INTERNATIONAL STANDARD

ISO/IEC 10373-3

First edition
2001-02-15

Identification cards — Test methods —

Part 3: Integrated circuit(s) cards with contacts and related interface devices

Cartes d'identification — Méthodes d'essai —

Partie 3: Cartes à circuit(s) intégré(s) à contacts et dispositifs d'interface assimilés

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282493e6-1a22-4c5d-8b2b-bbcac93f36b5/iso-iec-10373-3-2001

Reference number
ISO/IEC 10373-3:2001(E)

© ISO/IEC 2001

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282493e6-1a22-4c5d-8b2b-bbcac93f36b5/iso-iec-10373-3-2001

© ISO/IEC 2001

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

 © ISO/IEC 2001 – All rights reserved

Contents

Foreword vi
1 Scope 1
2 Normative references 1
3 Terms and definitions 2
4 General items applicable to the test methods 3
4.1 Test environment 3
4.2 Pre-conditioning 3
4.3 Default tolerance 3
4.4 Total measurement uncertainty 3
4.5 Conventions for electrical measurements 3
4.6 Apparatus 3
4.6.1 Default ICC-holder, reference axes and default measurement position 3
4.6.2 Apparatus for testing the integrated circuit(s) cards with contacts (ICC-test-apparatus) 5
4.6.3 Apparatus for testing the interface device (IFD-test-apparatus) 11
4.6.4 Test Scenario 17
4.7 Relationship of test methods versus base standard requirements 17
5 Test methods for physical characteristics of ICCs with contacts 21
5.1 Dimension and Location of Contacts 21
5.1.1 Apparatus 21
5.1.2 Procedure 21
5.1.3 Test report 22
5.2 Static electricity 22
5.2.1 Test Report 22
5.3 Electrical surface resistance of contacts 22
5.3.1 Apparatus 22
5.3.2 Procedure 23
5.3.3 Test report 23
5.3.4 Preliminary requirement 23
5.4 Surface profile of contacts 24
5.4.1 Apparatus 24
5.4.2 Procedure 24
5.4.3 Test report 25
6 Test methods for electrical characteristics of ICCs with contacts 25
6.1 VCC contact 25
6.1.1 Apparatus 25
6.1.2 Procedure 25
6.1.3 Test report 26
6.2 I/O contact 27
6.2.1 Apparatus 27
6.2.2 Procedure 27
6.2.3 Test report 29
6.3 CLK contact 29
6.3.1 Apparatus 29
6.3.2 Procedure 29
6.3.3 Test report 31
6.4 RST contact 31
6.4.1 Apparatus 31
6.4.2 Procedure 31
6.4.3 Test report 32

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282493e6-1a22-4c5d-8b2b-bbcac93f36b5/iso-iec-10373-3-2001

© ISO/IEC 2001 – All rights reserved

6.5 VPP contact 32

7 Test methods for logical operations of ICCs with contacts 33
7.1 Answer to Reset (ATR) 33
7.1.1 Cold Reset and Answer-to-Reset (ATR) 33
7.1.2 Warm Reset 33
7.1.3 Selection of the operation class A 34
7.2 T=0 Protocol 35
7.2.1 I/O transmission timing for T=0 protocol 35
7.2.2 I/O character repetition for T=0 protocol 36
7.2.3 I/O reception timing and error signaling for T=0 protocol 37
7.3 T=1 Protocol 38
7.3.1 I/O transmission timing for T=1 protocol 38
7.3.2 I/O reception timing for T=1 protocol 39
7.3.3 ICC Character Waiting Time (CWT) behavior 41
7.3.4 ICC-reaction to IFD exceeding character waiting time (CWT) 41
7.3.5 Block Guardtime (BGT) 42
7.3.6 Block sequencing by the ICC 43
7.3.7 Reactions of the ICC to protocol errors 45
7.3.8 Recovery of a transmission error by the ICC 46
7.3.9 Resynchronization 47
7.3.10 IFSD negotiation 48
7.3.11 Abortion by the IFD 49

8 Test methods for physical and electrical characteristics of the IFD 50
8.1 Activation of contacts 50
8.1.1 Apparatus 50
8.1.2 Procedure 50
8.1.3 Test report 51
8.2 VCC contact 51
8.2.1 Apparatus 51
8.2.2 Procedure 51
8.2.3 Test report 53
8.3 I/O contact 53
8.3.1 Apparatus 53
8.3.2 Procedure 53
8.3.3 Test report 55
8.4 CLK contact 55
8.4.1 Apparatus 56
8.4.2 Procedure 56
8.4.3 Test report 58
8.5 RST contact 58
8.5.1 Apparatus 58
8.5.2 Procedure 58
8.5.3 Test report 59
8.6 VPP contact 59
8.7 Deactivation of the contacts 59
8.7.1 Apparatus 60
8.7.2 Procedure 60
8.7.3 Test report 60

