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ВЫБОР ЦИФРОВЫХ УСТРОЙСТВ ДЛЯ КОНТРОЛЯ ВЛАЖНОСТИ ХЛОПКА-СЫРЦА

Аннотация

Изучение основных параметров цифровых индикаторов, определяющих качество восприятия числа, и параметров, характеризующих собственно цифровые индикаторы, таких как величина знака, число и форма, угловой размер знака, яркостная контрастность; время контакта; разрядность; цвет знака; напряжение и мощность. Приведены конструкция корпуса, габаритные размеры и предельные рабочие параметры некоторых из наиболее часто используемых цифровых индикаторов. Двухрядный (двухканальный) жидкокристаллический цифровой индикатор, созданный на базе контроллера, рекомендуется для контрольно-измерительной аппаратуры.

Ключевые слова: электролюминесцентные, цифровые индикаторы, жидкие кристаллы; качество восприятия цифр, размер знака, форма, яркостный контраст, время экспозиции.

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SELECTION OF DIGITAL DEVICES FOR CONTROLLING THE MOISTURE CONTENT OF RAW COTTON

Annotation

The study of the main parameters of digital indicators that determine the quality of number perception and parameters that characterize actual digital indicators, such as sign size, number and shape, angular size, sign, brightness contrast; exposure time; digit capacity; sign color; voltage and power. The case's design, overall dimensions, and limiting operating data of some of the most often used digital indicators are all provided. A two-row (two-channel) liquid-crystal digital indicator created on the basis of a controller is recommended for control and measuring equipment.

Keywords: Electroluminescent, digital indicators, liquid crystal; quality of perception of numbers, size of a sign, shape, brightness contrast, exposure time.

It is known that in the creation of consumer control and measuring devices, in addition to their reliability and accuracy indicators, the following are important: aesthetic appearance, overall dimensions, visibility of information display and other indicators. At present, for the implementation of the developed control and management tools, in addition to their reliable indicators, it is important: aesthetic appearance, overall dimensions, visibility of information display, operation device, etc.

At present, with the development and improvement of digital indicator devices (DIC), various versions of displays are produced, based on: electroluminescent digital indicators (DI); QI on light emitting diodes (LED); digital indicators on liquid crystal [1].

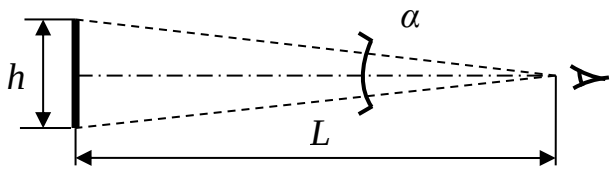
When choosing a QI, it is necessary to pay attention to their general characteristics. In this case, it is necessary to distinguish between the parameters that determine the quality of the perception of numbers, and the parameters that characterize the DI itself. [2].

The quality of the perception of the number, as well as of any other symbol, is determined by the factors listed below.

The size of the mark and its shape. The dimensions of the digit, its height h and width b of different CIPs can be very different: from h = 2mm (for miniature devices) to h = 150mm (for panel boards). Usually h≈20mm is considered the optimal ratio b = (0.6 ... 0.66) h. However, the quality of perception of a sign is determined by its angular size (Fig. 3.):

α=*arctg h/2L*.

The minimum allowable value of α is 20 'and the optimal value is 30'÷ 40'



Rice. 3. To the choice of the angular size of the sign

The signs of the standard form are perceived best of all, however, in segmental and mosaic DIs it is necessary to deviate significantly from the standard.

Brightness contrast. The boundaries in which a person can distinguish the gradations of brightness are very wide (Fig. 4): from 10-4 (subjectively black) to 105 kg / m2 blinding brightness. For perception, it is not the brightness itself that is important, but the difference in the brightness of the background (B_f) and the sign (B_{sn}) - the brightness contrast, direct at $B_f > B_{sn}$-dark signs on a light background (book, DI on liquid crystals):

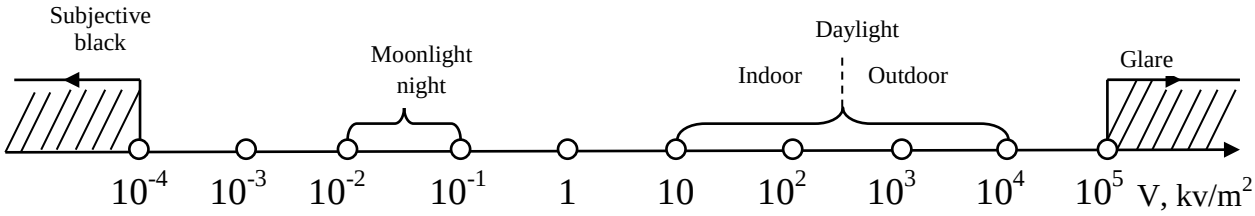
$$K_0 = \frac{B_ф - B_{зн}}{B_ф} 100.$$

And the reverse is when $B_{zn} > B_f$- luminous digits (all other DIs):

$$K_0 = \frac{B_{зн} - B_ф}{B_{зн}} 100.$$

The minimum allowable K_0 value is 50%.

