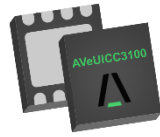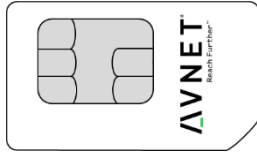# VODAFONE-bootstrapped industrial grade GSMA 3.1-compliant eUICC

Connectivity

- Preloaded VODAFONE profile with 100kB worth of connectivity

- Compliant with 2G / 3G / 4G / cat-M1 / cat-NB1 networks worldwide

- Access to 2G, 3G & 4G VODAFONE networks worldwide

- Remotely administrable by AVNET's SM-SR platform

Hardware

- Up to 350kB Flash memory space for simultaneous MNO profile hosting (3 to 10 profiles depending on profile size)

- 32-bit ARM® CPU in 90 nm CMOS technology

- 32kB RAM

- CLK frequency 1-10MHz

- Supply voltage range: 1.62 V to 5.50 V

- ESD protection > 4 kV (HBM)

- NVM Endurance
  o up to 500,000 cycles/page
  o max. cycling: 16 million per 256 bytes file @85°C

- Common Criteria EAL5+

- Form Factor: MFF2, 2FF

- ROHS compliance

- Temperature Range
  o Operating -40°C to +105°C
  o Storage -45°C to +125°C

- Data Retention

  o Up to 15 years at 85°C

Software

- Extended Lifetime Features 2.0
  o 128 kB (16 files per MNO profile) / 16 M cycles HSM
  o High-Stress Embedded Application Control
  o On-card & Remote Counters Monitoring/Audit
  o + Applet Lock Status + NVM Global counter
  o + EF Global counter + RESET Counter

- GSMA SGP.02 v3.1

- GSMA CI

- Global Platform 2.2.1
  o Amendment A: Controlling Authority Scenario 2b
  o Amendment B: OTA management over HTTPS
  o Amendment C: Dynamic Memory Allocation
  o Amendment D: SCP03 support
  o Amendment E/F: Scenario 3

- Java Card™ 3.0.4 Classic Edition

Table of Contents

1 Introduction

This datasheet provides a technical description of the AVeUICC3100xxx family of eUICC components manufactured by AVNET.

The AVNET eUICC (embedded Universal Integrated Circuit Card) program aims to bring the benefits and services of the eUICC to any business or industry, by allowing SIM cards to be reprogrammed and managed remotely. AVNET has launched a program with affiliated carriers that enables any user to remotely download, enable, disable or swap cellular operator profiles in their cellular-connected IoT devices. The program will continue to expand with the announcement of additional selected carrier partners on a regular basis.

The solution is based on the AVeUICC3100xxx with an administration platform provided by IDEMIA, leading global provider of SIM cards, eUICC and security solutions. The AVeUICC3100xxx chip comes with a pre-paid allowance subscribed with an AVNET eUICC Program partner carrier in order to provide an initial connectivity bootstrap which can be used to conduct a product factory test and/or the download of a different profile supplied by a different carrier affiliated to AVNET's eUICC Program.

By offering a complete range of care levels across all the complex processes behind the on-boarding, AVNET is able to save its customers from doing this complicated task. This solution is also a world-first in the way that AVNET takes complete care of the complex processes behind the on-boarding of new cellular carriers instead of its customers doing it.

The AVNET eUICC Program offers customers the most open and future-proof solution on the market and is predicted to unleash the ability to quickly develop cellular connectivity in the IoT.

2 Overview

The AVeUICC3100xxx is based on IDEMIA's DakOTa M2M v3.1 industrial-grade eUICC Operating System powering an INFINEON SLM97 secure chip, designed to offer capabilities to remotely provision mobile operator credentials onto a SIM to remotely support IoT devices. IDEMIA has actively participated in GSMA driven works on specifying the Remote Provisioning Architecture together with Mobile Network Operators and other SIM solution suppliers, which led to recent release of GSMA SGP.02 version 3.1 in May 2016.

One of the improvements brought by SGP.02v3.1 is a Profile Interoperability achieved by implementation of SIMalliance eUICC Profile Package - Interoperable Format Technical Specification V2.0 (IDEMIA is one of the SIMalliance board members and an active participant).

Keeping in mind that interoperability is a major concern DakOTa products have been tested with a variety of communication modules and 3rd party Subscription Management Platforms including GSMA SM-SR change PoCs. As a consequence, the AVeUICC3100xxx supports the revised SM-SR change procedure defined by SGP.02 v3.2.

The AVeUICC3100xxx benefits from IDEMIA's, INFINEON's and AVNET's extensive experience in IoT and embedded Secure Elements (eSE) markets. OS improvements include, but are not limited to, self-testing capabilities and memory anti-erosion mechanisms. In addition to GSMA specification, AVeUICC3100xxx offers proprietary functionalities simplifying the implementation of typical IoT scenarios, including local management.

In order to ensure that adequate security measures to protect the interests of mobile network operators (MNO) have been implemented the AVeUICC3100xxx is personalized in SAS-UP v7 accredited sites and can therefore participate in the GSMA eUICC PKI ecosystem.
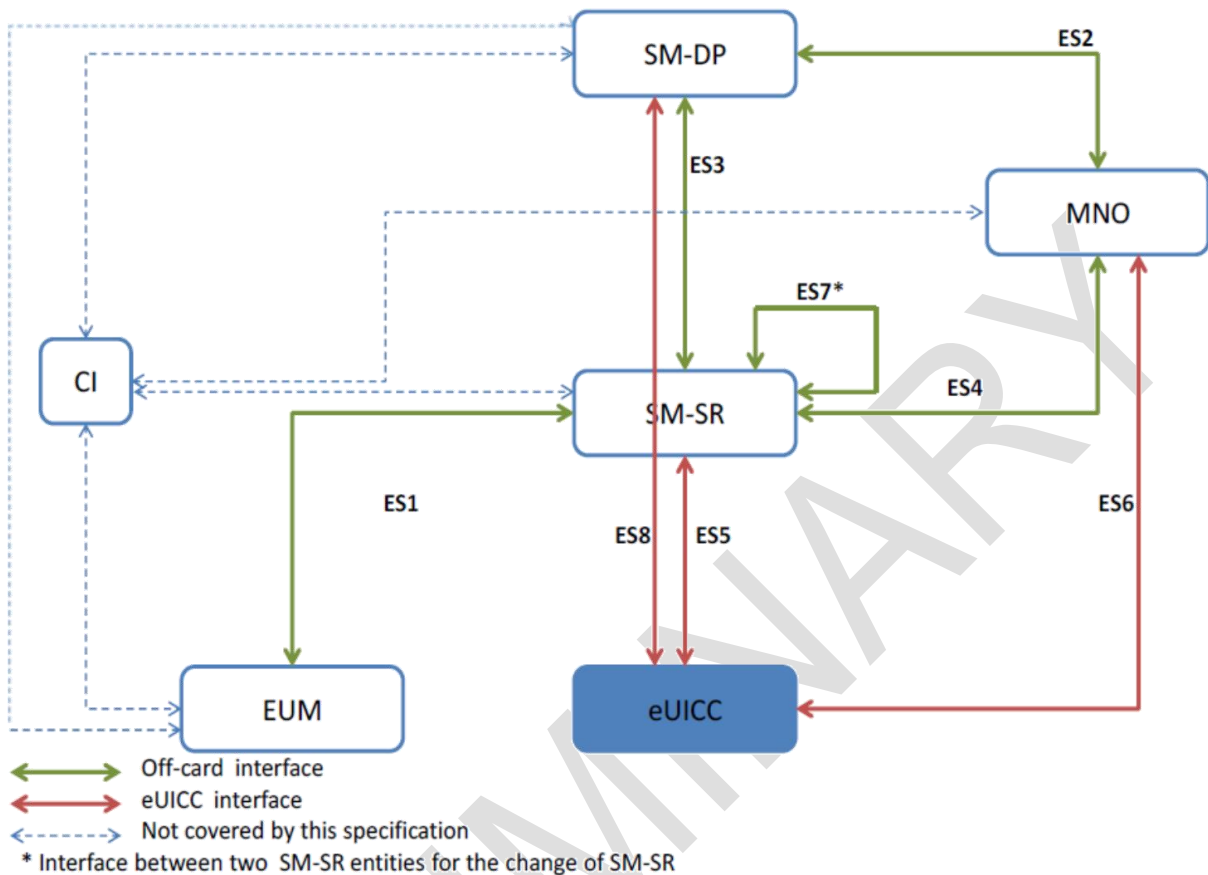
Figure 1: eUICC Remote Provisioning System

