

## 74AC373 • 74ACT373

### Octal Transparent Latch with 3-STATE Outputs

#### General Description

The AC/ACT373 consists of eight latches with 3-STATE outputs for bus organized system applications. The flip-flops appear transparent to the data when Latch Enable (LE) is HIGH. When LE is LOW, the data that meets the setup time is latched. Data appears on the bus when the Output Enable ( $\overline{OE}$ ) is LOW. When  $\overline{OE}$  is HIGH, the bus output is in the high impedance state.

#### Features

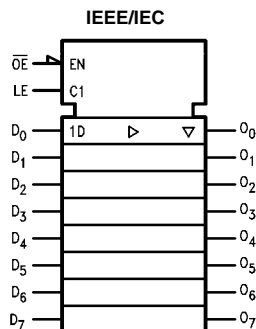
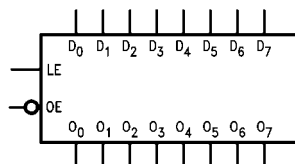
- $I_{CC}$  and  $I_{OZ}$  reduced by 50%
- Eight latches in a single package
- 3-STATE outputs for bus interfacing
- Outputs source/sink 24 mA
- ACT373 has TTL-compatible inputs

#### Ordering Code:

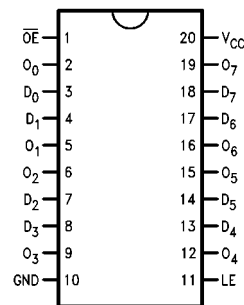
Order Number	Package Number	Package Description
74AC373SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Body
74AC373SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74AC373MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74AC373PC	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
74ACT373SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Body
74ACT373SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74ACT373MSA	MSA20	20-Lead Shrink Small Outline Package (SSOP), EIAJ TYPE II, 5.3mm Wide
74ACT373MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74ACT373PC	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 information

#### Logic Symbols



#### Connection Diagram



#### Pin Descriptions

Pin Names	Description
$D_0$ - $D_7$	Data Inputs
LE	Latch Enable Input
$\overline{OE}$	Output Enable Input
$O_0$ - $O_7$	3-STATE Latch Outputs

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## Functional Description

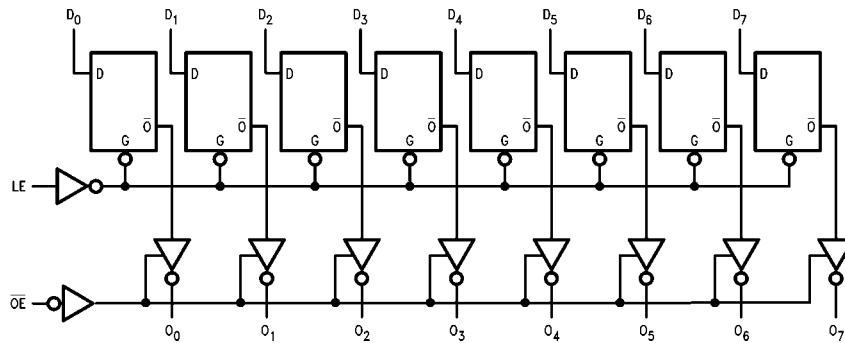
The AC/ACT373 contains eight D-type latches with 3-STATE standard outputs. When the Latch Enable (LE) input is HIGH, data on the  $D_n$  inputs enters the latches. In this condition the latches are transparent, i.e., a latch output will change state each time its D-type input changes. When LE is LOW, the latches store the information that was present on the D-type inputs a setup time preceding the HIGH-to-LOW transition of LE. The 3-STATE standard outputs are controlled by the Output Enable ( $\overline{OE}$ ) input. When  $\overline{OE}$  is LOW, the standard outputs are in the 2-state mode. When  $\overline{OE}$  is HIGH, the standard outputs are in the high impedance mode but this does not interfere with entering new data into the latches.

