

Method of selecting MKY35-compatible oscillators and circuit constants

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■ Product of interest

MKY35

■ 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 MKY35, 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 MKY35 and select the circuit constant, using the following method.

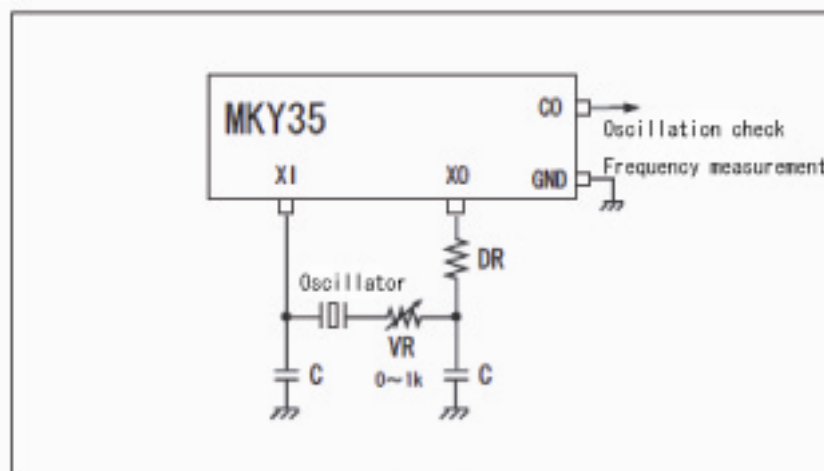


Figure 1

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.

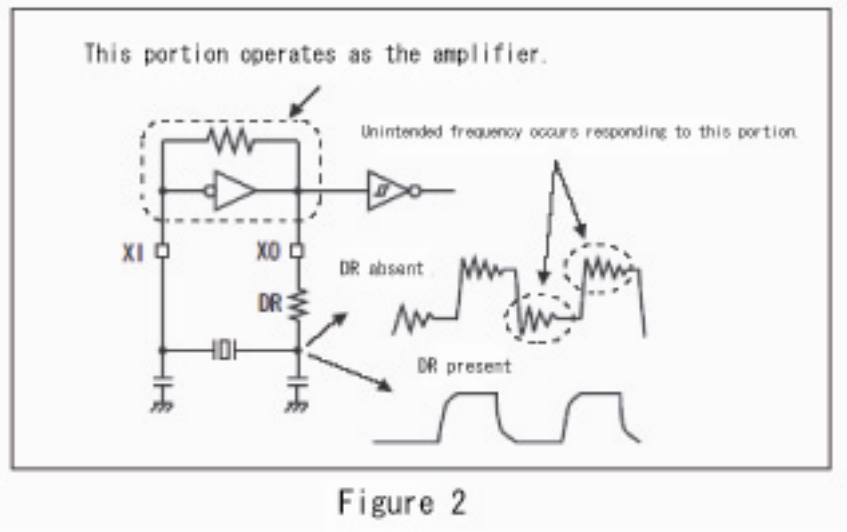
3. If you cannot obtain a favorable oscillation operation by just selecting the above C value, select the DR value also that is in the range from 0 to 300Ω. When oscillation does not start, decrease the DR value starting with about 33Ω; when frequency oscillation becomes abnormal, increase the DR value starting with about 33Ω (see "Role of DR").
4. 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.
5. 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 fully stable.

Notes:

1. BPSS=Lo; IO mode=0 to 5; and each input pin must not float.
2. The oscillation frequency goes up and down in some degree depending on the C value, DR value and the power supply voltage, but as far as the fluctuation is within 1%, MKY35 is put to practical use (because of the characteristics of HLS).
3. "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 ensured power supply voltage width.

■ Role of DR (damping resistor)

When the signal output is strong, signal distortion such as overshoot or undershoot occurs, which may cause unstable oscillation operation. The damping resistor is used to prevent such a signal distortion.



■ Measurement results for ceramic oscillator

CSACV24.00MXJ040

Connected C	Oscillation frequency	Measured VR value		
		4 V	5 V	6 V
Open	Undefined oscillation	*****	*****	*****
20 pF	24.0278 MHz	0→577Ω	60→542Ω	266→543Ω
25 pF	24.0118 MHz	0→508Ω	0→481Ω	0→5Ω
30 pF	24.0003 MHz	0→394Ω	0→429Ω	0→4Ω
35 pF	24.9919 MHz	0→310Ω	0→340Ω	0→3Ω

Table 1

Recommended C value: 30pF, Equivalent internal resistance: 40Ω or smaller, Evaluated value: 200Ω or greater

CSACV48.00MXJ040

Connected C	Oscillation frequency	Measured VR value		
		4 V	5 V	6 V
Open	Undefined oscillation	*****	*****	*****
5 pF	48.1096 MHz	0→449Ω	0→520Ω	0→543Ω
10 pF	48.0668 MHz	0→331Ω	0→391Ω	0→399Ω
15 pF	48.0409 MHz	0→205Ω	0→243Ω	0→272Ω
20 pF	48.0220 MHz	0→132Ω	0→158Ω	0→173Ω

Table 2

Recommended C value: 10pF, Equivalent internal resistance: 40Ω or smaller, Evaluated value: 200Ω or greater

Notes:

1. The frequency values in the above tables are the ones measured when DR is 33Ω, the voltage is 5V, and VR is 0.
2. There exists no MKY35-compatible ceramic oscillator having built-in capacitance, among Murata Manufacturing's standard products. So, we have not evaluated the recommended C value.
3. 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.

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