ON Semiconductor®

NC7SZ125
TinyLogic® UHS Buffer with Three-State Output

Features

- Ultra-High Speed: t_{PD} 2.6 ns (Typical) into 50 pF at 5 V V_{CC}

- High Output Drive: ±24 mA at 3 V V_{CC}

- Broad V_{CC} Operating Range: 1.65 V to 5.5 V

- Matches Performance of LCX Operated at 3.3 V V_{CC}

- Power Down High-Impedance Inputs/Outputs

- Over-Voltage Tolerance Inputs Facilitate 5 V to 3 V Translation

- Proprietary Noise/EMI Reduction Circuitry

- Ultra-Small MicroPak™ Packages

- Space-Saving SOT23 and SC70 Packages

Description

The NC7SZ125 is a single buffer with three-state output from ON Semiconductor's Ultra-High Speed (UHS) of TinyLogic®. The device is fabricated with advanced CMOS technology to achieve ultra high speed with high output drive while maintaining low static power dissipation over a very broad V_{CC} operating range. The device is specified to operate over the 1.65 V to 5.5 V range. The inputs and output are high impedance above ground when V_{CC} is 0 V. Inputs tolerate voltages up to 6 V independent of V_{CC} operating voltage. The output tolerates voltages above V_{CC} when in the 3-STATE condition.

Ordering Information

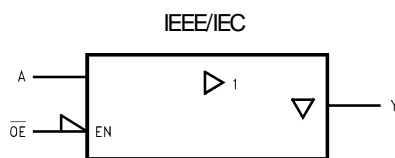| Part Number	Top Mark	Package	Packing Method
NC7SZ125M5X	7Z25	5-Lead SOT23, JEDEC MO-178 1.6 mm	3000 Units on Tape & Reel
NC7SZ125P5X	Z25	5-Lead SC70, EIAJ SC-88a, 1.25 mm Wide	3000 Units on Tape & Reel
NC7SZ125L6X	DD	6-Lead MicroPak™, 1.00 mm Wide	5000 Units on Tape & Reel
NC7SZ125FHX	DD	6-Lead, MicroPak2, 1x1 mm Body, .35mm Pitch	5000 Units on Tape & Reel

Connection Diagrams

Figure 1. Logic Symbol
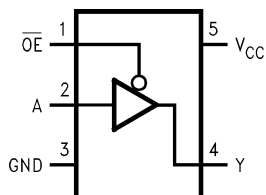
Pin Configurations

Figure 2. SC70 and SOT23 (Top View)
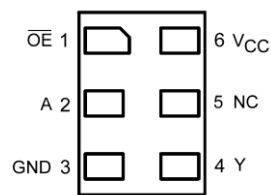
Figure 3. MicroPak™ (Top Through View)

Pin Definitions

Pin # SC70 / SOT23	Pin # MicroPak	Name	Description
1	1	OE	Input
2	2	A	Input
3	3	GND	Ground
4	4	Y	Output
5	6	V_{CC}	Supply Voltage
	5	NC	No Connect

Function Table

Inputs		Output
/OE	In A	Out Y
L	L	L
L	H	H
H	X	Z

H = HIGH Logic Level

L = LOW Logic Level

X = HIGH or LOW Logic Level

Z = HIGH Impedance State

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		Min.	Max.	Unit
V_{CC}	Supply Voltage		-0.5	6.0	V
V_{IN}	DC Input Voltage		-0.5	6.0	V
V_{OUT}	DC Output Voltage		-0.5	6.0	V
I_{IK}	DC Input Diode Current	$V_{IN} < -0.5$ V		-50	mA
		$V_{IN} > 6.0$ V		+20	
I_{OK}	DC Output Diode Current	$V_{OUT} < -0.5$ V		-50	mA
		$V_{OUT} > 6$ V, V_{CC}=GND		+20	
I_{OUT}	DC Output Current			±50	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current			±50	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	SOT-23		200	mW
		SC70-5		150	
		MicroPak-6		130	
		MicroPak2-6		120	
ESD	Human Body Model, JESD22-A114			4000	V
	Charged Device Model, JESD22-C101			2000	

