



Smart Vehicle Wireless Networks  
**Urban Mobility Digital Transformation**

**In-Vehicle LTE Gateways**



VHG760



VHG87B


## Advances in Urban Mobility




Disruptive innovations changed the way people get around the cities. Carsharing models of rentals are showing exponential growth, and ridesharing services spread worldwide offering an affordable ride in minutes. New mobility services are emerging on principles of accessibility, convenience, and punctuality. Transportation industry is evolving, and fixed-route transits are urged to increase the quality of service. Ride alternatives are not here to compete with fixed-route transits, but rather to indicate a change. Efficiency of new mobility services is just a fraction of what public transportation agencies can do. Cities will continue to rely heavily on them.


## Meeting Challenges


Utilizing communication technologies opens new opportunities and brings benefits to all parties in the industry. However, the environment is challenging, and requires unbreakable cellular connectivity, a gateway that will withstand vibration, extreme temperatures, and provide data communication for all the equipment on board. AMIT offer solution that could be integrated with multiple information systems, a device with sufficient functionality to implement the most ambitious ideas, and get the infrastructure ready for a rapid development. Not long before intelligent transportation systems will be built on collaboration between transit agencies and private service providers.





**VHG87B**  
In-Vehicle LTE Gateway

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**4G LTE Network**  
Equipped with LTE Cat.4 modem(s) and SIM Failover gateway provides high-speed, reliable, and stable cellular connectivity. Available options with two LTE modems enable seamless failover offering unbreakable connectivity, and load balance to distribute incoming network traffic.
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**Simultaneous Dual-Band WiFi (2.4GHz + 5GHz)**  
Internet access for passengers provided via latest 802.11ac WiFi technology, while the other band is reserved for communication with in-vehicle electronic equipment. Authorized access through captive portal, enabling monetizing WiFi network through advertising campaigns, and passenger behavioral data collection.
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**GNSS (GPS + GLONASS)**  
Real-time tracking module provides high positioning accuracy in urban environment with concurrent reception of GPS and GLONASS. Location data complies with NMEA 0183 protocol for easier backend integration.
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**In-Vehicle Networking (3x RJ45, 2x DI, 1x DO, 1x RS232)**  
Set of various interfaces offers flexibility to connect electronic equipment on-board. The gateway acts as a communication hub for surveillance, ticketing, and passenger information system. Event triggering and real-time notifications are implemented via advanced administration tools, and directly connected sensors.
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**Ignition Sensing**  
Ignition sense on/off wiring optimized for In-vehicle installations. Designated time delay for power off is software defined. Option allows the gateway to remain on for a pre-set time after the ignition key is turned off. Low power voltage detection prevents gateway from draining power completely.

## Building Scalable Solutions



In our practice we encounter large-scale transportation projects where budget constraints define equipment preferences. Looking for compromises system integrators have a potential risk to jeopardize the system deploying not entirely suitable, and therefore less reliable solutions. Complex transportation systems based on interdependent networks where malfunction cost of single unit multiplies exponentially. In AMIT, it was our goal to design a cost-effective gateway that will provide sufficient functionality, and withstand in-vehicle operating environment.

### In-Vehicle Design (E-Mark Compliant)

Designed to withstand: shocks, constant vibration, wide temperature range, variable power input, and cold cranking amps. Robust and compact enclosure made for easy deployment.



### 4G LTE Network

Equipped with LTE Cat.4 modem (DL 150 Mbps/UL 50 Mbps) and SIM Failover gateway provides high-speed, reliable, and stable cellular connectivity.



### WiFi Hotspot

Authorized access through external captive portal, enabling monetizing WiFi network through advertising campaigns, and passenger behavioral data collection.



### Fleet Tracking (GPS + A-GPS)

Assisted GPS improves real-time positioning of the fleet through cellular tower triangulation. Location data complies with NMEA 0183 protocol for easier backend integration.



