FAIRCHILD SEMICONDUCTOR®

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FSTD3306
2-Bit Low-Power Bus Switch with Level Shifting

Features

- Typical 3Ω switch resistance at 5.0V V_{CC}, V_{IN} = 0V
- Level shift facilitates 5V to 3.3V interfacing
- Minimal propagation delay through the switch
- Power down high impedance input/output
- Zero bounce in flow-through mode
- TTL compatible active LOW control inputs
- Control inputs are over-voltage tolerant

Description

The FSTD3306 is a 2-bit ultra high-speed CMOS FET bus switch with enhanced level-shifting circuitry and TTL-compatible active LOW control inputs. The low on resistance of the switch allows inputs to be connected to outputs with minimal propagation delay and without generating additional ground bounce noise. The device is organized as a 2-bit switch with independent bus-enable ($\overline{BE}$) controls. When $\overline{BE}$ is LOW, the switch is ON and Port A is connected to Port B. When $\overline{BE}$ is HIGH, the switch is OPEN and a high-impedance state exists between the two ports. Reduced voltage drive to the gate of the FET switch permits nominal level shifting of 5v to 3V through the switch. Control inputs tolerate voltages up to 5.5V independent of V_{CC}.

Ordering Information

Part Number	Top Mark	Package	Pb-Free	Operating Temperature Range	Packing Method
FSTD3306MTCX	FD3306	8-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide	Yes	-40 to +85°C	Tape & Reel
FSTD3306MTC	FD3306	8-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide	Yes	-40 to +85°C	Tube
FSTD3306L8X	TD	8-Lead MicroPak™	Yes	-40 to +85°C	5000 units on Reel

Logic Diagram

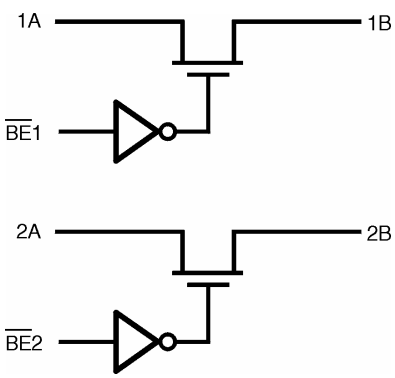


Figure 1. Logical Connections for the FSTD3306

Connections Diagram

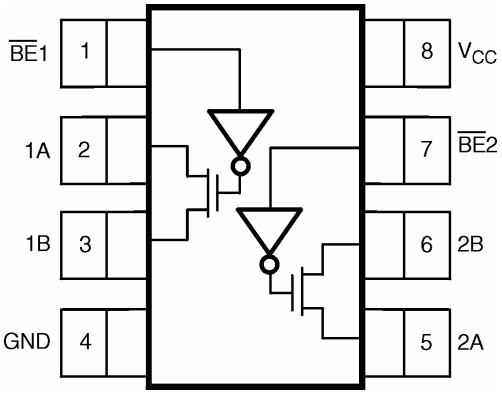


Figure 2. TSSOP Pin Outs (Top View)

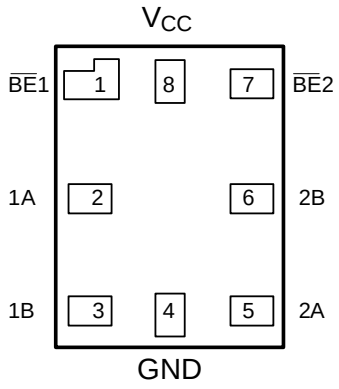


Figure 3. MicroPak Pin Outs (Top View)

Pin Definitions

Pin	Description
A	Bus A switch I/O
B	Bus B switch I/O
$\overline{BE}$	Bus enable input

Function Table

Bus Enable Input ($\overline{BE}$)	Function
LOW Logic Level	B connected to A
HIGH Logic Level	Disconnected

Absolute Maximum Ratings

The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table defines the conditions for actual device operation.