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. ON Semiconductor does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Conditions	Min.	Max.	Unit
V_{CC}	Supply Voltage Operating		1.65	5.50	V
	Supply Voltage Data Retention		1.50	5.50	
V_{IN}	Input Voltage		0	5.5	V
V_{OUT}	Output Voltage	Active State	0	V_{CC}	V
		Three-State	0	5.5	
T_A	Operating Temperature		-40	+85	°C
t_r, t_f	Input Rise and Fall Times	V_{CC} at 1.8 V, 2.5 V ±0.2 V	0	20	ns/V
		V_{CC} at 3.3 V ±0.3 V	0	10	
		V_{CC} at 5.0 V ±0.5 V	0	5	
θ_{JA}	Thermal Resistance	SOT-23		300	°C/W

		SC70-5		425	
		MicroPak-6		500	
		MicroPak2-6		560	

Note:

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

DC Electrical Characteristics

Symbol	Parameter	V_{CC}	Conditions	T_A=+25°C			T_A=-40 to +85°C		Units
				Min.	Typ.	Max.	Min.	Max.	
V_{IH}	HIGH Level Input Voltage	1.65 to 1.95		$0.75V_{CC}$			$0.75V_{CC}$		V
		2.30 to 5.50		$0.70V_{CC}$			$0.70V_{CC}$		
V_{IL}	LOW Level Input Voltage	1.65 to 1.95				$0.25V_{CC}$		$0.25V_{CC}$	V
		2.30 to 5.50				$0.30V_{CC}$		$0.30V_{CC}$	
V_{OH}	HIGH Level Output Voltage	1.65	$V_{IN}=V_{IH}$, I_{OH}=-100 µA	1.55	1.65		1.55		V
		1.80		1.70	1.80		1.70		
		2.30		2.20	2.30		2.20		
		3.00		2.90	3.00		2.90		
		4.50		4.40	4.50		4.40		
		1.65	I_{OH}=-4 mA	1.29	1.52		1.29		
		2.30	I_{OH}=-8 mA	1.90	2.15		1.90		
		3.00	I_{OH}=-16 mA	2.40	2.80		2.40		
		3.00	I_{OH}=-24 mA	2.30	2.68		2.30		
		4.50	I_{OH}=-32 mA	3.80	4.20		3.80		
V_{OL}	LOW Level Output Voltage	1.65	$V_{IN}=V_{IL}$, I_{OL}=100 µA		0.00	0.10		0.00	V
		1.80			0.00	0.10		0.10	
		2.30			0.00	0.10		0.10	
		3.00			0.00	0.10		0.10	
		4.50			0.00	0.10		0.10	
		1.65	I_{OL}=4 mA		0.80	0.24		0.24	
		2.30	I_{OL}=8 mA		0.10	0.30		0.30	
		3.00	I_{OL}=16 mA		0.15	0.40		0.40	
		3.00	I_{OL}=24 mA		0.22	0.55		0.55	
		4.50	I_{OL}=32 mA		0.22	0.55		0.55	
I_{IN}	Input Leakage Current	0 to 5.5	$0 \geq V_{IN} \geq 5.5$ V			±1		±10	µA
I_{OZ}	3-STATE Output Leakage	0 to 5.5	$V_{IN}=V_{IH}$ or V_{IL} $0 \geq V_O \geq 5.5$ V			±1		±10	µA
I_{OFF}	Power Off Leakage Current	0	V_{IN} or V_{OUT}=5.5 V			1		10	µA
I_{CC}	Quiescent Supply Current	1.65 to 5.50	V_{IN}=5.5 V, GND			2		20	µA

