

# SMD WATCH CRYSTAL 32.768 kHz

SERIES „M2012 STANDARD“ (2 pad ceramic housing 2.0 x 1.2 mm)

## FEATURES

- + Small ceramic packaged 32.768 kHz quartz crystal
- + High reliability for low cost / ultra low profile
- + Standard operating temperature range of -40/+85°C, others available on request
- + Excellent clock generator for CPU's, Wireless, Mobile Comm., RTC, IoT, Industrial, etc.
- + LRT-TECHNOLOGY Inside (LRT is our unique Low ESR Resonator-Technology)
- + Our top quality promise / depth of production:
  - Only use of crystal blanks from our in-house production, based on our unique LRT-Technology
  - Excellent product features guaranteed by multiple 100% tests and 100% end-test
  - 100% quality monitoring from crystal raw material to the end product
  - Excellent quality, performance and reliability is guaranteed.



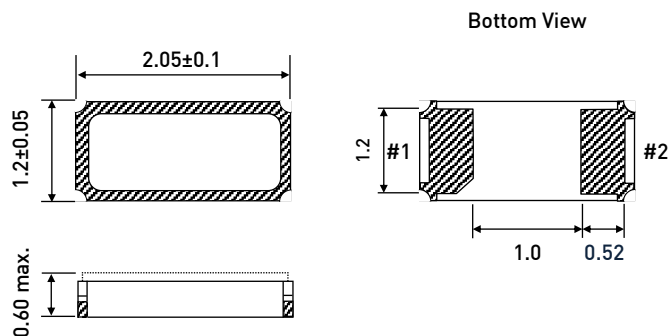
## GENERAL DATA

PARAMETERS	PRODUCT FEATURES AND CONDITIONS
SMD-CRYSTAL SERIES	M2012
NUMBER OF SOLDER PADS	2
FREQUENCY RANGE	32.768 kHz
FREQUENCY TOLERANCES AT 25°C	±20 ppm (standard) / ±10 ppm (option)
LOAD CAPACITANCE (C <sub>L</sub> )	12.5 pF (standard) 4, 6, 7, 9 pF or 18 pF available on request
WORKING TEMPERATURE RANGE	-40/+85°C
RESONANCE RESISTANCE	60 kΩ typ. / 70 kΩ max.
SHUNT CAPACITANCE (C <sub>0</sub> )	1.15 pF typ.
TURNOVER TEMPERATURE	+25°C ±5°C
PARABOLIC COEFFICIENT	-0.036±0.005ppm/°C <sup>2</sup>
DRIVE LEVEL	0.1 µW typical (0.5 µW max.)
AGING	±3 ppm max. first year
INSULATION RESISTANCE	>500 MΩ DC/100V ±10%
STORAGE TEMPERATURE	-55°/+125°C
DELIVERY FORM	Tape and Reel (3.000 pcs per reel)
RoHS	Lead free and RoHS compliant
POP (EU)2019/1021	No POP substances
PFAS	No PFAS present
PROP 65	Compliant to PROP 65
TSCA	Compliant to TSCA
<a href="#">SELECT YOUR REQUIRED CRYSTAL (PRODUCT CONFIGURATOR)</a>	<a href="#">REQUEST CRYSTAL SAMPLES (SAMPLE CONFIGURATOR)</a>

## DIMENSIONS AND PATTERNS

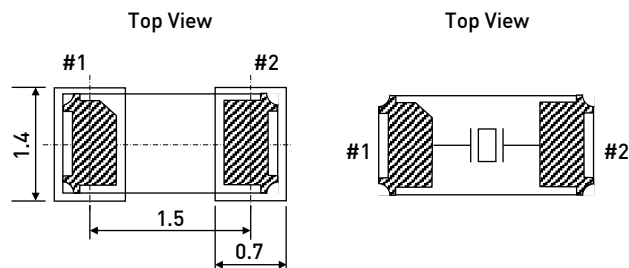
### PACKAGE SIZE – DIMENSIONS (UNIT:MM)

