CN268-1 IEEE-1588 SOLUTION

CHINA SYSTEM SOLUTIONS TEAM (SST)
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System Overview

IEEE 1588 is a precise time protocol (PTP) used to synchronize clocks in computer networks. In a local area network, it can control the clock accuracy in sub microsecond ranges, making it suitable for measurement and control systems. There are many base stations and IoT devices requiring large-scale network synchronization with 5G coming. Renesas' synchronous timing device is designed for IEEE 1588 applications that require advanced clock recovery algorithms and precision timing to reconstruct accurate synchronization signals for 5G networks.
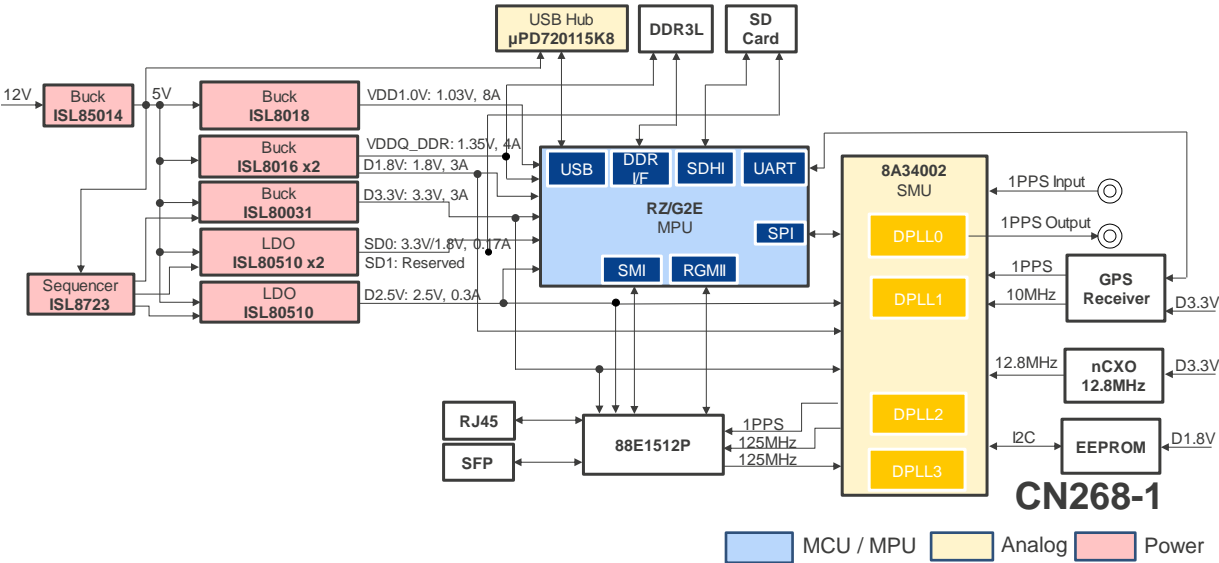
System Benefits

- IEEE 1588 solution realized with Renesas' high-processing performance MPU and precision timing clock IC.
- Renesas advanced clock recovery algorithms reconstruct accurate synchronization signals for networks.
- Clock accuracy is within ±10ns.

Target Applications

- Core and access IP switches/routers
- Synchronous Ethernet equipment
- Wireless infrastructure for 5G network equipment
- 10Gb, 40Gb, and 100Gb Ethernet interfaces

Category	Orderable P/N	Key Features
MPU	RZ/G2E R8A774C0HA01BG	High processing performance with dual-core Arm® Cortex®-A53 (1.2 GHz) CPUs, with 3D graphics and video CODEC engine
Power	ISL85014FRZ	14A Synchronous Buck Regulator, 3.8V to 18V Input and Output Voltage Adjustable from 0.6V
	ISL80031AFRZ	2.7V to 5Vin, 3A Sync Buck, Low Quiescent Current High Efficiency with 2x2 DFN Package
	ISL8018IRAJZ	8A Low Iq Synchronous Buck Regulator
	ISL8016IRAJZ	6A Low Iq Synchronous Buck Regulator
	ISL80510IRAJZ	High Performance 1A LDO
	ISL8723IRZ	4 Channel Sequencers Controlling the On and Off Sequence for Large System
Analog	8A34002	System Synchronizer for IEEE 1588 generates ultra-low jitter; precision timing signals based on the IEEE 1588 Precision Time Protocol (PTP) and Synchronous Ethernet (SyncE).
	UPD720115K8-711-BAK-A	USB2.0 Hub controller with 4 ports

