Wintec SATA DOM
WxDMxxxG1TC-J51xx
(J5) Series

Revision History

Revision	Month	Year	History
1.0	Jan	2012	Preliminary Release

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Wintec SATA DOM

WxDMxxxG1TC-J51xx Series

Features:

GENERAL
- Density up to 128GB
- JMicron 605 controller
- SATA-II interface and backwards compatible
- High-Performance SLC or MLC NAND Flash memory

PERFORMANCE
- Read Performance 60MB/s Seq. Read (SATA-II)[*]
- Write Performance 15MB/s Seq. Write (SATA-II)[*]
- Random Read: 5K IOPS at 4KB transfer (SATA-II)[*]

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

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

Wintec SATA DOM

NOTE:
See Section 5.0 for Configuration & Ordering Guide

Description:

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 J5 series SATA DOM provides high-speed data transfer and reliability utilizing SLC or MLC NAND-flash in storage capacities ranging from 1GB to 128GB in compact form factor. Its robust design enables the SSD to achieve outstanding reliability and performance.

The JMF605 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 J5 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).

*8GB MLC based performance on IOMeter 2007 with 128KB sequential and 4KB random transfers.
*Read/Write performance vary based on Flash type/capacity/configuration and block size used for testing.

1.0   General Product Specification

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-provison
W7DM001G1TC-J51yyy-zzz.aa	SLC	1GB	7%
W7DM002G1TC-J51yyy-zzz.aa	SLC	2GB	7%
W7DM004G1TC-J51yyy-zzz.aa	SLC	4GB	7%
W7DM016G1TC-J51yyy-zzz.aa	SLC	16GB	7%
W2DM008G1TC-J51yyy-zzz.aa	MLC	8GB	7%
W2DM016G1TC-J51yyy-zzz.aa	MLC	16GB	7%
W2DM032G1TC-J51yyy-zzz.aa	MLC	32 GB	7%
W2DM064G1TC-J51yyy-zzz.aa	MLC	64 GB	7%
W2DM128G1TC-J51yyy-zzz.aa	MLC	128 GB	7%

NOTE:
1. See Section 5.0 for Configuration & Ordering Guide
2. 1GB = 1,000,000,000 Bytes
3. 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 60MB/sec (MLC); 80MB/sec (SLC)
Sustained Sequential Write	up to 20MB/sec (MLC); 50MB/sec (SLC)
Sustained IOPS Random Read	up to 5000 IOPS (MLC); up to 6000 IOPS (SLC)

NOTE:
4. 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 60,000 cycles for SLC up to 5,000 cycles for MLC
Data Retention	5 Years (Min.)
MTTF	2,000,000 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

| Parameters		Operating	Non-Operating
Temperature	Commercial Temp.	0°C to 70°C	-55°C to 95°C
Humidity (Non-Condensing)		5% to 85%	5% to 95%
Vibration		20 G RMS	N/A
Shock (Operating)		1,500 G (Max.)	N/A
Noise		0 dB	0 dB

1.1   Block Diagram
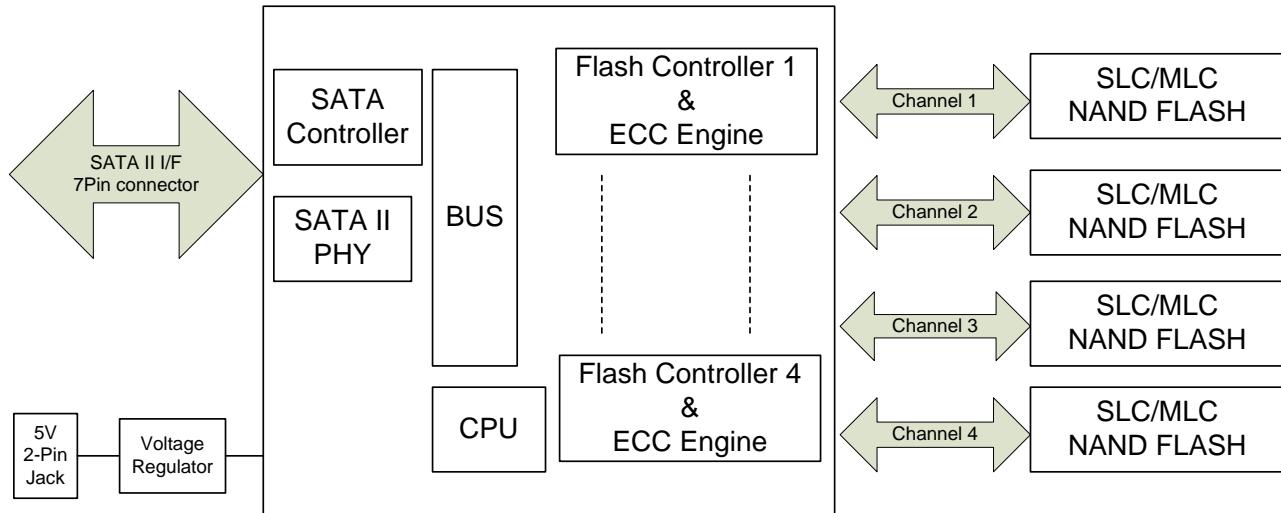
Figure 1. Block Diagram

1.2   Architecture

The Wintec J5 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   ECC Correction

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 (V_{CC}=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	TBD	Watts
P_T	Typical operating power consumption	TBD	Watts
P_{max}	Maximum operating power consumption	TBD	Watts

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
	S1	GND	Ground
	S2	A+	
	S3	A-	Differential signal A
Signal	S4	GND	Ground
	S5	B-	
	S6	B+	Differential signal B
	S7	GND	Ground

* Design option available to not use the power jack.

