



November 2006



## FXL2TD245

# Low Voltage Dual Supply 2-Bit Signal Translator with Configurable Voltage Supplies and Signal Levels and 3-STATE Outputs and Independent Direction Controls

### General Description

The FXL2TD245 is a configurable dual-voltage-supply translator designed for both uni-directional and bi-directional voltage translation between two logic levels. The device allows translation between voltages as high as 3.6V to as low as 1.1V. The A Port tracks the  $V_{CCA}$  level, and the B Port tracks the  $V_{CCB}$  level. This allows for bi-directional voltage translation over a variety of voltage levels: 1.2V, 1.5V, 1.8V, 2.5V, and 3.3V.

The device remains in 3-STATE until both  $V_{CCS}$  reach active levels allowing either  $V_{CC}$  to be powered-up first. Internal power down control circuits place the device in 3-STATE if either  $V_{CC}$  is removed.

The Transmit/Receive inputs independently determine the direction of data through each of the two bits. The  $\overline{OE}$  input, when HIGH, disables both the A and B Ports by placing them in a 3-STATE condition. The FXL2TD245 is designed so that the control pins ( $T/\overline{R}$  and  $\overline{OE}$ ) are supplied by  $V_{CCA}$ .

### Features

- Bi-directional interface between any 2 levels from 1.1V to 3.6V
- Fully configurable: Inputs track  $V_{CC}$  level
- Non-preferential power-up sequencing; either  $V_{CC}$  may be powered-up first
- Outputs remain in 3-STATE until active  $V_{CC}$  level is reached
- Outputs switch to 3-STATE if either  $V_{CC}$  is at GND
- Power-off protection
- Control inputs ( $T/\overline{R}_n$ ,  $\overline{OE}$ ) levels are referenced to  $V_{CCA}$  voltage
- Packaged in the Chipscale MicroPak10 (1.6mm x 2.1mm)
- ESD protections exceeds:
  - 4kV HBM ESD (per JESD22-A114 & Mil Std 883e 3015.7)
  - 8kV HBM I/O to GND ESD (per JESD22-A114 & Mil Std 883e 3015.7)
  - 1kV CDM ESD (per ESD STM 5.3)
  - 200V MM ESD (per JESD22-A115 & ESD STM5.2)

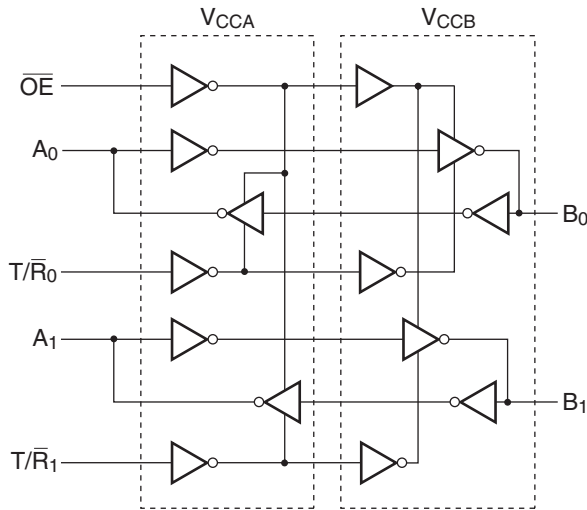
### Ordering Information

Order Number	Package Number	Pb-Free	Package Description
FXL2TD245L10X	MAC010A	Yes	10-Lead MicroPak, 1.6mm x 2.1mm

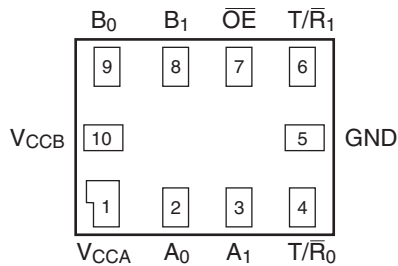
Pb-Free package per JEDEC J-STD-020B.

FXL2TD245 Low Voltage Dual Supply 2-Bit Signal Translator with Configurable Voltage Supplies and Signal Levels and 3-STATE Outputs and Independent Direction Controls

## Functional Diagram



## Connection Diagram



(Top View)

## Pin Assignment

Pin Number	Terminal Name
1	$V_{CCA}$
2	$A_0$
3	$A_1$
4	$T/\bar{R}_0$
5	GND
6	$T/\bar{R}_1$
7	$\overline{OE}$
8	$B_1$
9	$B_0$
10	$V_{CCB}$

## Pin Descriptions

Pin Names	Description
$\overline{OE}$	Output Enable Input
$T/\bar{R}_n$	Transmit/Receive Inputs
$A_n$	Side A Inputs or 3-STATE Outputs
$B_n$	Side B Inputs or 3-STATE Outputs
$V_{CCA}$	Side A Power Supply
$V_{CCB}$	Side B Power Supply

