IZ2815

MICROCIRCUIT FOR ELECTRONIC PLASTIC SMART-CARDS

Packageless itegrated microcircuit IZ2815 is designed for application in the intellectual plastic SMART-cards. Sphere of application: account systems with pre-payment as per the tariff - telephone cards, petrol filling stations, public transport, parking lots, subscription etc.

Microcircuit has the following functional features:

- storage of information with the cut-off supply voltage;
- chip protection at the stage of transportation from the chip producer to the manufacturer of the plastic SMART-cards by means of the 3-byte secret transport code with the error counter with the trial limit of 5 for the number of attempts to select the code;
- full compatibility by features with the microcircuit SLE4436E;
- two modes of authentification: the first is similar to SLE4436E, the second is enabled by option and grants permission for authentification only after reduction of the counter value;

Microcircuit is essentially the intellectual 302-bit counter with EEPROM of the capacity over 20000 tariff units with the security logic and the high security degree by means of the authentification mechanism.

- EEPROM capacity of 302 bits

104 bits of the usable memory are completely compatible with the microcircuit SLE4436E:

  - 64-bit authentification area:
    16-bit single programmable memory
    48-bit OTPROM personalization area
  - 40-bit counter area

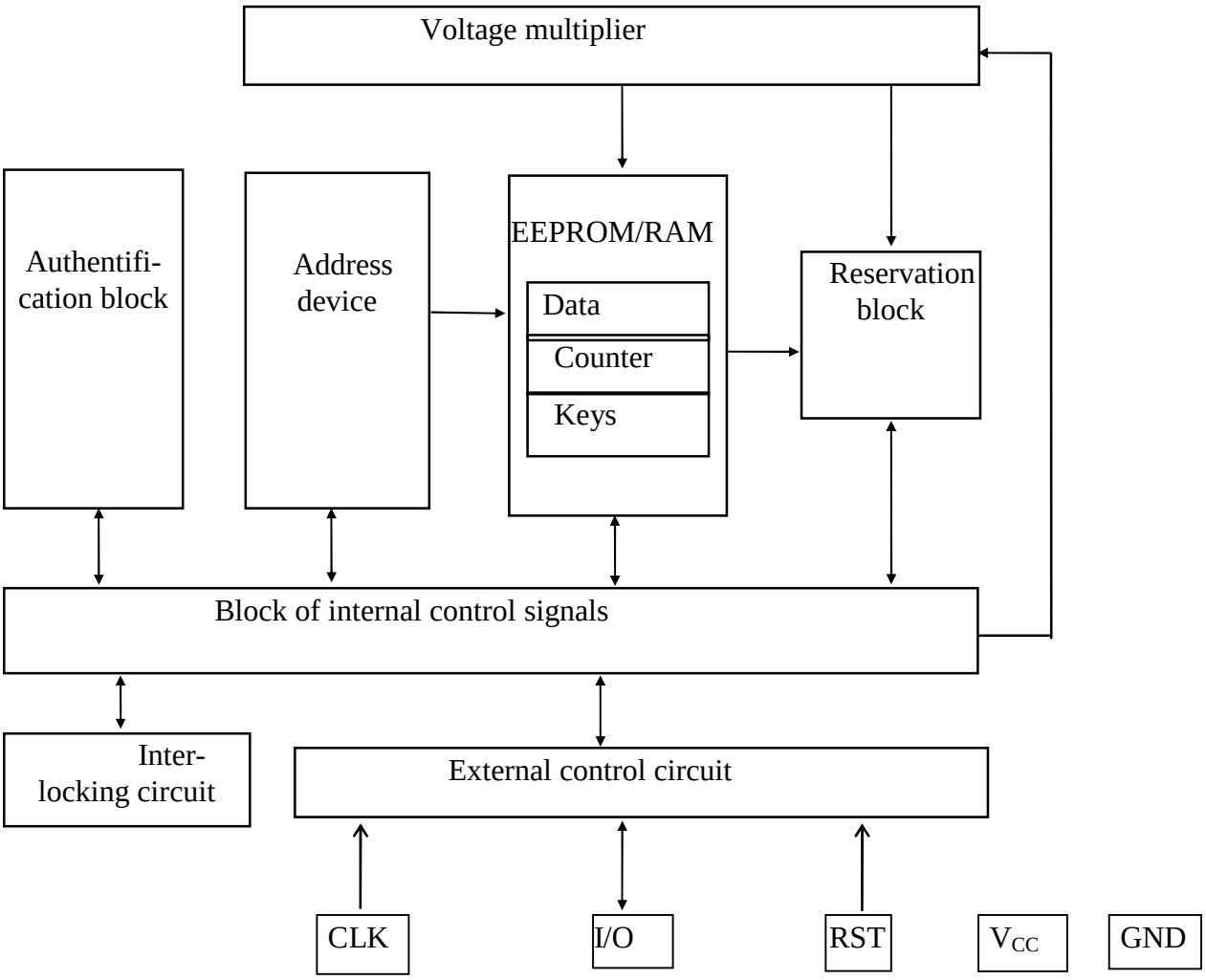
198-bit additional memory:

  - 4 bits for the restoration function at upset of the counters
  - 1 bit for initialization of the authentification by option
  - 1 bit for initialization of the second secret key
  - 16-bit data area 1 for the user
  - 48-bit first secret key
  - 64-bit additional data area for the user
  - 48-bit second secret key or 48-bit second secret key or 48-bit data area 2 for the user
  - 16-bit data area 3 for the user

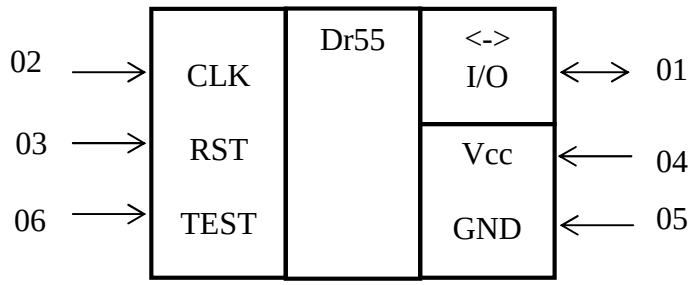
- Three functional memory areas (single time programmable RAM, OTPROM, EEPROM)
- Maximum counter capacity over 20000 units
- Protection functions from the information loss in the counter
- Transport code protection for the supplier
- Microcircuit layout of the blocks, responsible for the security function, protected from the physical and electronic analysis
- Authentification device with the high degree of secrecy
  - Random input sequence
  - Individual secret key
  - Additional secret key
  - Reply formation up to 16 bits for 30 msec at the cycle frequency of 100 kHz

  - Additional authentification mode, included by option and granting authentification performance after reduction of the counter value only.
- Supply voltage of 5.0 V ± 10 % (group A), 3.0 V ± 10 % (group B)
- Consumption current not over 1 mA (group A), not over 0.6 mA (group B)
- EEPROM programming time - 5 msec
- Over 100000 cycles of write/erase
- Temperature range from minus 40 to plus 85 °C
- Permissible potential value of the static electricity of 1500 V
- Latch current not over 100 mA at the temperature of 85 °C and the supply voltage of 5,5 V
- Contacts positioning and exchange protocol in compliance with the Standard ISO 7816-3 (synchronous transfer).

Structural Diagram



IC Referential Graphic Identification



Identification of Contact Pads

No. of Contact Pad	Identification	Purpose
01	I/O	Input/output bidirectional data line (open drain)
02	CLK	Cycle frequency input
03	RST	Control input (reset)
04	VCC	Supply voltage pin
05	GND	Common pin
06	TEST	Test input

Range of operational temperatures

Range of operational temperatures from -40°C to +85°C.

Limit Permissible Modes

Parameter Identification	Parameter Description	Norm		Unit
		Not less	Not more	
V_{CC}	Supply voltage (group A)	4,5	5,5	V
	Supply voltage (group B)	2,7	3,3	V
V_{IH}	High level input voltage	$0,7V_{CC}$	V_{CC}	V
V_{IL}	Low level input voltage	0	0,8	V
T	Range of operational temperatures	-40	+85	ºC

Limit Modes

Parameter Identification	Parameter Description	Norm		Measurement Unit
		Not less	Not more	
V_{CC}	Supply voltage	-0,35	7,0	V
V_{IH}	High level input voltage	-	7,0	V
V_{IL}	Low level input voltage	-0,35	-	V
T_{stg}	Storage temperature	-60	+125	ºC

Under influence of the limit modes functionality of the microcircuits is not guaranteed. After removal of the limit modes functionality is guaranteed in the limit permissible mode.

