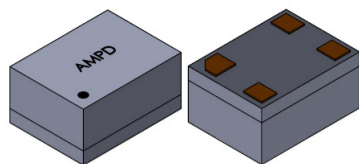


# FREQUENCY SELECTABLE MEMS OSCILLATORS



## AMPD-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

- Output selectable between 2 frequencies
- 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
- 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°C to 85 °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	$f_{out} = 24\text{MHz}$ , $V_{DD} = 1.8V$ , No Load
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	%	1 MHz to 39 MHz 61 MHz to 80 MHz
		40		60		40 MHz to 60 MHz
Output Logic Levels	$V_{OH}$	$0.8 \cdot V_{DD}$			V	Logic High I = 1 mA
	$V_{OL}$			$0.2 \cdot V_{DD}$		Logic Low I = -1 mA
Input Logic Levels	$V_{IH}$	$0.7 \cdot V_{DD}$			V	Logic High
	$V_{IL}$			$0.3 \cdot V_{DD}$		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 ( $t_{SU}$ )				1.3	ms	From 90% $V_{DD}$ to valid clock output, @ 25°C

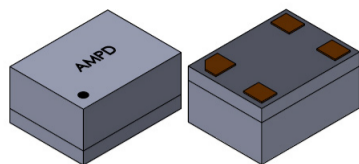


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# FREQUENCY SELECTABLE MEMS OSCILLATORS



AMPD-SERIES



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

## ELECTRICAL SPECIFICATIONS

Parameters		min	Typ.	Max.	Units	Note
Frequency Select Settling Time ( $t_{fs}$ )			40		$\mu s$	
Rise (Tr) / Fall (Tf) 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		$^{\circ}C$	40 Sec Maximum
ESD Protection	4 kV HBM, 400V MM, 2 kV CDM				

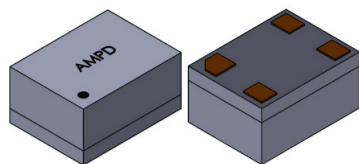


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# FREQUENCY SELECTABLE MEMS OSCILLATORS



AMPD-SERIES



ESD Sensitive

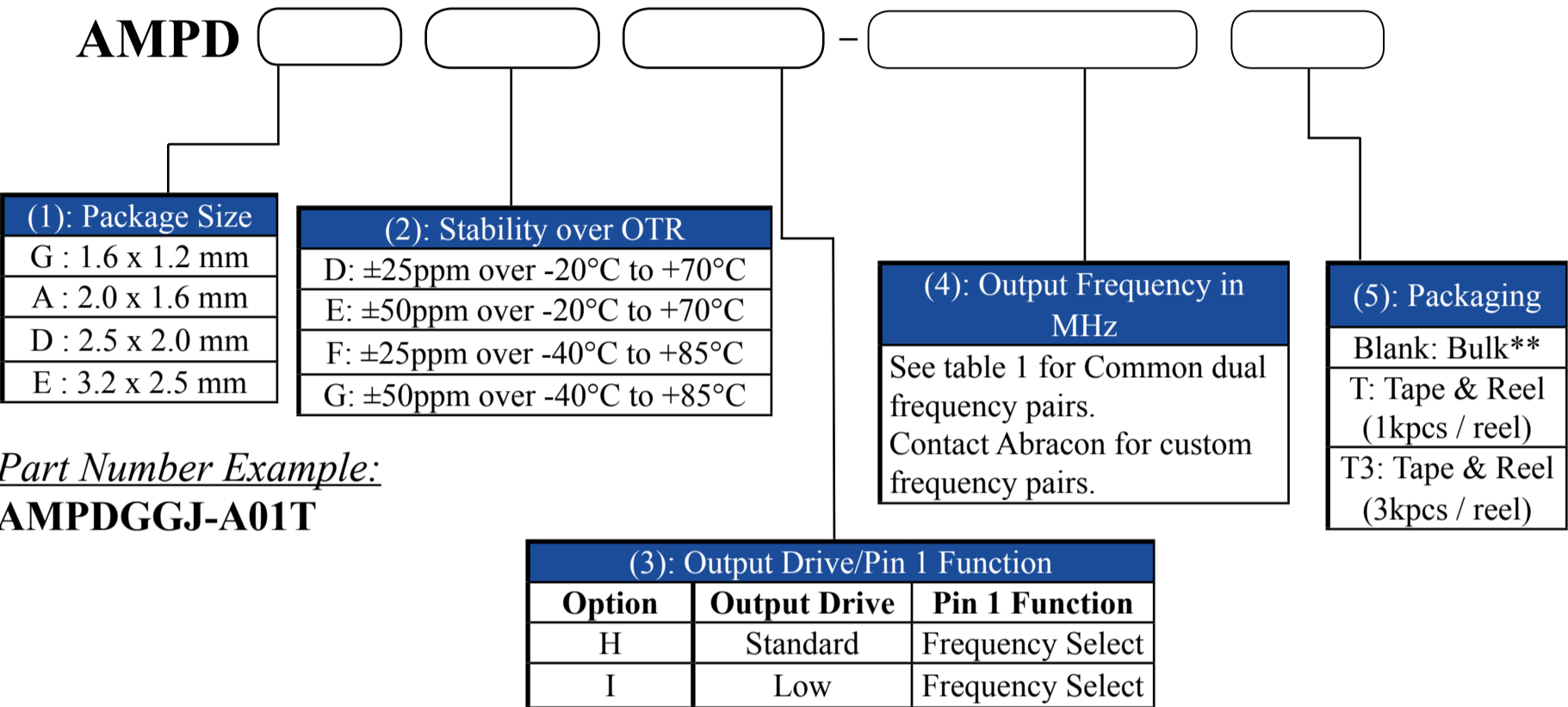


RoHS/RoHS II Compliant

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

## OPTIONS AND PART IDENTIFICATION



Frequency Code	Frequency 1	Frequency 2	Frequency Code	Frequency 1	Frequency 2
A01	20.000 MHz	25.000 MHz	A09	24.000 MHz	48.000 MHz
A02	50.000 MHz	25.000 MHz	A10	48.000MHz	50.000MHz
A03	40.000 MHz	80.000 MHz	A11	50.000 MHz	100.000 MHz
A04	74.250 MHz	74.1758 MHz	A12	75.000 MHz	100.000 MHz
A05	25.000 MHz	27.000 MHz	A13	6.16791 MHz	6.1298496 MHz
A06	26.000 MHz	27.000 MHz	A14	27.000 MHz	32.000 MHz
A07	19.440 MHz	25.000 MHz	A15	25.000 MHz	32.000 MHz
A08	12.000 MHz	24.000 MHz	A16	12.000 MHz	48.000 MHz

\*\*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 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 or greater than 1000pcs:  
Bulk is not an option. Please refer to tape and reel packaging.

