

Currency Counter With Counterfeit Detection

November 2019

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■ Overview

Currency counters are a common product seen in every shop. The basic device is a simple design, and isn't much more than a counter with a motor control. Given the challenges with counterfeit currency, there is a need in the market for currency counters that can detect the legitimacy of the currency. These applications can extend past point of sales and be applied to ATMs or other cash transactions where speed, accuracy and verification are essential.

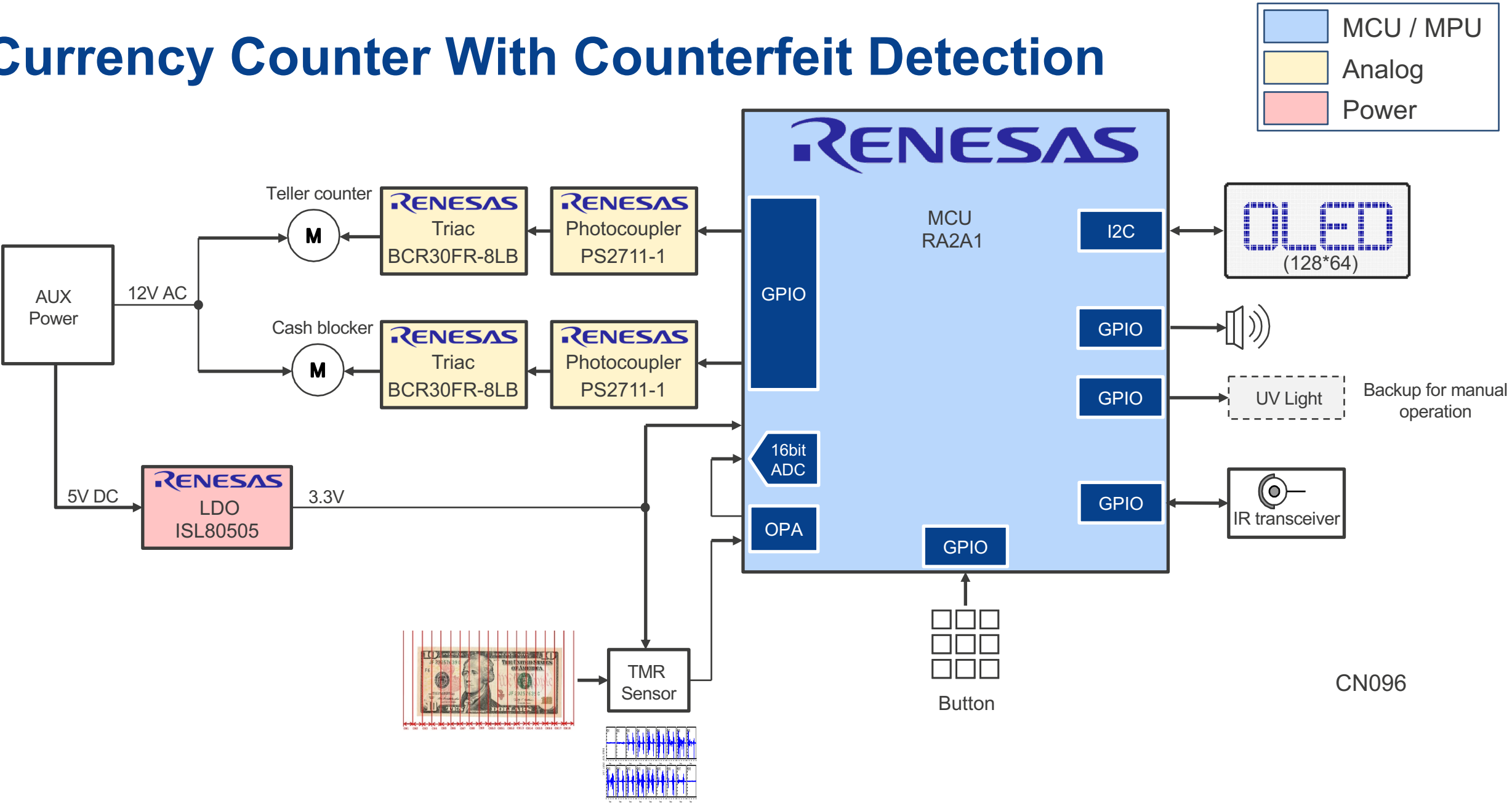
This design solves the market need by providing a complete currency counter with counterfeit detection solution, including a TMR sensor, which has high accuracy via multiple scans.

