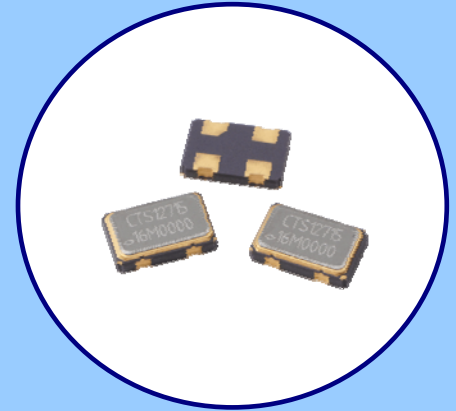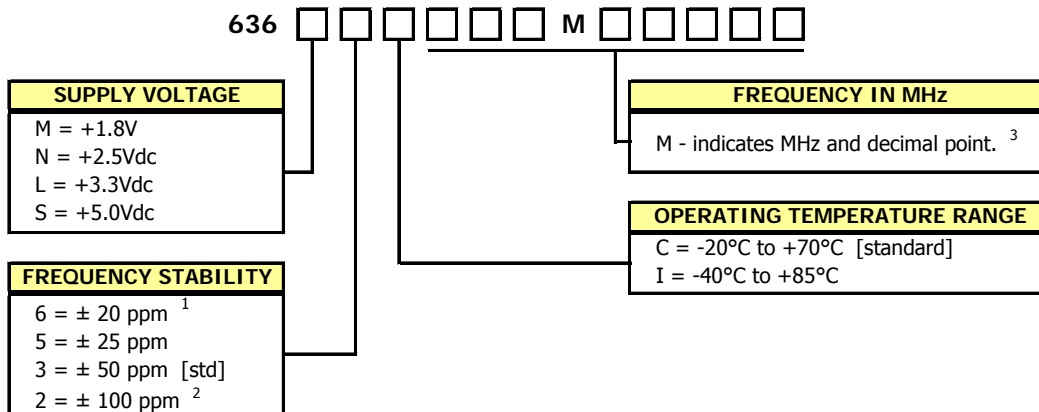# Model 636
## HCMOS/TTL Clock Oscillator

### FEATURES
- **Standard 5.0mm x 3.2mm 4-Pad Surface Mount Package**
- **HCMOS/TTL Compatible Output**
- **Fundamental and 3rd Overtone Crystal Designs**
- Frequency Range 1 – 160 MHz
- Frequency Stability ±50 ppm Standard, ±25 ppm and ±20 ppm Available
- Operating Voltages +1.8Vdc, +2.5Vdc, +3.3Vdc or +5.0Vdc
- Operating Temperature to -40°C to +85°C
- Output Enable Standard
- Tape & Reel Packaging Standard, EIA-418
- **RoHS/Green Compliant [6/6]**

### APPLICATIONS
Model 636 is ideal for applications; such as digital video, networking equipment, broadband access, Ethernet/Gigabit Ethernet, microprocessors/DSP/FPGA, storage area networks, computers and peripherals, cameras and other portable devices to name a few.

### ORDERING INFORMATION

636 ☐ ☐ ☐ ☐ ☐ M ☐ ☐ ☐ ☐ ☐

| SUPPLY VOLTAGE |
| --- |
| M = +1.8V |
| N = +2.5Vdc |
| L = +3.3Vdc |
| S = +5.0Vdc |

| FREQUENCY STABILITY |
| --- |
| 6 = ± 20 ppm  [1] |
| 5 = ± 25 ppm |
| 3 = ± 50 ppm  [std] |
| 2 = ± 100 ppm  [2] |

| FREQUENCY IN MHz |
| --- |
| M - indicates MHz and decimal point.  [3] |

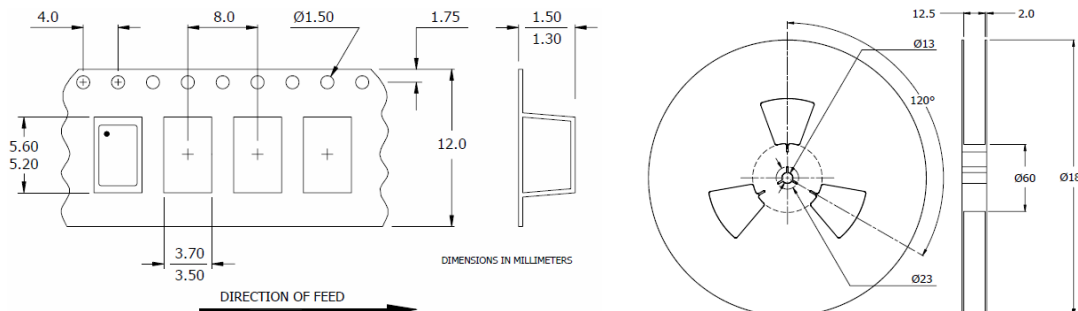| OPERATING TEMPERATURE RANGE |
| --- |
| C = -20°C to +70°C  [standard] |
| I = -40°C to +85°C |

1] Consult factory for 6I Stability/Temperature availability.

