

# GreenPAK™

Configurable Mixed-Signal Matrix



# GreenPAK IC BENEFITS

GreenPAK, a member of Renesas' Configurable Mixed-Signal Matrix products, is a cost-effective one-time NVM programmable device which enables innovators to integrate many system functions while minimizing component count, board space, and power consumption.

Using GreenPAK Designer software and GreenPAK Development Kit, designers can create and program a custom circuit in minutes.

Now supporting automotive grade GreenPAK devices.



Faster time to market



Improved noise performance



Lower cost for designs



BOM & design size reduction



Design security



Reduced power consumption



Decrease probability of design failure (POF)



Adaptable & flexible design



Improve thermal performance



No NRE



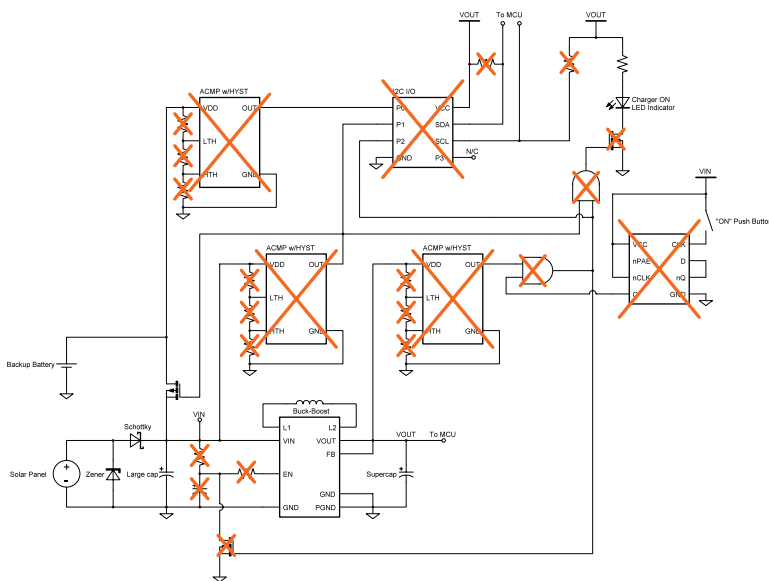
No production commitment



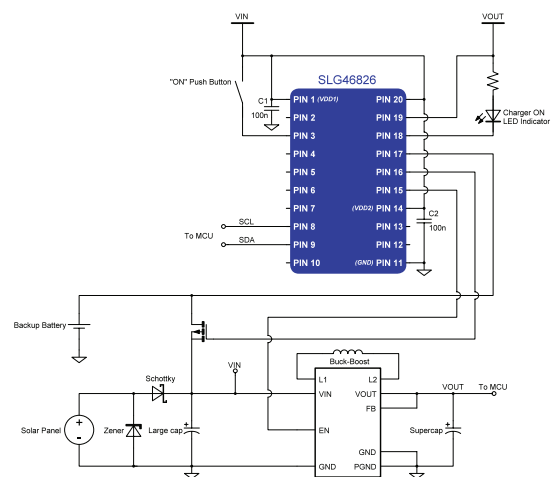
Custom datasheet

## GreenPAK Design Integration

Original Design



Optimized GreenPAK Design



Design reduced by  
 - 5 ICs  
 - 2 NMOS transistors  
 - 14 passive components

# UNIQUE FUNCTIONS & FEATURES

## ALL-IN-ONE PACKAGE

The GreenPAK family of products empowers designers to implement one, or a combination of many, numerous functions and features into their design. Some examples include:

### Analog

- Analog switch
- Battery charge indicator
- Comparators
- Current sense/limiter
- LDOs
- Low voltage indicator
- Logic (Mux, gates, etc.)
- OpAmp
- Over-temp detection
- Potentiometer
- Rheostat
- Voltage level detection
- Wake/sleep function
- and More

### Digital

- Control
- Deserialization/serialization
- Frequency detection
- Frequency divider
- GPIOs (6-28)
- H-/Half-Bridge
- I<sup>2</sup>C expansion
- Interrupt
- LED driving/pattern
- Level shifting
- Motor driving
- Pattern generator
- PWM generation
- Sequencer
- SPI or I<sup>2</sup>C Communication
- System reset
- Watchdog timer
- and More

