FAIRCHILD SEMICONDUCTOR®

January 2008

74AC373, 74ACT373
Octal Transparent Latch with 3-STATE Outputs

Features

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

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.

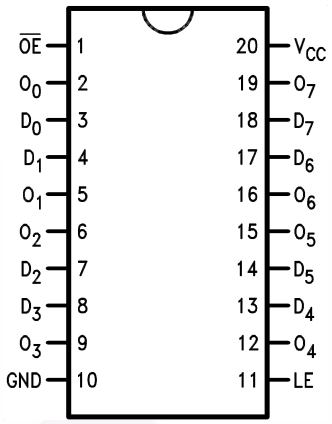
Ordering Information

Order Number	Package Number	Package Description
74AC373SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
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
74ACT373SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74ACT373MSA	MSA20	20-Lead Shrink Small Outline Package (SSOP), JEDEC MO-150, 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

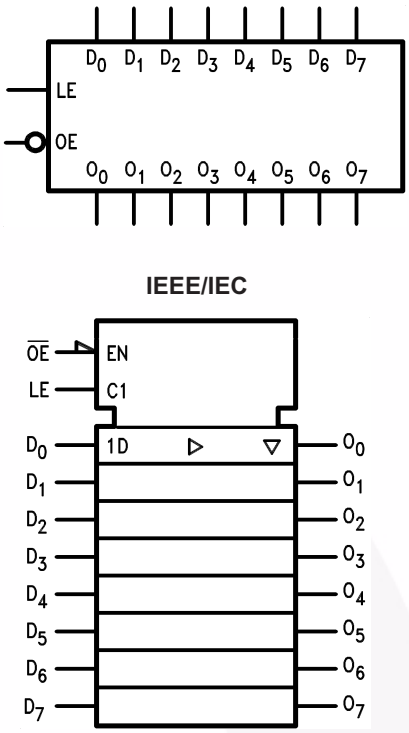
Device also available in Tape and Reel. Specify by appending suffix letter “X” to the ordering number.

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

Connection Diagram



Logic Symbols



Pin Description

Pin Names	Description
D_0–D_7	Data Inputs
LE	Latch Enable Input
OE	Output Enable Input
O_0–O_7	3-STATE Latch Outputs

