

ARTESYN DS750PED-3 SERIES

750 Watts Distributed Power System



PRODUCT DESCRIPTION

Advanced Energy's DS750PED-3 series bulk front end AC-DC power supply accepts a wide range 90 to 264Vac input and provides a main 12V output plus a 12V standby output. Rated at 750 watts, it is an 80 Plus Platinum power supply with a peak conversion efficiency of 94%. Housed in a 1U high rack-mounting enclosure with a short form factor that frees up system space, the DS750PED-3 has a high power density of 16.4 watts per cubic in. This series comes in two airflow versions — dc-connector to ac-connector and vice versa. The main 12V output can deliver up to 62.5A and stays within regulation down to zero load, making it perfect for feeding downstream DC-DC converters in systems that use distributed power architectures.

SPECIAL FEATURES

- 750W output power
- 1U power supply
- High power and short form factor
- Active power factor correction
- High-density design: 16.4W/in³
- EN61000-3-2 harmonic compliance
- Inrush current control
- +12Vdc output
- +12Vdc standby
- N+N, N+1 redundant
- Hot-pluggable
- Active current sharing (10 to 100% load)
- Compatible with Artesyn's Universal PMBus™ GUI
- Reverse airflow option
- Two years warranty

SAFETY

- UL/cUL62368 (UL Recognized)
- Demko+CB Report EN62368
- EN62368
- CE Mark
- UKCA Mark
- China CCC
- BSMI

TYPICAL APPLICATIONS

- Industrial

AT A GLANCE

Total Power

750 Watts

Input Voltage

90 to 264 Vac

of Outputs

Main and Standby



MODEL NUMBERS

Standard	Output Voltage	Minimum Load	Maximum Load	Stand-By Supply	Air Flow Direction
DS750PED-3	12.0Vdc	0.5A	62.5A	12V@3A	Forward (DC Connector to Red Handle)
DS750PED-3-001	12.0Vdc	0.5A	62.5A	12V@3A	Reverse (Handle to DC Blue 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	Models	Symbol	Min	Typ	Max	Unit
Input Voltage AC continuous operation	All models	$V_{IN,AC}$	90	-	264	Vac
Maximum Output Power (Main + Standby)	All models	$P_{O,max}$	-	-	750	W
Isolation Voltage						
Input to outputs	All models		-	-	3000	Vac
Input to safety ground	All models		-	-	2285	Vac
Output to safety ground	All models		-	-	N/A	Vac
Ambient Operating Temperature ¹	All models	T_A	0	-	50	°C
Storage Temperature	All models	T_{STG}	-40	-	70	°C
Humidity (non-condensing)						
Operating	All models		20	-	80	%
Non-operating	All models		10	-	95	%
Altitude						
Operating	All models		-	-	10000	Feet
Non-operating	All models		-	-	50000	Feet

Note 1 - Operation up to 60°C is allowed with power derating (see page 24 power derating curve).

ELECTRICAL SPECIFICATIONS

Input Specifications

Table 2. Input Specifications						
Parameter	Condition	Symbol	Min	Typ	Max	Unit
Operating Input Voltage, AC	All	$V_{IN,AC}$	90	115/230	264	Vac
Input AC Frequency	All	$f_{IN,AC}$	47	50/60	63	Hz
Maximum Input Current ($I_O = I_{O,max}$, $I_{SB} = I_{SB,max}$)	$V_{IN,AC} = 90Vac$	$I_{IN,max}$	-	-	10	A
Standby Input Current ($V_O = Off$, $I_{SB} = 0A$)	$V_{IN,AC} = 90Vac$	$I_{IN,Standby}$	-	-	180	mA
Standby Input Power ($V_O = Off$, $I_{SB} = 0A$)	All	$P_{IN,Standby}$	-	-	5	W
No Load Input Current ($V_O = On$, $I_O = 0A$, $I_{SB} = 0A$)	$V_{IN,AC} = 90Vac$	$I_{IN,no-load}$	-	-	250	mA
Harmonic Line Currents	All	THD	Per IEC61000-3-2			
Power Factor	20% load and above	PF	-	0.90	-	
Startup Surge Current (Inrush) @ 25°C	$V_{IN,AC} = 264Vac$	$I_{IN,surge}$	-	-	55	A
Input Fuse	Internal, 5x20mm, Quick Acting 12.5A, 250Vdc		-	-	12.5	A
Leakage Current to Earth Ground	$V_{IN,AC} = 240Vac$ $f_{IN,AC} = 50/60Hz$		-	-	1.75	mA
Operating Efficiency @ 25°C	$V_{IN,AC} = 230Vac$ $I_O = 50\%I_{O,max}$	η	-	-	94	%
System Stability	Phase Margin Gain Margin		45 -10	-	-	ϕ dB

ELECTRICAL SPECIFICATIONS

Output Specifications

Table 3. Output Specifications						
Parameter	Condition	Symbol	Min	Typ	Max	Unit
Output Regulation	Inclusive of set-point, temperature change, warm-up drift and dynamic load	V_O	11.4	12.0	12.6	V
		V_{SB}	11.4	12.0	12.6	V
Output Ripple, pk-pk	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}
		V_{SB}	-	-	120	mV _{PK-PK}
Output Current ¹	$90 \leq V_{ac} \leq 264V_{ac}$	I_O	0.5	-	62.5	A
		I_{SB}	0.1	-	3.0	A
Main Output Current Share Accuracy	10% to 100% $I_{O,max}$		-	-	5	% I_O
Minimum Load for Current Sharing			10	-	-	% $I_{O,max}$
Number of Parallel Units	Main output current share connected		-	-	6	
Load Capacitance	Start up	C_O	2000	-	40000	μ F
		C_{SB}	47	-	680	μ F
Main Output Dynamic Response Peak Deviation	50% load change Slew rate = 1A/ μ s	$\pm\%V_O$	-	-	5	%
Main Output Long Term Stability Max change over 24 hours	After thermal equilibrium (30mins)	$\pm\%V_O$	-	-	0.2	%

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

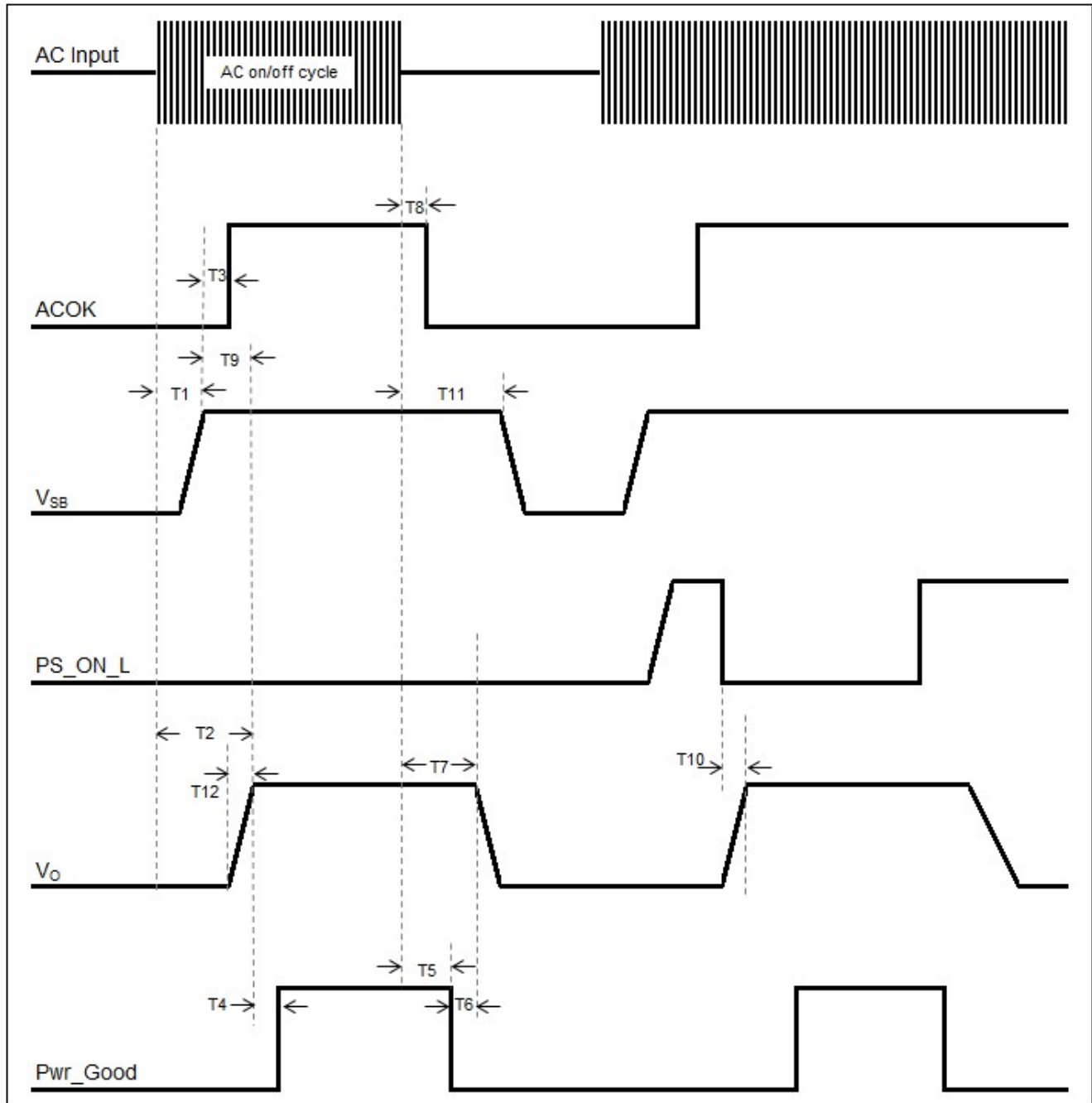
ELECTRICAL SPECIFICATIONS

System Timing Specifications

Table 4. System Timing Specifications					
Label	Parameter	Min	Typ	Max	Unit
T1	Delay from AC being applied to V_{SB} being within regulation.	20	-	1700	mSec
T2	Delay from AC being applied to main output voltages being within regulation.	-	-	2200	mSec
T3	Delay from standby output to ACOK assertion.	-	-	20	mSec
T4	Delay from output voltages within regulation limits to Pwr_Good asserted.	100	-	1000	mSec
T5	Delay from loss of AC to de-assertion of Pwr_Good.	10	-	-	mSec
T6	Delay from de-assertion of Pwr_Good to output voltages falling out of regulation.	1	-	-	mSec
T7	Delay from loss of AC to main output being within regulation.	11	-	-	mSec
T8	Delay from loss of AC to assertion of ACOK.	-	-	6	mSec
T9	Delay from standby output to main output voltage being within regulation.	-	-	300	mSec
T10	Delay from PS_ON_L assertion to output voltages being within regulation.	-	-	350	mSec
T11	Delay from loss of AC to standby output being within regulation.	150	-	-	mSec
T12	Output voltage rise time from the main output.	5	-	50	mSec

ELECTRICAL SPECIFICATIONS

System Timing Diagram



ELECTRICAL SPECIFICATIONS

DS750PED-3 Performance Curves

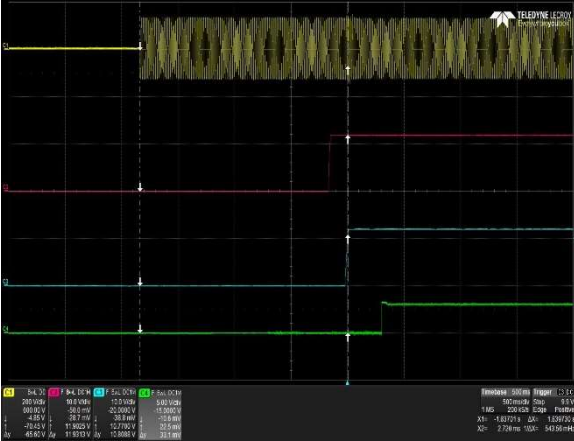


Figure 1: DS750PED-3 Turn-On Delay via AC Mains
 Vin = 90Vac Load: I_O = 62.5A I_{SB} = 3A
 Ch 1: AC Mains Ch 2: V_{SB} Ch 3: V_O Ch 4: Pwr_GOOD



Figure 2: DS750PED-3 Turn-On Delay via PS_ON_L
 Vin = 90Vac Load: I_O = 62.5A I_{SB} = 3A
 Ch 1: AC Mains Ch 2: PS_ON_L Ch 3: V_O Ch 4: Pwr_GOOD

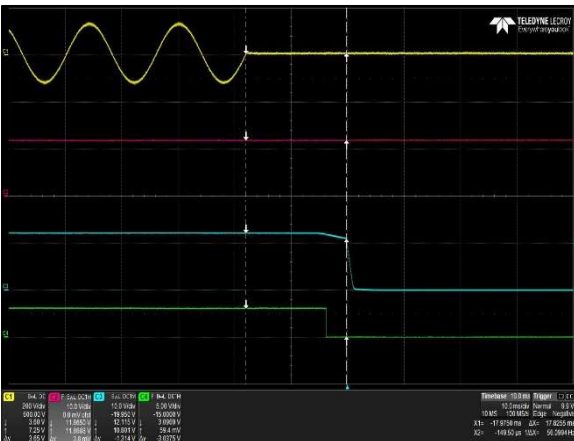


Figure 3: DS750PED-3 Hold-up Time
 Vin = 90Vac fin = 63Hz Load: I_O = 62.5A I_{SB} = 3A
 Ch 1: AC Mains Ch 2: V_{SB} Ch 3: V_O Ch 4: Pwr_GOOD

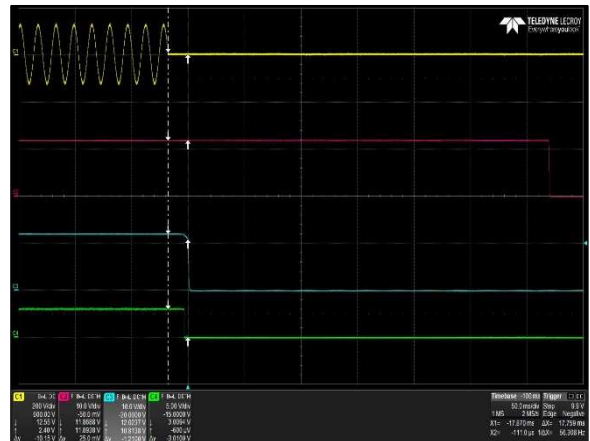


Figure 4: DS750PED-3 Hold-up Time
 Vin = 264Vac fin = 47Hz Load: I_O = 62.5A I_{SB} = 3A
 Ch 1: AC Mains Ch 2: V_{SB} Ch 3: V_O Ch 4: Pwr_GOOD

