

32.768KHZ IoT OPTIMIZED SMD CRYSTAL



ABS07W

3.2 x 1.5 x 0.9 mm

RoHS/RoHS II Compliant

MSL = N/A: NOT APPLICABLE

FEATURES

- Exceptionally low plating load of 3.0pF, ideal for wearables, wireless, and IoT applications
- Simultaneously optimized for ESR over extended operating temperature range
- Miniature 3.2x1.5x0.9 mm SMD package, ideally suited for space constrained designs
- Available with ± 10 ppm set tolerance
- Seam sealed package for long term reliability

APPLICATIONS

- Wearables
- Wireless Modules
- Internet of Things (IoT)
- Bluetooth/Bluetooth Low Energy (BLE)
- Machine-to-Machine (M2M) Connectivity
- Ultra Low Power MCU
- Near Field Communication (NFC)
- ISM Band Applications
- Ultra low power, energy saving MCU

STANDARD SPECIFICATIONS

PARAMETERS	MINIMUM	TYPICAL	MAXIMUM	UNITS	NOTES
Frequency	32.768			kHz	
Operation Mode	Flexural Mode (Tuning Fork)				
Operating Temperature	-40		+125	°C	See options
Storage Temperature	-55		+125	°C	
Frequency Tolerance @ +25°C	-10		+10	ppm	Refer to Note #1, ± 20 ppm is also available
Shift through standard RoHS Reflow, (2) reflow cycles maximum	-2.00		+2.00	ppm	260°C peak maximum reflow temperature, relative to stand-alone set-tolerance frequency
Temperature Coefficient	-0.040	-0.036		ppm/T ²	
Turn-over temperature	+20	+25	+30	°C	
Frequency Stability Over Operating Temperature, relative to in-circuit measured frequency post reflow	-200		-100	ppm	Over -40°C to +85°C
	-275		-100	ppm	Over -40°C to +105°C
	-450		-100	ppm	Over -40°C to +125°C
Load capacitance (CL)	3			pF	Refer to Note #2
Equivalent Series Resistance (ESR)		< 40	45	k Ω	@ +25 \pm 3°C
		< 45	55	k Ω	Over -40°C to +85°C
		< 50	60	k Ω	Over -40°C to +105°C
		< 60	70	k Ω	Over -40°C to +125°C
Shunt capacitance (C0)		1.15	1.30	pF	Combined Electrode & Package Capacitance
Motional Capacitance (C1)		4.68		fF	C1 also referred as Cm
Motional Inductance (L1)		5,048,571		mH	L1 also referred as Lm
Drive Level		0.1	0.5	μ W	
Crystal sensitivity to closed-loop oscillator loading (Ts)	125		140	ppm/pF	Refer to Note #3
Q value	13000				Quality Factor
Aging @ +25°C \pm 3°C [First Year]	-3		+3	ppm	Relative to post reflow measured frequency
Aging @ +25°C \pm 3°C [Over 10-years]	-10		+10	ppm	Relative to post reflow measured frequency
Insulation Resistance	500			M Ω	@ 100Vdc

Note #1: With an effective loop capacitance of 3.0pF, 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 3.0 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: $T_s = - (C1) / [2*(C0 + CL)^2]$ Where CL = 3pF

