

Optimizing Asset Trackers With Logic and Translation Use Cases



ABSTRACT

Asset trackers integrate numerous subsystems in a small space. Though the tracking modules can differ in style and features, they share similar digital interfacing challenges, such as reading in data from a variety of sensors or interfacing with a GPS module. All of the use cases shown in the [Block Diagram](#) and [Logic and Translation Use Cases](#) sections of this document are commonly seen in asset tracker designs.

Logic gates, voltage translators, and other logic devices are utilized for many purposes throughout modern electronic systems. This document provides example solutions for common design challenges that can be solved using logic and translation. Not all of the solutions here appear in every system; however, all solutions shown are commonly used and effective.

Table of Contents

1 Block Diagram	2
2 Logic and Translation Use Cases	2
3 Voltage Translation for Wireless Interface Modules	3

List of Figures

Figure 1-1. Simplified Block Diagram for Asset Trackers.....	2
Figure 3-1. Example 2-wire UART Voltage Translation Block Diagram.....	3

List of Tables

Table 2-1. Logic Use Cases.....	2
Table 2-2. Translation Use Cases.....	2
Table 3-1. Recommended Parts.....	3

Trademarks

All trademarks are the property of their respective owners.

1 Block Diagram

For the purpose of this report, a simplified asset tracker block diagram is used to illustrate the logic and translation use cases, see [Figure 1-1](#). Each red block has an associated use-case document. Links are provided in [Logic and Translation Use Cases](#). For a more complete block diagram, see the [interactive online end equipment reference diagram for asset trackers](#).

