



SMART Storage Products

SMART Modular XceedUltra2 SCSI Solid State Drive



3.5" Data Storage

May 2009, Rev A
PN: 810100019-1N



REVISION HISTORY

Date	Revision	Section(s)	Description
May 2009	A	All	Prepared for release.



ESD Caution – Handling

Static electricity may be discharged through this disk subsystem. In extreme cases, this may temporarily interrupt the operation or damage components. To prevent this, make sure you are working in an ESD-safe environment. For example, before handling the disk subsystem, touch a grounded device, such as a computer case, prior to handling.

Where listed for specific models, performance characteristics for other models may differ.

One gigabyte, or GByte, equals one billion bytes when referring to drive capacity. Accessible capacity may vary based on the operating environment and drive formatting.

SMART Modular Technologies

SSD Design Center

4415 E. Cotton Center Blvd.

Phoenix, AZ 85040

602-735-0300 voice

602-735-0349 fax

marketing@adtron.com

An ISO 9001 certified company.

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1.0 INTRODUCTION

This product specification defines the architecture, attributes, performance, technologies, and compliance and regulatory requirements for the XceedUltra2 SCSI data storage drive.

1.1 Product Description

The XceedUltra2 SCSI solid state drive (SSD) provides high capacity non-volatile storage at significantly greater speeds than comparable 3.5" SCSI hard disk drives. Equipped with long-life operation that far exceeds the mean time between failures (MTBF) of hard disk drives (HDDs) and enhanced operating reliability and rugged durability, the XceedUltra2 SCSI excels in mission critical applications where the cost of lost data is high.

The industry-standard Wide SCSI interface simplifies the integration of flash storage memory into any computing platform and operating environment. The XceedUltra2 SCSI SSD is available with a 68-pin or 80-pin unitized connector. Designed for heavy duty operation, the XceedUltra2 SCSI SSDs perform under conditions of extended temperature, high shock and vibration, and rapid temperature gradients.

1.2 Key Features

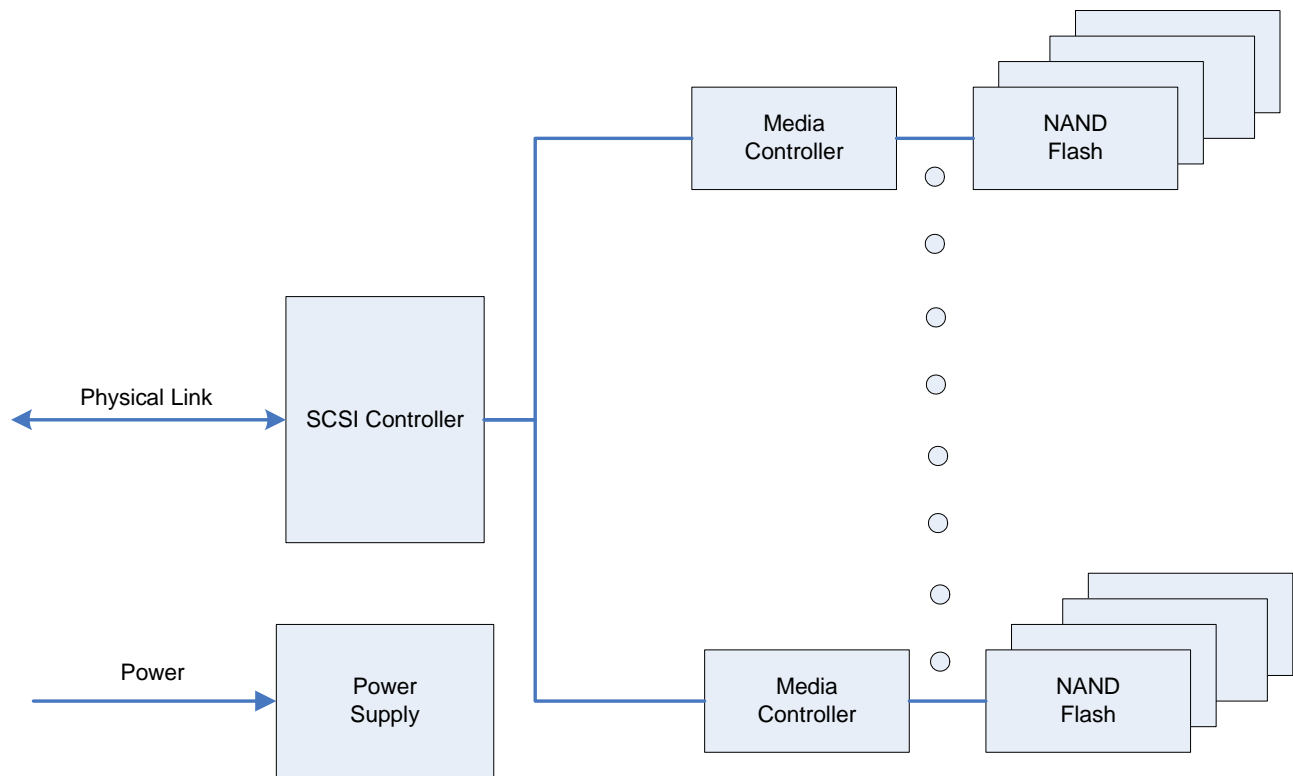
- Solid state flash technology
- Ultra Wide SCSI high performance
- Support for Low Voltage Differential (LVD) and Single-Ended (SE) operations
- 68-pin interface for cable connection; 80-pin interface for backplane connection
- Broad compatibility with operating system drivers
- Full SCSI drive operation support
- Built-in support for 512-byte sector operation
- 5 V operation
- Available in commercial (0°C to +70°C) and industrial (-40°C to +85°C) operating temperature ranges
- Compliant with ANSI INCITS 301-1997 SPC (American National Standard for Information Systems, SCSI-3)
- Tested to MIL-STD-810F specifications
- 3-year standard warranty

