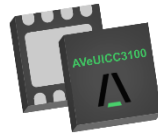
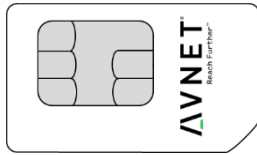


ARKESSA-bootstrapped industrial grade GSMA 3.1-compliant eUICC



Connectivity

- Preloaded with ARKESSA bootstrap profile and 700kB worth of connectivity
- Compliant with 2G / 3G / 4G / cat-M1 / cat-NB1 networks worldwide
- Access to 2G & 3G ARKESSA roaming networks worldwide
- Remotely managed 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
  - up to 500,000 cycles/page
  - max. cycling: 16 million per 256 bytes file @85°C
- Common Criteria EAL5+
- Form Factor: MFF2, 2FF
- ROHS compliance
- Temperature Range
  - Operating -40°C to +105°C
  - Storage -45°C to +125°C
- Data Retention
  - Up to 15 years at 85°C

Software

- Extended Lifetime Features 2.0
  - 128 kB (16 files per MNO profile) / 16 M cycles HSM
  - High-Stress Embedded Application Control
  - On-card & Remote Counters Monitoring/Audit
  - + Applet Lock Status + NVM Global counter
  - + EF Global counter + RESET Counter
- GSMA SGP.02 v3.1
- GSMA CI
- Global Platform 2.2.1
  - Amendment A: Controlling Authority Scenario 2b
  - Amendment B: OTA management over HTTPS
  - Amendment C: Dynamic Memory Allocation
  - Amendment D: SCP03 support
  - Amendment E/F: Scenario 3
- Java Card™ 3.0.4 Classic Edition

