

# RZ/N1D REAL-TIME INDUSTRIAL ETHERNET SWITCH EU012

09-2019

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# RZ/N1D Real-Time Industrial Ethernet Switch

## Overview

Customers in the industrial arena often require **Realtime Ethernet Solutions**, also called **Industrial Ethernet**. Common standards in these industries are Ethercat, Powerlink, Sercos III, ProfiNet, Modbus TCP and others.

For an Industrial Ethernet switch or similar setup the **RZ/N1D** is a perfect fit because of its high integration, calculation power, rich interfaces. Also the integrated Cortex<sup>®</sup> M3 based **R-In engine** offloads the two Cortex<sup>®</sup> A7 main cores by working as a dedicated Gigabit Ethernet hardware RTOS / accelerator.

A typical setup for an Industrial Ethernet Switch, besides RZ/N1D requires external storage (eMMCs or QSPI), external RAM (DDR3 or DDR3L) and up to five Ethernet PHYs.

To power this setup, up to four precise power rails are required. This can easily be achieved by using our Power Management IC (PMIC) **ISL91212** as a perfect fit, providing up to four power levels in one chip, including flexible voltage selection for DDR3 / DDR3L. Furthermore, Power-up sequencing is included and the complete solution has a small PCB footprint by using only one additional DCDC (ISL85005) to convert the input voltage to a lower level.

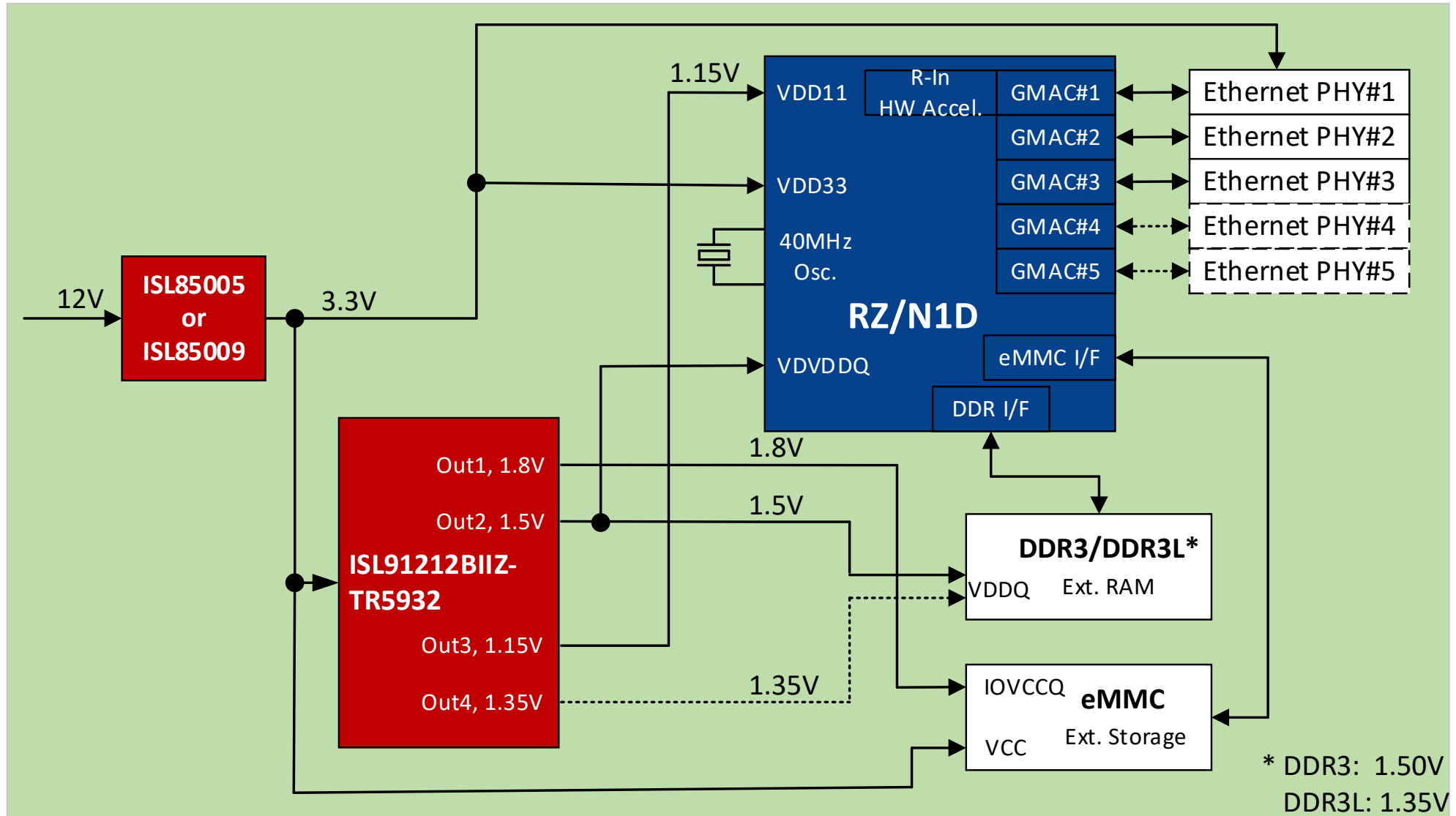
So finally, only two power-supply chips are needed in total.

