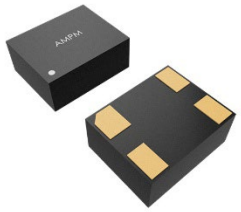
AMPM series

Plastic SMD MEMS Clock Oscillator

Description

The Abracon AMPM series is a programmable MEMS oscillator, offering four different package size configurations (1612mm, 2016mm, 2520mm, and 3225mm). All packages are capable of operating with a supply voltage range of 1.71V to 3.63V. This series features low power consumption, a wide frequency range, tight stabilities, and short lead times for industrial, consumer, and other applications.



Features

- Compact footprint as small as 1.6x1.2mm
- Low power consumption, 1.3mA IDD (typ at Fo=24MHz)
- 1MHz to 80MHz output frequency range
- Output Drive Options: Standard or Low
- Wide -40°C to 85°C operating temperature range
- Output enable or standby function
- REACH/RoHS II Compliant | MSL Level 1

Typical Applications

- Storage Area Networks (SATA, SAS, Fiber Channel)
- Passive Optical Networks (EPON, 10G-EPON, GPON, 10G-PON)
- Ethernet (1G, 10GBASE-T,/KR/LR/SR, FCoE)
- PCI Express
- Display port

Electrical Specifications

Electrical characteristics unless otherwise indicated, VDD =1.8V -5% to 3.3V +10%, temperature range -40ºC to 85 ºC

Parameters		Min.	Typ.	Max.	Units	Notes
Frequency Range (F)		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}) [Note 1]			1.0		µA	V_{DD} = 1.8/2.5V
			1.5			V_{DD} = 3.3V
Operating Temperature Range		-40		+85	°C	See Options
Storage Temperature		-55		+150	°C	
All Inclusive Frequency Stability [Note 2]		-25		+25	ppm	Option “D” or “F”
		-50		+50		Option “E” or “G”
Aging		-5		+5	ppm	1st 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*V_{DD}			V	
	V_{OL}			0.2*V_{DD}		
Input Logic Levels [Note 3]	V_{IH}	0.7*V_{DD}			V	Logic High
	V_{IL}			0.3*V_{DD}		Logic Low
Enable Pull-Up Resistor [Note 5]			300		kΩ	
Power Supply Ramp (t_{PU}) [Note 6]		0.1		100	ms	Time to 90% targeted V_{DD}
Start-up Time (tsu)				1.5	ms	From 90% VDD to valid clock output, @ 25ºC

Revision: B
Initial Release 2/10/2025

Disclaimer

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Electrical Specifications *continued*

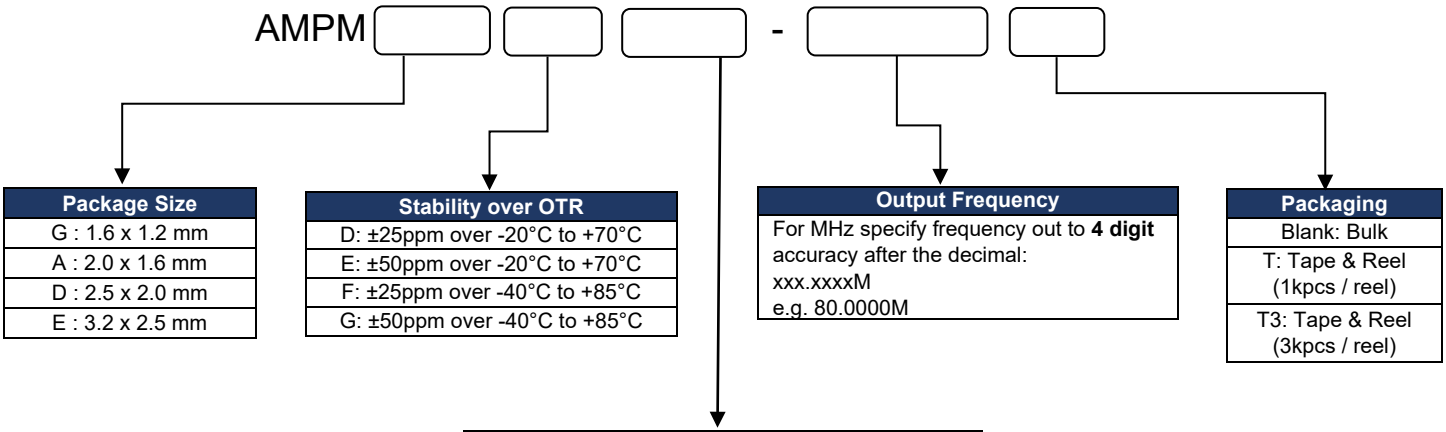
Parameters		Min.	Typ.	Max.	Units	Notes
Output Enable Time (t_{EN}) [Note 4]	OE			1	µs	
	Standby			1.5	ms	
Output Disable Time (t_{DA})				200+2 periods	ns	
Rise (T_r) / Fall (T_f) Time	Low Drive 20% ↔ 80%		2.5	3.5	ns	CL = 5 pF | VDD =1.8V
			1.5	2.2		CL = 5 pF V_{DD} =2.5V/3.3V
	Std Drive 20% ↔ 80%		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 (J_{PER})	Low Drive f_{out} = 27 MHz		28	40	ps	VDD = 1.8V, CL= 5 pF
			23	32		VDD = 2.5/3.3V, CL = 5pF
	Std Drive f_{out} = 27 MHz		20	30		VDD = 1.8V, CL= 10pF
			18	28		VDD = 2.5/3.3V, CL = 10pF
Cycle-to-Cycle Jitter (Peak) (J_{Cy-Cy})	Low Drive fout = 27 MHz		120	240	ps	VDD = 1.8V, CL= 5 pF
			90	170		VDD = 2.5/3.3V, CL = 5pF
	Std Drive fout = 27 MHz		115	190		VDD = 1.8V, CL= 10pF
			90	150		VDD = 2.5/3.3V, CL = 10pF
Peak-to-Peak Period Jitter (J_{pk-pk}) [Note 7]	Low Drive fout = 27 MHz		210		ps	VDD = 1.8V, CL= 5 pF
			190			VDD = 2.5/3.3V, CL = 5pF
	Std Drive fout = 27 MHz		160			VDD = 1.8V, CL= 10pF
			144			VDD = 2.5/3.3V, CL = 10pF

Note 1: Not including current through pull-up resistor on EN pin (if configured).
Note 2: Includes post reflow frequency accuracy, temperature stability, load pulling and power supply variation.
Note 3: Input waveform must be monotonic with rise/fall time <10 ms.
Note 4: For parts configured with OE, not Standby.
Note 5: Output is enabled if pad is floated or not connected.
Note 6: Time to reach 90% of target VDD. Power ramp rise must be monotonic
Note 7: Peak to peak period jitter is measured over 10,000 cycles.

