

AD910A M.2 (NGFF) to SATA III Converter Card

Performance & Burn In Test Rev. 1.0

Table of Contents

1. Overview

2. Performance Measurement Tools and Results

- 2.1 Test Platform
- 2.2 Test target and Used SATA III SSD
- 2.3 Install Hardware
- 2.4 BIOS & Windows 7 OS environment setup
- 2.5 SSD I/O Performance impact factors
- 2.6 CrystalDiskMark 3.0.1 x64 performance test
- 2.7 AS SSD Benchmark 1.7 performance test
- 2.8 HD Tune Pro 5.5 performance test
- 2.9 ATTO Disk Benchmark performance test
- 2.10 AnvilBenchmark_V110_B337 performance test

3.Burn In Tests and Results

3.1 BurnInTestv7.1 Pro burn in test

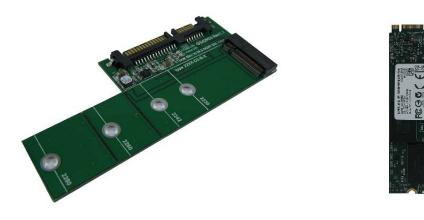
4.Summary

1. Overview

AD910A adapters, support M.2 67pin B key type connector to convert M.2(NGFF) SSD into SATA III 7+15pin standard interface.

2. Tools and Results of Performance Measurement

- 2.1 Test Platform
 - M/B :ASUS P8P67CPU :Intel i5-2500, 3.3MHz/ 6G Cache/ 5GTMemory :Kingston KVR1333D3N9K2/4G, DDR3-1333MHz,4G(2GB DIMM*2)ATX Power :TC START W500, 500W ATX,12V V2.2 Power SupplierGraphic :MSI , R6700 / AMD HD 6700 SeriesOS :Microsoft Windows 7 64bit OS
- 2.2 Test target: AD910A adapter and SSD(LITE-ON LGT-128M6G)



AD910A

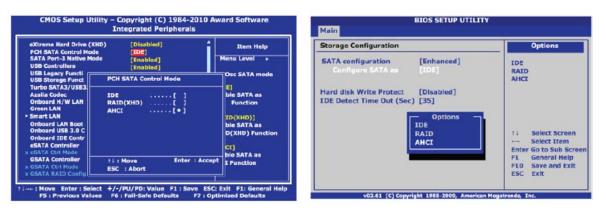
LITE-ON LGT-128M6G

2.3 Install Hardware

Insert M.2(NGFF) SSD(LITE-ON LGT-128M6G) into AD910A converter's M.2 67pin B key connector, and then with coppers, and screws to fix SSDs. Connect AD910A converter to SATA III Port of ASUS P8P67 motherboard.

2.4 BIOS & Windows 7 OS environment setup

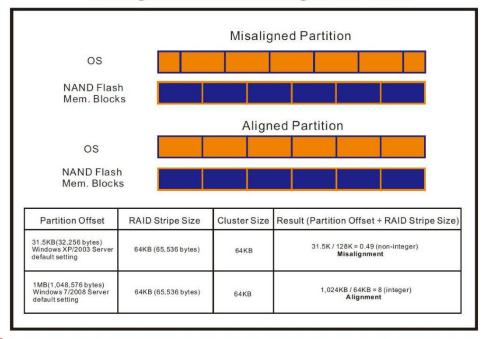
2.4.1 In BIOS(Basic Input/Output Setup) – Change IDE Mode into AHCI Mode



2.4.2 Partition Alignment & I/O Alignment

Windows XP and Windows Server 2000/2003 start partition offset at 31.5KB (32,256 bytes). Due to this misalignment, clusters of data are spread across physical memory block boundaries, incurring a read- modify-write penalty. As a result, the SSD controller must write up to 200% more data to the flash than is sent from the host to the drive.

When choosing a partition starting offset, Storage Systems recommends that system integrators correlate the partition offset with the RAID stripe size and cluster size to achieve optimal SSD I/O performance. As following Figure shows an example of a misaligned partition offset and an example of an aligned partition offset for Windows Server.