Exposure time. Human visual perception has a certain inertia, and besides, according to the indicators of physiological studies, it is stated that in order to understand which sign is visible, it takes some time. [4].



Rice. 4. Scale of brightness.

The minimum holding time of a digital measurement result, i.e. the minimum exposure time depends on the digit capacity of the number and on other factors and should be 0,1-1 s.

Sign color. It is known that the human eye is most susceptible to green color (wavelength 0.5 microns) and that this color is the least tiring with long-term perception, but for various reasons, it is necessary to use QI with signs of other colors. [5].

Thus, we list the parameters that characterize the DI itself:

1. Height h and shape of the sign (angular size α depends on h and on the observation distance L);
2. The brightness of the sign B_зн with the opposite brightness contrast (the contrast itself also depends on the external illumination);
3. Sign color;
4. Voltage and power; low voltages are desirable, consistent with the rest of the ICC; the minimum power is desirable, especially with small dimensions of the CIP and with battery power.

Among the listed, the most suitable for a microprocessor-based device for monitoring the parameters of the measured substances is liquid crystal indicators. They differ from others in minimum power consumption; brightness contrast, the ability to programmatically control the glow time (indication), multichannel, etc. At the same time, a number of electro-optical effects observed

in LCDs are known. For QI, the effect of rotation of the plane of polarization of a linearly polarized color in a thin layer of a nematic liquid crystal is of greatest interest. This effect is also called twist-effect.

For the purpose of choosing the optimal one in terms of the main parameters, let us give the most important characteristics of some liquid crystal indicators [].

ИЖКЦ 1-4/16. Four-digit numeric-sign displays with a digit height of 16 mm. The work is based on the effect of dynamic scattering in liquid crystals. Glass case with leads for connector. Weight no more than 55 g.

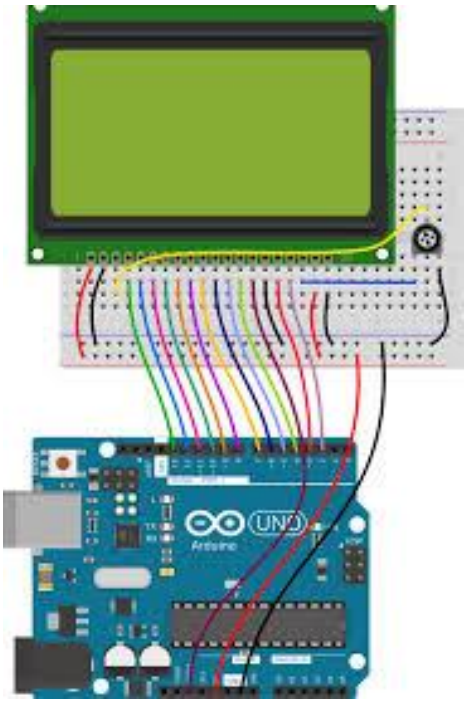
Limit operating data: Minimum control voltage - effective 15 V. Maximum control voltage - effective 30 V. Operating frequency range of control voltage 30-500 Hz Operating ambient temperature range 1-50^0 C.

ИЖКЦ 1-4/24 (А, Б, В), ИЖКЦ 2-4/24 (А, Б, В). Four-digit numeric-sign displays with a digit height of 24 mm. The indicator is based on the twist effect of liquid crystals. Indication method for light reflection. The body is made of glass sealed with epoxy compound around the entire perimeter. Weight no more than 100g.

Limiting performance data. Minimum control voltage - effective 2.4 V Maximum control voltage - effective 10 V Operating frequency range of the control voltage 30-100 Hz Operating ambient temperature range 1-500 C

Liquid crystal module MT-12864A (Fig. 5). This module consists of LSI control controller and LCD panel [6].

As a result of studying the main characteristics of the above LCD for a microprocessor device for an express method for controlling the moisture content of raw cotton, we chose a two-channel liquid crystal indicator of the MT-12864A type, which has the following characteristics:



Operating limits: Minimum control voltage - 4.5V effective. Maximum control voltage - 5.5V effective. The operating frequency range of the control voltage is 2 MHz, when supplied with 5V and 1 MHz at 3V. Ambient operating temperature range -20 ° C ... + 70 ° C.

To connect the LCD module to the control system, a parallel synchronous bus is used, numbering 8 or 4 (software selectable) DB0 ... DB7 data lines, an R / W operation selection line, an RS register selection line, and an E strobe / synchronization line. [8] There are two lines for supplying the 5 V supply voltage - GND and VCC, and a line for supplying the LCD driver supply voltage - V0.

Writing and reading to the microcontroller memory of the LCD indicator is carried out according to the timing diagrams shown in Figures 6 and 7.

