GreenPAK™

Configurable Mixed-Signal Matrix



renesas.com/greenpak

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.

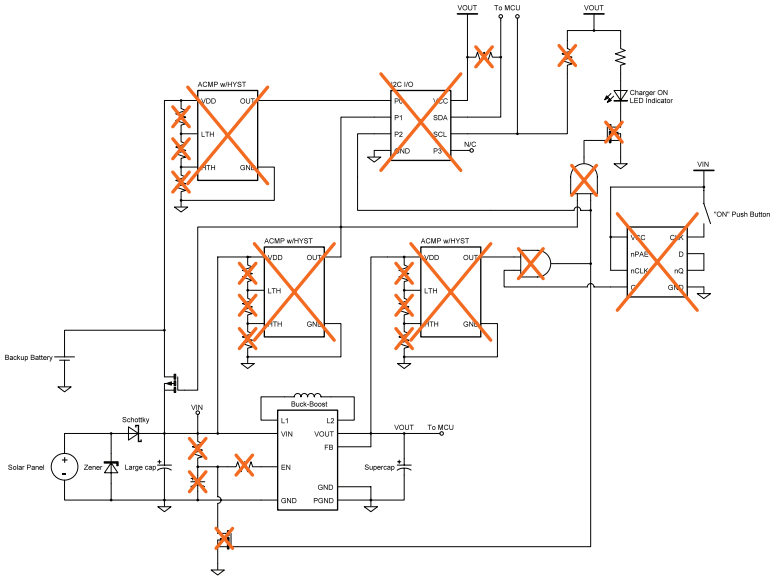
Using GreenPAK Designer software and GreenPAK Development Kit, designers can create and program a custom circuit in minutes.

Now supporting automotive grade GreenPAK devices.

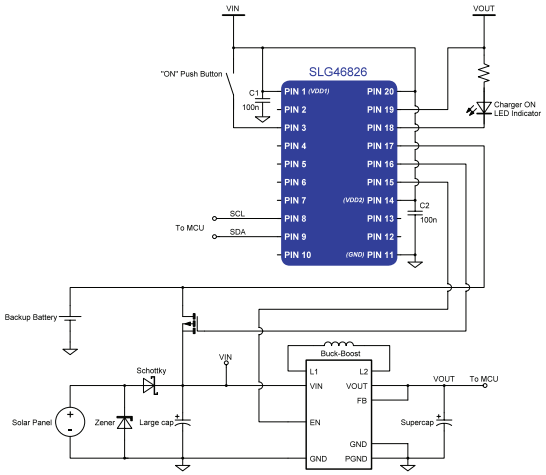
- Faster time to market
- Improved noise performance
- Lower cost for designs
- BOM & design size reduction
- Design security
- Reduced power consumption
- Decrease probability of design failure (POF)
- Adaptable & flexible design
- Improve thermal performance
- No NRE
- No production commitment
- Custom datasheet

GreenPAK Design Integration

Original Design



Optimized GreenPAK Design



Design reduced by
- 5 ICs
- 2 NMOS transitors
- 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
- I²C expansion
- Interrupt
- LED driving/pattern
- Level shifting
- Motor driving
- Pattern generator
- PWM generation
- Sequencer
- SPI or I²C Communication
- System reset
- Watchdog timer
- and More

Offerings Include:

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



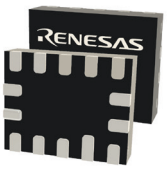
1.0 mm x 1.2 mm
8-pin STQFN
0.4 mm pitch



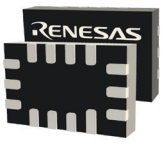
1.6 mm x 1.6 mm
12-pin STQFN
0.4 mm pitch



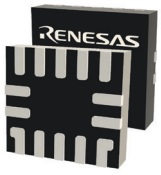
1.6 mm x 2.0 mm
16-pin MSTQFN
0.4 mm pitch



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



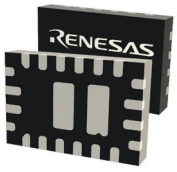
1.6 mm x 2.5 mm
14-pin STQFN
0.4 mm pitch



