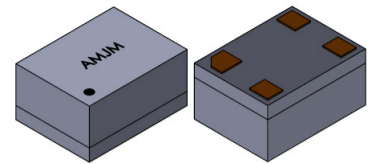




**THE DATASHEET OF  
AMJMAGA-90.0000T3**



# 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    | $f_{out} = 27MHz, V_{DD} = 1.8V,$<br>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<br>$V_{OH}$ | $0.8 \cdot V_{DD}$ |                    | V     | Std Drive option: I = 3mA                       |
|   | Logic Low<br>$V_{OL}$  |                    | $0.2 \cdot V_{DD}$ |       | High Drive option: I = 6 mA                     |
| Input Logic Levels                          | Logic High<br>$V_{IH}$ | $0.7 \cdot V_{DD}$ |                    | V     | Std Drive option: I = -3mA                      |
|   | Logic Low<br>$V_{IL}$  |                    | $0.3 \cdot V_{DD}$ |       | 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 ( $t_{SU}$ )                  |                        |                    | 1.5                | ms    | From 90% $V_{DD}$ to valid clock output, @ 25°C |

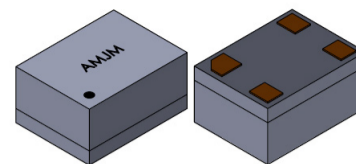


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1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

MSL = MSL 1

## ELECTRICAL SPECIFICATIONS

| Parameters                           | Min                                     | Typ. | Max.        | Units   | Note                               |
|--------------------------------------|---|------|-------------|---------|------------------------------------|
| Output Enable Time ( $t_{EN}$ )      |   |      | 1           | $\mu$ s |                                    |
| Output Disable Time ( $t_{DA}$ )     |   |      | 200+2period | ns      |                                    |
| Rise ( $T_r$ ) / Fall ( $T_f$ ) Time | High Drive<br>20% $\leftrightarrow$ 80% | 1    | 1.5         | ns      | CL = 15 pF   $V_{DD} = 1.8V$       |
|                                      |   | 0.5  | 1.0         |         | CL = 15 pF<br>$V_{DD} = 2.5V/3.3V$ |
|                                      | Std Drive<br>20% $\leftrightarrow$ 80%  | 1.2  | 2.0         |         | CL = 10 pF   $V_{DD} = 1.8V$       |
|                                      |   | 1.5  | 2.2         |         | CL = 10 pF<br>$V_{DD} = 2.5V/3.3V$ |
| RMS Period Jitter                    | $f_{out} =$<br>27 MHz                   | 9.5  | 11          | ps      | $V_{DD} = 1.8 V$                   |
|                                      |   | 7.5  | 9           |         | $V_{DD} = 2.5V/3.3V$               |
| Cycle-to-Cycle Jitter<br>(Peak)      | $f_{out} =$<br>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 |                | $^{\circ}C$ |                     |
| ESD Protection                    | 4 kV HBM, 400V MM, 2 kV CDM |      |                |             |                     |

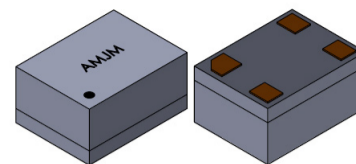


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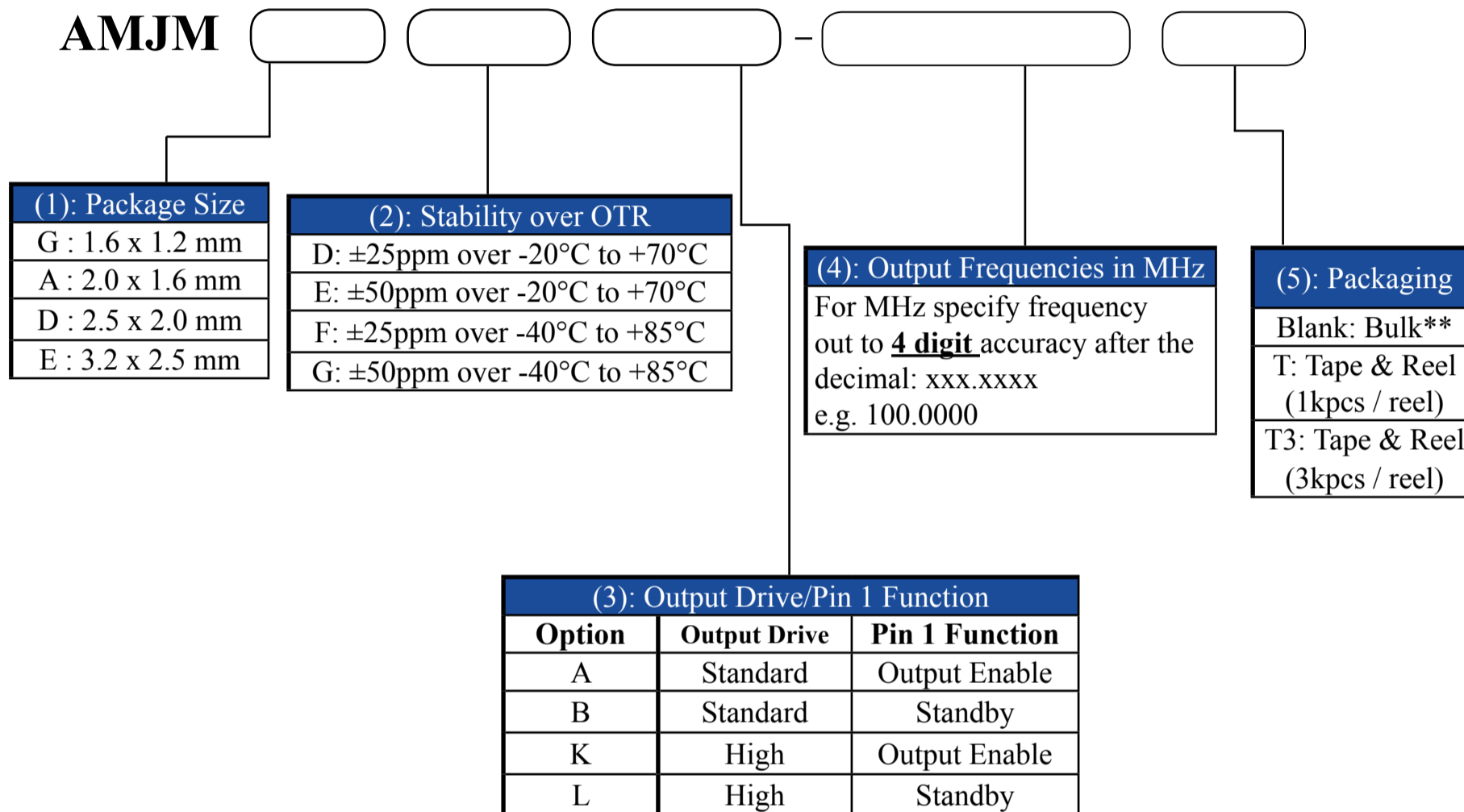
RoHS/RoHS II Compliant

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**



*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.

