54F240,54F241,54F244,74F240,74F241, 74F244

54F240/54F241/54FF244 Octal Buffers/Line Drivers with TRI-STATE(RM) Outputs

Literature Number: SNOS175A

National Semiconductor

May 1995

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 = DMQB, FMQB and LMQB.

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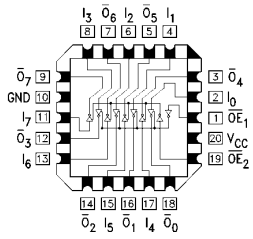
 TL/F/9501 RRD-B30M75/Printed in U. S. A.

Connection Diagrams

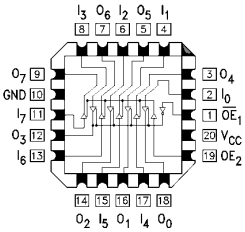
Pin Assignment for LCC

'F240



TL/F/9501–2

'F241



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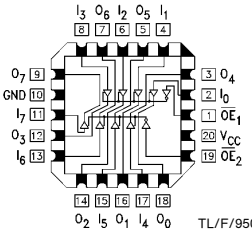
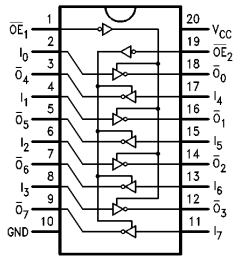


TL/F/9501–6

Pin Assignment for DIP, SOIC, SSOP and Flatpak



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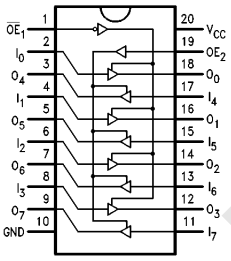

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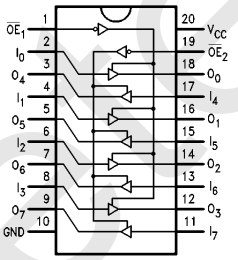
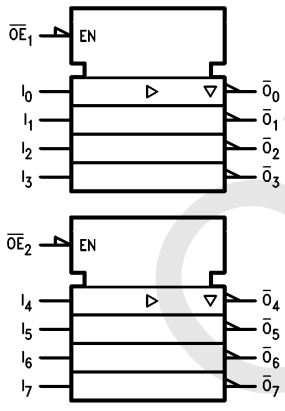


TL/F/9501–5

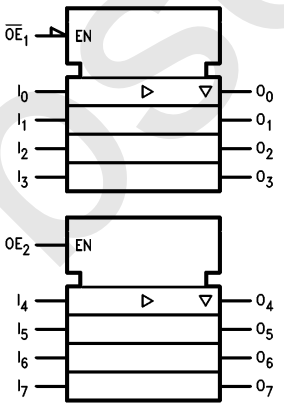
Logic Symbols

IEEE/IEC
'F240



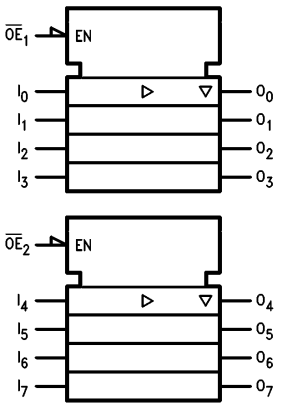
TL/F/9501–7

IEEE/IEC
'F241



TL/F/9501–8

IEEE/IEC
'F244



TL/F/9501–9

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 μA/−1 mA
OE_2	TRI-STATE Output Enable Input (Active HIGH)	1.0/1.667	20 μA/−1 mA
I_0–I_7	Inputs ('F240)	1.0/1.667*	20 μA/−1 mA
I_0–I_7	Inputs ('F241, 'F244)	1.0/2.667*	20 μA/−1.6 mA
$\overline{O}_0$–$\overline{O}_7$, 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

