FAIRCHILD SEMICONDUCTOR™

January 1993
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74ABT273
Octal D-Type Flip-Flop

General Description

The ABT273 has eight edge-triggered D-type flip-flops with individual D inputs and Q outputs. The common buffered Clock (CP) and Master Reset ($\overline{MR}$) inputs load and reset (clear) all flip-flops simultaneously.

The register is fully edge-triggered. The state of each D 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.

Features

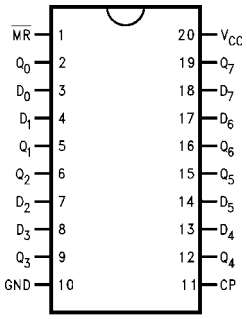
- Eight edge-triggered D-type flip-flops
- Buffered common clock
- Buffered, asynchronous Master Reset
- See ABT377 for clock enable version
- See ABT373 for transparent latch version
- See ABT374 for 3-STATE version
- Output sink capability of 64 mA, source capability of 32 mA
- Guaranteed latchup protection
- High impedance glitch free bus loading during entire power up and power down cycle
- Non-destructive hot insertion capability
- Disable time less than enable time to avoid bus contention

Ordering Code:

Order Number	Package Number	Package Description
74ABT273CSC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Body
74ABT273CSJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74ABT273CMSA	MSA20	20-Lead Shrink Small Outline Package (SSOP), EIAJ TYPE II, 5.3mm Wide
74ABT273CMTC	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 code.

Connection Diagram



Pin Descriptions

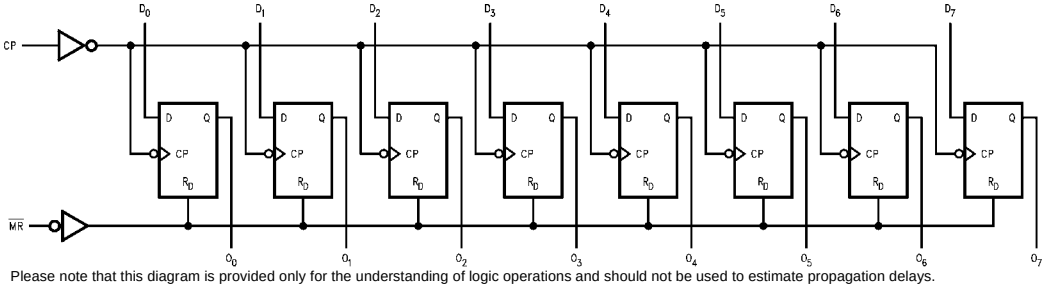
Pin Names	Description
D_0–D_7	Data Inputs
$\overline{MR}$	Master Reset (Active LOW)
CP	Clock Pulse Input (Active Rising Edge)
Q_0–Q_7	Data Outputs

Truth Table

Operating Mode	Inputs			Output
	$\overline{MR}$	CP	D_n	Q_n
Reset (Clear)	L	X	X	L
Load “1”	H	⌐	h	H
Load “0”	H	⌐	l	L

H = HIGH Voltage Level steady state
h = HIGH Voltage Level one setup time prior to the LOW-to-HIGH clock transition
L = LOW Voltage Level steady state
l = LOW Voltage Level one setup time prior to the LOW-to-HIGH clock transition
X = Immaterial
⌐ = LOW-to-HIGH clock 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(Note 1)

Storage Temperature	−65°C to +150°C
Ambient Temperature under Bias	−55°C to +125°C
Junction Temperature under Bias	−55°C to +150°C
V_{CC} Pin Potential to Ground Pin	−0.5V to +7.0V
Input Voltage (Note 2)	−0.5V to +7.0V
Input Current (Note 2)	−30 mA to +5.0 mA
Voltage Applied to Any Output	
in the Disabled or	
Power-Off State	−0.5V to +4.75V
in the HIGH State	−0.5V to V_{CC}
Current Applied to Output	
in LOW State (Max)	twice the rated I_{OL} (mA)
DC Latchup Source Current	−500 mA
(Across Comm Operating Range)	
Over Voltage Latchup	V_{CC} + 4.5V

