



# DM74AS240, 241, 242, 243, 244 TRI-STATE® Bus Driver/Receiver

## General Description

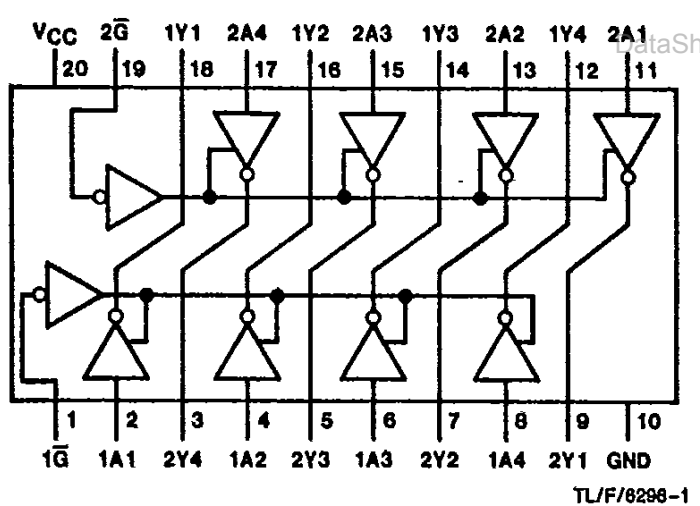
This family of Advance Schottky TRI-STATE Bus circuits are designed to provide either bidirectional or unidirectional buffer interface in Memory, Microprocessor, and Communication Systems. The output characteristics of the circuits have low impedance sufficient to drive terminated transmission lines down to 133 ohms. The input characteristics of the circuits likewise have a high impedance so it will not significantly load the transmission line. The package contains eight TRI-STATE buffers organized with four buffers having a common TRI-STATE enable gate. The AS240, 241 and 244 are eight wide in a 20 pin package, and may be used as a 4 wide bidirectional or eight wide unidirectional. The AS242 and 243 are organized four wide bidirectional in a 14 pin package. The buffer selection includes inverting and non-inverting, with enable or disable TRI-STATE control.

## Features

- Advanced oxide-isolated, ion-implanted Schottky TTL process
- Improved switching performance with less power dissipation compared with Schottky counterpart
- Functional and pin compatible with 54/74LS and Schottky counterpart
- Switching response specified into 500 ohm and 50 pF
- Specified to interface with CMOS at  $V_{OH} = V_{CC} - 2V$

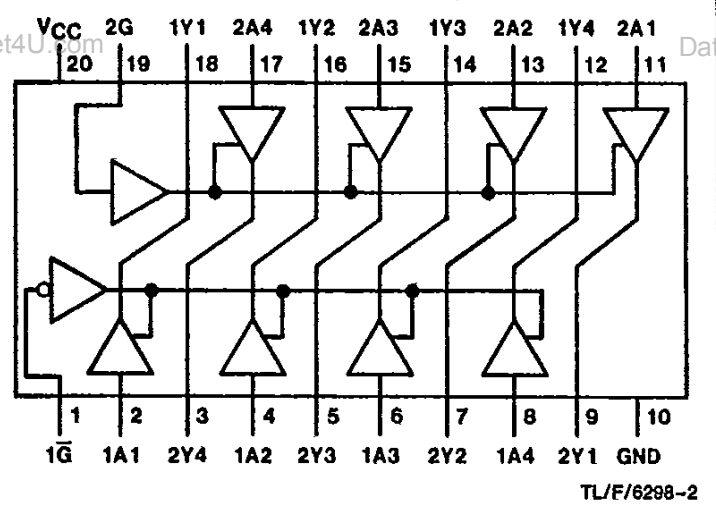
## Connection Diagrams

Dual-In-Line Package



Order Number DM74AS240N  
See NS Package Number N20A\*

Dual-In-Line Package



Order Number DM74AS241N  
See NS Package Number N20A\*

\*Contact your local NSC representative about surface mount (M) package availability.

