

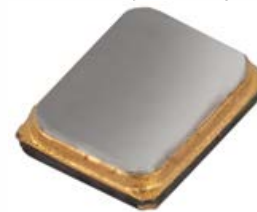


SA164 Series

Automotive Grade Quartz Crystal

Features

- AEC-Q200 Compliant
- Hermetic Ceramic Surface Mount Package
- Fundamental Crystal Design
- Frequency Range 24 – 60MHz
- Frequency Tolerance, $\pm 30\text{ppm}$ Standard
- Frequency Stability, $\pm 50\text{ppm}$ Standard
- Operating Temperature Range to -55°C to $+125^{\circ}\text{C}$
- Tape and Reel Packaging, EIA-418



Part Dimensions:
 $1.6 \times 1.2 \times 0.45\text{mm}$ • 2.76mg

Standard Frequencies – see Page 5 for developed frequencies.
* Check with factory for availability of frequencies not listed.

Applications

- Automotive Electronics
- Mobile Multimedia/Infotainment
- Car Navigation Systems
- Internet of Things [IoT, IIoT]
- Microcontrollers and FPGAs
- Wireless Communication
- Ethernet/GbE/SyncE
- Medical Electronics
- Commercial Military & Aerospace

Description

CTS Model SA164 incorporates a low cost, high Q, small size quartz resonator specifically developed to operate over extended temperature ranges for use in automotive electronics.

Ordering Information

| Model | Frequency Code [MHz] | Mode of Oscillation | Tolerance @ $+25^{\circ}\text{C}$ | Temperature Stability | Temperature Range | Load Capacitance | Packaging |
|-------------------------------------|----------------------|--|-----------------------------------|---|-------------------|---|-----------|
| SA164 | XXX | F | 3 | 5 | G | A | R |
| | | | | | | | |
| Code Frequency | | Code Tolerance | | Code Temp. Range | | Code Packing | |
| Product Frequency Code ¹ | | 1 $\pm 10\text{ppm}$ X $\pm 15\text{ppm}$ 2 $\pm 20\text{ppm}$ 3 $\pm 30\text{ppm}$ 5 $\pm 50\text{ppm}$ | | I -40°C to $+85^{\circ}\text{C}$ ² G -40°C to $+105^{\circ}\text{C}$ ³ H -40°C to $+125^{\circ}\text{C}$ ⁴ N -40°C to $+150^{\circ}\text{C}$ ⁵ P -55°C to $+105^{\circ}\text{C}$ ⁵ M -55°C to $+125^{\circ}\text{C}$ ⁵ | | R 3k pcs./reel | |
| | | Code Mode | | Code Stability | | Code Capacitance Code Capacitance | |
| | | F Fundamental | | X $\pm 15\text{ppm}$ 2 $\pm 20\text{ppm}$ 3 $\pm 30\text{ppm}$ 5 $\pm 50\text{ppm}$ 6 $\pm 100\text{ppm}$ 7 $\pm 150\text{ppm}$ | | V 7pF C 16pF K 8pF D 18pF J 9pF E 20pF A 10pF F 24pF L 12pF G 30pF B 13pF S Series | |

Notes:

- 1] Refer to document 016-1454-0, Frequency Code Tables. 3-digits for frequencies $<100\text{MHz}$, 4-digits for frequencies 100MHz or greater.
- 2] Available with all stability codes.
- 3] Available with stability codes 3, 5, 6 and 7.
- 4] Available with stability codes 5, 6 and 7.
- 5] Stability codes 6 and 7. Contact factory for code 5 availability.

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 | |
| | | | -40 | | +125 | |
| | | | -40 | | +150 | |
| | | | -55 | | +105 | |
| | | | -55 | | +125 | |
| Storage Temperature | T _{STG} | - | -55 | - | +125 | °C |

Frequency Stability

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|---------------------|--------------------|-----------------------------|-----|----------------------------|-----|------|
| Frequency Range | f _O | Fundamental mode | | 24 - 60 | | MHz |
| Frequency Tolerance | Δf/f _O | @ +25°C | | 10, 15, 20, 30 or 50 | | ±ppm |
| Frequency Stability | Δf/f ₂₅ | Referenced to +25°C reading | | 15, 20, 30, 50, 100 or 150 | | ±ppm |
| Aging | Δf/f _O | Typical per year @ +25°C | -3 | - | 3 | ppm |

