

### Dynamic Engineers Inc.

2550 Gray Falls Dr., Suite#128, Houston, TX, 77077 TEL: 281-870-8822EMAIL:Sales@DynamicEngineers.com

#### J7H7LC!&")!" "&!@|8G!| A<n

LVDS Voltage Controlled Temperature Compensated Crystal Oscillator

#### Features and Benefits

Frequency Range from 10 MHz to 1450 MHz 2.5 mm x 3.2 mm x 1.6mm compact SMD package Up to ±0.5 ppm stability (depends on operating temperature) LVDS output 2.5V or 3.3V supply Integrated phase jitter performance of 1.5 pS RMS Low power consumption

#### Typical Applications

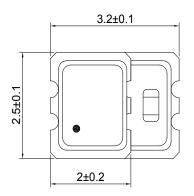
WiMAX, WLAN Telecommunication Mobile phone

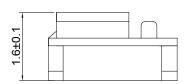
#### Description

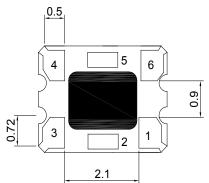
A new series of compact voltage controlled temperature compensated crystal oscillators with the latest low noise integrated circuit topologies.

### Mechanical Drawing & Pin Connections

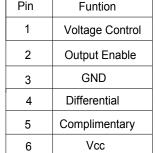
Drawing No:MD160046-1







Pin Connection Pin **Funtion** 1 Voltage Control 2 **Output Enable** 



0.75 0.75 89 o. 1.35 0.5 1.6 2.3 1.28 1.28

Unit: mm 1mm=0.0394inch



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# **Specifications**

Min.   Max.   Min.   Max.   Min.   Max.   Min.   Max.	General Specifications at Ta = +25°C, CL = 15pF									
Trequency Stability			Min.	Min. Max.				Max.		
\$\frac{\text{Frequency Stability}{\text{Vs. Temperature (ref to +25°C)}}	Supply Voltage V <sub>DD</sub>		2.5V ±5%		3.3V ±5%					
Vs. Temperature (ref to +25°C)       ±0.5 ppm over -30°C to +85°C (available)         Vs Voltage (±5%) input change       ±0.2 ppm max         Vs Load (±10%) condition       ±0.2 ppm max         Vs. Reflow (1 reflow and measured 24 hours afterwards)       1.0 ppm max         Current Consumption         All values are typical and over the operating temperatures       156 MHz : 22 mA       156 MHz : 25 mA         600 MHz : 30 mA       800 MHz : 30 mA       800 MHz : 30 mA         800 MHz : 30 mA       16 MHz : 36 mA         Current with Output Disabled         Load       Differential         Output Logic         High *1"       1.4V (typical), 1.6V (max.)         Low *0"       1.1V (typical), 0.9V (min.)         Rise Time / Fall Time         O.2nS (typical), 0.4nS (max)         Tr / Tf : 20% ↔ 80% waveform         Initial Calibration Tolerance         Phase Noise [dBc / Hz]         [dBc / Hz]       77.76       156.25       212.5       62.08       1000       1250         [dBc / Hz]       10 Hz       -100       -92       -90       -79       -73       -75         [dBc / Hz]       10 Hz       -112       -114       -110					10MHz 1450MHz		450MHz			
#1.0 ppm over -40°C to +85°C (available) #2.0 ppm max #2.	Frequency Sta	bility	±2.5 ppm ove	±2.5 ppm over -30°C to +85°C (default)						
Vs Voltage (±5%) input change   ±0.2 ppm max   ±0	Vs. Temperatur	e (ref to +25°C)	±0.5 ppm over -30°C to +85°C (available)							
Vs Load (±10%) condition change       ±0.2 ppm max         Vs Aging (per year at 25°C)       1.0 ppm max         Vs. Reflow (1 reflow and measured 24 hours afterwards)       1.0 ppm max         Current Consumption       No ppm max         All values are typical and over the operating temperatures       156 MHz : 22 mA       156 MHz : 25 mA         600 MHz : 38 mA       600 MHz : 30 mA       800 MHz : 32 mA         Bouth (15 mm)       156 MHz : 34 mA       16 MHz : 36 mA         Current with Output Disabled       18 mA (typical)         Load       Differential         Output Logic       High "1"       1.4V (typical), 1.6V (max.)         Low "0"       1.1V (typical), 0.9V (min.)         Rise Time / Fall Time       1.1V (typical), 0.4NS (max)         Tr / Tf : 20% ← 80% waveform         Initial Calibration Tolerance       ±1.0 ppm max. at +25°C ±2°C (at shipment)         Phase Noise [dBc / Hz (typical)]         [dBc / Hz (typical)]       10 Hz			±1.0 ppm over -40°C to +85°C (available)							