**VHG760  
In-Vehicle LTE Gateway**



## NETWORK MANAGEMENT SYSTEM

- Remote monitoring and management
- Fleet tracking and statistics
- Firmware update and configuration
- Heartbeat monitor tool – disconnected devices failure alert

## Digital Transformation



AMIT solution transforms urban mobility by connecting service providers, passengers, vehicles, and ground systems into a single network. High-speed, high-capacity wireless connectivity allows real-time travel data exchange. Integrating networking technologies helps design a smarter, more convenient, and more efficient transportation service. Built on essentials of personal mobility and freedom it will speed up the passenger flow, and reduce traffic congestion.

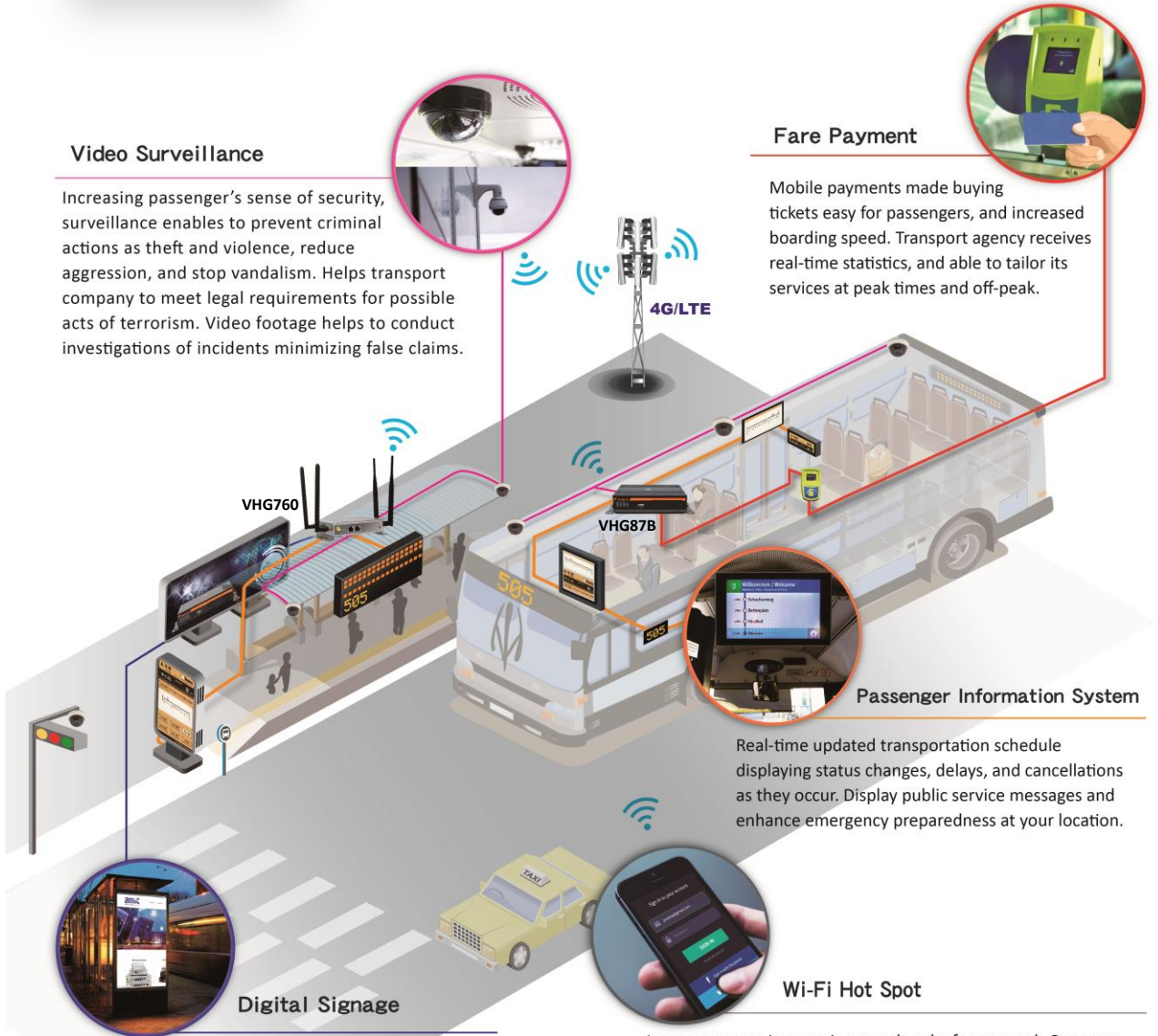
### Video Surveillance

Increasing passenger's sense of security, surveillance enables to prevent criminal actions as theft and violence, reduce aggression, and stop vandalism. Helps transport company to meet legal requirements for possible acts of terrorism. Video footage helps to conduct investigations of incidents minimizing false claims.



### Fare Payment

Mobile payments made buying tickets easy for passengers, and increased boarding speed. Transport agency receives real-time statistics, and able to tailor its services at peak times and off-peak.



### Passenger Information System

Real-time updated transportation schedule displaying status changes, delays, and cancellations as they occur. Display public service messages and enhance emergency preparedness at your location.



### Digital Signage

Showcase retail options, restaurants and services nearby. Offer new advertising solution to improve footfall, and increase vendor sales.



### Wi-Fi Hot Spot

Internet access is a service people take for granted. Generate revenue by satisfying consumer demand for Wi-Fi. General monetization model includes "pay to play" premium access ad sponsored free Wi-Fi. Leverage captive portal to gain a wealth of data. Enable fast login with social networks, and collect information that allows understanding and interacting with customers in new effective ways.



*InterWave deploys AMIT solutions Taiwan wide to increase mobility, and meet customer expectations of free WiFi services*

## Connected Citizens and Tourists



Taiwan is one of the first countries to provide free Internet access wide coverage for its citizens and international visitors. WiFi hotspots are being set up in public service offices, business active areas, tourist attractions, and during outdoor activities. One of the major and critical tasks is to provide mobile internet access in public transportation sector, including vehicles and stations. 4G LTE coverage in Taiwan has already reached 83% pushing limits further away and opening new possibilities.

Visitors rely on their electronic devices and basic information services. Wherever they go, WiFi network is expected to be secure, reliable and free. The convenience of their travel will shape overall experience and define satisfaction score.

