



**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  $\pm 0.5\text{ppm} \sim \pm 2.5\text{ppm}$
- Operating Voltage, +1.8Vdc  $\sim$  +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, 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**



\* 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
Maximum Supply Voltage	V <sub>CC</sub>	-	-0.5	-	6.0	V
Maximum Control Voltage	V <sub>C</sub>	-	-0.5	-	V <sub>CC</sub>	V
Storage Temperature	T <sub>STG</sub>	-	-40	-	85	°C
Frequency Range	f <sub>0</sub>	Std frequencies listed in Ordering Information	10	-	52	MHz
Frequency Stability	Δf/f <sub>0</sub>	Frequency vs. Temperature Only	0.5, 1.0, 1.5 2.0, 2.5			± ppm
Frequency Stability vs. Initial Calibration	-	@25°C	-	-	2.0	± ppm
vs. Supply Voltage		±5% change	-	-	0.2	
vs. Load		±10% change	-	-	0.2	
vs. Reflow Shift		After 2 reflows	-	-	2.0	
vs. Aging		1st year	-	-	1.0	
		10 year	-	-	10.0	
Operating Temperature	T <sub>A</sub>	-	0	25	55	°C
Order Code 'W'			-10		60	
Order Code 'H'			-20		70	
Order Code 'C'			-30		85	
Order Code 'D'			-40		85	
Order Code 'I'						
Supply Voltage	V <sub>CC</sub>	±5%	1.77	1.8	1.83	V
Order Code 'M'			2.38	2.5	2.63	
Order Code 'N'			2.66	2.8	2.94	
Order Code 'T'			2.85	3.0	3.15	
Order Code 'R'			3.14	3.3	3.47	
Order Code 'L'						
Supply Current	I <sub>CC</sub>	10.00 MHz - 25.99 MHz 26.00 MHz - 52.00 MHz	-	-	2 2.5	mA
Control Voltage	V <sub>C</sub>	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 <sub>C</sub> Range	5.0	-	-	± ppm
V <sub>C</sub> Input Impedance	ZV <sub>C</sub>	-	500	-	-	kOhm
Output Waveform		AC coupled Clipped Sinewave				
Output Voltage Levels	V <sub>O</sub>		0.8	-	-	Vp-p
Output Load	R <sub>L</sub> // C <sub>L</sub>		10 kOhm // 10 pF			
Start Up Time	T <sub>S</sub>		-	-	2	ms
Phase Noise	-	Varies based on output frequency. See example plot @ 19.2 MHz below.				dBc/Hz

ELECTRICAL PARAMETERS



**ELECTRICAL CHARACTERISTICS**

**D.U.T. PIN ASSIGNMENTS**

PIN	SYMBOL	DESCRIPTION
1	V <sub>C</sub>	GND – TCXO [Note 1] Control Voltage – VCTCXO
2	GND	Circuit & Package Ground
3	Output	Clipped Sine Wave Output [Note 2]
4	V <sub>CC</sub>	Supply Voltage

**NOTES**

1. Connect to ground for TCXO (no AFC) option.
2. DC-Cut Capacitor Required.  
Add 1000pF capacitor between TCXO output and input of load.

**TEST CIRCUIT – RL//CL LOAD**



\* DC-Cut Capacitor

**MECHANICAL SPECIFICATIONS**

**PACKAGE DRAWING**



**MARKING INFORMATION**

1. M520 - CTS Model Series.
2. ● – Pin 1 identifier.
3. D – Date code. See Table I for codes.
4. XXX – Frequency code. Reference CTS document 016-1454-01.

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 and castellations, as they 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.

**SUGGESTED SOLDER PAD GEOMETRY**



C<sub>BYPASS</sub> should be ≥ 0.01 uF.

**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

**PACKAGING INFORMATION [Reference]**

Device quantity is 1k pieces minimum and 3k maximum per 180mm reel.

