EUROPEAN TELECOMMUNICATION STANDARD

ETS 300 641

August 1997

Second Edition

Source: ETSI SMG

Reference: RE/SMG-091112QR

ICS: 33.020

Key words: Digital cellular telecommunications system, Global System for Mobile communications (GSM)

GLOBAL SYSTEM FOR
MOBILE COMMUNICATIONS

Digital cellular telecommunications system (Phase 2); Specification of the 3 Volt Subscriber Identity Module - Mobile Equipment (SIM - ME) interface (GSM 11.12 version 4.2.1)

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE
Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE
X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 4 92 94 42 00 - Fax: +33 4 93 65 47 16

Contents

Blank page

Foreword

This European Telecommunications Standard (ETS) has been produced by the Special Mobile Group (SMG) of the European Telecommunications Standards Institute (ETSI).

This ETS defines the aspects of the Subscriber Identity Module - Mobile Equipment (SIM - ME) interface which are based on 3V technology to be used in the Mobile Station (MS) within the digital cellular telecommunications system (Phase 2).

Transposition dates	
Date of adoption:	25 July 1997
Date of latest announcement of this ETS (doa):	30 November 1997
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	31 May 1998
Date of withdrawal of any conflicting National Standard (dow):	31 May 1998

Blank page

1 Scope

This European Telecommunications Standard (ETS) defines the aspects of the Subscriber Identity Module-Mobile Equipment (SIM - ME) interface which are based on 3V technology to be used in the Mobile Station (MS). It specifies the electrical and logical requirements necessary for the operation of the 3V SIM - ME interface where it differs from GSM 11.11 (ETS 300 608) [1]. For all aspects of the SIM - ME interface which are not covered by this ETS, GSM 11.11 (ETS 300 608) [1] applies.

2 Normative references

This ETS incorporates by dated and non-dated reference, provisions from other publications. This normative reference is cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For non-dated references the latest edition of the publication referred to applies.

[1] GSM 11.11 (ETS 300 608): "Digital cellular telecommunications system (Phase 2); Specification of the Subscriber Identity Module-Mobile Equipment (SIM - ME) interface".

3 Definitions, abbreviations and symbols

3.1 Definitions

For the purposes of this ETS, the following definitions apply.

3V technology SIM: A SIM operating at 3V ± 10 % and 5V ± 10 %.

3V technology ME: An ME operating the SIM - ME interface at 3V ± 10 % according to this ETS and 5V ± 10 % according to GSM 11.11 (ETS 300 608) [1].

3V only ME: An ME only operating the SIM - ME interface at 3V ± 10 % according to this ETS.

3.2 Abbreviations

For the purposes of this ETS, the following abbreviations apply.

ATR	Answer To Reset
CLK	Clock
IC	Integrated Circuit
I/O	Input/Output
ME	Mobile Equipment
MS	Mobile Station
RST	Reset
SIM	Subscriber Identity Module

3.3 Symbols

For the purposes of this ETS, the following symbols apply.

t_F	fall time
t_R	rise time
V_{IH}	Input Voltage (high)
V_{IL}	Input Voltage (low)
V_{OH}	Output Voltage (high)
V_{OL}	Output Voltage (low)

4 3V technology

4.1 3V technology SIM

The SIM shall operate on both 5V ± 10 % according to GSM 11.11 (ETS 300 608) [1], and on 3V ± 10 % according to this ETS. If the ME supplies 5V to the SIM, both the ME and the SIM shall operate according to GSM 11.11 (ETS 300 608) [1]. The logical operation of the 3V technology SIM shall be as defined in GSM 11.11 (ETS 300 608) [1].

Clock stop mode shall be supported by the SIM. The SIM shall indicate "Clock Stop Allowed" in the file characteristics of the status information as specified in GSM 11.11 (ETS 300 608) [1].

4.2 3V technology impact

When supplied with the supply voltage as specified in this ETS the SIM shall be operated with a clock frequency of 1 to 4 MHz.

4.3 3V technology SIM Identification

The 3V technology SIM shall contain an identification. The identification is coded on bit 5 in byte 14 of the status information as follows:

"0" : 5V only SIM;

"1" : 3V technology SIM.