Misaligned Partition vs. Aligned Partition

E: WDC WD5000AACS-00ZU	B0 🔹		D: INTEL SSDSA2M080G2G	C •	
WDC 01.0 iaStor - OK 31 K - BAD 465.76 GB	Read:	Write:	INTEL 2CV1 iaStor - OK 1024 K - OK 74.53 GB	Read:	Write:
🗷 Seq	MB/s	MB/s	🗹 Seq	MB/s	MB/s
☑ 4K	MB/s	MB/s	☑ 4K	MB/s	MB/s
4K-64Thrd	MB/s	MB/s	4K-64Thrd	MB/s	MB/s
Acc.time	ms	ms	Acc.time	ms	ms
Score:			Score:		1

XUsing AS SSD Benchmark viewing partition is aligned

XUsing AS SSD Benchmark to check vendor AHCI Drive is installed

AS SSD Benchmark 1.7.47	and a second			🛎 AS SSD Benchmark 1.7.4739	.38088	
File Edit View Too				File Edit View Tools G: MINERVA-Mercury PRO(64GB		
WDC 01.0 iaStor - OK 31 K - BAD 465.76 GB	Read: 使用Intel AHCI Driver	Write:		MINERVA-Mercury 1916 msahci - OK 1024 K - OK 59.62 GB	Read: 使用Microsoft AHC	Write:
🗷 Seq	MB/s	MB/s		✓ Seq	MB/s	MB/s
☑ 4K	MB/s	MB/s		☑ 4K	MB/s	MB/s
4K-64Thrd	MB/s	MB/s		4K-64Thrd	MB/s	MB/s
Acc.time	ms	ms		Acc.time	ms	ms
Score:				Score:		
Start Abort						

- 2.4.3 In Windows 7, formatted SSD to NTFS Mode. Don't install any program. Because FAT32 previous versions do not support NCQ, recommended formatted NTFS file mode.
- 2.4.4 AHCI support Queue CommandAHCI queue command protocol allows each disk contains 32 commands. so QD(Queue Depth) is 32.
- 2.4.5 SSD Write Cache Setting Enable the Write Cache setting in Windows 7.

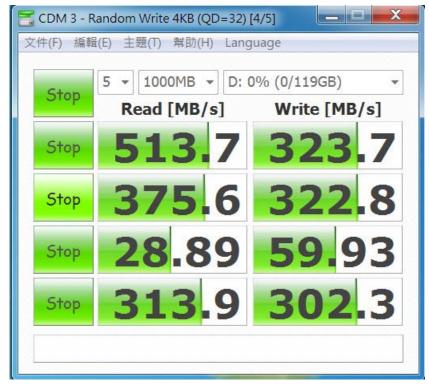
2.5 SSD I/O Performance impact factors

- 2.5.1 SATA I/O performance -- depending on the SSD Controller IC
- 2.5.2 SATA I/O performance -depending on the NAND Flash IC.
 - 2.5.2.1 Toggle DDR mode or ONFI synchronous NAND Flash IC, will show good performance
 - 2.5.2.2 Traditional asynchronous or SDR NAND Flash IC, will show poor performance

Suggestion:

Please use the motherboard containing native SATA 6Gb/s Port testing, can provide more correct I/O performance. (Such as Intel 6 Series chipsets or AMD 9 Series Chipsets). If you are using a motherboard plus SATA III host bus adapter, non-native 6Gb/s Port or SATA to PCI-e adapter provides 6Gb/s Port. I/O performance testing will be very much lower than the native SATA III Port.

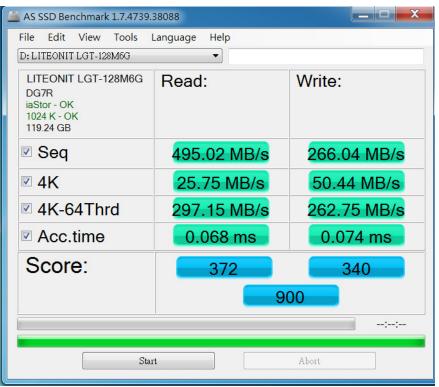
- 2.6 CrystalDiskMark 3.0.1 x64 performance test
 ※Benchmark (Sequential Read & Write / default = 1MB)
 - 2.6.1 Used LITE-ON LGT-128M6G performance as below:



2.7 AS SSD Benchmark 1.6 performance test

※Benchmark (Read & Write by MB/s, default block size = 16MB)

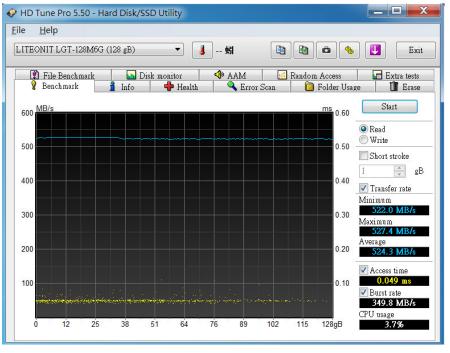
2.7.1 Used LITE-ON_LGT-128M6G performance as below:



2.8 HD Tune Pro 5.5 performance test

※Benchmark (Sequential Read & Write / default block size = 8MB)

2.8.1 Used LITE-ON LGT-128M6G / formatted Read performance as below:



2.9 ATTO Disk Benchmark

2.9.1 Used LITE-ON LGT-128M6G performance as below:

File View Help Dirve: [-d-] Force Write Access ✓ Direct I/O Transfer Size: 0.5 10 8192.0 KB Total Length: 256 MB ✓ Øueue Depth: 4 Controlled by: ✓ Start ✓ ✓ Start ✓ ✓ Øueue Depth: 4 ✓ ✓ Øueueue Depth: 4 ✓ ✓ Øueueueueueueueueueueueueueueueueueueue
Prive: [-d-] Force Write Access Digrect I/O Transfer Size: 0.5 10 8192.0 KB (VO Qomparison Total Length: 256 MB Queue Depth: 4 Controlled by: Start Controlled by: Start Vite Read Write Read 32175 34944 0.5 10 10 10000 100000 100000 100000 10 32175 34944 1000000 1000000 100000
Transfer Size: 0.5 to 8192.0 KB Total Length: 256 MB Quertapped I/O Controlled by: Controlled by: Controlled by: Controlled by: <
Total Length: 256 MB Image: Controlled by: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controlled by: Image: Controled by: Image: Controlled by:<
Total Length: 256 MB Neither Queue Depth: 4 Controlled by: Start Start
Queue Depth: 4 Queue Depth: 4 Controlled by: Start Controlled by: Test Results Write Read Write Read Start Start Start Controlled by: Controlled by: Controlled by: Start Controled by:
Controlled by:
Image: Construction in the image: Construction in th
Test Results Write Read 0.5 32175 1.0 59648 2.0 59648 2.0 108550 1.0 2010 2.0 2017 2.0 2017 2.0 2017 2.0 2017 2.0 2017 2.0 2017
Write Read Write Read 0.5 32175 34944 59648 67072 2.0 108550 109604 108550 109604 4.0 160933 180297 221806 290963 16.0 259522 364216 299704 403779 32.0 322677 495103 3226277 495103 128.0 3318827 522241 318827 522241 512.0 319566 527637 526427 319566 527637
Write Read Write Read 0.5 32175 34944 59648 67072 2.0 108550 109604 108550 109604 4.0 160933 180297 221806 290963 16.0 259522 364216 299704 403779 32.0 322677 495103 3226277 495103 128.0 3318827 522241 318827 522241 512.0 319566 527637 526427 319566 527637
Write Read Write Read 0.5 32175 34944 59648 67072 2.0 59648 67072 108550 109604 4.0 106550 109604 1069033 180297 8.0 221806 290963 259522 364216 32.0 322677 495103 322677 495103 128.0 328677 522241 318827 522241 512.0 319566 527637 319566 527637
0.5 1.0 2.0 4.0 8.0 8.0 8.0 8.0 8.0 8.0 8.0 8
1.0 59648 67072 2.0 108550 109604 4.0 169033 180297 8.0 221806 290963 10.0 259522 364216 32.0 322677 495103 128.0 322677 501276 256.0 318827 52241 512.0 319566 527637
2.0 108550 109604 4.0 180033 180297 8.0 290963 259522 32.0 299704 403779 64.0 322677 495103 128.0 322677 501276 256.0 318627 522241 51.0 319566 527637
8.0 221806 290963 16.0 259522 364216 32.0 299704 403779 64.0 322677 495103 128.0 322772 501276 255.0 318827 522241 512.0 319566 527637
16.0 259522 364216 32.0 299704 403779 64.0 322677 495103 128.0 327422 501276 256.0 318827 522241 512.0 319566 527637
32.0 299704 403779 64.0 322677 495103 128.0 322477 501276 256.0 318827 522241 512.0 319566 527637
64.0 322677 495103 128.0 327422 501276 256.0 318827 522241 512.0 319566 527637
128.0 327422 501276 256.0 318827 522241 512.0 319566 527637
256.0 318827 522241 512.0 319566 527637
512.0 319566 527637
1024.0 319566 528936
2048.0 319566 531555
4096.0 319566 519971
8192.0 319566 532140
0 100 200 300 400 500 600 700 800 900 1000 Transfer Rate - MB / Sec
For Help, press F1

