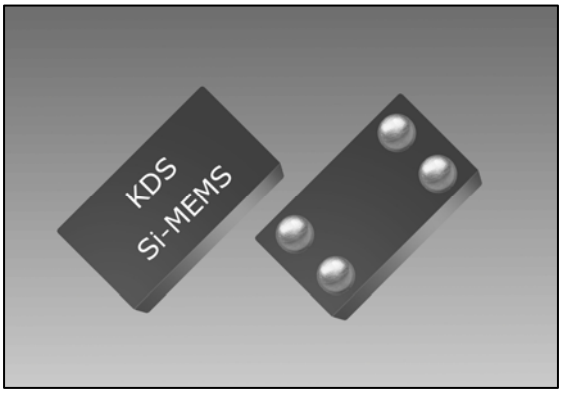
kHz Band MEMS Oscillator

MO1532



■Features

- ●Fixed 32.768 kHz
- ●Smallest footprint in chip-scale (CSP): 1.5 x 0.8 mm
- ●<10 x 10^{-6} frequency tolerance
- ●Ultra-low power: <+1 µA
- ●Internal filtering eliminates external Vdd bypass cap
- ●NanoDrive™ programmable output swing for lowest power

■Applications

- ●Mobile Phones, Tablets
- ●Health and wellness monitors, Fitness Watches
- ●Pulse-per- second timekeeping, RTC reference clock
- ●Battery Management Timekeeping

Pb-Free

RoHS Compliant

■Standard Specification

Item	symbol	Min.	Typ.	Max.	Unit	Condition
Fixed Output Frequency	Fout		32.768		kHz	
Operating Supply Voltage	Vdd	+1.2	-	+3.63	V	T_A = -10°C to +70°C
		+1.5	-	+3.63		T_A = -40°C to +85°C
Operating Temperature Range	T_use		-10~+70 / -40~+85		°C	
Frequency stability [1]	F_stab	-	-	+75	x10^{-6}	T_A = -10°C to +70°C, Vdd: +1.5V – +3.63V
		-	-	+100		T_A = -40°C to +85°C, Vdd: +1.5V – +3.63V
		-	-	+250		T_A = -10°C to +70°C, Vdd: +1.2V – +1.5V
Frequency Tolerance [2]	F_tol	-	-	+10	x10^{-6}	T_A = +25°C, post reflow, Vdd: +1.5V – +3.63V.
		-	-	+20		T_A = +25°C, post reflow with board-level underfill, Vdd: +1.5V – +3.63V
First yerar Frequency Aging		-1.0	-	+1.0	x10^{-6}	T_A = +25°C
Core Operating Current [3]	Idd	-	+0.9	-	µA	T_A = +25°C, Vdd: +1.8V. No load
		-	-	+1.3		T_A = -10°C to +70°C, Vdd max: +3.63V. No load
		-	-	+1.4		T_A = -40°C to +85°C, Vdd max: +3.63V. No load
Start-up Time at Power-up [4]	t_start	-	180	300	ms	T_A = -40°C ≤ T_A ≤ +50°C, valid output
		-	-	450		T_A = +50°C < T_A ≤ +85°C, valid output
LVCMOS Output Option, T_A = -40°C to +85°C, typical values are at T_A = +25°C						
Output Clock Duty Cycle	DC	48	-	52	%	
Output Voltage Low	V_{OL}	-	-	Vdd x 0.1	V	Vdd: +1.5V – +3.63V, I_{OH} = 10 µA, 15 pF
Output Voltage High	V_{OH}	Vdd x 0.9	-	-	V	Vdd: +1.5V – +3.63V, I_{OH} = -10 µA, 15 pF
Output Rise/Fall Time	tr,tf	-	100	200	ns	10-90% (Vdd), 15 pF load, Vdd = +1.5V to +3.63V
		-	-	50		10-90% (Vdd), 5 pF load, Vdd ≥ +1.62V
NanoDrive™ Programmable, Reduced Swing Output						
Output Clock Duty Cycle	DC	48	-	52	%	
AC-coupled Programmable Output Swing	V_sw	-	+0.20 to +0.80	-	V	MO1532 does not internally AC-couple. This output description is intended for a receiver that is AC-coupled. Vdd: +1.5V – +3.63V, 10 pF Load, I_{OH} / I_{OL} = ±0.2 µA
DC-Biased Programmable Output Voltage Low Range	V_{OL}	-	+0.35 to +0.80	-	V	Vdd: +1.5V – +3.63V. I_{OL} = +0.2 µA, 10 pF Load.
DC-Biased Programmable Output Voltage High Range	V_{OH}	-	+0.60 to +1.225	-	V	Vdd +1.5V – +3.63V. I_{OH} = -0.2 µA, 10 pF Load.
Output Rise/Fall Time	tr,tf	-	-	200	ns	30-70% (V_{OL}/V_{OH}), 10 pF Load

[1]. Measured peak-to-peak. Inclusive of Initial Tolerance at +25°C, and variations over operating temperature, rated power supply voltage and load. Stability is specified for two operating voltage ranges. Stability progressively degrades with supply voltage below +1.5V.

[2]. Measured peak-to-peak. Tested with Keysight 53132A frequency counter. Due to the low operating frequency, the gate time must be ≥100 ms to ensure an accurate frequency measurement.

[3]. Core operating current does not include output driver operating current or load current. To derive total operating current (no load), add core operating current + (+0.065 µA/V) * (output voltage swing).

[4]. Measured from the time Vdd reaches +1.5V.

Consult our sales representative for other specifications.

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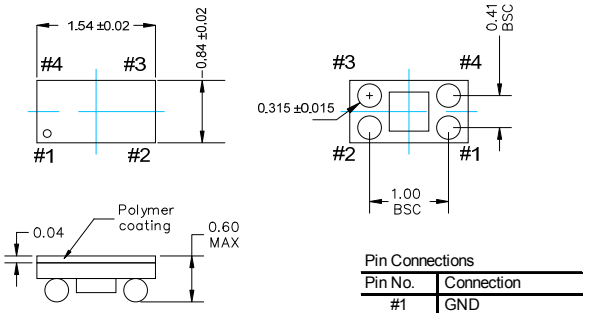
■Dimensions and Patterns

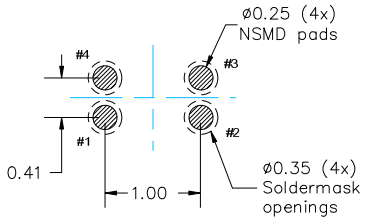
Package Size – Dimensions (Unit: mm)	Recommended Land Pattern (Unit: mm)

1.55 x 0.85 mm CSP



Pin Connections

Pin No.	Connection
#1	GND
#2	CLK Output
#3	Vdd
#4	GND



(soldermask openings shown with heavy dashed line)

Recommend 4-mil (0.1mm) stencil thickness