Symbol	Parameter	Condition	Min.	Typ.	Max	Unit
V_{CC}	Supply Voltage		- 0.5		+ 7.0	V
V_S	DC Switch Voltage		- 0.5		+ 7.0	V
V_{IN}	DC Output Voltage(1)		- 0.5		+ 7.0	V
I_{IK}	DC Input Diode Current	V_{IN} < 0V		- 50		mA
I_{OUT}	DC Output Sink Current			128		mA
I_{CC}/I_{GND}	DC V_{CC} or Ground Current			± 100		mA
T_{STG}	Storage Temperature Range		- 65		+150	°C
T_J	Junction Temperature	under Bias		+ 150		°C
T_L	Junction Lead Temperature	(Soldering, 10 Seconds)		+ 260		°C
P_D	Power Dissipation	at +85°C		250		mW

Notes:

1. The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

Recommended Operating Conditions(2)

Symbol	Parameter	Condition	Min.	Typ.	Max	Unit
V_{CC}	Supply Voltage		4.5		5.5	V
V_{IN}	Control Input Voltage		0.0		5.5	V
V_{IN}	Switch Input Voltage		0.0		5.5	V
V_{OUT}	Switch Output Voltage		0.0		5.5	V
T_A	Operating Temperature		- 40		+ 85	°C
t_r, t_f	Input Rise and Fall Time	Control Input	0		5	ns/V
		Switch I/O	0		DC	ns/V
Θ_{JA}	Thermal Resistance			250		°C/W

Notes:

2. Unused logic inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

Ambient temperature (T_A) is -40°C to +85° unless otherwise specified.

Symbol	Parameters	Conditions	V_{CC} (V)	Min.	Typ.	Max.	Unit
V_{IK}	Clamp Diode Voltage	I_{IN} = - 18 mA	4.5			-1.2	V
V_{IH}	HIGH-Level Input Voltage		4.5-5.5	2.0			V
V_{IL}	LOW-Level Input Voltage		4.5-5.5			0.8	V
V_{OH}	HIGH-Level Output Voltage	$V_{IN} = V_{CC}$	4.5-5.5		(3)		V
I_{IN}	Input Leakage Current	$0 \le V_{IN} \le 5.5V$	5.5			±1.0	µA
I_{OFF}	Power OFF Leakage Current	$0 \le A, B \le V_{CC}$	5.5			±1.0	µA
R_{ON}	Switch On Resistance(4)	V_{IN} = 0V, I_{IN} = 64mA	4.5		3	7	Ω
		V_{IN} = 0V, I_{IN} = 30mA	4.5		3	7	Ω
		V_{IN} = 2.4V, I_{IN} = 15mA	4.5		15	50	Ω
I_{CC}	Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND, I_{OUT} = 0 $\overline{BE}1 = \overline{BE}2$ = GND	5.5		1.1	1.5	mA
		$V_{IN} = V_{CC}$ or GND, I_{OUT} = 0 $\overline{BE}1 = \overline{BE}2 = V_{CC}$	5.5			10	µA
ΔI_{CC}	Increase in I_{CC} per Input(5)	V_{IN} = 3.4V, I_O = 0, one control input only, other $\overline{BE} = V_{CC}$	5.5		1	2.5	mA

Notes:

3. For typical DC characteristics, see Figures 7-9.
4. Measured by the voltage drop between A and B pins at the indicated current through the switch. On resistance is determined by the lower of the voltages on the two (A or B) pins.
5. Increase per TTL-driven input (VIN = 3.4V, control input only). A and B pins do not contribute to I_{CC}.

AC Electrical Characteristics

Ambient temperature (T_A) is -40°C to +85° and C_L = 50pF, RU = RD = 500Ω unless otherwise specified.

Symbol	Parameter	Conditions	V_{CC} (V)	Min.	Typ.	Max.	Unit
t_{PHL}, t_{PLH}	Propagation Delay Bus-to-Bus(6)	V_I = OPEN	4.5 - 5.5			0.25	ns
t_{PZL}, t_{PZH}	Output Enable Time	V_I = 7V for t_{PZL}, V_I = 0V for t_{PZH}	4.5 - 5.5	1.0	3.5	5.8	ns
t_{PLZ}, t_{PHZ}	Output Disable Time	V_I = 7V for t_{PLZ}, V_I = 0V for t_{PHZ}	4.5 - 5.5	0.8	3.5	4.8	ns

Notes:

6. This parameter is guaranteed. The bus switch contributes no propagation delay other than the RC delay of the typical on resistance of the switch and the 50pF load capacitance when driven by an ideal voltage source (zero output impedance). The specified limit is calculated on this basis.

