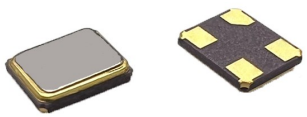
PLETRONICS SM9T Series
Miniature SMD Crystal



SM9T
2.5 x 2.0 x 0.55 mm
Ceramic Package

Features

- Pletronics' SM9T Series is a miniature low profile surface mount crystal.
- Package is ideal for automated surface mount assembly and reflow practices.
- Tape and Reel Packaging.
- AT Cut Crystal
- 12 MHz to 80 MHz

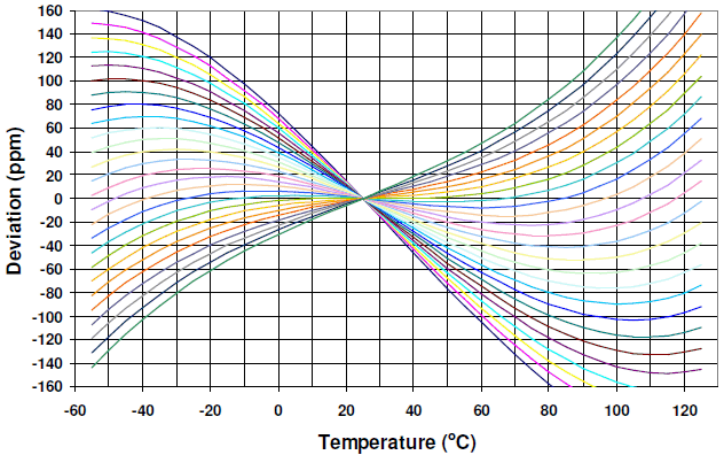
Applications

Bluetooth
WLAN
IoT
Wearables

Electrical Characteristics

Parameter	**Min**	**Typ**	**Max**	**Unit**	**Condition** (Consult factory for other options)
Frequency Range	12	-	80	MHz	
Calibration Frequency Tolerance	±10	-	±50	ppm	at 25°C ± 3°C, see part number guide below for available options
Frequency Stability	±10	-	±100	ppm	see part number guide below for available options
Operating Temperature Range	-40	-	+125	°C	see part number guide below for available options
Storage Temperature Range	-55	-	+125	°C	
Equivalent Series Resistance (ESR)	-	-	180 80 70 50	Ω	12 MHz ≤ Freq < 16 MHz 16 MHz ≤ Freq < 21 MHz 21 MHz ≤ Freq < 31 MHz 31 MHz ≤ Freq ≤ 80 MHz
Drive Level	-	-	100	µW	Use 10µW for testing
Shunt Capacitance (C0)	-	-	5.0	pF	Pad to Pad Capacitance
Aging at 25°C±3°C	-	-	±5	ppm	for the first year
	-	-	±2	ppm	after the first year

AT Cut Crystal Frequency versus Temperature Typical Performance:



Part Numbering

Series Model	Load Capacitance (CLoad) in pF	Frequency in MHz	Frequency Calibration Tolerance	Frequency Stability	Fundamental Mode AT Cut Crystal	Operating Temperature Range		Internal Code Or Blank
						Lowest	Highest	
SM9T	**-8**	**-25.0M**	**-20**	**H**	**1**	**G**	**G**	**-xx**
	Parallel Resonance from **06** to **18** pF (8pF is standard) **SR** = Series Resonance		(Typical Values Shown) **10** = ±10 ppm at 25°C ± 3°C **15** = ±15 ppm at 25°C ± 3°C **20** = ±20 ppm at 25°C ± 3°C (Standard) **25** = ±25 ppm at 25°C ± 3°C **50** = ±50 ppm at 25°C ± 3°C	See Table Below	1 = Fundamental	**C** = 0°C **D** = -5°C **E** = -10°C **G** = -20°C **J** = -30°C **K** = -35°C **L** = -40°C	**C** = +50°C **E** = +60°C **G** = +70°C **H** = +75°C **J** = +80°C **K** = +85°C **P** = +105°C **U** = +125°C	

Available Frequency Stability versus Temperature in ppm

Operating Temperature Range		D	E	F	G	H	J
	CODE	±10	±15	±20	±30	±50	±100
0 to +50°C	**CC**	•	•	•	•	•	•
0 to +60°C	**CE**	•	•	•	•	•	•
0 to +70°C	**CG**	•	•	•	•	STD	•
-10 to +50°C	**EC**	•	•	•	•	•	•
-10 to +60°C	**EE**	•	•	•	•	•	•
-10 to +70°C	**EH**	•	•	•	•	•	•
-20 to +70°C	**GG**	•	•	•	•	•	•
-20 to +75°C	**GH**	•	•	•	•	•	•
-30 to +75°C	**JH**		•	•	•	•	•
-30 to +85°C	**JK**		•	•	•	•	•
-35 to +80°C	**KJ**		△	•	•	•	•
-40 to +85°C	**LK**		△	•	•	•	•
-40 to +105°C	**LP**				•	•	•
-40 to +125°C	**LU**				△	•	•

• = Available △ = Check with Pletronics

Device Marking

PFFM YMDx	OR	FFYMx

FF = Crystal Frequency in MHz
x = Internal factory codes
P = Pletronics
YMD or *YM* = Date code (Year-Month-Day or Year-Month see chart below)

Specifications such as part number, frequency stability, supply voltage and operating temperature range, etc. are not identified from marking. External packaging labels and packing list will correctly identify the ordered Pletronics part number.

