

Wintec SATA DOM

JM605 Series

WxDMxxxG1TC-J51xx

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Product Introduction

Wintec SATA DOM JM605 Series – 4 Channel

WxDMxxxG1TC-J51xx

The Wintec Industries WxDMxxxG1TC-J51xx series of ROHS Compliant SATA Disk-On-Module drives are constructed with NAND-type flash memory devices paired to JMicron 605 SSD controller for virtual-to-physical address mapping and other sophisticated flash management functions. The Wintec Flash Solid State Disk (SSD) provides major advantages over the traditional magnetic hard disk drive (HDD). Faster access time and transfer rate, silent operation and low power consumption, better shock and vibration resistance, and lower total cost of ownership make the Wintec SSDs an attractive choice as the next generation mass storage device.

The Wintec JM605 series SATA DOM provides high-speed data transfer and reliability utilizing SLC or MLC NAND-flash in storage capacities ranging from 4GB to 64GB in compact form factor. Its robust design enables the SSD to achieve outstanding reliability and performance.

The JM605 controller implements bad block management and dynamic/static wear-leveling techniques to ensure that the NAND flash memory is not worn out prematurely. The controller utilizes 24 bits/1K byte sector BCH ECC algorithms for error correction. The drive supports basic SMART features to monitor the drive status and TRIM command to efficiently maintain the data.

The Wintec JM605 series SATA DOM drives are ideal for portable and desktop computers, point of sale (POS), handheld device, gaming machine, network equipment, notebook, thin-client and set-top boxes (STB).

*Read/Write performance vary based on Flash type/capacity/configuration and block size used for testing.

General Features

- Density up to 64GB
- JMicron 605 controller
- SATA-II and backwards compatible
- High-Performance SLC or MLC NAND Flash memory

Reliability

- Bad Block Management & Wear Leveling
- ECC Engine: Up to 24 bits correctable per 1KB sector
- Data Integrity under power cycling
- MTTF: 1,000,000 operating hours

Performance

- High Performance 140MB/s Seq. Read (SATA-II)¹
- High Performance 60MB/s Seq. Write (SATA-II)¹
- Random Read: 5K IOPS at 4KB transfer (SATA-II)

Compatibility

- Serial ATA Revision 2.6 Compliant
- ATA/ATAPI-7 Compliant
- Supports TRIM and S.M.A.R.T command
- RoHS Compliant

NOTE:

1. See Section 5.0 for Configuration & Ordering Guide

Revision History

| Revision | Month | Year | History |
|----------|--------|------|--|
| 1.00 | August | 2012 | Preliminary Release |
| 1.01 | May | 2013 | Revised Look and Feel Removed 128GB Updated MLC available densities: 4GB-64GB Updated SLC available densities: 1GB-16GB |
| | | | |

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1.0 General Product Specifications

For all the following specifications, values are defined at ambient temperature unless otherwise stated.

Table 1: User Capacity Specifications

| Model Number ¹ (typ) ^{2,3} | NAND Flash Type | NAND Flash Total Capacity | Over-provision |
|--|-----------------|---------------------------|----------------|
| W7DM001G1TC-J51yyy-zzz.aa | SLC | 1GB | 7% |
| WxDM002G1TC-J51yyy-zzz.aa | SLC | 2GB | 7% |
| W7DM004G1TC-J51yyy-zzz.aa | SLC/MLC | 4GB | 7% |
| WxDM008G1TC-J51yyy-zzz.aa | SLC/MLC | 8GB | 7% |
| WxDM016G1TC-J51yyy-zzz.aa | SLC/MLC | 16GB | 7% |
| WxDM032G1TC-J51yyy-zzz.aa | SLC | 32 GB | 7% |
| WxDM064G1TC-J51yyy-zzz.aa | SLC | 64 GB | 7% |

Note:

- See Section 5.0 for Configuration & Ordering Guide
- 1GB = 1,000,000,000 Bytes
- Capacity available to end-user is less than "Total Capacity" due to flash controller overhead, and may vary with flash configuration.

Table 2: Typical Performance Specifications

| Parameter | Typical Performance ⁴ |
|----------------------------|----------------------------------|
| Sustained Sequential Read | Up to 140MB/s (MLC) |
| Sustained Sequential Write | Up to 60MB/s (MLC) |
| Sustained IOPS Random Read | 5,000 IOPS (MLC) |

Note:

- Bandwidth measured on high-performance desktop system. Note that performance may also vary depending on host system, drive capacity, and drive configuration. Measured at QD=32.