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PRELIMINARY

## 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.

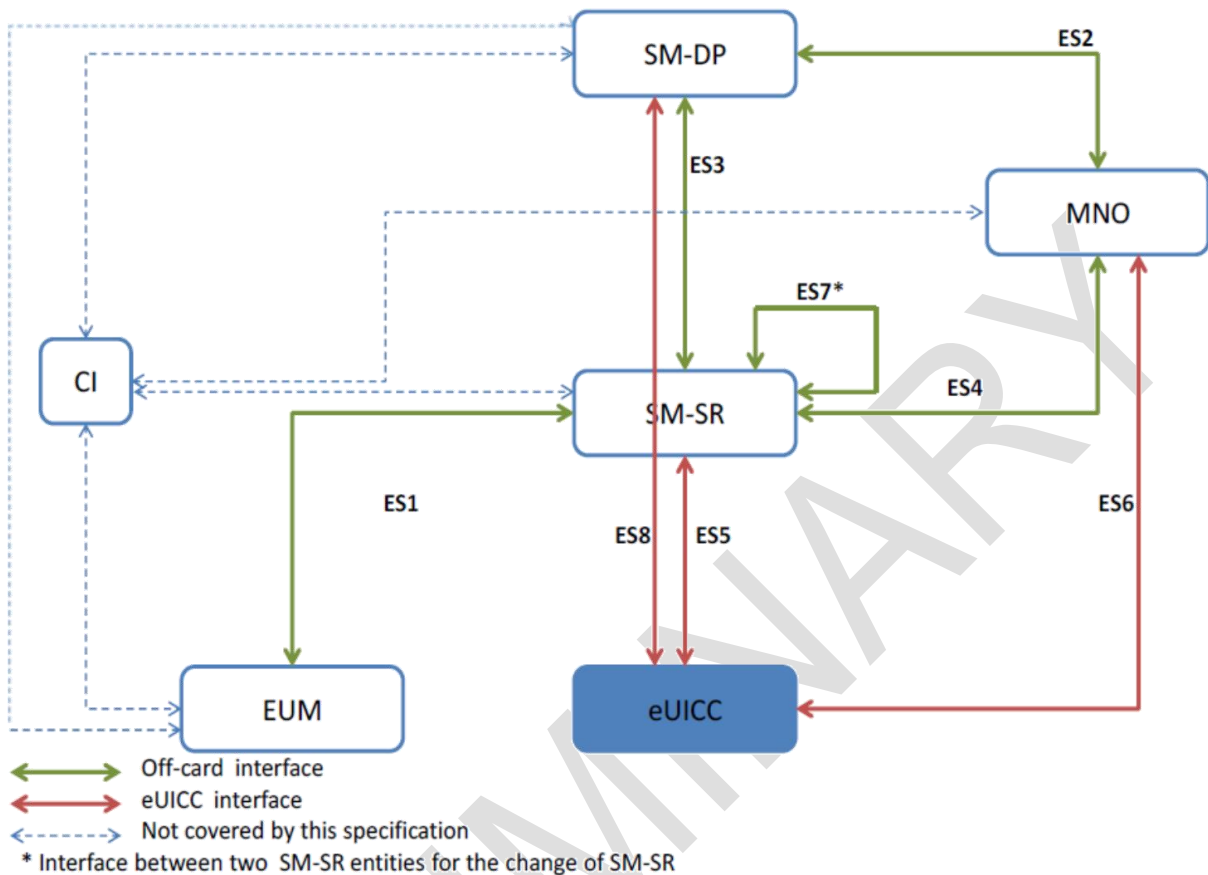


Figure 1: eUICC Remote Provisioning System

### 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:

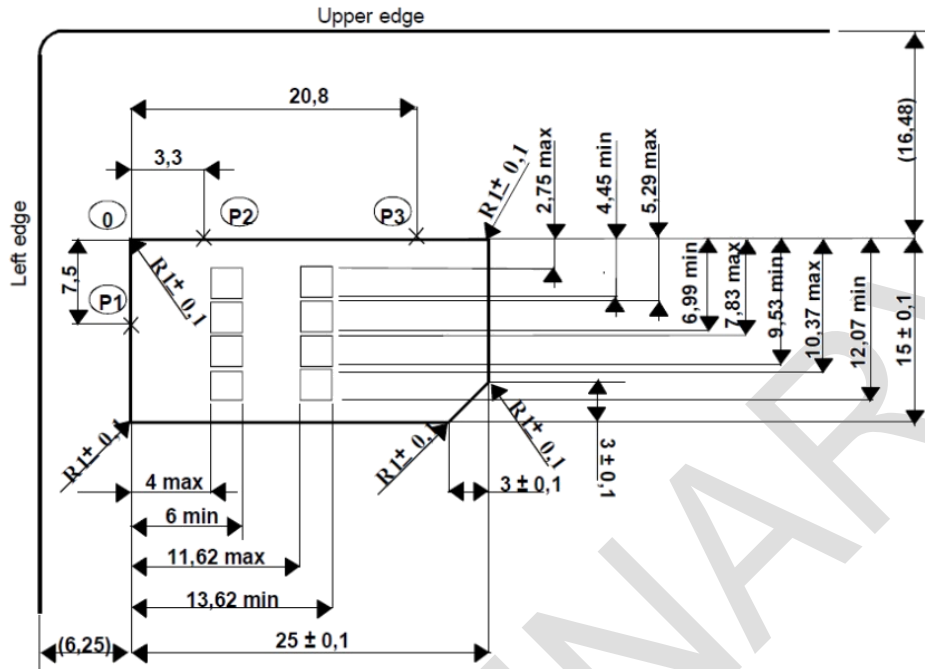
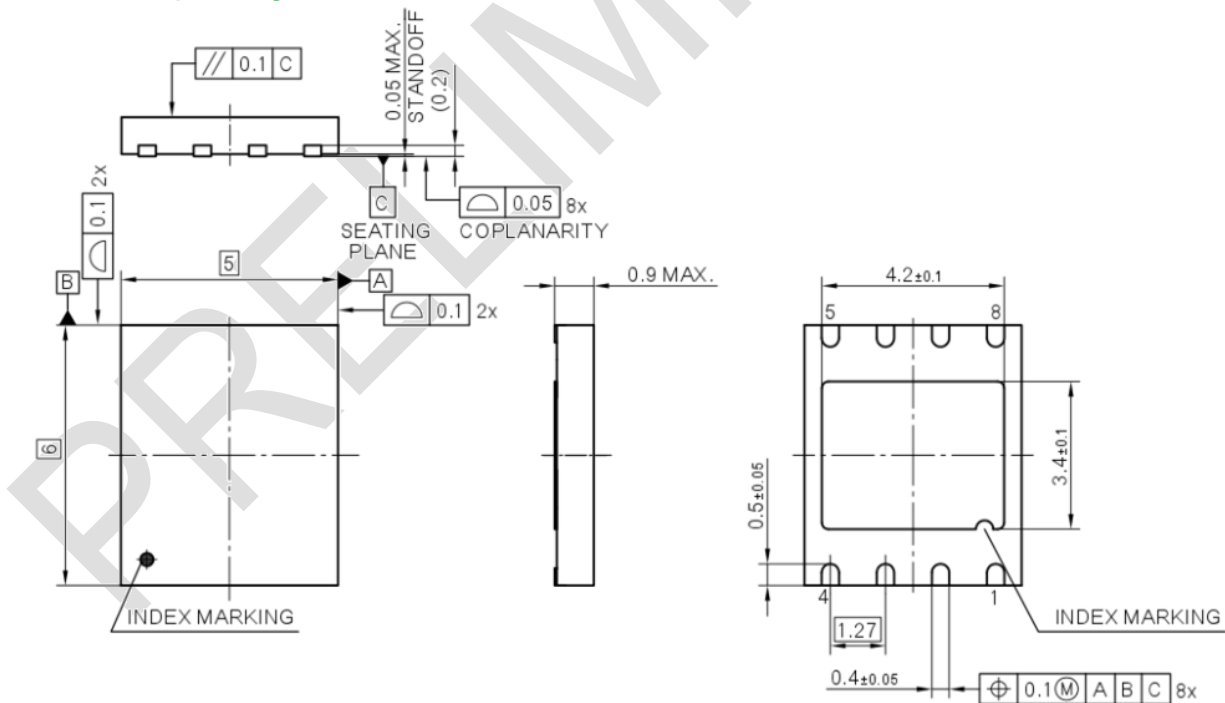


Figure 2: 2FF package dimensions

## 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 <sub>SS</sub>	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 <sub>CC</sub>	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 ARK 0M7 F2 B**

