

February 1993

54AC/74AC244 • 54ACT/74ACT244 Octal Buffer/Line Driver with TRI-STATE® Outputs

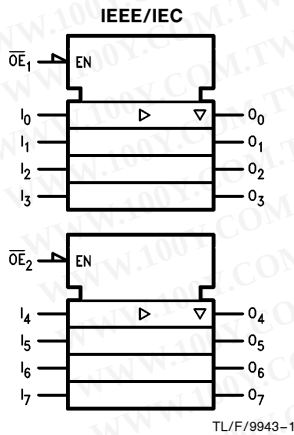
General Description

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.

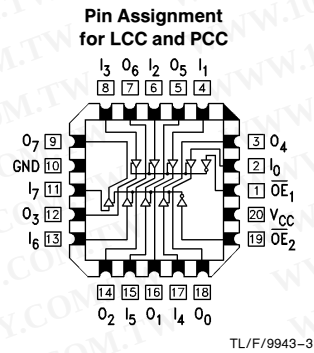
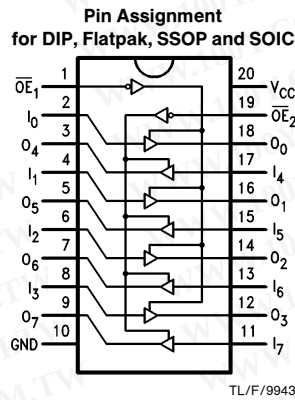
Features

- 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

Logic Symbol



Connection Diagrams



Truth Tables

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

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

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

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

TRI-STATE® is a registered trademark of National Semiconductor Corporation.
FACT™ is a trademark of National Semiconductor Corporation.

Absolute Maximum Ratings (Note 1)

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

Note 1: 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.

Recommended Operating Conditions

Supply Voltage (V_{CC})	2.0V to 6.0V
'AC	
'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

DC Characteristics for 'AC Family Devices

Symbol	Parameter	V _{CC} (V)	74AC		54AC		74AC		Units	Conditions
			T _A = +25°C		T _A = −55°C to +125°C		T _A = −40°C to +85°C			
			Typ	Guaranteed Limits						
V _{IH}	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1		2.1		V	V _{OUT} = 0.1V or V _{CC} − 0.1V
		4.5	2.25	3.15	3.15		3.15			
		5.5	2.75	3.85	3.85		3.85			
V _{IL}	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9		0.9		V	V _{OUT} = 0.1V or V _{CC} − 0.1V
		4.5	2.25	1.35	1.35		1.35			
		5.5	2.75	1.65	1.65		1.65			
V _{OH}	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9		2.9		V	I _{OUT} = −50 μA
		4.5	4.49	4.4	4.4		4.4			
		5.5	5.49	5.4	5.4		5.4			
		3.0		2.56	2.4		2.46		V	*V _{IN} = V _{IL} or V _{IH} −12 mA I _{OH} −24 mA −24 mA
		4.5		3.86	3.7		3.76			
		5.5		4.86	4.7		4.76			
V _{OL}	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1		0.1		V	I _{OUT} = 50 μA
		4.5	0.001	0.1	0.1		0.1			
		5.5	0.001	0.1	0.1		0.1			
		3.0		0.36	0.50		0.44		V	*V _{IN} = V _{IL} or V _{IH} 12 mA I _{OL} 24 mA 24 mA
		4.5		0.36	0.50		0.44			
		5.5		0.36	0.50		0.44			
I _{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0		±1.0		μA	V _I = V _{CC} , GND

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

DC Characteristics for 'AC Family Devices (Continued)

Symbol	Parameter	V _{CC} (V)	74AC		54AC		74AC		Units	Conditions
			T _A = + 25°C		T _A = − 55°C to + 125°C		T _A = − 40°C to + 85°C			
			Typ	Guaranteed Limits						
I _{OZ}	Maximum TRI-STATE® Current	5.5		± 0.25	± 5.0		± 2.5		μA	V _I (OE) = V _{IL} , V _{IH} V _I = V _{CC} , V _{GND} V _O = V _{CC} , GND
I _{OLD}	†Minimum Dynamic Output Current	5.5			50		75		mA	V _{OLD} = 1.65V Max
I _{OHD}		5.5			− 50		− 75		mA	V _{OHD} = 3.85V Min
I _{CC}	Maximum Quiescent Supply Current	5.5		4.0	80.0		40.0		μA	V _{IN} = V _{CC} or GND

†Maximum test duration 2.0 ms, one output loaded at a time.