1.3 Applications

- Radar mapping systems
- Avionics and airborne systems
- Electronic counter measures
- Telecommunications and fibre optic switches
- Streaming video
- Wireless-base station controllers
- Network routers and switches
- CNC manufacturing equipment
- Medical CAT/MRI scanning equipment

1.4 Block Diagram

Figure 1: Block Diagram



1.5 Related Documents

- ANSI INCITS 301-1997 SPC (American National Standard for Information Systems, SCSI-3)
- XceedUltra2 SCSI Installation Manual

2.0 PRODUCT SPECIFICATIONS

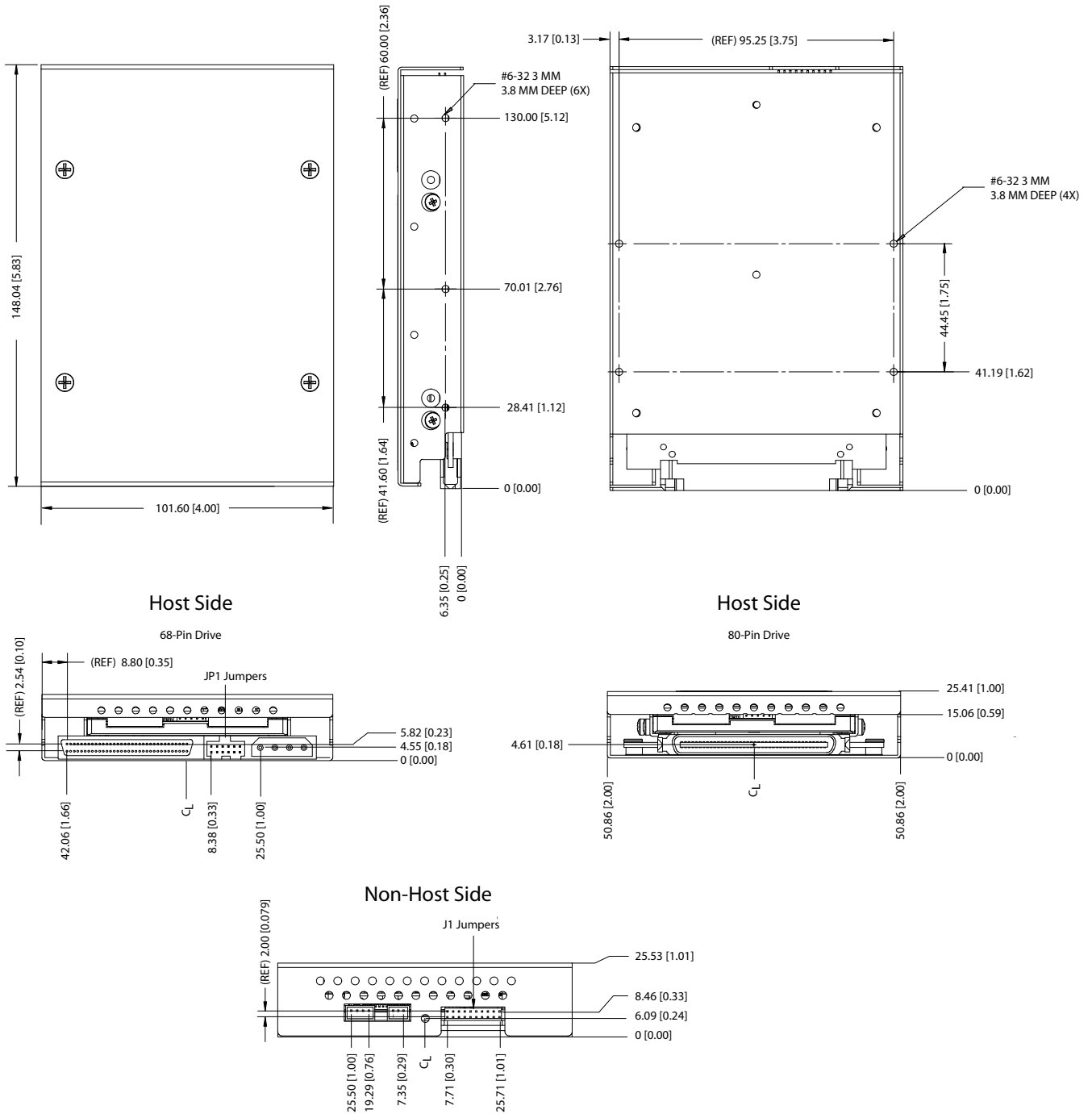
2.1 Physical Characteristics

The following table describes the XceedUltra2 SCSI SSD dimensions, with the maximum weight. For detailed mounting configurations, see [Figure 2](#).

Table 1: Physical Characteristics

Parameter	Value
Length	148.0 mm [5.8 in]
Width	101.6 mm [4.0 in]
Height	25.5 mm [1.0 in]
Weight (Maximum)	315.0 g [0.7 lbs]

Figure 2: Physical Dimensions in mm [inches]



2.2 Performance

Tables 2 and 3 show the performance specifications, which are based on the S35FCU-64GC01N.