RZ/G2E – DUAL-CORE ARM® CORTEX®-A53(1.2GHZ) MPU

ULTRA-HIGH PERFORMANCE MPU WITH 3D GRAPHICS AND VIDEO CODEC ENGINE

High Reliability for System

- L1/L2 cache and memory I/F have ECC functionality for high reliability systems

Trusted Security Function

- Security functionality is equipped for protecting program and data transfer

Full High-definition Decode

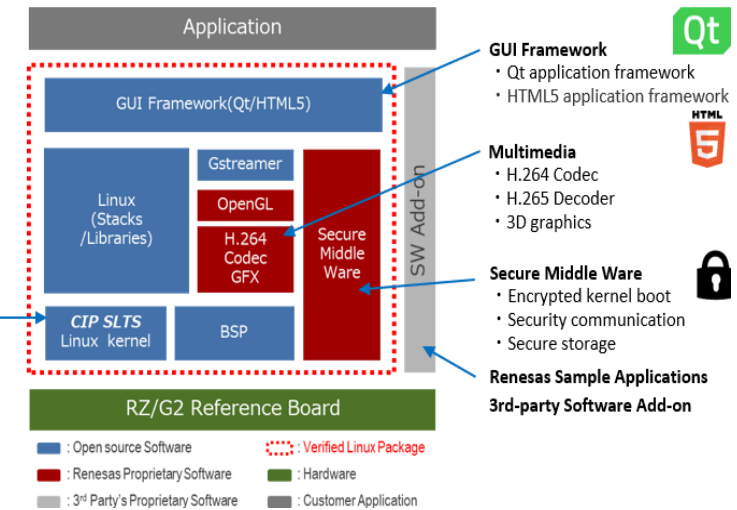- H.265 decoder and H.264 decoder/ encoder for FHD system implemented

Multi Interface

- High speed serial interface implemented USB3.0, PCI-e and GbE

Part #	Package
R8A774C0HA01BG	552pin FCBGA, 21mm x 21mm 0.8mm ball pitch

RZ/G2E Software and Hardware Platform

EK874 RZ/G2E Evaluation Board

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ISL85014 – 14A SYNCHRONOUS BUCK REGULATOR
3.8V TO 18V INPUT AND OUTPUT VOLTAGE ADJUSTABLE FROM 0.6V

Wide Working Range

- Power input voltage range variable 3.8V to 18V
- PWM output voltage adjustable from 0.6V
- Up to 14A output load

Small Package and Easy to Use

- Space saving 3.5 x 3.5mm TQFN package and minimal external BOM count saves PCB area
- "Flow through" IC package layout makes routing of power and ground simple

Excellent Safety

- Output overvoltage and thermal protection
- Input overvoltage protection
- Integrated boot diode with undervoltage detection
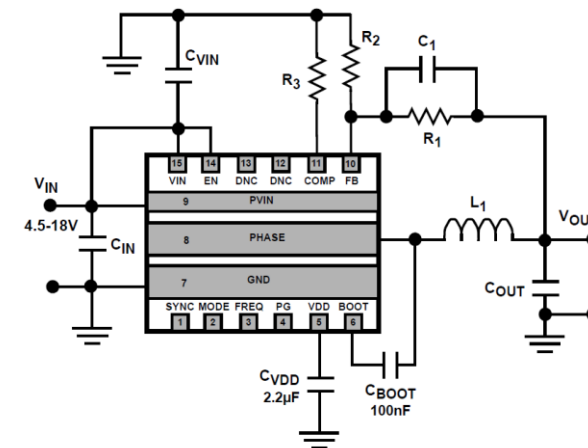
Typical Application Circuit

ISL85014EVAL1Z Evaluation Board

Part #	Iout (A)	V_{IN} Range(V)	Temp.(°C)	Package
ISL85014FRZ-T	14	3.8 to 18	-40 to 125	15 Ld 3.5x3.5 TQFN

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ISL80030/31/30A/31A – 2.7V TO 5VIN, 3A SYNC BUCK
LOW QUIESCENT CURRENT HIGH EFFICIENCY WITH 2X2 DFN PACKAGE

