

## 54F/74F240•54F/74F241•54F/74F244 Octal Buffers/Line Drivers with TRI-STATE® Outputs

### General Description

The 'F240, 'F241 and 'F244 are octal buffers and line drivers designed to be employed as memory and address drivers, clock drivers and bus-oriented transmitters/receivers which provide improved PC and board density.

### Features

- TRI-STATE outputs drive bus lines or buffer memory address registers
- Outputs sink 64 mA (48 mA mil)
- 12 mA source current
- Input clamp diodes limit high-speed termination effects
- Guaranteed 4000V minimum ESD protection

Commercial	Military	Package Number	Package Description
74F240PC		N20A	20-Lead (0.300" Wide) Molded Dual-In-Line
	54F240DM (Note 2)	J20A	20-Lead Ceramic Dual-In-Line
74F240SC (Note 1)		M20B	20-Lead (0.300" Wide) Molded Small Outline, JEDEC
74F240SJ (Note 1)		M20D	20-Lead (0.300" Wide) Molded Small Outline, EIAJ
	54F240FM (Note 2)	W20A	20-Lead Cerpack
	54F240LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C
74F241PC		N20A	20-Lead (0.300" Wide) Molded Dual-In-Line
	54F241DM (Note 2)	J20A	20-Lead Ceramic Dual-In-Line
74F241SC (Note 1)		M20B	20-Lead (0.300" Wide) Molded Small Outline, JEDEC
74F241SJ (Note 1)		M20D	20-Lead (0.300" Wide) Molded Small Outline, EIAJ
	54F241FM (Note 2)	W20A	20-Lead Cerpack
	54F241LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C
74F244PC		N20A	20-Lead (0.300" Wide) Molded Dual-In-Line
	54F244DM (Note 2)	J20A	20-Lead Ceramic Dual-In-Line
74F244SC (Note 1)		M20B	20-Lead (0.300" Wide) Molded Small Outline, JEDEC
74F244SJ (Note 1)		M20D	20-Lead (0.300" Wide) Molded Small Outline, EIAJ
74F244MSA (Note 1)		MSA20	20-Lead Molded Shrink Small Outline, EIAJ Type II
	54F244FM (Note 2)	W20A	20-Lead Cerpack
	54F244LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

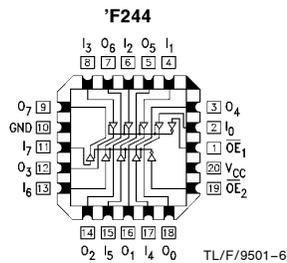
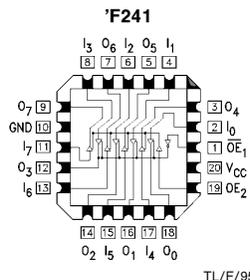
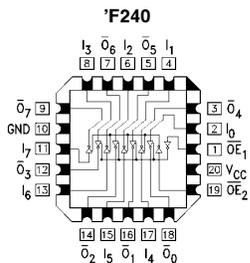
**Note 1:** Devices also available in 13" reel. Use Suffix = SCX, SJX and MSAX.

**Note 2:** Military grade device with environmental and burn-in processing. Use suffix = DMOB, FMOB and LMOB.

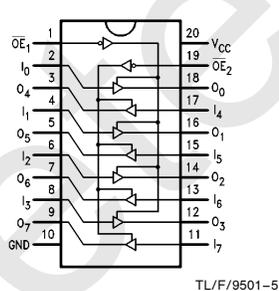
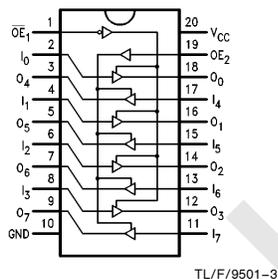
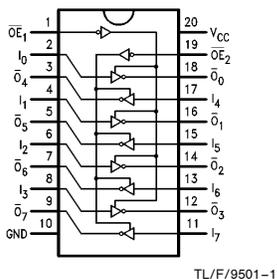
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## Connection Diagrams

