DS1100TDC-3

1100 Watts

Distributed Power

Total Power: 1100 Watts
Input Voltage: -40 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: 26 W/in^3
- Inrush current control
- N+1 or N+N Redundant
- Hot-pluggable
- Active current sharing
- Compatible with DS1100SLPE-3
- Full digital control
- PMBus compliant
- Compatible with Artesyn's Universal PMBus GUI
- Reverse airflow option
- Two-year warranty

Safety

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

Product Descriptions

DS1100TDC-3 is a 1100 Watts switching power supply with following features: -54V(nominal) DC input, single 12V output with a 3.3V standby aux output. This power supply has a power density of more than 26 Watts per cubic inch, and the efficiency is 90% at -48V DC input for 50% load. The form factor is 1U and can be used in single or in redundant configurations.

DS1100TDC-3 is equipped with an I^{2}C 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
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	Model	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 Input to outputs Input to safety ground	 All models All models		 - -	 - -	 2121[1] 2121[1]	 Vdc Vdc
Ambient Operating Temperature	DS1100TDC-3 DS1100TDC-3-001	T_A	-5 -5	- -	+65[2] +55[2]	^{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		 - -	 - -	 10,000 50,000	 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.

Input Specifications

Table 2. Input Specifications:

Parameter	Conditions	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^{O}C	All Meet ETSI EN 300 132-2 Limits	$I_{IN,surge}$	-	-	25	A_{PK}
Input Fuse	Internal, Fast Acting 25A/125V, 2 in parallel		-	-	50	A
Operating Efficiency	$V_{IN,AC}$ = -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

Output Specifications

Table 3. Output Specifications:

Parameter	Conditions	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 0.1uF ceramic capacitor in parallel with a 10uF tantalum capacitor, 0 to 20MHz bandwidth	V_O	-	-	180	mV_{PK-PK}
		V_{SB}	-	-	45	
Output Current	All	I_O	0.5[1]	-	91.6	A
		I_{SB}	0.1[1]	-	3	
V_O 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	V_O	500	-	11,000	uF
		V_{SB}	1	-	680	uF
V_O Dynamic Response Peak Deviation	50% load change, slew rate = 1A/uS	$\pm\%V_O$	-	-	5	%
V_O Long Term Stability Max change over 24 hours	After thermal equilibrium (30 mins)	$\pm\%V_O$	-	-	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.

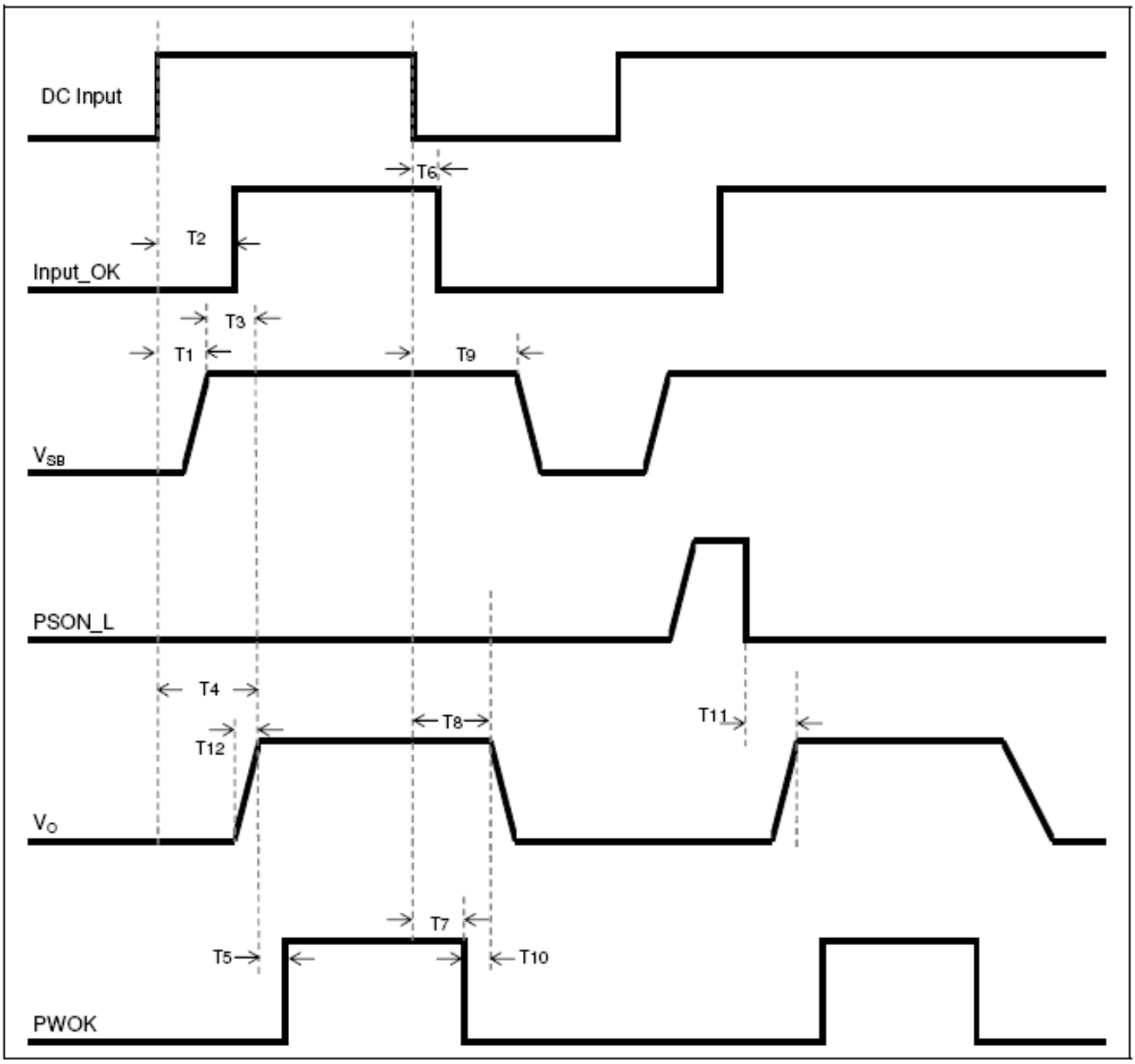
System Timing Specifications

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 deassert 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.

System Timing Specifications



DS1100TDC-3 Performance Curves

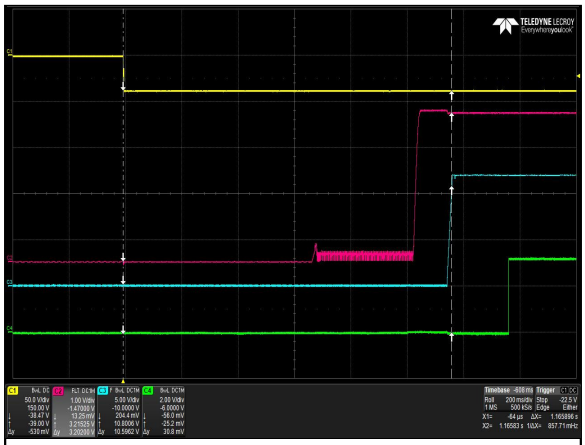


Figure 1: DS1100TDC-3 Turn-on delay via DC input – V_{IN} = -40Vdc
Full Load: I_O = 90.83A, I_{SB} = 3A
Ch 1: V_{IN} Ch 2: V_{SB} Ch 3: V_O Ch 4: PWOK

