

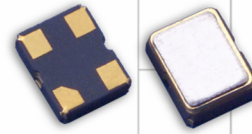


Model 521

HCMOS TCXO

Features

- Ceramic Surface Mount Package
- Low Phase Jitter Performance
- Fundamental Crystal Design
- Frequency Range 9.5 – 60MHz *
- +1.8V, +2.5V, +2.8V, +3.0V and +3.3V Operation
- Output Enable Standard
- Tape and Reel Packaging, EIA-481



Part Dimensions:
2.5 × 2.0 × 1.0mm • 14.25851mg

Standard Frequencies

* See Page 7 for common frequencies.
Check with factory for frequency availability.

Applications

- GPS
- IoT and IIoT
- Wireless Connectivity
- Synchronous Ethernet
- Base Stations/Femto Cells
- Mobile Communication
- WiMax/Wi-Fi/WLAN
- Phase Locked Loop
- Test Equipment

Description

CTS Model 521 is a low cost, small size, high performance Temperature Compensated Crystal Oscillator [TCXO]. Employing analog IC technology that provides a HCMOS output, high order temperature compensation engine; coupled with a fundamental quartz crystal M521 has excellent stability and low jitter/phase noise performance.

Ordering Information

Model	Supply Voltage	Frequency Code [MHz]	Frequency Stability ²	Temperature Range	Frequency Tuning	Packaging																						
521	L	XXX	25	D	T	R																						
<table><tr><th>Code</th><th>Voltage</th></tr><tr><td>M</td><td>+1.8Vdc</td></tr><tr><td>N</td><td>+2.5Vdc</td></tr><tr><td>T</td><td>+2.8Vdc</td></tr><tr><td>R</td><td>+3.0Vdc</td></tr><tr><td>L</td><td>+3.3Vdc</td></tr></table>		Code	Voltage	M	+1.8Vdc	N	+2.5Vdc	T	+2.8Vdc	R	+3.0Vdc	L	+3.3Vdc		<table><tr><th>Code</th><th>Stability</th></tr><tr><td>20</td><td>±2.0ppm ³</td></tr><tr><td>25</td><td>±2.5ppm</td></tr></table>	Code	Stability	20	±2.0ppm ³	25	±2.5ppm		<table><tr><th>Code</th><th>Frequency Deviation</th></tr><tr><td>T</td><td>TCXO [No Voltage Control]</td></tr></table>	Code	Frequency Deviation	T	TCXO [No Voltage Control]	
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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] Frequency vs. Temperature only.
- 3] Contact factory for availability with Temperature Range codes "D" and "I".

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
Maximum Supply Voltage	V_{CC}	-	-0.5	-	4.6	V
Supply Voltage	V_{CC}	$\pm 5\%$	1.71	1.8	1.89	V
			2.38	2.5	2.63	
			2.66	2.8	2.94	
			2.85	3.0	3.15	
			3.14	3.3	3.47	
Supply Current	I_{CC}	9.50MHz - 60.00MHz	-	-	10	mA
Output Load	C_L	-	-	-	15	pF
Operating Temperature	T_A	-	-20	+25	+70	°C
			-30		+85	
			-40		+85	
Storage Temperature	T_{STG}	-	-40	-	+85	°C

Frequency Stability

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Frequency Range	f_0	-		9.5 - 60		MHz
Frequency Stability						
Initial Calibration	$\Delta f/f_0$	Calibration @ +25°C, After 2 Reflows	-2.0	-	2.0	ppm
Temperature Only	$\Delta f/f_{25}$	Referenced to +25°C Reading		2.0, 2.5		$\pm$ ppm
Voltage Coefficient		Supply Voltage, $\pm 5\%$	-0.2	-	0.2	ppm
Load Coefficient		Load, $\pm 10\%$	-0.2	-	0.2	ppm
Aging	$\Delta f/f_{25}$	First Year @ +25°C, nominal V_{CC} and V_C	-1.0	-	1.0	ppm
		10 Years @ +25°C, nominal V_{CC} and V_C	-10	-	10	ppm

Output Parameters

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Output Type	-	-		HCMOS		-
Output Voltage Levels	V_{OH}	Logic '1' Level, CMOS Load	$0.9V_{CC}$	-	-	V
	V_{OL}	Logic '0' Level, CMOS Load	-	-	$0.1V_{CC}$	
Output Duty Cycle	SYM	@ 50% Level	45	-	55	%
Rise and Fall Time	T_R, T_F	@ 20%/80% Levels	-	-	5	ns
Start Up Time	T_S	Application of V_{CC}	-	-	5	ms
Phase Noise	-	See Typical Plots	-	-	-	-

