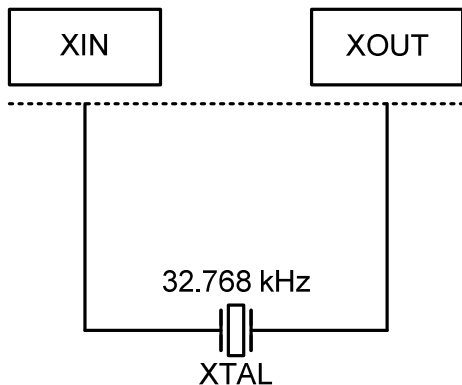


Pierce Oscillator

Design and Crystal Recommendations

Texas Instruments
MSP430x4xx Family

MSP430x4xx Family



Oscillator Design Check

Test Conditions		
Power Supply Voltage V_{DD}	≥ 1.8	V
Load Capacitors	Integrated	pF
Oscillator Setting C_X^1	18	pF
Results		
Effective Load Capacitance	9.0	pF
Oscillation Allowance	500	k Ω
Oscillator Output Voltage AC	130	mV _{RMS}
Drive Level	0.070	μ W
Startup Time	400	ms
Overtone Mode Suppression	Safe	----

Recommendation

Crystal						
Crystal Type Metal-can	MS3V-T1R					
Crystal Type Ceramic	CC7V-T1A					
Frequency	32.768			kHz		
Tolerance	+/-20			ppm		
Oscillator Design						
Oscillator Setting	C_X^1	0	10	14	18	pF
OSCCAPx		0	1	2	3	----
Load Capacitance	C_L	4.0	5.8	7.0	9.0	pF

¹ C_X corresponds to parameters C_{XIN} and C_{XOUT} (Integrated Load Capacitance), $C_{XIN} = C_{XOUT}$.

Recommendations

- **Recommended "Oscillator Setting":** $C_{XIN} = C_{XOUT} = 18$ pF **Corresponding crystal's C_L : 9.0 pF.**
- **Alternative "Oscillator Setting":** $C_{XIN} = C_{XOUT} = 14$ pF **Corresponding crystal's C_L : 7.0 pF.**
- The 0 pF and 10 pF settings are not recommended to use with a quartz crystal.

Remarks

- All load capacitors C_{XIN} and C_{XOUT} are integrated and selectable (Oscillator Setting).
- The 32.768 kHz crystal must be connected to XIN and XOUT pins and the crystal's ESR constraints have to be respected.
- The PCB traces should be designed as short as possible to avoid additional load capacitance and to minimize external interferences.

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