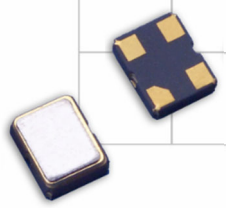
Model 616

HCMOS Clock Oscillator



Part Dimensions:
1.65 × 1.25 × 0.70mm • 3.86 mg

Features

- Ceramic Surface Mount Package
- Operating Temperature Range to -40°C to +105°C
- Fundamental and 3rd Overtone Crystal Designs
- Frequency Range 1.0 – 60.0MHz *
- +1.8V, +2.5V and +3.3V Operation
- Output Enable Standard
- Tape and Reel Packaging, EIA-481

Standard Frequencies

* See Page 6 for common frequencies.
Check with factory for availability of frequencies not listed.

Applications

- Internet of Things [IoT, IIoT]
- Microcontrollers and FPGAs
- Wireless Communication
- Networking Equipment
- Data Communications
- Computers and Peripherals
- Ethernet/GbE/SyncE
- Portable Devices
- Test and Measurement

Description

CTS Model 616 is a low cost, ultra-low voltage clock oscillator supporting HCMOS output. Employing the latest IC technology, M616 has excellent stability and low phase jitter performance.

Ordering Information

Model	Supply Voltage	Frequency Stability	Temperature Range	Frequency Code [MHz]	Packaging
616	L	3	C	XXXMXXXXX	R

Code	Voltage
M	+1.8Vdc
N	+2.5Vdc
L	+3.3Vdc

Code	Temp. Range
C	-20°C to +70°C
I	-40°C to +85°C
G	-40°C to +105°C [2]

Code	Stability	Code	Stability
6	±20ppm [1]	4	±30ppm
5	±25ppm	3	±50ppm

Code	Frequency
Product Frequency Code [3]	

Code	Packing
R	3k pcs./reel

Notes:

1] Consult factory for availability of 6I Stability/Temperature combination.

2] Available with stability codes 4 and 3.

3] Frequency is recorded with 3 leading digits before and 5 significant digits after the "M" [including zeroes].
[Ex. 3.579545MHz = 003M57954; 14.31818MHz = 014M31818; 25MHz = 025M00000; 125MHz = 125M00000]

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

Electrical Specifications

Operating Conditions

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Maximum Supply Voltage	V_{CC}	-	-0.5	-	4.0	V
Supply Voltage	V_{CC}	±5%	1.710	1.80	1.890	V
			2.375	2.50	2.665	
			3.135	3.30	3.465	
Supply Current	I_{CC}	Typical @ Nominal Vcc, C_L = 15 pF, T_A = +25°C				mA
		@ +1.8V, 1.0MHz to <60MHz	-	-	7	
		@ +2.5V, 1.0MHz to <60MHz	-	-	10	
		@ +3.3V, 1.0MHz to <60MHz	-	-	15	
Output Load	C_L	-	-	-	15	pF
Operating Temperature	TA	-	-20		+70	
			-40	+25	+85	
			-40		+105	
Storage Temperature	T_{STG}	-	-55	-	+125	°C

Frequency Stability

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Frequency Range	f_O	-		1.0 - 60.0		MHz
Frequency Stability [Note 1]	$\Delta f/f_O$	-		20, 25, 30, or 50		±ppm
Aging	$\Delta f/f_{25}$	First Year @ +25°C, nominal V_{CC}	-3	-	3	ppm

1.] Inclusive of initial tolerance at time of shipment, changes in supply voltage, load, temperature and 1st year aging.

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 Current Levels	I_{OH}	V_{OH} = 90%V_{CC} [+1.8V, +2.5V, +3.3V]	-	-	-4, -4, -8	mA
	I_{OL}	V_{OL} = 10%V_{CC} [+1.8V, +2.5V, +3.3V]	-	-	+4, +4, +8	
Output Duty Cycle	SYM	@ 50% Level	45	-	55	%
Rise and Fall Time [Note 2]	T_R, T_F	@ 10%/90% Levels, Nominal V_{CC}, C_L = 15pF				ns
		@ +1.8V, 1.0MHz to <60MHz	-	-	6	
		@ +2.5V, 1.0MHz to <60MHz	-	-	4	
		@ +3.3V, 1.0MHz to <60MHz	-	-	4	
Start Up Time	T_S	Application of V_{CC}	-	2	5	ms

2.] Parameters are worst case and account for comprehensive range of product specification. Performance may vary by application and must be validated by end user.