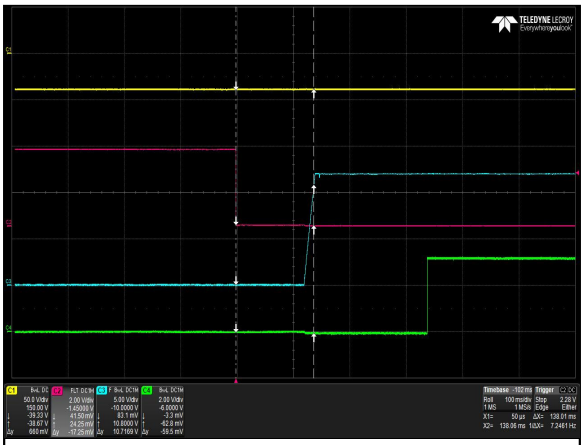


Figure 2: DS1100TDC-3 Turn-on delay via PSON_L – V_{IN} = -40Vdc
Full Load: I_O = 90.83A, I_{SB} = 3A
Ch 1: V_{IN} Ch 2: PSON_L Ch 3: V_O Ch 4: PWOK

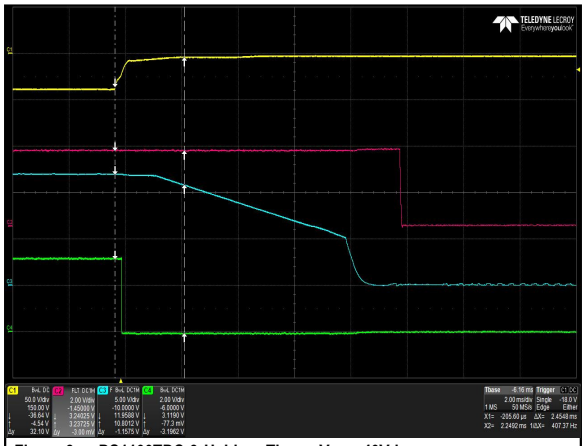


Figure 3: DS1100TDC-3 Hold-up Time – V_{IN} = -40Vdc
Full Load: I_O = 90.83A, I_{SB} = 3A
Ch 1: V_{IN} Ch 2: V_{SB} Ch 3: V_O Ch 4: PWOK

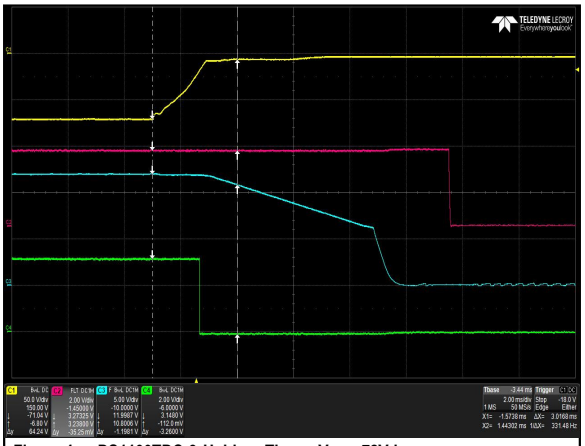


Figure 4: DS1100TDC-3 Hold-up Time – V_{IN} = -72Vdc
Full Load: I_O = 90.83A, I_{SB} = 3A
Ch 1: V_{IN} Ch 2: V_{SB} Ch 3: V_O Ch 4: PWOK

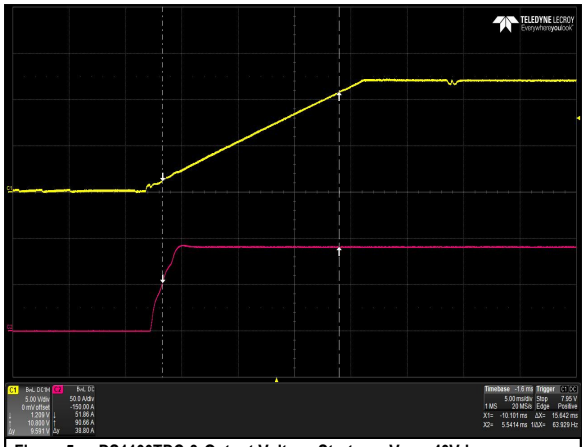


Figure 5: DS1100TDC-3 Output Voltage Startup – V_{IN} = -40Vdc
Full Load: I_O = 90.83A, I_{SB} = 3A
Ch 1: V_O Ch 2: I_O

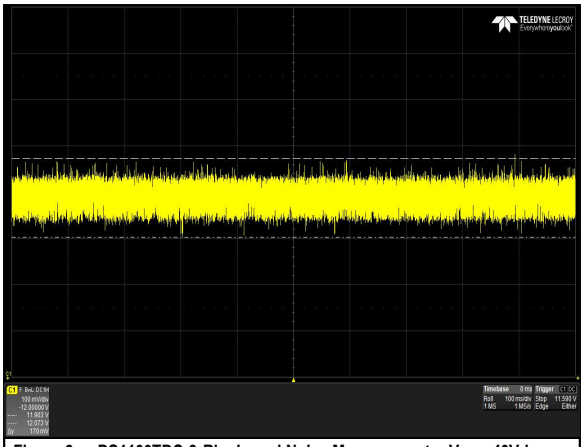


Figure 6: DS1100TDC-3 Ripple and Noise Measurement – V_{IN} = -40Vdc
Full Load: I_O = 90.83A, I_{SB} = 3A
Ch 1: V_O

DS1100TDC-3 Performance Curves

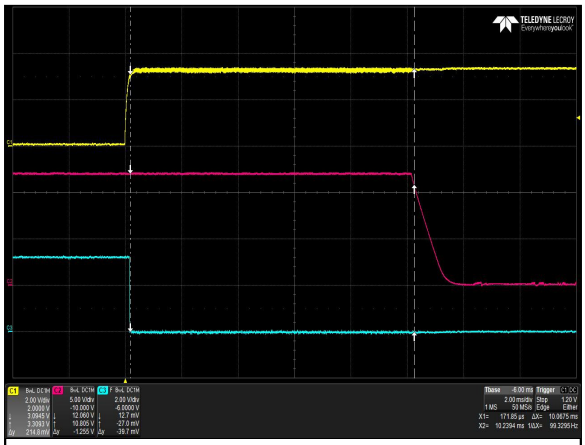


Figure 7: DS1100TDC-3 Turn Off Characteristic via PSON_L
Full Load: I_O = 90.83A, I_{SB} = 3A
Ch 1: PSON_L Ch 2: V_O Ch 3: PWOK

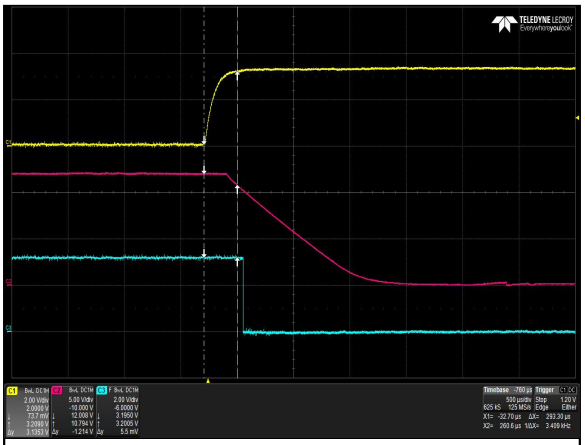


Figure 8: DS1100TDC-3 Turn Off Characteristic via PSKILL_H
Full Load: I_O = 90.83A, I_{SB} = 3A
Ch 1: PSKILL_H Ch 2: V_O Ch 3: PWOK

