FAIRCHILD SEMICONDUCTOR®

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FSA2267 • FSA2267A
0.35Ω Low Voltage Dual SPDT Analog Switch

General Description

The FSA2267 and FSA2267A are Dual Single Pole Double Throw (SPDT) analog switches. The FSA2267 operates from a single 1.65V to 3.6V supply while the FSA2267A operates from a single 2.3V to 4.3V supply. Each features an ultra-low On Resistance of 0.35Ω at a +2.7V supply and 25C. Both devices are fabricated with sub-micron CMOS technology to achieve fast switching speeds and is designed for break-before-make operation.

FSA2267A features very low quiescent current even when the control voltage is lower than the V_{CC} supply. This feature services the mobile handset applications very well allowing for the direct interface with baseband processor general purpose I/Os.

Features

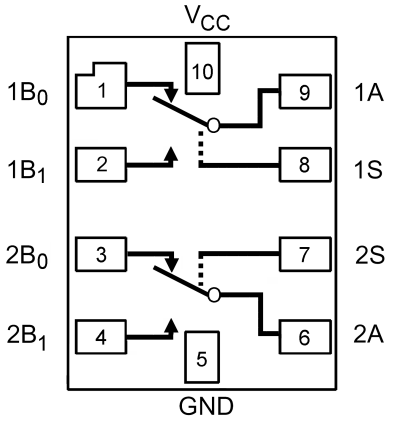
- Typical 0.35Ω On Resistance (R_{ON}) for +2.7V supply
- FSA2267A features lower I_{CC} when S Input is lower than V_{CC}
- 0.25Ω maximum R_{ON} flatness for +2.7V supply
- 1.6mm x 2.1mm 10-Lead Pb-Free MicroPak™ package
- Broad V_{CC} operating range
- Low THD (0.02% typical for 32Ω load)
- High current handling capability (350mA continuous current under 3.3V supply)

Ordering Code:

Order Number	Package Number	Product Code Top Mark	Package Description	Supplied As
FSA2267L10X	MAC010A	FC	Pb-Free 10-Lead MicroPak, 1.6 mm x 2.1mm	5K Units on Tape and Reel
FSA2267AL10X (Preliminary)	MAC010A	FD	Pb-Free 10-Lead MicroPak, 1.6 mm x 2.1mm	5K Units on Tape and Reel

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

Analog Symbols



(Top Through View)

Truth Table

Control Input(s)	Function
L	B_0 Connected to A
H	B_1 Connected to A

H = HIGH Logic Level
L = LOW Logic Level

Pin Descriptions

Pin Names	Function
1A, 2A, $1B_0$, $1B_1$, $2B_0$, $2B_1$	Data Ports
1S, 2S	Control Input

MicroPak™ is a trademark of Fairchild Semiconductor Corporation.

Absolute Maximum Ratings(Note 1)

Supply Voltage (V_{CC})	−0.5V to +4.6V
Switch Voltage (V_S) (Note 2)	−0.5V to V_{CC} + 0.5V
Input Voltage (V_{IN}) (Note 2)	−0.5V to +4.6V
Input Diode Current	−50 mA
Switch Current	350 mA
Peak Switch Current (Pulsed at 1 ms duration, <10% Duty Cycle)	500 mA
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: FSA2267	7500V
Human Body Model: FSA2267A	7000V

Recommended Operating Conditions

Supply Voltage (V_{CC})	
FSA2267	1.65V to 3.6V
FSA2267A	2.3V to 4.3V
Control Input Voltage (V_{IN}) (Note 3)	0V to V_{CC}
Switch Input Voltage (V_{IN})	0V to V_{CC}
Operating Temperature (T_A)	−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 ratings. The "Recommended Operating Conditions" table 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 inputs must be held HIGH or LOW. They may not float.

