



## SM45 Series Miniature SMD Crystal

May 2009

- The Pletronics' SM45 Series is a miniature surface mount crystal
- The package is ideal for automated surface mount assembly and reflow practices.
- Tape and Reel packaging
- 3 MHz to 70 MHz
- 5 x 13 x 5 mm 4 pad
- AT Cut Crystal

**Pletronics Inc. certifies this device is in accordance with the RoHS 5/6 (2002/95/EC) and WEEE (2002/96/EC) directives.**

Pletronics Inc. guarantees the device does not contain the following:

Cadmium, Hexavalent Chromium, Lead (<1000 ppm), Mercury, PBB's, PBDE's

Weight of the Device: 0.65 grams

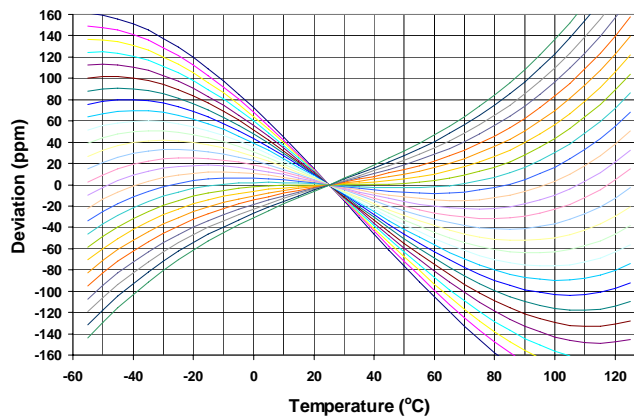
Moisture Sensitivity Level: 1 As defined in J-STD-020C

Second Level Interconnect code: e1, e2, e3 or e4

### Electrical Specification:

Item	Min	Max	Unit	Condition
Frequency Range	3	70	MHz	AT cut
Calibration Frequency Tolerance	-	-	ppm	at +25°C ± 3°C
Frequency Stability over OTR	-	-	ppm	see table on page 3 for available options
Equivalent Series Resistance (ESR)	-	200	Ohms	3 MHz to 4 MHz
	-	150	Ohms	4 MHz to 5 MHz
	-	120	Ohms	5 MHz to 6 MHz
	-	100	Ohms	6 MHz to 7 MHz
	-	80	Ohms	7 MHz to 8 MHz
	-	50	Ohms	8 MHz to 13 MHz
	-	40	Ohms	13 MHz to 30 MHz
	-	100	Ohms	25 MHz to 70 MHz
Drive Level	-	1	mW	use 10 µW for testing
Shunt Capacitance (C0)	-	7	pF	Pad to Pad capacitance
Aging	-5	+5	ppm /Yr	at +25°C ± 3°C
Specified Temperature Range	-40	+85	°C	see table on page 3 for available options
Storage Temperature Range	-55	+125	°C	

**AT Cut Crystal Frequency  
versus Temperature  
Typical Performance:**



**Part Marking:**

**8xFFFFPymdz or L8xFFFFzywwz**

**Legend:**

- 8 = Model code for SM45
- x = Capacitance load code from below
- FFFF = Frequency coded
- P or L = Pletronics
- ymd or yww = Date of Manufacture (year, month and day) or year, week week
- All other marking is internal factory codes

Some frequency marking examples: 3.579545M = 03579, 14.31818M = 14181, 24.0M = 24000

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

Code	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y
pF	10	12	13	8	15	18	20	22	24	26	28	30	32	34	36	27	series	33	50	19	16	17	14

**Codes for Date Code YMD**

Code	6	7	8	9	0	1	2
Year	2006	2007	2008	2009	2010	2011	2012

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

**Part Number:**

SM45 -18 -14.31818M -50 H 1 G G -XX

See chart below for available options

<div style="font-size: 4em; margin: 0;">}</div>	Internal code or blank
	<b>Highest Specified Operating Temperature</b> <b>A</b> = 40°C <b>G</b> = 70°C <b>B</b> = 45°C <b>H</b> = 75°C <b>C</b> = 50°C <b>J</b> = 80°C <b>D</b> = 55°C <b>K</b> = 85°C <b>E</b> = 60°C <b>F</b> = 65°C
	<b>Lowest Specified Operating Temperature</b> <b>A</b> = +10°C <b>F</b> = -15°C <b>L</b> = -40°C <b>B</b> = +5°C <b>G</b> = -20°C <b>C</b> = 0°C <b>H</b> = -25°C <b>D</b> = -5°C <b>J</b> = -30°C <b>E</b> = -10°C <b>K</b> = -35°C
	<b>Mode:</b> <b>1</b> = Fundamental <b>3</b> =3rd Overtone
	<b>Frequency Stability</b> See chart below
	<b>Calibration Frequency Tolerance</b> <b>15</b> = ± 15 ppm at 25°C ± 3°C <b>20</b> = ± 20 ppm at 25°C ± 3°C <b>30</b> = ± 30 ppm at 25°C ± 3°C (Standard)
	<b>Frequency in MHz</b>
	<b>Clload in pF</b> Parallel Resonance from <b>09</b> to <b>44</b> pF or <b>SR</b> = Series Resonance
<b>Series Model</b>	