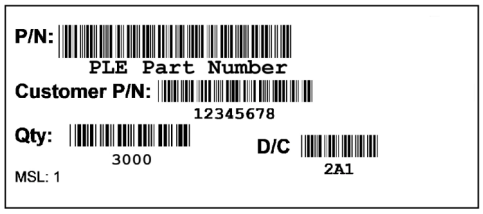
Codes for Date Code YMD (Year Month Day)

Code	3	4	5	6	7	Code	A	B	C	D	E	F	G	H	J	K	L	M
Year	2023	2024	2025	2026	2027	Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

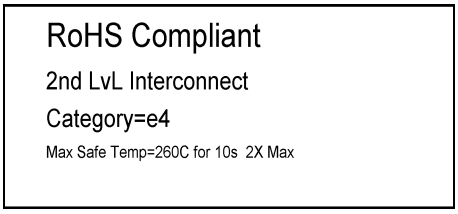
Code	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	T	U	V	W	X	Y	Z
Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

Package Labeling

P/N Label is 1" x 2.6" (25.4mm x 66.7mm)
Font is Courier New
Bar code is 39-Full ASCII



RoHs Label is 1" x 2.6" (25.4mm x 66.7mm)
Font is Arial

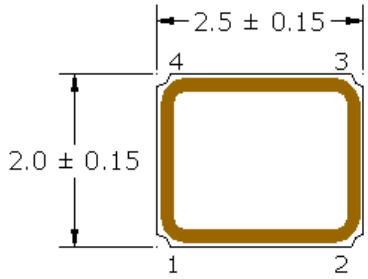


Pletronics Inc. certifies this device is in accordance with the RoHS and REACH directives.
Pletronics Inc. guarantees the device does not contain the following: Cadmium, Hexavalent Chromium, Lead, Mercury, PBB's, PBDE's
Weight of the Device: 0.009 grams
Moisture Sensitivity Level: 1 As defined in J-STD-020D
Second Level Interconnect code: e4

Reliability

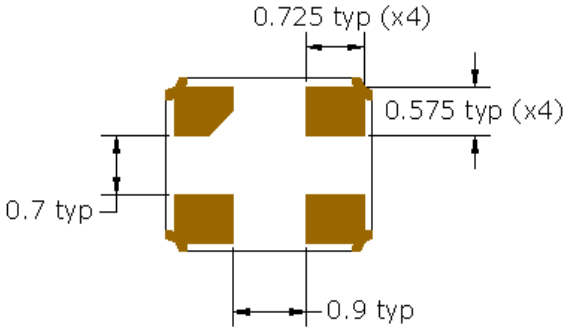
Parameter	Condition
Mechanical Shock	MIL-STD-883, Method 2002, Condition B
Vibration	MIL-STD-883, Method 2007, Condition A
Solderability	IPC J-STD-002
Thermal Cycle	MIL-STD-883 Method 1010, Condition B

Mechanical Dimensions

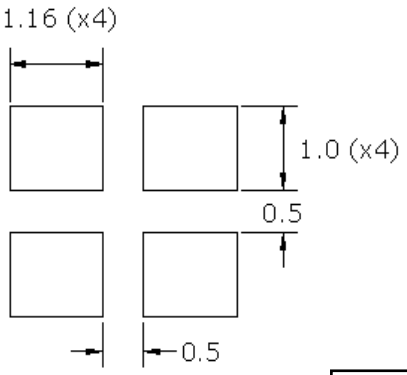


Pin Connections

Pins 1 and 3 - Crystal
Pins 2 and 4 - Lid (connect to ground)



Solder Pad Layout



Pad Layout
Disclaimer: Recommended layout shown. Adjust layout as needed for individual process requirements.

Dimensions in mm

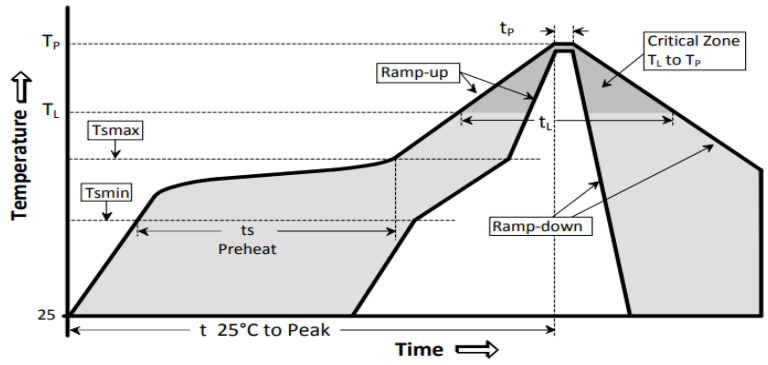
Contacts (pads): Gold (0.3 to 1µm) over Nickel (1.27 to 8.89 µm)
The chamfered pad may or may not be present and may be on any pad.
The crystal is symmetrical, there is no Pad 1 preference. The part can be rotated 180° when being assembled on the PCB and will still perform correctly.