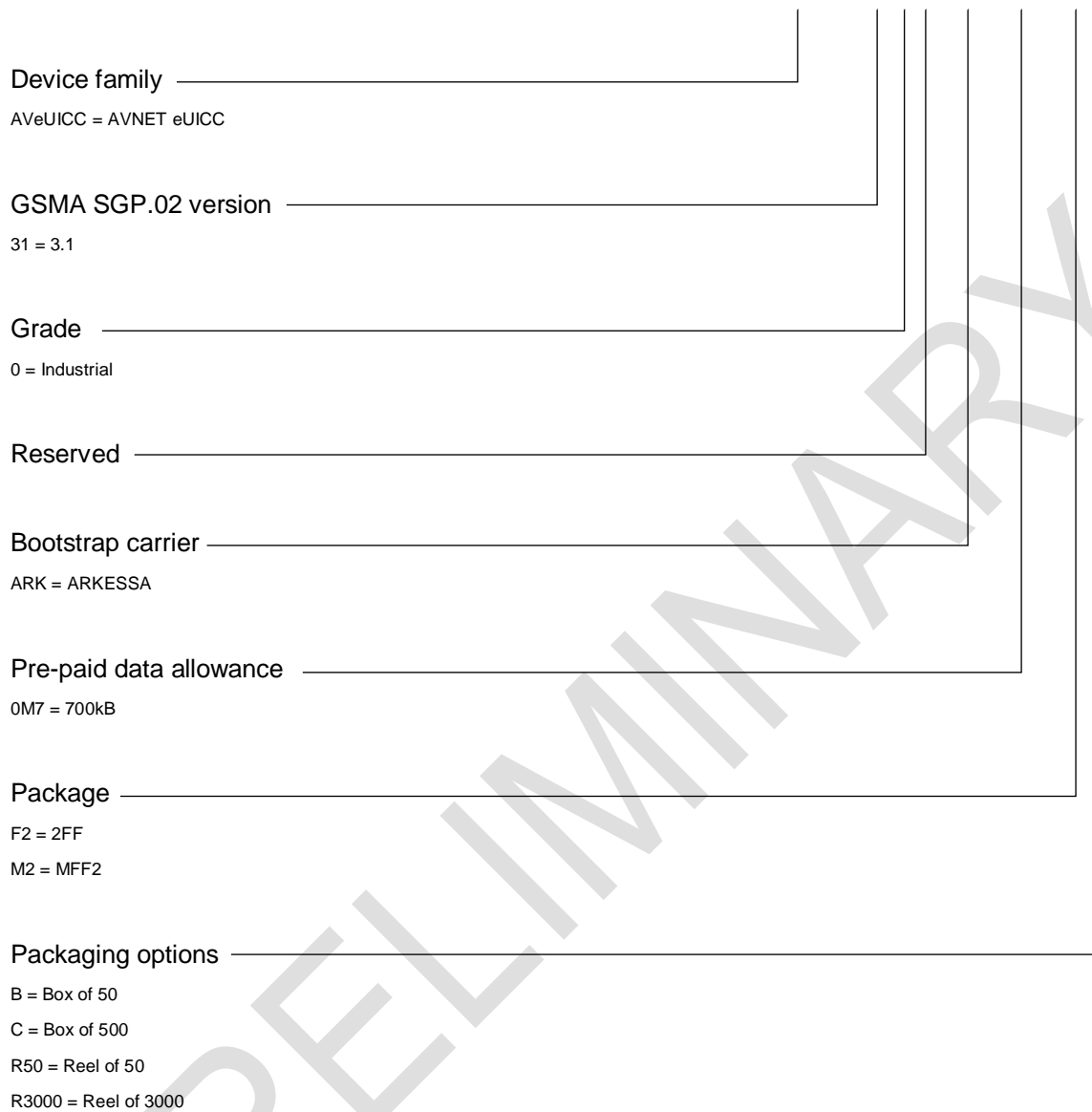


Figure 5: Nomenclature

## 7 Product characteristics

### 7.1 Absolute maximum ratings

Parameter	Symbol	Min	Typ	Max	Unit	Comment
Supply Voltage	V <sub>CC</sub>	-0.3	-	7.0	V	-
Input Voltage	V <sub>IN</sub>	-0.3	-	V <sub>CC</sub> + 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.

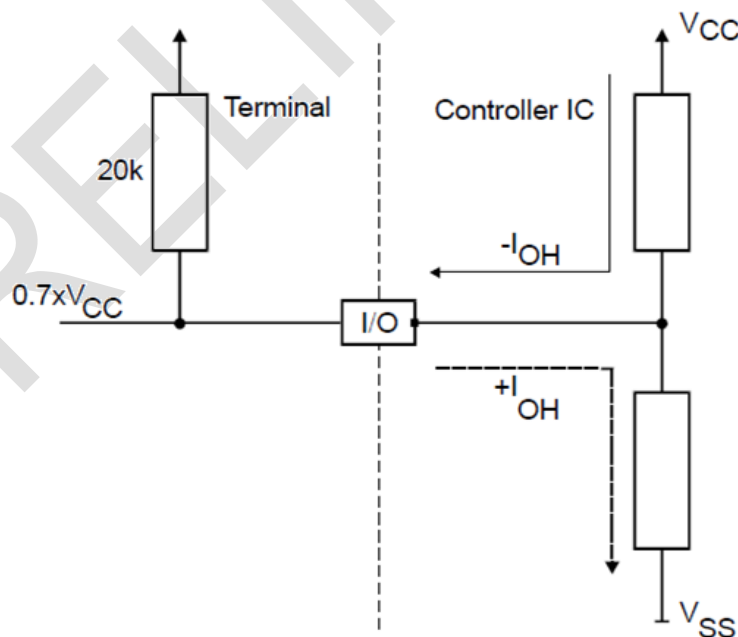


Figure 6: Pad interfacing - signs and symbols

### 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.  
 $T_A = -40\text{ }^\circ\text{C}$  to  $+105\text{ }^\circ\text{C}$  (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	$T_A = 25^\circ\text{C}$
Supply Current Spikes	$I_{CCD}$			100	mA	Class A - $Q < 20\text{ nAs}$
				50		Class B - $Q < 10\text{ nAs}$
				30		Class C - $Q < 6\text{ nAs}$
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	$\mu\text{A}$	$T_A = 25^\circ\text{C}$ , Clock 1 Mhz
Supply Current in sleep mode	$I_{CCS2}$			200	$\mu\text{A}$	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.*

