Technical Reference Note

Embedded Power for
Business-Critical Continuity

DS2900

2900 Watts

Distributed Power System

Total Power: 2900 Watts
Input Voltage: 180-264 Vac
# of Outputs: Main + standby

Special Features

- Active power factor correction
- EN61000-3-2 harmonic compliance
- Active AC inrush control
- 2U X 3U form factor
- 24.8 W / in^3
- +12 Vdc Output
- +3.3 Vdc stand-by
  (5 V standby - consult factory)
- No minimum load required
- Hot plug operation
- N + 1 redundant
- Internal OR'ing fets
- Active current sharing
  (10 - 100% load)
- I^2C communication interface bus
- PMBus compliant
- EERPOM for FRU data
- 2 LED (Green and Amber)
- Internal fan speed control
- INTEL, SSI Std. logic timing
- INTEL, SSI Std. FRU data format
- Full digital control
- Two year warranty

Safety

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

PMBus

Product Descriptions

The DS2900 power supply features a very wide 180V to 264 Vac input voltage range and employ active power factor correction to minimize input harmonic current distortion and to ensure compliance with the international EN61000-3-2 standard – they have a power factor of 0.99 typical. The power supplies also feature active ac inrush control, to automatically limit inrush current at turn-on to 50 A maximum, and is protected against overvoltage conditions up to 130 percent.

The power supply employs a new patent-pending ultra high efficiency conversion topology, together with an innovative power transformer and rectifier construction that further improves power density and reduces interconnect power losses. The power supply's main +12 Vdc payload output is digitally programmable over the range 11.52 to 12.48Vdc, and users have a choice of standard I^2C or advanced PMBus communications. The control software runs under Windows® on any standard PC, and uses a highly intuitive graphical user interface to simplify power supply set-up.

The DS2900 can deliver up to 240 A from its main +12 Vdc payload output, and up to 3A from its +3.3 Vdc auxiliary output. The supply has a 2U x 3U form factor and has a power density of more than 24.8 watts per cubic inch. The DS2900 can achieve a very high – 91 percent typical – conversion efficiency at 50 percent load.

EMERSON
Network Power

Model Numbers

Standard	Output Voltage	Minimum Load	Maximum Load	Stand-By Supply	Air Flow Direction
DS2900-3	12.0Vdc	0A	240A	3.3V@3A	Normal (DC Connector to Handle)
DS2900-3-002	12.0Vdc	0A	240A	5.0V@2A	Normal (DC Connector to Handle)
DS2900-3-003	12.0Vdc	0A	240A	5.0V@2A	Reversed (Handle to DC Connector)
DS2900-3-004	12.0Vdc	0A	240A	3.3V@3A	Reversed (Handle to DC Connector)

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:						
AC continuous operation	All models	$V_{IN,AC}$	180	-	264	Vac
Maximum Output Power (Main + Stand-by)	All models	$P_{O,max}$	-	-	2900	W
Isolation Voltage						
Input to outputs	All models		-	-	2500	Vdc
Input to safety ground	All models		-	-	2500	Vdc
Outputs to safety ground	All models		-	-	NA	Vdc
Ambient Operating Temperature	All models	T_A	0	-	+70[1]	^{O}C
Storage Temperature	All models	T_{STG}	-40	-	+85	^{O}C
Humidity (non-condensing)						
Operating	All models		20	-	90	%
Non-operating	All models		10	-	95	%
Altitude						
Operating	All models		-	-	10,000	feet
Non-operating	All models		-	-	30,000	feet

Note 1: With power derating at 70^{O}C

Input Specifications

Table 2. Input Specifications:

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Operating Input Voltage, AC		V_{IAC}	180	230	264	Vac_{RMS}
Input Vac Source Frequency		f_{IAC}	47	50/60	63	Hz
Maximum Input Current ($I_O = I_{O,max}$, $I_{VSB} = I_{VSB,Max}$)	$V_{IAC} = 180V_{AC}$	$I_{I,max}$	-	-	20	A_{RMS}
Standby Input Current (V_O Off, $I_{VSB} = 0A$)	$V_{IAC} = 180V_{AC}$	$I_{I,standby}$	-	-	250	mA_{RMS}
No Load Input Current (V_O On, $I_O = 0A$, $I_{VSB} = 0A$)	$V_{IAC} = 180V_{AC}$	I_{I,no_load}	-	-	600	mA_{RMS}
No Load Input Power (V_O On, $I_O = 0A$, $I_{VSB} = 0A$)	$V_{IAC} = 180V_{AC}$	P_{I,no_load}	-	-	60	W
Harmonic Line Currents	All	THD	Per IEC1000-3-2			
Power Factor	All		-	0.99	-	
Startup Surge Current (Inrush) @ 25°C	$V_{IAC} = 264V_{AC}$		-	-	50	A_{PK}
Input Fuse	Internal, L and N 5x20mm, Quick Acting 25A, 250V		-	-	25	A
Isolation – Input to Output			-	2500	-	Vdc
Isolation – Input to Chassis			-	2500	-	Vdc
Leakage Current to earth ground	$V_{IAC} = 240V_{AC}$ $f_{IAC} = 50/60$ Hz		-	-	1.4	mA
PFC Switching Frequency	All	$f_{SW,PFC}$	50		60	kHz
Operating Efficiency @ 25°C	$I_O = I_{O,max}$ $V_{IAC} = 230V_{AC}$	η	90	-	-	%
System Stability: Phase Margin Gain Margin			 45 10	-	-	 Ø dB

Output Specifications

Table 3. Output Specifications:

Parameter		Condition	Symbol	Min	Typ	Max	Unit
Output Regulation	All models	Inclusive of set-point, temperature change, warm-up drift and dynamic load	V_O	11.52	12.0	12.48	V
	DS2900-3 DS2900-3-004		V_{VSB}	3.135	3.30	3.465	
	DS2900-3-002 DS2900-3-003		V_{VSB}	4.75	5.00	5.25	
Output Ripple, pk-pk	All models	Measure with a 0.1 µ F ceramic capacitor in parallel with a 10 µ F tantalum capacitor, 0 to 20MHz bandwidth	V_O	-	-	120	mV_{PK-PK}
	DS2900-3 DS2900-3-004		V_{VSB}	-	-	60	
	DS2900-3-002 DS2900-3-003		V_{VSB}	-	-	60	
Output Current	All models	180 - 264Vac	I_O	0	-	240	A
	DS2900-3 DS2900-3-004	All	I_{VSB}	0	-	3.0	
	DS2900-3-002 DS2900-3-003	All	I_{VSB}	0	-	2.0	
Ripple Frequency		All	$f_{SW,DC-DC}$	130		150	kHz
V_O Current Share Accuracy		All		-	-	10	$\%I_O$
V_O Minimum Current Share Loading				10	-	-	$\%I_{O,max}$
Number of Parallel Units		Main Output Current Share connected		-	-	8	unit
V_O Load Capacitance		Start up	-	0	-	6000	µF
V_O Dynamic Response	Peak Deviation Settling Time	10% - 100%load change, slew rate = 1A/µs 12000uF additional load capacitance	$\pm\%V_O$ T_s	- -	- -	3 -	% µSec
V_O Long Term Stability Max change over 24 hours		After thermal equilibrium (30 mins)	$\pm\%V_O$			0.2	%

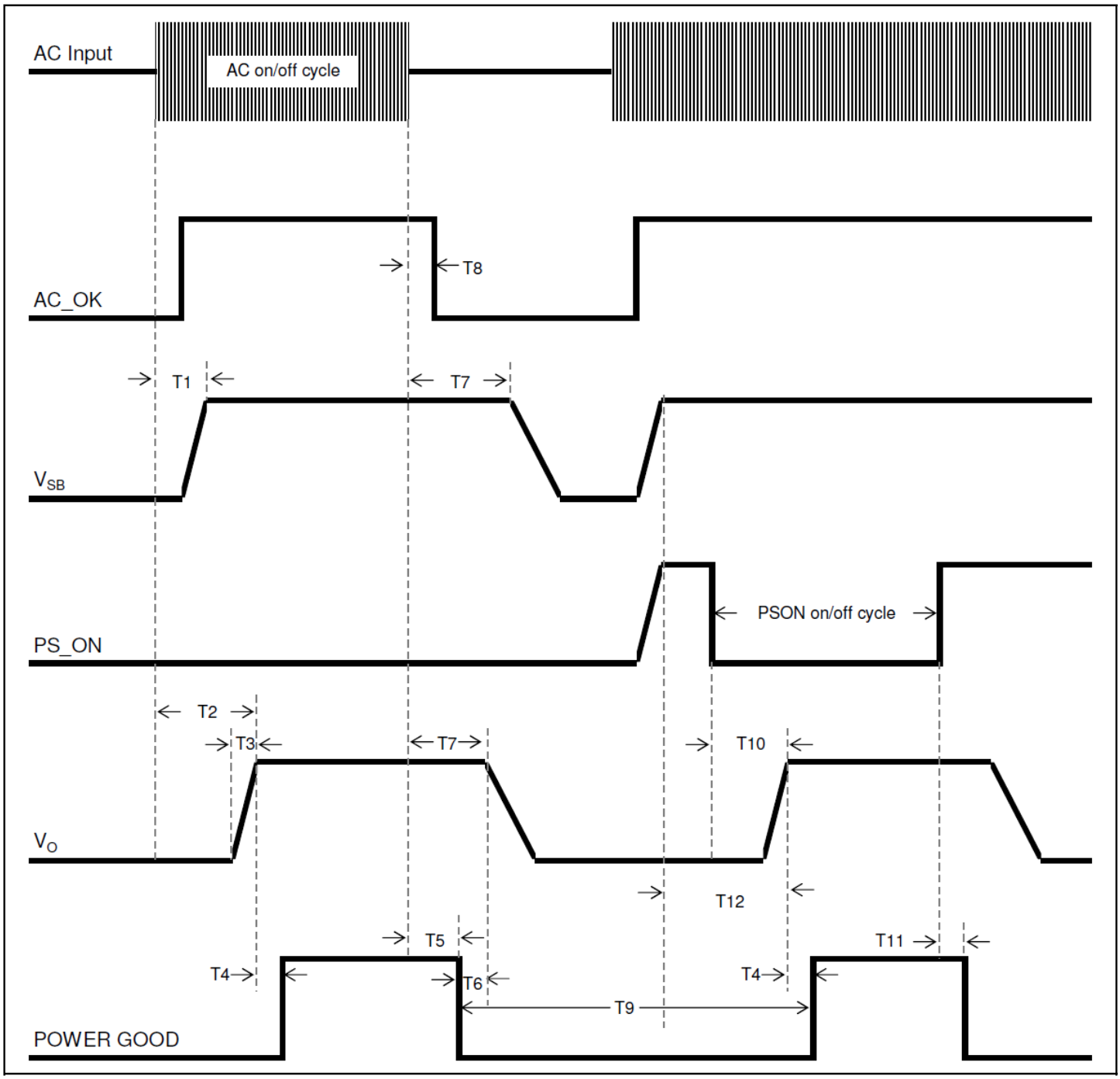
System Timing Specifications

Table 4. System Timing Specifications:

Label	Parameter	Min	Typ	Max	Unit
T1	Delay from AC being applied to V_{SB} being within regulation	-	-	1500	mSec
T2	Delay from AC being applied to output voltages being within regulation with PS_ON asserted low.	-	-	3000	mSec
T3	V_O rise time, 10%V_O to V_O in regulation.	5	-	300	mSec
T4	Delay from output voltages within regulation limits to POWER GOOD asserted at turn on.	100	-	1000	mSec
T5	Delay from loss of AC to de-assertion of POWER GOOD	5	-		mSec
T6	Delay from POWER GOOD de-asserted to output voltages dropping out of regulation limits.	1	-	1000	mSec
T7	Hold up time - time all output voltages, including V_{SB}, stay within regulation after loss of AC.	10	-	-	mSec
T8	Delay from loss of AC input to de-assertion of ACOK#	10	-	-	mSec
T9	Duration of POWER GOOD being in the de-asserted state during an off/on cycle using AC or the PS_ON signal	100	-	-	mSec
T10	Delay from PS_ON active to output voltages within regulation limits.	5	-	200	mSec
T11	Delay from PS_ON deactivate to POWER GOOD de-asserted low.	-	-	50	mSec
T12	Delay from 3.30Vsb being in regulation to 12VDC being in regulation at AC turn on.	50	-	2000	mSec

System Timing Specifications

Figure 1. System Timing Diagram:



DS2900-3 Performance Curves

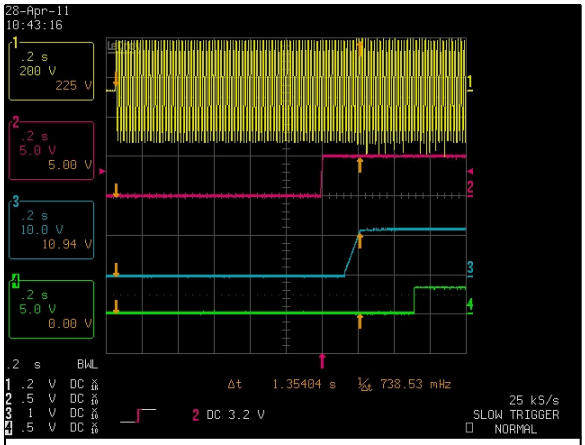


Figure 1: DS2900-3 Turn-on delay via AC mains – Vin = 180Vac
Full Load: Io = 240A, ISB = 2A (5V)
Ch 1: AC Mains Ch 2: VSB Ch 3: Vo Ch 4: POWER GOOD

