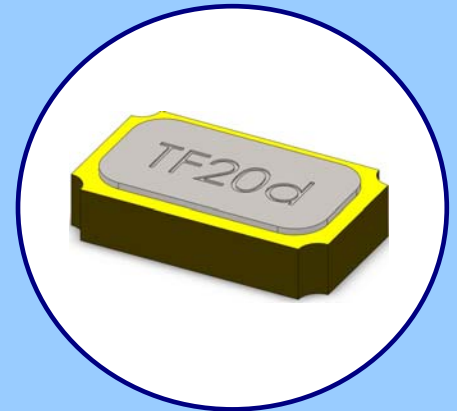




FEATURES

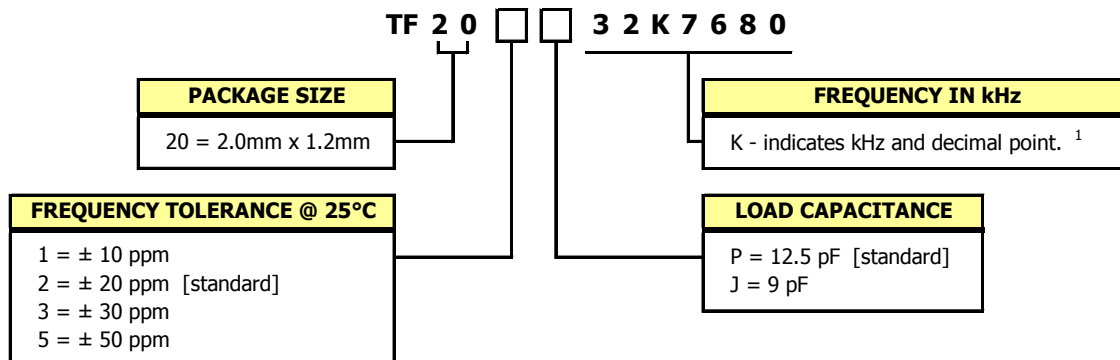
- **32.7680 kHz Frequency Reference**
- **Package Size 2.0mm x 1.2mm**
- **Tuning Fork Crystal Design**
- **Hermetic Ceramic Package**
- Frequency Tolerance, ± 20 ppm Standard
[± 10 ppm, ± 30 ppm and ± 50 ppm available]
- Frequency Temperature Coefficient, $-0.030\text{ppm}/^\circ\text{C}^2$
- Operating Temperature, -40°C to $+85^\circ\text{C}$ Standard
- Tape & Reel Packaging
- **RoHS/Green Compliant (6/6)**



APPLICATIONS

The TF20 crystal series is ideal for use in a wide range of communication equipment, measurement equipment, industrial applications, automotive electronics, wireless communications, PDAs, mobile phones and notebooks.

ORDERING INFORMATION



Example Part Numbers:
TF202P32K7680
TF202J32K7680

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

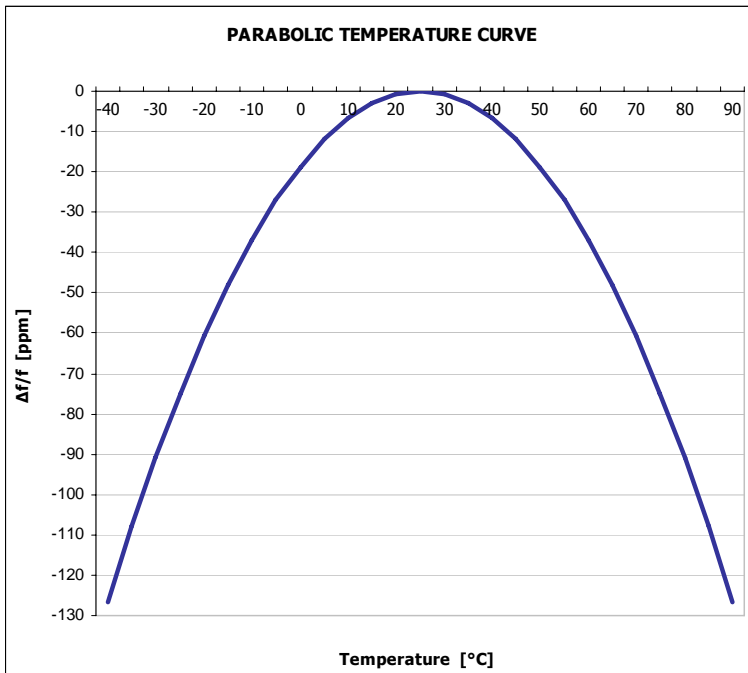
**Not all performance combinations and frequencies may be available.
Contact your local CTS Representative or CTS Customer Service for availability.**

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 @ +25°C *	$\Delta f/f_0$		-	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		-	7.0	-	fF
	Series Resistance	R_1		-	-	90	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



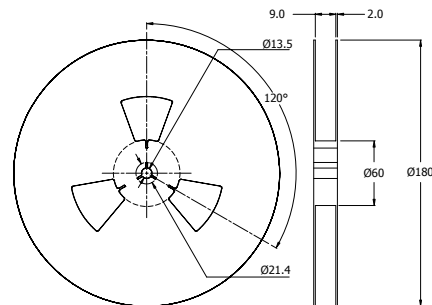
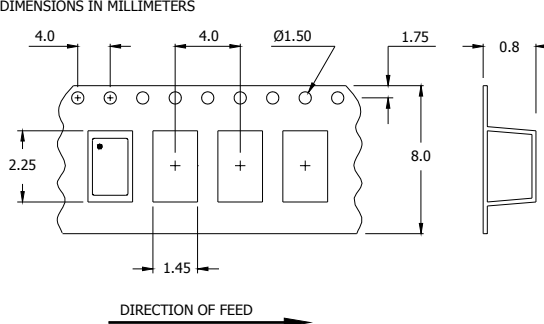
Frequency stability [ppm] is determined using parabolic curve, $\Delta f = \text{Temperature Coefficient}(T_A - T_M)^2$.