## Truth Table

Inputs			Outputs
$\overline{OE}$	$T/\bar{R}_0$	$T/\bar{R}_1$	
L	L	X	$B_0$ Data to $A_0$ Output
L	H	X	$A_0$ Data to $B_0$ Output
L	X	L	$B_1$ Data to $A_1$ Output
L	X	H	$A_1$ Data to $B_1$ Output
H	X	X	3-STATE

H = HIGH Voltage Level

L = LOW Voltage Level

X = Don't Care

## Power-Up/Power-Down Sequencing

FXL translators offer an advantage in that either  $V_{CC}$  may be powered up first. This benefit derives from the chip design. When either  $V_{CC}$  is at 0 volts, outputs are in a HIGH-Impedance state. The control inputs ( $T/\bar{R}_n$  and  $\overline{OE}$ ) are designed to track the  $V_{CCA}$  supply. A pull-up resistor tying  $\overline{OE}$  to  $V_{CCA}$  should be used to ensure that bus contention, excessive currents, or oscillations do not occur during power-up/power-down. The size of the pull-up resistor is based upon the current-sinking capability of the  $\overline{OE}$  driver.

The recommended power-up sequence is the following:

1. Apply power to either  $V_{CC}$ .
2. Apply power to the  $T/\bar{R}_n$  inputs (Logic HIGH for A-to-B operation; Logic LOW for B-to-A operation) and to the respective data inputs (A Port or B Port). This may occur at the same time as Step 1.
3. Apply power to other  $V_{CC}$ .
4. Drive the  $\overline{OE}$  input LOW to enable the device.

The recommended power-down sequence is the following:

1. Drive  $\overline{OE}$  input HIGH to disable the device.
2. Remove power from either  $V_{CC}$ .
3. Remove power from other  $V_{CC}$ .

## 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 will define the conditions for actual device operation.

Symbol	Parameter	Rating
$V_{CCA}, V_{CCB}$	Supply Voltage	-0.5V to +4.6V
$V_I$	DC Input Voltage I/O Port A I/O Port B Control Inputs ( $T/\bar{R}_n, \bar{OE}$ )	-0.5V to +4.6V -0.5V to +4.6V -0.5V to +4.6V
$V_O$	Output Voltage <sup>(1)</sup> Outputs 3-STATE Outputs Active ( $A_n$ ) Outputs Active ( $B_n$ )	-0.5V to +4.6V -0.5V to $V_{CCA} + 0.5V$ -0.5V to $V_{CCB} + 0.5V$
$I_{IK}$	DC Input Diode Current @ $V_I < 0V$	-50mA
$I_{OK}$	DC Output Diode Current @ $V_O < 0V$ $V_O > V_{CC}$	-50mA +50mA
$I_{OH}/I_{OL}$	DC Output Source/Sink Current	-50mA / +50mA
$I_{CC}$	DC $V_{CC}$ or Ground Current per Supply Pin	$\pm 100mA$
$T_{STG}$	Storage Temperature Range	-65°C to +150°C

## Recommended Operating Conditions<sup>(2)</sup>

Symbol	Parameter	Rating
$V_{CCA}$ or $V_{CCB}$	Power Supply Operating	1.1V to 3.6V
	Input Voltage Port A Port B Control Inputs ( $T/\bar{R}_n, \bar{OE}$ )	0.0V to 3.6V 0.0V to 3.6V 0.0V to $V_{CCA}$
	Output Current in $I_{OH}/I_{OL}$ with $V_{CC}$ @ 3.0V to 3.6V 2.3V to 2.7V 1.65V to 1.95V 1.4V to 1.65V 1.1V to 1.4V	$\pm 24mA$ $\pm 18mA$ $\pm 6mA$ $\pm 2mA$ $\pm 0.5mA$
$T_A$	Free Air Operating Temperature	-40°C to +85°C
$\Delta t/\Delta V$	Maximum Input Edge Rate $V_{CCA/B} = 1.1V$ to 3.6V	10ns/V

### Notes:

- $I_O$  Absolute Maximum Rating must be observed.
- All unused inputs and input/output pins must be held at  $V_{CC1}$  or GND.