Vs Load (±10%) condition change       ±0.2 ppm max         Vs Aging (per year at 25°C)       1.0 ppm max         Vs. Reflow (1 reflow and measured 24 hours afterwards)       1.0 ppm max         Current Consumption       No ppm max         All values are typical and over the operating temperatures       156 MHz : 22 mA       156 MHz : 25 mA         600 MHz : 38 mA       600 MHz : 30 mA       800 MHz : 32 mA         Bouth (15 mm)       156 MHz : 34 mA       16 MHz : 36 mA         Current with Output Disabled       18 mA (typical)         Load       Differential         Output Logic       High "1"       1.4V (typical), 1.6V (max.)         Low "0"       1.1V (typical), 0.9V (min.)         Rise Time / Fall Time       1.1V (typical), 0.4NS (max)         Tr / Tf : 20% ← 80% waveform         Initial Calibration Tolerance       ±1.0 ppm max. at +25°C ±2°C (at shipment)         Phase Noise [dBc / Hz (typical)]         [dBc / Hz (typical)]       10 Hz										
change       Vs Aging (per year at 25°C)       1.0 ppm max         Vs. Reflow (1 reflow and measured 24 hours afterwards)       1.0 ppm max         Current Consumption       V <sub>DD</sub> = +2.5V       V <sub>DD</sub> = +3.3V         All values are typical and over the operating temperatures       156 MHz : 22 mA       600 MHz : 30 mA         800 MHz : 34 mA       800 MHz : 30 mA         800 MHz : 34 mA       16 MHz : 36 mA         Current with Output Disabled         Load       Differential         Output Logic         High "1"       1.4V (typical), 1.6V (max.)         Low "0"       1.1V (typical), 0.9V (min.)         Rise Time / Fall Time         Initial Calibration Tolerance         ± 1.0 ppm max. at +25°C ±2°C (at shipment)         For T.7.76         156.25       212.5       622.08       1000       1250         100 Hz       -62       -65       -61       -51       -40       -43         100 Hz       -100       -92       -90       -79       -73       -75         [dBc / Hz (typical)]       10 KHz       -114       -110       -102       -99       -95         100 Hz       -124<		Vs Voltage (±5%) input change								
Vs Aging (per year at 25°C)         Vs. Reflow (1 reflow and measured 24 hours afterwards)         Current Consumption         All values are typical and over the operating temperatures       000 MHz : 22 mA       156 MHz : 25 mA         600 MHz : 30 mA       800 MHz : 30 mA       800 MHz : 32 mA         800 MHz : 30 mA       800 MHz : 36 mA       16 MHz : 36 mA         Current with Output Disabled         Load       Differential         Output Logic         High *1"       1.4V (typical), 1.6V (max.)         Low "0"       1.1V (typical), 0.9V (min.)         Rise Time / Fall Time         O.2nS (typical), 0.4nS (max)         Tr / Tf : 20% ↔ 80% waveform         Initial Calibration Tolerance         ± 1.0 ppm max. at +25°C ±2°C (at shipment)         Offset       77.76       156.25       212.5       622.08       1000       1250         Phase Noise [dBc / Hz (typical)]         (dbc / Hz (typical)]       -62       -65       -61       -51       -40       -43         10 Hz (typical)         10 KHz (typical)         10 KHz (typical)       -100       -92       -90 </th <th></th> <td colspan="2"></td> <td colspan="7">±0.2 ppm max</td>				±0.2 ppm max						
Vs. Reflow (1 reflow and measured 24 hours afterwards)         Current Consumption         All values are typical and over the operating temperatures       156 MHz : 22 mA (600 MHz : 30 mA) (800 MHz : 30 mA) (800 MHz : 30 mA) (800 MHz : 34 mA) (15 MHz : 36 mA)         Current with Output Disabled Load       18 mA (typical)         Loy "0"       1.4V (typical), 1.6V (max.)         Loy "0"       1.4V (typical), 0.9V (min.)         Rise Time / Fall Time       1.77.76 156.25 212.5 622.08 1000 1250         Initial Calibration Tolerance       ± 1.0 Hz       -62 -65 -61 -51 -40 -43         Phase Noise [dBc / Hz (typical)]       1.6 KHz       -116 -108 -90 -79 -91 -889       -99 -95         [dBc / Hz (typical)]       1.0 KHz       -122 -114 -110 -102 -99 -99       -95         Phase Jitter (12KHz ~ 20 MHz, RMS) unit : pS       -124 -117 -112 -103 -99 -96       -127 -117 -112       -134 -129 -127         Phase Jitter (12KHz ~ 20 MHz, RMS) unit : pS       -50 ±50       50 ±50       -50 ±50       -50 ±50       -50 ±50       -122 ±1.1 ±1.1       -1.1       1.2       -129 ±127 <th></th> <td></td> <td colspan="7"></td>										