DC Electrical Characteristics - FSA2267

(All typical values are @ 25°C unless otherwise specified)

Symbol	Parameter	V_{CC} (V)	T_A = +25°C Min	Typ	Max	T_A = −40°C to +85°C Min	Max	Units	Conditions
V_{IH}	Input Voltage High	2.7 to 3.6				2.0		V	
		2.3 to 2.7				1.7			
		1.65 to 1.95				0.65 V_{CC}			
V_{IL}	Input Voltage Low	2.7 to 3.6					0.8	V	
		2.3 to 2.7					0.7		
		1.65 to 1.95					0.35 V_{CC}		
I_{IN}	Control Input Leakage	1.65 to 3.6				−0.5	0.5	μA	V_{IN} = 0V to V_{CC}
$I_{NO(OFF)}$, $I_{NC(OFF)}$	OFF-Leakage Current of Port nB_0 and nB_1	3.6	-5.0		5.0	−50.0	50.0	nA	nA = 0.3V, 3.3V, nB_0 or nB_1 = 0.3V, 3.3V
		2.7	−5.0		5.0	−50.0	50.0		nA = 0.3V, 2.4V, nB_0 or nB_1 = 0.3V, 2.4V or Floating
		1.95	−5.0		5.0	−50.0	50.0		nA = 0.3V, 1.65V, nB_0 or nB_1 = 0.3V, 1.65V or Floating
$I_{A(ON)}$	ON Leakage Current of Port A	3.6	−5.0		5.0	−50.0	50.0	nA	nA = 0.3V, 3.3V nB_0 or nB_1 = 0.3V, 3.3V or Floating
		2.7	−5.0		5.0	−50.0	50.0		nA = 0.3V, 2.4V nB_0 or nB_1 = 0.3V, 2.4V or Floating
		1.95	−5.0		5.0	−50.0	50.0		nA = 0.3V, 1.65V nB_0 or nB_1 = 0.3V, 1.65V or Floating
R_{ON}	Switch On Resistance (Note 4)	2.7		0.35			0.6	Ω	I_{OUT} = 100 mA, nB_0 or nB_1 = 0V, 0.7V, 2.0V, 2.7V
		2.3		0.45			0.75		I_{OUT} = 100 mA, nB_0 or nB_1 = 0V, 0.7V, 1.6V, 2.3V
		1.65		1.0			3.9		I_{OUT} = 100 mA, nB_0 or nB_1 = 0.8V
ΔR_{ON}	On Resistance Matching Between Channels (Note 5)	2.7		0.04			0.075	Ω	I_{OUT} = 100 mA, nB_0 or nB_1 = 0.7V
		2.3		0.16			0.08		
		1.65		0.1					
$R_{FLAT(ON)}$	On Resistance Flatness (Note 6)	2.7					0.25	Ω	I_{OUT} = 100 mA, nB_0 or nB_1 = 0V to V_{CC}
		2.3					0.3		
		1.65		0.3					
I_{CC}	Quiescent Supply Current	3.6	−100		100	−500	500	nA	V_{IN} = 0V or V_{CC}, I_{OUT} = 0V

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 specified range of conditions.

DC Electrical Characteristics - FSA2267A

(All typical values are @ 25°C unless otherwise specified)

