

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

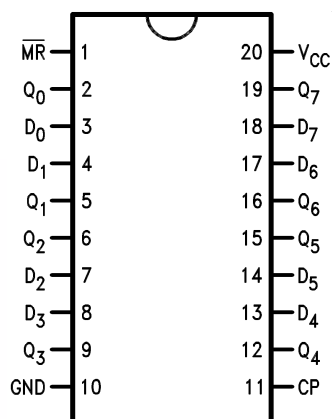
Order Number	Package Number	Package Description
74AC273SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74AC273SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74AC273MTC	MTC20	20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm 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.

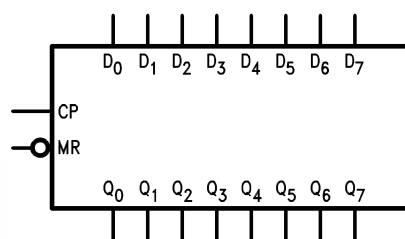
Connection Diagram



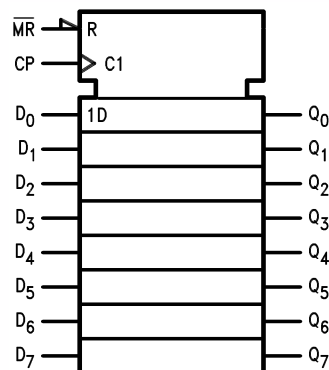
Pin Description

Pin Names	Description
D ₀ –D ₇	Data Inputs
$\overline{\text{MR}}$	Master Reset
CP	Clock Pulse Input
Q ₀ –Q ₇	Data Outputs

Logic Symbols



IEEE/IEC



Mode Select-Function Table

Operating Mode	Inputs			Outputs
	$\overline{\text{MR}}$	CP	D _n	
Reset (Clear)	L	X	X	L
Load '1'	H	⌄	H	H
Load '0'	H	⌄	L	L

