Dynamic Engineers Inc.
2550 Gray Falls Dr., Suite#128, Houston, TX, 77077
TEL: 1-281-870-8822 EMAIL: Sales@DynamicEng.com

XO3225AE-37.5MHz-A
High Temperature Oscillator

Features and Benefits

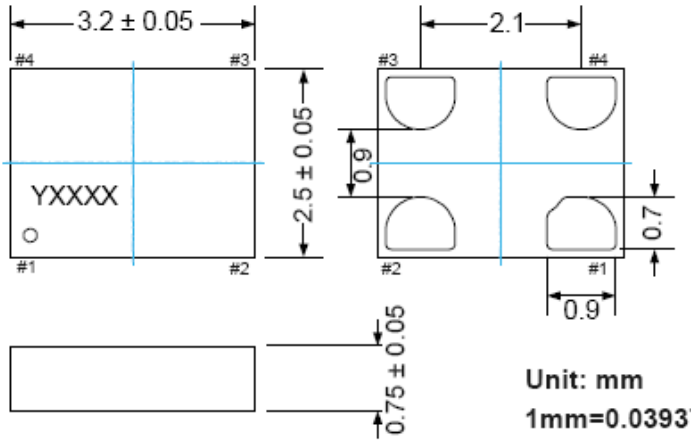
37.5MHz LVCMOS output
Operating temperature from -40°C to 125°C
3.3V supply voltage, 3.8mA typical current
Excellent total frequency stability as low as ±20 ppm
RoHS and REACH compliant, Pb-free, Halogen-free and Antimony-free

Typical Applications

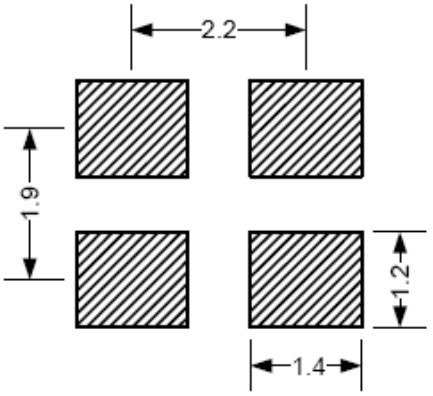
Industrial, medical, non AEC-Q100 automotive, avionics and other high temperature applications
Industrial sensors, PLC, motor servo, outdoor networking equipment, medical video cam, asset tracking systems, etc.

Mechanical Drawing & Pin Connections

Drawing No: MD160072-1



Unit: mm
1mm=0.03937inch



Recommended Land Pattern

Table 1. Pin Description

Pin	Symbol		Functionality
1	OE/ $\overline{\text{ST}}$/NC	Output Enable	H[1]: specified frequency output L: output is high impedance. Only output driver is disabled.
		Standby	H[1]: specified frequency output L: output is low (weak pull down). Device goes to sleep mode. Supply current reduces to I_std.
		No Connect	Any voltage between 0 and Vdd or Open[1]: Specified frequency output. Pin 1 has no function.
2	GND	Power	Electrical ground
3	OUT	Output	Oscillator output
4	VDD	Power	Power supply voltage[2]

Notes:

1. In OE or $\overline{\text{ST}}$ mode, a pull-up resistor of 10 kΩ or less is recommended if pin 1 is not externally driven. If pin 1 needs to be left floating, use the NC option.
2. A capacitor of value 0.1 µF or higher between Vdd and GND is required.

