SM843251-156

ClockWorks™ 10-Gigabit Ethernet, 156.25MHz, Ultra-Low Jitter LVPECL Clock Frequency Synthesizer

General Description

The SM843251-156 is a 10-Gigabit Ethernet, 156.25MHz LVPECL clock frequency synthesizer and a member of the ClockWorks™ family of devices from Micrel. It provides a low-noise timing solution for high-speed, high-accuracy synthesis of clock signals. It includes a patented RotaryWave® architecture that provides a very stable clock with very low noise.

Power supplies of either 2.5V or 3.3V are supported, with superior jitter and phase noise performance. The device synthesizes a 156.25MHz, low-noise, LVPECL output for Ethernet applications. The crystal reference frequency is 25MHz.

The SM843251-156 is an excellent replacement for IDT FemtoClocks®, with improved waveform integrity, and jitter.

Data sheets and support documentation can be found on Micrel's web site at: www.micrel.com.

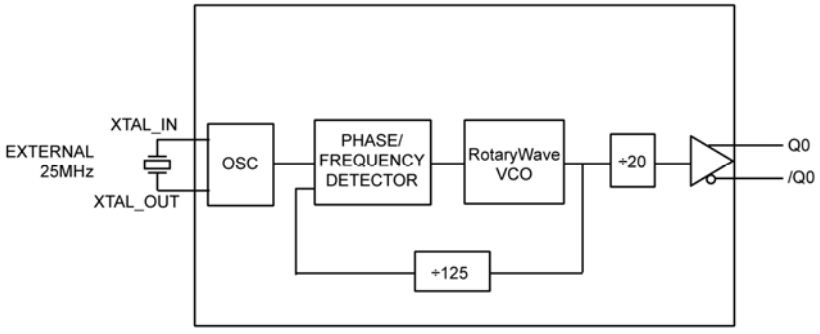
Features

- Generates a low-noise 156.25MHz LVPECL output
- 2.5V or 3.3V operating voltage
- Typical phase jitter @156.25MHz~110fs (1.875MHz – 20MHz)
- Crystal frequency: 25MHz
- 156.25MHz output frequency
- Phase Noise @ 156.25MHz:
  - 1kHz: –123dBc/Hz
  - 10kHz: –130dBc/Hz
  - 100kHz: –135dBc/Hz
  - 1MHz: –140dBc/Hz
  - 10MHz: –161dBc/Hz
  - 20MHz: –166/dBc/Hz
- Industrial temperature range
- Green-, RoHS-, and PFOS-compliant
- Available in 8-pin TSSOP

Applications

- Gigabit Ethernet
- 10-Gigabit Ethernet

Block Diagram



ClockWorks is a trademark of Micrel, Inc.
RotaryWave is a registered trademark of Multigig, Inc.
FemtoClocks is a registered trademark of IDT, Inc.

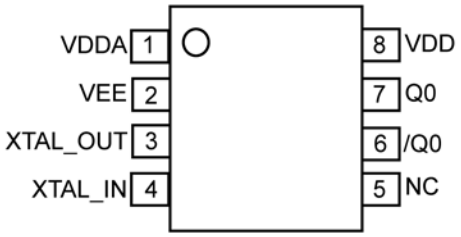
Ordering Information[1]

Part Number	Package Type	Operating Range	Package Marking
SM843251-156KA	K-8	Industrial	843251-156
SM843251-156KA TR[2]	K-8	Industrial	843251-156

Notes:

1. Devices are Green-, RoHS-, and PFOS-compliant.
2. Tape and Reel.

Pin Configuration



8-Pin TSSOP (K-8)

