

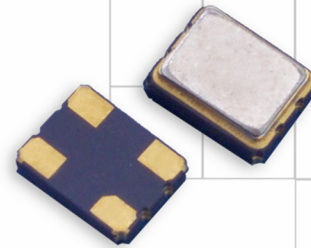


Model 525

Clipped Sine Wave TCXO/VC-TCXO

Features

- Ceramic Surface Mount Package
- Low Phase Jitter Performance
- Fundamental Crystal Design
- Frequency Range 13 – 52MHz *
- +1.8V, +2.5V, +2.8V, +3.0V and +3.3V Operation
- Voltage Control Option for Frequency Tuning [VC-TCXO]
- Tape and Reel Packaging, EIA-481



Part Dimensions:
3.2 × 2.5 × 1.2mm • 30.8030mg

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 525 is a low cost, small size, high performance Temperature Compensated Crystal Oscillator [TCXO]. Employing analog IC technology that provides a clipped sine wave output, high order temperature compensation engine; coupled with a fundamental quartz crystal M525 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																																											
525	L		XXX	10	D	T	R																																											
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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] See Electrical Characteristics for Voltage Control range per Supply Voltage selected.

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}	-	-0.6	-	4.6	V
Maximum Control Voltage	V_C	-	-0.6	-	$V_{CC}+0.6$	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}	13.00MHz - <26.00MHz	-	-	2.0	mA
		26.00MHz - 52.00MHz	-	-	2.5	
Output Load	$R_L//C_L$	-	10k Ohm//10pF			-
Operating Temperature	T_A		-20		+70	°C
			-30	+25	+85	
			-40		+85	
Storage Temperature	T_{STG}	-	-40	-	+85	°C

Frequency Stability

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Frequency Range	f_0	-		13 - 52		MHz
Frequency Stability						
Initial Calibration	$\Delta f/f_0$	Calibration @ +25°C, After 2 Reflows	-2.0	-	2.0	ppm
Temperature Only		Referenced to +25°C Reading		0.5, 1.0, 1.5, 2.0, 2.5		$\pm$ ppm
Voltage Coefficient	$\Delta f/f_{25}$	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	

Output Parameters

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Output Type	-	DC Coupled		Clipped Sine		-
Output Voltage Levels	V_O	-	0.8	-	-	V_{P-P}
Start Up Time	T_S	Application of V_{CC}	-	-	2	ms
Phase Noise	-	See Typical Plots	-	-	-	-

Control Voltage

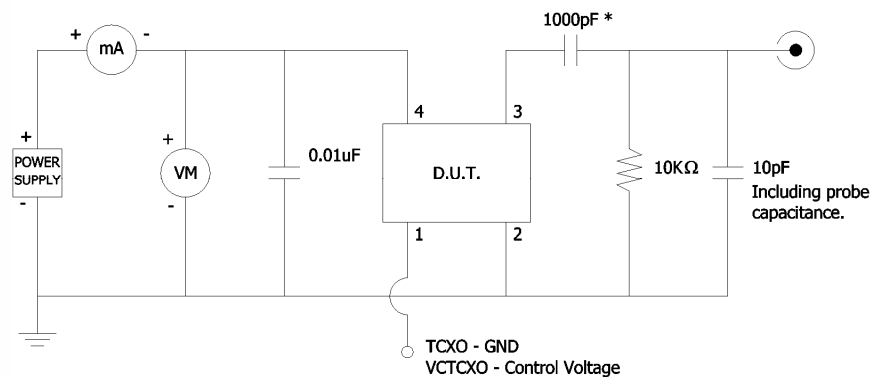
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Control Voltage	V_C	1.8V	0.30	0.90	1.50	V
		2.5V, 2.8V, 3.0V, 3.3V	0.40	1.40	2.40	
Frequency Tuning [VCTCXO Only]	$\Delta f/f_0$	Specified V_C Range	± 5	-	-	ppm
Linearity	L	Best Straight Line Fit	-	± 5	± 10	%
Input Impedance	Z_{Vc}	-	500	-	-	kOhms
Transfer Function	-	-		Positive		-

Electrical Specifications

Test Circuit

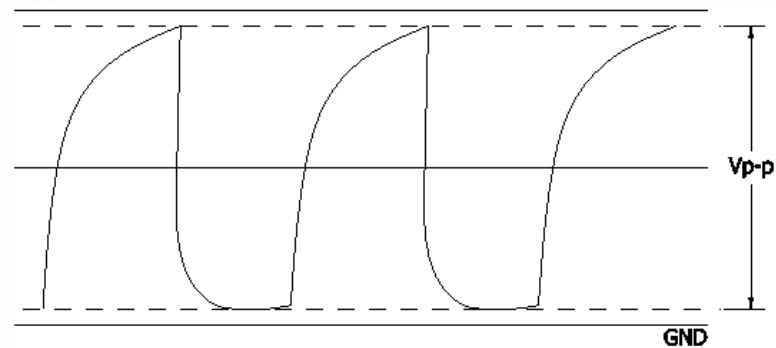
Clipped Sine

* DC-Cut Capacitor: Add 1000pF capacitor between the TCXO output and input of load.



