

## 54LS245/DM54LS245/DM74LS245 TRI-STATE® Octal Bus Transceiver

### General Description

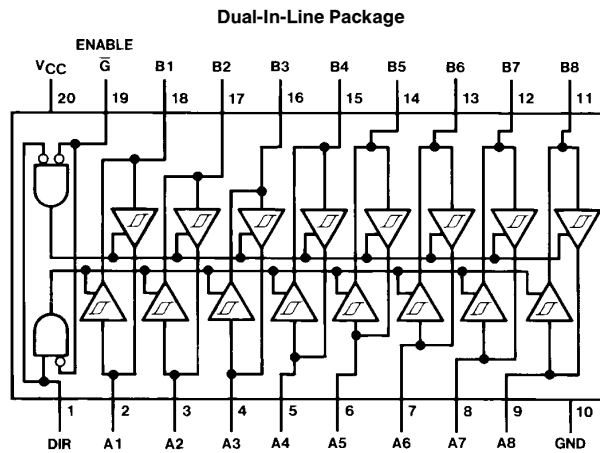
These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control function implementation minimizes external timing requirements.

The device allows data transmission from the A bus to the B bus or from the B bus to the A bus depending upon the logic level at the direction control (DIR) input. The enable input ( $\bar{G}$ ) can be used to disable the device so that the buses are effectively isolated.

### Features

- Bi-Directional bus transceiver in a high-density 20-pin package
- TRI-STATE outputs drive bus lines directly
- PNP inputs reduce DC loading on bus lines
- Hysteresis at bus inputs improve noise margins
- Typical propagation delay times, port-to-port 8 ns
- Typical enable/disable times 17 ns
- $I_{OL}$  (sink current)
  - 54LS 12 mA
  - 74LS 24 mA
- $I_{OH}$  (source current)
  - 54LS -12 mA
  - 74LS -15 mA
- Alternate Military/Aerospace device (54LS245) is available. Contact a National Semiconductor Sales Office/Distributor for specifications.

### Connection Diagram



TL/F/6413-1

Order Number 54LS245DMQB, 54LS245FMQB, 54LS245LMQB,  
DM54LS245J, DM54LS245W, DM74LS245WM or DM74LS245N  
See NS Package Number E20A, J20A, M20B, N20A or W20A

### Function Table

Enable $\bar{G}$	Direction Control DIR	Operation
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

H = High Level, L = Low Level, X = Irrelevant

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## Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	
DIR or $\bar{G}$	7V
A or B	5.5V
Operating Free Air Temperature Range	
DM54LS and 54LS	-55°C to +125°C
DM74LS	0°C to +70°C
Storage Temperature Range	-65°C to +150°C

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	DM54LS245			DM74LS245			Units
		Min	Nom	Max	Min	Nom	Max	
V <sub>CC</sub>	Supply Voltage	4.5	5	5.5	4.75	5	5.25	V
V <sub>IH</sub>	High Level Input Voltage	2			2			V
V <sub>IL</sub>	Low Level Input Voltage			0.7			0.8	V
I <sub>OH</sub>	High Level Output Current			-12			-15	mA
I <sub>OL</sub>	Low Level Output Current			12			24	mA
T <sub>A</sub>	Free Air Operating Temperature	-55		125	0		70	°C

## Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 1)	Max	Units	
V <sub>I</sub>	Input Clamp Voltage	V <sub>CC</sub> = Min, I <sub>I</sub> = -18 mA				-1.5	V	
HYS	Hysteresis (V <sub>T+</sub> - V <sub>T-</sub> )	V <sub>CC</sub> = Min		0.2	0.4		V	
V <sub>OH</sub>	High Level Output Voltage	V <sub>CC</sub> = Min, V <sub>IH</sub> = Min V <sub>IL</sub> = Max, I <sub>OH</sub> = -1 mA	DM74	2.7			V	
		V <sub>CC</sub> = Min, V <sub>IL</sub> = Min V <sub>IL</sub> = Max, I <sub>OH</sub> = -3 mA	DM54/DM74	2.4	3.4			
		V <sub>CC</sub> = Min, V <sub>IH</sub> = Min V <sub>IL</sub> = 0.5V, I <sub>OH</sub> = Max	DM54/DM74	2				
V <sub>OL</sub>	Low Level Output Voltage	V <sub>CC</sub> = Min V <sub>IL</sub> = Max V <sub>IH</sub> = Min	I <sub>OL</sub> = 12 mA	DM74		0.4	V	
			I <sub>OL</sub> = Max	DM54		0.4		
				DM74		0.5		
I <sub>OZH</sub>	Off-State Output Current, High Level Voltage Applied	V <sub>CC</sub> = Max V <sub>IL</sub> = Max V <sub>IH</sub> = Min	V <sub>O</sub> = 2.7V			20	μA	
I <sub>OZL</sub>	Off-State Output Current, Low Level Voltage Applied		V <sub>O</sub> = 0.4V			-200	μA	
I <sub>I</sub>	Input Current at Maximum Input Voltage	V <sub>CC</sub> = Max	A or B	V <sub>I</sub> = 5.5V		0.1	mA	
			DIR or $\bar{G}$	V <sub>I</sub> = 7V		0.1		
I <sub>IH</sub>	High Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 2.7V				20	μA	
I <sub>IL</sub>	Low Level Input Current	V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V				-0.2	mA	
I <sub>OS</sub>	Short Circuit Output Current	V <sub>CC</sub> = Max (Note 2)		-40		-225	mA	
I <sub>CC</sub>	Supply Current	Outputs High		V <sub>CC</sub> = Max		48	70	mA
		Outputs Low				62	90	
		Outputs at Hi-Z				64	95	

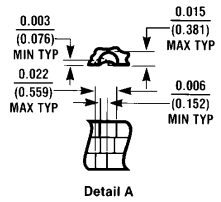
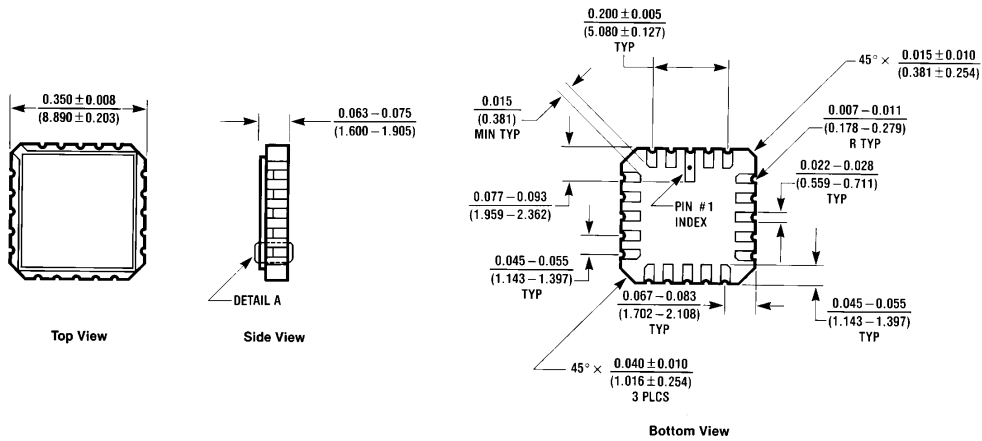
Note 1: All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

Note 2: Not more than one output should be shorted at a time, not to exceed one second duration

