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FSA2258 Low-Voltage, Dual-SPDT (0.8Ω) Analog Switch with 16kV ESD

Features

- 0.8Ω Typical On Resistance (R_{ON}) for +3.0V Supply
- 0.40Ω Maximum R_{ON} Flatness for +3.0V Supply
- -3db Bandwidth: > 50MHz
- Low I_{CCT} Current Over an Expanded Control Input Range
- Packaged in 10-Lead MicroPak™ (1.6 x 2.1mm)
- Power-Off Protection on Common Ports
- Broad V_{CC} Operating Range: 1.65V to 4.30V
- HBM JEDEC: JESD22-A114
 - I/O to GND: 9kV
 - Power to GND: 16kV

Applications

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

Description

The FSA2258 is a high-performance, dual, Single Pole Double Throw (SPDT) analog switch that features low R_{ON} of 0.8Ω (typical) at 3.0V V_{CC} . The FSA2258 operates over a wide V_{CC} range of 1.65V to 4.3V and is designed for break-before-make operation. The select input is TTL-level compatible.

The FSA2258 features very low quiescent current even when the control voltage is lower than the V_{CC} supply. This feature suits mobile handset applications by allowing direct interface with baseband processor general-purpose I/Os with minimal battery consumption.

IMPORTANT NOTE:

For additional information, please contact analogswitch@fairchildsemi.com.

Ordering Information

Part Number	Top Mark	Operating Temperature Range	Package
FSA2258L10X	JS	-40 to +85°C	10-Lead MicroPak™ 1.6 x 2.1mm, JEDEC MO-255B

Analog Symbol

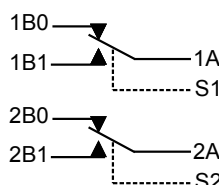


Figure 1. FSA2258

Pin Configuration

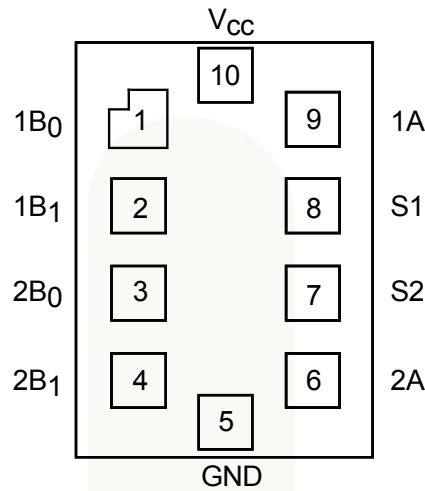


Figure 2. 10-Lead MicroPak™ (Top-Through View)

Pin Descriptions

Pin #	Name	Description
1	1B ₀	Data Ports
2	1B ₁	Data Ports
3	2B ₀	Data Ports
4	2B ₁	Data Ports
5	GND	Ground
6	2A	Data Ports
7	S2	Switch Select Pins
8	S1	Switch Select Pins
9	1A	Data Ports
10	V _{CC}	Supply Voltage

Truth Table

Control Input, S _n	Function
LOW Logic Level	nB0 connected to nA
HIGH Logic Level	nB1 connected to nA

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.	Units
V_{CC}	Supply Voltage		-0.5	5.5	V
V_{SW}	Switch I/O Voltage ⁽¹⁾	1B0, 1B1, 2B0, 2B1, 1A, 2A Pins	-0.5	$V_{CC} + 0.3$	V
V_{IN}	Control Input Voltage ⁽¹⁾	S1, S2	-0.5	5.5	V
I_{IK}	Input Clamp Diode Current			-50	mA
I_{SW}	Switch I/O Current (Continuous)			350	mA
I_{SWPEAK}	Peak Switch Current (Pulsed at 1ms Duration, <10% Duty Cycle)			500	mA
T_{STG}	Storage Temperature Range		-65	+150	°C
T_J	Maximum Junction Temperature			+150	°C
T_L	Lead Temperature (Soldering, 10 seconds)			+260	°C
ESD	Human Body Model, JEDEC: JESD22-A114	I/O to GND		9	kV
		Power to GND		16	
		All Other Pins		9	
	Charged Device Model, JEDEC: JESD22-C101			2	

