

# FSA1211 — Low-Power, Twelve-Port, High-Speed Isolation Switch

## Features

- Low  $C_{OFF}$  Capacitance: 2.0 pF Typical
- Low On Resistance: 7.5  $\Omega$  Typical
- Low Power Consumption: 1  $\mu$ A Maximum
- 10 $\mu$ A Maximum  $I_{CCT}$  over an Expanded Voltage Range ( $V_{IN}=2.6$  V,  $V_{CC}=4.3$  V)
- Wide -3 db Bandwidth: > 720 MHz
- Packaged in Space-Saving 28-Lead UMLP
- 5.5 kV ESD Rating; >9 kV Power/GND ESD Rating
- Low On Capacitance: 6 pF Typical

## Applications

- Cell phone, PDA, Digital Camera, and Notebook
- LCD Monitor, TV, and Set-Top Box

## IMPORTANT NOTE:

For additional performance information, please contact [analogswitch@fairchildsemi.com](mailto:analogswitch@fairchildsemi.com).

## Description

The FSA1211 is a low-power, twelve-port, high-speed switch. This part is configured as a single-pole, single-throw switch (SPST) and is optimized for isolating a high-speed source, such as a cell phone camera interface. The FSA1211 features an extremely low on capacitance ( $C_{ON}$ ) of 6 pF. The wide bandwidth (>720 MHz) exceeds the bandwidth needed to pass the third harmonic, resulting in signals with minimum edge and phase distortion. Superior channel-to-channel crosstalk minimizes interference.

The FSA1211 contains special circuitry on pins A and B that allows the device to withstand an over-voltage condition. This device is designed to minimize current consumption even when the control voltage applied to the /OE pin is lower than the supply voltage ( $V_{CC}$ ). This feature is especially valuable for mobile applications, such as cell phones, allowing direct interface with the general-purpose I/Os of the baseband processor. Other applications include port isolation and switching in portable cell phones, PDAs, digital cameras, printers, and notebook computers.

## Ordering Information

Part Number	Top Mark	Operating Temperature Range	Package
FSA1211UMX	F1211	-40 to +85°C	28-Lead, Quad, Ultra-thin Molded Leadless Package (UMLP), 3.5x4 mm
FSA1211UDMX	F1211	-40 to +85°C	28-Lead, Quad, Dual-Row, Ultra-thin Molded Leadless Package (UMLP), 3.6x2.9 mm

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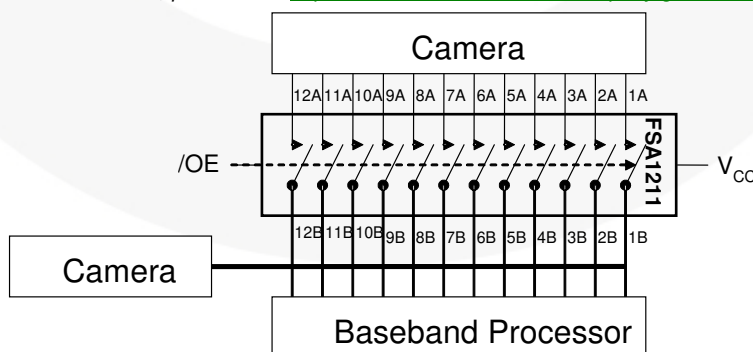


