

**FEATURES**

- HCMOS Output
- Optional Voltage Control for Frequency Tuning [VCTCXO]
- 7.0mm x 5.0mm Surface Mount Package
- Frequency Range 5 – 52 MHz
- Fundamental Crystal Design
- Operating Voltage, +3.0Vdc, +3.3Vdc or +5.0Vdc
- Overall Frequency Stability  $\pm 4.6$ ppm
- Operating Temperature to  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Tape & Reel Packaging Standard, EIA-418
- **RoHS/Green Compliant [6/6]**



**APPLICATIONS**

The Model 589, a quartz based analog TCXO with HCMOS output and optional frequency tuning, is suitable for applications requiring Stratum 3 performance such as base stations, Microcells, Femtocells, 1588 and Synchronous Ethernet timing, wireless communications, test and measurement.

**ORDERING INFORMATION**



\* Frequency vs. Temperature Only

1] Only available with temperature range code "C".

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

**ELECTRICAL CHARACTERISTICS**

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	
Maximum Supply Voltage	V <sub>CC</sub>	-	-0.6	-	6.0	V	
Maximum Control Voltage	V <sub>C</sub>	-	-0.5	-	V <sub>CC</sub>	V	
Storage Temperature	T <sub>STG</sub>	-	-40	-	+100	°C	
Operating Temperature	T <sub>A</sub>	-	-20	+25	+70	°C	
Order Code 'C'			-40		+85		
Order Code 'I'							
Frequency Range	f <sub>0</sub>	-	5	-	52	MHz	
Supply Voltage	V <sub>CC</sub>	±5%	2.85	3.0	3.15	V	
Order Code 'R'			3.14	3.3	3.47		
Order Code 'L'			4.75	5.0	5.25		
Order Code 'S'							
Supply Current	I <sub>CC</sub>	-	-	-	6.0	mA	
Frequency Stability	Δf/f <sub>0</sub>	Reference to f <sub>0</sub> , Including 20 years aging @ +25°C, at time of shipment	-	-	4.60	± ppm	
Overall Frequency Stability vs. Initial Calibration			-	-	1.00		
vs. Operating Temperature			[Fmax. - Fmin.]/2, over -40°C to +85°C	-	-		0.28
vs. Supply Voltage			[Fmax. - Fmin.]/2, over -20°C to +70°C	-	-		0.14
vs. Load			±5% change @ +25°C	-	-		0.40
vs. Aging			±5% change 20 years @ +40°C	-	-		2.80
Holdover	Δf/f <sub>0</sub>	[Fmax. - Fmin.]/2, over 24 hours	-	-	0.32		
Control Voltage	V <sub>C</sub>	-	0.5	1.5	2.5	V	
Frequency Tuning [VCTCXO Only]	-	V <sub>C</sub> = 1.5V ±1.0V, monotonic positive		5 - 8		± ppm	
V <sub>C</sub> Input Impedance	Z <sub>V<sub>C</sub></sub>	-	100	-	-	kOhm	
Output Waveform		HCMOS					
Output Voltage Levels							
Logic '1' Level	V <sub>OH</sub>	HCMOS Load	0.9*V <sub>CC</sub>	-	-	V	
Logic '0' Level	V <sub>OL</sub>	HCMOS Load	-	-	0.1*V <sub>CC</sub>		
Output Load	C <sub>L</sub>	-	-	-	15	pF	
Rise and Fall Time	T <sub>R</sub> , T <sub>F</sub>	@ 20% - 80% Levels	-	3.0	6.0	ns	
Output Duty Cycle	SYM	@ 50% Level	45	-	55	%	
Start Up Time	T <sub>S</sub>	-	-	-	2	ms	
Enable Function							
Enable Input Voltage	V <sub>IH</sub>	Pin 8 Logic '1', Output Enabled	0.7*V <sub>CC</sub>	-	-	V	
Disable Input Voltage	V <sub>IL</sub>	Pin 8 Logic '0', Output Disabled [High Imp]	-	-	0.3*V <sub>CC</sub>		
Phase Noise <sup>1</sup>	-	-				dBc/Hz	

ELECTRICAL PARAMETERS

Notes:  
1. Phase Noise performance may vary based on output frequency. See example plot at 10 MHz below.



**TEST CIRCUIT – HCMOS LOAD**



**MECHANICAL SPECIFICATIONS**

**PACKAGE DRAWING**



**MARKING INFORMATION**

1. M589 – CTS Model Series.
  2. ● – Pin 1 identifier.
  3. C – CTS identifier.
  4. D – Date code. See Table II for codes.
  5. xxx – Frequency Code.
- Refer to document 016-1454-0, Frequency Code Tables.

**NOTES**

1. DO NOT make connections to non-labeled pins or 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.
4. MSL = 1.

**SUGGESTED SOLDER PAD GEOMETRY**



**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	HCMOS Output
4	$V_{CC}$	Supply Voltage

**NOTES**

1. Connect to ground for TCXO [no AFC] option.

**TABLE II – DATE CODE**

YEAR		MONTH					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
		2001	2005	2009	2013	2017												
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 pcs. maximum per 180mm reel.

