

DS1100SDC-3

1100 Watts

Distributed Power

Total Power: 1100 Watts
Input Voltage: -36 to -72 Vdc
of Outputs: Main and Standby



Special Features

- 1100 W output power
- High-power and short form factor
- 1U power supply
- High-density design: 24 W/in³
- Inrush current control
- N+1 or N+N Redundant
- Hot-pluggable
- Active current sharing
- Full digital control
- PMBus™ compliant
- Compatible with Artesyn's universal PMBus GUI
- Reverse airflow option
- Two-year warranty

Safety

UL/cUL 60950 (UL Recognized)
DEMKO+ CB Report EN60950
EN60950
CE Mark
China CCC

Product Descriptions

DS1100SDC-3 is a 1100 Watt switching power supply with the following features; -54V(nominal) DC input, Single 12V output with a 12V standby aux output. This power supply has a power density of more than 24 Watts per cubic inch, and the efficiency will be 91% at -48V DC input for 50% load. The form factor is 1U and can be used in single or in redundant configurations.

DS1100SDC-3 is equipped with an I²C interface available with industry-standard PMBus™ communications protocol. It also contains a memory device (EEPROM) that is preprogrammed with data about the unit – including its type, serial number and date of manufacture – to facilitate replacement in the field.

Model Numbers

Standard	Output Voltage	Minimum Load ¹	Maximum Load	Standby Supply	Air Flow Direction
DS1100SDC-3	12.0Vdc	2A	91.6A	12.0V@3A	Forward (Output Connector to Red Handle)
DS1100SDC-3-001	12.0Vdc	2A	91.6A	12.0V@3A	Reverse (Blue Handle to Output Connector)

Note 1 - Minimum current for transient load response testing only. Unit is designed to operate and be within output regulation range at zero load.

Options

None

Electrical Specifications

Absolute Maximum Ratings

Stress in excess of those listed in the “Absolute Maximum Ratings” may cause permanent damage to the power supply. These are stress ratings only and functional operation of the unit is not implied at these or any other conditions above those given in the operational sections of this TRN. Exposure to any absolute maximum rated condition for extended periods may adversely affect the power supply’s reliability.

Table 1. Absolute Maximum Ratings:

Parameter	Model	Symbol	Min	Typ	Max	Unit
Input Voltage DC continuous operation	All models	$V_{IN,DC}$	-36	-	-72	Vdc
Maximum Output Power (Main + Standby)	All models	$P_{O,max}$	-	-	1100	W
Isolation Voltage	Input to outputs	All models	-	-	1400	Vdc
	Input to safety ground	All models	-	-	1400	Vdc
Ambient Operating Temperature	DS1100SDC-3 DS1100SDC-3-001	T_A	0 0	- -	+50 +40	°C
Storage Temperature	All models	T_{STG}	-40	-	+70	°C
Humidity (non-condensing)	Operating	All models	20	-	80	%
	Non-operating	All models	10	-	95	%
Altitude	Operating	All models	-	-	10,000	feet
	Non-operating	All models	-	-	50,000	feet

Input Specifications

Table 2. Input Specifications:

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Operating Input Voltage, DC	All	$V_{IN,DC}$	-36	-54	-72	Vdc
Maximum Input Current ($I_O = I_{O,max}$, $I_{SB} = I_{SB,max}$)	$V_{IN,DC} = -36Vdc$	$I_{IN,max}$	-	-	37	A
Standby Input Current ($V_O = Off$, $I_{SB} = 0A$)	$V_{IN,DC} = -36Vdc$	$I_{IN,standby}$	-	-	290	mA
Standby Input Power ($V_O = Off$, $I_{SB} = 0A$)	$V_{IN,DC} = -36Vdc$	$P_{IN,standby}$	-	-	10.44	W
No Load Input Current ($V_O = On$, $I_O = 0A$, $I_{SB} = 0A$)	$V_{IN,DC} = -36Vdc$	$I_{IN,no-load}$	-	-	450	mA
No Load Input Power ($V_O = On$, $I_O = 0A$, $I_{SB} = 0A$)	$V_{IN,DC} = -36Vdc$	$P_{IN,no-load}$	-	-	16.2	W
Startup Surge Current (Inrush) @ 25°C	$V_{IN,DC} = -72Vdc$	$I_{IN,surge}$	-	-	55	A_{PK}
Input Fuse	Internal, Fast Acting 50A, 170V		-	-	50	A
Operating Efficiency @ 25°C	$I_O = 50\%I_{O,max}$ $V_{IN,DC} = -48Vdc$	η	-	-	90	%
System Stability:						
Phase Margin	All		45	-	-	°
Gain Margin	All		-10	-	-	dB

Output Specifications

Table 3. Output Specifications:

Parameter	Condition	Symbol	Min	Typ	Max	Unit	
Output Regulation	All models	V_O	11.4	12.0	12.6	V	
	All models	V_{SB}	11.4	12.0	12.6		
Output Ripple, pk-pk	All models	Measure with a 0.1uF ceramic capacitor in parallel with a 10uF tantalum capacitor, 0 to 20MHz bandwidth	-	-	120	mV _{PK-PK}	
	All models		-	-	120		
Output Current	All models	$V_{IDC} = -36$ to -72 Vdc	I_O	2 ¹	-	91.6	A
			I_{SB}	0.1 ¹	-	3.0	
Vo Current Share Accuracy			-	-	+/-5	% $I_{O,max}$	
V_O Minimum Current Share Loading			10	-	-	% $I_{O,max}$	
Number of Parallel Units		Main Output "ISHARE" connected	-	-	4		
Load Capacitance	Start up		2000	-	40000	μ F	
			0	-	680	μ F	
V_O Dynamic Response Peak Deviation		50% load change, slew rate = 1A/ μ s	% V_O	-5	-	5	%
MTBF		Telcordia SR232 at 40degC, nominal input, full load		200	-	-	KHr

Note 1 - Minimum current for transient load response testing only. Unit is designed to operate and be within output regulation range at zero load.

System Timing Specifications

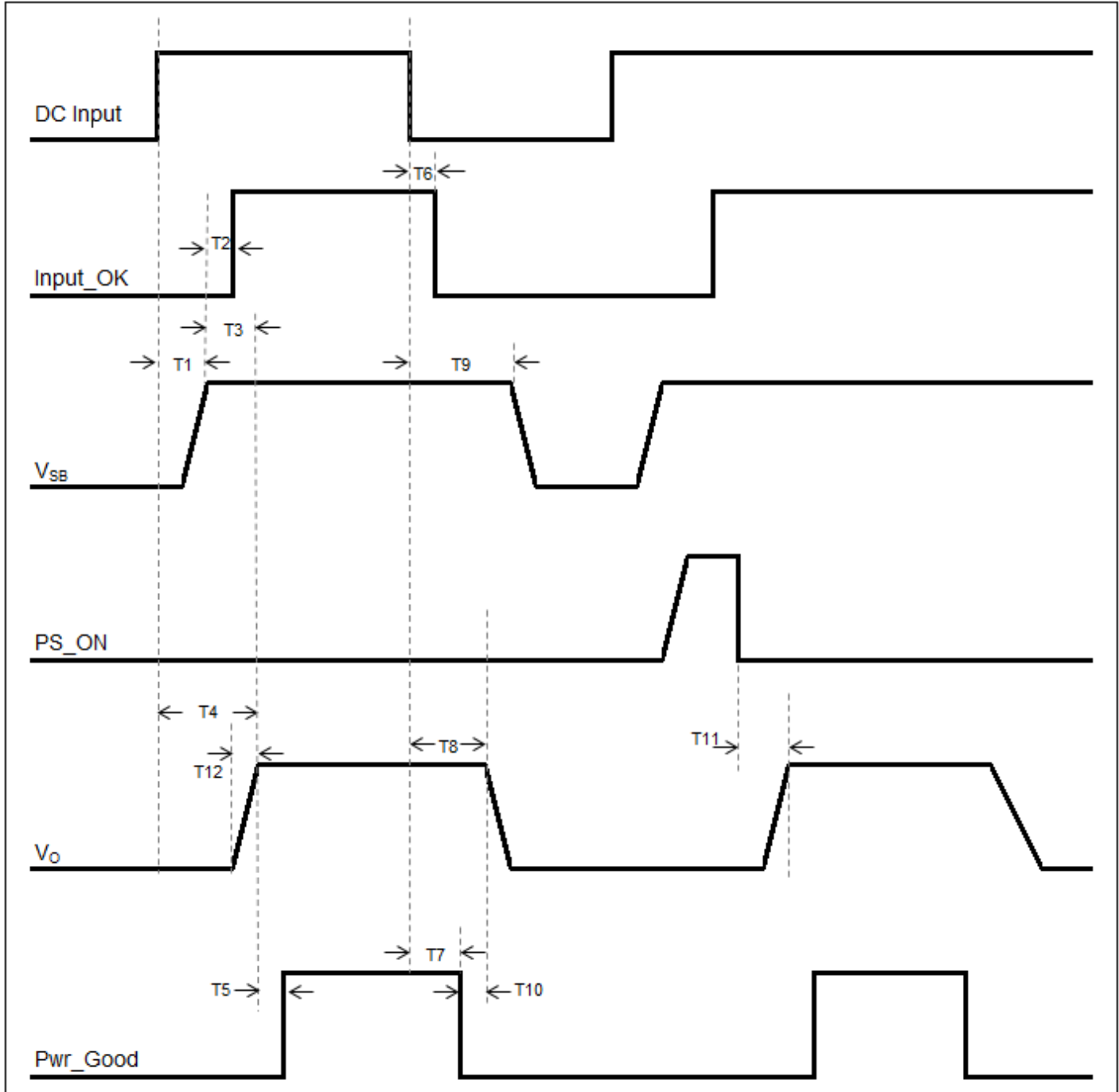
Table 4. System Timing Specifications:

Label	Parameter	Min	Typ	Max	Unit
T1	Delay from DC being applied to standby output being within regulation	20	-	1700	mSec
T2	Delay from standby output to INPUT_OK assertion.	See note 1&2	-	20	mSec
T3	Delay from standby output to main output voltage being within regulation	-	-	300	mSec
T4	Delay from DC being applied to main output being within regulation	-	-	2200	mSec
T5	Delay from output voltages within regulation limits to Pwr_Good asserted.	100	-	1000	mSec
T6	Delay from loss of DC to deassertion of INPUT_OK.	-	-	6	mSec
T7	Delay from loss of DC to deassertion of Pwr_Good	-	-	0.2	mSec
T8	Delay from loss of DC to main output falling out of regulation	1	-	-	mSec
T9	Delay from loss of DC to standby output falling out of regulation.	150	-	-	mSec
T10	Delay from deassertion of Pwr_Good to output falling out of regulation	1	-	-	mSec
T11	Delay from PS_ON assertion to output being within regulation.	-	-	350	mSec

Note 1- INPUT_OK can assert earlier than the standby output

Note 2- Measured with standby output loaded at 1A.

System Timing Specifications



DS1100SDC-3 Performance Curves

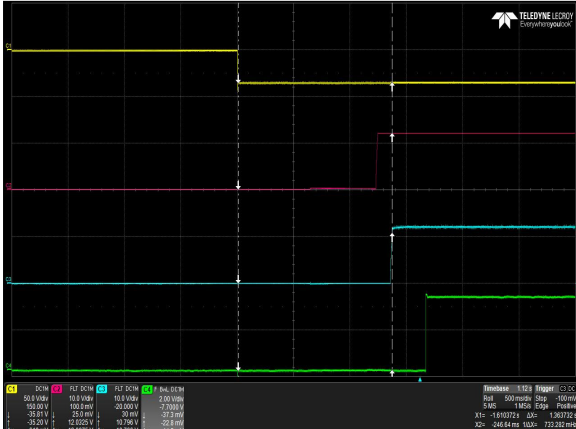


Figure 1: DS1100SDC-3 Turn-on delay via DC input – Vin = -36Vdc
Full Load: Io = 91.6A, Isb = 3A
Ch 1: Vin Ch 2: Vsb Ch 3: Vo Ch 4: Pwr_Good

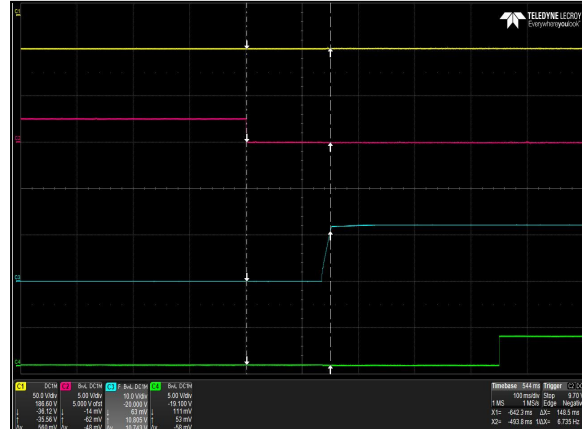


Figure 2: DS1100SDC-3 Turn-on delay via PS_ON – Vin = -36Vdc
Full Load: Io = 91.6A, Isb = 3A
Ch 1: Vin Ch 2: PS_ON Ch 3: Vo Ch 4: Pwr_Good

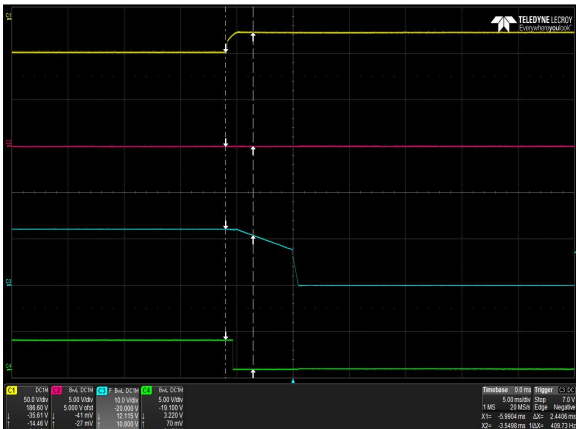


Figure 3: DS1100SDC-3 Hold-up Time – Vin = -36Vdc
Full Load: Io = 91.6A, Isb = 3A
Ch 1: Vin Ch 2: Vsb Ch 3: Vo Ch 4: Pwr_Good