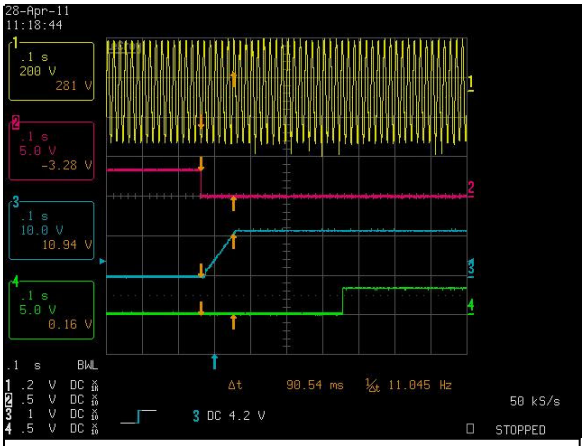


Figure 2: DS2900-3 Turn-on delay via PS_ON – Vin = 180Vac
Full Load: Io = 240A, ISB = 2A (5V)
Ch 1: AC Mains Ch 2: PS_ON Ch 3: Vo Ch 4: POWER GOOD

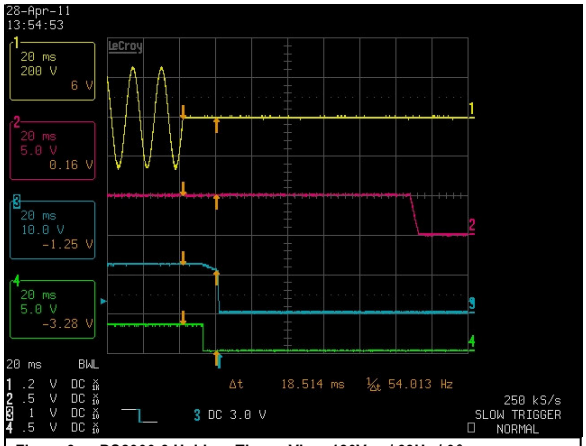


Figure 3: DS2900-3 Hold-up Time – Vin = 180Vac / 63Hz / 0°
Full Load: Io = 240A, ISB= 2A (5V)
Ch 1: AC Mains Ch 2: VSB Ch 3: Vo Ch 4: POWER GOOD

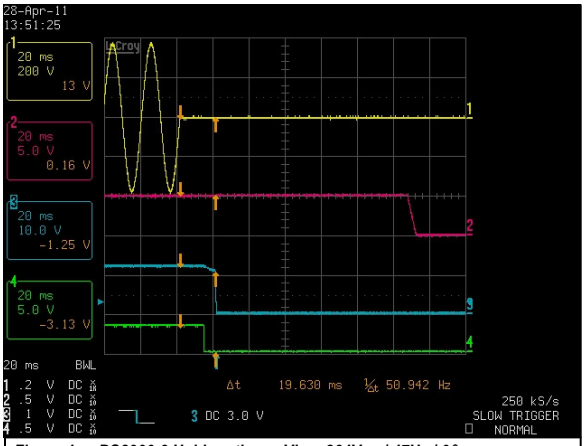


Figure 4: DS2900-3 Hold-up time – Vin = 264Vac / 47Hz / 0°
Full Load: Io = 240A, ISB = 2A (5V)
Ch 1: AC Mains Ch 2: VSB Ch 3: Vo Ch 4: POWER GOOD

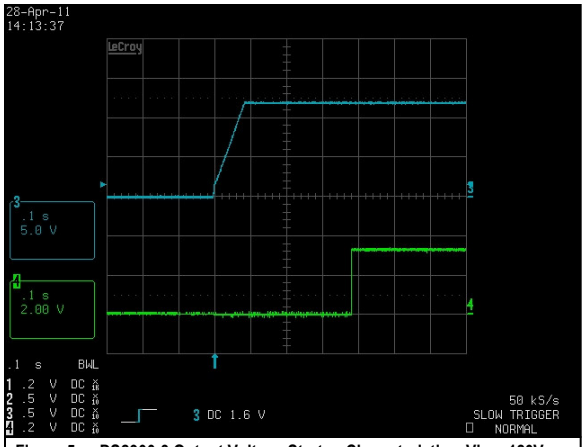


Figure 5: DS2900-3 Output Voltage Startup Characteristic – Vin = 180Vac
Full Load: Io = 240A, ISB = 2A (5V)
Ch 1: Vo Ch 2: POWER GOOD

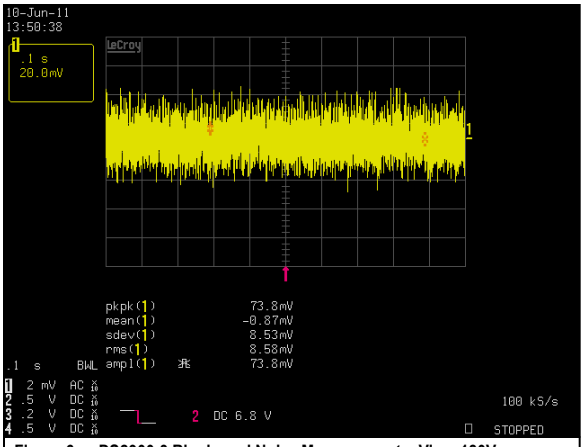


Figure 6: DS2900-3 Ripple and Noise Measurement – Vin = 180Vac
Full Load: Io = 240A, ISB = 2A (5V)
Ch 1: Vo

DS2900-3 Performance Curves

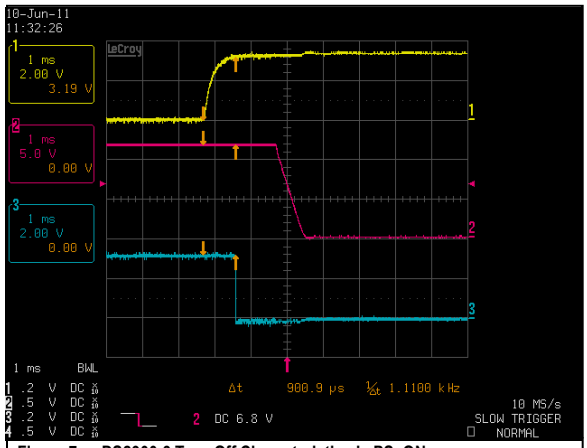


Figure 7: DS2900-3 Turn Off Characteristic via PS_ON
Full Load: Io = 240A, ISB = 2A (5V)
Ch 1: PS_ON Ch 2: Vo Ch 3: POWER GOOD

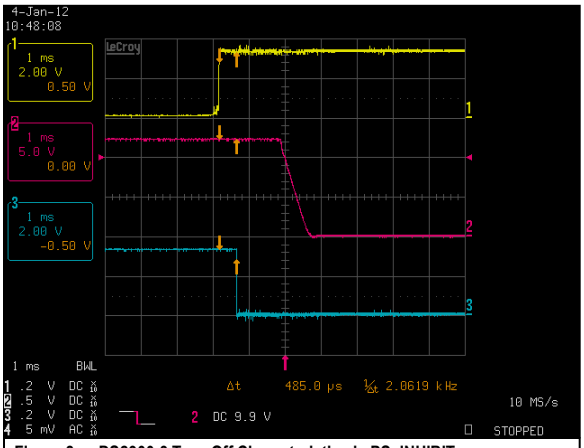


Figure 8: DS2900-3 Turn Off Characteristic via PS_INHIBIT
Full Load: Io = 240A, ISB = 2A (5V)
Ch 1: PS_KILL Ch 2: Vo Ch 3: POWER GOOD

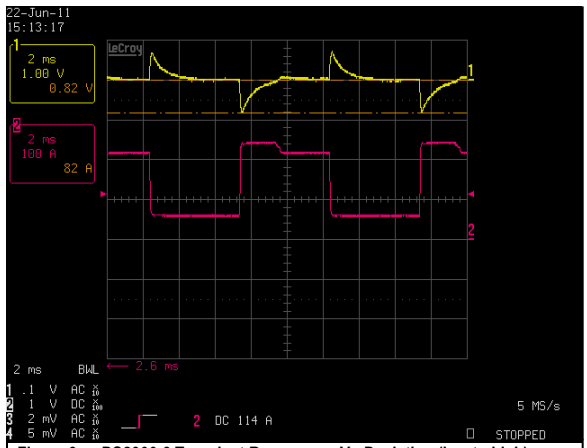


Figure 9: DS2900-3 Transient Response – Vo Deviation (low to high)
25% to 75% load change, 1A/µS slew rate, Vin = 230Vac
Ch 1: Vo Ch 2: Io

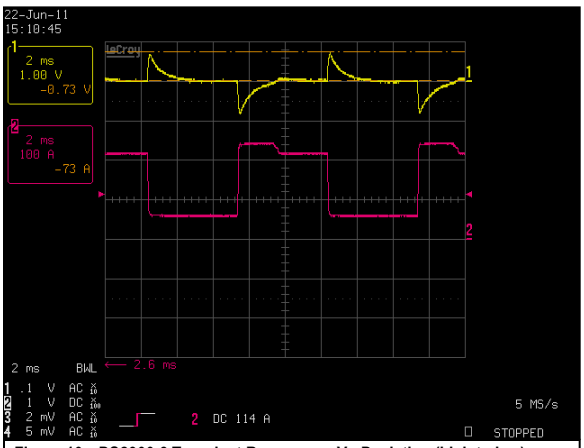


Figure 10: DS2900-3 Transient Response – Vo Deviation (high to low)
75% to 25% load change, 1A/µS slew rate, Vin = 230Vac
Ch 1: Vo Ch 2: Io

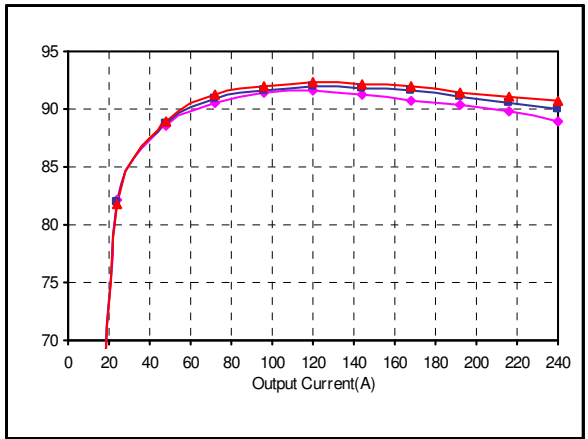


Figure 11: DS2900-3 Efficiency Curves @ 25 degC
----- 180 Vac ----- 230 Vac ----- 264 Vac
Loading: Io = 10% increment to 240A, ISB = 2A (5V)

Input Fusing

DS2900-3 series is equipped with an internal non user serviceable 25A High Rupturing Capacity (HRC) 250 Vac fuse to IEC 127 for fault protection in Live line of AC input.

Over Voltage Protection / Under Voltage Protection (OVP/UVP)

The power supplies over voltage protection will be locally sensed. The power supply will shutdown in a latch off mode after an over voltage condition or under voltage condition. This latch can be cleared by an AC power interruption. The values are measured at the output of the power supply DC connector.

OVP

Parameter	Min	Nom	Max	Unit
V_O Output Overvoltage	13.2	/	15.6	V
Standby Output Overvoltage 3.3V 5.0V	 3.63 5.5	 /	 4.29 6.5	 V V

UVP

Parameter	Min	Nom	Max	Unit
V_O Output Undervoltage	9	/	10	V

Over Current / Short circuit protection (OCP/SCP)

DS2900-3 series includes internal current limit circuitry to prevent damage in the event of overload or short circuit. The current limiting shall be of the latch type for the +12VDC and the hiccup type for the 3.30vsb output.