### DC Electrical Characteristics

Symbol	Parameter	Conditions	V <sub>CCI</sub> (V)	V <sub>CC0</sub> (V)	Min.	Max.	Units
V <sub>IH</sub>	High Level Input Voltage <sup>(3)</sup>	Data Inputs A <sub>n</sub> , B <sub>n</sub>	2.7–3.6	1.1–3.6	2.0		V
			2.3–2.7		1.6		
			1.65–2.3		0.65 x V <sub>CCI</sub>		
			1.4–1.65		0.65 x V <sub>CCI</sub>		
			1.1–1.4		0.9 x V <sub>CCI</sub>		
		Control Pins $\overline{OE}$ , T/ $\overline{R}_n$ (Referenced to V <sub>CCA</sub> )	2.7–3.6	1.1–3.6	2.0		
			2.3–2.7		1.6		
			1.65–2.3		0.65 x V <sub>CCA</sub>		
			1.4–1.65		0.65 x V <sub>CCA</sub>		
			1.1–1.4		0.9 x V <sub>CCA</sub>		
V <sub>IL</sub>	Low Level Input Voltage <sup>(3)</sup>	Data Inputs A <sub>n</sub> , B <sub>n</sub>	2.7–3.6	1.1–3.6		0.8	V
			2.3–2.7			0.7	
			1.65–2.3			0.35 x V <sub>CCI</sub>	
			1.4–1.65			0.35 x V <sub>CCI</sub>	
			1.1–1.4			0.1 x V <sub>CCI</sub>	
		Control Pins $\overline{OE}$ , T/ $\overline{R}_n$ (Referenced to V <sub>CCA</sub> )	2.7–3.6	1.1–3.6		0.8	
			2.3–2.7			0.7	
			1.65–2.3			0.35 x V <sub>CCA</sub>	
			1.4–1.65			0.35 x V <sub>CCA</sub>	
			1.1–1.4			0.1 x V <sub>CCA</sub>	
V <sub>OH</sub>	High Level Output Voltage <sup>(4)</sup>	I <sub>OH</sub> = -100μA	1.1–3.6	1.1–3.6	V <sub>CC0</sub> -0.2		V
		I <sub>OH</sub> = -12mA	2.7	2.7	2.2		
		I <sub>OH</sub> = -18mA	3.0	3.0	2.4		
		I <sub>OH</sub> = -24mA	3.0	3.0	2.2		
		I <sub>OH</sub> = -6mA	2.3	2.3	2.0		
		I <sub>OH</sub> = -12mA	2.3	2.3	1.8		
		I <sub>OH</sub> = -18mA	2.3	2.3	1.7		
		I <sub>OH</sub> = -6mA	1.65	1.65	1.25		
		I <sub>OH</sub> = -2mA	1.4	1.4	1.05		
		I <sub>OH</sub> = -0.5mA	1.1	1.1	0.75 x V <sub>CC0</sub>		
V <sub>OL</sub>	Low Level Output Voltage <sup>(4)</sup>	I <sub>OL</sub> = 100μA	1.1–3.6	1.1–3.6		0.2	V
		I <sub>OL</sub> = 12mA	2.7	2.7		0.4	
		I <sub>OL</sub> = 18mA	3.0	3.0		0.4	
		I <sub>OL</sub> = 24mA	3.0	3.0		0.55	
		I <sub>OL</sub> = 12mA	2.3	2.3		0.4	
		I <sub>OL</sub> = 18mA	2.3	2.3		0.6	
		I <sub>OL</sub> = 6mA	1.65	1.65		0.3	
		I <sub>OL</sub> = 2mA	1.4	1.4		0.35	
		I <sub>OL</sub> = 0.5mA	1.1	1.1		0.3 x V <sub>CC0</sub>	
I <sub>I</sub>	Input Leakage Current Control Pins	V <sub>I</sub> = V <sub>CCA</sub> or GND	1.1–3.6	3.6		±1.0	μA

