



# Model TT32

## HCMOS TCXO @ 32.768kHz

### Features

- 32.768kHz Frequency Reference
- Low Power Consumption, 2.5uA Maximum @ +3.3V
- Ceramic Surface Mount Package
- Fundamental Crystal Design
- +1.8V, +2.5V, +3.0V or +3.3V Operating Voltage
- Stability ±5ppm
- Operating Temperature Range -40°C to +85°C
- Tape and Reel Packaging, EIA-418



Part Dimensions:  
3.28 × 2.50 × 1.40mm • 22.66mg

### Applications

- Real Times Clock Reference
- Smart Metering
- Portable Electronics
- Timing Synchronization
- GPS Receivers
- Data Loggers
- Telematics
- Battery Powered Applications
- Industrial Controls & Automation
- Wireless Communications
- Medical Devices
- IoT

### Description

CTS Model TT32 is a low cost, small size, HCMOS Temperature Compensated Crystal Oscillator [TCXO] operating at 32.768kHz. Employing IC technology that delivers low current consumption, TT32 provides a Real Time Clock reference with excellent stability and low phase noise/jitter performance.

### Ordering Information

Model	Supply Voltage	Frequency Code [MHz]	Frequency Stability <sup>1</sup>	Temperature Range	Frequency Tuning	Packaging																		
TT32	L	327K	50	I	T	R																		
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Notes:

1] Frequency vs. Temperature only.

**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	-	4.0	V
			1.71	1.8	1.89	
Supply Voltage	$V_{CC}$	$\pm 5\%$	2.38	2.5	2.63	V
			2.85	3.0	3.15	
			3.14	3.3	3.47	
Supply Current	$I_{CC}$	$V_{CC} = +3.3V$	-	2.0	2.5	$\mu A$
Output Load	$C_L$	-	-	-	15	pF
Operating Temperature	$T_A$	-	-40	+25	+85	$^{\circ}C$
Storage Temperature	$T_{STG}$	-	-55	-	+125	$^{\circ}C$

### Frequency Stability

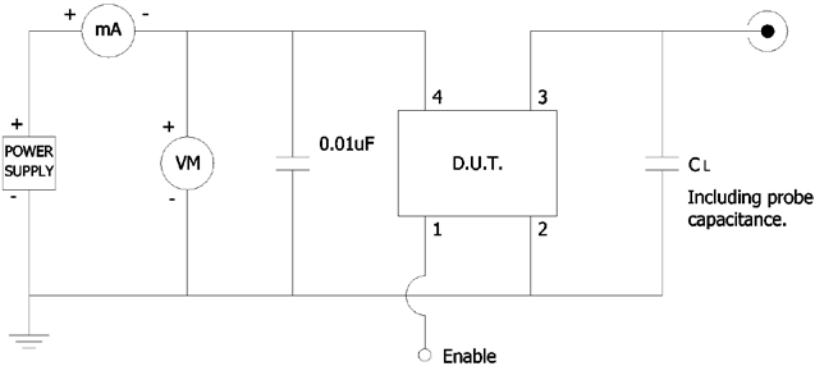
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Frequency	$f_0$	-		32.768		kHz
<b>Frequency Stability</b>						
Initial Calibration		Calibration @ +25 $^{\circ}C$ , At Time of Shipment	-1.5	-	1.5	ppm
Temperature Only	$\Delta f/f_{25}$	-40 $^{\circ}C$ to +85 $^{\circ}C$	-5.0	-	5.0	ppm
Voltage Coefficient	$\Delta f/f_{25}$	Supply Voltage, $\pm 5\%$	-0.2	-	0.2	ppm
Load Coefficient	$\Delta f/f_{25}$	Load, $\pm 10\%$	-0.2	-	0.2	ppm
Reflow Shift	$\Delta f/f_{25}$	1 Reflow Measured After 24 Hours	-1.0	-	1.0	ppm
Aging	$\Delta f/f_{25}$	1st Year, @ +25 $^{\circ}C$ and Nominal $V_{CC}$	-3.0	-	3.0	ppm
Timing Error	$f_0$ @ +25 $^{\circ}C$	Error Over Time	$\pm 0.432\text{sec/day}$ ; $\pm 12.960\text{sec/month}$ ; $\pm 2.628\text{min/year}$			

### Output Parameters

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Output Type	-	-		HCMOS		-
Output Voltage Levels	$V_{OH}$	Logic '1' Level, CMOS Load	$V_{CC}-0.4$	-	-	V
	$V_{OL}$	Logic '0' Level, CMOS Load	-	-	0.4	
Output Duty Cycle	SYM	@ 50% Level	45	-	55	%
Rise and Fall Time	$T_R, T_F$	@ 20%/80% Levels	-	-	100	ns
Start Up Time	$T_S$	@ +25 $^{\circ}C$	-	-	1	sec
		Over -40 $^{\circ}C$ to +85 $^{\circ}C$	-	-	3	
<b>Enable Function</b>						
Enable Input Voltage	$V_{IH}$	Pin 1 Logic '1', Output Enabled	$0.8V_{CC}$	-	-	V
Disable Input Voltage	$V_{IL}$	Pin 1 Logic '0', Output Disabled	-	-	$0.2V_{CC}$	V
Disable Current	$I_{STB}$	Pin 1 Logic '0', Output Disabled	-	1	-	$\mu A$
Enable Time	$T_{PLZ}$	Pin 1 Logic '1'	-	1	-	ms