Absolute Maximum Ratings

Parameters	Min.	Typ.	Max.	Units	Notes
Supply Voltage	-0.3		+4.0	V	
Input Voltage	-0.3		VDD+0.3	V	
Maximum Junction Temperature			+150	ºC	
Ambient Operating Temperature	-40		+85	ºC	Industrial
Ambient Operating Temperature	-20		+70	ºC	Extended Commercial
Storage Ambient Temperature Range	-55		+150	ºC	
Soldering Temperature		+260		ºC	
ESD Protection	4 kV HBM, 400V MM, 2kV CDM				

Options and Part Identification



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

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

Output Frequency
For MHz specify frequency out to **4 digit** accuracy after the decimal: xxx.xxxxM e.g. 80.0000M

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

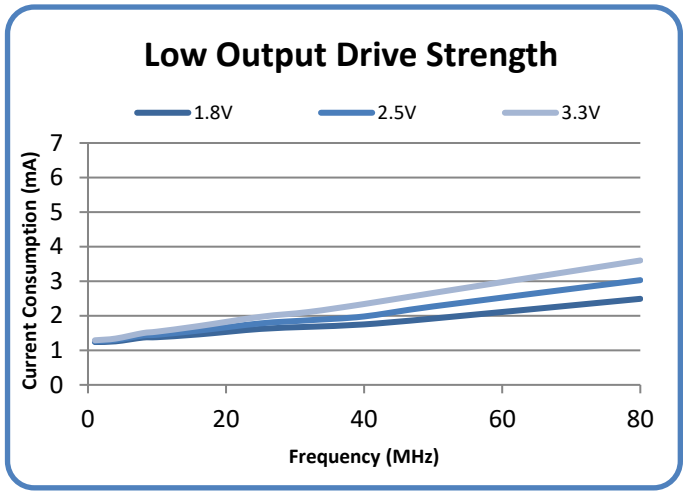
Output Drive/Pin 1 Function		
Option	**Output Drive**	**Pin 1**
A	Standard	Output Enable
B	Standard	Standby
C	Low	Output Enable
D	Low	Standby

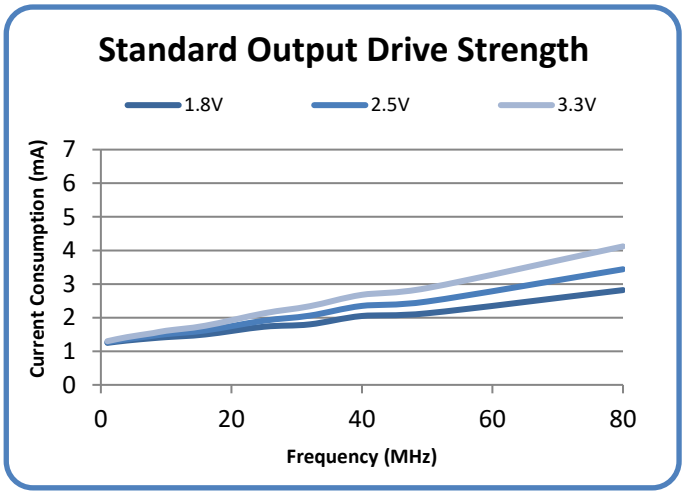
Part Number Example:

AMPMGGD-16.0000MT

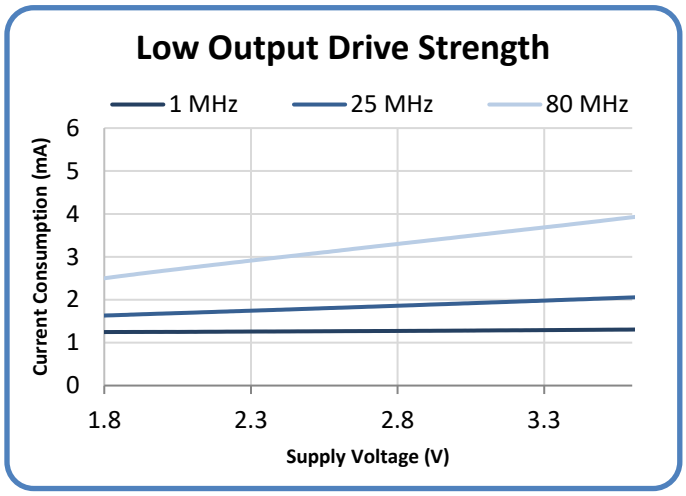
Typical Performance Data @ 25ºC ± 3ºC

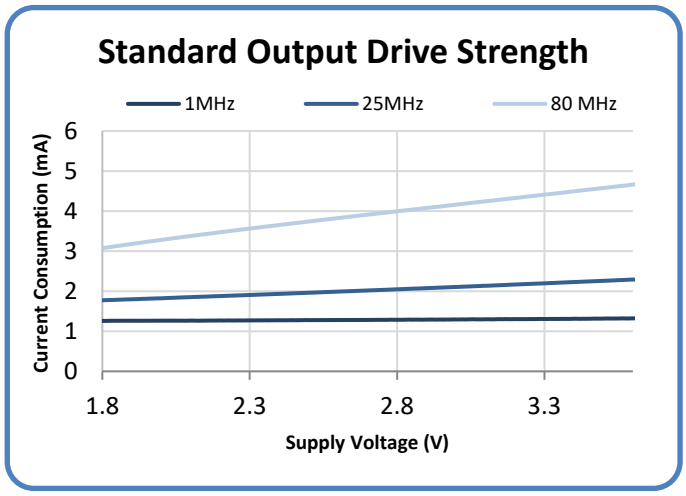
Current Consumption vs Frequency





Current Consumption vs Supply Voltage





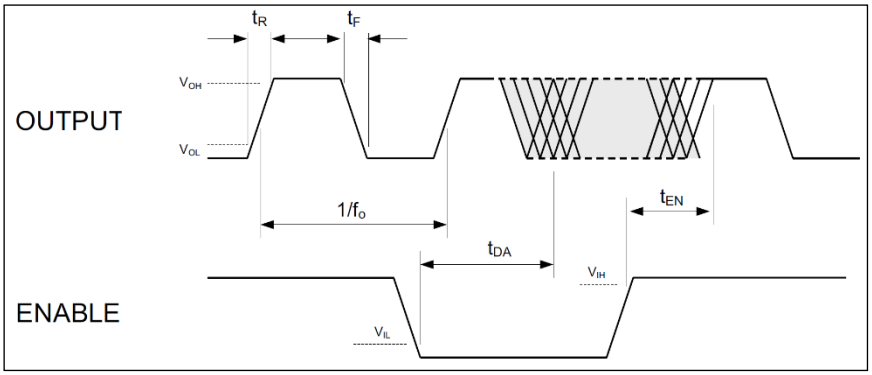
Pin Functions

Pin #	Pin Name	Description
1	OE	Output Enable [Note 8&10] : High or Open = Specified Frequency Output Low = Output is high impedance
	STBY	Standby [Note 8&10]: High or Open = Specified Frequency Output Low = Output is high impedance, Device is in low power mode, Supply current is ISTBY
2	GND	Power Supply Ground
3	Output	Oscillator clock output
4	V_{DD}	Power supply [Note 9]

