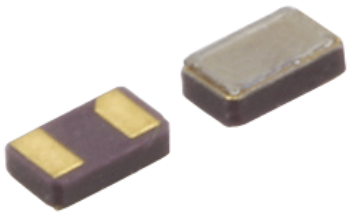
TFE20 Series

Low ESR Tuning Fork Crystal



Part Dimensions:
2.0 × 1.2 × 0.6mm • 4.5926mg

Features

- 32.7680kHz Frequency Reference
- Low ESR Tuning Fork Crystal Design, <50k Ohms
- Hermetic Ceramic Surface Mount Package
- Ideal for High Density Circuit Boards
- Frequency Tolerance, ±20ppm Standard
- Parabolic Temperature Coefficient
- Tape and Reel Packaging, EIA-418

Applications

- Real Time Clock Reference
- Low Power FPGAs & MCUs
- Wearable Electronics
- Healthcare Devices
- Battery Powered Applications
- Portable Electronics
- Data Loggers
- Smart Meters

Description

CTS TFE20 Series is designed to pair with low power microcontrollers requiring a Real Time Clock reference with an ESR of 50k Ohms maximum. This series will support general commercial and industrial applications.

Ordering Information

Model		Frequency Tolerance	Load Capacitance	Frequency Code [kHz]	Packaging
TF	E20	2	P	32K7680	R

Code	Package
E	Low ESR
20	2.0x1.2mm

Code	Capacitance
P	12.5pF
J	9pF
V	7pF
W	5pF

Code	@ +25°C
2	±20ppm
1	±10ppm

Code	Frequency
	Product Frequency Code [1]

Code	Packing
R	3k pcs./reel

Notes:

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 Specifications

Operating Conditions

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Temperature	T_A	-	-40	+25	+85	°C
Turnover Temperature	T_M	-	+20	+25	+30	°C
Storage Temperature	T_{STG}	-	-55	-	+125	°C

Frequency Stability

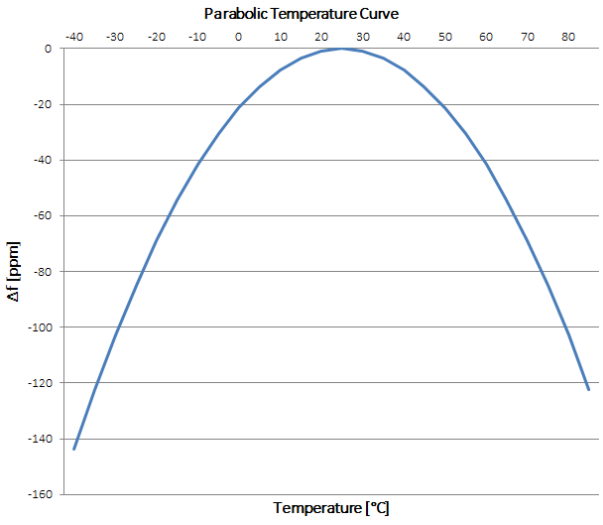
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Frequency	f_O	-		32.7680		kHz
Frequency Tolerance [Note 1]	$\Delta f/f_O$	Standard @ +25°C	-20	-	20	ppm
Parabolic Coefficient	ß	See Figure 1		-0.034 ±0.006		ppm/°C^2
Aging	$\Delta f/f_0$	First Year @ +25°C	-3	-	3	ppm

Crystal Parameters

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Mode	-	-		Flexural Mode [Tuning Fork]		-
Load Capacitance [Note 1]	C_L	Standard	-	12.5	-	pF
Shunt Capacitance	C_0	-	-	1.8	-	pF
Motional Capacitance	C_1	-	-	9.5	-	fF
Series Resistance	R_1	-	-	-	50	kΩ
Drive Level	DL	-	-	0.1	0.5	µW
Insulation Resistance	R_i	+100Vdc ±15Vdc	500	-	-	MΩ

1.] See Ordering Information for available options.

