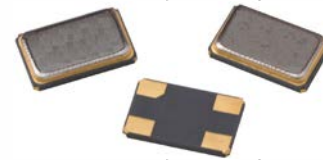




# Model 405

## Surface Mount Quartz Crystal



Part Dimensions:  
5.0 × 3.2 × 0.85mm • 47mg

### Features

- Hermetic Ceramic Surface Mount Package
- Fundamental Crystal Design
- Frequency Range 6.76438 – 54MHz
- Frequency Tolerance,  $\pm 30\text{ppm}$  Standard
- Frequency Stability,  $\pm 30\text{ppm}$  Standard
- Operating Temperature Range to  $-40^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$
- Tape and Reel Packaging, EIA-481

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
- Broadband Access

### Description

CTS Model 405 incorporates a high Q quartz resonator and is ideal for supporting a wide range of commercial and industrial applications.

### Ordering Information

| Model                                                                                                                                                                                                                                                                                  | Temperature Range            | Tolerance @ +25°C | Temperature Stability | Load Capacitance | Frequency [MHz]             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------|-----------------------|------------------|-----------------------------|---|-----------------------------|---|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------|-------------|--------|-----|--------|-----|--------|-----|--------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------|------------------------|------|---|------|---|------|---|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------|---|------|---|------|---|------|---|--------|
| 405                                                                                                                                                                                                                                                                                    | C                            | 3                 | 5                     | D                | XXMXXXXX                    |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
|                                                                                                                                                                                                                                                                                        |                              |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| <table><tr><th>Code</th><th>Temp. Range</th></tr><tr><td>C</td><td>-20°C to +70°C <sup>1</sup></td></tr><tr><td>D</td><td>-30°C to +85°C <sup>1</sup></td></tr><tr><td>I</td><td>-40°C to +85°C <sup>2</sup></td></tr><tr><td>G</td><td>-40°C to +105°C <sup>3</sup></td></tr></table> |                              | Code              | Temp. Range           | C                | -20°C to +70°C <sup>1</sup> | D | -30°C to +85°C <sup>1</sup> | I | -40°C to +85°C <sup>2</sup> | G                                                                                                                           | -40°C to +105°C <sup>3</sup> |           | <table><tr><th>Code</th><th>Stability</th></tr><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><tr><td>5</td><td>±50ppm</td></tr></table> | Code   | Stability | 1      | ±10ppm                                                                                                                                                                                 | X | ±15ppm | 2           | ±20ppm | Y   | ±25ppm | 3   | ±30ppm | 5   | ±50ppm |      | <table><tr><th>Code</th><th>Frequency</th></tr><tr><td colspan="2">Frequency <sup>4</sup></td></tr></table>                                                                               | Code | Frequency   | Frequency <sup>4</sup> |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| Code                                                                                                                                                                                                                                                                                   | Temp. Range                  |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| C                                                                                                                                                                                                                                                                                      | -20°C to +70°C <sup>1</sup>  |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| D                                                                                                                                                                                                                                                                                      | -30°C to +85°C <sup>1</sup>  |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| I                                                                                                                                                                                                                                                                                      | -40°C to +85°C <sup>2</sup>  |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| G                                                                                                                                                                                                                                                                                      | -40°C to +105°C <sup>3</sup> |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| Code                                                                                                                                                                                                                                                                                   | Stability                    |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| 1                                                                                                                                                                                                                                                                                      | ±10ppm                       |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| X                                                                                                                                                                                                                                                                                      | ±15ppm                       |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| 2                                                                                                                                                                                                                                                                                      | ±20ppm                       |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| Y                                                                                                                                                                                                                                                                                      | ±25ppm                       |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| 3                                                                                                                                                                                                                                                                                      | ±30ppm                       |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| 5                                                                                                                                                                                                                                                                                      | ±50ppm                       |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| Code                                                                                                                                                                                                                                                                                   | Frequency                    |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| Frequency <sup>4</sup>                                                                                                                                                                                                                                                                 |                              |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
|                                                                                                                                                                                                                                                                                        |                              |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| <table><tr><th>Code</th><th>Tolerance</th></tr><tr><td>1</td><td>±10ppm</td></tr><tr><td>X</td><td>±15ppm</td></tr><tr><td>2</td><td>±20ppm</td></tr></table>                                                                                                                          |                              | Code              | Tolerance             | 1                | ±10ppm                      | X | ±15ppm                      | 2 | ±20ppm                      | <table><tr><th>Code</th><th>Tolerance</th></tr><tr><td>Y</td><td>±25ppm</td></tr><tr><td>3</td><td>±30ppm</td></tr></table> | Code                         | Tolerance | Y                                                                                                                                                                                                                                                                   | ±25ppm | 3         | ±30ppm | <table><tr><th>Code</th><th>Capacitance</th></tr><tr><td>V</td><td>7pF</td></tr><tr><td>K</td><td>8pF</td></tr><tr><td>J</td><td>9pF</td></tr><tr><td>A</td><td>10pF</td></tr></table> |   | Code   | Capacitance | V      | 7pF | K      | 8pF | J      | 9pF | A      | 10pF | <table><tr><th>Code</th><th>Capacitance</th></tr><tr><td>L</td><td>12pF</td></tr><tr><td>B</td><td>13pF</td></tr><tr><td>C</td><td>16pF</td></tr><tr><td>D</td><td>18pF</td></tr></table> | Code | Capacitance | L                      | 12pF | B | 13pF | C | 16pF | D | 18pF | <table><tr><th>Code</th><th>Capacitance</th></tr><tr><td>E</td><td>20pF</td></tr><tr><td>F</td><td>24pF</td></tr><tr><td>G</td><td>30pF</td></tr><tr><td>S</td><td>Series</td></tr></table> | Code | Capacitance | E | 20pF | F | 24pF | G | 30pF | S | Series |
