SPECIFICATIONS
OF
SUPER MULTI DVD WRITER
Model GH24NSD0
For LG-Brand

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Checked by: S. M. Park
Authorized by: J. W. Kim

* This specifications can be changed for improvement without prior notice.
# Revision History

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<td>2015-04-15</td>
<td>1st Release</td>
<td>T1.0</td>
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0. Attention

-To export this product-

The Shipment of this product is limited by the rules of export in each country. The proper procedures should be taken when exporting this product.

1. Features

1.1 General
(1) Half-height Internal Super Multi Drive
(2) CD-R/RW, DVD-R/RW/RAM/ +R/RW +/-R DL M-DISC/+M SL read and write compatible, CD Family and DVD-ROM read compatible
(3) Enhanced IDE (ATAPI) interface : SATA interface
(4) Large buffer memory 0.5MB
(5) Buffer Under-run prevention function embedded
(6) Power loading and power eject of a disc. Bare media loading
(7) MTBF: 100,000 POH
(8) Vertical and Horizontal installable
(9) Compliance with RoHS/ Pb Free production

1.2 Supported disc formats
(1) Reads data in each DVD-ROM, DVD-R(Ver. 2.0 for Authoring) and DVD-RAM(Ver.1.0)
(2) Reads and writes in each DVD-R(Ver. 2.1 for General), DVD-R DL(Dual Layer),DVD-RW, DVD-RAM(Ver.2.x), DVD+R, DVD+R DL(Double Layer) and +RW
(3) Reads data in each CD-ROM, CD-ROM XA, CD-I, Video CD, CD-Extra and CD-Text
(4) Reads data in Photo CD (Single and Multi session )
(5) Reads standard CD-DA
(6) Support to read Super Audio CD (Compatible layer in Hybrid type)
(7) Reads and writes CD-R discs conforming to “Orange Book Part 2”
(8) Reads and writes CD-RW discs conforming to “Orange Book Part 3”
(9) Reads DVD-R / RW / RAM with CPRM
(10) Reads and writes in M-DISC/+M (Archival)

1.3 Supported write method
(1) DVD-R: Disc at Once and Incremental Recording
(2) DVD-R DL: Disc at Once, Format 4 (Layer Jump Recording)
(3) DVD-RW: Disc at Once, Incremental Recording and Restricted Overwrite
(4) DVD-RAM: Random Write
(5) DVD+R: Sequential Recording
(6) DVD+R DL: Sequential Recording
(7) DVD+RW: Random Write
(8) CD-R/RW: Disc at Once, Session at Once, Track at Once and Packet Write
1.4 Performance

(1) Average access time:
   DVD-ROM 145 ms
   CD-ROM 125 ms

(2) Write speed:
   DVD-R 2x, 4x CLV, 8x PAV, 16x, 24x CAV
   DVD-R DL 4x CLV, 8x ZCLV
   DVD-RW 2x, 4x, 6x CLV
   DVD-RAM 2x, 3x 5x ZCLV
   DVD+R 2.4x CLV 4x CLV, 8x PAV, 16x, 24x CAV
   DVD+R DL 2.4x, 4x CLV, 8x ZCLV
   DVD+RW 2.4x, 4x, 6x CLV, 8x ZCLV
   CD-R 16x CLV, 32x, 40x PAV, 48x CAV
   CD-RW 4x, 10x,16x CLV, 24x ZCLV
   M-DISC/+M 4x CLV

(3) Read speed:
   DVD-R/RW/ROM(SL/DL) 16x/13x/16x/12x max.
   DVD-R DL 12x max.
   DVD-RAM (Ver.1.0/2.x) 2x ZCLV / 5x PAV
   DVD- Video (CSS Compliant Disc) 16x max.
   DVD+R/-RW 16x / 13x max.
   DVD+R DL 12x max.
   CD-R/RW/ROM 48x/40x/48x max.
   CD-DA (DAE) 40x max.
   80 mm CD 22x max.
   M-DISC/+M 12x CAV

(4) Sustained Transfer rate: DVD-ROM 22.16 Mbytes/s (16x) max.
   CD-ROM 7,200 kB/s (48x) max.