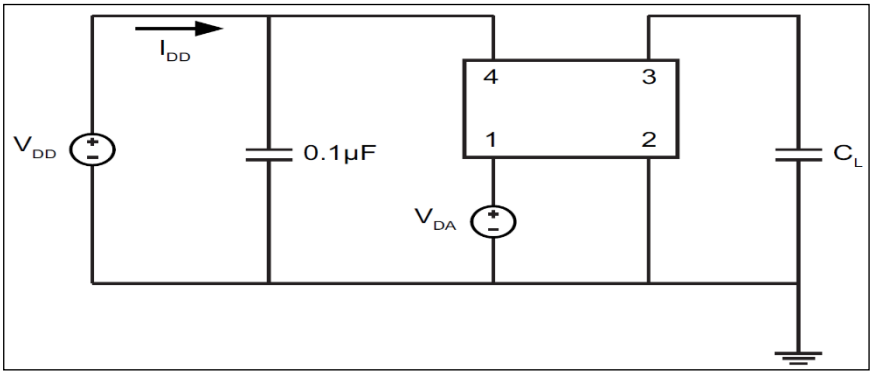
Note 8. If pin 1 is high or floating, there will be frequency output. If pin 1 is low, output will be disengaged.
Note 9. Bypass with 0.1 µF capacitor placed as close to VDD pin as possible.
Note 10. 300 KΩ internal pull-up resistor present on pin 1.

Diagrams

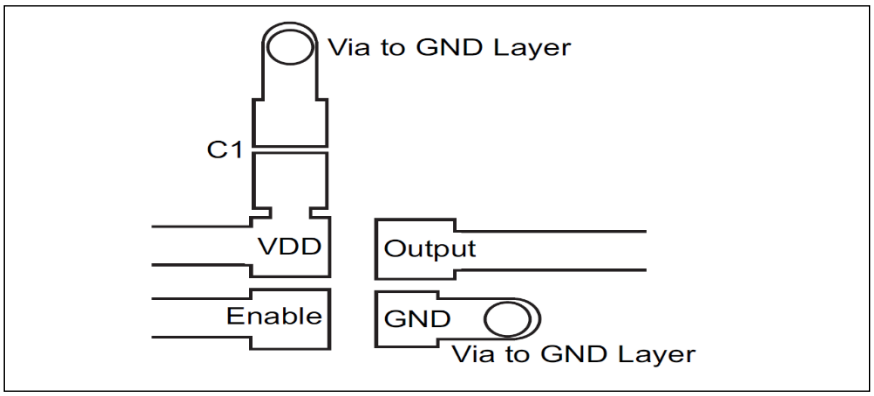
Output Waveform



Test Circuit



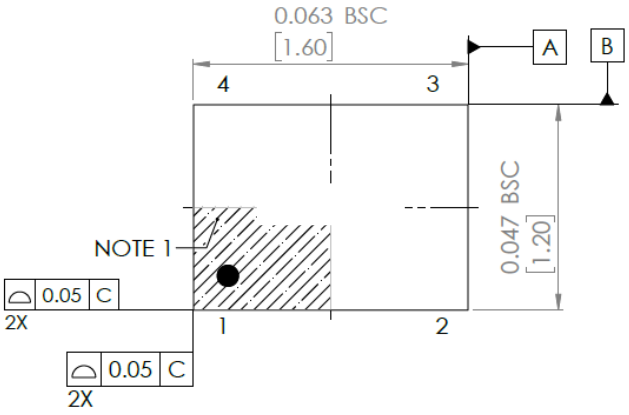
Recommended Board Layout



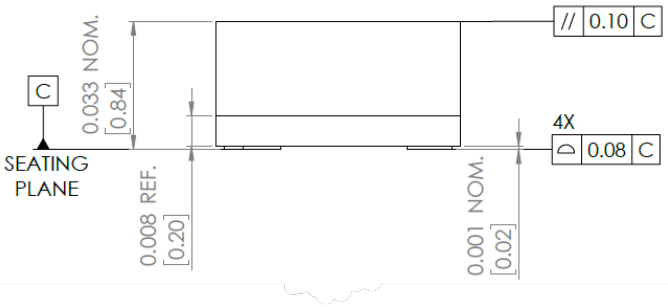
Mechanical Dimensions

1.6 x 1.2 mm VFLGA Package Outline

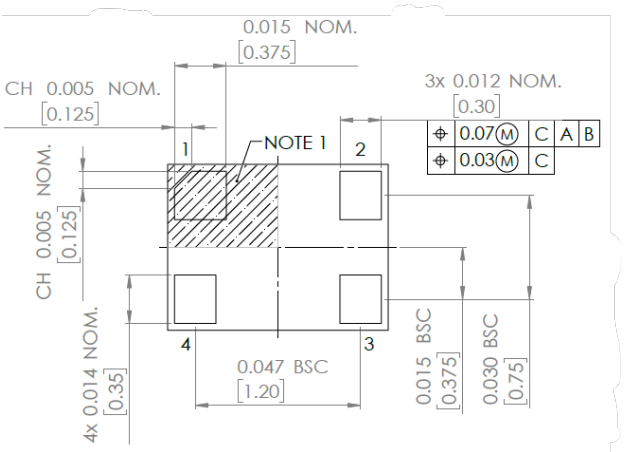
Top View



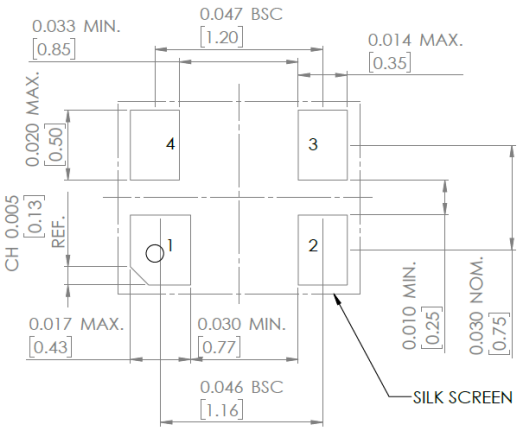
Side View



Bottom View



Recommended Landing Pattern



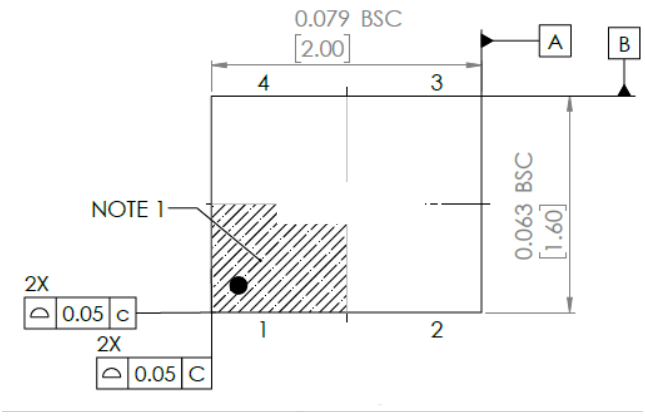
*Standoff max .05 mm and min 0.00 mm

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

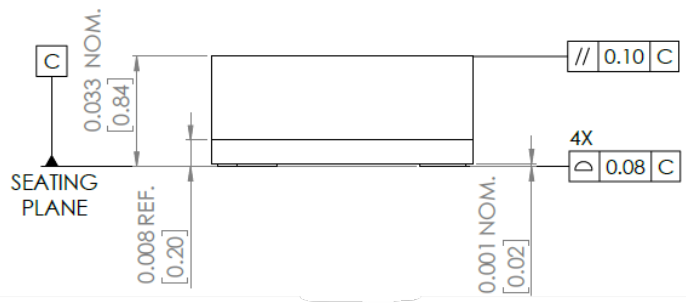
Dimensions: Inches[mm]

