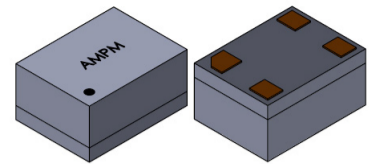


POWER OPTIMIZED MEMS OSCILLATORS



AMPM-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 80MHz 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: 1.3mA 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 $-40^{\circ}C$ to $85^{\circ}C$

| Parameters | Min. | Typ. | Max. | Units | Note |
|--|----------|----------------|----------------|-------|---|
| Frequency Range | 1.0000 | | 80.0000 | MHz | |
| Power Supply Voltage (V_{DD}) | 1.71 | | 3.63 | V | |
| Current Consumption (I_{DD}) | | 1.3 | | mA | $f_{out} = 24MHz, V_{DD} = 1.8V,$ No Load |
| Standby Current Consumption (I_{STBY}) | | 12 | 30 | μA | $V_{DD} = 1.8/2.5V$ |
| | | 80 | 160 | | $V_{DD} = 3.3V$ |
| 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 st year @25°C |
| | -1 | | +1 | | Per year after first year |
| Duty Cycle | 45 | | 55 | % | 1 MHz to 39 MHz |
| | 40 | | 60 | | 61 MHz to 80 MHz 40 MHz to 60 MHz |
| Output Logic Levels | V_{OH} | $0.8 * V_{DD}$ | | V | Logic High I = 1 mA |
| | V_{OL} | | $0.2 * V_{DD}$ | | Logic Low I = -1 mA |
| Input Logic Levels | V_{IH} | $0.7 * V_{DD}$ | | V | Logic High |
| | V_{IL} | | $0.3 * V_{DD}$ | | Logic Low |
| 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 |

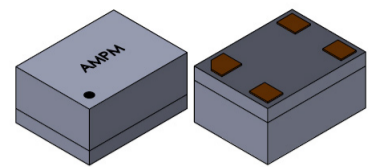


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2.0 x 1.6 x 0.84 mm
2.5 x 2.0 x 0.84 mm
3.2 x 2.5 x 0.85 mm

ELECTRICAL SPECIFICATIONS

| Parameters | | min | Typ. | Max. | Units | Note |
|-----------------------------------|--|-----|------|-------------|---------|------------------------------------|
| Output Enable Time (t_{EN}) | | | | 1 | μ s | |
| Output Disable Time (t_{DA}) | | | | 200+2period | ns | |
| Rise(T_r)/Fall (T_f) Time | Low Drive 20% \leftrightarrow 80% | | 2.5 | 3.5 | ns | CL = 5 pF $V_{DD} = 1.8V$ |
| | | | 1.5 | 2.2 | | CL = 5 pF $V_{DD} = 2.5V/3.3V$ |
| | Std Drive 20% \leftrightarrow 80% | | 1.2 | 2.0 | | CL = 10 pF $V_{DD} = 1.8V$ |
| | | | 0.6 | 1.2 | | CL = 10 pF $V_{DD} = 2.5V/3.3V$ |
| RMS Period Jitter | Low Drive $f_{out} = 27$ MHz | | 32 | 40 | ps | $V_{DD} = 1.8V$ |
| | | | 25 | 32 | | $V_{DD} = 2.5/3.3V$ |
| | Std Drive $f_{out} = 27$ MHz | | 23 | 30 | | $V_{DD} = 1.8V$ |
| | | | 20 | 28 | | $V_{DD} = 2.5/3.3V$ |
| Cycle-to-Cycle Jitter (Peak) | Low Drive $f_{out} = 27$ MHz | | 180 | 240 | ps | $V_{DD} = 1.8V$ |
| | | | 120 | 170 | | $V_{DD} = 2.5/3.3V$ |
| | Std Drive $f_{out} = 27$ MHz | | 115 | 190 | | $V_{DD} = 1.8V$ |
| | | | 90 | 150 | | $V_{DD} = 2.5/3.3V$ |

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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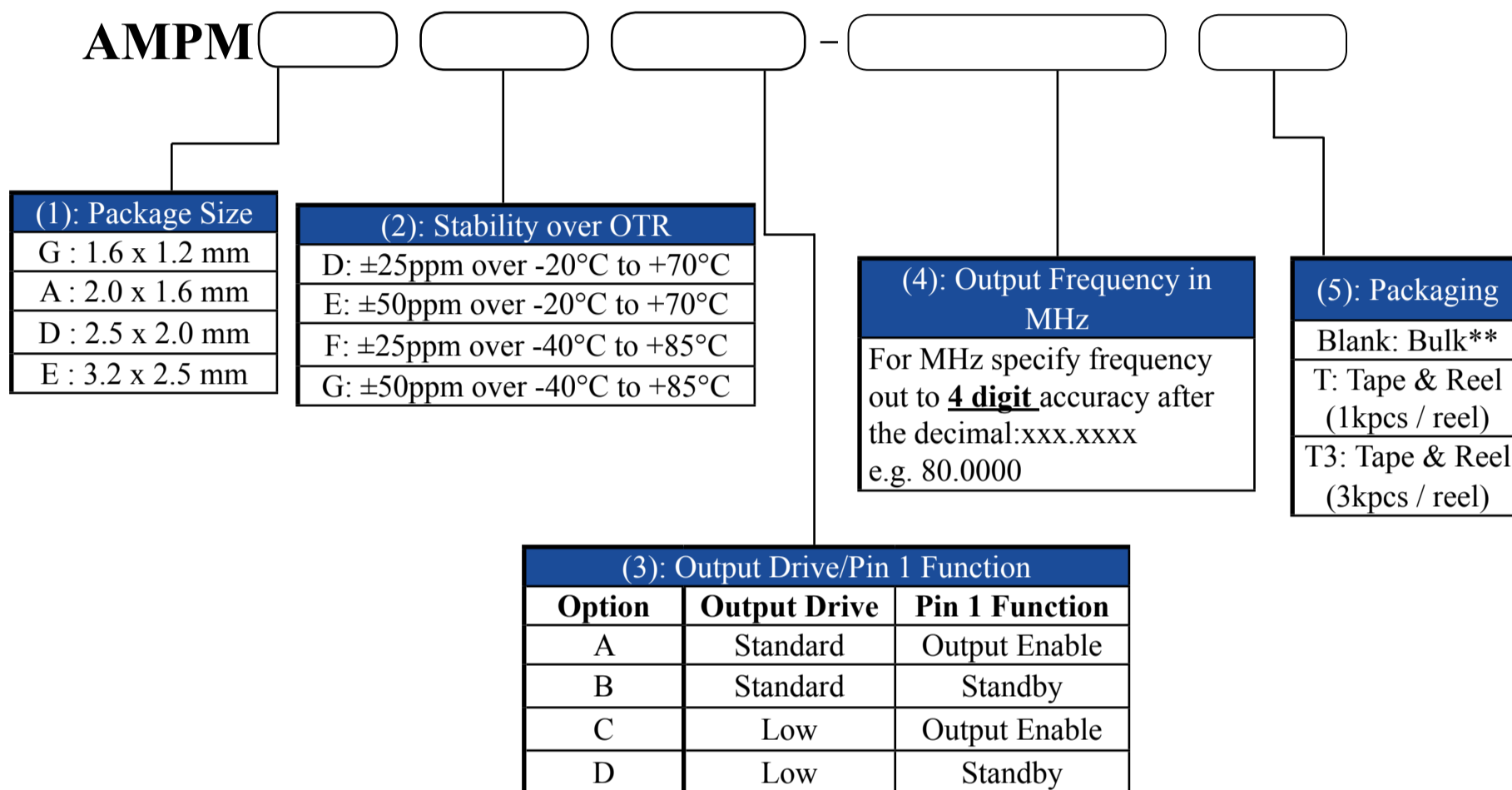


