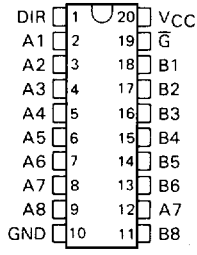
OCTAL BUS TRANSCEIVERS

D2661, DECEMBER 1983—REVISED MAY 1986

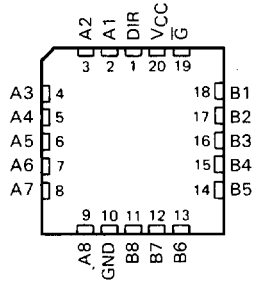
- **Bidirectional Bus Transceivers in High-Density 20-Pin Packages**
- **Choice of True or Inverting Logic**
- **Choice of 3-State or Open-Collector Outputs**
- **Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers, and Standard Plastic and Ceramic 300-mil DIPs**
- **Dependable Texas Instruments Quality and Reliability**

DEVICE	OUTPUT	LOGIC
'ALS640A, 'AS640	3-State	Inverting
'ALS641A, 'AS641	Open-Collector	True
'ALS642A, 'AS642	Open-Collector	Inverting
'ALS643A, 'AS643	3-State	True and Inverting
'ALS644A, 'AS644	Open-Collector	True and Inverting
'ALS645A, 'AS645	3-State	True

SN54ALS', SN54AS' . . . J PACKAGE
SN74ALS', SN74AS' . . . DW OR N PACKAGE
(TOP VIEW)



SN54ALS', SN54AS' . . . FK PACKAGE
(TOP VIEW)



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 ($\overline{G}$) can be used to disable the device so the buses are effectively isolated.

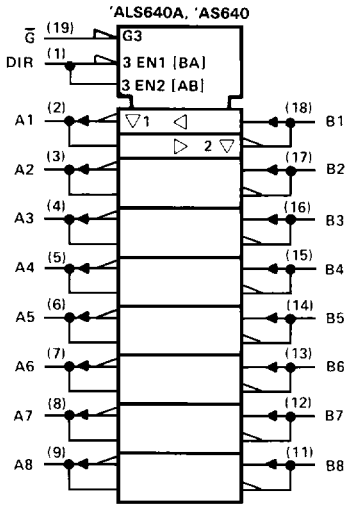
The -1 versions of the SN74ALS' parts are identical to the standard versions except that the recommended maximum I_{OL} is increased to 48 milliamperes. There are no -1 versions of the SN54ALS' parts.

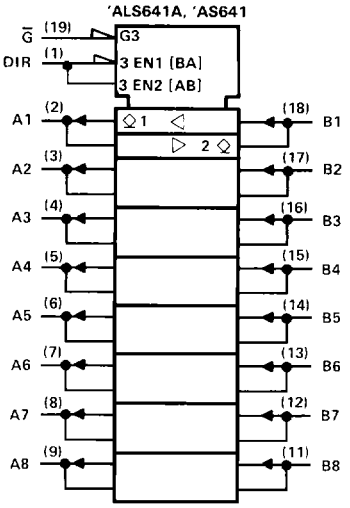
The SN54' family is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74' family is characterized for operation from 0°C to 70°C.

FUNCTION TABLE

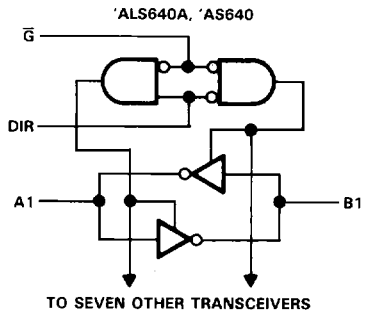
CONTROL INPUTS		OPERATION		
$\overline{G}$	DIR	'ALS640A, 'AS640 'ALS642A, 'AS642	'ALS641A, 'AS641 'ALS645A, 'AS645	'ALS643A, 'AS643 'ALS644A, 'AS644
L	L	$\overline{B}$ data to A bus	B data to A bus	B data to A bus
L	H	$\overline{A}$ data to B bus	A data to B bus	$\overline{A}$ data to B bus
H	X	Isolation	Isolation	Isolation

