

# 74AC520, 74ACT520 8-Bit Identity Comparator

## Features

- Compares two 8-bit words in 6.5ns typ.
- Expandable to any word length
- 20-pin package
- Outputs source/sink 24mA
- ACT520 has TTL-compatible inputs

## General Description

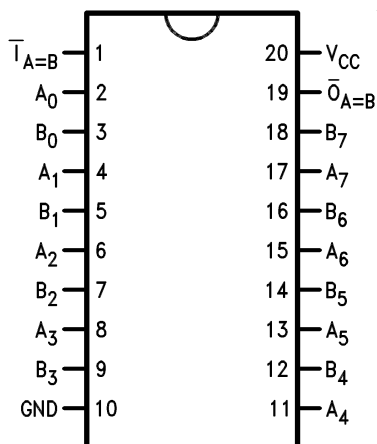
The AC/ACT520 are expandable 8-bit comparators. They compare two words of up to eight bits each and provide a LOW output when the two words match bit for bit. The expansion input  $\bar{I}_{A=B}$  also serves as an active LOW enable input.

## Ordering Information

Order Number	Package Number	Package Description
74AC520SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Body
74ACT520SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Body
74ACT520SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74ACT520PC	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering number.

## Connection Diagram



## Pin Descriptions

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

## Truth Table

Inputs		Outputs
$\bar{I}_{A=B}$	A, B	$\bar{O}_{A=B}$
L	A = B <sup>(1)</sup>	L
L	A ≠ B	H
H	A = B <sup>(1)</sup>	H
H	A ≠ B	H

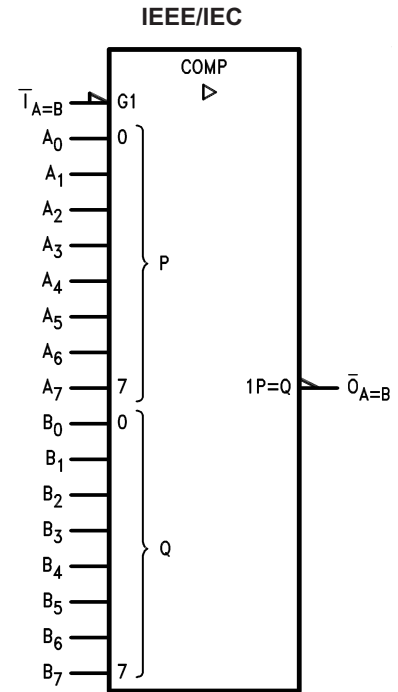
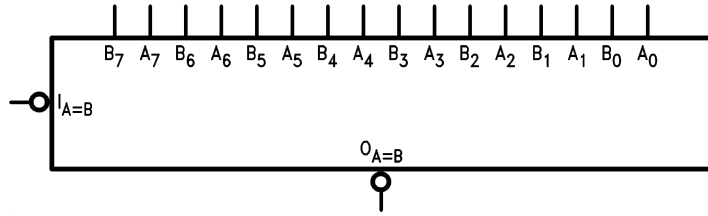
H = HIGH Voltage Level

