innodisk

Total Solution For
Industrial Flash Storage

nanoSSD

SATA 3TE7 Series

Customer: _____

Customer Part Number: _____

Innodisk Part Number: _____

Innodisk Model Name: _____

Date: _____

Innodisk Approver	Customer Approver

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Revision History

Revision	Description	Date
Preliminary	First Released	Sep, 2019
Rev 1.0	Update the power consumption	Dec, 2019
Rev 1.1	Update the GPIO Description & model name	Mar, 2020

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1. Product Overview

1.1 Introduction of Innodisk nanoSSD SATA 3TE7

Innodisk nanoSSD is an integrated SATA storage device, it combines Maxiotek MK8215 NAND flash controller and latest NAND flash in a JEDEC MO-276(μSSD) form factor with ball grid array (BGA) package.

The nanoSSD supports SATA III 6Gbps within a tiny dimension, as well as low power consumption and high reliability. It offers an ideal solution for embedded, automotive, medical, gaming and most industrial applications.

1.2 Product View and Models

Innodisk nanoSSD SATA 3TE7 is available in follow capacities:

nanoSSD SATA 3TE7 32GB nanoSSD SATA 3TE7 64GB

nanoSSD SATA 3TE7 128GB nanoSSD SATA 3TE7 256GB

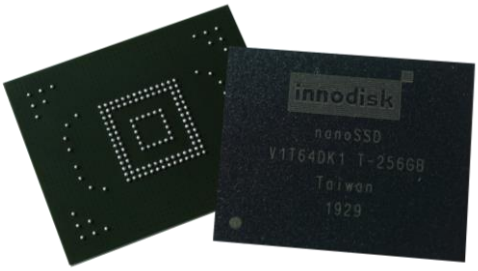


Figure 1: Innodisk nanoSSD SATA 3TE7

1.3 SATA Interface

Innodisk nanoSSD SATA 3TE7 supports SATA III interface, and compliant with Serial ATA Gen 1, Gen 2 and Gen 3 specification (Gen 3 supports 1.5Gbps /3.0Gbps/6.0Gbps data rate).

1.4 JEDEC MO-276 Form Factor

The Innodisk nanoSSD SATA 3TE7 is offered in JEDEC MO-276F form factor with a 16mm x 20mm 156 ball TFBGA package for capacities 32GB to 256GB. The MO-276F is one of micro SSD standard from factor from JEDEC, and is available at http://www.jedec.org/standards-documents/docs/mo-276f. The small form factor enables further miniaturization of embedded system designs as well as for a whole range of other applications that have mechanical restriction

2. Product Specifications

2.1 Capacity and Device Parameters

nanoSSD SATA 3TE7 device parameters are shown in Table 1.

Table 1: Device parameters

Capacity	Cylinders	Heads	Sectors	LBA	User Space (MB)
32GB	16383	16	63	53742528	26239
64GB	16383	16	63	117231408	57239
128GB	16383	16	63	234441648	114471
256GB	16383	16	63	468862128	228934

2.2 Performance

Burst Transfer Rate: 6.0Gbps

Table 2: Performance

Capacity	32GB	64GB	128GB	256GB
Sequential Read (max.)	185 MB/sec	370 MB/sec	535 MB/sec	535 MB/sec
Sequential Write (max.)	30 MB/sec	65 MB/sec	130 MB/sec	260 MB/sec
4KB Random Read (QD32)	50 MB/sec	95 MB/sec	190 MB/sec	280 MB/sec
4KB Random Write (QD32)	30 MB/sec	60 MB/sec	125 MB/sec	235 MB/sec

Note: Base on CrystalDiskMark 5.1.2 with file size 1000MB

2.3 Electrical Specifications

2.3.1 Power Requirement

Table 3: Innodisk nanoSSD SATA 3TE7 Power Requirement

Item	Symbol	Rating	Unit
Input voltage	V_{IN}	+3.3 DC +- 5%	V

2.3.2 Power Consumption

Table 4: Power Consumption

Voltage rail	Rating	Power Consumption (mA)
Main power supply	3.3 V ±5%	250 (max.)
Flash IO supply	1.8 V ±5%	150 (max.)
Controller core supply	1.1 V ±5%	700 (max.)

* Target: nanoSSD SATA 3TE7 256GB

2.4 Environmental Specifications

2.4.1 Temperature Ranges

Table 5: Temperature range for nanoSSD SATA 3TE7

Temperature	Range
Operating	Standard Grade: 0°C to +70°C
Storage	-55°C to +95°C

* Operating Temperature is the ambient temperature around the nanoSSD.

Below are some recommendations for PCB design to lowest effect of thermal.

- Maximize copper thickness and trace width for all pins to thermal features such as thermal vias, thermal side rails, and thermal conduction screw holes.
- Copper ground/supply planes in the PCB can provide very effective heat dissipation for the IC package. To maximize effectiveness, thermal vias should be added to connect the package's mechanical ground balls to the ground plane. There should be at least one thermal via allocated for each MGB of the package. The plating thickness of vias should be maximized to optimize thermal conduction.

2.4.2 Humidity

Relative Humidity: 10-95%, non-condensing

2.4.3 Shock and Vibration

Table 6: Shock/Vibration Testing for nanoSSD SATA 3TE7

Reliability	Test Conditions	Reference Standards
Vibration	7 Hz to 2K Hz, 20G, 3 axes	IEC 68-2-6
Mechanical Shock	Duration: 0.5ms, 1500 G, 3 axes	IEC 68-2-27

2.4.4 Mean Time between Failures (MTBF)

Table 7 summarizes the MTBF prediction results for various nanoSSD SATA 3TE7 configurations. The analysis was performed using a RAM Commander™ failure rate prediction.