2.0 x 1.6 mm VFLGA Package Outline

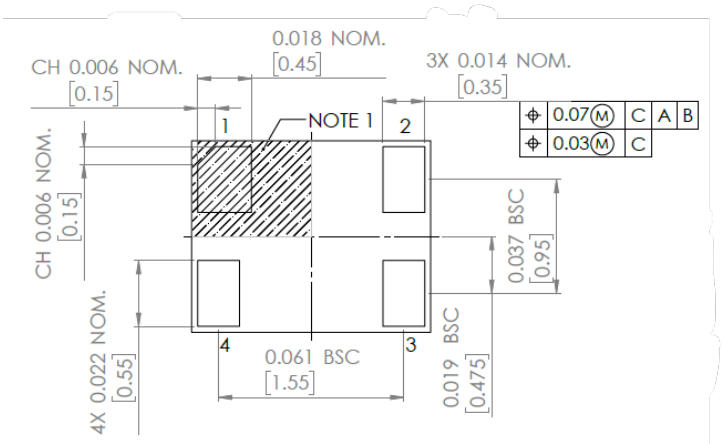
Top View



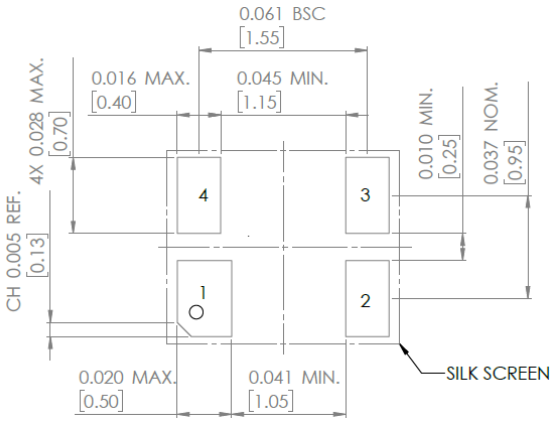
Side View



Bottom View



Recommended Landing Pattern



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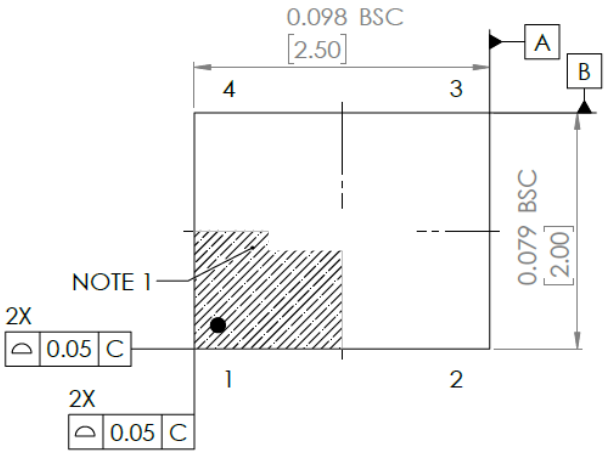
Dimensioning and tolerance per ASME Y14.5M
BSC: Basic Dimension. Theoretically exact value shown without tolerances
REF: Reference Dimension, usually without tolerance, for information purposes only

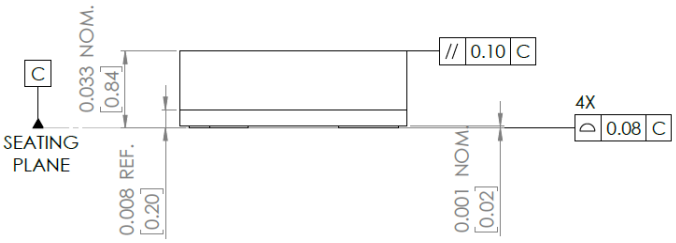
Dimensions: Inches[mm]

2.5 x 2.0 mm DFN Package Outline

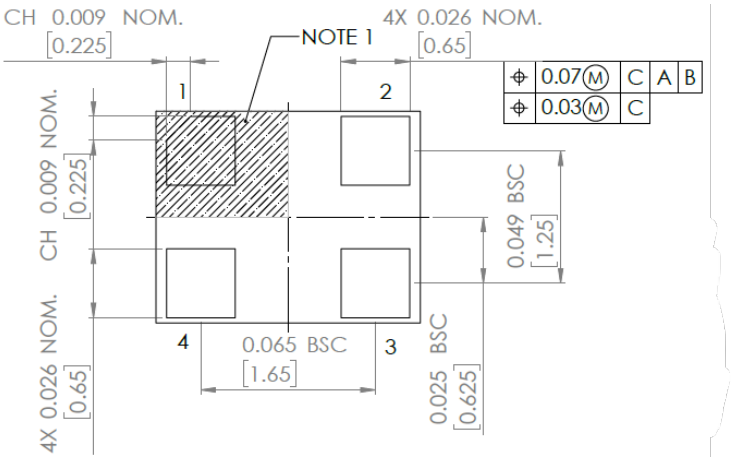
Top View



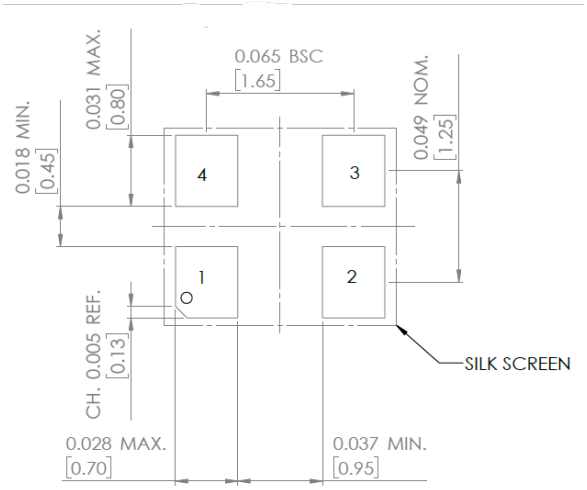
Side View



Bottom View



Recommended Landing Pattern



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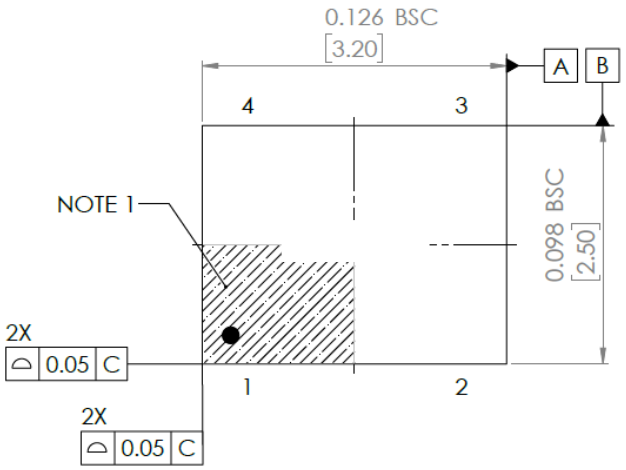
Dimensioning and tolerance per ASME Y14.5M
BSC: Basic Dimension. Theoretically exact value shown without tolerances
REF: Reference Dimension, usually without tolerance, for information purposes only

