

R_10076

Driving LPC1700/LPC1800/LPC4300 with EPSON Crystals

Rev. 1.1 — 23 November 2015

Report

Document information

Info	Content
Keywords	LPC175x, LPC176x, LPC177x, LPC178x, LPC18xx, LPC43xx, RTC, Crystal, Oscillator
Abstract	Characterization results of EPSON crystals with LPC1700/LPC1800/LPC4300 MHz and (RTC) 32.768kHz Oscillator.



Revision history

Rev	Date	Description
1.0	20150925	Initial version
1.1	20151123	Updated based on some further tests

Contact information

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1. Introduction

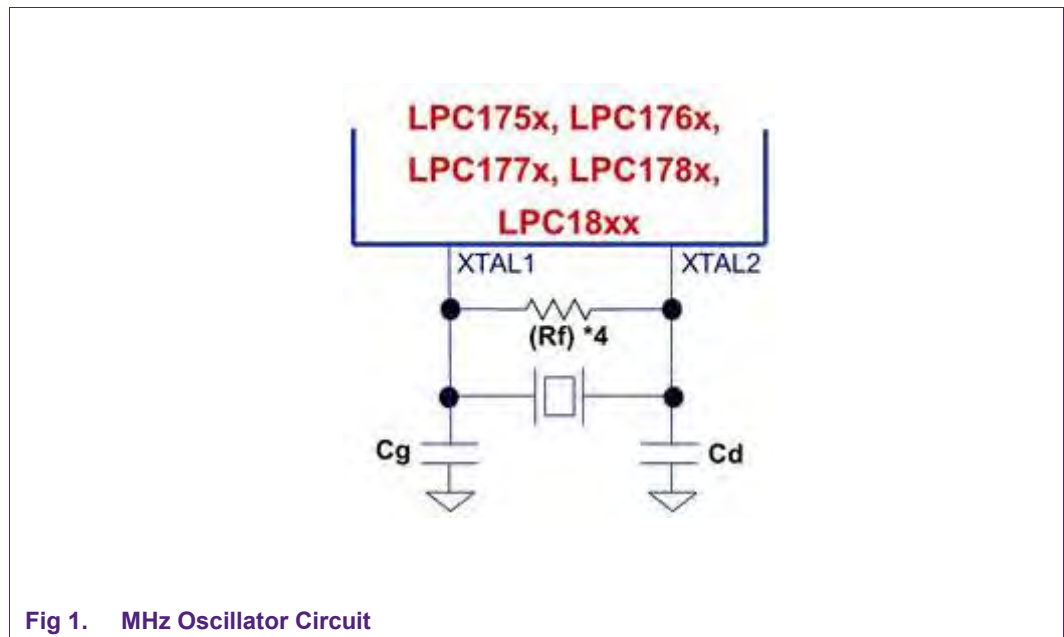
The LPC17xx and LPC18xx series are both ARM Cortex-M3 based MCU families. The LPC17xx runs at speeds up to 120MHz, while the LPC18xx runs up to 180MHz. And LPC43xx series is ARM Cortex-M4 based MCU family running up to 204MHz.

These microcontroller families supports three different clock sources: internal IRC oscillator, crystal (MHz) oscillator, and 32.768 kHz (RTC) oscillator. The nominal IRC frequency is 12MHz. Upon power-up or any chip reset, the MCU always starts up with IRC as the clock source. Software may later switch to one of the other available clock sources.

We have evaluated/characterized EPSON make 12 MHz and 32.768 kHz (RTC) crystals with LPC17xx/LPC18xx/LPC43xx and the results/recommendations are given below.

2. Characterization Results

2.1 MHz Oscillator Circuit



2.2 MHz Crystals and External Components

Based on the characterization results, following crystals and external components are recommended for LPC1700, LPC1800 and LPC4300 series microcontrollers. Note that equivalent crystals from other manufacturers can also be used instead.