9 Test methods for logical operations of the IFD 60
9.1 Answer to Reset (ATR) 60
9.1.1 ICC Reset (cold reset) 60
9.1.2 ICC Reset (warm reset) 61
9.2 T=0 Protocol 61
9.2.1 I/O transmission timing for T=0 protocol 61
9.2.2 I/O character repetition for T=0 protocol 62
9.2.3 I/O reception timing and error signaling for T=0 protocol 63
9.3 T=1 Protocol 65
9.3.1 I/O transmission timing for T=1 protocol 65

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282493e6-1a22-4c5d-8b2b-bbcac93f36b5/iso-iec-10373-3-2001

 © ISO/IEC 2001 – All rights reserved

9.3.2 I/O reception timing for T=1 protocol 66
9.3.3 IFD Character Waiting Time (CWT) behavior 67
9.3.4 IFD-reaction to ICC exceeding CWT 68
9.3.5 Block Guardtime (BGT) 68
9.3.6 Block sequencing by the IFD 69
9.3.7 Recovery of a transmission error by the IFD 73
9.3.8 IFSC negotiation 73
9.3.9 Abortion by the ICC 74

Annex A (informative) Additional Test Methods 76
A.1 ICC — Mechanical strength: 3 wheel test 76
A.1.1 Apparatus 76
A.1.2 Method 78
A.1.3 Test Report 79
A.2 IFD — Reaction of the IFD to invalid PCBs 79
A.2.1 Apparatus 79
A.2.2 Procedure 79
A.2.3 Test report 80

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282493e6-1a22-4c5d-8b2b-bbcac93f36b5/iso-iec-10373-3-2001

© ISO/IEC 2001 – All rights reserved

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO/IEC 10373 may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 10373-3 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Identification cards and related devices*.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/IEC 10373 consists of the following parts, under the general title *Identification cards — Test methods*:

— *Part 1: General characteristics tests*

— *Part 2: Cards with magnetic stripes*

ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282493e6-1a22-4c5d-8b2b-bbcac93f36b5/iso-iec-10373-3-2001

— *Part 3: Integrated circuit(s) cards with contacts and related interface devices*

— *Part 4: Contactless integrated circuit cards*

— *Part 5: Optical memory cards*

— *Part 6: Proximity cards*

— *Part 7: Vicinity cards*

Annex A of this part of ISO/IEC 10373 is for information only.

© ISO/IEC 2001 – All rights reserved

Identification cards — Test methods —

Part 3:
Integrated circuit(s) cards with contacts and related interface devices

1 Scope

This part of ISO/IEC 10373 defines test methods for characteristics of integrated circuit(s) cards with contacts and related interface devices according to the definition given in ISO/IEC 7816. Each test method is cross-referenced to one or more base standards, which may be ISO/IEC 7810 or one or more of the supplementary standards that define the information storage technologies employed in identification card applications.

NOTE 1 Criteria for acceptability do not form part of this International Standard but will be found in the International Standards mentioned above.

This part of ISO/IEC 10373 deals with test methods, which are specific to integrated circuit technology with contacts. ISO/IEC 10373-1 deals with test methods which are common to one or more card technologies and other parts deal with other technology-specific tests.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Test methods described in this part of ISO/IEC 10373 are intended to be performed separately and independently. A given card is not required to pass through all the tests sequentially. The test methods described in this part of ISO/IEC 10373 are based on specifications defined or to be defined in ISO/IEC 7816.

ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282495e6-1a22-4e5d-8626-bbcac93f36b5/iso-iec-10373-3-2001

Conformance of ICCs and IFDs determined using the test methods defined in this part of ISO/IEC 10373 do not preclude failures in the field. Reliability testing is outside the scope of this part of ISO/IEC 10373.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 10373. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO/IEC 10373 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO/IEC 7810:1995, *Identification cards — Physical characteristics*.

ISO/IEC 7816-1:1998, *Identification cards — Integrated circuit(s) cards with contacts — Part 1: Physical characteristics*.

