

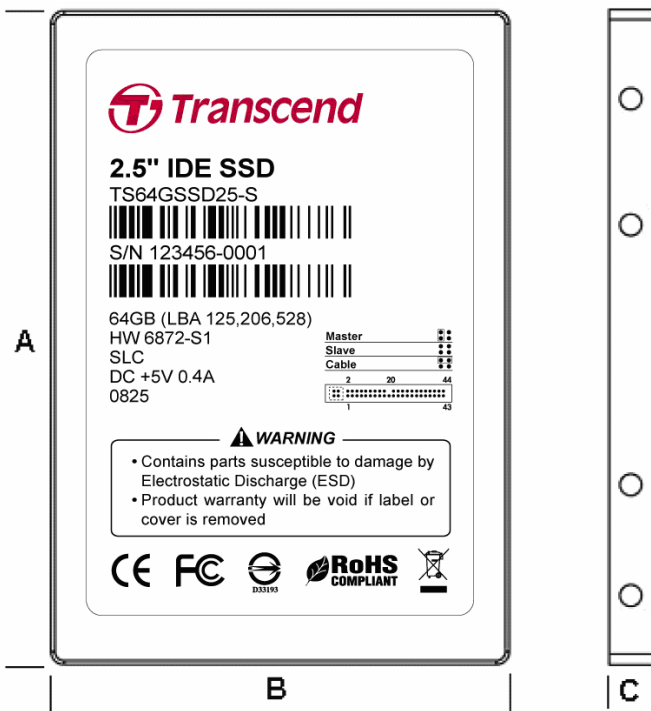
TS8GSSD25-S TS16GSSD25-S TS32GSSD25-S/M TS64GSSD25-M

2.5" Solid State Disk

Description

Due to smaller size (fit the standard dimensions of 2.5" IDE Hard Disk Drives), huge capacity, high speed, and low power consumption, Solid State Disk is perfect replacement storage device for PCs, Laptops, gaming systems, and handheld devices.

Placement



Features

- RoHS compliant
- Fully compatible with devices and OS that support the IDE standard (44-Pin, pitch = 2.00 mm)
- Non-volatile Flash Memory for outstanding data retention
- Built-in ECC (Error Correction Code) functionality and wear-leveling algorithm ensures highly reliable of data transfer
- Supports up to Ultra DMA Mode 5
- Shock resistance

Dimensions

Side	Millimeters	Inches
A	100.00 ± 0.40	3.937 ± 0.016
B	69.85 ± 0.20	2.750 ± 0.008
C	7.40 ± 0.15	0.292 ± 0.004

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

Specifications

Physical Specification		
Form Factor	2.5-inch HDD	
Storage Capacities	8 GB to 64 GB	
Dimensions (mm)	Length	100.0 0 ± 0.40
	Width	69.85 ± 0.20
	Height	7.40 ± 0.15
Input Voltage	3.3V/5V ± 5%	
Weight	80 g	
Connector	44-Pin standard IDE/ATA connector (Pitch 2.0 mm)	

Environmental Specifications	
Operating Temperature	0 °C to 70 °C
Storage Temperature	- 40 °C to 85 °C

Power Requirements			
Input Voltage	3.3V/5V ± 5%		
Mode		TYP (mA)	TYP (W)
Power Consumption (DC 5V @25°C)	Write	326.5	1.6
	Read	307.5	1.5
	Idle	151.6	0.7

Reliability	
Data Reliability	Supports BCH ECC 8 bits in 512 bytes
Data Retention	10 years
MTBF	1,000,000 hours

Interface Specification	
Jumper Settings	Master/Slave/Cable-select Settings
ATA Compatibility	ATA/ATAPI 6
	UDMA Modes 5

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

Performance				
Model P/N	Read (MB/s)	Write (MB/s)	Random Read (MB/s)	Random Write (MB/s)
TS8GSSD25-S	70	61~68	55~62	24
TS16GSSD25-S	70~84	60~74	60~64	20~24
TS32GSSD25-S	71~80	68~71	55~60	20~24
TS32GSSD25-M	68~80	47	52	14~18
TS64GSSD25-M	66~80	48	52	14~18

Actual Capacity				
Model P/N	User Max. LBA	Cylinder	Head	Sector
TS8GSSD25-S	15,604,848	15,498	16	63
TS16GSSD25-S	31,244,288	16,383	16	63
TS32GSSD25-S	62,521,344	16,383	16	63
TS32GSSD25-M	62,521,344	16,383	16	63
TS64GSSD25-M	125,206,528	16,383	16	63

Regulations	
Compliance	CE, FCC and BSMI

Vibration	
Operating	3.0G, 5 - 800Hz
Non-Operating	3.0G, 5 - 800Hz

* Note: Reference to the IEC 60068-2-6 Testing procedures; Operating-Sine wave, 5-800Hz/1 oct., 1.5mm, 3g, 0.5 hr./axis, total 1.5 hrs.

Shock	
Operating	1500G, 0.5ms
Non-Operating	1500G, 0.5ms

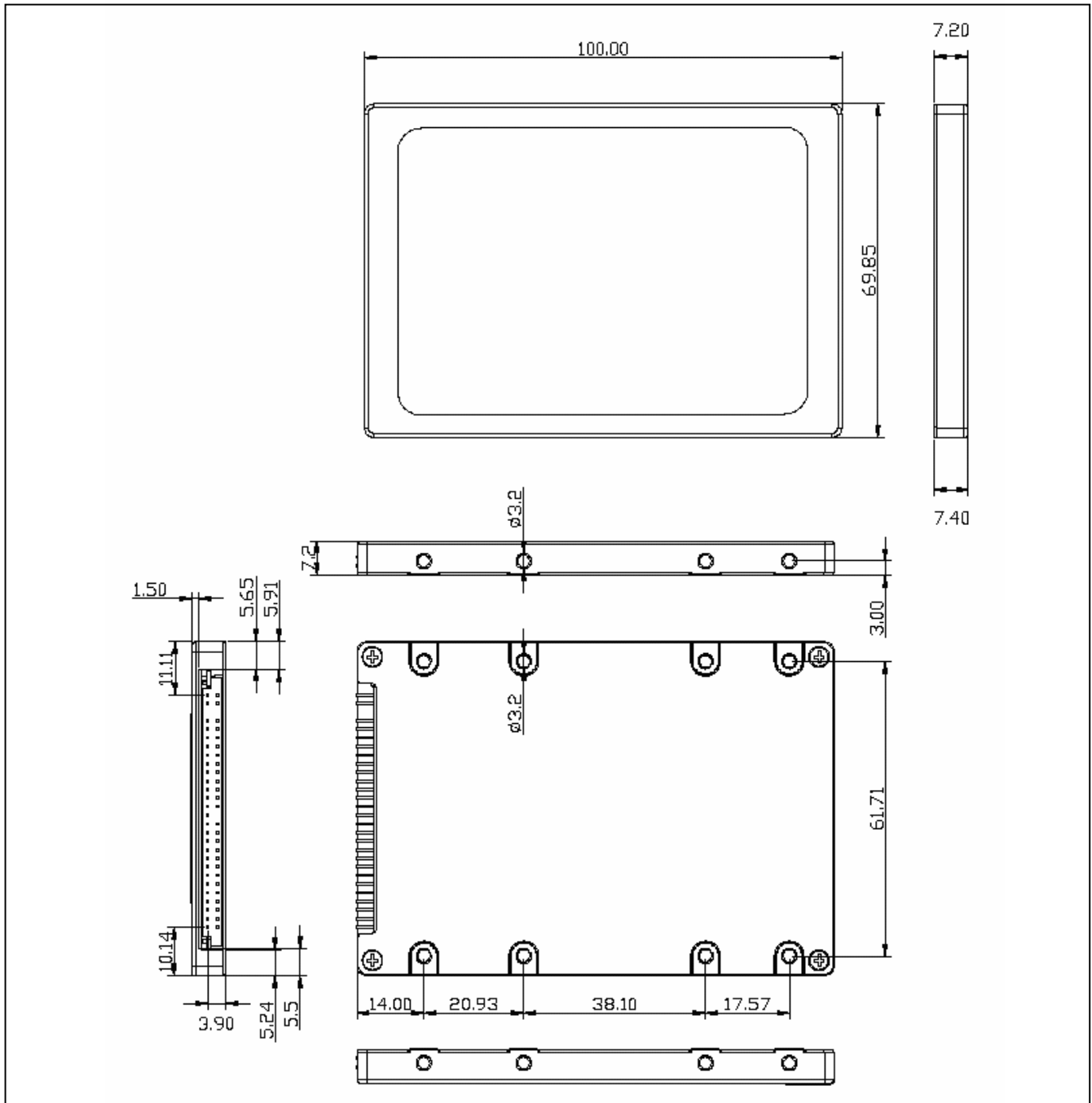
* Note: Reference to the IEC 60068-2-27 Testing procedures; Operating-Half-sine wave, 1500g, 0.5ms, 3 times/dir., total 18 times.

