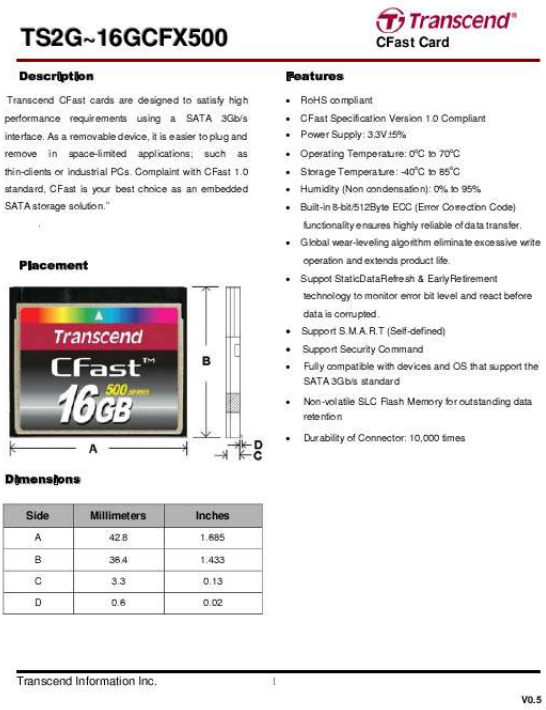

TS2G~16GCFX500

Transcend
CFast Card

Description

Transcend CFast cards are designed to satisfy high performance requirements using a SATA 3Gb/s interface. As a removable device, it is easier to plug and remove in space-limited applications; such as thin-clients or industrial PCs. Complaint with CFast 1.0 standard, CFast is your best choice as an embedded SATA storage solution."

Features

- RoHS compliant
- CFast Specification Version 1.0 Compliant
- Power Supply: 3.3V±5%
- Operating Temperature: 0°C to 70°C
- Storage Temperature: -40°C to 85°C
- Humidity (Non condensation): 0% to 95%
- Built-in 8-bit/512Byte ECC (Error Correction Code) functionality ensures highly reliable of data transfer.
- Global wear-leveling algorithm eliminate excessive write operation and extends product life.
- Suppot StaticDataRefresh & EarlyRetirement technology to monitor error bit level and react before data is corrupted.
- Support S.M.A.R.T (Self-defined)
- Support Security Command
- Fully compatible with devices and OS that support the SATA 3Gb/s standard
- Non-volatile SLC Flash Memory for outstanding data retention
- Durability of Connector: 10,000 times

Placement

Dimensions

Side	Millimeters	Inches
A	42.8	1.685
B	36.4	1.433
C	3.3	0.13
D	0.8	0.02

Transcend Information Inc. 1

V0.5

Manual abstract:

As a removable device, it is easier to plug and remove in space-limited applications; such as CFast Card Features · · · · · · · · RoHS compliant CFast Specification Version 1.0 Compliant Power Supply: 3.3V±5% Operating Temperature: 0oC to 70oC Storage Temperature: -40oC to 85oC Humidity (Non condensation): 0% to 95% Built-in 8-bit/512Byte ECC (Error Correction Code) functionality ensures highly reliable of data transfer. Global wear-leveling algorithm eliminate excessive write operation and extends product life. · Suppot StaticDataRefresh & EarlyRetirement technology to monitor error bit level and react before data is corrupted. thin-clients or industrial PCs. Complaint with CFast 1.0 standard, CFast is your best choice as an embedded SATA storage solution. . Placement · · · · · Support S.

M.A.R.T (Self-defined) Support Security Command Fully compatible with devices and OS that support the SATA 3Gb/s standard Non-volatile SLC Flash Memory for outstanding data retention Durability of Connector: 10,000 times Dimensions Side A B C D Millimeters 42.8 36.

4 3.3 0.6 Inches 1.685 1.433 0.

13 0.02 Transcend Information Inc. 1 V0.5 TS2G~16GCFX500 Specifications Physical Specification Form Factor Storage Capacities Length Dimensions (mm) Width Height Input Voltage Weight Connector CFast 2GB~16 GB 42.8 ± 0.1 36.4 ± 0.15 3.3 ± 0.1 3.

