Model 407
Surface Mount Quartz Crystal

Features

- Hermetic Ceramic Surface Mount Package
- Fundamental and 3rd Overtone Crystal Design
- Frequency Range 6 – 133MHz
- Frequency Tolerance, ±30ppm Standard
- Frequency Stability, ±50ppm Standard
- Operating Temperature Range to -40°C to +85°C
- Tape and Reel Packaging, EIA-418

Part Dimensions:
7.0 × 5.0 × 1.3mm • 104.78mg

Applications

- Wireless Communications
- Broadband Access
- FPGA/Microcontrollers
- Computer Peripherals
- USB Interfaces
- Test and Measurement
- Consumer Electronics
- Portable Equipment

Standard Frequencies

- 6.00MHz	- 27.00MHz	- 60.00MHz
- 8.00MHz	- 32.00MHz	- 66.666MHz
- 10.00MHz	- 48.00MHz	- 98.304MHz
- 25.00MHz	- 50.00MHz	- 125.00MHz

* See Page 5 for additional developed frequencies.
Check with factory for availability of frequencies not listed.

Description

CTS Model 407 incorporates a high Q quartz resonator and is ideal for supporting a wide range of commercial and industrial applications.

Ordering Information

Model	Mode of Oscillation	Tolerance @ +25°C	Temperature Stability/Temperature Range	Load Capacitance	Frequency [MHz]
407	F	3	5	D	XXXMXXXX

Code	Mode
F	Fundamental
T	3rd Overtone

Code	Stability -20°C to +70°C	Code	Stability -30°C to +85°C	Code	Stability -40°C to +85°C
1	±10ppm	R	±10ppm	-	-
X	±15ppm	Y	±15ppm	W	±15ppm
2	±20ppm	N	±20ppm	6	±20ppm
3	±30ppm	4	±30ppm	7	±30ppm
5	±50ppm	8	±50ppm	9	±50ppm

Code	Frequency
	Frequency [1]

Code	Tolerance
1	±10ppm
X	±15ppm
2	±20ppm
3	±30ppm

Code	Capacitance	Code	Capacitance
K	8pF	D	18pF
J	9pF	E	20pF
A	10pF	F	24pF
L	12pF	G	30pF
C	16pF	S	Series

Notes:

1] Frequency is recorded with 3 leading digits before the "M" and 4 significant digits after the "M" [including zeroes]. (Ex. XXXMXXXX [016M3840], XXXMXXXX
There are frequencies that have significant digits after the "M" that exceed the 4 digits. The remaining digits will be truncated from the CTS part number,
but the factory will calibrate to the full frequency desired. Examples below; P/N Frequency = Actual Frequency

13M5537 = 13.553750MHz	14M3181 = 14.318180MHz	16M6666 = 16.666670MHz	28M6363 = 28.636360MHz

Not all performance combinations and frequencies may be available.
Contact your local CTS Representative or CTS Customer Service for availability.

Electrical Specifications

Operating Conditions

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Temperature	T_A	-	-20	+25	+70	°C
			-30		+85	
			-40		+85	
Storage Temperature	T_{STG}	-	-40	-	+100	°C

Frequency Stability

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Frequency Range	f_O	-		6 - 133		MHz
Frequency Tolerance	$\Delta f/f_O$	@ +25°C		10, 15, 20 or 30		±ppm
Frequency Stability	$\Delta f/f_{25}$	Referenced to +25°C reading		10, 15, 20, 30 or 50		±ppm
Aging	$\Delta f/f_0$	Typical per year @ +25°C	-3	-	3	ppm

Crystal Parameters

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Mode	-	-		Fundamental		-
Crystal Cut	-	-		AT-Cut Strip		-
Load Capacitance	C_L	-		See Ordering Information		pF
Shunt Capacitance	C_0	-	-	-	7.0	pF
Series Resistance						
Fundamental	R_1	6MHz - <10MHz	-	-	80	Ω
		10MHz - <15MHz	-	-	70	
		15MHz - <20MHz	-	-	50	
		20MHz - 45MHz	-	-	40	
3rd Overtone	R_1	35MHz - <44MHz	-	-	80	Ω
		44MHz - <50MHz	-	-	60	
		50MHz - <80MHz	-	-	60	
		80MHz - <133MHz	-	-	60	
Drive Level	DL	-	-	10	200	µW
Insulation Resistance	R_i	+100Vdc ±15Vdc	500	-	-	MΩ

$\Delta f/f_0$ - Frequency deviation referenced to nominal frequency.