Figure 1. Analog Symbol

## Pin Configurations

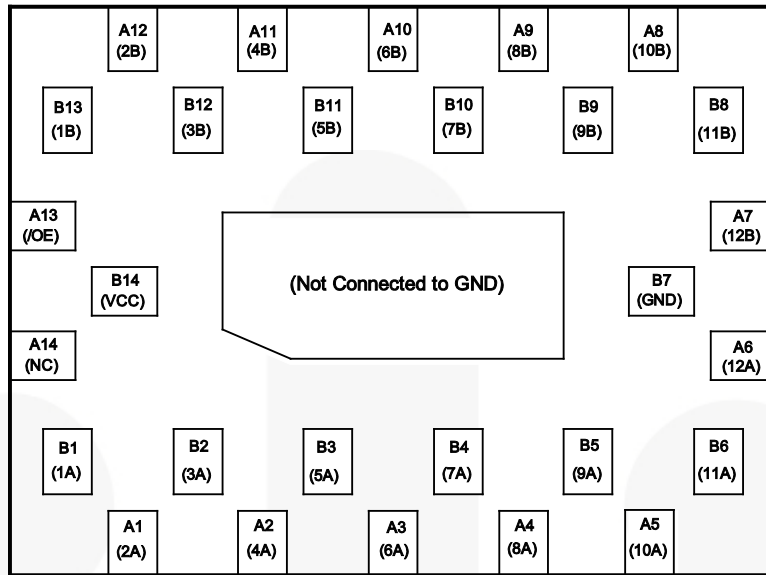


Figure 2. Dual-Row UMLP (Function in Parenthesis) (Top Through View)

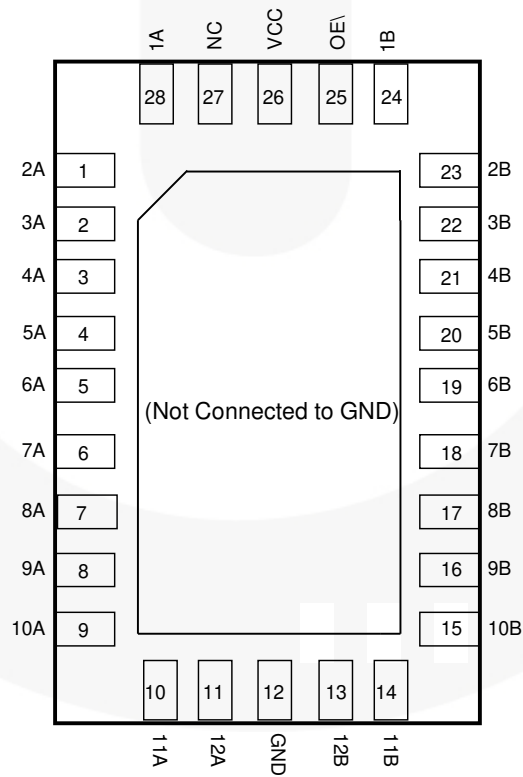


Figure 3. UMLP (Top Through View)

## Pin Definitions

UMLP Dual Pin #	UMLP Single Pin #	Name	Description
A1-A6, B1-B6	1-11, 28	1A-12A	A Side of Bus
B7	12	GND	Ground
A7-A12, B8-B13	13-24	12B-1B	B Side of Bus
A14	27	NC	No Connect
A13	25	/OE	Switch Enable
B14	26	VCC	Power

## Truth Table

/OE	Function
HIGH	Disconnect
LOW	1A-12A=1B-12B

## 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	-0.50	+5.25	V
$V_{CNTRL}$	DC Input Voltage (/OE) <sup>(1)</sup>	-0.5	$V_{CC}$	V
$V_{SW}$	DC Switch I/O Voltage <sup>(1)</sup>	-0.5	$V_{CC} + 0.3$	V
$I_{IK}$	DC Input Diode Current	-50		mA
$I_{OUT}$	DC Output Current		50	mA
$T_{STG}$	Storage Temperature	-65	+150	°C
ESD	Human Body Model, JEDEC: JESD22-A114	All Pins	5.5	kV
		I/O to GND	9	
		Power to GND	9	
	Charged Device Model, JEDEC: JESD22-C101		2	

### Note:

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

## 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	Min.	Max.	Unit
$V_{CC}$	Supply Voltage	1.8	4.3	V
$V_{CNTRL}$	Control Input Voltage (S, /OE) <sup>(2)</sup>	0	$V_{CC}$	V
$V_{SW}$	Switch I/O Voltage	-0.5	$V_{CC}$	V
$T_A$	Operating Temperature	-40	+85	°C

### Note:

- The control input must be held HIGH or LOW; it must not float.

## DC Electrical Characteristics

All typical values are at 25°C unless otherwise specified.

