54F545,74F545

54F545 74F545 Octal Bidirectional Transceiver with TRI-STATE(RM) Outputs

Literature Number: SNOS205A

National Semiconductor

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54F/74F545 Octal Bidirectional Transceiver with TRI-STATE® Outputs

General Description

The 'F545 is an 8-bit, TRI-STATE, high-speed transceiver. It provides bidirectional drive for bus-oriented microprocessor and digital communications systems. Straight through bidirectional transceivers are featured, with 24 mA (20 mA Mil) bus drive capability on the A ports and 64 mA (48 mA Mil) bus drive capability on the B ports.

One input, Transmit/Receive ($T/\overline{R}$) determines the direction of logic signals through the bidirectional transceiver. Transmit enables data from A ports to B ports; Receive enables data from B ports to A ports. The Output Enable input disables both A and B ports by placing them in a TRI-STATE condition.

Features

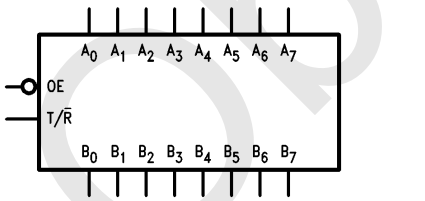
- Higher drive than 8304
- 8-bit bidirectional data flow reduces system package count
- TRI-STATE inputs/outputs for interfacing with bus-oriented systems
- 24 mA (20 mA Mil) and 64 mA (48 mA Mil) bus drive capability on A and B ports, respectively
- Transmit/Receive and Output Enable simplify control logic
- Guaranteed 4000V minimum ESD protection
- Pin for Pin compatible with Intel 8286

Commercial	Military	Package Number	Package Description
74F545PC		N20A	20-Lead (0.300″ Wide) Molded Dual-In-Line
	54F545DM (Note 2)	J20A	20-Lead Ceramic Dual-In-Line
74F545SC (Note 1)		M20B	20-Lead (0.300″ Wide) Molded Small Outline, JEDEC
74F545SJ (Note 1)		M20D	20-Lead (0.300″ Wide) Molded Small Outline, EIAJ
	54F545FM (Note 2)	W20A	20-Lead Cerpack
	54F545LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

Note 1: Devices also available in 13″ reel. Use suffix = SCX and SJX.

Note 2: Military grade device with environmental and burn-in processing. Use suffix = DMQB, FMQB and LMQB.

Logic Symbols



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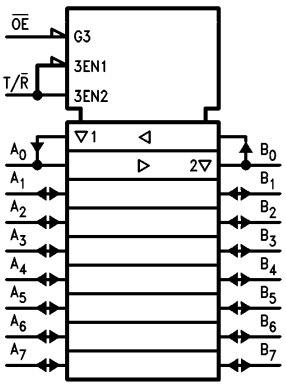
IEEE/IEC



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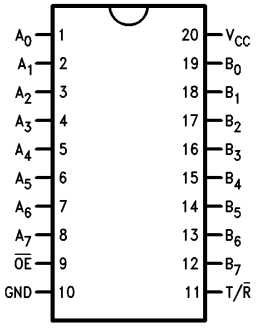
Connection Diagrams

Pin Assignment for DIP, SOIC and Flatpak



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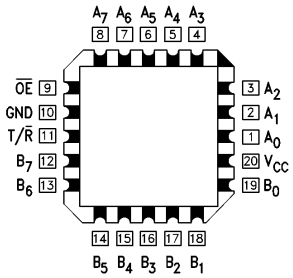
Pin Assignment for LCC



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Truth Table

Inputs		Outputs
$\overline{OE}$	T/$\overline{R}$	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	High Z

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
Z = High Impedance

Unit Loading/Fan Out

Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input I_{IH}/I_{IL} Output I_{OH}/I_{OL}
$\overline{OE}$	Output Enable Input (Active LOW)	1.0/2.0	20 μA/−1.2 mA
T/$\overline{R}$	Transmit/Receive Input	1.0/2.0	20 μA/−1.2 mA
A_0–A_7	Side A TRI-STATE Inputs or	3.5/1.083	70 μA/−650 μA
	TRI-STATE Outputs	150/40 (33.3)	−3 mA/24 mA (20 mA)
B_0–B_7	Side B TRI-STATE Inputs or	3.5/1.083	70 μA/−650 μA
	TRI-STATE Outputs	600/106.6 (80)	−12 mA/64 mA (48 mA)