2] -40°C to +85°C Only.

3] Frequency is recorded with three leading significant digits before the 'M' and 5 significant digits after the 'M' (including zeros).
[Ex. 3.579545 MHz, code as 003M57954; 14.31818 MHz, code as 014M31818; 125 MHz, code as 125M00000]

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

### PACKAGING INFORMATION [Reference]
Factory may package reels in quantities of 1k pcs. or 3k pcs.  Reel size is 180mm.  12mm tape width.



DIMENSIONS IN MILLIMETERS

DIRECTION OF FEED

## ELECTRICAL CHARACTERISTICS

**ELECTRICAL PARAMETERS**

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Maximum Supply Voltage | $V_{CC}$ | - | -0.5 | - | 7.0 | V |
| Storage Temperature | $T_{STG}$ | - | -55 | - | 125 | °C |
| Frequency Range | $f_O$ | - | 1.0 | - | 160 | MHz |
| Frequency Stability [See Note 1 and Ordering Information] | $\Delta f/f_O$ | - | - | - | 20,25, 50 or 100 | ± ppm |
| Aging | $\Delta f/f_O$ | - | - | - | 3 | ± ppm/yr |
| Operating Temperature<br>  Commercial<br>  Industrial | $T_A$ | - | -20<br>-40 | 25 | 70<br>85 | °C |
| Supply Voltage<br>  Model 636M<br>  Model 636N<br>  Model 636L<br>  Model 636S | $V_{CC}$ | ± 10 % | 1.62<br>2.25<br>2.97<br>4.50 | 1.8<br>2.5<br>3.3<br>5.0 | 1.98<br>2.75<br>3.63<br>5.50 | V |
| Supply Current<br>  Model 636M<br>  [+1.8V]<br><br><br><br>  Model 636N<br>  [+2.5V]<br><br><br><br>  Model 636L<br>  [+3.3V]<br><br><br><br>  Model 636S<br>  [+5.0] | $I_{CC}$ | $C_L$ = 15pF<br>1.0 MHz to 34.999 MHz<br>35 MHz to 60 MHz<br>60.001 MHz to 99.999 MHz<br>100 MHz to 106.250 MHz<br>106.251 MHz to 160 MHz<br>1.0 MHz to 34.999 MHz<br>35 MHz to 60 MHz<br>60.001 MHz to 99.999 MHz<br>100 MHz to 106.250 MHz<br>106.251 MHz to 160 MHz<br>1.0 MHz to 34.999 MHz<br>35 MHz to 60 MHz<br>60.001 MHz to 99.999 MHz<br>100 MHz to 106.250 MHz<br>106.251 MHz to 160 MHz<br>1.0 MHz to 34.999 MHz<br>35 MHz to 60 MHz<br>60.001 MHz to 99.999 MHz<br>100 MHz to 106.250 MHz | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | -<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>-<br>- | 8<br>15<br>25<br>35<br>35<br>10<br>20<br>30<br>40<br>40<br>16<br>25<br>40<br>50<br>50<br>25<br>50<br>60<br>80 | mA |
| Output Load<br>  Model 636M<br>  Model 636N & 636L<br><br>  Model 636S | $C_L$ | 1.0 MHz to 160 MHz<br>1.0 MHz to 50 MHz<br>50.001 MHz to 160 MHz<br>1.0 MHz to 50 MHz<br>50.001 MHz to 80 MHz<br>80.001 MHz to 106.250 MHz | -<br>-<br><br>- | -<br>-<br><br>- | 15<br>30<br>15<br>50<br>30<br>15 | pF |
| Output Voltage Levels<br>  Logic '1' Level<br>  Logic '0' Level | <br>$V_{OH}$<br>$V_{OL}$ | <br>CMOS Load<br>CMOS Load | <br>90%$V_{CC}$<br>- | <br>-<br>- | <br>-<br>10%$V_{CC}$ | V |
| Output Current<br>  Logic '1' Level  (M,N,L,S)<br>  Logic '0' Level  (M,N,L,S) | <br>$I_{OH}$<br>$I_{OL}$ | <br>$V_{OH}$ = 90%$V_{CC}$<br>$V_{OL}$ = 10%$V_{CC}$ | <br>-<br>- | <br>-<br>- | <br>-2, -4, -8, -16<br>+2, +4, +8, +16 | mA |
| Output Duty Cycle | SYM | @ 50% Level | 45 | - | 55 | % |
| Rise and Fall Time<br>  Model 636M, 636N & 636L<br><br><br>  Model 636S | $T_R$, $T_F$ | @ 10% - 90% Levels, $C_L$ = 15pF<br>1.0 MHz to 50 MHz<br>50.001 MHz to 125 MHz<br>125.001 MHz to 160 MHz<br>1.0 MHz to 20 MHz<br>20.001 MHz to 50 MHz<br>50.001 MHz to 106.250 MHz | <br>-<br>-<br>-<br>-<br>-<br>- | <br>6<br>3<br>1.5<br>6<br>3<br>1.5 | <br>10<br>5<br>2.5<br>8<br>5<br>2 | ns |
| Start Up Time | $T_S$ | Application of $V_{CC}$ | - | 5 | 10 | ms |
| Period Jitter, Pk-Pk | - | - | - | - | 100 | ps |
| Period Jitter, RMS | - | - | - | - | 25 | |
| Phase Jitter, RMS | - | Bandwidth 12 kHz - 20 MHz | - | - | 1 | |

Notes:
1. Inclusive of initial tolerance at time of shipment, changes in supply voltage, load, temperature and aging.