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

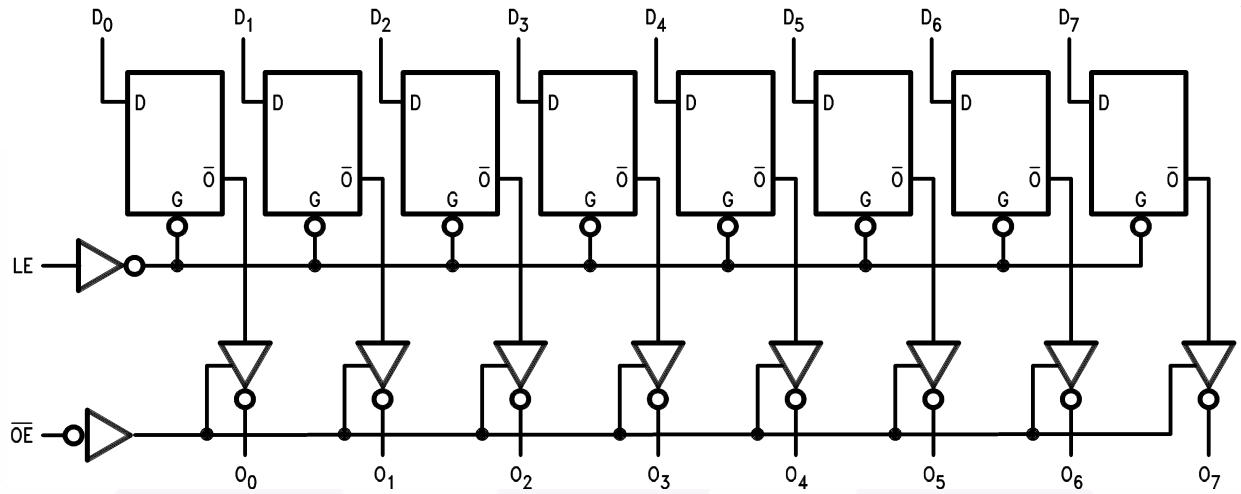
L = LOW Voltage Level

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

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:	125mV/ns
	V_{IN} from 30% to 70% of V_{CC}, V_{CC} @ 3.3V, 4.5V, 5.5V	
$\Delta V / \Delta t$	Minimum Input Edge Rate, ACT Devices:	125mV/ns
	V_{IN} from 0.8V to 2.0V, V_{CC} @ 4.5V, 5.5V	

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_{OZ}	Maximum 3-STATE Leakage Current	5.5	V_I (OE) = V_{IL}, V_{IH}; $V_I = V_{CC}$, GND; $V_O = V_{CC}$, GND		±0.25	±2.5	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_{OZ}	Maximum 3-STATE Leakage Current	5.5	$V_I = V_{IL}$, V_{IH}; $V_O = V_{CC}$, GND		±0.25	±2.5	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]	$T_A = +25°C$, $C_L = 50pF$			$T_A = -40°C$ to $+85°C$, $C_L = 50pF$		Units
			Min.	Typ.	Max.	Min.	Max.	
t_{PLH}	Propagation Delay, D_n to O_n	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_{PHL}	Propagation Delay, D_n to O_n	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_{PLH}	Propagation Delay, LE to O_n	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_{PHL}	Propagation Delay, LE to O_n	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_{PZH}	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_{PZL}	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_{PHZ}	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_{PLZ}	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:

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_{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, D_n to LE	3.3	3.5	5.5	6.0	ns
		5.0	2.0	4.0	4.5	
t_H	Hold Time, HIGH or LOW, D_n to LE	3.3	–3.0	1.0	1.0	ns
		5.0	–1.5	1.0	1.0	
t_W	LE Pulse Width, HIGH	3.3	4.0	5.5	6.0	ns
		5.0	2.0	4.0	4.5	

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)[8]	$T_A = +25°C$, $C_L = 50pF$			$T_A = -40°C$ to $+85°C$, $C_L = 50pF$		Units
			Min.	Typ.	Max.	Min.	Max.	
t_{PLH}	Propagation Delay, D_n to O_n	5.0	2.5	8.5	10.0	1.5	11.5	ns
t_{PHL}	Propagation Delay, D_n to O_n	5.0	2.0	8.0	10.0	1.5	11.5	ns
t_{PLH}	Propagation Delay, LE to O_n	5.0	2.5	8.5	11.0	2.0	11.5	ns
t_{PHL}	Propagation Delay, LE to O_n	5.0	2.0	8.0	10.0	1.5	11.5	ns
t_{PZH}	Output Enable Time	5.0	2.0	8.0	9.5	1.5	10.5	ns
t_{PZL}	Output Enable Time	5.0	2.0	7.5	9.0	1.5	10.5	ns
t_{PHZ}	Output Disable Time	5.0	2.5	9.0	11.0	2.5	12.5	ns
t_{PLZ}	Output Disable Time	5.0	1.5	7.5	8.5	1.0	10.0	ns

Note:

8. Voltage range 5.0 is 5.0V ± 0.5V.

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 LE	5.0	0.8	2.5	3.5	ns
t_H	Hold Time, HIGH or LOW, D_n to LE	5.0	0	0	1.0	ns
t_W	LE Pulse Width, HIGH	5.0	2.0	7.0	8.0	ns

Note:

9. Voltage range 5.0 is 5.0V ± 0.5V.

Capacitance

Symbol	Parameter	Conditions	Typ.	Units
C_{IN}	Input Capacitance	V_{CC} = OPEN	4.5	pF
C_{PD}	Power Dissipation Capacitance	V_{CC} = 5.0V	40.0	pF

