Quartz Crystal Units

■ Oscillation Circuits

The following circuit diagrams are examples of the oscillation circuits recommended when crystal units are used. After determining your frequency range and overtone specifications, you can then establish various circuit elements and conditions depending on the choice of either an IC circuit or discrete transistor.
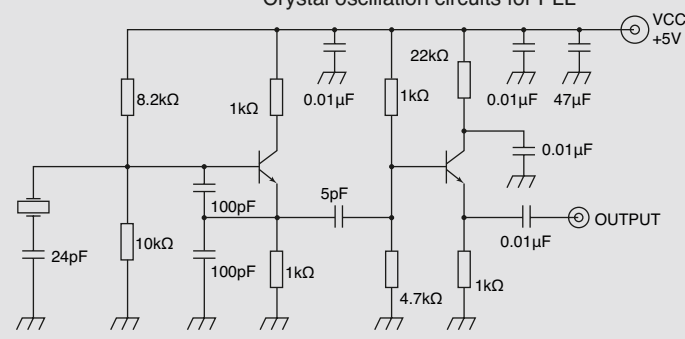
IC circuit constants or circuit configurations vary among the different IC manufactures and such factors may have a subtle effect upon the oscillation of a crystal unit.

For further details, please contact us.

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1. Frequency Range : 12 to 20 MHz
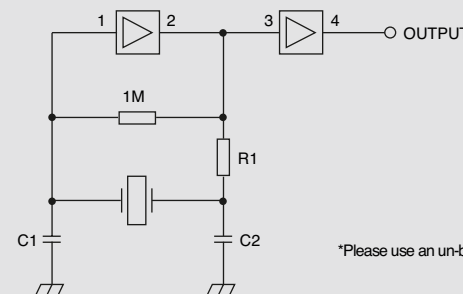**Overtone Order : Fundamental**
Load Capacitance C_L = 20 pF

Crystal oscillation circuits for PLL

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2. Frequency Range : 3 to 25 MHz
Overtone Order : Fundamental

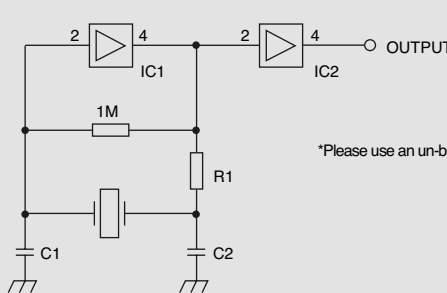| Frequency Range(MHz)	C1=C2(pF)	R1(Ω)	Load Capacitance(pF)
3 to 4	33	4.7 k	20
4 to 5	33	3.3 k	20
5 to 6	33	2.2 k	20
6 to 9	22	1.0 k	16
9 to 10	22	470	16
10 to 15	15	470	12
15 to 20	15	470	12
20 to 25	10	470	10

74HCUO4AP

*Please use an un-buffered type inverter.

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3. Frequency Range : 3 to 25 MHz
Overtone Order : Fundamental

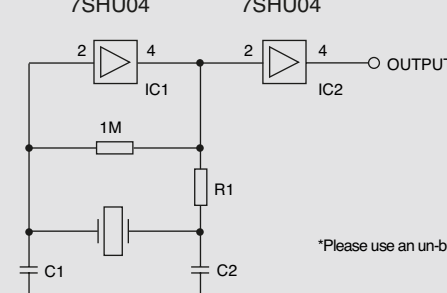| Frequency Range(MHz)	C1=C2(pF)	R1(Ω)	Load Capacitance(pF)
3 to 4	33	6.8 k	20
4 to 5	33	4.7 k	20
5 to 6	33	3.3 k	20
6 to 9	22	2.2 k	16
9 to 10	22	1.0 k	16
10 to 15	15	470	12
15 to 20	10	330	12
20 to 25	7	330	10

7SU04F   7SU04F

*Please use an un-buffered type inverter.

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4. Frequency Range : 25 to 50MHz
Overtone Order : Fundamental

Frequency Range(MHz)	C1=C2(pF)	R1(Ω)	Load Capacitance(pF)
25 to 30	15	1.0 k	12
30 to 40	10	680	10
40 to 50	7	330	8

7SHU04   7SHU04

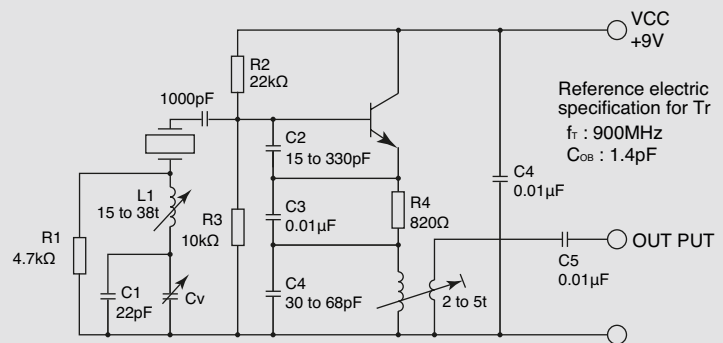*Please use an un-buffered type inverter.

