November 2005
Revised December 2005

FSA3259
Dual SP3T Analog Switch

General Description

The FSA3259 Dual Single Pole Triple Throw (SP3T) analog switch operates from a single 1.65V to 5.5V supply. It features a typical On Resistance (R_{ON}) of <9Ω at a +3.3V supply and 25°C. The device is fabricated with sub-micron CMOS technology to achieve fast switching speeds and is designed for break-before-make operation.

The FSA3259 also features wide-bandwidth (>250Mbz), high Off Isolation and low crosstalk. The dual SP3T configuration allows for maximum design flexibility.

Features

- < 9Ω typical On Resistance (R_{ON}) @ +3.3V
- Ideal for 3:1 Multiplex/Demultiplex cell phone applications
- Broad V_{CC} operating range: 1.65V to 5.5V
- 250MHz – 3dB Bandwidth
- Break-before-make enable circuitry

Applications

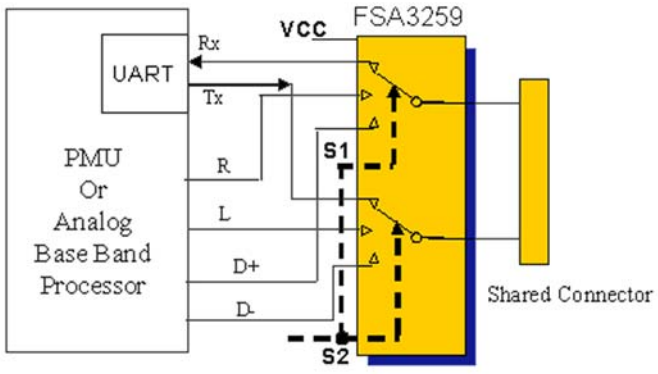
- Cell phone, PDA
- Video
- Multi-port USB

Ordering Code:

Order Number	Package Number	Package Description
FSA3259BQX	MLP016E	Pb-Free 16-Terminal Depopulated Quad Very-Thin Flat Pack No Leads (DQFN), JEDEC MO-241, 2.5 x 3.5mm

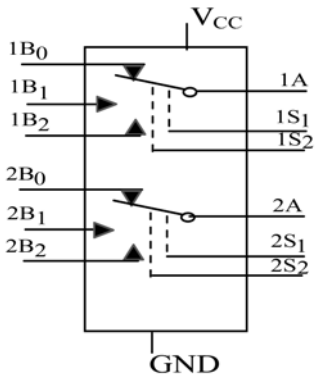
Pb-Free package per JEDEC J-STD-020B.
DQFN package available in Tape and Reel only.

Application Diagram

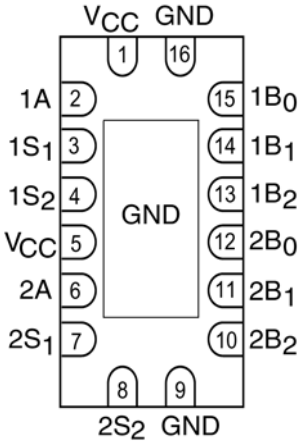


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Analog Symbol



Connection Diagram



(Top Through View)

Pin Descriptions

Pin Name	Description
nA, nB_0, nB_1, nB_2	Data Ports
nS_1, nS_2	Control Inputs

Truth Table

Control Inputs (S_1, S_2)		Function
nS_1	**nS_2**	
L	L	No Connection
H	L	nB_0 Connected to nA
L	H	nB_1 Connected to nA
H	H	nB_2 Connected to nA

H = HIGH Logic Level L = LOW Logic Level

Absolute Maximum Ratings(Note 1)

Supply Voltage (V_{CC})	−0.5V to +7.0V
Switch Voltage (Note 2)	−0.5V to V_{CC} +0.05V
Input Voltage (V_{IN}) (Note 2)	−0.5V to +7.0V
Input Diode Current (I_{IK})	−50 mA
Switch Current	100 mA
Peak Switch Current (Pulsed at 1mS Duration, <10% Duty Cycle)	150mA
Power Dissipation @ 85°C	TBD
Storage Temperature Range (T_{STG})	−65°C to +150°C
Maximum Junction Temperature (T_J)	+150°C
Lead Temperature (T_L) (Soldering, 10 Seconds)	+260°C
ESD	
Human Body Model	5000V
I/O to GND	8000V

