THALES

Cinterion® LTE Modem Card mPLAS9-W

Hardware Interface Description

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0 Document History

Preceding document: "Cinterion® mPLAS9-W Hardware Interface Description" Version **02.001a**
New document: "Cinterion® mPLAS9-W Hardware Interface Description" Version **02.001b**

Chapter	What is new
-	New document layout

Preceding document: "Cinterion® mPLAS9-W Hardware Interface Description" Version **02.001**
New document: "Cinterion® mPLAS9-W Hardware Interface Description" Version **02.001a**

Chapter	What is new
2.1, 2.3	Change width from 32mm to 32.6mm

New document: "LTE Modem Card mPLAS9-W Hardware Interface Description" Version **02.001**
Previous document: "LTE Modem Card mPLAS9-W Hardware Interface Description" Version **02.000**

Chapter	What is new
2	Revised Figure 1 and Figure 2
5.5	Revised Table 9 and power consumptions added

New document: "LTE Modem Card mPLAS9-W Hardware Interface Description" Version 02.000

Chapter	What is new
--	Initial document setup.

1 Introduction

This document[1] describes the hardware of the Cinterion® LTE Modem Card mPLAS9-W product. It helps you quickly retrieve interface specifications, electrical and mechanical details, and information on the requirements to be considered for integrating further components.

1.1 Ordering Information

Table 1: LTE Modem Card mPLAS9-W

Product	Module	Ordering information
LTE Modem Card mPLAS9-W	PLAS9-W	Order number: L30960-N3260-A300

1.2 Related Documents

[1] PLAS9-W AT Command Set Specification
[2] PLAS9-W Hardware Interface Specification
[3] PLAS9-W Release Note
[4] PCI Express® Mini Card Electromechanical Specification, Revision 2.0, April 21, 2012

1.3 Terms and Abbreviations

Abbreviation	Description
3FF	Third Form Factor
3GPP	3rd Generation Partnership Project
CE	Conformité Européene (European Conformity)
CSD	Circuit Switched Data
CTM	Cellular Text Telephone Modem
ETS	European Telecommunication Standard
FCC	Federal Communications Commission (U.S.)
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
HSPA	High Speed Packet Access
HSDPA	High Speed Download Packet Access
I/O	Input/Output

1. The document is effective only if listed in the appropriate Release Notes as part of the technical documentation delivered with your Thales product.

Abbreviation	Description
IC	Integrated Circuit
IEC	International Electrotechnical Commission
ISO	International Standards Organization
ITU	International Telecommunications Union
LED	Light Emitting Diode
Mbps	Mbits per second
MFF2	M2M UICC Form Factor 2
MMI	Man Machine Interface
MNO	Mobile Network Operator
MO	Mobile Originated
MT	Mobile Terminated
PBCCH	Packet Switched Broadcast Control Channel
PCI	Peripheral Component Interconnect (personal computer bus)
PDU	Protocol Data Unit
PIN	Personal Identification Number
PPP	Point-to-point protocol
R&TTE	Radio and Telecommunication Terminal Equipment
RF	Radio Frequency
RLP	Radio Link Protocol
RoHS	Restriction of the use of certain hazardous substances in electrical and electronic equipment.
SAR	Specific Absorption Rate
SIM	Subscriber Identification Module
SMS	Short Message Service
TTY	Text Telephone
UICC	Universal Integrated Circuit Card
UMTS	Universal Mobile Telecommunications System
USB	Universal Serial Bus
USSD	Unstructured Supplementary Service Data

2 Product Concept

Figure 1 and Figure 2 show the top and bottom view of LTE Modem Card mPLAS9-W.