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> =- 40°C to +85°C			Units
				Min.	Typ.	Max.	
V <sub>IK</sub>	Clamp Diode Voltage	I <sub>IN</sub> =-18 mA	2.8			-1.2	V
V <sub>IH</sub>	Input Voltage High		1.8	1.0			
			2.8	1.3			V
			3.6	1.5			
			4.3	1.7			V
V <sub>IL</sub>	Input Voltage Low		1.8			0.4	
			2.8			0.5	
			3.6			0.6	V
			4.3			0.7	V
I <sub>IN</sub>	Control Input Leakage	V <sub>SW</sub> =0 to V <sub>CC</sub>	1.8 to 4.3	-1		1	μA
I <sub>OZ</sub>	Off State Leakage	0 ≤ A, B ≤ 3.6 V	1.8 to 4.3	-2		2	μA
R <sub>ON</sub>	Switch On Resistance <sup>(3)</sup>	I <sub>ON</sub> =-8 mA, V <sub>SW</sub> =0 V, Figure 4	2.8		5.7	10.0	Ω
		I <sub>ON</sub> =-8 mA, V <sub>SW</sub> =3.0 V, Figure 4	2.8		9.0	14.0	
		I <sub>ON</sub> =-8mA, V <sub>SW</sub> =0V, Figure 4	1.8		8.5	15.0	
		I <sub>ON</sub> =-8 mA, V <sub>SW</sub> =1.8 V, Figure 4	1.8		15.0	30.0	
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> =0 or V <sub>CC</sub> , I <sub>OUT</sub> =0	4.3			1	μA
I <sub>CCCT</sub>	Increase in I <sub>CC</sub> Current Per Control Voltage and V <sub>CC</sub>	V <sub>IN</sub> =2.6 V, V <sub>CC</sub> =4.3 V	4.3			10	μA

### Notes:

- 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 voltage on the two (A or B ports).

## AC Electrical Characteristics

All typical values are for  $V_{CC}=3.3$  V at  $25^{\circ}\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	$V_{CC}$ (V)	$T_A=-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$			Units
				Min.	Typ.	Max.	
$t_{ON}$	Turn-On Time /OE to Output	$R_L=50\ \Omega$ , $C_L=5\ \text{pF}$ , $V_{SW}=0.8\ \text{V}$ Figure 5, Figure 6	2.8 to 3.6		23	30	ns
			1.8			45	
$t_{OFF}$	Turn-Off Time /OE to Output	$R_L=50\ \Omega$ , $C_L=5\ \text{pF}$ , $V_{SW}=0.8\ \text{V}$ Figure 5, Figure 6	2.8 to 3.6		19	25	ns
			1.8			35	
$t_{PD}$	Propagation Delay <sup>(4)</sup>	$C_L=5\ \text{pF}$ , $R_L=50\ \Omega$ Figure 5, Figure 7	3.3		0.25		ns
$O_{IRR}$	Off Isolation	$R_L=50\ \Omega$ , $f=100\ \text{MHz}$ Figure 12	1.8 to 3.6		-45		dB
Xtalk	Non-Adjacent Channel Crosstalk	$R_L=50\ \Omega$ , $f=100\ \text{MHz}$ Figure 13	1.8 to 3.6		-40		dB
BW	-3db Bandwidth	$R_L=50\ \Omega$ , $C_L=0\ \text{pF}$ Figure 11	1.8 to 3.6		720		MHz
		$R_L=50\ \Omega$ , $C_L=5\ \text{pF}$ Figure 11			325		MHz

**Note:**

4. Guaranteed by characterization.

## High-Speed-Related AC Electrical Characteristics

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	T <sub>A</sub> =- 40°C to +85°C			Units
				Min.	Typ.	Max.	
t <sub>SK(O)</sub>	Channel-to-Channel Skew <sup>(5)</sup>	C <sub>L</sub> =5 pF	3.0 to 3.6		60		ps
t <sub>SK(P)</sub>	Skew of Opposite Transitions of the Same Output <sup>(5)</sup>	C <sub>L</sub> =5 pF	3.0 to 3.6		20		ps