(5) Burst Transfer rate:
   SATA, Ultra DMA Mode 6
   Multi word DMA Mode2, PIO Mode 4

(6) Multimedia MPC-3 compliant

1.5 Audio

(1) 16 bit digital data output through ATA interface

*Definition
   Transfer Rate: 1x (DVD) = 1.385 Mbytes/s,  Mbytes/s = 10^6 bytes/s
   1x (CD) = 150 kB/s,              kB/s = 2^{10} bytes/s
   Capacity:    MB = 2^{20} bytes, kB = 2^{10} bytes
2. General description

2.1 Applicable disc formats

**DVD**
- **DVD-ROM**: 4.7GB (Single Layer)
  - 8.5GB (Dual Layer)
- **DVD-R**: 4.7GB (Ver. 2.0 for Authoring: read only)
  - 4.7GB (Ver. 2.1 for General: read & write)
- **(DL)**: 8.5GB (Ver. 3.0)
- **DVD-RW**: 4.7GB (Ver. 1.2/ Rev 1.0, 2.0, 3.0)
- **DVD-RAM**: 2.6GB/side (Ver. 1.0: read only)
  - 1.46GB/side, 4.7GB/side (Ver. 2.x)
- **DVD+R**: 4.7GB (Ver. 1.3)
  - (DL): 8.5GB (Ver. 1.1)
- **DVD+RW**: 4.7GB (Vol. 1/Ver.1.3, Vol. 2/Ver.1.0)

**Archival**
- M-DISC/M 4.7GB

**CD**
- CD-ROM Mode-1 data disc
- CD-ROM Mode-2 data disc
- CD-ROM XA, CD-I, Photo-CD Multi-Session, Video CD
- CD-Audio Disc
- Mixed mode CD-ROM disc (data and audio)
- CD-Extra
- CD-Text
- CD-R (Conforming to “Orange Book Part 2”: read & write)
- CD-RW (Conforming to “Orange Book Part 3”: read & write)

2.2 Writing method

1. **(1) DVD-R/RW**
   - Disc at Once
   - Incremental Recording
   - Restricted Overwrite (DVD-RW only)
2. **(2) DVD-R DL**
   - Disc at Once (DAO), Format4 (Layer Jump Recording)
3. **(3) DVD-RAM/+RW**
   - Random Write
4. **(4) DVD+R**
   - Sequential Recording
5. **(5) DVD+R DL**
   - Sequential Recording
6. **(6) CD-R/RW**
   - Disc at Once (DAO)
   - Session at Once (SAO)
   - Track at Once (TAO)
   - Packet Writing

2.3 Disc diameter

- 120 mm
- 80 mm

2.4 Data capacity

- **User data / Block**
  - **DVD-ROM/R/RW/RAM /+R/+RW**: 2,048 bytes/block
  - **CD (Yellow Book)**: 4,096 bytes/block (Mode1 & Mode2 Form1)
  - 2,336 bytes/block (Mode2)
  - 2,328 bytes/block (Mode2 Form2)
  - 2,352 bytes/block (CD-DA)
3. Drive performance

