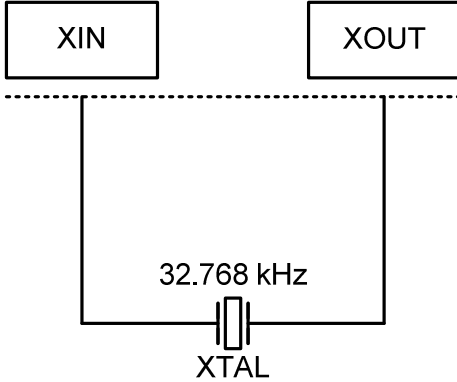


Pierce Oscillator

Design and Crystal Recommendations

Texas Instruments
MSP430x5xx Family

MSP430x5xx Family



Oscillator Design Check

Test Conditions		
Power Supply Voltage V_{DD}	≥ 1.8	V
Load Capacitors	Integrated	pF
Oscillator Setting XTS	3	----
Oscillator Setting XCAPx	3	----
Results		
Effective Load Capacitance	12.5	pF
Oscillation Allowance	>500	$k\Omega$
Oscillator Output Voltage AC	90	mV_{RMS}
Drive Level	0.010	μW
Startup Time	200	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
Load Capacitance C_L	7.0 or 12.5	pF

Oscillator Settings

	XTS				Effective Load Capacitance C_{Load} / pF	Crystal Load Capacitance C_L / pF
	0	1	2	3		
XCAPx	0				4.3	To be used with external load capacitors
	1	✓ ¹			7.5	7.0 pF
	2				10.3	Does not correspond to a standard C_L value
	3				12.5	12.5 pF

¹Lowest power consumption oscillator setting.

²Recommended oscillator setting.

Remarks

- XTS: oscillator's drive setting, 0 = min to 3 = max.
- XCAPx: integrated load capacitors C_{XIN} and C_{XOUT} (represented by $C_{L,eff}$) setting, 0 = 2 pF, 1 = 5.5 pF, 2 = 8.5 pF and 3 = 12.0 pF.
- 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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Page 1/1

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