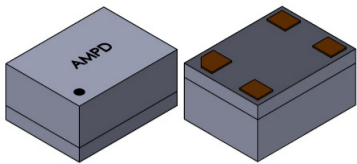


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## AMPD-SERIES



ESD Sensitive



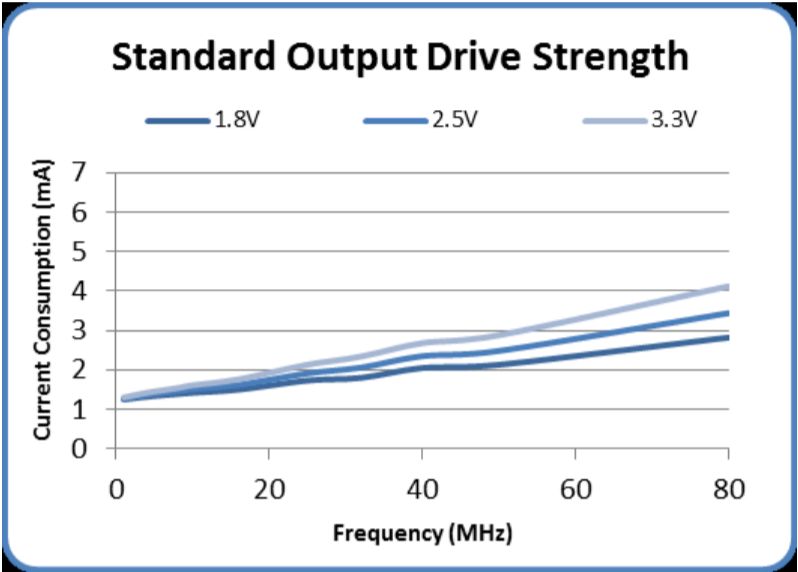
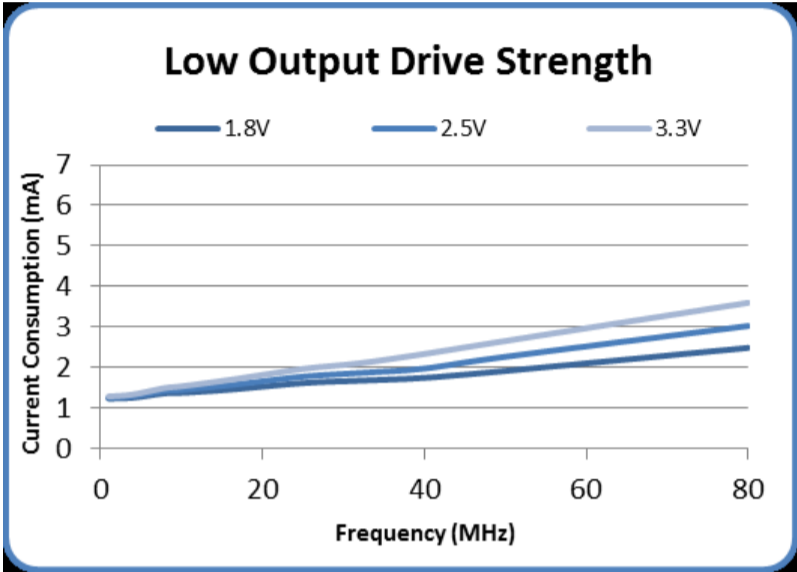
RoHS/RoHS II Compliant

MSL = MSL 1

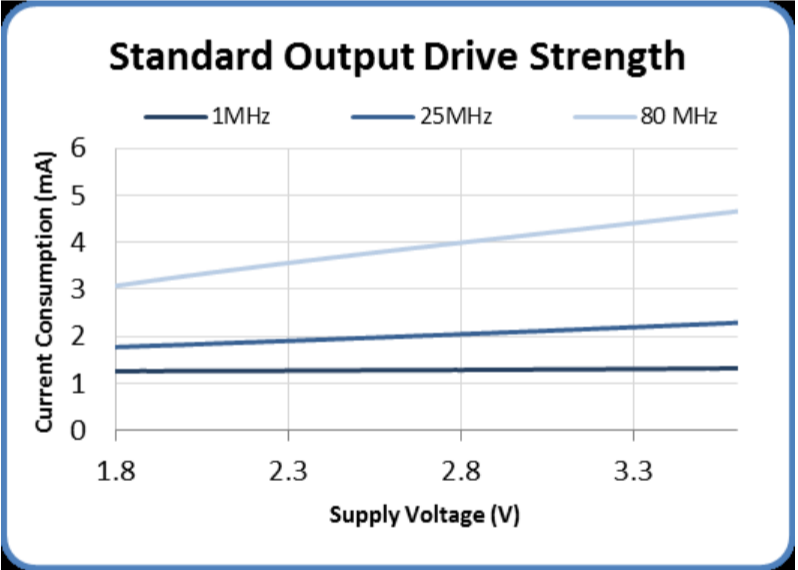
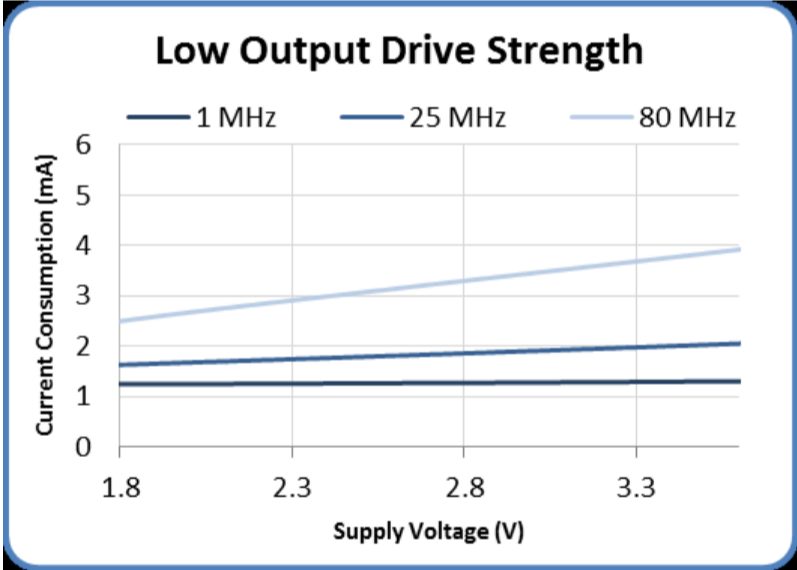
1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

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

#### Current Consumption vs Frequency



#### Current Consumption vs Supply Voltage



### PINFUNCTIONS

Pin Number	Pin Name	Description
1	FS	Frequency Select <sup>Note 1&amp;3</sup> : High or Open = Frequency 1 Low = Frequency 2
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, frequency 1 will be engaged on pin 3. If pin 1 is low, frequency 2 will be engaged on pin 3.
2. Bypass with 0.1  $\mu$ F capacitor placed as close to V<sub>DD</sub> pin as possible.
3. 300 K $\Omega$  internal pull-up resistor present on pin 1.

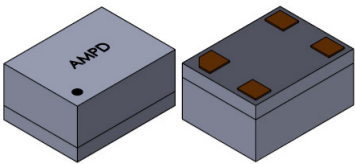


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# FREQUENCY SELECTABLE MEMS OSCILLATORS



## AMPD-SERIES



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RoHS/RoHS II Compliant

MSL = MSL 1

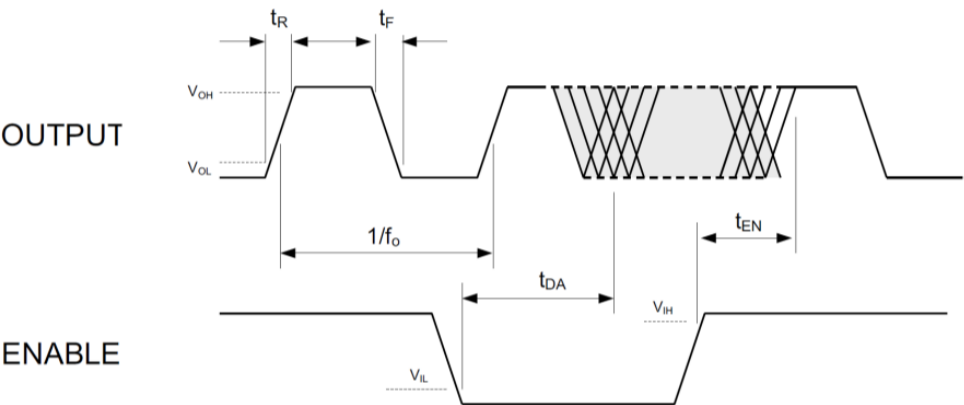
1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

## OUTPUT BUFFER OPTIONS

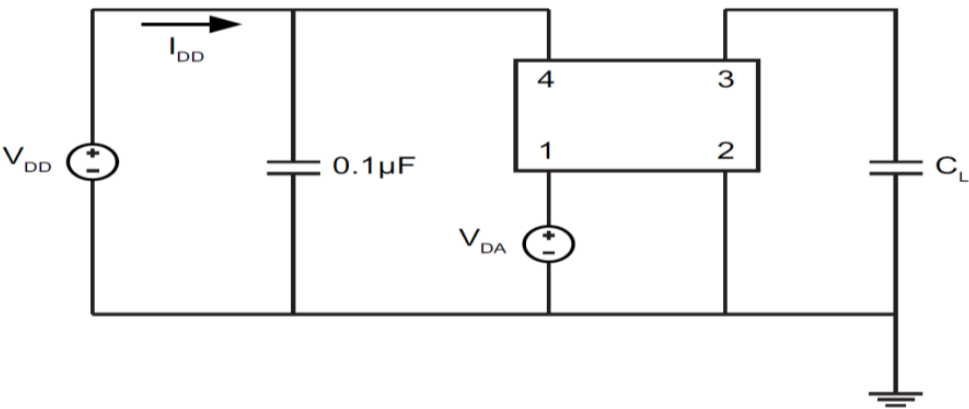
The AMPD Series is available in multiple output driver configurations. The low-power driver minimizes current consumption and EMI while delivering greater than 1 mA output current at 20% to 80% of the supply voltage. The standard-drive delivers greater than 3 mA output current at 20% to 80% of the supply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