- **Failure Rate**: The total number of failures within an item population, divided by the total number of life units expended by that population, during a particular measurement interval under stated condition.
- **Mean Time between Failures (MTBF)**: A basic measure of reliability for repairable items: The mean number of life units during which all parts of the item perform within their specified limits, during a particular measurement interval under stated conditions.

Table 7: nanoSSD SATA 3TE7 MTBF

Product	Condition	MTBF (Hours)
Innodisk nanoSSD SATA 3TE7	Telcordia SR-332 GB, 25°C	>3,000,000

2.5 RoHS Compliance

nanoSSD SATA 3TE7 is fully compliant with RoHS directive.

2.6 Reliability

Parameter	Value
Read Cycles	Unlimited Read Cycles
Flash endurance	3,000 P/E cycles
Wear-Leveling Algorithm	Support
Bad Blocks Management	Support
DIE RAID Recovery	Support
Error Correct Code	Support
TBW* (Total Bytes Written) Units: TB	

Capacity	Sequential workload	Client workload
32GB	84.3	37.5
64GB	168.6	75
128GB	337.2	150
256GB	674.4	250

* Note:

1. Sequential: Mainly sequential write, tested by Vdbench.
2. Client: Follow JESD218 Test method and JESD219A Workload, tested by ULINK. (The capacity lower than 64GB client workload is not specified in JEDEC219A, the values are estimated.)
3. Based on out-of-box performance.

2.7 Transfer Mode

nanoSSD SATA 3TE7 support following transfer mode:
Serial ATA III 6.0Gbps
Serial ATA II 3.0Gbps
Serial ATA I 1.5Gbps

2.8 Ball and Signal Description

The following table provides the pin definition of nanoSSD balls.

TYPE: Input - nanoSSD receives signal from host.
TYPE: Output - nanoSSD drives/transmits signal to host device.
TYPE: IO - Signal is bi-directional.

Table 8: Innodisk nanoSSD SATA 3TE7 Pin Assignment

SATA interface signals			
Ball #	***Ball name***	***Type***	***Description***
P7	*L0_RXP*	*Input*	*SATA Receive Signal Differential Pair*
R7	*L0_RXN*	*Input*	*SATA Receive Signal Differential Pair*

U7	*L0_TXN*	*Output*	*SATA Transmit Signal Differential Pair*
V7	*L0_TXP*	*Output*	*SATA Transmit Signal Differential Pair*
R11	*A1V1*	*Supply*	*SATA PHY VDDC*
T11	*A1V1*	*Supply*	*SATA PHY VDDC*
P8	*A1V1*	*Supply*	*SATA PHY VDDC*
R8	*A1V1*	*Supply*	*SATA PHY VDDC*
T7	*VSS*	*GND*	*SATA_VSS*
N7	*VSS*	*GND*	*SATA_VSS*
W7	*VSS*	*GND*	*SATA_VSS*
Debug signals			
Ball #	***Ball name***	***Type***	***Description***
L16	*GPIO 3*	*Output*	*RS232 TXD (UART)*
L17	*GPIO 2*	*Input*	*RS232 RXD (UART)*
Power supply signals			
Ball #	***Ball name***	***Type***	***Description***
L12	*VCCF*	*Supply*	*3.3V Power Supply*
M11	*VCCF*	*Supply*	*3.3V Power Supply*
R13	*VCCF*	*Supply*	*3.3V Power Supply*
R14	*VCCF*	*Supply*	*3.3V Power Supply*
R15	*VCCF*	*Supply*	*3.3V Power Supply*
R16	*VCCF*	*Supply*	*3.3V Power Supply*
R19	*VCCF*	*Supply*	*3.3V Power Supply*
R20	*VCCF*	*Supply*	*3.3V Power Supply*
T16	*VCCF*	*Supply*	*3.3V Power Supply*
U8	*AHS3V3*	*Supply*	*Analog 3.3V*

U16	*VCCF*	*Supply*	*3.3V Power Supply*
V8	*AHS3V3*	*Supply*	*Analog 3.3V*
V11	*AHS3V3*	*Supply*	*Analog 3.3V*
V16	*FVDD*	*Supply*	*1.8V VCCQ*
W16	*FVDD*	*Supply*	*1.8V VCCQ*
Y16	*FVDD*	*Supply*	*1.8V VCCQ*
Y19	*G3V3*	*Supply*	*3.3 GPIO Supply*
Y20	*VCCF*	*Supply*	*3.3V Power Supply*
AA19	*G3V3*	*Supply*	*3.3 GPIO Supply*
AC8	*G3V3*	*Supply*	*3.3 GPIO Supply*
W11	*C1V1*	*Supply*	*1.1V Power Supply*
Y7	*C1V1*	*Supply*	*1.1V Power Supply*
Y8	*C1V1*	*Supply*	*1.1V Power Supply*
Y11	*C1V1*	*Supply*	*1.1V Power Supply*
Y12	*C1V1*	*Supply*	*1.1V Power Supply*
Y13	*C1V1*	*Supply*	*1.1V Power Supply*
AA7	*C1V1*	*Supply*	*1.1V Power Supply*
Ground (GND) signals			
Ball #	***Ball name***	***Type***	***Description***
L7	*VSS*	*GND*	*Ground*
L8	*VSS*	*GND*	*Ground*
L11	*VSS*	*GND*	*Ground*
L19	*VSS*	*GND*	*Ground*
L20	*VSS*	*GND*	*Ground*
M7	*VSS*	*GND*	*Ground*

