VC-840

CMOS Crystal Oscillator

Description

Vectron's VC-840 Crystal Oscillator (XO) is a quartz stabilized square wave generator with a CMOS output. The VC-840 is a fundamental oscillator resulting in very low jitter performance, and a monolithic IC which improves reliability and reduces cost.

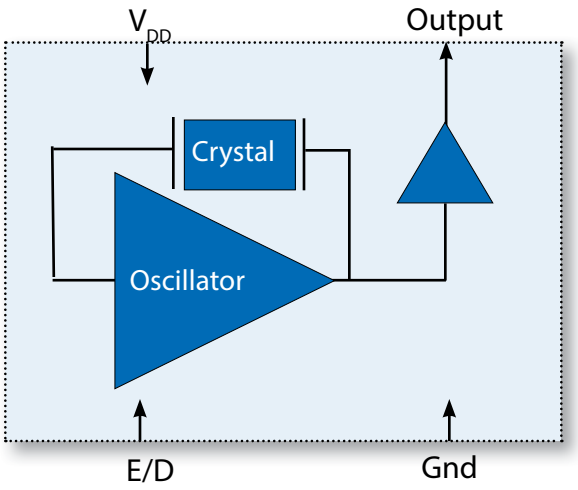
Features

- CMOS output XO
- 1-160.000 MHz Output Frequency
- 1.8, 2.5 or 3.3 V Operation
- Fundamental Crystal Design with low Jitter Performance
- Output Disable Feature
- Small Industry Standard Package, 2.5x2.0mm
- Product is compliant to RoHS directive and fully compatible with lead free assembly

Applications

- SONET/SDH/DWDM
- Ethernet, GE, SynchE
- Storage Area Networking
- Fiber Channel
- Digital Video
- Broadband Access
- Base Stations, Picocells

Block Diagram



Specifications

Table 1. Electrical Performance, 3.3 V option

Parameter	Symbol	Min	Typical	Maximum	Units
Supply					
Voltage[1]	V_{DD}	3.15	3.3	3.45	V
Maximum Voltage		-0.5		7	V
Current[2], <20.000MHz 20.000-40.000MHz 40.001-60.000MHz 60.001-75.000MHz 75.001-100.000MHz 100.001-130.000MHz 130.001-160.000MHz	I_{DD}			7 13 19 24 25 30 35	mA
Current, Output Disabled				10	uA
Frequency					
Nominal Frequency	f_N	0.75		160	MHz
Stability[3], *Ordering Information*		±25, ±50 or ±100			ppm
Outputs					
Output Logic Levels[2] Output Logic High Output Logic Low Output Logic High Drive Output Logic Low Drive	 V_{OH} V_{OL} I_{OH} I_{OL}	 0.9*V_{DD} 4 4		 0.1*V_{DD}	 V V mA mA
Load	I_{OUT}			15	pF
Output Rise /Fall Time[2], $f_N \leq$ 75MHz $f_N >$ 75MHz	t_R/t_F		2.5 2.0	5 3	ns ns
Duty Cycle[2,4]		45		55	%
Phase Jitter, 125MHz, 12kHz-20MHz			90	150	fs
Period Jitter[5] RMS Peak-Peak	ϕJ		 1.5 12		 ps ps
Enable/Disable					
Output Enable/Disable[6] Output Enable Output Disable	 V_{IH} V_{IL}	 0.7*VDD		 0.3*VDD	 V V
Disable Time				150	ns
Start-Up Time	t_{SU}			10	ms
Operating Temp, *Ordering Information*	T_{OP}	-20/70, -40/85 and -40/105			°C

1] The power supply should have by-pass capacitors as close to the supply and to ground as possible, for example 0.1 and 0.01uF.
2] Parameters are tested with production test circuit below , Figure 1.
3] Includes initial accuracy, operating temperature, supply voltage, shock and vibration (not under operation) and aging
4] Duty Cycle is measured as On Time/Period (Fig 2).
5] Broadband Period Jitter measured using LeCroy Waverunner 610Zi, 200k minimum samples
6] The Output is Enabled if the Enable/Disable is left open.

