

# Model TT32

## HCMOS TCXO @ 32.768kHz



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

### Features

- 32.768kHz Frequency Reference
- Low Power Consumption, 3.7uA 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-481

### 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 <sub>CC</sub>	-	-0.5	-	4.0	V
Supply Voltage	V <sub>CC</sub>	±5%	1.71	1.8	1.89	V
			2.38	2.5	2.63	
			2.85	3.0	3.15	
			3.14	3.3	3.47	
Supply Current	I <sub>CC</sub>	V <sub>CC</sub> = +3.3V	-	2.0	3.7	uA
Output Load	C <sub>L</sub>	-	-	-	15	pF
Operating Temperature	T <sub>A</sub>	-	-40	+25	+85	°C
Storage Temperature	T <sub>STG</sub>	-	-55	-	+125	°C

### Frequency Stability

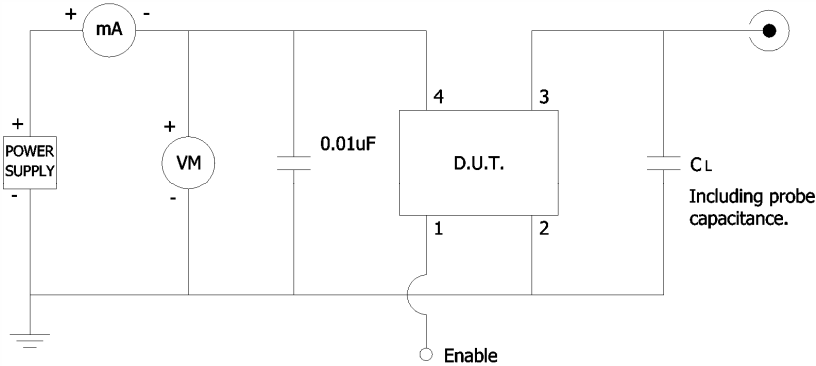
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Frequency	f <sub>0</sub>	-		32.768		kHz
<b>Frequency Stability</b>						
Initial Calibration		Calibration @ +25°C, At Time of Shipment	-2.5	-	2.5	ppm
Temperature Only	Δf/f <sub>25</sub>	-40°C to +85°C	-5.0	-	5.0	ppm
Voltage Coefficient	Δf/f <sub>25</sub>	Supply Voltage, ±5%	-0.2	-	0.2	ppm
Load Coefficient	Δf/f <sub>25</sub>	Load, ±10%	-0.2	-	0.2	ppm
Reflow Shift	Δf/f <sub>25</sub>	1 Reflow Measured After 24 Hours	-1.0	-	1.0	ppm
Aging	Δf/f <sub>25</sub>	1st Year, @ +25°C and Nominal V <sub>CC</sub>	-3.0	-	3.0	ppm
Timing Error	f <sub>0</sub> @+25°C	Error Over Time	±0.432sec/day; ±12.960sec/month; ±2.628min/year			

### Output Parameters

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Output Type	-	-		HCMOS		-
Output Voltage Levels	V <sub>OH</sub>	Logic '1' Level, CMOS Load	V <sub>CC</sub> -0.4	-	-	V
	V <sub>OL</sub>	Logic '0' Level, CMOS Load	-	-	0.4	
Output Duty Cycle	SYM	@ 50% Level	40	-	60	%
Rise and Fall Time	T <sub>R</sub> , T <sub>F</sub>	@ 20%/80% Levels	-	-	100	ns
Start Up Time	T <sub>S</sub>	@ +25°C	-	-	1	sec
		Over -40°C to +85°C	-	-	3	
<b>Enable Function</b>						
Enable Input Voltage	V <sub>IH</sub>	Pin 1 Logic '1', Output Enabled	0.8V <sub>CC</sub>	-	-	V
Disable Input Voltage	V <sub>IL</sub>	Pin 1 Logic '0', Output Disabled	-	-	0.2V <sub>CC</sub>	V
Disable Current	I <sub>STB</sub>	Pin 1 Logic '0', Output Disabled	-	1	-	μA
Enable Time	T <sub>PLZ</sub>	Pin 1 Logic '1'	-	1	-	ms

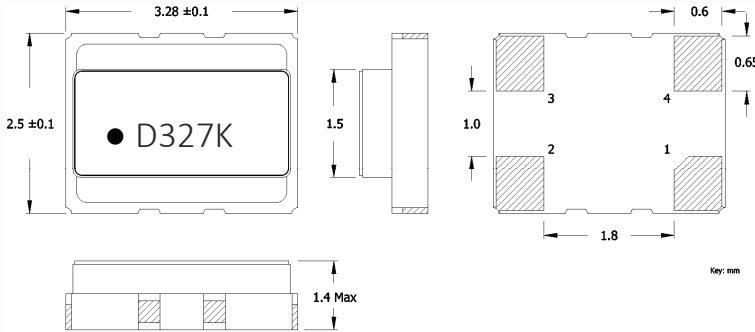
## Electrical Specifications

Test Circuit  
HCMOS



## Mechanical Specifications

Package Drawing



Marking Information

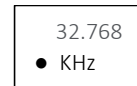
### Option 1 - CTS Preferred

- – 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.]

