



54F/74F2640 • 54F/74F2643 • 54F/74F2645

Octal Bus Transceiver with 25Ω Series Resistors in the Outputs

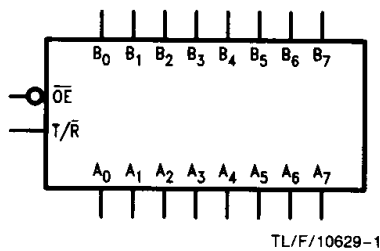
General Description

These devices are octal bus transceivers designed for asynchronous two-way data flow between the A and B busses. These devices are functionally equivalent to the 'F640, 'F643, and 'F645. The 25Ω series resistors in the outputs reduce ringing and eliminate the need for external resistors. Both busses are capable of sinking 12 mA, sourcing 15 mA, have TRI-STATE outputs, and a common output enable pin. The direction of data flow is determined by the transmit/receive (T/ \bar{R}) input. The 'F2640 is an inverting version of the 'F2645. The 'F2643 has a noninverting A bus and an inverting B bus. The 'F2645 is a low power version of the 'F245 with 25Ω series resistors in the outputs.

Features

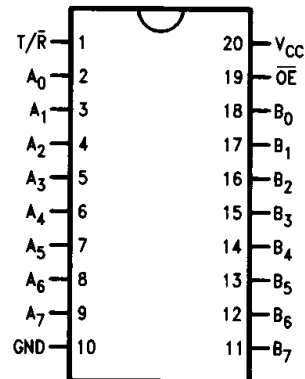
- 25Ω series resistors in the outputs eliminates the need for external resistors
- Designed for asynchronous two-way data flow between busses
- Outputs sink 12 mA and source 15 mA
- Transmit/receive (T/ \bar{R}) input controls the direction of data flow
- Guaranteed 4000V minimum ESD protection
- 'F2645 is a low power version of the 'F245 with 25Ω series resistors in the outputs
- 'F2640 is an inverting option of the 'F2645
- 'F2643 has noninverting A bus and inverting B bus

Logic Symbol



Connection Diagrams

Pin Assignment for DIP, SOIC and Flatpak

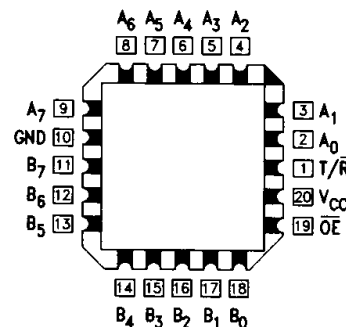


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Unit Loading/Fan Out

Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input I_{IH}/I_{IL} Output I_{OH}/I_{OL}
$\bar{O}E$	Output Enable Input (Active LOW)	1.0/1.0	20 μ A / -0.6 mA
T/ \bar{R}	Transmit/Receive Input	1.0/1.0	20 μ A / -0.6 mA
A ₀ -A ₇	Side A Inputs or TRI-STATE Outputs	3.5/0.667	70 μ A / -0.4 mA
B ₀ -B ₇	Side B Inputs or TRI-STATE Outputs	3.5/0.667	70 μ A / -0.4 mA

Pin Assignment for LCC and PCC



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54F/74F2640 • 54F/74F2643 • 54F/74F2645 Octal Bus Transceiver with 25Ω Series Resistors in the Outputs

Functional Description

The output enable (\overline{OE}) is active LOW. If the device is disabled (\overline{OE} HIGH), the outputs are in the high impedance state. The transmit/receive input (T/\overline{R}) controls whether data is transmitted from the A bus to the B bus or from the B bus to the A bus. When T/\overline{R} is LOW, B data is sent to the A bus. If T/\overline{R} is HIGH, A data is sent to the B bus.