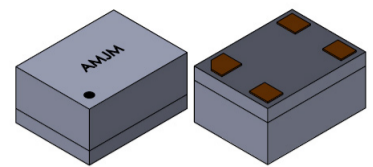


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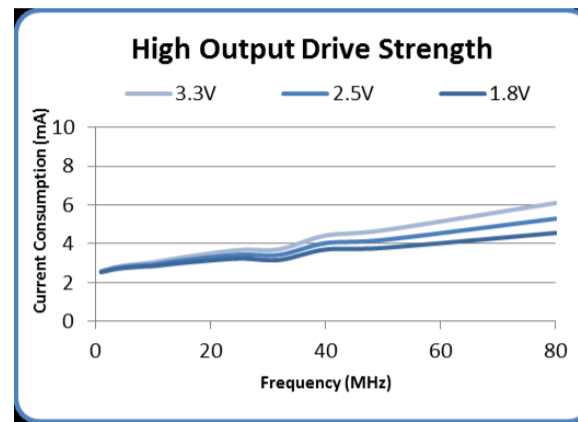
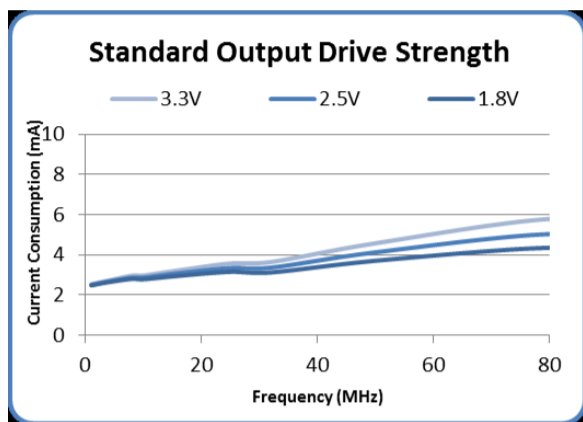
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MSL = MSL 1

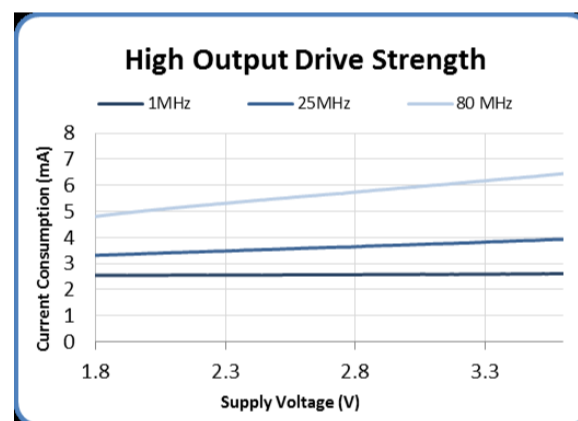
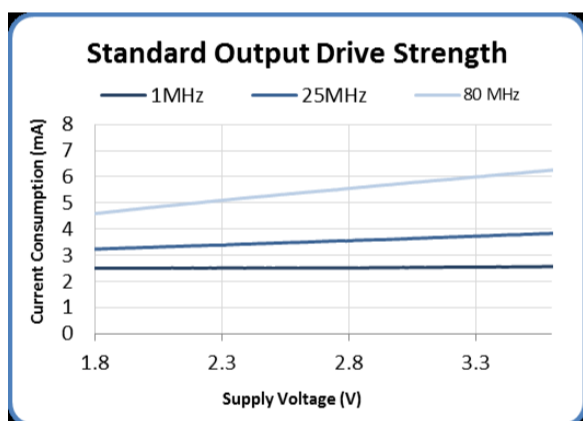
1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

## 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<br>Low = Output is high impedance  |
|            | STBY     | Standby <sup>Note 1&amp;3</sup> : High or Open = Specified Frequency Output<br>Low = Output is high impedance, Device is in low power mode, Supply current is $I_{STBY}$ |
| 2          | GND      | Power Supply Ground  |
| 3          | Output   | Oscillator Clock Output  |
| 4          | $V_{DD}$ | 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  $\mu$ F capacitor placed as close to  $V_{DD}$  pin as possible.
3. 300 K $\Omega$  internal pull-up resistor present on pin 1.

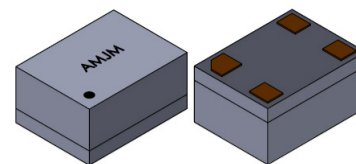


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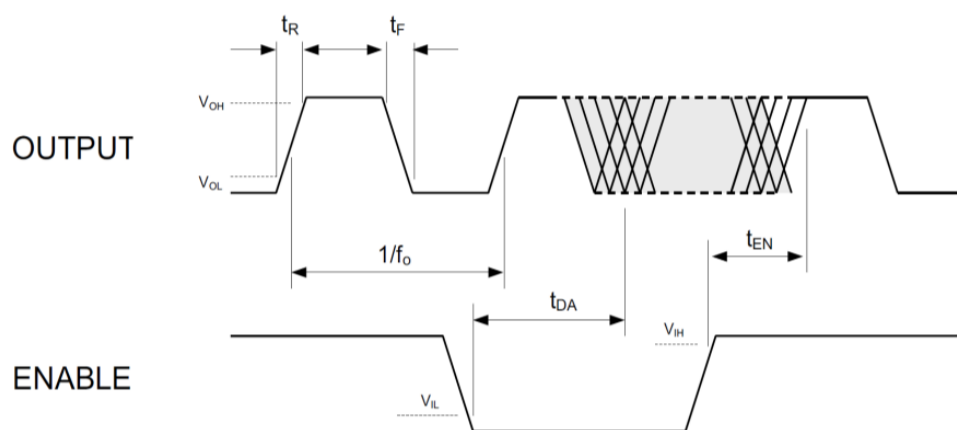
1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

