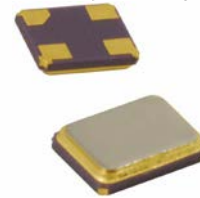




# Model 425

## Miniature Surface Mount Crystal



Part Dimensions:  
2.5 x 2.0 x 0.65mm • 9.00005gm

### Features

- Hermetic Ceramic Surface Mount Package
- Fundamental Crystal Design
- Frequency Range 12 – 80MHz
- Frequency Tolerance, ±30ppm Standard
- Frequency Stability, ±30ppm Standard
- Operating Temperature Range to -40°C to +105°C
- Tape and Reel Packaging, EIA-418

Standard Frequencies – see Page 5 for common frequencies.  
\* Check with factory for availability of frequencies not listed.

### Applications

- IoT and IIoT Applications
- Wireless Communications
- FPGA/Microcontrollers
- USB Interfaces
- Computer Peripherals
- Portable Equipment
- Test and Measurement
- M2M Communications
- Wearables

### Description

CTS Model 425 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] |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
|---|---------------------|-------------------|---|----------------|-------------|---|------------------|-----------------|-----------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--|--|--|----------------|--|----------------|--|----------------|--|-----------------|--|------|-----------|------|-----------|------|-----------|------|-----------|---|--------|---|--------|---|---|---|---|---|--------|---|--------|---|--------|---|---|---|--------|---|--------|---|--------|---|---|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--------|---|--|------|-------------|------|-------------|---|-----|---|------|---|-----|---|------|---|------|---|------|---|------|---|------|---|------|---|--------|---|--|------|-----------|------------------------|--|
| 425   | F                   | 3                 | 3                                       |                |             |   | A                | XXXMXXXX        |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| <table border="1"> <thead> <tr> <th>Code</th> <th>Mode</th> </tr> </thead> <tbody> <tr> <td>F</td> <td>Fundamental</td> </tr> </tbody> </table> |                     | Code              | Mode                                    | F              | Fundamental | <table border="1"> <thead> <tr> <th>Code</th> <th>Tolerance</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>±10ppm</td> </tr> <tr> <td>X</td> <td>±15ppm</td> </tr> <tr> <td>2</td> <td>±20ppm</td> </tr> <tr> <td>Y</td> <td>±25ppm</td> </tr> <tr> <td>3</td> <td>±30ppm</td> </tr> </tbody> </table> |                  | Code            | Tolerance | 1 | ±10ppm | X | ±15ppm | 2 | ±20ppm | Y | ±25ppm | 3 | ±30ppm | <table border="1"> <thead> <tr> <th colspan="2">-20°C to +70°C</th> <th colspan="2">-30°C to +85°C</th> <th colspan="2">-40°C to +85°C</th> <th colspan="2">-40°C to +105°C</th> </tr> <tr> <th>Code</th> <th>Stability</th> <th>Code</th> <th>Stability</th> <th>Code</th> <th>Stability</th> <th>Code</th> <th>Stability</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>±10ppm</td> <td>R</td> <td>±10ppm</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>X</td> <td>±15ppm</td> <td>Y</td> <td>±15ppm</td> <td>W</td> <td>±15ppm</td> <td>-</td> <td>-</td> </tr> <tr> <td>2</td> <td>±20ppm</td> <td>N</td> <td>±20ppm</td> <td>6</td> <td>±20ppm</td> <td>-</td> <td>-</td> </tr> <tr> <td>3</td> <td>±30ppm</td> <td>4</td> <td>±30ppm</td> <td>7</td> <td>±30ppm</td> <td>T</td> <td>±30ppm</td> </tr> <tr> <td>5</td> <td>±50ppm</td> <td>8</td> <td>±50ppm</td> <td>9</td> <td>±50ppm</td> <td>V</td> <td>±50ppm</td> </tr> </tbody> </table> |  |  |  | -20°C to +70°C |  | -30°C to +85°C |  | -40°C to +85°C |  | -40°C to +105°C |  | Code | Stability | Code | Stability | Code | Stability | Code | Stability | 1 | ±10ppm | R | ±10ppm | - | - | - | - | X | ±15ppm | Y | ±15ppm | W | ±15ppm | - | - | 2 | ±20ppm | N | ±20ppm | 6 | ±20ppm | - | - | 3 | ±30ppm | 4 | ±30ppm | 7 | ±30ppm | T | ±30ppm | 5 | ±50ppm | 8 | ±50ppm | 9 | ±50ppm | V | ±50ppm | <table border="1"> <thead> <tr> <th>Code</th> <th>Capacitance</th> <th>Code</th> <th>Capacitance</th> </tr> </thead> <tbody> <tr> <td>K</td> <td>8pF</td> <td>D</td> <td>18pF</td> </tr> <tr> <td>J</td> <td>9pF</td> <td>E</td> <td>20pF</td> </tr> <tr> <td>A</td> <td>10pF</td> <td>F</td> <td>24pF</td> </tr> <tr> <td>L</td> <td>12pF</td> <td>G</td> <td>30pF</td> </tr> <tr> <td>C</td> <td>16pF</td> <td>S</td> <td>Series</td> </tr> </tbody> </table> |  | Code | Capacitance | Code | Capacitance | K | 8pF | D | 18pF | J | 9pF | E | 20pF | A | 10pF | F | 24pF | L | 12pF | G | 30pF | C | 16pF | S | Series | <table border="1"> <thead> <tr> <th>Code</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td colspan="2">Frequency<sup>1</sup></td> </tr> </tbody> </table> |  | Code | Frequency | Frequency <sup>1</sup> |  |