### Offerings Include:

- Automotive qualified
- Multi-time or One-time programmable
- Single or Dual Supply



1.0 mm x 1.2 mm  
8-pin STQFN  
0.4 mm pitch



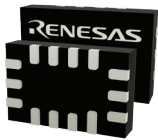
1.6 mm x 1.6 mm  
12-pin STQFN  
0.4 mm pitch



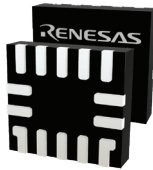
1.6 mm x 2.0 mm  
16-pin MSTQFN  
0.4 mm pitch



1.6 mm x 2.0 mm  
14-pin STQFN  
0.4 mm pitch



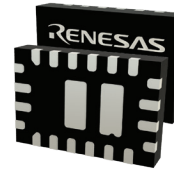
1.6 mm x 2.5 mm  
14-pin STQFN  
0.4 mm pitch



2.0 mm x 2.2 mm  
14-pin STQFN  
0.4 mm pitch



2.0 mm x 2.2 mm  
22-pin MSTQFN  
0.4 mm pitch



2.0 mm x 3.0 mm  
20-pin STQFN  
0.4 mm pitch



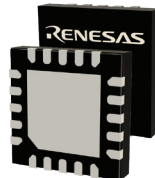
2.0 mm x 3.0 mm  
28-pin MSTQFN  
0.4 mm pitch



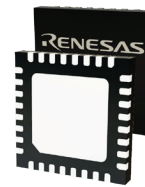
3.0 mm x 3.0 mm  
14-pin FCQFN  
0.65 mm pitch



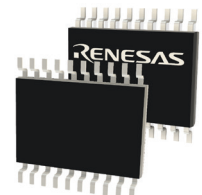
3.0 mm x 3.0 mm  
24-pin STQFN  
0.4 mm pitch



