

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

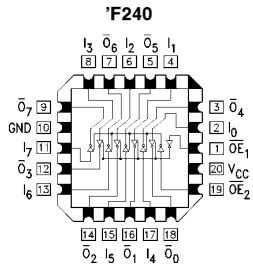
Note 1: Devices also available in 13" reel. Use Suffix = SCX, SJX and MSAX.

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

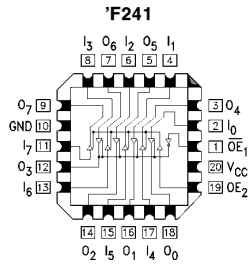
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Connection Diagrams

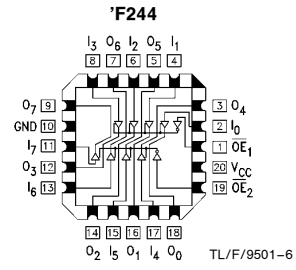
Pin Assignment for LCC



TL/F/9501-2

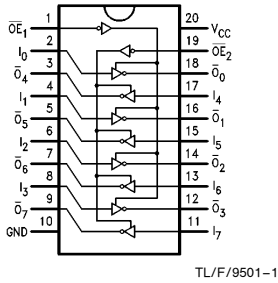


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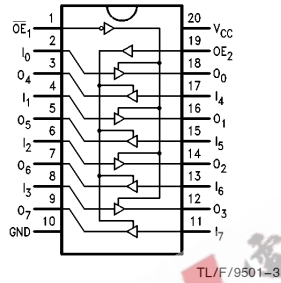


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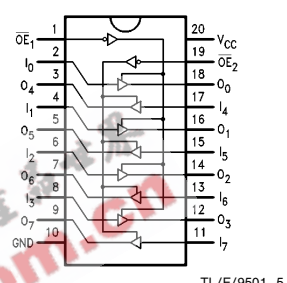
Pin Assignment for DIP, SOIC, SSOP and Flatpak



TL/F/9501-1



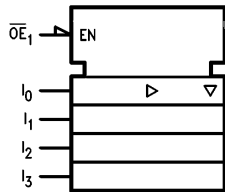
TL/F/9501-3



TL/F/9501-5

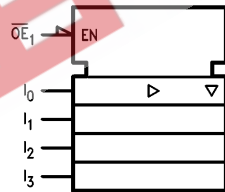
Logic Symbols

IEEE/IEC
'F240



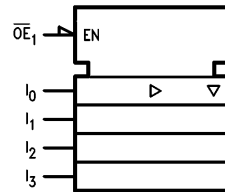
TL/F/9501-7

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 μ A/ -1 mA
OE_2	TRI-STATE Output Enable Input (Active HIGH)	1.0/1.667	20 μ A/ -1 mA
I_0-I_7	Inputs ('F240)	1.0/1.667*	20 μ A/ -1 mA
I_0-I_7	Inputs ('F241, 'F244)	1.0/2.667*	20 μ A/ -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

'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

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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
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	-55°C to +125°C
Military	0°C to +70°C
Commercial	
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
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 -1.6	mA	Max	V _{IN} = 0.5V ($\overline{OE}_1, \overline{OE}_2, OE_2, D_n$ ('F240)) 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}	Propagation Delay	3.0	5.1	7.0	3.0	9.0	3.0	8.0	ns
t _{PHL}	Data to Output ('F240)	2.0	3.5	4.7	2.0	6.0	2.0	5.7	
t _{PZH}	Output Enable Time ('F240)	2.0	3.5	4.7	2.0	6.5	2.0	5.7	ns
t _{PZL}	Output Disable Time ('F240)	4.0	6.9	9.0	4.0	10.5	4.0	10.0	
t _{PHZ}	Output Disable Time ('F240)	2.0	4.0	5.3	2.0	6.5	2.0	6.3	ns
t _{PLZ}	Output Disable Time ('F240)	2.0	6.0	8.0	2.0	12.5	2.0	9.5	
t _{PLH}	Propagation Delay	2.5	4.0	5.2	2.0	6.5	2.5	6.2	ns
t _{PHL}	Data to Output ('F241, 'F244)	2.5	4.0	5.2	2.0	7.0	2.5	6.5	
t _{PZH}	Output Enable Time ('F241, 'F244)	2.0	4.3	5.7	2.0	7.0	2.0	6.7	ns
t _{PZL}	Output Disable Time ('F241, 'F244)	2.0	5.4	7.0	2.0	8.5	2.0	8.0	
t _{PHZ}	Output Disable Time ('F241, 'F244)	2.0	4.5	6.0	2.0	7.0	2.0	7.0	ns
t _{PLZ}	Output Disable Time ('F241, 'F244)	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:

74F 240/241/244* S C X

Temperature Range Family
74F = Commercial
54F = Military

Device Type

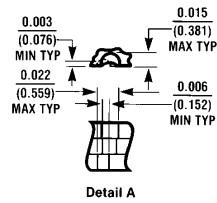
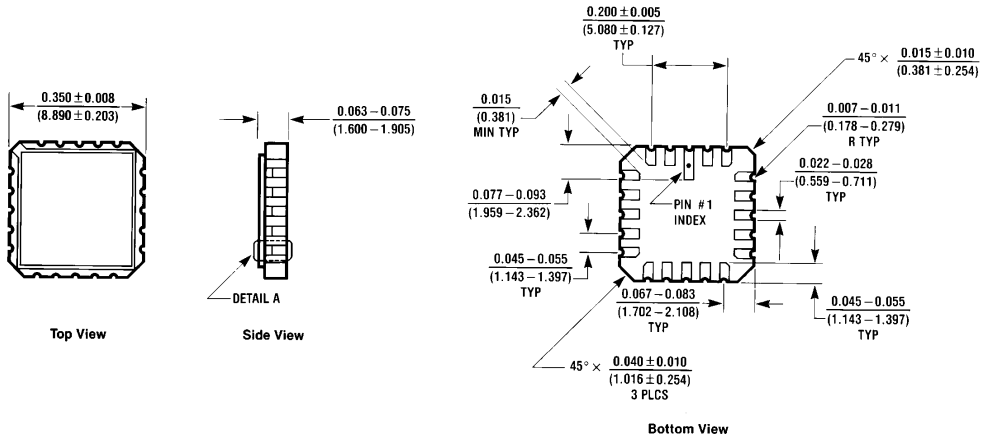
Package Code
P = Plastic DIP
D = Ceramic DIP
F = Flatpak
L = Leadless Chip Carrier (LCC)
S = Small Outline SOIC JEDEC
*MSA = Shrink Small Outline Package (EIAJ SSOP) ('244 only)
SJ = Small Outline SOIC EIAJ

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

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

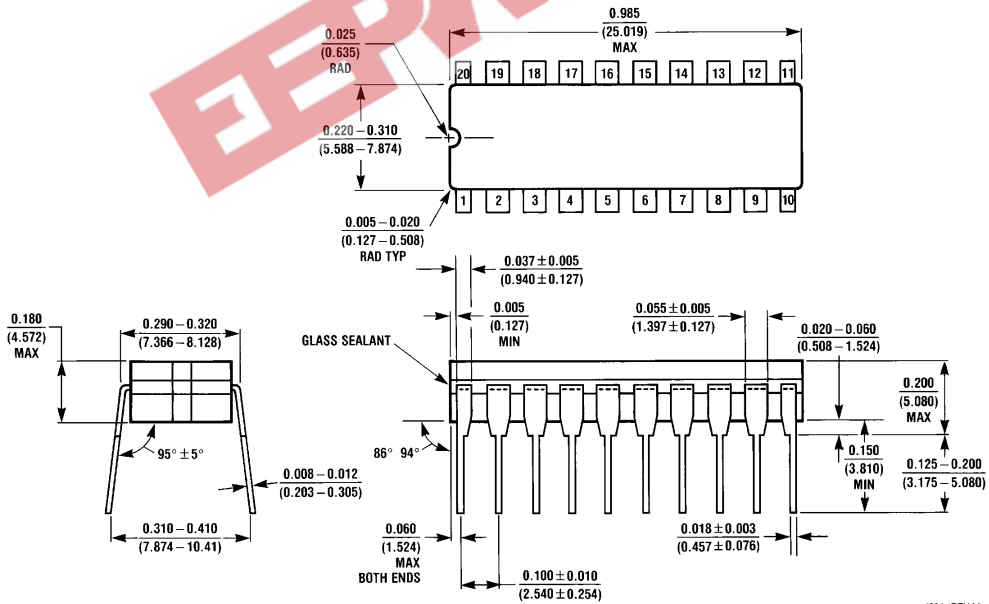
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Physical Dimensions inches (millimeters)