Output Enable/Disable

Enable Function		Standby				
Enable Input Voltage	V_{IH}	Pin 1 Logic '1', Output Enabled	$0.7V_{CC}$	-	-	V
Disable Input Voltage	V_{IL}	Pin 1 Logic '0', Output Standby	-	-	$0.3V_{CC}$	V
Standby Current	I_{STB}	Pin 1 Logic '0', Output Standby	-	-	10	μ A
Enable Time	T_{PLZ}	Pin 1 Logic '1'	-	-	5	ms

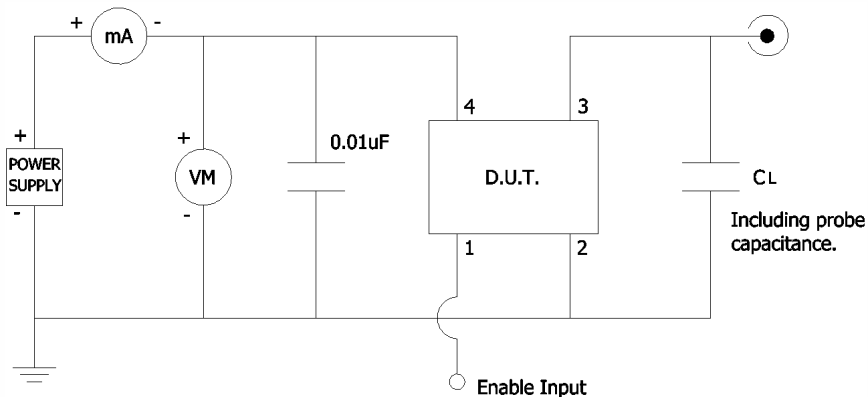
Electrical Specifications

Enable Truth Table

Pin 1	Pin 3
Logic '1'	Output Enabled
Open	Output Enabled
Logic '0'	Output Disabled, High Impedance

