

SH-32R

3215-Size Low-Power 32 kHz Temperature-Compensated Tuning Fork Crystal Oscillator (TCXO)

•Features

- 3215 Size: 3.2 × 1.5 × 0.90 mm
- Ultra-low current consumption beyond the capability of conventional AT-cut crystal oscillators
- TCXO specification: ±50 ppm over -40°C to +85°C
- EU RoHS compliant (completely Pb-free)
- Built-in crystal resonator manufactured using highly reliable photolithography technology

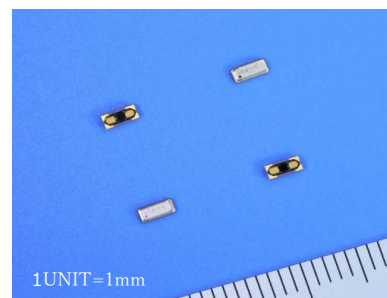
•Applications

- Smart Meters
- MCU Sub-Clocks
- GPS/GNSS Modules
- Industrial Equipment
- Data Loggers

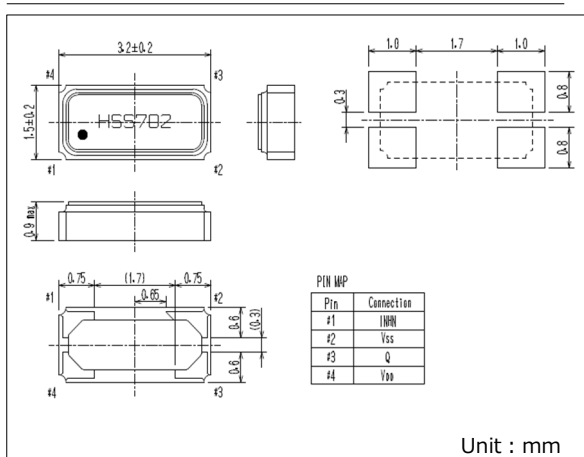
•Specifications

Unless otherwise noted, the specified characteristics are based on the conditions of Ta = +25°C and VDD = 3.3 V.

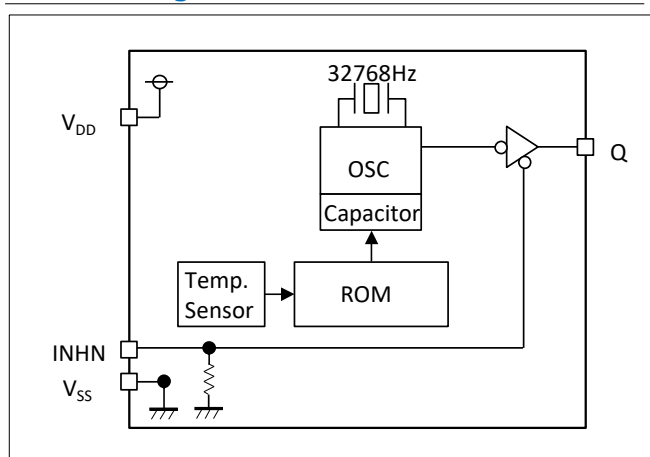
Item	Symbol	Specification	Unit	Conditions / Note
Nominal Frequency	f _{nom}	32.768	kHz	
Frequency Tolerance	f _{tol}	±3	×10 ⁻⁶	
Frequency vs. Temperature Characteristics	f0-Tc	±50	×10 ⁻⁶	-40°C to +85°C (Referenced to +25°C)
Frequency vs. Supply Voltage Characteristics	f0_VDD	±1	×10 ⁻⁶	VDD 1.5V~3.63V
Supply Voltage	VDD	1.5~3.63		
Storage Temperature Range	T _{stg}	-40~+105	°C	
Operating Temperature Range	T _{use}	-40~+85	°C	
Current Consumption	I _{DD}	1.3 Typ. 2.5 Max.	μA	No Load
Output Waveform Symmetry	SYM	40/60	%	30 pF Load
Rise Time	tr	40 Max.	ns	30pF Load, 0.1VDD → 0.9VDD
Fall Time	tf	40 Max.	ns	30pF Load, 0.9VDD → 0.1VDD
Input Voltage Level	V _{IL}	0.2VDD Max.	V	INHN Pin
	V _{IH}	0.8VDD Min.	V	INHN Pin
Output Voltage Level	V _{OL}	0.1VDD Max.	V	Q Output
	V _{OH}	0.9VDD Min.	V	Q Output
Output Load Capacitance	CL _{OUT}	30 Max.	pF	CMOS Load
Start-up Time	t _{str}	0.5 Max.	sec	
Frequency Aging	f _{age}	±3	×10 ⁻⁶	First Year