| Code                                                                                                                                                                                                                                                                                   | Tolerance                    |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| 1                                                                                                                                                                                                                                                                                      | ±10ppm                       |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| X                                                                                                                                                                                                                                                                                      | ±15ppm                       |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| 2                                                                                                                                                                                                                                                                                      | ±20ppm                       |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| Code                                                                                                                                                                                                                                                                                   | Tolerance                    |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| Y                                                                                                                                                                                                                                                                                      | ±25ppm                       |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| 3                                                                                                                                                                                                                                                                                      | ±30ppm                       |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| Code                                                                                                                                                                                                                                                                                   | Capacitance                  |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| V                                                                                                                                                                                                                                                                                      | 7pF                          |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| K                                                                                                                                                                                                                                                                                      | 8pF                          |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| J                                                                                                                                                                                                                                                                                      | 9pF                          |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| A                                                                                                                                                                                                                                                                                      | 10pF                         |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| Code                                                                                                                                                                                                                                                                                   | Capacitance                  |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| L                                                                                                                                                                                                                                                                                      | 12pF                         |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| B                                                                                                                                                                                                                                                                                      | 13pF                         |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| C                                                                                                                                                                                                                                                                                      | 16pF                         |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| D                                                                                                                                                                                                                                                                                      | 18pF                         |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| Code                                                                                                                                                                                                                                                                                   | Capacitance                  |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| E                                                                                                                                                                                                                                                                                      | 20pF                         |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| F                                                                                                                                                                                                                                                                                      | 24pF                         |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| G                                                                                                                                                                                                                                                                                      | 30pF                         |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |
| S                                                                                                                                                                                                                                                                                      | Series                       |                   |                       |                  |                             |   |                             |   |                             |                                                                                                                             |                              |           |                                                                                                                                                                                                                                                                     |        |           |        |                                                                                                                                                                                        |   |        |             |        |     |        |     |        |     |        |      |                                                                                                                                                                                           |      |             |                        |      |   |      |   |      |   |      |                                                                                                                                                                                             |      |             |   |      |   |      |   |      |   |        |