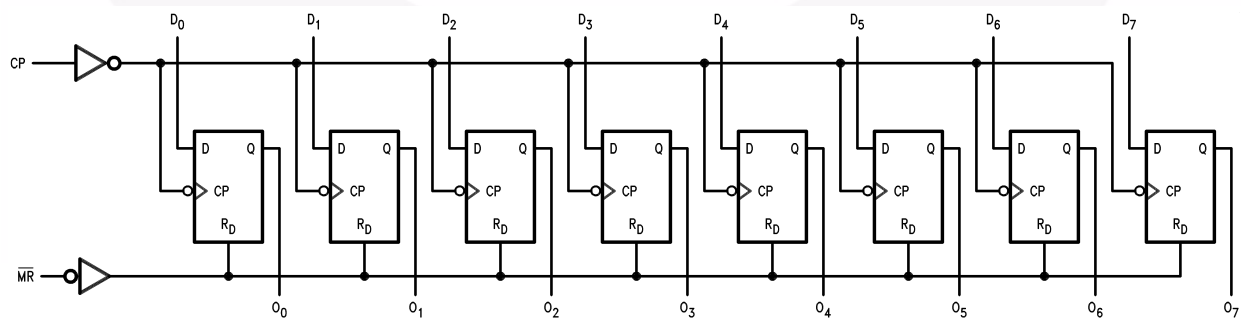
H = HIGH Voltage Level

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	±50mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current per Output Pin	±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 _{CC} (V)	Conditions	T _A = +25°C		T _A = −40°C to +85°C		Units
				Typ.	Guaranteed Limits			
V _{IH}	Minimum HIGH Level Input Voltage	3.0	V _{OUT} = 0.1V or V _{CC} − 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 _{IL}	Maximum LOW Level Input Voltage	3.0	V _{OUT} = 0.1V or V _{CC} − 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 _{OH}	Minimum HIGH Level Output Voltage	3.0	I _{OUT} = −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 _{IN} = V _{IL} or V _{IH} , I _{OH} = −12mA		2.56	2.46		
		4.5	V _{IN} = V _{IL} or V _{IH} , I _{OH} = −24mA		3.86	3.76		
		5.5	V _{IN} = V _{IL} or V _{IH} , I _{OH} = −24mA ⁽¹⁾		4.86	4.76		
V _{OL}	Maximum LOW Level Output Voltage	3.0	I _{OUT} = 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 _{IN} = V _{IL} or V _{IH} , I _{OL} = 12mA		0.36	0.44		
		4.5	V _{IN} = V _{IL} or V _{IH} , I _{OL} = 24mA		0.36	0.44		
		5.5	V _{IN} = V _{IL} or V _{IH} , I _{OL} = 24mA ⁽¹⁾		0.36	0.44		
I _{IN} ⁽²⁾	Maximum Input Leakage Current	5.5	V _I = V _{CC} , GND		±0.1	±1.0		μA
I _{OLD}	Minimum Dynamic Output Current ⁽³⁾	5.5	V _{OLD} = 1.65V Max.			75		mA
I _{OHD}		5.5	V _{OHD} = 3.85V Min.			−75		mA
I _{CC} ⁽²⁾	Maximum Quiescent Supply Current	5.5	V _{IN} = V _{CC} or GND		4.0	40.0		μA

Notes:

1. All outputs loaded; thresholds on input associated with output under test.
2. I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC}.
3. Maximum test duration 2.0ms, one output loaded at a time.

DC Electrical Characteristics for ACT

Symbol	Parameter	V _{CC} (V)	Conditions	T _A = +25°C		T _A = −40°C to +85°C		Units
				Typ.	Guaranteed Limits			
V _{IH}	Minimum HIGH Level Input Voltage	4.5	V _{OUT} = 0.1V or V _{CC} − 0.1V	1.5	2.0	2.0		V
		5.5		1.5	2.0	2.0		
V _{IL}	Maximum LOW Level Input Voltage	4.5	V _{OUT} = 0.1V or V _{CC} − 0.1V	1.5	0.8	0.8		V
		5.5		1.5	0.8	0.8		
V _{OH}	Minimum HIGH Level Output Voltage	4.5	I _{OUT} = −50μA	4.49	4.4	4.4		V
		5.5		5.49	5.4	5.4		
		4.5	V _{IN} = V _{IL} or V _{IH} , I _{OH} = −24mA		3.86	3.76		
		5.5	V _{IN} = V _{IL} or V _{IH} , I _{OH} = −24mA ⁽⁴⁾		4.86	4.76		
V _{OL}	Maximum LOW Level Output Voltage	4.5	I _{OUT} = 50μA	0.001	0.1	0.1		V
		5.5		0.001	0.1	0.1		
		4.5	V _{IN} = V _{IL} or V _{IH} , I _{OL} = 24mA		0.36	0.44		
		5.5	V _{IN} = V _{IL} or V _{IH} , I _{OL} = 24mA ⁽⁴⁾		0.36	0.44		
I _{IN}	Maximum Input Leakage Current	5.5	V _I = V _{CC} , GND		±0.1	±1.0		μA
I _{CCT}	Maximum I _{CC} /Input	5.5	V _I = V _{CC} − 2.1V	0.6		1.5		mA
I _{OLD}	Minimum Dynamic Output Current ⁽⁵⁾	5.5	V _{OLD} = 1.65V Max.			75		mA
I _{OHD}		5.5	V _{OHD} = 3.85V Min.			−75		mA
I _{CC}	Maximum Quiescent Supply Current	5.5	V _{IN} = V _{CC} or GND		4.0	40.0		μA

Notes:

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

AC Electrical Characteristics for AC

Symbol	Parameter	V_{CC} (V) ⁽⁶⁾	$T_A = +25^\circ\text{C}$, $C_L = 50\text{pF}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$, $C_L = 50\text{pF}$		Units
			Min.	Typ.	Max.	Min.	Max.	
f_{MAX}	Maximum Clock Frequency	3.3	90	125		75		MHz
		5.0	140	175		125		
t_{PLH}	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_{PHL}	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_{PHL}	Propagation Delay, $\overline{MR}$ 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 $3.3\text{V} \pm 0.3\text{V}$. Voltage range 5.0 is $5.0\text{V} \pm 0.5\text{V}$.