3.1 Host interface

T13 ATA/ATAPI-8, MMC-6, INF-8090i v8

3.2 Write Speed

<table>
<thead>
<tr>
<th>Media</th>
<th>Writing Speed</th>
<th>Transfer rate (DVD: Mbytes/s, CD: kB/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVD-R (1-2x)</td>
<td>2x CLV</td>
<td>2.77 Mbytes/s</td>
</tr>
<tr>
<td>-R (1-4x)</td>
<td>4x CLV</td>
<td>5.54</td>
</tr>
<tr>
<td>-R (1-8x)</td>
<td>4x CLV, 6-8x PAV</td>
<td>5.54, 8.31-11.08</td>
</tr>
<tr>
<td>-R(1-16x)</td>
<td>7-8x PAV, 7-16x CAV</td>
<td>9.9-11.08, 9.9-22.16</td>
</tr>
<tr>
<td></td>
<td>10-24x CAV</td>
<td>13.85-33.24</td>
</tr>
<tr>
<td>-R (8cm)</td>
<td>4x CLV</td>
<td>5.5</td>
</tr>
<tr>
<td>DVD-R DL (2-4x)</td>
<td>4x CLV</td>
<td>5.54</td>
</tr>
<tr>
<td>- DL (2-8x)</td>
<td>4x CLV, 4+6+8x ZCLV</td>
<td>5.54, 5.54+8.31+11.08</td>
</tr>
<tr>
<td>- DL (8cm)</td>
<td>4x CLV</td>
<td>5.54</td>
</tr>
<tr>
<td>DVD-RW (2x)</td>
<td>2x CLV</td>
<td>2.77</td>
</tr>
<tr>
<td>-RW (2-4x)</td>
<td>4x CLV</td>
<td>5.54</td>
</tr>
<tr>
<td>-RW (2-6x)</td>
<td>4x, 6x CLV</td>
<td>5.54, 8.31</td>
</tr>
<tr>
<td>-RW (8cm)</td>
<td>2x CLV</td>
<td>2.77 (w/o Verify)</td>
</tr>
<tr>
<td>DVD-RAM (Ver.2.x) (2x)</td>
<td>2x CLV</td>
<td>2.77 (w/o Verify)</td>
</tr>
<tr>
<td>-RAM (3x)</td>
<td>3x CLV</td>
<td>4.16 (w/o Verify)</td>
</tr>
<tr>
<td>-RAM (5x)</td>
<td>5x ZCLV</td>
<td>6.93 (w/o Verify)</td>
</tr>
<tr>
<td>-RAM (8cm)</td>
<td>2x CLV</td>
<td>2.77 (w/o Verify)</td>
</tr>
<tr>
<td>DVD+R (2.4x)</td>
<td>2.4x CLV</td>
<td>3.32</td>
</tr>
<tr>
<td>+R (2.4-4x)</td>
<td>4x CLV</td>
<td>5.54</td>
</tr>
<tr>
<td>+R (2.4-8x)</td>
<td>4x CLV, 6-8x PAV</td>
<td>5.54, 8.31-11.08</td>
</tr>
<tr>
<td>+R (2.4-16x)</td>
<td>7.1-8 PAV, 7.1-16x CAV</td>
<td>9.9-11.08, 9.9-22.16</td>
</tr>
<tr>
<td></td>
<td>10-24x CAV</td>
<td>13.85-33.24</td>
</tr>
<tr>
<td>DVD+R DL (2.4x)</td>
<td>2.4x CLV</td>
<td>3.32</td>
</tr>
<tr>
<td>+R DL (2.4-8x)</td>
<td>4x CLV, 4+6+8xZCLV,</td>
<td>5.54, 5.54+8.31+11.08,</td>
</tr>
<tr>
<td>DVD+R DL (8cm)</td>
<td>2.4x CLV</td>
<td>3.32</td>
</tr>
<tr>
<td>DVD+RW (2.4x)</td>
<td>2.4x CLV</td>
<td>3.32</td>
</tr>
<tr>
<td>+RW (2.4-4x)</td>
<td>4x CLV</td>
<td>5.54</td>
</tr>
<tr>
<td>+RW (2.4-8x)</td>
<td>6x CLV, 6+8x ZCLV</td>
<td>8.31, 8.31+11.08</td>
</tr>
<tr>
<td>DVD+RW (8cm)</td>
<td>4x CLV</td>
<td>5.54</td>
</tr>
</tbody>
</table>

| CD-R      | 16x CLV,     | 2,400 kB/s                              |
|          | 21-32x PAV   | 3,150-4,800                             |
|          | 21-40x PAV   | 3,150-6,000                             |
|          | 48x CAV      | 7,200                                   |
| CD-R (8cm) | 16x CLV,    | 2,400 kB/s                              |

| CD-RW (MS:1,2,4x) | 4x CLV | 600                                      |
| -RW(HS:4-10x) | 10x CLV | 1,500                                    |
| -RW (US:8-24x) | 16x CLV, 16+24x ZCLV | 2,400, 2,400+3,600          |
| -RW (US+:8-32x) | 16x CLV, 16+24x ZCLV | 2,400, 2,400+3,600          |
| CD-RW (8cm) | 10x CLV,    | 1,500 kB/s                              |
### 3.3 Read Speed

