



General Description

The SM843031-01 is a 10-Gigabit Ethernet, 312.5MHz 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 312.5MHz, low-noise, LVPECL output for Ethernet applications. The crystal reference frequency used is 25MHz.

The SM843031-01 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.

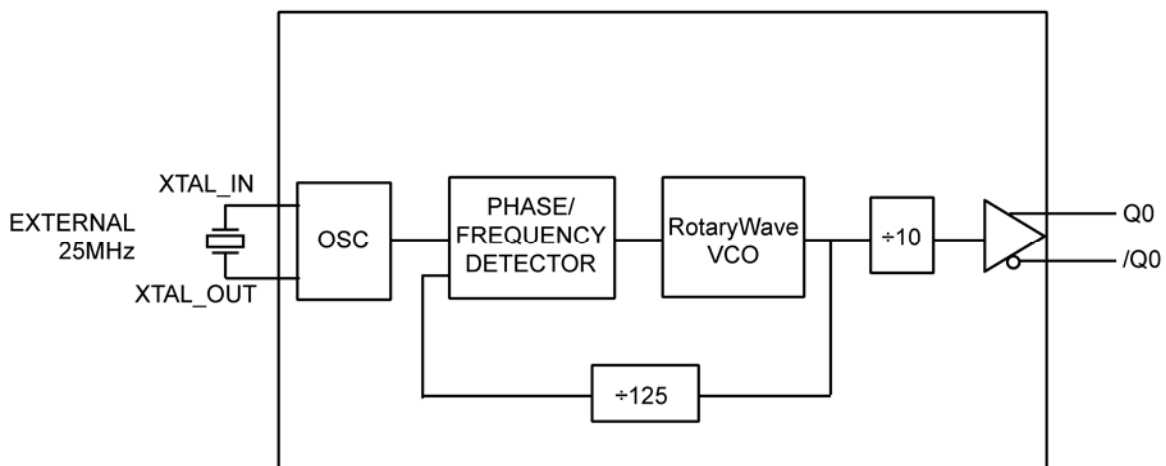
Features

- Generates a low noise LVPECL output
- 2.5V or 3.3V operating range
- Typical phase jitter @ 312.5MHz (1.875MHz to 20MHz): 119 fs (typical) @ 3.3V
- Crystal frequency: 25MHz
- 312.5MHz Output frequency
- Industrial temperature range
- Green-, RoHS-, and PFOS-compliant
- Available in 8-pin TSSOP

Applications

- Gigabit Ethernet
- 10-Gigabit Ethernet

Block Diagram



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

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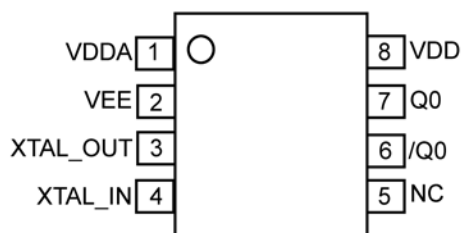
Ordering Information⁽¹⁾

| Part Number | Package Type | Operating Range | Package Marking |
|---------------------------------|--------------|-----------------|-----------------|
| SM843031-01KA | K-8 | Industrial | 843031-01 |
| SM843031-01KA TR ⁽²⁾ | K-8 | Industrial | 843031-01 |

Notes:

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

Pin Configuration



8-Pin TSSOP (K-8)

(Top View)

Pin Description

| Pin Number | Pin Name | Pin Type | Pin 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}) | +2.375V to +3.465V |
| Ambient Temperature (T_A) | -40°C to +85°C |
| Junction Thermal Resistance | |
| TSSOP (θ_{JA})(Still Air) | 141°C/W |

DC Electrical Characteristics⁽³⁾

$V_{DD} = V_{DDA} = 3.3V \pm 5\%$; $T_A = -40^\circ C$ to $+85^\circ C$, 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 | | 95 | 115 | mA |

$V_{DD} = V_{DDA} = 2.5V \pm 5\%$; $T_A = -40^\circ C$ to $+85^\circ C$, 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 | | 87 | 105 | mA |

LVPECL DC Electrical Characteristics^(3, 4)

$V_{DD} = V_{DDA} = 2.5V \pm 5\%$ or $3.3V \pm 5\%$, $T_A = -40^\circ C$ to $+85^\circ C$, 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 lfm.
4. See Figure 4 for load test circuit example.