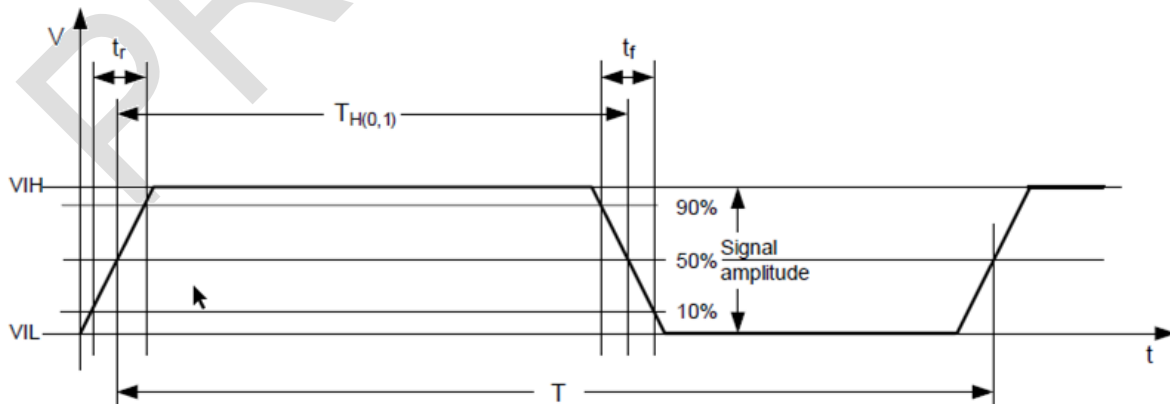
### 7.2.2 AC characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Comment
Supply Voltage ramp-up time	$t_{VCCR}$	1	-	$10^7$	$\mu\text{s}$	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	$I_{IH} = -20\mu A \dots + 20\mu A$
	$V_{IL}$	-0.3		$0.2 * V_{CC}$		$I_{IL} = -20\mu A \dots + 20\mu A$
<b>RST signal</b>						
Input Voltage	$V_{IH}$	$0.8 * V_{CC}$		$V_{CC} + 0.3$	V	$I_{IH} = -20 \mu A \dots + 20\mu A$
	$V_{IL}$	-0.3		$0.2 * V_{CC}$		$I_{IL} = -50 \mu A \dots + 20 \mu A$
Rise/fall time	$t_r, t_f$			1	$\mu s$	30 pF external
<b>I/O signal</b>						
Rise/fall time	$t_r, t_f$			1	$\mu s$	30 pF external
Input Voltage	$V_{IH}$	$0.7 * V_{CC}$		$V_{CC} + 0.3$	V	$I_{IH} = -20\mu A \dots + 20\mu A$
	$V_{IL}$	-0.3		$0.2 * V_{CC}$		$I_{IL} = -1 \text{ mA} \dots + 20 \mu A$
Output Voltage	$V_{OH}$	$0.7 * V_{CC}$		$V_{CC} + 0.3$	V	$I_{OH} = +/- 20\mu A$
				0.4		$I_{OL} = -1 \text{ mA Class A}$
	$V_{OL}$			0.4		$I_{OL} = -1 \text{ mA Class B}$
				0.3		$I_{OL} = -1 \text{ mA Class C}$

*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 ARKESSA

The AVeUICC3100ARK with the ARKESSA profile active will seek connectivity on the ARKESSA 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-ARKESSA.NET (*)

Field	Value
Username	arkessa
Password	arkessa
Authentication	PAP

(\*) 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 ARKESSA Internet Breakout Pools
  - 212.38.172.4 to 212.38.173.9
  - 212.38.173.35 to 212.38.173.40

### 9.2 IP addressing

- Private Static IP addresses will be assigned to the device
- Specific Range details will be provided at provisioning

### 9.3 Supported protocols

- Nothing is blocked
- DNS included
- UDP example with PacketSender™

Clear Log

	Time	From IP	From Port	To IP	To Port	Method	Error	ASCII	
1	15:08:12.843	You (Response)	21456	212.38.173.35	46816	UDP		This is a UDP answer from the server	54 68 69 73 20 69 73 20 6
2	15:08:12.843	212.38.173.35	46816	You	21456	UDP		This is a UDP query to the server	54 68 69 73 20 69 73 20 6

- TCP example with PacketSender™

Clear Log

	Time	From IP	From Port	To IP	To Port	Method	Error	ASCII	
1	15:06:51.848	You (Response)	21456	212.38.173.36	50147	TCP		This is a TCP answer from the server	54 68 69 73 20 69 73 20
2	15:06:50.472	212.38.173.36	50147	You	21456	TCP		This is a TCP query to the server	54 68 69 73 20 69 73 20

### 9.4 Security

- SSL VPNs available to allow remote access to cellular devices from PC's, laptops and tablets
- IPSec VPNs available to create private end to end networks and access to remote devices.

### 9.5 Supported network types

- 2G/3G global roaming on ARKESSA Connect Profile
- 4G, LTE Cat-NB1 & Cat-M1 agreements in progress



## 9.6 Data allowance

The AVeUICC3100ARK includes a data allowance of 700kB valid for a period of 12 months after purchase in up to 200 territories.