Compact Footprint for Space-Limited Applications

- 8 pin 2mmx2mm TDFN
- 1MHz or 2MHz switching frequency allows the use of small inductors
- The high-side internal PMOS eliminates external bootstrap capacitor
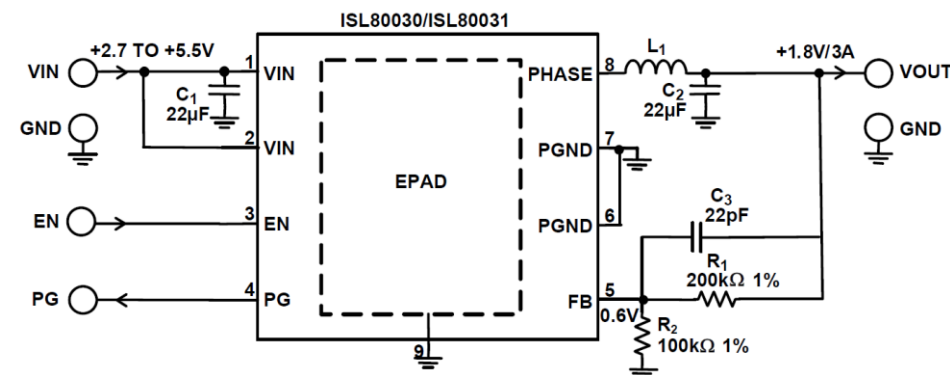
High Efficiency

- Up to 95% peak efficiency
- 35µA quiescent current

Excellent Safety

- Overcurrent and short circuit protection
- Over-temperature/thermal protection
- V_{IN} undervoltage Lockout and V_{OUT} overvoltage protection
- Negative current protection

Part #	Iout (MAX)(A)	V_{IN} Range(V)	f_{SW}(MHZ)	Temp.(℃)	Package
ISL80030FRZ-T	3	2.7 to 5.5	1	-40 to 125	8 pin 2x2 DFN
ISL80030AFRZ-T	3	2.7 to 5.5	2	-40 to 125	8 pin 2x2 DFN
ISL80031FRZ-T	3	2.7 to 5.5	1	-40 to 125	8 pin 2x2 DFN
ISL80031AFRZ-T	3	2.7 to 5.5	2	-40 to 125	8 pin 2x2 DFN

Typical Application Circuit
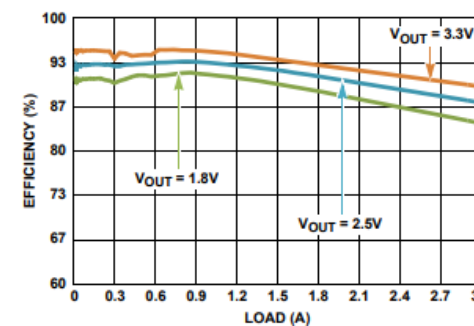
Efficiency vs Load, ISL80031, V_{IN} = 5V, T_A = +25°C

ISL8003xDEMO1Z Evaluation Board

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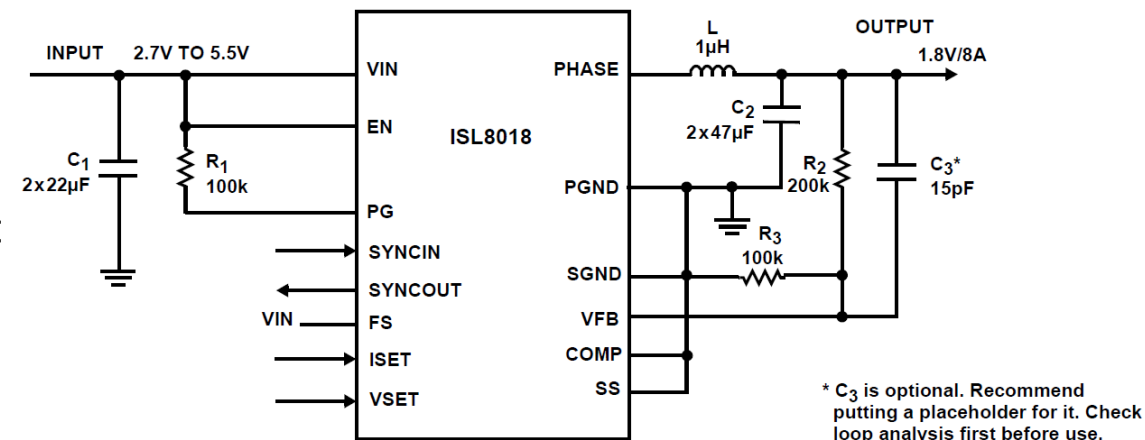# ISL8018 8A LOW IQ SYNCHRONOUS BUCK REGULATOR

DC/DC POL MODULE, LI-ION BATTERY POWER DEVICES, MC/MP, FPGA AND DSP POWER
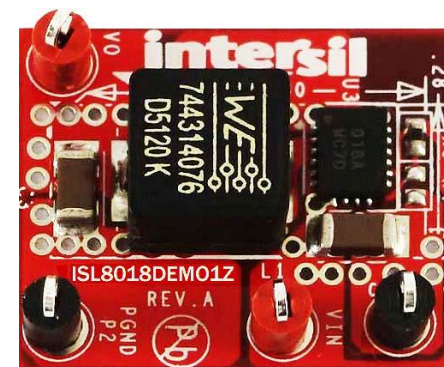
High Performance and High Efficiency

