# FET Control Using GreenPAK2

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*Date: September 4, 2013*

## Description

Modern electronics are changing and improving rapidly. Circuit designs become more and more complicated. The number of blocks in the electronic circuits is growing. This requires more supply lines with more advanced controls for the schemes. As a result switching power supply lines becomes very important issue.

A driver circuit to prioritize and turn on power supply lines will be realized using chip SLG46400 chip.

### Advantages of the chip are:

- Low Cost
- Small Package Size: TDFN-12 2.5mm x 2.5 mm
- Operating Temperature Range: -40°C to +85°C
- Supply Voltage from 1.8 V to 5 V
- Does not Require External Clock
- Configurable PINs
- Low Supply Current
- Low-Voltage Inputs are Present (HL=1.0V)

### Applications:

- Smart Phones
- Tablet's, E-Books
- MP3-Players
- Network Routers
- Portable Consumer
- Navigation Devices
- Intelligent Instruments
- Embedded Control Systems

## Principles of Operation

The SLG46400 will sequence three MOSFETs that will turn on three supply lines. The chip has three inputs S1, S2 and S3. S1 has a highest priority. S2 has a higher priority than the S3, but a lower priority than S1. S3 has the lowest priority. For example, if a logical HIGH will be applied to S1 and S3 inputs at the same time, S1 output will be active and S3 will be inactive. S1 is assigned to PIN3, S2 to PIN4 and S3 to PIN5.

The scheme also uses delay lines. They are used for turn on delay to avoid possibility of two FETs active at the same time. The minimum delay time is 0.1µs. The maximum delay time is 6.75s. The time delay time depends on "Counter Data" value and clocking frequency. Delay block DLY0 is responsible for the T1 delay on PIN3; delay cell DLY1 is responsible for the T2 delay on PIN4; delay cell DLY2 is responsible for the T3 delay on PIN5.

The Power On Reset (POR) macro cell will produce logical HIGH signal on its output in typically 7ms after the power supply (VDD) rises to about 1.4-1.6V. External signals cannot affect the chip until POR signal is asserted.

The internal oscillator operates only during delay cells operation. This allows the chip to consume less power in standby mode (static inputs and outputs).

### Advantages of this scheme are:

- PFET or NFET control
- Situation of all FETs opened is impossible
- Different time between lines turned on (T1,T2, T3)
- Different number of power lines
- Freedom of the input priority choice
- The possibility of switching number of voltage sources on a single load.

• The possibility of switching one voltage source on to several loads and other source/load combinations

• Output PIN's may be configured to be push-pull and/or open drain type.

Internal structure of the chip is shown in Figures 1 and 2.

As can be seen from the timing diagram shown in Figure 3, a circuit has three delays. This is done to secure connections to power supply or load. By default, all lines are turned off. The activation of all the lines is impossible.