For Optimum Jitter Performance, Pletronics recommends:

- Trace lengths to the crystal should be kept as short as possible.
- The crystal connections are sensitive to noise.
- The package should be grounded for optimum performance, pad 2 or 4 connected to ground.
- These very small crystals have high ESR, the oscillator start-up and operation should take this into consideration.
- These small crystals should have their maximum drive level limited to 100 µW.

Reflow Cycle

Maximum Reflow Conditions in accordance with IPC/JEDEC J-STD-020C "Pb-free"

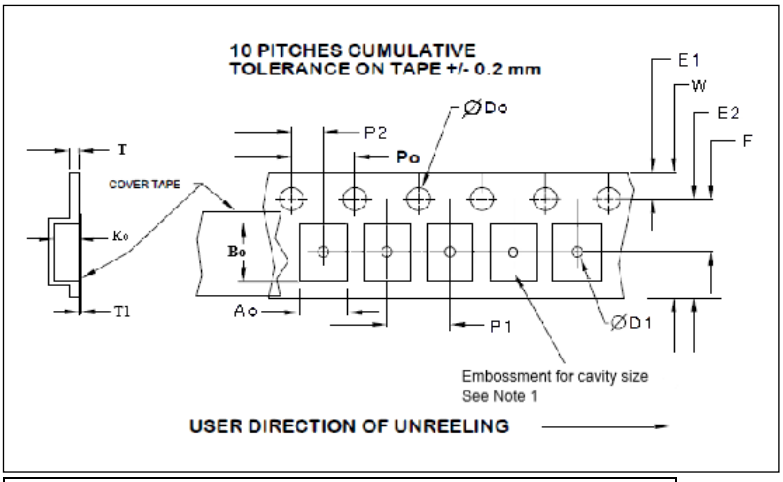


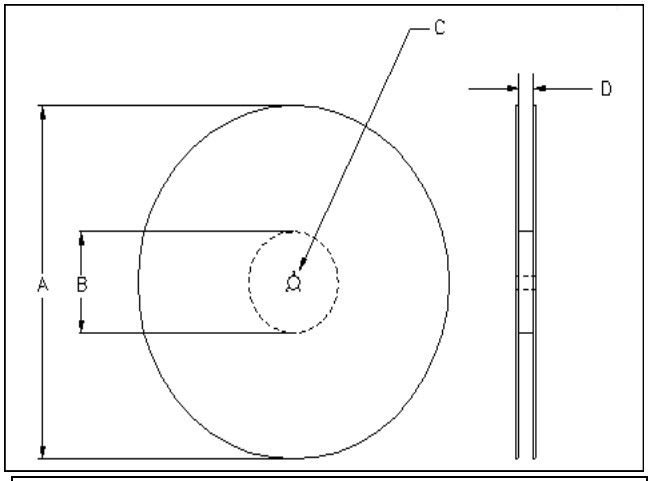
Temperature Profile	Symbol	Condition	Unit
Average ramp-up rate	(Ts_{max} to T_P)	3°C / second max	°C / s
Ramp down Rate	T_{cool}	6°C / second max	°C / s
Time 25°C to Peak Temperature	$T_{to\text{-}peak}$	8 minutes max	min
Preheat			
Temperature min	Ts_{min}	150	°C
Temperature max	Ts_{max}	200	°C
Time Ts_{min} to Ts_{max}	ts	60 – 180	sec
Soldering above liquidus			
Temperature liquidus	T_L	217	°C
Time above liquidus	t_L	60 – 150	sec
Peak temperature			
Peak Temperature	Tp	260	°C
Time within 5°C of peak temperature	tp	20 – 40	sec

The part may be reflowed 2 times without degradation
(typical for lead free processing).

Tape and Reel

Tape and Reel available for quantities of 250 to 3000 per reel, cut tape for < 1000. 8mm tape, 4mm pitch.





Tape Variable Dimensions Table 2							
Tape Size	E2 typ	F	P1	W max	Ao	Bo	Ko
8mm	6.25	3.5 ±0.05	4.0 ±0.1	8.2	2.25 ± 0.1	2.75 ± 0.1	1.15 ± 0.1

Dimensions in mm Drawing Not to scale
Note 1: Embossed cavity to conform to EIA– 481-B

Reel Dimensions (may vary) Table 3						
	A		B		C	D
Reel Size	Inches	mm	Inches	mm	mm	mm
7	7.0	180	2.50	60	13.0 +0.5 -0.2	Tape size +0.4 +2.0 -0.0

Tape Constant Dimensions Table 1							
Tape Size	Do	D1 min	E1	Po	P2	T max	T1 max
8mm	1.5 +0.1 -0.0	1.0	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	0.25	0.1

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