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
Plastic	−55°C to +150°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 Min	54F/74F Typ	54F/74F Max	Units	V_{CC}	Conditions
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 ($\overline{OE}$, T/$\overline{R}$)
V_{OH}	Output HIGH Voltage	54F 10% V_{CC}	2.5			V	Min	I_{OH} = −1 mA (A_n)
		54F 10% V_{CC}	2.4					I_{OH} = −3 mA (A_n)
		54F 10% V_{CC}	2.0					I_{OH} = −12 mA (B_n)
		74F 10% V_{CC}	2.5					I_{OH} = −1 mA (A_n)
		74F 10% V_{CC}	2.4					I_{OH} = −3 mA (A_n)
		74F 10% V_{CC}	2.0					I_{OH} = −15 mA (B_n)
		74F 5% V_{CC}	2.7					I_{OH} = −1 mA (A_n)
		74F 5% V_{CC}	2.7					I_{OH} = −3 mA (A_n)
V_{OL}	Output LOW Voltage	54F 10% V_{CC}			0.5	V	Min	I_{OL} = 20 mA (A_n)
		54F 10% V_{CC}			0.55			I_{OL} = 48 mA (B_n)
		74F 10% V_{CC}			0.5			I_{OL} = 24 mA (A_n)
		74F 10% V_{CC}			0.55			I_{OL} = 64 mA (B_n)
I_{IH}	Input HIGH Current	54F			20.0	μA	Max	V_{IN} = 2.7V ($\overline{OE}$, T/$\overline{R}$)
		74F			5.0			
I_{BVI}	Input HIGH Current Breakdown Test	54F			100	μA	Max	V_{IN} = 7.0V ($\overline{OE}$, T/$\overline{R}$)
		74F			7.0			
I_{BVIT}	Input HIGH Current Breakdown (I/O)	54F			1.0	mA	Max	V_{IN} = 5.5V (A_n, B_n)
		74F			0.5			
I_{CEX}	Output HIGH Leakage Current	54F			250	μA	Max	V_{OUT} = V_{CC}
		74F			50			
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				−1.2	mA	Max	V_{IN} = 0.5V ($\overline{OE}$, T/$\overline{R}$)
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		−60		−150	mA	Max	V_{OUT} = 0V (A_n)
			−100		−225			V_{OUT} = 0V (B_n)

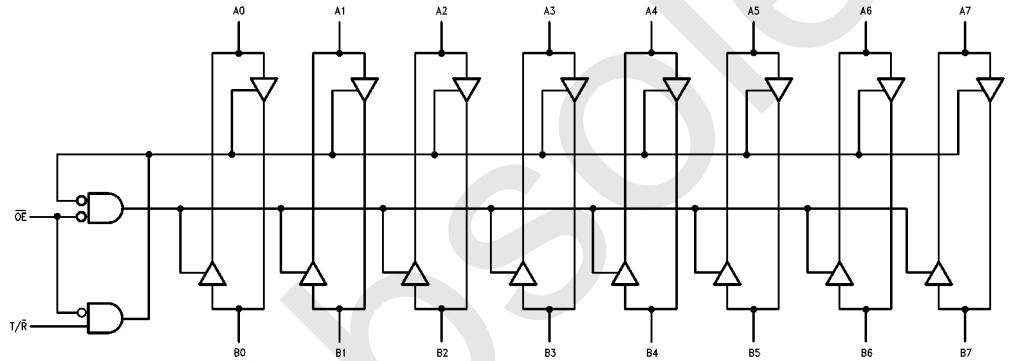
DC Electrical Characteristics (Continued)

Symbol	Parameter	54F/74F			Units	V_{CC}	Conditions
		Min	Typ	Max			
I_{ZZ}	Bus Drainage Test			500	μA	0.0V	V_{OUT} = 5.25V
I_{CCH}	Power Supply Current		70	90	mA	Max	V_O = HIGH
I_{CCL}	Power Supply Current		95	120	mA	Max	V_O = LOW
I_{CCZ}	Power Supply Current		85	110	mA	Max	V_O = HIGH Z

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}	Propagation Delay	2.5	4.2	6.0	2.0	7.5	2.5	7.0	ns
t_{PHL}	A_n to B_n or B_n to A_n	2.5	4.6	6.0	2.0	7.5	2.5	7.0	
t_{PZH}	Output Enable Time	3.0	5.3	7.0	2.5	9.0	3.0	8.0	ns
t_{PZL}		3.5	6.0	8.0	3.0	10.0	3.5	9.0	
t_{PHZ}	Output Disable Time	3.0	5.0	6.5	2.5	9.0	3.0	7.5	
t_{PLZ}		2.0	5.0	6.5	2.0	10.0	2.0	7.5	

