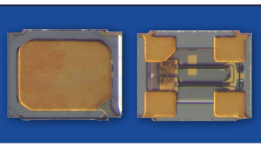
32.768kHz IoT Optimized SMD Crystal



ABS04W SERIES

1.20 x 1.00 x 0.35mm
RoHS/RoHS II Complaint
MSL = N/A: Not Applicable

FEATURES

- Industry's smallest Tuning Fork Crystal (1.20 x 1.00 x 0.35 mm package)
- Ideally suited for space constraint IoT, Wearables & Wireless applications
- Simultaneously optimized for low plating load & ESR over extended temperature range
- Enhanced performance for start-up time and power savings with Low Energy SoC's
- Low profile - ideal for height constraint designs
- Available with ±20 ppm set-tolerance

APPLICATIONS

- Wearables
- Wireless Modules
- Internet of Things (IoT)
- Bluetooth / Bluetooth Low Energy (BLE)
- Machine-to-Machine (M2M) Connectivity
- Ultra-Low Power MCU's, SoC's, Transceivers
- Near Field Communication
- ISM Band Applications

Electrical Specifications

Parameters	Min.	Typ.	Max.	Units	Note
Frequency		32.768		kHz	
Operation Mode		Flexural Mode (Tuning Fork)			
Operating Temperature	-40		+85	°C	See Options
Storage Temperature	-55		+125	°C	
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	°C	
Frequency Stability Over Operating Temperature, relative to in-circuit measured frequency post reflow	-200		1	ppm	Over -40°C to +85°C
Load capacitance (CL)		4.0		pF	Refer to Note #2 See Options
Equivalent Series Resistance (ESR)		<75	80	kΩ	@ +25±3°C
		<75	130	kΩ	Over -40°C to +85°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	
Crystal sensitivity to closed-loop oscillator loading (Ts)	45	55	65	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

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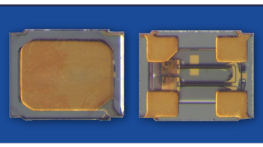

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Note #1: With an effective loop capacitance of 4.0pF, the oscillator circuit will be within set-tolerance specification; less any frequency shift due to the reflow process.

Note #2: The oscillator loop needs to present an effective loop capacitance of 4.0 pF 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 = 4pF

Options and Part Identification

ABS04W-32.768 kHz - ☐ – ☐ ☐ – ☐

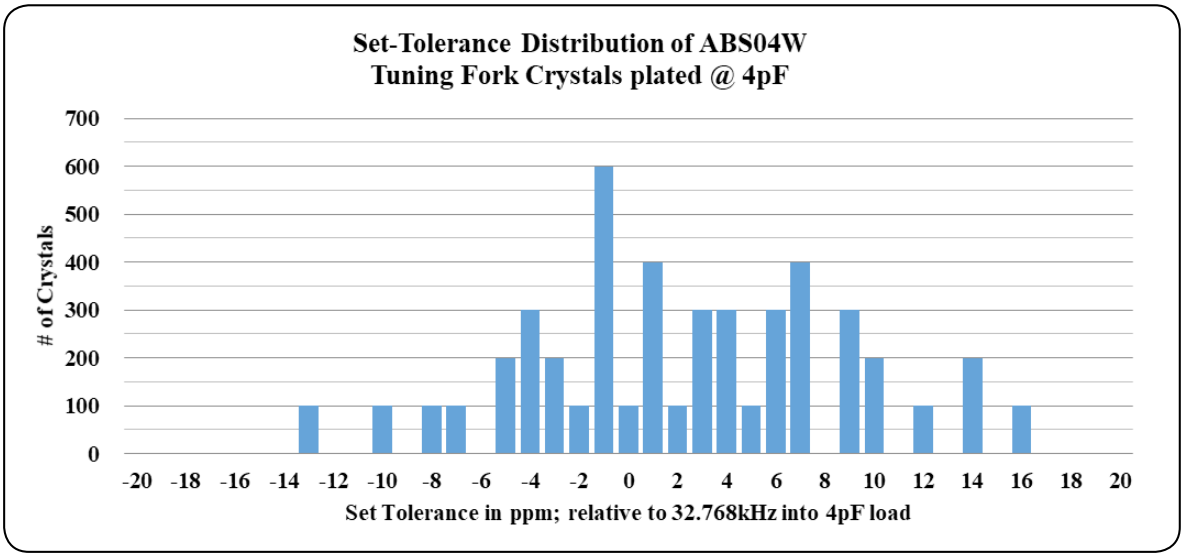
Load Capacitance (pF)
V: 12.5pF
9: 9pF
7:7pF
6: 6pF
5: 5pF
4: 4pF

