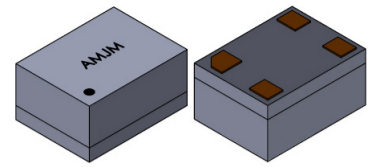


# POWER OPTIMIZED MEMS OSCILLATORS



AMJM-SERIES



ESD Sensitive



RoHS/RoHS II Compliant

MSL = MSL 1

1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

## FEATURES

- Compact footprint as small as 1.6x1.2mm
- Low 0.84mm profile
- Low power consumption
- 1MHz to 100MHz output frequency range
- Short lead time for new frequencies
- Wide -40°C to +85°C operating temperature range
- Output enable or ultra-low power standby: 12μA (typ)
- Low operating current: 3mA IDD (typ)

## APPLICATIONS

- Wearables
- Internet of Things (IoT)
- Industrial IoT
- Audio and video
- Drones and robotics

## ELECTRICAL SPECIFICATIONS

Electrical characteristics unless otherwise indicated,  $V_{DD} = 1.8V - 5\%$  to  $3.3V + 10\%$ , temperature range -40°C to 85°C

Parameters	Min.	Typ.	Max.	Units	Note
Frequency Range	1.0000		100.0000	MHz	
Power Supply Voltage ( $V_{DD}$ )	1.71		3.63	V	
Current Consumption ( $I_{DD}$ )		3.0		mA	$f_{out} = 27MHz, V_{DD} = 1.8V,$ No Load
Standby Current Consumptions ( $I_{STBY}$ )		12		μA	$V_{DD} = 1.8V/2.5V$
		80			$V_{DD} = 3.3V$
Operating Temperature Range	-40		+85	°C	See Options
Storage Temperature	-55		+150	°C	
All Inclusive Frequency Stability	-25		+25	ppm	Options "D" or "F"
	-50		+50		Options "E" or "G"
Aging	-5		+5	ppm	1 <sup>st</sup> year @25°C
	-1		+1		Per year after first year
Duty Cycle	45		55	%	
Output Logic Levels	Logic High $V_{OH}$	$0.8 * V_{DD}$		V	Std Drive option: I = 3mA
	Logic Low $V_{OL}$		$0.2 * V_{DD}$		High Drive option: I = 6 mA
Input Logic Levels	Logic High $V_{IH}$	$0.7 * V_{DD}$		V	Std Drive option: I = -3mA
	Logic Low $V_{IL}$		$0.3 * V_{DD}$		High Drive option: I = -6 mA
Enable Pull-Up Resistor		300		kΩ	
Power Supply Ramp ( $t_{PU}$ )	0.1		100	ms	Time to 90% targeted $V_{DD}$
Start-up Time ( $t_{SU}$ )			1.3	ms	From 90% $V_{DD}$ to valid clock output, @ 25°C

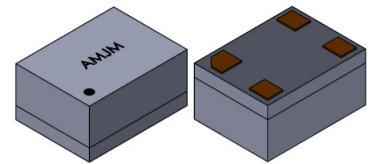


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ESD Sensitive



RoHS/RoHS II Compliant

MSL = MSL 1

1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

## ELECTRICAL SPECIFICATIONS

Parameters		Min	Typ.	Max.	Units	Note
Output Enable Time ( $t_{EN}$ )				1	$\mu$ s	
Output Disable Time ( $t_{DA}$ )				200+period	ns	
Rise ( $T_r$ ) / Fall ( $T_f$ ) Time	High Drive 20% $\leftrightarrow$ 80%		1	1.5	ns	CL = 15 pF   $V_{DD} = 1.8V$
			0.5	1.0		CL = 15 pF $V_{DD} = 2.5V/3.3V$
	Std Drive 20% $\leftrightarrow$ 80%		1.2	2.0		CL = 10 pF   $V_{DD} = 1.8V$
			1.5	2.2		CL = 10 pF $V_{DD} = 2.5V/3.3V$
RMS Period Jitter	$f_{out} =$ 27 MHz		9.5	11	ps	$V_{DD} = 1.8 V$
			7.5	9		$V_{DD} = 2.5V/3.3V$
Cycle-to-Cycle Jitter (Peak)	$f_{out} =$ 27 MHz		50	70	ps	$V_{DD} = 1.8 V$
			35	60		$V_{DD} = 2.5V/3.3V$

## ABSOLUTE MAXIMUM RATINGS

Parameters	Min	Typ.	Max.	Units	Note
Supply Voltage	-0.3		+4.0	V	
Input Voltage	-0.3		$V_{DD} + 0.3$	V	
Maximum Junction Temperature			+150	$^{\circ}C$	
Ambient Operating Temperature	-40		+85	$^{\circ}C$	Industrial
Ambient Operating Temperature	-20		+70	$^{\circ}C$	Extended Commercial
Storage Ambient Temperature Range	-55		+150	$^{\circ}C$	
Soldering Temperature		+260		$^{\circ}C$	40 Sec Maximum
ESD Protection	4 kV HBM, 400V MM, 2 kV CDM				

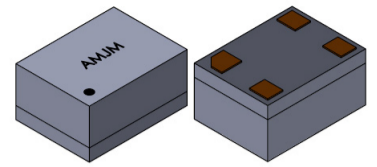


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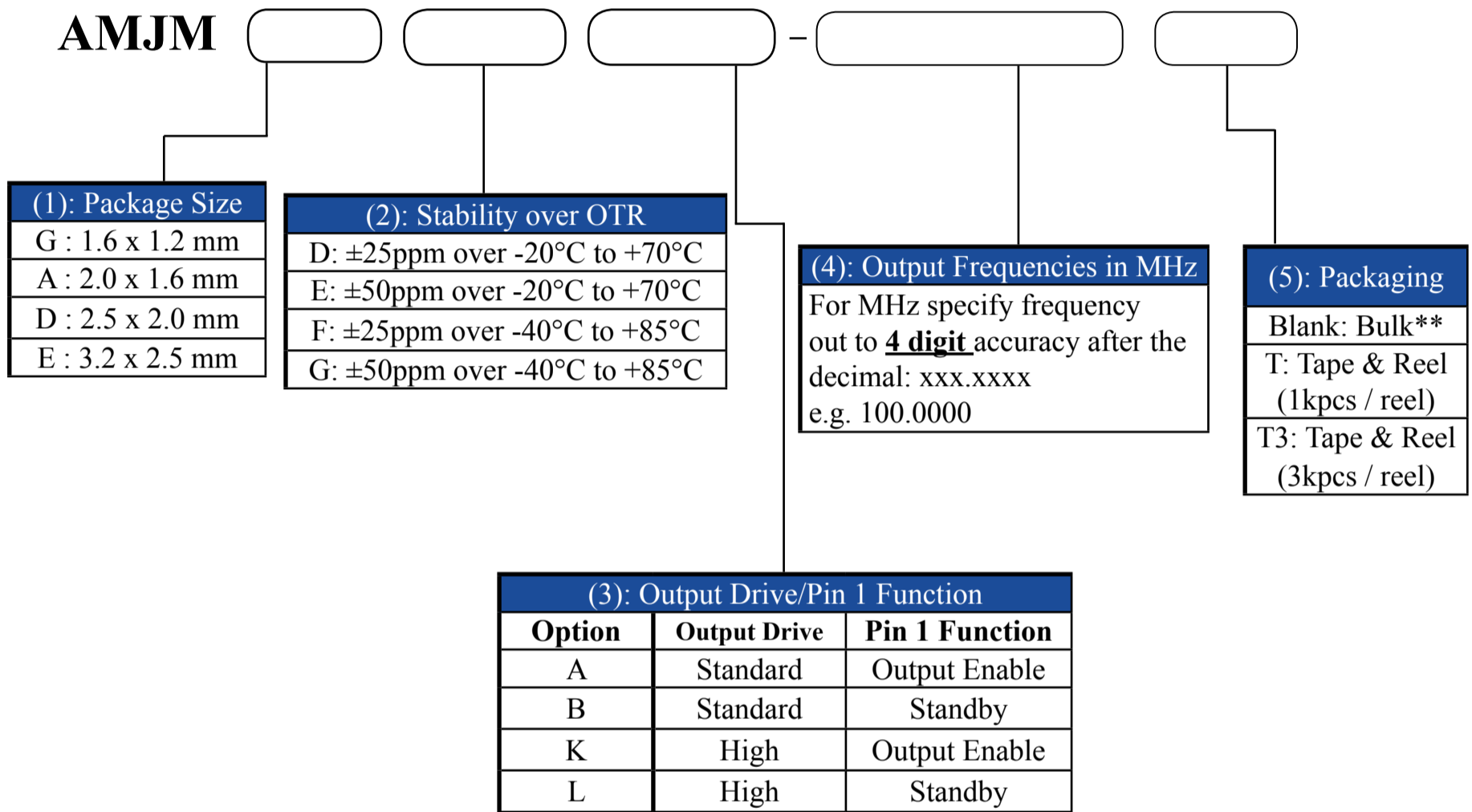
RoHS/RoHS II Compliant