Note

- Input and output negative ratings may be exceeded if 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.	Units
V_{CC}	Supply Voltage	1.65	4.30	V
V_{IN}	Control Input Voltage	0	V_{CC}	V
V_{SW}	Switch I/O Voltage	0	V_{CC}	V
T_A	Operating Temperature	-40	+85	°C

DC Electrical Characteristics

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

Symbol	Parameter	Conditions	V _{CC} (V)	T _A =+25°C			T _A =-40 to +85°C		Unit
				Min.	Typ.	Max.	Min.	Max.	
V _{IH}	Control Input Voltage HIGH		3.60 to 4.30				1.7		V
			2.70 to 3.60				1.5		
			2.30 to 2.70				1.4		
			1.65 to 1.95				0.9		
V _{IL}	Control Input Voltage LOW		3.60 to 4.30					0.7	V
			2.70 to 3.60					0.5	
			2.30 to 2.70					0.4	
			1.65 to 1.95					0.4	
I _{IN}	Control Input Leakage (S1,S2)	V _{IN} =0 to V _{CC}	1.65 to 4.30				-0.5	0.5	μA
I _{NO(OFF)} , I _{NC(OFF)}	Off Leakage Current of Port nB0 and nB1	nA=0.3V, V _{CC} =0.3V nB0 or nB1=V _{CC} -0.3V, 0.3V, or Floating Figure 4	1.95 to 4.30	-10		10	-50	50	nA
I _{A(ON)}	On Leakage Current of Port nA	nA=0.3V, V _{CC} =0.3V nB0 or nB1=V _{CC} -0.3V, 0.3V, or Floating Figure 5	1.95 to 4.30	-20		20	-100	100	nA
I _{OFF}	Power-Off Leakage Current (Common Port Only 1A, 2A)	Common Port (1A, 2A), V _{IN} =0V to 4.3V, V _{CC} =0V nB0, nB1=Floating	0					±1	μA
R _{ON}	Switch On Resistance ^(2,5)	I _{ON} =100mA, nB0 or nB1=0.7V, 3.6V Figure 3	4.30		0.5			1.0	Ω
		I _{ON} =100mA, nB0 or nB1=0.7V, 2.3V Figure 3	3.00		0.8			1.2	
		I _{ON} =100mA, nB0 or nB1=0V, 0.7V, 1.6V, 2.3V Figure 3	2.30		1.1				
		I _{ON} =100mA, nB0 or nB1=0V, 0.7V, 1.65V Figure 3	1.65		1.5				
ΔR _{ON}	On Resistance Matching Between Channels ^(3,5)	I _{ON} =100mA, nB0 or nB1=0.7V	4.30		0.08			0.25	Ω
			3.00		0.20			0.25	
			2.30		0.40				
			1.65		0.50				
R _{FLAT(ON)}	On Resistance Flatness ^(4,5)	I _{OUT} =100mA, nB0 or nB1=0V to V _{CC}	4.30					0.4	Ω
			3.00					0.4	
			2.30		0.9				
			1.65		1.2				
I _{CC}	Quiescent Supply Current	V _{IN} =0 or V _{CC} , I _{OUT} =0	4.30	-100		100	-500	500	nA
I _{CCCT}	Increase in I _{CC} per Input	Input at 2.6V	4.30		3			7	μA
		Input at 1.8V			7			15	

Notes:

- On resistance is determined by the voltage drop between A and B pins at the indicated current through the switch.
- ΔR_{ON}=R_{ON max} – R_{ON min} measured at identical V_{CC}, temperature, and voltage.
- Flatness is defined as the difference between the maximum and minimum value of on resistance (R_{ON}) over the specified range of conditions.
- Guaranteed by characterization, not production tested for V_{CC}=1.65 – 3.0V.

AC Electrical Characteristics

All typical value are for $V_{CC}=3.3V$ at 25°C unless otherwise specified.

