

DEX038

Audio Frequency Function Generator

dextam

GENERAL DESCRIPTION

The DEX038 is a single-supply, single-chip function generator intended for low frequency, non-critical applications.

In the full configuration, it generates sine and square waves from 20 Hz to 20 kHz, and triangle waves from 20 Hz to 4 kHz. Each waveform has adjustable amplitude and offset. The waveform shape (sine, square, or triangle) is pushbutton selectable. Only one output is available at a time.

In the minimum configuration, only four external components are required for a sine wave output with variable frequency. With a 5 V supply, the nominal amplitude and offset is 4.4 V_{PP} and 2.5 V respectively.

Several frequency ranges are selected with up/down push-buttons, and frequencies within each range are set with Coarse and Fine potentiometers. ($\leq 10 \text{ k}\Omega$) The selected waveform and frequency range is automatically stored in nonvolatile memory and restored upon power up.

The raw output is stepped, and a simple output RLC filter (620 Ω , 0.01 μF , and 6.8 mH) is required for minimum waveform distortion with the Sine and Triangle waves.

Frequency resolution ranges between about 1% to 4% of the output frequency, or about 1 Hz at low frequencies (100 Hz and below), and approximately 0.07 kHz at high frequencies (19 kHz and above), with intermediate resolutions in the intervening ranges.

FEATURES

- Single-Supply: 5V nominal, 3.3 V - 5.5 V. (All amplitude specs in this datasheet assume V+ = 5.0 V.)

Minimum Configuration:

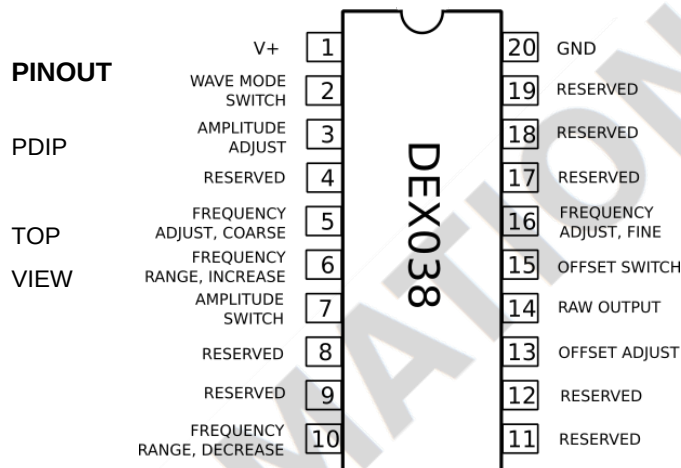
- Sine: Adjustable 700 Hz - 3.5 kHz
- Amplitude: 4.4 V_{PP}
- Offset Voltage: 2.5 V

Full Configuration:

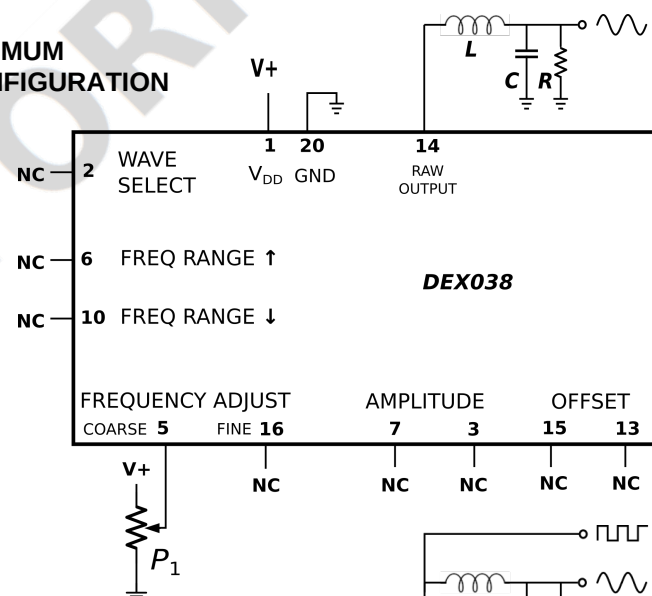
- Sine: Adjustable 20 Hz - 20 kHz
- Square: Adjustable 20 Hz - 20 kHz
- Triangle: Adjustable 20 Hz - 4 kHz
- Amplitude: Adjustable 250 mV_{PP} - 4.4 V_{PP}
- Offset: Adjustable 2.5 V nominal, 100 mV - 4.4 V

