

# TCG-4

## TCG data modules

### KEY FEATURES

- Form fit function compatible to TC3G and TC1
- 4G/LTE connectivity
- Embedded Linux for fast and easy development of applications
- Compatible with STWs cloud solutions and all other common cloud platforms
- Compliance with standards for the automotive, agricultural and construction machinery industries.

### TECHNICAL DATA

- i.MX 6UL @700 MHz 32 GB Flash / 1GB RAM
- 4G/3G/2G communication
- GPS / GLONASS / BEIDOU / GALILEO
- WiFi 2.4/5 GHz / Bluetooth 4.2
- 4 CAN interfaces / 4 Multi-Input / 2 Digital Out
- Ethernet 10/100-Base-Tx / BroadR-Reach) / USB 2.0

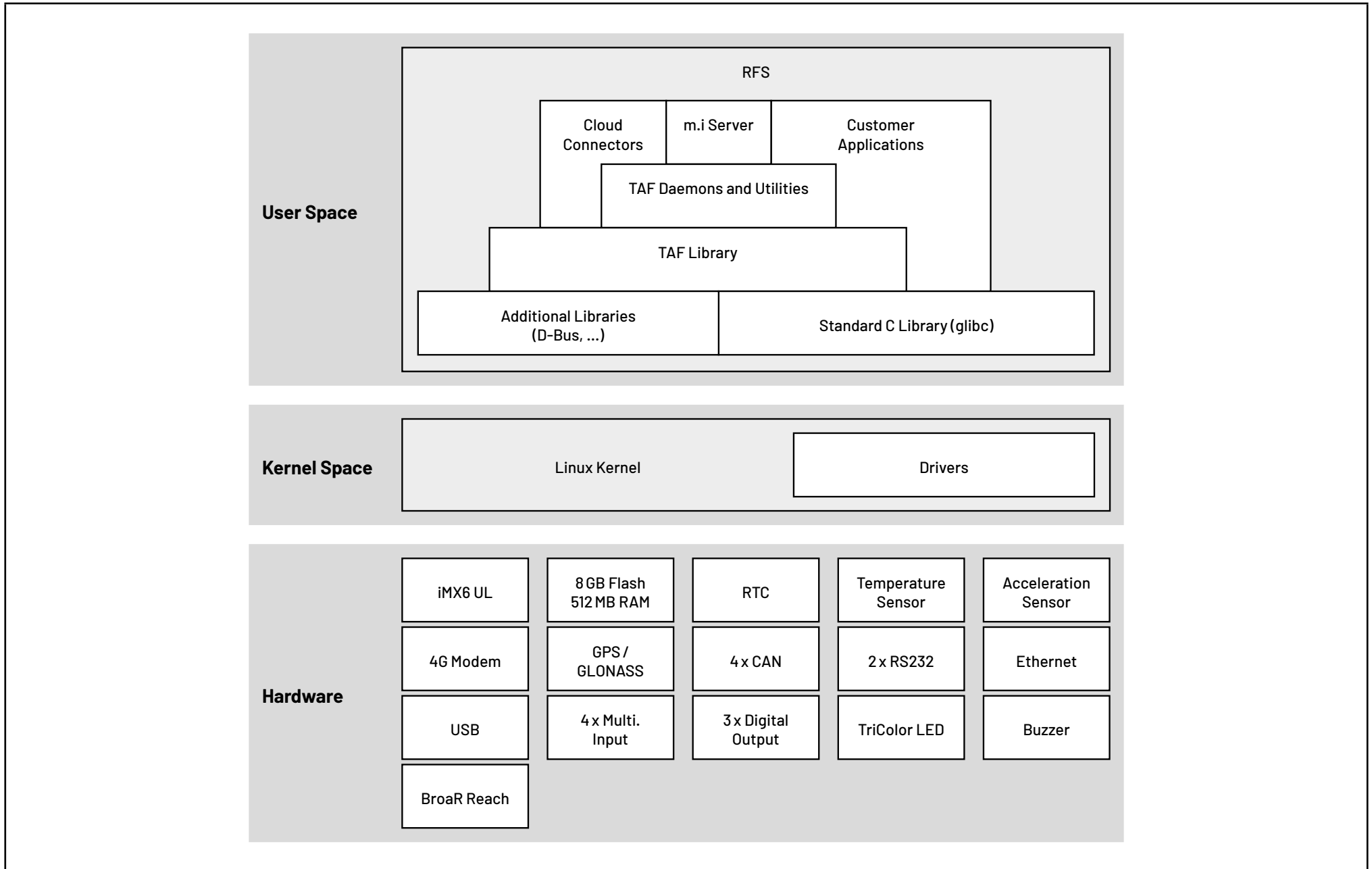
### ACCESSORIES

- Mating connector set
- Development box with power supply
- Breakout cable for development purposes
- Antennas for wireless communication interfaces (for the TCG-4 version with external antennas)
- Software development kit under [stw-digitalization.com](http://stw-digitalization.com) pw: connectivity

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# SYSTEM ARCHITECTURE



# VARIANTS

Type	Modem Region	Antenna	Flash	Ordering Number	Ordering Number with M.i	RAM	4G Modem	GNSS	WiFi / BT
TCG-4 Telematic	global	external	8 GB	86878	92648	512 MB	.	.	.
				94139	94138	512 MB	.	.	.
				92444	92268	512 MB	.	.	.
				92445	92269	512 MB	.	.	.
		32 GB	93629	100301	512 MB	.	.	.	
			94091	Request	1024 MB	.	.	.	
		internal	8 GB	102210	Request	512 MB	.	.	.

## Additional Options

TCG-4	CAN 3 galvanic decoupled
	2nd serial interface can be RS485
	USB 2.0 OTG
	BroadR-Reach
	Customer specific Software and Configuration

## TECHNICAL DATA

### Software Data

Type	Features
Operation System	Embedded Linux
Buildroot Version	2021.02
Linux Kernel Version	5.4
Programming Language	C/C++, Shell script, other programming languages available on request
Teleservice Application Framework	A set of daemons and utilities providing connectivity and telematic functionalities

