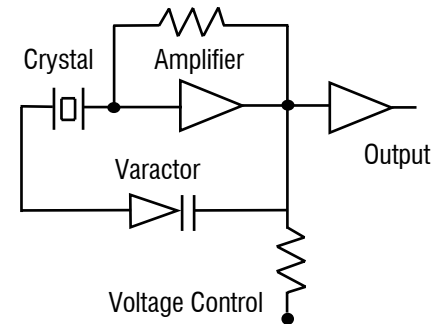## What is a VCXO ?

Unlike regular clock oscillator which has fixed output frequency, the output frequency of a **VCXO** (also known as "**frequency modulator**") can be tuned $\pm 50 \sim \pm 200$ ppm up or down from the nominal frequency by varying the control voltage on the voltage control pin. Varactor, a voltage variable capacitance tuning diode, is used to achieve this purpose.

Applications of VCXO include (PLL) phase lock loop, SONET/ATM, set-top boxes, MPEG , audio-video modulations, video game consoles and HDTV sets.

Product Summary:

Package Code	Frequency Range	Assembly Technique	Package Size (mm) [inches]
Thru-Hole Types			
G14	500 kHz $\sim$ 170 MHz	4 pin DIL full size	12.8 x 20.2 x 5.88H [0.504 x 0.795 x 0.231]
G8	500 kHz $\sim$ 170 MHz	4 pin DIL half size	12.8 x 12.8 x 5.88H [0.504 x 0.504 x 0.231]
Surface Mount Types – Gull Wing			
G24	500 kHz $\sim$ 170 MHz	Gull wing version of G14	12.8 x 20.2 x 7.6H [0.504 x 0.795 x 0.300]
G18	500 kHz $\sim$ 170 MHz	Gull wing version of G8	12.8 x 12.8 x 7.6H [0.504 x 0.504 x 0.300]
Surface Mount Types – Leadless			
G61	500 kHz $\sim$ 170 MHz	6 pad FR4 Leadless	9.6 x 11.4 x 1.85H [0.378 x 0.449 x 0.073]
G62	500 kHz $\sim$ 170 MHz	6 pad FR4 Leadless	9.6 x 11.4 x 2.5H [0.378 x 0.449 x 0.098]
G42	500 kHz $\sim$ 170 MHz	4 pad FR4 Leadless	9.6 x 11.4 x 2.5H [0.378 x 0.449 x 0.098]
G64	500 kHz $\sim$ 170 MHz	6 pad FR4 Leadless	9.6 x 11.4 x 4.7H [0.378 x 0.449 x 0.185]
G44	500 kHz $\sim$ 170 MHz	4 pad FR4 Leadless	9.6 x 11.4 x 4.7H [0.378 x 0.449 x 0.185]
G57	2 MHz $\sim$ 60 MHz	4 pad Ceramic Leadless	5.0 x 7.0 x 1.7H [0.197 x 0.275 x 0.067]
G576	2 MHz $\sim$ 60 MHz	6 pad Ceramic Leadless	5.0 x 7.0 x 1.7H [0.197 x 0.275 x 0.067]
G575	500 KHz $\sim$ 170 MHz	6 pad Leadless	5.0 x 7.5 x 2.65H [0.197 x 0.295 x 0.104]

MERCURY www.mercury-crystal.com
Taiwan: TEL (886)-2-2695-7099, FAX (886)-2-2695-7473, e-mail: sales-tw@mercury-crystal.com
U.S.A.: TEL (1)-909-466-0427,   FAX (1)-909-466-0762,   e-mail: sales-us@mercury-crystal.com
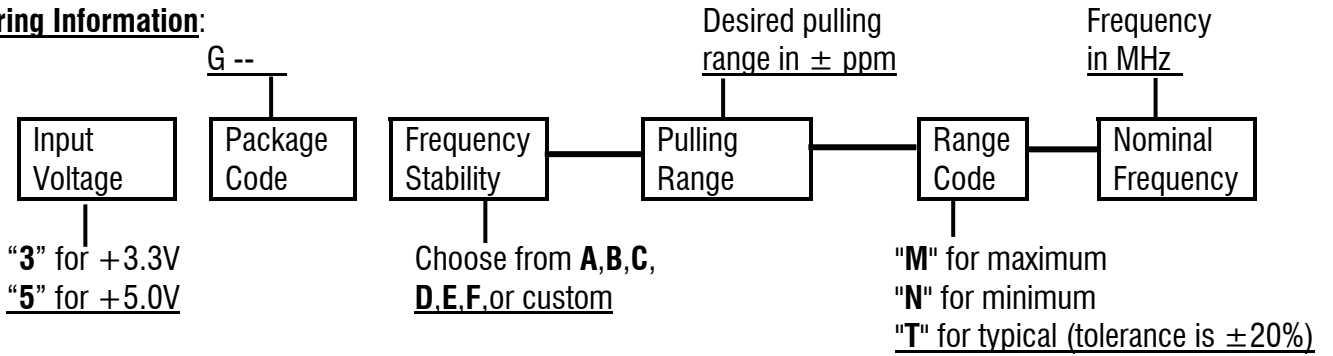
| MERCURY | Page 1 of 6 | Date: Dec. 1, 2001 | Rev. 0 |