<table>
<thead>
<tr>
<th>Media (Media Speed)</th>
<th>Read Speed</th>
<th>Transfer rate (DVD: Mbytes/s, CD: kB/s)</th>
<th>Rotational speed (Approx. r/min)</th>
</tr>
</thead>
</table>

#### 3.3.1 Data

- **DVD-ROM (SL)** 6.6 - 16x CAV 9.14- 22.16 Mbytes/s 9,360 r/min
- **(DL)** 5.0 - 12x CAV 6.92- 16.62 7,750
- **DVD-R** 6.6 - 16x CAV 9.14- 22.16 9,360
- **DVD+R** 6.6 - 16x CAV 9.14- 22.16 9,360
- **DVD-R DL** 5.0 - 12x CAV 6.92- 16.62 7,750
- **DVD+R DL** 5.0 - 12x CAV 6.92- 16.62 7,750
- **DVD-RW** 5.4 - 13x CAV 7.48- 18.00 7,670
- **DVD+RW** 5.4 - 13x CAV 7.48- 18.00 7,670
- **DVD-RAM** *3(Ver. 1.0) 2x CLV 2.77 4,780-2,020
- **-RAM (Ver. 2.x) 3 - 5x PCAV 4.16- 6.93 4,880-3,450
- **RAM (8cm) 3 - 5x PCAV 4.16- 6.93 4,880-3,450
- **CD-R/ROM** *1 20 - 48x CAV 3,000-7,200 kB/s 9,660
- **CD-RW** 17 - 40x CAV 2,590-6,000 kB/s 8,050
- **(8cm) 13.3 - 22x CAV 1,995 - 3,300 kB/s 6,480
- **M-DISC/+M** 5.0 - 12x CAV 6.92- 16.62 Mbytes/s 7,050

#### 3.3.2 DVD-Video, Video Format and CD-DA Playback

- **DVD-Video** *2 (SL/DL) 2.5 - 6x CAV 3.46- 8.31 3,600/4,000
- **DVD-R** 2.5 - 6x CAV 3.46- 8.31 3,600
- **DVD+R** 2.5 - 6x CAV 3.46- 8.31 3,600
- **DVD-R DL** 2.5 - 6x CAV 3.46- 8.31 4,000
- **DVD+R DL** 2.5 - 6x CAV 3.46- 8.31 4,000
- **DVD-RW** 2.5 - 6x CAV 3.46- 8.31 3,600
- **DVD+RW** 2.5 - 6x CAV 3.46- 8.31 3,600
- **DVD-RAM** *3 ditto Same as the speed of Data above
- **CD-DA(DAE)** *4 17 - 40x CAV 2,590-6,000 kB/s 8,050 r/min
- **CD-DA (Audio Play)** *4 4.2 - 10x CAV 630-1,500 1,900

*1) Fully recorded CD-R should be used.
*2) DVD-Video: CSS compliant discs
*3) DVD-RAM: Read speed of Data and Video Format are same as above.
*4) Read speed of CD-R/RW/ROM are same as above.

* Rotational speed (CLV, ZCLV)
- **DVD-R/RW/ROM, +R/RW** 1x: Approx. 1,390 (Inside) - 580 r/min (Outside)
- **DVD-RAM** Ver. 1.0 1x: Approx. 2,390 (Inside) - 1,010 r/min (Outside)
- **Ver. 2.x** 2x: Approx. 3,250 (Inside) - 1,380 r/min (Outside)
- **CD-R/RW/ROM** 1x: Approx. 500 (Inside) - 210 r/min (Outside)

*1) “+”: change by step for ZCLV  *2) “-“: continuous change, for CAV, PCAV
3.4 Burst transfer rate

SATA Gen.1 1.5 Gbps

3.5 Access time (Random)

<table>
<thead>
<tr>
<th>Type</th>
<th>Time (Typ.)</th>
<th>Limit (Note 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVD-ROM</td>
<td>145 ms</td>
<td>(190ms Limit)</td>
</tr>
<tr>
<td>DVD-ROM DL</td>
<td>220 ms</td>
<td>(300ms Limit)</td>
</tr>
<tr>
<td>CD-ROM</td>
<td>125 ms</td>
<td>(180ms Limit)</td>
</tr>
<tr>
<td>DVD-RAM (Ver.2.x)</td>
<td>270 ms</td>
<td>(400ms Limit)</td>
</tr>
</tbody>
</table>

Note:
1) Average access time is the typical value of more than 50 times including latency and error correction time.

