

## 54AC/74AC244 • 54ACT/74ACT244

### Octal Buffer/Line Driver with TRI-STATE® Outputs

#### General Description

The 'AC/'ACT244 is an octal buffer and line driver designed to be employed as a memory address driver, clock driver and bus-oriented transmitter/receiver which provides improved PC board density.

#### Features

- $I_{CC}$  and  $I_{OZ}$  reduced by 50%
- TRI-STATE outputs drive bus lines or buffer memory address registers
- Outputs source/sink 24 mA
- 'ACT244 has TTL-compatible inputs
- Standard Military Drawing (SMD)
  - 'AC244: 5962-87552
  - 'ACT244: 5962-87760

**Ordering Code:** See Section 0

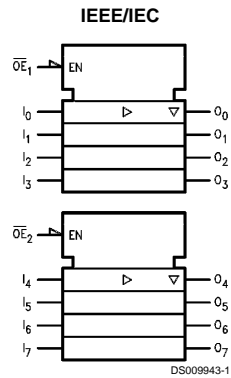
Commercial	Military	Package Number	Package Description
74AC244PC		N20A	20-Lead Molded Dual-In-Line (0.300" Wide)
74AC244SC (Note 1)		M20B	20-Lead Molded Small Outline (0.300" Wide), JEDEC
74AC244SJ (Note 1)		M20D	20-Lead Molded Small Outline, EIAJ
74AC244MTC (Note 1)		MTC20	20-Lead Molded Thin Shrink Small Outline Package, JEDEC
74ACT244PC		N20A	20-Lead Molded Dual-In-Line (0.300" Wide)
74ACT244SC (Note 1)		M20B	20-Lead Molded Small Outline (0.300" Wide), JEDEC
74ACT244SJ (Note 1)		M20D	20-Lead Molded Small Outline, EIAJ
74ACT244MTC (Note 1)		MTC20	20-Lead Molded Thin Shrink Small Outline Package, JEDEC
74ACT244MSA (Note 1)		MSA20	20-Lead Molded Small Shrink Outline Package, (EIAJ SSOP)
	54AC244DM (Note 2)	J20A	20-Lead Ceramic Dual-In-Line
	54AC244FM (Note 2)	W20A	20-Lead Cerpak
	54AC244LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C
	54ACT244DM (Note 2)	J20A	20-Lead Ceramic Dual-In-Line
	54ACT244FM (Note 2)	W20A	20-Lead Cerpak
	54ACT244LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

**Note 1:** Devices also available in 13" Tape and Reel. Use suffix SCX, SJX, and MTCX.

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

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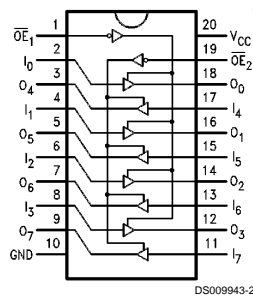
## Logic Symbol



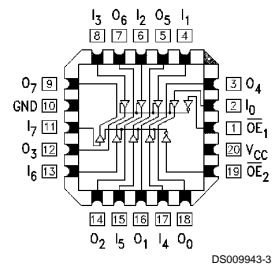
Pin Names	Description
$\overline{OE}_1, \overline{OE}_2$	TRI-STATE Output Enable Inputs
$I_0-I_7$	Inputs
$O_0-O_7$	Outputs

