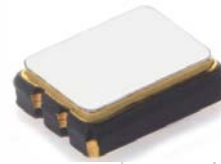




# Model 334C

## Advanced PLL HCMOS VCXO



Part Dimensions:  
3.2 × 2.5 × 1.1mm • 24mg

### Features

- Ceramic Surface Mount Package
- Low Phase Jitter Performance, 600fs Typical
- Advanced PLL Design w/ Low Fundamental Crystal
- Frequency Range 10 – 250MHz \*
- +2.5V or +3.3V Operation
- Output Enable Standard
- Tape and Reel Packaging, EIA-418

### Applications

- Broadcast Video Systems
- Storage Area Networking
- Broadband Access
- Phase-Locked Loop
- Networking Equipment
- Ethernet/GbE/SyncE
- Fiber Channel
- Test and Measurement

#### Standard Frequencies

- 50.00MHz
- 77.76MHz
- 100.00MHz
- 122.88MHz
- 125.00MHz
- 155.52MHz
- 156.25MHz
- 200.00MHz

\* See Page 7 for additional developed frequencies.  
Check with factory for availability of frequencies not listed.

### Description

CTS Model 334C is a low cost, high performance PLL voltage controlled oscillator supporting HCMOS output. Employing the latest IC technology, M334C has excellent stability and low phase jitter performance.

### Ordering Information

| Model                                                                                 | Output Type         | Frequency Code [MHz]                                                                                                     | Absolute Pull Range | Frequency Stability | Temperature Range                   | Supply Voltage | Packaging                                                                           |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
|---------------------------------------------------------------------------------------|---------------------|--------------------------------------------------------------------------------------------------------------------------|---------------------|---------------------|-------------------------------------|----------------|-------------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----------|---|-----------------------------------------------------------------------------------------------------------------------------------------------|------|-------------|---|----------------|---|----------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------|---------|---------|--------------|---------|
| 334                                                                                   | C                   | XXX or XXXX                                                                                                              | B                   | 3                   | I                                   | 3              | T                                                                                   |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| <table><tr><th>Code</th><th>Output</th></tr><tr><td>C</td><td>HCMOS</td></tr></table> |                     | Code                                                                                                                     | Output              | C                   | HCMOS                               |                | <table><tr><th>Code</th><th>APR</th></tr><tr><td>B</td><td>±50ppm</td></tr></table> | Code | APR                                                                                                                                                                        | B    | ±50ppm    |   | <table><tr><th>Code</th><th>Temp. Range</th></tr><tr><td>C</td><td>-20°C to +70°C</td></tr><tr><td>I</td><td>-40°C to +85°C</td></tr></table> | Code | Temp. Range | C | -20°C to +70°C | I | -40°C to +85°C |                                                                                                                             | <table><tr><th>Code</th><th>Packing</th></tr><tr><td>T</td><td>1k pcs./reel</td></tr></table> | Code    | Packing | T       | 1k pcs./reel |         |
| Code                                                                                  | Output              |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| C                                                                                     | HCMOS               |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| Code                                                                                  | APR                 |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| B                                                                                     | ±50ppm              |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| Code                                                                                  | Temp. Range         |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| C                                                                                     | -20°C to +70°C      |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| I                                                                                     | -40°C to +85°C      |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| Code                                                                                  | Packing             |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| T                                                                                     | 1k pcs./reel        |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
|                                                                                       |                     | <table><tr><th>Code</th><th>Frequency</th></tr><tr><td colspan="2">Product Frequency Code <sup>1</sup></td></tr></table> | Code                | Frequency           | Product Frequency Code <sup>1</sup> |                |                                                                                     |      | <table><tr><th>Code</th><th>Stability</th></tr><tr><td>5</td><td>±25ppm <sup>2</sup></td></tr><tr><td>4</td><td>±30ppm</td></tr><tr><td>3</td><td>±50ppm</td></tr></table> | Code | Stability | 5 | ±25ppm <sup>2</sup>                                                                                                                           | 4    | ±30ppm      | 3 | ±50ppm         |   |                | <table><tr><th>Code</th><th>Voltage</th></tr><tr><td>2</td><td>+2.5Vdc</td></tr><tr><td>3</td><td>+3.3Vdc</td></tr></table> | Code                                                                                          | Voltage | 2       | +2.5Vdc | 3            | +3.3Vdc |
| Code                                                                                  | Frequency           |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| Product Frequency Code <sup>1</sup>                                                   |                     |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| Code                                                                                  | Stability           |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| 5                                                                                     | ±25ppm <sup>2</sup> |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| 4                                                                                     | ±30ppm              |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| 3                                                                                     | ±50ppm              |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| Code                                                                                  | Voltage             |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| 2                                                                                     | +2.5Vdc             |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |
| 3                                                                                     | +3.3Vdc             |                                                                                                                          |                     |                     |                                     |                |                                                                                     |      |                                                                                                                                                                            |      |           |   |                                                                                                                                               |      |             |   |                |   |                |                                                                                                                             |                                                                                               |         |         |         |              |         |