■ System Benefits

- An MCU with high integration, USB for power supply, IrDA for support for multiple detection methods, and LCD for counter display
- Accurate counterfeit detection

CN096

Currency Counter With Counterfeit Detection



CN096

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Device Category	P/N	Key Features
MCU	RA2A1	-Built-in communications functions such as USB and IrDA -On-chip op amp and DSAD is very fit for signal sampling
Power	ISL80505/510	Single output LDO capable of sourcing up to 500mA /1A output current
Analog	PS2711-1	Suitable for applications such as I/O interfaces and signal transmission circuits
	BCR30FR-8LB	-VDRM (V) up to 400V -IT (RMS) 30A -Guaranteed junction temperature (Tj) of 150°C

RA2A1 – Ultra-Low Power 48-MHz Arm® Cortex®-M23 Core

Complete Analog Solution for Signal Conditioning and Measurement

High Performance

- 48MHz Arm® Cortex®-M23 CPU

Highly integrated, high-accuracy analog capabilities

- Op Amp x3
- 24-Bit S/D ADC (10 ch.) /16-Bit SAR ADC (17 ch.)
- 12-Bit DAC (1 ch.)/8-Bit DAC (2 ch.)
- Temperature Sensor (TSN)
- High-Speed Comparator x2
- Low-Power Comparator x2

Communication Interfaces

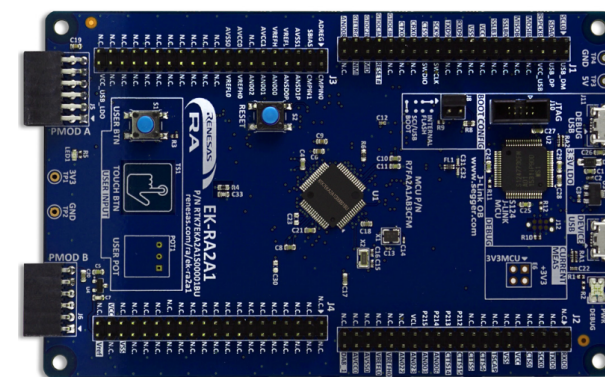
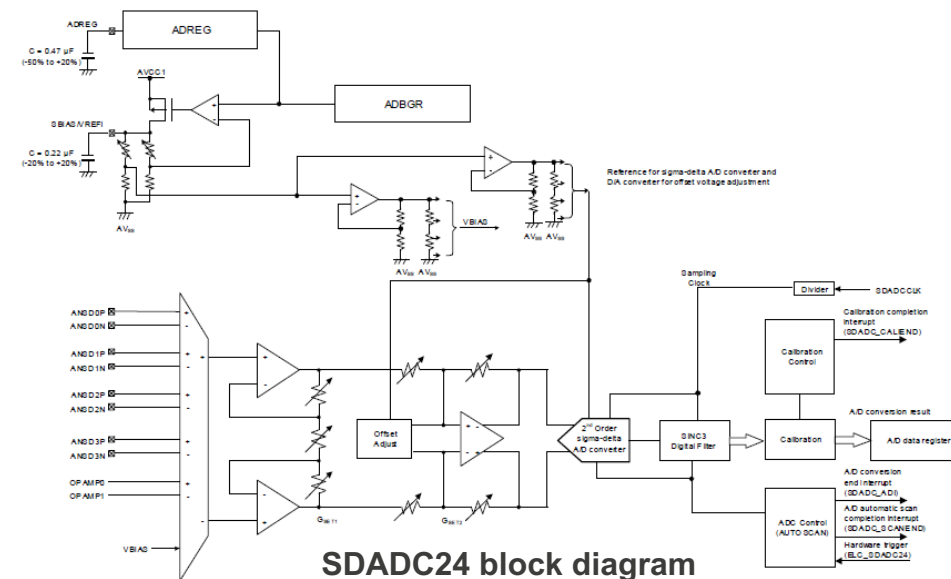
- USB 2.0(Full Speed)
- CAN
- SCI x3/SPIx2/IICx2

HMI Interface

- Capacitive Touch Sensing Unit (26 ch.)

