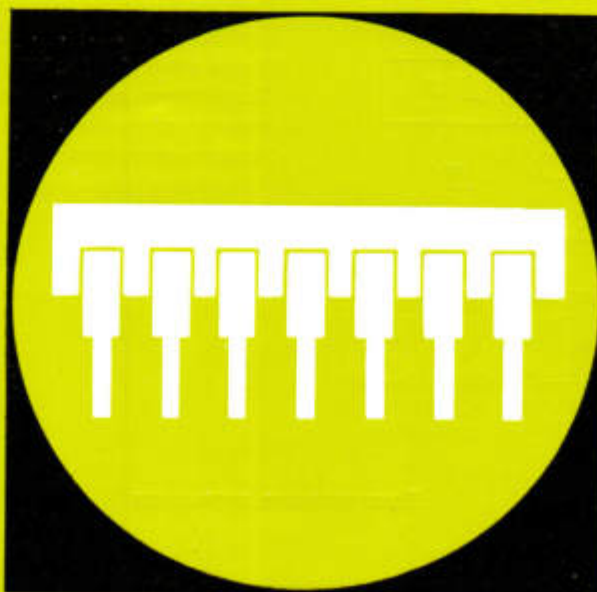


ИНТЕГРАЛЬНАЯ  
МИКРОСХЕМА  
INTEGRATED CIRCUIT

К573РФ2



**ELORG**

SSSR · MOSKVA

# ИНТЕГРАЛЬНАЯ МИКРОСХЕМА К573РФ2

Интегральная микросхема К573РФ2 — перепрограммируемое постоянное запоминающее устройство с ультрафиолетовым стиранием и электрической записью информации, с длительным сохранением информации при включенном и отключенном напряжении питания.

Микросхема предназначена для работы в блоках памяти электронно-вычислительных машин, в устройствах сбора и обработки информации, устройствах автоматики и контроля.

Микросхема является функциональным аналогом микросхемы типа 2716 фирмы Intel.

Микросхема выпускается в 24-выводном металлокерамическом Dip корпусе с шагом 2,5 мм.

Простые требования к программированию:  
возможность селективного программирования;  
возможность программирования одним импульсом длительностью 50 мс или серией импульсов длительностью 1 мс.

Входы и выходы микросхемы совместимы с ТТЛ ИС в режимах считывания и программирования; использована схема статического типа.

## НАЗНАЧЕНИЕ ВЫВОДОВ PURPOSE OF PINS

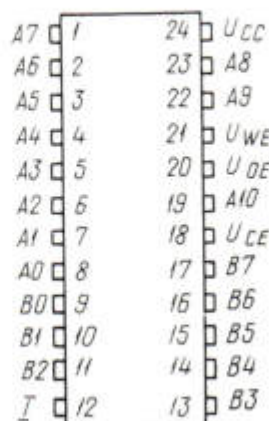


Рис. 2. A0—A10 — входы адресные; U<sub>CE</sub> — напряжение сигнала разрешения обращения; U<sub>OE</sub> — напряжение сигнала разрешения выхода; U<sub>WE</sub> — напряжение сигнала записи-считывания; B1—B7 — входы-выходы; I — общий

Fig. 2. A0—A10 — address inputs, U<sub>CE</sub> — call enable signal voltage, U<sub>OE</sub> — output enable signal voltage, U<sub>WE</sub> — write-read signal voltage, B1—B7 — inputs-outputs; I — common

## ФУНКЦИОНАЛЬНАЯ СХЕМА LOGIC DIAGRAM

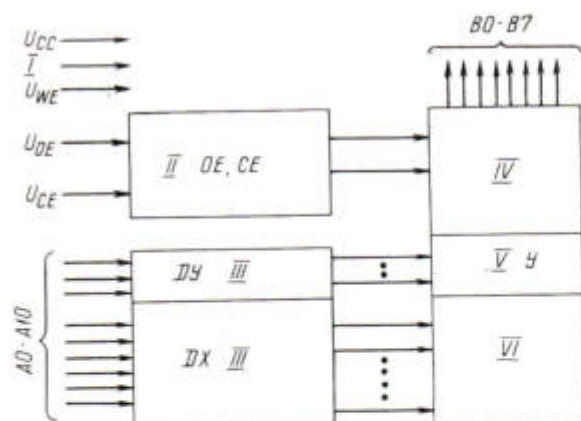


Рис. 1. I — общий; II — усилители; III — дешифратор; IV — входные-выходные усилители; V — ключи; VI — матрица-накопитель на 1638 бит