Function Table

Inputs		Outputs		
\overline{OE}	T/\overline{R}	'F2640	'F2643	'F2645
L	L	Bus \overline{B} data to Bus A	Bus B data to Bus A	Bus B data to Bus A
L	H	Bus \overline{A} data to Bus B	Bus \overline{A} data to Bus B	Bus A data to Bus B
H	X	Z	Z	Z

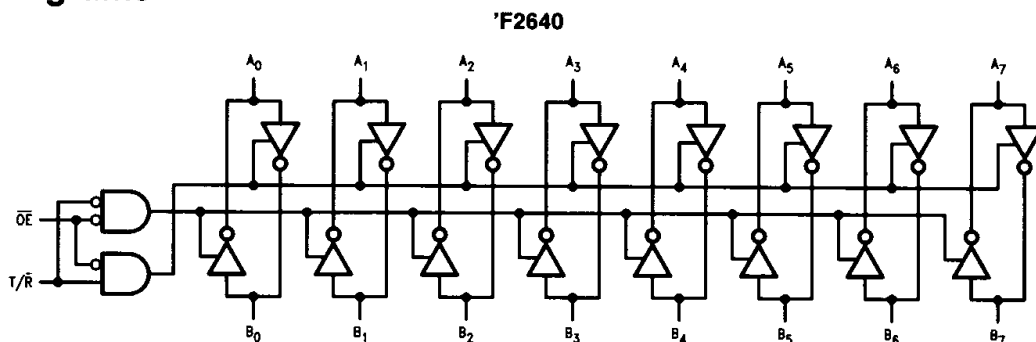
H = High voltage level

L = Low voltage level

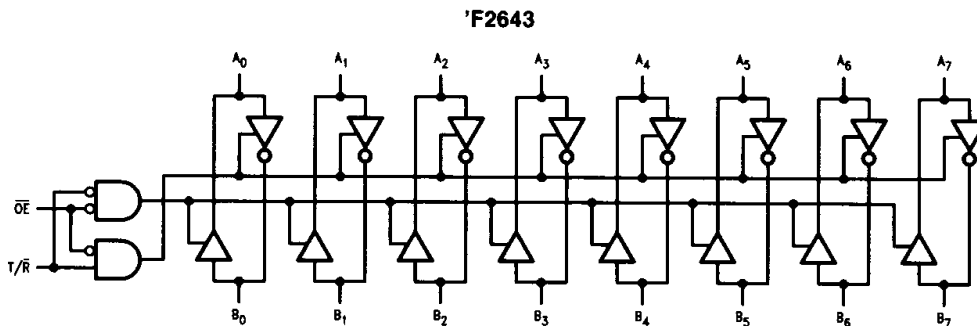
X = Don't care

Z = High-impedance state

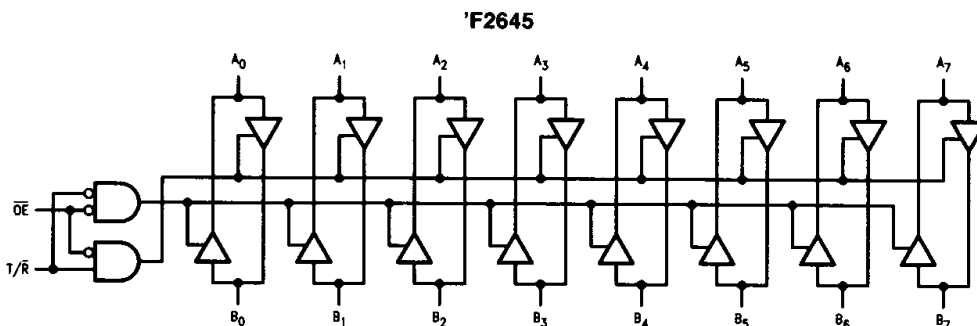
Logic Diagrams



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Absolute Maximum Ratings (Note 1)

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

Storage Temperature	-65°C to +150°C
Ambient Temperature under Bias	-55°C to +125°C
Junction Temperature under Bias	-55°C to +175°C
V _{CC} Pin Potential to Ground Pin	-0.5V to +7.0V
Input Voltage (Note 2)	-0.5V to +7.0V
Input Current (Note 2)	-30 mA to +5.0 mA
Voltage Applied to Output in HIGH State (with V _{CC} = 0V)	
Standard Output	-0.5V to V _{CC}
TRI-STATE Output	-0.5V to +5.5V

Current Applied to Output in LOW State (Max) twice the rated I_{OL} (mA)
 ESD Last Passing Voltage (Min) 4000V