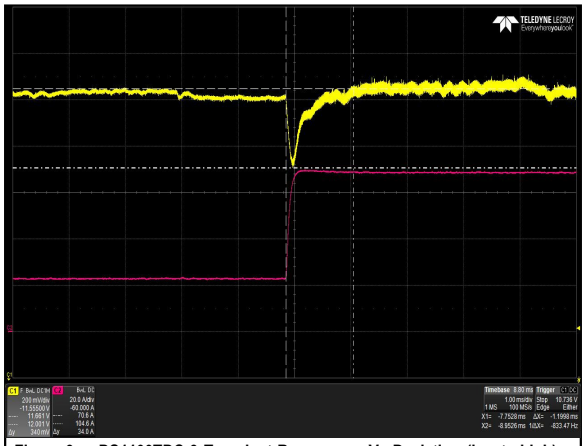


Figure 9: DS1100TDC-3 Transient Response – Vo Deviation (low to high)
25% to 75% load change, 1A/uS slew rate, V_{IN} = -54Vdc
Ch 1: V_O Ch 2: I_O Output capacitance=1000uF

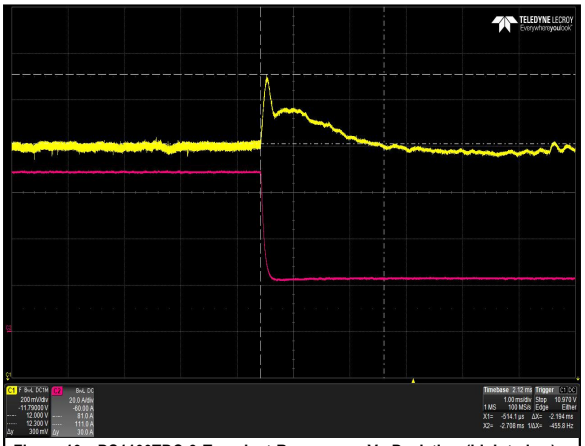


Figure 10: DS1100TDC-3 Transient Response – Vo Deviation (high to low)
75% to 25% load change, 1A/uS slew rate, V_{IN} = -54Vdc
Ch 1: V_O Ch 2: I_O Output capacitance=1000uF

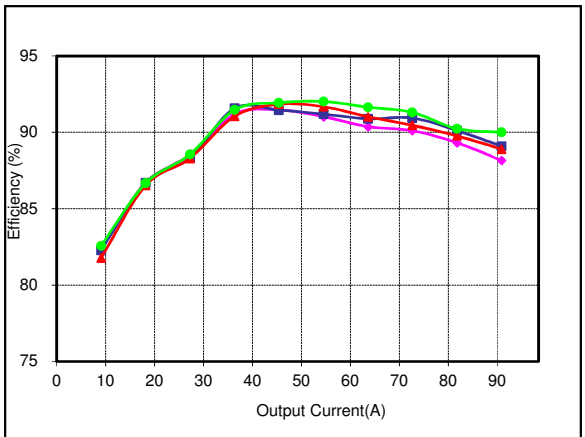


Figure 11: DS1100TDC-3 Efficiency Curves @ 25 degC,
-40 Vdc -48 Vdc -54 Vdc -72 Vdc
Loading: I_O = 10% increment to 90.83A, I_{SB} = 10% increment to 3A

Protection Function Specification

Input Fusing

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	Vdc
V_{SB} Output Overvoltage	3.6	/	4.1	Vdc

Over Current Protection (OCP)

DS1100TDC-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 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	$\%I_{SB,max}$

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 0.05 ohm 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.

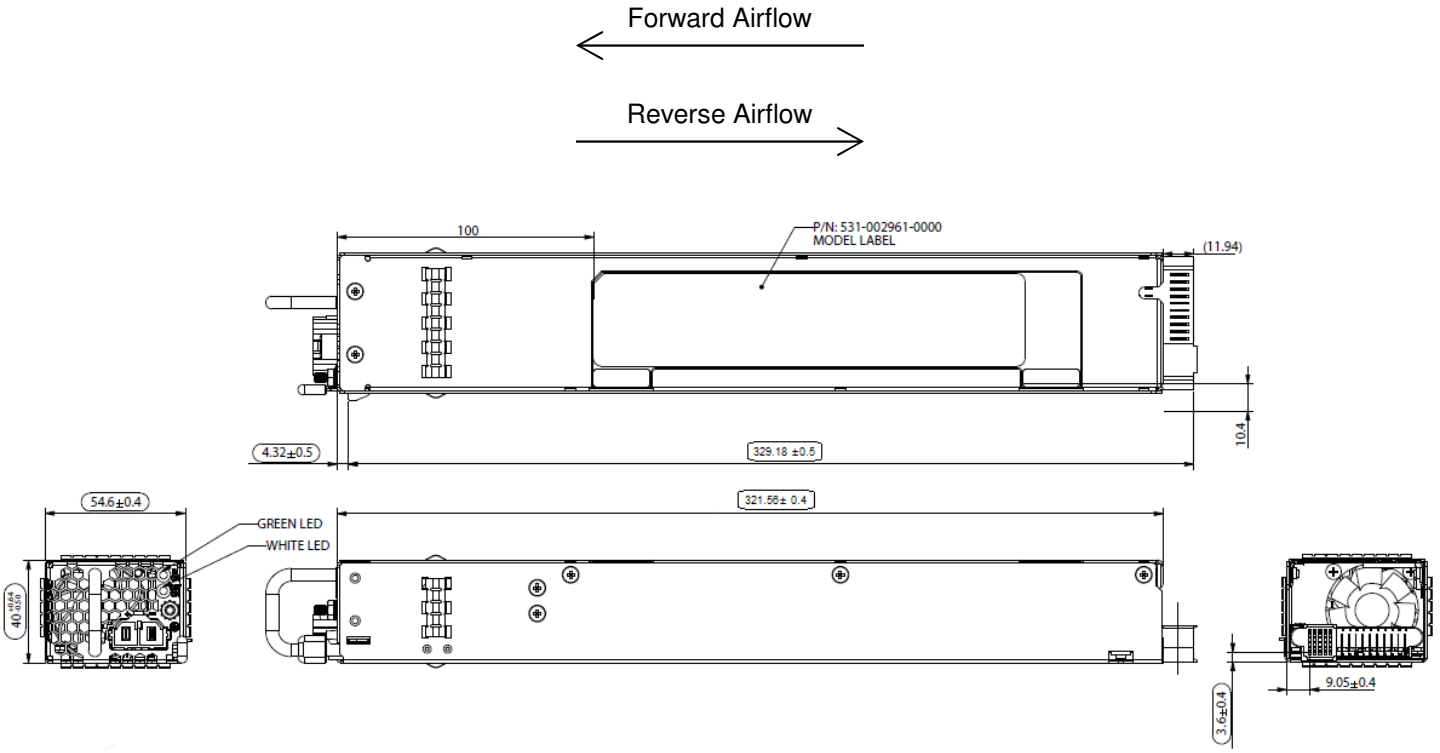
The standby output is shut down due to OTP only when the ambient temperature has gone above 70degC.