Ex. Find frequency stability at $T_A = 45^\circ\text{C}$
 $\Delta f = -0.030(45-25)^2$
 $\Delta f = -0.030(20)^2$
 $\Delta f = -12.0 \text{ ppm}$

PACKAGING INFORMATION

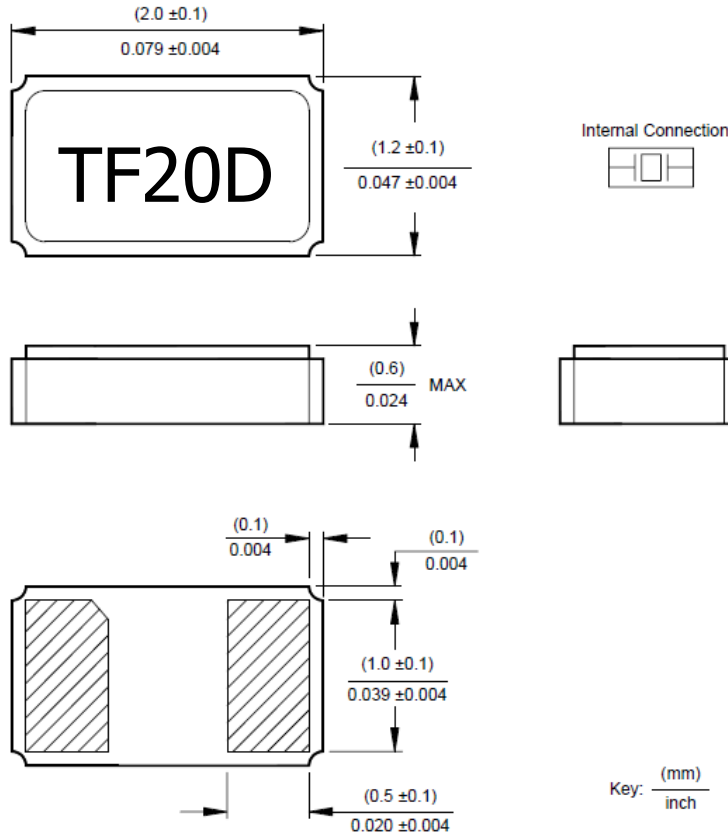
Per standard EIA-418. Device quantity is 3,000 pieces per 180mm reel.

DIMENSIONS IN MILLIMETERS



MECHANICAL SPECIFICATIONS

TF20 PACKAGE DRAWING



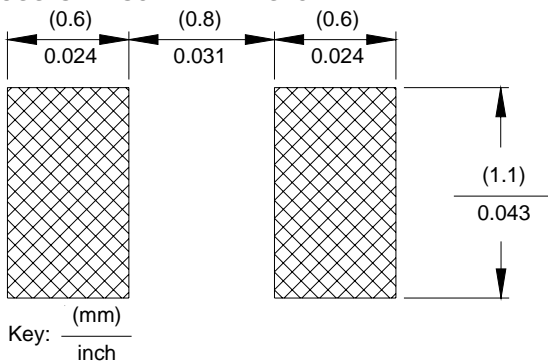
MARKING INFORMATION

1. TF20 - CTS Model Series.
2. D - Date code. See Table I for codes.

TABLE I – DATE CODE

YEAR \ MONTH					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.

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Click to view products by [CTS](#) manufacturer:

Other Similar products are found below :

[MC405 32.0000K-R3:PURE SN](#) [7A-40.000MAAE-T](#) [MP1-8.0 99-BU](#) [9B-15.360MBBK-B](#) [PTX-A2JM-10.000M](#) [9C-7.680MBBK-T](#) [H10S-12.000-18-EXT-TR](#) [R38-32.768-12.5-5PPM-NPB](#) [BTD1062E05A-513](#) [C711980XFAS30XX](#) [21U15A-21.4MHZ](#) [RTX-781DF1-S-20.950](#) [LFX TAL066198Cutt](#) [9C-14.31818MBBK-T](#) [A-11.000MHZ-27](#) [SPT2A-.032768B](#) [SPT2A.032768G](#) [SSPT7F-9PF20-R](#) [FX325BS-38.88EEM1201](#) [MP-1-25.000MHZ-3L](#) [MP-1-6.000MHZ](#) [LFX TAL065253Cutt](#) [LFX TAL066431Cutt](#) [XT9S20ANA14M7456](#) [XT9SNLANA16M](#) [646G-24-2](#) [7A-24.576MBBK-T](#) [7B-30.000MBBK-T](#) [7A-14.31818MBBK-T](#) [6526-202-1501](#) [BTJ120E02C](#) [SG636PCE-20.000MC](#) [3404](#) [CM315D32768EZFT](#) [C1E-24.000-7-2020-R](#) [C1E-19.200-12-1530-X-R](#) [C1E-16.000-12-1530-X-R](#) [ABM11-16.000MHZ-9-B1U-T](#) [FL5000014](#) [EUCA18-3.1872M](#) [425F35E027M0000](#) [17196](#) [MS3V-T1R-32.768kHz-7pF-20PPM-TA-QC-Au](#) [VXM7-1C1-16M000](#) [MS1V-T1K-32.768kHz-10pF-20PPM-TA-QC-Au](#) [MS3V-T1R-32.768kHz-9pF-20PPM-TA-QC-Au](#) [ECS-80-18-30-JGN-TR](#) [17000](#) [17301](#)