## Truth Table

Inputs			Outputs
LE	$\overline{OE}$	$D_n$	$O_n$
X	H	X	Z
H	L	L	L
H	L	H	H
L	L	X	$O_0$

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 Z = High Impedance  
 X = Immaterial  
 $O_0$  = Previous  $O_0$  before HIGH-to-LOW transition of Latch Enable

## 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.

**Absolute Maximum Ratings**(Note 1)

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 ( $I_O$ )	$\pm 50$ mA
DC $V_{CC}$ or Ground Current per Output Pin ( $I_{CC}$ or $I_{GND}$ )	$\pm 50$ mA
Storage Temperature ( $T_{STG}$ )	-65°C to +150°C
Junction Temperature ( $T_J$ )	
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 ( $T_A$ )	-40°C to +85°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. Fairchild does not recommend operation of FACT™ circuits outside databook specifications.

**DC Electrical Characteristics for AC**

Symbol	Parameter	$V_{CC}$ (V)	$T_A = +25^\circ\text{C}$		$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		Units	Conditions
			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			
		3.0		2.56	2.46		V	$V_{IN} = V_{IL}$ or $V_{IH}$ $I_{OH} = -12 \text{ mA}$ $I_{OH} = -24 \text{ mA}$ $I_{OL} = -24 \text{ mA}$ (Note 2)
		4.5		3.86	3.76			
		5.5		4.86	4.76			
$V_{OL}$	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			
		3.0		0.36	0.44		V	$V_{IN} = V_{IL}$ or $V_{IH}$ $I_{OL} = 12 \text{ mA}$ $I_{OL} = 24 \text{ mA}$ $I_{OL} = 24 \text{ mA}$ (Note 2)
		4.5		0.36	0.44			
		5.5		0.36	0.44			
$I_{IN}$ (Note 4)	Maximum Input Leakage Current	5.5		$\pm 0.1$	$\pm 1.0$		$\mu\text{A}$	$V_I = V_{CC}, \text{ GND}$
$I_{OZ}$	Maximum 3-STATE Current	5.5		$\pm 0.25$	$\pm 2.5$		$\mu\text{A}$	$V_I$ (OE) = $V_{IL}, V_{IH}$ $V_I = V_{CC}, \text{ GND}$ $V_O = V_{CC}, \text{ GND}$
$I_{OLD}$	Minimum Dynamic Output Current (Note 3)	5.5			75		mA	$V_{OLD} = 1.65V \text{ Max}$
$I_{OHD}$		5.5			-75		mA	$V_{OHD} = 3.85V \text{ Min}$
$I_{CC}$ (Note 4)	Maximum Quiescent Supply Current	5.5		4.0	40.0		$\mu\text{A}$	$V_{IN} = V_{CC}$ or 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.

**Note 4:**  $I_{IN}$  and  $I_{CC}$  @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V  $V_{CC}$ .

## DC Electrical Characteristics for ACT

Symbol	Parameter	V <sub>CC</sub> (V)	T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C		Units	Conditions
			Typ	Guaranteed Limits				
V <sub>IH</sub>	Minimum HIGH Level Input Voltage	4.5	1.5	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			
V <sub>IL</sub>	Maximum LOW Level Input Voltage	4.5	1.5	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			
V <sub>OH</sub>	Minimum HIGH Level Output Voltage	4.5	4.49	4.4	4.4	V	I <sub>OUT</sub> = -50 μA	
		5.5	5.49	5.4	5.4			
		4.5		3.86	3.76	V	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> I <sub>OH</sub> = -24 mA I <sub>OH</sub> = -24 mA (Note 5)	
		5.5		4.86	4.76			
V <sub>OL</sub>	Maximum LOW Level Output Voltage	4.5	0.001	0.1	0.1	V	I <sub>OUT</sub> = 50 μA	
		5.5	0.001	0.1	0.1			
		4.5		0.36	0.44	V	V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> I <sub>OL</sub> = 24 mA I <sub>OL</sub> = 24 mA (Note 5)	
		5.5		0.36	0.44			
I <sub>IN</sub>	Maximum Input Leakage Current	5.5		± 0.1	± 1.0	μA	V <sub>I</sub> = V <sub>CC</sub> , GND	
I <sub>OZ</sub>	Maximum 3-STATE Current	5.5		± 0.25	± 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>CC1</sub>	Maximum I <sub>CC</sub> /Input	5.5	0.6		1.5	mA	V <sub>I</sub> = V <sub>CC</sub> - 2.1V	
I <sub>OLD</sub>	Minimum Dynamic	5.5			75	mA	V <sub>OLD</sub> = 1.65V Max	
	Output Current (Note 6)	5.5			-75	mA	V <sub>OH</sub> = 3.85V Min	
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5		4.0	40.0	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND	

Note 5: All outputs loaded; thresholds on input associated with output under test.