Recommended Operating Conditions
(Note 3)

Supply Voltage (V_{CC})	1.65V to 5.5V
Control Input Voltage (V_{IN}) (Note 3)	0V to V_{CC}
Switch Input Voltage	0V to V_{CC}
Operating Temperature	−40°C to 85°C

Note 1: 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 rating. The Recommended Operating Conditions tables will define the conditions for actual device operation.

Note 2: The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.

Note 3: Unused control inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics (All Typical values are @ 25°C unless otherwise specified)

Symbol	Parameter	V_{CC}	T_A = +25°C			T_A = −40 °C to +85 °C		Units	Conditions
		(V)	Min	Typ	Max	Min	Max		
V_{IH}	Input Voltage HIGH	1.65 to 1.95	0.75*V_{CC}			0.75 *V_{CC}		V	
		2.3 to 5.5	0.7*V_{CC}			0.7 *V_{CC}			
V_{IL}	Input Voltage LOW	1.65 to 1.95			0.25*V_{CC}		0.25 *V_{CC}	V	
		2.3 to 5.5			0.3*V_{CC}		0.3 *V_{CC}		
I_{IN}	Control Input Leakage	0 to 5.5	–0.1		0.1	−1.0	1.0	μA	V_{IN} = 0V to 5.5V
$I_{NC(OFF)}$ $I_{NO(OFF)}$	OFF-Leakage Current of Ports nB_0, nB_1, nB_2, and nA	1.65 to 5.5	–0.1		0.1	−1.0	1.0	μA	0 < nA, nB_0, nB_1, nB_2 < V_{CC}
R_{ON}	Switch On Resistance (Note 4)	4.5		5.0	7.0		7.0	Ω	I_{OUT} = 30mA, V_{IN} = 0
				6.0	12.0		12.0		I_{OUT} = −30mA, V_{IN} = 2.4
				7.0	15.0		15.0		I_{OUT} = 30mA, V_{IN} = 4.5
		3.0		6.5	9.0		9.0		I_{OUT} = 24mA, V_{IN} = 0
				9.0	20.0		20.0		I_{OUT} = −24mA, V_{IN} = 3.0
		2.3		8.0	12.0		12.0		I_{OUT} = 8mA, V_{IN} = 0
				11.0	30.0		30.0		I_{OUT} = −8mA, V_{IN} = 2.3
		1.65		10.0	20.0		20.0		I_{OUT} = 4mA, V_{IN} = 0
				17.0	50.0		50.0		I_{OUT} = −4mA, V_{IN} = 1.65
ΔR_{ON}	On Resistance	4.5		0.15				Ω	I_{OUT} = −30mA, nB_0, nB_1, nB_2 = 3.15V
	Matching between	3.0		0.22					I_{OUT} = −24mA, nB_0, nB_1, nB_2 = 2.1V
	Channels	2.3		0.31					I_{OUT} = −8mA, nB_0, nB_1, nB_2 = 1.6V
	(Note 5)	1.65		0.62					I_{OUT} = −4mA, nB_0, nB_1, nB_2 = 1.15V
$R_{FLAT(ON)}$	On Resistance	5.0		6.0				Ω	I_{nA} = −30mA, 0 ≤ nB_0, nB_1, nB_2 ≤ V_{CC}
	Flatness	3.3		12.0					I_{nA} = −24mA, 0 ≤ nB_0, nB_1, nB_2 ≤ V_{CC}
	(Note 6)	2.5		40.0					I_{nA} = −8mA, 0 ≤ nB_0, nB_1, nB_2 ≤ V_{CC}
		1.8		140					I_{nA} = −4mA, 0 ≤ nB_0, nB_1, nB_2 ≤ V_{CC}
I_{CC}	Quiescent Supply Current	5.5		1.0	20.0		20.0	μA	V_{IN} = 0 or V_{CC}, I_{OUT} = 0

Note 4: On Resistance is determined by the voltage drop between A and B pins at the indicated current through the switch.

