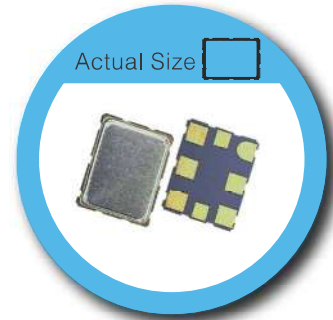


VD-M Type High Frequency and Ultra Low Noise 7.0 x 5.0mm SMD Voltage Control Crystal Oscillator

FEATURE

- Low Power Supply Voltage: 3.3, 2.5, and 1.8V Supply Options
- Clock Output: LVPECL, LVDS, CML, HCSL and LVCMOS
- Output Frequency Support from 15MHz to 2.1GHz
- Ultra Low Noise, Phase Jitter < 300 fs
(Typical: 150 fs at 12kHz to 20MHz Frequency Offsets)
- Tri-state Enable / Disable Mode.
- Temperature Range: -40 to 125°C
- Pb-free/RoHS Compliant

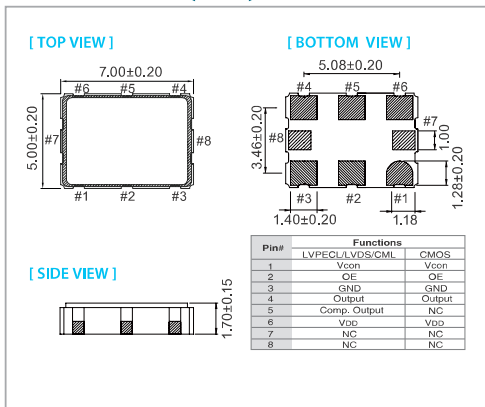


RoHS Compliant

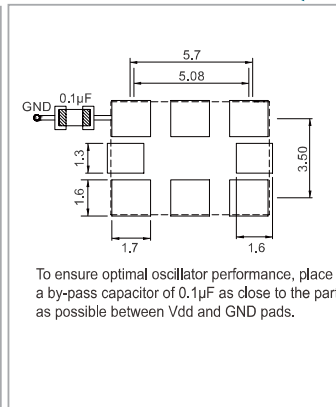
TYPICAL APPLICATION

- Set-Top Box, HDTV
- xDSL/VoIP, Cable Modem
- Jitter Attenuator, ADC

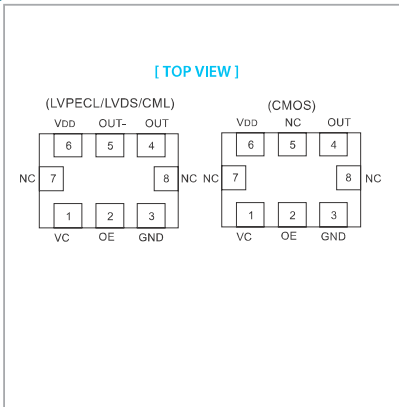
DIMENSION (mm)



SOLDER PAD LAYOUT(mm)



PIN ASSIGNMENTS



ELECTRICAL SPECIFICATION

Parameter	LVPECL				unit		
	3.3V		2.5V				
	Min.	Max.	Min.	Max.			
Supply Voltage Variation (VDD)	3.63	2.97	2.25	2.75	V		
Frequency Range	15	2100	15	2100	MHz		
Supply Current	—	120	—	95	mA		
Output Level	Output High	VDD-1.165	VDD-0.8	VDD-1.165	VDD-0.8	V	
	Output Low	VDD-2.0	VDD-1.55	VDD-2.0	VDD-1.55		
Transition Time (20%-80%)	Rise Time / Fall Time		—	0.35	—	0.35	nSec
Duty Cycle	45	55	45	55	%		
Startup Time	—	8	—	8	mSec		
Tri-State Mode (Input to Pin 2)	Enable	0.7-VDD	—	0.7 x VDD	—	V	
	Disable	—	0.3 x VDD	—	0.3 x VDD		
Standby Current	—	100	—	80	mA		
Output Load	50 ohms into VDD-2V						
Phase Noise	Typ.	Max.	Typ.	Max.	dBc/Hz		
	At VDD=3.3V ,Fout=644.5MHz						
At VDD=3.3V ,Fout=644.5MHz	1kHz offset	-87	—	-87			
	10kHz offset	-110	—	-110			
	100kHz offset	-127	—	-127			
	1MHz offset	-138	—	-138			
	20MHz offset	-153	—	-153			
RMS Phase Jitter (12kHz to 20MHz)	150	300	150	300	fs		
Period Jitter	—	50	—	50	ps		