Available Frequency Stability versus Temperature in ppm

Operating Temperature Range	CODE	D	E	F	G	H	J
		± 10	± 15	± 20	± 30	± 50	± 100
0 to +45°C	CB	•	•	•	•	•	•
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 +75°C	EH	•	•	•	•	•	•
-20 to +70°C	GG	•	•	•	•	•	•
-20 to +75°C	GH	•	•	•	•	•	•
-30 to +75°C	JH	•	•	•	•	•	•
-30 to +80°C	JJ	•	•	•	•	•	•
-30 to +85°C	JK	•	•	•	•	•	•
-35 to +80°C	KJ		•	•	•	•	•
-40 to +85°C	LK		•	•	•	•	•

## Legacy Part Number (not for new designs):

SM45	B	E	-18	-11.0592M	-XX	
						<b>Internal code or blank</b>
						<b>Frequency in MHz</b>
						<b>Load in pF</b> Parallel Resonance in pF or <b>SR</b> = Series Resonance
						<b>Operating Temperature Range</b> Blank = 0 to +70°C (STD) <b>E</b> = -40 to +85°C
						<b>Calibration Tolerance / Frequency Stability</b> Blank = 30/50 (STD) <b>B</b> = 30/30 <b>C</b> = 15/30 <b>D</b> = 10/20 (not all frequencies)
						<b>Series Model</b>






## Reliability: Environmental Compliance

Parameter	Condition
Mechanical Shock	MIL-STD-883 Method 2002, Condition B
Vibration	MIL-STD-883 Method 2007, Condition A
Solderability	MIL-STD-883 Method 2003
Thermal Shock	MIL-STD-883 Method 1011, Condition A

## Package Labeling

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

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

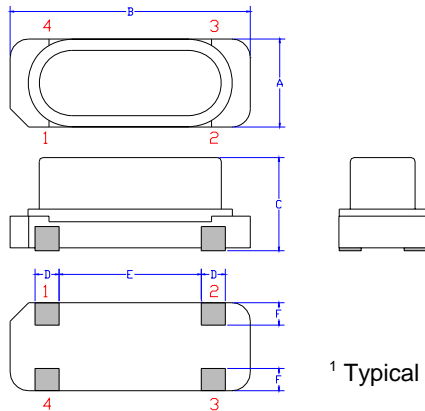
P/N:		
	SM45-10-20.0M	
Customer P/N:		
	12345678	
Qty:		D/C: 
	1000	6HL

RoHS Compliant
2nd LvL Interconnect
Category=e1
Max Safe Temp=260C for 10s 2X Max

RoHS Compliant
2nd LvL Interconnect
Category=e3
Max Safe Temp=260C for 10s 2X Max

RoHS Compliant
2nd LvL Interconnect
Category=e2
Max Safe Temp=260C for 10s 2X Max

## Mechanical:

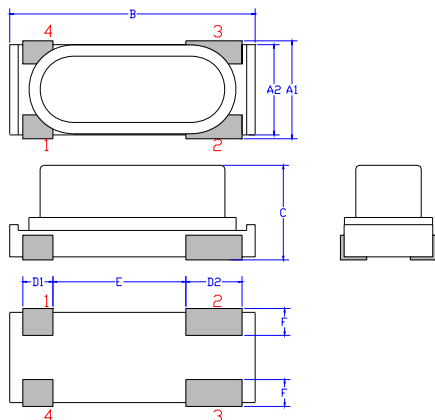


Not to Scale

<sup>1</sup> Typical dimensions

	Inches	mm
A	0.189 max	4.8 max
B	0.512 max	13.0 max
C	0.196 max	5.0 max
D <sup>1</sup>	0.051	1.3
E <sup>1</sup>	0.303	7.7
F <sup>1</sup>	0.047	1.2

Contacts : Matte Tin (Sn) -or- Tin over Copper (SnCu) or SAC (SnAgCu)



