ARTESYN DS760SL SERIES

760 Watts Distributed Power System

PRODUCT DESCRIPTION

Advanced Energy's Artesyn DS760SL series bulk front end AC-DC power supply accepts a wide range 90 to 264Vac input and provides a main 12V output plus a 5V standby output. Rated at 760 watts it has a high peak efficiency of 91%. Housed in a slimline 1U high, 2.1 in wide rack-mounting package, the power supply is primarily designed for 'always-on' enterprise servers and similar space-constrained applications. This series comes in two airflow versions — dc-connector to ac-connector and vice versa.

AT A GLANCE

Total Power:

760 Watts

Input Voltage:

90 to 264 Vac

# of Outputs:

Main and Standby

SPECIAL FEATURES

- 1U × 54.5mm form factor (slimline) (5V standby - consult factory)
- 760W output power
- Active power factor correction
- N+1 redundant
- 18.1W/in^3
- Internal OR'Ing
- 5.0V housekeeping
- Hot-swap
- High efficiency 91% @ 230Vac, 50% load
- Variable speed "smart fans"
- EMI Class A
- EN61000 Immunity
- Two years warranty

SAFETY

- UL/cUL 60950-1
- CSA 60950-1
- VDE 60950-1
- China CCC
- CB Scheme Report/Cert
- BSMI

TYPICAL APPLICATIONS

- Industrial

RoHS

MODEL NUMBERS

Standard	Output Voltage	Minimum Load	Maximum Load	Stand-By Supply	Air Flow Direction
DS760SL-3	12.0Vdc	0A	62.3A	5.0V@2.4A	Standard (DC Connector to Handle)
DS760SL-3-001	12.0Vdc	0A	50.0A	5.0V@2.4A	Reverse (Handle to DC Connector)
DS760SL-3-002	12.0Vdc	0A	62.3A	3.3V@2.4A	Standard (DC Connector to Handle)
DS760SL-3-003	12.0Vdc	0A	50.0A	3.3V@2.4A	Reverse (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	Models	Symbol	Min	Typ	Max	Unit
Input Voltage AC continuous operation	All models	$V_{IN,AC}$	90	-	264	Vac
Maximum Output Power (Main + Stand-by)	DS760SL-3 DS760SL-3-001 DS760SL-3-002 DS760SL-3-003	$P_{O,max}$	- - - -	- - - -	760 600 760 600	W W W W
Isolation Voltage Input to outputs Input to safety ground	 All models All models		 - -	 - -	 2121 2121	 Vac Vdc
Ambient Operating Temperature	All models	T_A	-10	-	50	^{O}C
Storage Temperature	All models	T_{STG}	-40	-	85	^{O}C
Humidity (non-condensing) Operating Non-operating	 All models All models		 7 5	 - -	 93 95	 % %
Altitude Operating Non-operating	 All models All models		 - -	 - -	 4000 13000	 m m

ELECTRICAL SPECIFICATIONS

Input Specifications

Table 2. Input Specifications

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Operating Input Voltage, AC		$V_{IN,AC}$	90	115/230	264	Vac
Input Vac Source Frequency		$f_{IN,AC}$	47	50/60	63	Hz
Maximum Input Current ($I_O = I_{O,max}$, $I_{SB} = I_{SB,Max}$)	$V_{IN,AC}$ = 100Vac	$I_{IN,,max}$	-	-	9	A
Standby Input Current (V_O Off, I_{SB} = 0A)	$V_{IN,AC}$ = 90Vac $V_{IN,AC}$ = 180Vac	$I_{I,standby}$	- -	- -	400 300	mA mA
No Load Input Current (V_O On, I_O = 0A, I_{VSB} = 0A)	$V_{IN,AC}$ = 90Vac $V_{IN,AC}$ = 180Vac	I_{I,no_load}	- -	- -	800 450	mA mA
Harmonic Line Currents	All	THD	Per IEC61000-3-2			
Power Factor	All		-	0.99	-	
Startup Surge Current (Inrush) @ 25°C	$V_{IN,AC}$ = 264Vac		-	-	25	A
Input Fuse	Internal, L and N 5x20mm, Quick Acting 10A, 250V		-	-	10	A
Leakage Current to earth ground	$V_{IN,AC}$ = 264Vac $f_{IN,AC}$ = 50/60Hz		-	-	1.5	mA
Operating Efficiency @ 25°C	$I_O = I_{O,max}$ $V_{IN,AC}$ = 100Vac $V_{IN,AC}$ = 230Vac	η	87 87	- -	- -	% %
System Stability Phase Margin Gain Margin			 45 6	 - -	 - -	 Ø dB

