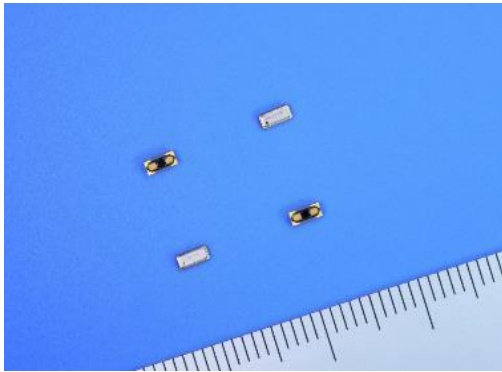


## High accuracy Crystal Oscillator 32.768kHz SH-32R



### Features

- Excellent frequency accuracy and Temperature characteristics
- Low current consumption
- Complete Pb-free
- Incorporated highly reliable photolithographic crystal resonator

### Applications

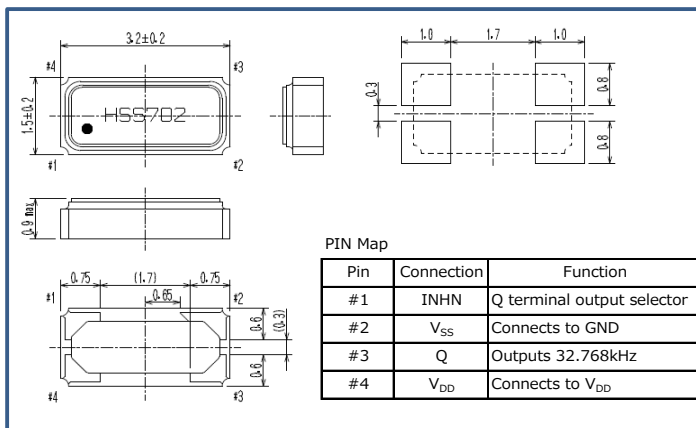
Smart Meter, IoT, Wearable device, Industry device, High precision timing device, Event data recorder

### Specifications

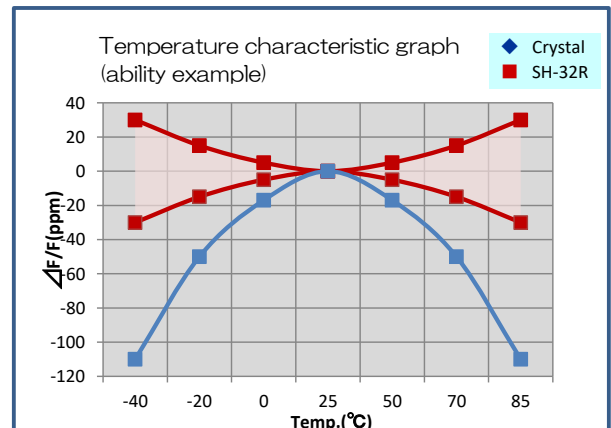
Item	Symbol	Specifications	Unit	Conditions Note
Nominal Frequency	f_nom	32.768	kHz	
Frequency tolerance	f_tol	±3	×10 <sup>-6</sup>	
Frequency temperature coefficient	f0-Tc	±50	×10 <sup>-6</sup>	-40 to +85°C(+25°C is reference)
Frequency / voltage coefficient	f0_VDD	±1	×10 <sup>-6</sup> /V	V <sub>DD</sub> 1.5V to 3.63V
Supply Voltage	V <sub>DD</sub>	1.5~3.63	V	
Storage temperature	T_stg	-40~+105	°C	
Operating temperature	T_use	-40~+85	°C	
Current consumption	I <sub>DD</sub>	1.3 typ.	μA	No load condition
		2.5 max.	μA	
Symmetry	SYM	40/60	%	Load: 30pF
Rise time	t <sub>r</sub>	40 max.	ns	Load: 30pF output level 0.1V <sub>DD</sub> →0.9V <sub>DD</sub>
Fall time	t <sub>f</sub>	40 max.	ns	Load: 30pF output level 0.9V <sub>DD</sub> →0.1V <sub>DD</sub>
Input voltage	V <sub>IL</sub>	0.2V <sub>DD</sub> max.	V	INHN terminal
	V <sub>IH</sub>	0.8V <sub>DD</sub> min.	V	INHN terminal
Output voltage	V <sub>OL</sub>	0.1V <sub>DD</sub> max.	V	Q terminal
	V <sub>OH</sub>	0.9V <sub>DD</sub> min.	V	Q terminal
Output load condition (CMOS)	C <sub>LOAD</sub>	30 max.	pF	CMOS Loading
Start-up time	t <sub>str</sub>	0.5 max.	sec	
Frequency aging	f_aging	±3	×10 <sup>-6</sup>	First year

Unless otherwise stated, characteristics (specifications) shown in the above table are based on the Ta=+25°C, V<sub>DD</sub>=3.3V condition.