Recommended Operating Conditions

Free Air Ambient Temperature	−40°C to +85°C
Supply Voltage	+4.5V to +5.5V
Minimum Input Edge Rate (ΔV/Δt)	
Data Input	50 mV/ns
Enable Input	20 mV/ns

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

DC Electrical Characteristics

Symbol	Parameter	Min	Typ	Max	Units	V_{CC}	Conditions
V_{IH}	Input HIGH Voltage	2.0			V		Recognized HIGH Signal
V_{IL}	Input LOW Voltage			0.8	V		Recognized LOW Signal
V_{CD}	Input Clamp Diode Voltage			−1.2	V	Min	I_{IN} = −18 mA
V_{OH}	Output HIGH Voltage	2.5 2.0			V	Min	I_{OH} = −3 mA I_{OH} = −32 mA
V_{OL}	Output LOW Voltage			0.55	V	Min	I_{OL} = 64 mA
I_{IH}	Input HIGH Current			1 1	μA	Max	V_{IN} = 2.7V (Note 3) V_{IN} = V_{CC}
I_{BVI}	Input HIGH Current Breakdown Test			7	μA	Max	V_{IN} = 7.0V
I_{IL}	Input LOW Current			−1 −1	μA	Max	V_{IN} = 0.5V (Note 3) V_{IN} = 0.0V
V_{ID}	Input Leakage Test	4.75			V	0.0	I_{ID} = 1.9 μA All Other Pins Grounded
I_{OS}	Output Short-Circuit Current	−100		−275	mA	Max	V_{OUT} = 0.0V
I_{CEX}	Output HIGH Leakage Current			50	μA	Max	V_{OUT} = V_{CC}
I_{CCH}	Power Supply Current			50	μA	Max	All Outputs HIGH
I_{CCL}	Power Supply Current			30	mA	Max	All Outputs LOW
I_{CCT}	Maximum I_{CC}/Input Outputs Enabled			1.5	mA	Max	V_I = V_{CC} − 2.1V Data Input V_I = V_{CC} − 2.1V All Others at V_{CC} or GND
I_{CCD}	Dynamic I_{CC} No Load			0.3	mA/ MHz	Max	Outputs Open (Note 4) One Bit Toggling, 50% Duty Cycle

Note 3: Guaranteed but not tested.

Note 4: For 8 bits toggling, I_{CCD} < 0.5 mA/MHz.

AC Electrical Characteristics

(SSOIC package)

Symbol	Parameter	$T_A = +25°C$, $V_{CC} = +5.0V$, $C_L = 50$ pF			$T_A = -55°C$ to $+125°C$, $V_{CC} = 4.5V$ to $5.5V$, $C_L = 50$ pF		$T_A = -40°C$ to $+85°C$, $V_{CC} = 4.5V$ to $5.5V$, $C_L = 50$ pF		Units
		Min	Typ	Max	Min	Max	Min	Max	
f_{MAX}	Maximum Clock Frequency	150	200		150		150		MHz
t_{PLH}	Propagation Delay	2.0		6.0	1.0	7.0	2.0	6.0	ns
t_{PHL}	CP to O_n	2.8		6.8	1.0	7.5	2.8	6.8	
t_{PHL}	Propagation Delay $\overline{MR}$ to O_n	2.5		7.4	1.0	8.2	2.5	7.4	ns