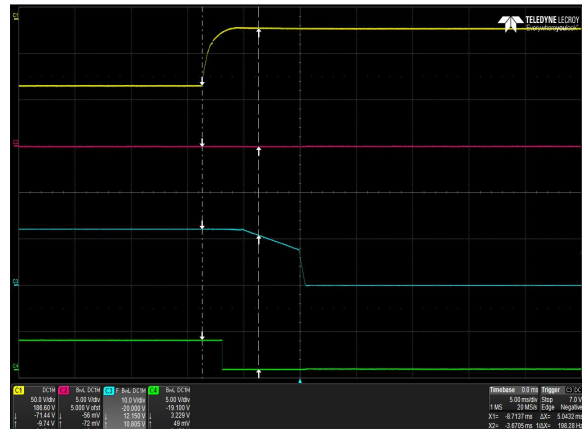


Figure 4: DS1100SDC-3 Hold-up Time – Vin = -72Vdc
Full Load: Io = 91.6A, Isb = 3A
Ch 1: Vin Ch 2: Vsb Ch 3: Vo Ch 4: Pwr_Good

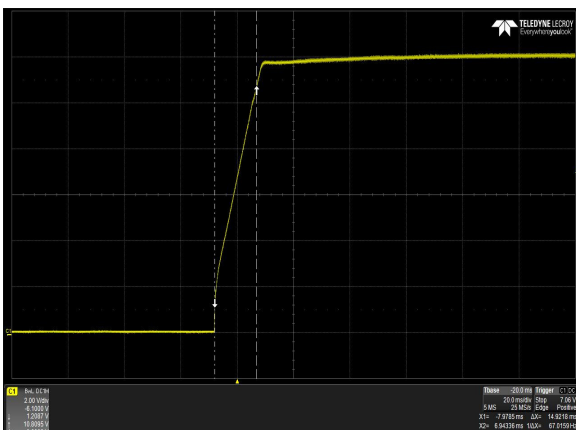


Figure 5: DS1100SDC-3 Output Voltage Startup – Vin = -36Vdc
Full Load: Io = 91.6A, Isb = 3A
Ch 1: Vo

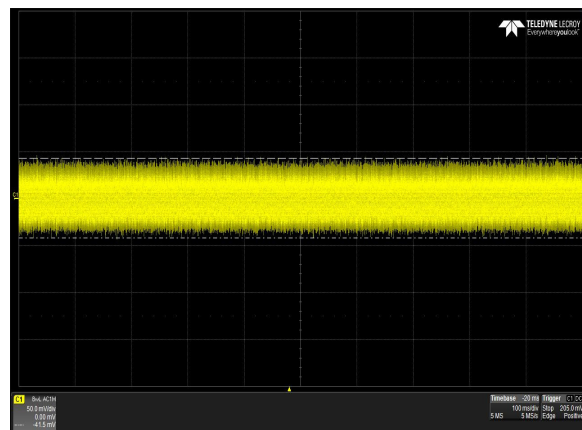


Figure 6: DS1100SDC-3 Ripple and Noise Measurement – Vin = -36Vdc
Full Load: Io = 91.6A, Isb = 3A
Ch 1: Vo (20MHz ON)

DS1100SDC-3 Performance Curves

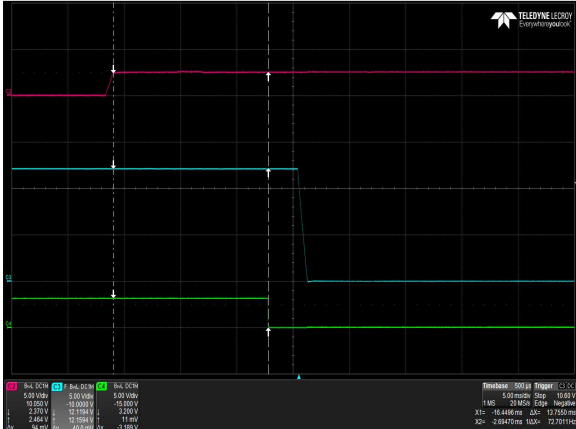


Figure 7: DS1100SDC-3 Turn Off Characteristic via PS_ON
Full Load: $I_o = 91.6A$, $I_{sb} = 3A$
Ch 2: PS_ON Ch 3: Vo Ch 4: Pwr_Good

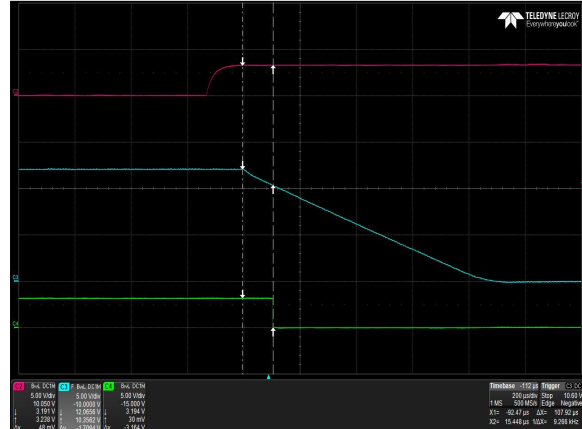


Figure 8: DS1100SDC-3 Turn Off Characteristic via PS_KILL
Full Load: $I_o = 91.6A$, $I_{sb} = 3A$
Ch 2: PS_KILL Ch 3: Vo Ch 4: Pwr_Good

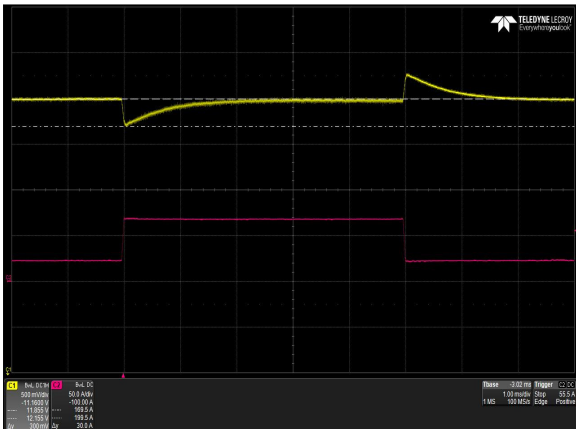


Figure 9: DS1100SDC-3 Transient Response – Vo Deviation (low to high)
25% to 75% load change, $1A/\mu S$ slew rate, $V_{in} = -54Vdc$, with 4700uF Cap.
Ch 1: Vo Ch 2: Io

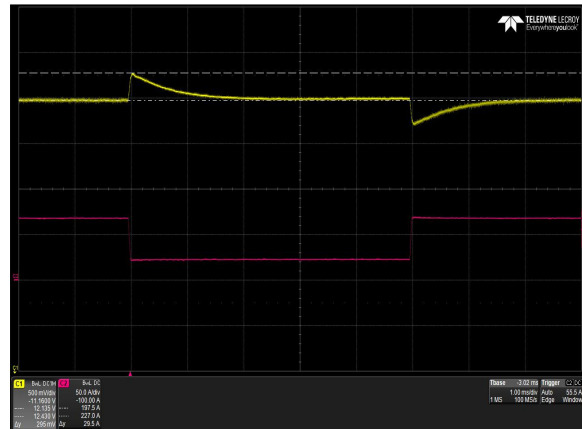


Figure 10: DS1100SDC-3 Transient Response – Vo Deviation (high to low)
75% to 25% load change, $1A/\mu S$ slew rate, $V_{in} = -54Vdc$, with 4700uF Cap.
Ch 1: Vo Ch 2: Io

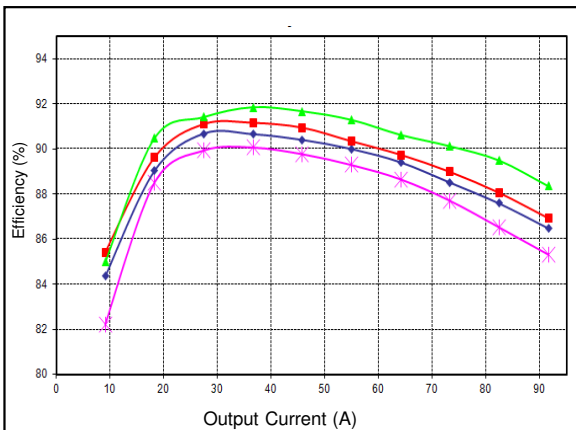


Figure 11: DS1100SDC-3 Efficiency Curves @ 25 degC
-36Vdc -48Vdc -54Vdc -72Vdc
Loading: $I_o / I_{sb} = 10\%$ increment to 91.6/3A

Protection Function Specification

Input Fusing

DS1100SDC-3 series is equipped with an internal non user serviceable 50A 170 Vdc fuse to IEC 127 for fault protection in input.

Over Voltage / Under Voltage Protection (OVP / UVP)

The power supply will provide latch mode over and under voltage protection as defined by the output under voltage and output over voltage parameters for each output.

OVP

Parameter	Min	Nom	Max	Unit
V _O Output Overvoltage	13.5	/	15.0	V
V _{SB} Output Overvoltage	13.5	/	15.0	V

UVP

Parameter	Min	Nom	Max	Unit
V _O Output Undervoltage	10.5	/	11.0	V
V _{SB} Output Undervoltage	10.0	/	10.5	V

Over Current Protection (OCP)

DS1100SDC-3 series includes internal current limit circuitry to prevent damage in the event of overload or short circuit. Recovery is automatic when the overload is removed, if the overload lasts for 500 millisecond or less, and less than or equal to 120% of rated load. If the overload is > 125% of rated load, the power supply will latch off immediately within 10ms. If the overload is between 120% and 125% of rated load, the power supply will latch off within 500ms. The latched state will require DC power / PS_ON recycling to restart the power supply. A fault in the main output will not cause the standby output to shut down. No damage will result to the supply as the result of either short term or long term overloads of the outputs.

The standby output shall have an OCP limit from 120%-150% and shall auto-recover when the overload is removed. A fault in the standby output shall shutdown other outputs and shall auto-recover as well when the overload on the standby is removed.

Parameter	Min	Nom	Max	Unit
V _O Output Overcurrent	109	/	137.4	A
V _{SB} Output Overcurrent	3.6	/	4.5	A

Short Circuit Protection (SCP)

The DS1100SDC-3 power supply will withstand a continuous short circuit with no permanent damage, applied to its main output during start-up or while running. A short circuit is defined as an impedance of 0.1 ohms or less.

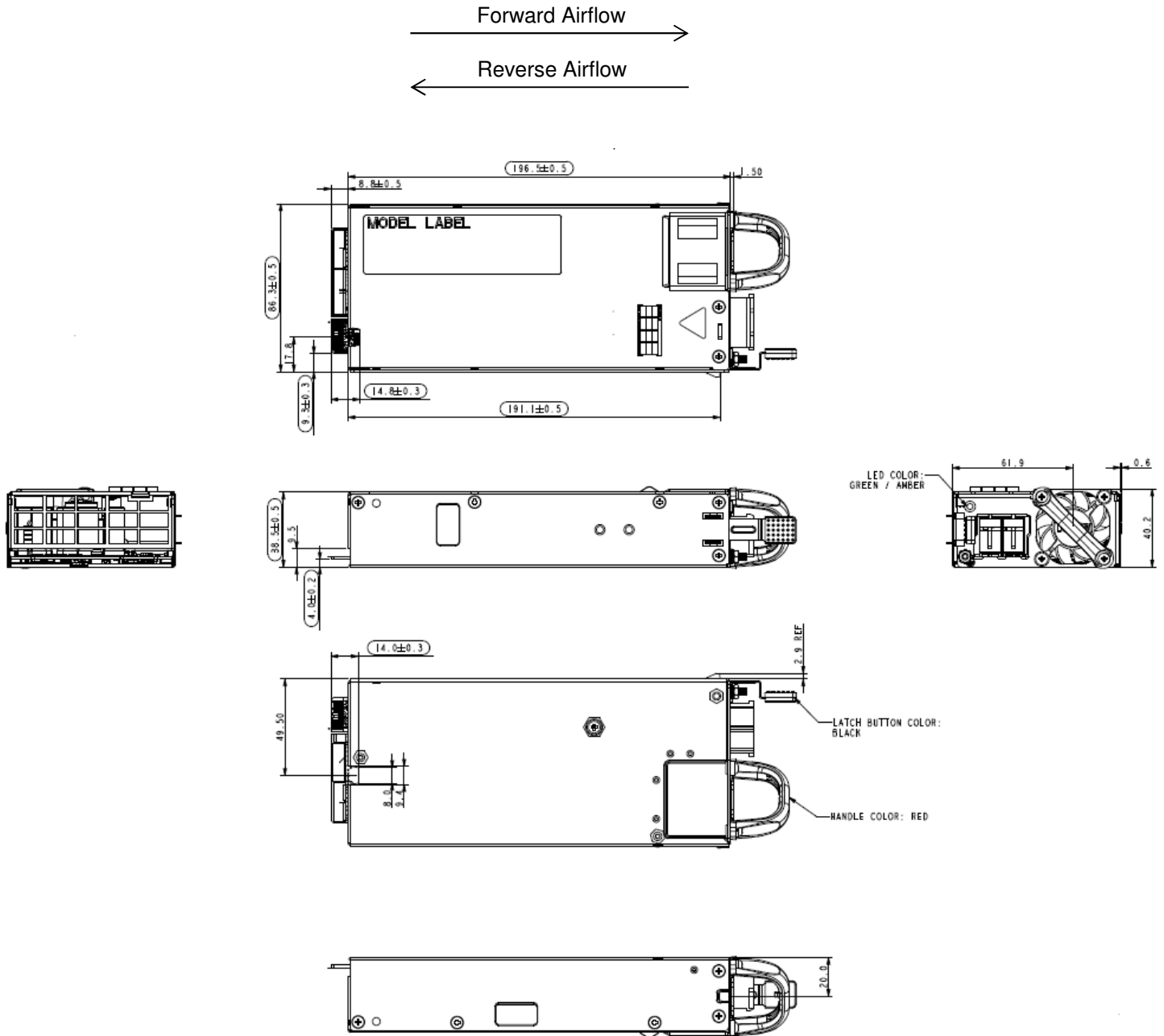
When the standby output is shorted, the output will go into “hiccup mode”. When the standby output attempts to restart, the maximum peak current from the standby output will be less than 20.0A peak. The maximum average current, taking into account the “hiccup” duty cycle, must not exceed rated dc output current of the standby (3.0A).

Over Temperature Protection (OTP)

The DS1100SDC-3 is internally protected against over temperature conditions. When the OTP circuit is activated, the power supply will not be damaged and main output will shut down. The main output will remain off until the over-temperature condition no longer exists. Hysteresis is employed to prevent a frequent toggling on and off of the outputs. The low limit point is within operating temperature range.