M19	*VSS*	*GND*	*Ground*
M20	*VSS*	*GND*	*Ground*
N8	*VSS*	*GND*	*Ground*
N19	*VSS*	*GND*	*Ground*
P19	*VSS*	*GND*	*Ground*
P20	*VSS*	*GND*	*Ground*
R12	*VSS*	*GND*	*Ground*
T8	*VSS*	*GND*	*Ground*
U11	*VSS*	*GND*	*Ground*
U19	*VSS*	*GND*	*Ground*
U20	*VSS*	*GND*	*Ground*
V19	*VSS*	*GND*	*Ground*
Y14	*VSS*	*GND*	*Ground*
Y15	*VSS*	*GND*	*Ground*
AB7	*VSS*	*GND*	*Ground*
AC7	*VSS*	*GND*	*Ground*
AC20	*VSS*	*GND*	*Ground*
AD7	*VSS*	*GND*	*Ground*
AD8	*VSS*	*GND*	*Ground*
AD19	*VSS*	*GND*	*Ground*
AD20	*VSS*	*GND*	*Ground*
Analog signals			
L9	*XOUT*	*Output*	*25MHz Crystal out*
M10	*XIN*	*Input*	*25MHz Crystal in*
Do not use (DNU) signals			

Ball #	Ball name	Type	Description
L10	NC_L10	DNU	Do not use
L14	NC_L14	DNU	Do not use
M8	NC_M8	DNU	Do not use
M12	NC_M12	DNU	Do not use
M14	NC_M14	DNU	Do not use
M15	NC_M15	DNU	Do not use
M16	NC_M16	DNU	Do not use
M17	NC_M17	DNU	Do not use
M18	NC_M18	DNU	Do not use
N20	NC_N20	DNU	Do not use
T19	NC_T19	DNU	Do not use
T20	NC_T20	DNU	Do not use
V20	NC_V20	DNU	Do not use
W8	NC_W8	DNU	Do not use
W19	NC_W19	DNU	Do not use
W20	NC_W20	DNU	Do not use
AA8	NC_AA8	DNU	Do not use
AB8	NC_AB8	DNU	Do not use
AB19	NC_AB19	DNU	Do not use
AB20	NC_AB20	DNU	Do not use
AC10	VPP	DNU	Do not use
AC11	NC_AC11	DNU	Do not use
AC12	NC_AC12	DNU	Do not use
AC13	VPP	DNU	Do not use

AC14	*NC_AC14*	*DNU*	*Do not use*
AC15	*NC_AC15*	*DNU*	*Do not use*
AC16	*NC_AC16*	*DNU*	*Do not use*
AC17	*NC_AC17*	*DNU*	*Do not use*
AC18	*NC_AC18*	*DNU*	*Do not use*
AC19	*NC_AC10*	*DNU*	*Do not use*
AD9	*VPP*	*DNU*	*Do not use*
AD11	*VPP*	*DNU*	*Do not use*
AD13	*NC_AD13*	*DNU*	*Do not use*
AD14	*NC_AD14*	*DNU*	*Do not use*
AD15	*NC_AD15*	*DNU*	*Do not use*
AD16	*NC_AD16*	*DNU*	*Do not use*
AD17	*NC_AD17*	*DNU*	*Do not use*
AD18	*NC_AD18*	*DNU*	*Do not use*
Reserved signals			
Ball #	***Ball name***	***Type***	***Description***
L15	*GPIO 0*	*In &Out*	*I2C_SDA* For I2C interface thermal sensor IC
AD10	*GPIO 1*	*Output*	*I2C_SCL* For I2C interface thermal sensor IC
L18	*GPIO 5*	*Input*	*Load mode* Strapping input type when power on, Set it in high for entering loader mode, default is low.
AC9	*GPIO 12*	*Input*	*Reserver* No function

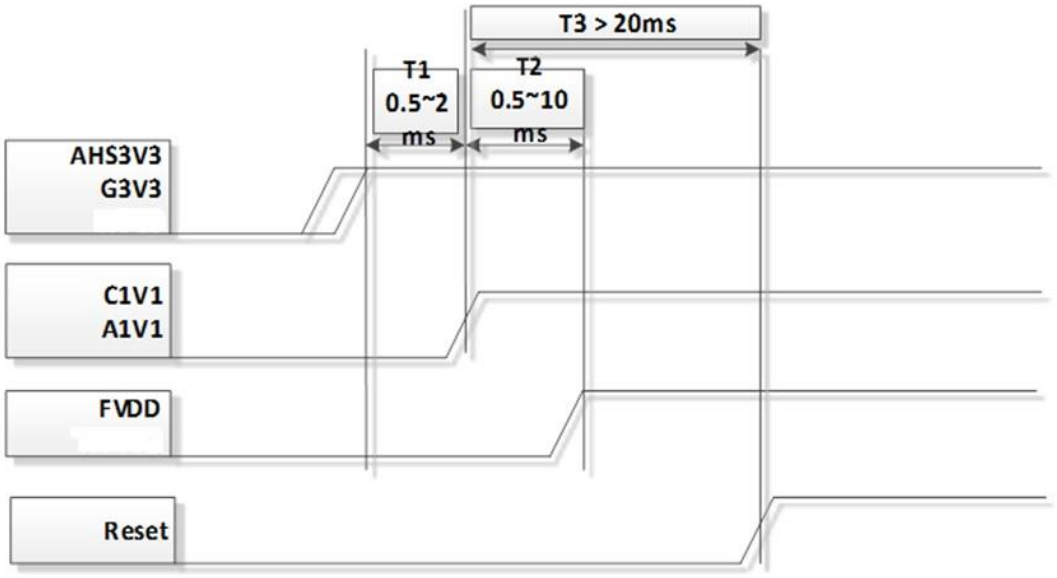
AD12	*GPIO 13*	*Input*	*WP (write protect)* Low active, it will be entering firmware write protection function if pull low, external pull up resistor is required even without such function.
M13	*GPIO 14*	*Output*	*DAS* When SSD is transferred data, it will output high and low for indicating data access.
L13	*GPIO 22*	*Input*	*Low power detect* Low power detect function. External pull up resistor is required even without such function, and the detect component would be different depend on the input power.
M9	*RSTn*	*Input*	*SSD Reset*
Ground balls			
Ball #	***Ball name***	***Type***	***Description***
A1	*VSS*	*GND*	*Ground*
A3	*VSS*	*GND*	*Ground*
A5	*VSS*	*GND*	*Ground*
A22	*VSS*	*GND*	*Ground*
A24	*VSS*	*GND*	*Ground*
A26	*VSS*	*GND*	*Ground*
C1	*VSS*	*GND*	*Ground*
C3	*VSS*	*GND*	*Ground*
C24	*VSS*	*GND*	*Ground*
C26	*VSS*	*GND*	*Ground*
D10	*VSS*	*GND*	*Ground*