Symbol	Parameter	Conditions	V_{CC} (V)	$T_A=+25^\circ C$			$T_A=-40$ to $+85^\circ C$		Unit	Figure
				Min.	Typ.	Max.	Min.	Max.		
t_{ON}	Turn-On Time	nB0 or nB1=1.5V, $R_L=50\Omega$, $C_L=35pF$	3.60 to 4.30			55		60	ns	Figure 6 Figure 7
			2.70 to 3.60			60		65		
			2.30 to 2.70			65		70		
			1.65 to 1.95		70					
t_{OFF}	Turn-Off Time	nB0 or nB1=1.5V, $R_L=50\Omega$, $C_L=35pF$	3.60 to 4.30			30	5	35	ns	
			2.70 to 3.60			35	5	40		
			2.30 to 2.70			40	5	45		
			1.65 to 1.95		40					
t_{BBM}	Break-Before-Make Time ⁽⁶⁾	nB0 or nB1=1.5V, $R_L=50\Omega$, $C_L=35pF$	3.60 to 4.30		15		2		ns	Figure 8
			2.70 to 3.60		15		2			
			2.30 to 2.70		15		2			
			1.65 to 1.95		16		2			
Q	Charge Injection ⁽⁶⁾	$C_L=1.0nF$, $V_S=0V$, $R_S=0\Omega$	1.65 to 4.30		25				pC	Figure 12
OIRR	Off Isolation ⁽⁶⁾	$f=100kHz$, $R_L=50\Omega$, $C_L=0pF$	1.65 to 4.30		-80				dB	Figure 10
Xtalk	Crosstalk ⁽⁶⁾	$f=100kHz$, $R_L=50\Omega$, $C_L=0pF$	1.65 to 4.30		-100				dB	Figure 11
BW	-3db Bandwidth ⁽⁶⁾	$R_L=50\Omega$, $C_L=0pF$	1.65 to 4.30		>50				MHz	Figure 9
THD+N	Total Harmonic Distortion + Noise ⁽⁶⁾	$f=20Hz$ to 20kHz, $R_L=32\Omega$, $V_{IN}=2V_{PP}$	1.65 to 4.30		.06				%	Figure 15

Note:

6. Guaranteed by characterization, not production tested

Capacitance

All capacitance specifications are guaranteed by characterization and are not production tested.

Symbol	Parameter	Conditions	V_{CC} (V)	$T_A=+25^\circ C$			Unit	Figure
				Min.	Typ.	Max.		
C_{IN}	Control Pin Input Capacitance	$f=1MHz$	0		1.5		pF	Figure 13
C_{OFF}	B Port Off Capacitance	$f=1MHz$	3.3		30		pF	Figure 13
C_{ON}	A Port On Capacitance	$f=1MHz$	3.3		50		pF	Figure 14

Test Diagrams

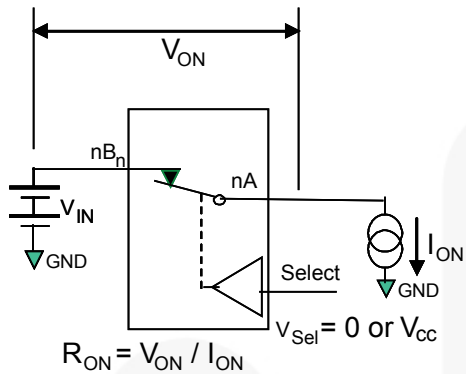
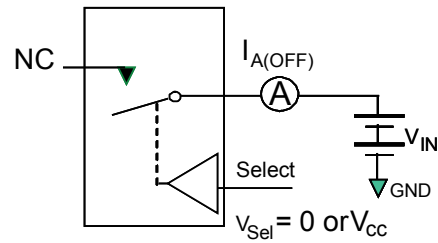


Figure 3. On Resistance



**Each switch port is tested separately.

Figure 4. Off Leakage (Ports Tested Separately)