Table 3: Flash Endurance

| Parameter | Spec |
|----------------------|---|
| Program/Erase Cycles | Up to 70,000 cycles for SLC Up to 3,000 cycles for MLC |
| Data Retention | 5 Years (Min.) |
| MTTF | 1,000,000 Hours |

Table 4: SSD Data Reliability

| Parameter | Spec |
|------------------------|------------------------------------|
| Non-Recoverable Errors | < 1 in 10 ¹⁶ Bytes Read |
| Raw ECC Correctability | Up to 24 bits / 1024 Bytes data |

Table 5: Environmental Specifications

| Parameter | | Operating | Non-Operating |
|---------------------------|------------------|----------------|---------------|
| Temperature | Commercial Temp. | 0°C to 70°C | -55°C to 95°C |
| Humidity (Non-Condensing) | | 5% to 95% | 5% to 95% |
| Vibration | | 20 G RMS | N/A |
| Shock (Operating) | | 1,500 G (Max.) | |
| Noise | | 0 dB | 0 dB |

1.1 Block Diagram

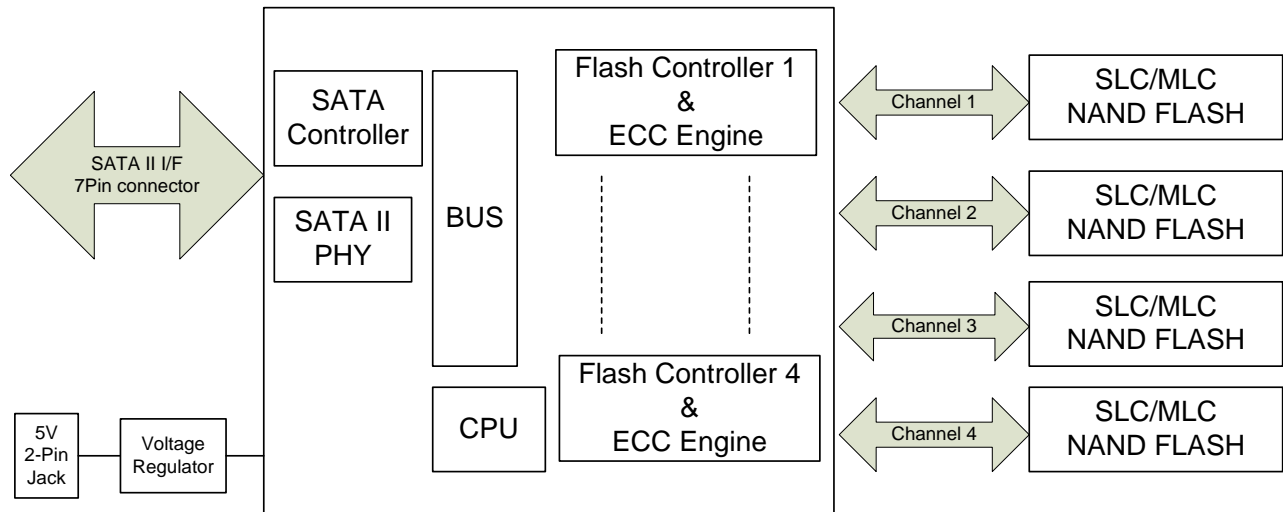


Figure 1: Block Diagram

1.2 Architecture

The Wintec JM605 series SSD utilizes a single flash controller chip with 4 parallel channels of flash memory interface. The flash controller also simultaneously manages the file read and write interface with the host system via a single SATA-II interface. By utilizing 4 parallel channels of SLC or MLC flash memory, SATA DOM SSD can provide both high performance and reliability, while maintaining a minimal unit cost.

1.3 Wear Leveling

The SSD controller tracks the number of PE (program/erase) cycles that each block in the SSD goes through, and will dynamically remap logical sectors written from the host to different physical pages and blocks within the NAND flash. This including with static wear leveling ensures the flash cells wear evenly, and no premature wear out or data loss will occur in any portions of the drive.

1.4 Error correction and data integrity

The drive supports BCH error correction code; the controller can correct 16 bits or 24 bits per 1024 byte data.

