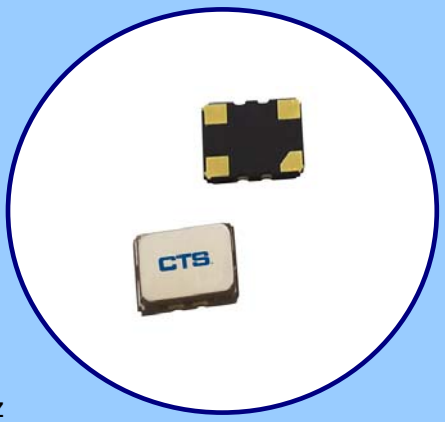
Model 520

Temperature Compensated Crystal Oscillator

FEATURES

- **Clipped Sine Wave Output**
- **Optional Voltage Control for Frequency Tuning [VCTCXO]**
- 2.5mmx2.0mm Surface Mount Package
- Frequency Range 10 – 52 MHz [Standard Frequencies List Shown Below]
- Fundamental Crystal Design
- Frequency Stability, several options to choose from ±0.5ppm ~ ±2.5ppm
- Operating Voltage, +1.8Vdc ~ +2.5Vdc
- Operating Temperature to -40°C to +85°C
- Tape & Reel Packaging Available
- **RoHS/Green Compliant (6/6)**



APPLICATIONS

The Model 520 Temperature Compensated Crystal Oscillator (TCXO) is a quartz based, clipped sine wave output, digital temperature compensated oscillator with optional frequency tuning, in a hermetically sealed ceramic package. M520 is suitable for wireless communications, broadband access, WLAN/WiMax/WIFI, portable equipment, test and measurement and mobile applications.

ORDERING INFORMATION

520 ☐☐☐☐☐☐☐ M ☐☐☐☐

SUPPLY VOLTAGE
- M = +1.8Vdc
- N = +2.5Vdc
- T = +2.8Vdc
- R = +3.0Vdc
- L = +3.3Vdc

FREQUENCY IN MHz
- M - indicates MHz and decimal point. [3]
- [See table below for standard frequencies available.]

FREQUENCY TUNING (AFC)
- T = TCXO (no AFC)
- A = ± 5 ppm [4]

FREQUENCY STABILITY *
- 05 = ± 0.5 ppm [1]
- 10 = ± 1.0 ppm [2]
- 15 = ± 1.5 ppm
- 20 = ± 2.0 ppm
- 25 = ± 2.5 ppm (std)

OPERATING TEMPERATURE RANGE
- H = -10°C to +60°C
- C = -20°C to +70°C
- D = -30°C to +85°C (std)
- I = -40°C to +85°C

* Frequency vs. Temperature Only

1] Only available with temperature range codes "H" and "C".

2] Only available with temperature range codes "H", "C" and "D".

3] Frequency is recorded with two leading digits before the 'M' and 4 significant digits after the 'M' (including zeros).
[Ex. XXMXXXX (10M0000), XXMXXXX (16M3840)]

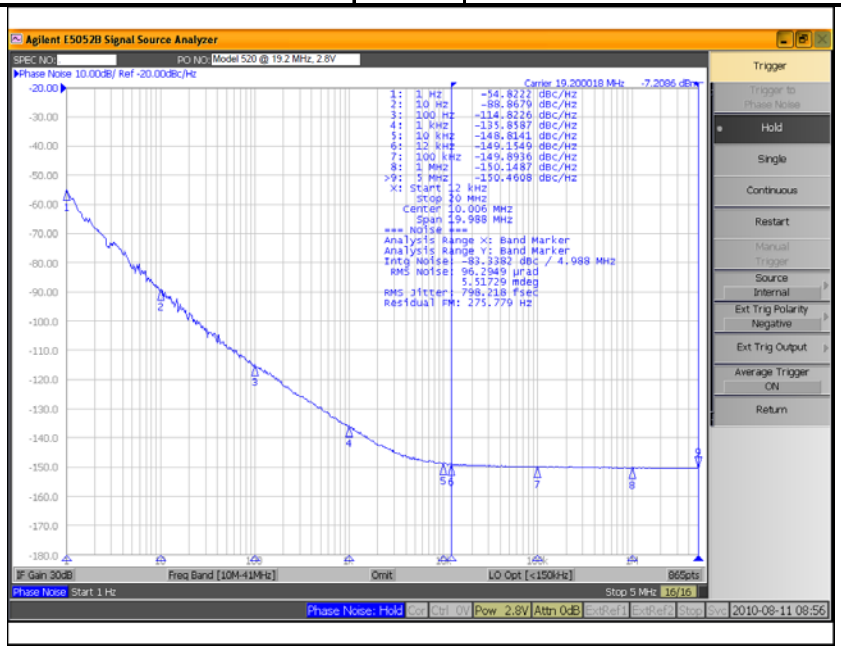
4] See Electrical Characteristics for Control Voltage range per Supply Voltage selected.