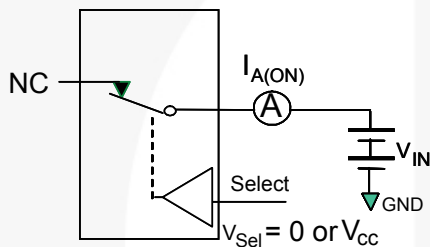


Figure 5. On Leakage

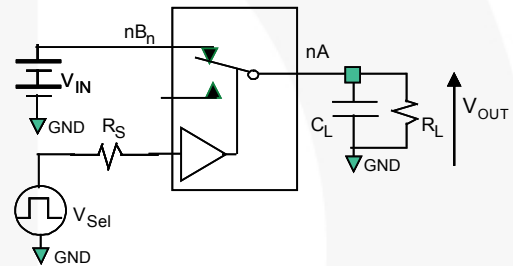


Figure 6. Test Circuit Load

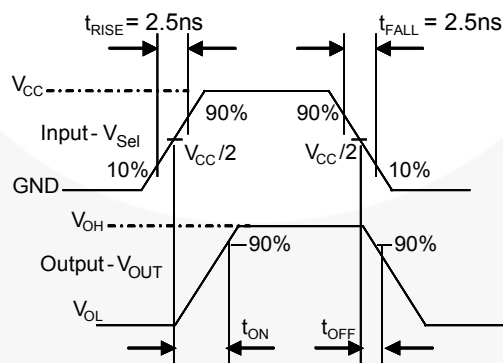


Figure 7. Turn-On / Turn-Off Waveforms

Test Diagrams (Continued)

