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SFF Committee

SFF-8660 Specification for

Variable Power Supply for Pluggable Modules and Hosts

Rev 0.3 June 8 2010

Secretariat: SFF Committee

Abstract: This specification defines the variable power supply controls for pluggable modules and host.

This specification provides a common reference for systems manufacturers, system integrators, and suppliers. This is an internal working specification of the SFF Committee, an industry ad hoc group.

This specification is made available for public review, and written comments are solicited from readers. Comments received by the members will be considered for inclusion in future revisions of this specification.

Support: This specification is supported by the identified member companies of the SFF Committee.

POINTS OF CONTACT:

Technical Editor

George Noh
Vitesse Semiconductor
741 Calle Plano
Camarillo, CA 93012
Ph: 818-477-4214
Email: noh at vitesse dot com

Chairman SFF Committee

I. Dal Allan
14426 Black Walnut Court
Saratoga CA 95070

408-867-6630
endlcom at acm dot org

EXPRESSION OF SUPPORT BY MANUFACTURERS

The following member companies of the SFF Committee voted in favor of this industry specification:

tbd

The following member companies of the SFF Committee voted against this industry specification:

tbd

The following member companies of the SFF Committee voted to abstain on this industry specification:

tbd

The user's attention is called to the possibility that implementation to this Specification may require use of an invention covered by patent rights. By distribution of this specification, no position is taken with respect to the validity of a claim or claims or of any patent rights in connection therewith. Members of the SFF Committee which advise that a patent exists are required to provide a statement of willingness to grant a license under these rights on reasonable and non-discriminatory terms and conditions to applicants desiring to obtain such a license.

Foreword

The development work on this specification was done by the SFF Committee, an industry group. The membership of the committee since its formation in August 1990 has included a mix of companies which are leaders across the industry.

When 2 1/2" diameter disk drives were introduced, there was no commonality on external dimensions e.g. physical size, mounting locations, connector type, connector location, between vendors.

The first use of these disk drives was in specific applications such as laptop portable computers and system integrators worked individually with vendors to develop the packaging. The result was wide diversity, and incompatibility.

The problems faced by integrators, device suppliers, and component suppliers led to the formation of the SFF Committee as an industry ad hoc group to address the marketing and engineering considerations of the emerging new technology.

During the development of the form factor definitions, other activities were suggested because participants in the SFF Committee faced more problems than the physical form factors of disk drives. In November 1992, the charter was expanded to address any issues of general interest and concern to the storage industry. The SFF Committee became a forum for resolving industry issues that are either not addressed by the standards process or need an immediate solution.

Those companies which have agreed to support a specification are identified in the first pages of each SFF Specification. Industry consensus is not an essential requirement to publish an SFF Specification because it is recognized that in an emerging product area, there is room for more than one approach. By making the documentation on competing proposals available, an integrator can examine the alternatives available and select the product that is felt to be most suitable.

SFF Committee meetings are held during T10 weeks (see www.t10.org), and Specific Subject Working Groups are held at the convenience of the participants. Material presented at SFF Committee meetings becomes public domain, and there are no restrictions on the open mailing of material presented at committee meetings.

Most of the specifications developed by the SFF Committee have either been incorporated into standards or adopted as standards by EIA (Electronic Industries Association), ANSI (American National Standards Institute) and IEC (International Electrotechnical Commission).

If you are interested in participating or wish to follow the activities of the SFF Committee, the signup for membership and/or documentation can be found at:

www.sffcommittee.com/ie/join.html

The complete list of SFF Specifications which have been completed or are currently being worked on by the SFF Committee can be found at:

ftp://ftp.seagate.com/sff/SFF-8000.TXT

If you wish to know more about the SFF Committee, the principles which guide the activities can be found at:

ftp://ftp.seagate.com/sff/SFF-8032.TXT

Suggestions for improvement of this specification will be welcome. They should be sent to the SFF Committee, 14426 Black Walnut Ct, Saratoga, CA 95070.

SFF Committee --

Variable Power Supply for Pluggable Modules and Hosts

1. Scope

This specification defines the variable power supply controls for pluggable modules and host.

1.1 Description of Clauses

Clause 1 contains the Scope and Purpose.
Clause 2 contains Referenced and Related Standards and SFF Specifications.
Clause 3 contains the General Description.
Clause 4 contains the Auxilary Monitoring.
Clause 5 contains the SFP+ Connector Description.
Clause 6 contains the QSFP+ Connector Description.
Clause 7 contains the CXP Connector Description.
Clause 8 contains the mini-SAS Connector Description.

2. References

2.1 Industry Documents

The following interface standards are relevant to many SFF Specifications.

- SFF8431 SFP+
- SFF8436 QSFP+
- SFF8642 CXP
- SFF8086/87 mini-SAS

2.2 SFF Specifications

There are several projects active within the SFF Committee. The complete list of specifications which have been completed or are still being worked on are listed in the specification at ftp://ftp.seagate.com/sff/SFF-8000.TXT

2.3 Sources

Those who join the SFF Committee as an Observer or Member receive electronic copies of the minutes and SFF specifications (http://www.sffcommittee.com/ie/join.html).

