

ACP-S0001

Industrial TLC SATA Solid State Drive Series

Features

- SATA Revision 3.1
- SATA 1.5Gbps, 3Gbps, and 6Gbps Interface
- Flash Type: 3D TLC
- Up to 16pcs of BGA132/152 Flash
- Read up to 550 MB/s , Write up to 530 MB/s
- Active Mode: < 5,000 mW
- Idle Mode: < 1,800 mW
- Operation Temperature: -40°C - 85°C
- MTBF: 3,000,000 Hours

Appearance





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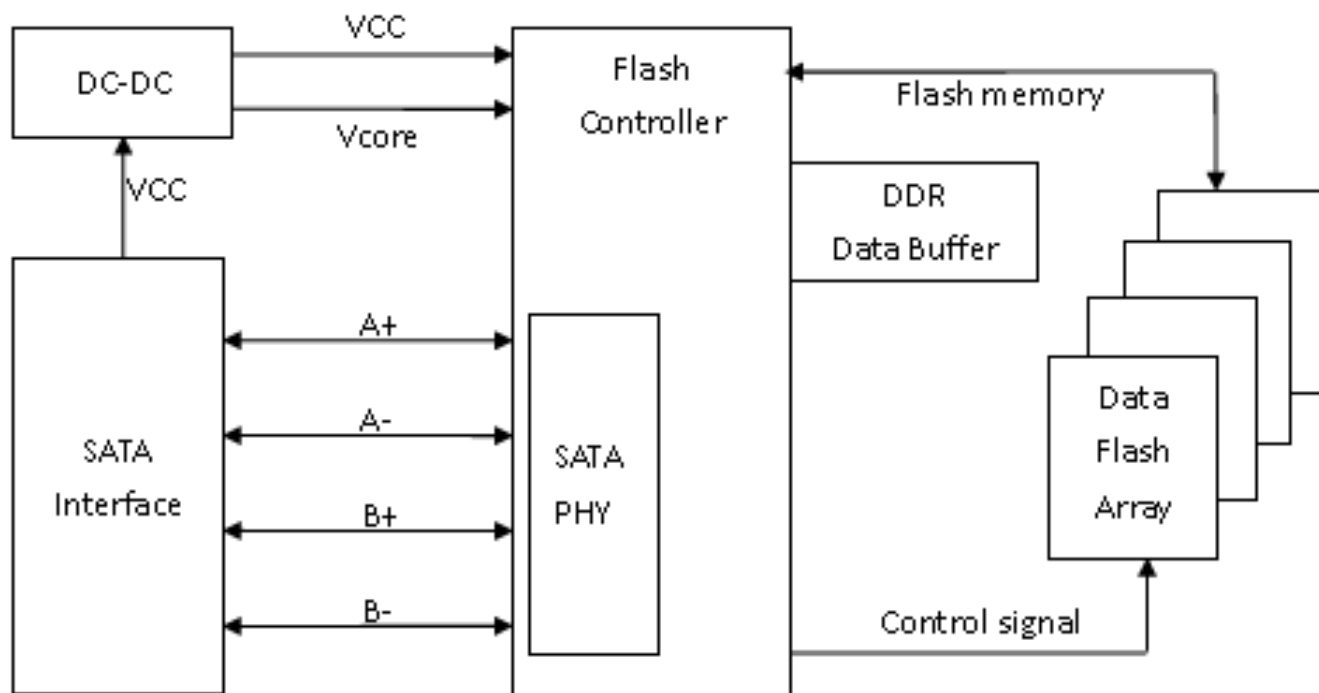
Revision Table

Date	Revision	Content	By
2025/10/9	0.1	First Draft	Mark

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Block Diagram



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Specification

Capacity	
TLC	240GB up to 15360 GB (16TB)
Electrical/Physical Interface	
Interface	Compliant with SATA Revision 3.1 Compatible with SATA 1.5Gbps, 3Gbps and 6Gbps
Other	Support Expanded Register for SATA Protocol 48 bits Addressing Mode Support Hardware Write Protect Function (Optional) Support Hardware Quick Erase Function (Optional) Support Hardware Power Loss Protection (Optional)