## Connection Diagrams

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



Pin Assignment for LCC



## Truth Tables

Inputs		Outputs
$\overline{OE}_1$	$I_n$	(Pins 12, 14, 16, 18)
L	L	L
L	H	H
H	X	Z

H = HIGH Voltage Level  
L = LOW Voltage Level

Inputs		Outputs
$\overline{OE}_2$	$I_n$	(Pins 3, 5, 7, 9)
L	L	L
L	H	H
H	X	Z

X = Immaterial  
Z = High Impedance

### Absolute Maximum Ratings (Note 3)

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

Supply Voltage ( $V_{CC}$ )	-0.5V to +7.0V
DC Input Diode Current ( $I_{IK}$ )	
$V_I = -0.5V$	-20 mA
$V_I = V_{CC} + 0.5V$	+20 mA
DC Input Voltage ( $V_I$ )	-0.5V to $V_{CC} + 0.5V$
DC Output Diode Current ( $I_{OK}$ )	
$V_O = -0.5V$	-20 mA
$V_O = V_{CC} + 0.5V$	+20 mA
DC Output Voltage ( $V_O$ )	-0.5V to $V_{CC} + 0.5V$
DC Output Source or Sink Current ( $I_O$ )	±50 mA
DC $V_{CC}$ or Ground Current per Output Pin ( $I_{CC}$ or $I_{GND}$ )	±50 mA
Storage Temperature ( $T_{STG}$ )	-65°C to +150°C
Junction Temperature ( $T_J$ )	
CDIP	175°C
PDIP	140°C

### Recommended Operating Conditions

Supply Voltage ( $V_{CC}$ )	
'AC	2.0V to 6.0V
'ACT	4.5V to 5.5V
Input Voltage ( $V_I$ )	0V to $V_{CC}$
Output Voltage ( $V_O$ )	0V to $V_{CC}$
Operating Temperature ( $T_A$ )	
74AC/ACT	-40°C to +85°C
54AC/ACT	-55°C to +125°C
Minimum Input Edge Rate ( $\Delta V/\Delta t$ )	
'AC Devices	
$V_{IN}$ from 30% to 70% of $V_{CC}$	
$V_{CC}$ @ 3.3V, 4.5V, 5.5V	125 mV/ns
Minimum Input Edge Rate ( $\Delta V/\Delta t$ )	
'ACT Devices	
$V_{IN}$ from 0.8V to 2.0V	
$V_{CC}$ @ 4.5V, 5.5V	125 mV/ns

Note 3: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT™ circuits outside databook specifications.

### DC Characteristics for 'AC Family Devices

Symbol	Parameter	$V_{CC}$ (V)	74AC		54AC	74AC	Units	Conditions
			$T_A = +25^\circ\text{C}$		$T_A =$	$T_A =$		
					-55°C to +125°C	-40°C to +85°C		
			Typ	Guaranteed Limits				
$V_{IH}$	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$	
		4.5	2.25	3.15	3.15			
		5.5	2.75	3.85	3.85			
$V_{IL}$	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$	
		4.5	2.25	1.35	1.35			
		5.5	2.75	1.65	1.65			
$V_{OH}$	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9	V	$I_{OUT} = -50 \mu\text{A}$	
		4.5	4.49	4.4	4.4			
		5.5	5.49	5.4	5.4			
$V_{OL}$	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1	V	$I_{OUT} = 50 \mu\text{A}$	
		4.5	0.001	0.1	0.1			
		5.5	0.001	0.1	0.1			
$I_{IN}$	Maximum Input Leakage Current	3.0		0.36	0.50	V	(Note 4) $V_{IN} = V_{IL}$ or $V_{IH}$ 12 mA $I_{OL}$ 24 mA	
		4.5		0.36	0.50			
		5.5		0.36	0.50			
$I_{IN}$	Maximum Input Leakage Current	5.5		±0.1	±1.0	µA	$V_I = V_{CC}, GND$	

### DC Characteristics for 'AC Family Devices (Continued)

Symbol	Parameter	V <sub>CC</sub> (V)	74AC		54AC	74AC	Units	Conditions
			T <sub>A</sub> = +25°C		T <sub>A</sub> = -55°C to +125°C	T <sub>A</sub> = -40°C to +85°C		
			Typ	Guaranteed Limits				
I <sub>OZ</sub>	Maximum TRI-STATE Current	5.5		±0.25	±5.0	±2.5	μA	V <sub>I</sub> (OE) = V <sub>IL</sub> , V <sub>IH</sub> V <sub>I</sub> = V <sub>CC</sub> , V <sub>GND</sub> V <sub>O</sub> = V <sub>CC</sub> , GND
I <sub>OLD</sub>	(Note 5) Minimum Dynamic Output Current	5.5			50	75	mA	V <sub>OLD</sub> = 1.65V Max
I <sub>OHD</sub>		5.5			-50	-75	mA	V <sub>OHD</sub> = 3.85V Min
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5		4.0	80.0	40.0	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND

**Note 4:** All outputs loaded; thresholds on input associated with output under test.

**Note 5:** Maximum test duration 2.0 ms, one output loaded at a time.

**Note 6:** I<sub>IN</sub> and I<sub>CC</sub> @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V<sub>CC</sub>.

**Note 7:** I<sub>CC</sub> for 54AC @ 25°C is identical to 74AC @ 25°C.

### DC Characteristics for 'ACT Family Devices

Symbol	Parameter	V <sub>CC</sub> (V)	74ACT		54ACT	74ACT	Units	Conditions
			T <sub>A</sub> = +25°C		T <sub>A</sub> = -55°C to +125°C	T <sub>A</sub> = -40°C to +85°C		
			Typ	Guaranteed Limits				
V <sub>IH</sub>	Minimum High Level Input Voltage	4.5	1.5	2.0	2.0	2.0	V	V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1V
		5.5	1.5	2.0	2.0	2.0		
V <sub>IL</sub>	Maximum Low Level Input Voltage	4.5	1.5	0.8	0.8	0.8	V	V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1V
		5.5	1.5	0.8	0.8	0.8		
V <sub>OH</sub>	Minimum High Level Output Voltage	4.5	4.49	4.4	4.4	4.4	V	I <sub>OUT</sub> = -50 μA
		5.5	5.49	5.4	5.4	5.4		
		4.5		3.86	3.70	3.76	V	(Note 8) V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> I <sub>OH</sub> -24 mA -24 mA
		5.5		4.86	4.70	4.76		
V <sub>OL</sub>	Maximum Low Level Output Voltage	4.5	0.001	0.1	0.1	0.1	V	I <sub>OUT</sub> = 50 μA
		5.5	0.001	0.1	0.1	0.1		
		4.5		0.36	0.50	0.44	V	(Note 8) V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> I <sub>OL</sub> 24 mA 24 mA
5.5		0.36	0.50	0.44				
I <sub>IN</sub>	Maximum Input Leakage Current	5.5		±0.1	±1.0	±1.0	μA	V <sub>I</sub> = V <sub>CC</sub> , GND
I <sub>OZ</sub>	Maximum TRI-STATE Current	5.5		±0.25	±5.0	±2.5	μA	V <sub>I</sub> = V <sub>IL</sub> , V <sub>IH</sub> V <sub>O</sub> = V <sub>CC</sub> , GND
I <sub>CCT</sub>	Maximum I <sub>CC</sub> /Input	5.5	0.6		1.6	1.5	mA	V <sub>I</sub> = V <sub>CC</sub> - 2.1V
I <sub>OLD</sub>	(Note 9) Minimum Dynamic Output Current	5.5			50	75	mA	V <sub>OLD</sub> = 1.65V Max
I <sub>OHD</sub>		5.5			-50	-75	mA	V <sub>OHD</sub> = 3.85V Min
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5		4.0	80.0	40.0	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND

**Note 8:** All outputs loaded; thresholds on input associated with output under test.

**Note 9:** Maximum test duration 2.0 ms, one output loaded at a time.

## DC Characteristics for 'ACT Family Devices (Continued)

Note 10:  $I_{CC}$  for 54ACT @ 25°C is identical to 74ACT @ 25°C.