MSL = MSL 1

1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

## OPTIONS AND PART IDENTIFICATION

**AMJM**



(1): Package Size
G : 1.6 x 1.2 mm
A : 2.0 x 1.6 mm
D : 2.5 x 2.0 mm
E : 3.2 x 2.5 mm

(2): Stability over OTR
D: ±25ppm over -20°C to +70°C
E: ±50ppm over -20°C to +70°C
F: ±25ppm over -40°C to +85°C
G: ±50ppm over -40°C to +85°C

(3): Output Drive/Pin 1 Function		
Option	Output Drive	Pin 1 Function
A	Standard	Output Enable
B	Standard	Standby
K	High	Output Enable
L	High	Standby

(4): Output Frequencies in MHz
For MHz specify frequency out to <b>4 digit</b> accuracy after the decimal: xxx.xxxx e.g. 100.0000

(5): Packaging
Blank: Bulk**
T: Tape & Reel (1kpcs / reel)
T3: Tape & Reel (3kpcs / reel)

*Part Number Example:*  
**AMJMGK-8.0000T**

\*\*MOQ per package:  
1.6x1.2mm: 100pcs/bag  
2.0x1.6mm: 100pcs/bag  
2.5x2.0mm: 140 pcs/tube  
3.2x2.5mm: 110 pcs/tube

For Quick turn-around programmable sample orders less than MOQ represented above:  
Due to the immediate availability of stock and the qty of the order, the parts may be delivered as Cut Tape, Loose parts in Antistatic Bag or in Tube(s).

For orders equal to or greater than MOQ and less than 1000pcs.  
Due to packaging, the order must be a multiple of MOQ per package size above

For orders equal to or greater than 1000pcs:  
Bulk is not an option. Please refer to tape and reel packaging.

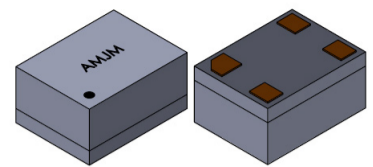


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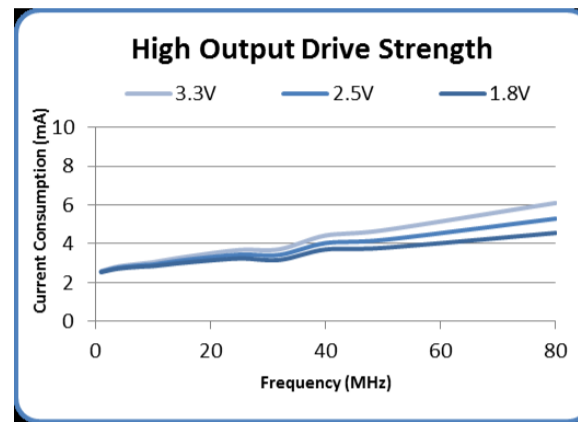
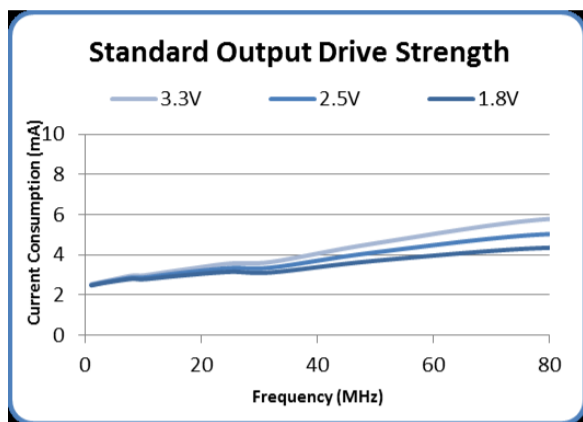
RoHS/RoHS II Compliant

MSL = MSL 1

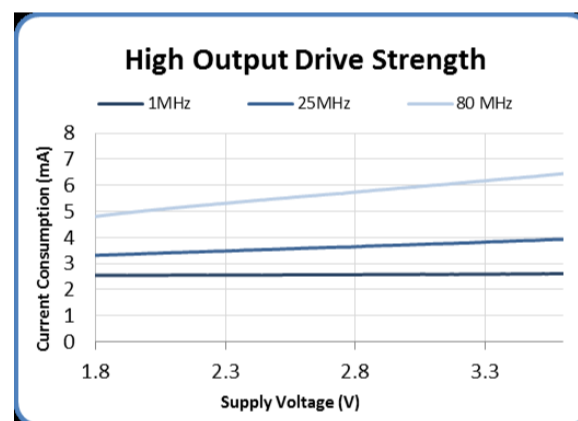
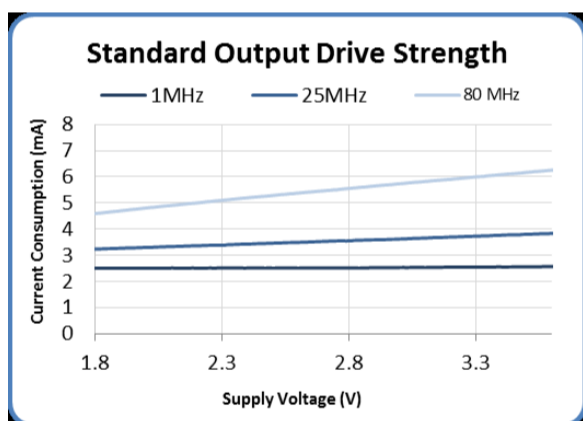
1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

## TYPICAL PERFORMANCE DATA @ 25°C ± 3°C

### Current Consumption vs Frequency



### Current Consumption vs Supply Voltage



## PINFUNCTIONS

Pin Number	Pin Name	Description
1	OE	Output Enable <sup>Note 1&amp;3</sup> : High or Open = Specified Frequency Output Low = Output is high impedance
	STBY	Standby <sup>Note 1&amp;3</sup> : High or Open = Specified Frequency Output Low = Output is high impedance, Device is in low power mode, Supply current is I <sub>STBY</sub>
2	GND	Power Supply Ground
3	Output	Oscillator Clock Output
4	V <sub>DD</sub>	Power Supply <sup>Note 2</sup>

### NOTES:

1. If pin 1 is high or floating, there will be frequency output. If pin 1 is low, output will be disengaged.
2. Bypass with 0.1 μF capacitor placed as close to V<sub>DD</sub> pin as possible.
3. 300 KΩ internal pull-up resistor present on pin 1.

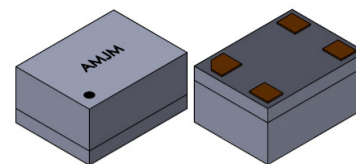


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1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

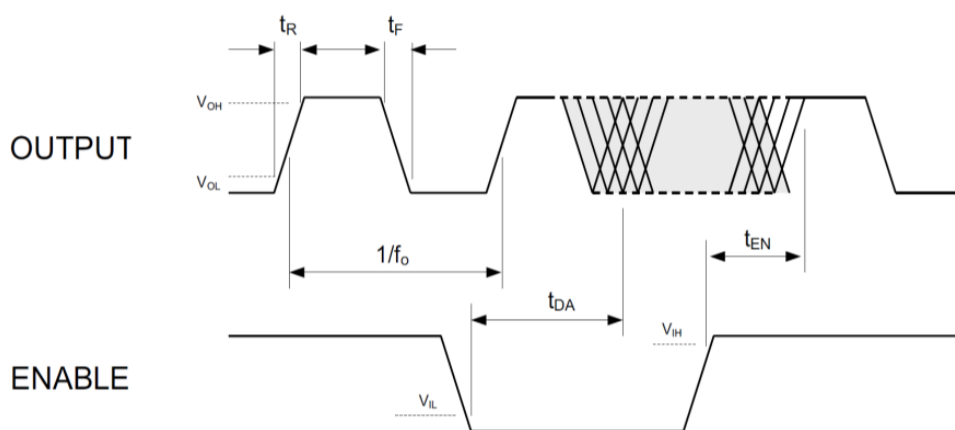
MSL = MSL 1

## OUTPUT BUFFER OPTIONS

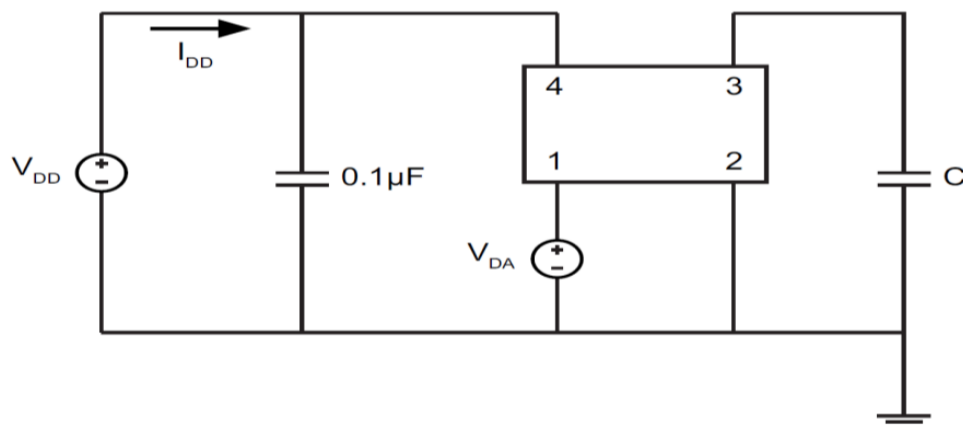
The AMJM Series is available in multiple output driver configurations. The standard-drive and high-drive deliver respective output currents of greater than 3 mA and 6 mA at 20% to 80% of the supply voltage. For loads of 15 pF or higher, the high-drive option is recommended.