2.0 Electrical Specification

2.1 General

Table 6: Absolute Maximum Ratings

| Symbol | Parameter | Min | Max | Units |
|-----------------|-------------------------------------|------|-----|-------|
| V _{cc} | V _{cc} With Respect to GND | -0.5 | 6.0 | V |

Table 7: Typical Operating Conditions (VCC=5V ± 10%)

| Symbol | Parameter | Min | Max | Units |
|-----------------|---|-----|-----|-------|
| V _{cc} | V _{cc} With Respect to GND | 4.5 | 5.5 | V |
| T _A | Operating Temperature (Commercial Temp) | 0 | 70 | °C |
| | Operating Temperature (Industrial Temp) | -40 | 85 | °C |
| H | Humidity | 5 | 85 | % |

Table 8: Power Consumption

| Symbol | Parameter | Value | Units |
|------------------|-------------------------------------|-------|-------|
| P _i | Idle Power consumption | 0.16 | Watts |
| P _T | Typical operating power consumption | 0.55 | Watts |
| P _{max} | Maximum operating power consumption | 1.00 | Watts |

Power measurements were taken under IOMeter06 stress load with 4KB aligned reads and writes

2.2 SATA Pin Assignment and Description

The 7-Pin female SATA connector is used for data bus interface and 2-pin 5V power jack is used to provide operating voltage to the drive through the voltage regulator.

Table 9: SATA connector specification compliant

| | No. | Plug Connector Pin Definition | |
|--------|-----|-------------------------------|-----------------------|
| Signal | S1 | GND | Ground |
| | S2 | A+ | Differential signal A |
| | S3 | A- | |
| | S4 | GND | Ground |
| | S5 | B- | Differential signal B |
| | S6 | B+ | |
| | S7 | GND | Ground |

*Design option available to not use the power jack

3.0 Electrical Specification

3.1 ATA Command Set

All mandatory, and many optional commands and features are supported. The following tables summarize the ATA feature set and commands.

Table 10: ATA Command

| Feature Set | Code | Parameters Used | | | | | |
|------------------------------|------------|-----------------|----|----|----|----|----|
| | | SC | SN | CY | DR | HD | FT |
| CHECK POWER MODE | E5h | O | X | X | O | X | X |
| DEVICE CONFIGURATION OVERLAY | B1h | X | X | X | O | X | O |
| EXECUTE DIAGNOSTICS | 90h | X | X | X | O | X | X |
| FLUSH CACHE | E7h | X | X | X | O | X | X |
| FLUSH CACHE EXT | EAh | X | X | X | O | X | X |
| IDENTIFY DEVICE | ECh | X | X | X | O | X | X |
| IDLE | E3h | O | X | X | O | X | X |
| IDLE IMMEDIATE | E1h | X | X | X | O | X | X |
| NOP | 00h | F | F | F | O | X | O |
| INITIALIZE DEVICE PARAMETERS | 91h | O | X | X | O | O | X |
| READ BUFFER | E4h | X | X | X | O | X | X |
| READ DMA | C8h or C9h | O | O | O | O | O | X |
| READ DMA EXT | 25h | O | O | O | O | O | X |
| READ FPDMA QUEUED | 60h | O | O | O | O | O | O |
| READ LOG EXT | 2Fh | O | O | O | O | O | O |
| READ MULTIPLE | C4h | O | O | O | O | O | X |
| READ MULTIPLE EXT | 29h | O | O | O | O | O | X |
| READ NATIVE MAX ADDRESS | F8h | X | X | X | O | X | X |
| READ NATIVE MAX ADDRESS EXT | 27h | X | X | X | O | X | X |
| READ SECTOR(S) | 20h or 21h | O | O | O | O | O | X |
| READ SECTOR(S) EXT | 24h | O | O | O | O | O | X |
| READ VERIFY SECTOR(S) | 40h or 41h | O | O | O | O | O | X |
| READ VERIFY SECTOR(S) EXT | 42h | O | O | O | O | O | X |
| RECALIBRATE | 10h | X | X | X | O | X | X |
| SECURITY DISABLE PASSWORD | F6h | X | X | X | O | X | X |
| SECURITY ERASE PREPARE | F3h | X | X | X | O | X | X |
| SECURITY ERASE UNIT | F4h | X | X | X | O | X | X |
| SECURITY FREEZE LOCK | F5h | X | X | X | O | X | X |
| SECURITY SET PASSWORD | F1h | X | X | X | O | X | X |
| SECURITY UNLOCK | F2h | X | X | X | O | X | X |
| SEEK | 7xh | X | X | O | O | O | X |
| SET FEATURES | EFh | O | X | X | O | X | O |
| SET MAX | F9h | O | O | O | O | O | O |
| SET MAX ADDRESS EXT | 37h | O | O | O | O | O | X |
| SET MULTIPLE MODE | C6h | O | X | X | O | X | X |
| SLEEP | E6h | X | X | X | O | X | X |
| SMART | B0h | X | X | O | O | X | O |
| STANDBY | E2h | X | X | X | O | X | X |