$\Delta f/f_{25}$ - Frequency deviation over operating temperature range, referenced to +25°C frequency.

Mechanical Specifications

Package Drawing

7.00 ±0.20

5.00 ±0.20

CTS**YYWW
● XXXX

1.30 Max

Top View

4   3

1   2

Key: mm

4.60   1.20

1.00

2.54

1   2

4   3

Bottom View
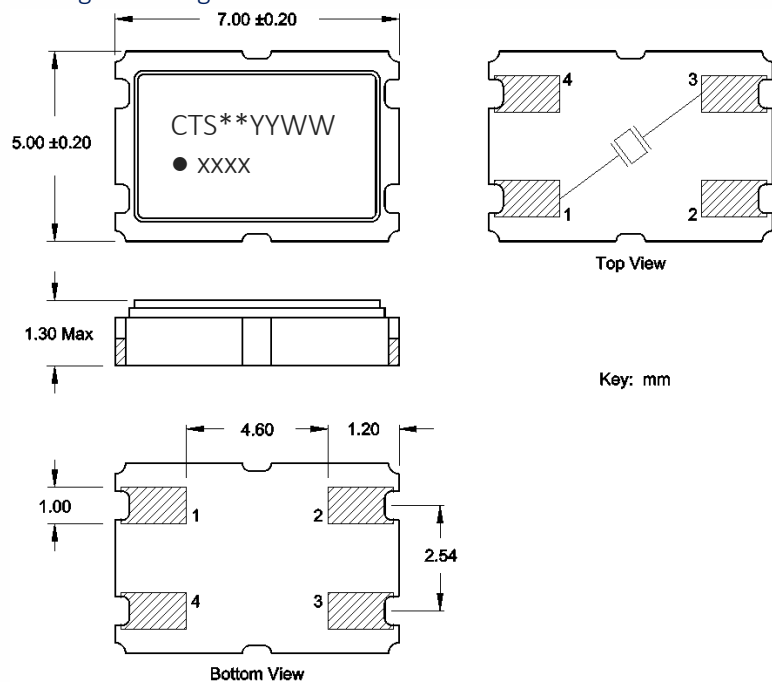
Marking Information

1. ** – Manufacturing Site Code.
2. YYWW – Date Code; YY = year, WW = week.
3. xxxx – Frequency Code.
   3-digits, frequencies below 100MHz
   4-digits, frequencies 100MHz or greater

[See document 016-1454-0, Frequency Code Tables.]

Recommended Pad Layout


2.00

1.40

2.54

5.80

4   3

1   2

Key: mm
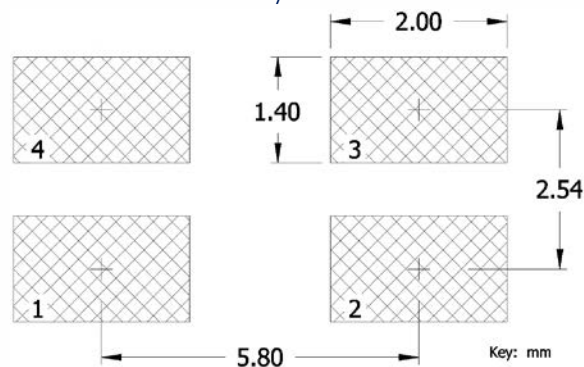
Notes

1. Terminations #2, #4 and metal lid are connected internally. End user may connect these pins to circuit ground for EMI suppression.
2. JEDEC termination code (e4). Barrier-plating is nickel [Ni] with gold [Au] flash plate.
2. Reflow conditions per JEDEC J-STD-020; +260°C maximum, 20 seconds.
3. MSL = 1.

