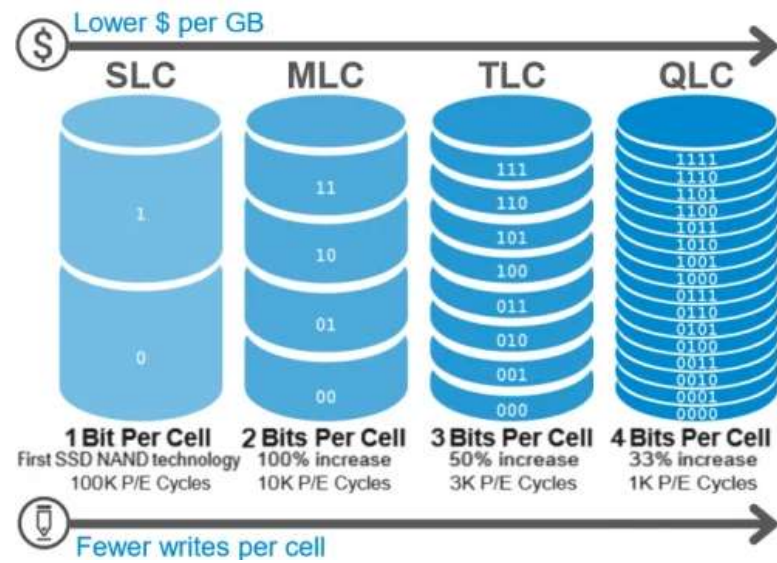# FLASH (SLC, MLC, TLC, QLC, PLC)

FLASH (NOR, NAND, 3D NAND)

Micron

2Gb: x8, x16 NAND Flash Memory Features

NAND Flash Memory

MT29F2G08ABAEAH4, MT29F2G08ABAEAWP, MT29F2G08ABBEAH4
MT29F2G08ABBEAHC, MT29F2G16ABAEAWP, MT29F2G16ABBEAH4
MT29F2G16ABBEAHC

Features

- Open NAND Flash Interface (ONFI) 1.0-compliant[1]
- Single-level cell (SLC) technology
- Organization
  - Page size x8: 2112 bytes (2048 + 64 bytes)
  - Page size x16: 1056 words (1024 + 32 words)
  - Block size: 64 pages (128K + 4K bytes)
  - Plane size: 2 planes x 1024 blocks per plane
  - Device size: 2Gb: 2048 blocks
- Asynchronous I/O performance
  - $^tRC/^tWC$: 20ns (3.3V), 25ns (1.8V)
- Array performance
  - Read page: 25µs[3]
  - Program page: 200µs (TYP: 1.8V, 3.3V)[3]
  - Erase block: 700µs (TYP)
- Command set: ONFI NAND Flash Protocol
- Advanced command set
  - Program page cache mode[4]
  - Read page cache mode[4]
  - One-time programmable (OTP) mode
  - Two-plane commands[4]
  - Interleaved die (LUN) operations
  - Read unique ID
  - Block lock (1.8V only)
  - Internal data move
- Operation status byte provides software method for detecting
  - Operation completion
  - Pass/fail condition
  - Write-protect status
- Ready/Busy# (R/B#) signal provides a hardware method of detecting operation completion
- WP# signal: Write protect entire device

- First block (block address 00h) is valid when shipped from factory with ECC. For minimum required ECC, see Error Management.
- Block 0 requires 1-bit ECC if PROGRAM/ERASE cycles are less than 1000
- RESET (FFh) required as first command after power-on
- Alternate method of device initialization (Nand_Init) after power up (contact factory)
- Internal data move operations supported within the plane from which data is read
- Quality and reliability
  - Data retention: 10 years
- Operating voltage range
  - V_{CC}: 2.7–3.6V
  - V_{CC}: 1.7–1.95V
- Operating temperature:
  - Commercial: 0°C to +70°C
  - Industrial (IT): –40°C to +85°C
- Package
  - 48-pin TSOP type 1, CPL[2]
  - 63-ball VFBGA

Notes: 1. The ONFI 1.0 specification is available at www.onfi.org.
2. CPL = Center parting line.
3. See Electrical Specifications – Program/Erase Characteristics for ^tR_ECC and $^tPROG\_ECC$ specifications.
4. These commands supported only with ECC disabled.

MT29F2G08ABAEAWP-IT:E, Микросхема Parallel [TSOPI-48]

290 ₽

| – | 1 | + | от **15 шт.** — 258 ₽ |

→ 1 шт. на сумму 290 ₽

Добавить в корзину

Изображения служат только для ознакомления, см. техническую документацию
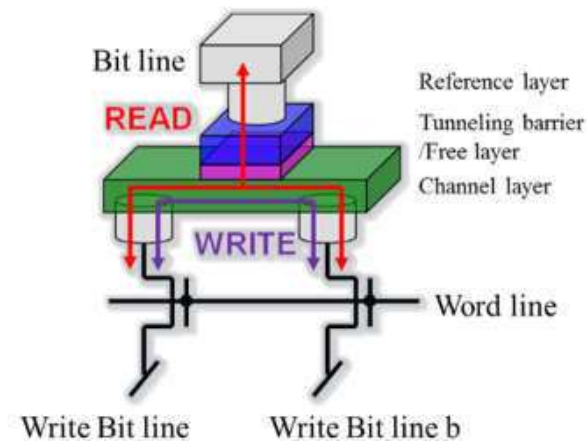
MRAM (magnetoresistive random-access memory)
Магниторезистивная оперативная память

(a) Memory cell structure for STT-MRAM and VC-MRAM

(b) Memory cell structure for SOT-MRAM

MRAM (magnetoresistive random-access memory)
Магниторезистивная оперативная память

EVERSPIN TECHNOLOGIES

MR20H40 / MR25H40

MR20H40 - 50MHz/20ns ^{t}SCK 4Mb SPI Interface MRAM
MR25H40 - 40MHz/25ns ^{t}SCK 4Mb SPI Interface MRAM
For more information on product options, see "Table 16 – Ordering Part Numbers" on page 25.