'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

'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

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_{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
V_{OH}	Output HIGH Voltage	54F 10% V_{CC}	2.4			V	Min	I_{OH} = −3 mA
		54F 10% V_{CC}	2.0					I_{OH} = −12 mA
		74F 10% V_{CC}	2.4					I_{OH} = −3 mA
		74F 10% V_{CC}	2.0					I_{OH} = −15 mA
		74F 5% V_{CC}	2.7					I_{OH} = −3 mA
V_{OL}	Output LOW Voltage	54F 10% V_{CC}			0.55	V	Min	I_{OL} = 48 mA
		74F 10% V_{CC}			0.55			I_{OL} = 64 mA
I_{IH}	Input HIGH Current	54F			20.0	μA	Max	V_{IN} = 2.7V
		74F			5.0			
I_{BVI}	Input HIGH Current Breakdown Test	54F			100	μA	Max	V_{IN} = 7.0V
		74F			7.0			
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				−1.0	mA	Max	V_{IN} = 0.5V ($\overline{OE}_1$, $\overline{OE}_2$, OE_2, D_n ('F240))
					−1.6			V_{IN} = 0.5V (D_n ('F241, 'F244))
I_{OZH}	Output Leakage Current				50	μA	Max	V_{OUT} = 2.7V
I_{OZL}	Output Leakage Current				−50	μA	Max	V_{OUT} = 0.5V
I_{OS}	Output Short-Circuit Current		−100		−225	mA	Max	V_{OUT} = 0V
I_{ZZ}	Bus Drainage Test				500	μA	0.0V	V_{OUT} = 5.25V

DC Electrical Characteristics (Continued)

Symbol	Parameter	54F/74F			Units	V_{CC}	Conditions
		Min	Typ	Max			
I_{CCH}	Power Supply Current ('F240)		19	29	mA	Max	V_O = HIGH
I_{CCL}	Power Supply Current ('F240)		50	75	mA	Max	V_O = LOW
I_{CCZ}	Power Supply Current ('F240)		42	63	mA	Max	V_O = HIGH Z
I_{CCH}	Power Supply Current ('F241, 'F244)		40	60	mA	Max	V_O = HIGH
I_{CCL}	Power Supply Current ('F241, 'F244)		60	90	mA	Max	V_O = LOW
I_{CCZ}	Power Supply Current ('F241, 'F244)		60	90	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} t_{PHL}	Propagation Delay Data to Output ('F240)	3.0 2.0	5.1 3.5	7.0 4.7	3.0 2.0	9.0 6.0	3.0 2.0	8.0 5.7	ns
t_{PZH} t_{PZL}	Output Enable Time ('F240)	2.0 4.0	3.5 6.9	4.7 9.0	2.0 4.0	6.5 10.5	2.0 4.0	5.7 10.0	ns
t_{PHZ} t_{PLZ}	Output Disable Time ('F240)	2.0 2.0	4.0 6.0	5.3 8.0	2.0 2.0	6.5 12.5	2.0 2.0	6.3 9.5	
t_{PLH} t_{PHL}	Propagation Delay Data to Output ('F241, 'F244)	2.5 2.5	4.0 4.0	5.2 5.2	2.0 2.0	6.5 7.0	2.5 2.5	6.2 6.5	ns
t_{PZH} t_{PZL}	Output Enable Time ('F241, 'F244)	2.0 2.0	4.3 5.4	5.7 7.0	2.0 2.0	7.0 8.5	2.0 2.0	6.7 8.0	ns
t_{PHZ} t_{PLZ}	Output Disable Time ('F241, 'F244)	2.0 2.0	4.5 4.5	6.0 6.0	2.0 2.0	7.0 7.5	2.0 2.0	7.0 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:

74F 240/241/244* S C X

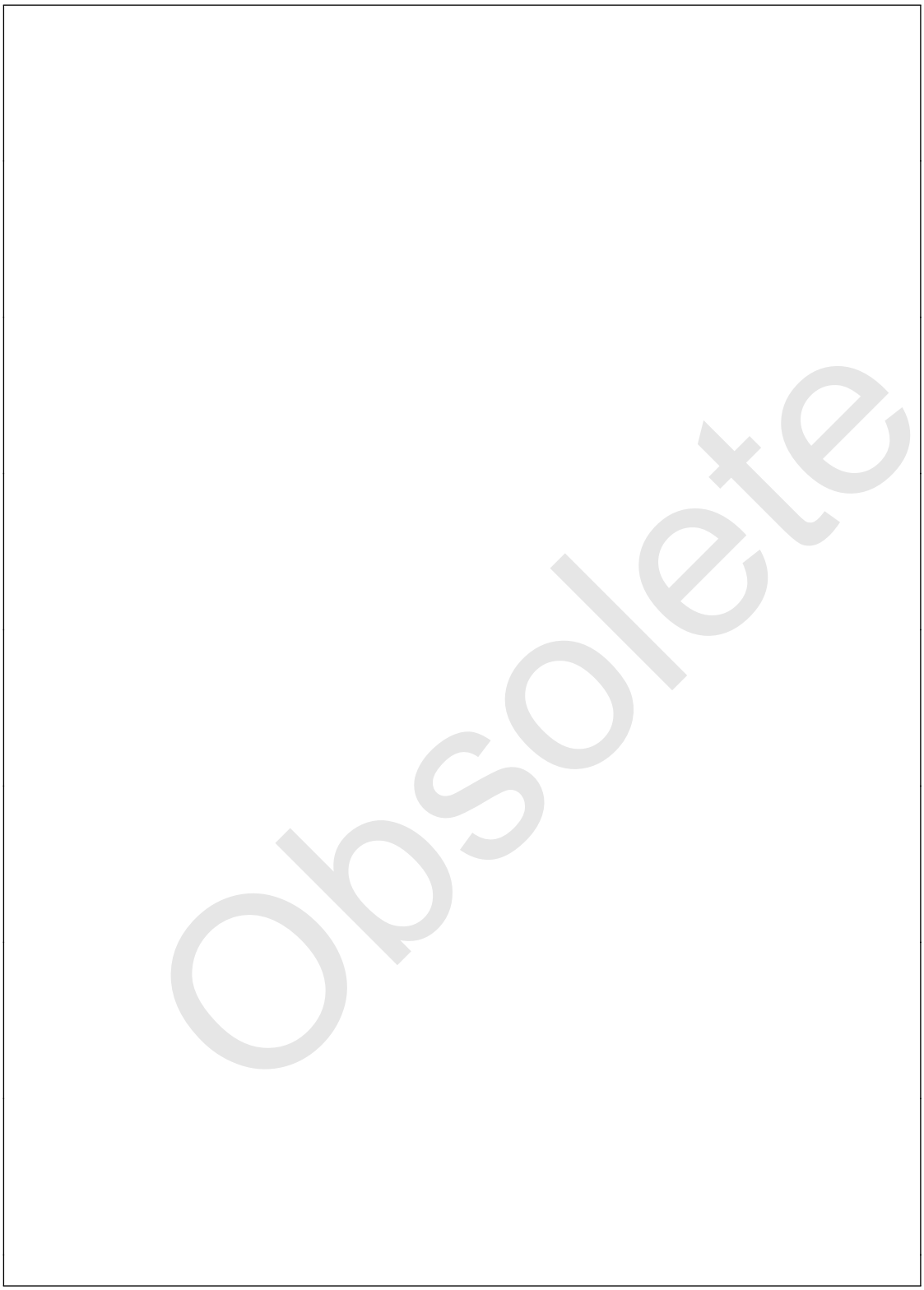
Temperature Range Family
74F = Commercia
54F = Military

Device Type

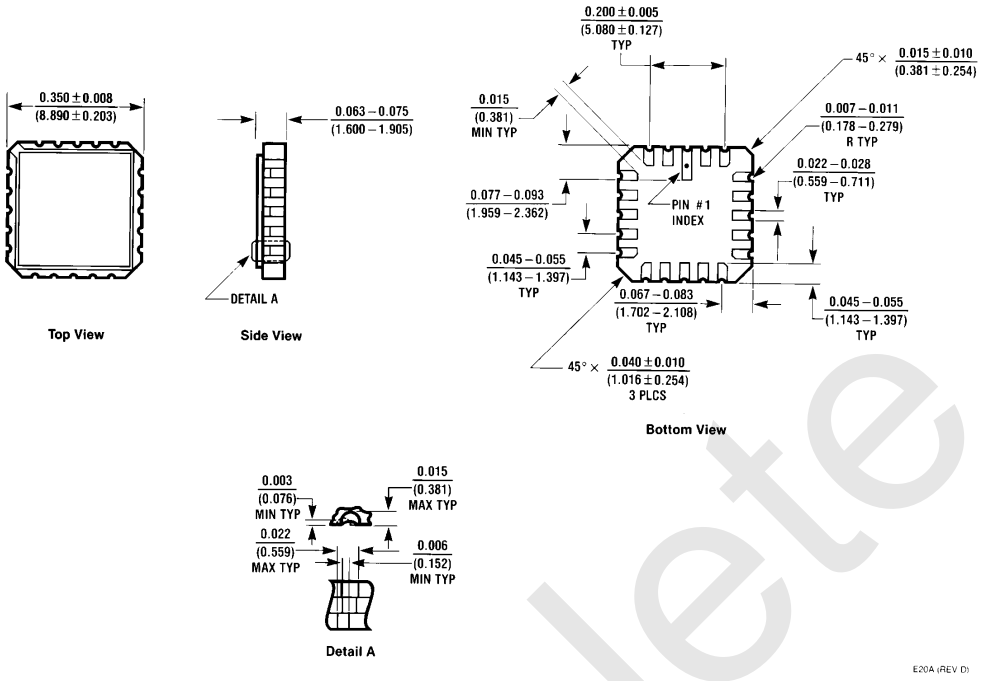
Package Code
P = Plastic DIP
D = Ceramic DIP
F = Flatpak
L = Leadless Chip Carrier (LCC)
S = Small Outline SOIC JEDEC
*MSA = Shrink Small Outline Package (EIAJ SSOP) ('244 only)
SJ = Small Outline SOIC EIAJ