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

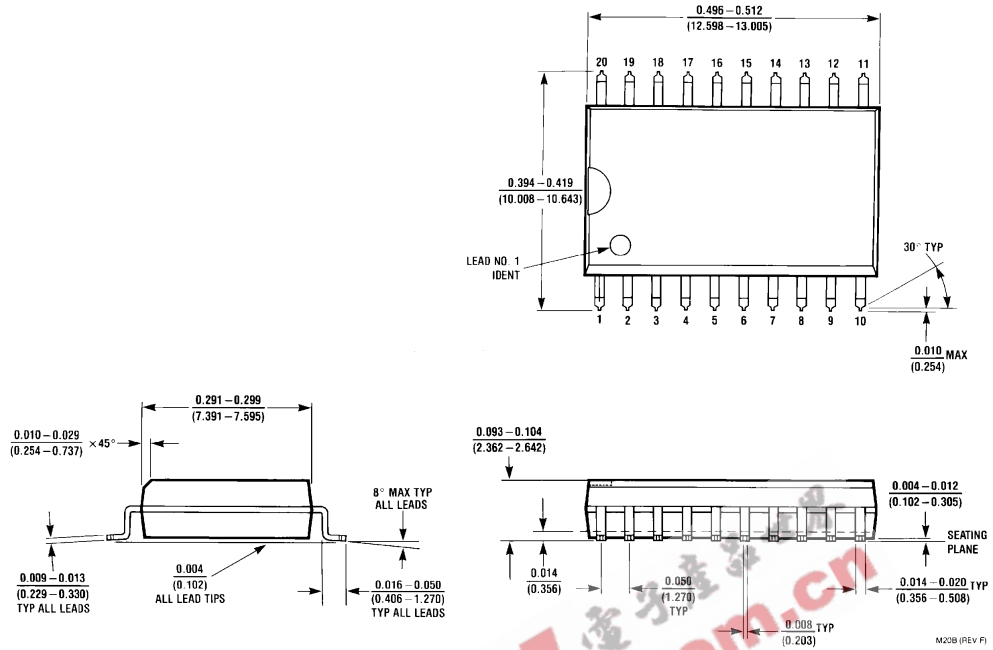
E20A (REV D)



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

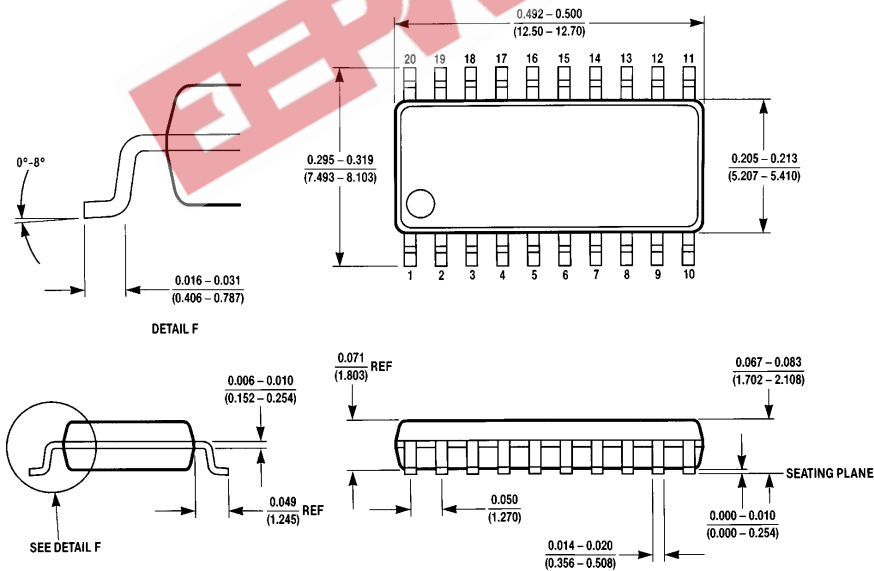
J20A (REV M)