"G" series General Specifications

$T_A = +25°C$, $V_{DD} =$ At specified voltage, CL=15 pF

		3.3 V System	5.0 V System
Input Voltage (V_{DD})		$V_{DD} = +3.3$ V D.C. $\pm5\%$ Control Voltage Center (Vc)= +1.65 V Voltage code is "**3**"	$V_{DD} = +5.0$ V D.C. $\pm5\%$ Control Voltage Center (Vc) = +2.5 V Voltage code is "**5**"
Initial Frequency Accuracy (at+25°C)		To tune to the nominal frequency with Vc = 1.65 V$\pm$0.2V	To tune to the nominal frequency with Vc = 2.5V V$\pm$0.2V
Frequency Range	**Commercial temperature (0°C to +70°C)**	500 kHz $\sim$ 100 MHz	500 kHz $\sim$ 156 MHz
	Industrial temperature (-40°C to +85°C)	500 kHz $\sim$ 90 MHz	500 kHz $\sim$ 140 MHz
Output Voltage HIGH "1"	TTL	2.4 V min.	2.4 V min.
	CMOS	2.97 min.	Vcc – 0.5 min.
Output Voltage LOW "0"	TTL	0.4 V max.	0.4 V max.
	CMOS	0.33 max.	0.5 V max.
Frequency Pulling Range		From ±30 ppm to ±150 ppm Control Voltage Range: 0.3 V to 3.0 V	From ±80 ppm to ±200 ppm Control Voltage Range: 0.5 V to 4.5 V
Frequency Stability[1] Commercial temp. range (code "**C**")		"**A**": ±25 ppm over 0°C to +70°C "**B**":±50 ppm over 0°C to +70°C "**C**":±100 ppm over 0°C to +70°C For non-standard please give desired frequency stability after the "**C**". For example "C20" is ±20 ppm over 0 to +70°C	
Frequency Stability[1] Industrial temp. range (code "**I**")		"**D**":±25 ppm over -40°C to +85° (not available on all packages) "**E**":±50 ppm over -40°C to +85°C "**F**":±100 ppm over -40°C to +85°C For non-standard please give desired frequency stability after the "**I**". For example "I20" is ±20 ppm over -40 to +85°C	
Output Load	TTL	5 $\sim$ 10 TTL gates	
	CMOS	15 $\sim$ 50 pF	
Rise Time (Tr) and Fall Time (Tf)	TTL	5 n Sec. max; 2 n Sec. typical. Measured between 0.4V to 2.4V (RL=390 Ω; CL=15 pF)	
	CMOS	5 n Sec. max; 2 n Sec. typical. Measured between 10% to 90%V_{DD} (CL=15 pF)	
Duty Cycle	TTL	40% min. 60 % max. (measured at +1.4 V)	
	CMOS	40% min. 60 % max. (measured at 50% V_{DD})	
Start-up Time (Ts)		10 m Sec. max. 5 m Sec. typical	
Linearity		10% max.; 6% typical	
Slope Polarity (Transfer Function)		**Monotonic and Positive**: Increasing control voltage always increases output frequency. Negative slope is also available.	
Current Consumption		15 $\sim$ 45 mA (frequency dependent)	
Modulation Bandwidth (±3 dB)		10 kHz min.	
Input Impedance		10 kΩ at 10 kHz min.	
Storage Temperature		-40°C to +85°C	
Aging		±5 ppm per year max.	
Jitter, one sigma, 155.520 MHz, +5 V		25 ps typical, 28 ps max.	