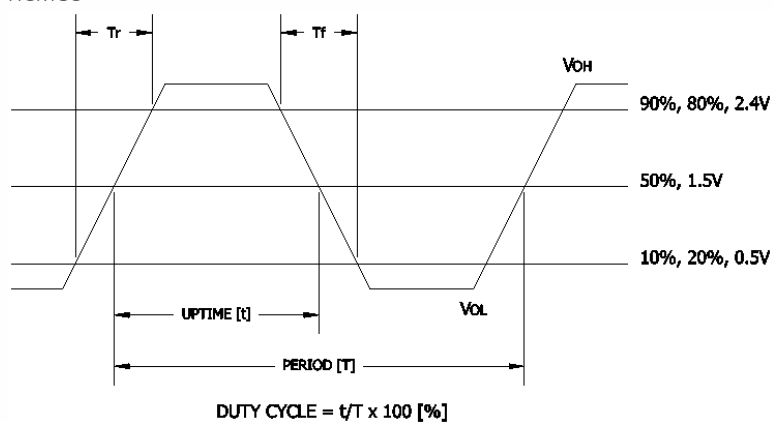
Test Circuit

HCMOS



Output Waveform

HCMOS



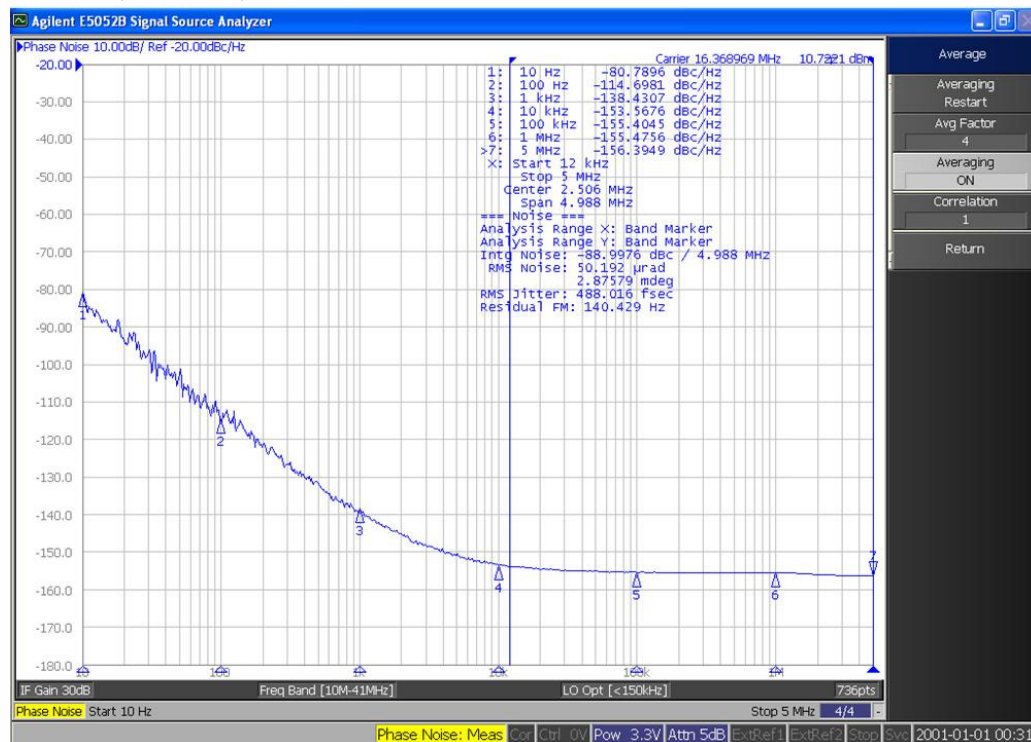


Electrical Specifications

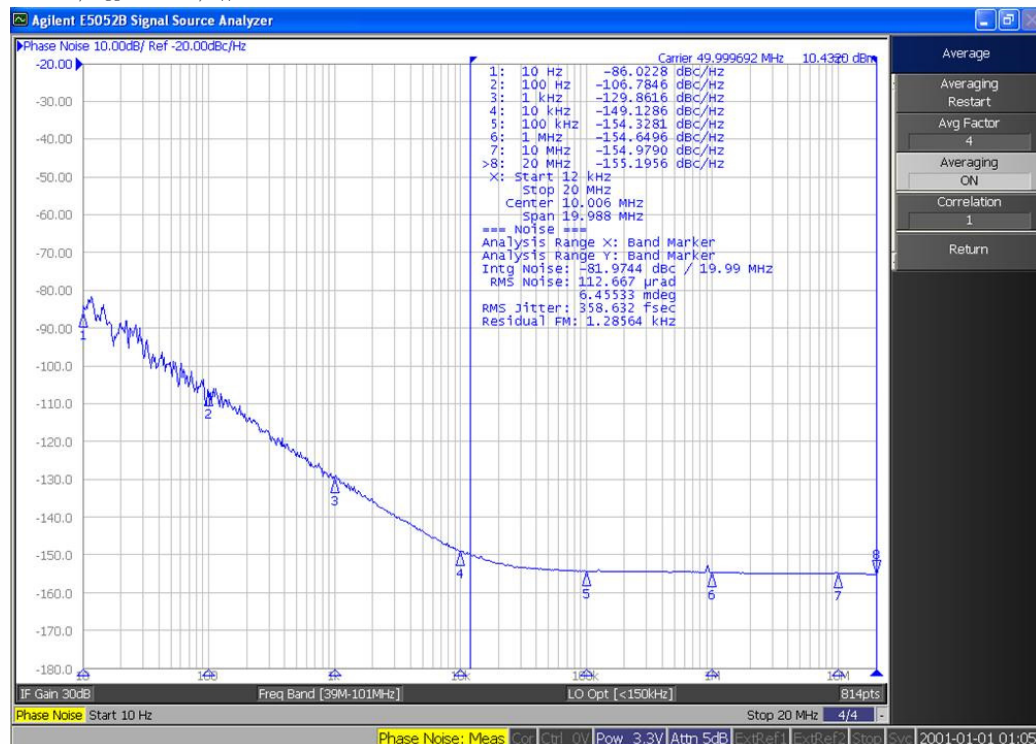
Performance Data

Phase Noise [typical]