3.5 mm x 3.5 mm  
20-pin TQFN  
0.5 mm pitch



4.0 mm x 4.0 mm  
32-pin STQFN  
0.4 mm pitch



6.5 mm x 6.4 mm  
20-pin TSSOP  
0.65 mm pitch

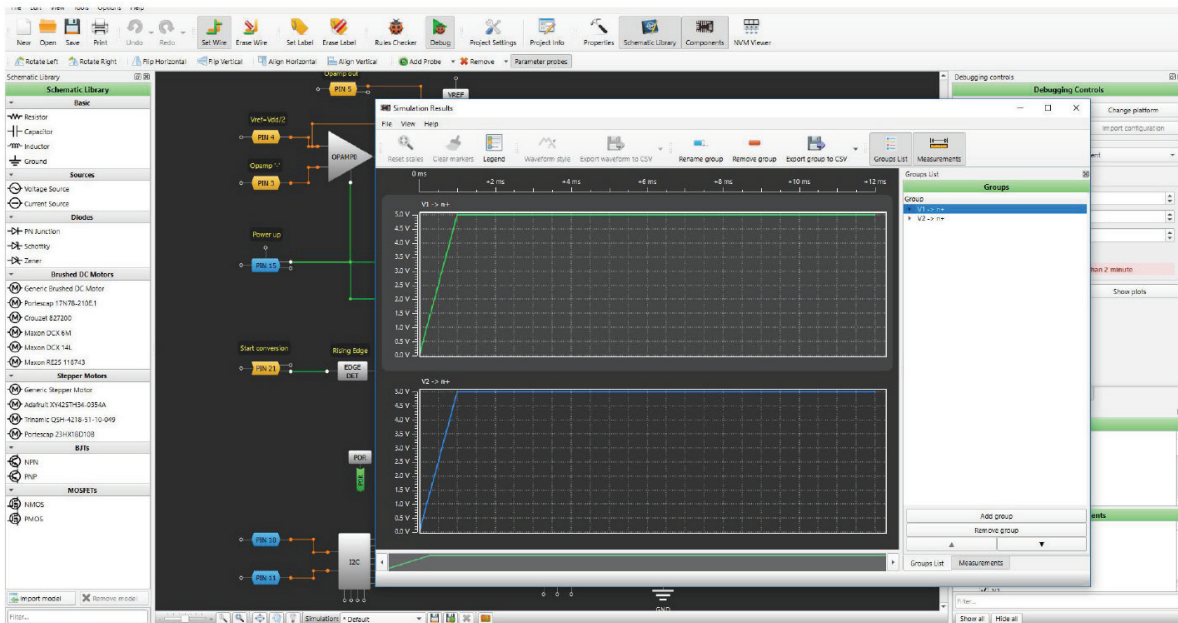
\*more packages available



# DEVELOPMENT SOFTWARE

Renesas' Go Configure™ Software Hub development software enables a completely graphical design process, requiring no programming language or compiler, allowing a designer to configure, program, and test custom GreenPAK samples in minutes.

- Schematic capture-like design and routing
- Entire component library showing available resources for each device
- Easy component configuration
- Example projects and support documentation
- Simulation capability with external components



[Download Go Configure™ Software Hub](#)

[View the Software User Guide](#)

**Step 1**  
  
Place unprogrammed GreenPAK into socket

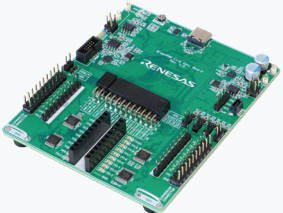
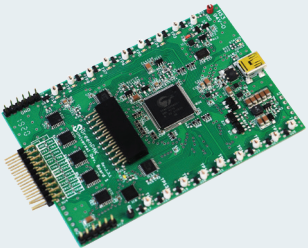
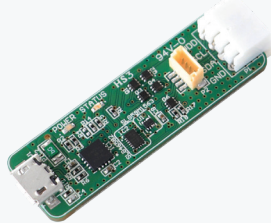
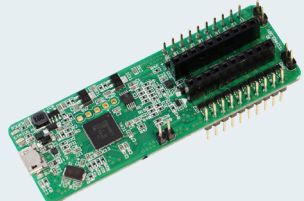
**Step 2**  
  
Design your IC with GreenPAK GUI

**Step 3**  
  
Click **Program** to freeze GreenPAK's NVM

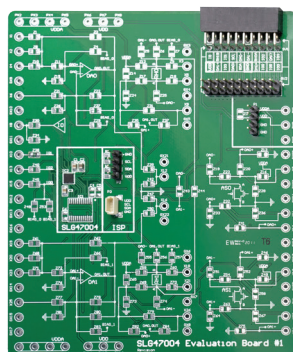
**Step 4**  
  
Your custom IC is ready for use

# GreenPAK TOOLS

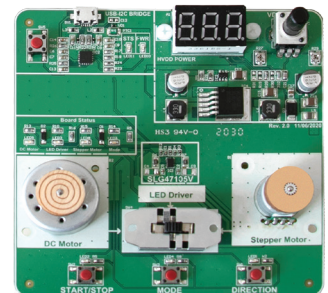
There are four development boards that allow engineers to develop their custom designs using GreenPAK mixed-signal ICs. You can design your own projects starting from a blank project, or by altering the sample projects provided at [renesas.com](https://www.renesas.com).