D12	*VSS*	*GND*	*Ground*
D15	*VSS*	*GND*	*Ground*
D17	*VSS*	*GND*	*Ground*
E1	*VSS*	*GND*	*Ground*
E8	*VSS*	*GND*	*Ground*
E19	*VSS*	*GND*	*Ground*
E26	*VSS*	*GND*	*Ground*
G7	*VSS*	*GND*	*Ground*
G20	*VSS*	*GND*	*Ground*
AH7	*VSS*	*GND*	*Ground*
AH20	*VSS*	*GND*	*Ground*
AK1	*VSS*	*GND*	*Ground*
AK8	*VSS*	*GND*	*Ground*
AK19	*VSS*	*GND*	*Ground*
AK26	*VSS*	*GND*	*Ground*
AL10	*VSS*	*GND*	*Ground*
AL12	*VSS*	*GND*	*Ground*
AL15	*VSS*	*GND*	*Ground*
AL17	*VSS*	*GND*	*Ground*
AM1	*VSS*	*GND*	*Ground*
AM3	*VSS*	*GND*	*Ground*
AM24	*VSS*	*GND*	*Ground*
AM26	*VSS*	*GND*	*Ground*
AP1	*VSS*	*GND*	*Ground*
AP3	*VSS*	*GND*	*Ground*

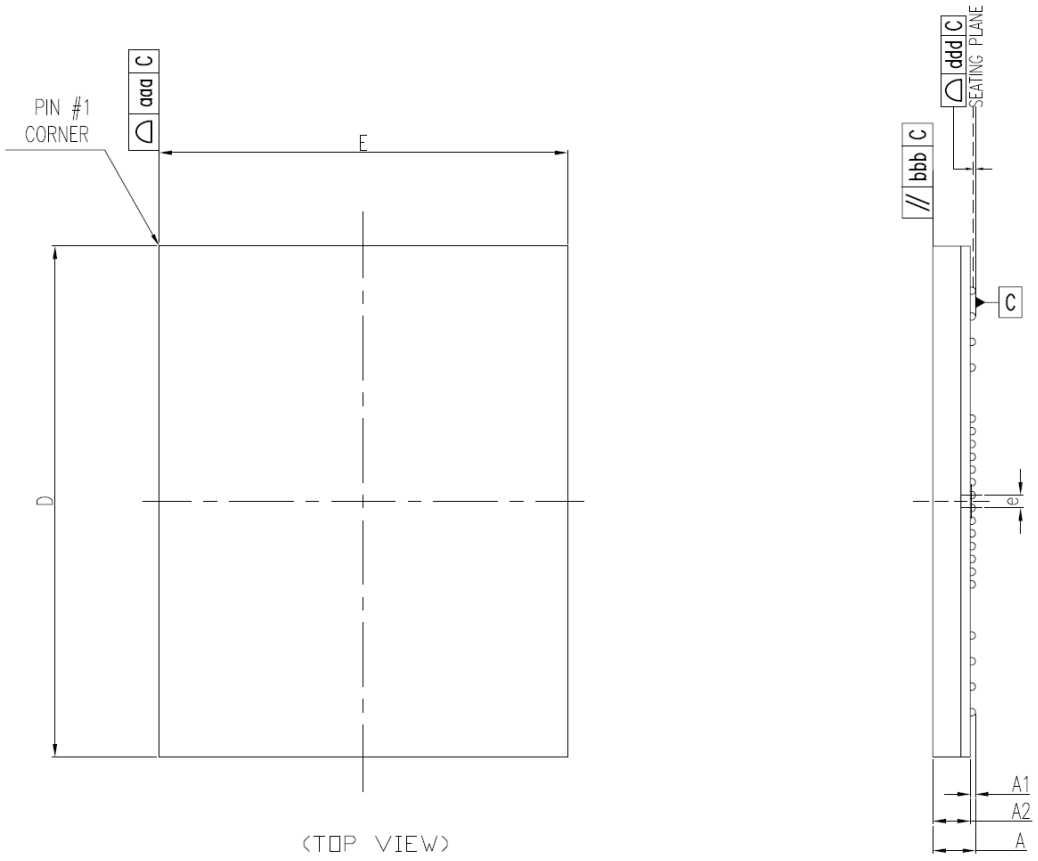
AP5	*VSS*	*GND*	*Ground*
AP22	*VSS*	*GND*	*Ground*
AP24	*VSS*	*GND*	*Ground*
AP26	*VSS*	*GND*	*Ground*