Fig. 1. I — common, II — amplifiers, III — decoder, IV — input-output amplifiers, V — keys, VI — 1638-bit storage matrix

## ОСНОВНЫЕ ДАННЫЕ

Информационная емкость, восьмиразрядные слова . . . . . 2048

Время выборки адреса, нс . . . . . 450

Напряжение одного источника питания в режиме считывания, В . . . . . +5

Условия эксплуатации:

температура окружающей среды, °C от -45 до +70  
температура при записи, °C . . . . . 25±10

## Электрические параметры

Таблица 1

| Параметр                                                                | Обозначение      | Норма технических условий | Типовое значение | Режим измерения                                               |
|-------------------------------------------------------------------------|------------------|---------------------------|------------------|---------------------------------------------------------------|
| 1                                                                       | 2                | 3                         | 4                | 5                                                             |
| Время выборки адреса, нс                                                | t <sub>ACC</sub> | < 450                     | 300              | -45...+70 °C<br>U <sub>OEL</sub> = U <sub>CEL</sub> (0—0,4) В |
| Время выборки обращения, нс                                             | t <sub>CE</sub>  | < 450                     | 340              | -45...+70 °C<br>U <sub>OEL</sub> = (0—0,4) В                  |
| Время выборки выхода, нс                                                | t <sub>OE</sub>  | < 200                     | 160              | -45...+70 °C<br>U <sub>CEL</sub> = (0—0,4) В                  |
| Время задержки перехода выходной информации в состояние „выключено“, нс | t <sub>DF</sub>  | < 120                     | 70               | -45...+70 °C<br>U <sub>CEL</sub> = (0—0,4) В                  |

| 1                                                                                                                        | 2                                    | 3              | 4          | 5                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------|----------------|------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Количество циклов перепрограммирования информации                                                                        | N                                    | 100            |            | 25 °C ± 10 °C                                                                                                                            |
| Время хранения информации при отключенном напряжении питания, ч                                                          | t <sub>HH</sub>                      | 100000         |            | 25 °C ± 10 °C                                                                                                                            |
| Время хранения информации при включенном напряжении питания, ч                                                           | t <sub>Н2</sub>                      | 25000          |            | 25 °C ± 10 °C                                                                                                                            |
| Выходное напряжение, В:<br>низкий уровень<br>высокий уровень                                                             | U <sub>DOL</sub><br>U <sub>DOH</sub> | < 0,4<br>> 2,4 | 0,1<br>3,0 | —45...+70 °C<br>I <sub>DOL</sub> = 2,4 мА<br>I <sub>DOH</sub> = —400 мкА                                                                 |
| Ток потребления в режиме считывания от источников напряжений U <sub>CC</sub> , U <sub>WE</sub> , мА                      | I <sub>RCC</sub><br>I <sub>RWE</sub> | < 100<br>< 10  | 65<br>4    | —45...+70 °C<br>U <sub>OEL</sub> = U <sub>CEL</sub> = (0—0,4) В<br>U <sub>CC</sub> = U <sub>WEL</sub> = 5,5 В                            |
| Ток потребления в режиме снижения потребляемой мощности от источников напряжений U <sub>CC</sub> и U <sub>WE</sub> , мА  | I <sub>HCC</sub><br>I <sub>HWE</sub> | < 25<br>< 2    | 14<br>0,5  | —45...+70 °C<br>U <sub>OEL</sub> = (0—0,45) В<br>U <sub>CEH</sub> = (2,4—5,5) В<br>U <sub>CC</sub> = U <sub>WEL</sub> = 5,5 В            |
| Ток потребления от источника напряжения U <sub>WEH</sub> в режиме записи, мА                                             | I <sub>WEH</sub>                     | < 7            |            | 25 °C ± 10 °C<br>U <sub>WEH</sub> = 24,5 В<br>U <sub>CEL</sub> = (0—0,4) В                                                               |
|                                                                                                                          | I <sub>WEH</sub>                     | < 30           | 15         | U <sub>WEH</sub> = 24,5 В<br>U <sub>CEH</sub> = (2,4—5,5) В                                                                              |
| Ток утечки по входам (вход адресный, выход-вход, вход сигнала разрешения выхода, вход сигнала разрешения обращения), мкА |                                      | < 10           |            | 25 °C ± 10 °C<br>U <sub>AH</sub> = 5,5 В;<br>U <sub>DIN</sub> = U <sub>OEH</sub> = U <sub>CEH</sub> = 5,5 В<br>U <sub>DIL</sub> = 0,45 В |
| Входная емкость выводов микросхемы, пФ:<br>адресных, входа разрешения обращения, входа разрешения выхода<br>выход-вход   | C <sub>in</sub>                      | < 8            | 4          | 25 °C ± 10 °C                                                                                                                            |
|                                                                                                                          | C <sub>out</sub>                     | < 12           | 6          |                                                                                                                                          |