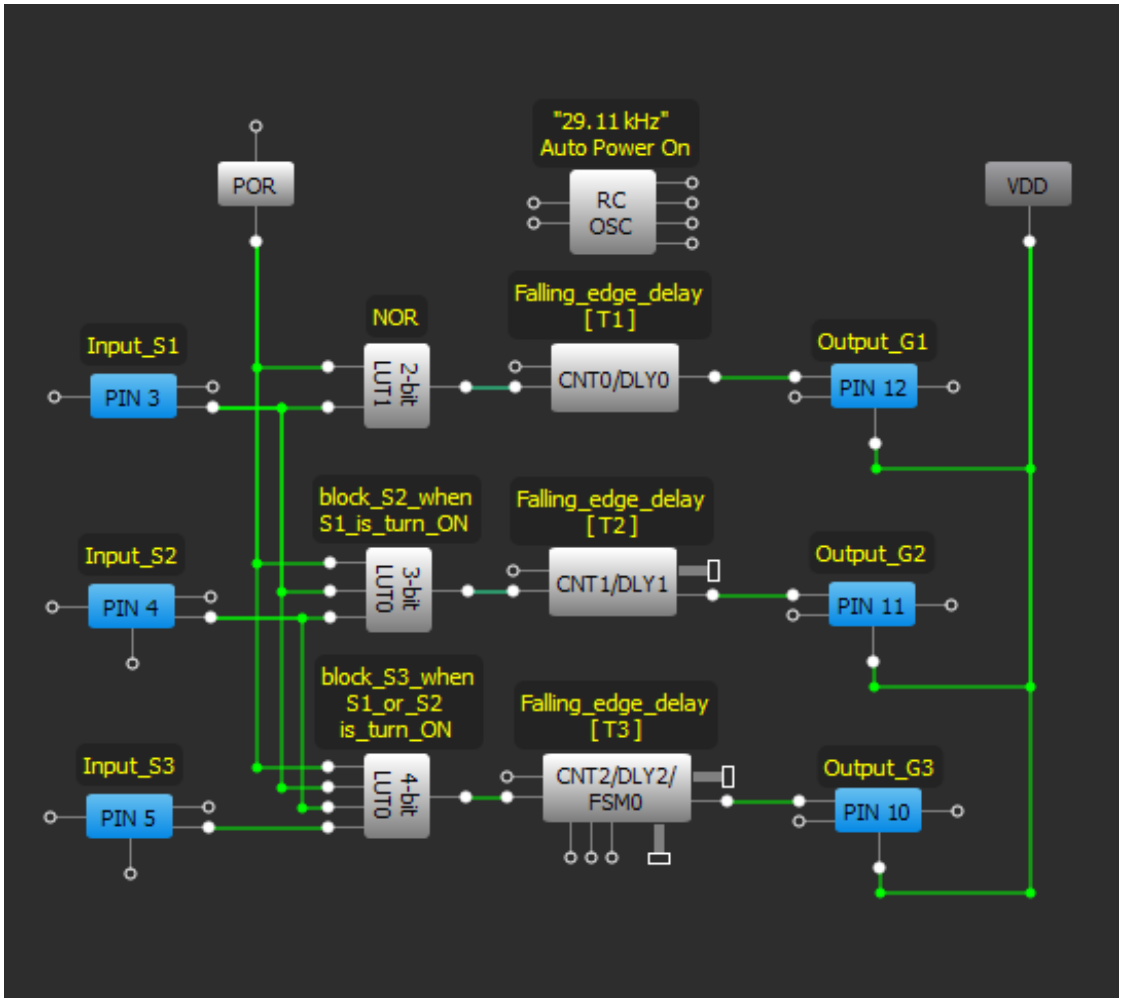


**Figure 1. 3-lines GreenPAK2 driver with priority lines. The output PINs are driving P-channel MOSFET**

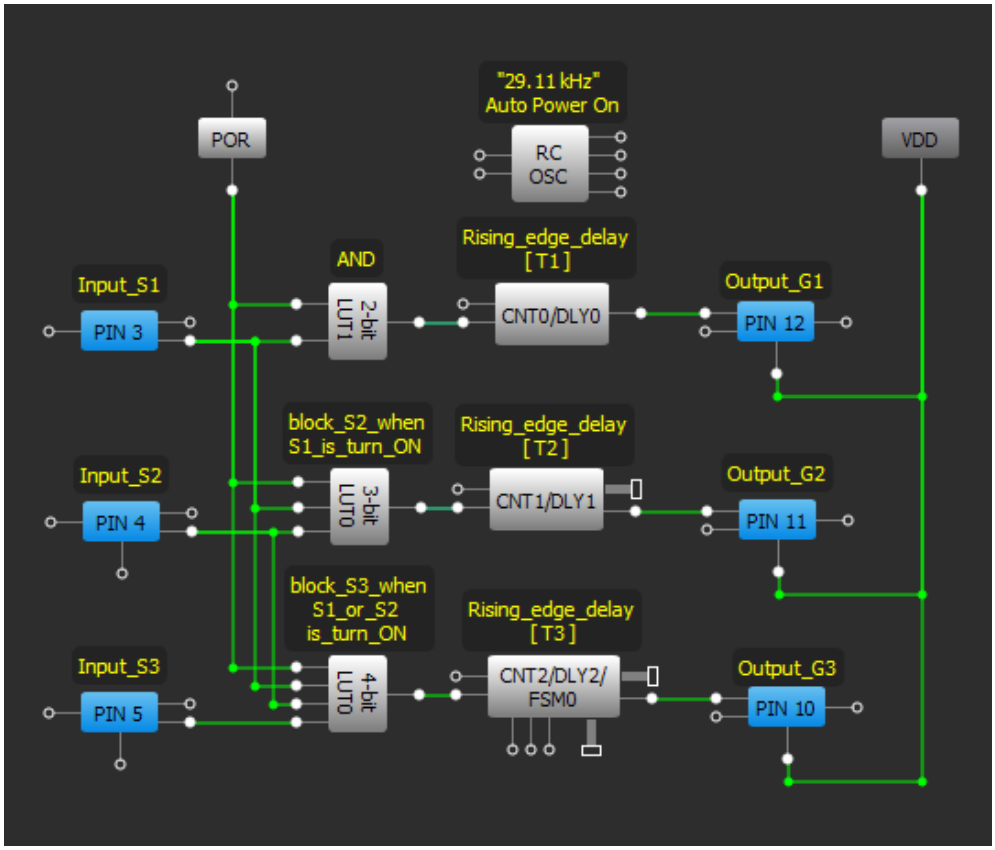


**Figure 2. 3-lines GreenPAK2 driver with priority lines. The output PINs are driving N-channel MOSFET**

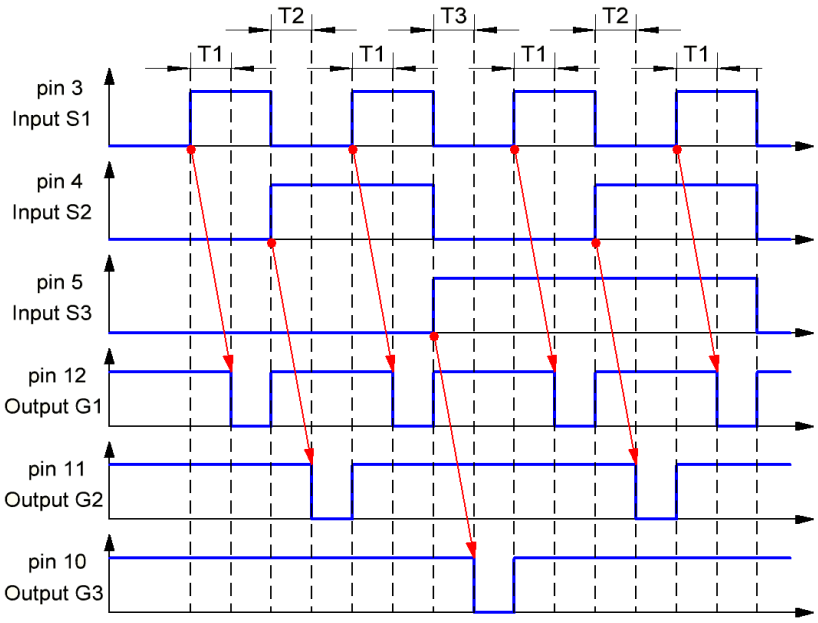


**Figure 3. Timing diagram of operation of the circuit shown in Figure 4a**

## Typical Application Circuits

Circuits shown in Figure 4 are easy to implement. They can be used when a voltage sources are compatible with the supply voltage of GreenPAK2 chip. Circuit shown in Figure 5 can be used when the lines voltages exceed the chip operating voltage range. The