**DC Electrical Characteristics** (Continued)

Symbol	Parameter	Conditions	V <sub>CCI</sub> (V)	V <sub>CCO</sub> (V)	Min.	Max.	Units
I <sub>OFF</sub>	Power Off Leakage Current	A <sub>n</sub> , V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V	0	3.6		±10.0	μA
		B <sub>n</sub> , V <sub>I</sub> or V <sub>O</sub> = 0V to 3.6V	3.6	0		±10.0	
I <sub>OZ</sub>	3-STATE Output Leakage <sup>(5)</sup> 0 ≤ V <sub>O</sub> ≤ 3.6V V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	A <sub>n</sub> , B <sub>n</sub> $\overline{OE} = V_{IH}$	3.6	3.6		±10.0	μA
		B <sub>n</sub> , $\overline{OE} = \text{Don't Care}$	0	3.6		+10.0	
		A <sub>n</sub> , $\overline{OE} = \text{Don't Care}$	3.6	0		+10.0	
I <sub>CCA/B</sub>	Quiescent Supply Current <sup>(6)</sup>	V <sub>I</sub> = V <sub>CCI</sub> or GND; I <sub>O</sub> = 0	1.1–3.6	1.1–3.6		20.0	μA
I <sub>CCZ</sub>	Quiescent Supply Current <sup>(6)</sup>	V <sub>I</sub> = V <sub>CCI</sub> or GND; I <sub>O</sub> = 0	1.1–3.6	1.1–3.6		20.0	μA
I <sub>CCA</sub>	Quiescent Supply Current	V <sub>I</sub> = V <sub>CCA</sub> or GND; I <sub>O</sub> = 0	0	1.1–3.6		-10.0	μA
		V <sub>I</sub> = V <sub>CCA</sub> or GND; I <sub>O</sub> = 0	1.1–3.6	0		10.0	μA
I <sub>CCB</sub>	Quiescent Supply Current	V <sub>I</sub> = V <sub>CCB</sub> or GND; I <sub>O</sub> = 0	1.1–3.6	0		-10.0	μA
		V <sub>I</sub> = V <sub>CCB</sub> or GND; I <sub>O</sub> = 0	0	1.1–3.6		10.0	μA
ΔI <sub>CCA/B</sub>	Increase in I <sub>CC</sub> per Input; Other Inputs at V <sub>CC</sub> or GND	V <sub>IH</sub> = 3.0	3.6	3.6		500	μA

**Notes:**

3. V<sub>CCI</sub> = the V<sub>CC</sub> associated with the data input under test.
4. V<sub>CCO</sub> = the V<sub>CC</sub> associated with the output under test.
5. Don't Care = Any valid logic level.
6. Reflects current per supply, V<sub>CCA</sub> or V<sub>CCB</sub>.

## AC Electrical Characteristics

$V_{CCA} = 3.0V \text{ to } 3.6V$

Symbol	Parameter	$T_A = -40^\circ C \text{ to } +85^\circ C$										Units
		$V_{CCB} = 3.0V \text{ to } 3.6V$		$V_{CCB} = 2.3V \text{ to } 2.7V$		$V_{CCB} = 1.65V \text{ to } 1.95V$		$V_{CCB} = 1.4V \text{ to } 1.6V$		$V_{CCB} = 1.1V \text{ to } 1.3V$		
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
$t_{PLH}, t_{PHL}$	Propagation Delay A to B	0.2	3.5	0.3	3.9	0.5	5.4	0.6	6.8	1.4	22.0	ns
	Propagation Delay B to A	0.2	3.5	0.2	3.8	0.3	4.0	0.5	4.3	0.8	13.0	
$t_{PZH}, t_{PZL}$	Output Enable $\overline{OE}$ to B	0.5	4.0	0.7	4.4	1.0	5.9	1.0	6.4	1.5	17.0	ns
	Output Enable $\overline{OE}$ to A	0.5	4.0	0.5	4.0	0.5	4.0	0.5	4.0	0.5	4.0	
$t_{PHZ}, t_{PLZ}$	Output Disable $\overline{OE}$ to B	0.2	3.8	0.2	4.0	0.7	4.8	1.5	6.2	2.0	17.0	ns
	Output Disable $\overline{OE}$ to A	0.2	3.7	0.2	3.7	0.2	3.7	0.2	3.7	0.2	3.7	

$V_{CCA} = 2.3V \text{ to } 2.7V$

Symbol	Parameter	$T_A = -40^\circ C \text{ to } +85^\circ C$										Units
		$V_{CCB} = 3.0V \text{ to } 3.6V$		$V_{CCB} = 2.3V \text{ to } 2.7V$		$V_{CCB} = 1.65V \text{ to } 1.95V$		$V_{CCB} = 1.4V \text{ to } 1.6V$		$V_{CCB} = 1.1V \text{ to } 1.3V$		
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
$t_{PLH}, t_{PHL}$	Propagation Delay A to B	0.2	3.8	0.4	4.2	0.5	5.6	0.8	6.9	1.4	22.0	ns
	Propagation Delay B to A	0.3	3.9	0.4	4.2	0.5	4.5	0.5	4.8	1.0	7.0	
$t_{PZH}, t_{PZL}$	Output Enable $\overline{OE}$ to B	0.6	4.2	0.8	4.6	1.0	6.0	1.0	6.8	1.5	17.0	ns
	Output Enable $\overline{OE}$ to A	0.6	4.5	0.6	4.5	0.6	4.5	0.6	4.5	0.6	4.5	
$t_{PHZ}, t_{PLZ}$	Output Disable $\overline{OE}$ to B	0.2	4.1	0.2	4.3	0.7	4.8	1.5	6.7	2.0	17.0	ns
	Output Disable $\overline{OE}$ to A	0.2	4.0	0.2	4.0	0.2	4.0	0.2	4.0	0.2	4.0	