Mechanical Specifications

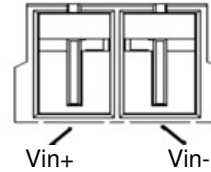
Mechanical Outlines (Unit:mm)



Connector Definitions

DC Input Connector

- Pin 1 – Vin+ (Positive DC Input)
- Pin 2 – Vin- (Negative DC Input)



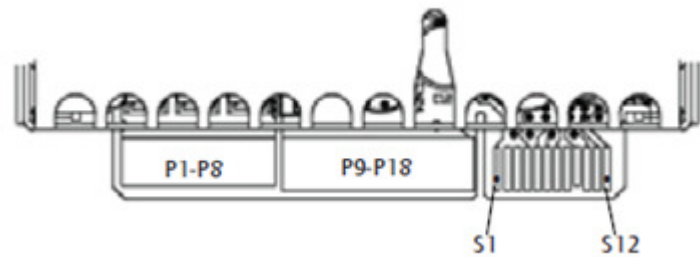
Output Connector – Power Blades

- P1-P8 – + Main Output (V_O)
- P9-P18 – Main Output Return
- P19-P20 – Standby Output (V_{SB})
- P21-P28 – Main Output / Standby Return
- P29-P36 – + Main Output (V_O)

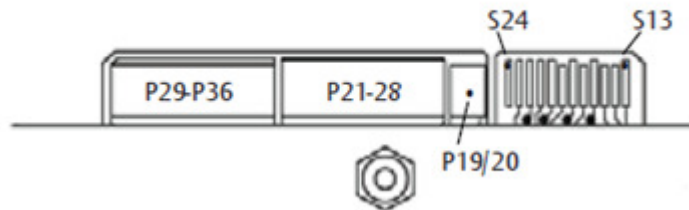
Output Connector – Control Signals

- S1 – PS PRESENT
- S2 – Reserved
- S3 – Reserved
- S4 – Pwr_Good
- S5 – INPUT_OK
- S6 – RTN
- S7 – ISHARE
- S8 – Reserved
- S9 – PS_INTERRUPT
- S10 – RETURN
- S11 – Reserved
- S12 – Reserved
- S13 – PS_ON
- S14 – PS_KILL
- S15 – Reserved
- S16 – RETURN
- S17 – SDA
- S18 – RETURN
- S19 – SCL
- S20 – RETURN
- S21 – REMOTE SENSE-
- S22 – RETURN
- S23 – REMOTE SENSE+
- S24 – Reserved

Power Supply Output Card Edge (Top Side)



Power Supply Output Card Edge (Bottom Side)



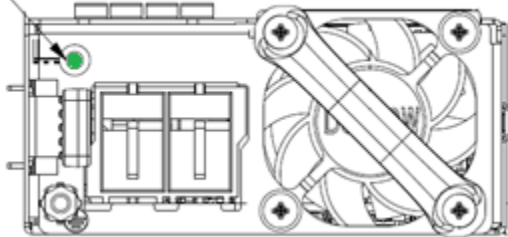
Power / Signal Mating Connectors and Pin Types

Table 5. Mating Connectors for DS1100SDC-3 series

Reference	On Power Supply	Mating Connector or Equivalent
Input Connector	Molex 394250002	Molex 394210002
Output Connector	Card-edge	FCI 10107844-002LF

LED indicator Definition

Status LED



One bi-color (green/amber) LED at the power supply front provides status signal. The status LED conditions is shown on the below table.

Condition	LED Status
No DC input to PSU	Off
$V_{SB} = ON, V_O = ON$	Solid Green
$V_{SB} = ON, V_O = OFF, DC\ Input = ON$	Blinking Amber
$V_O = OCP / OVP / OTP / FAN\ FAULT$	Blinking Amber

Weight

The DS1100SDC-3 series weight is 2.39 lbs / 1.087 kg maximum.

Environmental Specifications

EMC Immunity

DS1100SDC-3 series power supply is designed to meet the following EMC immunity specifications:

Table 6. Environmental Specifications:

Document	Description
FCC Docket No. 20780 Part 15 Subpart J Class A/ EN55022, Level A	Conducted and Radiated EMI Limits
IEC/EN 61000-4-2, Edition 1.2, 2001-04	Electromagnetic Compatibility (EMC) - Testing and measurement techniques – Electrostatic discharge immunity test. +/-8KV air, +/-4KV contact discharge, performance Criteria A
IEC/EN 61000-4-4, 1995, Amendment 2, 2001-07	Electromagnetic Compatibility (EMC) - Testing and measurement techniques, Electrical Fast Transient/Burst Immunity Test. +/- 2 KV, Criteria B
IEC/EN 61000-4-5, Edition 1.1, 2001-04	Electromagnetic Compatibility (EMC) - Testing and measurement techniques – 1KV common mode and 0.5KV differential mode, performance criteria B.

Safety Certifications

The DS1100SDC-3 power supply is intended for inclusion in other equipment and the installer must ensure that it is in compliance with all the requirements of the end application. This product is only for inclusion by professional installers within other equipment and must not be operated as a stand alone product.

Table 7. Safety Certifications for DS1100SDC-3 series power supply system .

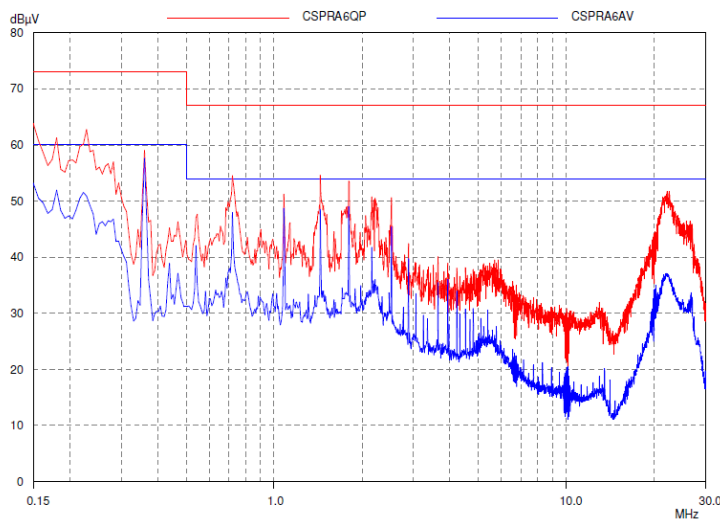
Document	File #	Description
UL60950	E186249-A250-UL-X6	US and Canada Requirements
EN60950	D-03365-A1	European Requirements
CE (LVD+RoHS)	14311	Europe Requirements
CB Certificate and Report	DK-38993-A1-UL	(All CENELEC Countries)
CAN/CSA-C22.2 No. 60950-1 –03		Canada Requirements
CHINA CCC Approval	2014010907716519	China Requirements
GB4943.1-2011	C-00401-Z1410QD-05063	Safety of Information Technology Equipment including Electrical Business Equipment (Similar to IEC 60950 for China)

EMI Emissions

The DS1100SDC-3 series has been designed to comply with the Class A limits of EMI requirements of FCC Part 15 and CISPR 22 (EN55022) for emissions and relevant sections of EN61000 (IEC 61000) for immunity. The unit is enclosed inside a metal box, tested at 1100W using resistive load with cooling fan.

Conducted Emissions

The applicable standard for conducted emissions is EN55022 (FCC Part 15). Conducted noise can appear as both differential mode and common mode noise currents. Differential mode noise is measured between the two input lines, with the major components occurring at the supply fundamental switching frequency and its harmonics. Common mode noise, a contributor to both radiated emissions and input conducted emissions, is measured between the input lines and system ground and can be broadband in nature.



The DS1100SDC-3 power supplies have internal EMI filters to ensure the convertors' conducted EMI levels comply with EN55022 (FCC Part 15) Class A and EN55022 (CISPR 22) Class A limits. The EMI measurements are performed with resistive loads at maximum rated loading.

Sample of EN55022 Conducted EMI Measurement at -48Vdc input

Note: Red Line refers to Artesyn Quasi Peak margin, which is 6dB below the CISPR international limit. Blue Line refers to the Artesyn Average margin, which is 6dB below the CISPR international limit.

Conducted Emissions

Table 8. Conducted EMI emission specifications of the DS1100SDC-3 series

Parameter	Model	Symbol	Min	Typ	Max	Unit
FCC Part 15 Subpart J, class A	All	Margin	-	-	6	dB
CISPR 22 (EN55022) class A	All	Margin	-	-	6	dB

Radiated Emissions

Unlike conducted EMI, radiated EMI performance in a system environment may differ drastically from that in a stand-alone power supply. The shielding effect provided by the system enclosure may bring the EMI level from Class A to Class B. It is thus recommended that radiated EMI be evaluated in a system environment. The applicable standard is EN55022 Class A (FCC Part 15). Testing the power supply as a stand-alone component to the exact requirements of EN55022 can be difficult, because the standard calls for 1m leads to be attached to the input and outputs and aligned such as to maximize the disturbance. In such a set-up, it is possible to form a perfect dipole antenna that very few dc-dc convertors could pass. However, the standard also states that 'an attempt should be made to maximize the disturbance consistent with the typical application by varying the configuration of the test sample.

Operating Temperature

The DS1100SDC-3 power supplies will start and operate within stated specifications at an ambient temperature from 0 °C to 50 °C under all load conditions with internal fan. And the DS1100SDC-3-001 power supplies will start and operate within stated specifications at an ambient temperature from 0 °C to 40 °C under all load conditions with internal fan. All the DS1100SDC-3 series power supplies can withstand operation up to 65 °C at derated power without damage.

Forced Air Cooling

The DS1100SDC-3 series power supplies included internal cooling fans as part of the power supply assembly to provide forced air-cooling to maintain and control temperature of devices and ambient temperature in the power supply to appropriate levels. The standard direction of airflow is from the DC output connector end to the DC input end of the power supply.

The cooling fan is a variable speed fan. When 12V output is enabled, power supply fan will operate at minimum achievable fan speed. Power supply fan speed control algorithms will vary the speed so that the critical component temperatures do not exceed safe operating levels. Fans will be powered from voltage source inside the power supply and from system side voltage source.

Power Derating Table

DS1100SDC-3 & DS1100SDC-3-001 total output power will be derated according to the table shown below

Table 9. Power Derating .

Model	Notes	Min	Max	Altitude
DS1100SDC-3	1100W load	0 °C	50 °C	6,000 ft
	1100W load	0 °C	40 °C	10,000 ft
	880W load	0 °C	50 °C	6,000 ft
	750W load	0 °C	55 °C	10,000 ft
	400W load	0 °C	65 °C	10,000 ft
DS1100SDC-3-001	1100W load	0 °C	40 °C	6,000 ft
	1100W load	0 °C	30 °C	10,000 ft
	750W load	0 °C	45 °C	10,000 ft
	400W load	0 °C	55 °C	10,000 ft

Storage and Shipping Temperature / Humidity

The DS1100SDC-3 series power supplies can be stored or shipped at temperatures between -40 °C to +70 °C and relative humidity from 10% to 95% non-condensing.

Altitude

The DS1100SDC-3 series will operate within specifications at altitudes up to 10,000 feet above sea level. The power supply will not be damaged when stored at altitudes of up to 50,000 feet above sea level.

Humidity

Operating: Power supply is designed to operate with no degradation of performance while operating in range of 20%RH to 80%RH non-condensing.

Non-Operating: Power supply is designed to operate with no degradation of performance while operating in range of 10%RH to 95%RH non-condensing.

Vibration

The DS1100SDC-3 power supply will pass the following vibration specifications:

Non-Operating Random Vibration

Acceleration	3.12	gRMS
Frequency Range	0-500	Hz
Duration	15	Mins per axis
Direction	Rotating each axis on vertical vibration	
PSD Profile	FREQ	SLOPE
	0-5Hz	dB/oct
	20-500Hz	PSD
		g²/Hz
		0.002
		0.02

Operating Random Vibration

Acceleration	0.5	gRMS
Frequency Range	7-800	Hz
Duration	30	Mins per axis
Direction	Rotating each axis on vertical vibration	
PSD Profile	FREQ	SLOPE
	7Hz	dB/oct
	312Hz	PSD
	800Hz	g²/Hz
		0.00015
		0.000065
		0.000023

Shock

The DS1100SDC-3 power supply will pass the following shock specifications:

Non-Operating Half-Sine Shock

Acceleration	30	G
Duration	18	msec
Pulse	Half-Sine	
No. of Shock	3 times on all 6 faces (each positive and negative directions)	

Operating Half-Sine Shock

Acceleration	15	G
Duration	11	msec
Pulse	Half-Sine	
No. of Shock	3 times on all 6 faces (each positive and negative directions)	

Power and Control Signal Descriptions

DC Input Connector

This connector supplies the DC input power to the DS1100SDC-3 power supply.

- Pin 1 - Vin+
- Pin 2 - Vin-

Output Connector – Power Blades

These pins provide the main output for the DS1100SDC-3. The + Main Output (V_O) and the Main Output Return pins are the positive and negative rails, respectively, of the V_O main output of the DS1100SDC-3 power supply. The Main Output (V_O) is electrically isolated from the power supply chassis.