### AC Electrical Characteristics

See Section 0 for waveforms

Symbol	Parameter	$V_{CC}$ (Note 11) (V)	74AC			54AC		74AC		Units	Fig. No.
			$T_A = +25^\circ\text{C}$ $C_L = 50\text{ pF}$			$T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$ $C_L = 50\text{ pF}$		$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ $C_L = 50\text{ pF}$			
			Min	Typ	Max	Min	Max	Min	Max		
$t_{PLH}$	Propagation Delay Data to Output	3.3	2.0	6.5	9.0	1.0	12.5	1.5	10.0	ns	◆◆◆◆
		5.0	1.5	5.0	7.0	1.0	9.5	1.0	7.5		
$t_{PHL}$	Propagation Delay Data to Output	3.3	2.0	6.5	9.0	1.0	12.0	2.0	10.0	ns	◆◆◆◆
		5.0	1.5	5.0	7.0	1.0	9.0	1.0	7.5		
$t_{PZH}$	Output Enable Time	3.3	2.0	6.0	10.5	1.0	11.5	1.5	11.0	ns	◆◆◆◆
		5.0	1.5	5.0	7.0	1.0	9.0	1.5	8.0		
$t_{PZL}$	Output Enable Time	3.3	2.5	7.5	10.0	1.0	13.0	2.0	11.0	ns	◆◆◆◆
		5.0	1.5	5.5	8.0	1.0	10.5	1.5	8.5		
$t_{PHZ}$	Output Disable Time	3.3	3.0	7.0	10.0	1.0	12.5	1.5	10.5	ns	◆◆◆◆
		5.0	2.5	6.5	9.0	1.0	10.5	1.0	9.5		
$t_{PLZ}$	Output Disable Time	3.3	2.5	7.5	10.5	1.0	13.0	2.5	11.5	ns	◆◆◆◆
		5.0	2.0	6.5	9.0	1.0	11.0	2.0	9.5		

Note 11: Voltage Range 3.3 is 3.3V  $\pm 0.3V$   
Voltage Range 5.0 is 5.0V  $\pm 0.5V$

### AC Electrical Characteristics

See Section 0 for waveforms

Symbol	Parameter	$V_{CC}$ (Note 12) (V)	74ACT			54ACT		74ACT		Units	Fig. No.
			$T_A = +25^\circ\text{C}$ $C_L = 50\text{ pF}$			$T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$ $C_L = 50\text{ pF}$		$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$ $C_L = 50\text{ pF}$			
			Min	Typ	Max	Min	Max	Min	Max		
$t_{PLH}$	Propagation Delay Data to Output	5.0	2.0	6.5	9.0	1.0	10.0	1.5	10.0	ns	◆◆◆◆
$t_{PHL}$	Propagation Delay Data to Output	5.0	2.0	7.0	9.0	1.0	10.0	1.5	10.0	ns	◆◆◆◆
$t_{PZH}$	Output Enable Time	5.0	1.5	6.0	8.5	1.0	9.5	1.0	9.5	ns	◆◆◆◆
$t_{PZL}$	Output Enable Time	5.0	2.0	7.0	9.5	1.0	11.0	1.5	10.5	ns	◆◆◆◆
$t_{PHZ}$	Output Disable Time	5.0	2.0	7.0	9.5	1.0	11.0	1.5	10.5	ns	◆◆◆◆
$t_{PLZ}$	Output Disable Time	5.0	2.5	7.5	10.0	1.0	11.5	2.0	10.5	ns	◆◆◆◆

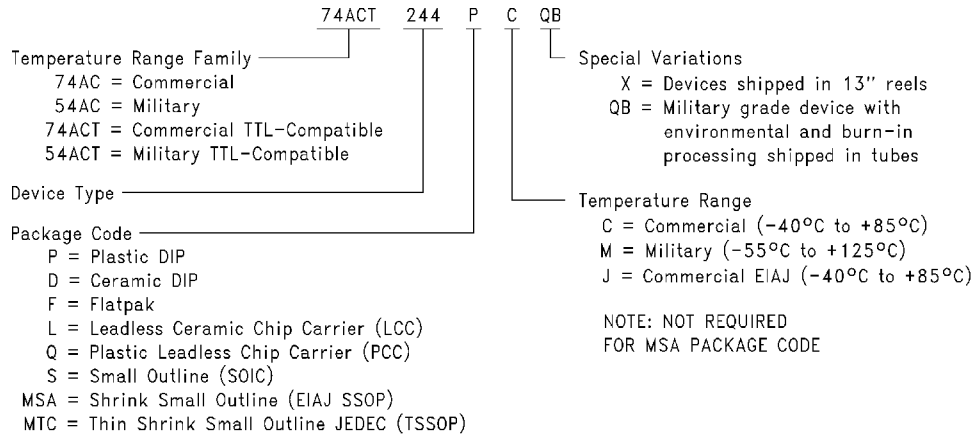
Note 12: Voltage Range 5.0 is 5.0V  $\pm 0.5V$