Wide Voltage and Low Power Consumption

- Wide operating voltage range of 1.6V to 5.5V
- Various Low Power Modes



RTK7EKA2A1S00001BU

Part #	Flash Memory	RAM	Temp	Package
R7FA2A1AB3CFJ#AA0	256KB	32KB	40 ~ 105°C	32 LQFP
R7FA2A1AB3CFM#AA0	256KB	32KB	40 ~ 105°C	64 LQFP

ISL80505/510 – High Performance 0.5A/1A LDO

High PSRR for Instrumentation, Industrial, and Medical Applications

Stable Output Voltage

- $\pm 1.8\%$ V_{OUT} accuracy guaranteed over line, load
- Stable with a $4.7\mu\text{F}$ output ceramic capacitor

High Efficiency

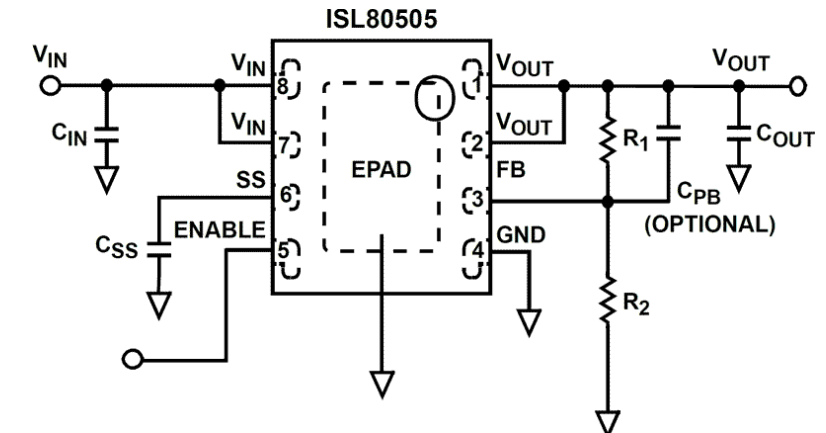
- Very low 45mV dropout voltage at $V_{OUT} = 2.5\text{V}$
- Very fast transient response

High Performance

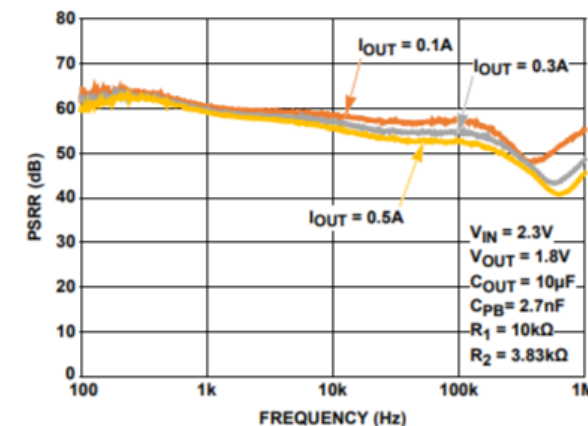
- Excellent PSRR over wide frequency range
- Programmable output soft-start time

Excellent Safety

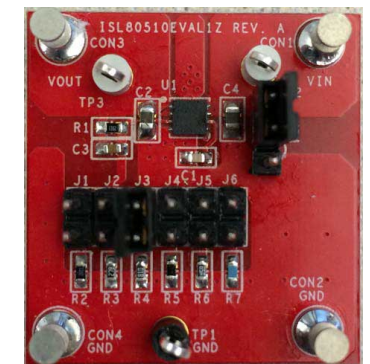
- Current limit protection
- Thermal shutdown function



Typical Application Circuit



PSRR (power supply rejection ratio)



ISL80510EVAL1Z 1A LDO Eval Board

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

PS2711-1 – DC Input/Single Output Photocouplers

High CTR 4-Pin SOP Photocoupler

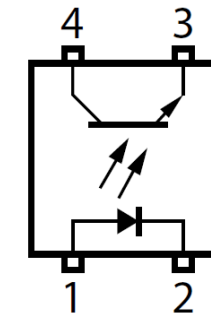
High Performance and Small Package

- High current transfer ratio (CTR = 200% TYP. @ $I_F = 1\text{mA}$)
- High isolation voltage ($BV = 3750\text{ Vr.m.s.}$)
- Small and thin package (4-pin SOP)