Capacitance

Symbol	Parameter	Conditions	Typ.	Unit
C_{IN}	Control Pin Input Capacitance	V_{CC} = 0V	2.5	pF
$C_{I/O}$ (OFF)	Port OFF Capacitance	V_{CC} = 5.0V = $\overline{BE}$	6	pF
$C_{I/O}$ (ON)	Port ON Capacitance	V_{CC} = 5.0V, $\overline{BE}$ = 0V	12	pF

AC Loading and Waveforms

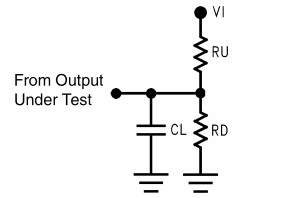


Figure 4. AC Test Circuit. Input driven by 50Ω source-terminated in 50Ω. C_L includes load and stray capacitance. Input PRR = 1.0 MHz; T_W = 500ns.

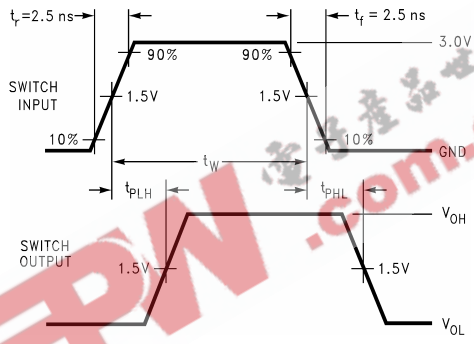


Figure 5. AC Waveform

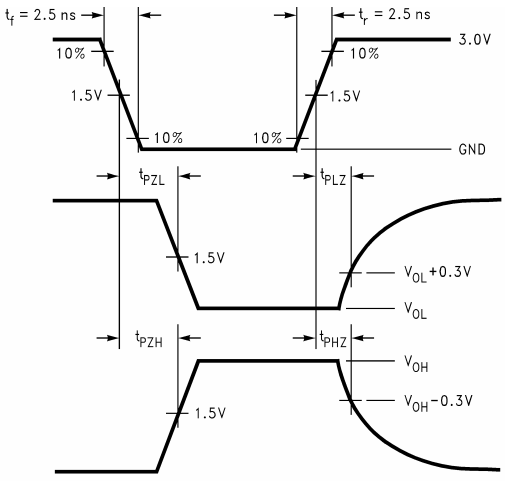


Figure 6. AC Waveform

DC Characteristics

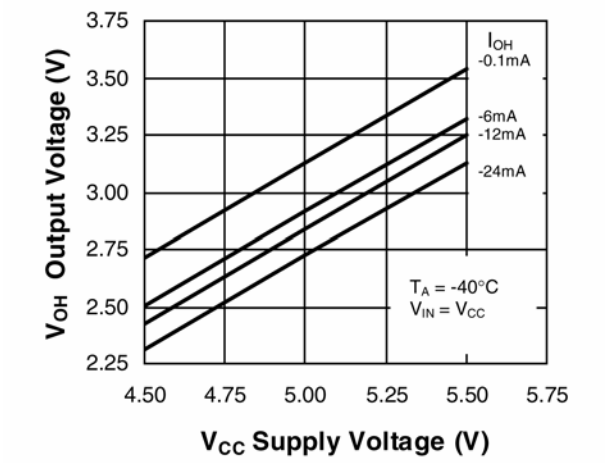


Figure 7. Typical High-Level Output Voltage vs. Supply Voltage (T_A = -40°C, V_{IN} = V_{CC})