Temperature Range
C = Commercial (0°C to +70°C)
M = Military (−55°C to +125°C)
NOTE:
Not required for MSA package code

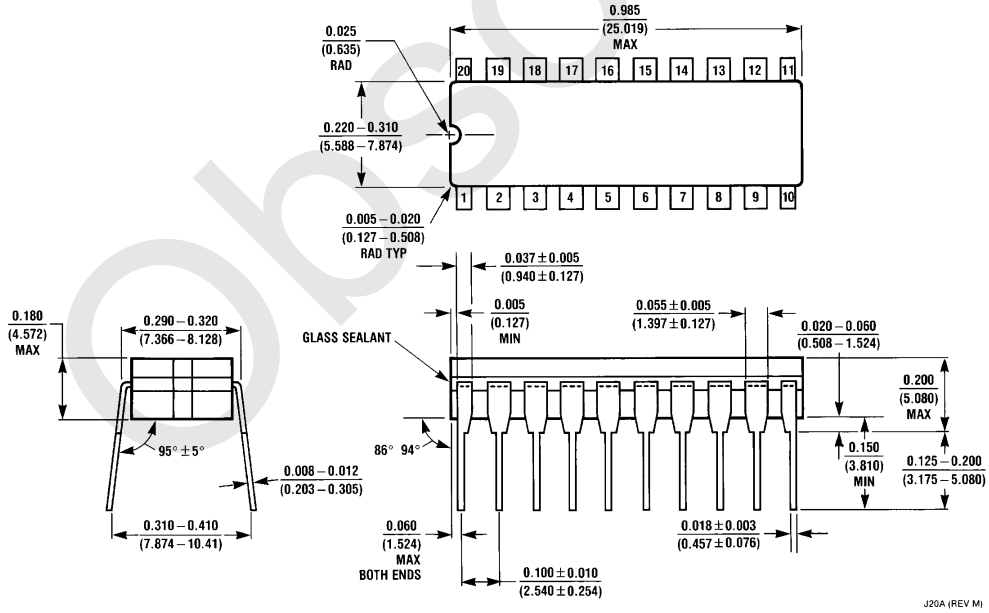
Special Variations
QB = Military grade device with environmental and burn-in processing
X = devices shipped in 13″ reel


Obsolete

Physical Dimensions inches (millimeters)