Symbol	Parameter	V_{CC} (V)	$T_A = +25°C$			$T_A = -40°C$ to $+85°C$		Units	Conditions
			Min	Typ	Max	Min	Max		
V_{IH}	Input Voltage High	3.6 to 4.3				1.7		V	
		2.7 to 3.6				1.5			
		2.3 to 2.7				1.4			
V_{IL}	Input Voltage Low	3.6 to 4.3					0.7	V	
		2.7 to 3.6					0.5		
		2.3 to 2.7					0.4		
I_{IN}	Control Input Leakage	2.3 to 4.3				−0.5	0.5	μA	V_{IN} = 0V to V_{CC}
$I_{NO(OFF)}$, $I_{NC(OFF)}$	OFF-Leakage Current of Port nB_0 and nB_1	4.3	-10.0		10.0	−100	100	nA	nA = 0.3V, 4.0V, nB_0 or nB_1 = 4.0V, 0.3V
		3.6	−5.0		5.0	−50.0	50.0		nA = 0.3V, 3.3V, nB_0 or nB_1 = 0.3V, 3.3V or Floating
		2.7	−5.0		5.0	−50.0	50.0		nA = 0.3V, 2.4V, nB_0 or nB_1 = 0.3V, 2.4V or Floating
$I_{A(ON)}$	ON Leakage Current of Port A	4.3	−20.0		20.0	−200	200	nA	nA = 0.3V, 4.0V nB_0 or nB_1 = 0.3V, 4.0V or Floating
		3.6	−5.0		5.0	−50.0	50.0		nA = 0.3V, 3.3V nB_0 or nB_1 = 0.3V, 3.3V or Floating
		2.7	−5.0		5.0	−50.0	50.0		nA = 0.3V, 2.4V nB_0 or nB_1 = 0.3V, 2.4V or Floating
R_{ON}	Switch On Resistance (Note 7)	4.3		0.35			0.6	Ω	I_{OUT} = 100 mA, nB_0 or nB_1 = 0V, 0.7V, 3.6V, 4.3V
		3.0		0.35			0.6		I_{OUT} = 100 mA, nB_0 or nB_1 = 0V, 0.7V, 2.3V, 3.0V
		2.7		0.35			0.6		I_{OUT} = 100 mA, nB_0 or nB_1 = 0V 0.7V, 2.0V, 2.7V
ΔR_{ON}	On Resistance Matching Between Channels (Note 8)	4.3		0.04			0.075	Ω	I_{OUT} = 100 mA, nB_0 or nB_1 = 0.7V
		3.0		0.04			0.075		
		2.7		0.04			0.075		
$R_{FLAT(ON)}$	On Resistance Flatness (Note 9)	4.3		0.15			0.25	Ω	I_{OUT} = 100 mA, nB_0 or nB_1 = 0V to V_{CC}
		3.0		0.15			0.25		
		2.7		0.15			0.25		
I_{CC}	Quiescent Supply Current	4.3	−100	80.0	100	−500	500	nA	V_{IN} = 0V or V_{CC}, I_{OUT} = 0V
ΔI_{CC}	Increase in I_{CC} per Input	4.3		7.0	10.0		15.0	μA	V_{IN} = 1.8V
				0.5	2.0		7.0		V_{IN} = 2.6V

Note 7: On Resistance is determined by the voltage drop between A and B pins at the indicated current through the switch.

Note 8: $\Delta R_{ON} = R_{ONmax} - R_{ONmin}$ measured at identical V_{CC}, temperature, and voltage.

Note 9: Flatness is defined as the difference between the maximum and minimum value of On Resistance over the specified range of conditions.