ISO/IEC 7816-2:1999, *Information technology — Identification cards — Integrated circuit(s) cards with contacts — Part 2: Dimensions and location of the contacts*.

ISO/IEC 7816-3:1997*, Information technology — Identification cards — Integrated circuit(s) cards with contacts — Part 3: Electronic signals and transmission protocols*.

ISO/IEC 7816-4:1995, *Information technology — Identification cards — Integrated circuit(s) cards with contacts — Part 4: Interindustry commands for interchange*.

ISO/IEC 10373-1:1998, *Identification cards — Test methods — Part 1: General characteristics tests*.

© ISO/IEC 2001 – All rights reserved

United States of America, Department of Defense, Test Method Standard, Microcircuits, MIL-STD-883, Version E, 31 December 1996, Method 3015.7 'Electrostatic discharge sensitivity classification'.

3 Terms and definitions

For the purposes of this part of ISO/IEC 10373, the following terms and definitions apply.

3.1
test method
method for testing characteristics of identification cards and related interface devices for the purpose of confirming their compliance with International Standards

3.2
testably functional
has survived the action of some potentially destructive influence to the extent that:

a) any magnetic stripe present on the card shows a relationship between signal amplitudes before and after exposure that is in accordance with the base standard;

b) any integrated circuit(s) present in the card continues to show an Answer to Reset response[1] which conforms to the base standard;

iTeh STANDARD PREVIEW
(standards.iteh.ai)

c) any contacts associated with any integrated circuit(s) present in the card continue to show electrical resistance which conforms to the base standard;

ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282492e6-1a22-4e5d-8b2b-bbcac93f36b5/iso-iec-10373-3-2001

d) any optical memory present in the card continue to show optical characteristics which conform to the base standard

3.3
normal use
use as an Identification card (see clause 4 of ISO/IEC 7810:1995), involving equipment processes appropriate to the card technology and storage as a personal document between equipment processes

3.4
ICC
integrated circuit(s) card with contacts as defined in the ISO/IEC 7816 series of standards

3.5
IFD
interface device related to integrated circuit(s) cards with contacts as defined in the ISO/IEC 7816 series of standards

3.6
DUT
device under test; within the scope of this document the ICC or the IFD subject to testing

---

[1] This part of ISO/IEC 10373 does not define any test to establish the complete functioning of integrated circuit(s) cards. The test methods require only that the minimum functionality (testably functional) be verified. This may, in appropriate circumstances, be supplemented by further, application specific functionality criteria which are not available in the general case.

 © ISO/IEC 2001 – All rights reserved

3.7
typical protocol and application specific communication
any communication between a DUT and the corresponding test-apparatus based on protocol and application implemented in the DUT and representing its normal use

3.8
Test Scenario
a defined typical protocol and application specific communication to be used with the test methods defined in this document

4 General items applicable to the test methods

4.1 Test environment

Unless otherwise specified, testing of physical, electrical and logical characteristics shall take place in an environment of temperature 23 °C ± 3 °C, of relative humidity 40 % to 60 %.

4.2 Pre-conditioning

Where pre-conditioning is required by the test method, the identification cards to be tested shall be conditioned to the test environment for a period of 24 h before testing unless otherwise specified.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

4.3 Default tolerance

ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282493e6-1a22-4e5d-8b2b-bb1ac93f3fb5/iso-iec-10373-3-2001

Unless otherwise specified, a default tolerance of ± 5 % shall be applied to the quantity values given to specify the characteristics of the test equipment (e.g. linear dimensions) and the test method procedures (e.g. test equipment adjustments).

4.4 Total measurement uncertainty

The total measurement uncertainty for each quantity determined by these test methods shall be stated in the test report.

4.5 Conventions for electrical measurements

Potential differences are defined with respect to the GND contact of the ICC and currents flowing to the ICC are considered positive.

