

# R\_10075

## Driving LPC1500 with EPSON Crystals

Rev. 1.0 — 06 October 2015

Report

### Document information

Info	Content
<b>Keywords</b>	LPC15xx, RTC, Crystal, Oscillator
<b>Abstract</b>	Characterization results of EPSON crystals with LPC15xx MHz and (RTC) 32.768 kHz Oscillator.



**Revision history**

Rev	Date	Description
1.0	20151006	Initial version

**Contact information**

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## 1. Introduction

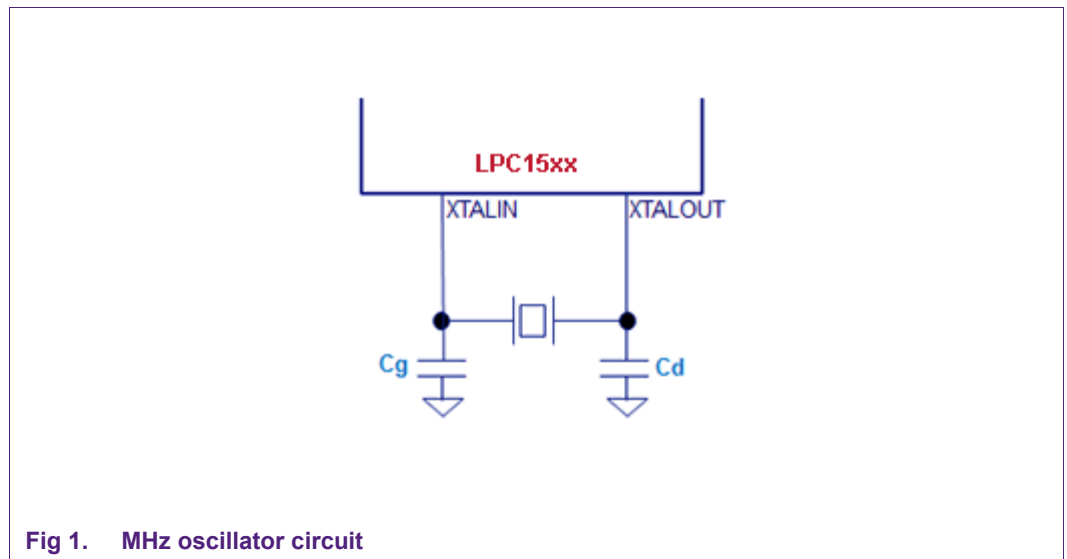
The LPC15xx series are Cortex-M3 based MCUs running at speeds up to 72MHz.

This microcontroller family supports four different clock sources: internal IRC oscillator, watchdog oscillator, crystal (MHz) oscillator, and 32.768 kHz (RTC) oscillator. The nominal IRC frequency is 12 MHz. Upon power-up or any chip reset, the LPC15xx 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 LPC15xx and the results/recommendations are given below.

## 2. Characterization results

### 2.1 MHz oscillator circuit



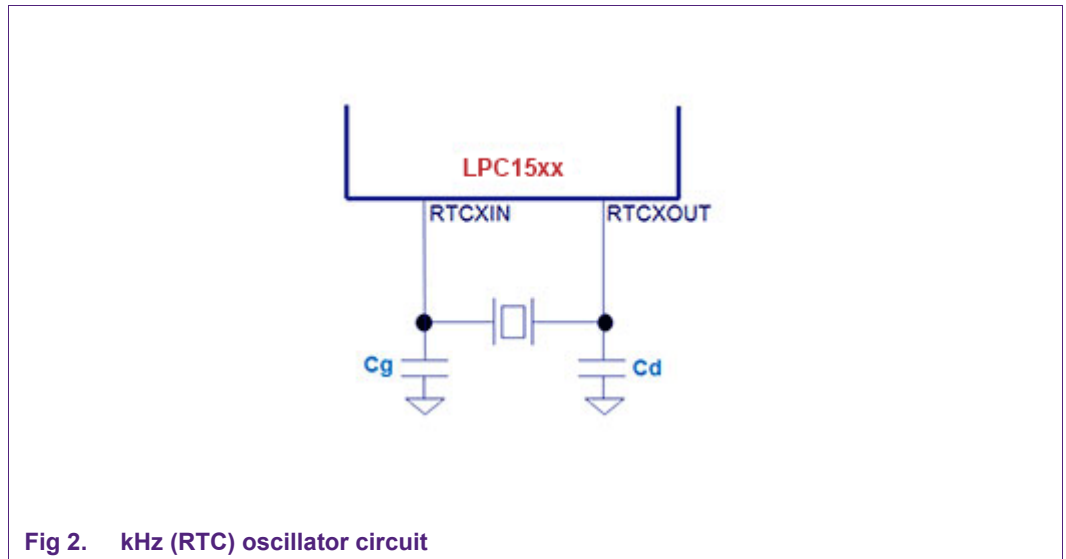
## 2.2 MHz recommended crystals and external components

Based on the characterization results, following crystals and external components are recommended for LPC15xx series microcontrollers. Note that equivalent crystals from other manufacturers can also be used instead.

Table 1. Recommended crystals and external components

Product Name	Product Code	Frequency [MHz]	CL [pF]	External Components		Drive Level [uW]	-R  [Ω]
				Cd [pF]	Cg [pF]		
FA-238V	Q22FA23V00019**	12	10	7	7	37	2490
FA-238V	Q22FA23V00007**	12	12	10	10	49	1890
FA-20H	Q24FA20H00152**	12	10	7	7	69	2490

## 2.3 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	18	0.11	560	
MC-146	Q13MC14620002**	32.768	12.5	22	18	0.13	560	

### Notes:

1. Above recommendations are based on the actual evaluation results and solely intended to help users in picking the right components.
2. Note that these results are based on a particular hardware board (design) and a particular LPC MCU sample. Therefore, it does not cater to part to part variation, be it MCU or the external components.
3. 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.
4. 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](http://www5.epsondevice.com/en/ic_partners/nxp/lpc1x.html)

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