JP083 Image Sensor Module

March 2020

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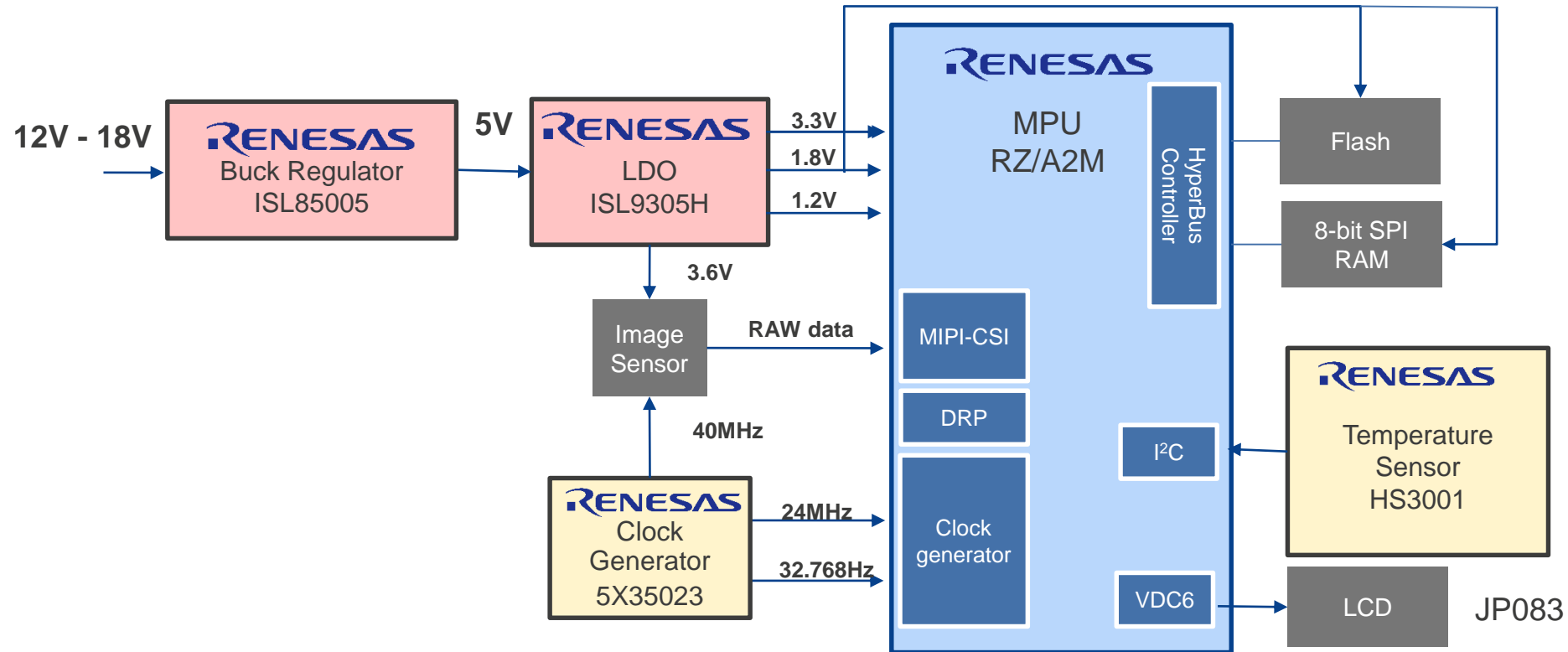
Image Sensor Module

- ## Overview

  Renesas' RZ/A2M microprocessor's dynamically reconfigurable processor (DRP) feature helps customers achieve low-cost and high-speed image recognition solutions. The RZ/A2M's DRP is responsible for processing the signal received from the image sensor. The temperature sensor is used to measure the temperature of the image sensor, which is very sensitive to ambient temperature as it is an uncooled system.