4.6 Apparatus

4.6.1 Default ICC-holder, reference axes and default measurement position

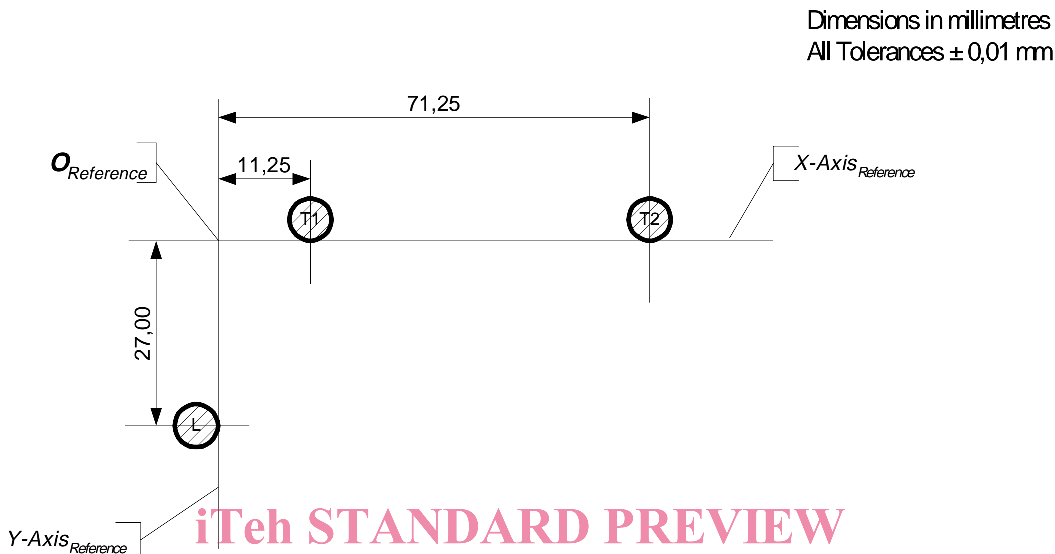
When required by the test-method, the ICC shall be positioned in the default measurement position as subsequently defined.

The default measurement position requires the ICC to be positioned in an ICC-holder and flattened by a flattening plate. All Measurements using this default measurement position shall be relative to the reference axes defined in Figure 1.

© ISO/IEC 2001 – All rights reserved

4.6.1.1 Default ICC-holder and reference axes:

The default ICC holder shall comply with Figure 1:



iTeh STANDARD PREVIEW
(standards.iteh.ai)

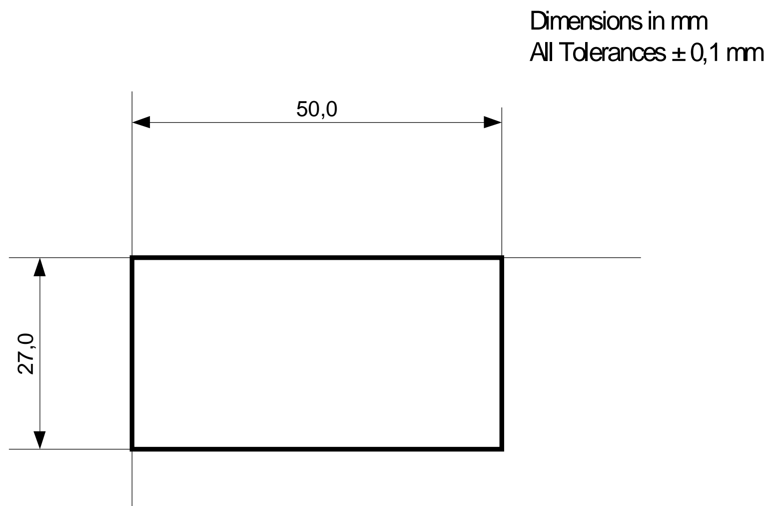
L, T1 and T2 shall be metal cylinders, having a diameter of 5 mm ± 0,1 mm, a surface roughness R_a < 5 µm, mounted on a level rigid plate with a surface roughness R_a < 5 µm.

ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282493e6-1a22-4c5d-8b2b-bbcac93f36b5/iso-iec-10373-3-2001

Figure 1 — ICC-holder

4.6.1.2 Flattening Plate

The flattening plate shall comply with Figure 2:



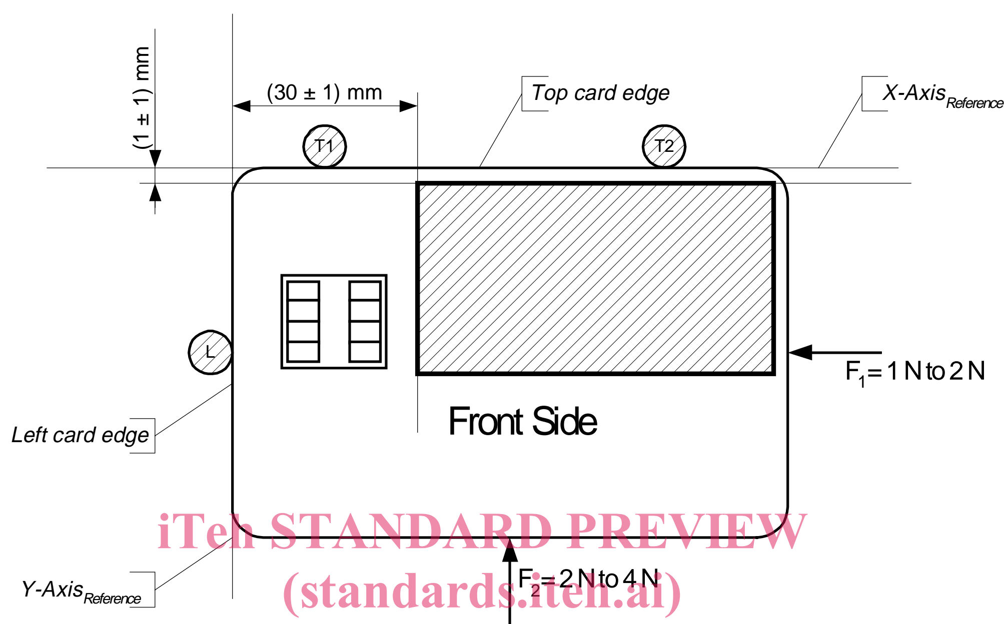
The surface roughness of the flattening plate shall be R_a < 5 µm.

Figure 2 — Flattening plate

© ISO/IEC 2001 – All rights reserved

4.6.1.3 Default Measurement Position

The ICC and the flattening plate shall be mounted on the ICC-holder as shown in Figure 3:



iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282493e6-1a22-4c5d-8b2b-bbcac93f36b5/iso-iec-10373-3-2001

F_1 and F_2 are forces applied to the center of the right and the bottom edge of the card respectively to fix the card in the card-holder.
The flattening plate shall apply a force of 2,2 N ± 0,2 N to the surface of the card

Figure 3 — Position of ICC and flattening plate on ICC-holder

4.6.2 Apparatus for testing the integrated circuit(s) cards with contacts (ICC-test-apparatus)

4.6.2.1 General

All relative voltage definitions (e.g. $0{,}7 \times V_{CC}$, $0{,}15 \times V_{CC}$ or V_{CC} + 0,3 V) shall be determined relative to GND and checked against the simultaneously measured value of V_{CC}.

4.6.2.2 Generating the VCC voltage (V_{CC}) and timing

Parameter	ICC class	Range	Accuracy
V_{CC}	Class A	-1 V to 6 V	± 50 mV
	Class B	-1 V to 4 V	± 30 mV
t_R, t_F	Class A, Class B	500 µs	± 100 µs

© ISO/IEC 2001 – All rights reserved

4.6.2.3 Measuring the VCC current (I_{CC})

Characteristic	Mode	Range	Accuracy	Resolution
I_{CC}	Spike Measurement	0 mA to 200 mA	± 2 mA	20 ns
	Active mode	0 mA to 100 mA	± 1 mA	Averaged over 1 ms
	Clock stop	0 mA to 1 mA	± 10 µA	Averaged over 1 ms

4.6.2.4 Generating the VPP voltage (V_{PP}) and timing

Parameter	ICC class	Range	Accuracy	Resolution
V_{PP}	Class A	-1 V to 26 V	± 50 mV	20 ns
t_R, t_F	Class A	1 µs to 220 µs	± 1 µs	
NOTE 1 t_R and t_F are measured between 10% and 90% of V_H min and V_L max values. NOTE 2 Certain functionality may not be implemented into the application in the ICC, hence in such circumstances the ICC-test-apparatus is not required to have the corresponding test-capability (e.g. V_{PP})				

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282493e6-1a22-4c5d-8b2b-bbcac93f36b5/iso-iec-10373-3-2001

4.6.2.5 Measuring the VPP current (I_{PP})

Characteristic	Mode	Range	Accuracy	Resolution
I_{PP}	active (Programming State)	0 mA to 100 mA	±1 mA	100 ns
	inactive (Pause)	0 mA to 100 mA	±1 mA	100 ns
NOTE Certain functionality may not be implemented into the application in the ICC, hence in such circumstances the ICC-test-apparatus is not required to have the corresponding test-capability (e.g. I_{PP}).				