FEATURES

- No write delays
- Unlimited write endurance
- Data retention greater than 20 years
- Automatic data protection on power loss
- Fast, simple SPI interface, up to 50 MHz clock rate with MR20H40.
- 3.0 to 3.6 Volt power supply range
- Low-current sleep mode
- Commercial (0 to 70°C), Industrial (-40 to 85°C), Extended (-40 to 105°C), and AEC-Q100 Grade 1 (-40 to 125°C) temperature range options.
- Available in 8-pin DFN or 8-pin DFN Small Flag, RoHS-compliant packages.
- Direct replacement for serial EEPROM, Flash, and FeRAM
- MSL Level 3

8-DFN

8-DFN Small Flag

√RoHS

MR20H40CDF, MRAM 4Mb 3.3V 50Mhz 512K x 8 SPI

829 шт.. срок 5-9 недель

7 400 ₽

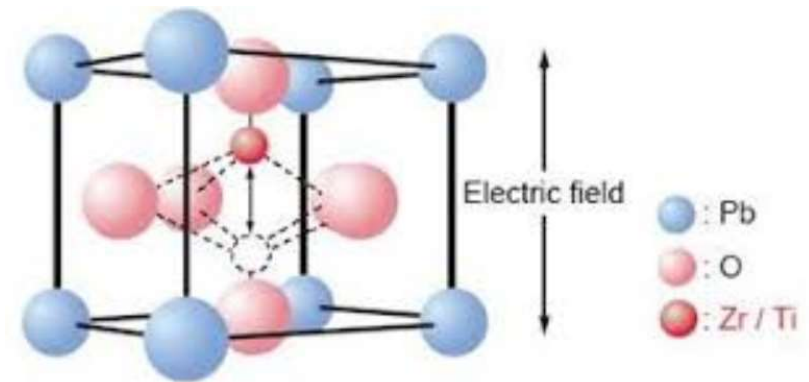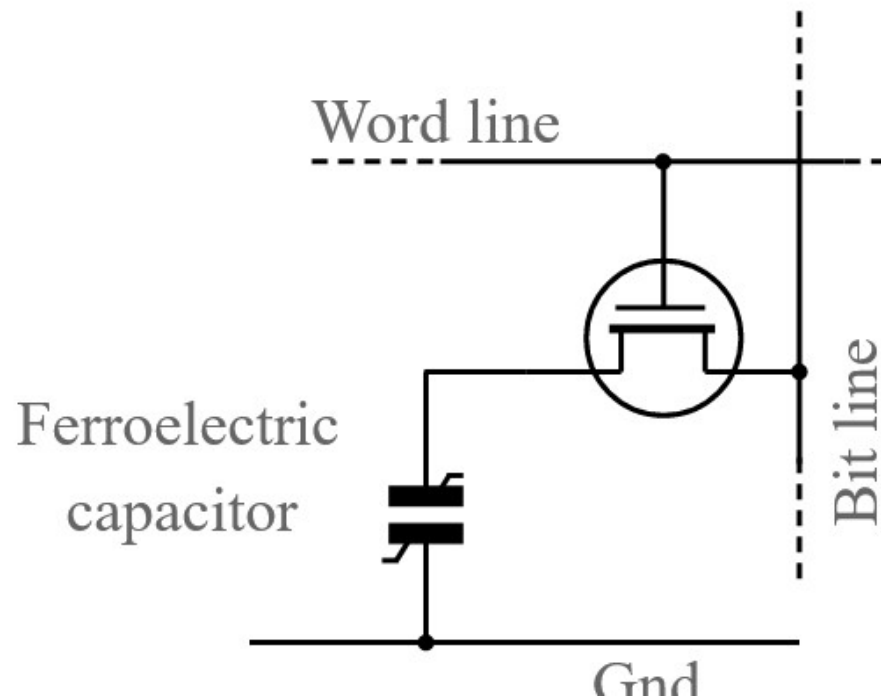| − | 1 | + | от **10 шт.** — 6 130 ₽ |
| | | | от **25 шт.** — 5 510 ₽ |
| | | | от **50 шт.** — 4 834.06 ₽ |

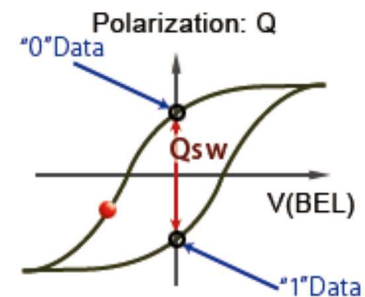→ 1 шт. на сумму 7 400 ₽

Добавить в корзину   Купить в 1 клик

Изображения служат только для ознакомления, см. техническую документацию

FRAM(Ferroelectric RAM) Сегнетоэлектрическая оперативная память

Word line

Ferroelectric capacitor

Bit line

Gnd

Electric field

- : Pb
- : O
- : Zr / Ti

Hysteresis Loop of PZT

Polarization: Q

"0" Data

Qsw

V(BEL)

"1" Data

FRAM(Ferroelectric RAM) Сегнетоэлектрическая оперативная память

FM25CL64B
64Kb Serial 3V F-RAM Memory

RAMTRON

Features

64K bit Ferroelectric Nonvolatile RAM
- Organized as 8,192 x 8 bits
- High Endurance 100 Trillion (10^{14}) Read/Writes
- 38 Year Data Retention (@ +75°C)
- NoDelay™ Writes
- Advanced High-Reliability Ferroelectric Process