Not all performance combinations and frequencies may be available.
Contact your local CTS Representative or CTS Customer Service for availability.

M520 Standard Frequencies				
13.000000	16.368000	19.200000	26.000000	40.000000
16.367667	16.369000	20.000000	38.400000	

ELECTRICAL CHARACTERISTICS

	PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
ELECTRICAL PARAMETERS	Maximum Supply Voltage	V_{CC}	-	-0.5	-	6.0	V
	Maximum Control Voltage	V_C	-	-0.5	-	V_{CC}	V
	Storage Temperature	T_{STG}	-	-40	-	85	°C
	Frequency Range	f_O	Std frequencies listed in Ordering Information	10	-	52	MHz
	Frequency Stability	$\Delta f/f_O$	Frequency vs. Temperature Only	0.5, 1.0, 1.5 2.0, 2.5			± ppm
	Frequency Stability vs. Initial Calibration vs. Supply Voltage vs. Load vs. Reflow Shift vs. Aging	-	 @25°C ±5% change ±10% change After 2 reflows 1st year 10 year	 - - - - - -	 - - - - - -	 2.0 0.2 0.2 2.0 1.0 10.0	± ppm
	Operating Temperature Order Code 'W' Order Code 'H' Order Code 'C' Order Code 'D' Order Code 'I'	T_A	-	 0 -10 -20 -30 -40	 25 	 55 60 70 85 85	°C
	Supply Voltage Order Code 'M' Order Code 'N' Order Code 'T' Order Code 'R' Order Code 'L'	V_{CC}	±5%	 1.77 2.38 2.66 2.85 3.14	 1.8 2.5 2.8 3.0 3.3	 1.83 2.63 2.94 3.15 3.47	V
	Supply Current	I_{CC}	10.00 MHz - 25.99 MHz 26.00 MHz - 52.00 MHz	- -	- -	2 2.5	mA
	Control Voltage	V_C	2.5V, 2.8V, 3.0V, 3.3V 1.8V	0.4 0.3	1.5 0.9	2.4 1.5	V
	Frequency Tuning [VCTCXO Only]	-	Specified V_C Range	5.0	-	-	± ppm
	V_C Input Impedance	ZV_C	-	500	-	-	kOhm
	Output Waveform		AC coupled Clipped Sinewave				
	Output Voltage Levels	V_O		0.8	-	-	Vp-p
	Output Load	R_L // C_L	-	10 kOhm // 10 pF			
	Start Up Time	T_S	-	-	-	2	ms
	Phase Noise	-	Varies based on output frequency. See example plot @ 19.2 MHz below.				dBc/Hz



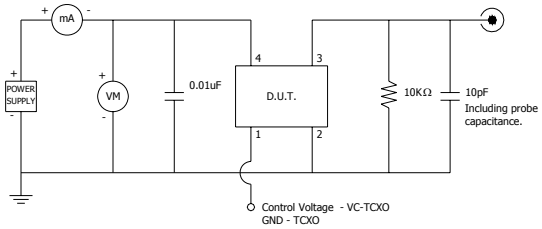
ELECTRICAL CHARACTERISTICS

D.U.T. PIN ASSIGNMENTS

PIN	SYMBOL	DESCRIPTION
1	V_C	Control Voltage – VCTCXO [Note 1] GND - TCXO
2	GND	Circuit & Package Ground
3	Output	Clipped Sine Wave Output
4	V_{CC}	Supply Voltage