Pin Description

Pin Number	Pin Name	Type	Level	Pin Function
1	V_{DDA}	PWR		Analog 2.5V or 3.3V Power Supply. No filter resistor needed.
2	V_{EE}	PWR		Ground.
3	XTAL_OUT	O, (SE)	12pF crystal	Crystal Reference Output, no load caps needed.
4	XTAL_IN	I, (SE)	12pF crystal	Crystal Reference Input, no load caps needed.
5	NC	–		No Connect
6	/Q0	O, (DIF)	LVPECL	Differential Clock Output
7	Q0	O, (DIF)	LVPECL	Differential Clock Output
8	V_{DD}	PWR		2.5V or 3.3V Power Supply

Absolute Maximum Ratings[1]

Supply Voltage (V_{DDA}, V_{DD},) ..... +4.6V
Input Voltage (V_{IN}) ..... –0.50V to V_{DD} + 0.5V
LVPECL Output Current (I_{OUT})
  Continuous 50mA
  Surge 100mA
Lead Temperature (soldering, 20sec.) ..... 260°C
Case Temperature ..... 115°C
Storage Temperature (T_s) ..... –65°C to +150°C

Operating Ratings[2]

Supply Voltage ($V_{DD,}$ V_{DDA}) ..... +2.375 to +3.465
Ambient Temperature (T_A) ..... –40°C to +85°C
Junction Thermal Resistance
  TSSOP (θ_{JA})(Still Air) ..... 141°C/W

DC Electrical Characteristics[3]

V_{DD} = V_{DDA} = 3.3V ±5%; T_A = –40°C to +85°C, unless noted.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
V_{DD}	Core Supply Voltage		3.135	3.30	3.465	V
V_{DDA}	Analog Supply Voltage		3.135	3.30	3.465	V
I_{DDA}	Analog Supply Current	Included in I_{EE}		50	60	mA
I_{EE}	Total Supply Current	No load		88	110	mA

V_{DD} = V_{DDA} = 2.5V ±5%; T_A = –40°C to +85°C, unless noted.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
V_{DD}	Core Supply Voltage		2.375	2.50	2.625	V
V_{DDA}	Analog Supply Voltage		2.375	2.50	2.625	V
I_{DDA}	Analog Supply Current	Included in I_{EE}		50	60	mA
I_{EE}	Total Supply Current	No load		80	100	mA

LVPECL DC Electrical Characteristics[3, 4]

V_{DD} = V_{DDA} = 2.5V ±5% or 3.3V ±5%, T_A = –40°C to +85°C, unless noted.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
V_{OH}	Output High Voltage	50Ω to V_{DD} – 2V	V_{DD} – 1.145	V_{DD} – 0.97	V_{DD} – 0.845	V
V_{OL}	Output Low Voltage	50Ω to V_{DD} – 2V	V_{DD} – 1.945	V_{DD} – 1.77	V_{DD} – 1.645	V
V_{SWING}	Peak-to-Peak Output Voltage Swing		0.6	0.8	1.0	V

Notes:

1. Permanent device damage may occur if absolute maximum ratings are exceeded. This is a stress rating only and functional operation is not implied at conditions other than those detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
2. The data sheet limits are not guaranteed if the device is operated beyond the operating ratings.
3. The circuit is designed to meet the DC specifications shown in the above table after thermal equilibrium has been established with a transverse airflow greater than 500 lfpm.
4. See Figure 4 for load test circuit example.

AC Electrical Characteristics[5]

V_{DD} = V_{DDA} = 2.5V ±5% or 3.3V ±5%, T_A = –40°C to +85°C, unless noted.