### Development Package

Type	Features
Documentation	Contains all necessary user documentation and help files for product usage.
Libraries	Contains STW's library frameworks, which provide beneficial functionality for faster development.
Toolchain	Contains the GCC Linaro Toolchain that allows users to build own application within Linux and Windows.
OPKG Packages	Contains all of STW provided OPK packages. Possibility of individual updates.
Board Support Package	Contains all components, which are necessary to boot up the system. Included components are the bootloader u-boot, the Linux kernel, the device tree for hardware abstraction and the root file system.
BSP Updater	Application for updating the board support package (BSP) of the device under Linux and Windows.

### System

Type	Features
Power supply	9 ... 32 V DC
Current consumption	Standby < 1 mA (@12 V) Sleep (SMS wakeup) ~ 35 mA (@12 V) Normal operations (typ.) 230 mA (@12 V)
Dimensions (L x W x H)	174 x 117.4 x 36 mm (without SMA connectors) 183 x 117.4 x 36 mm (with SMA connectors)
Connector	Tyco, 3 rows, female 29pin

### Processor and Memory

Type	Features
Processor	32 bit controller, NXP i.MX 6UltraLite, 696 MHz
RAM	up to 1 GB DDR3L-SDRAM
EEPROM	128 kB (64 kB free to use)
eMMC Memory	up to 32 GB (4 GB reserved for system)
RTC	Real time clock with internal gold cap for maintaining time for approx. 7 days and system wakeup function

### Miscellaneous

Type	Features
Watchdog	Configurable watchdog
Temperature sensor	Measuring range -40 °C to +85 °C / -40 °F ... +122 °F
Acceleration sensor	Measuring ranges +/-2g or +/-4g or +/-8g or +/-16g (configurable) in 3 axis (X, Y, Z) System wakeup function
Signaling	<ul style="list-style-type: none"> <li>Buzzer for audible device information</li> <li>1 x multicolor LED</li> <li>5 x green LEDs alongside the antenna connectors indicating the status of the wireless interfaces</li> </ul>

