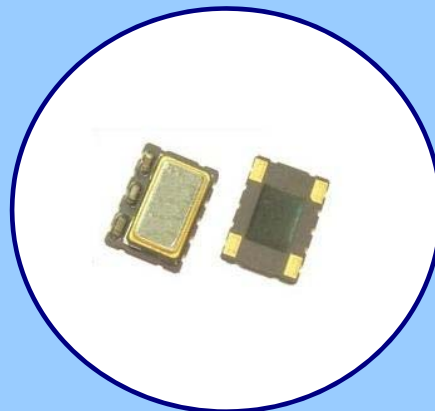


## FEATURES

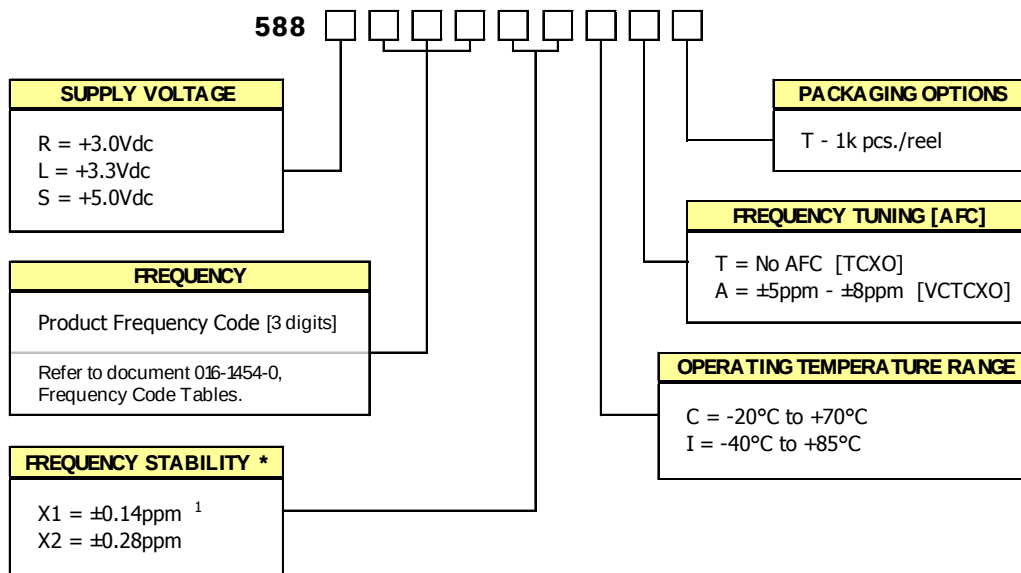
- **Clipped Sine Wave Output**
- **Optional Voltage Control for Frequency Tuning [VCTCXO]**
- 7.0mm x 5.0mm Surface Mount Package
- Frequency Range 5 – 52 MHz
- Fundamental Crystal Design
- Operating Voltage, +3.0Vdc, +3.3Vdc or +5.0Vdc
- Overall Frequency Stability  $\pm 4.6$ ppm
- Operating Temperature to -40°C to +85°C
- Tape & Reel Packaging Standard, EIA-418
- **RoHS/Green Compliant [6/6]**



## APPLICATIONS

The Model 588, a quartz based analog TCXO with Clipped Sine output and optional frequency tuning, is suitable for applications requiring Stratum 3 performance such as base stations, Microcells, Femtocells, 1588 and Synchronous Ethernet timing, wireless communications, test and measurement.

## ORDERING INFORMATION



\* Frequency vs. Temperature Only

<sup>1</sup> Only available with temperature range code "C".

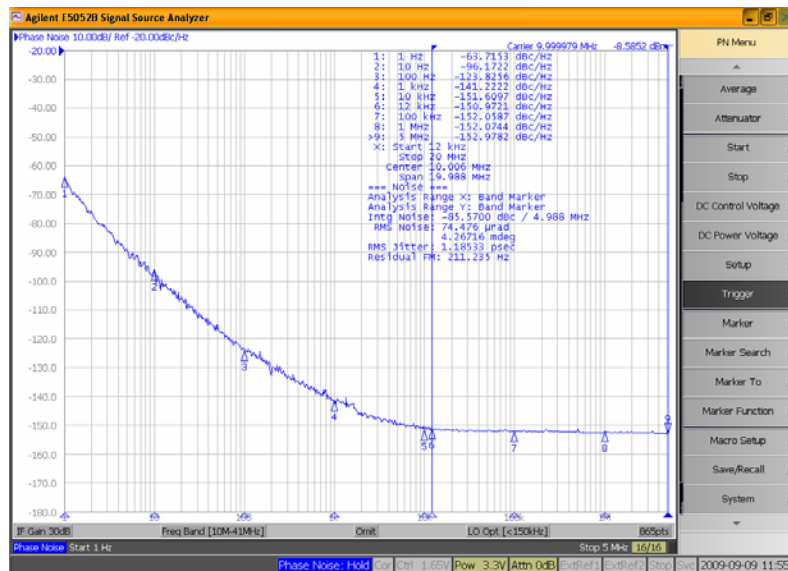
**Not all performance combinations and frequencies may be available.  
Contact your local CTS Representative or CTS Customer Service for availability.**

