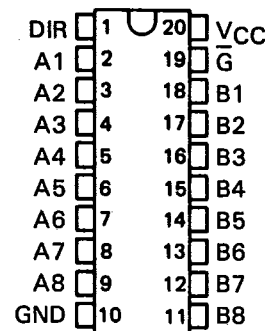


**SN54ALS638A, SN54ALS639A, SN54AS638A, SN54AS639**  
**SN74ALS638A, SN74ALS639A, SN74AS638A, SN74AS639**  
**OCTAL BUS TRANSCEIVERS**

D2261, DECEMBER 1983—REVISED JANUARY 1987

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

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



**description**

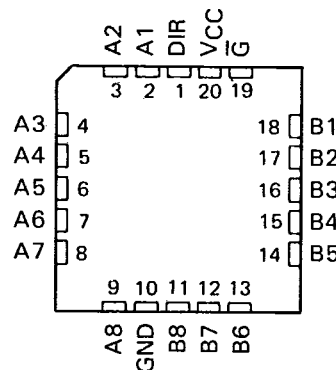
These octal bus transceivers are designed for asynchronous two-way communication between open-collector and 3-state buses. The devices transmit data from the A bus (open-collector) to the B bus (3-state) or from the B bus to the A bus depending upon the level at the direction control (DIR) input. The enable input ( $\bar{G}$ ) can be used to disable the device so the buses are isolated.

DEVICE	A OUTPUT	B OUTPUT	LOGIC
'ALS638A, 'AS638A	Open-Collector	3-State	Inverting
'ALS639A, 'AS639	Open-Collector	3-State	True

The -1 versions of the SN74ALS' parts are identical to the standard versions except that recommended maximum of  $I_{OL}$  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.

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



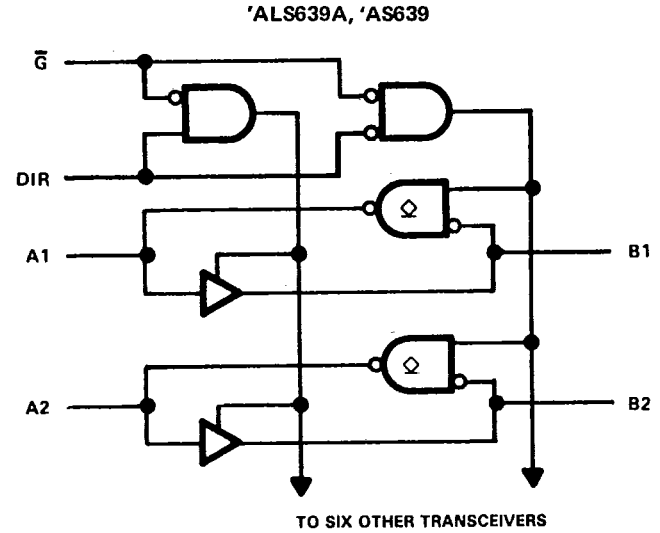
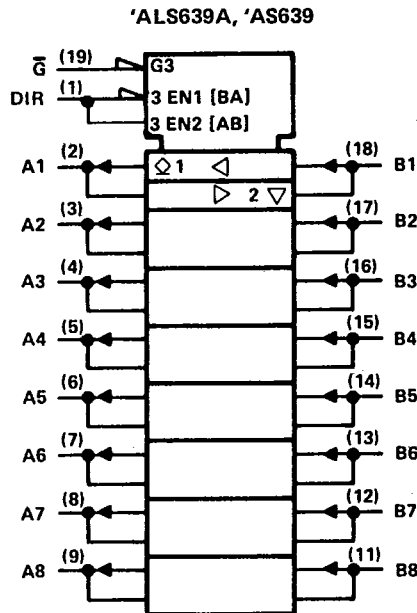
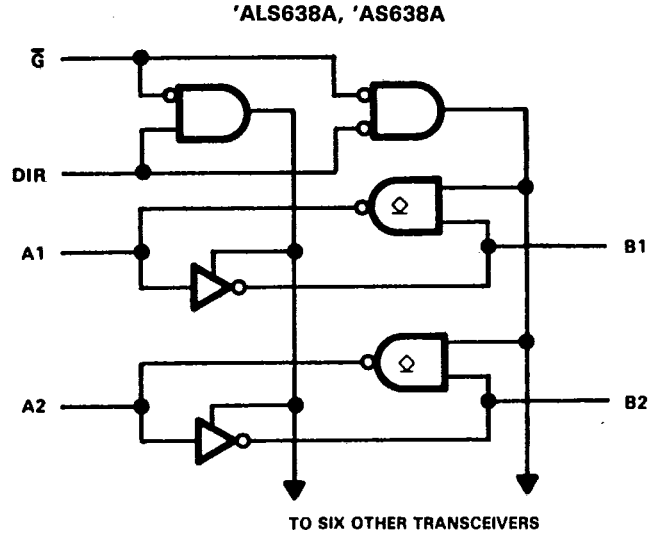
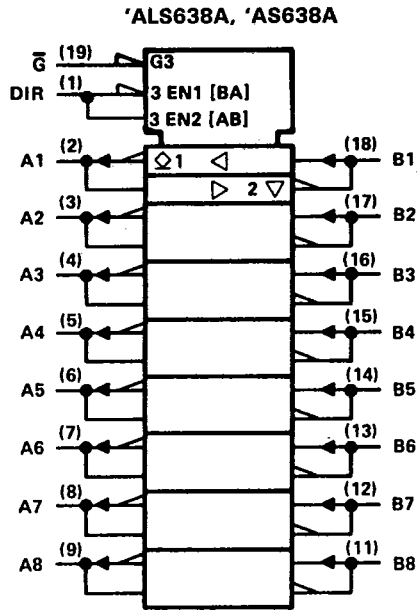
**FUNCTION TABLE**

