

Space Level Clock Oscillator



Flat Pack

PDI *FP-Series XO*, utilizing premium swept quartz crystal resonator in a 4-point mount, is designed for low-to-mid orbit applications and manufactured in PDI's own MIL-PRF-38534 and MIL-PRF-55310/QPL certified manufacturing facility. (Higher Orbits available upon request)

ex) **FP2—T—25000X—M—C—D—3—G—EM—X***

PACKAGE TYPE	ENABLE	FREQUENCY	OUTPUT	FREQUENCY STABILITY	OPERATING TEMPERATURE	SUPPLY VOLTAGE	LEAD FORM	GRADE
FP1 = 24 Pin	T = Tri-State	00750X-99999X =	C = CMOS	B = +/-25.0 (Temp B)	B = -20 to +70°C	2 = +2.5V	G = Gull Wing	EB =
FP2 = 20 Pin	X = No Connect	750.000kHz –	M = LVDS	U = +/-35.0 (Temp B+D)	D = -40 to +85°C	3 = +3.3V	X = None	Eng. Bread Bd.
FP4 = 14 Pin		99.000MHz	O = LVCMOS	C = +/-50.0 (Temp B+D)	E = -55 to +125°C		S = Special	EM =
FP6 = 16 Pin		C10000-C80000 =	P = LVPECL	V = +/-65.0 (Temp E)	S = Special			Eng. Model
		100.000MHz –		S = Special				FM =
		800.000MHz						Flight Model

Absolute Maximum Ratings

*(X) for standard or assigned for customization.

PARAMETER	SYM	MIN	MAX	UNIT
Frequency Range		.750	800	MHz
Output Ranges	CMOS & LVCMOS	.750	160	MHz
	LVDS & LVPECL	24	800	
Supply Voltage	Vdd		4.6	V
Input Voltage	VI	-0.5	Vdd+0.5 V	
Output Voltage	VO	-0.5	Vdd+0.5 V	
Storage Temperature	TS	-65	150	C
Ambient Operating Temperature	TA	-40	85	C
Junction Temperature	TJ		125	C
ESD Protection Human Body Model			2	kV
Radiation, Total Ionized Dose	TID		100	Krad
Single Event Latch Up Immunity	SEL		60	MeV-cm ² /mg

General Electrical Specifications

PARAMETER	SYM	CONDITIONS	MIN	TYP	MAX	UNIT
Supply Current under load	Idd	Fo<24MHz (LVCMOS)			15	mA
		24MHz<Fout<180MHz (LVPECL/LVDS/LVCMOS)			65/45/30	
		180MHz<Fout<800MHz (LVPECL/LVDS)			100/80	
Operating Voltage	Vdd		2.97	3.3	3.63	V
Output Clock Duty Cycle		@ 50% Vdd (LVCMOS) @ 1.25V (LVDS) @ Vdd – 1.3V (LVPECL)	45	50	55	%

REV: NA

SIZE: A

CAGE: A

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Jitter Specifications

PARAMETER	CONDITIONS	FREQ	MIN	TYP	MAX	UNIT
Period Jitter (RMS)	Sample size > 10,000 cycles	25 MHz		2.0		psec
		155.52 MHz		4.3		
		622.08 MHz		5.0		
Period Jitter (pk-pk)	Sample size > 10,000 cycles	25 MHz		20.0		
		155.52 MHz		35.0		
		622.08 MHz		45.0		
Phase Jitter (RMS)	Integrated 12 kHz to 20 MHz	25 MHz		1.0		
		77.76 MHz		0.5		
		155.52 MHz		0.3		
		622.08 MHz		0.1		

Phase Noise Specifications

PARAMETER	FREQ	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz
Phase Noise, dBc/Hz (typical)	25 MHz	-73	-103	-133	-147	153
	77.76 MHz	-66	-96	-120	-129	-126
	155.52 MHz	-63	-93	-117	-126	-123
	622.08 MHz	-52	-83	-105	-113	-110

LVC MOS Electrical Characteristics

PARAMETER	SYM	CONDITIONS	MIN	TYP	MAX	UNIT
Frequency Range			0.75		200	MHz
Output Drive Current (Low Drive)	I _{oh}	V _{oh} = V _{dd} -0.4V, V _{dd} = 3.3V	10			mA
	I _{ol}	V _{ol} = 0.4V, V _{dd} = 3.3V	10			
Output Drive Current (High Drive)	I _{oh}	V _{oh} = V _{dd} -0.4V, V _{dd} = 3.3V	30			
	I _{ol}	V _{ol} = 0.4V, V _{dd} = 3.3V	30			
Rise / Fall time (Low Drive)	Tr/Tf	0.3V ~ 3.0V with 15 pF load		2.4		nsec
Rise / Fall time (High Drive)	Tr/Tf	0.3V ~ 3.0V with 15 pF load		1.2		
Duty Cycle		15 pF load	45	50	55	%

