

# VENDING MACHINE WITH SECURE CLOUD CONNECTION: OVERVIEW

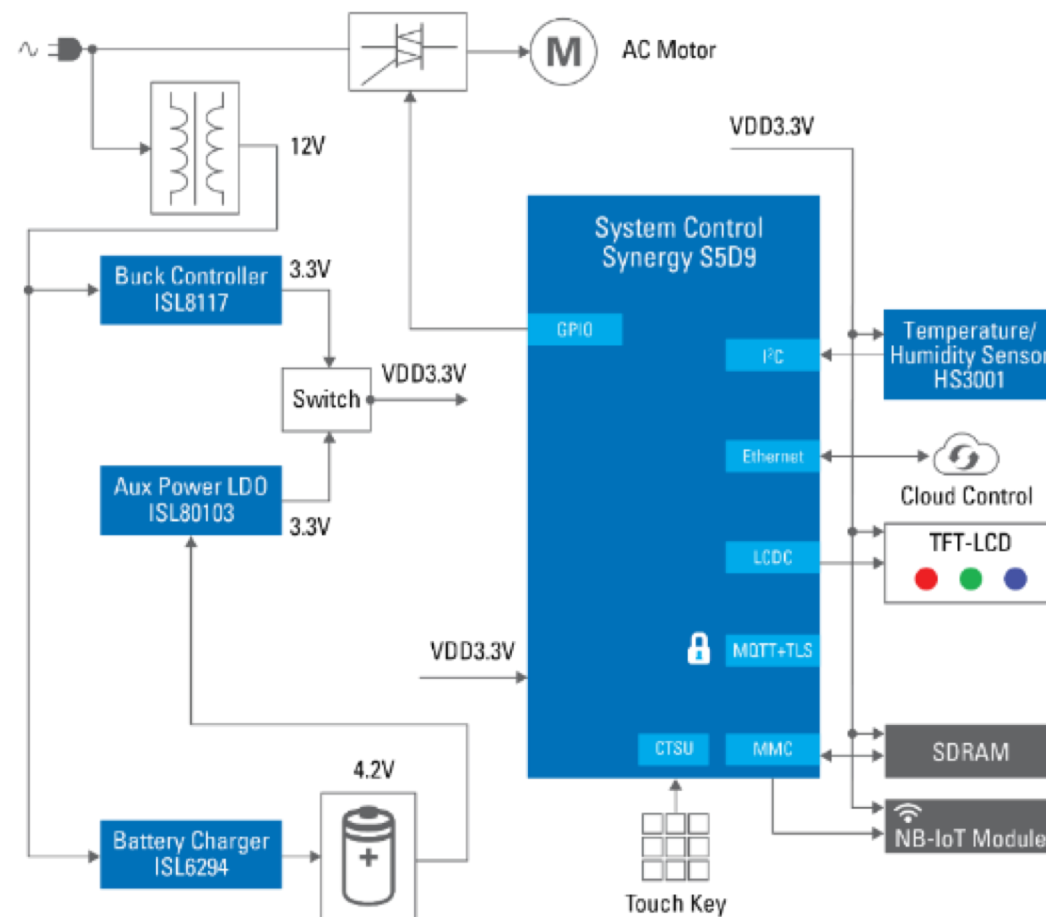
Smart vending machines have increased in popularity with the trend to be cash-less. The basic functions include an Human-Machine Interface (HMI) with payment and secure monitoring in the cloud. The Renesas Synergy S5D9 MCU has on-chip hardware security, an LCD controller, and qualified SSP for quickly connecting to the cloud. A NarrowBand-Internet of Things (NB-IoT) modem enables direct connection to cloud. The HS300x provides high accuracy and excellent stability for measuring humidity and temperature. With power support from the ISL8117 DC/DC controller, ISL6294 battery charger, and an ISL80103 LDO, the system is complete.

This solution can support differential cable Ethernet and cable-less WLAN connections, such as WiFi, and NB-IoT. The hardware encryption and software protocol, TLS, ensures a secure cloud connection. The capacitive touch and larger color TFT LCD support an optimized HMI experience for the user.

