

## Ordering Information: USB Family

### Viking High Performance USB Drive Ordering Information

Part Number	Temp	NAND	GB	Controller	Interface	NAND
VRFUSB2256GACCMTL	(0 to +70'c)	MLC	256	Hyperstone U8	USB 2.0	TSB L-Die
VRFUSB2128GACZMTL	(0 to +70'c)	MLC	128	Hyperstone U8	USB 2.0	TSB L-Die
VRFUSB2064GACAMTL	(0 to +70'c)	MLC	64	Hyperstone U8	USB 2.0	TSB L-Die
VRFUSB2016GACSTH	(0 to +70'c)	SLC	16	Hyperstone U8	USB 2.0	TSB H-Die
VRFUSB28192ACRTH	(0 to +70'c)	SLC	8	Hyperstone U8	USB 2.0	TSB H-Die
VRFUSB28192AIRTH	(-40 to +85 °C)	SLC	8	Hyperstone U8	USB 2.0	TSB H-Die
VRFUSB24096ACQTH	(0 to +70'c)	SLC	4	Hyperstone U8	USB 2.0	TSB H-Die
VRFUSB24096AIQTH	(-40 to +85 °C)	SLC	4	Hyperstone U8	USB 2.0	TSB H-Die
VRFUSB24096AIQTHxx	(-40 to +85 °C)	SLC	4	Hyperstone U8	USB 2.0	TSB H-Die
VRFUSB22048ACQTH	(0 to +70'c)	SLC	2	Hyperstone U8	USB 2.0	TSB H-Die
VRFUSB21024ACQTH	(0 to +70'c)	SLC	1	Hyperstone U8	USB 2.0	TSB H-Die
VRFUSB2032GAC1WT3	(0 to +70'c)	MLC	32	Hyperstone U8	USB 2.0	TSB 3D NAND
VRFUSB2064GAC5WT3	(0 to +70'c)	MLC	64	Hyperstone U8	USB 2.0	TSB 3D NAND
VRFUSB2128GACHWT3	(0 to +70'c)	MLC	128	Hyperstone U8	USB 2.0	TSB 3D NAND

**Note:**

1. Storage capacity listed will vary due to formatting and additional functions, and therefore is not available for storage.
2. USB's ship unformatted from the factory unless otherwise stated or requested.
3. All USBs are based on SLC flash unless otherwise requested.
4. The lower case "xx" characters denotes a wild card to specify locked BOM attributes (i.e MLC NAND or customer specific information)
5. Modules are 5V standard.

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Product Picture(s)



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## 1 Introduction

### 1.1 Product Overview

Viking Flash Drives are small, removable, high-speed USB 2.0 and USB 1.1 compatible data storage systems using flash technology. USB Drives allow easy data storage and transfer via the USB port on the host system with no driver installation required. The high speed Read/Write operation eliminates latency and seek-time associated with a hard disk drive. Flash storage incorporates an intelligent power management scheme that provides the lowest total power consumption.