Parameter		LVDS						unit
		3.3V		2.5V		1.8V		
		Min.	Max.	Min.	Max.	Min.	Max.	
Supply Voltage Variation (V _{DD}) ±10%		3.63	2.97	2.25	2.75	1.71	1.89	V
Frequency Range		15	2100	15	2100	15	2100	MHz
Supply Current		–	90	–	80	–	70	mA
Output Level	Output High	–	1.6	–	1.6	–	1.6	V
	Output Low	0.9	–	0.9	–	0.9	–	
Transition Time (20%-80%)	Rise Time / Fall Time	–	0.35	–	0.35	–	0.35	nSec
Duty Cycle		45	55	45	55	45	55	%
Startup Time		–	8	–	8	–	8	mSec
Tri-State Mode (Input to Pin 2)	Enable	0.7 x V _{DD}	–	0.7 x V _{DD}	–	0.7 x V _{DD}	–	V
	Disable	–	0.3 x V _{DD}	–	0.3 x V _{DD}	–	0.3 x V _{DD}	
Standby Current		–	80	–	70	–	70	mA
Output Load		100 ohms between O _{UT} and O _{UTN}						
Phase Noise		Typ.	Max.	Typ.	Max.	Typ.	Max.	
At V _{DD} =3.3V, F _{out} =644.5MHz	1kHz offset	-87	–	-87	–	-87	–	dBc/Hz
	10kHz offset	-110	–	-110	–	-110	–	
	100kHz offset	-127	–	-127	–	-127	–	
	1MHz offset	-138	–	-138	–	-138	–	
	20MHz offset	-153	–	-153	–	-153	–	
RMS Phase Jitter (12kHz to 20MHz)		150	300	150	300	150	300	fs
Period Jitter		–	50	–	50	–	50	ps

Parameter		CML						unit
		3.3V		2.5V		1.8V		
		Min.	Max.	Min.	Max.	Min.	Max.	
Supply Voltage Variation (V _{DD})		3.63	2.97	2.25	2.75	1.71	1.89	V
Frequency Range		15	2100	15	2100	15	2100	MHz
Supply Current		–	90	–	80	–	70	mA
Output Level	Output High	V _{DD} -0.085	V _{DD}	V _{DD} -0.085	V _{DD}	V _{DD} -0.085	V _{DD}	V
	Output Low	V _{DD} -0.6	V _{DD} -0.32	V _{DD} -0.6	V _{DD} -0.32	V _{DD} -0.6	V _{DD} -0.32	
Transition Time (20%-80%)	Rise Time / Fall Time	–	0.35	–	0.35	–	0.35	nSec
Duty Cycle		45	55	45	55	45	55	%
Startup Time		–	8	–	8	–	8	mSec
Tri-State Mode (Input to Pin 2)	Enable	0.7 x V _{DD}	–	0.7 x V _{DD}	–	0.7 x V _{DD}	–	V
	Disable	–	0.3 x V _{DD}	–	0.3 x V _{DD}	–	0.3 x V _{DD}	
Standby Current		–	70	–	70	–	70	mA
Output Load		50 ohms to V _{DD}						
Phase Noise		Typ.	Max.	Typ.	Max.	Typ.	Max.	
At V _{DD} =3.3V, F _{out} =644.5MHz	1kHz offset	-87	–	-87	–	-87	–	dBc/Hz
	10kHz offset	-110	–	-110	–	-110	–	
	100kHz offset	-127	–	-127	–	-127	–	
	1MHz offset	-138	–	-138	–	-138	–	
	20MHz offset	-153	–	-153	–	-153	–	
RMS Phase Jitter (12kHz to 20MHz)		150	300	150	300	150	300	fs
Period Jitter		–	50	–	50	–	50	ps

