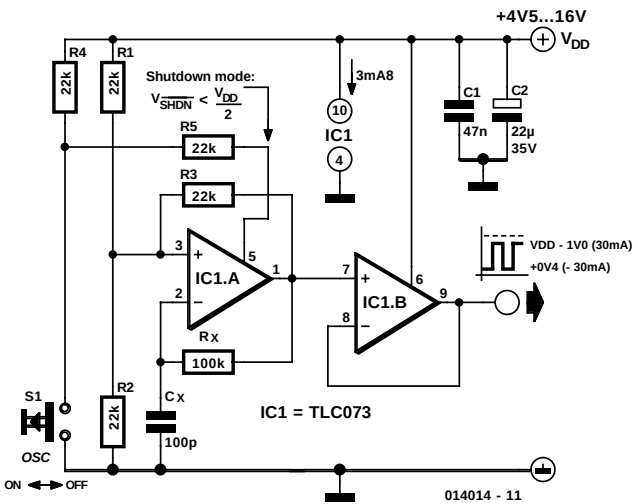
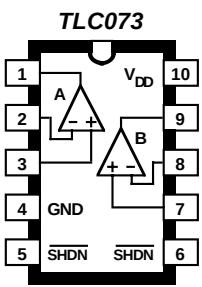
Squarewave Oscillator Using TLC073

045

K. Thiesler





The new range of low-noise, high-speed and low-distortion BiMOS op-amps from Texas Instruments, type TLC070 to TLC075, is intended for use in instrumentation, audio and automotive applications. This oscillator is an ideal example of its application: a stable, highly accurate squarewave at frequencies up to 60 kHz can be produced with an output current of ±30 mA.

The TLC073, a dual op-amp with shutdown function, is used here. IC1a is configured as a standard squarewave generator, IC1b as a driver. The frequency of oscillation depends on Cx and Rx and is calcu-

lated (for frequencies up to 20 kHz) as follows:

$$f = \frac{1}{\frac{1}{7000} \times \sqrt[3]{Rx \times Cx} + \sqrt{2} \times Rx \times Cx}$$

where Rx is measured in Ohms and Cx in Farads.

The table shows preferred values that give various frequencies. Note that the frequency variation is largely determined by the capacitor, since Rx must always be significantly larger than feedback resistor R3. The effect of supply voltage, at –130 dB, is negligibly small, and the temperature coefficient of frequency is very low: only 1.5 %. At frequencies above 20 kHz the oscillator remains stable, but increasingly non-linear.

The mark-space ratio of the signal can be adjusted in the range 10% to 90% by changing the ratio of resistors R1 to R2. If the two resistors are equal, the output is symmetrical. The output of the driver swings between +0.3 V (low) and 1 V below the supply voltage (high).

The oscillator is switched on and off via the shutdown input of IC1a. The output of the opamp goes to high impedance and the current consumption drops to 35 nA.

The oscillator can of course be built using the common or garden TL071 (U_b = 7 V, U_{out} = 1.2/6.2 V, I_{out} = 1.75 mA, f_{max} = 50 kHz). As can be seen, the output drive capability is rather lower.

(014014-1)

f	60 kHz	10 kHz	6 kHz	3 kHz	400 Hz	50 Hz
Cx	100 pF	680 pF	1 nF	1 nF	10 nF	68 nF
Rx	100 kΩ	100 kΩ	100 kΩ	220 kΩ	180 kΩ	220 kΩ

BiMOS opamp family TLC07x

The new family of BiMOS opamps types TLC070 to TLC075 replaces the older TL070 family of BiFET amplifiers. The new components incorporate some significant advances:

– Very low noise (7 nV/√Hz)
– Low harmonic and non-harmonic distortion (0.002 %) at A = 1
– Bandwidth 10 MHz, slew rate 16 V/µs
– Input quiescent current only 1.5 pA
– Offset voltage 60 µV
– Output current ±50 mA
– Supply voltage rejection –130 dB
– Quiescent current consumption 1.9 mA per opamp
– Symmetric (±2.25 to 8 V) or single supply voltage (+4.5 to16 V)
– Shutdown function for each opamp (TLC070, TLC073 and TLC075 only)
– Single, dual and quad opamps available in DIP, SO and TSSOP packages