

TC-6000 Series Component Compatibility Guide

A list of peripheral components suitable for use with the TC-6000 series of computers

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1. Introduction

This document lists hardware components that are proven to provide the performance listed in the specification when used with the Moxa TC-6000 series of embedded computers, or computers that share basic design features with the TC-6000 series. Moxa computers come with multiple peripheral options and are engineered to work with components having different hardware specifications. This flexibility could sometimes lead to compatibility issues. When used with the TC-6000 series of embedded computers, peripherals from one manufacturer may not work as well as the ones made by another manufacturer. Moxa provides this list of TC-6000 series-compatible components, so that users can be certain of a reliable performance from the TC-6000 series, when used with the components listed in this document.

2. Testing Methods

To validate that a component meets the Moxa standards for quality and performance, the following five key compatibility tests are run:

- Ambient temperature burn-in
- Low temperature hard start
- Heat/humidity burn-in
- Cyclic high-low temperature burn-in
- Vibration test

Ambient Temperature Burn-In

The component is mounted on to a TC-6000 computer and put through a series of stress tests at an ambient temperature of around 25°C, for a specified period of time. The duration of the test is determined based on the class of peripherals being tested.

Low Temperature Hard Start

The component is mounted on to an unpowered TC-6000 computer and then the system is booted up at an extremely low temperature. The designated low temperature value depends on the computer model being tested.

Heat/Humidity Burn-In

The component is mounted on to a TC-6000 computer, placed in a temperature- and humidity-controlled enclosure, and then put through the burn-in test for a specified period of time. The temperature, humidity, and time targets vary depending on the specification of the computer model used in the test.

Cyclic High-Low Temperature Burn-In

The component is mounted on to a TC-6000 computer, placed in a temperature controlled enclosure, and then put through the burn-in test wherein the temperature is cyclically varied from very high to very low and back again, over a specified period of time. The target temperature range and the duration of the test can vary depending on the specification of the computer model used in the test.

Vibration Test

The component is mounted on to a TC-6000 computer that is bound inside an electromagnetic vibrator, and then put through random vibration tests along three orthogonal axes: longitudinal, transverse, and vertical. The vibration tests are compliant with the EN50155/IEC61373 vibration standards.

3. Storage Endurance

Storage media, such as SSDs, CF cards, SD cards, Disk on Module, and Cfast, are composed of different electrical components. The main electrical components in these storage media, the NAND-flash memory and NAND-flash controller, impact the storage endurance and lifespan of the storage media.

NAND-Flash Memory Endurance

NAND-flash memories have a limit on the number of times they can be programmed and erased (P/E). The P/E cycle as well as the erase count of a NAND-flash memory can be used to determine this limit. For example, an SLC (single-level cell) flash memory has a 60,000 P/E cycle, an MLC (multi-level cell) flash memory has a 3,000 P/E cycle, and TLC NAND flash memories have P/E cycle values up to 1,000. Each flash memory type has a different endurance level, which is why the storage lifespan is based on the flash memory type. Storage that uses SLC type flash memory could have the best endurance level compared with the MLC type storage. SLC storage usually comes with a 5-year OEM warranty (the actual warranty period depends on the original manufacturer). MLC storage only comes with a 1- to 3-year warranty. The major differences between SLC and MLC are: (a) The SLC NAND flash has a lifespan that is around 20 times that of an MLC, and (b) The price can differ by a factor of 4 to 5. The SLC type of storage is recommended for systems that are expected to have high reliability, and for applications that need to frequently write data to a storage medium.

Terabytes Written (TBW)

TBW is the unit used to evaluate SSD endurance. In actual applications, storage is used for routine operations and data access. Therefore the physical P/E cycle is not appropriate for describing the total rewritable data capacity. The management efficiency of the storage controller also affects the

total rewritable data capacity result. For these reasons, Joint Electron Device Engineering Council (JEDEC) has defined a standard for SSD endurance evaluation called JESD218, which uses TBW to measure the endurance of the storage memory. By referring to this TBW value, users can easily estimate the storage specification and select a suitable storage for real-life use cases. For example, when routine operations need a maximum of 20 GB and the expected storage lifespan is 3 years, the total rewritable data demand would be 21.9 TBW (20 GB x 365 x 3). In this case, a storage that has more than 21.9 TBW will meet the requirement. We recommend selecting a storage media with a TBW that is greater than the calculated value.