L = LOW Voltage Level

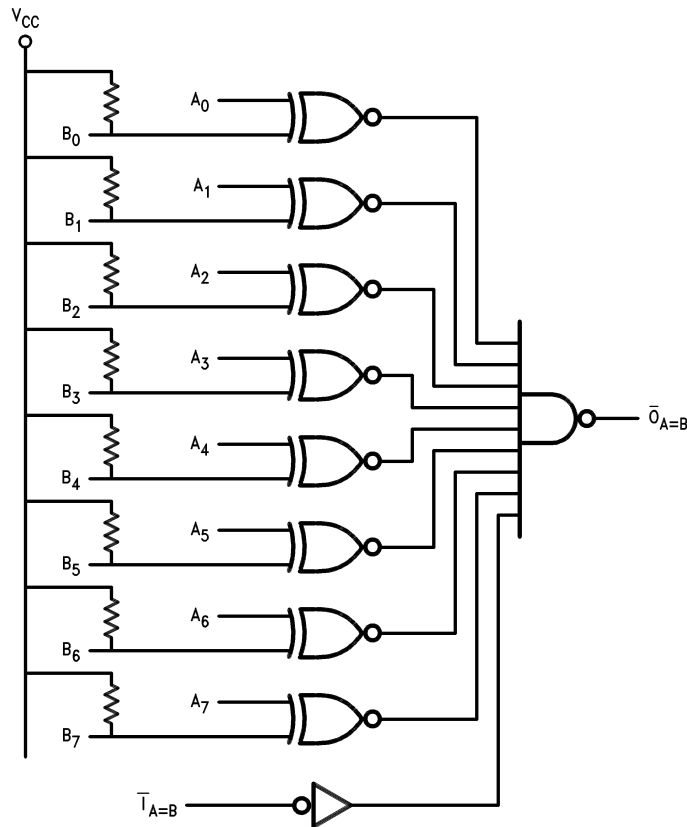
### Note:

1. A<sub>0</sub> = B<sub>0</sub>, A<sub>1</sub> = B<sub>1</sub>, A<sub>2</sub> = B<sub>2</sub>, etc.

Logic Symbols

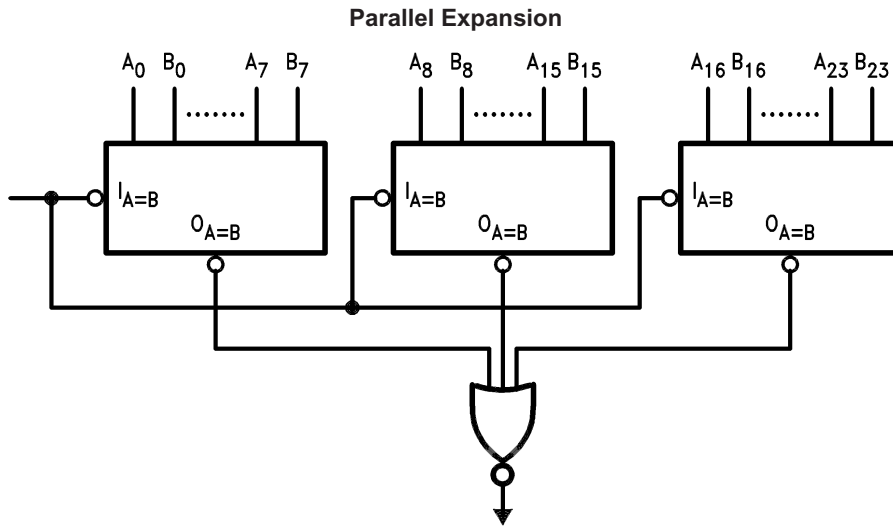
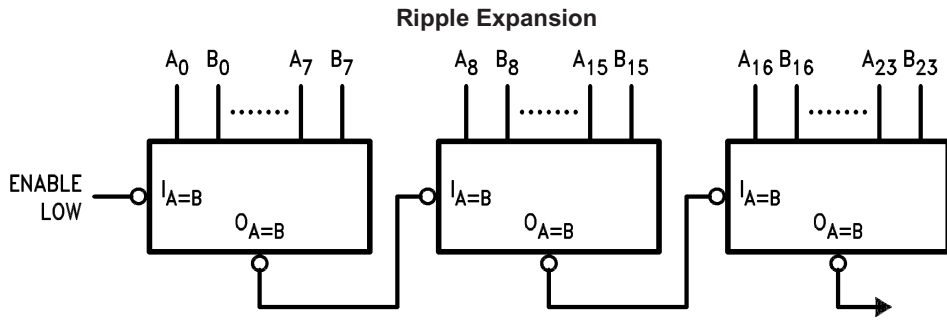


