CN195
Point-of-Sale Printer Controller

October 2019

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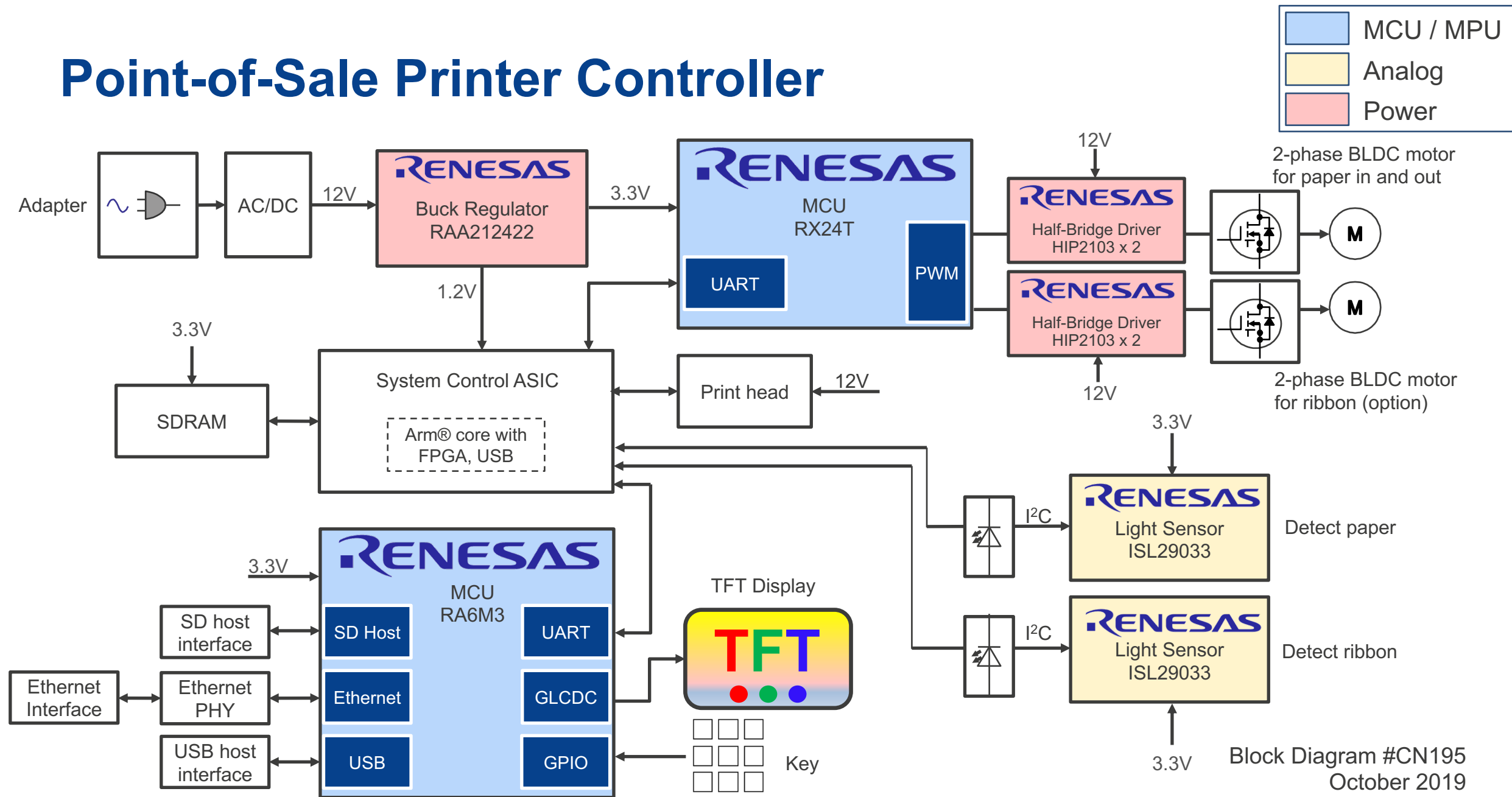
RENESAS

Point-of-Sale Printer Controller

▪ Overview

With the rising trend of miniaturizing printers, the use of BLDC motors with intelligent system applications - including intelligent detection, cloud connectivity and a richer human-machine interface - will become a core value for system designs. Renesas' mini printer solution integrates these required features for customers and enables dual BLDC control, a rich human-machine interface, and secure cloud connectivity. In addition, the entire solution demonstrates lower power consumption and higher stability by using Renesas' high-performance power supply and analog devices.