2.9 Power supply & Sequence

	Voltage rail	Specification
Input voltage	AHS3V3	3.3V± 5%
	G3V3	3.3V± 5%
	VCCF	3.3V± 5%
	FVDD	1.8V ± 5%
	A1V1	1.1V ± 5%
	C1V1	1.1V ± 5%



2.10 Mechanical Dimensions



SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.60	1.67	1.74	0.063	0.066	0.069
A1	---	0.21	---	---	0.008	---
A2	---	1.46	---	---	0.057	---
b	0.25	0.30	0.35	0.010	0.012	0.014
D	19.90	20.00	20.10	0.783	0.787	0.791
E	15.90	16.00	16.10	0.626	0.630	0.634
e	0.50 BSC.			0.020 BSC.		
JEDEC	MO-276(REF.)/MM					
aaa	0.15					
bbb	0.20					
ddd	0.08					
eee	0.15					
fff	0.05					

N	SE (mm)	SD (mm)	E1 (mm)	D1 (mm)
156	0.25 BSC.	0.25 BSC.	12.50 BSC.	16.50 BSC.

2.11 Assembly Weight

An Innodisk nanoSSD SATA 3TE7 within flash ICs, 256GB's weight is 1.4 grams approximately.

2.12 Seek Time

Innodisk nanoSSD SATA 3TE7 is not a magnetic rotating design. There is no seek or rotational latency required.

2.13 NAND Flash Memory

Innodisk nanoSSD SATA 3TE7 uses 3D TLC NAND flash memory, with 3,000 program & erase cycles, which is non-volatility, high reliability and high speed memory storage.

3. Theory of Operation

3.1 Overview

Figure 2 shows the operation of Innodisk nanoSSD SATA 3TE7 from the system level, including the major hardware blocks.

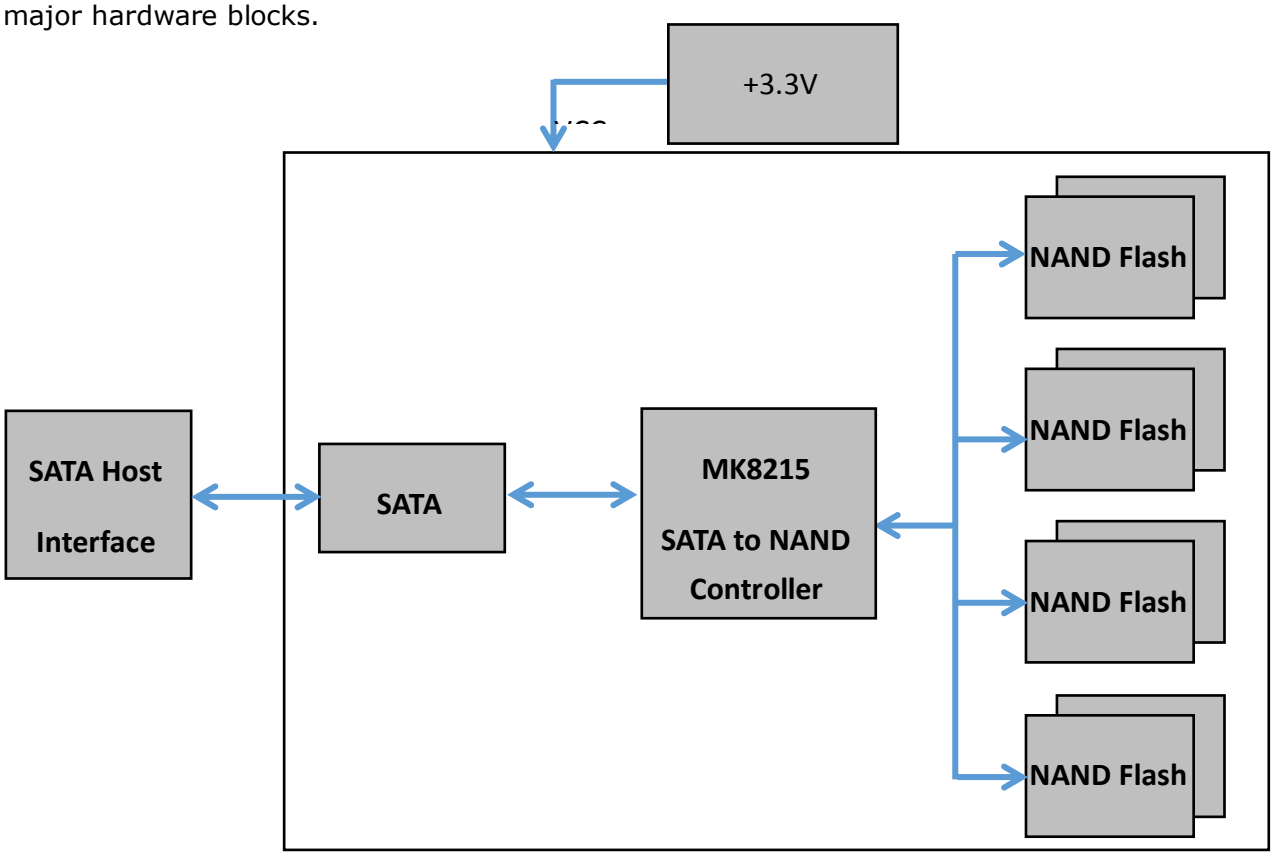


Figure 2: Innodisk nanoSSD SATA 3TE7 Block Diagram

Innodisk nanoSSD SATA 3TE7 integrates a SATA III controller and NAND flash memories. Communication with the host occurs through the host interface, using the standard ATA protocol. Communication with the flash device(s) occurs through the flash interface.