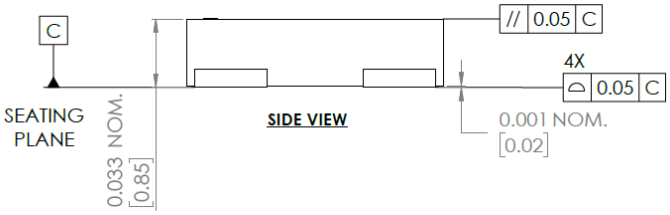
Dimensions: Inches[mm]

3.2 x 2.5 mm VFLGA Package Outline

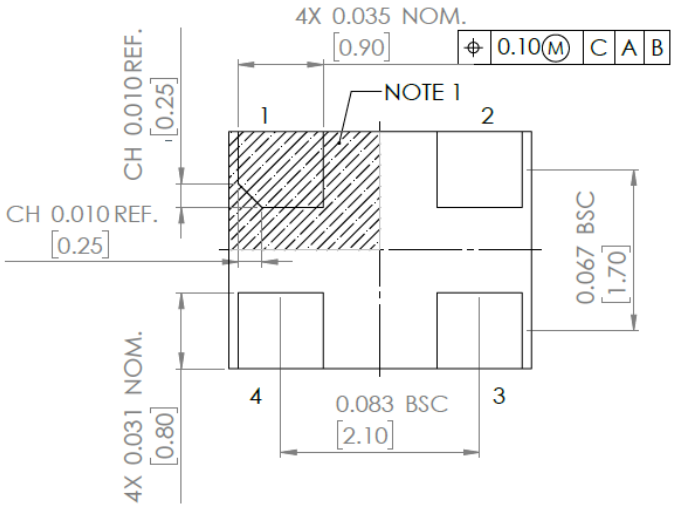
Top View



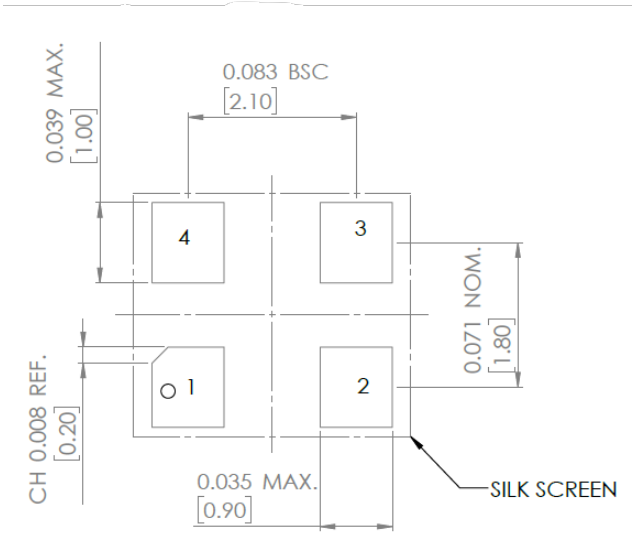
Side View



Bottom View



Recommended Landing Pattern



*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
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Dimensions: Inches[mm]

Reflow Profile [JEDEC J-STD-020]

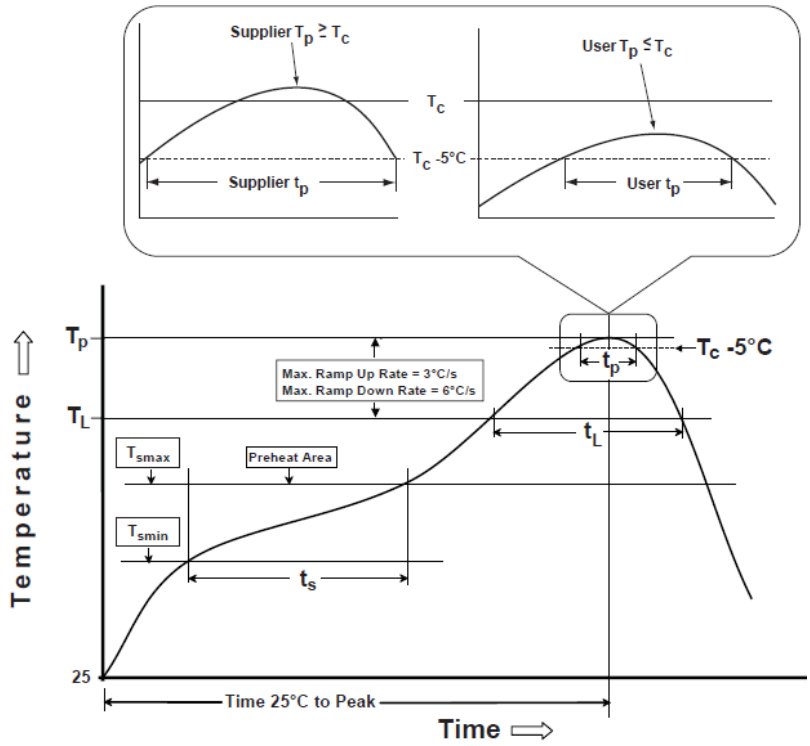


Table 1

SnPb Eutectic Process Classification Temperatures (T_c)		
Package Thickness	**Volume mm³ <350**	**Volume mm³ ≥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 mm³ <350**	**Volume mm³ 350-2000**	**Volume mm³ >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