OCP

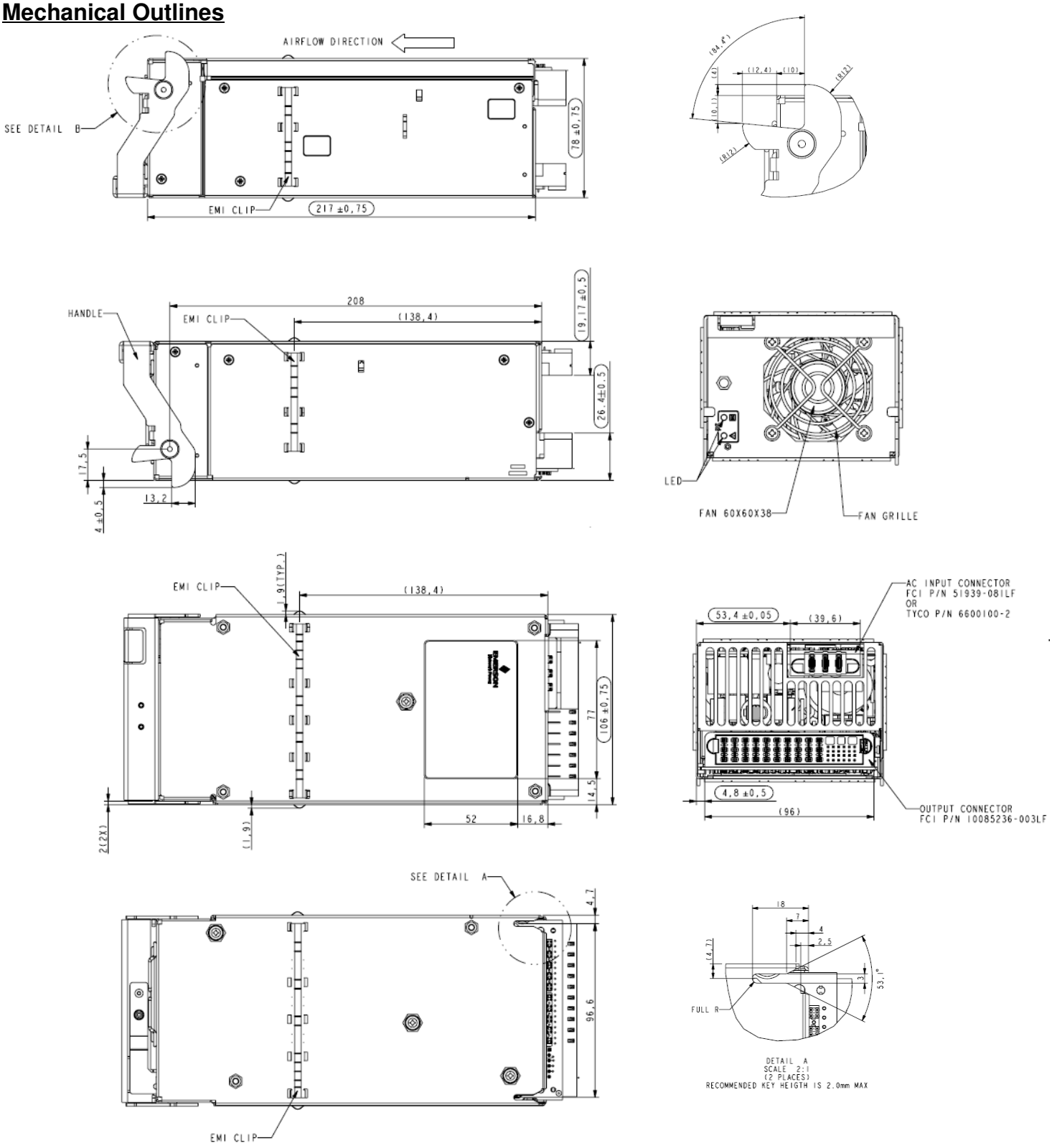
Parameter	Min	Nom	Max	Unit
V_O Output Overcurrent	252	/	276	A
Standby Output Overcurrent 3.3V 5.0V	 3.45 2.3	 / /	 4.2 2.8	 A A

Over Temperature Protection (OTP)

The power supply is internally protected against over temperature conditions. In an OTP condition, the power supply will be shutdown with the exception of the 3.30Vsb output. When the power supply temperature drops to within specified limits, the power supply will restore the +12VDC output automatically. The OTP circuit must have built in Hysteresis such that the power supply will not oscillate on and off due to temperature recovering condition. Input ambient OTP should be 5degC above operating limit. The operating limit is OTP_reset. The power supply restarts 20sec after hitting OTP_reset.

Mechanical Specifications

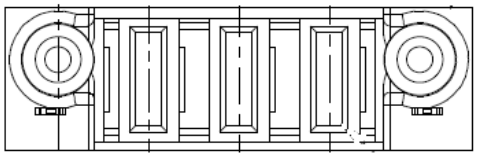
Mechanical Outlines



Connector Definitions

AC Input Connector

Pin 1 – AC Line
Pin 2 – Earth Ground
Pin 3 – AC Neutral



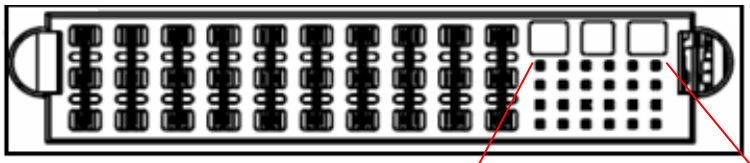
Pin3 Pin2 Pin1

AC Neutral	Earth Ground	AC Line

View from power supply AC connector end

Output Connector – Power Blades

PB1 – + Vout
PB2 – + Vout
PB3 – + Vout
PB4 – + Vout
PB5 – + Vout
PB6 – + Vout Return
PB7 – + Vout Return
PB8 – + Vout Return
PB9 – + Vout Return
PB10 – + Vout Return



PB1	PB2	PB3	PB4	PB5	PB6	PB7	PB8	PB9	PB10	D1	D2	D3	D4	D5	D6
										C1	C2	C3	C4	C5	C6
										B1	B2	B3	B4	B5	B6
										A1	A2	A3	A4	A5	A6

View from power supply output connector end

Output Connector – Control Signals

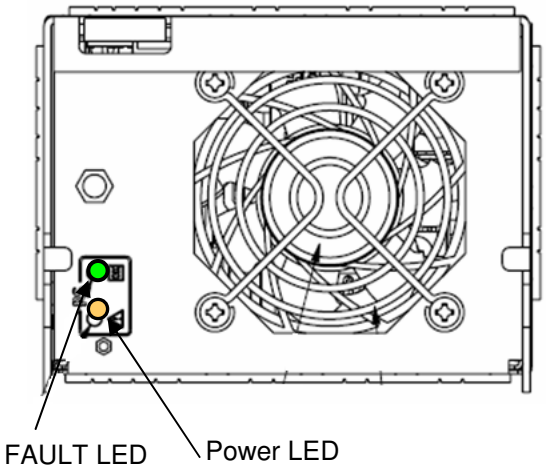
A1 – PS_KILL
A2 – +PS_ON
A3 – +Vout_Share
A4 – S_INT
A5 – +STBY
A6 – +STBY Return
B1 – PS_SEATED
B2 – ACOK
B3 – PWR_GOOD
B4 – A2
B5 – +STBY
B6 – +STBY Return
C1 – SDA (I^2C Data Signal)
C2 – SCL (I^2C Clock Signal)
C3 – A1
C4 – A0
C5 – +STBY
C6 – +STBY Return
D1 – Reserve
D2 – WP
D3 – +Vout_RS
D4 – +Vout_RS_RETURN
D5 – +STBY
D6 – +STBY Return

Power / Signal Mating Connectors and Pin Types

Table 5. Mating Connectors for DS2900-3 series

Reference	On Power Supply	Mating Connector or Equivalent
AC Input Connector	FCI P/N 51939-081LF or TYCO P/N 6600100-2	FCI P/N; 51915-022LF
		FCI P/N; 51940-059
Output Connector	FCI HCI Series Connector 10 Power Blades 24 Signal pins P/N SK10085236-003LF	FCI HCI Series Connector Molex Power Dock Senior 10 Power Blades 24 Signal pins P/N SK10065866-003LF
		FCI HCI Series Connector Molex Power Dock Senior 10 Power Blades 24 Signal pins P/N SK10065127-001

LED indicator Definition



There will be a green POWER LED to indicate that AC is applied to the PSU and standby voltage is available when blinking. This same LED should go solid when the +12VDC output is enabled and operational.

There will be an Amber FAULT LED to indicate that the power supply has failed and a replacement of the unit is necessary. Faults including UVP, OVP, OTP, or Fan Fail when PSON# is asserted “Logic Low” shall cause the amber LED to turn on. The LED can be reset by toggling PSON# signal or an AC recycle.

Condition	FAULT LED Status
V_{SB} = ON, V_O = OFF, AC Input = ON	Blinking Green
V_{SB} = ON, V_O = ON	Solid Green
V_O = OCP / OVP	Solid Amber
FAN_FAULT / OTP / V_{SB} = OCP/UVP	Solid Amber

Weight

The DS2900-3 series weight is 5.29 lbs/ 2.4kg maximum.

EMC Immunity

DS2900-3 series power supply is designed to meet the following EMC immunity specifications:

Table 6. Environmental Specifications:

Document	Description
FCC Docket No. 20780 Part 15 Subpart J Class A/ EN55022, Level A	Conducted and Radiated EMI Limits
EN61000-3-2	Harmonics
EN61000-3-3	Voltage Fluctuations
IEC/EN 61000-4-2, Edition 1.2, 2001-04	Electromagnetic Compatibility (EMC) - Testing and measurement techniques – Electrostatic discharge immunity test. +/-15KV air, +/-8KV contact discharge, performance Criteria B
IEC/EN 61000-4-3, 2002, Amendment 1, 2002-08	Electromagnetic Compatibility (EMC) - Testing and measurement techniques, Radiated, radio-frequency, electromagnetic field immunity test
IEC/EN 61000-4-4, 1995, Amendment 2, 2001-07	Electromagnetic Compatibility (EMC) - Testing and measurement techniques, Electrical Fast Transient/Burst Immunity Test. 2KV for AC power port, 1.0KV for DC ports, I/O and signal ports performance Criteria B
IEC/EN 61000-4-5, Edition 1.1, 2001-04	Electromagnetic Compatibility (EMC) - Testing and measurement techniques – 2KV common mode and 1KV differential mode for AC ports and 0.5kV differential mode for DC power, I/O and signal ports, performance criteria B.
IEC/EN 61000-4-11, Edition 1.1, 2001-04	Electromagnetic Compatibility (EMC) - Testing and measurement techniques : Voltage Dips and Interruptions: 30% reduction for 500ms- Criteria B>95% reduction for 10mS, Criteria A, >95% reduction for 5000mS, Criteria C
EN55024:1998	Information Technology Equipment-Immunity Characteristics, Limits and Method of Measurements

Safety Certifications

The DS2900-3 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 DS2900-3 series power supply system

Document	File #	Description
UL 60950 No.	E186249-A82-UL-1	US and Canada Requirements
CSA 22.2 No. 60950		Information Technology Equipment - Safety - Part 1: General Requirements (Bi-National standard, with UL 60950-1)
EN60950		European Requirements
EN60950 Deviations		International Requirements
CB Certificate and Report	DK-14590	(All CENELEC Countries)
CHINA CCC Approval	2009010907320502	China Requirements

EMI Emissions

The DS2900-3 series 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 (IEC 61000) for immunity. The unit is enclosed inside a metal box, tested at 2900w using resistive load with cooling fan.

Conducted Emissions

Table 8. Conducted EMI emission specifications of the DS2900-3 series

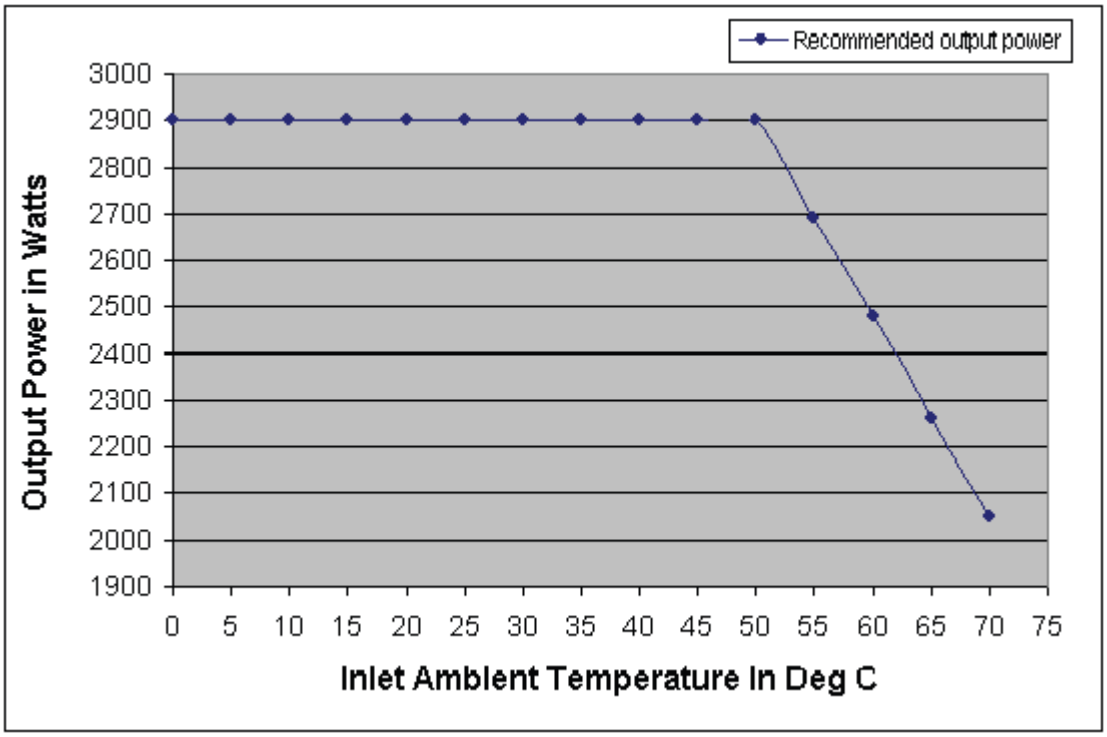
Parameter	Model	Symbol	Min	Typ	Max	Unit
FCC Part 15, class A	All	Margin	-	-	6	dB
CISPR 22 (EN55022) class A	All	Margin	-	-	6	dB

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 ac-dc convertors 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 ac-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 DS2900-3 series power supplies will start and operate within stated specifications at an ambient temperature from 0^{O}C to 50^{O}C under all load conditions with internal fan. It can operate up to 70^{O}C with derated power.