CONTROL INPUTS		OPERATION	
$\bar{G}$	DIR	'ALS638A 'AS638A	'ALS639A 'AS639
L	L	$\bar{B}$ data to A bus	B data to A bus
L	H	$\bar{A}$ data to B bus	A data to B bus
H	X	Isolation	Isolation

**SN54ALS638A, SN54ALS639A, SN54AS638A, SN54AS639**  
**SN74ALS638A, SN74ALS639A, SN74AS638A, SN74AS639**  
**OCTAL BUS TRANSCEIVERS**

logic symbols†

logic diagrams (positive logic)



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

**SN54ALS638A, SN54ALS639A, SN74ALS638A, SN74ALS639A  
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
  - A bus I/O ports ..... 7 V
  - B bus I/O ports ..... 5.5 V
- Operating free-air temperature range: SN54ALS638A, SN54ALS639A ..... -55°C to 125°C
  - SN74ALS638A, SN74ALS639A ..... 0°C to 70°C
- Storage temperature range ..... -65°C to 150°C

**recommended operating conditions**

			SN54ALS638A SN54ALS639A			SN74ALS638A SN74ALS639A			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 voltage	A ports	5.5			5.5			V
$I_{OH}$	High-level output current	B ports	-12			-15			mA
$I_{OL}$	Low-level output current	A or B ports	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 SN74ALS638A-1 and SN74ALS639A-1 only.