Test Disc: DVD-ROM: ALMEDIO TDV-520 / TDR-820
DVD-ROM DL: ALMEDIO TDV-540 / TDR-840
CD: ALMEDIO TCD-701 / HITACHI HCD-1

*) Typical value defines a measured value in normal temperature (20 ºC) and horizontal position.

3.6 Data error rate (Measured with 5 retries maximum)

<table>
<thead>
<tr>
<th>Type</th>
<th>Error Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVD-R/RW/ROM/RAM</td>
<td>&lt;10^-12</td>
</tr>
<tr>
<td>DVD+R/+RW</td>
<td>&lt;10^-12</td>
</tr>
<tr>
<td>CD-R/RW/ROM</td>
<td>&lt;10^-12 (Mode-1)</td>
</tr>
<tr>
<td></td>
<td>&lt;10^-9 (Mode-2)</td>
</tr>
</tbody>
</table>

Condition: It is assumed that the worst case raw error rate of the disc is 10^-3

3.7 Spin up, Load time without Multi-session

Spin up time (Time to drive ready mode from standby mode)
5 s typ.

Load time (Time to drive ready mode from tray loading)

<table>
<thead>
<tr>
<th>Type</th>
<th>Time (Typ.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVD-ROM</td>
<td>8 s</td>
</tr>
<tr>
<td>DVD-R</td>
<td>22 s        (Disc At Once, Ver. 2.0 for General)</td>
</tr>
<tr>
<td>DVD-RW</td>
<td>22 s        (Disc At Once, Ver. 1.2)</td>
</tr>
<tr>
<td>DVD-RAM</td>
<td>40 s        (60 s Limit)</td>
</tr>
<tr>
<td>DVD+R/RW</td>
<td>22 s</td>
</tr>
<tr>
<td>CD-ROM</td>
<td>9 s</td>
</tr>
<tr>
<td>DVD±R DL</td>
<td>30 s</td>
</tr>
</tbody>
</table>

3.8 Data buffer capacity 0.5MB
4. Environmental conditions

4.1 Ambient temperature
- Operating: 5 to 40 °C
- Storage / Transportation: -30 to 60 °C

4.2 Temperature gradient
- 10 °C/h

4.3 Relative humidity
- Operating: 15% to 85% (Non-Condensing)
- Storage / Transportation: 10% to 90% (Non-Condensing)

4.4 Dew point temperature restrictions
- Less than 29 °C

4.5 Altitude
- Operating: 0 to 3,000 m
- Non-operating: 0 to 12,000 m

4.6 Vibration
1) Operating
- Read: Audio: 3.43 m/s² (0.35G) No unrecoverable error
  Data: 3.43 m/s² (0.35G) No unrecoverable error
  10 - 500Hz sine wave sweep, 1 oct./min at each of 3 directions
- Write: DVD: 0.98 m/s² (0.1G) No recording stop
  CD-R/RW: 2.94 m/s² (0.3G) No recording stop
  10 - 500Hz sine wave sweep, 1 oct./min at each of 3 directions

2) Non-Operating:
- 19.6 m/s² (2G) No damage must result
- 10 - 500Hz sine wave sweep, 1 oct./min at each of 3 directions
  for 40 minutes.