3.2 SATA III Controller

Innodisk nanoSSD SATA 3TE7 is designed with MK8215, a SATA III 6.0Gbps (Gen. 3) controller. The Serial ATA physical, link and transport layers are compliant with Serial ATA Gen 1, Gen 2 and Gen 3 specification (Gen 3 supports 1.5Gbps/3.0Gbps/6.0Gbps data rate). The controller has 4 channels for flash interface.

3.3 Error Detection and Correction

Innodisk nanoSSD SATA 3TE7 is designed with hardware LDPC ECC engine with hard-decision and Soft-decision decoding. Low-density parity-check (LDPC) codes have excellent error correcting Performance close to the Shannon limit when decoded with the belief-propagation (BP) algorithm using soft-decision information.

3.4 Wear-Leveling

Flash memory can be erased within a limited number of times. This number is called the ***erase cycle limit*** or ***write endurance limit*** and is defined by the flash array vendor. The erase cycle limit applies to each individual erase block in the flash device.

Innodisk nanoSSD SATA 3TE7 uses a static wear-leveling algorithm to ensure that consecutive writes of a specific sector are not written physically to the same page/block in the flash. This spreads flash media usage evenly across all pages, thereby extending flash lifetime.

3.5 Bad Blocks Management

Bad Blocks are blocks that contain one or more invalid bits whose reliability are not guaranteed. The Bad Blocks may be presented while the SSD is shipped, or may develop during the life time of the SSD. When the Bad Blocks is detected, it will be flagged, and not be used anymore. The SSD implement Bad Blocks management, Bad Blocks replacement, Error Correct Code to avoid data error occurred. The functions will be enabled automatically to transfer data from Bad Blocks to spare blocks, and correct error bit.

3.6 Power Cycling

Innodisk's power cycling management is a comprehensive data protection mechanism that functions before and after a sudden power outage to SSD. Low-power detection terminates data writing before an abnormal power-off, while table-remapping after power-on deletes corrupt data and maintains data integrity. Innodisk's power cycling provides effective power cycling management, preventing data stored in flash from degrading with use.

3.7 Garbage Collection

Garbage collection technology is used to maintain data consistency and perform continual data cleansing on SSDs. It runs as a background process, freeing up valuable controller resources while sorting good data into available blocks, and deleting bad blocks. It also significantly reduces write operations to the drive, thereby increasing the SSD's speed and lifespan.

3.8 TRIM

The TRIM command is designed to enable the operating system to notify the SSD which pages no longer contain valid data due to erases either by the user or operating system itself. During a delete operation, the OS will mark the sectors as free for new data and send a TRIM command to the SSD to mark them as not containing valid data. After that the SSD knows not to preserve the contents of the block when writing a page, resulting in less write amplification with fewer writes to the flash, higher write speed, and increased drive life.

4. Installation Requirements

4.1 Component Placement and Routing Requirements

This section states component placement and routing requirements of nanoSSD. Please refer to attachments for reference design.

4.1.1 SATA Differential Signals

To comply with SATA interface specifications, the SATA differential lines must have 100 Ohm differential impedance.

4.1.2 Power Distribution

To comply with SATA interface specifications, the SATA differential lines must have 100 Ohm differential impedance.

- The SATA AC coupling capacitors should be placed close to the host.
- All decoupling capacitors and filters must be placed as close to the power supply pads as possible.
- The PCB stack up must include at least one solid ground plane.
- All traces, except supply/ground and SATA differential pair, should have 50 ohm single-ended impedance.

4.2 Reference Design

A reference design using the nanoSSD has been provided here to help with the integration. All peripheral circuits are included in the design and meet specifications laid out in the earlier sections of this document. We recommend this circuit design to match the reference design as closely as possible. The schematic and bill of materials (BOM) are listed in attachments.

4.2.1 SCHEMATIC

Please refer to the attachment "nanoSSD SATA 3TE7_BGA156_Schematic" files.

4.3 Production guide

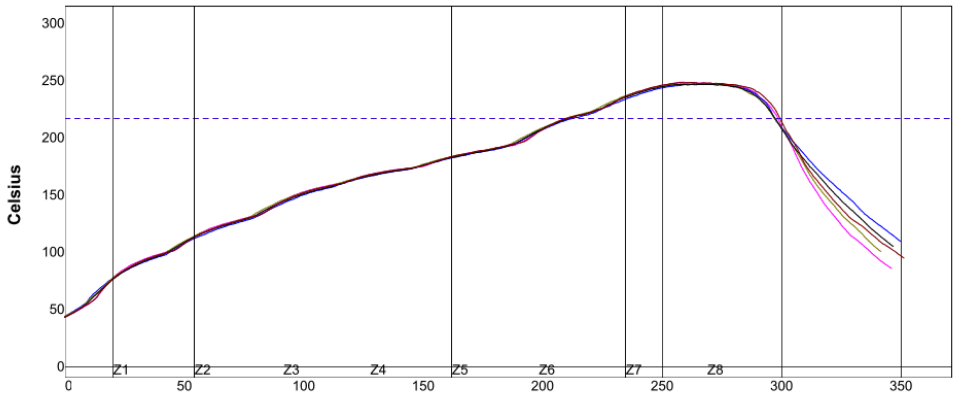
4.3.1 Preheat

Before printed circuit board assembly, a process of preheat is requested.