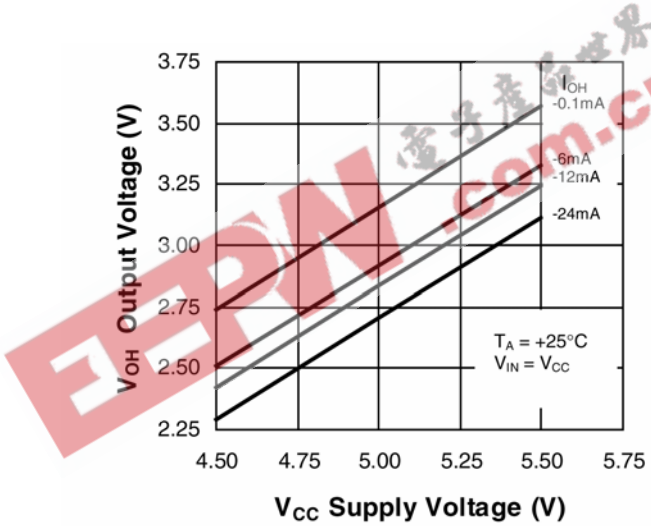


Figure 8. Typical High-Level Output Voltage vs. Supply Voltage (T_A = 25°C, V_{IN} = V_{CC})

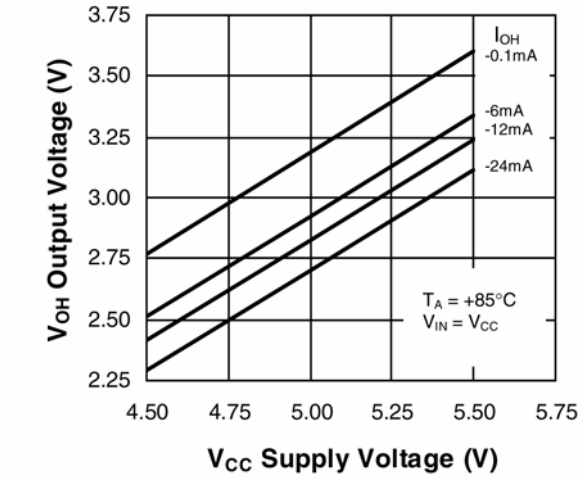


Figure 9. Typical High-Level Output Voltage vs. Supply Voltage (T_A = 85°C, V_{IN} = V_{CC})

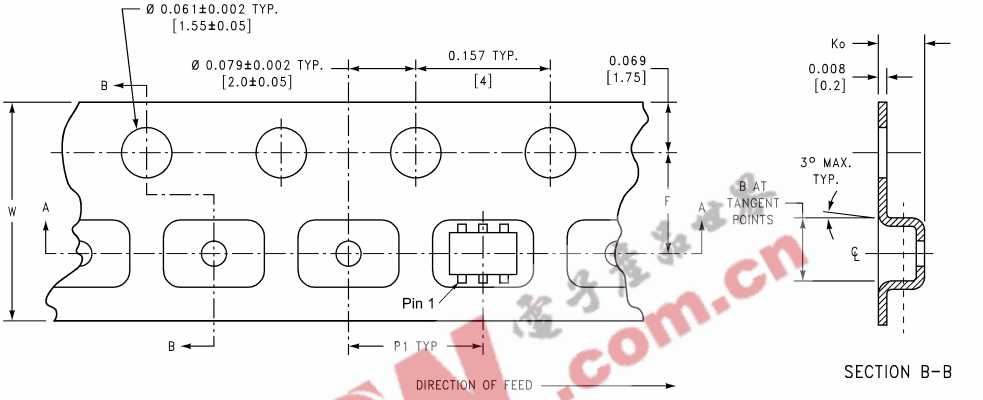
Tape and Reel Specifications

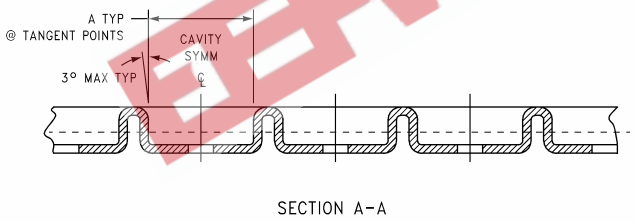
Tape Format MicroPak

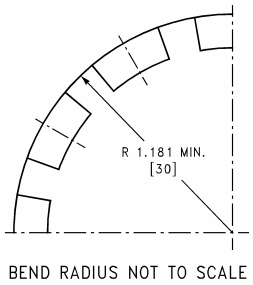
Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
L8X	Leader (Start End)	125 (typ.)	Empty	Sealed
	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (typ.)	Empty	Sealed