 © ISO/IEC 2001 – All rights reserved

4.6.2.6 Generating the RST voltage and timing

Parameter	ICC class	Range	Accuracy
V_{IH}	Class A	2 V to 6 V	± 50 mV
	Class B	2 V to 4 V	± 30 mV
V_{IL}	Class A	-1 V to 2 V	± 50 mV
	Class B	-1 V to 2 V	± 30 mV
t_R, t_F		0 µs to 2 µs	± 20 ns
NOTE t_R and t_F are generated between 10% and 90% of V_H min and V_L max values.			

4.6.2.7 Measuring the RST current

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Characteristic	Mode	Range	Accuracy	Resolution
I_{IH}	Active	-30 µA to 200 µA	± 10 µA	100 ns
I_{IL}	Active	-250 µA to 30 µA	± 10 µA	100 ns

ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282493e6-1a22-4c5d-8b2b-bbcac93f36b5/iso-iec-10373-3-2001

4.6.2.8 Generating the I/O voltage and timing in reception mode

Parameter	Mode	ICC class	Range	Accuracy
V_{IH}	ICC: Reception, Apparatus: Transmission	Class A	2 V to 6 V	± 50 mV
		Class B	2 V to 4 V	± 30 mV
V_{IL}	ICC: Reception, Apparatus: Transmission	Class A	-1 V to 2 V	± 50 mV
		Class B	-1 V to 2 V	± 30 mV
t_R, t_F	ICC: Reception, Apparatus: Transmission		0 µs to 2 µs	± 100 ns
NOTE t_R and t_F are generated between 10% and 90% of V_H min and V_L max values.				

© ISO/IEC 2001 – All rights reserved

4.6.2.9 Measuring the I/O current in reception mode

Parameter	Mode	Range	Accuracy	Resolution
I_{IH}	ICC: Reception, Apparatus: Transmission	-350 µA to 30 µA	± 1 µA	100 ns
I_{IL}	ICC: Reception, Apparatus: Transmission	-1,5 mA to 30 µA	± 10 µA	100 ns

4.6.2.10 Generating the I/O current

Parameter	Mode	Range	Accuracy	Stabilization time after level is reached
I_{OH}	ICC: Transmission Apparatus: Reception	20 kΩ pull-up to VCC or equivalent circuit	± 200 Ω	
I_{OL}	ICC: Transmission Apparatus: Reception	0 mA to 1,5 mA	± 10 µA	< 100 ns

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282493e6-1a22-4c5d-8b2b-bbcac93f36b5/iso-iec-10373-3-2001

4.6.2.11 Measuring the I/O voltage and timing

Characteristic	ICC class	Range	Accuracy	Resolution
V_{IH}, V_{IL}	Class A	-1 V to 6 V	± 50 mV	20 ns
V_{IH}, V_{IL}	Class B	-1 V to 4 V	± 30 mV	20 ns
t_R, t_F		0 µs to 2 µs	± 20 ns	
NOTE t_R and t_F are measured between 10% and 90% of V_H min and V_L max values.				

© ISO/IEC 2001 – All rights reserved

4.6.2.12 Generating the CLK-voltage

Parameter	ICC class	Range	Accuracy	Resolution
V_{IH}	Class A	2 V to 6 V	± 50 mV	20 ns
	Class B	2 V to 4 V	± 30 mV	20 ns
V_{IL}	Class A	-1 V to 2 V	± 50 mV	20 ns
	Class B	-1 V to 2 V	± 30 mV	20 ns

4.6.2.13 Generating the CLK-waveforms (single cycle measurement)

Parameter	Range	Accuracy
Duty cycle	35 % to 65 % of period	± 5 ns
Frequency	0,5 MHz to 5,5 MHz	± 5 kHz
Frequency	5 MHz to 20,5 MHz	± 50 kHz
t_R, t_F	1 % to 10 % of period	± 5 ns
NOTE t_R and t_F are generated between 10% and 90% of V_H (100%) min and V_L (0%) max.		

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/IEC 10373-3:2001
https://standards.iteh.ai/catalog/standards/sist/282493e6-1a22-4c5d-8b2b-bbcac93f36b5/iso-iec-10373-3-2001

4.6.2.14 Measuring the CLK current

Characteristic	Mode	Range	Accuracy	Resolution
I_{IH}	active	-30 µA to 150 µA	± 10 µA	20 ns
I_{IL}	active	-150 µA to 30 µA	± 10 µA	20 ns

4.6.2.15 Measuring the contact capacitance of RST, CLK and I/O

Characteristic	Range	Accuracy
C	0 pF to 50 pF	± 5 pF
The contact capacitance of a contact shall be measured between the contact and the GND contact.		

© ISO/IEC 2001 – All rights reserved