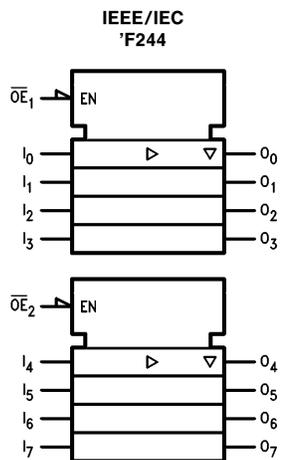
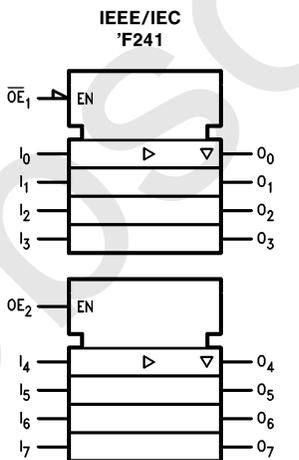
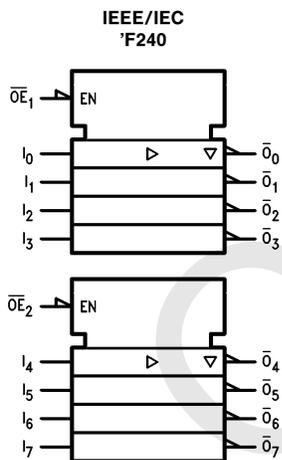
### Pin Assignment for LCC



### Pin Assignment for DIP, SOIC, SSOP and Flatpak



## Logic Symbols



## Unit Loading/Fan Out

Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input $I_{IH}/I_{IL}$ Output $I_{OH}/I_{OL}$
$\overline{OE}_1, \overline{OE}_2$	TRI-STATE Output Enable Input (Active LOW)	1.0/1.667	20 $\mu$ A/ -1 mA
$OE_2$	TRI-STATE Output Enable Input (Active HIGH)	1.0/1.667	20 $\mu$ A/ -1 mA
$I_0-I_7$	Inputs ('F240)	1.0/1.667*	20 $\mu$ A/ -1 mA
$I_0-I_7$	Inputs ('F241, 'F244)	1.0/2.667*	20 $\mu$ A/ -1.6 mA
$O_0-O_7, O_0-O_7$	Outputs	600/106.6 (80)	-12 mA/64 mA (48 mA)

\*Worst-case 'F240 enabled; 'F241, 'F244 disabled

## Truth Tables

'F240

$\overline{OE}_1$	$D_{1n}$	$O_{1n}$	$\overline{OE}_2$	$D_{2n}$	$O_{2n}$
H	X	Z	H	X	Z
L	H	L	L	H	L
L	L	H	L	L	H

'F244

$\overline{OE}_1$	$D_{1n}$	$O_{1n}$	$\overline{OE}_2$	$D_{2n}$	$O_{2n}$
H	X	Z	H	X	Z
L	H	H	L	H	H
L	L	L	L	L	L

'F241

$\overline{OE}_1$	$D_{1n}$	$O_{1n}$	$OE_2$	$D_{2n}$	$O_{2n}$
H	X	Z	L	X	Z
L	H	H	H	H	H
L	L	L	H	L	L

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

## 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<sub>CC</sub> 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<sub>CC</sub> = 0V)  
 Standard Output -0.5V to V<sub>CC</sub>  
 TRI-STATE Output -0.5V to +5.5V

Current Applied to Output in LOW State (Max) twice the rated I<sub>OL</sub> (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	-55°C to +125°C
Military	-55°C to +125°C
Commercial	0°C to +70°C
Supply Voltage	+4.5V to +5.5V
Military	+4.5V to +5.5V
Commercial	+4.5V to +5.5V