### 1.2 Features

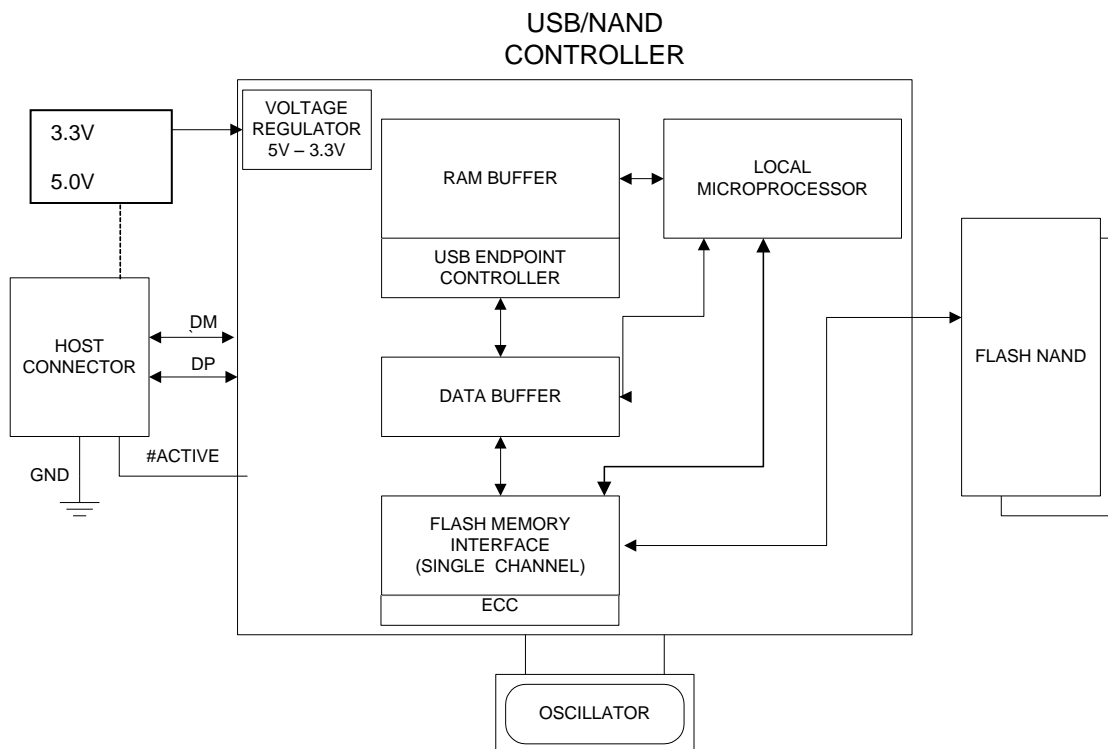
The USB drive delivers the following features:

- USB 2.0 high speed compatible (supports Bulk-Only transport protocol)\*
  - Specification for Host Interface up to 60MB/s (480Mbit/s)
- Drive Activity indicator signal
- Firmware upgradeable via USB bus
- Low power Dissipation
- Solid state, Non-volatile NAND Memory
- RoHS Compliant
- Static Wear Leveling
- High endurance SLC NAND

\* With exception of 3.3V only operation, USB specification is 5V.

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**Figure 1-1: High-Level Block Diagram**



Notes: Up to 4 CE on a channel. (8 CE may be configurable via GPIO firmware option)

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### 1.3 USB Interface

- The USB interface is compliant with the USB 2.0 specification.
- The USB interface connects the host computer to the USB.
- The USB interface runs at a maximum speed of 2.0 Gbps (gigabits per second). If the host computer is unable to negotiate a speed of 2.0 Gbps, the USB interface automatically renegotiates to lower speeds.

## 2 Product Specifications

### 2.1 Performance

The host interface speed is 480Mbit/s with a read/write bandwidth shown in the following tables.

**Table 2-1: Maximum Sustained Read and Write Bandwidth\***

Access Type	MB/s (100% Sequential)
MLC: Read, Single Channel	Up to 33.2
MLC: Write, Single Channel	Up to 21.3
SLC: Read, Single Channel	Up to 33.2
SLC: Write, Single Channel	Up to 28.3
pSLC: Read, Single Channel	Up to 33.2
pSLC: Write, Single Channel	Up to 28.3

\* IOMeter 2006 performance using a 16GB USB with Toshiba A19 MLC NAND  
SLC performance based on IOMeter 2006 using a 32GB USB with Toshiba SLC NAND toggle

### 2.2 Timing

**Table 2-2: Timing Specifications**

Parameter	Symbol	Min.	Typical	Max.	Unit
Power on Time to Ready (from 2.7V VBUS)	tRESET	100	150	250	ms
Write latency			<50		us

**Notes:**

1. This power-up timing can be changed to 10ms upon request. The long power-up delay is designed to accommodate slow power-up times of rack systems.

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## 2.3 Electrical Characteristics

### 2.3.1 Absolute Maximum Ratings

**Table 2-3: Absolute Maximum Ratings**

Parameter	Symbol	Value	Unit
5.0 Supply Voltage	VBUS	-0.3 ~ 5.5	V
3.3 Supply Voltage	VBUS	-0.3 ~ 3.6	V
Input Voltage	VIN	GND - 0.5 ~ VCC + 0.3	V
Storage Temperature	TST	-40 ~ 125	°C

**Notes:**

1. Permanent device damage may occur if 'ABSOLUTE MAXIMUM RATINGS' are exceeded. Functional operation should be restricted to recommended operating condition. Exposure to higher than recommended voltage for extended periods of time could affect device reliability.