ELECTRICAL SPECIFICATIONS

Output Specifications

Table 3. Output Specifications

Parameter		Condition	Symbol	Min	Typ	Max	Unit
Output Regulation	All models	Inclusive of set-point, temperature change, warm-up drift and dynamic load	V_O	11.88	12.0	12.12	V
			V_{SB}	4.75	5.0	5.25	V
Output Ripple, pk-pk	All models	Measure with a 0.1uF ceramic capacitor in parallel with a 10uF tantalum capacitor, 0 to 20MHz bandwidth.	V_O	-	-	100	mV_{PK-PK}
			V_{SB}	-	-	100	mV_{PK-PK}
Output Current	DS760SL-3 DS760SL-3-001 DS760SL-3-002 DS760SL-3-003	90Vac ≤ $V_{IN,AC}$ ≤ 264Vac	I_O	0 0 0 0	- - - -	62.3 49.0 63.3 49.0	A
			I_{SB}	0	-	2.4	A
V_O Current Share Accuracy[1]		20% to 100% I_O ≤ 20% I_O		- -	- -	10 3.11	$\%I_O$ A
V_O Minimum Load for Current Sharing				20	-	-	$\%I_{O,max}$
V_O Load Capacitance		Start up		-	5000	30000	uF
V_{SB} Load Capacitance		Start up		-	3000	10000	uF
V_O Dynamic Response Peak Deviation Settling Time		50% load change, slew rate = 1A/ms	$\pm\%V_O$ T_s	- -	- -	1 250	% uSec
V_O Long Term Stability Max change over 24 hours		After thermal equilibrium (30 mins)	$\pm\%V_O$	-	-	0.2	%

Note 1 - This is typical testing results of two sample, it does not representing the extreme cases (one unit set to +0.5% above and one unit set to -0.5% below nominal).