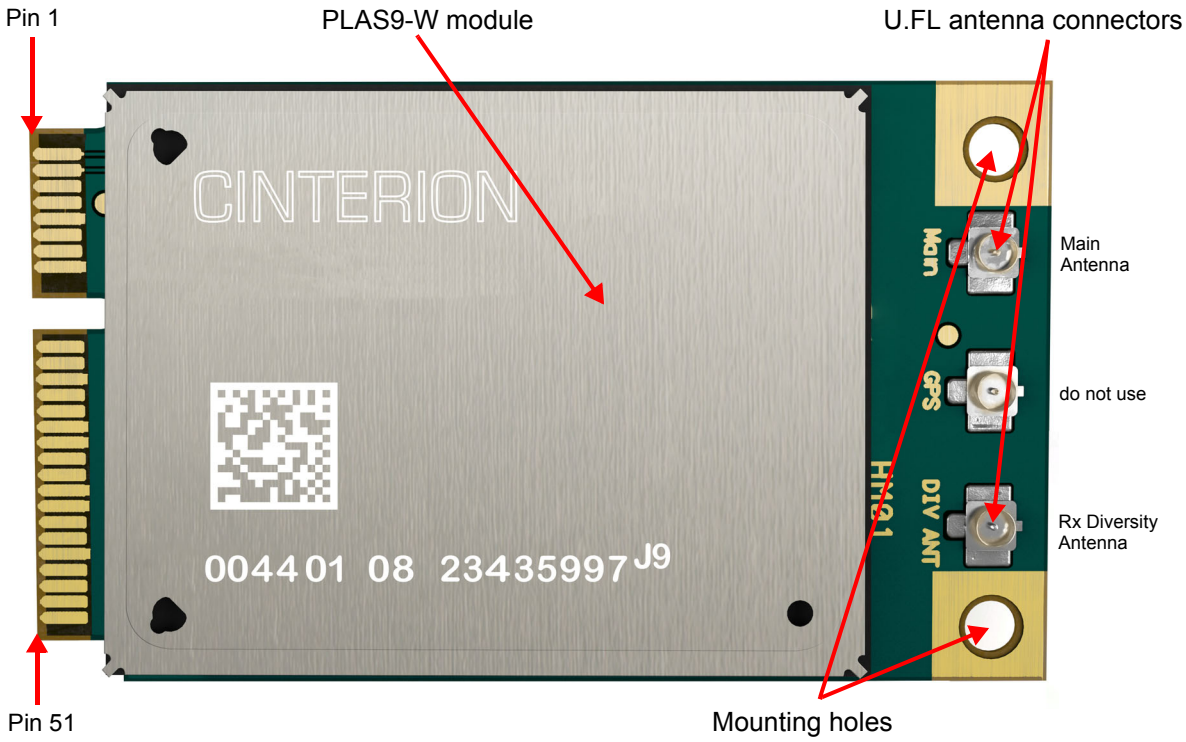

Figure 1: LTE Modem Card mPLAS9-W top view

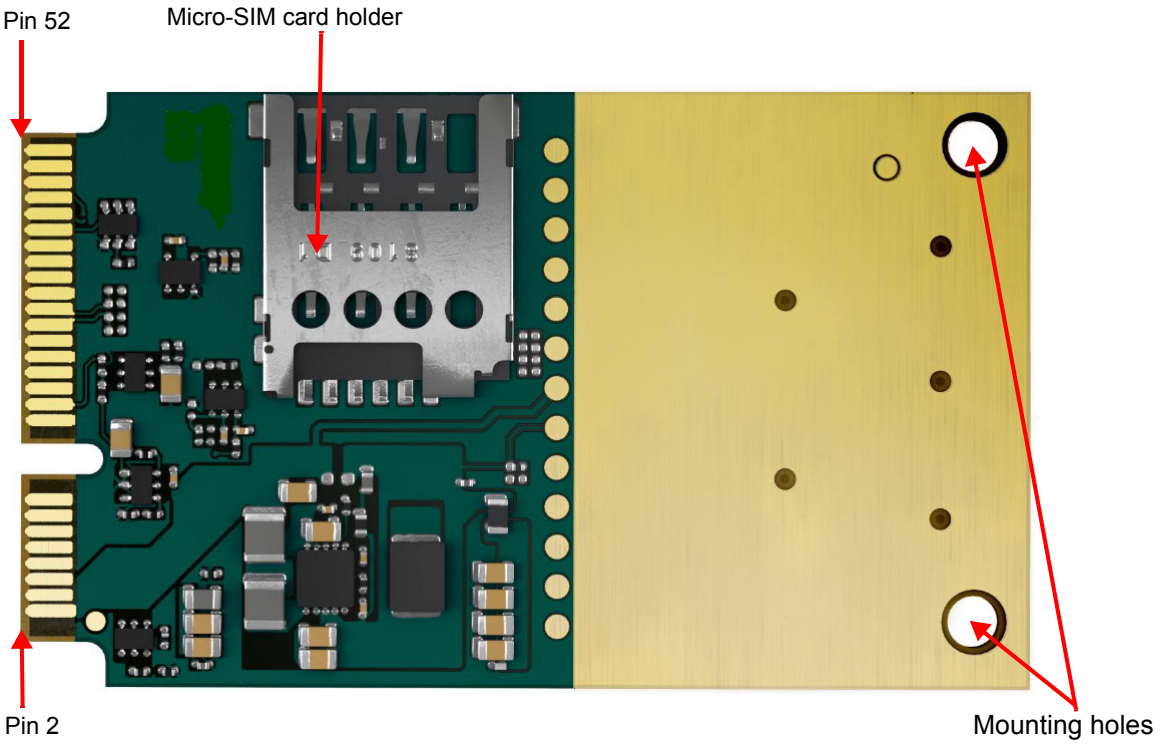

Figure 2: LTE Modem Card mPLAS9-W bottom view

2.1 Key Features at a Glance

Feature	Implementation
General	
Incorporates PLAS9-W module	The PLAS9-W module handles all signal and data processing within the LTE Modem Card mPLAS9-W. Internal software runs the complete GSM/ UMTS/LTE protocol stack.
Frequency bands	GSM/GPRS/EDGE: Dual band, 900/1800MHz UMTS/HSPA+: Five band, 850 (BdV, Bd VI) / 900 (BdVIII) / 1800 (BdIII) / 2100MHz (BdI) LTE (FDD): Eleven band, 700 (Bd28A, Bd28B) / 800 (Bd20) / 850 (Bd5, Bd18, Bd19, Bd26) / 900 (Bd8) / 1800 (Bd3) / 2100 (Bd1) / 2600MHz (Bd7) LTE (TDD): Quad band, 1900 (Bd39) / 2300 (Bd40) / 2600MHz (Bd38, Bd41) TD-SCDMA: Dual band, 1900 (Bd39) / 2000MHz (Bd34)
GSM class	Small MS
Output power (according to Release 99, V5)	Class 4 (+33dBm ±2dB) for EGSM900 Class 1 (+30dBm ±2dB) for GSM1800 Class E2 (+27dBm ± 3dB) for GSM 900 8-PSK Class E2 (+26dBm +3 /-4dB) for GSM 1800 8-PSK Class 3 (+24dBm +1/-3dB) for UMTS 2100, WCDMA FDD BdI Class 3 (+24dBm +1/-3dB) for UMTS 1800, WCDMA FDD BdIII Class 3 (+24dBm +1/-3dB) for UMTS 900, WCDMA FDD BdVIII Class 3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdV Class 3 (+24dBm +1/-3dB) for UMTS 850, WCDMA FDD BdVI
Output power (according to Release 8)	LTE (FDD): Class 3 (+23dBm +-2dB) for LTE 2600, LTE FDD Bd7 Class 3 (+23dBm +-2dB) for LTE 2100, LTE FDD Bd1 Class 3 (+23dBm +-2dB) for LTE 1800, LTE FDD Bd3 Class 3 (+23dBm +-2dB) for LTE 900, LTE FDD Bd8 Class 3 (+23dBm +-2dB) for LTE 850, LTE FDD Bd5 Class 3 (+23dBm +-2dB) for LTE 850, LTE FDD Bd18 Class 3 (+23dBm +-2dB) for LTE 850, LTE FDD Bd19 Class 3 (+23dBm +-2dB) for LTE 850, LTE FDD Bd26 Class 3 (+23dBm +-2dB) for LTE 800, LTE FDD Bd20 Class 3 (+23dBm +-2dB) for LTE 700, LTE FDD Bd28A, Bd28B LTE (TDD): Class 3 (+23dBm +-2dB) for LTE 2600, LTE TDD Bd41 Class 3 (+23dBm +-2dB) for LTE 2600, LTE TDD Bd38 Class 3 (+23dBm +-2dB) for LTE 2300, LTE TDD Bd40 Class 3 (+23dBm +-2dB) for LTE 2000, LTE TDD Bd39
Power supply	3.0V to 3.6V (typical +3.3V)
Operating temperature (PLAS9-W module board temperature)	Normal operation: -30°C to +85°C Extended operation: -40°C to +95°C
Physical	Dimensions: 51mm x 32.6mm x 5.3mm Weight: approx. 8g

Feature	Implementation
RoHS	All hardware components fully compliant with EU RoHS Directive
LTE features	
3GPP Release 10	Downlink carrier aggregation (CA) to increase bandwidth, and thereby increase bitrate: • Maximum aggregated bandwidth: 40MHz • Maximum number of component carriers: 2 • Inter-band FDD, non-contiguous • Intra-band FDD, contiguous, non-contiguous • Intra-band TDD, contiguous, non-contiguous • Supported inter-band CA configurations: CA_1A-5A (with bandwidth combination set 0 and 1) CA_1A-8A (with bandwidth combination set 0, 1 and 2) CA_1A-18A (with bandwidth combination set 0 and 1) CA_1A-19A (with bandwidth combination set 0) CA_1A-26A (with bandwidth combination set 0 and 1) CA_3A-5A (with bandwidth combination set 0, 1 and 2) CA_3A-8A (with bandwidth combination set 0, 1 and 2) CA_3A-19A (with bandwidth combination set 0) CA_3A-20A (with bandwidth combination set 0 and 1) CA_3A-26A (with bandwidth combination set 0 and 1) CA_3A-28A (with bandwidth combination set 0) CA_5A-7A (with bandwidth combination set 0) CA_7A-20A (with bandwidth combination set 0 and 1) CA_7A-28A (with bandwidth combination set 0 and 1) • Supported intra-band CA configurations: CA_1C (with bandwidth combination set 0) CA_3C (with bandwidth combination set 0) CA_7C (with bandwidth combination set 0 and 1) CA_38C (with bandwidth combination set 0) CA_40C (with bandwidth combination set 0 and 1) CA_41C (with bandwidth combination set 0 and 1) CA_3A-3A (with bandwidth combination set 0) CA_7A-7A (with bandwidth combination set 0) CA_41A-41A (with bandwidth combination set 0 and 1) CAT 6 supported DL 300Mbps, UL 50Mbps 2x2 MIMO in DL direction
HSPA features	
3GPP Release 9	UE CAT. 14, 24 DC-HSPA+ – DL 42Mbps HSUPA – UL 5.76Mbps Compressed mode (CM) supported according to 3GPP TS25.212
UMTS features	
3GPP Release 9	PS data rate – 384 kbps DL / 384 kbps UL