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)

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



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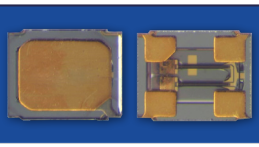

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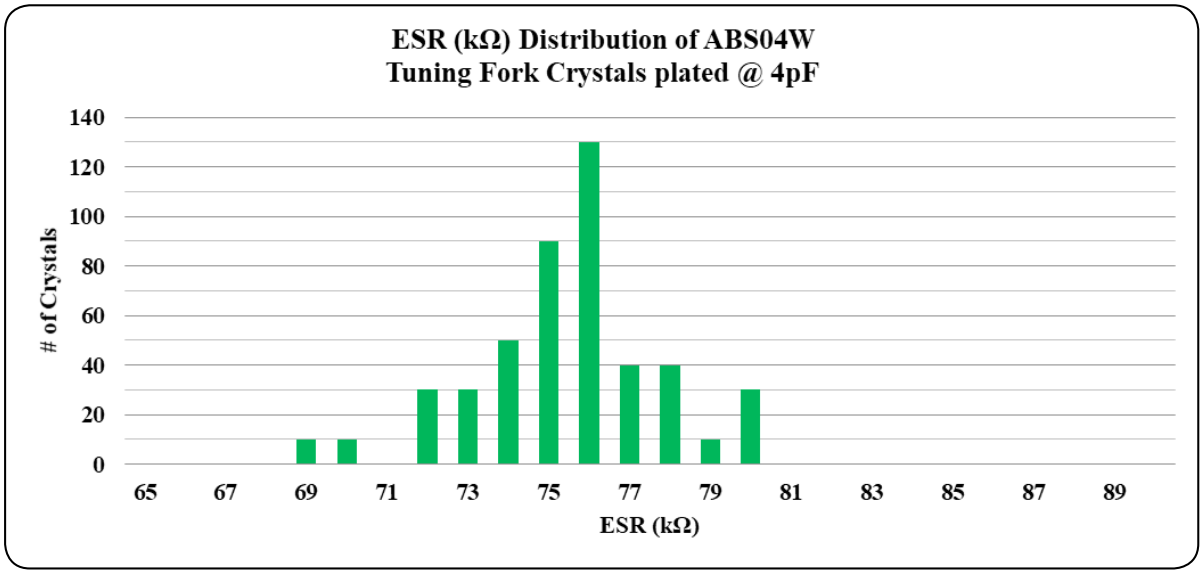
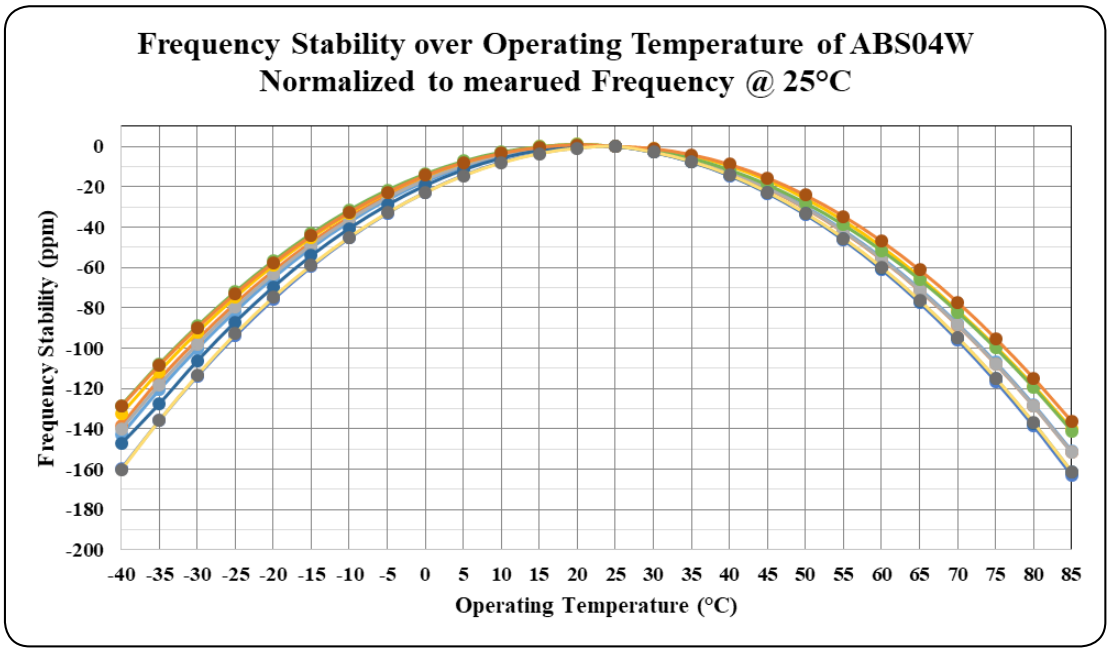
Typical ESR Distribution (at 25ºC ± 3ºC):