RoHS/RoHS II Compliant

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



Part Number Example:

AMPMGGD - 16.0000T

**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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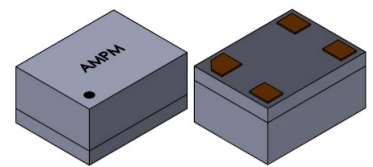
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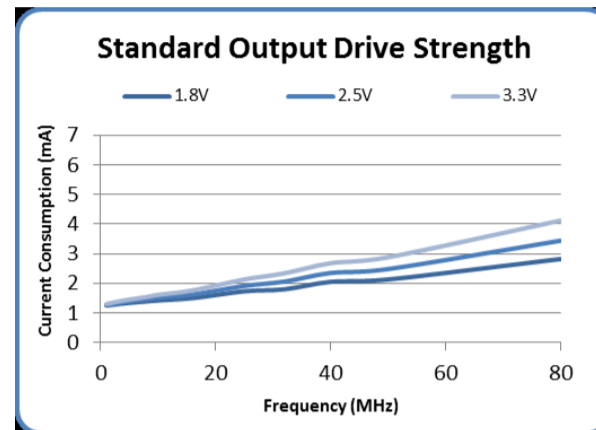
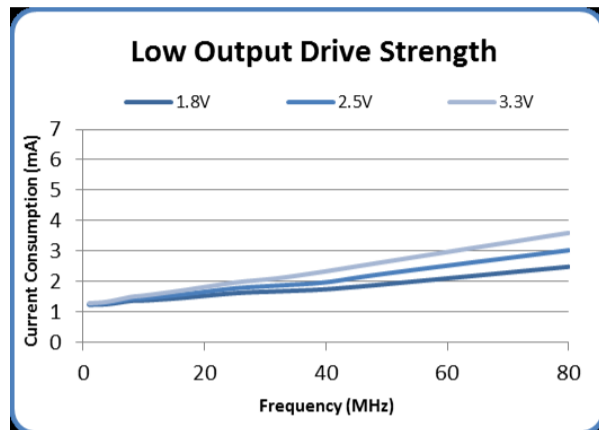
RoHS/RoHS II Compliant

MSL = MSL 1

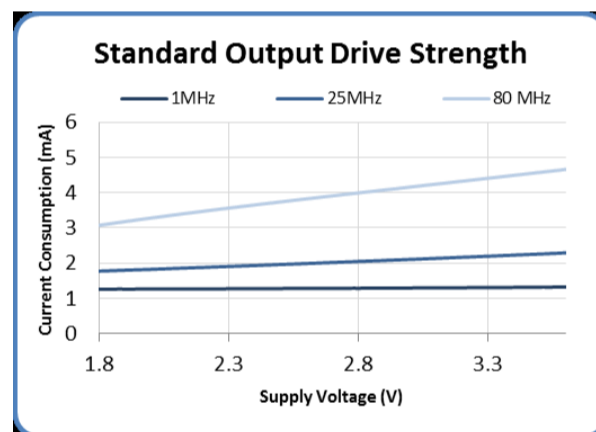
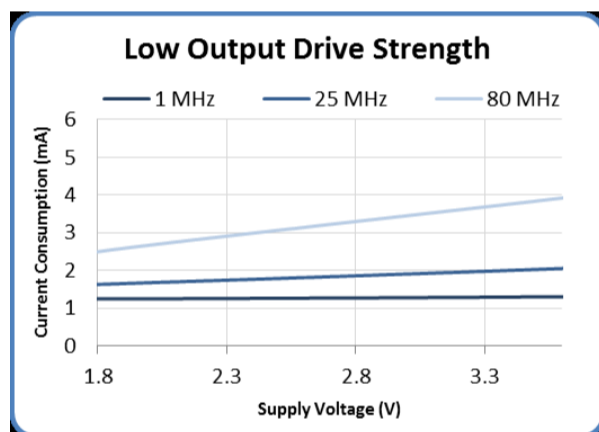
1.6 x 1.2 x 0.84 mm
2.0 x 1.6 x 0.84 mm
2.5 x 2.0 x 0.84 mm
3.2 x 2.5 x 0.85 mm

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 ^{Note 1&3} : High or Open = Specified Frequency Output Low = Output is high impedance |
| | STBY | Standby ^{Note 1&3} : High or Open = Specified Frequency Output 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 ^{Note 2} |

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 μ F capacitor placed as close to VDD pin as possible.
3. 300 K Ω internal pull-up resistor present on pin 1.



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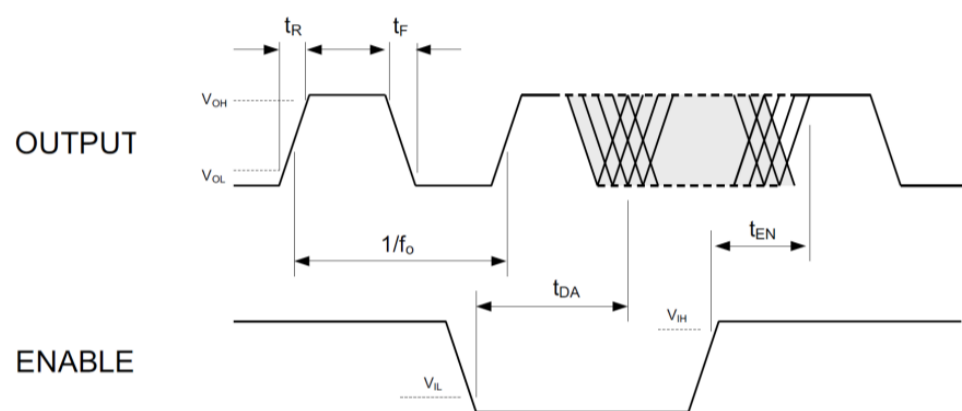
1.6 x 1.2 x 0.84 mm
2.0 x 1.6 x 0.84 mm
2.5 x 2.0 x 0.84 mm
3.2 x 2.5 x 0.85 mm

OUTPUT BUFFER OPTIONS

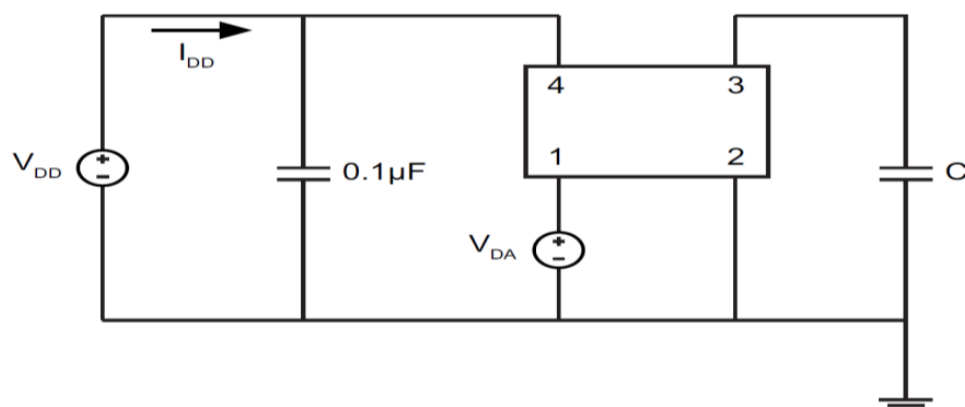
The AMPM Series is available in multiple output driver configurations. The low-power driver minimizes current consumption and EMI while delivering greater than 1 mA output current at 20% to 80% of the supply voltage. The standard-drive delivers greater than 3 mA output current at 20% to 80% of the supply voltage.