- Up to 8A continuous output current
- Up to 97% efficiency
- Adjustable voltage from 0.6V to V_{IN}
- Internal soft-start - 1ms or adjustable, internal/external compensatio
- Less than 250mV dropout at 8A output
- Adjustable frequency from 500kHz to 4MHz - default at 1MHz
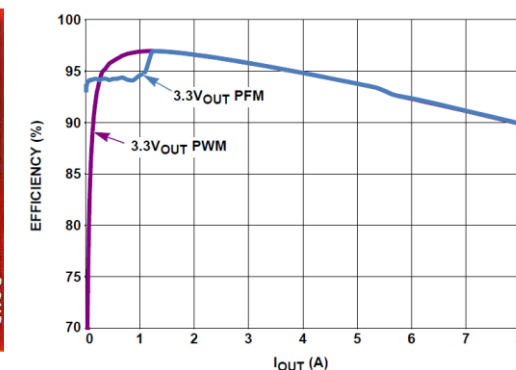
System Safe Design and Small Package

- Adjustable current limit
- Peak current limiting, hiccup mode short-circuit protection and over-temperature protection
- Small 3x4mm QFN package, the complete converter occupies less than 96.8mm^2 area

Typical Application Circuit

* C_3 is optional. Recommend putting a placeholder for it. Check loop analysis first before use.

Part #	Output Voltage(V)	Temp. Range	Package
ISL8018IRAJZ	Adjustable	-40 to +85 °C	20Ld 3 x 4mm QFN

ISL8018DEMO01Z Eval Board

Efficiency T = +25°C V_{IN} = 5V

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# ISL8016 6A LOW IQ SYNCHRONOUS BUCK REGULATOR
DC/DC POL MODULE, LI-ION BATTERY POWER DEVICES, MC/MP, FPGA AND DSP POWER
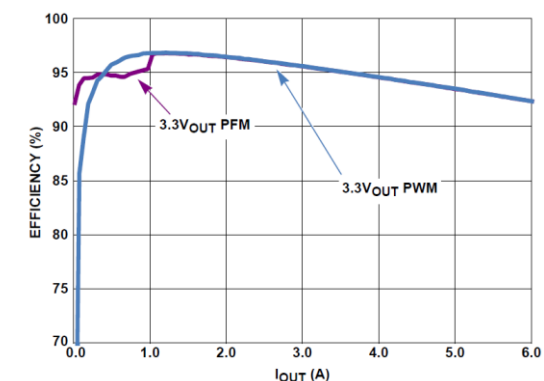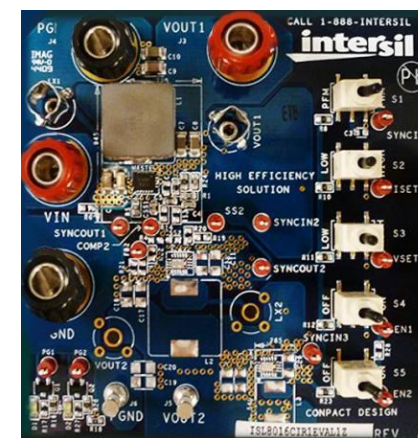
High Performance and High Efficiency

- Up to 6A continuous output current
- Up to 97% efficiency
- Adjustable voltage from 0.6V to V_{IN}
- Internal soft-start - 1ms or adjustable, internal/external compensation
- Less than 200mV dropout at 8A output
- Adjustable frequency from 500kHz to 4MHz - default at 1MHz

System Safe Design and Small Package

- Adjustable current limit
- Peak current limiting, hiccup mode short-circuit protection and over-temperature protection
- Small 3x4mm QFN package, the complete converter occupies less than 0.15in^2 area.

