Bluetooth Low Energy Digital Instrument Cluster

1 Solution Features

- Reference Solution based on Single BLE 5.3 compliant SoC along with 7" TFT LCD display connected with throttle assembly, combination switch in a two-wheeler handlebar mock setup.
- Digital Gauges for Speed, RPM, ODO meter, Trip Meter, Gear Position, Battery status, Tell tales etc.
- BLE communication & control with the Mobile phone through Android app. with the foll. features
  - Connection Status
  - Phone Call Notification / Call Accept or Reject
  - SMS Notification (Normal / ALERT)
  - Turn-by-Turn Navigation
  - Location Notification
  - TPMS Notification (currently simulated)
- Test setup for the Throttle and switch assembly
  - Throttle with Speed mode switch configured as Gear Position
  - Combination switch containing Left / Right Indicator, Lights On/Off, High Beam On/Off, Beam flasher switch positions
  - Potentiometer to simulate the Battery charging / discharging

2 Description

Parry Technology's ***Bluetooth Low Energy 5.3 Digital Instrument Cluster Solution*** is a reference solution based on **Single BLE SoC** operating at **maximum 125MHz** for BLE connectivity, Graphic display, Navigation and other core Digital Instrument cluster functions.

This MCU has Single Corex-M55 compatible core that could run at 40MHz with lower supply voltage for low power consumption purpose, and at maximum clock 125MHz in high performance mode. It supports Trustzone, AES 128/256, SHA, ECC, RSA, TRNG and consists of flexible memory controller (FMC), AUXADC and high-resolution ADC, high TX power RF transceiver, audio codec, display controller supporting QSPI/8080/RGB interfaces, Ethernet RMII, CAN, LCD segment/common terminal controller, 2.4GHz proprietary, USB 2.0 controller, etc. The MCU has ITCM 192KB, DTCM 128KB, internal 4MB MCM PSRAM, GPIOs, SPI, I2C, I2S and UART. The MCU comes with 88-pin QFN in 10x10mm^2 0.4mm pitch package. The operating temperature range is -40° C to +85° C.

5 Simplified Block Diagram

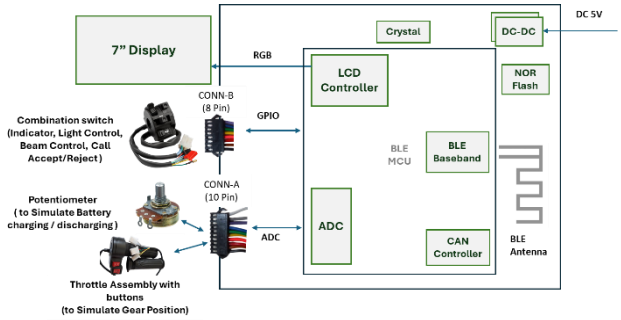

Figure 1 Block Diagram

CONNECTOR A: 8-Pin (for Combination switch Assembly)

Pin #	Color	Function
1	Black	GND
2	Brown	PASS / Flash
3	RED	NC
4	Orange	Low Beam
5	Yellow	Right Indicator
6	Green	Left Indicator
7	Blue	Call Accept
8	Violet	Call Reject

Table 1: Connector A – 8 Pin

CONNECTOR B: 10-Pin (for Throttle Assembly)

Pin #	Color	Function
1	Black	GND
2	Brown	Throttle Out
3	RED	Throttle PWR (5V)
4	Orange	Gear 1st
5	Yellow	FWD / Neutral
6	Green	Gear 3rd
7	Blue	GND
8	Violet	NC
9	Grey	NC
10	White	NC

Table 2: Connector B – 10 Pin

3 Cluster Application Features

The cluster application has the following features

- Graphical Display of RPM, Speed, Gear Position, Speed Mode (STANDARD, ECO, SPORTS), Indicator, Light status, Battery Status, ODO, Trip meters, Call / SMS Notification, Call Accept/Reject and OFF, TPMS display
- Map showing the movement once the device location is enabled and Turn-by-Turn Navigation is ON

4 Android Application Features

The reference Android application has the following features

- Available / Paired BLE devices listing
- Buttons for
  - Connect / Disconnect
  - Notification: ON / OFF
  - Start / Stop Turn-by-Turn Navigation
  - Send TPMS (simulated value pushed to the Cluster to display Tire-pressure)
  - Start GPS / Stop GPS
- Map showing the movement once the device location is enabled and Turn-by-Turn Navigation is ON

6 Detailed overview

ParryTech's ***Bluetooth Low Energy 5.3 Digital Instrument Cluster Solution*** is a reference solution based on **Single BLE MCU** operating at **maximum 125MHz** delivering Real-time simulation of core digital cluster functions (Speed, RPM, Indicator ON/OFF, Lights ON/OFF etc.) combined with the Bluetooth communication features and control with your paired mobile phone

The solution comprises of the BLE MCU Board along with 7" LCD enclosed in acrylic enclosure (1) with the two-wheeler handle-bar assembly connected along Combination switch (2) assembly and Throttle assembly (3) for the real-time simulation of Speed, RPM, Tell-tale features. The Acrylic enclosure has potentiometer (4) to simulate the battery charging / discharging function. The cable harness coming out with 8-Pin Connector-A (5) and 10-Pin Connector- (6) B to connect as shown in the figure 4. The buttons (7) panel below the LCD has Reset, Theme change and TPMS simulation.