## Taiwan Tourist Shuttle



Taiwan is an attractive tourist destination with nearly 10.7 million people visited in 2016 hitting another record of tourist number. The tourism industry has a significant impact on local economy, and its participants are constantly looking for ways to improve visitor's experience. The Taiwan Tourist Shuttle service has planned its routes all over the island to capture the main attractions and scenic spots. Convenience is the company's main focus to grow its competitive advantage. Free WiFi on board is what enables customers to obtain information and share their exciting travel experience on the go.

### CHALLENGES

- Growing number of mobile devices
- Customers increasingly demanding high-speed Internet access
- Secure access to free WiFi network
- In-vehicle installation with ignition system and voltage spikes
- High temperature environment

### BENEFITS

- Secure and reliable wireless connectivity on-board and on the ground
- High performance, free WiFi access for passengers
- Remote monitoring and management of devices via AMIT NMS
- Ability to manage network bandwidth per user
- Scalable solution to meet the needs of increasing business operations

*"Free WiFi network is an essential service we aim to provide for our citizens and guests of Taiwan. We are especially satisfied with how easy it is to deploy AMIT devices in vehicles, and our partners really appreciate remote management system."*

- Danny Lin 林俊宏,  
InterWave Information Corp.  
英特威資訊股份有限公司

*In Taiwan public transportation boarding has been declining for over a decade now with major cities reporting figures below 10%. AMIT wireless solutions are brought to redesign transportation service and improve the quality of ridership.*



## Setting a New Course

Public transit ridership remains low in Taiwan. While rapid transit system is praised for its service, metro ride is not an option for the majority of population. People are increasingly dissatisfied with infamous bus transit. Being infrequent with complicated route network, it built a reputation of inconvenient and unreliable way of commuting. Disastrous outcome for city governance is in steady decline of transit usage rate and growing private vehicle use. Taiwan Ministry of Transport and Communications is determined to turn the things around and increase attractiveness of riding buses. With close collaboration between Asia Pacific Telecom and Transportation Bureau, Taiwan aims to redesign its public transit services embracing new technologies. Digital transformation initiative found strong support of Taipei and Kaohsiung City Governments. Two areas have the largest number of diverse commuters with constant flow of visitors and foreign tourists. The comprehensive plan includes gradual but simultaneous launch of connected services.