Part #	Output Voltage(V)	Temp. Range	Package
ISL8016IRAJZ	Adjustable	-40 to +85 ℃	20Ld 3 x 4mm QFN
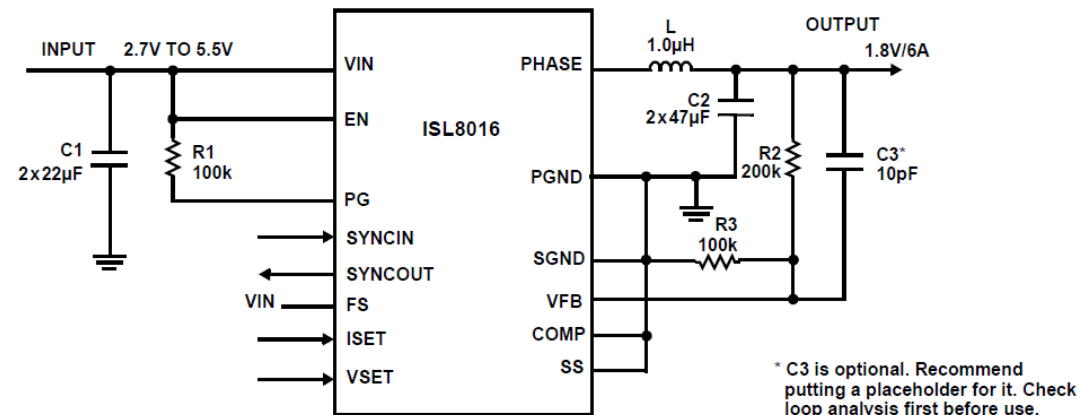
Typical Application Circuit

ISL8016CIR1EVAL1Z **Eval Board**

Efficiency T = +25°C V$_{IN}$ = 5V

ISL80505/510 – HIGH PERFORMANCE 0.5A/1A LDO
HIGH PSRR FOR INSTRUMENTATION, INDUSTRIAL, AND MEDICAL APPLICATIONS

Stable Output Voltage

- ±1.8% V_{OUT} accuracy guaranteed over line, load
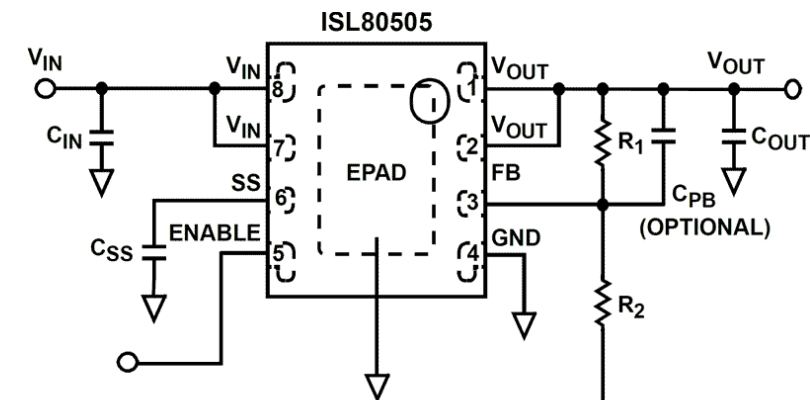- Stable with a 4.7µF output ceramic capacitor

High Efficiency

- Very low 45mV dropout voltage at V_{OUT} = 2.5V
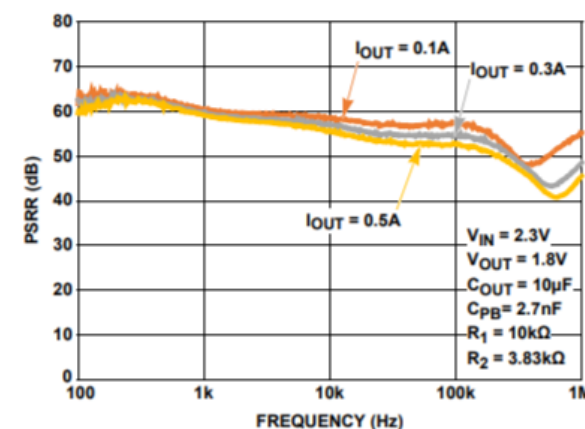- Very fast transient response

High Performance

- Excellent PSRR over wide frequency range
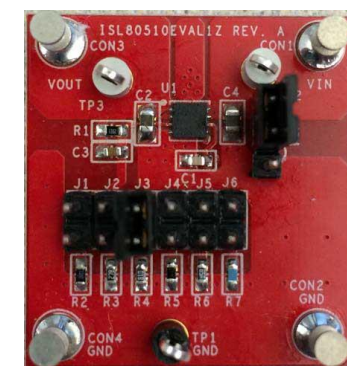- Programmable output soft-start time

Excellent Safety

- Current limit protection
- Thermal shutdown function

Typical Application Circuit

Part #	Vin (V)	Iout (A)	Package
ISL80505IRAJZ	1.8V to 6V	0.5	3x3 DFN
ISL80510IRAJZ	2.2V to 6V	1	3x3 DFN

PSRR (power supply rejection ratio)

ISL80510EVAL1Z 1A LDO Eval Board

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ISL8723/4 – POWER SEQUENCING CONTROLLERS
## 4 CHANNEL SEQUENCERS CONTROLLING THE ON AND OFF SEQUENCE FOR LARGE SYSTEM