## ELECTRICAL CHARACTERISTICS

| PARAMETER                      | SYMBOL            | CONDITIONS                                    | MIN                | TYP | MAX                | UNIT   |
|--------------------------------|-------------------|-----------------------------------------------|--------------------|-----|--------------------|--------|
| Maximum Supply Voltage         | $V_{CC}$          | -                                             | -0.6               | -   | 6.0                | V      |
| Maximum Control Voltage        | $V_C$             | -                                             | -0.5               | -   | $V_{CC}$           | V      |
| Storage Temperature            | $T_{STG}$         | -                                             | -40                | -   | +100               | °C     |
| Operating Temperature          | $T_A$             | -                                             | -20                | +25 | +70                | °C     |
| Order Code 'C'                 |                   |                                               | -40                |     | +85                |        |
| Order Code 'I'                 |                   |                                               |                    |     |                    |        |
| Frequency Range                | $f_0$             | -                                             | 5                  | -   | 52                 | MHz    |
| Supply Voltage                 | $V_{CC}$          | ±5%                                           | 2.85               | 3.0 | 3.15               | V      |
| Order Code 'R'                 |                   |                                               | 3.14               | 3.3 | 3.47               |        |
| Order Code 'L'                 |                   |                                               | 4.75               | 5.0 | 5.25               |        |
| Order Code 'S'                 |                   |                                               |                    |     |                    |        |
| Supply Current                 | $I_{CC}$          | -                                             | -                  | -   | 3.5                | mA     |
| Frequency Stability            | $\Delta f/f_0$    | Reference to $f_0$ , Including 20 years aging | -                  | -   | 4.60               | ± ppm  |
| Overall Frequency Stability    |                   | @ +25°C, at time of shipment                  | -                  | -   | 1.00               |        |
| vs. Initial Calibration        |                   | [Fmax. - Fmin.]/2, over -40°C to +85°C        | -                  | -   | 0.28               |        |
| vs. Operating Temperature      |                   | [Fmax. - Fmin.]/2, over -20°C to +70°C        | -                  | -   | 0.14               |        |
| vs. Supply Voltage             |                   | ±5% change @ +25°C                            | -                  | -   | 0.40               |        |
| vs. Load                       | $\Delta f/f_{25}$ | ±5% change                                    | -                  | -   | 0.10               |        |
| vs. Aging                      |                   | 20 years @ +40°C                              | -                  | -   | 2.80               |        |
| Holdover                       | $\Delta f/f_0$    | [Fmax. - Fmin.]/2, over 24 hours              | -                  | -   | 0.32               |        |
| Control Voltage                | $V_C$             | -                                             | 0.5                | 1.5 | 2.5                | V      |
| Frequency Tuning [VCTCXO Only] | -                 | $V_C = 1.5V \pm 1.0V$ , monotonic positive    | 5 - 8              |     |                    | ± ppm  |
| $V_C$ Input Impedance          | $Z_{V_C}$         | -                                             | 100                | -   | -                  | kOhm   |
| Output Waveform                |                   | AC coupled Clipped Sinewave                   |                    |     |                    |        |
| Output Voltage Levels          |                   |                                               | 0.8                | -   | -                  | Vp-p   |
| Output Load                    | $R_L // C_L$      | -                                             | 10kOhm // 10pF     |     |                    |        |
| Output Duty Cycle              | SYM               | @ 50% Level                                   | 45                 | -   | 55                 | %      |
| Start Up Time                  | $T_S$             | -                                             | -                  | -   | 2                  | ms     |
| Enable Function                |                   |                                               |                    |     |                    |        |
| Enable Input Voltage           | $V_{IH}$          | Pin 8 Logic '1', Output Enabled               | $0.7 \cdot V_{CC}$ | -   | -                  | V      |
| Disable Input Voltage          | $V_{IL}$          | Pin 8 Logic '0', Output Disabled [High Imp]   | -                  | -   | $0.3 \cdot V_{CC}$ |        |
| Phase Noise <sup>1</sup>       | -                 | -                                             |                    |     |                    | dBc/Hz |

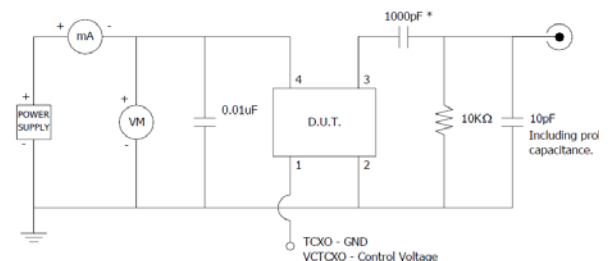
Notes:

1. Phase Noise performance may vary based on output frequency. See example plot at 10 MHz below.



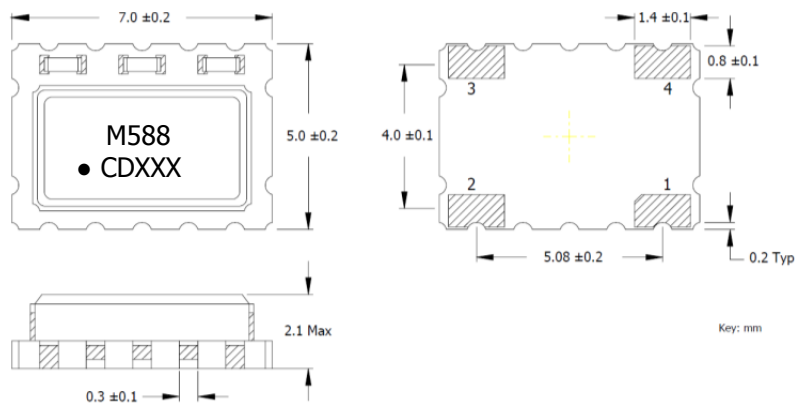
### TEST CIRCUIT – Clipped Sine Load

\* DC-Cut Capacitor: Add 1000pF capacitor between the TCXO output and input of load.

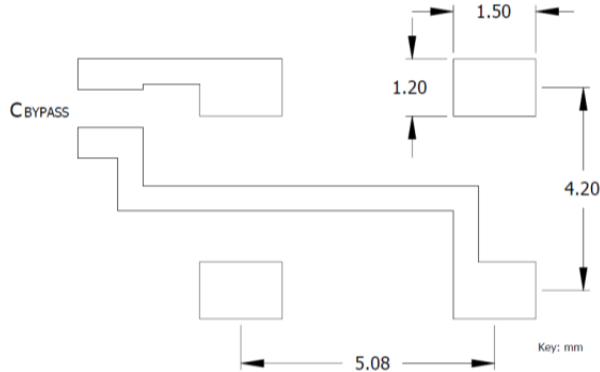


## MECHANICAL SPECIFICATIONS

### PACKAGE DRAWING



### SUGGESTED SOLDER PAD GEOMETRY



### MARKING INFORMATION

1. M588 – CTS Model Series.
  2. • – Pin 1 identifier.
  3. C – CTS identifier.
  4. D – Date code. See Table II for codes.
  6. xxx – Frequency Code.
- Refer to document 016-1454-0, Frequency Code Tables.

### NOTES

1. DO NOT make connections to non-labeled pins or 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.
4. MSL = 1.

### D.U.T. PIN ASSIGNMENTS

| PIN | SYMBOL          | DESCRIPTION                                     |
|-----|-----------------|-------------------------------------------------|
| 1   | V <sub>C</sub>  | Control Voltage – VCTCXO [Note 1]<br>GND - TCXO |
| 2   | GND             | Circuit & Package Ground                        |
| 3   | Output          | Clipped Sine Wave Output                        |
| 4   | V <sub>CC</sub> | Supply Voltage                                  |

### NOTES

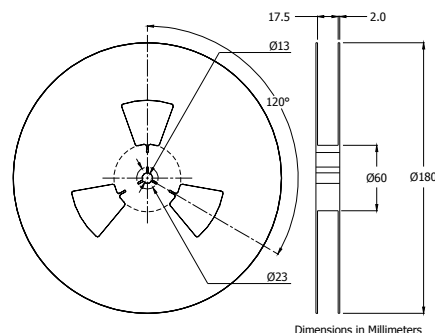
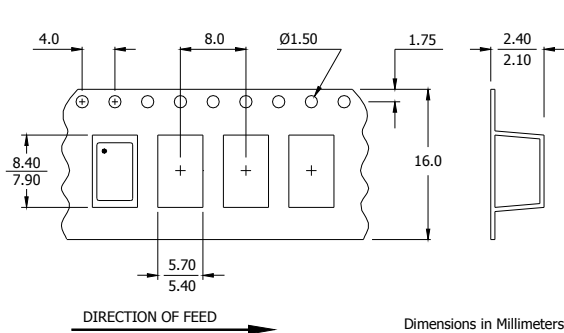
1. Connect to ground for TCXO [no AFC] option.
2. DC-Cut Capacitor Required.  
Add 1000pF capacitor between TCXO output and input of load.

TABLE II – DATE CODE

| MONTH |     |     |     |     | YEAR |     |     |     |     |     |     |      |      |      |      |      |
|-------|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|------|------|------|------|------|
| JAN   | FEB | MAR | APR | MAY | JUN  | JUL | AUG | SEP | OCT | NOV | DEC | 2001 | 2002 | 2003 | 2004 | 2005 |
| A     | B   | C   | D   | E   | F    | G   | H   | J   | K   | L   | M   | 2006 | 2007 | 2008 | 2009 | 2010 |
| N     | P   | Q   | R   | S   | T    | U   | V   | W   | X   | Y   | Z   | 2011 | 2012 | 2013 | 2014 | 2015 |
| a     | b   | c   | d   | e   | f    | g   | h   | j   | k   | l   | m   | 2016 | 2017 | 2018 | 2019 | 2020 |
| n     | p   | q   | r   | s   | t    | u   | v   | w   | x   | y   | z   | 2021 | 2022 | 2023 | 2024 | 2025 |

## PACKAGING INFORMATION [reference]

Device quantity is 1k pcs. maximum per 180mm reel.



Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

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Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

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Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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