16.368MHz, $V_{CC} = +3.3V$, $T_A = +25^{\circ}C$

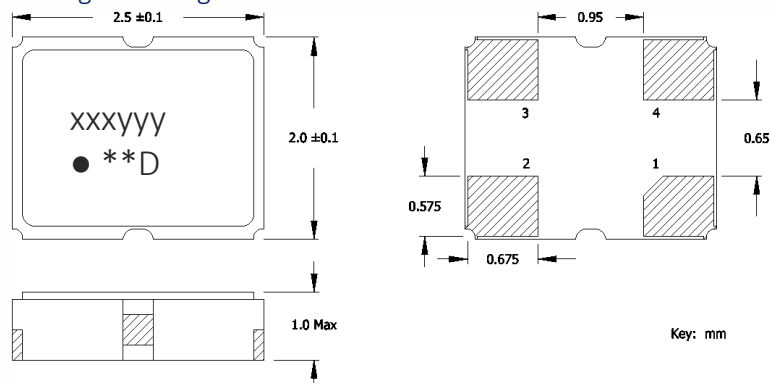


50MHz, $V_{CC} = +3.3V$, $T_A = +25^{\circ}C$



Mechanical Specifications

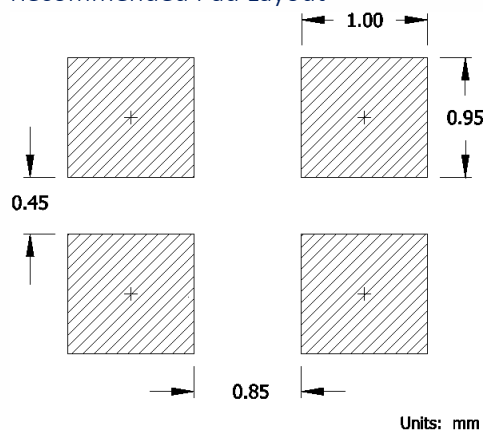
Package Drawing



Marking Information

- xxx – Frequency Code.
3-digits for frequencies <100MHz
[See document 016-1454-0, Frequency Code Tables.]
- yyy – Crystal Lot Code or Date Code [Optional].
- – Pin 1 identifier.
- ** – Manufacturing Site Code.
- D – Date Code. See Table I for codes.

Recommended Pad Layout



Notes

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

Pin Assignments

Pin	Symbol	Function
1	EOH	Output Enable/Disable [Note 1]
2	GND	Circuit & Package
3	Output	RF Output
4	V _{CC}	Supply Voltage

Notes

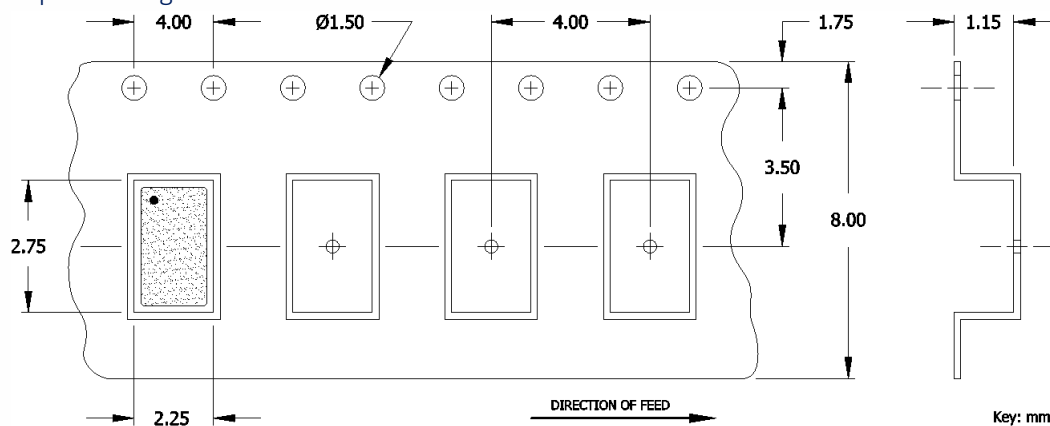
- Pin 1 can be left floating if enable function is not needed. Pin connected to V_{CC} through internal pull-up resistor. Do not connect to ground.