## DC Electrical Characteristics

Symbol	Parameter	54F/74F			Units	V <sub>CC</sub>	Conditions
		Min	Typ	Max			
V <sub>IH</sub>	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V <sub>IL</sub>	Input LOW Voltage	0.8			V		Recognized as a LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage	-1.2			V	Min	I <sub>IN</sub> = -18 mA
V <sub>OH</sub>	Output HIGH Voltage	54F 10% V <sub>CC</sub>	2.4		V	Min	I <sub>OH</sub> = -3 mA
		54F 10% V <sub>CC</sub>	2.0				I <sub>OH</sub> = -12 mA
		74F 10% V <sub>CC</sub>	2.4				I <sub>OH</sub> = -3 mA
		74F 10% V <sub>CC</sub>	2.0				I <sub>OH</sub> = -15 mA
		74F 5% V <sub>CC</sub>	2.7				I <sub>OH</sub> = -3 mA
V <sub>OL</sub>	Output LOW Voltage	54F 10% V <sub>CC</sub>	0.55		V	Min	I <sub>OL</sub> = 48 mA
		74F 10% V <sub>CC</sub>	0.55				I <sub>OL</sub> = 64 mA
I <sub>IH</sub>	Input HIGH Current	54F	20.0		μA	Max	V <sub>IN</sub> = 2.7V
		74F	5.0				
I <sub>BVI</sub>	Input HIGH Current Breakdown Test	54F	100		μA	Max	V <sub>IN</sub> = 7.0V
		74F	7.0				
I <sub>CEX</sub>	Output HIGH Leakage Current	54F	250		μA	Max	V <sub>OUT</sub> = V <sub>CC</sub>
		74F	50				
V <sub>ID</sub>	Input Leakage Test	74F	4.75		V	0.0	I <sub>ID</sub> = 1.9 μA All Other Pins Grounded
I <sub>OD</sub>	Output Leakage Circuit Current	74F	3.75		μA	0.0	V <sub>IOD</sub> = 150 mV All Other Pins Grounded
I <sub>IL</sub>	Input LOW Current		-1.0		mA	Max	V <sub>IN</sub> = 0.5V ( $\overline{OE}_1, \overline{OE}_2, OE_2, D_n$ ('F240))
			-1.6				V <sub>IN</sub> = 0.5V (D <sub>n</sub> ('F241, 'F244))
I <sub>OZH</sub>	Output Leakage Current		50		μA	Max	V <sub>OUT</sub> = 2.7V
I <sub>OZL</sub>	Output Leakage Current		-50		μA	Max	V <sub>OUT</sub> = 0.5V
I <sub>OS</sub>	Output Short-Circuit Current		-100	-225	mA	Max	V <sub>OUT</sub> = 0V
I <sub>ZZ</sub>	Bus Drainage Test		500		μA	0.0V	V <sub>OUT</sub> = 5.25V

## DC Electrical Characteristics (Continued)

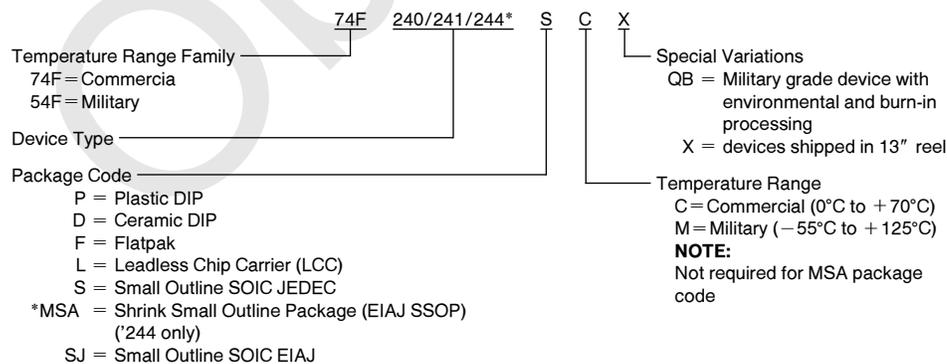
Symbol	Parameter	54F/74F			Units	V <sub>CC</sub>	Conditions
		Min	Typ	Max			
I <sub>CC</sub> H	Power Supply Current ('F240)	19	29		mA	Max	V <sub>O</sub> = HIGH
I <sub>CC</sub> L	Power Supply Current ('F240)	50	75		mA	Max	V <sub>O</sub> = LOW
I <sub>CC</sub> Z	Power Supply Current ('F240)	42	63		mA	Max	V <sub>O</sub> = HIGH Z
I <sub>CC</sub> H	Power Supply Current ('F241, 'F244)	40	60		mA	Max	V <sub>O</sub> = HIGH
I <sub>CC</sub> L	Power Supply Current ('F241, 'F244)	60	90		mA	Max	V <sub>O</sub> = LOW
I <sub>CC</sub> Z	Power Supply Current ('F241, 'F244)	60	90		mA	Max	V <sub>O</sub> = HIGH Z