AMIT wireless connectivity solutions were chosen to implement digital transformation. Transit vehicles are equipped with AMIT In-Vehicle Gateways. 4G Smart Bus campaign was launched to announce positive changes and to promote free WiFi services for passengers on board. Upgraded vehicles took the busiest routes through city center, main stations and tourist attraction sites.

### CHALLENGES

- Not popular inconvenient transportation service with long waiting time and complicated routes
- Complex fixed transit infrastructure requires wireless communications for the fleet of constantly moving vehicles and boarding stations.
- Multiple equipment and mobile device compatibility
- The need for scalable and centrally manageable solution

### BENEFITS

- High-speed reliable wireless connectivity for the entire infrastructure
- Easy scalable and cost-effective solution
- Remote monitoring and management of devices via AMIT NMS
- Convenient and attractive service with real-time information and free WiFi access to the network
- AD WiFi monetization framework
- Proximity mobile marketing opportunities
- Scalable solution to meet the needs of increasing business operations

*Smart transportation system takes convenience of transit service to a new level, and creates multiple opportunities for business.*

## Leveraging Mobility

Passenger convenience in mass transit areas were significantly improved with wireless connectivity. Reliability of the service was enhanced with easy accessible information. New bus stops were placed along the routes. Installations include:

- > **Real-time passenger information displays** with accurate time of bus arrivals.
- > **Interactive touch screen monitors** where people can learn more about transit routes, read important public announcements, receive emergency notifications, or get real-time relevant information such as weather forecasts.
- > **Free WiFi hot spot** to stay connected and make waiting time more pleasant.
- > **Video surveillance** to enhance public safety.

The project has also become an advertising platform for proximity marketing to showcase local businesses and tourist attractions nearby. Ads are being displayed on interactive screens and user's mobile devices while connecting to the free of charge network.



All-in-one new mobile application was developed to make the transit information more accessible and increase convenience for riders while planning their movements.

New information kiosks with touch screens were conveniently placed in mass transit areas. The area is also covered with free WiFi access points and video surveillance implemented via cellular connectivity.



## CONNECTIVITY SOLUTION

- Implemented via single device VHG760
- Integrated high-performance 4G LTE modem
- Wire link to IP cam and digital signage LCD monitor
- WiFi public hot spot via 802.11n mobility solution
- AMIT NMS cloud-based remote management for entire infrastructure

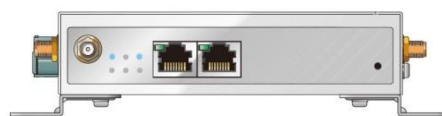
# Product Specification<sup>1</sup>:

VHG760	-0T001	-0T021
Uplink – Cellular	1* LTE cat.4 (single SIM)	1* LTE cat.4 (dual SIM)
	(LTE: 800/900/1800/2100/2300/2600MHz; UMTS: 850/900/1900/2100MHz; GPRS/EDGE: 850/900/1800/1900MHz) <sup>2</sup>	
LAN - Ethernet	2*RJ45 FE (include 1*LAN/WAN configurable)	
WLAN - WiFi	IEEE 802.11b/g/n (2.4GHz), 2T2R MIMO	
GNSS	GPS Receiver	
Serial Port	-	
Input / Output	-	
Log Storage	-	
Power Source	1* DC 9V ~ 36V (Terminal Block), Power Consumption: max. 9W	