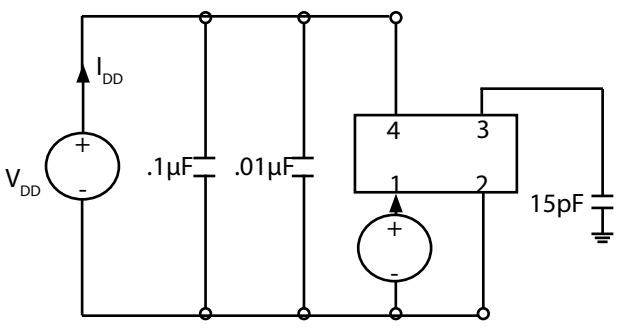


Fig 1: Test Circuit

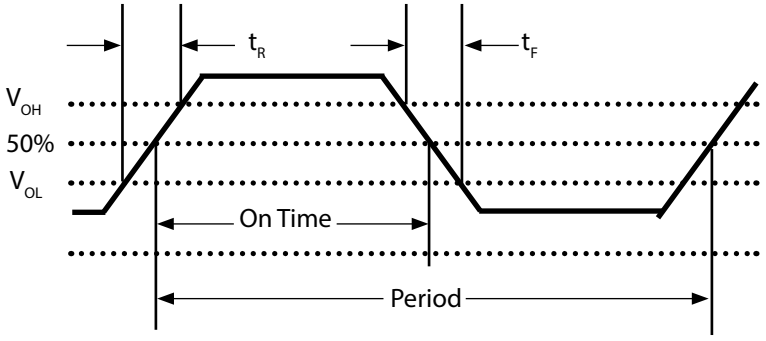


Fig 2: Waveform

Specifications

Table 2. Electrical Performance, 2.5V option

Parameter	Symbol	Min	Typical	Maximum	Units
Supply					
Voltage[1]	V_{DD}	2.375	2.5	2.625	V
Maximum Voltage		-0.5		7	V
Current[2], <20.000MHz 20.000-40.000MHz 40.001-60.000MHz 60.001-75.000MHz 75.001-100.000MHz 100.001-130.000MHz 130.001-160.000MHz	I_{DD}			5 9 11 14 20 25 30	mA
Current, Output Disabled				10	uA
Frequency					
Nominal Frequency	f_N	0.75		160	MHz
Stability[3], *Ordering Information*		±25, ±50 or ±100			ppm
Outputs					
Output Logic Levels[2] Output Logic High Output Logic Low Output Logic High Drive Output Logic Low Drive	 V_{OH} V_{OL} I_{OH} I_{OL}	 0.9*V_{DD} 4 4		 0.1*V_{DD}	 V V mA mA
Load	I_{OUT}			15	pF
Output Rise /Fall Time[2] $f_N \leq$ 75MHz $f_N >$ 75MHz	t_R/t_F		2.5 2	5 3	ns ns
Duty Cycle[2,4]		40		60	%
Phase Jitter, 125MHz, 12kHz-20MHz			100	170	fs
Period Jitter[5] RMS Peak-Peak	ϕJ		 1.5 12		 ps ps
Enable/Disable					
Output Enable/Disable[6] Output Enable Output Disable	 V_{IH} V_{IL}	 0.7*VDD		 0.3*VDD	 V V
Disable Time				150	ns
Start-Up Time	t_{SU}			10	ms
Operating Temp, *Ordering Information*	T_{OP}	-20/70, -40/85 and -40/105			°C

1] The power supply should have by-pass capacitors as close to the supply and to ground as possible, for example 0.1 and 0.01uF.
2] Parameters are tested with production test circuit below , Figure 1.
3] Includes initial accuracy, operating temperature, supply voltage, shock and vibration (not under operation) and aging
4] Duty Cycle is measured as On Time/Period (Fig 2).
5] Broadband Period Jitter measured using LeCroy Waverunner 610Zi, 200k minimum samples
6] The Output is Enabled if the Enable/Disable is left open.