- ## System Benefits

  - The RZ/A2M microprocessor (MPU) delivers ten times the image processing performance of its predecessor, the RZ/A1 MPU, and incorporates Renesas' exclusive DRP, which achieves real-time image processing at a low power consumption
  - Power and timing products provide compact solutions

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Image Sensor Module

12V - 18V → **Buck Regulator ISL85005** (RENESAS, Power)

5V → **LDO ISL9305H** (RENESAS, Power)

LDO outputs:
- 3.3V →
- 1.8V →
- 1.2V →
- 3.6V → Image Sensor

Image Sensor → RAW data → MIPI-CSI

Clock Generator 5X35023 (RENESAS, Analog)
- 40MHz → Image Sensor
- 24MHz → Clock generator
- 32.768Hz → Clock generator

MPU RZ/A2M (RENESAS)
- HyperBus Controller → Flash, 8-bit SPI RAM
- MIPI-CSI
- DRP
- Clock generator
- I^2C → Temperature Sensor HS3001 (RENESAS, Analog)
- VDC6 → LCD

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Flash

8-bit SPI RAM

Temperature Sensor HS3001 (RENESAS, Analog)

LCD

Legend:
- MCU / MPU
- Analog
- Power

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Image Sensor Module

Device Category	P/N	Key Features
MCU	RZ/A2M	High-speed embedded AI-based image processing device with Dynamically Reconfigurable Processor (DRP) technology
Power	ISL9305H	The ISL9305H integrates two high-efficiency 3MHz synchronous step-down converters (DCD1 and DCD2) and two low-input, low-dropout linear regulators (LDO1 and LDO2)
	ISL85005	4.5V to 18V input, 5A high efficiency synchronous buck regulator
Analog	HS3001	Silicon carbide capacitive sensing element, excellent stability against aging, temperature sensor accuracy of $\pm 0.2°$ C
	5X35023	Three PLL architecture design, and each PLL is individually programmable and allowing for up to five unique frequency outputs

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RZ/A2M – Arm® Cortex®-A9 MPU with Embedded SRAM

Unique DRP Technology for Image Processing

No External Memory Required

- Embedded 4MB SRAM inside
- Benefit cost and board size

High Speed on Image Processing

- With 2D graphic accelerator
- DRP tech with specific library

Low Power Consumption

- Eco-friendly DRP tech on real time processing comparing to common FPGA

Multi-Interface and Security

- Support MIPI interface
- Double channel Ethernet interface
- On-chip hardware encryption

Part #	Feature	Package
R7S921040VCBG	No DRP, no trusted secure IP	PLBG0176GA-B
R7S921045VCBG	No DRP, w/ trusted secure IP	PLBG0176GA-B
R7S921051VCBG	w/ DRP, no trusted secure IP	PLBG0256KA-B
R7S921056VCBG	w/ DRP, w/ trusted secure IP	PLBG0256KA-B
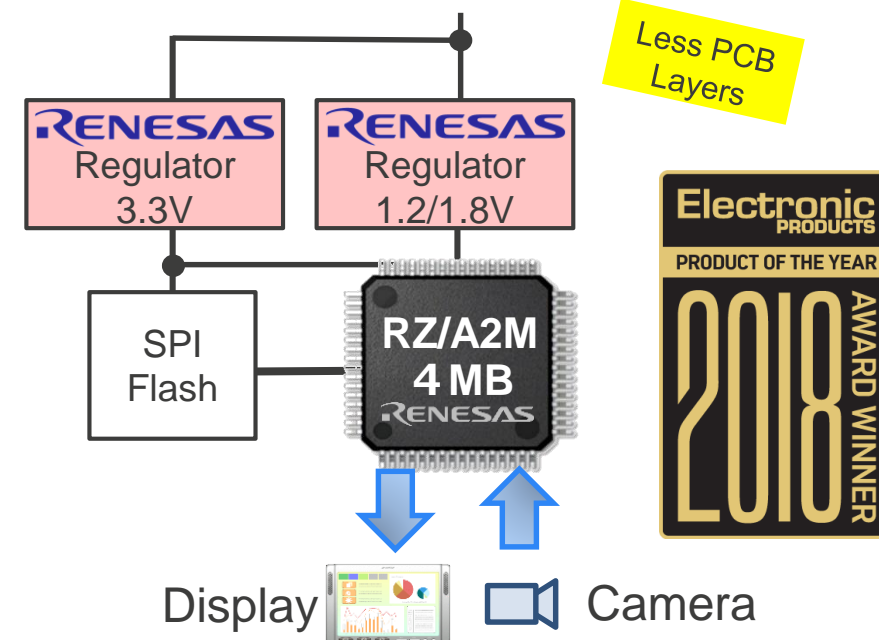
Typical Application Diagram

RZ/A2M Evaluation Board

ISL9305H – Dual Step-Down Converters/Dual LDOs
Portable and Battery-Powered Instruments and Equipment

