TS20GSJ18

1.8" StoreJet Portable HDD 20GB (TOSHIBA)

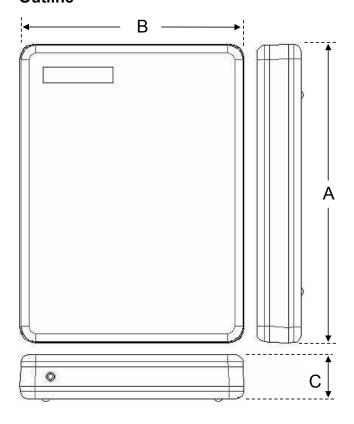## Description

TS20GSJ18 is a USB 2.0 20GB Portable Hard Disk. This device is a 20GB TOSHIBA 1.8" hard disk drive (HDD) installed in a Portable Hard Disk Enclosure. It is designed to expedite exchanging huge amounts of data between this device and any desktop or notebook computers.

Outline

System Requirements

- Desktop or notebook computers with USB port

- One of following operating systems:

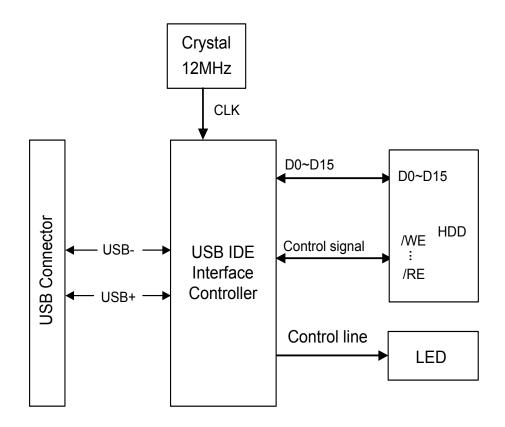 Win$^®$ 98, Win$^®$ Me, Win$^®$ 2000, Win$^®$ XP, Mac$^™$ OS

Features

- 100% Compatible with USB Interface in Windows or Mac

- USB connection for true Plug and Play

- Single Power Supply: 5V $\pm$ 10%

- Connector Durability: 5000 times

- Recommended operating temperature : 5℃ – 60 ℃

- Supports Resume Suspend and Low power modes

- Compliant with USB specification version 1.1 & 2.0

- Support 1.8" hard disk drive. (TOSHIBA)

- LEDs indicate Power On and Data Traffic

Dimensions

Side	Millimeters	Inches
A	95.00 $\pm$ 1.00	37.40 $\pm$ 0.04
B	71.50 $\pm$ 1.00	28.15 $\pm$ 0.04
C	15.00 $\pm$ 1.00	5.90 $\pm$ 0.04

Block Diagram

```
                    ┌──────────────┐
                    │   Crystal    │
                    │    12MHz     │
                    └──────┬───────┘
                           │ CLK
                           ▼
  ┌──────────┐    ┌────────────────┐   D0~D15   ┌──────────────┐
  │          │    │                │◄─────────►│  D0~D15      │
  │          │    │                │            │              │
  │  USB     │    │   USB IDE      │            │         HDD  │
  │  Connector│   │   Interface    │ Control    │  /WE         │
  │          │◄──USB-──►│Controller│◄─signal──►│   ⋮          │
  │          │◄──USB+──►│          │            │  /RE         │
  │          │    │                │            └──────────────┘
  │          │    │                │ Control line ┌────────────┐
  │          │    │                │─────────────►│    LED     │
  └──────────┘    └────────────────┘              └────────────┘
```

| Crystal 12MHz |
| USB Connector — USB- / USB+ — USB IDE Interface Controller |
| D0~D15 — HDD (/WE ⋮ /RE) |
| Control signal |
| Control line — LED |

Pinouts

Pin No.	Pin Name
01	VCC
02	USB-
03	USB+
04	VSS

Pin Identification

Symbol	Function
USB-	USB differential signal:
USB+	The pairs are used to transmit Data/Address/Command
VSS	Ground
VCC	USB power input

TS20GSJ18

Specification

Size	L x W x H	95mm x 71.5mm x 15mm
Weight		118 g
Temperature	Operating	5℃ – 60 ℃
Shock resistant	Operating	250G
	Non-Operating	1000G
Capacity		20 GBytes
Sustained transfer rate	Read	16.6 MB/sec
	Write	16.4 MB/sec
Bus transfer rate	USB 2.0 Full Speed	480 Mb/sec
Certificate		CE, FCC, BSMI

Electrical DC Characteristics (Ta=0°C to 70°C, Vcc=3.3V$\pm$10%)

Parameter	Symbol	MIN	TYP	MAX	Unit
Power Supply	VDD	3	3.3	3.6	V
Input Voltage	VIH	0.9xVDD	--	5	V
	VIL	-0.3	--	0.5xVDD	V
Output Voltage	VOH	VDD-0.4	--	--	V
	VOL	--	--	0.4	V
Input leakage current	ILK	-1	--	1	μA
Working Current	IRW	--		--	mA
Operating Temperature	Ta	0		70	°C
Storage Temperature	Ts	-55		+150	°C
IO output current	IOH	--	4	--	mA
	IOL	--	4	--	mA