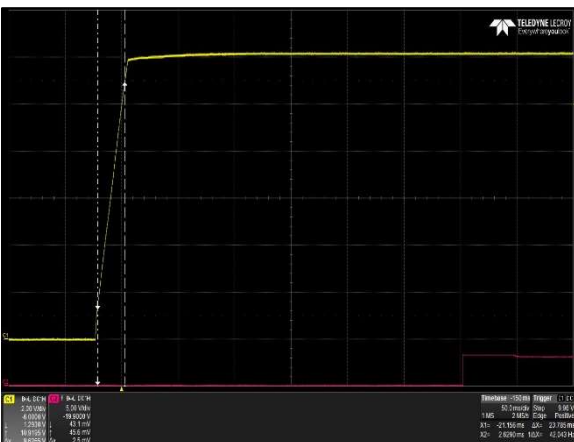


Figure 5: DS750PED-3 Output Voltage Startup Characteristic
 Vin = 90Vac Load: I_O = 62.5A I_{SB} = 3A
 Ch 1: V_O Ch 2: Pwr_GOOD

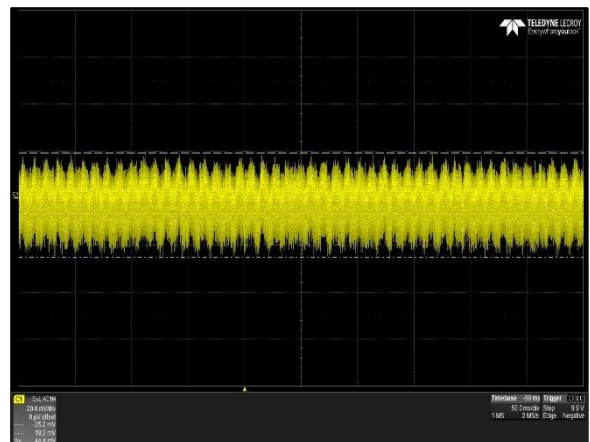


Figure 6: DS750PED-3 Ripple and Noise Measurement
 Vin = 90Vac Load: I_O = 62.5A I_{SB} = 3A
 Ch 1: V_O

ELECTRICAL SPECIFICATIONS

DS750PED-3 Performance Curves

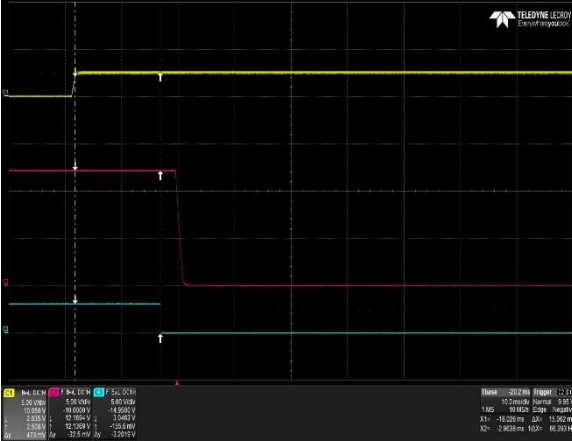


Figure 7: DS750PED-3 Turn Off Characteristic via PS_ON_L
 Load: $I_O = 62.5A$ $I_{SB} = 3A$
 Ch 1: PS_ON_L Ch 2: V_O Ch 3: Pwr_GOOD

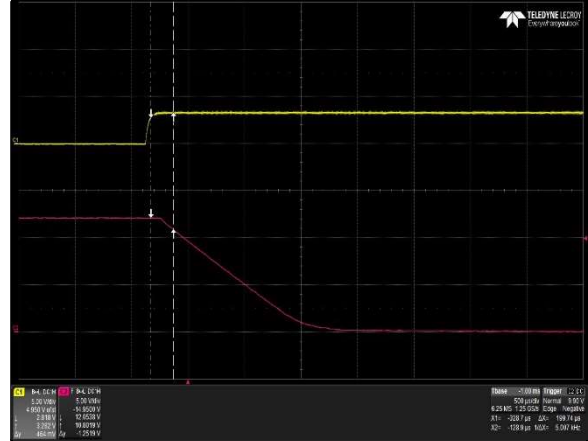


Figure 8: DS750PED-3 Turn Off Characteristic via PS_KILL_L
 Load: $I_O = 62.5A$ $I_{SB} = 3A$
 Ch 1: PS_KILL_L Ch 2: V_O Ch 3: Pwr_GOOD

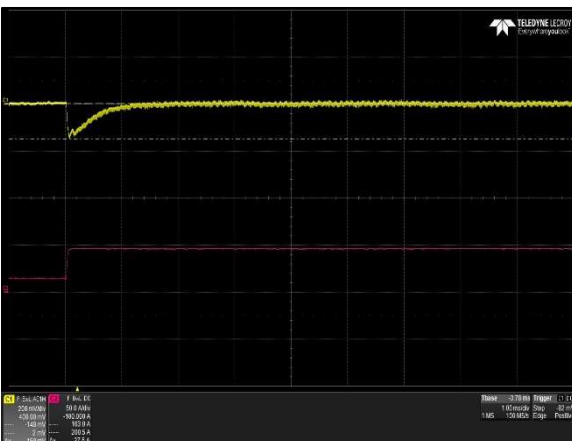


Figure 9: DS750PED-3 Transient Response - V_O Deviation
 25% to 75% load change $1A/uS$ slew rate $V_{in} = 230Vac$
 Ch 1: V_O Ch 2: I_O Output capacitance=2350uF

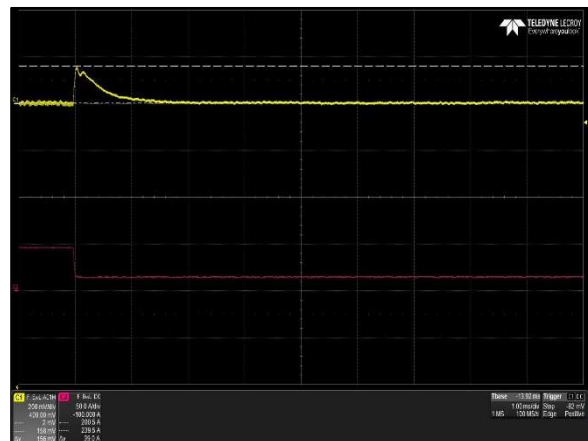


Figure 10: DS750PED-3 Transient Response - V_O Deviation
 75% to 25% load change $1A/uS$ slew rate $V_{in} = 230Vac$
 Ch 1: V_O Ch 2: I_O Output capacitance=2350uF

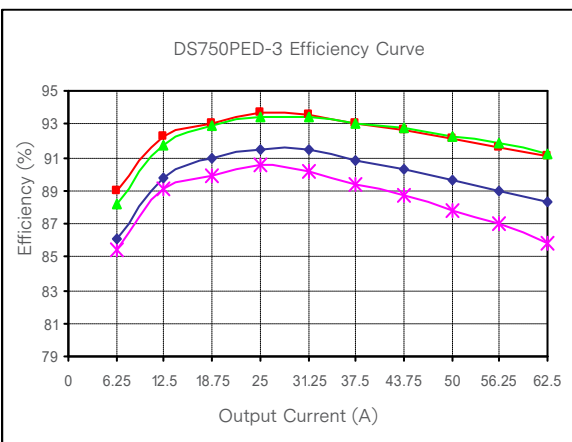


Figure 11: DS750PED-3 Efficiency Curve @ 25°C
 Loading: $I_O = 10\% I_{O,max}$ increment to 62.5A, $I_{SB} = 3A$

ELECTRICAL SPECIFICATIONS

Protection Function Specifications

Input Fuse

DS750PED-3 series power supply is equipped with an internal non user serviceable 12.5A Fast Acting 250Vac fuse to IEC 127 for fault protection on L line input.

Over Voltage / Under Voltage Protection (OVP / UVP)

The power supply provides latch mode over and under voltage protection as defined by the output under voltage and output over voltage parameters for each output. A fault on the main output and standby will not cause the standby output to shutdown. A fault on the standby output will cause all other outputs to shutdown.

OVP

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

UVP

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

Over Current Protection (OCP)

DS750PED-3 series power supply includes internal current limit circuitry to prevent damage in the event of overload or short circuit. Recovery must be automatic when the overload is removed, if the overload lasts for 500 millisecond or less, and if it is less than or equal to 120% of rated load. If the overload is >125% of rated load, the power supply shall latch off immediately within 10ms. The latched state will require AC power / PS_ON_L recycling to restart the power supply. A fault in the main output shall not cause the standby output to shut down. No damage shall result to the supply as the result of either short term or long term overloads of the outputs.

Parameter	Min	Nom	Max	Unit
V _O Output Overvoltage	75	/	93.75	A
V _{SB} Output Overvoltage	3.6	/	4.5	A

ELECTRICAL SPECIFICATIONS

Short Circuit Protection (SCP)

The DS750PED-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 0.1ohms or less.

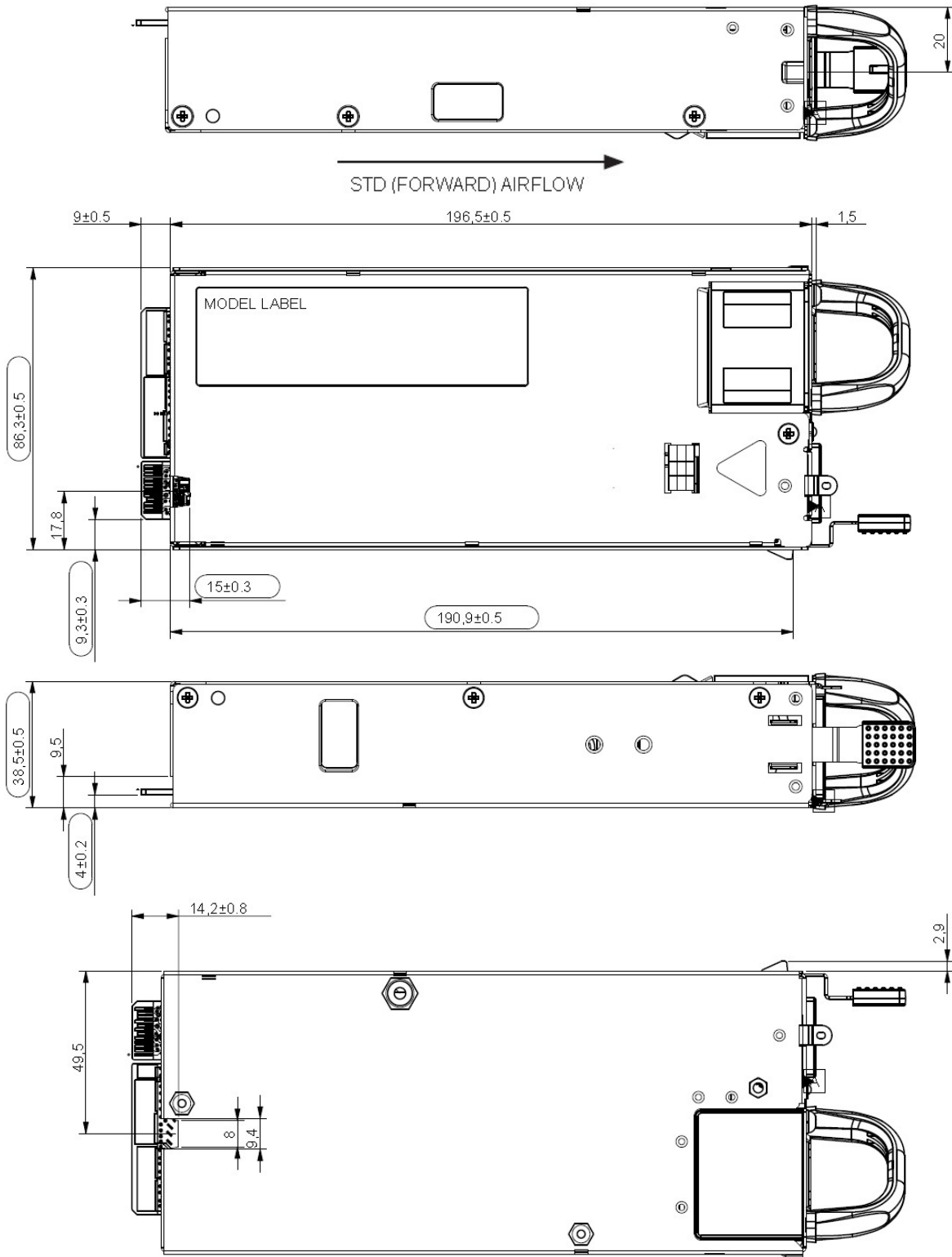
When the standby output is shorted the output will go into “hiccup mode”. When the standby output attempts to restart, the maximum peak current from the standby output will be less than 17.0A peak. The maximum average current, taking into account the “hiccup” duty cycle, is less than 3.0A.

Over Temperature Protection (OTP)

The DS750PED-3 is internally protected against over temperature conditions. When the OTP circuit is activated, the power supply will not be damaged and main outputs shall automatically restart after the over temp condition no longer exists. Hysteresis shall be employed to prevent a frequent toggling on and off of the outputs. The low limit point has to be within operating temperature range.