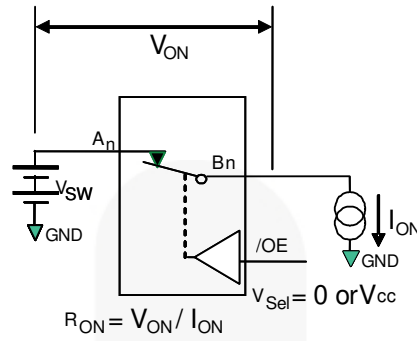
**Note:**

5. Guaranteed by characterization.

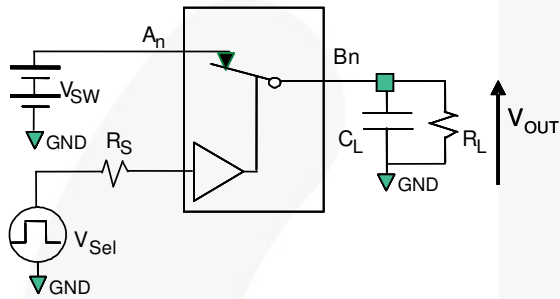
## Capacitance

Symbol	Parameter	Conditions	T <sub>A</sub> =- 40°C to +85°C			Units
			Min.	Typ.	Max.	
C <sub>IN</sub>	Control Pin Input Capacitance	V <sub>CC</sub> =0 V, f=1 MHz		1.0		pF
C <sub>ON</sub>	D+/D- On Capacitance	V <sub>CC</sub> =3.3 V, /OE=0 V, f=1 MHz Figure 10		6.0		
C <sub>OFF</sub>	D1n, D2n Off Capacitance	V <sub>CC</sub> and /OE=3.3 V, f=1 MHz Figure 9		2.0		

## Test Diagrams

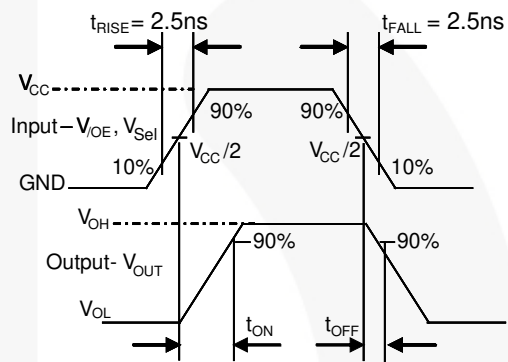


**Figure 4. On Resistance**

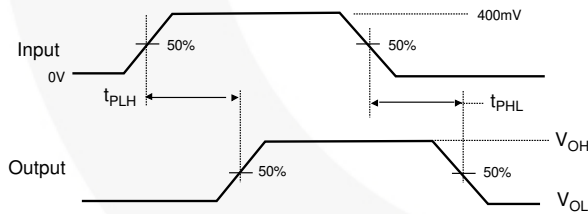


$R_L$ ,  $R_S$ , and  $C_L$  are functions of the application environment (see AC Tables for specific values).  $C_L$  includes test fixture and stray capacitance.

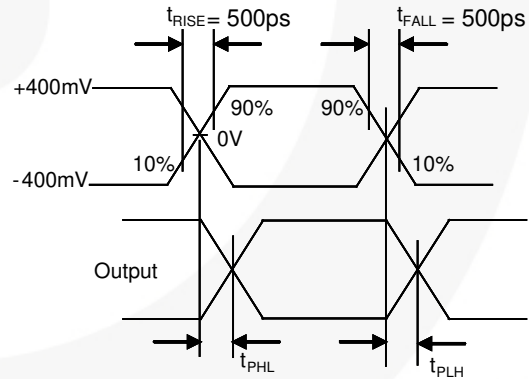
**Figure 5. AC Test Circuit Load**



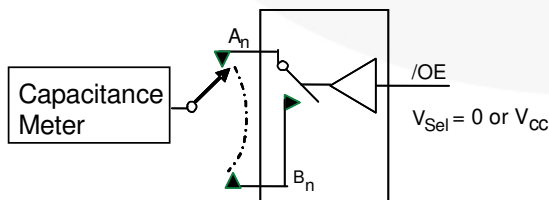
**Figure 6. Turn-On / Turn-Off Waveforms**