## SN54ALS638A, SN54ALS639A, SN74ALS638A, SN74ALS639A

## OCTAL BUS TRANSCEIVERS

TEXAS INSTR (LOGIC) 91 DE

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

PARAMETER		TEST CONDITIONS	SN54ALS638A SN54ALS639A		SN74ALS638A SN74ALS639A		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	
$I_{OH}$	A ports	$V_{CC} = 4.5 \text{ V}$ , $V_{OH} = 5.5 \text{ V}$			0.1		0.1	mA	
$V_{OH}$	B ports	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ , $I_{OH} = -0.4 \text{ mA}$	$V_{CC}-2$		$V_{CC}-2$				
		$V_{CC} = 4.5 \text{ V}$ , $I_{OH} = -3 \text{ mA}$	2.4	3.2	2.4	3.2		V	
		$V_{CC} = 4.5 \text{ V}$ , $I_{OH} = -12 \text{ mA}$	2						
		$V_{CC} = 4.5 \text{ V}$ , $I_{OH} = -15 \text{ mA}$			2				
$V_{OL}$	A or B ports	$V_{CC} = 4.5 \text{ V}$ , $I_{OL} = 12 \text{ mA}$	0.25	0.4	0.25	0.4		V	
		$V_{CC} = 4.5 \text{ V}$ , $I_{OL} = 24 \text{ mA}$ ( $I_{OL} = 48 \text{ mA}$ for -1 versions)			0.35	0.5			
$I_I$	Control inputs	$V_{CC} = 5.5 \text{ V}$ , $V_I = 7 \text{ V}$			0.1		0.1	mA	
	A or B ports	$V_{CC} = 5.5 \text{ V}$ , $V_I = 5.5 \text{ V}$			0.1		0.1		
$I_{IH}$	Control inputs	$V_{CC} = 5.5 \text{ V}$ , $V_I = 2.7 \text{ V}$			20	20			
	A or B ports‡				20	20		$\mu\text{A}$	
$I_{IL}$	Control inputs	$V_{CC} = 5.5 \text{ V}$ , $V_I = 0.4 \text{ V}$			-0.1	-0.1		mA	
	A or B ports‡				-0.1	-0.1			
$I_O^{\S}$	B ports	$V_{CC} = 5.5 \text{ V}$ , $V_O = 2.25 \text{ V}$	-30		-112	-30	-112	mA	
$I_{CC}$	'ALS638A	$V_{CC} = 5.5 \text{ V}$	Outputs high		18	36	18	30	mA
			Outputs low		25	48	26	41	
			Outputs disabled		16	35	16	30	
	'ALS639A		Outputs high		25	45	25	40	
			Outputs low		30	55	30	50	
			Outputs disabled		33	60	33	54	

†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.

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

## 'ALS638A switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ , $C_L = 50 \text{ pF}$ , $R_L = 680 \Omega$ (A outputs), $R_1 = R_2 = 500 \Omega$ (B outputs), $T_A = \text{MIN to MAX}$				UNIT
			SN54ALS638A		SN74ALS638A		
			MIN	MAX	MIN	MAX	
$t_{PLH}$	A	B	2	15	2	12	ns
$t_{PHL}$			2	15	2	12	
$t_{PLH}$	B	A	8	30	8	25	ns
$t_{PHL}$			8	35	8	30	
$t_{PLH}$	$\bar{G}$	A	5	30	5	25	ns
$t_{PHL}$			10	50	10	45	
$t_{PZH}$	$\bar{G}$	B	5	25	5	20	ns
$t_{PZL}$			5	28	5	22	
$t_{PHZ}$	$\bar{G}$	B	2	12	2	10	ns
$t_{PLZ}$			3	18	3	15	

## 'ALS639A switching characteristics (see Note 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ , $C_L = 50 \text{ pF}$ , $R_L = 680 \Omega$ (A outputs), $R_1 = R_2 = 500 \Omega$ (B outputs), $T_A = \text{MIN to MAX}$				UNIT
			SN54ALS639A		SN74ALS639A		
			MIN	MAX	MIN	MAX	
$t_{PLH}$	A	B	2	15	2	12	ns
$t_{PHL}$			2	15	2	12	
$t_{PLH}$	B	A	10	35	10	30	ns
$t_{PHL}$			5	28	5	22	
$t_{PLH}$	$\bar{G}$	A	10	35	10	30	ns
$t_{PHL}$			10	40	10	35	
$t_{PZH}$	$\bar{G}$	B	6	28	6	21	ns
$t_{PZL}$			8	30	8	25	
$t_{PHZ}$	$\bar{G}$	B	2	12	2	10	ns
$t_{PLZ}$			3	19	3	16	

NOTE 1: For load circuit and voltage waveforms, see Section 1 of *ALS/AS Logic Data Book*, 1986.

**SN54AS638A, SN54AS639, SN74AS638A, SN74AS639****OCTAL BUS TRANSCEIVERS**

TEXAS INSTR (LOGIC) 91 DE

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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
A bus I/O ports .....	7 V
B bus I/O ports .....	5.5 V
Operating free-air temperature range: SN54AS638A, SN54AS639 .....	-55°C to 125°C
SN74AS638A, SN74AS639 .....	0°C to 70°C
Storage temperature range .....	-65°C to 150°C