Figure 1



Frequency Stability [Δf] at a given temperature,

$$\Delta f = ß[T_A - T_M]^2$$

ß = Parabolic Coefficient
T_A = Ambient Temperature
T_M = Turnover Temperature

Ex. Find frequency stability at T_A = +45°C

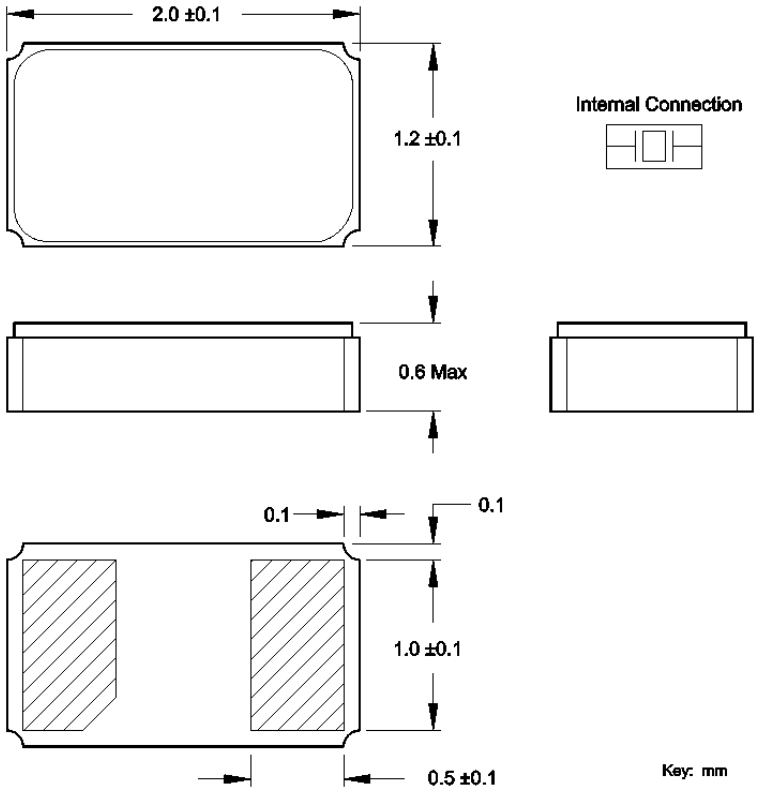
$\Delta f = -0.034[45-25]^2$

$\Delta f = -0.034[20]^2$

$\Delta f = -13.6$ppm

Mechanical Specifications

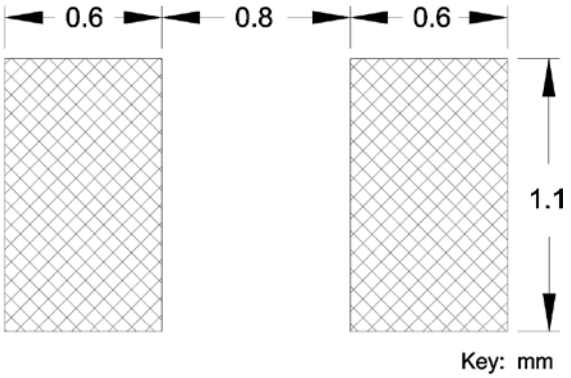
Package Drawing



Marking Information

Refer to document 016-0071-0, TF Marking Guide, for marking format by product family.

Recommended Pad Layout

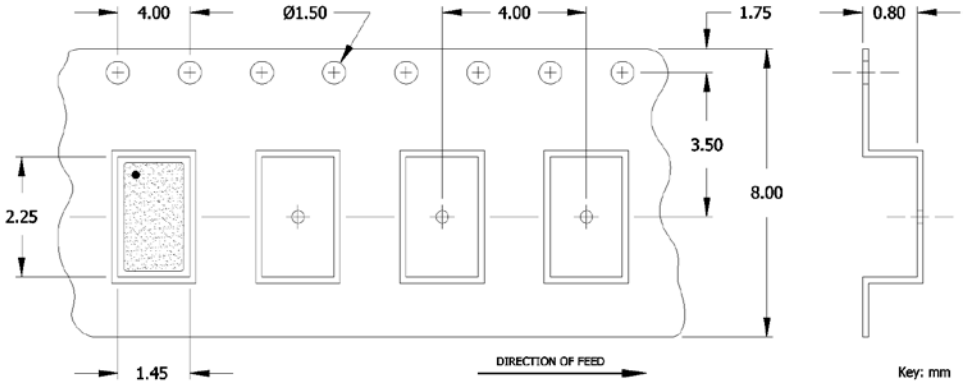


Notes

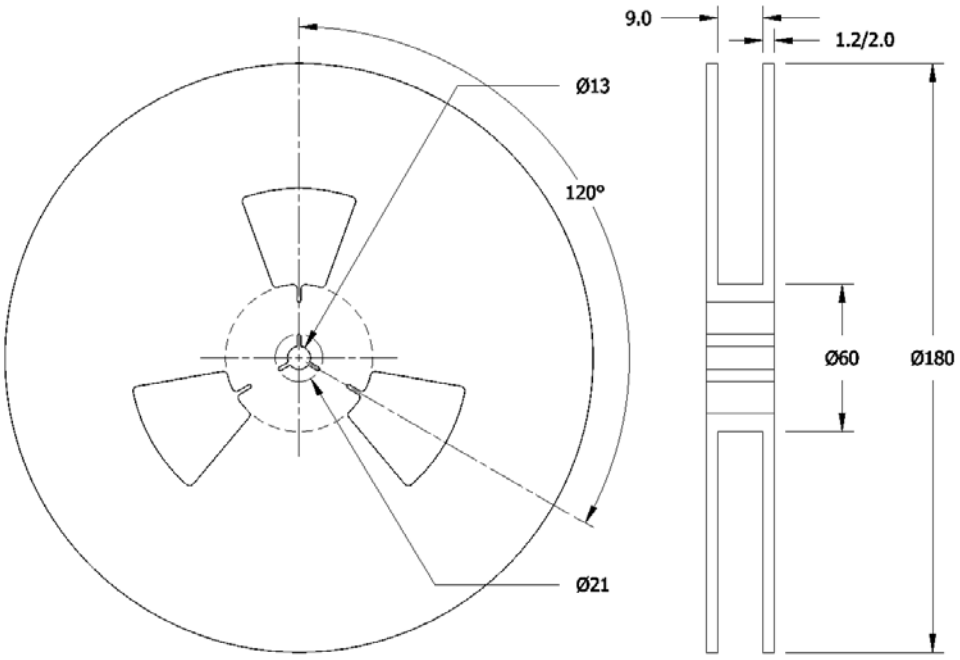
1. JEDEC termination code (e4). Barrier-plating is nickel [Ni] with gold [Au] flash plate.
2. Reflow conditions per JEDEC J-STD-020; +260°C maximum, 20 seconds.
3. MSL = 1.

Packaging - Tape and Reel

Tape Drawing



Reel Drawing



Notes

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