Choosing the Right Memory IC:

- For ***Small Non-Volatile Data Storage***:

  EEPROM: AT24C256 (256 Kbit), easy to interface with I2C.

- For ***Larger Non-Volatile Storage:***

  Flash Memory: W25Q64 (64 Mbit), interfaced using SPI.

- For ***Large Volatile Storage***:

  SRAM: 23LC1024 (1 Mbit), interfaced using SPI.

- For ***Very Large Storage*** Needs:

  SD Card Module: Supports up to several gigabytes, interfaced using SPI.

Hardware Requirements and Connections:

1. External EEPROM (AT24C256)

Components:

AT24C256 EEPROM

AT24C256 Robu.com 256 Kbit (No 1 Mbit option available)

Arduino Uno

Pull-up resistors (typically 10kΩ)

Connecting wires

Breadboard

Wiring:

SDA (EEPROM) -> A4 (Arduino)

SCL (EEPROM) -> A5 (Arduino)

VCC (EEPROM) -> 5V (Arduino)

GND (EEPROM) -> GND (Arduino)

WP (EEPROM) -> GND (Arduino)

Pull-up resistors between SDA and VCC, and SCL and VCC

2. External Flash Memory (W25Q64)

Components:

W25Q64 Flash Memory

WQ25 RoboCraze.com Module 64 Mbit

Flash Module Robu Buy link (W25Q128 8Mbit)

Arduino Uno

Pull-up resistors (typically 10kΩ for CS, optional for other SPI lines)

Connecting wires

Breadboard

Wiring:

MISO (Flash) -> 12 (Arduino)

MOSI (Flash) -> 11 (Arduino)

SCK (Flash) -> 13 (Arduino)

CS (Flash) -> 10 (Arduino)

VCC (Flash) -> 3.3V (Arduino)

GND (Flash) -> GND (Arduino)

3. External SRAM (23LC1024)

Components:

23LC1024 SRAM

23LC1024 1 Mbit Arrow Price

Arduino Uno

Pull-up resistors

Connecting wires

Breadboard

Wiring:

MISO (SRAM) -> 12 (Arduino)

MOSI (SRAM) -> 11 (Arduino)

SCK (SRAM) -> 13 (Arduino)

CS (SRAM) -> 10 (Arduino)

VCC (SRAM) -> 5V (Arduino)

GND (SRAM) -> GND (Arduino)

4. SD Card Module

Components:

SD Card Module

UNO Rev3 with built in SD Card Module

MicroSD Card

Arduino Uno

Connecting wires

Breadboard

Wiring:

MISO (SD Module) -> 12 (Arduino)

MOSI (SD Module) -> 11 (Arduino)

SCK (SD Module) -> 13 (Arduino)

CS (SD Module) -> 10 (Arduino)

VCC (SD Module) -> 5V (Arduino)

GND (SD Module) -> GND (Arduino)

Comparison:

Price: Flash < EEPROM < SRAM < SD_Card_Module

Storage availability: SD_Card_Module> (Flash = SRAM)> EEPROM

Memory Type	Interface	Max Clock Speed	Write Speed	Read Speed	Use Case
AT24C256 EEPROM	I2C	400 kHz	~5 ms per byte	Limited by I2C speed	Small non-volatile storage, speed not critical
W25Q64 Flash	SPI	104 MHz (quad)	Page program ~1.5 ms	Up to 50 MB/s (quad)	Large non-volatile storage, faster read/write
23LC1024 SRAM	SPI	20 MHz	Instantaneous	Instantaneous	Large volatile storage, very fast
SD Card Module	SPI	25 MHz (typical)	2-20 MB/s	20-90 MB/s	Very large storage needs, moderate read/write speed

So, considering these parameters we can conclude that flash memory will be the best option as external memory.