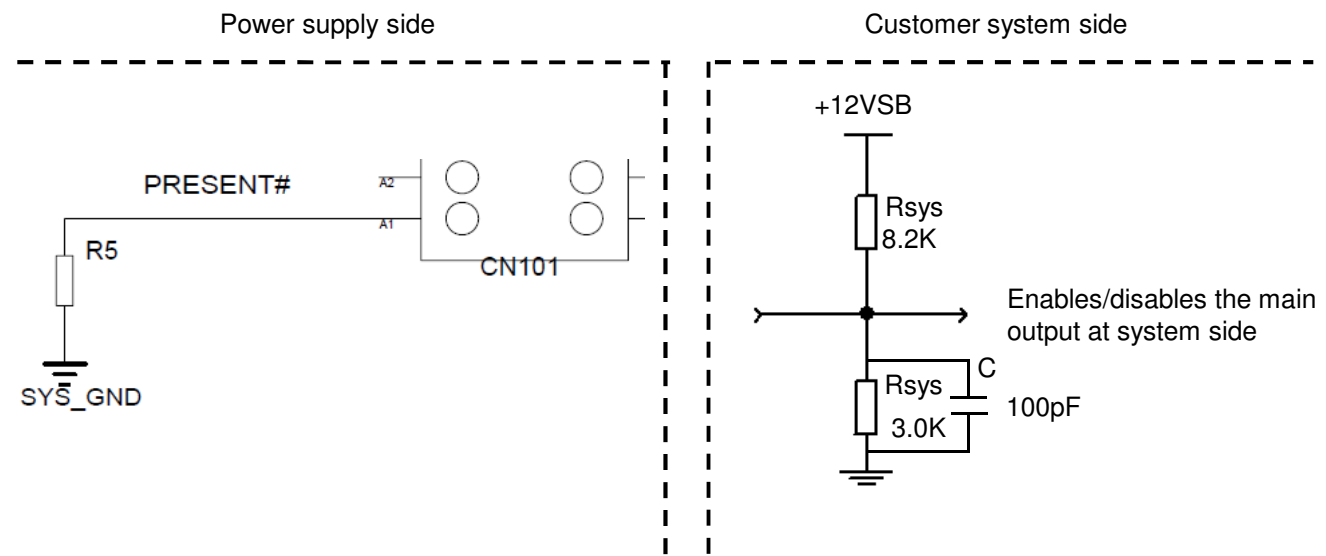
- P1-P8 - + Main Output (V_O)
- P9-P18 - Main Output Return
- P19-P20 - Standby Output (V_{SB})
- P21-P28 - Main Output / Standby Output Return
- P29-P36 - + Main Output (V_O)

Output Connector - Control Signals

The DS1100SDC-3 series contains a 24 pins control signal header providing an analogue control interface, standby power and I²C interface signal connections.

PS_PRESENT – (pin S1)

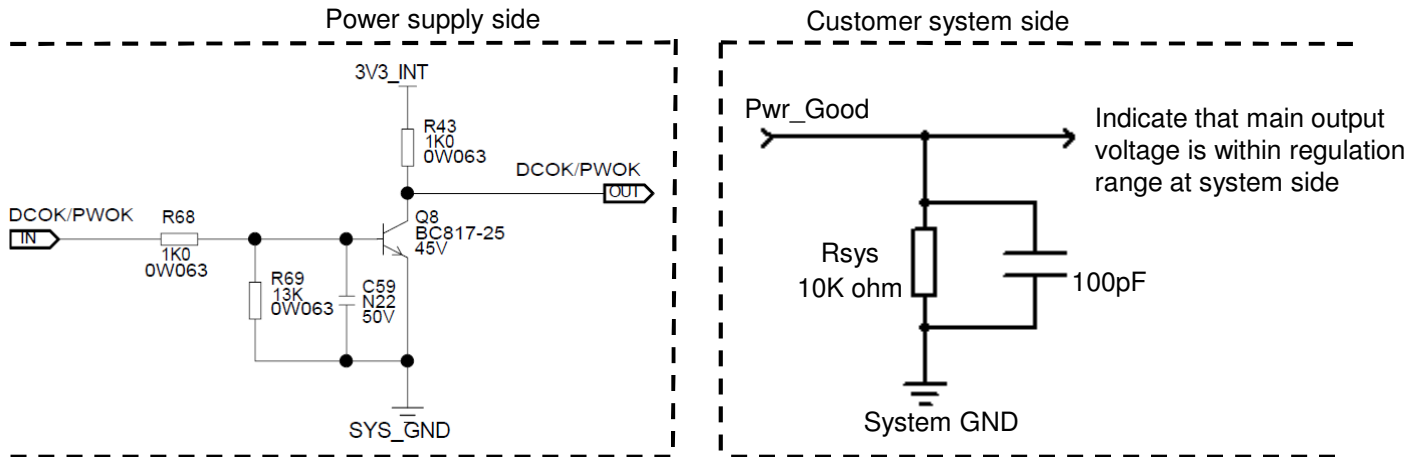
Signal used to indicate to the system that a power supply is inserted in the power bay by using a suitable pull-up to standby bus with a noise filter capacitor connected to standby return. This pin is connected to the Standby return via 220ohm resistor in the power supply.



Pwr_Good – (pin S4)

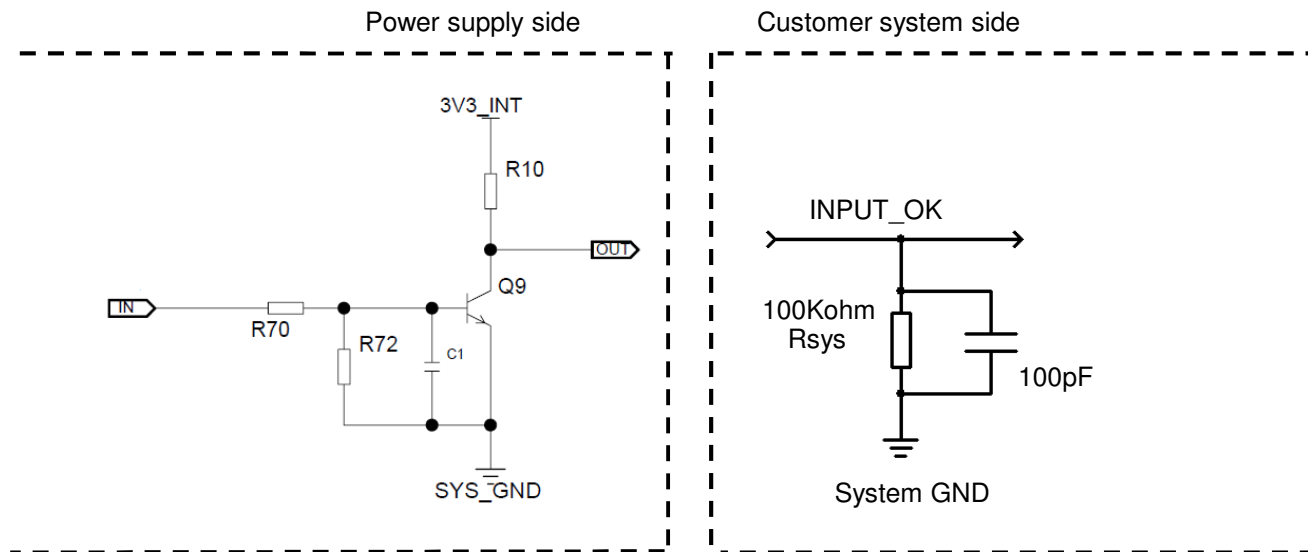
Signal used to indicate that main output voltage is within regulation range. The Pwr_Good signal will be driven HIGH when the output voltage is valid and will be driven LOW when the output falls below the under-voltage threshold. This signal also gives an advance warning when there is an impending power loss due to loss of DC input or system shutdown request.

This is an common collector/drain output. This pin is pulled high by a 1.0K ohm resistor connected to 3.3V inside the power supply. It is recommended that this pin be connected to a 100pF decoupling capacitor and pulled down by a 10K ohm resistor.



INPUT_OK – (pin S5)

Signal used to indicate the presence of DC input to the power supply. A logic level HIGH will indicate that the DC input to the power supply is within the operating range while a logic level LOW will indicate that DC input has been lost. This is an open collector/drain output. This pin is pulled high by a 1.0K ohm resistor connected to 3.3V inside the power supply. It is recommended that this pin is connected to a 100pF decoupling capacitor and pulled down by a 100K ohm resistor.



ISHARE – (pin S7)

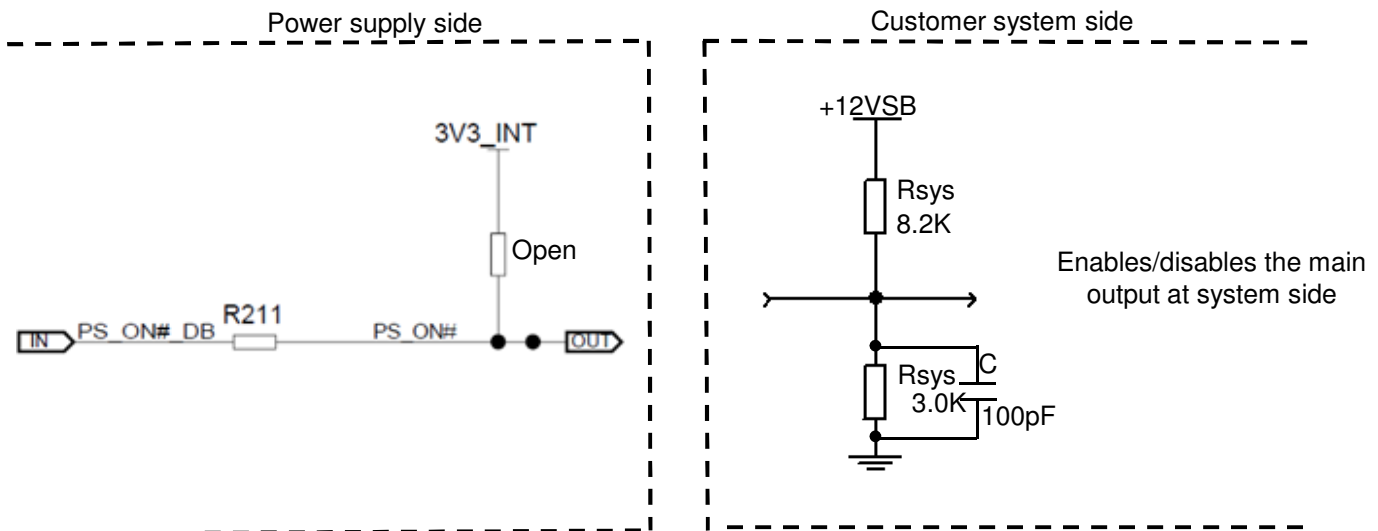
The DS1100SDC-3 supports active current sharing through a single wire connection between the power supplies. This input/output signal pin allows two or more power supplies to share the main output load current to increase the overall power capability or to operate the units in a N+N configuration for redundancy purposes.

The voltage of this signal is a linear slope from no load to full load. At 45.8A of each power supply output when two supplies are running in parallel, the ISHARE voltage will be between 4.0V and 4.25V. At 91.6A of each power supply output when two supplies are running in parallel, the ISHARE voltage will be between 7.75V and 8.25V.

When two or more power supplies are connected and operating in parallel and each is delivering 100%, 50%, 25% and 10% of its rated output to the load, the power supplies will current share with 2%, 4% , 8% and 10% accuracy. (Below 10% load, there is no guarantee of output current sharing). If any power supply is hot swapped, no glitch will occur that violates the regulation limits of the power supply defined in this specification.

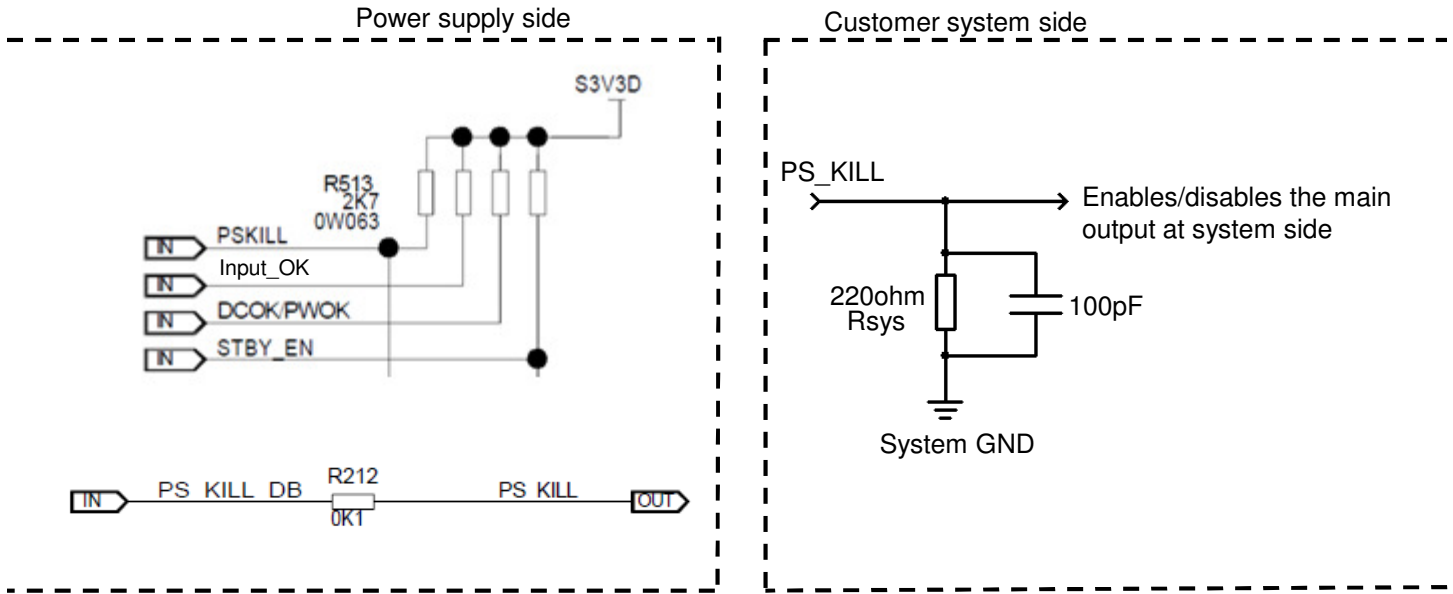
PS_ON – (pin S13)

This signal input pin controls the normal turning ON and OFF of the Main Output of the DS1100SDC-3 power supply. The power supply main output (V_O) will be enabled when this signal is pulled low, below 0.8V. The power supply output (except V_{SB} output) will be disabled when this input is driven higher than 2.06V, or open circuited. Recommended pull-up resistor to $12V_{SB}$ is 8.2K ohm with a 3.0K ohm pull-down to ground. A 100 pF decoupling capacitor is also recommended.



PS_KILL – (pin S14)

First break/Last Mate active LOW signal which enables/disables the main output. When this signal is shorted to ground by the system, the 12V main output shall be enabled. When this signal is opened by the power supply removal from the system, the main output will shut down within 100us. This pin is pulled high by a 2.7kohm resistor connected to 3.3V inside the power supply. This signal will have to be pulled to ground at the system side with a 220 ohm resistor. A 100pF decoupling capacitor is also recommended. Standby output will remain on.



SDA, SCL and PS_INTERRUPT – (pins S9, S17, S19)

Please refer to “Communication Bus Descriptions” section.

