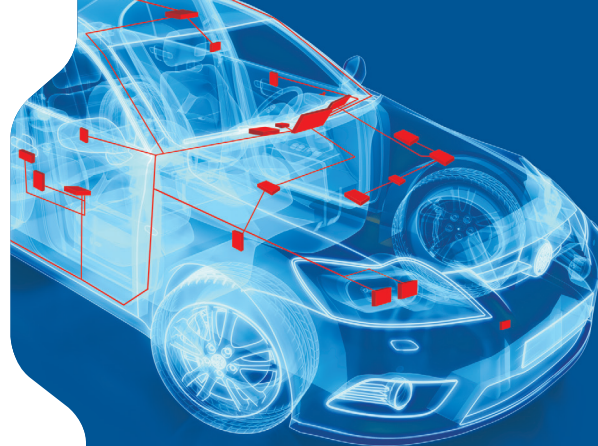


CYPRESS eCT™ FLASH

THE MOST SCALABLE HIGH-PERFORMANCE, HIGH-RELIABILITY
EMBEDDED FLASH SOLUTION FOR NEXT-GENERATION MCUS



PRODUCT OVERVIEW

INTRODUCTION

eCT (embedded Charge Trap) is a patented and proprietary NOR Flash technology that Cypress developed for high-performance MCUs with stringent reliability requirements. eCT has very attractive features for embedded Flash memory in automotive, industrial and consumer applications. eCT Flash is based on charge-trap technology that has been proven in volume production in six technology generations of MiroBit® NOR Flash memory. eCT is in volume production at the 40-nm node since 2016.

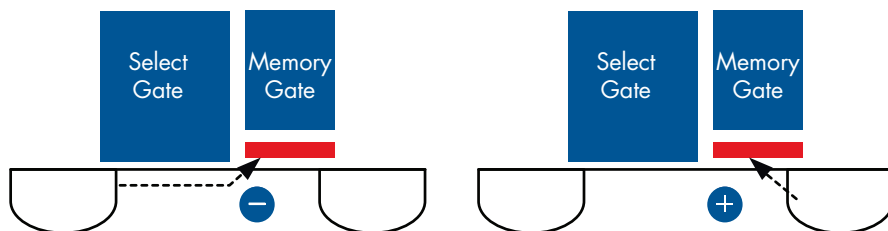
CELL OPERATION

eCT Flash bit cell uses a split-gate (1.5T) architecture in which one transistor is a Memory Gate (MG) that stores non-volatile data, and the other is a Select Gate (SG). The threshold voltage (V_t) of MG can be changed by adding or removing electric charge from the nitride layer of an Oxide-Nitride-Oxide (ONO) gate dielectric.

Using thin nitride layer to store electric charge makes the bit cell highly reliable and scalable. At the 40-nm node, eCT bit cell is approximately 25 percent smaller than the nearest competitor's embedded Flash cell.

MG is programmed by channel hot electron injection (CHEI); threshold voltage is increased by injecting negative charges into the nitride layer.

Erase operation utilizes band-to-band tunneling (BTBT) hot-hole injection; threshold voltage is decreased by injecting positive charges into the nitride layer.



Program (left) by CHEI and Erase (right) by BTBT Hot Hole Injection

FEATURES

eCT FLASH:

- Delivers the smallest embedded Flash bit cell in the industry, 0.053 sq. μm , at the 40-nm node
- Enables easy scaling to the 28-nm node, in both PolySiON and HKMG variants
- Provides fast 8-ns random access time and fast 30- μs word-programming speed
- Provides 125,000 write endurance cycles
- Provides 20 years of data retention
- Meets Automotive Grade-1 reliability requirements
- Requires a low number of extra masks beyond the standard CMOS logic process
- Leaves CMOS transistor characteristics unchanged, preserving existing models and design IP



40-nm eCT Bit Cell

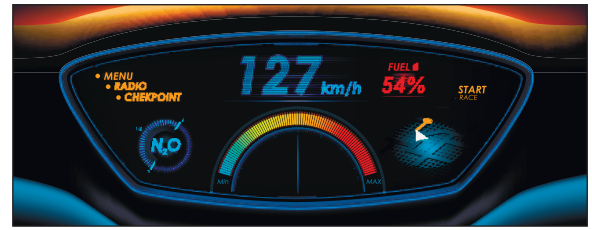
APPLICATIONS

eCT technology is used in numerous automotive MCUs, such as Traveo™ and Traveo™ II product families. These products serve a broad range of automotive applications including:

- Instrument clusters and head-up displays
- Hybrid and electrical vehicle motor control
- Body control modules and HVAC

eCT Flash is also well suited for industrial and consumer applications in which overall SoC performance and reliability are the predominant requirements, e.g.:

- Command and control modules in smart factories
- Power metering in smart grid
- Machine vision systems
- Test and measurement
- Electronic games



eCT FLASH MACRO FEATURES

	Code Flash	Data Flash
Density available	4Mb, 8Mb, 16Mb, 32Mb, 48Mb, 64Mb	512kb, 1Mb, 2Mb, 4Mb
Read access time	8 ns	55 ns
Program time per word	30 μ s	30 μ s
Write endurance	1k	125k
Data retention	20 years	
Junction temperature	-40°C to 150°C	

8-ns Read Speed	-40°C	0°C	25°C	90°C	125°C	150°C
0.99 V	✓	✓	✓	✓	✓	✓
1.10 V	✓	✓	✓	✓	✓	✓
1.21 V	✓	✓	✓	✓	✓	✓

Read Speed across Full VDD and Temperature Range

GET STARTED NOW

For more details, please contact us at: ip_licensing@cypress.com

HIGHLIGHTS

eCT Flash delivers:

- High performance
 - 8-ns random access time
 - 30- μ s word-programming speed
- High reliability
 - Automotive Grade-1 (AEC Q100 standard)
 - 125,000 write endurance cycles
 - 20 years of data retention
- Low manufacturing cost and excellent scalability
 - Industry-leading bit cell size at the 40-nm node
 - Low mask count
 - Simple structure and easy scaling to the 28-nm node
 - CMOS compatible; integrated into UMC 40LP/uLP logic process

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