Table I - Date Code, Beginning year 2021

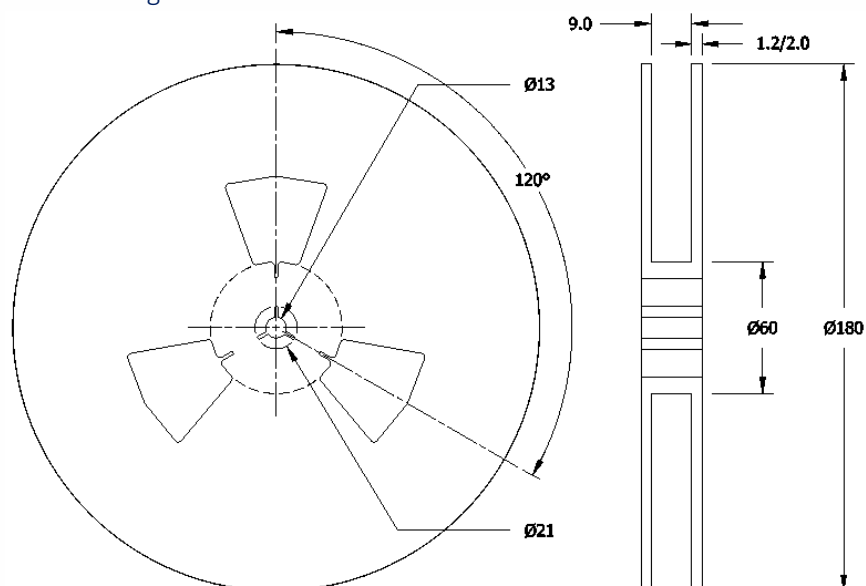
MONTH					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
YEAR																
2021	2025	2029	2033	2037	A	B	C	D	E	F	G	H	J	K	L	M
2022	2026	2030	2034	2038	N	P	Q	R	S	T	U	V	W	X	Y	Z
2023	2027	2031	2035	2039	a	b	c	d	e	f	g	h	j	k	l	m
2024	2028	2032	2036	2040	n	p	q	r	s	t	u	v	w	x	y	z

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 and date code information must appear on reel and carton labels.



Addendum

Common Frequencies – MHz

FREQUENCY	ORDERING CODE	FREQUENCY	ORDERING CODE	FREQUENCY	ORDERING CODE	FREQUENCY	ORDERING CODE
10.000000	100	26.000000	260				
14.400000	144	27.000000	270				
14.745600	147	30.720000	307				
16.000000	160	32.000000	320				
16.384000	163	38.400000	384				
18.432000	184	40.000000	400				
19.200000	192	44.000000	440				
20.000000	200	48.000000	480				
24.000000	240	50.000000	500				
25.000000	250	52.000000	520				

Mouser Electronics

Authorized Distributor

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

CTS:

521L10020CTR	521L10020DTR	521L10020ITR	521L10025CTR	521L10025DTR	521L10025ITR	521L14420CTR
521L14420DTR	521L14420ITR	521L14425CTR	521L14425DTR	521L14425ITR	521L14720CTR	521L14720DTR
521L14720ITR	521L14725CTR	521L14725DTR	521L14725ITR	521L16020CTR	521L16020DTR	521L16020ITR
521L16025CTR	521L16025DTR	521L16025ITR	521L16320CTR	521L16320DTR	521L16320ITR	521L16325CTR
521L16325DTR	521L16325ITR	521L18420CTR	521L18420DTR	521L18420ITR	521L18425CTR	521L18425DTR
521L18425ITR	521L19220CTR	521L19220DTR	521L19220ITR	521L19225CTR	521L19225DTR	521L19225ITR
521L20020CTR	521L20020DTR	521L20020ITR	521L20025CTR	521L20025DTR	521L20025ITR	521L24020CTR
521L24020DTR	521L24020ITR	521L24025CTR	521L24025DTR	521L24025ITR	521L25020CTR	521L25020DTR
521L25020ITR	521L25025CTR	521L25025DTR	521L25025ITR	521L26020CTR	521L26020DTR	521L26020ITR
521L26025CTR	521L26025DTR	521L26025ITR	521L27020CTR	521L27020DTR	521L27020ITR	521L27025CTR
521L27025DTR	521L27025ITR	521L30720CTR	521L30720DTR	521L30720ITR	521L30725CTR	521L30725DTR
521L30725ITR	521L32020CTR	521L32020DTR	521L32020ITR	521L32025CTR	521L32025DTR	521L32025ITR
521L38420CTR	521L38420DTR	521L38420ITR	521L38425CTR	521L38425DTR	521L38425ITR	521L40020CTR
521L40020DTR	521L40020ITR	521L40025CTR	521L40025DTR	521L40025ITR	521L44020CTR	521L44020DTR
521L44020ITR	521L44025CTR					