$V_{CCA} = 1.65V \text{ to } 1.95V$

Symbol	Parameter	$T_A = -40^\circ C \text{ to } +85^\circ C$										Units
		$V_{CCB} = 3.0V \text{ to } 3.6V$		$V_{CCB} = 2.3V \text{ to } 2.7V$		$V_{CCB} = 1.65V \text{ to } 1.95V$		$V_{CCB} = 1.4V \text{ to } 1.6V$		$V_{CCB} = 1.1V \text{ to } 1.3V$		
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
$t_{PLH}, t_{PHL}$	Propagation Delay A to B	0.3	4.0	0.5	4.5	0.8	5.7	0.9	7.1	1.5	22.0	ns
	Propagation Delay B to A	0.5	5.4	0.5	5.6	0.8	5.7	1.0	6.0	1.2	8.0	
$t_{PZH}, t_{PZL}$	Output Enable $\overline{OE}$ to B	0.6	5.2	0.8	5.4	1.2	6.9	1.2	7.2	1.5	18.0	ns
	Output Enable $\overline{OE}$ to A	1.0	6.7	1.0	6.7	1.0	6.7	1.0	6.7	1.0	6.7	
$t_{PHZ}, t_{PLZ}$	Output Disable $\overline{OE}$ to B	0.2	5.1	0.2	5.2	0.8	5.2	1.5	7.0	2.0	17.0	ns
	Output Disable $\overline{OE}$ to A	0.5	5.0	0.5	5.0	0.5	5.0	0.5	5.0	0.5	5.0	

## AC Electrical Characteristics (Continued)

$V_{CCA} = 1.4V$  to  $1.6V$

Symbol	Parameter	$T_A = -40^\circ C$ to $+85^\circ C$										Units
		$V_{CCB} = 3.0V$ to $3.6V$		$V_{CCB} = 2.3V$ to $2.7V$		$V_{CCB} = 1.65V$ to $1.95V$		$V_{CCB} = 1.4V$ to $1.6V$		$V_{CCB} = 1.1V$ to $1.3V$		
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
$t_{PLH}, t_{PHL}$	Propagation Delay A to B	0.5	4.3	0.5	4.8	1.0	6.0	1.0	7.3	1.5	22.0	ns
	Propagation Delay B to A	0.6	6.8	0.8	6.9	0.9	7.1	1.0	7.3	1.3	9.5	
$t_{PZH}, t_{PZL}$	Output Enable $\overline{OE}$ to B	1.1	7.5	1.1	7.6	1.3	7.7	1.4	7.9	2.0	20.0	ns
	Output Enable $\overline{OE}$ to A	1.0	7.5	1.0	7.5	1.0	7.5	1.0	7.5	1.0	7.5	
$t_{PHZ}, t_{PLZ}$	Output Disable $\overline{OE}$ to B	0.4	6.1	0.4	6.2	0.9	6.2	1.5	7.5	2.0	18.0	ns
	Output Disable $\overline{OE}$ to A	1.0	6.0	1.0	6.0	1.0	6.0	1.0	6.0	1.0	6.0	

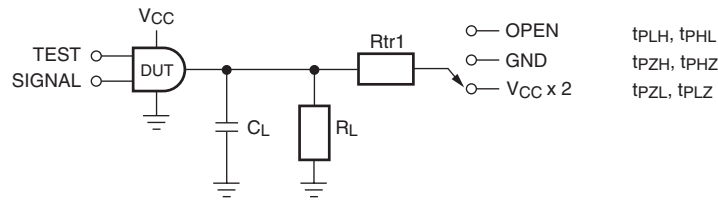
$V_{CCA} = 1.1V$  to  $1.3V$

Symbol	Parameter	$T_A = -40^\circ C$ to $+85^\circ C$										Units
		$V_{CCB} = 3.0V$ to $3.6V$		$V_{CCB} = 2.3V$ to $2.7V$		$V_{CCB} = 1.65V$ to $1.95V$		$V_{CCB} = 1.4V$ to $1.6V$		$V_{CCB} = 1.1V$ to $1.3V$		
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
$t_{PLH}, t_{PHL}$	Propagation Delay A to B	0.8	13.0	1.0	7.0	1.2	8.0	1.3	9.5	2.0	24.0	ns
	Propagation Delay B to A	1.4	22.0	1.4	22.0	1.5	22.0	1.5	22.0	2.0	24.0	
$t_{PZH}, t_{PZL}$	Output Enable $\overline{OE}$ to B	1.0	12.0	1.0	9.0	2.0	10.0	2.0	11.0	2.0	24.0	ns
	Output Enable $\overline{OE}$ to A	2.0	22.0	2.0	22.0	2.0	22.0	2.0	22.0	2.0	22.0	
$t_{PHZ}, t_{PLZ}$	Output Disable $\overline{OE}$ to B	1.0	15.0	0.7	7.0	1.0	8.0	2.0	10.0	2.0	20.0	ns
	Output Disable $\overline{OE}$ to A	2.0	15.0	2.0	12.0	2.0	12.0	2.0	12.0	2.0	12.0	