LVDS Electrical Characteristics

PARAMETER	SYM	CONDITIONS	MIN	TYP	MAX	UNIT
Frequency Range		Load = 100 ohms	24		800	MHz
Output Differential Voltage	V _{od}		247	355	454	mV
Output High Voltage	V _{oh}			1.4	1.6	V
Output Low Voltage	V _{ol}		0.9	1.1		
Offset Voltage	V _{os}		1.125	1.2	1.37	
Output Short Circuit Current	I _{osd}				-8	mA
Rise / Fall time	Tr/Tf			0.7	1	nsec
Duty Cycle			40	50	60	%

LVPECL Electrical Characteristics

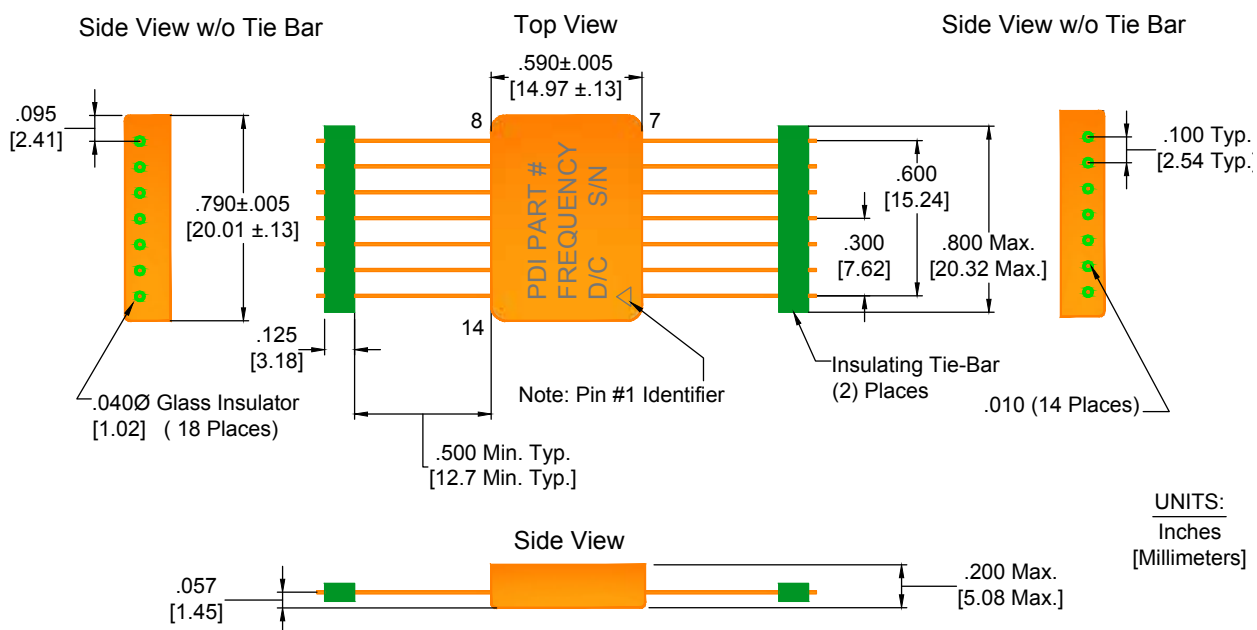
PARAMETER	SYM	CONDITIONS	MIN	TYP	MAX	UNIT
Frequency Range			24		800	MHz
Output High Voltage	V _{oh}	Load = 50 ohms to V _{dd} -2V	V _{dd} - 1.025			V
Output Low Voltage	V _{ol}	Load = 50 ohms to V _{dd} -2V			V _{dd} - 1.620	V
Rise / Fall time	Tr/Tf	20%/80% of waveform		0.6	1.5	psec
Duty Cycle		Load = 50 ohms to V _{dd} -2V	40	50	60	%

14 Pin Flat Pack Package Type FP4

PDI *FP-Series XO* is designed for low-to-mid orbit applications and manufactured in PDI's own MIL-PRF-38534 and MIL-PRF-55310/QPL certified manufacturing facility.