## AC Electrical Characteristics

Symbol	Parameter	74F			54F		74F		Units
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> , V <sub>CC</sub> = Mil C <sub>L</sub> = 50 pF		T <sub>A</sub> , V <sub>CC</sub> = Com C <sub>L</sub> = 50 pF		
		Min	Typ	Max	Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay	3.0	5.1	7.0	3.0	9.0	3.0	8.0	ns
t <sub>PHL</sub>	Data to Output ('F240)	2.0	3.5	4.7	2.0	6.0	2.0	5.7	
t <sub>PZH</sub>	Output Enable Time ('F240)	2.0	3.5	4.7	2.0	6.5	2.0	5.7	ns
t <sub>PZL</sub>		4.0	6.9	9.0	4.0	10.5	4.0	10.0	
t <sub>PHZ</sub>	Output Disable Time ('F240)	2.0	4.0	5.3	2.0	6.5	2.0	6.3	ns
t <sub>PLZ</sub>		2.0	6.0	8.0	2.0	12.5	2.0	9.5	
t <sub>PLH</sub>	Propagation Delay	2.5	4.0	5.2	2.0	6.5	2.5	6.2	ns
t <sub>PHL</sub>	Data to Output ('F241, 'F244)	2.5	4.0	5.2	2.0	7.0	2.5	6.5	
t <sub>PZH</sub>	Output Enable Time ('F241, 'F244)	2.0	4.3	5.7	2.0	7.0	2.0	6.7	ns
t <sub>PZL</sub>		2.0	5.4	7.0	2.0	8.5	2.0	8.0	
t <sub>PHZ</sub>	Output Disable Time ('F241, 'F244)	2.0	4.5	6.0	2.0	7.0	2.0	7.0	ns
t <sub>PLZ</sub>		2.0	4.5	6.0	2.0	7.5	2.0	7.0	

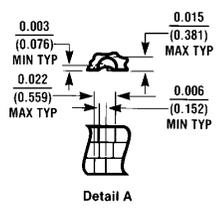
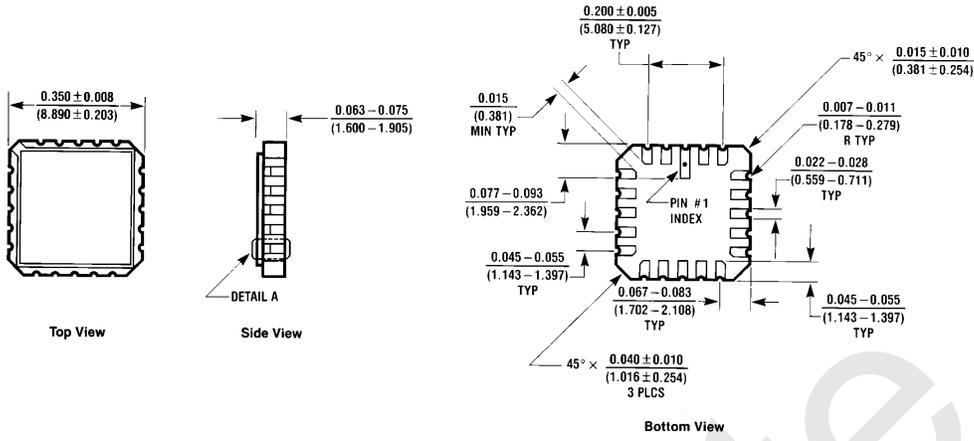
## Ordering Information

