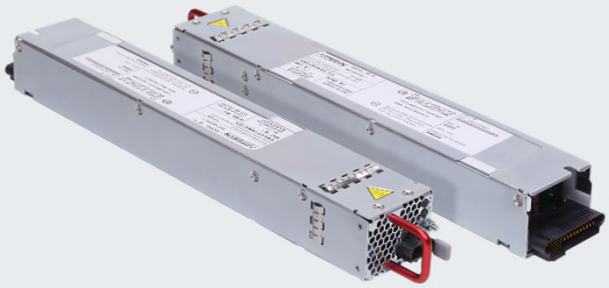
ARTESYN DS1100TDC-3 SERIES

1100 Watts Distributed Power System



PRODUCT DESCRIPTION

Advanced Energy's Artesyn DS1100TDC series bulk front end DC-DC power supply accepts a wide range -40 to -72 Vdc input and provides a main 12 V output plus a 3.3 V standby output. Housed in an industry standard 1U x 2.1 in rack-mounting package and able to deliver 1,100W, the power supply is ideal for space-constrained applications. This series comes in two airflow versions – output-connector to input-connector and vice versa.

AT A GLANCE

Total Power

1100 Watts

Input Voltage

-40 to 72 Vdc

# of Outputs

Main and Standby

SPECIAL FEATURES

- 1100W output power
- 1U power supply
- High power and short form factor
- High-density design: 26W/in^3
- Hot-pluggable
- Inrush current control
- Compatible with DS1100SLPE-3
- N+N, N+1 redundant
- Hot-pluggable
- Full digital control
- Two-year warranty
- Compatible with Artesyn's Universal PMBus™ GUI
- Reverse airflow option

SAFETY

- UL/cUL60950
- Demko+CB Report
- EN60950
- CE and UKCA Mark
- China CCC

TYPICAL APPLICATIONS

- Industrial

RoHS

MODEL NUMBERS

Standard	Output Voltage	Minimum Load[1]	Maximum Load	Stand-By Supply	Air Flow Direction
DS1100TDC-3	12.0Vdc	3A	91.6A	3.3Vdc@3A	Forward (DC Connector to Red Handle)
DS1100TDC-3 -001	12.0Vdc	3A	91.6A	3.3Vdc@3A	Reverse (Blue Handle to DC 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	Models	Symbol	Min	Typ	Max	Unit
Input Voltage DC continuous operation	All models	$V_{IN,DC}$	-40	-	-72	Vdc
Maximum Output Power (Main + Standby)	All models	$P_{O,max}$	-	-	1100	W
Isolation Voltage[1] Input to outputs Input to safety ground	 All models All models		 - -	 - -	 2121 2121	 Vac Vac
Ambient Operating Temperature[2]	DS1100TDC-3 DS1100TDC-3-001	T_A	-5 -5	- -	+65 +55	^{O}C ^{O}C
Storage Temperature	All models	T_{STG}	-40	-	70	^{O}C
Humidity (non-condensing)	All models		5	-	95	%
Altitude Operating Non-operating	 All models All models		 - -	 - -	 10000 50000	 Feet Feet

Note 1 - To test 2121Vdc isolation, remove two chassis screws near the front panel at the base of the chassis.
Note 2 - DS1100TDC-3: 1100W from -5 to 50^{O}C, withstand operation up to 65^{O}C at 660W output power without damage.
DS1100TDC-3-001: 1100W from -5 to 45^{O}C, withstand operation up to 55^{O}C at 660W output power without damage.

ELECTRICAL SPECIFICATIONS

Input Specifications

Table 2. Input Specifications

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Operating Input Voltage, DC	All	$V_{IN,DC}$	-40	-54	-72	Vdc
Maximum Input Current ($I_O = I_{O,max}$, $I_{SB} = I_{SB,max}$)	$V_{IN,DC}$ = -40Vdc	$I_{IN,max}$	-	-	37	A
Standby Input Current (V_O = Off, I_{SB} = 0A)	$V_{IN,DC}$ = -40Vdc	$I_{IN,Standby}$	-	-	100	mA
Standby Input Power (V_O = Off, I_{SB} = 0A)	$V_{IN,DC}$ = -40Vdc	$P_{IN,Standby}$	-	-	4	W
No Load Input Current (V_O = On, I_O = 0A, I_{SB} = 0A)	$V_{IN,DC}$ = -40Vdc	$I_{IN,no-load}$	-	-	300	mA
No Load Input Power (V_O = On, I_O = 0A, I_{SB} = 0A)	$V_{IN,DC}$ = -40Vdc	$P_{IN,no-load}$	-	-	12	W
Startup Surge Current (Inrush) @ 25°C	All Meet ETSI EN 300 132-2 Limits	$I_{IN,surge}$	-	-	25	A
Input Fuse	Internal, Fast Acting 25A/125V, 2 in parallel		-	-	50	A
Operating Efficiency	$V_{IN,DC}$ = -48Vdc I_O = 10% $I_{O,max}$ I_O = 20% $I_{O,max}$ I_O = 50% $I_{O,max}$ I_O = 100% $I_{O,max}$	η	 80 85 90 87	 - - - -	 - - - -	 % % % %
System Stability Phase Margin Gain Margin			 45 -	 - -	 - -6	 Ø dB

ELECTRICAL SPECIFICATIONS

Output Specifications

Table 3. Output Specifications

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Factory Set Voltage	All	$\%V_O$	-1	-	+1	%
		$\%V_{SB}$	-2.5	-	+2.5	
Output Regulation	Inclusive of set-point, temperature change, warm-up drift and dynamic load	V_O	11.4	12.0	12.6	Vdc
		V_{SB}	3.14	3.3	3.46	
Output Ripple, pk-pk	Measure with a 0.1µF ceramic capacitor in parallel with a 10µF tantalum capacitor, 10 to 20MHz bandwidth	V_O	-	-	180	mV_{PK-PK}
		V_{SB}	-	-	45	
Output Current[1]	All	I_O	0.5	-	91.6	A
		I_{SB}	0.1	-	3	
Main Output Current Share Accuracy	25% to 100%$I_{O,max}$		-	-	5.625	A
Minimum Load for Current Sharing	All		7	-	-	$\%I_{O,max}$
Number of Parallel Units	Main Output "ISHARE" connected		-	-	4	
Load Capacitance	Start up	C_O	500	-	11000	uF
		C_{SB}	1	-	680	
Main Output Dynamic Response Peak Deviation	50% load change, slew rate = 1A/uS	$\pm\%V_O$	-	-	5	%
Main Output Long Term Stability Max change over 24 hours	After thermal equilibrium (30mins)	$\pm\%V_O$	-	-	0.5	%
MTBF	Telcordia Issue 3 at full load, 40°C		300	-	-	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.

ELECTRICAL SPECIFICATIONS

System Timing Specifications

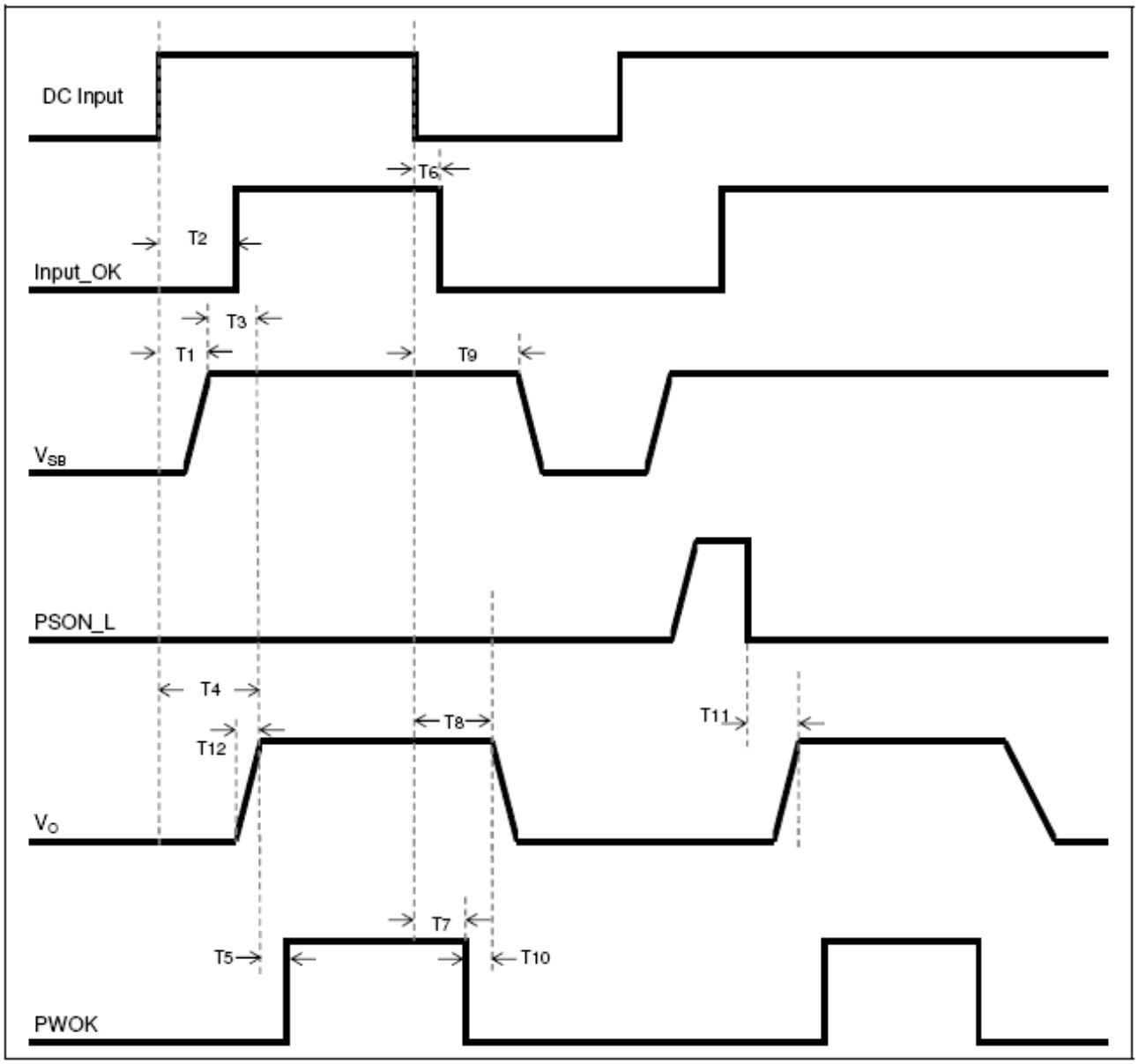
Table 4. System Timing Specifications

Label	Parameter	Min	Typ	Max	Unit
T1	Delay from input being applied to standby output being within regulation.	-	-	2500	mSec
T2	Delay from input being applied to INPUT_OK assertion.	-	-	1500	mSec
T3	Delay from standby output to main output voltage being within regulation.	-	-	1000	mSec
T4	Delay from input being applied to main output being within regulation.	-	-	3000	mSec
T5	Delay from output voltages within regulation limits to PWOK asserted.	100	-	1000	mSec
T6	Delay from loss of input to deassertion of INPUT_OK.	-	-	20	mSec
T7	Delay from loss of input to deassertion of PWOK.	PWOK may de-assert as soon as input loss is detected			
T8	Delay from loss of input to main output falling out of regulation.	1	-	-	mSec
T9	Delay from loss of input to standby output falling out of regulation.	25	-	-	mSec
T10[1]	Delay from deassertion of PWOK to output falling out of regulation.	1	-	700	mSec
T11[2]	Delay from PSON_L assertion to output being within regulation.	-	-	400	mSec
T12	Main output voltage rise time.	-	-	100	mSec

Note 1 - Measured with standby output loaded at 1A.
Note 2 - Tested at -44 to -60Vdc input range.