[1]Inclusive of 25°C tolerance, operating temperature range, $\pm10\%$ input voltage variation, load change, aging, shock and vibration.
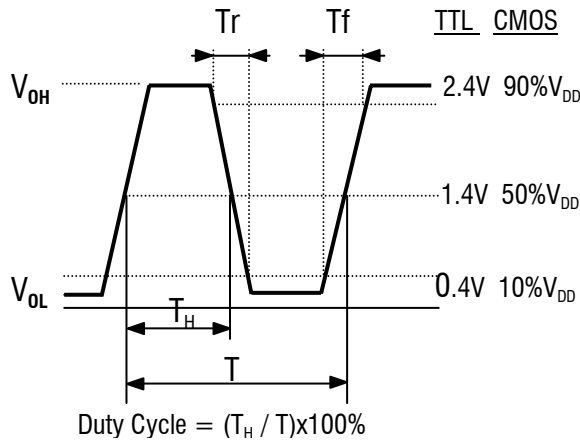
V C X O   "G" series

Logic: TTL / CMOS
Wave Form: Square

MERCURY
Since 1973

Ordering Information:

G --

Desired pulling range in ± ppm

Frequency in MHz

Input Voltage	Package Code	Frequency Stability	Pulling Range	Range Code	Nominal Frequency

"**3**" for +3.3V
"**5**" for +5.0V

Choose from **A,B,C, D,E,F,**or custom

"**M**" for maximum
"**N**" for minimum
"**T**" for typical (tolerance is ±20%)

Part Number Examples:

3G44B-120T-54.000   represents 54.0 MHz VCXO in G44 package, frequency stability is ±50 ppm from 0°C to +70°C, pullability is ±120 ppm typical, +3.3 V.
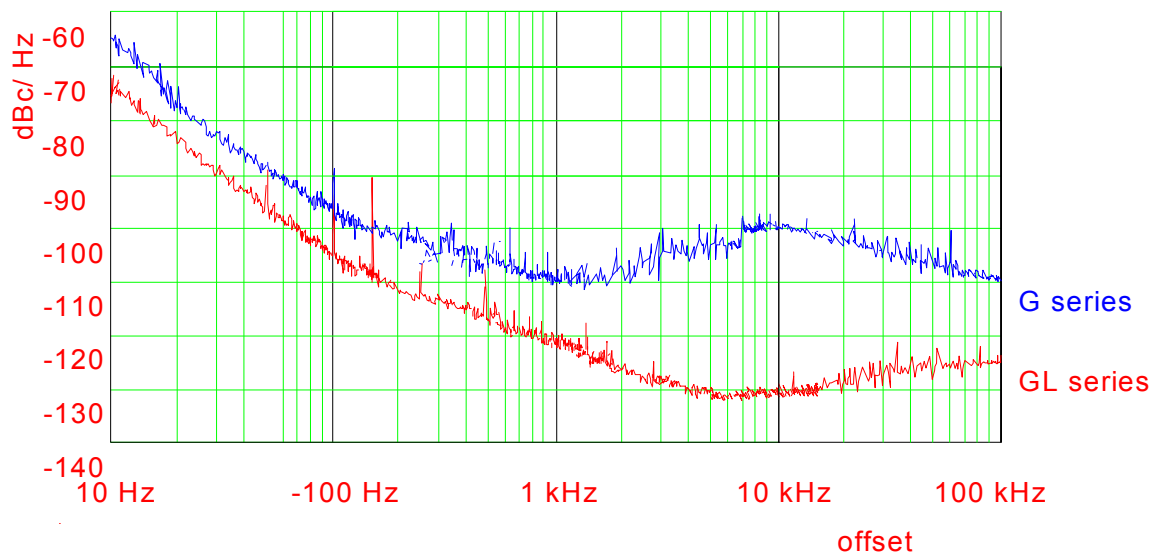
Output Waveform:

Tr   Tf   TTL CMOS

V_{OH} 2.4V 90%V_{DD}

1.4V 50%V_{DD}

V_{OL} 0.4V 10%V_{DD}

T_H

T

Duty Cycle = (T_H / T)x100%

Transfer Function: Typical response of 5G14C-150N-27.000
(at +25°C, postive transfer)

Freq. Deviation (ppm)

+150
+100
+50
0
-50
-100
-150

0.5   1.5   2.5   3.5   4.5
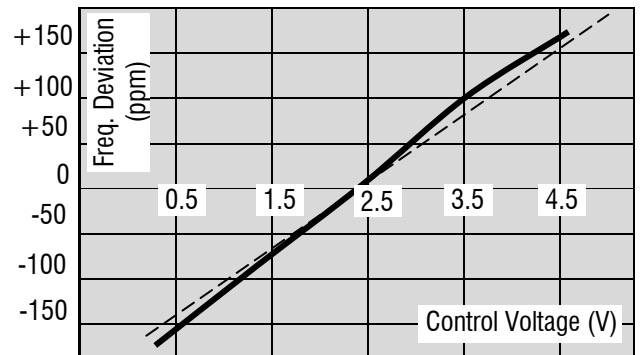
Control Voltage (V)

