

CN232 Cloud Gateway Module

January 2020

Cloud Gateway Module

■ Overview

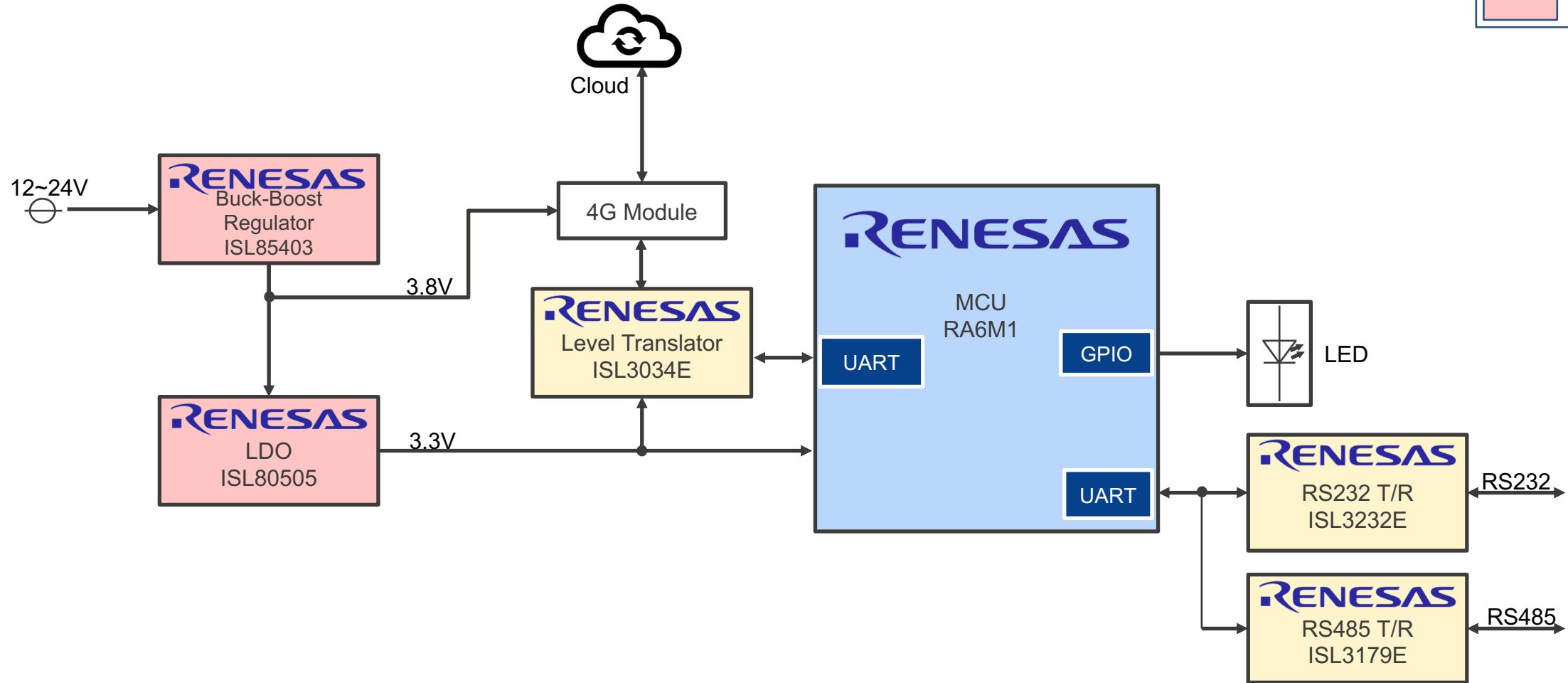
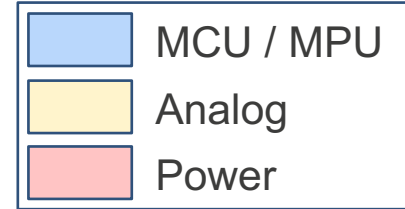
This solution demonstrates an implementation of a cloud-connected gateway module that utilizes Renesas' RA6M1 MCU with an Arm® Cortex®-M4 core. This system communicates with an external module through common interfaces (RS-485/RS-232). Collected data can be uploaded via the 4G module to the cloud for further analysis. The power supply is designed to be flexible for either 12V or 24V inputs for wider adoption in systems.

