Miniature 32.768kHz SMD Crystal - IoT Optimized

ABS04W Series

Request Samples | Check Inventory

1.2 x 1.0 x 0.35 mm
RoHS/RoHS II Compliant
MSL Level = N/A

Key Electrical Specifications

Parameters	Minimum	Typical	Maximum	Units	Notes
Frequency		32.768		kHz	
Operation Mode		Flexural Mode (Tuning Fork)			
Operating Temperature	-40		+85	ºC	See options
Storage Temperature	-55		+125	ºC	
Frequency Tolerance @ +25°C	-20		+20	ppm	Refer to Note #1 See options
Shift through standard RoHS Reflow, (2) reflow cycles maximum	-5.00	±2.00	+5.00	ppm	260°C peak maximum reflow temperature, relative to stand-alone set-tolerance frequency
Temperature Coefficient:	-0.04	-0.03	-0.02	ppm/T²	
Turn-over temperature:	+20	+25	+30	ºC	
Frequency Stability Over Operating Temperature, relative to in-circuit measured frequency post reflow	-200		1	ppm	Over -40°C to +85°C
	-300		1	ppm	Over -40°C to +105°C
Load capacitance (CL)		4.0		pF	Refer to Note #2 See options
Equivalent Series Resistance (ESR)			90	kΩ	@ +25±3°C
			130	kΩ	Over -40°C to +85°C
			130	kΩ	Over -40°C to +105°C
Shunt Capacitance (C0)		1.5	2.0	pF	Combined Electrode & Package Capacitance
Motional Capacitance (C1)		6.50		fF	C1 also referred as Cm
Motional Inductance (L1)		3,800,000		mH	L1 also referred as Lm
Drive Level		0.1	0.5	µW	

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Parameters	Minimum	Typical	Maximum	Units	Notes
Crystal sensitivity to closed-loop oscillator loading (Ts)	-125		-90	ppm/pF	Refer to Note #3
Q value	8,000	10,000			Quality Factor
Aging @ +25°C±3°C [First Year]	-3		+3	ppm	Relative to post reflow measured frequency
Aging @ +25°C±3°C [Over 10 years]	-15		+15	ppm	Relative to post reflow measured frequency
Insulation Resistance	500			MΩ	@ 100Vdc ± 15V

***Refer to Note#1, #2, & #3 on the following page**

Note #1: With an effective loop capacitance of 4.0pF, the oscillator circuit will be within set-tolerance specification, less any frequency shift due to the reflow process.

Note #2: The oscillator loop needs to present an effective loop capacitance of 4.0pF to track the stand-alone crystal frequency. This loop capacitance is essential to ensure highest possible Closed-Loop Safety Factor for the entire population of crystals.

Note #3: $Ts = -(C1) / [2*(C0 + CL)^2]$ ……. Where CL = 4.0pF

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Options and Part Identification

ABS04W-32. 768 kHZ - ☐ - ☐ ☐ - ☐

Load Capacitance
V: 12.5pF
9: 9pF
7: 7pF
6: 6pF
5: 5pF
4: 4pF

Operating Temp. Range
B: -20°C ~ +70°C
D: -40°C ~ +85°C
J: -40°C ~ +105°C

Freq. Tolerance
2: ±20ppm
3: ±30ppm
5: ±50ppm

Packaging
Blank: Bulk
T5: Tape & Reel (5000pcs/reel)