Static Parameters

T_A = от -40 до +85ºC

Parameter Identification	Parameter Description	Measurement Conditions	Norm		Unit
			Not less	Not more	
V_{IL}	Low level input voltage (group A)	V_{CC}=from 4,5 to 5,5V	0	0,8	V
	Low level input voltage (group B)	V_{CC}=from 2,7 to 3,3V	0	0,8	V
V_{IH}	High level input voltage (group A)	V_{CC}=from 4,5 to 5,5V	0,7V_{CC}	V_{CC}	V
	High level input voltage (group B)	V_{CC}=from 2,7 to 3,3V	0,7V_{CC}	V_{CC}	V
I_{IH}	High level input current (CLK), (group A)	V_{CC}=5,5V V_{IH}=5,5V	-	100	mcA
	High level input current (CLK), (group B)	V_{CC}=3,3V V_{IH}=3,3V	-	60	mcA
I_{IL}	Low level input current (RST), (group A)	V_{CC}=5,5V V_{IL}=0V	-	-100	mcA
	Low level input current (RST), (group B)	V_{CC}=3,3V V_{IL}=0V	-	-60	mcA
I_{OLH}	High level output leakage current (group A)	V_{CC}=5,5V V_{OH}=5,5V	-	10	mcA
	High level output leakage current (group B)	V_{CC}=3,3V V_{OH}=3,3V	-	6,0	mcA
I_{OL}	Low level output current (group A)	V_{CC}=from 4,5 to 5,5V V_{OL}= 0,5V	1,0	-	mA
	Low level output current (group B)	V_{CC}=from 2,7 to 3,3V V_{OL}= 0,5V	0,5	-	mA
I_{CC}	Consumption current (group A)	V_{CC}=5,5V, V_{IL}=0V, V_{IH}=V_{CC}	-	1,0	mA
	Consumption current (group B)	V_{CC}=3,3V, V_{IL}=0V, V_{IH}=V_{CC}	-	0,6	mA

Dynamic Parameters

V_{CC}= 3 V ±10% (group A), 5V ±10% (group B), T_A = from -40 to +85ºC

Parameter Identification	Parameter Description	Norm		Unit
		Not less	Not more	
t_1	Pre-setting time RST from low CLK	2,5	-	mcsec
t_2	Pre-setting time CLK from low RST (write at address)	2,5	-	mcsec
t_3	Duration of high level RST (write flag)	10	-	mcsec
t_4	Duration of low level CLK (after write)	10	-	mcsec
t_5	Release time of data line		2,5	mcsec
t_6	Data pre-setting time	2,5	-	mcsec
t_7	Data hold time	2,5	-	mcsec
t_{10}	Pre-setting time CLK from high RST	2,0	-	mcsec
t_{11}	Hold time of RST from low CLK	2,0	-	mcsec
t_{12}	Duration of high level RST (address reset)	50	-	mcsec
t_{13}	Data delivery time from low RST	-	5,0	mcsec
t_{14}	Pre-setting time of CLK from low RST (address pre-setting)	5,0	-	mcsec
t_{15}	Duration of low level CLK (address pre-setting)	5,0	-	mcsec
t_{16}	Duration of high level CLK (address pre-setting)	5,0	-	mcsec
t_{17}	Data delivery time from low CLK	-	2,5	mcsec
t_{21}	Duration of low level CLK (after authentification start)	5,0	-	mcsec
t_{22}	Duration of high level CLK (authentification mode)	5,0	55	mcsec
t_{23}	Duration of low level CLK (authentification mode)	5,0	55	mcsec
t_W	Duration of high level CLK (write)	5,0	-	msec
t_{DW}	Duration of high level CLK (false write)	5,0	-	mcsec
t_{Auth}	Period of CLK (authentification mode)	10	100	mcsec
t_R	Rise duration of CLK	-	1,0	
t_F	Fall duration of CLK	-	1,0	