AC Electrical Characteristics - FSA2267

(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_{ON}	Turn ON Time	2.7 to 3.6		30.0	38.0		42.0	ns	nB_0 or nB_1 = 1.5V, R_L = 50Ω, C_L = 35 pF	Figure 1
		2.3 to 2.7		29.0	37.0		40.0			
		1.65 to 1.95		27.0	35.0		38.0			
t_{OFF}	Turn OFF Time	2.7 to 3.6		13.0	16.0		18.0	ns	nB_0 or nB_1 = 1.5V, R_L = 50Ω, C_L = 35 pF	Figure 1
		2.3 to 2.7		14.0	18.0		20.0			
		1.65 to 1.95		15.0	21.0		25.0			
t_{B-M}	Break-Before-Make Time	2.7 to 3.6		17.0		2.0		ns	nB_0 or nB_1 = 1.5V, R_L = 50Ω, C_L = 35 pF	Figure 2
		2.3 to 2.7		15.0		2.0				
		1.65 to 1.95		12.0		2.0				
Q	Charge Injection	2.7 to 3.6		9.0				pC	C_L = 100 pF, V_{GEN} = 0V, R_{GEN} = 0Ω	Figure 4
		2.3 to 2.7		9.0					C_L = 100 pF, V_{GEN} = 0V, R_{GEN} = 0Ω	
		1.65 to 1.95		9.0					C_L = 100 pF, V_{GEN} = 0V, R_{GEN} = 0Ω	
OIRR	OFF-Isolation	2.7 to 3.6		−80.0				dB	f = 100kHz, R_L = 50Ω, C_L = 5 pF (Stray)	Figure 3
		2.3 to 2.7		−80.0						
		1.65 to 1.95		−80.0						
Xtalk	Crosstalk	2.7 to 3.6		−80.0				dB	f = 100kHz, R_L = 50Ω, C_L = 5 pF (Stray)	Figure 3
		2.3 to 2.7		−80.0						
		1.65 to 1.95		−80.0						
BW	−3db Bandwidth	1.65 to 3.6		45.0				MHz	R_L = 50Ω	Figure 6
THD	Total Harmonic Distortion	2.7 to 3.6		0.024				%	R_L = 32Ω, V_{IN} = 2V P.P, f= 20Hz to 20kHz	Figure 7
		2.3 to 2.7		0.015					R_L = 32Ω, V_{IN} = 1.5V P.P, f= 20Hz to 20kHz	
		1.65 to 1.95		0.35					R_L = 32Ω, V_{IN} = 1.2V P.P, f= 20Hz to 20kHz	

AC Electrical Characteristics - FSA2267A

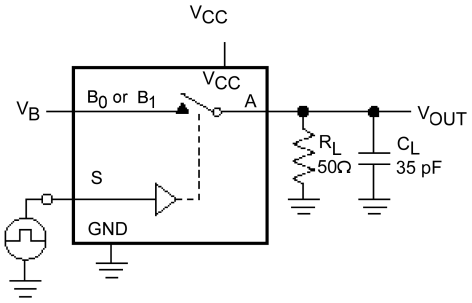
(All typical value are @ 25°C unless otherwise specified)

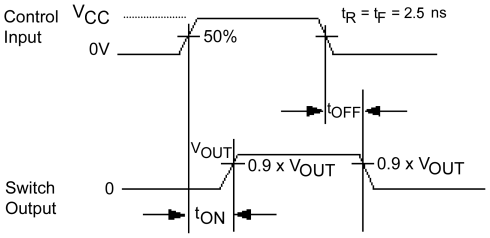
Symbol	Parameter	V_{CC} (V)	T_A = +25°C			T_A = −40°C to +85°C		Units	Conditions	Figure Number
			Min	Typ	Max	Min	Max			
t_{ON}	Turn ON Time	3.6 to 4.3		37.0	46.0		48.0	ns	nB_0 or nB_1 = 1.5V, R_L = 50Ω, C_L = 35 pF	Figure 1
		2.7 to 3.6		37.0	50.0		57.0			
		2.3 to 2.7		60.0						
t_{OFF}	Turn OFF Time	3.6 to 4.3		15.0	23.0		25.0	ns	nB_0 or nB_1 = 1.5V, R_L = 50Ω, C_L = 35 pF	Figure 1
		2.7 to 3.6		16.0	28.0		30.0			
		2.3 to 2.7		50.0						
t_{B-M}	Break-Before-Make Time	3.6 to 4.3		8.0		2.0		ns	nB_0 or nB_1 = 1.5V, R_L = 50Ω, C_L = 35 pF	Figure 2
		2.7 to 3.6		8.0		2.0				
		2.3 to 2.7		8.0		2.0				
Q	Charge Injection	3.6 to 4.3		24.0				pC	C_L = 100 pF, V_{GEN} = 0V, R_{GEN} = 0Ω	Figure 4
		2.7 to 3.6		24.0					C_L = 100 pF, V_{GEN} = 0V, R_{GEN} = 0Ω	
		2.3 to 2.7		24.0					C_L = 100 pF, V_{GEN} = 0V, R_{GEN} = 0Ω	
OIRR	OFF-Isolation	3.6 to 4.3		−75.0				dB	f = 100kHz, R_L = 50Ω, C_L = 5 pF (Stray)	Figure 3
		2.7 to 3.6		−75.0						
		2.3 to 2.7		−75.0						
Xtalk	Crosstalk	3.6 to 4.3		−70.0				dB	f = 100kHz, R_L = 50Ω, C_L = 5 pF (Stray)	Figure 3
		2.7 to 3.6		−70.0						
		2.3 to 2.7		−70.0						
BW	−3db Bandwidth	2.3 to 4.3		45.0				MHz	R_L = 50Ω	Figure 6
THD	Total Harmonic Distortion	3.6 to 4.3		0.02				%	R_L = 32Ω, V_{IN} = 2V P.P, f= 20Hz to 20kHz	Figure 7
		2.7 to 3.6		0.02					R_L = 32Ω, V_{IN} = 1.5V P.P, f= 20Hz to 20kHz	
		2.3 to 2.7		0.02					R_L = 32Ω, V_{IN} = 1.2V P.P, f= 20Hz 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 Input Capacitance	0.0		1.5				pF	f = 1MHz (see Figure 5)
C_{OFF}	B Port OFF Capacitance	3.3		30.0				pF	f = 1MHz (see Figure 5)
C_{ON}	A Port ON Capacitance	3.3		126				pF	f = 1MHz (see Figure 5)