Device Capacity

Capacity	IDEMA Standard		User Data Size
	512 Bytes/Sector	4K Bytes/Sector	
	Total Sectors (LBA)	Total Sectors (LBA)	
240GB	468,862,128	58,607,766	Depended on file management
480GB	937,703,088	117,212,886	
960GB	1,875,385,008	234,423,126	
1920GB	3,750,748,848	468,843,606	
3840GB	7,501,476,528	937,684,566	
7680GB	15,002,931,888	1,875,366,486	
15360GB	30,005,842,608	3,750,730,326	

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Notes:

1 Gigabyte (GB) is equal to 1,000,000,000 Bytes; 1 sector is equal to 512 Bytes.

The calculation is following IDEMA Standard.

The total actual user data size of the SSD may be less than device capacity due to SSD format, SSD partition, operating system.

EX: OS shows 223.57GB (NTFS) with 240GB SSD.

MTBF

MTBF, an acronym for Mean Time between Failures, is a measure of reliability of a device. Its value represents the average time between a repair and the next failure. The unit of MTBF is in hours. The higher the MTBF value, the higher the reliability of the device.

Our MTBF result is based on simulation software (Relex 7.3). Please note that a lower MTBF should be expected for higher capacity drives, and we apply the lowest MTBF for all capacities.

Capacity	Flash Type
240GB ~ 15360GB	3 Million Hours

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Performance

Capacity	Flash Structure	Sequential		4K Random	
		Read (MB/s)	Write (MB/s)	Read (IOP S)	Write (IOP S)
240GB	64GB x 4, BGA, Kioxia BiCS5	550	140	47K	35K
	128GB x 2, BGA, Kioxia BiCS5	550	150	47K	38K
480GB	64GB x 8, BGA, Kioxia BiCS5	550	330	92K	85K
	128GB x 4, BGA, Kioxia BiCS5	550	360	92K	88K
960GB	128GB x 8, BGA, Kioxia BiCS5	550	520	98K	88K
	256GB x 4, BGA, Kioxia BiCS5	550	530	98K	88K
1920GB	256GB x 8, BGA, Kioxia BiCS5	550	520	98K	88K
3840GB	512GB x 8, BGA, Kioxia BiCS5	550	520	98K	88K
7680Gb	512GB x 16, BGA, Kioxia BiCS5	550	520	98K	88K
15360GB Note5	1TB x 16, BGA, Kioxia BiCS5 (Only C-Temp.)	550	490	85K	80K

Notes:

- Performance may differ according to flash configuration and platform.
- Performance is measured with the follow conditions:
 - Crystal Disk Mark 6.0, 1GB range, QD32T1 for sequential
 - IO meter, 1GB range, 4K data size, QD32 for random IOPS
 - OS: Win10 64bit, version 1709
 - Intel Core i7-8700K CPU @ 3.70GHz
- Measurement environment: Room temperature: 20~25°C, humidity: 40~60%RH, DC+5V condition.
- The configurations are for BGAX8 PCBA.
- Only support 0-70°C

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Thermal Throttling

The purpose of thermal throttling is to prevent any components in an SSD from overheating during read and write operations. The controller is designed with an on-die thermal sensor and with its accuracy, firmware can apply different levels of throttling to achieve the purpose of protection efficiently and proactively via S.M.A.R.T. reading.

SSD Configuration:

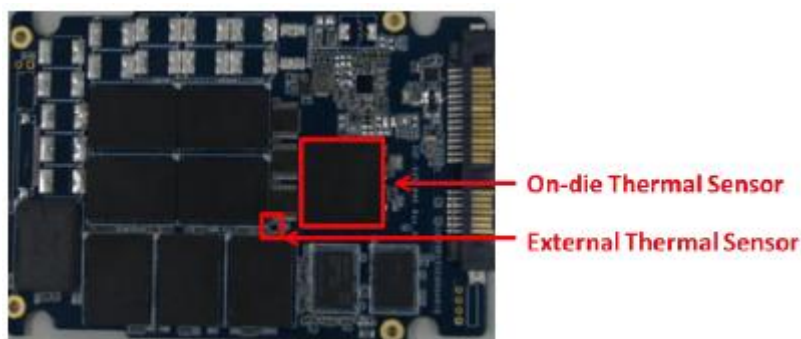
- Example 480GB SSD: (BiCS3 256Gb x 2CE) x 8pcs BGA132/152, total 16CE
- CE = Chip Enable pins, max CE = All 16CE enabled. Total CE numbers depends on SSD configuration

Purpose of Thermal Throttling:

- In order to keep the optimal performance in the safe range of the temperature.