## ELECTRICAL CHARACTERISTICS

| | PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| ELECTRICAL PARAMETERS | Enable Function | | | | | | |
| | Enable Input Voltage | | | | | | |
| |    Model 636M | $V_{IH}$ | Pin 1 Logic '1', Output Enabled | 1.26 | - | - | |
| |    Model 636N | | Pin 1 Logic '1', Output Enabled | 1.75 | - | - | |
| |    Model 636L | | Pin 1 Logic '1', Output Enabled | 2.0 | - | - | |
| |    Model 636S | | Pin 1 Logic '1', Output Enabled | 4.0 | - | - | V |
| | Disable Input Voltage | | | | | | |
| |    Model 636M,636N,636L | $V_{IL}$ | Pin 1 Logic '0', Output Disabled | - | - | 0.3 | |
| |    Model 636S | | Pin 1 Logic '0', Output Disabled | - | - | 0.8 | |
| | Enable Time (M,N,L,S) | $T_{PLZ}$ | Pin 1 Logic '1' | - | - | 10 | ms |
| | Standby Current | $I_{ST}$ | Pin 1 Logic '0', Output Disabled | - | - | 10 | µA |

### LVCMOS OUTPUT WAVEFORM
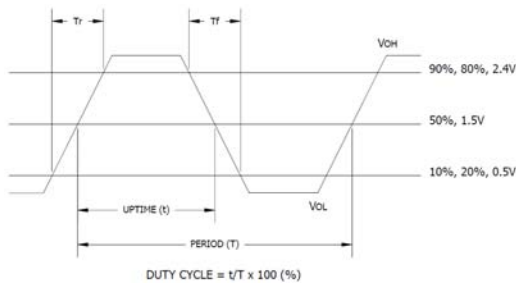


### TEST CIRCUIT, CMOS LOAD
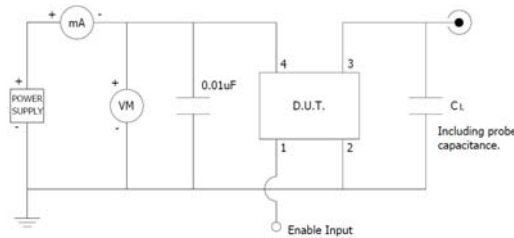


### ENABLE TRUTH TABLE

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

## MECHANICAL SPECIFICATIONS

### PACKAGE DRAWING



### SUGGESTED SOLDER PAD GEOMETRY

$C_{BYPASS}$ should be ≥ 0.01 uF.
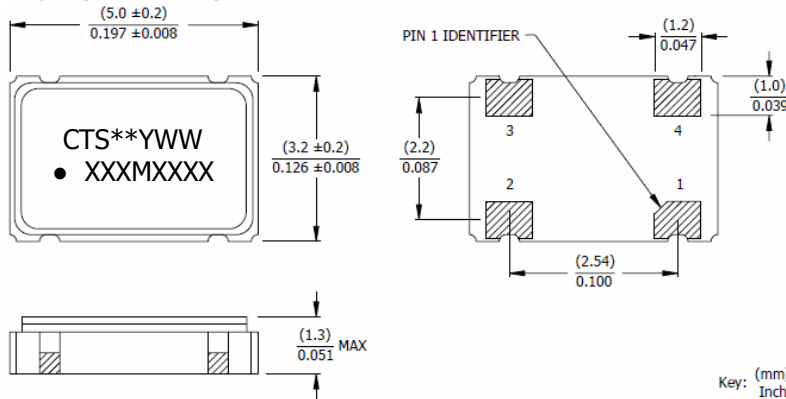


### MARKING INFORMATION

1. ** - Manufacturing Site Code.
2. YWW – Date code, Y – year, WW – week.
3. XXXMXXXX – Frequency is marked with only leading significant digits before the 'M' and 4 digits after the 'M' [including zeros].
   - Ex. XXMXXXX [62M5000]
   - XXXMXXXX [155M5200]

### NOTES

1. Termination pads [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.

### D.U.T. PIN ASSIGNMENTS

| PIN | SYMBOL | DESCRIPTION |
|---|---|---|
| 1 | EOH | Enable |
| 2 | GND | Circuit & Package Ground |
| 3 | Output | RF Output |
| 4 | $V_{CC}$ | Supply Voltage |