3 Compliance

3.1 3GPP specifications

3GPP TS 21.111 (v13.0.1, Rel-13): USIM and IC card requirements

3GPP TS 22.038 (v6.5.0, Rel-6): USIM Application Toolkit (USAT) - Stage 1

3GPP TS 23.040 (v8.6.0, Rel-8): Technical realization of the Short Message Service (SMS)

3GPP TS 23.041 (v7.0.0, Rel-7): Technical realization of Cell Broadcast Service (CBS)

3GPP TS 23.048 (v5.9.0, Rel-5): Security Mechanisms for the (U)SIM application toolkit; Stage 2

3GPP TS 31.048 (v5.1.0, Rel-5): Test of (U)SAT security

3GPP TS 31.101 (v9.1.2, Rel-9): UICC-Terminal interface; Physical and Logical Characteristics

3GPP TS 31.102 (v8.17.0, Rel-8): Characteristics of the USIM Application

3GPP TS 31.103 (v7.7.0, Rel-7): Characteristics of the ISIM Application

3GPP TS 31.111 (v8.14.0, Rel-8): USIM Application Toolkit (USAT)

3GPP TS 31.115 (v11.0.1, Rel-11): Secured packet structure for (U)SIM Toolkit applications

3GPP TS 31.116 (v11.0.1, Rel-11): Remote APDU Structure for (U)SIM Toolkit applications

3GPP TS 31.122 (v8.0.0, Rel-8): USIM conformance test (card side)

3GPP TS 31.130 (v8.3.0, Rel-8): (U)SIM Application Programming Interface; (U)SIM API for Java™ Card

3GPP TR 31.900 (v7.1.0, Rel-7): SIM/USIM Internal and External Inter-working Aspects

3GPP TR 31.919 (v6.1.0, Rel-6): 2G/3G Java Card™ API based applet interworking

3GPP TS 33.102 (v8.6.0, Rel-8): 3G Security; Security architecture

3GPP TS 33.105 (v6.0.0, Rel-6): Cryptographic algorithm requirements

3GPP TS 35.205 (v11.0.0, Rel-11): Specification of the MILENAGE Algorithm Set

3GPP TS 42.017 (v4.0.0, Rel-4): SIM functional characteristics

3GPP TS 42.019 (v5.6.0, Rel-5): SIM API for Java Card™ - Stage 1 -

3GPP TS 43.019 (v5.6.0, Rel-5): Subscriber Identity Module Application Programming Interface; (SIM API) for Java Card™; Stage 2

3GPP TS 51.011 (v4.15.0, Rel-4): Specification of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface

3GPP TS 51.014 (v4.5.0, Rel-4): Specification of the SIM Application Toolkit for the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface

3GPP TS 51.017 (v4.2.0, Rel-4): Test of SIM-ME interface (card side) DIM® 2.0 Automotive on IO270

3.2   ETSI specifications

ETSI TS 101 220 (v12.0.0, Rel-12): Application Identifiers for telecommunications

ETSI TS 102 124 (v6.1.0, Rel-6): Transport Protocol for CAT Applications - Stage 1

ETSI TS 102 151 (v6.0.0, Rel-6): Measurement of Electromagnetic Emission of SIM cards

ETSI TS 102 221 (v11.0.0, Rel-11): UICC-Terminal interface; Physical and logical characteristics

ETSI TS 102 222 (v7.1.0, Rel-7): Administrative Commands for telecommunications applications

ETSI TS 102 223 (v9.4.0, Rel-9): Card Application Toolkit

ETSI TS 102 224 (v8.0.0, Rel-8): CAT security – Stage 1

ETSI TS 102 225 (v12.1.0, Rel-12): Secured packet structure for UICC applications

ETSI TS 102 226 (v11.0.0, Rel-11): Remote APDU Structure for UICC based Applications

ETSI TS 102 240 (v9.1.0, Rel-9): UICC Java Card™ API - Stage 1

ETSI TS 102 241 (v8.2.0, Rel-8): UICC Java Card™ API - Stage 2

3.3   SUN Java Card specifications

Java Card 3.0.4 API Specification

Java Card 3.0.4 Runtime Environment Specification

Java Card 3.0.4 VM Architecture Specification

3.4   Global Platform specifications

Global Platform Card Specification 2.2.1

Global Platform Card UICC Configuration – Version 1.0.1

Global Platform Card - Remote Application Management over HTTP - Card Spec. 2.2 – Amendment B - Version 1.1.3

Global Platform Card Technology - Secure Channel Protocol 03 - Card Spec. 2.2 – Amendment D - Version 1.1

Global Platform Card - Security Upgrade for Card Content Management - Card Spec. 2.2 – Amendment E – Version 1.0

3.5   GSMA specifications

GSMA SGP.01 - Embedded-SIM-Remote-Provisioning-Architecture-Version-1.1

GSMA SGP.02 - Remote-Provisioning-Architecture-for-Embedded-UICC-Technical-Specification-Version-3.1

GSMA SGP.11 - Remote-Provisioning-Architecture for Embedded UICC Test Specification Version-3.1

4 Pinout & mechanical data

4.1   2FF package

Annex A of ISO/IEC 7816-2 applies with the location of the reference points adapted to the smaller size. The three reference points P1, P2 and P3 measure 7.5 mm, 3.3 mm and 20.8 mm respectively.