" ------ " : Theoretical 0% non-linearity

SSB Phase Noise: 155.520 MHz at +3.3V
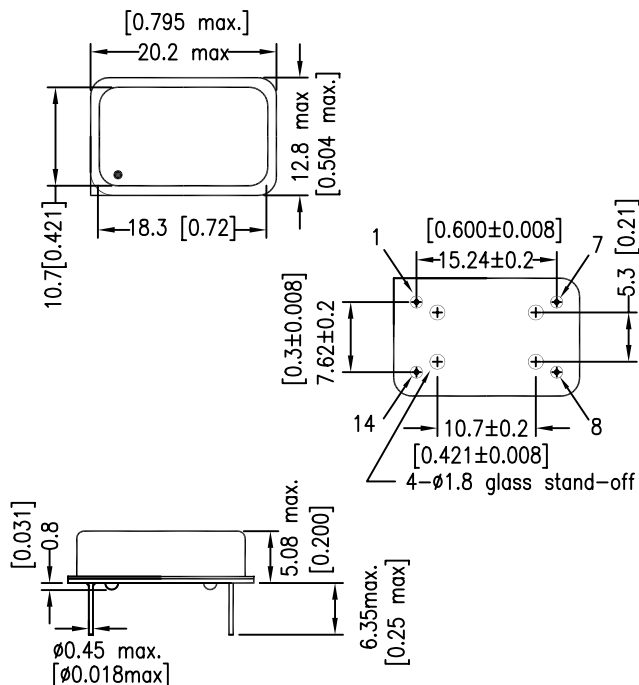
dBc/ Hz

-60
-70
-80
-90
-100
-110
-120
-130
-140

10 Hz   -100 Hz   1 kHz   10 kHz   100 kHz

offset

G series

GL series

Package: G14

[0.795 max.]
20.2 max

12.8 max
[0.504 max.]

10.7[0.421]

18.3 [0.72]

[0.600±0.008]
15.24±0.2

1   7

[0.3±0.008]
7.62±0.2

5.3 [0.21]

14   8

10.7±0.2
[0.421±0.008]

4-Ø1.8 glass stand-off

[0.031]
0.8

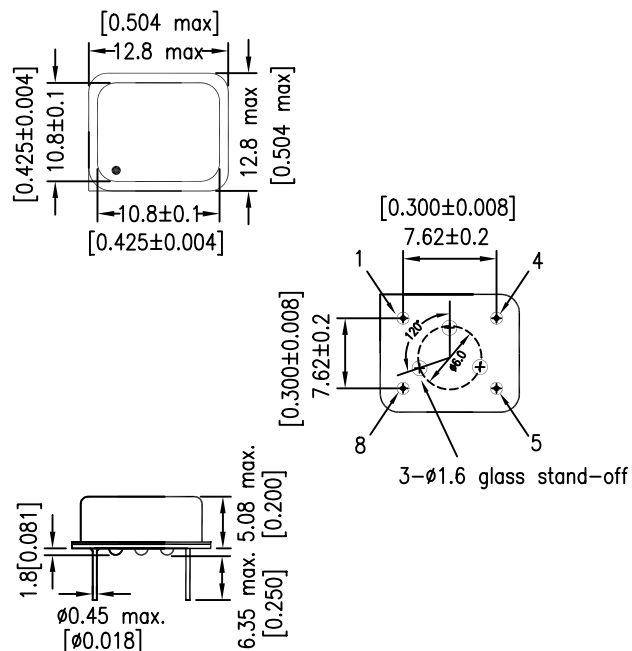5.08 max.
5.08
[0.200]

6.35max.
[0.25 max]

Ø0.45 max.
[Ø0.018max]