■ System Benefits

- Features an Arm® Cortex®-M4 core running on 120MHz for outstanding performance. It integrates 512kB of flash memory and 256kB of SRAM.
- High performance, low input voltage and high PSRR LDO. Highly efficient, synchronous buck/boost regulator delivering up to 2.5A of continuous output current.
- Robust communication interface with RS-485/RS-232.

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Cloud Gateway Module



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Device Category	P/N	Key Features
MCU	RA6M1	Leading performance 120-MHz Arm® Cortex®-M4 core, up to 512kB code flash memory, 256KB SRAM, graphics LCD controller, capacitive touch sensing unit, Ethernet MAC controller, USB 2.0 full-speed, CAN 2.0B, SDHI, Quad SPI, security and safety features, and advanced analog.
Power	ISL85403	2.5A regulator with integrated high side FET, supports 3V-40V input voltage range
	ISL80505	Single output LDO capable of sourcing up to 500mA output current
Analog	ISL3179E	High ESD protected, +125°C, full fail-safe, 40Mbps RS-485/RS-422 transceivers
	ISL3232E	QFN packaged, ±15kV ESD protected, +2.7V to +5.5V, 150nA, 250kbps, RS-232 transmitters/receivers
	ISL3034E	High speed data transfer rates, best-in-class ESD protection

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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

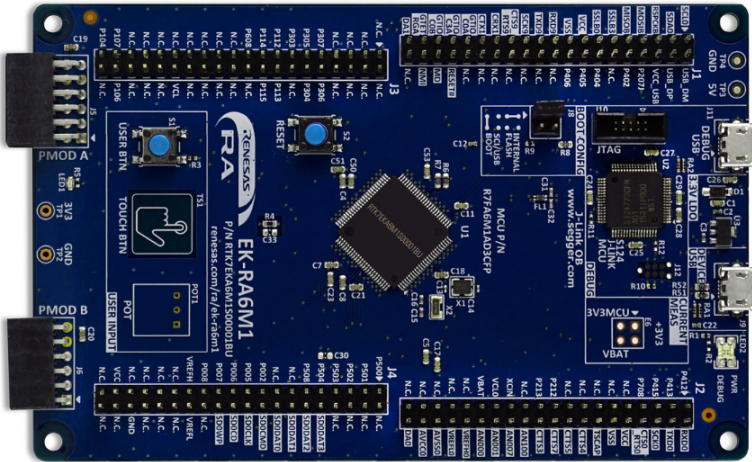
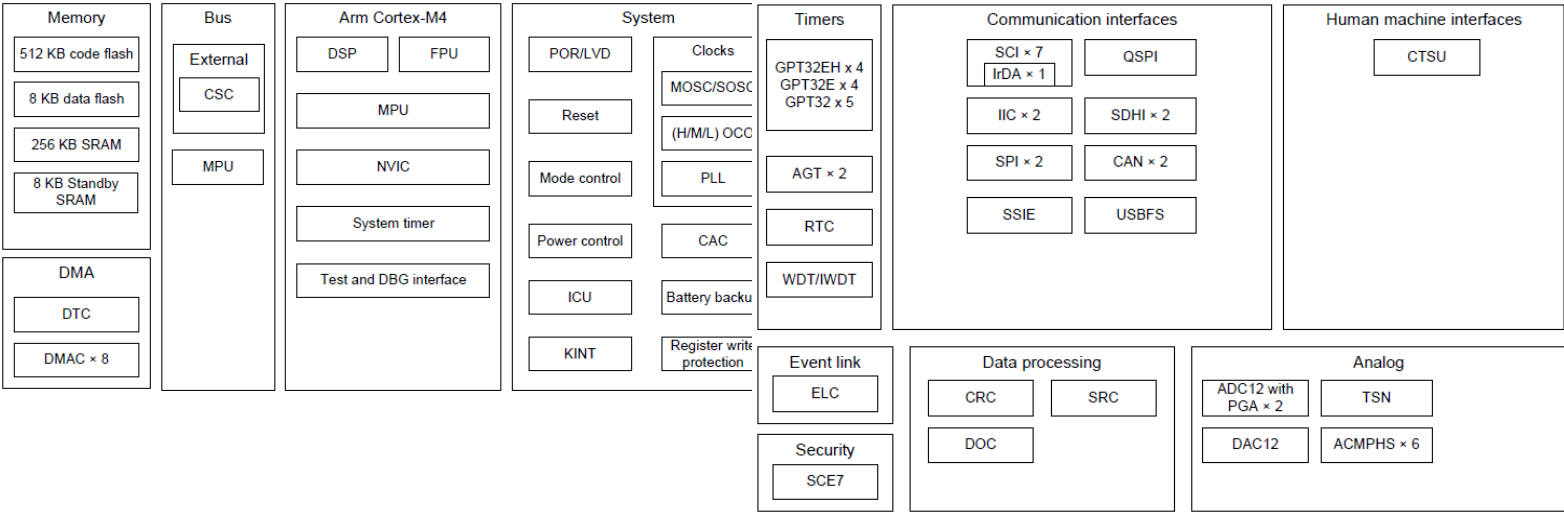
- USB 2.0 (Full Speed/ High Speed)
- Ethernet Controller with DMA
- SCI x7/SPIx2/IICx2

