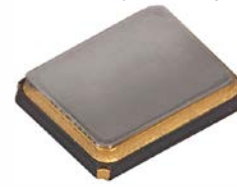




SA324 Series

Automotive Grade Quartz Crystal



Features

- AEC-Q200 Compliant
- Hermetic Ceramic Surface Mount Package
- Fundamental and 3rd Overtone Crystal Design
- Frequency Range 8 – 160MHz
- Frequency Tolerance, ± 30 ppm Standard
- Frequency Stability, ± 50 ppm Standard
- Operating Temperature Range to -55°C to $+125^{\circ}\text{C}$
- Tape and Reel Packaging, EIA-418

Part Dimensions:
3.2 x 2.5 x 0.8mm • 20.716mg

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 SA324 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°C	Temperature Stability	Temperature Range	Load Capacitance	Packaging																																															
SA324	XXX or XXXX	F	3	5	G	A	R																																															
<table><tr><th>Code</th><th>Frequency</th></tr><tr><td colspan="2">Product Frequency Code ¹</td></tr></table>		Code	Frequency	Product Frequency Code ¹			<table><tr><th>Code</th><th>Tolerance</th></tr><tr><td>1</td><td>±10ppm</td></tr><tr><td>X</td><td>±15ppm</td></tr><tr><td>2</td><td>±20ppm</td></tr><tr><td>3</td><td>±30ppm</td></tr><tr><td>5</td><td>±50ppm</td></tr></table>	Code	Tolerance	1	±10ppm	X	±15ppm	2	±20ppm	3	±30ppm	5	±50ppm		<table><tr><th>Code</th><th>Temp. Range</th></tr><tr><td>I</td><td>-40°C to +85°C ²</td></tr><tr><td>G</td><td>-40°C to +105°C ³</td></tr><tr><td>H</td><td>-40°C to +125°C ⁴</td></tr><tr><td>N</td><td>-40°C to +150°C ⁵</td></tr><tr><td>P</td><td>-55°C to +105°C ⁵</td></tr><tr><td>M</td><td>-55°C to +125°C ⁵</td></tr></table>	Code	Temp. Range	I	-40°C to +85°C ²	G	-40°C to +105°C ³	H	-40°C to +125°C ⁴	N	-40°C to +150°C ⁵	P	-55°C to +105°C ⁵	M	-55°C to +125°C ⁵		<table><tr><th>Code</th><th>Packing</th></tr><tr><td>R</td><td>3k pcs./reel</td></tr></table>	Code	Packing	R	3k pcs./reel													
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Notes:

- 1) Refer to document 016-1454-0, Frequency Code Tables. 3-digits for frequencies <100MHz, 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		8 - 80		MHz
		3rd Overtone mode		80 - 160		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

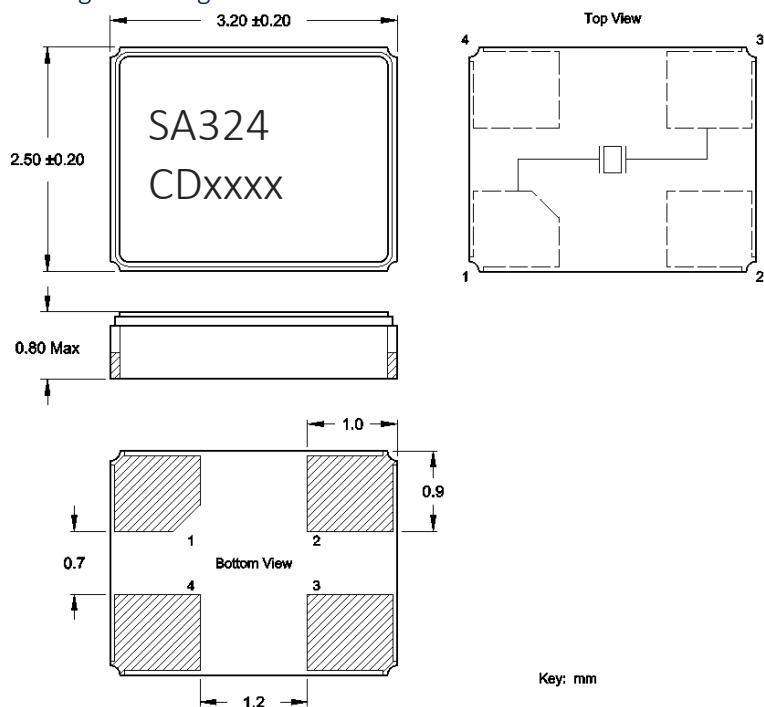
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Mode	-	-	Fundamental & 3rd Overtone			-
Crystal Cut	-	-	AT-Cut Strip			-
Load Capacitance	C _L	-	See Ordering Information			pF
Shunt Capacitance	C ₀	-	-	-	3.0	pF
Series Resistance						
Fundamental	R ₁	8MHz - <10MHz	-	-	500	Ω
		10MHz - <11MHz	-	-	250	
		11MHz - <12MHz	-	-	150	
		12MHz - <16MHz	-	-	100	
		16MHz - <30MHz	-	-	70	
		30MHz - 80MHz	-	-	50	
3rd Overtone	R ₁	80MHz - 160MHz	-	-	100	
Drive Level	DL	-	-	10	200	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

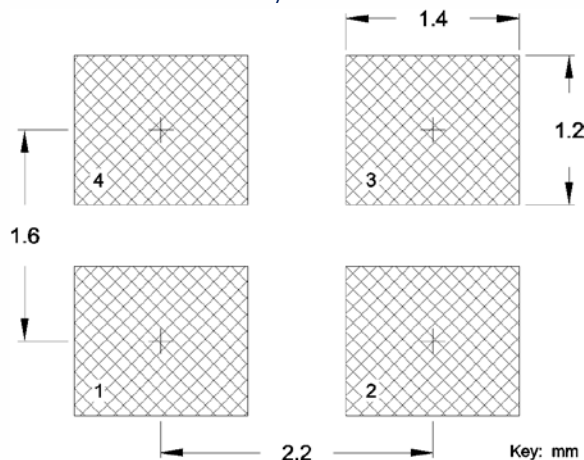
Package Drawing



Marking Information

1. SA324 – CTS model.
2. C – CTS.
2. D – Date Code. See Table I for codes.
3. xxx or xxxx – Frequency Code.
3-digits, frequencies below 100MHz
4-digits, frequencies 100MHz or greater
[See document 016-1454-0, Frequency Code Tables.]