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

Package Dimensions

Below figure illustrates the Transcend 2.5" Solid State Disk. All dimensions are in mm.



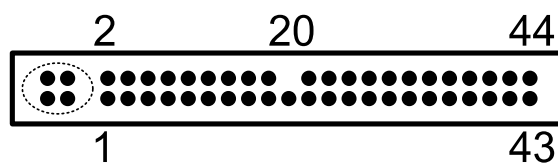
TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

Pin Assignments

Pin No.	Pin Name	Pin No.	Pin Name
01	-RESET	02	GND
03	DD7	04	DD8
05	DD6	06	DD9
07	DD5	08	DD10
09	DD4	10	DD11
11	DD3	12	DD12
13	DD2	14	DD13
15	DD1	16	DD14
17	DD0	18	DD15
19	GND	20	KEY-PIN (OPEN)
21	DMARQ	22	GND
23	-DIOW : STOP	24	GND
25	-DIOR : -HDMARDY : HSTROBE	26	GND
27	IORDY : DDMARDY : DSTROBE	28	CSEL
29	-DMACK	30	GND
31	INTRQ	32	IOCS16B
33	DA1	34	-PDIAG : -CBLID
35	DA0	36	DA2
37	-CS0	38	-CS1
39	-DASP	40	GND
41	VCC	42	VCC
43	GND	44	NC (No Connect)

Pin Layout



Master Mode



Slave Mode

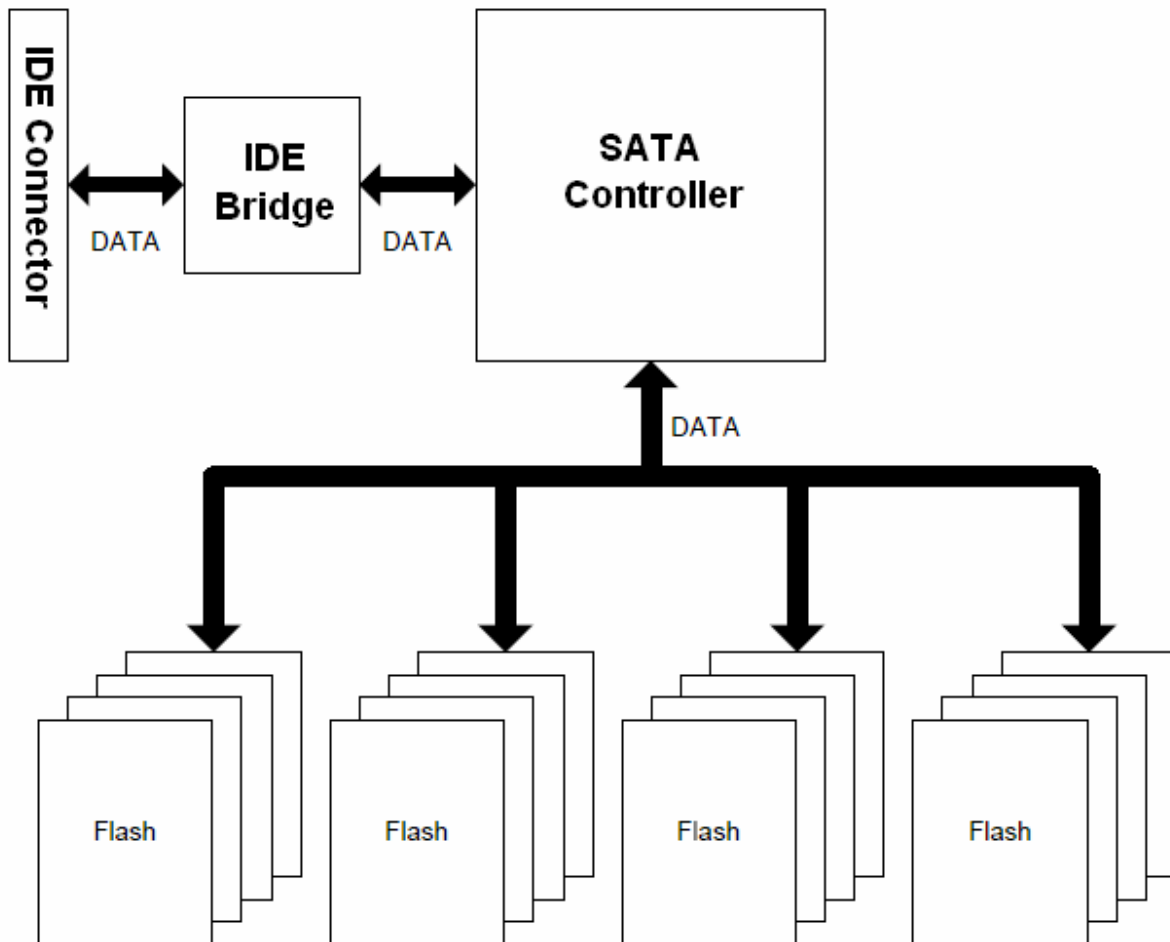


Cable Select

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

Block Diagram



TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

Reliability

Wear-Leveling algorithm

The controller supports static/dynamic wear leveling. When the host writes data, the controller will find and use the block with the lowest erase count among the free blocks. This is known as dynamic wear leveling. When the free blocks' erase count is higher than the data blocks', it will activate the static wear leveling, replacing the not so frequently used user blocks with the high erase count free blocks.

ECC algorithm

The controller use BCH8 ECC algorithm per 512 bytes. BCH8 can correct up to 8 random error bits within 512 data bytes.

Bad-block management

When the flash encounters ECC failed, program fail or erase fail, the controller will mark the block as bad block to prevent the used of this block and caused data lost later on.

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

Support ATA/ATAPI Command List

Command Name	Code	PARAMETERS USED					
		SC	SN	CY	DR	HD	FT
CHECK POWER MODE	E5h	X	X	X	O	X	X
EXECUTE DIAGNOSTICS	90h	X	X	X	O	X	X
FLUSH CACHE	E7h	X	X	X	O	O	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
INITIALIZE DEVICE PARAMETERS	91h	O	X	X	O	O	X
READ DMA	C8h or C9h	O	O	O	O	O	X
READ MULTIPLE	C4h	O	O	O	O	O	X
READ SECTOR(S)	20h or 21h	O	O	O	O	O	X
READ VERIFY SECTOR(S)	40h or 41h	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 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 DMA	CAh or CBh	O	O	O	O	O	X
WRITE MULTIPLE	C5h	O	O	O	O	O	X
WRITE SECTOR(S)	30h or 31h	O	O	O	O	O	X

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

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

ATA Command Specifications

CHECK POWER MODE (E5h)

The host can use this command to determine the current power management mode.

EXECUTE DIAGNOSTICS (90h)

This command performs the internal diagnostic tests implemented by the drive.

FLUSH CACHE (E7h)

This command is used by the host to request the device to flush the write cache. If there is data in the write cache, that data shall be written to the media. The BSY bit shall remain set to one until all data has been successfully written or an error occurs.

IDENTIFY DEVICE (ECh)

This commands read out 512Bytes of drive parameter information. Parameter Information consists of the arrangement and value as shown in the following table. This command enables the host to receive the Identify Drive Information from the device.

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

Identify Device Information Default Value

Word	Value	F/V	Description
			General configuration bit-significant information:
		F	15 0 = ATA device
		X	14-8 Retired
		F	7 1 = removable media device
0	0040h	X	6 Obsolete
		X	5-3 Retired
		F	2 Reserved
		X	1 Retired
		F	0 Reserved
1	XXXXh	X	Number of logical cylinders
2	C837h	V	Specific configuration
3	00XXh	X	Number of logical heads
4-5	XXXXh	X	Retired
6	XXXXh	X	Number of logical sector per logical track
7-8	XXXXh	V	Reserved for assignment by the CompactFlash_ Association
9	000Eh	X	Retired
10-19	XXXXh	F	Serial number (20 ASCII characters)
20-21	XXXXh	X	Retired
22	003Fh	X	Obsolete
23-26	XXXXh	F	Firmware revision (8 ASCII characters)
27-46	XXXXh	F	Model number (40 ASCII characters)
		F	15-8 80h
47	8000h	F	7-0 00h = Reserved
		F	01h = Maximum number of 1 sectors on READ/WRITE MULTIPLE commands
48	4000h	F	Reserved
			Capabilities
		F	15-14 Reserved for the IDENTIFY PACKET DEVICE command.
		F	13 1 = Standby timer values as specified in this standard are supported 0 = Standby timer values shall be managed by the device
		F	12 Reserved for the IDENTIFY PACKET DEVICE command.
49	2F00h	F	11 1 = IORDY supported 0 = IORDY may be supported
		F	10 1 = IORDY may be disabled
		F	9 1 = LBA supported
		F	8 1 = DMA supported.
		X	7-0 Retired
			Capabilities
50	4000h	F	15 Shall be cleared to zero.
		F	14 Shall be set to one.