Pin Connections   Square corner denotes pin 1

Pin 1: Voltage Control
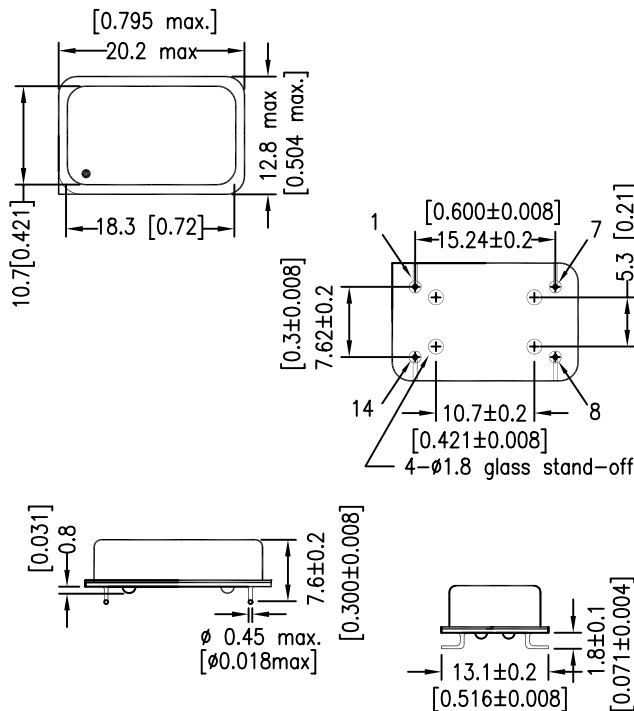Pin 7: Ground
Pin 8: Output
Pin 14: Supply Voltage

Package: G8

[0.504 max]
12.8 max

[0.425±0.004]
10.8±0.1

12.8 max
[0.504 max]

10.8±0.1
[0.425±0.004]

[0.300±0.008]
7.62±0.2

1   4

[0.300±0.008]
7.62±0.2

8   5

120°
Ø6.0

3-Ø1.6 glass stand-off

1.8[0.081]

5.08 max.
[0.200]

6.35 max.
[0.250]

Ø0.45 max.
[Ø0.018]

Pin Connections   Square corner denotes pin 1

Pin 1: Voltage Control
Pin 4: Ground
Pin 5: Output
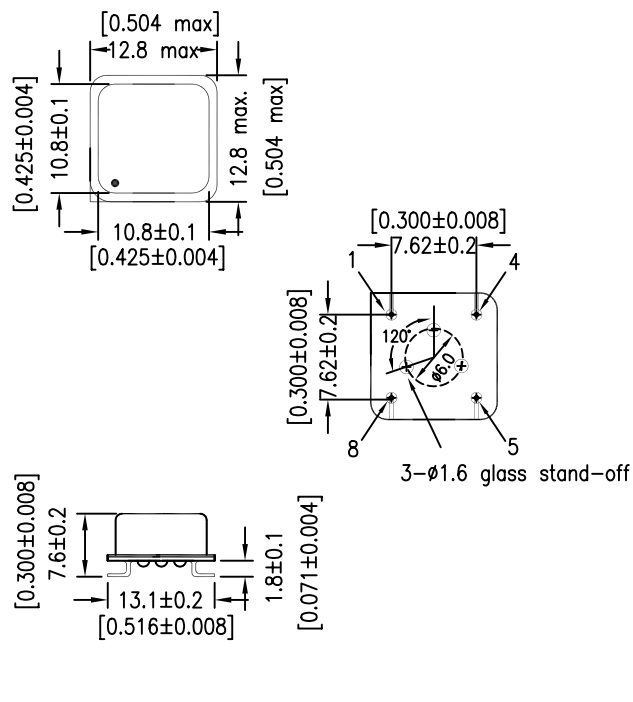Pin 8: Supply Voltage

VCXO
TTL,HCMOS

Package: G24

[0.795 max.]
20.2 max

12.8 max
[0.504 max.]

10.7[0.421]

18.3 [0.72]

[0.600±0.008]
15.24±0.2

1   7

[0.3±0.008]
7.62±0.2

5.3 [0.21]

14   8

10.7±0.2
[0.421±0.008]

4-Ø1.8 glass stand-off

[0.031]
0.8

7.6±0.2
[0.300±0.008]

Ø 0.45 max.
[Ø0.018max]

13.1±0.2
[0.516±0.008]

1.8±0.1
[0.071±0.004]

Pin Connections   Square corner denotes pin 1

Pin 1: Voltage Control
Pin 7: Ground
Pin 8: Output
Pin 14: Supply Voltage

Package: G18

[0.504 max]
12.8 max

[0.425±0.004]
10.8±0.1

12.8 max
[0.504 max]

10.8±0.1
[0.425±0.004]