ELECTRICAL SPECIFICATIONS

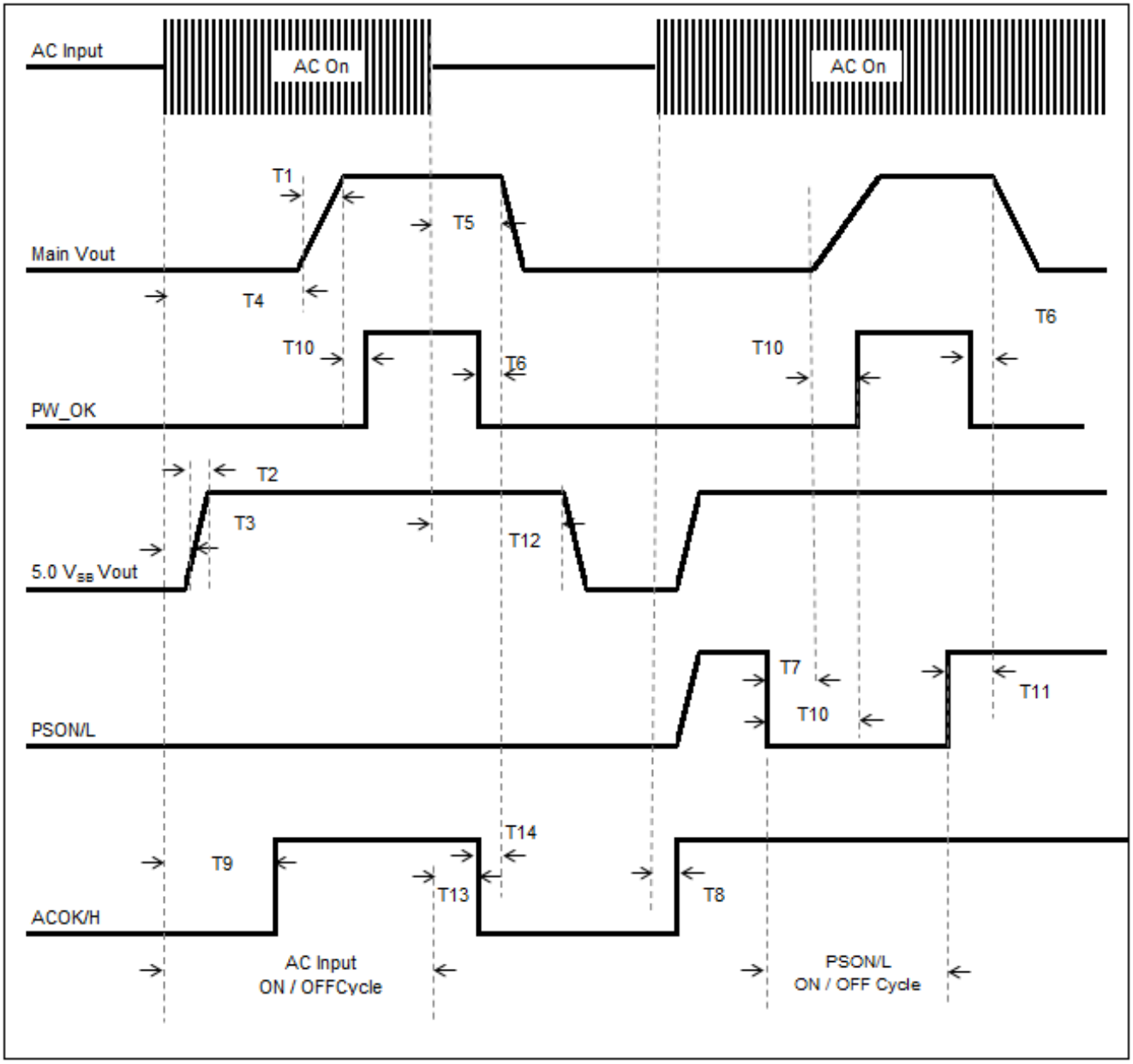
System Timing Specifications

Table 4. System Timing Specifications

Label	Parameter	Min	Typ	Max	Unit
T1	+12V output rise time	10	-	300	mSec
T2	5.0Vsb output rise time	10	-	300	mSec
T3	Delay from AC being applied to 5.0Vsb begin to rise up	-	-	1500	mSec
T4	Delay from AC being applied to 12Vdc begin to rise up	-	-	3000	mSec
T5	Time all 12Vdc hold up time after loss of AC	12	-	-	mSec
T6	Delay from loss of 12Vdc to de-assertion of PW_OK	-1	-	1	mSec
T7	Delay from PSON/L active to output voltages starts rise up	45	-	2500	mSec
T8	Delay ACOK/H after AC recycle	0	-	300	mSec
T9	Delay from sense of AC input to de-assertion of ACOK/H	0	-	600	mSec
T10	Delay PSON/L to PW_OK asserted at turn on	100	-	500	mSec
T11	Delay from PSON/H to 12Vdc dropping out of regulation limits	0	-	100	mSec
T12	Duration of 5.0Vsb hold up after loss of AC	20	-	-	mSec
T13	ACOK/L detected after loss of AC	0	-	-	mSec
T14	Warn of AC loss before 12Vdc drop out of regulation	7	-	-	mSec