* 1) 3 direction: X (left and right), Y (back and front), Z (top and bottom) axis

4.7 Shock
1) Operating
- Read: Audio: 19.6 m/s² (2G) No unrecoverable error
  Data: 58.8 m/s² (6G) No unrecoverable error
  11ms, Half sine wave (5 time shocks, 6 s between shocks.)
  at each of 3 directions
- Write: DVD: 4.9 m/s² (0.5G) No recording stop
  CD-R/RW: 9.8 m/s² (1G) No recording stop
  11 ms, Half sine wave (5 time shocks, 6 s between shocks.)
  at each of 3 directions

2) Non-Operating
- 1,372 m/s² (140G) No damage after shock
  2 ms Half sine wave at each of 3 directions

* 1) 3 direction: X (left and right), Y (back and front), Z (top and bottom) axis

4.8 Drop impact
- Less than 60 cm, No performance and physical damage
- Note: Bulk package, 1 corner, 3 edges, 6 faces.
5. Quality and Reliability

5.1 MTBF

100,000 Power On Hours (POH)

- Assumption: Used in a normal office environment at room temperature.
- POH per year: 3,000
- ON / OFF cycles per year: 600
- Operating duty cycle: 20 % of power on time (Seek: 5 % of operating time)

5.2 Tray cycle test

20,000 times
No degeneration in the mechanical part after test
(1cycle ; one loading and one ejecting)

5.3 Actuator mechanism

1,000,000 full stroke seek

5.4 MTTR (Mean Time To Repair)

0.5 h

5.5 Component life

5 years or 2,000 h of Laser radiating time

Assumption:
Used in a normal office environment

6. Electro Static Discharge susceptibility (ESD)

0 to 4 kV: With no user detectable data read errors
From 5 kV to 8 kV: No catastrophic failure or damage
* Test conditions: C = 150 pF, R = 330 ohms, 50 times discharge except connector

7. Power requirements

7.1 Source voltage

+ 5 V +/- 5 % tolerance, less than 100 mVp-p Ripple voltage
+12 V +/- 10 % tolerance, less than 100 mVp-p Ripple voltage
(when DVD+/-R 24x write, +12V 0% tolerance less than 100 mVp-p Ripple voltage)

7.2 Current

<table>
<thead>
<tr>
<th>State</th>
<th>Voltage</th>
<th>Current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle (Hold track state)</td>
<td>+ 5 V DC</td>
<td>0.9 A typ.</td>
</tr>
<tr>
<td></td>
<td>+ 12 V DC</td>
<td>0.5 A typ.</td>
</tr>
<tr>
<td>Write (Active)</td>
<td>+ 5 V DC</td>
<td>1.3 A typ.</td>
</tr>
<tr>
<td></td>
<td>+ 12 V DC</td>
<td>1.5 A typ.</td>
</tr>
<tr>
<td>Read (Active)</td>
<td>+ 5 V DC</td>
<td>1.2 A typ.</td>
</tr>
<tr>
<td></td>
<td>+ 12 V DC</td>
<td>0.9 A typ.</td>
</tr>
<tr>
<td>Seek (Access)</td>
<td>+5 V DC</td>
<td>1.0 A typ.</td>
</tr>
<tr>
<td></td>
<td>+12 V DC</td>
<td>1.2 A typ.</td>
</tr>
</tbody>
</table>

7.3 Standby

Sleep mode (No disc) 1.0 W typ.
8. Acoustic noise
Less than 50 dB, A scale, at 0.5 m away from bezel and 0.45m height away
Note: 1. Disc: Less than imbalance 0.3 x 10^{-4} Nm
2. Installation: Horizontal (In system)
3. Ambient temperature: Normal temperature
4. Except loading, unloading and seek
5. ISO7779 Seated operator position

9. Dimensions
External dimensions (W x H x D) 146 x 41.3 x 165 mm (W/O Bezel, Refer to Section 15.)
Front bezel (W x H x D) 148 x 42 x 5 mm

10. Mass
610 ± 30g

11. Mechanical
11.1 Disc loading
Tray type, Auto loading
11.2 Mounting requirements

-Note-
Operation with postures other than the above drawings is not guaranteed.
12. Front Design of Front side
12.1 Front side (Front Design)

Refer to Appendix 1. for Front design (Logo, color, material, etc.)

13. Controls and Functions
13.1 Front side

13.2 Rear side
14. Connector Pin define

SATA Drive consist of two connector. First, Power connector supply 5V and 12V Power. 3.3V was not supplied.

Second, Signal Connector has 2 pairs.