## 9.7 Countries and roaming networks

The ARKESSA connectivity included in the AVeUICC3100ARK bundle operates on up to 600 networks\* in 200 territories. The current list of countries and territories (subject to change) is provided for reference:

Afghanistan, Albania, Anguilla, Antigua and Barbuda, Argentina, Armenia, Aruba, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Barbados, Belarus, Belgium, Benin, Bermuda, Bhutan, Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Cambodia, Canada, Cayman Islands, Central African Republic, Chile, China, Colombia, Congo, (Dem.Rep., Kinshasa), Costa Rica, Croatia (Local Name: Hrvatska), Cyprus, Czech Republic, Denmark, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Faroe Islands, Fiji, Finland, France, French Guyana, French Polynesia, French West Indies, Gabon, Georgia, Germany, Ghana, Gibraltar, Greece, Grenada, Guadeloupe, Guatemala, Guernsey, Guinea, Guinea-Bissau, Guyana, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Iraq, Ireland, Isle of Man, Israel, Italy, Ivory Coast, Jamaica, Japan, Jersey, Jordan, Kazakhstan, Kenya, Korea, Republic Of, Kosovo, Kuwait, Kyrgyzstan, Latvia, Lesotho, Liberia, Liechtenstein, Lithuania, Luxembourg, Macau, Macedonia, The Former Yugoslav Republic of, Malaysia, Malta, Mexico, Moldova, Republic of, Monaco, Mongolia, Montenegro, Montserrat, Mozambique, Myanmar, Netherlands, Netherlands Antilles, New Zealand, Nicaragua, Nigeria, Norway, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Puerto Rico, Qatar, Réunion, Romania, Russian Federation, Samoa, Saudi Arabia, Serbia, Serbia & Montenegro, Singapore, Slovakia, Slovenia, South Africa, South Sudan, Spain, Sri Lanka, St Kitts And Nevis, St Lucia, St Vincent And The Grenadines, Suriname, Swaziland, Sweden, Switzerland, Taiwan, Province of China, Tajikistan, Tanzania, United Republic of, Thailand, Tonga, Trinidad and Tobago, Turkey, Turks and Caicos Islands, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, Uzbekistan, Vanuatu, Virgin Islands (British), Yemen, Zambia, Zimbabwe.

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:

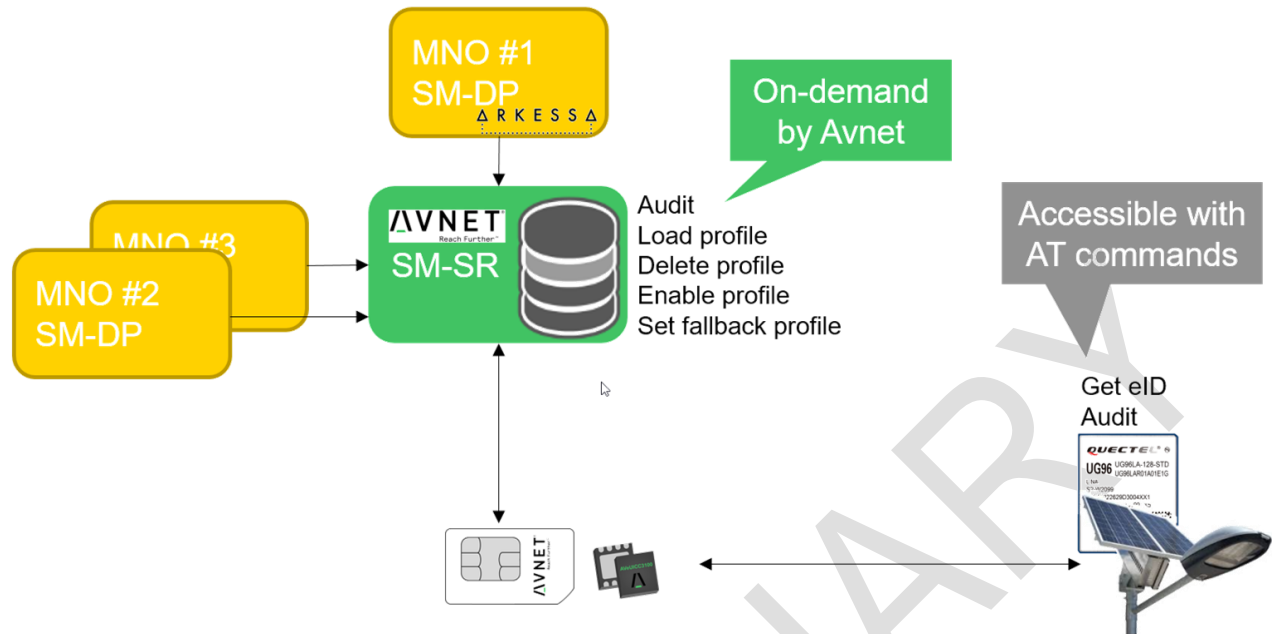


Figure 5: Simplified system overview

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 or 3G network. As previously explained, 4G or Cat-M1 (LTE-M) network is subject to availability with ARKESSA.

*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,"01A4040010A000000770307601100FE0000300001" // select LM applet
  - +CSIM: 4,"9000"
- AT+CSIM=10,"8116000012" // get EID
  - +CSIM: 40,"4C10890330242081004911000000000005399000"
- 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,"01A4040010A000000770307601100FE0000300001" // select LM applet
  - +CSIM: 4,"9000"
- AT+CSIM=10,"81180000FF" // AUDIT
  - +CSIM: 238,"
    - E3 25 4F 10A0000005591010FFFFFFFF8900001000 // 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 ARKESSA profile reading 98440123456789ABCDEF should read 89441032547698BADCFE.*

## 11 Glossary

SIM: Subscriber Identifier Module (2FF plastic format)

eSIM: embedded SIM (MFF2 chip format)

UICC: Universal Integrated Circuit Card = reprogrammable SIM (2FF plastic format)

eUICC: embedded UICC = reprogrammable eSIM (MFF2 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-free<sup>1)</sup> 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.