## Capacitance

Symbol	Parameter	Conditions	$T_A = +25^\circ C$	Units
			Typical	
$C_{IN}$	Input Capacitance Control Pins ( $\overline{OE}$ , $T/\overline{Rn}$ )	$V_{CCA} = V_{CCB} = 3.3V, V_I = 0V$ or $V_{CCA/B}$	4.0	pF
$C_{I/O}$	Input/Output Capacitance $A_n, B_n$ Ports	$V_{CCA} = V_{CCB} = 3.3V, V_I = 0V$ or $V_{CCA/B}$	5.0	pF
$C_{PD}$	Power Dissipation Capacitance	$V_{CCA} = V_{CCB} = 3.3V, V_I = 0V$ or $V_{CC}$ , $F = 10MHz$	20.0	pF

## AC Loading and Waveforms

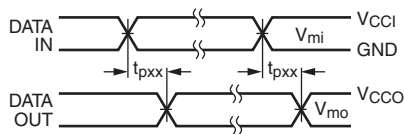


Test	Switch
$t_{PLH}$ , $t_{PHL}$	OPEN
$t_{PLZ}$ , $t_{PZL}$	$V_{CCO} \times 2$ at $V_{CCO} = 3.3 \pm 0.3V, 2.5V \pm 0.2V, 1.8V \pm 0.15V, 1.5V \pm 0.1V, 1.2V \pm 0.1V$
$t_{PHZ}$ , $t_{PZH}$	GND

Figure 1. AC Test Circuit

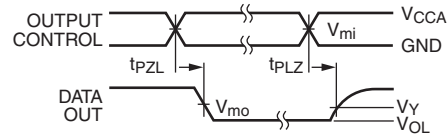
### AC Load Table

$V_{CCO}$	$C_L$	$R_L$	$R_{tr1}$
$1.2V \pm 0.1V$	15pF	2k $\Omega$	2k $\Omega$
$1.5V \pm 0.1V$	15pF	2k $\Omega$	2k $\Omega$
$1.8V \pm 0.15V$	15pF	2k $\Omega$	2k $\Omega$
$2.5V \pm 0.2V$	15pF	2k $\Omega$	2k $\Omega$
$3.3V \pm 0.3V$	15pF	2k $\Omega$	2k $\Omega$



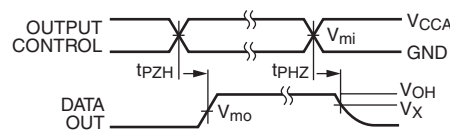
Input  $t_R = t_F = 2.0$  ns, 10% to 90%  
 Input  $t_R = t_F = 2.5$ ns, 10% to 90%, @  $V_I = 3.0V$  to  $3.6V$  only

Figure 2. Waveform for Inverting and Non-Inverting Functions



Input  $t_R = t_F = 2.0$  ns, 10% to 90%  
 Input  $t_R = t_F = 2.5$ ns, 10% to 90%, @  $V_I = 3.0V$  to  $3.6V$  only

Figure 3. 3-STATE Output Low Enable and Disable Times for Low Voltage Logic



Input  $t_R = t_F = 2.0$  ns, 10% to 90%  
 Input  $t_R = t_F = 2.5$ ns, 10% to 90%, @  $V_I = 3.0V$  to  $3.6V$  only

Figure 4. 3-STATE Output High Enable and Disable Times for Low Voltage Logic

Symbol	$V_{CC}$				
	$3.3V \pm 0.3V$	$2.5V \pm 0.2V$	$1.8V \pm 0.15V$	$1.5V \pm 0.1V$	$1.2V \pm 0.1V$
$V_{mi}$	$V_{CCI}/2$	$V_{CCI}/2$	$V_{CCI}/2$	$V_{CCI}/2$	$V_{CCI}/2$
$V_{mo}$	$V_{CCO}/2$	$V_{CCO}/2$	$V_{CCO}/2$	$V_{CCO}/2$	$V_{CCO}/2$
$V_X$	$V_{OH} - 0.3V$	$V_{OH} - 0.15V$	$V_{OH} - 0.15V$	$V_{OH} - 0.1V$	$V_{OH} - 0.1V$
$V_Y$	$V_{OL} + 0.3V$	$V_{OL} + 0.15V$	$V_{OL} + 0.15V$	$V_{OL} + 0.1V$	$V_{OL} + 0.1V$