## DIAGRAMS

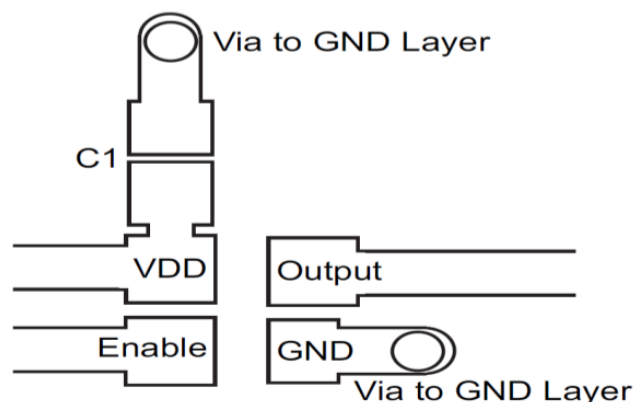
### Output Waveform



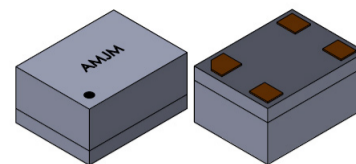
### Test Circuit



### Recommended Board Layout



# POWER OPTIMIZED MEMS OSCILLATORS



AMJM-SERIES



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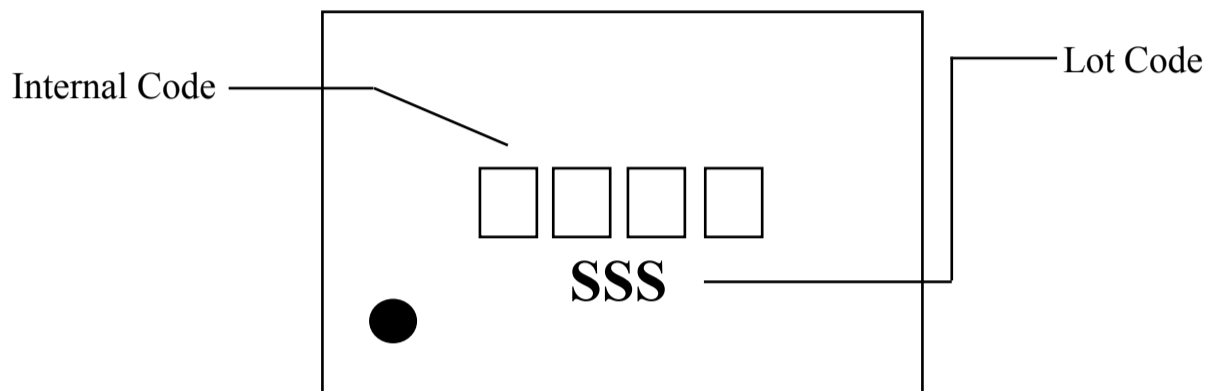
RoHS/RoHS II Compliant

1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

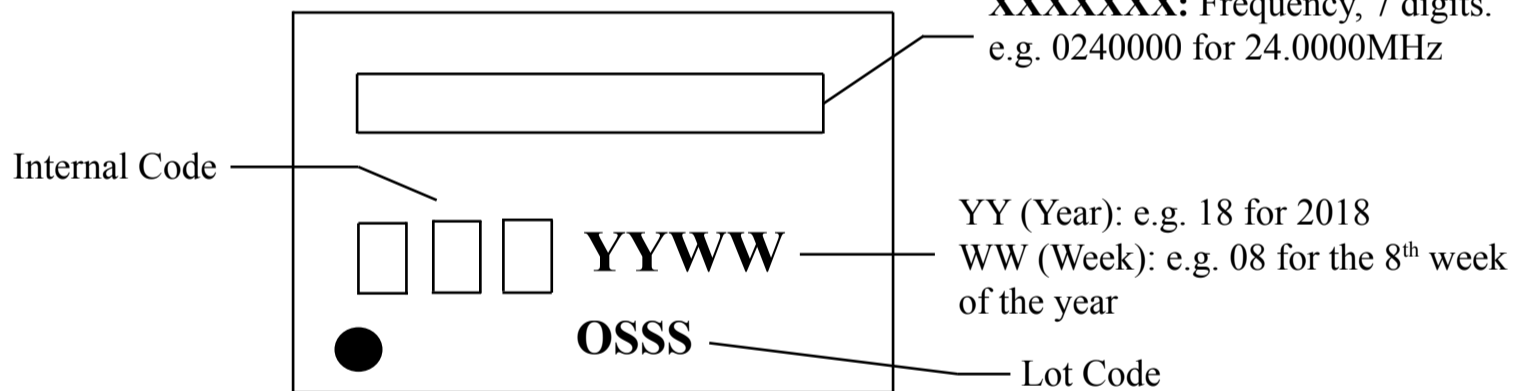
MSL = MSL 1

## MARKING

1.6 mm x 1.2 mm VFLGA  
2.0 mm x 1.6 mm VFLGA



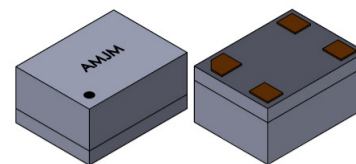
2.5 mm x 2.0 mm VLGA  
3.2 mm x 2.5 mm DFN



Marking Method: Laser Marking



# POWER OPTIMIZED MEMS OSCILLATORS



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ESD Sensitive



RoHS/RoHS II Compliant

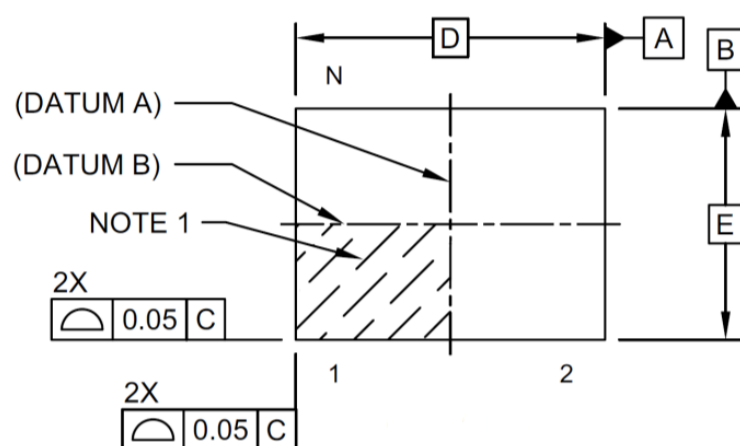
1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

MSL = MSL 1

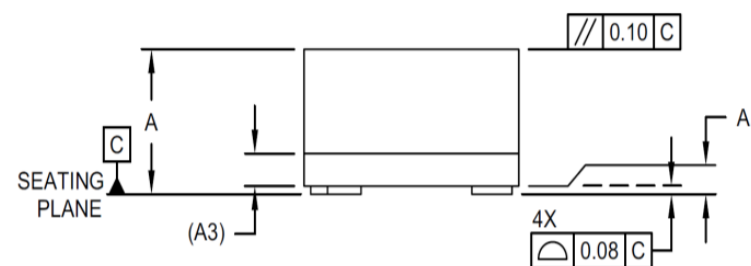
## MECHANICAL DIMENSIONS

### 1.6 x 1.2 mm VFLGA Package Outline

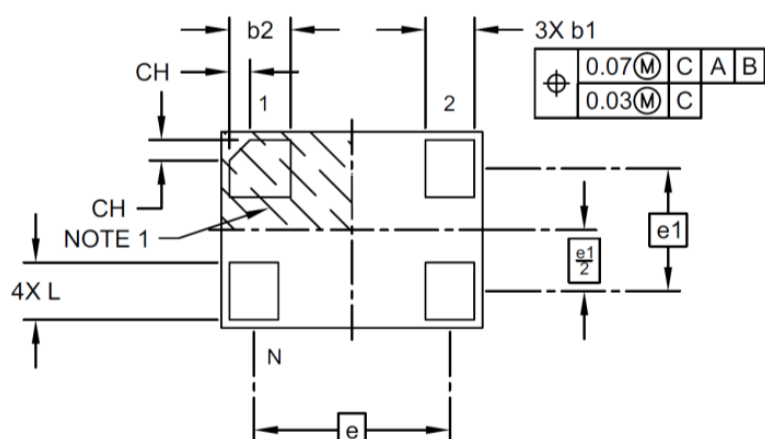
#### Top View



#### Side View



#### Bottom View



Description	Marker	Dimensions (mm)
Number of Terminals	N	4
Terminal Pitch	e	1.20 BSC
Terminal Pitch	e1	0.75 BSC
Overall Height	A	0.84 ± 0.05
Standoff*	A1	.02
Substrate Thickness (with Terminals)	A3	0.20 REF
Overall Length	D	1.60 BSC
Overall Width	E	1.20 BSC
Terminal Width	b1	0.30 ± 0.05
Terminal Width	b2	0.375 ± 0.05
Terminal Length	L	0.35 ± 0.05
Terminal 1 Index Chamfer	CH	0.125

