

## FEATURES

- **Clipped Sine Wave Output**
- **Optional Voltage Control for Frequency Tuning [VCTCXO]**
- 2.5mmx2.0mm Surface Mount Package
- Frequency Range 10 – 52 MHz [Standard Frequencies List Shown Below]
- Fundamental Crystal Design
- Frequency Stability, several options to choose from  $\pm 0.5\text{ppm} \sim \pm 2.5\text{ppm}$
- Operating Voltage, +1.8Vdc  $\sim$  +2.5Vdc
- Operating Temperature to -40°C to +85°C
- Tape & Reel Packaging Available
- **RoHS/Green Compliant (6/6)**



## APPLICATIONS

The Model 520 Temperature Compensated Crystal Oscillator (TCXO) is a quartz based, clipped sine wave output, with optional frequency tuning, in a hermetically sealed ceramic package. M520 is suitable for wireless communications, broadband access, WLAN/WiMax/WIFI, portable equipment, test and measurement and mobile applications.

## ORDERING INFORMATION



\* Frequency vs. Temperature Only

1] Only available with temperature range codes "H" and "C".

2] Only available with temperature range codes "H", "C" and "D".

3] Frequency is recorded with two leading digits before the 'M' and 4 significant digits after the 'M' (including zeros).

[Ex. XXMXXXX (10M0000), XXMXXXX (16M3840)]

4] See Electrical Characteristics for Control Voltage range per Supply Voltage selected.

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

| M520 Standard Frequencies |           |           |           |           |
|---------------------------|-----------|-----------|-----------|-----------|
| 13.000000                 | 16.368000 | 19.200000 | 26.000000 | 40.000000 |
| 16.367667                 | 16.369000 | 20.000000 | 38.400000 |           |

**ELECTRICAL CHARACTERISTICS**

| ELECTRICAL PARAMETERS | PARAMETER                                                                                                         | SYMBOL         | CONDITIONS                                                                   | MIN                                  | TYP                             | MAX                                     | UNIT   |
|-----------------------|-------------------------------------------------------------------------------------------------------------------|----------------|------------------------------------------------------------------------------|--------------------------------------|---------------------------------|-----------------------------------------|--------|
|                       | Maximum Supply Voltage                                                                                            | $V_{CC}$       | -                                                                            | -0.5                                 | -                               | 6.0                                     | V      |
|                       | Maximum Control Voltage                                                                                           | $V_C$          | -                                                                            | -0.5                                 | -                               | $V_{CC}$                                | V      |
|                       | Storage Temperature                                                                                               | $T_{STG}$      | -                                                                            | -40                                  | -                               | 85                                      | °C     |
|                       | Frequency Range                                                                                                   | $f_0$          | Std frequencies listed in Ordering Information                               | 10                                   | -                               | 52                                      | MHz    |
|                       | Frequency Stability                                                                                               | $\Delta f/f_0$ | Frequency vs. Temperature Only                                               | 0.5, 1.0, 1.5<br>2.0, 2.5            |                                 |                                         | ± ppm  |
|                       | Frequency Stability<br>vs. Initial Calibration<br>vs. Supply Voltage<br>vs. Load<br>vs. Reflow Shift<br>vs. Aging | -              | @25°C<br>±5% change<br>±10% change<br>After 2 reflows<br>1st year<br>10 year | -                                    | -                               | 2.0<br>0.2<br>0.2<br>2.0<br>1.0<br>10.0 | ± ppm  |
|                       | Operating Temperature<br>Order Code 'W'<br>Order Code 'H'<br>Order Code 'C'<br>Order Code 'D'<br>Order Code 'I'   | $T_A$          | -                                                                            | 0<br>-10<br>-20<br>-30<br>-40        | 25                              | 55<br>60<br>70<br>85<br>85              | °C     |
|                       | Supply Voltage<br>Order Code 'M'<br>Order Code 'N'<br>Order Code 'T'<br>Order Code 'R'<br>Order Code 'L'          | $V_{CC}$       | ±5%                                                                          | 1.77<br>2.38<br>2.66<br>2.85<br>3.14 | 1.8<br>2.5<br>2.8<br>3.0<br>3.3 | 1.83<br>2.63<br>2.94<br>3.15<br>3.47    | V      |
|                       | Supply Current                                                                                                    | $I_{CC}$       | 10.00 MHz - 25.99 MHz<br>26.00 MHz - 52.00 MHz                               | -                                    | -                               | 2<br>2.5                                | mA     |
|                       | Control Voltage                                                                                                   | $V_C$          | 2.5V, 2.8V, 3.0V, 3.3V<br>1.8V                                               | 0.4<br>0.3                           | 1.5<br>0.9                      | 2.4<br>1.5                              | V      |
|                       | Frequency Tuning [VCTCXO Only]                                                                                    | -              | Specified $V_C$ Range                                                        | 5.0                                  | -                               | -                                       | ± ppm  |
|                       | $V_C$ Input Impedance                                                                                             | $ZV_C$         | -                                                                            | 500                                  | -                               | -                                       | kOhm   |
|                       | Output Waveform                                                                                                   |                | AC coupled Clipped Sinewave                                                  |                                      |                                 |                                         |        |
|                       | Output Voltage Levels                                                                                             | $V_0$          |                                                                              | 0.8                                  | -                               | -                                       | Vp-p   |
|                       | Output Load                                                                                                       | $R_L // C_L$   | -                                                                            | 10 kOhm // 10 pF                     |                                 |                                         |        |
|                       | Start Up Time                                                                                                     | $T_S$          | -                                                                            | -                                    | -                               | 2                                       | ms     |
|                       | Phase Noise                                                                                                       | -              | Varies based on output frequency. See example plot @ 19.2 MHz below.         |                                      |                                 |                                         | dBc/Hz |



