

# Using GreenPAK’s I2C Port to Control an RGB LED Pulse SLG46537

The application note gives step-by-step guidelines for using GreenPAK’s I2C port to control an RGB LED pulse. A unique set of components of the SLG46537 allows the creation of such a system.

The application note comes complete with design files which can be found in the Reference section.

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## 1. Terms and Definitions

CNT	Counter
IC	Integrated Circuit
LED	Light-emitting Diode
POR	Power-on Reset
PWM	Pulse Width Modulation
SOC	System on Chip

## 2. References

For related documents and software, please visit:

[GreenPAK Programmable Mixed-Signal Products | Renesas](#)

Download our free GreenPAK Designer software [1] to open the .gp files [2] and view the proposed circuit design. Use the GreenPAK development tools [3] to freeze the design into your own customized IC in a matter of minutes. Renesas provides a complete library of application notes [4] featuring design examples as well as explanations of features and blocks within the Renesas IC.

[1] [GreenPAK Designer Software](#), Software Download and User Guide, Renesas Electronics

[2] [AN-1099 Using GreenPAK's I2C Port to Control an RGB LED Pulse.gp](#), GreenPAK Design File, Renesas Electronics

[3] [GreenPAK Development Tools](#), GreenPAK Development Tools Webpage, Renesas Electronics

[4] [Application Notes](#), GreenPAK Application Notes Webpage, Renesas Electronics

### 3. Introduction

This app note explains how to reconfigure the SLG46537's registers via I2C. Specifically, it shows how to change the registers associated with counters that set the on and off time for driving the R, G, and B cathodes of an LED. This creates a repetitive output pulse of light.

It is important to note that any reconfigurations via I2C are volatile and will revert to the programmed code after the POR inside the GreenPAK resets.

### 4. GreenPAK Benefits

GreenPAK is a very versatile, low current consumption IC. It can offload functions from other microcontrollers and larger SOC's. For example, a microcontroller can be active, drawing several mA of current, and can write via I2C to the SLG46537V to set the RGB "on time" (or pulse pattern) (see Figure 1). The GreenPAK would manage the RGB light function while the microcontroller enters a deep sleep mode to save system current. When desired, the GreenPAK can wake up the microcontroller using another I/O pin as an interrupt.