Physical Dimensions

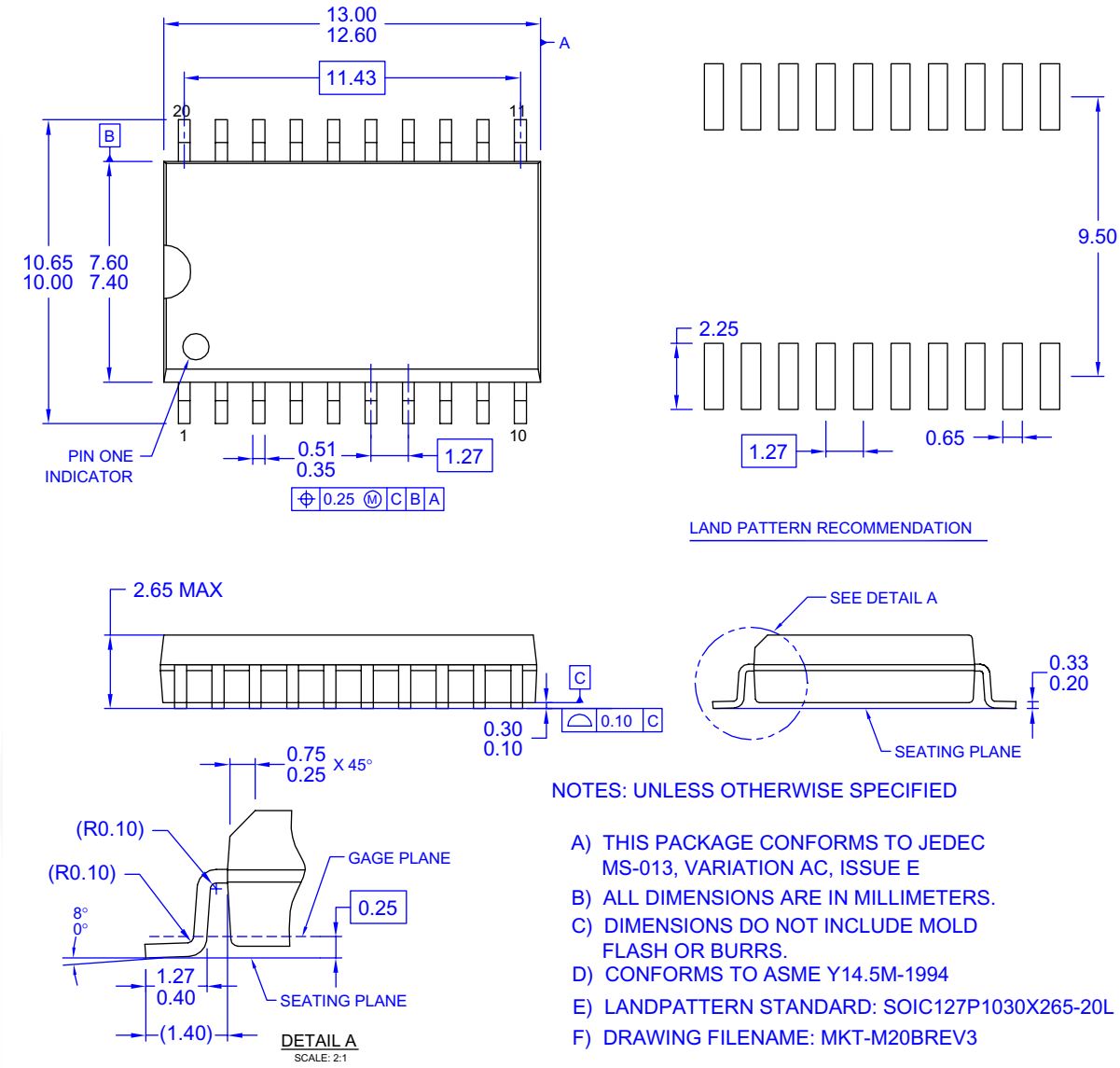


Figure 1. 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide

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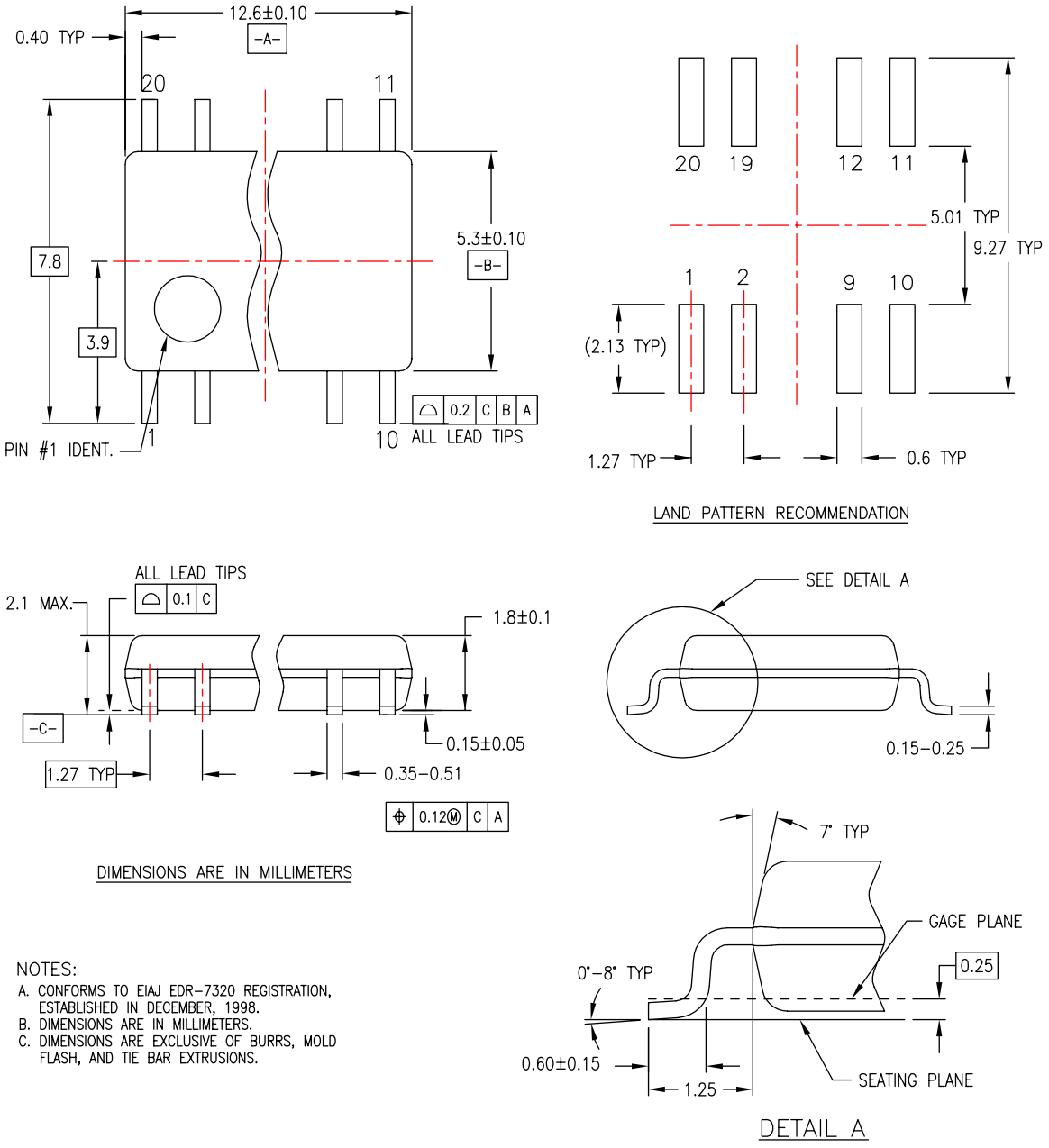
Physical Dimensions (Continued)



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.