Logic Diagram



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Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Ordering Information

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

74F 545 S C X

Temperature Range Family
- 74F = Commercial
- 54F = Military

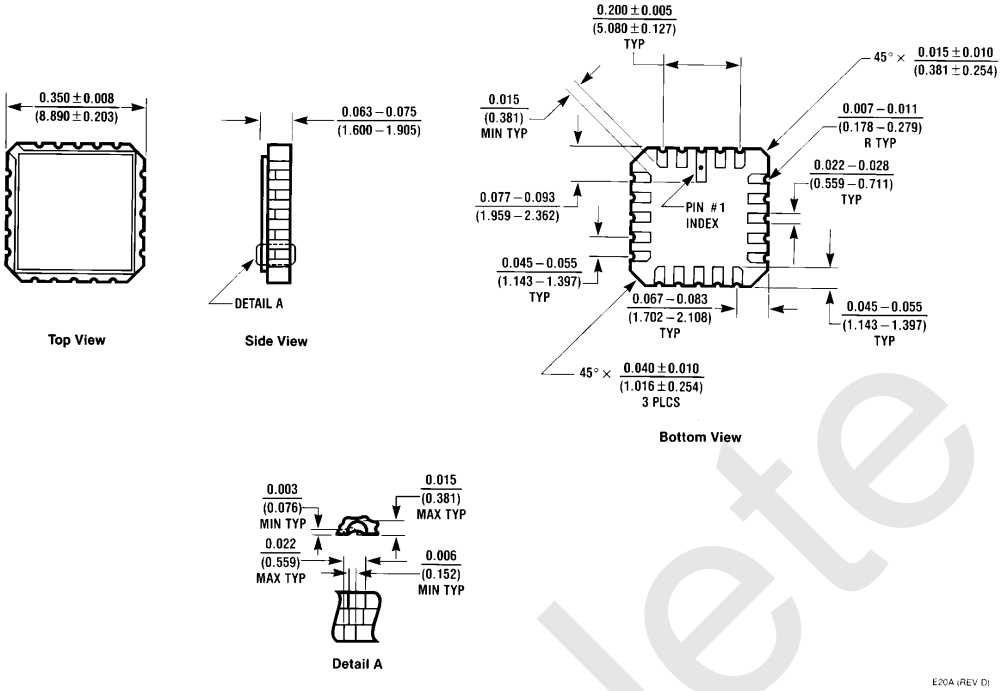
Device Type

Package Code
- P = Plastic DIP
- D = Ceramic DIP
- F = Flatpak
- L = Leadless Chip Carrier (LCC)
- S = Small Outline SOIC JEDEC
- SJ = Small Outline SOIC EIAJ

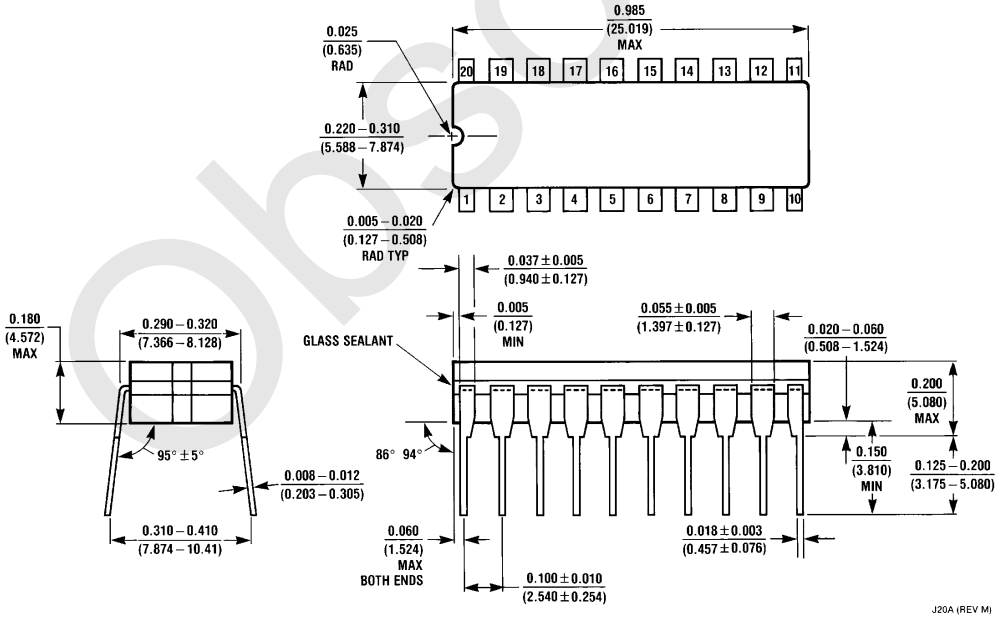
Temperature Range
- C = Commercial (0°C to +70°C)
- M = Military (−55°C to +125°C)