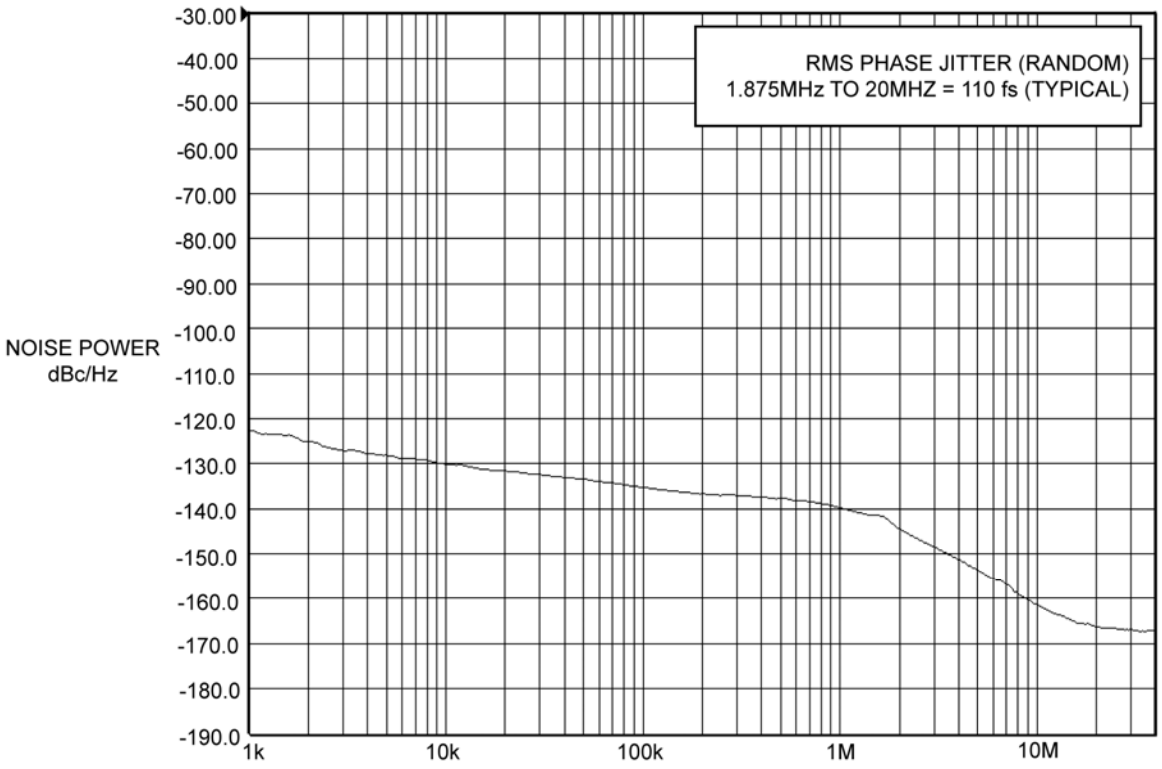
Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
F_{OUT}	Output Frequency	25MHz Crystal		156.25		MHz
t_{JITTER}	RMS Phase Jitter (Output = 156.25 MHz)	Integration Range: 1.875MHz to 20MHz		110		fs
t_R / t_F	Output Rise/Fall Time	20% to 80%	80	175	350	ps
O_{DC}	Output Duty Cycle		48	50	52	%

Note:

5. The circuit is designed to meet the AC specifications shown in the above table(s) after thermal equilibrium has been established with a transverse airflow greater than 500 lfpm.

Crystal Characteristics

Parameter	Condition	Min.	Typ.	Max.	Units
Mode of Oscillation	12pF Load		Fundamental, Parallel Resonant		
Frequency			25		MHz
Equivalent Series Resistance (ESR)				50	Ω
Shunt Capacitor, C0			3	7	pF
Correlation Drive Level			100	300	uW