2.10 AnvilBenchmark_V110_B337

2.10.1 Used LITE-ON LGT-128M6G performance as below:

Anvil's Storage Utilities 1.1.0 (2014-January-1)						
ile Benchmarks		Info Settings	Test size 1GB	· Drive ■ d: [新5	曾磁埰區]	Screenshot Help
SD Benchmarl						LITEONIT LGT-128M6G 128GB/DC
Read	Resp. time	MB read	IOPS	MB/s		
Seq 4MB	8.0742ms	2,048.0	123.85	495.40		
4K	0.1446ms	337.7	6,915.90	27.02		
4K QD4	0.1447ms	1,349.9	27,645.06	107.99		1,750.54
4K.QD16	0.2356ms	3,315.4	67,898.80	265.23	Run read	1,750.54
32K	0.2784ms	1,684.4	3,591.55	112.24		
128K	0.7206ms	2,603.4	1,387.82	173.48		3,587.69
Write Resp. time MB written			IOPS	MB/s	Run	3,587.69
Seq 4MB	12.9805ms	1.024.0	77.04	308.16		
· · · · · · · · · · · · · · · · · · ·						1,837.15
4K	0.0690ms	565.9	14,488.00	56.59	Run write	1,837.15
4K QD4	0.0847ms	640.0	47,256.84	184.60		
4K QD16	0.2504ms	640.0	63,899.97	249.61		
	7旗艦版 64-bit Build	(7600)	Drives :			LITEONIT LGT-128M6G 128GB/DG7R Drive D: 119.2/119.1GB free (99.9%)
P8P67/1502, LGA1155 Intel(R) Core(TM) i5-2500 CPU @ 3.30GHz		Notes :			NTFS - Cluster size 4096B	
Memory : 4,073 MB		Notes.			Storage driveriaStor 10.5.0.1026	
						Alignment 1024KB OK Compression 100% (Incompressible)

Burn In Tests and Results

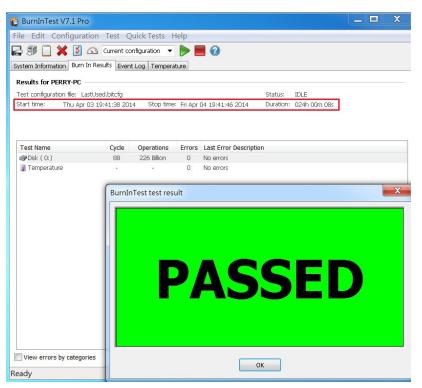
- 3.1 BurnInTest v7.1 Pro
 - 3.1.1 system information for LITE-ON LGT-128M6G as below:

👸 BurnInTest V7.1 Pro						
File Edit Configuration Test Quick Tests Help						
🖬 🗊 📋 💥 💆 🖎 🕻	Current configuration 🔻 ╞ 📕 🕢					
System Information Burn In Resu	Its Event Log Temperature					
Graphics		A				
AMD Radeon HD 6770 Chip Type: DAC Type: Memory: BIOS: Driver provider: Driver version: Driver date:	ATI display adapter (0x68BA) Internal DAC(4000Hz) 1024MB 113-AC36800-103 ATI Technologies Inc. 8.8220.0.0 1-12-2011	_				
Monitor 1:	1920x1080x32 60Hz (Primary monitor)					
Disk volumes						
C: Local drive, NTFS, (59.53GB total, 41.06GB free)						
	128M6G Serial: 002317113953 (Disk: 0, Size: 119.24GB, Volumes: N/A) D2 Serial: 00000000121009082940 (Disk: 1, Size: 59.62GB, Volumes: C)	A				
Optical drives						
Network						
Realtek PCIe GBE Family Contro	ller (Speed: 100Mb/s) (MAC: BC;AE;CS:78:0B:C1)					
Ports						
通訊連接埠: Kaukaard Barti	COM1 - RS232 Serial Port (max Baud rate: 115200)	<i></i>				
Ready						

3.1.2 show Disk test mode(default cyclic -- 10 ways cycle test)