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)



RTK7EKA6M1S00001BU

Part #	Flash Memory	RAM	Temp	Package
R7FA6M1AD3CFP#AA0	512KB	256KB	40 ~ 105°C	100 LQFP
R7FA6M1AD3CFM#AA0	512KB	256KB	40 ~ 105°C	64 LQFP

ISL85403 – 2.5A Regulator with Integrated High Side FET

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

Wide Working Range

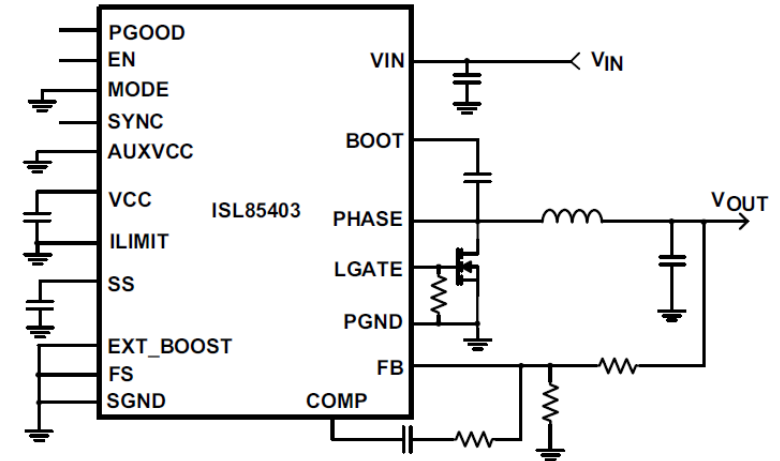
- Power input voltage range from 3V to 40V
- Support both step down (buck) or boost+buck outputs
- Up to 2.5A load over full temperature range

High Efficiency

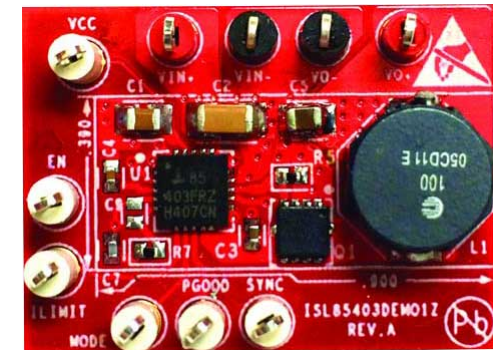
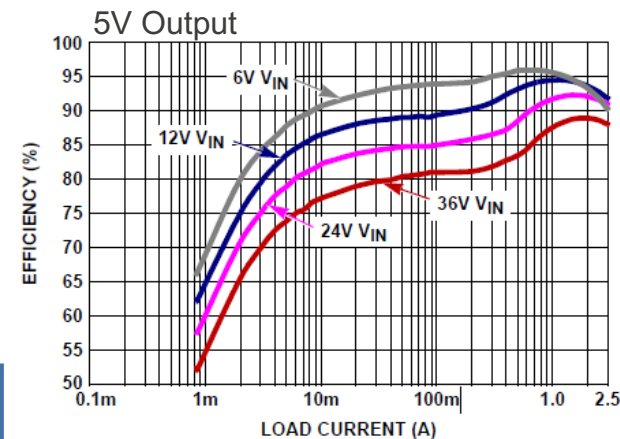
- Optional external low side FET for higher efficiency
- Selectable PWM / PFM modes
- 300uA input quiescent PFM mode current
- Less than 5uA shutdown current

