Crystals

Connect

CtS

**Your Partner in
Smart Solutions**

Crystals

CTS has a wide variety of crystal (XTAL) products that are available in multiple package types and frequencies. We have the perfect crystal solution whether you are starting a new design with critical specifications or if you need a reliable source for an existing application. Contact our team to help you select from a range of crystals available in glass seal or seam seal packages with sizes as small as 1.6×1.2mm.

Standard Crystals

CTS offers a comprehensive portfolio of quartz crystal resonators for direct use in electronic applications. This line-up offers a wide selection of industry standard packages, meets RoHS/REACH requirements, achieves high Q values and supports tight stabilities over temperature. Applications include wearable electronics, IoT, wireless communication, Bluetooth and USB interfaces, handheld devices, instrumentation, notebooks and other computer peripherals.

Tuning Fork Crystals

Commonly referred to as "watch crystals", these designs are suitable for applications that require a real time clock reference [RTC]; including computer clock timers, FPGAs and micro-controllers, wireless communication, test and measurement, handheld devices, and wearable electronic products. The CTS portfolio offers a wide array of package configurations, providing a solution for any customer application.

Automotive & High-Temp Crystals

Automotive Grade crystals compliant to AEC-Q200 & TS16949 standards, offer operating temperatures to +150°C. Target applications are RKE [remote keyless entry], audio/video systems, mobile multimedia systems, wireless communication and TPMS [tire pressure monitoring system]. High Temp crystals are developed to support applications with temperature requirements beyond +85°C, supporting operation to +150°C. Target applications are industrial controllers, factory automation, LED lighting, communication systems, transportation, energy; outdoor signage, security and surveillance systems.

IoT Enhanced Crystals

CTS offers crystal models with specific enhanced design parameters targeted for wireless protocols used in Internet of Things (IoT) enterprises. Applications include wearable electronics, wireless communications, Bluetooth, low power MCUs, SoCs, RF ICs., near field communication, and home/building automation.

Standard Crystals

» Load Capacitance: Available with series or parallel load
» Calibration Tolerance: Most models ±10, ±15, ±20, ±25, ±30 & ±50 ppm; model 445 ±20 & ±30 only;
  models ATS and ATS-SM ±30ppm only
» Stability & Temperature Range: ±10 ppm standard range -20°C to +70°C & mid range -30°C to +85°C
  ±15, ±20, ±25 ±30 & ±50 ppm standard, mid & extended range -40°C to +85°C

Model	Features	Package Type	Package Size (mm)	Frequency Range [MHz]	E.S.R. Maximum (Ohm)
416	General Purpose 4-pad	Seam Seal	1.6 x 1.2 x 0.35	24-80 Fund	120-60
402	General Purpose 4-pad	Seam Seal	2.0 x 1.6 x 0.55	16-60 Fund	120-60
425	General Purpose 4-pad	Seam Seal	2.5 x 2.0 x 0.65	12-60 Fund	120-50
403	General Purpose 4-pad	Seam Seal	3.2 x 2.5 x 0.80	10-60 Fund	120-60
443	Low Cost General Purpose 4-pad	Glass Seal	3.2 x 2.5 x 0.90	12-50 Fund	100-60
445	Low Cost General Purpose 2-pad	Glass Seal	5.0 x 3.2 x 1.35	10-50 Fund	100 - 30
405	General Purpose 4-pad	Seam Seal	5.0 x 3.2 x 0.90	6.75-54 Fund	80-40
406	General Purpose 4-pad	Seam Seal	6.0 x 3.5 x 1.20	8-52 Fund	70-35
407	General Purpose 4-pad	Seam Seal	7.0 x 5.0 x 1.20	6-40 Fund 35-133 3rd OT	80-40 Fund 80-60 3rd OT
ATS-SM	General Purpose	Metal Can	12.30 x 4.83 x 4.30	3.2-30 Fund 27-64 3rd OT	150-30 Fund 80-60 3rd OT
ATSSMTS	Tight Stability Options	Metal Can	12.30 x 4.83 x 4.30	3.2-30 Fund 27-64 3rd OT	150-30 Fund 80-60 3rd OT
ATSSMLP	General Purpose Low Profile Package (3.20mm Height)	Metal Can	12.30 x 4.83 x 3.20	3.2-30 Fund 27-64 3rd OT	150-30 Fund 80-60 3rd OT
ATSSMGL	Ground Lead 3-pad	Metal Can	12.30 x 5.00 x 4.30	3.2-30 Fund 27-64 3rd OT	150-30 Fund 80-60 3rd OT
ATS*	General Purpose	Metal Can	10.85 x 4.50 x 3.68	3.2-30 Fund 27-64 3rd OT	150-30 Fund 80-60 3rd OT