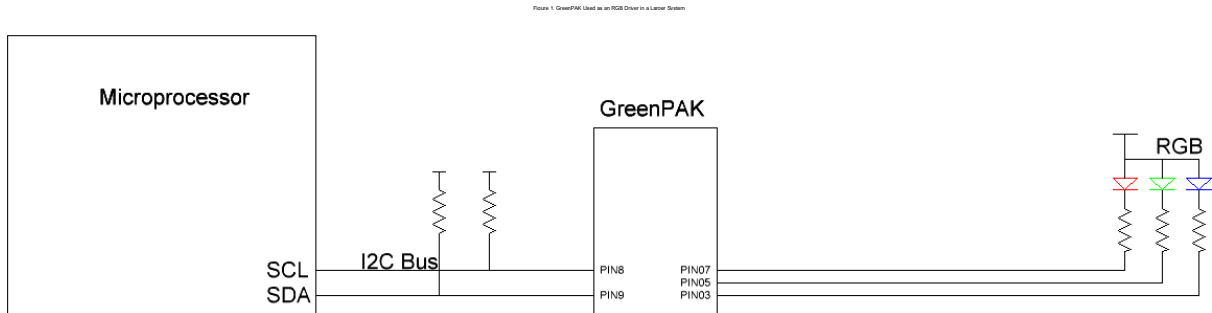


Figure 1. GreenPAK Used as an RGB Driver in a Larger System

### 5. GreenPAK Configuration

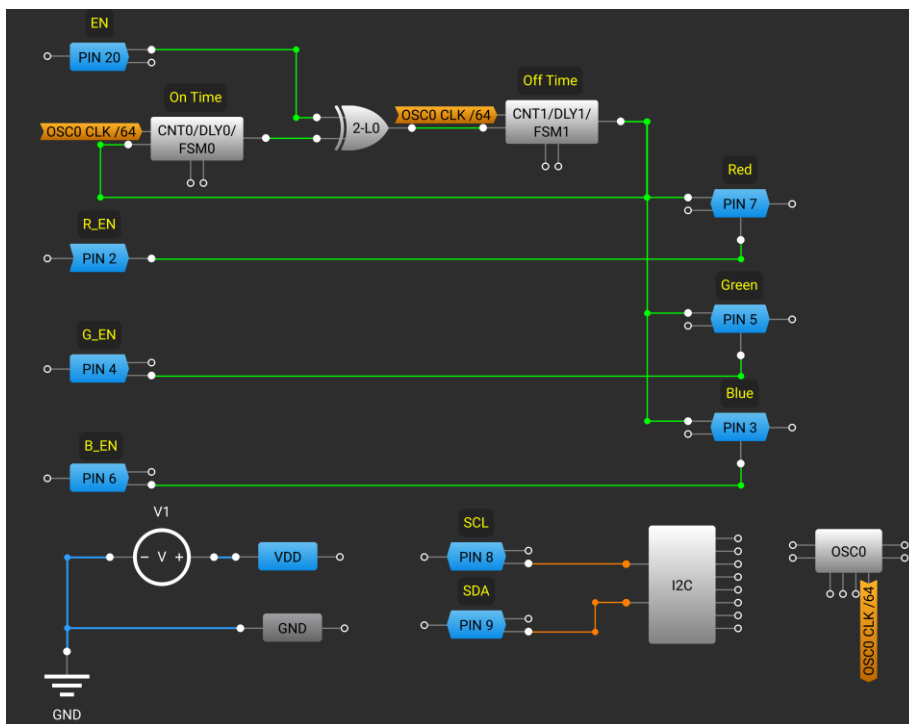


Figure 2. GreenPAK block diagram with counters for setting the PWM of each color

The GreenPAK design shown in Figure 2 implements a simple RGB LED driver. On the GreenPAK Universal Dev Board, connect Pin 3 to the cathode of the blue LED, Pin 5 to the cathode of the green LED and Pin 7 to the cathode of the red LED. The common anode should be connected to the VDD pin of the GreenPAK. Remember to use current limiting resistors in series with the LEDs as needed.

Counter0 sets the three LED's "on time." The default value set in this design is a counter zero (CNT0) register value of 50 (decimal) which equates to 523 msec (or 7D in hex). Counter1 sets the three LED's "off time." CNT1's register is also set to 50 or 523 msec. To set the RGB color, this design was configured to accept three separate external PWM signals on pins 2, 4 and 6. Pin 20 is used as an enable for the three LED outputs.

## 6. Creating an I2C Command to Write Register Bits

This application note will not cover the basic GPAK I2C command format. Instead, we will emphasize the specific commands to implement the RGB LED. In the example GreenPAK design file, we have used a default chip address of 0x00. Note '[' represents an I2C start bit and ']' represents a stop bit.

Since the design uses two counters we need to know the address of each counter's register. [Table 1](#) provides the register address for each of the counters used in this design. Changing these registers will impact the on time of the LED.

**Table 1. Counter register address**

Counter	Byte Address (Hex)
CNT0	0xC5
CNT1	0xC7, 0xC8

Since CNT1 is two bytes, we must be sure that we write the data in the correct order. 0xC7 is for the LSB and 0xC8 is for the MSB. When writing data to the GPAK chip, we write the MSB first then the LSB. This can be done in a sequential write mode to save write time.

By putting together all of this information, we can create a command to turn on and off the three LED's in a pulsing pattern by writing the following to the GreenPAK:

To write to CNT0 we use this command:

**[ 0x00 0xC5 0x7D ]**

Similarly, for CNT1 we use this command since CNT1 has two bytes of data:

**[ 0x00 0xC7 0x7D 0x00 ]**

## 7. Using the GreenPAK Development Kit Emulator

We can use the GreenPAK Development kits emulator to create the signals that we need to drive the LEDs properly. First we must connect the development kit to a computer or laptop's USB port. Second, place a SLG46537V chip into the socket. Third, open the design file inside the GreenPAK Designer software Click the "Emulator" button in the upper toolbar. Next we must enable the I2C tools within the software. This is the button to the right side of the screen.

After enabling the I2C tools, we must select the I2C "Virtual Inputs" button. This tool allows us to write directly to the counter registers. Please see [Figure 3](#).