ELECTRICAL SPECIFICATIONS

System Timing Diagram



ELECTRICAL SPECIFICATIONS

DS760SL-3 Performance Curves

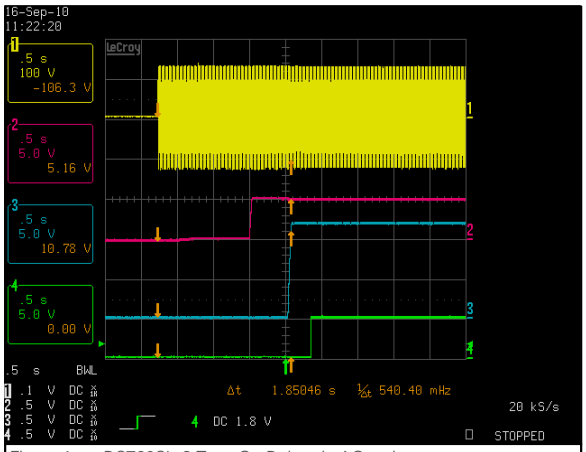


Figure 1: DS760SL-3 Turn-On Delay via AC mains

Vin = 90Vac Load: I_O = 62.3A I_{SB} = 0A

Ch 1: AC mains Ch 2: V_{SB} Ch 3: V_O Ch 4: PW_OK

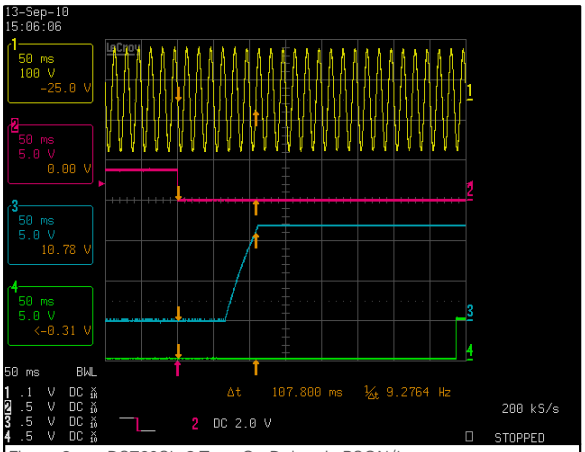


Figure 2: DS760SL-3 Turn-On Delay via PSON/L

Vin = 90Vac Load: I_O = 62.3A I_{SB} = 0A

Ch 1: AC mains Ch 2: PSON/L Ch 3: V_O Ch 4: PW_OK

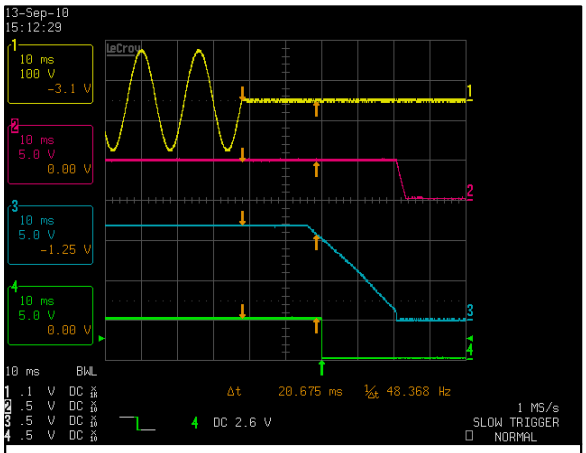


Figure 3: DS760SL-3 Hold-up Time

Vin = 90Vac fin = 63Hz Load: I_O = 62.3A I_{SB} = 0A

Ch 1: AC mains Ch 2: V_{SB} Ch 3: V_O Ch 4: PW_OK

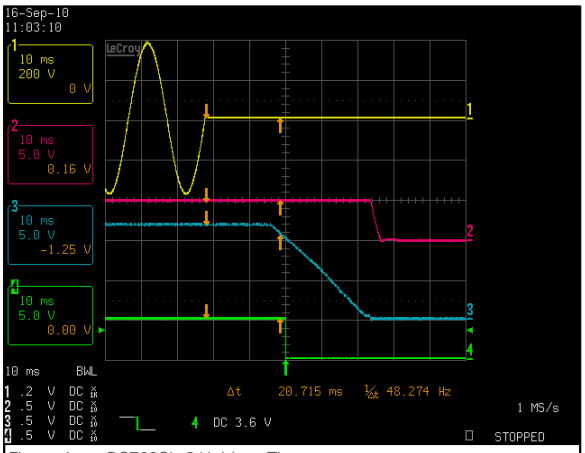


Figure 4: DS760SL-3 Hold-up Time

Vin = 264Vac fin = 47Hz Load: Io = 62.3A I_{SB} = 0A

Ch 1: AC mains Ch 2: V_{SB} Ch 3: V_O Ch 4: PW_OK

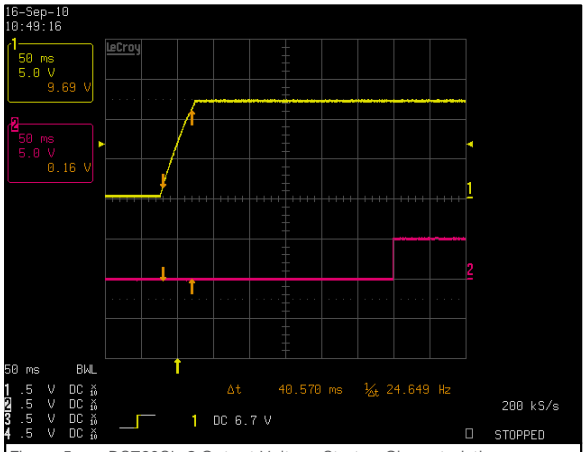


Figure 5: DS760SL-3 Output Voltage Startup Characteristic