For  $V_{mi}$ :  $V_{CCI} = V_{CCA}$  for Control Pins  $\overline{T/R}$  and  $\overline{OE}$ , or  $V_{CCA}/2$

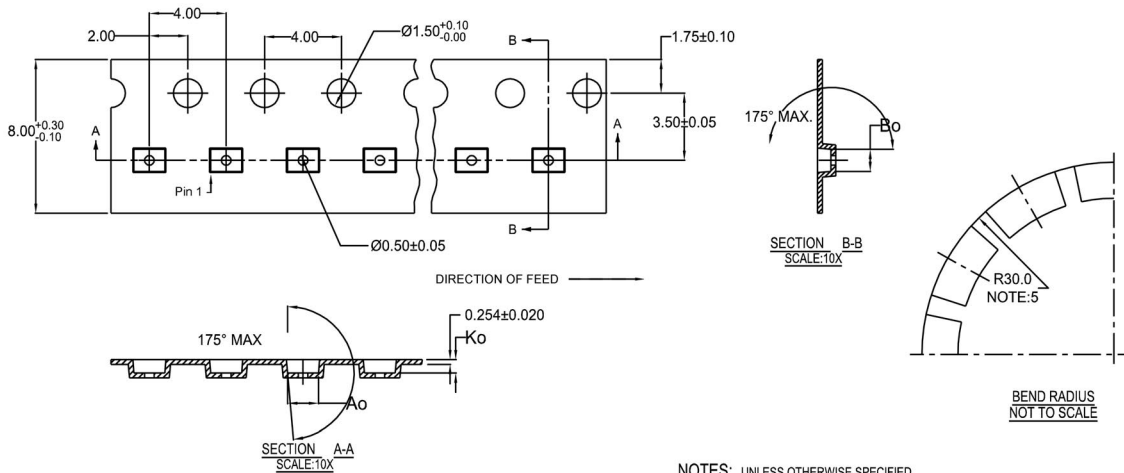


## Tape and Reel Specification

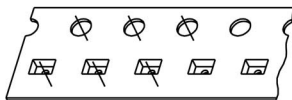
### Tape Format for MicroPak 10

Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
L10X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

### Tape Dimensions inches (millimeters)



10	300056	2.30 ± 0.05	1.78 ± 0.05	0.68 ± 0.05
8	300038	1.78 ± 0.05	1.78 ± 0.05	0.68 ± 0.05
6	300033	1.60 ± 0.05	1.15 ± 0.05	0.70 ± 0.05

