

Cactus[®]

Technologies

100 Series Industrial Grade USB Flash Drive (UFD)

Product Manual

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01

Introduction to Cactus Technologies 100 Series Industrial Grade UFD Products



Features

- Solid state design with no moving parts
- Plugs into industry standard USB-A receptacles
- Compliant with USB2.0 specifications
- Compliant with USB Mass Storage Class specifications v1.0
- High reliability, MTBF > 6,500,000 hrs.
- Enhanced error correction with 8-bit BCH ECC

Overview

Cactus Technologies® UFD is a low capacity solid-state flash memory product that complies with the USB2.0 standard. Cactus Technologies® UFDs provide up to 8GB of formatted storage capacity and is designed to plug in directly to USB-A receptacles. Cactus Technologies® UFDs are designed to be used in applications which require a low capacity solid state disk that is compatible with USB interface.

The Cactus Technologies® Industrial Grade UFD products use high quality flash memory from well-known vendors, such as Samsung Corporation. In addition, it include an on-drive intelligent controller that manages interface protocols, data storage and retrieval as well as ECC, defect handling and diagnostics, power management, and clock control.

1.1. Supported Standards

Cactus Technologies® UFD is fully electrically compatible with the following specification:

- USB2.0 Specification published by the USB Implementor's Forum

1.2. Product Features

Cactus Technologies® Industrial UFD contains a high level, intelligent controller. This intelligent controller provides many capabilities including the following:

- USB command processing.
- Management of erasing and programming the flash memory independent of the host system
- Sophisticated defect managing capabilities (similar to magnetic disk drives).
- Sophisticated system for error recovery using powerful error correction code (ECC).
- Intelligent power management for low power operation.

➔ 1.2.1. Host and Technology Independence

Cactus Technologies® Industrial UFD appears as a standard USB mass storage device to the host system. The host computer software simply issues USB commands to the drive as per the USB specifications. The host software then waits for the commands to complete. The host system does not get involved in the details of how the flash memory is erased, programmed or read as this is all managed by the built-in controller in the drive. Also, with the intelligent on-board controller, the host system software will not require changing as new flash memory evolves. Thus, systems that support the Cactus Technologies® Industrial UFD products today will continue to work with future Cactus Technologies® Industrial UFDs built with new flash technology without having to update or change host software.

➔ 1.2.2. Defect and Error Management

Cactus Technologies® Industrial UFD contains a sophisticated defect and error management system similar to those found in magnetic disk drives. The defect management is completely transparent to the host and does not consume any user data space.

The soft error rate for Cactus Technologies® Industrial UFDs is much lower than that of magnetic disk drives. In the extremely rare case where a read error does occur, the drive has sophisticated ECC to recover the data.

These defect and error management systems, coupled with the solid-state construction, give Cactus Technologies® Industrial UFDs unparalleled reliability.

➔ 1.2.3. Intelligent Power Management

Cactus Technologies® Industrial UFD employs sophisticated static, dynamic and global wear leveling algorithms and intelligent bad block management to ensure high data reliability and to maximize product life.

02 Power Supply Requirements



Cactus Technologies Industrial DOM is a dual voltage product, which means it will operate at a voltage range of 3.30 volts $\pm 10\%$ or 5.00 volts $\pm 10\%$. Product Specifications

For all the following specifications, values are defined at ambient temperature and nominal supply voltage unless otherwise stated.

2.1. System Environmental Specifications

Table 2-1. Environmental Specifications		Cactus Industrial UFD
→ Temperature	Operating:	0° C to +70° C (Standard) -45° C to +90° C (Extended)
→ Humidity	Operating & Non-Operating:	8% to 95%, non-condensing
→ Acoustic Noise		0 dB
→ Vibration	Operating & Non-Operating:	20 G MIL-STD-883G Method 2007.3 condition A
→ Shock	Operating & Non-Operating:	3,000 G MIL-STD-883G Method 2002.4 condition C
→ Altitude (relative to sea level)	Operating & Non-Operating:	100,000 feet maximum

2.2. System Power Requirements

Table 2-2. Power Requirements		Cactus Industrial UFD
→ DC Input Voltage (VCC) 100 mV max. ripple (p-p)		5.0V $\pm 10\%$
→ (Maximum Average Value) See Notes.	Standby: Reading: Writing:	58 mA 130 mA 130 mA

NOTES: All values quoted are typical at ambient temperature and nominal supply voltage unless otherwise stated.

Sleep mode is specified under the condition that all drive inputs are static CMOS levels and in a "Not Busy" operating state.

2.3. System Performance

All performance numbers are typical values assuming the card controller is in the default (i.e., fastest) mode.