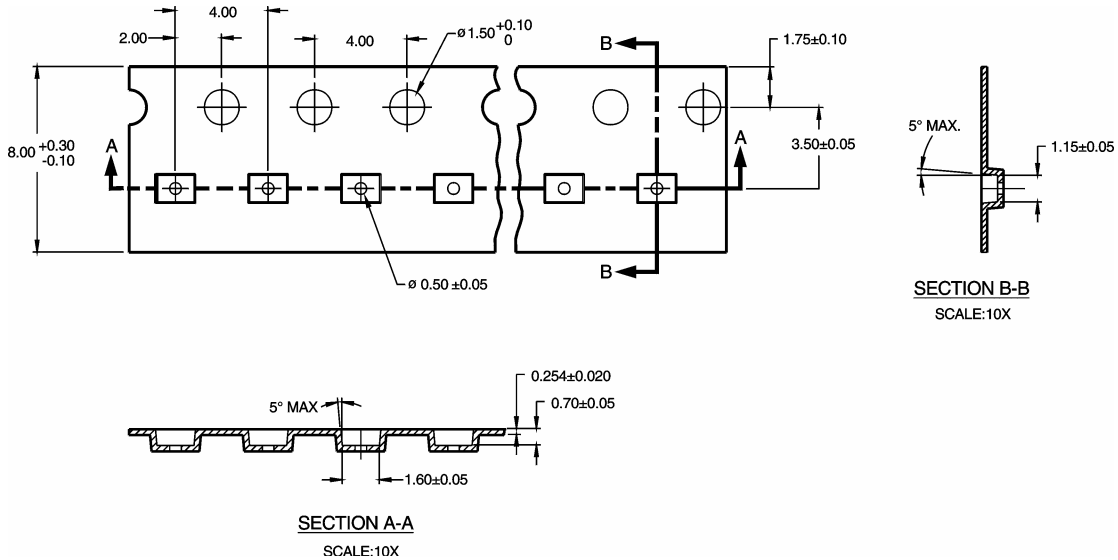
Tape Dimensions

Dimensions are in millimeters unless otherwise noted.

