CN193
Emergency Broadcast System (Watercraft)

October 2019

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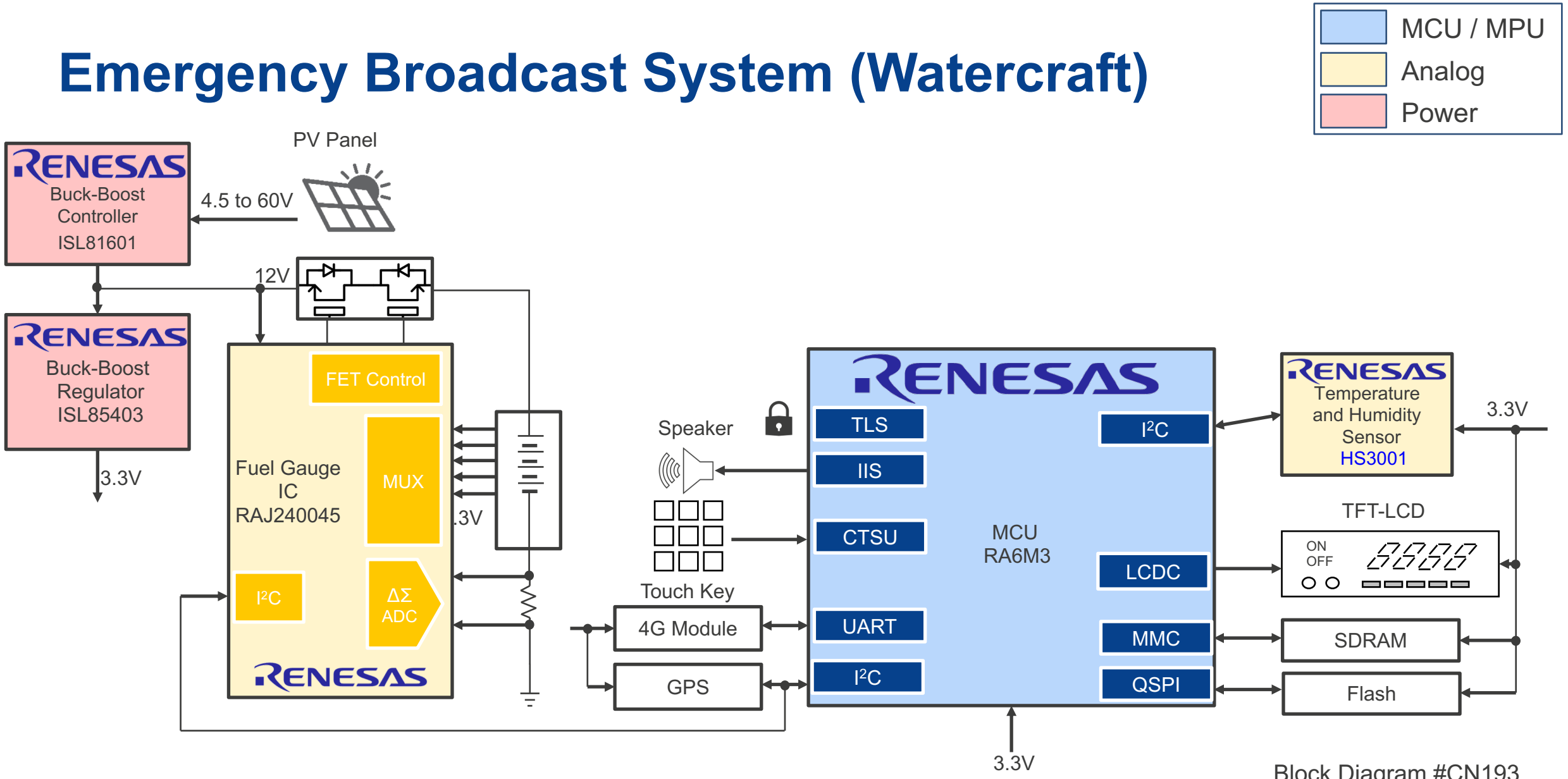
Overview

This design shows an emergency broadcast system for boats, and features Renesas' newly-launched RA6 MCU series. This MCU provides a high-performance system, which includes system control, human-machine interface (HMI), touch control, alarm sound output, a 4G/GPS connection, and system encryption. The entire solution enables better scalability and easy maintenance because of the Arm® ecosystem. This design also features Renesas' power devices for adaptive solar charging and battery management systems.