AC Operating Requirements

Symbol	Parameter	$T_A = +25°C$, $V_{CC} = +5.0V$, $C_L = 50$ pF		$T_A = -55°C$ to $+125°C$, $V_{CC} = 4.5V$ to $5.5V$, $C_L = 50$ pF		$T_A = -40°C$ to $+85°C$, $V_{CC} = 4.5V$ to $5.5V$, $C_L = 50$ pF		Units
		Min	Max	Min	Max	Min	Max	
$t_S(H)$	Setup Time, HIGH	2.0		2.0		2.0		ns
$t_S(L)$	or LOW D_n to CP	2.5		2.5		2.5		
$t_H(H)$	Hold Time, HIGH	1.2		1.4		1.2		ns
$t_H(L)$	or LOW D_n to CP	1.2		1.4		1.2		
$t_W(H)$	Pulse Width, CP,	3.3		3.3		3.3		ns
$t_W(L)$	HIGH or LOW	3.3		3.3		3.3		
$t_W(L)$	Master Reset Pulse Width, LOW	3.3		3.3		3.3		ns
t_{REC}	Recovery Time $\overline{MR}$ to CP	2.0		2.0		2.0		ns

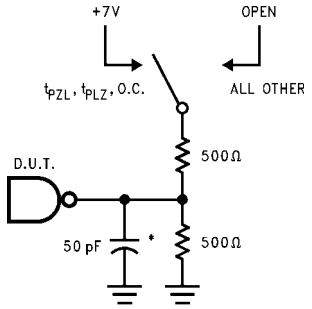
Capacitance

(SOIC package)

Symbol	Parameter	Typ	Units	Conditions $T_A = 25°C$
C_{IN}	Input Capacitance	5	pF	$V_{CC} = 0V$
C_{OUT} (Note 5)	Output Capacitance	9	pF	$V_{CC} = 5.0V$

Note 5: C_{OUT} is measured at frequency f = 1 MHz, per MIL-STD-833, Method 3012.