## OUTPUT BUFFER OPTIONS

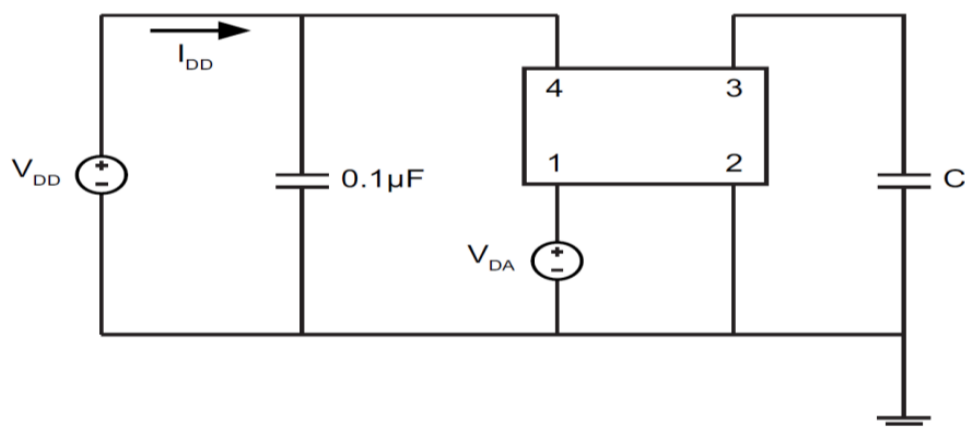
The AMJM Series is available in multiple output driver configurations. The standard-drive and high-drive deliver respective output currents of greater than 3 mA and 6 mA at 20% to 80% of the supply voltage. For loads of 15 pF or higher, the high-drive option is recommended.

## DIAGRAMS

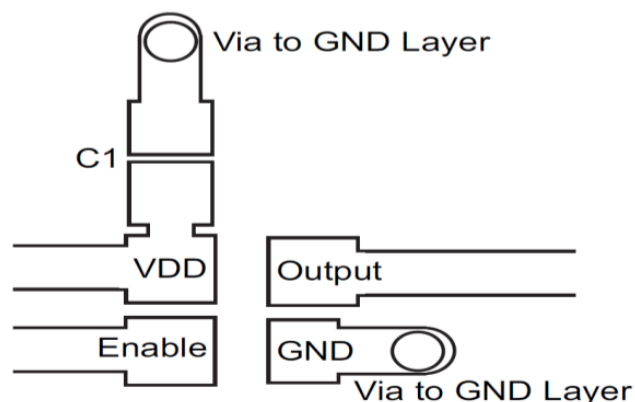
### Output Waveform



### Test Circuit

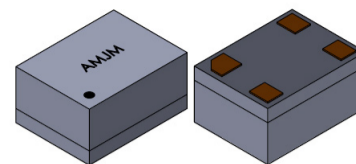


### Recommended Board Layout





# POWER OPTIMIZED MEMS OSCILLATORS



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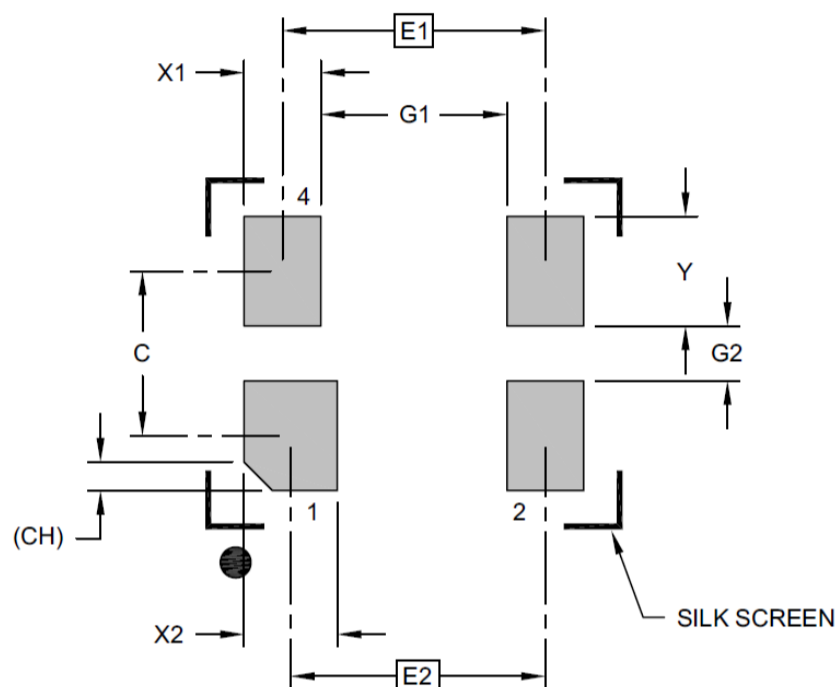
RoHS/RoHS II Compliant

MSL = MSL 1

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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

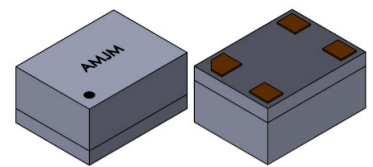


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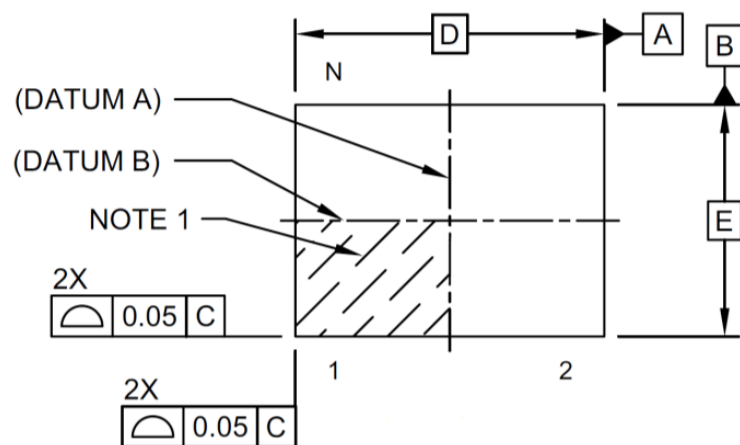
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2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