\*Standoff max .05 mm and min 0.00 mm

Dimensioning and tolerance per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances

REF: Reference Dimension, usually without tolerance, for information purposes only

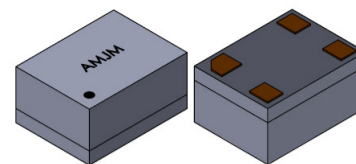


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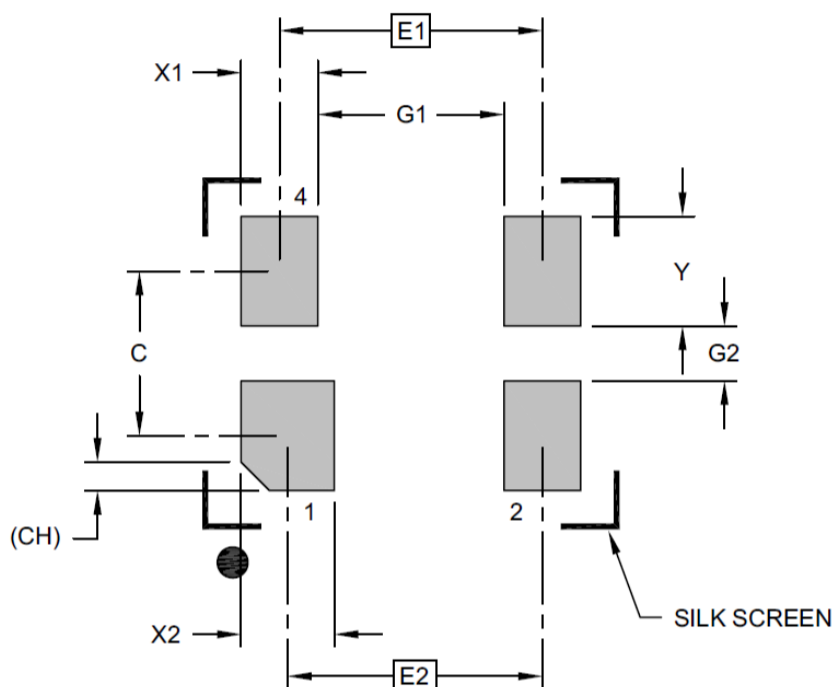


RoHS/RoHS II Compliant  
MSL = MSL 1

1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

## MECHANICAL DIMENSIONS

### Recommended Landing Pattern



Description	Marker	Max	Typ	Max	Unit
Contact Pitch	E1	1.20 BSC			mm
Contact Pitch	E2	1.16 BSC			
Contact Spacing	C		0.75		
Contact Width	X1			0.35	
Contact Width	X2			0.43	
Contact Pad Length	Y			0.50	
Space Between Contacts	G1	0.85			
Space Between Contacts	G2	0.25			
Contact 1 Index Chamfer	CH	0.13 x 45° REF			

Dimensioning and tolerance per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances

REF: Reference Dimension, usually without tolerance, for information purposes only



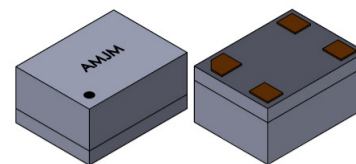
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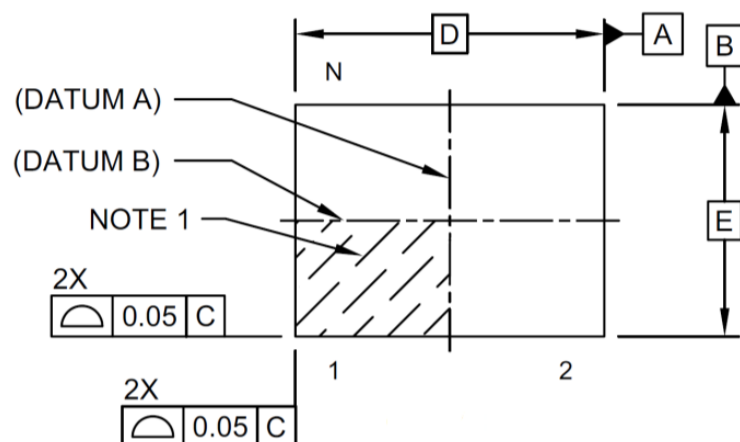
1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

MSL = MSL 1

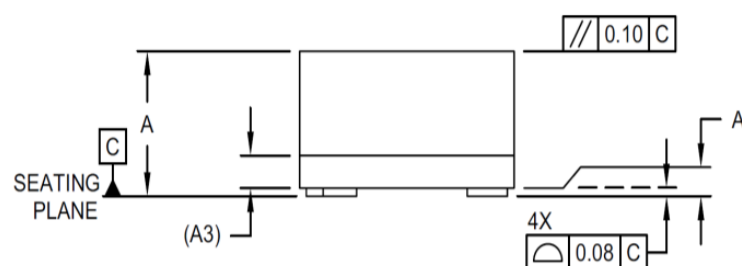
## MECHANICAL DIMENSIONS

### 2.0 x 1.6 mm VFLGA Package Outline

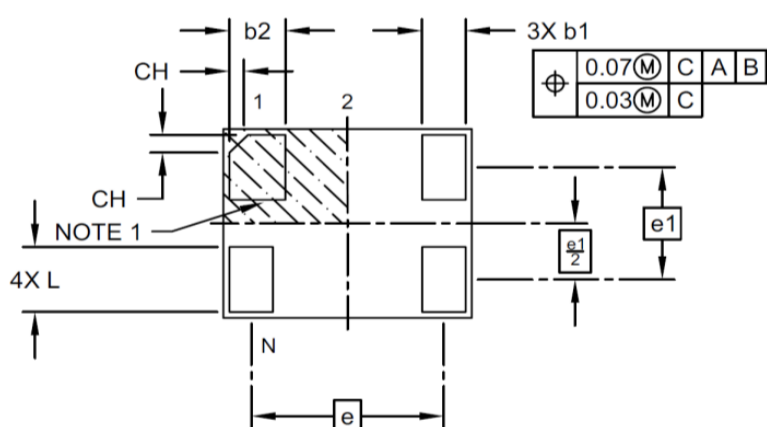
#### Top View



#### Side View



#### Bottom View



Description	Marker	Dimensions (mm)
Number of Terminals	N	4
Terminal Pitch	e	1.55 BSC
Terminal Pitch	e1	0.95 BSC
Overall Height	A	0.84 ± 0.05
Standoff*	A1	.02
Substrate Thickness (with Terminals)	A3	0.20 REF
Overall Length	D	2.00 BSC
Overall Width	E	1.60 BSC
Terminal Width	b1	0.35 ± 0.05
Terminal Width	b2	0.45 ± 0.05
Terminal Length	L	0.55 ± 0.05
Terminal 1 Index Chamfer	CH	0.15

\*Standoff max .05 mm and min 0.00 mm

Dimensioning and tolerance per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances

REF: Reference Dimension, usually without tolerance, for information purposes only

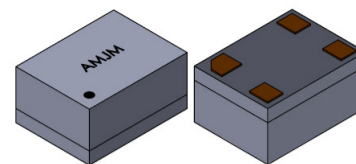


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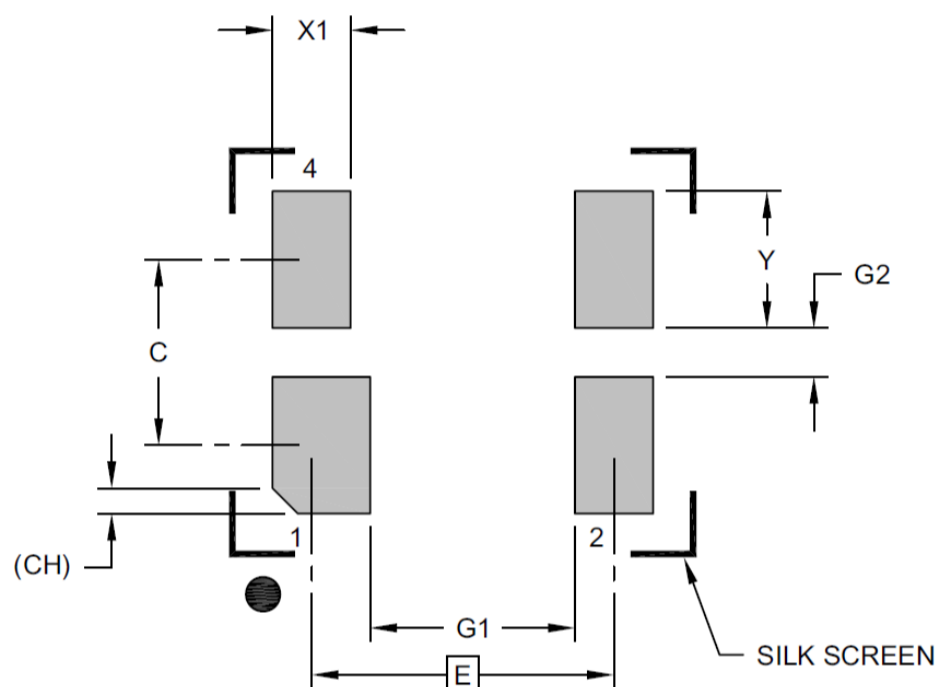
RoHS/RoHS II Compliant