•Dimensions



•Block Diagram



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}	$-0.3 \sim +4.5$	V	Between V_{DD} and V_{SS}
Input Voltage Range	V_{in}	$-0.3 \sim V_{DD} + 0.3$	V	Input Pin (INHN)
Output Voltage Range	V_{out}	$-0.3 \sim V_{DD} + 0.3$	V	Output Pin (Q)
Output Current	I_{out}	± 10	mA	Output Pin (Q)

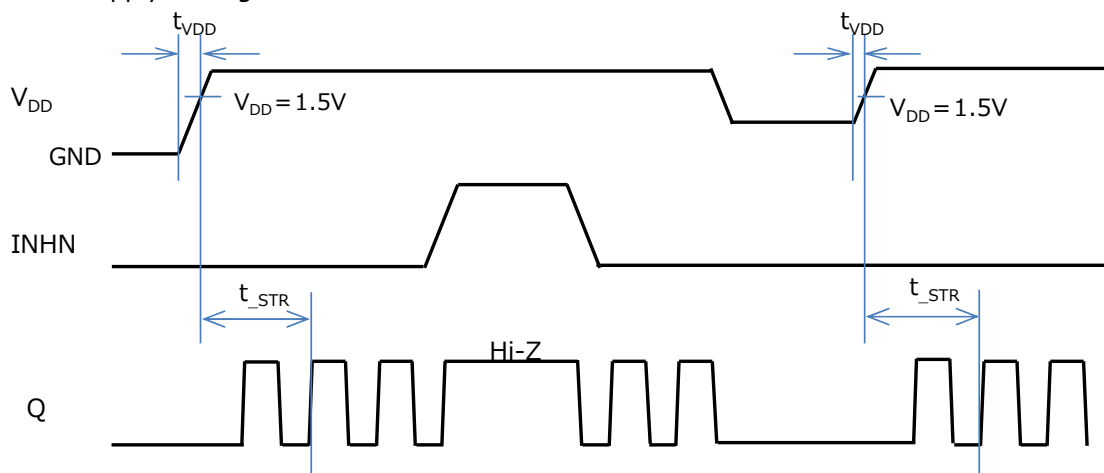
Note: Absolute maximum ratings must not be exceeded, even momentarily.

•Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
V_{DD} Rise Time	t_{VDD}	—	—	10	ms/V
V_{DD} OFF Time	t_{OFF}	0.5	—	—	ms
V_{DD} OFF Voltage	V_{bot}	—	—	0	V

Note: To guarantee proper start-up operation, V_{DD} must be maintained at 0 V for a minimum of 0.5 ms and then ramped up with a rise time of less than 10 ms/V. Reapplying V_{DD} without first discharging it to 0 V may prevent the 32.768 kHz oscillator from starting.

Power Supply Timing Chart



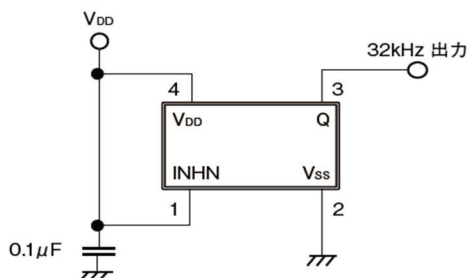
Note 1: A built-in boost circuit operates for 500 ms after start-up to reduce oscillator start-up time (t_{STR}). During this period, the output frequency does not meet the 32.768 kHz ± 3 ppm specification.

Note 2: To ensure proper operation, hold V_{DD} at 0 V for at least 0.5 ms, then ramp up at less than 10 ms/V. Reapplying V_{DD} without first dropping to 0 V may prevent oscillator start-up.

•Example of MCU Interface Circuit

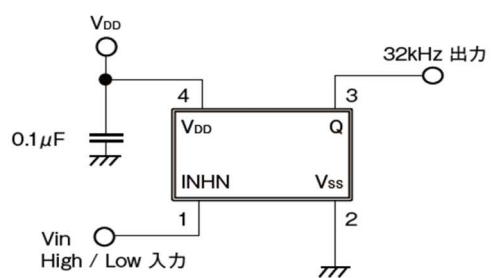
Connection Example 1

When ON/OFF control of the 32 kHz output is not required, connect the V_{DD} 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 μ F to 0.1 μ F should be connected as close as possible between V_{DD} and V_{SS} for both connection examples.

•Q Output and Configuration

Q Output	INHN Input		Remarks
32.768 kHz Output	High	$0.8V_{DD} \sim V_{DD} + 0.3$	—
Hi-Z	Low	$-0.3V \sim 0.2V_{DD}$	—
—	OPEN	—	Do Not Use

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