Intermediate Configurations

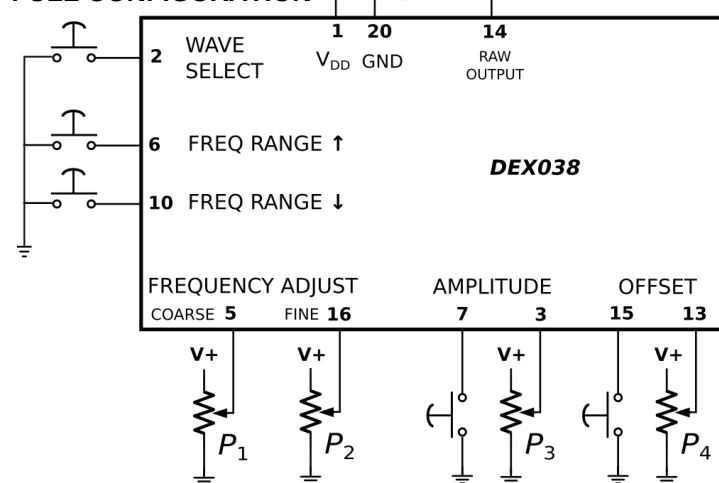
Any combination of inputs (Wave shape, Range up/down, Frequency coarse/fine, Amplitude adjust, and Offset adjust) may be connected or omitted to enable the features needed for the intended application. For example, if Amplitude and/or Offset controls are not needed, those buttons and potentiometers may be omitted. If omitted, the output will default to an offset of 2.5 V, and an amplitude of 4.4 V_{PP}.



