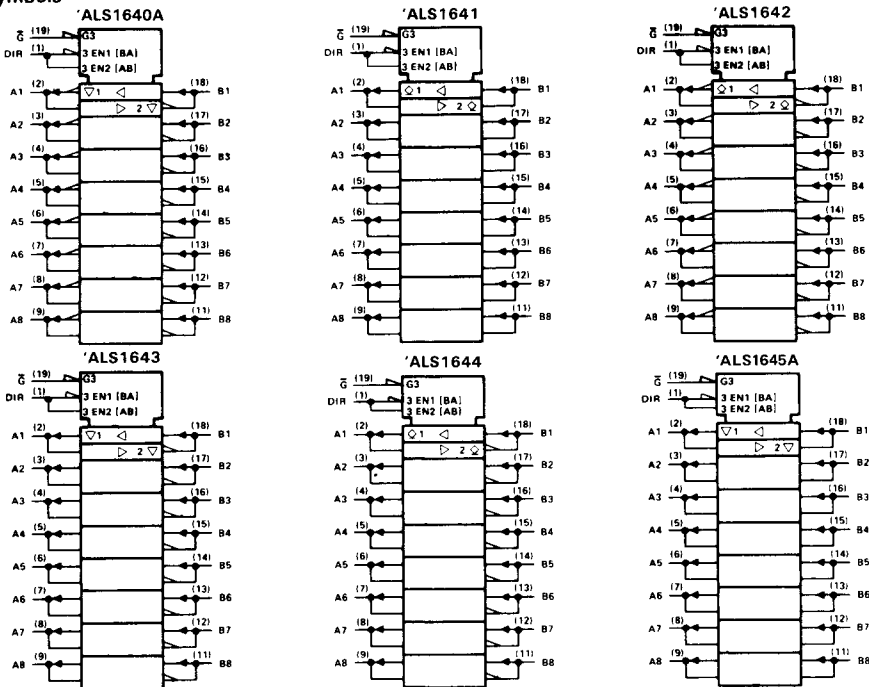


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ALS AND AS CIRCUITS

# TYPES SN54ALS1640A, SN54ALS1645A, SN54ALS1641 THRU SN54ALS1644 SN74ALS1640A, SN74ALS1645A, SN74ALS1641 THRU SN74ALS1644 OCTAL BUS TRANSCEIVERS

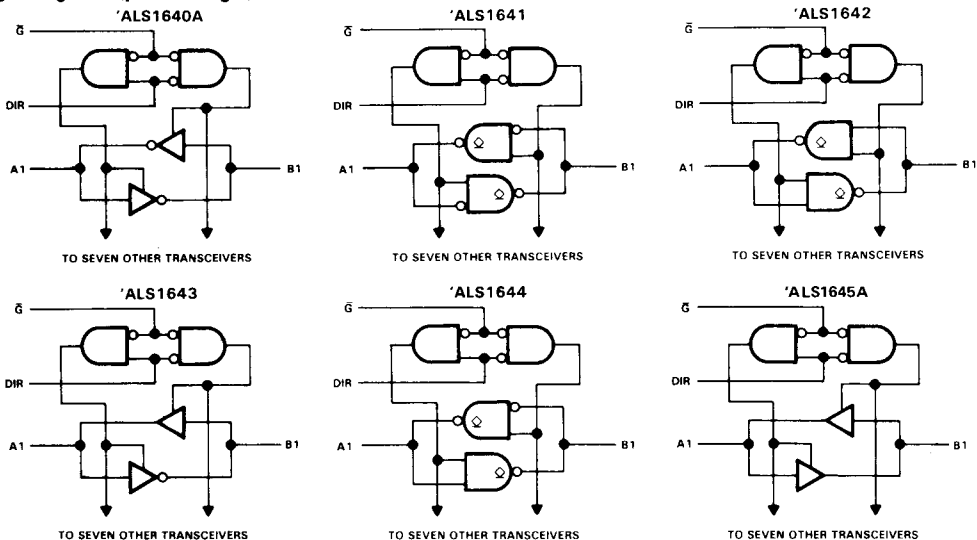
## logic symbols



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## ALS AND AS CIRCUITS

### logic diagrams (positive logic)



Pin numbers shown are for J and N packages.