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<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>S1</td>
<td>GND</td>
</tr>
<tr>
<td>S2</td>
<td>R+</td>
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<tr>
<td>S3</td>
<td>R-</td>
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<td>S4</td>
<td>GND</td>
</tr>
<tr>
<td>S5</td>
<td>T-</td>
</tr>
<tr>
<td>S6</td>
<td>T+</td>
</tr>
<tr>
<td>S7</td>
<td>GND</td>
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<tbody>
<tr>
<td>P1</td>
<td>3.3V</td>
</tr>
<tr>
<td>P2</td>
<td>3.3V</td>
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<tr>
<td>P3</td>
<td>3.3V</td>
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<tr>
<td>P4</td>
<td>GND</td>
</tr>
<tr>
<td>P5</td>
<td>GND</td>
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</tr>
<tr>
<td>P10</td>
<td>GND</td>
</tr>
<tr>
<td>P11</td>
<td>Reserved</td>
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<td>P12</td>
<td>GND</td>
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<tr>
<td>P13</td>
<td>12V</td>
</tr>
<tr>
<td>P14</td>
<td>12V</td>
</tr>
<tr>
<td>P15</td>
<td>12V</td>
</tr>
</tbody>
</table>

< SATA Connector Pin Assignment >
15. Mechanical dimensions
Mechanical Drawing (Front & Back of Drive)
Unit: mm Allowance: +/- 0.5 unless otherwise stated

Host bracket recommend holes size: 3.2~3.5mm
Torque spec.
MIN. 4Kgf, Max. : 7Kgf
Recommend spec: 5~6Kgf.cm
16. Supported Command List

16.1 ATA Commands

<table>
<thead>
<tr>
<th>&lt; Command &gt;</th>
<th>&lt; Code &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) ATAPI Packet Command</td>
<td>A0h</td>
</tr>
<tr>
<td>(2) ATAPI Soft Reset</td>
<td>08h</td>
</tr>
<tr>
<td>(3) Check Power Mode</td>
<td>E5h</td>
</tr>
<tr>
<td>(4) Execute Drive Diagnostics</td>
<td>90h</td>
</tr>
<tr>
<td>(5) Flush Cache</td>
<td>E7h</td>
</tr>
<tr>
<td>(6) Identify Packet Device</td>
<td>A1h</td>
</tr>
<tr>
<td>(7) Idle Immediate</td>
<td>E1h</td>
</tr>
<tr>
<td>(8) Set Features</td>
<td>EFh</td>
</tr>
<tr>
<td>(9) Sleep</td>
<td>E6h</td>
</tr>
<tr>
<td>(10) Standby Immediate</td>
<td>E0h</td>
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16.2 ATAPI Packet Commands