Note 5: $\Delta R_{ON} = R_{ONmax} - R_{ONmin}$ measured at identical V_{CC}, temperature and voltage.

Note 6: Flatness is defined as the difference between the maximum and minimum value of On Resistance over the specific range of conditions.

AC Electrical Characteristics (All Typical value are @ 25°C unless otherwise specified)

Symbol	Parameter	V_{CC} (V)	$T_A = +25°C$			$T_A = -40°C$ to $+85°C$		Units	Conditions	Figure Number
			Min	Typ	Max	Min	Max			
t_{PLH}	Propagation Delay	1.65 - 1.95		2.0				ns	V_I = Open	Figures 1, 2
t_{PHL}	Bus-to-Bus	2.3 - 2.7		1.1					$R_L = R_{L1} = 500\Omega$,	
		3.0 - 3.6		0.7					C_L = 50pF	
		4.5 - 5.5		0.4						
t_{ON}	Turn ON Time	1.65 - 1.95	5.0		32.0	5.0	34.0	ns	$V_I = 2*V_{CC}$ for t_{PZL}	Figures 1, 2
(t_{PZL}, t_{PZH})	(nA to nB_n)	2.3 - 2.7	3.0		15.0	3.0	16.5		V_I = 0 for t_{PZH}	
		3.0 - 3.6	2.0		9.5	2.0	11.0		$R_L = R_{L1} = 500\Omega$	
		4.5 - 5.5	1.5		6.5	1.5	7.0		C_L = 50pF	
t_{OFF}	Turn OFF Time	1.65 - 1.95	3.0		14.0	3.0	14.5	ns	$V_I = 2*V_{CC}$ for t_{PLZ}	Figures 1, 2
(t_{PLZ}, t_{PHZ})	(nA to nB_n)	2.3 - 2.7	2.0		7.2	2.0	7.8		V_I = 0 for t_{PHZ}	
		3.0 - 3.6	1.5		5.1	1.5	5.5		$R_L = R_{L1} = 500\Omega$	
		4.5 - 5.5	0.8		3.7	0.8	4.0		C_L = 50pF	
t_{B-M}	Break-Before-Make Time	1.65 - 5.5	0.5			0.5		ns	nB_0 or nB_1 = 1.5V, $R_L = 50\Omega$, C_L = 35pF	Figure 3
Q	Charge Injection	5.0		3.0				pC	C_L = 0.1 nF, V_{GEN} = 0V, $R_{GEN} = 0\Omega$	Figure 4
		3.3		2.0						
OIRR	OFF-Isolation	1.65 - 5.5		−58.0				dB	f = 10MHz, $R_L = 50\Omega$	Figure 5
Xtalk	Crosstalk	1.65 - 5.5		−60.0				dB	f = 10MHz, $R_L = 50\Omega$	Figure 6
BW	−3dB Bandwidth	1.65 - 5.5		250				MHz	$R_L = 50\Omega$	Figure 9
THD	Total Harmonic Distortion	5.0		0.01				%	$R_L = 600\Omega$, $V_{IN} = 0.5V_{P-P}$, f = 600Hz to 20kHz	

Capacitance

Symbol	Parameter	V_{CC} (V)	$T_A = +25°C$			$T_A = -40°C$ to $+85°C$		Units	Conditions
			Min	Typ	Max	Min	Max		
C_{IN}	Control Pin (nS_n) Input Capacitance	0		2.0				pF	f = 1MHz (see Figure 7)
C_{OFF}	nB_n Port OFF Capacitance	5.0		3.6				pF	f = 1MHz (see Figure 7)
C_{ON}	nA Port ON Capacitance	5.0		14.5				pF	f = 1MHz (see Figure 8)