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

Recommended Operating Conditions

Free Air Ambient Temperature	
Military	-55°C to +125°C
Commercial	0°C to +70°C
Supply Voltage	
Military	+4.5V to +5.5V
Commercial	+4.5V to +5.5V

DC Electrical Characteristics

Symbol	Parameter	54F/74F			Units	V _{CC}	Conditions
		Min	Typ	Max			
V _{IH}	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V _{IL}	Input LOW Voltage			0.8	V		Recognized as a LOW Signal
V _{CD}	Input Clamp Diode Voltage			-1.2	V	Min	I _{IN} = -18 mA (Non I/O Pins)
V _{OH}	Output HIGH Voltage	54F 10% V _{CC} 74F 10% V _{CC}	2.0 2.0		V	Min	I _{OH} = -12 mA (A _n , B _n) I _{OH} = -15 mA (A _n , B _n)
V _{OL}	Output LOW Voltage	74F 10% V _{CC} 74F 10% V _{CC}		0.50 0.75	V	Min	I _{OL} = 1 mA (A _n , B _n) I _{OL} = 12 mA (A _n , B _n)
I _{IH}	Input HIGH Current	54F 74F		20.0 5.0	μA	Max	V _{IN} = 2.7V (Non I/O Pins)
I _{BVI}	Input HIGH Current Breakdown Test	54F 74F		100 7.0	μA	Max	V _{IN} = 7.0V (Non I/O Pins)
I _{BVIT}	Input HIGH Current Breakdown (I/O)	54F 74F		1.0 0.5	mA	Max	V _{IN} = 5.5V (A _n , B _n)
I _{CEX}	Output HIGH Leakage Current	54F 74F		250 50	μA	Max	V _{OUT} = V _{CC}
V _{ID}	Input Leakage Test	74F	4.75		V	0.0	I _{ID} = 1.9 μA All Other Pins Grounded
I _{OD}	Output Leakage Circuit Current	74F		3.75	μA	0.0	V _{IOD} = 150 mV All Other Pins Grounded
I _{IL}	Input LOW Current			-0.6	mA	Max	V _{IN} = 0.5V (Non I/O Pins)
I _{IH} + I _{OZH}	Output Leakage Current			70	μA	Max	V _{OUT} = 2.7V (A _n , B _n)
I _{IL} + I _{OZL}	Output Leakage Current			-650	μA	Max	V _{OUT} = 0.5V (A _n , B _n)
I _{OS}	Output Short-Circuit Current		-100	-225	mA	Max	V _{OUT} = 0V
I _{ZZ}	Bus Drainage Test			500	μA	0.0V	V _{OUT} = 5.25
I _{CCH}	Power Supply Current ('F2640)			82	mA	Max	V _O = HIGH, V _{IN} = 0.2V
I _{CCL}	Power Supply Current ('F2640)			82	mA	Max	V _O = LOW
I _{CCZ}	Power Supply Current ('F2640)			95	mA	Max	V _O = HIGH Z
I _{CCH}	Power Supply Current ('F2643)			82	mA	Max	V _O = HIGH, V _{IN} = 0.2V (A _n)
I _{CCL}	Power Supply Current ('F2643)			82	mA	Max	V _O = LOW, V _{IN} = 0.2V (B _n)
I _{CCZ}	Power Supply Current ('F2643)			95	mA	Max	V _O = HIGH Z
I _{CCH}	Power Supply Current ('F2645)			82	mA	Max	V _O = HIGH
I _{CCL}	Power Supply Current ('F2645)			82	mA	Max	V _O = LOW, V _{IN} = 0.2V
I _{CCZ}	Power Supply Current ('F2645)			95	mA	Max	V _O = HIGH Z

'F2640 AC Electrical Characteristics:

Symbol	Parameter	74F			54F		74F		Units
		T _A = +25°C V _{CC} = +5.0V C _L = 50 pF			T _A , V _{CC} = Mil C _L = 50 pF		T _A , V _{CC} = Com C _L = 50 pF		
		Min	Typ	Max	Min	Max	Min	Max	
t _{PLH} t _{PHL}	Propagation Delay A Input to B Output	2.5		7.5			2.0	8.0	ns
		2.5		7.5			2.5	7.5	
t _{PLH} t _{PHL}	Propagation Delay B Input to A Output	2.5		7.5			2.0	8.0	ns
		2.5		7.5			2.5	7.5	
t _{PZH} t _{PZL}	Enable Time OE Input to A Output	2.5		7.5			2.0	9.0	ns
		2.5		8.0			2.0	8.5	
t _{PHZ} t _{PLZ}	Disable Time OE Input to A Output	1.5		7.0			1.0	7.5	
		1.5		6.0			1.5	6.0	
t _{PZH} t _{PZL}	Enable Time OE Input to B Output	2.5		7.5			2.0	9.0	ns
		2.5		8.0			2.0	8.5	
t _{PHZ} t _{PLZ}	Disable Time OE Input to B Output	1.5		6.5			1.0	7.5	
		1.5		6.0			1.5	6.0	

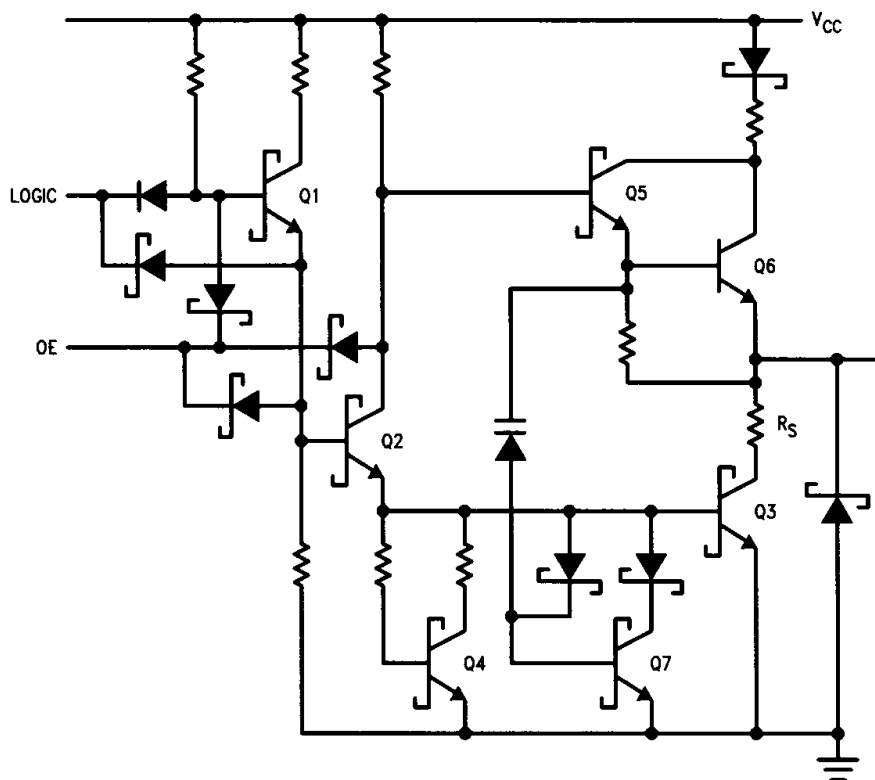
'F2643 AC Electrical Characteristics:

Symbol	Parameter	74F			54F		74F		Units
		T _A = +25°C V _{CC} = +5.0V C _L = 50 pF			T _A , V _{CC} = Mil C _L = 50 pF		T _A , V _{CC} = Com C _L = 50 pF		
		Min	Typ	Max	Min	Max	Min	Max	
t _{PLH} t _{PHL}	Propagation Delay A Input to B Output	2.5		7.5			2.0	8.0	ns
		2.5		7.5			2.5	7.5	
t _{PLH} t _{PHL}	Propagation Delay B Input to A Output	2.5		7.0			2.5	8.0	ns
		2.5		7.5			2.5	8.0	
t _{PZH} t _{PZL}	Enable Time OE Input to A Output	2.5		8.0			2.0	9.0	ns
		2.5		8.5			2.0	8.5	
t _{PHZ} t _{PLZ}	Disable Time OE Input to A Output	1.5		7.0			1.0	8.0	
		1.0		5.5			1.0	5.5	
t _{PZH} t _{PZL}	Enable Time OE Input to B Output	2.5		7.5			2.0	9.0	ns
		2.5		8.0			2.0	8.5	
t _{PHZ} t _{PLZ}	Disable Time OE Input to B Output	1.5		6.5			1.0	7.5	
		1.5		6.0			1.5	6.0	