* ATS model with Thru-Hole, all other models are SMD.
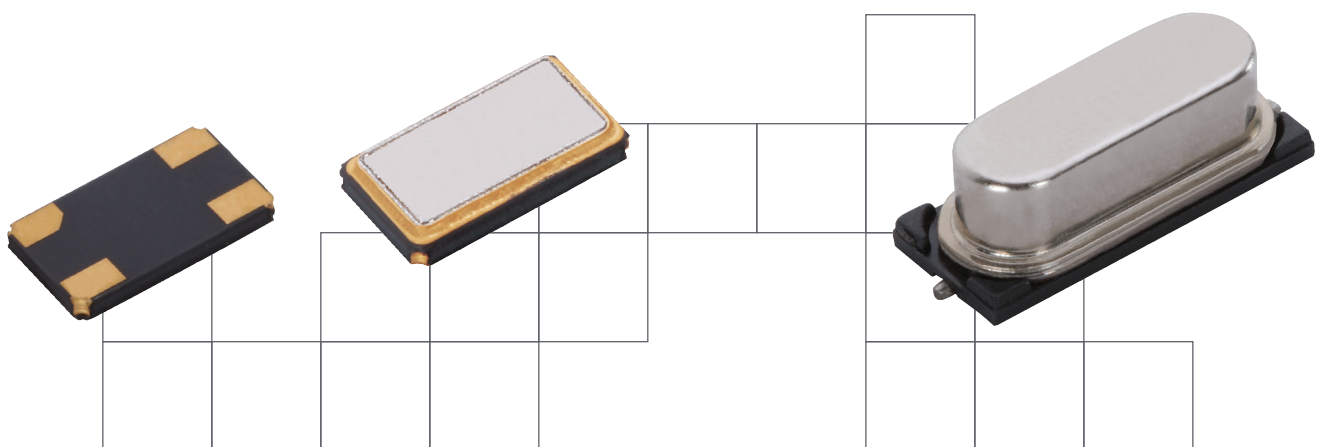
Tuning Fork Crystals

» Frequency Range: 0.032768 MHz
» Calibration Tolerance: ±20 ppm standard, ±10 ppm optional, check with factory for availability
» Temperature Range: All models extended range -40°C to +85°C except TFSM26, TFNC38, TFNC26
   & TFNC15 are -10°C to +60°C