AC Loading and Waveforms

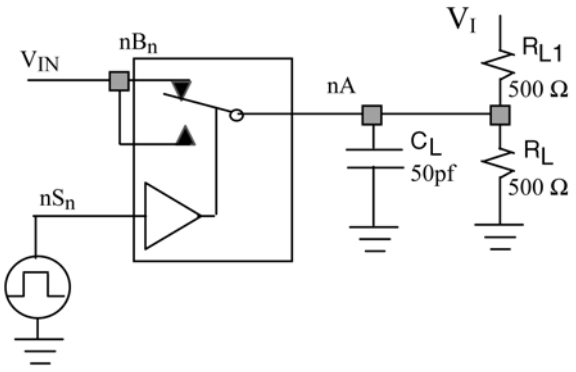


FIGURE 1. AC Test Circuit

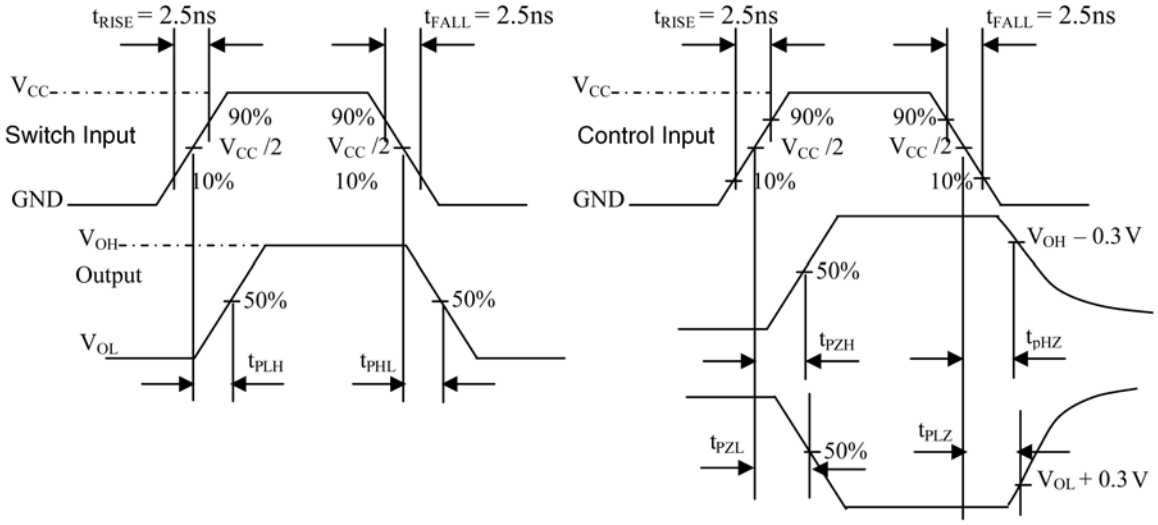


FIGURE 2. AC Waveforms and Measure Points

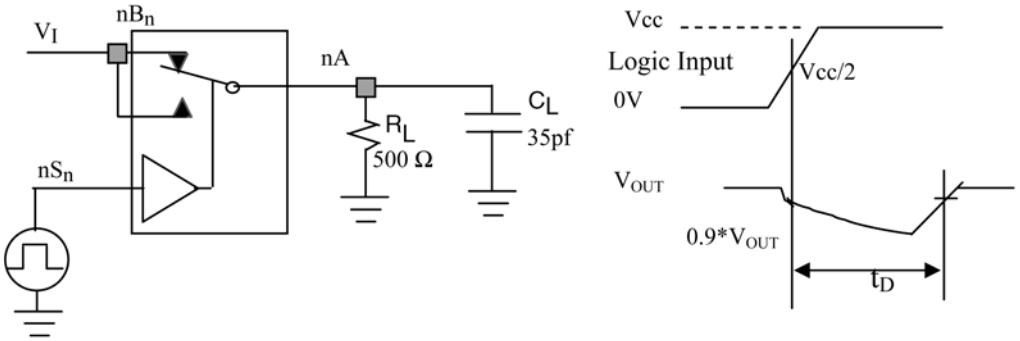


FIGURE 3. Break-Before-Make Interval Timing

AC Loading and Waveforms (continued)