ELECTRICAL SPECIFICATIONS

System Timing Diagram



ELECTRICAL SPECIFICATIONS

DS1100TDC-3 Performance Curves

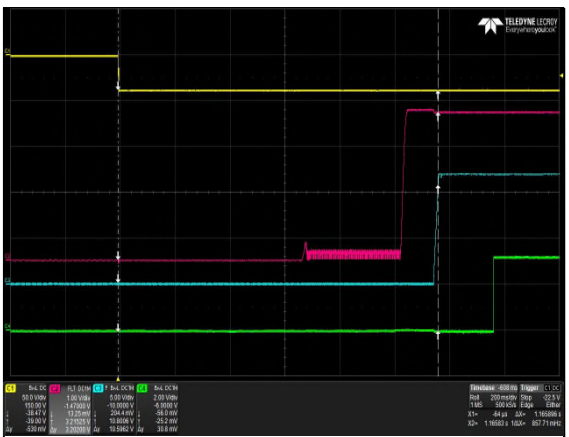


Figure 1: DS1100TDC-3 Turn-On Delay via DC Input
Vin = -40Vdc Load: I_O = 90.83A I_{SB} = 3A
Ch 1: V_{IN} Ch 2: V_{SB} Ch 3: V_O Ch 4: PWOK

Figure 2: DS1100TDC-3 Turn-On Delay via PSON_L
Vin = -40Vdc Load: I_O = 90.83A I_{SB} = 3A
Ch 1: V_{IN} Ch 2: PSON_L Ch 3: V_O Ch 4: PWOK

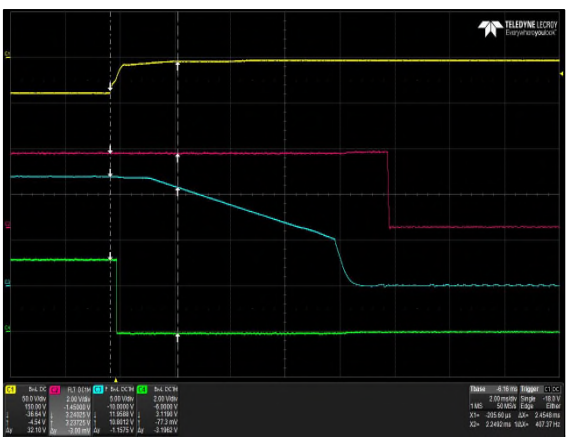


Figure 3: DS1100TDC-3 Hold-up Time
Vin = -40Vdc Load: Io = 90.83A I_{SB} = 3A
Ch 1: V_{IN} Ch 2: V_{SB} Ch 3: V_O Ch 4: PWOK

Figure 4: DS1100TDC-3 Hold-up Time
Vin = -72Vdc Load: Io = 90.83A I_{SB} = 3A
Ch 1: V_{IN} Ch 2: V_{SB} Ch 3: V_O Ch 4: PWOK

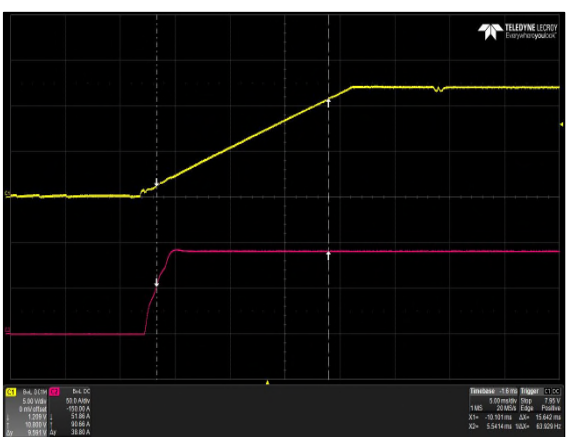


Figure 5: DS1100TDC-3 Output Voltage Startup Characteristic
Vin = -40Vdc Load: Io = 90.83A I_{SB} = 3A
Ch 1: V_O Ch 2: I_O

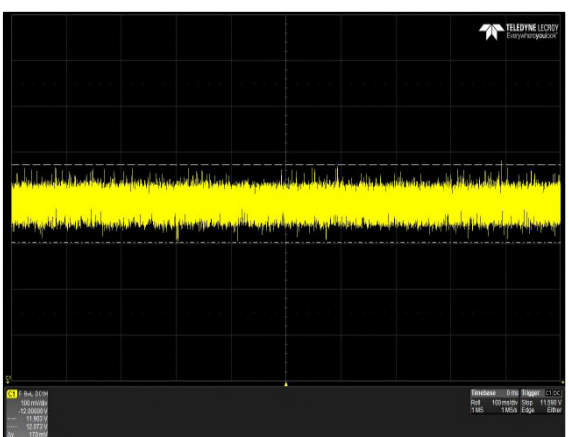


Figure 6: DS1100TDC-3 Ripple and Noise Measurement
Vin = -40Vdc Load: Io = 90.83A I_{SB} = 3A
Ch 1: V_O

ELECTRICAL SPECIFICATIONS

DS1100TDC-3 Performance Curves

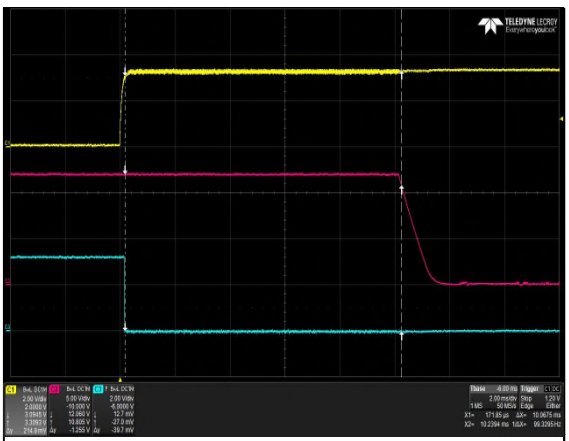


Figure 7: DS1100TDC-3 Turn Off Characteristic via PSON_L
Load: I_O = 90.83A I_{SB} = 3A
Ch 1: PSON_L Ch 2: V_O Ch 3: PWOK

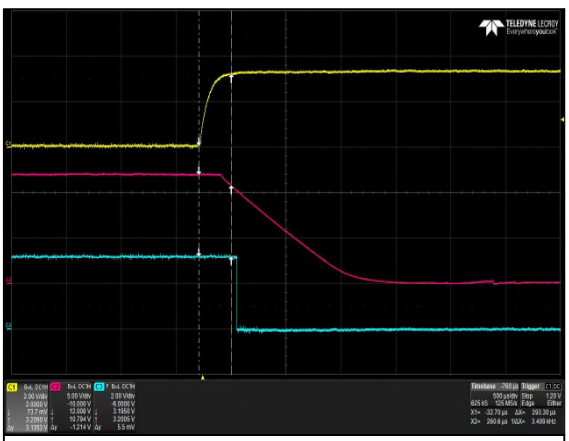


Figure 8: DS1100TDC-3 Turn Off Characteristic via PSKILL_H
Load: I_O = 90.83A I_{SB} = 3A
Ch 1: PSON_L Ch 2: V_O Ch 3: PWOK

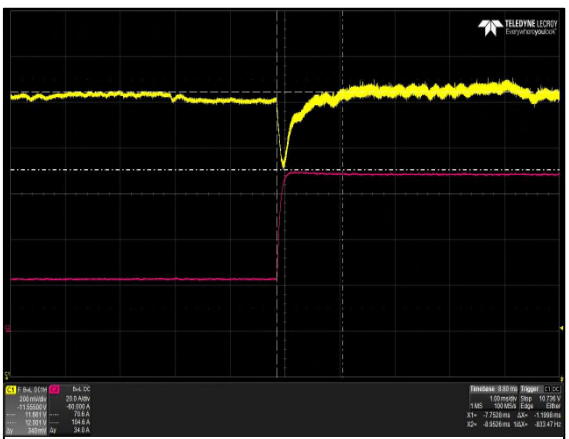


Figure 9: DS1100TDC-3 Transient Response - V_O Deviation
25% to 75% load change 1A/uS slew rate Vin = -54Vdc
Ch 1: V_O Ch 2: I_O Output capacitance=1000uF

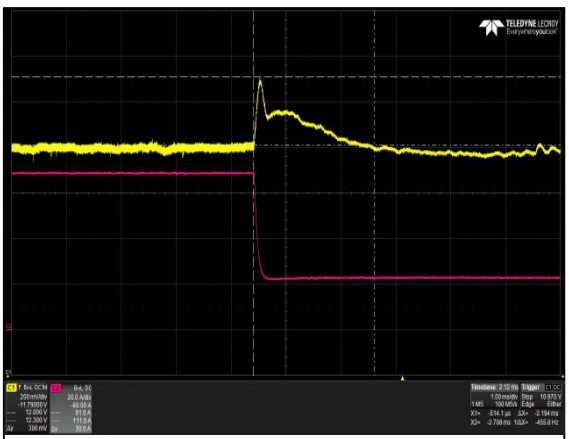


Figure 10: DS1100TDC-3 Transient Response - V_O Deviation
75% to 25% load change 1A/uS slew rate Vin = -54Vdc
Ch 1: V_O Ch 2: I_O Output capacitance=1000uF

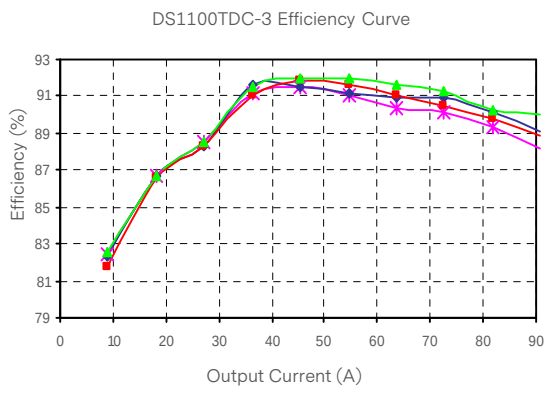


Figure 11: DS1100TDC-3 Efficiency Curve @ 25°C
-40Vdc -48Vdc -54Vdc -72Vdc
Loading: I_o = 10% increment to 90.83A, I_{SB} = 10% increment to 3A

ELECTRICAL SPECIFICATIONS

Protection Function Specifications

Input Fuse

DS1100TDC-3 series is equipped with 2 internal non user serviceable 25A Fast Acting 125Vdc fuses to IEC 127 for fault protection in input.

Over Voltage / Under Voltage Protection (OVP / UVP)

The power supply will provide latch mode over voltage protection as defined by the output over voltage parameters for each output. The latched state will require DC power / PSON_L recycling to restart the power supply.

The power supply will shutdown within 20msec if the output voltage drops below 20% of the nominal rating for more than 2.5msec. The power supply will attempt to auto-recover once every 3sec.

OVP

Parameter	Min	Nom	Max	Unit
V_O Output Overvoltage	13.5	/	14.5	V
V_{SB} Output Overvoltage	3.6	/	4.1	V

Over Current Protection (OCP)

DS1100TDC-3 series includes internal current limit circuit to prevent damage in the event of overload or short circuit. Recovery is automatic when the overload is removed, if the overload lasts for 5sec or more, the power supply will latch off. The latched state requires DC power / PSON_L 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 has an OCP limit from 107%-150% and will auto-recover when the overload is removed. A fault in the standby output will shutdown other outputs and shall auto-recover as well when the overload on the standby is removed.

The fail LED (Amber) will blink at 2Hz rate with a 10-20% duty cycle whenever the output load is within the range on the over current limits as below.

OCP

Parameter	Min	Nom	Max	Unit
V_O Output Overcurrent	107	/	130	$\%I_{O,max}$
V_{SB} Output Overcurrent	107	/	150	$\%I_{SB,max}$

ELECTRICAL SPECIFICATIONS

Short Circuit Protection (SCP)

The DS1100TDC-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 0.1ohm or less. With an approximate 0.05ohm effective shorting resistance (impedances external to the power supply not considered), the initial peak current will be about 300A.