Thermal sensors:

- We have external thermal sensor & on-die thermal sensor (internal controller) to detect temperature. There is 1pcs external thermal sensor on PCB, the position depends on different form factor (The thermal sensor is shown below. The picture is for reference only).
- External thermal sensor would detect flash temperature; On-die thermal sensor detect controller temperature



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Environment Compliance

Operating Temp.		-40°C to +85°C
Storage Temp.		-40°C to +85°C
Humidity		≤ 95% (At 85°C, Non-Condensing)
Shock	Acceleration Force	1500G 0-p with Half Sine Wave (0.5ms)
Vibration	Frequency / Displacement	20Hz - 80Hz / 1.52mm
	Frequency / Acceleration	80Hz - 2000Hz / 20G p-p with Sine Wave
Drop	Height of Drop	80cm Free Fall
	Number of Drop	6 Face of Each Unit
	Conflicting Material	Concrete Floor

Environmental performance may vary according to the integration method or final integration scenario.

TBW (Terabytes Written)

Capacity	Flash Type	TBW	DWPD
240GB	Kioxia BiCS5	495	1.93
480GB	Kioxia BiCS5	1,010	1.97
960GB	Kioxia BiCS5	2,055	2.01
1920GB	Kioxia BiCS5	4,220	2.06
3840GB	Kioxia BiCS5	8,450	2.06
7680Gb	Kioxia BiCS5	17,100	2.09
15360GB	Kioxia BiCS5	34,2800	2.09

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Power Consumption

Capacity	Flash Type	Read	Write	Idle
240GB	64GB x 4, BGA, Kioxia BiCS5	2,000	2,300	1,300
	128GB x 2, BGA, Kioxia BiCS5	2,000	2,000	1,200
480GB	64GB x 8, BGA, Kioxia BiCS5	2,000	2,700	1,300
	128GB x 4, BGA, Kioxia BiCS5	2,000	2,600	1,200
960GB	128GB x 8, BGA, Kioxia BiCS5	2,000	3,200	1,300
	256GB x 4, BGA, Kioxia BiCS5	2,000	3,000	1,200
1920GB	256GB x 8, BGA, Kioxia BiCS5	2,400	3,400	1,400
3840GB	512GB x 8, BGA, Kioxia BiCS5	2,500	3,600	1,500
7680Gb	512GB x 16, BGA, Kioxia BiCS5	2,600	3,700	1,500
15360GB	1TB x 16, BGA, Kioxia BiCS5	3,500	4,500	1,600

Unit: mW

Notes:

1. The average value of power consumption is achieved based on 100% conversion efficiency.
2. The measured power voltage is 5V.
3. Measurement environment: Room temperature: 20~25°C, humidity: 40~60%RH.
4. Sequential R/W is measured while testing 1GB sequential R/W 5 times by Crystal Disk Mark.
5. Power Consumption may differ according to flash configuration and platform.
6. The configurations are for BGAX8 PCBA.

