

## 74AC273, 74ACT273 Octal D-Type Flip-Flop

### Features

- Ideal buffer for microprocessor or memory
- Eight edge-triggered D-type flip-flops
- Buffered common clock
- Buffered, asynchronous master reset
- See 377 for clock enable version
- See 373 for transparent latch version
- See 374 for 3-STATE version
- Outputs source/sink 24mA
- 74ACT273 has TTL-compatible inputs

### General Description

The AC273 and ACT273 have eight edge-triggered D-type flip-flops with individual D-type inputs and Q outputs. The common buffered Clock (CP) and Master Reset ( $\overline{MR}$ ) input load and reset (clear) all flip-flops simultaneously.


The register is fully edge-triggered. The state of each D-type input, one setup time before the LOW-to-HIGH clock transition, is transferred to the corresponding flip-flop's Q output.

All outputs will be forced LOW independently of Clock or Data inputs by a LOW voltage level on the  $\overline{MR}$  input. The device is useful for applications where the true output only is required and the Clock and Master Reset are common to all storage elements.

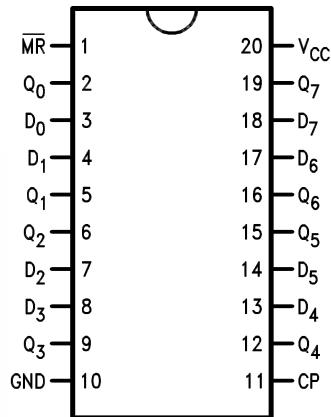
### Ordering Information

Order Number	Package Number	Package Description
74AC273SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74AC273SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74AC273MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74AC273PC	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
74ACT273SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74ACT273SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74ACT273MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

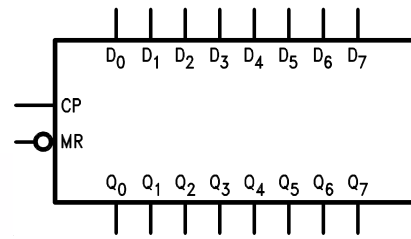
Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering number.

 All packages are lead free per JEDEC: J-STD-020B standard.

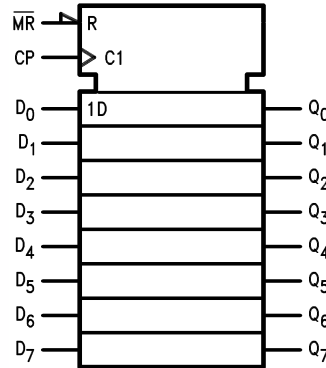
### Connection Diagram



### Logic Symbols



#### IEEE/IEC



### Pin Description

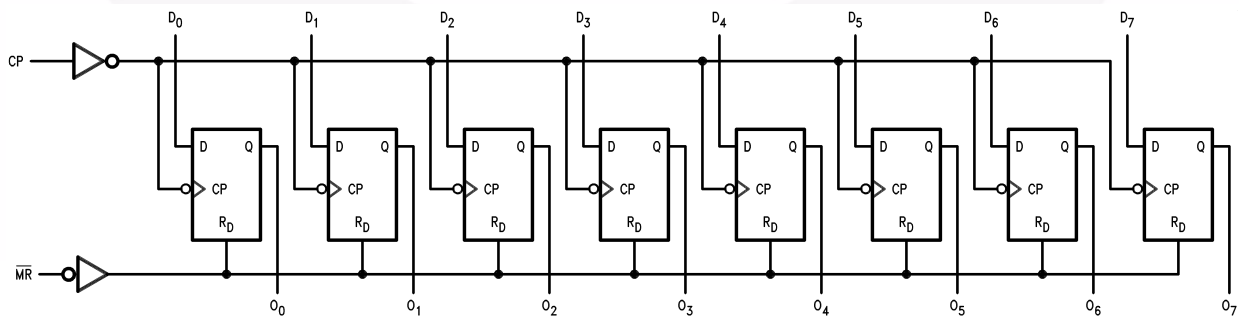
Pin Names	Description
D <sub>0</sub> -D <sub>7</sub>	Data Inputs
$\overline{\text{MR}}$	Master Reset
CP	Clock Pulse Input
Q <sub>0</sub> -Q <sub>7</sub>	Data Outputs

### Mode Select-Function Table

Operating Mode	Inputs			Outputs
	$\overline{\text{MR}}$	CP	D <sub>n</sub>	Q <sub>n</sub>
Reset (Clear)	L	X	X	L
Load '1'	H	↗	H	H
Load '0'	H	↗	L	L

