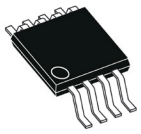
MULTIGIG QuietClock™ Series

MQC840001

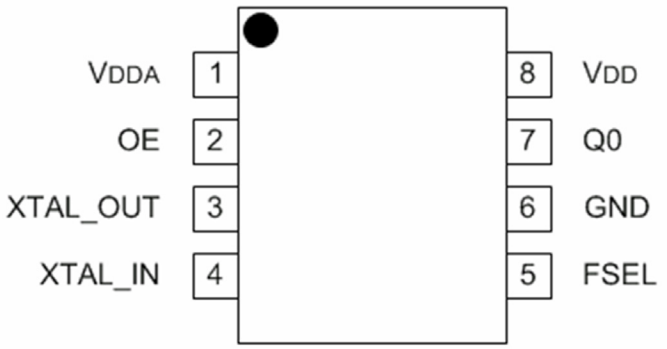
Low Voltage High Performance Clock Synthesizer



8-Lead TSSOP

Product Description

The MQC840001 synthesizer series were designed with communications standards in mind (Fibre Channel, Ethernet, etc.). The device design is optimized for 106.25 MHz or 212.5 MHz using a 26.5625 MHz fundamental parallel resonant crystal, with stability and accuracy over the full operating range and provides an easy fit for Jitter and Phase Noise standards that require these high performance interfaces. The MQC840001 includes a unique power reduction methodology, along with the Multigig QuietClock™ architecture based upon our proprietary RotaryWave™ technology. This provides for a stable clock with very low noise for optimized performance yielding an overall improved Bit Error Rate (BER) and improved waveform integrity.



MQC840001 8-Lead TSSOP Pinout (Top View)

Features

- Generates a single LVCMOS/LVTTL Output
- Integrated loop filter components
- Operates with either a 3.3 V or 2.5 V supply
- Power consumption: 56mA @3.3V (typical)
- Fundamental Crystal oscillator interface
- Input frequency of 26.5625 MHz parallel resonant
- Selectable Output Frequency: 106.25 or 212.5 MHz
- RMS phase jitter @106.25MHz (637kHz - 10 MHz) 0.145 (typical)
- RMS phase jitter @212.5MHz (2.55 MHz - 20 MHz) 0.050ps (typical)
- Available in 8-pin TSSOP package
- Pin Compatible with the ICS/IDT 840001

MQC840001 Part Number:

MQC840001M

- Multigig Quiet Clock™ Series
- Device Part Number
- Package Suffix: M=TSSOP
- Shipping Configuration: Blank=Tube/Tray, R=Tape & Reel
- Device Grade: R=RoHS, Blank=Green
- Temperature Grade: C=Commercial (0 - 70°C), Blank=Industrial (-40 to 85°C)