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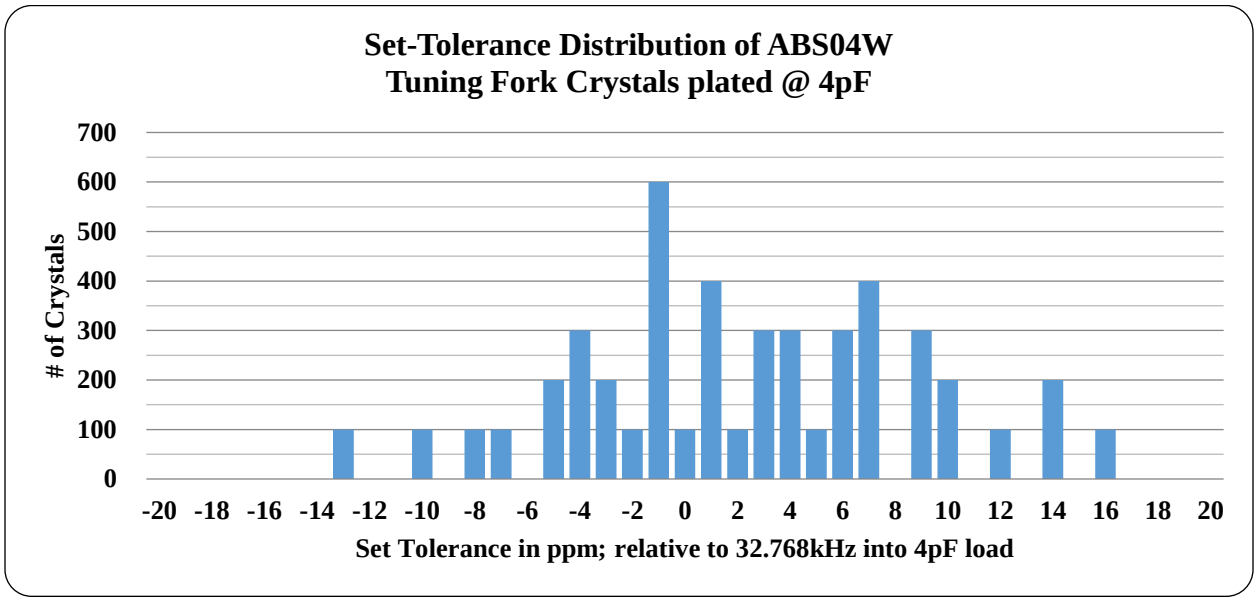
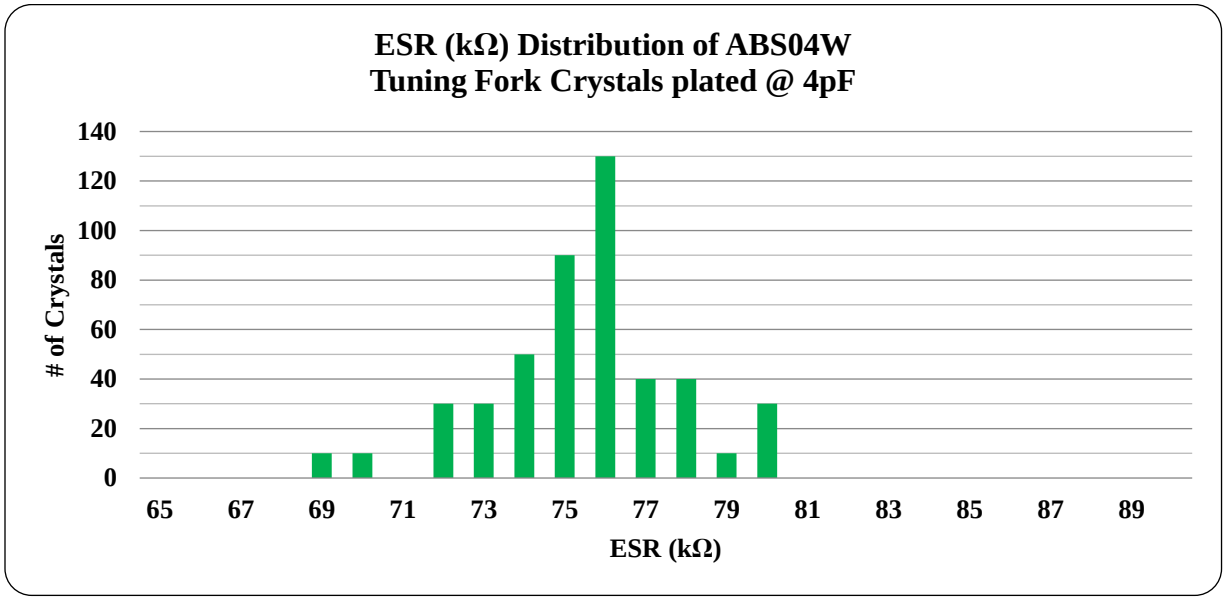
MSL Level = N/A