Forced Air Cooling

The DS2900-3 series power supplies included internal cooling fans as part of the power supply assembly to provide forced air-cooling to maintain and control temperature of devices and ambient temperature in the power supply to appropriate levels. The standard direction of airflow is from the DC connector end to the AC connector end of the power supply. The PSU has a firmware program that determines the fan speed/airflow delivery based on % O/P load condition and ambient air temperature. Current fan firmware settings deliver 32.9 CFM for 50% Load at 50^{O}C ambient, with the fan running at 13,050 RPM.

Storage and Shipping Temperature / Humidity

The DS2900-3 series power supplies can be stored or shipped at temperatures between –40 ^{O}C to +85 ^{O}C and relative humidity from 5% to 95% non-condensing.

Altitude

The DS2900-3 series will operate within specifications at altitudes up to 10,000 feet above sea level. The power supply shall not be damaged when stored at altitudes of up to 30,000 feet above sea level.

Humidity

The DS2900-3 series will operate within specifications when subjected to a relative humidity from 20% to 90% non-condensing. The DS2900-3 series can be stored in a relative humidity from 5% to 95% non-condensing.

Vibration

The DS2900-3 power supply will pass the following vibration specifications:

Non-Operating Random Vibration

Acceleration	2.7		gRMS
Frequency Range	10-2000		Hz
Duration	20		mins
Direction	3 mutually perpendicular axis		
PSD Profile	**FREQ** 10-190 Hz 190-210 Hz 210-2000 Hz	**SLOPE** **dB/oct** --- -31.213dB/oct ---	**PSD** **g^2/Hz** 0.01 g^2/Hz --- 0.003 g^2/Hz

Operating Random Vibration

Acceleration	1.0		gRMS
Frequency Range	10-500		Hz
Duration	20		mins
Direction	3 mutually perpendicular axis		
PSD Profile	**FREQ** 10-500 Hz	**SLOPE** **dB/oct** ---	**PSD** **g^2/Hz** 0.002 g^2/Hz

Shock

The DS2900-3 power supply will pass the following vibration specifications:

Non-Operating Half-Sine Shock

Acceleration	30	G
Duration	18	msec
Pulse	Half-Sine	
No. of Shock	3 shock on each of 6 faces	

Operating Half-Sine Shock

Acceleration	4	G
Duration	22	msec
Pulse	Half-Sine	
No. of Shock	3 shock on each of 6 faces	

AC Input Connector

This connector supplies the AC Mains to the DS2900-3 power supply.

Pin 1 - AC Line
Pin 2 - Earth Ground
Pin 3 - AC Neutral

Output Connector – Power Blades

These pins provide the main output for the DS2900-3. The + Vout and the + Vout Return pins are the positive and negative rails, respectively, of the V_O main output of the DS1200-3 power supply. The + Vout is electrically isolated from the power supply chassis.

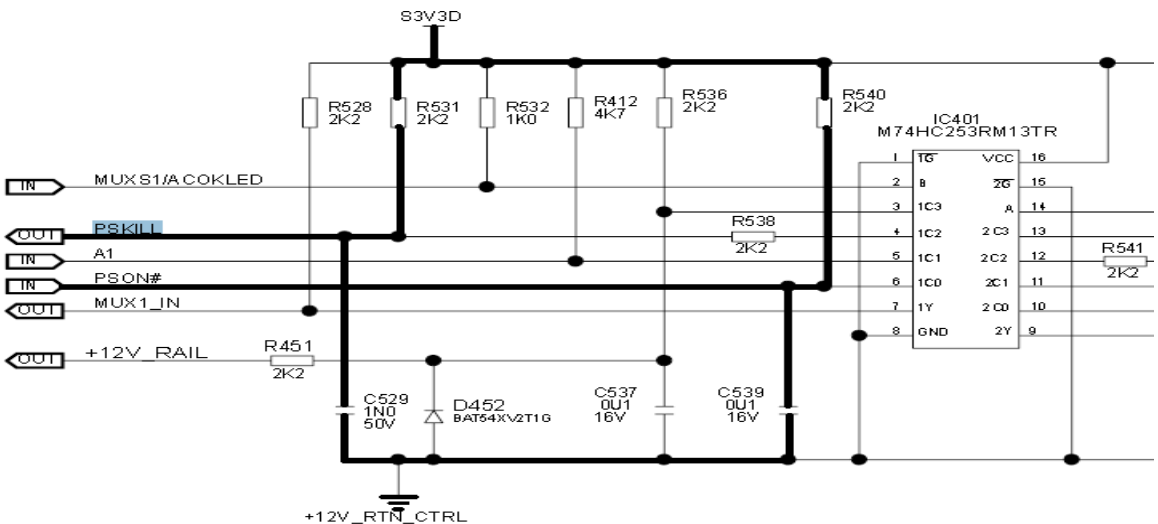
PB1 - + Vout
PB2 - + Vout
PB3 - + Vout
PB4 - + Vout
PB5 - + Vout
PB6 - + Vout Return
PB7 - + Vout Return
PB8 - + Vout Return
PB9 - + Vout Return
PB10 - + Vout Return

Output Connector - Control Signals

The DS2900-3 series contains a 24 pins control signal header providing an analogue control interface, standby power and i^2C interface signal connections.

PS_KILL – (pin A1)

This signal pin should be grounded in the system. If left open, power supply operation will be inhibited (StandBy V_{SB} output will remain on).



+PS_ON – (pin A2)

This signal input pin controls the normal turning ON and Off of the Main Output of the DS2900-3 power supply.

The output will be enabled when this signal is pulled low, below 0.8 V outputs disabled when pin is driven high or left open.

+Vout_share – (pin A3)

The DS2900-3 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+1 configuration for redundancy purposes. Share Bus voltage at full load is 8.00vdc.Share Bus voltage at half load is 4.0vdc

+STBY*, +STBY* Return – (pins A5, A6, B5, B6, C5, C6, D5, D6)

The DS2900-3 provides a regulated 3.3 volt 3 amp (or 5.0 volt 2 amp) 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 (VSB) voltage is available whenever a valid AC input voltage is applied to the unit. The StandBy Output is independently short circuit protected and is referenced to the StandBy Output Return pins (A6, B6, C6, D6).

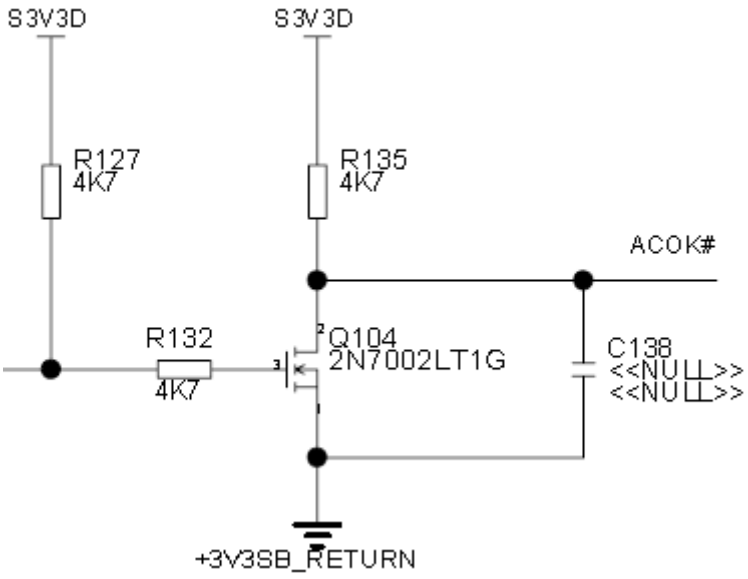
PS_SEATED – (pin B1)

This signal pin is connected to Main Output Return inside the power supply via a 220 ohm resistor. This pin is to be pull high on the system side by a resistor of 4.7K or higher. A TTL logic LOW indicates the power supply is inserted and seated into the system power supply connector. A Logic HIGH indicated the removal of the power supply.

The resistance from PS_SEATED pin to +12V_RTN, R < 250 ohms

ACOK – (pin B2)

The ACOK signal is used to indicate presence of AC input to the power supply. This signal will be connected to 3.3Vsb through a resistor on the host system side. A logic "High" level on this signal shall indicate AC input to the power supply is present. A Logic "Low" on this signal will indicate a loss of AC input to the power supply.



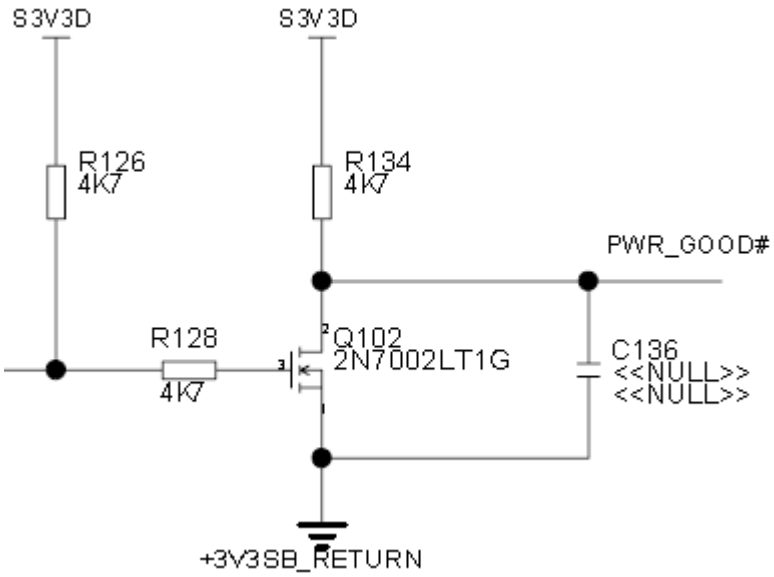
ACOK Signal characteristics

Signal Type	Pull-up tp 3.3Vsb through a resistor in the host system	
ACOK#=High	AC Present	
ACOK#=Low	AC Not Present	
	MIN	**MAX**
Logic level low voltage, Isink=4mA	0V	0.8V
Logic level high voltage, Isink=50uA	2.0V	4.125V
Sink current, ACOK# =Low		4mA
Sink current, ACOK# =high		50uA

PWR_GOOD – (pin B3)

PWR_GOOD is a power good signal and will be pulled HIGH by the power supply to indicate that both the outputs

are above the regulation limits of the power supply. When any output voltage falls below regulation limits or when AC power has been removed for a time sufficiently long so that power supply operation is no longer guaranteed, PWOK will be de-asserted to a LOW state. The start of the PWR_GOOD delay time shall be inhibited as long as the +12VDC output is in current limit or the 3.30Vsb output is below the regulation limit.



PWR_GOOD Signal characteristics

Signal Type	**Open collector/drain output from power supply. Pull-up to 3.3vsb internal to the power supply.**	
PWR_GOOD =Low	Power Not Good	
PWR_GOOD =High	Power Good	
	MIN	**MAX**
Logic level low voltage, Isink=4mA	0V	0.8V
Logic level high voltage, Isink=200uA	2.0V	4.125V
Sink current, PWR_GOOD=Low		4mA
Sink current, PWR_GOOD=high		2mA
PWR_GOOD delay: Tpwok_on	100ms	1000ms
PWR_GOOD rise and fall time		100usec
Power down delay:Tpwrgood_off	1ms	1000msec

SDA, SCL and S_INT – (pin C1, C2, A4)

Please refer to “Communication Bus Descriptions” section.

A0, A1 and A2 – (pins C4, C3, B4)

Please refer to “Communication Bus Descriptions” section.

+Vout_RS, +Vout_RS_RETURN – (pins D3, D4)

Remote sense is required for the 12V and 3.30Vsb Output rail to compensate for 500mV load bus drop. Single remote sense connection is acceptable for 3.3Vsb output.

I²C Bus Signals

The DS2900-3 power supply contains enhanced monitor and control functions implemented via the I²C bus. The DS2900-3 I²C functionality (PMBus™ and FRU data) can be accessed via the output connector control signals. The communication bus is powered either by the internal 3.3V supply or from an external power source connected to the StandBy Output (ie: accessing an unpowered power supply as long as the StandBy Output of another power supply connected in parallel is on).

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

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

SDA, SCL (I²C Data and Clock Signals) – (pin C1, C2)

I²C serial data and clock bus - these pins are internally pulled up to internal 3.3V supply with a 10K resistor.

S_INT (Alarm) – (pin A4)

S_INT 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. To reset the S_INT signal back to normal (logic HIGH level) - (1) recycle input AC power, (2) toggle PSON signal and (3) issuance of a CLEAR_FAULTS PMBus™ command.

A0, A1 and A2 (I²C Address BIT 0, BIT1 and BIT2 Signals) – (pin C3, C4, B4)

These three input pins are the address lines A0 , A1 and A2 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 4.7K resistor.