Notes:

- 1] Refer to document 016-1454-0, Frequency Code Tables.  
3-digits for frequencies <100MHz, 4-digits for frequencies 100MHz or greater.
- 2] Check factory availability when paired with "I" temperature code.

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

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## Electrical Specifications

### Operating Conditions

| PARAMETER               | SYMBOL    | CONDITIONS       | MIN   | TYP | MAX   | UNIT |
|-------------------------|-----------|------------------|-------|-----|-------|------|
| Maximum Supply Voltage  | $V_{CC}$  | -                | -0.5  | -   | 4.0   | V    |
| Maximum Control Voltage | $V_C$     | $V_{CC} = +2.5V$ | -0.5  | -   | 3.0   | V    |
|                         |           | $V_{CC} = +3.3V$ | -0.5  | -   | 3.8   |      |
| Supply Voltage          | $V_{CC}$  | $\pm 5\%$        | 2.375 | 2.5 | 2.625 | V    |
|                         |           |                  | 3.135 | 3.3 | 3.465 |      |
| Supply Current          | $I_{CC}$  | Maximum Load     | -     | 20  | 65    | mA   |
| Operating Temperature   | $T_A$     | -                | -20   | +25 | +70   | °C   |
|                         |           |                  | -40   |     | +85   |      |
| Storage Temperature     | $T_{STG}$ | -                | -55   | -   | +125  | °C   |

### Frequency Stability

| PARAMETER                       | SYMBOL            | CONDITIONS                           | MIN | TYP          | MAX | UNIT |
|---------------------------------|-------------------|--------------------------------------|-----|--------------|-----|------|
| Frequency Range                 | $f_O$             | -                                    |     | 10 - 250     |     | MHz  |
| Frequency Stability<br>[Note 1] | $\Delta f/f_O$    | -                                    |     | 25, 30 or 50 |     | ±ppm |
| Absolute Pull Range<br>[Note 2] | APR               | -                                    | 50  | -            | -   | ±ppm |
| Aging                           | $\Delta f/f_{25}$ | First Year @ +25°C, nominal $V_{CC}$ | -3  | -            | 3   | ppm  |

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

2.] Minimum guaranteed frequency shift from  $f_O$  over variations in temperature, aging, power supply and load.