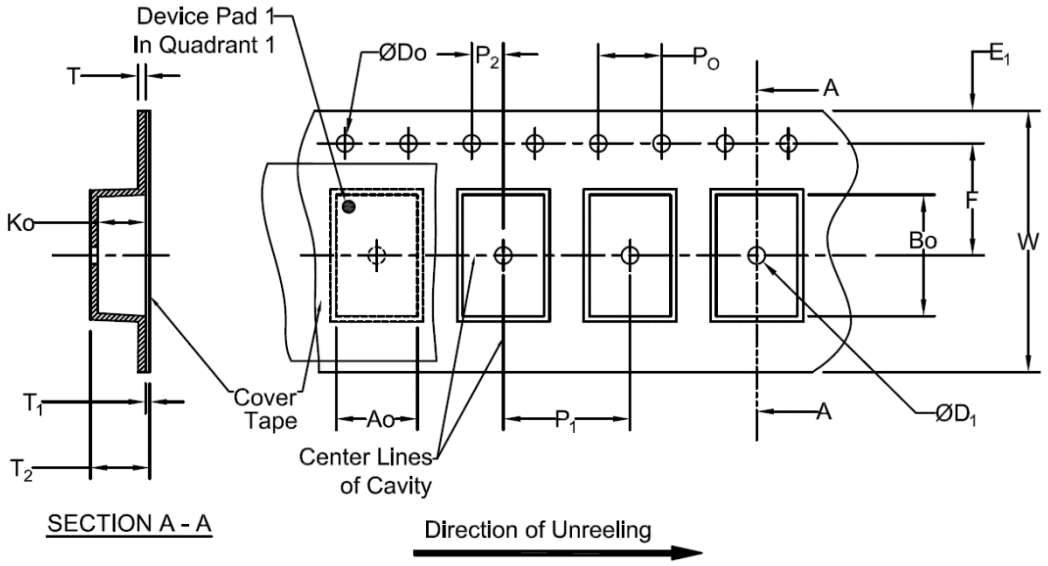
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat / soak		
Temperature minimum (T_{smin})	100°C	150°C
Temperature maximum (T_{smax})	150°C	200°C
Time (T_{smin} to T_{smax}) (t_s)	60 - 120 sec.	60 - 120 sec.
Average ramp-up rate (T_{smax} to T_P)	3°C/sec. max	3°C/sec. max
Liquidous temperature (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.

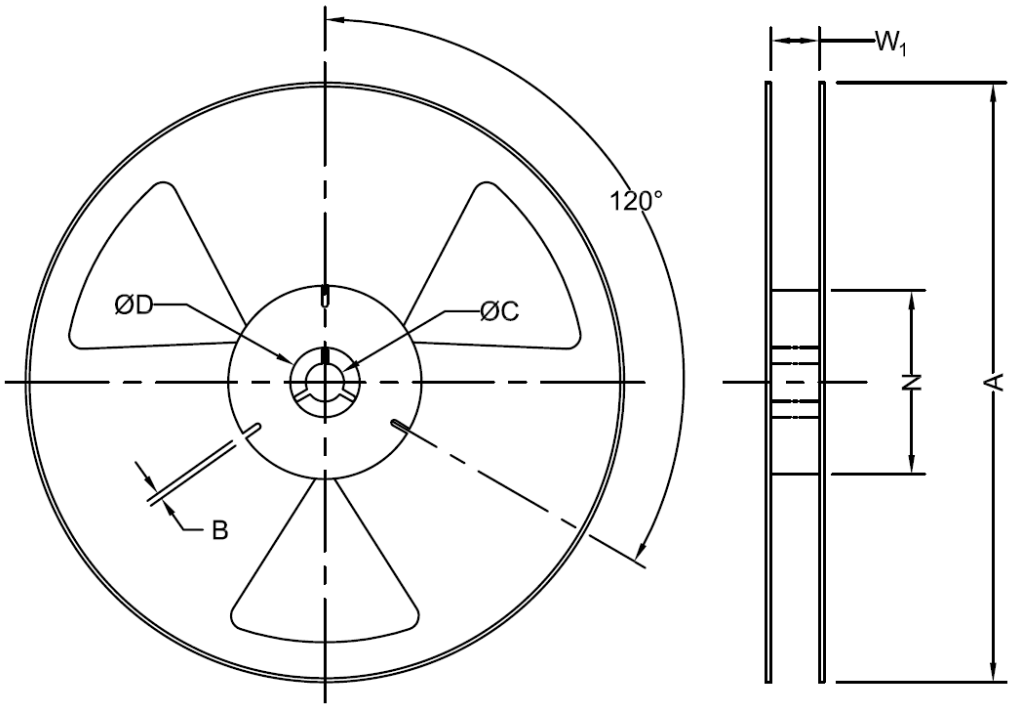
Packaging

1.6 mm x 1.2 mm VFLGA
T=1,000pcs/reel
T3=3,000pcs/reel



Tape Specifications (mm)							
Width	Ao	Bo	Do	D_1 (Min)	E_1	F	Ko
8mm	*	*	1.5+0.1/-0.0	1.0	1.75±0.1	3.5±0.05	*
Width	P1	P2	P0	T (Max)	T1 (Max)	T2 (Max)	W (Max)
8mm	4.0±0.1	2.0±0.05	4.0±0.1	0.6	0.1	2.5	8.3

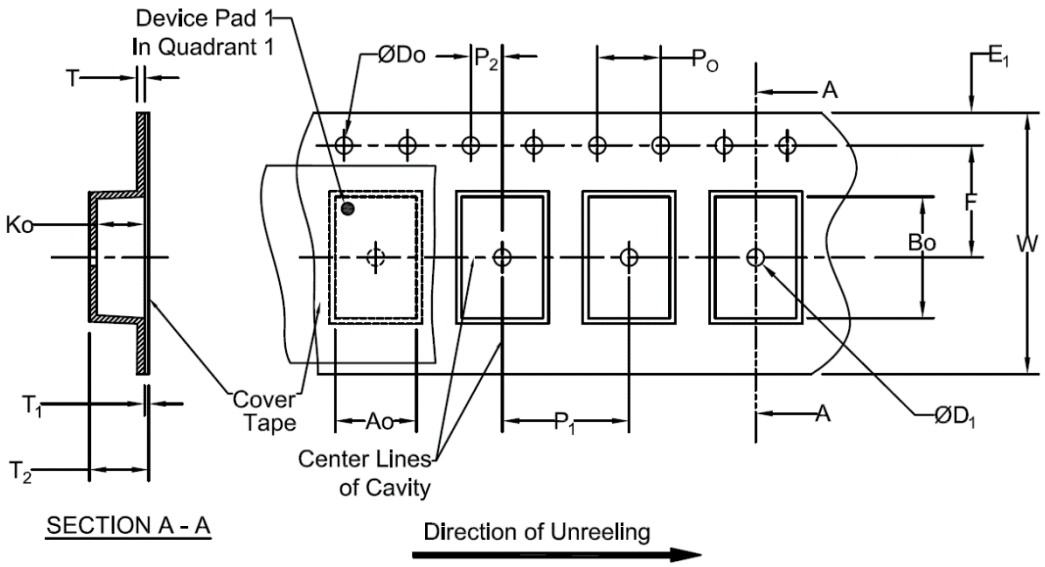
***Note: Compliant to EIA-481**



Reel Specifications (mm)							
Width	Qty/Reel	A (Nom)	B (Min)	C (Min)	D (Min)	N (Min)	*W_1
8mm	1000	178	1.5	13.0+0.5/-0.2	20.2	50	8.4+1.5/-0.0
	3000	178	1.5	13.0+0.5/-0.2	20.2	50	8.4+1.5/-0.0