AC Characteristics

Parameter	Symbol	MIN	TYP	MAX	Unit
Input rising delay	TPIlh	0.35(2PF)	0.4(4PF)	0.54(8PF)	ns
Input falling delay	TPIhl	0.46(2PF)	0.53(4PF)	0.64(8PF)	ns
Output rising delay	TPOlh	1.35(10PF)	2.41(30PF)	2.59(50PF)	ns
Output falling delay	TPOhl	1.61(10PF)	2.41(30PF)	3.21(50PF)	ns

Hard Drive Basic Specifications:

Principal Specification

MODEL	MK2004GAL
Formatted Capacity (gigabytes)	**20.000**
Servo design method	**Sector Servo**
Recording method	**32/34 TC-EEPR4+PP**
Recording density	
Track / mm (TPI)	**3465 (88.0k)**
Bit / mm (BPI)	**27.4k (695k) max.**
Flux change / mm (FRPI)	**29.1k (738k) max**
Number of disks	**1**
Number of data heads	**2**
Number of user data cylinders	**38,160**
Bytes per sector	**512**

Performance

Access time (msec) <*1>	
Track to track seek <*2>	3
Average seek <*3>	15
Max. seek <*4>	26
Rotation speed (RPM)	4,200 $\pm$ 0.1%
Average Latency Time (msec)	7.14
Internal Transfer rate (Mbits / sec)	125.5 – 253.1
Host Transfer rate (Mbytes / sec)	
Ultra DMA mode	100
PIO mode	16.6
Sector Interleave	1:1
Track skew	Yes
Buffer size (Mbytes)	2
Cache	Read Ahead Cache Write Cache
Start time <*5> (Up to Drive Ready)	3.5 sec (Typical) 20 sec (Maximum)
Recovery time from Stand- by <*5>	3 sec (Typical) 20 sec (Maximum)
Command Overhead (msec)	1

<*1> Under the condition of normal voltage, 25°C normal temperature and bottom side down.
<*2> Average time to seek all possible adjacent track without head switching.
<*3> Weighted average time to travel between all possible combination of track calculated as below.
    Weighted average access time = [Sum of P(n)*t(n)] / [Sum of P(n)], n = 1 to N.
        Where, N; Total number of tracks.
        P(n); Total number of seek for stroke n [= 2*(N - n)].
        t(n); Average seek time for stroke n.
    Average seek time to seek to stroke n is the average time to 1,000 seeks for stroke n, with random head

<*4> Average time for 1,000 full stroke seeks with random head switches.
<*5> Typical values are for the condition of normal voltage, 25°C normal temperature and placing bottom side down. Maximum values are for all conditions specified in this document.

Supply Voltage

Allowable voltage	3.3V + 5%
Allowable noise/ripple	70 mV p-p or less

Power Consumption

	Average (note1)
	MK2004GAL
Start	1.2 W Maximum
Seek (note2)	1.4 W Typical
Read / Write (note3)	1.4 W Typical
Active idle (node4)	0.6 W Typical
Low power idle (note5)	0.4 W Typical
Stand-by (note6)	0.2 W Typical
Sleep	0.08 W Typical

(note 1) Under normal condition (25°C, 101.3 kPa (1,013 mb)) and 3.3V $\pm$ 0%.
(note 2) The seek average current is specified based on three operations per 100 ms.
(note 3) The read/write current is specified based on three operations of 63 sector read/write per 100 ms.
(note 4) Motor is rotating at normal speed but none of Read, Write or Seek is executed.
(note 5) Motor is rotating at normal speed but heads are unloaded on the ramp.
(note 6) Motor is not rotating and heads are unloaded on the ramp.

Temperature and Humidity

Operating	5°C- 60°C Gradient 15°C / Hour maximum
Non- operating	- 20°C- 65°C Gradient 15°C / Hour maximum
Under shipment	- 40°C- 70°C Gradient 30°C / Hour maximum (Packed in Toshiba's original shipping package.)

Operating	8%- 90% R.H. (No condensation.)
Non- operating	8%- 90% R.H. (No condensation.)
Under shipment	5%- 90% R.H. (Packed in Toshiba's original shipping package.)
Max. wet bulb	29°C (Operating) 40°C (Non- operating)

Shock

Operating	2,450 m/s^2 (250G) 2 msec half sine wave Repeated twice maximum / second No unrecoverable error.
Non- operating	9,800 m/s^2 (1000G) 1 msec half sine wave Repeated twice maximum / second No unrecoverable error.
Under shipment	70 cm free drop No unrecoverable error. Apply shocks in each direction of the drive's three mutually perpendicular axes, one axis at a time. (Packed in Toshiba's original shipping package.)

Acoustics (Sound Power)

MK2004GAL	
22dB	For idle mode (Spindle in rotating).
26dB	Randomly select a track to be sought in such a way that every track has equal probability of being selected. Seek rate(ns) is defined by the following formura: ns = 0.4 / (tT = tL) tT is published time to seek from one random track to another without including rotational latency; tL is the time for the drive to ratate by half a revolution.

Mean Time to Failure (MTTF)

MTTF	300,000 hours
Conditions	
Power on hours	2,800 hours (200 days x 14 hours) / year)
Operating hours	600 hours (200 days x 3 hours) / year)
Seek hours	1.30 x 10^6 seeks / month
Number of load / unload	70 times / hour (60,000 times / year)
Environment	Normal (25°C, 101.3 kPa (1,013 mb))

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