Vin = 90Vac Load: Io = 62.3A I_{SB} = 0A

Ch 1: V_O Ch 2: PW_OK

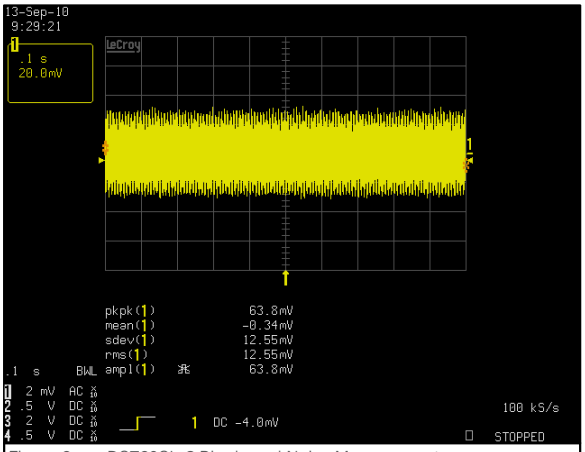


Figure 6: DS760SL-3 Ripple and Noise Measurement

Vin = 90Vac Load: Io = 62.3A I_{SB} = 0A

Ch 1: V_O

ELECTRICAL SPECIFICATIONS

DS760SL-3 Performance Curves

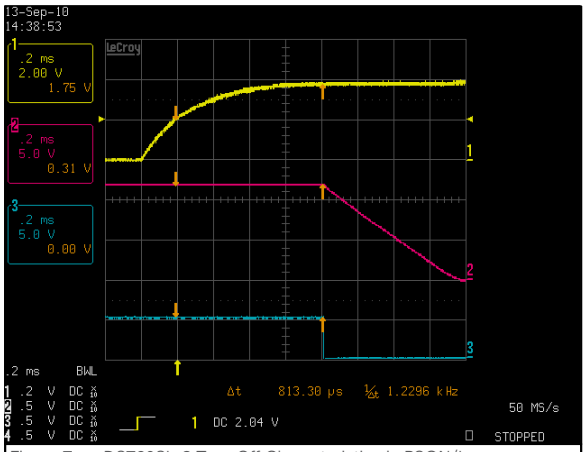


Figure 7: DS760SL-3 Turn Off Characteristic via PSON/L
Load: I_O = 62.3A I_{SB} = 2.4A
Ch 1: PSON/L Ch 2: V_O Ch 3: PW_OK

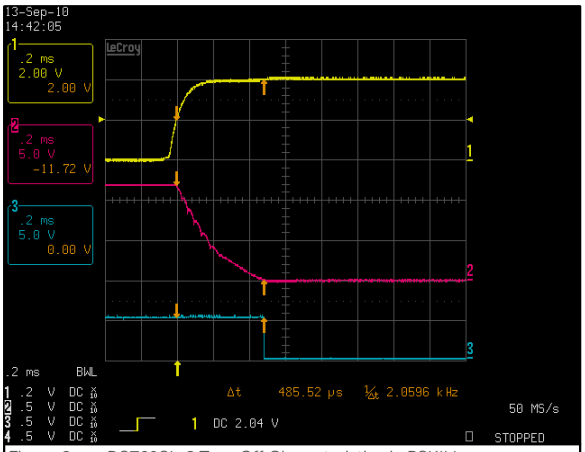


Figure 8: DS760SL-3 Turn Off Characteristic via PSKILL
Load: I_O = 62.3A I_{SB} = 2.4A
Ch 1: PSKILL Ch 2: V_O Ch 3: PW_OK

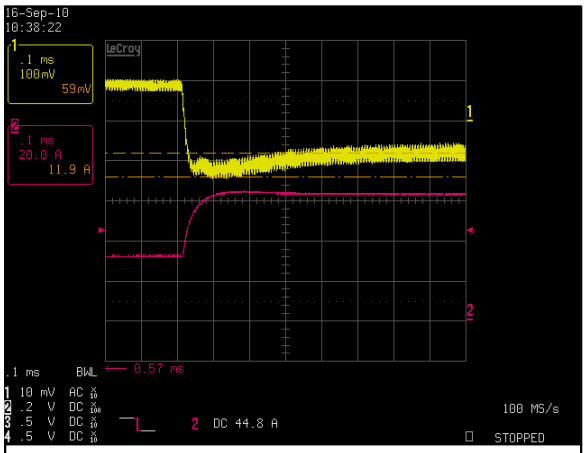


Figure 9: DS760SL-3 Transient Response - V_O Deviation
50% to 100% load change 1A/uS slew rate Vin = 230Vac
Ch 1: V_O Ch 2: I_O

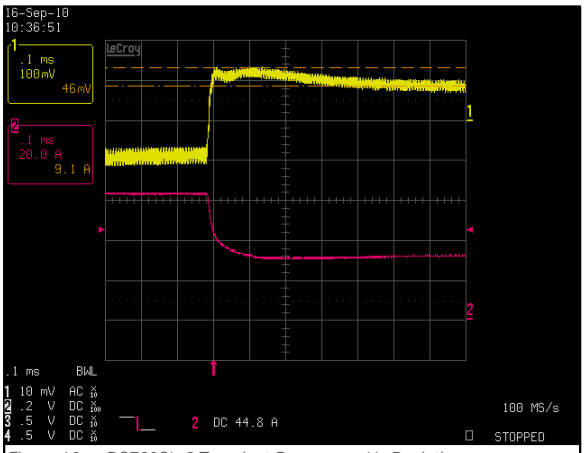


Figure 10: DS760SL-3 Transient Response - V_O Deviation
100% to 50% load change 1A/uS slew rate Vin = 230Vac
Ch 1: V_O Ch 2: I_O