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Specifications

Oscillator Specification	Sym	Condition	Value			Unit	Note
			Min.	Typ.	Max.		
Frequency Range				37.5		MHz	
RF Output							
Waveform :				LVCMOS			
Output Voltage Level High	VOH		2.97			V	IOH = -4 mA
Output Voltage Level Low	VOL				0.33	V	IOL = 4 mA
Output Load Capacitance					15	pF	
Duty Cycle			45		55	%	
Rise/Fall Time				1.0	2.0	ns	
Power Supply							
Supply Voltage	Vdd		2.97	3.3	3.63	V	
Supply Current	Idd			3.8	4.7	mA	
OE Disable Current	I_od	OE = Low, Output in high Z state.			4.5	mA	
Standby Current	I_std	$\overline{ST}$ = Low, Output is weakly pulled down		2.6	8.5	uA	
Frequency Stability							
Frequency Stability		Inclusive of Initial tolerance at 25°C, 1st year aging at 25°C, and variations over operating temperature, rated power supply voltage and load (15 pF ± 10%).			±20	ppm	In operating temperature range
Operating Temperature Range				-40°C to 125°C			
Input Characteristics							
Input High Voltage		Pin 1, OE or $\overline{ST}$	70%			Vdd	
Input Low Voltage		Pin 1, OE or $\overline{ST}$			30%	Vdd	
Input Pull-up Impedence		Pin 1, OE logic high or logic low, or $\overline{ST}$ logic high	50	87	150	Kohm	
		Pin 1, $\overline{ST}$ logic low	2			Mohm	
Startup and Resume Timing							
Startup Time		Measured from the time Vdd reaches its rated minimum value			5	ms	
Enable/Disable Time		T_oe = 100 ns + 3 * clock periods			180	ns	
Resume Time		Measured from the time ST pin crosses 50% threshold			5	ms	
Jitter							
RMS Period Jitter				1.6	2.5	ps	
Peak-to-peak Period Jitter				12	20	ps	
RMS Phase Jitter (random)		Integration bandwidth = 900 kHz to 7.5 MHz		0.5	0.8	Ps	
		Integration bandwidth = 12 kHz to 20 MHz		1.3	2.0	ps	

Absolute Maximum Limits

Parameter	Value			Unit	Note
	Min.	Typ.	Max.		
Storage Temperature	-65		+150	°C	
Vdd	-0.5		4	V	
Electrostatic Discharge			2000	V	
Soldering Temperature			260	°C	follow standard Pb free soldering guidelines
Junction Temperature[3]			150	°C	

Note: 3. Exceeding this temperature for extended period of time may damage the device.

Thermal Consideration[4]

Package	ΦJA, 4 Layer Board (°C/W)	ΦJA, 2 Layer Board (°C/W)	ΦJC, Bottom (°C/W)
3225	109	212	27

Note: 4. Refer to JESD51-7 for ΦJA and ΦJC definitions, and reference layout used to determine the ΦJA and ΦJC values in the above table.

Maximum Operating Junction Temperature [5]

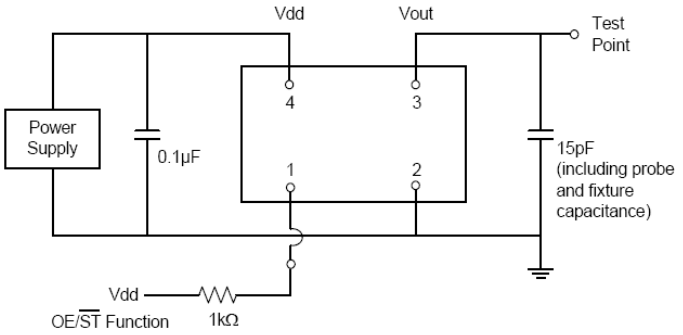
Max Operating Temperature (ambient)	Maximum Operating Junction Temperature
105°C	115°C
125°C	135°C

Note: 5. Datasheet specifications are not guaranteed if junction temperature exceeds the maximum operating junction temperature.

