



# GreenPAK™

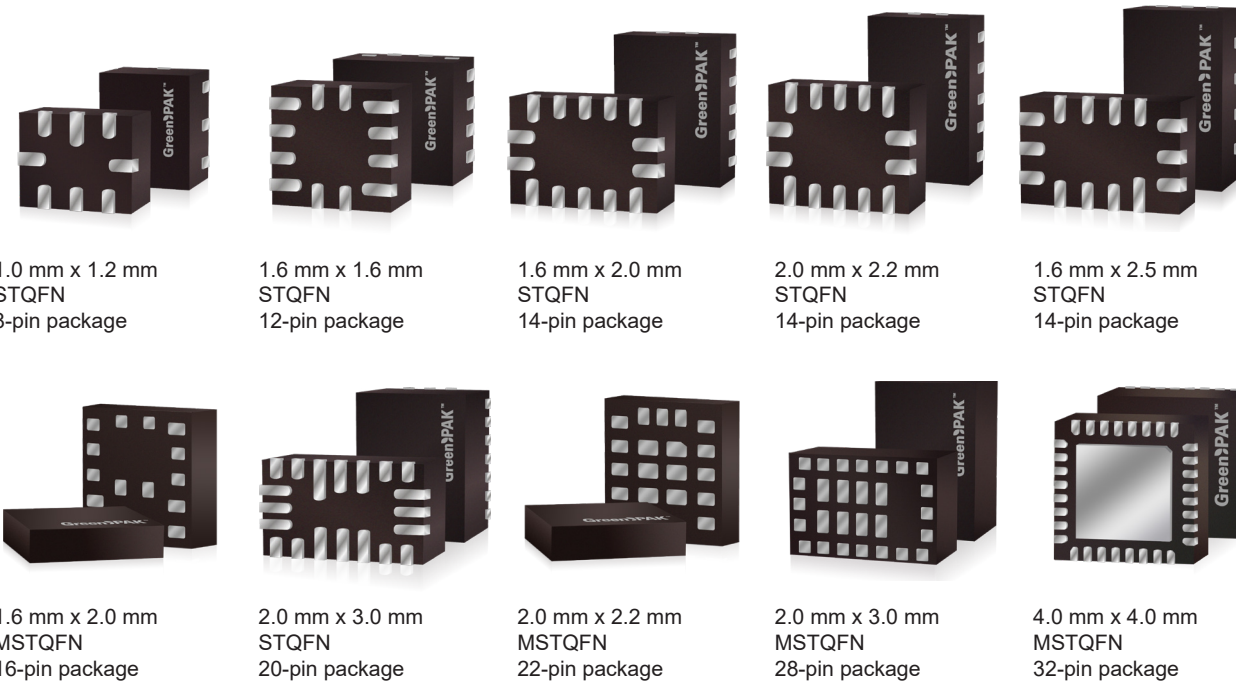
Q2 2022

# GreenPAK Programmable Mixed-Signal

GreenPAK, a member of Renesas' Programmable Mixed-Signal ASIC 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.



## GreenPAK IS IDEAL FOR

- Functional replacement of popular mixed-signal standard products, often in combination.
- Providing reliable hardware safety, supervisory and reset functions for software coded devices, such as SoCs and microcontrollers.

## BENEFITS OVER DISCRETE DESIGN

- **Smaller PCB footprint** – Plastic packages as small as 1.0 mm x 1.2 mm.
- **Fewer Components/Lower Cost** – A typical GreenPAK implementation removes from ten to thirty components per instance.
- **Higher Reliability** – Fewer PCB interconnects increases reliability.
- **Faster Design** – Develop and program devices in minutes at your desk. Quickly respond to changing design requirements and increase productivity at the design and prototype verification stages.
- **Lower Power** – Save power by removing discrete resistors in voltage dividers, pull ups, pull downs, etc. and replacing with low-power, integrated components. Further reduce power consumption using the sleep function.
- **Design Security** – Makes reverse engineering substantially more difficult by disabling the read-back of NVM configuration, obscuring design details.
- **Tested Solution** – Every GreenPAK is 100% tested. A discrete circuit is not tested prior to the final board level test.

# GreenPAK EXAMPLES

## By Application

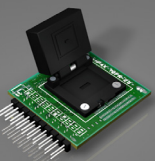
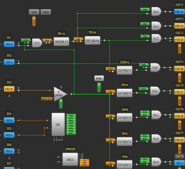

- Power Sequencing
- System Reset
- Level Shift
- LED Control
- Over Voltage Protection
- Voltage Detection
- Sensor Interface
- Port Detection
- IO Expansion
- Motor & Fan Control

## By Function

- State Machine
- Timing Delays and Counters
- Voltage Monitoring by ACMP or ADC
- Voltage Reference
- Pulse Width Modulator
- Glue Logic