Board/Functions	Features
<p><b>GreenPAK Lite Development Board</b> Programs custom samples in minutes and works with both DIP and socket adapters.</p> 	<ul style="list-style-type: none"> <li>• USB 2.0 board power and communication</li> <li>• Dual VDD IC's support</li> <li>• Onboard PIN LED state indication, Pull-up, Pull-down, GND, VDD, Hi-Z, VDD2, and a programmable software button</li> <li>• Gated expansion header for connection to external test equipment</li> </ul>
<p><b>GreenPAK Advanced Development Platform</b> Program custom samples in minutes using any GreenPAK device.</p> 	<ul style="list-style-type: none"> <li>• USB interface</li> <li>• MacOS, Windows and Linux compatible</li> <li>• Programming and Emulation</li> <li>• Gated expansion header for connection to external test equipment</li> <li>• Integrated signal and logic generators LEDs for visual indication</li> </ul>
<p><b>GreenPAK Serial Debugger Board (GSD)</b> Serial debugging for all GreenPAK parts with I<sup>2</sup>C.</p> 	<ul style="list-style-type: none"> <li>• USB interface for power and control</li> <li>• 4 pin header with I<sup>2</sup>C interface to target system</li> <li>• MacOS, Windows and Linux compatible</li> <li>• GSD supports serial programming for SLG46824, SLG46826, and SLG47004.</li> </ul>
<p><b>GreenPAK DIP Development Platform</b> Perfect for breadboarding and fast prototypes.</p> 	<ul style="list-style-type: none"> <li>• USB interface</li> <li>• MacOS, Windows and Linux compatible</li> <li>• Programming and Emulation</li> <li>• Gated expansion header for connection to external test equipment</li> </ul>

The evaluation board for the SLG47004 is designed to prototype basic analog configurations of SLG47004 with user-defined circuits and parameters.



The HVPAK™ Demo Board allows testing designs based on SLG47105 which drives the built-in DC and stepper motors, along with enabling the LED control.



## SLG47004V-EVB

GreenPAK SLG47004V Evaluation Board



## SLG47105V-DMO

HVPAK SLG47105 Demonstration Board

# GreenPAK PORTFOLIO

## Configurable Mixed-Signal Matrix

	SLG46108	SLG46110	SLG46116/7	SLG46120	SLG46127	SLG46140	SLG46169
Memory Type	OTP	OTP	OTP	OTP	OTP	OTP	OTP
Temperature Range (°C)	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85
# of GPIOs	6	8	7	10 *	6	12	12
Operating Voltage (V)	1.8 to 5.0	1.8 to 5.0	1.8 to 5.0	1.8 to 5.0	1.8 to 5.0	1.8 to 5.0	1.8 to 5.0
Dual Supply (VDD2 1.8 V to VDD)	–	–	–	SLG46121 *	–	–	–
8-bit SAR ADC	–	–	–	–	–	–	–
Analog/Digital Comparators	–	2/0	2/0	2/0	2/0	2/3	2/3
Maximum Look Up Tables (LUTs)	10	10	10	16	10	16	18
Maximum Counters/Delays	4	4	4	4	4	4	7
Maximum DFF / Latch	4	4	4	8	4	6	6
PWMs	–	–	–	–	–	3	–
Pipe Delay	–	8-stage	8-stage	8-stage	8-stage	16-stage	16-stage
Programmable Delay	1	1	1	1	1	1	1
Internal Oscillator (Hz)	25 k / 2 M	25 k / 2 M	25 k / 2 M	25 k / 2 M	25 k / 2 M	1.7 k / 25 k / 2 M / 27 M	25 k / 2 M
LoadSwitch (LS) / LDO / DCDC / High Current Output (HCO)	–	–	1.25 A PFET LS	–	2 x 2 A PFET LS	–	–
Asynchronous State Machine	–	–	–	–	–	–	–
Communication Interface	–	–	–	–	–	SPI	–
QFN Part Number	SLG46108V	SLG46110V	SLG46116V SLG46117V	SLG46120V SLG46121V	–	SLG46140V	SLG46169V
QFN Package Size (mm)	1.0 x 1.2	1.6 x 1.6	1.6 x 2.5	1.6 x 1.6	–	1.6 x 2.0	2.0 x 2.2
Alternate Package Part Number	–	–	–	SLG46120P	SLG46127M	–	–
Alternate Package Type and Size (mm)	–	–	–	STQFN 2.0 x 2.0	MSTQFN 1.6 x 2.0	–	–