## DIAGRAMS

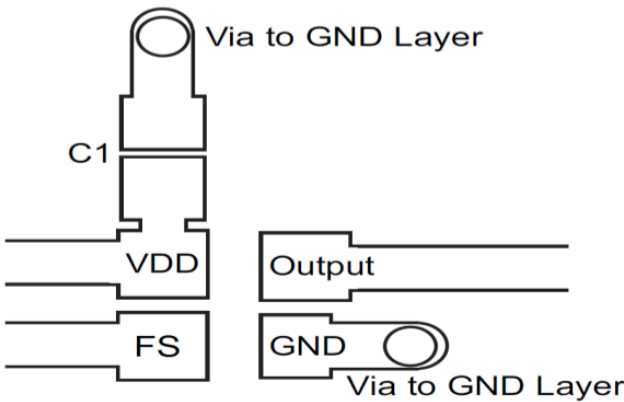
### Output Waveform



### Test Circuit



### Recommended Board Layout

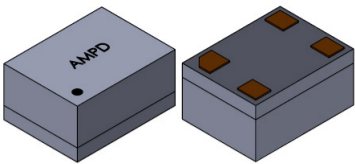


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AMPD-SERIES



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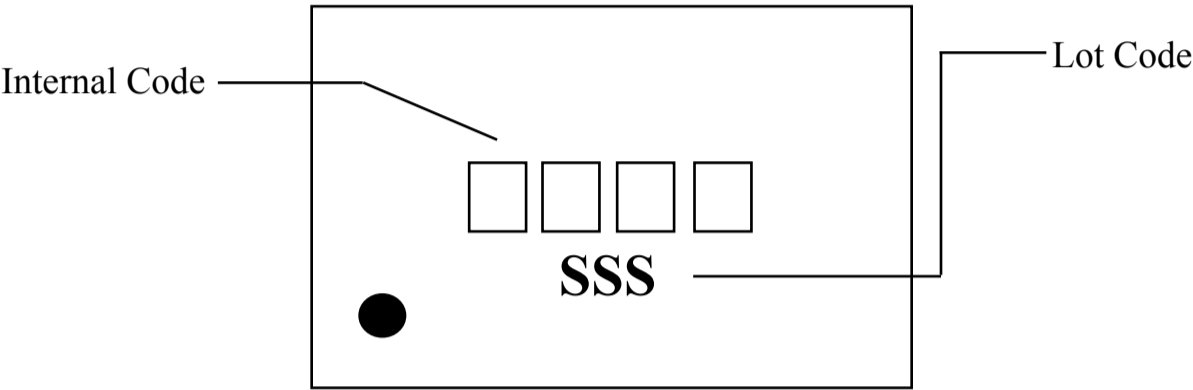
RoHS/RoHS II Compliant

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

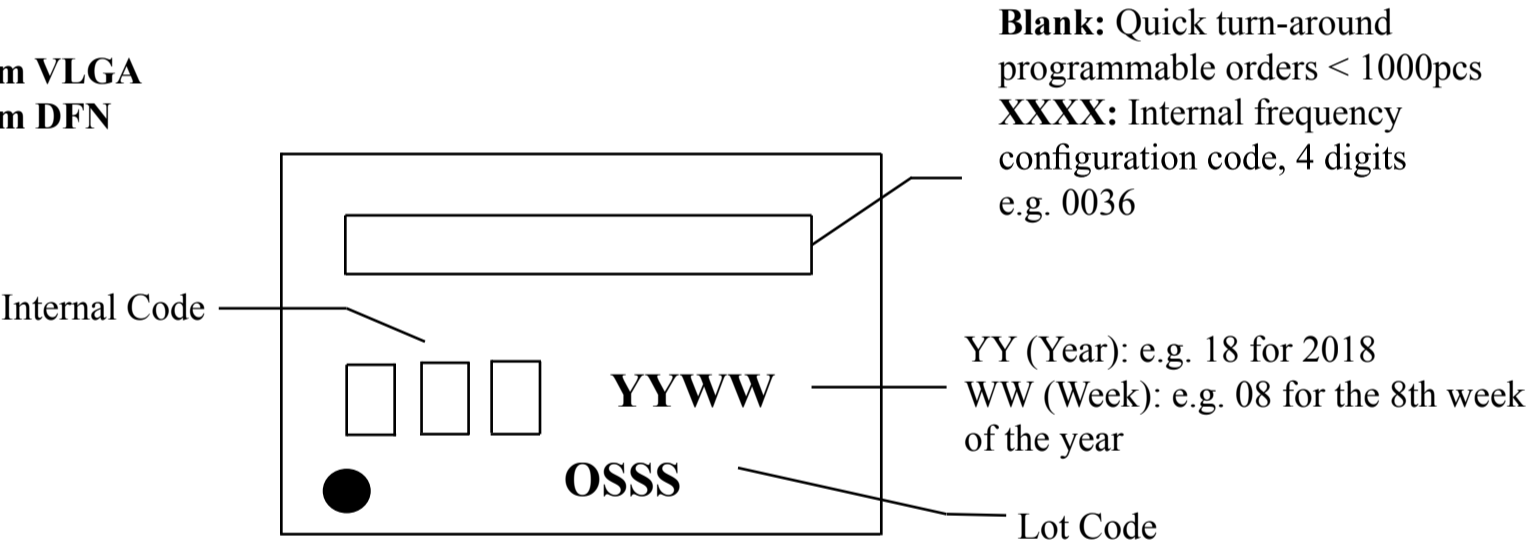
MSL = MSL 1

## 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



**Blank:** Quick turn-around programmable orders < 1000pcs  
**XXXX:** Internal frequency configuration code, 4 digits e.g. 0036

YY (Year): e.g. 18 for 2018  
WW (Week): e.g. 08 for the 8th week of the year

Marking Method: Laser Marking

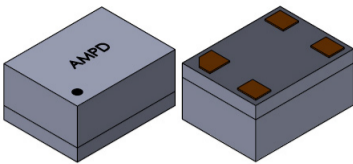


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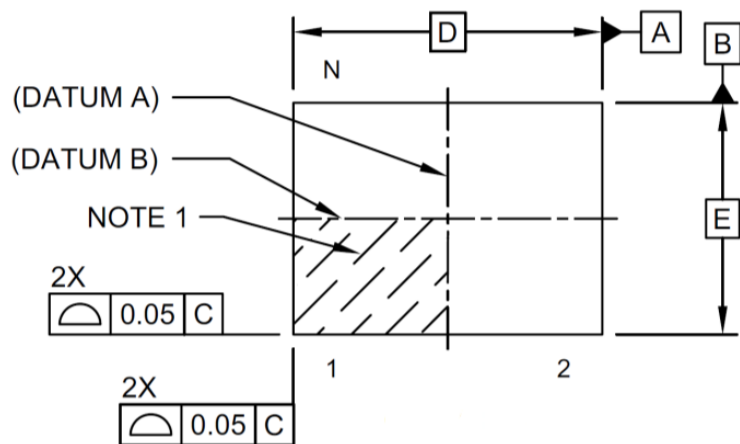
RoHS/RoHS II Compliant