2.0 X 1.2 X 0.6 MM



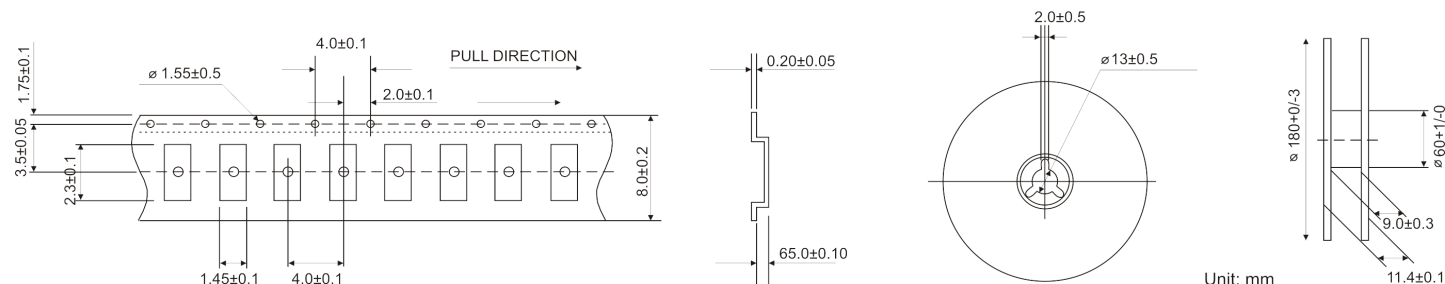
### RECOMMENDED

### INTERNAL

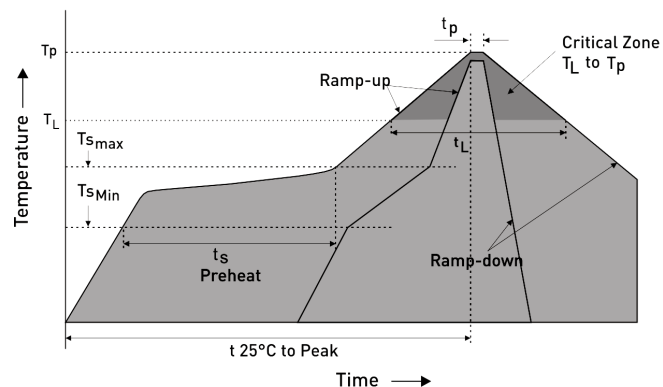


All dimensions in mm typical

## REEL SPECIFICATION

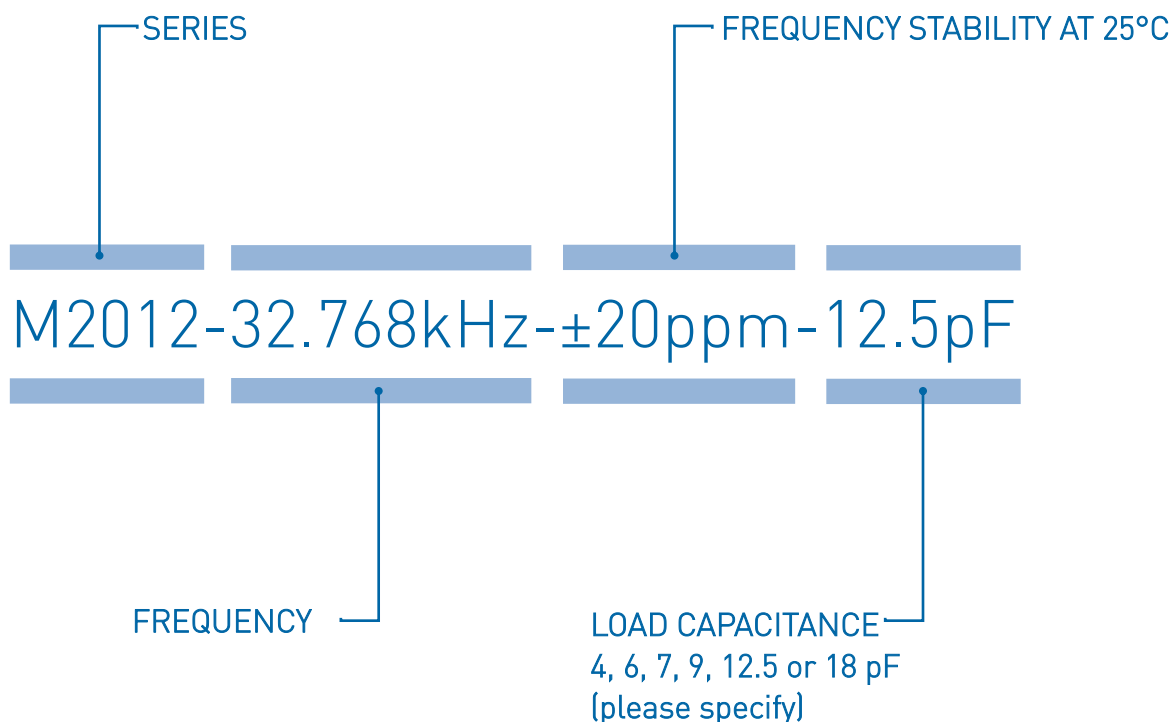


## REFLOW SOLDER PROFILE



IPC/JEDEC Standard	IPC/JEDEC J-STD-020
Moisture Sensitivity Level	Level 1
TS MAX to TL (Ramp-up Rate)	3°C/second Maximum
Preheat	
- Temperature Minimum (TS MIN)	150°C
- Temperature Typical (TS TYP)	175°C
- Temperature Maximum (TS MAX)	200°C
- Time (tS)	60 - 180 seconds
Ramp-up Rate (TL to TP)	3°C/second Maximum
Time Maintained Above:	
- Temperature [TL]	217°C
- Time (TL)	60 - 150 seconds
Peak Temperature (TP)	265°C Maximum
Target Peak Temperature (TP Target)	255°C
Time within 5°C of actual peak (tP)	20 - 40 seconds
Max. Number of Reflow Cycles	2
Ramp-down Rate	6°C/second Maximum
Time 25°C to Peak Temperature (t)	8 minutes Maximum

## ORDERING INFORMATION



EXAMPLE: M2012-32.768kHz-±20ppm-12.5pF

PLEASE INDICATE YOUR REQUIRED PARAMETERS

## REVISION HISTORY<sup>[1]</sup>

REVISION	RELEASE DATE	AMENDMENTS SUMMARY
01	June 2017	<ul style="list-style-type: none"> <li>+ Revised load capacitance</li> <li>+ Revised resonance resistance</li> <li>+ Revised shunt capacitance</li> <li>+ Revised drive level</li> <li>+ Revised reflow soldering profile</li> <li>+ Revised tape and reel options</li> </ul>