▪ System benefits

– The RA6M3 MCU features high-performance connectivity, which includes an Ethernet/USB/SD card, as well as an LCD controller and real-time system control

– The RX24T MCU enables dual BLDC control

– High-performance buck power, sensor, and MOSFET drivers for system control and stability

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Point-of-Sale Printer Controller

Adapter

AC/DC

12V

RENESAS
Buck Regulator
RAA212422

3.3V

RENESAS
MCU
RX24T

UART

PWM

RENESAS
Half-Bridge Driver
HIP2103 x 2

12V

M

2-phase BLDC motor
for paper in and out

RENESAS
Half-Bridge Driver
HIP2103 x 2

12V

M

2-phase BLDC motor
for ribbon (option)

1.2V

3.3V

SDRAM

System Control ASIC

Arm® core with
FPGA, USB

Print head

12V

3.3V

RENESAS
Light Sensor
ISL29033

Detect paper

I²C

3.3V

MCU
RA6M3

RENESAS

3.3V

SD host
interface

SD Host

UART

Ethernet
Interface

Ethernet
PHY

Ethernet

GLCDC

USB host
interface

USB

GPIO

TFT Display

TFT

Key

I²C

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Light Sensor
ISL29033

Detect ribbon

3.3V

Block Diagram #CN195
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Point-of-Sale Printer Controller

Device Category	P/N	Key Features
MCU	RA6M3	Leading performance 120-MHz Arm® Cortex®-M4 core, up to 2MB code flash memory, 640-KB SRAM, Graphics LCD Controller, 2D Drawing Engine, Capacitive Touch Sensing Unit, Ethernet MAC Controller with IEEE 1588 PTP, USB 2.0 High-Speed, USB 2.0 Full-Speed, SDHI, Quad SPI, security and safety features, and advanced analog.
	RX24T R5F523Txxxxx	32-bit microcontroller, great set of timers to support inverter control, incorporate a floating point unit (FPU), able to control up to 3 inverters.
Power	HIP2103	60V, 1A/2A Peak, 1/2 Bridge Driver with 4V UVLO
	RAA212422	Dual output regulator combining a 1.1A synchronous buck regulator (input: 3V to 40V), and a 1.5A synchronous buck regulator (input: 2.7V to 5.5V)
Analog	ISL29033	Light sensor close to human eye response

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RA6M3 – Ultra-Low Power 120-MHz Arm® Cortex®-M4 Core
Fully Featured for Applications Needing HMI/Control/Security/Graphical and Capacitive Touch

High Performance
- 120MHz Arm® Cortex®-M4 CPU

Highly Integrated Capabilities
- 1MB-2MB Flash Memory and 640kB SRAM
- 128-bit unique ID
- 12-Bit ADC (x2)
- 12-Bit DAC

Communication Interfaces
- USB 2.0 (Full Speed/ High Speed)
- Ethernet Controller with DMA
- SCI x10/SPIx2/IICx3

HMI Interface
- Capacitive Touch Sensing Unit (18ch.)
- Graphics LCD Controller

Security and Encryption
- AES128/192/256, 3DES/ARC4, SHA1/SHA224/SHA256/MD5, GHASH, RSA/DSA/ECC
- True Random Number Generator (TRNG)

FLASH / RAM	2MB / 640kB	RA6M3	RA6M3	RA6M3	RA6M3	RA6M3
	1MB / 640kB	RA6M3	RA6M3	RA6M3	RA6M3	RA6M3
Pin Count Package Size Pitch		100pin LQFP 14x14 0.5mm	144pin LQFP 20x20 0.5mm	145pin LGA 7x7 0.5mm	176pin LQFP 24x24 0.5mm	176pin BGA 13x13 0.8mm

Flash/ RAM/ Package Table

Part #	Flash Memory	RAM	Temp	Package
R7FA6M3AH3CFC	2MB	640KB	40 ~ 105℃	176 LQFP
R7FA6M3AF3CFC	1MB	640KB	40 ~ 105℃	176 LQFP

