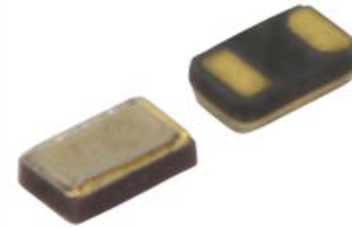


TFA16 Series

Automotive Grade Tuning Fork Crystal

Features

- AEC-Q200 Compliant
- Hermetic Ceramic Surface Mount Package
- Tuning Fork Crystal Design
- 32.7680kHz Frequency Reference
- Frequency Tolerance, ± 20 ppm Standard
- Parabolic Temperature Coefficient
- Tape and Reel Packaging, EIA-418



Part Dimensions:
1.6 × 1.0 × 0.5mm • 2.33909mg

Applications

- Automotive Electronics
- Car Navigation Systems
- Car Infotainment Systems
- Industrial Control Equipment
- M2M Communications
- FPGAs & Microcontrollers

Description

CTS TFA16 Series is ideal for supporting wide range of electronic designs requiring a Real Time Clock reference. This series will support general automotive and industrial applications.

Ordering Information

| Model | Frequency Tolerance | Load Capacitance | Temperature Range | Frequency Code [kHz] | Packaging |
|--------------|---------------------|------------------|-------------------|----------------------|----------------|
| TF A16 | 2 | P | I | 327K | R |
| Code Package | | Code Capacitance | | Code Frequency | |
| A Automotive | | P 12.5pF | | 327K = 32.7680kHz | |
| 16 1.6x1.0mm | | J 9pF | | | |
| | | V 7pF | | | |
| | | W 5pF | | | |
| | Code @ +25°C | | Code Temp. Range | | Code Packing |
| | 2 ± 20 ppm | | I -40°C to +85°C | | R 3k pcs./reel |
| | 1 ± 10 ppm | | G -40°C to +105°C | | |

Notes:

**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 |
|-----------------------|------------------|------------|-----|-----|------|------|
| Operating Temperature | T _A | - | -40 | +25 | +85 | °C |
| | | | -40 | | +105 | |
| Turnover Temperature | T _M | - | +20 | +25 | +30 | °C |
| Storage Temperature | T _{STG} | - | -55 | - | +125 | °C |

Frequency Stability

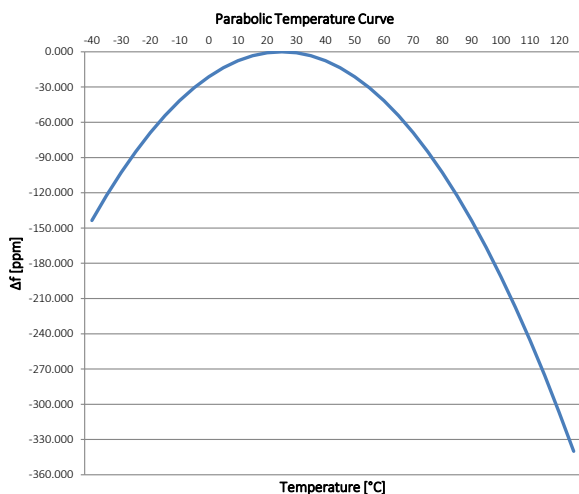
| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|---------------------------------|-------------------|--------------------|-----|---------------|-----|---------------------|
| Frequency | f ₀ | - | | 32.7680 | | kHz |
| Frequency Tolerance [Note 1] | Δf/f ₀ | Standard @ +25°C | -20 | - | 20 | ppm |
| Parabolic Coefficient | β | See Figure 1 | | -0.034 ±0.010 | | ppm/°C ² |
| Aging | Δf/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 | - | - | 1.3 | - | pF |
| Motional Capacitance | C ₁ | - | - | 6.5 | - | fF |
| Series Resistance | R ₁ | - | - | - | 90 | 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,

$$\Delta f = \beta [T_A - T_M]^2$$

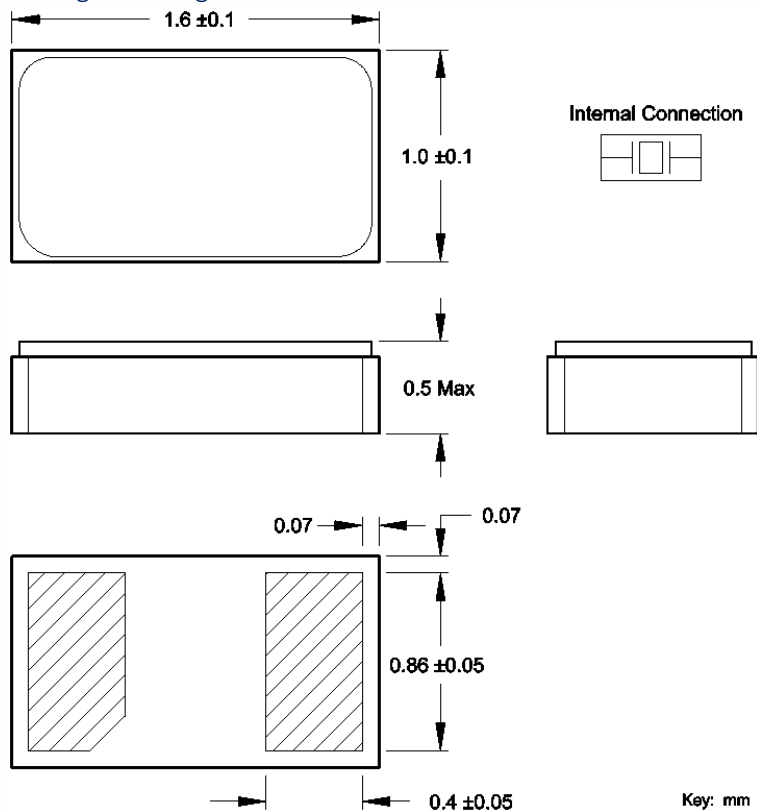
β = Parabolic Coefficient
T_A = Ambient Temperature
T_M = Turnover Temperature