### Key Features:

- Highly integrated Industrial Ethernet (switch) solution with R-In offload engine / HW accelerator
- Easy to use, preconfigured PMIC setup, providing all required voltages and sequencing, alternatively using either DDR3 or DDR3L memory
- Low BOM count and small PCB space

# RZ/N1D Real-Time Industrial Ethernet Switch

## Power Supply



# RZ/N1D Real-Time Industrial Ethernet Switch

## Summary

Device Category	P/N	Key Features
MCU	RZ/N1D	Industrial Ethernet MPU with Dual Cortex® A7 + Single Cortex® M3
Power	ISL91212BIIZ-TR5932	Quad Output PMIC with I2C Interface 2.5 - 5.5V supply voltage; 5A per phase
	ISL85005 OR	Buck Regulator VIN 4.5-18V / 5A Part of our 12V Buck Regulator Family (small solution size, high efficiency)
	ISL85009	Buck Regulator VIN 3.8-18V / 9A Part of our 12V Buck Regulator Family (small solution size, high efficiency)

Block Diagram #EU012  
September, 2019

# RZ/N1D Industrial Ethernet MPU

## Dual Cortex<sup>®</sup> A7 + Single Cortex<sup>®</sup> M3

### 2x 500 MHz Cortex<sup>®</sup>-A7 + R-IN Engine 125 MHz Cortex<sup>®</sup>-M3

- Proven R-IN engine as HW accelerator for Industrial Ethernet communication
- Internal oscillator for 40MHz crystal, i.e. no external clock required

### DDR interface for external RAM

- Allows to interface with cost efficient external memory

### Integrated up to 5 port Ethernet Switch

### External Storage interface

- 1x QSPI, 2x SDIO/eMMC
- Several storage devices can be chosen based on application requests

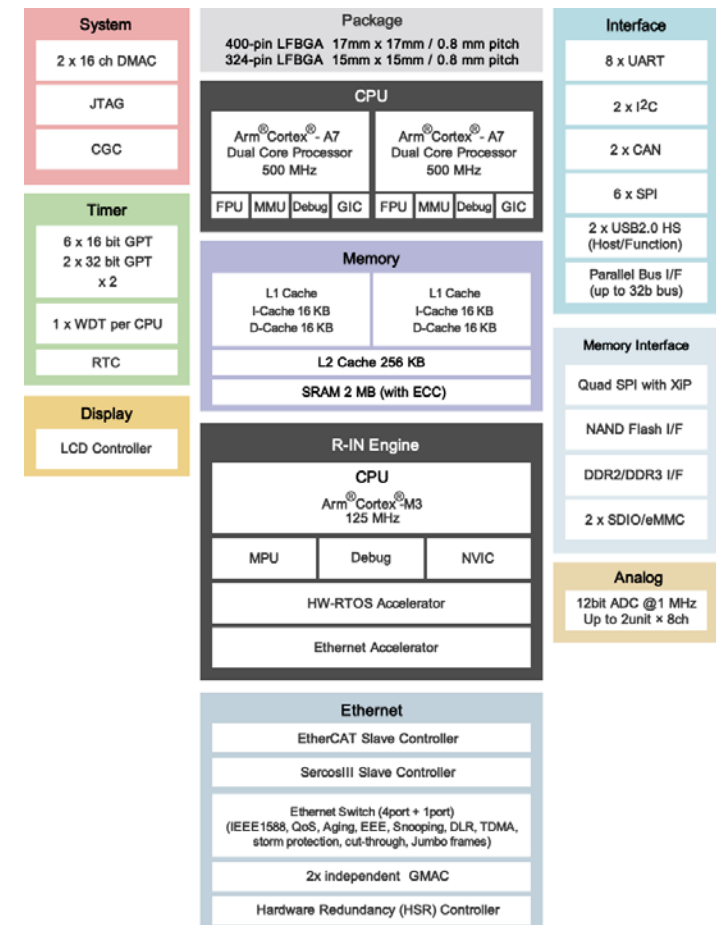
### LCD controller, Multiple Timers, RTC

### Rich interfaces:

- up to 2x USB2.0, 2x CAN, 8x UART, 6x SPI etc.