MSL = MSL 1

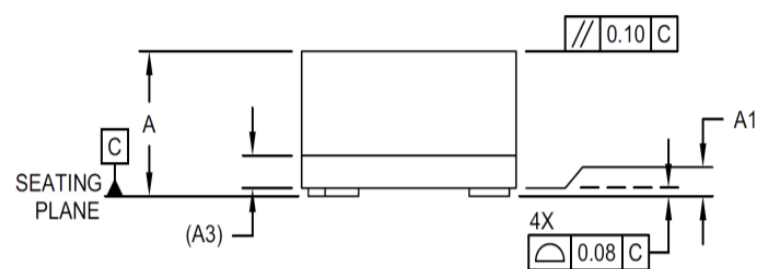
## MECHANICAL DIMENSIONS

### 2.0 x 1.6 mm VFLGA Package Outline

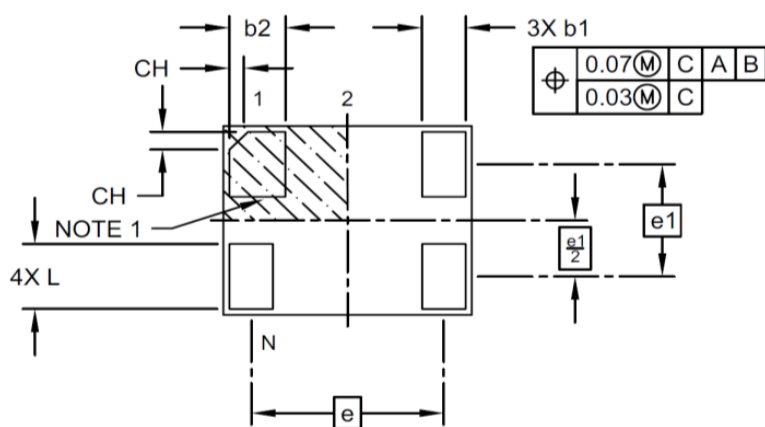
#### Top View



#### 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

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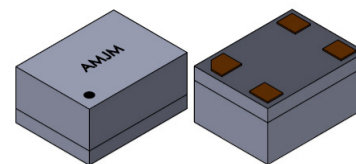


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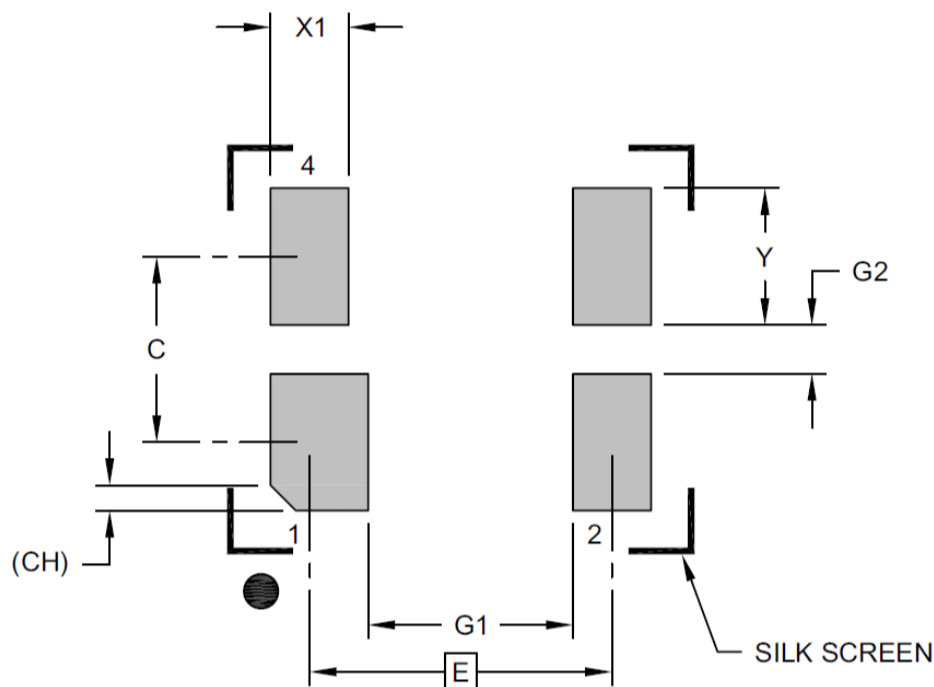
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MSL = MSL 1

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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           | 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

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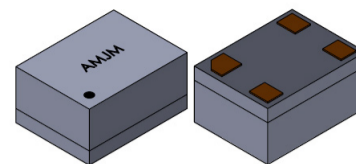


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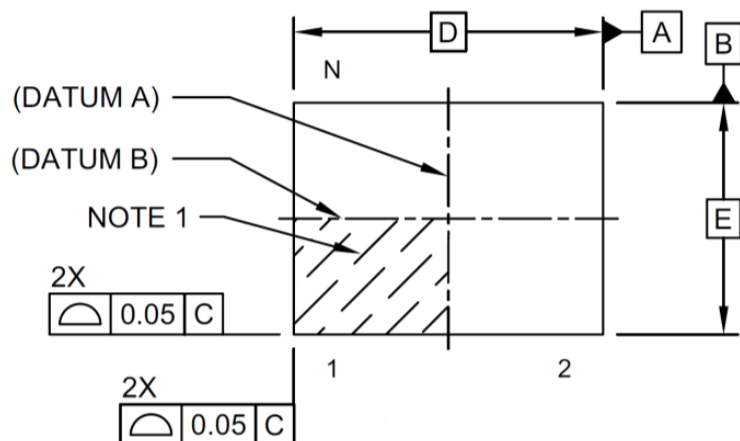
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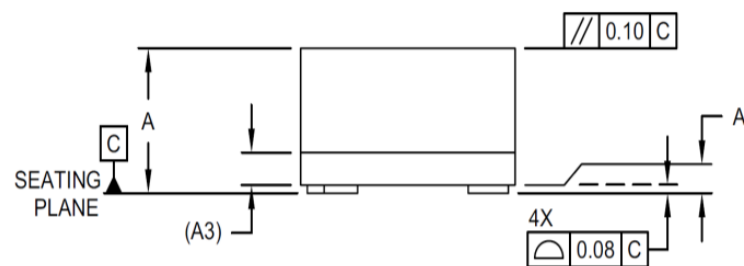
## MECHANICAL DIMENSIONS

