RL78/G23
Resonator and Oscillator Constants

The resonators for which the operation is verified and their oscillator constants are shown below.

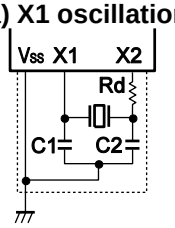
Cautions

1. The oscillator constants shown above are reference values based on evaluation in a specific environment by the resonator manufacturer. Be sure to apply to the resonator manufacturer for evaluation on the actual circuit before using these constants for your application.
Also apply to the resonator manufacturer for re-evaluation on the actual circuit if you have changed the make of the microcontroller or the board.

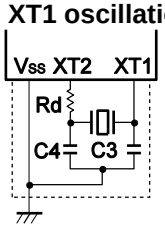
2. The oscillation voltage and oscillation frequency only indicate the oscillator characteristic. Use the RL78 microcontroller so that the internal operation conditions are within the specifications of the DC and AC characteristics.

Figure 5-16. External Oscillation Circuit Example

(a) X1 oscillation



(b) XT1 oscillation



(1) X1 oscillation (30-pin to 128-pin products) As of September, 2023

Manufacturer	Resonator	Part Number	SMD/ Lead	Frequency (MHz)	Recommended Circuit Constants Note 1 (reference)			Oscillation Voltage Range (V)		Operating ambient temperature (℃)
					C1 (pF)	C2 (pF)	Rd (Ω)	MIN.	MAX.	
Murata Manufacturing Co., Ltd. Note 2	Ceramic resonator	CSTCR4M00G55-R0	SMD	4.0	(39)	(39)	0	1.6	5.5	-40 to 85
		CSTCR4M00G55Z-R0			(39)	(39)	0			-40 to 105
		CSTLS4M00G56-B0	Lead		(47)	(47)	0			-40 to 85
		CSTLS4M00G56Z-B0			(47)	(47)	0			-40 to 105
		CSTCR4M19G55-R0	SMD	4.194	(39)	(39)	0	1.8	5.5	-40 to 85
		CSTCR4M19G55Z-R0			(39)	(39)	0			-40 to 105
		CSTLS4M19G56-B0	Lead		(47)	(47)	0			-40 to 85
		CSTLS4M19G56Z-B0			(47)	(47)	0			-40 to 105
		CSTCR4M91G55-R0	SMD	4.915	(39)	(39)	0			-40 to 85
		CSTCR4M91G55Z-R0			(39)	(39)	0			-40 to 105
		CSTLS4M91G56-B0	Lead		(47)	(47)	0			-40 to 85
		CSTLS4M91G56Z-B0			(47)	(47)	0			-40 to 105
		CSTCR5M00G55-R0	SMD	5.0	(39)	(39)	0			-40 to 85
		CSTCR5M00G55Z-R0			(39)	(39)	0			-40 to 105
		CSTLS5M00G56-B0	Lead		(47)	(47)	0			-40 to 85
		CSTLS5M00G56Z-B0			(47)	(47)	0			-40 to 105
		CSTCR6M00G55-R0	SMD	6.0	(39)	(39)	0			-40 to 85
		CSTCR6M00G55Z-R0			(39)	(39)	0			-40 to 105
		CSTLS6M00G56-B0	Lead		(47)	(47)	0			-40 to 85
		CSTLS6M00G56Z-B0			(47)	(47)	0			-40 to 105
		CSTNE8M00G550000R0	SMD	8.0	(33)	(33)	0			-40 to 85
		CSTNE8M00G55Z000R0			(33)	(33)	0			-40 to 105
		CSTLS8M00G56-B0	Lead		(47)	(47)	0			-40 to 85
		CSTLS8M00G56Z-B0			(47)	(47)	0			-40 to 105
		CSTNE10M0G550000R0	SMD	10.0	(33)	(33)	0			-40 to 85
		CSTNE10M0G55Z000R0			(33)	(33)	0			-40 to 105
		CSTLS10M0G56-B0	Lead		(47)	(47)	0			-40 to 85
		CSTLS10M0G56Z-B0			(47)	(47)	0			-40 to 105
		CSTNE12M0G550000R0	SMD	12.0	(33)	(33)	0			-40 to 85
		CSTNE12M0G55Z000R0			(33)	(33)	0			-40 to 105
		CSTNE16M0V530000R0	SMD	16.0	(15)	(15)	0			-40 to 85
		CSTNE16M0V53Z000R0			(15)	(15)	0			-40 to 105
		CSTLS16M0X53-B0	Lead		(15)	(15)	0			-40 to 85
		CSTLS16M0X53Z-B0			(15)	(15)	0			-40 to 105
		CSTNE20M0V530000R0	SMD	20.0	(15)	(15)	0			-40 to 85
		CSTNE20M0V53Z000R0			(15)	(15)	0			-40 to 105
Nihon Dempa Kogyo Co., Ltd. Note 3	Crystal resonator	NX5032GA (CL=6pF) CHP-CSK-15	SMD	8.0	5	5	0	1.8	5.5	-40 to 105
		NX2016SA (CL=5pF) CHP-CZS-75	SMD	20.0	3	3	0			

(Notes are listed on the next page.)

