

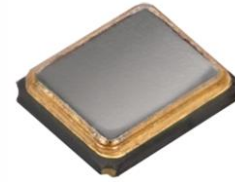


THE DATASHEET OF 402F2501XIAR



Model 402

Sub-Miniature Surface Mount Crystal



Part Dimensions:
2.0 × 1.6 × 0.55mm • 3.9mg

Features

- Hermetic Ceramic Surface Mount Package
- Fundamental Crystal Design
- Frequency Range 16 – 60MHz
- Frequency Tolerance, $\pm 30\text{ppm}$ Standard
- Frequency Stability, $\pm 30\text{ppm}$ Standard
- Operating Temperature Range to -40°C to $+105^{\circ}\text{C}$
- Tape and Reel Packaging, EIA-481

Applications

- IoT and IIoT Applications
- Wireless Communications
- FPGA/Microcontrollers
- USB Interfaces
- Computer Peripherals
- Portable Equipment
- Test and Measurement
- M2M Communications
- Wearables

Description

CTS Model 402 incorporates a high Q quartz resonator and is ideal for supporting a wide range of commercial and industrial applications.

Ordering Information

Model	Mode of Oscillation	Frequency Code [MHz]	Tolerance @ +25°C	Temperature Stability	Temperature Range	Load Capacitance	Packaging																																														
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Notes:

- 1] Refer to document 016-1454-0, Frequency Code Tables. 3-digits for frequencies $<100\text{MHz}$.
- 2] Available with all stability codes.
- 3] Available with stability codes X, 2, 3 and 5.
- 4] Available with stability codes 3 and 5.

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			-20		+70	°C
			-40		+85	
			-40		+105	
Storage Temperature	T_{STG}	-	-40	-	+125	°C

Frequency Stability

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Frequency Range	f_0	-		16 - 60		MHz
Frequency Tolerance	$\Delta f/f_0$	@ +25°C		10, 15, 20, or 30		±ppm
Frequency Stability	$\Delta f/f_{25}$	Referenced to +25°C reading		10, 15, 20, 30 or 50		±ppm
Aging	$\Delta f/f_0$	Typical per year @ +25°C	-3	-	3	ppm

Crystal Parameters

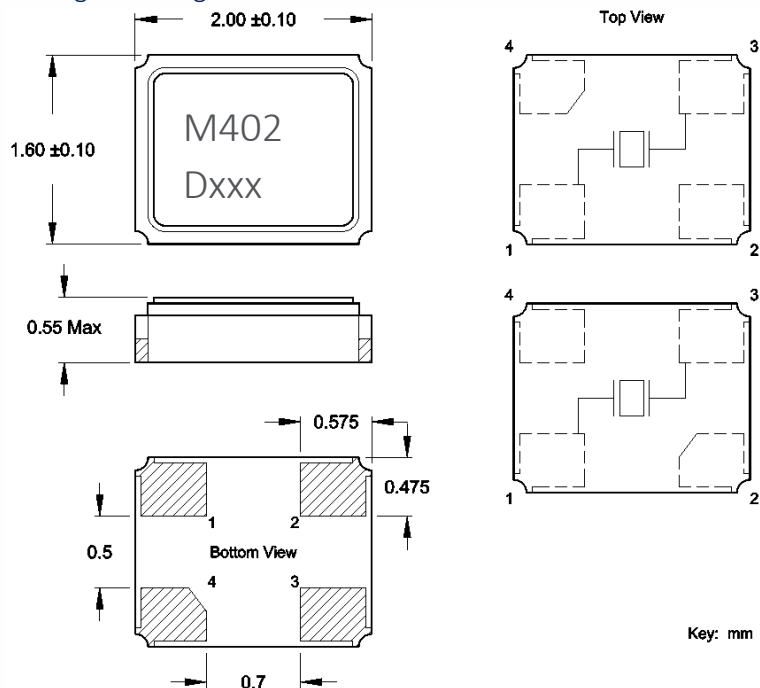
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Mode	-	-		Fundamental		-
Crystal Cut	-	-		AT-Cut Strip		-
Load Capacitance	C_L	-		See Ordering Information		pF
Shunt Capacitance	C_0	-	-	-	3.0	pF
Series Resistance	R_1	16MHz - <24MHz	-	-	150	Ω
		24MHz - <30MHz	-	-	100	
		30MHz - <40MHz	-	-	80	
		40MHz - <60MHz	-	-	60	
Drive Level	DL	-	-	10	150	µW
Insulation Resistance	R_i	+100Vdc ±15Vdc	500	-	-	MΩ

$\Delta f/f_1$ - Frequency deviation referenced to nominal frequency.

$\Delta f/f_{25}$ - Frequency deviation over operating temperature range, referenced to +25°C frequency.