3V ± 5% TBD CFAST connector CFast Card Environmental Specifications Operating Temperature Storage Temperature Humidity Operating Non-Operating 0 to 70 - 40 to 85 0% to 95% (Non-condensing) 0% to 95% (Non-condensing) Regulations Compliance CE, FCC and BSMI Performance Model P/N TS2GCFX500 TS4GCFX500 TS8GCFX500 TS16GCFX500 Read 56 MB/s 56 MB/s 102 MB/s 108 MB/s Write 27MB/s 49MB/s 88MB/s 91MB/s ® Random Read 50 MB/s 50 MB/s 83MB/s 89 MB/s Random Write 8 MB/s 12 MB/s 17 MB/s 18 MB/s Note: 25 , test on ASUS P4S800-MX, 1GB RAM, Windows XP Version 2002 SP2, benchmark utility HDBENCH (version 3.4006), copied file 1GB. Transcend Information Inc. 2 V0.5 TS2G~16GCFX500 Actual Capacity Model P/N TS2GCFX500 TS4GCFX500 TS8GCFX500 TS16GCFX500 User Max. LBA 3,865,680 7,732,368/ 15,465,344 30,932,992 Cylinder 3,835 7,671 15,343 16,383 CFast Card Head 16 16 16 15 Sector 63 63 63 63 Power Requirements Input Voltage Mode Write(peak) Power Consumption Read(peak) Idle(peak) 3.3V ± 5% Max. (mA) 352 371 141 SHOCK & Vibration Test Condition Mechanical Shock Test Vibration Test 1500G, 0.5ms, 3 axis 20G (Peak-to-Peak) 20Hz to 2000Hz (Frequency) Standard IEC 60068-2-27 IEC 60068-2-6 Transcend Information Inc. 3 V0.

5 TS2G~16GCFX500 Package Dimensions Below figure illustrates the Transcend CFastTM. All dimensions are in mm. CFast Card Transcend Information Inc. 4 V0.5 TS2G~16GCFX500 Pin Assignments Pin No.

S1 S2 S3 S4 S5 S6 S7 PC1 PC2 PC3 PC4 PC5 PC6 PC7 PC8 PC9 PC10 PC11 PC12 PC13 PC14 PC15 PC16 PC17 Pin Name 7-pin Signal Segment GND A+ AGND BB+ GND 17-pin Power Segment CDI GND NC NC NC NC GND NC NC NC NC NC 3.3V 3.3V GND GND CDO CFast Card Pin Layout Transcend Information Inc. 5 V0.5 TS2G~16GCFX500 Block Diagram CFast Card CFASTTM Interface SATA SSD CTL Flash Flash Flash Flash Transcend Information Inc.

6 V0.5 TS2G~16GCFX500 Reliability Wear-Leveling algorithm CFast Card The controller supports static/dynamic wear leveling. @@This is known as dynamic wear leveling. @@@@@@StaticDataRefresh Technology Normally, ECC engine corrections are taken place without affecting the host normal operations. As time passes by, the number of error bits accumulated in the read transaction exceeds the correcting capability of the ECC engine, resulting in corrupted data being sent to the host. To prevent this, the controller monitors the error bit levels at each read operation; when it reaches the preset threshold value, the controller automatically performs data refresh to "restore" the correct charge levels in the cell. This implementation practically restores the data to its original, error-free state, and hence, lengthening the life of the data. EarlyRetirement Technology The StaticDataRefresh feature functions well when the cells in a block are still healthy. As the block ages over time, it cannot reliably store charge anymore, EarlyRetirement enters the scene. EarlyRetirement works by moving the static data to another block (a health block) before the previously used block becomes completely incapable of holding charges for data.

When the charge loss error level exceeds another threshold value (higher from that for StaticDataRefresh), the controller automatically moves its data to another block. In addition, the original block is then marked as a bad block, which prevents its further use, and thus the block enters the state of "EarlyRetirement." Note that, through this process, the incorrect data are detected and effectively corrected by the ECC engine, thus the data in the new block is stored error-free. Transcend Information Inc. 7 V0.5 TS2G~16GCFX500 CFastTM Interface Out of bank signaling CFast Card There shall be three Out Of Band (OOB) signals used/detected by the Phy: COMRESET, COMINIT, and COMWAKE. COMINIT, COMRESET and COMWAKE OOB signaling shall be achieved by transmission of either a burst of four Gen1 ALIGNP primitives or a burst composed of four Gen1 Dwords with each Dword composed of four D24.3 characters, each burst having a duration of 160 UIOOB. Each burst is followed by idle periods (at common-mode levels), having durations as depicted in Figure 4 and Table 2. Figure 4 : OOB signals Table 2 : OOB signal times Transcend Information Inc.