## Key Features:

- Secure cloud connection to safely transmit billing information
- High-performance Arm® Cortex® S5D9 MCU with built-in TFT-LCDC, capacitive touch, and qualified SSP
- Support for wired Ethernet or various wireless connections such as NB-IoT or WiFi

# VENDING MACHINE WITH SECURE CLOUD CONNECTION: BLOCK DIAGRAM



CN040 - D24

# VENDING MACHINE WITH SECURE CLOUD CONNECTION: SUMMARY

## ■ System benefits

- High performance MCU supports TFT-LCDC, qualified SSP support quick stack development
- Supports ISL8117 buck controller, ISL6294 battery charger and ISL8050310 3A adjustable LDO power solution
- HS3001 is highly-accurate, fully-calibrated relative humidity and temperature sensor

Device Category	P/N	Key Features
MCU	R7FS5D9	Arm® Cortex®-M4, FPU, Max to 120 MHz, 640K RAM, support TFT-LCD, SSP support to quick stack development. MMC support SDRAM I/F. Integrate cap touch.
Power	ISL8117	Wide input(4.5-60V) and output voltage ranges(Vout 30A/0.6-54V), provide OV/OC/OT protections
Power	ISL6294	A cost-effective, fully integrated high input voltage single-cell Li-ion battery charger
Power	ISL80103	Option 3.3V/3A LDO for controller & NB-IoT connection (big current)
Analog	HS3001	A highly-accurate, fully-calibrated relative humidity and temperature sensor

# S5D9 SYNERGY PRODUCT SNAPSHOT

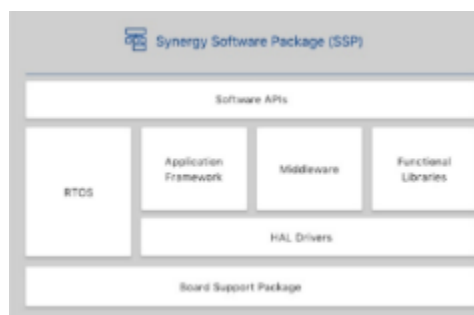
## Performance MCU Series

Features	Benefits	Applications
<ul style="list-style-type: none"> <li>High performance 40nm Arm® Cortex®-M4F cores</li> <li>Up to 2MB flash / 640KB SRAM</li> <li>High integration including Ethernet, USBHS, LCD controller, capacitive touch</li> <li>Secure Crypto engine: 128-Bit Unique ID, TRNG, AES, 3DES, ECC/RSA/DSA, SHA &amp; GHASH (Built-in hardware)</li> <li>Built-in Safety: ECC in SRAM, Flash area protection, IWDG plus more</li> <li>Comprehensive tools and support</li> </ul>	<ul style="list-style-type: none"> <li>Full access to the Synergy Software Package (SSP), which includes a commercial grade RTOS, middleware, frameworks, HAL drivers and the accompanying board support packages</li> <li>Fully integrated and tested software with no licensing, royalties or maintenance fees</li> <li>Unlimited usage for any Synergy device</li> <li>Hardware and software scalability: Pin compatibility across packages and feature compatibility</li> <li>All tech support for hardware and software done through Renesas</li> </ul>	<ul style="list-style-type: none"> <li>Graphical HMI</li> <li>Connectivity hub</li> <li>Medical instrumentation</li> <li>Motor &amp; position control</li> <li>Security gateway/peripheral</li> <li>Building automation</li> <li>Industrial automation</li> </ul>

## Typical application and key performances



Fully integrated Promotion Kits



Fully tested SSP and library for your use



Full support for either IDE, your choice

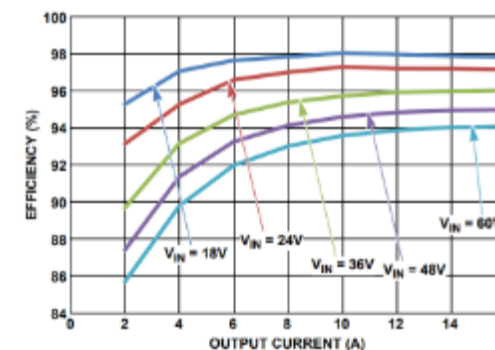
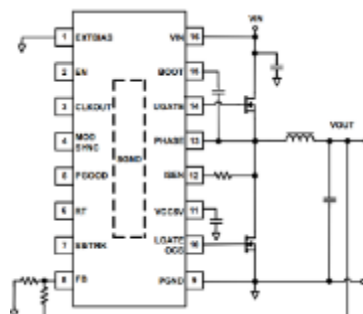
# ISL8117/A: DEFAULT SETTINGS, LOW COMPONENT COUNT

