

## TO-700 Series Temperature Compensated Crystal Oscillator



### Features

- Frequencies to 52 MHz
- Stability to  $\pm 1\text{ppm}$  @  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Low Aging
- 14mm x 9mm and 19mm x 13mm Surface Mount Designs
- 3.3 and 5.0 Volt Options
- HCMOS, LVHCMOS and Sinewave Outputs Available
- ASIC Technology

### Applications

- Wireless Communication Equipment
- Mobile Radios and Network systems
- ISDN, ATM, SONET/SDH and GSM Systems

### Description

The model TO-700 Temperature Compensated Crystal Oscillator is available in frequencies from 2 MHz to 52MHz.

The new design introduces an ASIC based temperature compensation method that provides exceptionally low aging rates and superior temperature stabilities in a small surface mount package.

The TO-700 can achieve an aging rate of  $<1\text{ppm}/\text{year}$  with stability to  $\pm 1\text{ppm}$  at  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

# TO-700 Series

## Temperature Compensated Crystal Oscillator

### Performance Characteristics

| Parameter                                                                                         |                                                                                             | Characteristic                                                                   |                                                                                  |
|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Series:                                                                                           | TO-700                                                                                      | TO-710                                                                           | TO-720                                                                           |
| Frequency Range:                                                                                  | 10 MHz to 52 MHz                                                                            | 2 MHz to 52 MHz                                                                  | 10 MHz to 52 MHz                                                                 |
| Nominal Frequency Tolerance:<br>@ 2.5 V before reflow soldering<br>@ 2.5 V after reflow soldering | <±1 ppm<br><±3 ppm                                                                          |                                                                                  |                                                                                  |
| Frequency Stability<br>(in the Operating Temperature Range):                                      | TO-701: <±1.0 ppm<br>TO-702: <±1.5 ppm<br>TO-703: <±0.5 ppm<br>TO-704: <±1.0 ppm            | TO-711: <±1.0 ppm<br>TO-712: <±1.5 ppm<br>TO-713: <±0.5 ppm<br>TO-714: <±1.0 ppm | TO-721: <±1.0 ppm<br>TO-722: <±1.5 ppm<br>TO-723: <±0.5 ppm<br>TO-724: <±1.0 ppm |
| Frequency vs Supply - Voltage                                                                     | <±0.2 ppm ±10%                                                                              | <±0.25 ppm ±5%                                                                   |                                                                                  |
| Frequency vs Load - Changes                                                                       | 0.1 ppm ±10%                                                                                |                                                                                  |                                                                                  |
| Aging @ 25°C:                                                                                     | <±2.0 ppm/first year<br><±1.0 ppm/year                                                      |                                                                                  |                                                                                  |
| Frequency Control Range:                                                                          | ±10 to 15 ppm                                                                               |                                                                                  |                                                                                  |
| Control Voltage Range:                                                                            | 0.5V to 4.5V                                                                                |                                                                                  | 0.3V to 3.0V                                                                     |
| Voltage Control Input Impedence:                                                                  | >50 k Ohm                                                                                   |                                                                                  |                                                                                  |
| Transfer Function Linearity:                                                                      | negative/10%                                                                                |                                                                                  |                                                                                  |
| Supply Voltage:                                                                                   | 5.0Vdc±10%                                                                                  |                                                                                  | 3.3Vdc±10%                                                                       |
| Current Consumption:                                                                              | ≤3 mA                                                                                       | ≤20 mA                                                                           |                                                                                  |
| Output Voltage/Load:                                                                              | Sinewave<br>≥1V <sub>pp</sub> , 10 k Ohm//10pF<br>(optional 1kOhm)                          | HCMOS<br>1k Ohm//15pF<br>40%...60%                                               | LVHCMOS<br>1k Ohm//15pF<br>40%...60%                                             |
| Phase Noise (typical) at 10 MHz:                                                                  | -110 dBc/Hz at 100 Hz offset<br>-130 dBc/Hz at 1 kHz offset<br>-135 dBc/Hz at 10 kHz offset |                                                                                  |                                                                                  |
| Temperature Ranges                                                                                | TO-701/TO-702<br>-40°C to +85°C<br>TO-703/TO-704<br>-20°C to +70°C                          | TO-711/TO-712<br>-40°C to +85°C<br>TO-713/TO-714<br>-20°C to +70°C               | TO-701/TO-702<br>-40°C to +85°C<br>TO-723/TO-724<br>-20°C to +70°C               |