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

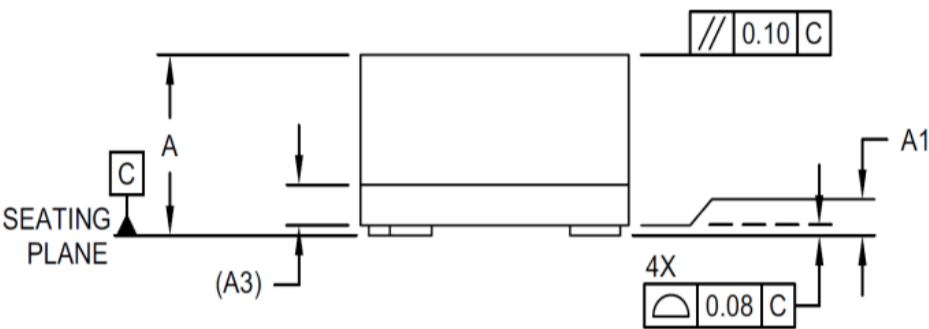
MECHANICAL DIMENSIONS

1.6 x 1.2 mm VFLGA Package Outline

Top View

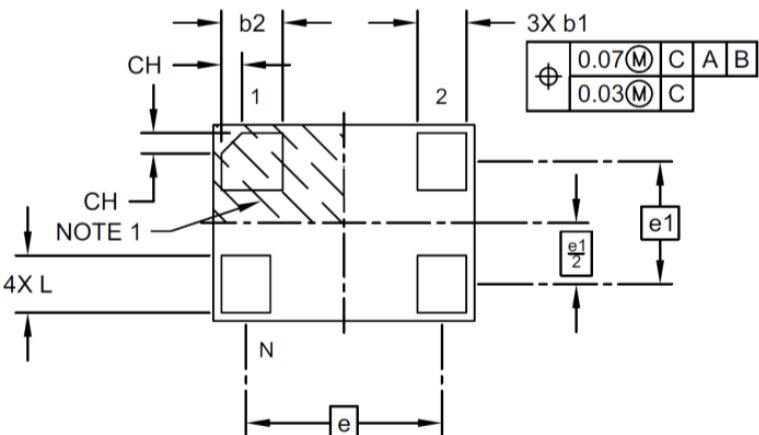


Side View



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

Bottom View



\*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

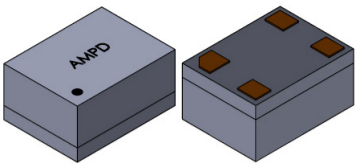


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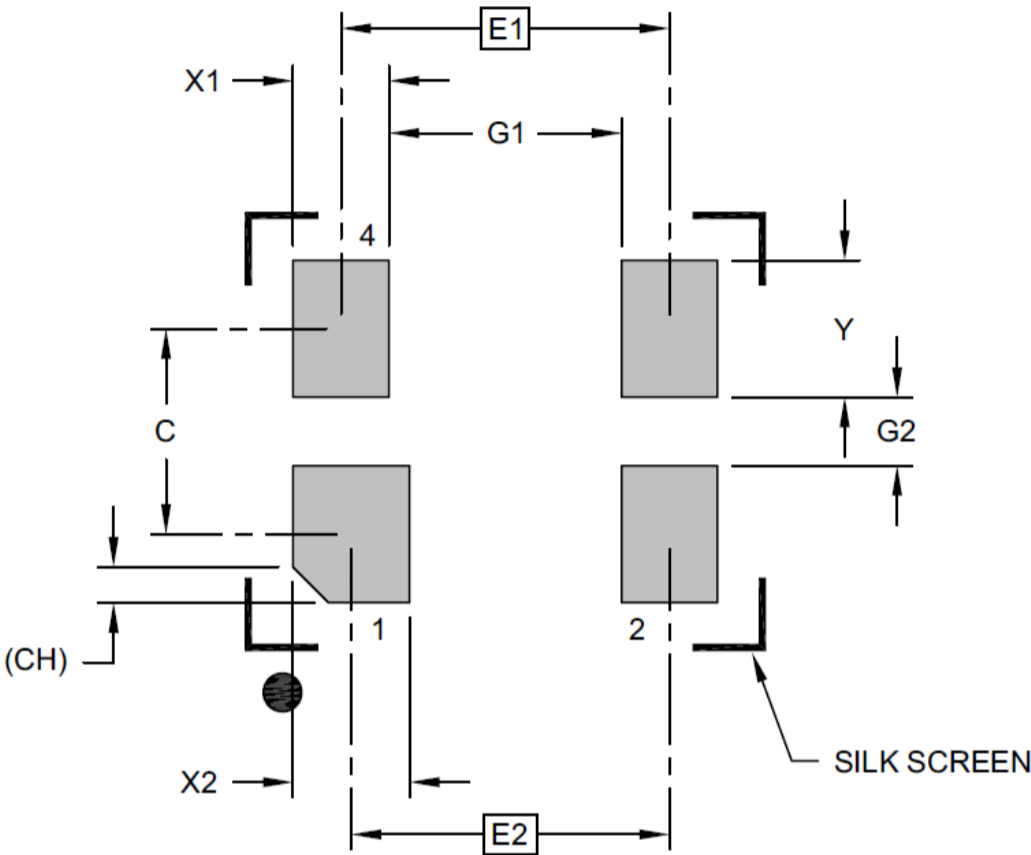
RoHS/RoHS II Compliant

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

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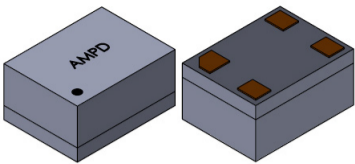


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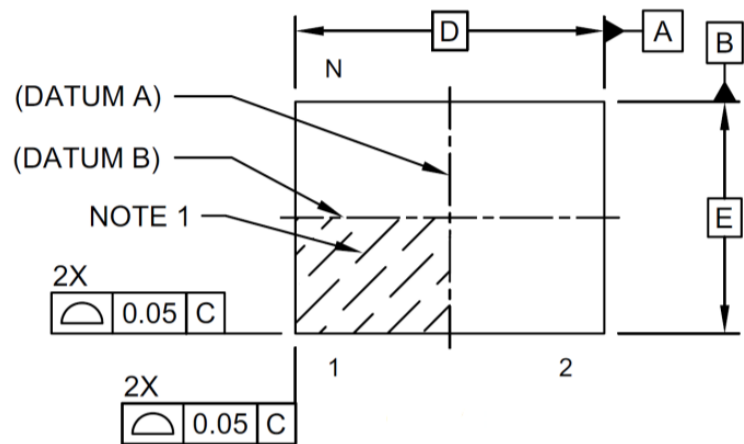
1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

MSL = MSL 1

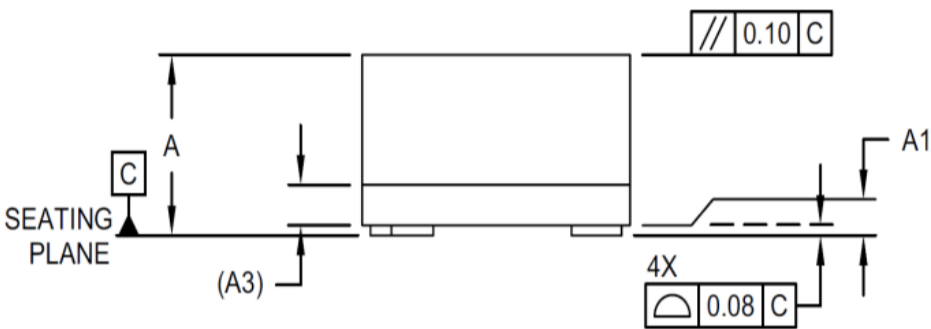
## MECHANICAL DIMENSIONS

### 2.0 x 1.6 mm VFLGA Package Outline

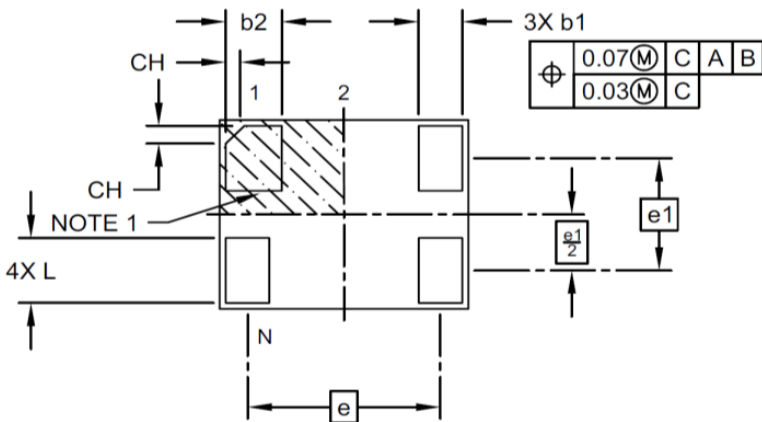
#### Top View



#### 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  
BSC: Basic Dimension. Theoretically exact value shown without tolerances  
REF: Reference Dimension, usually without tolerance, for information purposes only