Table 2-3. Performance

→ Read Transfer Rate		up to 33.0 Mbytes/sec*
→ Write Transfer Rate		up to 26.0 Mbytes/sec *

2.4. System Reliability

Table 2-4. Reliability

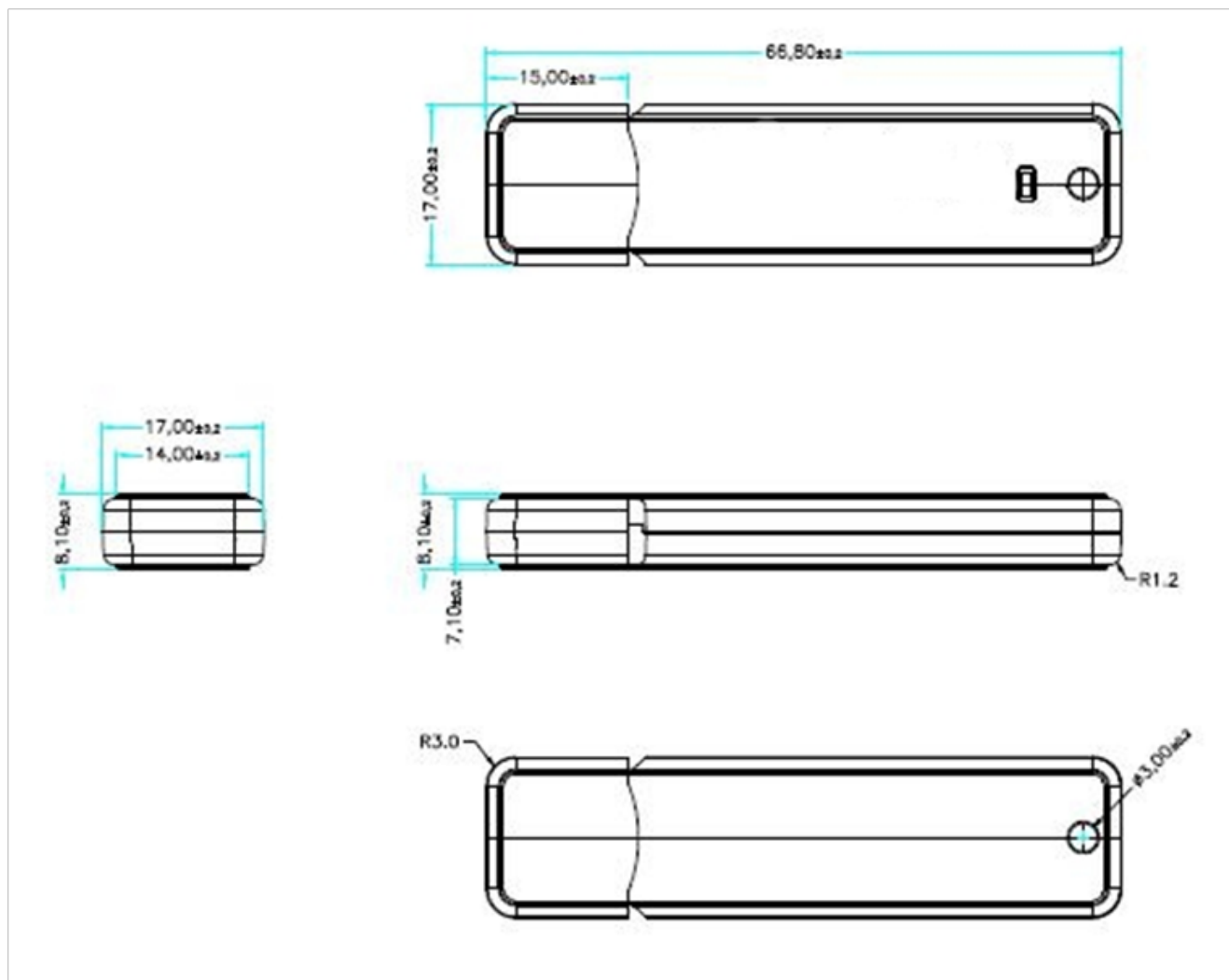
→ MTBF (@ 25°C)	>6,500,000 hours
→ Data Reliability	<1 non-recoverable error in 10 ¹⁴ bits READ
→ Endurance:	>2,000,000 erase/program cycles

2.5. Physical Specifications

The following sections provide the physical specifications for Cactus Technologies® Industrial UFD products.

➔ 2.5.1. UFD Physical Specifications

Refer to Figure 2-1 for Cactus 40-pin DOM physical specifications and dimensions and Figure 2-2 for Cactus 44-pin DOM physical specifications.



2.6. Capacity Specifications

Cactus Technologies[®] UFD product is offered in capacities of 128MByte, 256MByte, 512MByte, 1GByte, 2GByte, 4GByte or 8 GByte.

03 Interface Description

The following sections provide detailed information on the Cactus Technologies® Industrial UFD interface.