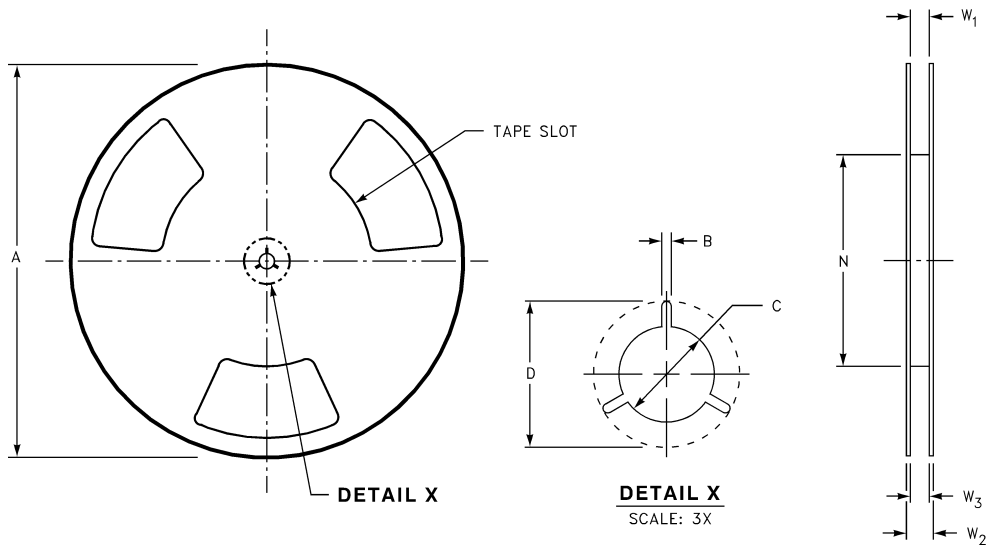


SCALE: 6X

#### NOTES: UNLESS OTHERWISE SPECIFIED

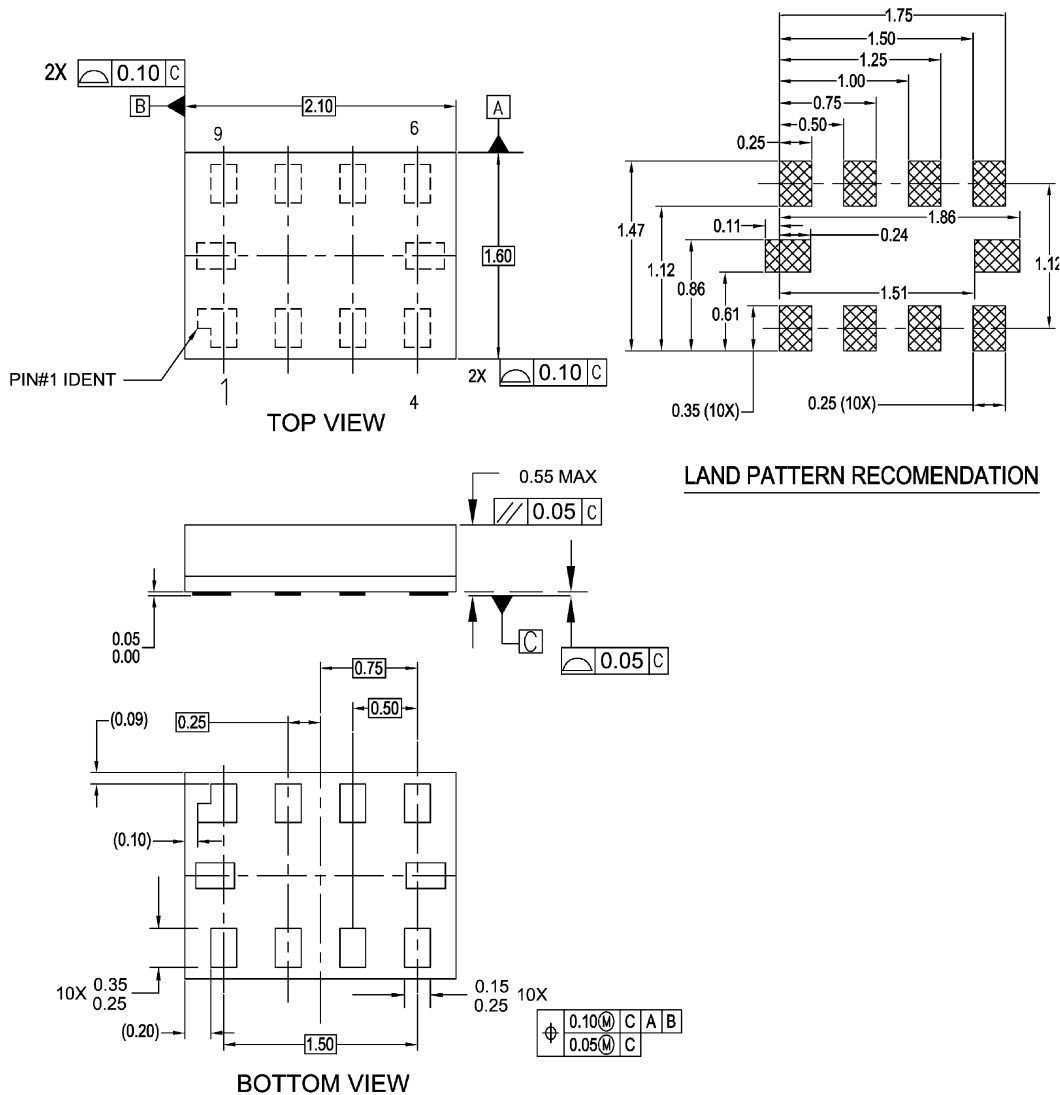
1. ACCUMULATED 50 SPROCKETS, SPROCKET HOLE PITCH IS 200.00 ± 0.30MM
2. NO INDICATED CORNER RADIUS IS 0.127MM
3. CAMBER NOT TO EXCEED 1MM IN 100MM
4. SMALLEST ALLOWABLE BENDING RADIUS
5. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE

**MicroPak 10 Reel Dimensions** inches (millimeters)



Tape Size	A	B	C	D	N	W1	W2	W3
8 mm	7.0 (177.8)	0.059 (1.50)	0.512 (13.00)	0.795 (20.20)	2.165 (55.00)	$0.331 + 0.059/-0.000$ (8.40 + 1.50/-0.00)	0.567 (14.40)	$W1 + 0.078/-0.039W$ (W1 + 2.00/-1.00)

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



**NOTES:**

- A. PACKAGE CONFORMS TO JEDEC MO255, VARIATION UABD
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES CONFORMS TO ASME Y14.5M, 1994.

MAC010ARevC

**Pb-Free 10-Lead MicroPak, 1.6mm x 2.1mm  
Package Number MAC010A**

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Programmable Active Droop™				

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