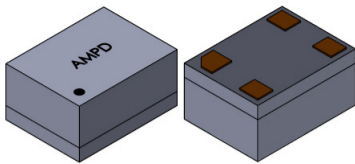


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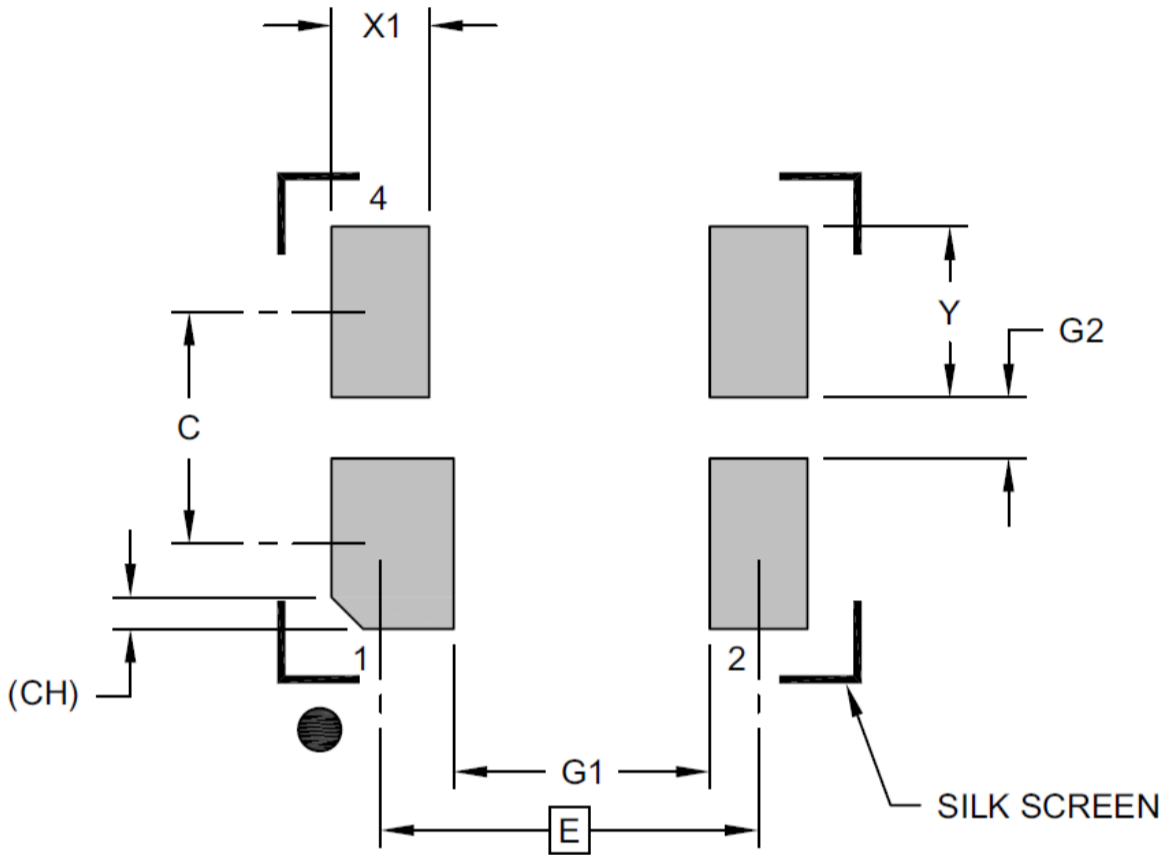
RoHS/RoHS II Compliant

MSL = MSL 1

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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

BSC: Basic Dimension. Theoretically exact value shown without tolerances

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

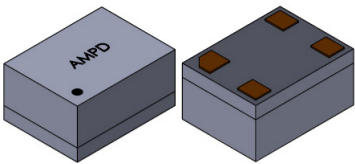


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ESD Sensitive



RoHS/RoHS II Compliant

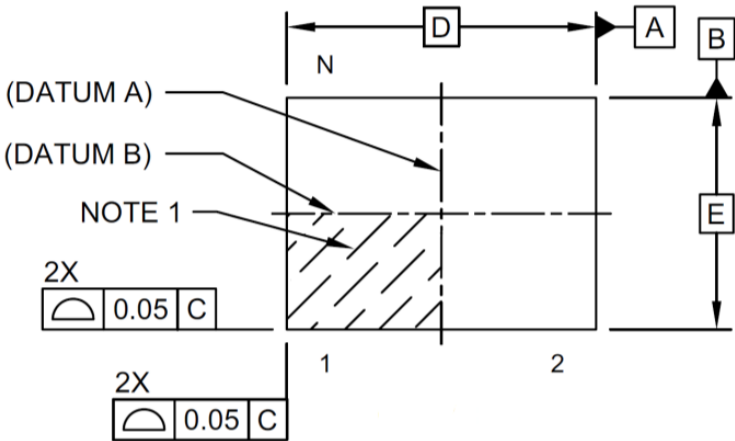
MSL = MSL 1

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

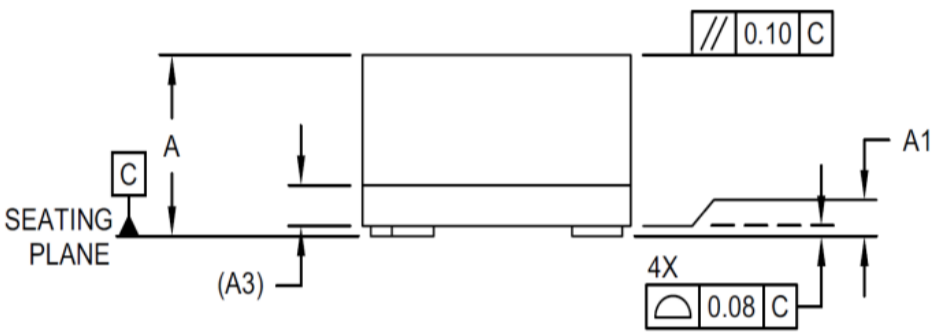
## MECHANICAL DIMENSIONS

### 2.5 x 2.0 mm VLGA Package Outline

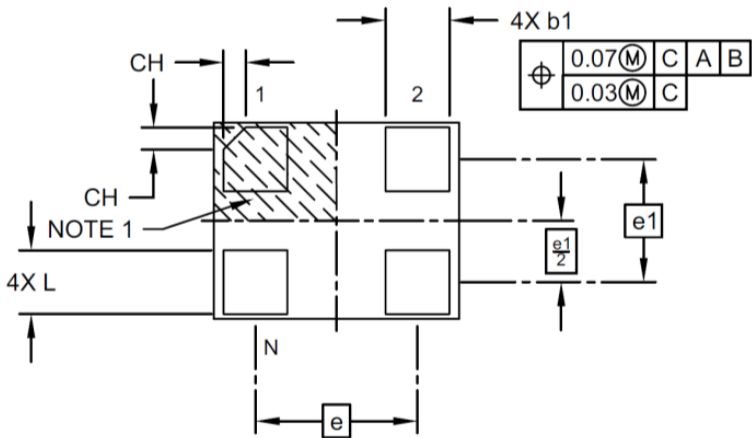
#### Top View



#### 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

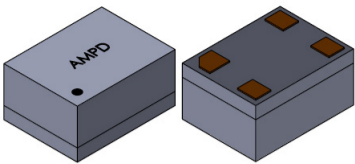


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# FREQUENCY SELECTABLE MEMS OSCILLATORS



AMPD-SERIES



ESD Sensitive



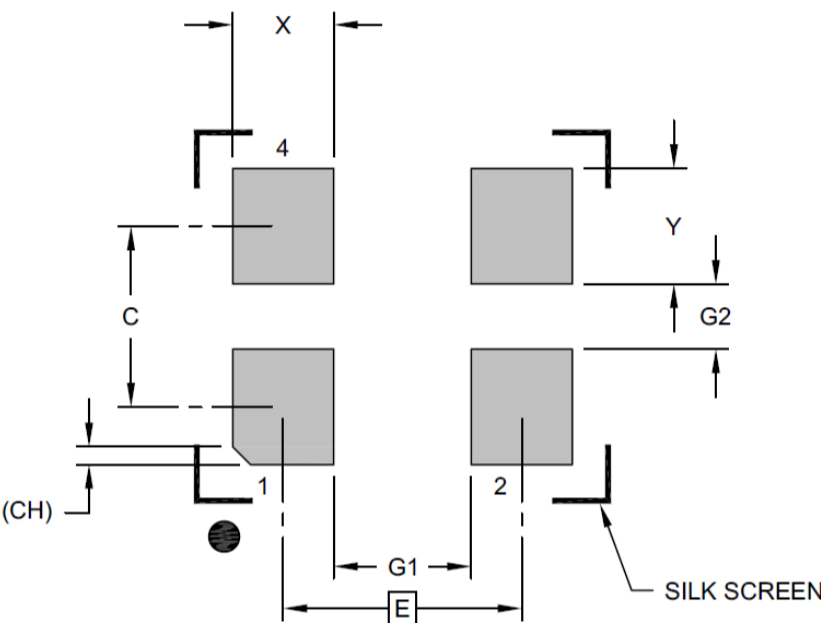
RoHS/RoHS II Compliant

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

### 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

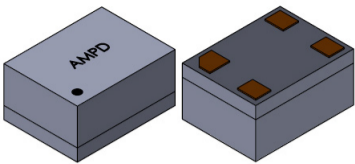


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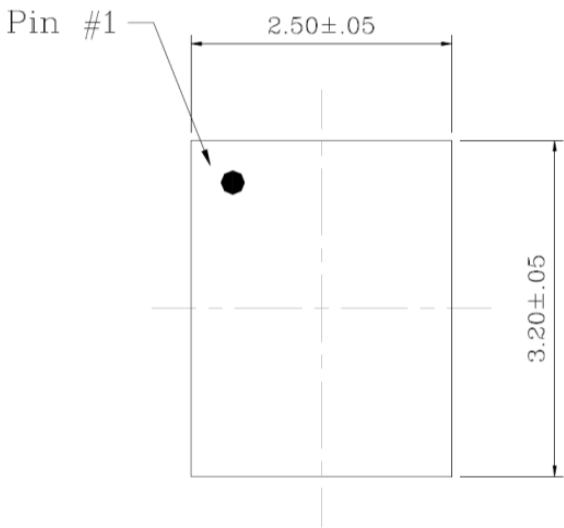
MSL = MSL 1