### Output Parameters

| PARAMETER                   | SYMBOL       | CONDITIONS                       | MIN         | TYP   | MAX         | UNIT |
|-----------------------------|--------------|----------------------------------|-------------|-------|-------------|------|
| Output Type                 | -            | -                                |             | HCMOS |             | -    |
| Output Load                 | $C_L$        | -                                | -           | -     | 15          | pF   |
| Output Voltage Levels       | $V_{OH}$     | CMOS Load                        | $0.9V_{CC}$ | -     | -           | V    |
|                             | $V_{OL}$     |                                  | -           | -     | $0.1V_{CC}$ |      |
| Output Duty Cycle           | SYM          | @ 50% Level                      | 45          | -     | 55          | %    |
| Rise and Fall Time          | $T_R, T_F$   | @ 20%/80% Levels, $C_L = 15pF$   | -           | 5     | 10          | ns   |
| Start Up Time               | $T_S$        | Application of $V_{CC}$          | -           | 3     | 5           | ms   |
| Enable Function [Tri-State] |              |                                  |             |       |             |      |
| Enable Input Voltage        | $V_{IH}$     | Pin 2 Logic '1', Output Enabled  | $0.7V_{CC}$ | -     | -           | V    |
| Disable Input Voltage       | $V_{IL}$     | Pin 2 Logic '0', Output Disabled | -           | -     | $0.3V_{CC}$ | V    |
| Disable Current             | $I_{IL}$     | Pin 2 Logic '0', Output Disabled | -           | 16    | 22          | mA   |
| Enable Time                 | $T_{PLZ}$    | Pin 2 Logic '1', Output Enabled  | -           | -     | 200         | ns   |
| Phase Jitter, RMS           | $t_{jrms}$   | Bandwidth 12 kHz - 20 MHz        | -           | 600   | <1000       | fs   |
| Period Jitter, RMS          | $p_{jrms}$   | -                                | -           | 3.0   | -           | ps   |
| Period Jitter, pk-pk        | $p_{jpk-pk}$ | -                                | -           | 30    | -           | ps   |

## Electrical Specifications

### Control Voltage

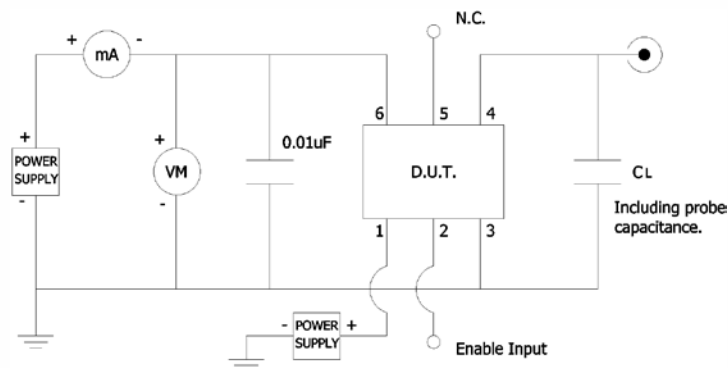
| PARAMETER           | SYMBOL         | CONDITIONS                        | MIN | TYP         | MAX | UNIT  |
|---------------------|----------------|-----------------------------------|-----|-------------|-----|-------|
| Control Voltage     | $V_C$          | $V_{CC} = 2.5V$                   | 0.2 | 1.25        | 2.3 | V     |
|                     |                | $V_{CC} = 3.3V$                   | 0.3 | 1.65        | 3.0 |       |
| Frequency Deviation | $\Delta f/f_0$ | $V_C = 0.2V$                      |     | -60 to -180 |     | ppm   |
|                     |                | $V_C = 2.3V$                      |     | 60 to 180   |     |       |
|                     |                | $V_C = 0.3V$                      |     | -60 to -180 |     | ppm   |
|                     |                | $V_C = 3.0V$                      |     | 60 to 180   |     |       |
| Linearity           | L              | Best Straight Line Fit            | -   | -           | ±15 | %     |
| Gain Transfer       | $K_V$          | Pull Sensitivity; @ +1.25V, +25°C | -   | 80          | 260 | ppm/V |
|                     |                | Pull Sensitivity; @ +1.65V, +25°C |     |             |     |       |
| Input Impedance     | $Z_{Vc}$       | -                                 | 1   | -           | -   | MOhms |
| Modulation Roll-off | -              | @ -3dB                            | 10  | -           | -   | kHz   |
| Transfer Function   | -              | -                                 |     | Positive    |     | -     |

### Enable Truth Table

| Pin 2     | Pin 4     |
|-----------|-----------|
| Logic '1' | Output    |
| Open      | Output    |
| Logic '0' | High Imp. |