1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

MSL = MSL 1

## MECHANICAL DIMENSIONS

### Recommended Landing Pattern



Description	Marker	Max	Typ	Max	Unit
Contact Pitch	E2	1.55 BSC			mm
Contact Spacing	C		0.95		
Contact Width	X1			0.50	
Contact Width	X2			0.40	
Contact Pad Length	Y			0.70	
Space Between Contacts	G1	1.05			
Space Between Contacts	G2	0.25			
Contact 1 Index Chamfer	CH	0.13 x 45° REF			

Dimensioning and tolerance per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances

REF: Reference Dimension, usually without tolerance, for information purposes only

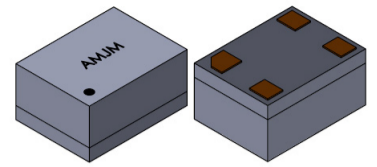


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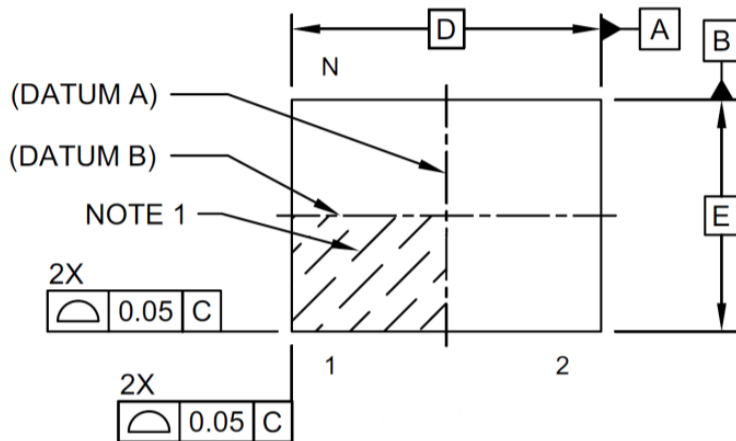
1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

MSL = MSL 1

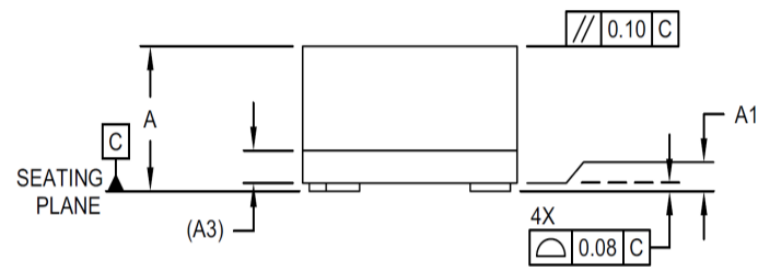
## MECHANICAL DIMENSIONS

### 2.5 x 2.0 mm VLGA Package Outline

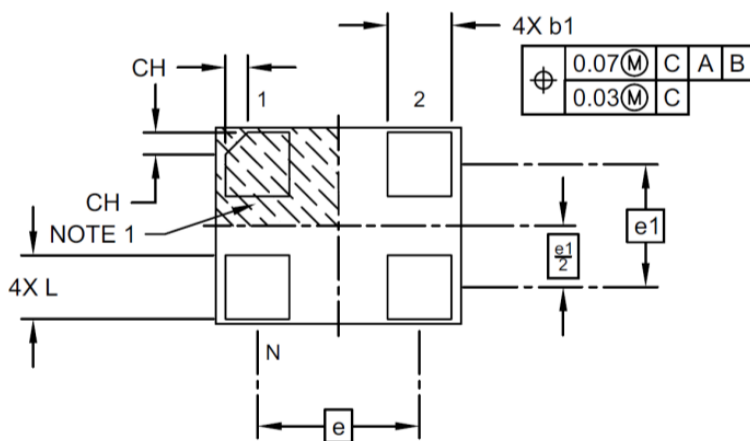
#### Top View



#### Side View



#### Bottom View



Description	Marker	Dimensions (mm)
Number of Terminals	N	4
Terminal Pitch	e	1.65 BSC
Terminal Pitch	e1	1.25 BSC
Overall Height	A	0.84 ± 0.05
Standoff*	A1	.02
Substrate Thickness (with Terminals)	A3	0.20REF
Overall Length	D	2.50BSC
Overall Width	E	2.00BSC
Terminal Width	b1	0.65 ± 0.05
Terminal Length	L	0.65 ± 0.05
Terminal 1 Index Chamfer	CH	0.225

\*Standoff max .05 mm and min 0.00 mm

Dimensioning and tolerance per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances

REF: Reference Dimension, usually without tolerance, for information purposes only

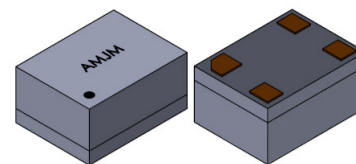


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# POWER OPTIMIZED MEMS OSCILLATORS



AMJM-SERIES



ESD Sensitive



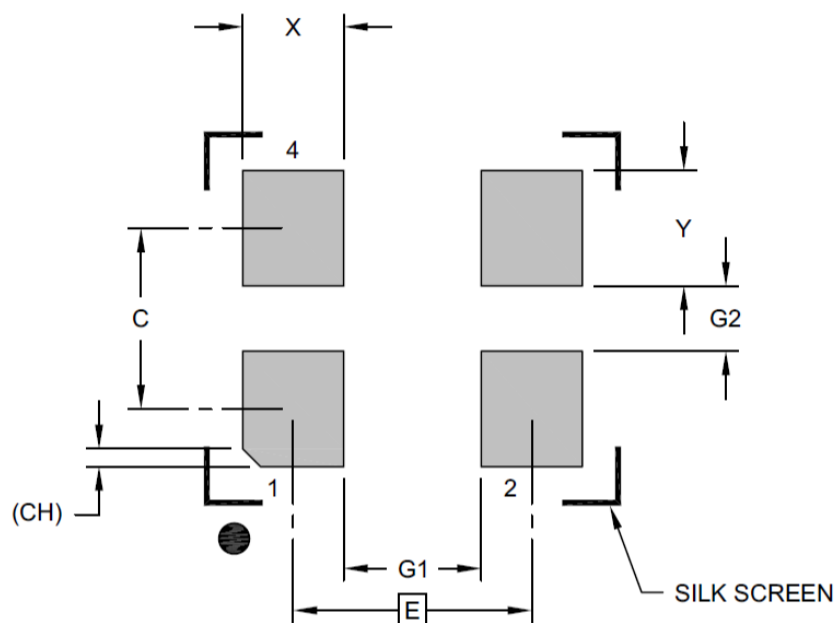
RoHS/RoHS II Compliant

MSL = MSL 1

1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

## MECHANICAL DIMENSIONS

### Recommended Landing Pattern



Description	Marker	Max	Typ	Max	Unit
Contact Pitch	E	1.65 BSC			mm
Contact Spacing	C		1.25		
Contact Width	X1			0.70	
Contact Width	X2			0.80	
Contact Pad Length	Y			0.50	
Space Between Contacts	G1	0.95			
Space Between Contacts	G2	0.45			
Contact 1 Index Chamfer	CH	0.13 x 45° REF			

Dimensioning and tolerance per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances

REF: Reference Dimension, usually without tolerance, for information purposes only

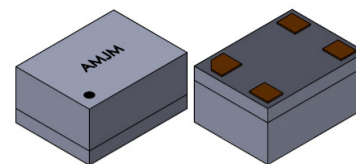


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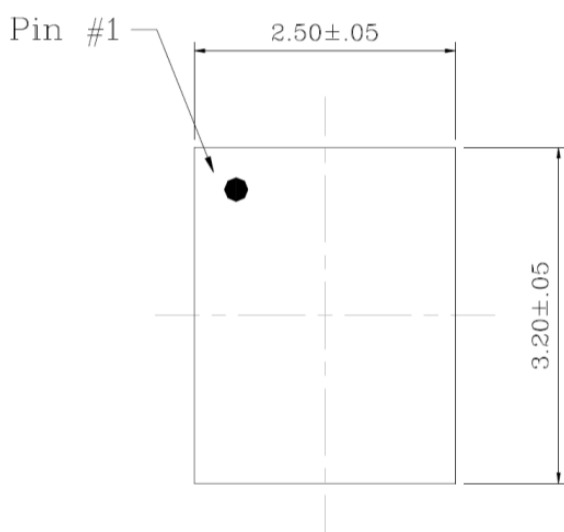
MSL = MSL 1