I²C Bus Communication Interval

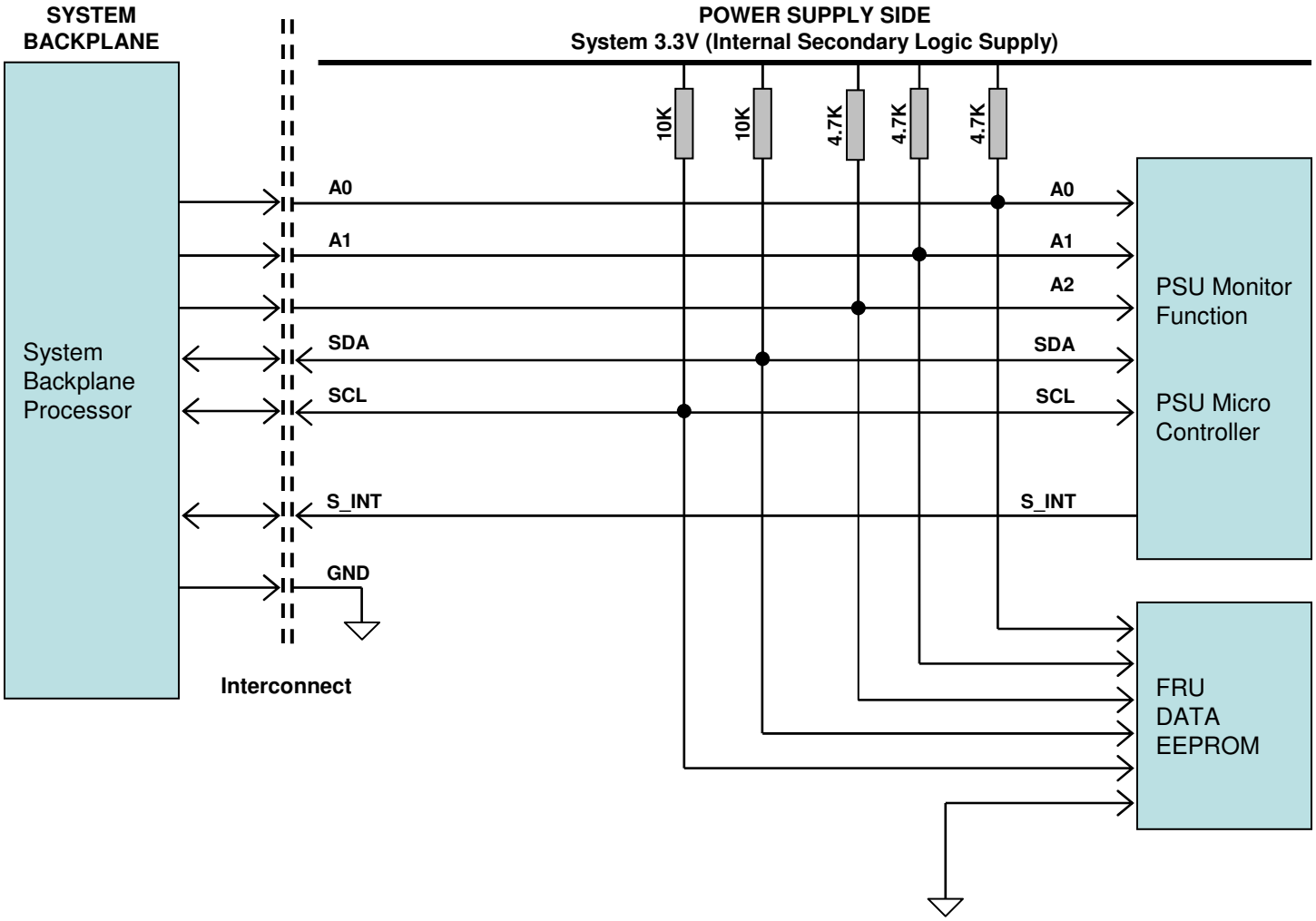
The interval between two consecutive I²C communications to the power supply should be at least 50ms to ensure proper monitoring functionality.

I²C Bus Signal Integrity

The noise on the I²C bus (SDA, SCL lines) due to the power supply will be less than 500mV 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 3.2K ohm resistors pulled up to StandBy Output and 20pf ceramic capacitors to StandBy Output Return.

The noise on the address lines A0 and A1 will be less than 100mV peak-to-peak. This noise measurement should be made at the power supply output connector.

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}	-	10	-	Kohm
SDA, SCL internal bus capacitance		C_{int}	-	0	-	pF
Recommended external pull-up resistor 1 PSU	1 PSU	R_{ext}	-	1	-	Kohm
	8 PSU		-	0.125	-	Kohm

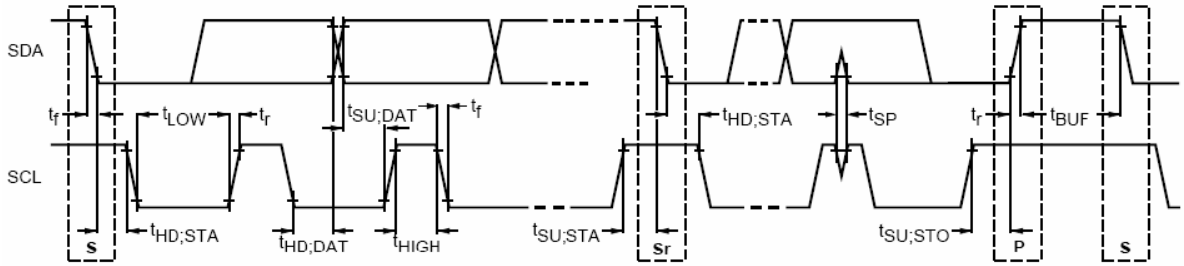
Logic Levels

DS2900-3 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: Philips™ I2C adapter was used.

Timings



Parameter	Symbol	Standard-Mode Soecs		Actual		Unit
		Min	Max			
SCL Clock Frequency	f_{SCL}	0	100	86.92		kHz
Hold time (repeated) START condition	$t_{HD;STA}$	4.0	-	4.43		us
LOW period of SCL clock	t_{LOW}	4.7	-	15.24		us
HIGH period of SCL clock	t_{HIGH}	4.0	-	4.95		us
Setup time for repeated START condition	$t_{SU;STA}$	4.7	-	5.1		us
Data hold time	$t_{HD;DAT}$	0	3.45	0.146		us
Data setup time	$t_{SU;DAT}$	250	-	3560		ns
Rise time	t_r	-	1000	SCL = 764	SDA = 883	ns
Fall time	t_f	-	300	SCL = 129	SDA = 126	ns
Setup time for STOP condition	$t_{SU;STO}$	4.0	-	5.56		us
Bus free time between a STOP and START condition	t_{BUF}	4.7	-	31.04***		us

*** Note Philips™ I2C adapter and bundled software (USB-to-I2C) was used

Device Addressing

The DS2900 series will respond to supported commands on the I2C bus that are addressed according to pins A2, A1 and A0 pins.

PMBus™ address is B, [logic combination of A2, A1 and A0].

FRU address is A, [logic combination of A2, A1 and A0].

Address pins are held HIGH by default via pull-up to 5V_I2C. Connect these pins to GND to set it logic LOW.

As an example, if the address pins were left unconnected, A2, A1 and A0 are logic High. Thus, addressing is as follows:

PMBus™ - B, [A2, A1, A0, 0] therefore, if left unconnected, B, [1,1,1,0] = BE (default PMBus Address)

FRU - A, [A2, A1, A0, 0] therefore, if left unconnected, A, [1,1,1,0] = AE (default FRU Address)

Important: The least significant bit of the address byte is always 0.

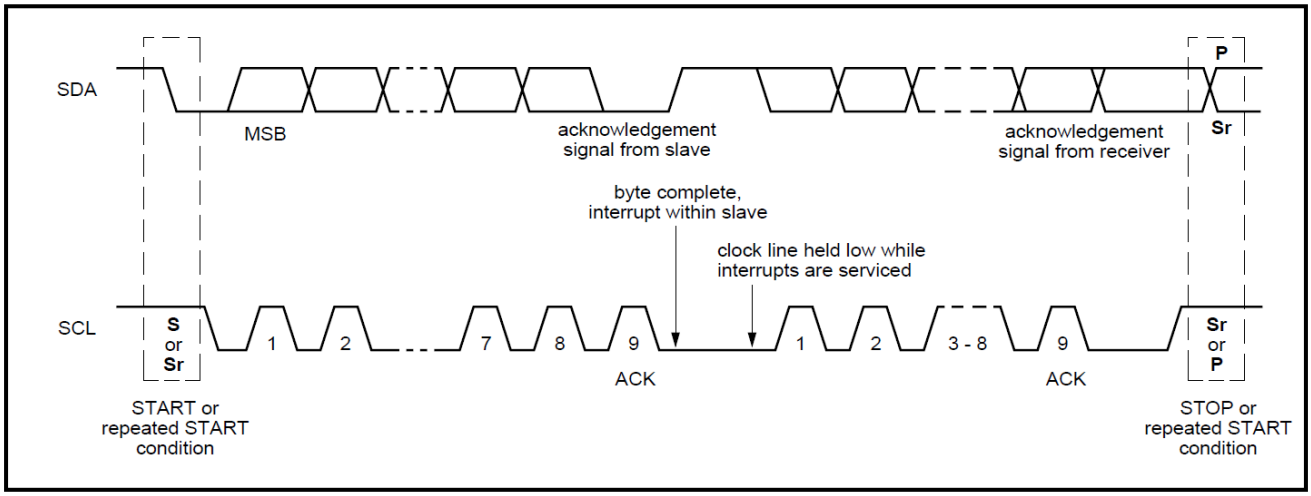
The i^2C address of the device is based on the slot the PSU is in. The address is defined as follows:

Bus	PSU Slot	Slot ID Bits			PMBus™ Address	EEPROM (FRU) Address
		A2	A1	A0*		
I2C _PSU1	1	0	0	0	B0	A0
I2C _PSU2	2	0	0	1	B2	A2
I2C _PSU3	3	0	1	0	B4	A4
I2C _PSU4	4	0	1	1	B6	A6
I2C _PSU5	5	1	0	0	B8	A8
I2C _PSU6	6	1	0	1	BA	AA
I2C _PSU7	7	1	1	0	BC	AC
I2C _PSU8	8	1	1	1	BE	AE

I²C Clock Synchronization

The DS2900-3 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 DS2900-3 is 100 microseconds.



FRU (EEPROM) Data

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

The DS2900-3 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 DS2900-3 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.

DS2900-3 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** (In multiples of 8 Bytes)	24	18
2	02	**CHASSIS INFO AREA OFFSET** (In multiples of 8 Bytes)	1	01
3	03	**BOARD INFO AREA OFFSET** (Not Used)	0	00
4	04	**PRODUCT INFO AREA OFFSET** (In multiples of 8 bytes)	5	05
5	05	**MULTI RECORD AREA OFFSET** (In multiples of 8 bytes)	15	0F
6	06	**PAD** (reserved) Default value is 0.	0	00
7	07	**ZERO CHECK SUM** (256 – (Sum of bytes 0 to 6))	210	D2
		CHASSIS INFO AREA, 32 BYTES		
8	08	**FORMAT VERSION NUMBER** (Default value is 1)	1	01
9	09	**CHASSIS INFO AREA LENGTH** (Default value is 0)	0	00
10	0A	**CHASSIS TYPE** (Default value is 0)	0	00
11	0B	**Chassis Part Number Type/Length 10 byte allocation** 0CAH (if used) (Default value is 0)	0	00
12	0C	**CHASSIS PART NUMBER BYTES**	0	00
13	0D	(Default value is 0)	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 15 byte allocation** 0CFH (if used) (Default value is 0)	207	CF
23	17	**CHASSIS SERIAL NUMBER BYTES**	0	00
24	18	(Default value is 0)	0	00
25	19		0	00
26	1A		0	00
27	1B		0	00
28	1C		0	00
29	1D		0	00
30	1E		0	00
31	1F		0	00
32	20		0	00

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
33 34 35 36 37	20 22 23 24 25	CHASSIS SERIAL NUMBER BYTES, Default value is 0.	0 0 0 0 0	00 00 00 00 00
38	26	**End Tag** (0C1h if used)	193	C1
39	27	**CHKSUM** (Zero CHKSUM if used)	159	9F
		PRODUCT INFORMATION AREA, 80 BYTES		
40	28	**FORMAT VERSION NUMBER** (Product Info Area) 7:4 - Reserved, write as 0000b 3:0 - Format Version Number = 1h for this specification	1	01
41	29	**PRODUCT INFO AREA LENGTH** (In multiples of 8 bytes)	10	0A
42	2A	**Language (English)**	25	19
43	2B	**MANUFACTURER NAME TYPE** / **LENGTH** (0C5H) Type “ASCII+LATIN1” 5 Bytes.	197	C5
		MANUFACTURER'S NAME 5 byte sequence		
44 45 46 47 48	2C 2D 2E 2F 30	“A”= 41h “S”=53h “T”= 54h “E”= 45h “C”= 43h	65 83 84 69 67	41 53 54 45 43
49	31	**Product Name Type/Length (0C8H)** 7-6: (11)b, 8-Bit ASCII + Latin 1, 5-0: (001000)b, 8-Byte Allocation	200	C8
50 51 52 53 54 55 56 57	32 33 34 35 36 37 38 39	“S” = 53H “t” = 74H “a” = 61H “n” = 6EH “d” = 64H “a” = 61H “r” = 72H “d” = 64H	83 116 97 110 100 97 114 100	53 74 61 6E 64 61 72 64
58	3A	**Part/Model Number Type/Length (0C8H)** 7-6: (11)b, 8-Bit ASCII + Latin 1, 5-0: (001000)b, 8-Byte Allocation	200	C8
		Part Number		
59 60 61 62 63 64 65 66	3B 3C 3D 3E 3F 40 41 42	“D” = 44H “S” = 53H “2” = 32H “9“ = 39H “0” = 30H “0” = 30H “-” = 2DH “3” = 33H	68 83 50 57 48 48 45 51	44 53 32 39 30 30 2D 33
67	43	**PRODUCT VERSION NUMBER** Type/Length (C2h) Type = “ASCII+LATIN1” = (11)b Length = 2 bytes = (000010)b	194	C2
68 69	44 45	“0” = 30H “B”= 42H	48 66	30 42
70	46	Product Serial Number Type/Length (0CDH)	205	CD
		Product Serial Number: MODEL ID		
71 72 73 74	47 48 49 4A	“G” = 47H “1” = 31H “0” = 30H “0” = 30H	71 49 48 48	47 31 30 30

