

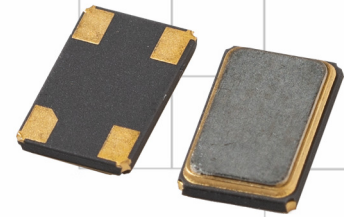


Model 533

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:
5.0 × 3.2 × 1.65mm • 60.7734mg

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 533 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 M533 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																						
533	L	XXX	25	D	T	T																						
<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	$^{\circ}\text{C}$
			-30		+85	
			-40		+85	
Storage Temperature	T_{STG}	-	-40	-	+85	$^{\circ}\text{C}$

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 $^{\circ}\text{C}$, After 2 Reflows	-2.0	-	2.0	ppm
Temperature Only	$\Delta f/f_{25}$	Referenced to +25 $^{\circ}\text{C}$ 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 $^{\circ}\text{C}$, nominal V_{CC} and V_C	-1.0	-	1.0	ppm
		10 Years @ +25 $^{\circ}\text{C}$, 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	μA
Enable Time	T_{PLZ}	Pin 1 Logic '1'	-	-	5	ms

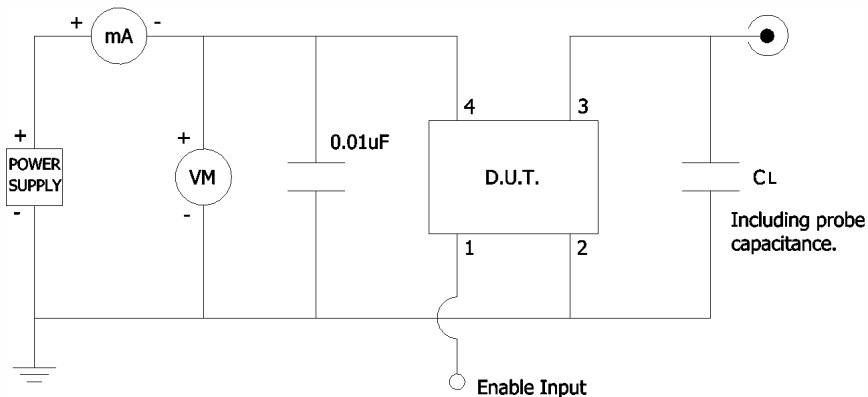
Electrical Specifications

Enable Truth Table

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

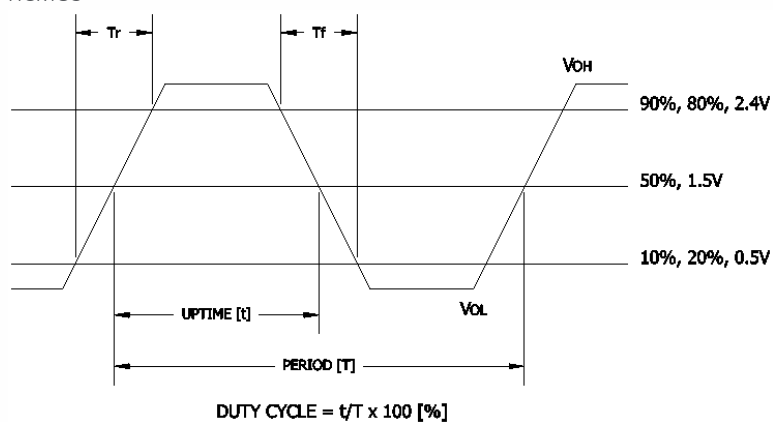
Test Circuit

HCMOS



Output Waveform

HCMOS



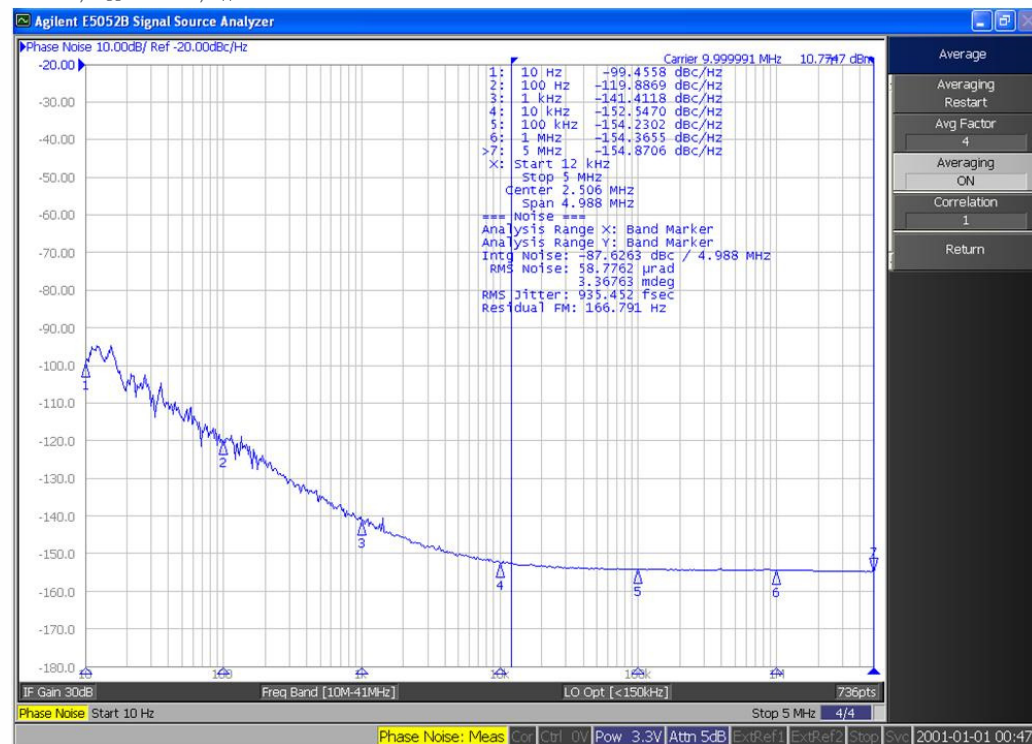


Electrical Specifications

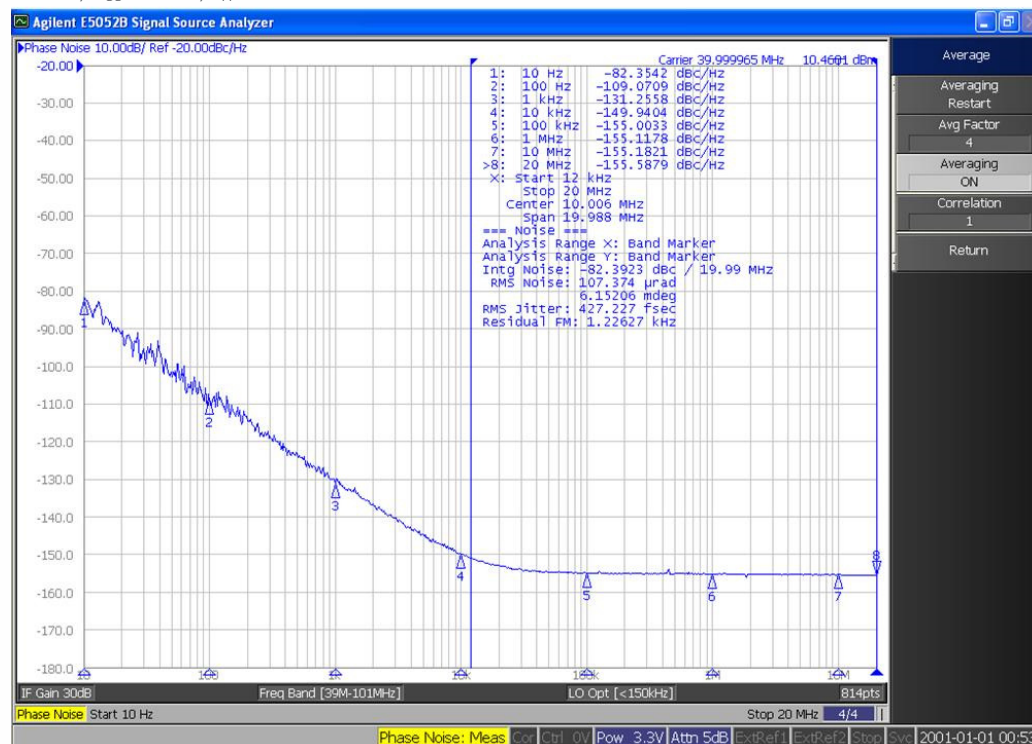
Performance Data

Phase Noise [typical]