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 10.0A peak. The maximum average current, taking into account the “hiccup” duty cycle, must not exceed rated DC output current of the standby.

Note: Excessive peak current due to the discharge of output capacitors are not controllable in the event of a short circuit at any output, with the peak current subject to the impedance of the short.

Over Temperature Protection (OTP)

The DS1100TDC-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.

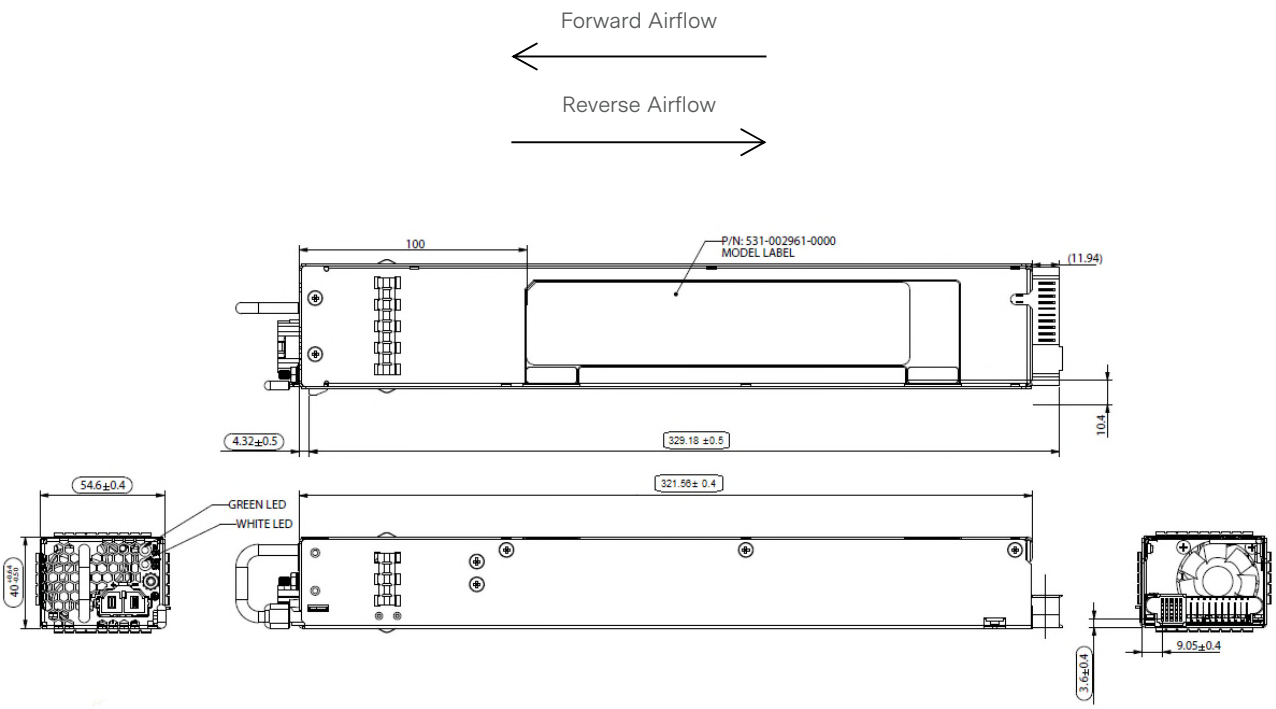
The standby output is shut down due to OTP only when the ambient temperature has gone above 70degC.

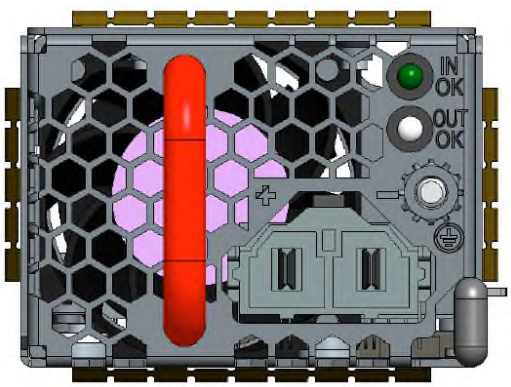
A suitable hysteresis point between the OTP threshold and the recovery point shall be set to ensure there is no frequent on-off cycling of the outputs. The temperature recovery point shall be set well - within the operating temperature range. Upon reaching the temperature recovery point, all outputs shall auto recover.

Any OTP fault will be reported in the PMBus status flag, without discriminating on which OTP sensing circuit was triggered.

MECHANICAL SPECIFICATIONS

Mechanical Outlines (unit: mm)



DS1100TDC-3 (FORWARD) - RED HANDLE	DS1100TDC-3-001 (REVERSE) - BLUE HANDLE
	

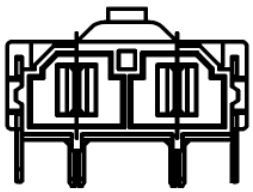
MECHANICAL SPECIFICATIONS

Connector Definitions

DC Input Connector

Pin 1 – Vin- (Negative DC Input)

Pin 2 – Vin+ (Positive DC Input)



Vin+ Vin-

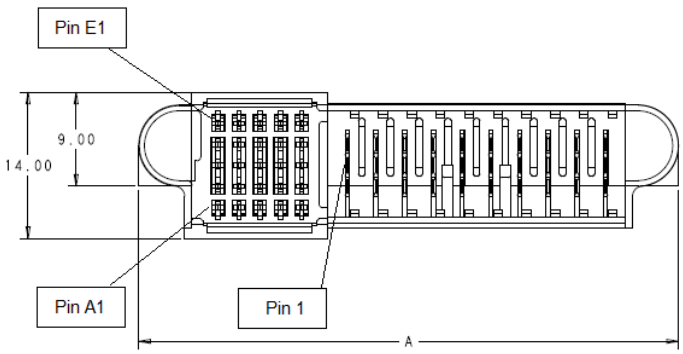
Output Connector - Power Blades

P1-P5 – Main Output Return

P6-P10 – Main Output (V_O)

Output Connector - Control Signals

A1	–	3.3V V_{SB}
B1	–	3.3V V_{SB}
C1	–	3.3V V_{SB}
D1	–	3.3V V_{SB}
E1	–	3.3V V_{SB}
A2&B2	–	SGND
C2&D2&E2	–	RESERVED
A3	–	A2
B3	–	A0
C3	–	SDA
D3	–	REMOTE SENSE-
E3	–	REMOTE SENSE+
A4	–	SCL
B4	–	PSON_L
C4	–	PS_INTERRUPT_L
D4	–	A1
E4	–	INPUT_OK
A5	–	PSKILL_H
B5	–	ISHARE
C5	–	PWOK
D5	–	RESERVED
E5	–	PS_PRESENT_L



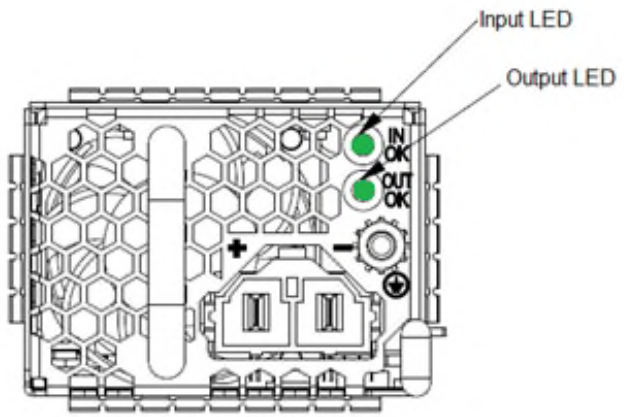
MECHANICAL SPECIFICATIONS

Power / Signal Mating Connectors and Pin Types

Table 5. Mating Connectors for DS1100TDC-3 Series		
Reference	On Power Supply	Mating Connector or Equivalent
Input Connector	Molex 42820-2213	Molex 42816-0212
Output Connector	TEI 1926736-3	TEI 2-1926739-5

MECHANICAL SPECIFICATIONS

LED Indicator Definitions



Two LEDs at the power supply front provides status signal. The Output LED indicated will be bi-color (green/amber). The status LED conditions are shown on the below table.

Conditions	Input LED Status	Output LED Status
DC Input = OFF	OFF	OFF
V_{SB} = ON, V_O = ON	Solid Green	Solid Green
V_{SB} = ON, V_O = OFF, DC Input = ON	Solid Green	Blinking Amber, at least 1Hz
Power supply warning (Hi-temp)	Solid Green	Blinking Amber/Green, at 2:1 ratio, at least 1Hz
Power supply warning (Slow fan)	Solid Green	Blinking Amber/Green, at 1:1 ratio, at least 1Hz
V_O or V_{SB} = OCP / OVP / OTP / FAN FAULT	Solid Green	Amber

MECHANICAL SPECIFICATIONS

Weight

The DS1100TDC-3 series power supply weight is 1041g/2.3lbs maximum.

ENVIRONMENTAL SPECIFICATIONS

EMC Immunity

DS1100TDC-3 series power supply is designed to meet the following EMC immunity specifications.

Table 6. Environmental Specifications

Document	Description
FCC 15 Docket No.20780 Subpart J Class A and CISPR 22/EN55032 and EN300386 Class A	Conducted and Radiated EMI Limits
IEC/EN61000-4-2	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Electrostatic discharge immunity test: +/-8KV air, +/-4KV contact discharge. Performance - Criteria A
IEC/EN61000-4-3	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test: Performance - Criteria A
IEC/EN61000-4-4	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Electrical fast transient/burst immunity test: +/-2KV Performance - Criteria B
IEC/EN61000-4-5	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Surge test: 2KV common mode and 1KV differential mode for AC ports. Performance - Criteria A
IEC/EN61000-4-6	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields. Performance - Criteria A
EN55032	Information Technology Equipment - Immunity Characteristics, Limits and Method of Measurements

ENVIRONMENTAL SPECIFICATIONS

Safety Certifications

The DS1100TDC-3 series 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 DS1100TDC-3 Series Power Supply

Standard	File #	Description
UL60950	E186249-A293-UL-X6	US and Canada Requirements
EN60950	D-04218-A2	Europe Requirements
CE (RoHS)	15155	Europe Requirements
CB Certificate and Report	DK-45693-A2-UL	(All CENELEC Countries)
CHINA CCC Approval	2015010907806482	China Requirements
UKCA	UKCA	UK Requirements

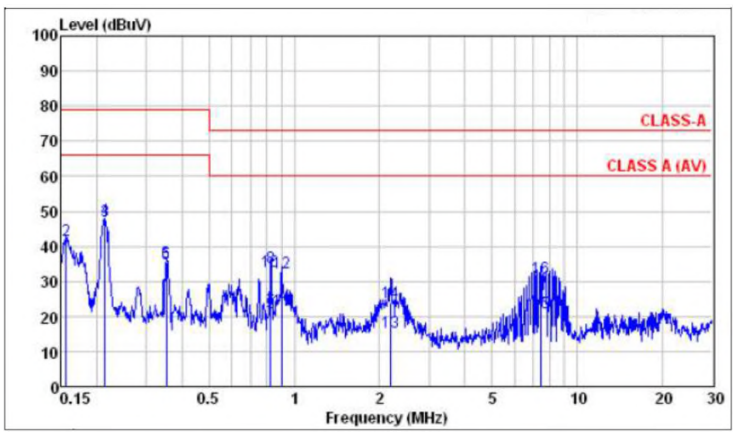
ENVIRONMENTAL SPECIFICATIONS

EMI Emissions

The DS1100TDC-3 series power supply has been designed to comply with the Class A limits of EMI requirements of EN55022 (FCC Part 15) and CISPR 22 (EN55022) for emissions and relevant sections of EN61000 (IEC61000) 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 DS1100TDC-3 series power supply has internal EMI filters to ensure the convertor's 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

Table 8. Conducted EMI Emission Specifications of The DS1100TDC-3 Series Power Supply

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 lead 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 AC-DC converters could pass. However, the standard also states that an attempt will be made to maximize the disturbance consistent with the typical application by varying the configuration of the test sample.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature

The DS1100TDC-3 series power supplies can start and operate within stated specifications at an ambient temperature from -5 ^{O}C to 50 ^{O}C under all load conditions with internal fan. DS1100TDC-3 can provide derated output power from 50 ^{O}C up to 65 ^{O}C ambient temperature max.