[0.300±0.008]
7.62±0.2

1   4

[0.300±0.008]
7.62±0.2

8   5

120°
Ø6.0

3-Ø1.6 glass stand-off

[0.300±0.008]
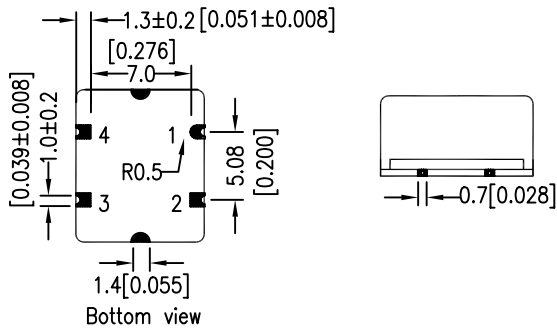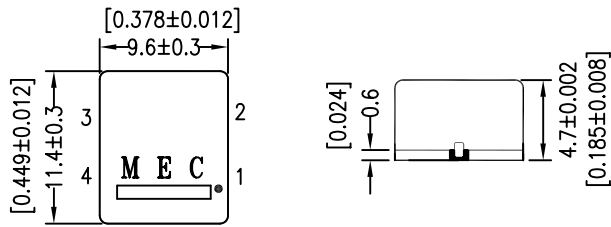7.6±0.2

13.1±0.2
[0.516±0.008]

1.8±0.1
[0.071±0.004]

Pin Connections   Square corner denotes pin 1

Pin 1: Voltage Control
Pin 4: Ground
Pin 5: Output
Pin 8: Supply Voltage

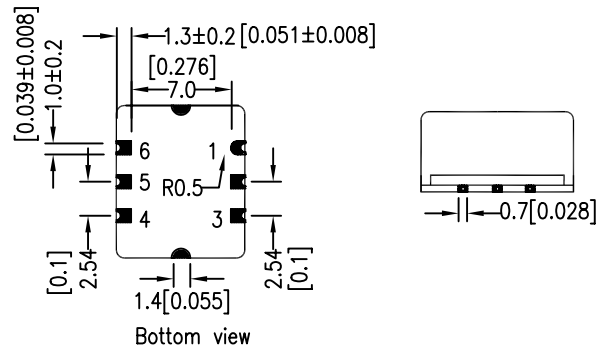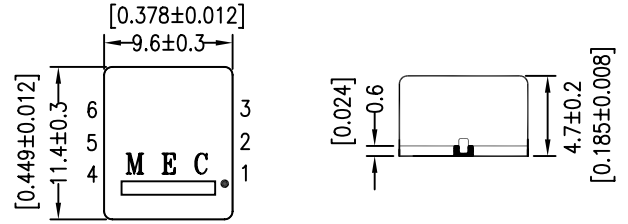## Package: G44
"44" represents 4 pads and 4.7 mm overall height

[0.378±0.012]
9.6±0.3
[0.449±0.012]
11.4±0.3
M E C
3
2
1
4

[0.024]
0.6
4.7±0.002
[0.185±0.008]

1.3±0.2 [0.051±0.008]
[0.276]
7.0
[0.039±0.008]
1.0±0.2
4   1
R0.5
3   2
5.08
[0.200]
1.4[0.055]
Bottom view

0.7[0.028]

Pad Connections:
Pad 1: Voltage Control (rounded pad)
Pad 2: Ground
Pad 3: Output
Pad 4: Supply Voltage

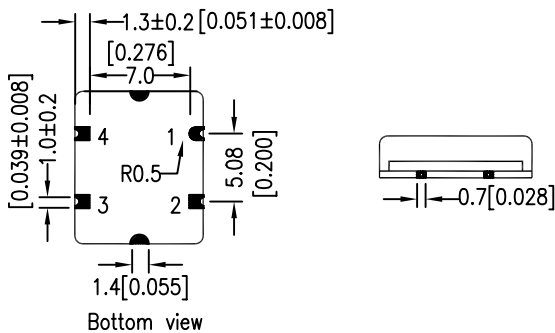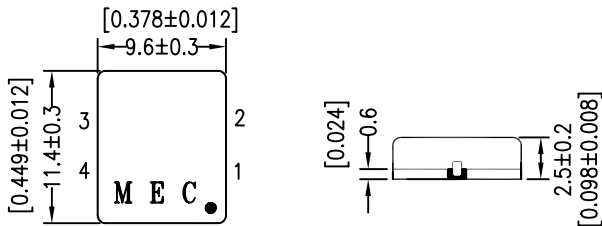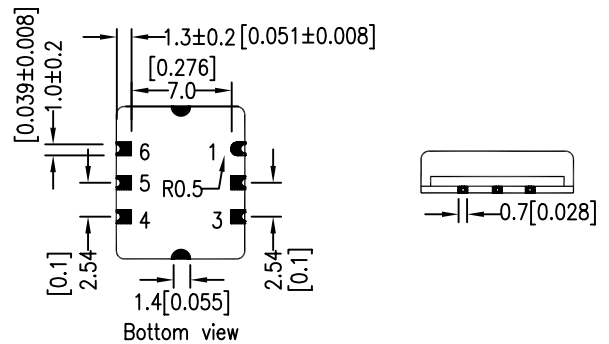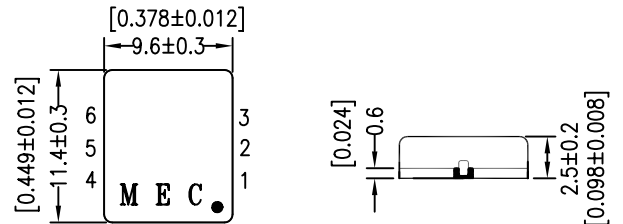## Package: G64
"64" represents 6 pads and 4.7 mm overall height