| Code  | Mode                |                   |   |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| F   | Fundamental         |                   |   |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| Code  | Tolerance           |                   |   |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| 1   | ±10ppm              |                   |   |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| X   | ±15ppm              |                   |   |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| 2   | ±20ppm              |                   |   |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| Y   | ±25ppm              |                   |   |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| 3   | ±30ppm              |                   |   |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| -20°C to +70°C  |                     | -30°C to +85°C    |   | -40°C to +85°C |             | -40°C to +105°C   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| Code  | Stability           | Code              | Stability                               | Code           | Stability   | Code  | Stability        |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| 1   | ±10ppm              | R                 | ±10ppm                                  | -              | -           | -   | -                |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| X   | ±15ppm              | Y                 | ±15ppm                                  | W              | ±15ppm      | -   | -                |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| 2   | ±20ppm              | N                 | ±20ppm                                  | 6              | ±20ppm      | -   | -                |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| 3   | ±30ppm              | 4                 | ±30ppm                                  | 7              | ±30ppm      | T   | ±30ppm           |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| 5   | ±50ppm              | 8                 | ±50ppm                                  | 9              | ±50ppm      | V   | ±50ppm           |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| Code  | Capacitance         | Code              | Capacitance                             |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| K   | 8pF                 | D                 | 18pF                                    |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| J   | 9pF                 | E                 | 20pF                                    |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| A   | 10pF                | F                 | 24pF                                    |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| L   | 12pF                | G                 | 30pF                                    |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| C   | 16pF                | S                 | Series                                  |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| Code  | Frequency           |                   |   |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |
| Frequency <sup>1</sup>  |                     |                   |   |                |             |   |                  |                 |           |   |        |   |        |   |        |   |        |   |        |   |  |  |  |                |  |                |  |                |  |                 |  |      |           |      |           |      |           |      |           |   |        |   |        |   |   |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |   |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |        |   |  |      |             |      |             |   |     |   |      |   |     |   |      |   |      |   |      |   |      |   |      |   |      |   |        |   |  |      |           |                        |  |

Notes:

- 1] Frequency is recorded with 3 leading digits before the "M" and 4 significant digits after the "M" [including zeroes]. 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.**

This product is specified for use only in standard commercial applications. Supplier disclaims all express and implied warranties and liability in connection with any use of this product in any non-commercial applications or in any application that may expose the product to conditions that are outside of the tolerances provided in its specification.