Note: I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC}.

I_{CC} for 54AC @ 25°C is identical to 74AC @ 25°C.

DC Characteristics for 'ACT Family Devices

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

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

†Maximum test duration 2.0 ms, one output loaded at a time.

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

AC Electrical Characteristics

Symbol	Parameter	V _{CC} * (V)	74AC			54AC		74AC		Units
			T _A = +25°C C _L = 50 pF			T _A = −55°C to +125°C C _L = 50 pF		T _A = −40°C to +85°C C _L = 50 pF		
			Min	Typ	Max	Min	Max	Min	Max	
t _{PLH}	Propagation Delay Data to Output	3.3 5.0	2.0 1.5	6.5 5.0	9.0 7.0	1.0 1.0	12.5 9.5	1.5 1.0	10.0 7.5	ns
t _{PHL}	Propagation Delay Data to Output	3.3 5.0	2.0 1.5	6.5 5.0	9.0 7.0	1.0 1.0	12.0 9.0	2.0 1.0	10.0 7.5	ns
t _{PZH}	Output Enable Time	3.3 5.0	2.0 1.5	6.0 5.0	10.5 7.0	1.0 1.0	11.5 9.0	1.5 1.5	11.0 8.0	ns
t _{PZL}	Output Enable Time	3.3 5.0	2.5 1.5	7.5 5.5	10.0 8.0	1.0 1.0	13.0 10.5	2.0 1.5	11.0 8.5	ns
t _{PHZ}	Output Disable Time	3.3 5.0	3.0 2.5	7.0 6.5	10.0 9.0	1.0 1.0	12.5 10.5	1.5 1.0	10.5 9.5	ns
t _{PLZ}	Output Disable Time	3.3 5.0	2.5 2.0	7.5 6.5	10.5 9.0	1.0 1.0	13.0 11.0	2.5 2.0	11.5 9.5	ns

*Voltage Range 3.3 is 3.3V ±0.3V
 Voltage Range 5.0 is 5.0V ±0.5V

AC Electrical Characteristics

Symbol	Parameter	V _{CC} * (V)	74ACT			54ACT		74ACT		Units
			T _A = +25°C C _L = 50 pF			T _A = −55°C to +125°C C _L = 50 pF		T _A = −40°C to +85°C C _L = 50 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

*Voltage Range 5.0 is 5.0V ±0.5V

Capacitance

Symbol	Parameter	Typ	Units	Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = OPEN
C _{PD}	Power Dissipation Capacitance	45.0	pF	V _{CC} = 5.0V