### Capacitance

Symbol	Parameter	Typ	Units	Conditions
$C_{IN}$	Input Capacitance	4.5	pF	$V_{CC} = \text{OPEN}$
$C_{PD}$	Power Dissipation Capacitance	45.0	pF	$V_{CC} = 5.0V$

## Ordering Information

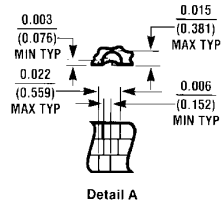
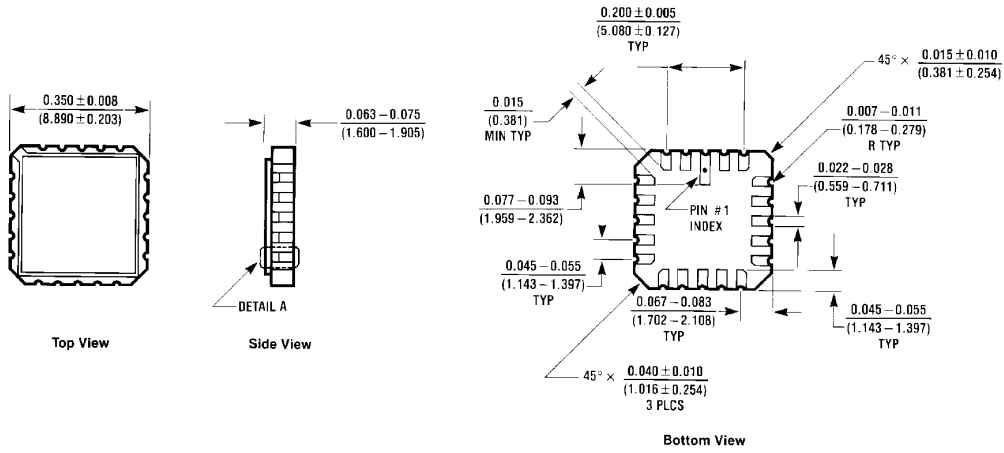
The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



Book  
Extract  
End

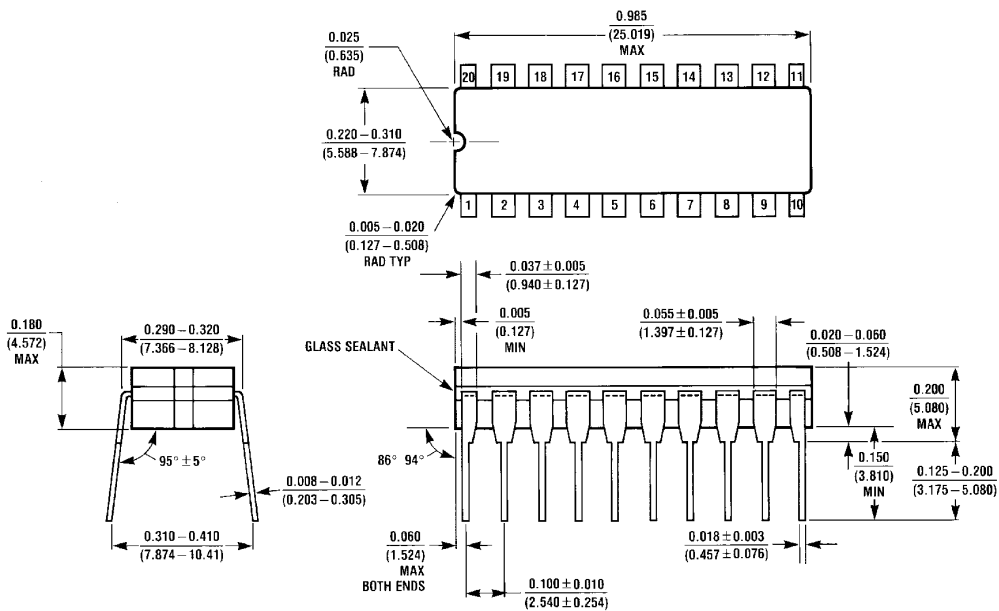
DS009943-5

**Physical Dimensions** inches (millimeters)



E20A (REV D)