AC Operating Requirements for AC

Symbol	Parameter	V _{CC} (V) ⁽⁷⁾	T _A = +25°C, C _L = 50pF		T _A = −40°C to +85°C, C _L = 50pF		Units
			Typ.	Guaranteed Minimum			
t _S	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 _H	Hold Time, HIGH or LOW, Data to CP	3.3	−2.0	0	0		ns
		5.0	−1.0	1.0	1.0		
t _W	Clock Pulse Width, HIGH or LOW	3.3	3.5	5.5	6.0		ns
		5.0	2.5	4.0	4.5		
t _W	$\overline{\text{MR}}$ Pulse Width, HIGH or LOW	3.3	2.0	5.5	6.0		ns
		5.0	1.5	4.0	4.5		
t _{rec}	Recovery Time, $\overline{\text{MR}}$ 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 $3.3\text{V} \pm 0.3\text{V}$. Voltage range 5.0 is $5.0\text{V} \pm 0.5\text{V}$.

AC Electrical Characteristics for ACT

Symbol	Parameter	V_{CC} (V) ⁽⁸⁾	$T_A = +25^\circ\text{C}$, $C_L = 50\text{pF}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$, $C_L = 50\text{pF}$		Units
			Min.	Typ.	Max.	Min.	Max.	
f_{MAX}	Maximum Clock Frequency	2.0	125	189		110		MHz
$t_{\text{PLH}}, t_{\text{PHL}}$	Propagation Delay, CP to Q_n	5.0	1.5	6.5	8.5	1.5	9.0	ns
t_{PHL}	Propagation Delay, $\overline{\text{MR}}$ 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) ⁽⁹⁾	T _A = +25°C, C _L = 50pF		T _A = −40°C to +85°C, C _L = 50pF	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	$\overline{\text{MR}}$ Pulse Width, HIGH or LOW	5.0	1.5	4.0	4.0	ns
t _W	Recovery Time, $\overline{\text{MR}}$ 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