Copies of ANSI standards may be purchased from the InterNational Committee for Information Technology Standards (http://tinyurl.com/c4psg).

2.4 Conventions

The ISO convention of numbering is used i.e., the thousands and higher multiples are separated by a space and a period is used as the decimal point. This is equivalent to the English/American convention of a comma and a period.

English	French	ISO
0.6	0,6	0.6
1,000	1 000	1 000
1,323,462.9	1 323 462,9	1 323 462.9

2.5 Definitions

For the purpose of SFF Specifications, the following definitions apply:

Advanced grounding contacts: Connector contacts that make first and break last and are capable of carrying power ground return currents and performing electrostatic discharge. Other terms sometimes used to describe these features are: grounding pins, ESD contacts, grounding contacts, static drain, and pre-grounding contacts.

Alignment guides: Connector features that preposition insulators prior to electrical contact. Other terms sometimes used to describe these features are: guide pins, guide posts, blind mating features, mating features, alignment features, and mating guides

Board Termination Technologies: Surface mount single row, surface mount dual row, through hole, hybrid, straddle mount, pressfit.

Cable Termination: The attachment of wires to the termination side of a connector. Schemes commonly used in the industry are IDC (Insulation Displacement Contact), IDT (Insulation Displacement Termination), wire slots, solder, weld, crimp, braise, etc.

Contact mating sequence: Order of electrical contact during mating/unmating process. Other terms sometimes used to describe this feature are: contact sequencing, contact positioning, make first/break last, EMLB (early make late break) staggered contacts, and long pin / short pin.

Fixed: Used to describe the gender of the mating side of the connector that accepts its mate upon mating. This gender is frequently, but not always, associated with the common terminology “receptacle”. Other terms commonly used are “female” and “socket connector”. The term “fixed” is adopted from EIA standard terminology as the gender that most commonly exists on the fixed end of a connection, for example, on the board or bulkhead side. In this specification “fixed” is specifically used to describe the mating side gender illustrated in Figure 2.

Free: Used to describe the gender of the mating side of the connector that penetrates its mate upon mating. This gender is frequently, but not always, associated with the common terminology “plug”. Other terms commonly used are “male” and “pin connector”. The term “free” is adopted from EIA standard terminology as the gender that most commonly exists on the free end of a connection, for example, on the cable side. In this specification “free” is specifically used to describe the mating side gender illustrated in Figure 2.

Frontshell: That metallic part of a connector body that directly contacts the backshell or other shielding material that provides mechanical and shielding continuity between the connector and the cable media. Other terms sometimes used to describe this part of a cable assembly are: housing, nosepiece, cowling, and metal shroud.

Free Board: A connector that uses a free gender mating side and a termination side suitable for any of the printed circuit board termination technologies

Fixed Board: A connector that uses a fixed gender mating side and a termination side suitable for any of the printed circuit board termination technologies

Height: Distance from board surface to farthest overall connector feature

Mating side: The side of the connector that joins and separates from the mating side of a connector of opposite gender. Other terms commonly used in the industry are mating interface, separable interface and mating face.

Offset: An alignment shift from the center line of the connector

Optional: This term describes features which are not required by the SFF Specification. However, if any feature defined by the SFF Specification is implemented, it shall be done in the same way as defined by the Specification. Describing a feature as optional in the text is done to assist the reader. If there is a conflict between text and tables on a feature described as optional, the table shall be accepted as being correct.

Reserved: Where this term is used for defining the signal on a connector pin its actual function is set aside for future standardization. It is not available for vendor specific use. Where this term is used for bits, bytes, fields and code values; the bits, bytes, fields and code values are set aside for future standardization. The default value shall be zero. The originator is required to define a Reserved field or bit as zero, but the receiver should not check Reserved fields or bits for zero.

Right Angle: A connector design for use with printed circuit board assembly technology where the mating direction is parallel to the plane of the printed circuit board

Single row: A connector design for use with surface mount printed circuit board assembly technology where the termination side points are arranged in one line

Single sided termination: A cable termination assembly style and a connector design style where only one side of the connector is accessible when attaching wires. This style frequently has IDC termination points that point in the same direction.

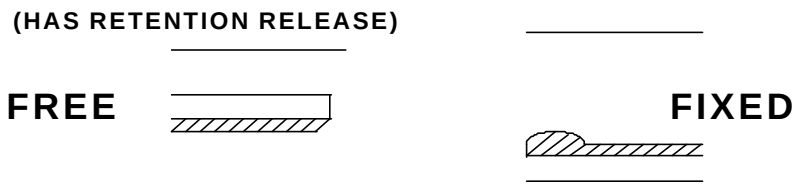
Straddle mount: A connector design style and a printed circuit board design style that uses surface mount termination points on both sides of the board. The connector is frequently centered between the top and bottom surfaces of the board.