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

		F	13-2	Reserved.
		X	1	Obsolete
		F	0	Shall be set to one to indicate a device specific Standby timer value minimum.
51	0280h	X	15-8	PIO data transfer cycle timing mode
			7-0	Reserved
52	0000h	X		Obsolete
		F	15-3	Reserved
		F	2	1 = the fields reported in word 88 are valid 0 = the fields reported in word 88 are not valid
53	0007h	F	1	1 = the fields reported in words 70:64 are valid 0 = the fields reported in words 70:64 are not valid
		X	0	1 = the fields reported in words 58:54 are valid 0 = the fields reported in words 58:54 are not valid
54	XXXXh	X		Number of current cylinders
55	00XXh	X		Number of current heads
56	XXXXh	X		Number of current sector per track
57-58	XXXXh	X		Current capacity in sectors
		F	15-9	Reserved
59	0000h	V	8	1 = Multiple sector setting is valid
		V	7-0	xxh = Setting for number of sectors that shall be transferred per interrupt on R/W Multiple command
60-61	XXXXh	F		Total number of user addressable sectors
62	0000h	X		Obsolete
		F	15-11	Reserved
		V	10	1 = Multiword DMA mode 2 is selected 0 = Multiword DMA mode 2 is not selected
		V	9	1 = Multiword DMA mode 1 is selected 0 = Multiword DMA mode 1 is not selected
63	0007h	V	8	1 = Multiword DMA mode 0 is selected 0 = Multiword DMA mode 0 is not selected
		F	7-3	Reserved
		F	2	1 = Multiword DMA mode 2 and below are supported
		F	1	1 = Multiword DMA mode 1 and below are supported
		F	0	1 = Multiword DMA mode 0 is supported
		F	15-8	Reserved
64	0003h	F	7-0	Advanced PIO modes supported
65	0078h	F		Minimum Multiword DMA transfer cycle time per word
66	0078h	F		Manufacturer's recommended Multiword DMA transfer cycle time
67	0078h	F		Minimum PIO transfer cycle time without flow control
68	0078h	F		Minimum PIO transfer cycle time with IORDY flow control
69-79	0000h	F		Reserved (for future command overlap and queuing)
				Major version number 0000h or FFFFh = device does not report version
80	01FEh	F	15	Reserved
		F	14	Reserved for ATA/ATAPI-14

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

		F	13	Reserved for ATA/ATAPI-13
		F	12	Reserved for ATA/ATAPI-12
		F	11	Reserved for ATA/ATAPI-11
		F	10	Reserved for ATA/ATAPI-10
		F	9	Reserved for ATA/ATAPI-9
		F	8	Reserved for ATA/ATAPI-8
		F	7	1 = supports ATA/ATAPI-7
		F	6	1 = supports ATA/ATAPI-6
		F	5	1 = supports ATA/ATAPI-5
		F	4	1 = supports ATA/ATAPI-4
		F	3	Obsolete
		X	2	Obsolete
		X	1	Obsolete
		F	0	Reserved
81	0021h	F		Minor version number
				Command set supported.
		X	15	Obsolete
		F	14	1 = NOP command supported
		F	13	1 = READ BUFFER command supported
		F	12	1 = WRITE BUFFER command supported
		X	11	Obsolete
		F	10	1 = Host Protected Area feature set supported
		F	9	1 = DEVICE RESET command supported
82	0068h	F	8	1 = SERVICE interrupt supported
		F	7	1 = release interrupt supported
		F	6	1 = look-ahead supported
		F	5	1 = write cache supported
		F	4	Shall be cleared to zero to indicate that the PACKET Command feature set is not supported.
		F	3	1 = mandatory Power Management feature set supported
		F	2	1 = Removable Media feature set supported
		F	1	1 = Security Mode feature set supported
		F	0	1 = SMART feature set supported
				Command sets supported.
		F	15	Shall be cleared to zero
		F	14	Shall be set to one
		F	13-9	Reserved
		F	8	1 = SET MAX security extension supported
		F	7	Reserved
83	5000h	F	6	1 = SET FEATURES subcommand required to spinup after power-up
		F	5	1 = Power-Up In Standby feature set supported
		F	4	1 = Removable Media Status Notification feature set supported
		F	3	1 = Advanced Power Management feature set supported
		F	2	1 = CFA feature set supported
		F	1	1 = READ/WRITE DMA QUEUED supported
		F	0	1 = DOWNLOAD MICROCODE command supported
				Command set/feature supported extension.
84	4000h	F	15	Shall be cleared to zero
		F	14	Shall be set to one

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5” Solid State Disk

		F	13-2	Reserved
		F	1	1 = SMART self-test supported
		F	0	1 = SMART error logging supported
				Command set/feature enabled.
		X	15	Obsolete
		F	14	1 = NOP command enabled
		F	13	1 = READ BUFFER command enabled
		F	12	1 = WRITE BUFFER command enabled
		X	11	Obsolete
		V	10	1 = Host Protected Area feature set enabled
		F	9	1 = DEVICE RESET command enabled
85	0008h	V	8	1 = SERVICE interrupt enabled
		V	7	1 = release interrupt enabled
		V	6	1 = look-ahead enabled
		V	5	1 = write cache enabled
		F	4	Shall be cleared to zero to indicate that the PACKET Command feature set is not supported.
		F	3	1 = Power Management feature set enabled
		F	2	1 = Removable Media feature set enabled
		V	1	1 = Security Mode feature set enabled
		V	0	1 = SMART feature set enabled
				Command set/feature enabled.
		F	15-9	Reserved
		F	8	1 = SET MAX security extension enabled by SET MAX SET PASSWORD
		F	7	See Address Offset Reserved Area Boot, INCITS TR27:2001
86	5000h	F	6	1 = SET FEATURES subcommand required to spin-up after power-up
		V	5	1 = Power-Up In Standby feature set enabled
		V	4	1 = Removable Media Status Notification feature set enabled
		V	3-1	1 = Advanced Power Management feature set enabled
		F	0	1 = DOWNLOAD MICROCODE command supported
				Command set/feature default.
		F	15	Shall be cleared to zero
		F	14	Shall be set to one
87	4000h	F	13-2	Reserved
		F	1	1 = SMART self-test supported
		F	0	1 = SMART error logging supported
				15-13 Reserved
		V	12	1 = Ultra DMA mode 4 is selected 0 = Ultra DMA mode 4 is not selected
		V	11	1 = Ultra DMA mode 3 is selected 0 = Ultra DMA mode 3 is not selected
		V	10	1 = Ultra DMA mode 2 is selected 0 = Ultra DMA mode 2 is not selected
88	203Fh	V	9	1 = Ultra DMA mode 1 is selected 0 = Ultra DMA mode 1 is not selected
		V	8	1 = Ultra DMA mode 0 is selected 0 = Ultra DMA mode 0 is not selected
		F	7-5	Reserved
		F	4	1 = Ultra DMA mode 4 and below are supported
		F	3	1 = Ultra DMA mode 3 and below are supported

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

		F	2	1 = Ultra DMA mode 2 and below are supported
		F	1	1 = Ultra DMA mode 1 and below are supported
		F	0	1 = Ultra DMA mode 0 is supported
89	0000h	F		Time required for security erase unit completion
90	0000h	F		Time required for Enhanced security erase completion
91	0000h	V		Current advanced power management value
92	0000h	V		Master Password Revision Code
93	0000h	X		Hardware reset result
94-126	0000h	V		Reserved
				Removable Media Status Notification feature set support
		F	15-2	Reserved
127	0000h	F	1-0	00 = Removable Media Status Notification feature set not supported 01 = Removable Media Status Notification feature supported 10 = Reserved 11 = Reserved
				Security status
		F	15-9	Reserved
		V	8	Security level 0 = High, 1 = Maximum
		F	7-6	Reserved
128	0001h	F	5	1 = Enhanced security erase supported
		V	4	1 = Security count expired
		V	3	1 = Security frozen
		V	2	1 = Security locked
		V	1	1 = Security enabled
		F	0	1 = Security supported
129-159	0000h	X		Vendor specific
160-254	0000h	X		Reserved
				Integrity word
255	0000h	X	15-8	Checksum
			7-0	Signature

Key:

F/V = Fixed/variable content

F = the content of the word is fixed and does not change. For removable media devices, these values may change when media is removed or changed.

V = the contents of the word is variable and may change depending on the state of the device or the commands executed by the device.

X = the content of the word may be fixed or variable.

IDLE (E3h)

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)

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

This command causes the device to set BSY, enter the Idle(Read) mode, clear BSY and generate an interrupt.

INITIALIZE DEVICE PARAMETERS (91h)

This command enables the host to set the number of sectors per track and the number of tracks per heads.