DIAGRAMS

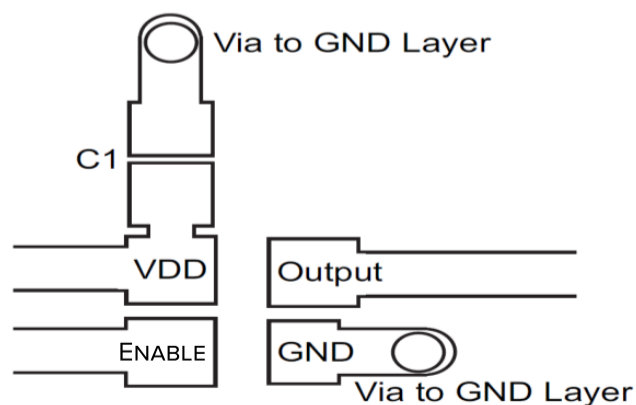
Output Waveform



Test Circuit



Recommended Board Layout



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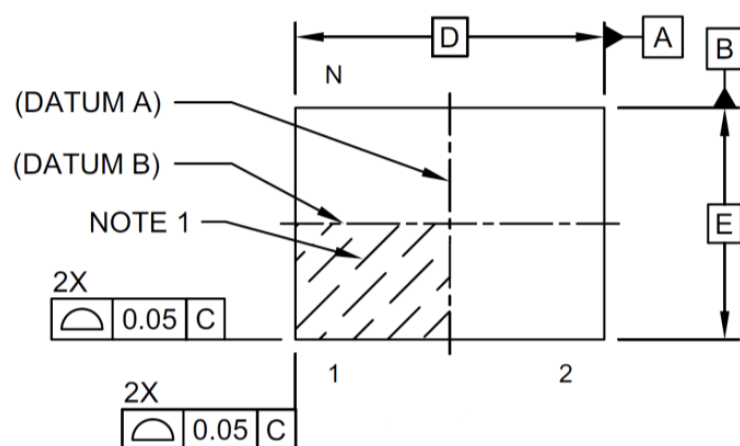
1.6 x 1.2 x 0.84 mm
2.0 x 1.6 x 0.84 mm
2.5 x 2.0 x 0.84 mm
3.2 x 2.5 x 0.85 mm

MSL = MSL 1

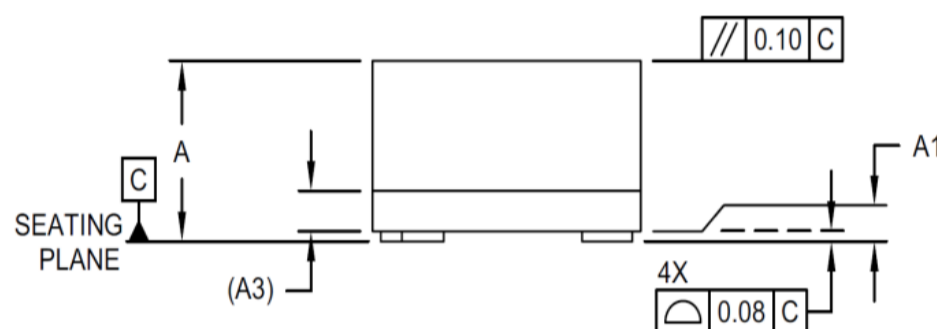
MECHANICAL DIMENSIONS

1.6 x 1.2 mm VFLGA Package Outline

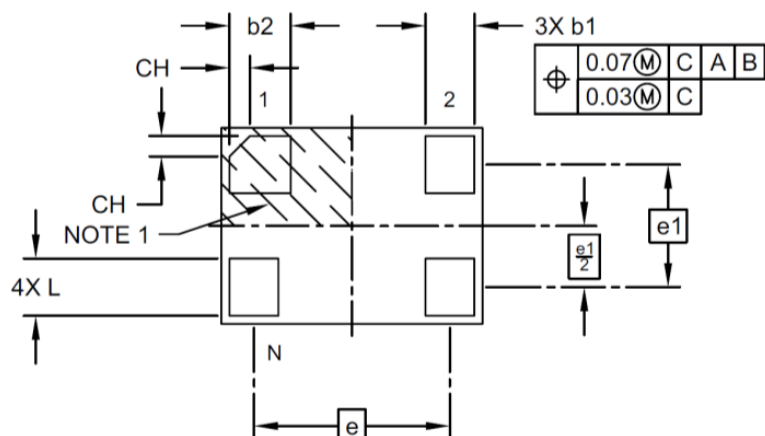
Top View



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 | 0.20REF |
| Overall Length | D | 1.60BSC |
| Overall Width | E | 1.20BSC |
| 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

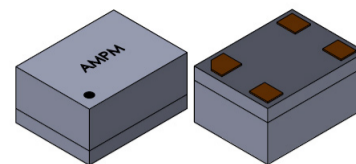


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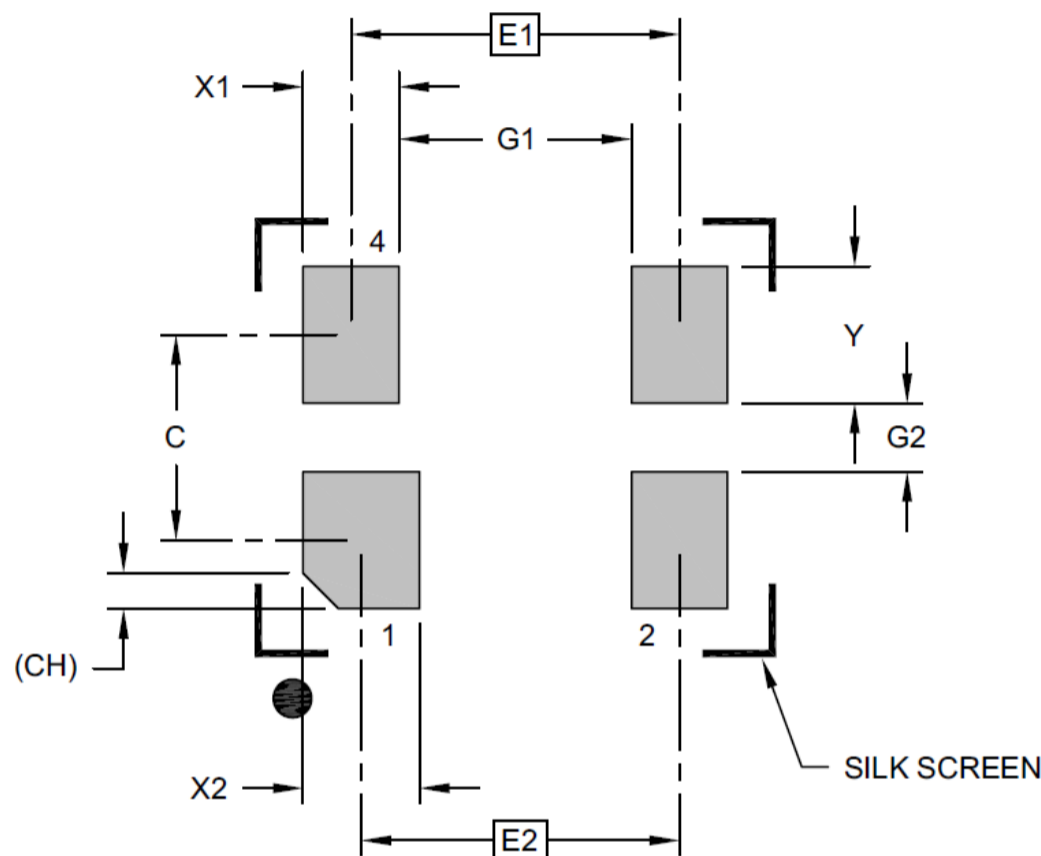
RoHS/RoHS II Compliant