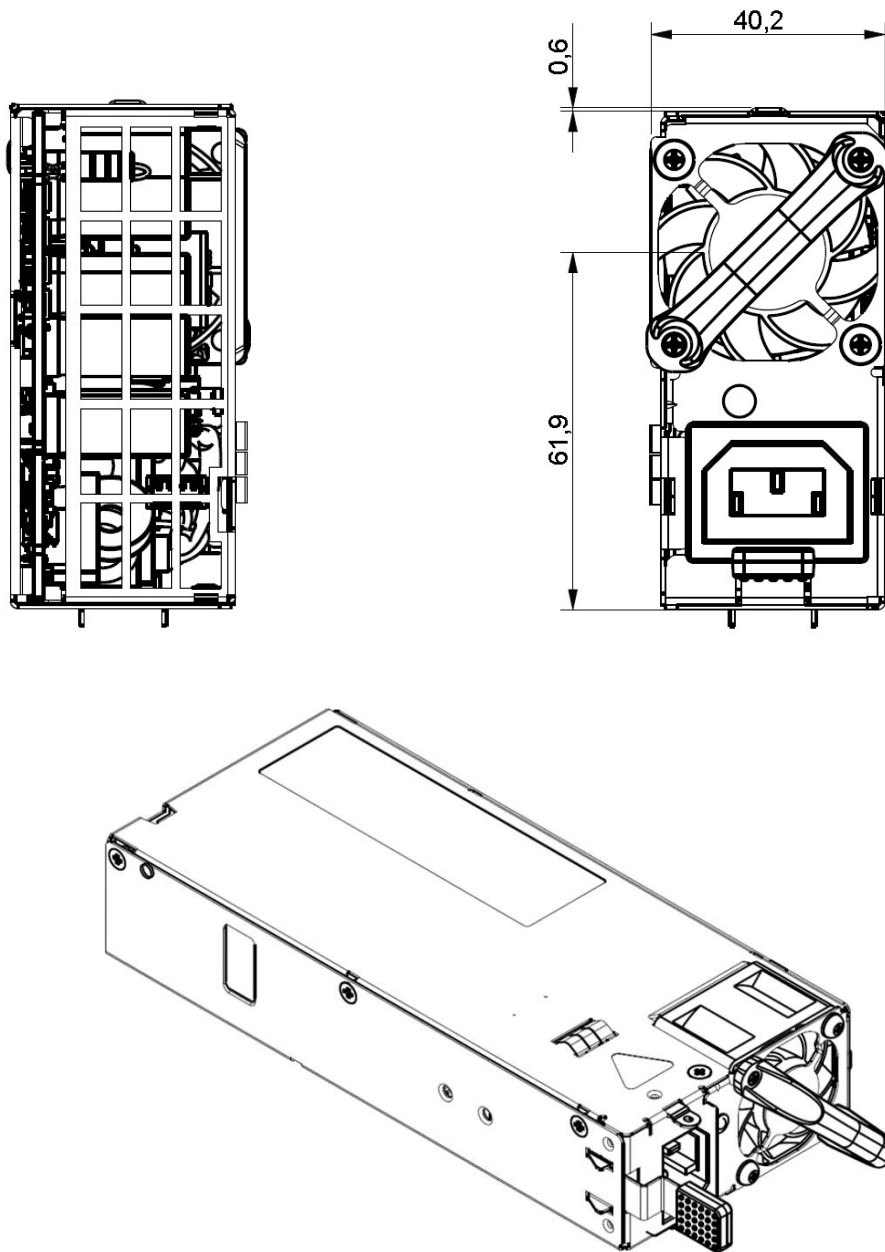
MECHANICAL SPECIFICATIONS

Mechanical Outlines (unit: mm)



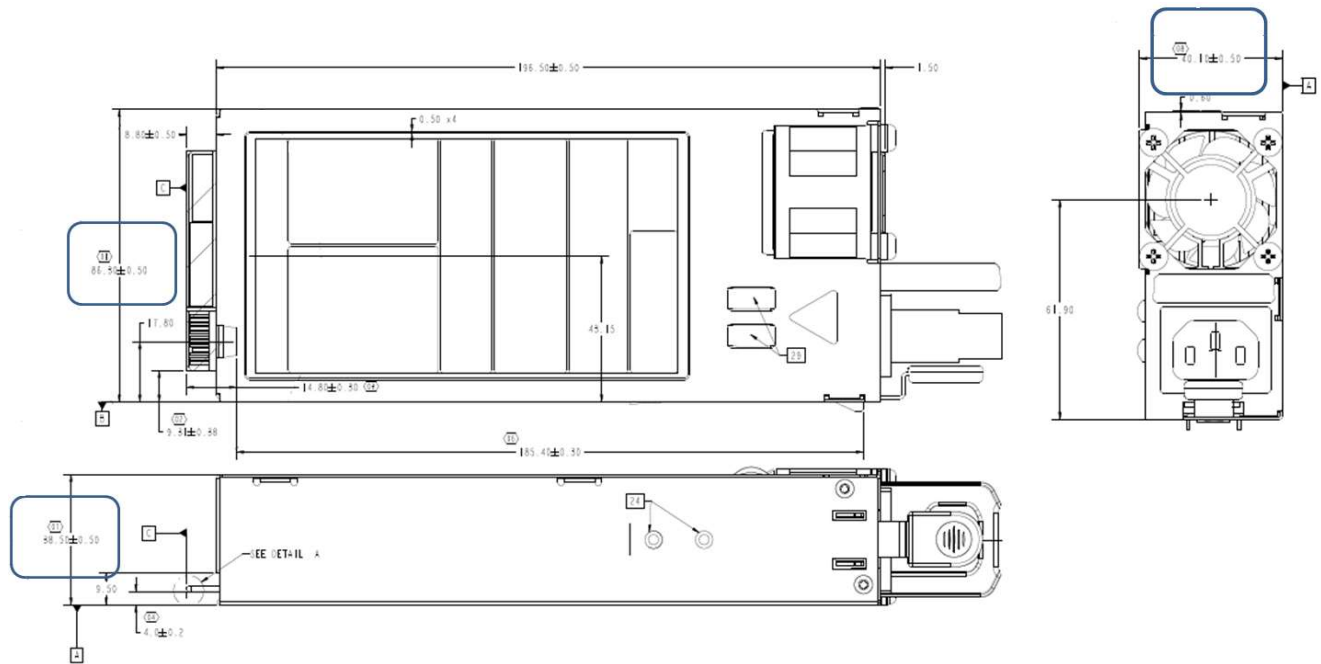
MECHANICAL SPECIFICATIONS

Mechanical Outlines (unit: mm)



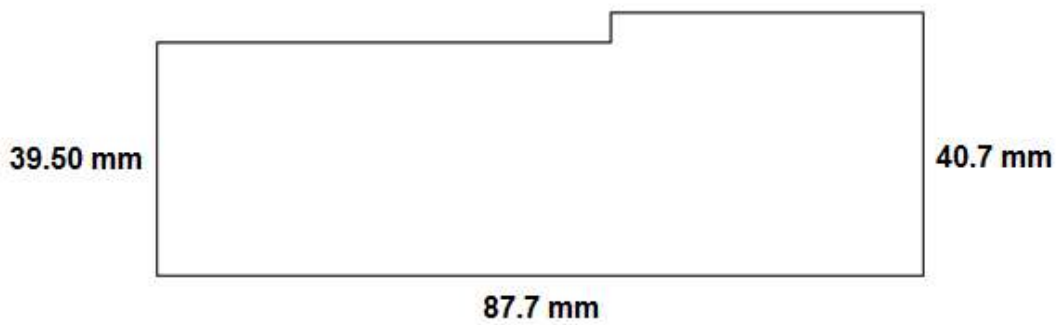
MECHANICAL SPECIFICATIONS

Mechanical Outlines (unit: mm)



SYSTEM SLOT DIMENSIONS

(Refer to PSU Mechanical Outline drawing for details and tolerancing)



MECHANICAL SPECIFICATIONS

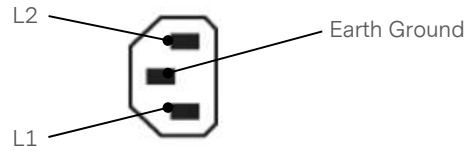
Connector Definitions

AC Input Connector

Pin 1 – L1

Pin 2 – L2

Pin 3 – Earth Ground



Output Connector - Power Blades

P1-P8 – Main Output (V_O)

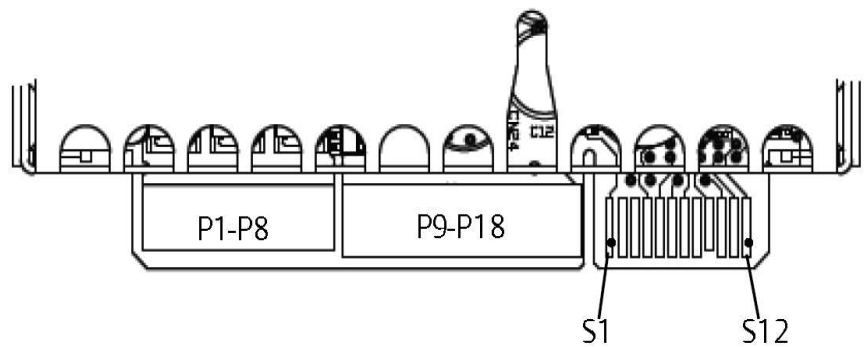
P9-P18 – Main Output Return

P19-P20 – Standby Output (V_{SB})

P21-P28 – Main Output / Standby Return

P29-P36 – Main Output (V_O)

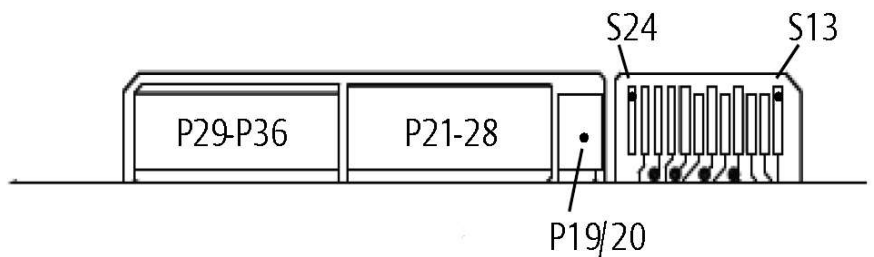
Power Supply Output Card Edge (Top Side)



Output Connector - Control Signals

- S1 – PS_PRESENT
- S2 – RESERVED
- S3 – RESERVED
- S4 – PWR_GOOD
- S5 – ACOK (AC Input Present)
- S6 – RETURN
- S7 – ISHARE
- S8 – RESERVED
- S9 – PS_INTERRUPT_L
- S10 – RETURN
- S11&S12 – RESERVED
- S13 – PS_ON_L
- S14 – PS_KILL_L
- S15 – RESERVED
- S16 – RETURN
- S17 – SDA
- S18 – RETURN
- S19 – SCL
- S20 – RETURN
- S21 – REMOTE SENSE-
- S22 – RETURN
- S23 – REMOTE SENSE+
- S24 – RESERVED

Power Supply Output Card Edge (Bottom Side)



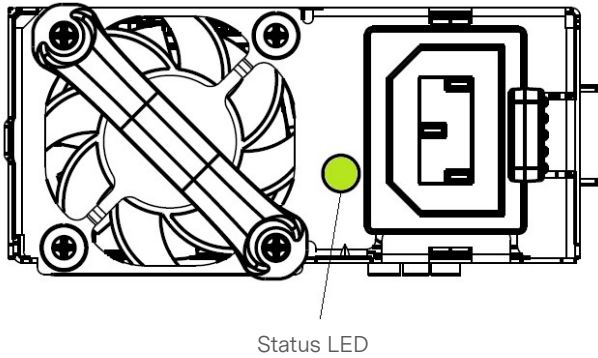
MECHANICAL SPECIFICATIONS

Power / Signal Mating Connectors and Pin Types

Table 5. Mating Connectors for DS750PED-3 Series		
Reference	On Power Supply	Mating Connector or Equivalent
AC Input Connector	IEC320-C13	IEC320-C14
Output Connector	Card-edge	FCI Power Blade 10107844-002LF Straight Pins
		FCI Power Blade 10115859-004LF Right Angle Pins

MECHANICAL SPECIFICATIONS

LED Indicator Definitions



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

Conditions	LED Status
$V_{SB} = ON$, $V_O = OFF$, AC Input = ON	Blinking Amber
$V_{SB} = ON$, $V_O = ON$	Solid Green
$V_O = OCP / OVP / OTP / FAN FAULT$	Blinking Amber
$V_{SB} = OCP$	Blinking Amber

MECHANICAL SPECIFICATIONS

Weight

The DS750PED-3 series power supply weight is 0.991kg/2.193lbs maximum.

ENVIRONMENTAL SPECIFICATIONS

EMC Immunity

DS750PED-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 / EN55032, Class A	Conducted and Radiated EMI Limits
EN61000-3-2	Harmonic Currents
EN61000-3-3	Voltage Fluctuations
IEC/EN61000-4-2	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Electrostatic discharge immunity test: +/-8KV air, +/-4KV contact discharge. Performance - Criteria B
IEC/EN61000-4-3	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test: Performance - Criteria A
IEC/EN61000-4-4	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Electrical fast transient/burst immunity test: 2KV for AC power port. Performance - Criteria B 1KV for DC ports, I/O and signal ports. Performance - Criteria B
IEC/EN61000-4-5	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Surge test: 2KV common mode and 1KV differential mode for AC ports and 0.5KV differential mode for DC power, I/O and signal ports. Performance - Criteria B
IEC/EN61000-4-11	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Voltage dips and interruptions: Criteria B: >95% reduction for 10ms; Criteria C: >30% reduction for 500mS, or Criteria C: >95% reduction for 500mS.
EN55032	Information Technology Equipment - Immunity Characteristics, Limits and Method of Measurements

ENVIRONMENTAL SPECIFICATIONS

Safety Certifications

The DS750PED-3 series power supply is intended for inclusion in other equipment and the installer must ensure that it is in compliance with all the requirements of the end application. This product is only for inclusion by professional installers within other equipment and must not be operated as a stand alone product.