In the case that the ME offers full compatibility by being able to operate the SIM interface at both 3V and 5V, then bit 5 in byte 14 of the status information, when set to "1", indicates that the SIM may be operated at 3V.

The procedure for deriving the identification bit shall be performed by the ME immediately after the Answer To Reset (ATR) and before issuing any other command. The procedure consists of the two commands "SELECT GSM" and "STATUS/GET RESPONSE".

4.4 3V technology ME

The 3V technology ME shall initially activate the SIM with 3V according to this specification.

If the ME detects a 3V technology SIM, the ME may operate the SIM at 3V according to this specification. If the ME is able to detect a 5V SIM, the ME shall switch to 5V operation as defined in GSM 11.11 (ETS 300 608) [1] using the procedure as defined in subclause 4.7. If switching is performed, it shall take place before issuing any further commands as defined in subclause 4.3.

If a faulty ATR is received at 3V, the ME shall initiate the error handling procedure described in GSM 11.11 (ETS 300 608) [1] with the supply voltage remaining at 3V. If the error handling does not result in an errorless ATR, the ME shall activate the SIM at 5V. Activation at 5V shall be performed in accordance with TS GSM 11.11 (ETS 300 608) [1].

If no ATR is received at 3V, the ME shall deactivate the SIM and activate it at 5V according to GSM 11.11 (ETS 300 608) [1].

4.5 3V Only ME

The 3V only ME activates the SIM at 3V.

If the ME is able to detect a 5V only SIM according to the procedure in subclause 4.3, or if the procedure cannot be completed, the ME shall deactivate and reject the SIM immediately (maximum of 5 s) without issuing any further command. This rejection ensures that a SIM which appears to operate successfully during these early procedures is not allowed to continue further into the GSM session where it may subsequently give unreliable operation at 3V.

If an ATR is corrupted or not received by the ME, error handling according to subclause 5.10 of GSM 11.11 (ETS 300 608) [1] shall apply.

4.6 Activation and deactivation

The ME shall connect, activate and deactivate the SIM in accordance with the operating procedures specified in GSM 11.11 (ETS 300 608) [1] taking into account the electrical characteristics specified in clause 5 of this ETS. In particular, Vcc is powered when it has a value between 2,7 V and 3,3 V.

4.7 Supply voltage switching

MEs supporting both 3V and 5V operation may switch between the two supply voltages. Switching shall always be performed by deactivating the SIM and activating it at the new supply voltage. Activation and deactivation of the SIM with 5V shall be according to GSM 11.11 (ETS 300 608) [1], whereas activation and deactivation of the SIM with 3V shall be according to this ETS.

4.8 Cross compatibility

Cross compatibility means that the ME supports 3V and 5V operation. This is, however, optional for the ME. In case of the 3V technology ME, full cross compatibility is provided, whereas, a 3V only ME requires a 3V technology SIM for operation. However, the 3V technology SIM (see definitions) ensures full cross compatibility.

4.9 Outlook

Due to technology development it is possible in the future, when sub-micron technology is introduced, that Integrated Circuits (ICs) used in MEs may not withstand the 5V supply voltage. This may, in particular, be the case for ICs operating in the power supply range of 1,5V to 3,6V. It may therefore be necessary in the future to specify a low voltage only SIM interface.

NOTE: When a low voltage only SIM is inserted into an ME when it is supplying 5V, the SIM may be destroyed which in some cases could cause permanent damage to the ME. Precautions should be taken by the IC manufacturers to prevent the low voltage ICs from being damaged at 5V.

5 Electrical specifications of the SIM - ME interface

The electrical specification given in this ETS covers the supply voltage range from 2,7V to 3,3V. The supply voltage range from 4,5V to 5,5V is specified in GSM 11.11 (ETS 300 608) [1]. For each state (V_{OH}, V_{IH}, V_{IL} and V_{OL}) a positive current is defined as flowing out of the entity (ME or SIM) in that state. Vpp is not supported by the 3V technology ME or the 3V technology SIM.

When the SIM is in idle state the current consumption of the card shall not exceed 200 µA at 1 MHz at +25°C. When the SIM is in clock stop mode the current consumption shall not exceed 100 µA at +25 °C.