Easy to Use and Low Cost

- Enables arbitrary turn-on and turn-off sequencing of up to four power supplies (0.7V to 5V)
- Operates from 2.5V to 5V supply voltage
- Multiple sequencers can be easily daisy-chained to sequence an infinite number of independent voltages
- Adjustable voltage slew rate for each rail
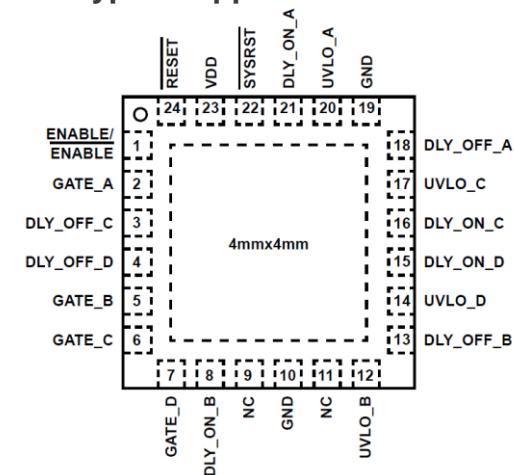- Integrated charge pump to drive 4 external low-cost N-channel MOSFET

Low Power and Safety

- 30µA sleep state (ISL8723)
- Undervoltage lockout for each monitored supply voltage

Part #	Sequencer channel	V_{DD} Range(V)	Temp.(℃)	Package
ISL8723IRZ	4	2.5 to 5	-40 to 85	24 Ld 4x4 QFN
ISL8724IRZ	4	2.5 to 5	-40 to 85	24 Ld 4x4 QFN
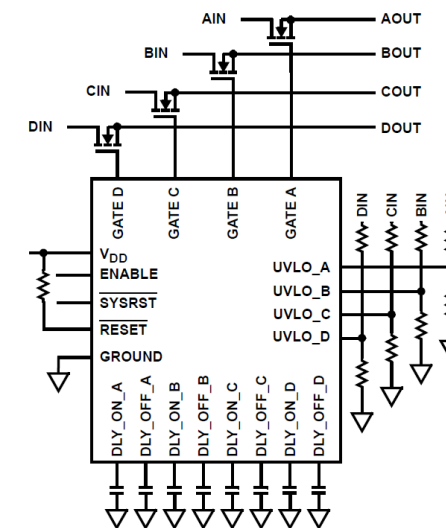
Typical Application Circuit

Package Top View

8A34002 – SYNCHRONIZATION MANAGEMENT UNIT
SYSTEM SYNCHRONIZER FOR IEEE 1588 – 8 DIFFERENTIAL/16 LVCMOS OUTPUTS

Flexible Timing

- Four independent timing channels
- Digital PLLs (DPLLs) lock to any frequency from 0.5Hz to 1GHz
- DPLLs / Digitally Controlled Oscillators (DCOs) generate any frequency from 0.5Hz to 1GHz
- DPLLs comply with ITU-T G.8262 for Synchronous Ethernet (SyncE)

Simple Input Frequency

- Device requires only a crystal oscillator or fundamental-mode crystal: 25MHz to 54MHz

IEEE Support

- DCOs can be controlled by external IEEE 1588 software to synthesize Precision Time Protocol (PTP) / IEEE 1588 clocks with frequency resolution less than 1.11×10^{-16}
- Combo Bus simplifies compliance with ITU-T G.8273.2

Part #	Shipping Package	Package
8A34002E-dddNLG	Tray	72 10x10x0.9mm VFQFN
8A34001E-dddNLG8	Tape and Reel, Pin1 Orientation: EIA-481-C	72 10x10x0.9mm VFQFN
8A34001E-dddNLG8#	Tape and Reel, Pin1 Orientation: EIA-481-D	72 10x10x0.9mm VFQFN