Table 7. Safety Certifications for DS750PED-3 Series Power Supply		
Document	File #	Description
UL62368		US and Canada Requirements
CSA 22.2 No.62368-1		Information Technology Equipment - Safety - Part 1: General Requirements (Bi-National standard, with UL62368-1)
EN62368		European Requirements
EN62368 Deviations		International Requirements
CB Certificate and Report	E186249-A227-CB-1	(All CENELEC Countries)
CHINA CCC Approval	2013010907595688	China Requirements
BSMI		Taiwan Requirement
UKCA Mark		UK Requirements

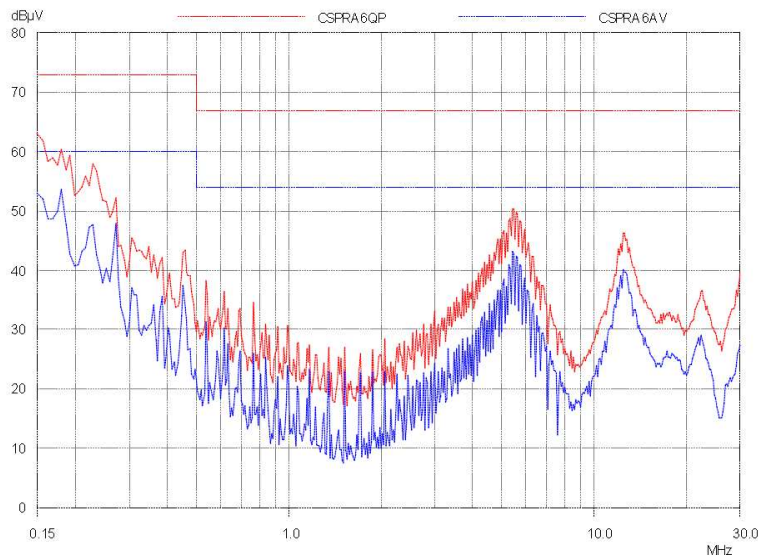
ENVIRONMENTAL SPECIFICATIONS

EMI Emissions

The DS750PED-3 series power supply has been designed to comply with the Class A limits of EMI requirements of EN55032 (FCC Part 15) and CISPR 22 (EN55032) for emissions and relevant sections of EN61000 (IEC61000) for immunity. The unit is enclosed inside a metal box, tested at 750W using resistive load with cooling fan.

Conducted Emissions

The applicable standard for conducted emissions is EN55032 (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 DS750PED-3 series power supply has internal EMI filters to ensure the convertor's conducted EMI levels comply with EN55032 (FCC Part 15) Class A and EN55032 (CISPR 22) Class A limits. The EMI measurements are performed with resistive loads at maximum rated loading.

Sample of EN55032 Conducted EMI Measurement at 110Vac input

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

Table 8. Conducted EMI Emission Specifications of The DS750PED-3 Series Power Supply						
Parameter	Model	Symbol	Min	Typ	Max	Unit
FCC Part 15, class A	All	Margin	-	-	6	dB
CISPR 22 (EN55032), 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. It is thus recommended that radiated EMI be evaluated in a system environment. The applicable standard is EN55032 Class A (FCC Part 15). Testing AC-DC converters as a stand-alone component to the exact requirements of EN55032 can be difficult because the standard calls for 1m lead to be attached to the input and outputs and aligned such as to maximize the disturbance. In such a set-up, it is possible to form a perfect dipole antenna that very few AC-DC converters could pass. However, the standard also states that an attempt will be made to maximize the disturbance consistent with the typical application by varying the configuration of the test sample.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature

The DS750PED-3 series power supplies will start and operate within stated specifications at an ambient temperature from 0°C to 50°C under all load conditions with internal fan. The power supply can withstand operation up to 60°C at full power without damage.

Forced Air Cooling

The DS750PED-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 cooling fan is a variable speed fan. In standby mode power supply fan will operate at minimum speed to maintain component reliability at all load, line and ambient conditions. 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.

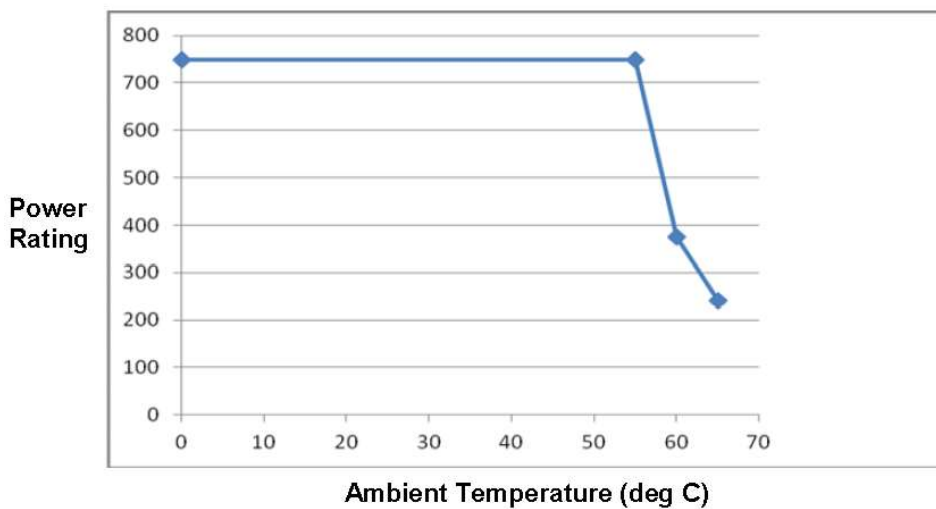
ENVIRONMENTAL SPECIFICATIONS

Power Derating Curves

DS750PED-3 total output power will be derated according to the curve shown below. All models can provide derated output power from 50degC up to 70degC ambient temp max. The V_{SB} output will be derated after 50degC ambient, unless airflow can be allowed during standby mode conditions.

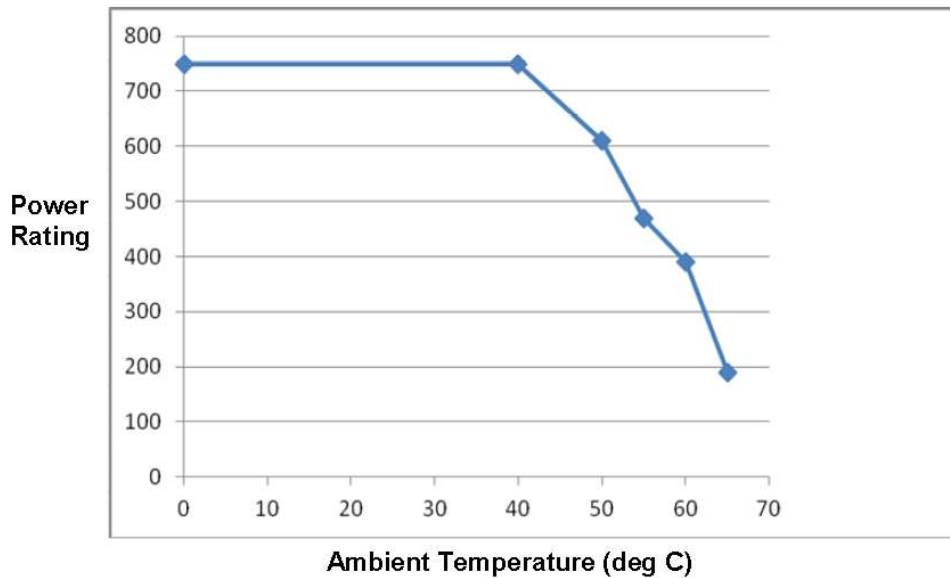
POWER DERATING CURVE VS TEMPERATURE

Forward Fan Airflow



POWER DERATING CURVE VS TEMPERATURE

Reverse Fan Airflow



ENVIRONMENTAL SPECIFICATIONS

Storage and Shipping Temperature

The DS750PED-3 series power supply can be stored or shipped at temperatures between -40°C to +70°C and relative humidity from 10% to 95% non-condensing.

Altitude

The DS750PED-3 series power supply will operate within specifications at altitudes up to 10000 feet above sea level. The power supply will not be damaged when stored at altitudes up to 50000 feet above sea level.

Humidity

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

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

Vibration

The DS750PED-3 series power supply will pass the following vibration specifications:

Non-Operating Random Vibration

Acceleration	3.12	gRMS	
Frequency Range	5 - 500	Hz	
Duration	15	Mins	
Direction	Rotating each axis on vertical vibration		
PSD Profile	FREQ (Hz)	SLOPE (db/oct)	PSD (g ² /Hz)
	5 - 500	/	0.02

Shock

The DS750PED-3 power supply will pass the following vibration specifications:

Non-Operating Half-Sine Shock

Acceleration	202	G
Duration	2	mSec
Pulse	Half-sine	
Number of Shock	6 shocks on each of 6 faces	

POWER AND CONTROL SIGNAL DESCRIPTIONS

AC Input Connector

This connector supplies the AC mains to the DS750PED-3 series power supply.

- Pin 1 – L1
- Pin 2 – L2
- Pin 3 – Earth Ground

Output Connector – Power Blades

These pins provide the main output for the DS750PED-3 series power supply. The main output (V_O) and the main output return pins are the positive and negative rails, respectively, of the V_O main output of the DS750PED-3 series power supply. The main output (V_O) is electrically isolated from the power supply chassis.

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

Output Connector – Control Signals

The DS750PED-3 series power supply contains a 24 pins control signal header providing an analogue control interface, standby power and I²C interface signal connections.

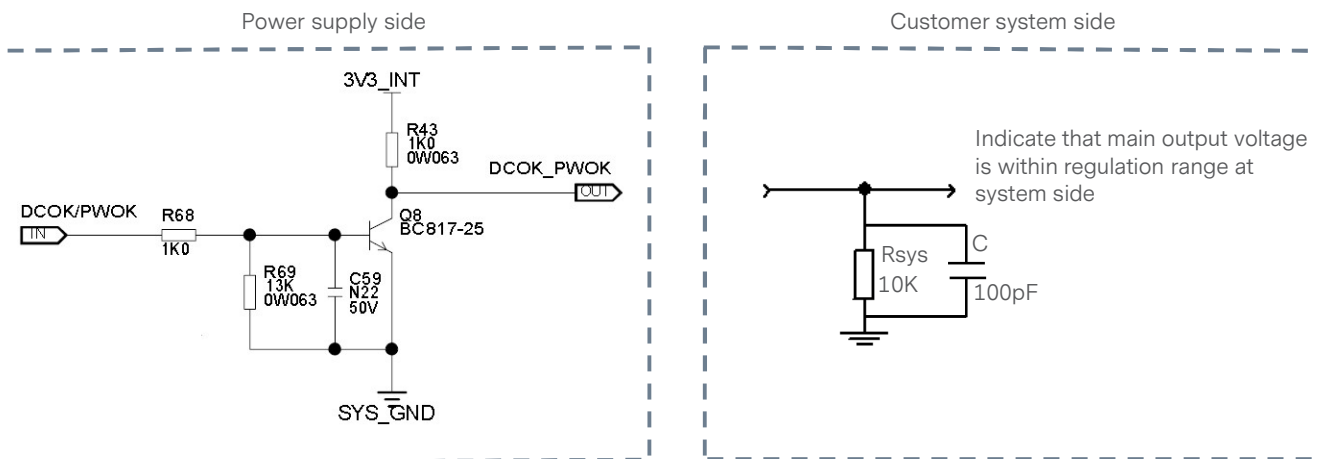
PS_PRESENT - (Pin S1)

This signal used to indicate to the system that a power supply is inserted in the power bay. This pin is connected to the standby return via 220ohm resistor in the power supply. Recommended pull-up resistor to 12Vsb is 8.2kohm with a 3.0kohm pull-down to ground. A 100pF decoupling capacitor is also recommended.

Pwr_Good - (Pin S4)

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

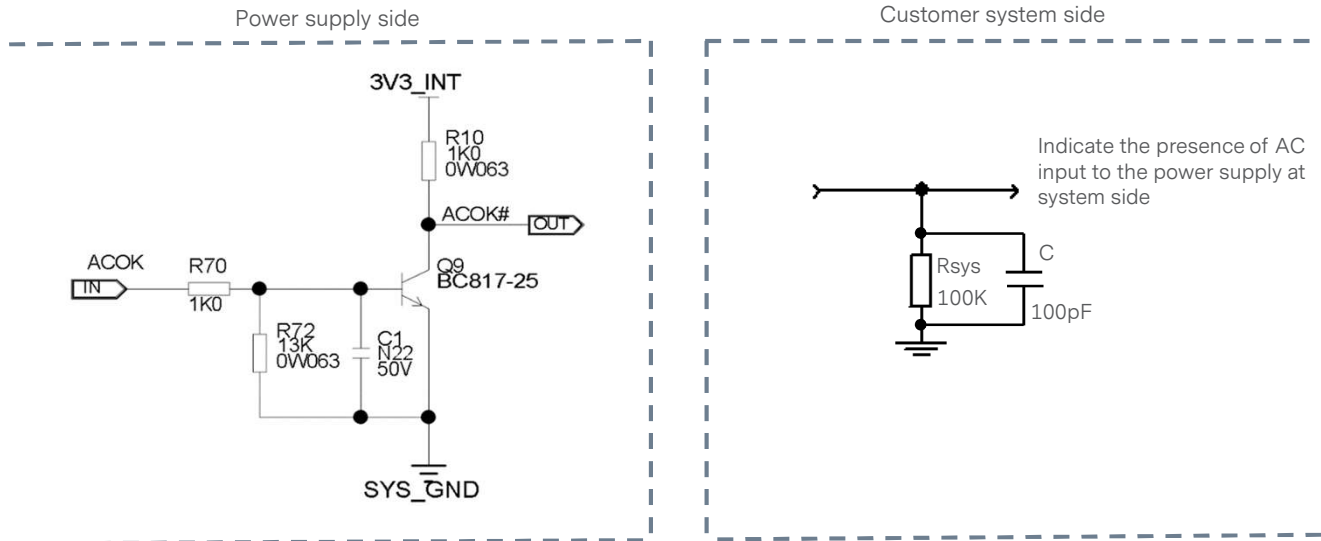
This is an open collector/drain output. This pin is pulled high by a 1.0kohm resistor connected to 3.3V inside the power supply. It is recommended that this pin be connected to a 100pF decoupling capacitor and pulled down by a 10kohm resistor.



