REMOTE MONITORING SYSTEM: OVERVIEW

Remote monitoring and control (M&C) systems are designed to control large or complex facilities such as factories, power plants, network operations centers, airports, and spacecraft, with some degree of automation. M&C systems may receive data from sensors, telemetry streams, user inputs, and pre-programmed procedures. It is often convenient to have remote monitoring stations to provide status and control to the various "nodes" on the system, typically through RS-232, RS-485 and RS-422. Using the Synergy S5D9 microcontroller (MCU), Renesas' Remote Monitoring System solution can quickly support various connectivity standards and an LCD to form a monitoring station. The ISL32704E transceiver supports a fully-isolated and robust ESD RS-485 interface while the RV1S9160A photocoupler provides isolation for the other RS-232/485 transceivers.

The solution also supports voice recognition and capacitive touch control. The Wi-Fi can support WLAN connectivity to the cloud. And, the bigger color TFT-LCD supports an improved HMI.

An optional cloud connection is supported by the peripheral module interface (PMOD) RF modules and the Synergy SSP.

Key Features

- Wide connectivity with multiple isolated RS-485, RS-232 and RS-422 buses
- High performance Arm® Cortex® S5D9 MCU with built-in TFT-LCDC, capacitive touch with qualified SSP
- Large memory for supporting the high connectivity requirements
- Easy cloud connection

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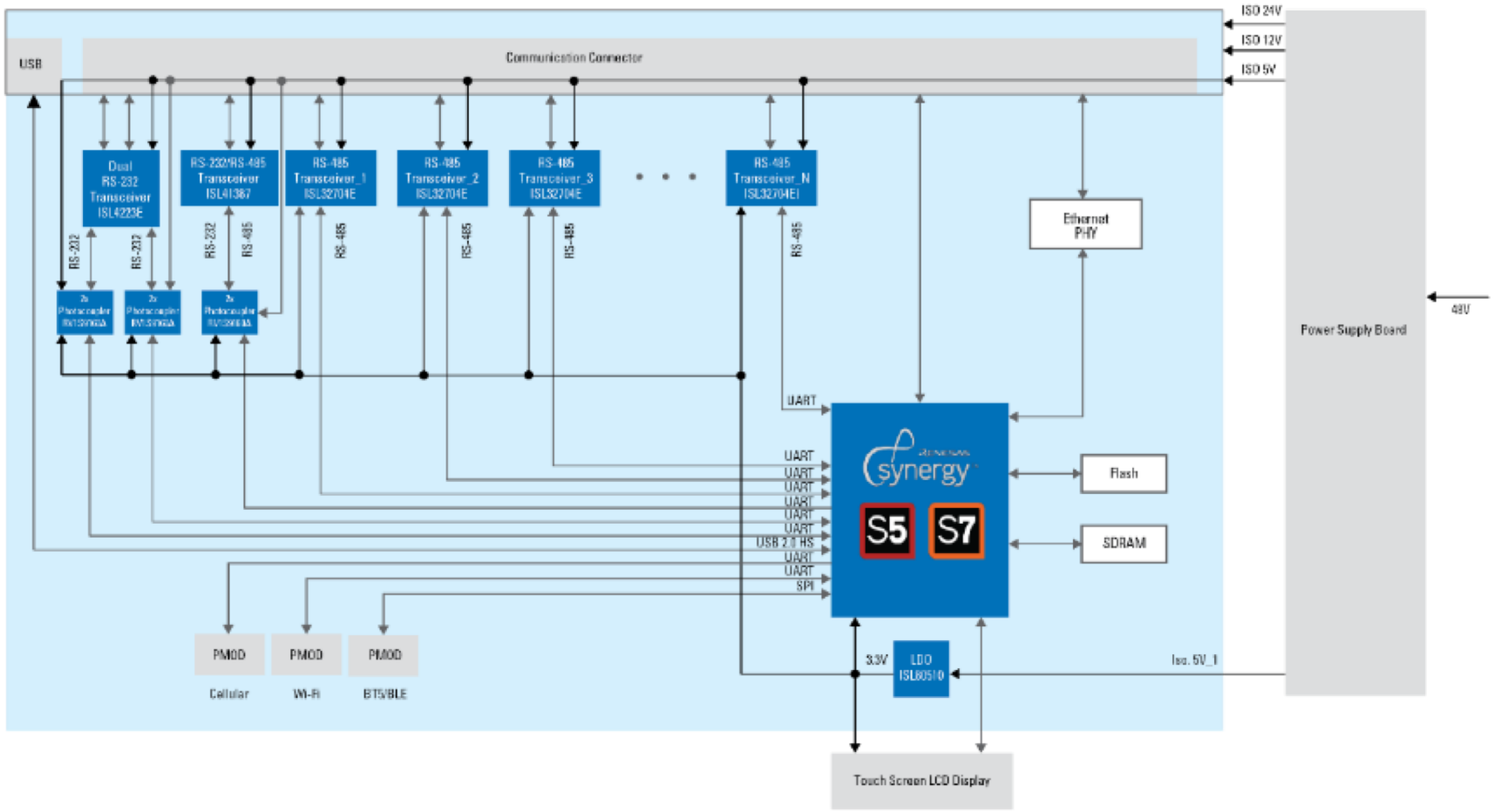
REMOTE MONITORING SYSTEM: OVERVIEW