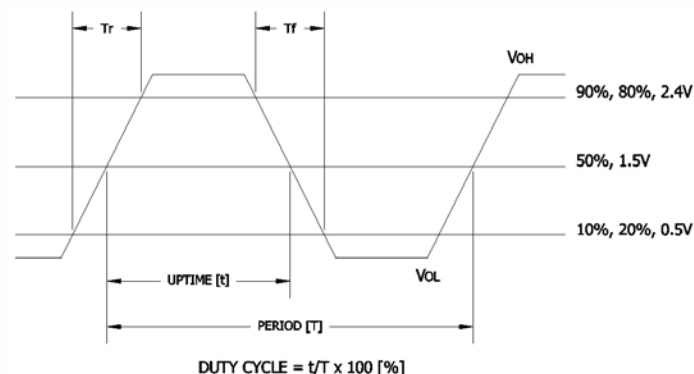
### Test Circuit

HCMOS



### Output Waveform

HCMOS



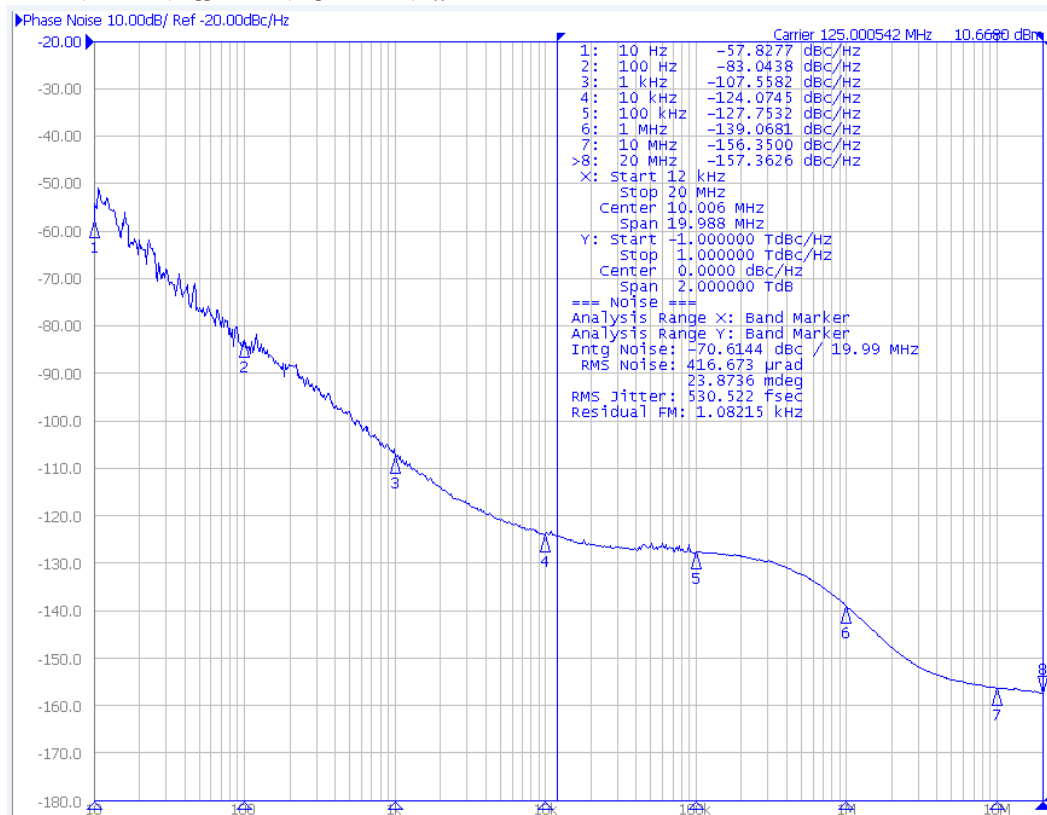


## Electrical Specifications

### Performance Data

#### Phase Noise [typical]

125MHz, HCMOS,  $V_{CC} = +3.3V$ ,  $V_C = +1.65V$ ,  $T_A = +25^\circ C$



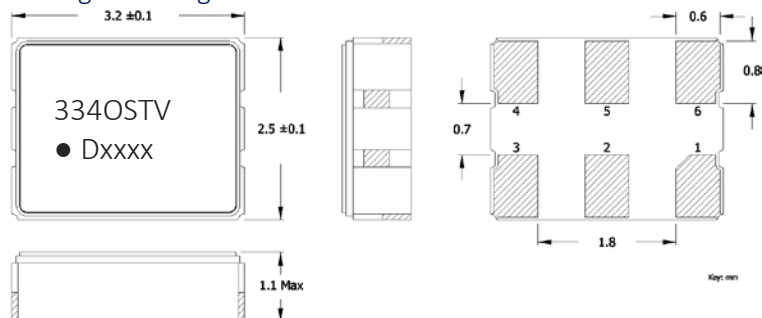
#### Phase Noise Tabulated

125MHz, HCMOS,  $V_{CC} = +3.3V$ ,  $V_C = +1.65V$ ,  $T_A = +25^\circ C$

| PARAMETER         | SYMBOL           | CONDITIONS                          | TYP       | UNIT   |
|-------------------|------------------|-------------------------------------|-----------|--------|
| HCMOS @ 125.00MHz |                  |                                     |           |        |
| Phase Noise       | Single Side Band |                                     |           |        |
|                   | @ 10Hz           |                                     | -57.8277  |        |
|                   | @ 100Hz          |                                     | -83.0438  |        |
|                   | @ 1kHz           |                                     | -107.5582 |        |
|                   | @ 10kHz          |                                     | -124.0745 | dBc/Hz |
|                   | @ 100kHz         |                                     | -127.7532 |        |