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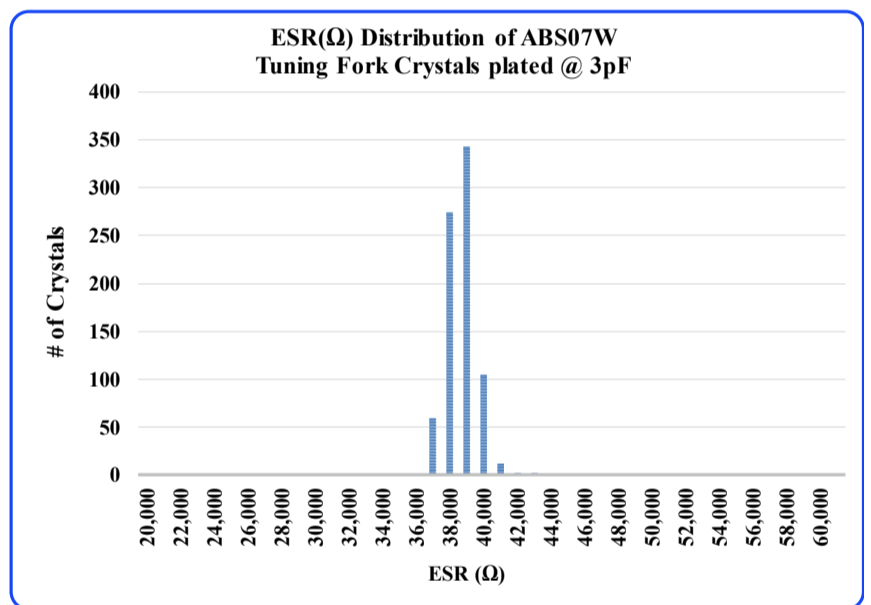
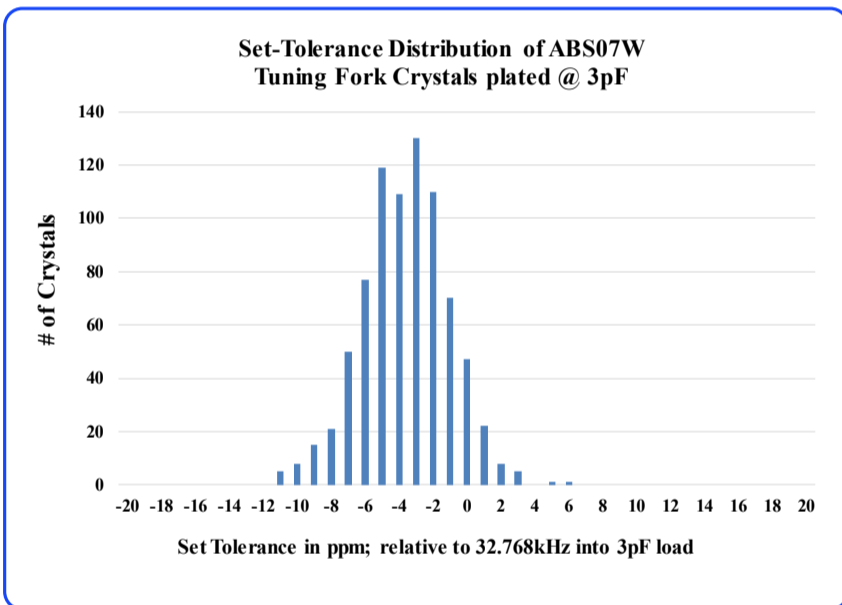
OPTIONS AND PART IDENTIFICATION

ABS07W - 32.768kHz - - -

OPERATING TEMP RANGE	FREQ. TOLERANCE	PACKAGING
D: -40°C ~ +85°C	1: ±10 ppm	Blank: Bulk
J: -40°C ~ +105°C	2: ±20 ppm	T: Tape & Reel (3,000pcs/reel)
K: -40°C ~ +125°C		

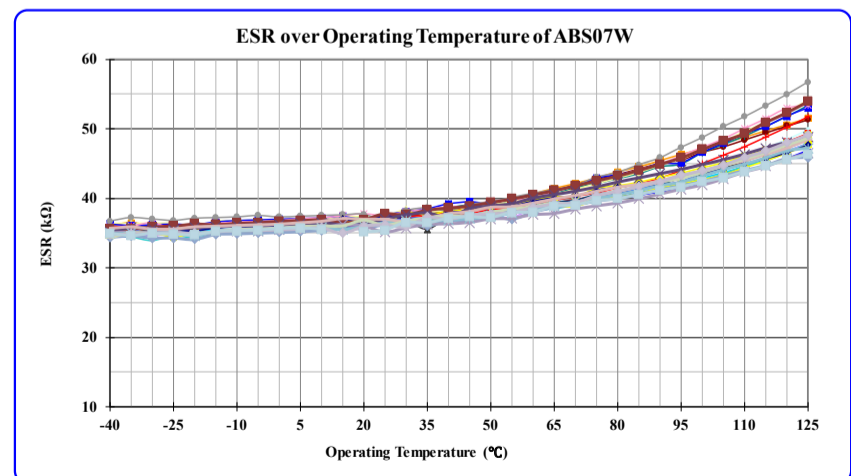
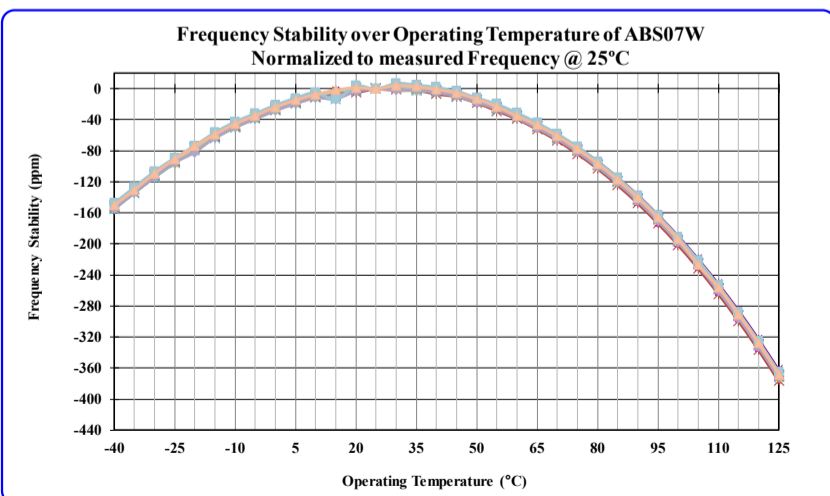
TYPICAL FREQUENCY TOLERANCE DISTRIBUTION (AT 25°C ± 3°C)