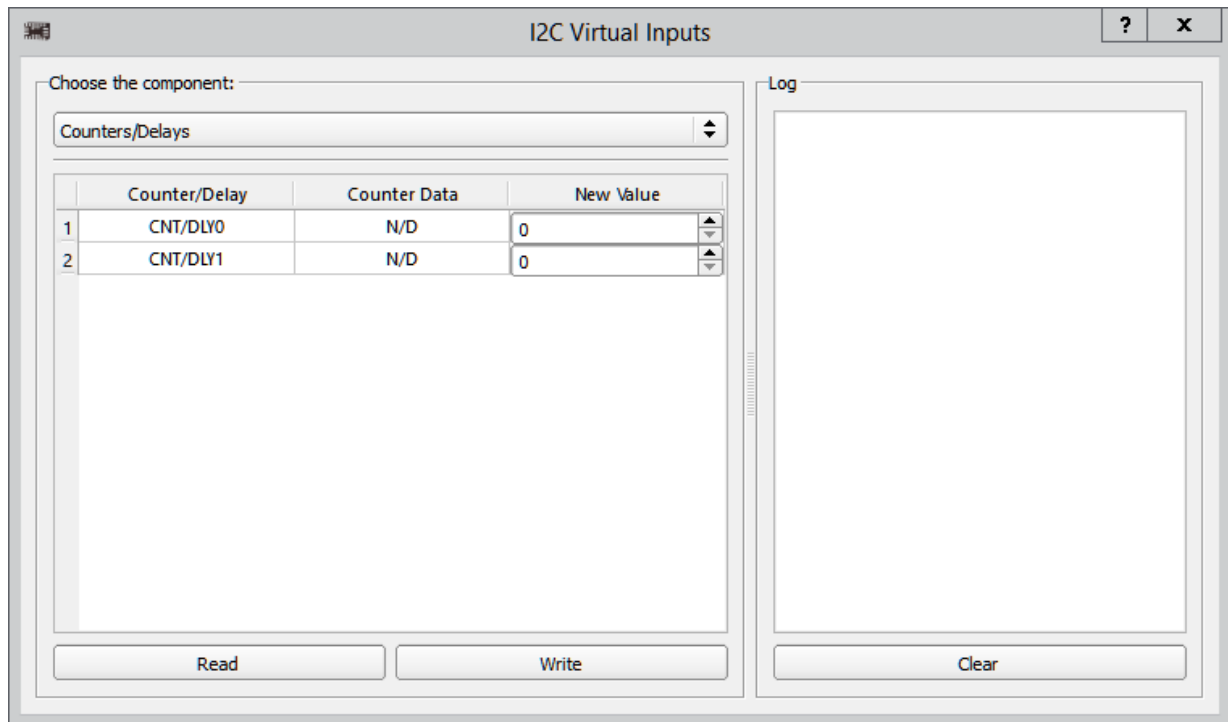


Figure 3. GreenPAK emulator with I2C Virtual Inputs window

Enter the value of 125 (decimal) into the “New Value” box for counter 0 (CNT0). This sets the on timing for the LED’s. Next enter 125 into the “New Value” box for Counter 1 (CNT1) and press the “Write” button. This will flash the RGB LED and continue as long as the OE pin (Pin 20) is set to a high value and the individual PWM inputs are high.

Next enter 250 into the “New Value” box for CNT1. Press “Write” and you will see the RGB LED turn on for the same amount of time, but it will turn off for twice as long. Please see Figure 4 for the emulator window settings for this pulse pattern.

Likewise, as long as a value within the CNT0 and CNT1’s register range is entered, any combination of pulse patterns on/off time can be created.

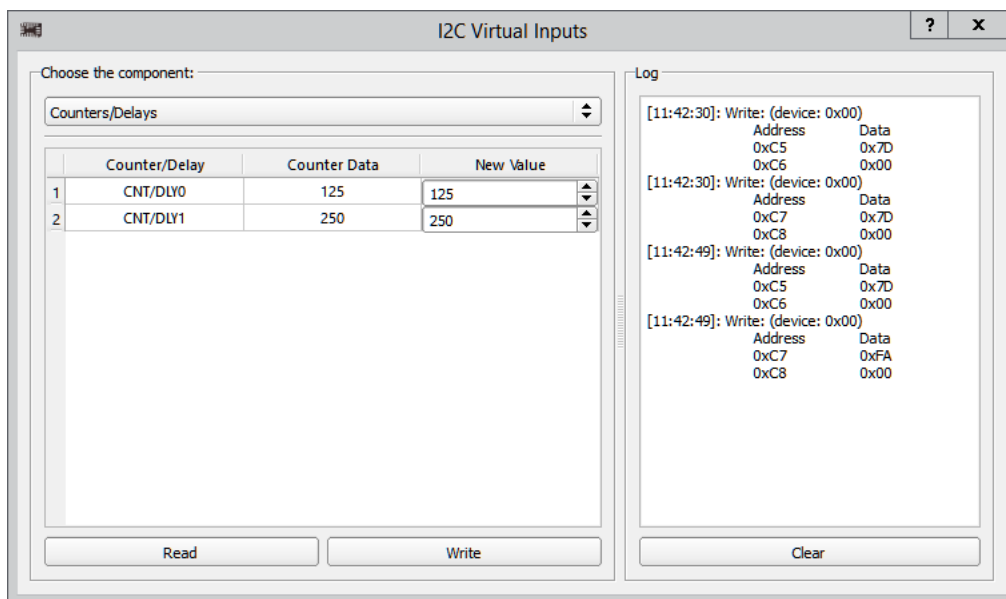


Figure 4. GreenPAK Development Kit driving the red LED in an RGB LED

## 8. Conclusion

We can use a GreenPAK SLG46537V to implement RGB LED driver functions. By implementing a system architecture this way, a microcontroller or other system SOC can be put in sleep mode to save overall system power consumption which is desirable for battery based portable and wearable systems.

## 9. Revision History

Revision	Date	Description
1.00	March 1, 2016	Initial release.
2.00	April 21, 2026	The part number has been changed from SLG46531V to SLG46537V.

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