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 | 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

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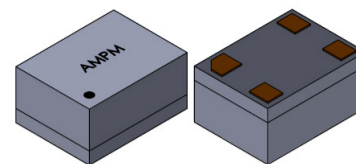


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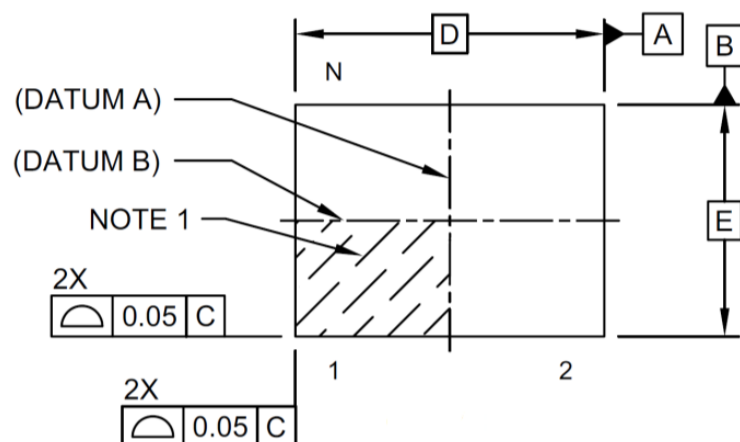
1.6 x 1.2 x 0.84 mm
2.0 x 1.6 x 0.84 mm
2.5 x 2.0 x 0.84 mm
3.2 x 2.5 x 0.85 mm

MSL = MSL 1

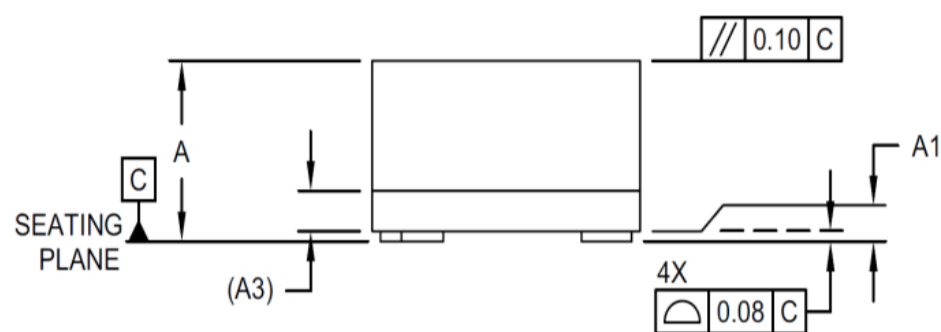
MECHANICAL DIMENSIONS

2.0 x 1.6 mm VFLGA Package Outline

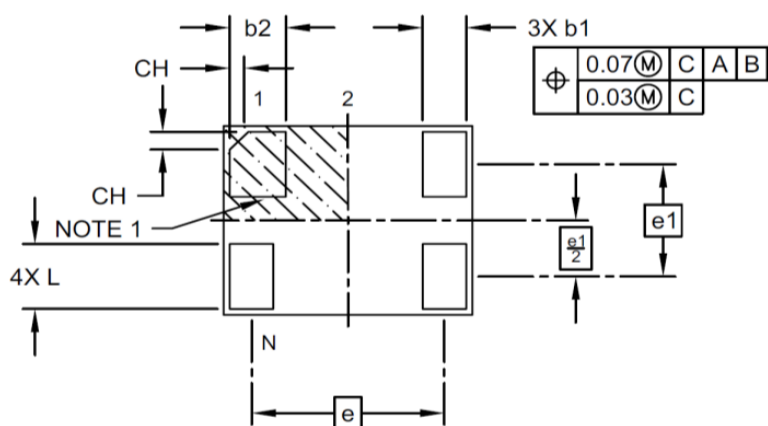
Top View



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

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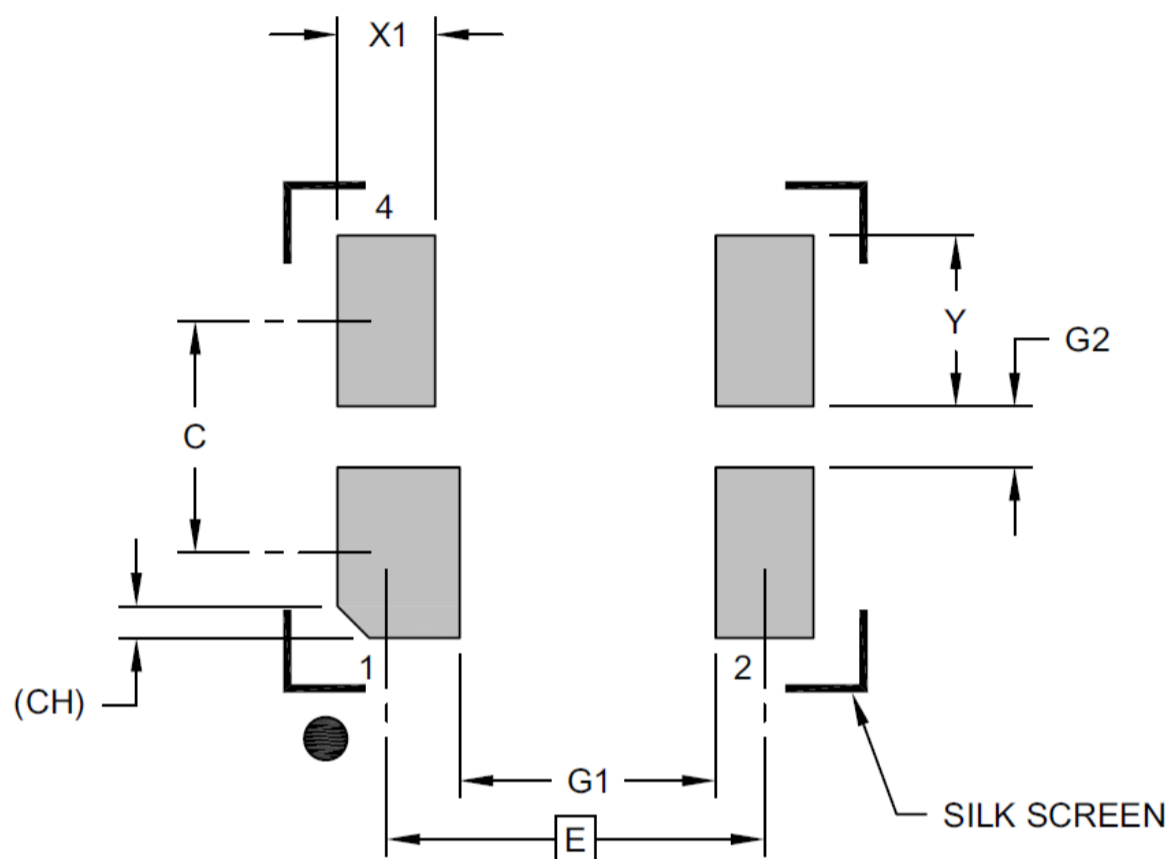
RoHS/RoHS II Compliant