AC Loading



*Includes jig and probe capacitance

FIGURE 1. Standard AC Test Load

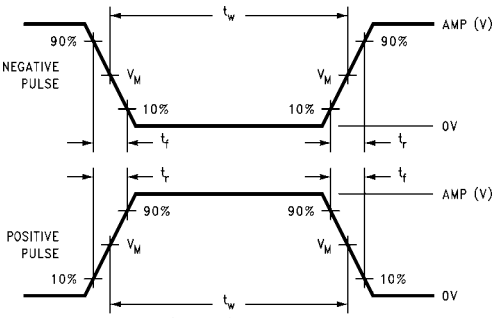


FIGURE 2. V_M = 1.5V Input Pulse Requirements

Amplitude	Rep. Rate	t_W	t_r	t_f
3.0V	1 MHz	500 ns	2.5 ns	2.5 ns

FIGURE 3. Test Input Signal Requirements

AC Waveforms

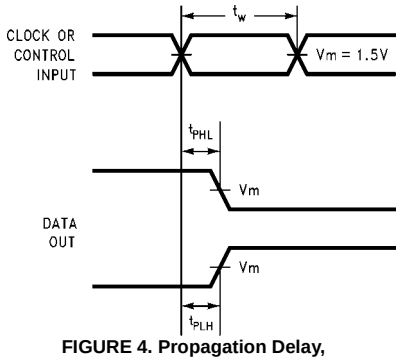


FIGURE 4. Propagation Delay, Pulse Width Waveforms

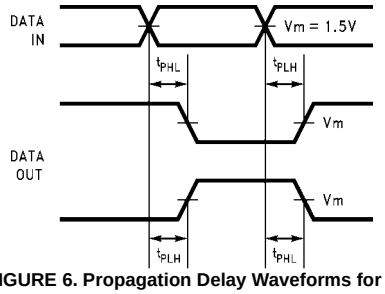


FIGURE 6. Propagation Delay Waveforms for Inverting and Non-Inverting Functions

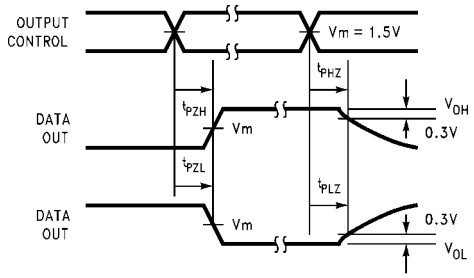


FIGURE 5. 3-STATE Output HIGH and LOW Enable and Disable Times

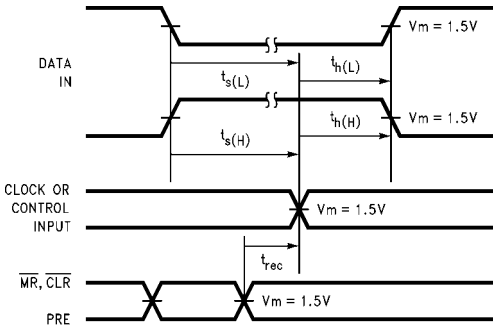
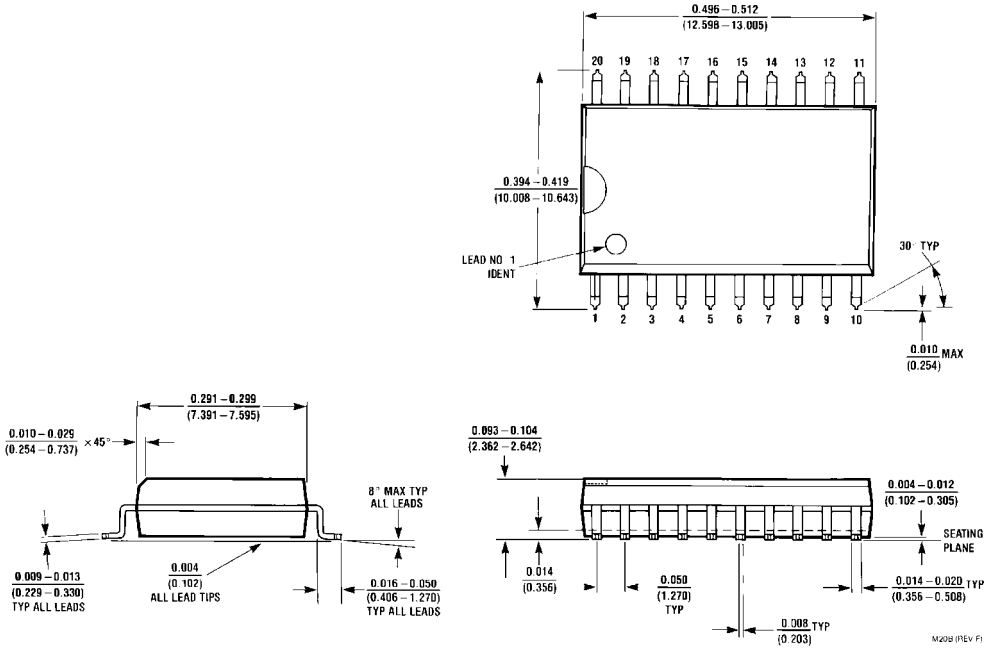