Output Parameters

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
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	-	-	15	µA
Enable Time	T_{PLZ}	Pin 1 Logic '1'	-	-	5	ms
Phase Jitter, RMS	tjrms	Bandwidth 12kHz - 5MHz, <40MHz	-	-	<1.0	ps
		Bandwidth 12kHz - 20MHz, >40MHz	-	-	<0.5	

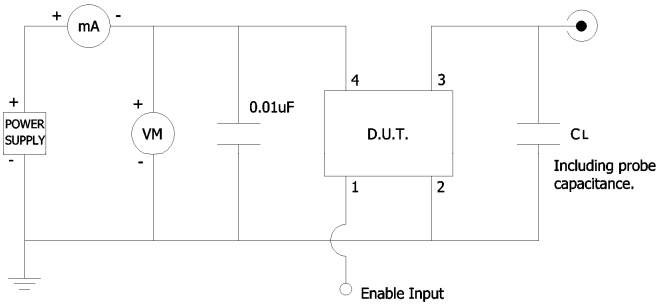
Electrical Specifications

Enable Truth Table

Pin 1	Pin 4
Logic '1'	Output Enabled
Open	Output Enabled
Logic '0'	Output Disabled, High Impedance

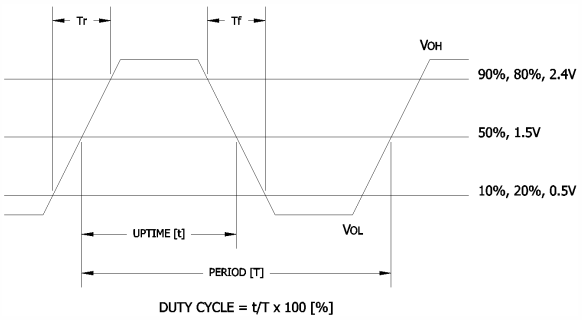
Test Circuit

HCMOS



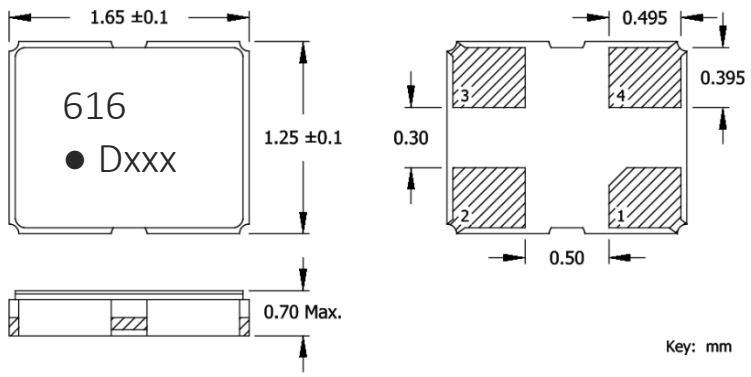
Output Waveform

HCMOS



Mechanical Specifications

Package Drawing

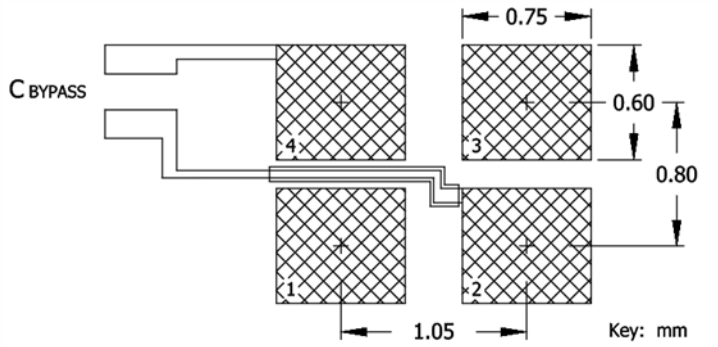


Marking Information

1. 616 – CTS Model.
2. D - Date Code. See Table I for codes.
3. ● - Pin 1 indicator
4. xxx - Frequency Code.
   3-digits, frequencies below 100MHz
   4-digits, frequencies 100MHz or greater

[See document 016-1454-0, Frequency Code Tables.]

Recommended Pad Layout



Notes

1. JEDEC termination code (e4). Barrier-plating is nickel [Ni] with gold [Au] flash plate.
2. Reflow conditions per JEDEC J-STD-020; +260°C maximum, 20 seconds.
3. MSL = 1.