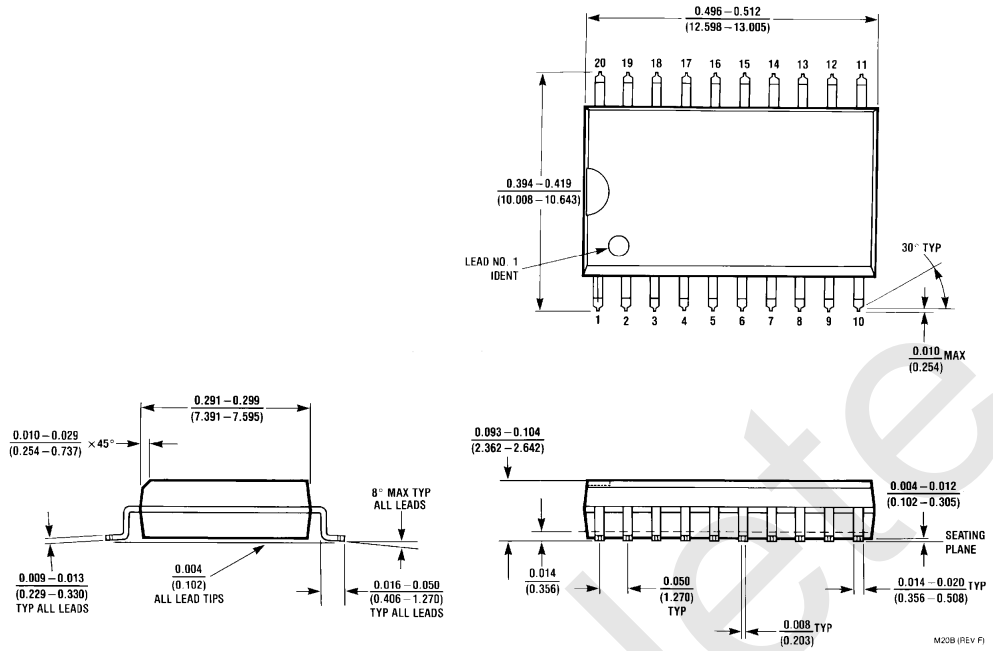


20-Lead Ceramic Leadless Chip Carrier (L)
NS Package Number E20A

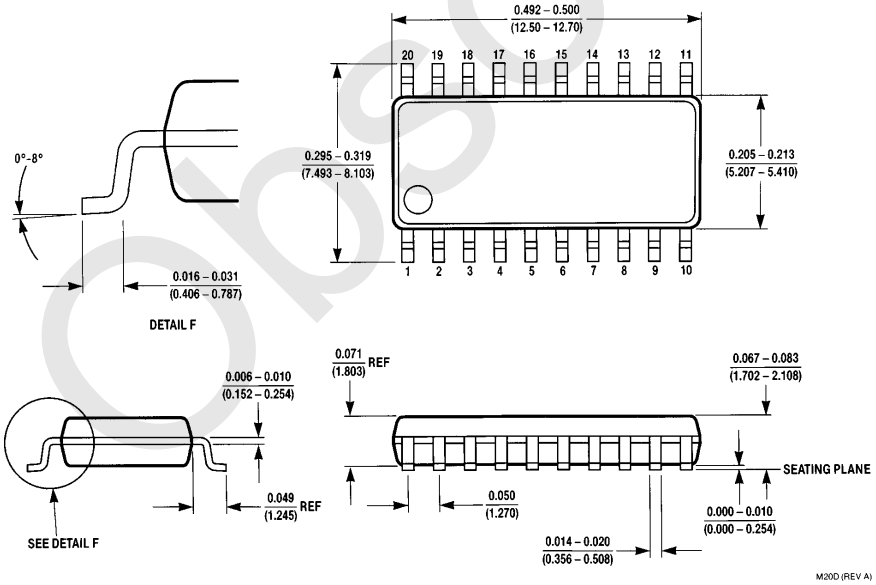


20-Lead Ceramic Dual-In-Line Package (D)
NS Package Number J20A

Physical Dimensions inches (millimeters) (Continued)