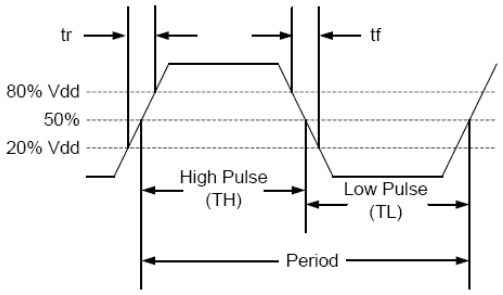
Environmental Compliance

Parameter	Condition/Test Method
Mechanical Shock	MIL-STD-883F, Method 2002
Mechanical Vibration	MIL-STD-883F, Method 2007
Temperature Cycle	JESD22, Method A104
Solderability	MIL-STD-883F, Method 2003
Moisture Sensitivity Level	MSL1 @ 260°C

Test Circuit and Waveform [6]



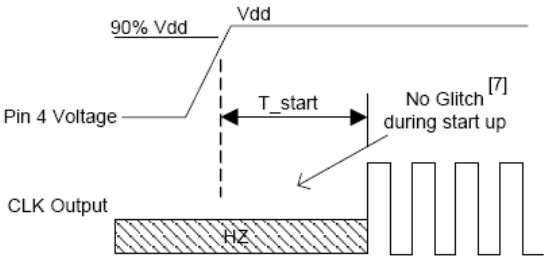
Test Circuit



Waveform

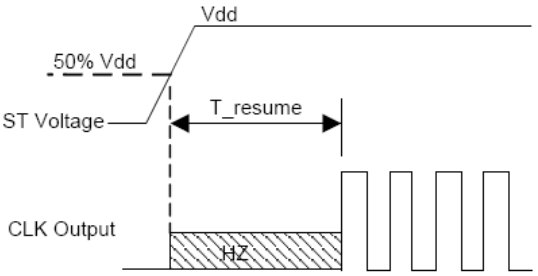
Note: 6. Duty Cycle is computed as Duty Cycle = TH/Period.

Timing Diagrams



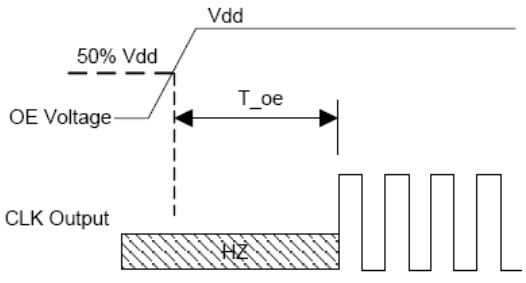
T_start: Time to start from power-off

Startup Timing (OE/$\overline{ST}$ Mode)



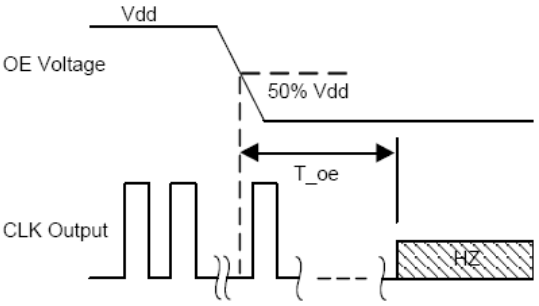
T_resume: Time to resume from ST

Standby Resume Timing ($\overline{ST}$ Mode Only)



T_oe: Time to re-enable the clock output

OE Enable Timing (OE Mode Only)



T_oe: Time to put the output in High Z mode

OE Disable Timing (OE Mode Only)

Note: 7. XO3225AE has “no runt” pulses and “no glitch” output during startup or resume.

Pin 1 Configuration Options (OE, $\overline{ST}$, or NC)

Pin 1 of the XO3225AE can be factory-programmed to support three modes: Output enable (OE), standby ($\overline{ST}$) or No Connect(NC). These modes can also be programmed.

Output Enable (OE) Mode

In the OE mode, applying logic Low to the OE pin only disables the output driver and puts it in Hi-Z mode. The core of the device continues to operate normally. Power consumption is reduced due to the inactivity of the output. When the OE pin is pulled High, the output is typically enabled in <1µs.

Standby ($\overline{ST}$) Mode

In the $\overline{ST}$ mode, a device enters into the standby mode when Pin 1 pulled Low. All internal circuits of the device are turned off. The current is reduced to a standby current, typically in the range of a few µA. When $\overline{ST}$ is pulled High, the device goes through the “resume” process, which can take up to 5 ms.