Preheat condition: 16 HRs with 125°C

4.3.2 Reflow Profile

Setpoints (Celsius)								
Zone	1	2	3	4	5	6	7	8
Top	100	130	165	170	180	230	255	245
Bottom	100	130	165	170	180	230	255	245
Conveyor Speed (cm/min):	65.0							



PWI= 97%	ax Rising Slop		ax Falling Slo		reheat 30-110		ak Time 110-15		flow Time /21		Peak Temp		lope1 (30-110		ope2 (217-255		Time 150-217	
2	1.84	49%	-3.85	-90%	50.97	27%	44.64	-2%	88.53	95%	248.81	38%	1.84	68%	0.91	-73%	113.84	79%
3	1.67	25%	-2.70	-13%	52.28	31%	47.50	17%	84.64	82%	247.17	22%	1.67	52%	0.85	-80%	112.70	76%
4	1.74	34%	-3.28	-52%	50.93	27%	46.26	8%	87.52	92%	247.40	24%	1.74	58%	0.87	-77%	112.90	76%
5	1.73	32%	-2.83	-22%	50.55	26%	47.44	16%	86.53	88%	246.95	20%	1.73	57%	0.86	-79%	112.13	74%
6	1.77	39%	-3.44	-63%	51.04	28%	45.85	6%	89.09	97%	248.43	34%	1.77	61%	0.91	-72%	112.75	76%
Delta	0.17		1.15		1.73		2.86		4.45		1.86		0.17		0.06		1.71	

Process Window:

Solder Paste:	System Default for Reflow		
Statistic Name	**Low Limit**	**High Limit**	**Units**
Max Rising Slope (Target=1.5)	0.7	2.2	Degrees/Second
(Calculate Slope over 20 Seconds)			
Slope1 (Target=1.1)			
Between 30.0 and 110.0	0	2.2	Degrees/Second
(Calculate Slope over 20 Seconds)			
Slope2 (Target=1.5)			
Between 217.0 and 255.0	0.7	2.2	Degrees/Second
(Calculate Slope over 20 Seconds)			
Max Falling Slope	-4	-1	Degrees/Second
(Calculate Slope over 20 Seconds)			
Preheat Time 30-110C	0	80	Seconds
Soak Time 110-150C	30	60	Seconds
Soak Time 150-217C-(2)	60	120	Seconds
Time Above Reflow - 217C	30	90	Seconds
Peak Temperature	235	255	Degrees Celsius

5. Part Number Rule

CODE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	D	**E**	**N**	**S**	**D**	**-**	**3**	**2**	**G**	**D**	**K**	**1**	**E**	**C**	**A**	**S**	**L**	**-**	**X**	**X**
Description	Disk	nanoSSD SATA 3TE7					Capacity			Category			Flash Mode	Operation Temp.	Internal Control	CH.	Flash	-	Customized Code	

Definition	
Code 1st (Disk)	**Code 13th (Flash mode)**
D : Disk	E: 64 layers 3D flash
Code 2nd	**Code 14th (Operation Temperature)**
E: Embedded	C: Standard Grade (0℃~ +70℃)
Code 3rd ~ 5th (Form Factor)	**Code 15th (Internal control)**
NSD:nanoSSD	**Code 16th (Channel of data transfer)**
	S: Single Channel
Code 7th ~9th (Capacity)	D: Dual Channels
32G: 32GB	Q: Quad Channels
64G: 64GB	
A28: 128GB	**Code 17th (Flash Type)**
B56: 256GB	L: Sandisk 3D TLC
Code 10th ~12th (Series)	
DK1: nanoSSD SATA 3TE7	**Code 19th~20th (Customized Code)**

CE

VERIFICATION OF COMPLIANCE

This Verification of Compliance is hereby issued to the below named company. The test results of this report relate only to the tested sample identified in this report.

Technical Standard: EMC DIRECTIVE 2014/30/EU (EN55022 / EN55024)

General Information

Applicant: Innodisk Corporation
5F., No. 237, Sec. 1, Datong Rd., Xizhi Dist.,
New Taipei City 22161, Taiwan (R.O.C)

Product Description

EUT Description: CFast
Brand Name: Innodisk
Model Number: CFast 3$*#-&
$:Flash type: (S:SLC, I:iSLC, M:MLC, T:3D TLC)
*:Product line: (E:Embedded, G:EverGreen, R:InnoRobust)
#:Product Generation: (empty, 0~9)
&:Product line: (empty, P:Plus)

Measurement Standard

EN 55022: 2010 / AC: 2011
EN 61000-3-2: 2014
EN 61000-3-3: 2013
EN 55024: 2010 + A1: 2015
(IEC 61000-4-2: 2008; IEC 61000-4-3: 2006 + A1: 2007 + A2: 2010; IEC 61000-4-4: 2012; IEC 61000-4-5: 2014; IEC 61000-4-6: 2013; IEC 61000-4-8: 2009; IEC 61000-4-11: 2004)

Measurement Facilities

Xindian Lab.: *Compliance Certification Services Inc.*
No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, 23151 Taiwan
Tel: +886-2-22170894 / Fax: +886-2-22171029

This device has been shown to be in compliance with and was tested in accordance with the measurement procedures specified in the Standards & Specifications listed above and as indicated in the measurement report number: TI61014D05-E

Sam Hu / Assistant Manager
Date: October 18, 2016

CCSRF
程馨科技股份有限公司
Compliance Certification Services Inc.

FC

VERIFICATION OF COMPLIANCE

This Verification of Compliance is hereby issued to the below named company. The test results of this report relate only to the tested sample identified in this report.