Block Diagram

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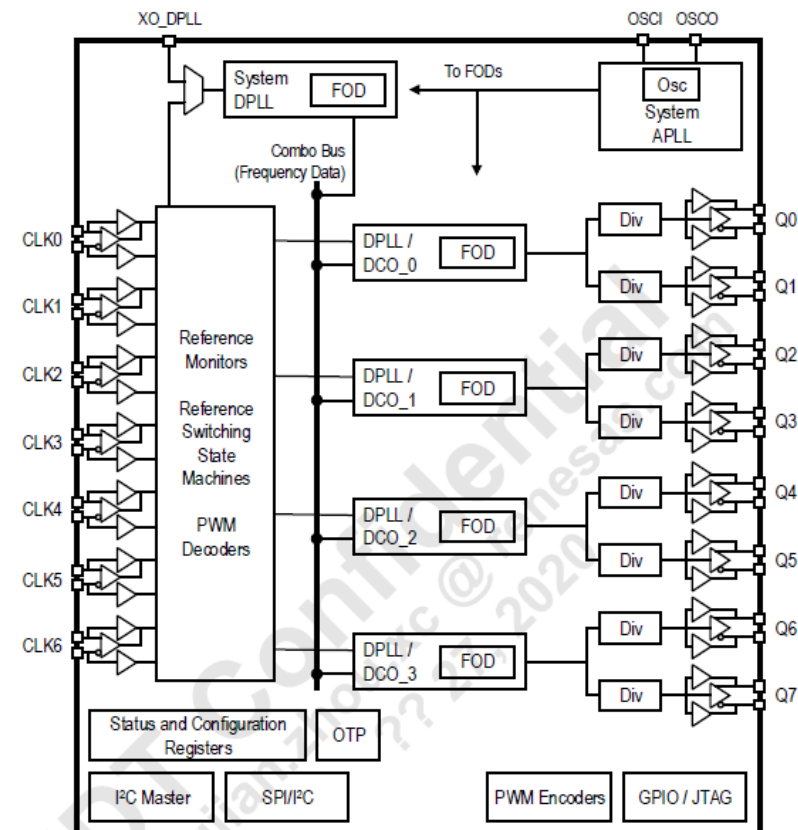
MPD720115 – USB2.0 HUB CONTROLLER WITH 4 PORTS
SUPPORT USB BATTERY CHARGING SPECIFICATION 1.2

Low cost on External Component

- Integrates two regulators to eliminate external regulators and this saves system costs

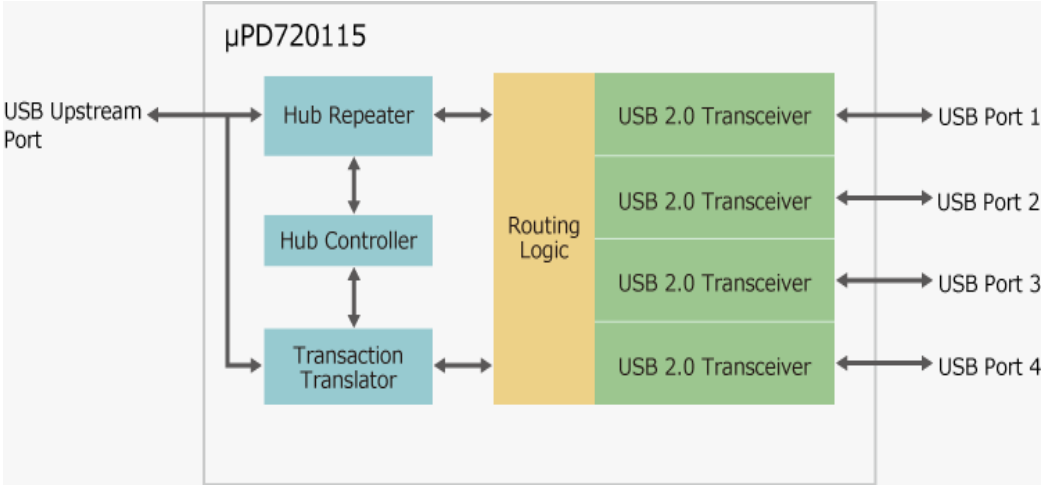### Wide Range Usage Environment

- Enhances operating temperature range from -40 to +85 degree
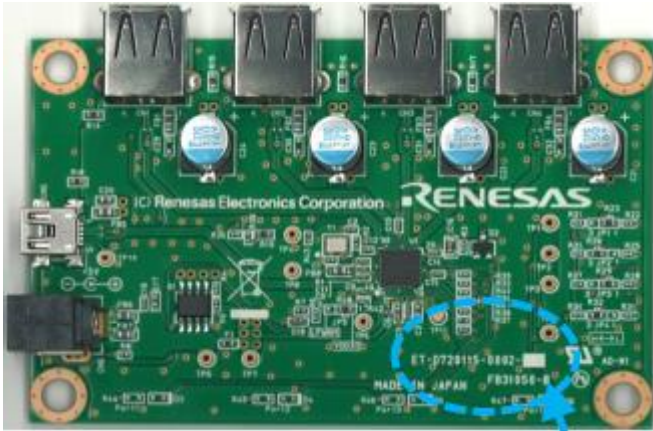
Trusted Reliability and Stability

- USB-IF Certified : TID(Test ID) = 30000066
- Supporting USB 2.0 Link Power Management
- Supports Individual/Gang power control/overcurrent detection