Typical Frequency Tolerance Distribution (at 25ºC ± 3ºC):



Typical ESR Distribution (at 25ºC ± 3ºC):



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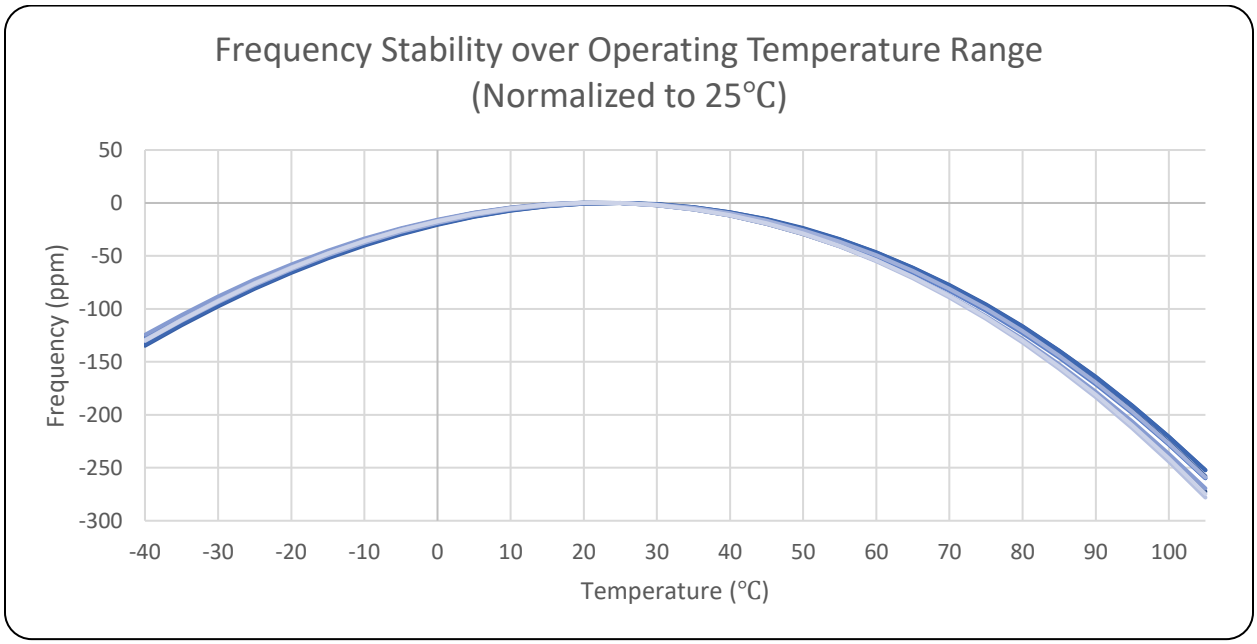
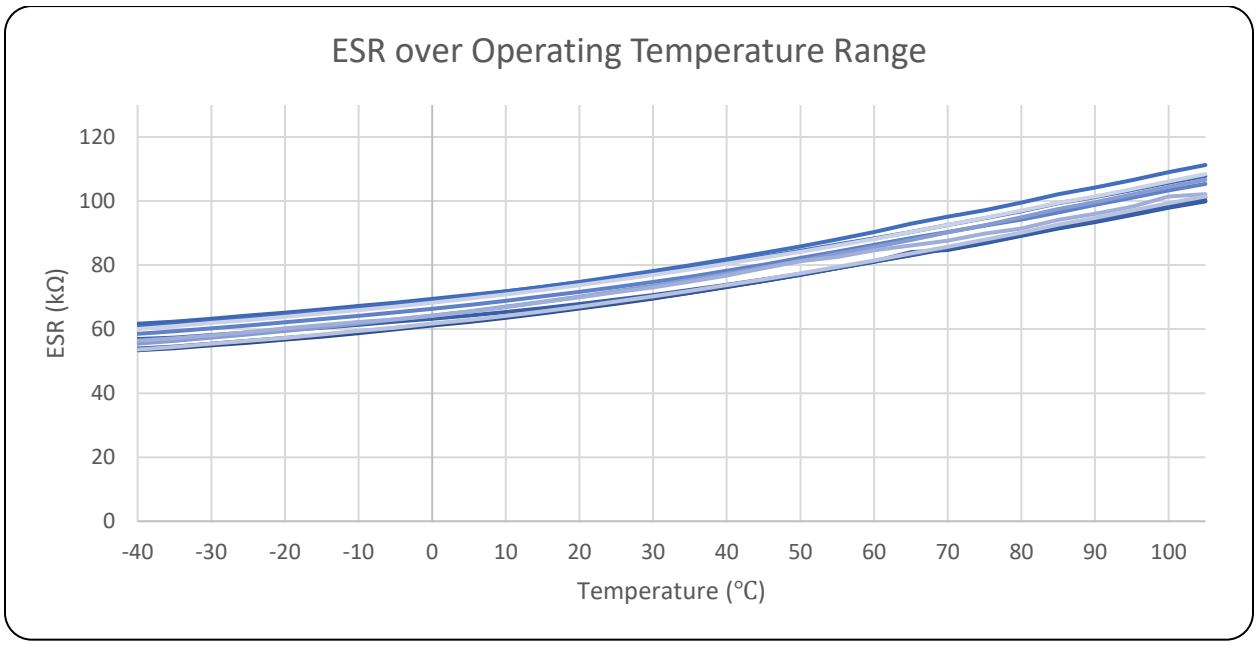
MSL Level = N/A