Technical Standard: FCC Part 15 Class B
IC ICES-003

General Information

Applicant: Innodisk Corporation
5F., No. 237, Sec. 1, Datong Rd., Xizhi Dist.,
New Taipei City 22161, Taiwan (R.O.C)

Product Description

EUT Description: CFast
Brand Name: Innodisk
Model Number: CFast 3$*#-&
$:Flash type: (S:SLC, I:iSLC, M:MLC, T:3D TLC)
*:Product line: (E:Embedded, G:EverGreen, R:InnoRobust)
#:Product Generation: (empty, 0~9)
&:Product line: (empty, P:Plus)

Measurement Facilities

Xindian Lab.: *Compliance Certification Services Inc.*
No.163-1, Jhongsheng Rd., Xindian Dist., New Taipei City, 23151 Taiwan.
Tel: +886-2-22170894 / Fax: +886-2-22171029

This device has been shown to be in compliance with and was tested in accordance with the measurement procedures specified in the Standards & Specifications listed above and as indicated in the measurement report number: T161014D05-D

Sam Hu

Sam Hu / Assistant Manager
Date: October 18, 2016

CCSRF
Compliance Certification Services Inc.

innodisk

宜鼎國際股份有限公司
Innodisk Corporation

Tel:(02)7703-3000 Fax:(02) 7703-3555 Internet: http://www.innodisk.com/

RoHS 自我宣告書 (RoHS Declaration of Conformity)

Manufacturer Product: All Innodisk EP products

一、 宜鼎國際股份有限公司（以下稱本公司）特此保證售予貴公司之所有產品，皆符合歐盟 2011/65/EU 及(EU) 2015/863 關於 RoHS 之規範要求。

Innodisk Corporation declares that all products sold to the company, are complied with European Union RoHS Directive (2011/65/EU) and (EU) 2015/863 requirement.

二、 本公司同意因本保證書或與本保證書相關事宜有所爭議時，雙方宜友好協商，達成協議。

Innodisk Corporation agrees that both parties shall settle any dispute arising from or in connection with this Declaration of Conformity by friendly negotiations.

Name of hazardous substance	Limited of RoHS ppm（mg/kg）
鉛（Pb）	< 1000 ppm
汞（Hg）	< 1000 ppm
鎘（Cd）	< 100 ppm
六價鉻（Cr 6+）	< 1000 ppm
多溴聯苯（PBBs）	< 1000 ppm
多溴二苯醚（PBDEs）	< 1000 ppm
鄰苯二甲酸二(2-乙基己基)酯（DEHP）	< 1000 ppm
鄰苯二甲酸丁酯苯甲酯（BBP）	< 1000 ppm
鄰苯二甲酸二丁酯（DBP）	< 1000 ppm
鄰苯二甲酸二異丁酯（DIBP）	< 1000 ppm

立 保 證 書 人 (Guarantor)

Company name 公司名稱： Innodisk Corporation 宜鼎國際股份有限公司

Company Representative 公司代表人： Randy Chien 簡川勝

Company Representative Title 公司代表人職稱： Chairman 董事長

Date 日期： 2018 / 07 / 01

宜鼎國際股份有限公司
Innodisk Corporation

Tel:(02)7703-3000 Fax:(02) 7703-3555 Internet: http://www.innodisk.com/

REACH Declaration of Conformity

Manufacturer Product: All Innodisk EM Flash and Dram products

1.宜鼎國際股份有限公司（以下稱本公司）特此保證此售予貴公司之產品，皆符合歐盟化學品法案(Registration , Evaluation and Authorization of Chemicals；REACH)之規定(http://www.echa.europa.eu/de/candidate-list-table **last updated: 15/01/2018**)。所提供之產品包含：(1) 產品或產品所使用到的所有原物料；(2)包裝材料；(3)設計、生產及重工過程中所使用到的所有原物料。

We Innodisk Corporation hereby declare that our products are in compliance with the requirements according to the REACH Regulation (http://www.echa.europa.eu/de/candidate-list-table **last updated: 15/01/2018**). Products include： 1) Product and raw material used by the product； 2) Packaging material ；3) Raw material used in the process of design, production and rework

2.本公司同意因本保證書或與本保證書相關事宜有所爭議時，雙方宜友好協商，達成協議。

InnoDisk Corporation agrees that both parties shall settle any dispute arising from or in connection with this Declaration of Conformity by friendly negotiations.

立 保 證 書 人 (Guarantor)

Company name 公司名稱： InnoDisk Corporation 宜鼎國際股份有限公司

Company Representative 公司代表人： Randy Chien 簡川勝

Company Representative Title 公司代表人職稱： Chairman 董事長

Date 日期： 2018 / 02 / 08

MSL Declaration of Conformity

1. Purpose: MSL (Moisture Sensitivity Levels) specification statement for all Innodisk products

2. Scope: For All Innodisk finish goods

3. Responsibilities: QA

4. Reference:

   4.1 JEDEC, S-STD-020

   4.2 JEDEC,J-STD-033

5. Description

   5.1 Innodisk Products Level: All Innodisk products meet MSL Level 1

   5.2 Floor Life Time: Refer following table

	Soak Requirements					
	Floor Life		Standard		Accelerated	
Level	Time	Cond degC/%RH	Time (hrs)	Cond degC/%RH	Time (hrs)	Cond degC/%RH
1	unlimited	<=30/85%	168+5/-0	85/85	n/a	n/a
2	1 year	<=30/60%	168+5/-0	85/60	n/a	n/a
2a	4 weeks	<=30/60%	696+5/-0	30/60	120+1/-0	60/60
3	168 hours	<=30/60%	192+5/-0	30/60	40+1/-0	60/60
4	72 hours	<=30/60%	96+2/-0	30/60	20+0.5/-0	60/60
5	48 hours	<=30/60%	72+2/-0	30/60	15+0.5/-0	60/60
5a	24 hours	<=30/60%	48+2/-0	30/60	10+0.5/-0	60/60
6	TOL	<=30/60%	TOL	30/60	n/a	60/60

Innodisk Corporation
Quality Assurance Div
Manager
Yi Chuan Chen
Date: 2018.09.21

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