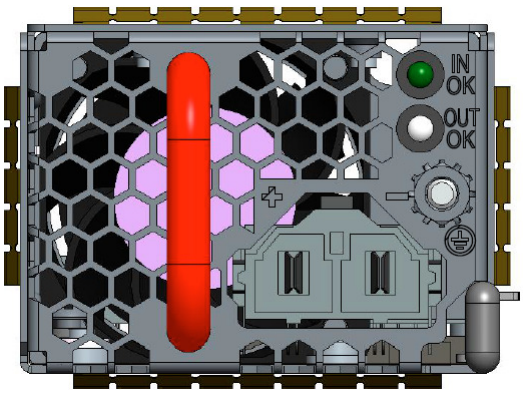
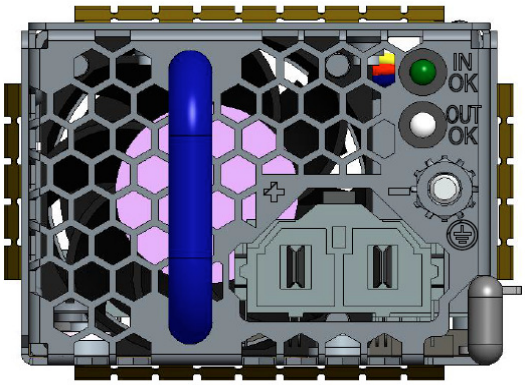
A suitable hysteresis point between the OTP threshold and the recovery point shall be set to ensure there is no frequent on-off cycling of the outputs. The temperature recovery point shall be set well-within the operating temperature range. Upon reaching the temperature recovery point, all outputs shall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

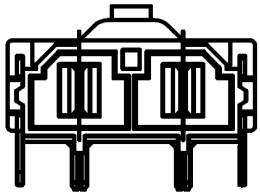


DS1100TDC-3 (FORWARD) - RED HANDLE	DS1100TDC-3-001 (REVERSE) - BLUE HANDLE
	

Connector Definitions

DC Input Connector

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

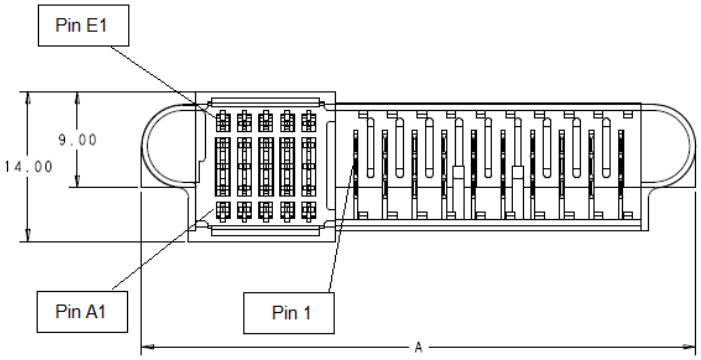


Vin+ Vin-

Output Connector – Power Blades

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

Output Connector – Control Signals



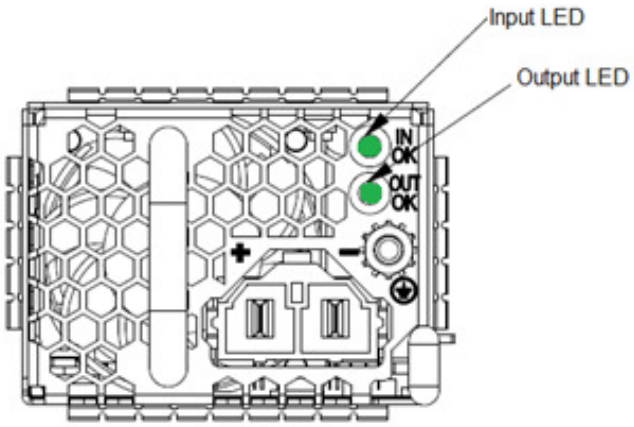
A1 – 3.3V V_{SB}
B1 – 3.3V V_{SB}
C1 – 3.3V V_{SB}
D1 – 3.3V V_{SB}
E1 – 3.3V V_{SB}
A2 – SGND
B2 – SGND
C2 – Reserved
D2 – Reserved
E2 – Reserved
A3 – A2
B3 – A0
C3 – SDA
D3 – Remote Sense-
E3 – Remote Sense+
A4 – SCL
B4 – PSON_L
C4 – PS_INTERRUPT_L
D4 – A1
E4 – INPUT_OK
A5 – PSKILL_H
B5 – ISHARE
C5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

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

LED Indicator Definition



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.

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

Weight

The DS1100TDC-3 series weight is 2.3 lbs / 1041 g 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/ EN55022 and EN300386 Class A	Conducted and Radiated EMI Limits
IEC/EN 61000-4-2	Electromagnetic Compatibility (EMC) - Testing and measurement techniques – Electrostatic discharge immunity test. +/-8KV air, +/-4KV contact discharge, performance Criteria A
IEC/EN 61000-4-3	Electromagnetic Compatibility (EMC) - Testing and measurement techniques, Radiated, radio-frequency, electromagnetic field immunity test, Criteria A
IEC/EN 61000-4-4	Electromagnetic Compatibility (EMC) - Testing and measurement techniques, Electrical Fast Transient/Burst Immunity Test. +/- 2 KV, Criteria B
IEC/EN 61000-4-5	Electromagnetic Compatibility (EMC) - Testing and measurement techniques – 2KV common mode and 1KV differential mode for AC ports performance criteria A.
IEC/EN 61000-4-6	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields, performance criteria A.
EN55022	Information Technology Equipment-Immunity Characteristics, Limits and Method of Measurements

Safety Certifications

The DS1100TDC-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 DS1100TDC-3 series power supply system .

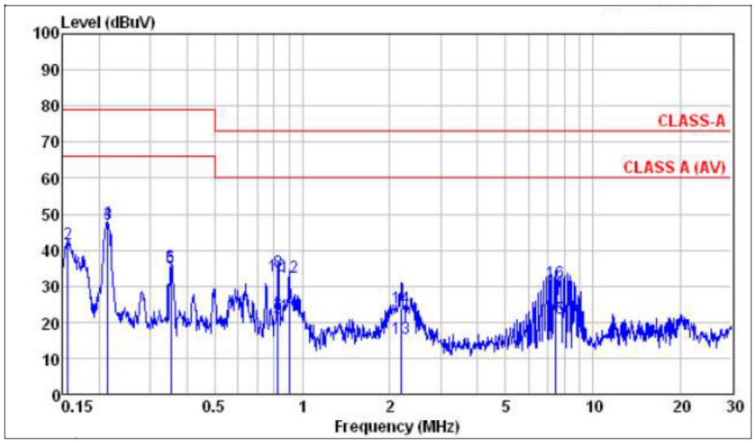
Document	File #	Description
UL60950	E186249-A293-UL-X6	US and Canada Requirements
EN60950	D-04218-A2	Europe Requirements
CE (RoHS)	15155	Europe Requirements
CB Certificate and Report	DK-45693-A2-UL	(All CENELEC Countries)
CHINA CCC Approval	2015010907806482	China Requirements

EMI Emissions

The DS1100TDC-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 DS1100TDC-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

Conducted Emissions

Table 8. Conducted EMI emission specifications of the DS1100TDC-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 DS1100TDC-3 power supply will 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 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. 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	10,000 ft	0.5” H_2O
	660W load	-5 ^{O}C	55 ^{O}C	6,000 ft	0.5” H_2O

Storage and Shipping Temperature / Humidity

The DS1100TDC-3 series power supplies can be stored or shipped at temperatures between -40^{O}C to +70^{O}C and relative humidity from 5% to 95% non-condensing.