Crystal Parameters

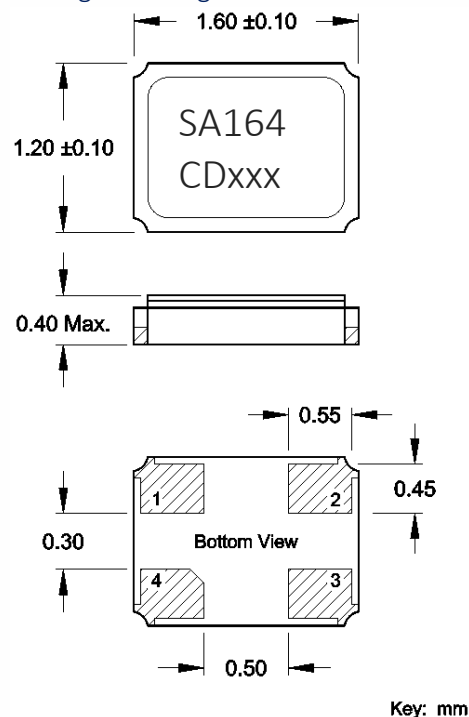
| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|-----------------------|----------------|----------------|-----|--------------------------|-----|------|
| Operating Mode | - | - | | Fundamental | | - |
| Crystal Cut | - | - | | AT-Cut Strip | | - |
| Load Capacitance | C _L | - | | See Ordering Information | | pF |
| Shunt Capacitance | C ₀ | - | - | - | 3.0 | pF |
| Series Resistance | | | | | | |
| Fundamental | R ₁ | 24MHz - <40MHz | - | - | 150 | Ω |
| | | 40MHz - 60MHz | - | - | 100 | |
| Drive Level | DL | - | - | 10 | 150 | μW |
| Insulation Resistance | R _i | +100Vdc ±15Vdc | 500 | - | - | MΩ |

Δf/f_O - Frequency deviation referenced to nominal frequency.

Δf/f₂₅ - Frequency deviation over operating temperature range, referenced to +25°C frequency.

Mechanical Specifications

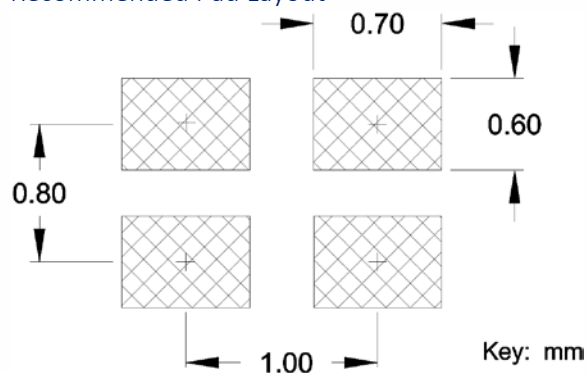
Package Drawing



Marking Information

1. SA164 – CTS model.
2. C – CTS.
2. D – Date Code. See Table I for codes.
3. xxx – Frequency Code.
3-digits, frequencies below 100MHz
[See document 016-1454-0, Frequency Code Tables.]

Recommended Pad Layout



Notes

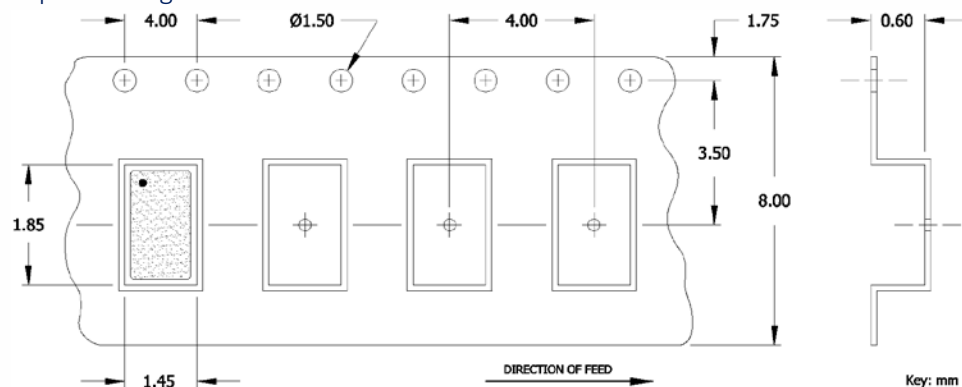
1. JEDEC termination code (e4). Barrier-plating is nickel [Ni] with gold [Au] flash plate.
2. Terminations #2, #4 and the metal lid are connected internally. End user may connect these pins to circuit ground for EMI suppression.
3. Due to package variability, the pad chamfer on the bottom could be located on Pin 1 in a given lot. Layout orientation should be based on the top view [marking side], as indicated in package drawing. The chamfer location does not affect the electrical performance of the device.
4. Reflow conditions per JEDEC J-STD-020; +260°C maximum, 20 seconds.
5. MSL = 1.