AC Electrical Characteristics⁽⁵⁾

$V_{DD} = V_{DDA} = 2.5V \pm 5\%$ or $3.3V \pm 5\%$, $T_A = -40^{\circ}C$ to $+85^{\circ}C$, unless noted.

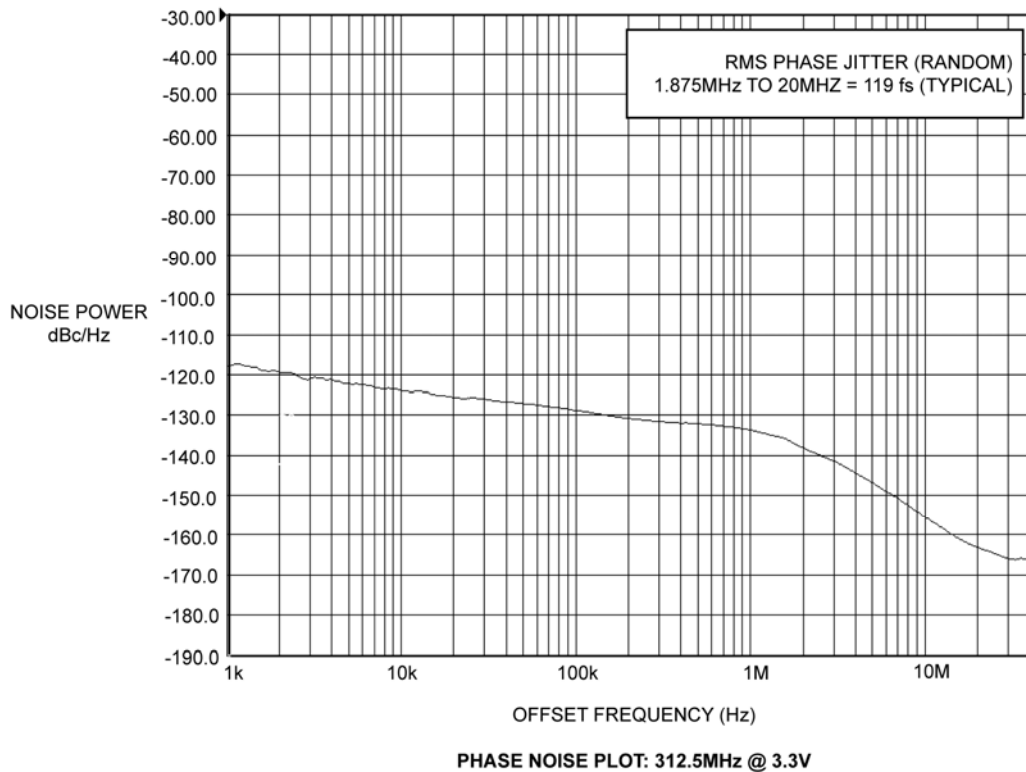
| Symbol | Parameter | Condition | Min. | Typ. | Max. | Units |
|--------------|---------------------------------------|--------------------------------------|------|-------|------|-------|
| F_{OUT} | Output Frequency | | | 312.5 | | MHz |
| t_{JITTER} | RMS Phase Jitter (Output = 312.5 MHz) | Integration Range: 1.875MHz to 20MHz | | 119 | | 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:

- 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 lpm.