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REMOTE MONITORING SYSTEM: SUMMARY

- **System benefits**
  - Fully isolated control system for noisy systems with high safety and reliability requirements
  - Numerous communication interface options
  - High performance MCU with Arm® Cortex® core

Device Category	P/N	Key Features
MCU	S5D9	Arm® Cortex®-M4 core, high-performance, rich communication and HMI features
Power	ISL80510	1A adjustable Vout 0.8-5.5V LDO
Analog	ISL32704E	Ultra-low EMI, smallest package isolated RS-485 transceiver with high drive capability, robust ESD
Analog	ISL41387	±15kV ESD Protected, 5V, dual protocol (RS-232/RS-485) transceiver with robust ESD
Analog	ISL4223E	±15kV ESD Protected, +2.7V to +5.5V, 150nA, 250kbps, RS-232 transmitter/receiver
Analog	RV1S9160A	3750Vrms isolation, 15 MBPS photocoupler

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S5D9: SYNERGY™ MICROCONTROLLER

High Performance MCU series in the Synergy™ Family

Features

- Arm® Cortex®-M4, 120MHz 32 bit core
- 100-176 pin package
- 2MB FLASH/640kB RAM/64kB data FLASH
- High performance w/ 2.7V to 3.6V operation
- High integration including oscillators, power-on-reset, low voltage detection, watchdog, real time clocks and analog functions
- Comprehensive tools and support
  - Advanced tools, 3rd party, online resources and training

Benefits

- The large on-chip SRAM, graphics LCD controller, 2D drawing engine, and capacitive touch interface make the S5D9 ideal for cost-competitive HMI applications
- Pre-qualified Synergy Software Package
- Security and safety features
- Integration options allow for many of the functions necessary to make the solution smaller, more reliable and lower cost

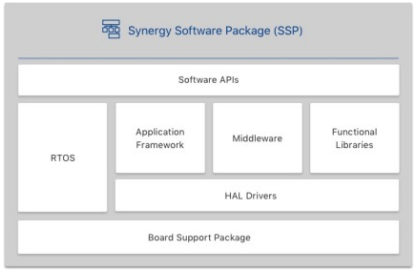
Applications

- Vivid color graphical user interfaces
- Cloud connectivity solutions
- Cellular framework applications
- Industrial control panel applications

Typical application and key performances

Choose → ***Evaluate*** → ***Create Application***

- Low parts count systems due to high integration
- Focus on HMI applications
  - Graphics LDC controller
  - 2D drawing engine
  - Capacitive touch sensing unit
- LVD, POR and safety functions



ISL80510: SINGLE OUTPUT LOW DROPOUT REGULATOR

High performance 5V/1A LDO

Features

- Input voltage 2.2V to 6V
- Output voltage 0.8V to 5.5V
- ±1.8% Vout accuracy over line, load and temperature variation
- Very low 130mV dropout voltage at VOUT = 2.5V
- Programmable output soft-start time

Benefits

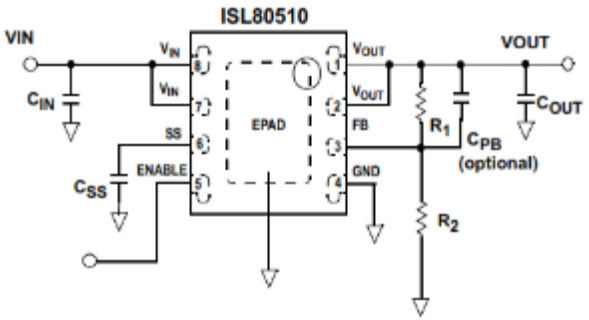
- Thermally enhanced 8LD DFN package
- Programmable soft start
- Very fast transient response
- It achieves a very fast load transient response and excellent PSRR