Typical Frequency vs. Temperature Characteristics



Typical Frequency vs. Temperature Characteristics



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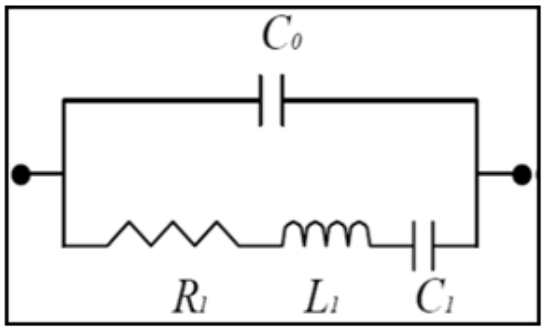
MSL Level = N/A

SPICE Model (based on typical values at 25ºC ± 3ºC)

Quartz Crystal Equivalent Circuit



Frequency: 32.768kHz

Plating Load (CL) = 4pF			
C0	=	1.54	pF
R1	=	72,895	Ω
L1	=	3,702,326	mH
C1	=	6.47	fF
Plating Load (CL) = 6pF			
C0	=	1.50	pF
R1	=	72,615	Ω
L1	=	3,750,717	mH
C1	=	6.38	fF
Plating Load (CL) = 12.5pF			
C0	=	1.48	pF
R1	=	75,455	Ω
L1	=	3,660,470	mH
C1	=	6.55	fF

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Request Samples | Check Inventory

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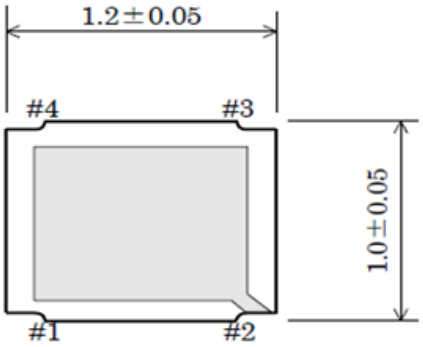
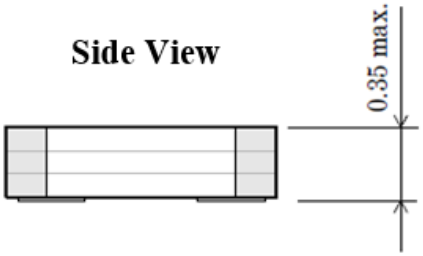
RoHS/RoHS II Compliant
MSL Level = N/A