The values in figure 2 of ISO/IEC 7816-2 are replaced by the corresponding values in the diagram below:
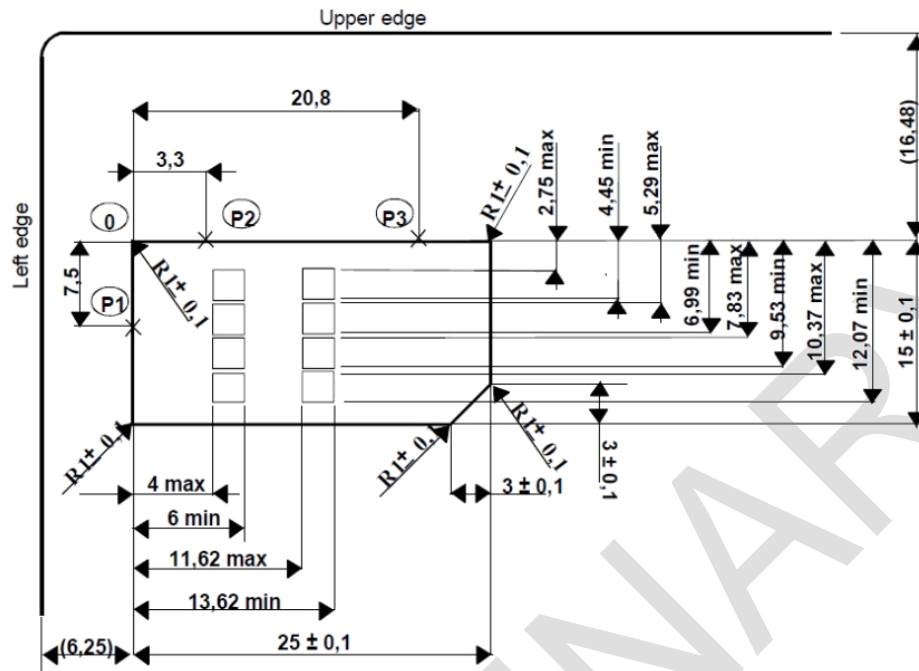
Figure 2: 2FF package dimensions

4.2 MFF2 package
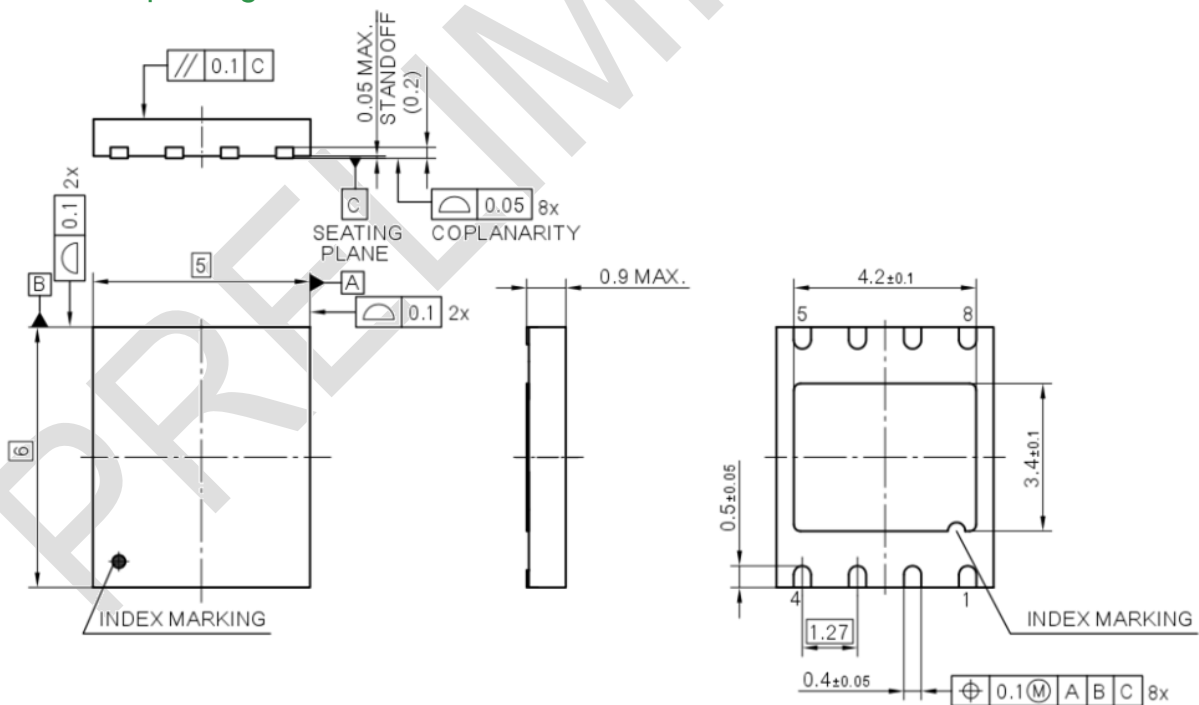
ALL DIMENSIONS ARE IN UNITS MM
THE DRAWING IS IN COMPLIANCE WITH ISO 128 & PROJECTION METHOD 1 [ ]

Figure 3: MFF2 package dimensions

Note: the exposed die-pad is not electrically connected to the die and can be used as a mechanical anchor to strengthen the attachment of the MFF2 package to the printed circuit board (PCB).

PIN	ISO	Signal	Description	PIN	ISO	Signal	Description
1	C5	V_{SS}	Ground	5	C4	NC	Reserved
2	C6	NC	Reserved	6	C3	CLK	Clock signal input
3	C7	I/O	Serial data I/O	7	C2	RST	Reset signal input
4	C8	NC	Reserved	8	C1	V_{CC}	Power supply

Pin assignment of contacts C1 to C8 is defined as per ETSI TS 102 221 and TS 102 671.

NC: Do Not Connect

5 Typical application diagram

Figure 4: Typical connection to modem

Additional passive components may be required depending on modem brand and model. Please refer to the modem application diagram for a detailed implementation.