No Connect (NC) Mode

In the NC mode, the device always operates in its normal mode and output the specified frequency regardless of the logic level on pin 1.

Output on Startup and Resume

The XO3225AE comes with gated output. Its clock output is accurate to the rated frequency stability within the first pulse from initial device startup or resume from the standby mode. In addition, the XO3225AE has NO RUNT, NO GLITCH output during startup or resume as shown in the waveform captures in Figure 17 and Figure 18.

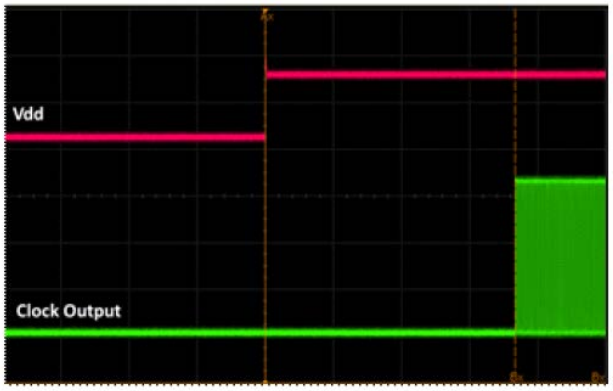


Figure 17. Startup Waveform vs. Vdd

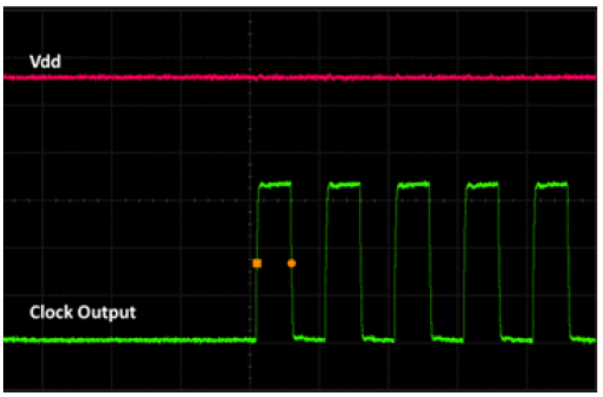
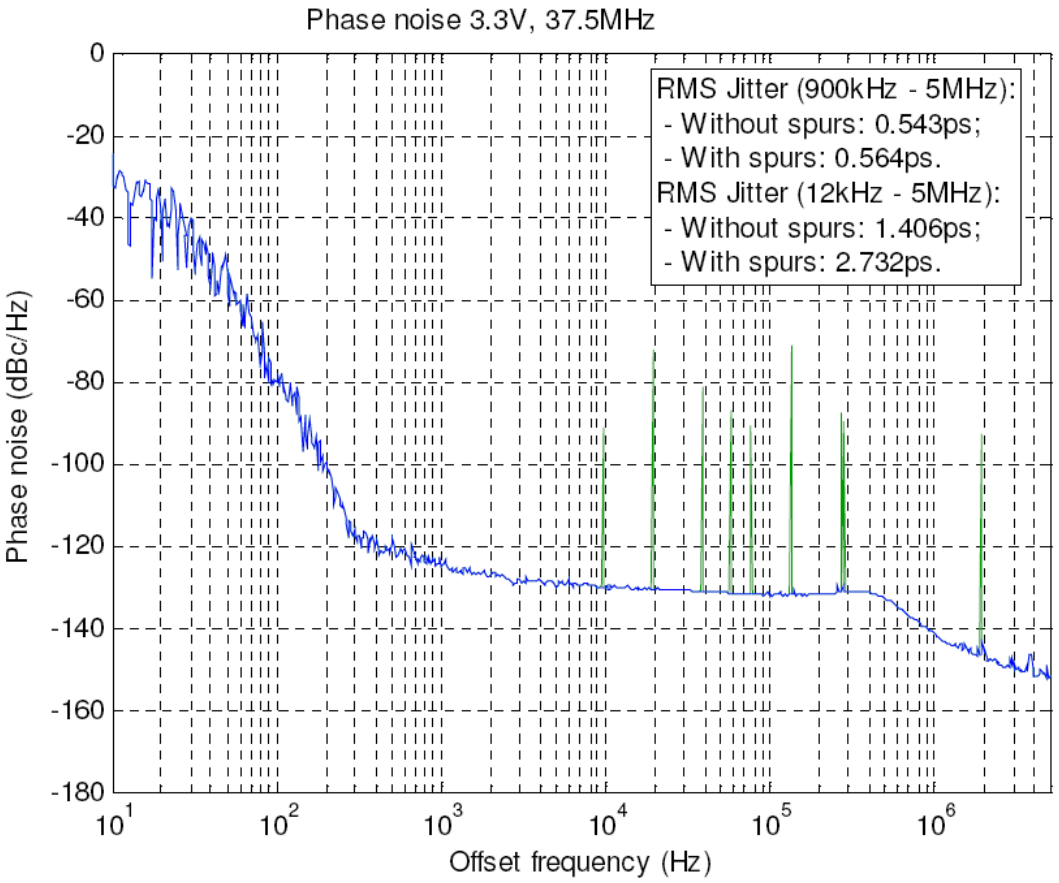
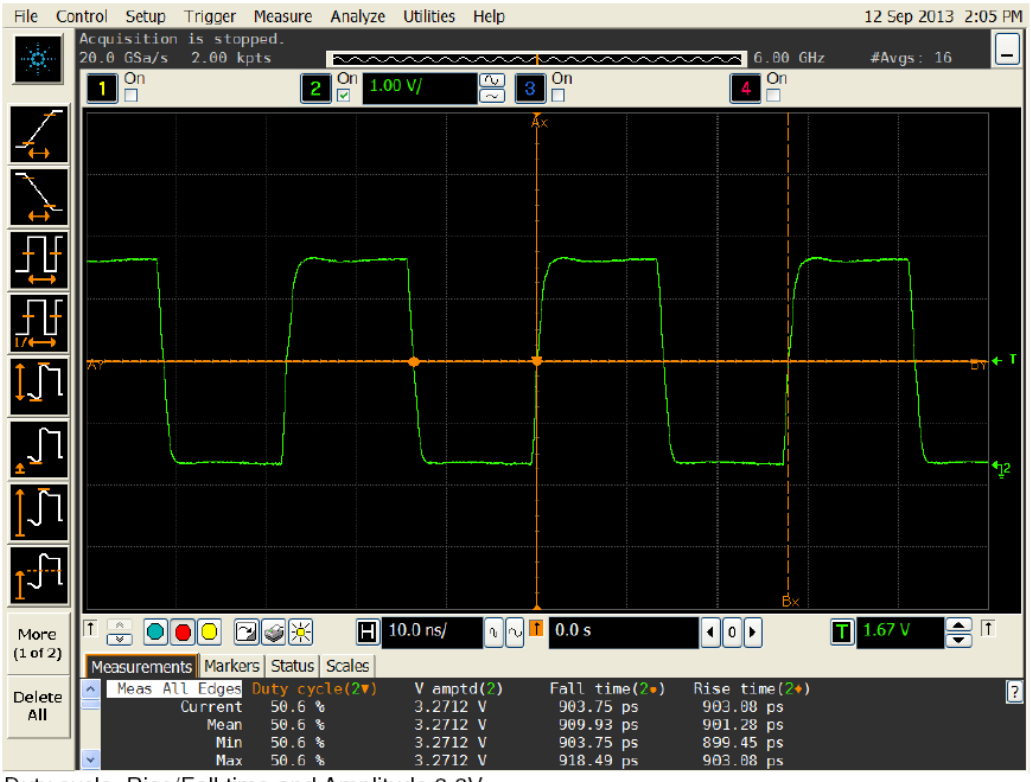