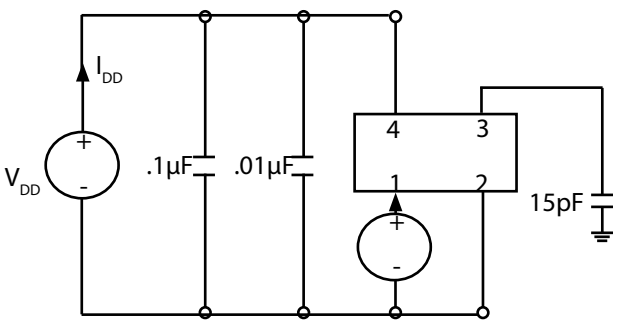


Fig 3: Test Circuit

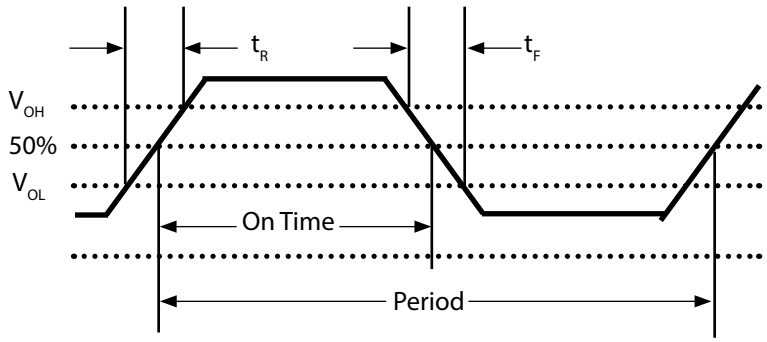


Fig 4: Waveform

Specifications

Table 3. Electrical Performance, 1.8V option

Parameter	Symbol	Min	Typical	Maximum	Units
Supply					
Voltage[1]	V_{DD}	1.71	1.8	1.89	V
Maximum Voltage		-0.5		7	V
Current[2], <20.000MHz 20.000-40.000MHz 40.001-50.000MHz 50.001-75.000MHz 75.001-100.000MHz 100.001-130.000MHz	I_{DD}			 2.5 3.0 3.5 10 15 20	mA
Current, Output Disabled				10	uA
Frequency					
Nominal Frequency	f_N	0.75		125	MHz
Stability[3], *Ordering Information*		±25, ±50 or ±100			ppm
Outputs					
Output Logic Levels[2] Output Logic High Output Logic Low Output Logic High Drive Output Logic Low Drive	 V_{OH} V_{OL} I_{OH} I_{OL}	 0.9*V_{DD} 4 4		 0.1*V_{DD}	 V V mA mA
Load	I_{OUT}			15	pF
Output Rise /Fall Time[2] $f_N \leq$ 75MHz $f_N >$ 75MHz	t_R/t_F		2.5 2	5 3	ns ns
Duty Cycle[2],[4]		45		55	%
Phase Jitter, 125MHz, 12kHz-20MHz			150	225	fs
Period Jitter[5] RMS Peak-Peak	ϕJ		 1.5 12		 ps ps
Enable/Disable					
Output Enable/Disable[6] Output Enable Output Disable	 V_{IH} V_{IL}	 0.7*VDD		 0.3*VDD	 V V
Disable Time				150	ns
Start-Up Time	t_{SU}			10	ms
Operating Temp, *Ordering Information*	T_{OP}	-20/70, -40/85, -40/105			°C

1] The power supply should have by-pass capacitors as close to the supply and to ground as possible, for example 0.1 and 0.01uF.
2] Parameters are tested with production test circuit below , Figure 1.
3] Includes initial accuracy, operating temperature, supply voltage, shock and vibration (not under operation) and aging
4] Duty Cycle is measured as On Time/Period (Fig 2).
5] Broadband Period Jitter measured using LeCroy Waverunner 610Zi, 200k minimum samples
6] The Output is Enabled if the Enable/Disable is left open.