File Edit Configuration Test Current con System Information Burn In Results Event Printer Pre-Test Post-Test Video Playback Graphics AVD Radeon HD 6770 Tape Serial ports Parallel ports 2D Graphics AVD Radeon HD 6770 ATI depoints Usb RAM Playback Tape Serial ports Parallel ports 2D Graphics AVD Radeon HD 6770 ATI depoints Logging Errors Network Temp / Battery Drive Intermy Intermy Bornory: 1024 BIOS: 113-24 Drive Test Mode Thres File SMART: Oriver rowider: 113-22 Intermy Intermy Intermy Battery Disk selection Automatically select all hard drives at the start of testing Drive Test Mode Thres File SMART: Disk drives 13-22 Monitor 1: 12-22 Not Testing Not Testing Disk drives 13-22 Intermy Not Testing Not Testing Not Testing Disk drives 120-128MeG Sere	👸 BurnInTest V7.1 Pro	
System Information Burn In Results Event Graphics AMO Radeon HD 6770 Chip Type: ATI dt DAC Type: Intern Memory: 1024 BIOS: 113-A Driver provider: ATI TO Disk certain: 113-A Driver provider: ATI TO Diver reston: 8.820 Driver reston: 8.820 Disk drives 112-22 Montor 1: 1920x Disk drives 112-22 Bisk drives 112-22 Disk drives 12-22 Disk drives	File Edit Configuration Test Qu	👸 BurnInTest Preferences
System Information Burn In Results Event Graphics Serial ports Parallel ports 2D Graphics AMD Radeon HD 6770 Disk Disk USB RAM Plug-in Management AMD Radeon HD 6770 Disk Disk USB RAM Plug-in Management AMD Radeon HD 6770 Original Disk USB Errors Network Temp / Battery Disk Disk Optical Disk Logging Errors Network Temp / Battery Disk selection Network 113-A Automatically select all hard drives at the start of testing Driver date: 112-22 Monitor 1: 1920x Disk selection Not Testing Disk drives 112-22 Monitor 1: 1920x Disk Edit details for drive: 00: [Physical disk raw] Edit details for drive: 00: [Physical disk raw] Edit details for drive: 00: [Physical disk raw] Test mode Disk would for the second disk raw] Edit details for drive: 00: [Physical disk raw] Test mode Disk would for the second disk raw] Edit details for drive: 00: [Physical disk raw] Test mode Disk woul	🕞 🗊 📋 💥 💆 🖎 Current cont	Sound CPU Printer Pre-Test Post-Test Wideo Playback
AMD Radeon HD 6770 ATI de Info Type: ATI de Info Type: ATI de Info Type: Info Info Info Info Info Info Info Info		
Chip Type: ATL de DAC Type: Intern Intern Merrory: Disk selection Disk selection Disk selection Merrory: 1024M BIOS: 113-Ad Diver resion: 8.820 Monitor 1: 1920c Disk volumes 1:22 Monitor 1: 1920c Disk volumes 1:22 Monitor 1: 1920c C: Local drive, NTFS, (59.53GB total, 41.0 Not Testing Disk drives Edit details for drive: 00: [Physical disk raw] Edit details for drive: 00: [Physical disk raw] Test mode Test mode Optical drives 00 Bissifie: Model: LITEONIT LGT-128M6G Ser Bissifie: Model: MA-CT064M4SD22 Serial: 00 Pike size 1.00 Optical drives 00 Block size 32< KBissifie: Model: Controller (Speed: Slow drive Network Slow drive Realtek PCIe GBE Family Controller (Speed: SMART options Run self test and log SMART errors Log bad sector increase Log bad sector increase Bad sector	Graphics	🔥 3D Graphics 🛛 🚿 USB 🖉 RAM 🛛 🐼 Plug-in 🔃 🖪 Management
DAC Type: Intern Memory: 1024M BIOS: 113-AI Driver provider: ATI TE Driver orson: 8.820 Driver date: 1-12-2 Monitor 1: 1920A Disk drives 12-2 Monitor 1: 1920A Disk drives C: Local drive, NTFS, (59.53GB total, 41.0 Disk drives Edit details for drive: 00: [Physical disk raw] Edit details for drive: 00: [Physical disk raw] Test this drive: Test mode [Default (Cyclic) Optical drives File size 1.00 (% of disk) Seek count 100 Block size 32 KB Slow drive: Slow drive: 0.0 Mattek PCIe GBE Family Controller (Speed: SMART options Realtek PCIe GBE Family Controller (Speed: SMART options Run self test and log SMART errors Log bad sector increase Bad sector 20		🥩 Disk 💿 Optical Disk 📑 Logging 🙆 Errors 🛃 Network 📳 Temp / Battery
