

54AC520 • 54ACT520

8-Bit Identity Comparator

General Description

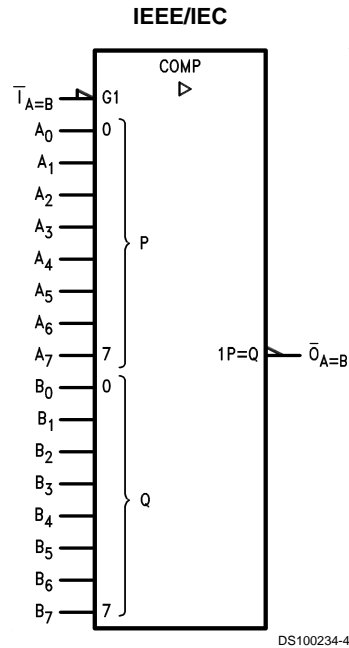
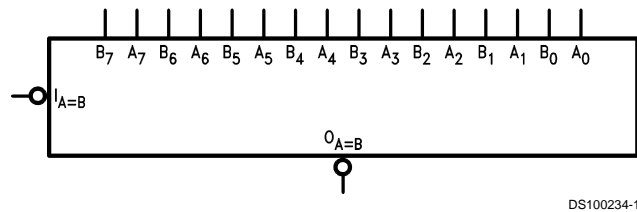
The 'AC/'ACT520 are expandable 8-bit comparators. They compare two words of up to eight bits each and provide a LOW output when the two words match bit for bit. The expansion input $\bar{I}_{A=B}$ also serves as an active LOW enable input.

Features

- Compares two 8-bit words in 6.5 ns typ

- Expandable to any word length
- 20-pin package
- Outputs source/sink 24 mA
- 'ACT520 has TTL-compatible inputs
- Standard Microcircuit Drawing (SMD)
 - 54AC520: 5962-90916
 - 54ACT520: 5962-89793

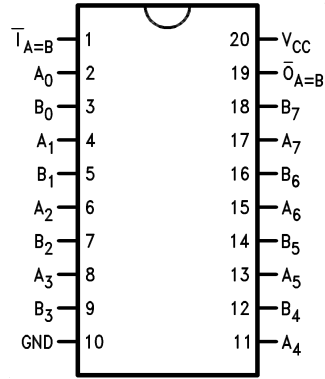
Logic Symbols



Pin Names	Description
A ₀ –A ₇	Word A Inputs
B ₀ –B ₇	Word B Inputs
$\bar{I}_{A=B}$	Expansion or Enable Input
$\bar{O}_{A=B}$	Identity Output