## Document Control

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Version	Date	Comment
0.50	12/19/2018	Initial draft
0.90	01/31/2019	Preliminary

## Appendix A: List of ARKESSA roaming partners

An up-to-date list of ARKESSA roaming partners can be provided on request. It includes up to 600 networks\* in 200 territories (\*subject to change):

Territory	Network	EU/ROW
Afghanistan	Afghan Wireless Communication Company	ROW
Afghanistan	Etisalat Afghanistan	ROW
Afghanistan	ROSHAN	ROW
Albania	Eagle Albania	ROW
Albania	Vodafone	ROW
Anguilla	C&W	ROW
Antigua and Barbuda	C&W	ROW
Argentina	Claro Argentina	ROW
Argentina	Movistar (Telefonica)	ROW
Argentina	Telecom Personal	ROW
Armenia	ArmenTel	ROW
Armenia	MTS/OJSC Armenia	ROW
Armenia	Orange Armenia	ROW
Aruba	Setar GSM	ROW
Australia	SingTel Optus	ROW
Australia	Telstra / MobileNet	ROW
Australia	Vodafone	ROW
Austria	Hutchison 3 Austria GmbH	EU
Austria	T-Mobile	EU
Austria	A1	EU
Azerbaijan	Bakcell	ROW
Bahrain	Batelco	ROW
Bahrain	MTC - Vodafone	ROW
Bahrain	STC Bahrain (VIVA)	ROW
Bangladesh	Axiata (Bangladesh) Limited	ROW
Bangladesh	Sheba Telecom (Pvt.) Ltd.	ROW
Bangladesh	GrameenPhone Ltd	ROW
Barbados	Cable & Wireless Barbados Ltd.	ROW
Belarus	Unitary Enterprise velcom	ROW
Belgium	Base Company NV/SA	EU
Belgium	Mobistar	EU
Belgium	Proximus	EU

Benin	MTN	ROW
Bermuda	Bermuda Digital Communications Limited	ROW
Bhutan	Tashi InfoComm Ltd	ROW
Bosnia and Herzegovina	Mobi's Telekom Srpska	ROW
Bosnia and Herzegovina	BH Telecom (GSMBIH)	ROW
Botswana	MTN	ROW
Brazil	Oi Brazil	ROW
Brazil	Claro	ROW
Brazil	TIM Celular S.A.	ROW
Brazil	Oi Move! S.A.	ROW
Brunei Darussalam	B-Mobile Communications SDN.BHD	ROW
Brunei Darussalam	DST Communications	ROW
Bulgaria	Mobitel	EU
Bulgaria	Telenor Bulgaria	EU
Bulgaria	BTC Bulgarian Telecommunication Company EAD	EU
Cambodia	CamGSM (Mobitel)	ROW
Cambodia	SMART Axiata	ROW
Canada	Bell Mobility	ROW
Canada	Rogers Communications Canada	ROW
Canada	Saskatchewan telecom	ROW
Canada	Telus	ROW
Cayman Islands	Lime	ROW
Central African Republic	Etisalat	ROW
Chile	Entel PCS	ROW
Chile	Claro Chile SA	ROW
China	China Mobile	ROW
China	China Unicom	ROW
Colombia	Claro	ROW
Colombia	Colombia Movil	ROW
Congo, (Dem.Rep., Kinshasa)	Vodacom Congo (RDC) sprl	ROW
Costa Rica	CLARO CR Telecomunicaciones, S.A.	ROW
Croatia (Local Name: Hrvatska)	T-Mobile	EU
Croatia (Local Name: Hrvatska)	Tele2 d.o.o za telekomunikacijske uluge	EU



Croatia (Local Name: Hrvatska)	VIPnet	EU
Cyprus	Cyprus Telecommunications Auth	EU
Cyprus	PrimeTel PLC	EU
Cyprus	MTN	EU
Czech Republic	Vodafone	EU
Czech Republic	O2-Czech Republic	EU
Czech Republic	T-Mobile	EU
Denmark	Telenor	EU
Denmark	TeliaDK	EU
Denmark	TDC	EU
Dominica	Lime	ROW
Dominican Republic	Orange	ROW
Dominican Republic	CLARO DOMINICANA	ROW
Ecuador	Claro	ROW
Egypt	Vodafone	ROW
El Salvador	Digicel	ROW
El Salvador	CTE Telecom Personal SA de CV	ROW
El Salvador	Telefonica	ROW
Estonia	EMT	EU
Estonia	Tele2	EU
Estonia	Elisa	EU
Faroe Islands	Faroese Telecom	ROW
Faroe Islands	Vodafone Faroe Island	ROW
Fiji	Digicel	ROW
Fiji	Vodafone Fiji	ROW
Finland	DNA Ltd	EU
Finland	Alands Mobiltelefon Ab	EU
Finland	Elisa	EU
Finland	Telia Sonera	EU
France	Orange	EU
France	SFR	EU
France	Bouygues	EU
France	Free Mobile	EU
French Guyana	Outremer Telcom	EU
French Polynesia	Vodafone French Polynesia	ROW
French West Indies	Digicel Antilles Française Guyane	EU
Gabon	Airtel	ROW
Gabon	Etisalat	ROW
Georgia	Magticom	ROW