AC Loading and Waveforms

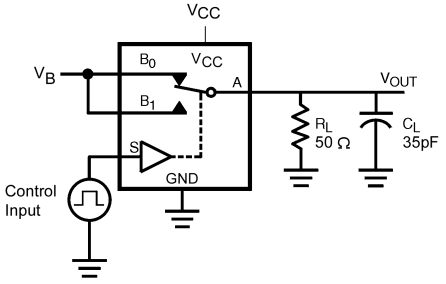


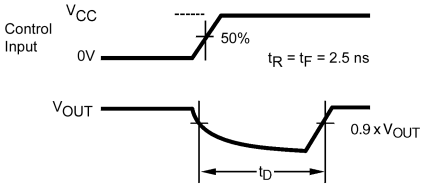


C_L includes Fixture and Stray Capacitance

Logic Input Waveforms Inverted for Switches that have the Opposite Logic Sense

FIGURE 1. Turn-On/Turn-Off Timing





C_L Includes Fixture and Stray Capacitance

FIGURE 2. Break-Before-Make Timing

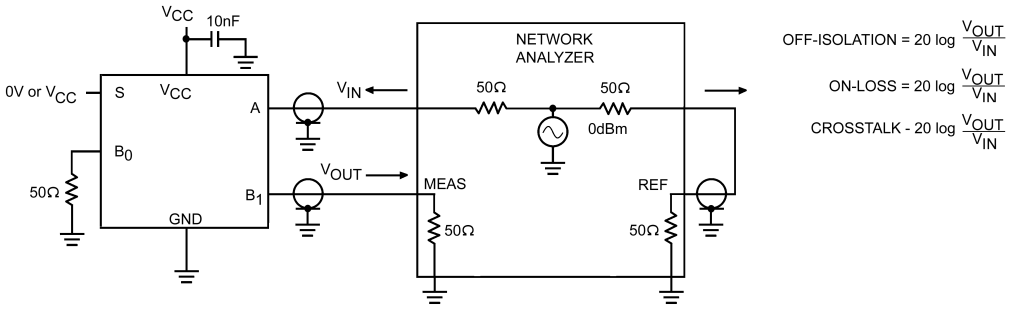


FIGURE 3. OFF Isolation and Crosstalk

AC Loading and Waveforms (Continued)