## TECHNICAL DATA

### Communication Interfaces

Type	Quantity	Configuration
4G modem	1	<p>Option 1) Global internal antenna:</p> <ul style="list-style-type: none"> <li>4G: LTE Cat. 1 (FDD: B1/2/3/4/5/7/8/12/13/18/19/20/26/28) (TDD: B38/B39/B40/B41)</li> <li>3G: B1/2/4/5/6/8/19</li> <li>2G: B2/3/5/8</li> </ul> <p>Option 2) Global external antenna:</p> <ul style="list-style-type: none"> <li>4G: LTE Cat. 4 (FDD: B1/2/3/4/5/7/8/12/13/18/19/20/26/28) (TDD: B38/B39/B40/B41)</li> <li>3G: B1/2/4/5/6/8/19</li> <li>2G: B2/3/5/8</li> </ul> <p>SIM card options:</p> <ul style="list-style-type: none"> <li>2FF Mini SIM card, can be accessed through a clip at the side of the housing.</li> <li>Alternative: MFF2 eSIM card, can be placed on the PCB (optional)</li> <li>SMS - system wakeup function (optional)</li> </ul>
GNSS	1	<p>Standard) Dedicated GNSS receiver:</p> <ul style="list-style-type: none"> <li>Simultaneous GPS / GLONASS with max. 10 Hz update rate, BeiDou, Galileo, SBAS, QZSS</li> <li>5V bias power supply for external, active GNSS antenna, current limited</li> </ul> <p>Option) GNSS receiver integrated in cellular modem:</p> <ul style="list-style-type: none"> <li>GPS, GLONASS, BeiDou, Galileo, QZSS, 1Hz update rate</li> </ul>

### Communication Interfaces

Type	Quantity	Configuration
WiFi / Bluetooth	1	<p>IEEE 802.11 b/g/n - 2.4 GHz 64-, 128-, 256-bit WEP, WPA and WPA2.0 TKIP or AES keys Power Class 1 (+18 dBm)</p> <p>Bluetooth 4.2 (Bluetooth Smart ready: Bluetooth Classic &amp; BLE) Power Class 1.5 (+11.7 dBm)</p>
CAN	4	<p>CAN 2.0B, high / low-speed, max. 1Mbps, listen only mode possible</p> <p>CAN1 wakeup function (optional)</p> <p>CAN3 galvanic decoupled (optional)</p>
RS232	2	<p>Serial interface with programmable baud rate up to 230400 baud</p> <p>2nd serial interface can be RS485 (optional)</p>
Ethernet	1	ETH 1 - 10/100-Base-Tx Half-/Full-Duplex
BroadR-Reach	1	ETH 2 - 100-Base-T1 (BroadR-Reach)
USB	1	<p>USB 2.0</p> <p>USB 2.0 OTG (optional)</p>

