CANect® CL-T16 Family

4G LTE CELLULAR AND GNSS MODULE

CANect® offers the best in telematics (M2M) and Internet of Things (IoT) capabilities. The CL-T16 family offers 4G LTE cellular connectivity options while including common software configurations and convenient on module connection capabilities such as Ethernet and USB 2.0 host/client. Similar to the CL-T17, the CL-T16 uniquely provides 3rd party support of LTE SIM cards allowing you to choose your own carrier for connectivity needs. This cellular connected module is a capable product with telecaching and variety of features that makes telematics and M2M applications possible. The CANect CL-T16 module is for those who want reliable data at all times from their fleet.

HED's CANect Telematics portfolio lets you create a complete telematics strategy that suits your customer base, all customized to your application. CANect is a full portfolio of hardware, software, and web portal tools that give you complete control of your assets in the field.

Functionality:

- View live vehicle data for trouble-shooting issues
- Provide prognostics by viewing and trending historical data
- Set vehicle parameters with a smart device
- Over the Air Programming (OTAP)
  - Push new firmware and configurations remotely
  - Determine current software versions
  - Update digital manuals and documentation
- Pushing vehicle data to secure servers via cell connectivity

Features:

- 4G LTE Cat1 cellular connectivity
- Data logging capability - 4GB memory standard; upgradeable to 32 GB
- External Cellular, and GPS antenna (not included)
- 2 CAN ports - J1939 and CANopen capable
- Real Time Clock
- 3-axis accelerometer
- GNSS—GPS, Glonass, BeiDou, Galileo
- Ethrenet - 10/100BaseT
- USB 2.0 Host/Client

Figure 1: CL-T16-108-10

Figure 2: CL-T16-108-10 left and right view

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Processor and Memory	
Processor	Freescale i.MX6UL - 696MHz
Architecture	ARM Microprocessor
Operating System	Linux
Memory (Ram, Flash[1])	128MB DDR3 4GB eMMC

[1] Flash memory options up to 32GB

Environmental	
IP Rating	IP67
Temperature	-40°C to 70°C -Operating [1] -40°C to 85°C -Storage
RoHS Compliant	Yes

[1] Temperature range subject to use case. HED assumes heat dissipation based on general market software and solution use cases.

GNSS Interface	
Reciever	Concurrent reception of up to 3 GNSS. 72-channel, GPS L1C/A, SBAS L1C/A, QZSS L1C/A, QZSS L1 SAIF, GLONASS L1OF, BeiDou B1I, Galileo E1B/C
Horizontal Accuracy (Position)	2.5 m (GPS&GLONASS, GPS), 4.0 m (GLONASS), 3.0 m (Beiduo)
Max Navigation Update Rate	10 Hz (GPS&GLONASS), 18 Hz (GPS, GLONASS, Beiduo)
Time-To-First-Fix (Cold)	26 s (GPS&GLONASS), 29 s (GPS), 30 s (GLONASS), 34 s (Beiduo),
Time-To-First-Fix (Hot)	1 s (GPS&GLONASS, GPS, GLONASS, Beiduo)
Sensitivity (Reacquisition)	-160 dBm (GPS&GLONASS), -159 dBm (GPS), -156 dBm (GLONASS), -155 dBm (Beiduo)
Sensitivity (Cold)	-148 dBm (GPS&GLONASS), -147 dBm (GPS), -145 dBm (GLONASS), -143 dBm (Beiduo)
Sensitivity (Hot)	-157 dBm (GPS&GLONASS), -156 dBm (GPS), -155 dBm (GLONASS, Beiduo)
Supported Antennas	External SMA Connector
Supported Signals	Speed Over Ground (SOG) Course Over Ground (COG) Latitude, Longitude, Altitude and Number of Satellites

Accelerometer/Inclinometer	
Function	3-Axis
Sensitivity Range	2/4/8G
Accuracy[1]	Inclinometer ±3°

[1] The inclinometer is accurate to ±3° when the accelerometer is configured to 2G under the operating temeratures defined in this document

