EU022
CO Detector

EMEA System Solutions Team (SST)
09/2019   1v0

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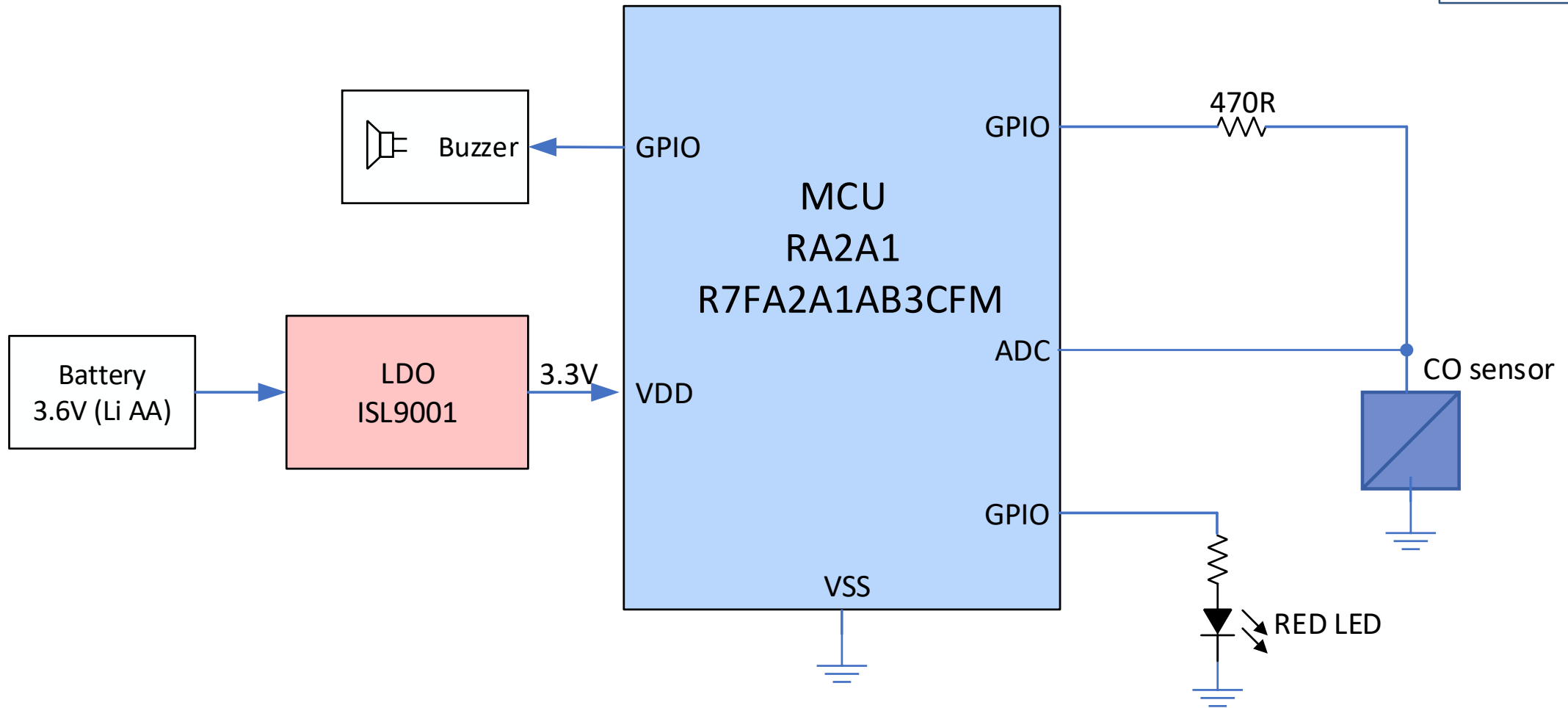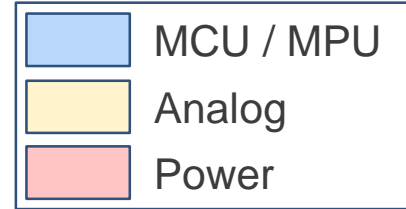# EU022 Carbon Monoxide (CO) Detector