Very Fast Serial Peripheral Interface - SPI
- Up to 20 MHz Frequency
- Direct Hardware Replacement for EEPROM
- SPI Mode 0 & 3 (CPOL, CPHA=0,0 & 1,1)

Sophisticated Write Protection Scheme
- Hardware Protection
- Software Protection

Low Power Consumption
- Low Voltage Operation 2.7-3.65V
- 200 µA Active Current (1 MHz)
- 3 µA (typ.) Standby Current

Industry Standard Configuration
- Industrial Temperature -40°C to +85°C
- 8-pin "Green"/RoHS SOIC and TDFN Packages

Description

The FM25CL64B is a 64-kilobit nonvolatile memory employing an advanced ferroelectric process. A ferroelectric random access memory or F-RAM is nonvolatile and performs reads and writes like a RAM. It provides reliable data retention for 38 years while eliminating the complexities, overhead, and system level reliability problems caused by EEPROM and other nonvolatile memories.

The FM25CL64B performs write operations at bus speed. No write delays are incurred. Data is written to the memory array immediately after each byte has been successfully transferred to the device. The next bus cycle may commence immediately without the need for data polling. In addition, the product offers substantial write endurance compared with other nonvolatile memories. The FM25CL64B is capable of supporting 10^{14} read/write cycles, or 100 million times more write cycles than EEPROM.

Pin Configuration

```
    ___
    CS  [ 1      8 ]  VDD
    SO  [ 2      7 ]  HOLD
    ___                ____
    WP  [ 3      6 ]  SCK
    VSS [ 4      5 ]  SI
```

Top View

```
    /CS  [ 1      8 ]  VDD
    SO   [ 2      7 ]  /HOLD
    /WP  [ 3      6 ]  SCK
    VSS  [ 4      5 ]  SI
```

FM25CL64B-GTR, микросхема памяти FRAM

✓ **520 шт.** со склада г.Москва

230 ₽

| – | 1 | + |

| от **2 шт.** — 200 ₽ |
| от **8 шт.** — 172 ₽ |
| от **14 шт.** — 165.04 ₽ |

→ 1 шт. на сумму 230 ₽

Добавить в корзину

Альтернативные предложения [1]

Изображения служат только для ознакомления, см. техническую документацию
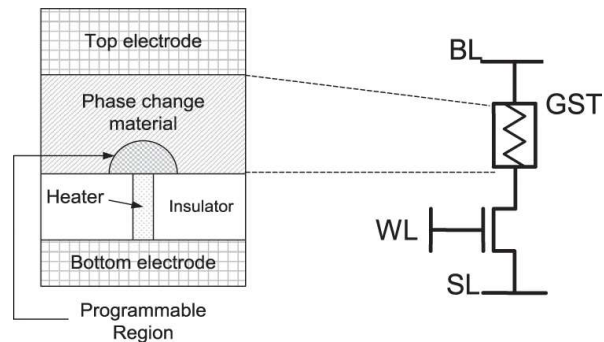
PRAM(*Phase-change memory) память с изменением фазового состояния*

Высокая скорость записи/чтения;
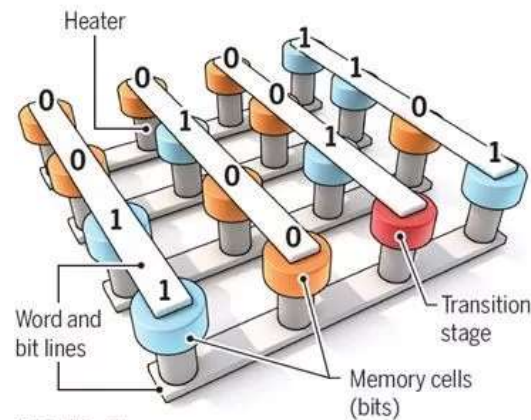
Высокая надежность (порядка 10^8 циклов записи);

Высокая стабильность (в рабочем диапазоне температур);