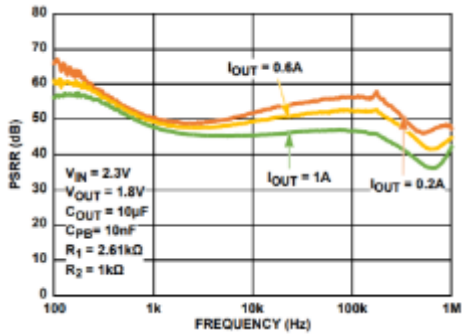
Applications

- Noise-sensitive instrumentation systems
- Post regulation of switched mode power supplies
- Industrial systems
- Medical equipment
- Telecommunications and networking equipment
- Servers
- Hard disk drives (HD/HDD)

Typical application and key performances

Typical application circuit





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ISL32704E: ISOLATED RS-485 TRANSCEIVER

Ultra-low EMI, smallest package RS-485 transceiver with high drive capability, robust ESD

Features

- 4Mbps data rate
- 2.5kVRMS isolation per UL 1577
- 600VRMS working voltage per VDE 0884
- Single unit load receiver input
- Driver drives up to 150 unit loads
- 50kV/µs (typical), 30kV/µs (minimum) common-mode transient immunity
- 44000 years barrier life
- 15kV ESD bus-pin protection
- Thermal shutdown protection
- Meets or exceeds ANSI RS-485
- VDE V0884-10 certified

Benefits

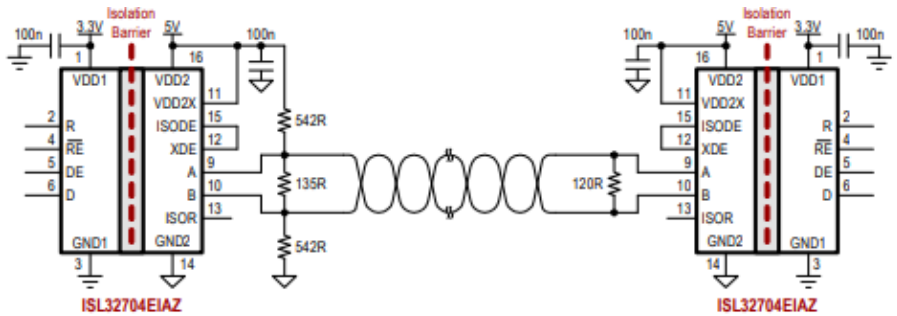
- The device uses Giant Magnetoresistance (GMR) as isolation technology. A unique ceramic/polymer composite barrier provides excellent isolation and virtually unlimited barrier life.
- The device is compatible with 3V and 5V input supplies, enabling it to interface with standard microcontrollers without additional level shifting.

Applications

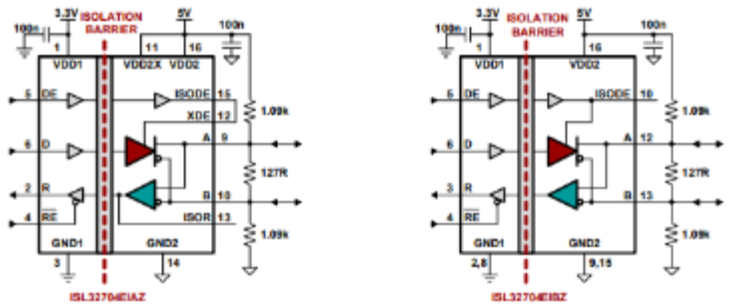
- Factory automation
- Security networks
- Building environmental control systems
- Industrial/process control networks
- Level translators (i.e., RS-232 to RS-485)

Typical application and key performances

TYPICAL ISOLATED HIGH-SPEED RS-485 APPLICATIONS



TYPICAL OPERATING CIRCUITS



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ISL41387: MULTI-PROTOCOL TRANSCEIVER

±15kV ESD Protected, 5V, dual protocol (RS-232/RS-485) transceivers with robust ESD

Features

- User selectable RS-232 or RS-485, RS-422
- ±15kV (HBM) ESD protected bus pins
- True flow-through pinouts simplify PC layouts
- Large (2.7V) differential VOUT for improved noise immunity in RS-485, RS-422 networks
- Rx Full fail-safe in RS-485, RS-422 mode
- Loopback mode for board self test functions
- User selectable RS-485 data rates: 20Mbps
- Slew rate limited: 460kbps
- Slew rate limited (ISL41387 only): 115kbps
- Fast RS-232 data rate: up to 650kbps
- Low current shutdown mode: 35µA