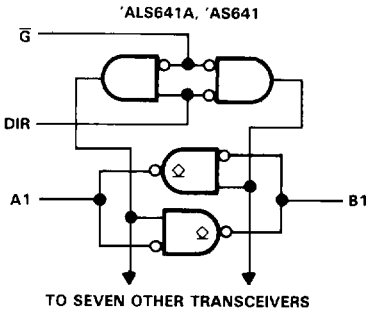
logic symbols†





logic diagrams (positive logic)





† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for DW, J, and N packages.

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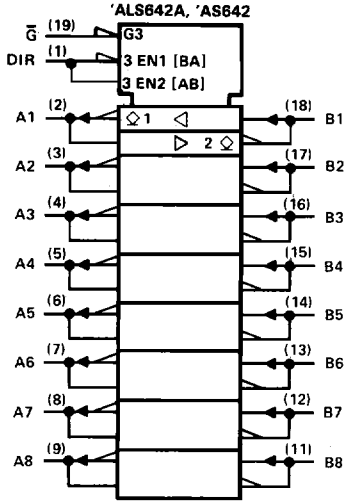
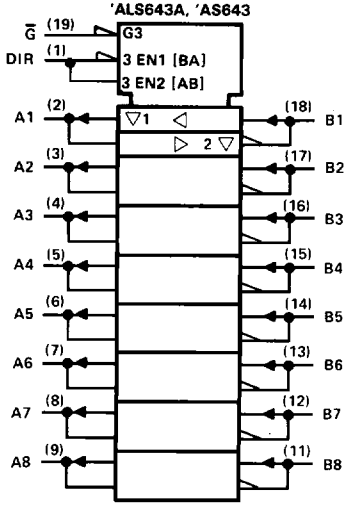
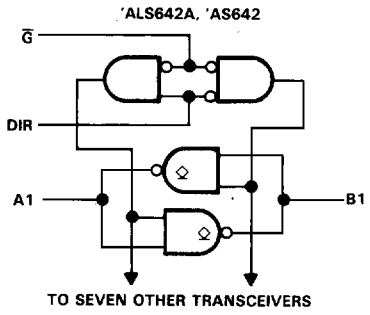
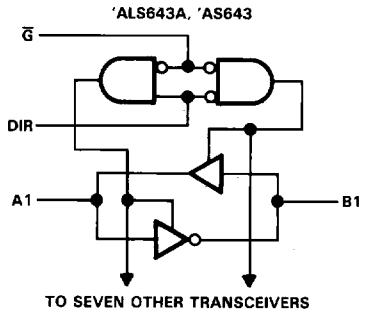
logic symbols†





logic diagrams (positive logic)





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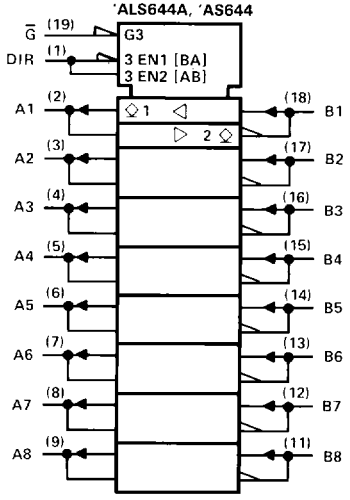
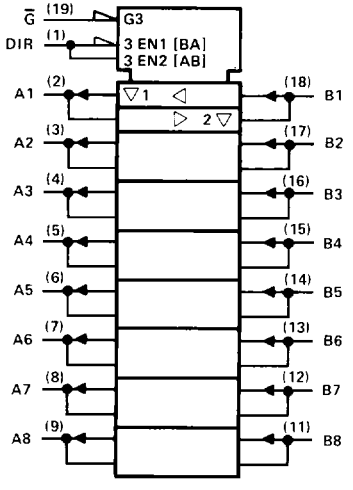
Pin numbers shown are for DW, J, and N packages.