### 2.5 x 2.0 mm VLGA Package Outline

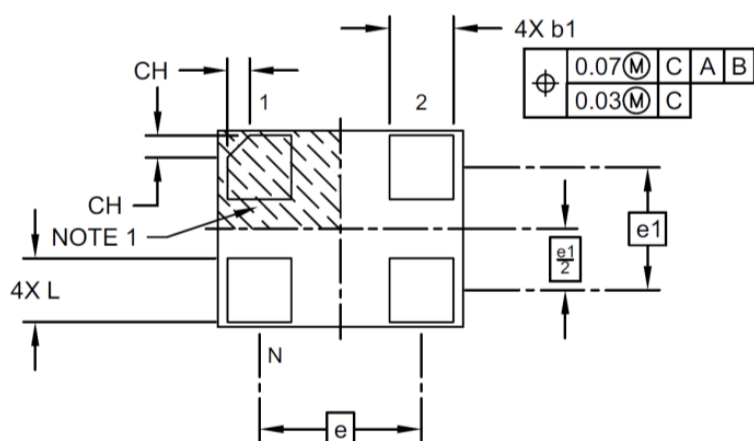
#### Top View



#### 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

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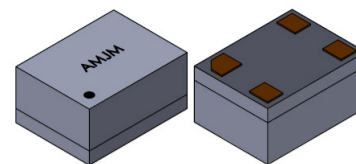


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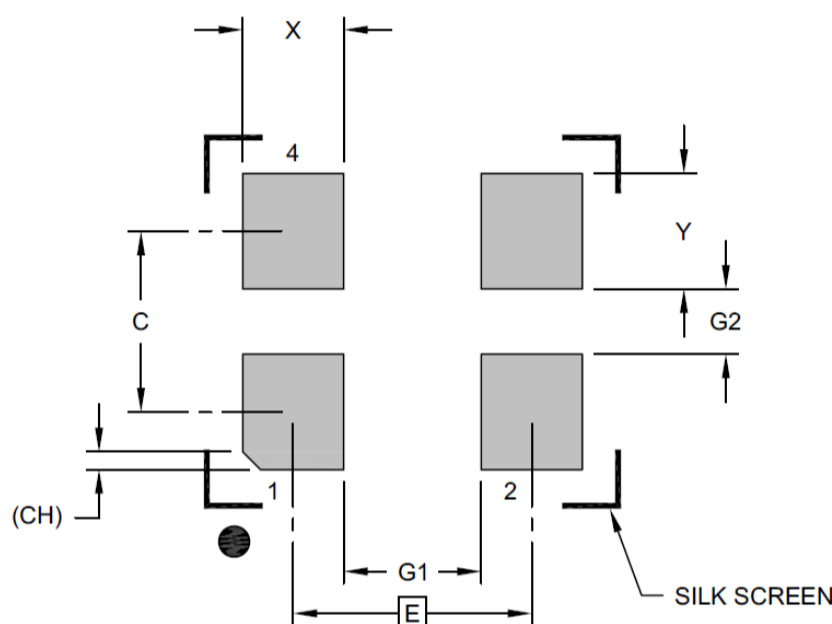
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MSL = MSL 1

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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

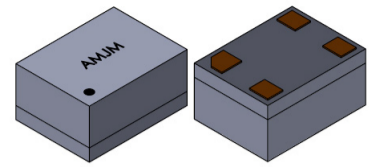


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# POWER OPTIMIZED MEMS OSCILLATORS