Ex. Find frequency stability at T_A = +60°C

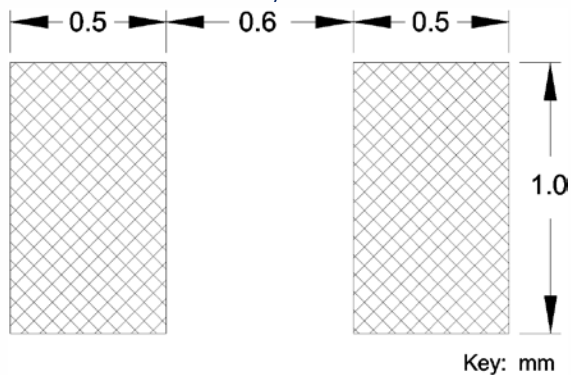
$$\begin{aligned} \Delta f &= -0.034[60-25]^2 \\ \Delta f &= -0.034[35]^2 \\ \Delta f &= -41.65\text{ppm} \end{aligned}$$

Mechanical Specifications

Package Drawing



Recommended Pad Layout



Marking Information

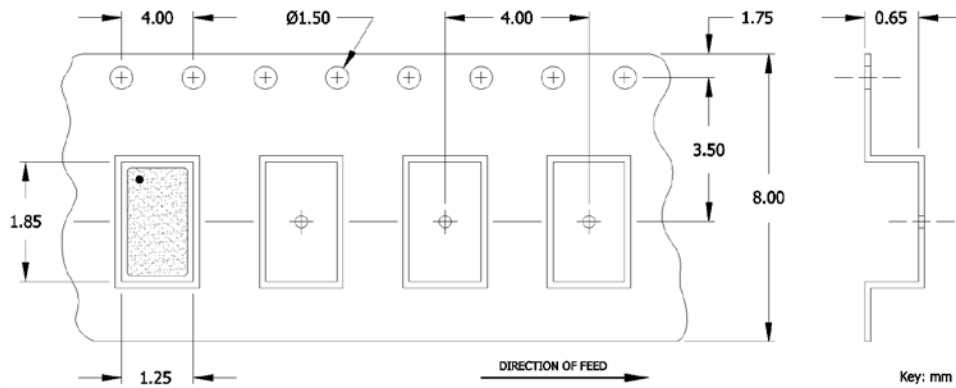
Refer to document 016-0071-0, TF Marking Guide, for marking format by product family.

Notes

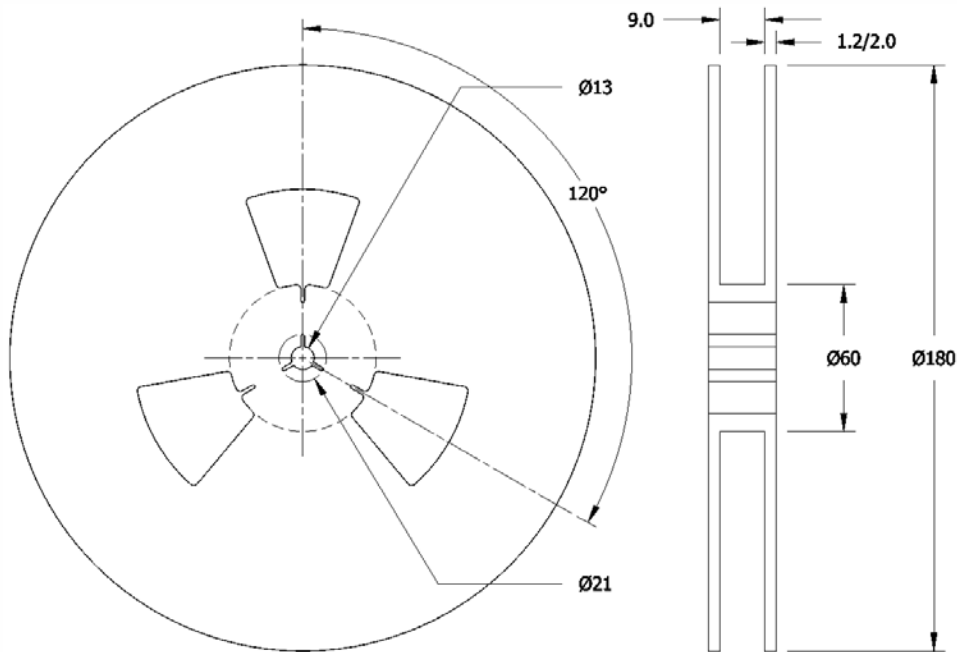
1. JEDEC termination code (e4). Barrier-plating is nickel [Ni] with gold [Au] flash plate.
2. Reflow conditions per JEDEC J-STD-020; +260°C maximum, 20 seconds.
3. MSL = 1.

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.