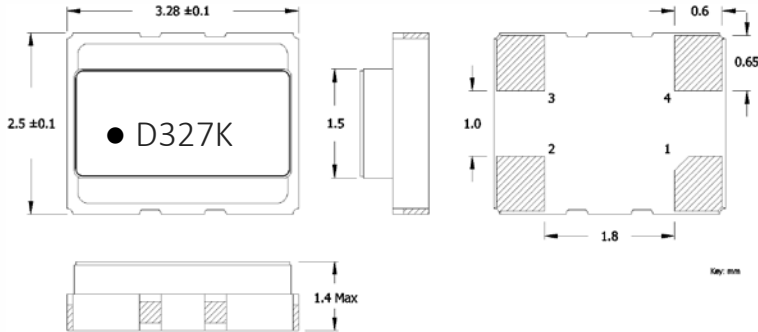
## Electrical Specifications

Test Circuit  
HCMOS



## Mechanical Specifications

Package Drawing



Marking Information

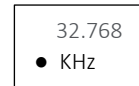
### Option 1 - CTS Preferred

- – Pin 1 identifier.
  - D – Date Code. See Table I for codes.
  - 327K – Frequency Code, 327K = 32.768kHz.
- [See document 016-1454-0, Frequency Code Tables.]

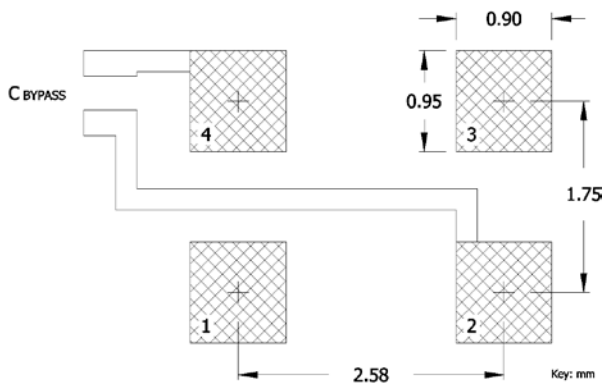


### Option 2 - CTS Acceptable

- 32.768 – nominal frequency value.
- – Pin 1 identifier.
- KHz – frequency units of measure.



Recommended Pad Layout



Notes

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



## Mechanical Specifications

### Pin Assignments

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

### Notes

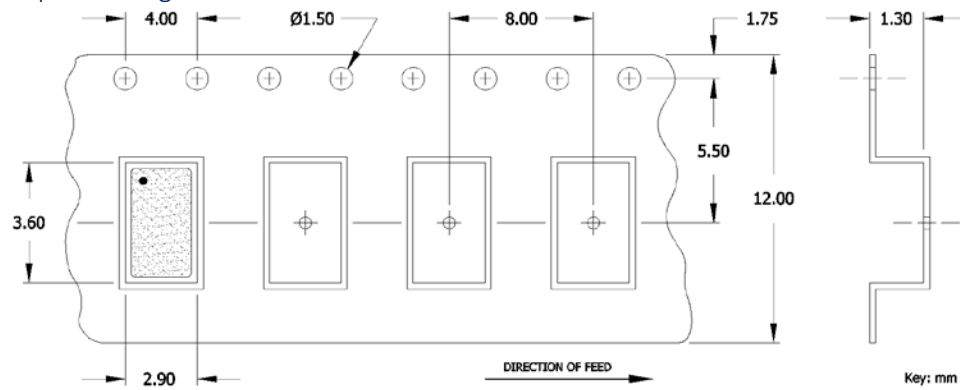
- DO NOT leave Pin 1 open.

Table I - Date Code

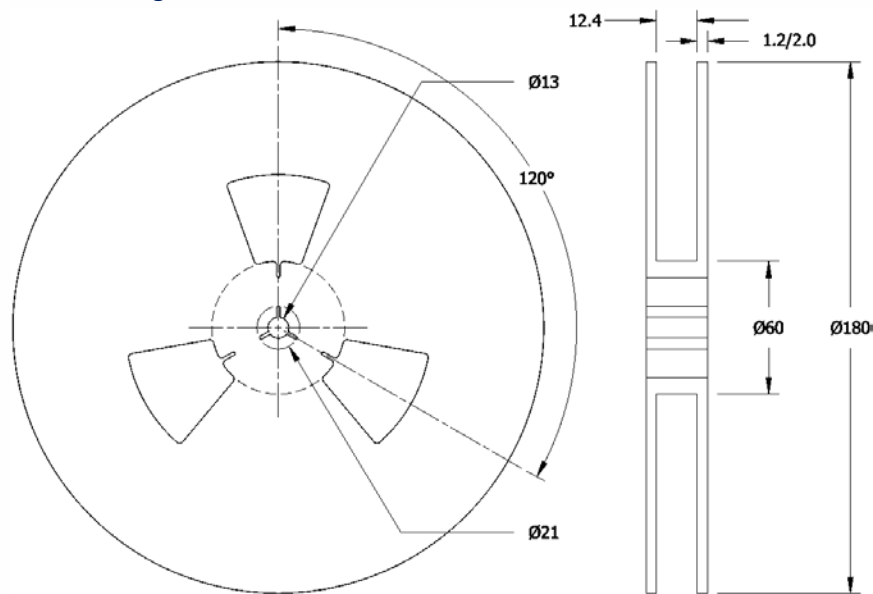
YEAR \ MONTH					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
					2001	2005	2009	2013	2017	A	B	C	D	E	F	G
2002	2006	2010	2014	2018	N	P	Q	R	S	T	U	V	W	X	Y	Z
2003	2007	2011	2015	2019	a	b	c	d	e	f	g	h	j	k	l	m
2004	2008	2012	2016	2020	n	p	q	r	s	t	u	v	w	x	y	z

### Packaging - Tape and Reel

#### Tape Drawing



#### Reel Drawing



#### Notes

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