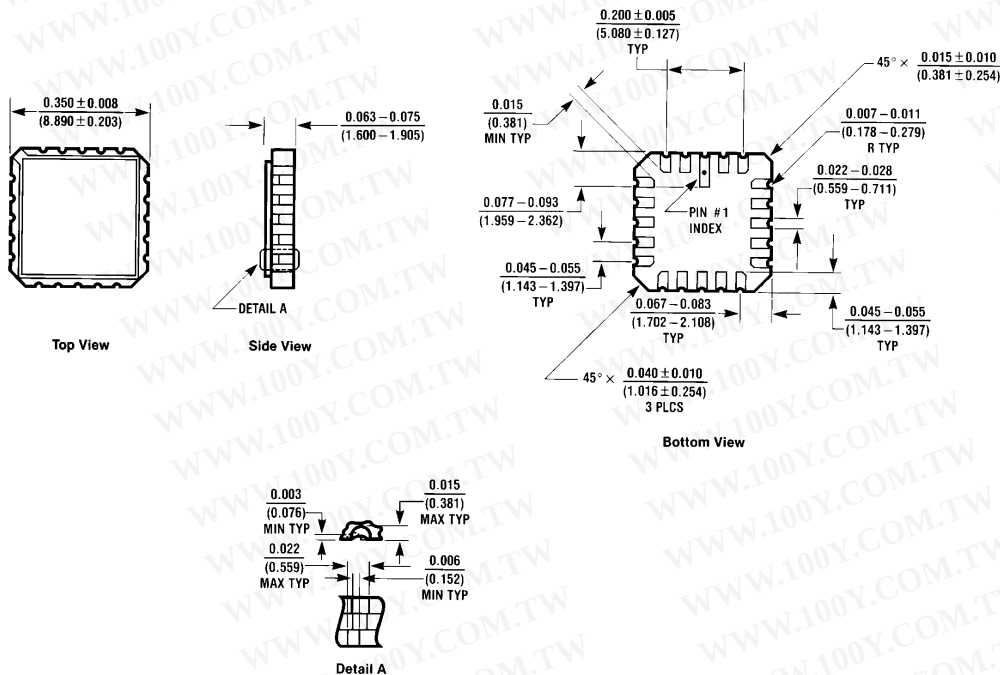
Ordering Information

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

Temperature Range Family	74ACT	244	P	C	QR	Special Variations
74AC = Commercial						X = Devices shipped in 13" reels
54AC = Military						QR = Commercial grade device with burn-in
74ACT = Commercial TTL-Compatible						QB = Military grade device with environmental and burn-in processing shipped in tubes
54ACT = Military TTL-Compatible						
Device Type						
Package Code						Temperature Range