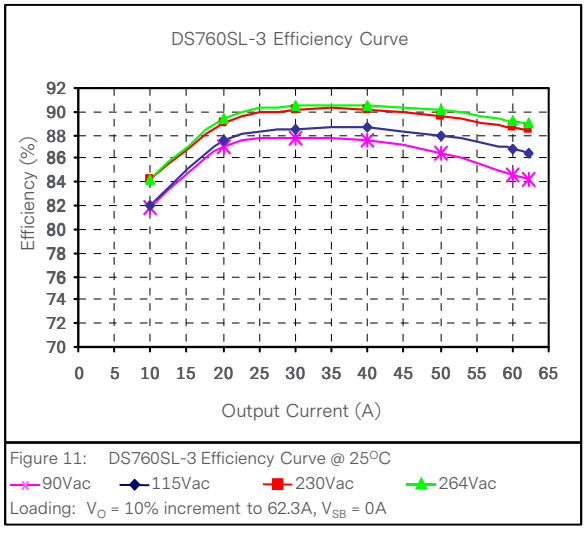


Figure 11: DS760SL-3 Efficiency Curve @ 25°C
90Vac 115Vac 230Vac 264Vac
Loading: V_O = 10% increment to 62.3A, V_{SB} = 0A

ELECTRICAL SPECIFICATIONS

DS760SL-3-001 Performance Curves

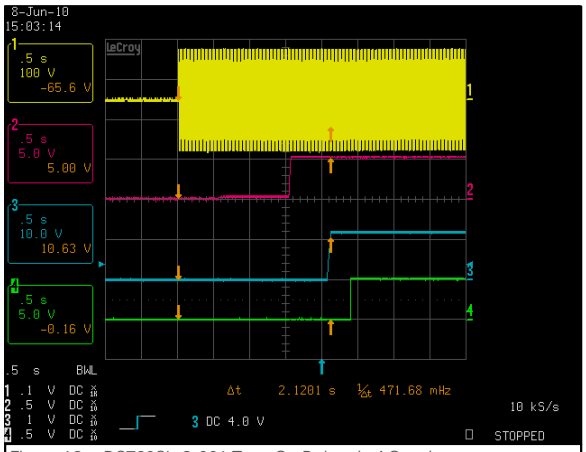


Figure 12: DS760SL-3-001 Turn-On Delay via AC mains

Vin = 90Vac | Load: I_O = 49A | I_{SB} = 0A

Ch 1: AC mains | Ch 2: V_{SB} | Ch 3: V_O | Ch 4: PW_OK

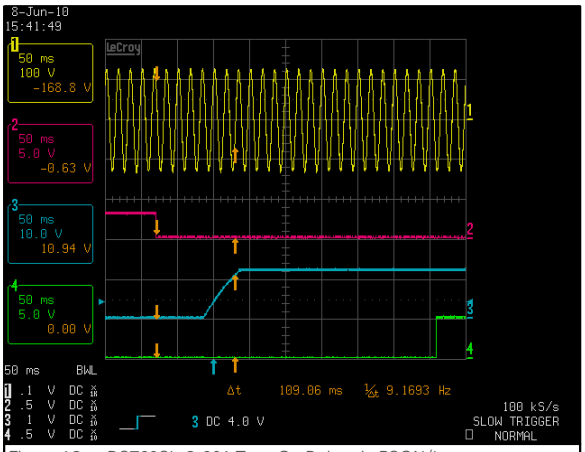


Figure 13: DS760SL-3-001 Turn-On Delay via PSON/L

Vin = 90Vac | Load: I_O = 49A | I_{SB} = 0A

Ch 1: AC mains | Ch 2: PSON/L | Ch 3: V_O | Ch 4: PW_OK

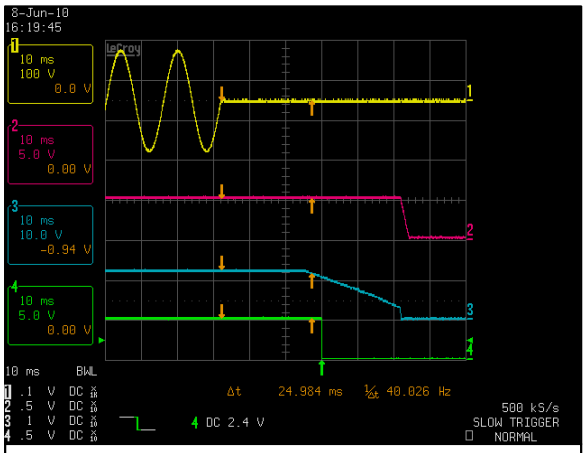


Figure 14: DS760SL-3-001 Hold-up Time

Vin = 90Vac | fin = 63Hz | Load: I_O = 49A | I_{SB} = 2.4A

Ch 1: AC mains | Ch 2: V_{SB} | Ch 3: V_O | Ch 4: PW_OK

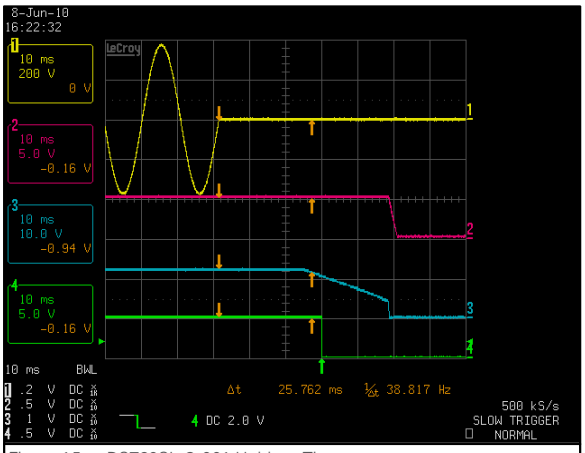