## Configurable Mixed-Signal Matrix

	SLG46170	SLG46517	SLG46533	SLG46534	SLG46536	SLG46537	SLG46580
Memory Type	OTP	OTP	OTP	OTP	OTP	OTP	OTP
Temperature Range (°C)	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85
# of GPIOs	12	16	18	12 *	12	18 *	9
Operating Voltage (V)	1.8 to 5.0	1.8 to 5.0	1.8 to 5.0	1.8 to 5.0	1.8 to 5.0	1.8 to 5.0	2.5 to 5.0
Dual Supply (VDD2 1.8 V to VDD)	–	–	–	SLG46535 *	–	SLG46538 *	–
8-bit SAR ADC	–	–	–	–	–	–	–
Analog/Digital Comparators	–	4/0	4/0	3/0	3/0	4/0	4/0
Maximum Look Up Tables (LUTs)	17	17	25	17	25	17	15
Maximum Counters/Delays	8	7	7	7	7	7	5
Maximum DFF / Latch	6	8	15	8	15	8	9
PWMs	–	–	–	–	–	–	–
Pipe Delay	16-stage	16-stage	16-stage	16-stage	16-stage	16-stage	16-stage
Programmable Delay	1	1	1	1	1	1	1
Internal Oscillator (Hz)	25 k / 2 M	25 k / 2 M / 25 M	25 k / 2 M / 25 M	25 k / 2 M / 25 M	25 k / 2 M / 25 M	25 k / 2 M / 25 M	25 k / 2 M / 25 M
LoadSwitch (LS) / LDO / DCDC / High Current Output (HCO)	–	2 x 2 A PFET LS	–	–	–	–	4 x 150 mA LDO
Asynchronous State Machine	–	8-State	–	8-State	–	8-State	8-State
Communication Interface	–	I <sup>2</sup> C	I <sup>2</sup> C	I <sup>2</sup> C	I <sup>2</sup> C	I <sup>2</sup> C	I <sup>2</sup> C
QFN Part Number	SLG46170V	–	SLG46533V	SLG46534V SLG46535V	SLG46536V	SLG46537V SLG46538V	SLG46580V
QFN Package Size (mm)	2.0 x 2.2	–	2.0 x 3.0	2.0 x 2.2	2.0 x 2.2	2.0 x 3.0	2.0 x 3.0
Alternate Package Part Number	–	SLG46517M	SLG46533M	–	–	SLG46537M SLG46538M	–
Alternate Package Type and Size (mm)	–	MSTQFN 2.0 x 3.0	MSTQFN 2.0 x 2.2	–	–	MSTQFN 2.0 x 2.2	–

\*Dual Supply versions lose one GPIO for VDD2

## GreenPAK PORTFOLIO

Configurable Mixed-Signal Matrix	SLG46582	SLG46583	SLG46585	SLG46721	SLG46722	SLG46811	SLG46855
Memory Type	OTP	OTP	OTP	OTP	OTP	OTP	OTP
Temperature Range (°C)	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85
# of GPIOs	9	9	7	18	18	10	12
Operating Voltage (V)	2.5 to 5.0	2.5 to 5.0	2.5 to 5.0	1.8 to 5.0	1.8 to 5.0	2.3 to 5.5	2.3 to 5.0
Dual Supply (VDD2 1.8 V to VDD)	–	–	–	–	–	–	–
8-bit SAR ADC	–	–	–	–	–	–	–
Analog/Digital Comparators	4/0	4/0	4/0	4/0	–	1(4)/0	4/0
Maximum Look Up Tables (LUTs)	15	15	16	18	17	18	23
Maximum Counters/Delays	5	5	5	7	8	6	8
Maximum DFF / Latch	9	9	9	6	6	17	21
PWMs	–	–	–	–	–	–	–
Pipe Delay	16-stage	16-stage	16-stage	16-stage	16-stage	4 Shift Registers	16-stage
Programmable Delay	1	1	1	1	1	1	Yes
Internal Oscillator (Hz)	25 k / 2 M / 25 M	25 k / 2 M / 25 M	25 k / 2 M / 25 M	25 k / 2 M	25 k / 2 M	2 k / 10 k / 25 M	2 k / 2 M / 25 M
LoadSwitch (LS) / LDO / DCDC / High Current Output (HCO)	2 x 300 mA LDO	1 x 600 mA LDO	4 x 150 mA LDO 1 A DCDC	–	–	–	–
Asynchronous State Machine	8-State	8-State	8-State	–	8-State	–	–
Communication Interface	I <sup>2</sup> C	I <sup>2</sup> C	I <sup>2</sup> C	–	–	I <sup>2</sup> C	I <sup>2</sup> C
QFN Part Number	SLG46582V	SLG46583V	–	SLG46721V	SLG46722V	SLG46811V	SLG46855V
QFN Package Size (mm)	2.0 x 3.0	2.0 x 3.0	–	2.0 x 3.0	2.0 x 3.0	1.6 x 1.6	1.6 x 2.0
Alternate Package Part Number	–	–	SLG46585M	–	–	–	–
Alternate Package Type and Size (mm)	–	–	MSTQFN 3.0 x 3.0	–	–	–	–