- 1.6 x 1.2 x 0.84 mm
- 2.0 x 1.6 x 0.84 mm
- 2.5 x 2.0 x 0.84 mm
- 3.2 x 2.5 x 0.85 mm

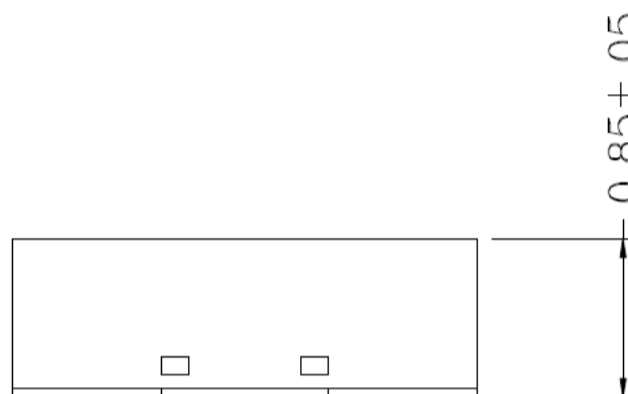
## MECHANICAL DIMENSIONS

### 3.2 x 2.5 mm DFN Package Outline

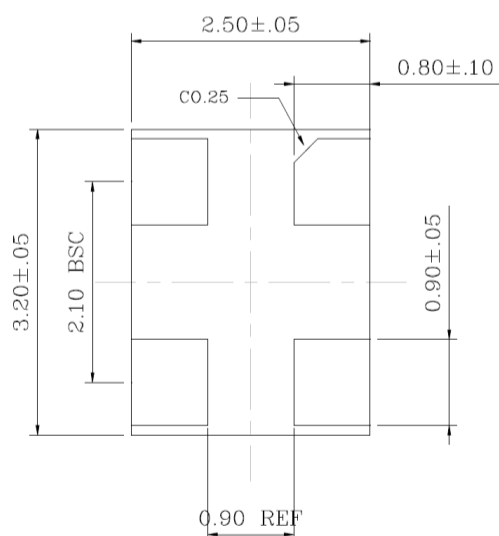
#### Top View



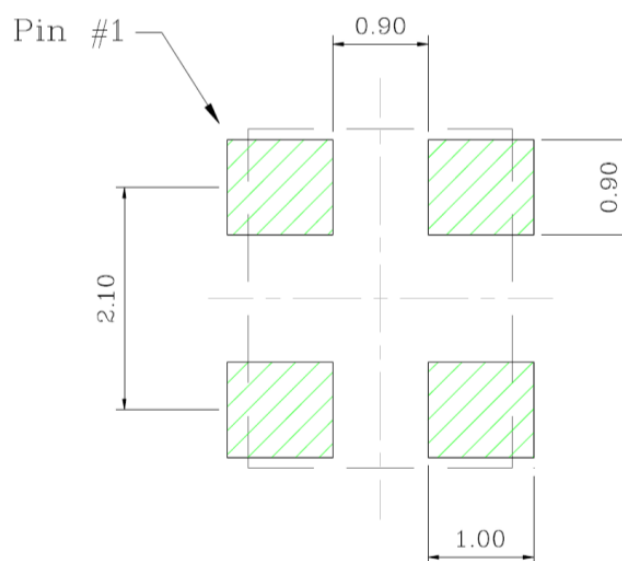
#### Side View



#### Bottom View

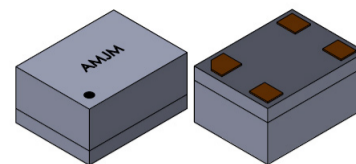


#### Recommended Landing Pattern



Dimensions : mm

# POWER OPTIMIZED MEMS OSCILLATORS



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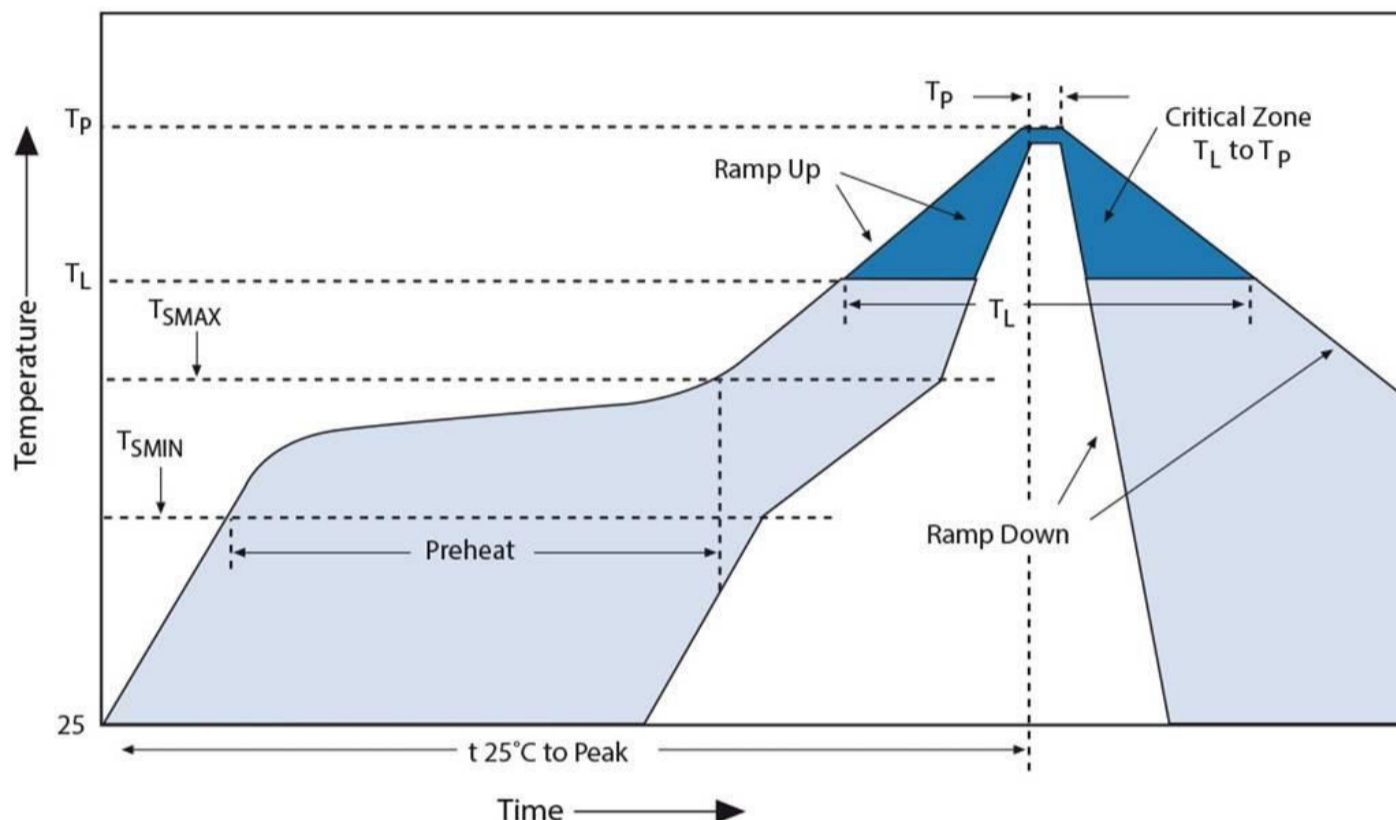


RoHS/RoHS II Compliant

1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

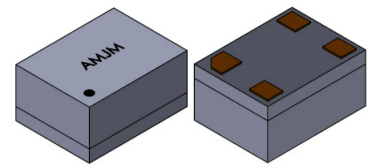
MSL = MSL 1

## REFLOW PROFILE



Zone	Description	Temperature	Time
1	Preheat / Soak	$T_{SMIN} \sim T_{SMAX}$ 150°C ~ 200°C	60 ~ 180 sec.
2	Reflow	$T_L$ 217°C	60 ~ 150 sec.
3	Peak heat	$T_P$ 255°C - 260°C	20-40 sec. MAX.

