

SN-20S

2012-Size Ultra-Low Current 32 kHz Tuning Fork Crystal Oscillator (SPXO)

•Features

- Ultra-Low Current Consumption of 0.35 μA typ. ($V_{DD} = 1.8\text{ V}$),
One of the Lowest Among Crystal Oscillators in Its Class
- Compact 2012-Size Package ($2.0 \times 1.2 \times 0.85\text{ mm}$)
- Compliant with EU RoHS Directive (Fully Pb-Free)
- Incorporates a Highly Reliable Photolithographically
Processed Crystal Resonator

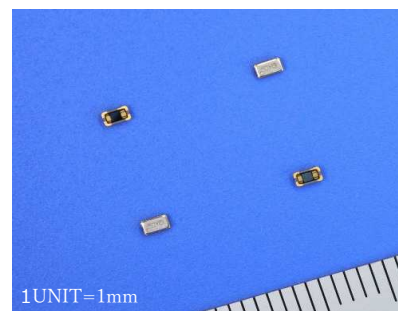
•Applications

- Smart Meters
- Wearable Devices
- MCU Sub-Clock Applications
- IoT Devices
- Industrial Equipment

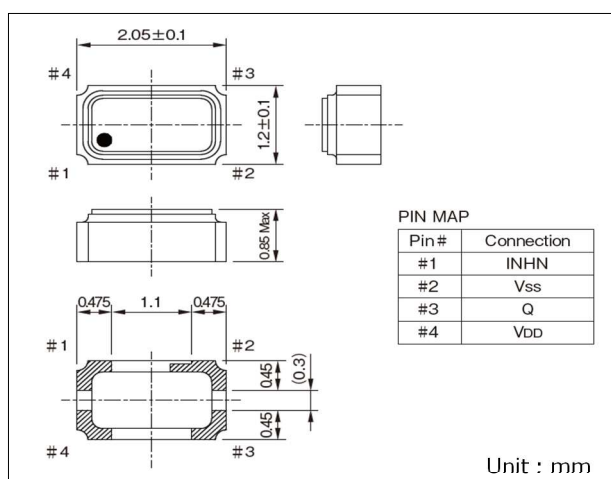
•Specifications

Unless otherwise noted, the specified characteristics are based on the conditions of $T_a = +25^\circ\text{C}$ and $V_{DD} = 3.3\text{ V}$.

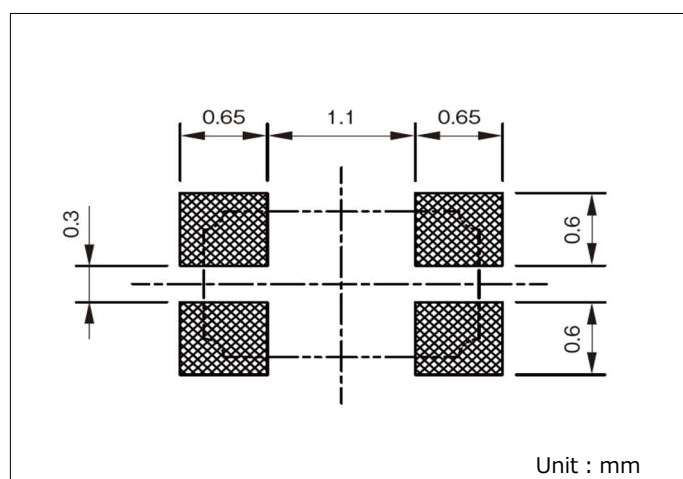
Item	Symbol	Specification	Unit	Conditions / Note
Nominal Frequency	f_{nom}	32.768	kHz	
Frequency Tolerance	f_{tol}	± 20	$\times 10^{-6}$	
Supply Voltage	V_{DD}	1.2~5.5	V	
Storage Temperature Range	T_{stg}	$-40 \sim +125$	$^\circ\text{C}$	
Operating Temperature Range	T_{use}	$-40 \sim +85$	$^\circ\text{C}$	
Turnover Temperature	T_i	$25^\circ\text{C} \pm 5$	$^\circ\text{C}$	
Parabolic Coefficient	β	$-0.030 \pm 10\%$	$\times 10^{-6}/^\circ\text{C}^2$	
Frequency vs. Supply Voltage	$f_{0_V_{DD}}$	± 1	$\times 10^{-6}/\text{V}$	$V_{DD} = 1.2\text{V} \sim 5.5\text{V}$
Current Consumption	I_{DD}	0.35 Typ./0.65 Max.	μA	$V_{DD} = 1.8\text{V}$ No Load
		0.50 Typ./0.80 Max.	μA	$V_{DD} = 3.3\text{V}$ No Load
Sleep Current Consumption	I_{DD2}	0.25 Typ./0.60 Max.	μA	$V_{DD} = 1.2\text{V} \sim 5.5\text{V}$ No Load
Waveform Symmetry	SYM	50 ± 10	%	15pF Load
Rise Time	t_r	200 Max.	ns	15pF Load, $0.1V_{DD} \rightarrow 0.9V_{DD}$
Fall Time	t_f	200 Max.	ns	15pF Load, $0.9V_{DD} \rightarrow 0.1V_{DD}$
Input Voltage Level	V_{IL}	$0.2V_{DD}$ Max.	V	INHN Pin
	V_{IH}	$0.8V_{DD}$ Min.	V	INHN Pin
Output Voltage Level	V_{OL}	0.4 Max.	V	Q Output Pin
	V_{OH}	$V_{DD} - 0.4$ Min.	V	Q Output Pin
Output Load Capacitance	CL_{OUT}	15 Max.	pF	CMOS Load
Start-up Time	t_{str}	0.15 Typ./0.5 Max.	sec	
Frequency Aging	f_{age}	± 3	$\times 10^{-6}$	First Year



