Technical report No. 003 > HLS family > MKY34

Method of selecting MKY34-compatible oscillators and circuit constants

Preparation date: March 13, 2003

Last updated date: July 31, 2006

■ Product of interest

MKY34

■ Description

The oscillator has device-specific parameters that are posted by the oscillator maker. In an oscillation circuit that uses the C-MOS inverter adopted by MKY34, as an amplifier, focus on the load capacitance and the equivalent resistance, which are parameters that are posted by the oscillator maker. The equivalent resistance value is an criterion to measure and determine the stability and margin of the oscillation circuit. Evaluate MKY34 and select the circuit constant, using the following method.

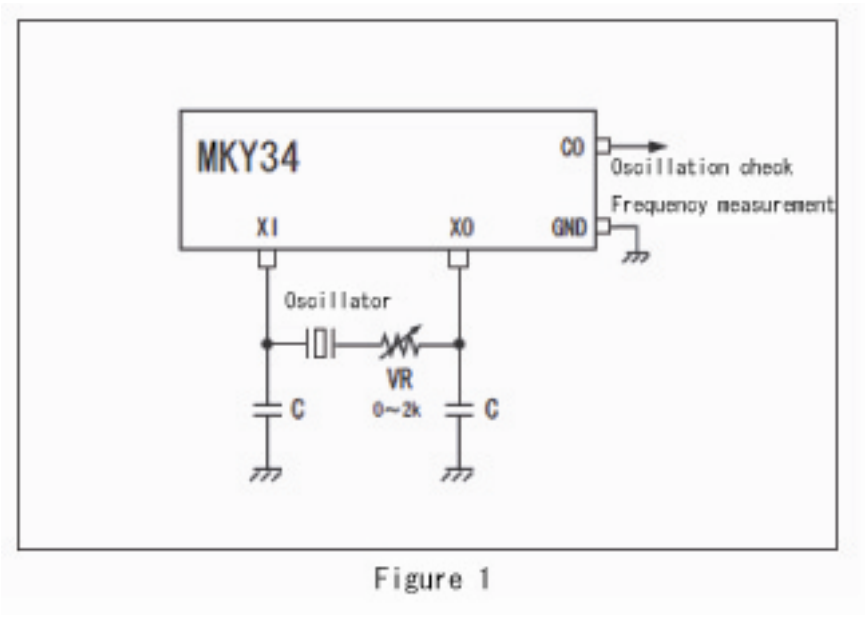

Figure 1

1. As shown in Figure 1 above, connect VR to the oscillator in series, and at the CO pin, check the oscillation and measure the frequency (place each part close to the IC, and do not route wiring).
2. With VR set to 0Ω, turn ON/OFF the power when the power supply voltage is 4V, 5V and 6V, and select the C value at which the desired frequency oscillates. Change the C value incrementally starting with several pF; the max C value is roughly a little

greater than twice the load capacitance value. The load capacitance that is generally posted by the oscillator maker for your reference is the value as viewed from the crystal oscillator (that is, the value that is connected to both pins of the oscillator), and so that value is different from the C value that is connected to the circuit. In the circuit, total of the C value synthesized in series and the capacitance of the IC and wiring is the actual load capacitance.

3. When you have successfully checked the oscillation at each power supply voltage of 4V, 5V and 6V, then measure the stability and margin. At each power supply voltage of 4V, 5V and 6V, turn ON/OFF the power while incrementing the VR value; and at the point at which the desired frequency has stopped oscillating (with the power set to OFF), measure the VR value.
4. If the minimum VR value measured at each power supply voltage of 4V, 5V and 6V is more than five times the equivalent resistance value (an oscillator-specific parameter), the oscillator and circuit constant that have been selected are stable.

Notes:

1. The oscillation frequency goes up and down in some degree depending on the C value and the power supply voltage, but as far as the fluctuation is within 1%, MKY34 is put to practical use (because of the characteristics of HLS).
2. "The minimum VR value measured at normal temperature and 5V power is more than three times the equivalent resistance value" is the general standard for this evaluation. But, this evaluation assumes the equivalent allowance due to temperature change, having a margin more than five times as much by measuring the VR value at 4 to 6V, which are wider than the power supply voltage width.

■ Measurement results for ceramic oscillator

CSACV12.0		Measured VR value		
Connected C	Oscillation frequency	4 V	5 V	6 V
10 pF	12.1476 MHz	0→2 kΩ or greater	0→2 kΩ or greater	0→2 kΩ or greater
20 pF	12.0693 MHz	0→1046Ω	0→1508Ω	0→1855Ω
30 pF	12.0248 MHz	0→697Ω	0→893Ω	0→1074Ω
33 pF	12.0110 MHz	0→611Ω	0→790Ω	0→970Ω
36 pF	11.9912 MHz	0→512Ω	0→666Ω	0→765Ω

Table 1

Recommended C value: 33pF, Equivalent internal resistance: 30Ω or smaller, Evaluated value: 150Ω or greater

CSACV24.00MXJ040

		Measured VR value		
Connected C	Oscillation frequency	4 V	5 V	6 V
Open	24.0563 MHz	0→2 kΩ or greater	0→2 kΩ or greater	0→2 kΩ or greater
10 pF	24.0315 MHz	0→649Ω	0→891Ω	0→1158Ω
15 pF	24.0242 MHz	0→314Ω	0→533Ω	0→662Ω
20 pF	24.0176 MHz	0→141Ω	0→202Ω	0→304Ω
25 pF	24.0137 MHz	0→84Ω	0→184Ω	0→190Ω

Table 2

Recommended C value: 15pF, Equivalent internal resistance: 40Ω or smaller, Evaluated value: 200Ω or greater

(Note) The frequency values in the above tables are the ones measured when the voltage is 5V and VR is 0.

■ Measurement results for ceramic oscillator having built-in capacitance

In the ceramic oscillator having built-in capacitance, the C value in the above figure is fixed. So, measure the VR value at each power supply voltage of 4V, 5V and 6V and evaluate the stability and margin.

CSTCV12.0MTJ0C4

	Measured VR value		
Oscillation frequency	4 V	5 V	6 V
12.-460 MHz	0→2 kΩ or greater	0→2 kΩ or greater	0→2 kΩ or greater

Table 3

Built-in capacitance value: Within 22pF±20%

Equivalent internal resistance: 30Ω or smaller, Evaluated value: 150Ω or greater

CSRCV24.00MXJ040

	Measured VR value		
Oscillation frequency	4 V	5 V	6 V
12.-460 MHz	0→368 kΩ	0→586 kΩ	0→744 kΩ

Table 4

Built-in capacitance value: Within 15pF±20%

Equivalent internal resistance: 40Ω or smaller, Evaluated value: 200Ω or greater

(Note) The ceramic oscillator we recommended is advantageous in terms of space factor, price, etc. But, it is inferior to the crystal oscillator in terms of performance such as operating temperature range, frequency accuracy, frequency stability, and secular change. When selecting the crystal oscillator, based on the set use environment conditions, select an appropriate constant in the above way.

STEP TECHNICA CO.,LTD.