AC Electrical Characteristics

| Symbol	Parameter	V_{CC}	Conditions	T_A=+25°C			T_A=-40 to +85°C		Units	Figure
				Min.	Typ.	Max.	Min.	Max.		
t_{PLH}, t_{PHL}	Propagation Delay	1.65	C_L=15 pF, R_D=1 MΩ S_1=OPEN	2.0	6.4	13.2	2.0	13.8	ns	Figure 4 Figure 6
		1.80		2.0	5.3	11.0	2.0	11.5		
		2.50 ±0.20		0.8	3.4	7.5	0.8	8.0		
		3.30 ±0.30		0.5	2.5	5.2	0.5	5.5		
		5.00 ±0.50		0.5	2.1	4.5	0.5	4.8		
		3.30 ±0.30	C_L=50 pF, R_D=500 Ω S_1=OPEN	1.5	3.2	5.7	1.5	6.0		
		5.00 ±0.50		0.8	2.6	5.0	0.8	5.3		
t_{PZL}, t_{PZH}	Output Enable Time	1.65	C_L=50 pF, R_D=500 Ω RU=500 Ω S_1=GND for t_{PZH} S_1=V_{IN} for t_{PZL} V_{IN}=2•V_{CC}	2.0	8.4	15.0	2.0	15.6	ns	Figure 4 Figure 6
		1.80		2.0	7.0	12.5	2.0	13.0		
		2.50 ±0.20		1.5	4.6	8.5	1.5	9.0		
		3.30 ±0.30		1.5	3.5	6.2	1.5	6.5		
		5.00 ±0.50		0.8	2.8	5.5	0.8	5.8		
t_{PLZ}, t_{PHZ}	Output Disable Time	1.65	C_L=50 pF, R_D=500 Ω RU=500 Ω S_1=GND for t_{PHZ} S_1=V_{IN} for t_{PLZ} V_{IN}=2•V_{CC}	2.0	6.5	13.2	2.0	14.5		
		1.80		2.0	5.4	11.0	2.0	12.0		
		2.50 ±0.20		1.5	3.5	8.0	1.5	8.5		
		3.30 ±0.30		1.0	2.8	5.7	1.0	6.0		
		5.00 ±0.50		0.5	2.1	4.7	0.5	5.0		
C_{IN}	Input Capacitance	0.00			4				pF	
C_{OUT}	Output Capacitance	0.00			8				pF	
C_{PD}	Power Dissipation Capacitance[2]	3.30			17				pF	Figure 5
		5.00			24					

Note:

2. C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output lading and operating at 50% duty cycle. C_{PD} is related to I_{CCD} dynamic operating current by the expression: $I_{CCD}=(C_{PD})(V_{CC})(f_{IN})+(I_{CC}static)$.
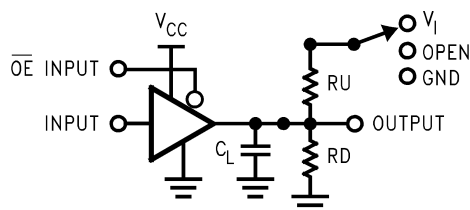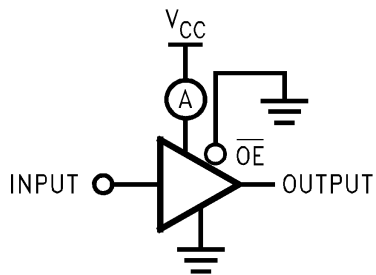

Note:

3. C_L includes load and stray capacitance.
   Input PRR=1.0 MHz, t_W=500 ns.

Figure 4. AC Test Circuit
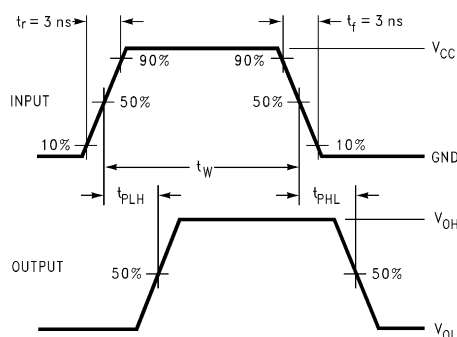
Note:

4. Input=AC Waveform; t_r=t_f=1.8 ns;
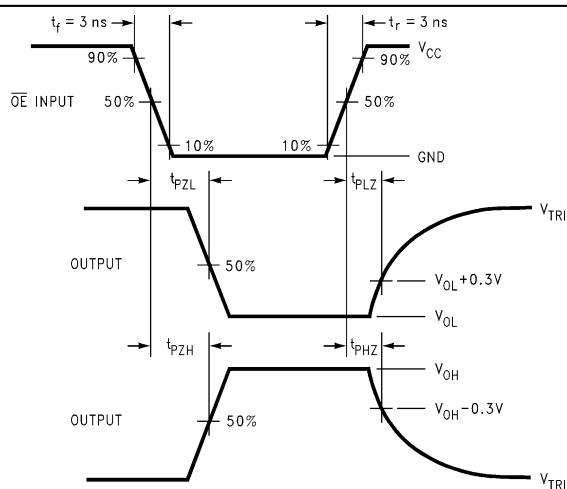   PRR=10 MHz; Duty Cycle=50%.

Figure 5. I_{CCD} Test Circuit

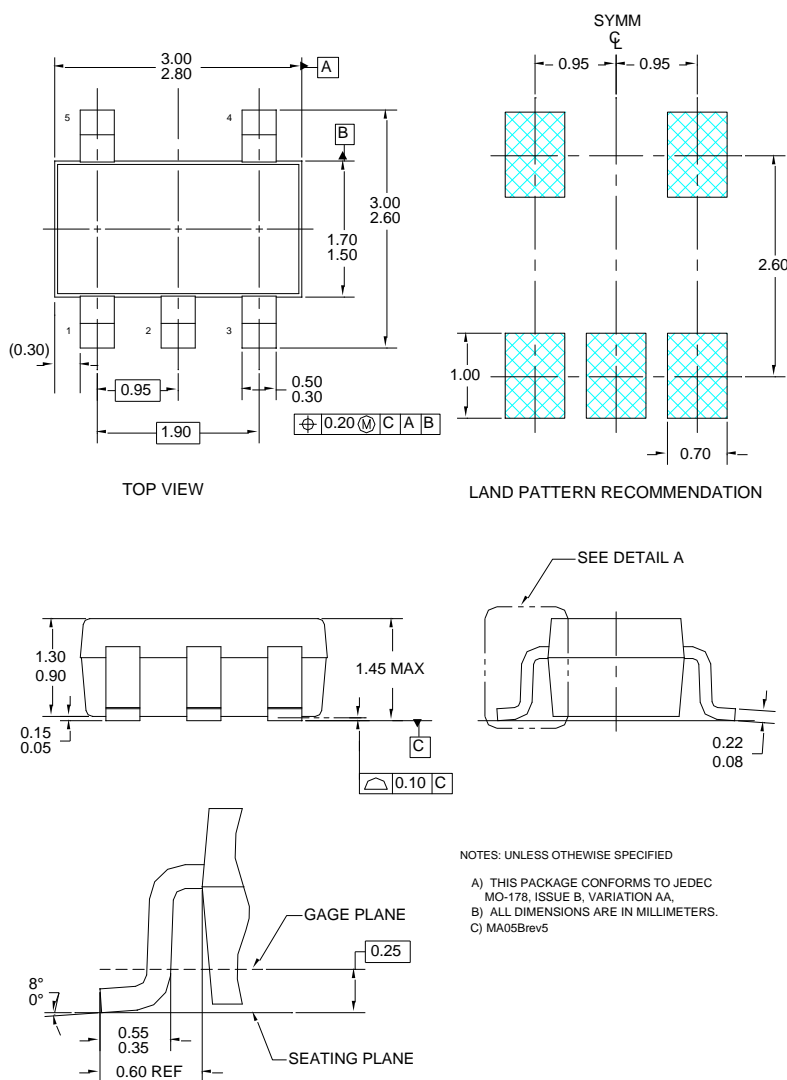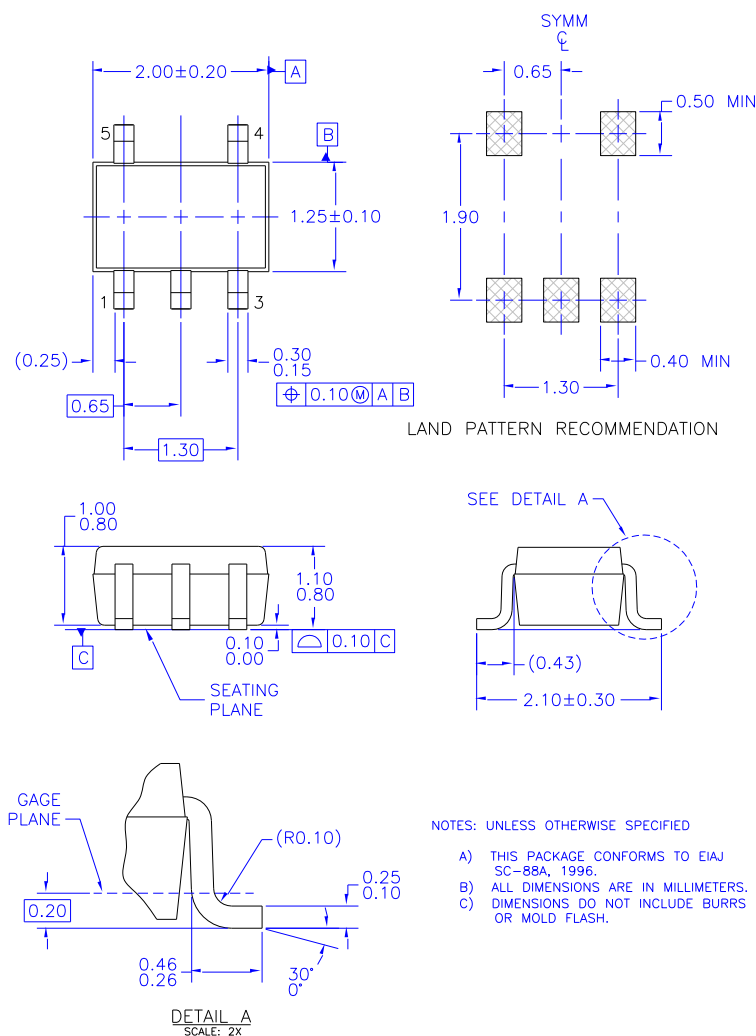

Figure 6. AC Waveforms

Physical Dimensions

SYMM
C̶L

3.00
2.80

A

5   4

B

3.00
2.60

1.70
1.50

(0.30)

1   2   3

0.95

0.50
0.30

1.90

⊕ |0.20 Ⓜ| C | A | B

TOP VIEW

0.95 — C̶L — 0.95

2.60

1.00

0.70

LAND PATTERN RECOMMENDATION

SEE DETAIL A

1.30
0.90

1.45 MAX

0.15
0.05

C

⌒ | 0.10 | C

0.22
0.08

NOTES: UNLESS OTHEWISE SPECIFIED

A) THIS PACKAGE CONFORMS TO JEDEC
    MO-178, ISSUE B, VARIATION AA,
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) MA05Brev5

GAGE PLANE

0.25

8°
0°

0.55
0.35

0.60 REF

SEATING PLANE

Figure 7. 5-Lead SOT23, JEDEC MO-178 1.6 mm

Package drawings are provided as a service to customers considering ON Semiconductor components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a ON Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of ON Semiconductor's worldwide terms and conditions, specifically the warranty therein, which covers ON Semiconductor products.

Tape and Reel Specifications

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
M5X	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed

Physical Dimensions

SYMM
₵

2.00±0.20 [A]

5   4   [B]

1.25±0.10

1   3

(0.25)   0.30
0.15

[0.65]

[⊕ | 0.10 (M) | A | B]

[1.30]

0.65

0.50 MIN

1.90

1.30

0.40 MIN

LAND PATTERN RECOMMENDATION

1.00
0.80

1.10
0.80

[C]   0.10
0.00   [⌒ | 0.10 | C]

SEATING
PLANE

SEE DETAIL A

(0.43)

2.10±0.30

GAGE
PLANE

(R0.10)

[0.20]

0.25
0.10

0.46
0.26   30°
0°

DETAIL A
SCALE: 2X

NOTES: UNLESS OTHERWISE SPECIFIED

A) THIS PACKAGE CONFORMS TO EIAJ
    SC-88A, 1996.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE BURRS
    OR MOLD FLASH.