8 V0.5 TS2G~16GCFX500 COMRESET CFast Card COMRESET always originates from the host controller, and forces a hardware reset in the device. It is indicated by transmitting bursts of data separated by an idle bus condition. The OOB COMRESET signal shall consist of no less than six data bursts, including inter-burst temporal spacing. The COMRESET signal shall be: 1) Sustained/continued uninterrupted as long as the system hard reset is asserted, or 2) Started during the system hardware reset and ended some time after the negation of system hardware reset, or 3) Transmitted immediately following the negation of the system hardware reset signal.

The host controller shall ignore any signal received from the device from the assertion of the hardware reset signal until the COMRESET signal is transmitted. Each burst shall be 160 Gen1 UI's long (106.7 ns) and each inter-burst idle state shall be 480 Gen1 UI's long (320 ns). A COMRESET detector looks for four consecutive bursts with 320 ns spacing (nominal). Any spacing less than 175 ns or greater than 525 ns shall invalidate the COMRESET detector output.

The COMRESET interface signal to the Phy layer shall initiate the Reset sequence shown in Figure 5 below.

The interface shall be held inactive for at least 525 ns after the last burst to ensure far-end detector detects the negation properly. Figure 5: Comreset sequence Transcend Information Inc. 9 V0.5 TS2G~16GCFX500 Description: 2. Some condition in the host causes the host to issue COMRESET CFast Card 1. Host/device is powered and operating normally with some form of active communication. 3. Host releases COMRESET. Once the condition causing the COMRESET is released, the host releases the COMRESET signal and puts the bus in a quiescent condition.

4. Device issues COMINIT When the device detects the release of COMRESET, it responds with a COMINIT. This is also the entry point if the device is late starting. The device may initiate communications at any time by issuing a COMINIT. 5. Host calibrates and issues a COMWAKE. 6. @@@@After ALIGNP Dwords have been sent for 54.6us (2048 nominal Gen1 Dword times) without a response from the host as determined by detection of ALIGNP primitives received from the host, the device assumes that the host cannot communicate at that speed. If additional speeds are available the device tries the next lower supported speed by sending ALIGNP Dwords at that rate for 54.
6 us (2048 nominal Gen1 Dword times.) This step is repeated for as many slower speeds as are supported. Once the lowest speed has been reached without response from the host, the device enters an error state. 7. @@@@A host shall be designed such that it acquires lock in 54.
6us (2048 nominal Gen1 Dword times) at any given speed. @@@@If no ALIGNP is received within 873.8 us (32768 nominal Gen1 Dword times) the host restarts the power-on sequence repeating indefinitely until told to stop by the Application layer. 8. @@9.
@@@@@@@@2. Some condition in the device causes the device to issues a COMINIT 3. Host calibrates and issues a COMWAKE. 4.
@@@@@@@@Once the lowest speed has been 5. @@@@@@@@@@If no ALIGNP is received within 873.8 us (32768 nominal Gen1 Dword times) the host restarts the potic Non-data PIO data-In DMA PIO data-In PIO data-In Non-data Non-data Non-data DMA PIO data-out PIO data-out Non-data PIO data-In PIO data-out Non-data Non-data Non-data Non-data Non-data Non-data PIO data-out PIO data-out Non-data PIO data-out Non-data PIO data-out Non-data Non-data Non-data Non-data Non-data PIO data-In Non-data Non-data PIO data-out Non-data Non-data PIO data-out Power Management Feature Set CHECK POWER MODE IDLE IDLE IMMEDIATE SLEEP STANDBY STANDBY IMMEDIATE Security Mode Feature Set SECURITY SET PASSWORD SECURITY UNLOCK SECURITY ERASE PREPARE SECURITY ERASE UNIT SECURITY FREEZE LOCK SECURITY DISABLE PASSWORD SMART Feature Set SMART Disable Operations SMART Enable/Disable Autosave SMART Enable Operations SMART Return Status SMART Execute Off-Line Immediate SMART Read Data Host Protected Area Feature Set Read Native Max Address Set Max Address Set Max Set Password Set Max Lock Set Max Freeze Lock Set Max Unlock Transcend Information Inc. 14 V0.5 TS2G~16GCFX500 ATA Command Specifications FLUSH CACHE (E7h) CFast Card This command is used by the host to request the device to flush the write cache. @@@@@@@@@@@@@@@@Use the SET FEATURES command to specify the mode value.

