

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.

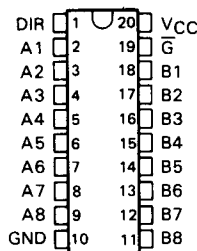
The -1 versions of the SN74ALS' parts are identical to the standard versions except that the recommended maximum I_{OL} is increased to 24 milliamperes. There are no -1 versions of the SN54ALS' parts.

The SN54ALS' family is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ALS' family is characterized for operation from 0°C to 70°C .

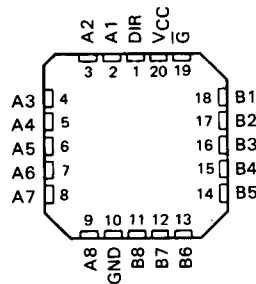
FUNCTION TABLE

CONTROL INPUTS	OPERATION		
	'ALS1640A	'ALS1641	'ALS1643
\bar{G} DIR	'ALS1642	'ALS1645A	'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)

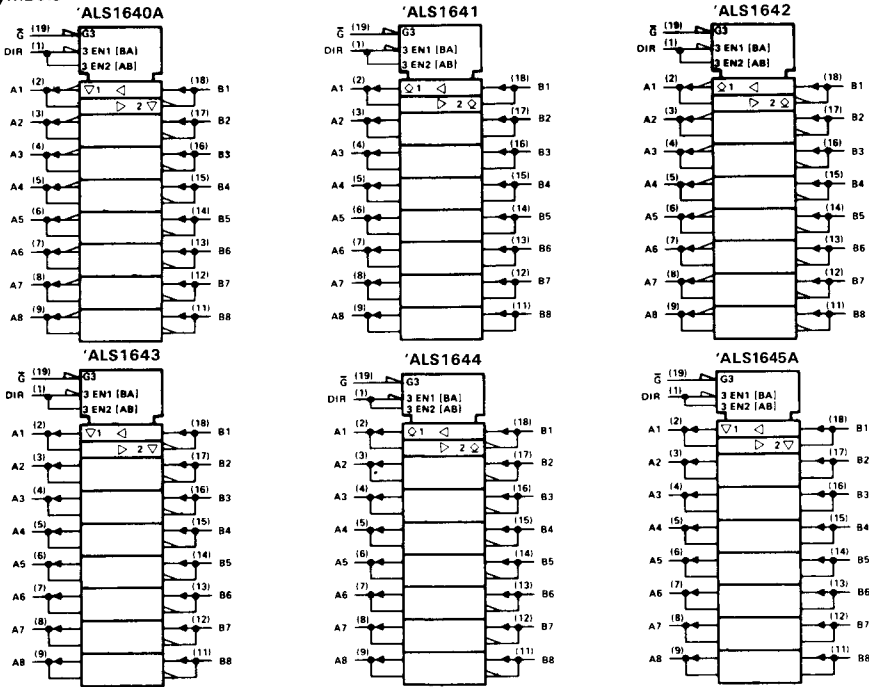


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ALS AND AS CIRCUITS

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

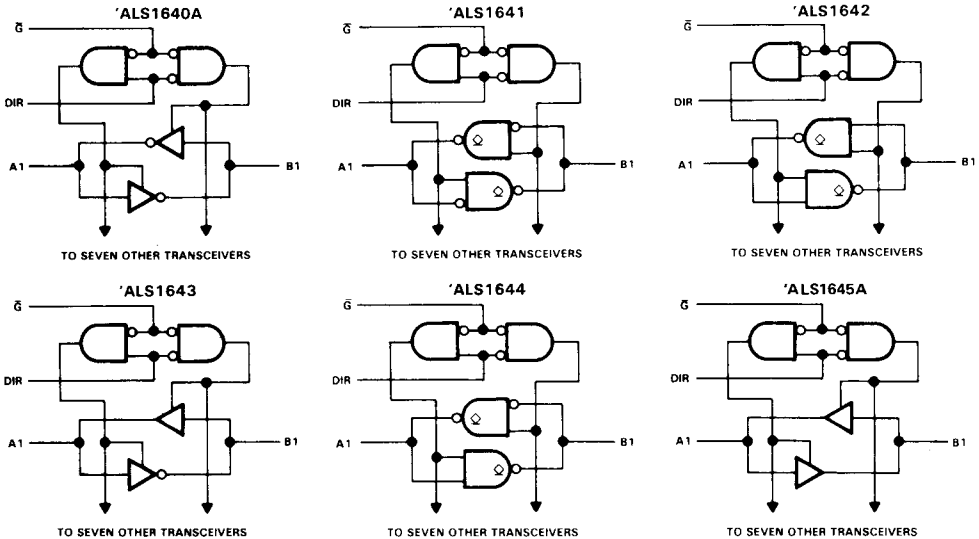
logic symbols



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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			0.8			V
I_{OH}	High-level output current	-12			-15			mA
I_{OL}	Low-level output current	8			16			mA
					24 [†]			
T_A	Operating free-air temperature	-55	125		0	70		°C

[†]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 [‡]	MAX	MIN	TYP [‡]	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 ($I_{OL} = 24$ mA for -1 versions)				0.35		0.5	
I_I	Control inputs	$V_{CC} = 5.5$ V, $V_I = 7$ V			0.1			mA
	A or B ports	$V_{CC} = 5.5$ V, $V_I = 5.5$ V			0.1			
I_{IH}	Control inputs				20			μ A
	A or B ports [§]	$V_{CC} = 5.5$ V, $V_I = 2.7$ V			20			
I_{IL}	Control inputs				-0.1			mA
	A or B ports [§]	$V_{CC} = 5.5$ V, $V_I = 0.4$ V			-0.1			
I_O [¶]	$V_{CC} = 5.5$ V, $V_O = 2.25$ V	-30	-112		-30	-112		mA
I_{CC}	'ALS1640A				18		35	mA
	'ALS1643				22		22	
	'ALS1645A				25		40	

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

[§]For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.

[¶]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

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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 V to 5.5 V, C _L = 50 pF, R ₁ = 500 Ω, R ₂ = 500 Ω, T _A = 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 V to 5.5 V, C _L = 50 pF, R ₁ = 500 Ω, R ₂ = 500 Ω, T _A = MIN to MAX						UNIT
			SN54ALS1643			SN74ALS1643			
			MIN	TYP [†]	MAX	MIN	TYP [†]	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 V to 5.5 V, C _L = 50 pF, R ₁ = 500 Ω, R ₂ = 500 Ω, T _A = 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	

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

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

ADVANCE INFORMATION

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2 ALS AND AS CIRCUITS

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 [†]	
T_A	Operating free-air temperature	-55		125	0		70	°C

[†]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 [‡]	MAX	MIN		TYP [‡]	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		0.25	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	μA	
	A or B ports [§]			20		20		
I_{IL}	Control inputs			-0.1		-0.1	mA	
	A or B ports [§]			-0.1		-0.1		
I_{CC}	'ALS1641			23		23	mA	
	'ALS1642			20		20		
	'ALS1644			22		22		

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

[§]For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.

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PRODUCT PREVIEW

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**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 [†]	MAX	MIN	TYP [†]	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 [†]	MAX	MIN	TYP [†]	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 [†]	MAX	MIN	TYP [†]	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			

[†]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.

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PRODUCT PREVIEW

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