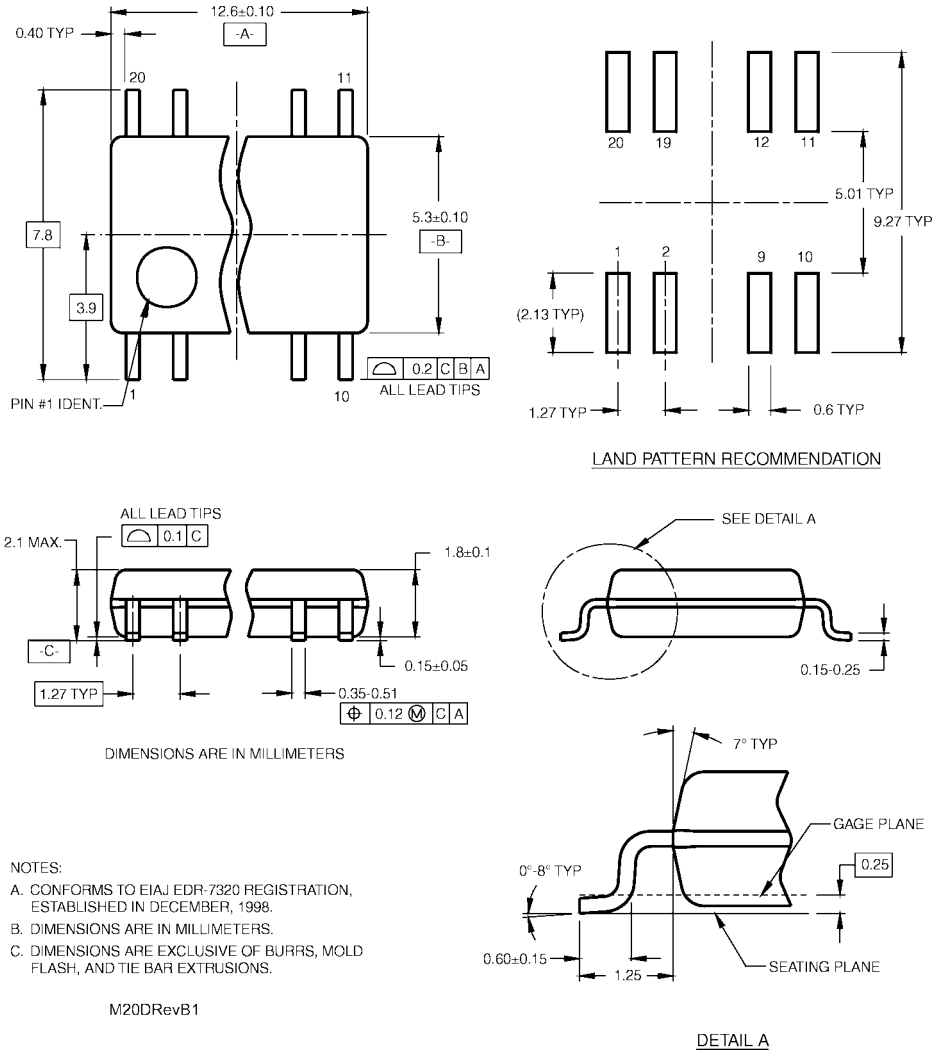
FIGURE 7. Setup Time, Hold Time and Recovery Time Waveforms

Physical Dimensions inches (millimeters) unless otherwise noted



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

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



NOTES:

A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.

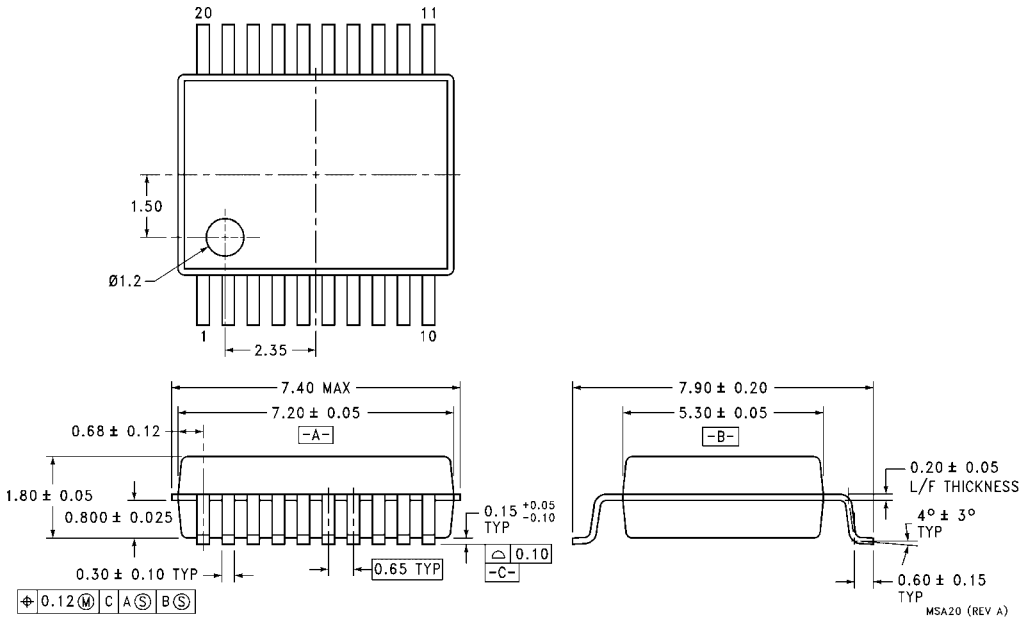
B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M20DRevB1