System Benefits

- The RA6M3 high-performance MCU with HMI, touch, security and 4G/GPS connectivity
- High-performance power devices for solar charging and battery management systems, as well as maximum power point tracking (MPPT) and battery control algorithms

Emergency Broadcast System (Watercraft)



Block Diagram #CN193
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Device Category	P/N	Key Features
MCU	RA6M3	Arm® Cortex®-M4, FPU, Max to 240 MHz, support TFT-LCD, SSP support to quick Stack development. Rich communication I/F for GPS/4G/Flash/SDRAM/Ethernet etc.
Power	ISL81601	Bidirectional Buck-Boost Voltage Regulator with protection, used for Multiple Cell Battery Chargers
	ISL85403	40V, 2.5A synchronous buck or boost-buck controller with an integrated high-side MOSFET and low-side driver, adjustable Vout 0.8-36V.
Analog	RAJ240045	2 to 4 Series Li-ion Battery Manager
	HS3001	Highly-accurate, fully-calibrated relative humidity and temperature sensor.

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

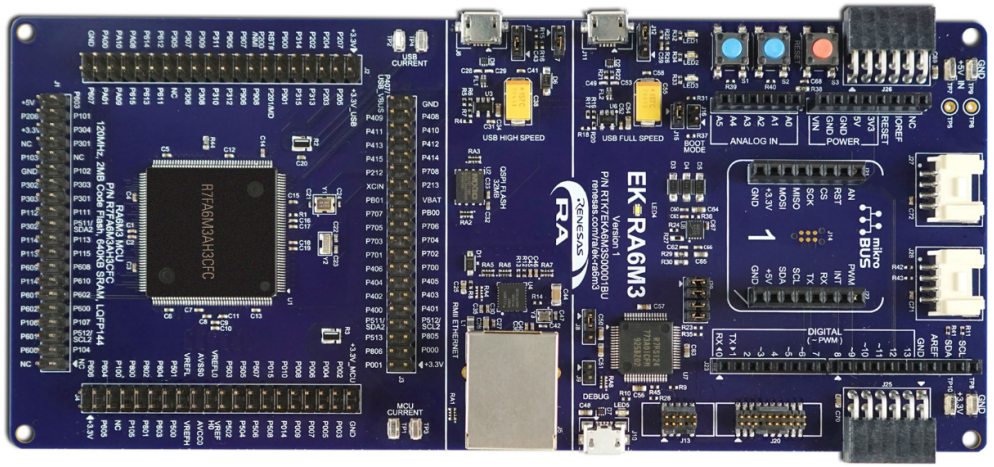
HMI Interface
- Capacitive Touch Sensing Unit (18ch.)
- Graphics LCD Controller

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

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

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



RTK7EKA6M3S00001BU

ISL81601 – High Voltage Buck Boost Controller

60V Bi-Directional 4 Switch Synchronous Buck-Boost Controller

Bi-Directional Buck-Boost

- Peak & average current sensing and monitoring at input/output
- 4 independent controls for input/output voltages and currents
- 4 Switch design with smooth transition between modes

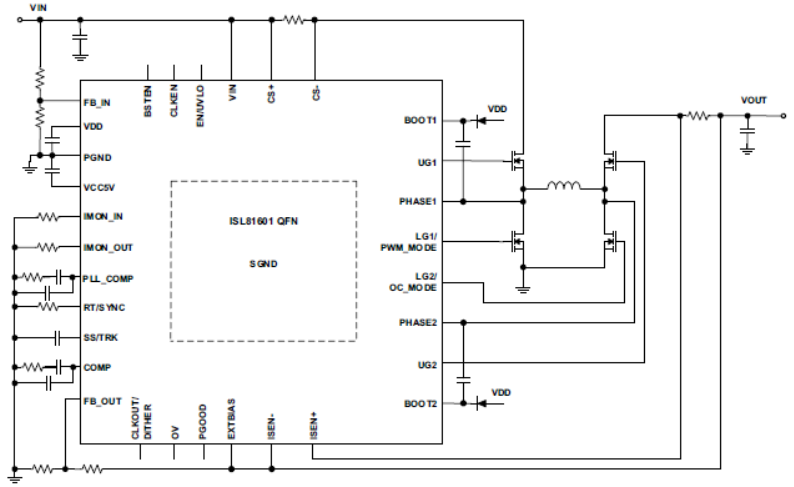
Wide Working Range

- Input voltage range: 4.5V to 60V
- Output voltage range: 0.8V to 60V
- Adjustable Fsw from 100 to 600 kHz
- Ability to sync to external clock