3.1. Electrical Specification

The following table defines all D.C. Characteristics for the UFD. Unless otherwise stated, conditions are:

$V_{CC} = 5V \pm 10\%$
 $T_a = 0^{\circ}C \text{ to } 70^{\circ}C$

3.1.1. Absolute Maximum Ratings

Parameter	Symbol	MIN	MAX	Units
Storage Temperature	T_s	-55	150	oC
Operating Temperature	T_A	-45	90	oC
Vcc with respect to GND	V_{CC}	-0.3	6.5	V

3.1.2. DC Characteristics

Parameter	Symbol	MIN	MAX	Units
Input Levels USB D+,D-, Full Speed Mode				V
Low	V_{iL}	-	0.8	
High	V_{iH}	2.0	-	
Output Levels USB D+, D-, Full Speed Mode				V
Low	V_{oL}	0	0.3	
High	V_{oH}	2.8	3.6	
Output Signal Crossover Voltage USB D+, D-, Full Speed Mode	V_{CRS}	1.3	2	V
Input Levels USB D+, High Speed Mode				mV
Low	V_{iL}	-10	10	
High	V_{iH}	360	440	
Input Levels USB D-, High Speed Mode				mV
Low	V_{iL}	360	440	
High	V_{iH}	-10	10	

Parameter	Symbol	MIN	MAX	Units
Output Levels USB D+, D-, High Speed Mode				
Low	V_{OL}	-10	10	mV
High	V_{OH}	360	440	
Operating Current				
Suspend	I_{CC}		2,5	mA
Active			200	

A

Ordering
Information

Model KUXRY-100

Where **X** is card capacities:

128M	128MB
256M	256MB
512M	512MB
1G	1GB
2G	2GB
4G	4GB
8G	8GB

Where **Y** is temperature

Blank	Standard temperature (0° C to +70° C)
I	Extended temperature (-45° C to +90° C)

Example:

1. 2GB standard temp UFD KU2GR-100
2. 1GB extended temp UFD KU1GRI-100

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I. WARRANTY STATEMENT

Cactus Technologies® warrants its Industrial Grade products only to be free of any defects in materials or workmanship that would prevent them from functioning properly for five years from the date of purchase. This express warranty is extended by Cactus Technologies® Limited

II. GENERAL PROVISIONS

This warranty sets forth the full extent of Cactus Technologies® responsibilities regarding the Cactus Industrial Grade Flash Storage products. In satisfaction of its obligations hereunder, Cactus Technologies®, at its sole option, will either repair, replace or refund the purchase price of the product.

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Cactus Technologies® products are not warranted to operate without failure. Accordingly, in any use of products in life support systems or other applications where failure could cause injury or loss of life, the products should only be incorporated in systems designed with appropriate redundancy, fault tolerant or back-up features.

III. WHAT THIS WARRANTY COVERS

For products found to be defective within five years of purchase, Cactus Technologies® will have the option of repairing or replacing the defective product, if the following conditions are met:

- A. The defective product is returned to Cactus Technologies® for failure analysis as soon as possible after the failure occurs.
- B. An incident card filled out by the user, explaining the conditions of usage and the nature of the failure, accompanies each returned defective product.
- C. No evidence is found of abuse or operation of products not in accordance with the published specifications, or of exceeding storage or maximum ratings or operating conditions.

All failing products returned to Cactus Technologies® under the provisions of this limited warranty

shall be tested to the product's functional and performance specifications. Upon confirmation of failure, each product will be analyzed, by whatever means necessary, to determine the root cause of failure. If the root cause of failure is found to be not covered by the above provisions, then the product will be returned to the customer with a report indicating why the failure was not covered under the warranty.

This warranty does not cover defects, malfunctions, performance failures or damages to the unit resulting from use in other than its normal and customary manner, misuse, accident or neglect; or improper alterations or repairs.

Cactus Technologies® reserves the right to repair or replace, at its discretion, any product returned by its customers, even if such product is not covered under warranty, but is under no obligation to do so.

Cactus Technologies® may, at its discretion, ship repaired or rebuilt products identified in the same way as new products, provided such cards meet or exceed the same published specifications as new products. Concurrently, Cactus Technologies® also reserves the right to market any products, whether new, repaired, or rebuilt, under different specifications and product designations if such products do not meet the original product's specifications.

IV. RECEIVING WARRANTY SERVICE

According to Cactus Technologies® warranty procedure, defective product should be returned only with prior authorization from Cactus Technologies® Limited. Please contact Cactus Technologies® Customer Service department with the following information: product model number and description, nature of defect, conditions of use, proof of purchase and purchase date. If approved, Cactus Technologies® will issue a Return Material Authorization or Product Repair Authorization number. Ship the defective product to:

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