And the DS1100TDC-3-001 power supply will start and operate within stated specifications at an ambient temperature from -5 ^{O}C to 45 ^{O}C under all load conditions with internal fan. DS1100TDC-3-001 can provide derated output power from 45 ^{O}C up to 55 ^{O}C ambient temperature max.

Forced Air Cooling

The DS1100TDC-3 series power supplies include 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 connector end to the input end of the power supply.

The cooling fan is a variable speed fan. When 12Vdc 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. If used in redundant mode operation and when the 12V main is present, fans are allowed to run even if there is no input on a unit.

Power Derating Table

DS1100TDC-3 & DS1100TDC-3-001 total output power will be derated according to the table shown below.

Table 9. Power Derating

Model	Notes	Min	Max	Altitude	System Back Pressure
DS1100TDC-3	1100W load	0 ^{O}C	55 ^{O}C	6000 ft	0.1” H_2O
	1100W load	0 ^{O}C	50 ^{O}C	6000 ft	0.3” H_2O
	660W load	0 ^{O}C	55 ^{O}C	10000 ft	0.5” H_2O
	660W load	-5 ^{O}C	65 ^{O}C	6000 ft	0.5” H_2O
DS1100TDC-3 -001	1100W load	0 ^{O}C	50 ^{O}C	6000 ft	0.1” H_2O
	1100W load	0 ^{O}C	45 ^{O}C	6000 ft	0.3” H_2O
	660W load	0 ^{O}C	45 ^{O}C	10000 ft	0.5” H_2O
	660W load	-5 ^{O}C	55 ^{O}C	6000 ft	0.5” H_2O

ENVIRONMENTAL SPECIFICATIONS

Storage and Shipping Temperature

The DS1100TDC-3 series power supply can be stored or shipped at temperatures between -40°C to 70°C and relative humidity from 5% to 95% non-condensing.

Altitude

The DS1100TDC-3 series power supply will operate within specifications at altitudes up to 10000 feet above sea level. The power supply will not be damaged when stored at altitudes up to 50000 feet above sea level.

Humidity

Operating: Power supply will be designed to operate with no degradation of performance while operating in range of 5%RH to 95%RH non-condensing.

Non-Operating: Power supply will be designed to operate with no degradation of performance while operating in range of 5%RH to 95%RH non-condensing.

Vibration

The DS1100TDC-3 series power supply will pass the following vibration specifications:

Non-Operating Random Vibration

Acceleration	1.87		gRMS
Frequency Range	10 - 500		Hz
Duration	30		Mins
Direction	3 mutually perpendicular axis		
PSD Profile	FREQ (Hz)	SLOPE (db/oct)	PSD (g^2/Hz)
	10	/	0.009
	200	-2.66dB/oct	0.004
	500	/	0.004

Operating Random Vibration

Acceleration	0.71		gRMS
Frequency Range	10 - 500		Hz
Duration	30		Mins
Direction	3 mutually perpendicular axis		
PSD Profile	FREQ (Hz)	SLOPE (db/oct)	PSD (g^2/Hz)
	10	/	0.000229
	30	/	0.0021
	200	/	0.0021
	500	/	0.000054

ENVIRONMENTAL SPECIFICATIONS

Shock

The DS1100TDC-3 power supply will pass the following shock specifications:

Non-Operating Half-Sine Shock

Acceleration	30	G
Duration	11	mSec
Pulse	Half-sine	
Number of Shock	3 shocks on each of 6 faces	

Operating Half-Sine Shock

Acceleration	30	G
Duration	11	mSec
Pulse	Half-sine	
Number of Shock	3 shocks in each of 6 faces	

POWER AND CONTROL SIGNAL DESCRIPTIONS

DC Input Connector

This connector supplies the DC input power to the DS1100TDC-3 series power supply.

Pin 1 – Vin+
Pin 2 – Vin-

Output Connector - Power Blades

These pins provide the main output for the DS1100TDC-3 series power supply. 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 DS1100TDC-3 series power supply. The Main Output (V_O) is electrically isolated from the power supply chassis ground at least 50V.

P1-P5 – Main Output Return
P6-P10 – Main Output (V_O)

Output Connector - Control Signals

The DS1100TDC-3 series power supply contains a 25 pins control signal header providing an analogue control interface, standby power and I^2C interface signal connections.

Standby Output - (Pins A1, B1, C1, D1, E1)

The DS1100TDC-3 provides a regulated 3.3V 3A auxiliary output voltage to power critical circuitry that must remain active regardless of the on/off status of the power supply's main output. The standby output (V_{SB}) voltage is available whenever a valid DC input voltage is applied to the unit.

A0, A1, A2 - (Pins B3, D4, A3)

Please refer to "Communication Bus Descriptions" section.

SDA, SCL and PS_INTERRUPT_L - (Pins C3, A4, C4)

Please refer to "Communication Bus Descriptions" section.

Main Output Remote Sense Return, Main Output Remote Sense - (Pins D3, E3)

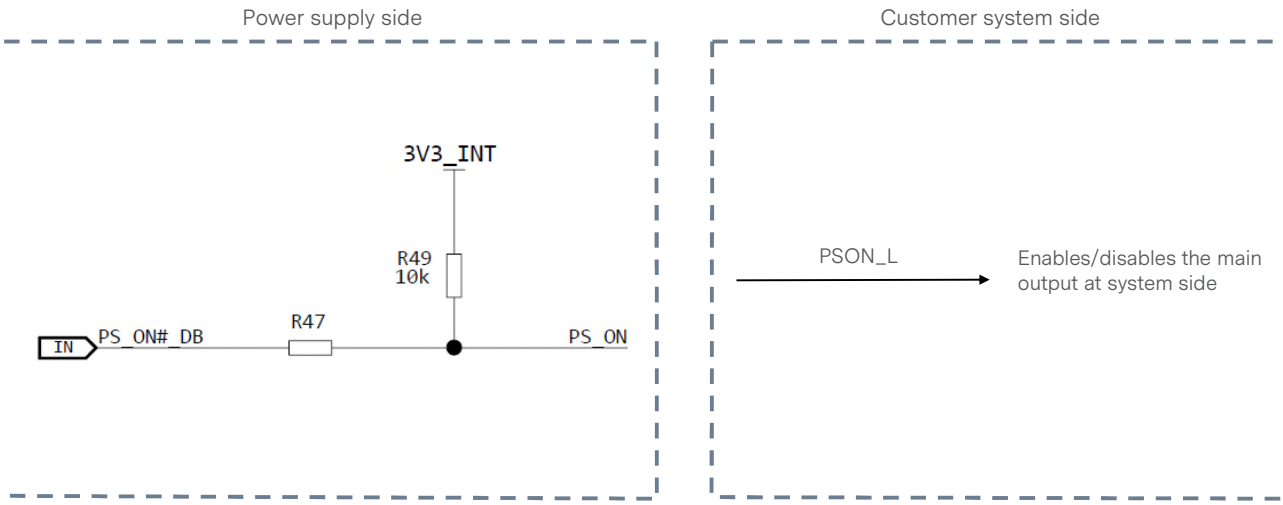
The main output of the DS1100TDC-3 is equipped with a remote sensing capability that will compensate for a power path drop around the entire loop of 200mV. This feature is implemented by connecting the main output remote sense (pin E3) and the main output remote sense return (pin D3) to the positive and negative rails of the main output, respectively, at a location that is near to the load. 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}).

In the event of a failure of the remote sense lines, the output voltage will revert to the internal sense so as to limit the output voltage to less than 105% of the nominal.

POWER AND CONTROL SIGNAL DESCRIPTIONS

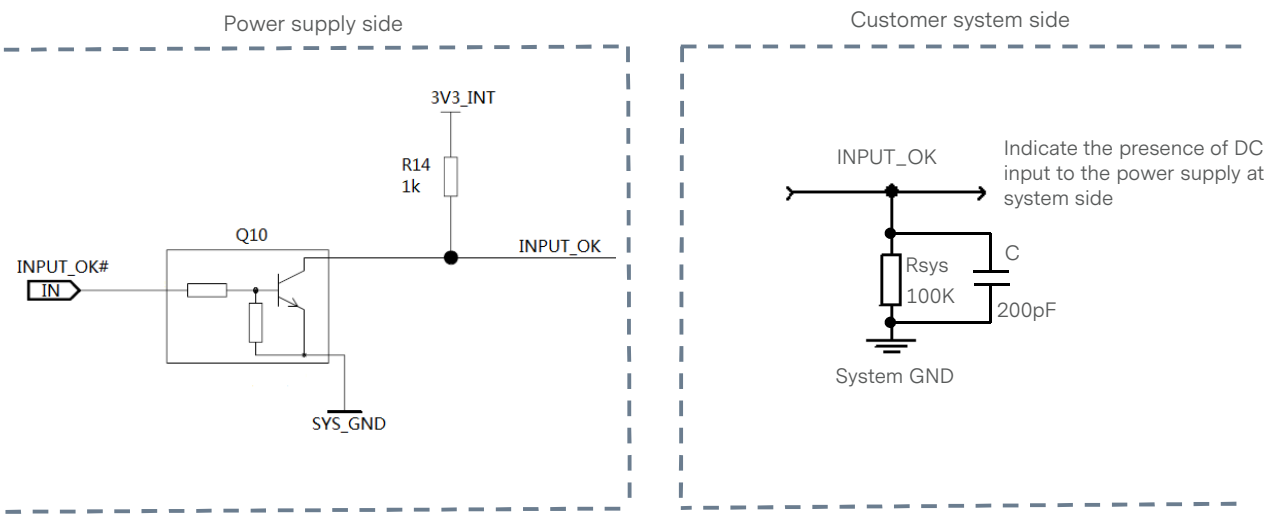
PSON_L - (Pin B4)

This signal input pin controls the normal turning ON and OFF of the main output of the DS1100TDC-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 2.0V, or open circuited.



INPUT_OK - (Pin E4)

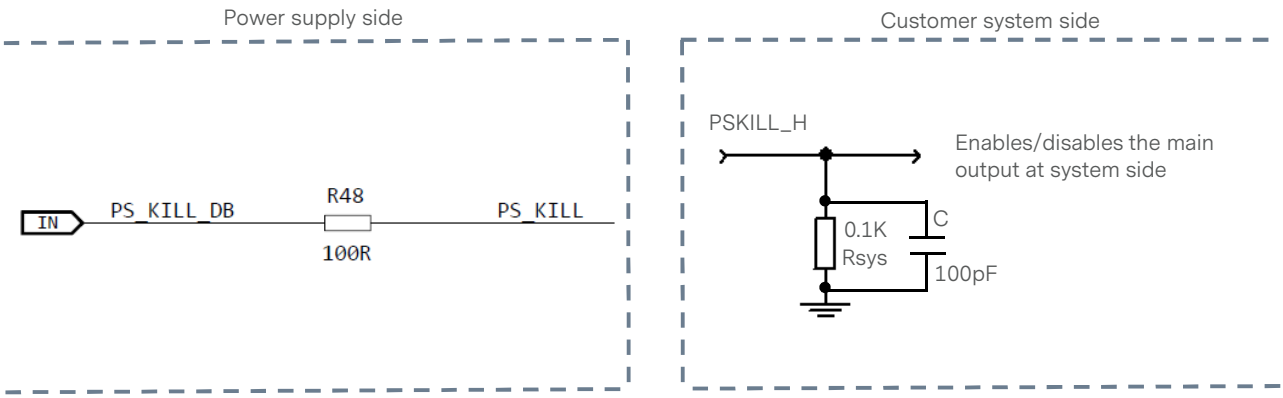
Signal used to indicate the presence of DC input to the power supply. A logic level HIGH will indicate that the DC input to the power supply is within the operating range while a logic level LOW will indicate that DC input has been lost. This is an open collector/drain output. This pin is pulled high by a 1Kohm resistor connected to 3.3V inside the power supply. It is recommended that this pin is connected to a 200pF decoupling capacitor and pulled down by a 100Kohm resistor.