High Performance

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



Typical Application Circuit



ISL85403EVAL1Z Evaluation Board

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

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

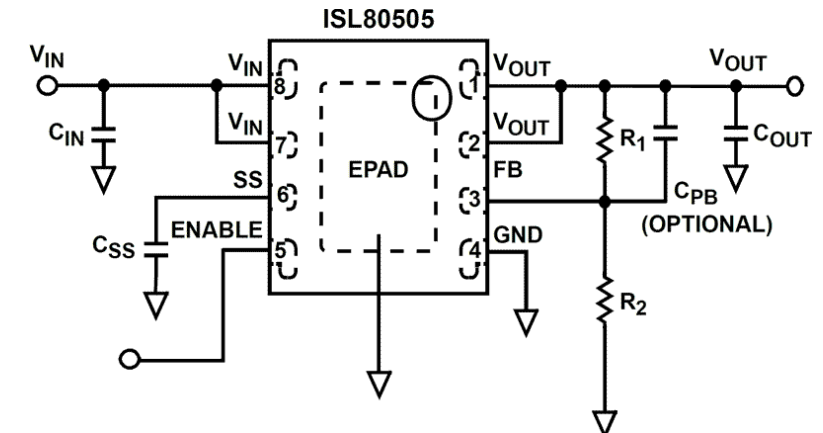
- Very low 45mV dropout voltage at $V_{OUT} = 2.5\text{V}$
- Very fast transient response

High Performance

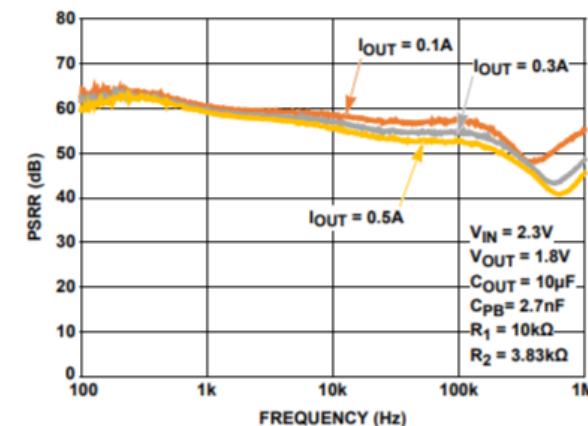
- Excellent PSRR over wide frequency range
- Programmable output soft-start time

Excellent Safety

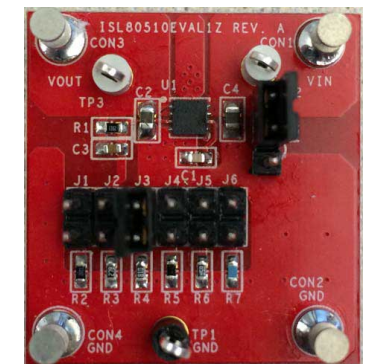
- Current limit protection
- Thermal shutdown function



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

ISL3179E High ESD Protected RS-485/RS-422 Transceivers

40Mbps, 3.3V, Full Fail-Safe, 3.3V Powered Single Transceivers

High ESD Performance

- ±16.5kV comply with IEC61000
- ESD protection on RS-485 I/O pins
- Class 3 HBM level on all other pins (ISL3179E): >9kV