Note 6: Maximum test duration 2.0 ms, one output loaded at a time.

## AC Electrical Characteristics for AC

Symbol	Parameter	V <sub>CC</sub> (V) (Note 7)	T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF			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 D <sub>n</sub> to O <sub>n</sub>	3.3	1.5	10.0	13.5	1.5	15.0	ns
		5.0	1.5	7.0	9.5	1.5	10.5	
t <sub>PHL</sub>	Propagation Delay D <sub>n</sub> to O <sub>n</sub>	3.3	1.5	9.5	13.0	1.5	14.5	ns
		5.0	1.5	7.0	9.5	1.5	10.5	
t <sub>PLH</sub>	Propagation Delay LE to O <sub>n</sub>	3.3	1.5	10.0	13.5	1.5	15.0	ns
		5.0	1.5	7.5	9.5	1.5	10.5	
t <sub>PHL</sub>	Propagation Delay LE to O <sub>n</sub>	3.3	1.5	9.5	12.5	1.5	14.0	ns
		5.0	1.5	7.0	9.5	1.5	10.5	
t <sub>PZH</sub>	Output Enable Time	3.3	1.5	9.0	11.5	1.0	13.0	ns
		5.0	1.5	7.0	8.5	1.0	9.5	
t <sub>PZL</sub>	Output Enable Time	3.3	1.5	8.5	11.5	1.0	13.0	ns
		5.0	1.5	6.5	8.5	1.0	9.5	
t <sub>PHZ</sub>	Output Disable Time	3.3	1.5	10.0	12.5	1.0	14.5	ns
		5.0	1.5	8.0	11.0	1.0	12.5	
t <sub>PLZ</sub>	Output Disable Time	3.3	1.5	8.0	11.5	1.0	12.5	ns
		5.0	1.5	6.5	8.5	1.0	10.0	

Note 7: Voltage Range 3.3 is 3.3V ± 0.3V

Voltage Range 5.0 is 5.0V ± 0.5V

AC Operating Requirements for AC							
Symbol	Parameter	V <sub>CC</sub> (V) (Note 8)	T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF		T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF		Units
			Typ	Guaranteed Minimum			
t <sub>S</sub>	Setup Time, HIGH or LOW	3.3	3.5	5.5	6.0		ns
	D <sub>n</sub> to LE	5.0	2.0	4.0	4.5		
t <sub>H</sub>	Hold Time, HIGH or LOW	3.3	-3.0	1.0	1.0		ns
	D <sub>n</sub> to LE	5.0	-1.5	1.0	1.0		
t <sub>W</sub>	LE Pulse Width,	3.3	4.0	5.5	6.0		ns
	HIGH	5.0	2.0	4.0	4.5		

**Note 8:** 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) (Note 9)	T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF			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 D <sub>n</sub> to O <sub>n</sub>	5.0	2.5	8.5	10.0	1.5	11.5	ns
t <sub>PHL</sub>	Propagation Delay D <sub>n</sub> to O <sub>n</sub>	5.0	2.0	8.0	10.0	1.5	11.5	ns
t <sub>PLH</sub>	Propagation Delay LE to O <sub>n</sub>	5.0	2.5	8.5	11.0	2.0	11.5	ns
t <sub>PHL</sub>	Propagation Delay LE to O <sub>n</sub>	5.0	2.0	8.0	10.0	1.5	11.5	ns
t <sub>PZH</sub>	Output Enable Time	5.0	2.0	8.0	9.5	1.5	10.5	ns
t <sub>PZL</sub>	Output Enable Time	5.0	2.0	7.5	9.0	1.5	10.5	ns
t <sub>PHZ</sub>	Output Disable Time	5.0	2.5	9.0	11.0	2.5	12.5	ns
t <sub>PLZ</sub>	Output Disable Time	5.0	1.5	7.5	8.5	1.0	10.0	ns