4. Declaration for Liability Exclusion

The specifications, warranty terms, and liability of items listed in this guide are the sole responsibility of the original manufacturers. Moxa does not take any responsibility in this regard. Please visit the manufacturers' official websites for up-to-date product information before purchasing the components.

5. Compatible Components

Peripheral components that have been tested and found suitable for use with the TC-6000 series of computers are listed in this section. The following table lists the Test Codes and their descriptions:

Test Code	Description
A	The component has passed the ambient temperature verification test
B	The component has passed the low temperature verification test
C	The component has passed the heat/humidity verification test
D	The component has passed the cyclic high-low temperature verification test
E	The component has not been tested, but is similar to another component that has been tested in terms of its material and design.
F	The component has passed the vibration verification test

DRAM

Vendor	Memory Size	Moxa's PN	Vendor's PN	Interface	Chip Brand	Speed	Test Codes
Apacer	2 GB	N/A	75.A83E4.G010C	DDR3	Micron	1600 MHz	A
DSL	2 GB	1352110022011	D3SS56081XH18AC	DDR3	Samsung	1066 MHz	B, C, D
DSL	2 GB	13521100220A1	D3SP56081XH15BBI	DDR3	ProMOS	1333 MHz	B, C, D
DSL	4 GB	1352110042070	D3SH56082XH15AB	DDR3	Hynix	1333 MHz	B, C, D
InnoDisk	2 GB	N/A	M3SP-2GHJCI0C-D	DDR3	Hynix	1600 MHz	B, C, D
InnoDisk	2 GB	N/A	M3SW-2GHJCC0C-E	DDR3	Hynix	1600 MHz	B, C, D

CF										
Vendor	Storage Size	Moxa's PN	Vendor's PN	Flash Memory Brand	Flash Memory Spec	Controller	Firmware	Warranty	Warranty Exclusion	Test Codes
InnoDisk	8 GB	1352010082115	DC1M-08GD71AW1QB	N/A	SLC	N/A	N/A	5 years	Endurance > 60,000	B, C, D
Memoright	1 GB	N/A	MRCFM2A001GB6C1IA0	Samsung	SLC	SMI2232	K1124	5 years	N/A	E
Memoright	2 GB	N/A	MRCFM2A002GB8C1IA0	Samsung	SLC	SMI2232	K1124	5 years	N/A	E
Memoright	4 GB	N/A	MRCFM2A004GB0C1IA0	Samsung	SLC	SM2232	K1124	5 years	N/A	E
Memoright	8 GB	N/A	MRCFM2A008GB0C1IA0	Samsung	SLC	SM2232	K1124	5 years	N/A	B, C, D
Memoright	16 GB	N/A	MRCFM2A016GN2C1IA0	Samsung	SLC	SM2232	K0407	5 years	N/A	B, C, D
Transcend	128 MB	N/A	TS128MCF200I	Samsung	MLC	SM2232AD	N/A	2 years	N/A	E
Transcend	256 MB	N/A	TS256MCF200I	Samsung	MLC	SM2232AD	N/A	2 years	N/A	E
Transcend	512 MB	N/A	TS512MCF200I	Samsung	MLC	SM2232AD	N/A	2 years	N/A	E
Transcend	1 GB	N/A	TS1GCF133	SanDisk/ Micron	MLC	SM2232AD	N/A	2 years	N/A	E
Transcend	1 GB	N/A	TS1GCF200I	Samsung	MLC	SM2232AD	N/A	2 years	N/A	E
Transcend	2 GB	N/A	TS2GCF133	SanDisk/ Micron	MLC	SM2232AD	N/A	2 years	N/A	E
Transcend	2 GB	N/A	TS2GCF200I	Samsung	MLC	SM2232AD	N/A	2 years	N/A	E
Transcend	4 GB	N/A	TS4GCF133	SanDisk/ Micron	MLC	SM2232AD	N/A	2 years	N/A	E
Transcend	4 GB	N/A	TS4GCF200I	Samsung	MLC	SM2232AD	N/A	2 years	N/A	A
Transcend	8 GB	N/A	TS8GCF400	SanDisk/ Micron	MLC	SM2236AC	N/A	2 years	N/A	E
Transcend	8 GB	N/A	TS8GCF133	SanDisk/ Micron	MLC	SM2232AD	N/A	2 years	N/A	E
Transcend	8 GB	N/A	TS8GCF200I	Samsung	MLC	SM2232AD	N/A	2 years	N/A	E
Transcend	16 GB	N/A	TS16GCF1000	SanDisk/ Micron	MLC	SM2232ENAC	N/A	2 years	N/A	E
Transcend	16 GB	N/A	TS16GCF400	SanDisk/ Micron	MLC	SM2236AC	N/A	2 years	N/A	E
Transcend	16 GB	N/A	TS16GCF133	SanDisk/ Micron	MLC	SM2232AD	N/A	2 years	N/A	E
Transcend	16 GB	N/A	TS16GCF200I	Samsung	MLC	SM2232AD	N/A	2 years	N/A	E
Transcend	32 GB	N/A	TS32GCF1000	SanDisk/ Micron	MLC	SM2236AC	N/A	2 years	N/A	A
Transcend	32 GB	N/A	TS32GCF400	SanDisk/ Micron	MLC	SM2236AC	N/A	2 years	N/A	A
Transcend	32 GB	N/A	TS32GCF133	SanDisk/ Micron	MLC	SM2232AD	N/A	2 years	N/A	E
Transcend	32 GB	N/A	TS32GCF200I	Samsung	MLC	SM2232AD	N/A	2 years	N/A	A