## Electrical Specifications

### Operating Conditions

| PARAMETER             | SYMBOL    | CONDITIONS | MIN | TYP | MAX  | UNIT |
|-----------------------|-----------|------------|-----|-----|------|------|
| Operating Temperature | $T_A$     | -          | -20 |     | +70  | °C   |
|                       |           |            | -30 | +25 | +85  |      |
|                       |           |            | -40 |     | +85  |      |
|                       |           |            | -40 |     | +105 |      |
| Storage Temperature   | $T_{STG}$ | -          | -40 | -   | +125 | °C   |

### Frequency Stability

| PARAMETER           | SYMBOL            | CONDITIONS                  | MIN | TYP                      | MAX | UNIT |
|---------------------|-------------------|-----------------------------|-----|--------------------------|-----|------|
| Frequency Range     | $f_o$             | -                           |     | 12 - 80                  |     | MHz  |
| Frequency Tolerance | $\Delta f/f_o$    | @ +25°C                     |     | 10, 15, 20, 25 or 30     |     | ±ppm |
| Frequency Stability | $\Delta f/f_{25}$ | Referenced to +25°C reading |     | 10, 15, 20, 25, 30 or 50 |     | ±ppm |
| Aging               | $\Delta f/f_o$    | Typical per year @ +25°C    | -3  | -                        | 3   | ppm  |

### Crystal Parameters

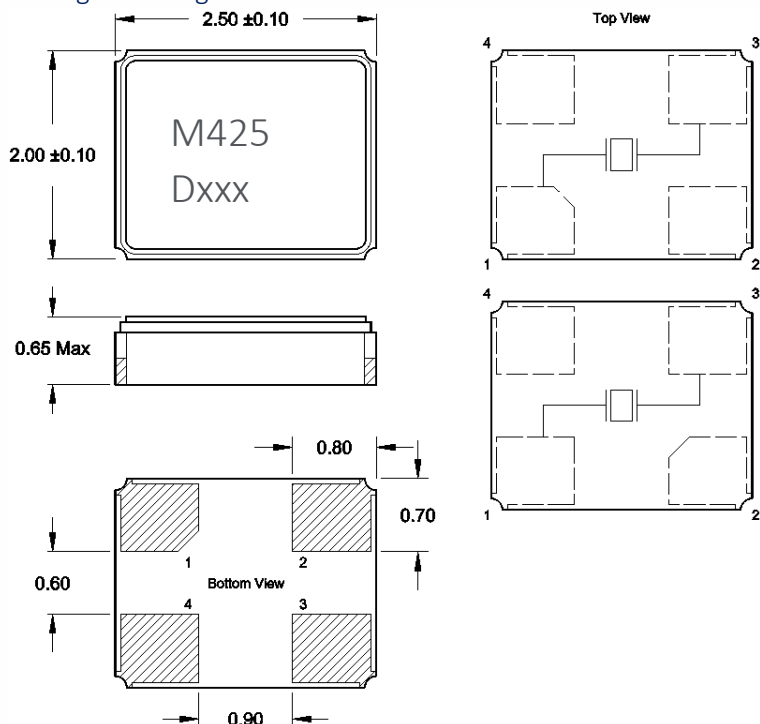
| PARAMETER                | SYMBOL | CONDITIONS          | MIN | TYP                      | MAX | UNIT       |
|--------------------------|--------|---------------------|-----|--------------------------|-----|------------|
| Operating Mode           | -      | -                   |     | Fundamental              |     | -          |
| Crystal Cut              | -      | -                   |     | AT-Cut Strip             |     | -          |
| Load Capacitance         | $C_L$  | -                   |     | See Ordering Information |     | pF         |
| Shunt Capacitance        | $C_o$  | -                   | -   | 1.0                      | 3.0 | pF         |
| <b>Series Resistance</b> |        |                     |     |                          |     |            |
| Fundamental              | $R_1$  | 12MHz - <16MHz      | -   | -                        | 150 | $\Omega$   |
|                          |        | 16MHz - <22MHz      | -   | -                        | 100 |            |
|                          |        | 22MHz - <30MHz      | -   | -                        | 80  |            |
|                          |        | 30MHz - <36MHz      | -   | -                        | 60  |            |
|                          |        | 36MHz - 80MHz       | -   | -                        | 50  |            |
| Drive Level              | DL     | -                   | -   | 10                       | 200 | $\mu$ W    |
| Insulation Resistance    | $R_i$  | +100Vdc $\pm$ 15Vdc | 500 | -                        | -   | M $\Omega$ |