6 Product code and ordering

AVeUICC 31 0 0 VOD 0M1 F2 B

Device family

AVeUICC = AVNET eUICC

GSMA SGP.02 version

31 = 3.1

Grade

0 = Industrial

Reserved

Bootstrap carrier

VOD = VODAFONE

Pre-paid data allowance

0M1 = 100kB

Package

F2 = 2FF

M2 = MFF2

Packaging options

B = Box of 50

C = Box of 500

R50 = Reel of 50

R3000 = Reel of 3000
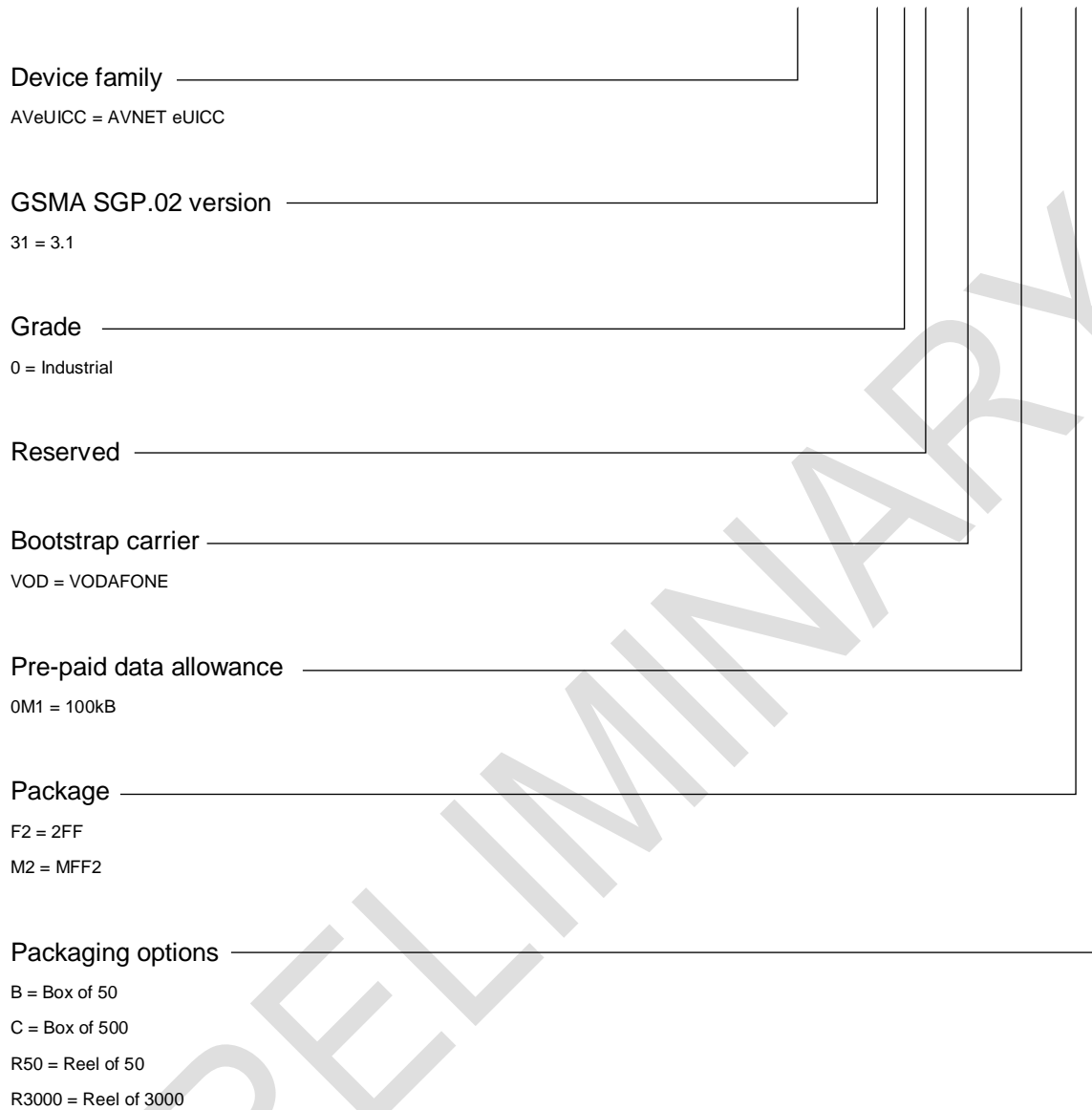
Figure 5: Nomenclature

7 Product characteristics

7.1 Absolute maximum ratings

Parameter	Symbol	Min	Typ	Max	Unit	Comment
Supply Voltage	V_{CC}	-0.3	-	7.0	V	-
Input Voltage	V_{IN}	-0.3	-	$V_{CC} + 0.3$	V	-

Parameter	Symbol	Min	Typ	Max	Unit	Comment
Operating Temperature (ambient)	T_A	-40		+105	°C	T_J must be kept
Junction Temperature	T_J	-40		+110	°C	-
Pulse voltage ESD protection of RST, CLK, I/O	V_{ESD}	4000	-	-	V	ISO 7816-1 and JESD22-A114C

Note: *Stresses exceeding the values listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or at any other conditions whose values exceed those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability, including EEPROM data retention and write/erase endurance.*

7.2   Electrical characteristics

All directions of currents are seen from the terminal's point of view. Positive currents ('+') are sink currents from the terminal to the controller and negative currents ('-') are source currents from the controller to the terminal.
Figure 6 below shows circuitry for the I/O pin (with external pull-up) as a typical example of signs and signals used for representation of the pad characteristics.
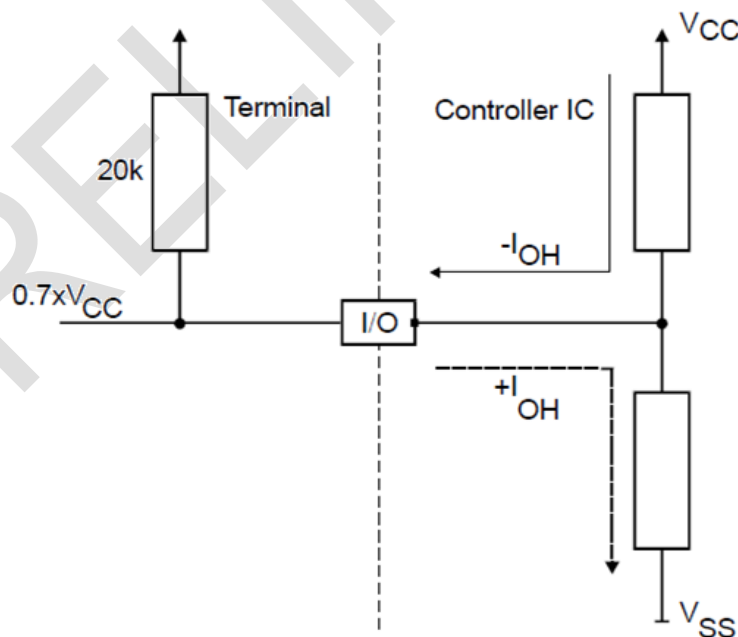
Figure 6: Pad interfacing - signs and symbols

7.2.1 DC characteristics

Current and voltage values assume a terminal that is able to supply the product according to the referenced standards providing a capacitor of 100nF as close as possible to the contacting elements.
T_A = –40 °C to +105 °C (unless otherwise stated).

Parameter	Symbol	Min	Typ	Max	Unit	Comment
Supply Voltage	V_{CC}	4.5	5	5.5	V	Class A
		2.7	3	3.3		Class B
		1.62	1.8	1.98		Class C
Supply Current	I_{CC}			21	mA	T_A = 25°C
Supply Current Spikes	I_{CCD}			100	mA	Class A - Q < 20 nAs
				50		Class B - Q < 10 nAs
				30		Class C - Q < 6 nAs
Supply Current in current limitation mode	I_{MAX}			10	mA	Class A
				6		Class B
				4		Class C
Supply Current in sleep mode	I_{CCS1}			200	uA	TA = 25°C, Clock 1 Mhz
Supply Current in sleep mode	I_{CCS2}			200	µA	Clock OFF Class A
				100		Clock OFF Class B
				100		Clock OFF Class C

Note: Power class is managed by the modem as described in the ISO/IEC 7816-3 standard, chapter 6.2.