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Immaterial  
 ↗ = LOW-to-HIGH Transition

### 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

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 $V_I = -0.5V$	-20mA
	$V_I = V_{CC} + 0.5$	+20mA
$V_I$	DC Input Voltage	-0.5V to $V_{CC} + 0.5V$
$I_{OK}$	DC Output Diode Current $V_O = -0.5V$	-20mA
	$V_O = V_{CC} + 0.5V$	+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	2.0V to 6.0V
	ACT	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		V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = -24mA		3.86	3.76		
		5.5		V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = -24mA <sup>(1)</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		V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24mA		0.36	0.44		
		5.5		V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24mA <sup>(1)</sup>		0.36	0.44		
I <sub>IN</sub> <sup>(2)</sup>	Maximum Input Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> , GND		±0.1	±1.0		μA	
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> <sup>(2)</sup>	Maximum Quiescent Supply Current	5.5	V <sub>IN</sub> = V <sub>CC</sub> or GND		4.0	40.0		μA	

**Notes:**

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

## 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		V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OH</sub> = -24mA <sup>(4)</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		V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , I <sub>OL</sub> = 24mA <sup>(4)</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>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>(5)</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

**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>(6)</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.	
f <sub>MAX</sub>	Maximum Clock Frequency	3.3	90	125		75		MHz
		5.0	140	175		125		
t <sub>PLH</sub>	Propagation Delay, Clock to Output	3.3	4.0	7.0	12.5	3.0	14.0	ns
		5.0	3.0	5.5	9.0	2.5	10.0	
t <sub>PHL</sub>	Propagation Delay, Clock to Output	3.3	4.0	7.0	13.0	3.5	14.5	ns
		5.0	3.0	5.0	10.0	2.5	11.0	
t <sub>PHL</sub>	Propagation Delay, MR to Output	3.3	4.0	7.0	13.0	3.5	14.0	ns
		5.0	3.0	5.0	10.0	2.5	10.5	

**Note:**

6. 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) <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
			Typ.	Guaranteed Minimum			
t <sub>S</sub>	Setup Time, HIGH or LOW, Data to CP	3.3	3.5	5.5	6.0		ns
		5.0	2.5	4.0	4.5		
t <sub>H</sub>	Hold Time, HIGH or LOW, Data to CP	3.3	-2.0	0	0		ns
		5.0	-1.0	1.0	1.0		
t <sub>W</sub>	Clock Pulse Width, HIGH or LOW	3.3	3.5	5.5	6.0		ns
		5.0	2.5	4.0	4.5		
t <sub>W</sub>	MR Pulse Width, HIGH or LOW	3.3	2.0	5.5	6.0		ns
		5.0	1.5	4.0	4.5		
t <sub>rec</sub>	Recovery Time, MR to CP	3.3	1.5	3.5	4.5		ns
		5.0	1.0	2.0	3.0		

**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	$V_{CC}$ (V) <sup>(8)</sup>	$T_A = +25^\circ\text{C}$ , $C_L = 50\text{pF}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$ , $C_L = 50\text{pF}$		Units
			Min.	Typ.	Max.	Min.	Max.	
$f_{MAX}$	Maximum Clock Frequency	2.0	125	189		110		MHz
$t_{PLH}$ , $t_{PHL}$	Propagation Delay, CP to $Q_n$	5.0	1.5	6.5	8.5	1.5	9.0	ns
$t_{PHL}$	Propagation Delay, $\overline{MR}$ to $Q_n$	5.0	1.5	7.0	9.0	1.5	8.5	ns

### Note:

8. Voltage range 5.0 is  $5.0\text{V} \pm 0.5\text{V}$ .

## AC Operating Requirements for ACT

Symbol	Parameter	$V_{CC}$ (V) <sup>(9)</sup>	$T_A = +25^\circ\text{C}$ , $C_L = 50\text{pF}$		$T_A = -40^\circ\text{C to } +85^\circ\text{C}$ , $C_L = 50\text{pF}$		Units
			Typ.	Guaranteed Minimum			
$t_S$	Setup Time, HIGH or LOW, $D_n$ to CP	5.0	1.0	3.5	3.5		ns
$t_H$	Hold Time, HIGH or LOW, $D_n$ to CP	5.0	-0.5	1.5	1.5		ns
$t_W$	Clock Pulse Width, HIGH or LOW	5.0	2.0	4.0	4.0		ns
$t_W$	$\overline{MR}$ Pulse Width, HIGH or LOW	5.0	1.5	4.0	4.0		ns
$t_W$	Recovery Time, $\overline{MR}$ to CP	5.0	0.5	3.0	3.0		ns