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

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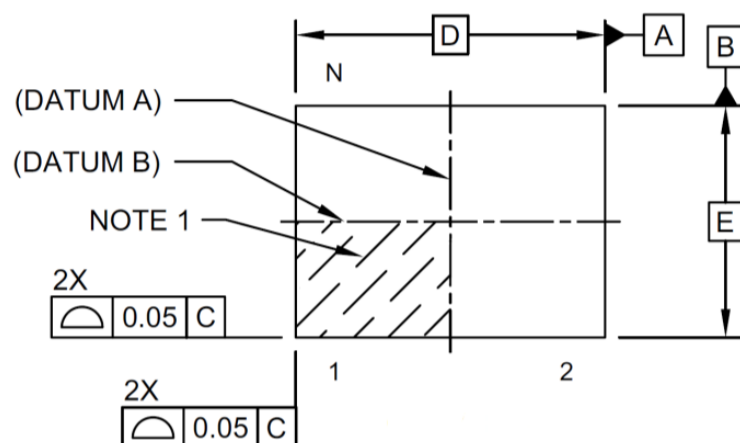
MSL = MSL 1

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

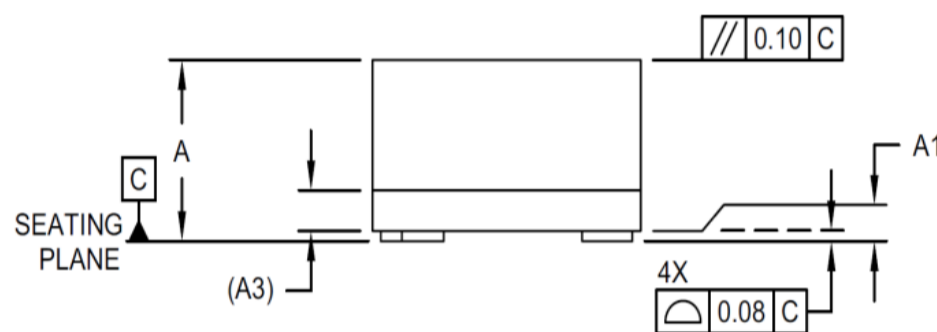
MECHANICAL DIMENSIONS

2.5 x 2.0 mm VLGA Package Outline

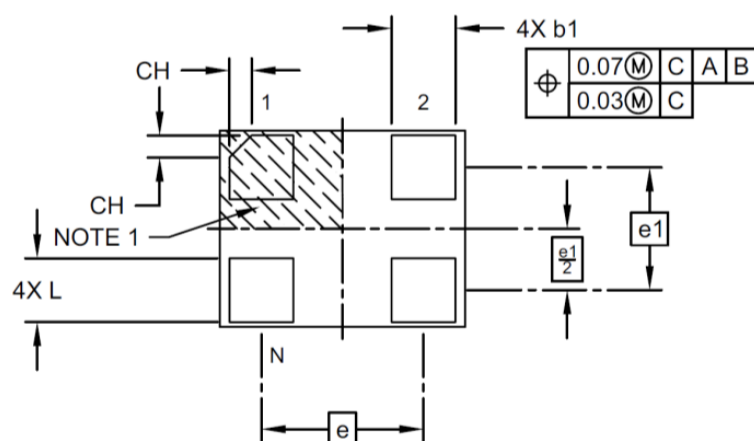
Top View



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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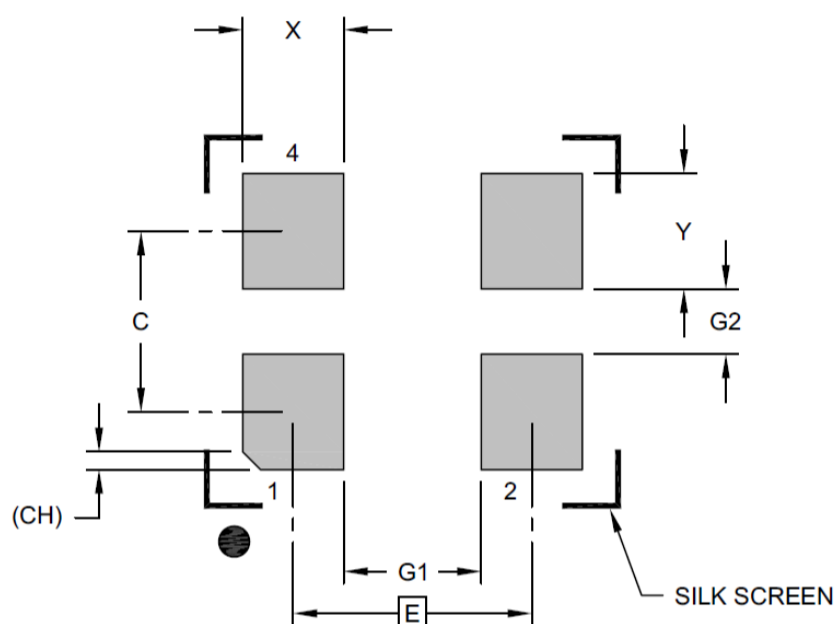
RoHS/RoHS II Compliant

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

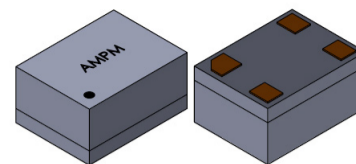


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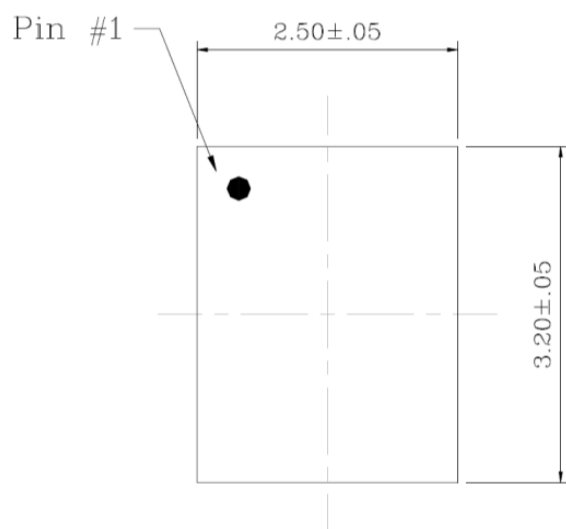
MSL = MSL 1

