



# Model CB3 & CB3LV

## HCMOS/TTL Clock Oscillator

### Features

- Ceramic Surface Mount Package
- Fundamental and 3<sup>rd</sup> Overtone Crystal Designs
- Frequency Range 1.0 – 200MHz \*
- +3.3V and +5.0V Operation
- Operating Temperature Range to -40°C to +85°C
- Output Enable Standard
- Tape and Reel Packaging, EIA-418



Part Dimensions:  
7.0 × 5.0 × 1.8mm • 171.497mg

#### Standard Frequencies

\* See Page 6 for common frequencies.  
Check with factory for availability of frequencies not listed.

### Applications

- Internet of Things [IoT, IIoT]
- Microcontrollers and FPGAs
- Wireless Communication
- Networking Equipment
- Data Communications
- Computers and Peripherals
- Ethernet/GbE/SyncE
- Portable Devices
- Test and Measurement

### Description

CTS Model CB3 and CB3LV are low cost, low voltage clock oscillators supporting HCMOS output. Employing the latest IC technology, CB3/CB3LV have excellent stability and low phase jitter performance.

### Ordering Information

| Model                  | Supply Voltage |                          | Frequency Stability |                            | Temperature Range |                                     | Frequency Code [MHz] |
|------------------------|----------------|--------------------------|---------------------|----------------------------|-------------------|-------------------------------------|----------------------|
| CB3                    | LV             | -                        | 3                   |                            | C                 | -                                   | XXXMXXXXXX           |
| <div>CodeVoltage</div> |                |                          |                     | <div>CodeTemp. Range</div> |                   |                                     |                      |
| LV+3.3Vdc              |                |                          |                     | C-20°C to +70°C            |                   |                                     |                      |
| Blank+5.0Vdc           |                |                          |                     | I-40°C to +85°C            |                   |                                     |                      |
|                        |                | <div>CodeStability</div> |                     |                            |                   | <div>CodeFrequency</div>            |                      |
|                        |                | 6±20ppm <sup>1</sup>     |                     |                            |                   | Product Frequency Code <sup>3</sup> |                      |
|                        |                | 5±25ppm                  |                     |                            |                   |                                     |                      |
|                        |                | 7±32ppm <sup>2</sup>     |                     |                            |                   |                                     |                      |
|                        |                | 3±50ppm                  |                     |                            |                   |                                     |                      |
|                        |                | 2±100ppm <sup>2</sup>    |                     |                            |                   |                                     |                      |

#### Notes:

- 1) Consult factory for availability of 6I Stability/Temperature combination.
- 2) These stabilities are not recommended for new designs.
- 3) Frequency is recorded with 1, 2 or 3 leading significant digits before and 6 significant digits [including zeroes] after the "M".  
[Ex. 3.579545MHz = 3M57954, 14.31818MHz = 14M318180, 25MHz = 25M000000, 125MHz = 125M000000]  
[Ex. part numbers - CB3LV-3C-25M000000, CB3-3C-14M318180]
- 4) CTS Distributors may add a -T or -1 at the end of the part number to indicate Tape and Reel packaging.

**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 |
|------------------------|-----------|--------------------------------------------------|--------------|------------|--------------|------|
| Maximum Supply Voltage | $V_{CC}$  | -                                                | -0.5         | -          | 7.0          | V    |
| Supply Voltage         | $V_{CC}$  | $\pm 10\%$                                       | 2.97<br>4.50 | 3.3<br>5.0 | 3.63<br>5.50 | V    |
| Supply Current         |           | Frequency Range @ Tested load for typical values |              |            |              |      |
| CB3                    | $I_{CC}$  | 1.0MHz to 20MHz @ $C_L = 30\text{pF}$            | -            | 10         | 25           | mA   |
|                        |           | 20.001MHz to 80MHz @ $C_L = 30\text{pF}$         | -            | 30         | 50           |      |
|                        |           | 80.001MHz to 107MHz @ $C_L = 15\text{pF}$        | -            | 40         | 70           |      |
| CB3LV                  |           | 1.0MHz to 20MHz @ $CL = 15\text{pF}$             | -            | 7          | 12           |      |
|                        |           | 20.001MHz to 80MHz @ $CL = 15\text{pF}$          | -            | 20         | 35           |      |
|                        |           | 80.001MHz to 200MHz @ $CL = 15\text{pF}$         | -            | 30         | 60           |      |
| Output Load            | $C_L$     | 1.0MHz to 50MHz                                  | -            | 30         | 50           | pF   |
|                        |           | 50.001MHz to 80MHz                               | -            | 15         | 30           |      |
|                        |           | 80.001MHz to 200MHz                              | -            | -          | 15           |      |
| Operating Temperature  | $T_A$     | -                                                | -20<br>-40   | +25        | +70<br>+85   | °C   |
| Storage Temperature    | $T_{STG}$ | -                                                | -55          | -          | +125         | °C   |