Memory: 1024W BIOS: 113-M Diver provider: A11 Ti Driver version: 8.820 Diver version: 8.820 Driver date: 112-24 Montor 1: 1920r Disk volumes C: Local drive, NTFS, (59.53GB total, 41.0 Disk drives Edit details for drive: 00: [Physical disk raw] Test mode Default (Cyclic) File size 1.00 (% of disk) Seek count 100 Block size Block size 32 < KB Slow drive 0.0 MB/Sec (NA = No threshold Duty cycle override % (or leave blank to accept default) SMART options Run self test and log SMART errors Log bad sector increase Bad sector 20		Disk selection
BIOS: 113-AI Driver provider: AIT TC Driver version: 8.820. Driver date: 112-24 Monitor 1: 1920x Disk volumes C: C: Local drive, NTFS, (59.53GB total, 41.0 Disk drives Edit details for drive: 00: [Physical disk raw] EditWRM: Model: LITEONIT LGT-128M6G Seriet BMRM: Model: M4-CT064M4SSD2 Serial: 0 Optical drives 00: [Physical disk raw] Test this drive Itel size 1.00 (% of disk) Slow drive 0.0 Block size 32 KB Slow drive 0.0 Matter PCIe GBE Family Controller (Speed: SMART options Run self test and log SMART errors Log bad sector increase Log bad sector increase Bad sector 20		Automatically called all band drives at the start of testing
Driver version: 8.820, Driver version: 1.220, Driver date: 1.122,0, Moritor 1: 1.122,0, Disk volumes 0: C: Local drive, NTFS, (59.53GB total, 41.0 Disk drives 0: Bisk drives 1:12:0, Disk drives 0:	BIOS: 113-A	Automatically select all hard drives at the start of testing
Diver date: 1-12-2; Monitor 1: 1920x Disk volumes 00: [Physical disk raw] Default (Cyclic) NA 1.00 N C: Local drive, NTFS, (59.53GB total, 41.0 Not Testing Disk drives III Disk drives Edit details for drive: 00: [Physical disk raw] Edit details for drive: 00: [Physical disk raw] Fett details for drive: 00: [Physical disk raw] Disk drives Test mode Default (Cyclic) III Disk drives Fett details for drive: 00: [Physical disk raw] Disk drives Test mode Default (Cyclic) Image: Complexity of the stand log SMART errors Realtek PCIe GBE Family Controller (Speed: SMART options Run self test and log SMART errors Log bad sector increase Bad sector 20 Edit sector increase		Drive Test Mode Thres File SMART:
Monitor 1: 1920x Disk volumes		00: [Physical disk raw] Default (Cyclic) NA 1.00 N
Disk volumes C: Local drive, NTFS, (59-53GB total, 41.0) Disk drives Disk drives 種種構態: Model: LITECNIT LGT-128M60 Ser ablikite: Mdel: M4-CT06-4M4SSD2 Serai: 00 Optical drives Optical drives Disk drives Realtek PCIe GBE Family Controller (Speed: SMART options Run self test and log SMART errors Log bad sector increase Bad sector 20		
C: Local drive, NTFS, (59.53GB total, 41.0 Disk drives Edit details for drive: 00: [Physical disk raw] Edit details for drive: 00: [Physical disk raw] Test this drive Test mode Default (Cyclic) File size 1.00 (% of disk) Seek count 100 Block size 32 KB Slow drive 0.0 MB/Sec (NA = No threshold Duty cycle override % (or leave blank to accept default) SMART options Run self test and log SMART errors Log bad sector increase Bad sector 20		
Realtek PCIe GBE Family Controller (Speed: SMART options Run self test and log SMART errors Bad sector 20	鼓碟機: Model: LITEONIT LGT-128M6G Ser 磁碟機: Model: M4-CT064M4SSD2 Serial: 00	Edit details for drive: 00: [Physical disk raw] Test this drive Test mode Default (Cyclic) File size 1.00 (% of disk) Seek count 100 Block size 32 KB
Realtek PCIe GBE Family Controller (Speed: SMART options Run self test and log SMART errors	Network	Duty cycle override % (or leave blank to accept default)
Run self test and log SMART errors		SMART ontions
Log bad sector increase Bad sector 20	Realter Pole God Pamily Controller (Speed:	
Ports		
	Ports	
通訊連接埠: COM1 // 確定 取消 說明		福安 取遊 約田
Ready	Ready	

3.1.3 show LITE-ON LGT-128M6G 24-hour Burn-in test PASSED



4. Summary

- 4.1 LITE-ON LGT-128M6G SSD is SATA III Interface, I/O speed, max. to 600MB/s.
- 4.2 AD910A adapter I/O performance is based on M.2(NGFF) SSD