Safety Standards

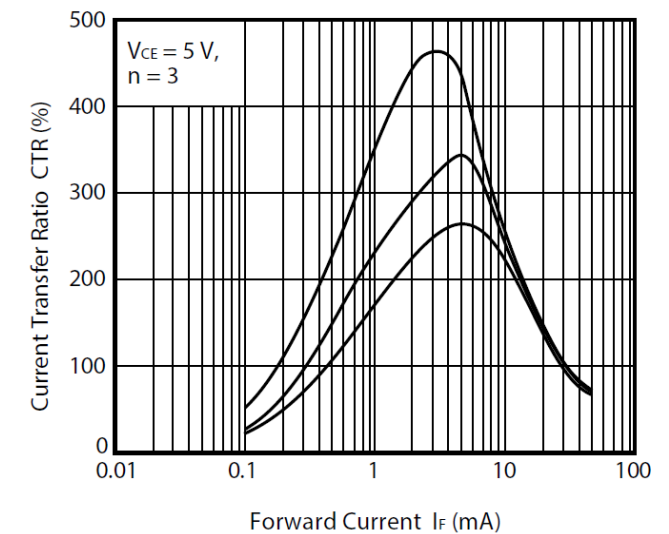
- UL approved: UL1577, Single protection
- CSA approved: CAN/CSA-C22.2 No.62368-1, Basic/Supplementary insulation
- VDE approved: DIN EN 60747-5-5 (Option)

Part #	Forward Current (mA)	Safety Standard	Package
PS2711-1	50	UL, CSA	4-PIN SOP
PS2711-1-V	50	UL, CSA, VDE	4-PIN SOP



1. Anode
2. Cathode
3. Emitter
4. Collector

PIN Connection



Current Transfer Ratio vs Forward Current

BCR30FR-8LB – High Performance Triacs

Guaranteed Junction Temperature (Tj) of 150°C, 400V/30A

High Performance

- VDRM (V) up to 400V
- IT (RMS) 30A
- Guaranteed junction temperature (Tj) of 150°C

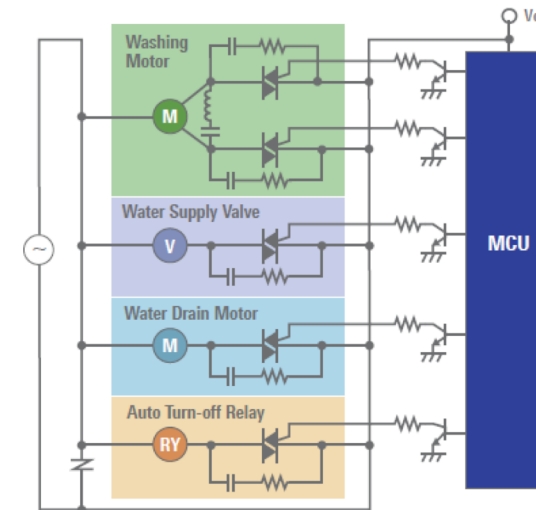
High Reliability

- Channel stopper provides stable voltage tolerance (stable under high-temperature, high-voltage testing: high reliability).
- Lightning surge tests (3A version)
- No damage at 12kV

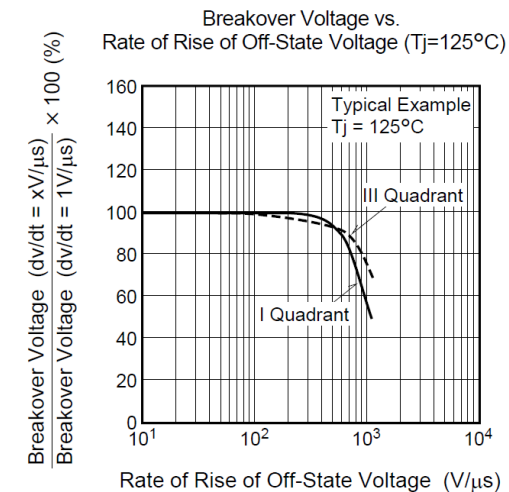
Best Fit for Applications

- Welding machine
- White goods like smart toilet
- Other home appliance

Part #	VDRM(V)	Peak Gate Voltage(V)	Peak Gate Current(A)	Junction Temp.(°C)	Package
BCR30FR-8LB	400	10	2	-40 to 150	TO-220FPA



Typical System Block



Breakover Voltage vs. Rate of Rise of Off-State Voltage (Tj=125°C)

[Renesas.com](https://www.renesas.com)