Flexible Downstream Output Port

- Configurable downstream port counts of 2,3, or 4 ports

µPD720115 Block Diagram
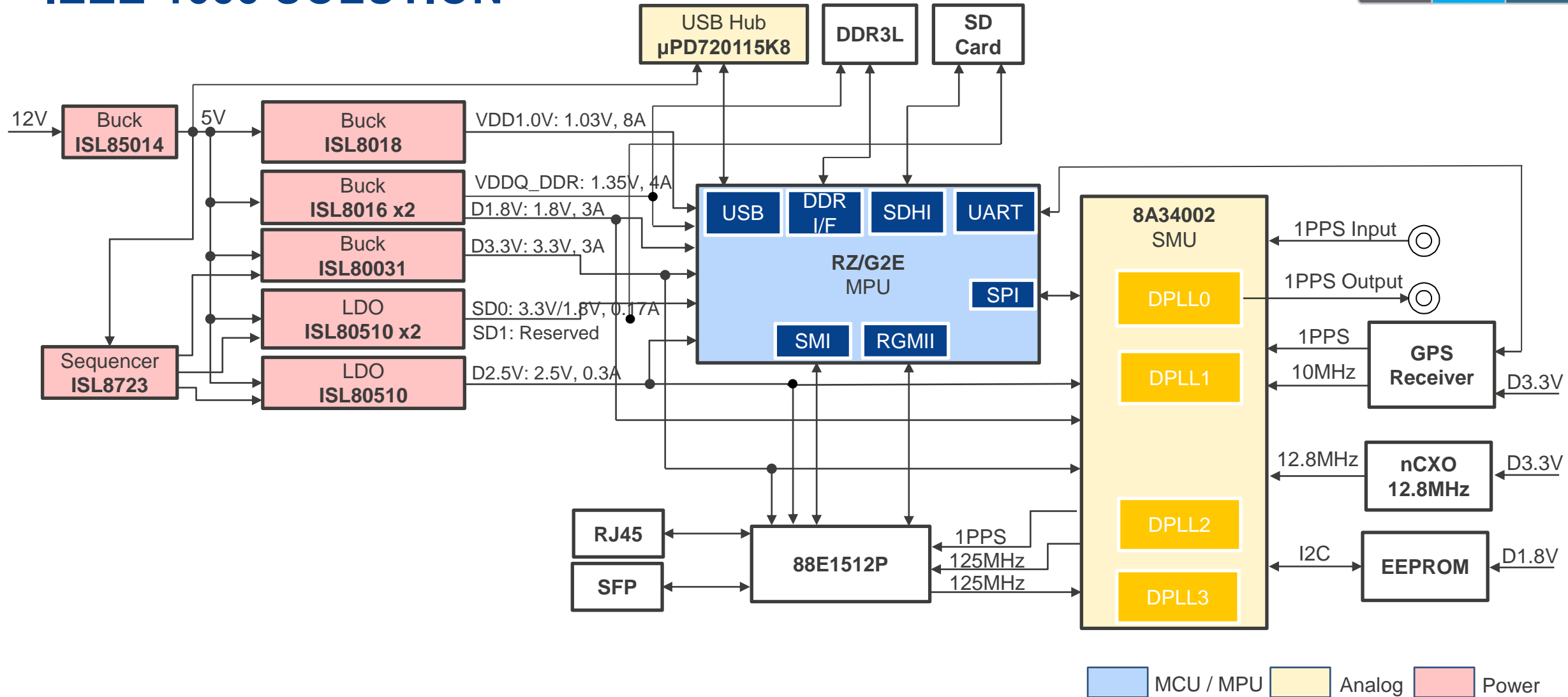

ET-D720115-0002 Reference Board

Part #	Feature	Package
UPD720115K8-611-BAK-A	0~85°C	40-pin QFN (6mm X 6mm)
UPD720115K8-711-BAK-A	-40~85°C	40-pin QFN (6mm X 6mm)

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	ISL80031AFRZ	2.7V to 5Vin, 3A Sync Buck, Low Quiescent Current High Efficiency with 2x2 DFN Package
	ISL8018IRAJZ	8A Low Iq Synchronous Buck Regulator
	ISL8016IRAJZ	6A Low Iq Synchronous Buck Regulator
	ISL80510IRAJZ	High Performance 1A LDO
	ISL8723IRZ	4 Channel Sequencers Controlling the On and Off Sequence for Large System
Analog	8A34002	System Synchronizer for IEEE 1588 generates ultra-low jitter; precision timing signals based on the IEEE 1588 Precision Time Protocol (PTP) and Synchronous Ethernet (SyncE).
	µPD720115K8-711-BAK-A	USB2.0 Hub controller with 4 ports

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