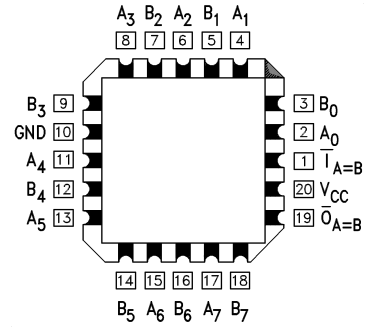
Connection Diagrams

Pin Assignment
for DIP and Flatpak



DS100234-2

Pin Assignment
for LCC



DS100234-3

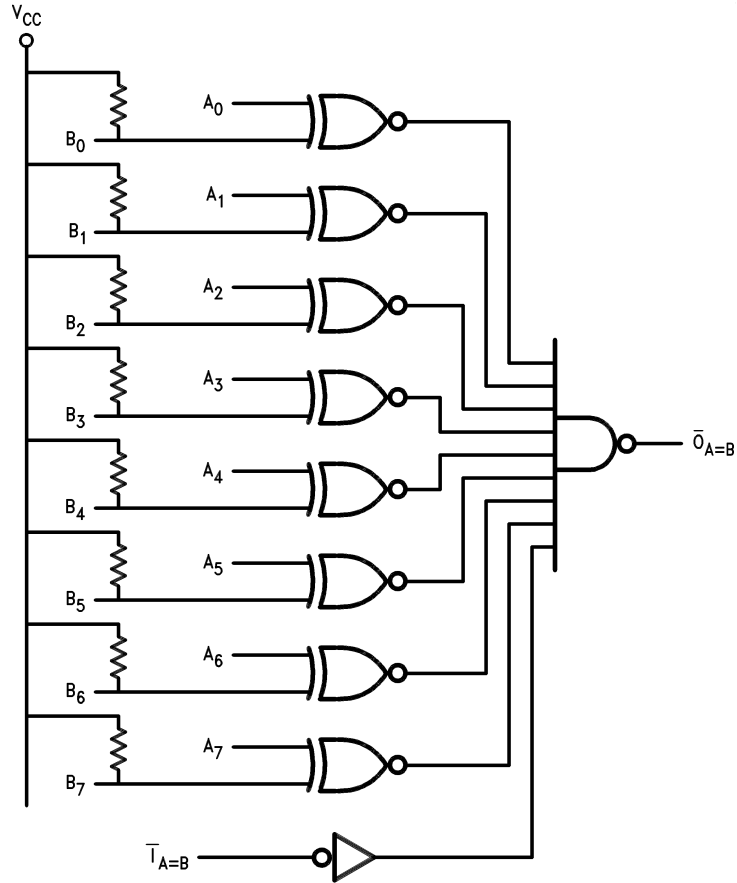
Inputs		Outputs
$\bar{I}_{A=B}$	A, B	$\bar{O}_{A=B}$
L	A = B*	L
L	A ≠ B	H
H	A = B*	H
H	A ≠ B	H

H = HIGH Voltage Level

L = LOW Voltage Level

*A₀ = B₀, A₁ = B₁, A₂ = B₂, etc.

Logic Diagram



DS100234-5

Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

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

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)	
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 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.

DC Characteristics for 'AC Family Devices

Symbol	Parameter	V_{CC} (V)	54AC		Units	Conditions	
			$T_A =$ -55°C to +125°C				
			Guaranteed Limits				
V_{IH}	Minimum High Level Input Voltage	3.0	2.1		V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$	
		4.5	3.15				
		5.5	3.85				
V_{IL}	Maximum Low Level Input Voltage	3.0	0.9		V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$	
		4.5	1.35				
		5.5	1.65				
V_{OH}	Minimum High Level Output Voltage	3.0	2.9		V	$I_{OUT} = -50 \mu A$	
		4.5	4.4				
		5.5	5.4				
			3.0	2.4		V	(Note 2) $V_{IN} = V_{IL}$ or V_{IH} $I_{OH} = -12 \text{ mA}$ $I_{OH} = -24 \text{ mA}$ $I_{OH} = -24 \text{ mA}$
			4.5	3.7			
			5.5	4.7			
V_{OL}	Maximum Low Level Output Voltage	3.0	0.1		V	$I_{OUT} = 50 \mu A$	
		4.5	0.1				
		5.5	0.1				
			3.0	0.50		V	(Note 2) $V_{IN} = V_{IL}$ or V_{IH} $I_{OL} = 12 \text{ mA}$ $I_{OL} = 24 \text{ mA}$ $I_{OL} = 24 \text{ mA}$
			4.5	0.50			
			5.5	0.50			
I_{IN}	Maximum Input Leakage Current	5.5	±1.0		μA	$V_I = V_{CC}, GND$ A Inputs Only	
I_{IH}	Maximum Input High Leakage Current	5.5	20.0		μA	$V_I = V_{CC}$ B Inputs Only	

DC Characteristics for 'AC Family Devices (Continued)

Symbol	Parameter	V _{CC} (V)	54AC	Units	Conditions
			T _A = -55°C to +125°C		
			Guaranteed Limits		
I _{IL}	Maximum Input Low Leakage Current	5.5	-1.5	mA	V _I = V _{CC} B Inputs Only
I _{OLD}	Minimum Dynamic (Note 3)	5.5	50	mA	V _{OLD} = 1.65V Max
I _{OHD}	Output Current	5.5	-50	mA	V _{OHD} = 3.85V Min
I _{CC}	Maximum Quiescent Supply Current	5.5	80.0	μA	V _{IN} = V _{CC}
I _{CC}	Maximum Quiescent Supply Current	5.5	8.0	mA	V _{IN} = GND

Note 2: All outputs loaded; thresholds on input associated with output under test.