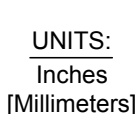
(Higher Orbits available upon request)

PIN	CONNECTION
1	DNC/Enable*
2-6	DNC
7	Ground/Case
9	Output
10-13	DNC
14	Supply
*Per Option NOTE: DNC = Do Not Connect	



PIN	CONNECTION
1	DNC/Enable*
2-7	DNC
8	Ground/Case
9	Output
10-15	DNC
16	Supply

*Per Option
NOTE: DNC = Do Not Connect



Gullwing Detail

The diagram shows a cross-section of a gullwing detail. The main body is orange. Dimensions are given in inches (top) and millimeters (bottom) with tolerances.

Dimension	Value (inches)	Value (millimeters)
Top flange thickness	$.060 \pm .004$	$[1.50 \pm 0.10]$
Web thickness	$.072 \pm .004$	$[1.80 \pm 0.10]$
Bottom flange thickness	$.130 \pm .004$	$[3.30 \pm 0.10]$
Overall height	$.008 \pm .004$	$[0.20 \pm 0.10]$

60/40 Solder Alloy
(16 Places)

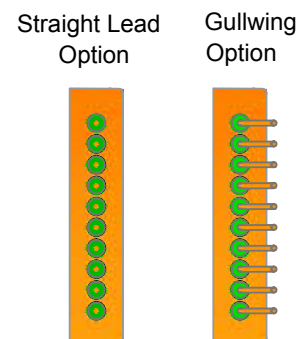
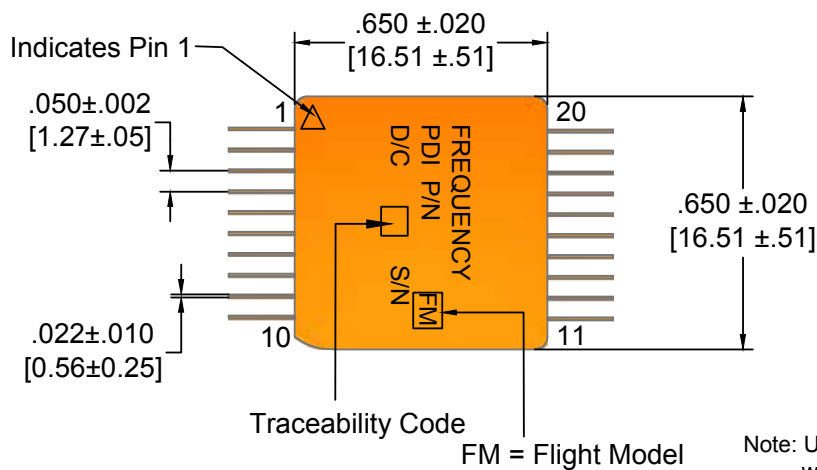
20 Pin Flat Pack Package Type FP2

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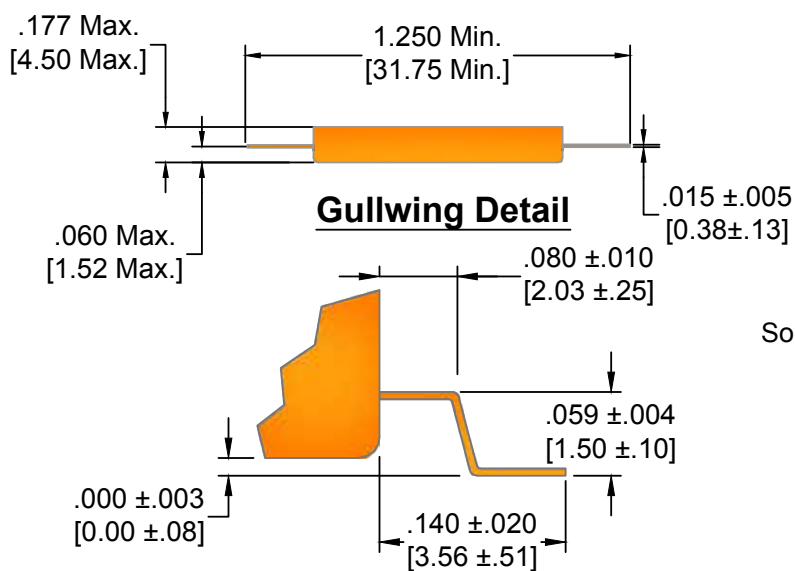
(Higher Orbits available upon request)

PIN	CONNECTION
1	DNC/Enable*
2-9	DNC
10	Ground/Case
11	Output
12	DNC
13	Supply (See note)
14-19	DNC
20	Supply (Optional, see note)

*Per Option
NOTE: DNC = Do Not Connect

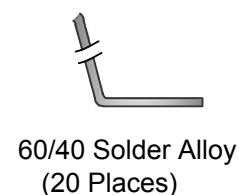


Note: Unit shall meet all requirements with pin 13 and 20 simultaneously tied to supply voltage.