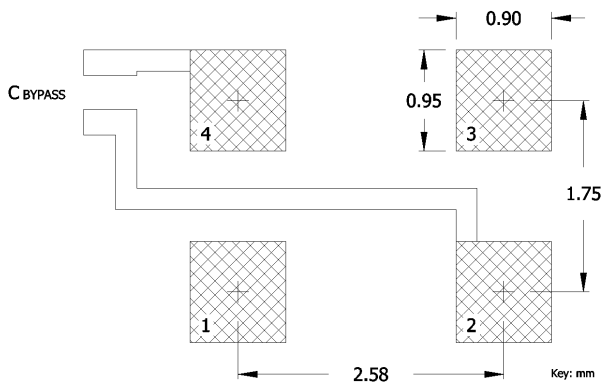


### Option 2 - CTS Acceptable

- 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	RF Output
4	V <sub>CC</sub>	Supply Voltage

### Notes

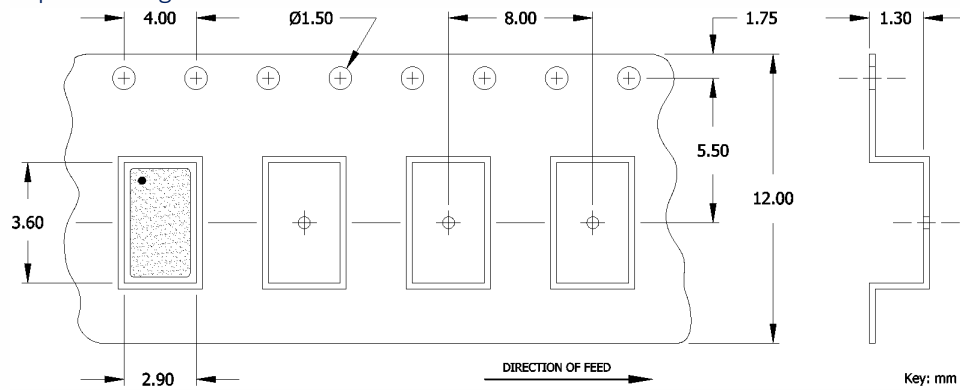
- DO NOT leave Pin 1 open.

Table I - Date Code, Beginning year 2021

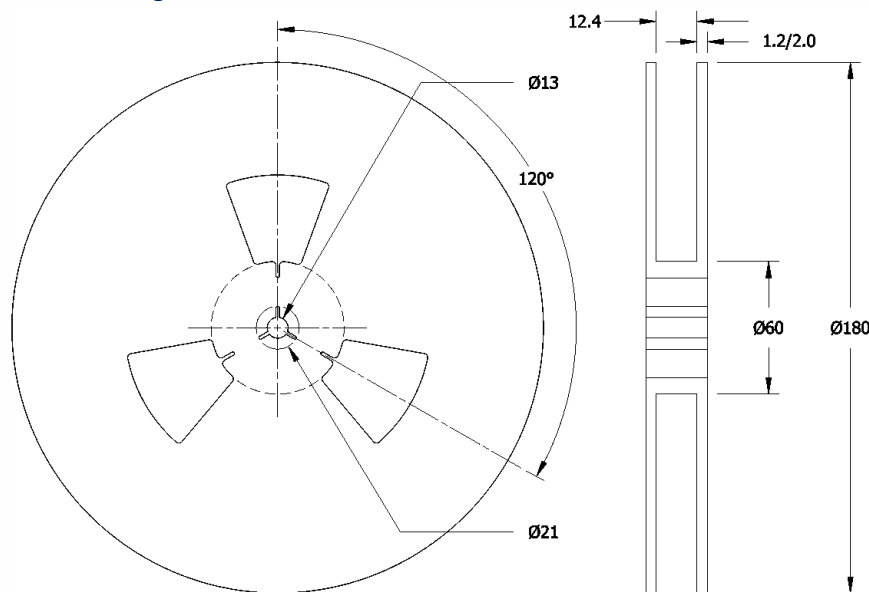
YEAR \ MONTH					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
					A	B	C	D	E	F	G	H	J	K	L	M
2021	2025	2029	2033	2037	N	P	Q	R	S	T	U	V	W	X	Y	Z
2022	2026	2030	2034	2038	a	b	c	d	e	f	g	h	j	k	l	m
2023	2027	2031	2035	2039	n	p	q	r	s	t	u	v	w	x	y	z
2024	2028	2032	2036	2040												

### 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.