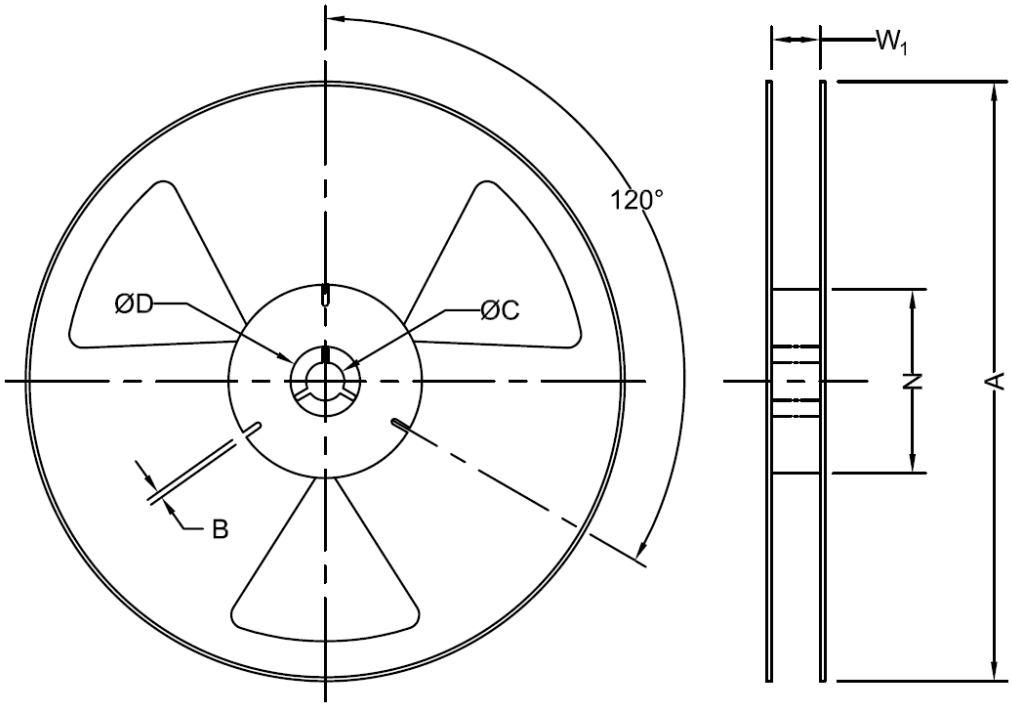
***Note: Measured at Hub**

2.0 mm x 1.6 mm VFLGA
T=1,000pcs/reel
T3=3,000pcs/reel



Tape Specifications (mm)							
Width	Ao	Bo	Do	D_1 (Min)	E_1	F	Ko
8mm	*	*	1.5+0.1/-0.0	1.0	1.75±0.1	3.5±0.05	*
Width	P1	P2	P0	T (Max)	T1 (Max)	T2 (Max)	W (Max)
8mm	4.0±0.1	2.0±0.05	4.0±0.1	0.6	0.1	2.5	8.3

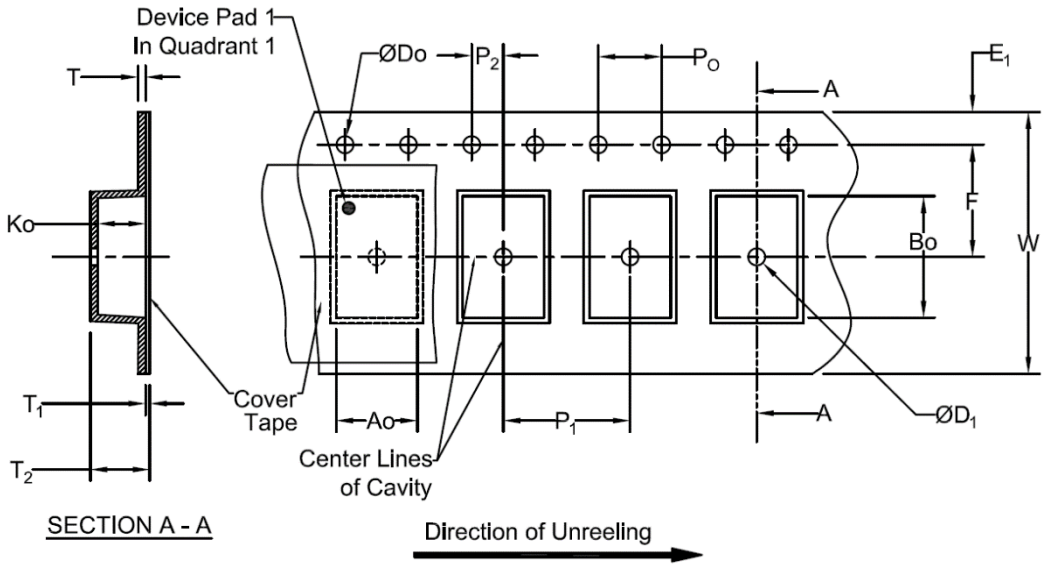
***Note: Compliant to EIA-481**



Reel Specifications (mm)							
Width	Qty/Reel	A (Nom)	B (Min)	C (Min)	D (Min)	N (Min)	*W_1
8mm	1000	178	1.5	13.0+0.5/-0.2	20.2	50	8.4+1.5/-0.0
	3000	178	1.5	13.0+0.5/-0.2	20.2	50	8.4+1.5/-0.0