MQC840001 Block Diagram

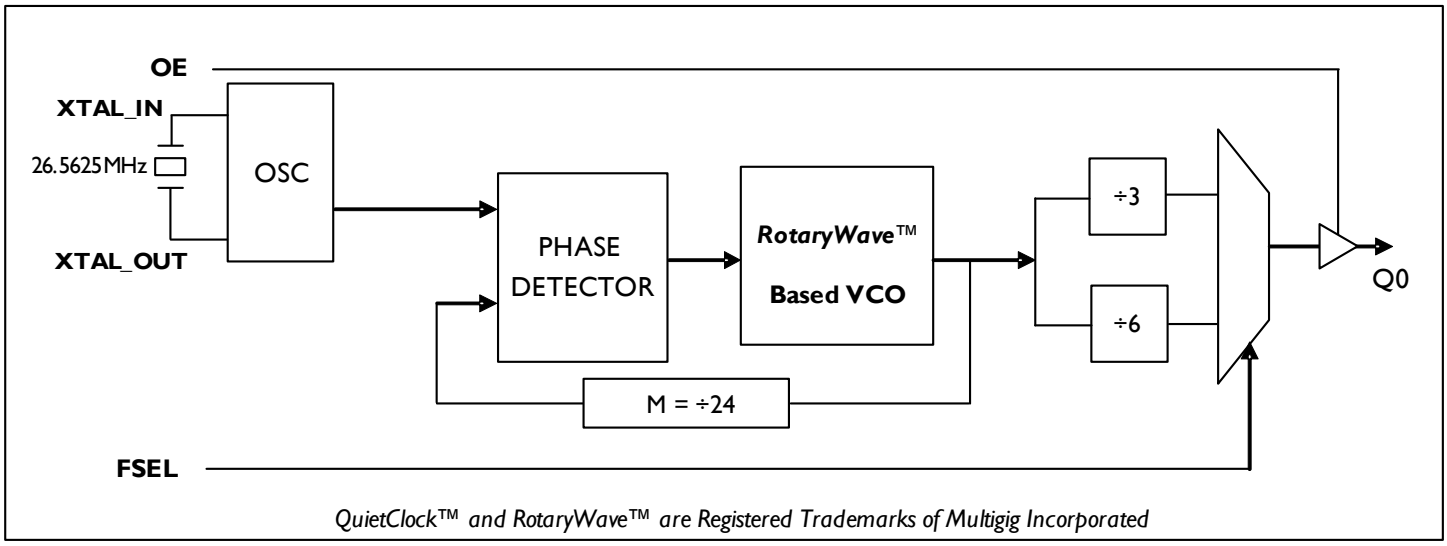


Figure-1

Device Description

Based Upon the unique Multigig Rotary Traveling Wave Oscillator ("RTWO") synthesizer, the MQC840001 provides a high performance and high accuracy solution for a precision clock source at 106.25 or 212.50MHz derived from a low cost 26.5625MHz Xtal. A single 12mA LVCMOS output is provided with tri state capability controlled via an external pin (OE).

The design of the MQC840001 consumes very low power in the PLL due to the RTWO technology in the VCO and the associated dividers. Output Divider ratios are fixed at either ÷3 or ÷6 controlled via the FSEL pin, and the feedback divider also fixed at ÷24. Duty Cycle is inherently improved due to the RTWO technology and guarantees tight control and stability on this critical specification. The device is fully pin compatible with the ICS/IDT840001 FemtoClock with improved specifications for Duty Cycle, Jitter, Phase Noise, Power Consumption, and noise sensitivity, plus, the MQC840001 will operate at either 3.3V or 2.5V supplies.

IC Pinout Description

Pin #	Name	Type	Level	Description
1	VDDA	P		Analog power
2	OE	I	Pullup	Output Enable: 1 = Active, 0 = Hi-Z
3	XTAL OUT	O		Crystal Out
4	XTAL IN	I		Crystal Input
5	FSEL	I	Pulldown	Frequency Select Pin
6	GND	P		Ground
7	QO	O		Single Ended LVCMOS Clock Out
8	VDD	P		Core Power

Absolute Maximum Ratings

Symbol	Characteristics	Min	Max	Unit	Condition
VDD	Supply Voltage		4.6	V	
VIN	Inputs	-0.50	VDD + 0.5	V	
VOUT	Outputs	-0.50	VDD + 0.5	V	
TA	Operating Temperature Range	-40	+85	C	Industrial
TS	Storage Temperature Range	-65	+150	C	
THETA-JA	Thermal Resistance Junction to Ambient	TBD		°C/W	(0 lfpm)

NOTE: *Exposure to stresses at or beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device and may affect product reliability. These are absolute maximum specifications only, and functional operation of the device at these conditions or any conditions beyond those listed is not implied or recommended.*

DC Characteristics (V_{DD} = 2.5V +/- 5%, TA = -40°C to 85°C)

Symbol	Characteristics	Min	Typ	Max	Unit	Condition
VDD	Core supply voltage	2.375	2.50	2.625	V	
VDDA	Analog supply voltage	2.375	2.50	2.625	V	
IDD	Core supply current		6		mA	No load
IDDA	Analog supply current		44		mA	

DC Characteristics (V_{DD} = 3.3V +/- 5%, TA = -40°C to 85°C)

Symbol	Characteristics	Min	Typ	Max	Unit	Condition
VDD	Core supply voltage	3.135	3.30	3.465	V	
VDDA	Analog supply voltage	3.135	3.30	3.465	V	
IDD	Core supply current		9		mA	No load
IDDA	Analog supply current		45		mA	

LVCMOS DC Characteristics

Symbol	Characteristics	Min	Typ	Max	Unit	Condition
VIH	Input HIGH voltage	2		V_{DD} + 0.3	V	
VIL	Input LOW voltage	-0.30		0.80	V	
IIH	Input HIGH current			5	uA	
IIL	Input LOW current	-150			uA	
VOH	Output HIGH voltage	Vdd-.501			V	Vdd=3.3 +-5%
VOH	Output HIGH voltage	Vdd-.507			V	Vdd=2.5+-5%
VOL	Output LOW voltage			0.507	V	

AC Characteristics (V_{DD} = 2.5V & 3.3V +/- 5%, T_A = -40°C to 85°C)