M20DREVC

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

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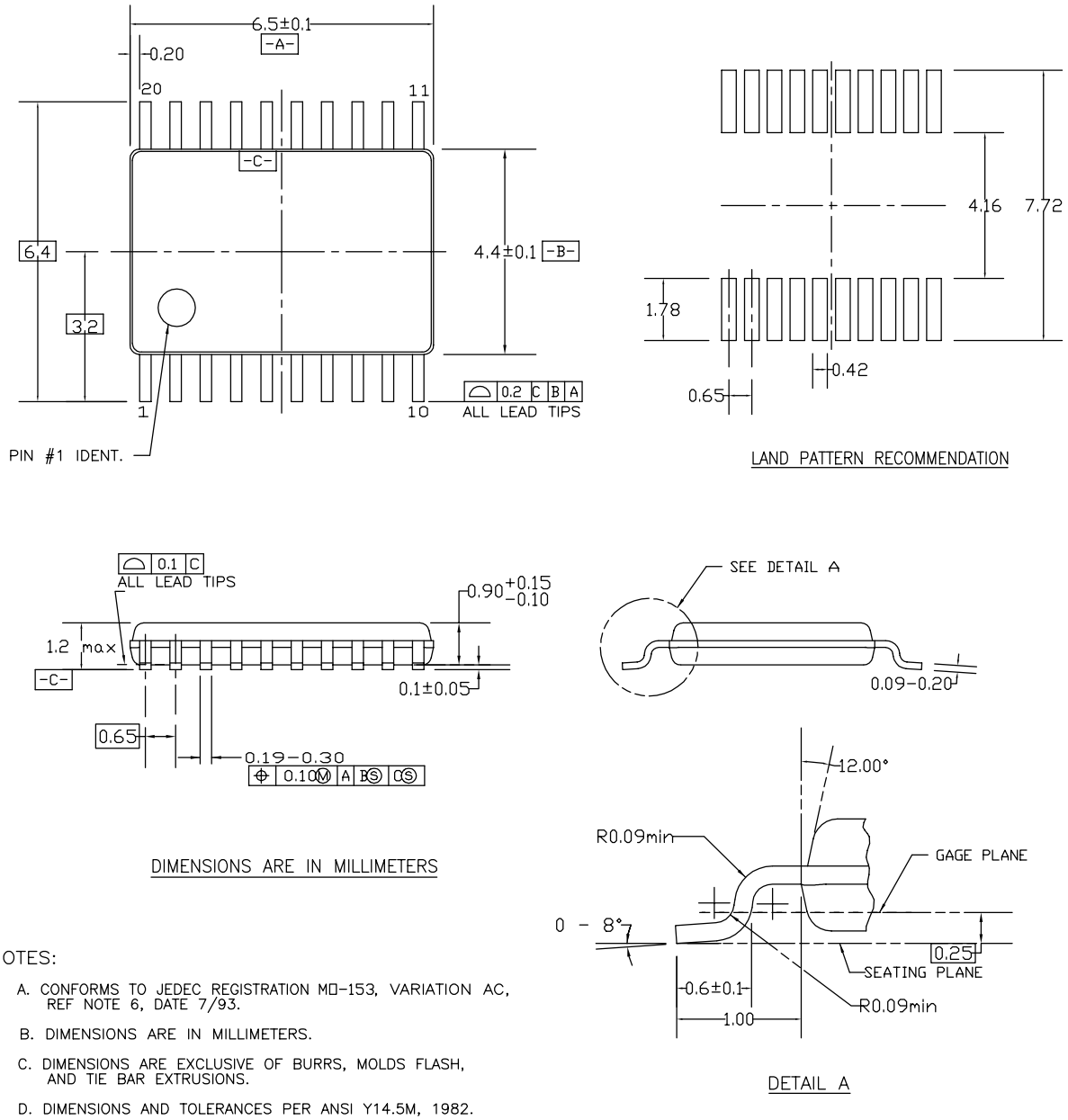
Physical Dimensions (Continued)



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, MOLDS FLASH, AND TIE BAR EXTRUSIONS.

