

# Function generator

# NE/SE566

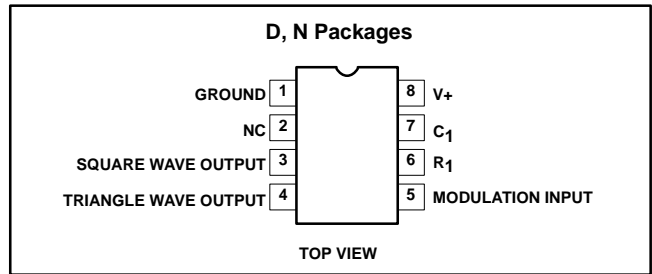
## DESCRIPTION

The NE/SE566 Function Generator is a voltage-controlled oscillator of exceptional linearity with buffered square wave and triangle wave outputs. The frequency of oscillation is determined by an external resistor and capacitor and the voltage applied to the control terminal. The oscillator can be programmed over a ten-to-one frequency range by proper selection of an external resistance and modulated over a ten-to-one range by the control voltage, with exceptional linearity.

## FEATURES

- Wide range of operating voltage (up to 24V; single or dual)
- High linearity of modulation
- Highly stable center frequency (200ppm/°C typical)
- Highly linear triangle wave output
- Frequency programming by means of a resistor or capacitor, voltage or current
- Frequency adjustable over 10-to-1 range with same capacitor

## PIN CONFIGURATIONS



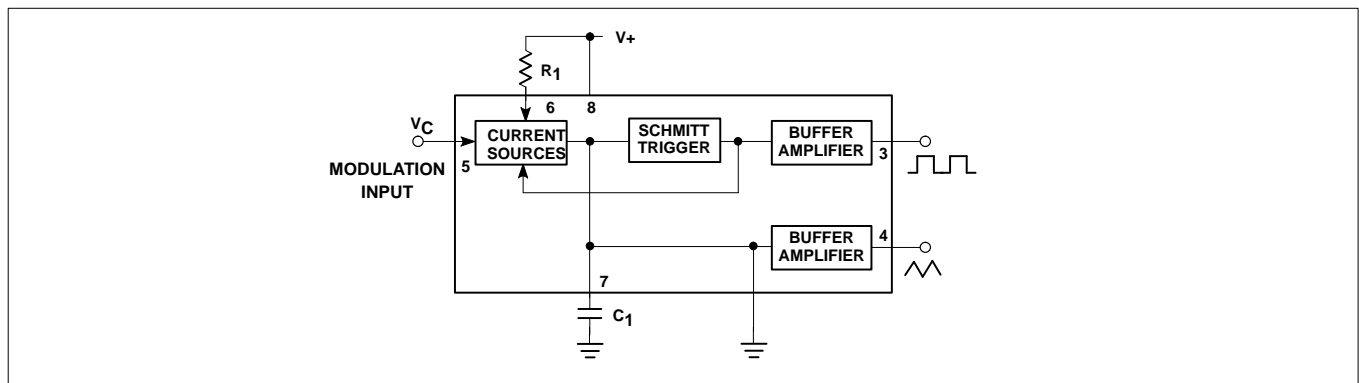
## APPLICATIONS

- Tone generators
- Frequency shift keying
- FM modulators
- Clock generators
- Signal generators
- Function generators

## ORDERING INFORMATION

| DESCRIPTION                                  | TEMPERATURE RANGE | ORDER CODE | DWG # |
|--|-------------------|------------|-------|
| 8-Pin Plastic Small Outline (SO) Package     | 0 to +70°C        | NE566D     | 0174C |
| 14-Pin Ceramic Dual In-Line Package (CERDIP) | 0 to +70°C        | NE566F     | 0581B |
| 8-Pin Plastic Dual In-Line Package (DIP)     | 0 to +70°C        | NE566N     | 0404B |
| 8-Pin Plastic Dual In-Line Package (DIP)     | -55°C to +125°C   | SE566N     | 0404B |