## Frequency Stability

| PARAMETER                       | SYMBOL            | CONDITIONS                           | MIN | TYP          | MAX | UNIT |
|---------------------------------|-------------------|--------------------------------------|-----|--------------|-----|------|
| Frequency Range                 | $f_O$             | CB3                                  |     | 1.0 - 107    |     | MHz  |
|                                 |                   | CB3LV                                |     | 1.0 - 200    |     |      |
| Frequency Stability<br>[Note 1] | $\Delta f/f_O$    | -                                    |     | 20, 25 or 50 |     | ±ppm |
| Aging                           | $\Delta f/f_{25}$ | First Year @ +25°C, nominal $V_{CC}$ | -5  | ±3           | 5   | ppm  |

1.] Inclusive of initial tolerance at time of shipment, changes in supply voltage, load, temperature and 1st year aging.

## Output Parameters

| PARAMETER                      | SYMBOL     | CONDITIONS                                                         | MIN             | TYP   | MAX         | UNIT |
|--------------------------------|------------|--------------------------------------------------------------------|-----------------|-------|-------------|------|
| Output Type                    | -          | -                                                                  |                 | HCMOS |             | -    |
| Output Voltage Levels          | $V_{OH}$   | Logic '1' Level, CMOS Load                                         | $0.9V_{CC}$     | -     | -           | V    |
|                                |            | Logic '1' Level, TTL Load                                          | $V_{CC} - 0.6V$ | -     | -           |      |
|                                | $V_{OL}$   | Logic '0' Level, CMOS Load                                         | -               | -     | $0.1V_{CC}$ |      |
|                                |            | Logic '0' Level, TTL Load                                          | -               | -     | 0.4         |      |
| Output Current Levels          | $I_{OH}$   | $V_{OH} = +2.2V/+3.9V$ $V_{CC} = +3.0V/+4.5V$                      | -               | -     | -8, -16     | mA   |
|                                | $I_{OL}$   | $V_{OL} = 0.4V$ $V_{CC} = +3.0V, +4.5V$                            | -               | -     | +8, +16     |      |
| Output Duty Cycle              | SYM        | @ 50% Level                                                        | 45              | -     | 55          | %    |
| Rise and Fall Time<br>[Note 2] |            | @ 10%/90% Levels, Frequency Range @ Tested load for typical values |                 |       |             |      |
| CB3                            | $T_R, T_F$ | 1.0MHz to 20MHz @ $C_L = 30\text{pF}$                              | -               | 8     | 10          | ns   |
|                                |            | 20.001MHz to 80MHz @ $C_L = 30\text{pF}$                           | -               | 5     | 8           |      |
|                                |            | 80.001MHz to 107MHz @ $C_L = 15\text{pF}$                          |                 | 2.5   | 5           |      |
| CB3LV                          |            | 1.0MHz to 20MHz @ $CL = 15\text{pF}$                               |                 | 6     | 8           |      |
|                                |            | 20.001MHz to 80MHz @ $CL = 15\text{pF}$                            |                 | 3     | 5           |      |
|                                |            | 80.001MHz to 200MHz @ $CL = 15\text{pF}$                           | -               | 1.5   | 3           |      |
| Start Up Time                  | $T_S$      | Application of $V_{CC}$                                            | -               | 5     | 10          | ms   |

2.] Parameters are worst case and account for comprehensive range of product specification. Performance may vary by application and must be validated by end user.