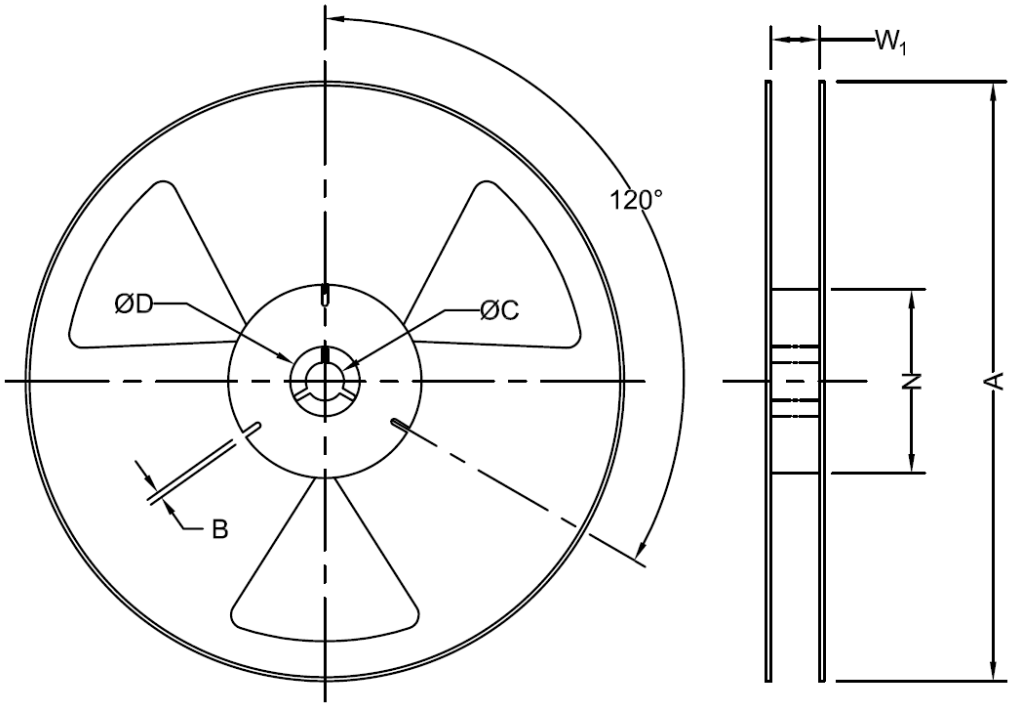
***Note: Measured at Hub**

2.5 mm x 2.0 mm VLGA
T= 1,000pcs/reel
T3= 3,000pcs/reel



Tape Specifications (mm)							
Width	Ao	Bo	Do	D_1 (Min)	E_1	F	Ko
8mm	*	*	1.5+0.1/-0.0	1.0	1.75±0.1	3.5±0.05	*
Width	P1	P2	P0	T (Max)	T1 (Max)	T2 (Max)	W (Max)
8mm	4.0±0.1	2.0±0.05	4.0±0.1	0.6	0.1	2.5	8.3

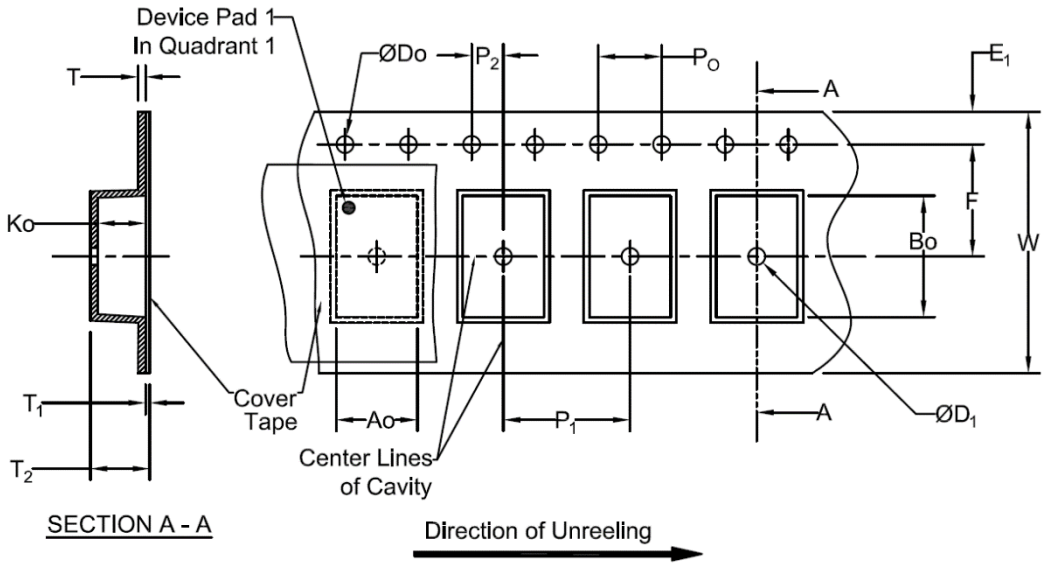
***Note: Compliant to EIA-481**



Reel Specifications (mm)							
Width	Qty/Reel	A (Nom)	B (Min)	C (Min)	D (Min)	N (Min)	*W_1
8mm	1000	178	1.5	13.0+0.5/-0.2	20.2	50	8.4+1.5/-0.0
	3000	178	1.5	13.0+0.5/-0.2	20.2	50	8.4+1.5/-0.0

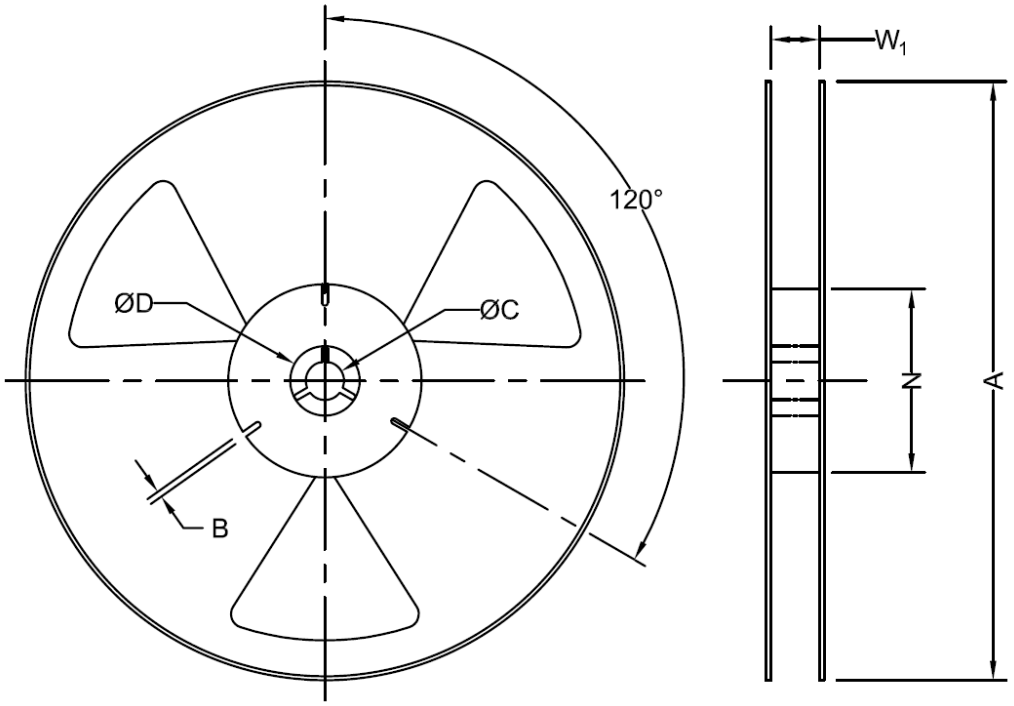
***Note: Measured at Hub**

3.2 mm x 2.5 mm VDFN
T= 1,000pcs/reel
T3= 3,000pcs/reel



Tape Specifications (mm)							
Width	Ao	Bo	Do	D_1 (Min)	E_1	F	Ko
12mm	*	*	1.5+0.1/-0.0	1.0	1.75±0.1	5.5±0.05	*
Width	P1	P2	P0	T (Max)	T1 (Max)	T2 (Max)	W (Max)
12mm	4.0±0.1	2.0±0.05	4.0±0.1	0.6	0.1	6.5	12.3

***Note: Compliant to EIA-481**



Reel Specifications (mm)							
Width	Qty/Reel	A (Nom)	B (Min)	C (Min)	D (Min)	N (Min)	*W_1
12mm	1000	178	1.5	13.0+0.5/-0.2	20.2	50	12.4+2.0/-0.0
12mm	3000	178	1.5	13.0+0.5/-0.2	20.2	50	12.4+2.0/-0.0

***Note: Measured at Hub**