Feature	Implementation
GSM/GPRS features	
Data transfer	GPRS: • Multislot Class 12 • Mobile Station Class B • Coding Scheme 1 – 4 EGPRS: • Multislot Class 12 • EDGE E2 power class for 8 PSK • Downlink coding schemes – CS 1-4, MCS 1-9 • Uplink coding schemes – CS 1-4, MCS 1-9 • SRB loopback and test mode B • 8-bit, 11-bit RACH • 1 phase/2 phase access procedures • Link adaptation and IR • NACC, extended UL TBF • Mobile Station Class B
SMS	Point-to-point MT and MO, Cell broadcast, Text and PDU mode
Software	
AT commands	Hayes 3GPP TS 27.007, TS 27.005, Thales M2M
SIM Application Toolkit	SAT Release 99
Interfaces	
Application connector	PCI Express® Mini Card system connector (52 pin)
UICC interface	Supported SIM/USIM cards: 3V, 1.8V External SIM card reader has to be connected via application connector. Micro-SIM card reader is provided with the LTE Modem Card mPLAS9-W, which is connected in parallel to the external SIM card reader. A second SIM/USIM interface is available at the application connector.
USB interface	USB 2.0 High Speed (480Mbit/s) device interface, Full Speed (12Mbit/s) compliant
Antenna interface	U.FL-R-SMT connectors for GSM/UMTS/LTE main antenna and UMTS/ LTE Diversity/MIMO antenna,
Power on/off, Reset	
Power on/off	Automatic switch-off in case of critical temperature and voltage conditions
Special features	
Phonebook	SIM and phone
TTY/CTM support	Integrated CTM modem

2.2 System Overview

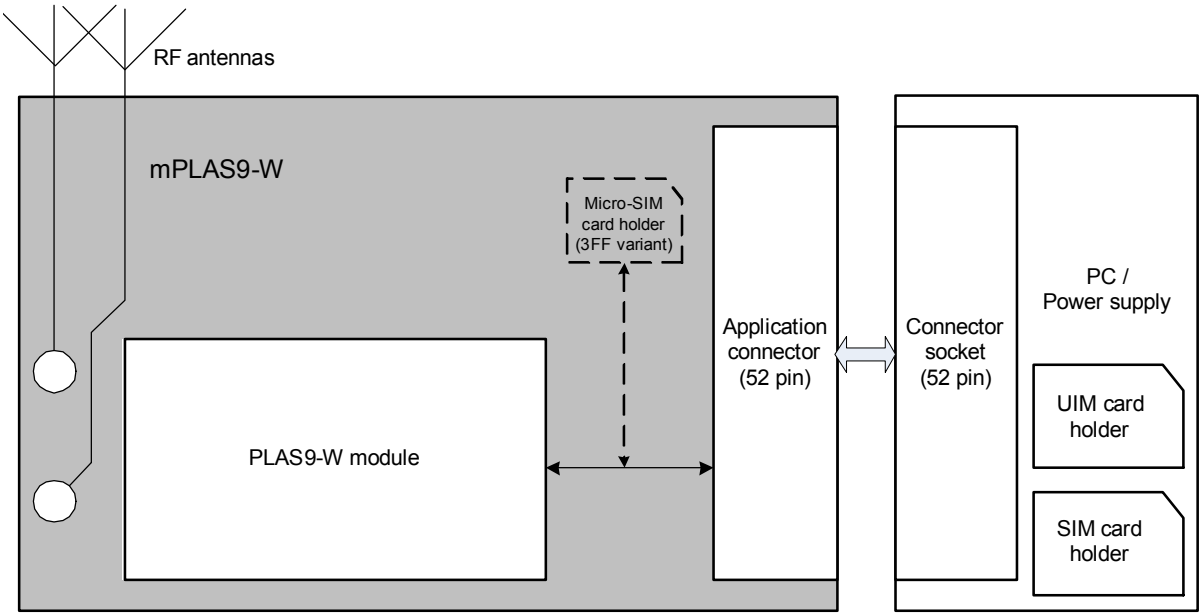

Figure 3: LTE Modem Card mPLAS9-W system overview

2.3 Mechanical Dimensions

The mechanical dimensions for PCI Express Mini Cards with a Full-Mini Card form factor are specified in [4] and shown in Figure 4. LTE Modem Card mPLAS9-W not fully complies with these values. The width (32.6mm±0.15mm) and hight (5.3mm) of LTE Modem Card mPLAS9-W are bigger as specified in [4].

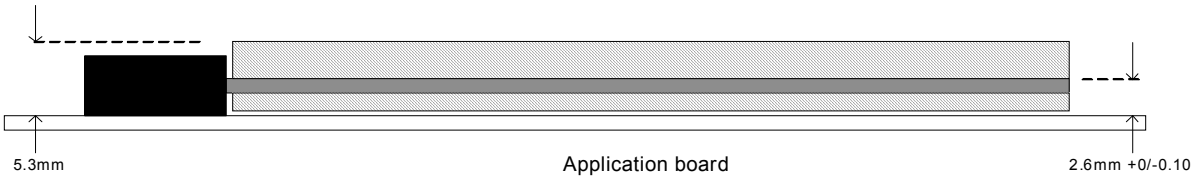

Figure 4: LTE Modem Card mPLAS9-W mechanical dimensions (height)

3 Application Connector Interface

3.1 Pin Assignments and Electrical Description

Table 2 matches the LTE Modem Card mPLAS9-W pin assignments at the 52-pin application connector to the pin assignments specified in [4]. Table 3 lists electrical characteristics of the assigned and available pins at the application connector interface.