Physical Dimensions inches (millimeters) (Continued)



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

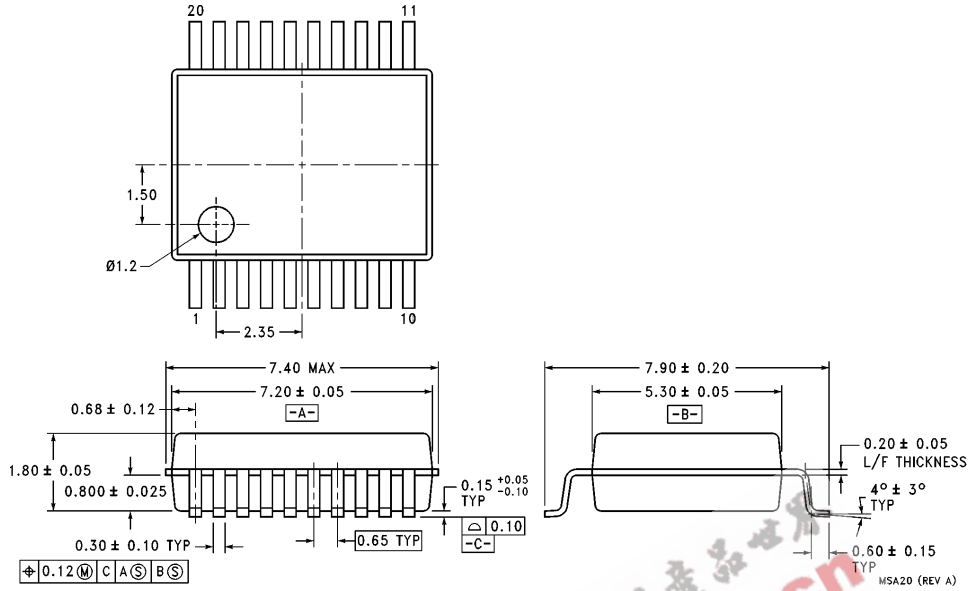
M20B (REV F)



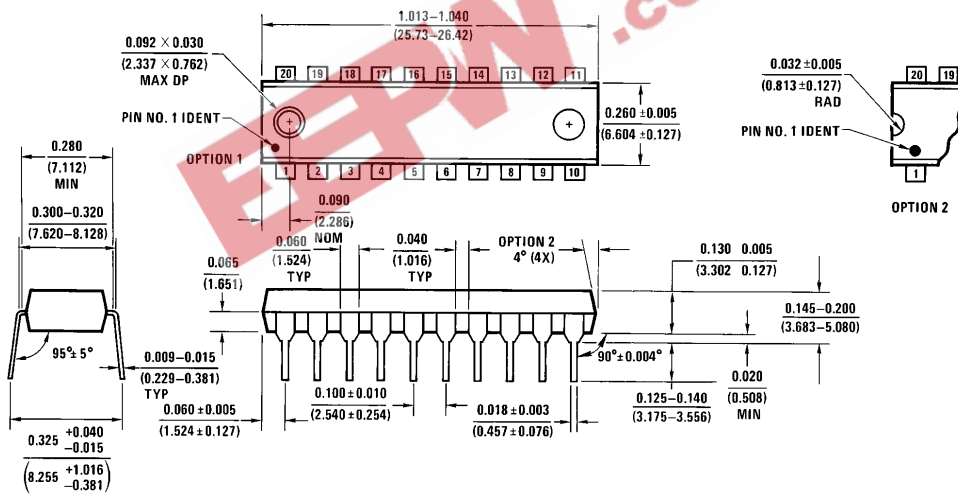
20-Lead (0.300" Wide) Molded Small Outline Package, EIAJ (SJ)
NS Package Number M20D

M20D (REV A)

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