- **Overview**
  - A carbon monoxide detector or CO detector is a device that detects the presence of the carbon monoxide (CO) gas in order to prevent carbon monoxide poisoning. CO is a colorless, tasteless and odorless compound produced by incomplete combustion of carbon-containing materials. It is often referred to as the "silent killer" because it is virtually undetectable by humans without using detection technology. Elevated levels of CO can be dangerous to humans depending on the amount present and length of exposure. Smaller concentrations can be harmful over longer periods of time while increasing concentrations require diminishing exposure times to be harmful.
  - The sensor used for this detector is based on an electrochemical function, as this is a type of fuel cell that instead of being designed to produce power, is designed to produce a signal current that is precisely related to the amount of the target gas (in this case carbon monoxide) in the atmosphere. Measurement of the current gives a measure of the concentration of carbon monoxide in the atmosphere.
  - The CO detector will measure CO levels over time and sound an alarm before dangerous levels of CO accumulate in an environment.

- **System benefits**
  - Using the new family of RA ARM™ based microcontrollers
  - Microcontroller contains the required Amplifiers needed to level the input signals
  - Very few external components needed

Block Diagram #EU022
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EU022 Carbon Monoxide (CO) Detector

Legend:
- MCU / MPU
- Analog
- Power

Buzzer — GPIO

MCU
RA2A1
R7FA2A1AB3CFM

Battery
3.6V (Li AA) → LDO ISL9001 → 3.3V → VDD

GPIO — 470R — CO sensor

ADC

GPIO — RED LED

VSS

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EU022 Carbon Monoxide (CO) Detector