- 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

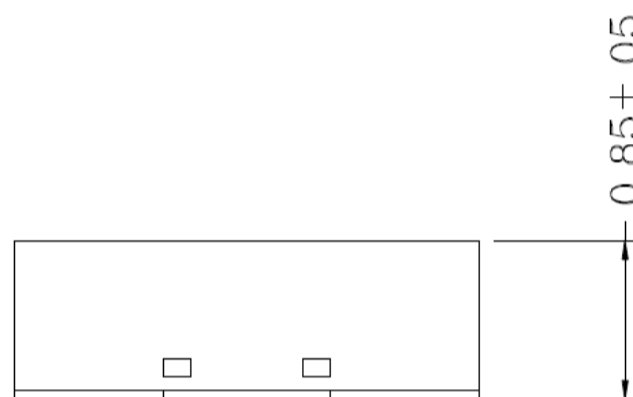
MECHANICAL DIMENSIONS

3.2 x 2.5 mm DFN Package Outline

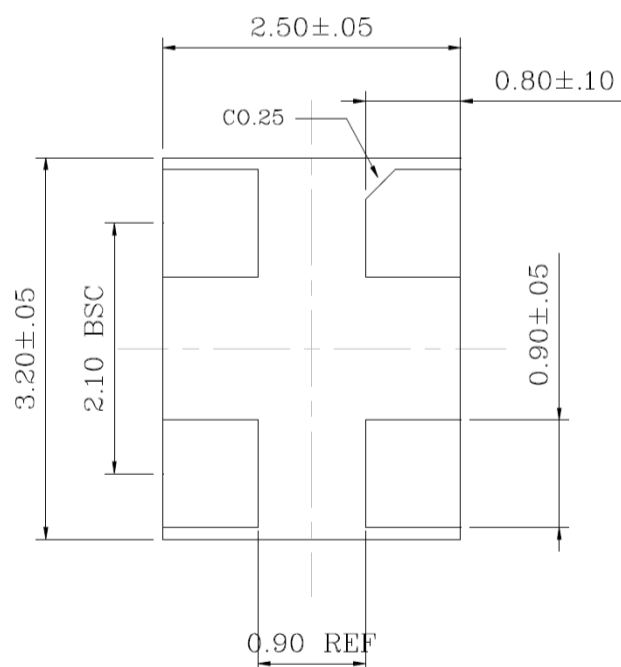
Top View



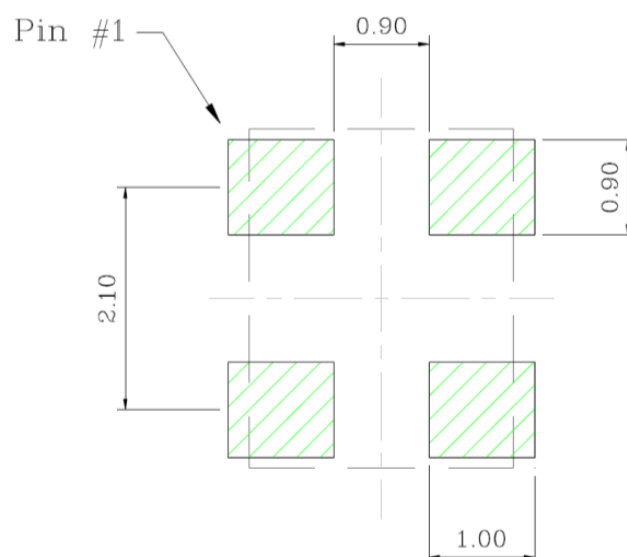
Side View



Bottom View



Recommended Landing Pattern



Dimensions : mm

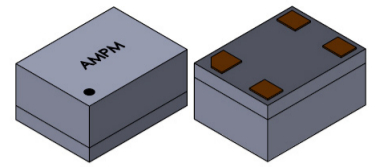


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1.6 x 1.2 x 0.84 mm
2.0 x 1.6 x 0.84 mm
2.5 x 2.0 x 0.84 mm
3.2 x 2.5 x 0.85 mm

MSL = MSL 1

Reflow Profile [JEDEC J-STD-020]

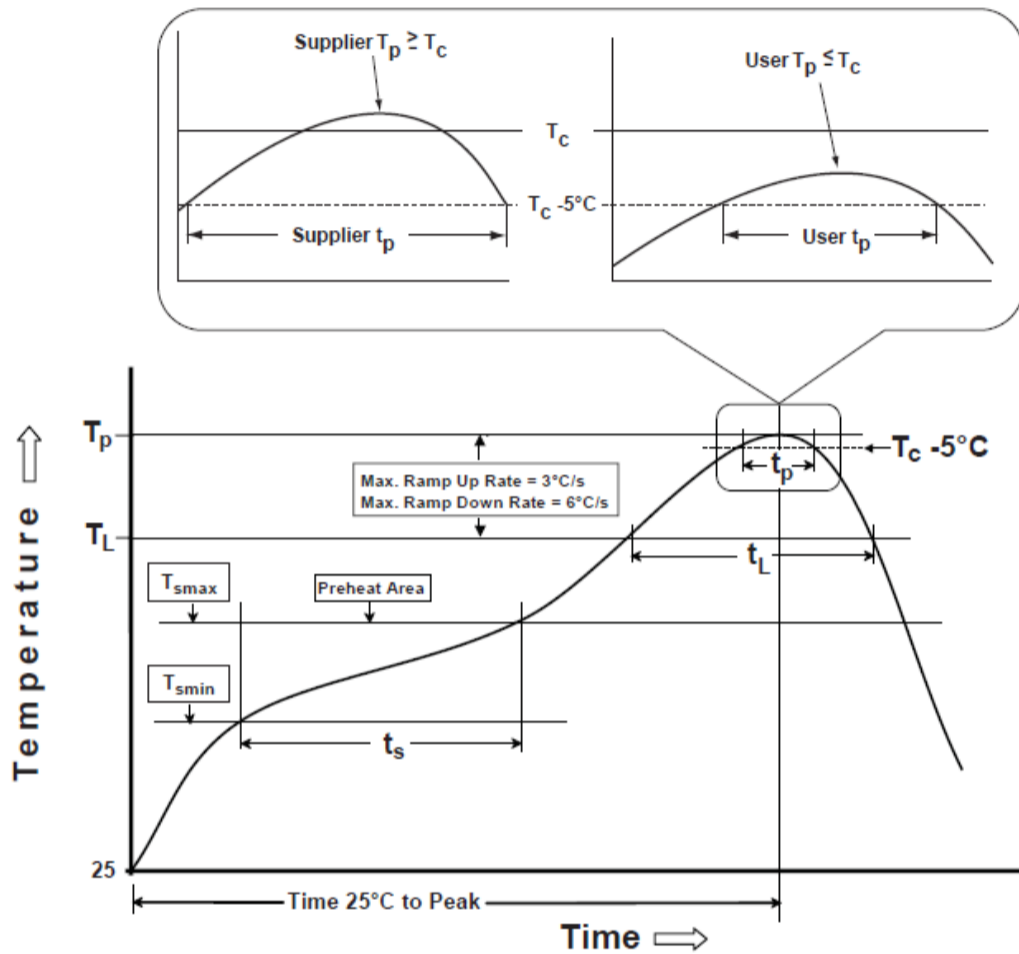


Table 1

SnPb Eutectic Process
Classification Temperatures (T_c)

| Package Thickness | Volume mm ³ <350 | Volume mm ³ >350 |
|-------------------|-----------------------------|-----------------------------|
| <2.5 mm | 235 °C | 220 °C |
| >2.5 mm | 220 °C | 220 °C |

Table 2

Pb-Free Process

Classification Temperatures (T_c)

| Package Thickness | Volume mm ³ <350 | Volume mm ³ 350-2000 | Volume 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.