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		PRODUCT SERIAL NUMBER:MANUFACTURING YEAR AND WEEK CODE(PER UNIT)		
75	4B	"W"=57H	87	57
76	4C	"W"=57H		
		Product Serial Number: UNIQUE SERIAL NUMBER (PER UNIT)		
77	4D	"S"=53H	83	53
78	4E	"S"=53H		
79	4F	"S"=53H		
80	50	"S"=53H		
		Product Serial Number: MODEL REVISION		
81	51	"0"= 30H	48	30
82	52	"B"= 42H	66	42
83	53	"P" = 50H (P for Laguna Philippines)	80	50
84	54	ASSET TAG 7-6: (11)b, 8-Bit ASCII + Latin 1, 5-0: (000111)b, 7-Byte Allocation	199	C7
85	55	NO ASSET TAG	0	00
86	56		0	00
87	57		0	00
88	58		0	00
89	59		0	00
90	5A		0	00
91	5B		0	00
92	5C	**FRU File ID** 7-6: (11)b, 8-Bit ASCII + Latin 1, 5-0: (010001)b, 17-Byte Allocation REFER TO IPS FOR LATEST FRU FILE NAME	209	D1
93	5D	**"Should track latest FRU File ID on Sec. 1.1"**	0	00
94	5E	NOT USED	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		0	00
104	68		0	00
105	69		0	00
106	6A		0	00
107	6B		0	00
108	6C		0	00
109	6D		0	00
110	6E	**End of Fields Marker**	193	C1
111	6F	**Reserved**	0	00
112	70	**Reserved**	0	00
113	71	**Reserved**	0	00
114	72	**Reserved**	0	00
115	73	**Reserved**	0	00
116	74	**Reserved**	0	00
117	75	**Reserved**	0	00
118	76	**Reserved**	0	00
119	77	**Reserved**	54	36
Multi Record Area, 72 Bytes				

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		POWER SUPPLY RECORD HEADER		
120	78	**Record Type ID** (0x00 = Power Supply Information)	0	00
121	79	7: (0)b, End of List 6-4: (000)b, Reserved 3-0: (0010)b, Record Format Version	2	02
122	7A	**Record Length: 24 Bytes**	24	18
123	7B	**Record Checksum (Zero Checksum From 125d To 148d)**	203	CB
124	7C	**Header Checksum (Zero Checksum From 120d To 123d)**	27	1B
125 126	7D 7E	**Overall Capacity** (Watts) 15-12: (0000)b, Reserved 11-0: (101000101000)b, 2900W = 0B54H Stored with LSB first then MSB.	84 11	54 0B
127 128	7F 80	**Peak VA** (Watts) 15-12: (0000)b, Reserved 11-0: **No peak VA rating** Stored with LSB first then MSB.	0 0	00 00
129	81	**Inrush Current** (Amps) 50Amps = 32H	50	32
130	82	**Inrush Interval** (ms) 100ms = 64H	100	64
131 132	83 84	**Low End Input Voltage Range 1** 180V = 18000 (x10mV) = 4650H Stored with LSB first then MSB.	80 70	50 46
133 134	85 86	**High End Input Voltage Range 1** 264V = 26400 (x10mV) = 6720H Stored with LSB first then MSB.	32 103	20 67
135 136	87 88	**Low End Input Voltage Range 2** NOT USED Stored with LSB first then MSB.	0 0	00 00
137 138	89 8A	**High End Input Voltage Range 2** NOT USED Stored with LSB first then MSB.	0 0	00 00
139	8B	**Low End Input Frequency Range,** 47Hz = 2FH	47	2F
140	8C	**High End Input Frequency Range**, 63Hz = 3FH	63	3F
141	8D	A/C Dropout Tolerance in ms, 12ms = 0CH	12	0C
142	8E	Binary Flags 7-5: (000)b, Reserved 4: (1)b, Tachometer Pulses per Rotation / Predictive Fail Polarity (2 Pulses Per Rotation = 1; 1 Pulse Per Rotation = 0) OR (Signal Asserted(1) Indicates Failure = 0, Signal Deasserted(0) Indicates Failure = 1) 3: (1)b, Hot Swap / Redundancy Support 2: (0)b, AutoSwitch Support 1: (1)b, Power Factor Correction Support 0: (0)b, Predictive Fail Support	26	1A
143 144	8F 90	**Peak Wattage Capacity and Holdup Time** 15-12: (0000)b, Hold Up Time in Seconds = 00H (Not Specified) 11-0: (000000000000)b, Peak Capacity in Watts = 00H (Not Specified)	0 0	00 00
145 146 147	91 92 93	**Combined Wattage** Byte 1: 048 = 30H Bits 7-4: 0011B for 3V3 Bits 3-0: 0000B for 12V Byte 2 and Byte 3: 54H, 0BH (2900W = 0B54H)	48 84 11	30 54 0B

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
148	94	**Predictive Fail Tachometer Lower Threshold,** Not applicable	0	00
		12V DC OUTPUT RECORD HEADER		
149	95	**Record Type ID** (0x01 = DC Output)	1	01
150	96	**End Of List/Record Format Version Number** 7: (0)b, End of List 6-4: (000)b, Reserved 3-0: (0010)b, Record Format Version	2	02
151	97	**Record Length: 13 Bytes**	13	0D
152	98	**Record Checksum** (Zero Checksum From 154d To 166d)	78	4E
153	99	**Header Checksum** (Zero Checksum From 149d To 152d)	162	A2
		+12V DC Output Record		
154	9A	**+12V Output Information** 7: (0)b, Standby 6-4: (000)b, Reserved 3-0: (0001)b, Output Number 1 = 001b	1	01
155 156	9B 9C	Nominal Voltage 12.00V = 1200 (x10mV) = 04B0H Stored with LSB first then MSB.	176 4	B0 04
157 158	9D 9E	**Maximum Negative Voltage Deviation** 11.52V = 1152 (x10mV) = 0480H Stored with LSB first then MSB.	128 4	80 04
159 160	9F A0	**Maximum Positive Voltage Deviation** 12.48V = 1248 (x10mV) = 04E0H Stored with LSB first then MSB.	224 4	E0 04
161 162	A1 A2	Ripple And Noise pk-pk 10Hz To 30MHz (mV) 120mV = 0078H Stored with LSB first then MSB.	120 0	78 00
163 164	A3 A4	**Minimum Current Draw** (10mA) 0000 = 0000H Stored with LSB first then MSB.	0 0	00 00
165 166	A5 A6	**Maximum Current Draw** (10mA) 240.0A = 24000(x10mA) = 5DC0H Stored with LSB first then MSB.	192 93	C0 5D
		3V3SB DC OUTPUT RECORD HEADER		
167	A7	**Record Type ID** (0x01 = DC Output)	1	01
168	A8	**End Of List/Record Format Version Number** 7: (1)b, End of List 6-4: (000)b, Reserved 3-0: (0010)b, Record Format Version	130	82
169	A9	**Record Length: 20 Bytes**	20	14
170	AA	Record Checksum (Zero Checksum From 172d To 191d)	52	34
171	AB	Header Checksum (Zero Checksum From 167d To 170d)	53	35
		3V3SB DC Output Record		
172	AC	**3V3SB Output Information** 7: (1)b, Standby (Bit = 1 to indicate standby output) 6-4: (000)b, Reserved 3-0: (0010)b, Output Number 2 = 010b	130	82
173 174	AD AE	**Nominal Voltage** 3.30V = 330 (x10mV) = 014AH Stored with LSB first then MSB.	74 1	4A 01
175 176	AF B0	**Maximum Negative Voltage Deviation** 3.14V = 314 (x10mV) = 013AH Stored with LSB first then MSB.	58 1	3A 01

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
177 178	B1 B2	**Maximum Positive Voltage Deviation** 3.46V = 346 (x10mV) = 015AH Stored with LSB first then MSB.	90 1	5A 01
179 180	B3 B4	**Ripple And Noise pk-pk 10Hz To 30MHz** (mV) 60mV = 003CH Stored with LSB first then MSB.	60 0	3C 00
181 182	B5 B6	**Minimum Current Draw** (10mA) 000 = 0000H Stored with LSB first then MSB.	0 0	00 00
183 184	B7 B8	**Maximum Current Draw** (10mA) 3.00A = 300(x 10mA) = 012CH Stored with LSB first then MSB.	44 1	2C 01
185	B9	Reserved	0	00
186	BA	Reserved	0	00
187	BB	Reserved	0	00
188	BC	Reserved	0	00
189	BD	Reserved	0	00
190	BE	Reserved	0	00
191	BF	Reserved	0	00
INTERNAL USE AREA, 64 BYTES				
192	C0	**Format Version Number** 7:4 -reserved, write as 0000b 3:0 -format version number = 1h for this specification.	1	01
193	C1	RESERVED	0	00
194	C2	RESERVED	0	00
195	C3	RESERVED	0	00
196	C4	RESERVED	0	00
197	C5	RESERVED	0	00
198	C6	RESERVED	0	00
199	C7	RESERVED	0	00
200	C8	RESERVED	0	00
201	C9	RESERVED	0	00
202	CA	RESERVED	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

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		INTERNAL USE AREA, 40 BYTES		
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	**CHKSUM:** (From 192 to 254 if used)	255	FF

DS2900-3-002/-003 FRU (EEPROM) deviations:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
PRODUCT INFORMATION AREA, 80 BYTES				
44	2C	**Manufacturer Name** "E"=045H	69	45
45	2D	"M"=04DH	77	4D
46	2E	"R"=052H	82	52
47	2F	"S"=053H	83	53
48	30	"N"=04EH	78	4E
49	31	**Product Name Type/Length (0CCH)** 7-6: (11)b, 8-Bit ASCII + Latin 1, 5-0: (001100)b, 8-Byte Allocation	200	C8
58	3A	**Part/Model Number Type/Length (0CBH)** 7-6: (11)b, 8-Bit ASCII + Latin 1, 5-0: (001110)b, 12-Byte Allocation	204	CC
		Part Number		
59	3B	"X" = 058H	88	58
60	3C	"X" = 058H	88	58
61	3D	"X" = 058H	88	58
62	3E	"X" = 058H	88	58
63	3F	"X" = 058H	88	58
64	40	"X" = 058H	88	58
65	41	"X" = 058H	88	58
66	42	"X" = 058H	88	58
67	43	"X" = 058H	88	58
68	44	"X" = 058H	88	58
69	45	"X" = 058H	88	58
70	46	"X" = 058H where "XXXXXXXXXXXX" is: DS2900-3-002: "DS2900-3-002" DS2900-3-003: "DS2900-3-003"	88	58
		Product Version Number/Auto Rev		
72	48	"X" = 058H	88	58
73	49	"X" = 058H Where "XX" is: DS2900-3-002: "0X" DS2900-3-003: "0X"	88	58
		Product Serial Number: MODEL ID		
75	4B	"X" = 058H	88	58
76	4C	"X" = 058H	88	58
77	4D	"X" = 058H	88	58
78	4E	"X" = 058H Where "XXXX" is: DS2900-3-002: **"I772"** DS2900-3-003: **"I771"**	88	58
		Product Serial Number: MODEL REVISION		
85	55	"X" = 058H	88	58
86	56	"X" = 058H Where "XX" is: DS2900-3-002: "0X" DS2900-3-003: "0X"	88	58
119	77	Zero Check Sum (256- (Sum of bytes 040d to 118d))	Per Unit	
POWER SUPPLY RECORD HEADER				
123	7B	Record Checksum (Zero Checksum From 125d To 148d)	92	5C
124	7C	Header Checksum (Zero Checksum From 120d To 123d)	138	8A
141	8D	A/C Dropout Tolerance in ms, 10ms = 0AH	10	0A
145	91	**Combined Wattage**	0	00
146	92	NOT APPLICABLE	0	00
147	93		0	00

DS2900-3-002/-003 FRU (EEPROM) deviations:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		5VSB DC OUTPUT RECORD HEADER		
169	A9	**Record Length: 13Bytes**	13	0D
170	AA	Record Checksum (Zero Checksum From 172d To 184d)	164	A4
171	AB	Header Checksum (Zero Checksum From 167d To 170d)	204	CC
		5VSB DC Output Record		
		Nominal Voltage		
173	AD	5.0V = 500 (x10mV) = 01F4H	244	F4
174	AE	Stored with LSB first then MSB.	1	01
		Maximum Negative Voltage Deviation		
175	AF	4.75V = 475 (x10mV) = 01DBH	219	DB
176	B0	Stored with LSB first then MSB.	1	01
		Maximum Positive Voltage Deviation		
177	B1	5.25V = 525 (x10mV) = 020DH	13	0D
178	B2	Stored with LSB first then MSB.	2	02
		Maximum Current Draw (10mA)		
183	B7	2.00A = 200(x 10mA) = 00C8H	200	C8
184	B8	Stored with LSB first then MSB.	0	00