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

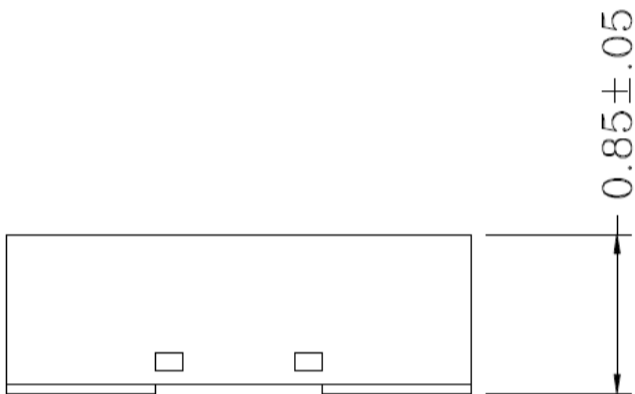
## MECHANICAL DIMENSIONS

### 3.2 x 2.5 mm DFN Package Outline

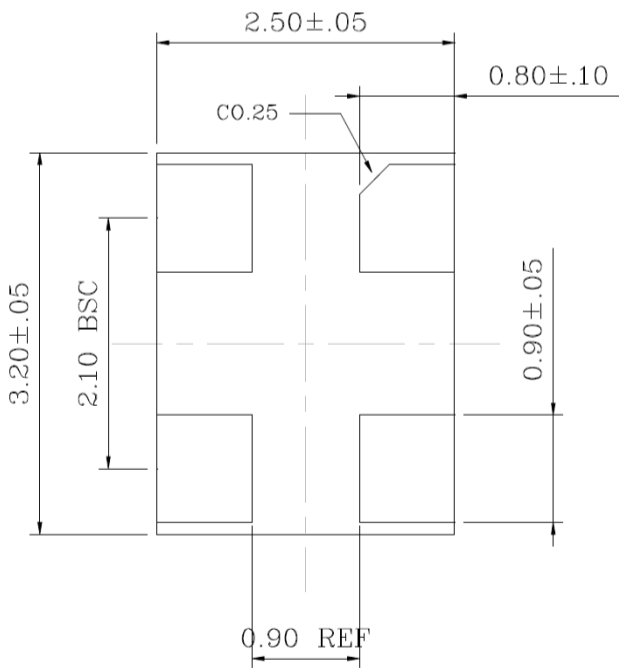
#### Top View



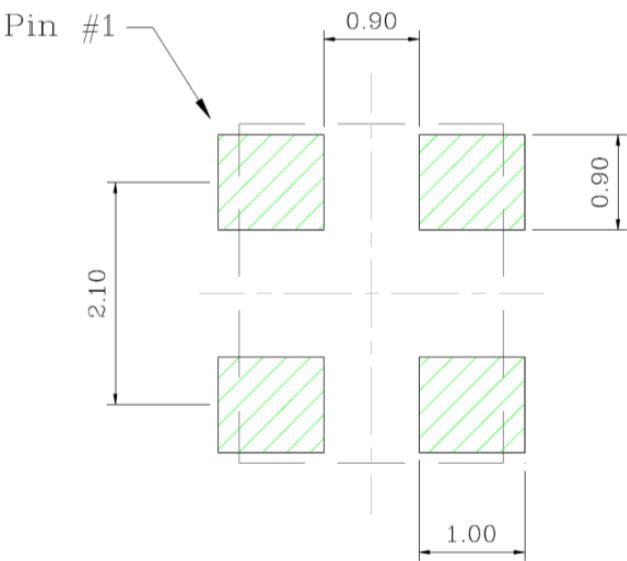
#### Side View



#### Bottom View



#### Recommended Landing Pattern



Dimensions : mm

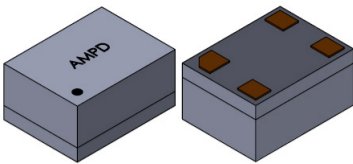


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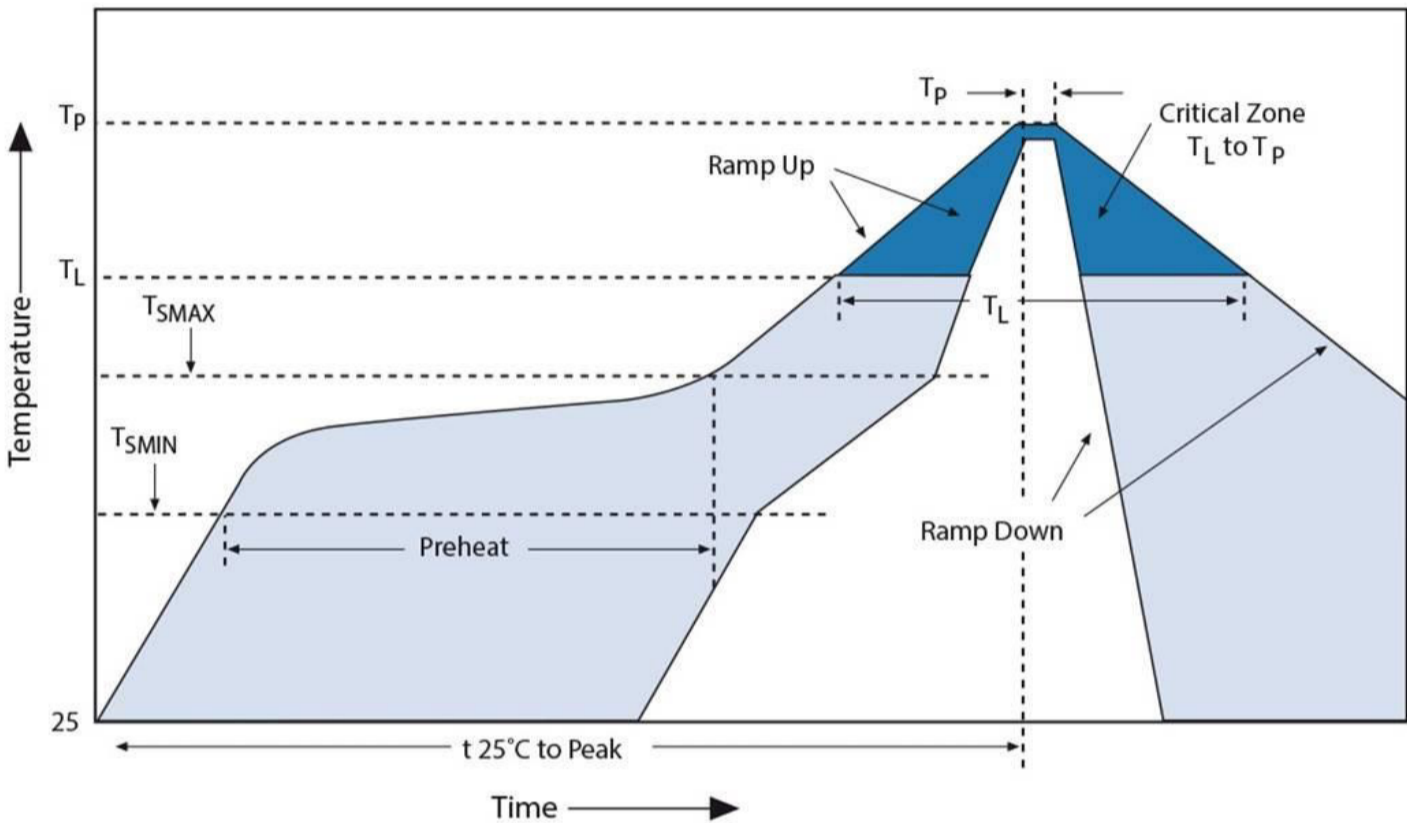