Figure 2 Parry's Digital BLE Cluster Reference Solution

The solution operates on 5V DC supply and can be powered by external 5V AC-DC power adapter.

The combination switch assembly has been tweaked to include two tactile switches each for call Accept and call Reject (or) call End functionality as shown below

Figure 3 Combination Switch with Call Answer / Reject buttons

7 Cluster Application: Overview

The entire cluster application runs on Single Core BLE MCU by showing the real-time inputs from the handle-bar assembly (throttle inputs, combination switch inputs) and also connectivity features with

ParryTech Bluetooth Mobile application. The mobile application passes the Call/SMS Alerts/Notifications, and location, navigation information to the cluster when it is paired and connected.

The Single core BLE MCU also runs the customized Open GL library to display the UI controls for these data concurrently on real-time.

The Cluster HMI is shown in Single window with multiple controls / elements placed in the window, overlaying certain information depending upon the user / mobile application inputs.

The following figure shows the different controls and notification areas in the Cluster HMI window.

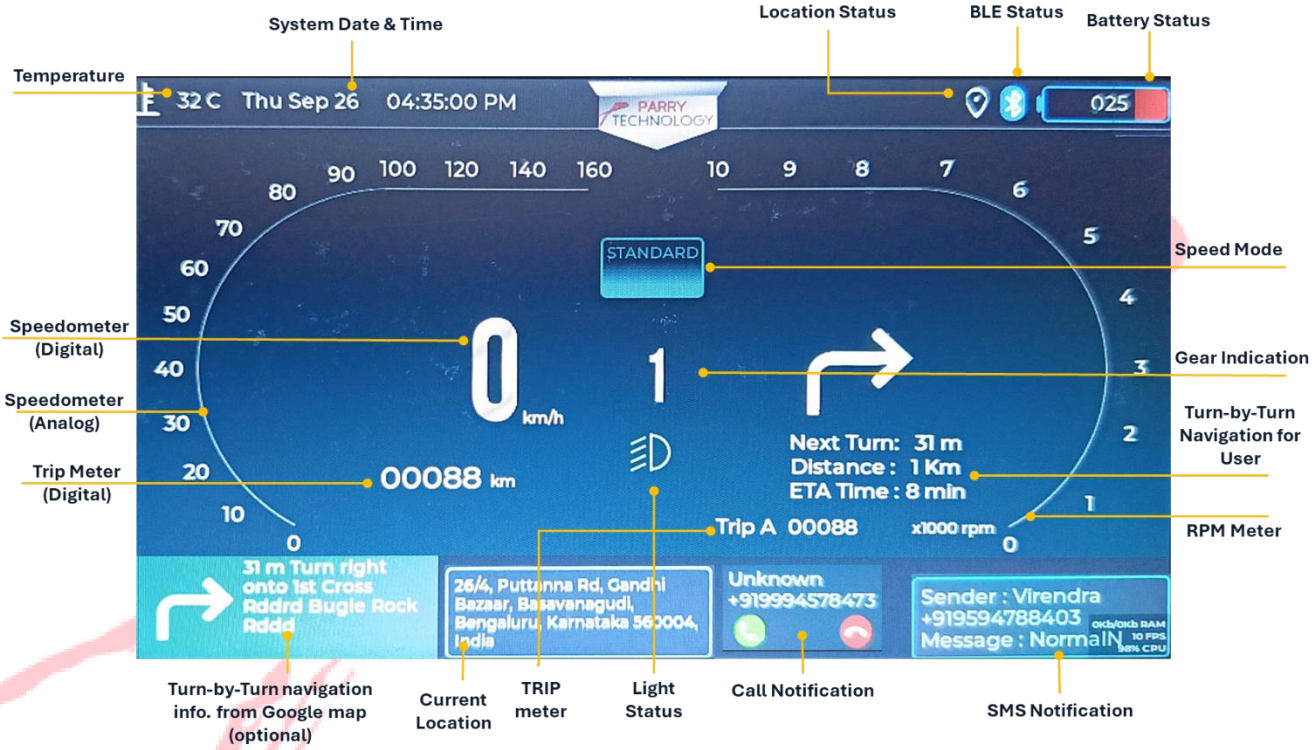

Figure 4 Cluster HMI: UI Elements, Position and description

Product Ordering Guide:

Part Number: **PTBLEREFCLS-RTK8772V1**

Parry Technology can customize this solution and offer Production ready solution. Our engineering services ranges from early engagement with customers to understand the system needs, convert the needs into requirements, finalize on the right technology implementation, circuit design, simulations, PCB development & testing, characterization, final qualifications, documentations at all stages and assistance on the product manufacturing and deployment.

For More details and to purchase the evaluation kit reach us by e-mail: enquiry@parrytech.net

www.parrytech.net