LM566C Voltage Controlled Oscillator

General Description
The LM566CN is a general purpose voltage controlled oscillator which may be used to generate square and triangular waves, the frequency of which is a linear function of a control voltage. The frequency is also a function of an external resistor and capacitor.
The LM566CN is specified for operation over the 0°C to +70°C temperature range.

Features
- Wide supply voltage range: 10V to 24V
- Very linear modulation characteristics
- High temperature stability
- Excellent supply voltage rejection
- 10 to 1 frequency range with fixed capacitor
- Frequency programmable by means of current, voltage, resistor or capacitor

Applications
- FM modulation
- Signal generation
- Function generation
- Frequency shift keying
- Tone generation

Connection Diagram
Dual-In-Line Package

Typical Application
1 kHz and 10 kHz TTL Compatible Voltage Controlled Oscillator

Order Number LM566CN
See NS Package Number N08E
**Absolute Maximum Ratings**

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Power Supply Voltage 26V
Power Dissipation (Note 1) 1000 mW
Operating Temperature Range, LM566CN 0°C to +70°C
Lead Temperature (Soldering, 10 sec.) +260°C

**Electrical Characteristics** $V_{CC} = 12V, T_A = 25°C, AC Test Circuit**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Conditions</th>
<th>LM566C</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Typ</td>
</tr>
<tr>
<td>Maximum Operating Frequency</td>
<td>$R_0 = 2k \quad C_0 = 2.7 \mu F$</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>VCO Free-Running Frequency</td>
<td>$C_0 = 1.5 \mu F \quad R_0 = 20k \quad f_0 = 10 \text{ kHz}$</td>
<td>$-30$</td>
<td>0</td>
</tr>
<tr>
<td>Input Voltage Range Pin 5</td>
<td>$\frac{1}{4} V_{CC}$</td>
<td>$V_{CC}$</td>
<td></td>
</tr>
<tr>
<td>Average Temperature Coefficient of Operating Frequency</td>
<td></td>
<td>200</td>
<td>ppm/°C</td>
</tr>
<tr>
<td>Supply Voltage Rejection</td>
<td>10–20V</td>
<td>0.1</td>
<td>2</td>
</tr>
<tr>
<td>Input impedance Pin 5</td>
<td>$0.5 \quad 1$</td>
<td>MΩ</td>
<td></td>
</tr>
<tr>
<td>VCO Sensitivity</td>
<td>For Pin 5, From $8–10V, f_0 = 10 \text{ kHz}$</td>
<td>6.0</td>
<td>6.6</td>
</tr>
<tr>
<td>FM Distortion</td>
<td>$\pm 10%$ Deviation</td>
<td>0.2</td>
<td>1.5</td>
</tr>
<tr>
<td>Maximum Sweep Rate</td>
<td></td>
<td>1</td>
<td>MHz</td>
</tr>
<tr>
<td>Sweep Range</td>
<td></td>
<td>10:1</td>
<td></td>
</tr>
<tr>
<td>Output Impedance Pin 3</td>
<td></td>
<td>50</td>
<td>Ω</td>
</tr>
<tr>
<td>Output Impedance Pin 4</td>
<td></td>
<td>50</td>
<td>Ω</td>
</tr>
<tr>
<td>Square Wave Output Level</td>
<td>$R_L1 = 10k$</td>
<td>5.0</td>
<td>5.4</td>
</tr>
<tr>
<td>Triangle Wave Output Level</td>
<td>$R_L2 = 10k$</td>
<td>2.0</td>
<td>2.4</td>
</tr>
<tr>
<td>Square Wave Duty Cycle</td>
<td></td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>Square Wave Rise Time</td>
<td></td>
<td>20</td>
<td>ns</td>
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<tr>
<td>Square Wave Fall Time</td>
<td></td>
<td>50</td>
<td>ns</td>
</tr>
<tr>
<td>Triangle Wave Linearity</td>
<td>$+1V$ Segment at $\frac{1}{4} V_{CC}$</td>
<td>0.5</td>
<td>%</td>
</tr>
</tbody>
</table>

**Note 1:** The maximum junction temperature of the LM566CN is 150°C. For operation at elevated junction temperatures, maximum power dissipation must be derated based on a thermal resistance of 115°C/W, junction to ambient.

**Applications Information**

The LM566CN may be operated from either a single supply as shown in this test circuit, or from a split (±) power supply. When operating from a split supply, the square wave output (pin 3) is TTL compatible (2 mA current sink) with the addition of a 4.7 kΩ resistor from pin 3 to ground.

A 0.001 μF capacitor is connected between pins 5 and 6 to prevent parasitic oscillations that may occur during VCO switching.

$$f_0 = \frac{2.4(V^+ - V_5)}{R_0 C_0 V^+}$$

where

$2K < R_0 < 20K$

and $V_5$ is voltage between pin 5 and pin 1.
Typical Performance Characteristics

Operating Frequency as a Function of Timing Resistor

Operating Frequency as a Function of Timing Capacitor

Normalized Frequency as a Function of Control Voltage

Power Supply Current

Temperature Stability

VCO Waveforms

Frequency Stability vs Load Resistance (Square Wave Output)

Frequency Stability vs Load Impedance (Triangle Output)

Square Wave Output Characteristics

Triangle Wave Output Characteristics

AC Test Circuit
Physical Dimensions

inches (millimeters)

LM566C Voltage Controlled Oscillator

Physical Dimensions

inches (millimeters)

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