READ DMA (C8h)

Read data from sectors during Ultra DMA and Multiword DMA transfer. 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/21h)

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.

RECALIBRATE (10h)

The current drive performs no processing if it receives this command. It is supported for backward compatibility with previous devices.

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.

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5” Solid State Disk

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

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.

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	Content		
0	Control word		
	Bit 0	Identifier	0=set user password 1=set master password
	Bits 1-7	Reserved	
	Bit 8	Security level	0=High 1=Maximum

TS8GSSD25-S TS16GSSD25-S TS32GSSD25-S/M TS64GSSD25-M

2.5" Solid State Disk

SEEK (7xh)

This command is effectively a NOP command to the device although it does perform a range check.

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.

Features register Value and settable operating mode

Value	Function
02h	Enable write cache
03h	Set transfer mode based on value in Sector Count register.
55h	Disable read look-ahead feature
82h	Disable write cache
AAh	Enable read look-ahead feature

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.

SLEEP (E6h)

This command causes the device to set BSY, enter the Sleep mode, clear BSY and generate an interrupt.

SMART Function Set (B0h)

Performs different processing required for predicting device failures, according to the subcommand specified in the Features register. If the Features register contains an unsupported value, the Aborted Command error is returned. If the SMART function is disabled, any subcommand other than SMART ENABLE OPERATIONS results in the Aborted Command error.

SMART Sub Command Set

Value	Function
D0h	Read Data
D1h	Read Attribute Thresholds
D2h	Enable/Disable Autosave
D3h	Save Attribute Values

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

D8h	Enable Operations
D9h	Disable Operations
DAh	Return Status

SMART ID List

ID(Hex)	Description	Reference
0C	Power Cycle Count	Support
09	Power On Hours Count	Not Support
C2	Temperature	Not Support
E5	Halt System ID, Flash ID	Table 1
E8	Firmware version information	Table 2
E9	ECC Fail Record	Table 3
EA	Average Erase Count, Max Erase Count	Table 4
EB	Good Block Count, System Block Count	Table 5
EC~EF	Reserved	
F1~FF	Reserved	

Individual Attribute Data structure

Byte	Description
0	Attribute ID
1	Status Flag (0x0002)
2	
3	Attribute Value (0x64)
4~11	Vendor Specific

Table 1

Byte	Description
0	Halt System ID
1	Flash ID (byte 1)
2	Flash ID (byte 2)
3	Flash ID (byte 3)
4	Flash ID (byte 4)
5	Flash ID (byte 5)
6	Flash ID (byte 6)

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

7	Flash ID (byte 7)
---	-------------------

Table 2

Byte	Description
0	Year (High Byte, ASCII)
1	Year (Low Byte, ASCII)
2	Month (High Byte, ASCII)
3	Month (Low Byte, ASCII)
4	Day (High Byte, ASCII)
5	Day (Low Byte, ASCII)
6	Channels (binary)
7	Banks (binary)

Table 3

Byte	Description
0	ECC fail number
1	Row address 3
2	Row address 2
3	Row address 1
4	Channel number of last ECC fail
5	Bank number of last ECC fail
6~7	Reserved

Table 4

Byte	Description
0	Average Erase Count (High Byte)
1	Average Erase Count
2	Average Erase Count (Low Byte)
3	Max Erase Count (High Byte)
4	Max Erase Count
5	Max Erase Count (Low Byte)
6~7	Reserved

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5” Solid State Disk

Table 5

Byte	Description
0	Good Block Count (High Byte)
1	Good Block Count
2	Good Block Count (Low Byte)
3	System(Free) Block Count (High Byte)
4	System(Free) Block Count (Low Byte)
5	Reserved
6	Reserved
7	Reserved

STANDBY (E2h)

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)

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.

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/31h)

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.

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

Ultra DMA data transfer

Ultra DMA data burst timing requirements

Name	Mode 0 (in ns)		Mode 1 (in ns)		Mode 2 (in ns)		Mode 3 (in ns)		Mode 4 (in ns)		Mode 5 (in ns)		Measurement location
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
t _{2CYCTYP}	240		160		120		90		60		40		Sender
t _{CYC}	112		73		54		39		25		16.8		Note 3
t _{2CYC}	230		153		115		86		57		38		Sender
t _{DS}	15.0		10.0		7.0		7.0		5.0		4.0		Recipient
t _{DH}	5.0		5.0		5.0		5.0		5.0		4.6		Recipient
t _{DVS}	70.0		48.0		31.0		20.0		6.7		4.8		Sender
t _{DVH}	6.2		6.2		6.2		6.2		6.2		4.8		Sender
t _{CS}	15.0		10.0		7.0		7.0		5.0		5.0		Device
t _{CH}	5.0		5.0		5.0		5.0		5.0		5.0		Device
t _{CVS}	70.0		48.0		31.0		20.0		6.7		10.0		Host
t _{CVH}	6.2		6.2		6.2		6.2		6.2		10.0		Host
t _{ZFS}	0		0		0		0		0		35		Device
t _{DZFS}	70.0		48.0		31.0		20.0		6.7		25		Sender
t _{FS}		230		200		170		130		120		90	Device
t _{LI}	0	150	0	150	0	150	0	100	0	100	0	75	Note 4
t _{MLI}	20		20		20		20		20		20		Host
t _{UI}	0		0		0		0		0		0		Host
t _{AZ}		10		10		10		10		10		10	Note 5
t _{ZAH}	20		20		20		20		20		20		Host
t _{ZAD}	0		0		0		0		0		0		Device
t _{ENV}	20	70	20	70	20	70	20	55	20	55	20	50	Host
t _{RFS}		75		70		60		60		60		50	Sender
t _{RP}	160		125		100		100		100		85		Recipient
t _{IORDYZ}		20		20		20		20		20		20	Device
t _{ZIORDY}	0		0		0		0		0		0		Device
t _{ACK}	20		20		20		20		20		20		Host
t _{SS}	50		50		50		50		50		50		Sender

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

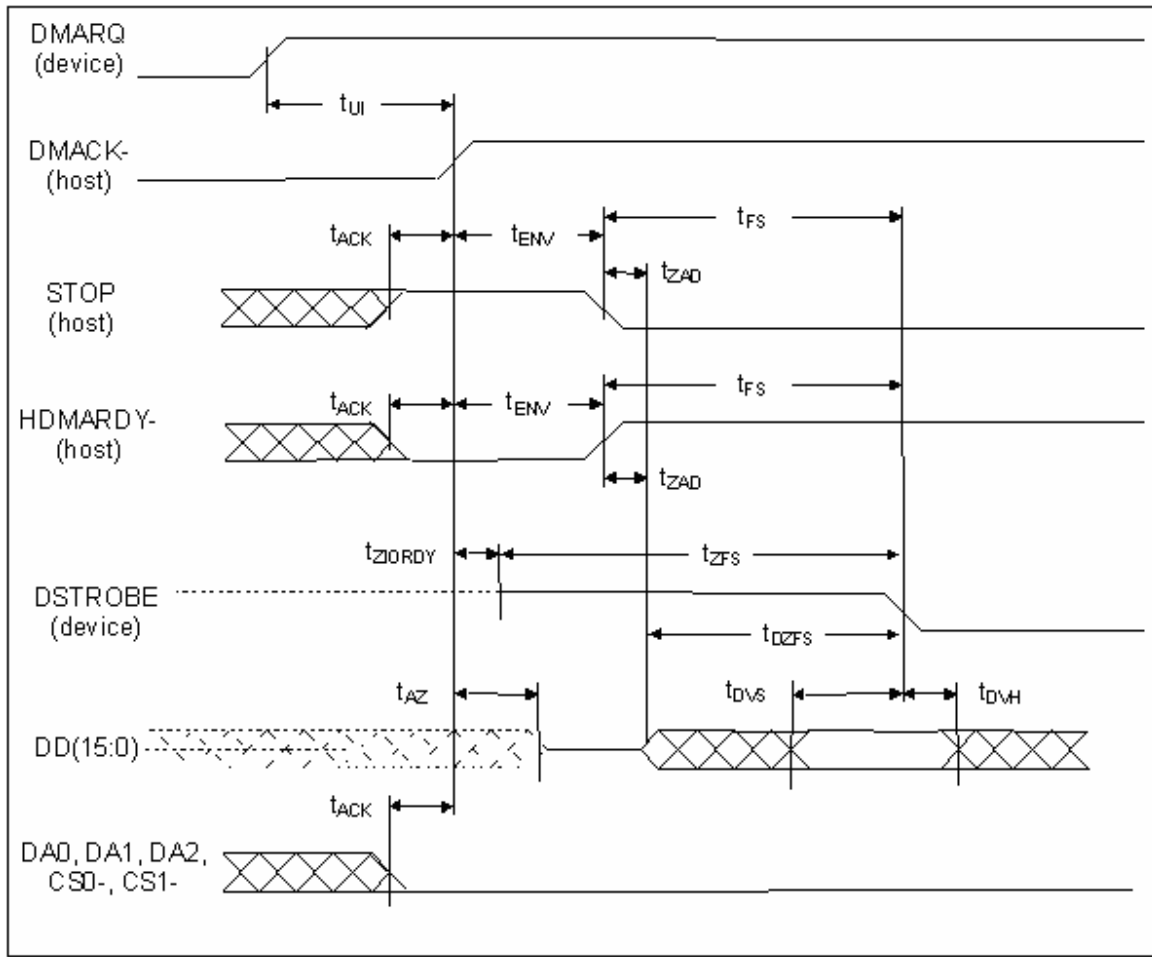
Ultra DMA data burst timing descriptions