Model	Features	Package Type	Package Size (mm)	Temperature Stability	E.S.R. Maximum (Ohm)
TFE16	Low ESR Design 2-pad	Hermetic Ceramic	1.6 x 1.0 x 0.50	-0.030 ppm/°C^2 Temp Coefficient	60k
TFE20	Low ESR Design 2-pad	Hermetic Ceramic	2.0 x 1.2 x 0.60	-0.030 ppm/°C^2 Temp Coefficient	50k
TFE32	Low ESR Design 2-pad	Hermetic Ceramic	3.2 x 1.5 x 0.80	-0.030 ppm/°C^2 Temp Coefficient	90k
TF16	2-pad	Hermetic Ceramic	1.6 x 1.0 x 0.50	-0.030 ppm/°C^2 Temp Coefficient	90k
TF20	2-pad	Hermetic Ceramic	2.0 x 1.2 x 0.60	-0.030 ppm/°C^2 Temp Coefficient	90k
TF20L	2-pad Low Profile Package (0.38mm height)	Hermetic Ceramic	2.0 x 1.2 x 0.38	-0.030 ppm/°C^2 Temp Coefficient	100k
TF32	2-pad	Hermetic Ceramic	3.2 x 1.5 x 0.80	-0.030 ppm/°C^2 Temp Coefficient	70k
TF415	2-pad	Hermetic Ceramic	4.1 x 1.5 x 0.90	-0.035 ppm/°C^2 Temp Coefficient	70k
TF519	2-pad	Hermetic Ceramic	4.9 x 1.8 x 1.0	-0.034 ppm/°C^2 Temp Coefficient	70k
TFPMN	Narrow Body. Replacement for Citizen CM310 Epson MC-146.	Plastic Molded	6.9 x 1.4 x 1.3	-0.034 ppm/°C^2 Temp Coefficient	70k
TFPM	Replacement for Citizen CM200 Epson MC-306.	Plastic Molded	8.0 x 3.8 x 2.5	-0.034 ppm/°C^2 Temp Coefficient	50k
TFSM26	Low Cost	Metal Cylinder with Lead-Form	6.2 x 2.1	-0.035 ppm/°C^2 Temp Coefficient	50k
TFNC38*	Replacement for Citizen CFS Epson C-Type.	Metal Cylinder	8.3 x 3.1	-0.035 ppm/°C^2 Temp Coefficient	50k
TFNC26*	Replacement for Citizen CFS Epson C-Type.	Metal Cylinder	6.2 x 2.1	-0.035 ppm/°C^2 Temp Coefficient	50k
TFNC15*	Replacement for Citizen CFS Epson C-Type.	Metal Cylinder	5.1 x 1.5	-0.035 ppm/°C^2 Temp Coefficient	50k

* TFNC38, TFNC26 & TFNC15 models with Thru-Hole, all other models are SMD.

CtS Your Partner in Smart Solutions
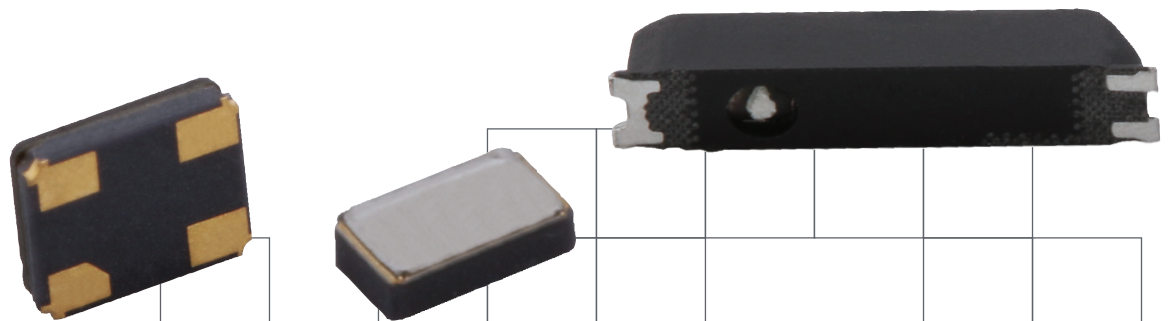
Automotive & High-Temp Crystals

» Calibration Tolerance: ±20, ±30 & ±50 ppm
» Stability Range: ±15, ±20, ±30, ±50, ±100 & ±150 ppm
» Temperature Range: -40°C to +85°C, -40°C to +105°C, -40°C to +125°C & -40°C to +150°C
» Surface Mount