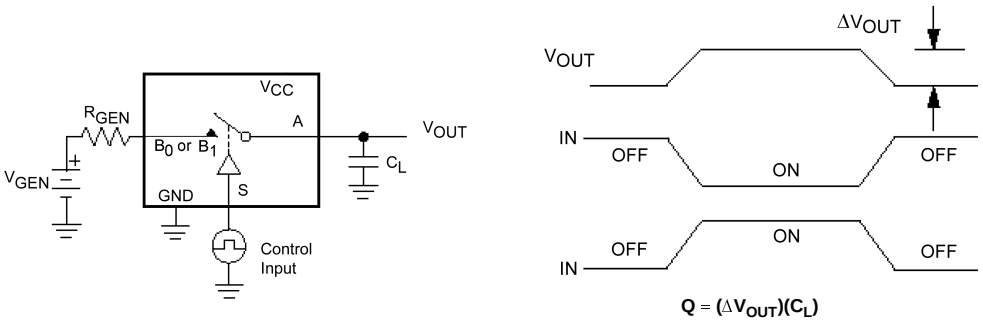


FIGURE 4. Charge Injection

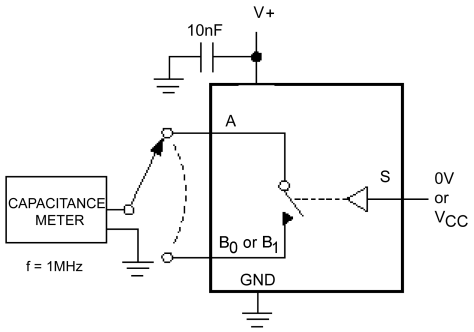


FIGURE 5. ON/OFF Capacitance Measurement Setup

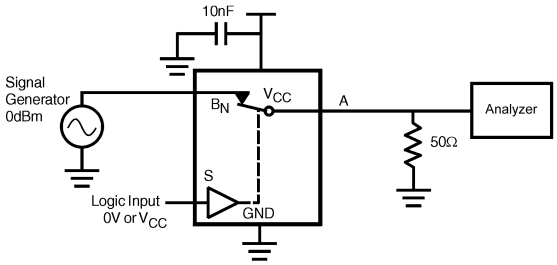


FIGURE 6. Bandwidth

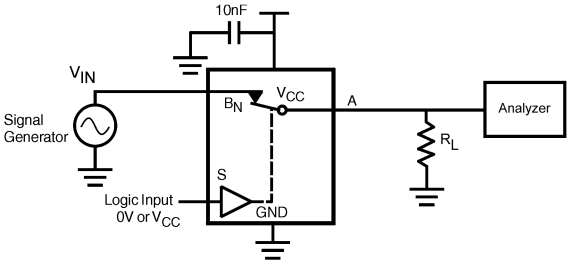
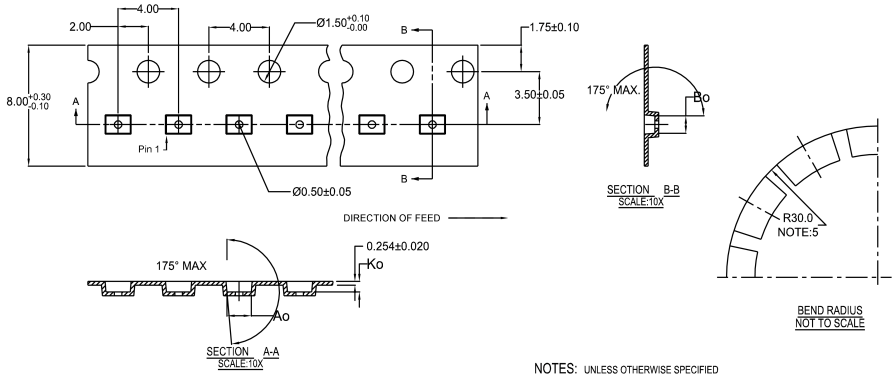


FIGURE 7. Harmonic Distortion

Tape and Reel Specification

Tape Format For Micropak 10

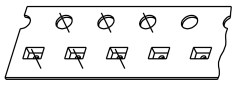
Package Designator	Tape Section	Number Cavities	Cavity Status	Cover Tape Status
L10X	Leader (Start End)	125 (typ)	Empty	Sealed
	Carrier	5000	Filled	Sealed
	Trailer (Hub End)	75 (typ)	Empty	Sealed