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



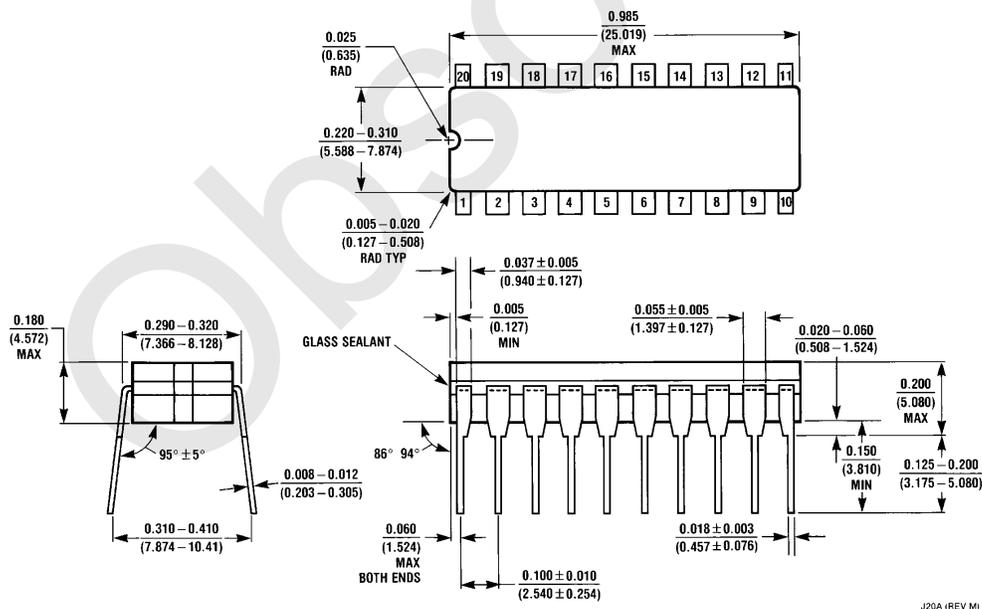
Obsolete

**Physical Dimensions** inches (millimeters)



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

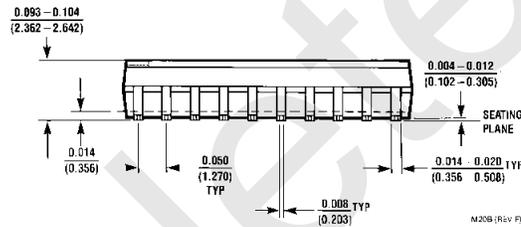
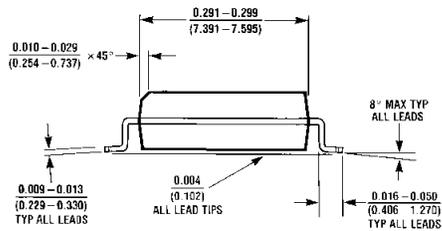
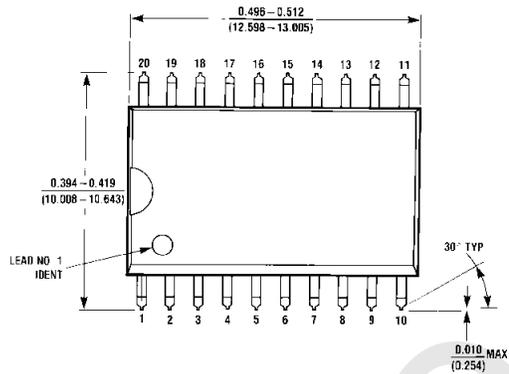
E20A (REV D)



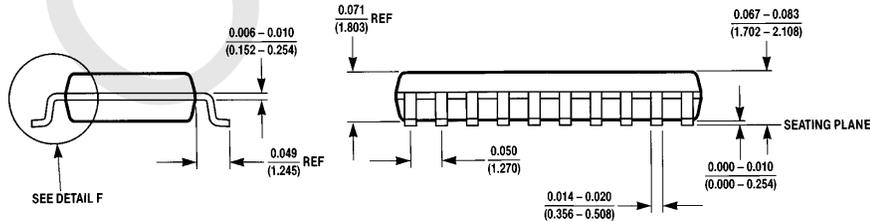
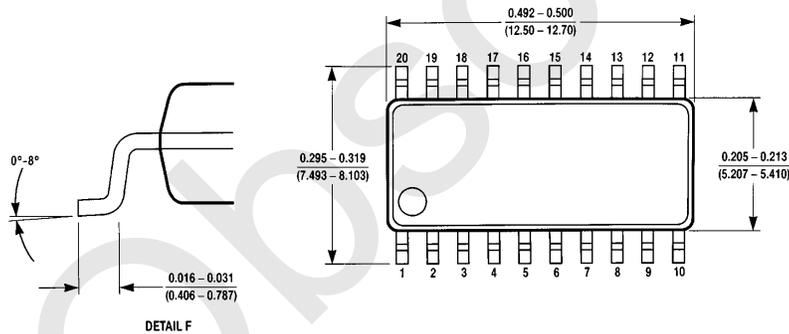
**20-Lead Ceramic Dual-In-Line Package (D)**  
NS Package Number J20A

J20A (REV M)