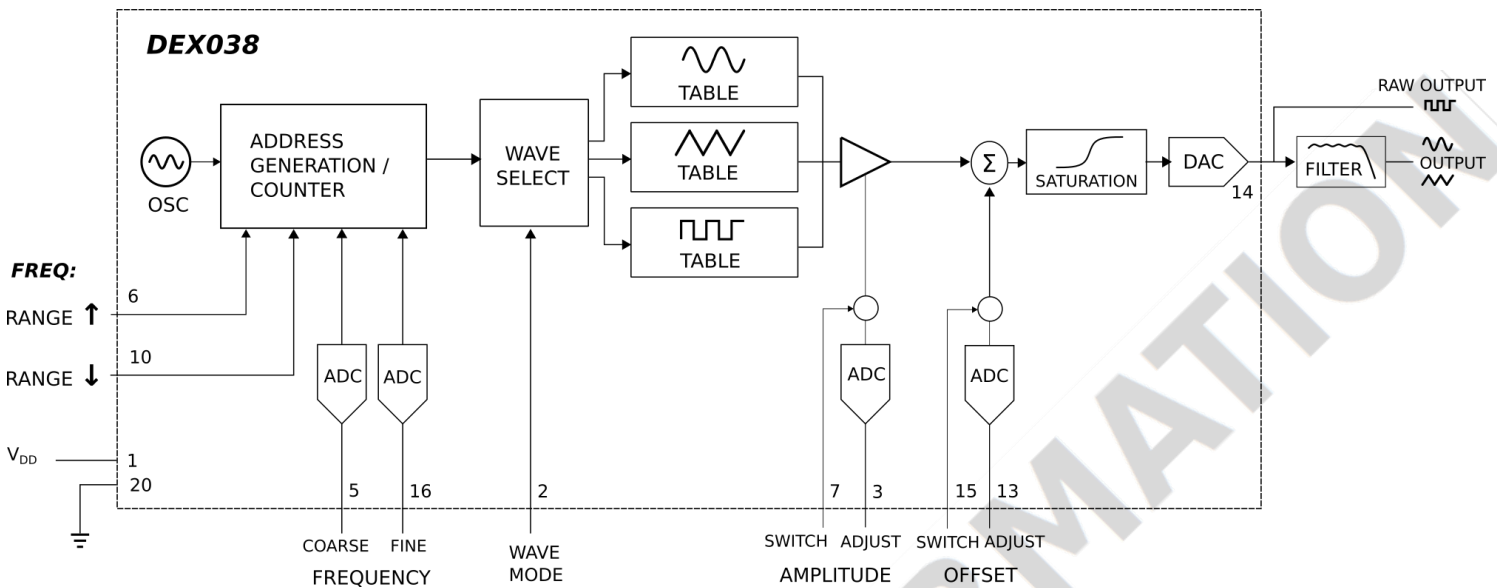
MINIMUM CONFIGURATION



FULL CONFIGURATION

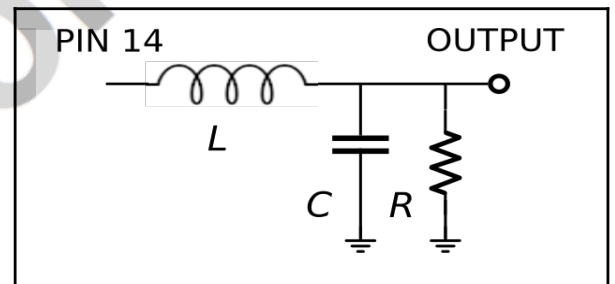
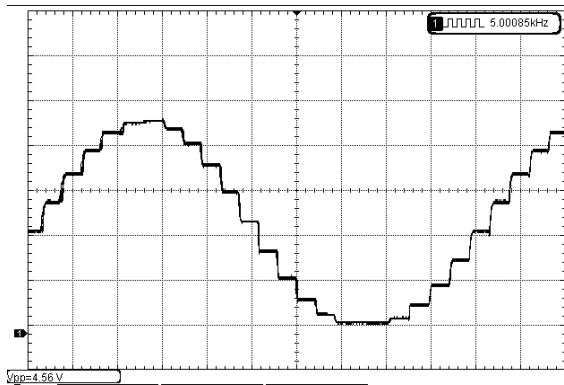


FUNCTIONAL BLOCK DIAGRAM (Simplified)



RECONSTRUCTION FILTER

The raw output of the DEX038 (Pin 14), is stepped. Unless this stepped output is acceptable in the intended application, an external reconstruction filter, as shown here and in the above diagrams, is necessary in the Sine and the Triangle modes. This is a standard 2-pole RLC filter with a critical frequency of 20 kHz. The nominal component values are as follows: $R = 620 \Omega$, $L = 6.8 \text{ mH}$, and $C = 0.01 \mu\text{F}$. Standard 5% or 10% tolerance values are acceptable. When the output is set to Square Wave, the filter is unnecessary; the Square Wave should be taken directly from the Raw Output at Pin 14.



OPERATING INSTRUCTIONS

The chip powers up in the state in which it was powered down.

Selecting the waveform

The output waveform is selected with the Wave Mode Button; a momentary press switches the waveform from Sine, to Triangle, to Square. Pressing the button in Square mode switches the waveform back to Sine.

Unlike the Sine and Square waves, the Triangle wave is limited to a maximum of approximately 4 kHz. Therefore, while in Triangle mode, pressing the Range Up button will not increment to the higher frequency ranges. In Sine or Square wave modes, at frequencies higher than 4 kHz, the Range Up and Range Down buttons skip over the Triangle wave mode.

Setting the frequency

To reduce the sensitivity of frequency setting and ease the

setting of specific frequencies, there are *three* frequency controls: Range Setting buttons, Coarse potentiometer, and Fine potentiometer.