Time Charts

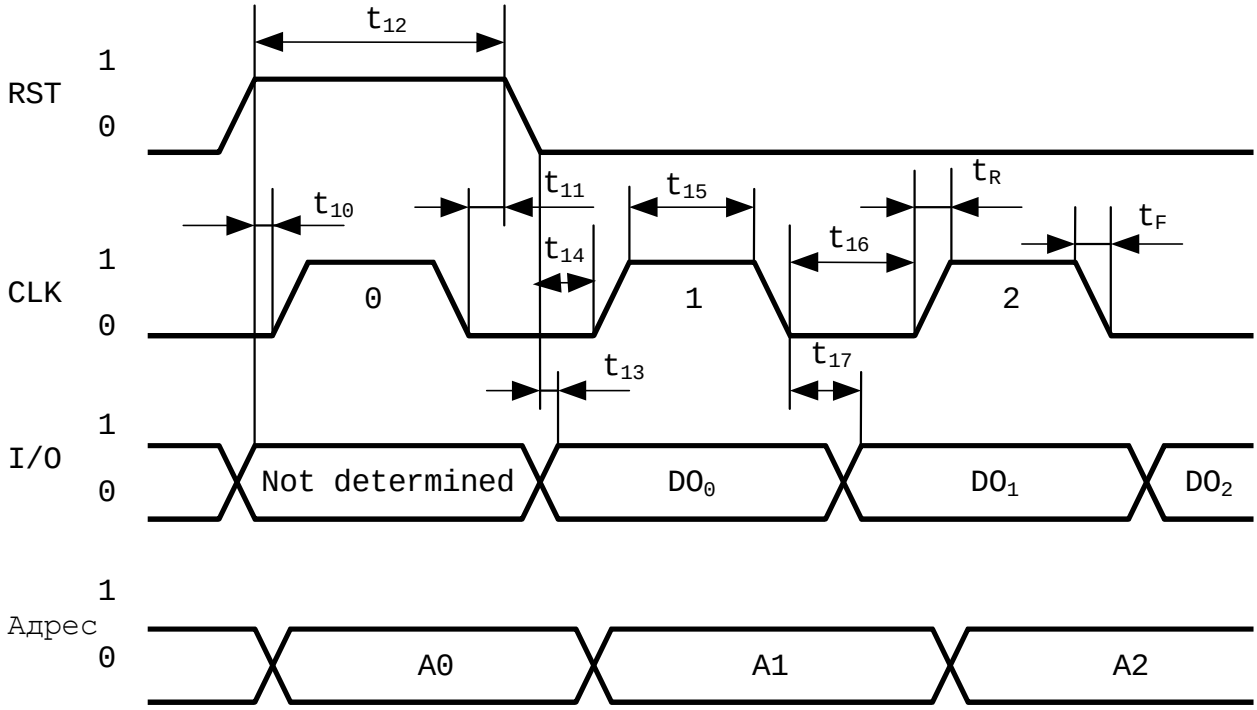


Figure 1 – Address pre-setting and readout

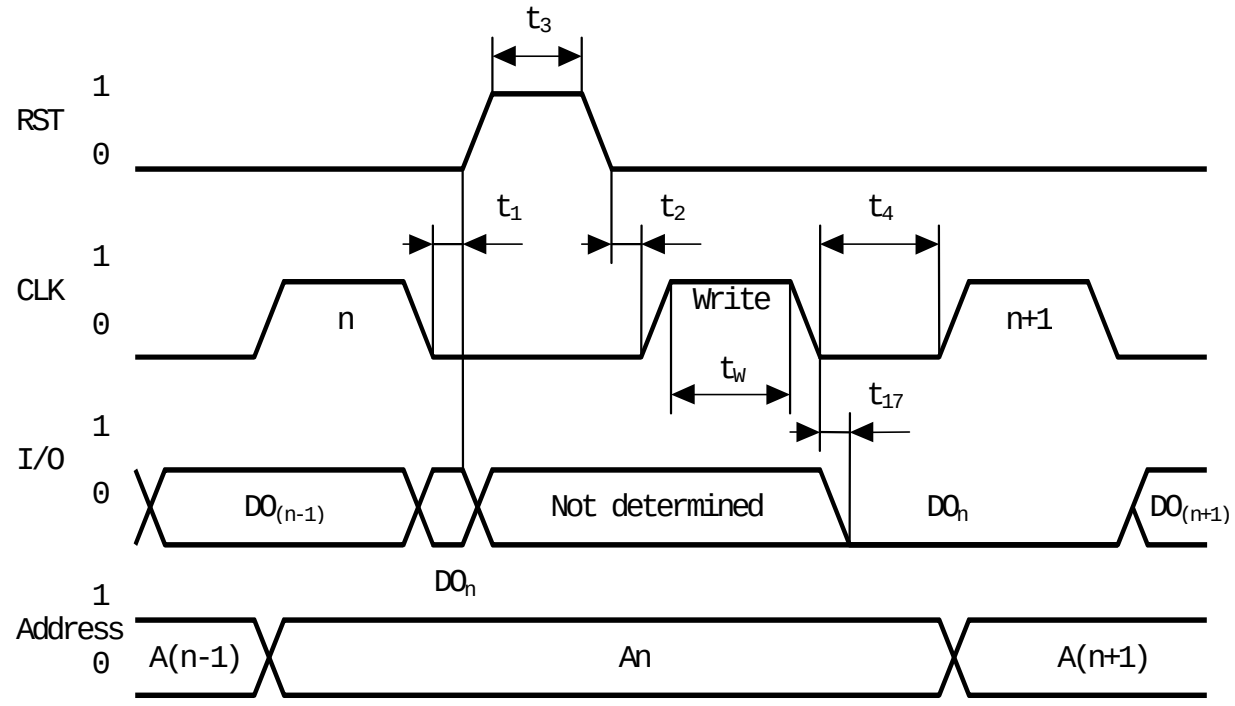


Figure 2 – Write operation at address

INTEGRAL

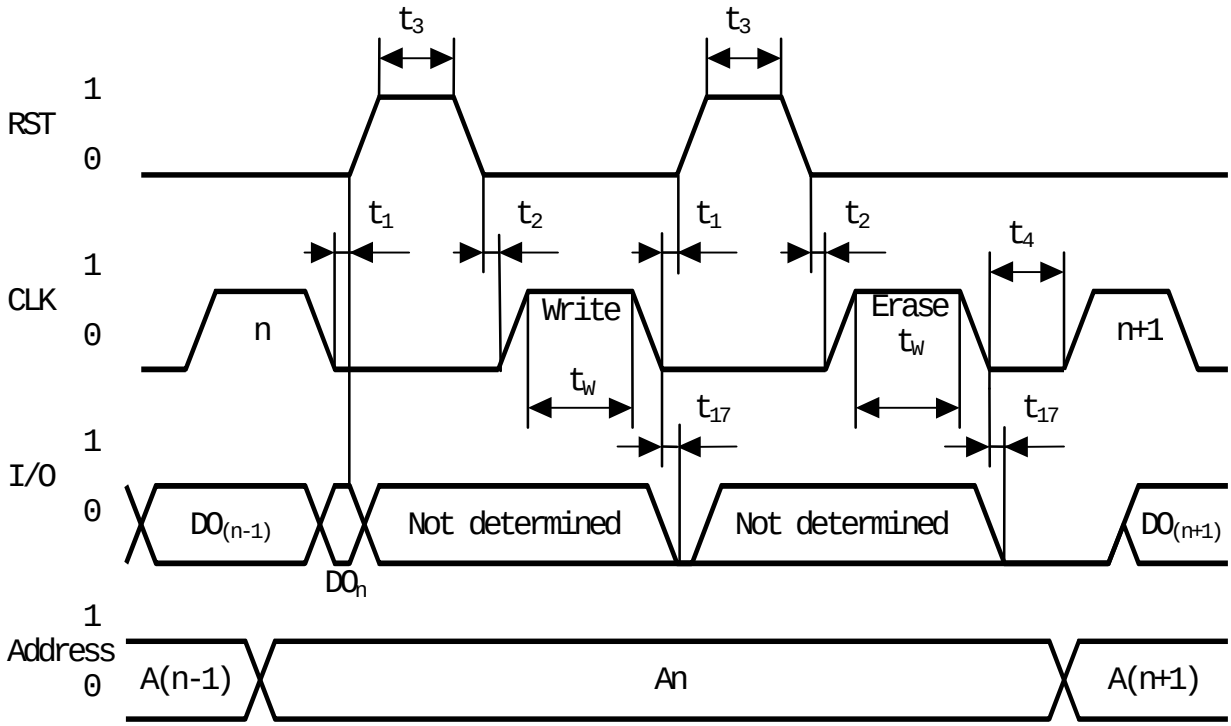


Figure 3 – Erase of 8 bits with transfer

