

Technical Data of Crystal Unit

MURATA Part No.: XRCMD48M000FXQ60R0

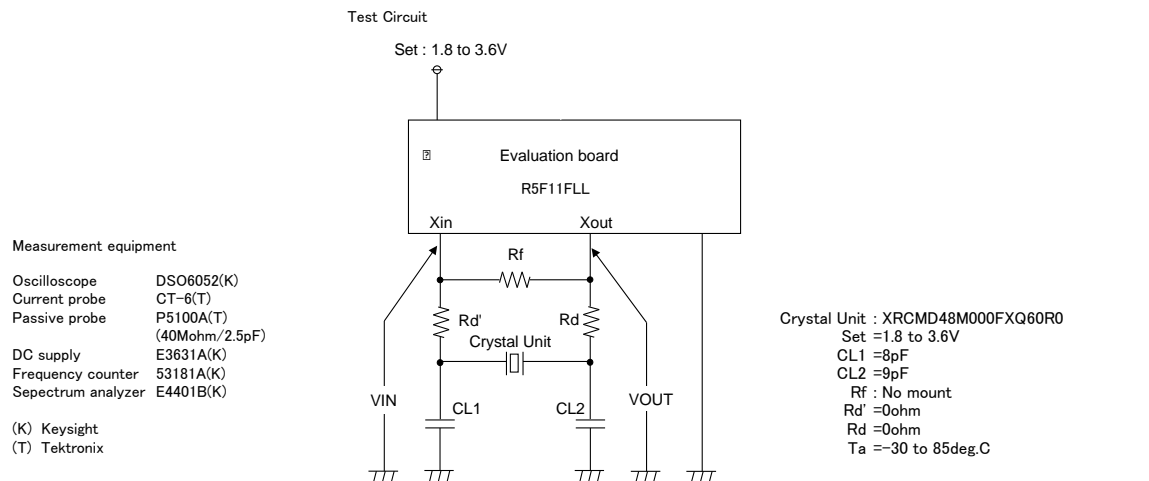
Applied to R5F11FLL

Compatibility Information

IC is compatible to :  
R5F11FLJ  
R5F11FLK

Murata's recommendation 推奨回路定数

Item		Condition	
IC name		IC名	
Parts Number of Crystal Unit		品番	
Circuit Parameter	External load capacitance	負荷容量	CL1
		負荷容量	CL2
	Feedback resistance	帰還抵抗	Rf
	Damping resistance	制限抵抗	Rd'
		制限抵抗	Rd
Supply Voltage Range		電源電圧範囲	
Temp. Range		温度範囲	



Characteristics of oscillation circuit on above condition 推奨定数での発振回路特性

Circuit Characteristics 特性	Value 測定値	Remarks 備考
Center Frequency and Difference 発振回路における発振周波数とそのずれ量 (*1) (Typical sample at Set=3V,+25deg.C)	48.000003 [MHz]	Oscillating frequency and its shift against nominal frequency 発振回路における発振周波数と振動子の公称周波数に対するずれ量
	0.06 [ppm]	
Load Capacitance on your PCB 負荷容量値 (Typical sample at Set=3V,+25deg.C)	5.8 [pF]	This value shows load capacitance the evaluated circuit has 発振回路において振動子の両端に仮想的に接続される容量
Negative Resistance and Oscillation margin 負性抵抗/発振余裕度 (at Set=3V,+25deg.C)	$-R$   130 [Ω]	The details is explained in page 2 詳細につきましては、次頁をご参照下さい。
	Ratio 3.25 [Times]	
Drive Level ドライブレベル (Typical sample at Set=3V,+25deg.C)	30 [uW]	Drive power of crystal under circuit condition 発振回路が動作している状態において振動子で消費される電力
Oscillating Voltage 発振電圧 (Typical sample at Set=3V,+25deg.C)	VIN <sub>p-p</sub> 0.8 [V]	Swing level at input side 発振入力振幅 (VIN_H - VIN_L)
	VOUT <sub>p-p</sub> 0.8 [V]	Swing level at output side 発振出力振幅 (VOUT_H - VOUT_L)
Oscillation Start up Time 起動時間 (*2) (Typical sample at Set=3V,+25deg.C)	0.38 [ms]	Time to reach 90% of the oscillation level under steady state 定常状態の発振振幅の90%に達するまでの時間

\*1 Frequency difference means the oscillating frequency difference between your PCB and Murata's frequency sorting circuit.  
貴社基板と当社検査回路では、同一振動子を使用した場合でも発振周波数の差が生じます。これを発振周波数相関と呼びます。  
\*2 The measurement results is affected by the rise-up characteristics of supplied voltage on your PCB.  
測定結果は実装基板の電源立ち上がり特性の影響を受けます。

Notes  
The characteristics of the crystal oscillation circuit is affected by the circuit constants and actual mounting conditions and so on. Therefore, it is possible to get the different results from above one due to the production variation of the crystal oscillator circuitry. In your company, please use this results after confirmation of the matching between our crystal unit and oscillator circuit. And furthermore, since the above-mentioned evaluation results evaluate only an oscillating circuit block, please confirm the checking of operations of a set in your company.