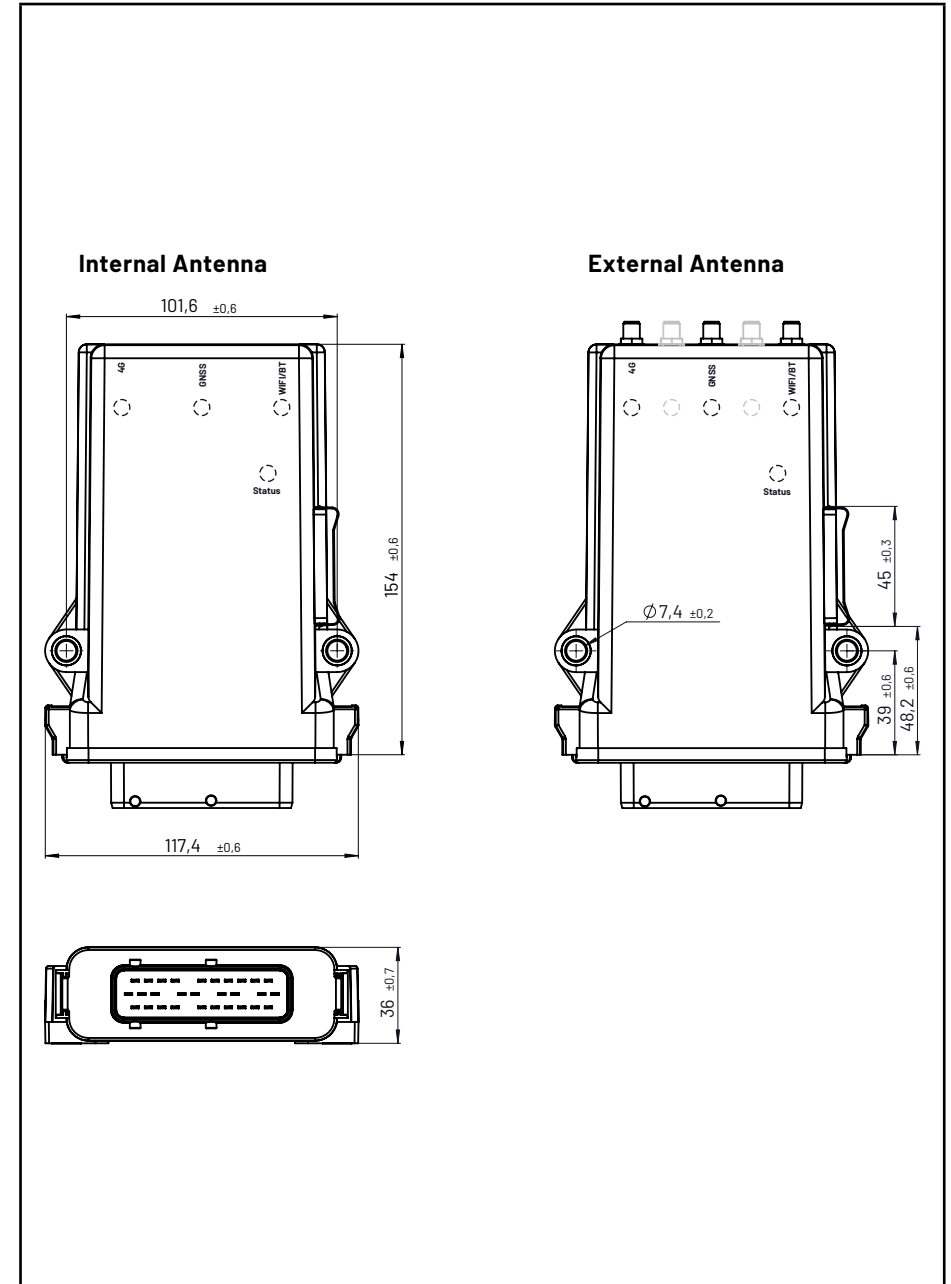
# TECHNICAL DATA

## In- / Outputs

### Type

Digital Input	4	Digital Input
Multifunction-Input	4	Analog Voltage (0...36 V) / Current Input (0...24 mA) - configurable by software;
		Digital Input
Digital Outputs	2 (3)	High side switch, max. 300 mA