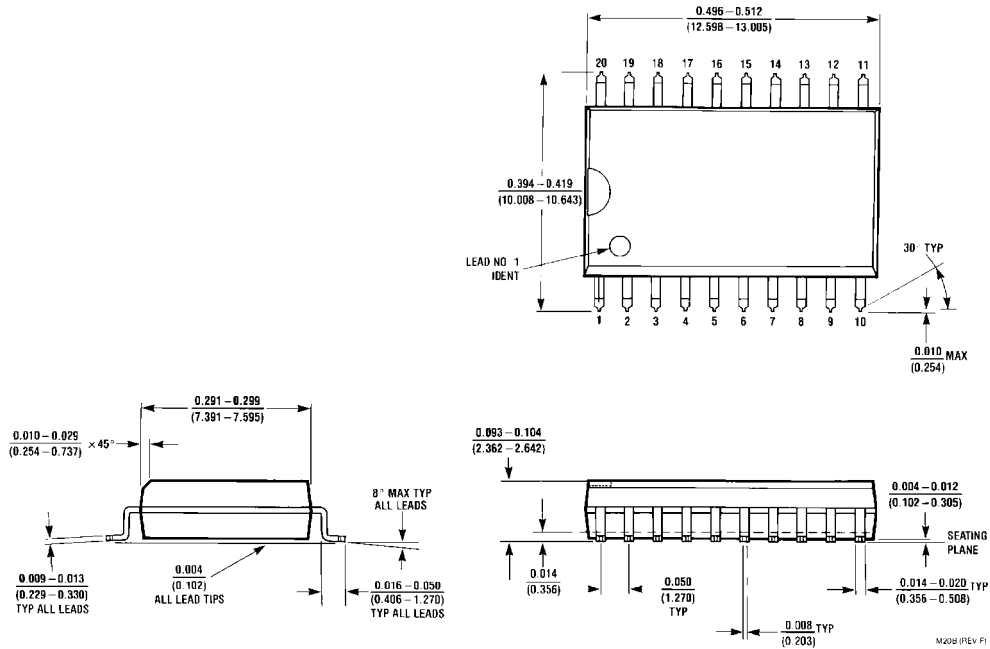
**Note 9:** Voltage Range 5.0 is 5.0V ± 0.5V

AC Operating Requirements for ACT							
Symbol	Parameter	V <sub>CC</sub> (V) (Note 10)	T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF		T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF		Units
			Typ	Guaranteed Minimum			
t <sub>S</sub>	Setup Time, HIGH or LOW	5.0	0.8	2.5	3.5		ns
	D <sub>n</sub> to LE						
t <sub>H</sub>	Hold Time, HIGH or LOW	5.0	0	0	1.0		ns
	D <sub>n</sub> to LE						
t <sub>W</sub>	LE Pulse Width, HIGH	5.0	2.0	7.0	8.0		ns

**Note 10:** Voltage Range 5.0 is 5.0V ± 0.5V

Capacitance				
Symbol	Parameter	Typ	Units	Conditions
C <sub>IN</sub>	Input Capacitance	4.5	pF	V <sub>CC</sub> = OPEN
C <sub>PD</sub>	Power Dissipation Capacitance	40.0	pF	V <sub>CC</sub> = 5.0V

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



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

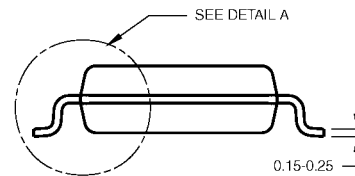
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LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