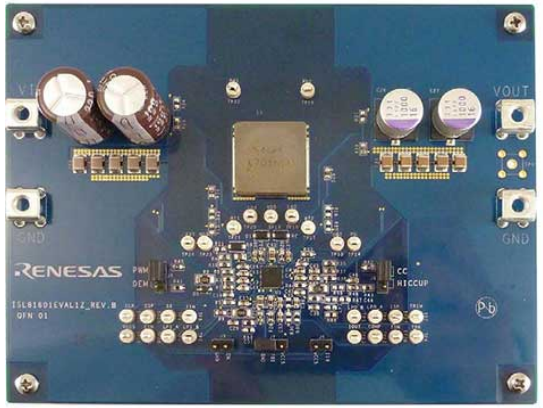
Complete Application Protection

- Multiple protection features: OVP, UVP, OTP, SCP
- Current limits on both input & output
- Adaptive shoot-through protection

Part #	Vin Range (V)	Vout Range (V)	Package
ISL81601FRZ-T	4.5-60	0.8-60	32Ld 5x5 DFN
ISL81601FVEZ-T	4.5-60	0.8-60	38Ld HTSSOP



Typical Operation Circuits



ISL81601EVAL1Z Evaluation Board

ISL85403 – 2.5A Regulator with Integrated High Side FET

Support 3V-40V Input Voltage Range for Buck or Buck-Boost Output

Wide Working Range

- Power input voltage range variable 3V to 40V
- Support both step down (buck) or buck-boost outputs
- Up to 2.5A load in temperature range

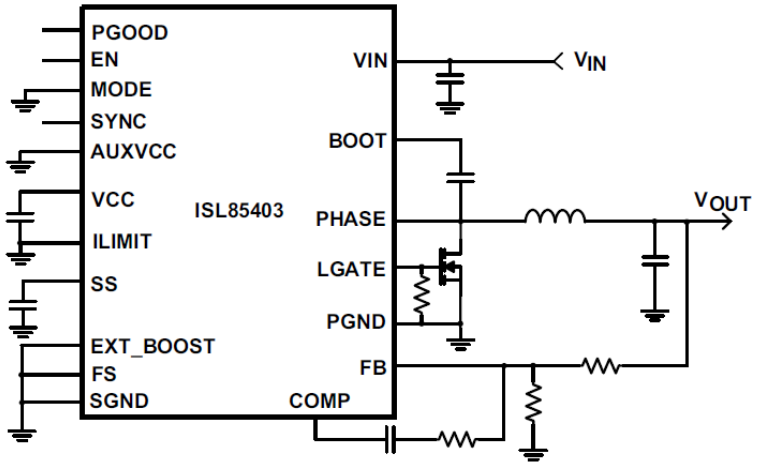
High Efficiency

- Optional external Low Side FET for higher efficiency
- Selectable PWM / PFM modes
- 300uA input quiescent PFM mode current
- Less than 5uA shutdown current

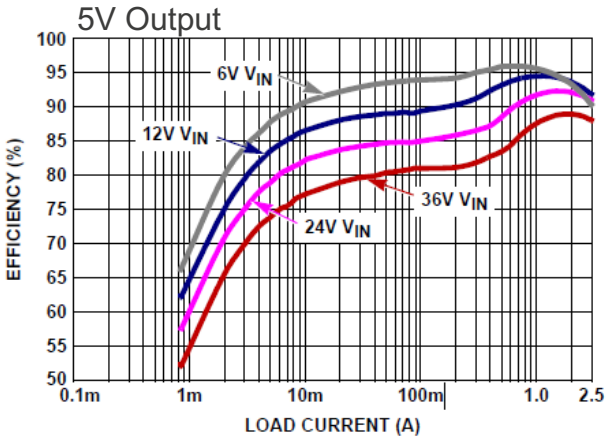
High Performance

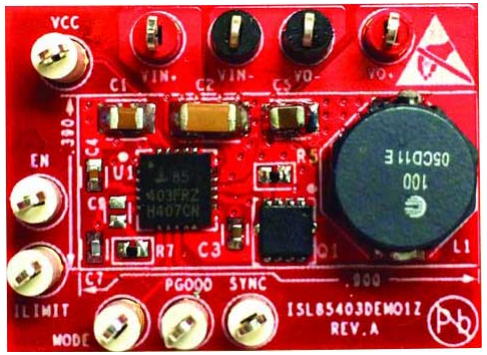
- 200KHz to 2.2MHz frequency range
- +/- 1% voltage regulation accuracy

Part #	V_{IN} Range(V)	Temp.(℃)	Package
ISL85403FRZ-T	3 to 40	-40 to 125	20 Ld 4x4 QFN



Typical Application Circuit





ISL85403EVAL1Z Evaluation Board

RAJ240045 – 2 to 4 Series Li-ion Battery Manage IC

2-4 Series(4-25V) Battery Management for One-chip Solution

Safety Features

- Built-in self-diagnostic functions for microcontroller and analog front-end (AFE)
- Low power mode for safe storage
- Supports various Li-ion chemistries (up to 25V)

