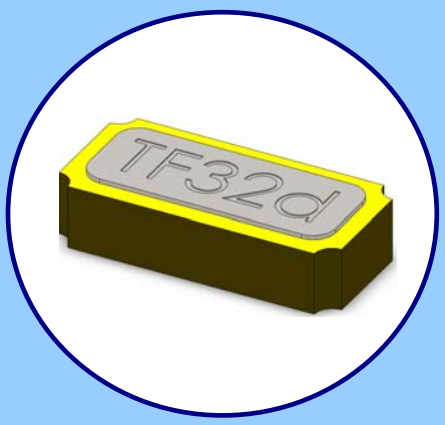
TF32 Series
Tuning Fork Crystal

FEATURES
- **32.7680 kHz Frequency Reference**
- **Package Size 3.2mm x 1.5mm**
- **Tuning Fork Crystal Design**
- **Hermetic Ceramic Package**
- Frequency Tolerance, ±20 ppm Standard
  [±10 ppm, ±30 ppm and ±50 ppm available]
- Frequency Temperature Coefficient, -0.030ppm/°C^2
- Operating Temperature, -40°C to +85°C Standard
- Tape & Reel Packaging, EIA-481
- **RoHS/Green Compliant [6/6]**



APPLICATIONS
The TF32 crystal series is ideal for use in a wide range of communication equipment, notebooks, computer peripherals, audio visual, Bluetooth and other wireless applications, USB interfaces, PDAs and automotive electronics.

ORDERING INFORMATION

TF 3 2 □ □ 3 2 K 7 6 8 0 □

PACKAGE SIZE
32 = 3.2mm x 1.5mm

FREQUENCY TOLERANCE @ 25°C
1 = ± 10 ppm
2 = ± 20 ppm [standard]
3 = ± 30 ppm
5 = ± 50 ppm

FREQUENCY IN kHz
K - indicates kHz and decimal point. [1]

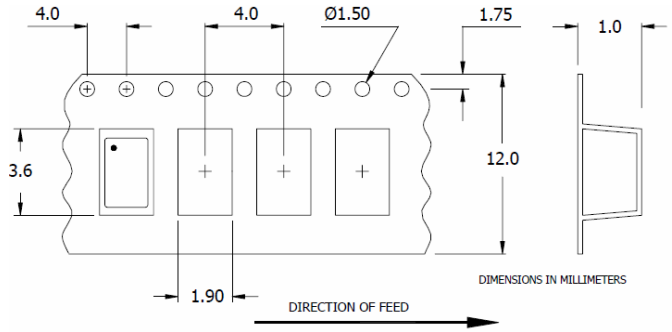
LOAD CAPACITANCE
P = 12.5 pF [standard]
J = 9 pF
N = 7 pF
T = 6 pF

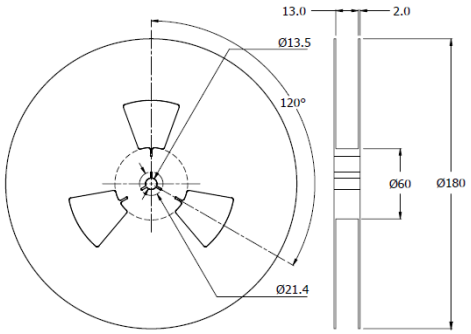
PACKAGING OPTIONS
T - 1k pcs./reel
R - 3k pcs./reel

1] Frequency is recorded with two leading digits before the 'K' and 4 significant digits after the 'K' (including zeros).

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.