Manufacturer	Resonator	Part Number	SMD/ Lead	Frequency (MHz)	Recommended Circuit Constants Note 1 (reference)			Oscillation Voltage Range (V)		Operating ambient temperature (℃)
					C1 (pF)	C2 (pF)	Rd (Ω)	MIN.	MAX.	
Kyocera Co., Ltd. Note 4	Crystal resonator	CX3225SA08000D0PPVL1	SMD	8.0	8	8	0	1.8	5.5	-40 to 85
		CX3225SA10000D0PPTL2	SMD	10.0	8	8	0			
		CX3225SA12000D0PPSCC	SMD	12.0	8	8	0			
		CX2016SA16000D0PPSCC	SMD	16.0	8	8	0			
		CX2016SA20000D0PPSCC	SMD	20.0	8	8	0			

Notes 1. Values in parentheses in the C1 and C2 columns indicate an internal capacitance.

2. When using this resonator, for details about the matching, contact Murata Manufacturing Co., Ltd. (https://www.murata.com/en-global)

3. When using this resonator, for details about the matching, contact Nihon Dempa Kogyo Co., Ltd. (https://www.ndk.com/en).

4. When using this resonator, for details about the matching, contact Kyocera Co., Ltd. (https://global.kyocera.com).

(2) XT1 oscillation (30-pin to 36-pin products) As of September, 2023

Manufacturer	Resonator	Part Number	SMD/ Lead	Frequency (kHz)	XT1 oscillation mode Note 1	Recommended Circuit Constants			Oscillation Voltage Range (V)		Operating ambient temperature (℃)
						C3 (pF)	C4 (pF)	Rd (Ω)	MIN.	MAX.	
Nihon Dempa Kogyo Co., Ltd.Note2	Crystal resonator	NX2012SA (CL=9pF) CHP-MUB-14	SMD	32.768	Normal oscillation	9	9	0	2.4	5.5	-40 to 105
					Low power consumption oscillation 1	9	9				
					Low power consumption oscillation 2	7	7				

Note 1. Set the XT1 oscillation mode by using the AMPHS0 and AMPHS1 bits of the clock operation mode control register (CMC).

2. When using this resonator, for details about the matching, contact Nihon Dempa Kogyo Co., Ltd (https://www.ndk.com/en).

(3) XT1 oscillation (40-pin to 128-pin products) As of September, 2023

Manufacturer	Resonator	Part Number	SMD/ Lead	Frequency (kHz)	XT1 oscillation mode Note 1	Recommended Circuit Constants			Oscillation Voltage Range (V)		Operating ambient temperature (℃)
						C3 (pF)	C4 (pF)	Rd (Ω)	MIN.	MAX.	
Murata Manufacturing Co., Ltd.Note 2	MEMS resonator	WMRAG32K76CS1C00R0	SMD	32.768	Normal oscillation	6	6	1M	1.6	5.5	-30 to 85
					Low power consumption oscillation 1	6	6	0			
					Low power consumption oscillation 2	5	5	0			
		WMRAG32K76CS3C00R0	SMD		Normal oscillation	6	6	1M			-40 to 105
					Low power consumption oscillation 1	6	6	0			
					Low power consumption oscillation 2	5	5	0			
Nihon Dempa Kogyo Co., Ltd.Note3	Crystal resonator	NX2012SA (CL=6pF) CHP-MUB-8	SMD	32.768	Normal oscillation	8	8	0	1.6	5.5	-40 to 105
					Low power consumption oscillation 1	8	8				
					Low power consumption oscillation 2	8	8				
					Low power consumption oscillation 3	2	2				

Note 1. Set the XT1 oscillation mode by using the AMPHS0 and AMPHS1 bits of the clock operation mode control register (CMC).

2. When using this resonator, for details about the matching, contact Murata Manufacturing Co., Ltd. (https://www.murata.com/en-global)

3. When using this resonator, for details about the matching, contact Nihon Dempa Kogyo Co., Ltd (https://www.ndk.com/en).