POWER AND CONTROL SIGNAL DESCRIPTIONS

PSKILL_H - (Pin A5)

First break/Last mate active HIGH signal which enables/disables the main output. When this signal is shorted to ground by the system, the 12V main output shall be enabled. This signal will have to be pulled to ground at the system side with a 100ohm resistor. A 100pF decoupling capacitor is also recommended.



ISHARE - (Pin S7)

The DS1100TDC-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.

All outputs of the DS1100TDC-3 with ISHARE pins connected will share load current and the current share errors (CSE) is within 5.625A of each. If any power supply is hot swapped, no glitch will occur that violates the regulation limits of the power supply defined in this specification. The current share loop should be activated when the output current exceed 7% of total load current.

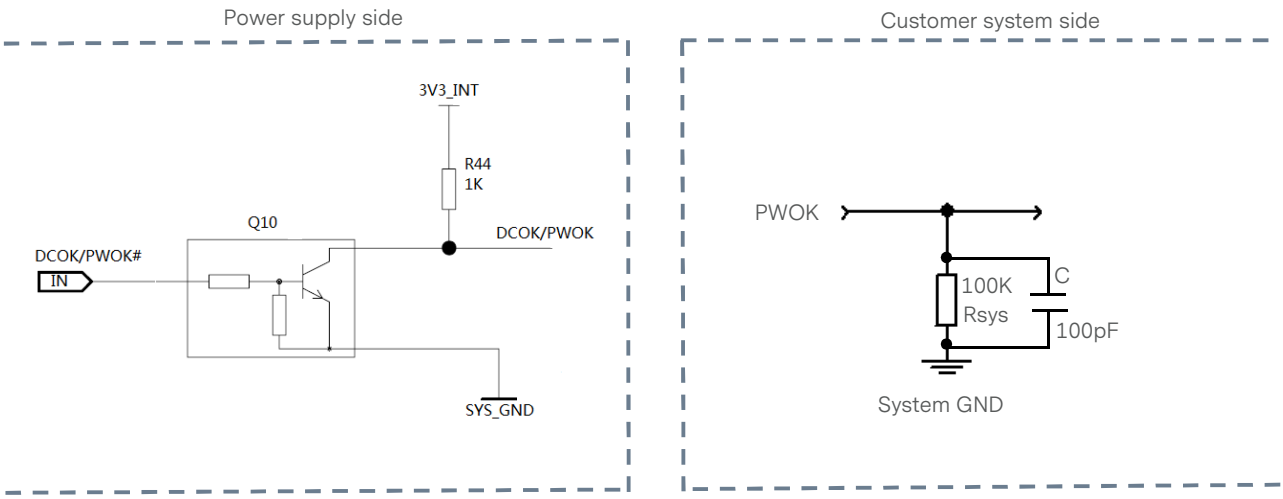
The voltage of this signal is a linear slope from no load to full load. At 10% load of each power supply output when two supplies are running in parallel, the ISHARE voltage will be between 0.6V and 1.0V. At 50% load of each power supply output when two supplies are running in parallel, the ISHARE voltage will be between 3.85V and 4.15V. At 100% load of each power supply output when two supplies are running in parallel, the ISHARE voltage will be between 7.75V and 8.25V. The waveform for this signal will be provided to confirm stability during parallel mode operation.

POWER AND CONTROL SIGNAL DESCRIPTIONS

PWOK - (Pin C5)

Signal used to indicate that main output voltage is within regulation range. The PWOK signal will be driven HIGH (>2.0V) when the output voltage is valid and will be driven LOW (<0.8V) 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 open collector/drain output. This pin is pulled high by a 1.0Kohm 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 100Kohm resistor.



PS_PRESENT_L - (Pin E5)

Signal used to indicate to the system that a power supply is inserted in the power bay. This pin is shorted to the standby return via 220ohm resister in the power supply. Recommended pull-up resistor to 3.3V V_{SB} is 5.1Kohm. A 100pF decoupling capacitor is also recommended.

COMMUNICATION BUS DESCRIPTIONS

I²C Bus Signals

The DS1100TDC-3 power supply contains enhanced monitor and control functions implemented via the I²C bus. The DS1100TDC-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 (i.e. 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 source connected.

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

A0, A1, A2 (I²C Address Signals) - (Pins B3, D4, A3)

These input pins are the address lines A0 and A1 to indicate the slot position the power supply occupies in the power bay and define the power supply addresses for FRU data and PMBus™ data communication. This allows the system to assign different addresses for each power supply. During I²C communication between system and power supplies, the system will be the master and power supplies will be slave.

They are internally pulled up to internal 3.3V supply with a 2.2K resistor.

Note: A2 address line shall be an optional address line. By default, the power supply address shall ignore the A2 input and shall rely exclusively on A0 and A1 logic levels. The address shall begin at B0h and A0h. The default address of the power supply shall be B6/B7 and A6/A7 when the address lines are left open. This ignores the logic level of A2.

SDA, SCL (I²C Data and Clock Signals) - (Pins C3, A4)

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

PS_INTERRUPT_L - (Pin C4)

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 where in 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 3.3V V_{SB} is 5.1Kohm. A 100pF decoupling capacitor is also recommended.

I²C Bus Communication Interval

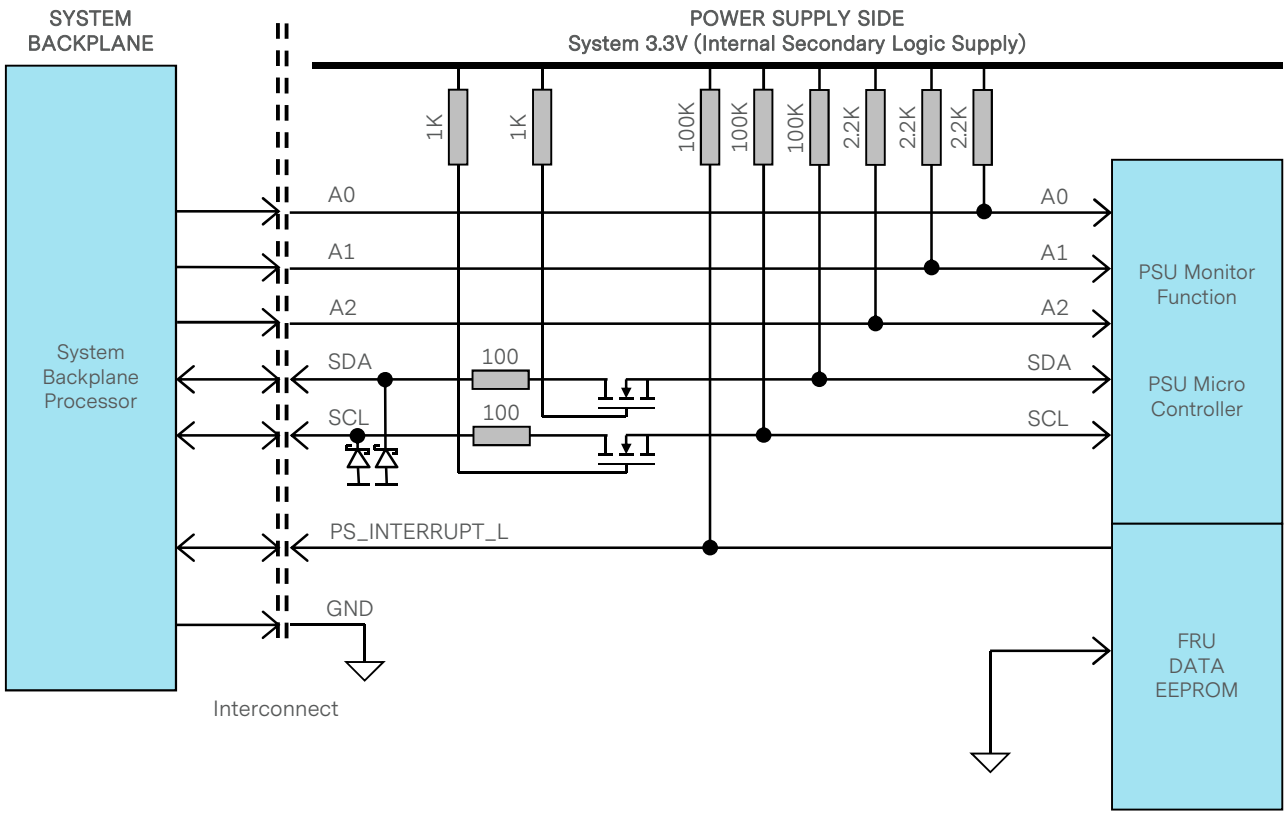
The interval between two consecutive I²C communications to the power supply must be at least 15ms to ensure proper monitoring functionality.

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 must be made at the power supply output connector with 2.2Kohm resistors pulled up to standby output and 47pF ceramic capacitors to standby output return.

COMMUNICATION BUS DESCRIPTIONS

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	Type	Max	Unit
SDA, SCL Internal Pull-up Resistor		R_{int}	-	100	-	Kohm
SDA, SCL Recommended External Bus Capacitance		C_{int}	-	200	-	pF
Recommended External Pull-up Resistor	1 to 4 PSU	R_{ext}	-	2.2	-	Kohm

COMMUNICATION BUS DESCRIPTIONS

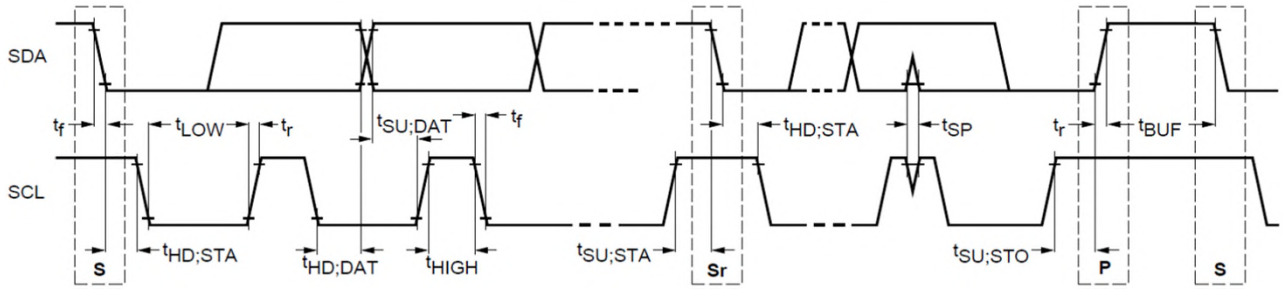
Logic Levels

DS1100TDC-3 series power supply I²C communication bus will respond to logic levels as per below:

Logic High: 3.3V nominal (Spec is 2.1V to 5.5V)**
Logic Low: 500mV nominal (Spec is 800mV max)**

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

Timings



Parameter	Symbol	Standard-Mode Specs		Actual Measured		Unit
		Min	Max			
SCL clock frequency	f_{SCL}	0	100	100		KHz
Hold time (repeated) START condition	$t_{HD;STA}$	4.0	-	4.76		uS
LOW period of SCL clock	t_{LOW}	4.7	-	5		uS
HIGH period of SCL clock	t_{HIGH}	4.0	50	9.88		uS
Setup time for repeated START condition	$t_{SU;STA}$	4.7	-	5		uS
Data hold time	$t_{HD;DAT}$	0	3.45	0.3		uS
Data setup time	$t_{SU;DAT}$	250	-	4907		nS
Rise time	t_r	-	1000	SCL = 989	SDA = 965	nS
Fall time	t_f	-	300	SCL = 114	SDA = 134	nS
Setup time for STOP condition	$t_{SU;STO}$	4.0	-	6.4		uS
Bus free time between a STOP and START condition	t_{BUF}	4.7	-	62.1		uS

COMMUNICATION BUS DESCRIPTIONS

Device Addressing

The DS1100TDC-3 series will respond to supported commands on the I²C bus that are addressed according to pins A1 and A0 pins of output connector.