2.2.1 Sustained Performance

Table 2: Sustained Read/Write Performance

Item	Estimated Performance
Sustained Read ¹	Up to 55 MBytes/sec ²
Sustained Write	Up to 50 MBytes/sec

2.2.2 Access/Startup Times

Table 3: Access/Startup Performance

Item	Estimated Performance
Reset to Selection	350 μ secs
Reset to Ready	290 msec
Access Time	510 μ secs
Seek Time	0

2.3 Memory Capacities

Table 4 describes the available memory capacities for the XceedUltra2 SCSI SSD.

Table 4: Memory Capacities

Uninitialized Drive Capacity (GBytes) ³	User-Addressable Sectors
8	15695872
16	31424512
32	62881792
64	125796352

¹ Sustained performance values are based on 128 KByte transfers.

² One megabyte, or MByte, equals 1,048,576 bytes.

³ This number does not include the OS file system overhead.

2.4 Supply Voltage

Table 5: XceedUltra2 SCSI SSD Supply Voltage

Parameter	Min	Typ	Max	Units
Supply Voltage (V _{CC})	4.75	5.00	5.25	V

2.5 Power Consumption

The following table identifies the power requirements for the XceedUltra2 SCSI SSD. All measurements are based on 5 V.

Table 6: Power Requirements

Parameter	Maximum	
	mA	W
Start-Up Current	1200	6.0
Read/Write Current	1400	7.0
Idle Current	800	4.0
Hot Swap Current (80-Pin Drive Only)	6900 ⁴	34.5

3.0 RELIABILITY CHARACTERISTICS

Table 7: Reliability Parameters

Item	Value
Bit Error Rate (BER)	< 1 non-recoverable error in 10 ¹⁴ bits
Write Endurance	> 260 years @ 200 GBytes/day (64 GByte drive) ⁵
Read Endurance	Unlimited
Data Retention at 25°C	10 years
ECC/EDC (BCH)	Up to 6 random bits per 512-byte sector
Reliability (MTBF)	1,300,000 hours (Pending) ⁶

⁴ This is an instantaneous surge of about 40 μsecs to charge the capacitors on the drive.

⁵ Based on 128 KByte file size, continuous write to the drive, and 300,000 program erase cycles. This number does not include file system write overhead, which may vary depending on the file system. The total lifespan of the drive is dependent on both MTBF and write endurance numbers.

⁶ Calculated using an S35FCU-64GC01N. Based on Telcordia, Ground Benign Controlled at 25°C.

4.0 ENVIRONMENTAL SPECIFICATIONS

4.1 Temperature

Table 8: Reliability Temperatures

Parameter	Min	Typ	Max
Commercial Operating Temperature (T_A)	0°C	25°C	70°C
Industrial Operating Temperature (T_A) ⁷	-40°C	--	85°C
Storage Temperature (T_{STG}) ⁷	-55°C	--	95°C

4.2 Operating Environment (Pending)

Table 9: Operating Environment

Parameter	Value
Relative Humidity ⁸	5% to 95%, non-condensing
Operating Altitude ⁹	24,384 m [80,000 ft]

4.3 Shock and Vibration (Pending)

Table 10: Shock and Vibration

Parameter	Value
Non-Operating Shock ¹⁰	1500 g half-sine, 0.5ms, 1 shock (+/- each) along the, X, Y, and Z axes
Operating Shock ¹⁰	50 g half-sine, 11 msec, 3 shocks along each axis, X, Y, and Z, in each direction
Operating Vibration ¹¹	10 g rms 10-2000 Hz, 3 axes

⁷ Based on MIL-STD-810F, Methods 501.4 and 502.4 Procedure I.

⁸ Based on MIL-STD-810F, Method 507.4.

⁹ Based on MIL-STD-810F, Method 500.4 Procedure I.

¹⁰ Based on MIL-STD-810F, Method 516.5-10 Procedure I (modified).

¹¹ Based on MIL-STD-810F, Method 514.5 Procedure IV (modified and pending).

4.4 Regulations

Table 11: Compliance

Regulation	Compliance
EMC/Emissions	EN 55022:1998+A1 & A2; CISPR 22:1997; FCC CFR 47 Part 15 Subpart B:2002
EMC/Immunity	EN 61000-4-2:1995; EN 61000-4-3:1998; EN 55024:1998, CISPR 24:1997
Safety	UL IEC 60950-1:2003; CSA C22.2 No. 60950-1
RoHS	EU Directive 2002/95/EC



5.0 SCSI BUS INTERFACE CHARACTERISTICS

5.1 Termination

Reliable operation requires proper termination. Because the XceedUltra2 SCSI drive does not contain any on-board termination circuits, SMART Modular Technologies recommends properly terminating each end of the bus in accordance with the SCSI Parallel Interface (SPI) specification.

5.2 SE Characteristics

Table 12: SE SCSI Bus Interface Characteristics

Parameter	Description	Test Conditions	Min	Max	Unit
V_{IH}	Input High Voltage		2.0	$V_{CC} + 0.5$	V
V_{IL}	Input Low Voltage		$V_{SS} - 0.5$	0.8	V
V_{OL}	Output Low Voltage	$I_{OL} = 48 \text{ mA}$	V_{SS}	0.5	V
V_{HYS}	Hysteresis		200	450	mV
I_{OL}	Output Low Current	$V_{OL} = 0.5 \text{ V}$	48		mA
I_{IH}	Input High Leakage	$V_{IH} = 5.25 \text{ V}$		50	μA
I_{IL}	Input Low Leakage	$V_{IL} = V_{SS}$		-50	μA