use of additional N-channel MOSFETs makes the scheme more secure. Circuit shown in Figure 6 uses other Silego devices – GreenFETs. Supply voltage determined by characteristics of GreenFETs and ranges from 1 to 20 V.

Load impedance affects the behavior of the flow of the current through the MOSFETs so there is a need to be careful when choosing FETs model. The main characteristic is the drain current capability. If the resistance of the load has small value, the more powerful MOSFET should be used.

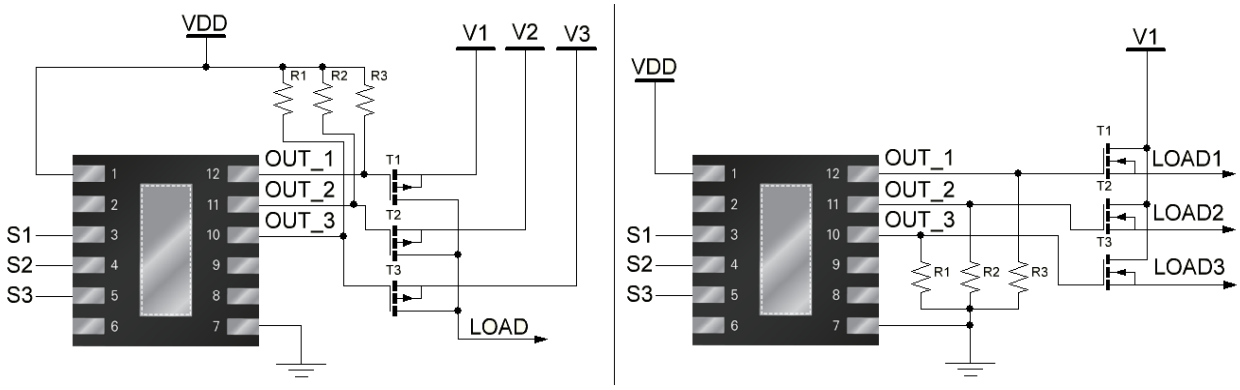


**Figure 4. Power lines control with GreenPAK2 as a driver:**
**a) P-channel MOSFETs, one load; b) N-channel MOSFETs, one power supply, three loads**