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



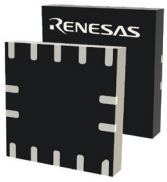
2.0 mm x 2.2 mm
22-pin MSTQFN
0.4 mm pitch



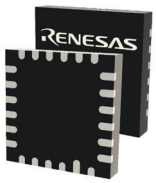
2.0 mm x 3.0 mm
20-pin STQFN
0.4 mm pitch



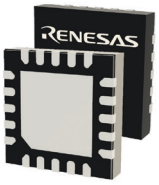
2.0 mm x 3.0 mm
28-pin MSTQFN
0.4 mm pitch



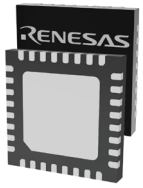
3.0 mm x 3.0 mm
14-pin FCQFN
0.65 mm pitch



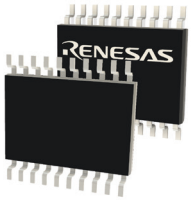
3.0 mm x 3.0 mm
24-pin STQFN
0.4 mm pitch



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



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



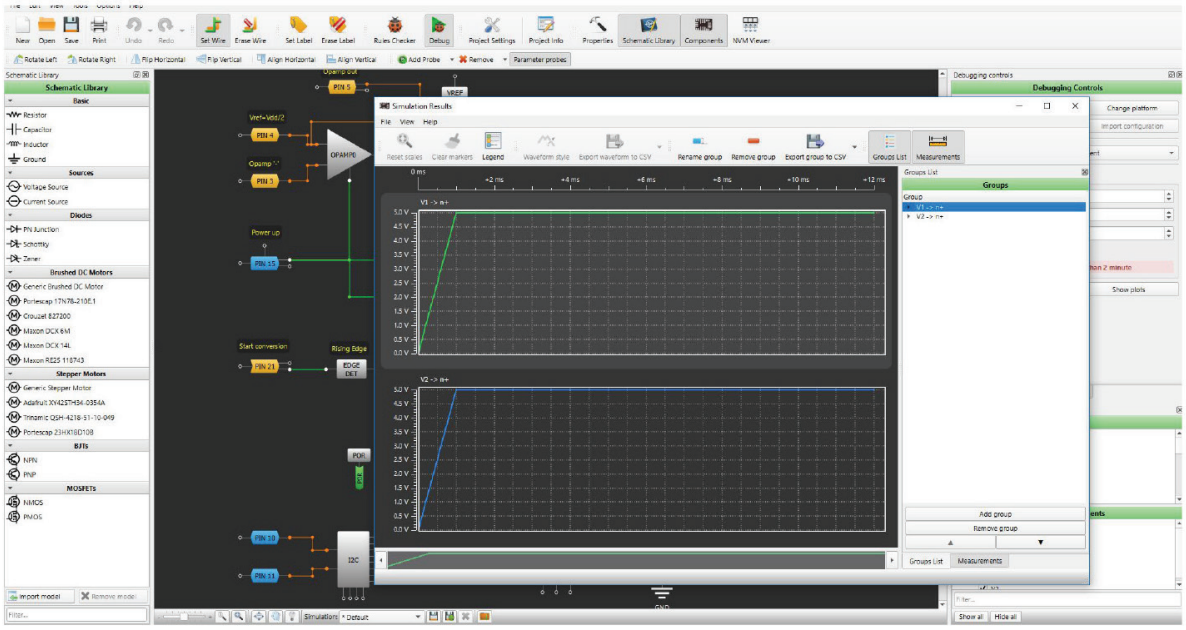
6.5 mm x 6.4 mm
20-pin TSSOP
0.65 mm pitch

*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



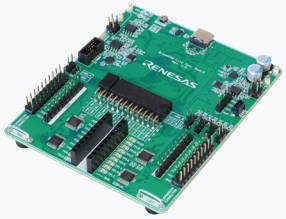
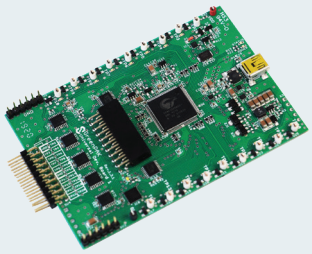
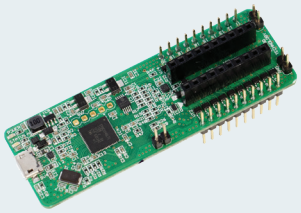
Download Go Configure™ Software Hub

View the Software User Guide

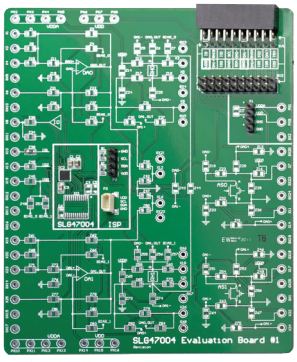


GreenPAK TOOLS

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**.