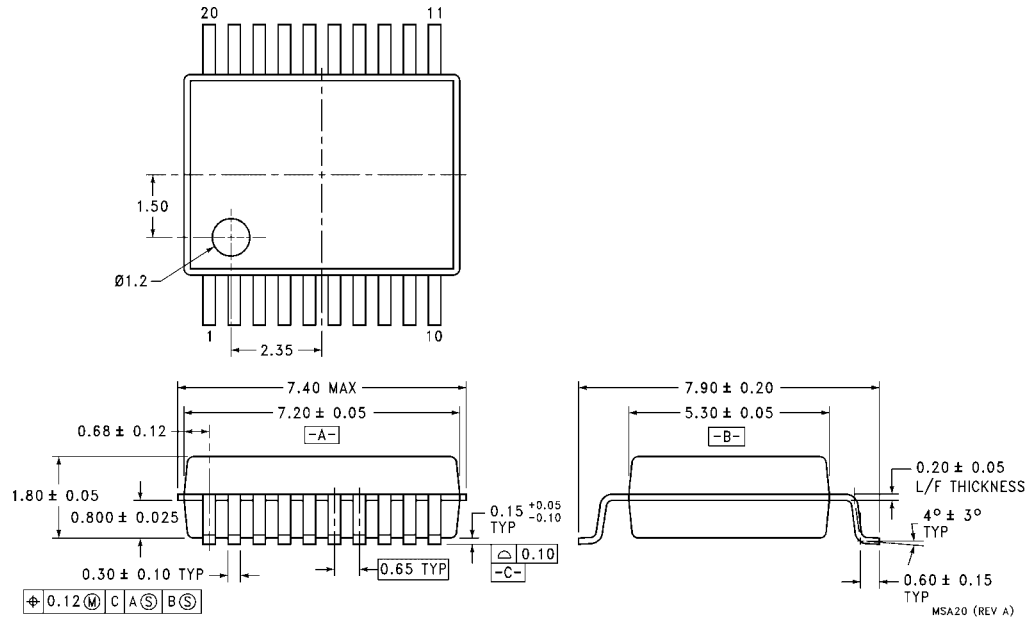
DETAIL A

- NOTES:
- A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
  - B. DIMENSIONS ARE IN MILLIMETERS.
  - C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M20DRevB1

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

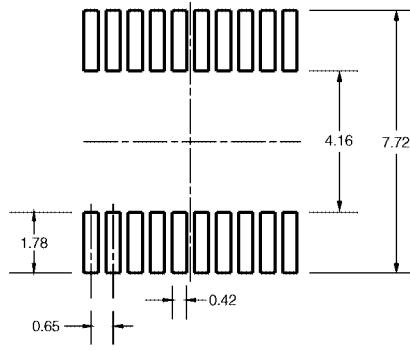
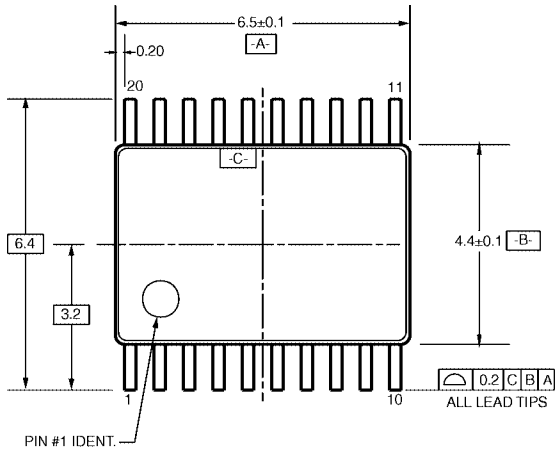
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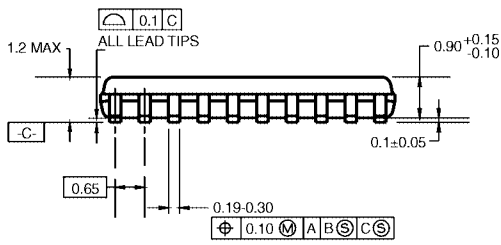
**20-Lead Shrink Small Outline Package (SSOP), EIAJ TYPE II, 5.3mm Wide  
Package Number MSA20**



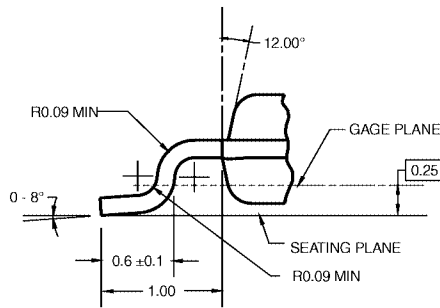
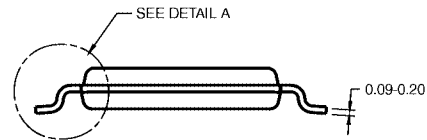
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



DETAIL A

NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AC, REF NOTE 6, DATE 7/93.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20RevD1

**20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide  
Package Number MTC20**

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



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

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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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