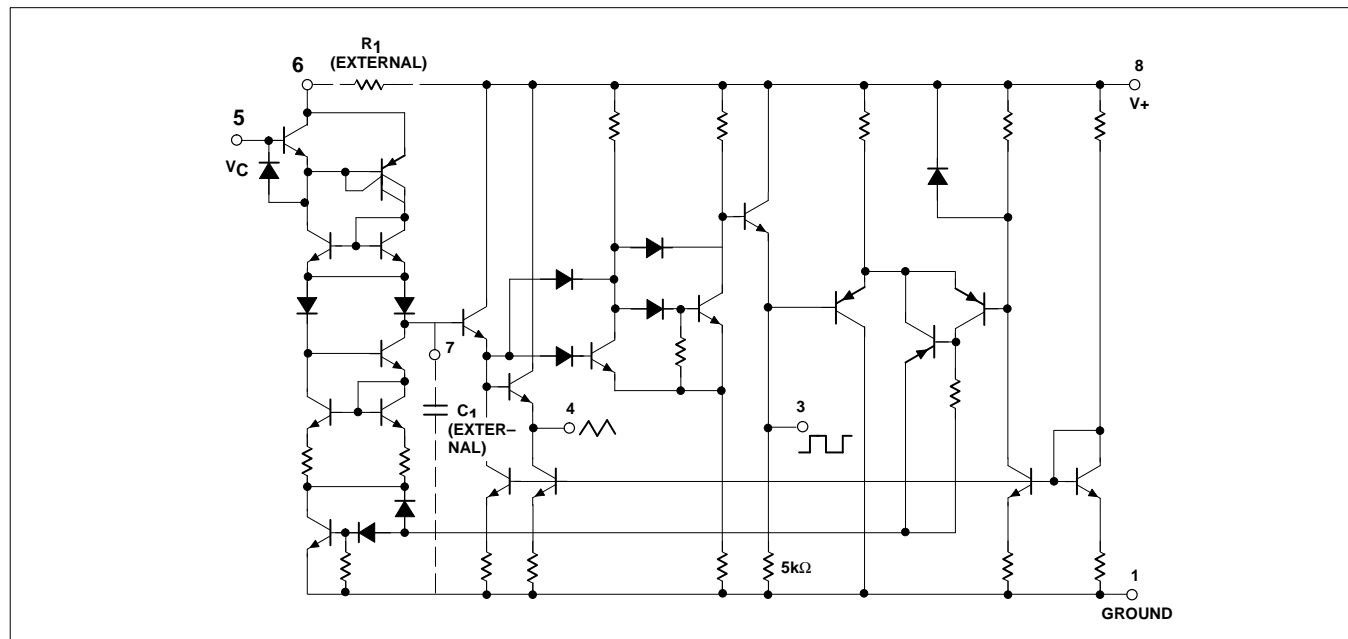
## BLOCK DIAGRAM



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## EQUIVALENT SCHEMATIC



## ABSOLUTE MAXIMUM RATINGS

| SYMBOL                           | PARAMETER                           | RATING      | UNIT             |
|----------------------------------|-------------------------------------|-------------|------------------|
| V+                               | Maximum operating voltage           | 26          | V                |
| V <sub>IN</sub> , V <sub>C</sub> | Input voltage                       | 3           | V <sub>P-P</sub> |
| T <sub>STG</sub>                 | Storage temperature range           | -65 to +150 | °C               |
| T <sub>A</sub>                   | Operating ambient temperature range |             |                  |
|                                  | NE566                               | 0 to +70    | °C               |
|                                  | SE566                               | -55 to +125 | °C               |
| P <sub>D</sub>                   | Power dissipation                   | 300         | mW               |

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**DC ELECTRICAL CHARACTERISTICS** $T_A=25^{\circ}\text{C}$ ,  $V_{CC}=\pm 6\text{V}$ , unless otherwise specified.