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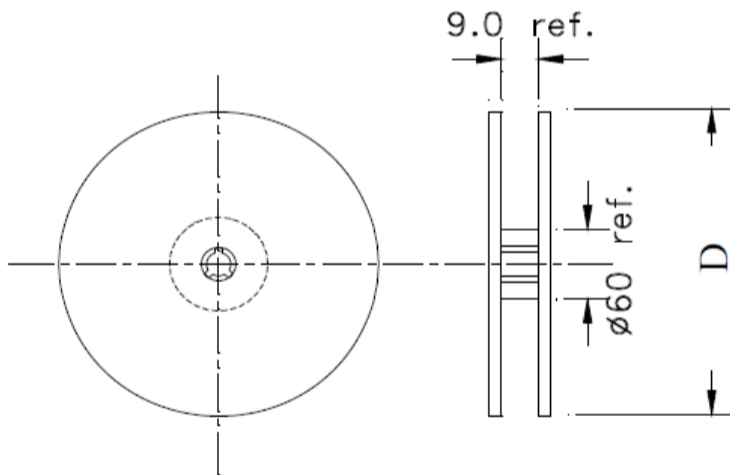
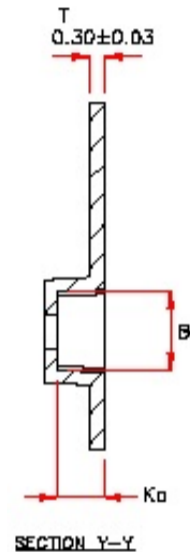
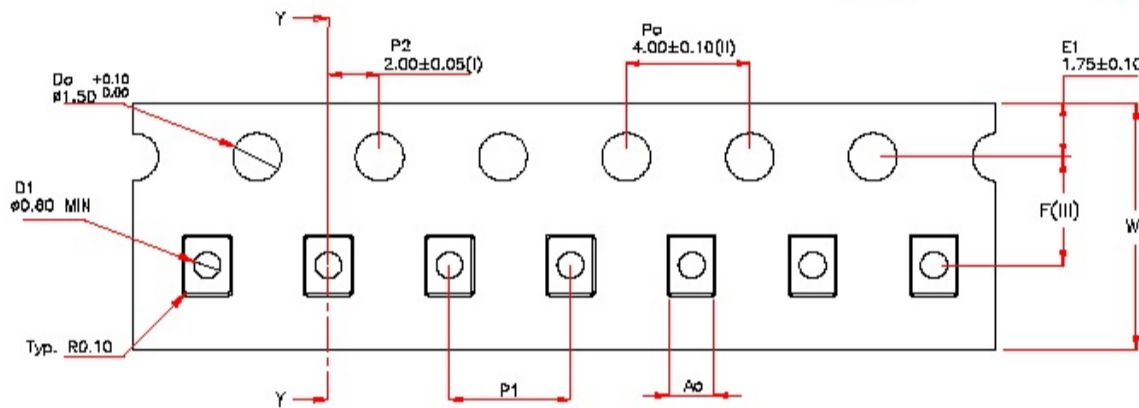
MSL = MSL 1

1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

## PACKAGING

Bulk MOQ= 100pcs/Bag\*  
T= 1,000pcs/reel (D=180mm)  
T3= 3,000pcs/reel (D=180mm)

Affected Package Size:  
1.6 mm x 1.2 mm VFLGA



$A_0$	$1.40 \pm 0.05$
$B_0$	$1.80 \pm 0.05$
$K_0$	$1.05 \pm 0.05$
F	$3.50 \pm 0.05$
$P_1$	$4.00 \pm 0.10$
W	$8.00 +0.30/-0.10$

### Dimensions : mm

\* For Quick turn-around programmable sample orders less than MOQ represented above:  
Due to the immediate availability of stock and the qty of the order, the parts may be delivered as Cut Tape,  
Loose parts in Antistatic Bag or in Tube(s).

For orders equal to or greater than MOQ and less than 1000pcs:  
Due to packaging, the order must be a multiple of MOQ per package size above

For orders equal to or greater than 1000pcs:  
Bulk is not an option. Please refer to tape and reel packaging.



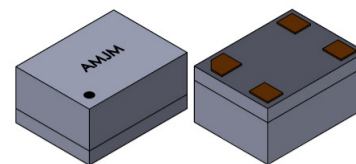
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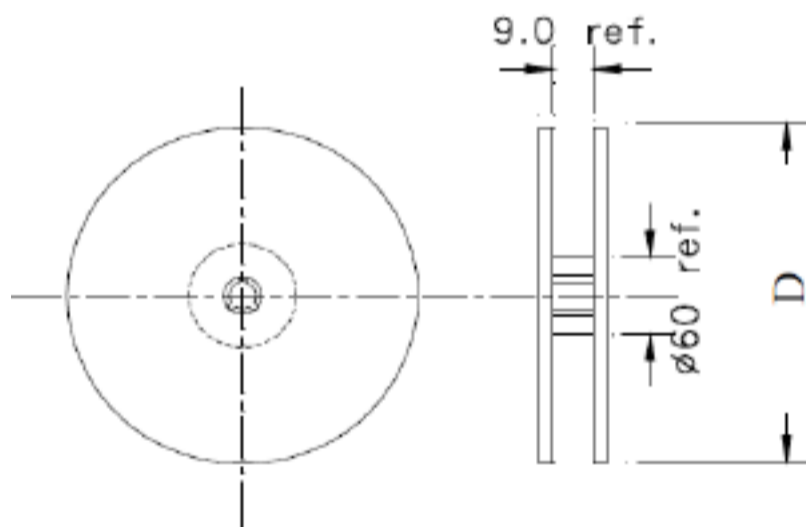
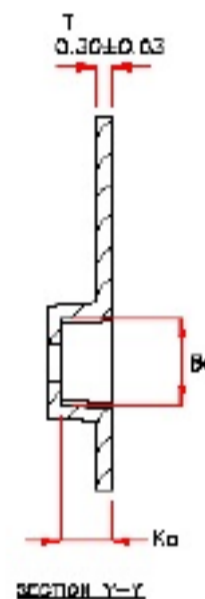
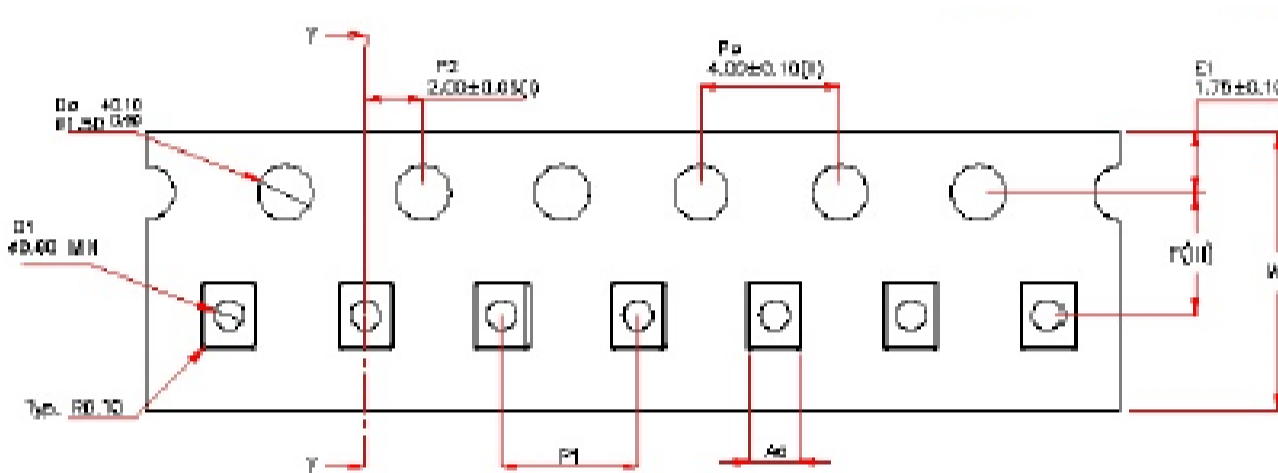
MSL = MSL 1

1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

## PACKAGING

Bulk MOQ= 100pcs/Bag\*  
T= 1,000pcs/reel (D=180mm)  
T3= 3,000pcs/reel (D=180mm)

Affected Package Sizes:  
2.0 mm x 1.6 mm VFLGA



$A_0$	$1.90 \pm 0.05$
$B_0$	$2.30 \pm 0.05$
$K_0$	$1.05 \pm 0.05$
F	$3.50 \pm 0.05$
$P_1$	$4.00 \pm 0.10$
W	$8.00 +0.30/-0.10$

### Dimensions : mm

\* For Quick turn-around programmable sample orders less than MOQ represented above:  
Due to the immediate availability of stock and the qty of the order, the parts may be delivered as Cut Tape,  
Loose parts in Antistatic Bag or in Tube(s).

For orders equal to or greater than MOQ and less than 1000pcs:  
Due to packaging, the order must be a multiple of MOQ per package size above

For orders equal to or greater than 1000pcs:  
Bulk is not an option. Please refer to tape and reel packaging.