5.3 LVD Characteristics

Table 13: LVD SCSI Bus Interface Characteristics

Parameter	Description	Test Conditions	Min	Max	Unit
I_{O+}	Source(+) Current	Asserted	-6.5	-13.5	mA
I_{O-}	Source(+) Current	Asserted	6.5	13.5	mA
I_{O+}	Source(+) Current	Negated	2.5	9.5	mA
I_{O-}	Source(+) Current	Negated	-2.5	-9.5	mA

6.0 PIN CONFIGURATIONS

6.1 68-Pin Connector Pinout

Table 14: 68-Pin Connector Pinout

Pin	Signal	Pin	Signal
1	+DB[12]	35	-DB[12]
2	+DB[13]	36	-DB[13]
3	+DB[14]	37	-DB[14]
4	+DB[15]	38	-DB[15]
5	+DBP[1]	39	-DBP[1]
6	+DB[0]	40	-DB[0]
7	+DB[1]	41	-DB[1]
8	+DB[2]	42	-DB[2]
9	+DB[3]	43	-DB[3]
10	+DB[4]	44	-DB[4]
11	+DB[5]	45	-DB[5]
12	+DB[6]	46	-DB[6]
13	+DB[7]	47	-DB[7]
14	+DBP[0] (+PCRCA)	48	-DBP[0] (-PCRCA)
15	GND	49	GND
16	DIFFSENS	50	GND
17	TERMPWR	51	TERMPWR
18	TERMPWR	52	TERMPWR
19	NC	53	NC
20	GND	54	GND
21	+ATN	55	-ATN
22	GND	56	GND
23	+BSY	57	-BSY
24	+ACK	58	-ACK
25	+RST	59	-RST
26	+MSG	60	-MSG
27	+SEL	61	-SEL
28	+C/D	62	-C/D
29	+REQ	63	-REQ
30	+I/O	64	-I/O
31	+DB[8]	65	-DB[8]
32	+DB[9]	66	-DB[9]
33	+DB[10]	67	-DB[10]
34	+DB[11]	68	-DB[11]

6.2 80-Pin Connector Pinout

Table 15: 80-Pin Connector Pinout

Pin	Signal	Pin	Signal
1	Not Used	41	GND
2	Not Used	42	GND
3	Not Used	43	GND
4	Not Used	44	MATED 1
5	NC	45	NC
6	NC	46	DIFFSENS
7	-DB[11]	47	+DB[11]
8	-DB[10]	48	+DB[10]
9	-DB[9]	49	+DB[9]
10	-DB[8]	50	+DB[8]
11	-I/O	51	+I/O
12	-REQ	52	+REQ
13	-C/D	53	+C/D
14	-SEL	54	+SEL
15	-MSG	55	+MSG
16	-RST	56	+RST
17	-ACK	57	+ACK
18	-BSY	58	+BSY
19	-ATN	59	+ATN
20	-PCRCA	60	+PCRCA
21	-DB[7]	61	+DB[7]
22	-DB[6]	62	+DB[6]
23	-DB[5]	63	+DB[5]
24	-DB[4]	64	+DB[4]
25	-DB[3]	65	+DB[3]
26	-DB[2]	66	+DB[2]
27	-DB[1]	67	+DB[1]
28	-DB[0]	68	+DB[0]
29	-DBP[1]	69	+DBP[1]
30	-DB[15]	70	+DB[15]
31	-DB[14]	71	+DB[14]
32	-DB[13]	72	+DB[13]
33	-DB[12]	73	+DB[12]
34	5 V	74	MATED 2 (GND)
35	5 V	75	5 V GND
36	5 V Charge	76	5 V GND
37	NC	77	ACTIVE LED OUT
38	NC	78	DLYD START
39	SCSI ID (0)	79	SCSI ID (1)
40	SCSI ID (2)	80	SCSI ID (3)

6.3 68-Pin Descriptions

Table 16: 68-Pin Connection Description

Signal Name	Pin Number(s)	Description
-BSY	57	BUSY is an OR-tied signal that indicates the SCSI bus is in use.
+BSY	23	
-SEL	61	SELECT is an OR-tied signal used by an initiator to select a target or by a target to reselect initiator.
+SEL	27	
-RST	59	RESET is an OR-tied signal that indicates the RESET condition.
+RST	25	
-C/D	62	The target initiates the CONTROL/DATA signal to indicate whether control or DATA phase information is on the DATA BUS. Asserted indicates control (i.e., COMMAND, STATUS and MESSAGE phases).
+C/D	28	
-I/O	64	The target initiates the INPUT/OUTPUT signal to control the direction of data movement on the DATA Bus with respect to an initiator. Asserted indicates INPUT. This signal is also used to distinguish between SELECTION and RESELECTION phases.
+I/O	30	
-MSG	60	The target initiates the MESSAGE signal to indicate the MESSAGE phase or a DATA phase depending on whether C/D is true or false. Asserted indicates MESSAGE or dual-transition data (DT DATA).
+MSG	26	
-REQ	63	The target initiates the REQUEST signal to indicate a request for an information transfer on the SCSI bus.
+REQ	29	
-ACK	58	The initiator generates the ACKNOWLEDGE signal to respond with an acknowledgement of an information transfer on the SCSI bus.
+ACK	24	
-ATN	55	The initiator generates the ATTENTION signal to indicate the ATTENTION condition.
+ATN	21	
-DB[15:0]	38-35, 68-65, 47-40	The 16-bit DATA BUS contains sixteen data-bit signals.
+DB[15:0]	4-1, 34-31, 13-6	
-DBP[0] (PCRCA)	48	The PARITY/CRC AVAILABLE signal indicates either parity or CRC is available based on bus phase and negotiated settings. This is the SCSI Low Byte Parity Data signal.
+DBP[0] (PCRCA)	14	
-DBP[1]	39	The PARITY 1 signal is normally sourced by the SCSI device driving the DATA BUS. This is the SCSI High Byte Parity Data signal.
+DBP[1]	5	
TERMPWR	17, 18, 51, 52	The SCSI host adapter normally sources the TERMPWR signal used to supply Termination Power to SCSI devices on the bus. Standard configuration uses V_{CC} for TERMPWR.
DIFFSENS	16	The DIFFSENS signal is used to define the signalling mode for the SCSI BUS. It is low for single-ended SCSI, approximately 1.3 V for LVD, and greater than 2 V for HVD. The XceedUltra2 SCSI drive does not support HVD (High Voltage Differential).
GND	15, 20, 22, 49, 50, 54, 56	Ground
NC	19, 53	No Connect