UNITS:
Inches
[Millimeters]

Solder Dipped Detail



24 Pin Flat Pack Package Type FP1

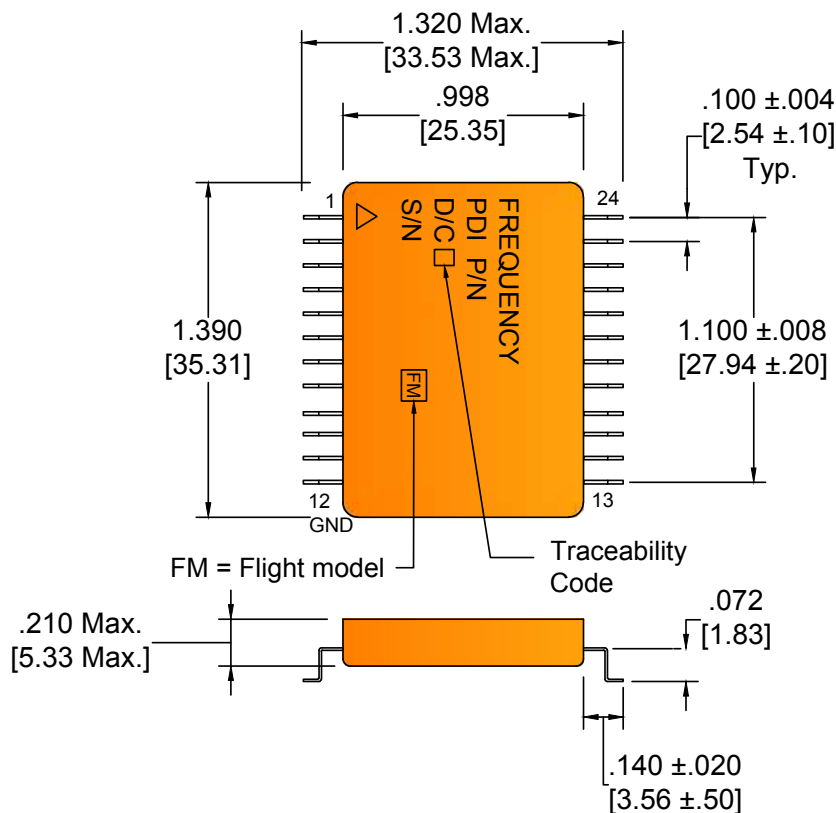


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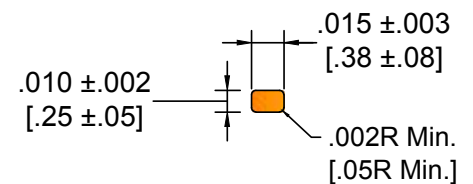
(Higher Orbits available upon request)

PIN	CONNECTION
1	DNC/Enable*
2-11	DNC
12	Ground/Case
13	Output
14-23	DNC
24	Supply

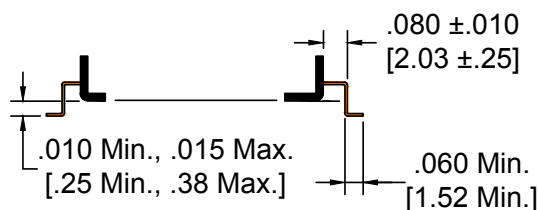
*Per Option
NOTE: DNC = Do Not Connect



Lead Detail



Gullwing Detail



UNITS:
Inches
[Millimeters]

