

## **Product Specification**

For the

### **TRAXIT Super 2G GPS Tracke Vehicle Tracking Device**

By

### **Montage Asia**

March 1, 2012

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#### **Document reference**

Revision: X1.00

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Release date: Date first printed above

File name: TRAXIT SUPER 2G GPS

TRACKER\_Overview\_Specification\_X100\_030112.docx

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**Revision History**

Revision	Date	Description
X1.00-	12/08/11	First draft release
X1.00	03/01/12	First Prototype Release

## **Scope**

This document sets forth the basic technical requirements and feature set for the TRAXIT SUPER 2G GPS TRACKER tracking device.

## **Description**

The TRAXIT SUPER 2G GPS TRACKER Tracker is a self contained, integrated commercial grade vehicle tracking device that uses GPS satellite location in combination with a quad band GPRS cellular radio connection to report that location. The TRAXIT SUPER 2G GPS TRACKER is optimized for reliability, cost and size. The TRAXIT SUPER 2G GPS TRACKER is a cost optimized version of the standard IONL1G2 tracker that is targeted at expandable and fleet oriented applications. The TRAXIT SUPER 2G GPS TRACKER is targeted more at the finance market.

All antennas including the GPS patch is internal to the device. Data reporting can be initiated by a server or by the tracker itself via GPRS SMS or UDP pathways or over a physical USB connection.

The TRAXIT SUPER 2G GPS TRACKER is comprised of a simple two piece plastic enclosure that is sonically welded together for reliability, durability and low cost assembly. Interface signals and power are ported through a strain relief bundle at one end with up to a 7-lead pigtail.

For added redundancy against system lockup, a physically separate, dedicated watchdog circuit oversees the TRAXIT SUPER 2G GPS TRACKER system operation. If the system does not maintain the watchdog circuit through programmed reporting, the system power is cycled and a new GPS satellite and cellular connection is established.

The TRAXIT SUPER 2G GPS TRACKER can be provisioned for UDP and SMS data services for application command and/or data transactions within the 850, and 1900 MHz bands. Network provisioning is done using embedded SIM technology for reliability and cost savings. For added safeguard against network connection loss, a hardware TRAXIT SUPER 2G GPS TRACKER endpoint reset and reboot can be initiated by simply calling the provisioned phone number and allowing it to ring three times.

Flexible I/O includes 2 bidirectional General Purpose Input Output (GPIO) ports. A separate dedicated USB port is provided for general use as well as development and programming support. A high current relay drive is provided for starter motor solenoid control or general purpose drive (current sink only).

Over The Air (OTA) application firmware updates are supported through at TFTP connection to a server. The entire application image can be updated using one specialized SMS or USB command.

All inputs are electrically hardened against overvoltage and over current conditions present in automotive environments. This includes transient electrical noise and

Electrostatic Discharge (ESD). The power input is further protected against over current with an internal self-resetting fuse.

The TRAXIT SUPER 2G GPS TRACKER is physically disguised to appear to be a nondescript part of the cabling system. It is a small black box with unremarkable features. Two LED status indicators are provided to verify correct installation and initial operation. A unique power management feature allows these LEDs to be extinguished once installation is verified to be correct. This feature reduces power and further conceals the ION Tracker from untrained parties wishing to defeat its operation.

As with all GPS location devices, the TRAXIT SUPER 2G GPS TRACKER should be installed in a vehicle such that it has an unobstructed view of the sky during normal operation. Double sided foam tape can be used to secure the surface not facing the sky if needed.

A factory populate option is provided to add a motion detector to the main board. Under software control, this motion detector can be used to wake the TRAXIT SUPER 2G GPS TRACKER from a very low power state.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

The antennas used for this transmitter as shown in this filing must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

## Bullet Specifications

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Cellular:	850/1900 MHz Quad band
	GPRS Protocol CS-1, CS-2, CS-3 and CS-4
	Output power:
	Class 4 (2W) @ 850MHz
	> 24dB @ 850MHz (OTA TRP)
	Class 1 (1W) @ 1900MHz
	> 26.5dB @ 1900MHz (OTA TRP)
	Sensitivity:
	< -107dBm @ 850MHz (Conducted)
	< -101dBm @ 850MHz (OTA TIS)
	< -106dBm @ 1900MHz (Conducted)
	< -103.5dBm @ 1900MHz (OTA TIS)
	Antenna:
	Integrated onto PCB
	Meets minimum AT&T TRP/TIS requirements

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Services:	GPRS Multi slot class 12
	SMS (Text):
	UDP data
	DNS address resolution

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GPS: L1-band (1.57542GHz)

Channels:

- 210 PRN
- 66 Search
- 22 Simultaneous tracking

Sensitivity (UHS):

- Tracking: -165dBm
- Reacquisition: -158dBm
- Acquisition: -149dBm

Acquisition time:

- Hot: <1.5s
- Warm: <34s
- Cold: <90s
- Reacquisition: <1.0s

WAAS:

- Position: <3m
- Velocity: >0.1m/s
- Acceleration: >0.1m/s<sup>2</sup>
- Altitude: 18,000m (max)
- Velocity: 515m/s (max)
- Acceleration: 4G (max)

32 Geo fences

25x25x4mm patch antenna

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I/O: One main port and one internal expansion port  
All pins are 16V tolerant and ESD protected

Pigtail:

- 2-Leads 2.8V GPIO
- 2-Leads USB2.0
  - Data+
  - Data-
- 1-Pin relay drive
  - 500mA drive
  - TVS overvoltage protection
- 1-Pin power input:
  - 1.0A resetting fuse
  - TVS overvoltage protection
- 1-Pin ground

SIM: Internal embedded

LED: Green GPS status

Battery voltage measurement

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### ***RF Supply Voltage***

Nominal Voltage: **12V**

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The normal input voltage: DC 12V  
the input voltage range: DC 6V--15V

Full Shutdown: < 500 $\mu$ A  
Standby: < 3.0mA  
GPS acquisition: < 40.0mA  
GPS tracking: < 36 mA  
GPRS max power: < 90.0mA (GPS Off)  
Peak instantaneous < 300mA

Software: Native ARM processor execution  
Proprietary application  
Extended AT command interface  
Easily configured reports to minimize data transport costs  
Based on proven GPRS modem stack  
Lockup protection:  
Independent watchdog with power cycle reset  
Flash memory:  
8MB for application and data storage  
Report buffer  
USB port update  
Over the air update  
Development:  
Complete C language tool chain  
Meta Download Tool  
MTK Flashtool

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Options: Motion sensor

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Physical:	Design:	Nondescript design
	Color:	Black
	Texture:	Light
	Material:	UL Lanxess PA6 Durethan BKV15+
	Size:	85.1mm x 32.2mm x 9.6mm
	Fasteners:	Sonic welded
	Label:	LED ported, and laser printable
	SIM:	Keyed retainer socket

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Environment: Temperature:  
-40 to 85° C Operation  
-50 to +100° C Storage  
Humidity:  
20% to 90% Operation  
10% to 95% Storage  
ESD: 15KV immune on all user accessible surfaces and ports  
Altitude: -500 to +18,000m