Disclaimer: Enabling the Sensitivity Range feature requires custom development

Cellular Communication (By part #)	
CL-T16-108-10	
4G LTE	Bands 12 (700MHz), 5 (850MHz), 4 (1700MHz), & 2 (1900MHz) 3GPP Release 9 Cat 1: up to 10.3 Mb/s downlink, up to 5.2 Mb/s uplink
3G UMTS/HSPA	850/900/1900/2100 MHz 3GPP Release 9 HSD-PA cat 8: up to 7.2 Mb/s downlink HSUPA cat 6: up to 5.76Mbps uplink
2G GSM/GPRS/ EDGE	850/900/1800/1900 Mhz 3GPP Release 9,
GPRS	Class 33, CS1-4 – up to 107 kb/s downlink, up to 85.6 kb/s uplink
EDGE	Class 33, MCS1-9 – up to 296 kb/s downlink, up to 236.8 kb/s uplink
SMS	MT/MO PDU
Protocols	TCP/IP, UDP/IP, HTTP/FTP/SSL
Supported Antenna	External SMA Connector
Certifications	Aeris, AT&T, PTCRB (Carrier) US (FCC CFR 47 part 15) Canada (IC RSS)
CL-T16-208-10	
4G LTE	Bands 13 (700 MHz) & 4 (1700MHz) 3GPP Release 9 Cat 1: up to 10.3 Mb/s downlink, up to 5.2Mb2 Mb/s uplink
SMS	MT/MO PDU
Protocols	TCP/IP, UDP/IP, HTTP/FTP/SSL
Supported Antenna	External SMA Connector
Certifications	Verizon (Carrier) US (FCC CFR 47 part 15) Canada (IC RSS)
CL-T16-308-10	
4G LTE	Bands 20 (800MHz), 3 (1800MHz), & 7 (2600MHz) 3GPP Release 9 Cat 1: up to 10.3 Mb/s downlink, up to 5.2 Mb/s uplink
2G GSM/GPRS/ EDGE	900/1800Mhz 3GPP Release 9,
GPRS	Class 33, CS1-4 – up to 107 kb/s downlink, up to 85.6 kb/s uplink
EDGE	Class 33, MCS1-9 – up to 296 kb/s downlink, up to 236.8 kb/s uplink
SMS	MT/MO PDU
Protocols	TCP/IP, UDP/IP, HTTP/FTP/SSL
Supported Antenna	External SMA Connector
Certifications	Aeris, AT&T, Oceania (RCM); Europe (CE)

Ethernet Port	
Standard	IEEE 802.3, 10/100BaseT
Data Rate	10/100M bits per second

CL-T16 Module Pinout

Main Connector - (DT16-18SA-K004)	
Pin	Function
1	Ethernet TXN
2	Ethernet TXP
3	Ethernet RXN
4	Ethernet RXP
5	Battery(-) Module
6	Unswitched Battery(+) Module
7	CAN1-H
8	CAN1-L
9	CAN2-H
10	CAN2-L
11	Keyswitch(+)
12	Input STB/STG/VTD (0-5.66V)
13	USB Power
14	USB DM (D-)
15	USB DP (D+)
16	USB ID (OTG)
17	USB Ground
18	150 mA Sinking Output

Disclaimer: Pins 12 and 18 require custom development for the pin features described above

WARNING OTG Pin

When using the OTG (On the Go) pin (16) you should always use the USB ground pin (pin 17). Never hook it up to the battery ground pin (pin 5) as this will damage the harness.

Software Development

Developers can choose between the CANect Software Development Kit (SDK) or the CANect Composer® solution development utility. Each piece of software is free to customers and requires an NDA.

Antenna Installation

The antennas need to be installed with their respective SMA connector for proper compliance. The SMA connections need to be torqued from 7 to 10 in-lb or the Metric equivalent range of 0.8 to 1.1 N-m

Mounting

The mounting holes in the mounting tabs are compatible with a #10 type bolt (either 10-32 or 10-24). Mounting bolts should be torqued between 25 and 35 in-lb. The Metric equivalent to the #10 is a M5 bolt with an installation torque range of 2.8 to 4N-m.

Universal Serial Bus (USB) [4]

Interface	Single, 5 pin USB with OTG
USB Standard	2.0 with OTG Support
Data Transfer Rate	480M bits per second
Host	Yes [1],[2]
Client	Yes [3]

[1] Application Note: USB Host is software configurable to respond to the OTG pin being asserted

[2] Application Note: USB Host can support flash drives, user inputs, and various other devices

[3] Application Note: USB Client is a common method to reprogram or serial terminal into the device

[4] USB is intended for module configuration and programming

Electrical Characteristics

Operating Voltage	6.5VDC to 32VDC
Max Amperage Draw	3.17Amps (6.5VDC); 1.5Amps (13.8VDC); 0.74Amps (28VDC): 0.64Amps (32VDC)
Average Amperage Draw	1.92Amps (6.5VDC); 0.91Amps (13.8VDC); 0.45Amps (28VDC); 0.39Amps (32VDC)
Average Shutdown Amperage Draw	185µA (6.5VDC); 248µA (13.8VDC); 490µA (28VDC); 571µA (32VDC)

Controller Area Network (CAN) [1]

Number of Buses	2
Standard	ISO 11898
Data Rate (configurable by Bus)	20K, 50K, 100K, 125K, 250K, 500K, 1M bits/sec
Identifier Support	11 and 29 bit
Data Length	0 to 8 byte(s)

1. Application Note The device is capable of supporting universal CAN protocols

RF Connections (left to right)

SMA	GPS (Left)
SMA	Cellular Receive Diversity (Left Center)
SMA	Cellular Main Antenna (Right Center)