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

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

## Mechanical Specifications

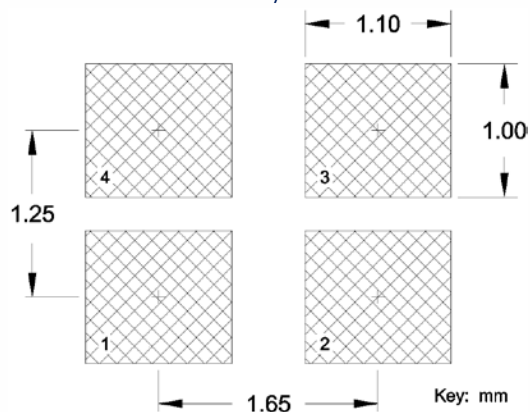
### Package Drawing



### Marking Information

1. M425 – CTS Model series.
2. D – Date code. See Table I for codes.
3. xxx – Frequency code, 3-digits frequencies below 100MHz.  
[See document 016-1454-0, Frequency Code Tables].

### Recommended Pad Layout



### Notes

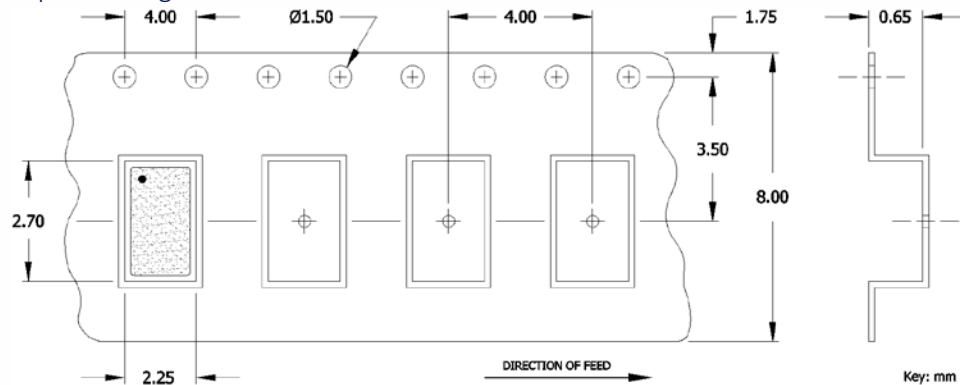
1. JEDEC termination code (e4). Barrier-plating is nickel [Ni] with gold [Au] flash plate.
2. Terminations #2, #4 and the metal lid are connected internally. End user may connect these pins to circuit ground for EMI suppression.
3. Due to package variability, the pad chamfer on the bottom could be located on Pin 1 or 2 in a given lot. Layout orientation should be based on the top view [marking side], as indicated in package drawing. The chamfer location does not affect the electrical performance of the device.
4. Reflow conditions per JEDEC J-STD-020; +260°C maximum, 20 seconds.
5. MSL = 1.