A sector count of zero requests 256 sectors. READ MULTIPLE (C4h) This command performs similarly to the Read Sectors command. Interrupts are not generated on each sector, but on the transfer of a block which contains the number of sectors defined by a Set Multiple command. READ SECTOR(S) (20h) This command reads 1 to 256 sectors as specified in the Sector Count register from sectors which is set by Sector number register. A sector count of 0 requests 256 sectors. The transfer beings specified in the Sector Number register. READ VERIFY SECTOR(S) (40h/41h) This command verifies one or more sectors on the drive by transferring data from the flash media to the data buffer in the drive and verifying that the ECC is correct. This command is identical to the Read Sectors command, except that DRQ is never set and no data is transferred to the host. SET FEATURES (EFh) This command set parameter to Features register and set drive's operation. For transfer mode, parameter is set to Sector Count register.
This command is used by the host to establish or select certain features. SET MULTIPLE MODE (C6h) This command enables the device to perform READ MULTIPLE and WRITE MULTIPLE operations and establishes the block count for these commands. WRITE DMA (CAh) Write data to sectors during Ultra DMA and Multiword DMA transfer. Use the SET FEATURES command to specify the mode value. WRITE MULTIPLE (C5h) This command is similar to the Write Sectors command.
Interrupts are not presented on each sector, but on the transfer of a block which contains the number of sectors defined by Set Multiple command. WRITE SECTOR(S) (30h) Write data to a specified number of sectors (1 to 256, as specified with the Sector Count register) from the specified address. Specify "00h" to write 256 sectors. NOP (00h) The device shall respond with command aborted. For devices implementing the Overlapped feature set, subcommand code 00h in the Features register shall abort any outstanding queue.
Subcommand codes 01h through FFh in the Features register shall not affect the status of any outstanding queue. READ BUFFER (E4h) The READ BUFFER command enables the host to read a 512-byte block of data. WRITE BUFFER (E8h) Transcend Information Inc. 18 V0.5 TS2G~16GCFX500 Power Management Feature Set CHECK POWER MODE (E5h or 98h) CFast Card This command enables the host to write the contents of one 512-byte block of data to the device's buffer. The host can use this command to determine the current power management mode. IDLE (E3h or 97h) This command causes the device to set BSY, enter the Idle mode, clear BSY and generate an interrupt. If sector count is non-zero, the automatic power down mode is enabled. If the sector count is zero, the automatic power mode is disabled. IDLE IMMEDIATE (E1h or 95h) This command causes the device to set BSY, enter the Idle(Read) mode, clear BSY and generate an interrupt.

SLEEP (E6h or 99h) This command causes the device to set BSY, enter the Sleep mode, clear BSY and generate an interrupt. STANDBY (E2h or 96h) This command causes the device to set BSY, enter the Sleep mode (which corresponds to the ATA "Standby" Mode), clear BSY and return the interrupt immediately. STANDBY IMMEDIATE (E0h or 94h) This command causes the drive to set BSY, enter the Sleep mode (which corresponds to the ATA "Standby" Mode), clear BSY and return the interrupt immediately. Security Mode Feature Set SECURITY SET PASSWORD (F1h) This command set user password or master password. The host outputs sector data with PIO data-out protocol to indicate the information defined in the following table. Security set Password data content Word 0 Control word Bit 0 Identifier 0=set user password 1=set master password Bits 1-7 Bit 8 Reserved Security level 0=High 1=Maximum Bits 9-15 1-16 Reserved Content Password (32 bytes) 19 V0.

5 Transcend Information Inc. TS2G~16GCFX500 17-255 Reserved CFast Card Transcend Information Inc. 20 V0.5 TS2G~16GCFX500 SECURITY UNLOCK (F2h) CFast Card This command disables LOCKED MODE of the device.