7.2.2 AC characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Comment
Supply Voltage ramp-up time	t_{VCCR}	1	-	10^7	µs	0 to 100% of target supply voltage

CLK signal

Parameter	Symbol	Min	Typ	Max	Unit	Comment
Rise/fall time	t_r, t_f			$0.1 * 1/f_{CLK}$	ns	
Frequency	f_{CLK}	1		10	MHz	
Duty Cycle		40		60	%	
Input Voltage	V_{IH}	$0.7 * V_{CC}$		$V_{CC} + 0.3$	V	I_{IH} = -20uA … + 20uA
	V_{IL}	-0.3		$0.2 \times V_{CC}$		I_{IL} = -20uA … + 20uA
RST signal						
Input Voltage	V_{IH}	$0.8 * V_{CC}$		$V_{CC} + 0.3$	V	I_{IH} = -20 uA … + 20uA
	V_{IL}	-0.3		$0.2 \times V_{CC}$		I_{IL} = -50 uA … +20 uA
Rise/fall time	t_r, t_f			1	µs	30 pF external
I/O signal						
Rise/fall time	t_r, t_f			1	µs	30 pF external
Input Voltage	V_{IH}	$0.7 * V_{CC}$		$V_{CC} + 0.3$	V	I_{IH} = -20uA … + 20uA
	V_{IL}	-0.3		$0.2 \times V_{CC}$		I_{IL} = -1 mA … +20 uA
Output Voltage	V_{OH}	$0.7 * V_{CC}$		$V_{CC} + 0.3$	V	I_{OH} = +/- 20uA
				0.4		I_{OL} = -1 mA Class A
	V_{OL}			0.4		I_{OL} = -1 mA Class B
				0.3		I_{OL} = -1 mA Class C

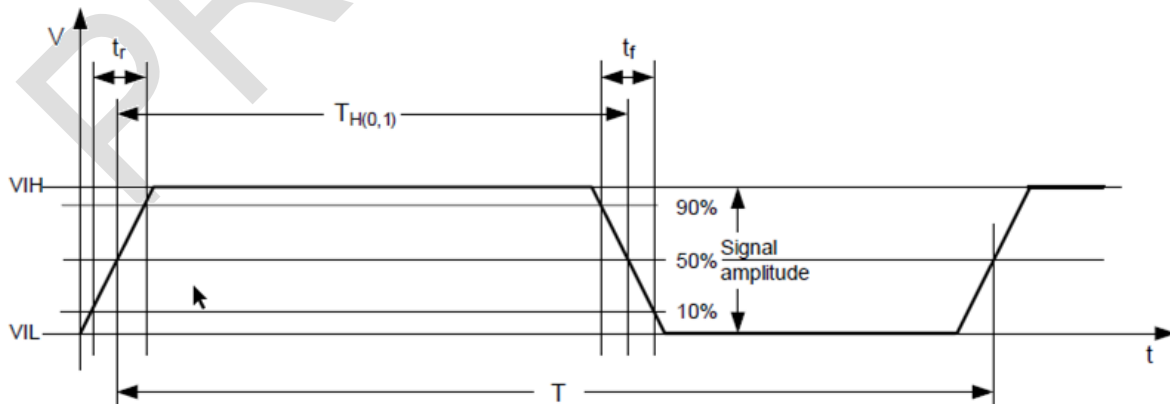_Note_: Power class is managed by the modem as described in the ISO/IEC 7816-3 standard, chapter 6.2.

Figure 7: Input voltage signal timing relations

8 Device operation

8.1 Data channels

The AVeUICC3100xxx drives the modem in order to maintain 2 data channels in parallel:

- 1 data channel via the active MNO profile acting for the user like a SIM card:
    - User APN
    - Access policies
    - User IP address
- 1 admin channel behind the MNO profiles for proper administration by AVNET's SM-SR platform:
    - Specific admin APN (hidden)
    - Secure access (hidden)
    - SM-SR IP address (hidden)

When provisioned with an operator profile activated, the AVeUICC3100xxx acts like a SIM card to authenticate devices on the active cellular network.

When contacted by AVNET's SM-SR platform for a life-cycle management task, the AVeUICC3100xxx may ask the modem to close the user data channel and to open the admin data channel for proper operation.

Network connectivity is required in order to open and maintain both channels, which is the reason why the AVeUICC3100xxx always needs at least 1 active profile and data subscription in order to be reachable.

Because the admin channel also uses the active data plan, the active MNO needs to open specific ports to allow this admin channel, which is the reason why this can only be done with MNOs/MVNOs partner to AVNET's eUICC program where this technical integration is being managed by AVNET.

8.2 Network types for eUICC compatibility

When provisioned with an operator profile, the AVeUICC3100xxx acts like a SIM card to authenticate devices on cellular networks. As such, the AVeUICC3100xxx will support connecting devices to any type of network available with the MNO providing the profile: 2G, 3G, 4G, Cat-M1(LTE-M), Cat-NB1 (NB-IoT).

When administrated by AVNET's SM-SR, the device and the platform will need to exchange SMS and open a secure data IP connection. These services are available on 2G, 3G, 4G and Cat-M1 (LTE-M) networks but not on Cat-NB1 (NB-IoT) networks as of today due to a lack of standardization.

As a consequence, the AVeUICC3100xxx can operate on any type of network for data operation, but needs to connect with 2G, 3G, 4G or Cat-M1 (LTE-M) for life-cycle management services by the SM-SR.

Cat-NB1 (NB-IoT) is expected to support eUICC services in future 3GPP releases although there is no clear timeline publicly available. AVNET and IDEMIA are working together on an interim solution.

In summary:

Network type	SM-SR admin	User data connection
2G (GPRS)	Yes	Yes
2G (EDGE)	Yes	Yes
3G	Yes	Yes
4G	Yes	Yes
Cat-M1 (LTE-M)	Yes	Yes
Cat-NB1 (NB-IoT)	X	Yes

8.3   Pre-qualified modems

The AVeUICC3100xxx is a GSMA-standardized technology (3.1) and should be seamlessly interoperable with various modem vendors provided that their firmware supports Auto-BIP (Bearer-Independent Protocol).

Nevertheless, real-life situations are sometimes more complex than theory and we want to thoroughly pre-qualify the product bundles we are bringing to market, making sure that our SM-SR platform will never lose permanent synchronization with your modems regardless of a radio and/or local power outage happening during an administration campaign.

We have therefore qualified a few modems to support the product launch and will continue qualifying new modems in order to enrich our ecosystem.

Although we strongly recommend to use one of the pre-qualified modems, we are open to qualifying non-listed modems on a case-by-case basis.

Please refer to the Application Note ANxxxxxxxxxxx for an up-to-date list of qualified modems, firmware versions and instructions.

9   Setting-up a data link with VODAFONE

The AVeUICC3100VOD with the VODAFONE profile active will seek connectivity on the VODAFONE global network.