Figure 15: DS760SL-3-001 Hold-up Time

Vin = 264Vac | fin = 47Hz | Load: Io = 49A | I_{SB} = 2.4A

Ch 1: AC mains | Ch 2: V_{SB} | Ch 3: V_O | Ch 4: PW_OK

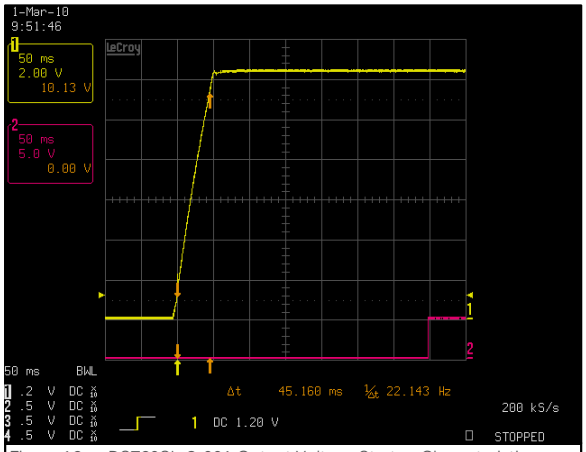


Figure 16: DS760SL-3-001 Output Voltage Startup Characteristic

Vin = 90Vac | Load: Io = 49A | I_{SB} = 2.4A

Ch 1: V_O | Ch 2: PW_OK

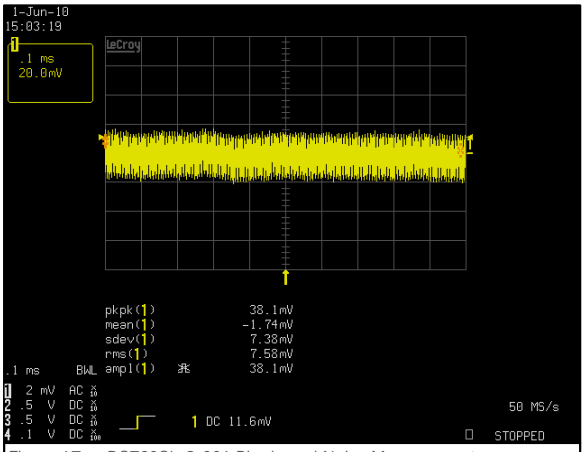


Figure 17: DS760SL-3-001 Ripple and Noise Measurement

Vin = 90Vac | Load: Io = 49A | I_{SB} = 2.4A

Ch 1: V_O

ELECTRICAL SPECIFICATIONS

DS760SL-3-001 Performance Curves

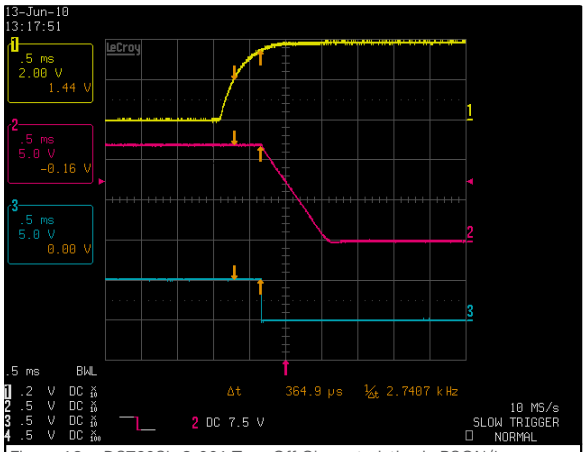


Figure 18: DS760SL-3-001 Turn Off Characteristic via PSON/L

Load: I_O = 49A I_{SB} = 2.4A

Ch 1: PSON/L Ch 2: V_O Ch 3: PW_OK

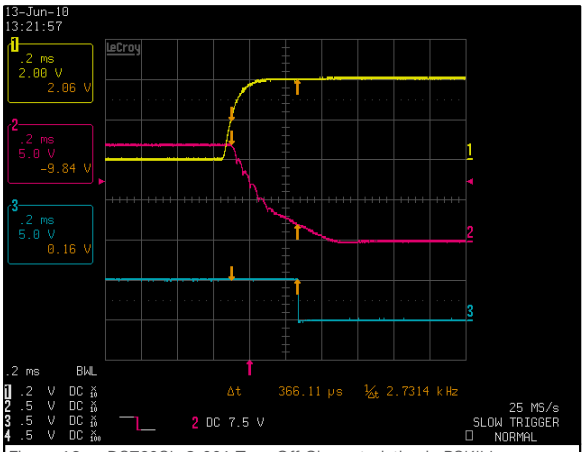


Figure 19: DS760SL-3-001 Turn Off Characteristic via PSKILL

Load: I_O = 49A I_{SB} = 2.4A