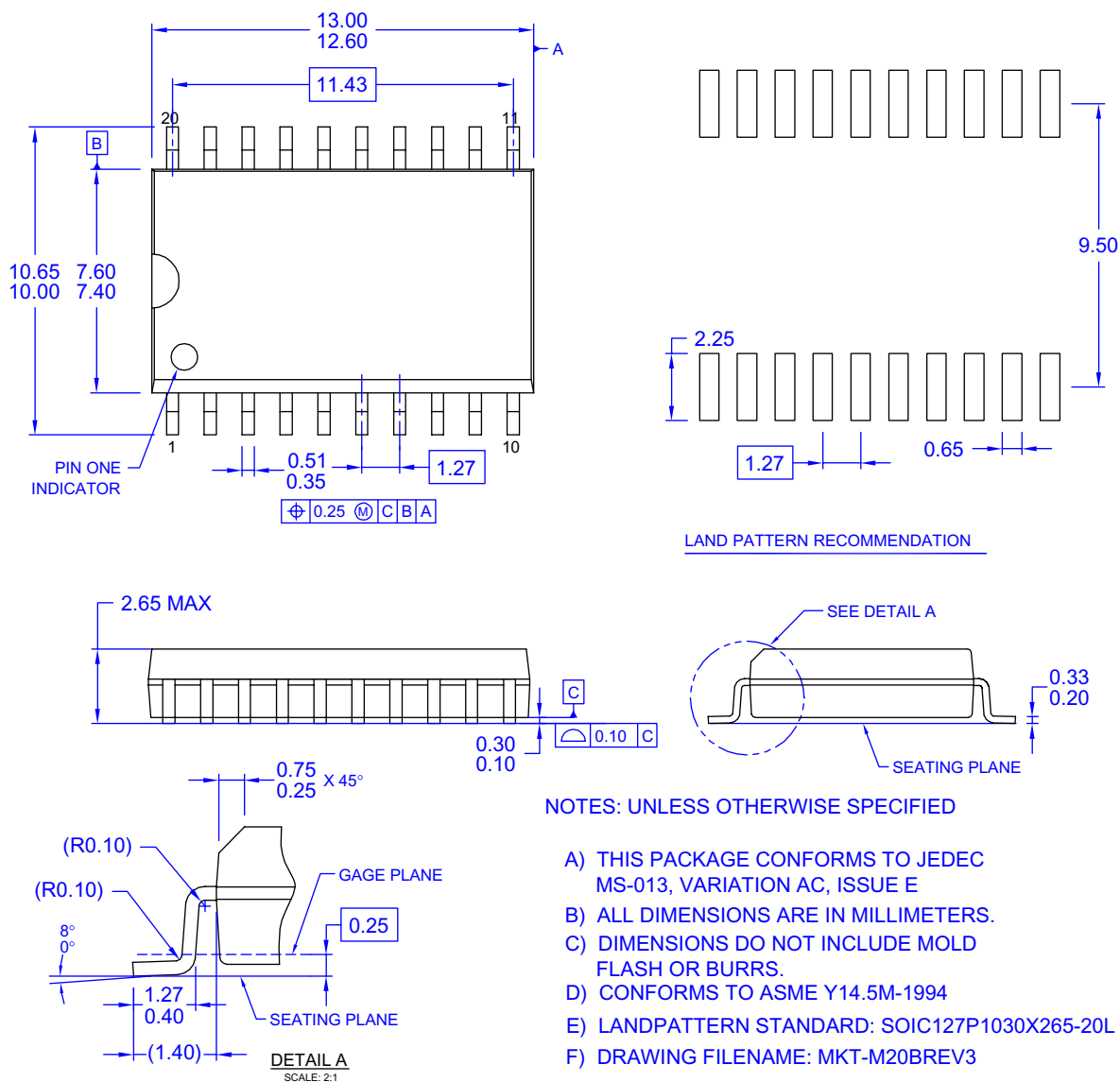


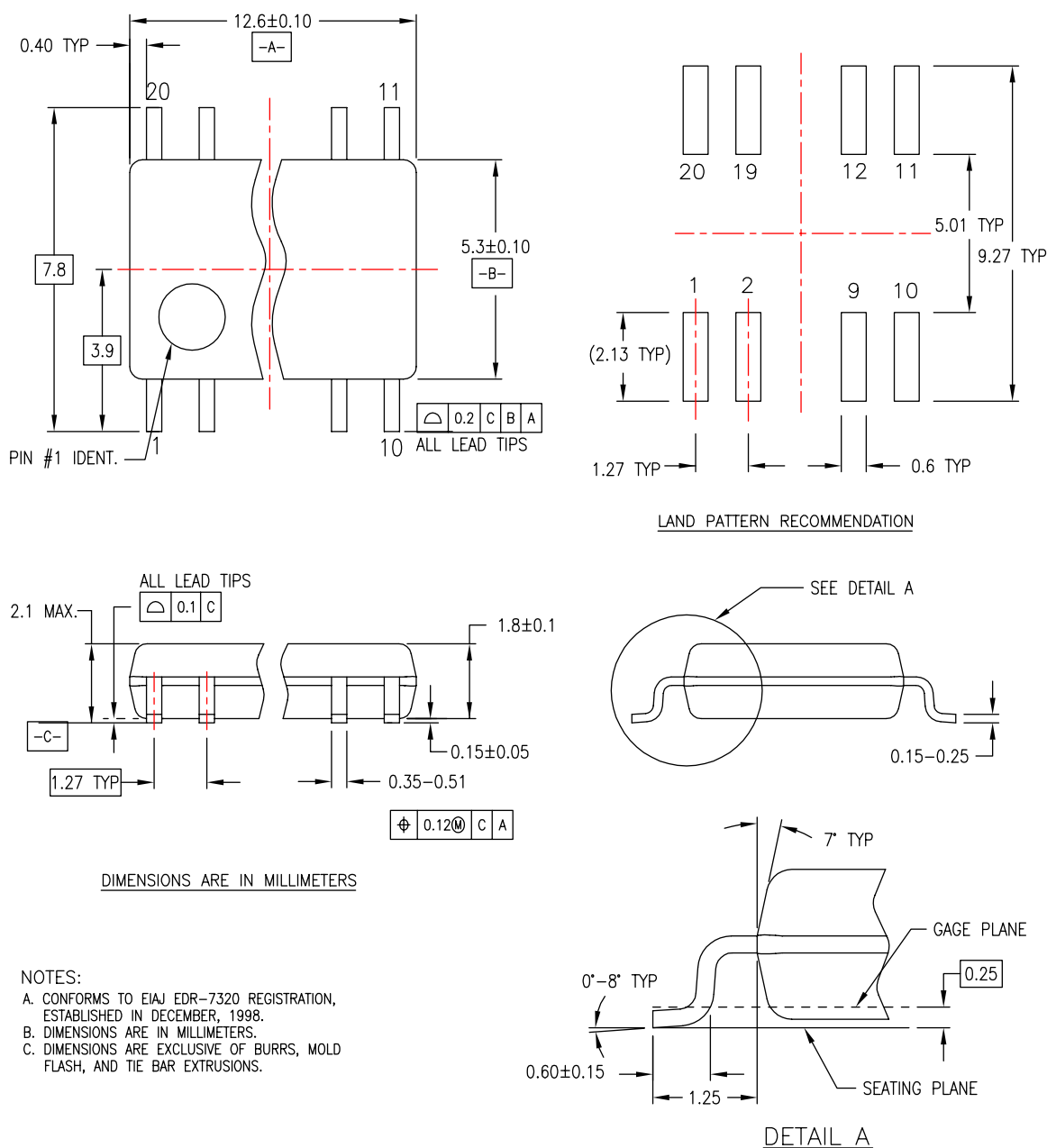
Figure 1. 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide

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Physical Dimensions (Continued)



M20DREVC

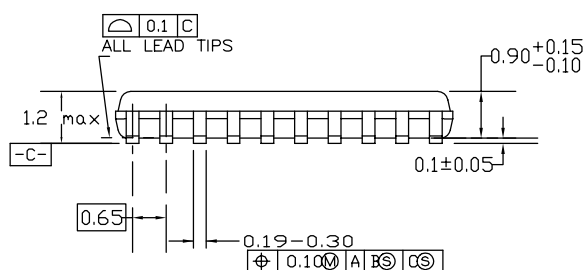
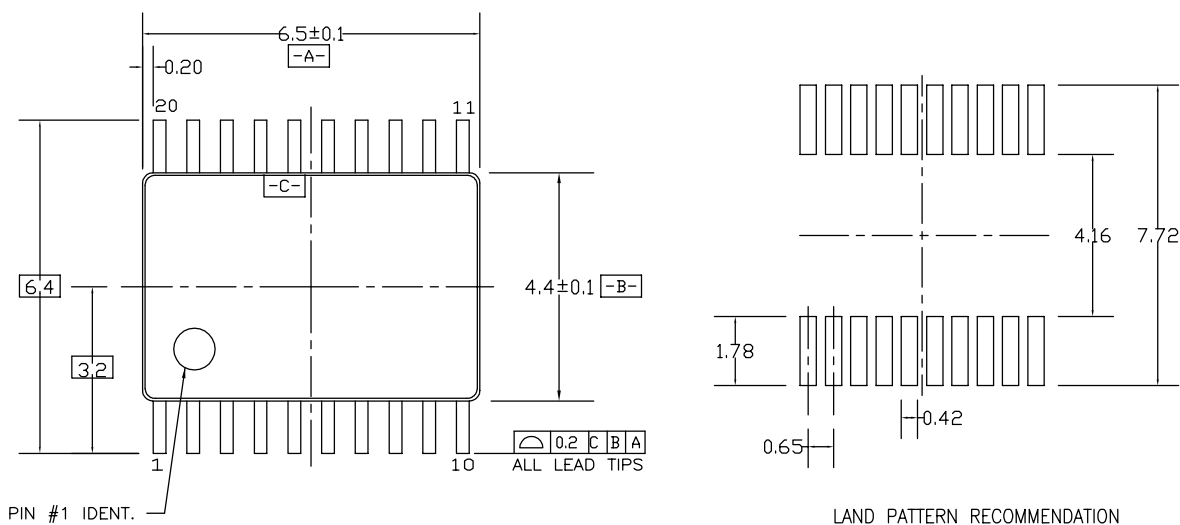
Figure 2. 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide

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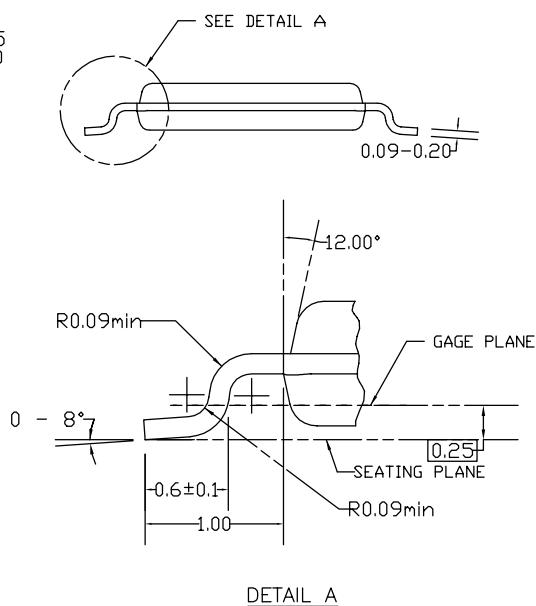
Physical Dimensions (Continued)



DIMENSIONS ARE IN MILLIMETERS

NOTES:

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



MTC20REV D1

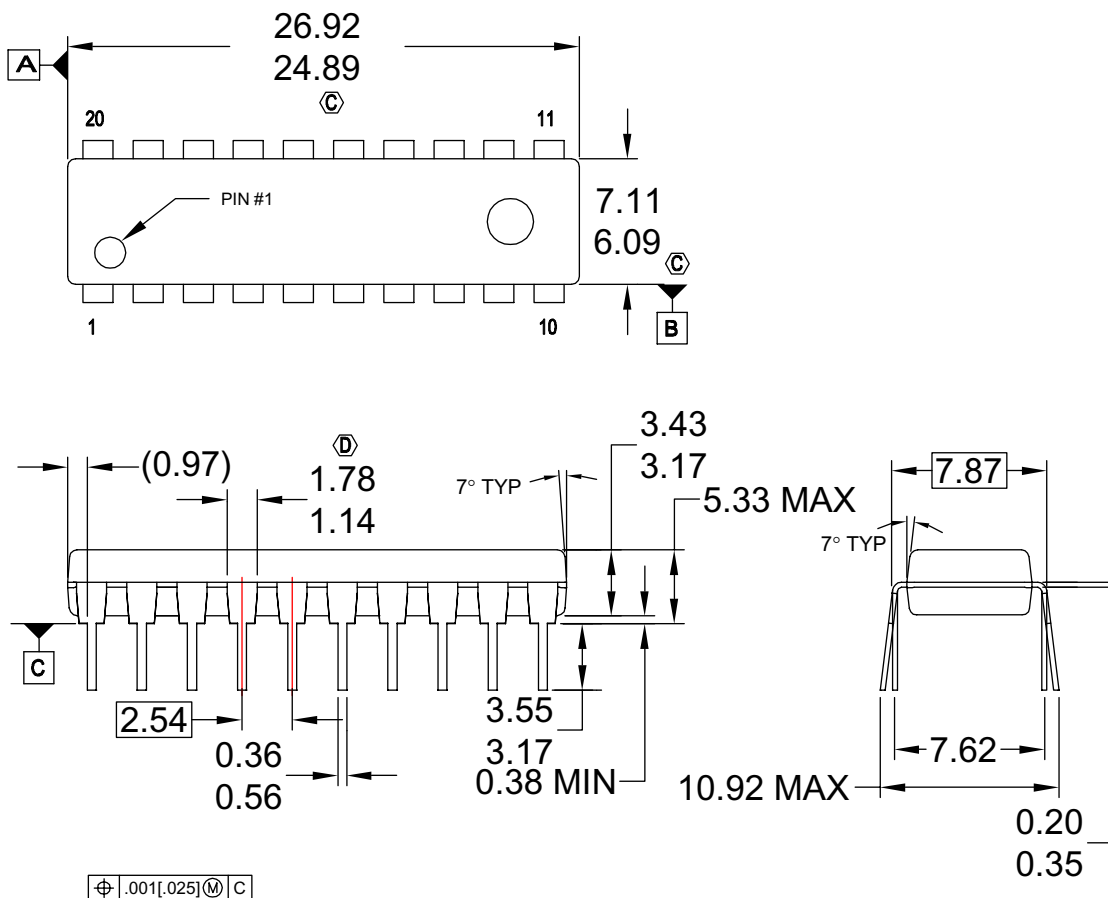
Figure 3. 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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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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PRODUCT STATUS DEFINITIONS

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 the design.
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Rev. I32

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