P = Plastic DIP						C = Commercial (−40°C to +85°C)
D = Ceramic DIP						M = Military (−55°C to +125°C)
F = Flatpak						
L = Leadless Ceramic Chip Carrier (LCC)						
Q = Plastic Leadless Chip Carrier (PCC)						
S = Small Outline (SOIC)						
MSA = Shrink Small Outline (EIAJ SSOP)						

NOTE: NOT REQUIRED
FOR MSA PACKAGE CODE

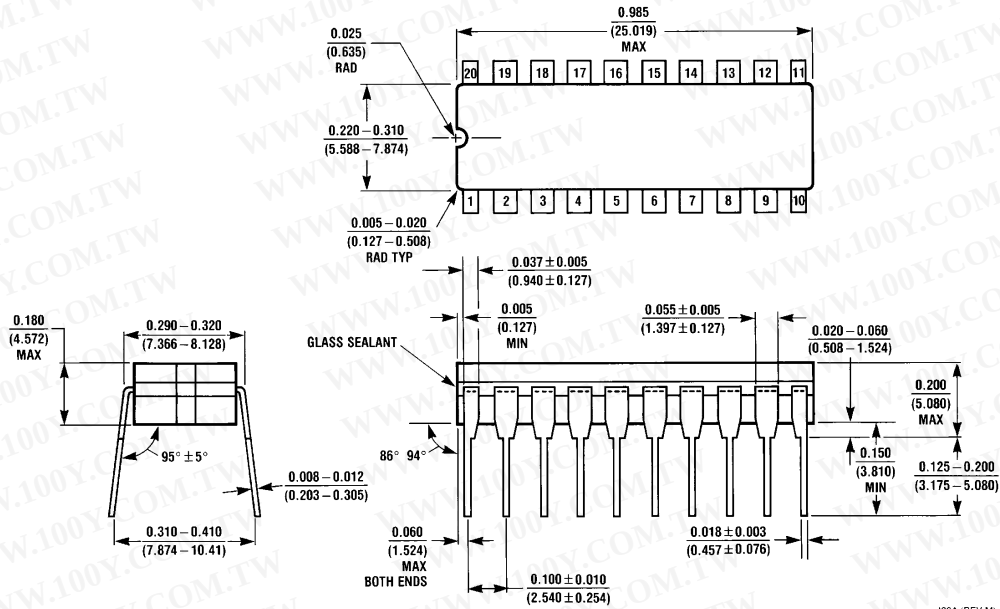
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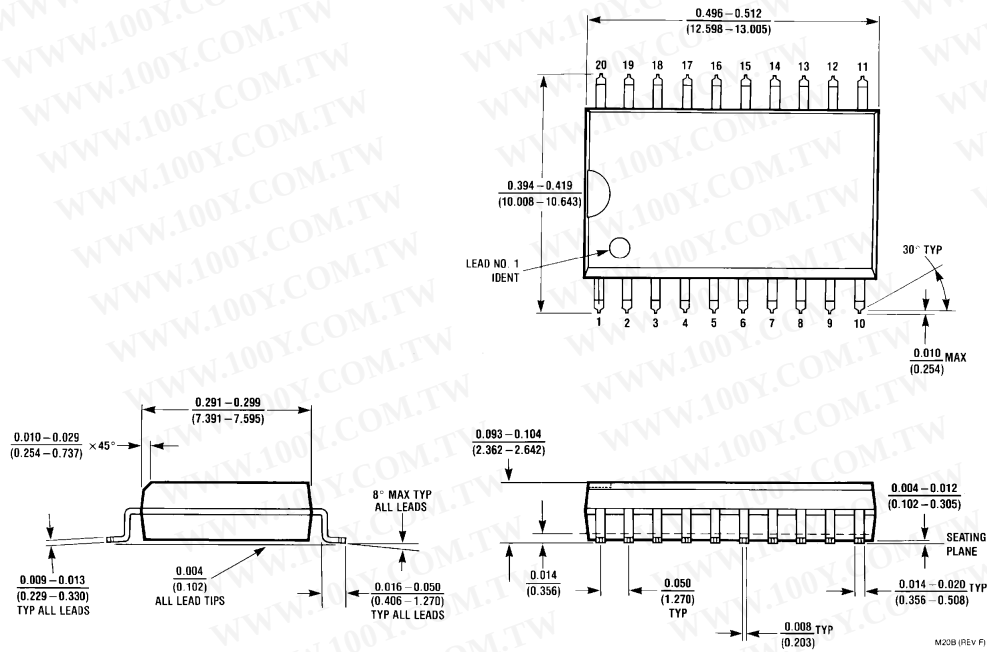
20 Terminal Ceramic Leadless Chip Carrier (L)
NS Package Number E20A