Not to Scale

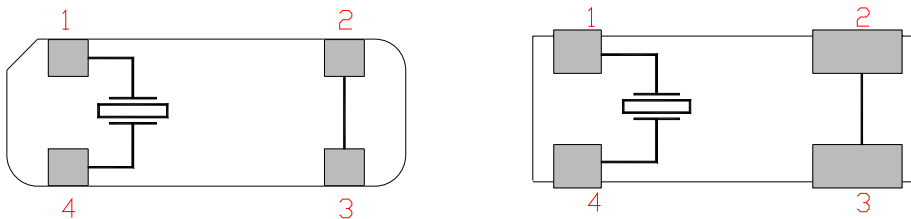
<sup>1</sup> Typical dimensions

	Inches	mm
A <sub>1</sub>	0.197 max	5.0 max
A <sub>2</sub>	0.181	4.6
B	0.516 max	13.1 max
C	0.196 max	5.0 max
D <sub>1</sub> <sup>1</sup>	0.063	1.6
D <sub>2</sub> <sup>1</sup>	0.118	3.0
E <sup>1</sup>	0.280	7.1
F <sup>1</sup>	0.039	1.0

Contacts : Matte Tin (Sn) -or- Tin over Copper (SnCu) or SAC (SnAgCu)

For product with e4, the contact is >2um of nickel with a >0.025um of gold

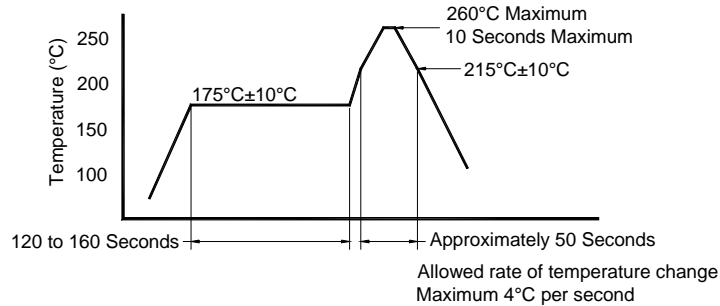
## Connection (bottom view) Pin 2 & 3 connected to metal case:



## Layout and application information

- 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.

## Reflow Cycle (typical for lead free processing)



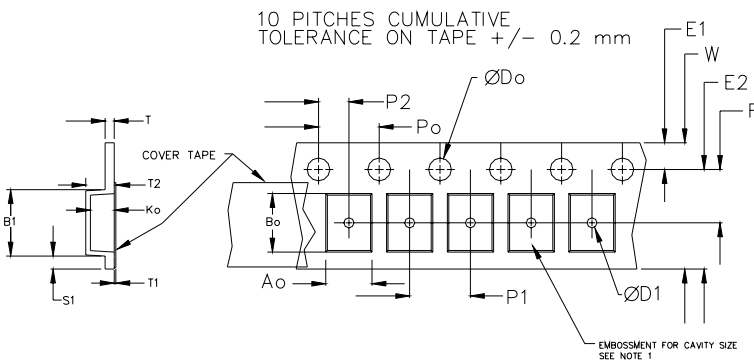
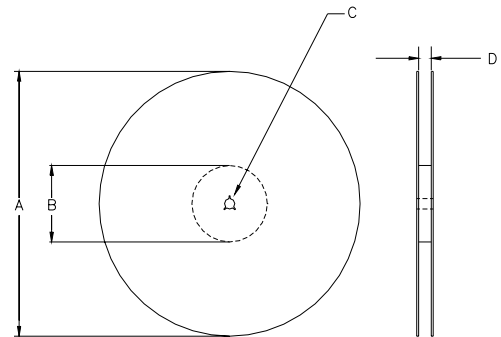
The part may be reflowed 2 times without degradation.

## Tape and Reel: available for quantities of 1000 per reel

Constant Dimensions Table 1								
Tape Size	D0	D1 Min	E1	P0	P2	S1 Min	T Max	T1 Max
8mm	1.5	1.0	1.75	4.0	2.0 ± 0.05	0.6	0.25	0.1
12mm		1.5			2.0 ± 0.1			
16mm		+0.1 -0.0			± 0.1			
24mm		1.5			± 0.1			

Variable Dimensions Table 2							
Tape Size	B1 Max	E2 Min	F	P1	T2 Max	W Max	Ao, Bo & Ko
24 mm	18	14.25	7.5 ± 0.1	12.0 ± 0.1	8	16.3	Note 1

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



USER DIRECTION OF UNREELING →

REEL DIMENSIONS					
A	inches	7.0	10.0	13.0	Tape Width
	mm	177.8	254.0	330.2	
B	inches	2.50	4.00	3.75	
	mm	63.5	101.6	95.3	
C	mm	13.0 +0.5 / -0.2			
D	mm	24.4	24.4	24.4	
		+2.0 -0.0	+2.0 -0.0	+2.0 -0.0	

Reel dimensions may vary from the above

## IMPORTANT NOTICE

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