| SYMBOL                 | PARAMETER                                     | SE566   |      |          | NE566   |      |          | UNIT                    |
|------------------------|---|---------|------|----------|---------|------|----------|-------------------------|
|                        |   | Min     | Typ  | Max      | Min     | Typ  | Max      |                         |
| <b>General</b>         |   |         |      |          |         |      |          |                         |
| $T_A$                  | Operating ambient temperature range           | -55     |      | 125      | 0       |      | 70       | $^{\circ}\text{C}$      |
| $V_{CC}$               | Operating supply voltage                      | $\pm 6$ |      | $\pm 12$ | $\pm 6$ |      | $\pm 12$ | V                       |
| $I_{CC}$               | Operating supply current                      |         | 7    | 12.5     |         | 7    | 12.5     | mA                      |
| <b>VCO<sup>1</sup></b> |   |         |      |          |         |      |          |                         |
| $f_{MAX}$              | Maximum operating frequency                   |         | 1    |          |         | 1    |          | MHz                     |
|                        | Frequency drift with temperature              |         | 500  |          |         | 600  |          | ppm/ $^{\circ}\text{C}$ |
|                        | Frequency drift with supply voltage           |         | 0.1  | 1        |         | 0.2  | 2        | %/V                     |
|                        | Control terminal input impedance <sup>2</sup> |         | 1    |          |         | 1    |          | M $\Omega$              |
|                        | FM distortion ( $\pm 10\%$ deviation)         |         | 0.2  | 0.75     |         | 0.4  | 1.5      | %                       |
|                        | Maximum sweep rate                            |         | 1    |          |         | 1    |          | MHz                     |
|                        | Sweep range                                   |         | 10:1 |          |         | 10:1 |          |                         |
| <b>Output</b>          |   |         |      |          |         |      |          |                         |
|                        | Triangle wave output                          |         |      |          |         |      |          |                         |
|                        | impedance                                     |         | 50   |          |         | 50   |          | $\Omega$                |
|                        | voltage                                       | 1.9     | 2.4  |          | 1.9     | 2.4  |          | $V_{P-P}$               |
|                        | linearity                                     |         | 0.2  |          |         | 0.5  |          | %                       |
|                        | Square wave input                             |         |      |          |         |      |          |                         |
|                        | impedance                                     |         | 50   |          |         | 50   |          | $\Omega$                |
|                        | voltage                                       | 5       | 5.4  |          | 5       | 5.4  |          | $V_{P-P}$               |
|                        | duty Cycle                                    | 45      | 50   | 55       | 40      | 50   | 60       | %                       |
| $t_R$                  | Rise time                                     |         | 20   |          |         | 20   |          | ns                      |
| $t_F$                  | Fall Time                                     |         | 50   |          |         | 50   |          | ns                      |