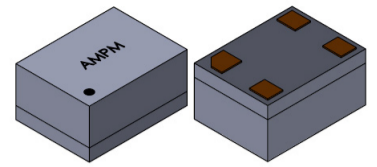


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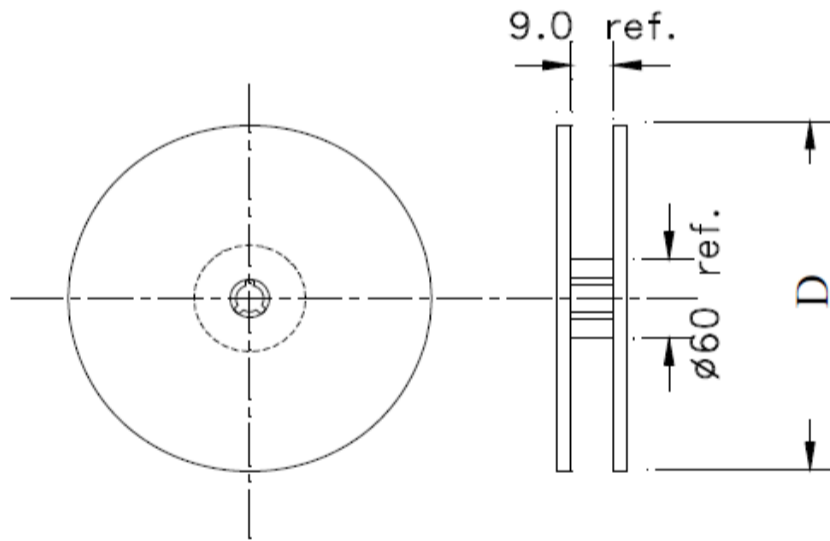
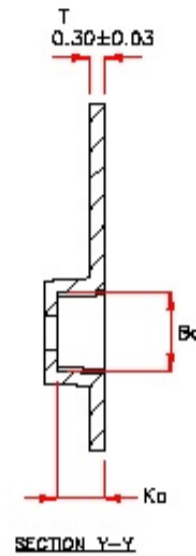
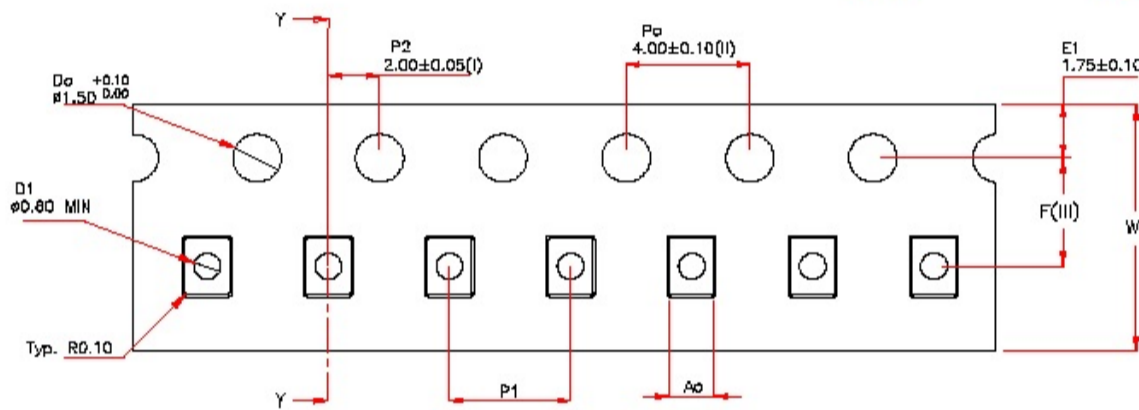
1.6 x 1.2 x 0.84 mm
2.0 x 1.6 x 0.84 mm
2.5 x 2.0 x 0.84 mm
3.2 x 2.5 x 0.85 mm

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 ± 0.05 |
| B_0 | 1.80 ± 0.05 |
| K_0 | 1.05 ± 0.05 |
| F | 3.50 ± 0.05 |
| P_1 | 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 1000 pcs:
Bulk is not an option. Please refer to tape and reel packaging.

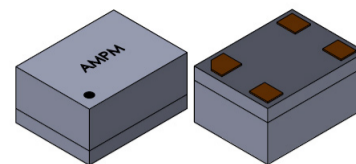


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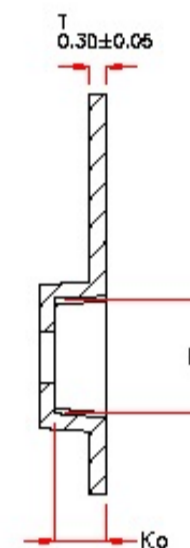
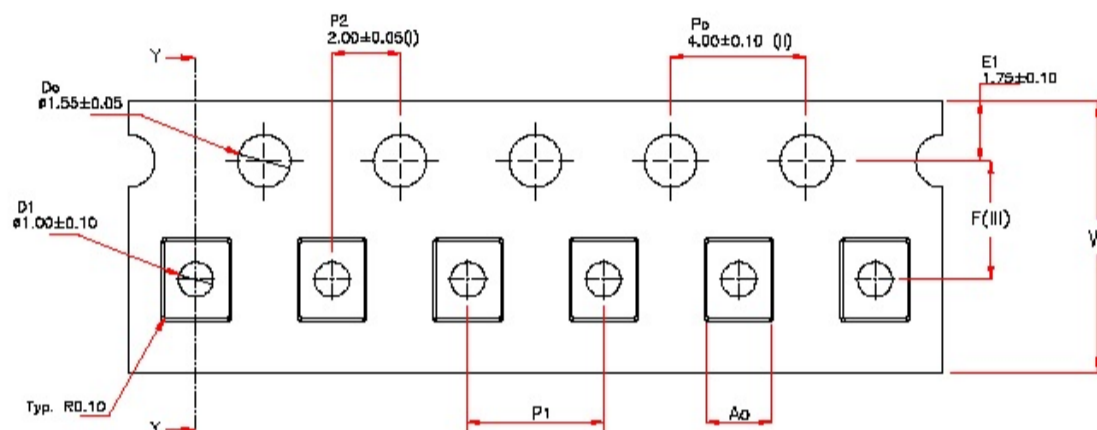
MSL = MSL 1

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

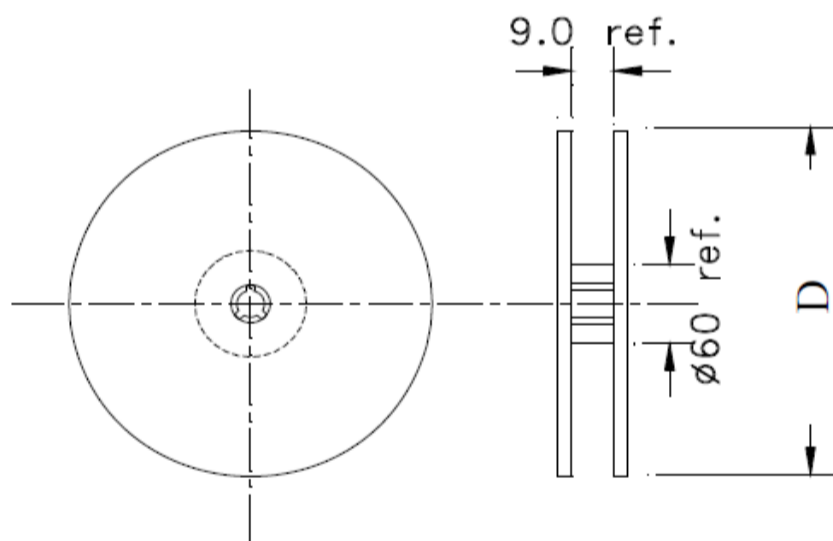
PACKAGING

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



SECTION Y-Y



| | |
|-------|--------------------|
| A_0 | 1.90 ± 0.05 |
| B_0 | 2.30 ± 0.05 |
| K_0 | 1.05 ± 0.05 |
| F | 3.50 ± 0.05 |
| P_1 | 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 1000 pcs:
Bulk is not an option. Please refer to tape and reel packaging.

