



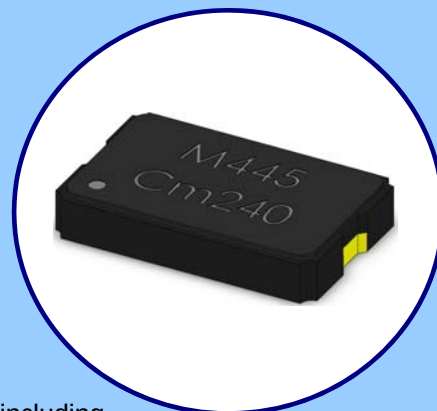
# THE DATASHEET OF 445I23G25M00000

# MODEL 445

## SURFACE MOUNT QUARTZ CRYSTAL

## FEATURES

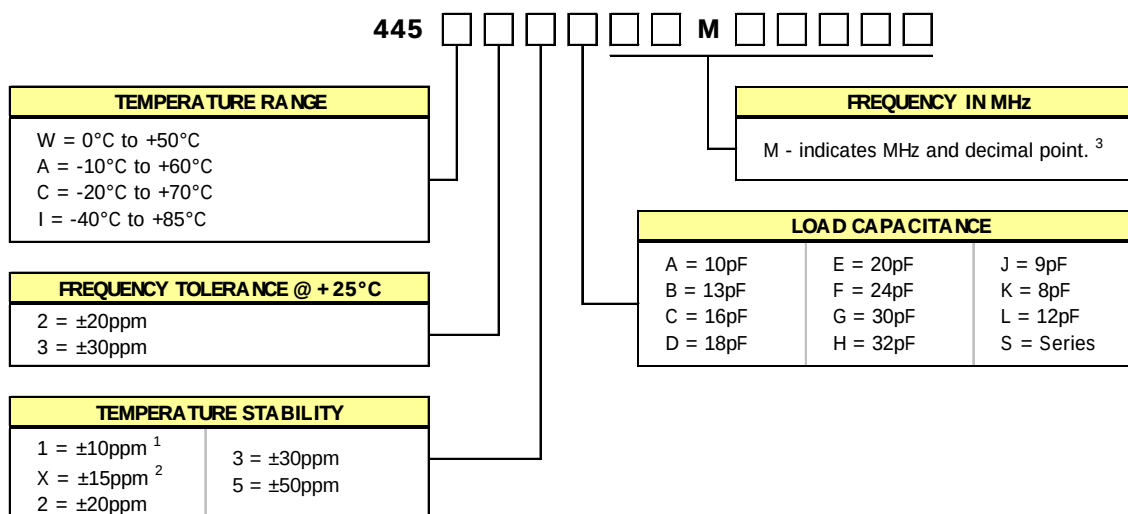
- **Standard 5.0mm x 3.2mm Glass Seal Package**
- **Fundamental Crystal Design**
- **Frequency Range 8 – 50MHz**
- **Frequency Tolerance,  $\pm 20\text{ppm}$  Standard** [other tolerances available]
- **Frequency Stability,  $\pm 30\text{ppm}$  Standard** [other stabilities available]
- **Operating Temperature to  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$**
- **Tape & Reel Packaging Standard, EIA-481**
- **RoHS Compliant in Accordance with EU Directive 2011/65/EU**
  - Lead-Free Termination Finish
  - Exemption 7(c)-1, Electrical and electronic components containing lead [Pb] in glass



## APPLICATIONS

Model 445 is a low cost device used in a wide range of commercial applications including notebooks, computer peripherals, audio visual, Bluetooth and USB interfaces, PDAs, and automotive electronics.

## ORDERING INFORMATION

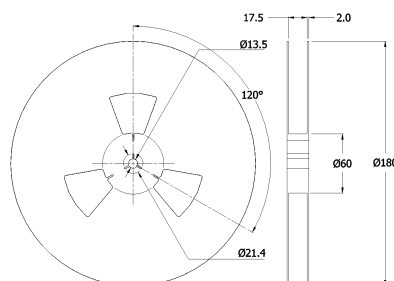
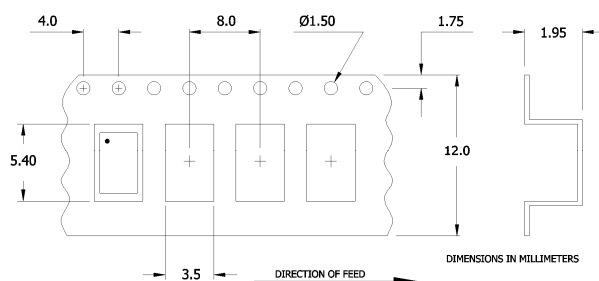


1. Only available with temperature range codes "W" and "A".
2. Only available with temperature range codes "W", "A" and "C".
3. Frequency is recorded with two leading digits before the 'M' and 5 significant digits after the 'M' [including zeros].