### Note:

9. Voltage range 5.0 is  $5.0\text{V} \pm 0.5\text{V}$ .

## Capacitance

Symbol	Parameter	Conditions	Typ.	Units
$C_{IN}$	Input Capacitance	$V_{CC} = \text{OPEN}$	4.5	pF
$C_{PD}$	Power Dissipation Capacitance for AC	$V_{CC} = 5.0\text{V}$	50.0	pF
	Power Dissipation Capacitance for ACT		40.0	

Physical Dimensions

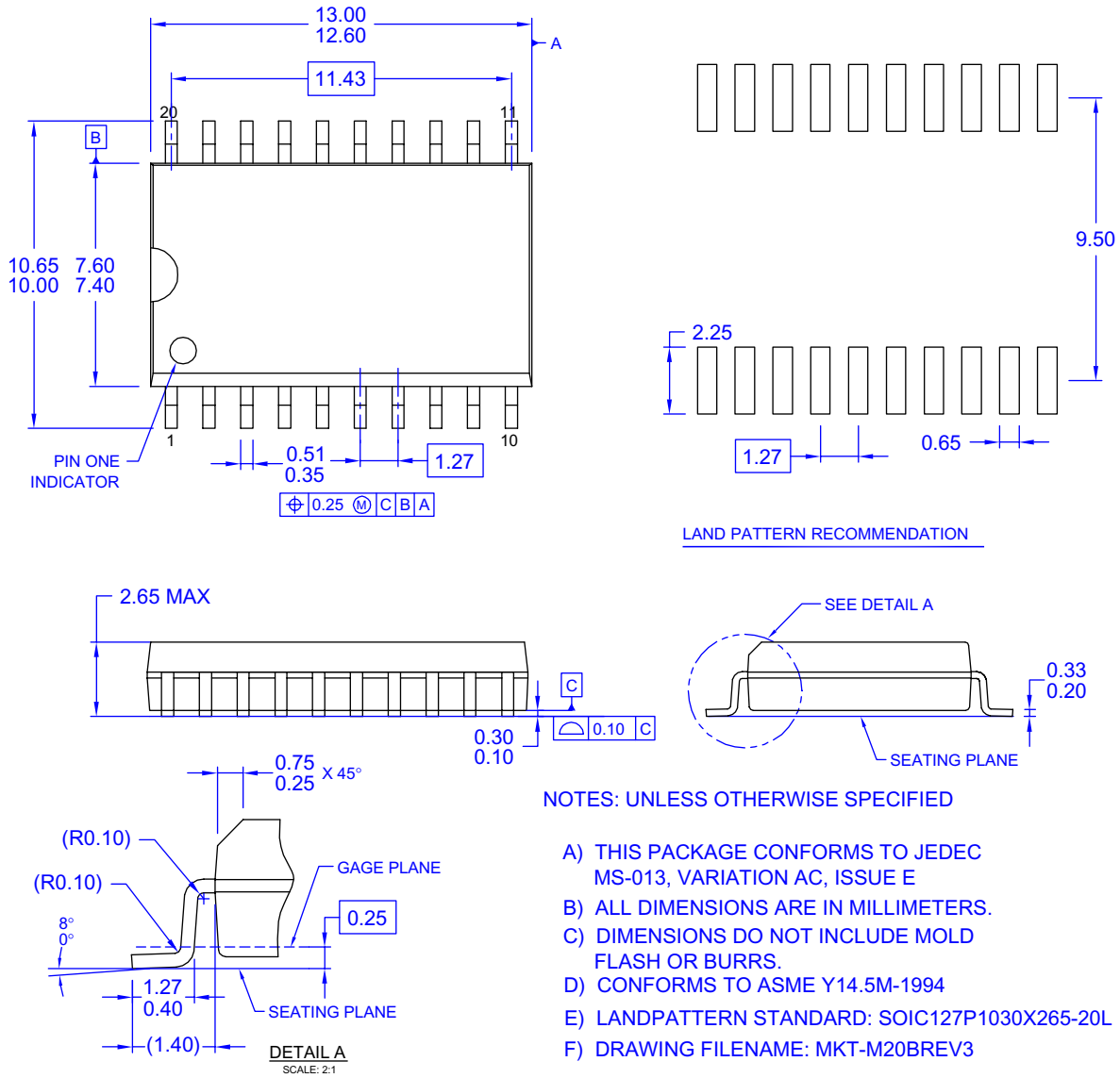


Figure 1. 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide

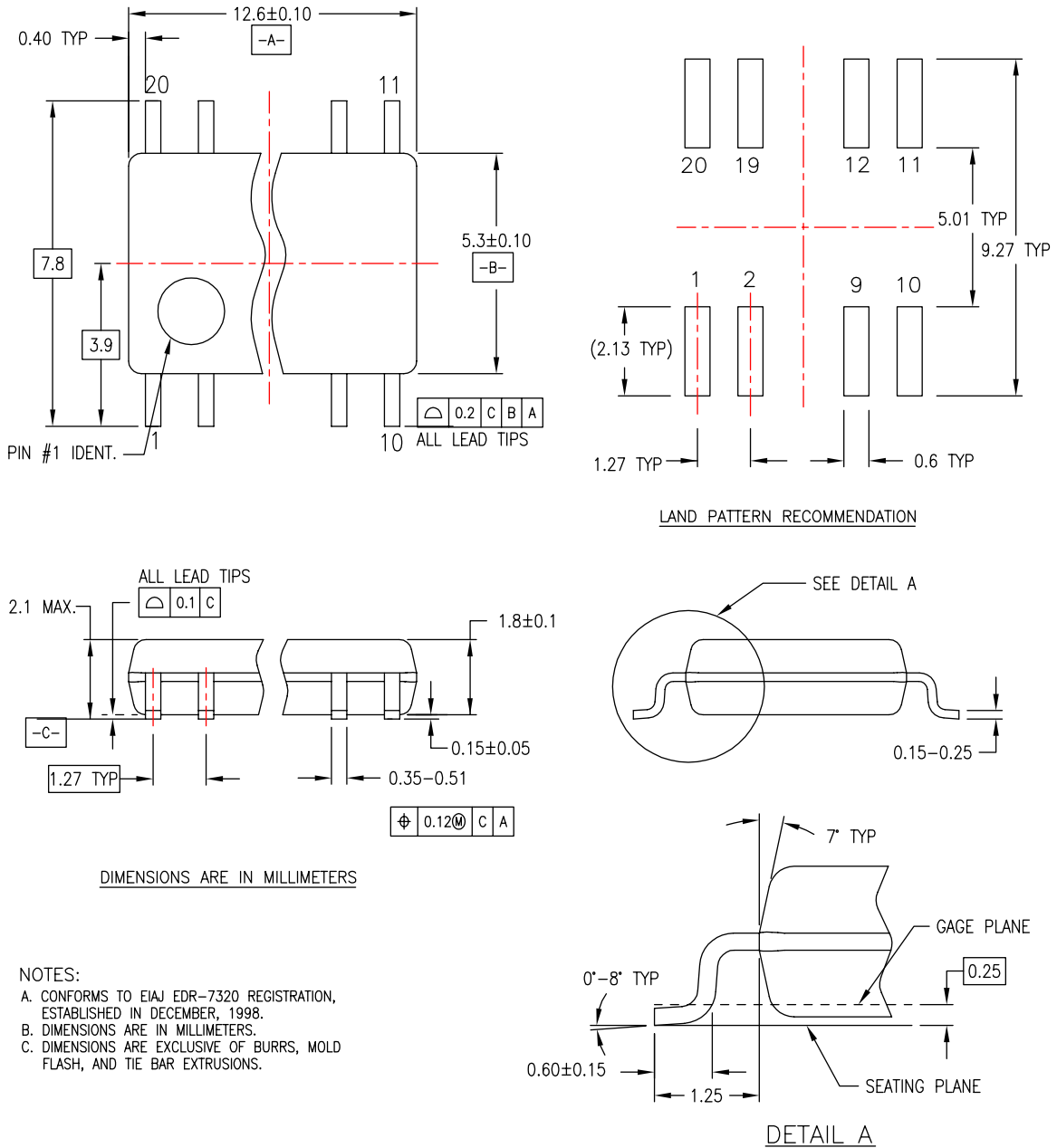
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Physical Dimensions (Continued)