Other Connectors

18 Socket, Key A - Deutsch P/N	DT16-18SA-K004 or equivalent
Socket 16-20awg – Deutsch P/N	0462-201-16141 or equivalent
Seal Plug – Deutsch P/N	114017

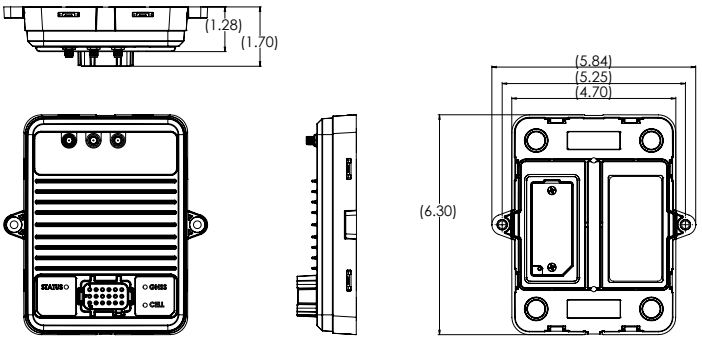
ISO Standards/Certifications	
EMC	
Radiated Emissions	CISPR 25 Method, 30-1000MHz, ISO 13766 Limits, FCC CFR 47 Part 15B, Class A; ICES-003
Conducted Immunity	ISO 11452-4 (BCI), 20-200MHz at 100mA
Radiated immunity	ISO 11452-2 (ALSE), 200MHz-2000MHz 1kHz AM 80% at 200V/m; 800-2000MHz PM at 200V/m EN 61000-4-3, 1000-6000MHz 1KHz AM 80% at 3V/m; 80-920MHz spot-check 1kHz AM 80% at 3V/m
ESD [1]	ISO 10605 powered, 8kV contact, 15kV air; unpowered 15kV contact, 25kV air
Climate	
Storage Temperature [1]	-40C 4 hours; +85C 4 hours
Combined Environment [1]	-40C to +70C, 98% RH, 24-hour cycle, 10 days
Air-to-Air Thermal Shock [1]	-40C to +85C, 5 min dwell, 200 cycles
Ingress Protetion [1]	ISO 20653, IP6K7
Solar Radiation [2]	SAE J2527, Xenon Weatherometer, 210 hours
Salt Spary [2]	IEC 60068-2-52, Test Kb, Severity Level 3
Chemical Resistance [2]	Brake Fluid, Gasoline, Diesel Fuel, Isopropyl Alcohol, Denatured Alcohol, Paint Thinner, Mineral Spirits, Battery Acid, Engine Oil, Hydraulic Oil, Zip Strip, Bleach, Simple Green All-Purpose Cleaner, Ammonia

[1] Testing performed on CL-T0x products
[2] Testing performed on other product using same materials

Mechanical	
Mechanical Shock	50G, 11ms, half-sine pulse, 100 cycles in each of 6 directions
Random Vibration [1]	27.8 m/s2 RMS (~2.84 Grms), 10-2000 Hz, 8 hours in each of 3 axes
Bench Handling Shock [1]	1000mm height, drop in all 3 axes in both directions

Electrical	
Reverse Polarity	-32V
Jump Start / Over-Voltage	+36V
Short-Circuit	All I/O protected against shorts to vehicle battery or ground, except USB
Transient Immunity	ISO 7637-2, Pulse 1, 2a, 2b, 3a, 3b
Starting Profile	ISO 16750-2, Section 4.6.3
Load Dump	ISO 16750-2, Section 4.6.4, 40V clamped

Figure 3: Mechanical Diagram



	i.MX6UL	4GB eMMc	128MB RAM	CAN bus (es)	USB (Host/Client)	Wi-Fi (Host/Client)	LTE CAT1	2G/3G Cell (GSM)	GPS	Antennas	Ethernet	RTC	Accelerometer	Security IC	HED Branded	Customer Branded Opt.
CL-T16-108-10	x	x	x	2	x		ATT (B2/5/12/17)	3G/2G GSM	x	Ext.	x	x	x	x		x
CL-T16-108-10-HED-01	x	x	x	2	x		ATT (B2/5/12/17)	3G/2G GSM	x	Ext.	x	x	x	x	x	
CL-T16-208-10	x	x	x	2	x		VZW - US (B4/13)		x	Ext.	x	x	x	x		x
CL-T16-208-10-HED-01	x	x	x	2	x		VZW - US (B4/13)		x	Ext.	x	x	x	x	x	
CL-T16-308-10	x	x	x	2	X		Europe (B3/7/20)	2G GSM	x	Ext.	x	x	x	x		x
CL-T16-308-10-HED-0	x	x	x	2	X		Europe (B3/7/20)	2G GSM	x	Ext.	x	x	x	x	x	

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