RTK7EKA6M3S00001BU

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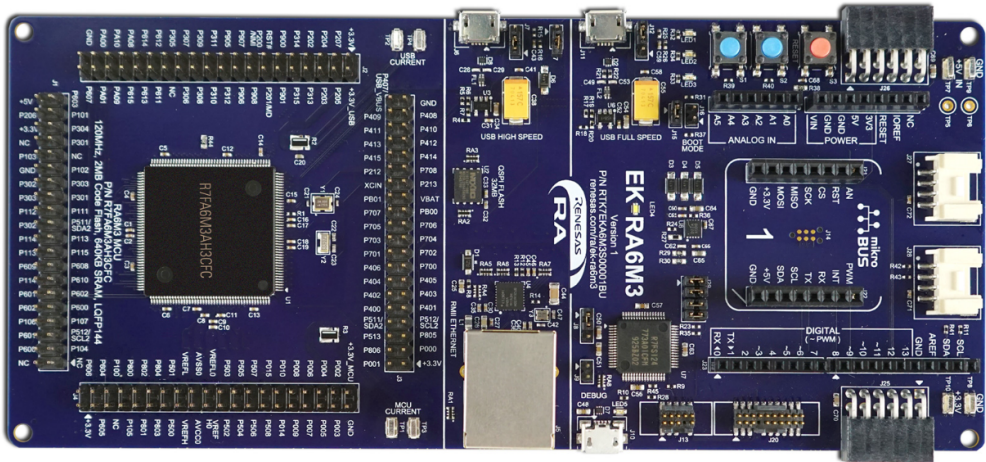
RX/24T – 32-bit FPU MCU Enable to Drive 2 Motors
80 MHz RX v2 Core with FPU, 5V Power Supply and Highly Accurate 12-Bit ADC

High Performance

- Max. operating frequency: 80MHz, 153.6 DMIPS
- Enhanced DSP: 32-bit multiply-accumulate and 16-bit multiply-subtract instructions
- Built-in FPU: 32-bit single-precision floating point(compliant to IEEE754)
- Divider, fast interrupt, CISC Harvard architecture with 5-stage pipeline
- Variable-length instructions, ultra-compact code

Suitable for Inverter Control

- 80MHz PWM (three-phase complementary output x 2ch + single-phase complementary output x 4ch or three-phase complementary output x 3ch + single-phase complementary output x 1ch

Rich Peripheral Functions

- Up to 6 communications channels
- Up to 25 extended-function timers
- 12-bit ADC: 22ch in 3 units
- 5V tolerant I/O port

Part #	ROM (Kbytes)	RAM (Kbytes)	Package
R5F524T8ADxx	128	16	100-LQFP(14 × 14), 80-LFQFP(14 × 14), 80-LQFP(12 × 12), 64-LFQFP(10 × 10)
R5F524TAADxx	256	16	100-LQFP(14 × 14), 80-LFQFP(14 × 14), 80-LQFP(12 × 12), 64-LFQFP(10 × 10)
R5F524TBADFP	256	32	100-LQFP(14 × 14)
R5F524TCADFP	384	32	100-LQFP(14 × 14)
R5F524TEADFP	512	32	100-LQFP(14 × 14)

Renesas Motor Workbench 2.0: Motor Control Development Tool 2.0
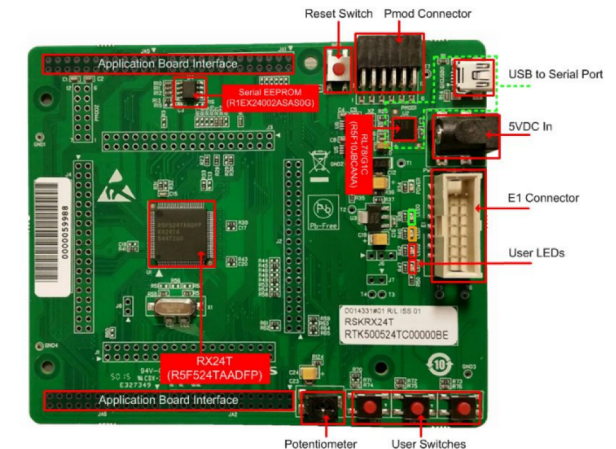
Renesas Starter Kit for RX24T

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HIP2103/4 – 60V, 1A/2A, Half-Bridge Driver
High Voltage Drivers for Industrial Motor Control

Optimized Half-Bridge Drivers
- Supports half bridge, full bridge configurations
- Enables DC and 3 phase BLDC motors

Independent High/Low Inputs
- Reduces connections to MCU and lowers cost
- Supports 3.3V and 5V signals

Sleep Mode
- Low quiescent current (5uA) with unique sleep mode
- Allows direct connection to battery without disconnect switch

Integrated LDO (HIP2104)
- Option with integrated 12V & 3.3V LDO (HIP2014)
- Provides bias to external MCU