Logic Diagram



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

Applications



## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

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

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter	Rating
$V_{CC}$	Supply Voltage AC ACT	2.0V to 6.0V 4.5V to 5.5V
$V_I$	Input Voltage	0V to $V_{CC}$
$V_O$	Output Voltage	0V to $V_{CC}$
$T_A$	Operating Temperature	-40°C to +85°C
$\Delta V / \Delta t$	Minimum Input Edge Rate, AC Devices: $V_{IN}$ from 30% to 70% of $V_{CC}$ , $V_{CC}$ @ 3.3V, 4.5V, 5.5V	125mV/ns
$\Delta V / \Delta t$	Minimum Input Edge Rate, ACT Devices: $V_{IN}$ from 0.8V to 2.0V, $V_{CC}$ @ 4.5V, 5.5V	125mV/ns

## DC Electrical Characteristics for AC

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C		Units
				Typ.	Guaranteed Limits			
V <sub>IH</sub>	Minimum HIGH Level Input Voltage	3.0	V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1V	1.5	2.1	2.1	V	
		4.5		2.25	3.15	3.15		
		5.5		2.75	3.85	3.85		
V <sub>IL</sub>	Maximum LOW Level Input Voltage	3.0	V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1V	1.5	0.9	0.9	V	
		4.5		2.25	1.35	1.35		
		5.5		2.75	1.65	1.65		
V <sub>OH</sub>	Minimum HIGH Level Output Voltage	3.0	I <sub>OUT</sub> = -50μA	2.99	2.9	2.9	V	
		4.5		4.49	4.4	4.4		
		5.5		5.49	5.4	5.4		
		3.0	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> ; I <sub>OH</sub> = -12mA		2.56	2.46		
		4.5	I <sub>OH</sub> = -24mA		3.86	3.76		
		5.5	I <sub>OH</sub> = -24mA <sup>(2)</sup>		4.86	4.76		
V <sub>OL</sub>	Maximum LOW Level Output Voltage	3.0	I <sub>OUT</sub> = 50μA	0.002	0.1	0.1	V	
		4.5		0.001	0.1	0.1		
		5.5		0.001	0.1	0.1		
		3.0	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> ; I <sub>OL</sub> = 12mA		0.36	0.44		
		4.5	I <sub>OL</sub> = 24mA		0.36	0.44		
		5.5	I <sub>OL</sub> = 24mA <sup>(2)</sup>		0.36	0.44		
I <sub>IN</sub> <sup>(4)</sup>	Maximum Input Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> , GND, A Inputs Only		±0.1	±1.0	μA	
I <sub>IH</sub>	Maximum Input HIGH Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> , B Inputs Only		10.0	10.0	μA	
I <sub>IL</sub>	Maximum Input LOW Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> , B Inputs Only	-0.3	-0.6	-1.0	mA	
I <sub>OLD</sub>	Minimum Dynamic Output Current <sup>(3)</sup>	5.5	V <sub>OLD</sub> = 1.65V Max.			75	mA	
I <sub>OHD</sub>		5.5	V <sub>OHD</sub> = 3.85V Min.			-75	mA	
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5	V <sub>IN</sub> = V <sub>CC</sub>		4.0	40.0	μA	
I <sub>CC</sub> <sup>(4)</sup>	Maximum Quiescent Supply Current	5.5	V <sub>IN</sub> = GND	2.3	4.8	8.0	mA	

**Notes:**

- All outputs loaded; thresholds on input associated with output under test.
- Maximum test duration 2.0ms, one output loaded at a time.
- 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>.