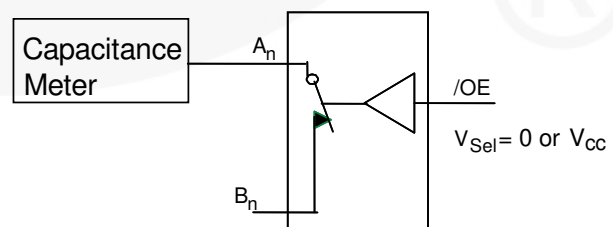
**Figure 7. Propagation Delay ( $t_{rF} = 500$  ps)**



**Figure 8. Intra-Pair Skew Test  $t_{sk(P)}$**



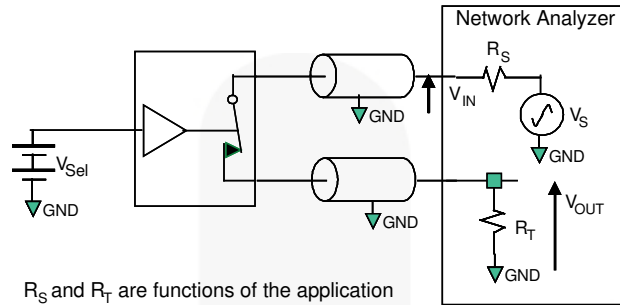
**Figure 9. Channel Off Capacitance**



**Figure 10. Channel On Capacitance**

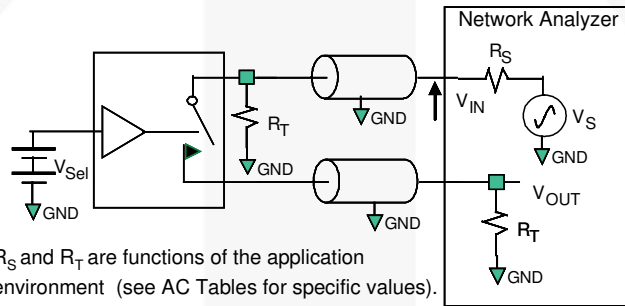


**Test Diagrams (Continued)**



$R_S$  and  $R_T$  are functions of the application environment (see AC Tables for specific values).

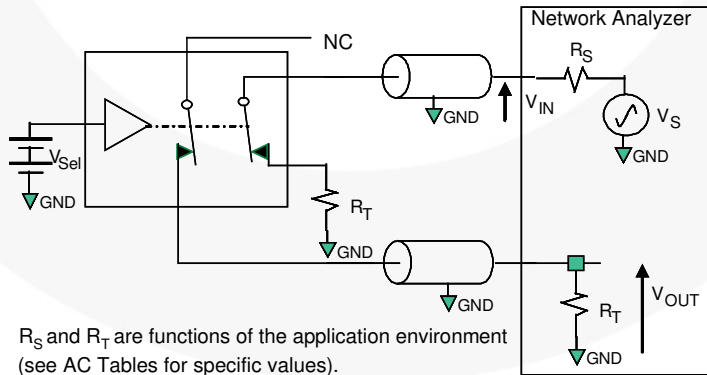
**Figure 11. Bandwidth**



$R_S$  and  $R_T$  are functions of the application environment (see AC Tables for specific values).