Georgia	Mobitel LLC	ROW
Germany	Telekom Deutschland	EU
Germany	Vodafone	EU
Germany	O2	EU
Ghana	Vodafone Ghana	ROW
Ghana	ScanCom	ROW
Ghana	Airtel	ROW
Gibraltar	Gibtel	EU
Greece	Cosmote	EU
Greece	Vodafone-Panafon	EU
Greece	WIND HELLAS Telecommunications	EU
Grenada	Lime	ROW
Guadeloupe	Orange Caraibe	EU
Guadeloupe	Dauphin	EU
Guatemala	COMCEL-Comunicaciones Celulares Sociedad Anonima	ROW
Guatemala	SERCOM S.A. (Guatemala)	ROW
Guernsey	Sure	ROW
Guinea	MTN-Areeba Guinea	ROW
Guinea-Bissau	MTN Guinee-Bissau SA	ROW
Guyana	Guyana Telephone & Telegraph Co.	ROW
Guyana	Digicel Guyana	ROW
Honduras	Sercom	ROW
Hong Kong	Hutchison Telecom (HK) Ltd	ROW
Hong Kong	3G	ROW
Hong Kong	PCCW	ROW
Hong Kong	SmarTone	ROW
Hong Kong	CSL	ROW
Hungary	Telenor	EU
Hungary	T Mobile	EU
Hungary	Vodafone	EU
Iceland	Nova ehf.	EU
Iceland	Siminn hf	EU
Iceland	Vodafone	EU
India	IDEA Cellular Limited	ROW
India	Bharti Airtel Limited	ROW
India	Vodafone Essar Cellular Limited	ROW
India	Vodafone Essar East Limited	ROW
India	Vodafone Essar Mobile Services Limited	ROW
India	IDEA Mobile Communications	ROW

India	Vodafone Essar Gujarat Limited	ROW
India	Bharti Hexacom Limited	ROW
India	Vodafone Essar Limited	ROW
India	Idea Cellular	ROW
India	Idea Punjab (India)	ROW
India	Dishnet Wireless Limited (Himachal Pradesh)	ROW
India	Dishnet Wireless Limited (West Bengal)	ROW
India	Dishnet Wireless Limited (Jharhad)	ROW
India	Dishnet Wireless Limited (Orissa)	ROW
India	Dishnet Wireless Limited (Kolkata)	ROW
India	Aircel Limited (Delhi)	ROW
India	Dishnet Wireless Limited (Kerala)	ROW
India	Aircel Limited (Mumbai)	ROW
India	Aircel Limited (Karnataka)	ROW
India	Aircel Limited (Andhra Pradesh)	ROW
India	Aircel Limited (Maharashtra and Goa)	ROW
India	Aircel Limited (Tamil Nadu)	ROW
India	Aircel Cellular Ltd	ROW
India	Reliance Telecom Ltd	ROW
Indonesia	3	ROW
Indonesia	XL	ROW
Indonesia	Indosat Ooredoo	ROW
Indonesia	PT Telkomsel	ROW
Iraq	Zain	ROW
Ireland	O2	EU
Ireland	Vodafone	EU
Isle of Man	Manx Telecom	ROW
Israel	Partner	ROW
Israel	Cellcom Israel Ltd	ROW
Israel	Pelephone	ROW
Italy	Vodafone	EU
Italy	Telecom Italia S.p.A.	EU
Italy	WIND	EU
Ivory Coast	MTN Ivory Coast	ROW
Jamaica	Lime	ROW
Jamaica	Digicel (Jamaica) ltd	ROW
Japan	NTT DoCoMo, Inc	ROW
Japan	SoftBank Corp	ROW
Jersey	Jersey Airtel Limited	ROW

Jersey	Jersey Telecom	ROW
Jordan	Zain/J.M.T.S.	ROW
Jordan	Petra Jordanian Mobile Telecommunications Company	ROW
Jordan	Umniah Mobile Company	ROW
Kazakhstan	Tele2 Kazakhstan	ROW
Kazakhstan	Kar-Tel Ltd	ROW
Kenya	Airtel	ROW
Kenya	Safaricom	ROW
Korea, Republic Of	KT 3G	ROW
Korea, Republic Of	SK Telecom	ROW
Kosovo	Mobitel (Kosovo region)	ROW
Kuwait	Mobile Telecommunications Company (Zain)	ROW
Kuwait	Ooredoo	ROW
Kyrgyzstan	Beeline	ROW
Latvia	Tele 2	EU
Latvia	SIA Bite Latvija	EU
Latvia	LMT	EU
Lesotho	Vodacom Lesotho (Pty) Ltd	ROW
Liberia	Lonestar Communications Corporation	ROW
Liechtenstein	Telecom Liechtenstein AG	EU
Liechtenstein	Salt (Liechtenstein) AG	EU
Lithuania	UAB TELE2	EU
Lithuania	Bite GSM	EU
Lithuania	Omnitel	EU
Luxembourg	POST Luxembourg	EU
Luxembourg	Tango	EU
Luxembourg	Orange	EU
Macau	Hutchinson/ 3 Maccau	ROW
Macau	SmarTone Mobile Communications (Macau) Ltd	ROW
Macedonia, The Former Yugoslav Republic of	one.Vip DOO Skopje	ROW
Malaysia	Maxis Broadband	ROW
Malaysia	Celcom (Malaysia) Sdn Bhd	ROW
Malaysia	U Mobile Sdn Bhd	ROW
Malaysia	Digi Telecom	ROW
Malta	Mobisle Communications Limited	EU