logic symbols†

'ALS644A, 'AS644

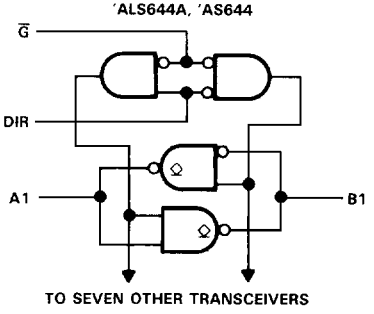


'ALS645A, 'AS645

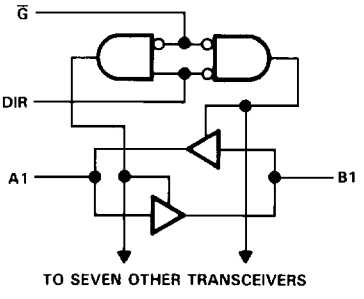


logic diagrams (positive logic)

'ALS644A, 'AS644



'ALS645A, 'AS645



† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for DW, J, and N packages.

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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: SN54ALS640A, SN54ALS643A, SN54ALS645A . . . . . −55 °C to 125 °C
SN74ALS640A, SN74ALS643A, SN74ALS645A . . . . . 0 °C to 70 °C
Storage temperature range . . . . . −65 °C to 150 °C

recommended operating conditions

		SN54ALS640A SN54ALS643A SN54ALS645A			SN74ALS640A SN74ALS643A SN74ALS645A			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			12			24	mA
							48†	
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 48-mA limit applies for the SN74ALS640A-1, SN74ALS643A-1, and SN74ALS645A-1 only.

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

PARAMETER		TEST CONDITIONS		SN54ALS'			SN74ALS'			UNIT
				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} = 12 mA		0.25	0.4		0.25	0.4	V
		V_{CC} = 4.5 V, (I_{OL} = 48 mA for −1 versions)	I_{OL} = 24 mA					0.35	0.5	
I_I	Control inputs	V_{CC} = 5.5 V,	V_I = 7 V			0.1			0.1	mA
	A or B ports	V_{CC} = 5.5 V,	V_I = 5.5 V			0.1			0.1	
I_{IH}	Control inputs	V_{CC} = 5.5 V,	V_I = 2.7 V			20			20	μA
	A or B ports§					20			20	
I_{IL}	Control inputs	V_{CC} = 5.5 V,	V_I = 0.4 V			−0.1			−0.1	mA
	A or B ports§					−0.1			−0.1	
I_O¶		V_{CC} = 5.5 V,	V_O = 2.25 V	−30		−112	−30		−112	mA
I_{CC}	'ALS640A	V_{CC} = 5.5 V	Outputs high		19	35		19	30	mA
			Outputs low		27	45		27	40	
			Outputs disabled		28	48		28	43	
	'ALS643A		Outputs high		25	37		25	35	
			Outputs low		33	47		33	45	
			Outputs disabled		35	50		35	48	
	'ALS645A		Outputs high		30	48		30	45	
			Outputs low		36	60		36	55	
			Outputs disabled		38	63		38	58	

‡ 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}.

'ALS640A switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX				UNIT
			SN54ALS640A		SN74ALS640A		
			MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	2	14	2	11	ns
t_{PHL}			2	13	2	10	
t_{PZH}	$\overline{G}$	A or B	5	25	5	21	ns
t_{PZL}			8	27	8	24	
t_{PHZ}	$\overline{G}$	A or B	2	12	2	10	ns
t_{PLZ}			3	20	3	15	