### 2.3.2 DC Operating Conditions and Characteristics

**Table 2-4: Voltage and Current Ratings**

Parameter	Symbol	Min.	Typical	Max.	Unit	
5.0 Supply voltage ( $\pm 5\%$ )	VBUS	4.75	5.0	5.25	V	
3.3 Supply voltage ( $\pm 5\%$ )	VBUS	3.135	3.3	3.465	V	
Input high voltage	VIH	2.0	-	-	V	
Input low voltage	VIL	-	-	0.8	V	
Output high voltage	VOH	2.4	-	-	V	
Output low voltage	VOL	-	-	0.4	V	
Standby Current <sup>2</sup>	1 Flash Device	I <sub>STB</sub>	-	16.5 + 6.6	23.1 + 33	μA
	2 Flash Devices		-	16.5 + 13.2	23.1 + 66	μA
Operating Current <sup>2</sup>	1 Flash Device	I <sub>OP</sub>	-	132 + 9.9	165 + 19.8	mA
	2 Flash Devices		-	132 + 19.8	165 + 39.6	mA

**Notes:**

1. Recommended operating conditions (Voltages referenced to GND, TA = 0 to 70C)
2. Based on 3.3V NAND, BGA or TSOP

### 2.3.3 Power Consumption

All onboard power requirements of the USB are derived from the 5V or 3.3V input rail.

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## 2.3.4 Capacitance

**Table 2-5: Bus Line Capacitance**

Parameter	Symbol	Min	Max	Unit
Bus line capacitance	C <sub>L</sub>	-	20	pF

## 2.4 Environmental Conditions

### 2.4.1 Temperature and Altitude

**Table 2-6: Temperature and Altitude Related Specifications**

Conditions	Operating	Shipping	Storage
<b>Commercial Temperature</b>	0 to 70°C (32 to 158° F)	-40 to 85°C (-40 to 185° F)	-40 to 85°C (-40 to 185° F)
<b>Industrial Temperature<sup>1</sup></b>	-40 to 85°C (-40 to 185° F)	-40 to 85°C (-40 to 185° F)	-40 to 85°C (-40 to 185° F)
<b>Humidity (non-condensing)</b>	5% to 95%	5% to 95%	5% to 95%
<b>Max Temperature Gradient</b>	20°C/Hour (36°F/Hour)	n/a	n/a
<b>Altitude</b>	-304.8 to 24,384 m (-1,000 to 80,000 ft)	-304.8 to 24,384 m (-1,000 to 80,000 ft)	-304.8 to 24,384 m (-1,000 to 80,000 ft)
<b>Storage Time Duration</b>	n/a	n/a	1 year

**Notes:**

1. SLC flash based products are available in the following temperature ranges:
  - a) Commercial temperature range of 0 to 70°C (32 to 158° F)
  - b) Industrial temperature range -40 to 85°C (-40 to 185° F)