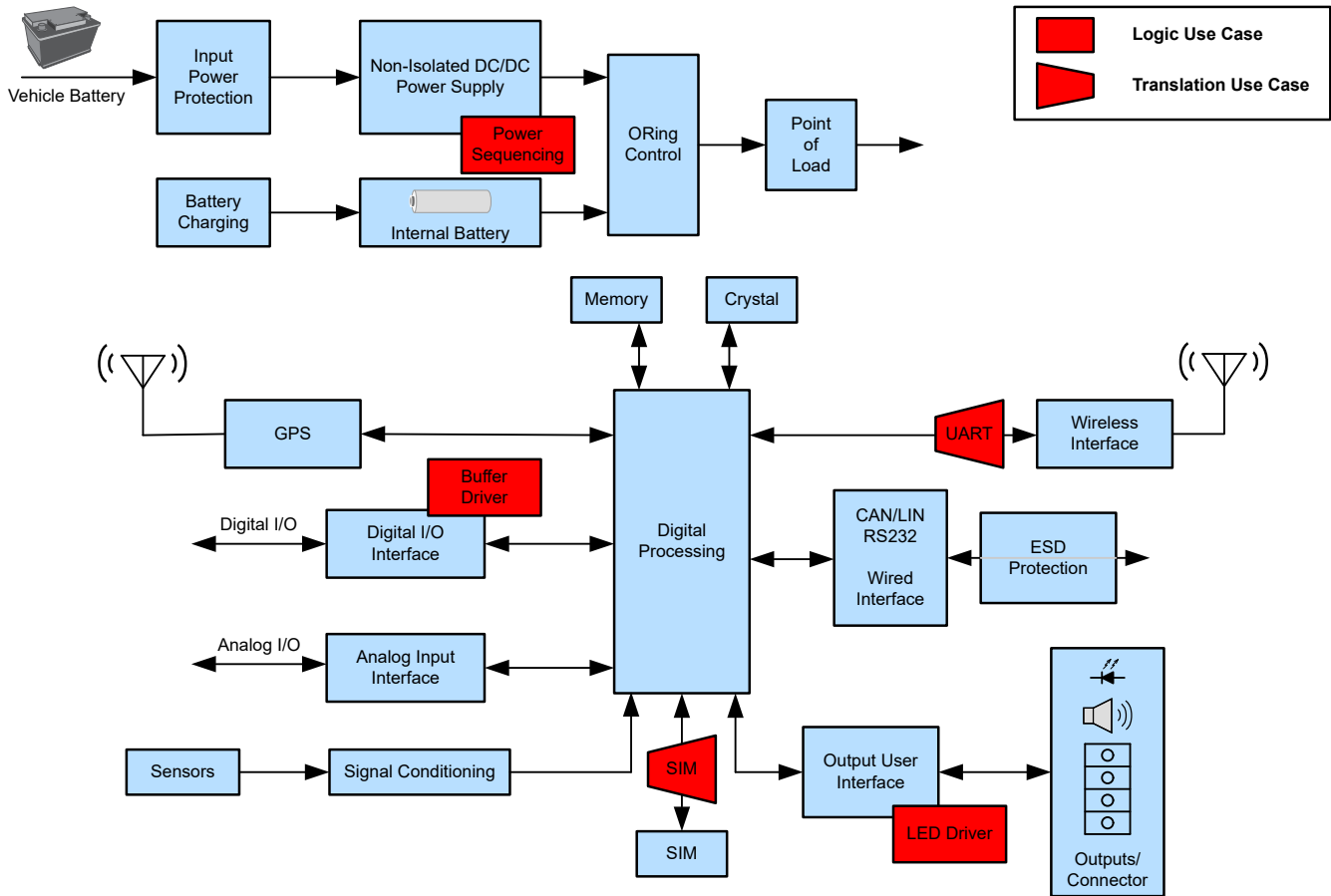


Figure 1-1. Simplified Block Diagram for Asset Trackers

2 Logic and Translation Use Cases

Each use case is linked to a separate short document that provides additional details including a block diagram, design tips, and part recommendations. The nearest block and use-case identifiers are listed to match up exactly to the use cases shown in the provided [simplified block diagram](#).

Table 2-1. Logic Use Cases

Nearest Block	Use-Case Identifier	Use Case
Non-Isolated DC/DC Power Supply	Power Sequencing	Combine Power Good Signals
Digital I/O Interface	Buffer Driver	Drive Transmission Lines With Logic
Output User Interface	LED Driver	Drive Indicator LEDs

Table 2-2. Translation Use Cases

Nearest Block	Use-Case Identifier	Use Case
Wireless Interface	UART	Voltage Translation for Wireless Interface Modules
SIM	SIM	SIM Card Translation

3 Voltage Translation for Wireless Interface Modules

It is common to see asset trackers utilizing wireless interface modules. These modules often use UART for communication, and commonly are operating at a different logic voltage level from the primary system controller. The addition of a voltage level translator protects low-power system controllers and ensures accurate communication to the peripheral module.

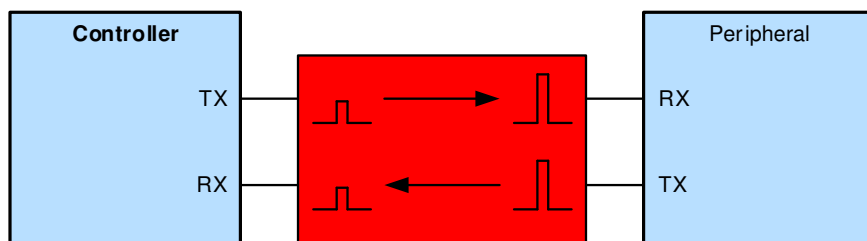


Figure 3-1. Example 2-wire UART Voltage Translation Block Diagram

See more about this use case in the *Logic Minute* video [Voltage Level Translation for UART Interface](#)

- Some devices support up to 5 Mbps UART communication; most are limited to 115 kbps or less
- Translators enable communication when devices have mismatched logic voltage levels
- Prevent damage to devices that cannot support higher voltage inputs
- Improve data rates over discrete translation solutions
- Protect controller while peripheral is not connected
- [\[FAQ\] How does a slow or floating input affect a CMOS device?](#)
- Need additional assistance? Ask our engineers a question on the [TI E2E™ Logic Support Forum](#)

Table 3-1. Recommended Parts

Part Number	Automotive Qualified	Voltage Translation Range	Features
SN74AXC2T245-Q1	✓	0.65 V — 3.6 V	Glitch-free power supply sequencing Outputs are disabled when either supply is 0 V Active translation architecture
SN74AXC2T245			
TXB0102		1.2 V — 3.6 V to 1.65 V — 5.5 V	Auto-bidirectional Active translation architecture
TXS0102-Q1	✓	1.2 V — 3.6 V to 1.65 V — 5.5 V	Auto-bidirectional Internal pull-up resistors Passive translation architecture

For more devices, browse through the [online parametric tool](#) where you can sort by desired voltage, channel numbers, and other features.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to TI's Terms of Sale (<https://www.ti.com/legal/termsofsale.html>) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2021, Texas Instruments Incorporated