Table 2: Pin assignments

Pin No.	LTE Modem Card mPLAS9-W pin name[1]	Comments	PIN Type
1	WAKE#	controlled by RING0 of the module	Output
2	3V3	Supply voltage range: 3.0V to 3.6V	Power
3	ANT_CTRL0	connected to GPIO1 of the module	Output
4	GND	Ground	Power
5	ANT_CTRL1	connected to GPIO2 of the module	I/O
6	nc	Not connected	
7	UIM_RESET	connected to CCRST2	Output
8	CCVCC	SIM/UICC supply voltage (UICC contact C1)	Power for SIM/UICC
9	GND	Ground	Power
10	CCIO	SIM/UICC input and output (UICC contact C7)	I/O
11	1V8	digital I/O reference voltage	Output
12	CCCLK	SIM/UICC clock (UICC contact C3)	Output
13	UIM_PWR	connected to CCVCC2 of the module	Power for UIM
14	CCRST	SIM/UICC reset (UICC contact C2)	Output
15	GND	Ground	Power
16	nc	Not connected	
17	UIM_CLK	connected to CCCLK2 of the module	Output
18	GND	Ground	Power
19	UIM_DATA	connected to CCIO2 of the module	I/O
20	W_DISABLE1#	controlling start-up of the module	Input
21	GND	Ground	Power
22	PERST#	connected to EMERG_OFF of the module	Input
23	nc	Not connected	
24	3V3	Supply voltage range: 3.0V to 3.6V	Power
25	nc	Not connected	
26	GND	Ground	Power
27	GND	Ground	Power
28	nc	Not connected	

Table 2: Pin assignments

Pin No.	LTE Modem Card mPLAS9-W pin name[1]	Comments	PIN Type
29	GND	Ground	Power
30	SMB_CLK	Not connected	
31	nc	Not connected	
32	SMB_DATA	Not connected	
33	nc	Not connected	
34	GND	Ground	Power
35	GND	Ground	Power
36	USB_D-	connected to USB_DN of the module	I/O
37	GND	Ground	Power
38	USB_D+	connected to USB_DP of the module	I/O
39	3V3	Supply voltage range: 3.0V to 3.6V	Power
40	GND	Ground	Power
41	3V3	Supply voltage range: 3.0V to 3.6V	Power
42	LED_WWAN#	reserved for future use, internal connected, do not connect	Output
43	GND	Ground	Power
44	LED_WLAN#	connected to GPIO3 of the module	Output
45	PCM1_CLK_MODULE	Not connected, reserved for future use (digital audio interface)	
46	LED_WPAN#	connected to GPIO4 of the module	Output
47	PCM1_OUT_MODULE	Not connected, reserved for future use (digital audio interface)	
48	nc	Not connected	
49	PCM1_IN_MODULE	Not connected, reserved for future use (digital audio interface)	
50	GND	Ground	Power
51	PCM1_FSC_MODULE	Not connected, reserved for future use (digital audio interface)	
52	3V3	Supply voltage range: 3.0V to 3.6V	Power

1. Connected lines (various): ; Power Supply: ; Ground lines (GND): ;
Not connected lines (nc): ; Do not connect, reserved for future use

Table 3: Electrical description of connector interface pins

Function	Pin name	IO	Signal form and level	Comment
Power supply	3V3	I	$V_I$max = 3.6V $V_I$norm = 3.3V $V_I$min = 3.0V during Tx burst on board	Lines of BATT+ and GND must be connected in parallel for supply purposes because higher peak currents may occur.
	GND		Ground	Application Ground
External supply voltage	1V8	O	$C_L$max = 1µF V_O = 1.80V +3% -5% $I_O$max = -50mA	1V8 may be used for application circuits. If unused keep line open. Test point recommended. The external digital logic must not cause any spikes or glitches on voltage 1V8. Do not exceed $I_O$max
Ignition	W_DISABLE1#	I	R_{PU} ≈ 100kΩ V_{IH}max = 3.6V V_{IH}min = 2.0V V_{IL}max = 0.8V	This signal disables the start-up of the module. It is required to drive this line low by an open drain or open collector driver connected to GND. Test point recommended.
Emergency off	PERST#	I	R_{PU} ≈ 40kΩ V_{OH}max = *1.8V* V_{IH}max = *2.1V* V_{IH}min = *1.17V* V_{IL}max = *630mV* ~~|___|~~ low impulse width up to 2200ms (as long as PWR_IND stays low typ. 346ms if firmware running properly)	This line must be driven low by an open drain or open collector driver connected to GND as long as the module turns off. If unused keep line open. Test point recommended.

Table 3: Electrical description of connector interface pins

Function	Pin name	IO	Signal form and level	Comment
3V SIM card interfaces (2x)	CCRST UIM_RESET	O	V_{OL}max = 0.4V at I = 2mA V_{OH}min = 2.36V at I = -2mA V_{OH}max = 3.01V	Maximum cable length or copper track should be not longer than 100mm to SIM card holder. UIM_DATA: External 10kΩ pull-up required If 2nd SIM interface not used, keep line open.
	CCIO UIM_DATA	I/O	CCIO: R_{PU} = 8.7..9.5kΩ to CCVCC UIM_DATA: R_{PU} = 65..200kΩ to UIM_PWR Additional external pull up 10k to UIM_PWR required V_{IL}max = 0.59V V_{IL}min = -0.3V V_{IH}min = 2.07V V_{IH}max = 3.25V V_{OL}max = 0.4V at I = 2mA V_{OH}min = 2.36V at I = -0.05mA V_{OH}max = 3.01V	
	CCCLK UIM_CLK	O	V_{OL}max = 0.4V at I = 2mA V_{OH}min = 2.36V at I = -2mA V_{OH}max = 3.01V	
	CCVCC UIM_PWR	O	$V_O$min = 2.85V $V_O$typ =2.95V $V_O$max = 3.01V $I_O$max = -50mA	
1.8V SIM card inter-face (2x)	CCRST UIM_RESET	O	V_{OL}max = 0.4V at I = 2mA V_{OH}min = 1.45V at I = -2mA V_{OH}max = 1.84V	Maximum cable length or copper track should be not longer than 100mm to SIM card holder. UIM_DATA: External 10kΩ pull-up required If 2nd SIM interface not used, keep line open.
	CCIO UIM_DATA	I/O	CCIO: R_{PU} = 8.7..9.5kΩ to CCVCC UIM_DATA: R_{PU} = 65..200kΩ to UIM_PWR Additional external pull up 10k to UIM_PWR required V_{IL}max = 0.36V V_{IL}min = -0.3V V_{IH}min = 1.30V V_{IH}max = 2.1V V_{OL}max = 0.4V at I = 2mA V_{OH}min = 1.45V at I = -0.05mA V_{OH}max = 1.84V	
	CCCLK UIM_CLK	O	V_{OL}max = 0.4V at I = 2mA V_{OH}min = 1.45V at I = -2mA V_{OH}max = 1.84V	
	CCVCC UIM_PWR	O	$V_O$min = 1.75V $V_O$typ = 1.80V $V_O$max = 1.84V $I_O$max = -50mA	
Host wakeup	WAKE#	O	V_{OL}max = 0.45V at I = 2mA	open collector output. If unused keep line open. Test point recom-mended.