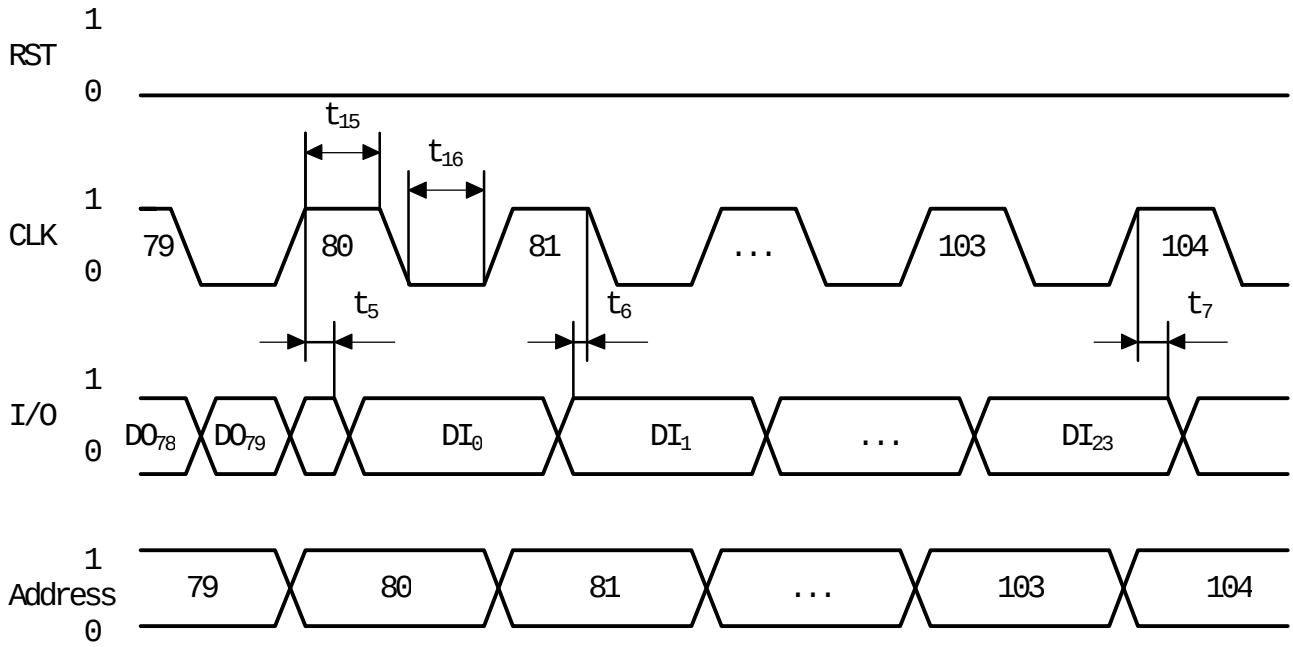


Figure 4 – Transport code entry

INTEGRAL

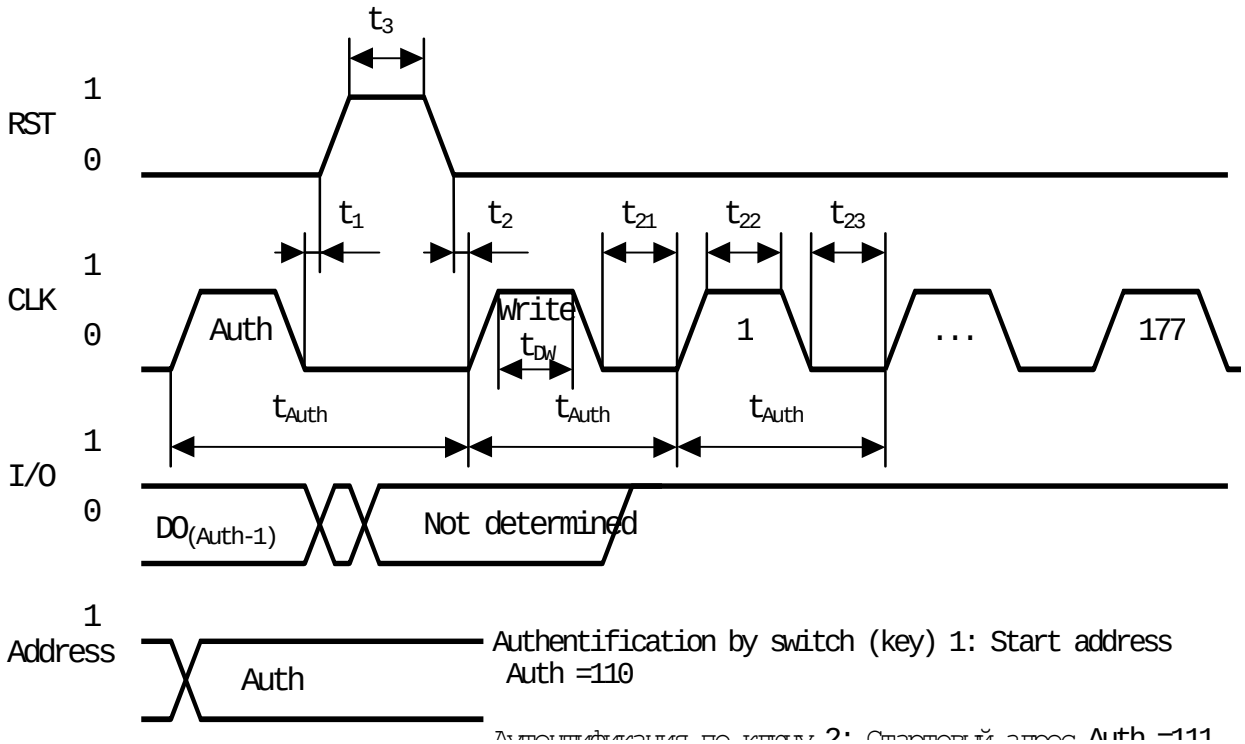


Figure 5 – Authentification procedure initiation

External View of Chip with Location of Contact Pads