TYPICAL ESR DISTRIBUTION (AT 25°C ± 3°C)



TYPICAL FREQUENCY Vs. TEMPERATURE CHARACTERISTICS

TYPICAL ESR (EQUIVALENT SERIES RESISTANCE) Vs. OPERATING TEMPERATURE



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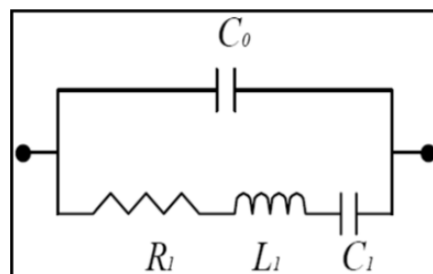
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SPICE MODEL (BASED ON TYPICAL VALUES AT 25°C ± 3°C):

Quartz Crystal Equivalent Circuit

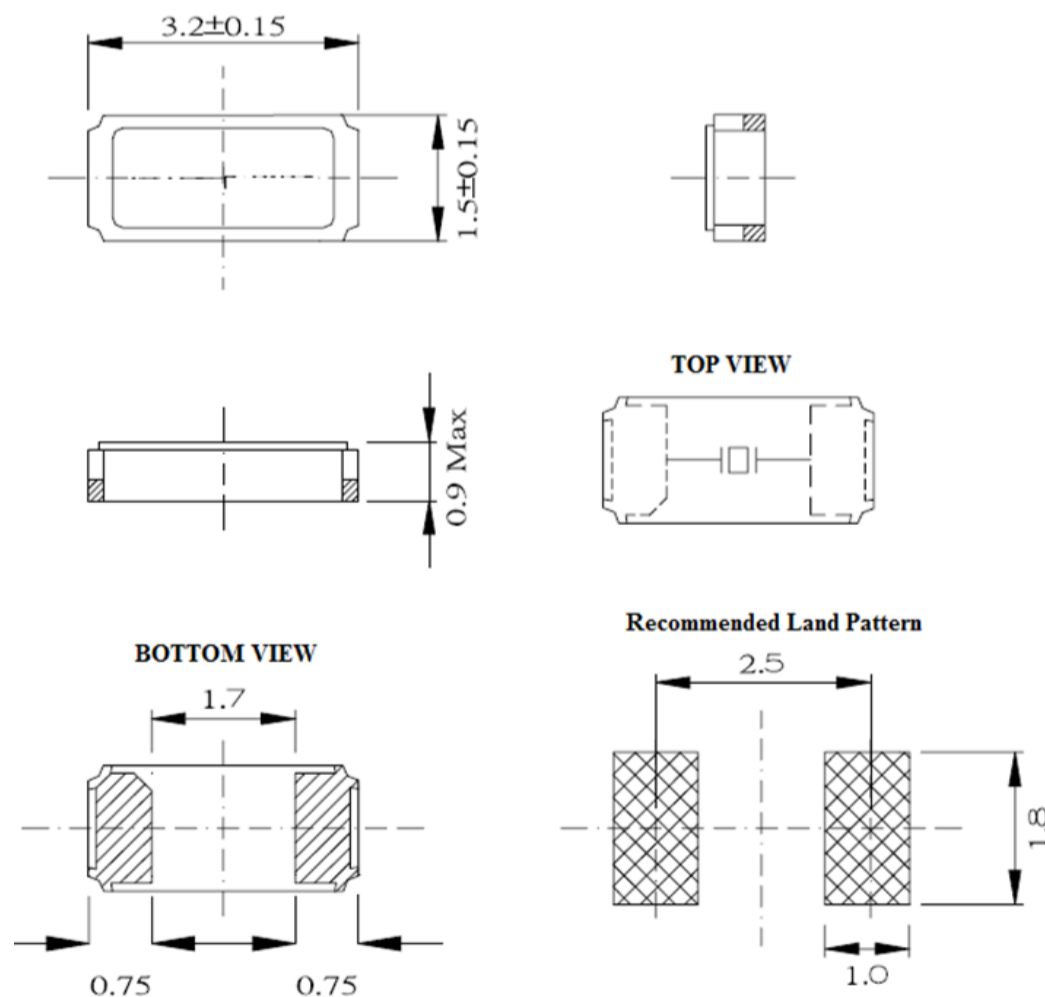


Frequency: 32.78kHz

Plating Load (CL) = 3pF

C0 = 1.15 pF
R1 = 38,194 Ω