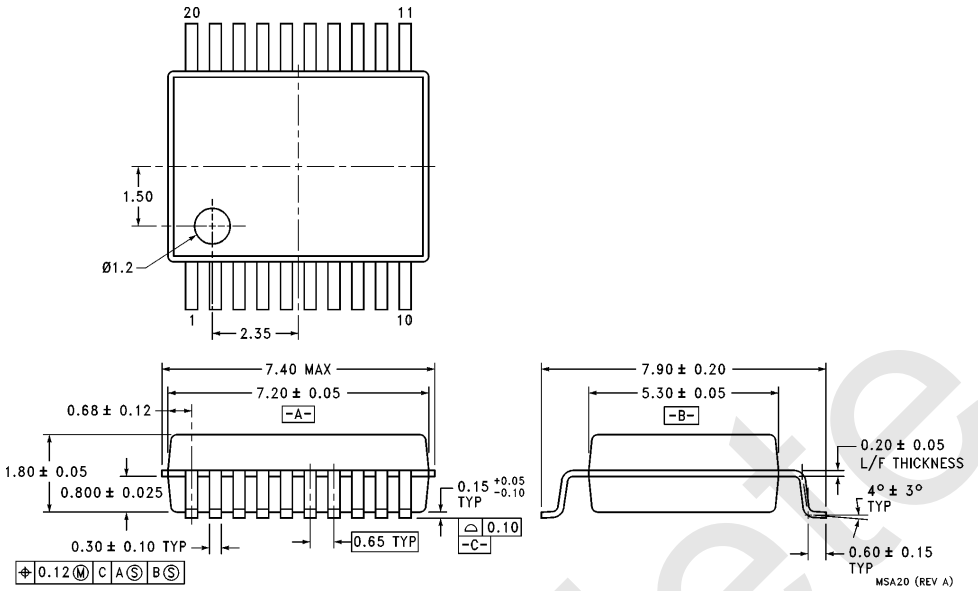


20-Lead (0.300″ Wide) Molded Small Outline Package, JEDEC (S)
NS Package Number M20B

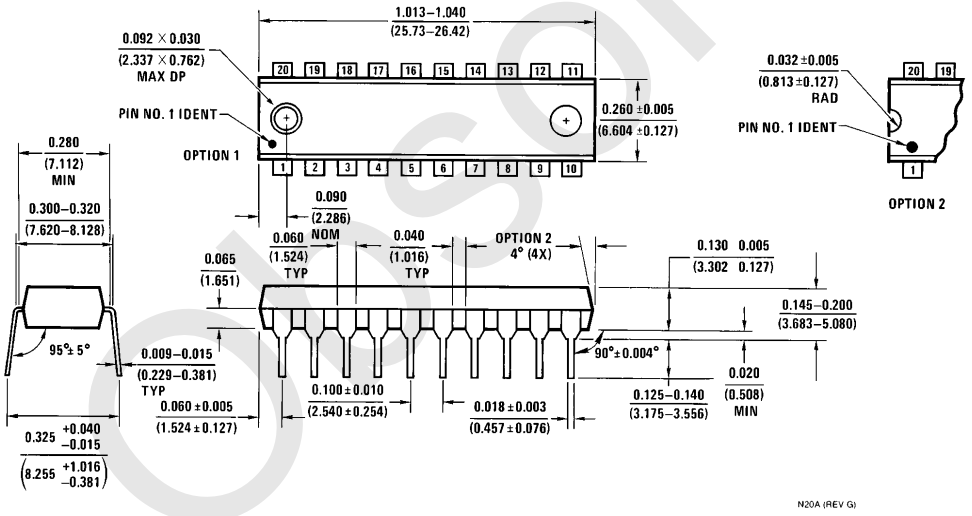


20-Lead (0.300″ Wide) Molded Small Outline Package, EIAJ (SJ)
NS Package Number M20D

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

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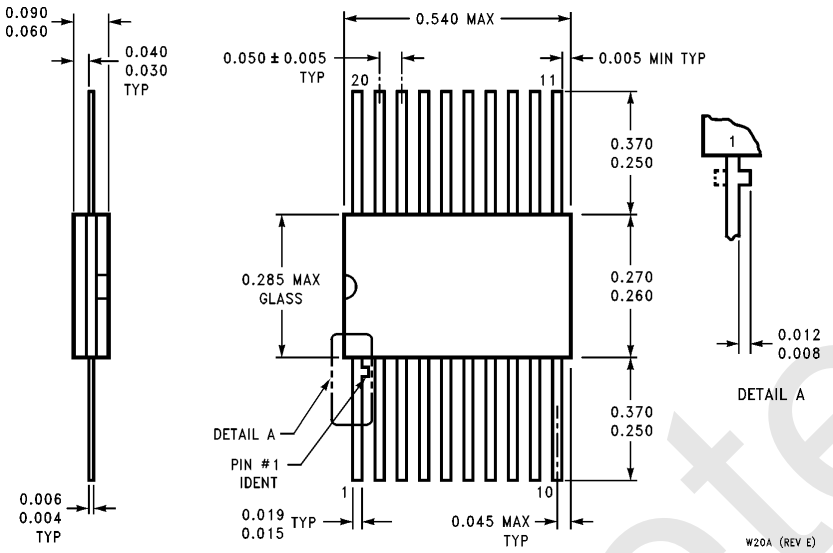

20-Lead Ceramic Flatpak (F)
NS Package Number W20A

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