**** IT IS RECOMMENDED TO SET THE MODEM IN AUTO MODE AND NOT TO FORCE A ROAMING PARTNER ****

In order to establish a user data channel, the following settings need to be programmed into the modem:

Field	Value
APN name	AVNET.VODAFONE (*)

Field	Value
Username	N/A
Password	N/A
Authentication	PAP or none

(*) The APN provided with the pre-paid allowance is a shared APN

9.1 Firewall configuration required

- Firewall in front of customer server receiving information from remote devices will need to be configured to receive data from the following gateway IP address:
  - 193.34.100.6

9.2 IP addressing

- Dynamic private IP assigned by VODAFONE, but end-customers will see the gateway's IP as it will break out to internet from there (see 9.1)

9.3 Supported protocols

- Nothing is blocked
- NO DNS provided
- UDP example with PacketSender™

	Time	From IP	From Port	To IP	To Port	Method	Error	ASCII	
1	14:59:35.608	You (Response)	21456	193.34.100.6	23888	UDP		This is a UDP answer from the server	54 68 69 73 20 69 73 20 61 20 55 4
2	14:59:35.608	193.34.100.6	23888	You	21456	UDP		This is a UDP query to the server	54 68 69 73 20 69 73 20 61 20 55 4

- TCP example with PacketSender™

	Time	From IP	From Port	To IP	To Port	Method	Error	ASCII	
1	15:03:11.472	You (Response)	21456	193.34.100.6	16354	TCP		This is a TCP answer from the server	54 68 69 73 20 69 73 20 61 20 54
2	15:03:09.800	193.34.100.6	16354	You	21456	TCP		This is a TCP query to the server	54 68 69 73 20 69 73 20 61 20 54

9.4 Security

- Production security standard by default

9.5 Supported network types

- 2G/3G/4G global roaming
- Cat-NB1 & Cat-M1 not available yet

9.6 Data allowance

The AVeUICC3100VOD includes a data allowance of 100kB valid for a period of 12 months after purchase in more than 100 territories.

9.7   Countries and roaming networks

The VODAFONE connectivity included in the AVeUICC3100VOD bundle operates in the following countries (subject to change):

Albania, Argentina, Armenia, Australia, Austria, Bahrain, Belgium, Bolivia, Brazil, Bulgaria, Canada, Chile, China, Colombia, Congo, Costa, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Faroe Islands, Finland, France, French Polynesia, Germany, Ghana, Greece, Guatemala, Honduras, Hong Kong, Hungary, Iceland, India, Ireland, Isle of Man, Italy, Japan, Jersey, Jordan, Kenya, Kuwait, Latvia, Lesotho, Liechtenstein, Lithuania, Luxembourg, Malaysia, Malta, Mexico, Mozambique, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Qatar, Reunion, Romania, Russian Federation, Rwanda, Saudi, Serbia, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan,, Tanzania, Thailand, Turkey, Uganda, Ukraine, UK, Uruguay, USA, Vietnam, Zambia.

See appendix A for detailed list of roaming partners.

10 Administrating the eUICC

The eUICC can be administrated both locally with AT commands and remotely from the SM-SR platform operated by AVNET:
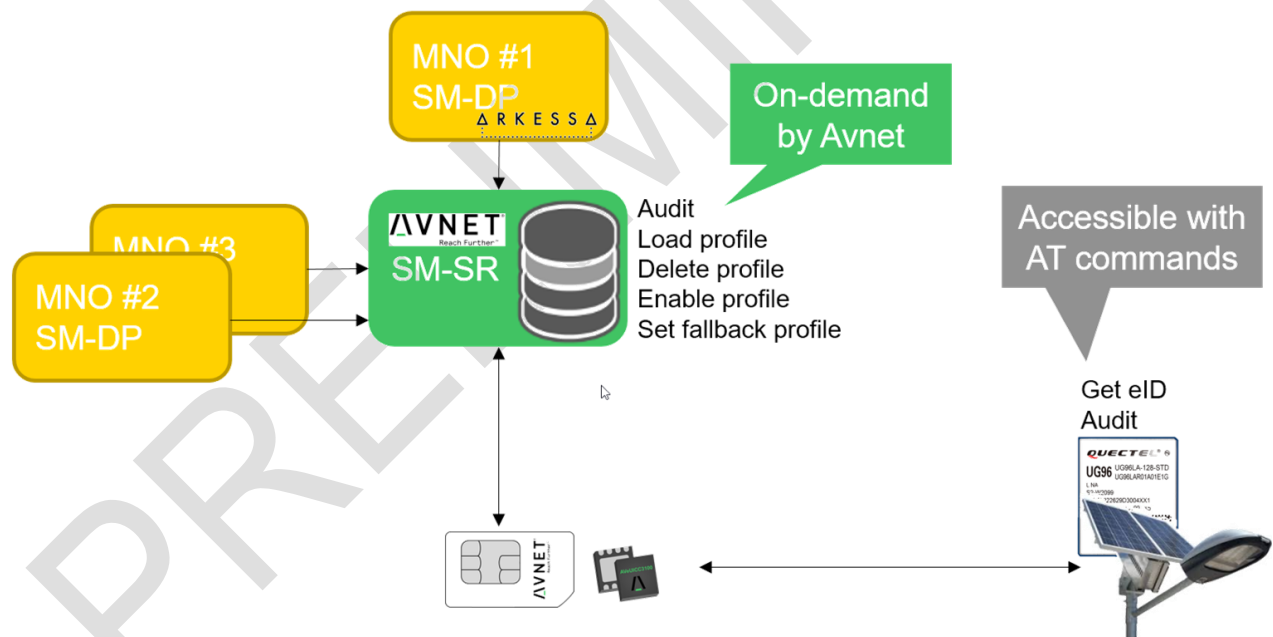

Figure 5: Simplified system overview

Upon request to your AVNET technical support, we will be happy to administrate your batches of eUICCs remotely:

-    Audit an eUICC to collect its state and re-synchronize to the platform

- Download a new profile provided by an AVNET eUICC Program MNO partner

- Activate a profile

- Delete an inactive profile

In order to optimize operations, please make sure that the eUICC is plugged into a modem and connected to a 2G, 3G, 4G or Cat-M1 (LTE-M) network as previously explained.

Note: an eUICC connecting to a Cat-NB1 (NB-IoT) network will not be reachable by our SM-SR platform.

Additionally, you are able to execute locally the following operation on your own with local AT commands input into the modem:

- Get the eID of an eUICC: useful at manufacturing in order to build the database of devices

- Audit an eUICC to collect its current state

For this purpose, here is a detailed description of the commands:

10.1 GET_eID

- AT+CSIM=10,"0070000001" // open channel 1
  - +CSIM: 6,"019000" // channel 1 selected
- AT+CSIM=42,"01A4040010A0000000770307601100FE0000300001" // select LM applet
  - +CSIM: 4,"9000"
- AT+CSIM=10,"8116000012" // get EID
  - +CSIM: 40,"4C1089033024208100491100000000000005399000"
- AT+CSIM=10,"0070800100" // close channel 1
  - +CSIM: 4,"9000"

10.2 AUDIT

Auditing the eUICC allows retrieving the current state of its memory. Profiles are stored in containers called ISDP or ISD-P (Issuer Security Domain Profile).