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 | μW |



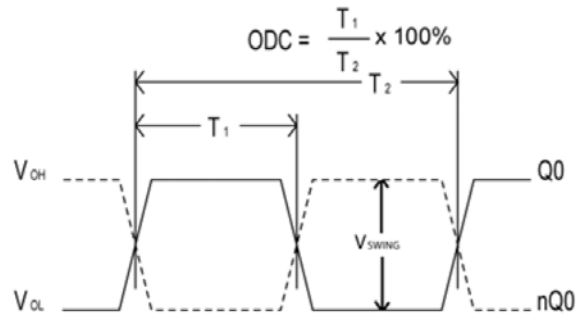


Figure 1. Duty Cycle Timing

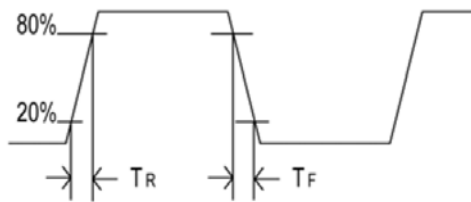


Figure 2. All Outputs Rise/Fall Time

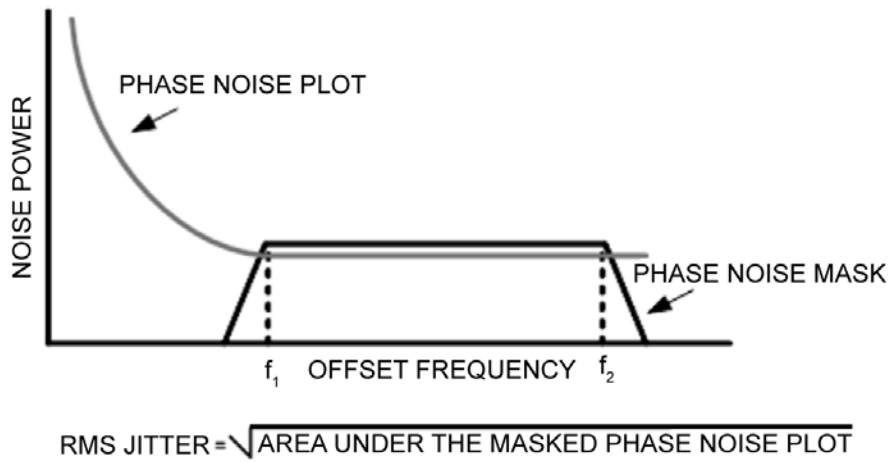


Figure 3. RMS Phase Noise/Jitter