Main Output Remote Sense Return, Main Output Remote Sense – (pins S21, S23)

The main output of the DS1100SDC-3 is equipped with a Remote Sensing capability that will compensate for a power path drop around the entire loop of 200 millivolt. This feature is implemented by connecting the Main Output Remote Sense (pin S23) and the Main Output Remote Sense Return (pin S21) to the positive and negative rails of the main output, respectively, at a location that is near to the load. Care should be taken in the routing of the sense lines as any noise sources or additional filtering components introduced into the voltage rail may affect the stability of the power supply. The DS1100SDC-3 will operate appropriately without the sense lines connected; however it is recommended that the sense lines be connected directly to the main output terminals if remote sensing is not required. This remote sense circuit will not raise the power supply’s output voltage to the OVP trip level. Main Output Remote Sense has no effect on the standby output (V_{SB}).

12V Main output return and standby output return lines are connected together inside PSU and connected to PSU chassis directly. It is recommended to connect output return to system chassis on end system application for better common mode noise.

Communication Bus Descriptions

I²C Bus Signals

The DS1100SDC-3 power supply contains enhanced monitor and control functions implemented via the I²C bus. The DS1100SDC-3 I²C functionality (PMBus™ and FRU data) can be accessed via the output connector control signals. The communication bus is powered either by the internal 3.3V supply or from an external power source connected to the standby output (ie: accessing an unpowered power supply as long as the standby output of another power supply connected in parallel is on).

If units are connected in parallel or in redundant mode, the standby outputs must be connected together in the system. Otherwise, the I²C bus will not work properly when a unit is inserted into the system without the DC input source connected.

Note - PMBus™ functionality can be accessed only when the PSU is powered-up.
Guaranteed communication I²C speed is 100KHz.

SDA, SCL (I²C Data and Clock Signals) – (pins S17, S19)

I²C serial data and clock bus - these pins are internally pulled up to internal 3.3V supply with a 100K resistor. These pins must be pulled-up in the system by an 2.2K ohm resistor to 3.3V and a 200pF decoupling capacitor at the system side.

PS_INTERRUPT – (pin S9)

PS_INTERRUPT is used to send a signal to the system that a fault in the power supply occurred. This signal is normally logic level HIGH. It will go to a LOW logic level when a fault bit has been set in the power supply's status register. This event can be triggered by faults such as OVP, OCP, OTP, and fan fault. The conditions wherein the signal goes back to high are: (1) DC recycle, (2) PSON recycle and (3) issuance of a CLEAR_FAULTS PMBus command. Recommended pull-up resistor to 12Vsb is 8.2k with a 3.0k pull-down to ground at system side. A 200pF decoupling capacitor is also recommended.

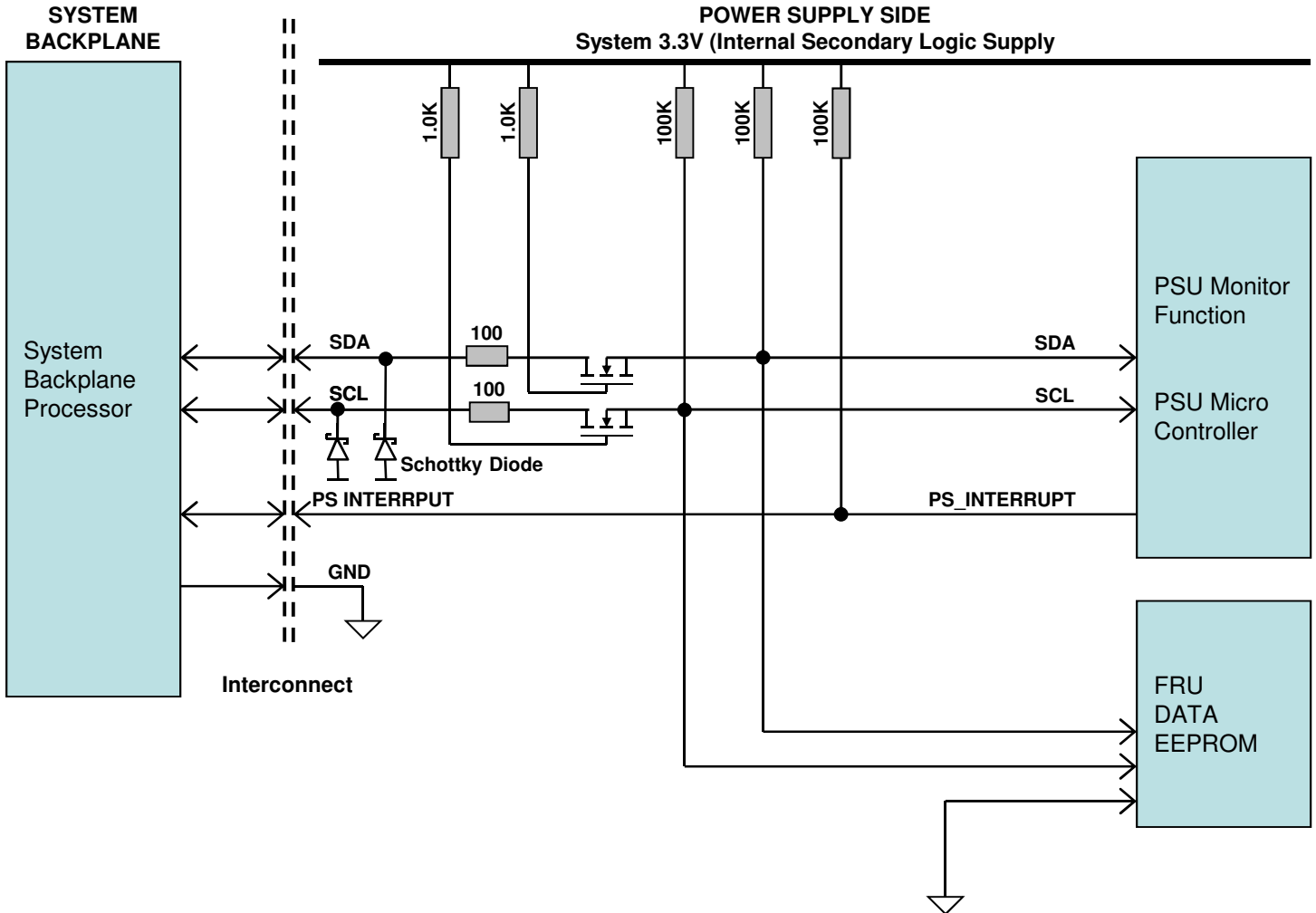
I²C Bus Communication Interval

The interval between two consecutive I²C communications to the power supply should be at least 15 ms to ensure proper monitoring functionality.

I²C Bus Signal Integrity

The noise on the I²C bus (SDA, SCL lines) due to the power supply will be less than 300mV peak-to-peak. This noise measurement should be made with an oscilloscope bandwidth limited to 100MHz. Measurements should be made at the power supply output connector with up to 47 pF ceramic capacitors to Standby Output Return.

I²C Bus Internal Implementation, Pull-ups and Bus Capacitances



I²C Bus - Recommended external pull-ups:

Electrical and Interface specifications of I²C signals (referenced to Standby Output Return pin, unless otherwise indicated):

Parameter	Condition	Symbol	Min	Typ	Max	Unit
SDA, SCL internal pull-up resistor		R_{int}	-	100	-	Kohm
SDA, SCL internal bus capacitance		C_{int}	-	0	-	pF
SDA, SCL external maximum allowed capacitance on system board		C_{ext}	-	-	100	pF
Recommended external pull-up resistor	1 PSU	R_{ext}	-	2.2	-	Kohm
	4 PSU		-	0.55	-	Kohm

Logic Levels

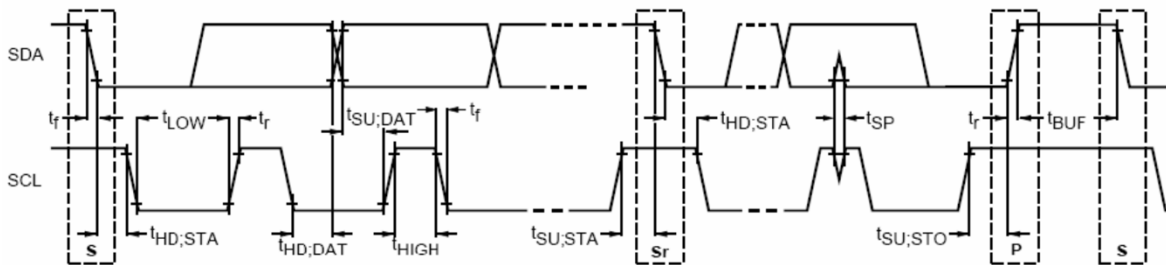
DS1100SDC-3 series power supply I²C Communication Bus will respond to logic levels as per below:

Logic High: 3.3V Nominal (Specs is 2.0V to 5.0V)**

Logic Low: 500mV nominal (Specs is 800mV max)**

** Note - Artesyn 73-769-001 I2C adapter was used.

Timings



Parameter	Symbol	Standard-Mode Soecs		Actual		Unit
		Min	Max			
SCL Clock Frequency	f_{SCL}	0	100	102.6		KHz
Hold time (repeated) START condition	$t_{HD,STA}$	4.0	-	4.7		uS
LOW period of SCL clock	t_{LOW}	4.7	-	15.4		uS
HIGH period of SCL clock	t_{HIGH}	4.0	-	3.1		uS
Setup time for repeated START condition	$t_{SU,STA}$	4.7	-	4.9		uS
Data hold time	$t_{HD,DAT}$	0	3.45	0.29		uS
Data setup time	$t_{SU,DAT}$	250	-	3248		nS
Rise time	t_r	-	1000	SCL = 1270	SDA = 1270	nS
Fall time	t_f	-	300	SCL = 136	SDA = 128	nS
Setup time for STOP condition	$t_{SU,STO}$	4.0	-	4.9		uS
Bus free time between a STOP and START condition	t_{BUF}	4.7	-	860.1		uS

Note - Artesyn 73-769-001 I2C adapter (USB-to-I2C) and Universal PMBus GUI software was used.

Device Addressing

The DS1100SDC-3 has a fixed i2C address 0xB0. This address has been set in the power supply side, there is no address bit accessible externally. In order to support multiple addresses, system side should use an i2C switcher or i2C expander. Contact Artesyn for the demo and application note of i2C switcher or i2C expander.

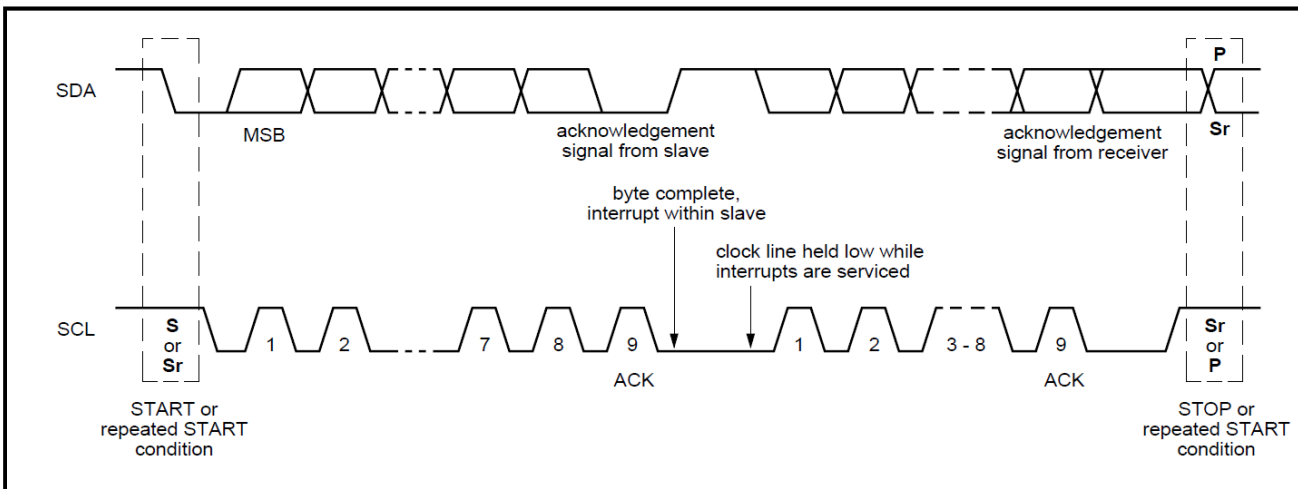
Contact Artesyn for availability of a variant model supporting multiple addresses.

Pull signaling pins S2, S3, and S24 at the system side to low for i2C addressing compatibility across all models in the short family of Front-end Bulk Power Series including the DS500SPE, DS750PED, DS1100PED and DS1600SPE.

I²C Clock Synchronization

The DS1100SDC-3 power supply might apply clock stretching. An addressed slave power supply may hold the clock line (SCL) low after receiving (or sending) a byte, indicating that it is not yet ready to process more data. The system master that is communicating with the power supply will attempt to raise the clock to transfer the next bit, but must verify that the clock line was actually raised. If the power supply is clock stretching, the clock line will still be low (because the connections are open-drain).

The maximum transaction timeout condition for clock stretching for DS1100SDC-3 is 100 milliseconds. Clock stretching will not exceed maximum clock low timeout of 25msec.



FRU (EEPROM) Data

The FRU (Field Replaceable Unit) data format is compliant with the Intel IPMI v1.0 specification.

The DS1100SDC-3 uses 1 page of EEPROM for FRU purpose. A page of EEPROM contains up to 255 byte-sized data locations.

Where: **OFFSET** - The **OFFSET** denotes the address in decimal format of a particular data byte within DS1100SDC-3 EEPROM.

VALUE - The **VALUE** details data written to a particular memory location of the EEPROM.

DEFINITION - The contents **DEFINITION** refers to the definition of a particular data byte.