Packaging - Tape and Reel

Tape Drawing
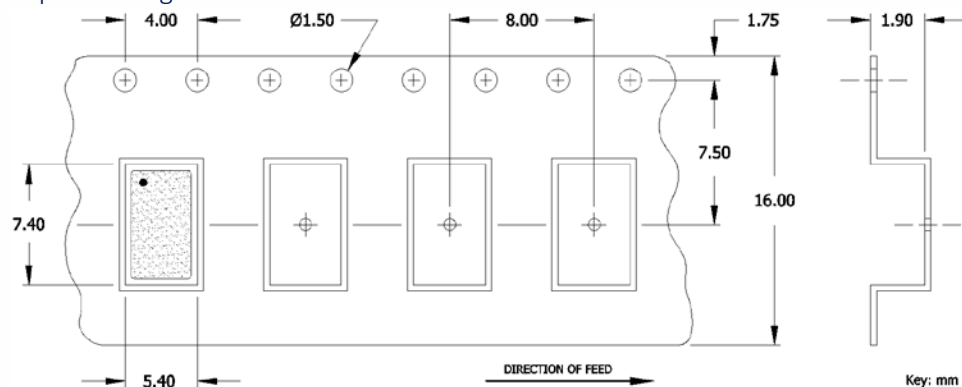
Reel Drawing
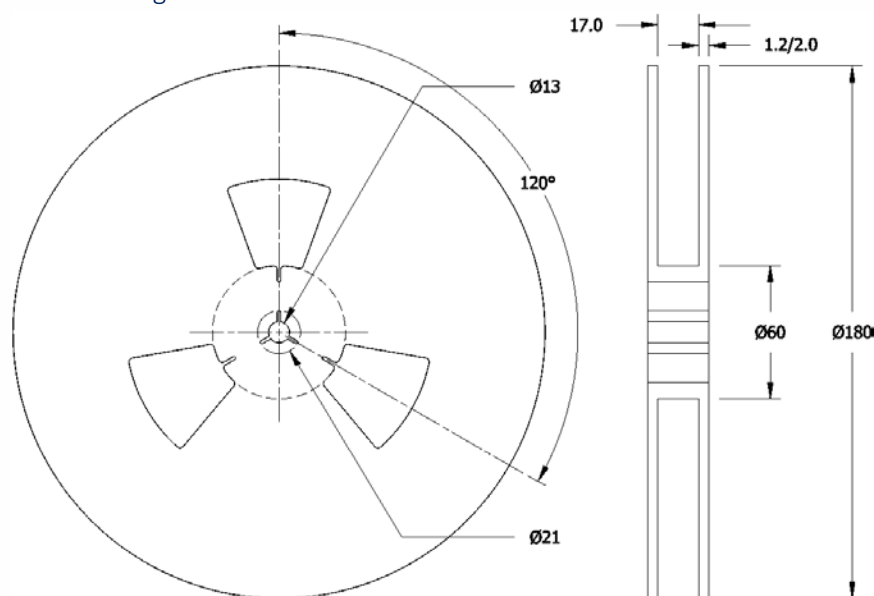
Notes

1. Device quantity is 1k pieces maximum per 180mm reel.
2. Complete CTS part number, frequency value, date code and manufacturing site code information must appear on reel and carton labels.

Addendum

Additional Developed Frequencies − MHz

FREQUENCY	FREQUENCY CODE	FREQUENCY	FREQUENCY CODE	FREQUENCY	FREQUENCY CODE	FREQUENCY	FREQUENCY CODE
7.372800	073	16.384000	163	32.768000	327	75.000000	750
7.600000	A76	16.800000	168	33.000000	330	77.760000	777
7.680000	076	16.934400	169	33.333000	33E	80.000000	800
8.192000	81	18.000000	180	33.333300	33A	81.000000	810
9.600000	096	18.432000	184	49.152000	491	83.000000	830
9.830400	098	19.200000	192	51.840000	518	83.333300	83B
10.245000	10A	19.660800	19B	54.000000	540	84.000000	840
10.368000	103	19.800000	198	55.000000	550	90.000000	900
11.059200	111	20.000000	200	58.000000	580	100.000000	1000
11.289600	11D	20.118400	20E	59.000000	590	106.250000	1062
12.000000	120	22.579200	225	62.500000	625	120.000000	1200
12.288000	122	24.000000	240	64.000000	640		
12.500000	125	24.576000	24C	65.000000	650		
13.000000	130	26.000000	260	66.000000	660		
13.560000	13C	28.322000	28D	66.666600	66D		
14.318180	143	28.375000	283	66.666670	66F		
14.745600	147	28.636360	286	70.000000	700		
15.360000	153	29.491200	29B	72.000000	720		
16.000000	160	30.000000	300	74.250000	742		

Frequency Codes for Cover Page Table − MHz

FREQUENCY	FREQUENCY CODE	FREQUENCY	FREQUENCY CODE	FREQUENCY	FREQUENCY CODE
6.000000	060	27.000000	270	60.000000	600
8.000000	080	32.000000	320	66.666000	666
10.000000	100	48.000000	480	98.304000	983
25.000000	250	50.000000	500	125.000000	1250