Altitude

The DS1100TDC-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 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 and Shock

The DS1100TDC-3 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** / **SLOPE dB/oct** / **PSD g^2/Hz** 10 Hz / --- / 0.009 g^2/Hz 200 Hz / -2.66dB/oct / 0.004 g^2/Hz 500 Hz / --- / 0.004 g^2/Hz	

Operating Random Vibration

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

Shock

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

Non-Operating Half-Sine Shock

Acceleration	30	G
Duration	11	msec
Pulse	Half-Sine	
No. of Shock	3 shock on each of 6 faces	

Operating Half-Sine Shock

Acceleration	30	G
Duration	11	msec
Pulse	Half-Sine	
No. of Shock	3 shock on each of 6 faces	

Power and Control Signal Descriptions

DC Input Connector

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

Pin 1 - Vin+
Pin 2 - Vin-

Output Connector – Power Blades

These pins provide the main output for the DS1100TDC-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 DS1100TDC-3 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 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.

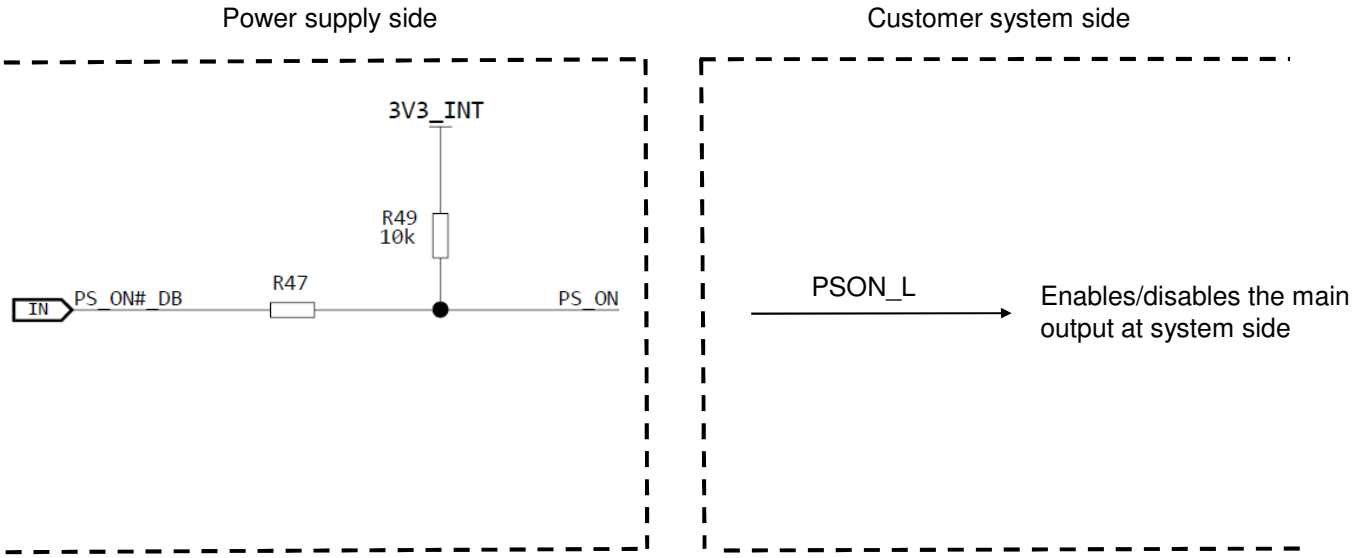
Main Output Remote Sense Return, Main Output Remote Sense – (pins D3, E3)

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 200 mV. 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.

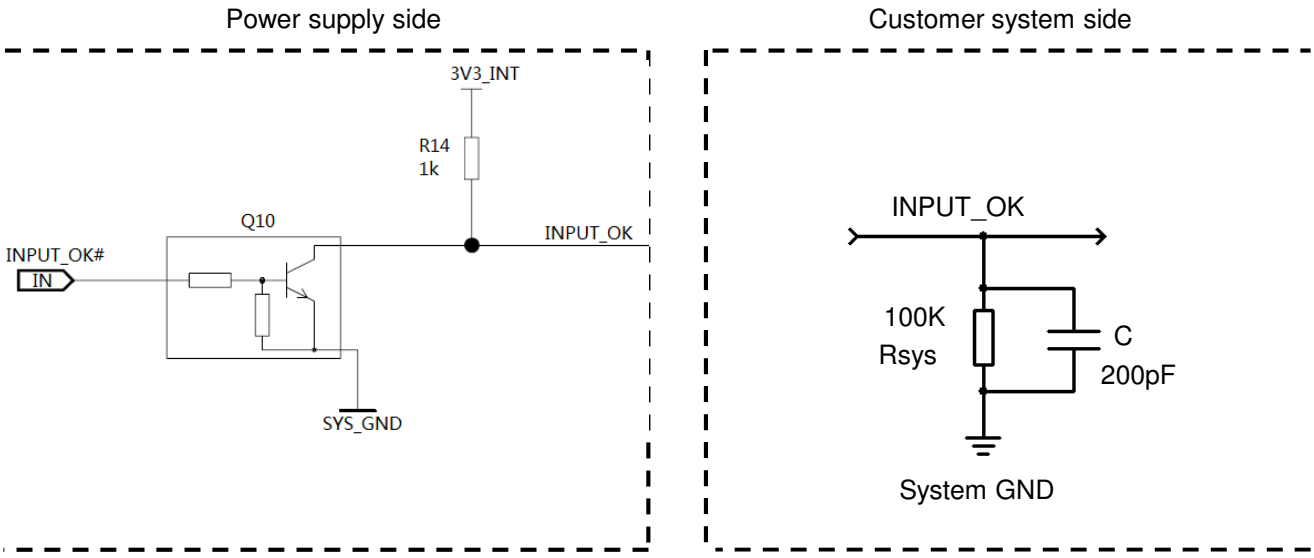
PSON_L – (pin B4)

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.



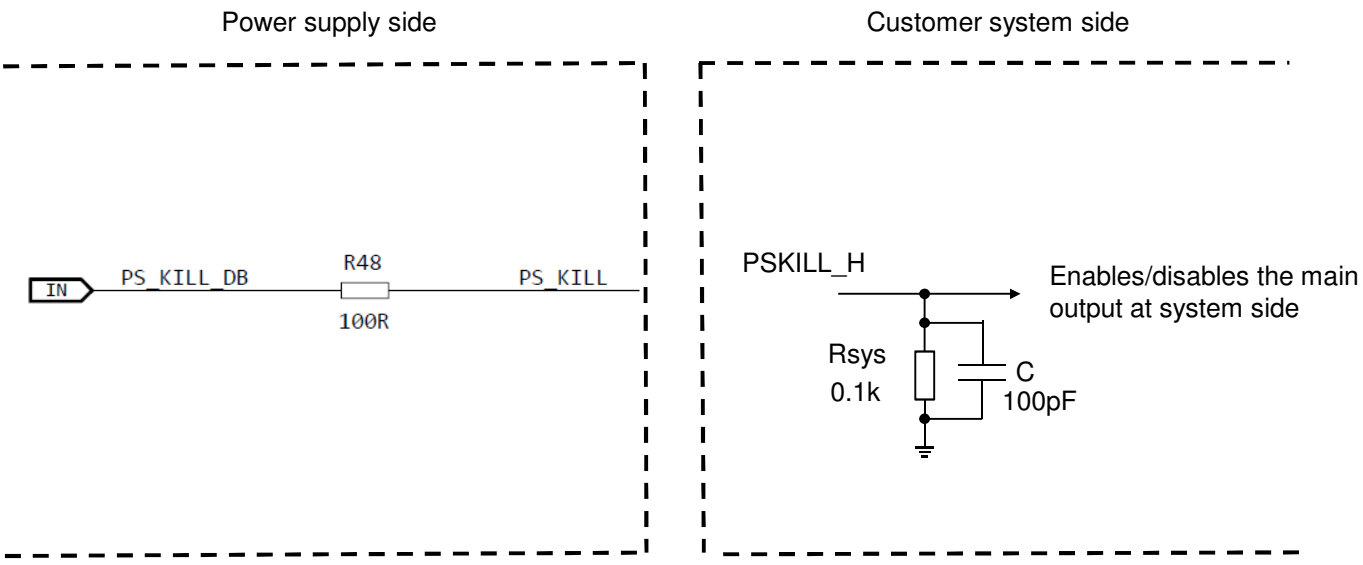
INPUT_OK – (pin E4)

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 1K ohm 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 100K ohm resistor.