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

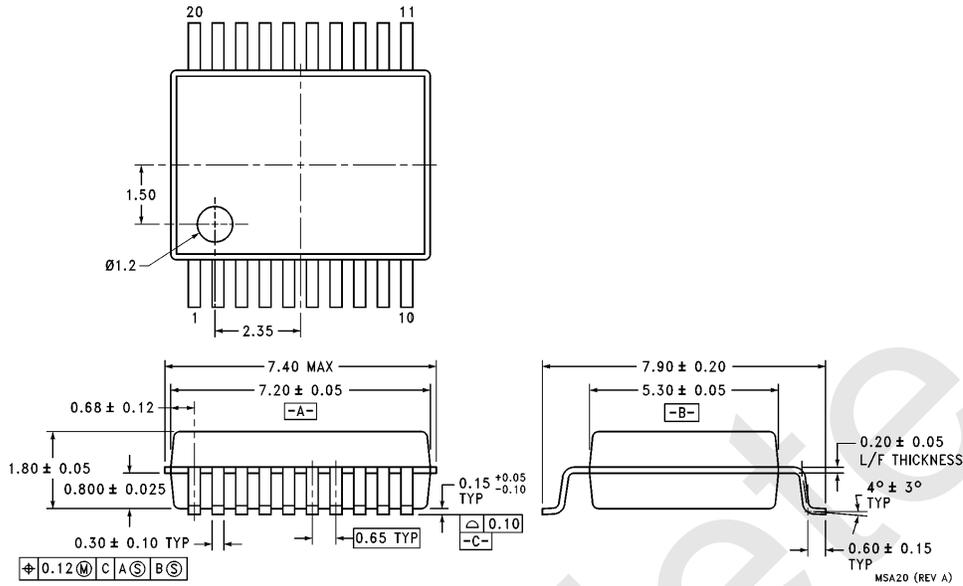


**20-Lead (0.300" Wide) Molded Small Outline Package, JEDEC (S)**  
NS Package Number M20B

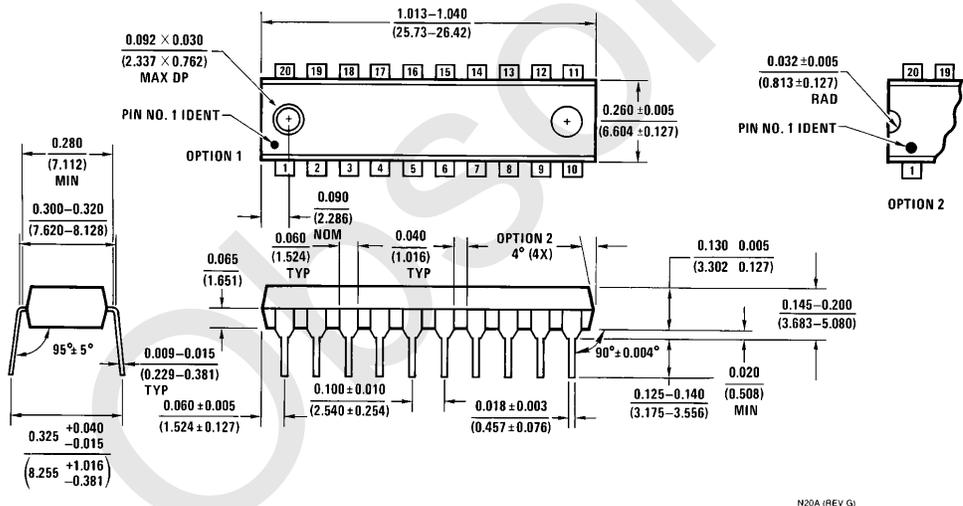


**20-Lead (0.300" Wide) Molded Small Outline Package, EIAJ (SJ)**  
NS Package Number M20D

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

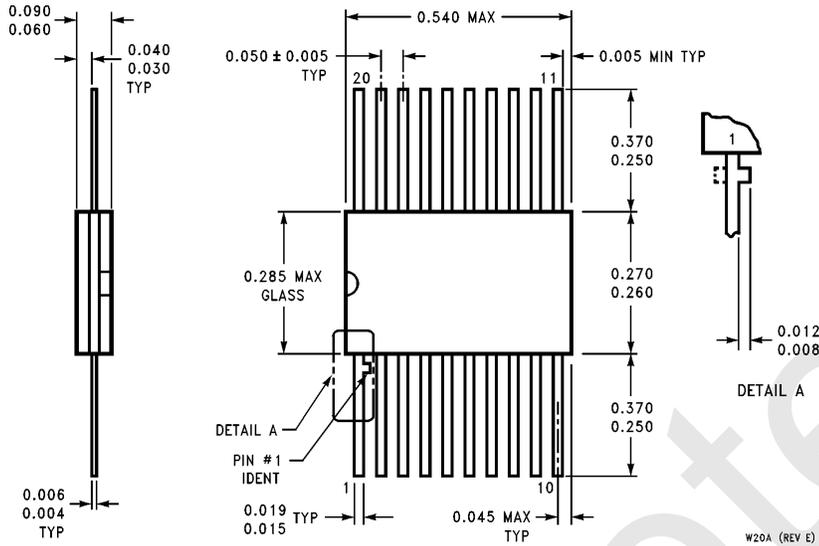


**20-Lead Molded Shrink Small Outline, EIAJ Type II (MSA)  
NS Package Number MSA20**



**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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