### Temperature range -40..+110°C

Name	P/N	Package	PRP/HSR IEC62439-3
RZ/N1D	R9A06G032VGBG	400BGA	--
	R9A06G032VGBA	324BGA	--
	R9A06G032NGBG	400BGA	PRP/HSR compliant



# ISL91212B – Quad Output PMIC with I2C Interface

2.5 - 5.5V supply voltage; 5A per phase

## Small Package: 7x10mm<sup>2</sup> for 4-phase design

- Overall: 7x10mm<sup>2</sup> total solution size for 4 outputs or phases

## Efficiency: Superior R5 Technology

- Efficiency: e.g. 94.7% for 3.8V<sub>IN</sub> / 1.8V<sub>OUT</sub>

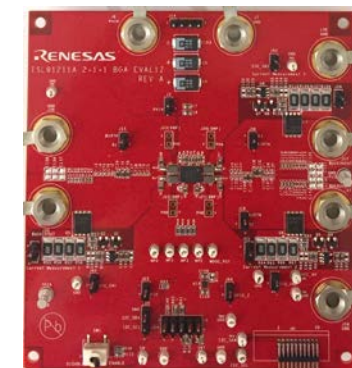
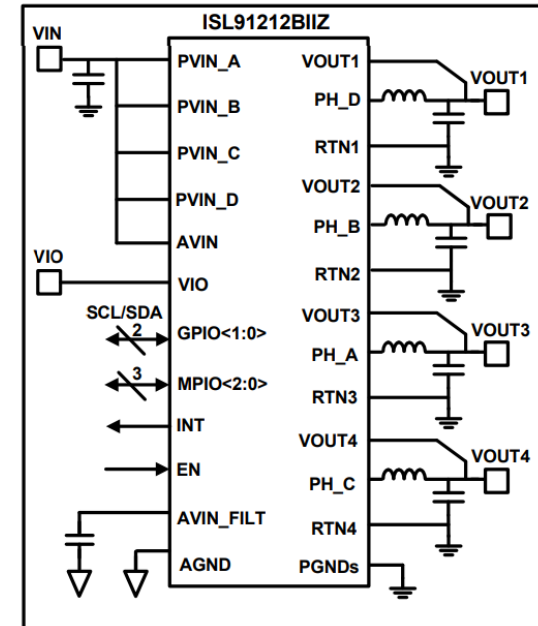
## 4MHz frequency

- Reduces board space, e.g. supports less than 2 x 2 x 1mm inductors

## Highly integrated

- No external components for compensation, V<sub>OUT</sub> setting, etc.

## I2C programmable output: 0.3V to 2V



Part Number	Phase Configuration	Max DC I <sub>OUT</sub> /Phase	Package Type	Package Size (mm x mm)
ISL91212B	1+1+1+1	5A	WLCSP, 7x5 bumps, 0.5mm pitch	2.55 x 3.67

# ISL85005 – Buck Regulator $V_{IN}$ 4.5-18V / 5A

Part of our 12V Buck Regulator Family (small solution size, high efficiency)