Automotive Model	High-Temp Model	Features	Package Type	Package Size (mm)	Frequency Range
GA324	HG24	4-pad	Glass Seal	3.2 x 2.5	12-40MHz Fund 36-120MHz 3rd OT
SA324	HS324	4-pad	Seam Seal	3.2 x 2.5	8-40MHz Fund 24-120MHz 3rd OT
GA532	HG532	2-pad	Glass Seal	5.0 x 3.2	12-40MHz Fund 36-120MHz 3rd OT
GA534	HG534	4-pad	Glass Seal	5.0 x 3.2	8-40MHz Fund 24-120MHz 3rd OT
SA534	HS534	4-pad	Seam Seal	5.0 x 3.2	8-40MHz Fund 24-120MHz 3rd OT

IoT Enhanced Crystals

» Load Capacitance: Typical values are 4, 5, 6, 7, 8, 9, 10 & 12pF
» Calibration Tolerance: ±7, ±10, ±15, ±20, ±25, ±30 ppm
» Stability & Temperature Range: ±10 ppm standard range -20°C to +70°C & mid-range -30°C to +85°C; ±15, ±20, ±25, ±30, ±50 ppm standard, mid & extended range -40°C to +85°C; ±20, ±50, ±100 ppm for -40°C to +105°C; ±50, ±100 ppm for -40°C to +125°C