Mechanical Dimensions

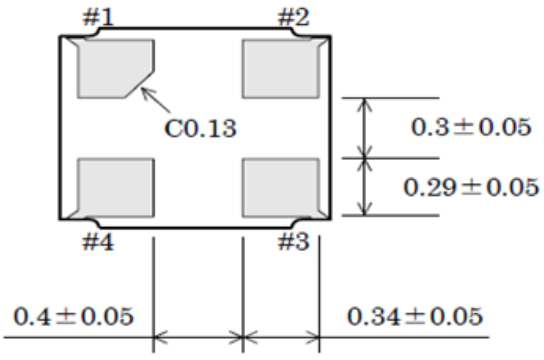
Top View



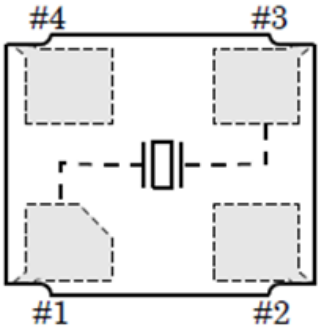
Side View



Bottom View

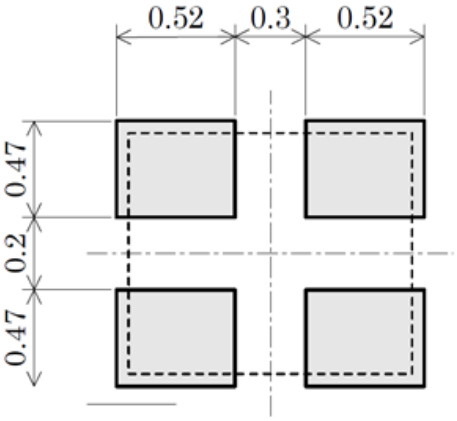


Crystal Internal Connections



Pin #2: GND
Pin #4: NC

Recommended Land Pattern



Dimensions: mm

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Reflow Profile [JEDEC J-STD-020]

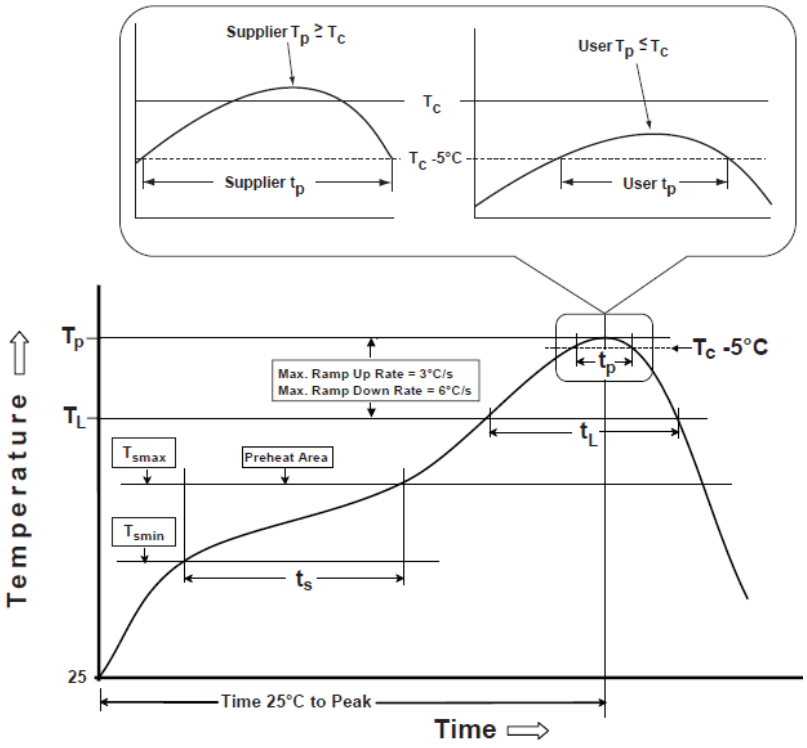

Table 1

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.