Notes:

- 1] Available with all stability codes.
- 2] Available with stability codes X, 2, Y, 3 and 5.
- 3] Available with stability codes 3 and 5.
- 4] Frequency is recorded with 2 leading digits before the "M" and 5 significant digits after the "M" [including zeroes].  
(Ex. XXMXXXX [16M38400], XXMXXXX [22M11840], XXMXXXX [14M31818])

**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 | +25 | +70  | °C   |
|                       |           |            | -30 |     | +85  |      |
|                       |           |            | -40 |     | +85  |      |
|                       |           |            | -40 |     | +105 |      |
| Storage Temperature   | $T_{STG}$ | -          | -55 | -   | +125 | °C   |

### Frequency Stability

| PARAMETER           | SYMBOL            | CONDITIONS                  | MIN                      | TYP          | MAX | UNIT |
|---------------------|-------------------|-----------------------------|--------------------------|--------------|-----|------|
| Frequency Range     | $f_o$             | Fundamental Mode            |                          | 6.76438 - 54 |     | 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

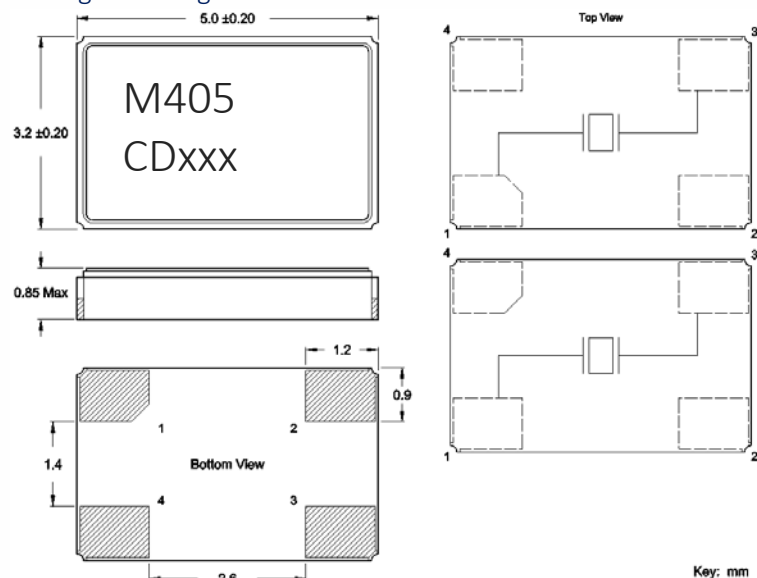
| PARAMETER             | SYMBOL | CONDITIONS          | MIN | TYP                      | MAX | UNIT     |
|-----------------------|--------|---------------------|-----|--------------------------|-----|----------|
| Operating Mode        | -      | -                   |     | Fundamental              |     | -        |
| Crystal Cut           | -      | -                   |     | AT-Cut Strip             |     | -        |
| Load Capacitance      | $C_L$  | -                   |     | See Ordering Information |     | pF       |
| Shunt Capacitance     | $C_o$  | -                   | -   | 3.0                      | 5.0 | pF       |
| Series Resistance     |        |                     |     |                          |     |          |
| Fundamental           | $R_1$  | 6.76438MHz - <12MHz | -   | -                        | 100 | $\Omega$ |
|                       |        | 12MHz - <14MHz      | -   | -                        | 60  |          |
|                       |        | 14MHz - <20MHz      | -   | -                        | 50  |          |
|                       |        | 20MHz - 54MHz       | -   | -                        | 40  |          |
| Drive Level           | DL     | -                   | -   | 10                       | 300 | μW       |
| Insulation Resistance | $R_i$  | +100Vdc ±15Vdc      | 500 | -                        | -   | MΩ       |

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

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

## Mechanical Specifications

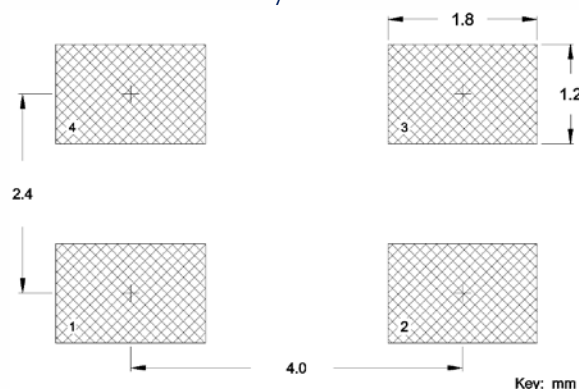
### Package Drawing



### Marking Information

1. M405 – CTS model.
  2. C – CTS.
  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

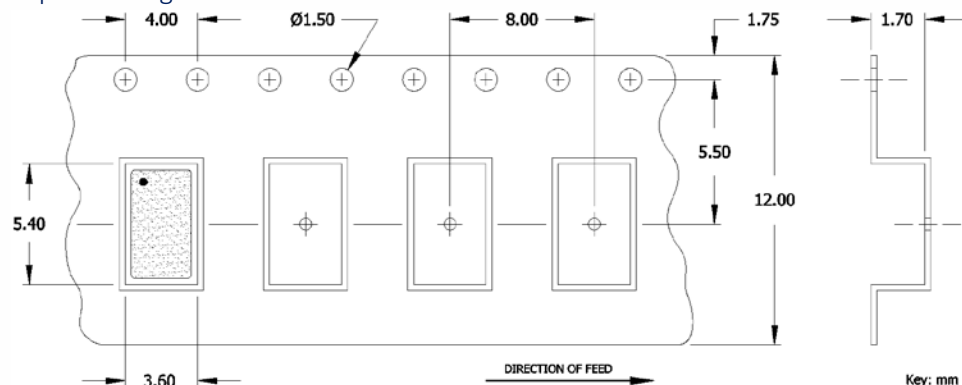
1. JEDEC termination code (e4). Barrier-plating is nickel [Ni] with gold [Au] flash plate.
2. Terminations #2, #4 and the metal lid are connected internally. End user may connect these pins to circuit ground for EMI suppression.
3. Due to package variability, the pad chamfer on the bottom could be located on Pin 1 or 4 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