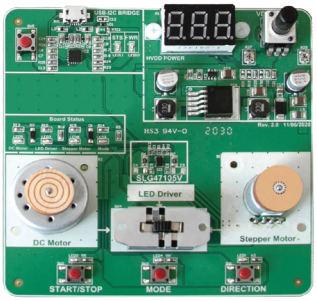
Board/Functions	Features	
GreenPAK Lite Development Board Programs custom samples in minutes and works with both DIP and socket adapters.	• USB 2.0 board power and communication • Dual VDD IC's support • Onboard PIN LED state indication, Pull-up, Pull-down, GND, VDD, Hi-Z, VDD2, and a programmable software button • Gated expansion header for connection to external test equipment	
GreenPAK Advanced Development Platform Program custom samples in minutes using any GreenPAK device.	• USB interface • MacOS, Windows and Linux compatible • Programming and Emulation • Gated expansion header for connection to external test equipment • Integrated signal and logic generators LEDs for visual indication	
GreenPAK Serial Debugger Board (GSD) Serial debugging for all GreenPAK parts with I²C.	• USB interface for power and control • 4 pin header with I²C interface to target system • MacOS, Windows and Linux compatible • GSD supports serial programming for SLG46824, SLG46826, and SLG47004.	
GreenPAK DIP Development Platform Perfect for breadboarding and fast prototypes.	• USB interface • MacOS, Windows and Linux compatible • Programming and Emulation • Gated expansion header for connection to external test equipment	

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



SLG47004V-EVB
GreenPAK SLG47004V Evaluation Board

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.



SLG47105V-DMO
HVPAK SLG47105 Demonstration Board

GreenPAK PORTFOLIO

Configurable 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	–	–

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 *	–	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	–	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

GreenPAK PORTFOLIO

Configurable Mixed-Signal Matrix	SLG46582	SLG46583	SLG46585	SLG46721	SLG46722	SLG46811	SLG46855
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	I²C	I²C	I²C	–	–	I²C	I²C
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
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	I²C	I²C	I²C	I²C	I²C	I²C
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
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^2C	SPI	SPI	I^2C	I^2C	I^2C	I^2C
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)	—	TSSOP 6.4 x 6.5	—	TSSOP 6.4 x 6.5	—	—	—

Configurable Mixed-Signal Matrix

	HVPAK™		AnalogPAK™
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^2C	I^2C	I^2C
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** for more details on the complete portfolio of products, including datasheets, eval boards and samples.

RENESAS

Renesas Electronics America Inc. | **renesas.com**
915 Murphy Ranch Road, Milpitas, CA 95035 | Phone: 1–888–468–3774

© 2023 Renesas Electronics America Inc. (REA). All rights reserved. All trademarks are the property of their respective owners. REA believes the information herein was accurate when given but assumes no risk as to its quality or use. All information is provided as–is without warranties of any kind, whether express, implied, statutory, or arising from course of dealing, usage, or trade practice, including without limitation as to merchantability, fitness for a particular purpose, or non–infringement. REA shall not be liable for any direct, indirect, special, consequential, incidental, or other damages whatsoever, arising from use of or reliance on the information herein, if advised of the possibility of such damages. REA reserves the right, without notice, to discontinue products or make changes to the design or specifications of its products or other information herein. All contents are protected by U.S. and international copyright laws. Except as specifically permitted herein, no portion of this material may be reproduced in any form, or by any means, without prior written permission from Renesas Electronics America Inc. Visitors or users are not permitted to modify, distribute, publish, transmit or create derivative works of any of this material for any public or commercial purposes.

Document No.: R11CP0004EU0000