SOS emergency signal generation

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Introduction

SOS is the international Morse code distress signal (· · · – – – · · ·) which became the worldwide standard by 1908. While it has since been replaced by the Global Maritime Distress and Safety System, SOS is still widely recognized as a visual distress signal. This application note describes how to generate the SOS signal using GreenPAK. This design can be described as a simple digital pattern generator.

SOS circuit design

As seen in the Fig1. schematic, the linear implementation uses six DFFs, two 2-bit LUTs, two 4-bit LUTs, two delays, one 3-bit LUT and filter. The design can be divided into 4 operational blocks: power ON/OFF, time generator, 5-bit state machine and 32-bit DE-MUX.

The power ON/OFF block is implemented using 2-bit LUT0, POR, Delay1 and DFF3. The time generator is implemented using Delay0 and 2-bit LUT4.

The 5-bit state machine is implemented using DFF4-DFF7 with nRESET and Pipe delay. The 32-bit DE-MUX is implemented using 4-bit LUT0, 4-bit LUT1 and 3-bit LUT7.

SOS circuit analysis

When this device is powered on, PIN8 is LOW. If PIN2 goes HIGH longer than 20ms, DDF3 output goes HIGH. It indicates that the device is turned ON. DFF4-DFF7 and Pipe Delay will then be turned ON. The time generator starts and it generates short pulses every 100ms (this period can be changed) for DFF4 and Pipe Delay.

DFF4-7 and Pipe Delay outputs will go HIGH after DFF3 output goes HIGH (11111). Following the first short pulse from time generator, DFF4 output goes LOW and other DFFs and Pipe delay outputs will go HIGH (11110). With each pulse from the time generator, the state machine outputs will change as: (11111->11110->11101->…->00001->00000->11111). The state machine has 32 states which change on each cycle.

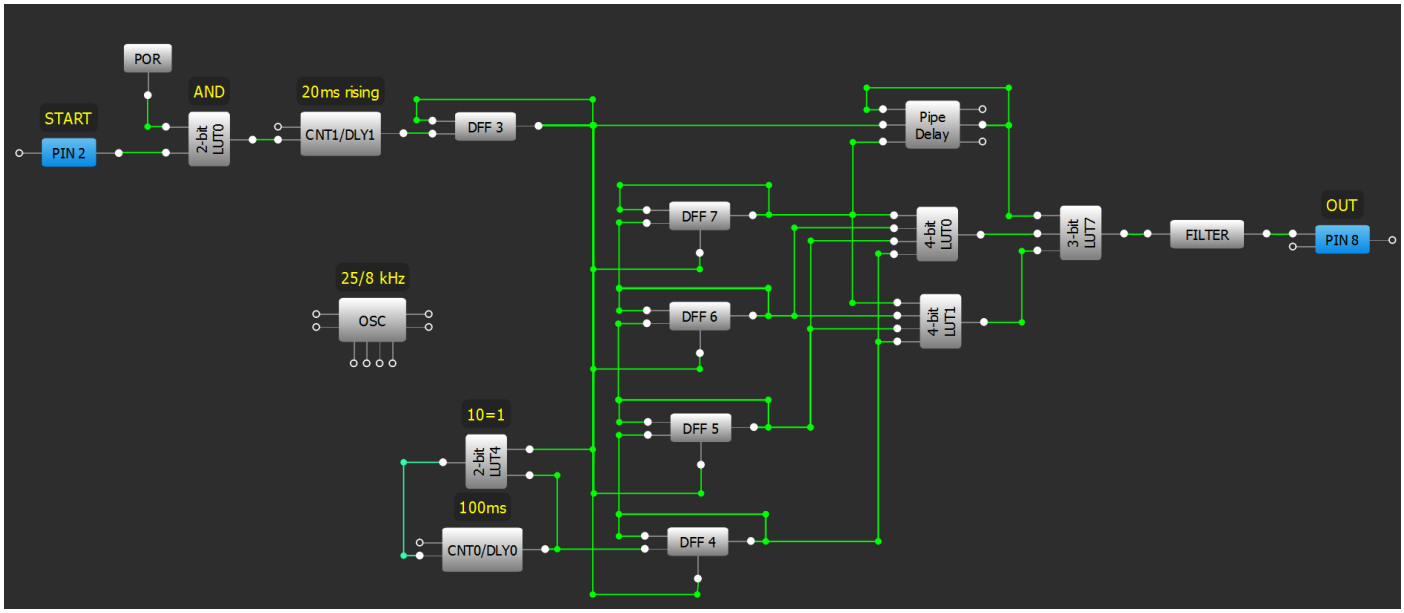

Fig 1. SOS schematic

4-bit LUT0, 4-BIT LUT1 and 3-bit LUT7 operate as a serial generator and can generate any 32 bit code, which in this case it generates the SOS signal.

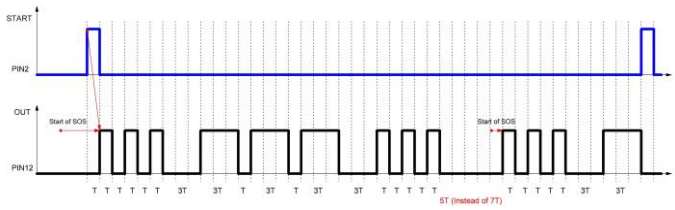

Fig 2. SOS timing diagram

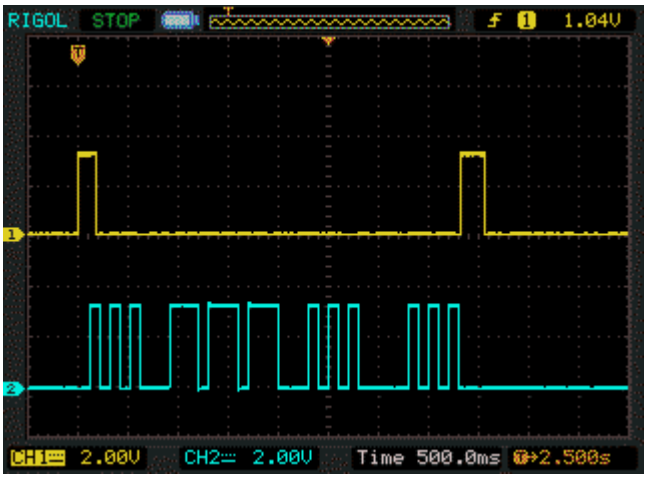

Fig 3. SOS functionality waveforms

Channel1 – PIN2(START)

Channel2 – PIN8(OUTPUT)

Conclusion

The SOS signal generator can be used to add emergency transmit features to flashlights, audio, or various radio devices. This design was implemented using a GreenPAK IC having low power consumption, using very little space, and having wide VDD operating range. It can be adapted to provide other patterns or codes as well.

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