**Switching Characteristics**  $V_{CC} = 5V, T_A = 25^{\circ}C$  (See Section 1 for Test Waveforms and Output Load)

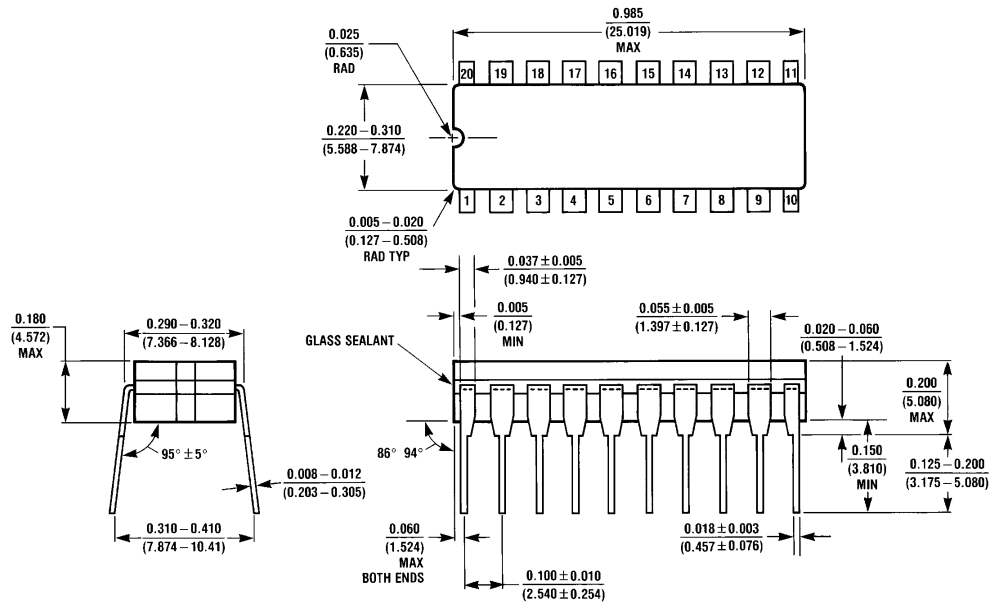
Symbol	Parameter	Conditions	DM54/74		Units
			LS245		
			Min	Max	
$t_{PLH}$	Propagation Delay Time, Low-to-High-Level Output	$C_L = 45\text{ pF}$ $R_L = 667\Omega$		12	ns
$t_{PHL}$	Propagation Delay Time, High-to-Low-Level Output			12	ns
$t_{PZL}$	Output Enable Time to Low Level			40	ns
$t_{PZH}$	Output Enable Time to High Level			40	ns
$t_{PLZ}$	Output Disable Time from Low Level	$C_L = 5\text{ pF}$ $R_L = 667\Omega$		25	ns
$t_{PHZ}$	Output Disable Time from High Level			25	ns
$t_{PLH}$	Propagation Delay Time, Low-to-High-Level Output	$C_L = 150\text{ pF}$ $R_L = 667\Omega$		16	ns
$t_{PHL}$	Propagation Delay Time, High-to-Low-Level Output			17	ns
$t_{PZL}$	Output Enable Time to Low Level			45	ns
$t_{PZH}$	Output Enable Time to High Level			45	ns

**Physical Dimensions** inches (millimeters)



**Ceramic Leadless Chip Carrier Package (E)**  
 Order Number 54LS245LMQB  
 NS Package Number E20A

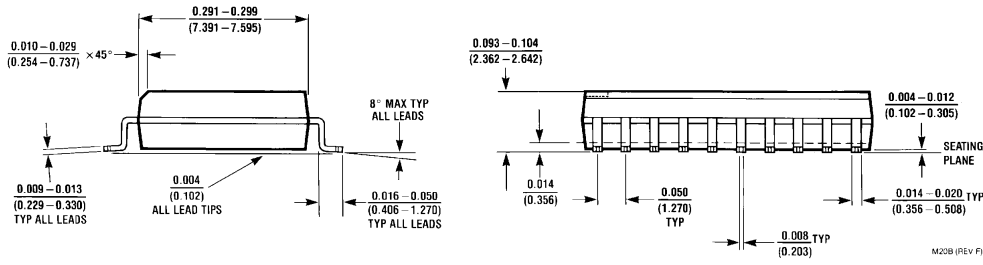
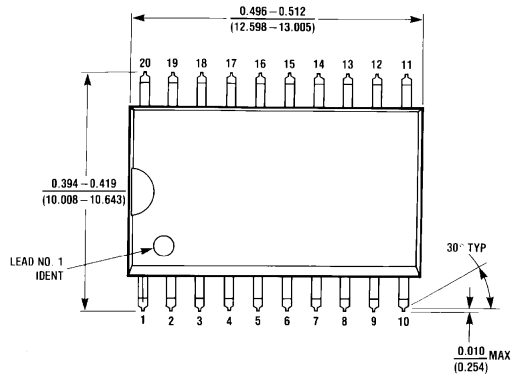
E20A (REV D)