## Electrical Specifications

### Output Parameters

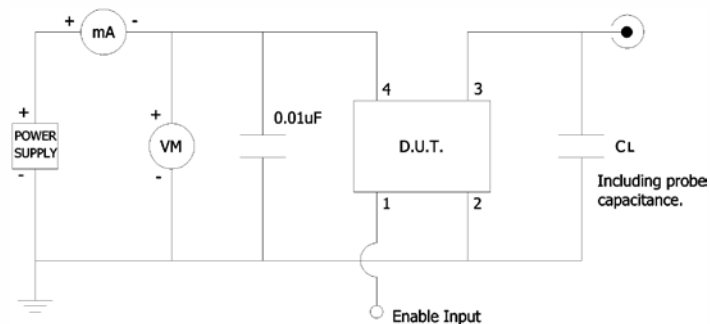
| PARAMETER             | SYMBOL     | CONDITIONS                       | MIN | TYP | MAX | UNIT    |
|-----------------------|------------|----------------------------------|-----|-----|-----|---------|
| Enable Function       |            | Tri-State                        |     |     |     |         |
| Enable Input Voltage  | $V_{IH}$   | Pin 1 Logic '1', Output Enabled  | 2.0 | -   | -   | V       |
| Disable Input Voltage | $V_{IL}$   | Pin 1 Logic '0', Output Disabled | -   | -   | 0.8 | V       |
| Enable Current        | $I_{STB}$  | Pin 1 Logic '0', Output Disabled | -   | -   | 10  | $\mu$ A |
| Enable Time           | $T_{PLZ}$  | Pin 1 Logic '1'                  | -   | -   | 10  | ms      |
| Phase Jitter, RMS     | $t_{jrms}$ | Bandwidth 12 kHz - 20 MHz        | -   | 0.5 | < 1 | ps      |

### Enable Truth Table

| Pin 1     | Pin 3     |
|-----------|-----------|
| Logic '1' | Output    |
| Open      | Output    |
| Logic '0' | High Imp. |

