



One-Time Programmable Memory Technology for 180nm CMOS

Problem Statement: In this connected world, electronic devices run our lives. The heart of electronics - Semiconductor chips are mass-produced, each ideally identical. Yet, manufacturing variations produce tiny offsets rendering chips useless and increasing the cost per chip. The tiny offset may be stored in a memory to correct the output, making each imperfect chip “perfect”! However, even the most advanced Fab in India, SCL Chandigarh, does not have this technology – thus suffering from significant yield loss, limiting efficiency, profitability, and customer satisfaction.

Uniqueness of the Solution: The IIT Bombay team has invented and demonstrated a memory cell and array-based on ultra-thin (2.5nm) insulator breakdown. The breakdown voltage is reduced to work at a standard supply of 3.3V compared to standard gate oxide technology requiring an excess of 6V. Thus, this technology avoids the penalty of large area high voltage generation

circuits. Further, the area of this memory cell is approximately three times smaller, which adds to the area advantage. The team fabricated OTP memory in a 180nm CMOS fab. This is the first-ever indigenous semiconductor memory technology adoption to manufacturing at the 180 nm node.

Current Status of Technology:

The technology is implemented in a manufacturing line at 180nm CMOS Fab line (most advanced fab in India) to meet all technical specifications to result in successful technology adoption of the memory. Low rate production is demonstrated.

Societal Impact: Semiconductor chips are a key element of electronic imports that rival the oil import bill. Having an indigenous semiconductor product can reduce import expenditure and ensure self-reliance and security. This product can be used in space and defence applications, secure memory, and

hardware encryption for credit cards and EVMs. A major application is Near Field Communication chips for cashless transfers.

Patent(s): Filed

Relevant Industries: Robotics, Electronics, Sensors, Semiconductors.

Faculty: Prof. Udayan Ganguly, Electrical Engineering.