Part #	UVLO	VCC Reg	VDD Reg	Package
HIP2103FRTAAZ-T	4.0V	N/A	N/A	8L 3x3 TDF
HIP2104FRTAAZ-T	4.0V	3.3V	12V	12L 4x4 DFN
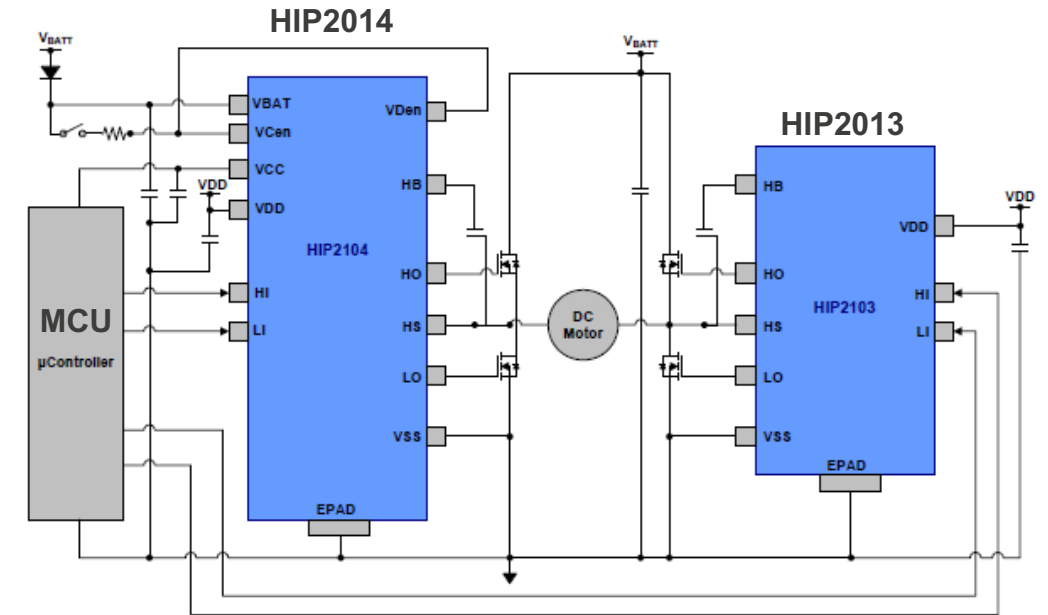
Typical Operating Circuits
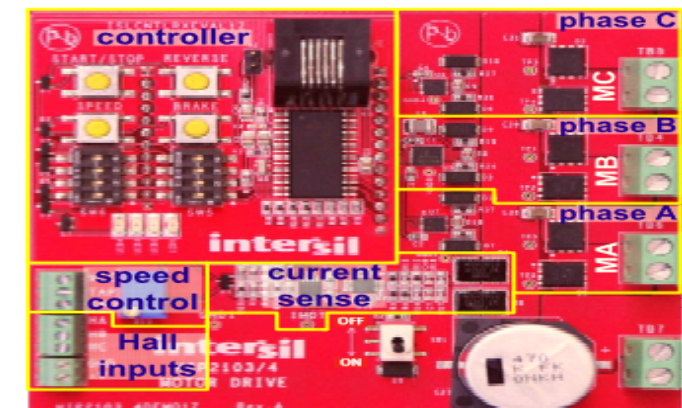
FIGURE 1. HIP2103-4DEMO1Z INPUTS AND OUTPUTS

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RAA212422 – Dual Step-Down Regulator

40V, 1.1A Synchronous Regulator and 5.5V, 1.5A Synchronous Buck Regulator in One Package

Dual Channel Buck Regulator

- High voltage, 3V-40V, 1.1 synchronous regulator
- Low voltage, 2.7V-5.5V, 1.5A synchronous regulator
- Designed for 12V and 24V input industrial bus applications

Compact Design

- HV Buck: Adjustable Switching frequency:300kHz to 2MHz
- LV Buck: Switching Frequency: 1MHz
- Synchronous operation with integrated FETs saves PCB area
- Integrated compensation eliminates external components

