CHARGE STORAGE/STROBE

VBStrobe

INTRODUCTION

The VBStrobe charge storage board accumulates charge from an external source and then releases the stored energy in bursts through a strobed high brightness LED. The unit is hardware programmed to have a nominal 1 Hz frequency with a 50% duty but this is dependent upon the voltage and internal impedance of the source. By changing onboard resistors and capacitors, a user can tailor the circuit for targeted applications.

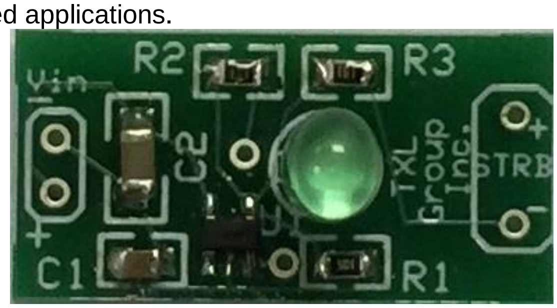

Figure 1 – The VBStrobe

DIMENSIONS & RATINGS

Size: 1.0" X 0.45"
Input: 2.3V to 10V. **DO NOT EXCEED Vin=10V**
Output: Oscillatory with programmable frequency, output clamped between V_{in} and the LED turn on voltage.

THEORY OF OPERATION

A schematic for the VBStrobe is shown in Figure 2. It is based upon a low power CMOS inverter U1. Capacitor C2 is used to accumulate charge from an external source. Zener diode D2 serves to clamp C2 to a maximum of 10 volts. When Vin exceeds 2.3 volts, the output of U1 begins to oscillate. When the output of U1 is low, it discharges capacitor C1 through resistor R1. When the voltage on capacitor C1 goes below about 0.6 volts, it causes the U1 output to invert. The output goes to a voltage of Vin, causing capacitor to start charging through resistor R1. When C1 is charged to a voltage in excess of a characteristic "turn on" voltage, inverter U1 changes state on the output, going to a logical low and starting the cycle over again.

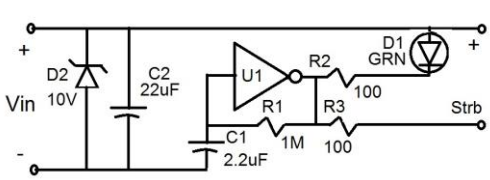

Figure 2 – Electrical Schematic for VBStrobe

When the output of U1 is low, it causes LED D1 to light up by drawing power from capacitor C2. The LED current is limited by resistor R2. Since in many applications, the input voltage source will be of relatively high impedance (that is, have limited power delivery capability), when the LED is first turned on, it will strobe as charge from C2 is furnished to D1 but LED brightness will diminish as C2 is discharged. Because Vin will be affected by whether the LED is turned on or off, the circuit function is very much a function of the source voltage and internal impedance.

As an option, two output connections are provided to allow a secondary LED to be attached or to allow the circuit to be used for timing or as a control output to communicate Vin characteristics. These correspond to Vin and strobe.

FREQUENCY ADJUSTMENTS

The output frequency of the VBStrobe is a function of the nature of the source and the product R_1C_1. For a given source, the frequency can be reduced by increasing either R1 or C1 or both. Similarly, the frequency can be increased by reducing R1 or C1 or both. Figure 3 depicts the voltage across C2 during operation.

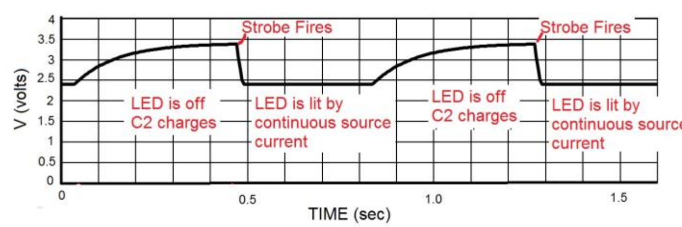

Figure 3 – Voltage Across C2 During Strobe Operation

When the output from U1 is high, there is no current flow from C2 to the LED, the LED is off and C2 charges from the voltage source. When U1 changes state, there is a current surge through D1 as C2 is discharged to the forward voltage drop of D1 of 2.4 volts. D1 remains on, but dim for the balance of the period and then U1 changes state (goes high) and the cycle repeats. It is important to note that the rate at which C2 will charge when the LED is off and the nominal (dim) level of brightness are dependent upon both the value of the input source voltage and the internal impedance of that source.

STROBE ADJUSTMENTS

Resistor R2 limits the rate of discharge of C2 through D1. Smaller values of R2 yield higher currents through D1 and a brighter flash, however, the flash duration will be shorter as C2 is discharged. So C2 and R2 are variables that can be adjusted to achieve a target strobe effect.

USE WITH VOLTAGE CONVERTERS

The VBStrobe offers a way to extend the function of boost converters to accumulate useful energy from thermoelectric generators. Examples include the VBXXXX family of boost converters.