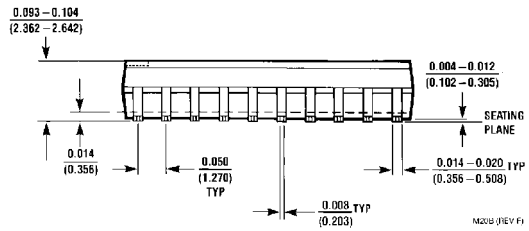
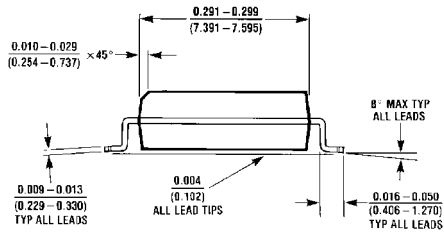
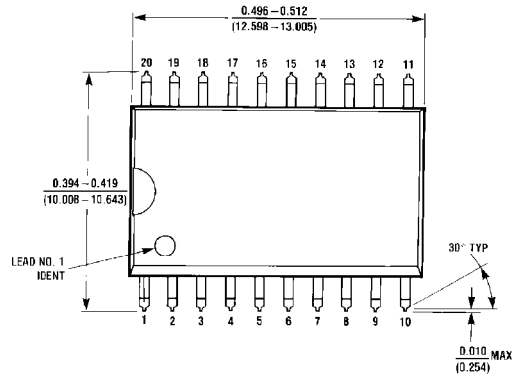
**20-Terminal Ceramic Leadless Chip Carrier (L)  
NS Package Number E20A**



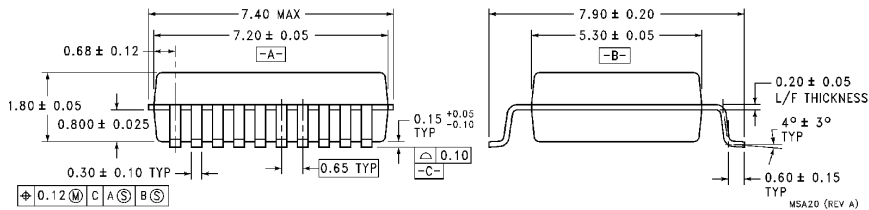
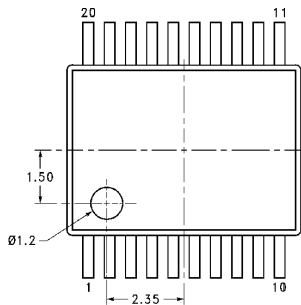
J20A (REV M)