$$\text{Off isolation} = 20 \text{ Log } (V_{OUT} / V_{IN})$$

**Figure 12. Channel Off Isolation**

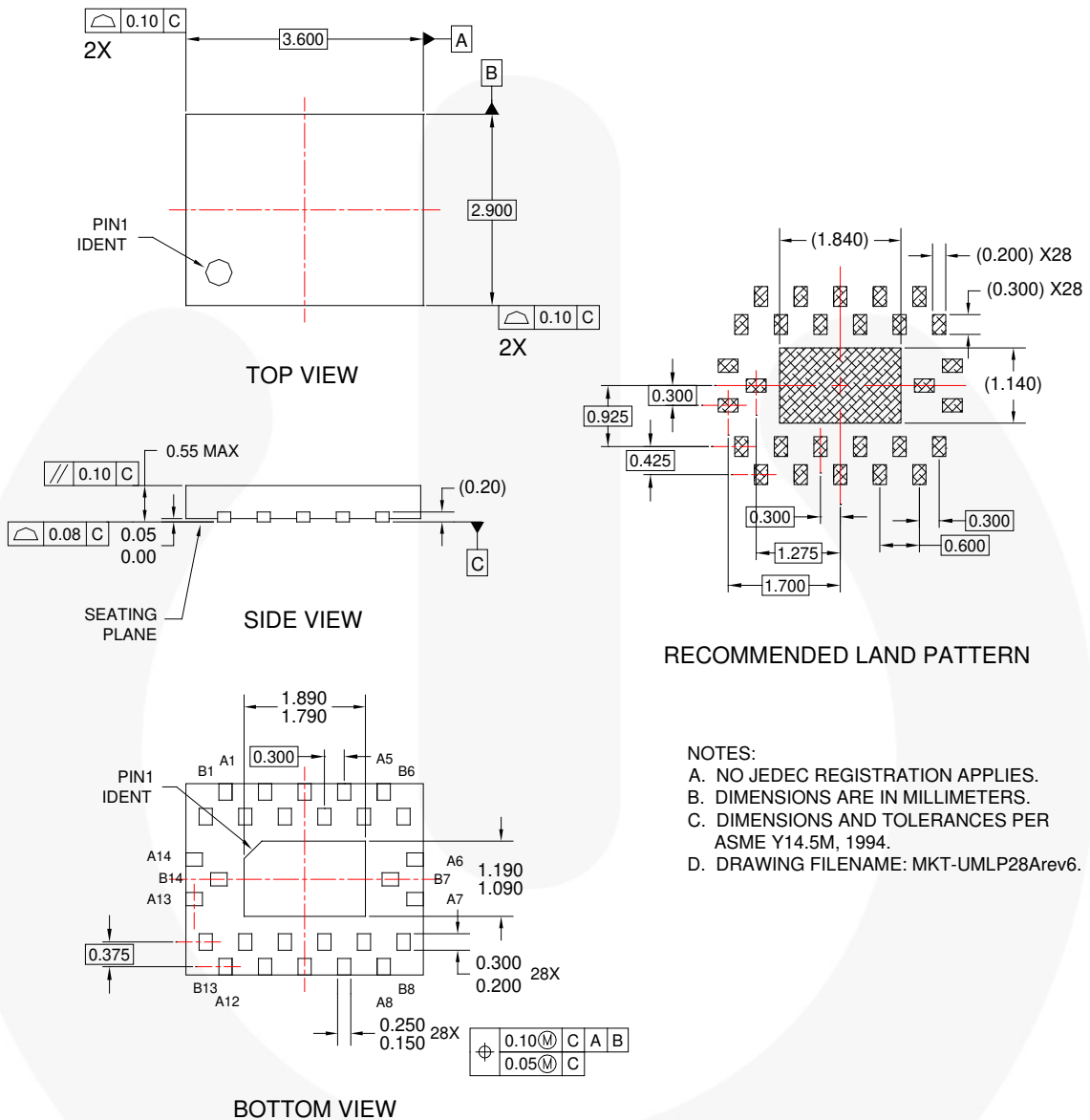


$R_S$  and  $R_T$  are functions of the application environment (see AC Tables for specific values).