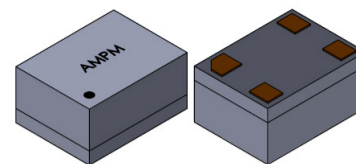


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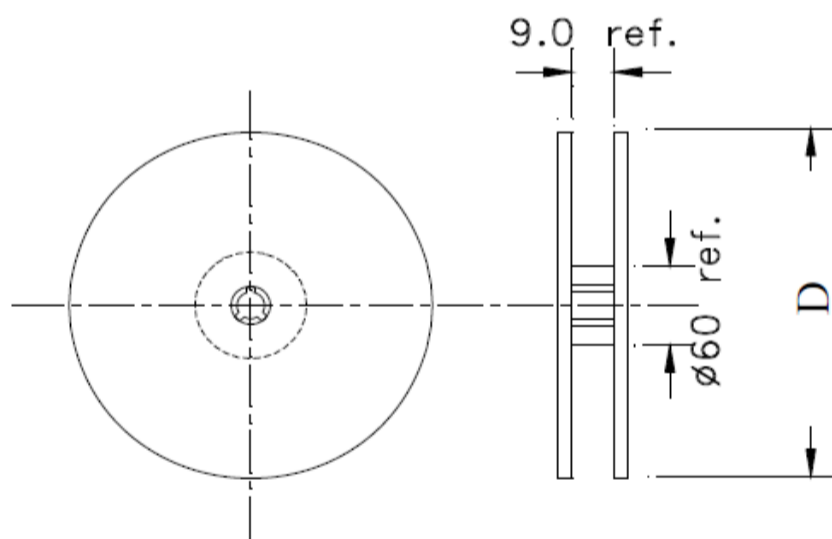
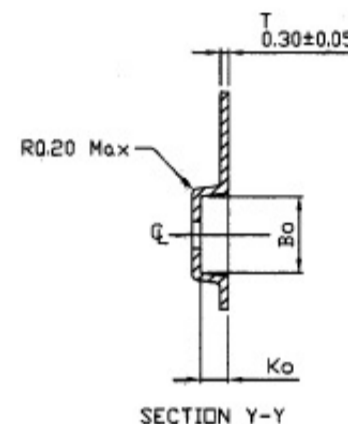
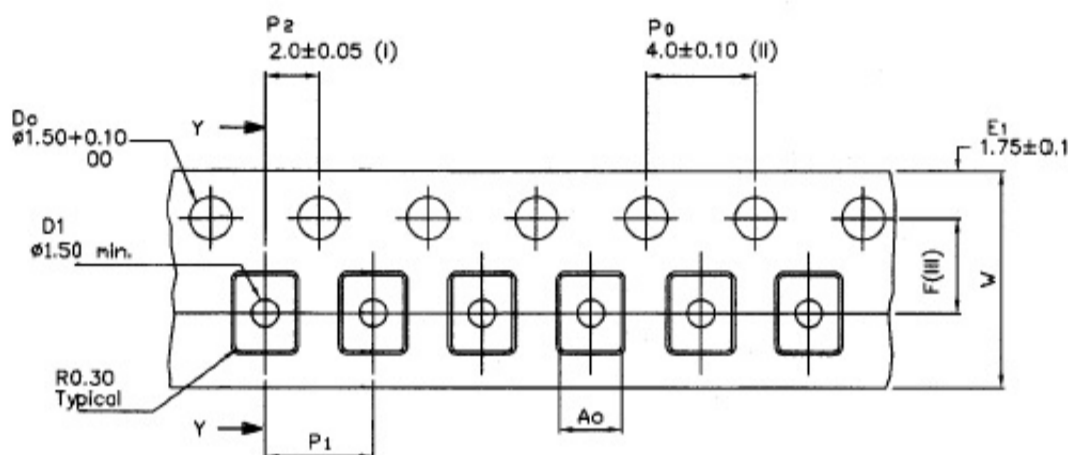
MSL = MSL 1

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 ± 0.05 |
| B_0 | 2.80 ± 0.05 |
| K_0 | 1.10 ± 0.05 |
| F | 3.50 ± 0.05 |
| P_1 | 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 1000 pcs:
Bulk is not an option. Please refer to tape and reel packaging.



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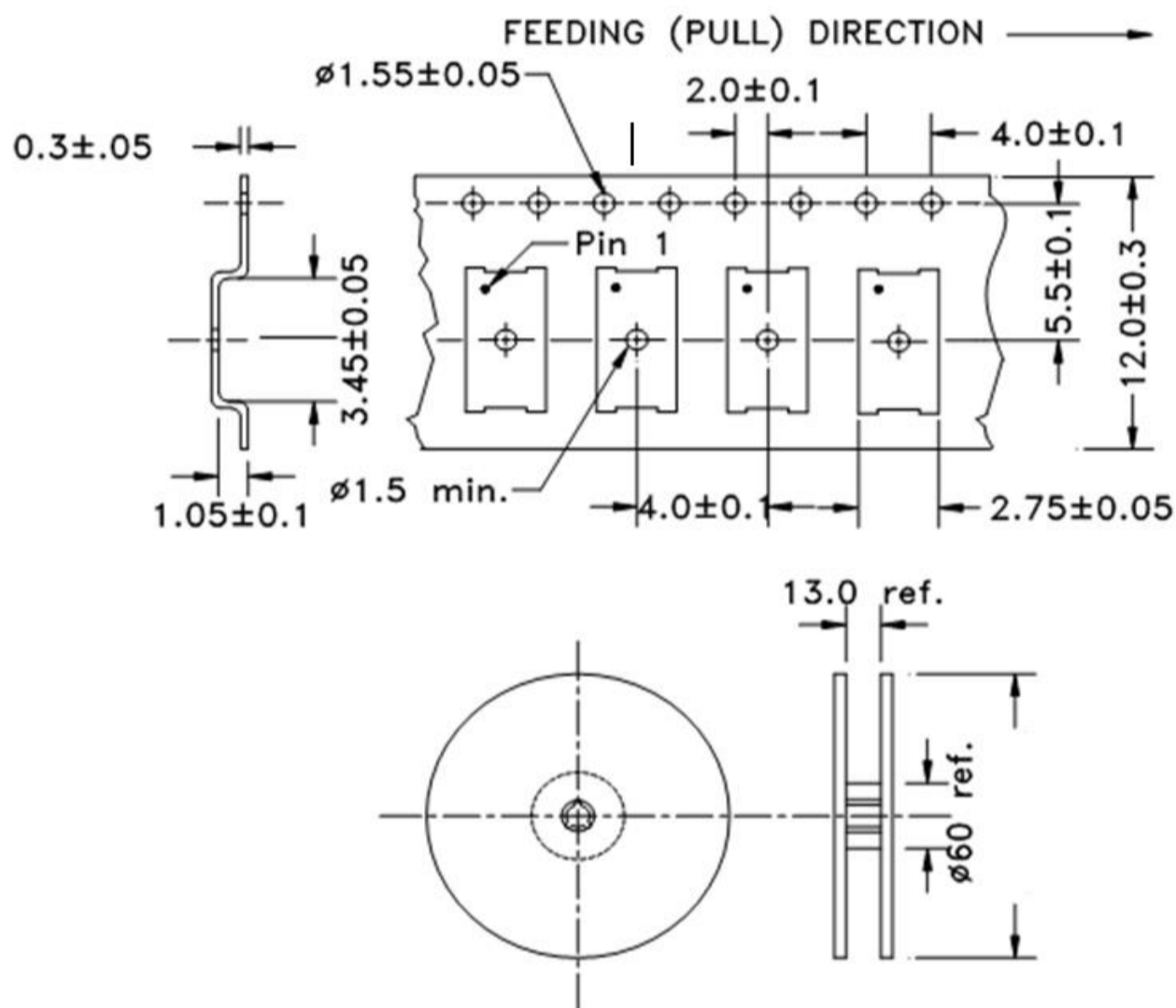
MSL = MSL 1

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).

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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