SSD

Vendor	Storage Size	Moxa's PN	Vendor's PN	Flash Memory Brand	Flash Memory Spec	Controller	Firmware	Warranty	Warranty Exclusion	Test Codes
Apacer	64 GB	N/A	AP64GAS510SB	N/A	MLC	N/A	N/A	2 years	Endurance > 3,000	A
Transcend	16 GB	N/A	TS16GSSD500	Samsung	SLC	JM616	120820	2 years	N/A	E
Transcend	32 GB	N/A	TS32GSSD500	Samsung	SLC	JM616	120820	2 years	N/A	E
Transcend	64 GB	N/A	TS64GSSD320	SanDisk/ Micron	MLC	SF2281	N/A	2 years	N/A	E
Transcend	64 GB	N/A	TS64GSSD500	Samsung	SLC	JM616	120820	2 years	N/A	A
Transcend	128 GB	N/A	TS128GSSD320	SanDisk/ Micron	MLC	SF2281	N/A	2 years	N/A	E
Transcend	256 GB	N/A	TS256GSSD320	SanDisk/ Micron	MLC	SF2281	N/A	2 years	N/A	A

HDD						
Vendor	Size	Moxa's PN	Vendor's PN	Controller	Firmware	Test Codes
HGST	500 GB	N/A	HTS725050A7E630 / 0J38075	N/A	N/A	A
HGST	640 GB	N/A	HTS541064A9E680	N/A	N/A	E
HGST	750 GB	N/A	HTS541075A9E680	N/A	N/A	E
HGST	1 TB	N/A	HCC541010A9E680	N/A	N/A	A
HGST	1 TB	N/A	HTS541010A9E680	N/A	N/A	A,F
HGST	1 TB	N/A	HTS721010A9E630 / 0J22423	N/A	N/A	A
HGST	1 TB	N/A	HTS541010A9E680	N/A	N/A	F
HGST	1 TB	N/A	HTS541010A9E650	N/A	N/A	A
HGST	1.5 TB	N/A	HTS541515A9E630	N/A	N/A	F
Samsung	2 TB	N/A	ST2000LM003	N/A	N/A	A
Toshiba	500 GB	N/A	MQ01ABD050	N/A	N/A	E
Toshiba	640 GB	N/A	MQ01ABD064	N/A	N/A	E
Toshiba	750 GB	N/A	MQ01ABD075	N/A	N/A	E
Toshiba	1 TB	N/A	MQ01ABD100	N/A	N/A	F
WD	500 GB	N/A	WD5000LUCT	N/A	N/A	E
WD	750 GB	N/A	WD7500BFCX	N/A	N/A	E
WD	750 GB	N/A	WD7500BPKT	N/A	N/A	A
WD	1 TB	N/A	WD10JUCT	N/A	N/A	A, F
WD	1 TB	N/A	WD10JPVT	N/A	N/A	A
WD	1 TB	N/A	WD10SPCX	N/A	N/A	A
WD	1 TB	N/A	WD10JFCX	N/A	N/A	F