'F2645 AC Electrical Characteristics:

Symbol	Parameter	74F			54F		74F		Units
		$T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$			$T_A, V_{CC} = \text{Mil}$ $C_L = 50\text{ pF}$		$T_A, V_{CC} = \text{Com}$ $C_L = 50\text{ pF}$		
		Min	Typ	Max	Min	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay A Input to B Output	1.5		6.0			1.5	7.0	ns
		2.5		7.5			2.5	8.0	
t_{PLH} t_{PHL}	Propagation Delay B Input to A Output	1.5		6.0			1.5	7.0	ns
		2.5		7.5			2.5	8.0	
t_{PZH} t_{PZL}	Enable Time \overline{OE} Input to A Output	2.5		8.0			2.0	9.0	ns
		2.5		8.5			2.0	8.5	
t_{PHZ} t_{PLZ}	Disable Time \overline{OE} Input to A Output	1.5		7.0			1.0	8.0	ns
		1.0		5.5			1.0	5.5	
t_{PZH} t_{PZL}	Enable Time \overline{OE} Input to B Output	2.5		7.5			2.0	9.5	ns
		2.5		8.5			2.5	9.0	
t_{PHZ} t_{PLZ}	Disable Time \overline{OE} Input to B Output	1.5		6.5			1.0	7.5	ns
		1.0		6.5			1.0	6.5	

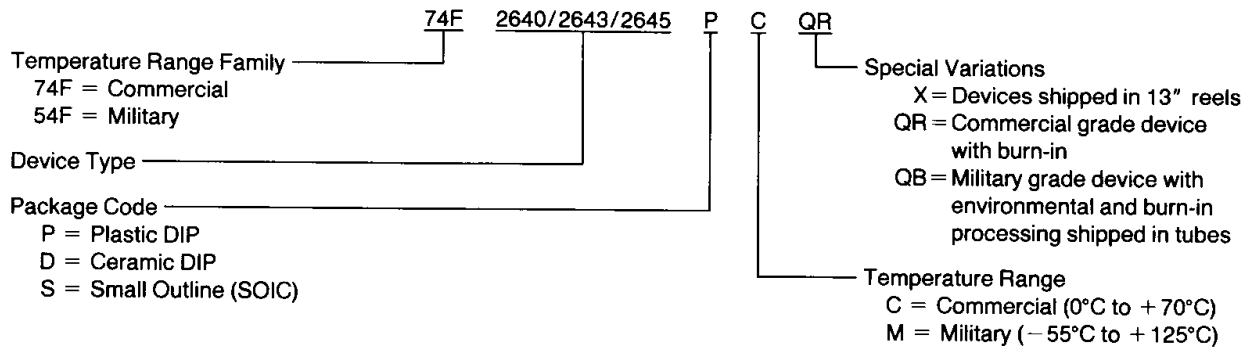
Basic FAST Circuit Showing Series Resistor Placement