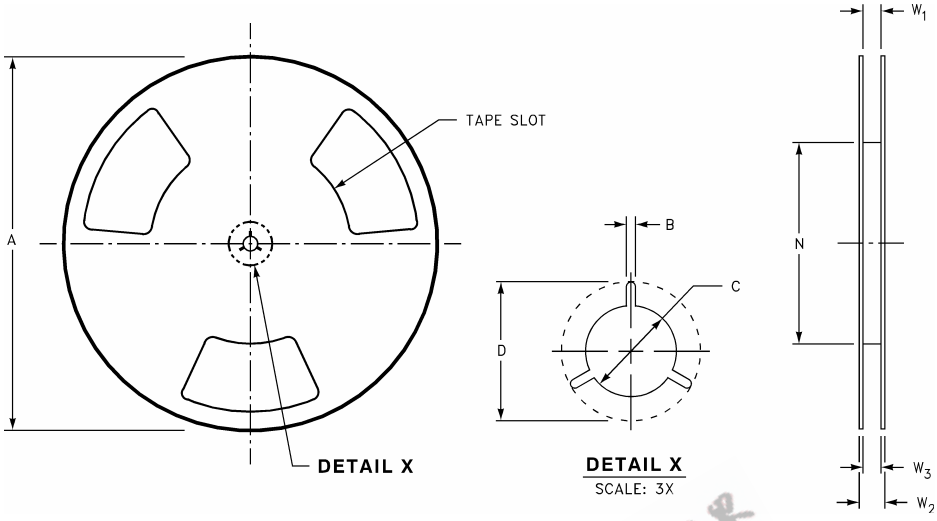








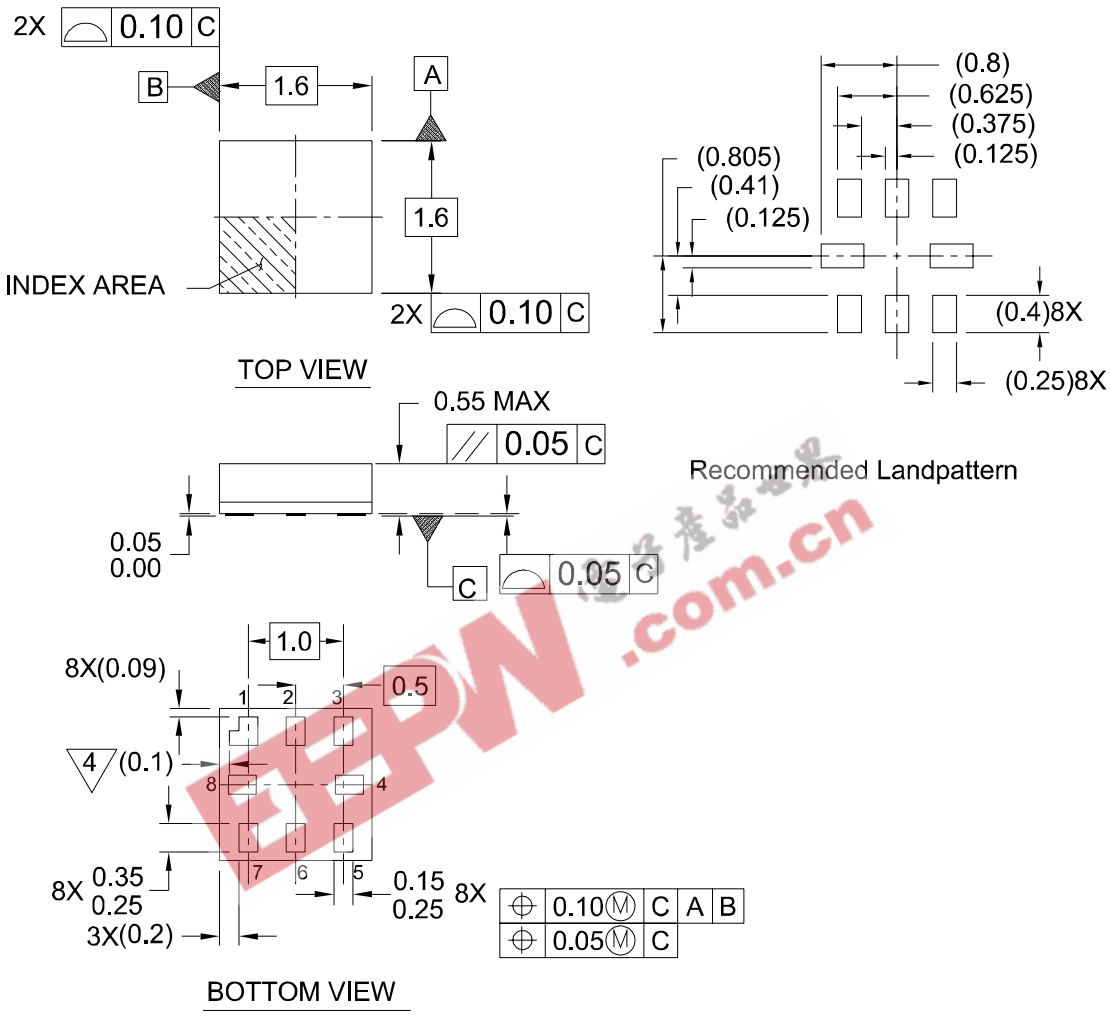
Reel Dimensions



Tape Size	A	B	C	D	N	W1	W2	W23
8mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	.0331 +0.059 / -0.000 (8.40 +1.50 / -0.00)	0.567 (14.40)	W1 +0.078 / -0.039 (W1 +2.00 / -1.00)

Physical Dimensions

Dimensions are in millimeters unless otherwise noted.



Notes:

1. PACKAGE CONFORMS TO JEDEC MO-255 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y.14M-1994
4. PIN 1 FLAG, END OF PACKAGE OFFSET.

