swissbit®

Product Fact Sheet

Industrial / Automotive e·MMC Memory

EM-36 Series

JEDEC e·MMC 5.1 compliant,
BGA 153 ball, Enhanced Mode (pSLC)
AEC – Q100 Grade 2

Industrial / Automotive
Temperature Grade

Date: March 6, 2024
Revision: 1.05

Made in Germany

Product Fact Sheet
EM-36 Series

Product Summary

- **Capacities:** 5 GBytes, 10 GBytes, 20 GBytes, 40 GBytes, 80 GBytes
- **Operating Temperature Range[1]:**
  - Industrial Operating Temperature (Tambient) -40 to 85°C
  - Automotive Operating Temperature (Tambient) -40 to 105°C
    ATS 2 Products2 (Assembly Test Site 2): AEC – Q100 Grade 2 certified, not available for 5 GBytes
- Endurance in TeraBytes Written (TBW) @ Max Capacity[2]: up to 4169

Product Features

- Fully compliant with JEDEC e•MMC 5.1 Standard (JESD84-B51)
- 153-ball BGA, 0.5mm pitch
- 11.5 x 13mm, RoHS compliant
- 3D TLC NAND base technology in Enhanced Mode (pSLC)
- Single enhanced mode partition
- High performance e•MMC 5.1 specification
  - Eleven-wire bus (clock, Data Strobe, 1 bit command, 8 bit data bus) and a hardware reset
  - Three different data bus width modes: 1-bit (default), 4-bit, and 8-bit
  - Clock frequencies 0-200MHz, High Speed Mode HS400
  - Command Queue Feature according to e•MMC Spec 5.1
  - Up to 330MB/s sequential read and up to 250MB/s sequential write
- Power Supply: (Low-power CMOS technology)
  - VCCQ 1.7V...1.95V or 2.7V...3.6V e•MMC supply
  - VCC 2.7V...3.6V NAND Flash supply
- Optimized FW algorithms
  - Power-fail data loss protection
  - Wear Leveling technology
    Equal wear leveling of static and dynamic data. The wear leveling assures that dynamic data as well as static data is balanced evenly across the memory. With that the maximum write endurance of the device is ensured
  - Read Disturb Management
    The read commands per region are monitored and the content is conditionally refreshed when critical levels have occurred
  - Auto Read Refresh
    The interruptible background process maintains the user data for Read Disturb effects or Retention degradation due to high temperature effects
  - Diagnostic features with Device Health Report according to e•MMC Spec 5.1, and detailed Lifetime Monitor data (Swissbit proprietary, accessible through standard e•MMC commands).
  - Field Firmware update[3] according to e•MMC Spec 5.1
  - Discard and Sanitize, Trim
  - Boot Operation Mode and Alternative Boot Operation Mode
  - Replay Protected Memory Block (RPMB)

[1] Adequate airflow is required to ensure the temperature Tcase does not exceed 95°C (industrial temperature drive), respectively 115°C (automotive temperature drive)
[2] According to JEDEC (JESD47I), the time to write the full TBW is a minimum of 18 months. Higher average daily data volume reduces the specified TBW. The values listed are estimates and are subject to change without notice.
[3] The support of In-Field FW update capabilities on host systems is recommended. The update must be transferred with a CMD25. For Linux, kernel 4.4 or higher is required.

- High reliability
  - Designed with sophisticated firmware architecture for industrial and embedded markets.
  - Enhanced Mode (pSLC) with higher write performance and endurance than 3D TLC configured products (EM-30).
  - Ideal for application like POS/POI, PLC, IoT, gaming, medical and use as general boot medium for embedded applications.
  - The product is optimized for long life cycle that requires superior data retention as well as power fail safety.
  - Controlled BOM & PCN process