Note 3: Maximum test duration 2.0 ms, one output loaded at a time.

DC Characteristics for 'ACT Family Devices

Symbol	Parameter	V _{CC} (V)	54ACT	Units	Conditions
			T _A = -55°C to +125°C		
			Guaranteed Limits		
V _{IH}	Minimum High Level Input Voltage	4.5	2.0	V	V _{OUT} = 0.1V or V _{CC} - 0.1V
		5.5	2.0		
V _{IL}	Maximum Low Level Input Voltage	4.5	0.8	V	V _{OUT} = 0.1V or V _{CC} - 0.1V
		5.5	0.8		
V _{OH}	Minimum High Level Output Voltage	4.5	4.4	V	I _{OUT} = -50 μA
		5.5	5.4		
		4.5	3.70	V	(Note 4) V _{IN} = V _{IL} or V _{IH} I _{OH} = -24 mA I _{OH} = -24 mA
		5.5	4.70		
V _{OL}	Maximum Low Level Output Voltage	4.5	0.1	V	I _{OUT} = 50 μA
		5.5	0.1		
		4.5	0.50	V	(Note 4) V _{IN} = V _{IL} or V _{IH} I _{OL} = 24 mA I _{OL} = 24 mA
		5.5	0.50		
I _{IN}	Maximum Input Leakage Current	5.5	±1.0	μA	V _I = V _{CC} , GND
I _{IH}	Maximum Input High Leakage Current	5.5	10.0	μA	V _I = V _{CC} B Inputs Only
I _{IL}	Maximum Input Low Leakage Current	5.5	-1.0	mA	V _I = V _{CC} B Inputs Only
I _{CCT}	Maximum I _{CC} /Input	5.5	1.6	mA	V _I = V _{CC} - 2.1V
I _{OLD}	Minimum Dynamic (Note 5)	5.5	50	mA	V _{OLD} = 1.65V Max
I _{OHD}	Output Current	5.5	-50	mA	V _{OHD} = 3.85V Min
I _{CC}	Maximum Quiescent Supply Current	5.5	80.0	μA	V _{IN} = V _{CC} or GND

DC Characteristics for 'ACT Family Devices (Continued)

Symbol	Parameter	V _{CC} (V)	54ACT		Units	Conditions
			T _A = -55°C to +125°C			
			Guaranteed Limits			
I _{CC}	Maximum Quiescent Supply Current	5.5	8.0		mA	V _{IN} = 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.

AC Electrical Characteristics

Symbol	Parameter	V _{CC} (V) (Note 6)	54AC		Units	Fig. No.
			T _A = -55°C to +125°C C _L = 50 pF			
			Min	Max		
t _{PLH}	Propagation Delay A _n or B _n to $\overline{O}_{A=B}$	3.3	1.0	14.0	ns	
		5.0	1.5	10.5		
t _{PHL}	Propagation Delay A _n or B _n to $\overline{O}_{A=B}$	3.3	1.0	15.0	ns	
		5.0	1.5	11.0		
t _{PLH}	Propagation Delay $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$	3.3	1.0	10.0	ns	
		5.0	1.5	7.5		
t _{PHL}	Propagation Delay $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$	3.3	1.0	10.5	ns	
		5.0	1.5	8.0		