Symbol	Characteristics	Min	Typ	Max	Unit	Condition
FOUT	Output frequency		212.5 106.25		MHz MHz	FSEL = 0 FSEL = 1
TJIT	RMS phase jitter		0.145 0.050		ps	106.25 MHz 212.50 MHz
TR / TF	Output rise/fall time	150		350	ps	20% to 80%
ODC	Output duty cycle	48 45		52 55	%	106.25 MHz 212.50 MHz

3.3V Carrier Frequency, 106.25MHz

Offset from Carrier	Measured Phase Noise	Unit
100Hz	-97	dBc/Hz
1kHz	-122	dBc/Hz
10kHz	-131	dBc/Hz
100kHz	-126	dBc/Hz
1MHz	-144	dBc/Hz
10MHz	-163	dBc/Hz
40 MHz	-165	dBc/Hz

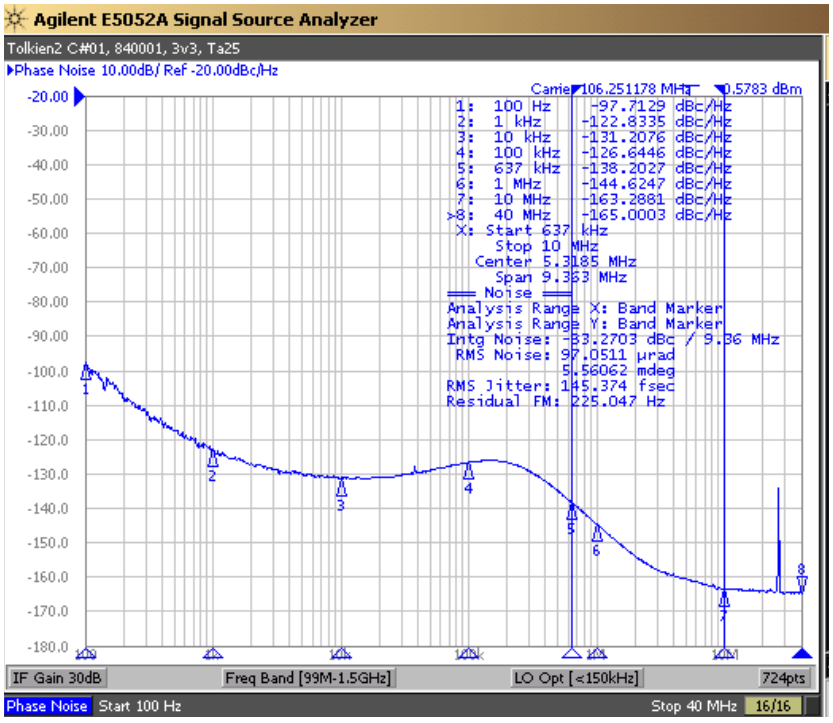
3.3V Carrier Frequency, 212.5MHz

Offset from Carrier	Measured Phase Noise	Unit
100Hz	-92	dBc/Hz
1kHz	-116	dBc/Hz
10kHz	-124	dBc/Hz
100kHz	-120	dBc/Hz
1MHz	-138	dBc/Hz
10MHz	-161	dBc/Hz
40MHz	-163	dBc/Hz