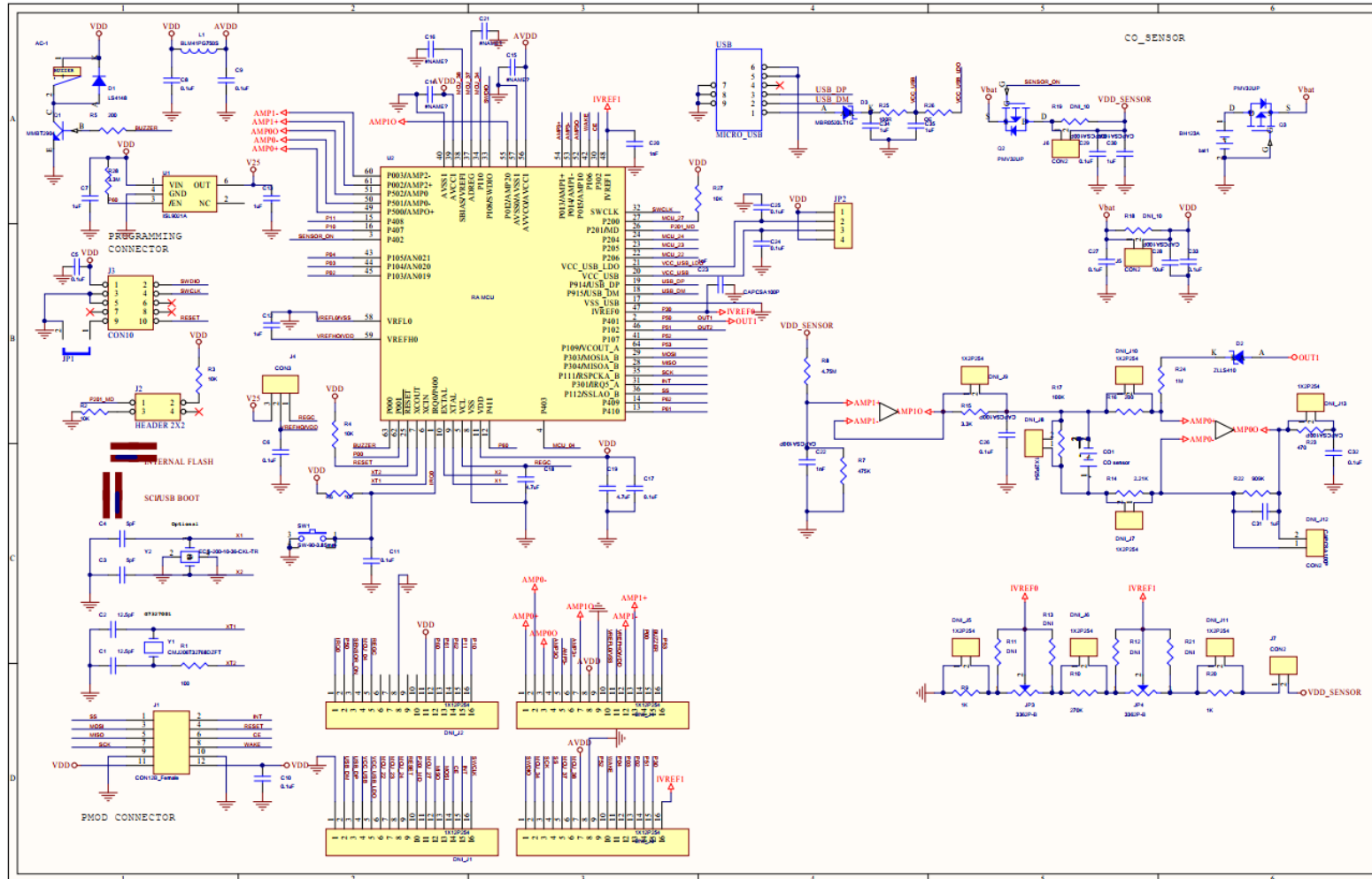| Device Category	P/N	Key Features
MCU	RA2A1 R7FA2A1AB3CFM	RA2 family of ARM™ based microcontrollers, including Analog amplifiers
Power	ISL9001AIRNZ-T	300mA LDO regulator 90dB PSSR 0.1-25µA Iq
Sensor	N/A	