MAA05AREV5

Figure 8. 5-Lead, SC70, EIAJ SC-88a, 1.25 mm Wide

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Tape and Reel Specifications

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
P5X	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed

Physical Dimensions

Figure 9. 6-Lead, MicroPak™, 1.0 mm Wide
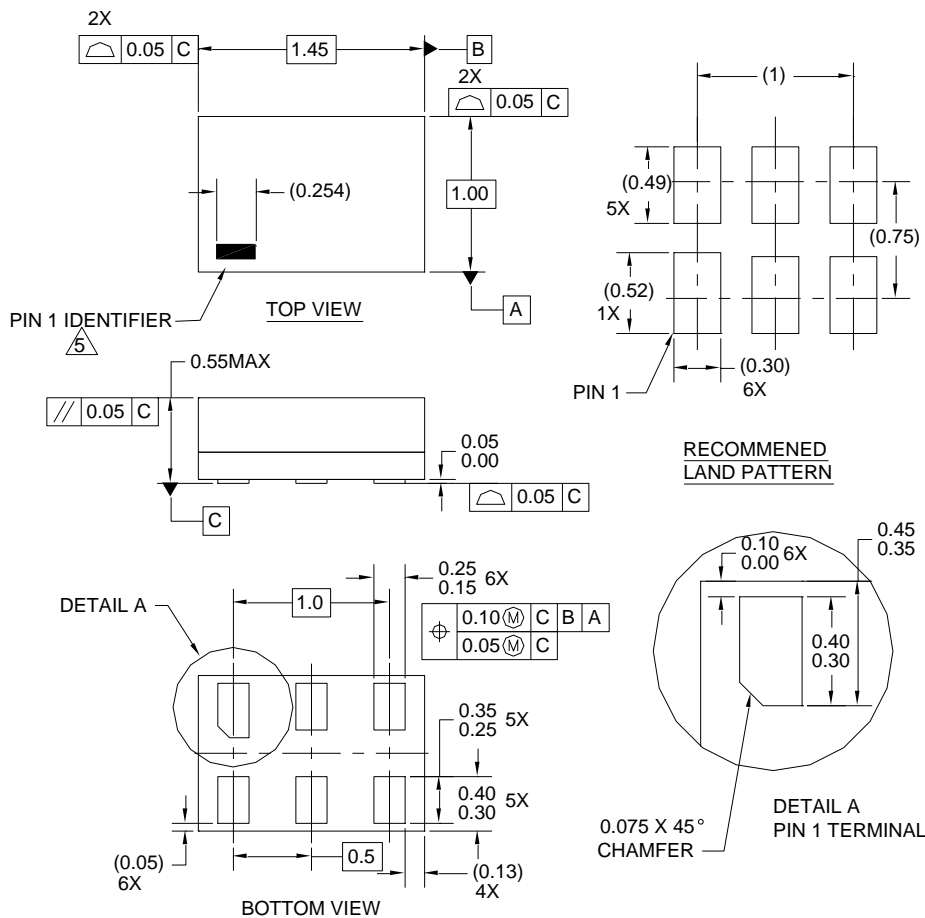
Notes:

1. CONFORMS TO JEDEC STANDARD M0-252 VARIATION UAAD
2. DIMENSIONS ARE IN MILLIMETERS
3. DRAWING CONFORMS TO ASME Y14.5M-1994
4. FILENAME AND REVISION: MAC06AREV4
5. PIN ONE IDENTIFIER IS 2X LENGTH OF ANY OTHER LINE IN THE MARK CODE LAYOUT.