This command transfers 512 bytes of data from the host with PIO data-out protocol. The following table defines the content of this information. Security Unlock information Word 0 Control word Bit 0 Identifier 0=compare user password 1=compare master password Bits 1-15 1-16 17-255 Reserved Content Password (32 bytes) Reserved SECURITY DISABLE PASSWORD (F6h) Disables any previously set user password and cancels the lock. The host transfers 512 bytes of data, as shown in the following table, to the drive. The transferred data contains a user or master password, which the drive compares with the saved password.

If they match, the drive cancels the lock. The master password is still saved. It is re-enabled by issuing the SECURITY SET PASSWORD command to re-set a user password. SECURITY ERASE PREPARE (F3h) This command shall be issued immediately before the Security Erase Unit command to enable erasing and unlocking. This command prevents accidental loss of data on the drive.

SECURITY ERASE UNIT (F4h) The host uses this command to transfer 512 bytes of data, as shown in the following table, to the drive. The transferred data contains a user or master password, which the drive compares with the saved password. If they match, the drive deletes user data, disables the user password, and cancels the lock. The master password is still saved. It is re-enabled by issuing the SECURITY SET PASSWORD command to re-set a user password. SECURITY FREEZE LOCK (F5h) Causes the drive to enter Frozen mode. Once this command has been executed, the following commands to update a lock result in the Aborted Command error: · SECURITY SET PASSWORD · SECURITY UNLOCK · SECURITY DISABLE PASSWORD · SECURITY ERASE PREPARE · SECURITY ERASE UNIT Transcend Information Inc. 21 V0.5 TS2G~16GCFX500 CFast Card The drive exits from Frozen mode upon a power-off or hard reset. If the SECURITY FREEZE LOCK command is issued when the drive is placed in Frozen mode, the drive executes the command, staying in Frozen mode.

SMART Feature Set Transcend IDE SSD supports the SMART command set and define some vendor-specific data to report spare/bad block numbers in each memory management unit. Individual SMART commands are identified by the value placed in the Feature register. Table shows these Feature register values. Value Command D0h SMART READ DATA D2h SMART ENABLE/DISABLE ATTRIBUTE AUTOSAVE D4h SMART EXECUTE OFF-LINE IMMEDIATE D8h SMART ENABLE OPERATIONS D9h SMART DISABLE OPERATIONS DAh SMART RETURN STATUS SMART DISABLE OPERATIONS B0h with a Feature register value of D9h.Disables the SMART function. Upon receiving the command, the drive disables all SMART operations. This setting is maintained when the power is turned off and then back on. Once this command has been received, all SMART commands other than SMART ENABLE OPERATIONS are aborted with the Aborted Command error. This command disables all SMART capabilities including any and all timer and event count functions related exclusively to this feature. After command acceptance, this controller will disable all SMART operations.

SMART data in no longer be monitored or saved. The state of SMART is preserved across power cycles. SMART ENABLE/DISABLE ATTRIBUTE AUTOSAVE B0h with a Feature register value of D2h.Enables or disables the attribute value autosave function. This command specifies whether the current attribute values are automatically saved to the drive when it changes the mode.

This setting is maintained when the power is turned on and off. SMART ENABL OPERATIONS B0h with a Feature register value of D8h.Enables the SMART function. This setting is maintained when the power is turned off and then back on. @@@@@@@@If a threshold exceeded condition is detected by the device, the device shall set the LBA Mid register to F4h and the LBA High register to 2Ch.

SMART Read Data B0h with the content of the Features register is equal to D0h. This command returns the Device SMART data structure to the host. SMART DATA Structure The following 512 bytes make up the device SMART data structure. Users can obtain the data using the Transcend Information Inc. 23 V0.5 TS2G~16GCFX500 CFast Card The above technical information is based on industry standard data and has been tested to be reliable. However, Transcend makes no warranty, either expressed or implied, as to its accuracy and assumes no liability in connection with the use of this product. Transcend reserves the right to make changes to the specifications at any time without prior notice USA Los Angeles: E-mail: sales@transcendusa.com Maryland: E-mail: sales_md@transcendusa.com www.

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