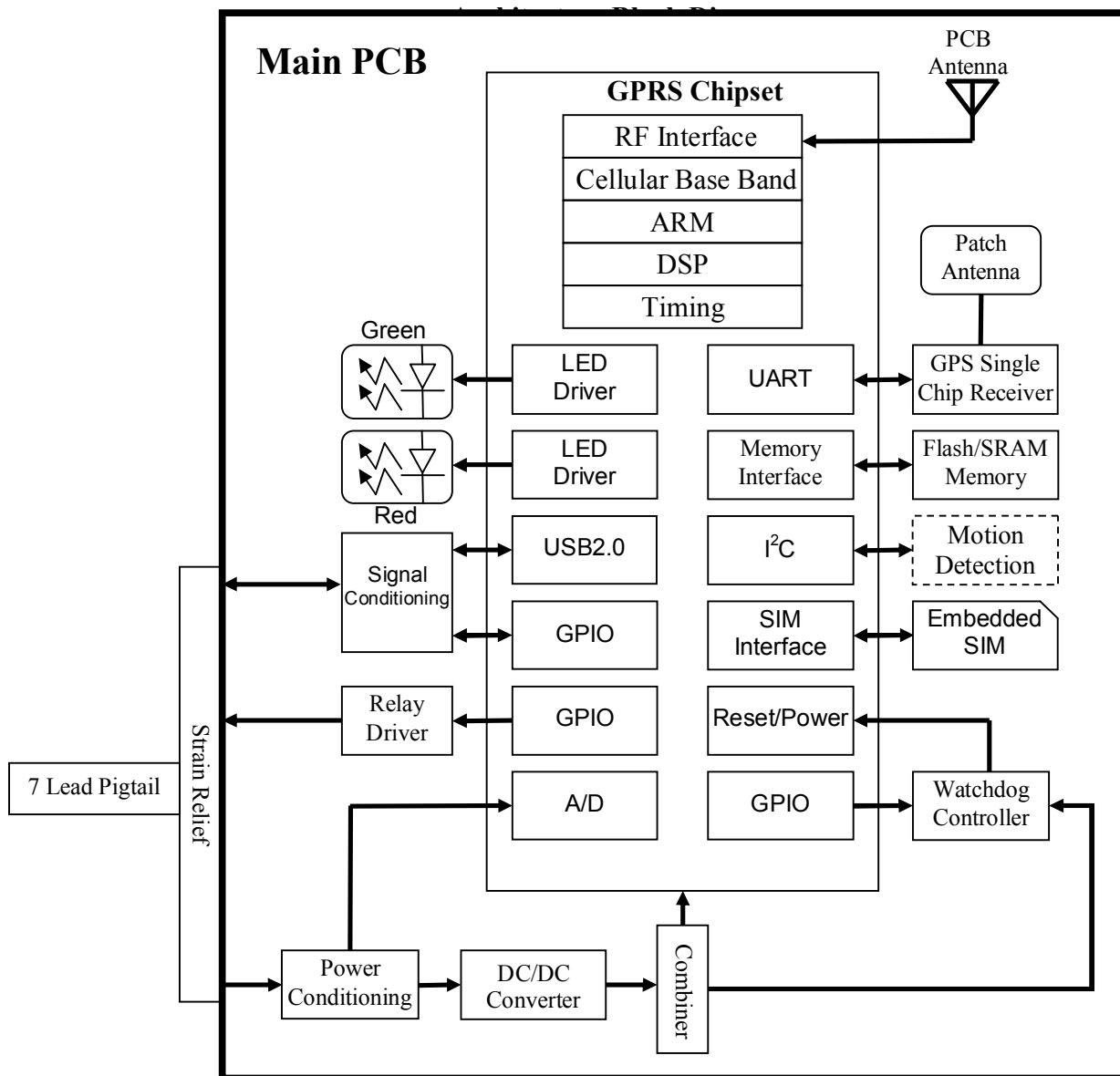
Shock: 25G

Vibration: Sinusoidal/random

## Hardware Architecture

Figure 1 shows a high level block diagram of the TRAXIT SUPER 2G GPS TRACKER system hardware. The core architecture is defined a highly integrated GPRS chipset and single chip GPS receiver. The motion detector is optionally populated at assembly time. Signal and power interface to the PCB is through a strain relieved 7 lead pigtail harness. Fewer wires may be populated as a cost reduction option at the factory at assembly time.

**Figure 1**  
**TRAXIT SUPER 2G GPS TRACKER Hardware**



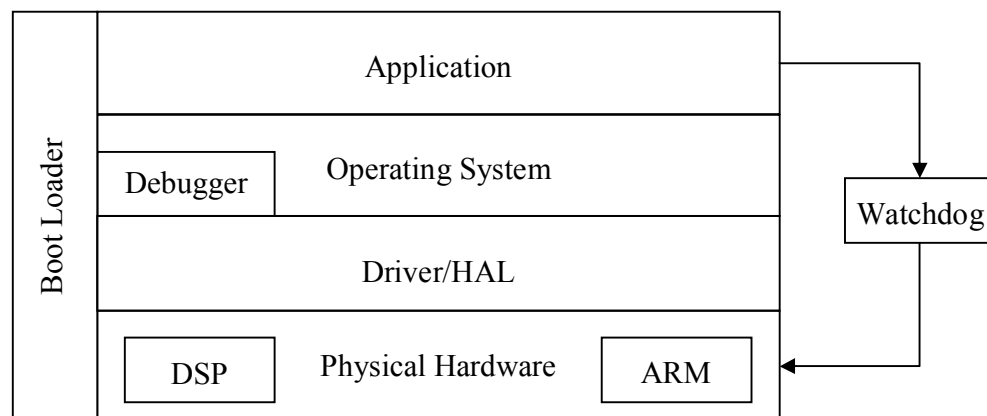
## Software Architecture

The TRAXIT SUPER 2G GPS TRACKER does not use an external applications processor.

### Structure

Figure 2 shows a high level block diagram of the basic architecture. The OS is closely knit with a debugger allowing for code development, maintenance and updates over the USB port. The boot loader provides control over all code and configuration memory. The watchdog is a dedicated hardware device that will issue a hardware reset to the unit in conjunction with a power cycle operation if it is not maintained by a periodic ping from the application program.

**Figure 2**  
**TRAXIT SUPER 2G GPS TRACKER Software Architecture**



### Features

TRAXIT SUPER 2G GPS TRACKERs to AT commands issued to it from either a physical USB port connection or to AT commands issued to it through an SMS or a UDP/IP connection. With regard to text messages, TRAXIT SUPER 2G GPS TRACKER “reads” all of its own text messages and tries to interpret each message as an AT command. SMS text may be sent to an ION through any CSD SMS connection.