Примечание. Динамические параметры обеспечиваются при фронте и срезе импульсных напряжений на входах микросхемы не более 20 нс.

Таблица 2

| Параметр                                                                      | Условное обозначение                                                                                                                                 | Норма        |              |
|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|
|                                                                               |                                                                                                                                                      | не менее     | не более     |
| Напряжение входных сигналов, В:<br>низкий уровень<br>высокий уровень          | U <sub>AL</sub> , U <sub>DIL</sub> , U <sub>OEL</sub> , U <sub>CEL</sub><br>U <sub>AH</sub> , U <sub>DIH</sub> , U <sub>OEH</sub> , U <sub>CEH</sub> | —0,3<br>2,2  | 0,6<br>5,25  |
| Напряжение питания, В                                                         | U <sub>CC</sub>                                                                                                                                      | 4,75         | 5,25         |
| Напряжение сигнала записи-считывания, В:<br>низкий уровень<br>высокий уровень | U <sub>WEL</sub><br>U <sub>WEH</sub>                                                                                                                 | 4,75<br>23,5 | 5,25<br>25,5 |

# INTEGRATED CIRCUIT K573PΦ2

The K573PΦ2 integrated circuit is a reprogrammable read-only memory (RePROM) with UV erasure and electrical data recording, and long-term data storage with power supply switched on and off.

The integrated circuit is intended for operation in memory units of computers, in data collection and processing devices, and in automatic control and monitoring equipment.

The integrated circuit is a functional analog of a micro-circuit type 2716 produced by the Intel company.

It is available as 24-pin metal-ceramic Dip package with a 2.5-mm spacing.

The IC offers the following advantages:  
simple programming requirements,

selective programming is possible,  
programming can be done by one 50-ms long pulse or a 1-ms pulse train.

The IC inputs and outputs are compatible with TTL ICs in the reading and programming modes; a static type circuitry is employed.

## SPECIFICATIONS

Information capacity, 8-bit words . . . . . 2048

Address fetch time, ns . . . . . 450

Voltage of one supply source in read mode, V . . . . . +5

Operating conditions:

ambient temperature, °C . . . . . -45 to +70

recording temperature, °C . . . . . 25 ± 10

## Electrical Characteristics

Table 1

| Parameter                                                                                              | Designation            | Rated value              | Typical value | Measurement parameters                                                                          |
|--------------------------------------------------------------------------------------------------------|------------------------|--------------------------|---------------|-------------------------------------------------------------------------------------------------|
| 1                                                                                                      | 2                      | 3                        | 4             | 5                                                                                               |
| Address fetch time, ns                                                                                 | $t_{ACC}$              | $\leq 450$               | 300           | -45 — +70 °C<br>$U_{OEL} = U_{CEL} = (0-0.4) V$                                                 |
| Call select time, ns                                                                                   | $t_{CE}$               | $\leq 450$               | 340           | -45 — +70 °C<br>$U_{OEL} = (0-0.4) V$                                                           |
| Output call time, ns                                                                                   | $t_{OE}$               | $\leq 200$               | 160           | -45 — +70 °C<br>$U_{CEL} = (0-0.4) V$                                                           |
| Delay of output data transition into OFF state, ns                                                     | $t_{DF}$               | $\leq 120$               | 70            | -45 — +70 °C<br>$U_{CEL} = (0-0.4) V$                                                           |
| Number of data reprogramming cycles                                                                    | N                      | 100                      |               | 25 °C ± 10 °C                                                                                   |
| Data storage time with power supply turned off, h                                                      | $t_{H1}$               | 100000                   |               | 25 °C ± 10 °C                                                                                   |
| Data storage time with power supply switched on, h                                                     | $t_{H2}$               | 25000                    |               | 25 °C ± 10 °C                                                                                   |
| Output voltage, V:<br>low level<br>high level                                                          | $U_{DOL}$<br>$U_{DOH}$ | $\leq 0.4$<br>$\geq 2.4$ | 0.1<br>3.0    | -45 — +70 °C<br>$I_{DOL} = 2.4 mA$<br>$I_{DOH} = -400 \mu A$                                    |
| Current consumption from voltage sources $U_{CC}$ , $U_{WE}$ in read mode, mA                          | $I_{RCC}$<br>$I_{RWE}$ | $\leq 100$<br>$\leq 10$  | 65<br>4       | -45 — +70 °C<br>$U_{OEL} = U_{CEL} = (0-0.4) V$<br>$U_{CC} = U_{WEL} = 5.5 V$                   |
| Current consumption from voltage sources $U_{CC}$ and $U_{WE}$ in power consumption reduction mode, mA | $I_{HCC}$<br>$I_{HWE}$ | $\leq 25$<br>$\leq 2$    | 14<br>0.5     | -45 — +70 °C<br>$U_{OEL} = (0-0.45) V$<br>$U_{CEH} = (2.4-5.5) V$<br>$U_{CC} = U_{WEL} = 5.5 V$ |
| Current consumption from voltage source $U_{WEH}$ in write mode, mA                                    | $I_{WEH}$              | $\leq 7$                 |               | 25 °C ± 10 °C<br>$U_{WEH} = 24.5 V$<br>$U_{CEL} = (0-0.4) V$                                    |
|                                                                                                        | $I_{WEH}$              | $\leq 30$                | 15            | $U_{WEH} = 24.5 V$<br>$U_{CEH} = (2.4-5.5) V$                                                   |

| 1                                                                                                                            | 2                | 3      | 4 | 5                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------|------------------|--------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Leakage current at inputs (address input, output-input, output enable signal input, call enable signal input), $\mu\text{A}$ |                  | $< 10$ |   | $25^\circ\text{C} \pm 10^\circ\text{C}$<br>$U_{\text{AH}} = 5.5 \text{ V};$<br>$U_{\text{DIN}} = U_{\text{OEH}} = U_{\text{CEH}} = 5.5 \text{ V}$<br>$U_{\text{DIL}} = 0.45 \text{ V}$ |
| Input capacitance of IC pins, pF:                                                                                            |                  |        |   | $25^\circ\text{C} \pm 10^\circ\text{C}$                                                                                                                                                |
| address, call enable input, output enable input                                                                              | $C_{\text{in}}$  | $< 8$  | 4 |                                                                                                                                                                                        |
| output-input                                                                                                                 | $C_{\text{out}}$ | $< 12$ | 6 |                                                                                                                                                                                        |

Note. The dynamic parameters of the IC are guaranteed when the rise and decay time of pulse voltages at IC inputs does not exceed 20 ns.