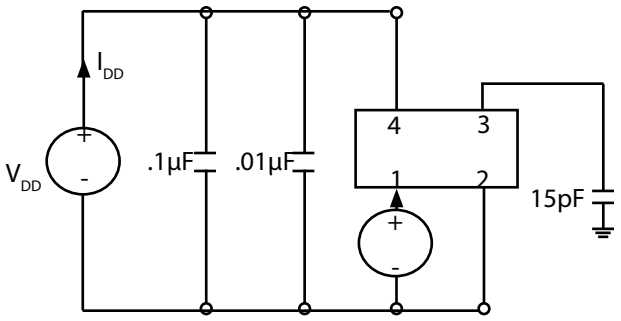


Fig 5: Test Circuit

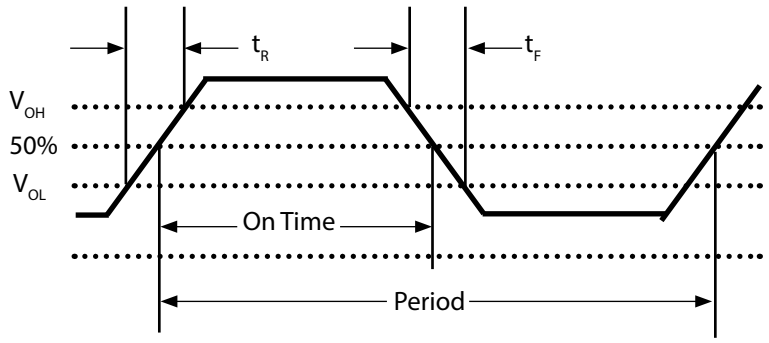
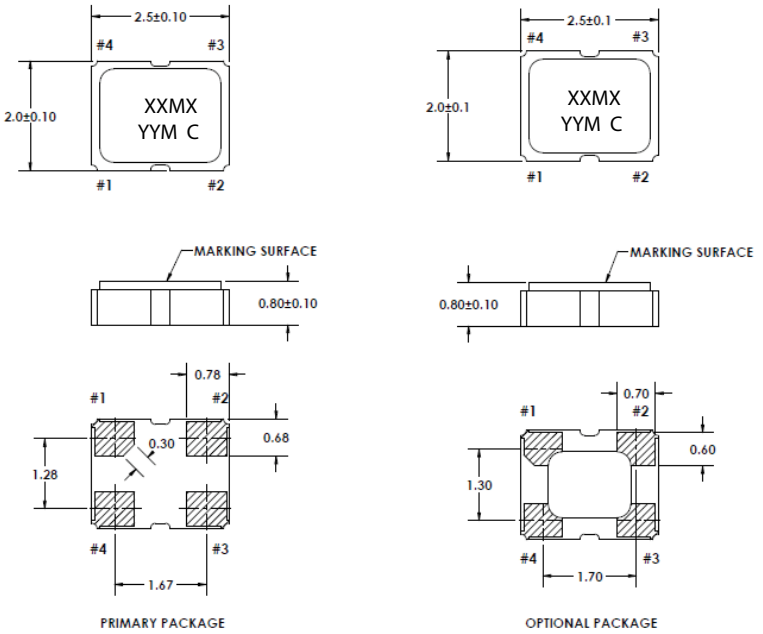


Fig 6: Waveform

Outline Drawing & Pad Layout



Dimensions in mm

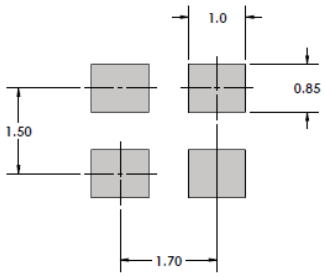


Table 4. Pin Out

Pin	Symbol	Function
1	E/D	Enable Disable
2	GND	Case and Electrical Ground
3	Output	Output
4	V_{DD}	Power Supply Voltage