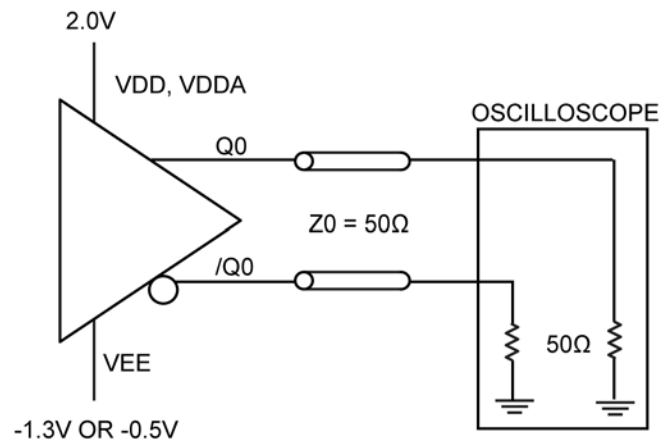


Figure 4. LVPECL Output Load and Test Circuit

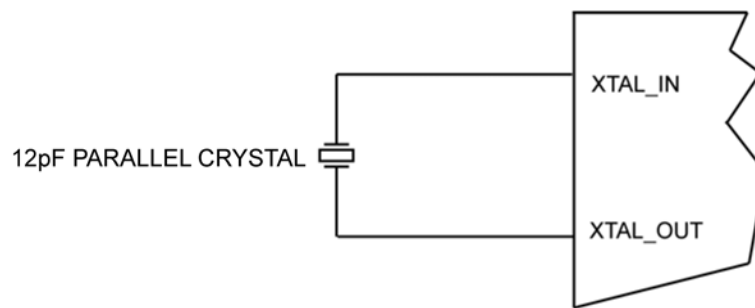
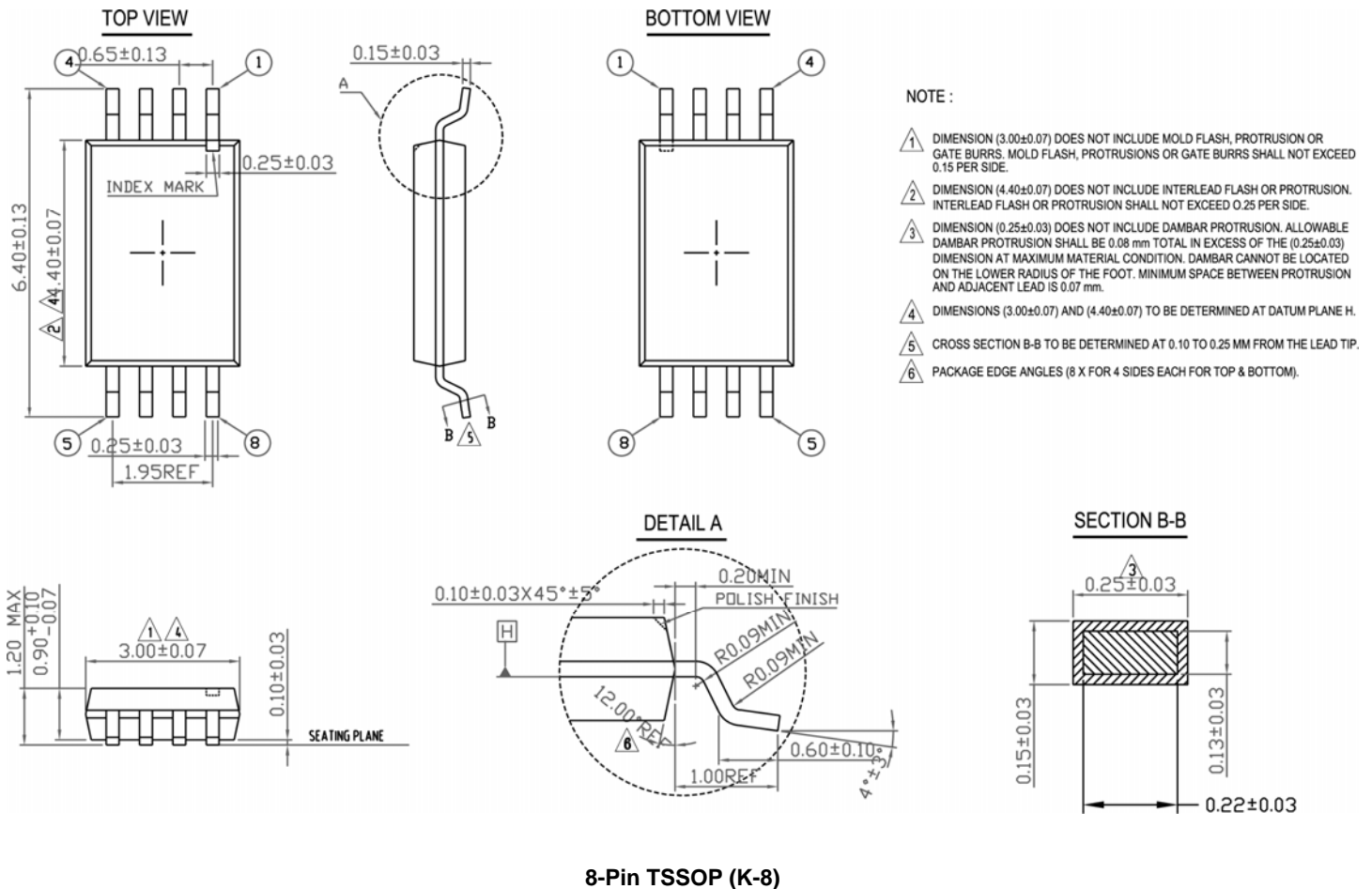


Figure 5. Crystal Input Interface

Package Information



8-Pin TSSOP (K-8)

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