| | | | | | | | |
|------------------------|------------|---|---|---|---|---|---|
| STANDBY IMMEDIATE | E0h | X | X | X | O | X | X |
| WRITE BUFFER | E8h | X | X | X | O | X | X |
| WRITE DMA | CAh or CBh | O | O | O | O | O | X |
| WRITE DMA EXT | 35h | O | O | O | O | O | X |
| WRITE DMA FUA EXT | 3Dh | O | O | O | O | O | X |
| WRITE FPDMA QUEUED | 61h | O | O | O | O | O | O |
| WRITE LOG EXT | 3Fh | O | O | O | O | O | X |
| WRITE MULTIPLE | C5h | O | O | O | O | O | X |
| WRITE MULTIPLE EXT | 39h | O | O | O | O | O | X |
| WRITE MULTIPLE FUA EXT | CEh | O | O | O | O | O | X |
| WRITE SECTOR(S) | 30h or 31h | O | O | O | O | O | X |
| WRITE SECTOR(S) EXT | 34h | O | O | O | O | O | X |
| WRITE VERIFY | 3Ch | O | O | O | O | O | O |

Note:

O = Valid, X = Don't care

SC = Sector Count Register

SN = Sector Number Register

CY = Cylinder Low/High Register

DR = Device Select Bit (Device/Head Register Bit 4)

HD = Head Select bit (Device/Head Register Bit 3-0)

FT = Features Register

3.2 SMART Command Support

The JM605 series SSD DOM supports basic SMART command Set used to define some vendor-specific data to report spare/bad block numbers in each memory management unit.

Table 11: SMART Function Set

| Value | Command | Value | Command |
|------------|-----------------------------------|------------|--------------------------|
| D0h | Read Data attributes | D1h | Read attribute Threshold |
| D2h | Enable/Disable attribute autosave | D3h | Save attribute Values |
| D8h | Enable SMART operation | D9h | Disable SMART operation |
| DAh | Smart Return Status | | |

3.2.1 SMART Attribute Sector

The following 512 bytes defines the SMART format. Users can obtain the data using the “Read Data” command.

Table 12: SMART Attribute Data Structure

| Byte | Description |
|----------------|---|
| 0-1 | Data Structure revision number |
| 2-13 | 1st attribute data |
| 14-361 | 2 nd -30 th individual attribute data |
| 362 | Off-line data collection status |
| 363 | Self-test execution status |
| 364-365 | Total time in seconds to complete off-line data collection |
| 366 | Reserved |
| 367 | Off-line data collection capability |
| 368-369 | SMART capability |
| 370 | Error logging capability |

| | |
|----------------|--|
| 371 | Self-test failure checkpoint |
| 372 | Short self-test routine recommended polling time (in minutes) |
| 373 | Extended self-test routine recommended polling time (in minutes) |
| 374-510 | Reserved |
| 511 | Data structure checksum |

3.2.2 Supported SMART Attribute

The following table summarizes the SMART attribute Menu.

Table 13: SMART Attribute Menu Summary

| ID | HEX | Attribute Name |
|-----|-----|------------------------------|
| 1 | 01h | Read Error Rate |
| 2 | 02h | Throughput Performance |
| 3 | 03h | Spin up time |
| 5 | 05h | Reallocated Sector Count |
| 7 | 07h | Seek Error Rate |
| 8 | 08h | Seek Time Performance |
| 9 | 09h | Power-On hours Count |
| 10 | 0Ah | Spin Retry Count |
| 12 | 0Ch | Device Power Cycle Count |
| 168 | A8h | SATA PHY Error Count |
| 170 | AAh | Bad Block Count |
| 173 | ADh | Erase Count |
| 175 | AFh | Bad Cluster Table Count |
| 192 | C0h | Unexpected power Loss Count |
| 194 | C2h | Temperature |
| 197 | C5h | Current Pending Sector Count |
| 240 | F0h | Write Head |

4.0 Physical Specifications

Table 14: Physical Specifications

| | |
|------------------|------------------------------------|
| Weight | |
| Length | 55.00 ± 0.15 mm (2.165 ± 0.006 in) |
| Width | 39.00 ± 0.10 mm (1.535 ± 0.004 in) |
| Thickness | 7.30 ± 0.10 mm (0.287 ± 0.004 in) |