The data above reflects typical distribution, lot-to-lot variation applies

Typical Frequency vs. Temperature Characteristics:



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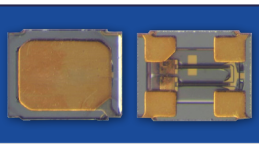

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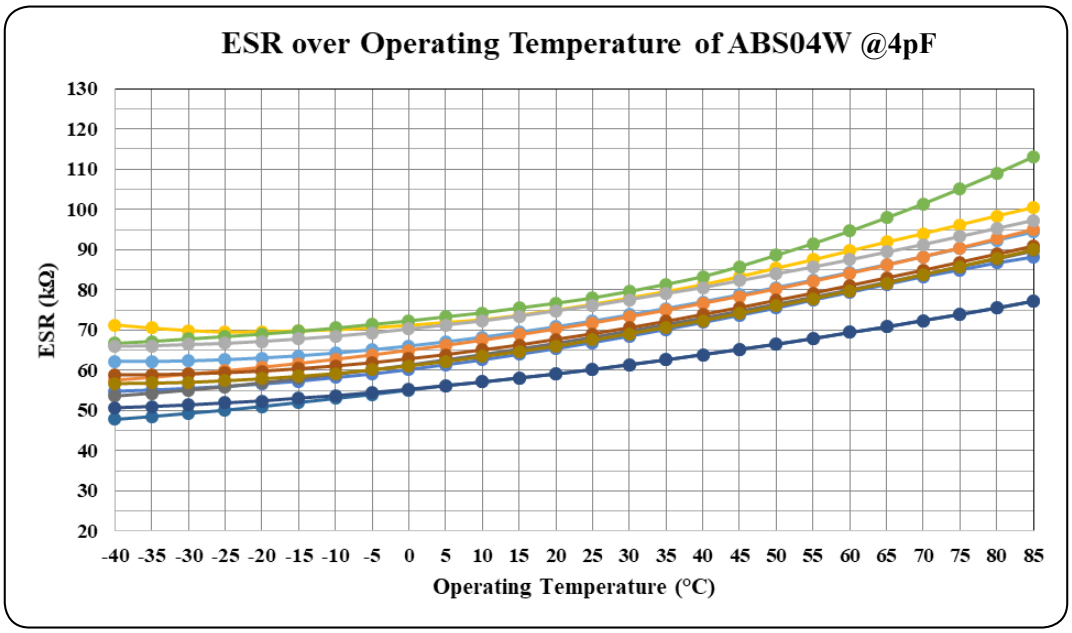
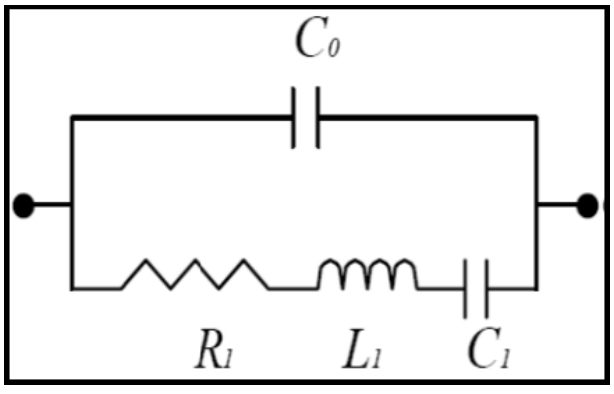
Typical ESR (Equivalent Series Resistance) vs. Temperature Characteristics:



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

Quartz Crystal Equivalent Circuit



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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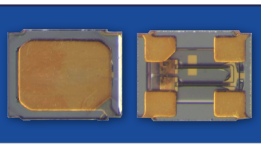

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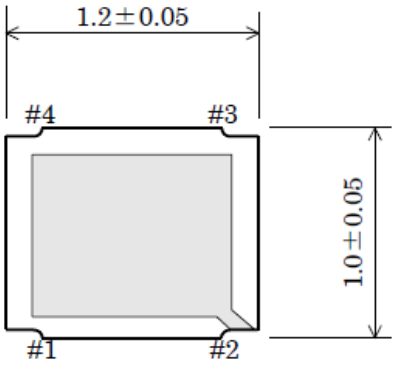
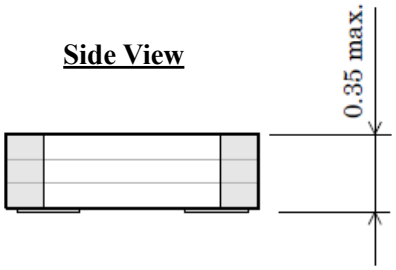
Mechanical Dimensions

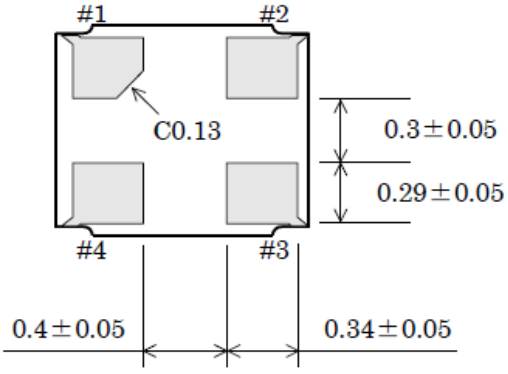
Top View



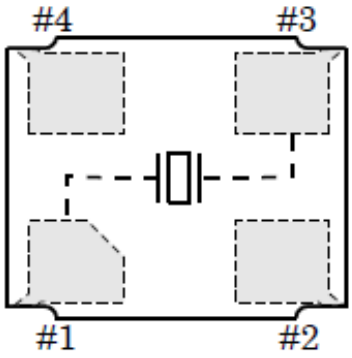
Side View



Bottom View



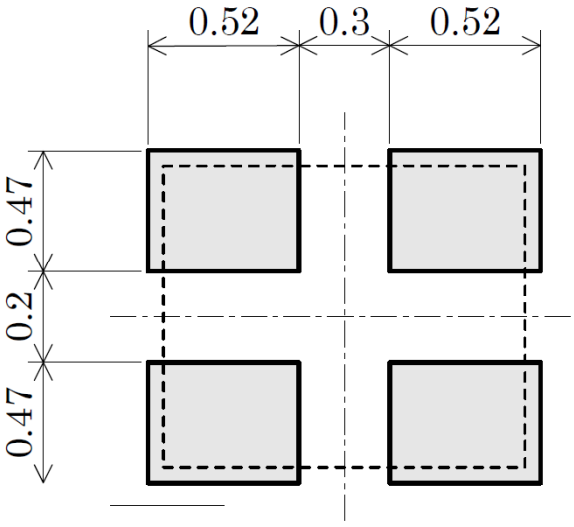
Crystal Internal Connections



Pin #2: GND*
Pin #4: NC

***Pin #2 is connected to lid of the crystal package.**

Recommended Land Pattern



Dimensions: mm

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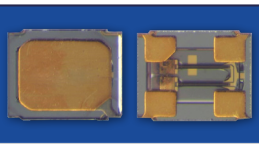