Address pins are held HIGH by default via pulled up to internal 3.3V supply with a 2.2K resistor. To set the address as “0”, the corresponding address line should be pulled down to logic ground level. Below table shows the address of the power supply with A0 and A1 pins set to either “0” or “1”.

PSU Slot	Slot ID Bits		PMBus™ Address	EEPROM (FRU) Address
	A1	A0		
1	0	0	0xB0	0xA0
2	0	1	0xB2	0xA2
3	1	0	0xB4	0xA4
4	1	1	0xB6	0xA6

Note 1 - A2 address line is an optional address line. By default, the power supply address will ignore the A2 input and will rely exclusively on A0 and A1 logic levels. The address will begin at B0h and A0h. The default address of the power supply are B6/B7 and A6/A7 when the address lines are left open. This ignores the logic level of A2.

COMMUNICATION BUS DESCRIPTIONS

Reporting Functions

The power supply will have enhanced monitor and control functions implemented via the I^2C bus. This will use the SDA and SCL pins. The power supply monitor will operate as an I^2C slave device.

The accuracy of the report functions will be as follows:

Firmware Reporting And Monitoring			
Output loading[1]	**5% to 20%**	**20% to 50%**	**50% to 100%**
Input voltage	±5%		
Input current	±0.55A fixed error	±4%	
Input power	±5W fixed error up to 120W input	±4%	
Output voltage	±2%		
Output current	±0.8A fixed error	±5%	±2%
Temperature	±5°C on the operating range		
E_{IN}	±15% from 10% to 20% load	±5%	
Fan speed	±250RPM		

PMBus	Yes
Remote ON/OFF	Yes

Note 1 - Negative values allowed when the load is <5%. When the load is <5%, the reported values must never be more than the value reported at 5% load.

COMMUNICATION BUS DESCRIPTIONS

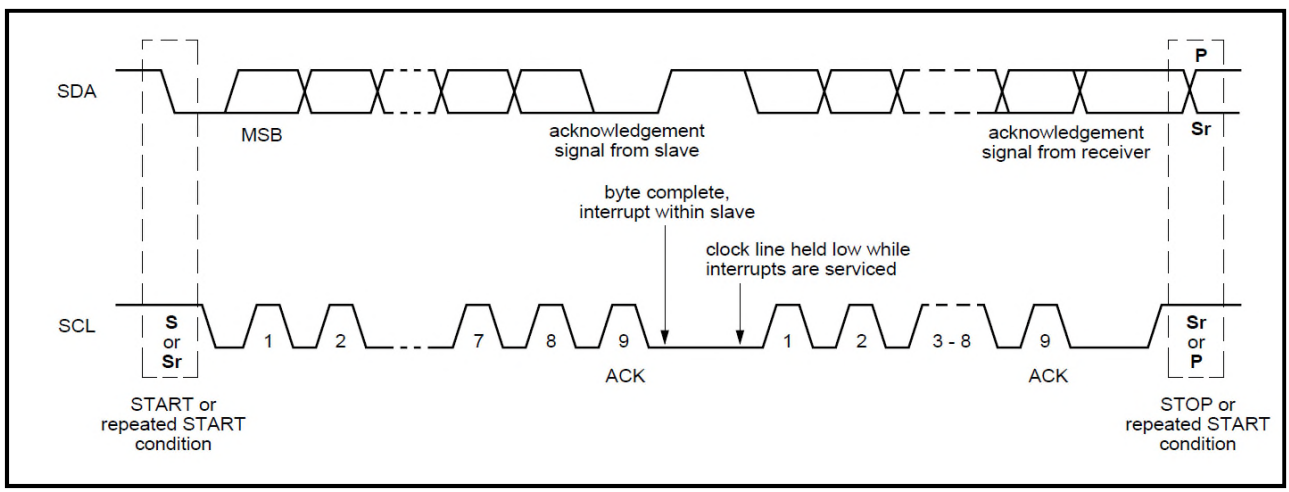
I²C Clock Synchronization

The DS1100TDC-3 series power supply applies clock stretching. An addressed slave power supply holds 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 time-out condition for clock stretching for DS1100TDC-3 series is 25 milliseconds.

The power supply has a command completion timeout of 100 milliseconds. That is a single transaction (from START to STOP condition) must be finished within 100 milliseconds.



COMMUNICATION BUS DESCRIPTIONS

FRU (EEPROM) Data

The FRU (Field Replaceable Unit) data format is compliant with the Intel IPMI v2.12 specification. The DS1100TDC-3 uses 1 page of EEPROM for FRU purpose. The one page of EEPROM contains up to 256 byte-sized data locations.

Where: OFFSET -The OFFSET denotes the address in decimal format of a particular data byte within DS1100TDC-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.

DS1100TDC-3 FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
COMMON HEADER, 8 BYTES				
0	00	**FORMAT VERSION NUMBER** (Common header)	1	01
1	01	**INTERNAL USE AREA OFFSET**	22	16
2	02	**CHASSIS INFO AREA OFFSET**	1	01
3	03	**BOARD INFO AREA OFFSET**	0	00
4	04	**PRODUCT INFO AREA OFFSET**	4	04
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))	215	D7
CHASSIS INFO AREA (24 BYTES)				
8	08	**FORMAT VERSION NUMBER** (Default value is 0.)	1	01
9	09	**CHASSIS INFO AREA LENGTH** (Default value is 0.)	3	03
10	0A	**CHASSIS TYPE** (Default value is 0.)	0	00
11	0B	**CHASSIS PART NUMBER** Type/Length 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 = 7 bytes = (001111)b	199	C7
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	**End Tag** (Default value is 0.)	193	C1
31	1F	**ZERO CHECK SUM** (From 8d to 30d if used.)	170	AA
PRODUCT INFORMATION AREA, 72 BYTES				
32	20	**FORMAT VERSION NUMBER**	1	01
33	21	**PRODUCT INFO AREA LENGTH** (In multiples of 8 bytes)	9	09

COMMUNICATION BUS DESCRIPTIONS

DS1100TDC-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
34	22	Language	25	19
35	23	MANUFACTURER NAME Type/Length Type = "ASCII+LATIN1" = (11)b Length = 7 bytes = (000111)b	199	C7
36	24	"A" = 41h	65	41
37	25	"R" = 52h	82	52
38	26	"T" = 54h	84	54
39	27	"E" = 45h	69	45
40	28	"S" = 53h	83	53
41	29	"Y" = 59h	89	59
42	2A	"N" = 4Eh	78	4E
43	2B	PRODUCT NAME Type/Length Type = "ASCII+LATIN1" = (11)b Length = 15 bytes = (001111)b	207	CF
44	2C	"D"	68	44
45	2D	"S"	83	53
46	2E	"1"	49	31
47	2F	"1"	49	31
48	30	"0"	48	30
49	31	"0"	48	30
50	32	"T"	84	54
51	33	"D"	68	44
52	34	"C"	67	43
53	35	"-"	45	2D
54	36	"3"	51	33
55	37		32	20
56	38		32	20
57	39		32	20
58	3A		32	20
59	3B	PRODUCT PART/MODEL NUMBER Type/Length Type = "ASCII+LATIN1" = (11)b length = 15 bytes = (001111)b	207	CF
60	3C	"D"	68	44
61	3D	"S"	83	53
62	3E	"1"	49	31
63	3F	"1"	49	31
64	40	"0"	48	30
65	41	"0"	48	30
66	42	"T"	84	54
67	43	"D"	68	44
68	44	"C"	67	43
69	45	"-"	45	2D
70	46	"3"	51	33
71	47		32	20
72	48		32	20
73	49		32	20
74	4A		32	20
75	4B	PRODUCT VERSION NUMBER Type/Length Type = "ASCII+LATIN1" = (11)b length = 2 bytes = (000010)b	194	C2
76	4C	"0"	48	30
77	4D	"A" (Should track customer part revision in IPRO)	65	41
78	4E	PRODUCT SERIAL NUMBER Type/Length Type = "ASCII+LATIN1" = (11)b length = 13 bytes = (001101)b	205	CD
		Model ID = DS1100TDC-3 / L041		
79	4F	"L"	76	4C
80	50	"0"	48	30
81	51	"4"	52	34
82	52	"1"	49	31

COMMUNICATION BUS DESCRIPTIONS

DS1100TDC-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		MANUFACTURING YEAR AND WEEK CODE		
83	53	"W" = 57h (Per unit)	87	57
84	54	"W" = 57h (Per unit)	87	57
		UNIQUE SERIAL NUMBER "SSSS"		
85	55	"S" = 53 (Per unit)	83	53
86	56	"S" = 53 (Per unit)	83	53
87	57	"S" = 53 (Per unit)	83	53
88	58	"S" = 53 (Per unit)	83	53
59	3B	**PRODUCT PART/MODEL NUMBER Type/Length** Type = "ASCII+LATIN1" = (11)b length = 15 bytes = (001111)b	207	CF
60	3C	"D"	68	44
61	3D	"S"	83	53
62	3E	"4"	52	34
63	3F	"9"	57	39
64	40	"5"	53	35
65	41	"S"	83	53
66	42	"P"	80	50
67	43	"E"	69	45
68	44	"-"	45	2D
69	45	"3"	51	33
70	46		xx	xx
71	47		xx	xx
72	48		xx	xx
73	49		xx	xx
74	4A		32	20
		PRODUCT VERSION NUMBER Type/Length		
75	4B	Type = "ASCII+LATIN1" = (11)b length = 2 bytes = (000010)b	194	C2
76	4C	"0"	48	30
77	4D	"A" (Should track customer part revision in IPRO)	65	41
		PRODUCT SERIAL NUMBER Type/Length		
78	4E	Type = "ASCII+LATIN1" = (11)b length = 13 bytes = (001101)b	205	CD
		Model ID. Per unit.		
79	4F		xx	xx
80	50		xx	xx
81	51		xx	xx
82	52		xx	xx
		MANUFACTURING YEAR AND WEEK CODE		
83	53	"W" = 57h (Per unit)	87	57
84	54	"W" = 57h (Per unit)	87	57
		UNIQUE SERIAL NUMBER "SSSS"		
85	55	"S" = 53 (Per unit)	83	53
86	56	"S" = 53 (Per unit)	83	53
87	57	"S" = 53 (Per unit)	83	53
88	58	"S" = 53 (Per unit)	83	53
		MODEL REVISION, Astec model rev, see latest model rev in IPS sec 1.2		
89	59	"R"	82	52
90	5A	"R"	82	52
		MANUFACTURING LOCATION		
91	5B	"P" for "Laguna, Philippines" In Decimal = 080; In Hex = 50H	80	50
92	5C	**Product Serial Number: ASSET TAG** (Default = 0)	0	00
93	5D	**End of Fields Marker**	193	C1