DS2900-3-004 FRU (EEPROM) deviations:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
PRODUCT INFORMATION AREA, 80 BYTES				
44	2C	**Manufacturer Name** "E"=045H	69	45
45	2D	"M"=04DH	77	4D
46	2E	"R"=052H	82	52
47	2F	"S"=053H	83	53
48	30	"N"=04EH	78	4E
49	31	**Product Name Type/Length (0CCH)** 7-6: (11)b, 8-Bit ASCII + Latin 1, 5-0: (001100)b, 8-Byte Allocation	200	C8
58	3A	**Part/Model Number Type/Length (0CBH)** 7-6: (11)b, 8-Bit ASCII + Latin 1, 5-0: (001110)b, 12-Byte Allocation	204	CC
		Part Number		
59	3B	"X" = 058H	88	58
60	3C	"X" = 058H	88	58
61	3D	"X" = 058H	88	58
62	3E	"X" = 058H	88	58
63	3F	"X" = 058H	88	58
64	40	"X" = 058H	88	58
65	41	"X" = 058H	88	58
66	42	"X" = 058H	88	58
67	43	"X" = 058H	88	58
68	44	"X" = 058H	88	58
69	45	"X" = 058H	88	58
70	46	"X" = 058H where "XXXXXXXXXXXX" is: DS2900-3: "DS2900-3" DS2900-3-004: "DS2900-3-004"	88	58
		Product Version Number/Auto Rev		
72	48	"X" = 058H	88	58
73	49	"X" = 058H Where "XX" is: DS2900-3: "0X" DS2900-3-004: "0X"	88	58
		Product Serial Number: MODEL ID		
75	4B	"X" = 058H	88	58
76	4C	"X" = 058H	88	58
77	4D	"X" = 058H	88	58
78	4E	"X" = 058H Where "XXXX" is: DS2900-3: **"G100"** DS2900-3-004: **"I773"**	88	58
		Product Serial Number: MODEL REVISION		
85	55	"X" = 058H	88	58
86	56	"X" = 058H Where "XX" is: DS2900-3: "0X" DS2900-3-004: "0X"	88	58
119	77	Zero Check Sum (256- (Sum of bytes 040d to 118d))	Per Unit	
POWER SUPPLY RECORD HEADER				
123	7B	Record Checksum (Zero Checksum From 125d To 148d)	92	5C
124	7C	Header Checksum (Zero Checksum From 120d To 123d)	138	8A
141	8D	A/C Dropout Tolerance in ms, 10ms = 0AH	10	0A
145	91	**Combined Wattage**	0	00
146	92	NOT APPLICABLE	0	00
147	93		0	00

DS2900-3-004 FRU (EEPROM) deviations:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
3.3VSB DC OUTPUT RECORD HEADER				
169	A9	**Record Length: 13Bytes**	13	0D
170	AA	Record Checksum (Zero Checksum From 172d To 184d)	52	34
171	AB	Header Checksum (Zero Checksum From 167d To 170d)	60	3C
5VSB DC Output Record				
		Nominal Voltage		
173	AD	3.3V = 330 (x10mV) = 014AH	74	4A
174	AE	Stored with LSB first then MSB.	1	01
		Maximum Negative Voltage Deviation		
175	AF	3.14V = 314 (x10mV) = 013AH	5B	3A
176	B0	Stored with LSB first then MSB.	1	01
		Maximum Positive Voltage Deviation		
177	B1	3.46V = 346 (x10mV) = 015AH	90	5A
178	B2	Stored with LSB first then MSB.	01	01
		Maximum Current Draw (10mA)		
183	B7	3.00A = 300(x 10mA) = 012CH	44	2C
184	B8	Stored with LSB first then MSB.	1	01

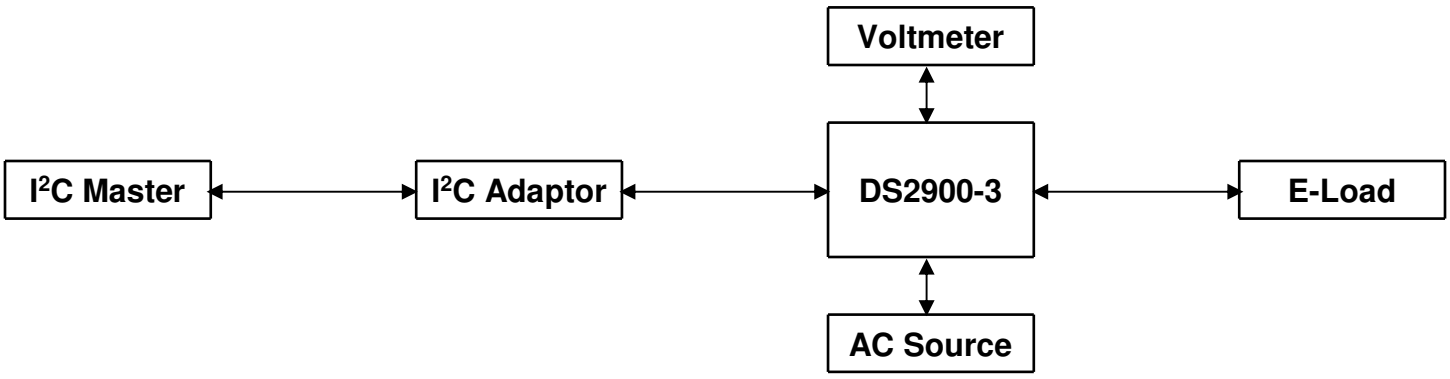
PMBus™ Interface Support

The DS2900-3 is compliant with the industry standard PMBus™ protocol for monitoring and control of the power supply via the I²C interface port.

DS2900-3 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 0x10h

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.

DS2900-3 Series Support PMBus™ Command List

The DS2900-3 is compliant with the industry standard PMBus™ protocol for monitoring and control of the power supply via the i²C interface port.

DS2900-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
01h	OPERATION	88	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.
	b7:6	10				00 – Immediate Turn OFF (No Sequencing) 01 – Soft Turn OFF (With Sequencing) 10 – PSU ON
	b5:4	00				01 – Margin Low 10 – Margin High 00 – No Margin
	b3:2	10				01 – Ignore Fault 10 – Act On Fault
	b1:0	00				Reserved
02h	ON_OFF_CONFIG	14	R/W	1		Configures the combination of CONTROL pin and serial communication commands needed to turn the Unit ON/OFF.
	b7:5	000				Reserved
	b4 – Enable CONTROL pin and Serial communication control.	1				0 – Unit powers up any time power is present regardless of the state of CONTROL pin. 1 – Unit powers up as dictated by CONTROL pin and OPERATION command (b3:0)
	b3 – Serial communication Control	0				0 – Unit Ignores ON/OFF portion of the OPERATION command. 1 – Enables Serial communication ON/OFF portion of OPERATION command. Requires CONTROL pin to be asserted for the unit to start and energize the output.
	b2 – Sets how the unit responds to CONTROL pin	1				0 – Unit ignores CONTROL pin. (ON/OFF controlled by OPERATION command). 1 – Unit requires CONTROL pin to be asserted to start the unit.
	b1 - CONTROL pin polarity	0				0 – Unit ignores CONTROL pin. (ON/OFF controlled by OPERATION command). 1 – Unit requires CONTROL pin to be asserted to start the unit.
	b0 – CONTROL pin Action	0				0 – Use programmed turn ON/OFF delay 1 – Turn OFF the output and stop transferring energy to the output as fast as possible.
03h	CLEAR_FAULTS	0	S			
10h	WRITE_PROTECT	80	R/W	1		Used to Control Writing to the PMBus Device 80h - Disables write except 10h 40h - Disables write except 10h, 01h, 00h 20h - Disables write except 10h,01h,00h,02h and 21h commands 00 - Enables write to all writeable commands.
11h	STORE_DEFAULT_ALL	-	S	0		Copies the Value of the Operating memory table to the matching DEFAULT non-volatile memory.
12h	RESTORE_DEFAULT_ALL	-	S	0		Copies the entire contents of the DEFAULT non-volatile memory to the Operating memory table.
15h	STORE_USER_ALL	-	S	0		Copies the Operating memory table to the matching USER non-volatile memory.

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	
16h	RESTORE_USER_ALL	-	S	0		Copies the entire USER non-volatile memory to the Operating memory table.
19h	CAPABILITY	00	R	1		Provides a way for the hosts system to determine some key capabilities of a PMBus device.
	b7 - Packet Error Checking	0				0 - PEC not supported 1 - PEC supported
	b6 - Maximum Bus Speed	1				0 - Maximum supported bus speed, 100khz 1 - Maximum supported bus speed, 400khz
	b5 - SMBALERT#	0				0 - SMBus Alert Pin not supported 1 - SMBus Alert Pin supported
	b4:0	00000				Reserved
20h	VOUT_MODE	40	R	1		Specifies the mode and parameters of Output Voltage related Data Formats
21h	VOUT_COMMAND	21900	R/W	2	Linear	Sets the Output Voltage Reference Vout command sends discreet value to change or trim output voltage. The value acts as Digital reference of the Power supply after additional operations are performed (to make the representation compatible). Affects OVP_WARNING and FAULT LIMIT, as well as POWER_GOOD_ON/OFF level.
24h	VOUT_MAX	04D4	R	2	Direct	Sets the max adjustable output voltage limit.
29h	VOUT_SCALR_MONITOR	17955	R/W	2	Linear	Ratio of ADC value to the actual voltage. A discreet value, to scale the reading of output voltage, using Read_Vout command. Vout scale = Vout * 32768 / Vref Vout is the output voltage in mV 32768 is ADC max ADCread can be scaled using Vref value. i.e.. using Vref value as an example. Voutscale = 12050 * 32768 / 24824 Voutscale = 15906
30h	COEFFICIENTS		R/W	5		use to retrieve the m, b and R coefficients, needed for DIRECT data format
	byte 1:2	0100				mlow Byte, m high byte
	byte 3:4	0000				b low Byte, b high byte
	byte 5	02				R byte
31h	POUT_MAX	12D5	R/W	2	Linear	Sets the operating power limit condition.
35h	VIN_ON	F2D0	R	2	Linear	Sets the value of input, in volts, at which the unit should start. ACGOOD 88Vac
36h	VIN_OFF	F2A8	R	2	Linear	Sets the value of input, in volts, at which the unit should stop power conversion. ACBAD
38h	IOUT_CAL_GAIN	25540	R	2		The ratio of voltage across the Current Sense to actual current.
39h	IOUT_CAL_OFFSET	0000	R/W	2		Used to null any offsets in the current sensing circuit. Normally used in conjunction with the IOUT_SCALE to minimize current sensing error.
3Ah	FAN_ CONFIG_1_2	90	R/W	1		Used to configure up to 2 fans associated with one PMBus device
	b7	1				1 – Fan is installed in position 1 0 – No Fan is installed in position 1
	b6	0				1 – Fan is commanded in RPM 0 – Fan is commanded in DC

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	
	b5:4	01				00 – 1 pulse per revolution 01 – 2 pulses per revolution 10 – 3 pulses per revolution 11 – 4 pulses per revolution
	b3	1				1 – Fan is commanded in RPM 0 – Fan is commanded in DC
	b2	0				1 – Fan is commanded in RPM 0 – Fan is commanded in DC
	b1:0	01				00 – 1 pulse per revolution 01 – 2 pulses per revolution 10 – 3 pulses per revolution 11 – 4 pulses per revolution
3Bh	FAN_COMMAND_1 (used by both Fan 1 and 2)	0000	R/W	2	Linear	Adjusts the operation of the Fans. The device may override the command, if it requires higher value, to maintain proper device temperature. RPM Control – Commands Speeds from 0-65535 RPM. Duty cycle Control – Commands Speeds from 0 to 100%
40h	VOUT_OV_FAULT_LIMIT	05A0	R/W	2	Direct	Sets Output Over voltage threshold.
41h	VOUT_OV_FAULT_RESPONSE	C0	R/W	1	-	Unit Latches OFF. Resets on PSON or CONTROL pin recycle or AC recycle.
42h	VOUT_OV_WARN_LIMIT	0504	R/W	2	Direct	Sets Over-voltage Warning threshold.
43h	VOUT_UV_WARN_LIMIT	03E8	R/W	2	Direct	Sets Under-voltage Warning threshold.
44h	VOUT_UV_FAULT_LIMIT	0190	R/W	2	Direct	Sets Under-voltage Fault threshold.
45h	VOUT_UV_FAULT_RESPONSE	C0	R/W	1	-	Turn PSU OFF
46h	IOUT_OC_FAULT_LIMIT	6720	R/W	2	Direct	Sets the Over current threshold in Amps.
47h	IOUT_OC_FAULT_RESPONSE	81	R/W	1	-	OCP ride through. If OCP persists.
48h	IOUT_OC_LV_FAULT_LIMIT	6720	R/W	2	Direct	Specifies low-level voltage limit during constant current OC condition.
49h	IOUT_OC_LV_FAULT_RES	00	R/W	1	-	Unit Latch OFF. Cleared on PSON or AC recycle.
4Ah	IOUT_OC_WARN_LIMIT	6720	R/W	2	Direct	Sets the Over Current Warning threshold in Amps.
4Fh	OT_FAULT_LIMIT	157C	R/W	2	Direct	Secondary ambient temperature Fault threshold, in degree C.
50h	OT_FAULT_RESPONSE	FF	R/W	1		Turn PSU OFF and retry once Over temp Fault is removed.
51h	OT_WARN_LIMIT	1388	R/W	2	Direct	Secondary ambient temperature warning threshold, in degree C. Operating limit. refer to section 3.1
55h	VIN_OV_FAULT_LIMIT	FA26	R	2	Linear	Sets input over-voltage threshold.
56h	VIN_OV_FAULT_RESPONSE	C0	R	1		Turn PSU OFF. Cleared upon AC recycle.
57h	VIN_OV_WARN_LIMIT	FA1C	R	2	Linear	Sets the threshold of input voltage that triggers high voltage warning.
5Bh	IIN_OC_FAULT_LIMIT	DA80	R	2	Linear	Sets the threshold for input current that causes over-current fault within 100ms.
5Ch	IIN-OC-FAULT_RESPONSE	C0	R	1		Turn PSU OFF. cleared upon AC recycle.
5Dh	IIN_OC_WARN_LIMIT	DA80	R	2	Linear	Input Over Current warning threshold.
5Eh	POWER_GOOD_ON	04AB	R	2	Direct	Sets the threshold by which the Power Good signal is asserted.
5Fh	POWER_GOOD_OFF	048C	R	2	Direct	Sets the threshold by which the Power Good signal is de-asserted.