## DC Electrical Characteristics for ACT

Symbol	Parameter	V <sub>CC</sub> (V)	Conditions	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C		Units	
				Typ.	Guaranteed Limits				
V <sub>IH</sub>	Minimum HIGH Level Input Voltage	4.5	V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1V	1.5	2.0	2.0		V	
		5.5		1.5	2.0	2.0			
V <sub>IL</sub>	Maximum LOW Level Input Voltage	4.5	V <sub>OUT</sub> = 0.1V or V <sub>CC</sub> - 0.1V	1.5	0.8	0.8		V	
		5.5		1.5	0.8	0.8			
V <sub>OH</sub>	Minimum HIGH Level Output Voltage	4.5	I <sub>OUT</sub> = -50μA	4.49	4.4	4.4		V	
		5.5		5.49	5.4	5.4			
		4.5	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> : I <sub>OH</sub> = -24mA			3.86	3.76		
		5.5	I <sub>OH</sub> = -24mA <sup>(5)</sup>			4.86	4.76		
V <sub>OL</sub>	Maximum LOW Level Output Voltage	4.5	I <sub>OUT</sub> = 50μA	0.001	0.1	0.1		V	
		5.5		0.001	0.1	0.1			
		4.5	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> : I <sub>OL</sub> = 24mA			0.36	0.44		
		5.5	I <sub>OL</sub> = 24mA <sup>(5)</sup>			0.36	0.44		
I <sub>IN</sub>	Maximum Input Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> , GND		±0.1	±1.0		μA	
I <sub>IH</sub>	Maximum Input HIGH Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> , B Inputs Only		10.0	10.0		μA	
I <sub>IL</sub>	Maximum Input LOW Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> , B Inputs Only	-0.3	-0.6	-1.0		mA	
I <sub>CCT</sub>	Maximum I <sub>CC</sub> /Input	5.5	V <sub>I</sub> = V <sub>CC</sub> - 2.1V	0.6		1.5		mA	
I <sub>OLD</sub>	Minimum Dynamic Output Current <sup>(6)</sup>	5.5	V <sub>OLD</sub> = 1.65V Max.			75		mA	
I <sub>OHD</sub>		5.5	V <sub>OHD</sub> = 3.85V Min.			-75		mA	
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5	V <sub>IN</sub> = V <sub>CC</sub> or GND		4.0	40.0		μA	
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5	V <sub>IN</sub> = GND	2.3	4.8	8.0		mA	

**Notes:**

- All outputs loaded; thresholds on input associated with output under test.
- Maximum test duration 2.0ms, one output loaded at a time.

### AC Electrical Characteristics for AC

Symbol	Parameter	V <sub>CC</sub> (V) <sup>(7)</sup>	T <sub>A</sub> = +25°C, C <sub>L</sub> = 50pF			T <sub>A</sub> = -40°C to +85°C, C <sub>L</sub> = 50pF		Units
			Min.	Typ.	Max.	Min.	Max.	
t <sub>PLH</sub>	Propagation Delay, A <sub>n</sub> or B <sub>n</sub> to $\overline{O}_{A=B}$	3.3	4.0	7.5	11.5	3.0	13.0	ns
		5.0	2.5	5.5	8.5	2.0	9.5	
t <sub>PHL</sub>	Propagation Delay, A <sub>n</sub> or B <sub>n</sub> to $\overline{O}_{A=B}$	3.3	4.5	8.0	12.0	3.5	13.5	ns
		5.0	3.0	5.5	9.0	2.5	10.0	
t <sub>PLH</sub>	Propagation Delay, $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$	3.3	3.5	5.5	8.5	2.5	9.5	ns
		5.0	2.5	4.5	6.5	2.0	7.0	
t <sub>PHL</sub>	Propagation Delay, $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$	3.3	3.5	5.5	8.5	2.5	9.5	ns
		5.0	2.5	4.5	6.5	2.0	7.0	

**Note:**

7. Voltage range 3.3 is 3.3V ± 0.3V. Voltage range 5.0 is 5.0V ± 0.5V.

### AC Electrical Characteristics for ACT

Symbol	Parameter	V <sub>CC</sub> (V) <sup>(8)</sup>	T <sub>A</sub> = +25°C, C <sub>L</sub> = 50pF			T <sub>A</sub> = -40°C to +85°C, C <sub>L</sub> = 50 pF		Units
			Min.	Typ.	Max.	Min.	Max.	
t <sub>PLH</sub>	Propagation Delay, A <sub>n</sub> or B <sub>n</sub> to $\overline{O}_{A=B}$	5.0	3.0	5.5	8.5	2.5	9.5	ns
t <sub>PHL</sub>	Propagation Delay, A <sub>n</sub> or B <sub>n</sub> to $\overline{O}_{A=B}$	5.0	3.0	6.0	10.0	2.5	11.5	ns
t <sub>PLH</sub>	Propagation Delay, $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$	5.0	2.0	4.0	6.0	2.0	6.5	ns
t <sub>PHL</sub>	Propagation Delay, $\overline{I}_{A=B}$ to $\overline{O}_{A=B}$	5.0	2.5	5.0	7.5	2.0	8.5	ns