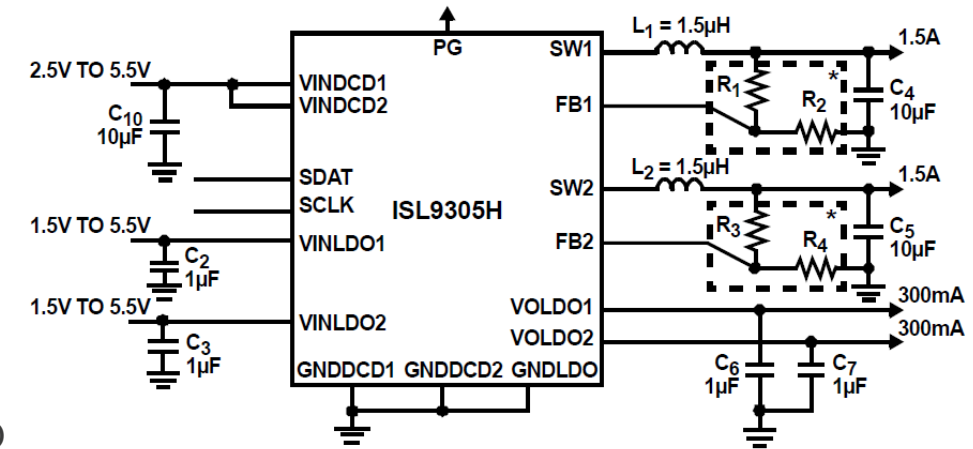### Integrated Functions and Small Package

- Dual 1.5A, sync step-down converters and dual 300mA, general-purpose LDOs
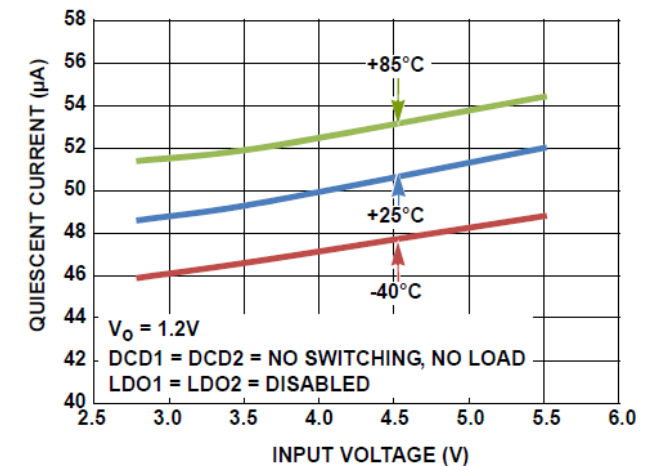- Small, thin, 4mm x 4mm TQFN

Input Voltage Range

- DCD1/DCD2: 2.5V to 5.5V   LDO1/LDO2: 1.5V to 5.5V

Adjustable Output Voltage

- VODCD1/VODCD2: 0.8V to VIN
- 50µA IQ (Typ) with DCD1/DCD2 in Skip Mode; 20µA IQ (Typ) for each enabled LDO
- EN Pins for DCD1/DCD2 and LDO1/LDO2

Part #	DCD1(V)	DCD2(V)	LDO1(V)	LDO2(V)	Package
ISL9305IRTHAANLZ-T	Adj	Adj	3.3	2.9	16Ld 4x4mm TQFN
ISL9305IRTHWBNLZ-T	1.2	1.5	3.3	2.9	16Ld 4x4mm TQFN
ISL9305IRTHWCLBZ-T	1.2	1.8	2.9	1.5	16Ld 4x4mm TQFN
ISL9305IRTHWCNYZ-T	1.2	1.8	3.3	0.9	16Ld 4x4mm TQFN
ISL9305IRTHWCNLZ-T	1.2	1.8	3.3	2.9	16Ld 4x4mm TQFN
ISL9305IRTHWLNCZ-T	1.2	2.9	3.3	1.8	16Ld 4x4mm TQFN
ISL9305IRTHBCNLZ-T	1.5	1.8	3.3	2.9	16Ld 4x4mm TQFN
ISL9305IRTHBFNCZ-T	1.5	2.5	3.3	1.8	16Ld 4x4mm TQFN

Typical Operating Circuits

Quiescent Current vs Input Voltage

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ISL85005 – 5A Synchronous Buck Regulator
4.5V to 18V Input and Output Voltage Adjustable from 0.6V