## Wide Input Voltage range 4.5 - 18V

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

## High Integration

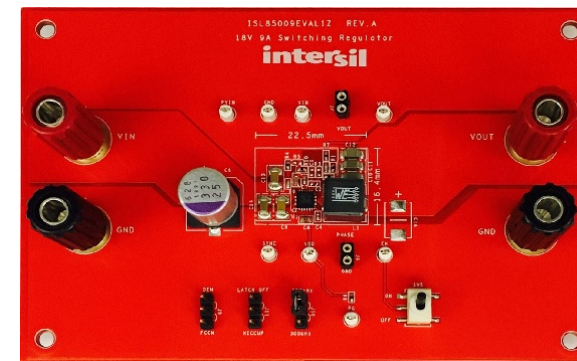
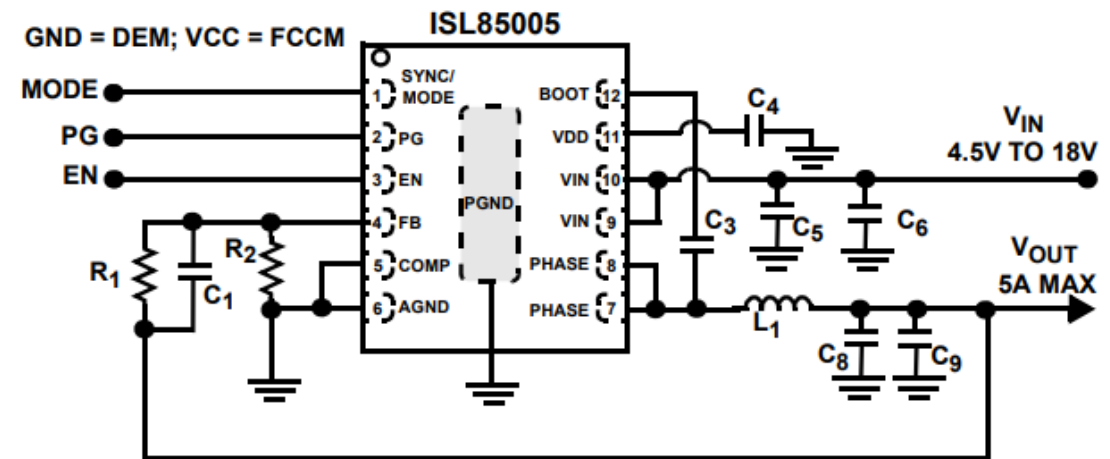
- Internal 5A MOSFETs
- Smaller Solution Size

## Switching Frequency up to 2 MHz

- Smaller passive components, thus solution size.
- Better transient response

## Internal/External compensation

- Design simplicity and flexibility



Part #	$V_{IN}$	$I_{OUT}$	Option	Package
ISL85005AFRZ	4.5 – 18V	5A	Softstart	3 x 4mm, DFN12
ISL85005FRZ	4.5 – 18V	5A	Sync	3 x 4mm, DFN12

# ISL85009 – Buck Regulator $V_{IN}$ 3.8-18V / 9A

Part of our 12V Buck Regulator Family (small solution size, high efficiency)

## Wide Input Voltage range 3.8 - 18V

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

## High Integration

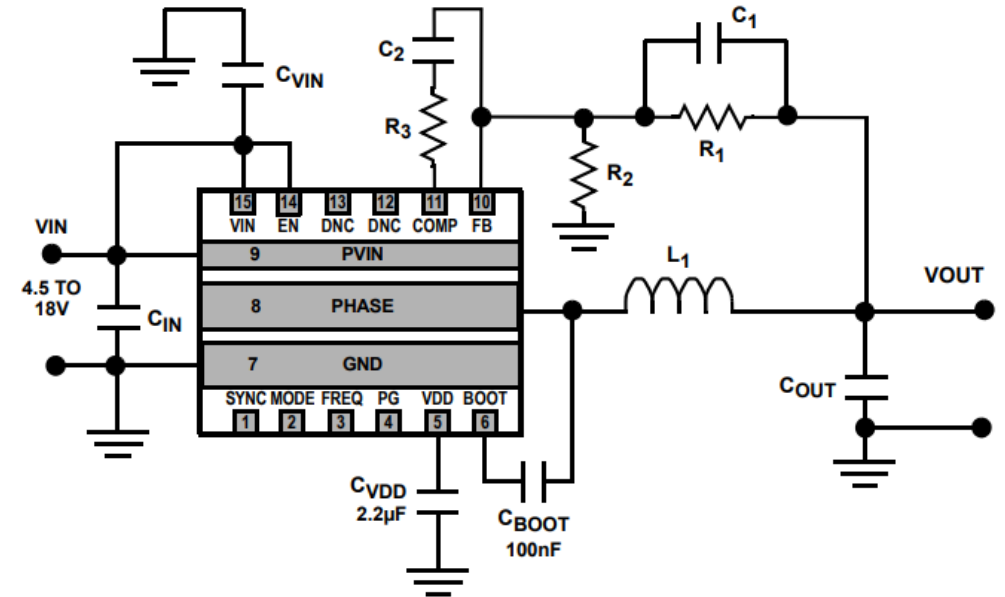
- Internal 9A MOSFETs
- Smaller Solution Size

## Switching Frequency up to 1 MHz

- Smaller passive components, thus solution size
- Better transient response

## Internal/External compensation

- Design simplicity and flexibility



Part #	$V_{IN}$	$I_{OUT}$	Package
ISL85009FRZ	3.8 – 18V	9A	3.5 x 3.5mm, TQFN15



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