**TYPES SN54ALS1640A, SN54ALS1643, SN54ALS1645A  
SN74ALS1640A, SN74ALS1643, SN74ALS1645A  
OCTAL BUS TRANSCEIVERS**

**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, SN54ALS1643, SN54ALS1645A .....	-55°C to 125°C
SN74ALS1640A, SN74ALS1643, SN74ALS1645A .....	0°C to 70°C
Storage temperature range .....	-65°C to 150°C

**recommended operating conditions**

		SN54ALS1640A			SN74ALS1640A			UNIT
		SN54ALS1643			SN74ALS1643			
		SN54ALS1645A			SN74ALS1645A			
		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			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			0 70 °C

<sup>†</sup>The extended limits apply only if  $V_{CC}$  is maintained between 4.75 V and 5.25 V.

The 24-mA limit applies for the SN74ALS1640A-1, SN74ALS1643-1, and SN74ALS1645A-1 only.

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

PARAMETER		TEST CONDITIONS	SN54ALS1640A			SN74ALS1640A			UNIT
			SN54ALS1643			SN74ALS1643			
			SN54ALS1645A			SN74ALS1645A			
			MIN	TYP <sup>‡</sup>	MAX	MIN	TYP <sup>‡</sup>	MAX	
$V_{IK}$		$V_{CC} = 4.5\text{ V}, I_I = -18\text{ mA}$				-1.5			V
$V_{OH}$		$V_{CC} = 4.5\text{ V to }5.5\text{ V}, I_{OH} = -0.4\text{ mA}$	$V_{CC} - 2$			$V_{CC} - 2$			V
		$V_{CC} = 4.5\text{ V}, I_{OH} = -3\text{ mA}$	2.4	3.2		2.4	3.2		
		$V_{CC} = 4.5\text{ V}, I_{OH} = -12\text{ mA}$	2						
		$V_{CC} = 4.5\text{ V}, I_{OH} = -15\text{ mA}$				2			
$V_{OL}$		$V_{CC} = 4.5\text{ V}, I_{OL} = 8\text{ mA}$	0.25			0.4			V
		$V_{CC} = 4.5\text{ V}, I_{OL} = 16\text{ mA}$ ( $I_{OL} = 24\text{ mA}$ for -1 versions)				0.35			
$I_I$	Control inputs	$V_{CC} = 5.5\text{ V}, V_I = 7\text{ V}$				0.1			mA
	A or B ports	$V_{CC} = 5.5\text{ V}, V_I = 5.5\text{ V}$				0.1			
$I_{IH}$	Control inputs	$V_{CC} = 5.5\text{ V}, V_I = 2.7\text{ V}$				20			$\mu\text{A}$
	A or B ports <sup>§</sup>					20			
$I_{IL}$	Control inputs	$V_{CC} = 5.5\text{ V}, V_I = 0.4\text{ V}$				-0.1			mA
	A or B ports <sup>§</sup>					-0.1			
$I_O^¶$		$V_{CC} = 5.5\text{ V}, V_O = 2.25\text{ V}$	-30			-112			-30 -112 mA
$I_{CC}$	'ALS1640A	$V_{CC} = 5.5\text{ V}$	18			35			mA
	'ALS1643		22			22			
	'ALS1645A		25			40			

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

<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,  $I_{OS}$ .

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

**ADVANCE INFORMATION**

This page contains information on a new product.  
Specifications are subject to change without notice.

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**TYPES SN54ALS1640A, SN54ALS1643, SN54ALS1645A  
SN74ALS1640A, SN74ALS1643, SN74ALS1645A  
OCTAL BUS TRANSCEIVERS**

'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	

'ALS1643 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
			SN54ALS1643			SN74ALS1643			
			MIN	TYP <sup>†</sup>	MAX	MIN	TYP <sup>†</sup>	MAX	
$t_{PLH}$	A	B	7			7			ns
$t_{PHL}$			7			7			
$t_{PLH}$	B	A	8			8			ns
$t_{PHL}$			8			8			
$t_{PZH}$	$\bar{G}$	A	18			18			ns
$t_{PZL}$			21			21			
$t_{PHZ}$	$\bar{G}$	A	12			12			ns
$t_{PLZ}$			13			13			
$t_{PZH}$	$\bar{G}$	B	18			18			ns
$t_{PZL}$			21			21			
$t_{PHZ}$	$\bar{G}$	B	12			12			ns
$t_{PLZ}$			13			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	

<sup>†</sup>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.