# TO-700 Series

## Temperature Compensated Crystal Oscillator

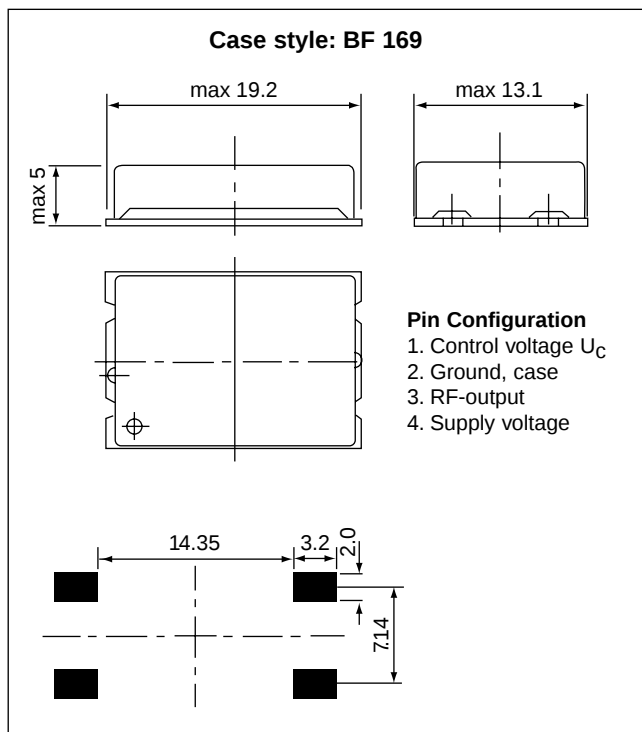
### Performance Characteristics

| Parameter                                                                                         | Characteristic                                                                              |                                                                                  |
|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Series:                                                                                           | TO-750                                                                                      | TO-760                                                                           |
| Frequency Range:                                                                                  | TO-751/752: 15 MHz to 22 MHz<br>TO-753/754: 15 MHz to 26 MHz                                | 15 MHz to 52 MHz                                                                 |
| Nominal Frequency Tolerance:<br>@ 2.5 V before reflow soldering<br>@ 2.5 V after reflow soldering | <±1 ppm<br><±3 ppm                                                                          |                                                                                  |
| Frequency Stability<br>(in the Operating Temperature Range):                                      | TO-751: <±2.5 ppm<br>TO-752: <±3.0 ppm<br>TO-753: <±1.5 ppm<br>TO-754: <±2.0 ppm            | TO-761: <±1.0 ppm<br>TO-762: <±1.5 ppm<br>TO-763: <±0.5 ppm<br>TO-764: <±1.0 ppm |
| Frequency V Supply - Voltage ±10%:                                                                | TO-751: <±1.5 ppm<br>TO-752: <±1.5 ppm<br>TO-753: <±1.0 ppm<br>TO-754: <±1.0 ppm            | <±0.2 ppm                                                                        |
| Frequency V Load - Changes ±10%:                                                                  | <±0.3 ppm                                                                                   | <±0.1 ppm                                                                        |
| Aging @ 25°C:                                                                                     | <±2.0 ppm/first year<br><±1.0 ppm/year after 2 years                                        |                                                                                  |
| Frequency Control Range:                                                                          | ≥±10 ppm                                                                                    |                                                                                  |
| Control Voltage Range:                                                                            | 0.5V to 4.5V                                                                                |                                                                                  |
| Voltage Control Input Impedance:                                                                  | >50 k Ohm                                                                                   |                                                                                  |
| Transfer Function Linearity:                                                                      | negative/10%                                                                                |                                                                                  |
| Supply Voltage:                                                                                   | 5.0Vdc±10%                                                                                  |                                                                                  |
| Current Consumption:                                                                              | ≤20 mA                                                                                      | ≤3 mA                                                                            |
| Output Voltage/Load:                                                                              | HCMOS<br>1k Ohm//15pF<br>40%...60%                                                          | Sinewave<br>10 k Ohm//10pF                                                       |
| Phase Noise (typical) at 10 MHz:                                                                  | -105 dBc/Hz at 100 Hz offset<br>-125 dBc/Hz at 1 kHz offset<br>-130 dBc/Hz at 10 kHz offset |                                                                                  |
| Temperature Ranges                                                                                | TO-751/752/761/762                                                                          | TO-753/754/763/764                                                               |
| Operating:                                                                                        | -40°C ... +85°C                                                                             | -20°C ... +70°C                                                                  |
| Operable:                                                                                         | -45°C ... +90°C                                                                             | -25°C ... +85°C                                                                  |
| Storage:                                                                                          | -50°C ... +105°C                                                                            | -50°C ... +105°C                                                                 |