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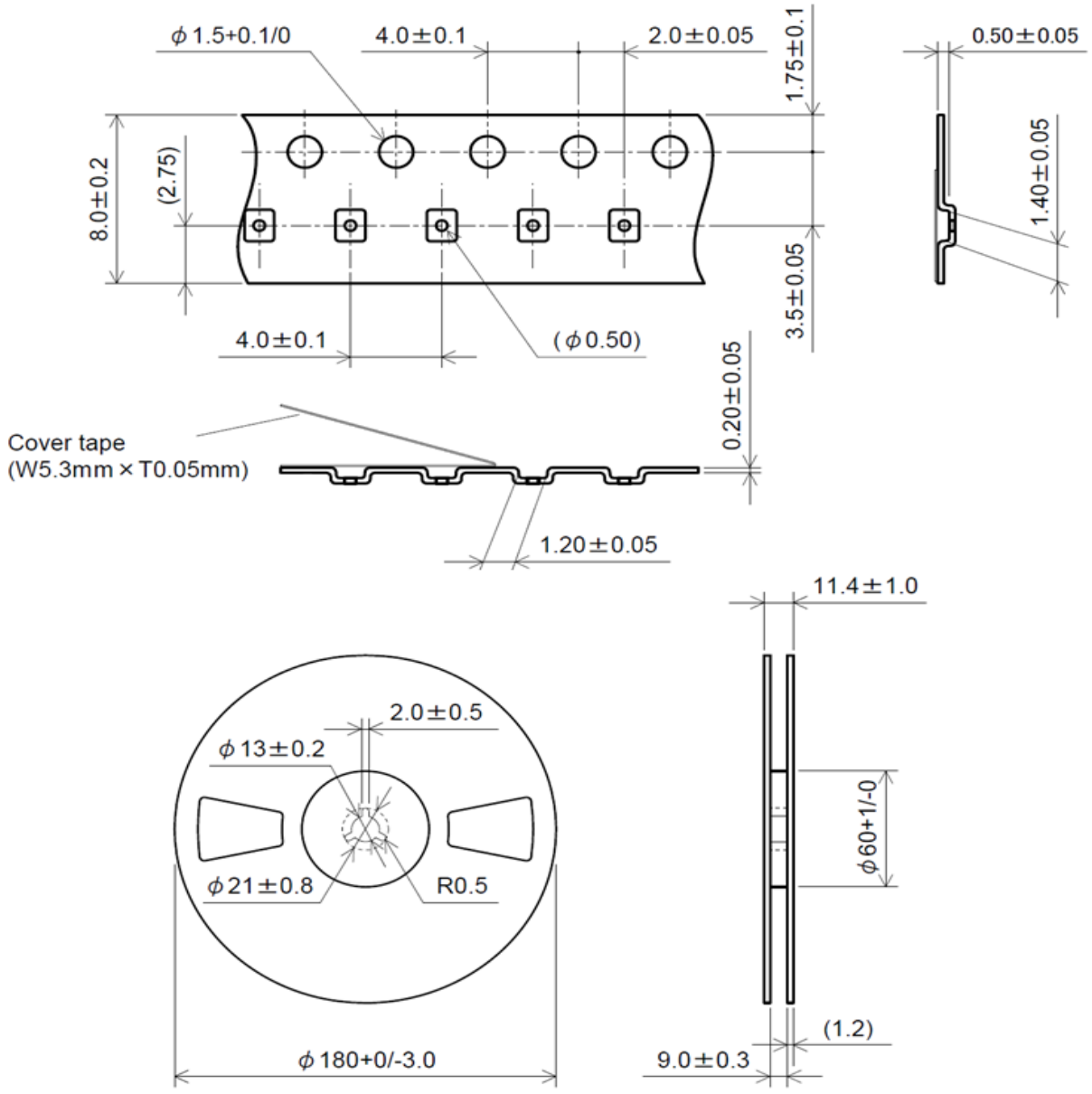
Packaging

T5: Tape and reel (5,000pcs/reel)



Dimensions: mm

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