'ALS643A switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX				UNIT
			SN54ALS643A		SN74ALS643A		
			MIN	MAX	MIN	MAX	
t_{PLH}	A	B	2	15	2	13	ns
t_{PHL}			2	13	2	11	
t_{PLH}	B	A	2	15	2	13	ns
t_{PHL}			2	13	2	11	
t_{PZH}	$\overline{G}$	A	5	28	5	25	ns
t_{PZL}			5	28	5	25	
t_{PHZ}	$\overline{G}$	A	2	12	2	10	ns
t_{PLZ}			3	22	3	17	
t_{PZH}	$\overline{G}$	B	5	28	5	25	ns
t_{PZL}			5	28	5	25	
t_{PHZ}	$\overline{G}$	B	2	12	2	10	ns
t_{PLZ}			3	22	3	17	

'ALS645A switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX				UNIT
			SN54ALS645A		SN74ALS645A		
			MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	1	19	3	10	ns
t_{PHL}			1	14	3	10	
t_{PZH}	$\overline{G}$	A or B	2	30	5	20	ns
t_{PZL}			2	29	5	20	
t_{PHZ}	$\overline{G}$	A or B	2	14	2	10	ns
t_{PLZ}			2	30	4	15	

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

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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:
SN54ALS641A, SN54ALS642A, SN54ALS644A . . . . . −55°C to 125°C
SN74ALS641A, SN74ALS642A, SN74ALS644A . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

		SN54ALS641A SN54ALS642A SN54ALS644A			SN74ALS641A SN74ALS642A SN74ALS644A			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
V_{OH}	High-level output current			5.5			5.5	V
I_{OL}	Low-level output current			12			24	mA
							48†	
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 48-mA limit applies for the SN74ALS641A-1, SN74ALS642A-1, and SN74ALS644A-1 only.

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

PARAMETER		TEST CONDITIONS			SN54ALS641A SN54ALS642A SN54ALS644A			SN74ALS641A SN74ALS642A SN74ALS644A			UNIT
					MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}		V_{CC} = 4.5 V,	I_I = −18 mA				−1.5			−1.5	V
I_{OH}		V_{CC} = 4.5 V,	V_{OH} = 5.5 V				0.1			0.1	mA
V_{OL}		V_{CC} = 4.5 V,	I_{OL} = 12 mA			0.25	0.4		0.25	0.4	V
		V_{CC} = 4.5 V, (I_{OL} = 48 mA for -1 versions)	I_{OL} = 24 mA						0.35	0.5	
I_I	Control inputs	V_{CC} = 5.5 V,	V_I = 7 V				0.1			0.1	mA
	A or B ports	V_{CC} = 5.5 V,	V_I = 5.5 V				0.1			0.1	
I_{IH}	Control inputs	V_{CC} = 5.5 V,	V_I = 2.7 V				20			20	µA
	A or B ports§						20			20	
I_{IL}	Control inputs	V_{CC} = 5.5 V,	V_I = 0.4 V				−0.1			−0.1	mA
	A or B ports§						−0.1			−0.1	
I_{CC}	'ALS641A	V_{CC} = 5.5 V		Outputs high		25	40		25	37	mA
				Outputs low		33	50		33	47	
	'ALS642A			Outputs high		8	15		8	15	
				Outputs low		18	28		18	28	
	'ALS644A			Outputs high		16	32		16	29	
				Outputs low		25	44		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.

'ALS641A switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_L = 680 Ω, T_A = MIN to MAX				UNIT
			SN54ALS641A		SN74ALS641A		
			MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	5	30	5	25	ns
t_{PHL}			3	23	3	18	
t_{PLH}	$\overline{G}$	A or B	8	35	8	30	ns
t_{PHL}			8	35	8	30	
t_{PLH}	DIR	A or B	8	37	8	32	ns
t_{PHL}			8	37	8	32	

'ALS642A switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_L = 680 Ω, T_A = MIN to MAX				UNIT
			SN54ALS642A		SN74ALS642A		
			MIN	MAX	MIN	MAX	
t_{PLH}	A	B	10	35	10	30	ns
t_{PHL}			5	25	5	22	
t_{PLH}	$\overline{G}$ or DIR	A or B	10	35	10	30	ns
t_{PHL}			15	43	15	38	