measured 24 hours afterwards)           Current Consumption         V <sub>DD</sub> = +2.5V         V <sub>DD</sub> = +3.3V           All values are typical and over the operating temperatures         156 MHz : 22 mA         156 MHz : 30 mA           800 MHz : 30 mA         800 MHz : 30 mA         800 MHz : 32 mA           1G MHz : 34 mA         1G MHz : 36 mA           Current with Output Disabled           18 mA (typical)           Differential           Output Logic           High "1"           Low "0"         1.4V (typical), 1.6V (max.)           Low "0"           1.1V (typical), 0.9V (min.)           Rise Time / Fall Time           Time / Fall Time           1.1V (typical), 0.9V (min.)           O.2nS (typical), 0.4nS (max)           Tr / Tf: 20% ↔ 80% waveform           Initial Calibration Tolerance         ±1.0 ppm max. at +25°C ±2°C (at shipment)           Ended Typical Time / Time										
Current Consumption         V <sub>DD</sub> = +2.5V         V <sub>DD</sub> = +3.3V           All values are typical and over the operating temperatures         156 MHz : 22 mA         156 MHz : 30 mA           800 MHz : 30 mA         800 MHz : 30 mA         800 MHz : 32 mA           Boy MHz : 34 mA         16 MHz : 36 mA           Current with Output Disabled           Load         Differential           Output Logic           High "1"         1.4V (typical), 1.6V (max.)           Low "0"         1.1V (typical), 0.9V (min.)           Rise Time / Fall Time         1.4V (typical), 0.4NS (max)           Tr/ Tf: 20% ↔ 80% waveform           Initial Calibration Tolerance         ±1.0 ppm max. at +25°C ±2°C (at shipment)           Phase Noise [dBc / Hz (typical)]         Offset         77.76         156.25         212.5         622.08         1000				1.0 ppm max						
All values are typical and over the operating temperatures    156 MHz : 22 mA						1				
the operating temperatures  600 MHz : 28 mA 800 MHz : 30 mA 800 MHz : 32 mA 1G MHz : 34 mA  Current with Output Disabled  Load  Output Logic High "1" Low "0"  Rise Time / Fall Time  Initial Calibration Tolerance  Phase Noise [dBc / Hz (typical)]  [dBc / Hz (typic										
Sum										
Current with Output Disabled         16 MHz : 34 mA         16 MHz : 36 mA           Current with Output Logic           High "1"         1.4V (typical), 1.6V (max.)           Low "0"         1.4V (typical), 0.9V (min.)           Rise Time / Fall Time         1.1V (typical), 0.4NS (max.)           Tr / Tf: 20% ↔ 80% waveform           Initial Calibration Tolerance         ±1.0 ppm max. at +25°C ±2°C (at shipment)           Offset         77.76         156.25         212.5         62.08         1000         1250           Phase Noise (dBc / Hz (typical))]         10 Hz         -62         -65         -61         -51         -40         -43           100 Hz         -116         -108         -106         -97         -91         -889           (dBc / Hz (typical))]         -100 Hz         -114         -110         -100         -92         -93         -95	the operating temperatures									
Current with Output Disabled           18 mA (typical)           Differential           Output Logic           High "1"         1.4V (typical), 1.6V (max.)           Low "0"         1.1V (typical), 0.9V (min.)           Rise Time / Fall Time         0.2nS (typical), 0.4nS (max)           Tr / Tf : 20% ↔ 80% waveform           Initial Calibration Tolerance         ±1.0 ppm max. at +25°C ±2°C (at shipment)           Offset         77.76         156.25         212.5         622.08         1000         1250           Phase Noise [dBc / Hz (typical)]         Offset         77.76         156.25         212.5         622.08         100         -43           100 Hz         -62         -65         -61         -51         -40         -43           100 Hz         -100         -92         -99         -79         -91         -889           (dBc / Hz (typical), 0.4nS (max)         -100 </th <td colspan="2"></td> <td colspan="3"></td> <td colspan="3"></td>										