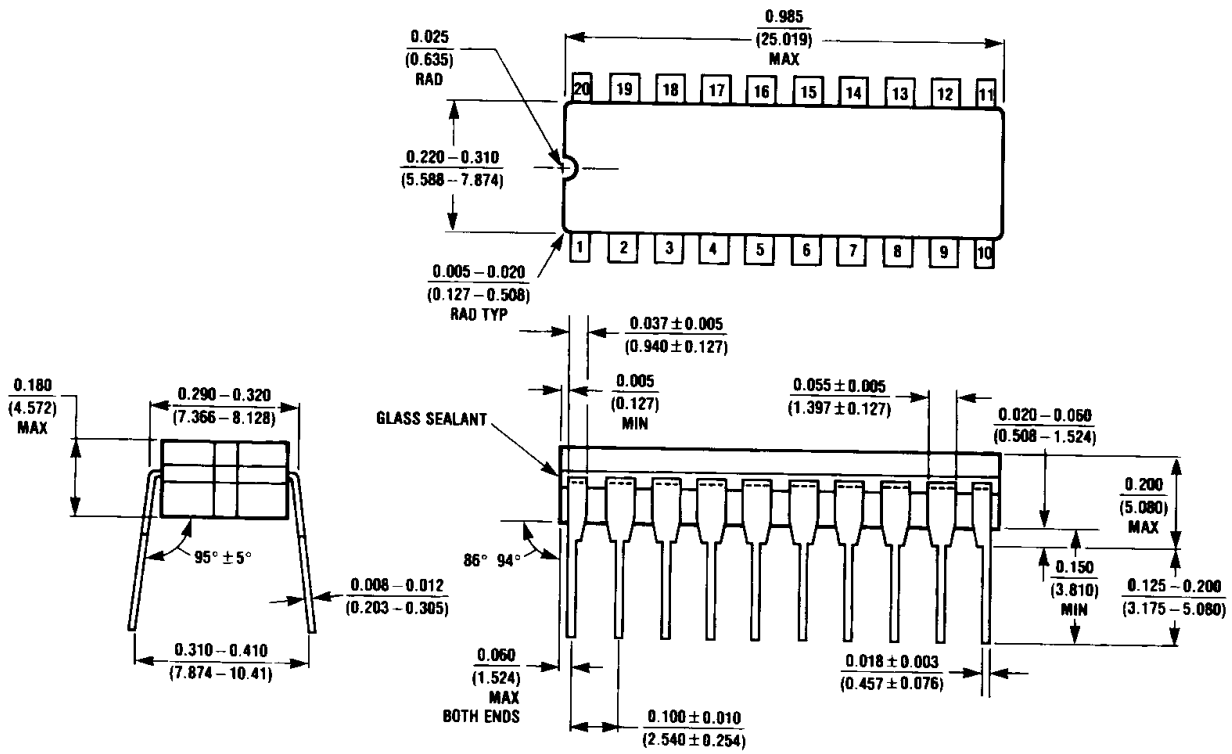
TL/F/10629-7

Ordering Information

The device number is used to form part of a simplified purchasing code where a package type and temperature range are defined as follows:

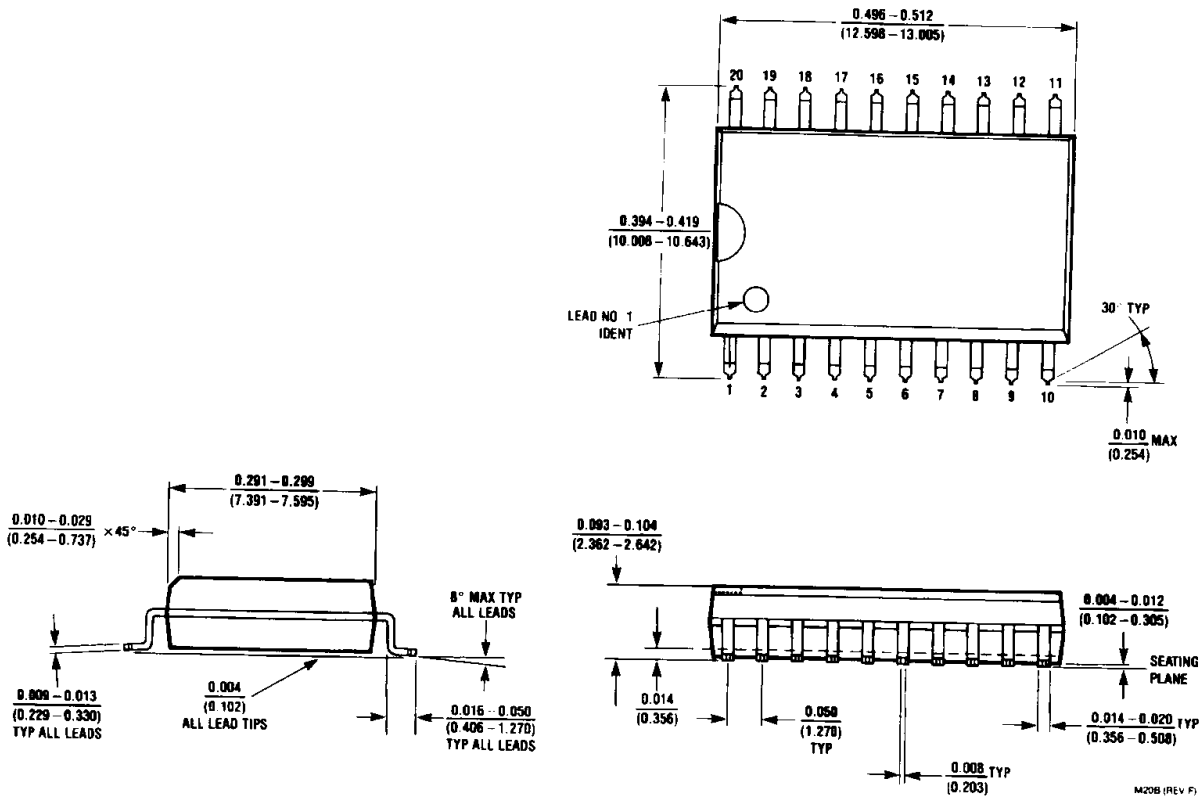


Physical Dimensions inches (millimeters)



J20A (REV M)

**20-Lead Ceramic Dual-In-Line Package (D)
NS Package Number J20A**

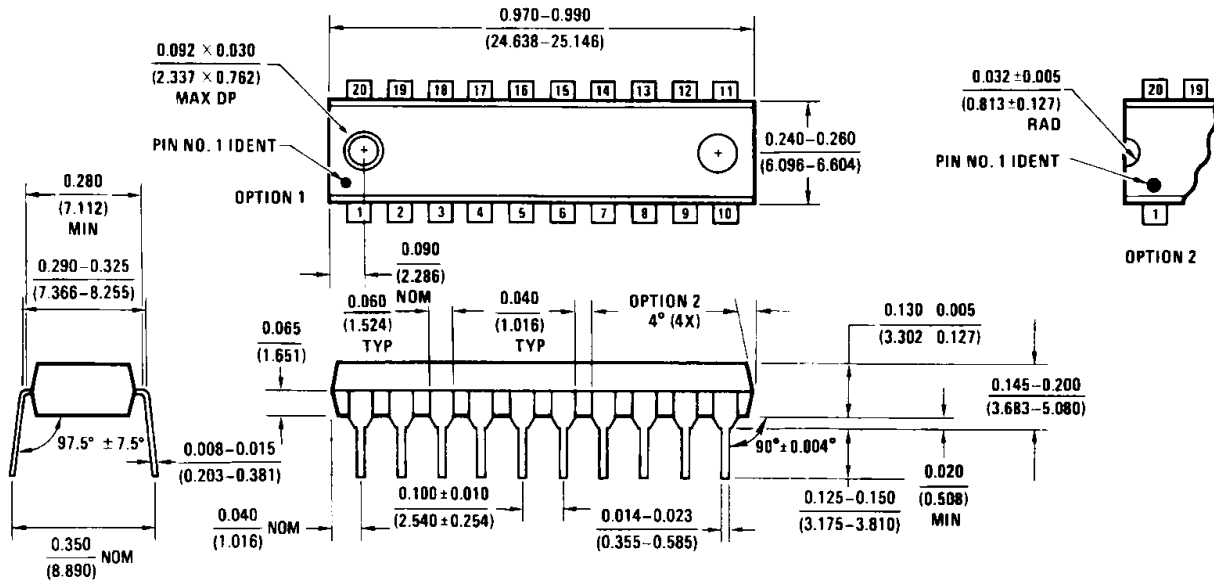


M20B (REV F)

**20-Lead Small Outline Integrated Circuit (S)
NS Package Number M20B**

Physical Dimensions inches (millimeters) (Continued)

Lit. # 114659



**20-Lead Plastic Dual-In-Line Package (P)
NS Package Number N20B**

N20B (REV A)

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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