|                   | @ 1MHz           |                                     | -139.0681 |        |
|                   | @ 10MHz          |                                     | -156.3500 |        |
|                   | @ 20MHz          |                                     | -157.3626 |        |
| Phase Jitter, RMS | tjrms            | Integration Bandwidth 12kHz - 20MHz | 530.5330  | fs     |

## Mechanical Specifications

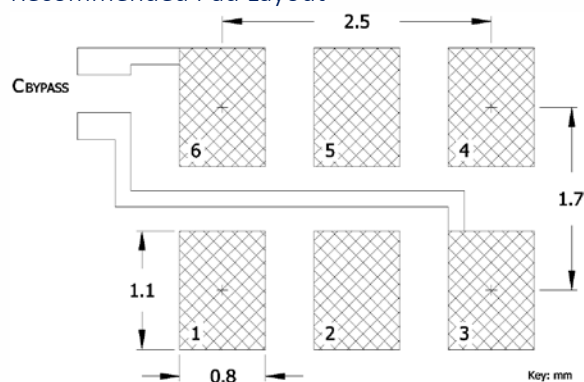
Package Drawing



## Marking Information

1. O – Output Type; C = HCMOS.
2. ST – Frequency Stability/Temperature Code. [Refer to Ordering Information]
3. V – Voltage Code; 3 = 3.3V, 2 = 2.5V.
4. D – Date Code. See Table I for codes.
5. xxxx – Frequency Code.  
3-digits, frequencies below 100MHz  
4-digits, frequencies 100MHz or greater  
[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. Reflow conditions per JEDEC J-STD-020; +260°C maximum, 20 seconds.
3. MSL = 1.

## Pin Assignments

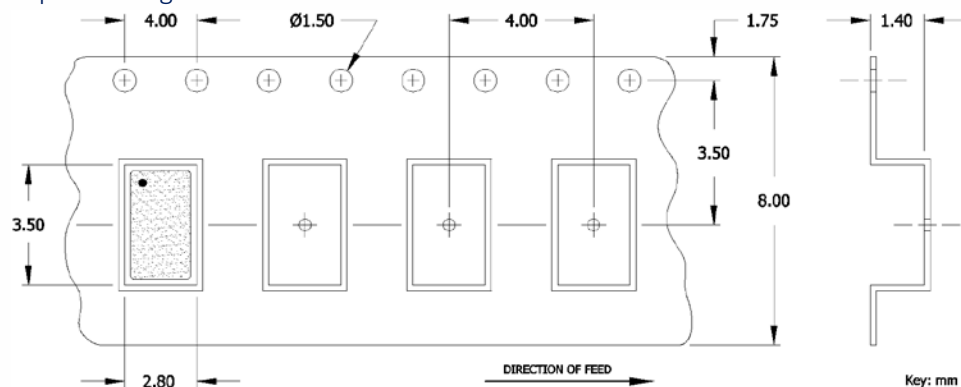
| Pin | Symbol          | Function                 |
|-----|-----------------|--------------------------|
| 1   | V <sub>C</sub>  | Voltage Control          |
| 2   | EOH             | Enable [tri-state]       |
| 3   | GND             | Circuit & Package Ground |
| 4   | Output          | RF Output                |
| 5   | N.C.            | No Connect               |
| 6   | V <sub>CC</sub> | Supply Voltage           |