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Tape and Reel Specifications

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
L6X	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed

Physical Dimensions

TOP VIEW

SIDE VIEW

DETAIL A

BOTTOM VIEW

RECOMMENDED LAND PATTERN
FOR SPACE CONSTRAINED PCB

ALTERNATIVE LAND PATTERN
FOR UNIVERSAL APPLICATION

PIN 1
MIN 250uM

0.075X45°
CHAMFER

DETAIL A
PIN 1 LEAD SCALE: 2X

NOTES:

A. COMPLIES TO JEDEC MO-252 STANDARD
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009
D. LANDPATTERN RECOMMENDATION IS BASED ON FSC
   DESIGN.
E. DRAWING FILENAME AND REVISION: MGF06AREV4
F) ON SEMICONDUCTOR
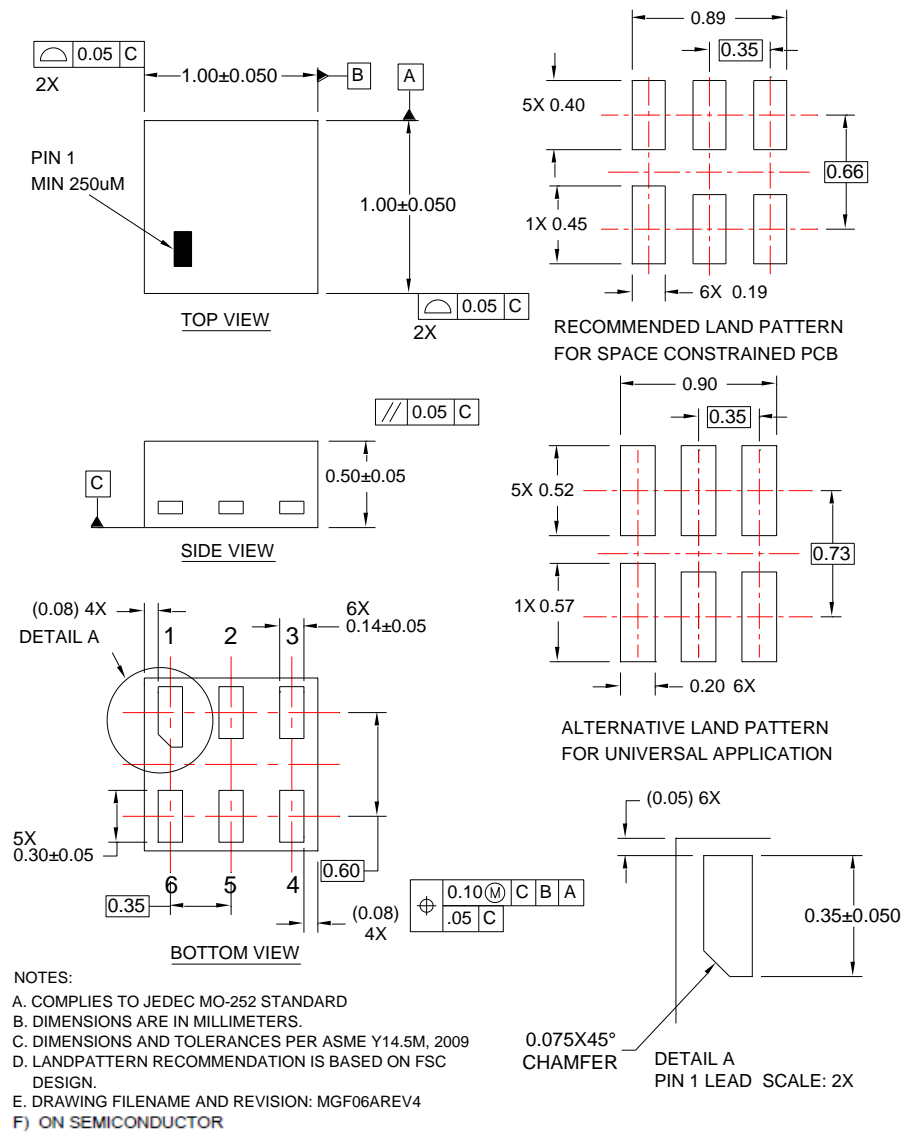
Figure 10. 6-Lead, MicroPak2, 1x1 mm Body, .35 mm Pitch

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Tape and Reel Specifications

Package Designator	Tape Section	Cavity Number	Cavity Status	Cover Type Status
FHX	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

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