### Dimensions



### Temperature characteristic



## High accuracy Crystal Oscillator 32.768kHz SH-32R

### Maximum Rating

Item	Symbol	Conditions	Rated value	Unit
Supply voltage range	$V_{DD}$	$V_{DD}-V_{SS}$	-0.3~+4.5	V
Input voltage range	$V_{in}$	input terminal (INH/N)	-0.3~ $V_{DD}+0.3$	V
Output voltage range	$V_{out}$	Output terminal (Q)	-0.3~ $V_{DD}+0.3$	V
output current	$I_{out}$	Output terminal (Q)	$\pm 10$	mA

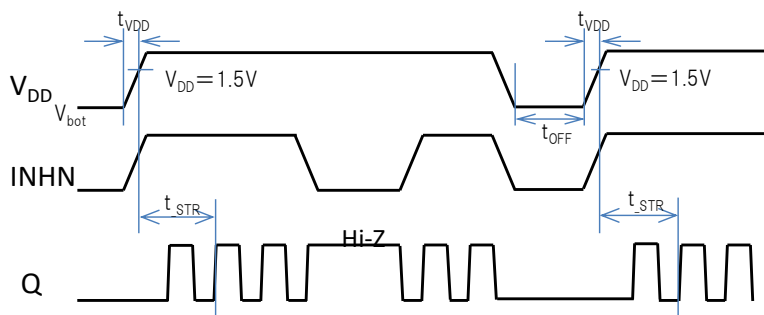
\*It is a value that should not be exceeded even for a moment.

### Operating Condition

Item	Symbol	Min.	Typ.	Max.	Unit
$V_{DD}$ rise time	$t_{VDD}$	-	-	10	ms/V
$V_{DD}$ OFF time	$t_{OFF}$	0.5	-	-	msec
$V_{DD}$ OFF voltage	$V_{bot}$	-	-	0	V

◆ In order to start oscillation correctly,  $V_{DD}$  must be kept at 0V for 0.5msec or more, and then start up at less than 10ms/V. Please note that 32.768kHz oscillation will not start if  $V_{DD}$  is restarted without dropping to 0V.

Timing chart for applying power supply voltage

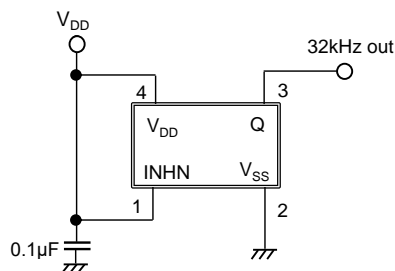


\*Oscillation startup time ( $t_{STR}$ ) is operated by the boot circuit, and the oscillation frequency is not  $32.768\text{kHz} \pm 3\text{ppm}$ .

### Circuit connection with MCU

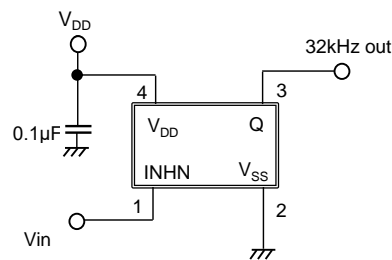
#### Connection example 1

Connect the  $V_{DD}$  pin and the INHN pin if the 32kHz output ON/OFF operation is not to be performed.



#### Connection example 2

Input High/Low to the INHN pin to turn the 32kHz output ON/OFF.



Connect a bypass capacitor (0.01µF to 0.1µF) between the power supply pins ( $V_{DD}-V_{SS}$ ).

### Q terminal output setting

Terminal INHN ( $V_{in}$ )	Terminal Q	Remarks
High	$0.8V_{DD} \sim V_{DD}+0.3$	32kHzOutput
Low	$-0.3V \sim 0.2V_{DD}$	Hi-Z
OPEN	-	Do not use