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 100 ohm 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.

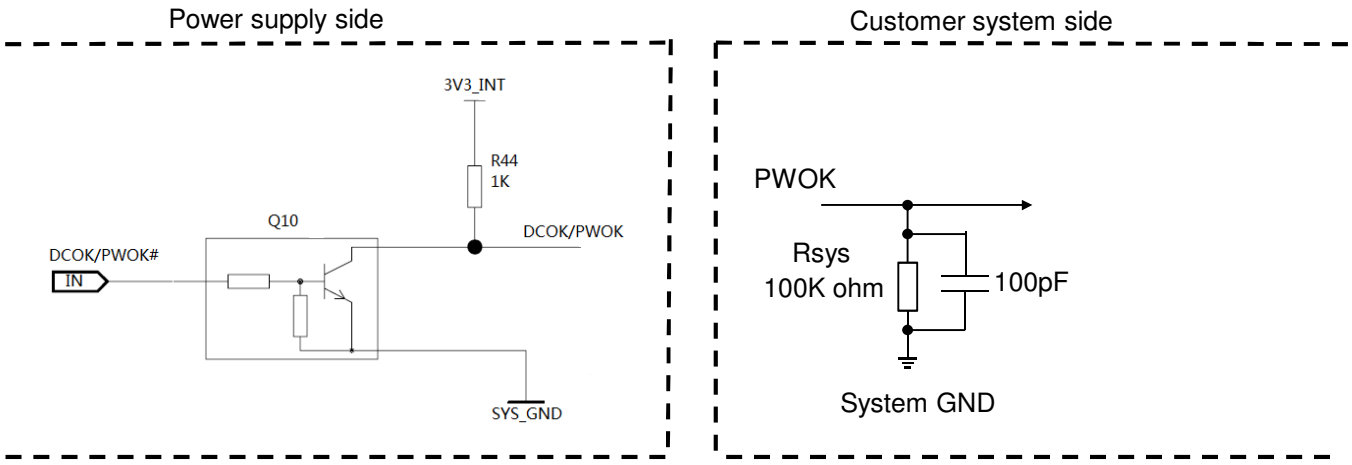
All outputs of the DS1100TDC-3 with ISHARE pins connected will share load current and the current share errors (CSE) is within 5.625A of each. If any power supply is hot swapped, no glitch will occur that violates the regulation limits of the power supply defined in this specification. The current share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

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 1.0K 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 100K ohm 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 5.1K ohm. 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 100K Hz.

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 100K ohm resistor. These pins must be pulled-up by a 2.2K ohm 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 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 3.3V V_{SB} is 5.1K ohm. A 100pF decoupling capacitor is also recommended.

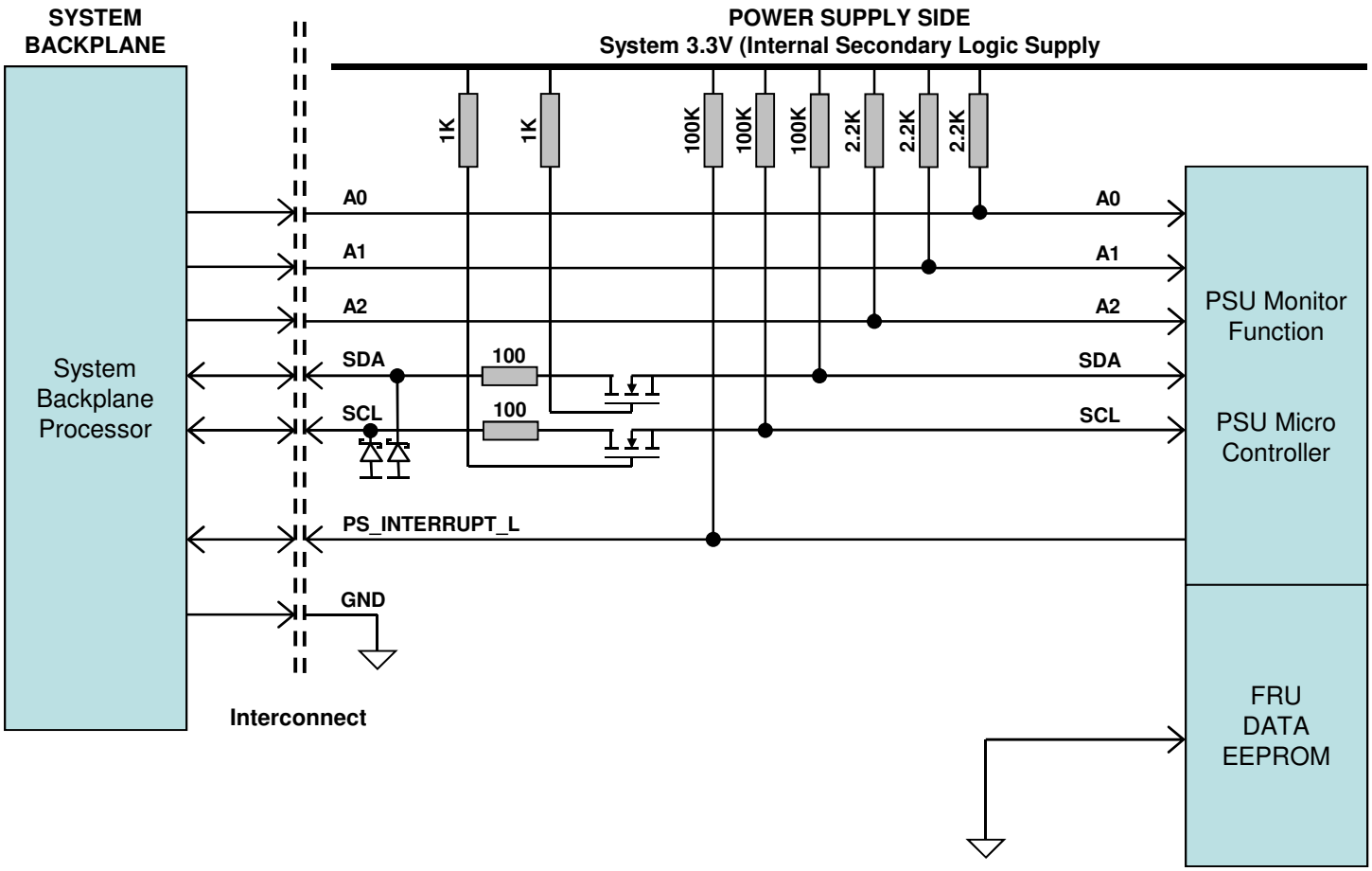
I²C Bus Communication Interval

The interval between two consecutive I²C communications to the power supply should 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 should be make at the power supply output connector with 2.2K ohm resistors pulled up to Standby Output and 47pF 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):