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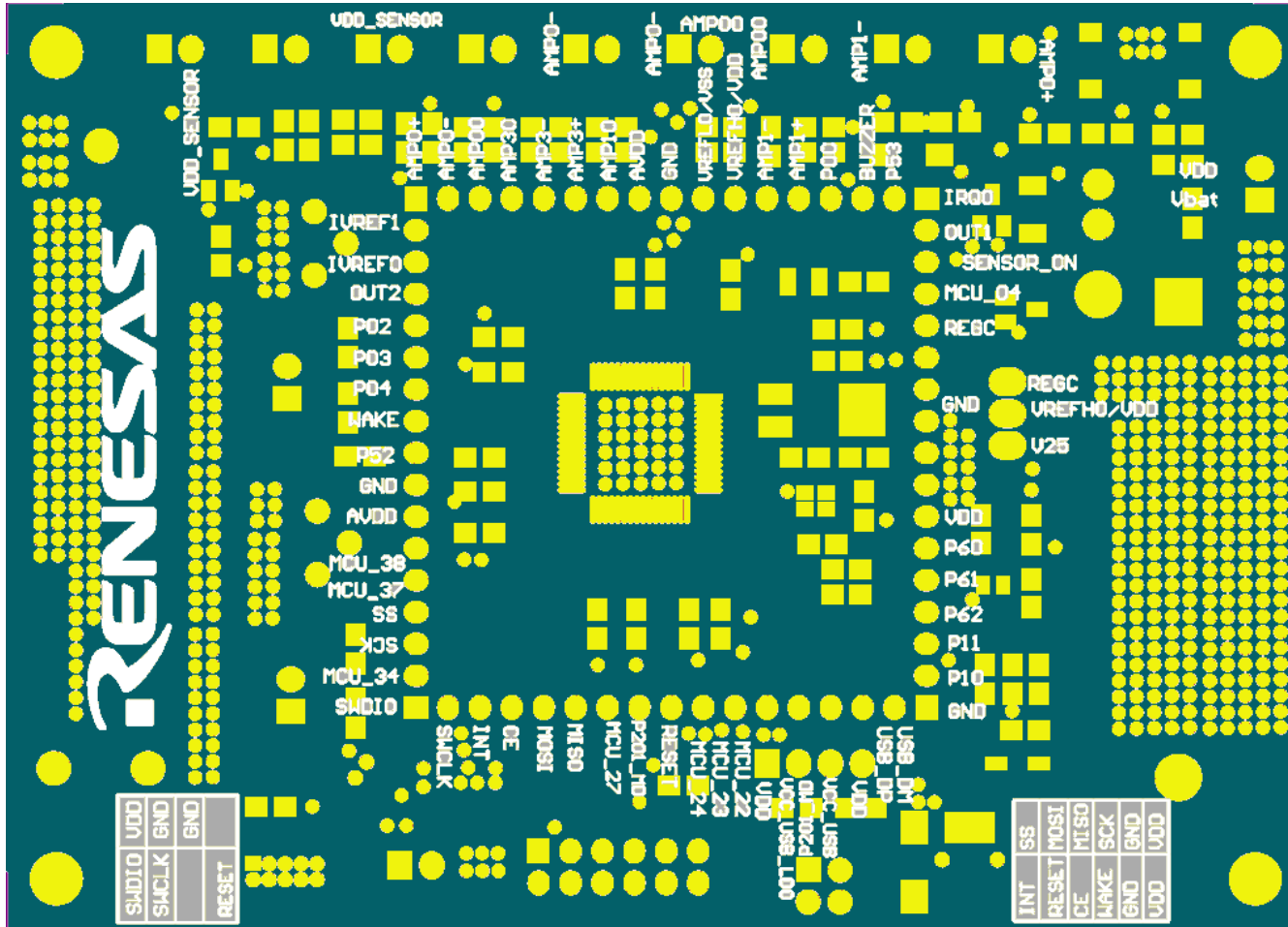BIG IDEAS FOR EVERY SPACE

EU022 Carbon Monoxide (CO) Detector
Target design schematics

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RA6M1 – Ultra-Low Power 120-MHz Arm®Cortex®- M4 Core
For Control/ Security/Graphical and Capacitive Touch