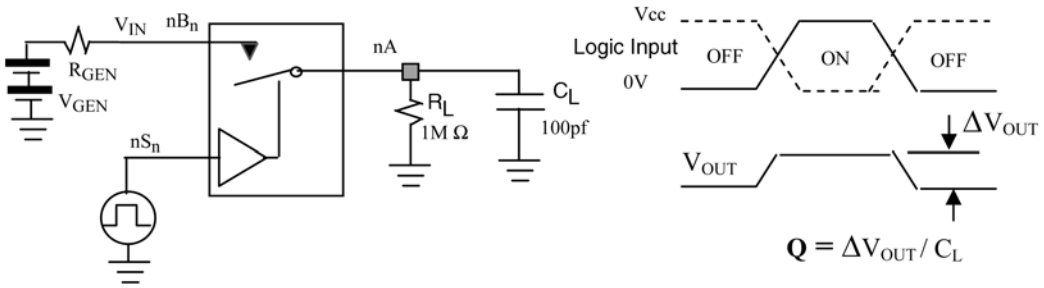


FIGURE 4. Charge Injection Testing

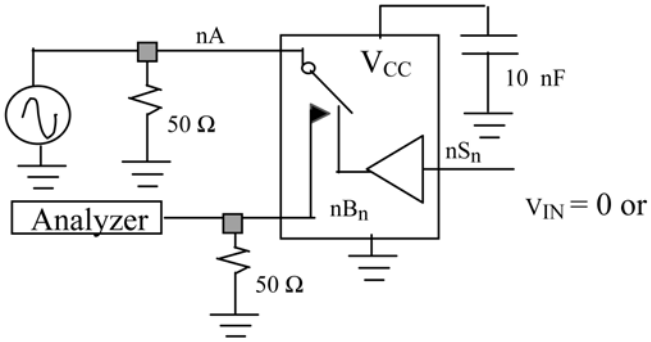


FIGURE 5. OFF Isolation

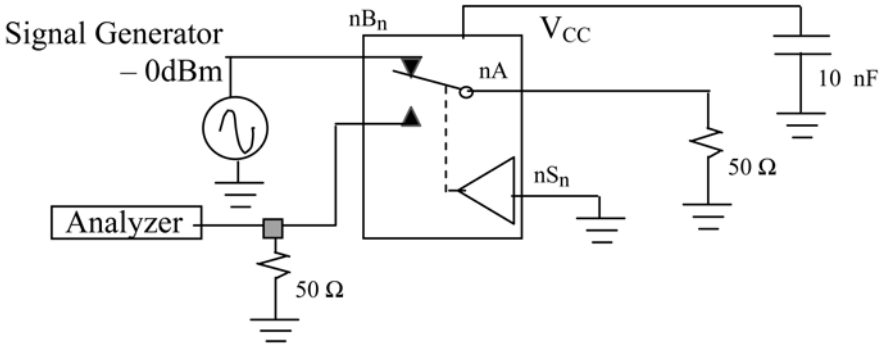


FIGURE 6. Crosstalk

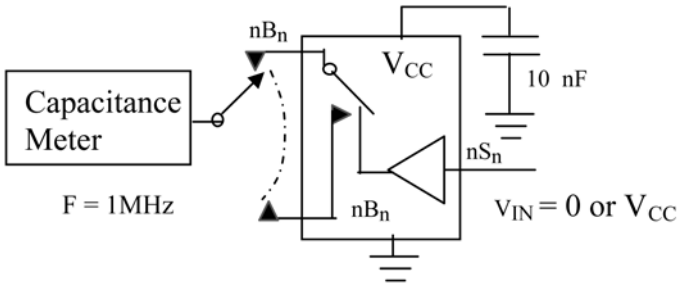


FIGURE 7. Channel OFF Capacitance

AC Loading and Waveforms (continued)