10MHz, $V_{CC} = +3.3V$, $T_A = +25^{\circ}C$

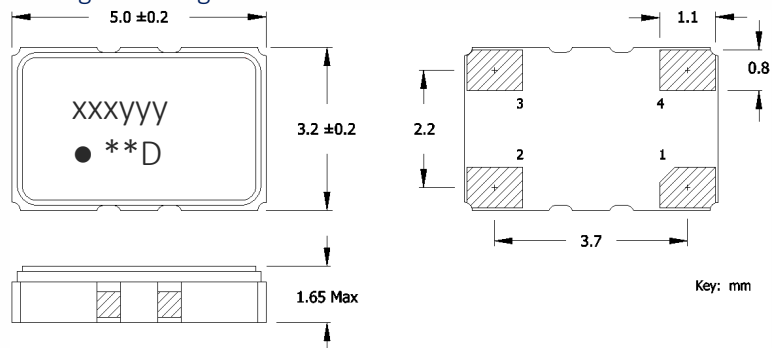


40MHz, $V_{CC} = +3.3V$, $T_A = +25^{\circ}C$



Mechanical Specifications

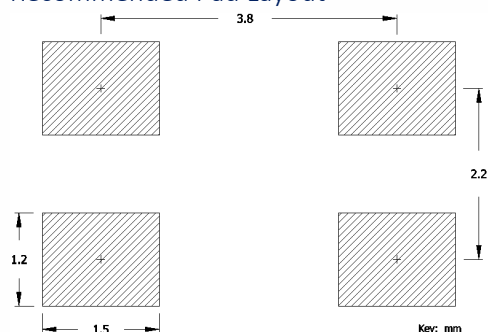
Package Drawing



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

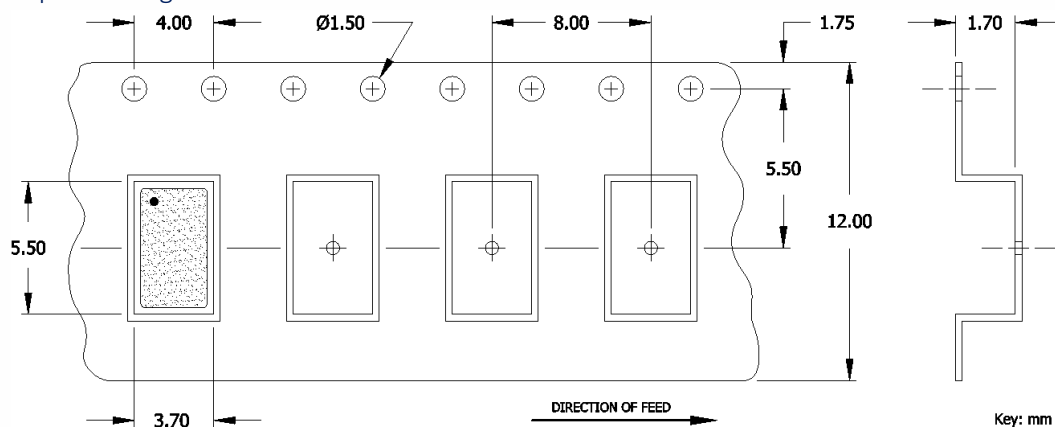
- Pin 1 can be left floating if enable function is not needed. Pin connected to V_{CC} through internal pull-up resistor. Do not connect to ground.