COMMUNICATION BUS DESCRIPTIONS

DS1100TDC-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
94	5E	**PAD (reserved)** (Default value is 0.)	0	00
95	5F		0	00
96	60		0	00
97	61		0	00
98	62		0	00
99	63		0	00
100	64		0	00
101	65		0	00
102	66		0	00
103	67	**ZERO CHECK SUM (256 – (Sum of bytes 032 to 103)) per unit**	154	9A
		MULTI RECORD AREA, 72 BYTES		
		Power Supply Record Header		
104	68	Record type = 00 for power supply		
105	69	End of list / Record format version number	0	00
106	6A	Record length of power supply record	2	02
107	6B	Record CHECKSUM of power supply record (Zero CHECKSUM)	24	18
		(256-(sum of bytes 109 to 132)	107	6B
108	6C	Header CHECKSUM of power supply record header (Zero CHECKSUM)		
		(256-(sum of bytes 104 to 107)	123	7B
		POWER SUPPLY RECORD		
		Overall Capacity of the Power Supply		
109	6D	2 bytes sequence	76	4C
110	6E	1100W = 044CH	4	04
		Peak VA, FFFFH if not specified		
111	6F	2 bytes sequence	255	FF
112	70		255	FF
113	71	**Inrush Current,** 25A In Decimal = 65 In Hex = 41H	65	41
114	72	**Inrush Interval,** 0mS In Decimal = 00 In Hex = 00H	0	00
		Low End Input Voltage Range 1(10mV), (90V/10mV) 9000 = 2328H 2 bytes sequence		
115	73	In Decimal = 160, 015	160	A0
116	74	In Hex = A0H, 0FH	15	0F
		High End Input Voltage Range 1(10mV), (72V/10mV) 7200 = 1C20H 2 bytes sequence		
117	75	In Decimal = 032, 028	32	20
118	76	In Hex = 20H, 1CH	28	1C
119	77	**Low End Input Voltage Range 2(10mV)**	0	00
120	78	Stored with LSB first then MSB.	0	00
121	79	**High End Input Voltage Range 2(10mV)**	0	00
122	7A	Stored with LSB first then MSB.	0	00
123	7B	**Low End Input Frequency Range**	0	00
124	7C	**Low End Input Frequency Range**	0	00
125	7D	**AC Dropout Tolerance in ms,** 1mS= 01H	1	01
126	7E	**Binary Flags**	26	1A
127	7F	**Peak Wattage Capacity and Holdup Time,** not specified	0	00
128	80		0	00
		Combined Wattage		
129	81	Byte 1: 7:4 - Voltage1 3:0 - Voltage2	0	00
130	82	Byte 2 and Byte 3: Total Combined Wattage	0	00
131	83		0	00

COMMUNICATION BUS DESCRIPTIONS

DS1100TDC-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
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)	61	3D
137	89	Header CHECKSUM of 12V DC output record header (Zero CHECKSUM) (256-(sum of bytes 133 to 136)	179	B3
		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 8C	**Maximum Negative Voltage Deviation (10mV), 11.40V=1140 (x10mV) = 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), 12.6V=1260 (x10mV) =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)** 2 bytes sequence In Decimal: 180, 000 In Hex: B4H, 00H	180 0	B4 00
147 148	93 94	**Minimum Current Draw (10mA),** (0A / 10mA) 10 = 0000H 2 bytes sequence	0 0	00 00
149 150	95 96	**Maximum Current Draw (10mA), 9160 = 23CFH** In Decimal: 207, 035 In Hex: CFH, 23H	207 35	CF 23
		VSB OUTPUT RECORD HEADER		
151	97	Record type = 01 for DC output record		
152	98	End of list / Record format version number for 3V3SB output record	1	01
153	99	Record length of 3V3SB output record	130	82
154	9A	Record CHECKSUM of 3V3SB output record (Zero CHECKSUM) (256-(sum of bytes 156 to 168)	13 67	0D 43
155	9B	Header CHECKSUM of 3V3SB output record header (Zero CHECKSUM) (256-(sum of bytes 151 to 154)	45	2D
156	9C	**V_{SB} Output Information**	130	82
157 158	9D 9E	**Nominal Voltage (10mV),** (3.3V/10mV) 0330 = 014AH 2 bytes sequence In Decimal: 04A, 001 In Hex: 4AH, 01H	74 1	4A 01

COMMUNICATION BUS DESCRIPTIONS

DS1100TDC-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		Maximum Negative Voltage Deviation (10mV), 0314 = 013AH		
		2 bytes sequence		
159	9F	In Decimal: 058, 001	58	3A
160	A0	In Hex: 3AH, 01H	1	01
		Maximum Positive Voltage Deviation (10mV), 0346 = 015AH		
		2 bytes sequence		
161	A1	In Decimal: 090, 001	90	5A
162	A2	In Hex: 5A, 01H	1	01
		Ripple and Noise pk-pk (mV), 45 = 2DH		
		2 bytes sequence		
163	A3	In Decimal: 045, 000	45	2D
164	A4	In Hex: 2DH, 00H	0	00
165	A5	**Minimum Current Draw (10mA),** (0A / 10mA) 10 = 0000H	0	00
166	A6	2 bytes sequence	0	00
		Maximum Current Draw (10mA), (3A / 10mA) 0300 = 012CH		
		2 bytes sequence		
167	A7	In Decimal: 44, 001	44	2C
168	A8	In Hex: 2CH, 01H	1	01
169	A9	Reserved, default value is 0.	0	00
170	AA		0	00
171	AB		0	00
172	AC		0	00
173	AD		0	00
174	AE		0	00
175	AF		0	00
INTERNAL USE AREA, 40 BYTES				
176	B0	**Internal User Area**	1	01
177	B1	RESERVED, default value is 0.	0	00
178	B2		0	00
179	B3		0	00
180	B4		0	00
181	B5		0	00
182	B6		0	00
183	B7		0	00
184	B8		0	00
185	B9		0	00
186	BA		0	00
187	BB		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

COMMUNICATION BUS DESCRIPTIONS

DS1100TDC-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
207	CF	**Internal User Area**	0	00
208	D0	RESERVED, default value is 0.	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
216	D8		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		0	00

COMMUNICATION BUS DESCRIPTIONS

DS1100TDC-3-001 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
PRODUCT INFORMATION AREA, 56 BYTES				
43	2B	PRODUCT NAME Type/Length	207	CF
44	2C	"D"	68	44
45	2D	"S"	83	53
46	2E	"1"	49	31
47	2F	"1"	49	31
48	30	"0"	48	30
49	31	"0"	48	30
50	32	"T"	84	54
51	33	"D"	68	44
52	34	"C"	67	43
53	35	"-"	45	2D
54	36	"3"	51	33
55	37	"-"	45	2D
56	38	"0"	48	30
57	39	"0"	48	30
58	3A	"1"	49	31
59	3B	PRODUCT PART/MODEL NUMBER Type/Length	207	CF
60	3C	"D"	68	44
61	3D	"S"	83	53
62	3E	"1"	49	31
63	3F	"1"	49	31
64	40	"0"	48	30
65	41	"0"	48	30
66	42	"T"	84	54
67	43	"D"	68	44
68	44	"C"	67	43
69	45	"-"	45	2D
70	46	"3"	51	33
71	47	"-"	45	2D
72	48	"0"	48	30
73	49	"0"	48	30
74	4A	"1"	49	31
78	4E	PRODUCT SERIAL NUMBER Type/Length	205	CD
		Model ID = DS1100TDC-3 / L041		
79	4F	"L"	76	4C
80	50	"0"	48	30
81	51	"4"	52	34
82	52	"2"	50	32
103	67	ZERO CHECK SUM (256 - (Sum of bytes 032 to 103)) per unit	29	1D

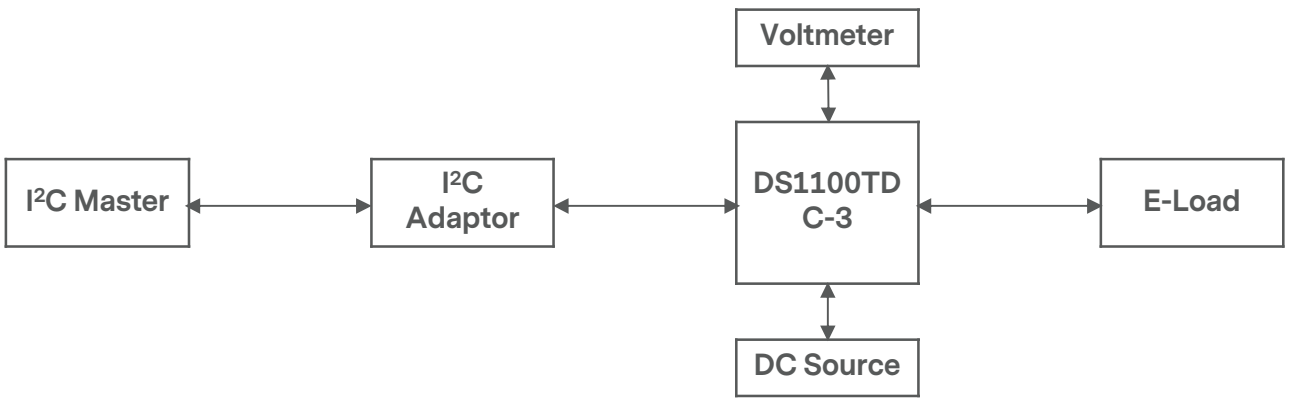
PMBus™ SPECIFICATIONS

The DS1100TDC-3 series is compliant with the industry standard PMBus™ protocol for monitoring and control of the power supply via the I²C interface port.

DS1100TDC-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 commends

20h - Disables write except 10h, 01h, 00h and 02h commands

40h - Disables write except 10h, 01h, and 00h commends

80h - Disable write except 0x00h

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.

PMBus™ SPECIFICATIONS

The DS1100TDC-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
00h	PAGE	00	R	1	Hex	
01h	OPERATION	80	R/W	1		Used to turn the unit ON/OFF in conjunction with the input CONTROL pin. It is also used to set output to upper or lower margin voltages. Valid input: 80h, 40h
02h	ON_OFF_CONFIG	1C	R	1		Configures the combination of CONTROL pin and serial communication commands needed to turn the unit ON/OFF.
03h	CLEAR_FAULTS		S			
10h	WRITE_PROTECT	80	R/W	1		Used to control writing to the PMBus™ device.
19h	CAPABILITY	90	R	1		Provides a way for the hosts system to determine some key capabilities of a PMBus device.
1Ah	QUERY		BW	1		
1Bh	SMBALERT_MASK		BW	2		Default Mask: STATUS_VOUT - 0x0B STATUS_IOUT - 0x5E STATUS_INPUT - 0x0F STATUS_TEMP - 0x3F STATUS_CML - 0xFF STATUS_OTHER - 0xFF STATUS_MFR - 0xFF STATUS_FANS_1_2 - 0x5F STATUS_FANS_3_4 - 0xFF
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	Default value is 12V. Vout command sends discreet value to change or trim output voltage. Valid Range: 11.4 to 12.6V.
24h	VOUT_MAX	1933	R	2	Linear	Default value is 12.6V.
30h	COEFFICIENTS	-	BW	2/5		Use to retrieve the m, b and R coefficients, needed for DIRECT data format. m = 1, b = 0, R = 0
35h	VIN_ON	E270	R	2	Linear	Sets the value of input, in volts, at which the unit should start. DCGOOD 39Vdc
36h	VIN_OFF	E240	R	2	Linear	Sets the value of input, in volts, at which the unit should stop power conversion. DCBAD 36Vdc
3Ah	FAN_ CONFIG_1_2	90	R	1		Read only to reflect setting of fans.
3Bh	FAN_COMMAND_1	0	R/W	2	Linear	Default: 0% Duty cycle control - Commands speeds from 0 to 100%
40h	VOUT_OV_FAULT_LIMIT	1B66	R/W	2	Linear	Sets output over voltage threshold. (13.7V) Valid Range: 12.6 to 15.5V