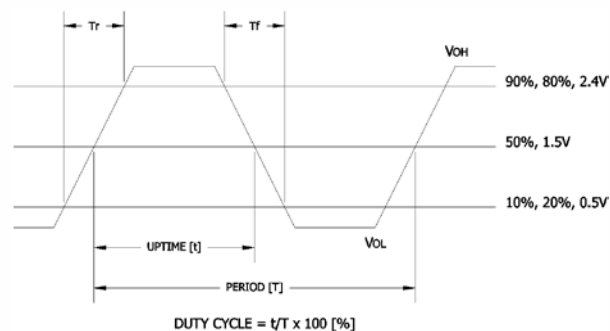
### Test Circuit

HCMOS



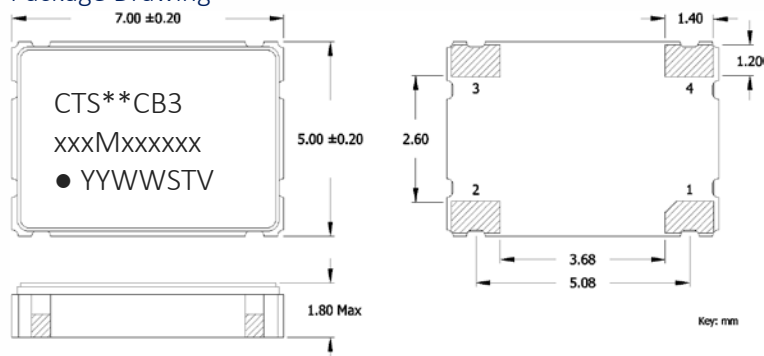
### Output Waveform

HCMOS



### Mechanical Specifications

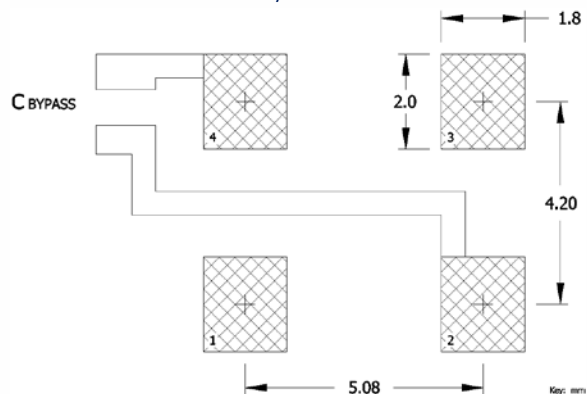
Package Drawing



### Marking Information

1. \*\* – Manufacturing Site Code.  
[Note a dash may follow the site code and is acceptable.]
2. xxxMxxxxxx – Frequency is marked with 1,2 or 3 leading significant digits before the “M” and 6 digits after the “M” [including zeroes].  
Ex. xMxxxxxx [3M579545]  
xxMxxxxxx [14M318180]  
xxMxxxxxx [25M000000]  
xxxMxxxxxx [125M000000]
3. YYWW – Date Code; YY = year, WW = week.
4. ST – Frequency Stability/Temperature Code.  
[Refer to ordering information for codes.]
5. V – Voltage Code; 3 = +3.3V, 5 = +5.0V.

### Recommended Pad Layout



### Notes

1. JEDEC termination code (e4). Barrier-plating is nickel [Ni] with gold [Au] flash plate.
2. Reflow conditions per JEDEC J-STD-020; +260°C maximum, 20 seconds.
3. MSL = 1.

### Pin Assignments

| Pin | Symbol          | Function                 |
|-----|-----------------|--------------------------|
| 1   | EOH             | Enable                   |
| 2   | GND             | Circuit & Package Ground |
| 3   | Output          | RF Output                |
| 4   | V <sub>CC</sub> | Supply Voltage           |

## 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 and date code information must appear on reel and carton labels.



## Addendum

### Common Frequencies – MHz

| FREQUENCY | FREQUENCY | FREQUENCY | FREQUENCY | FREQUENCY | FREQUENCY  |
|-----------|-----------|-----------|-----------|-----------|------------|
| 1.000000  | 5.000000  | 16.384000 | 27.120000 | 45.000000 | 74.250000  |
| 1.024000  | 6.144000  | 16.666700 | 30.000000 | 48.000000 | 74.752800  |
| 1.042000  | 6.176000  | 16.667000 | 30.720000 | 49.152000 | 77.760000  |
| 1.440000  | 7.372800  | 16.670000 | 32.000000 | 50.000000 | 80.000000  |
| 1.544000  | 7.680000  | 18.192000 | 32.768000 | 52.000000 | 98.304000  |
| 1.843200  | 8.000000  | 18.432000 | 33.000000 | 54.000000 | 100.000000 |
| 2.000000  | 8.192000  | 19.200000 | 33.330000 | 60.000000 | 106.250000 |
| 2.048000  | 9.600000  | 19.440000 | 33.333000 | 61.140000 | 125.000000 |
| 2.176000  | 9.830400  | 19.660800 | 33.333300 | 64.000000 | 125.009375 |
| 2.400000  | 10.000000 | 20.000000 | 33.333330 | 65.536000 | 127.000000 |
| 2.457600  | 10.240000 | 20.480000 | 34.368000 | 66.000000 | 133.000000 |
| 2.500000  | 11.059200 | 22.118400 | 34.560000 | 66.660000 | 148.500000 |
| 3.072000  | 12.000000 | 24.000000 | 35.000000 | 66.666000 | 150.000000 |
| 3.088000  | 12.288000 | 24.545454 | 36.000000 | 66.666600 | 153.600000 |
| 3.579545  | 13.000000 | 24.574600 | 37.400000 | 66.666660 | 155.520000 |
| 3.686400  | 13.560000 | 24.576000 | 38.400000 | 66.666700 | 156.250000 |
| 4.000000  | 14.318180 | 25.000000 | 40.000000 | 66.667000 | 160.000000 |
| 4.096000  | 14.745600 | 25.000625 | 40.960000 | 66.670000 | 166.000000 |
| 4.500000  | 15.360000 | 26.000000 | 42.500000 | 74.175800 |            |
| 4.915200  | 16.000000 | 27.000000 | 44.000000 | 74.175824 |            |