## By Market

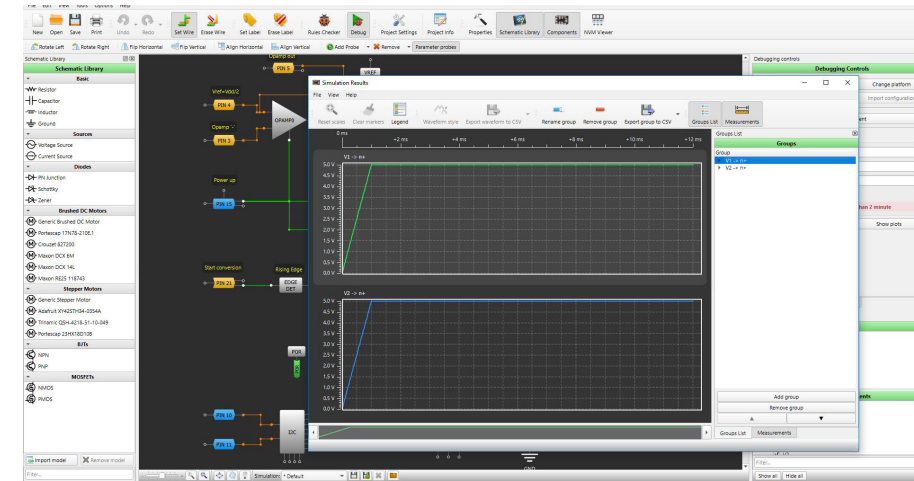
- Handheld Devices
- Wearable Electronics
- Internet of Things
- Computing & Storage
- Consumer Electronics
- Smart Home
- Networking & Communications
- Medical
- Automotive

	<p><b>STEP 1</b></p> <p>Place an unprogrammed GreenPAK IC into a socket</p>		<p><b>STEP 2</b></p> <p>Design your IC with GreenPAK GUI</p>	<p><b>STEP 3</b></p> <p>Click program to freeze GreenPAK's NVM</p> <p><b>Program</b></p>		<p><b>STEP 4</b></p> <p>Your custom IC is ready for use!</p>
---	---	---	--	--	---	--

# DEVELOPMENT SOFTWARE

Renesas' GreenPAK Designer 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



# UNIVERSAL DEVELOPMENT KIT

Working in tandem with the GreenPAK Designer Emulator, former Dialog Technology's Universal Development Kit allows designers to

- Program custom samples in minutes
- Test GreenPAK projects in-circuit
- Develop using any GreenPAK device



Download GreenPAK Designer software (a part of Go Configure™ Software Hub) here:



## Programmable Mixed-Signal Matrix

	SLG46108	SLG46110	SLG46116/7	SLG46120	SLG46127	SLG46140	SLG46169
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	-	-

\* Dual Supply versions lose one GPIO for VDD2

## Programmable Mixed-Signal Matrix

	SLG46170	SLG46517	SLG46533	SLG46534	SLG46536	SLG46537	SLG46580
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 *	-	SLG46535 *	-
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	-	I2C	I2C	I2C	I2C	I2C	I2C
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

## Programmable Mixed-Signal Matrix

	SLG46582	SLG46583	SLG46585	SLG46620	SLG46721	SLG46722
Temperature Range (°C)	-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	18
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	1.8 to 5.0
Dual Supply (VDD2 1.8 V to VDD)	-	-	-	SLG46621*	-	-
8-bit SAR ADC	-	-	-	1	-	-
Analog/Digital Comparators	4/0	4/0	4/0	6/3	4/0	-
Maximum Look Up Tables (LUTs)	15	15	16	26	18	17
Maximum Counters/Delays	5	5	5	10	7	8
Maximum DFF / Latch	9	9	9	12	6	6
PWMs	-	-	-	3	-	-
Pipe Delay	16-stage	16-stage	16-stage	2 x 16-stage	16-stage	16-stage
Programmable Delay	1	1	1	2	1	1
Internal Oscillator (Hz)	25 k / 2 M / 25 M	25 k / 2 M / 25 M	25 k / 2 M / 25 M	1.7 k / 25 k / 2 M / 27 M	25 k / 2 M	25 k / 2 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	I2C	I2C	I2C	SPI	-	-
QFN Part Number	SLG46582V	SLG46583V	-	SLG46620V SLG46621V	SLG46721V	SLG46722V
QFN Package Size (mm)	2.0 x 3.0	2.0 x 3.0	-	2.0 x 3.0	2.0 x 3.0	2.0 x 3.0
Alternate Package Part Number	-	-	SLG46585M	SLG46620G	-	-
Alternate Package Type and Size (mm)	-	-	MSTQFN 3.0 x 3.0	TSSOP 6.5 x 6.4	-	-

\* Dual Supply versions lose one GPIO for VDD2

Free GreenPAK Designer software download, training videos, design examples and application notes can be found on our website.

