

GreenPAK™

可编程混合信号矩阵



GreenPAK IC 优势

GreenPAK, 是瑞萨电子可编程混合信号矩阵家族的一员, 它是一种高性价比、一次烧录非易失性存储器件, 它允许设计人员集成众多系统功能, 最大限度减少元件数量、节省电路板空间以及降低功耗。

配合 GreenPAK Designer 软件以及 GreenPAK 开发套件, 设计者可以在几分钟内创建、测试、模拟和仿真您的设计。

目前车规级的 GreenPAK 产品已上市。



缩短上市时间



改善噪音问题



降低设计成本



降低 **BOM** 成本,
减小 **PCB** 尺寸



安全性与保密性



降低功耗



降低设计失败的机率
(POF)



按需设计, 高灵活度



改善散热性能



无新产品研发费用



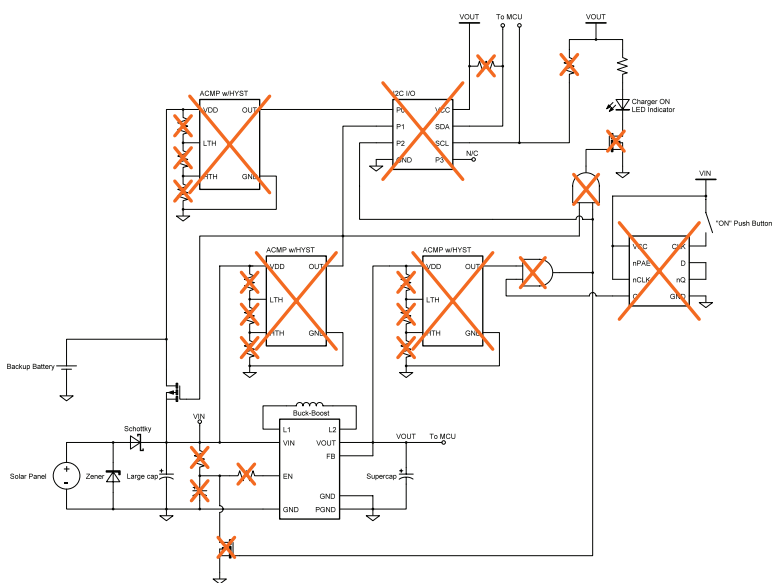
交期短, 灵活弹性供应,
无 **FCST** 承诺



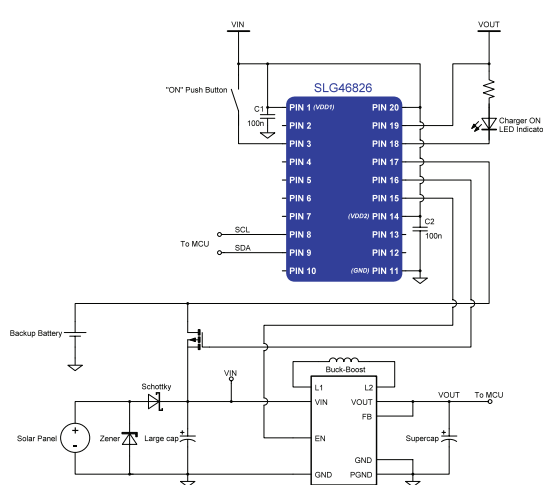
定制化规格书

GreenPAK 简化设计

分立器件方案



GreenPAK 方案



更精简设计

- 5 颗芯片
- 2 个NMOS晶体管
- 14 颗被动元件

独特的功能及特性，全合一封装

GreenPAK 系列产品可以使设计者实现一种或多种功能、特性相结合的设计，包括但不限于以下实例：

模拟部分

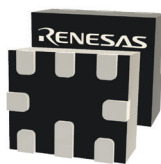
- 模拟开关
- 电池充电指示
- 比较器
- 电流采样/限流
- LDOs
- 低电压指示
- 逻辑功能 (多路复用器, 门等)
- 运算放大器
- 过温检测
- 电位器
- 变阻器
- 电压检测
- 唤醒/休眠控制
- 更多

数字部分

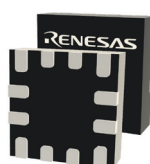
- 控制
- 串-并/并-串数据转换
- 频率侦测
- 分频
- GPIOs (6-28)
- H桥/半桥
- I2C 扩展
- 中断
- LED 驱动/模式控制
- 电平转换
- 电机驱动
- 模式发生器
- PWM 生成
- 电源序列
- SPI or I²C 通讯
- 系统复位
- 看门狗定时器
- 更多