Benefits

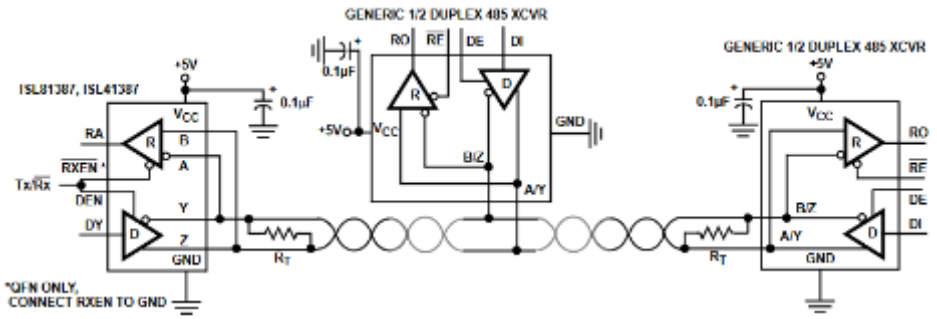
- Multi-protocol allows selection of the interface type based on system requirements
- On-board charge pump for RS-232 TX level generation (±5V) using low-cost 0.1uF capacitors
- Loopback mode for self-test
- QFN package for higher board density

Applications

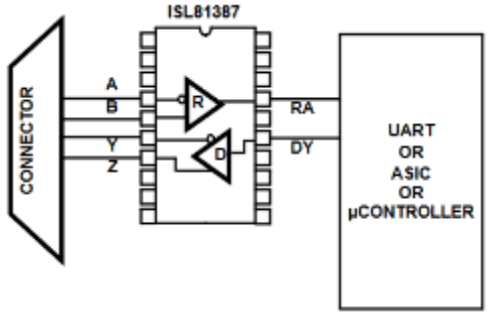
- Factory automation
- Security networks
- Building environmental control systems
- Industrial/process control networks
- Level translators (i.e., RS-232 to RS-485)

Typical application and key performances

TYPICAL HIGH-SPEED RS-485 APPLICATIONS



Flow-through Pinout simplifies board layout



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ISL4223E: LOW VOLTAGE, LOW CURRENT RS-232 TRANSMITTER

±15kV ESD Protected, +2.7V to +5.5V, 150nA, 250kbps, RS-232 transmitters/receivers

Features

- Available in near chip scale QFN (5mmx5mm) package, which is 40% smaller than a 20 Ld TSSOP
- ESD protection for RS-232 I/O pins to ±15kV (IEC61000)
- Meets EIA/TIA-232 and V.28/V.24 specifications at 3V
- RS-232 compatible with VCC = 2.7V
- Manual and automatic power down features
- Receiver hysteresis for improved noise immunity
- Assured minimum data rate: 250kbps

Benefits

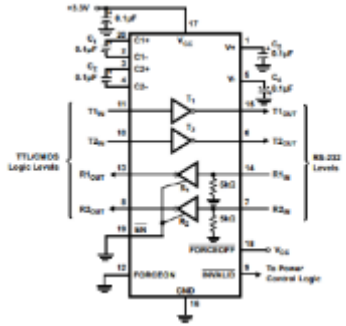
- On-chip voltage converters require only four external 0.1µF capacitors
- Wide power supply range: single +2.7V to +5.5V
- Low supply current in power down state: 150nA
- Pb-free (RoHS compliant)

Applications

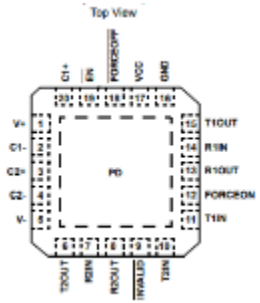
- Any space-constrained system requiring RS-232 ports
  - —Battery-powered and portable equipment
  - —Hand-held products (GPS receivers, bar code scanners, etc.)
  - —PDAs and Palmtops, data cables
  - —Cellular/mobile phones, digital cameras

Typical application and key performances

TYPICAL OPERATING CIRCUITS



Pinout
20 LD QFN



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RV1S9160A: DIGITAL ISOLATOR

3750Vrms isolation, 15 MBPS photocouplers

Features

- High isolation voltage (BV = 3750 Vr.m.s.)
- High temperature operation (-40 to +125°C)
- High speed communication (15 Mbps)
- High common mode (dv/dt) tolerant (CMH, CML = ±50 kV/μs MIN.)
- Low input drive current (IFHL = 2.0 mA MAX.)
- Low voltage power supply operation (VDD = 2.7 V~5.5 V)
- Low pulse width distortion (PWD = 20 ns MAX.)

Benefits

- Low current operation on 3.3V/5V power supply with high noise-tolerance
- Safety Standards Approvals:
  - UL: UL1577, Double protection
  - CSA: CAN/CSA-C22.2 No.62368-1, Basic insulation
  - VDE: DIN EN 60747-5-5 (Option)

Applications

- Factory automation systems
- Security networks
- Building environmental control systems
- Industrial/process control networks

Typical application