DS1100SDC-3 FRU (EEPROM) Data:

OFFSET		DEFINITION (REMARKS)	SPEC VALUE	
(DEC)	(HEX)		(DEC)	(HEX)
COMMON HEADER, 8 BYTES				
0	00	FORMAT VERSION NUMBER (Common Header) 7:4 - Reserved, write as 0000b 3:0 - Format Version Number = 1h for this specification	1	01
1	01	INTERNAL USE AREA OFFSET	27	1B
2	02	CHASSIS INFO AREA OFFSET	1	01
3	03	BOARD INFO AREA OFFSET	0	00
4	04	PRODUCT INFO AREA OFFSET	5	05
5	05	MULTI RECORD AREA OFFSET	13	0D
6	06	PAD (reserved) Default value is 0.	0	00
7	07	ZERO CHECK SUM (256 – (Sum of bytes 0 to 6))	209	D1
CHASSIS INFO AREA(32 BYTES) This area will be filled by the Mfg. Diag. or by the OS if used				
8	08	FORMAT VERSION NUMBER 7:4 - Reserved, write as 0000b 3:0 - Format Version Number = 1h for this specification	1	01
9	09	CHASSIS INFO AREA LENGTH in multiple of 8 bytes	4	04
10	0A	CHASSIS TYPE (Default value is 0.)	0	00
11	0B	CHASSIS PART NUMBER Type/Length CAh (if used) Type = "ASCII+LATIN1" = (11)b Length = 10 Bytes = (001010)b	202	CA
12	0C	CHASSIS PART NUMBER BYTES (Default value is 0.)	0	00
13	0D		0	00
14	0E		0	00
15	0F		0	00
16	10		0	00
17	11		0	00
18	12		0	00
19	13		0	00
20	14		0	00
21	15		0	00
22	16	CHASSIS SERIAL NUMBER Type/Length CFH (if used) Type = "ASCII+LATIN1" = (11)b Length = 15 Bytes = (001111)b	207	CF
23	17	CHASSIS SERIAL NUMBER BYTES , Default value is 0.	0	00
24	18		0	00
25	19		0	00
26	1A		0	00
27	1B		0	00
28	1C		0	00
29	1D		0	00
30	1E		0	00
31	1F		0	00
32	20		0	00

Technical Reference Note

DS1100SDC-3 FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
33	21	CHASSIS SERIAL NUMBER BYTES, Default value is 0.	0	00
34	22		0	00
35	23		0	00
36	24		0	00
37	25		0	00
38	26	End Tag (0C1h if used)	193	C1
39	27	CHKSUM (Zero CHKSUM if used)	161	A1
PRODUCT INFORMATION AREA, 64 BYTES				
40	28	FORMAT VERSION NUMBER (Product Info Area) 7:4 - Reserved, write as 0000b 3:0 - Format Version Number = 1h for this specification	1	01
41	29	PRODUCT INFO AREA LENGTH (In multiples of 8 bytes)	8	08
42	2A	Language (English)	25	19
43	2B	MANUFACTURER NAME TYPE / LENGTH (0C5H) 7:6 - (11)b, 8-Bit ASCII+Latin 1, 5:0 - (000101)b, 5-Byte Allocation	199	C7
44	2C	MANUFACTURER'S NAME 7 byte sequence "A" = 41h "R" = 52h "T" = 54h "E" = 45h "S" = 53h "Y" = 59h "N" = 4Eh	65	41
45	2D		82	52
46	2E		84	54
47	2F		69	45
48	30		83	53
49	31		89	59
50	32		78	4E
51	33	PRODUCT NAME Type/Length (CFH) Type = "ASCII+LATIN1" = (11)b Length = 15 Bytes = (001111)b	207	CF
52	34	PRODUCT NAME BYTES (15 Byte sequence) "D" "S" "1" "1" "0" "0" "S" "D" "C" "_" "3" " " " " " "	68	44
53	35		83	53
54	36		49	31
55	37		49	31
56	38		48	30
57	39		48	30
58	3A		83	53
59	3B		68	44
60	3C		67	43
61	3D		45	2D
62	3E		51	33
63	3F		32	20
64	40		32	20
65	41		32	20
66	42		32	20
67	43	PRODUCT PART/MODEL NUMBER Type/Length (CFH) Type = "ASCII+LATIN1" = (11)b Length = 15 Bytes = (001111)b	207	CF
68	44	PRODUCT NAME BYTES (15 Byte sequence) "D" "S" "1" "1" "0" "0" "S" "D" "C" "_" " " " " "	68	44
69	45		83	53
70	46		49	31
71	47		49	31
72	48		48	30
73	49		48	30
74	4A		83	53
75	4B		68	44
76	4C		67	43
77	4D		45	2D

Technical Reference Note

DS1100SDC-3 FRU (EEPROM) Data:

OFFSET		DEFINITION (REMARKS)	SPEC VALUE	
(DEC)	(HEX)		(DEC)	(HEX)
78	4E	"3"	51	33
79	4F		32	20
80	50		32	20
81	51		32	20
82	52		32	20
83	53	PRODUCT VERSION NUMBER Type/Length (C2h) Type = "ASCII+LATIN1" = (11)b Length = 2 bytes = (000010)b	194	C2
		PRODUCT VERSION NUMBER BYTES Refer to Section 1.2 Product Revision History in latest IPS		
84	54	"A"	65	41
85	55	"A"	65	41
86	56	PRODUCT SERIAL NUMBER Type/Length Type = "ASCII+LATIN1" = (11)b Length = 13 bytes = (001101)b	205	CD
		PRODUCT SERIAL NUMBER BYTES Model ID = DS1100SDC-3 / K846		
87	57	"K"	75	4B
88	58	"8"	56	38
89	59	"4"	52	34
90	5A	"6"	54	36
		MANUFACTURING YEAR AND WEEK CODE		
91	5B	"W"=57h (Per Unit)	87	57
92	5C	"W"=57h (Per Unit)	87	57
		UNIQUE SERIAL NUMBER		
		"SSSS"		
93	5D	"S" = 53 (Per Unit)	83	53
94	5E	"S" = 53 (Per Unit)	83	53
95	5F	"S" = 53 (Per Unit)	83	53
96	60	"S" = 53 (Per Unit)	83	53
		MODEL REVISION, Astec Model Rev, See Latest Model Rev in IPS Sec 1.2		
97	61	"A"	65	41
98	62	"A"	65	41
99	63	MANUFACTURING LOCATION "P" for "Laguna, Philippines" In Decimal = 080 In Hex = 50H	80	50
100	64	End Tag	193	C1
101	65	PAD (reserved), Default value is 0.	0	00
102	66		0	00
103	67	ZERO CHECK SUM (256 – (Sum of bytes 40 to 102)) Per Unit Zero Check Sum :Should follow check sum calculation as per IPMI v1.1 specs	75	4B
Multi Record Area, 88 Bytes				
		Power Supply Record Header		
104	68	Record type = 00 for Power supply	0	00
105	69	End of List /Record Format Version Number	2	02
106	6A	Record Length of Power Supply Record	24	18
107	6B	Record CHECKSUM of Power Supply Record (Zero CHECKSUM) (256-(sum of bytes 109 to 132))	79	4F
108	6C	Header CHECKSUM of Power Supply Record Header (Zero CHECKSUM) (256-(sum of bytes 104 to 107))	151	97
Power Supply Record				
		Overall Capacity of the Power Supply		
		2 Bytes Sequence		
		1100W = 044CH		
109	6D	In Decimal = 76, 04	76	4C
110	6E	In Hex = 4CH, 04H	4	04

Technical Reference Note

DS1100SDC-3 FRU (EEPROM) Data:

OFFSET		DEFINITION (REMARKS)	SPEC VALUE	
(DEC)	(HEX)		(DEC)	(HEX)
111 112	6F 70	Peak VA, 1332W = 0534H 2 Bytes Sequence In Decimal = 052, 005 In Hex = 34H, 05H	52 5	34 05
113	71	Inrush Current, 55A In Decimal = 055 In Hex = 37H	55	37
114	72	Inrush Interval, 10mS In Decimal = 010 In Hex = 0AH	10	0A
115 116	73 74	Low End Input Voltage Range 1(10mV), (36V / 10mV) 3600 = 0E10H 2 Bytes Sequence In Decimal = 016, 014 In Hex = 10H, 0EHH	16 14	10 0E
117 118	75 76	High End Input Voltage Range 1(10mV), (72V/10mV) 7200= 1C20H 2 Bytes Sequence In Decimal = 032, 028 In Hex = 20H, 1CH	32 28	20 1C
119 120	77 78	Low End Input Voltage Range 2(10mV) Not Applicable (Autoswitch)	0 0	00 00
121 122	79 7A	High End Input Voltage Range 2(10mV) Not Applicable (Autoswitch)	0 0	00 00
123	7B	Low End Input Frequency Range, 0Hz = 00H	0	00
124	7C	Low End Input Frequency Range, 0Hz = 00H	0	00
125	7D	DC Dropout Tolerance in ms, 1mS= 0AH	1	01
126	7E	Binary Flags, 1 indicates function supported and a 0 indicates function not supported. Bits 7-5: RESERVED, WRITE AS 000B Bit 5: PMBUS capable or not. 1 if Supported 0 if not. BIT = 1 Bit 4: Tachometer Pulses Per Rotation / Predictive Fail Polarity BIT = 0 Bit 3: Hot Swap / Redundancy Support BIT = 1 Bit 2: Auto switch Support BIT = 1 Bit 1: Power Factor Correction Support BIT = 0 Bit 0: Predictive Fail Support BIT = 0	44	2C
127 128	7F 80	Peak Wattage Capacity and Holdup Time 2 Bytes Sequence 1100W = 044CH 1ms = 01H	76 20	4C 14
129 130 131	81 82 83	Combined Wattage, Not Applicable, 3 Bytes Sequence Byte 1: 0000 0000 0000 0000 Byte 2 and Byte 3: 00H, 00H	0 0 0	00 00 00
132	84	Predictive Fail Tachometer Lower Threshold, Not Applicable. Predictive Failure is not Supported.	0	00
12V DC OUTPUT RECORD HEADER				
133	85	Record type = 01 for DC Output Record	1	01
134	86	End of List /Record Format Version Number for 12V DC Output Record	2	02
135	87	Record Length of 12V DC Output Record	13	0D
136	88	Record CHECKSUM of 12V DC Output Record (Zero CHECKSUM) (256-(sum of bytes 138 to 150))	78	4E
137	89	Header CHECKSUM of 12V DC Output Record Header (Zero CHECKSUM) (256-(sum of bytes 131 to 136))	162	A2

Technical Reference Note

DS1100SDC-3 FRU (EEPROM) Data:

OFFSET		DEFINITION (REMARKS)	SPEC VALUE	
(DEC)	(HEX)		(DEC)	(HEX)
12V OUTPUT RECORD				
138	8A	Output Information, 001 = 01H Bit 7: Standby Information = 0B Bits 6-4: Reserved, Write as 000B Bits 3-0: Output Number 1 = 001B	1	01
139 140	8B 8C	Nominal Voltage (10mV), (12V / 10mV) 1200 = 04B0H 2 Bytes Sequence In Decimal: 176, 004 In Hex: B0H, 04H	176 4	B0 04
141 142	8D 8E	Maximum Negative Voltage Deviation (10mV), 1140 = 0474H 2 Bytes Sequence In Decimal: 116, 004 In Hex: 74H, 04H	116 4	74 04
143 144	8F 90	Maximum Positive Voltage Deviation (10mV), 1260 =04ECH 2 Bytes Sequence In Decimal: 236, 004 In Hex: ECH, 04H	236 4	EC 04
145 146	91 92	Ripple and Noise pk-pk (mV), 120 = 78H 2 Bytes Sequence In Decimal: 120, 000 In Hex: 78H, 00H	120 0	78 00
147 148	93 94	Minimum Current Draw (10mA), 0050 = 0032H 2 Bytes Sequence In Decimal: 050, 000 In Hex: 32H, 00H	50 0	32 00
149 150	95 96	Maximum Current Draw (10mA), 9160 = 23C8H In Decimal: 200, 035 In Hex: C8H, 23H	200 35	C8 23
Vsb OUTPUT RECORD HEADER				
151	97	Record type = 01 for DC Output Record	1	01
152	98	End of List /Record Format Version Number for 3V3SB Output Record	2	02
153	99	Record Length of 3V3SB Output Record	13	0D
154	9A	Record CHECKSUM of 3V3SB Output Record (Zero CHECKSUM) (256-(sum of bytes 156 to 168))	179	B3
155	9B	Header CHECKSUM of 3V3SB Output Record Header (Zero CHECKSUM) (256-(sum of bytes 151 to 154))	61	3D
156	9C	Output Information, 002 = 02H Bit 7: Standby Information = 1B Bits 6-4: Reserved, Write as 000B Bits 3-0: Output Number 2 = 010B	130	82
157 158	9D 9E	Nominal Voltage (10mV), (12V / 10mV) 1200 = 04B0H 2 Bytes Sequence In Decimal: 176, 004 In Hex: B0H, 04H	176 4	B0 04
159 160	9F A0	Maximum Negative Voltage Deviation (10mV), 1140 = 0474H 2 Bytes Sequence In Decimal: 116, 004 In Hex: 74H, 04H	116 4	74 04
161 162	A1 A2	Maximum Positive Voltage Deviation (10mV), 1260 =04ECH 2 Bytes Sequence In Decimal: 236, 004 In Hex: ECH, 04H	236 4	EC 04
163 164	A3 A4	Ripple and Noise pk-pk (mV), 120 = 78H 2 Bytes Sequence In Decimal: 120, 000 In Hex: 78H, 00H	120 0	78 00

Technical Reference Note

DS1100SDC-3 FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
165	A5	Minimum Current Draw (10mA) , (0.1A / 10mA) 10 = 000AH 2 Bytes Sequence In Decimal: 010, 000 In Hex: 0AH, 00H	10	0A
166	A6		0	00
167	A7	Maximum Current Draw (10mA) , (3A / 10mA) 300 = 012CH 2 Bytes Sequence In Decimal: 044, 001 In Hex: 44H, 01H	44	2C
168	A8		1	01
OEM RECORD HEADER				
169	A9	Record type = C0H for OEM Record	192	C0
170	AA	End of List /Record Format Version Number for 3.3Vsb output Record	130	82
171	AB	Record Length of OEM Record	42	2A
172	AC	Record CHECKSUM of OEM Record (Zero CHECKSUM)	0	00
173	AD	Header CHECKSUM of OEM Record Header (Zero CHECKSUM) (256-(sum of bytes 169 to 172))	148	94
OEM RECORD				
174	AE	Manufacturer ID (3 bytes, Default is 0)	0	00
175	AF	RESERVED	0	00
176	B0	RESERVED	0	00
177	B1	RESERVED	0	00
178	B2	RESERVED	0	00
179	B3	RESERVED	0	00
180	B4	RESERVED	0	00
181	B5	RESERVED	0	00
182	B6	RESERVED	0	00
183	B7	RESERVED	0	00
184	B8	RESERVED	0	00
185	B9	RESERVED	0	00
186	BA	RESERVED	0	00
187	BB	PAD (reserved), Default value is 0.	0	00
188	BC		0	00
189	BD		0	00
190	BE		0	00
191	BF		0	00
192	C0		0	00
193	C1		0	00
194	C2		0	00
195	C3		0	00
196	C4		0	00
197	C5		0	00
198	C6		0	00
199	C7		0	00
200	C8		0	00
201	C9		0	00
202	CA		0	00
203	CB		0	00
204	CC		0	00
205	CD		0	00
206	CE	0	00	
207	CF	0	00	
208	D0	0	00	
209	D1	0	00	
210	D2	0	00	
211	D3	0	00	
212	D4	0	00	
213	D5	0	00	
214	D6	0	00	
215	D7	0	00	