## Absolute Maximum Ratings

Supply Voltage, $V_{CC}$	7V
Input Voltage	7V
Voltage Applied to Disabled Output	5.5V
Operating Free Air Temperature Range	0°C to +70°C
Storage Temperature Range	-65°C to +150°C
Typical $\theta_{JA}$	
AS240/241/244 N Package	57.0°C/W
M Package	76.0°C/W
AS242/243 N Package	73.5°C/W

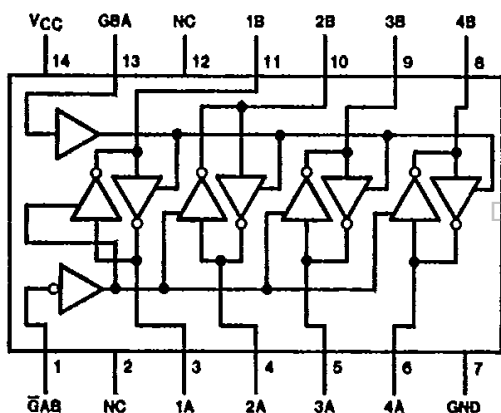
Note: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

## Recommended Operating Conditions

Symbol	Parameter	Min	Nom	Max	Units
$V_{CC}$	Supply Voltage	4.5	5	5.5	V
$V_{IH}$	High Level Input Voltage	2			V
$V_{IL}$	Low Level Input Voltage			0.8	V
$I_{OH}$	High Level Output Current			-15	mA
$I_{OL}$	Low Level Output Current			64	mA
$T_A$	Free Air Operating Temperature	0		70	°C

## Connection Diagrams (Continued)

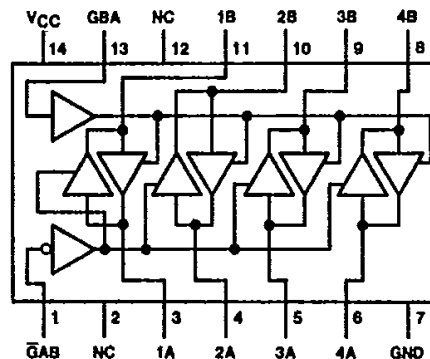
### Dual-In-Line Package



Order Number DM74AS242N  
See NS Package Number N14A\*

TL/F/6298-3

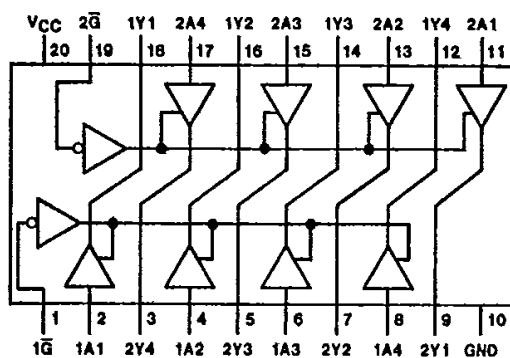
### Dual-In-Line Package



Order Number DM74AS243N  
See NS Package Number N14A\*

TL/F/6298-4

### Dual-In-Line Package



Order Number DM74AS244WM, N  
See NS Package Number M20B or N20A

TL/F/6298-5

\*Contact your local NSC representative about surface mount (M) package availability.

**Electrical Characteristics**over recommended operating free air temperature range. All typical values are measured at  $V_{CC} = 5V$ ,  $T_A = 25^\circ C$ .