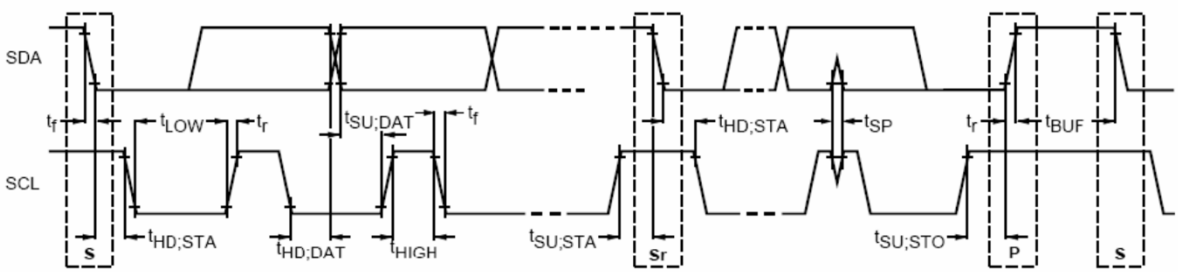
Parameter	Condition	Symbol	Min	Typ	Max	Unit
SDA, SCL internal pull-up resistor		R_{int}	-	100	-	Kohm
SDA, SCL recommended external bus capacitance		C_{ext}		200		pF
Recommended external pull-up resistor	1 to 4 PSU	R_{ext}	-	2.2	-	Kohm

Logic Levels

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

Logic High: 3.3V Nominal (Specs is 2.1V to 5.5V)**
Logic Low: 500mV nominal (Specs is 800mV max)**
** Note - Artesyn 73-769-001 I²C adapter was used.

Timings



Parameter	Symbol	Standard-Mode Specs		Actual		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	-	3.6		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

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 tables show 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) Read Address
	A1	A0		
1	0	0	0xB0	0xA0
2	0	1	0xB2	0xA2
3	1	0	0xB4	0xA4
4	1	1	0xB6	0xA6

Note: 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.

Reporting Functions

The power supply will have enhanced monitor and control functions implemented via the I²C bus. This will use the SDA and SCL pins. The power supply monitor will operate as an I²C 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 degC on the operating range		
E_{IN}	±15% from 10% to 20% load	±5%	
Fan speed	±250 RPM		

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.

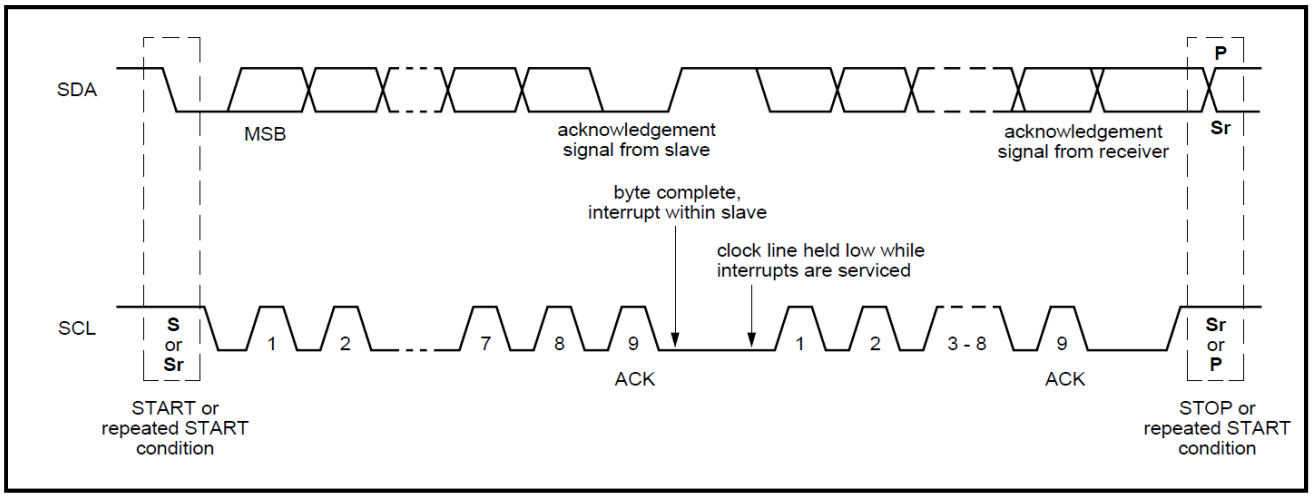
I²C Clock Synchronization

The DS1100TDC-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 time out condition for clock stretching for DS1100TDC-3 is 25 millisecond.

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



FRU (EEPROM) Data

The FRU (Field Replaceable Unit) data format is compliant with the Intel PSMI V2.12 specification.

The DS1100TDC-3 uses 1 page of EEPROM for FRU purpose. A 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** Type = "ASCII+LATIN1" = (11)b Length = 7 Bytes = (000111)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

DS1100TDC-3 FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		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
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

DS1100TDC-3 FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		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
		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		
89	59	“R"	82	52
90	5A	“R"	82	52
91	5B	**MANUFACTURING LOCATION**		
		“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
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	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)	107	6B
		(256-(sum of bytes 109 to 132)		
108	6C	Header CHECKSUM of Power Supply Record Header (Zero CHECKSUM)	123	7B
		(256-(sum of bytes 104 to 107)		
Power Supply Record				
		Overall Capacity of the Power Supply		
109	6D	2 Bytes Sequence	76	4C
110	6E	1100W = 044CH	4	04
		Peak VA		
111	6F	2 Bytes Sequence	255	FF
112	70		255	FF
113	71	**Inrush Current,** 65A In Decimal = 65 In Hex = 41H	65	41
114	72	**Inrush Interval,** 0mS In Decimal = 00 In Hex = 00H	0	00

DS1100TDC-3 FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		Low End Input Voltage Range 1(10mV), (40V / 10mV) 4000 = 0FA0H		
		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
		Low End Input Voltage Range 2(10mV)		
119	77	Stored with LSB first then MSB.	0	00
120	78		0	00
		High End Input Voltage Range 2(10mV)		
121	79	Stored with LSB first then MSB.	0	00
122	7A		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
		Peak Wattage Capacity and Holdup Time, Not Specified		
127	7F		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
		Predictive Fail Tachometer Lower Threshold, Not Applicable.		
132	84	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)	61	3D
		(256-(sum of bytes 138 to 150)		
137	89	Header CHECKSUM of 12V DC Output Record Header (Zero CHECKSUM)	179	B3
		(256-(sum of bytes 133 to 136)		
		12V OUTPUT RECORD		
		Output Information, 001 = 01H		
138	8A	Bit 7: Standby Information = 0B	1	01
		Bits 6-4: Reserved, Write as 000B		
		Bits 3-0: Output Number 1 = 001B		
		Nominal Voltage (10mV), (12V / 10mV) 1200 = 04B0H		
		2 Bytes Sequence		
139	8B	In Decimal: 176, 004	176	B0
140	8C	In Hex: B0H, 04H	4	04
		Maximum Negative Voltage Deviation (10mV), 1140 = 0474H		
		2 Bytes Sequence		
141	8D	In Decimal: 116, 004	116	74
142	8C	In Hex: 74H, 04H	4	04
		Maximum Positive Voltage Deviation (10mV), 1260 =04ECH		
		2 Bytes Sequence		
143	8F	In Decimal: 236, 004	236	EC
144	90	In Hex: ECH, 04H	4	04
		Ripple and Noise pk-pk (mV), 120 = 00B4H		
		2 Bytes Sequence		
145	91	In Decimal: 180, 000	180	B4
146	92	In Hex: B4H, 00H	0	00