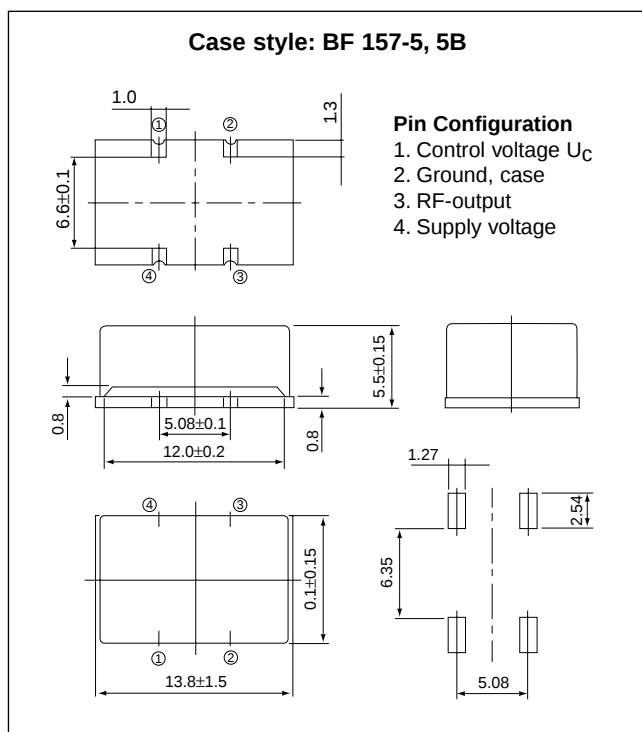
# TO-700 Series

## Temperature Compensated Crystal Oscillator

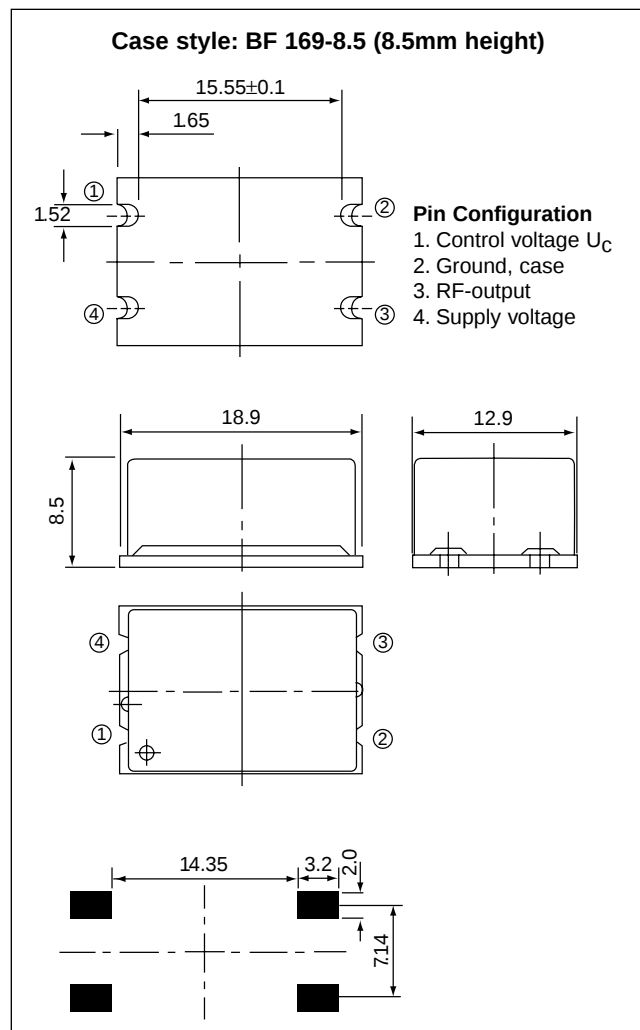
### TO-700 and TO-710 Series



### TO-750 and TO-760 Series



### TO-720 Series

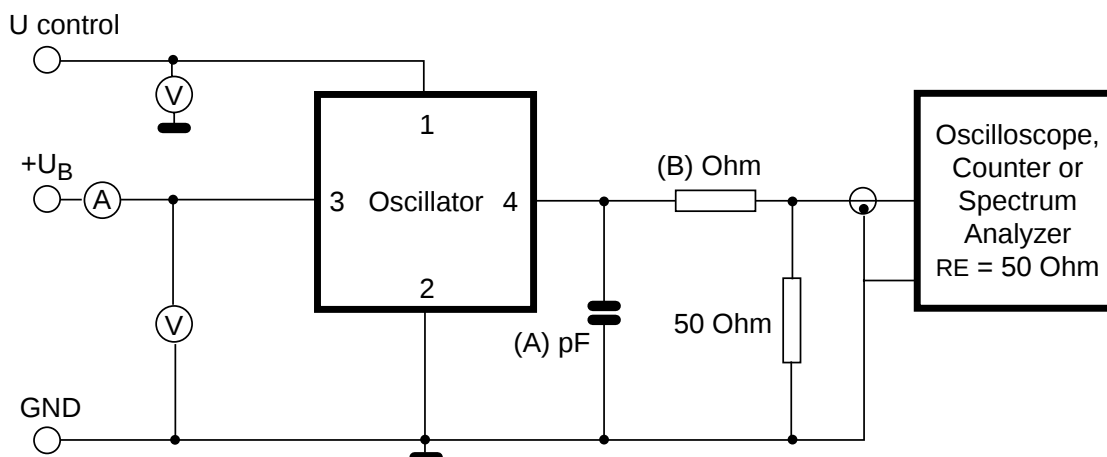


*Note: Dimensions in millimeters*

# TO-700 Series

## Temperature Compensated Crystal Oscillator

### Test Circuit



|               | A     | B        |
|---------------|-------|----------|