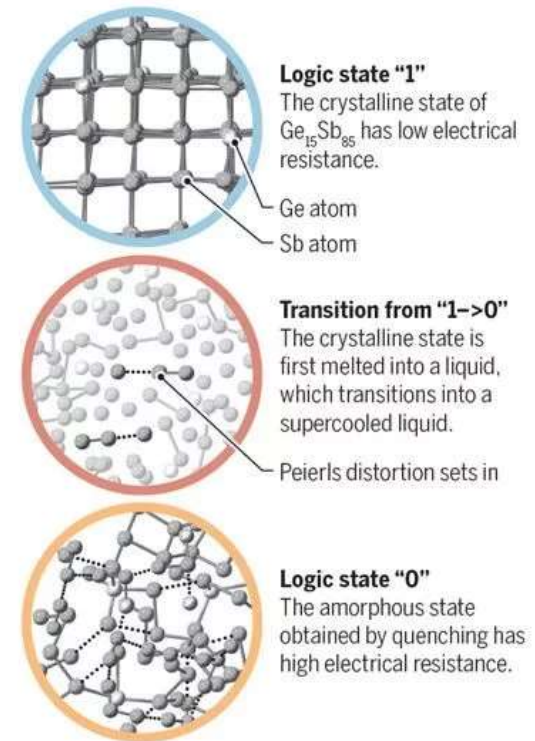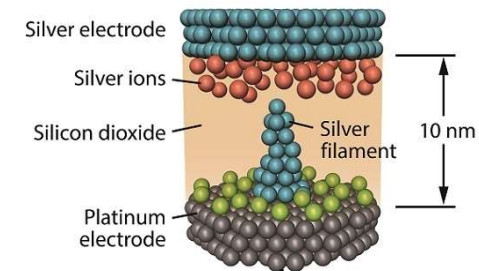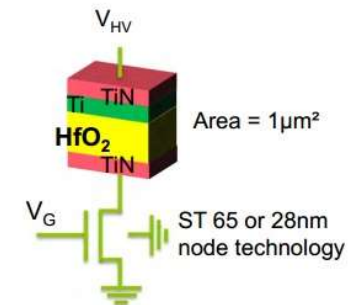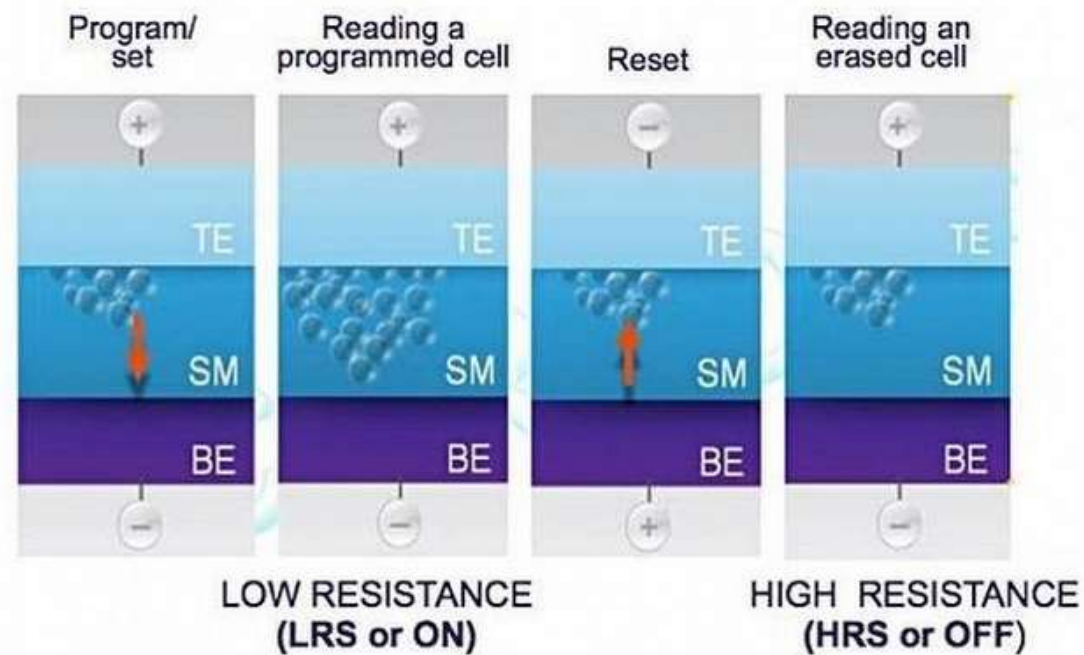Чувствительность к температуре окружающей среды.

3D XPOINT

3D XPOINT

ReRAM(Resistive RAM)

ReRAM(Resistive RAM)

■ **DESCRIPTION**

MB85AS4MT is a ReRAM (Resistive Random Access Memory) chip in a configuration of 524,288 words × 8 bits, using the resistance-variable memory process and silicon gate CMOS process technologies for forming the nonvolatile memory cells.
MB85AS4MT adopts the Serial Peripheral Interface (SPI).
MB85AS4MT is able to retain data without using a back-up battery, as is needed for SRAM.
The memory cells used in the MB85AS4MT can be used for 1.2×10^6 rewrite operations.