Straight: A connector design for use with printed circuit board assembly technology where the mating direction is perpendicular to the plane of the printed circuit board

Surface mount: A connector design and a printed circuit board design style where the connector termination points do not penetrate the printed circuit board and are subsequently soldered to the printed circuit board

Termination side: The side of the connector opposite the mating side that is used for permanently attaching conductors to the connector. Due to pin numbering differences between mating side genders the termination side shall always be specified in conjunction with a mating side of a specific gender. Other terms commonly used in the industry are: back end, non-mating side, footprint, pc board side, and post side

Through hole: A connector design and a printed circuit board design style where the connector termination points penetrates the printed circuit board and are subsequently soldered to the printed circuit board.



THE FIXED GENDER IS USED ON THE DEVICE SIDE EXCEPT WHEN USED WITH WIRE TERMINATION

FIGURE 4-1 – MATING SIDE GENDER DEFINITION

3. General Description

3.1 Variable Power Supply CONTROL

To facilitate the power/current savings of deep-submicron CMOS processes, the Variable Power Supply specification defines modules that optionally support a VCC2 supply lower than 3.3V. These modules are intended for use in systems employing a variable power supply (VPS). In the default mode, which shall be included in every SFP+, QSFP+, CFP, CXP, and mini-SAS compliant implementation, the module is supplied and can operate normally with a 3.3V voltage on its VCC2 pins.

A module may include a discrete or integrated regulator, which supplies the CMOS ICs with a voltage lower than 3.3V by stepping down the VCC2 supply. In the case of a module having the regulator, the module powers up in the default mode of operation capable of operating normally with 3.3V on the VCC2 pins.

In the case of a module not having the regulator, the module powers up with 3.3V on the VCC2 pins, but the module is not yet operational.

In the mode enabled (“Low Voltage mode”) the CMOS ICs are connected directly to the VCC2 pins of the module. Serial ID Byte 221 (Table 01h), bit 7 indicates if optional VPS is implemented. VPS control registers are located in Bytes 58-59 as defined in Table 3-1.

Table 1 Variable Power Supply Fields

Byte	Bit	Name	Description
58	7-4	Reserved	
58	3-0	Voltage Supplied on the VCC2 Pins	Read Write. Powers up to 0000b. See Note 1
59	7-4	Voltage Supported with a Bypassed Regulator or non default VCC2	Read Only. See Note 1.
59	3-1	Reserved	
59	0	Low Voltage mode	0b = Mode disabled. Powers up to 0b. 1b = Mode enabled

1. The values in these fields are unsigned 4-bit binary integers (INT[3:0]. To translate to absolute voltage use: V[absolute] = (3.3V)-(INT[3:0])*(0.1-V).

Modules which implement an optional voltage mode shall monitor the VCC2 rail as part of the Auxiliary Monitoring.

When a host selects the optional voltage modes, the module shall automatically adjust the appropriate threshold and alarm register values described in TBD. The module shall issue an Interrupt if the Vcc2 voltage is ever outside the acceptable range.

When a host selects one of the optional voltage modes, power and current requirements of the module should scale at least linearly with voltage (this assumption is made to simplify the specification - in most cases power savings will be larger than linear). However, when a module is switched to the optional mode it shall not change the values in TBD. The host can use the default values in TBD to calculate the minimum power savings of the optional mode.

All voltage setting changes should take place when the module is in the low power, stand-bymode (i.e. P_Down pin is held high). The 2-wire serial bus and module interface signals shall remain fully functional during voltage setting changes, and the falling edge of P_Down should not reset these changes. To achieve the lowest power operation under any condition a host supporting an optional voltage mode should hold the P_Down pin high on empty module sockets.

To enable the “low voltage mode” the following sequence shall occur:

1. Host sets the module into the stand-by mode by holding the P_Down/RST pin asserted. During stand-by mode the module transmitter should be disabled.
2. Host reads the content of Byte 58 and 59 to determine the most desirable setting for VPS and changes the voltage on VCC2 pins of the module connector.
3. Host then writes Bit 0 of Byte 59 to 1b.
4. When P_Down is de-asserted module verifies the voltage on VCC2 is within range.

If voltage is within range, module enables all circuitry within the module and resumes with normal operation. If voltage is not within range, module sets the appropriate voltage monitoring Interrupt bit to inform the host and asserts Mod_NR.

To return the module to the default mode (VCC2=3.3V) the host shall assert P_Down and return the R/W fields of Bytes 58 and 59 to their default values.

4. Auxiliary Monitoring

This standard defines two flexible auxiliary A/D monitoring channels. This Byte, defined in Table TBD and Table TBD describes which quantities are monitored by each auxiliary A/D channel.

5. SFP+ Connector Details

TBD

6. QSFP+ Connector Details

TBD

7. CXP+ Connector Details

TBD

8. mini-SAS Connector Details

TBD