+ 02	January 2018	<ul style="list-style-type: none"> <li>+ Added typical resonance resistance</li> <li>+ Added extra load capacitance values: 4,6 pF</li> <li>+ Revised dimensions</li> </ul>
+ 03	November 2025	<ul style="list-style-type: none"> <li>+ Revised load capacitance</li> <li>+ Revised shunt capacitance</li> <li>+ Revised parabolic coefficient</li> <li>+ Revised aging</li> <li>+ Revised storage temperature</li> <li>+ Added, POP (EU) 2019/1021, PFAS, PROP 65, TSCA</li> </ul>

**Note:**

1. Based on Datasheet version from June 2017/SPEC 01/REV.01
2. Based on Datasheet version from January 2018/SPEC 01/REV.02



## PREMIUM QUALITY BY PETERMANN-TECHNIK



OUR COMPANY IS CERTIFIED ACCORDING TO ISO 9001:2015 AND 14001:2015

THIS IS FOR YOU TO ENSURE THAT THE PRINCIPLES OF QUALITY MANAGEMENT ARE FULLY IMPLEMENTED IN OUR QM-SYSTEM AND QUALITY CONTROL METHODS .

CLOCKING YOUR WORLD

RELIABLE · COST-EFFECTIVE · COMPETENT

DESIGN SMARTER – WE MAKE GREAT IDEAS REALITY

FOR ALMOST 30 YEARS, WE HAVE BEEN YOUR SPECIALIST FOR CRYSTALS AND OSCILLATORS – FROM PROVEN STANDARDS TO CUSTOM-TAILORED SOLUTIONS.

YOU DEVELOP WITH THE HIGHEST STANDARDS – WE DELIVER THE COMPONENTS TO MATCH: INNOVATIVE, RELIABLE, AND COST-EFFICIENT.

CHOOSE OUR PRODUCTS AND BENEFIT FROM TOP-TIER QUALITY, INNOVATION, STABLE AND INDEPENDENT SUPPLY CHAINS AND PARTNERSHIP ON HIGHEST LEVEL.

SUSTAINABLE SUCCESS FOR YOU AND YOUR PRODUCTS!