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Information technology — Telecommunications and information exchange between systems — Near Field Communication Wired Interface (NFC-WI)

Technologies de l'information — Téléinformatique — Interface câblée de communication de champs proche (NFC-WI)

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Foreword

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ISO/IEC 28361 was prepared by Ecma International (as ECMA-373) and was adopted, under a special “fast-track procedure”, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

Introduction

Following the standardisation of Near Field Communication (NFC) systems and their test methods in Ecma International, this International Standard specifies a two-wire interface between two components called “Transceiver” and “Front-end”. Systems that implement the NFC-WI interface can thus be augmented with, for example, a wireless Front-end for NFCIP-1 as illustrated in Figure 1. Although this International Standard only specifies requirements for the Signal-In and Signal-Out wires and the digital signals they carry, informative Annex A lists some NFCIP-1 specific considerations.

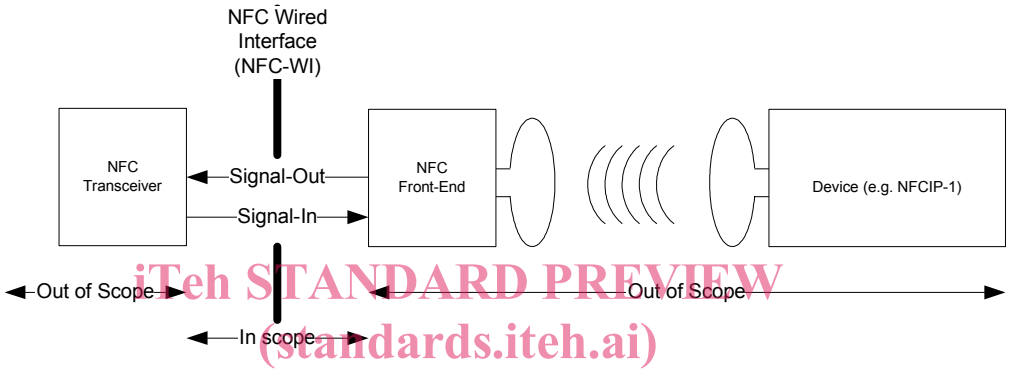

Figure 1 — Context diagram for the NFC wired interface

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1 Scope

This International Standard specifies the digital wire interface between a Transceiver and a Front-end. The specification includes the signal wires, binary signals, the state diagrams and the bit encodings for three data rates.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
Clock
sequence of LOW and HIGH as defined in 3.2 with duration of $1/(2*f_{CLK})$, where f_{clk} is the clock frequency as defined in 6.3

2.2
Information
bit-coded data as defined in Clause 8

2.3
Front-end
entity that drives the Signal-Out wire and receives on the Signal-In wire

2.4
Transceiver
entity that drives the Signal-In wire and receives on the Signal-Out wire

3 Conventions and notations

3.1 Representation of bit values

Bit values are either ZERO or ONE.

3.2 Representation of logical states of LOW and HIGH

— The logical signal state is LOW if the electrical level of a signal has the input voltage of V_{IL} or the output voltage of V_{OL} as specified in Table 1 in 6.2.

— The logical signal state is HIGH if the electrical level of a signal has the input voltage of V_{IH} or the output voltage of V_{OH} as specified in Table 1 in 6.2.

3.3 Capitalisation of names

The initial character of names of basic elements, e.g. specific fields, is capitalised.

3.4 State notation

The states are specified in Unified Modelling Language (UML) notation.

4 Symbols and abbreviated terms

AND	Logical AND operation
f_{CLK}	Clock frequency as defined in 6.3
NFC-WI	Near Field Communication Wired Interface
OR	Logical OR operation
XOR	Logical XOR operation
÷	Divide a clock frequency by a constant value.

Table 1 in 6.2 list additional symbols for electrical characteristics.