High Performance

- Selectable PWM/PFM modes for light load efficiency
- Separate "power good" and enable pins for both regulators
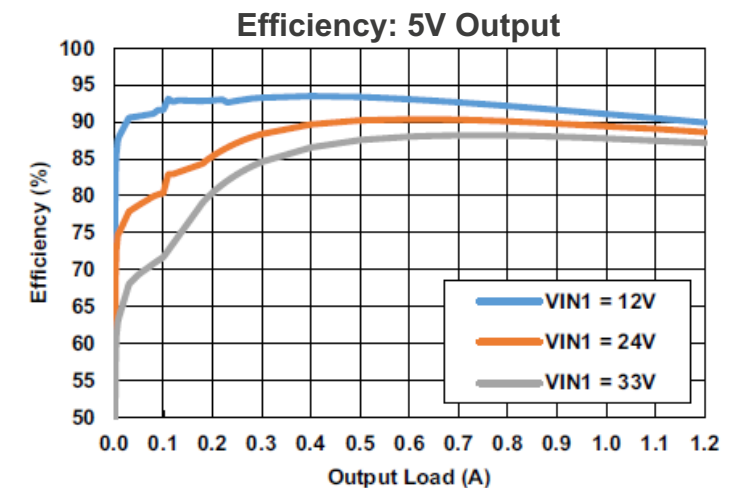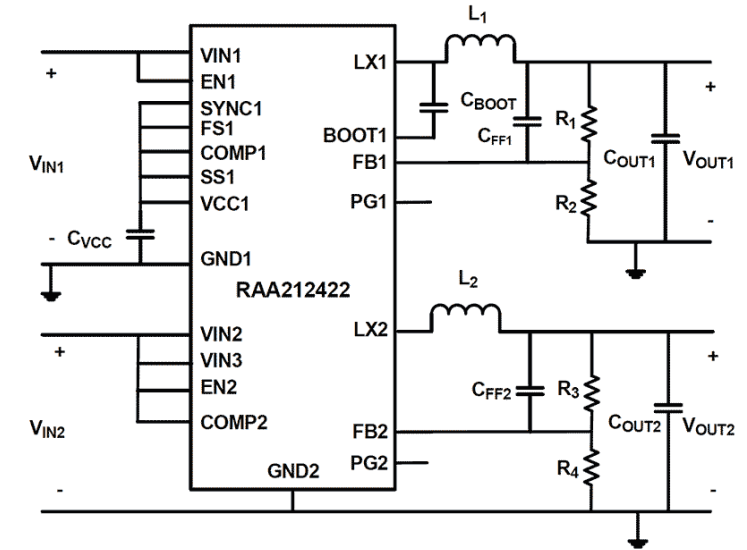
Part #	VIN	IOUT	Package
RAA2124224GNP#HA0	3V to 40V (SW 1) 2.7V to 5.5V (SW 2)	1.1A (SW 1) 1.5A (SW 2)	3 x 6mm, QFN22

Efficiency: 5V Output

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ISL29033 – Integrated Digital Ambient Light Sensor
Ultra-Low Lux, Low Power, Integrated Ambient and Infrared Light-to-Digital Converter

Integrated Functions and Small Package

- 6 pin 2.0mmx2.1mm ODFN
- On-chip 16-bit ADC
- I²C (SMBus compatible) Interface

High Performance

- Adjustable sensitivity up to 520 counts per lux
- Measurement range: 0.0019 to 8,000lux with four selectable ranges
- Close to human eye response with excellent IR/UV rejection
- Operation across -40 to +85°C

Low Power Design

- Normal operation 57uA
- 0.3uA maximum shutdown current

Part #	ALS Sensing	Interrupt Pin	Package
ISL29033IROZ-T7	Yes	Yes	6 Ld 2x2.1 ODFN
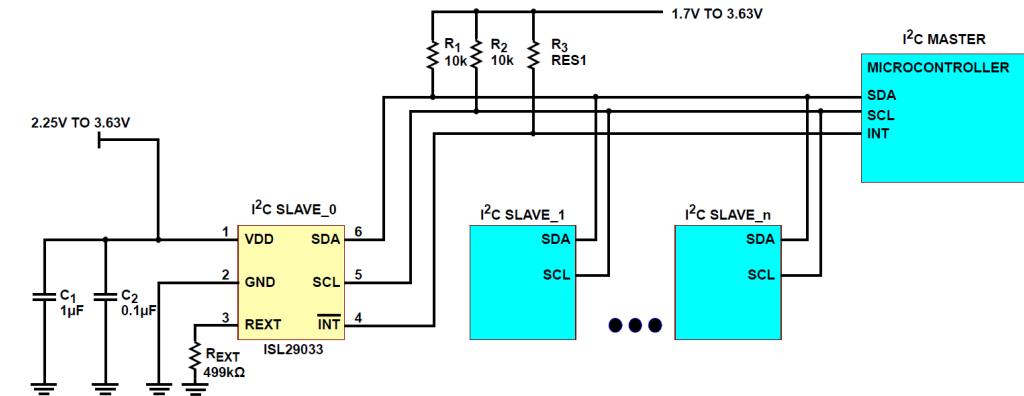
Typical Operating Circuits

ISL290xxIROZ-EVALZ Evaluation Board

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