L1 = 5,048,571 mH
C1 = 4.68 fF

MECHANICAL DIMENSIONS



DIMENSIONS: mm

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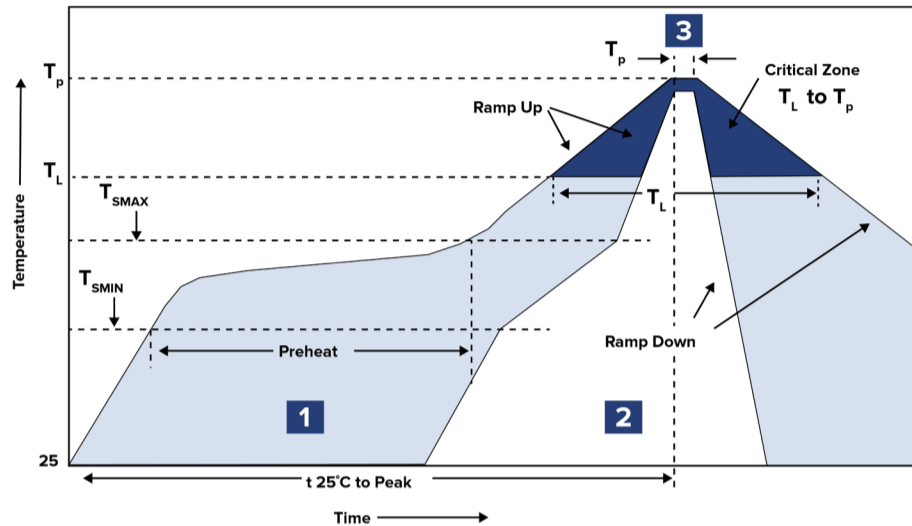
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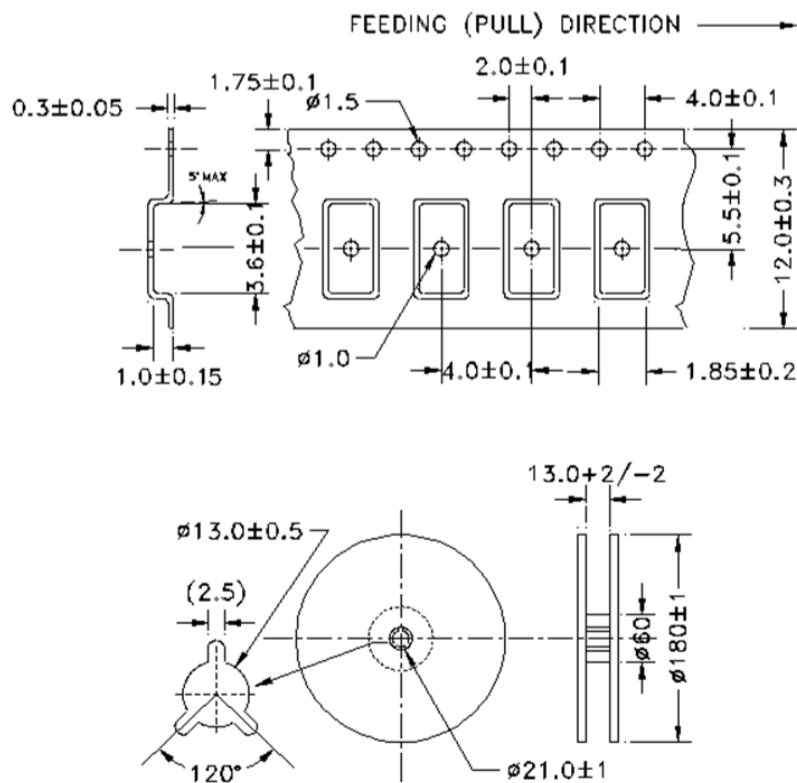
RECOMMENDED REFLOW PROFILE



Zone	Description	Temperature	Time
1	Preheat	$T_{SMIN} \sim T_{SMAX}$ 150°C ~ 200°C	60 ~ 120 sec.
2	Reflow	T_L 217°C	60 ~ 150 sec.
3	Peak Heat	T_P 260 ± 5°C	10 ± 5 sec. MAX

PACKAGING

TAPE AND REEL (3,000PCS/REEL)



DIMENSIONS: mm