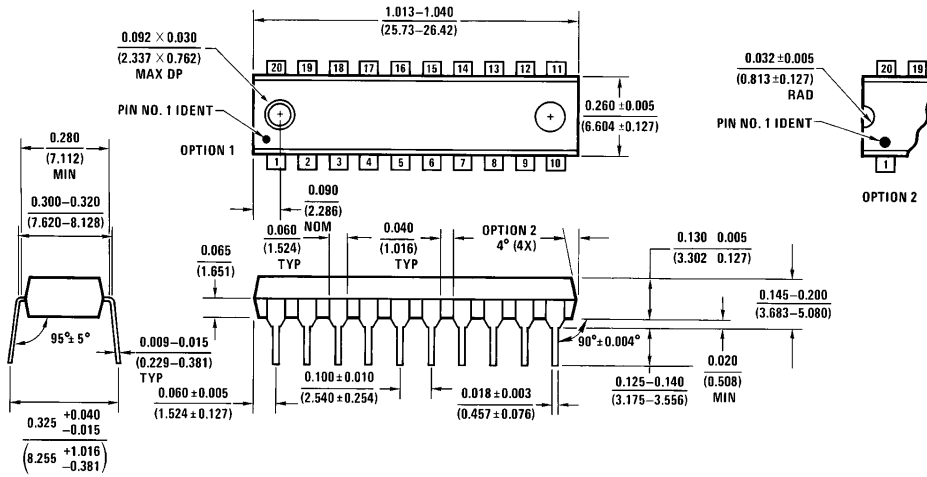
**20-Lead Ceramic Dual-In-Line Package (J)**  
 Order Number 54LS245DMQB or DM54LS245J  
 NS Package Number J20A

J20A (REV M)

**Physical Dimensions** inches (millimeters) (Continued)

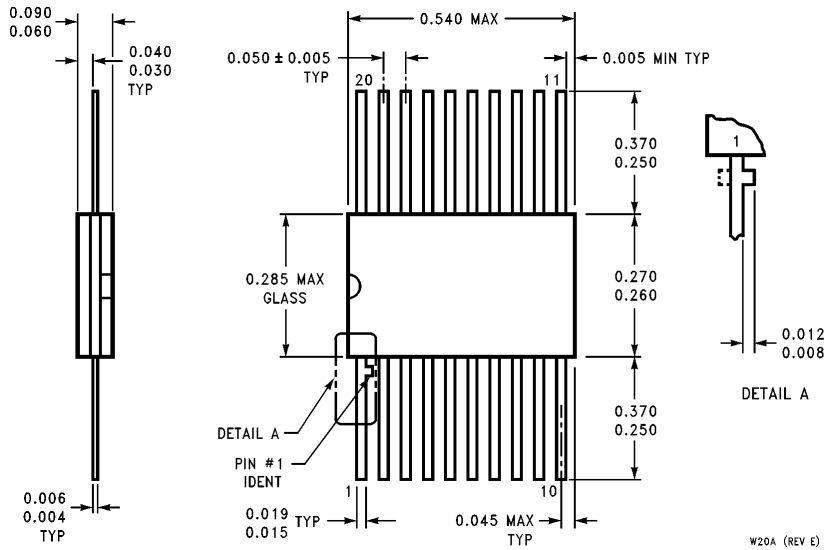


**20-Lead Small Outline Molded Package (M)**  
**Order Number DM74LS245WM**  
**NS Package Number M20B**



**20-Lead Molded Dual-In-Line Package (N)**  
**Order Number DM74LS245N**  
**NS Package Number N20A**

**Physical Dimensions** inches (millimeters) (Continued)



**20-Lead Ceramic Flat Package (W)**  
**Order Number 54LS245FMQB or DM54LS245W**  
**NS Package Number W20A**

W20A (REV E)

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