6.4 80-Pin Descriptions

Because the 80-pin connectors do not contain any TERMPWR pins, the host must provide terminator power.

Table 17: 80-Pin Connection Description

Signal Name	Pin Number(s)	Description
-BSY	18	BUSY is an OR-tied signal that indicates the SCSI bus is in use.
+BSY	58	
-SEL	14	SELECT is an OR-tied signal used by an initiator to select a target or by a target to reselect initiator.
+SEL	54	
-RST	16	RESET is an OR-tied signal that indicates the RESET condition.
+RST	56	
-C/D	13	The target initiates the CONTROL/DATA signal to indicate whether control or DATA phase information is on the DATA BUS. Asserted indicates control (i.e., COMMAND, STATUS and MESSAGE phases).
+C/D	53	
-I/O	11	The target initiates the INPUT/OUTPUT signal to control the direction of data movement on the DATA Bus with respect to an initiator. Asserted indicates INPUT. This signal is also used to distinguish between SELECTION and RESELECTION phases.
+I/O	51	
-MSG	15	The target initiates the MESSAGE signal to indicate the MESSAGE phase or a DATA phase depending on whether C/D is true or false. Asserted indicates MESSAGE or dual-transition data (DT DATA).
+MSG	55	
-REQ	12	The target initiates the REQUEST signal to indicate a request for an information transfer on the SCSI bus.
+REQ	52	
-ACK	17	The initiator generates the ACKNOWLEDGE signal to respond with an acknowledgement of an information transfer on the SCSI bus.
+ACK	57	
-ATN	19	The initiator generates the ATTENTION signal to indicate the ATTENTION condition.
+ATN	59	
-DB[15:0]	30-33, 7-10, 21-28	The 16-bit DATA BUS contains sixteen data-bit signals.
+DB[15:0]	70-73, 47-50, 61-68	
-PCRCA	20	The PARITY/CRC AVAILABLE signal indicates either parity or CRC is available based on bus phase and negotiated settings. This is the SCSI Low Byte Parity Data signal.
+PCRCA	60	
-DBP[1]	29	The PARITY 1 signal is normally sourced by the SCSI device driving the DATA BUS. This is the SCSI High Byte Parity Data signal.
+DBP[1]	69	
DIFFSENS	46	The DIFFSENS signal is used to define the signalling mode for the SCSI BUS. It is low for single-ended SCSI, approximately 1.3 V for LVD, and greater than 2 V for HVD. The XceedUltra2 SCSI drive does not support HVD (High Voltage Differential).
5 V Charge	36	Charge supply to device (1 A maximum continuous).
5 V	34-35	5 V
12 V	1-4	Not Used
MATED 2:1	74, 44	The MATED control signals ensure the drive is fully mated.
ACTIVE LED OUT	77	The drive will sink current to light an external LED. The user backplane or system must provide a current-limiting resistor and LED external to the drive. The sink current must be limited to less than 30 mA.
DLYD START	78	Not required; not used.
GND	41-43, 75, 76	Ground
NC	5, 6, 37, 38, 45, 77, 78	No Connect

6.5 Power Connector Pinout

The 68-pin XceedUltra2 SCSI SSD contains a 4-pin power connection. The 80-pin XceedUltra2 SCSI SSD receives power through the SCSI connection.

Table 18: Power Connector Pinout

Pin	Description
P1	+12 V (No Connection/Not Required)
P2	Ground
P3	Ground
P4	+5 V

Figure 3: 68-Pin and Power Connections

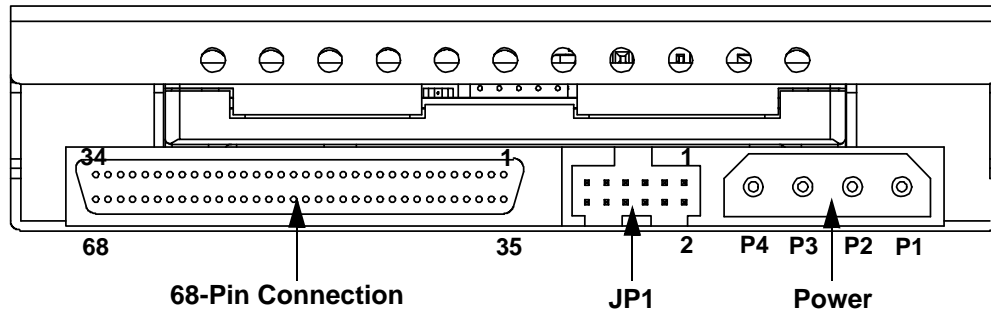
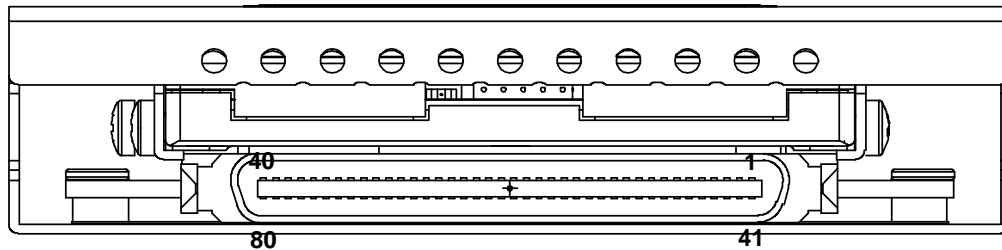