■ **FEATURES**

- Bit configuration : 4 Mbits (524,288 words × 8 bits)
- Serial Peripheral Interface : SPI (Serial Peripheral Interface)
  Correspondent to SPI mode 0 (0, 0) and mode 3 (1, 1)
- Write buffer size : 256 bytes
- Operating frequency : 5 MHz (Max)
- Data endurance : 1.2×10^6 times / byte
- Data retention : 10 years (+85 °C)
- Operating power supply voltage : 1.65 V to 3.6 V
- Operating power supply current : Rewrite current 1.3 mA (Typ)
  Read-out current 0.2 mA (Typ@5 MHz)
  Standby current 10 µA (Typ)
  Sleep current 2 µA (Typ)
- Operation ambient temperature range : -40 °C to +85 °C
- Package : 8-pin plastic SOP (FPT-8P-M11)
  RoHS compliant
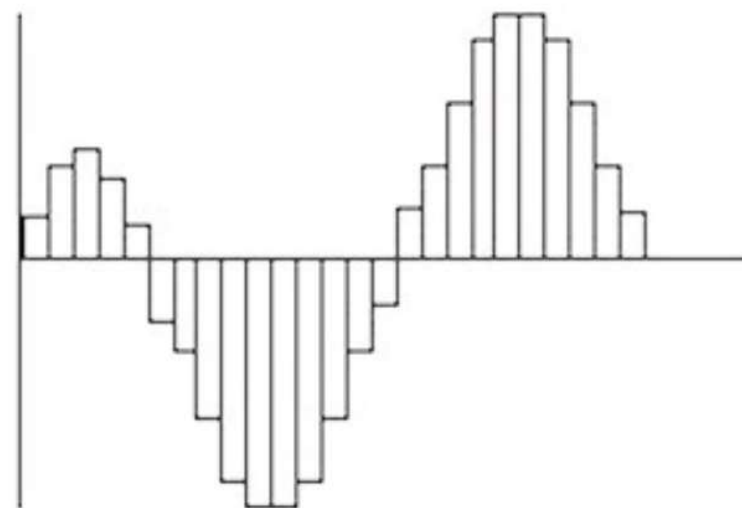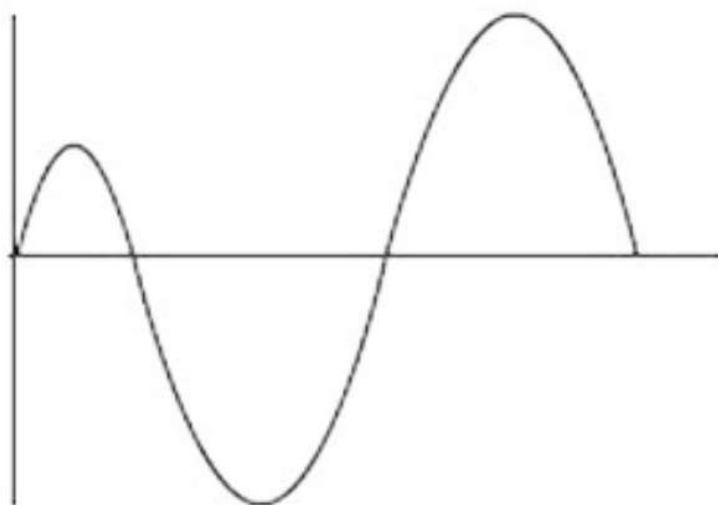
MIKROE-3641, ReRAM Click Development Kit mikroBUS
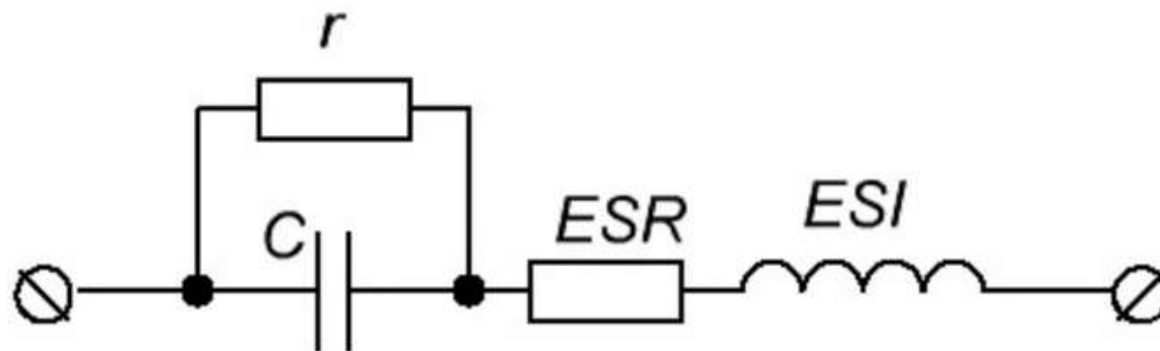
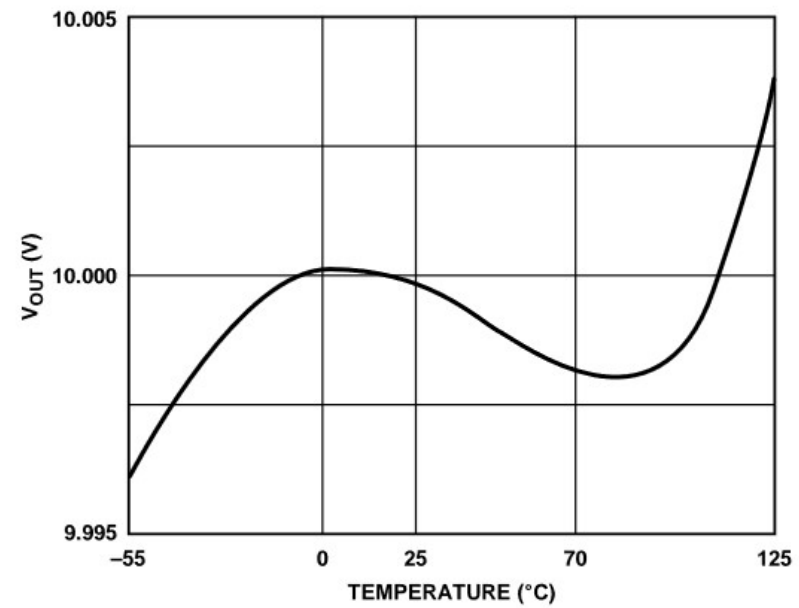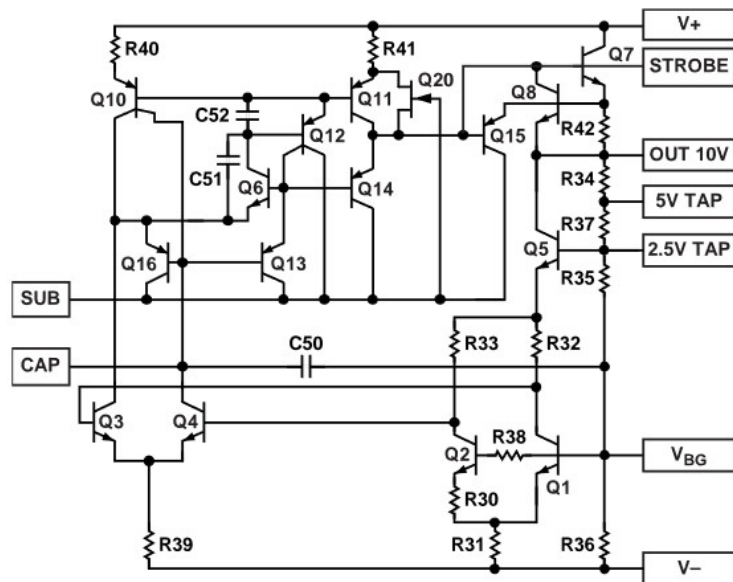# Цифроаналоговые преобразователи (ЦАП, DAC)
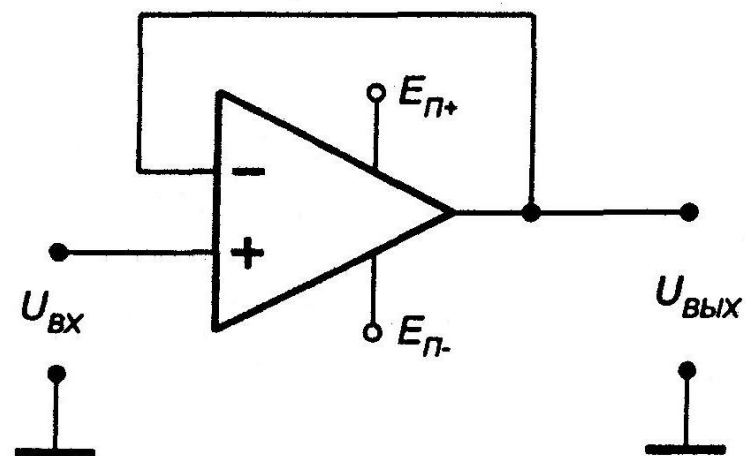
Последовательный ЦАП (ШИМ)
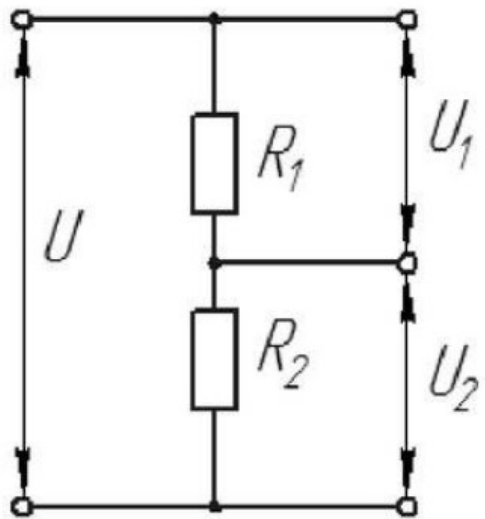
Сглаживающая емкость на выходе