Table I – Date Code, Beginning year 2021

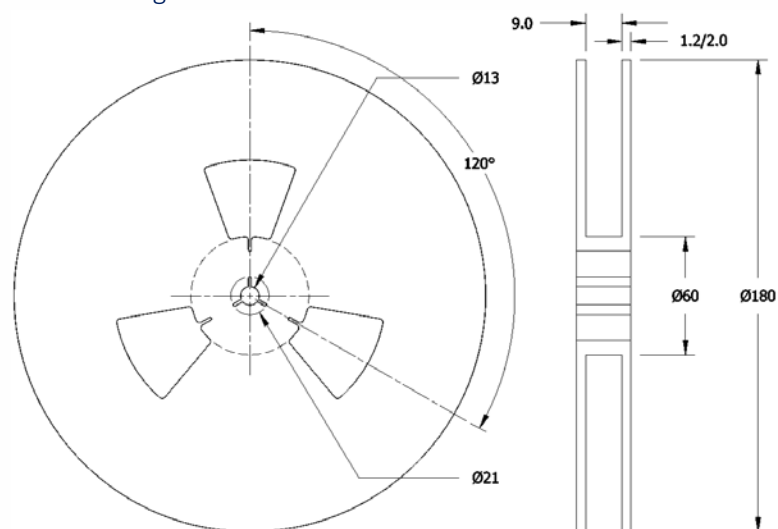
| MONTH | | | | | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|-------|------|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| YEAR | | | | | | | | | | | | | | | | |
| 2021 | 2025 | 2029 | 2033 | 2037 | A | B | C | D | E | F |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

Packaging – Tape and Reel

Tape Drawing



Reel Drawing



Notes

1. Device quantity is 1k pieces minimum to 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.



Addendum

Common Frequencies and Frequency Codes – MHz

| Common Wireless Frequencies | | Additional Frequencies | | | | | |
|-----------------------------|----------------|------------------------|----------------|-----------|----------------|-----------|----------------|
| FREQUENCY | FREQUENCY CODE | FREQUENCY | FREQUENCY CODE | FREQUENCY | FREQUENCY CODE | FREQUENCY | FREQUENCY CODE |
| 24.000000 | 240 | 24.305000 | 243 | 33.333300 | 33A | | |
| 25.000000 | 250 | 24.545400 | 24F | 33.868800 | 338 | | |
| 26.000000 | 260 | 24.545454 | 24G | 35.328000 | 353 | | |
| 27.120000 | 271 | 24.553500 | 24B | 36.000000 | 360 | | |
| 30.000000 | 300 | 24.576000 | 24C | 38.000000 | 380 | | |
| 32.000000 | 320 | 25.000625 | 25A | 38.880000 | 388 | | |
| 37.400000 | 374 | 26.041660 | 26F | 39.062500 | 39A | | |
| 38.400000 | 384 | 27.000000 | 270 | 41.600000 | 41C | | |
| 40.000000 | 400 | 28.224000 | 282 | 44.000000 | 440 | | |
| 48.000000 | 480 | 28.322000 | 28C | 45.000000 | 450 | | |
| 52.000000 | 520 | 28.375000 | 283 | 49.152000 | 491 | | |
| | | 28.636360 | 286 | 50.000000 | 500 | | |
| | | 29.491200 | 29B | 54.000000 | 540 | | |
| | | 30.400000 | 304 | | | | |
| | | 30.720000 | 307 | | | | |
| | | 31.250000 | 312 | | | | |
| | | 32.768000 | 327 | | | | |
| | | 33.000000 | 330 | | | | |
| | | 33.330000 | 333 | | | | |
| | | 33.333000 | 33E | | | | |

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

CTS:

| | | | | |
|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| <u>SA164271F15HKR</u> | <u>SA164240F15HKR</u> | <u>SA164243F15HKR</u> | <u>SA16424BF15HKR</u> | <u>SA16424CF15HKR</u> |
| <u>SA16424FF15HKR</u> | <u>SA16424GF15HKR</u> | <u>SA164540F15HKR</u> | <u>SA164440F15HKR</u> | <u>SA164450F15HKR</u> |
| <u>SA164480F15HKR</u> | <u>SA164491F15HKR</u> | <u>SA164500F15HKR</u> | <u>SA164520F15HKR</u> | <u>SA164380F15HKR</u> |
| <u>SA164384F15HKR</u> | <u>SA164388F15HKR</u> | <u>SA16439AF15HKR</u> | <u>SA164400F15HKR</u> | <u>SA16441CF15HKR</u> |
| <u>SA164338F15HKR</u> | <u>SA16433AF15HKR</u> | <u>SA16433EF15HKR</u> | <u>SA164353F15HKR</u> | <u>SA164360F15HKR</u> |
| <u>SA164374F15HKR</u> | <u>SA164307F15HKR</u> | <u>SA164312F15HKR</u> | <u>SA164320F15HKR</u> | <u>SA164327F15HKR</u> |
| <u>SA164330F15HKR</u> | <u>SA164333F15HKR</u> | <u>SA164283F15HKR</u> | <u>SA164286F15HKR</u> | <u>SA16428CF15HKR</u> |
| <u>SA16429BF15HKR</u> | <u>SA164300F15HKR</u> | <u>SA164304F15HKR</u> | <u>SA164250F15HKR</u> | <u>SA16425AF15HKR</u> |
| <u>SA164260F15HKR</u> | <u>SA16426FF15HKR</u> | <u>SA164270F15HKR</u> | <u>SA164282F15HKR</u> | |