MICRO CRYSTAL SWITZERLAND

Pierce Oscillator

Design and Crystal Recommendation

TI - MSP430

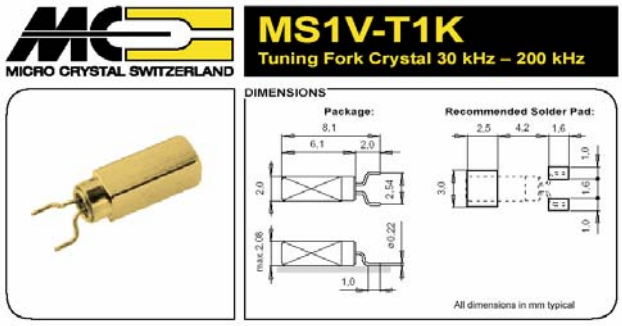
Low-Frequency Quartz Crystals from Micro Crystal are your simple solution to sourcing crystals compatible with TI's MSP430 Ultra-Low-Power Microcontrollers!

Take full advantage of the capabilities of TI's MSP430. Add a 32.768kHz crystal to your MSP430 controller and you'll generate an accurate reference frequency for the microcontroller's sleep mode, as well as your other circuitry that may require a timing reference.

We can help you match the right crystal and you'll have a reliable and accurate timing source.

Micro Crystal has worked with TI to help you choose an ideal crystal for your circuit application. Tell us about your application and we will provide recommendations for a crystal that is known to function well in your application.

The Micro Crystal line includes timing crystals in a variety of sizes and package designs to meet a wide range of size and cost constraints. We can offer application engineering assistance to help you optimize the efficiency of your sleep-mode circuitry, as well as selection advice. Fast delivery is available on 32.768kHz crystals in virtually any quantity required.



sales@microcrystal.ch

Micro Crystal is one of the world's leading producers of subminiature timing crystals. Founded 1978 by the Swiss watch industrie, Micro Crystal today is still a company of Swatch Group.

Complete data sheets in PDF format are available at: www.microcrystal.com

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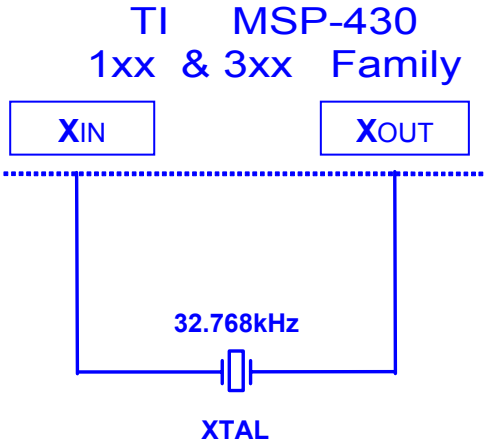
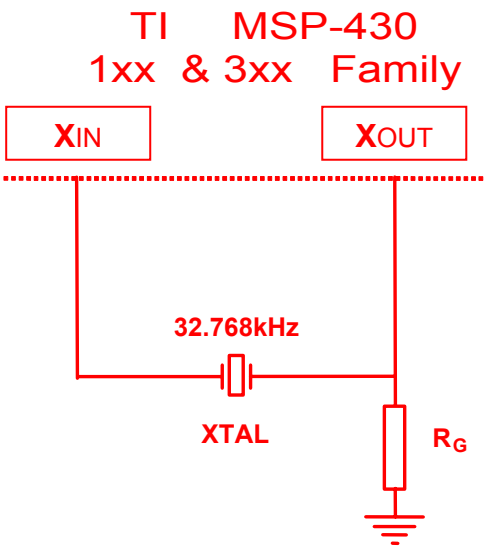
TI's MSP430 1xx, 3xx family



Results Oscillator Design check		Units
Power Supply V_{DD}	***>3.0***	***[Volt]***
Load capacitors	*integrated*	*[pF]*
Oscillation allowance	**300**	**[kOhm]**
Recommended Crystal ESR typ.	**60**	**[kOhm]**
Effective load-capacitance	**10.2**	**[pF]**
Drive level	**0.220**	**[microW]**
Start-up time	**1000**	**[ms]**
Overtone suppression	**Safe**	