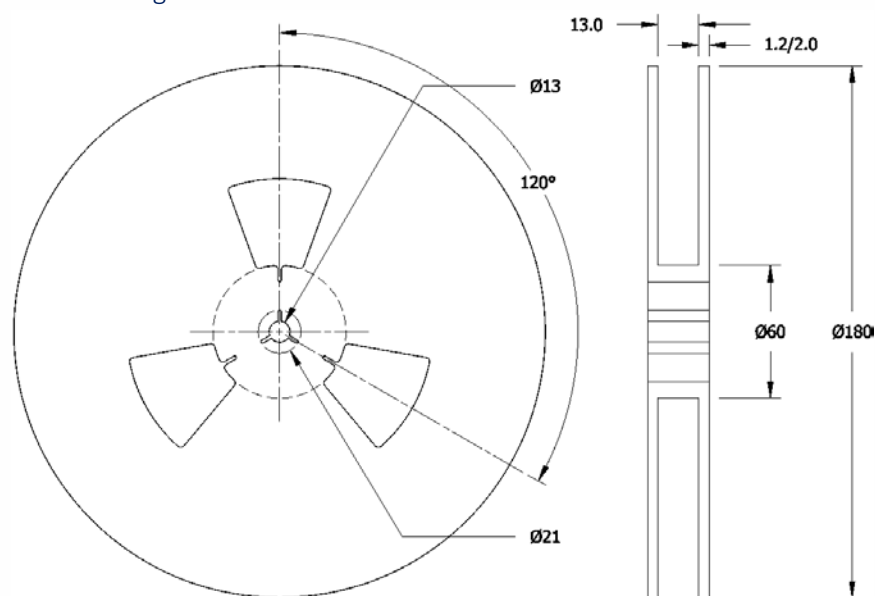
| MONTH |      |      |      |      | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|-------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| YEAR  |      |      |      |      |     |     |     |     |     |     |     |     |     |     |     |     |
| 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 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 |
|-----------|----------------|-----------|----------------|-----------|----------------|-----------|----------------|
| 12.000000 | 120            | 8.000000  | 080            | 18.000000 | 180            | 30.328000 | 303            |
| 13.560000 | 13C            | 8.192000  | 081            | 18.432000 | 184            | 30.400000 | 304            |
| 16.000000 | 160            | 10.000000 | 100            | 19.000000 | 190            | 30.720000 | 307            |
| 19.200000 | 192            | 11.059200 | 111            | 19.440000 | 194            | 31.250000 | 312            |
| 20.000000 | 200            | 12.288000 | 122            | 19.660800 | 19B            | 32.768000 | 327            |
| 24.000000 | 240            | 12.500000 | 125            | 19.680000 | 196            | 33.000000 | 330            |
| 25.000000 | 250            | 12.800000 | 128            | 19.800000 | 198            | 33.330000 | 333            |
| 26.000000 | 260            | 12.996000 | 12C            | 20.480000 | 204            | 33.333000 | 33E            |
| 27.120000 | 271            | 13.000000 | 130            | 20.736000 | 207            | 33.333300 | 33A            |
| 30.000000 | 300            | 13.500000 | 135            | 22.000000 | 220            | 33.868800 | 338            |
| 32.000000 | 320            | 13.553750 | 13B            | 22.118400 | 221            | 35.000000 | 350            |
| 37.400000 | 374            | 13.824000 | 138            | 22.579200 | 225            | 35.328000 | 353            |
| 38.400000 | 384            | 14.000000 | 140            | 24.305000 | 243            | 36.000000 | 360            |
| 40.000000 | 400            | 14.318180 | 143            | 24.545400 | 24F            | 38.000000 | 380            |
| 48.000000 | 480            | 14.400000 | 144            | 24.545454 | 24G            | 38.880000 | 388            |
| 52.000000 | 520            | 14.745600 | 147            | 24.553500 | 24B            | 39.062500 | 39A            |
|           |                | 15.360000 | 153            | 24.576000 | 24C            | 41.600000 | 41C            |
|           |                | 16.367600 | 16E            | 25.000625 | 25A            | 44.000000 | 440            |
|           |                | 16.368000 | 16C            | 26.041660 | 26F            | 45.000000 | 450            |
|           |                | 16.384000 | 163            | 27.000000 | 270            | 49.152000 | 491            |
|           |                | 16.666000 | 166            | 28.224000 | 282            | 50.000000 | 500            |
|           |                | 16.666700 | 16N            | 28.322000 | 28C            | 54.000000 | 540            |
|           |                | 16.667000 | 16P            | 28.375000 | 283            |           |                |
|           |                | 16.800000 | 168            | 28.636360 | 286            |           |                |
|           |                | 16.934400 | 169            | 29.491200 | 29B            |           |                |