Table 1. Crystals and External components

Product Name	Product Code	Frequency [MHz]	CL [pF]	External Components			Drive Level [uW]	-R [Ω]
				Cg [pF]	Cd [pF]	Rf [Ω]		
FA-238V	Q22FA23V00019**	12	10	10	10	1M	45	2445

2.3 RTC Oscillator Circuit

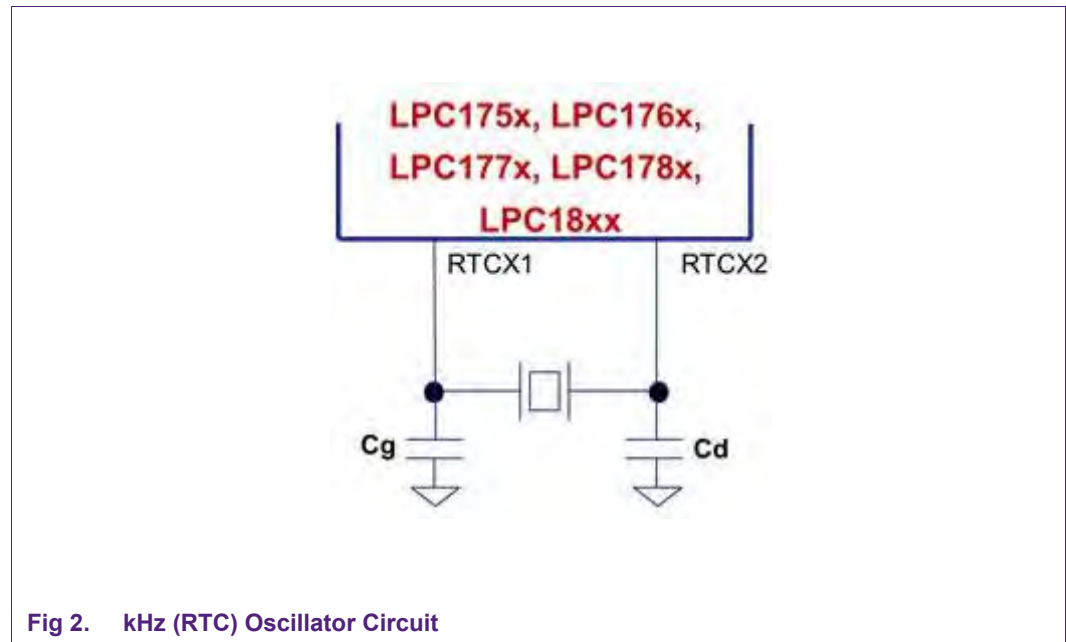


Fig 2. kHz (RTC) Oscillator Circuit

2.4 RTC Recommended Crystals and External Components

Table 2. Recommended Crystals and External components

Product Name	Product Code	Frequency [kHz]	CL [pF]	External Components		Drive Level [uW]	R [kΩ]
				Cg [pF]	Cd [pF]		
FC-135	Q13FC13500004	32.768	12.5	22	22	0.094	560
MC-146	Q13MC14620002	32.768	12.5	22	18	0.005	1000

Notes:

1. Above recommendations are based on the actual evaluation results and solely intended to help users in picking the right components.
2. Though MHz oscillator evaluation was done with an external feedback resistor (Rf), it's not must and might not be needed in your design. Note that the on-chip oscillator does have an internal feedback resistor.
3. Note that these results are based on a particular hardware board (design) and a particular LPC MCU sample. So, it does not cater to part to part variation, be it MCU or the external components.
4. As the actual board layout (design) and choice of external components greatly influences the best suitable crystal load capacitance, we do not assume any responsibility and grant warranty for above recommendations.
5. Hence, it is always recommended that the end users evaluate their own designs to ensure the best performance desired.

For more information on these crystals and guidelines, please visit the EPSON website. http://www5.epsondevice.com/en/ic_partners/nxp/lpc1x.html

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Date of release: 23 November 2015

Document identifier: R_10076