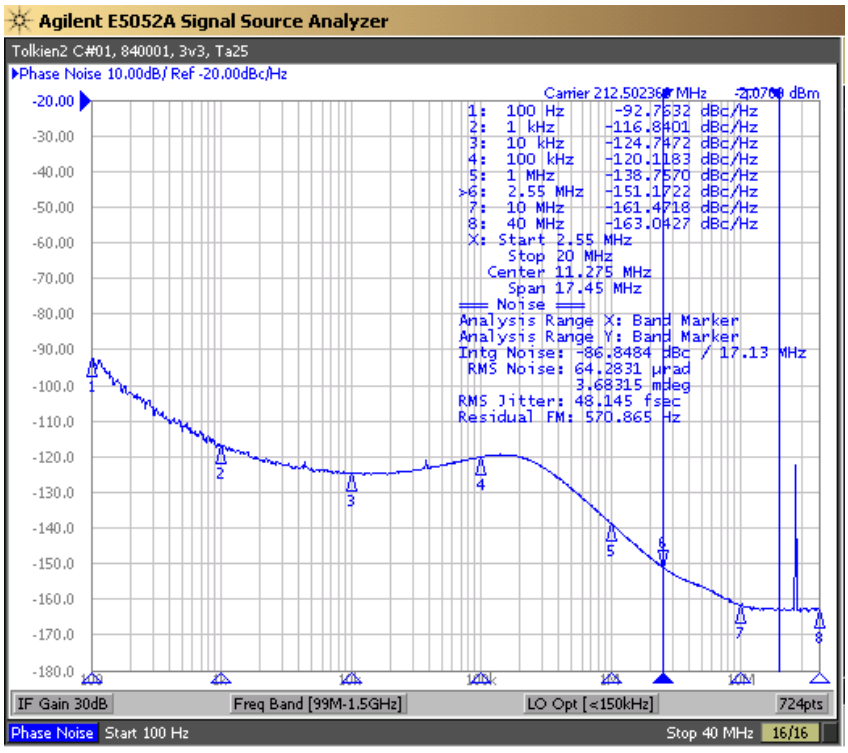
Crystal Characteristics

Parameter	Min	Typ	Max	Unit	Test Conditions
Mode of Oscillation	Fundamental Parallel Resonant				
Frequency		26.5625		MHz	
Equivalent Series Resistance (ESR)			50	Ohm	
Shunt capacitor			7	pF	
Drive level			1	mW	

Typical Phase Noise Plot 106.25 MHz @ 3.3V

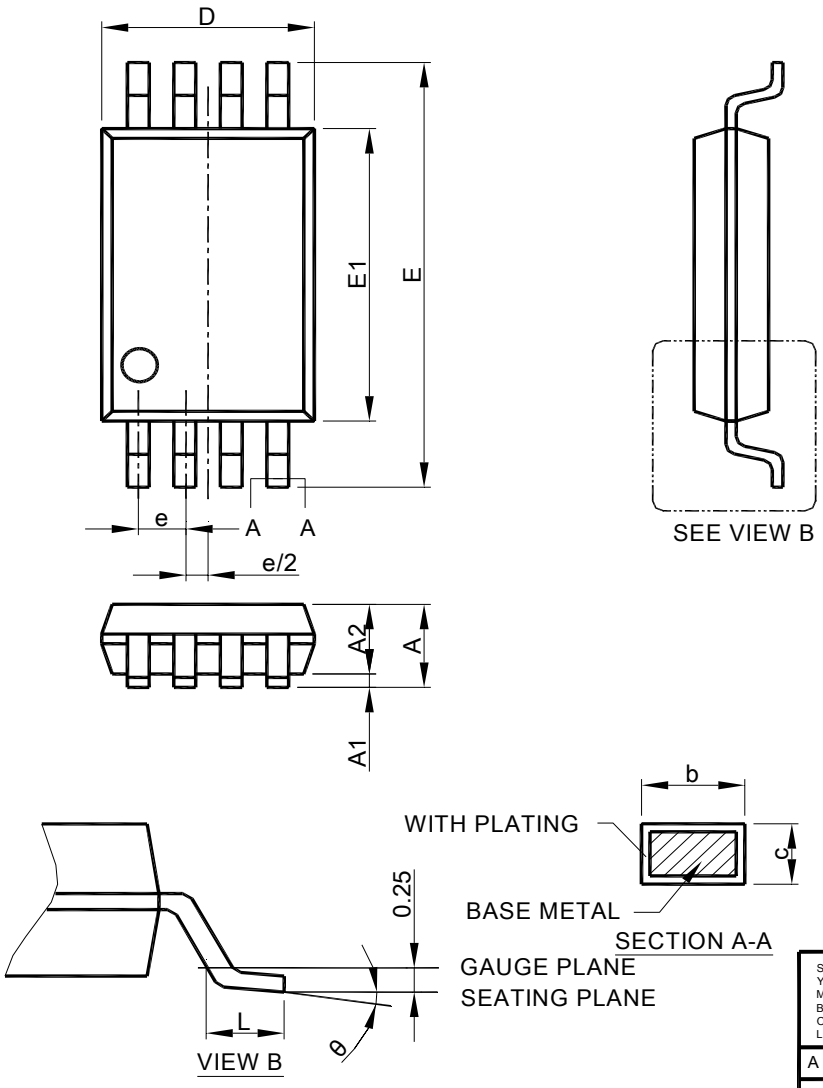


Typical Phase Noise Plot 212.5 MHz @ 3.3V



Package Outline Drawing

- TSSOP-8 PACKAGE OUTLINE DRAWING



Note: 1. Refer to JEDEC MO-153AA.
2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.
3. Dimension "E1" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

SYMBOL	TSSOP-8	
	MILLIMETERS	
	MIN.	MAX.
A		1.20
A1	0.05	0.15
A2	0.80	1.05
b	0.19	0.30
c	0.09	0.20
D	2.90	3.10
E	6.40 BSC	
E1	4.30	4.50
e	0.65 BSC	
L	0.45	0.75
θ	0°	8°