Mechanical Specifications

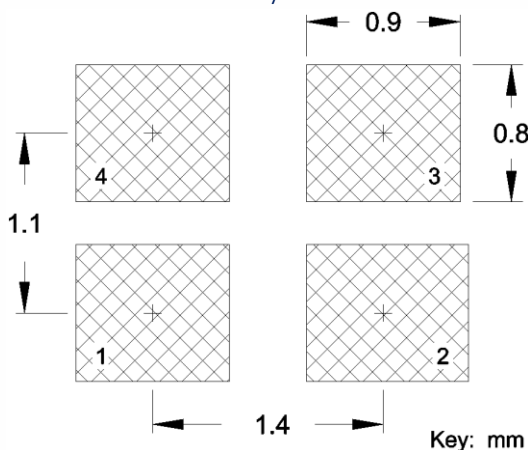
Package Drawing



Marking Information

1. M402 – CTS Model series.
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

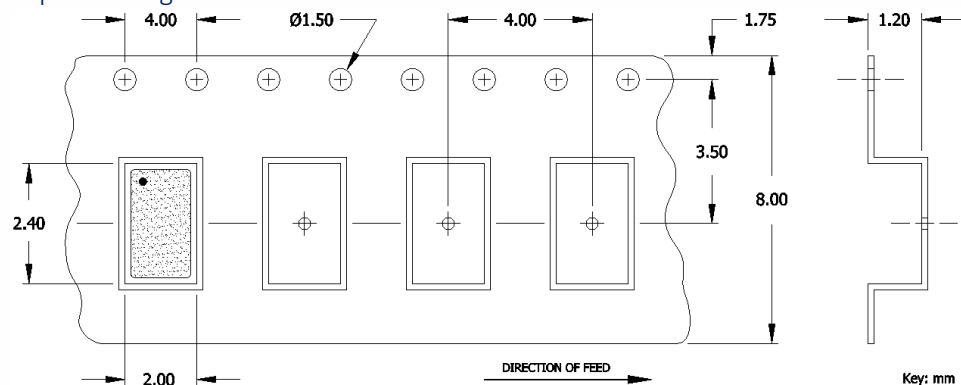
1. JEDEC termination code (e4). Barrier-plating is nickel [Ni] with gold [Au] flash plate.
2. Terminations #2, #4 and the metal lid are connected internally. End user may connect these pins to circuit ground for EMI suppression.
3. Due to package variability, the pad chamfer on the bottom could be located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

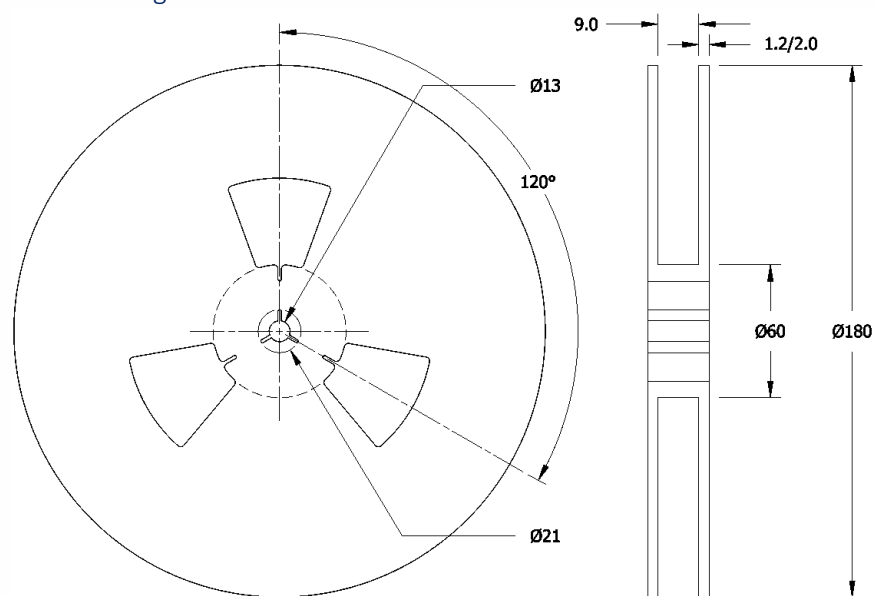
MONTH					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
YEAR																
2021	2025	2029	2033	2037	A	B	C	D	E	F	G	H	J	K	L	M
2022	2026	2030	2034	2038	N	P	Q	R	S	T	U	V	W	X	Y	Z
2023	2027	2031	2035	2039	a	b	c	d	e	f	g	h	j	k	l	m
2024	2028	2032	2036	2040	n	p	q	r	s	t	u	v	w	x	y	z

Packaging – Tape and Reel

Tape Drawing



Reel Drawing



Notes

1. Device quantity is 1k pieces minimum and 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.