



## TIM-LR

### Dead Reckoning GPS Receiver Module ANTARIS® Positioning Engine

The TIM-LR is an ultra-low power sensor-based dead reckoning GPS module suitable for passive and active antennas. The combination of the ANTARIS GPS positioning engine and the Enhanced Kalman Filter EKFTM algorithm provide precise navigation in locations with no or impaired GPS reception, for example tunnels, indoor car parks and deep urban canyons. Deviations in navigation caused by multipath effects, as commonly observed in cities with densely populated high-rise buildings, belong to the past. The TIM-LR is the ideal solution for high-volume applications requiring a cost-effective and tightly integrated product that fulfills 100% road coverage requirement.



25.4 x 25.4 x 3 mm

#### Overview

Dead reckoning GPS receivers supplement the GPS information with an incoming signal from a gyroscope (turn rate sensor) and from odometer pulses to do dead reckoning navigation through periods of GPS outages. Depending on the quality of the available GPS signals, the EKF algorithm from u-blox computes the next positions accurately by using an automatically weighted average of the GPS and sensor inputs. Dead reckoning is beneficial in following applications:

- In-Vehicle Navigation Systems (INVS) and telematics
- 24h Automatic Vehicle Location
- Car security and safety products
  - Stolen car recovery
  - Emergency and road side assistance
- GPS enabled road pricing
  - Distance-dependent billing, urban charge zones
  - Billing of metered parking areas
- Homeland security:
  - Dispatch of emergency vehicles
  - Monitoring transportation of dangerous goods
- Precise dynamic vehicle positioning
  - Agriculture, motor sport

#### Benefits

- High acquisition and tracking sensitivity
- Ultra-low power consumption
- Reliable navigation while satellites are out of sight
  - Left and right turns: detected by a gyroscope
  - Distanced traveled: pulses from vehicle odometer
  - Optional use of forward / reverse gear indication
  - Position output in NMEA and UBX protocols
- Excellent GPS performance
  - Excellent navigation accuracy, even at low signal levels
  - Active multipath detection and removal
  - Fast Time-To-First-Fix (TTFF)
- Highly integrated GPS module
  - Automatic pick-and-place assembly
  - Reflow solderable
- Fully EMI shielded
- Passive and active antenna support

#### Features

- 16 channel GPS receiver
- 8192 simultaneous time-frequency search bins
- 1 Hz position update rate
- Based on the ANTARIS GPS Technology
  - ATR0600 RF front-end IC
  - ATR0620 Baseband IC with ARM7TDMI inside
  - ATR0610 Low noise amplifier IC
- FLASH memory
- Dead Reckoning (DR) with Enhanced Kalman Filter:
  - 40 Hz DR calculation rate for high accuracy
  - Mixed GPS and DR operation, depending on availability and quality of GPS signal
  - Fully automatic calibration
  - Temperature compensation
- DGPS and SBAS (WAAS, EGNOS) support
- Operating voltage 2.7 to 3.3 V
- Battery supply pin for backup memory and RTC
- Industrial operating temperature range -40 to 85°C

*your position  
is our focus*



## Receiver Performance Data

<b>Receiver Type</b>	16 channel, L1 frequency, C/A code	
<b>Max. Update Rate</b>	1 Hz	
<b>Accuracy</b>	Position	2.5 m CEP
	DGPS / SBAS	2.0 m CEP <sup>1</sup>
<b>Start-up Times</b>	Hot start	<3.5 sec
	Warm start	33 sec
	Cold start	34 sec
	Reacquisition	< 1 s
<b>Sensitivity</b>	Acquisition	-140 dBm
	Tracking	-149 dBm
<b>Timing accuracy</b>	RMS:	50 ns
	99%:	<100 ns
<b>Dynamics</b>	< 4 g	
<b>Operational Limits</b>	COCOM restrictions apply	

<sup>1</sup> Depends on accuracy of correction data provided by the DGPS or SBAS service

## Electrical Data

<b>Power Supply</b>	2.7 – 3.3 V	
<b>Power Consumption</b>	VCC = 3.0 V:	typ. 189 mW
	VCC = 2.7 V:	typ. 170 mW
<b>Backup Power</b>	1.95 V – 3.6 V	
	Backup power must be provided to memorize last position and vehicle direction of the previous trip.	
<b>Antenna Power</b>	External or Internal VCC_RF	
<b>Antenna Supervision</b>	Integrated short-circuit detection and antenna shutdown, open circuit detection with little external circuit	

## Environmental Data

<b>Operating Temp.</b>	-40°C to 85°C
<b>Storage Temp.</b>	-40°C to 125°C
<b>Vibration</b>	5 Hz to 500 Hz, 5g (IEC 68-2-6)
<b>Shock</b>	Half sine 30g / 11ms (DIN 40046-7)

## Dead Reckoning (DR) Performance Data

**DR calculation rate** 40 Hz<sup>2</sup>

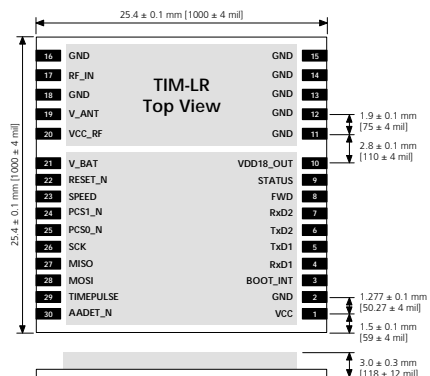
<sup>2</sup> Internal calculation rate for high accuracy in DR calculation. Not to be confused with max. navigation update rate listed under Receiver Performance Data.

## Interfaces

<b>Physical</b>	30 pin leadless chip carrier
<b>Serial Ports</b>	2 UARTS @ 3 V levels 5V TTL compatible inputs
<b>Protocols</b>	NMEA, UBX binary, RTCM Supports protocol mixing over same serial port
<b>Digital Inputs</b>	@1.8 V, configured for - Odometer pulses - Forward / Backward signal
<b>Digital Output</b>	TIMEPULSE @ 1.8 V
<b>SPI Interface</b>	@1.8V, configured for specified A/D converters to receive gyroscope and temperature information <sup>3</sup>

<sup>3</sup> Please refer to the TIM-LR Data Sheet for information about supported gyroscopes, A/D converters and temperature sensors

## Mechanical Data



## Support Product

<b>SBE-LS</b>	Dead Reckoning Evaluation Kit with built-in gyroscope to get familiarized with dead reckoning functionality on the ANTARIS technology
<b>ANTARIS</b>	Dead Reckoning Evaluation Kit

## Ordering Information

<b>TIM-LR-0-000-0</b>	TIM-LR – Dead Reckoning GPS Module
	<b>Delivery Packing</b>
	0 = Single samples
	1 = Tape on reel (100 pieces)
	5 = Tape on reel (500 pieces)

Parts of this product are patent protected.