**recommended operating conditions**

		SN54AS638A SN54AS639			SN74AS638A SN74AS639			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
$I_{OH}$	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	SN54AS638A SN54AS639			SN74AS638A SN74AS639			UNIT
		MIN	TYP†	MAX	MIN	TYP†	MAX	
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ , $I_I = -18\text{ mA}$			-1.2			-1.2	V
$I_{OH}$	A ports $V_{CC} = 4.5\text{ V}$ , $V_{OH} = 5.5\text{ V}$			0.1			0.1	mA
$V_{OH}$	B ports $V_{CC} = 4.5\text{ V}$ , to 5.5 V, $I_{OH} = -2\text{ mA}$	$V_{CC} - 2$			$V_{CC} - 2$			V
		$V_{CC} = 4.5\text{ V}$ , $I_{OH} = -3\text{ mA}$	2.4	3.2	2.4	3.2		
		$V_{CC} = 4.5\text{ V}$ , $I_{OH} = -12\text{ mA}$	2.4					
		$V_{CC} = 4.5\text{ V}$ , $I_{OH} = -15\text{ mA}$			2.4			
$V_{OL}$	A or B ports $V_{CC} = 4.5\text{ V}$ , $I_{OL} = 48\text{ mA}$	0.3	0.55				V	
		$V_{CC} = 4.5\text{ V}$ , $I_{OL} = 64\text{ mA}$			0.35	0.55		
$I_I$	Control inputs $V_{CC} = 5.5\text{ V}$ , $V_I = 7\text{ V}$			0.1			0.1	mA
	A or B ports $V_{CC} = 5.5\text{ V}$ , $V_I = 5.5\text{ V}$			0.1			0.1	
$I_{IH}$	Control inputs $V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$			20			20	μA
	A or B ports‡			70			70	
$I_{IL}$	Control inputs $V_{CC} = 5.5\text{ V}$ , $V_I = 0.4\text{ V}$			-0.5			-0.5	mA
	A or B ports‡			-0.75			-0.75	
$I_{O}^{\S}$	$V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$	-50		-150	-50		-150	mA
$I_{CC}$	'AS638A  'AS639	$V_{CC} = 5.5\text{ V}$	Outputs high	24	54	24	54	mA
			Outputs low	75	122	75	122	
			Outputs disabled	37	61	37	61	
			Outputs high	56	92	56	92	
			Outputs low	95	154	95	154	
			Outputs disabled	62	100	62	100	

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

**SN54AS638A, SN54AS639, SN74AS638A, SN74AS639  
OCTAL BUS TRANSCEIVERS**

**'AS638A switching characteristics (see Note 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω (A outputs), R <sub>L</sub> = 500 Ω (B outputs), T <sub>A</sub> = MIN to MAX				UNIT
			SN54AS638A		SN74AS638A		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	B	2	8	2	7	ns
t <sub>PHL</sub>			2	7.5	2	6.5	
t <sub>PLH</sub>	B	A	5	23	5	20	ns
t <sub>PHL</sub>			2	8	2	7	
t <sub>PLH</sub>	$\bar{G}$	A	5	20	5	19	ns
t <sub>PHL</sub>			2	10	2	9	
t <sub>PZH</sub>	$\bar{G}$	B	2	10	2	8	ns
t <sub>PZL</sub>			2	12	2	10	
t <sub>PHZ</sub>	$\bar{G}$	B	2	8	2	7	ns
t <sub>PLZ</sub>			2	12	2	10	

**'AS639A switching characteristics (see Note 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω (A outputs), R <sub>L</sub> = 500 Ω (B outputs), T <sub>A</sub> = MIN to MAX				UNIT
			SN54AS639		SN74AS639		
			MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	B	2	11	2	9.5	ns
t <sub>PHL</sub>			2	10.5	2	9	
t <sub>PLH</sub>	B	A	5	25	5	22	ns
t <sub>PHL</sub>			2	10	2	9	
t <sub>PLH</sub>	$\bar{G}$	A	5	23	5	21.5	ns
t <sub>PHL</sub>			2	12.5	2	11.5	
t <sub>PZH</sub>	$\bar{G}$	B	2	12	2	10.5	ns
t <sub>PZL</sub>			2	12	2	10.5	
t <sub>PHZ</sub>	$\bar{G}$	B	2	7.5	2	7	ns
t <sub>PLZ</sub>			2	12	2	10.5	

NOTE 1: For load circuit and voltage waveforms, see Section 1 of *ALS/AS Logic Data Book*, 1986.