PHASE NOISE PLOT: 156.25MHz @ 3.3V

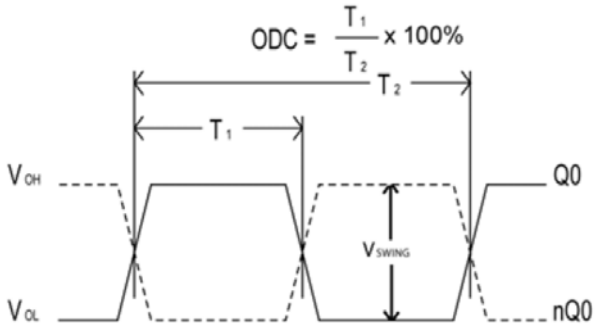


Figure 1. Duty Cycle Timing

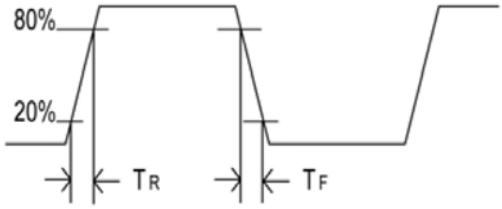


Figure 2. All Outputs Rise/Fall Time

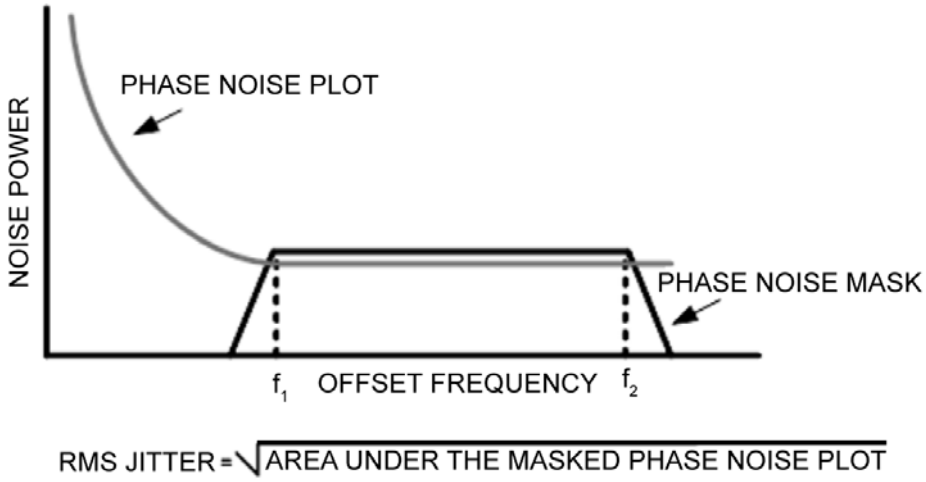


Figure 3. RMS Phase Noise/Jitter

