SMART’s DuraFlash BGAE540 eMMC is a soldered-down Flash storage solution that combines NAND Flash memory, an embedded MMC (MultiMediaCard) Controller, and advanced firmware in a small BGA (Ball Grid Array) package that provides stable, yet cost effective high-density embedded storage. The BGAE540 eMMC is designed to meet the rigid requirements of the industrial, medical and networking markets.

SMART’s BGAE540 eMMC is compliant to eMMC v5.1 specifications and is available in the standard JEDEC 0.5mm pitch, 153-ball BGA package, as well as 1.0mm pitch, 100-ball BGA package. The 100-ball package offers larger ball pitch and ball diameter enabling lower cost PCB designs and simplifies PCB routing with wider metal traces.

Features & Benefits
- Compliant to JEDEC v5.1 Standard
- BGAE540 SE: Base eMMC, TLC NAND with Capacities from 16GB to 128GB
- BGAE540 UE: Pre-configured to pSLC Enhanced Storage Media Mode with User Capacities from 5GB to 40GB
- Industrial Temp (-40°C to +85°C)

Product Family Overview

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Sequential Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGAE540 SE</td>
<td>eMMC</td>
</tr>
<tr>
<td>BGAE540 UE</td>
<td>eMMC</td>
</tr>
</tbody>
</table>

Applications
- Factory Automation
- IIoT
- Medical Devices
- Networking Appliances
- POS Terminals
- RFID Scanners
- Single-Board Computers
- Telecom Infrastructure
## Specifications (BGAE540 SE)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP9MDGP3AMI01</td>
<td>128GB</td>
</tr>
<tr>
<td>SP9MCGP3AMI01</td>
<td>64GB</td>
</tr>
<tr>
<td>SP9MBGP3AMI01</td>
<td>32GB</td>
</tr>
<tr>
<td>SP9MAGP3AMI01</td>
<td>16GB</td>
</tr>
</tbody>
</table>

### NAND Type
- TLC

### Performance
- **Host Interface Rate (maximum)**: eMMC v5.1 (HS400)
- **Capacities**: 16GB to 128GB
- **Sequential Read (maximum)**: Up to 320 MB/s
- **Sequential Write (maximum)**: Up to 45 MB/s
- **Random Read (maximum)**: Up to 9.3K IOPS
- **Random Write (maximum)**: Up to 2.1K IOPS

### Reliability
- **Endurance**: 128GB: 40 TBW  
  64GB: 20 TBW  
  32GB: 10 TBW  
  16GB: 25 TBW
- **(JEDEC Enterprise Workload)**

### Data Retention
- 10 years

### Error Correction
- LDPC

### Power
- **Input Voltage**: 3.3V ± 10%

### Environmental
- **Operating Shock**: 1500 g half-sine, 0.5 msec, 1 shock along each axis, X, Y, Z in each direction
- **Operating Vibration**: 20G 80-2000Hz, 1.52mm 20-80Hz, 3 axis
- **Operating Temperature**: Industrial: -40°C to +85°C
- **Storage Temperature**: -40°C to +85°C

### Physical
- **Length**: 11.5 mm  
  14 mm
- **Width**: 13 mm  
  18 mm
- **Height**: 1.0 mm  
  2.45 mm

(Continue on next page)
### Specifications (BGAE540 UE)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGAE540 UE</td>
<td>eMMC</td>
</tr>
<tr>
<td>SP9MDGP3AMI11</td>
<td>40GB</td>
</tr>
<tr>
<td>SP9MCGP3AMI11</td>
<td>20GB</td>
</tr>
<tr>
<td>SP9MBGP3AMI11</td>
<td>10GB</td>
</tr>
<tr>
<td>SP9MAGP3AMI11</td>
<td>5GB</td>
</tr>
<tr>
<td>BGAE540 UE</td>
<td>eMMC</td>
</tr>
<tr>
<td>SP9QDGP3AMI11</td>
<td>40GB</td>
</tr>
<tr>
<td>SP9QCGP3AMI11</td>
<td>20GB</td>
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<tr>
<td>SP9QBGP3AMI11</td>
<td>10GB</td>
</tr>
<tr>
<td>SP9QAGP3AMI11</td>
<td>5GB</td>
</tr>
</tbody>
</table>

#### NAND Type
- BGAE540 UE | 153-ball: pSLC
- BGAE540 UE | 100-ball: pSLC

#### Performance
- **Host Interface Rate (maximum):** eMMC v5.1 (HS400)
- **Capacities:** 5GB to 40GB
- **Sequential Read (maximum):** Up to 320 MB/s
- **Sequential Write (maximum):** Up to 215 MB/s
- **Random Read (maximum):** Up to 9.3K IOPS
- **Random Write (maximum):** Up to 2.1K IOPS

#### Reliability
- **Endurance:**
  - 40GB: 88 TBW
  - 20GB: 44 TBW
  - 10GB: 22 TBW
  - 5GB: 11 TBW
- **(JEDEC Enterprise Workload):**
  - 40GB: 88 TBW
  - 20GB: 44 TBW
  - 10GB: 22 TBW
  - 5GB: 11 TBW
- **Data Retention:** 10 years
- **Error Correction:** LDPC
- **Power:** Input Voltage: 3.3V ± 10%

#### Environmental
- **Operating Shock:** 1500 g half-sine, 0.5 msec, 1 shock along each axis, X, Y, Z in each direction
- **Operating Vibration:** 20G 80-2000Hz, 1.52mm 20-80Hz, 3 axis
- **Operating Temperature:** Industrial: -40°C to +85°C
- **Storage Temperature:** -40°C to +85°C

#### Physical
- **Length:** 11.5 mm
- **Width:** 13 mm
- **Height:** 1.0 mm
- **Length:** 14 mm
- **Width:** 18 mm
- **Height:** 2.45 mm

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**DuraFlash Product Grading System**

- **SE** Standard Endurance | TLC
- **HE** High Endurance | eTLC
- **PE** Premium Endurance | eTLC (OP 28%)
- **UE** Ultra Endurance | pSLC

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For more information, please visit: [www.smartm.com](http://www.smartm.com)