NOTES: UNLESS OTHERWISE SPECIFIED

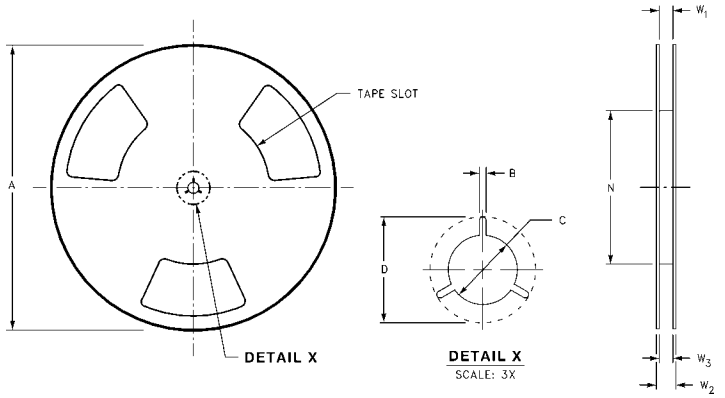
1. ACCUMULATED 50 SPROCKETS, SPROCKET HOLE PITCH IS 200.00 ±0.30MM
2. NO INDICATED CORNER RADIUS IS 0.127MM
3. CAMBER NOT TO EXCEED 1MM IN 100MM
4. SMALLEST ALLOWABLE BENDING RADIUS
5. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE

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



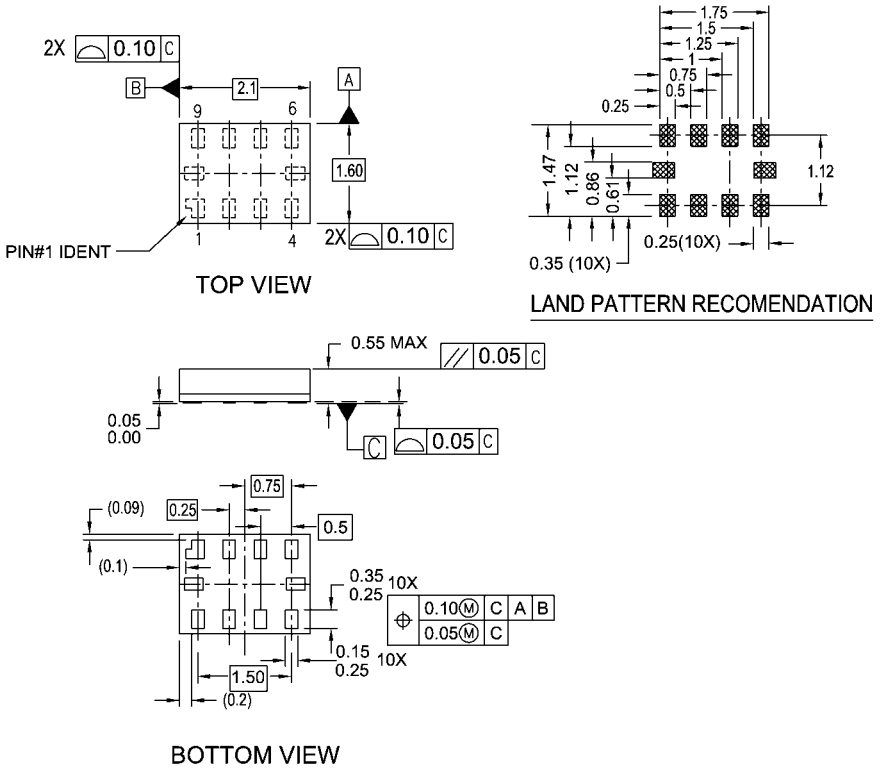
SCALE: 6X

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/–0.039 (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.

MAC010ARevB

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

littlediode
COMPONENTS FOR ALL

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