Malta	Melita Mobile Ltd Malta	EU
Malta	Vodafone Malta Limited	EU
Mexico	Iusacell Mexico	ROW
Mexico	Radiomovil Dipsa SA de CV (TELCEL)	ROW
Moldova, Republic of	Voxtel	ROW
Monaco	Monaco Telecom	ROW
Mongolia	Unitel LLC	ROW
Montenegro	MTEL Montenegro	ROW
Montenegro	Telenor (Promonte)	ROW
Montenegro	Telekom	ROW
Montserrat	Lime	ROW
Mozambique	VM, S.A.R.L.	ROW
Myanmar	Myanmar Posts and Telecommunications	ROW
Netherlands	Vodafone	EU
Netherlands Antilles	Mossel Limited T/A Digicel	ROW
Netherlands Antilles	Telcell N.V.	ROW
Netherlands Antilles	UTS Setel	ROW
New Zealand	Vodafone	ROW
Nicaragua	Empresa Nicaraguense de Telecomunicaciones S.A. - ENITEL	ROW
Nigeria	Airtel Niger (celtel)	ROW
Nigeria	MTN	ROW
Norway	Telia Norge AS	EU
Norway	Telenor Mobil	EU
Pakistan	Mobilink GSM	ROW
Pakistan	Telenor Pakistan	ROW
Panama	Digicel	ROW
Panama	Claro Panama	ROW
Panama	Cable & Wireless	ROW
Papua New Guinea	Digicel Papua New Guinea	ROW
Paraguay	Claro Paraguay	ROW
Paraguay	Telefonica Celular Del Paraguay S.A. (Telecel S.A.)	ROW
Peru	Nextel del Perú S.A.	ROW
Peru	America Movil Peru S.A.C.	ROW
Philippines	Smart Communications Inc	ROW
Philippines	Digital Telecommunications Phils, Inc	ROW
Poland	T-Mobile	EU
Poland	Orange Polska	EU

Poland	Polkomtel S.A.	EU
Poland	P4	EU
Portugal	Nos comunicacoes SA /Optimus	EU
Portugal	Vodafone	EU
Portugal	MEO	EU
Puerto Rico	Puerto Rico Telephone Company Inc.	ROW
Qatar	Vodafone Qatar	ROW
Réunion	SFR Reunion	EU
Réunion	Outremer Telcom	EU
Romania	RCS&RDS	EU
Romania	Cosmote	EU
Romania	Vodafone Romania SA	EU
Romania	Orange	EU
Russian Federation	Mobile PJSC	ROW
Russian Federation	Vimpelcom	ROW
Samoa	Digicel (Samoa) Limited	ROW
Saudi Arabia	STC	ROW
Saudi Arabia	Zain/Mobile	ROW
Serbia	Vip mobile DOO Servië	ROW
Serbia & Montenegro	Telenor d.o.o	ROW
Singapore	MobileOne	ROW
Singapore	StarHub Mobile	ROW
Singapore	Singapore Telecom Mobile	ROW
Slovakia	Slovak Telekom (T-Mobile)	EU
Slovakia	Orange	EU
Slovakia	O2	EU
Slovenia	Mobitel	EU
Slovenia	SI Mobil - Vodafone	EU
Slovenia	Tusmobil	EU
South Africa	MTN	ROW
South Africa	Vodacom	ROW
South Sudan	Zain South Sudan	ROW
Spain	Vodafone	EU
Spain	France Telecom Espana	EU
Spain	Telefonica	EU
Sri Lanka	Mobitel (Pvt) Limited	ROW
Sri Lanka	Airtel Lanka	ROW
Sri Lanka	Dialog Telekom Ltd	ROW
St Kitts And Nevis	Lime	ROW
St Lucia	Lime	ROW

St Vincent And The Grenadines	Lime	ROW
Suriname	Digicel Suriname	ROW
Swaziland	Swazi MTN Limited	ROW
Sweden	Telenor Sverige AB	EU
Sweden	Tele 2 Sverige AB	EU
Sweden	TeliaSonera	EU
Switzerland	Swisscom	ROW
Switzerland	Sunrise Communications AG	ROW
Taiwan	Far EasTone	ROW
Taiwan	Chunghwa	ROW
Taiwan	Taiwain Mobile	ROW
Tajikistan	Tacom LLC	ROW
Tajikistan	JOSA Babilon-Mobile	ROW
Tanzania	Vodacom Tanzania Limited	ROW
Thailand	RealFuture Company Ltd.	ROW
Thailand	True Move H. Universal	ROW
Thailand	dTac Trinet	ROW
Thailand	AIS 3G	ROW
Thailand	DTAC	ROW
Thailand	True Move (Real Future)	ROW
Tonga	Digicel	ROW
Trinidad and Tobago	Mossel Limited T/A Digicel	ROW
Turkey	Turk Telecom (Avea)	ROW
Turkey	Turkcell	ROW
Turkey	Vodafone Telekomunikasyon	ROW
Turks and Caicos Islands	Lime GSM	ROW
Uganda	MTN	ROW
Uganda	Airtel Telecom Uganda	ROW
Ukraine	MTS	ROW
United Arab Emirates	du Emirates	ROW
United Kingdom	O2	EU
United Kingdom	Everything Everywhere	EU
United Kingdom	Vodafone	EU
United States	Commnet Wireless	ROW
United States	Pulse Mobile	ROW
United States	T-Mobile (Voicestream)	ROW
Uruguay	AM Wireless Uruguay S.A.	ROW
Uruguay	ANTEL	ROW

Uzbekistan	Unitel LLC	ROW
Vanuatu	Digicel	ROW
Virgin Islands (British)	Caribbean Cellular Telephone	ROW
Virgin Islands (British)	Cable & Wireless (West Indies)	ROW
Yemen	MTN	ROW
Zambia	MTN (Zambia) Ltd	ROW
Zimbabwe	Telecel Zimbabwe	ROW

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