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	
60h	TON_DELAY	0064	R/W	2	Direct	Sets the time (ms), from start condition (Power ON) until the output starts to rise. default value is 0ms.
61h	TON_RISE	1770	R/W	2	Direct	Sets the time (ms), for the output rises from 0 to regulation. default value is 0ms.
64h	TOFF_DELAY	0096	R/W	2	Direct	Sets the time (ms), from a stop condition (Power OFF) until the output starts to drop (converter OFF).(23ms)
78h	STATUS_BYTE	-	R	1		Returns the summary of critical faults
	b7 – BUSY	-				A fault was declared because the device was busy and unable to respond.
	b6 – OFF	-				Unit is OFF
	b5 – VOUT_OV	-				Output over-voltage fault has occurred
	b4 – IOUT_OC	-				Output over-current fault has occurred
	b3 - VIN_UV	-				An input under--voltage fault has occurred
	b2 - TEMPERATURE	-				A temperature fault or warning has occurred
	b1 – CML	-				A communication, memory or logic fault has occurred.
	b0 – NONE OF THE ABOVE	-				A Fault Warning not listed in bits[7:1] has occurred.
79h	STATUS_WORD	-	R	2		Summary of units Fault and warning status.
	b15 – VOUT					An output voltage fault or warning has occurred
	b14 – IOUT/POUT					An Output current or power fault or warning has occurred.
	b13 – INPUT					An input voltage, current or power fault or warning as occurred.
	b12 – MFR					A manufacturer specific fault or warning has occurred.
	b11 – POWER_GOOD#					The POWER_GOOD signal is de-asserted
	b10 - FANS					A fan or airflow fault or warning has occurred.
	b9 – OTHER					A bit in STATUS_OTHER is set.
	b8 – UKNOWN					A fault type not given in bits [15:1] of the STATUS_WORD has been detected.
	b7 – BUSY					A fault was declared because the device was busy and unable to respond.
	b6 – OFF					Unit is OFF
	b5 – VOUT_OV					Output over-voltage fault has occurred
	b4 – IOUT_OC					Output over-current fault has occurred
	b3 - VIN_UV					An input under-voltage fault has occurred
	b2 – TEMPERATURE					A temperature fault or warning has occurred
	b1 – CML					A communication, memory or logic fault has occurred.
	b0 – NONE_OF_THE_ABOVE					A fault or warning not listed in bits[7:1] of this byte has occurred.
7Ah	STATUS_VOUT	-	R	1		Output voltage related faults and warnings
	b7					VOUT Over--voltage Fault
	b6					VOUT Over-voltage warning
	b5					VOUT Under-voltage Warning
	b4					VOUT Under-voltage Fault

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	
	b3					VOUT_MAX Warning, an attempt has been made to set output to a value higher that the highest permissible voltage.
	b2					
	b1					
	b0					reserved
7Bh	STATUS_IOUT		R	1		Output Current related faults and warnings
	b7					IOUT Over current Fault
	b6					IOUT Over current And Low Voltage shutdown Fault
	b5					IOUT Overcurrent Warning
	b4					IOUT Undercurrent Fault
	b3					Current Share Fault, Set if Ishare level is much greater or lower than the actual output current. Refer to section 5.13 for Load sharing limits.
	b2					Power Limiting
	b1					
	b0					
7Ch	STATUS_INPUT	-	R	1		Input related faults and warnings
	b7					VIN Overvoltage Fault
	b6					VIN Overvoltge Warning
	b5					
	b4					
	b3					Unit is OFF for insufficient Input Voltage
	b2					IIN Overcurrent Fault
	b1					IIN Overcurrent Warning
	b0					
7Dh	STATUS_TEMPERATURE	-	R	1		Temperature related faults and warnings
	b7					Overtemperature Fault
	b6					Overtemperature Warning
	b5					Undertemperature Warning
	b4					Undertemperature Fault
	b3:0					reserved
7Eh	STATUS_CML	-	R	1		Communications, Logic and Memory
	b7					Invalid or unsupported Command Received
	b6					
	b5					Packet Error Check Failed
	b4					Memory Fault Detect, CRC Error
	b3					
	b2					Reserved
	b1					
	b0					
80h	STATUS_MFR_SPECIFIC	-	R	1		Manufacturer Status codes
	b7					Bulk OK, 1- Bulk is within range and is ready for use
	b6					BulkUV, 1- Bulk is below operating range
	b5					BulkOV, 1 – Bulk voltage reached OVP limit.
	b4					Primary_OTP1, Heatsink OTP

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	
	b3					Primary_OTP2, Ambient OTP
	b2					reserved
	b1					reserved
	b0					PSON, CONTROL Pin Status 1 – asserted, 0 - deasserted
81h	STATUS_FANS_1_2		R	1		
	b7					Fan 1 Fault
	b6					Fan 2 Fault
	b5					Fan 1 Warning
	b4					Fan 2 Warning
	b3					Fan_1 Speed Overridden
	b2					Fan_2 Speed Overridden
	b1					
	b0					
88h	READ_VIN	-	R	2	Linear	Returns input Voltage in Volts ac.
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	Direct	Returns the actual, measured voltage in Volts.
8Ch	READ_IOUT	-	R	2	Direct	Returns the output current in amperes.
8Dh	READ_TEMPERATURE_1	-	R	2	Direct	Secondary Ambient Temperature
8Eh	READ_TEMPERATURE_2	-	R	2	Direct	Primary Heat-sink Temperature
8Fh	READ_TEMPERATURE_3	-	R	2	Direct	Primary Ambient Temperature
90h	READ_FAN_SPEED_1	-	R	2	Linear	Speed of Fan 1
91h	READ_FAN_SPEED_2	-	R	2	Linear	Speed of Fan 2
94h	READ_DUTY_CYCLE	-	R	2	Direct	Returns the Duty Cycle of the main power converter in percent.
95h	READ_FREQURNCY	-	R	2	Direct	Returns the actual switching frequency of the main power converter in kHz.
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	11	R	1		Reads the PMBus revision number
	b7:5	0001				Part 1 Revision 0000 – Revision 1.0 0001 – Revision 1.1
	b4:0	0001				Part 2 Revision 0000 – Revision 1.0 0001 – Revision 1.1
99h	MFR_ID	"ALL"	BR/W	4		Abbrev or symbol of manufacturers name.
9Ah	MFR_MODEL	"DS2900"	BR/W	6		Manufacturers Model number, ASCII format
9Bh	MFR_REVISION	"1.0"	BR/W	2		Manufacturers, revision number, ASCII format
9Ch	MFR_LOCATION	"xxx"	BR/W	3		Manufacturers facility, ASCII format
9Dh	MFR_DATE	"xxxxxxx"	BR/W	6		Manufacture Date, ASCII format structure : YYMMDD
9Eh	MFR_SERIAL	"xxxxxxxxxxxxxxx"	BR	16		Unit serial number, ASCII format.
A0h	MFR_VIN_MIN	F2D0	R	2	Linear	Minimum Input Voltage (90Vac)
A1h	MFR_VIN_MAX	FA10	R	2	Linear	Maximum Input Voltage (264Vac)
A2h	MFR_IIN_MAX	DA80	R	2	Linear	Maximum Input Current (13A)
A3h	MFR_PIN_MAX	1325			Linear	Maximum Input Power

DS2900-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value (HEX)	Access Type	Data Bytes	Data Format	
A4h	MFR_VOUT_MIN	048C	R	2	Direct	Minimum Output Voltage Regulation Window.
A5h	MFR_VOUT_MAX	04D4	R	2	Direct	Maximum Output Voltage. Regulation Window(12.36)
A6h	MFR_IOUT_MAX	5DC0	R	2	Direct	Maximum Output Current (150A)
A7h	MFR_POUT_MAX	12D5	R	2	Linear	Maximum Output Power (2900W)
A8h	MFR_TAMBIENT_MAX	1388	R	2	Direct	Maximum Operating Ambient Temperature (Secondary Ambient) (40 degC)
A9h	MFR_TAMBIENT_MIN	0000	R	2	Direct	Minimum Operating Ambient Temperature (Secondary Ambient) (-10 degC)
D0h	Primary_OTP	EB48	R	2	Direct	Primary Over Temperature Limit
D1h	STBY_UV	012C	R/W	2	Direct	Standby Under-voltage Level
D2h	Min Fan Speed	12DF	R/W	2	-	Standby Fan Speed, (13200 rpm / 20% Duty Cycle)
D3h	Max Fan Speed	2396	R/W	2	-	Normal operation Fan Speed (38400 rpm / 100% Duty Cycle)
D4h	MFR_STATUS WORD HISTORY	0000	R/W	2	-	Stores a copy of STATUS_WORD during the most recent fault.
E0h	READ_STBY	-	R	2	-	Read Standby Voltage
E3h	READ_PIN	-	R	2	-	Variable. Used by Factory to trim Ishare Voltage Slope. Default before tirmming, FF7F
E4h	READ_EFF	-	R	2	-	Read Efficiency

Current Sharing

The DS2900-3 series' main output V1 is equipped with current sharing capability. This will allow up to 4 power supplies to be connected in parallel for higher power application. Current share accuracy is typically 10% of full load. All current sharing functions are implemented internal to the power supply by making use of the 12V IShare signal. The system connects the 12V IShare lines between the power supplies.

Standby Load Sharing

Each 3.3Vsb/3.0A or 5V/2A standby output in the system will deliver current up to the current limit point. At this point the power supply will go into constant current mode and allow other power supplies in the system to deliver additional standby current (Droop method I sharing)

Redundancy / Fault Tolerance

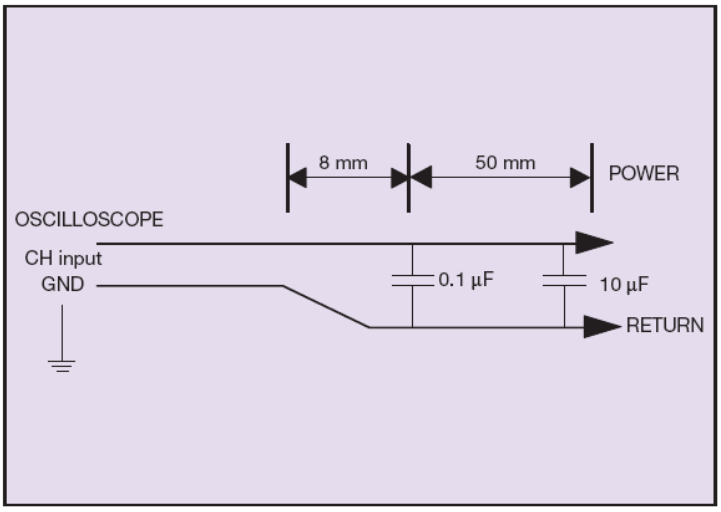
The DS2900-3 series power supplies will allow up to 8 power supplies to be connected in an N+1 redundant load. where n =1, 2, 3, 4…

Any failure of one power supply in parallel as well as hot swapping shall not cause more than a 4% change in main output. Current share accuracy is typically 3% of full load. The Failure of one or more supplies will not cause the remaining supplies to violate any of the input or output specifications noted in this specification including all status signals.

The latch of the DS2900-3 power supply is designed to prevent the latch from depressed if the AC cord is attached to the power supply. In order to remove the power supply from system chassis, the AC cord must be removed first so the power supply will always be in the powered off state during the removal from system chassis.

Output Ripple and Noise Measurement

The setup outlined in the diagram below has been used for output voltage ripple and noise measurements on the DS2900 Series. When measuring output ripple and noise, a scope jack in parallel with a 0.1uF ceramic chip capacitor, and a 10 uF aluminum electrolytic capacitor should be used. Oscilloscope should be set to 20 MHz bandwidth for this



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