*60V synchronous step-down PWM controller with wide Vin –Vout range*

Features	Benefits	Applications
<ul style="list-style-type: none"> <li>Wide input voltage range: 4.5V to 60V</li> <li>Wide output voltage range: 0.6V to 54V</li> <li>Light-load efficiency enhancement</li> <li>Programmable soft-start</li> <li>Programmable frequency: 100kHz to 2MHz</li> <li>Adaptive shoot-through protection</li> <li>No external current sense resistor</li> <li>Complete protection</li> </ul>	<ul style="list-style-type: none"> <li>It uses the valley current modulation technique to bring hassle-free power supply design with a minimal number of components and complete protection from unwanted events.</li> <li>Low pin count, fewer external components, and default internal values makes the ISL8117 an ideal solution for quick to market simple power supply designs.</li> <li>The unique DEM/Skipping mode at light-load dramatically lowers standby power consumption with consistent output ripple over different load levels.</li> </ul>	<ul style="list-style-type: none"> <li>PLC and factory automation</li> <li>Amusement machines</li> <li>Security surveillance</li> <li>Servers and data centers</li> <li>Switchers and routers</li> <li>Telecom and datacom</li> <li>LED panels</li> </ul>

## Typical application and key performances

Typical application circuit



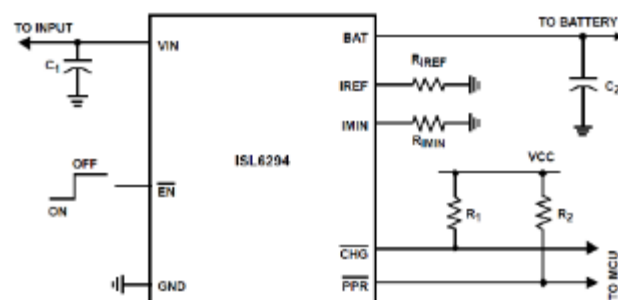
# ISL6294: SINGLE-CELL LI-ION BATTERY CHARGER

*Cost-effective, fully integrated high input voltage complete charger*

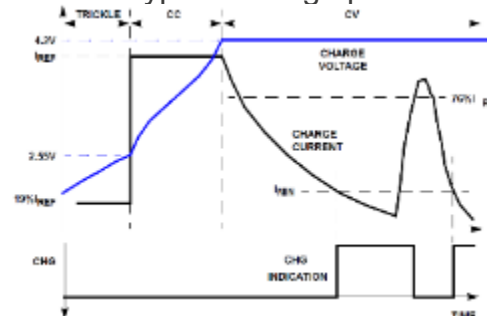
Features	Benefits	Applications
<ul style="list-style-type: none"> <li>Complete charger for single-cell batteries</li> <li>Integrated pass element and current sensor</li> <li>Low component count and cost</li> <li>No external blocking diode required</li> <li>1% voltage accuracy</li> <li>Programmable charge current</li> <li>Programmable end-of-charge current</li> <li>Charge current thermal foldback for thermal protection</li> <li>&lt;1uA leakage current off the battery</li> <li>28V maximum voltage for the power Input</li> </ul>	<ul style="list-style-type: none"> <li>Programmable charge current</li> <li>Charge current thermal foldback for thermal protection</li> <li>28V maximum voltage for the power input</li> <li>8 Ld 2x3 DFN and 8 Ld SOIC packages</li> <li>&lt;1uA leakage current off the battery</li> </ul>	<ul style="list-style-type: none"> <li>Mobile phones</li> <li>Bluetooth® devices</li> <li>PDA's</li> <li>MP3 players</li> <li>Stand-Alone chargers</li> <li>Other handheld devices</li> </ul>

## Typical application and key performances

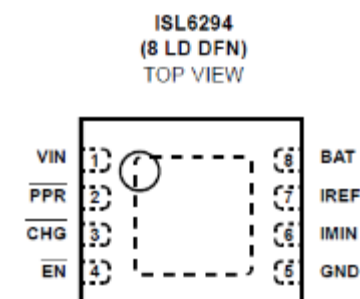
Typical application circuit with indication to MCU