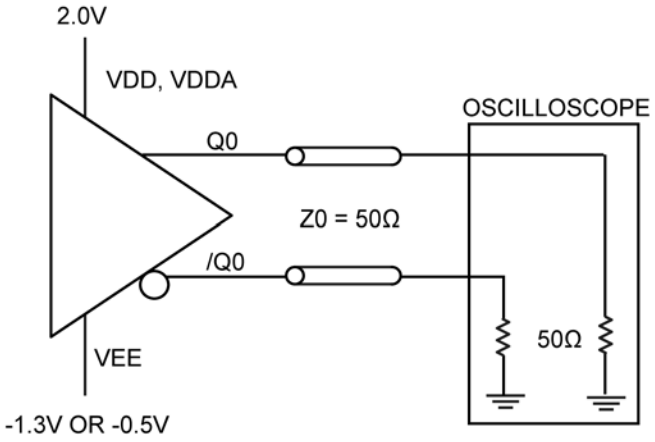


Figure 4. LVPECL Output Load and Test Circuit

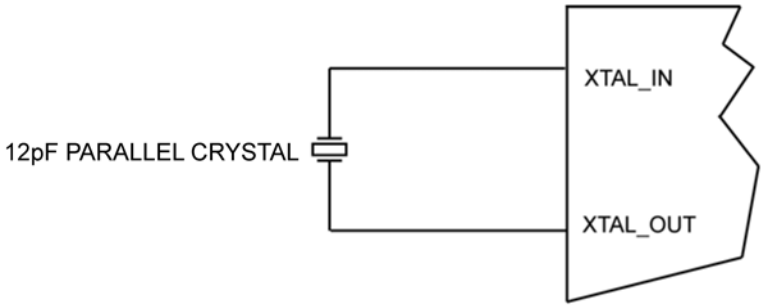
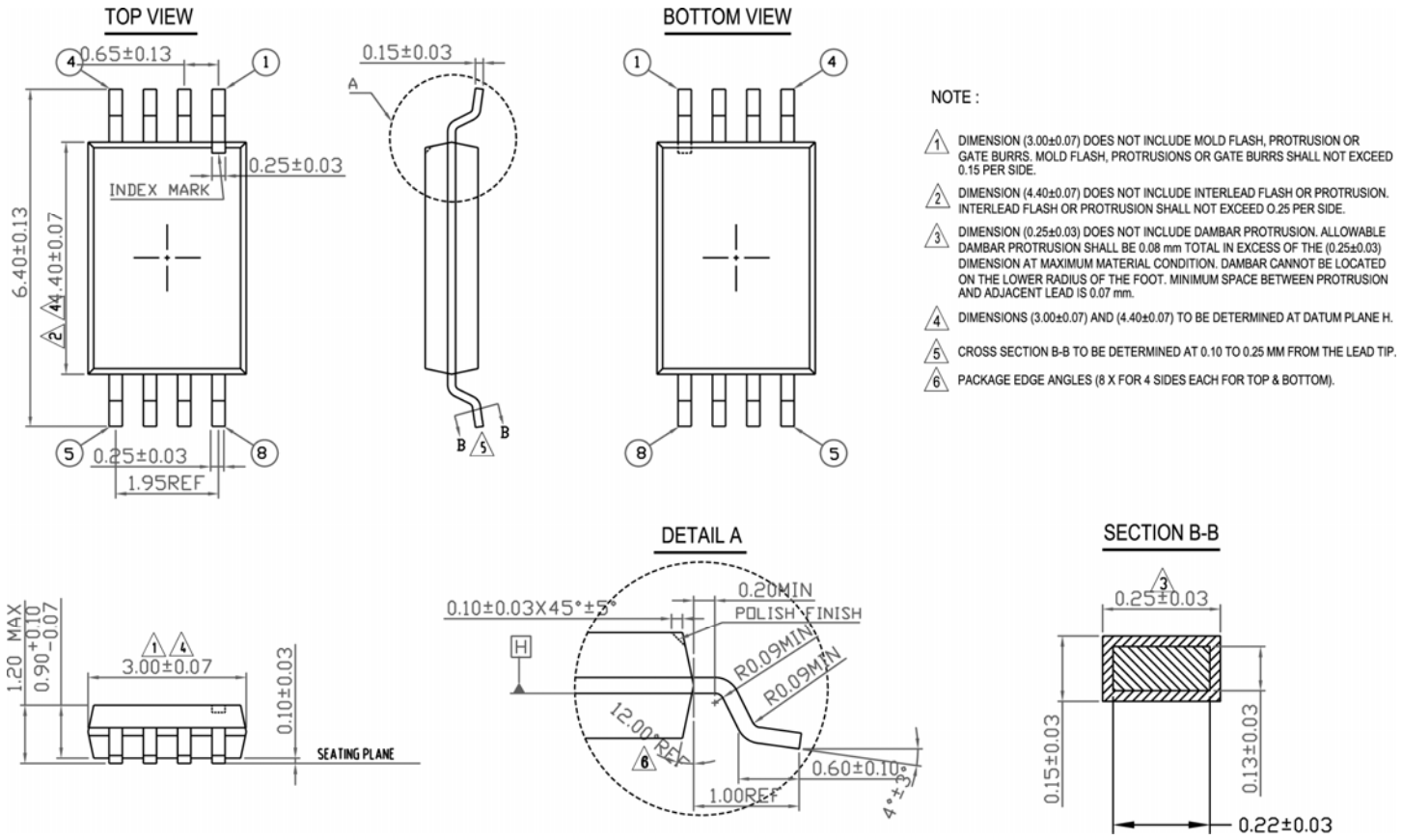


Figure 5. Crystal Input Interface

Package Information



8-Pin TSSOP (K-8)

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