5 General

The NFC-Wired Interface (NFC-WI) specifies the Signal-In and the Signal-Out wires as illustrated in Figure 2. The wires carry binary signals of HIGH and LOW.

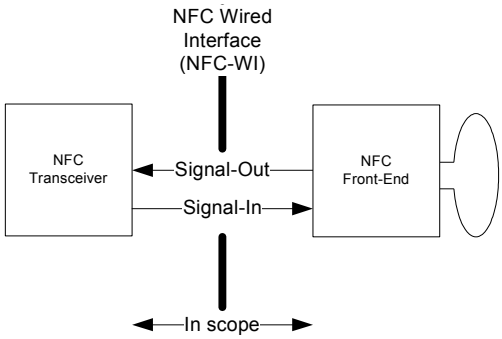

Figure 2 — NFC-WI

The combinations of the signals on the wires make up the NFC-WI states as defined in Clause 7.

Clause 8 specifies encodings for Information transfer, while in the On state, for the $f_{CLK}/128$, $f_{CLK}/64$ and $f_{CLK}/32$ data transfer rates.

Annex A lists NFCIP-1 specific considerations for implementing the NFC-WI; Annex B lists possible uses of the Command state, such as changing to alternative protocols.

6 Signals

6.1 Signal wires

6.1.1 Signal-In

The Transceiver drives the Signal-In wire with a binary signal of HIGH and LOW. The Front-end receives the binary signal on Signal-In.

6.1.2 Signal-Out

The Front-end drives the Signal-Out wire with a binary signal of HIGH and LOW. The Transceiver receives the binary signal on Signal-Out.

6.2 Electrical characteristics

The wires shall carry (binary) digital signals as illustrated in Figure 3 and specified in Table 1.

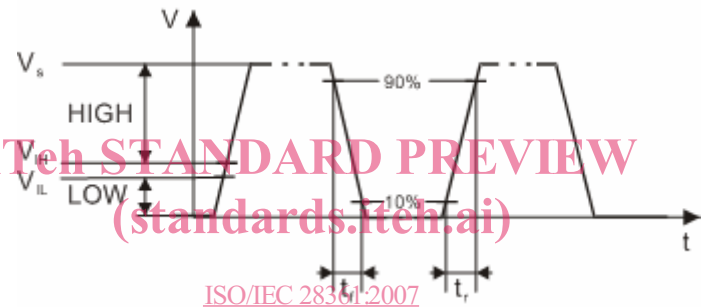

Figure 3 — Illustration of some electrical parameters

Table 1 — Electrical characteristics

Symbol	Parameter	Conditions	Min	Max	Unit
DC Characteristics					
V_S	Signalling voltage amplitude	Not applicable	1,62	3,63	V
V_{IH}	HIGH level input voltage	Not applicable	1,10	3,63	V
V_{IL}	LOW level input voltage	Not applicable	0	0,70	V
I_{LI}	Input leakage current	Input voltage is between V_{ILmin} and V_{IHmax}		± 4	mA
V_{OH}	HIGH level output voltage	Driver source current of 4mA	1,32	3,63	V
V_{OL}	LOW level output voltage	Driver sink current of 4mA	0	0,30	V

AC Characteristics					
t_r	Signal-In, Signal-Out rise time (from 10 % to 90 % of V_S)	Add an external capacitive load between 10 pF and 30 pF for testing	4	20	ns
t_f	Signal-In, Signal-Out fall time (from 90 % to 10 % of V_S)	Add an external capacitive load between 10 pF and 30 pF for testing	4	20	ns
t_{SP}	Pulse width of spikes and glitches which must be suppressed by the input filter	Not applicable		1	ns
C_I	Input capacitance	1 MHz test frequency		10	pF
C_L	External load capacitance for the driver	Not applicable		30	pF
V_{ITR}	Input voltage range at signal transitions	Not applicable	– 0,30	3,93	V
	Pulse width	Not applicable	30		ns
Environmental/Test Conditions					
T_{amb}	Ambient temperature for electrical characteristics measurements	Not applicable	20	26	°C

6.3 Clock frequency (f_{CLK})

The clock frequency (f_{CLK}) shall be 13,56 MHz ± 7 kHz.