Typical Charge profile



Package and pinouts



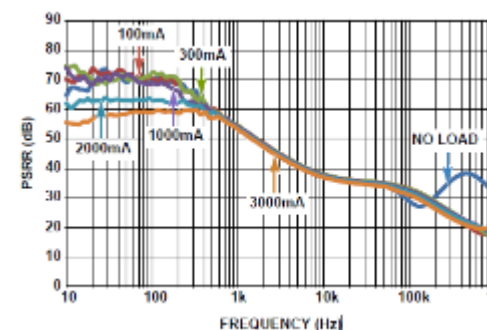
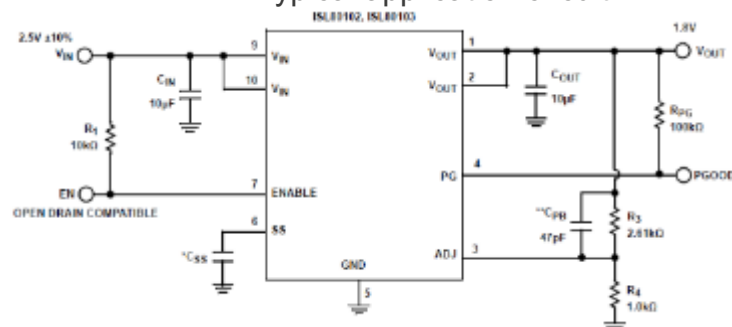
# ISL80103: LOW VOLTAGE, SINGLE OUTPUT 3A LDO

## High performance 5V/3A LDO

Features	Benefits	Applications
<ul style="list-style-type: none"> <li>Input voltage 2.2V to 6V</li> <li>Output voltage 0.8V to 5V</li> <li><math>\pm 1.8\%</math> Vout accuracy over line, load and temperature variation</li> <li>Very low 120mV dropout voltage at 3A</li> <li>Short-circuit and over-temperature protection</li> </ul>	<ul style="list-style-type: none"> <li>Thermally enhanced 10LD DFN package</li> <li>Adjustable inrush current limiting</li> <li>Very fast transient response</li> <li>It achieves a very fast load transient response and excellent PSRR</li> </ul>	<ul style="list-style-type: none"> <li>Routers &amp; switchers</li> <li>Instrumentation systems</li> <li>Medical equipment</li> <li>Telecommunications and networking</li> <li>Servers</li> </ul>

## Typical application and key performances

Typical application circuit



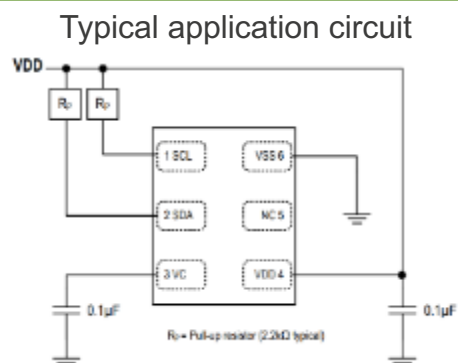


# HS300X: RELATIVE HUMIDITY AND TEMPERATURE SENSOR

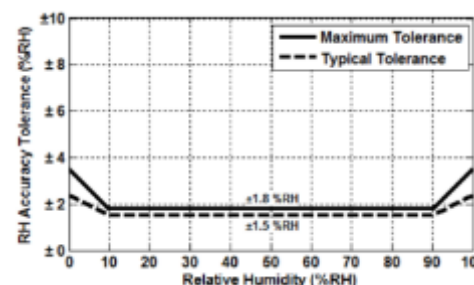
*Humidity sensor with industry-leading accuracy, response time, and excellent stability*

Features	Benefits	Applications
<ul style="list-style-type: none"> <li>• <math>\pm 1.5\%</math> relative humidity accuracy (HS3001)</li> <li>• Fast RH response time (Typical 6 seconds)</li> <li>• 14-bit resolution, 0.01%RH (Typical)</li> <li>• Low power consumption, 1.0<math>\mu</math>A average (one RH + T measurement per second)</li> <li>• Temperature sensor accuracy of <math>\pm 0.2^\circ\text{C}</math> (HS3001, HS3002)</li> <li>• Extended supply voltage, 1.8V to 5.5V</li> </ul>	<ul style="list-style-type: none"> <li>• Silicon-carbide capacitive sensing element</li> <li>• Excellent stability against aging</li> <li>• Highly robust protection from harsh environmental conditions and mechanical shock</li> <li>• Very low power consumption</li> <li>• Digital I<sup>2</sup>C Output</li> </ul>	<ul style="list-style-type: none"> <li>• Climate control systems</li> <li>• Home appliances</li> <li>• Weather stations</li> <li>• Industrial automation</li> <li>• Process controls and monitoring</li> <li>• Automotive climate control</li> <li>• Medical equipment</li> </ul>

## Typical application and key performances



HS3001 RH Accuracy Tolerance at 25°C



HS3001 Temperature Sensor Accuracy Tolerance