Note 6: 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) (Note 7)	54ACT		Units	Fig. No.
			T _A = -55°C to +125°C C _L = 50 pF			
			Min	Max		
t _{PLH}	Propagation Delay A _n or B _n to $\overline{O}_{A=B}$	5.0	1.5	12.0	ns	
t _{PHL}	Propagation Delay A _n or B _n to $\overline{O}_{A=B}$	5.0	1.5	12.0	ns	
t _{PLH}	Propagation Delay $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$	5.0	1.5	8.5	ns	
t _{PHL}	Propagation Delay $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$	5.0	1.5	9.0	ns	

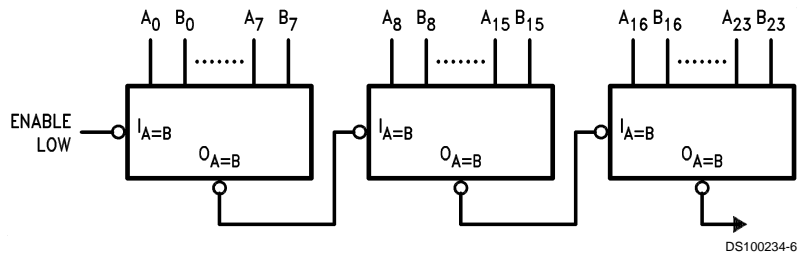
Note 7: Voltage Range 5.0 is 5.0V ±0.5V

Capacitance

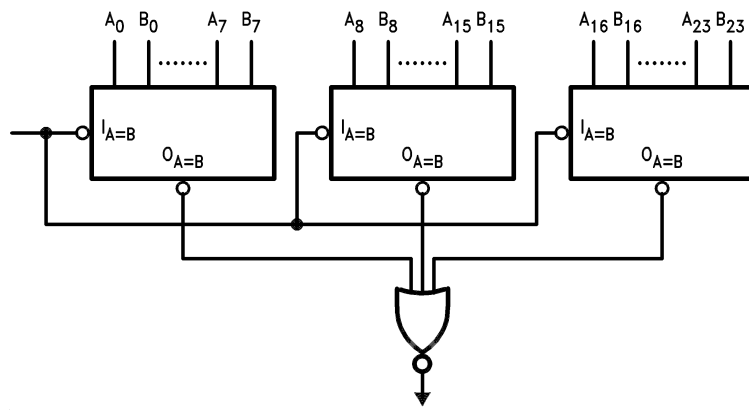
Symbol	Parameter	Typ	Units	Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = OPEN
C _{PD}	Power Dissipation Capacitance	40	pF	V _{CC} = 5.0V