Table 3: Electrical description of connector interface pins

Function	Pin name	IO	Signal form and level	Comment
USB	USB_D-	I/O	Full and High speed signal (differential) characteristics according USB 2.0 specification.	Test point recommended. USB High Speed mode operation requires a differential impedance of 90Ω.
	USB_D+	I/O		
GPIO interface	ANT_CTRL0 ANT_CTRL1 LED_WLAN# LED_WPAN	I/O	V_{IL}max = 0.63V V_{IH}min = 1.20V V_{IH}max = 2.1V I_{IHPD} = 27.5µA…97.5µA I_{ILPU} = -27.5µA…-97.5µA I_{High-Z} = max +-1µA V_{OL}max = 0.45V at I = 2mA V_{OH}min = 1.35V at I = -2mA V_{OH}max = 1.84V	ANT_CTRL0 has an internal pull-up resistor of 100kΩ. If unused keep lines open.

3.2 Characteristics

3.2.1 Power Supply and Ground

The LTE Modem Card mPLAS9-W uses the five 3V3 pins and 14 GND pins listed in Section 3.1.

3.2.2 USB Interface

The LTE Modem Card mPLAS9-W's USB interface (USB_D+, USB_D-) as part of the 52-pin application connector supports a USB 2.0 High Speed (480Mbit/s) device interface that is Full Speed (12Mbit/s) compliant. Because there is no separate voltage detection line available on the application connector, the LTE Modem Card mPLAS9-W reports as a self-powered device compliant with the "Universal Serial Bus Specification Revision 2.0"[1].

Via the USB interface it is possible to implement a Thales USB modem as well as six further Thales ports that provide an AT interface to the module. The appropriate modem and port configuration files (INF) can be downloaded from the Thales Extranet.

3.2.3 SIM/UICC Interface

The LTE Modem Card mPLAS9-W provides two SIM/UICC interfaces at the 52-pin application connector compliant to the ISO/IEC 7816-3 specification. The SIM interface is intended for 1.8V and 3V SIM cards in accordance with GSM 11.12 Phase 2.

The following table lists the pins available for both SIM/UICC interface.

Table 4: Signals of the SIM interface

Signal	Description
CCCLK UIM_CLK	Chipcard clock
CCVCC UIM_PWR	SIM supply voltage.
CCIO UIM_DATA	Serial data line, input and output.
CCRST UIM_RESET	Chipcard reset

Note: No guarantee can be given, nor any liability accepted, if loss of data is encountered after removing the SIM card during operation. Also, no guarantee can be given for properly initializing any SIM card that the user inserts after having removed the SIM card during operation. In this case, the LTE Modem Card mPLAS9-W must be restarted.

1. The specification is available for download on http://www.usb.org/developers/docs/

The total cable length between the PLAS9-X module pads soldered onto the LTE Modem Card mPLAS9-W and the pads of an external SIM card holder must not exceed 100mm in order to meet the specifications of 3GPP TS 51.010-1 and to satisfy the requirements of EMC compliance.

To avoid possible cross-talk from the CCCLK/UIM_CLK signal to the CCIO/UIM_DATA signal, be careful that both lines are not placed closely next to each other. A useful approach is using a GND line to shield the CCIO/UIM_DATA line from the CCCLK/UIM_CLK line.

LTE Modem Card mPLAS9-W provides a micro-SIM (3FF) card holder soldered directly onto the LTE Modem Card. It is possible to insert a micro-SIM card (3FF) into the holder on the LTE Modem Card mPLAS9-W. There is no need for a card holder in an external application. Simultaneous operation of an external and the onboard SIM/UICC is not possible.

3.2.4 W_DISABLE1# Signal

PLAS9-W will be automatically started, when the power supply 3V3 is present. If PLAS9-W is switched of by AT^SMSO, PLAS9-W will be started again. To disable the automatic start of the module at power up or after AT^SMSO, the W_DISABLE1# line has to be driven to low.

It is recommended to control this W_DISABLE1# line with an open collector transistor or an open drain field-effect transistor.

3.2.5 PERST# Signal

The PERST# signal is internally connected to the PLAS9-W of the LTE Modem Card mPLAS9-W. A low level for more than 10ms sets the PLAS9-W and with it all the other signal pads to their respective reset states usually reached right after LTE Modem Card mPLAS9-W startup. After releasing the PERST# line, i.e., with a change of the signal level from low to high, the module restarts.

It is recommended to control this PERST# line with an open collector transistor or an open drain field-effect transistor.

Caution: Use the PERST# signal only when, due to serious problems, the software is not responding for more than 5 seconds. Pulling the PERST# line causes the loss of all information stored in the volatile memory. Therefore, this procedure is intended only for use in case of emergency, e.g. if LTE Modem Card mPLAS9-W does not respond.

3.2.6 WAKE# Signal

The WAKE# signal is controlled by the RING0 signal of the module and signals to the application incoming calls, incoming SMS and URCs (see [1] for configuration details).

4 Antenna Interface

The LTE Modem Card mPLAS9-W GSM/UMTS/LTE antenna interface comprises a GSM/UMTS/LTE main antenna as well as a UMTS/LTE Rx diversity/MIMO antenna to improve signal reliability and quality[1]. Therefore the LTE Modem Card mPLAS9-W has two U.FL-R-SMT antenna connectors (see Figure 1).
The interface has an impedance of 50Ω. LTE Modem Card mPLAS9-W is capable of sustaining a total mismatch at the antenna interface without any damage, even when transmitting at maximum RF power.

The external antennas must be matched properly to achieve best performance regarding radiated power, modulation accuracy and harmonic suppression. Matching networks are not included on the LTE Modem Card mPLAS9-W PCB and should be placed in the host application, if the antenna does not have an impedance of 50Ω.

Regarding the return loss LTE Modem Card mPLAS9-W provides the following values in the active band:

Table 5: Return loss in the active band

State of module	Return loss of module	Recommended return loss of application
Receive	≥ 8dB	≥ 12dB
Transmit	not applicable	≥ 12dB
Idle	≤ 5dB	not applicable[1]

1. Return loss of application (transmit) must be better than 6dB.

4.1 Antenna Interface Specification

Measurement conditions: T_{amb}= 25°C, V_{3V3} = 3.3V.

Table 6: RF Antenna Interface GSM/UMTS/LTE

Parameter	Conditions	Min.	Typical	Max.	Unit
LTE connectivity[1]	Band 1, 3, 5, 7, 8, 18, 19, 20, 26, 28A, 28B, 38, 39, 40, 41				
Receiver Input Sensitivity @ ARP[2] (ch. bandwidth 5MHz)	LTE 2100 Band 1	-100	-103		dBm
	LTE 1800 Band 3	-97	-103		dBm
	LTE 850 Band 5	-98	-104		dBm
	LTE 2600 Band 7	-98	-102		dBm
	LTE 900 Band 8	-97	-103		dBm
	LTE 850 Band 18	-98	-103		dBm
	LTE 850 Band 19	-98	-103		dBm

1. By delivery default the UMTS/LTE Rx diversity/MIMO antenna is configured as available for the module since its usage is mandatory for LTE. Please refer to [1] for details on how to configure antenna settings.