Name	Comment
$t_{2CYCTYP}$	Typical sustained average two cycle time
t_{CYC}	Cycle time allowing for asymmetry and clock variations (from STROBE edge to STROBE edge)
t_{2CYC}	Two cycle time allowing for clock variations (from rising edge to next rising edge or from falling edge to next falling edge of STROBE)
t_{DS}	Data setup time at recipient (from data valid until STROBE edge)
t_{DH}	Data hold time at recipient (from STROBE edge until data may become invalid)
t_{DVS}	Data valid setup time at sender (from data valid until STROBE edge)
t_{DVH}	Data valid hold time at sender (from STROBE edge until data may become invalid)
t_{CS}	CRC word setup time at device
t_{CH}	CRC word hold time device
t_{CVS}	CRC word valid setup time at host (from CRC valid until DMACK- negation)
t_{CVH}	CRC word valid hold time at sender (from DMACK- negation until CRC may become invalid)
t_{ZFS}	Time from STROBE output released-to-driving until the first transition of critical timing.
t_{DZFS}	Time from data output released-to-driving until the first transition of critical timing.
t_{FS}	First STROBE time (for device to first negate DSTROBE from STOP during a data in burst)
t_{LI}	Limited interlock time
t_{MLI}	Interlock time with minimum
t_{UI}	Unlimited interlock time
t_{AZ}	Maximum time allowed for output drivers to release (from asserted or negated)
t_{ZAH}	Minimum delay time required for output
t_{ZAD}	drivers to assert or negate (from released)
t_{ENV}	Envelope time (from DMACK- to STOP and HDMARDY- during data in burst initiation and from DMACK to STOP during data out burst initiation)
t_{RFS}	Ready-to-final-STROBE time (no STROBE edges shall be sent this long after negation of DMARDY-)
t_{RP}	Ready-to-pause time (that recipient shall wait to pause after negating DMARDY-)
t_{IORDYZ}	Maximum time before releasing IORDY
t_{ZIORDY}	Minimum time before driving IORDY
t_{ACK}	Setup and hold times for DMACK- (before assertion or negation)
t_{SS}	Time from STROBE edge to negation of DMARQ or assertion of STOP (when sender terminates a burst)

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

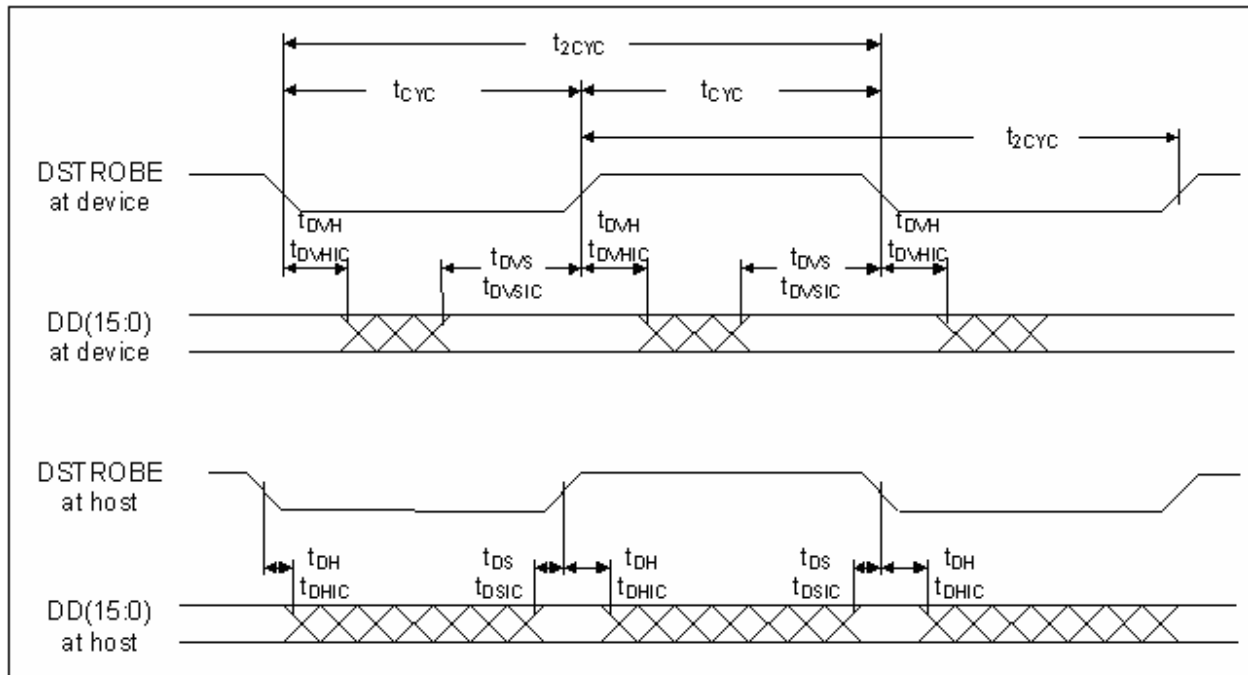
Initiating an Ultra DMA data-in burst



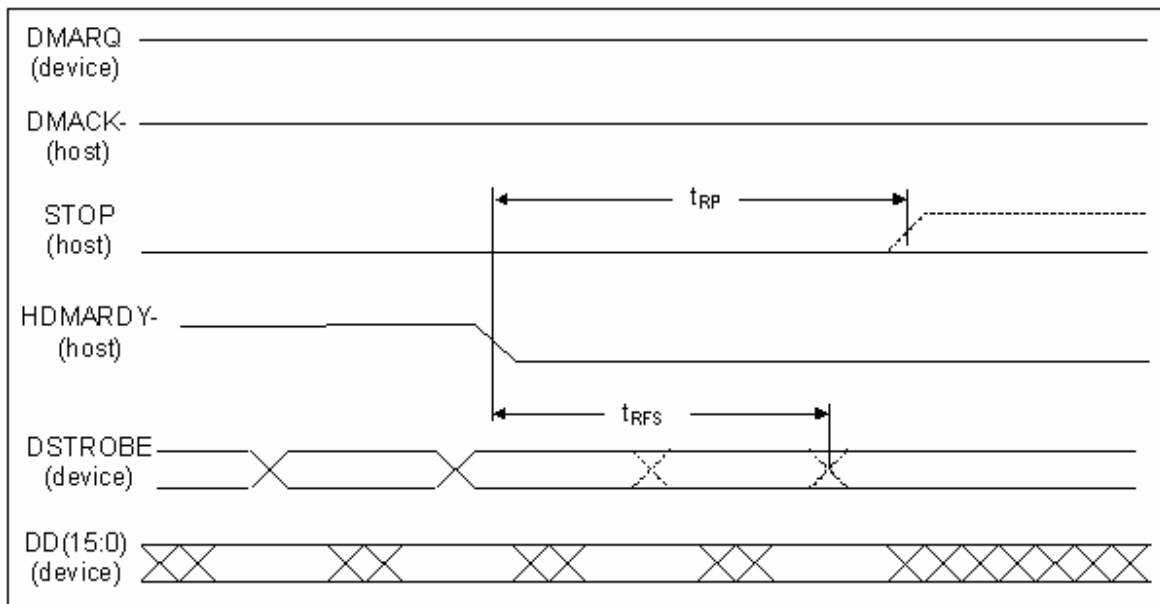
TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

