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# 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)<sup>1</sup>
- High Performance 60MB/s Seq. Write (SATA-II)<sup>1</sup>
- 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 <sup>1</sup> (typ) <sup>2,3</sup>	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 <sup>4</sup>
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

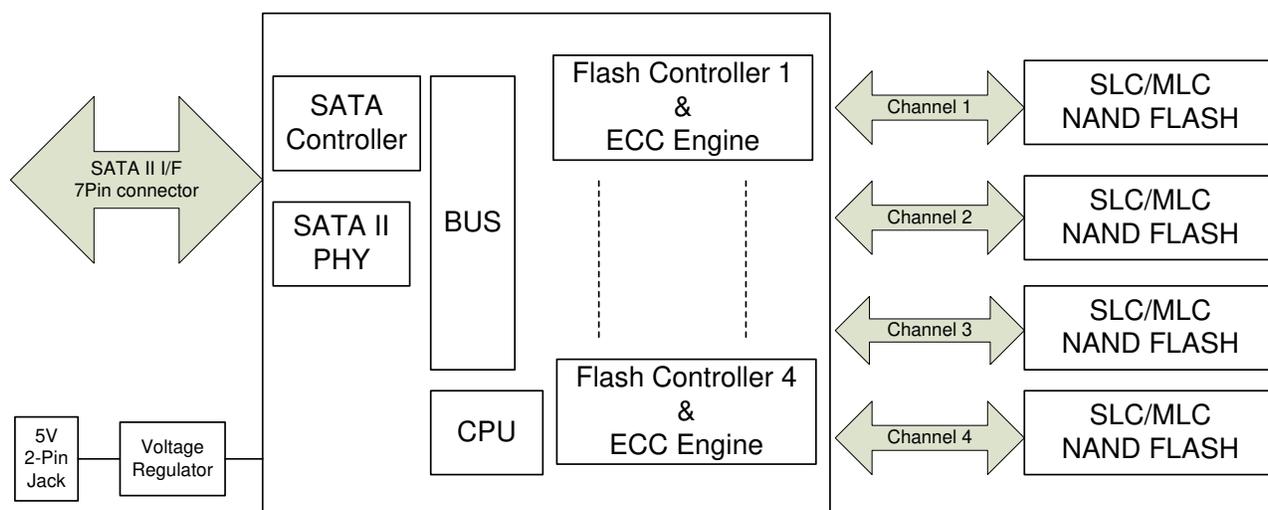
**Table 4: SSD Data Reliability**

Parameter	Spec
Non-Recoverable Errors	< 1 in 10 <sup>16</sup> 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 <sub>cc</sub>	V <sub>cc</sub> With Respect to GND	-0.5	6.0	V

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

Symbol	Parameter	Min	Max	Units
V <sub>cc</sub>	V <sub>cc</sub> With Respect to GND	4.5	5.5	V
T <sub>A</sub>	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 <sub>i</sub>	Idle Power consumption	0.16	Watts
P <sub>T</sub>	Typical operating power consumption	0.55	Watts
P <sub>max</sub>	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
<b>D0h</b>	Read Data attributes	<b>D1h</b>	Read attribute Threshold
<b>D2h</b>	Enable/Disable attribute autosave	<b>D3h</b>	Save attribute Values
<b>D8h</b>	Enable SMART operation	<b>D9h</b>	Disable SMART operation
<b>DAh</b>	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
<b>0-1</b>	Data Structure revision number
<b>2-13</b>	1st attribute data
<b>14-361</b>	2 <sup>nd</sup> -30 <sup>th</sup> individual attribute data
<b>362</b>	Off-line data collection status
<b>363</b>	Self-test execution status
<b>364-365</b>	Total time in seconds to complete off-line data collection
<b>366</b>	Reserved
<b>367</b>	Off-line data collection capability
<b>368-369</b>	SMART capability
<b>370</b>	Error logging capability

<b>371</b>	Self-test failure checkpoint
<b>372</b>	Short self-test routine recommended polling time (in minutes)
<b>373</b>	Extended self-test routine recommended polling time (in minutes)
<b>374-510</b>	Reserved
<b>511</b>	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

<b>Weight</b>	
<b>Length</b>	55.00 ± 0.15 mm (2.165 ± 0.006 in)
<b>Width</b>	39.00 ± 0.10 mm (1.535 ± 0.004 in)
<b>Thickness</b>	7.30 ± 0.10 mm (0.287 ± 0.004 in)

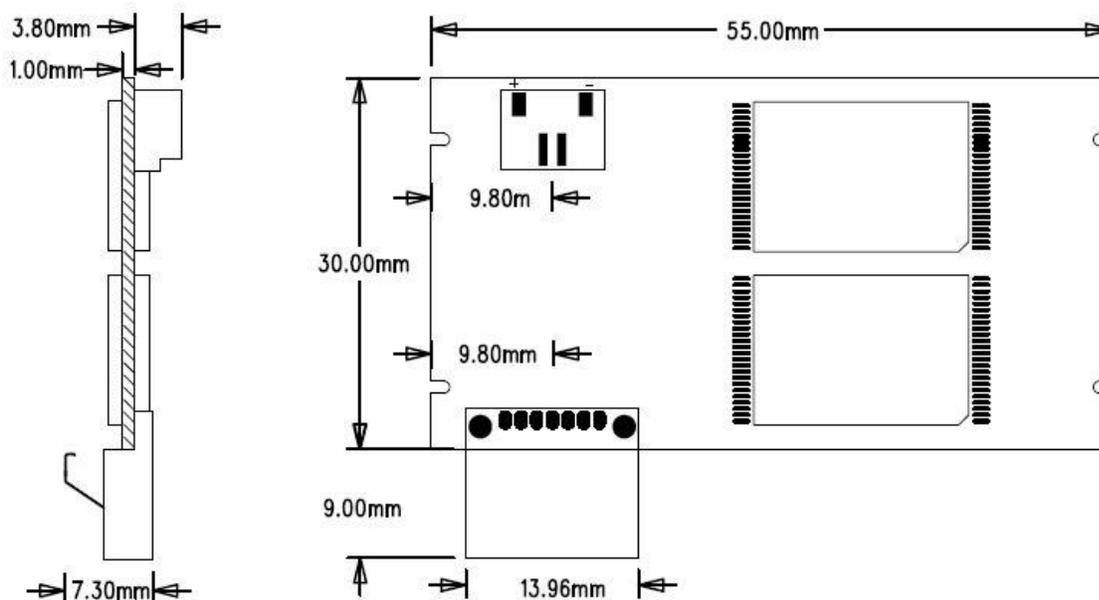


Figure 2: Physical Dimensions

## 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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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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**Datasheet**

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