Table 2

| Parameter                     | Designation                                                     | Rated value |      |
|-------------------------------|-----------------------------------------------------------------|-------------|------|
|                               |                                                                 | min.        | max. |
| Input voltage, V:             |                                                                 |             |      |
| low level                     | $U_{\text{AL}}, U_{\text{DIL}}, U_{\text{OEL}}, U_{\text{CEL}}$ | -0.3        | 0.6  |
| high level                    | $U_{\text{AH}}, U_{\text{DIH}}, U_{\text{OEH}}, U_{\text{CEH}}$ | 2.2         | 5.25 |
| Power supply voltage, V       | $U_{\text{CC}}$                                                 | 4.75        | 5.25 |
| Write-read signal voltage, V: |                                                                 |             |      |
| low level                     | $U_{\text{WEL}}$                                                | 4.75        | 5.25 |
| high level                    | $U_{\text{WEH}}$                                                | 23.5        | 25.5 |

Table 3

| Characteristic                   | $U_{\text{CE}}, \text{V}$        | $U_{\text{OE}}, \text{V}$        | $U_{\text{WE}}, \text{V}$ | $U_{\text{CC}}, \text{V}$ | Outputs-inputs                   |
|----------------------------------|----------------------------------|----------------------------------|---------------------------|---------------------------|----------------------------------|
| Reading                          | $U_{\text{CEL}}$                 | $U_{\text{OEL}}$                 | 5                         | 5                         | $U_{\text{DOL}}, U_{\text{DOH}}$ |
| Power consumption reduction mode | $U_{\text{CEH}}$                 | $U_{\text{OEL}}, U_{\text{OEH}}$ | 5                         | 5                         | OFF state                        |
| Programming                      | $U_{\text{CEL}}, U_{\text{CEH}}$ | $U_{\text{OEH}}$                 | 24.5                      | 5                         | $U_{\text{DIL}}, U_{\text{DIH}}$ |
| Programming disable              | $U_{\text{CEL}}$                 | $U_{\text{OEH}}$                 | 24.5                      | 5                         | OFF state                        |
| Programming check                | $U_{\text{CEL}}$                 | $U_{\text{OEL}}$                 | 24.5                      | 5                         | $U_{\text{DOL}}, U_{\text{DOH}}$ |

Notes: 1. Figs 3—6 show the boundaries of a 95-percent spread of the basic electrical characteristics, i. e. intervals into which 95 percent of delivered ICs fit depending on the operating modes and conditions.

2. The limit electrical characteristics are presented in Table 2.

## OPERATION

Table 3 lists five operating modes of the integrated circuit. In all operating modes the following TTL level signals are applied to the inputs  $U_{\text{CE}}, U_{\text{OE}}, U_{\text{A}}, U_{\text{DI}}$ :

low level (0—0.4) V,  
high level (2.4—5.5) V.

Power supply voltages:  
 $U_{\text{WEL}} = U_{\text{CC}} = 5 \text{ V} \pm 5\%$ ,  
 $U_{\text{WEH}} = (23.5—25.5) \text{ V}$ .

The  $U_{\text{WEL}}$  and  $U_{\text{CC}}$  power supplies may be replaced by a single source, except for the programming mode. In this case the current consumption is the sum of current  $I_{\text{CC}}$  and  $I_{\text{WEL}}$ .

The  $U_{\text{CC}}$  supply source must be switched on either at the same time or before the  $U_{\text{WE}}$  is turned on, and switched off either at the same time or after  $U_{\text{WE}}$  is turned off.

## Reading Mode

The integrated circuit is a static RePROM, so in the reading mode the steady-state output voltage is dependent on voltages at the address and control inputs and also on the data recorded.

The voltage timing chart is illustrated in Fig. 7.