Key superset functions outside that of typical GPRS modems support intrinsic TRAXIT SUPER 2G GPS TRACKER Features. These functions include:

- Automatic field lockup recovery
  - Dedicated hardware watchdog with power and reset cycle
- Specialized GPS functions including
  - GPS data reporting

- GPS status reporting
  - GPS power control
  - Setup and monitor geographic fences
- Device initiated UDP reporting
  - Recurring schedule event
  - Low battery condition
  - Change in GPIO state
  - Report record queue
  - User defined IP addresses
  - Geographic fence violation
- Virtual AT command processor over SMS or a UDP/IP connection
- OTA code update using TFTP
  - 100% buffered
  - Established standard protocol
- Application specific I/O
  - Read/write digital
  - Read battery voltage
- APN support with optional credential verification

Further details on the TRAXIT SUPER 2G GPS TRACKER software features are available in the document titled: "AT Command Specification for the TRAXIT SUPER 2G GPS TRACKER GPRS/GPS Tracking Device" and available from the author of this document.

## **Physical Attributes**

Figures 3A and 3B show various exterior views and dimensions of the TRAXIT SUPER 2G GPS TRACKER Tracker and some critical physical features. The top and bottom half shells are sonically welded together to provide a water resistant seal around the case perimeter. Through pressure engagement around the cable strain relief the welded enclosure also provides water resistance around the cable harness. This seal is also potted with a slow set adhesive when the case is welded together. The label is made of waterproof plastic and adhered the to the case bottom as shown using 3M waterproof adhesive. The label covers test points used in final manufacturing test and also provides a watertight lens over the LED ports. The label also provides media for silk-screening and printing barcode and other information onto.

## Interfaces

Electrical interface to the outside world is accomplished through a 7-lead pigtail wire harness that is retained directly by the sonically welded enclosure. Test points required for final test and provisioning are provided by port holes that are covered by the water resistant plastic label when applied. Dual LEDs provide status and are viewed through this label through clear ports where printing or silk-screening is omitted.

## Test Points

Information on test point location and function can be obtained from the author of this document. This information is provided only to authorized contract manufacturers of the TRAXIT SUPER 2G GPS TRACKER.

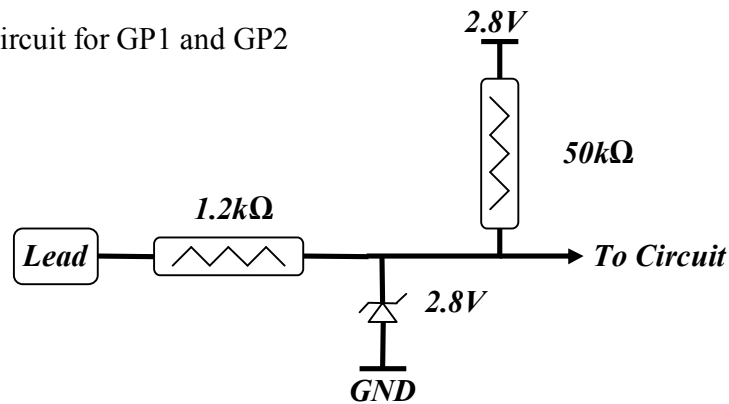
## Harness Signals

The signals present on the pigtail harness are described in the table below.

Main Signals			
Lead Color	Name	Description	Properties
BLACK	GND	System ground, connect to negative of battery power	Power and signal ground point
RED	VIN	Power input, connect to positive side of battery power	750mA PTC inline self resetting fuse, also clamped to GND through 16V
GRAY	USB+	Positive USB data	Can be directly connected to the + data pin on a standard USB2.0 data port
GREEN	USB-	Negative USB data	Can be directly connected to the - data pin on a standard USB2.0 data port
YELLOW	GP1	Configurable as general input or output	2.8V logic level, 16V tolerant, equivalent circuit in NOTE
BLUE	GP2	Configurable as general input or output	2.8V logic level, 16V tolerance, equivalent circuit in NOTE
ORANGE	RLY	Relay drive, connect relay coil between VIN (RED lead) and this pin	500mA, 16V tolerant open drain MOSFEET, TVS overvoltage protected

NOTE

Equivalent Circuit for GP1 and GP2

**Installation information**

The Tracker uses a simple cabling arrangement and supports splicing into an OBDII extension for power. Connection to the vehicle is made through a 3mm pitch rectangular header connection common to the automotive market.

As any GPS location device, the TRAXIT Super 2G GPS Tracker should be installed in a vehicle, so that it has an unobstructed view of the sky during normal operation. Double sided foam tape can be used to secure the surface not facing the sky, if needed.