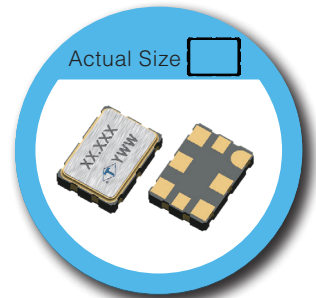


VD-M Type High Frequency and Ultra Low Noise

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 85°C
- Pb-free/RoHS Compliant

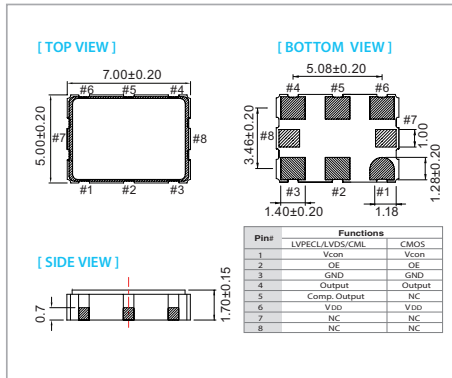


RoHS Compliant

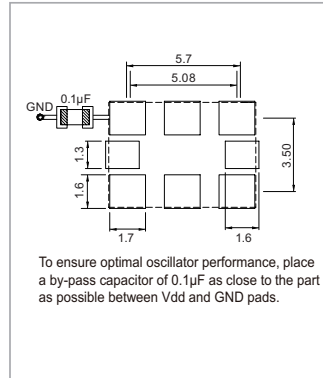
TYPICAL APPLICATION

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

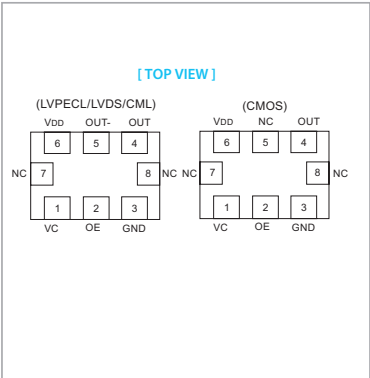
DIMENSION (mm)



SOLDER PAD LAYOUT(mm)



PIN ASSIGNMENTS



ELECTRICAL SPECIFICATION

Parameter	LVPECL				unit	
	3.3V		2.5V			
	Min.	Max.	Min.	Max.		
Supply Voltage Variation (V _{DD})	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	V _{DD} -1.165	V _{DD} -0.8	V _{DD} -1.165	V _{DD} -0.8	V
	Output Low	V _{DD} -2.0	V _{DD} -1.55	V _{DD} -2.0	V _{DD} -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-V _{DD}	-	0.7 x V _{DD}	-	V
	Disable	-	0.3 x V _{DD}	-	0.3 x V _{DD}	
Standby Current		-	120	-	95	mA
Output Load	50 ohms into V _{DD} -2V					
Phase Noise		Typ.	Max.	Typ.	Max.	dBc/Hz
At V _{DD} =3.3V, F _{out} =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

Note: not all combination of options are available. Other specifications may be available upon request.

Specifications subject to change without notice.

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		–	90	–	80	–	70	mA
Output Load		100 ohms between OUT and OUTN						
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		–	90	–	80	–	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		–	115	–	100	–	95	mA
Output Load		50 ohms to GND						
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

Note: not all combination of options are available. Other specifications may be available upon request.

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	-	90	-	80	-	70	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	-	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	-	90	-	80	-	70	mA
Output Load	15pF						
Period Jitter	-	100	-	100	-	100	ps

CONTROL VOLTAGE FUNCTION

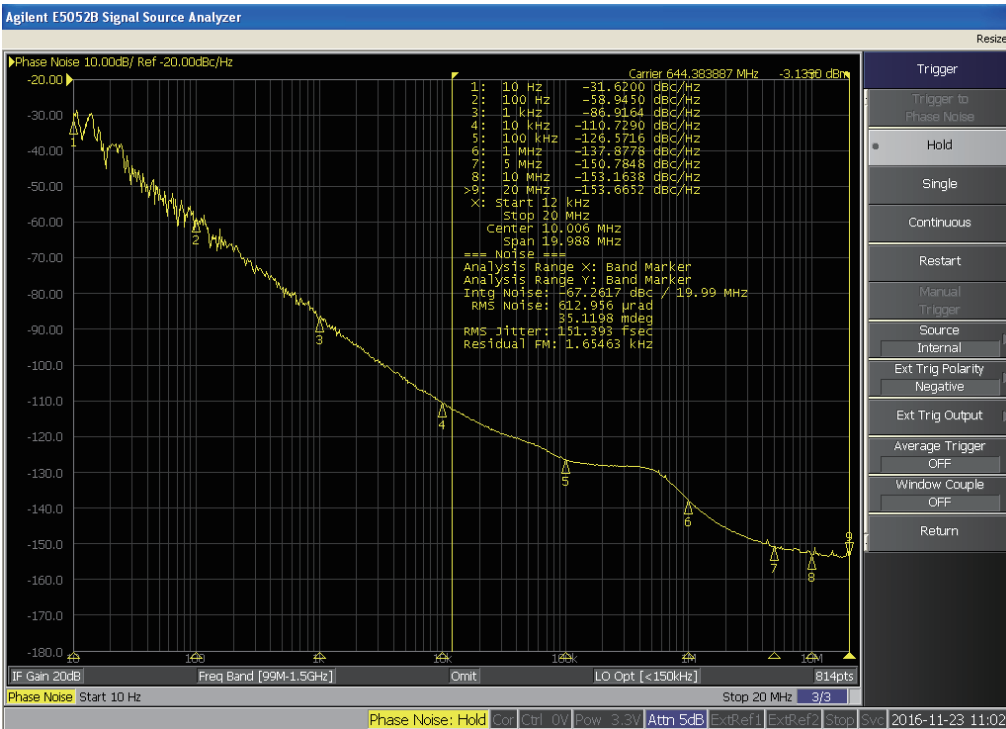
Parameter	Control Voltage Function on Pin 1						unit
	3.3V		2.5V		1.8V		
	Min.	Max.	Min.	Max.	Min.	Max.	
Control Voltage Center	1.65		1.25		0.9		V
Control Voltage Range	0.3	3	0.25	2.25	0.18	1.62	
Frequency Pulling Range	±50	±250	±50	±250	±50	±250	ppm
Linearity	-	±10	-	±10	-	±10	%
Modulation Bandwidth	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
-10~+60	○	○	○	○	○
-20~+70	△	○	○	○	○
-40~+85	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



Note: not all combination of options are available. Other specifications may be available upon request.