Special Variations
- QB = Military grade device with environmental and burn-in processing
- X = Devices shipped in 13″ reel

Physical Dimensions inches (millimeters)

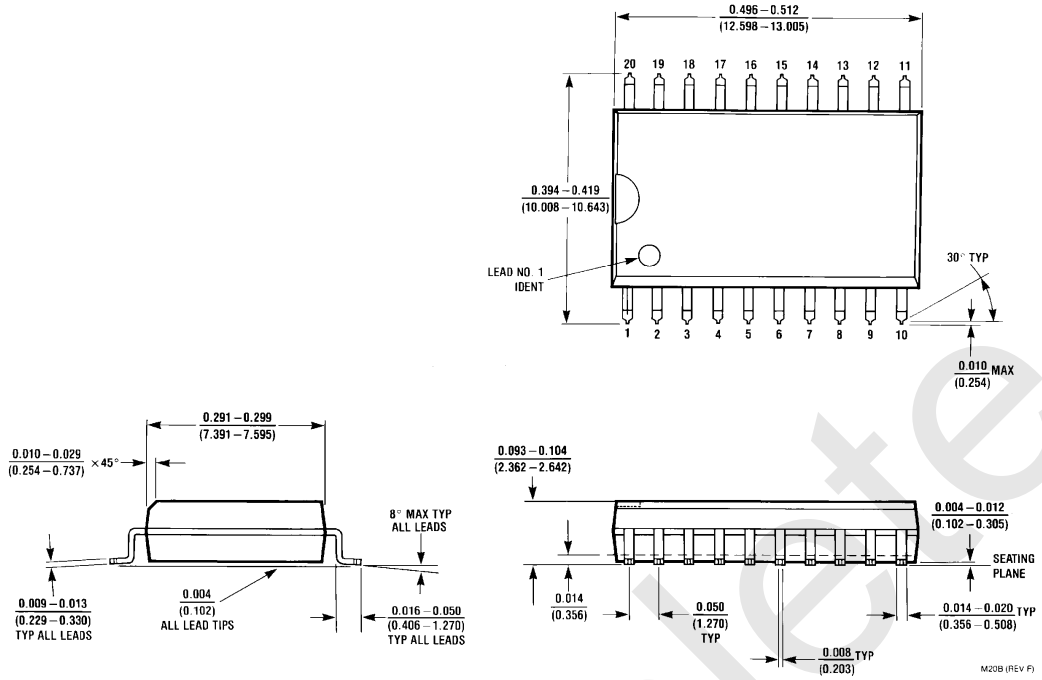


20-Lead Ceramic Leadless Chip Carrier (L)
NS Package Number E20A

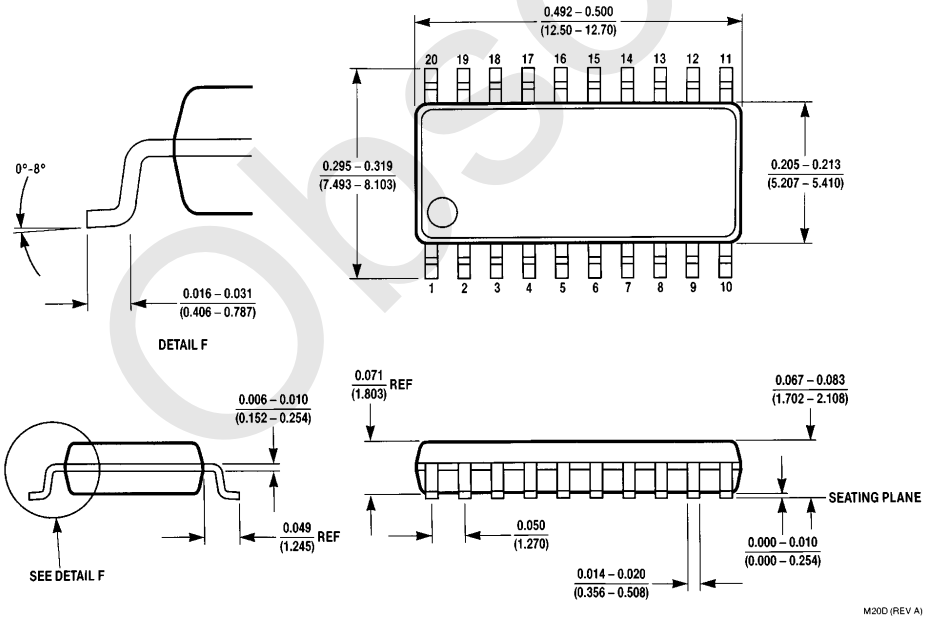


20-Lead Ceramic Dual-In-Line Package (D)
NS Package Number J20A

Physical Dimensions inches (millimeters) (Continued)