Опорное напряжение высокой точности

Компенсация нагрузки

Делитель напряжения

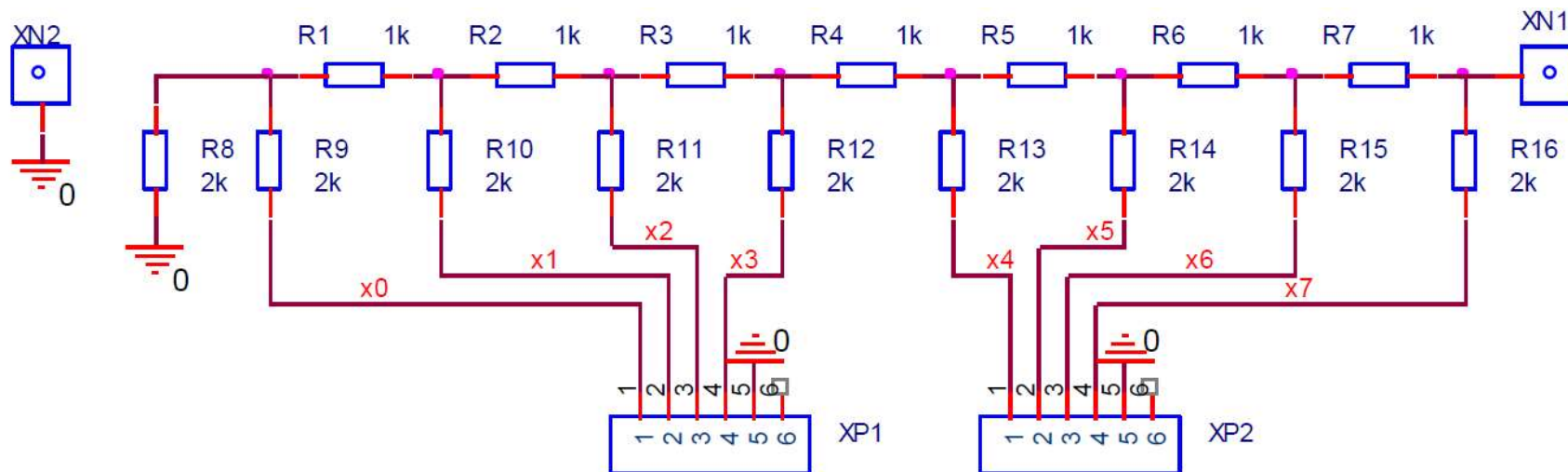$$I_1 = I_2 = I \qquad U_1 = IR_1 \qquad U_2 = IR_2$$