POWER AND CONTROL SIGNAL DESCRIPTIONS

ACOK - (Pin S5)

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



I_SHARE (Current Share Bus) - (Pin S7)

The DS750PED-3 supports active current sharing through a single wire connection between the power supplies. This input/output signal pin allows two or more power supplies to share the main output load current to increase the overall power capability or to operate the units in a N+N configuration for redundancy purposes.

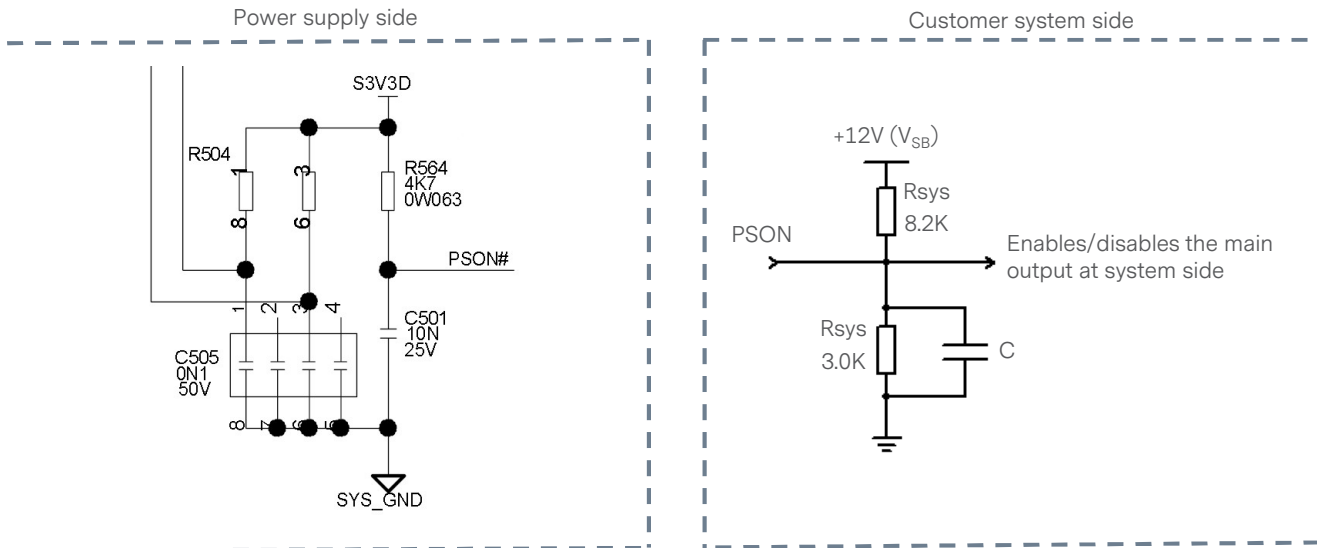
The voltage of this signal will be a linear slope from no load to full load. At 31.25A output when two supplies are running in parallel must be between 3.85 and 4.15V. At 62.5A output when two supplies are running in parallel must be between 7.75 and 8.25V.

All outputs with active current sharing will share load current and the current share errors (CSE) are fixed 4%, 8%, 16% and 40% of the average current at 100%, 50%, 20% and 10% rated load respectively. Example: If the maximum rated output current of an output is 100A, then the difference between half of total load and supplies' current cannot be greater than $\pm 2A/100\%$, $\pm 2A/50\%$, $\pm 2A/25\%$ and $\pm 2A/10\%$ load. The current share loop should be activated when the output current exceed 10% of total load.

POWER AND CONTROL SIGNAL DESCRIPTIONS

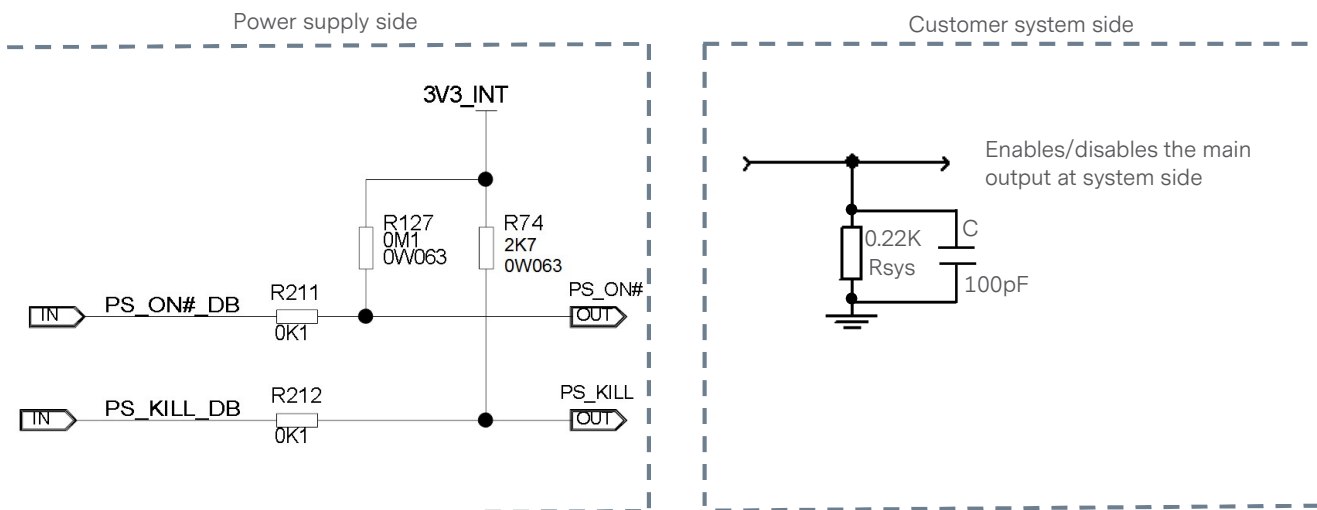
PS_ON_L - (Pin S13)

This signal input pin controls the normal turning ON and Off of the main output of the DS750PED-3 power supply. The power supply main output (V_O) will be enabled when this signal is pulled low ($<0.8V$) by the system. The Power supply output (except V_{SB} output) will be disabled when this signal is pulled high ($>2.0V$) or left open circuited. Recommended pull-up resistor to $12V_{SB}$ is $8.2k\Omega$ with a $3.0k\Omega$ pull-down to ground. A $100pF$ decoupling capacitor is also recommended.



PS_KILL_L - (Pin S14)

First break / last mate active LOW signal which enables/disables the main output. This signal will have to be pulled to ground at the system side with a 220Ω resistor. A $100pF$ decoupling capacitor is also recommended (standby output will remain on).



SDA, SCL, and PS_INTERRUPT_L - (Pins S17, S19 and S9)

Please refer to "Communication Bus Descriptions" section.

POWER AND CONTROL SIGNAL DESCRIPTIONS

Main Output Remote Sense Return, Main Output Remote Sense - (Pins S21, S23)

The main output of the DS750PED-3 is equipped with a remote sensing capability that will compensate for a power path drop around the entire loop of 200 millivolt. This feature is implemented by connecting the main output remote sense (pin S23) and the main output remote sense return (pin S21) to the positive and negative rails of the main output, respectively, at a location that is near to the load. Care should be taken in the routing of the sense lines as any noise sources or additional filtering components introduced into the voltage rail may affect the stability of the power supply. The DS750PED-3 will operate appropriately without the sense lines connected; however it is recommended that the sense lines be connected directly to the main output terminals if remote sensing is not required. This remote sense circuit will not raise the power supply's output voltage to the OVP trip level. Main output remote sense has no effect on the standby output (V_{SB}).

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

Standby Output, Standby Output Return - (Pins P19-P20, P21-P28)

The DS750PED-3 provides a regulated 12V 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 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 (P21-P28).

COMMUNICATION BUS DESCRIPTIONS

I²C Bus Signals

The DS750PED-3 series power supply contains enhanced monitor and control functions implemented via the I²C bus. The DS750PED-3 series 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 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) - (Pins S17, S19)

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

Refer to the communication interface specifications for more details.

PS_INTERRUPT_L - (Pin S9)

PS_INTERRUPT_L is used to send an alert 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. This signal can be cleared by a CLEAR_FAULT command. Recommended pull-up resistor to 12V_{SB} is 8.2kohm with a 3.0kohm pull-down to ground. A 100pF decoupling capacitor is also recommended.

I²C Bus Communication Interval

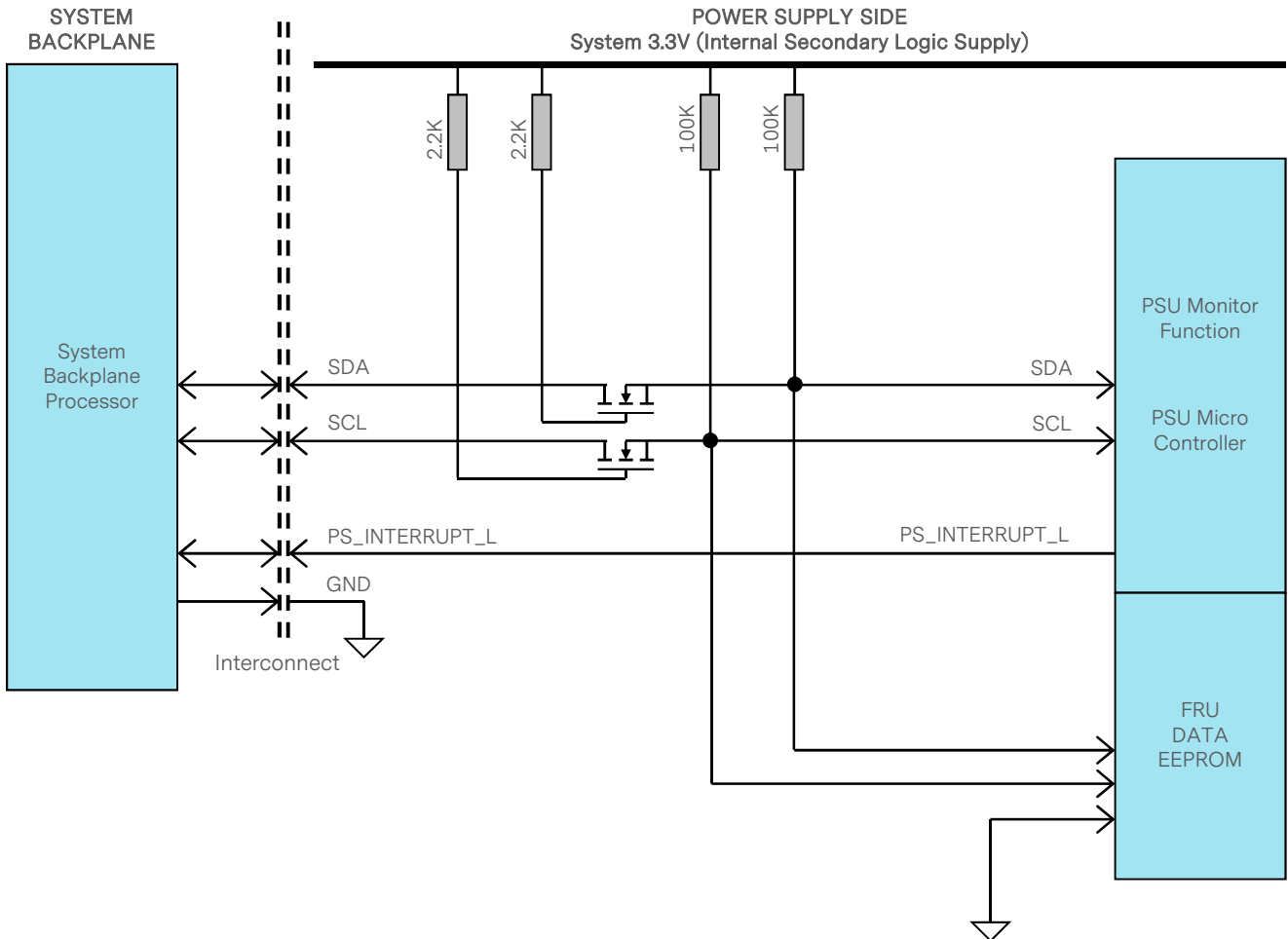
The interval between two consecutive I²C communications to the power supply must be at least 50ms to ensure proper monitoring functionality.

I²C Bus Signal Integrity

The noise on the I²C bus (SDA, SCL lines) due to the power supply will be less than 400mV peak-to-peak. This noise measurement should be made with an oscilloscope bandwidth limited to 100MHz. Measurements must be made at the power supply output connector with 2.2kohm resistors pulled up to standby output and 100pF ceramic capacitors to standby output return.