Parameter		HCSL						unit
		3.3V		2.5V		1.8V		
		Min.	Max.	Min.	Max.	Min.	Max.	
Supply Voltage Variation (V _{DD})		3.63	2.97	2.25	2.75	1.71	1.89	V
Frequency Range		15	700	15	700	15	700	MHz
Supply Current		–	115	–	100	–	94	mA
Output Level	Output High	0.66	1.15	0.66	1.15	0.66	1.15	V
	Output Low	0	0.15	0	0.15	0	0.15	
Transition Time (20%-80%)	Rise Time / Fall Time	–	0.4	–	0.4	–	0.4	nSec
Duty Cycle		45	55	45	55	45	55	%
Startup Time		–	8	–	8	–	8	mSec
Tri-State Mode (Input to Pin 2)	Enable	0.7 x V _{DD}	–	0.7 x V _{DD}	–	0.7 x V _{DD}	–	V
	Disable	–	0.3 x V _{DD}	–	0.3 x V _{DD}	–	0.3 x V _{DD}	
Standby Current		–	100	–	90	–	80	mA
Output Load		50 ohms to G _{ND}						
Phase Noise		Typ.	Max.	Typ.	Max.	Typ.	Max.	
At V _{DD} =3.3V, F _{out} =644.5MHz	1kHz offset	-87	–	-87	–	-87	–	dBc/Hz
	10kHz offset	-110	–	-110	–	-110	–	
	100kHz offset	-127	–	-127	–	-127	–	
	1MHz offset	-138	–	-138	–	-138	–	
	20MHz offset	-153	–	-153	–	-153	–	
RMS Phase Jitter (12kHz to 20MHz)		150	300	150	300	150	300	fs
Period Jitter		–	50	–	50	–	50	ps

Parameter	CMOS						unit	
	3.3V		2.5V		1.8V			
	Min.	Max.	Min.	Max.	Min.	Max.		
Supply Voltage Variation (V _{DD})	3.63	2.97	2.25	2.75	1.71	1.89	V	
Frequency Range	15	250	15	250	15	250	MHz	
Supply Current	–	80	–	70	–	60	mA	
Output Level	Output High	0.9 X V _{DD}	–	0.9 X V _{DD}	–	0.9 X V _{DD}	–	
	Output Low	–	0.1X V _{DD}	–	0.1X V _{DD}	–	0.1X V _{DD}	
Transition Time (20%-80%)	Rise Time / Fall Time		–	1.2	–	1.5	–	nSec
			–	–	–	–	2	
Duty Cycle	F _{out} <100MHz	45	55	45	55	45	55	%
	F _{out} >100MHz	40	60	40	60	40	60	
Startup Time	–	8	–	8	–	8	mSec	
Tri-State Mode (Input to Pin 2)	Enable	0.7 x V _{DD}	–	0.7 x V _{DD}	–	0.7 x V _{DD}	–	
	Disable	–	0.3 x V _{DD}	–	0.3 x V _{DD}	–	0.3 x V _{DD}	
Stand by Current	–	75	–	65	–	55	mA	
Output Load	15pF							
Period Jitter	–	100	–	100	–	100	ps	

Control Voltage Function

Parameter	Control Voltage Function on Pin 1						unit
	3.3V		2.5V		1.8V		
	Min.	Max.	Min.	Max.	Min.	Max.	
Control Voltage Center	1.65		1.25		0.9		V
Control Voltage Range	0.3	3	0.25	2.25	0.18	1.62	
Frequency Pulling Range	±50	±250	±50	±250	±50	±250	ppm
Linearity	–	±10	–	±10	–	±10	%
Modulation Bandwidth	5	20	5	20	5	20	KHz
VC Input Impedance	5	–	5	–	5	–	MΩ

FREQ. STABILITY vs. TEMP. RANGE

Temp. (°C)	ppm	±20	±25	±30	±50
-20~+70		△	○	○	○
-40~+80		X	△	○	○
-40~+125		X	X	X	○

* ○ : Available △:Conditional X: Not available

* Inclusive of calibration @ 25 °C, operating temperature range, input voltage variation, load variation, aging (1st year), shock, and vibration