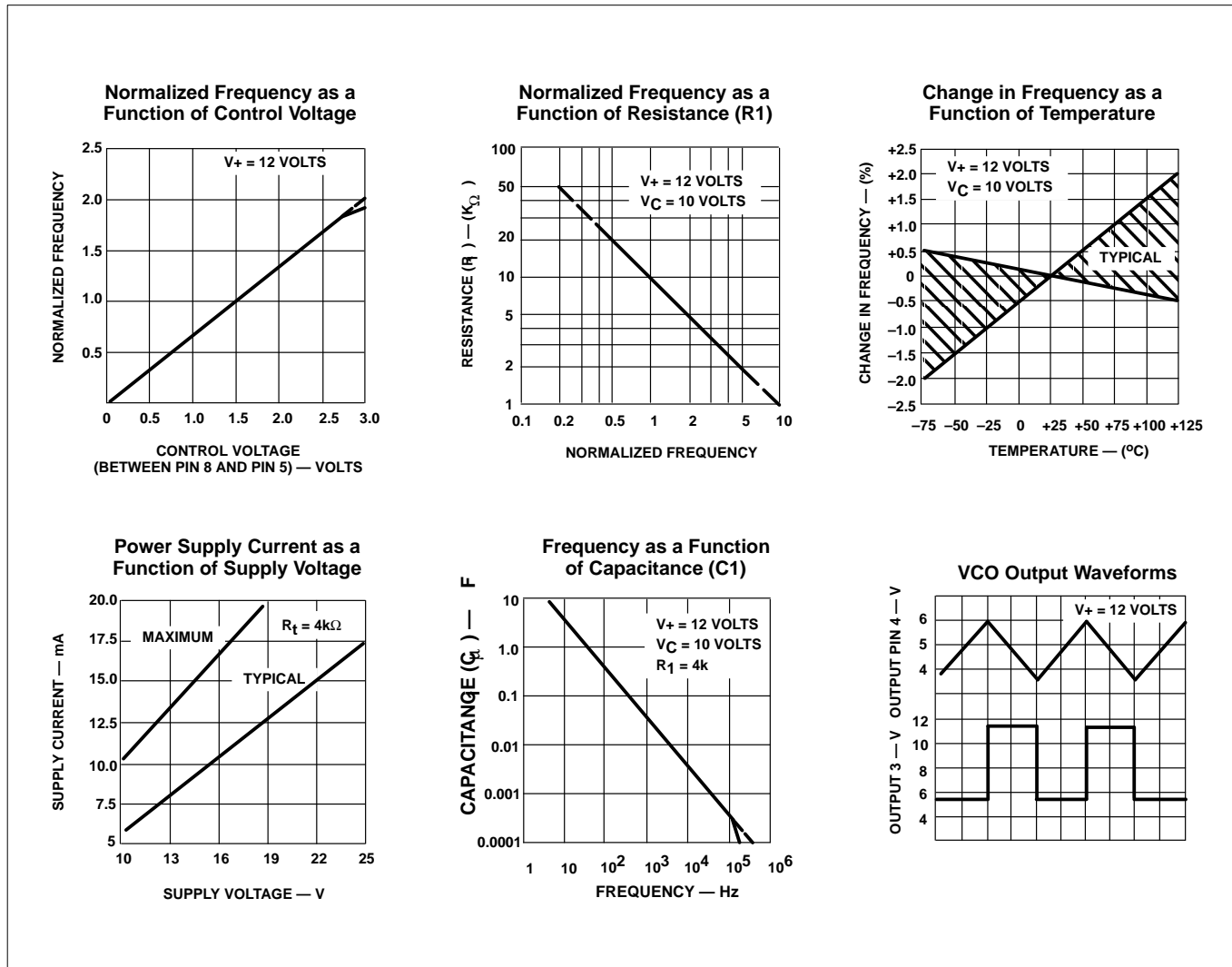
**NOTES:**

1. The external resistance for frequency adjustment ( $R_1$ ) must have a value between  $2\text{k}\Omega$  and  $20\text{k}\Omega$ .
2. The bias voltage ( $V_C$ ) applied to the control terminal (Pin 5) should be in the range  $V_+ \leq V_C \leq V_+$ .

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## TYPICAL PERFORMANCE CHARACTERISTICS



### OPERATING INSTRUCTIONS

The NE/SE566 Function Generator is a general purpose voltage-controlled oscillator designed for highly linear frequency modulation. The circuit provides simultaneous square wave and triangle wave outputs at frequencies up to 1MHz. A typical connection diagram is shown in Figure 1. The control terminal (Pin 5) must be biased externally with a voltage ( $V_C$ ) in the range

$$V_+ \leq V_C \leq V_+$$

where  $V_{CC}$  is the total supply voltage. In Figure 1, the control voltage is set by the voltage divider formed with  $R_2$  and  $R_3$ . The modulating signal is then AC coupled with the capacitor  $C_2$ . The modulating signal can be direct coupled as well, if the appropriate DC bias voltage is applied to the control terminal. The frequency is given approximately by

$$f_o = \frac{2 [(V_+) - (V_C)]}{R_1 C_1 V_+}$$

and  $R_1$  should be in the range  $2k\Omega < R_1 < 20k\Omega$ .

A small capacitor (typically  $0.001\mu F$ ) should be connected between Pins 5 and 6 to eliminate possible oscillation in the control current source.

If the VCO is to be used to drive standard logic circuitry, it may be desirable to use a dual supply as shown in Figure 2. In this case the square wave output has the proper DC levels for logic circuitry. RTL can be driven directly from Pin 3. For DTL or TTL gates, which require a current sink of more than 1mA, it is usually necessary to connect a  $5k\Omega$  resistor between Pin 3 and negative supply. This increases the current sinking capability to 2mA. The third type of

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interface shown uses a saturated transistor between the 566 and the logic circuitry. This scheme is used primarily for TTL circuitry which requires a fast fall time (<50ns) and a large current sinking capability.