<table>
<thead>
<tr>
<th>&lt; Command &gt;</th>
<th>&lt; Code &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) BLANK</td>
<td>A1h</td>
</tr>
<tr>
<td>(2) CLOSE TRACK/RZONE/SESSION/BORDER</td>
<td>5Bh</td>
</tr>
<tr>
<td>(3) FORMAT UNIT</td>
<td>04h</td>
</tr>
<tr>
<td>(4) GET CONFIGURATION</td>
<td>46h</td>
</tr>
<tr>
<td>(5) GET EVENT STATUS NOTIFICATION</td>
<td>4Ah</td>
</tr>
<tr>
<td>(6) GET PERFORMANCE</td>
<td>ACd</td>
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<tr>
<td>(7) INQUIRY</td>
<td>12h</td>
</tr>
<tr>
<td>(8) MECHANISM STATUS</td>
<td>BDh</td>
</tr>
<tr>
<td>(9) MODE SELECT (10)</td>
<td>55h</td>
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<tr>
<td>(10) MODE SENSE (10)</td>
<td>5Ah</td>
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<tr>
<td>(11) PREVENT ALLOW MEDIUM REMOVAL</td>
<td>1Eh</td>
</tr>
<tr>
<td>(12) READ (10)</td>
<td>28h</td>
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<tr>
<td>(13) READ (12)</td>
<td>A8h</td>
</tr>
<tr>
<td>(14) READ BUFFER</td>
<td>3Ch</td>
</tr>
<tr>
<td>(15) READ BUFFER CAPACITY</td>
<td>5Ch</td>
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<tr>
<td>(16) READ CAPACITY</td>
<td>25h</td>
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<tr>
<td>(17) READ CD</td>
<td>BEh</td>
</tr>
<tr>
<td>(18) READ CD MSF</td>
<td>B9h</td>
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<tr>
<td>(19) READ DISC INFORMATION</td>
<td>51h</td>
</tr>
<tr>
<td>(20) READ DVD STRUCTURE</td>
<td>ADh</td>
</tr>
<tr>
<td>(21) READ FORMAT CAPACITIES</td>
<td>23h</td>
</tr>
<tr>
<td>(22) READ HEADER</td>
<td>44h</td>
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<tr>
<td>(23) READ SUB-CHANNEL</td>
<td>42h</td>
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<tr>
<td>(24) READ TOC/PMA/ATIP</td>
<td>43h</td>
</tr>
<tr>
<td>(25) READ TRACK/RZONE INFORMATION</td>
<td>52h</td>
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<tr>
<td>(26) REPORT KEY</td>
<td>4Ah</td>
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<tr>
<td>(27) REQUEST SENSE</td>
<td>03h</td>
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<tr>
<td>(28) RESERVE TRACK/RZONE</td>
<td>53h</td>
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<tr>
<td>(29) REZERO UNIT</td>
<td>01h</td>
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<tr>
<td>(30) SEEK</td>
<td>2Bh</td>
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<tr>
<td>(31) SEND CUE SHEET</td>
<td>5Dh</td>
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<tr>
<td>(32) SEND DVD STRUCTURE</td>
<td>BFh</td>
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<tr>
<td>(33) SEND KEY</td>
<td>A3h</td>
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<tr>
<td>(34) SEND OPC INFORMATION</td>
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<tr>
<td>Command</td>
<td>Code</td>
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<td>-------------------------------</td>
<td>------</td>
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<tr>
<td>SET CD SPEED</td>
<td>BBh</td>
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<tr>
<td>SET READ AHEAD</td>
<td>A7h</td>
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<tr>
<td>SET STREAMING</td>
<td>B6h</td>
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<tr>
<td>START/ STOP UNIT</td>
<td>1Bh</td>
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<tr>
<td>SYNCHRONIZE CACHE</td>
<td>35h</td>
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<tr>
<td>TEST UNIT READY</td>
<td>00h</td>
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<tr>
<td>VERIFY(10)</td>
<td>2Fh</td>
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<tr>
<td>WRITE(10)</td>
<td>2Ah</td>
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<tr>
<td>WRITE(12)</td>
<td>AAh</td>
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<tr>
<td>WRITE AND VERIFY(10)</td>
<td>2Eh</td>
</tr>
<tr>
<td>WRITE BUFFER</td>
<td>3Bh</td>
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</table>
17. Regulations and Standards

17.1 Safety
The product will satisfy the safety standards outlined below.
- UL: UL 60950-1 Second Edition
- CSA: CSA C22.2 No. 60950-1-07
- TÜV: EN 60950-1 / EN60825-1
- SEMKO: EN 60950-1 / EN60825-1

17.2 EMC / EMI
The product complies with applicable technical requirements as specified below:
- FCC Part15 Class B
- CE Marking
- C-Tick Mark
- Taiwan EMC (BSMI)
- VCCI

17.3 Laser safety
The product will satisfy all the requirements for the laser specified below.
- Class 1 laser product comply with DHHS rules 21 CFR Subchapter J
- Class 1 laser product to EN60825-1 / IEC 60825-1

18. Supporting Operating System & Application Software

18.1 Operating System
- Windows XP (Home/Professional/Media Center Edition) with SP2 or higher,
- Windows Vista™ (X86,X64)
- Windows 7 x86/x64
- Windows 8 x86/x64
- Windows 8.1 x86/x64

18.2 Application Software
- (1) Cyberlink
Appendix 1. Packaging Spec

HD-PE Bag

EPS PACKING

TAPE

Pallet (5 stack): 450 unit
Size: 1,140 x 1,000 x 1,245 (mm)

Bulk box 380 x 330 x 225 (mm)

Area of box label
-P/N: 3850H-1392A(90*120)
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<th>Revised Date</th>
<th>Label Information</th>
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