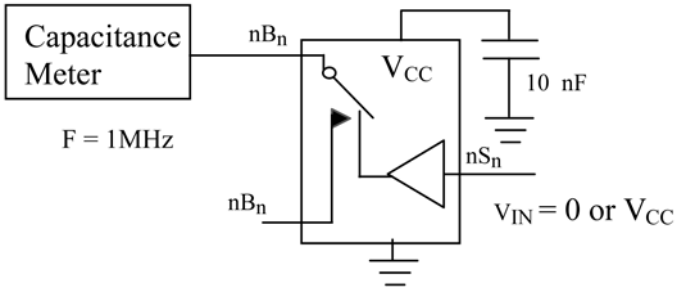


FIGURE 8. Channel ON Capacitance

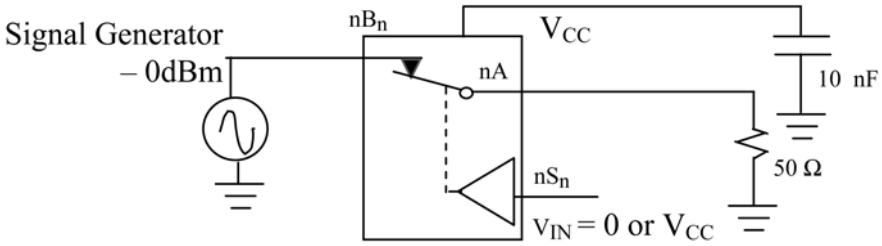


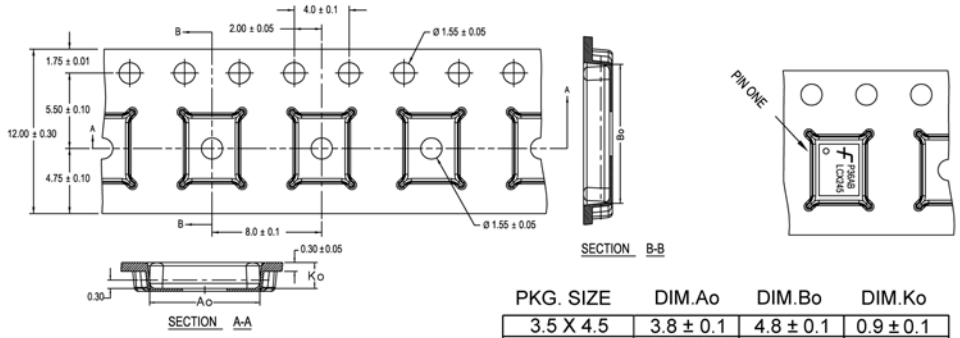
FIGURE 9. Bandwidth

Tape and Reel Specification

Tape Format for DQFN

Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
BQX	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	2500/3000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed

TAPE DIMENSIONS inches (millimeters)



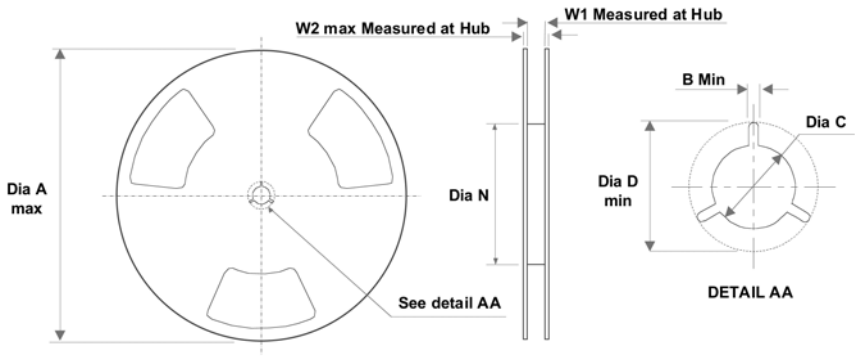
PKG. SIZE	DIM.Ao	DIM.Bo	DIM.Ko
3.5 X 4.5	3.8 ± 0.1	4.8 ± 0.1	0.9 ± 0.1
3.0 X 3.0	3.3 ± 0.1	3.3 ± 0.1	0.9 ± 0.1
2.5 X 4.5	2.8 ± 0.1	4.8 ± 0.1	0.9 ± 0.1
2.5 X 3.5	2.8 ± 0.1	3.8 ± 0.1	0.9 ± 0.1
2.5 X 3.0	2.8 ± 0.1	3.3 ± 0.1	0.9 ± 0.1
2.5 X 2.5	2.8 ± 0.1	2.8 ± 0.1	0.9 ± 0.1