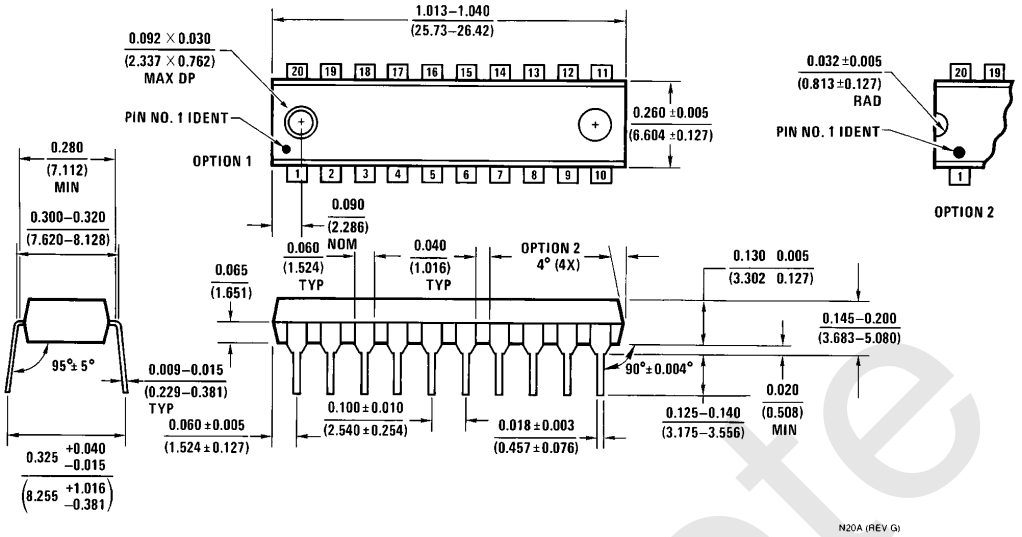


20-Lead (0.300″ Wide) Molded Small Outline Package, JEDEC (S)
NS Package Number M20B



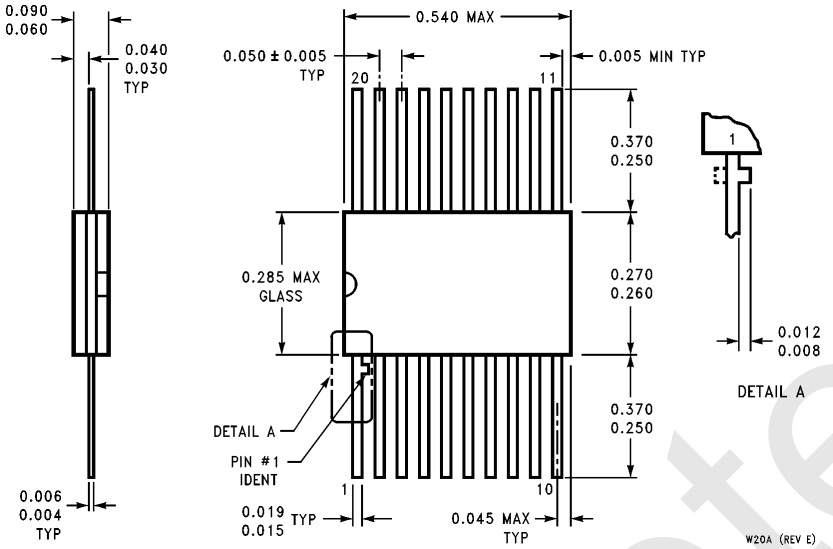
20-Lead (0.300″ Wide) Molded Small Outline Package, EIAJ
NS Package Number M20D

Physical Dimensions inches (millimeters) (Continued)



20-Lead (0.300″ Wide) Molded Dual-In-Line Package (P)
NS Package Number N20A

Physical Dimensions inches (millimeters) (Continued)



20-Lead Ceramic Flatpak (F)
NS Package Number W20A

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