The ME shall source the maximum current as defined in table 4. It shall also be able to counteract spikes in the current consumption of the card up to a maximum charge of 12 nAs with no more than 400 ns duration and an amplitude of at most 60 mA, ensuring that the supply voltage stays in the specified range.

The clock duty cycle shall be between 40 % and 60 % of the period during stable operation. A clock cycle is defined at 50 % of Vcc from rising to rising edge or falling to falling edge. When switching clock frequencies MEs shall ensure that no pulse is shorter than 100 ns which is 40 % of the shortest allowed period.

The ME need not provide contact C6 (Vpp). Contact C6 shall not be connected in the ME if provided.

Table 1: Electrical characteristics of I/O under normal operating conditions

Symbol	Conditions	Minimum	Maximum	Unit
V_{IH}	I_{IHmax} = ± 20 µA (note 2)	0,7 x Vcc	Vcc+0,3	V
V_{IL}	I_{ILmax} = + 1 mA	- 0,3	0,2 x Vcc	V
V_{OH} (note 1)	I_{OHmax} = + 20 µA	0,7 x Vcc	Vcc (note 3)	V
V_{OL}	I_{OLmax} = - 1mA	0 (note 3)	0,4	V
t_R t_F	C_{in} = C_{out} = 30 pF		1	µs

NOTE 1: It is assumed that a pull-up resistor is used on the interface device (recommended value: 20 k Ω).
NOTE 2: During static conditions (idle state) only the positive value can apply. Under dynamic operating conditions (transmissions) short term voltage spikes on the I/O line may cause a current reversal.
NOTE 3: To allow for overshoot the voltage on I/O shall remain between -0,3V and Vcc+0,3V during dynamic operation.

Table 2: Electrical characteristics of Clock (CLK) under normal operating conditions

Symbol	Conditions	Minimum	Maximum	Unit
V_{OH}	I_{OHmax} = + 20 µA	0,7 x Vcc	Vcc (note)	V
V_{OL}	I_{OLmax} = - 20 µA	0 (note)	0,2 x Vcc	V
t_R t_F	C_{in} = C_{out} = 30 pF		50	ns

NOTE: To allow for overshoot the voltage on CLK should remain between -0,3V and Vcc+0,3V during dynamic operations.

Table 3: Electrical characteristics of RESET (RST) under normal operating conditions in idle state

Symbol	Conditions	Minimum	Maximum	Unit
V_{OH}	I_{OHmax} = + 20 µA	0,8 x Vcc	Vcc (note)	V
V_{OL}	I_{OLmax} = -200 µA	0 (note)	0,2 x Vcc	V
t_R t_F	C_{in} = C_{out} = 30 pF		400	µs

NOTE: To allow for overshoot the voltage on RST should remain between -0,3V and Vcc +0,3V during dynamic operations.

Table 4: Electrical characteristics of RESET (RST) under normal operating conditions in operating state

Symbol	Conditions	Minimum	Maximum	Unit
V_{OH}	I_{OHmax} = + 200 µA	0,8 x Vcc	Vcc (note)	V
V_{OL}	I_{OLmax} = -200 µA	0 (note)	0,2 x Vcc	V
t_R t_F	C_{in} = C_{out} = 30 pF		400	µs

NOTE : To allow for overshoot the voltage on RST should remain between -0,3V and Vcc +0,3V during dynamic operations.

The value for I_{OHmax} will be reconsidered in 1997 to reduce the power consumption of the ME. The value aimed at is +20 µA.

Table 5: Electrical characteristics of Vcc under normal operating conditions

Symbol	Minimum	Maximum	Unit
Vcc	2,7	3,3	V
Icc		6 (note)	mA
NOTE: The supply current at 3,3V refers to a clock frequency of 4 MHz.			

History

Document history			
August 1995	Public Enquiry	PE 89:	1995-08-07 to 1995-12-01
August 1996	Vote	V 108:	1996-08-05 to 1996-09-27
December 1996	First Edition		
March 1997	One-step Approval Procedure (Second Edition)	OAP 9729:	1997-03-21 to 1997-07-18
August 1997	Second Edition		

ISBN 2-7437-1680-0
Dépôt légal :Août 1997