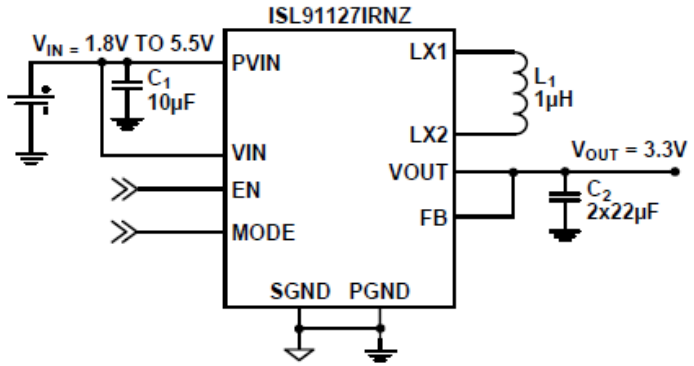
High Accuracy

- High-precision delta-sigma A/D converter specialized for current, voltage, and temperature detection
- Battery level calculation takes battery deterioration into account

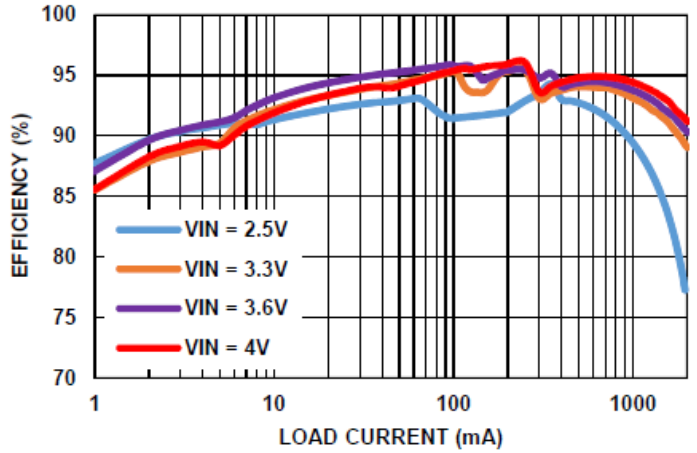
Design Support and Tools

- Starter kits include evaluation board with reference design and sample firmware for fast prototyping
- Application notes and training videos
- Regional support

Part #	Vin (V)	Communication	Package
RAJ240045DNP	4-25V	SPI/UART/IIC/ Intel® DBPT	32Ld 4x4 QFN



Typical Application Circuit



Efficiency V_{OUT}=3.3V

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

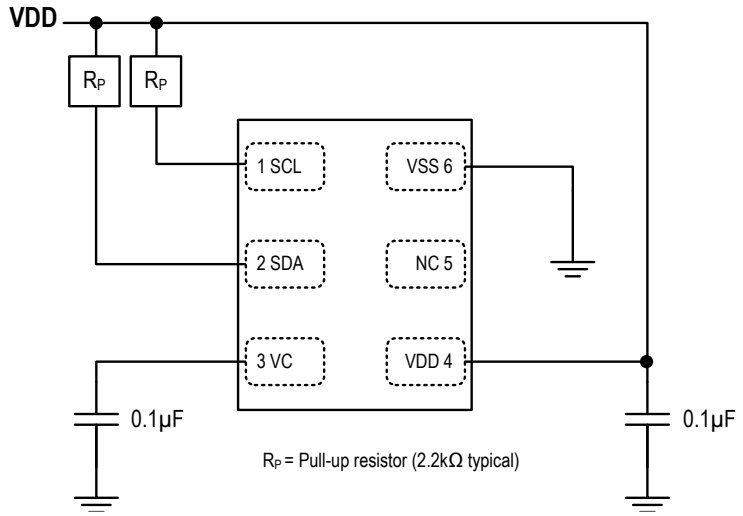
Fast Response

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

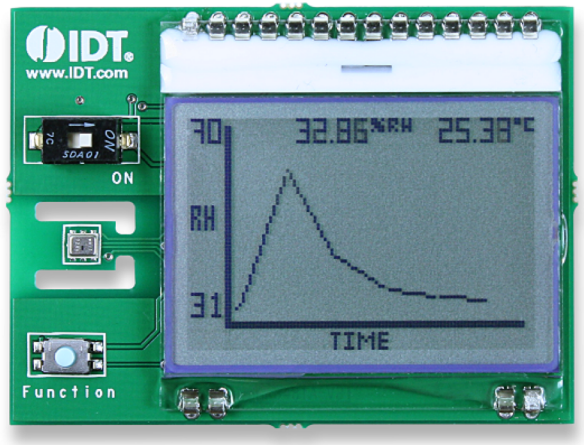
Extended Supply Voltage

- 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



SDAH02 Evaluation Kit

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