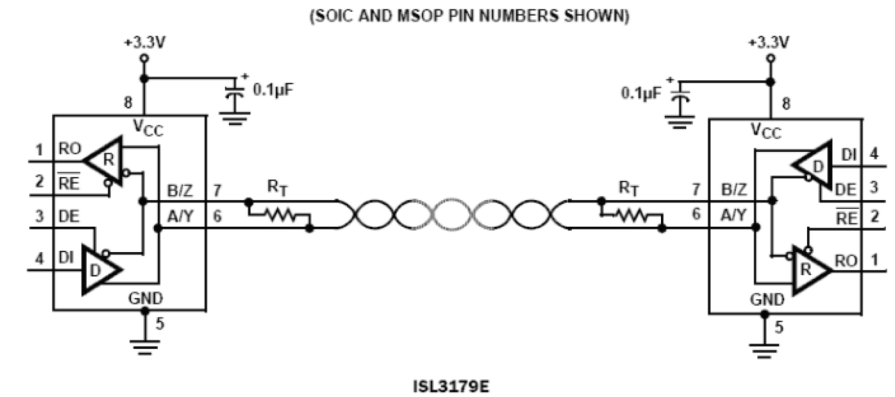
High Performance

- High data rates: up to 40Mbps
- 5V tolerant logic inputs
- 1/5 unit load allows up to 160 devices on the bus
- Meets both RS-485 and RS-422 standards

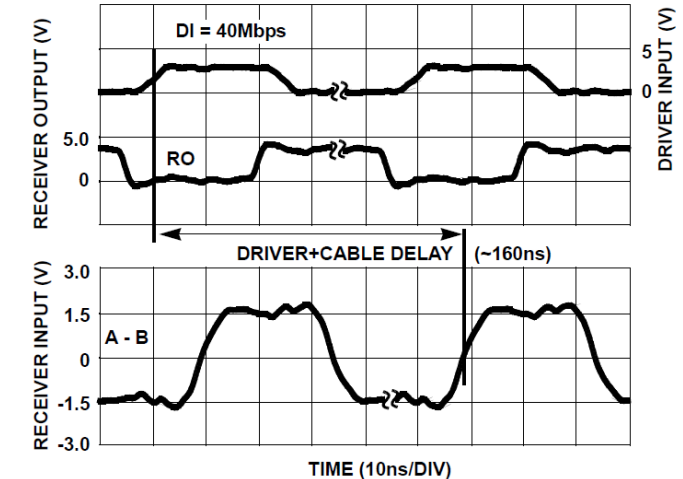
Best Fit for Applications

- Meter application
- Home appliance
- Other communication modules

Part #	Temp. Rang(°C)	Data rate	Work mode	Package
ISL3179EFBZ	-40~+125	40Mbps	RS-485/422 Half	8 Ld SOIC
ISL3179EFUZ	-40~+125	40Mbps	RS-485/422 Half	8 Ld MSOP
ISL3179EFRZ	-40~+125	40Mbps	RS-485/422 Half	10 Ld DFN
ISL3179EIBZ	-40~+85	40Mbps	RS-485/422 Half	8 Ld SOIC
ISL3179EIUZ	-40~+85	40Mbps	RS-485/422 Half	8 Ld MSOP
ISL3179EIRZ	-40~+85	40Mbps	RS-485/422 Half	10 Ld DFN



Typical System Block



Driver and Receive Waveforms Driving 100' (31m) of CAT5 Cable (Double Terminated with 120Ω)

ISL3232E – Small Package RS-232 Transmitter/Receiver

Space-Constrained Systems Requiring RS-232

Communication Speed

- 450Kbps data rate min.

Key Features

- Wide power supply range: single +2.7V to +5.5V
- Low supply current in power down state: 150nA
- ESD protection for RS-232 I/O pins to $\pm 15\text{kV}$ (IEC61000)
- On-chip voltage converters require only four external $0.1\mu\text{F}$ capacitors