Differential           Output Logic           High "1"         1.4V (typical), 1.6V (max.)           Low "0"         1.1V (typical), 0.9V (min.)           Rise Time / Fall Time         1.10 ppm max. at +25°C ±2°C (at shipment)           Initial Calibration Tolerance           ±1.0 ppm max. at +25°C ±2°C (at shipment)           Offset         77.76         156.25         220.8         1000         1250           Phase Noise [dBc / Hz (typical)]         10 Hz         -62         -65         -61         -51         -40         -43           100 Hz         -100         -92         -90         -79         -73         -75           1 KHz         -116         -108         -106         -97         -91         -889           (typical) [dBc / Hz (typical)]         10 KHz         -122         -114         -110         -102         -99         -95           1 MHz         -144         -139         -133         -125         -121         -117           10 MHz         -152         -147         -142         -134         -129         -127           Phase Jitter (12KHz ~ 20 MHz,	Occurrent with Octoor Disable							A		
Output Logic         High "1"       1.4V (typical), 1.6V (max.)         Low "0"       1.1V (typical), 0.9V (min.)         Rise Time / Fall Time         1										
High "1"			Differential							
Low "0"       1.1V (typical), 0.9V (min.)         Rise Time / Fall Time       1.1V (typical), 0.4nS (max)         Tr / Tf : 20% ↔ 80% waveform         Initial Calibration Tolerance       ±1.0 ppm max. at +25°C ±2°C (at shipment)         Phase Noise [dBc / Hz (typical)]         [dBc / Hz (typical)]       Offset       77.76       156.25       212.5       622.08       1000       1250         Phase Noise [dBc / Hz (typical)]       Offset       77.76       156.25       212.5       62.08       100       -43         10 Hz (typical)       -62       -65       -61       -51       -40       -43         10 Hz (typical)       -100       -92       -90       -79       -73       -75         1 KHz (typical)       -116       -108       -106       -97       -91       -889         10 KHz (typical)       -124       -117       -112       -103       -99       -96         1 MHz (typical)       -144       -139       -133       -125       -121       -117         10 MHz (typical)       -152	Output Logic		1.4\/ (typical) 1.6\/ (may.)							
Rise Time / Fall Time       0.2nS (typical), 0.4nS (max) Tr / Tf : 20% → 80% waveform         Initial Calibration Tolerance       ±1.0 ppm max. at +25°C ±2°C (at shipment)         Phase Noise [dBc / Hz (typical)]         [dBc / Hz (typical)]       Offset (T.V.)       77.76 (T.V.)       156.25 (T.V.)       212.5 (T.V.)       622.08 (T.V.)       1000 (T.V.)       1250 (T.V.)         Phase Noise [dBc / Hz (typical)]       100 Hz (T.V.)       -62 (T.V.)       -65 (T.V.)       -61 (T.V.)       -51 (T.V.)       -40 (T.V.)       -43 (T.V.)         100 Hz (typical) - 100 Hz (typical)       -100 (T.V.)       -92 (T.V.)       -90 (T.V.)       -75 (T.V.)										
Tr / Tf : 20% ↔ 80% waveform	LOW U									
Hnitial Calibration Tolerance         ±1.0 ppm max. at +25°C ±2°C (at shipment)           Phase Noise [dBc / Hz (typical)]         Offset         77.76         156.25         212.5         622.08         1000         1250           Phase Noise [dBc / Hz (typical)]         10 Hz         -62         -65         -61         -51         -40         -43           100 Hz         -100         -92         -90         -79         -73         -75           1 KHz         -116         -108         -106         -97         -91         -889           1 0 KHz         -122         -114         -110         -102         -99         -95           1 0 KHz         -124         -117         -112         -103         -99         -96           1 MHz         -144         -139         -133         -125         -121         -117           Phase Jitter (12KHz ~ 20 MHz, RMS) unit : pS         0.9         0.9         1.2         1.1         1.1         1.2           Duty Cycle           Start-up Time         5m sec max.           Aging at Ta = +25°C         ± 2 ppm max. first year at 25°C; ± 10 ppm max.	Rise Time / Fall Time									