Output Waveform

Clipped Sine



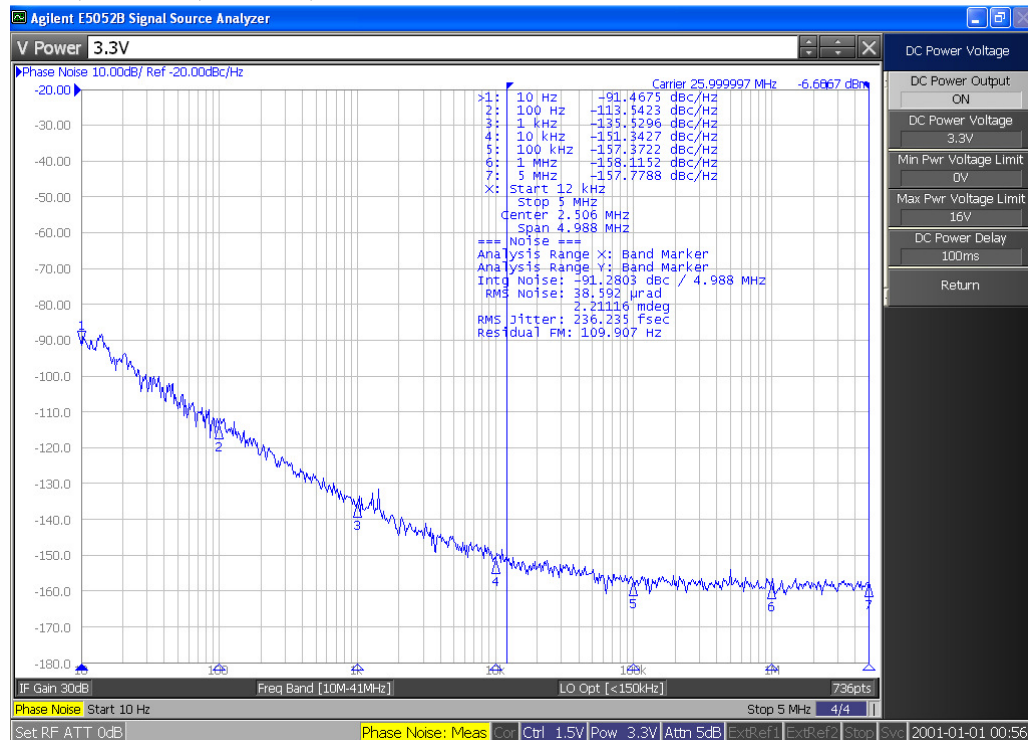


Electrical Specifications

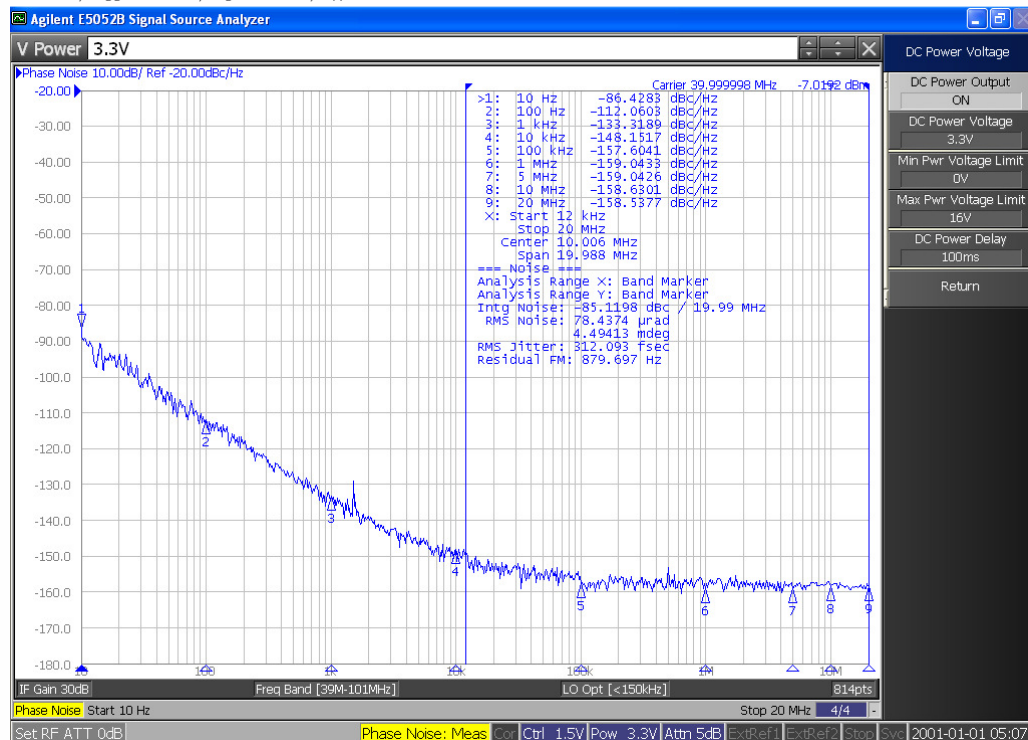
Performance Data

Phase Noise [typical]

26MHz, $V_{CC} = +3.3V$, $V_C = +1.5V$, $T_A = +25^\circ C$

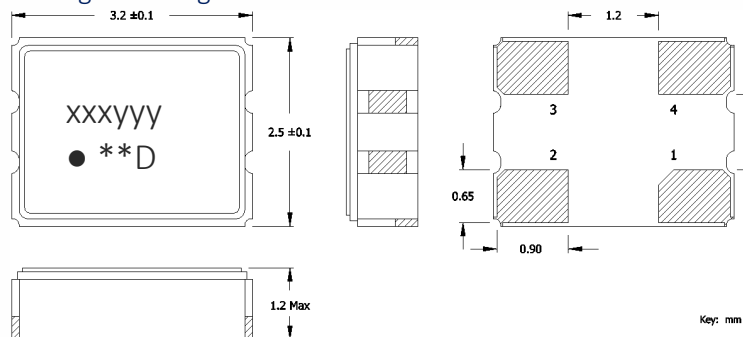


40MHz, $V_{CC} = +3.3V$, $V_C = +1.5V$, $T_A = +25^\circ C$



Mechanical Specifications

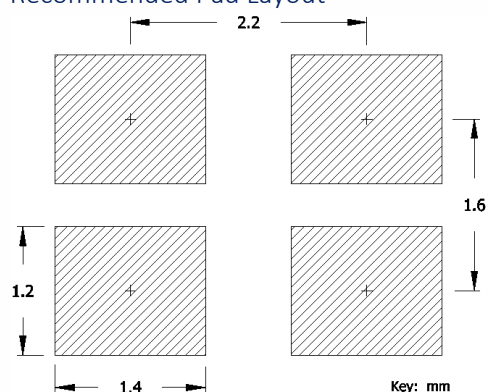