Table I – Date Code, Beginning year 2021

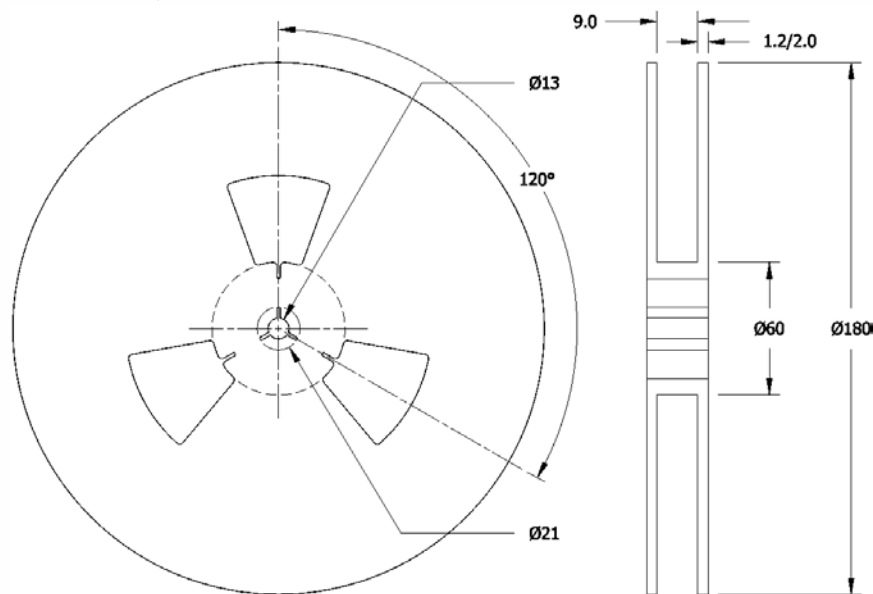
| MONTH |      |      |      |      | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|-------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| YEAR  |      |      |      |      |     |     |     |     |     |     |     |     |     |     |     |     |
| 2021  | 2025 | 2029 | 2033 | 2037 | A   | B   | C   | D   | E   | F   | G   | H   | J   | K   | L   | M   |
| 2022  | 2026 | 2030 | 2034 | 2038 | N   | P   | Q   | R   | S   | T   | U   | V   | W   | X   | Y   | Z   |
| 2023  | 2027 | 2031 | 2035 | 2039 | a   | b   | c   | d   | e   | f   | g   | h   | j   | k   | l   | m   |
| 2024  | 2028 | 2032 | 2036 | 2040 | n   | p   | q   | r   | s   | t   | u   | v   | w   | x   | y   | z   |

### Packaging – Tape and Reel

#### Tape Drawing



#### Reel Drawing



#### Notes

1. Device quantity is 1k pieces minimum and 3k 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

### Common Frequencies and Frequency Codes – MHz

| Common Wireless Frequencies |                | Additional Frequencies |                |           |                |           |                |
|-----------------------------|----------------|------------------------|----------------|-----------|----------------|-----------|----------------|
| FREQUENCY                   | FREQUENCY CODE | FREQUENCY              | FREQUENCY CODE | FREQUENCY | FREQUENCY CODE | FREQUENCY | FREQUENCY CODE |
| 16.000000                   | 160            | 16.367600              | 16E            | 26.041660 | 26F            | 39.062500 | 39A            |
| 19.200000                   | 192            | 16.384000              | 163            | 27.000000 | 270            | 41.600000 | 41C            |
| 20.000000                   | 200            | 16.666700              | 16N            | 28.224000 | 282            | 44.000000 | 440            |
| 24.000000                   | 240            | 16.800000              | 168            | 28.322000 | 28C            | 45.000000 | 450            |
| 25.000000                   | 250            | 16.934400              | 169            | 28.375000 | 283            | 49.152000 | 491            |
| 26.000000                   | 260            | 18.000000              | 180            | 28.636360 | 286            | 50.000000 | 500            |
| 27.120000                   | 271            | 18.432000              | 184            | 29.491200 | 29B            | 54.000000 | 540            |
| 30.000000                   | 300            | 19.440000              | 194            | 30.400000 | 304            |           |                |
| 32.000000                   | 320            | 19.660800              | 19B            | 30.720000 | 307            |           |                |
| 37.400000                   | 374            | 19.680000              | 196            | 31.250000 | 312            |           |                |
| 38.400000                   | 384            | 20.480000              | 204            | 32.768000 | 327            |           |                |
| 40.000000                   | 400            | 20.736000              | 207            | 33.000000 | 330            |           |                |
| 48.000000                   | 480            | 22.118400              | 221            | 33.330000 | 333            |           |                |
| 52.000000                   | 520            | 22.579200              | 225            | 33.333000 | 33E            |           |                |
|                             |                | 24.305000              | 243            | 33.333300 | 33A            |           |                |
|                             |                | 24.545400              | 24F            | 33.868800 | 338            |           |                |
|                             |                | 24.545454              | 24G            | 35.328000 | 353            |           |                |
|                             |                | 24.553500              | 24B            | 36.000000 | 360            |           |                |
|                             |                | 24.576000              | 24C            | 38.000000 | 380            |           |                |
|                             |                | 25.000625              | 25A            | 38.880000 | 388            |           |                |