Technical Reference Note

DS1100SDC-3 FRU (EEPROM) Data:

OFFSET		DEFINITION (REMARKS)	SPEC VALUE	
(DEC)	(HEX)		(DEC)	(HEX)
INTERNAL USE AREA, 40 BYTES				
216	D8	RESERVED, Default value is 0.	0	00
217	D9		0	00
218	DA		0	00
219	DB		0	00
220	DC		0	00
221	DD		0	00
222	DE		0	00
223	DF		0	00
224	E0		0	00
225	E1		0	00
226	E2		0	00
227	E3		0	00
228	E4		0	00
229	E5		0	00
230	E6		0	00
231	E7		0	00
232	E8		0	00
233	E9		0	00
234	EA		0	00
235	EB		0	00
236	EC		0	00
237	ED		0	00
238	EE		0	00
239	EF		0	00
240	F0		0	00
241	F1		0	00
242	F2		0	00
243	F3		0	00
244	F4		0	00
245	F5		0	00
246	F6		0	00
247	F7		0	00
248	F8		0	00
249	F9		0	00
250	FA		0	00
251	FB		0	00
252	FC		0	00
253	FD		0	00
254	FE		0	00
255	FF		Zero CHECKSUM of Internal Use Area (if used). Default Value=0	0

Technical Reference Note

DS1100SDC-3-001 FRU (EEPROM) deviations:

OFFSET		DEFINITION (REMARKS)	SPEC VALUE	
(DEC)	(HEX)		(DEC)	(HEX)
PRODUCT INFORMATION AREA, 56 BYTES				
PRODUCT NAME BYTES (15 Byte sequence)				
52	34	"D"	68	44
53	35	"S"	83	53
54	36	"1"	49	31
55	37	"1"	49	31
56	38	"0"	48	30
57	39	"0"	48	30
58	3A	"S"	83	53
59	3B	"D"	68	44
60	3C	"C"	67	43
61	3D	"_"	45	2D
62	3E	"3"	51	33
63	3F	"_"	45	2D
64	40	"0"	48	30
65	41	"0"	48	30
66	42	"1"	49	31
PRODUCT NAME BYTES (15 Byte sequence)				
68	44	"D"	68	44
69	45	"S"	83	53
70	46	"1"	49	31
71	47	"1"	49	31
72	48	"0"	48	30
73	49	"0"	48	30
74	4A	"S"	83	53
75	4B	"D"	68	44
76	4C	"C"	67	43
77	4D	"_"	45	2D
78	4E	"3"	51	33
79	4F	"_"	45	2D
80	50	"0"	48	30
81	51	"0"	48	30
82	52	"1"	49	31
PRODUCT SERIAL NUMBER BYTES				
Model ID = DS1100SDC-3-001 / K847				
87	57	"K"	75	4B
88	58	"8"	56	38
89	59	"4"	52	34
90	5A	"7"	55	37

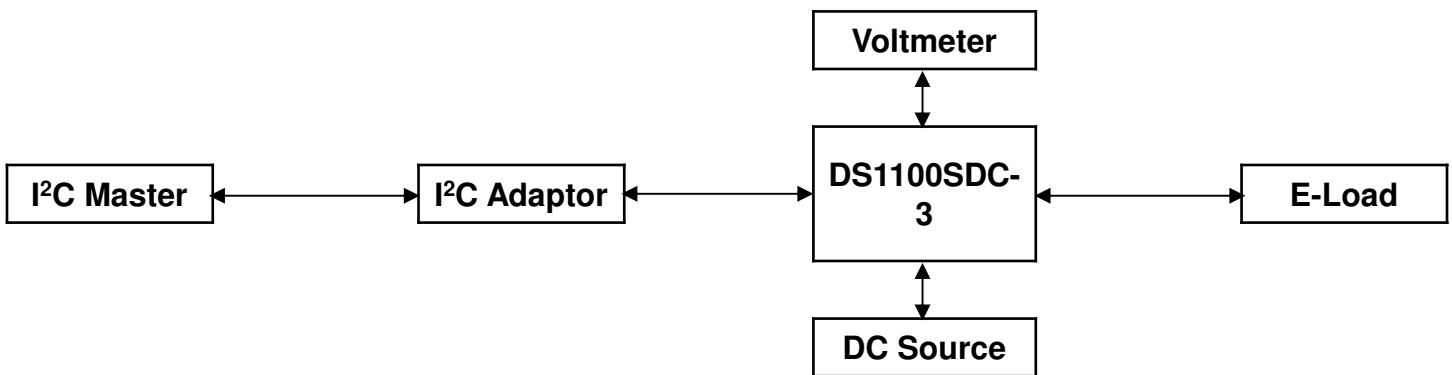
PMBus™ Interface Support

The DS1100SDC-3 is compliant with the industry standard PMBus™ protocol for monitoring and control of the power supply via the I²C interface port.

DS1100SDC-3 Series PMBus™ General Instructions

Equipment Setup

The following is typical I²C communication setup:



PMBus™ Writing Instructions

When writing to any PMBus™ R/W registers, ALWAYS do the following:

Disable Write Protect (command 10h) by writing any of the following accordingly:

- Levels: 00h – Enable writing to all writeable commands
- 20h – Disables write except 10h, 01h, 00h, 02h and 21h commands
- 40h – Disables write except 10h, 01h, and 00h commands
- 80h – Disable write except 00h command

To save changes on the USER PMBus™ Table:

Use send byte command: 15h STORE_USER_ALL

To save changes on the DEFAULT PMBus™ Table:

Use send byte command: 11h STORE_DEFAULT_ALL

Wait for 5 seconds, turn-off the PSU, wait for another 5 seconds before turning it on.

DS1100SDC-3 Series Support PMBus™ Command List

The DS1100SDC-3 is compliant with the industry standard PMBus™ protocol for monitoring and control of the power supply via the i²C interface port.

DS1100SDC-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
00h	PAGE	00	R	1		
01h	OPERATION	80	R/W	1		Used to Turn the unit ON/OFF in conjunction with the input PS_ON pin. It is also used to set output to upper or lower Margin Voltages. Valid values: 80h=PSU ON; 40h=PSU OFF.
	b7:6	10b				00 – Immediate Turn OFF (No Sequencing) 01 – Soft Turn OFF (With Sequencing) 10 – PSU ON
	b5:4	00b				
	b3:2	00b				
	b1:0	00b				Reserved
02h	ON_OFF_CONFIG	1C	R	1		Configures the combination of PS_ON pin and serial communication commands needed to turn the Unit ON/OFF.
	b7:5	000				Reserved
	b4 – Enable CONTROL pin and Serial communication control.	1				0 – Unit powers up any time power is present regardless of the state of CONTROL pin. 1 – Unit powers up as dictated by CONTROL pin and OPERATION command (b3:0)
	b3 – Serial communication Control	1				0 – Unit Ignores ON/OFF portion of the OPERATION command.1 – Enables Serial communication ON/OFF portion of OPERATION command. Requires CONTROL pin to be asserted for the unit to start and energize the output.
	b2 – Sets how the unit responds to CONTROL pin	1				0 – Unit ignores CONTROL pin. (ON/OFF controlled by OPERATION command). 1 – Unit requires CONTROL pin to be asserted to start the unit.
	b1 - CONTROL pin polarity	0				0 – Active Low (Pull Low to start the unit) 1 – Active high (Pull high to start the unit)
	b0 – CONTROL pin Action	0				0 – Use programmed turn ON/OFF delay 1 – Turn OFF the output and stop transferring energy to the output as fast as possible.
03h	CLEAR_FAULTS	0	S			
10h	WRITE_PROTECT	80	R/W	1		Used to Control Writing to the PMBus Device 80h - Disables write except 10h (write protected) 40h – Disables write except 10h, 01h, 00h 20h – Disables write except 0h,01h,00h,02h and 21h commands 00 – Enables write to all writeable commands.
15h	STORE_USER_ALL	-	S	0		Copies the Operating memory table to the matching USER non-volatile memory.

DS1100SDC-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
19h	CAPABILITY	90	R	1		Provides a way for the hosts system to determine some key capabilities of a PMBus device.
	b7 - Packet Error Checking	1				0 - PEC not supported 1 - PEC supported
	b6 - Maximum Bus Speed	0				0 - Maximum supported bus speed, 100khz 1 - Maximum supported bus speed, 400khz
	b5 - SMBALERT#	0				0 – SMBus Alert Pin <i>not supported</i> 1 – SMBus Alert Pin <i>supported</i>
	b4:0	00000				Reserved
1Ah	QUERY		BW-BR PC	2		
1Bh	SMBALERT_MASK		BW-BR PC	2		
20h	VOUT_MODE	17	R	1		Specifies the mode and parameters of Output Voltage related Data Formats
21h	VOUT_COMMAND	1800	R/W	2	Linear	Sets the Output Voltage Reference Vout command sends discreet value to change or trim output voltage. The value acts as Digital reference of the Power supply after additional operations are performed. (to make the representation compatible). Affects OVP_WARNING and FAULT LIMIT, as well as POWER_GOOD_ON/OFF level.
24h	VOUT_MAX	1933	R	2	Linear	Default value is 12.6V.
30h	COEFFICIENTS	N/A	BW-BR PC	6		use to retrieve the m, b and R coefficients, needed for DIRECT data format
	byte 1:2					m low Byte, m high byte
	byte 3:4					b low Byte, b high byte
	byte 5					R byte
35h	VIN_ON	0020	R	2	Linear	Sets the value of input, in volts, at which the unit should start. Default value: 32Vdc
36h	VIN_OFF	001E	R	2	Linear	Sets the value of input, in volts, at which the unit should stop power conversion. Default value: 30Vdc
3Ah	FAN_CONFIG_1_2	90	R	1		Read only to reflect setting of Fans
	b7	1				1 – Fan is installed in position 1 0 – No Fan is installed in position 1
	b6	0				1 – Fan is commanded in RPM 0 – Fan is commanded in DC
	b5:4	01				00 – 1 pulse per revolution 01 – 2 pulses per revolution 10 – 3 pulses per revolution 11 – 4 pulses per revolution
	b3	0				1 – Fan is installed in position 2 0 – No Fan is installed in position 2
	b2	0				1 – Fan is commanded in RPM 0 – Fan is commanded in DC
	b1:0	00				00 – 1 pulse per revolution 01 – 2 pulses per revolution 10 – 3 pulses per revolution 11 – 4 pulses per revolution

DS1100SDC-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
3Bh	FAN_COMMAND_1	0000	R/W	2	Linear	Adjusts the operation of the Fans. The device may override the command, if it requires higher value, to maintain proper device temperature. RPM Control – Commands Speeds from 0-65535 RPM. Duty cycle Control – Commands Speeds from 0 to 100%
40h	VOUT_OV_FAULT_LIMIT	1C80	R/W	2	Linear	Sets Output Over voltage threshold. (Default Value is 14.25V) Valid value range is 13.5V – 15.0V.
41h	VOUT_OV_FAULT_RESPONSE	80	R	1		Unit Latches OFF. Resets on PS_ON or CONTROL pin recycle or DC recycle.
42h	VOUT_OV_WARN_LIMIT	1A00	R/W	2	Linear	Sets Over-voltage Warning threshold. (Default Value is 13.0V), 12.6-13.4V
43h	VOUT_UV_WARN_LIMIT	1666	R/W	2	Linear	Sets Under-voltage Warning threshold. (11.2V)
44h	VOUT_UV_FAULT_LIMIT	1599	R/W	2	Linear	Sets Under-voltage Fault threshold. (Default Value is 10.8V)
45h	VOUT_UV_FAULT_RESPONSE	80	R	1		Turn PSU OFF
46h	IOUT_OC_FAULT_LIMIT	EB68	R/W	2	Linear	Sets the Over current threshold in Amps. (Default Value is 109A)
47h	IOUT_OC_FAULT_RESPONSE	C0	R	1		OCP ride through. If OCP persists.
4Ah	IOUT_OC_WARN_LIMIT	EB20	R/W	2	Linear	Sets the Over Current Warning threshold in Amps. (Default value is 100A)
4Fh	OT_FAULT_LIMIT	EB48	R/W	2	Linear	Secondary ambient temperature Fault threshold, in degree C. (Default value is 105degC)
50h	OT_FAULT_RESPONSE	F8	R	1	Linear	Turn PSU OFF and will retry indefinitely. Supported enable/disable of protection and recoverability.
51h	OT_WARN_LIMIT	EB20	R/W	2	Linear	Secondary ambient temperature warning threshold, in degree C. Operating limit (Default value is 100degC)
55h	VIN_OV_FAULT_LIMIT	0055	R	2	Linear	Sets input over-voltage threshold. (Default value is 85Vdc)
56h	VIN_OV_FAULT_RESPONSE	F8	R	1		(Default value is F8h)
57h	VIN_OV_WARN_LIMIT	004B	R	2	Linear	(Default value is 75Vdc)
58h	VIN_UV_WARN_LIMIT	0023	R	2	Linear	(Default value is 35Vdc)
59h	VIN_UV_FAULT_LIMIT	001E	R	2	Linear	(Default value is 30Vdc)
5Ah	VIN_UV_FAULT_RESPONSE	F8	R	1		(Default value is F8h)
5Eh	POWER_GOOD_ON	1766	R	2	Linear	Sets the threshold by which the Power Good signal is asserted. (11.7V)
5Fh	POWER_GOOD_OFF	16CC	R	2	Linear	Sets the threshold by which the Power Good signal is de-asserted. (11.4V)
60h	TON_DELAY	EB20	R/W	2	Linear	Sets the time (sec), from start condition (Power ON) until the output starts to rise. (0-2200ms) Default=100ms
61h	TON_RISE	DA80	R/W	2	Linear	Sets the time (ms), for the output rises from 0 to regulation. (0-50ms) Default=20ms
62h	TON_MAX_FAULT_LIMIT	C233	R/W	2	Linear	(Valid value is 2000-3000ms) Default=2200ms

