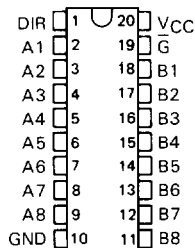


# SN54ALS638A, SN54ALS639A, SN54AS638, SN54AS639 SN74ALS638A, SN74ALS639A, SN74AS638, SN74AS639 OCTAL BUS TRANSCEIVERS

D2261, DECEMBER 1983 - REVISED MAY 1986

- 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

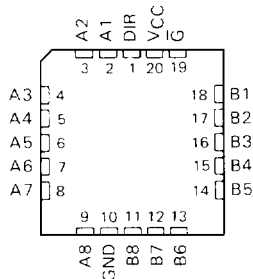
These octal bus transceivers are designed for asynchronous two-way communication between open-collector and 3-state buses. The devices transmit data from the A bus (open-collector) to the B bus (3-state) or from the B bus to the A bus depending upon the level at the direction control (DIR) input. The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

DEVICE	A OUTPUT	B OUTPUT	LOGIC
'ALS638A, 'AS638	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  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74' family is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

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



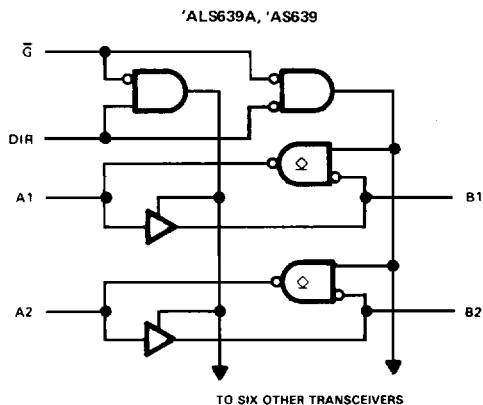
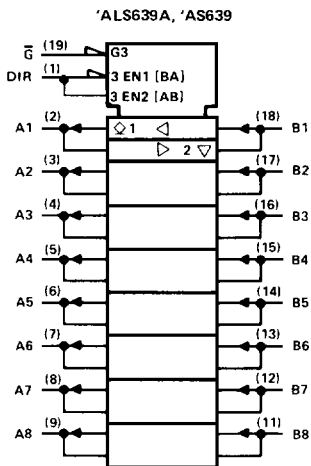
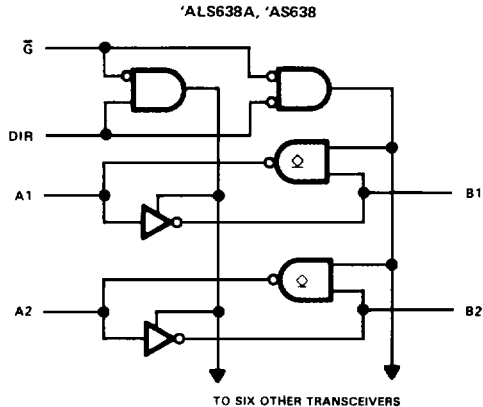
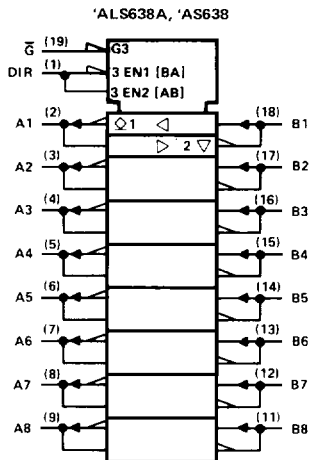
FUNCTION TABLE

CONTROL INPUTS		OPERATION	
$\bar{G}$	DIR	'ALS638A 'AS638	'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, SN54AS638, SN54AS639  
SN74ALS638A, SN74ALS639A, SN74AS638, SN74AS639  
OCTAL BUS TRANSCEIVERS**

logic symbols<sup>†</sup>

logic diagrams (positive logic)



<sup>†</sup>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			5.5			5.5	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 SN74ALS638A-1 and SN74ALS639A-1 only.

## 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
		$V_{CC} = 4.5 \text{ V}$ ,	$I_{OH} = -3 \text{ mA}$	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		
$V_{OL}$	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	$\mu\text{A}$
	A or B ports§					20			20	
$I_{IL}$	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	
$I_{O}^\dagger$	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	
			Outputs high		25	45		25	40	
			Outputs low		30	55		30	50	
			Outputs disabled		33	60		33	54	
'ALS639A	$V_{CC} = 5.5 \text{ V}$	Outputs high		18	36		18	30	mA	
		Outputs low		25	48		26	41		
		Outputs disabled		16	35		16	30		
		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,  $I_{OS}$ .

# SN54ALS638A, SN54ALS639A, SN74ALS638A, SN74ALS639A

## OCTAL BUS TRANSCEIVERS

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



**SN54AS638, SN54AS639, SN74AS638, SN74AS639**  
**OCTAL BUS TRANSCEIVERS**

**\*AS638 switching characteristics (see Note 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5\text{ V to }5.5\text{ V,}$ $C_L = 50\text{ pF,}$ $R_L = 500\ \Omega$ (A outputs), $R_1 = R_2 = 500\ \Omega$ (B outputs), $T_A = \text{MIN to MAX}$				UNIT
			SN54AS638		SN74AS638		
			MIN	MAX	MIN	MAX	
$t_{PLH}$	A	B	2	8	2	7	ns
$t_{PHL}$			2	7.5	2	6.5	
$t_{PLH}$	B	A	5	23	5	20	ns
$t_{PHL}$			2	8	2	7	
$t_{PLH}$	$\bar{G}$	A	5	20	5	19	ns
$t_{PHL}$			2	10	2	9	
$t_{PZH}$	$\bar{G}$	B	2	10	2	8	ns
$t_{PZL}$			2	12	2	10	
$t_{PHZ}$	$\bar{G}$	B	2	8	2	7	ns
$t_{PLZ}$			2	12	2	10	

**\*AS639 switching characteristics (see Note 1)**

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4.5\text{ V to }5.5\text{ V,}$ $C_L = 50\text{ pF,}$ $R_L = 500\ \Omega$ (A outputs), $R_1 = R_2 = 500\ \Omega$ (B outputs), $T_A = \text{MIN to MAX}$				UNIT
			SN54AS639		SN74AS639		
			MIN	MAX	MIN	MAX	
$t_{PLH}$	A	B	2	11	2	9.5	ns
$t_{PHL}$			2	10.5	2	9	
$t_{PLH}$	B	A	5	25	5	22	ns
$t_{PHL}$			2	10	2	9	
$t_{PLH}$	$\bar{G}$	A	5	23	5	21.5	ns
$t_{PHL}$			2	12.5	2	11.5	
$t_{PZH}$	$\bar{G}$	B	2	12	2	10.5	ns
$t_{PZL}$			2	12	2	10.5	
$t_{PHZ}$	$\bar{G}$	B	2	7.5	2	7	ns
$t_{PLZ}$			2	12	2	10.5	

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

**2 ALS and AS Circuits**