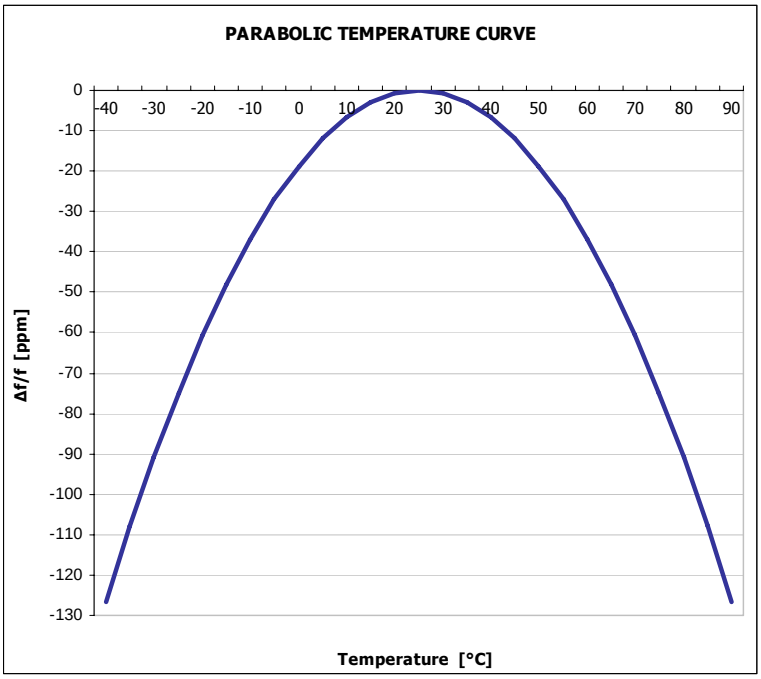


ELECTRICAL CHARACTERISTICS

	PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
ELECTRICAL PARAMETERS	Frequency	f_0			32.7680		kHz
	Operating Mode	-			Flexural Mode [Tuning Fork]		-
	Frequency Tolerance *	$\Delta f/f_0$	@+25°C	-	20	-	± ppm
	Frequency Temperature Coefficient	$\Delta f/f_M$			-0.030 ±0.01ppm/°C^2		-
	Frequency Stability				See Figure 1		
	Operating Temperature Range	T_A		-40	-	+85	°C
	Turnover Temperature	T_M	±5°C	-	+25	-	°C
	Load Capacitance *	C_L	Standard	-	12.5	-	pF
	Aging	$\Delta f/f_0$	@+25°C, 1st year	-	-	3.0	± ppm
	Drive Level	DL		-	0.1	0.5	µW
	Shunt Capacitance	C_0	@1 MHz	-	-	7.0	pF
	Motional Capacitance	C_1		-	5.0	-	fF
	Series Resistance	R_1		-	-	70	k Ohms
	Insulation Resistance	R_i	+100Vdc ±15Vdc	500	-	-	M Ohms
	Storage Temperature Range	T_{STR}		-55	-	+125	°C

* See Ordering Information for available options.

FIGURE 1



Frequency stability [ppm] is determined using parabolic curve, Δf = Temperature Coefficent$(T_A-T_M)^2$.

Ex. Find frequency stability at T_A = 45°C

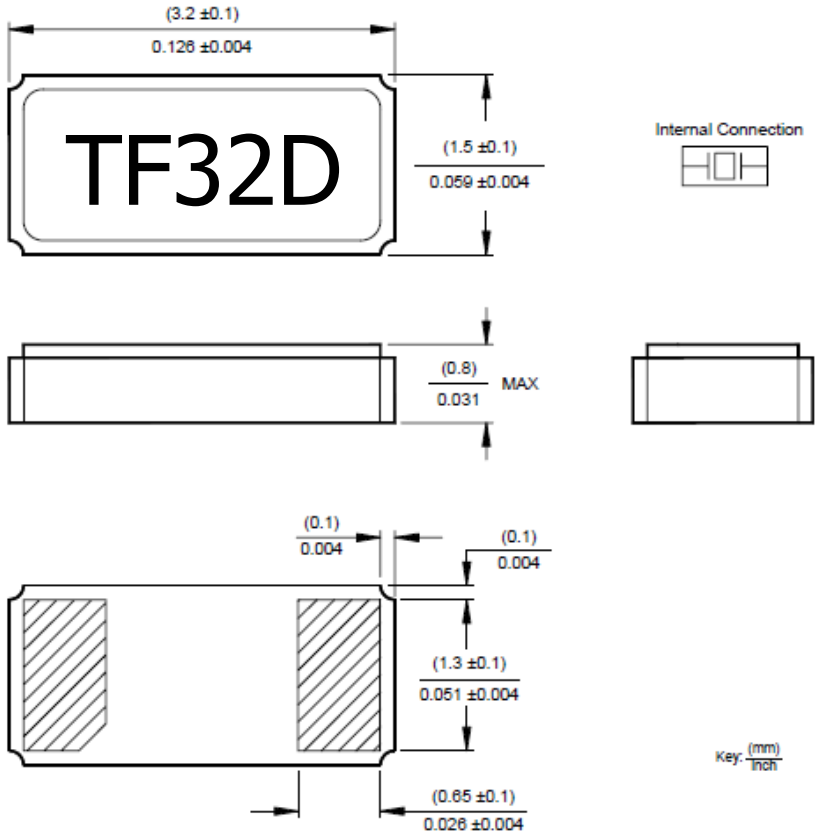
$\Delta f = -0.030(45-25)^2$

$\Delta f = -0.030(20)^2$

Δf = -12.0 ppm

MECHANICAL SPECIFICATIONS

TF32 PACKAGE DRAWING



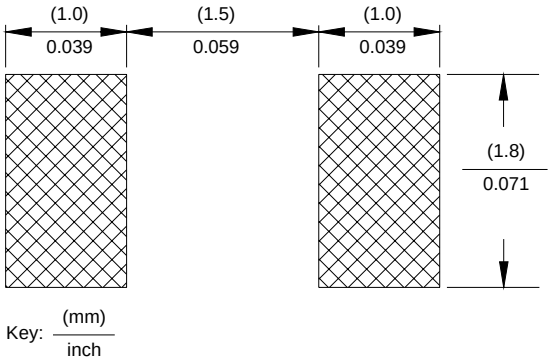
MARKING INFORMATION

1. TF32 - CTS Model Series.
2. D – Date code. See Table I for codes.

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	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

SUGGESTED SOLDER PAD GEOMETRY



NOTES

1. Complete CTS part number, frequency value, date code and manufacturing site code information must appear on reel and carton labels.
2. Termination pads (e4); barrier plating is nickel [Ni] with gold [Au] flash plate.
3. Reflow conditions per JEDEC J-STD-020; 260°C maximum, 20 seconds.
4. MSL = 1.