Package Drawing



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	GND V_C	Ground [Note 1] Voltage Control [VC-TCXO]
2	GND	Circuit & Package
3	Output	RF Output [Note 2]
4	V_{CC}	Supply Voltage

Notes

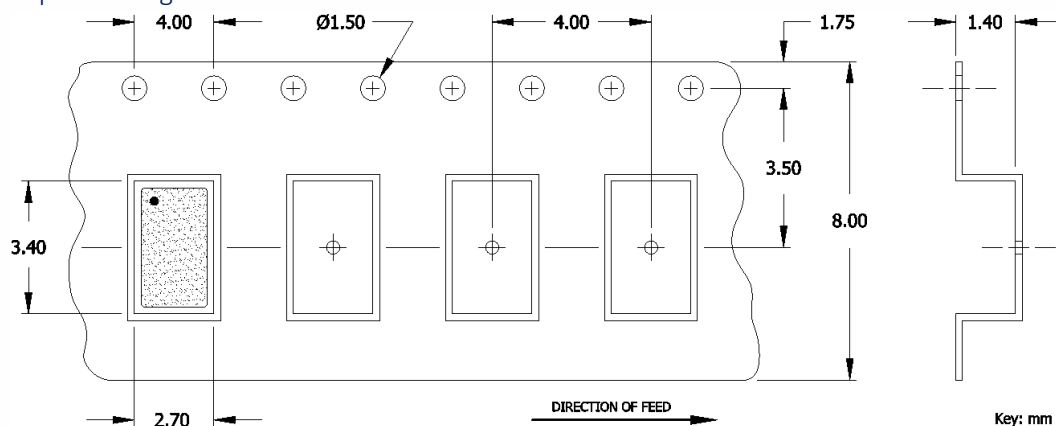
- Connect to ground for TCXO, no frequency tuning. This pin can be left floating.
- DC-Cut Capacitor Required. Add 1000pF capacitor between TCXO output and input of load.