$$U = I(R_1 + R_2) \qquad I = \frac{U}{R_1 + R_2}$$
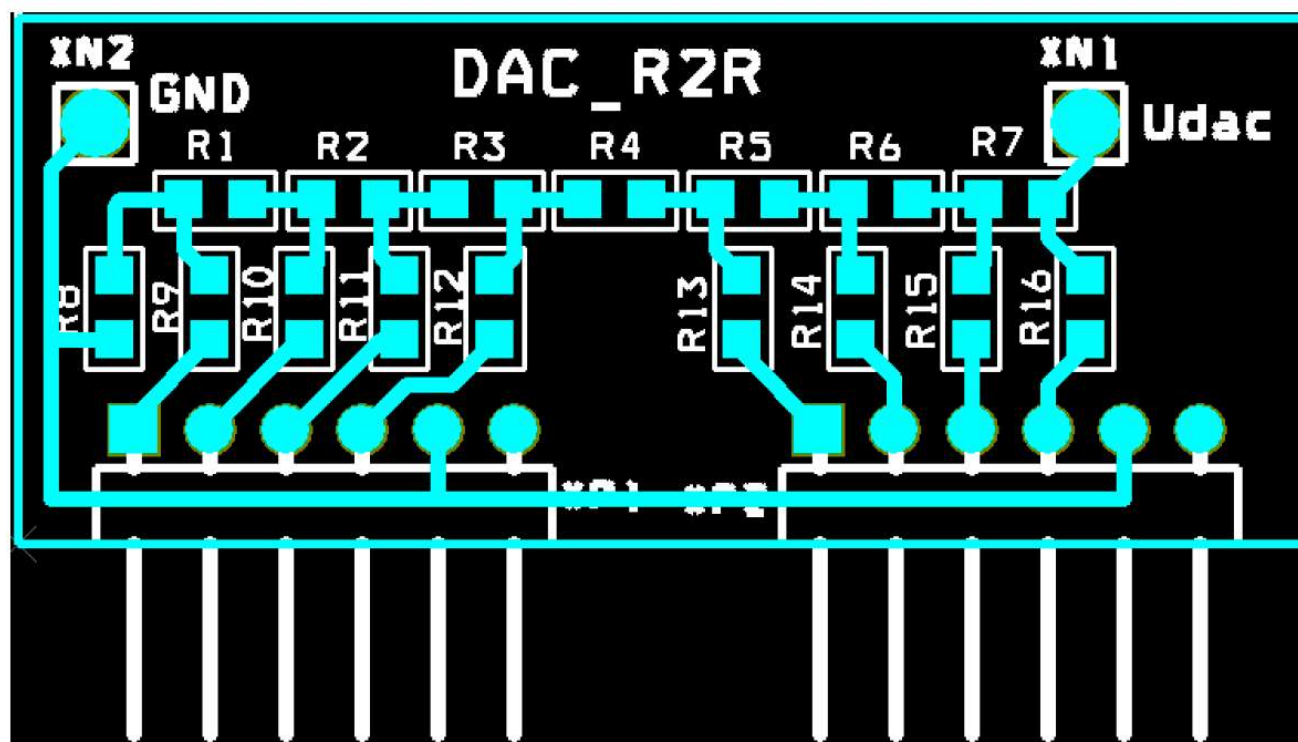
$$U_1 = \frac{R_1}{R_1 + R_2} U \qquad U_2 = \frac{R_2}{R_1 + R_2} U$$
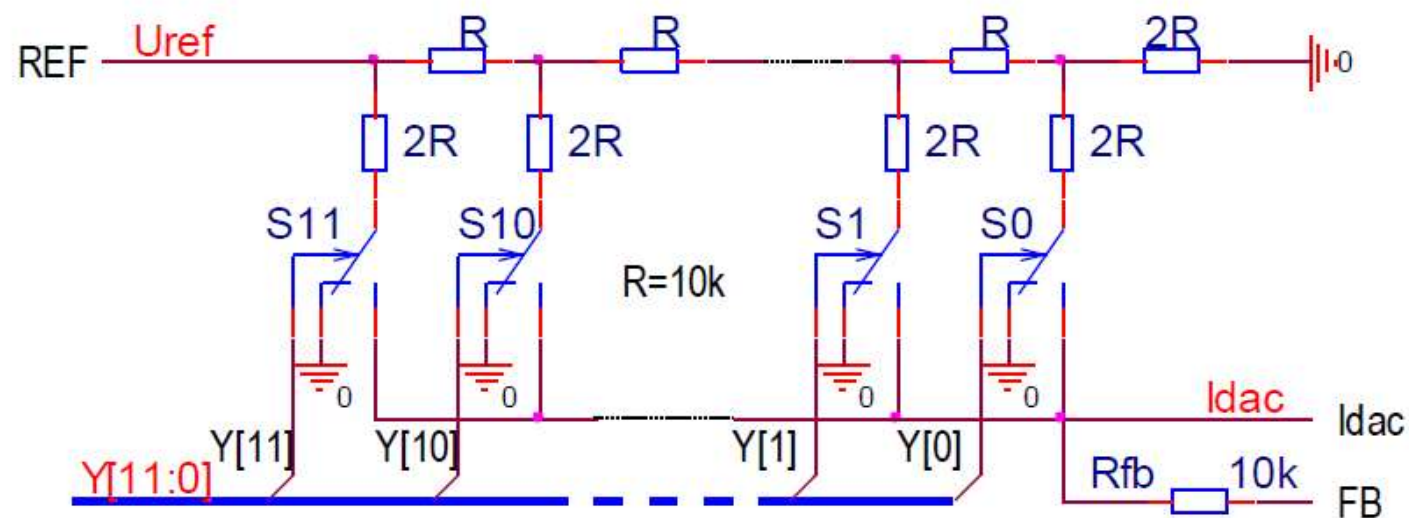
Параллельный ЦАП (R2R)