[0.378±0.012]
9.6±0.3
[0.449±0.012]
11.4±0.3
M E C
3
2
1
4

[0.024]
0.6
4.7±0.2
[0.185±0.008]

1.3±0.2[0.051±0.008]
[0.276]
7.0
[0.039±0.008]
1.0±0.2
6   1
5   R0.5
4   3
2.54
[0.1]
[0.1]
2.54
1.4[0.055]
Bottom view

0.7[0.028]

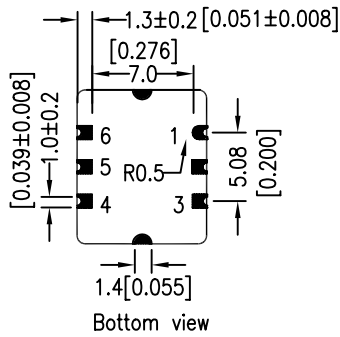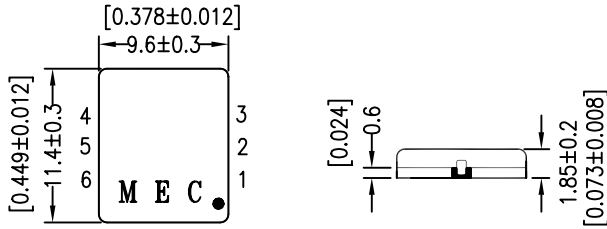### Pad Connections:
Pad 1: Voltage Control (rounded pad)
Pad 2: Tri-State
Pad 3: Ground
Pad 4: Output
Pad 5: No Connection
Pad 6: Supply Voltage

VCXO
TTL, HCMOS

Package: G42
"42" represents 4 pads and 2.5 mm overall height

[0.378±0.012]
9.6±0.3
[0.449±0.012]
11.4±0.3
M E C
3
2
1
4

[0.024]
0.6
2.5±0.2
[0.098±0.008]

1.3±0.2 [0.051±0.008]
[0.276]
7.0
[0.039±0.008]
1.0±0.2
4   1
R0.5
3   2
5.08
[0.200]
1.4[0.055]
Bottom view

0.7[0.028]

Pad Connections:
Pad 1: Voltage Control (rounded pad)
Pad 2: Ground
Pad 3: Output
Pad 4: Supply Voltage

Package: G62
"62" represents 6 pads and 2.5 mm overall height

[0.378±0.012]
9.6±0.3
[0.449±0.012]
11.4±0.3
M E C
6
5
4
3
2
1

[0.024]
0.6
2.5±0.2
[0.098±0.008]

1.3±0.2 [0.051±0.008]
[0.276]
7.0
[0.039±0.008]
1.0±0.2
6   1
5   R0.5
4   3
2.54
[0.1]
[0.1]
2.54
1.4[0.055]
Bottom view

0.7[0.028]

Pad Connections:
Pad 1: Voltage Control (rounded pad)
Pad 2: Tri-State
Pad 3: Ground
Pad 4: Output
Pad 5: No Connection
Pad 6: Supply Voltage

