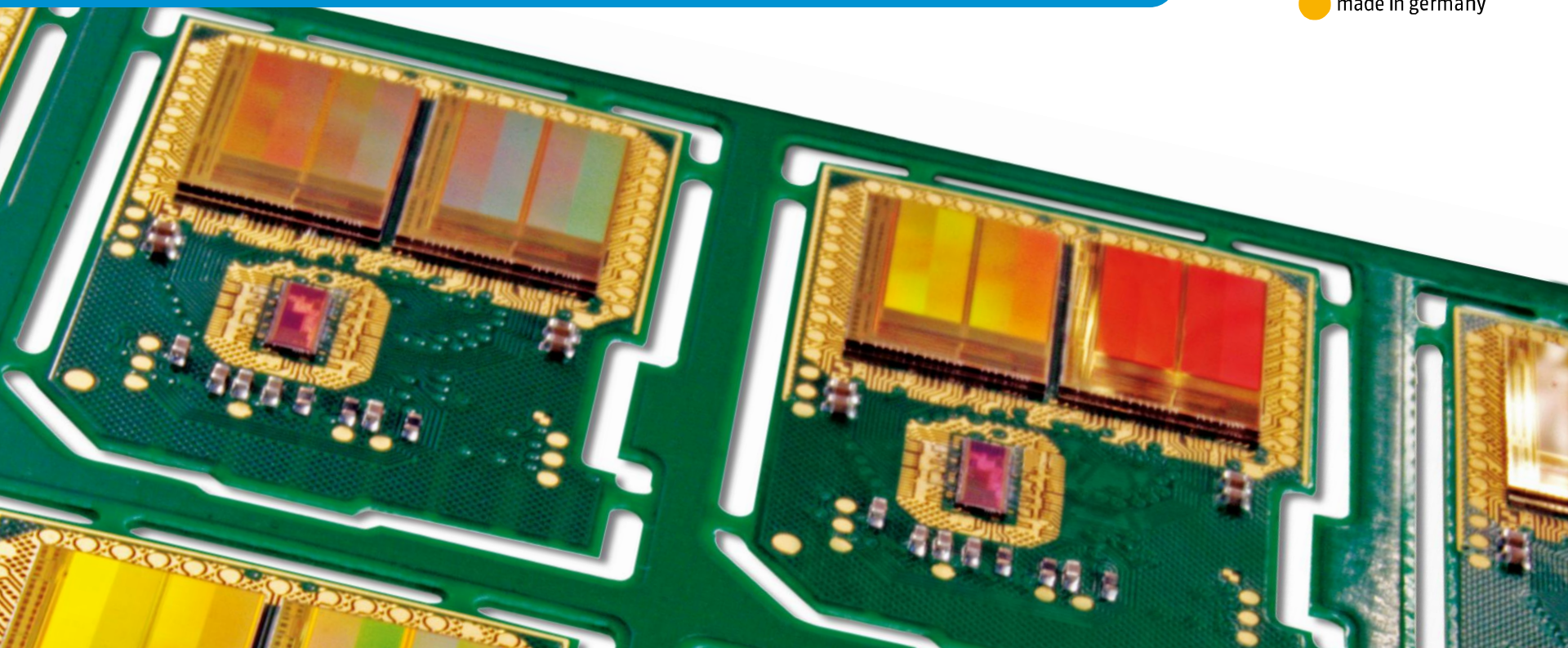
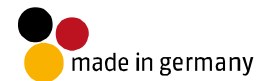


swissbit®

SWISSBIT SD CARD BENCHMARK

S-40 compared to other industrial MLC SD cards

June 12, 2014
Rev. 2



SPECIFICATION

S-40



**Company A
Industrial MLC
SD Card**

**Company B
Automotive MLC
SD Card**

| | S-40 | Company A Industrial MLC SD Card | Company B Automotive MLC SD Card |
|------------------|---|---|---|
| Interface | SD2.0 / 3.0 Class 6 | SD 3.01 (Non-UHS) Class 4 | SD 2.0 |
| Density | 512MB to 32GB | 4GB to 16GB | 4GB to 32GB |
| Op. Temperature | -40°C to 85°C | -40 °C to 85°C | -40 °C to 85°C |
| Storage Temp. | -40 °C to 100 °C | -40°C to 85°C | -40°C to 85°C |
| Shock /Vibration | 1'500 G / 50 G | 1'000 G / 15 G | Unknown |
| Insertion cycles | 20'000 | 10'000 | 10'000 |
| Others | Water Proof Dust Proof Torque/bending | | |

Especially in the case of MLC based products not all that are marketed as „industrial“ or „automotive“ actually offer industrial features (e.g. in terms of temperature range, longevity, reliability or firmware features).

Swissbit recommend to verify product specifications thoroughly in order to understand whether a product meets the application requirements

BILL OF MATERIALS

S-40



**Company A
Industrial MLC
SD Card**

**Company B
Automotive MLC
SD Card**

| | | | |
|----------------------|---|------------------|------------------|
| Controller | Industrial Grade | Unknown | Consumer grade |
| Flash | Toshiba 19nm MLC | Toshiba 19nm MLC | Samsung 21nm MLC |
| Card Assembly | COB Molded | TSOP PCB | Molded |
| Randomizer | AES Encryption Unit | Unknown | Pseudo random |
| Lifecycle Management | PCN Process | Unknown | Unknown |
| Longevity * | 10 Years | ~2 Years | ~2 Years |
| End Test | 100 % Devices 100 % Temperature range 100% Area | Unknown | Unknown |

* Longevity is mainly influenced by the controller
By using an industrial grade controller, Swissbit can guarantee maximum longevity for our industrial and automotive product lineup

RESULTS OF INTERNAL TESTS

S-40

Company A
Industrial MLC
SD CardCompany B
Automotive MLC SD
Card

| | | | |
|--------------------------|--------------------|-----------------------|---------------------------|
| Write Performance | 12.3 MB/S | 11.1 MB/S | 16.8 MB/S |
| Read Performance | 23.3 MB/s | 22.7 MB/S | 19.5 MB/S |
| 24 Hours Raw access Test | Pass | Pass | Pass |
| Sudden Power Fail | 10'000 cycles Pass | Fail after 50 cycles* | Fail after 1'000 cycles** |
| File System Test | Pass | Fail | Pass |

* After 50 power cycles, 7533140 (3.6 GByte) of static data corrupted.

** 7 Sectors of static data corrupted after 1000 Cycles.