Quartz Crystal Units

5. Frequency Range : 30 to 60 MHz
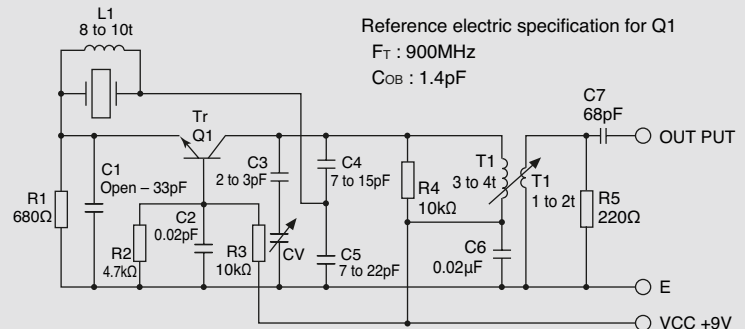**Overtone Order : 3rd overtone**

Frequency Range (MHz)	C1(pF)	C2(pF)	L1(µH)	R1(Ω)	Load Capacitance (pF)
3 0 t o 4 0	10	18 to 10	2.2	820	10
4 0 t o 5 0	7	15 to 10	1.5	470	8
5 0 t o 6 0	5	15 to 10	1.0	330	8

7SHU04 IC1   7SHU04 IC2

OUTPUT

1M

R1

C1

C2 L1

1000pF

*Please use an un-buffered type inverter.
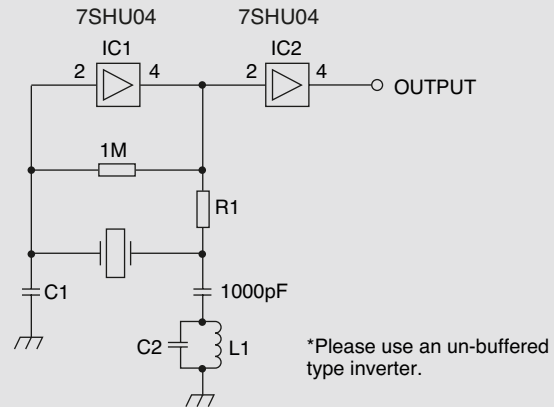
6. Frequency Range : 16 to 80 MHz max
Overtone Order : 3rd, 5th overtone
Load Capacitance CL : Series resonance

VCC +9V

Reference electric specification for Tr
f_T : 900MHz
C_{OB} : 1.4pF

R2 22kΩ
1000pF
C2 15 to 330pF
C3 0.01µF
R4 820Ω
C4 0.01µF
OUT PUT
C5 0.01µF
L1 15 to 38t
R3 10kΩ
R1 4.7kΩ
C1 22pF
Cv
C4 30 to 68pF
2 to 5t

7. Frequency Range : 80 to 140 MHz max
Overtone Order : 3rd, 5th overtone
Load Capacitance CL : Series resonance

L1 8 to 10t

Reference electric specification for Q1
F_T : 900MHz
C_{OB} : 1.4pF

Tr Q1
C1 Open – 33pF
R1 680Ω
R2 4.7kΩ
C2 0.02pF
R3 10kΩ
CV
C3 2 to 3pF
C5 7 to 22pF
C4 7 to 15pF
R4 10kΩ
C6 0.02µF
T1 3 to 4t
T1 1 to 2t
C7 68pF
OUT PUT
R5 220Ω
E
VCC +9V
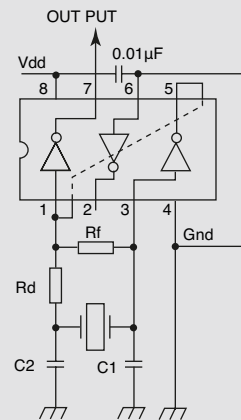
NDK
Crystal Bridge to the Future

■ Oscillation Circuits

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8. Example of Un-buffered IC Oscillation Circuit Connection

To prevent coupling between input and output:
• Position input pin 3 at a distance from output pin 7.
• Inactivate the inverter at the center.

OUT PUT
Vdd   0.01μF
8   7   6   5
1   2   3   4
Rf
Rd
Gnd
C2   C1

Rf=1MΩ
Rd=100 to 10kΩ
C1, C2=5 to 33pF

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9. Example of IC Internal Oscillation Circuit Connection

To achieve correct operation:
• When IC has Resistance R1 already embedded, its mounting is unnecessary.
• Resistance R2 is necessary for the prevention of abnormal oscillation.
• Use this circuitry as the base pattern.
• Install Resistance R2 on to the output side after checking the IC terminal function.

C-MOS
Xin   Xout
R1
R2
C1   C2
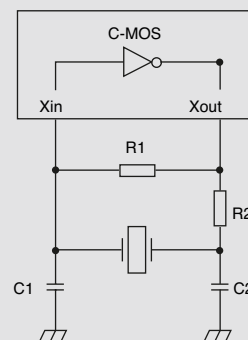
R1=1MΩ
R2=100 to 10kΩ
C1, C2=5 to 33pF

Note for Mounting:

1. Use the shortest distance for lines connecting parts, including ground lines, in order to prevent the inclusion of unnecessary stray capacitance.

2. Do not allow any part of the oscillation circuit to cross over a signal line of any other circuit on the same circuit board.