There are as many ISDP's as profiles loaded into an eUICC and the allocation process is dynamically managed by the eUICC OS whenever a profile is downloaded or deleted.

In the example below, the eUICC has 2 profiles downloaded and answers with descriptions of ISDP #1000 and ISDP #1100 containing respectively an enabled Vodafone profile set as fallback and a disabled Arkessa profile:

- AT+CSIM=10,"0070000001" // open channel 1
  - +CSIM: 6,"019000" // channel 1 selected
- AT+CSIM=42,"01A4040010A0000000770307601100FE0000300001" // select LM applet
  - +CSIM: 4,"9000"
- AT+CSIM=10,"81180000FF" // AUDIT
  - +CSIM: 238,"
    - E3 25 4F 10A0000005591010FFFFFFFFF8900001000 // ISDP #1000

- ▪ 9F70 01 3F // Enable
- ▪ 53 01 01 // Fallback attribute set
- ▪ 2C 0A 9888xxxxxxxxxxxxxxxx // ICCID in ISDP #1000
- ▪ E3 25 4F 10A0000005591010FFFFFFFF8900001100 // ISDP #1100
- ▪ 9F70 01 1F // Disable
- ▪ 53 01 00 // Fallback attribute NOT set
- ▪ 2C 0A 9844xxxxxxxxxxxxxxxx // ICCID in ISDP #1100
- ▪ 9000"
- • AT+CSIM=10,"0070800100" // close channel 1
  - ○ +CSIM: 4,"9000"

Caution: the ICCID numbers retrieved with this command have their nibbles swapped inside each octet.

Therefore, an VODAFONE profile reading 98440123456789ABCDEF should read 89441032547698BADCFE.

11 Glossary

SIM: Subscriber Identifier Module (plastic format)

eSIM: embedded SIM (chip format)

UICC: Universal Integrated Circuit Card = reprogrammable SIM (plastic format)

eUICC: embedded UICC = reprogrammable eSIM (chip format)

eID: eUICC/UICC hardware unique Identifier

ICCID: Integrated Circuit Card Identifier = MNO profile unique ID

ISDP: Issuer Security Domain Profile

SM-SR: Subscription Manager Secure Router = AVNET's eUICC life-cycle management platform

SM-DP: Subscription Manager Data Preparation = MNO platform connecting into our SM-SR to securely and remotely deliver profiles into eUICCs in the field

12 RoHS Compliance
12.1 AVNET statement

The Directive 2011/65/EU on the Restriction of the use of certain Hazardous Substances (RoHS II), replacing Directive 2002/95/EC (RoHS I), targets Electrical and Electronic Equipment (EEE) in order to avoid adverse impacts on human health and the environment.

EMEA subsidiaries of the Avnet group ("Avnet") doing business for EBV Elektronik, Avnet Silica, Avnet Abacus, Avnet Integrated Solutions and Avnet United business units, are fully aware of the requirements of the RoHS Directive 2011/65/EU in the EU. Roles and obligations have been identified by Avnet to the best of its knowledge.

Avnet, as a distributor, does not certify compliance with RoHS on behalf of the original manufacturers, since we e.g. do not control the manufacturing process of the products we supply.

RoHS Directive 2011/65/EU was amended by the Directive 2015/863/EU, which was published in June 2015. Four additional substances (phthalates) were added to Annex II of the original RoHS Directive. The provisions regarding the restriction of the newly added substances in 'Electrical and Electronic Equipment' do not apply before 22.07.2019. For medical devices and for monitoring and control instruments there is an additional two-year grace period.

The table below contains the following list of restricted substances and their tolerated maximum concentration values (MCV) by weight (w/w) in homogeneous materials (specific exemptions may apply or products be out of scope):

Restricted substances	MCV in % (w/w)
Lead (Pb)	0.1
Mercury (Hg)	0.1
Cadmium (Cd)	0.01
Hexavalent chromium (Cr (VI))	0.1
Polybrominated biphenyls (PBB)	0.1
Polybrominated diphenyl ethers (PBDE)	0.1
Bis(2-ethylhexyl) phthalate (DEHP)	0.1 (newly added)
Butyl benzyl phthalate (BBP)	0.1 (newly added)
Dibutyl phthalate (DBP)	0.1 (newly added)
Diisobutyl phthalate (DIBP)	0.1 (newly added)

For any further questions with regard to product RoHS compliance, please get in contact with your local sales representative.

12.2 INFINEON statement

On January 27, 2003 the European Parliament and the council adopted the following directives:

- 2002/95/EC on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment ("RoHS")

- 2002/96/EC on Waste Electrical and Electrical and Electronic Equipment ("WEEE")

Some of these restricted (lead) or recycling-relevant (brominated flame retardants) substances are currently found in the terminations (e.g. lead finish, bumps, balls) and substrate materials or mold compounds.

The European Union has finalized the Directives. It is the member states' task to convert these Directives into national laws. Most national laws are available, some member states have extended timelines for implementation. The laws arising from these Directives have come into force in 2006 or 2007.

The electro and electronic industry has to eliminate lead and other hazardous materials from their products. In addition, discussions are on-going with regard to the separate recycling of ceratin materials, e.g. plastic containing brominated flame retardants.

Infineon is fully committed to giving its customers maximum support in their efforts to convert to lead-free and halogen-free1) products. For this reason, Infineon's "Green Products" are ROHS-compliant.

Since all hazardous substances have been removed, Infineon calls its lead-free and halogen-free semiconductor packages "green." Details on Infineon's definition and upper limits for the restricted materials can be found here.

The assembly process of our high-technology semiconductor chips is an integral part of our quality strategy.

Accordingly, we will accurately evaluate and test alternative materials in order to replace lead and halogen so that we end up with the same or higher quality standards for our products.

The use of lead-free solders for board assembly results in higher process temperatures and increased requirements for the heat resistivity of semiconductor packages. This issue is addressed by Infineon by a new classification of the Moisture Sensitivity Level (MSL). In a first step the existing products have been classified according to the new requirements.