广泛的产品系列:

- 车规认证
- 可多次或一次性烧录
- 单/双电源



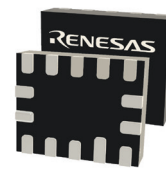
1.0 mm x 1.2 mm
8-pin STQFN
0.4 mm pitch



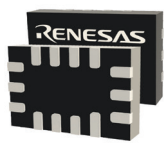
1.6 mm x 1.6 mm
12-pin STQFN
0.4 mm pitch



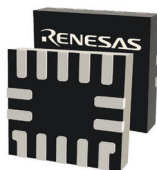
1.6 mm x 2.0 mm
16-pin MSTQFN
0.4 mm pitch



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



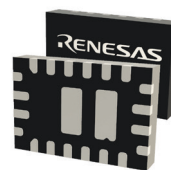
1.6 mm x 2.5 mm
14-pin STQFN
0.4 mm pitch



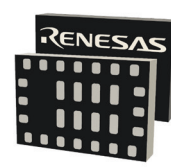
2.0 mm x 2.2 mm
14-pin STQFN
0.4 mm pitch



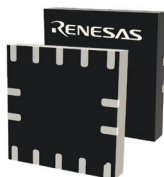
2.0 mm x 2.2 mm
22-pin MSTQFN
0.4 mm pitch



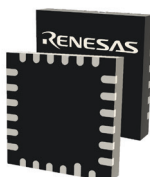
2.0 mm x 3.0 mm
20-pin STQFN
0.4 mm pitch



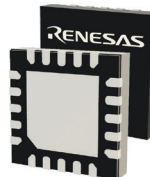
2.0 mm x 3.0 mm
28-pin MSTQFN
0.4 mm pitch



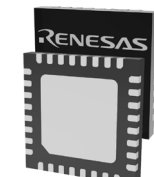
3.0 mm x 3.0 mm
14-pin FCQFN
0.65 mm pitch



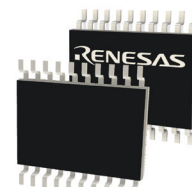
3.0 mm x 3.0 mm
24-pin STQFN
0.4 mm pitch



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



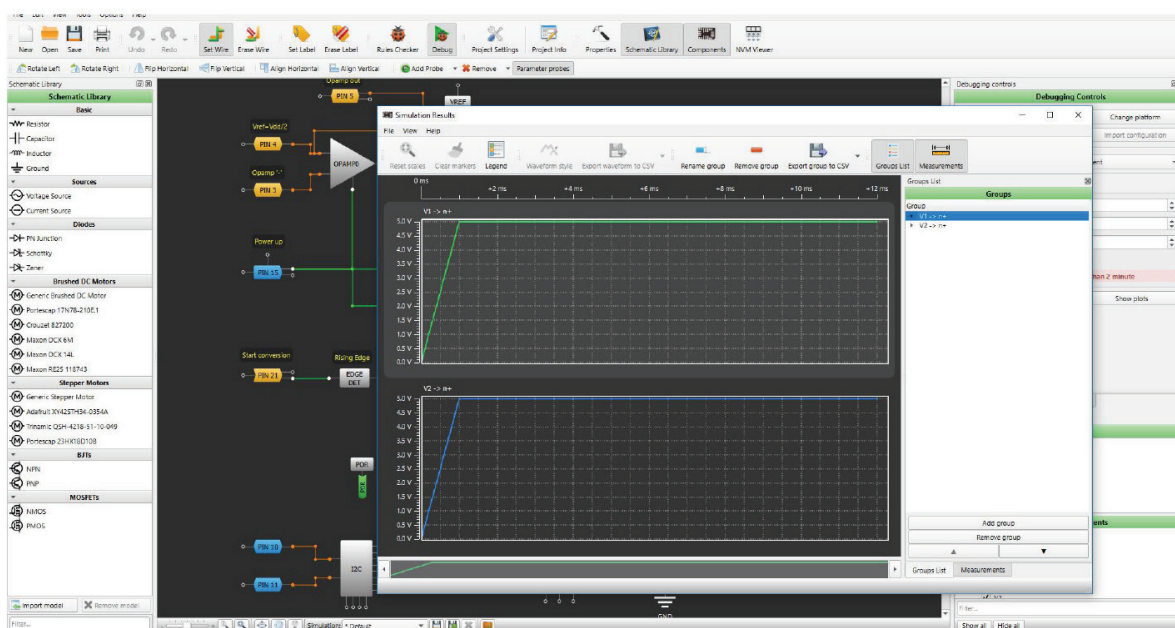
6.5 mm x 6.4 mm
20-pin TSSOP
0.65 mm pitch