'ALS644A switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_L = 680 Ω, T_A = MIN to MAX				UNIT
			SN54ALS644A		SN74ALS644A		
			MIN	MAX	MIN	MAX	
t_{PLH}	A	B	10	35	10	30	ns
t_{PHL}			5	25	5	22	
t_{PLH}	B	A	10	35	10	30	ns
t_{PHL}			5	23	5	21	
t_{PLH}	$\overline{G}$	A	8	35	8	30	ns
t_{PHL}			10	38	10	35	
t_{PLH}	$\overline{G}$	B	8	31	8	26	ns
t_{PHL}			15	40	15	35	
t_{PLH}	DIR	A	8	31	8	26	ns
t_{PHL}			10	40	10	35	
t_{PLH}	DIR	B	10	35	10	30	ns
t_{PHL}			15	40	15	35	

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

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:
SN54AS640, SN54AS643, SN54AS645 . . . . . −55°C to 125°C
SN74AS640, SN74AS643, SN74AS645 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

		SN54AS640 SN54AS643 SN54AS645			SN74AS640 SN74AS643 SN74AS645			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			−12			−15	mA
I_{OL}	Low-level output current			48			64	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		SN54AS'			SN74AS'			UNIT
				MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{IK}		V_{CC} = 4.5 V,	I_I = −18 mA			−1.2			−1.2	V
V_{OH}		V_{CC} = 4.5 V to 5.5 V,	I_{OH} = −2 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	2.4						
		V_{CC} = 4.5 V,	I_{OH} = −15 mA				2.4			
V_{OL}		V_{CC} = 4.5 V,	I_{OL} = 48 mA		0.30	0.55				V
		V_{CC} = 4.5 V,	I_{OL} = 64 mA					0.35	0.55	
I_I	Control inputs	V_{CC} = 5.5 V,	V_I = 7 V			0.1			0.1	mA
	A or B ports	V_{CC} = 5.5 V,	V_I = 5.5 V			0.1			0.1	
I_{IH}	Control inputs	V_{CC} = 5.5 V,	V_I = 2.7 V			20			20	μA
	A or B ports‡					70			70	
I_{IL}	Control inputs	V_{CC} = 5.5 V,	V_I = 0.4 V			−0.5			−0.5	mA
	A or B ports‡					−0.75			−0.75	
I_O§		V_{CC} = 5.5 V,	V_O = 2.25 V	−50		−150	−50		−150	mA
I_{CC}	'AS640	V_{CC} = 5.5 V	Outputs high		37	58		37	58	mA
			Outputs low		78	123		78	123	
			Outputs disabled		51	80		51	80	
	'AS643		Outputs high		48	79		48	79	
			Outputs low		88	143		88	143	
			Outputs disabled		61	100		61	100	
	'AS645		Outputs high		62	97		62	97	
			Outputs low		95	149		95	149	
			Outputs disabled		79	123		79	123	

†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}.

'AS640 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX				UNIT
			SN54AS640		SN74AS640		
			MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	2	8	2	7	ns
t_{PHL}			2	7	2	6	
t_{PZH}	$\overline{G}$	A or B	2	10	2	8	ns
t_{PZL}			2	12	2	10	
t_{PHZ}	$\overline{G}$	A or B	2	9	2	8	ns
t_{PLZ}			2	16	2	13	

'AS643 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX				UNIT
			SN54AS643		SN74AS643		
			MIN	MAX	MIN	MAX	
t_{PLH}	A	B	2	10	2	8	ns
t_{PHL}			2	7.5	2	7	
t_{PLH}	B	A	2	11.5	2	10	ns
t_{PHL}			2	10	2	9	
t_{PZH}	$\overline{G}$	A	2	13	2	11	ns
t_{PZL}			2	13	2	11	
t_{PHZ}	$\overline{G}$	A	2	8.5	2	7.5	ns
t_{PLZ}			2	12	2	10.5	
t_{PZH}	$\overline{G}$	B	2	11.5	2	10	ns
t_{PZL}			2	12	2	10	
t_{PHZ}	$\overline{G}$	B	2	8	2	7	ns
t_{PLZ}			2	12	2	10	