Applications

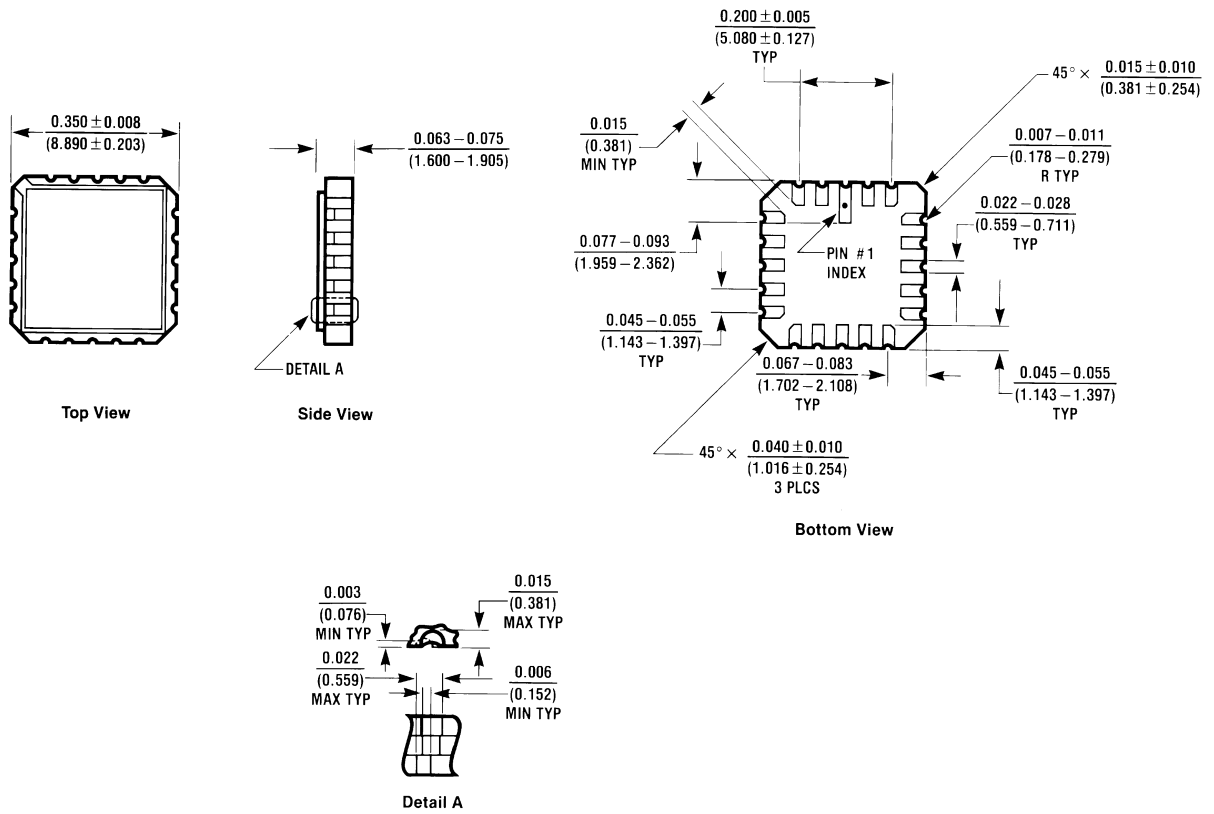
Ripple Expansion



Parallel Expansion

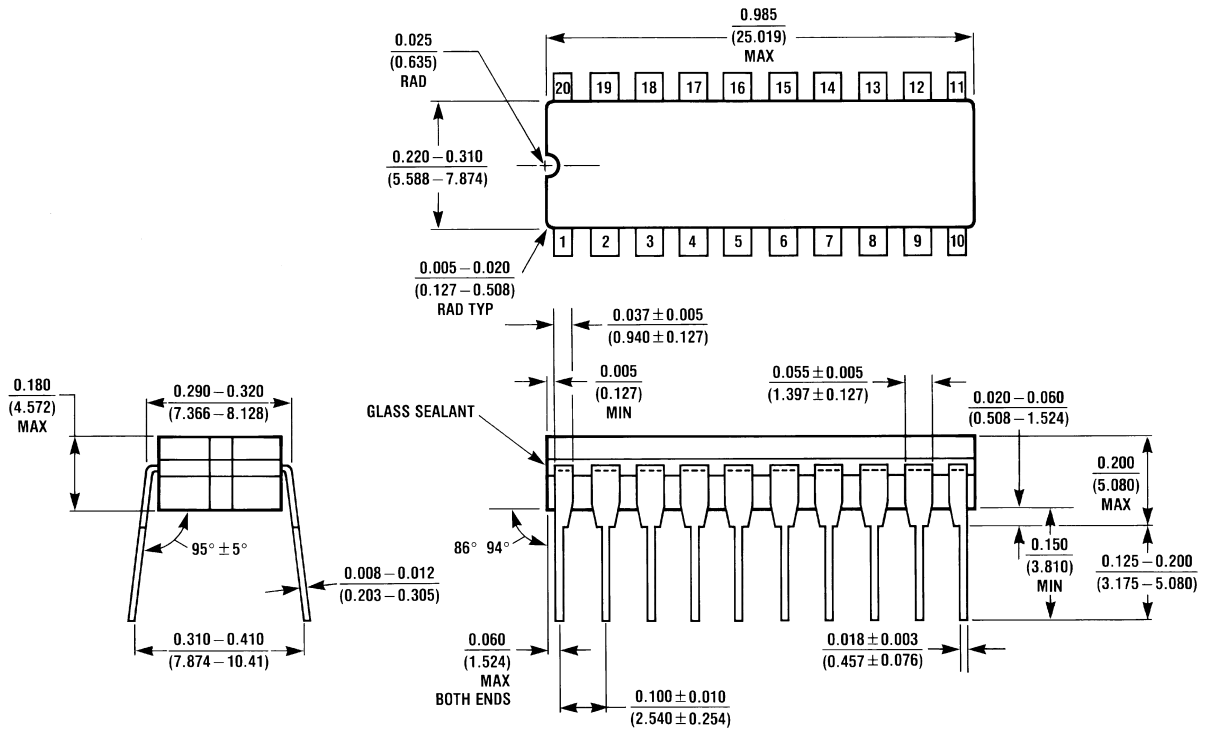


Physical Dimensions inches (millimeters) unless otherwise noted



E20A (REV D)

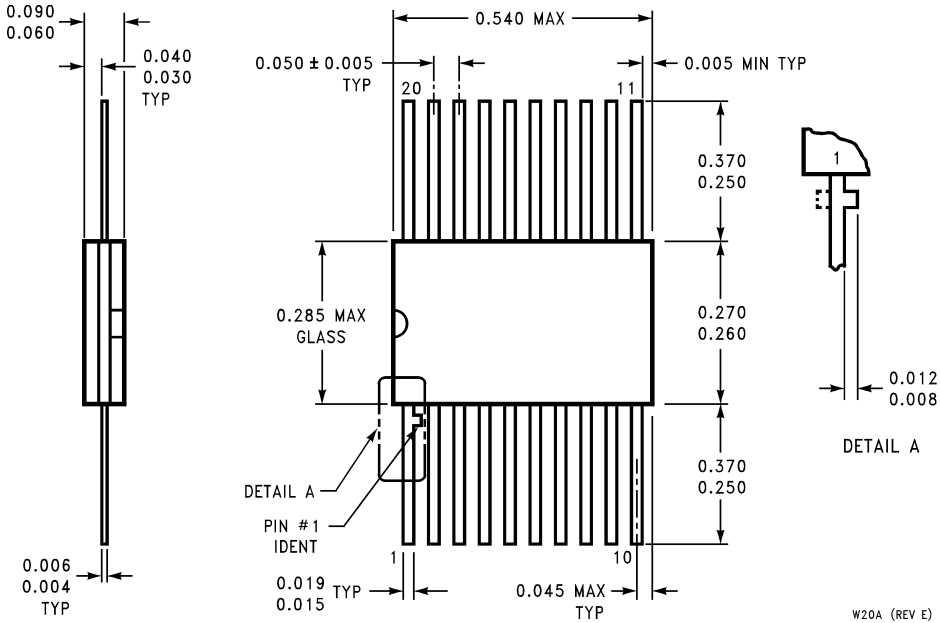
**20 Terminal Ceramic Leadless Chip Carrier (L)
 NS Package Number E20A**



J20A (REV M)

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

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



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

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT AND GENERAL COUNSEL OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
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.

 <p>National Semiconductor Corporation Americas Email: support@nsc.com</p>	<p>National Semiconductor Europe Fax: +49 (0) 180-530 85 86 Email: europe.support@nsc.com Deutsch Tel: +49 (0) 69 9508 6208 English Tel: +44 (0) 870 24 0 2171 Français Tel: +33 (0) 1 41 91 8790</p>	<p>National Semiconductor Asia Pacific Customer Response Group Tel: 65-2544466 Fax: 65-2504466 Email: ap.support@nsc.com</p>	<p>National Semiconductor Japan Ltd. Tel: 81-3-5639-7560 Fax: 81-3-5639-7507</p>
--	--	---	---

www.national.com

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.