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

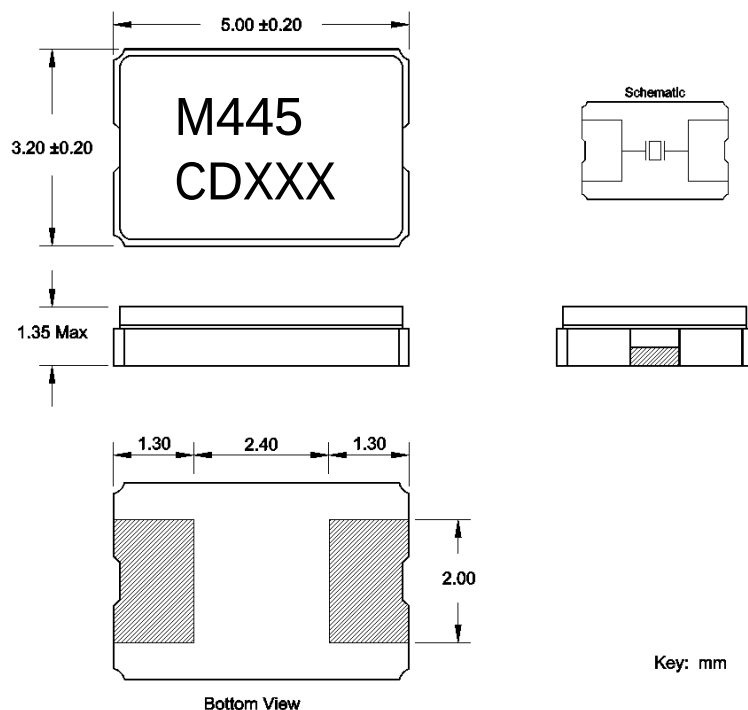
## PACKAGING INFORMATION [For Reference]

Factory may package reels in quantities of 1k pcs. or 3k pcs. Reel size is 180mm.



**ELECTRICAL CHARACTERISTICS**

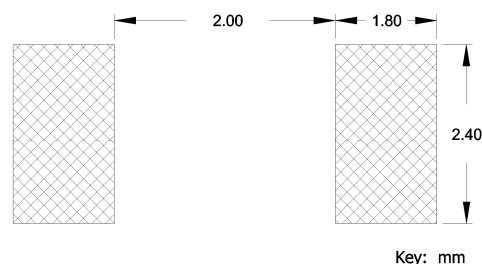
| ELECTRICAL PARAMETERS | PARAMETER                                                                                  | VALUE                                     |                |
|-----------------------|--------------------------------------------------------------------------------------------|-------------------------------------------|----------------|
|                       | Frequency Range                                                                            | 8MHz to 50MHz                             |                |
|                       | Operating Mode                                                                             | Fundamental                               |                |
|                       | Crystal Cut                                                                                | AT-Cut                                    |                |
|                       | Frequency Tolerance @ +25°C                                                                | ±20ppm, ±30ppm                            |                |
|                       | Frequency Stability Tolerance<br>[Operating Temperature Range, Referenced to 25°C Reading] | ±10ppm, ±15ppm,<br>±20ppm, ±30ppm, ±50ppm |                |
|                       | Operating Temperature Ranges                                                               | 0°C to +50°C                              | -10°C to +60°C |
|                       |                                                                                            | -20°C to +70°C                            | -40°C to +85°C |
|                       | Equivalent Series Resistance [Maximum]                                                     | 8MHz - <12MHz                             | 100 Ohms       |
|                       |                                                                                            | 12MHz - <16MHz                            | 50 Ohms        |
|                       |                                                                                            | 16MHz - <30MHz                            | 40 Ohms        |
|                       |                                                                                            | 30MHz - <50MHz                            | 30 Ohms        |
|                       | Load Capacitance or Resonance Mode                                                         | See Ordering Information                  |                |
|                       | Shunt Capacitance [C <sub>0</sub> ]                                                        | 5.0pF Typical, 7.0pF Maximum              |                |
|                       | Drive Level                                                                                | 10µW Min., 100µW Typ., 300µW Max.         |                |
|                       | Aging @ +25°C                                                                              | ±3ppm/yr Typical                          |                |
|                       | Storage Temperature Range                                                                  | -40°C to +85°C                            |                |

**MECHANICAL SPECIFICATIONS**
**PACKAGE DRAWING**

**MARKING INFORMATION**

1. M445 - CTS Model Series.
  2. C - CTS.
  3. D - Date code. See Table I for codes.
  4. XXX - Frequency code.
- Reference CTS document 016-1454-0.

**NOTES**

1. Complete CTS part number, frequency value, date code and manufacturing site code information must appear on reel and carton labels.
2. JEDEC termination code (e4). Barrier plating is nickel [Ni] with gold [Au] flash plate.
3. Reflow conditions per JEDEC J-STD-020; 260°C maximum, 10 seconds.
4. MSL - 1.

**SUGGESTED SOLDER PAD GEOMETRY**

**TABLE I - DATE CODE**

| YEAR |      |      |      |      | MONTH |     |     |     |     |     |     |     |     |     |     |     |
|------|------|------|------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|      |      |      |      |      | JAN   | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
| 2001 | 2005 | 2009 | 2013 | 2017 | A     | B   | C   | D   | E   | F   | G   | H   | J   | K   | L   | M   |
| 2002 | 2006 | 2010 | 2014 | 2018 | N     | P   | Q   | R   | S   | T   | U   | V   | W   | X   | Y   | Z   |
| 2003 | 2007 | 2011 | 2015 | 2019 | a     | b   | c   | d   | e   | f   | g   | h   | j   | k   | l   | m   |
| 2004 | 2008 | 2012 | 2016 | 2020 | n     | p   | q   | r   | s   | t   | u   | v   | w   | x   | y   | z   |