**ADVANCE INFORMATION**

2-728 This page contains information on a new product. Specifications are subject to change without notice.

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# TYPES SN54ALS1641, SN54ALS1642, SN54ALS1644 SN74ALS1641, SN74ALS1642, SN74ALS1644 OCTAL BUS TRANSCEIVERS

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

Supply voltage, $V_{CC}$ .....	7 V
Input voltage: All inputs and I/O ports .....	7 V
Operating free-air temperature range: SN54ALS1641, SN54ALS1642, SN54ALS1644 .....	-55 °C to 125 °C
SN74ALS1641, SN74ALS1642, SN74ALS1644 .....	0 °C to 70 °C
Storage temperature range .....	-65 °C to 150 °C

## recommended operating conditions

		SN54ALS1641 SN54ALS1642 SN54ALS1644			SN74ALS1641 SN74ALS1642 SN74ALS1644			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
$V_{OH}$	High-level output voltage			5.5			5.5	V
$I_{OL}$	Low-level output current			8			16	mA
							24 <sup>†</sup>	
$T_A$	Operating free-air temperature	-55		125	0		70	°C

<sup>†</sup>The extended limits apply only if  $V_{CC}$  is maintained between 4.75 V and 5.25 V.  
The 24-mA limit applies for the SN74ALS1641-1, SN74ALS1642-1, and SN74ALS1644-1 only.

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

PARAMETER	TEST CONDITIONS	SN54ALS1641 SN54ALS1642 SN54ALS1644		SN74ALS1641 SN74ALS1642 SN74ALS1644		UNIT		
		MIN	TYP <sup>‡</sup>	MAX	MIN		TYP <sup>‡</sup>	MAX
$V_{IK}$	$V_{CC} = 4.5 \text{ V}, I_I = -18 \text{ mA}$			-1.5		-1.5	V	
$I_{OH}$	$V_{CC} = 4.5 \text{ V}, V_{OH} = 5.5 \text{ V}$			0.1		0.1	mA	
$V_{OL}$	$V_{CC} = 4.5 \text{ V}, I_{OL} = 8 \text{ mA}$		0.25	0.4		0.25	0.4	V
	$V_{CC} = 4.5 \text{ V}, I_{OL} = 16 \text{ mA}$ ( $I_{OL} = 24 \text{ mA}$ for -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	$\mu\text{A}$	
	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		
$I_{CC}$	'ALS1641			23		23	mA	
	'ALS1642			20		20		
	'ALS1644			22		22		

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

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

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ALS AND AS CIRCUITS

**TYPES SN54ALS1641, SN54ALS1642, SN54ALS1644  
SN74ALS1641, SN74ALS1642, SN74ALS1644  
OCTAL BUS TRANSCEIVERS**

**\*ALS1641 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
			SN54ALS1641			SN74ALS1641			
			MIN	TYP <sup>†</sup>	MAX	MIN	TYP <sup>†</sup>	MAX	
$t_{PLH}$	A or B	B or A	22			22			ns
$t_{PHL}$			14			14			
$t_{PLH}$	$\bar{G}$ or DIR	A or B	26			26			ns
$t_{PHL}$			26			26			

**\*ALS1642 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
			SN54ALS1642			SN74ALS1642			
			MIN	TYP <sup>†</sup>	MAX	MIN	TYP <sup>†</sup>	MAX	
$t_{PLH}$	A or B	B or A	25			25			ns
$t_{PHL}$			13			13			
$t_{PLH}$	$\bar{G}$ or DIR	A or B	29			29			ns
$t_{PHL}$			29			29			

**\*ALS1644 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
			SN54ALS1644			SN74ALS1644			
			MIN	TYP <sup>†</sup>	MAX	MIN	TYP <sup>†</sup>	MAX	
$t_{PLH}$	A	B	27			27			ns
$t_{PHL}$			19			19			
$t_{PLH}$	B	A	24			24			ns
$t_{PHL}$			17			17			
$t_{PLH}$	$\bar{G}$ or DIR	A	30			30			ns
$t_{PHL}$			27			27			
$t_{PLH}$	$\bar{G}$ or DIR	B	24			24			ns
$t_{PHL}$			30			30			

<sup>†</sup>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.

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

**PRODUCT PREVIEW**

2-730 This page contains information on a product under development. Texas Instruments reserves the right to change or discontinue this product without notice.

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