注意事項  
発振回路の特性は回路定数や実装状態により影響を受けるため、回路や基板のパラツキ等によっては上記の結果と異なる可能性があります。貴社におかれましては弊社水晶振動子と発振回路とのマッチングをご確認の上、ご使用下さるようお願い致します。また上記評価結果は発振回路ブロックのみを評価したものですので、セットの動作確認は貴社にてご確認下さるようお願い致します。

### ■ Test Data : Characteristics of recommended conditions

#### Center frequency                      48.000003 MHz

Center frequency difference                      0.06 ppm from 48MHz

This frequency difference causes imbalance of initial frequency tolerance on your PCB, because of load capacitance difference.

#### Load capacitance of the circuit                      5.8 pF

This value shows load capacitance the evaluated circuit has.

Our crystal proposed in this report is sorted with 5.8pF as load capacitance

#### **Negative resistance**

Ratio of negative resistance  $|-R|$  to  $R1_{spec}$ .

#### Ratio                      3.25 times

Ratio =  $|-R| / R1_{spec}$ .

$|-R|$                       130 ohm  
Negative resistance  $|-R| = R_{s\_max} + R_e$

$R_{s\_max}$ :                      100 ohm  
Maximum series resistance for Crystal Unit to keep oscillation

$R_e$ :                      30.0 ohm  
Effective resistance of Crystal Unit at actual oscillation frequency

$R1_{spec}$ .                      40 ohm  
Equivalent series resistance

#### **Drive level**

Drive power of crystal under circuit condition shown in page 1

#### Drive level                      30 uW

Drive level =  $I^2 \times R1$

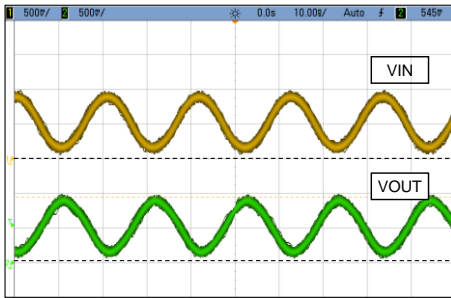
$I$ :                      1.17 mA (RMS)  
Current through Crystal Unit measured by current probe

$R1$ :                      22.1 ohm

■ Test Data : Characteristics of recommended conditions

**Oscillation waveform**

MODEL : XRCMD48M000FXQ60R0 with R5F11FLL



VIN [V]			VOUT [V]		
High	Low	p-p	High	Low	p-p
1.0	0.2	0.8	1.0	0.2	0.8

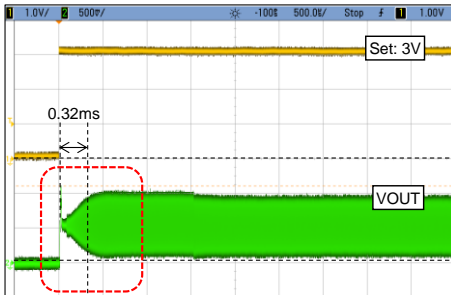
Typical sample at Set=3V, +25deg.C

[VIN] Vertical: 0.5V/div., Horizontal: 10ns/div.  
Broken line: GND

[VOUT] Vertical: 0.5V/div., Horizontal: 10ns/div.  
Broken line: GND

**Oscillation start up waveform**

MODEL : XRCMD48M000FXQ60R0 with R5F11FLL



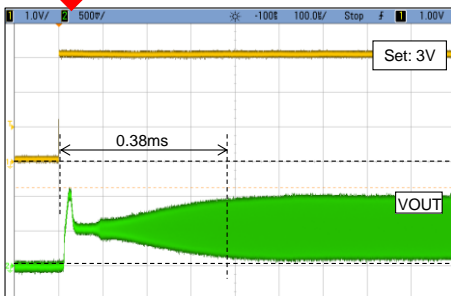
Start up time

The time takes to become 90% of steady amplitude of Vout(Xout) after power is applied.

Typical sample at Set=3V, +25deg.C

[Set] Vertical: 1V/div., Horizontal: 500us/div.

[VOUT] Vertical: 0.5V/div., Horizontal: 500us/div.  
Broken line: GND



[Set] Vertical: 1V/div., Horizontal: 100us/div.

[VOUT] Vertical: 0.5V/div., Horizontal: 100us/div.  
Broken line: GND