Table 5. Enable Disable Function

E/D Pin	Output
High	Clock Output
Open	Clock Output
Low	High Impedance

Reliability

Vectron qualification includes aging at various extreme temperatures, shock and vibration, temperature cycling, and IR reflow simulation. The VC-840 family is capable of meeting the following qualification tests:

Table 6. Environmental Compliance

Parameter	Conditions
Mechanical Shock	MIL-STD-883, Method 2002
Mechanical Vibration	MIL-STD-883, Method 2007
Solderability	MIL-STD-883, Method 2003
Gross and Fine Leak	MIL-STD-883, Method 1014
Resistance to Solvents	MIL-STD-883, Method 2015
Moisture Sensitivity Level	MSL 1
Contact Pads	Gold (0.3 um min to 1.0 um max) over Nickel

Although ESD protection circuitry has been designed into the VC-840 proper precautions should be taken when handling and mounting. Vectron employs a human body model (HBM) and a charged device model (CDM) for ESD susceptibility testing and design protection evaluation.

Table 7. ESD Ratings

Model	Minimum	Conditions
Human Body Model	1500V	MIL-STD-883, Method 3015
Charged Device Model	1000V	JESD22-C101

Stresses in excess of the absolute maximum ratings can permanently damage the device. Functional operation is not implied at these or any other conditions in excess of conditions represented in the operational sections of this datasheet. Exposure to absolute maximum ratings for extended periods may adversely affect device reliability. Permanent damage is also possible if E/D is applied before V_{DD}.

Table 8. Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Storage Temperature	T_S	-55 to 100	°C
Soldering Temp/Time	T_{LS}	260 / 10	°C / sec

IR Reflow

The VC-840 is qualified to meet the JEDEC standard for Pb-Free assembly. The temperatures and time intervals listed are based on the Pb-Free small body requirements. The VC-840 device is hermetically sealed so an aqueous wash is not an issue.

Solderprofile:

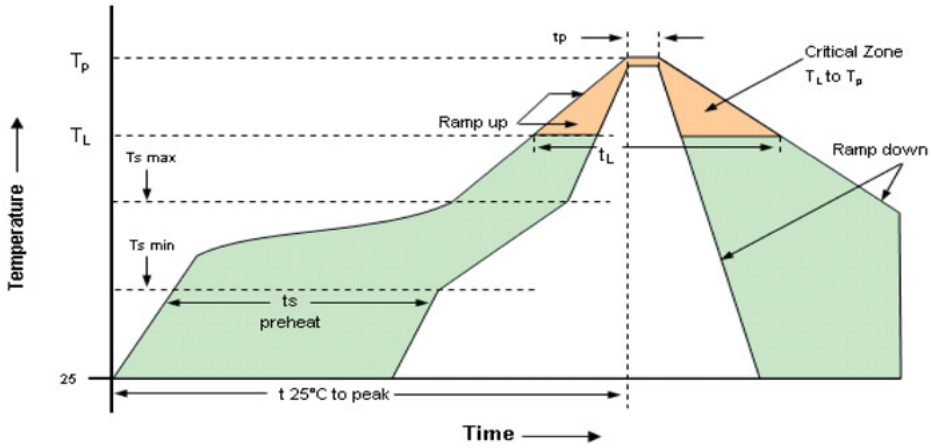


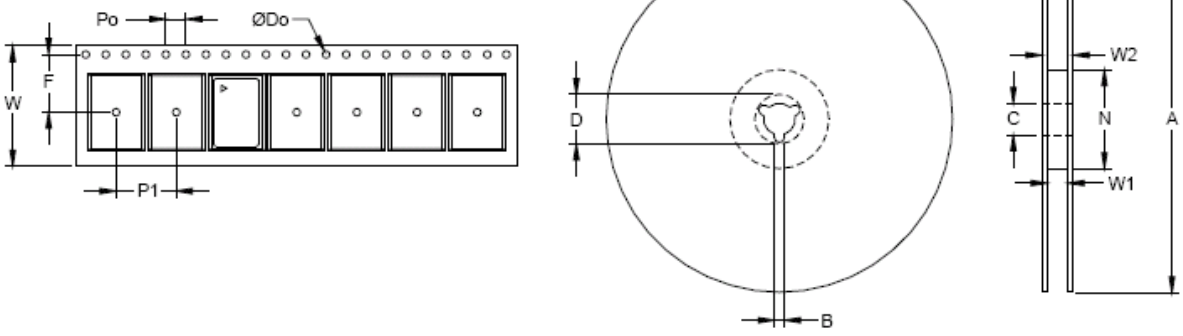
Table 9. Reflow Profile

Parameter	Symbol	Value
PreHeat Time Ts-min Ts-max	t_S	60 sec Min, 260 sec Max 150°C 200°C
Ramp Up	R_{UP}	3 °C/sec Max
Time Above 217 °C	t_L	60 sec Min, 150 sec Max
Time To Peak Temperature	T_{AMB-P}	480 sec Max
Time at 260 °C	t_P	30 sec Max
Ramp Down	R_{DN}	6 °C/sec Max

Tape and Reel

Table 10 . Tape and Reel Dimensions

Tape Dimensions (mm)						Reel Dimensions (mm)						
Dimension	**W**	**F**	**Do**	**Po**	**P1**	**A**	**B**	**C**	**D**	**N**	**W1**	**W2**
Tolerance	**Typ**	**Typ**	**Typ**	**Typ**	**Typ**	**Typ**	**Min**	**Typ**	**Min**	**Min**	**Typ**	**Max**
VC-840	8.0	3.5	1.5	4.0	4.0	180	2.0	13.0	21.0	60.0	9	11.4



Ordering Information

VC-840-EAE-KAAN- xxMxxxxxxxXX

Product Family
Crystal Oscillator

Package Size
2.5x2.0x0.9mm

Supply Voltage
E: +3.3Vdc
H: +2.5Vdc
J: +1.8Vdc

Output
A: LVCMOS

Operating Temperature
J: -20/70°C
E: -40/85°C
F: -40/105°C

Packaging
TR: Tape and Reel
blank: Cut Tape / non Tape and Reel quantities
_SNPB: Tin lead solder dipped

Frequency (See Above)
In MHz

Other
N: Standard

Load
A: 15pF

Enable/Disable Options
A: Enable High

Stability Options
S: ±100ppm
K: ±50ppm
F: ±25ppm

Note: Not all combinations of options are availible. Other specifications may be availible upon request. Consult with factory.

Example:

VC-840-EAE-KAAN-25M0000000TR	**Tape and Reel**
VC-840-EAE-KAAN-25M0000000	**Cut Tape**
VC-840-EAE-KAAN-25M0000000_SNPB	**Tin lead solder dipped**

Revision History

Revision Date	Edited	Approved	Description
May 14, 2014	VN	TG	Corrected Operating Temperature in Specification Tables 1, 2 and 3 to show -20/70°C Removed Standard Output Frequencies Table 10 (Empty)
Aug 4, 2015	EM	DL	Added temp range -40/105°C and note in RED on page 7
Aug 16, 2015	EM	DL	Updated Rise/Fall time
Jan 17, 2017	RC	RC	Update IR Reflow Table
Aug 10, 2018	FB	FB	Update logo and contact information, added SNPBDIP ordering option
March 30, 2019	FB	YM	Update logo, add gold thickness, add phase jitter, update SNPBDIP to SNPB
April 30, 2020	FB	YM	Add tape and reel ordering option, updates and corrections as needed

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