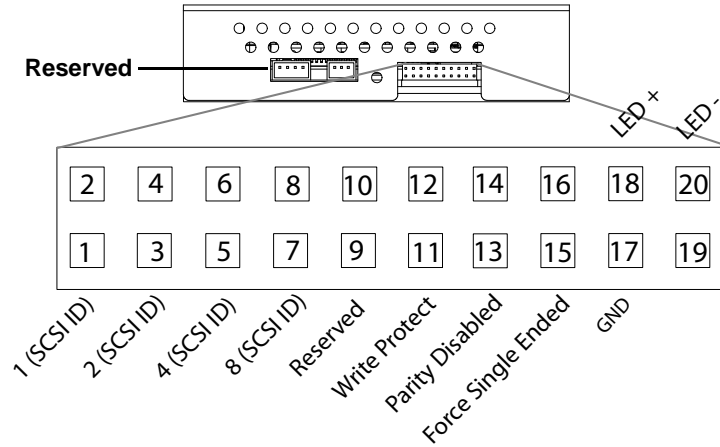
Figure 4: 80-Pin Connection



6.6 J1 Jumper Descriptions

Both the 68-pin and 80-pin drives provide the J1 jumper. This jumper contains 20 pins used for setting the SCSI ID, write protect, and other functions (see the following figure).

Figure 5: J1 Location and SCSI ID Settings



	1	2	4	8		1	2	4	8
SCSI ID 0	2	4	6	8	SCSI ID 8	2	4	6	8
	1	3	5	7		1	3	5	7
SCSI ID 1	2	4	6	8	SCSI ID 9	2	4	6	8
	1	3	5	7		1	3	5	7
SCSI ID 2	2	4	6	8	SCSI ID 10	2	4	6	8
	1	3	5	7		1	3	5	7
SCSI ID 3	2	4	6	8	SCSI ID 11	2	4	6	8
	1	3	5	7		1	3	5	7
SCSI ID 4	2	4	6	8	SCSI ID 12	2	4	6	8
	1	3	5	7		1	3	5	7
SCSI ID 5	2	4	6	8	SCSI ID 13	2	4	6	8
	1	3	5	7		1	3	5	7
SCSI ID 6	2	4	6	8	SCSI ID 14	2	4	6	8
	1	3	5	7		1	3	5	7
SCSI ID 7	2	4	6	8	SCSI ID 15	2	4	6	8
	1	3	5	7		1	3	5	7

6.6.1 Write Protect

By default, Write Protect is disabled. To enable Write Protect, place a jumper across J1 pins 11 and 12.

6.6.2 Parity

The XceedUltra2 SCSI SSD uses a parity bit to check for data errors. By default, parity checking is enabled. To disable parity checking, place a jumper across J1 pins 13 and 14.

6.6.3 Single-Ended (SE) and Low Voltage Differential (LVD)

All SCSI buses require a termination network at each end to function properly. Bus termination differs depending on the type of SCSI devices present on the bus, such as SE or LVD devices. The XceedUltra2 SCSI supports multi-mode active termination applications with SE and LVD SCSI devices on the same bus. The SCSI bus DIFFSENS signal determines the appropriate termination.

Conditional configuration modes include the following:

- **SE:** Single-ended devices short the DIFFSENS line to ground, signaling the XceedUltra2 SCSI SSD to operate in SE mode.
- **LVD:** Low voltage differential devices drive the DIFFSENS line to 1.3 V.
- **SE and LVD:** If both types of SCSI devices are present, SE devices drive a short to ground on the DIFFSENS line, forcing all devices on the bus into SE mode.

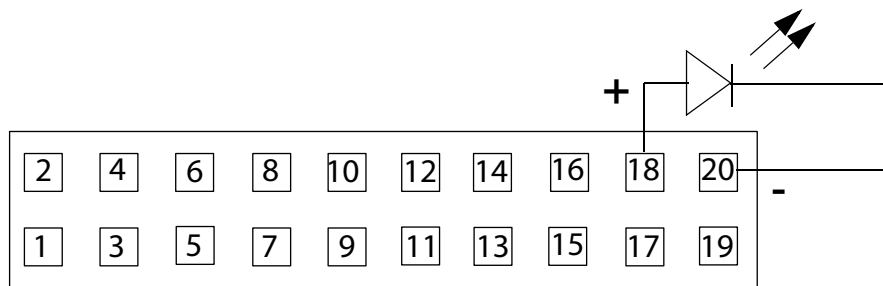
Placing a jumper across J1 pins 15 and 16 forces the XceedUltra2 SCSI SSD drive to operate in SE mode only. If left open, the drive operates as either SE or LVD, depending on the configuration mode.

All configuration modes comply with the SCSI Parallel Interface (SPI-3) Specification.