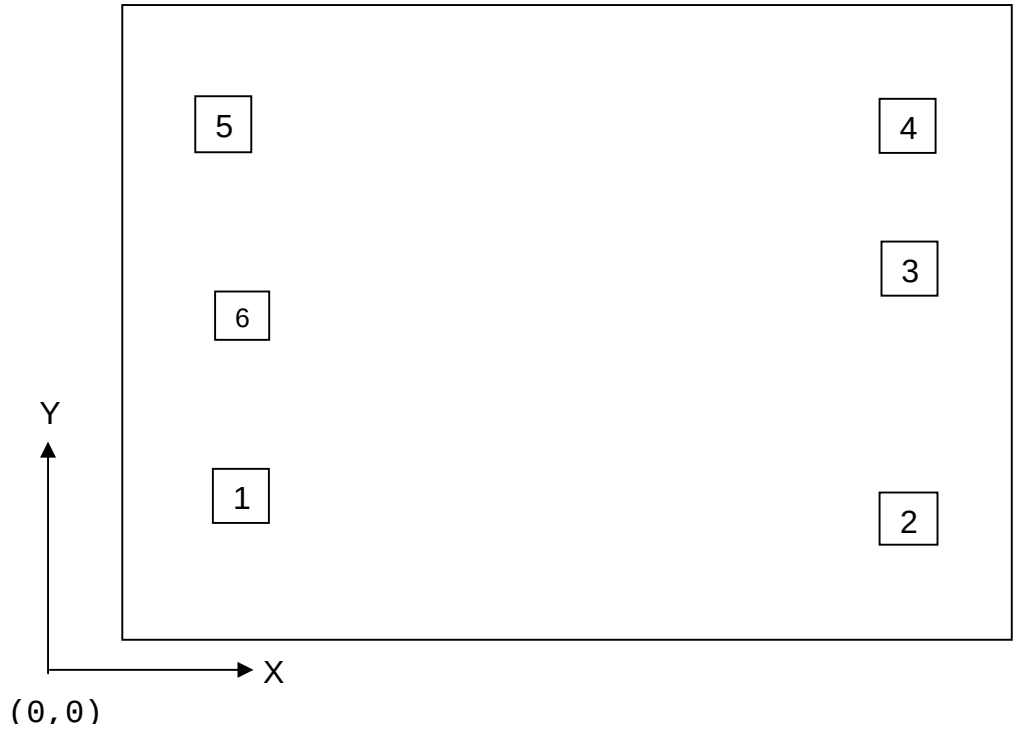


Table of Contact Pad Coordinates

Contact Pad	Identification	Coordinates (mcm)	
		X	Y
1	I/O	185	257.5
2	CLK	1255	191
3	RST	1255	653.3
4	VCC	1255	945.4
5	GND	150	975
6	TEST	195	600

Note: Size of contact pads 112×112 mcm x mcm by the «passivation» layer. Coordinates of the contact pads are indicated by the layer «metallization», by the left bottom contact pad corner.
Contact pad 06 is not bonded, its size by the layer «passivation» 90×90 mcm.
Scribe line width 200 mcm.

Chip size: 1570 × 1280 mcm x mcm.