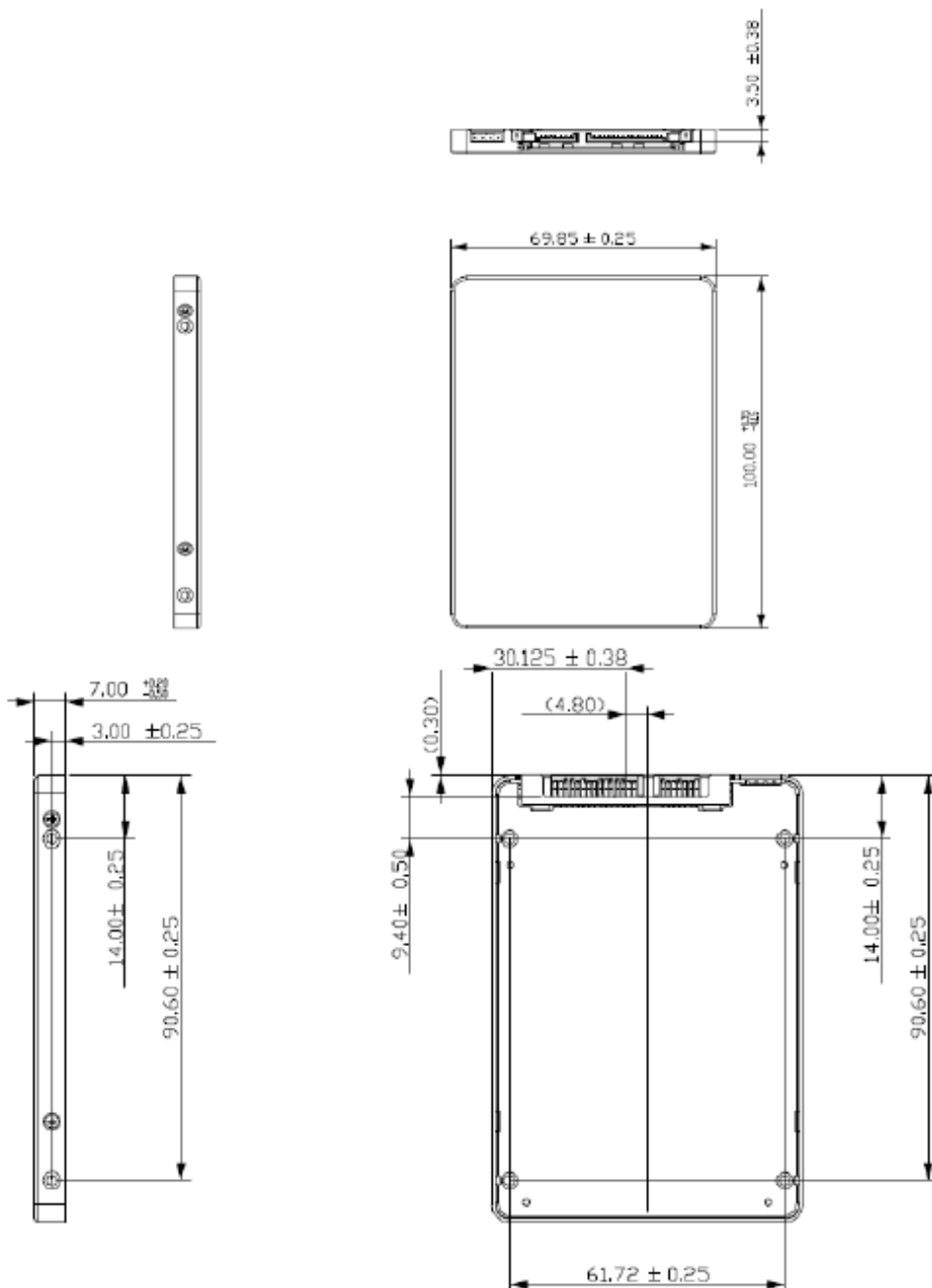
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Device Dimensions (mm)

Dimension_A: 100.10mm(L) x 69.85mm(W) x 7.00mm(H)

Dimension_B: 100.10mm(L) x 69.85mm(W) x 9.50mm(H) for 8TB(7680GB) PLP PCBA





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Deliverables

1 Industrial SATA Solid State Drive Series

Ordering Information

Model Name	Description	Unit
ACP-S0001-240	Industrial SATA 240GB Solid State Drive	1
ACP-S0001-480	Industrial SATA 480GB Solid State Drive	1
ACP-S0001-960	Industrial SATA 960GB Solid State Drive	1
ACP-S0001-2T	Industrial SATA 2TB Solid State Drive	1
ACP-S0001-4T	Industrial SATA 4TB Solid State Drive	1
ACP-S0001-8T	Industrial SATA 8TB Solid State Drive	1
ACP-S0001-16T	Industrial SATA 16TB Solid State Drive	1

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