AMJM-SERIES



ESD Sensitive



RoHS/RoHS II Compliant

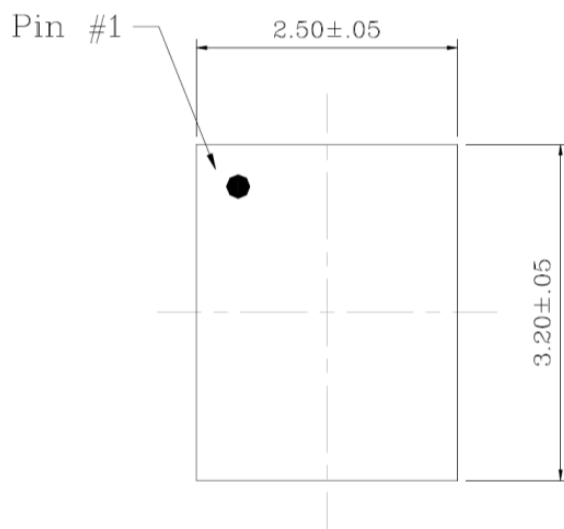
MSL = MSL 1

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

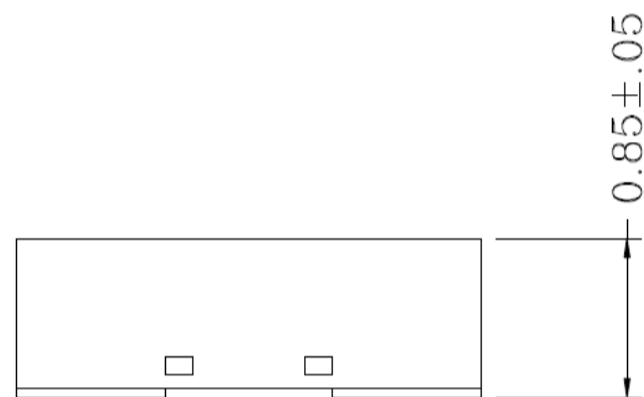
## MECHANICAL DIMENSIONS

### 3.2 x 2.5 mm DFN Package Outline

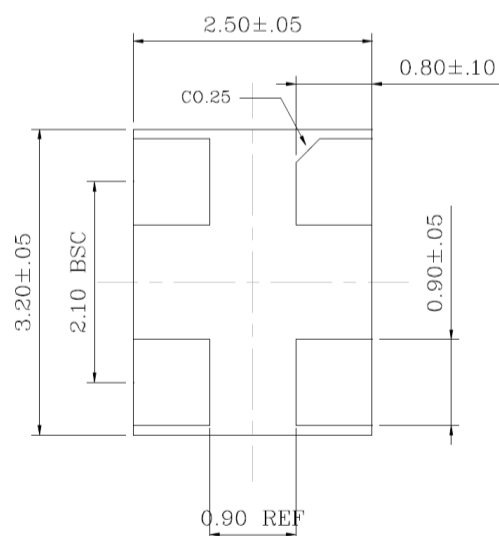
#### Top View



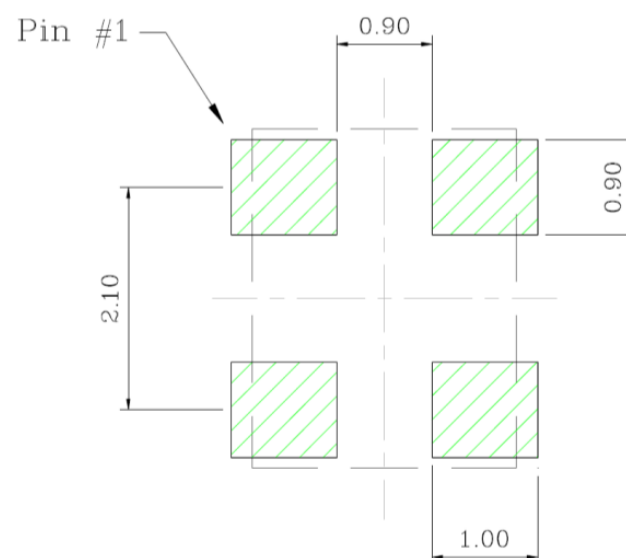
#### Side View



#### Bottom View

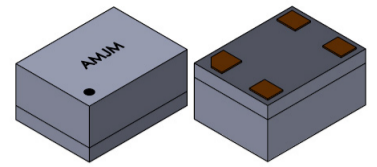


#### Recommended Landing Pattern



Dimensions : mm

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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

## Reflow Profile [JEDEC J-STD-020]



Table 1

| SnPb Eutectic Process<br>Classification Temperatures ( $T_c$ ) |                           |                           |
|--|---------------------------|---------------------------|
| Package Thickness  | Volume $\text{mm}^3$ <350 | Volume $\text{mm}^3$ >350 |
| <2.5 mm  | 235 °C                    | 220 °C                    |
| >2.5 mm  | 220 °C                    | 220 °C                    |

Table 2

| Pb-Free Process<br>Classification Temperatures ( $T_c$ ) |                           |                               |                            |
|--|---------------------------|-------------------------------|----------------------------|
| Package Thickness  | Volume $\text{mm}^3$ <350 | Volume $\text{mm}^3$ 350-2000 | Volume $\text{mm}^3$ >2000 |
| <1.6 mm  | 260 °C                    | 260 °C                        | 260 °C                     |
| 1.6 mm - 2.5 mm  | 260 °C                    | 250 °C                        | 245 °C                     |
| >2.5 mm  | 250 °C                    | 245 °C                        | 245 °C                     |

| Profile Feature   | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|---|-------------------------|------------------|
| Preheat/ soak   |                         |                  |
| Temperature minimum ( $T_{smin}$ )  | 100°C                   | 150°C            |
| Temperature maximum ( $T_{smax}$ )  | 150°C                   | 200°C            |
| Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )                                       | 60 - 120 sec.           | 60 - 120 sec.    |
| Average ramp-up rate ( $T_{smax}$ to $T_p$ )                                      | 3°C/sec. max            | 3°C/sec. max     |
| Liquidous temperature ( $T_L$ )   | 183°C                   | 217°C            |
| Time at liquidous ( $t_L$ )   | 60 - 150 sec.           | 60 - 150 sec.    |
| Peak package body temperature ( $T_p$ )*  | see Table 1             | see Table 2      |
| Time ( $t_p$ )** within 5°C of the specified classification temperature ( $T_c$ ) | 20 sec.                 | 30 sec.          |
| Ramp-down rate ( $T_p$ to $T_{smax}$ )  | 6°C/sec. max            | 6°C/sec. max     |
| Time 25°C to peak temperature   | 6 min. max              | 8 min. max       |
| Reflow cycles   | 2 max                   | 2 max            |

\*Tolerance for peak profile temperature ( $T_p$ ) is defined as a supplier minimum and a user maximum.

\*\*Tolerance for time at peak profile temperature ( $t_p$ ) is defined as supplier minimum and a user maximum.

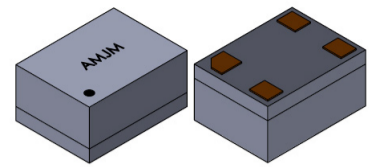


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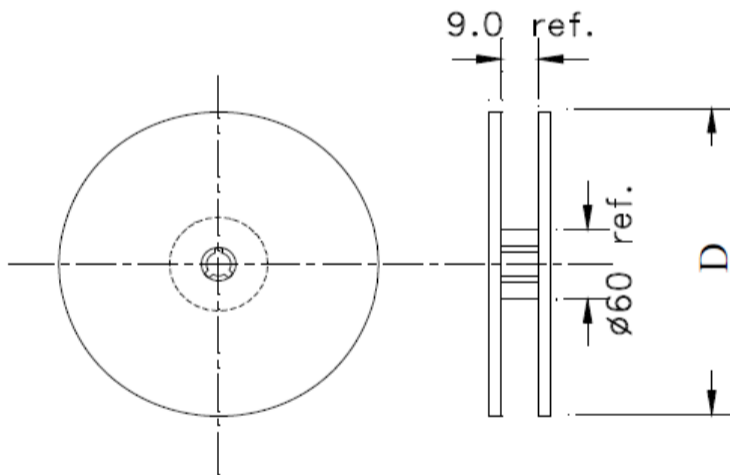
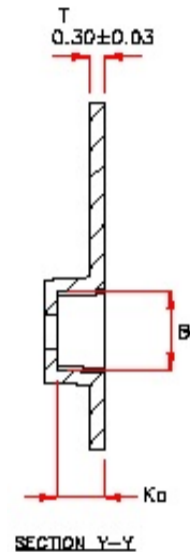
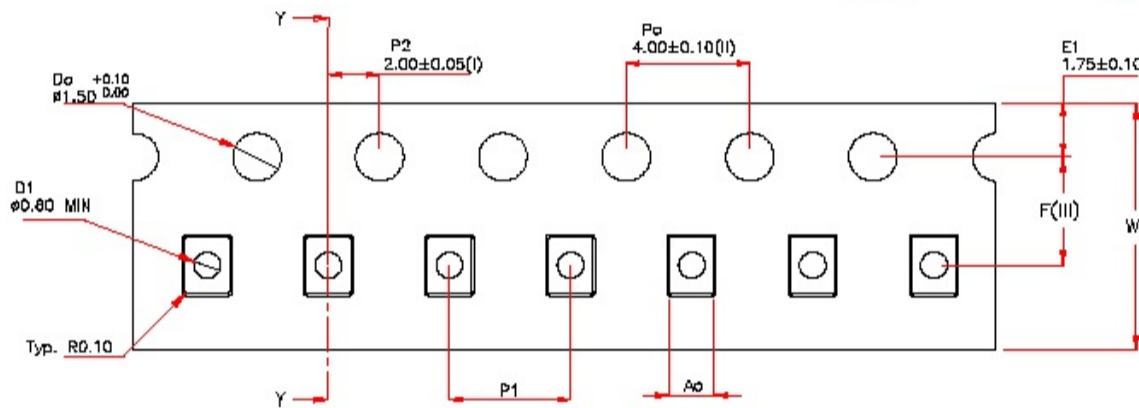
1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