$$\text{Crosstalk} = 20 \text{ Log } (V_{OUT} / V_{IN})$$

**Figure 13. Non-Adjacent Channel-to-Channel Crosstalk**

## Physical Dimensions

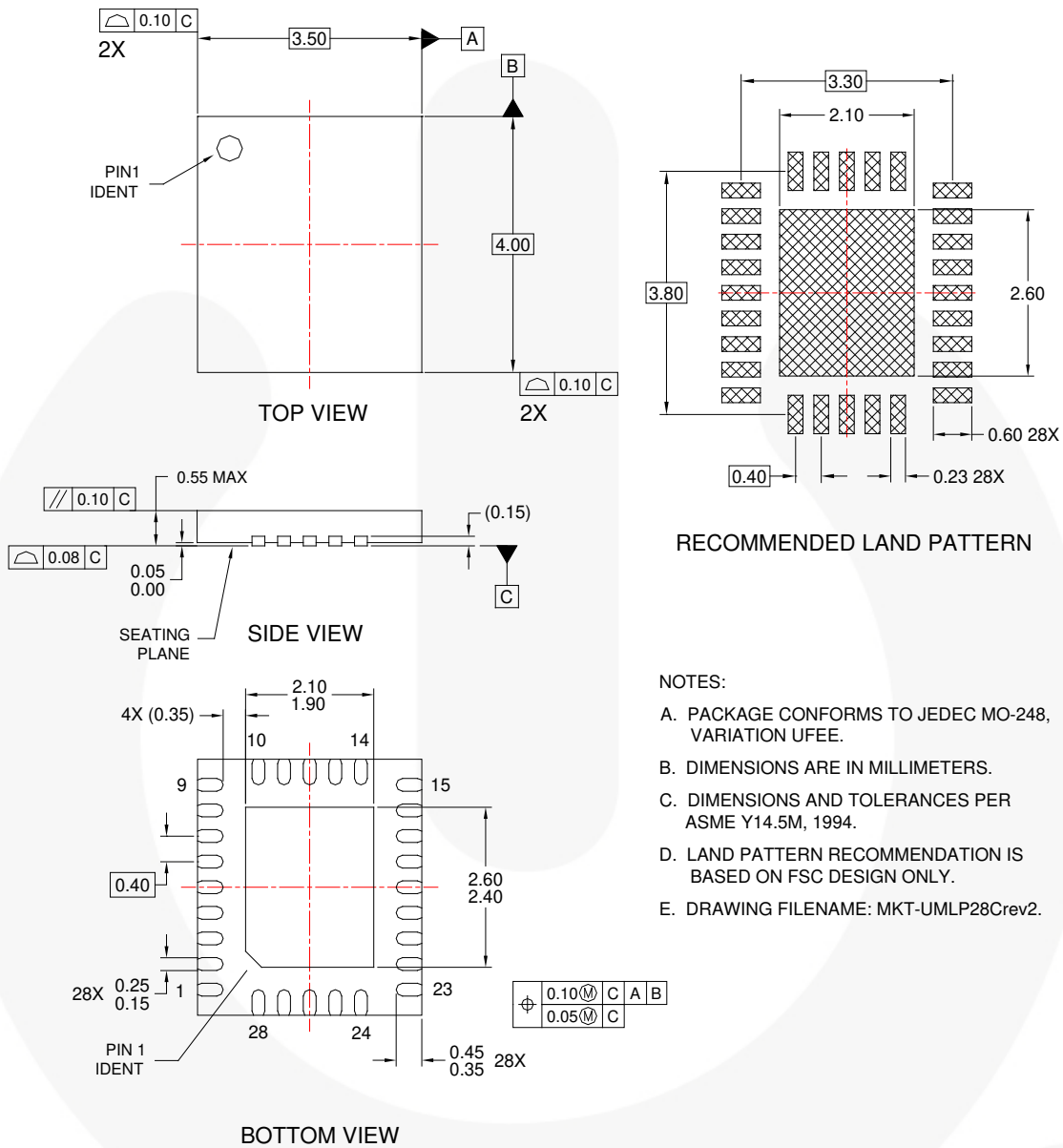


**Figure 14. 28-Lead, Dual Row, Ultra-thin Molded Leadless Package (UMLP)**

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## Physical Dimensions



**Figure 15. 28-Lead, Ultrathin Molded Leadless Package (UMLP)**

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