1 Order Information for EM-36

Table 1: Available Part Numbers

ATS 1 Gen3 Flash		
Capacity	Temperature	
	Industrial (-40 to 85°C)	Automotive (-40 to 105°C)
	Part Number	Part Number
5 GBytes	SFEM005GB1ED1TO-I-5E-11P-STD	-
10 GBytes	SFEM010GB1ED1TO-I-5E-11P-STD	-
20 GBytes	SFEM020GB1ED1TO-I-6F-11P-STD	-
40 GBytes	SFEM040GB1ED1TO-I-7G-11P-STD	-
80 GBytes	SFEM080GB1ED1TO-I-8H-11P-STD	-

ATS 1 (Assembly Test Site 1)

Table 2: Available Part Numbers

ATS 2 Gen3 Flash		
Capacity	Temperature	
	Industrial (-40 to 85°C)	Automotive (-40 to 105°C)
	Part Number	Part Number
5 GBytes	SFEM005GB2ED1TO-I-5E-11P-STD	SFEM005GB2ED1TO-A-5E-11P-STD
10 GBytes	SFEM010GB2ED1TO-I-5E-11P-STD	SFEM010GB2ED1TO-A-5E-11P-STD
20 GBytes	SFEM020GB2ED1TO-I-6F-11P-STD	SFEM020GB2ED1TO-A-6F-11P-STD
40 GBytes	SFEM040GB2ED1TO-I-7G-11P-STD	SFEM040GB2ED1TO-A-7G-11P-STD

ATS 2 (Assembly Test Site 2)

Table 3: Available Part Numbers

ATS 2 Gen5 Flash		
Capacity	Temperature	
	Industrial (-40 to 85°C)	Automotive (-40 to 105°C)
	Part Number	Part Number
20 GBytes	SFEM020GB2ED1TB-I-CE-11P-STD	SFEM020GB2ED1TB-A-CE-11P-STD
40 GBytes	SFEM040GB2ED1TB-I-EF-11P-STD	SFEM040GB2ED1TB-A-EF-11P-STD
80 GBytes	SFEM080GB2ED1TB-I-VG-11P-STD	SFEM080GB2ED1TB-A-VG-11P-STD

ATS 2 (Assembly Test Site 2)

1.1 System Performance

Gen3 Flash		
System Performance, HS400	**Max. reliable mode**	**Unit**
Burst Data transfer Rate HS400 (max clock 200MHz)	400	MB/s
Sequential Read	up to 320	
Sequential Write	up to 240	

Gen5 Flash		
System Performance, HS400	**Max. reliable mode**	**Unit**
Burst Data transfer Rate HS400 (max clock 200MHz)	400	MB/s
Sequential Read	up to 330	
Sequential Write	up to 250	

1.2 Current Consumption

Gen3 Flash			
Current Consumption, HS400, Max. Density	**Typ. ICCQ current @ VCCQ 1.8V**	**Typ. ICC current @ VCC 3.3V**	**Unit**
Write	99	97	mA
Read	138	108	
Sleep	0.07	0.07	

Gen5 Flash			
Current Consumption, HS400, Max. Density	**Typ. ICCQ current @ VCCQ 1.8V**	**Typ. ICC current @ VCC 3.3V**	**Unit**
Write	102	104	mA
Read	142	105	
Sleep	0.06	0.04	

1.3 Physical Dimensions

Physical Dimensions	Value	Unit
Length	13±0.1	mm
Width	11.5±0.1	
Thickness	1.2 max.	

1.4 Recommended Temperature Conditions

Parameter	Min.	Typ.	Max.	Unit
Industrial Operating Temperature	-40	25	85	°C
Automotive Operating Temperature	-40	25	105	°C

* High temperature storage without operation reduces the data retention, in operation the data will be refreshed, if data error issues were detected

For more information on e·MMC interface, please visit JEDEC homepage (www.jedec.org)

Why Swissbit?

Swissbit is focused on the design, development, manufacture, and support of leading edge memory and storage solutions for the worldwide OEM/ODM marketplace. As a global supplier, Swissbit recognizes and addressees the higher level of application requirements of today's industrial, Netcom, and automotive customers by providing best-in-class products and services, with uncompromised attention to driving overall value and quality.