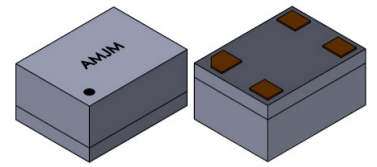


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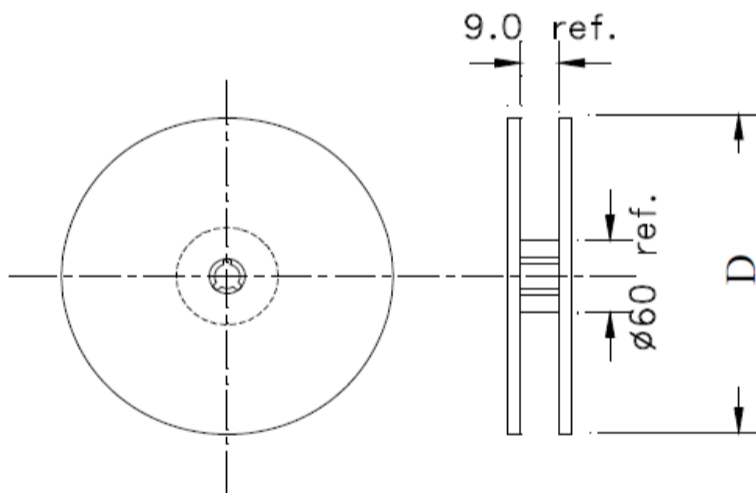
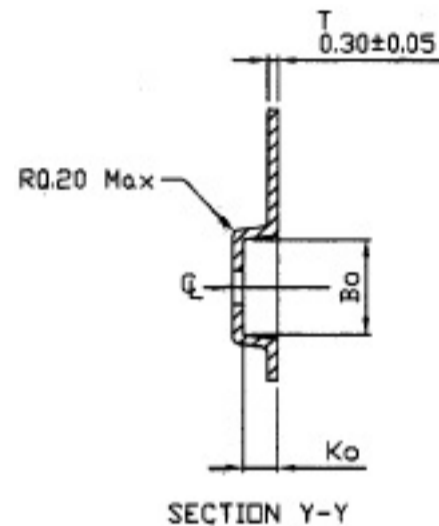
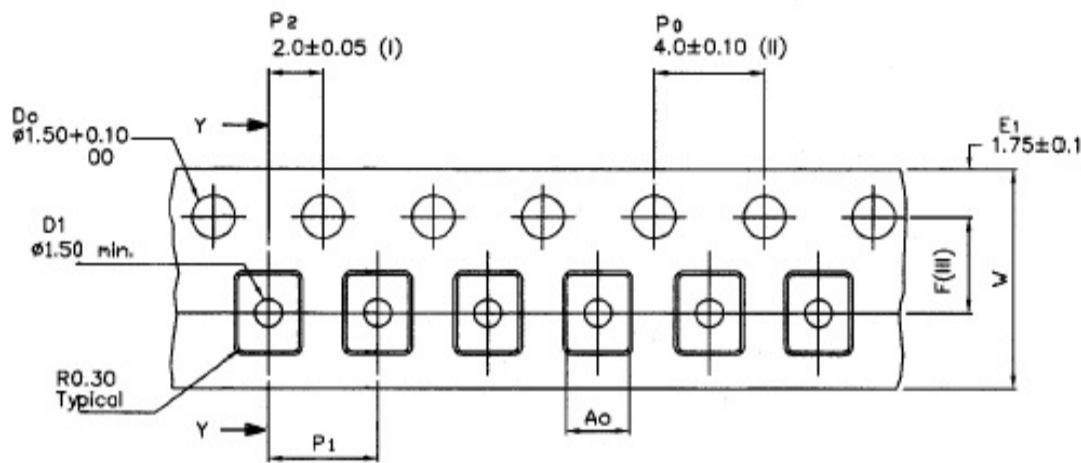
MSL = MSL 1

1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

## PACKAGING

Bulk MOQ= 140pcs/Tube\*  
T= 1,000pcs/reel (D=180mm)  
T3= 3,000pcs/reel (D=180mm)

Affected Package Sizes:  
2.5 mm x 2.0 mm VLGA



A <sub>0</sub>	2.25 ± 0.05
B <sub>0</sub>	2.80 ± 0.05
K <sub>0</sub>	1.10 ± 0.05
F	3.50 ± 0.05
P <sub>1</sub>	4.00 ± 0.10
W	8.00 + 0.30 / - 0.10

### Dimensions : mm

\* For Quick turn-around programmable sample orders less than MOQ represented above:  
Due to the immediate availability of stock and the qty of the order, the parts may be delivered as Cut Tape,  
Loose parts in Antistatic Bag or in Tube(s).

For orders equal to or greater than MOQ and less than 1000pcs:  
Due to packaging, the order must be a multiple of MOQ per package size above

For orders equal to or greater than 1000pcs:  
Bulk is not an option. Please refer to tape and reel packaging.

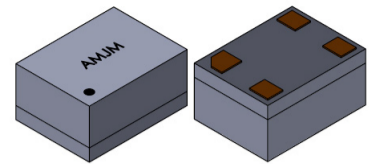


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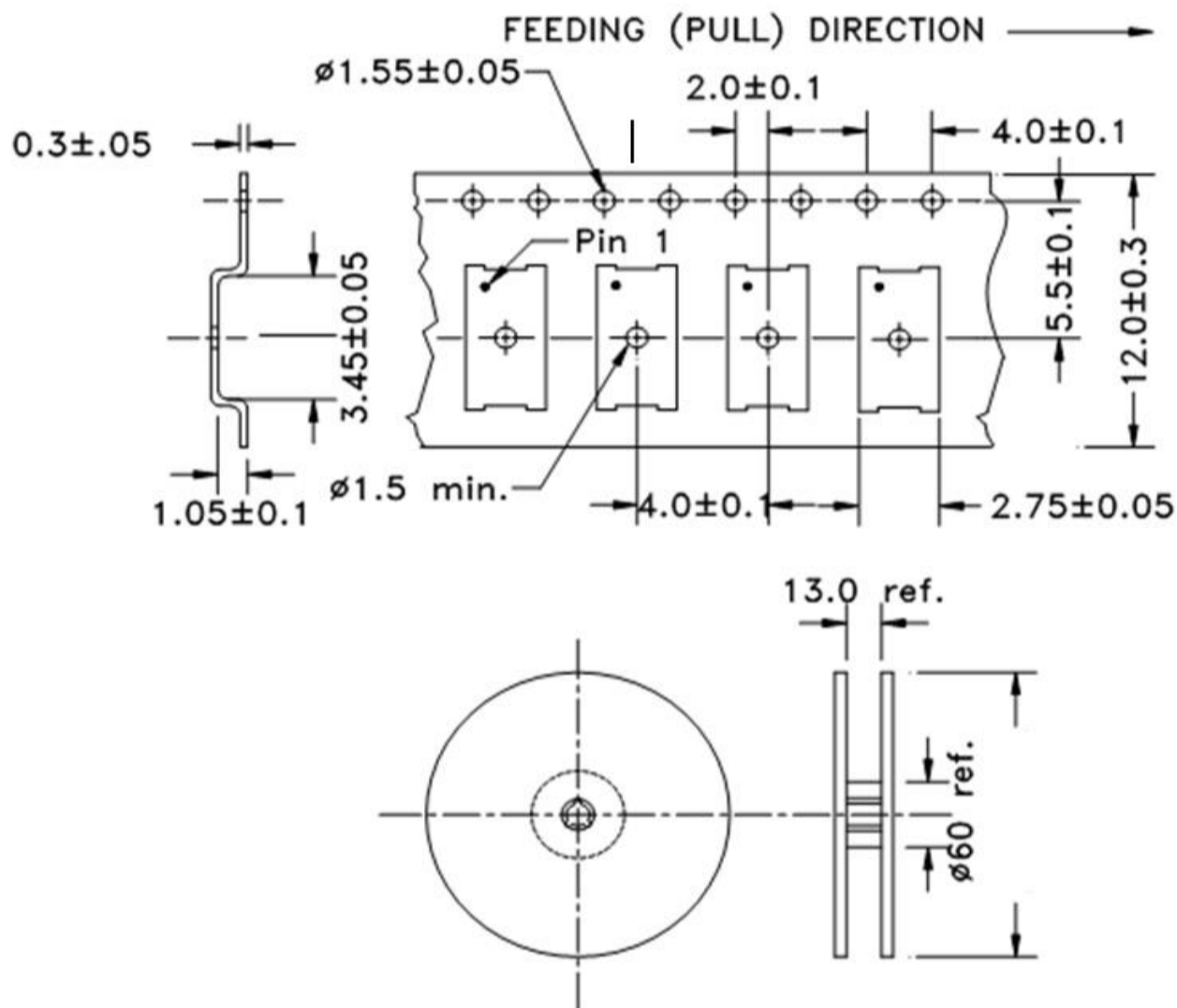
MSL = MSL 1

1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

## PACKAGING

Bulk MOQ= 110pcs/Tube\*  
T= 1,000pcs/reel (D=180mm)  
T3= 3,000pcs/reel (D=180mm)

Affected Package Sizes:  
3.2 mm x 2.5 mm DFN



### Dimensions : mm

\* For Quick turn-around programmable sample orders less than MOQ represented above:  
Due to the immediate availability of stock and the qty of the order, the parts may be delivered as Cut Tape,  
Loose parts in Antistatic Bag or in Tube(s).

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Due to packaging, the order must be a multiple of MOQ per package size above

For orders equal to or greater than 1000pcs:  
Bulk is not an option. Please refer to tape and reel packaging.



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