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0.90	01/31/2019	Preliminary

Appendix A: List of VODAFONE roaming partners

An up-to-date list of VODAFONE roaming partners can be provided on request. It includes up to 300 networks* in 100 territories (*subject to change):

Territory	Network	Tier
Albania	Vodafone	Vodafone Networks
Argentina	Claro	Preferred Partners
Armenia	VivaCell	Preferred Partners
Australia	Vodafone	Vodafone Networks
Austria	Mobilkom	Preferred Partners
Austria	Orange	EU28+2
Austria	T-Mobile	EU28+2
Austria	T-Mobile	EU28+2
Bahrain	Zain BH	Preferred Partners
Belgium	Base	EU28+2
Belgium	Mobistar	EU28+2
Belgium	Proximus	Preferred Partners
Bolivia	Nuevatel	Preferred Partners
Brazil	Claro	Preferred Partners
Bulgaria	M-Tel	Preferred Partners
Bulgaria	Globul	EU28+2
Bulgaria	Vivacom	EU28+2
Canada	Sasktel	Preferred Partners
Chile	Claro	Preferred Partners
China	China Mobile	Preferred Partners
Colombia	Claro	Preferred Partners
Congo (Kinshasa)	Vodacom	Preferred Partners
Costa Rica	Claro	Preferred Partners
Croatia	Croatian Telecom	EU28+2
Croatia	Tele2	EU28+2
Croatia	VIPnet	Preferred Partners
Cyprus	Cytamobile-Vodafone	Preferred Partners
Cyprus	MTN	EU28+2
Cyprus	PrimeTel	EU28+2
Czech Republic	T-Mobile	EU28+2
Czech Republic	O2	EU28+2
Czech Republic	Vodafone	Vodafone Networks
Denmark	TDC	Preferred Partners

Denmark	Telenor	EU28+2
Denmark	Telia	EU28+2
Dominican Republic	Claro	Preferred Partners
Ecuador	Conecel	Preferred Partners
Egypt	Vodafone	Vodafone Networks
El Salvador	Claro	Preferred Partners
Estonia	EMT	EU28+2
Estonia	Elisa	Preferred Partners
Estonia	Tele2	EU28+2
Faroe Islands	Vodafone	Preferred Partners
Finland	Alands Mobiltelefon	EU28+2
Finland	DNA	EU28+2
Finland	Elisa	Preferred Partners
Finland	Telia Sonera	EU28+2
France	Bouygues	EU28+2
France	Orange	EU28+2
France	SFR	Preferred Partners
French Polynesia	Vodafone	Preferred Partners
Germany	T-Mobile	EU28+2
Germany	Vodafone	Vodafone Networks
Germany	E-plus	EU28+2
Germany	O2	EU28+2
Ghana	Vodafone	Vodafone Networks
Greece	Cosmote	EU28+2
Greece	Vodafone	Vodafone Networks
Greece	Wind	EU28+2
Guatemala	Claro	Preferred Partners
Honduras	Claro	Preferred Partners
Hong Kong	3	Preferred Partners
Hong Kong	Hutchison	Preferred Partners
Hungary	Telenor	EU28+2
Hungary	T-Mobile	EU28+2
Hungary	Vodafone	Vodafone Networks
Iceland	Vodafone	Preferred Partners
India (Bombay/Mumbai)	Vodafone	Vodafone Networks
India (Delhi)	Vodafone	Vodafone Networks
India (Gujarat)	Vodafone	Vodafone Networks
India (Kerala)	Vodafone	Vodafone Networks
India (Kolkata)	Vodafone	Vodafone Networks

India (Maharashtra & Goa)	Vodafone	Vodafone Networks
India (Tamil Nadu)	Vodafone	Vodafone Networks
Ireland	O2	EU28+2
Ireland	Vodafone	Vodafone Networks
Isle of Man	Manx Telecom	EU28+2
Italy	TIM	EU28+2
Italy	Vodafone	Vodafone Networks
Italy	Wind	EU28+2
Japan	NTT DoCoMo	Preferred Partners
Jersey	Airtel-Vodafone	Preferred Partners
Jordan	Zain	Preferred Partners
Kenya	Safaricom	Preferred Partners
Kuwait	Zain	Preferred Partners
Latvia	LMT	EU28+2
Latvia	Tele2	EU28+2
Latvia	Bite Latvija	Preferred Partners
Lesotho	VODACOM	Preferred Partners
Liechtenstein	Mobilkom	EU28+2
Liechtenstein	Orange	EU28+2
Lithuania	Omnitel	EU28+2
Lithuania	Bite GSM	Preferred Partners
Lithuania	Tele2	EU28+2
Luxembourg	LUXGSM	EU28+2
Luxembourg	Tango	Preferred Partners
Luxembourg	Orange	EU28+2
Malaysia	Maxis Mobile	Preferred Partners
Malta	Vodafone	Vodafone Networks
Malta	go mobile	EU28+2
Malta	Melita Mobile	EU28+2
Mexico	Telcel	Preferred Partners
Mozambique	Vodacom	Preferred Partners
Netherlands	Vodafone	Vodafone Networks
New Zealand	Vodafone	Vodafone Networks
Nicaragua	Claro	Preferred Partners
Niger	Airtel	Preferred Partners
Nigeria	Airtel	Preferred Partners
Norway	Telenor	Preferred Partners
Norway	Netcom	EU28+2
Panama	Claro	Preferred Partners

Paraguay	Claro	Preferred Partners
Peru	Claro	Preferred Partners
Philippines	SMART Gold	Preferred Partners
Poland	Plus	Preferred Partners
Poland	Era	EU28+2
Poland	Orange	EU28+2
Poland	Play	EU28+2
Portugal	Vodafone	Vodafone Networks
Portugal	Optimus	EU28+2
Portugal	TMN	EU28+2
Puerto Rico	Claro	Preferred Partners
Qatar	Vodafone	Vodafone Networks
Reunion	SRR	Preferred Partners
Romania	Vodafone	Vodafone Networks
Romania	Orange	EU28+2
Romania	Digi.Mobil	EU28+2
Romania	Cosmote	EU28+2
Russian Federation	MTS	Preferred Partners
Rwanda	Airtel	Preferred Partners
Saudi Arabia	Zain	Preferred Partners
Serbia	VIP	Preferred Partners
Slovakia	Orange	EU28+2
Slovakia	T-Mobile	EU28+2
Slovakia	O2	EU28+2
Slovenia	SI Mobil	Preferred Partners
Slovenia	Mobitel	EU28+2
Slovenia	Tusmobil	EU28+2
South Africa	Vodacom	Vodafone Networks
Spain	Vodafone	Vodafone Networks
Spain	Orange	EU28+2
Spain	Movistar	EU28+2
Sri Lanka	Dialog	Preferred Partners
Sweden	TeliaSonera	EU28+2
Sweden	Tele2	EU28+2
Sweden	Tele2	EU28+2
Sweden	Telenor	Preferred Partners
Sweden	Telenor	Preferred Partners
Switzerland	Swisscom	Preferred Partners
Switzerland	Sunrise	EU28+2
Switzerland	Orange	EU28+2

Taiwan,	Chunghwa	Preferred Partners
Tanzania	Vodacom	Preferred Partners
Thailand	TRUE Move	Preferred Partners
Thailand	Real Future	Preferred Partners
Turkey	Vodafone	Vodafone Networks
Uganda	Airtel	Preferred Partners
Ukraine	Kyivstar	Preferred Partners
UAE	du	Preferred Partners
UK	O2	EU28+2
UK	Vodafone	Vodafone Networks
UK	T-Mobile	EU28+2
UK	EE	EU28+2
United States	T-Mobile	Preferred Partners
Uruguay	Claro	Preferred Partners
Vietnam	Vinaphone	Preferred Partners
Zambia	Airtel	Preferred Partners