Momentary presses of the Range Up/Down buttons allow the user to switch among 16 frequency ranges. See the *Frequency Ranges* graph for the frequencies available within each range. Within each range, the Coarse and Fine potentiometers enable setting of the desired frequency.

Setting the amplitude and offset

Amplitude is adjusted by pressing and holding the Amplitude button while turning the Amplitude potentiometer.

Similarly, Offset is adjusted by pressing and holding the Offset button while turning the Offset potentiometer.

The waveform frequency and waveshape is not valid while the Amplitude or Offset buttons are being pressed and held.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (V+ to GND).....-0.2 V to 6.2 V

I/O Pins.....0.2V to (.2V + V+)

OPERATING CONDITIONS

Supply Voltage (V+).....3.3 V to 5.5 V

ELECTRICAL CHARACTERISTICS

Supply Current (Output Amplitude = 4 Vpp)

OFFSET	SINE		SQUARE	
	20 Hz	20 kHz	20 Hz	20 kHz
0.0 V	7 mA	7 mA	7 mA	7 mA
2.5 V	9 mA	9 mA	9 mA	10 mA
5.0 V	11 mA	11 mA	11 mA	11 mA

Square Wave:

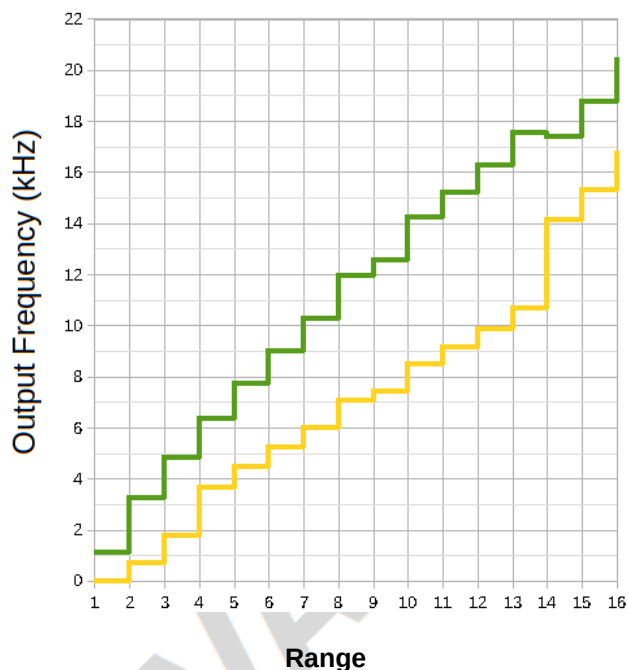
Rise Time (10% - 90%): 690 nSec

Fall Time (90% - 10%): 550 nSec

OUTPUT WAVEFORMS

(See Appendix, page 4)

FREQUENCY RANGES



FREQUENCY RESOLUTION

Because the output frequency from the DEX038 is synthesised via Direct Digital Synthesis (DDS), the output frequency is not infinitely adjustable; the frequency resolution is limited within each frequency range. At the lowest frequencies (below approximately 1 kHz), the frequency resolution varies from approx. 1 Hz (at an output frequency of 20 Hz), to approx. 4 Hz (at an output frequency of 1 kHz. At about 20 kHz, the frequency resolution is approx 70 Hz.

In applications where fine frequency resolution is not required, the Fine frequency adjustment potentiometer may be omitted.

PACKAGE

Style	Plastic Dual Inline Package (PDIP)
Pins	20
Nominal width	300 mil
Nominal Length	1000 mil
Nominal pin pitch	100 mil

REVISION HISTORY

Rev	Comments
B 2026-07	Updated General Description
A 2026-04	Initial Release

DEXTAM LLC INFORMATION

Email: info@dexam.com

Website: <http://www.dexam.com>

Contact Address: P.O. Box 25239, Tempe, AZ 85285

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OUTPUT WAVEFORMS