Configurable Mixed-Signal Matrix	SLG46620	SLG46824	SLG46826	SLG46867	SLG46880	SLG46881	SLG47512 SLG47513
Memory Type	OTP	MTP	MTP	OTP	OTP	OTP	OTP
Temperature Range (°C)	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85
# of GPIOs	18 *	17	17	10	28	28	10 (SLG47512) 14 (SLG47513)
Operating Voltage (V)	1.8 to 5.0	2.3 to 5.0	2.3 to 5.0	2.3 to 5.0	2.3 to 5.0	2.3 to 5.0	1.0 to 1.65
Dual Supply (VDD2 1.8 V to VDD)	SLG46621 *	1.71 to VDD	1.71 to VDD	–	2.3-VDD	1.0-1.8	–
8-bit SAR ADC	1	–	–	–	–	–	–
Analog/Digital Comparators	6/3	2/0	4/0	4/0	5/0	5/0	2/0
Maximum Look Up Tables (LUTs)	26	19	19	23	12	12	23
Maximum Counters/Delays	10	8	8	8	5	5	8
Maximum DFF / Latch	12	17	17	21	5	5	15
PWMs	3	–	–	–	–	–	–
Pipe Delay	2 x 16-stage	16-stage	16-stage	2 x 16-stage	16-stage	16-stage	14 Shift Registers
Programmable Delay	2	Yes	Yes	Yes	Yes	Yes	1
Internal Oscillator (Hz)	1.7 k / 25 k / 2 M / 27 M	2 k / 2 M / 25 M	2 k / 2 M / 25 M	2 k / 2 M / 25 M	2 k / 2 M / 25 M	2 k / 2 M / 25 M	2 k / 25 M
LoadSwitch (LS) / LDO / DCDC / High Current Output (HCO)	–	–	–	2 x 2 A PFET LS	–	–	–
Asynchronous State Machine	–	–	–	–	12-State	12-State	–
Communication Interface	SPI	I <sup>2</sup> C	I <sup>2</sup> C	I <sup>2</sup> C	I <sup>2</sup> C	I <sup>2</sup> C	I <sup>2</sup> C
QFN Part Number	SLG46620V SLG46621V	SLG46824V	SLG46826V	–	SLG46880V	SLG46881V	SLG47512V
QFN Package Size (mm)	2.0 x 3.0	2.0 x 3.0	2.0 x 3.0	–	4.0 x 4.0	4.0 x 4.0	1.6 x 1.6
Alternate Package Part Number	SLG46620G	SLG46824G	SLG46826G	SLG46867M	–	–	SLG47513M
Alternate Package Type and Size (mm)	TSSOP 6.5 x 6.4	TSSOP 6.5 x 6.4	TSSOP 6.5 x 6.4	MSTQFN 1.6 x 3.0	–	–	MSTQFN 1.6 x 1.6