Table I - Date Code, Beginning year 2021

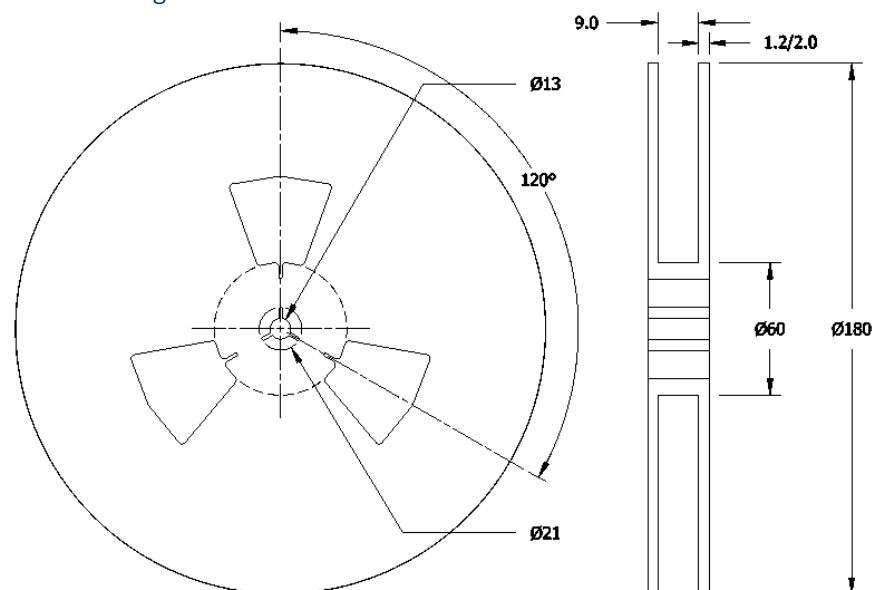
MONTH					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
YEAR																
2021	2025	2029	2033	2037	A	B	C	D	E	F	G	H	J	K	L	M
2022	2026	2030	2034	2038	N	P	Q	R	S	T	U	V	W	X	Y	Z
2023	2027	2031	2035	2039	a	b	c	d	e	f	g	h	j	k	l	m
2024	2028	2032	2036	2040	n	p	q	r	s	t	u	v	w	x	y	z

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
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				
26.000000	260						

Mouser Electronics

Authorized Distributor

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

CTS:

525L14405CTR	525L14405DTR	525L14405ITR	525L14410CTR	525L14410DTR	525L14410ITR	525L14415CTR
525L14415DTR	525L14415ITR	525L14420CTR	525L14420DTR	525L14420ITR	525L14425CTR	525L14425DTR
525L14425ITR	525L14705CTR	525L14705DTR	525L14705ITR	525L14710CTR	525L14710DTR	525L14710ITR
525L14715CTR	525L14715DTR	525L14715ITR	525L14720CTR	525L14720DTR	525L14720ITR	525L14725CTR
525L14725DTR	525L14725ITR	525L16005CTR	525L16005DTR	525L16005ITR	525L16010CTR	525L16010DTR
525L16010ITR	525L16015CTR	525L16015DTR	525L16015ITR	525L16020CTR	525L16020DTR	525L16020ITR
525L16025CTR	525L16025DTR	525L16025ITR	525L16305CTR	525L16305DTR	525L16305ITR	525L16310CTR
525L16310DTR	525L16310ITR	525L16315CTR	525L16315DTR	525L16315ITR	525L16320CTR	525L16320DTR
525L16320ITR	525L16325CTR	525L16325DTR	525L16325ITR	525L18405CTR	525L18405DTR	525L18405ITR
525L18410CTR	525L18410DTR	525L18410ITR	525L18415CTR	525L18415DTR	525L18415ITR	525L18420CTR
525L18420DTR	525L18420ITR	525L18425CTR	525L18425DTR	525L18425ITR	525L19205CTR	525L19205DTR
525L19205ITR	525L19210CTR	525L19210DTR	525L19210ITR	525L19215CTR	525L19215DTR	525L19215ITR
525L19220CTR	525L19220DTR	525L19220ITR	525L19225CTR	525L19225DTR	525L19225ITR	525L20005CTR
525L20005DTR	525L20005ITR	525L20010CTR	525L20010DTR	525L20010ITR	525L20015CTR	525L20015DTR
525L20015ITR	525L20020CTR					