Table 6: RF Antenna Interface GSM/UMTS/LTE

Parameter	Conditions	Min.	Typical	Max.	Unit
	LTE 800 Band 20	-97	-103		dBm
	LTE 850 Band 26	-97	-103		dBm
	LTE 700 Band 28	-97	-103		dBm
	LTE 700 Band 28A	-98,5	-103		dBm
	LTE 700 Band 28B	-98,5	-102		dBm
	LTE 2600 Band 38	-100	-101		dBm
	LTE 2000 Band 39	-100	-103		dBm
	LTE 2300 Band 40	-100	-102		dBm
	LTE 2600 Band 41	-98	-101		dBm
RF Power @ ARP[2] with 50Ω Load	LTE 2100 Band 1	+21	+23	+25	dBm
	LTE 1800 Band 3	+21	+23	+25	dBm
	LTE 850 Band 5	+21	+23	+25	dBm
	LTE 2600 Band 7	+21	+23	+25	dBm
	LTE 900 Band 8	+21	+23	+25	dBm
	LTE 850 Band 18	+21	+23	+25	dBm
	LTE 850 Band 19	+21	+23	+25	dBm
	LTE 800 Band 20	+21	+23	+25	dBm
	LTE 850 Band 26	+21	+23	+25	dBm
	LTE 700 Band 28	+21	+23	+25	dBm
	LTE 700 Band 28A	+21	+23	+25	dBm
	LTE 700 Band 28B	+21	+23	+25	dBm
	LTE 2600 Band 38	+21	+23	+25	dBm
	LTE 2000 Band 39	+21	+23	+25	dBm
	LTE 2300 Band 40	+21	+23	+25	dBm
	LTE 2600 Band 41	+21	+23	+25	dBm
UMTS/HSPA connectivity[3]	Band I, III, V, VI, VIII				
Receiver Input Sensitivity @ ARP	UMTS 2100 Band I	-106.7	-110		dBm
	UMTS 1800 Band III	-103.7	-110		dBm
	UMTS 900 Band VIII	-103.7	-111		dBm
	UMTS 850 Band V	-104.7	-110		dBm
	UMTS 850 Band VI	-106.7	-110		dBm
RF Power @ ARP[2] with 50Ω Load	UMTS 2100 Band I	+21	+24	+25	dBm
	UMTS 1800 Band III	+21	+24	+25	dBm

Table 6: RF Antenna Interface GSM/UMTS/LTE

Parameter		Conditions	Min.	Typical	Max.	Unit
		UMTS 900 Band VIII	+21	+24	+25	dBm
		UMTS 850 Band V	+21	+24	+25	dBm
		UMTS 850 Band VI	+21	+24	+25	dBm
GPRS coding schemes		Class 12, CS1 to CS4				
EGPRS		Class 12, MCS1 to MCS9				
GSM Class		Small MS				
Static Receiver input Sensitivity @ ARP		E-GSM 900	-102	-110		dBm
		GSM 1800	-102	-109		dBm
RF Power @ ARP[2] with 50Ω Load GSM		E-GSM 900		33		dBm
		GSM 1800		30		dBm
RF Power @ ARP[2] with 50Ω Load (**ROPR=4**, i.e., no reduction)	GPRS, 1 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 1 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 2 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 2 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 3 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 3 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 4 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 4 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm

Table 6: RF Antenna Interface GSM/UMTS/LTE

Parameter		Conditions	Min.	Typical	Max.	Unit
RF Power @ ARP[2] with 50Ω Load (**ROPR=5**)	GPRS, 1 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 1 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 2 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 2 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 3 TX	E-GSM 900		32.2		dBm
		GSM 1800		29.2		dBm
	EDGE, 3 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 4 TX	E-GSM 900		31		dBm
		GSM 1800		28		dBm
	EDGE, 4 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
RF Power @ ARP[2] with 50Ω Load (**ROPR=6**)	GPRS, 1 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 1 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 2 TX	E-GSM 900		31		dBm
		GSM 1800		28		dBm
	EDGE, 2 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 3 TX	E-GSM 900		30.2		dBm
		GSM 1800		27.2		dBm
	EDGE, 3 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 4 TX	E-GSM 900		29		dBm
		GSM 1800		26		dBm
	EDGE, 4 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm

Table 6: RF Antenna Interface GSM/UMTS/LTE

Parameter		Conditions	Min.	Typical	Max.	Unit
RF Power @ ARP[2] with 50Ω Load (**ROPR=7**)	GPRS, 1 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 1 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 2 TX	E-GSM 900		30		dBm
		GSM 1800		27		dBm
	EDGE, 2 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 3 TX	E-GSM 900		28.2		dBm
		GSM 1800		25.2		dBm
	EDGE, 3 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 4 TX	E-GSM 900		27		dBm
		GSM 1800		24		dBm
	EDGE, 4 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
RF Power @ ARP[2] with 50Ω Load (**ROPR=8**, i.e., max. reduction)	GPRS, 1 TX	E-GSM 900		33		dBm
		GSM 1800		30		dBm
	EDGE, 1 TX	E-GSM 900		27		dBm
		GSM 1800		26		dBm
	GPRS, 2 TX	E-GSM 900		30		dBm
		GSM 1800		27		dBm
	EDGE, 2 TX	E-GSM 900		24		dBm
		GSM 1800		23		dBm
	GPRS, 3 TX	E-GSM 900		28.2		dBm
		GSM 1800		25.2		dBm
	EDGE, 3 TX	E-GSM 900		22.2		dBm
		GSM 1800		21.2		dBm
	GPRS, 4 TX	E-GSM 900		27		dBm
		GSM 1800		24		dBm
	EDGE, 4 TX	E-GSM 900		21		dBm
		GSM 1800		20		dBm

1. Applies also to UMTS/LTE Rx diversity/MIMO antenna.
2. ARP (Antenna Reference Point) refers to the LTE Modem Card mPLAS9-W‘s U.FL antenna connector.

3. ARP (Antenna Reference Point) refers to the LTE Modem Card mPLAS9-W‘s U.FL antenna connector.

5 Operation

5.1 Operating Modes

The table below briefly summarizes the various operating modes available for the LTE Modem Card mPLAS9-W and referred to throughout the document.

Table 7: Overview of operating modes

Mode	Function	
	GSM / GPRS / UMTS / HSPA / LTE IDLE	no data transfer in progress.
	GPRS DATA	GPRS data transfer in progress. Power consumption depends on network settings (e.g. power control level), uplink / downlink data rates and GPRS configuration (e.g. used multislot settings).
	EGPRS DATA	EGPRS data transfer in progress. Power consumption depends on network settings (e.g. power control level), uplink / downlink data rates and EGPRS configuration (e.g. used multislot settings).
	UMTS DATA	UMTS data transfer in progress. Power consumption depends on network settings (e.g. TPC Pattern) and data transfer rate.
	HSPA DATA	HSPA data transfer in progress. Power consumption depends on network settings (e.g. TPC Pattern) and data transfer rate.
	LTE DATA	LTE data transfer in progress. Power consumption depends on network settings (e.g. TPC Pattern) and data transfer rate.
Power Down	Normal shutdown after sending the AT^SMSO command. Software is not active. Interfaces are not accessible. Operating voltage (connected to 3V3) remains applied. Only a voltage regulator is active for powering the RTC, as long as operating voltage applied at 3V3 does not drop below approx. 1.4V.	
Airplane mode	Airplane mode shuts down the radio part of the module, causes the module to log off from the GSM/GPRS network and disables all AT commands whose execution requires a radio connection. Airplane mode can be controlled by AT command (see [1]).	