COMMUNICATION BUS DESCRIPTIONS

I²C Bus Internal Implementation, Pull-ups and Bus Capacitances



I²C Bus - Recommended external pull-ups

Electrical and interface specifications of I²C signals (referenced to standby output return pin, unless otherwise indicated):

Parameter	Condition	Symbol	Min	Type	Max	Unit
SDA, SCL Internal Pull-up Resistor		R_{int}	-	100	-	Kohm
SDA, SCL Internal Bus Capacitance		C_{int}	-	100	-	pF
Recommended External Pull-up Resistor	1 PSU	R_{ext}	-	2.2	-	Kohm
	6 PSU	R_{ext}	-	0.37	-	Kohm

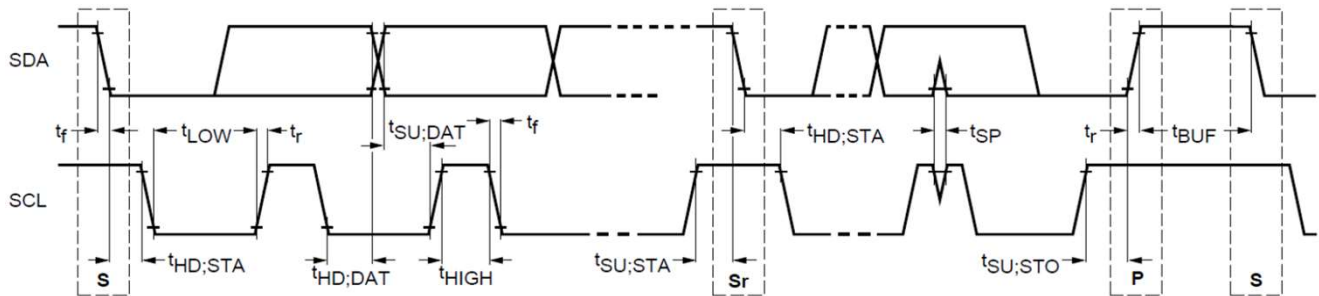
COMMUNICATION BUS DESCRIPTIONS

Logic Levels

DS750PED-3 series power supply I²C communication bus will respond to logic levels as per below:

Logic High: 5.1V nominal (Spec is 2.1V to 5.5V)**
 Logic Low: 500mV nominal (Spec is 800mV max)**

Timings



Parameter	Symbol	Standard-Mode Specs		Actual Measured		Unit
		Min	Max			
SCL clock frequency	f_{SCL}	0	100	100		KHz
Hold time (repeated) START condition	$t_{HD;STA}$	4.0	-	4.7336		uS
LOW period of SCL clock	t_{LOW}	4.7	-	16.334		uS
HIGH period of SCL clock	t_{HIGH}	4.0	50	4.2496		uS
Setup time for repeated START condition	$t_{SU;STA}$	4.7	-	19.039		uS
Data hold time	$t_{HD;DAT}$	0	3.45	1.5060		uS
Data setup time	$t_{SU;DAT}$	250	-	4728		nS
Rise time	t_r	-	1000	SCL = 845.6	SDA = 822.4	nS
Fall time	t_f	-	300	SCL = 122.4	SDA = 146.4	nS
Setup time for STOP condition	$t_{SU;STO}$	4.0	-	6.992		uS
Bus free time between a STOP and START condition	t_{BUF}	4.7	-	61.5708		mSec

COMMUNICATION BUS DESCRIPTIONS

Device Addressing

The DS750PED-3 has a fixed I²C address 0xB0. This address has been set in the power supply side, there is no address bit accessible externally. In order to support multiple addresses, system side should use an I²C switcher or I²C expander. Contact Artesyn for the demo and application note of I²C switcher or I²C expander.

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

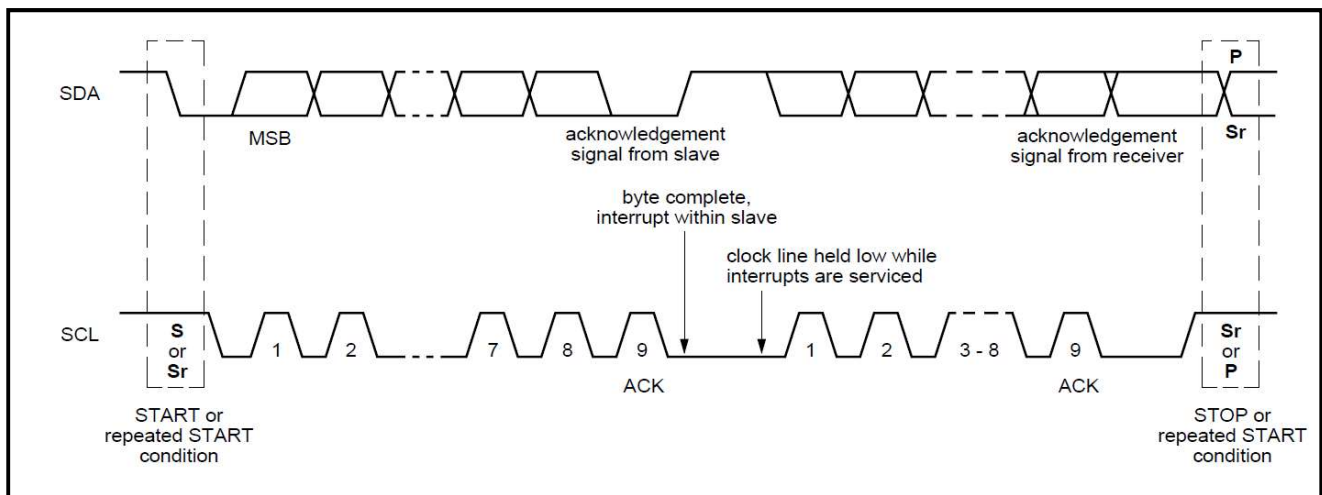
Pulling signal pins S2, S3, and S24 at the system side to low for I²C addressing compatibility across all models in the short family of front-end bulk power series including the DS500SPE, DS750PED, DS1100PED and DS1600SPE.

COMMUNICATION BUS DESCRIPTIONS

I²C Clock Synchronization

The DS750PED-3 series power supply applies clock stretching. An addressed slave power supply holds the clock line (SCL) low after receiving (or sending) a byte, indicating that it is not yet ready to process more data. The system master that is communicating with the power supply will attempt to raise the clock to transfer the next bit but must verify that the clock line was actually raised. If the power supply is clock stretching, the clock line will still be low (because the connections are open-drain).

The maximum time-out condition for clock stretching for DS750PED-3 series is 100 milliseconds.



COMMUNICATION BUS DESCRIPTIONS

FRU (EEPROM) Data

The FRU (Field Replaceable Unit) data format is compliant with the Intel IPMI v1.0 specification. The DS750PED-3 uses 1 page of EEPROM for FRU purpose. The one page of EEPROM contains up to 256 byte-sized data locations.

Where:	OFFSET	-The OFFSET denotes the address in decimal format of a particular data byte within DS750PED-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.

DS750PED-3 series FRU (EEPROM) Data:

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

COMMUNICATION BUS DESCRIPTIONS

DS750PED-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION (REMARKS)	SPEC VALUE	
(DEC)	(HEX)		(DEC)	(HEX)
32	20	CHASSIS SERIAL NUMBER BYTES , default value is 0.	0	00
33	21		0	00
34	22		0	00
35	23		0	00
36	24		0	00
37	25		0	00
38	26		End Tag (0C1h if used)	193
39	27	CHKSUM (Zero CHKSUM if used)	161	A1
PRODUCT INFORMATION AREA, 64 BYTES				
40	28	FORMAT VERSION NUMBER (Product Info Area) 7:4 - Reserved, write as 0000b 3:0 - Format Version Number = 1h for this specification	1	01
41	29	PRODUCT INFO AREA LENGTH (In multiples of 8 bytes)	8	08
42	2A	Language (English)	25	19
43	2B	MANUFACTURER NAME TYPE/LENGTH (0C5H) 7:6 - (11)b, 8-bit ASCII+Latin 1, 5:0 - (000101)b, 5-byte allocation	199	C7
44	2C	MANUFACTURER'S NAME 5 bytes sequence "A" = 41h "R" = 52h "T" = 54h "E" = 45h "S" = 53h "Y" = 59h "N" = 4Eh	65	41
45	2D		82	52
46	2E		84	54
47	2F		69	45
48	30		83	53
49	31		89	59
50	32		78	4E
51	33	PRODUCT NAME Type/Length (CCH) Type = "ASCII+LATIN1" = (11)b length = 15 bytes = (001111)b	207	CF
52	34	PRODUCT NAME BYTES (5 bytes sequence) "D" "D" "S" "S" "7" "7" "5" "5" "0" "0" "P" "P" "E" "E" "D" "D" "_" "_" "3" "3" "_" " "0" "0" "1"	68	44
53	35		83	53
54	36		55	37
55	37		53	35
56	38		48	30
57	39		80	50
58	3A		69	45
59	3B		68	44
60	3C		45	2D
61	3D		51	33
62	3E		32	20
63	3F		32	20
64	40		32	20
65	41		32	20
66	42		32	20
67	43	PRODUCT PART/MODEL NUMBER Type/Length (CFH) Type = "ASCII+LATIN1" = (11)b length = 15 bytes = (001111)b	207	CF

COMMUNICATION BUS DESCRIPTIONS

DS750PED-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION (REMARKS)	SPEC VALUE	
(DEC)	(HEX)		(DEC)	(HEX)
PRODUCT PART/MODEL NUMBER BYTES				
68	44	"D" "D"	68	44
69	45	"S" "S"	83	53
70	46	"7" "7"	55	37
71	47	"5" "5"	53	35
72	48	"0" "0"	48	30
73	49	"P" "P"	80	50
74	4A	"E" "E"	69	45
75	4B	"D" "D"	68	44
76	4C	"_" "_"	45	2D
77	4D	"3" "3"	51	33
78	4E	"_" "	32	20
79	4F	"0"	32	20
80	50	"0"	32	20
81	51	"1"	32	20
82	52		32	20
83	53	PRODUCT VERSION NUMBER Type/Length (C2h) Type = "ASCII+LATIN1" = (11)b length = 2 bytes = (000010)b	194	C2
PRODUCT VERSION NUMBER BYTES Refer to Section 1.2 Product Revision History in latest IPS				
84	54	"A"	65	41
85	55	"A"	72	48
86	56	PRODUCT SERIAL NUMBER Type/Length Type = "ASCII+LATIN1" = (11)b Length = 13 bytes = (001101)b	205	CD
PRODUCT SERIAL NUMBER BYTES Model ID = DS750PED-3 / K390, DS750PED-3-001 / K606				
87	57	"K" "K"	75	4B
88	58	"3" "6"	51	33
89	59	"9" "0"	57	39
90	5A	"0" "6"	48	30
MANUFACTURING YEAR AND WEEK CODE				
91	5B	"W" = 57h (Per Unit)	77	4D
92	5C	"W" = 57h (Per Unit)	57	39
UNIQUE SERIAL NUMBER				
"SSSS"				
93	5D	"S" = 53 (Per Unit)	48	30
94	5E	"S" = 53 (Per Unit)	48	30
95	5F	"S" = 53 (Per Unit)	54	36
96	60	"S" = 53 (Per Unit)	85	55
MODEL REVISION, Astec Model Rev, see latest model rev in IPS sec 1.2				
97	61	"A"	65	41
98	62	"A"	72	48
MANUFACTURING LOCATION				
"P" for "Laguna, Philippines" In Decimal = 080 In Hex = 50H "C" for "Cavite, Philippines" In Decimal = 067 In Hex = 43H				
100	64	End Tag	193	C1
PAD (reserved), default value is 0.				
101	65		0	00
102	66		0	00
ZERO CHECK SUM (256 - (Sum of bytes 40 to 102)) Per Unit Zero Check Sum: Should follow check sum calculation as per IPMI v1.1 specs.				
103	67		62	3E

COMMUNICATION BUS DESCRIPTIONS

DS750PED-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION (REMARKS)	SPEC VALUE	
(DEC)	(HEX)		(DEC)	(HEX)
MULTI RECORD AREA, 88 BYTES				
104	68	Power Supply Record Header Record type = 00 for power supply	0	00
105	69	End of List / Record Format Version Number	2	02
106	6A	Record length of power supply record	24	18
107	6B	Record CHECKSUM of power supply record (Zero CHECKSUM) (256-(sum of bytes 109 to 132))	64	40
108	6C	Header CHECKSUM of power supply record header (Zero CHECKSUM) (256-(sum of bytes 104 to 107))	166	A6
POWER SUPPLY RECORD				
109	6D	Overall Capacity of the Power Supply 2 bytes sequence 750W = 2EEH In Decimal = 238, 02 In Hex = EEH, 0H	238	EE
110	6E		2	02
111	6F	Peak VA, 900W = 0384H 2 bytes sequence In Decimal = 132, 003 In Hex = 84H, 03H	132	84
112	70		3	03
113	71	Inrush Current, 55A In Decimal = 055 In Hex = 37H	55	37
114	72	Inrush Interval, 10mS In Decimal = 010 In Hex = 0AH	10	0A
115	73	Low End Input Voltage Range 1(10mV), (90V/10mV) 9000 = 2328H 2 bytes sequence In Decimal = 040, 035 In Hex = 28H, 23H	40	28
116	74		35	23
117	75	High End Input Voltage Range 1(10mV), (264V/10mV) 26400 = 6720H 2 bytes sequence In Decimal = 032, 103 In Hex = 20H, 67H	32	20
118	76		103	67
119	77	Low End Input Voltage Range 2(10mV) Not applicable (Autoswitch)	0	00
120	78		0	00
121	79	High End Input Voltage Range 2(10mV) Not applicable (Autoswitch)	0	00
122	7A		0	00
123	7B	Low End Input Frequency Range, 47Hz = 2FH	47	2F
124	7C	Low End Input Frequency Range, 63Hz = 3FH	63	3F
125	7D	AC Dropout Tolerance in ms, 10mS = 0AH	10	0A
126	7E	Binary Flags, "1" indicates function supported and "0" indicates function not supported. Bits 7-5: RESERVED, write as 000B. Bit 5: PMBUS capable or not. 1 if supported 0 if not. BIT = 1 Bit 4: Tachometer Pulses Per Rotation / Predictive Fail Polarity BIT = 0 Bit 3: Hot Swap / Redundancy Support BIT = 1 Bit 2: Auto Switch Support BIT = 1 Bit 1: Power Factor Correction Support BIT = 1 Bit 0: Predictive Fail Support BIT = 0	46	2E
127	7F	Peak Wattage Capacity and Holdup Time 2 bytes sequence 750W = 2EEH 10ms = 0AH	238	EE
128	80		162	A2