## 2.5 Reliability

**Table 2-7: Reliability Specifications**

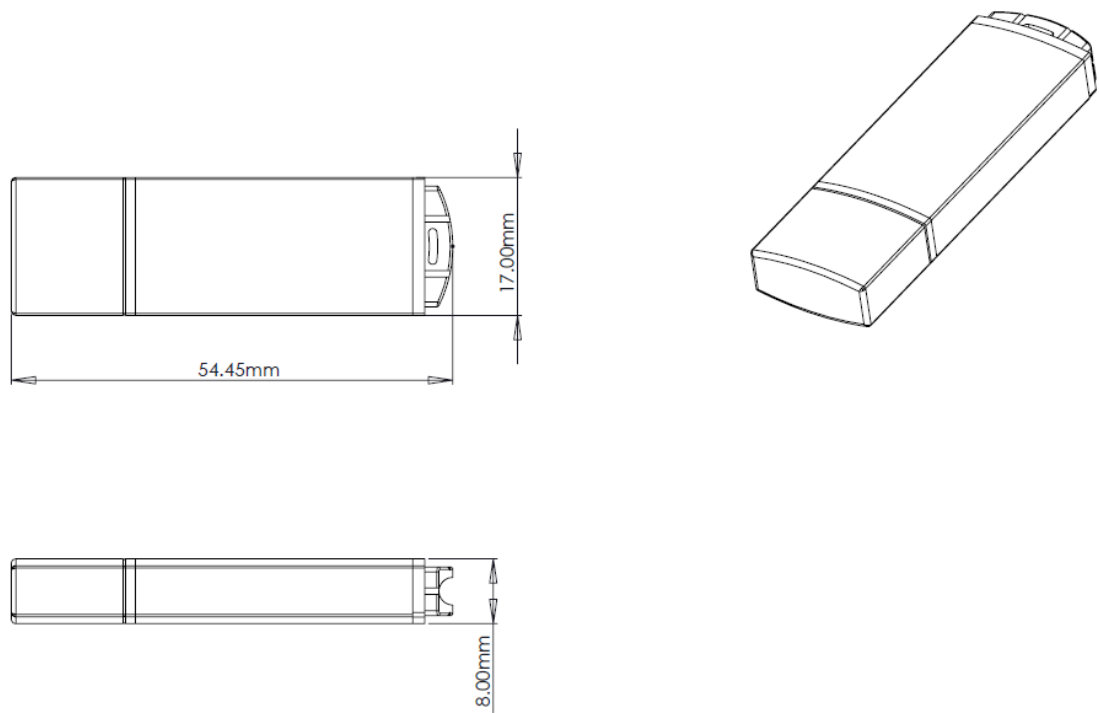
Parameter	Value
Mean Time Between Failures (MTBF)	2,500,000 hours
Read Endurance	Unlimited
Write or Erase Endurance	(specified by the flash component)
Data retention	>10 years

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### 3 Mechanical Information

**Table 3-1: Physical Dimensions**

Height (mm)	Width (mm)	Length (mm)
8.00	17.0	54.45



**Figure 3-1: Dimensions**

**Note:**

- All dimensions are in millimeters.

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## 4 Pin and Signal Descriptions

**Table 4-1: Pin Assignments**

Pin	Signal Name	Type	Function
1	VCC	-	Power supply for USB Flash Drive
2	D-	I/O	Differential Pair Serial Data I/O
3	D+	I/O	Differential Pair Serial Data I/O
4	GND	-	Ground

## 5 Certifications and Compliance

**Table 5-1: Device Certifications**

Certification/Compliance	Description
RoHS	Viking, Sanmina-SCI Corporation ("Viking") shall use commercially reasonable efforts to provide components, parts, materials, products and processes to customers that do not contain: (i) lead, mercury, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) above 0.1% by weight in homogeneous material or (ii) cadmium above 0.01% by weight of homogeneous material, except as provided in any exemption(s) from RoHS requirements (including the most current version of the "Annex" to Directive\ 2002/95/EC of 27 January, 2003), as codified in the specific laws of the EU member countries. Viking strives to obtain appropriate contractual protections from its suppliers in connection with the RoHS Directives.
EU WEEE Compliant	The Waste Electrical and Electronic Equipment Directive (WEEE Directive) is the European Community directive 2002/96/EC on waste electrical and electronic equipment (WEEE) which, together with the RoHS Directive 2002/95/EC, became European Law in February 2003, setting collection, recycling and recovery targets for all types of electrical goods.
Safety	All printed circuit boards (PCBs) have a flammability rating of UL94V-0.

## 6 References

- USB Specification, version 2.0

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## 7 Revision History

Revision	Release Date	Description of Change	Checked By (Full Name)
X1	August 29, 2011	Preliminary release	
A	October 6, 2015	Initial release with product photo. Revise mechanical dimensions	
B	6/15/17	Revise color format	
C	7/25/17	Revise MLC PN's	
D	3/7/18	Add VRFUSB24096AIQTHxx. revise note 4 on PN table	
E	5/9/18	Add VRFUSB2032GAC1WT3 VRFUSB2064GAC5WT3 VRFUSB2128GACHWT3	

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