Application Report
Optimizing Asset Trackers With Logic and Translation Use Cases

TEXAS INSTRUMENTS

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

List of Figures

List of Tables

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.
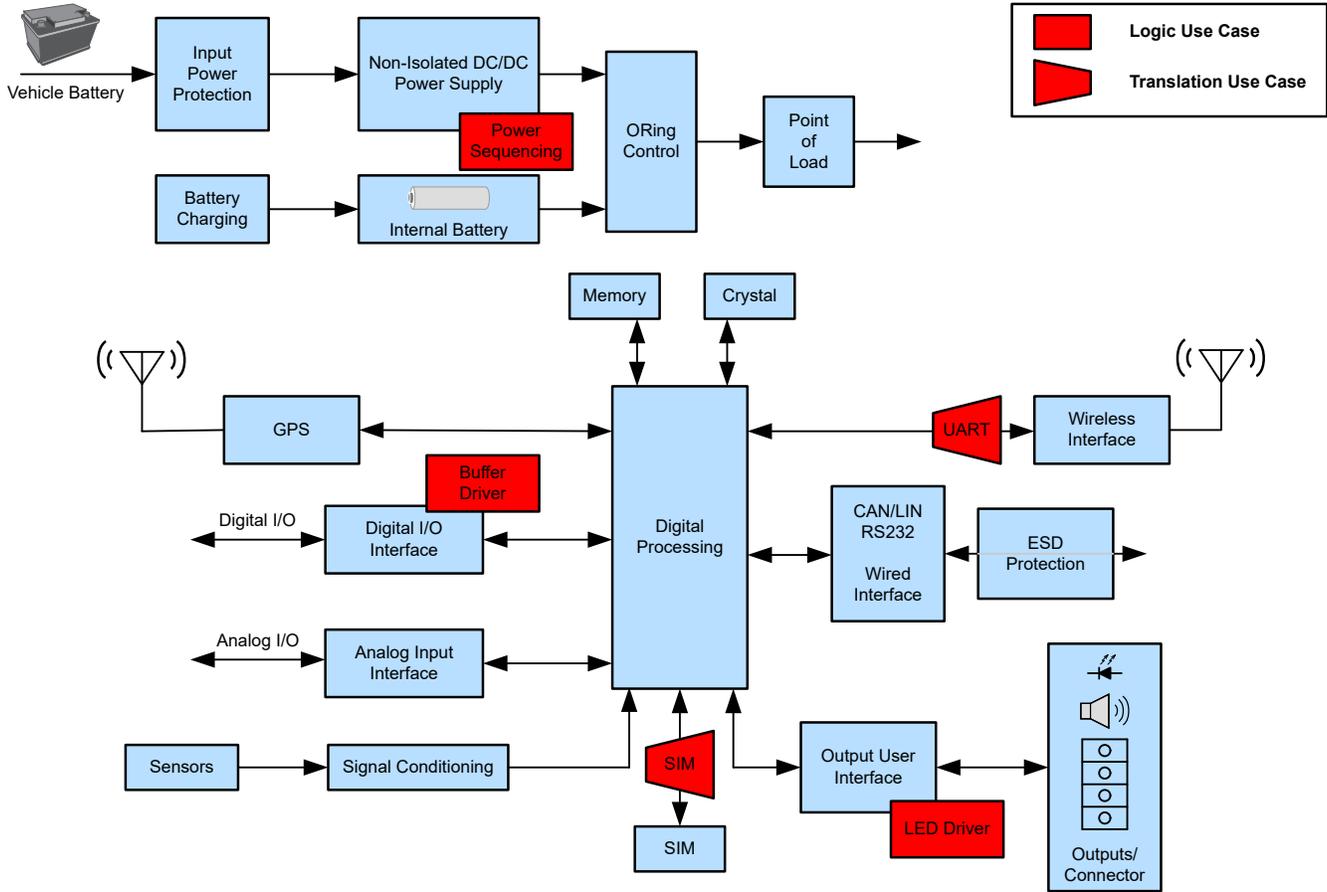

Figure 1-1. Simplified Block Diagram for Asset Trackers

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.
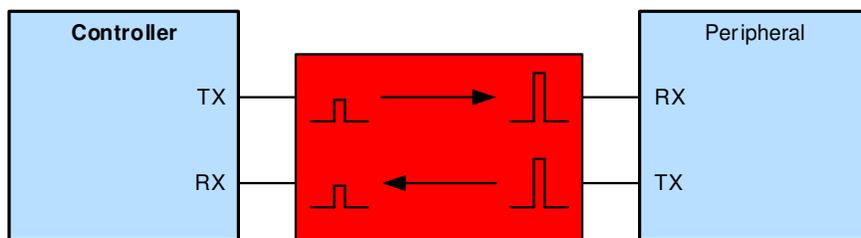

Figure 3-1. Example 2-wire UART Voltage Translation Block Diagram

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