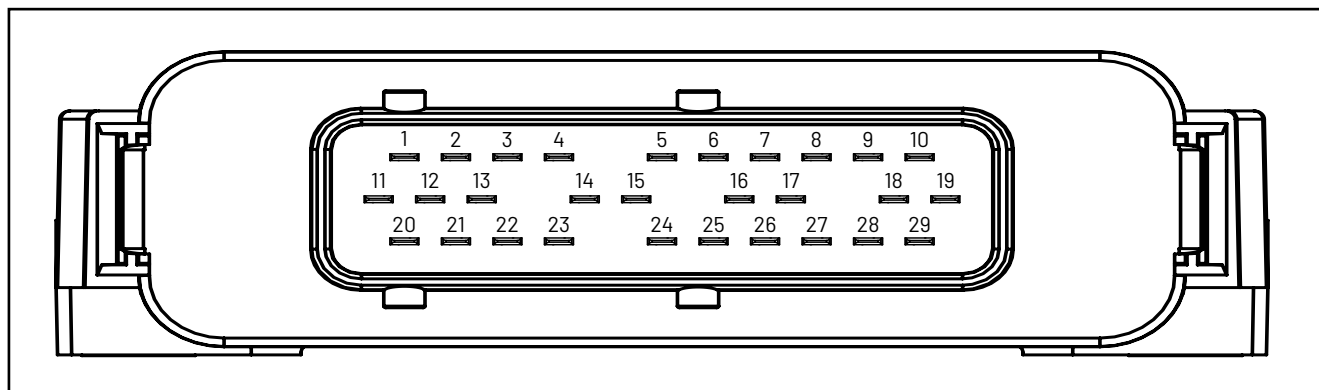
# TECHNICAL DRAWING



## PIN ASSIGNMENT TCG-4

### Pin assignment sorted by pin numbers

Pin	Description	Alternative Function
1	Multifunction Input 4	BroadR-Reach Minus
2	Multifunction Input 3	BroadR-Reach
3	RS232_2 RxD	
4	RS232_2 TxD	
5	Digital Output 2	GND for galvanic decoupled CAN 3
6	USB GND	USB on-the-go ID pin
7	Digital Output 1	
8	+UB Power supply (6-32VDC)	
9	GND	
10	Ignition pin / switched power line	
11	CAN3 Low	galvanic decoupled CAN3 Low
12	CAN3 High	galvanic decoupled CAN3 High
13	Multifunction Input 2	Digital Output 3 Ethernet Activation Line
14	CAN4 Low	
15	CAN4 High	
16	USB 5V	
17	Multifunction Input 1	
18	RS232 RxD	
19	RS232 TxD	
20	CAN1 Low	
21	CAN1 High	
22	CAN2 Low	
23	CAN2 High	



Pin	Description	Alternative Function
24	USB D-	
25	USB D+	
26	ETH Rx-	
27	ETH Rx+	
28	ETH Tx-	
29	ETH Tx+	

# QUALIFICATION

Regulatory body / Standard	Description	Remarks
CE conformity	Conformity is found in the User Manual	
KBA (Kraftfahrt-Bundesamt)	Compliant with the requirements of UN ECE Regulation No. 10	This approved device can be used on any vehicle type with the following restrictions: All vehicle types with a 12 V respectively 24 V electrical wiring and battery(-) at the body.
FCC	FCC 47 C.F.R. Part 15, Subpart B / C Module integration OET 65 (Human exposure)	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
ISED	Canada radio approval	
PTCRB		For the „External Antenna“-variant of the TCG-4 provide a minimum antenna cable length of 30cm For global variant only valid with two cellular antennas (4G / DIV)!
ACMA	Australia / New Zealand radio approval	
JATE / MIC	Japan radio approval	
RRA / KCC	South Korea radio approval	
ISO 16750	Road Vehicles – Environmental conditions and electrical testing for electrical and electronic equipment	CODE ISO 16750-C/E-Z(4.2.2)-C-H-D-Z(IP6k6/IP6k7/IP6k9k)
DIN EN 13309	Construction machinery – Electromagnetic compatibility of machines with internal power supply	
ISO 13766	Earth-moving machinery – Electromagnetic compatibility	
DIN EN ISO 14982	Agricultural and forestry machines – Electromagnetic compatibility	Compliance with this standard is only achieved in combination with an external load-dump module. The max. clamping voltage must not exceed 55 V!



# QUALIFICATION

## Environmental qualification

Standard	Test description	Parameter
ISO 20653	IP protection class	IP6Kx, IPx7 IPx6, IPx9K (only for "Internal antenna"-variant)
DIN EN 60068-2-6	Vibration (sinusoidal)	10 Hz to 2 kHz, 1 oct./min., 5 g, 10 cycles, bidirectional
DIN EN 60068-2-27	Shock	50 g, 11 ms, half sinus, 3 shocks/axis
DIN EN 60068-2-27	Bump	30 g, 6 ms, half sinus, 1000 shocks/axis
ISO 16750-4	Tests at constant temperature - high temperature - storage	48 hours at 85 °C
ISO 16750-4	Tests at constant temperature - low temperature - storage	24 hours at -40 °C

## Countries with certification for 4G usage

Australia	Czech Republic	Greece	Latvia	New Zealand	Slovenia
Austria	Denmark	Hungary	Liechtenstein	Norway	South Korea
Belgium	Estonia	Iceland	Lithuania	Poland	Spain
Bulgaria	Finland	Ireland	Luxembourg	Portugal	Sweden
Croatia	France	Italy	Malta	Romania	Switzerland
Cyprus	Germany	Japan	Netherlands	Slovakia	USA (depending on mobile service provider)