E20A (REV D)

Physical Dimensions inches (millimeters) (Continued)

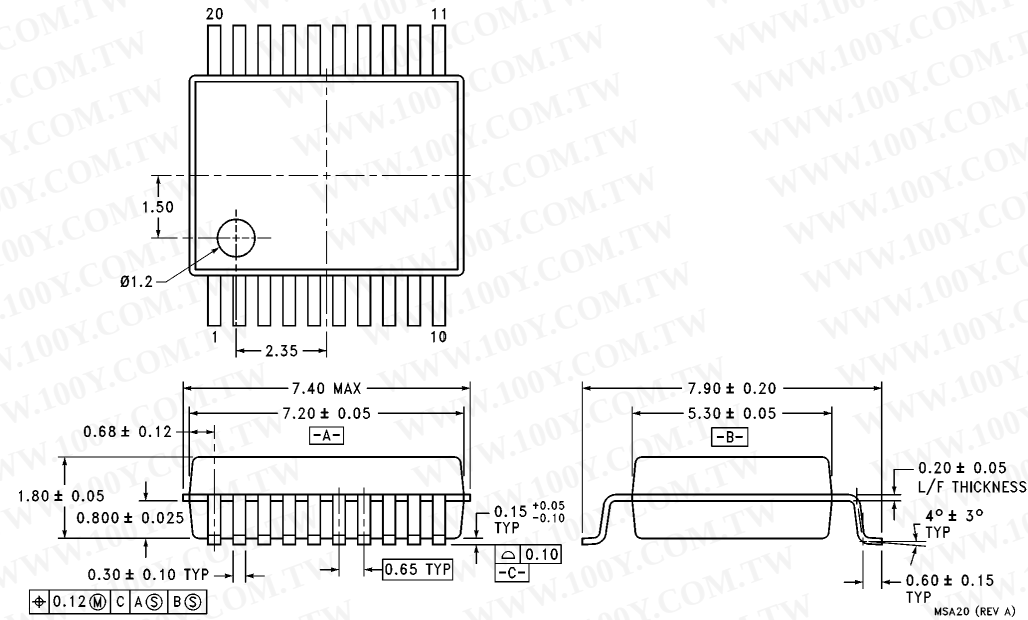


20 Lead Ceramic Dual-In-Line Package (D)
 NS Package Number J20A

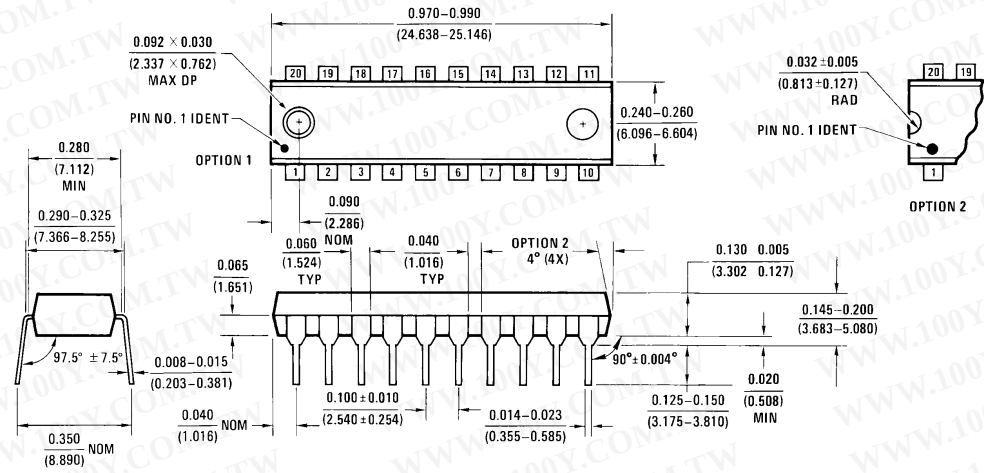


20 Lead Small Outline Integrated Circuit (S)
 NS Package Number M20B

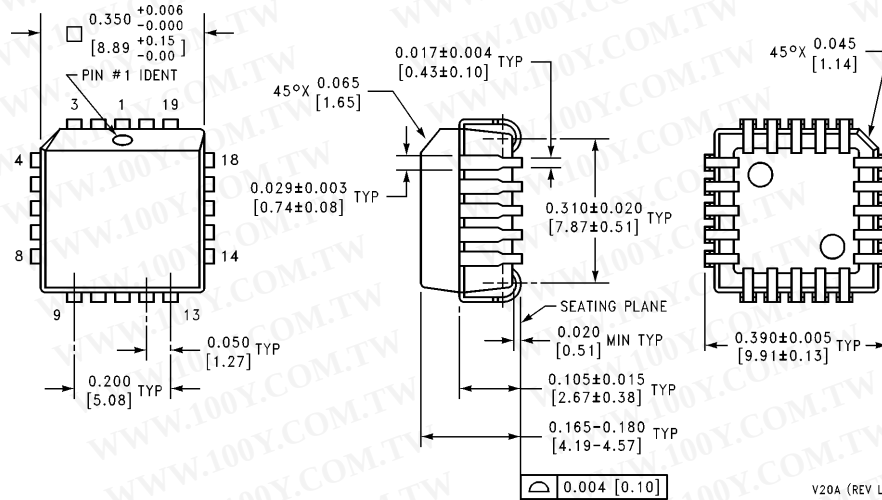
Physical Dimensions inches (millimeters) (Continued)



Physical Dimensions inches (millimeters) (Continued)

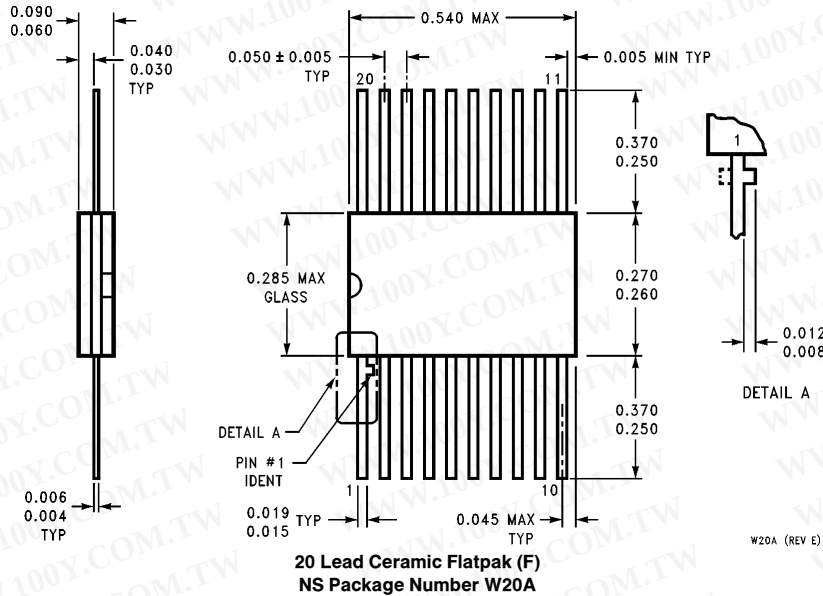


20 Lead Plastic Dual-In-Line Package (P)
NS Package Number N20B



20 Lead Plastic Chip Carrier (Q)
NS Package Number V20A

Physical Dimensions inches (millimeters) (Continued)



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2. A critical component is 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.