D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20REVD1

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

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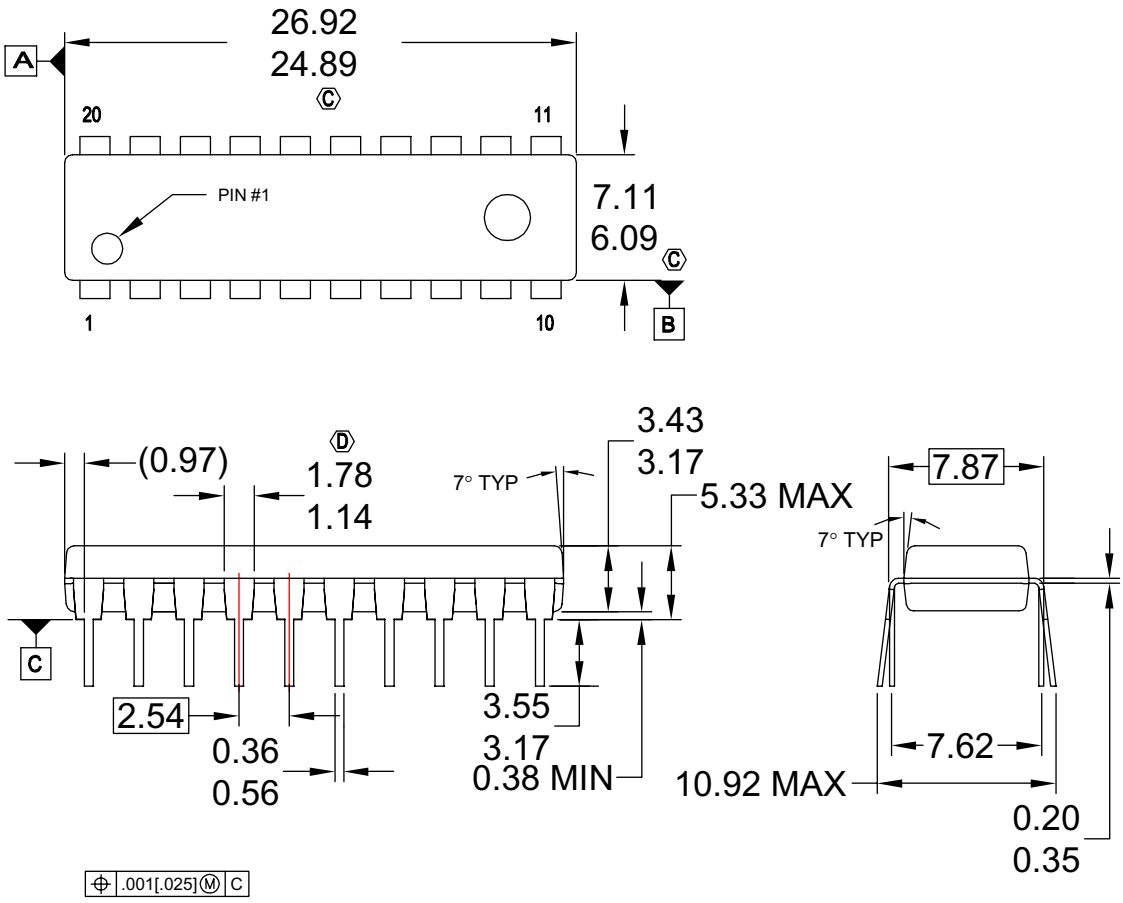
Physical Dimensions (Continued)