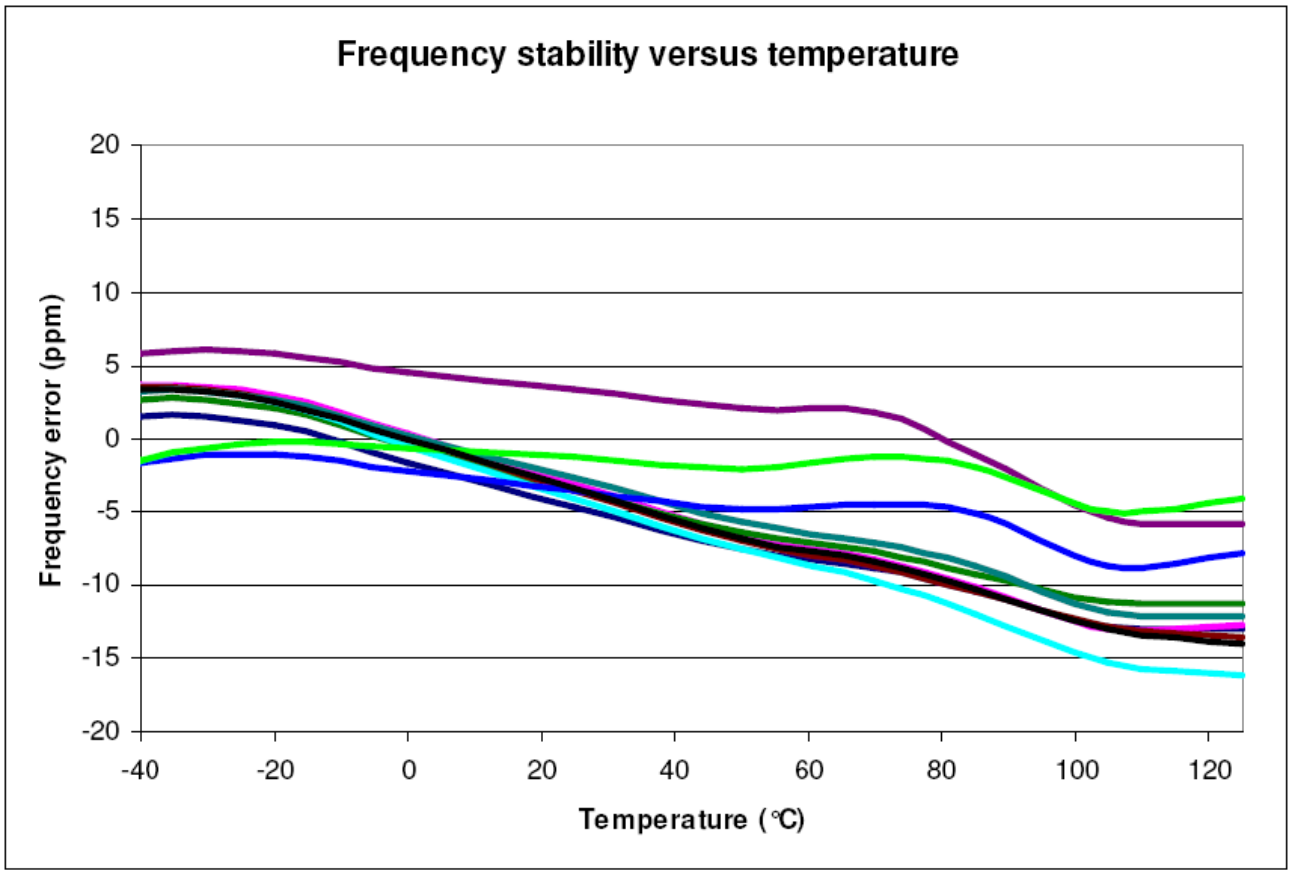
Figure 18. Startup Waveform vs. Vdd (Zoomed-in View of Figure 17)

Test Plot





Duty cycle, Rise/Fall time and Amplitude 3.3V



Frequency stability* versus temperature