6.6.4 Remote LED

Pins 18 and 20 support the connection of a remote light emitting diode (LED), as shown in Figure 6. The output is active high and includes an on-board, current-limiting resistance of 200 ohms. To install the LED, connect the positive lead to J1 pin 18 and the negative to J1 pin 20.

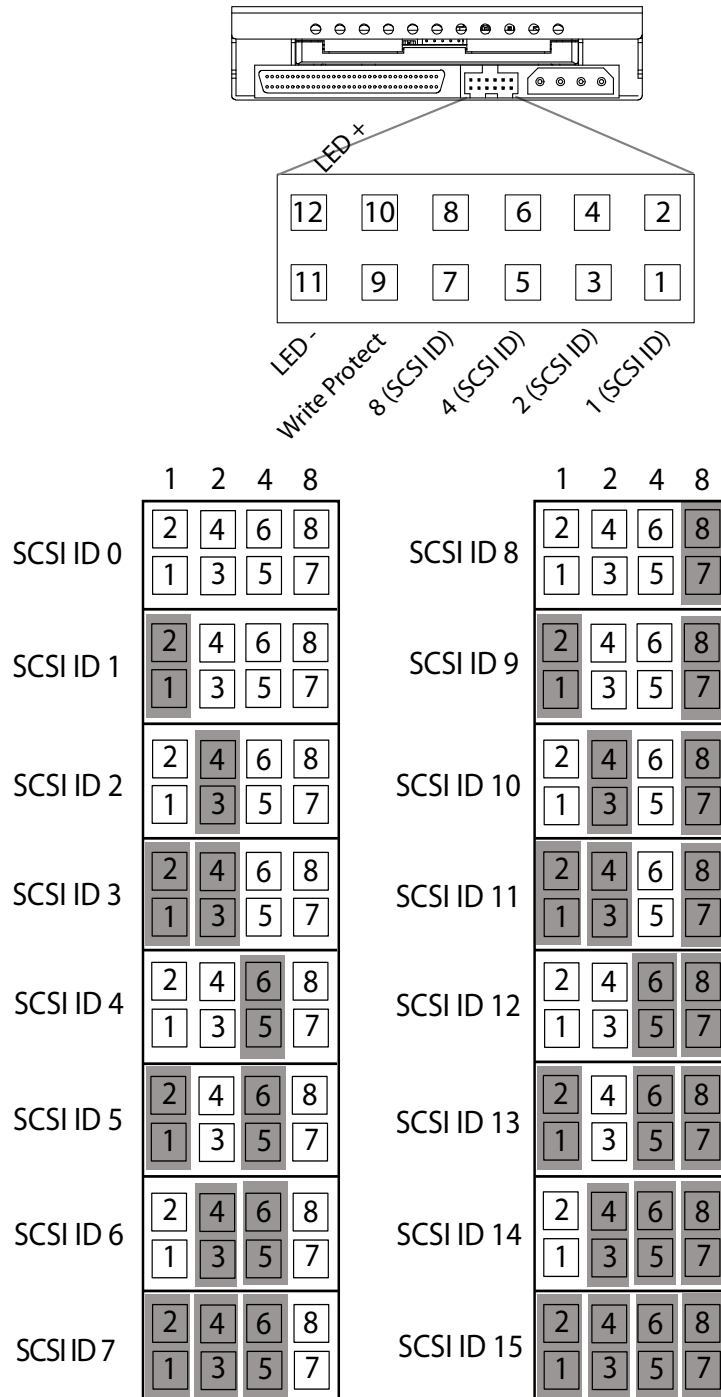
Figure 6: J1 Remote LED Connection



6.7 JP1 Jumper Descriptions

The 68-pin XceedUltra2 SCSI SSD contains a host-side jumper (JP1) with 12 pins. This jumper configures the SCSI ID, write protect feature, and connects to an external LED (see the following figure).

Figure 7: JP1 Location and SCSI ID Settings



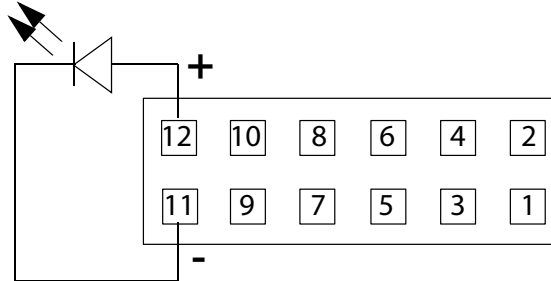
6.7.1 Write Protect

By default, Write Protect is disabled. To enable Write Protect, place a jumper across JP1 pins 9 and 10.

6.7.2 Remote LED

JP1 pins 11 and 12 support the connection of a remote light emitting diode (LED), as shown in [Figure 8](#). The output is active high and includes an on-board, current-limiting resistance of 200 ohms. To install the LED, connect the positive lead to pin 11 and the negative to pin 12.

Figure 8: JP1 Remote LED Connection



7.0 SUPPORTED SCSI COMMANDS

The XceedUltra2 SCSI SSD supports the commands listed in the following table. For a complete description of these commands, refer to the SCSI-3 specification.