DS1100SDC-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
63h	TON_MAX_FAULT_RESPONSE	C0	R	1	Linear	Default: C0h
64h	TOFF_DELAY	C280	R/W	2	Linear	Sets the time (ms), from a stop condition (Power OFF) until the output starts to drop (converter OFF).(0-2.7sec) Default=2.5secs
6Ah	POUT_OP_WARN_LIMIT	0A78	R/W	2	Linear	(Valid value is 1263 – 1265W) Default= 1264W
78h	STATUS_BYTE	-	R	1		Returns the summary of critical faults
	b7 – BUSY					Not supported
	b6 – OFF					Unit is OFF
	b5 – VOUT_OV					Output over-voltage fault has occurred
	b4 – IOUT_OC					Output over-current fault has occurred
	b3 - VIN_UV					An input under-voltage fault has occurred
	b2 - TEMPERATURE					A temperature fault or warning has occurred
	b1 – CML					A communication, memory or logic fault has occurred.
	b0 – NONE OF THE ABOVE					A Fault Warning not listed in bits[7:1] has occurred.
79h	STATUS_WORD	-	R	2		Summary of units Fault and warning status.
	b15 – VOUT					An output voltage fault or warning has occurred
	b14 – IOUT/POUT					An Output current or power fault or warning has occurred.
	b13 – INPUT					An input voltage, current or power fault or warning as occurred.
	b12 – MFR					A manufacturer specific fault or warning has occurred.
	b11 – POWER_GOOD#					The POWER_GOOD signal is de-asserted
	b10 - FANS					A fan or airflow fault or warning has occurred.
	b9 – OTHER					Not supported
	b8 – UNKNOWN					Not supported
	b7 – BUSY					A fault was declared because the device was busy and unable to respond.
	b6 – OFF					Unit is OFF
	b5 – VOUT_OV					Output over-voltage fault has occurred
	b4 – IOUT_OC					Output over-current fault has occurred
	b3 - VIN_UV					An input under-voltage fault has occurred
	b2 – TEMPERATURE					A temperature fault or warning has occurred
	b1 – CML					A communication, memory or logic fault has occurred.
	b0 – NONE_OF_THE_ABOVE					A fault or warning not listed in bits[7:1] of this byte has occurred.
7Ah	STATUS_VOUT	00	R/W	1		Output voltage related faults and warnings
	b7					VOUT Over-voltage Fault
	b6					VOUT Over-voltage warning
	b5					VOUT Under-voltage Warning
	b4					VOUT Under-voltage Fault
	b3					VOUT_MAX Warning, an attempt has been made to set output to a value higher that the highest permissible voltage.
	b2					TON_MAX_FAULT
	b1					TOFF_MAX Warning. Not supported
	b0					Not supported.

DS1100SDC-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
7Bh	STATUS_IOUT		R/W	1		Output Current related faults and warnings
	b7					IOUT Over current Fault
	b6					IOUT Over current And Low Voltage shutdown Fault
	b5					IOUT Overcurrent Warning
	b4					IOUT Undercurrent Fault
	b3					Current Share Fault
	b2					Power Limiting
	b1					POUT Overpower Fault
	b0					POUT Overpower Warning
7Ch	STATUS_INPUT		R/W	1		Input related faults and warnings
	b7					VIN Overvoltage Fault
	b6					VIN Overvoltage Warning
	b5					VIN Undervoltage Warning
	b4					VIN Undervoltage Fault
	b3					Unit is OFF for insufficient Input Voltage
	b2					IIN Overcurrent Fault
	b1					IIN Overcurrent Warning
	b0					PIN Overpower Warning
7Dh	STATUS_TEMPERATURE		R/W	1		Temperature related faults and warnings
	b7					Overtemperature Fault
	b6					Overtemperature Warning
	b5					Undertemperature Warning
	b4					Undertemperature Fault
	b3:0					Reserved
7Eh	STATUS_CML		R/W	1		Communications, Logic and Memory
	b7					Invalid or unsupported Command Received
	b6					Invalid Data
	b5					Packet Error Check Failed
	b4					Memory Fault Detect, CRC Error
	b3					Not Supported
	b2					Not Supported
	b1					Not Supported
	b0					Not Supported
80h	STATUS_MFR_SPECIFIC		R/W	1		Manufacturer Status codes
	b7					Not Used
	b6					Not Used
	b5					Not Used
	b4					Not Used
	b3					Not Used
	b2					Not Used
	b1					Not Used
	b0					MFR SPECIFIC FAULT. For Trouble shooting
81h	STATUS_FANS_1_2		R/W	1		
	b7					Fan 1 Fault
	b6					Fan 2 Fault

DS1100SDC-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
	b5					Fan 1 Warning
	b4					Fan 2 Warning
	b3					Fan_1 Speed Overridden
	b2					Fan_2 Speed Overridden
	b1					Not Used
	b0					Not Used
86h	READ_EIN	-	R	2	Linear	Returns the accumulated input power over time
87h	READ_EOUT	-	R	2	Linear	Returns the accumulated output power over time
88h	READ_VIN	-	R	2	Linear	Returns input Voltage in Volts dc.
89h	READ_IIN	-	R	2	Linear	Returns input Current in Amperes
8Ah	READ_VCAP	-	R	2	Linear	Returns Bulk Capacitor voltage in Volts
8Bh	READ_VOUT	-	R	2	Linear	Returns the actual, measured voltage in Volts.
8Ch	READ_IOUT	-	R	2	Linear	Returns the output current in amperes.
8Dh	READ_TEMPERATURE_1	-	R	2	Linear	Secondary Hotspot
8Eh	READ_TEMPERATURE_2	-	R	2	Linear	Secondary Ambient
8Fh	READ_TEMPERATURE_3	-	R	2	Linear	Primary Ambient
90h	READ_FAN_SPEED_1	-	R	2	Linear	Speed of Fan 1
96h	READ_POUT	-	R	2	Linear	Returns the output power, in Watts.
97h	READ_PIN	-	R	2	Linear	Returns the input power, in Watts.
98h	PMBUS_REVISION	22	R	1		Reads the PMBus revision number
	b7:5	0001				Part 1 Revision 0000 – Revision 1.0 0001 – Revision 1.1
	b4:0	0001				Part 2 Revision 0000 – Revision 1.0 0001 – Revision 1.1
99h	MFR_ID	“ALL”	BR, ASCII	7		Abbrev or symbol of manufacturers name.
9Ah	MFR_MODEL	“DS1100SDC-3”	BR, ASCII	13		Manufacturers Model number, ASCII format
9Bh	MFR_REVISION	4110	BR, ASCII	3		Manufacturers, revision number, ASCII format
9Ch	MFR_LOCATION	“xxxxxxxxxxxxx”	BR, ASCII	12		Manufacturers facility, ASCII format
9Dh	MFR_Date	“xxxxxx”	BR/BW	7		Manufacture Date, ASCII format structure : YYMMDD
9Eh	Unit serial number	“xxxxxxxxxxxxxxx x”	BR	16		Unit serial number, ASCII format.
A0h	MFR_VIN_MIN	0024	R	2	Linear	Minimum Input Voltage (Default value is 36Vdc)
A1h	MFR_VIN_MAX	0048	R	2	Linear	Maximum Input Voltage (Default value is 72Vdc)
A2h	MFR_IIN_MAX	E250	R	2	Linear	Maximum Input Current (Default value is 37A)

DS1100SDC-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
A3h	MFR_PIN_MAX	0A9A	R	2	Linear	Maximum Input Power (Default value is 1332W)
A4h	MFR_VOUT_MIN	16CD	R	2	Linear	Minimum Output Voltage Regulation Window. (Default value is 11.4V)
A5h	MFR_VOUT_MAX	1933	R	2	Linear	Maximum Output Voltage. Regulation Window (Default value is 12.6V)
A6h	MFR_IOUT_MAX	EADD	R	2	Linear	Maximum Output Current (Default value is 91.625A)
A7h	MFR_POUT_MAX	0A26	R	2	Linear	Maximum Output Power (Default value is 1100W)
A8h	MFR_TAMBIENT_MAX	E320	R	2	Linear	Maximum Operating Ambient Temperature (Secondary Ambient) (Default value is 50 degC)
A9h	MFR_TAMBIENT_MIN	0000	R	2	Linear	Minimum Operating Ambient Temperature (Secondary Ambient) (Default value is 0 degC)
AAh	MFR_EFFICIENCY_LL		BR	14		Default Value: 36Vdc, 220W, 85%, 550W, 90%, 1100W, 85%
ABh	MFR_EFFICIENCY_HL		BR	14		Default Value: 48Vdc, 220W, 88%, 550W, 92%, 1100W, 88%
B0h	USER_DATA_00		BW/BR			
E0h	FW_PRI_VERSION		BR	8	ASCII	
E1h	FW_SEC_VERSION		BR	8	ASCII	
E2h	CONFIG_UNLOCK_CODE		BW/BR	4	ASCII	
E3h	CONFIG_CTRL_CMD		BW/BR	1	Bitmapped	
F1h	ISP_UNLOCK_CODE			4	Bitmapped	
F2h	ISP_CTRL_CMD		R/W	1	Bitmapped	
F3h	ISP_STATUS_BYTE		R	1	Bitmapped	
F5h	ISP_FLASH_DATA		BW/BR		Direct	

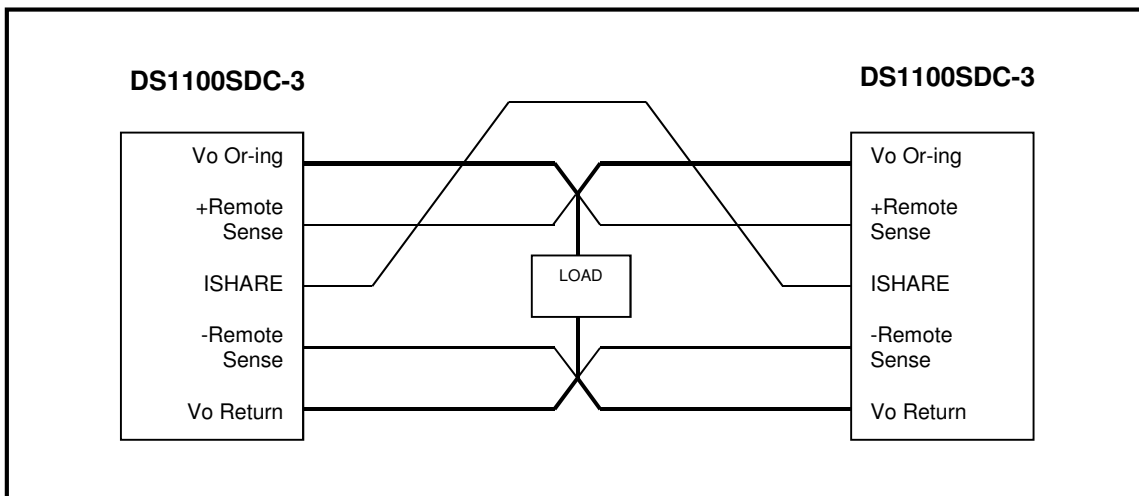
Current Sharing

The DS1100SDC-3 series' main output V_O is equipped with current sharing capability. This will allow up to 4 power supplies to be connected in parallel for higher power application. Current share accuracy is typically $\pm 6.23A$ maximum. Below 10% total loading, there is no guarantee of output current sharing.

Redundancy / Fault Tolerance

The DS1100SDC-3 series power supplies must be able to current share with 2(1+1) up to 4(2+2) power supplies in parallel and operate in a hot swap/redundant N+N configuration where N=1 or 2. The 12Vsb outputs of the power supplies are connected together in the system so that a failure or hot swap of a redundant power supply does not cause these outputs to go out of regulation in the system.

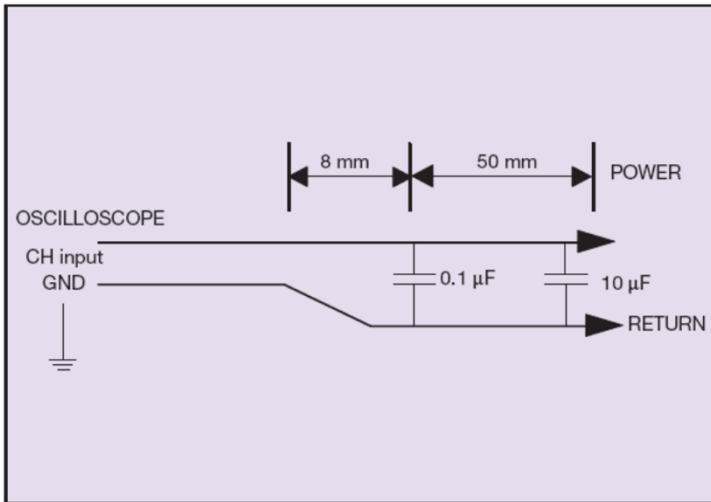
All power supply outputs will be designed for redundant mode operation. No internal failure in any power supply in this configuration should cause the bus voltage to fall below the regulation limits specified. All output voltages should stay within the regulation limits during cold swapping or hot swapping operation.



Note - For ease of current sharing, it is recommended that the remote sense lines be connected right at the mating connector of each power supply. Current sharing tests should be done with a backplane distribution impedance of 200uohm.

Output Ripple and Noise Measurement

The setup outlined in the diagram below has been used for output voltage ripple and noise measurements on the DS1100SDC-3 Series. When measuring output ripple and noise, a scope jack in parallel with a 0.1uF ceramic chip capacitor, and a 10uF aluminum electrolytic capacitor should be used. Oscilloscope should be set to 20 MHz bandwidth for this measurement.



Record of Revision and Changes

Issue	Date	Description	Originators
1.0	08.17.2015	First Issue	E. Wang
1.1	10.29.2015	Update PS_ON and PS_PRESENT description / update the command code 8Dh, 8Eh, 8Hh, description	E. Wang
1.2	05.06.2016	Update EMC Surge Specification	E. Wang
1.3	09.06.2016	Update PMBus Command 8Bh data format	E.Wang
1.4	02.22.2018	Update diagrams for PS_ON and PS PRESENT signals, PMBus command 46h default value	E.Wang
1.5	02.11.2019	Update altitude specification	E.Wang

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