RoHS/RoHS II Compliant

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

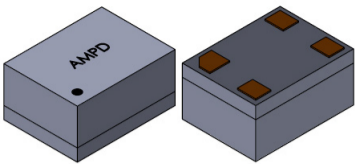
MSL = MSL 1

## 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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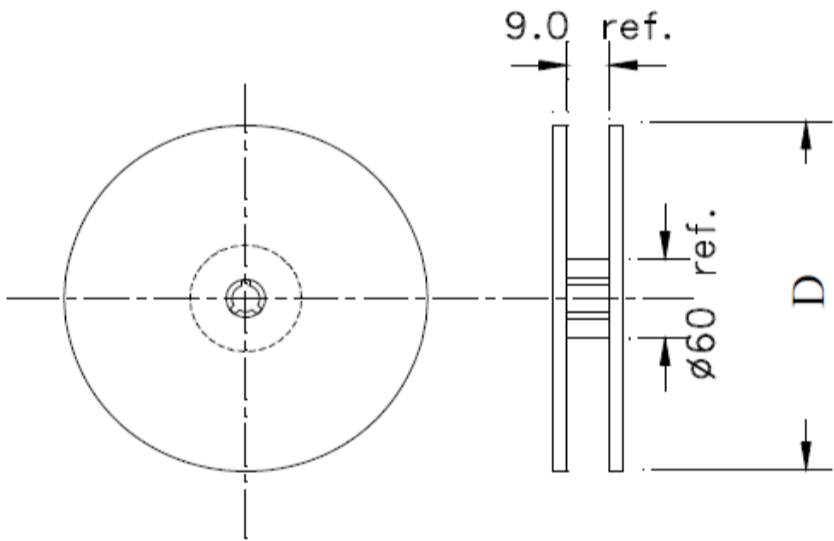
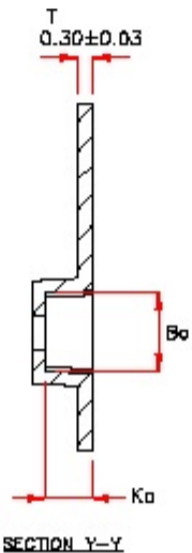
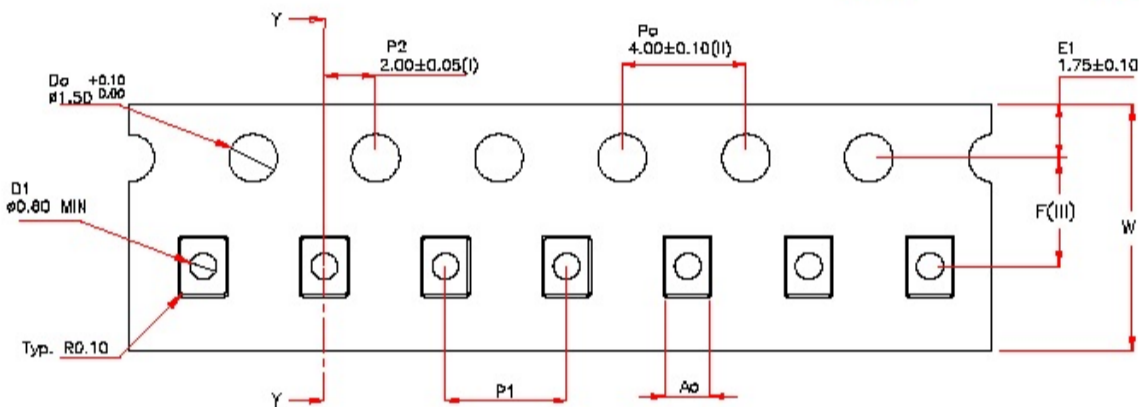
MSL = MSL 1

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.

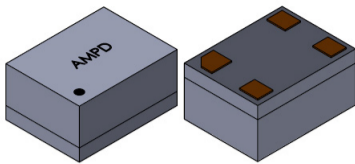


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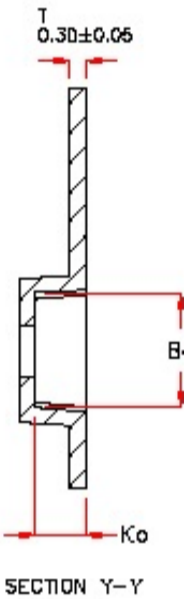
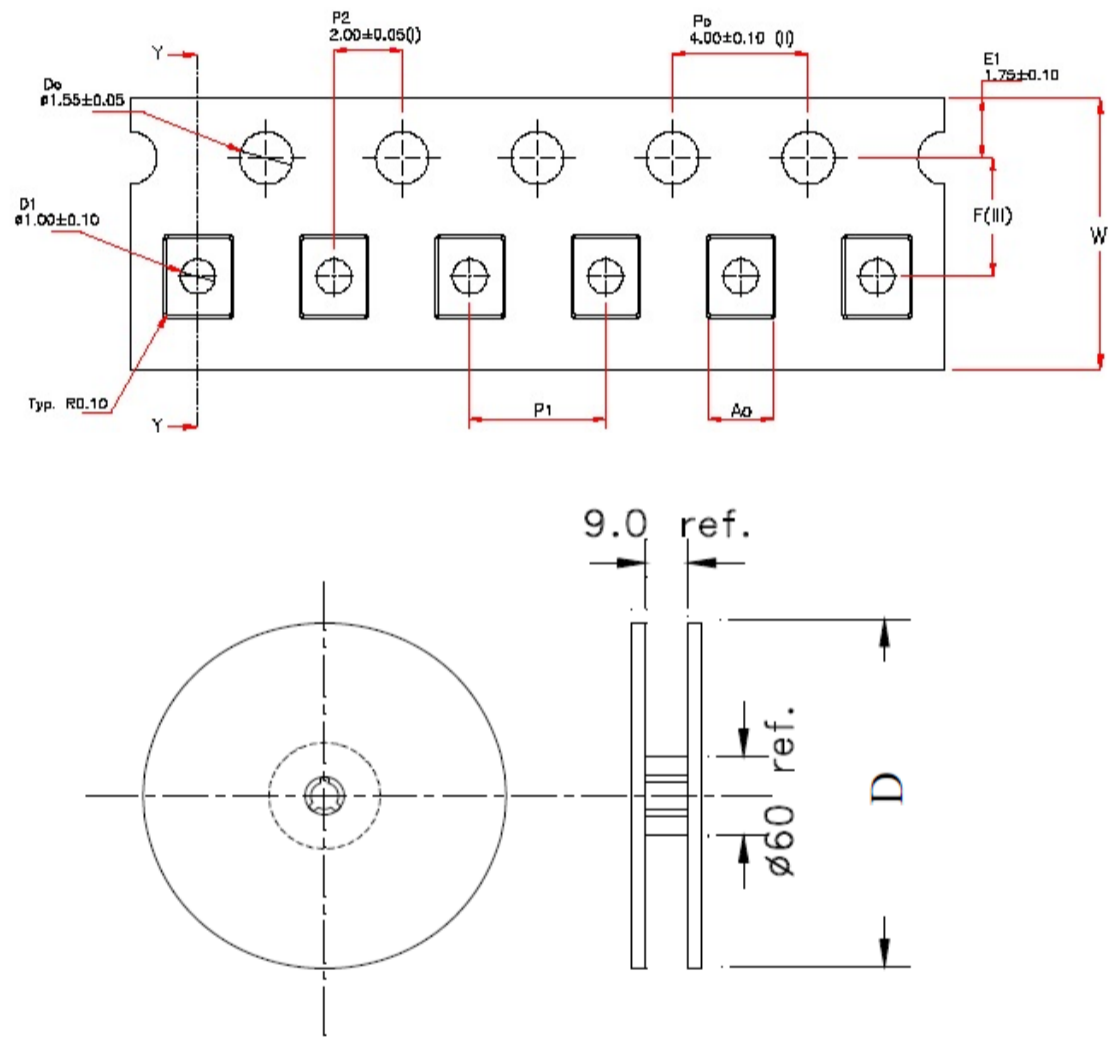
MSL = MSL 1

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 <sub>0</sub>	1.90 ± 0.05
B <sub>0</sub>	2.30 ± 0.05
K <sub>0</sub>	1.05 ± 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.