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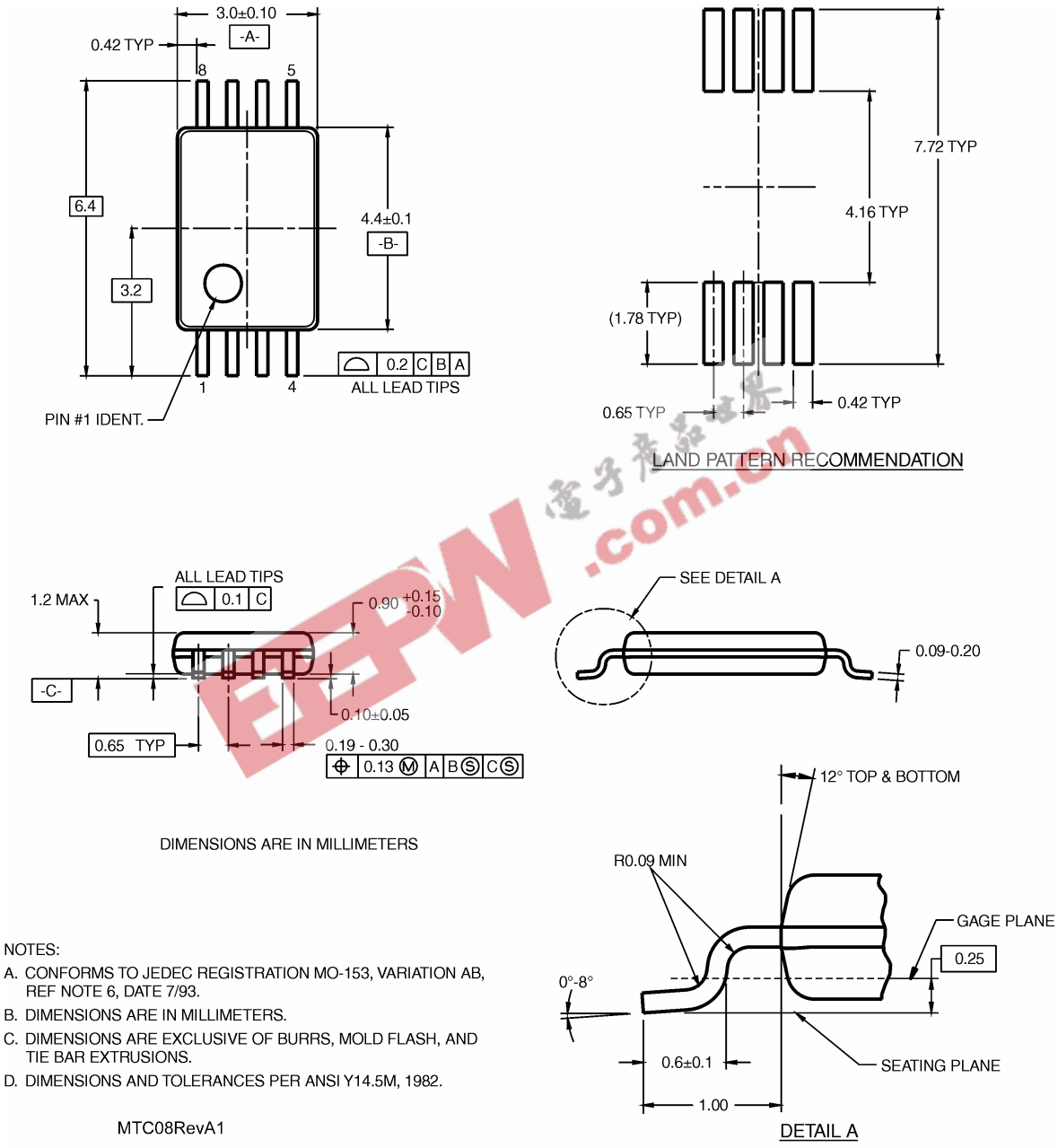
Figure 10. 8-Lead MicroPak, 1.6mm-wide Package

Physical Dimensions

Dimensions are in millimeters unless otherwise noted.



NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, 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.

MTC08RevA1

Figure 11. 8-Lead Thin Shrink Small Outline (TSSOP), JEDEC MO-153, 4.4mm-wide Package

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EcoSPARK™	ISOPLANAR™	PowerSaver™	SuperSOT™-6	UltraFET®
E^2CMOS™	LittleFET™	PowerTrench®	SuperSOT™-8	UniFET™
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FACT Quiet Series™	MicroPak™	QT Optoelectronics™	TinyBoost™	
FAST®	MICROWIRE™	Quiet Series™		
FASTr™	MSX™	RapidConfigure™	Across the board. Around the world.™	
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Rev. I20