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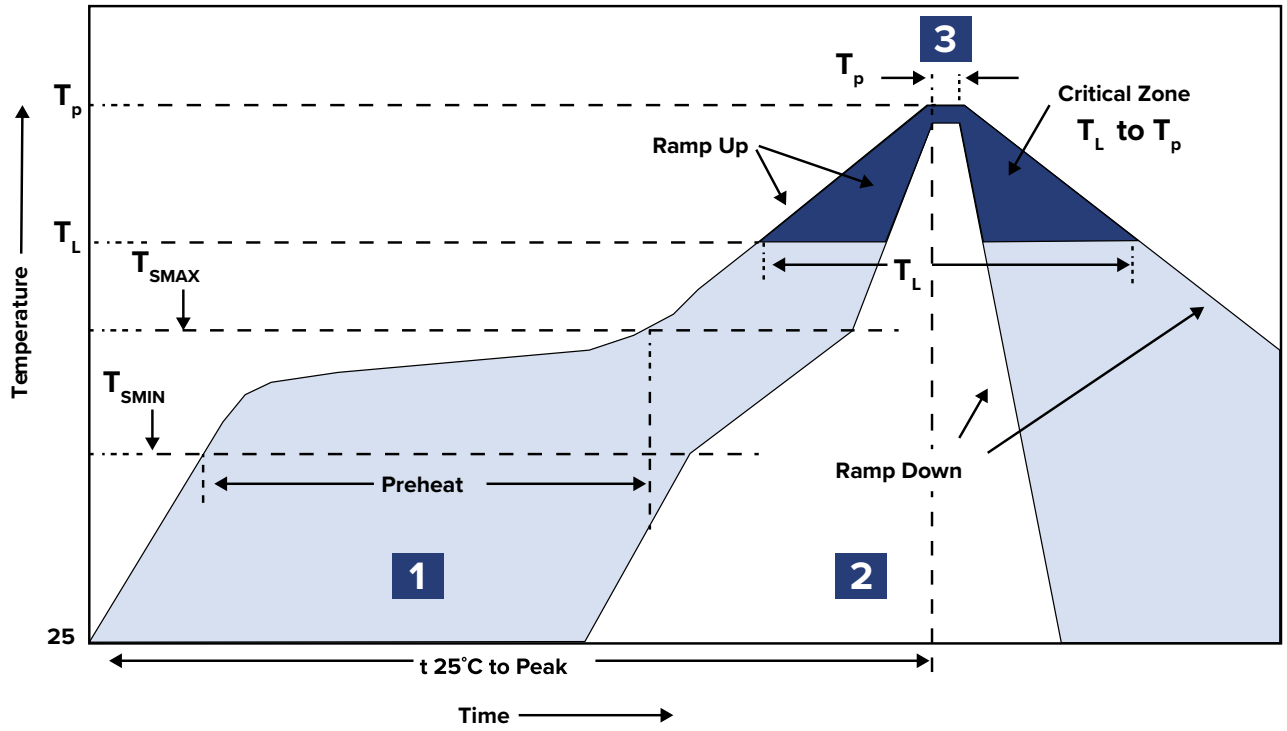
Recommended Reflow Profile



Zone	Description	Temperature	Time
1	Preheat / Soak	T_{SMIN} ~ T_{SMAX} 150~170°C	80 ~ 100 sec.
2	Reflow	T_L 220°C	50 ~ 70 sec.
3	Peak heat	T_P 260±5°C	5 sec. MAX.