'AS645 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T_A = MIN to MAX				UNIT
			SN54AS645		SN74AS645		
			MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	2	11	2	9.5	ns
t_{PHL}			2	10.5	2	9	
t_{PZH}	$\overline{G}$	A or B	2	12	2	11	ns
t_{PZL}			2	12	2	10	
t_{PHZ}	$\overline{G}$	A or B	2	8	2	7	ns
t_{PLZ}			2	13	2	12	

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

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:
SN54AS641, SN54AS642, SN54AS644 . . . . . −55°C to 125°C
SN74AS641, SN74AS642, SN74AS644 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

recommended operating conditions

		SN54AS641 SN54AS642 SN54AS644			SN74AS641 SN74AS642 SN74AS644			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 current			5.5			5.5	V
I_{OL}	Low-level output current			48			64	V
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		SN54AS641 SN54AS642 SN54AS644			SN74AS641 SN74AS642 SN74AS644			UNIT
				MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{IK}		V_{CC} = 4.5 V,	I_I = −18 mA			−1.2			−1.2	V
I_{OH}		V_{CC} = 4.5 V,	V_{OH} = 5.5 V			0.1			0.1	mA
V_{OL}		V_{CC} = 4.5 V,	I_{OL} = 48 mA		0.3	0.55				V
		V_{CC} = 4.5 V,	I_{OL} = 64 mA					0.35	0.55	
I_I	Control inputs	V_{CC} = 5.5 V,	V_I = 7 V			0.1			0.1	mA
	A or B ports	V_{CC} = 5.5 V,	V_I = 5.5 V			0.1			0.1	
I_{IH}	Control inputs	V_{CC} = 5.5 V,	V_I = 2.7 V			20			20	μA
	A or B ports‡					70			70	
I_{IL}	Control inputs	V_{CC} = 5.5 V,	V_I = 0.4 V			−0.5			−0.5	mA
	A or B ports‡					−0.75			−0.75	
I_{CC}	'AS641		Outputs high		50	82		50	82	mA
			Outputs low		84	136		84	136	
	'AS642	V_{CC} = 5.5 V	Outputs high		25	42		25	42	
			Outputs low		64	104		64	104	
	'AS644		Outputs high		38	62		38	62	
			Outputs low		76	124		76	124	

† 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.

'AS641 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_L = 500 Ω, T_A = MIN to MAX				UNIT
			SN54AS641		SN74AS641		
			MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	5	23	5	21	ns
t_{PHL}			1	8.5	1	7.5	
t_{PLH}	$\overline{G}$	A or B	5	24	5	21	ns
t_{PHL}			1	10	1	9	
t_{PLH}	DIR	A or B	5	26	5	22	ns
t_{PHL}			1	11	1	10	

'AS642 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_L = 500 Ω, T_A = MIN to MAX				UNIT
			SN54AS642		SN74AS642		
			MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	5	28.5	5	24	ns
t_{PHL}			1	8.5	1	7.5	
t_{PLH}	$\overline{G}$	A or B	5	25	5	22	ns
t_{PHL}			1	11	1	10	
t_{PLH}	DIR	A or B	5	26.5	5	23.5	ns
t_{PHL}			1	12.5	1	11.5	

'AS644 switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V_{CC} = 4.5 V to 5.5 V, C_L = 50 pF, R_L = 500 Ω, T_A = MIN to MAX				UNIT
			SN54AS644		SN74AS644		
			MIN	MAX	MIN	MAX	
t_{PLH}	A	B	5	28.5	5	24	ns
t_{PHL}			1	8.5	1	7.5	
t_{PLH}	B	A	5	23	5	21	ns
t_{PHL}			1	8.5	1	7.5	
t_{PLH}	$\overline{G}$	A or B	5	24	5	21	ns
t_{PHL}			1	10	1	9	
t_{PLH}	DIR	A or B	5	26	5	22	ns
t_{PHL}			1	11	1	10	

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

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