Table 19: Supported SCSI Commands

Command	Command Code	Type	Note
Format Unit (6 Bytes)	04h	Mandatory	Does not support the mandatory FmtData bits.
Inquiry (6 Bytes)	12h	Mandatory	
Mode Select (6 Bytes)	15h	Optional	
Mode Sense (6 and 10 Bytes)	1Ah	Optional	
	5Ah	Optional	
Prevent Allow Medium Removal (6 Bytes)	1Eh	Optional	
Request Sense (6 Bytes)	03h	Mandatory	
Read (6 and 10 Bytes)	08h	Mandatory	
	28h	Mandatory	
Read Capacity (10 Bytes)	25h	Mandatory	
Rezero (6 Bytes)	01h	Optional	
Release (6 Bytes)	17h	Optional	
Report Logical Unit Numbers (12 Bytes)	A0h	Mandatory	ANSI INCITS 301-1997 (SCSI-3)
Reserve (6 Bytes)	16h	Optional	
Seek (6 and 10 Bytes)	0Bh	Optional	
	2Bh	Optional	
Send Diagnostic (6 Bytes)	1Dh	Mandatory	Supports self-test only.
Start Stop Unit (6 Bytes)	1Bh	Optional	
Synchronize Cache (10 Bytes)	35h	Optional	
Test Unit Ready (6 Bytes)	00h	Mandatory	
Verify (10 Bytes)	2Fh	Optional	
Write (6 and 10 Bytes)	0Ah	Optional	
	2Ah	Optional	
Write and Verify (10 Bytes)	2Eh	Optional	

8.0 ORDERING INFORMATION

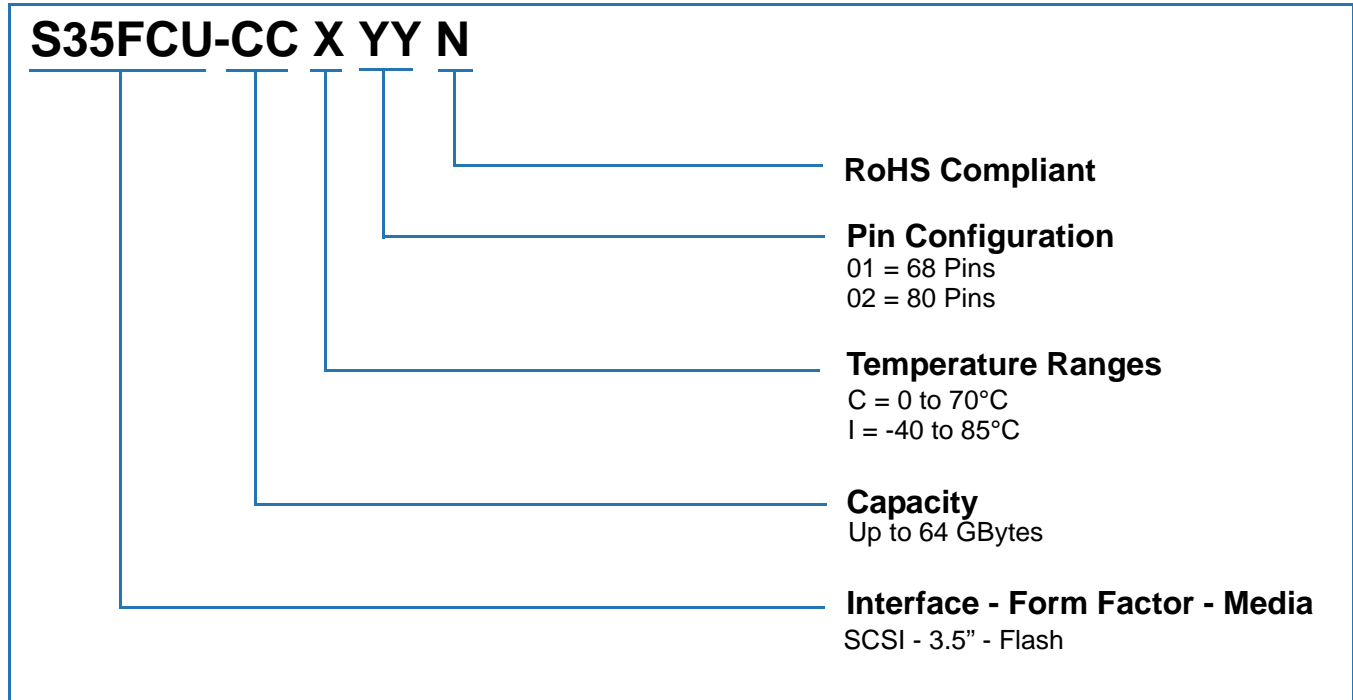


Table 20: Model Numbers ¹²

Model	Capacity (GBytes)	Height (mm)
S35FCU-8GXYYN	8	25.5
S35FCU-16GXYYN	16	25.5
S35FCU-32GXYYN	32	25.5
S35FCU-64GXYYN	64	25.5

¹²In the model number, "X" identifies the temperature range of the media (C = Commercial; I = Industrial), and "YY" indicates the pin configuration (01 = 68 Pins; 02 = 80 Pins).

9.0 CONTACT INFORMATION

9.1 SMART Modular Technologies Headquarters

39870 Eureka Dr.
Newark, CA 94560
Tel: (510) 623-1231
Fax: (510) 623-1434
E-mail: info@smartm.com
Web: <http://www.smartm.com>

9.2 SSD Design Center and North American Sales

4415 E. Cotton Center Blvd.
Phoenix, AZ 85040
Tel: (602) 735-0300
Fax: (602) 735-0349
E-mail: nasales@adtron.com
Web: <http://www.adtron.com>

9.3 International Sales

Phoenix, AZ 85040
Tel: (602) 735-0300
Fax: (602) 735-0349
E-mail: international@adtron.com

9.4 Worldwide Technical Support

4415 E. Cotton Center Blvd.
Phoenix, AZ 85040
Tel: (602) 735-0300
Fax: (602) 735-0359
E-mail: techsupport@adtron.com