## Programmable Mixed-Signal Matrix

	SLG46824	SLG46826	SLG46855	SLG46867	SLG46880	SLG46881
Temperature Range (°C)	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85
# of GPIOs	17	17	12	10	28	28
Operating Voltage (V)	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	2.3 to 5.0
Dual Supply (VDD2 1.8 V to VDD)	1.71 to VDD	1.71 to VDD	-	-	2.3-VDD	1.0-1.8
8-bit SAR ADC	-	-	-	-	-	-
Analog/Digital Comparators	2/0	4/0	4/0	4/0	5/0	5/0
Maximum Look Up Tables (LUTs)	19	19	23	23	12	12
Maximum Counters/Delays	8	8	8	8	5	5
Maximum DFF / Latch	17	17	21	21	5	5
PWMs	-	-	-	-	-	-
Pipe Delay	16-stage	16-stage	16-stage	2 x 16-stage	16-stage	16-stage
Programmable Delay	Yes	Yes	Yes	Yes	Yes	Yes
Internal Oscillator (Hz)	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 / 2 M / 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	I2C	I2C	I2C	I2C	I2C	I2C
QFN Part Number	SLG46824V	SLG46826V	SLG46855V	-	SLG46880V	SLG46881V
QFN Package Size (mm)	2.0 x 3.0	2.0 x 3.0	1.6 x 2.0	-	4.0 x 4.0	4.0 x 4.0
Alternate Package Part Number	SLG46824G	SLG46826G	-	SLG46867M	-	-
Alternate Package Type and Size (mm)	TSSOP 6.5 x 6.4	TSSOP 6.5 x 6.4	-	MSTQFN 1.6 x 3.0	-	-

## Programmable Mixed-Signal Matrix

	SLG47105	SLG47115	SLG47004	SLG46811	SLG47512 SLG47513
Temperature Range (°C)	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85
# of GPIOs	8	8	8	10	10 (SLG47512) 14 (SLG47513)
Operating Voltage (V)	2.3 to 5.5	2.3 to 5.5	2.4 to 5.5	2.3 to 5.5	1.0 to 1.65
Dual Supply (VDD2)	3.0 to 13.2	4.5 to 26.4	-	-	-
8-bit ADC	-	-	-	-	-
Analog/Digital Comparators	4/0	3/0	3/0	1(4)/0	2/0
Operational Amplifiers	-	-	3	-	-
Analog Switch	-	-	2	-	-
Digital Rheostats (1024 Position)	-	-	2	-	-
Maximum Look Up Tables (LUTs)	17	17	20	18	23
Maximum Counters/Delays	5	5	7	6	8
Maximum DFF / Latch	15	15	18	17	15
PWMs	2	2	-	-	-
Pipe Delay	16-stage	16-stage	16-stage	4 Shift Registers	14 Shift Registers
Programmable Delay	1	1	1	1	1
Internal Oscillator (Hz)	2 k / 25 M	2 k / 25 M	2.048 k / 2.048 M / 25 M	2.048 k / 10 k / 25 M	2.048 k / 25 M
LoadSwitch (LS) / LDO / DCDC / High Current Output (HCO)	4 x 1.5 A RMS HCO	2 x 1.5 A RMS HCO	-	-	-
Asynchronous State Machine	-	-	-	-	-
Communication Interface	I2C	I2C	I2C	I2C	I2C
QFN Part Number	SLG47105V	SLG47115V	SLG47004V	SLG46811V	SLG47512V
QFN Package Size (mm)	2.0 x 3.0	2.0 x 3.0	3.0 x 3.0	1.6 x 1.6	1.6 x 1.6
Alternate Package Part Number	-	-	-	-	SLG47513M
Alternate Package Type and Size (mm)	-	-	-	-	MSTQFN 1.6 x 1.6

## Automotive Programmable Mixed-Signal Matrix

	SLG46538-A	SLG46620-A	SLG46625-A	SLG46827-A	SLG46855-A	SLG46857-A	SLG46880-A
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 5.3	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
LoadSwitch (LS) / LDO / DCDC / High Current Output (HCO)	-	-	-	-	-	-	-
Asynchronous State Machine	8-State	-	-	-	-	-	12-State
Communication Interface	I2C	SPI	SPI	I2C	I2C	I2C	I2C
QFN Part Number	SLG46538-AP	-	SLG46625-AP	-	SLG46855-AP	SLG45857-AP	SLG46880-AP
QFN Package Size (mm)	3.5 x 3.5 with wettable flanks	-	3.5 x 3.5 with wettable flanks	-	3 x 3 with wettable flanks	3 x 3 with wettable flanks	5 x 5 with wettable flanks
Alternate Package Type and Size (mm)	-	6.4 x 6.5 TSSOP-20	-	6.4 x 6.5 TSSOP-20	-	-	-




5 billion GreenPAK and GreenFET ICs are already delivered  
to our customers from all over the world!


## Renesas Electronics Corporation

 [www.renesas.com](http://www.renesas.com)

### Japan

 +81 52 249 3337


### United States

 321 724 7000


### United Kingdom

 +44 1628 651 700


### Korea

 +82 2 558 3737

### Taiwan

 +886 2 8175 9600

### Germany

 +49 211 6503 0

This publication is issued to provide outline information only, which unless agreed by Renesas Electronics may not be used, applied, or reproduced for any purpose or be regarded as a representation relating to products. All use of Renesas products, software and applications referred to in this document are subject to Renesas' Legal Notices, available on the company website ([www.renesas.com](http://www.renesas.com)) unless otherwise stated.

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners © Renesas Electronics Corporation 2022. All rights reserved.