Symbol	Parameter	Conditions			Min	Typ	Max	Units
$V_{IK}$	Input Clamp Voltage	$V_{CC} = 4.5V, I_{IN} = -18\text{ mA}$					-1.2	V
$V_{OH}$	High Level Output Voltage	$V_{CC} = 4.5V, I_{OH} = -3\text{ mA}$			2.4	3.2		V
		$V_{CC} = 4.5V, I_{OH} = \text{Max}$			2.4			
		$I_{OH} = -2\text{ mA}, V_{CC} = 4.5V\text{ to }5.5V$			$V_{CC}-2$			
$V_{OL}$	Low Level Output Voltage	$V_{CC} = 4.5V, I_{OL} = \text{Max}$				0.35	0.55	V
$I_I$	Input Current at Max Input Voltage	$V_{CC} = 5.5V$	$V_{IN} = 7V$	Others			100	$\mu A$
			$V_{IN} = 5.5V$	For AS242, 243 (A or B)				
$I_{IH}$	High Level Input Current	$V_{CC} = 5.5V, V_{IN} = 2.7V$		AS242, 243 (A or B)			70	$\mu A$
				Others			20	
$I_{IL}$	Low Level Input Current	$V_{CC} = 5.5V, V_{IN} = 0.4V$		AS240, 241 (G, $\bar{G}$ ), 242, 243 (Control Inputs), 244 ( $\bar{G}$ )			-500	$\mu A$
				AS241 (A), 243 (A or B), 244 (A)			-1000	
$I_{OZH}$	High Level TRI-STATE Output Current	$V_{CC} = 5.5V, V = 2.7V$					50	$\mu A$
$I_{OZL}$	Low Level TRI-STATE Output Current	$V_{CC} = 5.5V, V = 0.4V$		AS242			-500	$\mu A$
				AS240, 241, 244			-50	
				AS243			-1000	
$I_O$ (Note)	Output Drive Current	$V_{CC} = 5.5V, V_{OUT} = 2.25V$			-50	-115	-150	mA
$I_{CC}$	AS240 Supply Current	$V_{CC} = 5.5V$		Outputs High		11	17	mA
				Outputs Low		51	75	
				TRI-STATE		24	38	
$I_{CC}$	AS241 Supply Current	$V_{CC} = 5.5V$		Outputs High		22	35	mA
				Outputs Low		61	90	
				TRI-STATE		35	56	
$I_{CC}$	AS242 Supply Current	$V_{CC} = 5.5V$		A Port Outputs High		18	28	mA
				A Port Outputs Low		38	60	
				TRI-STATE		25	39	
$I_{CC}$	AS243 Supply Current	$V_{CC} = 5.5V$		A Port Outputs High		28	44	mA
				A Port Outputs Low		47	74	
				TRI-STATE		35	56	
$I_{CC}$	AS244 Supply Current	$V_{CC} = 5.5V$		Outputs High		22	34	mA
				Outputs Low		60	90	
				TRI-STATE		34	54	

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

**'AS240 Switching Characteristics** over recommended operating free air temperature range (Note 1)

Symbol	Parameter	Conditions	From (Input)	To (Output)	Min	Max	Units
t <sub>PLH</sub>	Propagation Delay Time Low-to-High Level Output	V <sub>CC</sub> = 4.5V to 5.5V R <sub>1</sub> = R <sub>2</sub> = 500Ω C <sub>L</sub> = 50 pF	A	Y	2	6.5	ns
t <sub>PHL</sub>	Propagation Delay Time High-to-Low Level Output		A	Y	2	5.7	ns
t <sub>pZL</sub>	Output Enable to Low Level		$\bar{G}$	Y	2	9	ns
t <sub>pZH</sub>	Output Enable to High Level		$\bar{G}$	Y	2	6.4	ns
t <sub>PLZ</sub>	Output Disable from Low Level		$\bar{G}$	Y	2	9.5	ns
t <sub>PHZ</sub>	Output Disable from High Level		$\bar{G}$	Y	2	5	ns

**'AS241 Switching Characteristics** over recommended operating free air temperature range (Note 1)

Symbol	Parameter	Conditions	From (Input)	To (Output)	Min	Max	Units
t <sub>PLH</sub>	Propagation Delay Time Low-to-High Level Output	V <sub>CC</sub> = 4.5V to 5.5V R <sub>1</sub> = R <sub>2</sub> = 500Ω C <sub>L</sub> = 50 pF	A	Y	2	6.2	ns
t <sub>PHL</sub>	Propagation Delay Time High-to-Low Level Output		A	Y	2	6.2	ns
t <sub>pZL</sub>	Output Enable to Low Level		1 $\bar{G}$	Y	2	7.5	ns
t <sub>pZH</sub>	Output Enable to High Level		1 $\bar{G}$	Y	2	9	ns
t <sub>PLZ</sub>	Output Disable from Low Level		1 $\bar{G}$	Y	2	9	ns
t <sub>PHZ</sub>	Output Disable from High Level		1 $\bar{G}$	Y	2	6	ns
t <sub>pZL</sub>	Output Enable to Low Level		2G	Y	3	8.5	ns
t <sub>pZH</sub>	Output Enable to High Level		2G	Y	3	10.5	ns
t <sub>PLZ</sub>	Output Disable from Low Level		2G	Y	3	12	ns
t <sub>PHZ</sub>	Output Disable from High Level		2G	Y	3	7	ns