Model	Features	Package Type	Package Size (mm)	Frequency Range	E.S.R. Maximum (Ohm)	C0 Parameters (pF)
412W	IoT Enhanced Design 4-pad	Seam Seal	1.2 x 1.0 x 0.35	32 - 80 Fund	100 - 60	1.0 Typ. <3.0 Max
416W	IoT Enhanced Design 4-pad	Seam Seal	1.6 x 1.2 x 0.35	24 - 52 Fund	150 - 80	1.0 Typ. <3.0 Max
402W	IoT Enhanced Design 4-pad	Seam Seal	2.0 x 1.6 x 0.55	16 - 52 Fund	150 - 50	1.0 Typ. <3.0 Max
425W	IoT Enhanced Design 4-pad	Seam Seal	2.5 x 2.0 x 0.65	16 - 52 Fund	100 - 40	1.0 Typ. <3.0 Max
403W	IoT Enhanced Design 4-pad	Seam Seal	3.2 x 2.5 x 0.80	10 - 54 Fund	150 - 35	1.0 Typ. <3.0 Max
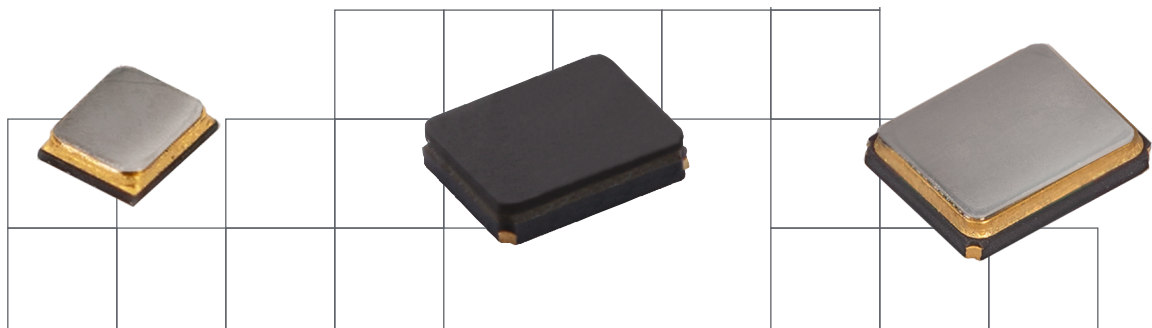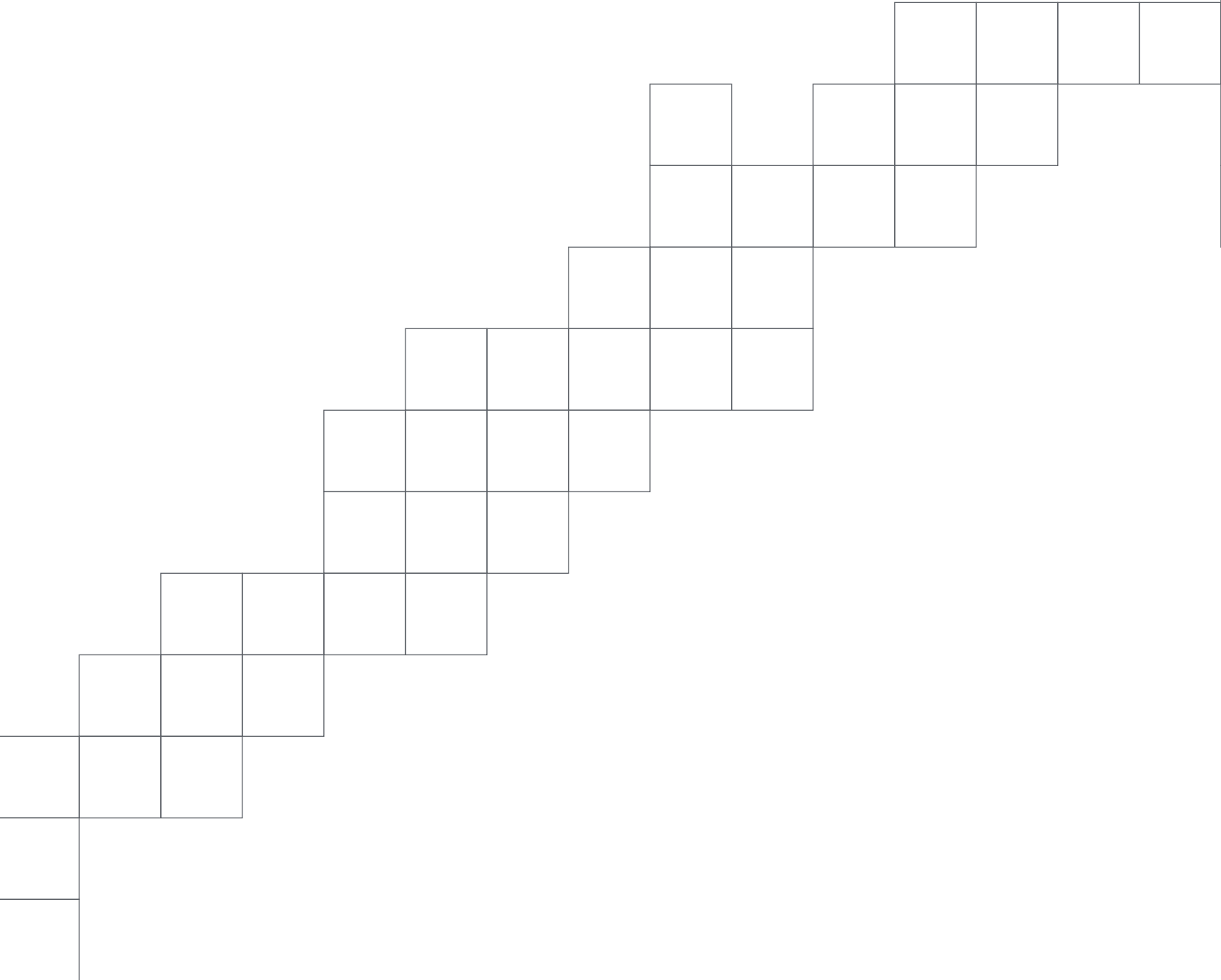
Contact Sales

North America
T: +1 (800) 982-5737

Asia
T: +65-6481-1466

All Other Regions
T: +1 (508) 435-6831

frequencysales@ctscorp.com

www.ctscorp.com