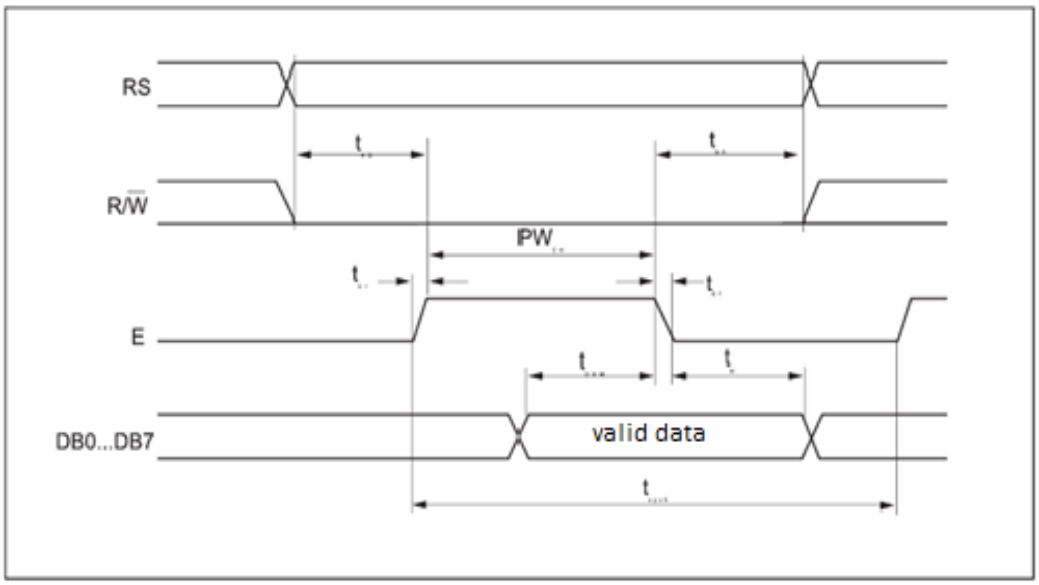


Fig. 6. Timing diagram of write operation

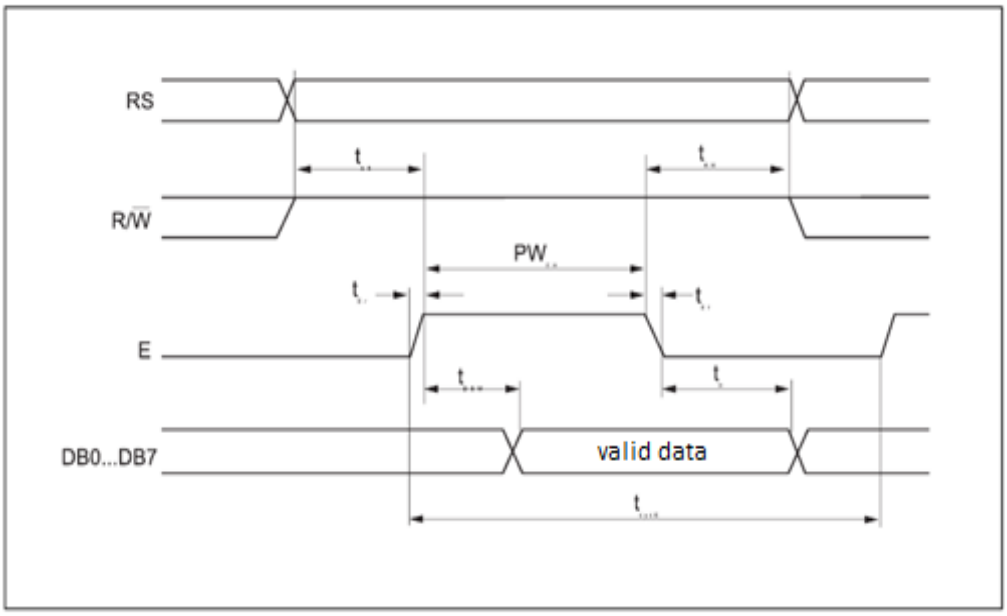


Fig. 7. Timing diagram of a read operation

Thus, according to the study and analysis of the main parameters of digital indicators, the following conclusion can be made:

1. For portable measuring devices, it is advisable to use an LCD with a sign size of at least 15-20 mm.

2. Selectable digital displays should be multi-digit and multi-line.

3. The maximum supply voltage of the selected digital indicator must match the supply voltage of the microcontroller.

4. The reliability of the LCD should be at least 0.997.

Literature

1. Анисимов Б.В., Курганов В.Д. Распознавание и цифровая обработка изображений.
2. Устройство соединений-защита от слабых контактов. А Эргашев, Э Шарибаев, Б Хайдаров, Д Тухтасинов Экономика и социум, 1220-1223.
3. Компоновка и конструкция микроэлектронной аппаратуры / П.И. Овсищер и др.Под ред. Б.Ф. Высоцкого и др.- М., Радио и связь, 1982.
4. Чекмарев А.А Стандартизация электронных приборов.
5. М., Энергия ,1987,(с.80-96).
6. GOST 273-79 printed circuit boards General specifications
7. GOST 14254-80 Protection of internal elements of electrical equipment from damage
8. GOST 12997-84 GSP products. General specifications