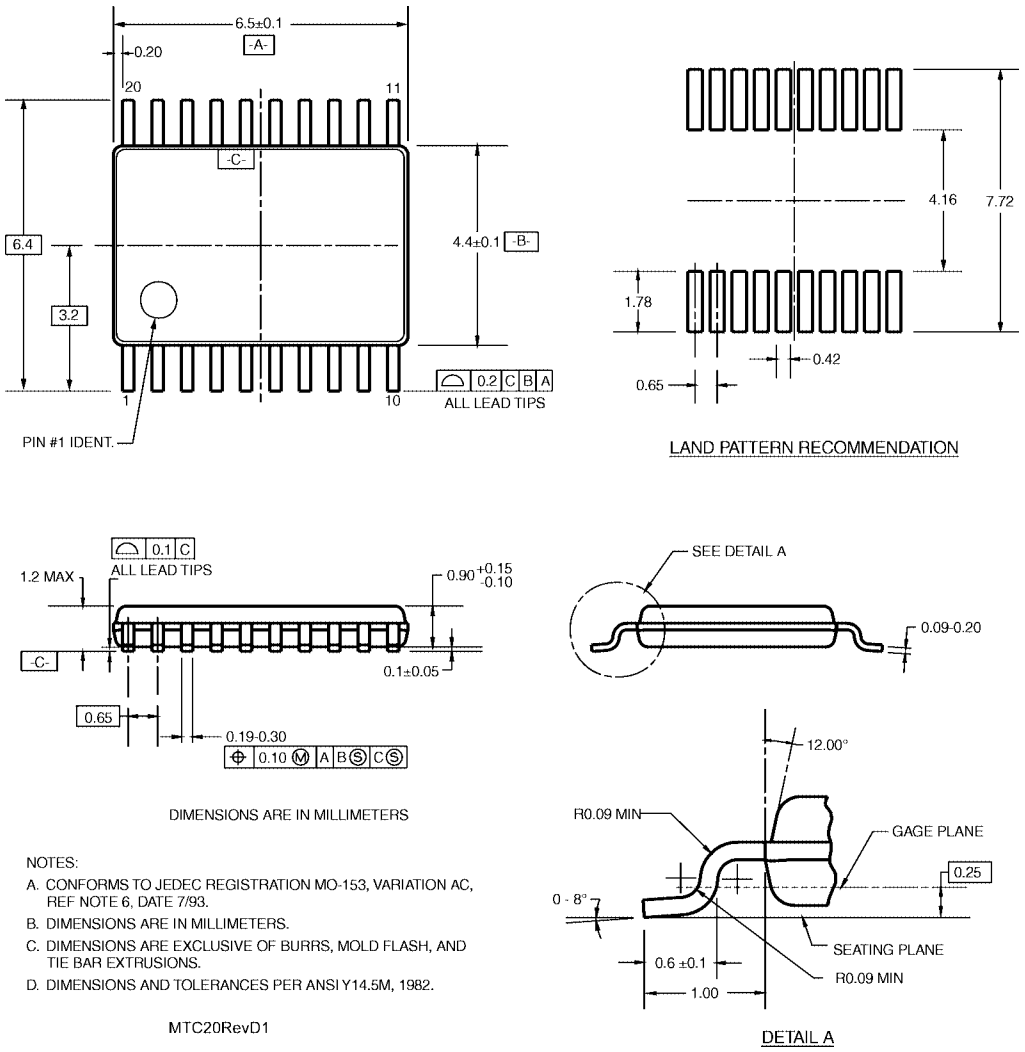
20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M20D

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



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

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



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

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