COMMUNICATION BUS DESCRIPTIONS

DS750PED-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION (REMARKS)	SPEC VALUE	
(DEC)	(HEX)		(DEC)	(HEX)
129	81	Combined Wattage , not applicable Byte 1: 0000 0000 0000 0000 Byte 2 and Byte 3: 00H, 00H 3 bytes sequence	0	00
130	82		0	00
131	83		0	00
132	84	Predictive Fail Tachometer Lower Threshold , not applicable. Predictive failure is not supported.	0	00
12V DC OUTPUT RECORD HEADER				
133	85	Record Type = 01 for DC Output Record	1	01
134	86	End of List / Record Format Version Number for 12V DC Output Record	2	02
135	87	Record Length of 12V DC Output Record	13	0D
136	88	Record CHECKSUM of 12V DC Output Record (Zero CHECKSUM) (256-(sum of bytes 138 to 150))	183	B7
137	89	Header CHECKSUM of 12V DC Output Record Header (Zero CHECKSUM) (256-(sum of bytes 131 to 136))	57	39
12V OUTPUT RECORD				
138	8A	Output Information, 001 = 01H Bit 7: Standby Information = 0B Bits 6-4: Reserved, write as 000B Bits 3-0: Output Number 1 = 001B	1	01
139	8B	Nominal Voltage (10mV), (12V / 10mV) 1200 = 04B0H 2 bytes sequence In Decimal: 176, 004 In Hex: B0H, 04H	176	B0
140	8C		4	04
141	8D	Maximum Negative Voltage Deviation (10mV), 1140 = 0474H 2 bytes sequence In Decimal: 116, 004 In Hex: 74H, 04H	116	74
142	8C		4	04
143	8F	Maximum Positive Voltage Deviation (10mV), 1260 = 04ECH 2 bytes sequence In Decimal: 236, 004 In Hex: ECH, 04H	236	EC
144	90		4	04
145	91	Ripple and Noise pk-pk (mV), 150 = 96H 2 bytes sequence In Decimal: 150, 000 In Hex: 96H, 00H	120	78
146	92		0	00
147	93	Minimum Current Draw (10mA), 0050 = 0032H 2 bytes sequence In Decimal: 050, 000 In Hex: 32H, 00H	50	32
148	94		0	00
149	95	Maximum Current Draw (10mA), 6250 = 186AH In Decimal: 106, 024 In Hex: 6AH, 18H	106	6A
150	96		24	18
VSB OUTPUT RECORD HEADER				
151	97	Record Type = 01 for DC Output Record	1	01
152	98	End of List / Record Format Version Number for 3V3SB Output Record	2	02
153	99	Record Length of 3V3SB Output Record	13	0D
154	9A	Record CHECKSUM of 3V3SB Output Record (Zero CHECKSUM) (256-(sum of bytes 156 to 168))	179	B3
155	9B	Header CHECKSUM of 3V3SB Output Record Header (Zero CHECKSUM) (256-(sum of bytes 151 to 154))	61	3D

COMMUNICATION BUS DESCRIPTIONS

DS750PED-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION (REMARKS)	SPEC VALUE	
(DEC)	(HEX)		(DEC)	(HEX)
156	9C	Output Information , 002 = 02H Bit 7: Standby Information = 1B Bits 6-4: Reserved, write as 000B Bits 3-0: Output Number 2 = 010B	130	82
157	9D	Nominal Voltage (10mV) , (12V/10mV) 1200 = 04B0H 2 bytes sequence In Decimal: 176, 004 In Hex: B0H, 04H	176 4	B0 04
158	9E			
159	9F	Maximum Negative Voltage Deviation (10mV) , 1140 = 0474H 2 bytes sequence In Decimal: 116, 004 In Hex: 74H, 04H	116 4	74 04
160	A0			
161	A1	Maximum Positive Voltage Deviation (10mV) , 1260 = 04ECH 2 bytes sequence In Decimal: 236, 004 In Hex: ECH, 04H	236 4	EC 04
162	A2			
163	A3	Ripple and Noise pk-pk (mV) , 120 = 78H 2 bytes sequence In Decimal: 120, 000 In Hex: 78H, 00H	120 0	78 00
164	A4			
165	A5	Minimum Current Draw (10mA) , (0.1A/10mA) 10 = 000AH 2 bytes sequence In Decimal: 010, 000 In Hex: 0AH, 00H	10 0	0A 00
166	A6			
167	A7	Maximum Current Draw (10mA) , (3A/10mA) 300 = 012CH 2 bytes sequence In Decimal: 044, 001 In Hex: 44H, 01H	44 1	2C 01
168	A8			
OEM RECORD HEADER				
169	A9	Record Type = C0H for OEM Record	192	C0
170	AA	End of List / Record Format Version Number for 3.3Vsb Output Record	130	82
171	AB	Record Length of OEM Record	42	2A
172	AC	Record CHECKSUM of OEM Record (Zero CHECKSUM)	0	00
173	AD	Header CHECKSUM of OEM Record Header (Zero CHECKSUM) (256-(sum of bytes 169 to 172))	148	94
OEM RECORD				
174	AE	Manufacturer ID (3 bytes, default is 0)	0	00
175	AF	RESERVED	0	00
176	B0	RESERVED	0	00
177	B1	RESERVED	0	00
178	B2	RESERVED	0	00
179	B3	RESERVED	0	00
180	B4	RESERVED	0	00
181	B5	RESERVED	0	00
182	B6	RESERVED	0	00
183	B7	RESERVED	0	00
184	B8	RESERVED	0	00
185	B9	RESERVED	0	00
186	BA	RESERVED	0	00
187	BB	PAD (reserved), default value is 0.	0	00
188	BC		0	00
189	BD		0	00
190	BE		0	00
191	BF		0	00
192	C0		0	00
193	C1		0	00

COMMUNICATION BUS DESCRIPTIONS

DS750PED-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION (REMARKS)	SPEC VALUE	
(DEC)	(HEX)		(DEC)	(HEX)
194	C2	PAD (reserved), default value is 0.	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	
INTERNAL USE AREA, 40 BYTES				
216	D8	RESERVED, default value is 0.	0	00
217	D9		0	00
218	DA		0	00
219	DB		0	00
220	DC		0	00
221	DD		0	00
222	DE		0	00
223	DF		0	00
224	E0		0	00
225	E1		0	00
226	E2		0	00
227	E3		0	00
228	E4		0	00
229	E5		0	00
230	E6		0	00
231	E7		0	00
232	E8		0	00
233	E9		0	00
234	EA		0	00
235	EB		0	00
236	EC		0	00
237	ED		0	00
238	EE		0	00
239	EF		0	00
240	F0		0	00
241	F1		0	00
242	F2		0	00
243	F3		0	00
244	F4		0	00
245	F5		0	00
246	F6		0	00
247	F7		0	00
248	F8		0	00
249	F9		0	00
250	FA		0	00

COMMUNICATION BUS DESCRIPTIONS

DS750PED-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION (REMARKS)	SPEC VALUE	
(DEC)	(HEX)		(DEC)	(HEX)
251	FB	RESERVED, default value is 0.	0	00
252	FC		0	00
253	FD		0	00
254	FE		0	00
255	FF	Zero CHECKSUM of Internal Use Area (if used). Default Value = 0	0	00

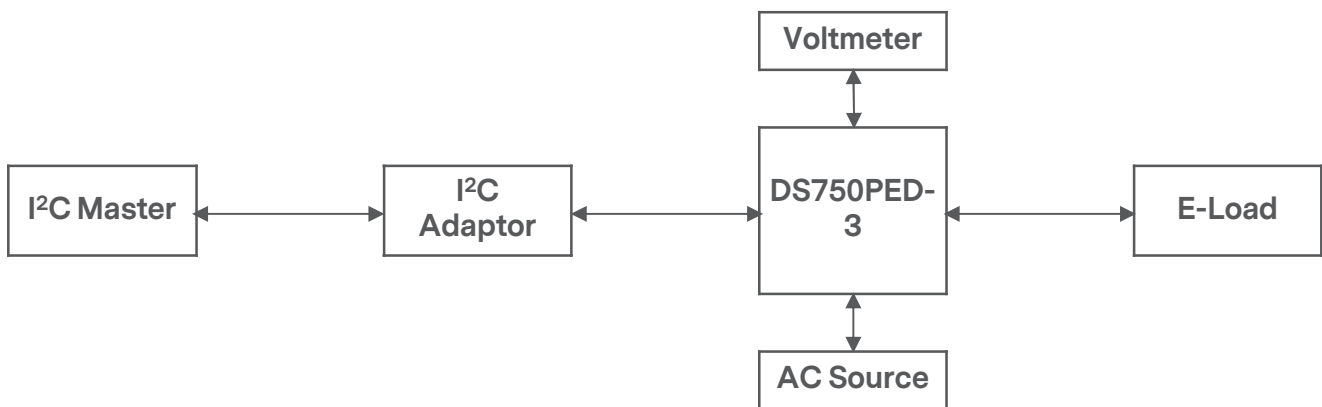
PMBus™ SPECIFICATIONS

The DS750PED-3 series is compliant with the industry standard PMBus™ protocol for monitoring and control of the power supply via the I²C interface port.

DS750PED-3 Series PMBus™ General Instructions

Equipment Setup

The following is typical I²C communication setup:



PMBus™ Writing Instructions

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

Disable write protect (command 10h) by writing any of the following accordingly:

- Levels:
- 00h - Enable writing to all writeable commands
 - 20h - Disables write except 10h, 01h, 00h, 02h and 21h commands
 - 40h - Disables write except 10h, 01h, and 00h commands
 - 80h - Disable write except 0x00h

To save changes on the USER PMBus™ Table:

Use send byte command: 15h STORE_USER_ALL

To save changes on the DEFAULT PMBus™ Table:

Use send byte command: 11h STORE_DEFAULT_ALL

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

PMBus™ SPECIFICATIONS

The DS750PED-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
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.
	b7:6	10				00 - Immediate turn OFF (No sequencing) 01 - Soft turn OFF (With sequencing) 10 - PSU ON
	b5:4	00				
	b3:2	00				
	b1:0	00				Reserved
02h	ON_OFF_CONFIG	1C	R	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	1				0 - Unit ignores ON/OFF portion of the OPERATION command. 1 - Enables serial communication ON/OFF portion of OPERATION command. Requires CONTROL pin to be asserted for the unit to start and energize the output.
	b2 - Sets how the unit responds to CONTROL pin	1				0 - Unit ignores CONTROL pin. (ON/OFF controlled by OPERATION command). 1 - Unit requires CONTROL pin to be asserted to start the unit.
	b1 - CONTROL pin polarity	0				0 - Active low (Pull low to start the unit) 1 - Active high (Pull high to start the unit)
	b0 - CONTROL pin action	0				0 - Use programmed turn ON/OFF delay. 1 - Turn OFF the output and stop transferring energy to the output as fast as possible.
03h	CLEAR_FAULTS	FF	S			

PMBus™ SPECIFICATIONS

The DS750PED-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
10h	WRITE_PROTECT	00	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.
16h	RESTORE_USER_ALL	-	S	0		Copies the entire USER non-volatile memory to the operating memory table.
19h	CAPABILITY	90	R	1		Provides a way for the hosts system to determine some key capabilities of a PMBus™ device.
	b7 - Packet Error Checking	1				0 - PEC not supported 1 - PEC supported
	b6 - Maximum Bus Speed	0				0 - Maximum supported bus speed, 100KHz 1 - Maximum supported bus speed, 400KHz
	b5 - SMBALERT	0				0 - SMBus Alert Pin not supported. 1 - SMBus Alert Pin supported.
	b4:0	00000				Reserved
20h	VOUT_MODE	17	R	1		Specifies the mode and parameters of output voltage related data formats.
21h	VOUT_COMMAND	1801	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.
22h	VOUT_TRIM	FFFF	R/W	2		Not supported
23h	VOUT_CAL_OFFSET	FFFF	R/W	2		Not supported
24h	VOUT_MAX	1933	R	2	Linear	Read Only (12.6V)

PMBus™ SPECIFICATIONS

The DS750PED-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
30h	COEFFICIENTS	FFFFFFFFFFFF	BR	6	Hex	Use to retrieve the m, b and R coefficients, needed for DIRECT data format.
	byte 5					R byte
	byte 4:3					b low byte, b high byte
	byte 2:1					m low byte, m high byte
31h	POUT_MAX	FFFF	R	2	Linear	Sets the operating power limit condition.
35h	VIN_ON	EAC0	R	2	Linear	Sets the value of input, in volts, at which the unit should start. ACGOOD 88Vac
36h	VIN_OFF	EA98	R	2	Linear	Sets the value of input, in volts, at which the unit should stop power conversion. ACBAD 83Vac
38h	IOUT_CAL_GAIN	FFFF	R	2		The ratio of voltage across the current sense to actual current. (Not supported).
39h	IOUT_CAL_OFFSET	FFFF	R	2		Used to null any offsets in the current sensing circuit. Normally used in conjunction with the IOUT_SCALE to minimize current sensing error. (Not supported)
3Ah	FAN_CONFIG_1_2	90	R	1		Read only to reflect setting of fans.
	b7	1				1 - Fan is installed in position 1. 0 - No fan is installed in position 1.
	b6	0				1 - Fan is commanded in RPM. 0 - Fan is commanded in DC.
	b5:4	01				00 - 1 pulse per revolution 01 - 2 pulses per revolution 10 - 3 pulses per revolution 11 - 4 pulses per revolution
	b3	0				1 - Fan is installed in position 2. 0 - No fan is installed in position 2.
	b2	0				1 - Fan is commanded in RPM. 0 - Fan is commanded in DC.
	b1:0	00				00 - 1 pulse per revolution 01 - 2 pulses per revolution 10 - 3 pulses per revolution 11 - 4 pulses per revolution
3Bh	FAN_COMMAND_1	0000	R/W	2	Linear	Adjusts the operation of the fans. The device may override the command, if it requires higher value, to maintain proper device temperature. RPM control - Commands speeds from 0-65535 RPM. Duty cycle control - Commands speeds from 0 to 100%.
40h	VOUT_OV_FAULT_LIMIT	1C81	R/W	2	Linear	Sets output over voltage threshold. (14.25V)