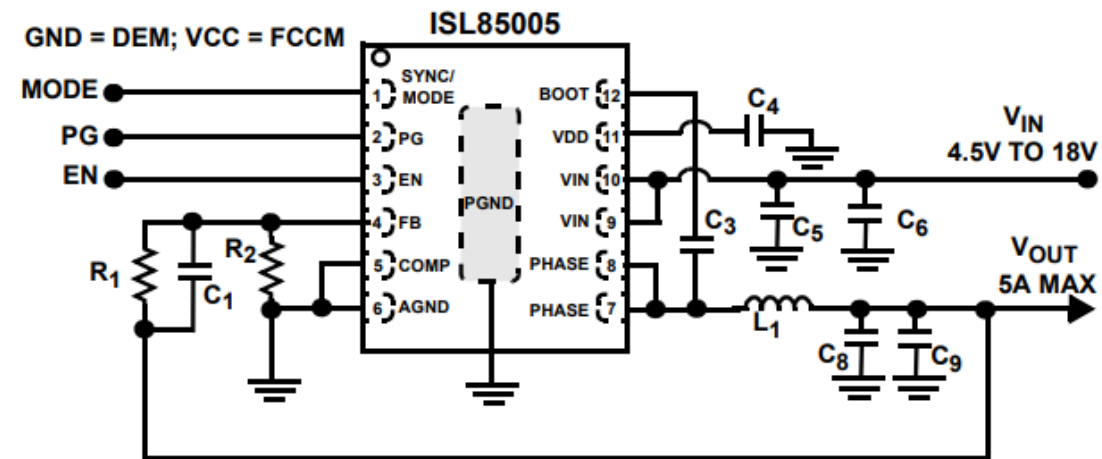## Wide Input Voltage Range of 4.5 - 18V

- Can be used for any point-of-load (POL) from 5V and 12V rails

High Integration

- Internal 5A MOSFETs
- Minimal external components enable a tiny total solution

Flexible Design

- Internal or external compensation
- Options for programmable soft-start or external clock synchronization

Typical Operation Circuits

Part #	External clock synchronization	Programmable soft start	Package
ISL85005FRZ	Yes	No	12L 3x4mm DFN
ISL85005**A**FRZ	No	Yes	12L 3x4mm DFN

Evaluation Board

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HS300x – Relative Humidity and Temperature Sensor
High Accuracy Humidity and Temperature Measurement for Environmental Monitoring

High Accuracy

- ±1.5%RH accuracy (HS3001)
- ±0.2°C temperature accuracy (HS3001, HS3002)

Excellent Stability

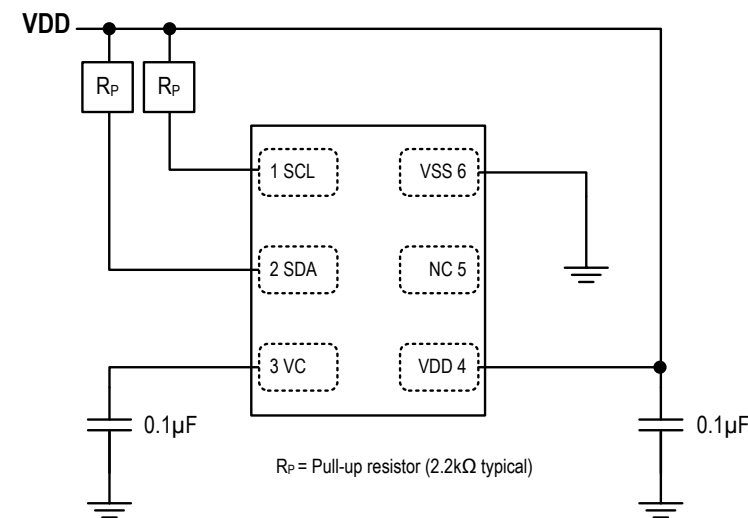- 0.1%RH per year drift
- MEMS silicon-carbide sensor technology

Fast Response

- Less than 6 seconds humidity response, in still air
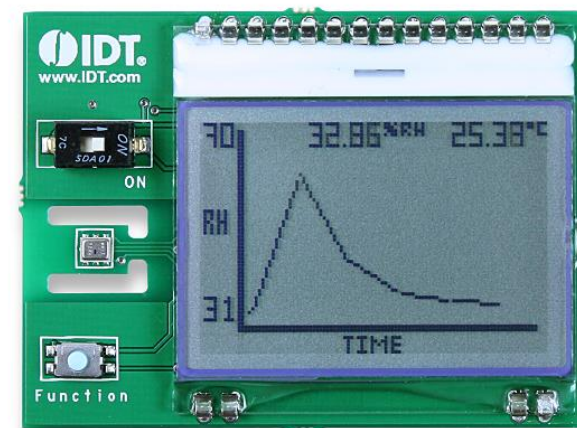- Less than 2 seconds temperature response