Recommended Pad Layout



Notes

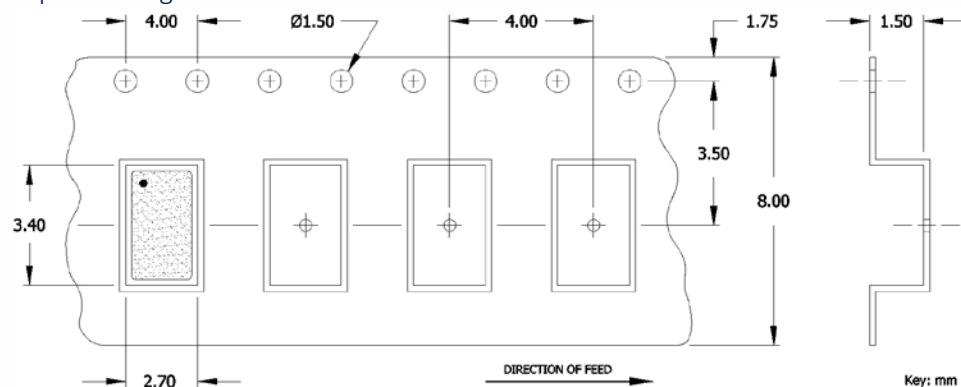
1. JEDEC termination code (e4). Barrier-plating is nickel [Ni] with gold [Au] flash plate.
2. Terminations #2, #4 and the metal lid are connected internally. End user may connect these pins to circuit ground for EMI suppression.
3. Due to package variability, the pad chamfer on the bottom could be located 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

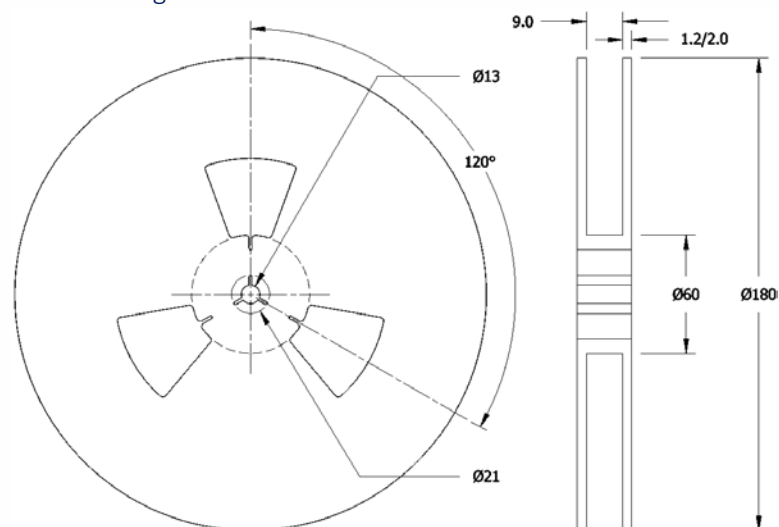
MONTH					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
YEAR																
2021	2025	2029	2033	2037	A	B	C	D	E	F	G	H	J	K	L	M
2022	2026	2030	2034	2038	N	P	Q	R	S	T	U	V	W	X	Y	Z
2023	2027	2031	2035	2039	a	b	c	d	e	f	g	h	j	k	l	m
2024	2028	2032	2036	2040	n	p	q	r	s	t	u	v	w	x	y	z

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
12.000000	120	8.000000	080	19.440000	194	32.768000	327
13.560000	13C	10.000000	100	19.660800	19B	33.000000	330
16.000000	160	11.059200	111	19.680000	196	33.330000	333
19.200000	192	12.288000	122	20.480000	204	33.333000	33E
20.000000	200	12.500000	125	20.736000	207	33.333300	33A
24.000000	240	12.688000	126	22.118400	221	33.868800	338
25.000000	250	12.800000	128	22.579200	225	35.328000	353
26.000000	260	13.000000	130	24.305000	243	36.000000	360
27.120000	271	13.500000	135	24.545400	24F	37.500000	375
30.000000	300	13.553750	13B	24.545454	24G	38.000000	380
32.000000	320	13.824000	138	24.553500	24B	38.880000	388
37.400000	374	13.934400	139	24.576000	24C	39.062500	39A
38.400000	384	14.000000	140	25.000625	25A	41.600000	41C
40.000000	400	14.318180	143	26.041660	26F	44.000000	440
48.000000	480	14.400000	144	26.800000	268	45.000000	450
52.000000	520	14.745600	147	27.000000	270	49.152000	491
		15.360000	153	27.600000	27C	50.000000	500
		16.367600	16E	28.224000	282	54.000000	540
		16.368000	16C	28.322000	28C	75.000000	750
		16.384000	163	28.375000	283	114.285000	1142
		16.666700	16N	28.636360	286	156.250000	1562
		16.800000	168	29.491200	29B		
		16.934400	169	30.400000	304		
		18.000000	180	30.720000	307		
		18.432000	184	31.250000	312		