PMBus™ SPECIFICATIONS

The DS1100TDC-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
41h	VOUT_OV_FAULT_RESPONSE	80	R	1		Unit latches OFF. Resets on PSON or CONTROL pin recycle or DC recycle.
42h	VOUT_OV_WARN_LIMIT	1999	R/W	2	Linear	Sets over-voltage warning threshold. (12.8V) Valid Range: 12.6 to 15.5V
43h	VOUT_UV_WARN_LIMIT	1666	R/W	2	Linear	Sets under-voltage warning threshold. (11.2V) Valid Range: 9 to 11.4V
44h	VOUT_UV_FAULT_LIMIT	1399	R/W	2	Linear	Sets under-voltage fault threshold. (9.8V) Valid Range: 9 to 11.4V
45h	VOUT_UV_FAULT_RESPONSE	BB	R	1		Turn PSU OFF. Delay time between restart attempts is 3 seconds.
46h	IOUT_OC_FAULT_LIMIT	EB48	R/W	2	Linear	Sets the over current threshold in Amps. (105A) Valid Range: 98 to 130A
47h	IOUT_OC_FAULT_RESPONSE	D5	R	1		OCP ride through. If OCP persists, delay time between restart attempts is 2.5 seconds.
4Ah	IOUT_OC_WARN_LIMIT	EB10	R/W	2	Linear	Sets the over current warning threshold in Amps. (98A) Valid Range: 98 to 130A
4Fh	OT_FAULT_LIMIT	F230	R/W	2	Linear	Secondary ambient temperature fault threshold, in degree C. (140degC)
50h	OT_FAULT_RESPONSE	78	R	1		Turn PSU OFF and will retry indefinitely. Supported enable/disable of protection and recoverability.
55h	VIN_OV_FAULT_LIMIT	EA58	R/W	2	Linear	Sets input over-voltage threshold. (75Vdc)
56h	VIN_OV_FAULT_RESPONSE	F8	R	1		
57h	VIN_OV_WARN_LIMIT	EA50	R/W	2	Linear	Default: 74Vdc
58h	VIN_UV_WARN_LIMIT	E250	R/W	2	Linear	Default: 37Vdc
59h	VIN_UV_FAULT_LIMIT	E230	R/W	2	Linear	Default: 35Vdc
5Ah	VIN_UV_FAULT_RESPONSE	F8	R	1		
5Eh	PWOK_GOOD_ON	1766	R/W	2	Linear	Sets the threshold by which the Power Good Default: 11.7V Valid Range: 11.4 to 12.6V
5Fh	PWOK_GOOD_OFF	16CD	R/W	2	Linear	Sets the threshold Power Good Default: 11.4V Valid Range <= 11.4V Valid Range >= 12.6V
60h	TON_DELAY	EB20	R/W	2	Linear	Sets the time (sec), from start condition (Power ON) until the output starts to rise. (2.1sec max) Default = 100ms Valid Range: 95ms to 105ms
61h	TON_RISE	DA80	R	2	Linear	Sets the time (ms), for the output rises from 0 to regulation. Default = 20ms

PMBus™ SPECIFICATIONS

The DS1100TDC-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
62h	TON_MAX_FAULT_LIMIT	1226	R/W	2	Linear	Default: 2.2s Valid Range: 2 - 2.5s
63h	TON_MAX_FAULT_RESPONSE	80	R			
6Ah	POUT_OP_WARN_LIMIT	0A30	R/W	2	Linear	Default: 1120W Valid Range: 1100 to 1300W
78h	STATUS_BYTE	00	R	1		Returns the summary of critical faults.
79h	STATUS_WORD	0000	R	2		Summary of units fault and warning status.
7Ah	STATUS_VOUT	00	R	1		Output voltage related faults and warnings (00H).
7Bh	STATUS_IOUT	00	R	1		Output current related faults and warnings (00H).
7Ch	STATUS_INPUT	00	R/W	1		Input related faults and warnings.
7Dh	STATUS_TEMPERATURE	00	R/W	1		Temperature related faults and warnings.
7Eh	STATUS_CML	00	R/W	1		Communications, Logic and Memory.
80h	STATUS_MFR_SPECIFIC	00	R/W	1		Manufacturer status codes
81h	STATUS_FANS_1_2	00	R/W	1		
86h	READ_EIN	-	BR	6		Returns the accumulated input power over time.
87h	READ_EOUT	-	BR	6		Returns the accumulated output power over time.
88h	READ_VIN	-	R	2	Linear	Returns input voltage in Volts.
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	PSU's inter hot spot temperature typically that of the main output rall heat sink. Format is linear-11.
8Eh	READ_TEMPERATURE_2	-	R	2	Linear	PSU's system side air inlet or internal ambient temperature. Format is linear-11.
8Fh	READ_TEMPERATURE_3	-	R	2	Linear	PSU's chassis side air exhaust temperature. Format is linear-11.
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	Linear	Reads the PMBus revision number.
99h	MFR_ID	"ARTESYN"	BR	-	ASCII	Abbrev or symbol of manufacturers name. ASCII (artesyn)

PMBus™ SPECIFICATIONS

The DS1100TDC-3 Series Supported PMBus™ Command List:

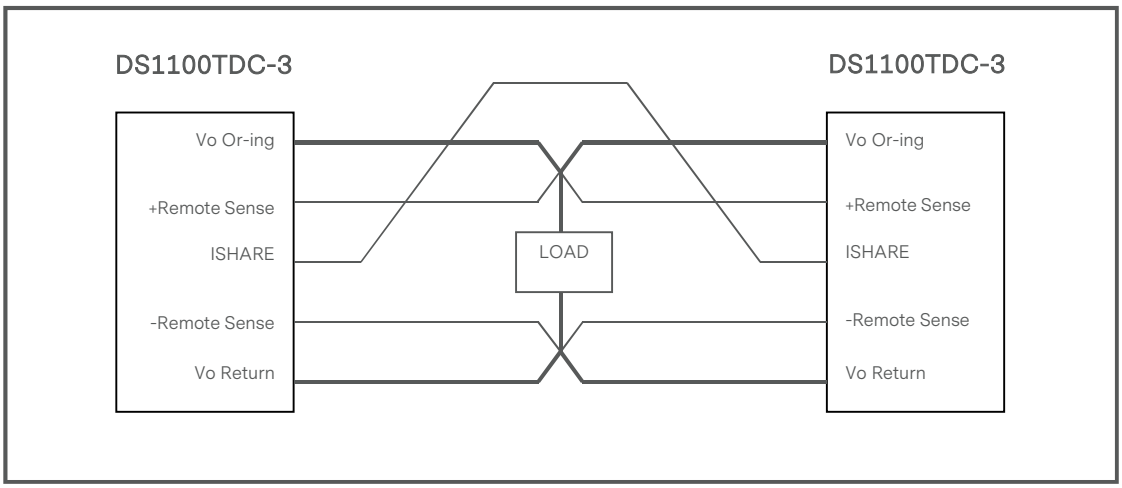
Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
9Ah	MFR_MODEL	"DS1100TDC-3"	BR	15	ASCII	Manufacturers model number, ASCII format
9Bh	MFR_REVISION	"0A"	BR/W	-	ASCII	Manufacturers, revision number, ASCII format
9Ch	MFR_LOCATION	"P"	BR	-	ASCII	Manufacturers facility, ASCII format
9Dh	MFR_DATE	“WW"	BR	-	ASCII	Manufacture Date, ASCII format
9Eh	MFR_SERIAL	"L041WWSSSSRRP"	BR/W	-	ASCII	Unit serial number, ASCII format
A0h	MFR_VIN_MIN	E280	R	2	Linear	Minimum Input Voltage (40Vdc)
A1h	MFR_VIN_MAX	EA40	R	2	Linear	Maximum Input Voltage (72Vdc)
A2h	MFR_IIN_MAX	E250	R	2	Linear	Maximum Input Current (37A)
A3h	MFR_PIN_MAX	0A9A	R	2	Linear	Maximum Input Power (1332W)
A4h	MFR_VOUT_MIN	16CC	R	2	Linear	Minimum Output Voltage Regulation Window (11.6V)
A5h	MFR_VOUT_MAX	1933	R	2	Linear	Maximum Output Voltage. Regulation Window (12.4V)
A6h	MFR_IOUT_MAX	EADD	R	2	Linear	Maximum Output Current (91.63A)
A7h	MFR_POUT_MAX	0A26	R	2	Linear	Maximum Output Power (1100W)
A8h	MFR_TAMBIENT_MAX	E370	R	2	Linear	Maximum Operating Ambient Temperature (Secondary Ambient) (55degC)
A9h	MFR_TAMBIENT_MIN	0000	R	2	Linear	Minimum Operating Ambient Temperature (Secondary Ambient) (0degC)
ABh	MFR_EFFICIENCY_HL		BR	14		Default: 48V, 220W, 85%; 550W, 90%; 1100W, 87%.
B0h	USER_DATA_00	-	BR/BW			
D2h	FAN_SPEED_MIN		R	2	Linear	Minimum Fan Speed (7600RPM)
D3h	FAN_SPEED_MAX		R	2	Linear	Maximum Fan Speed (20000RPM)
E0h	FW_PRI_VERSION		BR	8	ASCII	
E1h	FW_SEC_VERSION		BR	8	ASCII	
F1h	ISP_UNLOCK_CODE		BR/W	4	ASCII	00h,00h,00h,00h
F2h	ISP_CTRL_CMD	00	R/W	1		00h
F3h	ISP_STATUS_BYTE		R	1		
F4h	ISP_FLASH_ADDR		BR/W	4		
F5h	ISP_FLASH_DATA.		BR/W	4		

APPLICATION NOTES

Redundancy / Fault Tolerance

The DS1100TDC-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, 2, or 3. The 3.3V V_{SB} 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.

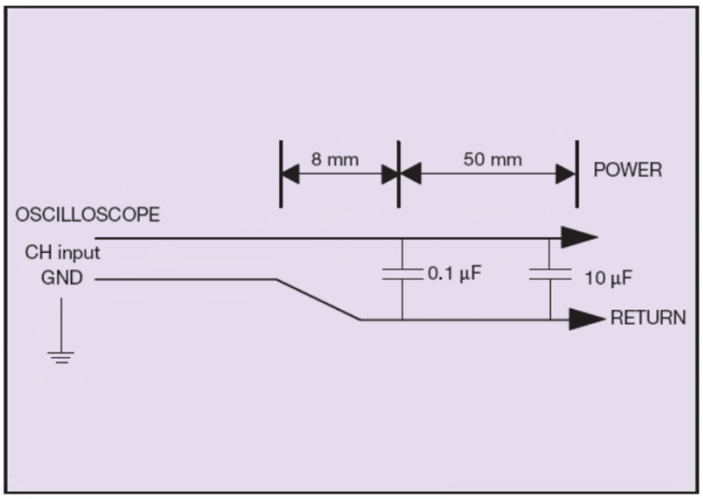
All power supply outputs will be designed for redundant mode operation. No internal failure in any power supply in this configuration should cause the bus voltage to fall below the regulation limits specified. All output voltages should stay within the regulation limits during cold swapping or hot swapping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



APPLICATION NOTES

Output Ripple and Noise Measurement

The setup outlined in the diagram below has been used for output voltage ripple and noise measurements on the DS1100TDC-3 series. When measuring output ripple and noise, a scope jack in parallel with a 0.1uF ceramic chip capacitor, and a 10uF tantalum capacitor will be used. Oscilloscope can be set to 20MHz bandwidth for this measurement.



RECORD OF REVISION AND CHANGES

Issue	Date	Description	Originators
1.0	12.16.2015	First issue	S. Yang
1.1	09.06.2017	Update the DC input connector pin number	A. Zhang
1.2	09.11.2017	Update PMBus command code List	K. Ma
1.3	02.23.2018	Update PSON_L, PMBus command code list	S. Yang
1.4	12.28.2018	Update the command 24h, 35h, 36h	K. Wang
1.5	12.29.2020	Update the SCL timing	C. Liu
1.6	03.03.2021	Update cover and back cover	C. Liu
1.7	03.18.2022	Update UKCA mark	E. Wang

ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

Our products enable customer innovation in complex applications for a wide range of industries including semiconductor equipment, industrial, manufacturing, telecommunications, data center computing, and medical. With deep applications know-how and responsive service and support across the globe, we build collaborative partnerships to meet rapid technological developments, propel growth for our customers, and innovate the future of power.

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