M20DREVC

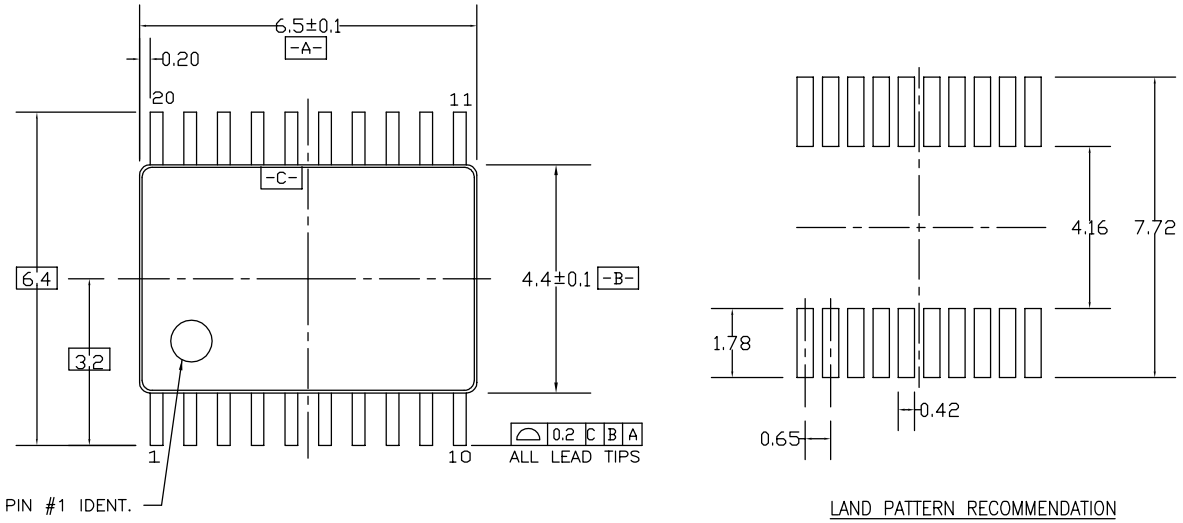
Figure 2. 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide

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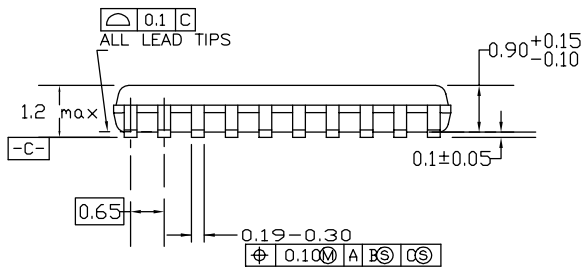
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Physical Dimensions (Continued)

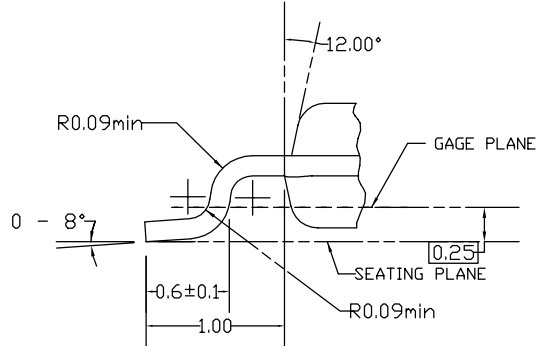
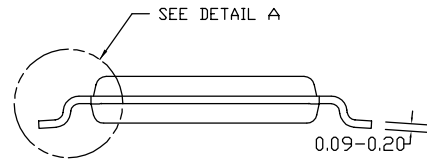


PIN #1 IDENT.

LAND PATTERN RECOMMENDATION



DIMENSIONS ARE IN MILLIMETERS



DETAIL A

NOTES:

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

MTC20REV D1

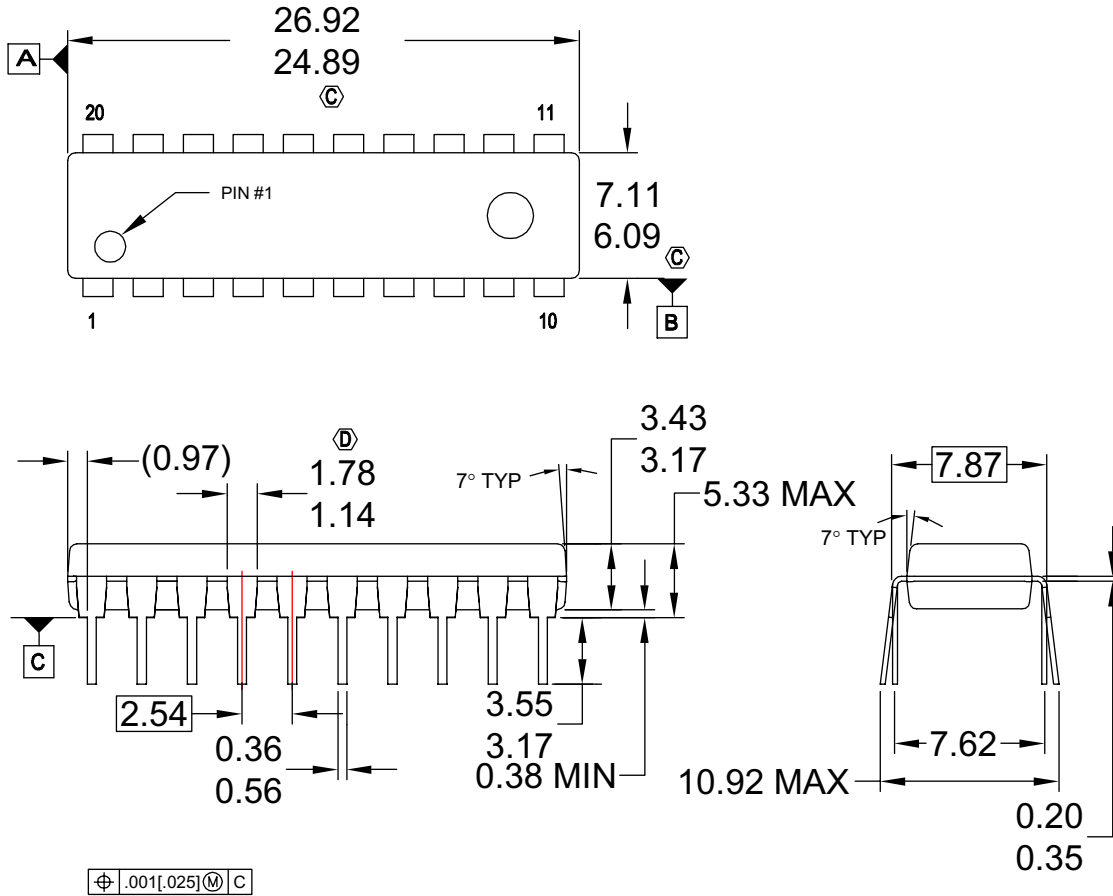
Figure 3. 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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**Physical Dimensions** (Continued)



**NOTES:**

- A. CONFORMS TO JEDEC REGISTRATION MS-001, VARIATIONS AD.
- B. ALL DIMENSIONS ARE IN MILLIMETERS
- C. DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.25MM.
- D. DOES NOT INCLUDE DAMBAR PROTRUSIONS. DAMBAR PROTRUSIONS SHALL NOT EXCEED 0.25MM.
- E. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
- F. DRAWING FILE NAME: N20AREV8

**Figure 4. 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide**

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

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CTL <sup>™</sup>	Green FPS <sup>™</sup> e-Series <sup>™</sup>	Power-SPM <sup>™</sup>	the power <sup>™</sup>
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 ™	ISOPLANAR <sup>™</sup>	QS <sup>™</sup>	TinyLogic <sup>®</sup>
 ™	MegaBuck <sup>™</sup>	QT Optoelectronics <sup>™</sup>	TINYOPTO <sup>™</sup>
Fairchild <sup>®</sup>	MICROCOUPLER <sup>™</sup>	Quiet Series <sup>™</sup>	TinyPower <sup>™</sup>
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FACT Quiet Series <sup>™</sup>	MicroPak <sup>™</sup>	SMART START <sup>™</sup>	TinyWire <sup>™</sup>
FACT <sup>®</sup>	MillerDrive <sup>™</sup>	SPM <sup>®</sup>	SerDes <sup>™</sup>
FAST <sup>®</sup>	Motion-SPM <sup>™</sup>	STEALTH <sup>™</sup>	UHC <sup>®</sup>
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FlashWriter <sup>®</sup> *	OPTOPLANAR <sup>®</sup>	SuperSOT <sup>™</sup> -3	UniFET <sup>™</sup>
		SuperSOT <sup>™</sup> -6	VCX <sup>™</sup>
		SuperSOT <sup>™</sup> -8	

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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 (c) 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 of the user.
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.

**PRODUCT STATUS DEFINITIONS**

**Definition of Terms**

Datasheet Identification	Product Status	Definition
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