MSL = MSL 1

## 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.

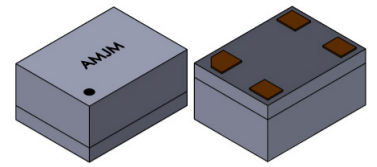


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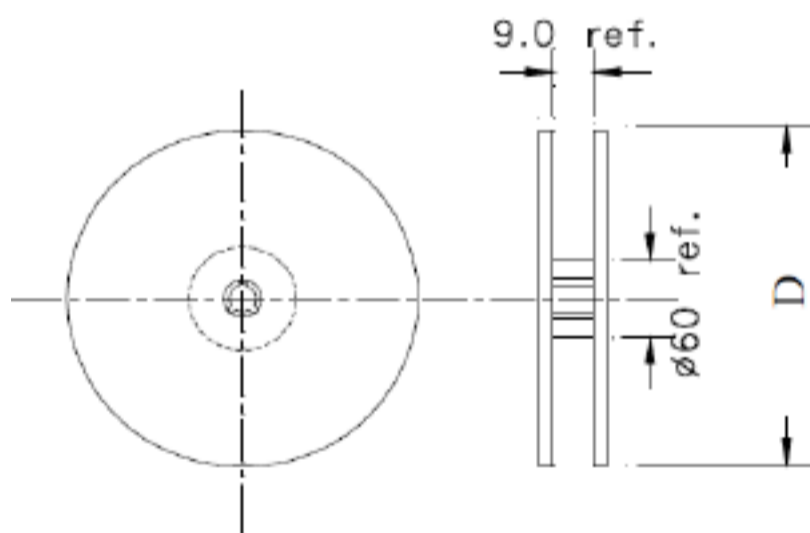
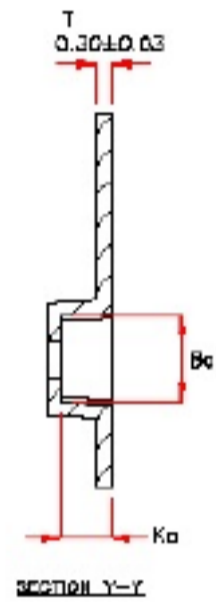
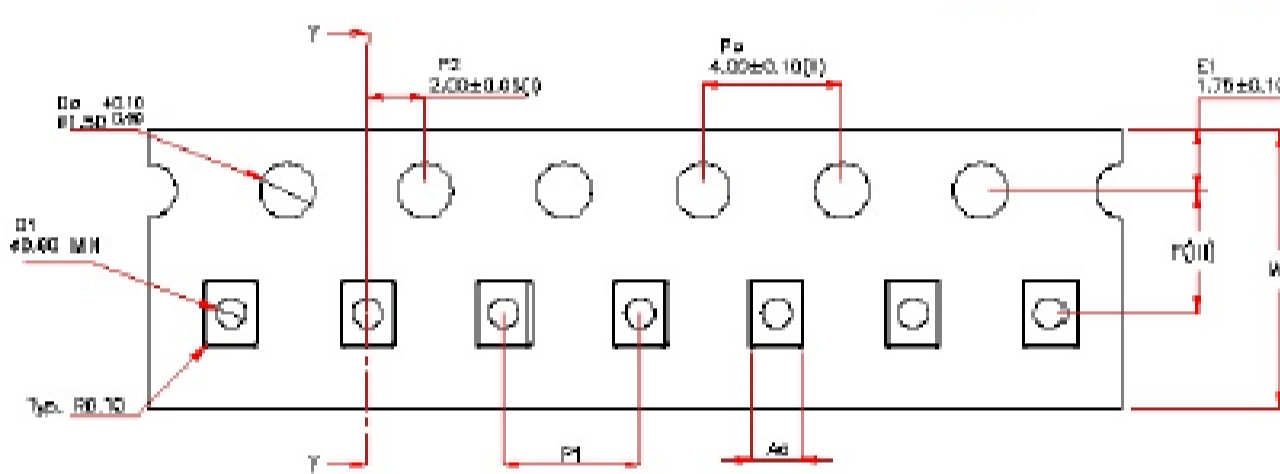
MSL = MSL 1

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.