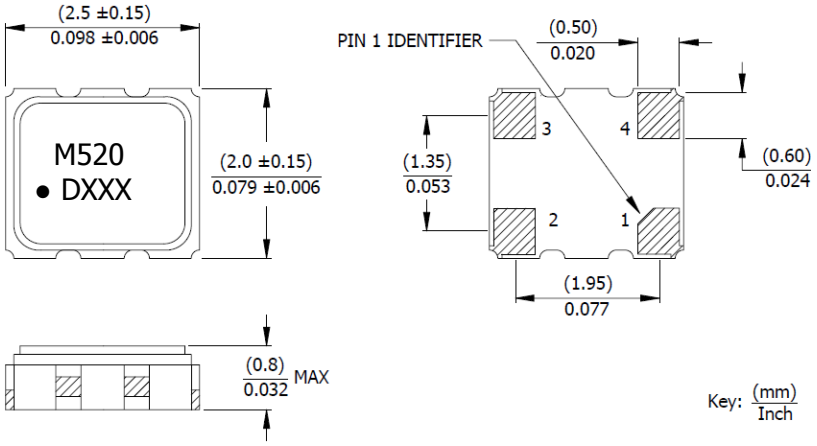
NOTES
1. Connect to ground for TCXO (no AFC) option.

TEST CIRCUIT – RL//CL LOAD

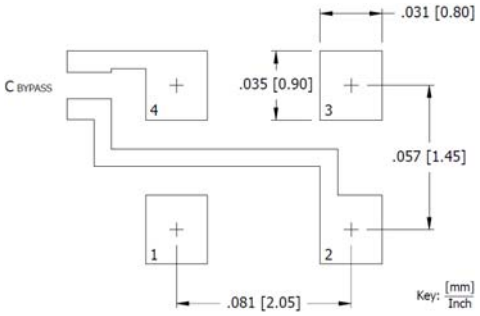


MECHANICAL SPECIFICATIONS

PACKAGE DRAWING



SUGGESTED SOLDER PAD GEOMETRY



C_{BYPASS} should be ≥ 0.01 uF.

MARKING INFORMATION

1. M520 - CTS Model Series.
2. • – Pin 1 identifier.
3. D – Date code. See Table I for codes.
4. XXX – Frequency code. See Table II for codes.

Complete CTS part number, frequency value and date code information must appear on reel and carton labels.

NOTES
1. DO NOT make connections to non-labeled pins. Castellation pins may have internal connections used in the manufacturing process.
2. Termination pads (e4); barrier plating is nickel (Ni) with gold (Au) flash plate.
3. Reflow conditions per JEDEC J-STD-020, 260°C maximum.
4. Required: 1000pF capacitor between the TCXO output and input of load.

TABLE I – DATE CODE

YEAR \ MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2001 2005 2009 2013 2017	A	B	C	D	E	F	G	H	J	K	L	M
2002 2006 2010 2014 2018	N	P	Q	R	S	T	U	V	W	X	Y	Z
2003 2007 2011 2015 2019	a	b	c	d	e	f	g	h	j	k	l	m
2004 2008 2012 2016 2020	n	p	q	r	s	t	u	v	w	x	y	z

MECHANICAL SPECIFICATIONS

TABLE II – FREQUENCY CODING

FREQUENCY	MARKING CODE	FREQUENCY	MARKING CODE	FREQUENCY	MARKING CODE	FREQUENCY	MARKING CODE
10.000 MHz	100	16.367 MHz	16A	19.800 MHz	198	30.720 MHz	307
10.240 MHz	102	16.3676 MHz	16E	19.998 MHz	199	32.000 MHz	320
12.000 MHz	120	16.367667 MHz	16B	20.000 MHz	200	32.512 MHz	325
12.288 MHz	122	16.368 MHz	16C	20.480 MHz	204	32.768 MHz	327
12.800 MHz	128	16.369 MHZ	16D	21.000 MHz	210	33.600 MHz	336
13.000 MHz	130	16.384 MHz	163	24.000 MHz	240	36.000 MHz	360
13.500 MHz	135	16.800 MHz	168	24.5535 MHz	24B	38.400 MHz	384
14.000 MHz	140	18.000 MHz	180	24.576 MHz	24C	38.880 MHz	388
14.400 MHz	144	18.432 MHz	184	25.000 MHz	250	40.000 MHz	400
14.7456 MHz	147	19.200 MHz	192	26.000 MHz	260	50.000 MHz	500
15.360 MHz	153	19.440 MHz	194	27.000 MHz	270		
16.000 MHz	160	19.680 MHz	196	30.000 MHz	300		

Not all frequencies listed may be available for this design.

PACKAGING INFORMATION

Device quantity is 1,000 pieces minimum per 180mm reel.

DIMENSIONS IN MILLIMETERS