Road-iQ VDS Operational Description

FCC ID: 2AD4Z-ROADIQ-VDS-01

The Road-iQ VDS is built around a Freescale iMX6Q CPU and its associated power management IC. It receives 12v input from the vehicle battery that it is attached to which is then filtered against power anomalies and regulated to 12v. The 12v is then regulated down to 5V0 and 3V3 which is then used across the circuit board. The 3V3 feeds the power management IC with then produces 3V0, 2V8, 2V5, 1V8, 1V5, 1V2, and 0V75 for the CPU and its support components include 1GB DDR3 SDRAM, and 8GB eMMC Flash. The CPU works as a hub for the entire system. From that hub the following peripherals are available:

1. 1000BT Ethernet – directly connected to the iMX6Q this circuit passes through a the HSZ9031RNX1A that converts RMII to Ethernet signals. This chip is powered by P3V3 and P1V8.

2. USB Host Ports – directly connected to iMX6Q this circuit passes through a PHY and ESD protection.
3. Video Analog to Digital Converter – This function is handled by the TW6869 which received NTSC video input and coverts it to digital form, which is then placed in SDRAM via the PICe interface that connected the TW6869 to the iMX6Q CPU. 6 channels of the parts 8 channel capacity are used. Only video is supported though the part can support audio as well.
4. General Purpose I/O – There are four 12v general purpose inputs and four general purpose outputs. The general purpose outputs simply short a signal to ground when on via the ZXMS6005DGTA.
5. CSR 6030A11 WiFi Chip – The Wifi chip manages all RF related to WiFi. The iMX6Q sends the 6030A11 the data that it wants sent via an SDIO interface. The 6030A11 sends received data back to the iMX6Q via the same interface.
6. Vehicle Bus Interface via a PIC32 MCU – The PIC32 connects to the motor vehicles CAN buses, J1708 bus and LIN bus. Not all are typically connected at the same time but they may be. The PIC32 also controls the master power switch for the box and can reset the iMX6Q. The PIC32 receives the vehicle bus data as serial data and then processes that data, then if necessary, sends that data to the iMX6Q via a serial interface.
7. MEMS Sensors on I2C – There is an accelerometer, magnetometer and gyroscope running off P3V3 that communicate with the iMX6Q via the I2C bus.
8. HDMI, LVDS, Parallel Video – These are not used or connected in this design.

When power is first applied to device the PIC32 MCU boots up to determine if the rest of the system should be running. It samples voltage levels and if certain voltage levels are obtained (configurable) the iMX6Q has power applied to it so that it can boot. The iMX6 then boots and initializes all other peripherals on the system, including the WiFi radio.

The system then proceeds to convert analog video input signals to digital form using the TW6869 then processing that video with the iMX6Q to produce H.264 compressed video that is send sent

out network interfaces upon request. The system also proceeds to monitor the GPIO's, allowing the software to act upon the input state based on configurable algorithms. The software may then enable or disable the outputs on GPIO. The PIC32 constantly monitors the vehicle bus inputs for activity which include two CAN buses, one J1708 bus, and one LIN bus. As bus information is collected by the PIC32 it is communicated to the iMX6Q via a serial link. Further the iMX6Q monitors for network traffic on the Ethernet port and WiFi port and routes that traffic accordingly. If an optional modem is plugged into to USB, the iMX6Q will route the traffic out to the modem as appropriate to the Internet. The iMX6Q also constantly monitors the accelerometer, magnetometer, gyroscope and internal temperature sensors and stores their values in memory in case they are requested via Ethernet, Wifi or USB. The system continues in this mode until the power is removed.

The CSR 6030A11 is the only source of intentional radiation in the system. The CSR 6030A11 is a self-contained WiFi chipset that interfaces to the iMX6Q via SDIO and connects to its antenna via an RFMD LNA (RFFM5765Q). Radio waveform generation is handled by the 6030A11 internally. The 6030A11 is powered by V_WL_VCC33 and V_WL_VCC18. The RFFM5765Q is powered by V_WL_VCC33. The signal passes through the TBF2012245R1 bandpass filter and then to the UFL antenna connector. The WiFi frequency is 2.4Ghz using the WiFi 'n' protocol. The subsystem is grounded to the system ground plane. Internal operation of the 6030A11 is opaque to the applicant.