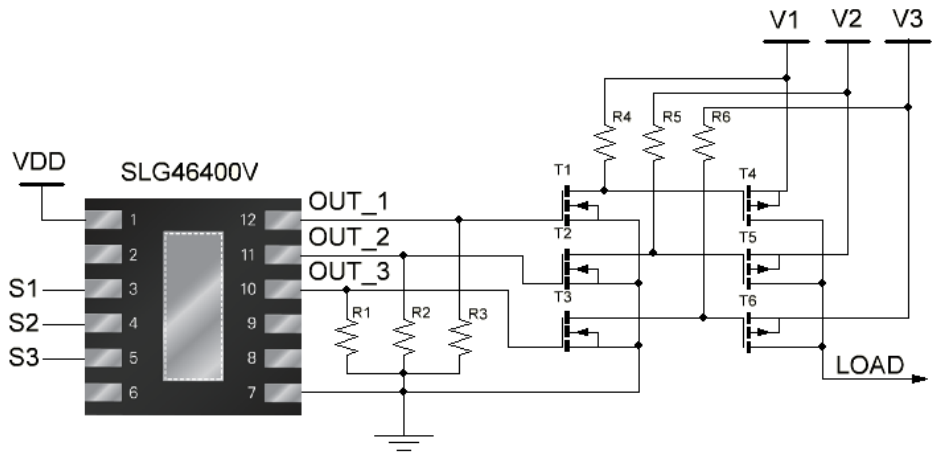


**Figure 5. Control of a high power lines using GreenPAK2 device**

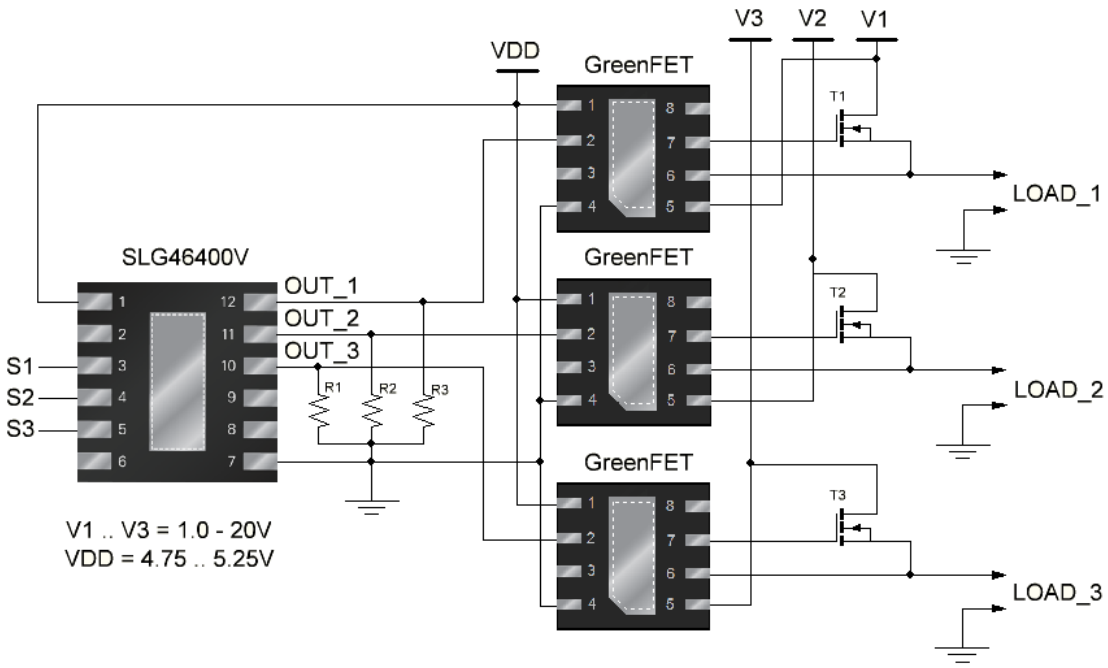


**Figure 6. Control of high power lines with GreenPAK2 device and GreenFET chips as drivers**

## About the Author

Name: Olexander Reshotka

Background: Olexander Reshotka graduated from Lviv Polytechnic National University in 2012 and received a Master's Degree in "Micro- and nanoelectronics". Since 2012 he has been working with crystalline materials, measuring equipment, research acousto-optic interaction of the laser beam in crystalline materials. He has also practical skills in working with electronics, drafting circuit, making drawings of printed-circuit boards, repairing computer equipment, audio equipment.

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## Document History

Document Title: FET Control Using GreenPAK2

Document Number: AN-1021

| Revision | Orig. of Change | Submission Date | Description of Change |
|---|---|---|---|
| A | Olexander Reshotka | 09/04/2013 | New application note |

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