MIL-55310 Screening



MIL-PRF-55310 Group A & B – Grades EM (Upon Request) & FM Only			
Operation	Requirements	Control Item	Sample Size
(1)	(2)	(3)	(4)
Internal Visual (Pre Cap)	Verify material, workmanship, cleanliness, and terminations used in construction. Form 8.2.4.51	MIL-STD-883, Method 2017 and 2032 NASA-STD-8739.3	100%
Stabilization Bake	8.2 ML 0001 Stabilization Bake Oven Operation at PDI	MIL-STD-883, Method 1008	100%
Resistance Weld	7.5 ML 001 welding process	per this specification 7.5 ML 001 welding process	100%
Random Vibration	Random vibration 37.80 Grms for 5 minutes per axis	MIL-STD-202, Method 214, Test Condition I-J	100%
Thermal Shock	15 minutes at -55°C and 15 minutes at +85°C; 25 cycles total	MIL-STD-202, Method 107, Test Condition A1	100%
Initial Electrical Test	Measure electrical parameters	The electrical parameters with limits to be measured, should be indicated in dedicated tables of a procurement specification. Per Source Control Drawing	100%
Burn-In	240 hours at +125°C with load applied	MIL-PRF-883, Method 1015	100%
Electrical Test	Measure electrical parameters	The electrical parameters with limits to be measured, should be indicated in dedicated tables of a procurement specification. Per Source Control Drawing	100%
Seal Test	Fine and gross	MIL-STD-202, Method 112, Condition C & D or E	100%
Radiographic Inspection	X-Ray performed by Seal Laboratories, El Segundo, California 90245	MIL-STD-202, Method 209	100%
Group A			
Electrical Test	Measure: Frequency; Output Level; Current Consumption at room	The electrical parameters with limits to be measured, should be indicated in dedicated tables of a procurement specification. Per Source Control Drawing	100%
Visual & Mechanical Inspection	Verify material, interface, physical dimensions, marking and workmanship	Per source control drawing	100%
Solderability	Per QA solder test methods	MIL-STD-202, Method 208	5 Empty Packages
Group B			
Electrical Testing	Measure electrical parameters	The electrical parameters with limits to be measured, should be indicated in dedicated tables of a procurement specification. Per Source Control Drawing	100%

MIL-55310 Screening



MIL-PRF-55310 Group C – Grade FM Only			
Operation	Requirements	Control Item	Sample Size
Group C Inspection MIL-PRF-55310 (Subgroup 1) - 8 Samples			
Vibration	MIL-STD-202, Method 204 (Customer specifies test conditions)	X	X
Shock	MIL-STD-202, Method 213, Condition C	X	X
Group C Inspection MIL-PRF-55310 (Subgroup 2) - 4 Samples from Subgroup 1			
Thermal Shock	MIL-STD-202, Method 107, Condition B	X	X
Ambient Pressure	MIL-PRF-55310, Paragraph 4.8.46.1	X	X
Storage Temperature	MIL-PRF-55310, Paragraph 4.8.47	X	X
Radiation Hardness	MIL-PRF-55310, Paragraph 4.8.48	AR	AR
Group C Inspection MIL-PRF-55310 (Subgroup 3) - 2 Samples from Subgroup 1			
Resistance to Soldering Heat	MIL-PRF-55310, Paragraph 4.8.49	X	X
Moisture Resistance	MIL-STD-202, Method 106 (Omit step 7b)	X	X
Salt Atmosphere	MIL-STD-883, Method 1009, Condition A (Test not required for class two oscillators if the test was performed on the package level per customer approval)	X	X
Group C Inspection MIL-PRF-55310 (Subgroup 4) - 2 Samples from Subgroup 1			
Terminal Strength (Lead integrity)	MIL-PRF-55310, Paragraph 4.8.52	X	X
Resistance to Solvents	MIL-STD-202, Method 215 (Not required for laser marked devices)	AR	AR

MIL-PRF-55310 Group D – Optional (Line item order only)					
Subgroup	Test	MIL-STD-883		Quantity (Accept number)	Reference Paragraph MIL-PRF-38534
		Method	Condition		
1	Thermal Shock	1011	C	5(0)	
	Stabilization Bake	1008	+150°C, 1 hour	5(0)	
	Lead Integrity	2004 2028	B2 (lead fatigue); D (leadless chip carrier) B1 for rigid leads (pin grid array leads)	1(0)	C.6.4.4.3
	Seal 23.1 Fine 23.2 Gross	1014	MIL-STD-883, Method 1014 A or B C or D	5(0)	
2	Not Used				
3	Salt Atmosphere	1009	A	5(0)	C.6.4.4.4
4	Metal Pkg. Isolation	1003	600Vdc, 100nA maximum	3(0)	C.6.4.4.5

Laboratory
Suitability Certified
MIL-STD-790 Product
Assurance Certified
MIL-PRF-38534 Hybrid
Microcircuit Certified



ISO 9001 FM 75597

REV: NA

SIZE: A

CAGE: A

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