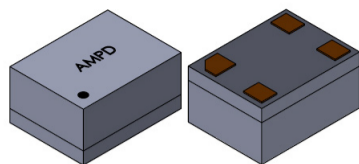


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RoHS/RoHS II Compliant

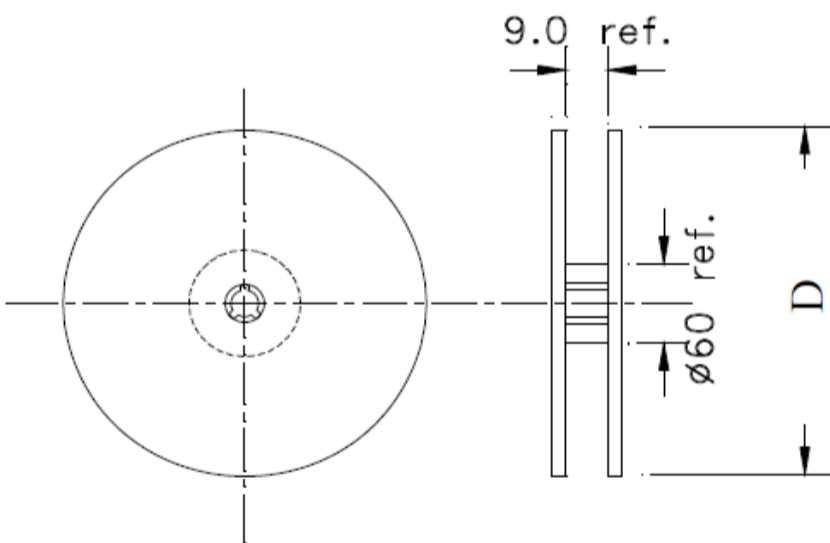
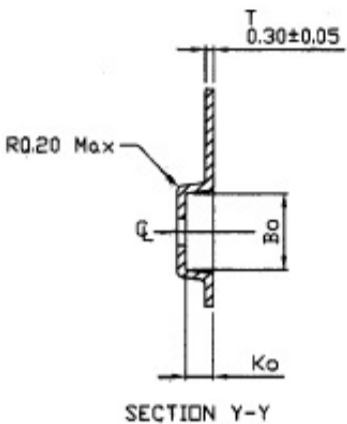
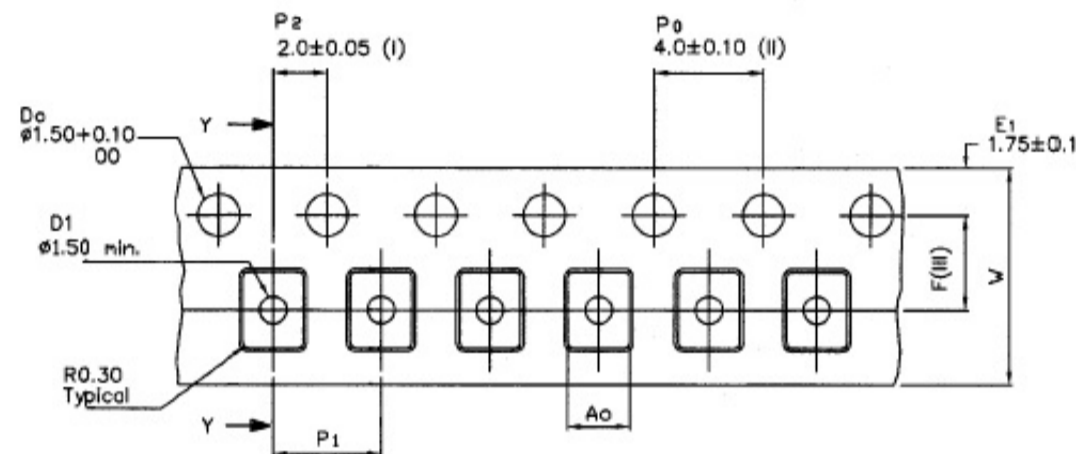
1.6 x 1.2 x 0.84 mm  
2.0 x 1.6 x 0.84 mm  
2.5 x 2.0 x 0.84 mm  
3.2 x 2.5 x 0.85 mm

MSL = MSL 1

## 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.

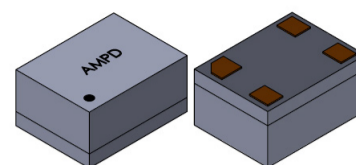


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RoHS/RoHS II Compliant

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

## PACKAGING

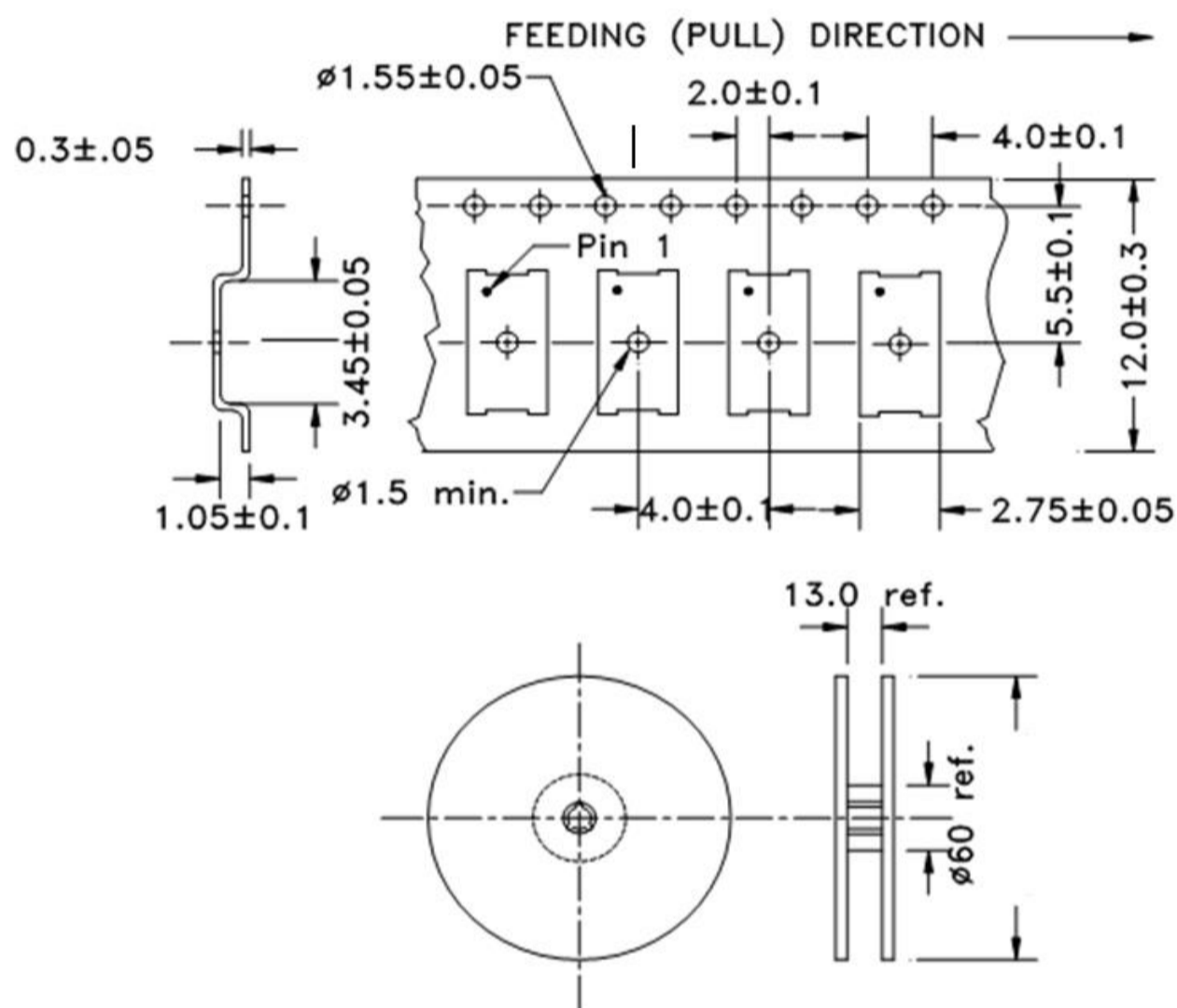
Bulk MOQ= 110pcs/Bag\*

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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