5.2 Power Up/Power Down Scenarios

In general, be sure not to turn on the LTE Modem Card mPLAS9-W while it is beyond the safety limits of voltage and temperature stated in Section 5.4 and Section 5.5.
LTE Modem Card mPLAS9-W will switch off after having detected these inappropriate conditions. In extreme cases this can cause permanent damage to the LTE Modem Card mPLAS9-W.

5.2.1 Turn LTE Modem Card mPLAS9-W on

The LTE Modem Card mPLAS9-W is turned on by connecting the power supply lines (3V3) of application connector to an external power supply source, e.g., by plugging the LTE Modem Card mPLAS9-W into the appropriate card slot of an external application. For electrical characteristics of the 3V3 lines see Section 3.2.1.
W_DISABLE1# signal goes high when LTE modem card is powered.

A dual inverter schmitt trigger & OC transistor circuitry will keep IGT signal of PLAS9-W low for the required minimum time of 100ms to startup the LTE modem card.

The automatic start-up can be disabled by the signal W_DISABLE1# driving low.

5.2.2 Reset/Restart LTE Modem Card mPLAS9-W

The LTE Modem Card mPLAS9-W can be reseted by driving the PERST# line of the application connector low for more than 10ms. For more information on the PERST# line see Section 3.2.5.

5.2.3 Turn LTE Modem Card mPLAS9-W off

The LTE Modem Card mPLAS9-W can be turned off by disconnecting the power supply lines (3V3), e.g., by unplugging the LTE Modem Card from its socket.

The LTE Modem Card mPLAS9-W can be switched of by AT^SMSO too, but to prevent automatic start-up again, the signal W_DISBALE1# has to be driven LOW.

Note: Before disconnecting the power supply lines, make sure that the LTE Modem Card mPLAS9-W is in a safe condition, i.e., that there are no data transfers or other communications going on. Volatile data may be lost.

5.3 Automatic thermal shutdown

An on-board NTC measures the temperature of the built-in Java module. If over- or undertemperature is detected on the module, LTE Modem Card mPLAS9-W automatically shuts down to avoid thermal damage to the system. Table 8 specifies the ambient temperature threshold for the LTE Modem Card mPLAS9-W.

On automatic shutdown procedure LTE Modem Card mPLAS9-W logs off from the network and the software enters a secure state avoiding loss of data.

Note: The LTE Modem Card mPLAS9-W will start immediately after thermal shutdown as long as the W_DISABLE#_1 is not driven low.

Alert messages transmitted before the LTE Modem Card mPLAS9-W switch off are implemented as Unsolicited Result codes (URCs). For details see the description of AT^SCTM command provided in [1].

5.4 Operating Temperatures

Table 8: Temperature characteristics

Parameter	Min	Typical	Max	Unit
Normal operation[1]	-30		+85	°C
Extended operation[1, 2]	-40 to -30		+85 to +90	°C
Automatic thermal shutdown[1, 3]	<-40		>+90	°C
Thermal resistance (R_{th})[4] 2G operation (with P_{th} = 1.1W) 3G operation (with P_{th} = 2.6W)		 18 18		K/W

1. Board temperature.
2. Extended operation allows normal mode speech calls or data transmission for limited time until automatic thermal shutdown takes effect. Within the extended temperature range (outside the normal operating temperature range) the specified electrical characteristics may be in- or decreased.
3. Due to temperature measurement uncertainty, a tolerance of ±3°C on these switching thresholds may occur.
4. Thermal resistance (R_{th}) of the LTE Modem Card mPLAS9-W at the highest possible thermal power (P_{th}) dissipation, i.e., at the worst possible network conditions. Measured in still air with an air gap of at least 100mm between the LTE Modem Card mPLAS9-W and other objects.

Note: Within the specified operating temperature ranges the board temperature may vary to a great extent depending on operating mode, used frequency band, radio output power and current supply voltage. Note also the differences and dependencies that usually exist between board (PCB) temperature of the Java module and its ambient temperature.

5.5 Power Supply Ratings

Table 9 lists selected power supply ratings at various conditions.

Table 9: Current consumption ratings

	Description	Conditions		Min	Typ	Max	Unit
3V3	Supply Voltage	Voltage must stay within the min/max values, including voltage drop, ripple, spikes		3.0	3.3	3.6	V
I_{BATT+} [1]	Average GSM / GPRS supply current	GPRS Data transfer GSM900; PCL=5; 4Tx/ 1Rx	ROPR=4 (no reduction)		1310		mA
		EDGE Data transfer GSM900; PCL=5; 4Tx/ 1Rx	ROPR=4 (no reduction)		661		mA
		GPRS Data transfer GSM1800; PCL=0; 4Tx/ 1Rx	ROPR=4 (no reduction)		709		mA
		EDGE Data transfer GSM1800; PCL=0; 4Tx/ 1Rx	ROPR=4 (no reduction)		503		mA
	Average UMTS supply current Data transfers measured @maximum Pout						
		UMTS Data transfer Band III			824		mA
		HSDPA Data transfer Band III			794		mA
	Average LTE supply current (FDD)[2] Data transfers measured @maximum Pout						
		LTE Data transfer Band 1			744		mA

1. With an impedance of Z_{LOAD}=50Ω at the antenna pads. Measured at 25°C and 3.3V
2. Communication tester settings:
   - Channel Bandwidth: 5MHz
   - Number of Resource Blocks: 25 (DL), 1 (UL)
   - Modulation: QPSK

5.6 Electrostatic Discharge

The LTE Modem Card mPLAS9-W is not protected against Electrostatic Discharge (ESD) in general. Consequently, it is subject to ESD handling precautions that typically apply to ESD sensitive components. Proper ESD handling and packaging procedures must be applied throughout the processing, handling and operation of any application that incorporates a LTE Modem Card mPLAS9-W module.

A special internal ESD protection has been implemented for the SIM interface as well as for the antenna interface. The other lines on the application connector are only protected according to the ANSI/ESDA/JEDEC JS-001-2011 requirements.

LTE Modem Card mPLAS9-W has been tested according to the following standards. Electrostatic values can be gathered from the following table.

Table 10: Electrostatic values

Specification/Requirements	Contact discharge	Air discharge
ANSI/ESDA/JEDEC JS-001-2011		
application connector signal (except SIM lines)	± 1kV	n.a.
ETSI EN 301 489-1/7		
Antenna interface	± 4kV	± 8kV
SIM interface lines	± 4kV	± 8kV

Note: The values may vary with the individual application design. For example, it matters whether or not the application platform is grounded over external devices like a computer or other equipment.

5.7 Reliability Characteristics

The test conditions stated below are an extract of the complete test specifications.