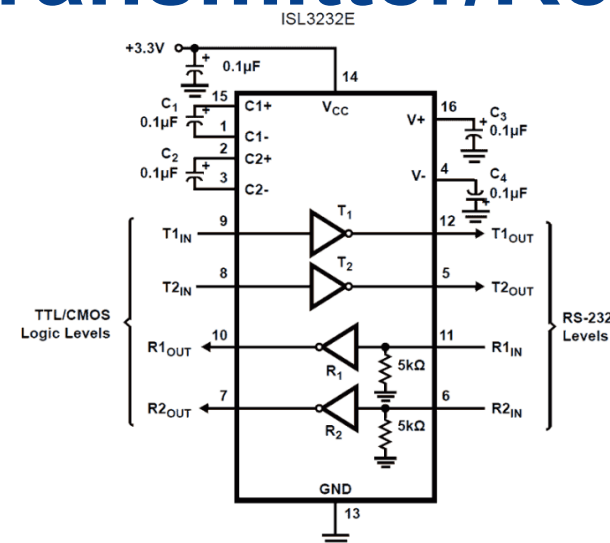
Good Connectivity

- RS-232 compatible with $V_{CC} = 2.7\text{V}$

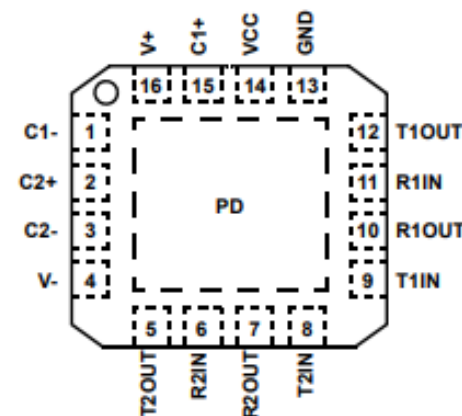
Industry Standard

- Meets EIA/TIA-232 and V.28/V.24 specifications at 3V

Part #	Temp. Rang	Package
ISL3232EIRZ-T7A	-40 to +85	16 Ld 5x5mm QFN
ISL3232EIRZ	-40 to +85	16 Ld 5x5mm QFN



Typical Operating Circuits



Pin out

ISL3034E – 6-Channel High Speed Logic Level Translator

High Speed Data Transfer Rates, Best-in-class ESD Protection

High Speed

- 100Mbps data rate

High Reliability

- Best-In-Class ESD protection: $\pm 15\text{kV}$ IEC61000-4-2 ESD protection on all input, output, and I/O lines
- $+1.35\text{V} \leq V_L \leq +3.2\text{V}$ and $+2.2\text{V} \leq V_{CC} \leq +3.6\text{V}$ supply voltage range
- Six bi-directional channels

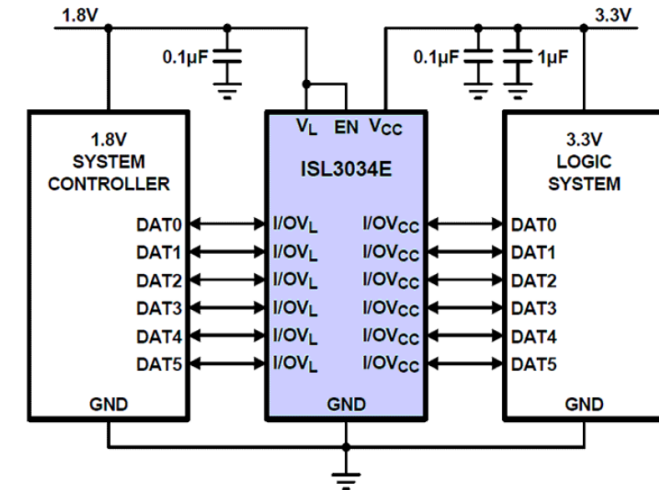
Good Connectivity

- Compatible with 4mA input drivers or larger

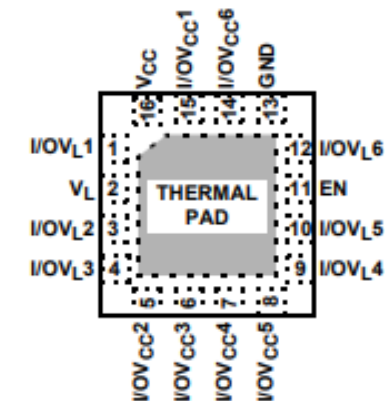
Industry Standard

- UL 1577 recognized
- VDE V0884-10 certified

Part #	ESD rating	Temp. Rang	Data Rate Mbps	MOQ	Package
ISL3034EIRUZ-T	15kV	-40 to +85	100	3K (T&R)	16 Ld TQFN
ISL3034EIRTZ	15kV	-40 to +85	100	2K (Bulk)	16 Ld UTQFN



Typical Operating Circuits



Pinout for TQFN

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