## ELECTRICAL CHARACTERISTICS

### D.U.T. PIN ASSIGNMENTS

| PIN | SYMBOL   | DESCRIPTION                                     |
|-----|----------|-------------------------------------------------|
| 1   | $V_C$    | GND – TCXO [Note 1]<br>Control Voltage – VCTCXO |
| 2   | GND      | Circuit & Package Ground                        |
| 3   | Output   | Clipped Sine Wave Output [Note 2]               |
| 4   | $V_{CC}$ | Supply Voltage                                  |

### NOTES

1. Connect to ground for TCXO (no AFC) option.
2. DC-Cut Capacitor Required.  
Add 1000pF capacitor between TCXO output and input of load.

### TEST CIRCUIT – RL // CL LOAD



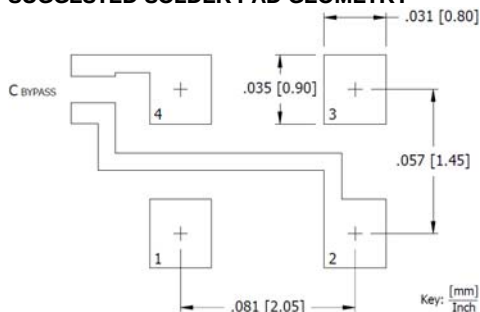
\* DC-Cut Capacitor

## MECHANICAL SPECIFICATIONS

### PACKAGE DRAWING



### SUGGESTED SOLDER PAD GEOMETRY



$C_{BYPASS}$  should be  $\geq 0.01 \mu F$ .

### MARKING INFORMATION

1. M520 - CTS Model Series.
2. • – Pin 1 identifier.
3. D – Date code. See Table I for codes.
4. XXX – Frequency code. Reference CTS document 016-1454-01.

Complete CTS part number, frequency value and date code information must appear on reel and carton labels.

### NOTES

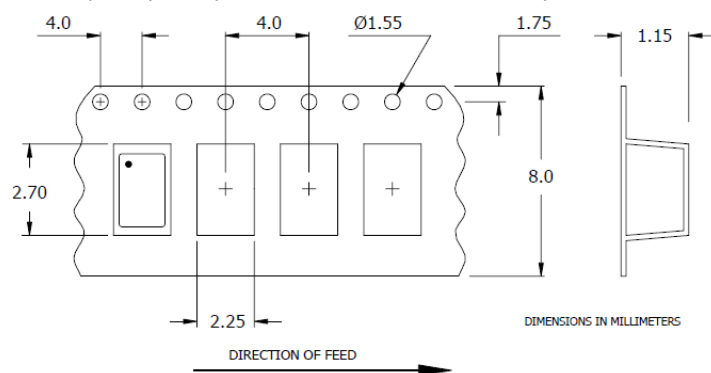
1. DO NOT make connections to non-labeled pins and castellations, as they may have internal connections used in the manufacturing process.
2. Termination pads (e4); barrier plating is nickel (Ni) with gold (Au) flash plate.
3. Reflow conditions per JEDEC J-STD-020, 260°C maximum.

TABLE I – DATE CODE

| YEAR |      |      |      |      | MONTH |     |     |     |     |     |     |     |     |     |     |     |
|------|------|------|------|------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2001 | 2002 | 2003 | 2004 | 2005 | 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   |

**PACKAGING INFORMATION [Reference]**

Device quantity is 1k pieces minimum and 3k maximum per 180mm reel.



## Данный компонент на территории Российской Федерации

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В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9