7 NFC-WI states

Figure 4 specifies the main NFC-WI states.

The Off state and the On state are the main NFC-WI states. The Off state is the default state.

NFC-WI shall move from the Off state to the On state as specified in 7.2.

NFC-WI shall move from the On state to the Off state as specified in 7.4.

NFC-WI shall move from the On state to the Command state via the Escape sequence.

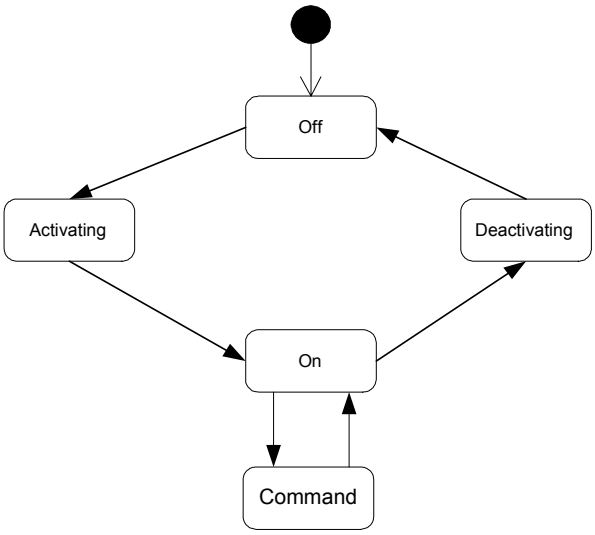

Figure 4 — Main states of NFC-WI

7.1 Off state

When Signal-In and Signal-Out are LOW for at least 120 µs, the NFC-WI state shall be Off.

NOTE In this state, power saving features may be implemented.

7.2 Activating state

The NFC-WI shall enter the Activating state when either Signal-Out or Signal-In carry the activation sequence, as specified in 7.2.1 and 7.2.2 respectively. When subsequently the opposite wire carries the activation response, the NFC-WI shall enter the On state, as shown in Figure 5.

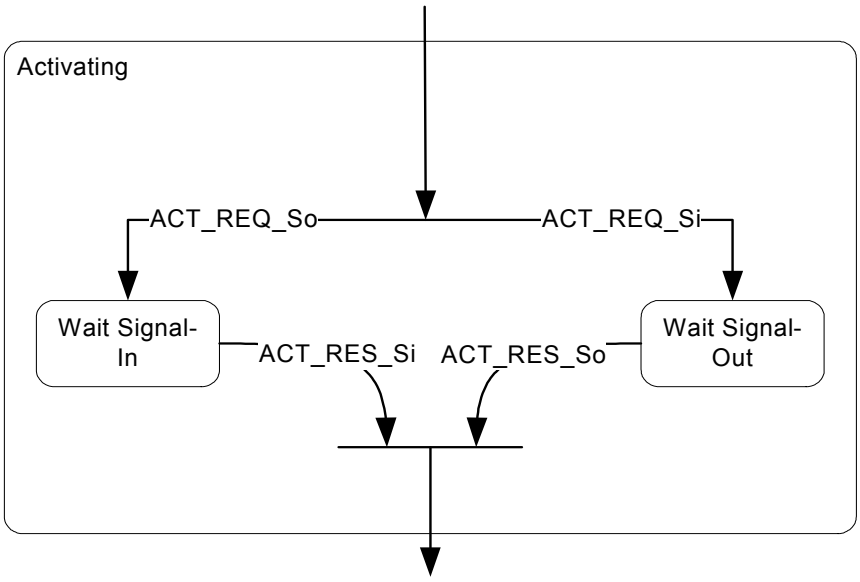

Figure 5 — Activating state