The call select time of the IC ( $t_{\text{CE}}$ ) does not exceed 450 ns, if the  $U_{\text{CE}}$  signal is generated simultaneously with the address. This time is always longer than the address fetch time ( $t_{\text{ACC}}$ ), because the call enable amplifier (CE) transfers the address drivers and decoders DX and DY to the operating state from the power consumption reduction mode within some time  $\Delta t = t_{\text{CE}} - t_{\text{ACC}}$ .

The output enable signal (OE) can be delayed relative to the address signals or to the steady-state call enable signal  $U_{\text{CEL}}$  for not longer than 250 ns, the address fetch time remaining unchanged.

The delay time of the data outputs-inputs in the OFF state ( $t_{OFF}$ ) is determined by the signals  $U_{OE}$  or  $U_{CE}$  depending on what signal was generated earlier.

### Power Consumption Reduction Mode

In this mode the power consumption from the supply sources is reduced as compared with the active mode by 70 percent (from 580 to 170 mW). This mode is initiated by a high level of the call enable signal  $U_{CEH}$ . The outputs-inputs are in the OFF state regardless of the OE input state.

### Programming Mode

In a non-programmed IC (i.e. the one that has just been received from the manufacturing plant or after the erasure of the data), all its locations carry logic "1" (Fig. 8). The information is entered by selective writing of logic "0" into required locations.

It is recommended that data be written into the integrated circuit locations at  $U_{WEH} = (24.0-24.5)$  V and  $U_{CEH} = (2.4-5.25)$  V.

The programming pulse ( $U_{CEH}$ ) should be applied after the address voltage has set so as to avoid false data writing. The write-read signal voltage  $U_{WEH}$  at the time of programming should better be kept constantly switched on rather than switch it at each address.

The memory locations can be programmed individually and sequentially by selecting addresses in a random manner.

Information can be recorded by a 1-ms train of pulses  $U_{CE}$  sequentially one pulse into each IC address. To store the recorded information within a required time, the total duration of pulses for writing into each address must be about  $t_{WE} = 48$  ms. Programming is accomplished in a cyclic manner. By a cycle is meant the delivery of 1-ms programmable pulses to each address and sequential selection of all the 2048 addresses similar to programming of the K573P01 integrated circuit.

When writing information in the IC used as part of a memory unit, one need not remove voltage  $U_{WEH}$  from other ICs. Voltage  $U_{OEH}$  must be applied to the pins "Output enable signal input" of the ICs. In this case the IC pins "Output-input" are in the OFF state at a high input impedance.

### PROGRAMMING DISABLE

When programming several ICs interconnected by their address inputs, outputs-inputs, output enable signal input, equal voltages are applied to all the pins.

The voltages of the ICs differ only in the call enable signal input  $U_{CE}$ . The information is placed only in the IC to which voltage  $U_{CEH}$  is applied. All other ICs must carry a low voltage level  $U_{CEL}$  which disables programming of these integrated circuits.

### Programming Check

This mode can be used for checking information written into the IC without removing the high write-read signal voltage  $U_{WEH}$ . The signals  $U_{CE}$  and  $U_{OE}$  are set to a low level state.

### Erasure and Storage Mode

The recorded data can be erased by UV radiation at a wavelength of  $\lambda \leq 400$  nm directed normal to the plane of the IC package input window during the time found from the formula

$$t_{EE} = \frac{H_E}{E_E} = \frac{1.5 \cdot 10^5}{E_E} \text{ (s)},$$

where  $E_E$ , W/m<sup>2</sup> is the measured value of the UV radiation energy (illumination intensity in the IC package window plane);

$H_E = 1.5 \cdot 10^5$ , W·s/m<sup>2</sup> is the permissible value of energy exposure.

During erasure, the IC package temperature must not exceed 70 °C, and  $E_E \leq 120$  W/m<sup>2</sup>.

To avoid accidental erasure of the information or reduce the time of its storage, it is recommended that the IC be protected from UV, X-ray, solar and luminescent radiation. For the purpose, the package window should be covered with a film that is opaque to these kinds of radiation or else the IC may be contained in a radiation-protective package.