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

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



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

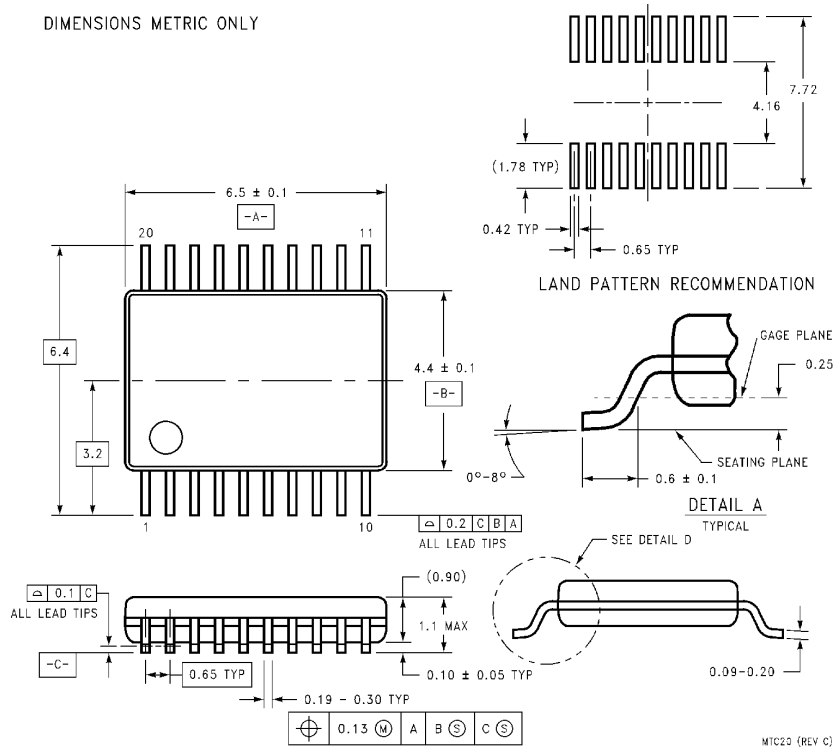


**20-Lead Plastic EIAJ SSOP (MSA)**  
NS Package Number MSA20

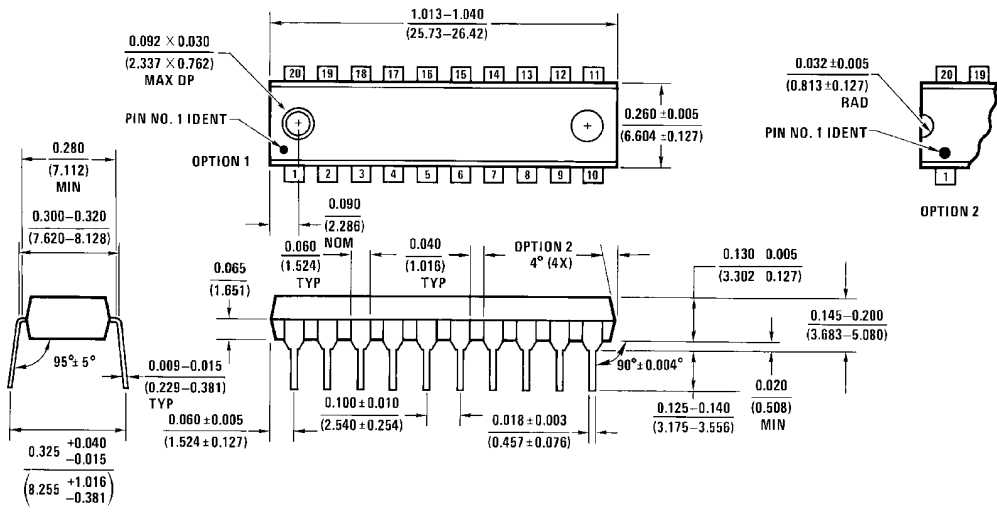


**Physical Dimensions** inches (millimeters) (Continued)

DIMENSIONS METRIC ONLY

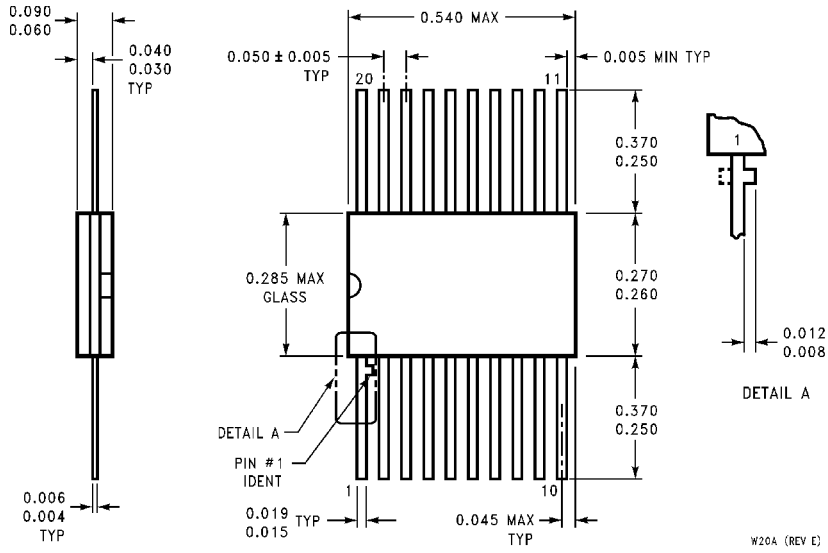


**20-Lead Molded Thin Shrink Small Outline Package, JEDEC  
NS Package Number MTC20**



**20-Lead Plastic Dual-In-Line Package (P)  
NS Package Number N20A**

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




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

**LIFE SUPPORT POLICY**

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2. A critical component in 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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