MEMS Oscillator Specification
IQMS-143

ISSUE 1; March 2016

Description

- Smallest footprint chip scale package (CSP), ultra low power MEMS Temperature Compensated Oscillator at 32.768kHz with CMOS output in a plastic package featuring a programmable drive strength feature to optimise specific clock applications. Factory programmable for a short lead time. Uses SiTime's MEMS First™ technology.
- APPLICATIONS:
  Smart Meters (Automatic Meter Reading)
  Health and Wellness Monitors
  Pulse-per-Second (pps) Timekeeping
  RTC Reference Clock

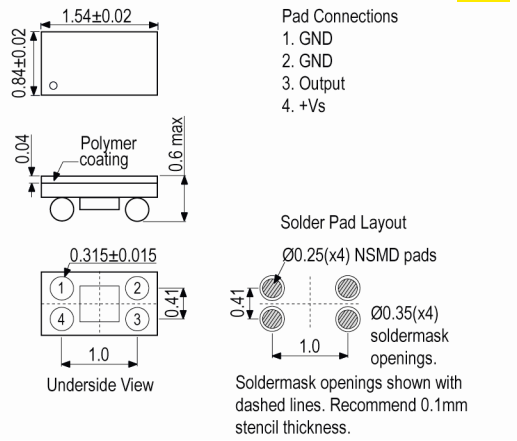
Frequency Parameters

- Frequency 32.768kHz
- Frequency Stability ±5.00ppm to ±20.00ppm
- Ageing ±1ppm max in 1st year @ 25°C & Vs=3.3V
- Frequency Stability and Tolerance Combined (Over Temperature):
  When stability=±5ppm, stability and tolerance combined=±10ppm
  When stability=±10ppm, stability and tolerance combined=±13ppm
  When stability=±20ppm, stability and tolerance combined=±22ppm
- Note: Frequency Stability is measured as peak-to-peak/2. Inclusive of three reflow processes and ±20% load variation, no board level underfill. Tested with an Agilent 53132A frequency counter. Due to the low operating frequency the gate time must be ≥100ms to ensure an accurate frequency measurement.
- Supply Voltage Variation:
  @ Vs=1.8V ±10%: ±0.75ppm max
  @ Vs=1.5V to 3.63V: ±1.5ppm max

Electrical Parameters

- Supply Voltage: 1.5V to 3.63V @ -40°C to 85°C
- Absolute Maximum Supply Voltage Rating: -0.5 to 3.63V
- Absolute Short Duration Supply Voltage (30mins max): 4.0V max
- Note: Operating beyond these limits may result in change or permanent damage to the oscillator.
- Core Operating Current:
  Measured with -
  TA=25°C, Vs=1.8V and no load: 0.99µA typ
  TA=-40°C to 85°C, Vs=1.5V to 3.63V and no load: 1.52µA max
- Note: Core Operating Current does not include Output Driver Operating Current or load current. To derive Total Operating Current (no load) add Core Operating Current + Output Driver Operating Current (a function of Output Voltage Swing).
- Power Supply Ramp (Vs ramp-up from 0 to 90%, TA=-40°C to 85°C): 100ms max
- Start Up Time @ Power Up:
  Measured with -
  TA=-40°C to 60°C, valid output: 180ms typ, 300ms max
  TA=60°C to 70°C, valid output: 350ms max
  TA=70°C to 85°C, valid output: 380ms max

Outline (mm)



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Operating Temperature Ranges

- 0 to 70°C
- -40 to 85°C

Output Details

- Output Compatability CMOS
- Drive Capability 15pF
- Output Voltage Levels (Vs=1.5V to 3.63V, Ioh/Iol=±1µA & load=15pF):
  Output Low (VoL): 10%Vs max
  Output High (VoH): 90%Vs min
- Rise & Fall Time (10% to 90%Vs):
  Load=15pF: 200ns max
  Load=5pF load & Vs=1.62V max): 50ns max
- Programmable Drive Strength: The IQMS-143 includes a programmable drive strength feature to provide a flexible tool to optimise the clock rise/fall time for specific applications.
- Programmable Output Voltage Swing Tolerance (TA=-40°C to 85°C & Vs=1.5V to 3.63V): ±0.055V max
- Reduced Swing Output Details:
  Rise & Fall Time (30% to 70%Vs & load=10pF): 200ns max
  Duty Cycle: 48/52% max
- AC-Coupled Programmable Output Swing (Vs=1.5V to 3.63V, load=10pF & Ioh/Iol=±0.2µA): Typically 0.2V to 0.8V
  (Note: IQMS-143 does not internally AC-couple. This output description is intended for a receiver that is AC-coupled.)
- DC-Biased Programmable Output Voltage High Range (Vs=1.5V to 3.63V, load=10pF & Ioh=-0.2µA: Typically 0.6V to 1.225V
- DC-Biased Programmable Output Voltage Low Range (Vs=1.5V to 3.63V, load=10pF & Iol=0.2µA): 0.35V to 0.8V

Noise Parameters

- Period Jitter (10000 cycles):
  Measured with TA=25°C, Vs=1.5V to 3.63V: 35ns RMS typ
- Long Term Jitter (81920 cycles [2.5 sec], 100 samples):
  Measured over operating temperature range: 2.5µs pk-pk max

Environmental Parameters

- Storage Temperature Range: –65 to 150°C
- Absolute Operating Temperature (Vs=1.5V to 3.63V): 105°C max
- Absolute Short Duration Operating Temperature (30mins max, Vs=1.5V to 3.63V): 125°C max
- Junction Temperature: 150°C max
- ESD Levels:
  Human Body Model (JESD22-A114): 3000V max
  Charge Device Model (JESD22-A115): 750V max
  Machine Model (JESD22-C101): 300V max
- Mechanical Shock: MIL-STD-883, Method 2002: 10000G max
- Vibration: MIL-STD-883, Method 2007: 70G max
- Latch Up Tolerance (JESD78): Compliant
- Note: Operating beyond these limits may result in change or permanent damage to the oscillator.

Manufacturing Details

- Maximum Process Temperature: Reflow profile as per JESD22-A113D.
- Cleaning: Do not ultrasonic clean, this may cause permanent damage or long-term reliability issues to the oscillator.
- Note: Do not apply underfill to the oscillator, the device will not meet the frequency stability specification if underfill is applied.

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Compliance

- RoHS Status (2011/65/EU) Compliant
- REACh Status Compliant
- MSL Rating (JDEC-STD-033): 1

Packaging Details

- Pack Style: Reel Tape & reel in accordance with EIA-481-D
  Pack Size: 1,000

Electrical Specification - maximum limiting values

Frequency	Temperature Range	Stability (Min)	Current (NoLoad)	Rise and Fall Time	Duty Cycle
	°C	ppm	mA	ns	%
32.768000kHz	-40 to 85	±5.00	-	200	48/52%
	0 to 70	±5.00	-	200	48/52%

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