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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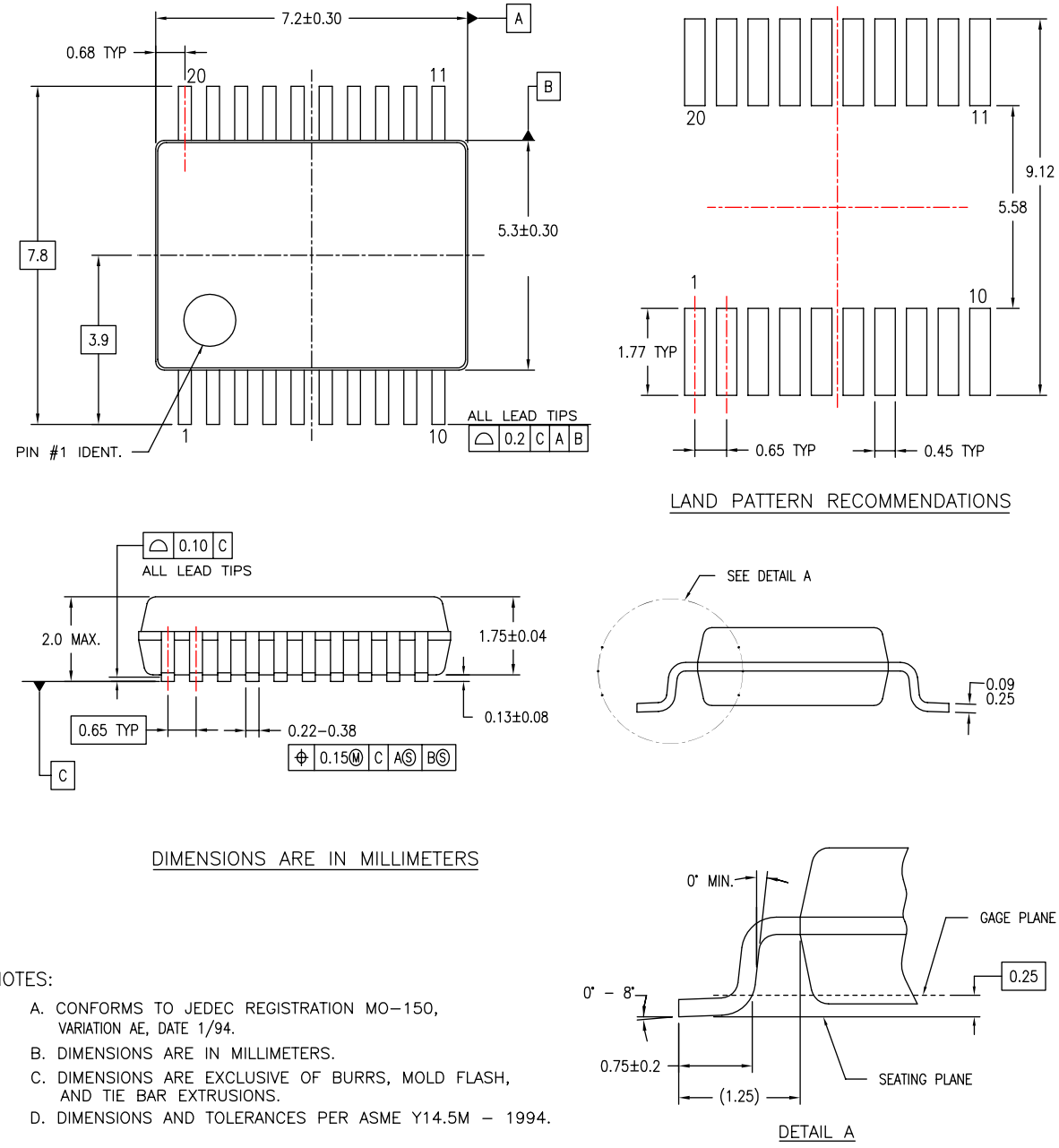
Physical Dimensions (Continued)



NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO–150, VARIATION AE, DATE 1/94.

B. DIMENSIONS ARE IN MILLIMETERS.

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

D. DIMENSIONS AND TOLERANCES PER ASME Y14.5M – 1994.

MSA20REVB

Figure 5. 20-Lead Shrink Small Outline Package (SSOP), JEDEC MO-150, 5.3mm Wide

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Green FPS™
Green FPS™ e-Series™
GTO™
i-Lo™
IntelliMAX™
ISOPLANAR™
MegaBuck™
MICROCOUPLER™
MicroFET™
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As used herein:

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
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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