\* Dual Supply versions lose one GPIO for VDD2

# GreenPAK PORTFOLIO

## Automotive Configurable Mixed-Signal Matrix

	SLG46538-A	SLG46620-A	SLG46625-A	SLG46827-A	SLG46855-A	SLG46857-A	SLG46880-A
Memory Type	OTP	OTP	OTP	MTP	OTP	OTP	OTP
Temperature Range (°C)	-40 to +125	-40 to +105	-40 to +125	-40 to +105	-40 to +105	-40 to +125	-40 to +125
# of GPIOs	20/17	20/18	20/18	20/17	14/12	14/12	32/28
Operating Voltage (V)	1.71 to 5.5	1.71 to 3.6	1.71 to 5	2.3 to 5.5	2.3 to 5.5	2.3 to 5.5	2.3 to 5.5
Dual Supply	1.71 to VDD	—	—	1.71 to VDD	—	—	2.3 to VDD
8-bit SAR ADC	—	1	1	—	—	—	—
Analog/Digital Comparators	4/0	6/3	6/3	4/0	4/0	4/0	5/0
Maximum Look Up Tables (LUTs)	17	26	26	19	28	28	12
Maximum Counters / Delays	7	10	10	8	8	8	5
Maximum DFF / Latch	8	12	12	16	21	21	5
PWMs	—	3	3	—	—	—	—
Pipe Delay	16-stage	2 x 16-stage	2 x 16-stage	16-stage	16-stage	16-stage	16-stage
Programmable Delay	1	2	2	1	1	1	1
Internal Oscillator (Hz)	25 k / 2 M / 25 M	1.7 k / 25 k / 2 M / 27 M	1.7 k / 25 k / 2 M / 27 M	2 k / 2 M / 25 M	2 k / 2 M / 25 M	2 k / 2 M / 25 M	2 k / 2 M / 25 M
Asynchronous State Machine	8-State	—	—	—	—	—	12-State
Communication Interface	I <sup>2</sup> C	SPI	SPI	I <sup>2</sup> C	I <sup>2</sup> C	I <sup>2</sup> C	I <sup>2</sup> C
QFN Part Number	SLG46538-AP	—	SLG46625-AP	—	SLG46855-AP	SLG45857-AP	SLG46880-AP
QFN Package Size (mm)	3.5 x 3.5	—	3.5 x 3.5	—	3 x 3	3 x 3	5 x 5
Alternate Package Type and Size (mm)	—	TSSOP 6.4 x 6.5	—	TSSOP 6.4 x 6.5	—	—	—

## Configurable Mixed-Signal Matrix

	HVPAK™		AnalogPAK™
Memory Type	OTP	OTP	MTP
Part number	SLG47105	SLG47115	SLG47004
Temperature Range (°C)	-40 to +85	-40 to +85	-40 to +85
# of GPIOs	8	8	8
High Voltage High Current Output (HV_GPO_HD)	4 x 1.5 A RMS (2 A Peak) HV_GPO_HD	2 x 1.5 A RMS (3 A Peak) HV_GPO_HD	—
Operating Voltage (V)	2.3 to 5.5	2.3 to 5.5	2.4 to 5.5
Dual Supply (VDD2, V)	3.0 to 13.2	4.5 to 26.4	—
Abs Max (VDD2, V)	18	32	—
Operational Amplifiers	—	—	3
Digital Rheostats (1024 Position), resistance	—	—	2 x 100kΩ
Analog Switch	—	—	2
Analog / Current Sense Comparators / Differential Amplifier	2/2/1	2/1/1	3/0/0
Maximum Look Up Tables (LUTs)	17	17	20
Maximum Counters/Delays	5	5	7
Maximum DFF / Latch	15	15	18
PWMs	2	2	—
Pipe Delay	16-stage	16-stage	16-stage
Programmable Delay	1	1	1
Internal Oscillator (Hz)	2 k / 25 M	2 k / 25 M	2.048 k / 2.048 M / 25 M
Communication Interface	I <sup>2</sup> C	I <sup>2</sup> C	I <sup>2</sup> C
QFN Package Size (mm)	20-pin, 2.0 x 3.0	20-pin, 2.0 x 3.0	24-pin, 3.0 x 3.0

Visit [renesas.com/greenpak](https://www.renesas.com/greenpak) for more details on the complete portfolio of products, including datasheets, eval boards and samples.



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