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

Highly integrated capabilities
- Up to 512KB Flash Memory and 256KB SRAM
- 128-bit unique ID
- 12-Bit ADC x2
- 12-Bit DAC x2
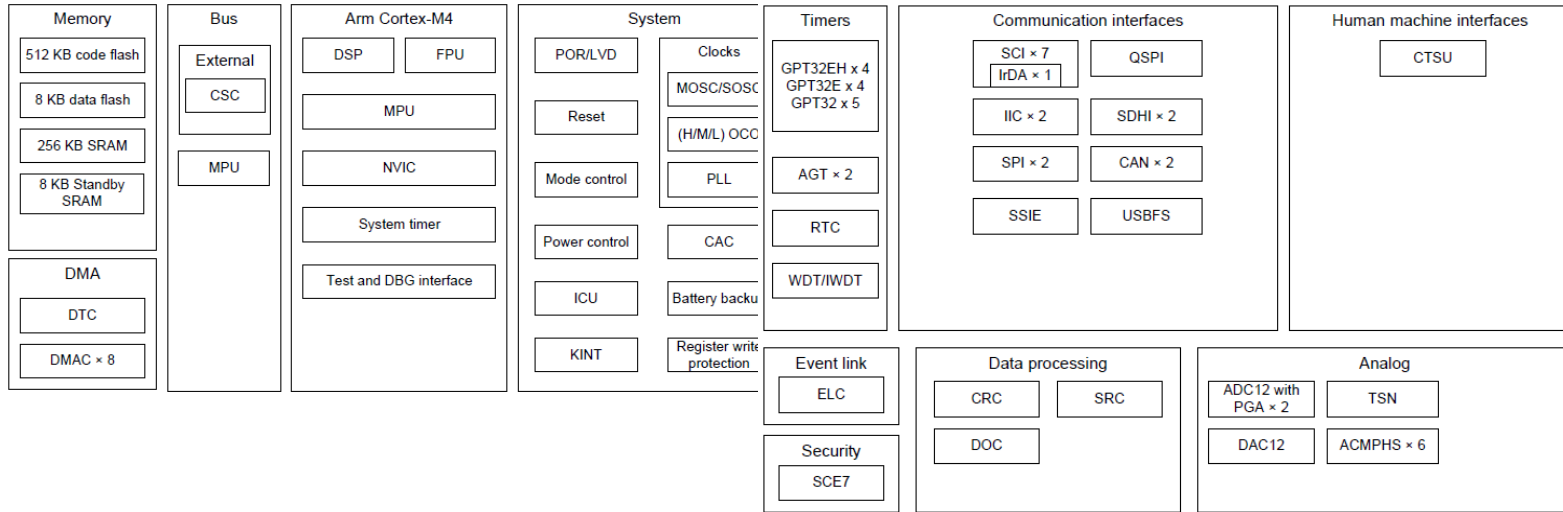
Communication interfaces
- USB 2.0(Full Speed/ High Speed)
- Ethernet Controller with DMA
- SCI x7/SPIx2/IICx2

HMI Interface
- Capacitive Touch Sensing Unit (12ch.)
- Graphics LCD Controller

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

Memory	Bus	Arm Cortex-M4	System		Timers	Communication interfaces		Human machine interfaces
512 KB code flash	External	DSP / FPU	POR/LVD	Clocks	GPT32EH x 4 GPT32E x 4 GPT32 x 5	SCI × 7 / IrDA × 1	QSPI	CTSU
8 KB data flash	CSC	MPU	Reset	MOSC/SOSC		IIC × 2	SDHI × 2	
256 KB SRAM	MPU	NVIC		(H/M/L) OCO	AGT × 2	SPI × 2	CAN × 2	
8 KB Standby SRAM		System timer	Mode control	PLL	RTC	SSIE	USBFS	
		Test and DBG interface	Power control	CAC	WDT/IWDT			
DMA			ICU	Battery backup				
DTC			KINT	Register write protection	Event link	Data processing		Analog
DMAC × 8					ELC	CRC / SRC		ADC12 with PGA × 2 / TSN
						DOC		DAC12 / ACMPHS × 6
					Security			
					SCE7			

Part #	Flash Memory	RAM	Temp	Package
R7FA6M1AD3CFP	512KB	256KB	40~105℃	100 LQFP
R7FA6M1AD3CFM	512KB	256KB	40~105℃	64 LQFP

RTK7EKA6M1S00001BU

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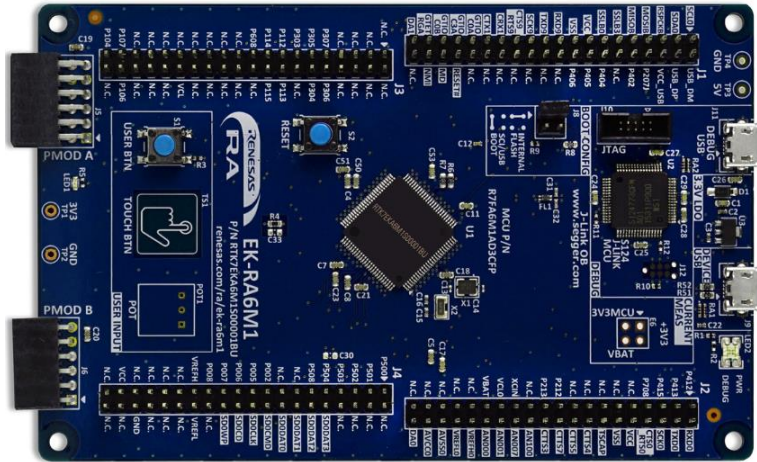
ISL9001A – V_{OUT} 1.5V to 3.3V/300mA LDO