Table I - Date Code, Beginning year 2021

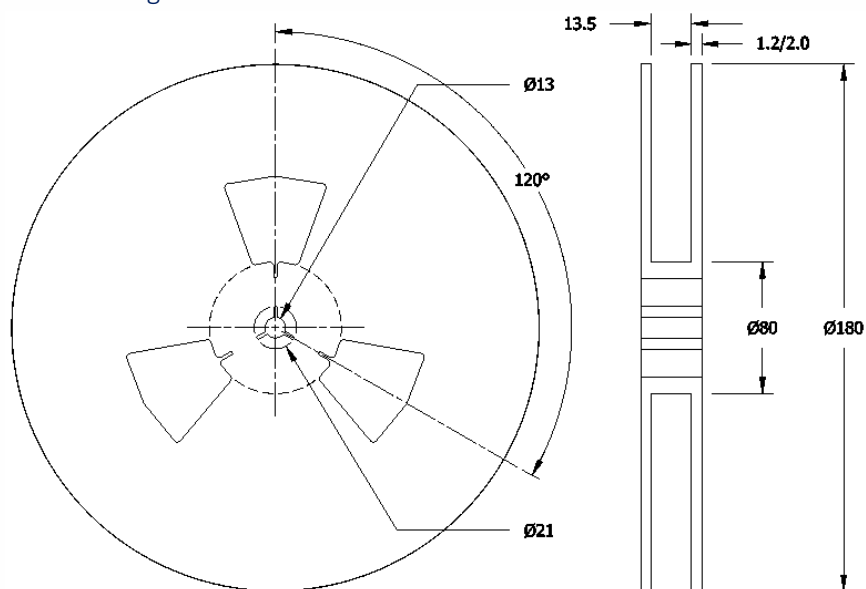
MONTH					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
YEAR																
2021	2025	2029	2033	2037	A	B	C	D	E	F	G	H	J	K	L	M
2022	2026	2030	2034	2038	N	P	Q	R	S	T	U	V	W	X	Y	Z
2023	2027	2031	2035	2039	a	b	c	d	e	f	g	h	j	k	l	m
2024	2028	2032	2036	2040	n	p	q	r	s	t	u	v	w	x	y	z

Packaging - Tape and Reel

Tape Drawing



Reel Drawing



Notes

1. Device quantity is 1k pieces 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:

533L10020CTR	533L10020DTR	533L10020ITR	533L10025CTR	533L10025DTR	533L10025ITR	533L14420CTR
533L14420DTR	533L14420ITR	533L14425CTR	533L14425DTR	533L14425ITR	533L14720CTR	533L14720DTR
533L14720ITR	533L14725CTR	533L14725DTR	533L14725ITR	533L16020CTR	533L16020DTR	533L16020ITR
533L16025CTR	533L16025DTR	533L16025ITR	533L16320CTR	533L16320DTR	533L16320ITR	533L16325CTR
533L16325DTR	533L16325ITR	533L18420CTR	533L18420DTR	533L18420ITR	533L18425CTR	533L18425DTR
533L18425ITR	533L19220CTR	533L19220DTR	533L19220ITR	533L19225CTR	533L19225DTR	533L19225ITR
533L20020CTR	533L20020DTR	533L20020ITR	533L20025CTR	533L20025DTR	533L20025ITR	533L24020CTR
533L24020DTR	533L24020ITR	533L24025CTR	533L24025DTR	533L24025ITR	533L25020CTR	533L25020DTR
533L25020ITR	533L25025CTR	533L25025DTR	533L25025ITR	533L26020CTR	533L26020DTR	533L26020ITR
533L26025CTR	533L26025DTR	533L26025ITR	533L27020CTR	533L27020DTR	533L27020ITR	533L27025CTR
533L27025DTR	533L27025ITR	533L30720CTR	533L30720DTR	533L30720ITR	533L30725CTR	533L30725DTR
533L30725ITR	533L32020CTR	533L32020DTR	533L32020ITR	533L32025CTR	533L32025DTR	533L32025ITR
533L38420CTR	533L38420DTR	533L38420ITR	533L38425CTR	533L38425DTR	533L38425ITR	533L40020CTR
533L40020DTR	533L40020ITR	533L40025CTR	533L40025DTR	533L40025ITR	533L44020CTR	533L44020DTR
533L44020ITR	533L44025CTR					