$$U_{xn1} = 1/2R \cdot U_{x7} + 1/4R \cdot U_{x6} + \ldots + 1/256R \cdot U_{x0}$$
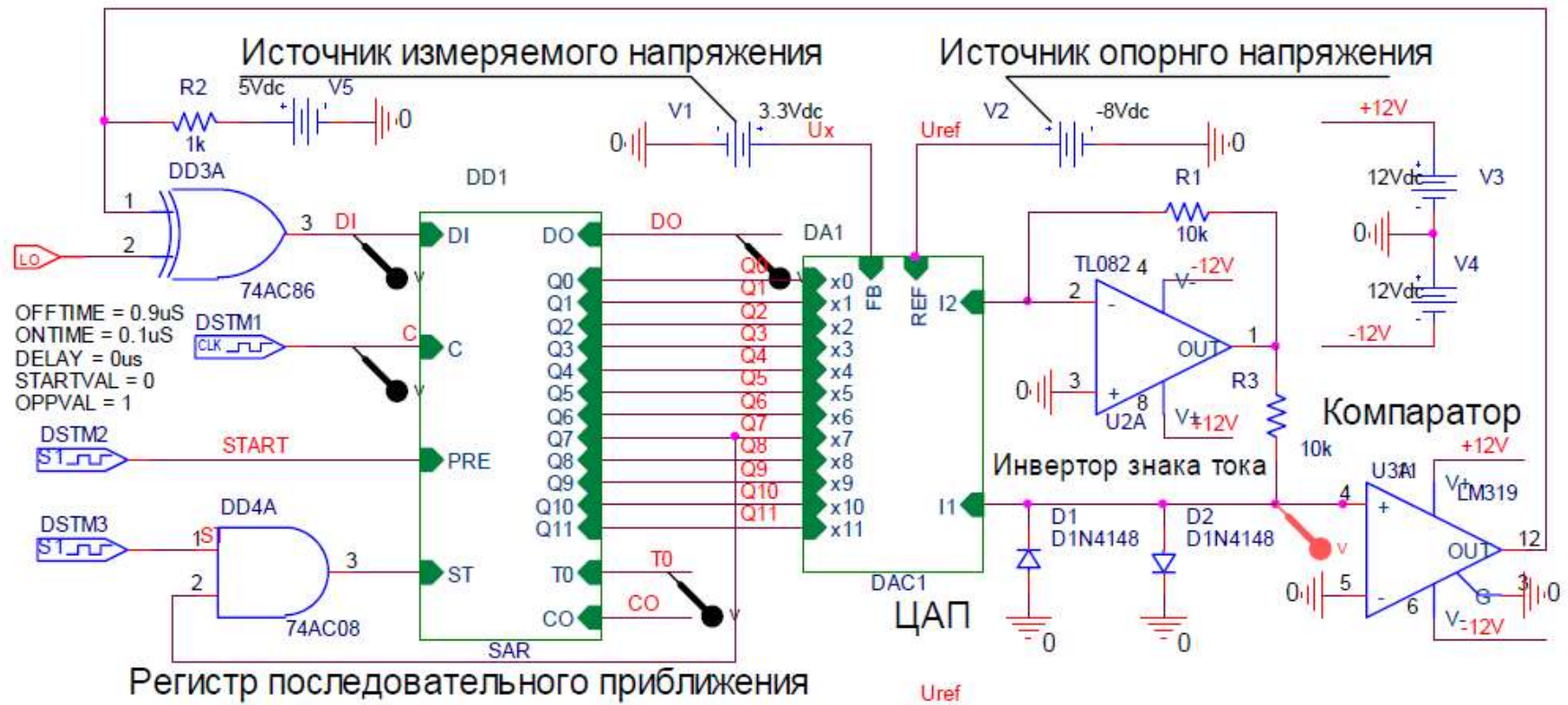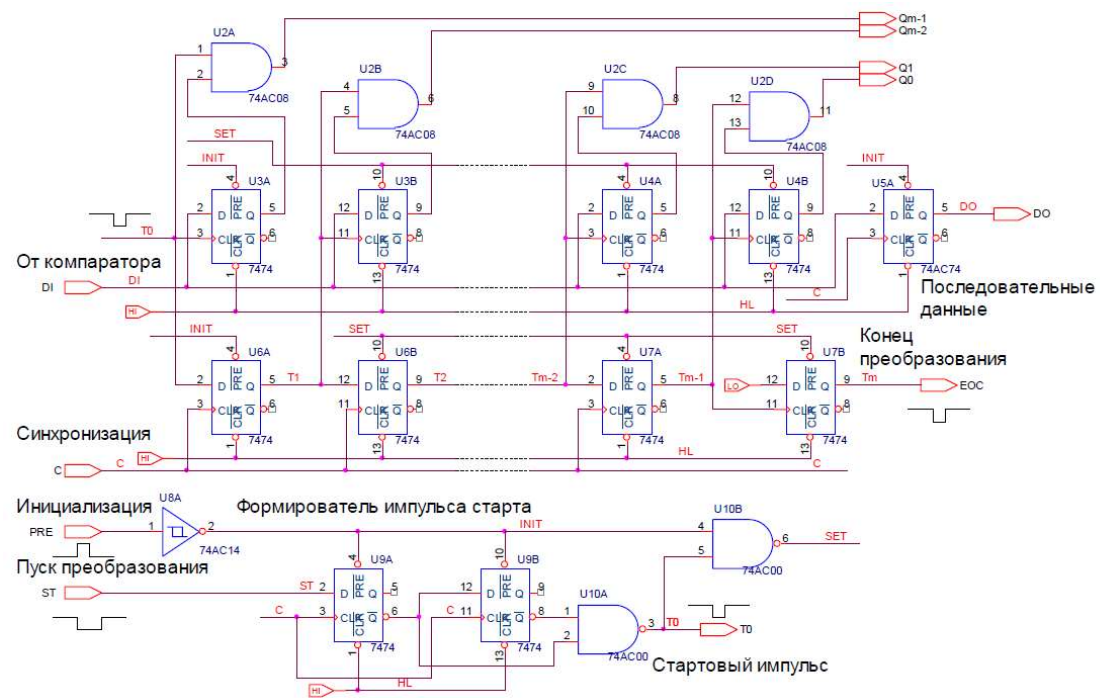
Пример топологии платы ЦАП (R2R)

ЦАП R2R с переключателями тока

АЦП последовательного приближения

АЦП последовательного приближения

Параллельные АЦП