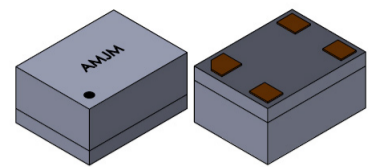


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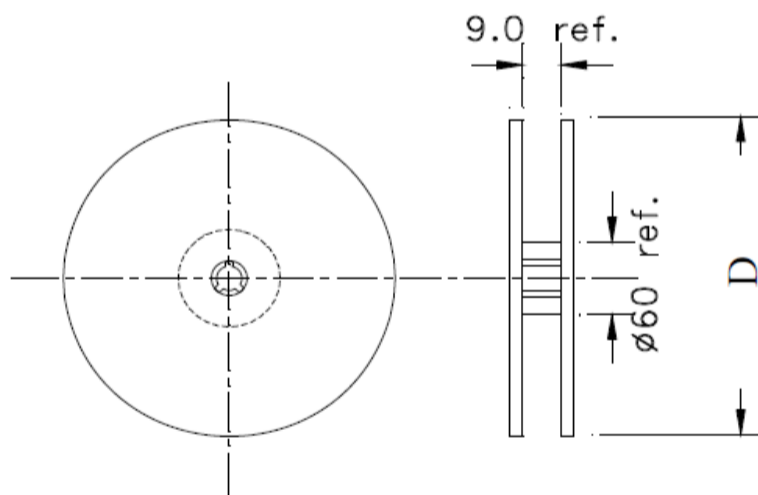
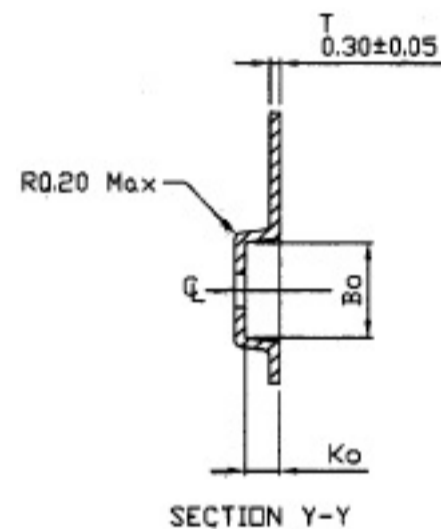
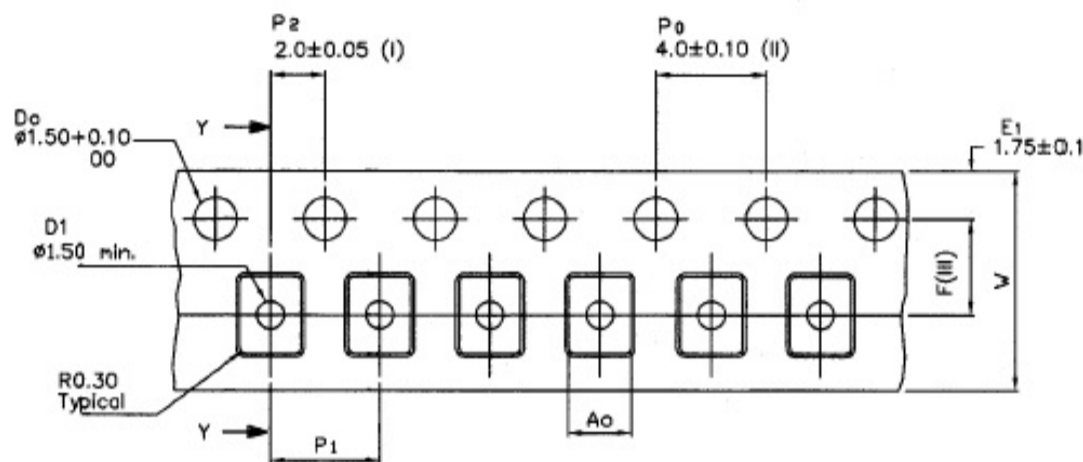
MSL = MSL 1

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



|       |                        |
|-------|------------------------|
| $A_0$ | $2.25 \pm 0.05$        |
| $B_0$ | $2.80 \pm 0.05$        |
| $K_0$ | $1.10 \pm 0.05$        |
| 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.

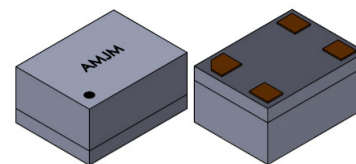


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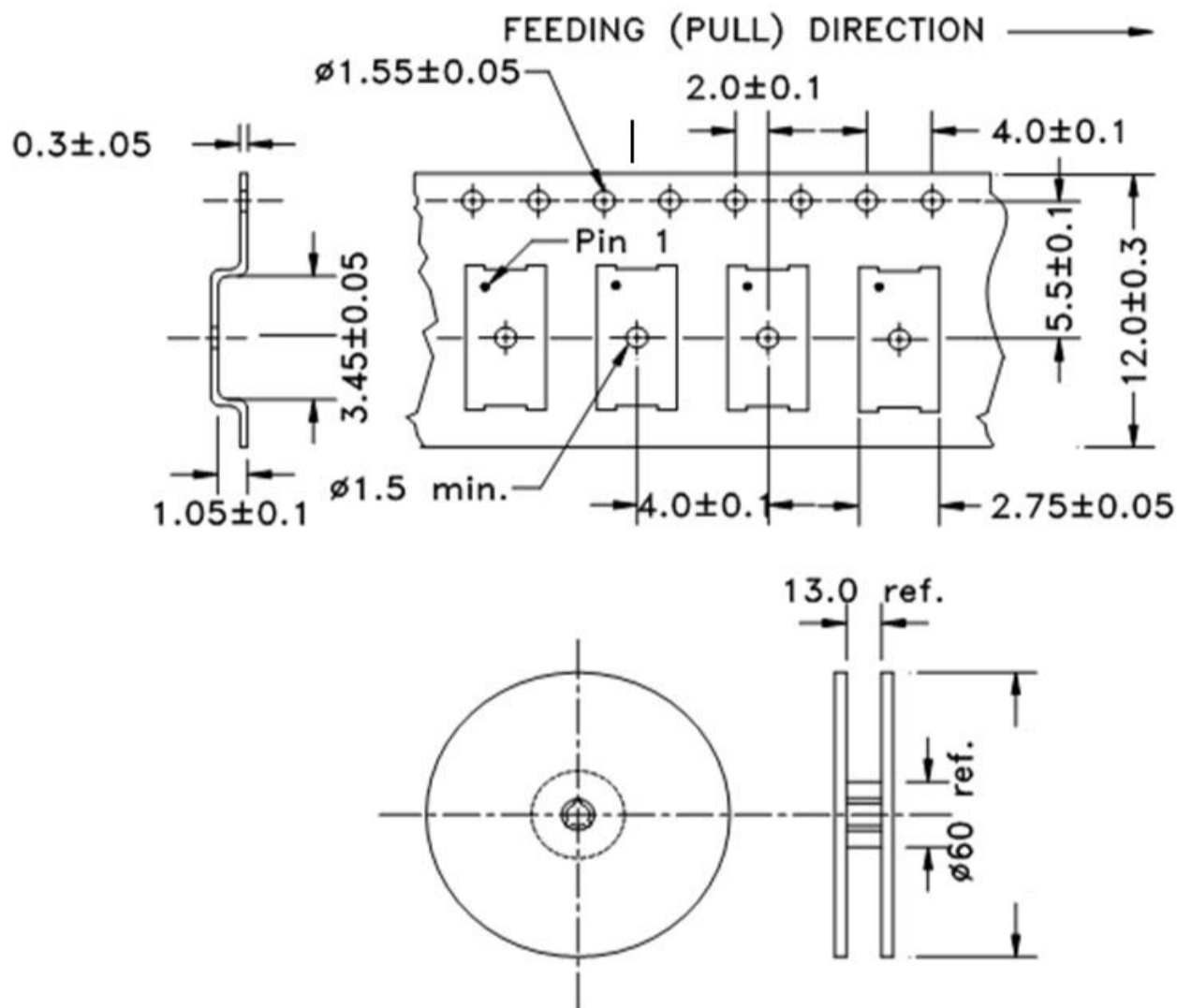
MSL = MSL 1

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= 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:  
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Loose parts in Antistatic Bag or in Tube(s).

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




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