DIMENSIONS ARE IN MILLIMETERS

NOTES: unless otherwise specified

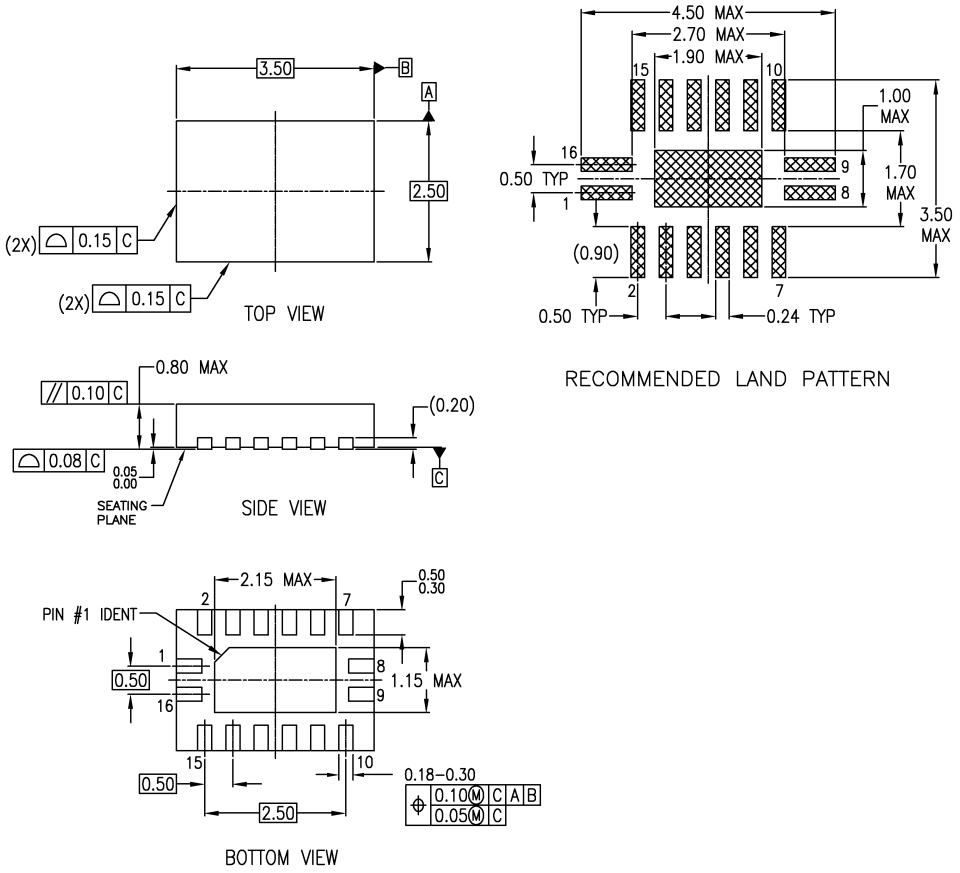
1. Cummulative pitch for feeding holes and cavities (chip pockets) not to exceed 0.008[0.20] over 10 pitch span.
2. Smallest allowable bending radius.
3. Thru hole inside cavity is centered within cavity.
4. Tolerance is ±0.002[0.05] for these dimensions on all 12mm tapes.
5. Ao and Bo measured on a plane 0.120[0.30] above the bottom of the pocket.
6. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
7. Pocket position relative to sprocket hole measured as true position of pocket. Not pocket hole.
8. Controlling dimension is millimeter. Diemension in inches rounded.

REEL DIMENSIONS inches (millimeters)



Tape Size	A	B	C	D	N	W1	W2
12 mm	13.0	0.059	0.512	0.795	7.008	0.488	0.724
	(330)	(1.50)	(13.00)	(20.20)	(178)	(12.4)	(18.4)

Physical Dimensions inches (millimeters) unless otherwise noted



NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO–241, VARIATION AB
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

MLP016ErevA

Pb-Free 16-Terminal Depopulated Quad Very-Thin Flat Pack No Leads (DQFN), JEDEC MO-241, 2.5 x 3.5mm
Package Number MLP016E

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PRODUCT STATUS DEFINITIONS

Definition of terms

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