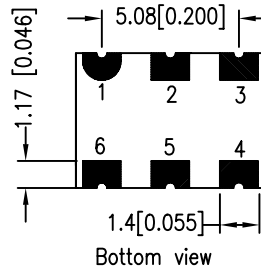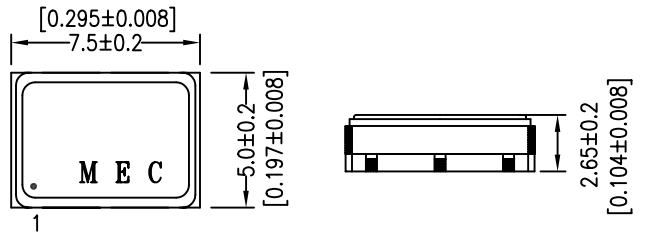**Package: G61**
"61" represents 6 pads and 1.85 mm overall height

Package: G575

Unit: mm [inches]

[0.378±0.012]
9.6±0.3

[0.449±0.012]
11.4±0.3

4
5
6

3
2
1

M E C

[0.024]
0.6

1.85±0.2
[0.073±0.008]

[0.295±0.008]
7.5±0.2

5.0±0.2
[0.197±0.008]

M E C
1

2.65±0.2
[0.104±0.008]

1.3±0.2 [0.051±0.008]
[0.276]
7.0

[0.039±0.008]
1.0±0.2

6
5
4

1
3

R0.5

5.08
[0.200]

←‖←0.7[0.028]

1.4[0.055]

Bottom view
Rounded pad is pad No. 1

1.17 [0.046]

5.08[0.200]
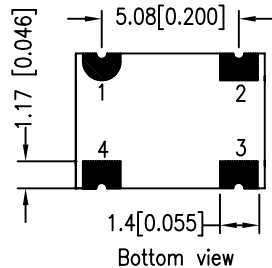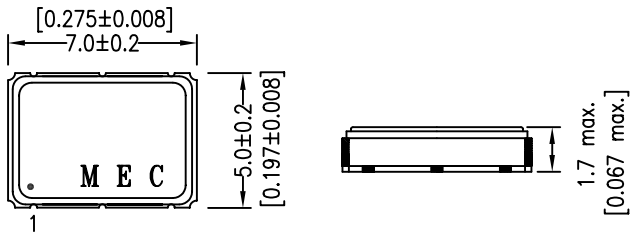
1
6

2
5

3
4

1.4[0.055]
Bottom view

0.6 [0.024]

Rounded pad is pad No. 1

Pad Connections:

Pad 1: Voltage Control   Pad 2: Tri−State
Pad 3: Ground   Pad 5: No connection
Pad 4: Output
Pad 6: Supply Voltage

Pad Connections:

Pad 1: Voltage Control   Pad 2: Tri−State
Pad 3: Ground   Pad 5: No connection
Pad 4: Output
Pad 6: Supply Voltage

V C X O
TTL,HCMOS

Package: G57   4 Pads

Package: G576   6 pads

[0.275±0.008]
7.0±0.2

5.0±0.2
[0.197±0.008]

M E C
1

1.7 max.
[0.067 max.]

[0.275±0.008]
7.0±0.2

5.0±0.2
[0.197±0.008]

M E C
1

1.7 max.
[0.067 max.]

1.17 [0.046]

5.08[0.200]

1
4

2
3

1.4[0.055]
Bottom view

0.6 [0.024]

1.17 [0.046]

5.08[0.200]
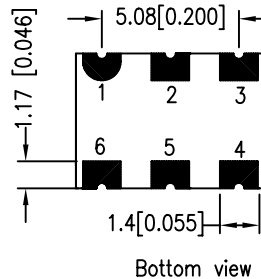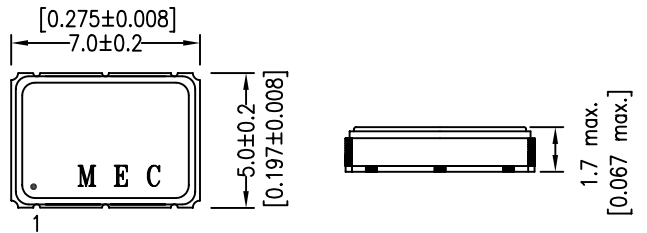
1
6

2
5

3
4

1.4[0.055]
Bottom view

0.6 [0.024]

Rounded pad is pad No. 1

Rounded pad is pad No. 1

Pad Connections:

Pad 1: Voltage Control
Pad 2: Ground
Pad 3: Output
Pad 4: Supply Voltage

Pad Connections:

Pad 1: Voltage Control   Pad 2: Tri−State
Pad 3: Ground   Pad 5: No connection
Pad 4: Output
Pad 6: Supply Voltage