Phase Noise [dBc / Hz (typical)]  Phase Jitter (12KHz ~ 20 MHz, RMS) unit : pS  Diffset  77.76  156.25  212.5  622.08  1000  1250  10 Hz  -62  -65  -61  -51  -40  -43  -75  -75  -75  -75  -75  -75  -75  -7	Initial Calibration Tolerance									
Phase Noise [dBc / Hz (typical)]    10 Hz	minua Gunbruti		77 76					1250		
Phase Noise [ dBc / Hz (typical) ]    100 Hz										
1 KHz	[dBc/Hz									
(typical) ]       10 KHz       -122       -114       -110       -102       -99       -95         100 KHz       -124       -117       -112       -103       -99       -96         1 MHz       -144       -139       -133       -125       -121       -117         10 MHz       -152       -147       -142       -134       -129       -127         Phase Jitter (12KHz ~ 20 MHz, RMS) unit : pS       0.9       0.9       1.2       1.1       1.1       1.2         Duty Cycle         Start-up Time         Aging at Ta = +25°C       ± 2 ppm max. first year at 25°C; ± 10 ppm max. over 10 years						_				
100 KHz			-122			-102	-99			
1 MHz       -144       -139       -133       -125       -121       -117         10 MHz       -152       -147       -142       -134       -129       -127         Phase Jitter (12KHz ~ 20 MHz, RMS) unit : pS       0.9       0.9       1.2       1.1       1.1       1.2         Duty Cycle         Start-up Time         5m sec max.         4 ging at Ta = +25°C       ± 2 ppm max. first year at 25°C; ± 10 ppm max. over 10 years			-124	-117		-103	-99			
Phase Jitter (12KHz ~ 20 MHz, RMS) unit : pS         0.9         0.9         1.2         1.1         1.1         1.2           Duty Cycle         50% ±5%         5m sec max.         5m sec max.         42 ppm max. first year at 25°C; ± 10 ppm max. over 10 years		1 MHz	-144	-139	-133					
RMS) unit : pS       0.9       0.9       1.2       1.1       1.1       1.2         Duty Cycle       50% ±5%         Start-up Time       5m sec max.         Aging at Ta = +25°C       ± 2 ppm max. first year at 25°C; ± 10 ppm max. over 10 years		10 MHz	-152	-147	-142	-134	-129	-127		
Duty Cycle 50% ±5%  Start-up Time 5m sec max.  Aging at Ta = +25°C ± 2 ppm max. first year at 25°C; ± 10 ppm max. over 10 years			0.0	0.0	1.2	1 1	1 1	1.0		
Start-up Time5m sec max.Aging at Ta = +25°C± 2 ppm max. first year at 25°C ; ± 10 ppm max. over 10 years	RMS) unit : pS			0.9	1.2	1.1	1.1	1.2		
Aging at Ta = +25°C ± 2 ppm max. first year at 25°C; ± 10 ppm max. over 10 years			50% ±5%							
				5m sec max.						
Storage Temperature -55°C to +150°C										
	Storage Tempe	erature	-55°C to +150°C							



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Control Voltage	Function on Pad 1	Output Enable Function on Pad 2		
Control Voltage Center and Range	+1.5V ±1.0V for both V <sub>DD</sub> = 2.5V and 3.3V	OE Control on Pad 2	0.7 of V <sub>DD</sub> (min.) or no connection to enable output. LVCMOS / LVTTL level.	
Frequency Pulling Range	±8 ppm min.		0.3 of V <sub>DD</sub> (max.) to disable output (high impedance). LVCMOS / LVTTL level	
Linearity	±1% typical. ±10% max	Output Enable Time / Disable Time	200 nS. Max. / 50 nS. Max	
Transfer Function	Positive Transfer	Integrated Phase litter	1.5 pS typical (12 KHz to 20 MHz)	
Absolute Voltage	4.0V max.	Integrated Phase Jitter	<400 fS (1.875 KHz to 21 MHz)	
Input Impedance	770KΩ typical			
Harmonics	-5.0 dBc max.			

Other customized specifications maybe available. Please contact Dynamic Engineers Inc. for further details.