Extended Supply Voltage

- 2.3V to 5.5V, 24.4µA at 3.3V (one RH+Temp per second)
- 1.8V custom order

Part #	Feature	Package
HS3001	±1.5%RH	3×2.41×0.8 LGA
HS3002	±1.8%RH	3×2.41×0.8 LGA
HS3003	±2.8%RH	3×2.41×0.8 LGA
HS3004	±3.8%RH	3×2.41×0.8 LGA

Typical Operating Circuit

R_P = Pull-up resistor (2.2kΩ typical)

SDAH02 Evaluation Kit

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5X35023 – VersaClock® Programmable Clock Generator
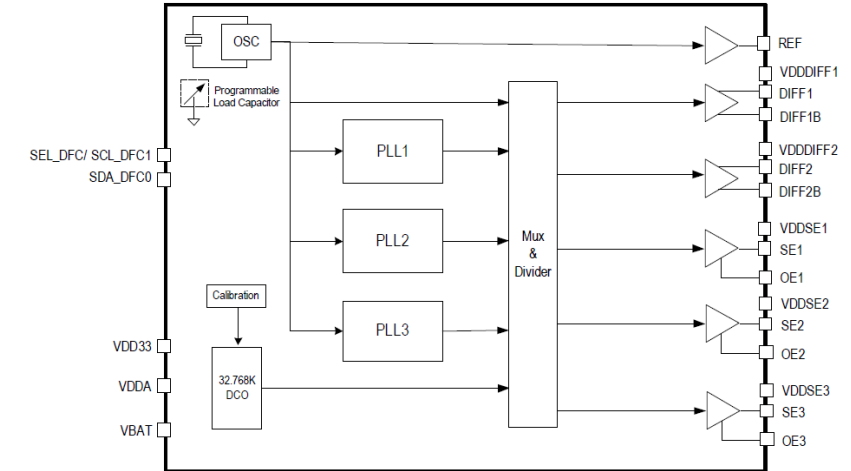## For Low Power, Consumer and High Performance PCI Express Applications

Key Features

- PCIe clocks phase jitter: PCIe Gen3
- Differential clocks <3 ps rms jitter integer range: 12kHz–20MHz
- 3 LVCMOS outputs: 1MHz–160MHz
- Maximum 8 LVCMOS outputs as REF + 3 × SE + 2 × DIFF_T as LVCMOS
- <2µA current consumption for system RTC reference clock
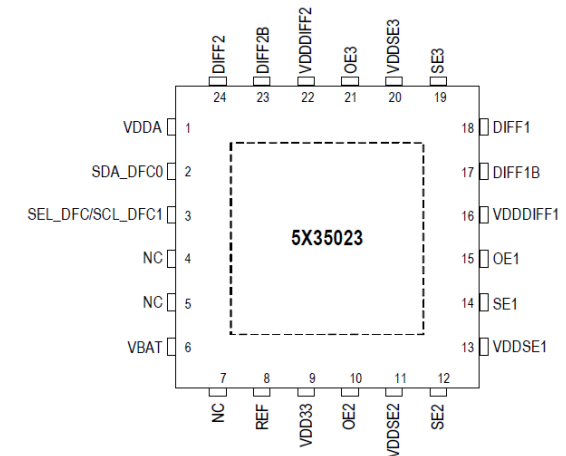- Integrated crystal

Configurability Built-in

- Configurable OE pin function as OE, PD#, PPS or DFC control function
- Configurable PLL bandwidth; minimizes jitter peaking
- PPS: Proactive Power Saving features save power during the end device power down mode
- PPB: Performance Power Balancing feature allows minimum power consumption based on required performance
- DFC: Dynamic Frequency Control feature allows up to 4 different frequencies to switch dynamically

Part #	Carrier Type	Temp.	Package
5X35023B-000NXGI	Tray	-40 to +85°C	24Ld 4x4mm VFQFPN
5X35023B-000NXGI8	Reel	-40 to +85°C	24Ld 4x4mm VFQFPN

Block Diagram

Pin Configuration

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