**'AS242 Switching Characteristics** over recommended operating free air temperature range (Note 1)

Symbol	Parameter	Conditions	From (Input)	To (Output)	Min	Max	Units
t <sub>PLH</sub>	Propagation Delay Time Low-to-High Level Output	V <sub>CC</sub> = 4.5V to 5.5V R <sub>1</sub> = R <sub>2</sub> = 500Ω C <sub>L</sub> = 50 pF	A or B	B or A	2	6.5	ns
t <sub>PHL</sub>	Propagation Delay Time High-to-Low Level Output		A or B	B or A	2	5.7	ns
t <sub>pZL</sub>	Output Enable to Low Level		GBA	A	3	9	ns
t <sub>pZH</sub>	Output Enable to High Level		GBA	A	3	7.5	ns
t <sub>PLZ</sub>	Output Disable from Low Level		GBA	A	3	13	ns
t <sub>PHZ</sub>	Output Disable from High Level		GBA	A	1.5	7	ns
t <sub>pZL</sub>	Output Enable to Low Level		$\bar{G}$ AB	B	2	8	ns
t <sub>pZH</sub>	Output Enable to High Level		$\bar{G}$ AB	B	2	7	ns
t <sub>PLZ</sub>	Output Disable from Low Level		$\bar{G}$ AB	B	2	12.5	ns
t <sub>PHZ</sub>	Output Disable from High Level		$\bar{G}$ AB	B	2	7.5	ns

**'AS243 Switching Characteristics** over recommended operating free air temperature range (Note 1)

Symbol	Parameter	Conditions	From (Input)	To (Output)	Min	Max	Units
$t_{PLH}$	Propagation Delay Time Low-to-High Level Output	$V_{CC} = 4.5V$ to $5.5V$ $R_1 = R_2 = 500\Omega$ $C_L = 50$ pF	A or B	B or A	3	7.5	ns
$t_{PHL}$	Propagation Delay Time High-to-Low Level Output		A or B	B or A	3	6.5	ns
$t_{PZL}$	Output Enable to Low Level		$\bar{G}AB$	B	2	7.5	ns
$t_{PZH}$	Output Enable to High Level		$\bar{G}AB$	B	2	9	ns
$t_{PLZ}$	Output Disable from Low Level		$\bar{G}AB$	B	2	9	ns
$t_{PHZ}$	Output Disable from High Level		$\bar{G}AB$	B	2	6.5	ns
$t_{PZL}$	Output Enable to Low Level		GBA	A	3	8.5	ns
$t_{PZH}$	Output Enable to High Level		GBA	A	3	10.5	ns
$t_{PLZ}$	Output Disable from Low Level		GBA	A	3	11	ns
$t_{PHZ}$	Output Disable from High Level		GBA	A	3	7	ns

**'AS244 Switching Characteristics** over recommended operating free air temperature range (Note 1)

Symbol	Parameter	Conditions	From (Input)	To (Output)	Min	Max	Units
$t_{PLH}$	Propagation Delay Time Low-to-High Level Output	$V_{CC} = 4.5V$ to $5.5V$ $R_1 = R_2 = 500\Omega$ $C_L = 50$ pF	A	Y	2	6.2	ns
$t_{PHL}$	Propagation Delay Time High-to-Low Level Output		A	Y	2	6.2	ns
$t_{PZL}$	Output Enable to Low Level		$\bar{G}$	Y	2	7.5	ns
$t_{PZH}$	Output Enable to High Level		$\bar{G}$	Y	2	9	ns
$t_{PLZ}$	Output Disable from Low Level		$\bar{G}$	Y	2	9	ns
$t_{PHZ}$	Output Disable from High Level		$\bar{G}$	Y	2	6	ns

Note 1: See Section 1 for test waveforms and output load.

## Function Tables

T-52-09

AS240

Inputs		Output
$\bar{G}$	A	Y
L	L	H
L	H	L
H	X	Z

AS244

Inputs		Output
$\bar{G}$	A	Y
L	L	L
L	H	H
H	X	Z

L = Low Logic Level

H = High Logic Level

X = Either Low or High Logic Level

Z = High Impedance

AS241

Inputs				Outputs	
2G	1 $\bar{G}$	1A	2A	1Y	2Y
X	L	L	X	L	
X	L	H	X	H	
X	H	X	X	Z	
H	X	X	L		L
H	X	X	H		H
L	X	X	X		Z

AS242, AS243

INPUTS		'AS242	'AS243
$\bar{G}AB$	GBA		
L	L	$\bar{A}$ to B	A to B
H	H	$\bar{B}$ to A	B to A
H	L	Isolation	Isolation
L	H	Latch A and B (A = $\bar{B}$ )	Latch A and B (A = B)