Results Oscillator Design check		Units
Power Supply V_{DD}	***<3.0***	***[Volt]***
R_G	***5.1***	***[Mohm]***
Load capacitors	*integrated*	*[pF]*
Recommended Crystal ESR typ.	**60**	**[kOhm]**
Effective load-capacitance	**10.2**	**[pF]**
Drive level	**0.220**	**[microW]**
Start-up time	**1000**	**[ms]**
Overtone suppression	**Safe**	

Remarks:

- All load-capacitors are integrated.
- Connect the 32.768kHz crystal to the XIN and XOUT pins and respect the crystal's ESR-constraints.
- Design the circuit traces as short as possible to avoid additional load-capacitance and to minimize external interferences.
- When Vdd is <3 volts, the 5.1 Mohm option in red allows the use of SMD-crystals with an ESR up to 60kOhm typ.

Design - Crystal recommendation			Units
Metal-can packge		**MS1V-T1K**	
Ceramic package		**CC4V-T1A**	
Frequency	**Fs**	**32.768**	**[kHz]**
Load-capacitance	**CL**	**10.0**	**[pF]**
Tolerance	**Tol**	**+/- 20**	**[ppm]**

**In accordance with our policy of continuous development and improvement,
Micro Crystal reserves the right to modify specifications or design-recommendations without prior notice.
The recommendations stated above are based on measured-results, respecting the "oscillator design rules".
Micro Crystal makes no representation or warranty for information in this "Design and Crystal Recommendation".**

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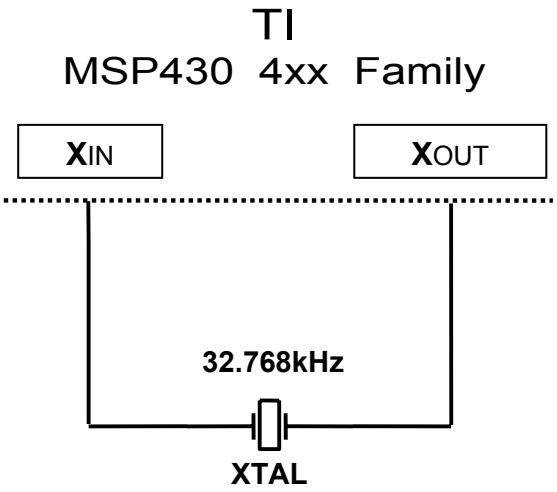
TI's MSP430 4xx family



Results Oscillator Design check		Units
Power Supply V_{DD}	*>1.8*	*[Volt]*
Load capacitors	*integrated*	*[pF]*
Oscillator setting	*18*	*[pF]*
Effective load-capacitance	**7.0**	**[pF]**
Oscillation allowance	**500**	**[kOhm]**
Drive level	**0.070**	**[microW]**
Start-up time	**400**	**[ms]**
Overtone suppression	**Safe**	

Design - Crystal recommendation			Units
Metal-can packge	**MS1V-T1K**		
Ceramic package	**CC5V-T1A**		
Frequency	**32.768**		**[kHz]**
Tolerance	**+/- 20**		**[ppm]**
Oscillator Setting	**18**	**(14)**	**[pF]**
C_L (crystals)	**7**	**(6)**	**[pF]**

Recommendation:

- **Recommended setting for the internal MSP 430 oscillator is 18pF**
- **(Alternative setting for the internal MSP 430 oscillator is 14pF)**
- **Do not use 0pF and 10pF settings for use with quartz crystals**

Remarks:

- All components are integrated, no external components others than the crystal are needed.
- Connect the 32.768kHz crystal to the XIN and XOUT pins and respect the crystal's specification constraints.
- Design the circuit traces as short as possible to minimize the effects of external interference and to avoid additional load-capacitance due to stray-capacitances.
- All crystal constraints are based on reasonable pad-layout and trace-length.

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