WAN	Multiple WANs, Failover/Load Balance
WiFi LAN	AP Router, WDS, WDS Hybrid Modes
VLAN	Port-based, Tag-based VLAN
Port Forwarding	Virtual Server/ Computer, DMZ Host, PPTP/L2TP/IPSec Pass-through
Routing	Static, Dynamic: RIP1/RIP2, OSPF, BGP
VPN	IPSec, OpenVPN, PPTP, L2TP, GRE
Firewall	SPI Firewall with Stealth Mode, IPS
Access Control	Packet Filter, URL Blocking, MAC Filter, Content Filter, Application Filter
Cellular Toolkit	SMS, Data Usage, SIM PIN, USSD, Network Scan
Event Handling	Managing / Notifying Events; DI, DO, SMS, Modbus, Syslog, SNMP Trap, Email Alert, Reboot
Authentication	External Captive Portal
Configure & Management	Web, Telnet CLI, Command Script, TR-069, SNMPv3 standard & AMIT MIB
System Operation	MMI, System Information, System Time / Log, Backup & Restore, Reboot & Reset
Diagnostic	Packet Analyzer, Diagnostic Tools
Location Track	GNSS, Track Viewer
Dimension (LxWxH)	131x 99x31mm (w/o mounting kit) 167x 99x39mm (with Bracket kit)
Temperature <sup>3</sup>	Operational: -30°C ~ 70°C; Storage: -40°C ~ 85°C
Humidity	10% ~ 95% (non-condensing)

## Device Interface:

(1) Front View



(2) Left View



(3) Right View



(Note: Interfaces may vary depending on models.)

## Accessory List:

(1) Package Content

- 1\*Device, 2\*Cellular Antenna (3dBi), 2\*WiFi Antenna (5dBi),
- 1\*Terminal Block (2-pin for DC Power),
- 2\*Mounting Brackets, 1\*Screw Bag,
- 1\*RJ45 Cable, 1\*CD (User Manual)

## Certification:

(1) Approval / Certificate  
CE, E-Mark

(2) Standards & Regulation

- EMI: EN 55032: 2015 +AC: 2016 Class B  
EN 61000-3-2:2014, 61000-3-3:2013  
CISPR 25 Radiated Emission (ECE R10)
- EMS: EN 55024:2010+A1:2015  
EN 61000-6-2:2005+AC:2005  
IEC 61000-4-2(ESD) Level 4  
IEC 61000-4-3(RS) Level 4  
IEC 61000-4-4(EFT) Level 4  
IEC 61000-4-5 (Surge) Level 3  
IEC 61000-4-6 (CS) Level 3  
IEC 61000-4-8(PFMF) Level 4  
ISO 7637-2(2004) (ECE R10)
- Radio: EN 301 489-1/-7/-17/-24/-52,  
EN 300 328 V2.1.1, EN 50385
- Safety: EN 60950-1

1. Specifications are subject to change without prior notice. 2. Supported cellular frequency depends on regional hardware version.  
3. 3G/4G and WiFi performance will be degraded if device's ambient temperature is above 60°C.

## AMIT Wireless Inc.

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No. 28, Lane 31, Huandong Rd., Sec. 1, Xinshi Dist., Tainan City 74146, Taiwan (R.O.C.)

VHG760 Datasheet, V1.7c



# Product Specification<sup>1</sup>:

VHG87B	-0T1B0	-0T1B1	-LT1B1
Uplink – Cellular	1* LTE cat.4 (dual SIM)		2* LTE cat.4 (2+2 SIM)
	(LTE: 800/900/1800/2100/2300/2600MHz; UMTS: 850/900/1900/2100MHz; GPRS/EDGE: 850/900/1800/1900MHz) <sup>2</sup>		
LAN - RJ45	3*RJ45 GE		
WLAN - WiFi	IEEE 802.11b/g/n (2.4GHz) + 802.11a/n/ac (5GHz), 2T2R MIMO		
GNSS	GPS Receiver	GPS + GLONASS Receivers	
Serial Port	1*RS232 (TX/RX)	1*RS232 (TX/RX)	1*RS232 (TX/RX)
Input / Output	2* Digital In (“Logic 0”: 0~1V, “Logic 1”: 5V~30V), 1* Digital Out (Relay Mode, up to 12W); 1*IGN for Ignition Sense		
Log Storage	1*USB 2.0	8GB, 1*USB 2.0	8GB
Power Source	1* DC 9V ~ 36V (Terminal Block), Power Consumption: max. 18.5W @ no DO driving		