V_{OUT} 1.5V to 3.3V/300mA LDO

LDO with Low I_{SUPPLY} and High PSSR

High Performance

- Excellent load regulation: <0.1% voltage change across full range of load current
- High PSRR: 90dB @ 1kHz
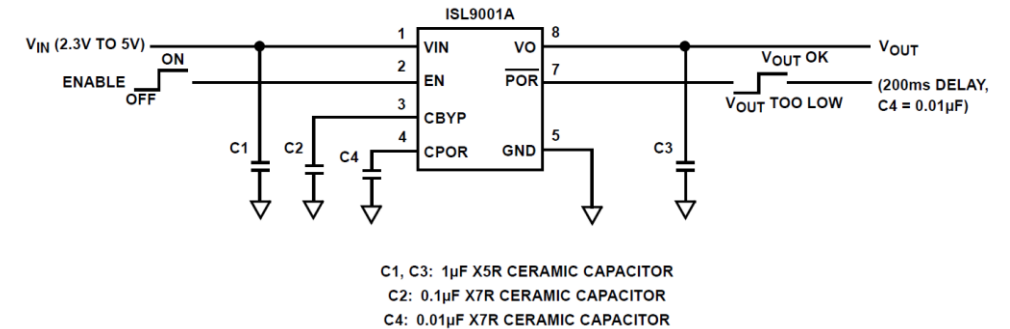
Stable Output Voltage

- ±1.8% V_{OUT} accuracy over all operating conditions
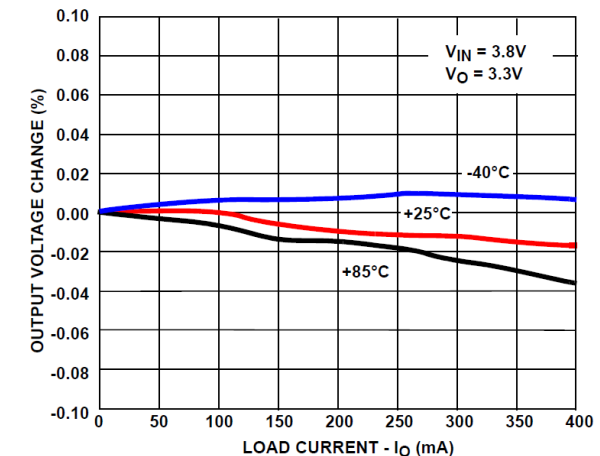- Stable with 1µF to 10µF ceramic capacitor

High Efficiency

- Extremely low quiescent current: 25µA
- Low dropout voltage: typically 200mV @ 300mA

Excellent Safety

- Current limit and overheat protection

Part #	Vout (V)	Temp.(℃)	Package
ISL9001AIRBZ-T	1.5	-40 to +85	8Ld 2x3 DFN
ISL9001AIRCZ-T	1.8	-40 to +85	8Ld 2x3 DFN
ISL9001AIRFZ-T	2.5	-40 to +85	8Ld 2x3 DFN
ISL9001AIRJZ-T	2.8	-40 to +85	8Ld 2x3 DFN
ISL9001AIRKZ-T	2.85	-40 to +85	8Ld 2x3 DFN
ISL9001AIRNZ-T	3.3	-40 to +85	8Ld 2x3 DFN

Typical Application Circuit

Output Voltage Change vs Load Current

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