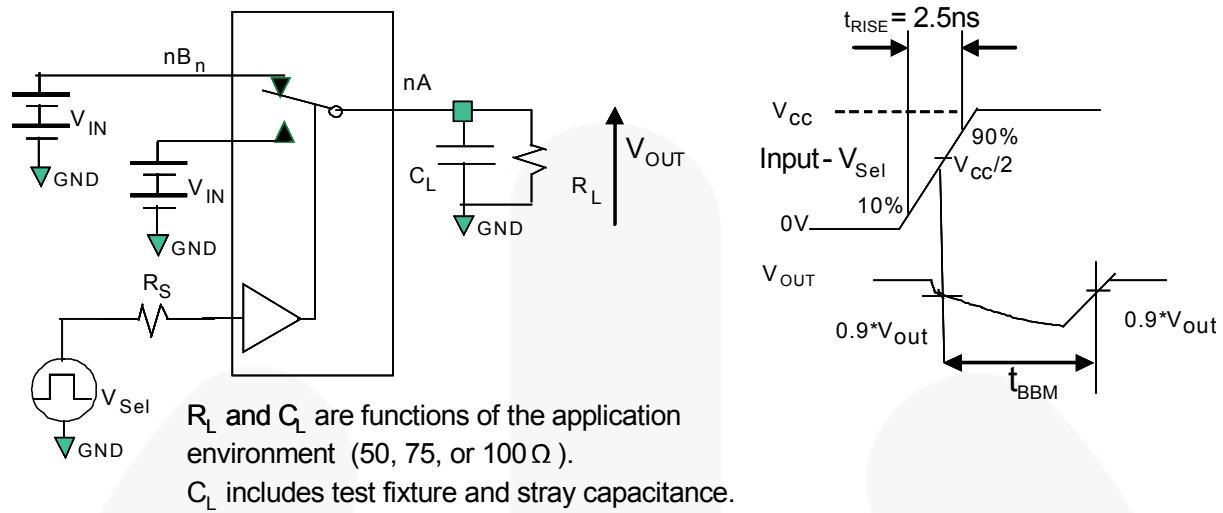


Figure 8. Break-Before-Make Interval Timing

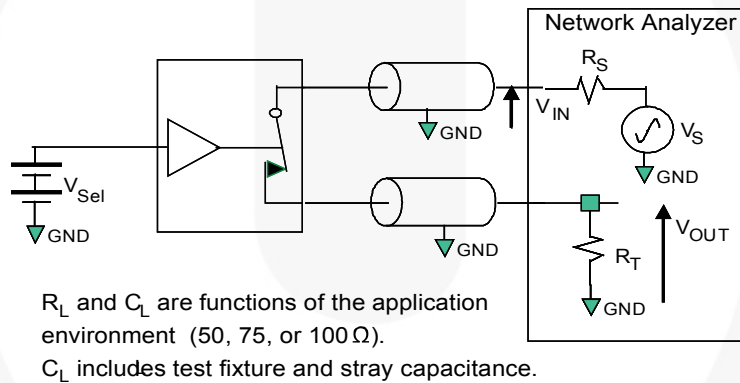


Figure 9. Bandwidth

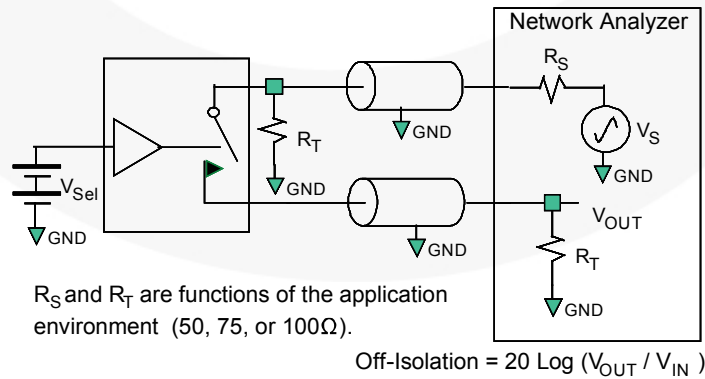


Figure 10. Channel Off Isolation

Test Diagrams (Continued)