| TO-700 Series | 10 pF | 9975 ohm |
| TO-710 Series | 15 pF | 975 ohm  |
| TO-720 Series | 15 pF | 975 ohm  |
| TO-750 Series | 15 pF | 9975 ohm |
| TO-760 Series | 10 pF | 9975 ohm |

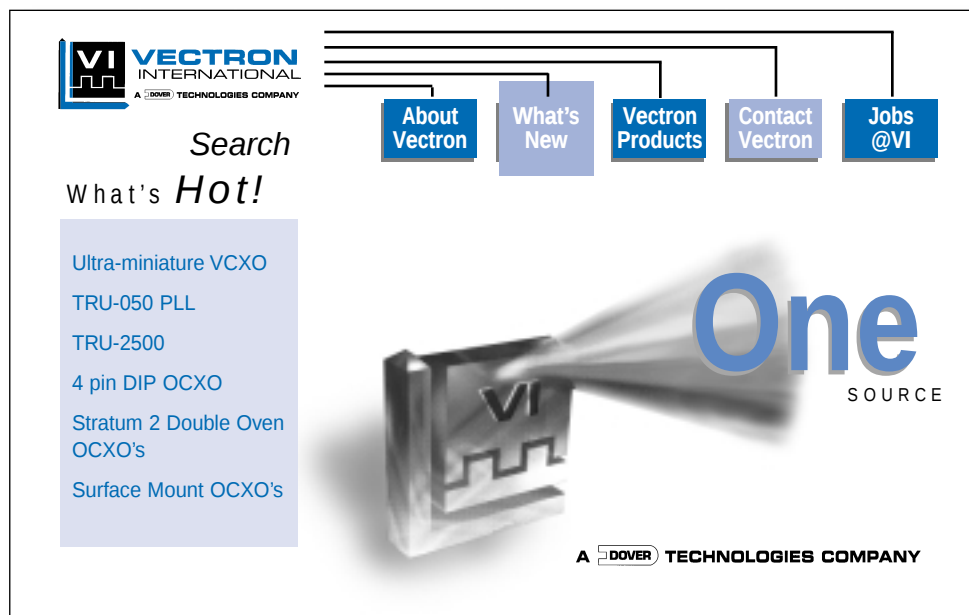
### How To Order

Series  at  Frequency

Examples: TO-701 @ 10 MHz  
 TO-711 @ 10 MHz  
 TO-724 @ 52 MHz  
 TO-753 @ 26 MHz  
 TO-762 @ 52 MHz

# TO-700 Series

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