Pin Assignments

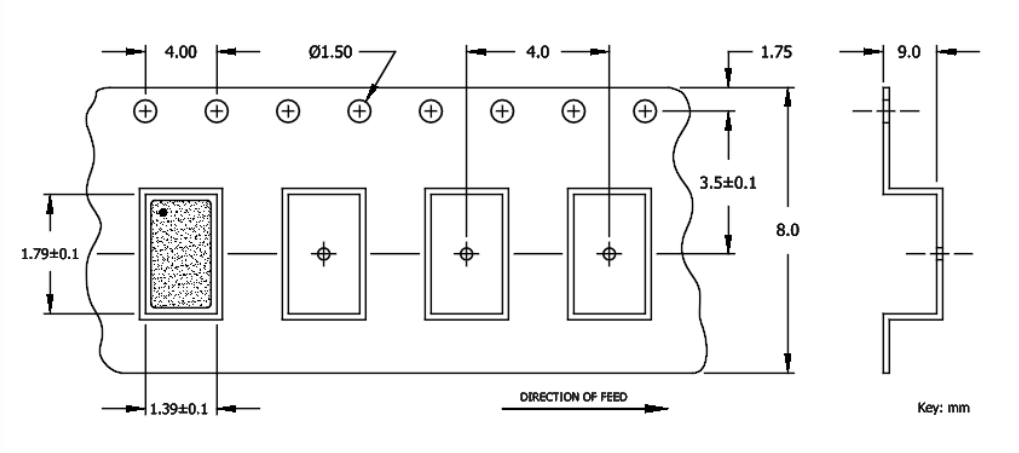
Pin	Symbol	Function
1	EOH	Enable
2	GND	Circuit & Package Ground
3	Output	RF Output
4	V_{CC}	Supply Voltage

Table I - Date Code, Beginning year 2021

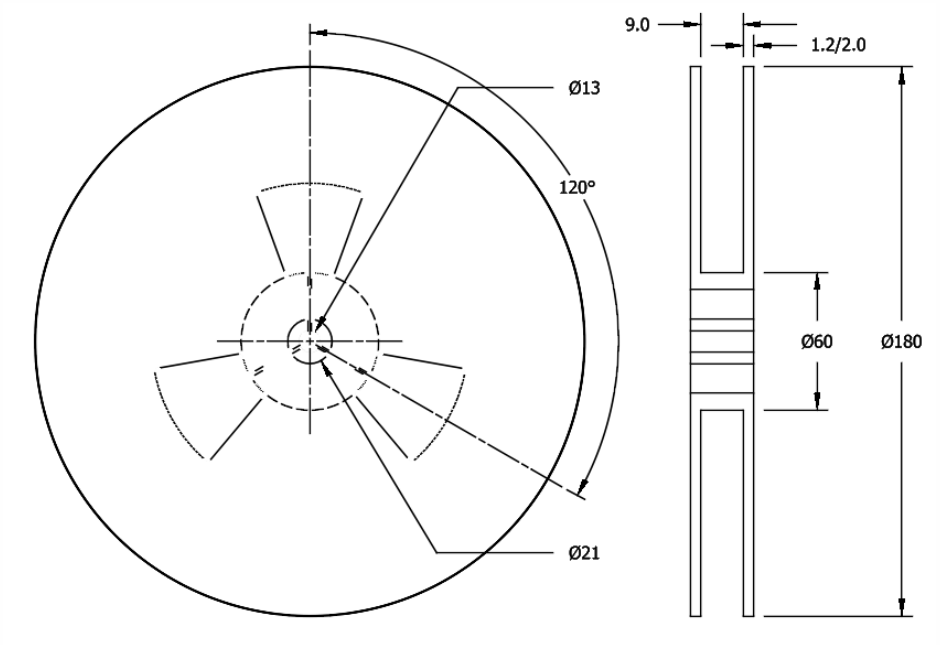
YEAR \ MONTH					JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2021	2025	2029	2033	2037	A	B	C	D	E	F	G	H	J	K	L	M
2022	2026	2030	2034	2038	N	P	Q	R	S	T	U	V	W	X	Y	Z
2023	2027	2031	2035	2039	a	b	c	d	e	f	g	h	j	k	l	m
2024	2028	2032	2036	2040	n	p	q	r	s	t	u	v	w	x	y	z

Packaging - Tape and Reel

Tape Drawing



Reel Drawing



Notes

1. Device quantity is 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	FREQUENCY CODE	FREQUENCY	FREQUENCY CODE	FREQUENCY	FREQUENCY CODE	FREQUENCY	FREQUENCY CODE
4.000000	040	24.576000	24C	50.000000	500		
6.000000	060	25.000000	250	54.000000	540		
8.000000	080	26.000000	260				
10.000000	100	27.000000	270				
12.000000	120	27.120000	271				
12.288000	122	32.000000	320				
16.000000	160	38.400000	384				
19.200000	192	40.000000	400				
20.000000	200	48.000000	480				
24.000000	240	49.152000	491				