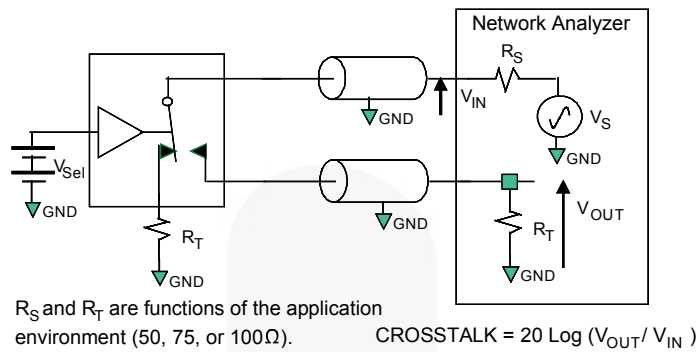


Figure 11. Adjacent Channel Crosstalk

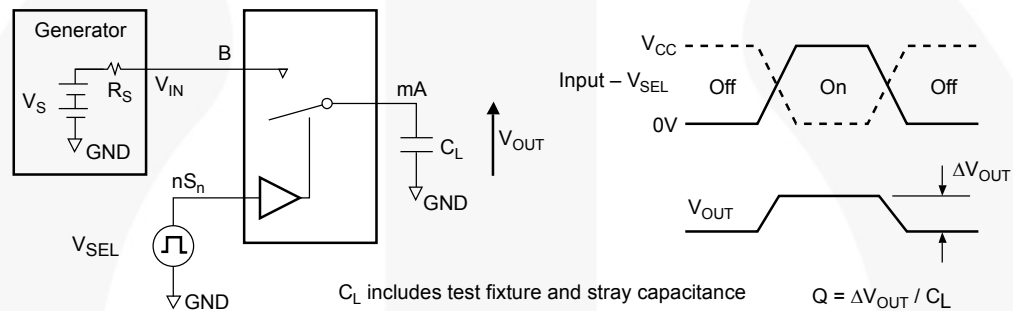


Figure 12. Charge Injection Test

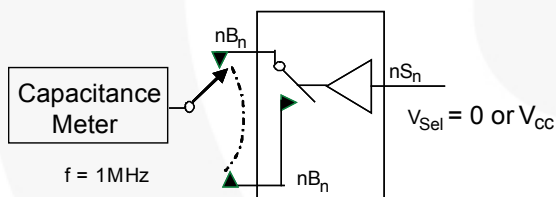


Figure 13. Channel Off Capacitance

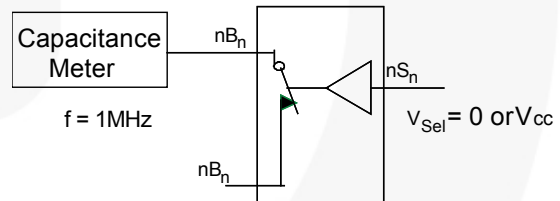


Figure 14. Channel On Capacitance

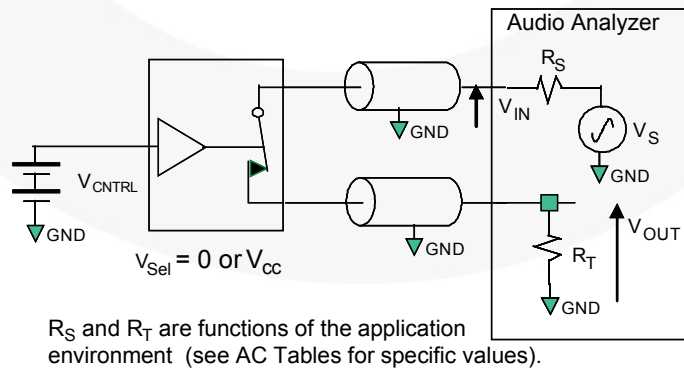


Figure 15. Total Harmonic Distortion

Physical Dimensions

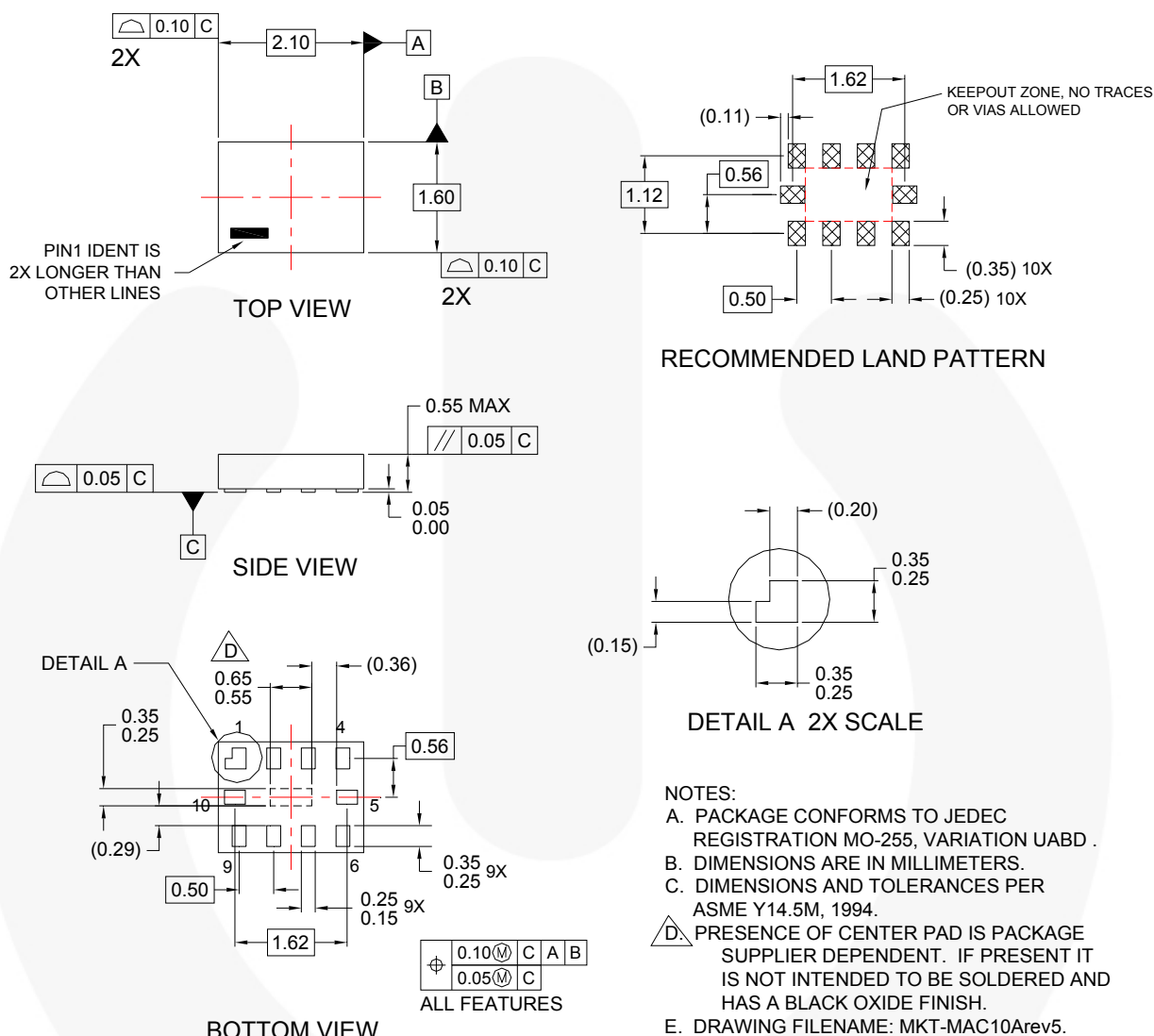


Figure 16. 10-Lead MicroPak™

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