Table 11: Summary of reliability test conditions

Type of test	Conditions	Standard
Vibration	Frequency range: 10-20Hz; acceleration: 5g Frequency range: 20-500Hz; acceleration: 20g Duration: 20h per axis; 3 axes	DIN IEC 60068-2-6[1]
Shock half-sinus	Acceleration: 500g Shock duration: 1ms 1 shock per axis 6 positions (± x, y and z)	DIN IEC 60068-2-27
Dry heat	Temperature: +70 ±2°C Test duration: 16h Humidity in the test chamber: < 50%	EN 60068-2-2 Bb ETS 300 019-2-7
Temperature change (shock)	Low temperature: -40°C ±2°C High temperature: +85°C ±2°C Changeover time: < 30s (dual chamber system) Test duration: 1h Number of repetitions: 100	DIN IEC 60068-2-14 Na ETS 300 019-2-7
Damp heat cyclic	High temperature: +55°C ±2°C Low temperature: +25°C ±2°C Humidity: 93% ±3% Number of repetitions: 6 Test duration: 12h + 12h	DIN IEC 60068-2-30 Db ETS 300 019-2-5
Cold (constant exposure)	Temperature: -40 ±2°C Test duration: 16h	DIN IEC 60068-2-1

1. For reliability tests in the frequency range 20-500Hz the Standard's acceleration reference value was increased to 20g.

5.8 Approval Information

The PLAS9-W module as part of the LTE Modem Card mPLAS9-W has been type approved. The Thales reference setup submitted to type approve the module consisted of the following components: PLAS9-W, PC as MMI, Power Supply.

Approval of mobile computing platforms containing LTE Modem Card mPLAS9-W can therefore be based on the existing module approval together with this document as appropriate technical documentation.

5.8.1 Directives and Standards

The PLAS9-W module as part of the LTE Modem Card mPLAS9-W is designed to comply with the directives and standards listed below.

Table 12: Directives

2014/53/EU	Directive of the European Parliament and of the council of 16 April 2014 on the harmonization of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/05/EC. The product is labeled with the CE conformity mark.
2002/95/EC (RoHS 1) 2011/65/EC (RoHS 2)	Directive of the European Parliament and of the Council of 27 January 2003 (and revised on 8 June 2011) on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)

Table 13: Standards of European type approval

3GPP TS 51.010-1	Digital cellular telecommunications system (Release 7); Mobile Station (MS) conformance specification;
ETSI EN 301 511 V12.5.1	Global System for Mobile communications (GSM); Mobile Stations (MS) equipment; Harmonized Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU
GCF-CC V3.68.0	Global Certification Forum - Certification Criteria
Draft ETSI EN 301 489-01 V2.2.0	Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonized Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU
Draft ETSI EN 301 489-52 V1.1.0	Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 52: Specific conditions for Cellular Communication Mobile and portable (UE) radio and ancillary equipment; Harmonized Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU
ETSI EN 301 908-01 V11.1.1	IMT cellular networks; Harmonized Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 1: Introduction and common requirements
ETSI EN 301 908-02 V11.1.2	IMT cellular networks; Harmonized Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 2: CDMA Direct Spread (UTRA FDD) User Equipment (UE)

Table 13: Standards of European type approval

ETSI EN 301 908-13 V11.1.2	IMT cellular networks; Harmonized Standard covering the essential requirements of article 3.2 of the Directive 2014/53/EU; Part 13: Evolved Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE)
EN 60950-1:2006/ A11:2009+A1:2010+A12:2011+A2:2013	Safety of information technology equipment

Table 14: Requirements of quality

IEC 60068	Environmental testing
DIN EN 60529	IP codes

Table 15: Standards of the Ministry of Information Industry of the People's Republic of China

SJ/T 11363-2006	"Requirements for Concentration Limits for Certain Hazardous Substances in Electronic Information Products" (2006-06).
SJ/T 11364-2006	"Marking for Control of Pollution Caused by Electronic Information Products" (2006-06). According to the "Chinese Administration on the Control of Pollution caused by Electronic Information Products" (ACPEIP) the EPUP, i.e., Environmental Protection Use Period, of this product is 20 years as per the symbol shown here, unless otherwise marked. The EPUP is valid only as long as the product is operated within the operating limits described in the Thales Hardware Interface Description. Please see Table 16 for an overview of toxic or hazardous substances or elements that might be contained in product parts in concentrations above the limits defined by SJ/T 11363-2006.

Table 16: Toxic or hazardous substances or elements with defined concentration limits

部件名称 Name of the part	有毒有害物质或元素 Hazardous substances					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
金属部件 (Metal Parts)	O	O	O	O	O	O
电路模块 (Circuit Modules)	X	O	O	O	O	O
电缆及电缆组件 (Cables and Cable Assemblies)	O	O	O	O	O	O
塑料和聚合物部件 (Plastic and Polymeric parts)	O	O	O	O	O	O

O:
表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11363-2006 标准规定的限量要求以下。
Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement in SJ/T11363-2006.

X:
表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11363-2006标准规定的限量要求。
Indicates that this toxic or hazardous substance contained in at least one of the homogeneous materials used for this part *might exceed* the limit requirement in SJ/T11363-2006.

5.9 Safety Precaution Notes

The following safety precautions must be observed during all phases of the operation, usage, service or repair of any cellular terminal or mobile incorporating LTE Modem Card mPLAS9-W. Manufacturers of the cellular terminal are advised to convey the following safety information to users and operating personnel and to incorporate these guidelines into all manuals supplied with the product. Failure to comply with these precautions violates safety standards of design, manufacture and intended use of the product. Thales assumes no liability for customer's failure to comply with these precautions.

	When in a hospital or other health care facility, observe the restrictions on the use of mobiles. Switch the cellular terminal or mobile off, if instructed to do so by the guidelines posted in sensitive areas. Medical equipment may be sensitive to RF energy. The operation of cardiac pacemakers, other implanted medical equipment and hearing aids can be affected by interference from cellular terminals or mobiles placed close to the device. If in doubt about potential danger, contact the physician or the manufacturer of the device to verify that the equipment is properly shielded. Pacemaker patients are advised to keep their hand-held mobile away from the pacemaker, while it is on.
	Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it cannot be switched on inadvertently. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communications systems. Failure to observe these instructions may lead to the suspension or denial of cellular services to the offender, legal action, or both.
	Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres can constitute a safety hazard.
	Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. Remember that interference can occur if it is used close to TV sets, radios, computers or inadequately shielded equipment. Follow any special regulations and always switch off the cellular terminal or mobile wherever forbidden, or when you suspect that it may cause interference or danger.
	Road safety comes first! Do not use a hand-held cellular terminal or mobile when driving a vehicle, unless it is securely mounted in a holder for speakerphone operation. Before making a call with a hand-held terminal or mobile, park the vehicle. Speakerphones must be installed by qualified personnel. Faulty installation or operation can constitute a safety hazard.
	IMPORTANT! Cellular terminals or mobiles operate using radio signals and cellular networks. Because of this, connection cannot be guaranteed at all times under all conditions. Therefore, you should never rely solely upon any wireless device for essential communications, for example emergency calls. Remember, in order to make or receive calls, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength. Some networks do not allow for emergency calls if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may need to deactivate those features before you can make an emergency call. Some networks require that a valid SIM card be properly inserted in the cellular terminal or mobile.

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