3.0 Software Interface

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

Command Name	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 J5 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 Command 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	2nd-30th 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 Attributes

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
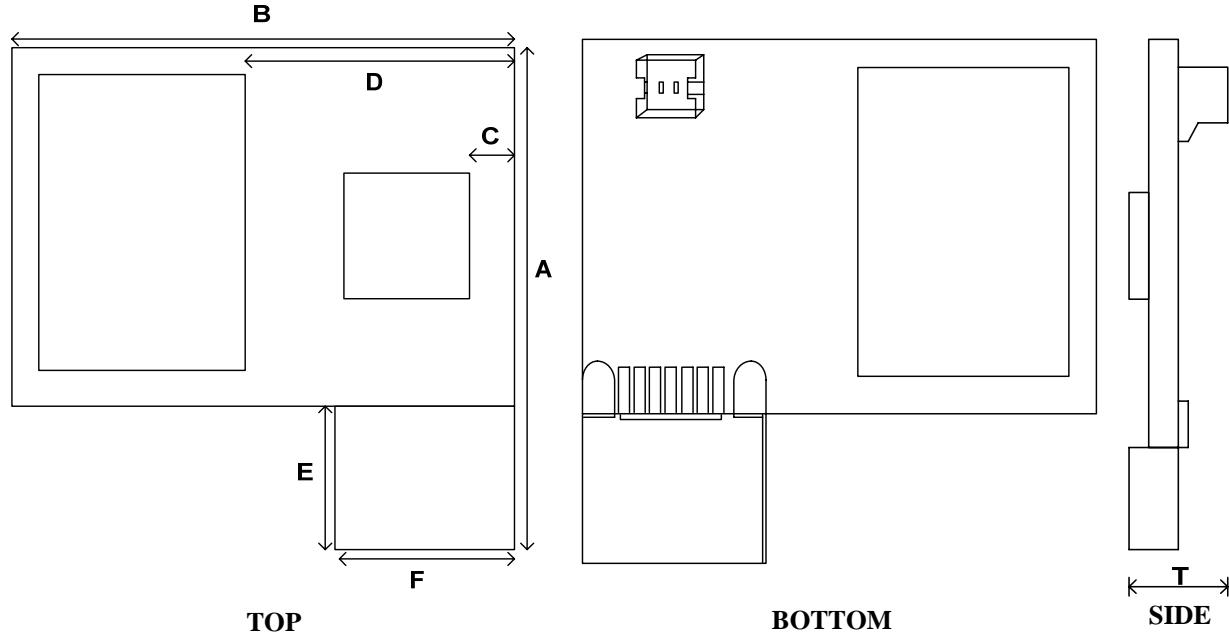
Figure 2: Physical Dimensions

Table 14: Physical Specifications

Symbol	Common Dimensions (mm)		
	Min	Nom	Max
A	33.08	33.10	33.12
B	31.92	31.95	31.98
C	3.56	3.57	3.58
D	18.06	18.08	18.10
E	9.01	9.00	9.02
F	13.99	14.00	14.01
T (Thickness)	6.12	6.15	6.18

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INDUSTRIES

5.0 Ordering Information

Table 15: Product Availability List & Naming

Model Number	NAND Flash Type	User Capacity
W7DM001G1TC-J51yyy-zzz.aa	SLC	0.94GB
W7DM002G1TC-J51yyy-zzz.aa	SLC	1.9GB
WxDM004G1TC-J51yyy-zzz.aa	SLC/MLC	2.8GB
WxDM008G1TC-J51yyy-zzz.aa	SLC/MLC	6.5 GB
WxDM016G1TC-J51yyy-zzz.aa	SLC/MLC	14 GB
WxDM032G1TC-J51yyy-zzz.aa	SLC/MLC	29 GB
WxDM064G1TC-J51yyy-zzz.aa	SLC/MLC	59 GB
WxDM128G1TC-J51yyy-zzz.aa	SLC/MLC	118 GB

(*x*)   Flash Type
   7: SLC Flash
   2: MLC Flash

(*yyy*) 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 Configuration
   002:   2-Nand, Single Die Package, 1-CE
   02D: 2-Nand, Dual Die Package, 1-CE
   2D2:   2-Nand, Dual Die Package, 2-CE
   2Q2:   2-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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