PMBus™ SPECIFICATIONS

The DS750PED-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
41h	VOUT_OV_FAULT_RESPONSE	80	R	1		Unit latches OFF. Resets on PSON or CONTROL pin recycle or AC recycle.
42h	VOUT_OV_WARN_LIMIT	1A01	R/W	2	Linear	Sets over-voltage warning threshold. (13.0V)
43h	VOUT_UV_WARN_LIMIT	1599	R/W	2	Linear	Sets under-voltage warning threshold. (10.8V)
44h	VOUT_UV_FAULT_LIMIT	1599	R/W	2	Linear	Sets under-voltage fault threshold. (10.8V)
45h	VOUT_UV_FAULT_RESPONSE	80	R	1		Turn PSU OFF
46h	IOUT_OC_FAULT_LIMIT	EA53	R	2	Linear	Sets the over current threshold in Amps. (74.38A for hi line and low line)
47h	IOUT_OC_FAULT_RESPONSE	C0	R	1		OCP ride through. If OCP persists.
4Ah	IOUT_OC_WARN_LIMIT	EA40	R	2	Linear	Sets the over current warning threshold in Amps. (72A for hi line and low line)
4Fh	OT_FAULT_LIMIT	EB48	R/W	2	Linear	Secondary ambient temperature fault threshold, in degree C. (105degC)
50h	OT_FAULT_RESPONSE	F8	R	1		Turn PSU OFF and will retry indefinitely. Supported enable/disable of protection and recoverability.
51h	OT_WARN_LIMIT	EB20	R	2	Linear	Secondary ambient temperature warning threshold, in degree C. Operating limit (100degC)
55h	VIN_OV_FAULT_LIMIT	FA26	R	2	Linear	Sets input over-voltage threshold. (275Vac)
56h	VIN_OV_FAULT_RESPONSE	C0	R	1		
58h	VIN_UV_WARN_LIMIT	EAB8	R	2	Linear	Default: 87Vac.
59h	VIN_UV_FAULT_LIMIT	EA80	R	2	Linear	Default: 80Vac
5Ah	VIN_UV_FAULT_RESPONSE	F8	R	1		
5Eh	POWER_GOOD_ON	D2C0	R	2	Linear	Sets the threshold by which the power good signal is asserted. (11.6-11.8V) Default=11.0V
5Fh	POWER_GOOD_OFF	0000	R	2	Linear	Sets the threshold by which the power good signal is de-asserted. (11.3-11.5V) Default=0V
60h	TON_DELAY	EB20	R	2	Linear	Sets the time (sec), from start condition (Power ON) until the output starts to rise. (2.1sec max) Default=100ms
61h	TON_RISE	DBC0	R	2	Linear	Sets the time (ms), for the output rises from 0 to regulation. (50ms max) Default=30ms
64h	TOFF_DELAY	1271	R	2	Linear	Sets the time (ms), from a stop condition (Power OFF) until the output starts to drop (converter OFF). (2.5sec max) Default=2.5secs

PMBus™ SPECIFICATIONS

The DS750PED-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
78h	STATUS_BYTE	-	R	1		Returns the summary of critical faults.
	b7 - BUSY	-				Not supported.
	b6 - OFF	-				Unit is OFF.
	b5 - VOUT_OV	-				Output over-voltage fault has occurred.
	b4 - IOUT_OC	-				Output over-current fault has occurred.
	b3 - VIN_UV	-				An input under-voltage fault has occurred.
	b2 - TEMPERATURE	-				A temperature fault or warning has occurred.
	b1 - CML	-				A communication, memory or logic fault has occurred.
	b0 - NONE OF THE ABOVE	-				A fault warning not listed in bits[7:1] has occurred.
79h	STATUS_WORD	-	R	2	1	Summary of units fault and warning status.
	b15 - VOUT					An output voltage fault or warning has occurred.
	b14 - IOUT/POUT					An output current or power fault or warning has occurred.
	b13 - INPUT					An input voltage, current or power fault or warning as occurred.
	b12 - MFR					A manufacturer specific fault or warning has occurred.
	b11 - POWER_GOOD#					The POWER_GOOD signal is de-asserted.
	b10 - FANS					A fan or airflow fault or warning has occurred.
	b9 - OTHER					Not supported
	b8 - UNKNOWN					Not supported
	b7 - BUSY					A fault was declared because the device was busy and unable to respond.
	b6 - OFF					Unit is OFF.
	b5 - VOUT_OV					Output over-voltage fault has occurred.
	b4 - IOUT_OC					Output over-current fault has occurred.
	b3 - VIN_UV					An input under-voltage fault has occurred.
	b2 - TEMPERATURE					A temperature fault or warning has occurred.
	b1 - CML					A communication, memory or logic fault has occurred.
	b0 - NONE_OF_THE_ABOVE					A fault or warning not listed in bits[7:1] of this byte has occurred.

PMBus™ SPECIFICATIONS

The DS750PED-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
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
	b3					VOUT_MAX warning, an attempt has been made to set output to a value higher than the highest permissible voltage.
	b2					TON_MAX_FAULT
	b1					TOFF_MAX warning. Not supported.
7Bh	STATUS_IOUT	00	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
	b2					Power Limiting
	b1					POUT Overpower Fault
7Ch	STATUS_INPUT	-	R	1		Input related faults and warnings.
	b7					VIN Overvoltage Fault
	b6					VIN Overvoltage Warning
	b5					VIN Under-voltage Warning
	b4					VIN Under-voltage Fault
	b3					Unit is OFF for insufficient input voltage.
	b2					IIN Over Current Fault
	b1					IIN over current warning
7Dh	STATUS_TEMPERATURE	-	R	1		Temperature related faults and warnings.
	b7					Over-temperature Fault
	b6					Over-temperature Warning
	b5					Under-temperature Warning.
	b4					Under-temperature Fault.
7Eh	STATUS_CML	-	R	1		Communications, logic and memory
	b7					Invalid or unsupported command received.
	b6					Invalid Data
	b5					Packet Error Check Failed
	b4					Memory Fault Detect, CRC Error

PMBus™ SPECIFICATIONS

The DS750PED-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
7Eh	b3					Not supported.
	b2					Not supported.
	b1					Not supported.
	b0					Not supported.
80h	STATUS_MFR_SPECIFIC	-	R	1		Manufacturer Status Codes
	b7					Not Used
	b6					Not Used
	b5					Not Used
	b4					Not Used
	b3					Not Used
	b2					Not Used
	b1					Not Used
81h	STATUS_FANS_1_2	00	R	1		MFR SPECIFIC FAULT For trouble shooting.
	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					Not used
86h	READ_EIN	-	BR	6	Linear	Returns the accumulated input power over time.
	READ_EOUT	-	BR	6	Linear	Returns the accumulated output power over time.
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	Linear	Returns the actual, measured voltage in Volts.
8Ch	READ_IOUT	-	R	2	Linear	Returns the output current in amperes.
8Dh	READ_TEMPERATURE_1	-	R	2	Linear	Secondary side hotspot
8Eh	READ_TEMPERATURE_2	-	R	2	Linear	Secondary side ambient
8Fh	READ_TEMPERATURE_3	-	R	2	Linear	Primary side ambient
90h	READ_FAN_SPEED_1	-	R	2	Linear	Speed of fan 1
96h	READ_POUT	-	R	2	Linear	Returns the output power, in Watts.
97h	READ_PIN	-	R	2	Linear	Returns the input power, in Watts.
98h	PMBus™_REVISION	22	R	1	Bitmapped	Reads the PMBus™ revision number
	b7:5	0001				Part 1 Revision 0000 - Revision 1.0 0001 - Revision 1.1

PMBus™ SPECIFICATIONS

The DS750PED-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
98h	b4:0	0001				Part 2 Revision 0000 - Revision 1.0 0001 - Revision 1.1
99h	MFR_ID	"ALL"	BR, ASCII	7		Abbrev or symbol of manufacturers name. ASCII (artesynt)
9Ah	MFR_MODEL	"DS750PED-3"	BR, ASCII			Manufacturers Model Number, ASCII format
9Bh	MFR_REVISION	4102	BR, ASCII	2		Manufacturers Revision Number, ASCII format
9Ch	MFR_LOCATION	"xxxxxxxxxxxxx"	BR, ASCII			Manufacturers Facility, ASCII format
9Dh	MFR_DATE	"xxxxxx"	BR	6		Manufacture Date, ASCII format structure: YYMMDD
9Eh	MFR_SERIAL	"K369WWSSSS AAZ"	BR	13		Unit Serial Number, ASCII format.
A0h	MFR_VIN_MIN	EAD0	R	2	Linear	Minimum Input Voltage (90Vac)
A1h	MFR_VIN_MAX	FA10	R	2	Linear	Maximum Input Voltage (264Vac)
A2h	MFR_IIN_MAX	D280	R	2	Linear	Maximum Input Current (10A)
A3h	MFR_PIN_MAX	-			Linear	
A4h	MFR_VOUT_MIN	16CD	R	2	Linear	Minimum Output Voltage Regulation Window. (11.4V)
A5h	MFR_VOUT_MAX	1933	R	2	Linear	Maximum Output Voltage. Regulation Window (12.6V)
A6h	MFR_IOUT_MAX	E3E8	R	2	Linear	Maximum Output Current (62.5A)
A7h	MFR_POOUT_MAX	02EE	R	2	Linear	Maximum Output Power
A8h	MFR_TAMBIENT_MAX	E320	R	2	Linear	Maximum Operating Ambient Temperature (Secondary Ambient) (50degC)
A9h	MFR_TAMBIENT_MIN	000A	R	2	Linear	Minimum Operating Ambient Temperature (Secondary Ambient) (0degC)
AAh	MFR_EFFICIENCY_LL	073E	R	14		
ABh	MFR_EFFICIENCY_HL		R	14		
B0h	USER_DATA_00		R/W			
E0h	FW_PRI_VERSION		R	8	ASCII	
E1h	FW_SEC_VERSION		R	8	ASCII	
E2h	CONFIG_UNLOCK_CODE		R/W	4		
E3h	CONFIG_CTRL_CMD		R/W			
F1h	ISP_UNLOCK_CODE		R/W	4		
F2h	ISP_CTRL_CMD		R/W			
F3h	ISP_STATUS_BYTE		R			
F5h	ISP_FLASH_DATA.		R/W	16		

APPLICATION NOTES

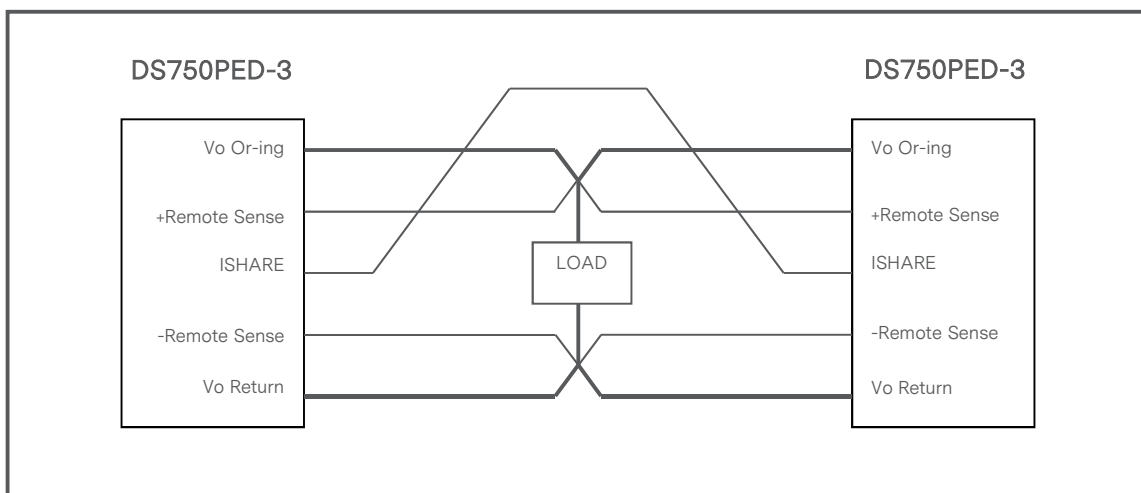
Current Sharing

The DS750PED-3 series main output V_O is equipped with current sharing capability. This will allow up to 6 power supplies to be connected in parallel for higher power application. Current share accuracy is typically 5% of full load. When supplying light loads between 10% and 100% of its rated load, the power supplies will share within 5% accuracy. Below 10% total loading, there is no guarantee of output current sharing.

Redundancy / Fault Tolerance

The DS750PED-3 series is able to current share with 2 (1+1) up to 4 (2+2) or 6 (3+3) power supplies in parallel and operate in a hot swap/redundant N+N configuration where N=1, 2, or 3. The 12V V_{SB} outputs of the power supplies are connected together in the system so that a failure or hot swap of a redundant power supply does not cause these outputs to go out of regulation in the system.

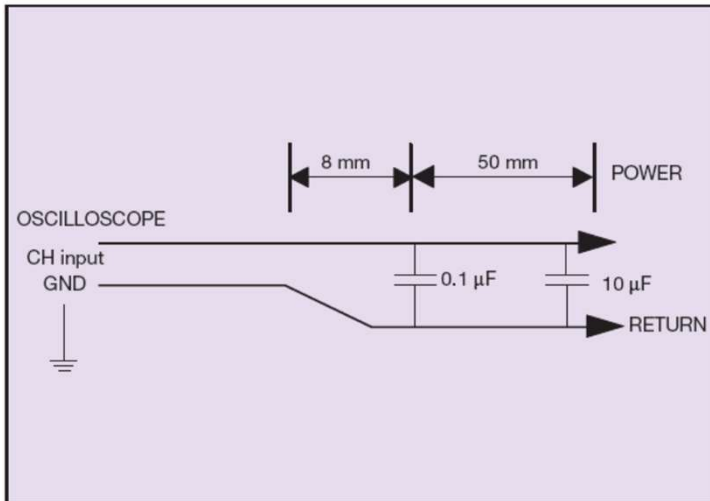
All power supply outputs will be designed for redundant mode operation. No internal failure in any power supply in this configuration should cause the bus voltage to fall below the regulation limits specified. All output voltages should stay within the regulation limits during cold swapping or hot swapping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



APPLICATION NOTES

Output Ripple and Noise Measurement

The setup outlined in the diagram below has been used for output voltage ripple and noise measurements on the DS750PED-3 series. When measuring output ripple and noise, a scope jack in parallel with a 0.1 μ F ceramic chip capacitor, and a 10 μ F tantalum capacitor will be used. Oscilloscope can be set to 20MHz bandwidth for this measurement.



RECORD OF REVISION AND CHANGES

Issue	Date	Description	Originators
1.0	08.17.2015	First issue	S. Dong
1.1	04.22.2015	Update mechanical outlines	S. Dong
1.2	10.30.2015	Update PS_ON_L and PS PRESENT description / update the command code 8Dh, 8Eh, 8Fh description	S. Dong
1.3	03.09.2017	Update PS_ON_L description	S. Dong
1.4	10.11.2017	Update command code 86h and 87h description	S. Dong
1.5	03.03.2021	Update cover and back cover	C. Liu
1.6	05.10.2022	Add UKCA Mark	C. Liu



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