Table I - Date Code

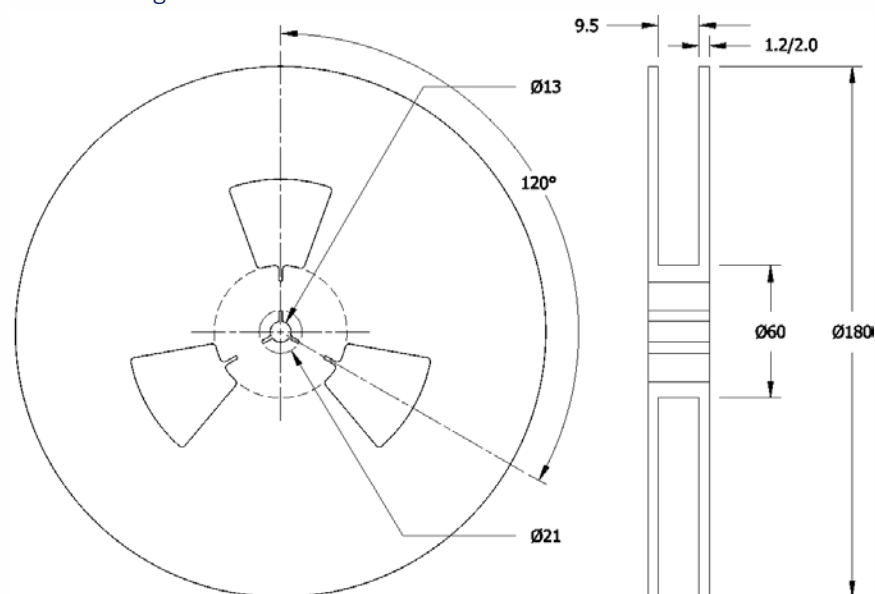
| MONTH<br>YEAR |      |      |      |      |     |     |     |     |     |     |     |     |     |     |     |     |
|---------------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|               |      |      |      |      | JAN | FEB | MAR | APR | 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 - Tape and Reel

### Tape Drawing



### Reel Drawing



### Notes

1. Device quantity is 1k pieces minimum and 3k pieces maximum per 180mm reel.
2. Complete CTS part number, frequency value and date code information must appear on reel and carton labels.



## Addendum

### Additional Developed Frequencies – MHz

| FREQUENCY  | FREQUENCY<br>CODE | FREQUENCY  | FREQUENCY<br>CODE | FREQUENCY | FREQUENCY<br>CODE | FREQUENCY | FREQUENCY<br>CODE |
|------------|-------------------|------------|-------------------|-----------|-------------------|-----------|-------------------|
| 25.000000  | 250               | 150.000000 | 1500              |           |                   |           |                   |
| 62.500000  | 625               | 153.600000 | 1536              |           |                   |           |                   |
| 106.250000 | 1062              | 250.000000 | 2500              |           |                   |           |                   |
| 132.000000 | 1320              |            |                   |           |                   |           |                   |
| 148.500000 | 1485              |            |                   |           |                   |           |                   |

### Frequency Codes for Cover Page Table – MHz

| FREQUENCY  | FREQUENCY<br>CODE | FREQUENCY  | FREQUENCY<br>CODE |
|------------|-------------------|------------|-------------------|
| 50.000000  | 500               | 155.520000 | 1555              |
| 77.760000  | 777               | 156.250000 | 1562              |
| 100.000000 | 1000              | 200.000000 | 2000              |
| 122.880000 | 1228              |            |                   |
| 125.000000 | 1250              |            |                   |



**Стандарт  
Электрон  
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

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