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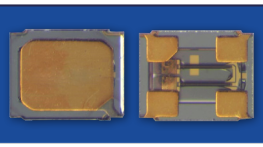
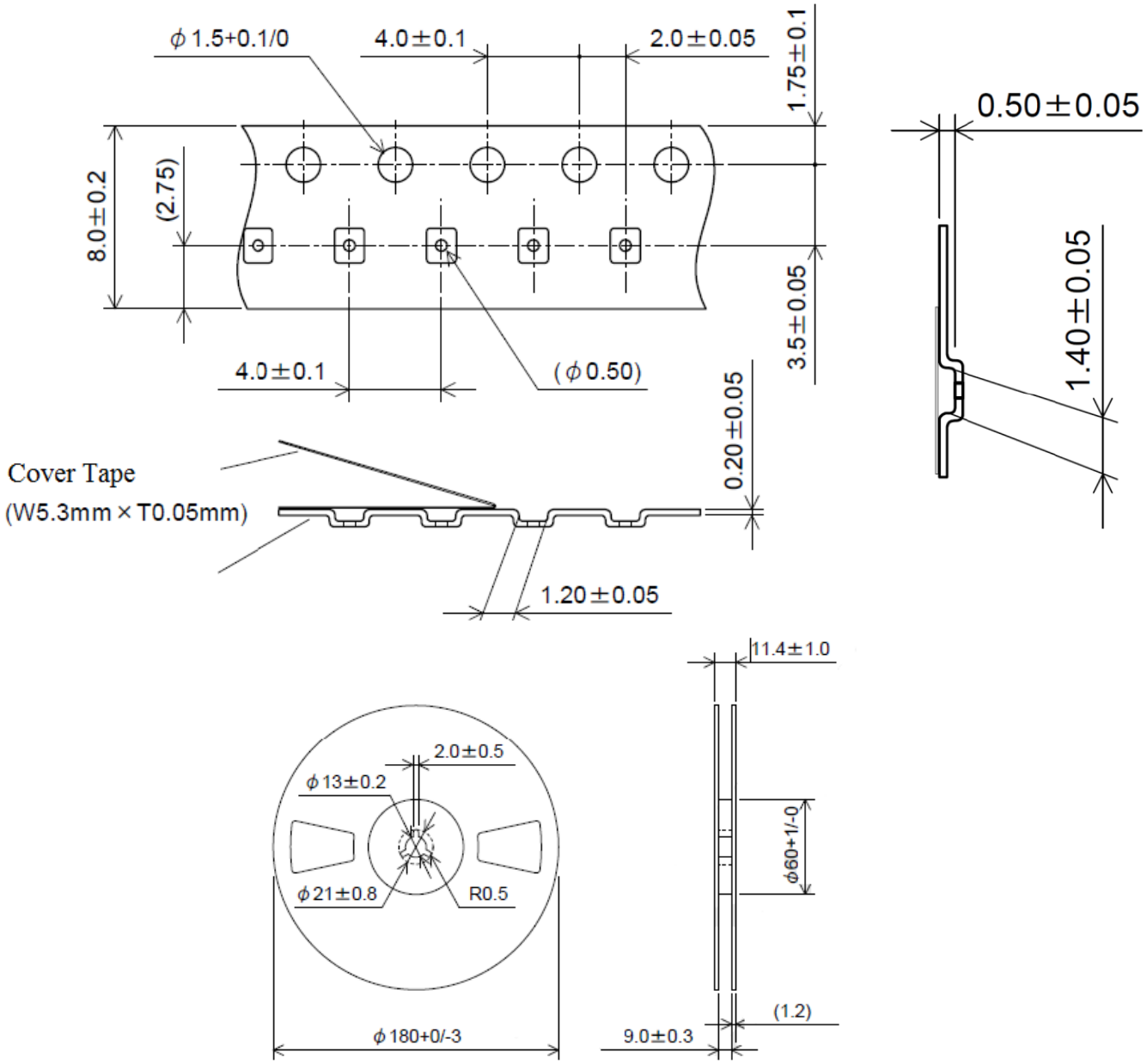


ABS04W SERIES

1.20 x 1.00 x 0.35mm
RoHS/RoHS II Complaint
MSL = N/A: Not Applicable

Packaging:

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



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