*more packages available

开发软件

瑞萨电子的 Go Configure™ Software Hub 开发软件使设计过程完全图形化，无需编程语言或编译器，设计人员可以在几分钟内配置、烧录和测试定制化 GreenPAK 方案。

- 与原理图绘制类似的设计和布线
- 组件库列出每颗产品的可用资源
- 简单的组件配置
- 丰富的应用实例和支持文档
- 配合外部器件的强大仿真能力



下载 Go Configure Software Hub



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



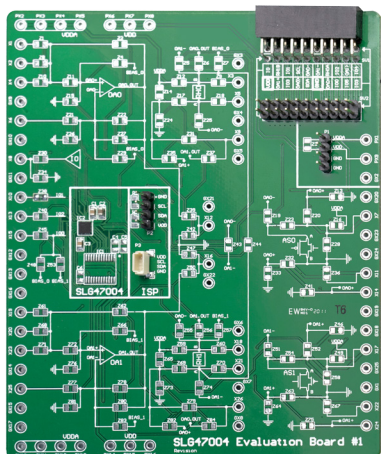
Your custom IC is ready for use

GREENPAK 工具

通过以下三种开发板，工程师可以使用 GreenPAK 混合信号 IC 开发定制化方案。您可以从一个全新的项目开始，或者通过修改瑞萨电子网站上 (renesas.com) 提供的实例而进行您自己的方案设计。

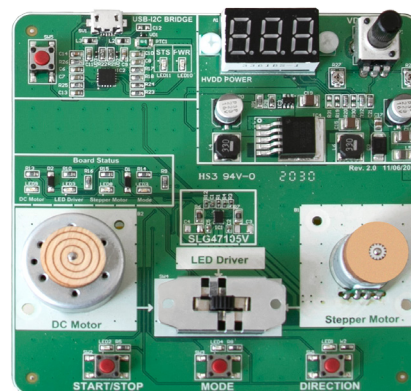
开发板/功能	特性
GreenPAK DIP 开发板 非常适合面包板和快速搭建原型机	<ul style="list-style-type: none"> • USB 接口 • 兼容 MacOS, Windows 和 Linux 系统 • 支持烧录和仿真 • 用于连接外部测试设备的门控扩展连接器 
GreenPAK 高级开发板 可以使用任意 GreenPAK IC，在几分钟内创建、烧录您的原型机。	<ul style="list-style-type: none"> • USB 接口 • 兼容 MacOS, Windows 和 Linux 系统 • 支持烧录和仿真 • 用于连接外部测试设备的门控扩展连接器 • 预置信号和逻辑功能指示灯便于状态识别指示 
GreenPAK 在线调试板 (GSD) 可以在线调试所有带 I ² C 的 GreenPAK IC	<ul style="list-style-type: none"> • 电源和控制 USB 接口 • 带有 I²C 接口的 4 pin 连接器 • 兼容 MacOS, Windows and Linux 系统 • 支持 SLG46824, SLG46826 和 SLG47004 在线烧录 

SLG47004 评估板-- 基于 SLG47004 的基本模拟配置，可实现用户定义的电路和参数的评估板



SLG47004V-EVB
GreenPAK SLG47004V 评估板

HVPAK™ 演示板 -- 用户可以进行 SLG47105 的测试评估它能够驱动内置直流和步进电机，并带有LED控制功能



SLG47105V-DMO
HVPAK SLG47105 演示板

GreenPAK 产品组合

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 / 25 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 产品组合

Programmable 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	–	–	–	–

Programmable 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 产品组合

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
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)	—	TSSOP 6.4 x 6.5	—	TSSOP 6.4 x 6.5	—	—	—

Programmable 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 100 kW
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	I2C	I2C	I2C
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

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