**Note:**

8. Voltage range 5.0 is 5.0V ± 0.5V

### Capacitance

Symbol	Parameter	Conditions	Typ.	Units
C <sub>IN</sub>	Input Capacitance	V <sub>CC</sub> = OPEN	4.5	pF
C <sub>PD</sub>	Power Dissipation Capacitance	V <sub>CC</sub> = 5.0V	40	pF

## Physical Dimensions

Dimensions are in inches (millimeters) unless otherwise noted.

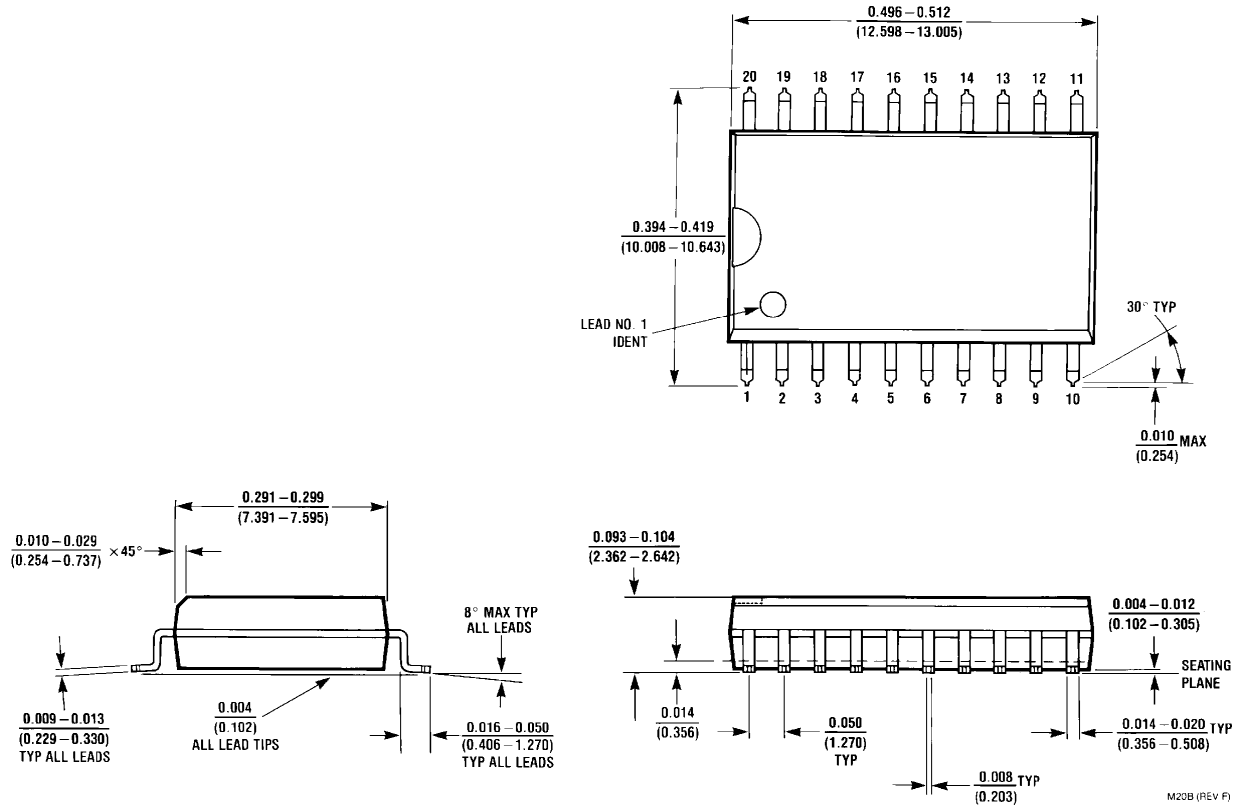
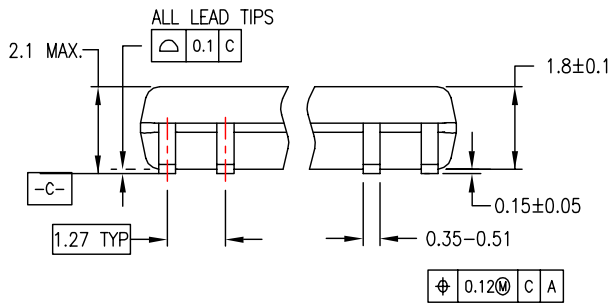
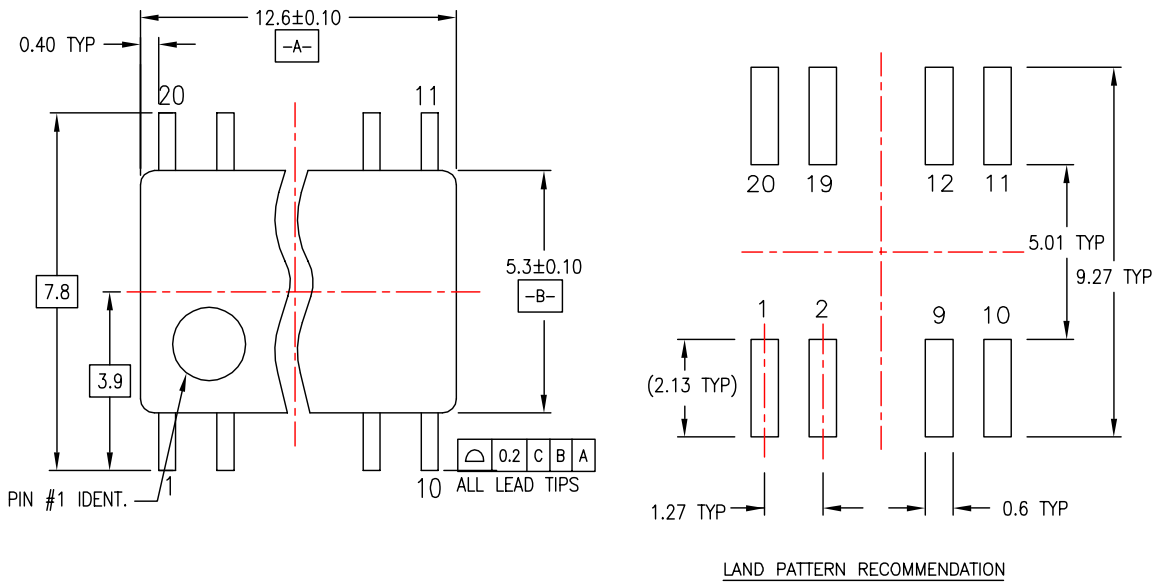