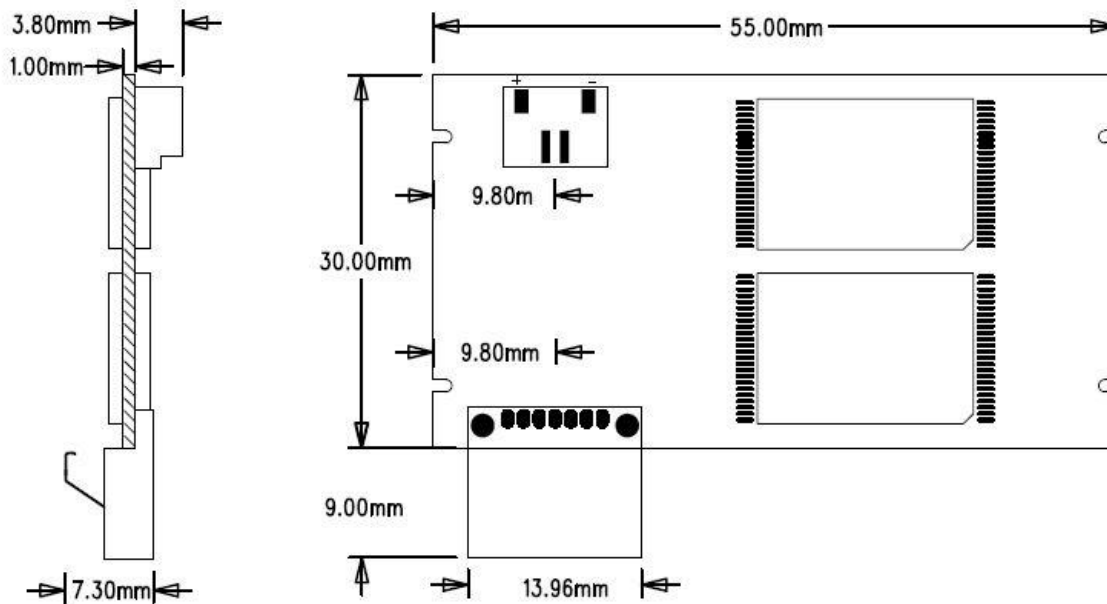


Figure 2: Physical Dimensions

5.0 Ordering Information

Wintec SATA DOM JM605 Series 4-Channel

Table 15: Product Availability List & Naming

| Part Number | NAND Flash Type |
|---------------------------|-----------------|
| WxDM001G1TC-J51yyy-zzz.aa | SLC |
| WxDM002G1TC-J51yyy-zzz.aa | SLC |
| WxDM004G1TC-J51yyy-zzz.aa | SLC/MLC |
| WxDM008G1TC-J51yyy-zzz.aa | SLC/MLC |
| WxDM016G1TC-J51yyy-zzz.aa | SLC/MLC |
| WxDM032G1TC-J51yyy-zzz.aa | SLC |
| WxDM064G1TC-J51yyy-zzz.aa | SLC |

(x) Flash Type

7 : SLC Flash
2 : MLC Flash

(www) Flash IC Manufacturer, Die Revision, Process

P: Samsung M: M-die 3: 3x nm
I: Intel A: A-die 2: 2x nm
M: Micron B: B-die

(zzz) Component Flash type

004: 4-Nand, Single Die Package, 1-CE
04D: 4-Nand, Dual Die Package, 1-CE
4D2: 4-Nand, Dual Die Package, 2-CE
4Q2: 4-Nand, Quad Die Package, 2-CE

(aa) Firmware Options

.01 : version 1

Please contact the factory for the latest firmware revisions and/or custom labeling and programming identification

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About Wintec Industries, Inc.:

Wintec Industries, founded in 1988, is headquartered in Milpitas, California. Wintec, an ODM/OEM solution provider, specializes in product designs and manufacturing, including Flash modules (CF, SD, USB, embedded Flash, SSD, etc), DRAM modules (RDIMM, SODIMM, UDIMM), wireless products, modem products (embedded and USB), Advanced Digital Display products (ADD2 DVI, HDMI, digital signage), and so on. With experienced engineering team in Silicon Valley, Wintec provides a wide range of services and solutions for customers. Wintec is ISO9001-2000 certified.

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