WAN	Multiple WANs, Failover/Load Balance
WiFi LAN	AP Router, WDS, WDS Hybrid Modes
VLAN	Port-based, Tag-based VLAN
Port Forwarding	Virtual Server/ Computer, DMZ Host, PPTP/L2TP/IPSec Pass-through
Routing	Static, Dynamic: RIP1/RIP2, OSPF, BGP
Virtual COM	RFC2217, TCP Client, TCP Server, UDP
VPN	IPSec, OpenVPN, PPTP, L2TP, GRE
Firewall	SPI Firewall with Stealth Mode, IPS
Access Control	Packet Filter, URL Blocking, MAC Filter, Content Filter, Application Filter
Cellular Toolkit	SMS, Data Usage, SIM PIN, USSD, Network Scan
Event Handling	Managing / Notifying Events; DI, DO, SMS, Modbus, Syslog, SNMP Trap, Email Alert, Reboot
Authentication	Captive Portal, MAC Authentication
Configure & Management	Web, Telnet CLI, Command Script, TR-069, SNMPv3 standard & AMIT MIB
System Operation	MMI, System Information, System Time / Log, Backup & Restore, Reboot & Reset
FTP	FTP Server, User Account
Diagnostic	Packet Analyzer, Diagnostic Tools
Location Track	GNSS, Track Viewer
Dimension (LxWxH)	160x125x47mm (w/o mounting kit) 200x125x 50mm (with mounting kit)
Temperature <sup>3</sup>	Operational: -30°C ~ 60°C (-0T1B0 only); -30°C ~ 70°C Storage: -40°C ~ 85°C
Humidity	10% ~ 95% (non-condensing)

## Device Interface:

(1) Front View



(2) Rear View



(Note: Interfaces may vary depending on models.)

## Accessory List:

(1) Package Contents

- 1\*Device, 2/4\*Cellular Antenna (3dBi), 2\*WiFi Antenna (5dBi),
- 1\*Terminal Block (8-pin for DC Power, IGN, DI/DO, RS232),
- 2\*Mounting Brackets, 1\*Screw Bag,
- 1\*RJ45 Cable, 1\*CD (User Manual);
- 1\*active GPS Antenna (except -0T1B0)

## Certification:

(1) Approval / Certificates  
CE, E-Mark

(2) Standards & Regulation

EMI: EN 55032: 2015 +AC: 2016 Class B  
EN 61000-3-2:2014, 61000-3-3:2013  
CISPR 25 Radiated Emission (ECE R10)

EMS: EN 55024:2010+A1:2015  
EN 61000-6-2:2005+AC:2005  
IEC 61000-4-2(ESD) Level 4  
IEC 61000-4-3(RS) Level 4  
IEC 61000-4-4(EFT) Level 4  
IEC 61000-4-5 (Surge) Level 3  
IEC 61000-4-6 (CS) Level 3  
IEC 61000-4-8 (PFMF) Level 4  
ISO 7637-2(2004) (ECE R10)

Radio: EN 301 489-1/-17/-24/52, EN 300 328 V2.1.1  
EN 301893 V1.8.1, EN 50385

Safety: EN 60950-1

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VHG87B Datasheet, V1.7c

# Wireless Networking Solutions

Wireless and wired communication links have been AMIT's core competency for twenty years. We offer expertise in embedded systems with routing functionality and protection from cyber security threats. AMIT solutions enable connectivity for full range of IoT and M2M applications. The reliability of AMIT's products and services has been confirmed in deployments worldwide. Comprehensive product portfolio is designed to implement smart projects, and to operate in extreme environments of industrial and business applications.



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