•Dimensions



•Recommended Soldering Pattern



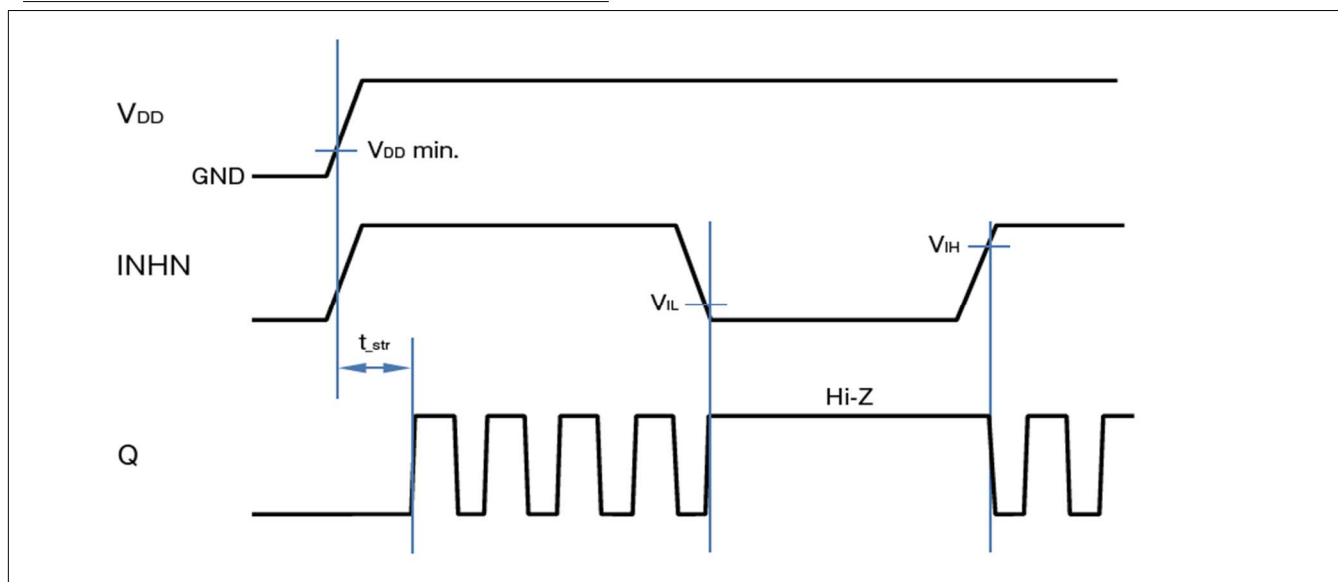
Note: Do not route any PCB traces directly underneath the crystal resonator mounting area (bottom side of the device).

•Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit	Conditions
Supply Voltage Range	V_{DD}	-0.5~+7.0	V	Between V_{DD} and VSS
Input Voltage Range	V_{in}	-0.5~+7.0	V	Input Pin (INHN)
Output Voltage Range	V_{out}	-0.5~ $V_{DD}+0.5$	V	Output Pin (Q)
Output Current	I_{out}	25	mA	Output Pin (Q)

Note: Absolute maximum ratings must not be exceeded, even momentarily.

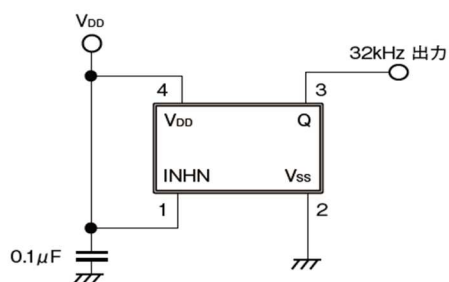
•Input/Output Waveforms



•Example of MCU Interface Circuit

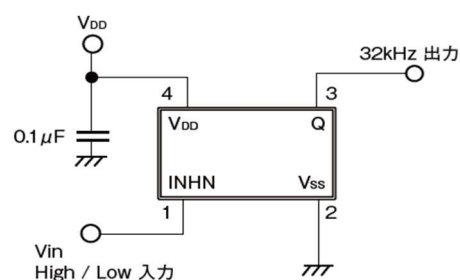
Connection Example 1

When ON/OFF control of the 32 kHz output is not required, connect the VDD pin and INHN pin together.



Connection Example 2

When ON/OFF control of the 32 kHz output is required, apply a High or Low signal to the INHN pin.



Note: A bypass capacitor of 0.01 μF to 0.1 μF should be connected as close as possible between VDD and VSS for both connection examples.

•Q Output and Configuration

Q Output	INHN Input		Remarks
32.768 kHz Output	High	$0.8V_{DD}$ Min.	—
Hi-Z	Low	$0.2V_{DD}$ Max.	—
—	OPEN	—	Do Not Use

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