DS1100TDC-3 FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		Minimum Current Draw (10mA),), (0A / 10mA) 10 = 0000H		
147	93	2 Bytes Sequence	0	00
148	94		0	00
		Maximum Current Draw (10mA), 9160 = 23CFH		
149	95	In Decimal: 207, 035	207	CF
150	96	In Hex: CFH, 23H	35	23
		V_{SB} 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	130	82
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)	67	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
		Nominal Voltage (10mV), (3.3V / 10mV) 0330 = 014AH		
		2 Bytes Sequence		
157	9D	In Decimal: 04A, 001	74	4A
158	9E	In Hex: 4AH, 01H	1	01
		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
		Minimum Current Draw (10mA), (0A / 10mA) 10 = 0000H		
		2 Bytes Sequence		
165	A5		0	00
166	A6		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

DS1100TDC-3 FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		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
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
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

DS1100TDC-3 FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
235	EB	RESERVED, Default value is 0.	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

DS1100-3-001 FRU (EEPROM) deviations:

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

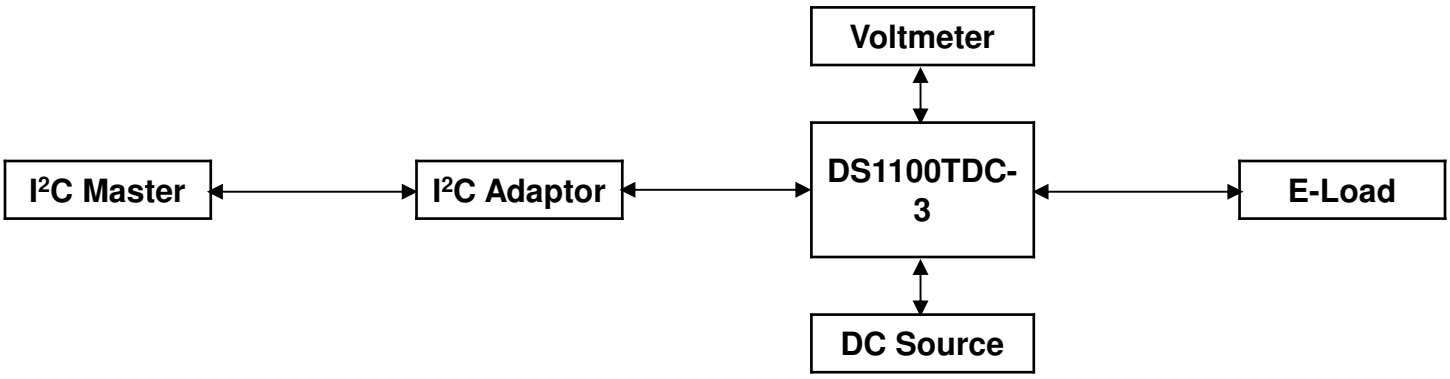
PMBus™ Interface Support

The DS1100TDC-3 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, 02h and 21h 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.

DS1100TDC-3 Series Support PMBus™ Command List

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

DS1100TDC-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	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 is 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
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

DS1100TDC-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
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 by which the 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
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 Rang: 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

DS1100TDC-3 Series Supported PMBus™ Command List:

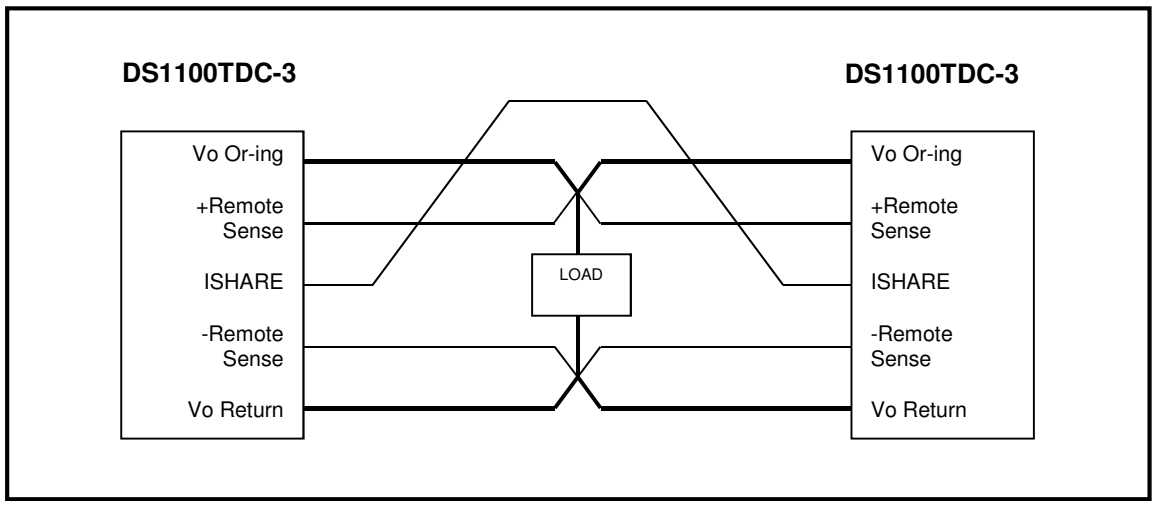
Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	Description
8Bh	READ_VOUT	-	R	2	Linear	Returns the actual, measured voltage in Volts.
8Ch	READ_IOUT	-	R	2	Linear	Returns the output current in amperes.
8Dh	READ_TEMPERATURE_1	-	R	2	Linear	PSU's inter hot spot temperature 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)
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	"L041WWSSSSR RP"	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 (7600 RPM)
D3h	FAN_SPEED_MAX		R	2	Linear	Maximum Fan Speed (20000 RPM)
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

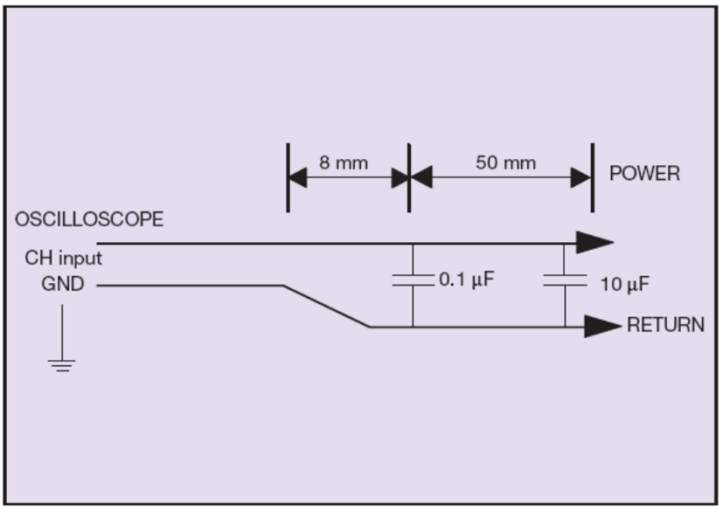
The DS1100TDC-3 series power supplies must be able to current share with 2(1+1) up to 4(2+2) power supplies in parallel and operate in a hot swap/redundant N+N configuration where N=1, 2, or 3. The 3.3V V_{SB} outputs of the power supplies are connected together in the system so that a failure or hot 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.



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 aluminum electrolytic capacitor should be used. Oscilloscope should 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

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