Figure 1. 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Package Number M20B

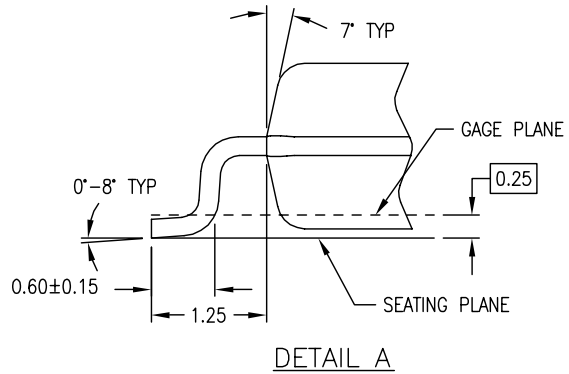
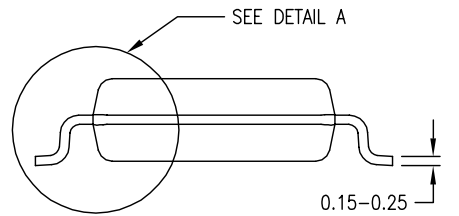


### Physical Dimensions (Continued)

Dimensions are in millimeters unless otherwise noted.



DIMENSIONS ARE IN MILLIMETERS



**NOTES:**

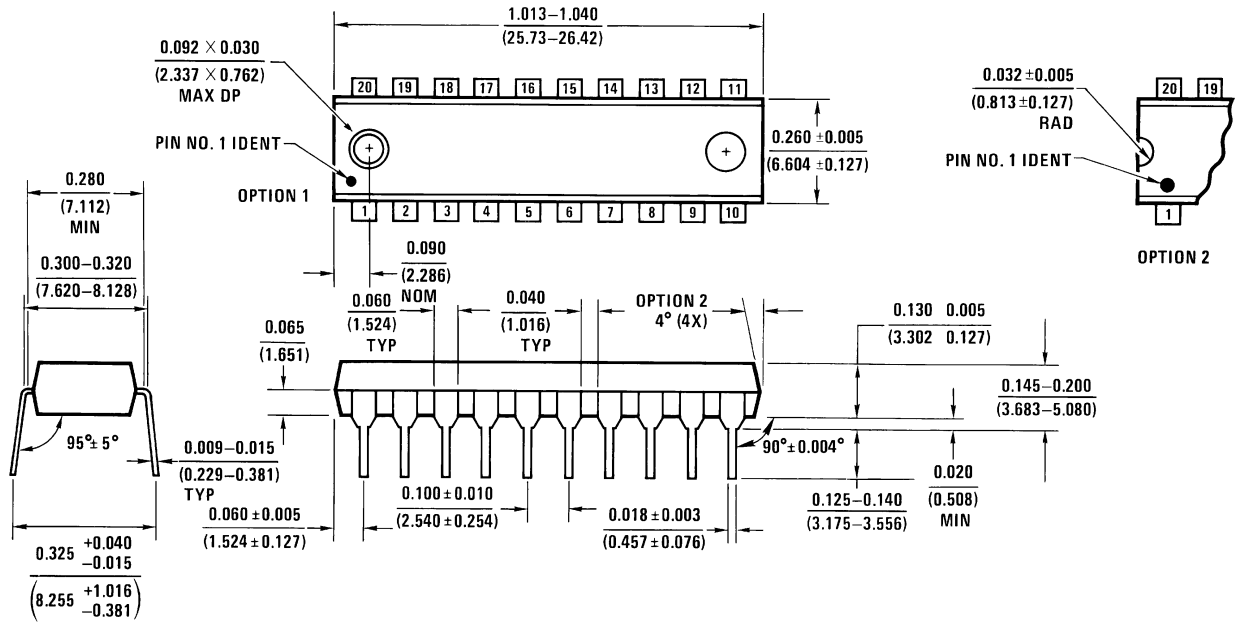
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- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND THE BAR EXTRUSIONS.

M20DREVC

**Figure 2. 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide Package Number M20D**

**Physical Dimensions** (Continued)

Dimensions are in inches (millimeters) unless otherwise noted.




N20A (REV G)

**Figure 3. 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide Package Number N20A**

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FACT <sup>®</sup>	PACMAN <sup>™</sup>	SuperSOT <sup>™</sup> -8	
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FASTr <sup>™</sup>	Power220 <sup>®</sup>	TCM <sup>™</sup>	
FPS <sup>™</sup>	Power247 <sup>®</sup>	The Power Franchise <sup>®</sup>	
FRFET <sup>®</sup>	PowerEdge <sup>™</sup>	 ™	
GlobalOptoisolator <sup>™</sup>	PowerSaver <sup>™</sup>	TinyBoost <sup>™</sup>	
GTO <sup>™</sup>	PowerTrench <sup>®</sup>	TinyBuck <sup>™</sup>	

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### Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild Semiconductor. The datasheet is printed for reference information only.

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