Sustained Ultra DMA data-in burst



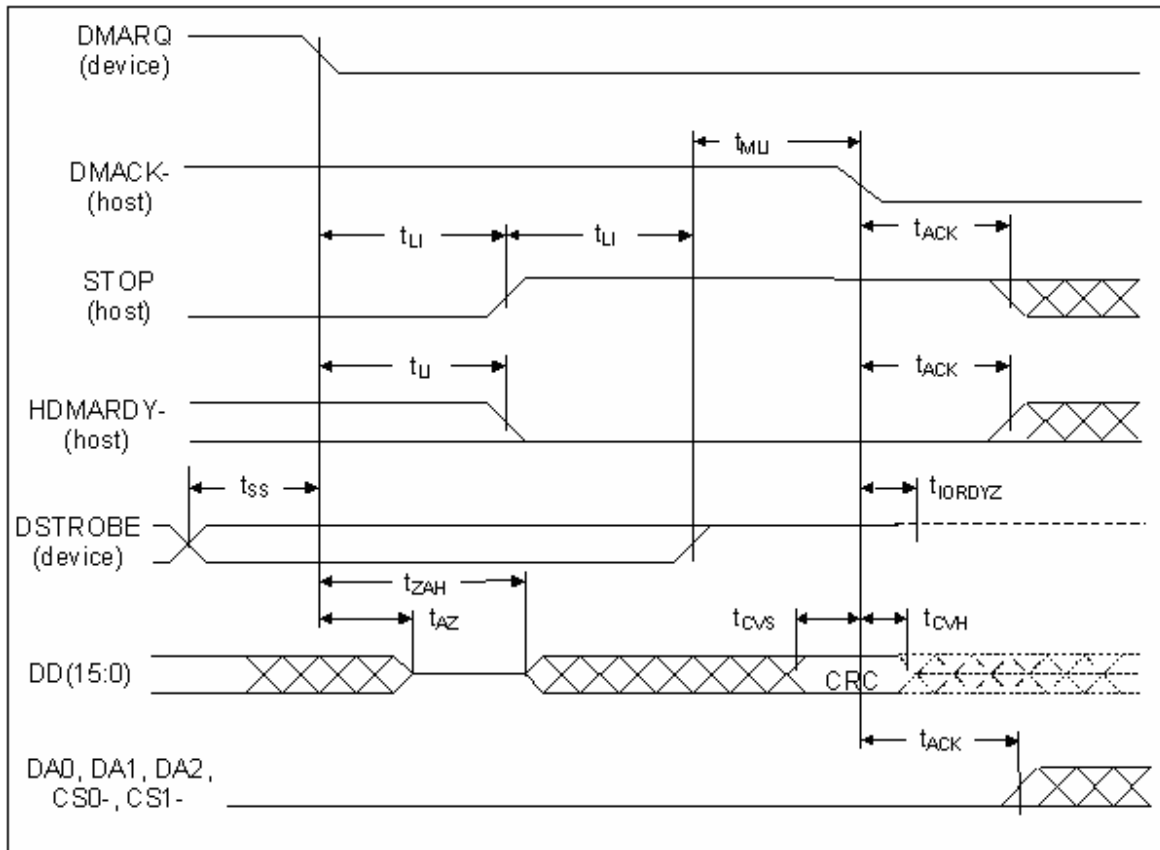
Host pausing an Ultra DMA data-in burst



TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

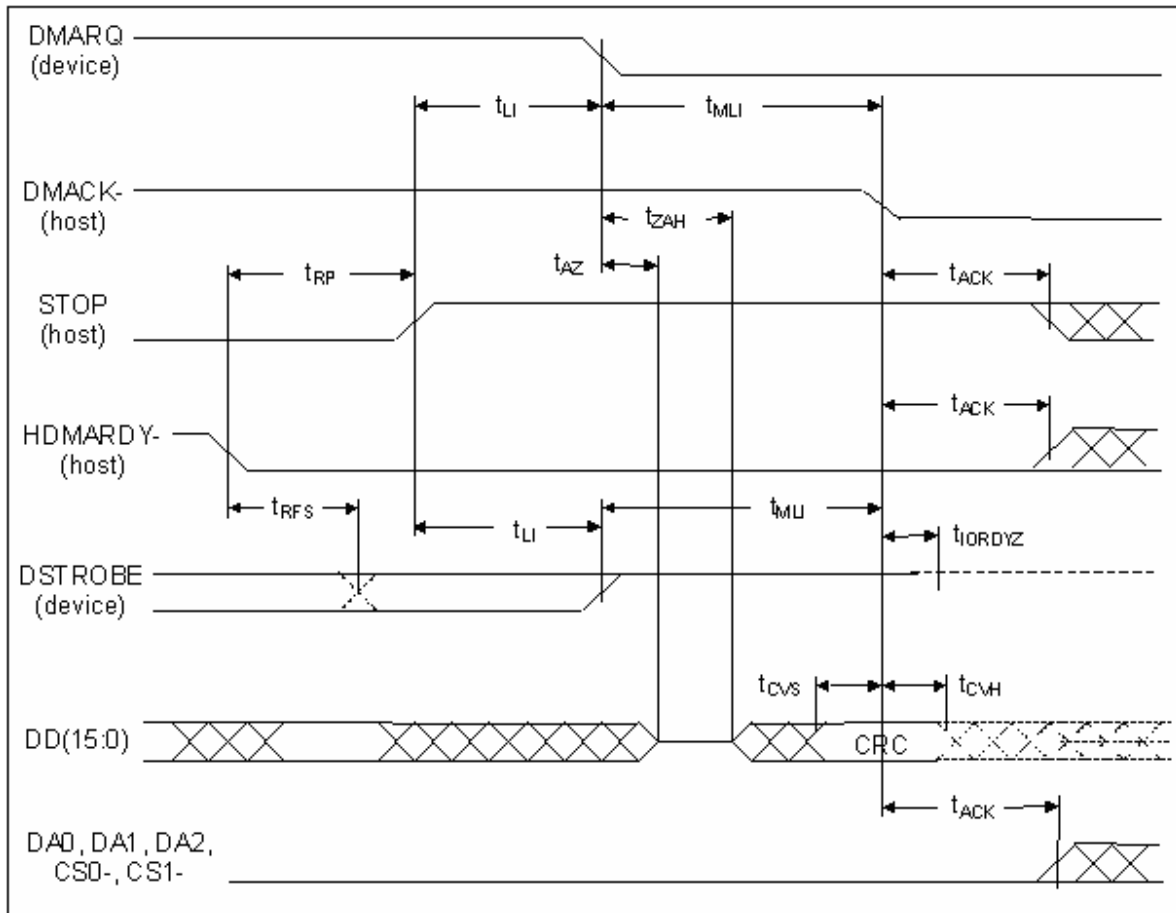
Device terminating an Ultra DMA data-in burst



TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

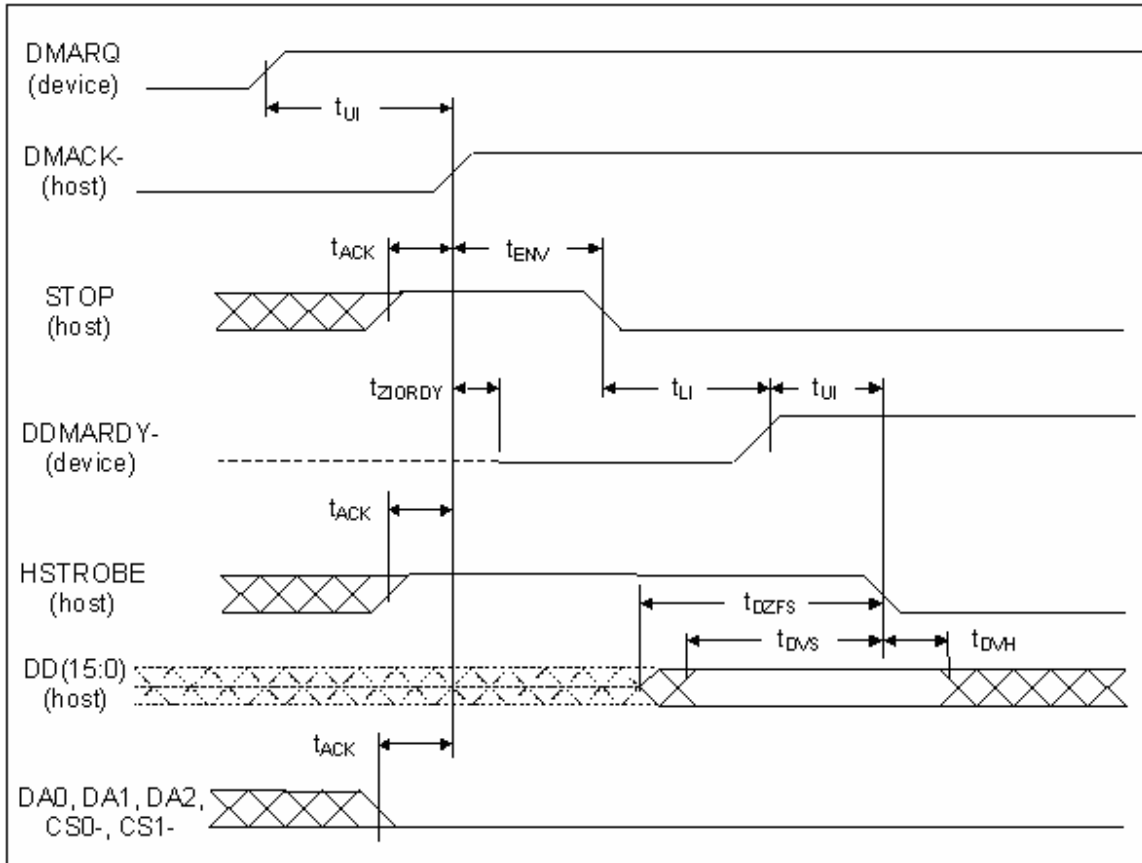
Host terminating an Ultra DMA data-in burst



TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

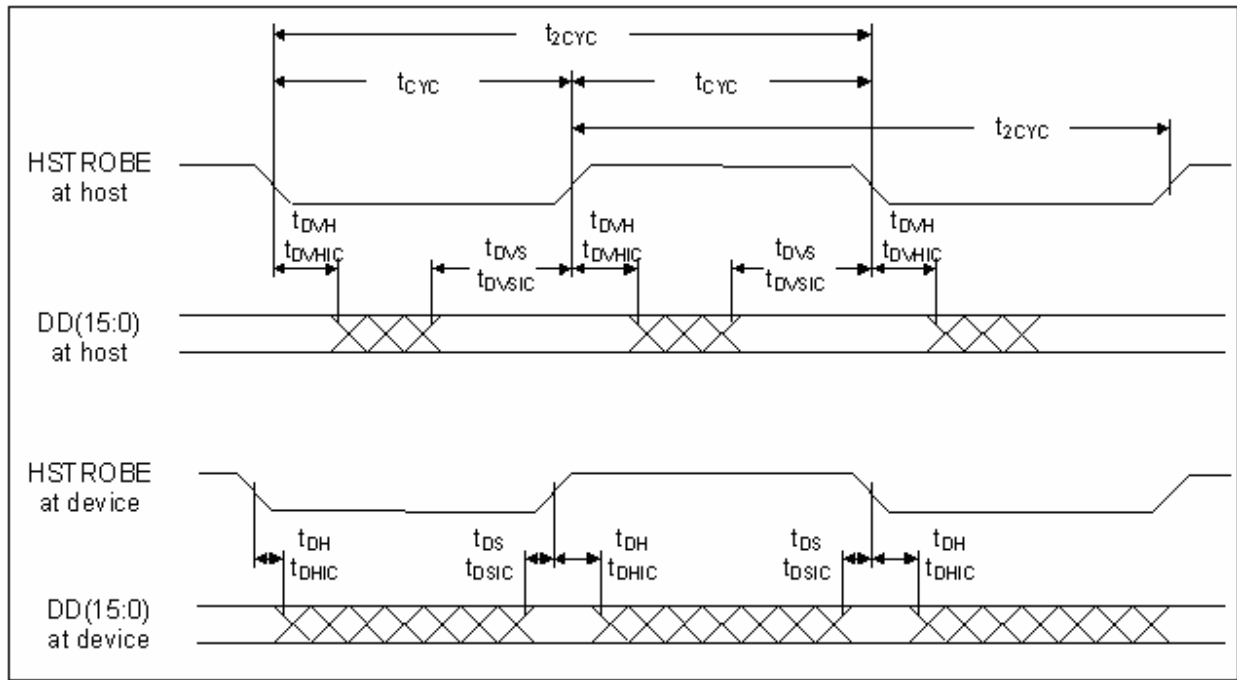
Initiating an Ultra DMA data-out burst



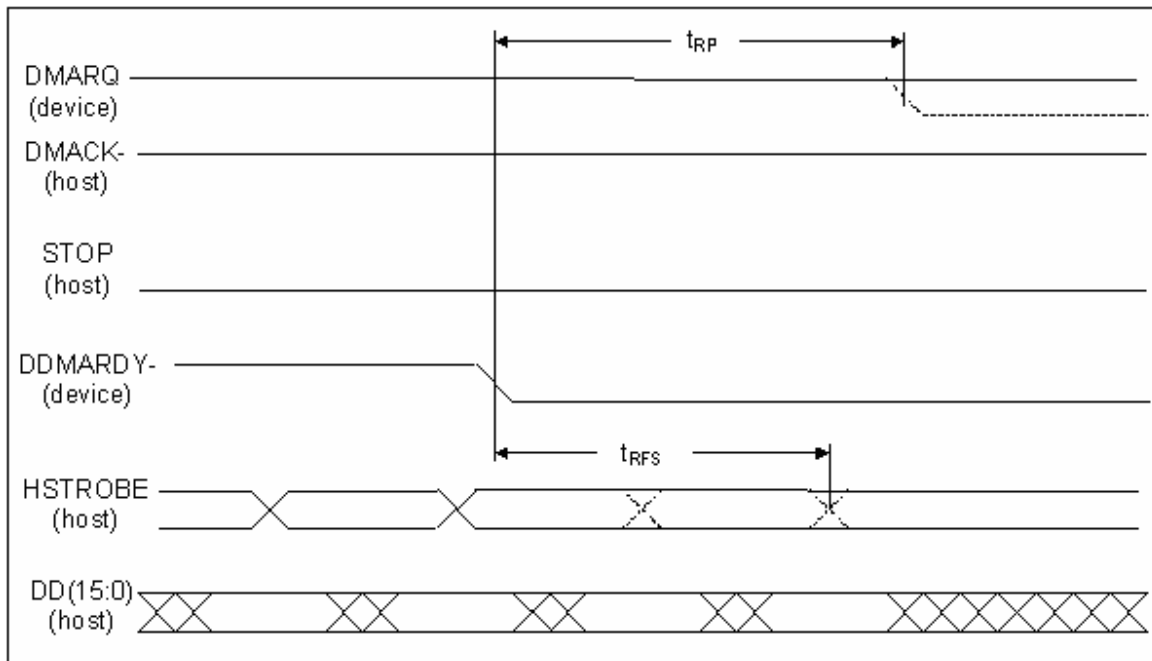
TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

Sustained Ultra DMA data-out burst



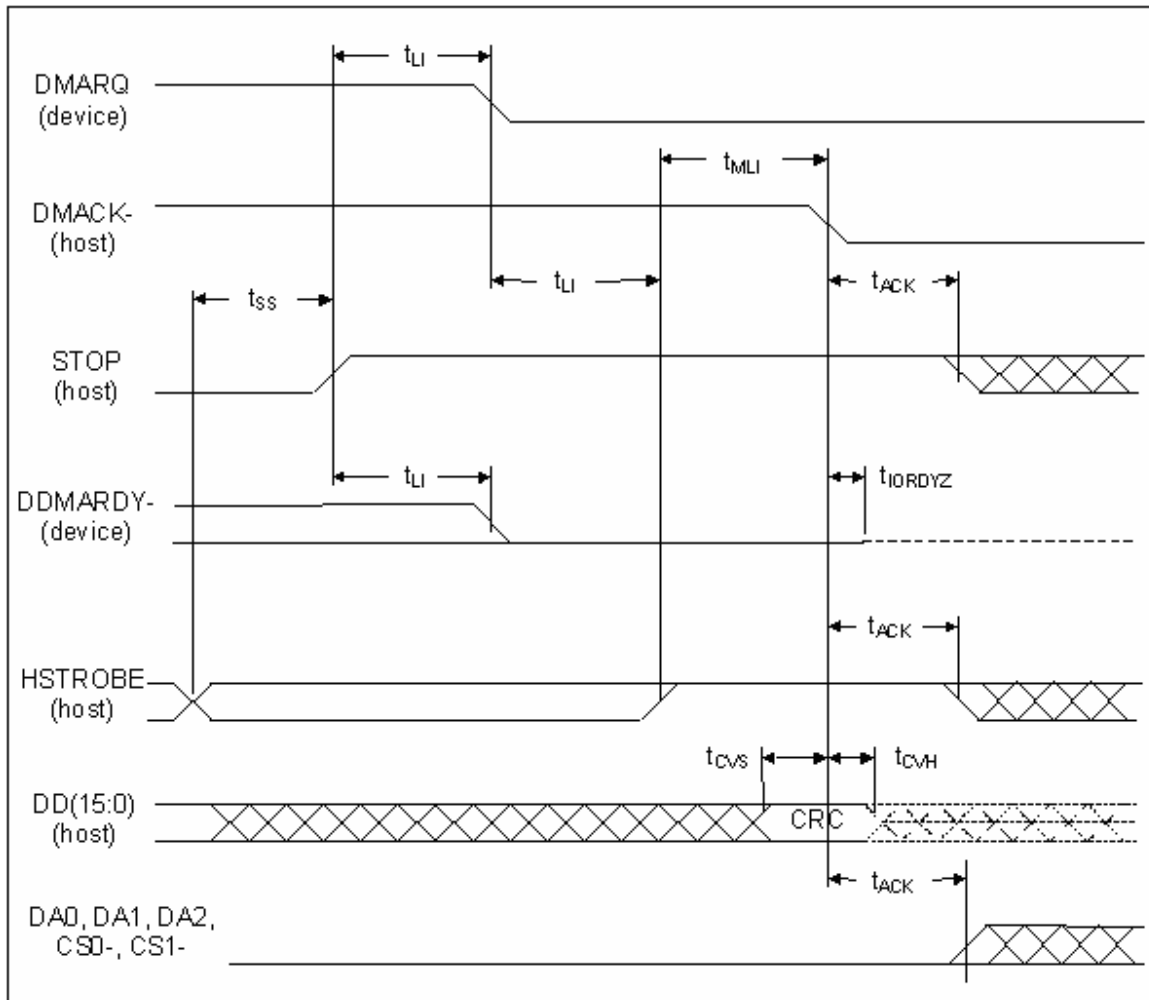
Device pausing an Ultra DMA data-out burst



TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

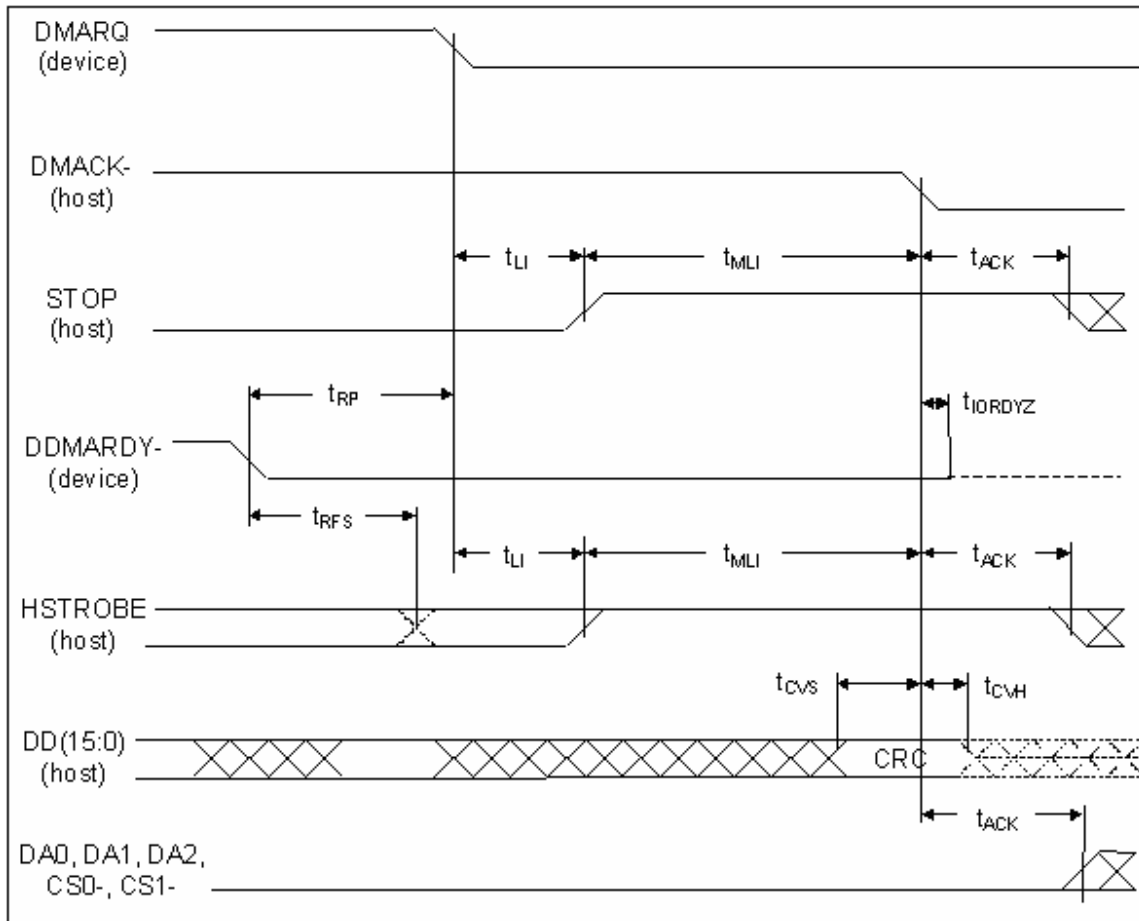
Host terminating an Ultra DMA data-out burst



TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

Device terminating an Ultra DMA data-out burst



TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

PIO data transfer

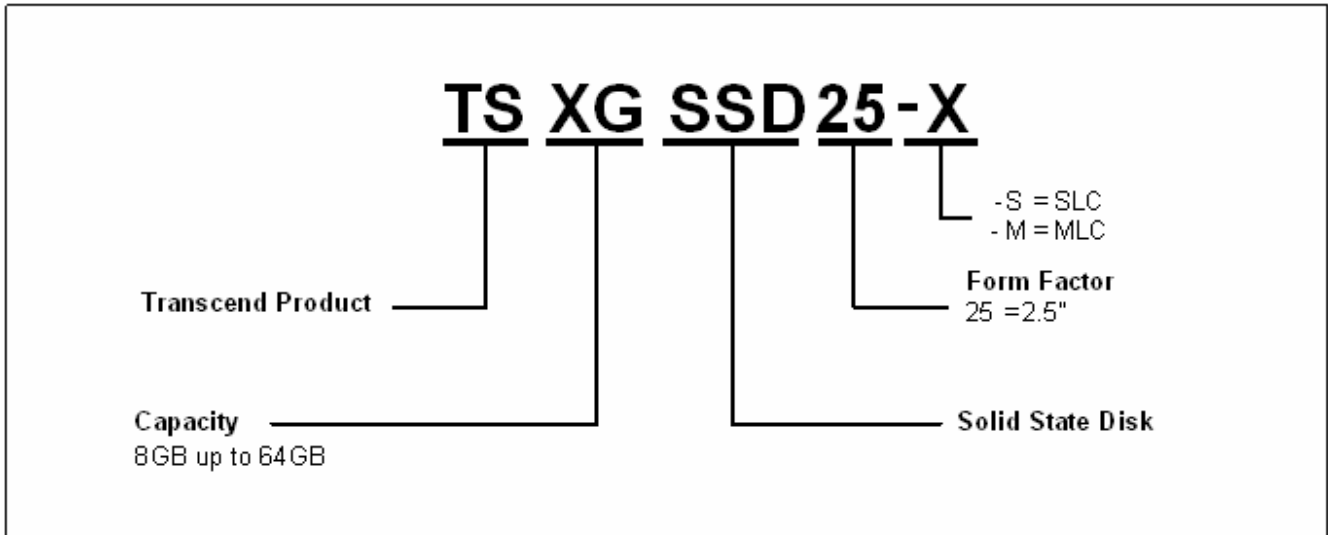
PIO timing requirements

PIO timing parameters		Mode 0	Mode 1	Mode 2	Mode 3	Mode 4
		ns	ns	ns	ns	ns
t ₀	Cycle time (min)	600	383	240	180	120
t ₁	Address valid to DIOR-/DIOW- setup (min)	70	50	30	30	25
t ₂	DIOR-/DIOW- (min)	165	125	100	80	70
t _{2i}	DIOR-/DIOW- recovery time (min)	-	-	-	70	25
t ₃	DIOW- data setup (min)	60	45	30	30	20
t ₄	DIOW- data hold (min)	30	20	15	10	10
t ₅	DIOR- data setup (min)	50	35	20	20	20
t ₆	DIOR- data hold (min)	5	5	5	5	5
t _{6Z}	DIOR- data tristate (max)	30	30	30	30	30
t ₉	DIOR-/DIOW- to address valid hold (min)	20	15	10	10	10
t _{RD}	Read Data Valid to IORDY active (min) (if IORDY initially low after t _A)	0	0	0	0	0
t _A	IORDY Setup time	35	35	35	35	35
t _B	IORDY Pulse Width (max)	1250	1250	1250	1250	1250
t _C	IORDY assertion to release (max)	5	5	5	5	5

TS8GSSD25-S
TS16GSSD25-S
TS32GSSD25-S/M
TS64GSSD25-M

2.5" Solid State Disk

Ordering Information



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.



TAIWAN

No.70, XingZhong Rd., NeiHu Dist., Taipei, Taiwan, R.O.C
TEL +886-2-2792-8000
Fax +886-2-2793-2222
E-mail: sales@transcend.com.tw
www.transcend.com.tw

USA

Los Angeles:

E-mail: sales@transcendusa.com

Maryland:

E-mail: sales_md@transcendusa.com

www.transcendusa.com

CHINA

E-mail: sales@transcendchina.com

www.transcendchina.com

GERMANY

E-mail: vertrieb@transcend.de

www.transcend.de

HONG KONG

E-mail: sales@transcend.com.hk

www.transcendchina.com

JAPAN

E-mail: sales@transcend.co.jp

www.transcend.jp

THE NETHERLANDS

E-mail: sales@transcend.nl

www.transcend.nl

United Kingdom

E-mail: sales@transcend-uk.com

www.transcend-uk.com