Ch 1: PSKILL Ch 2: V_O Ch 3: PW_OK

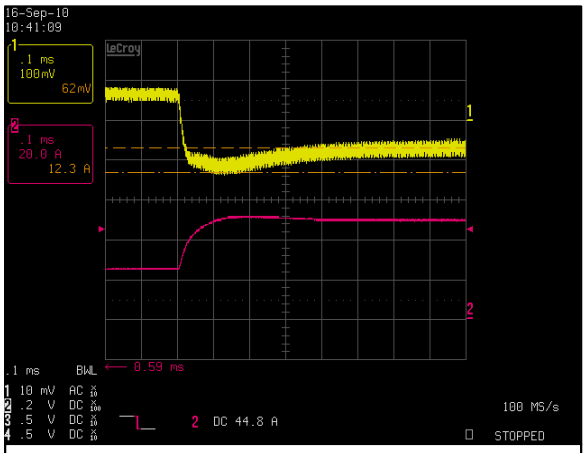


Figure 20: DS760SL-3-001 Transient Response - V_O Deviation

50% to 100% load change 1A/uS slew rate Vin = 230Vac

Ch 1: V_O Ch 2: I_O

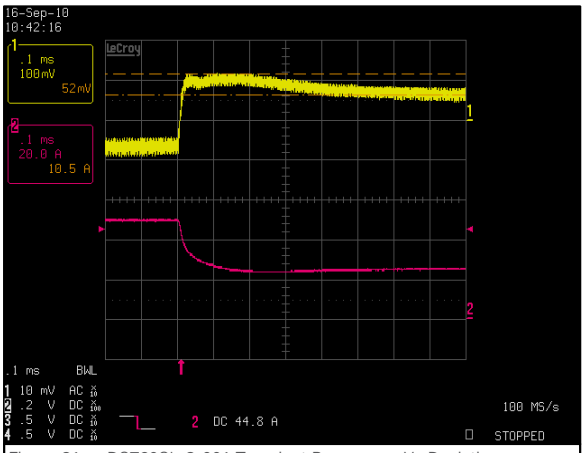


Figure 21: DS760SL-3-001 Transient Response - V_O Deviation

100% to 50% load change 1A/uS slew rate Vin = 230Vac

Ch 1: V_O Ch 2: I_O

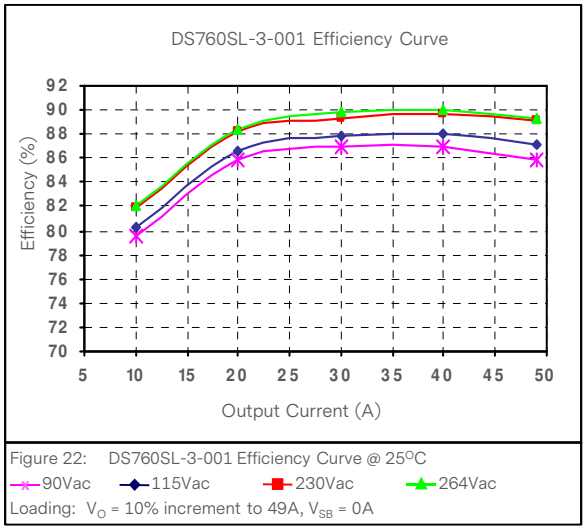


Figure 22: DS760SL-3-001 Efficiency Curve @ 25°C

90Vac 115Vac 230Vac 264Vac

Loading: V_O = 10% increment to 49A, V_{SB} = 0A

ELECTRICAL SPECIFICATIONS

Protection Function Specifications

Input Fuse

DS760SL series are equipped with an internal non user serviceable 10A High Rupturing Capacity (HRC) 250Vac fuse to IEC 127 for fault protection in both the L1 and L2 lines input.

Over Voltage / Under Voltage Protection (OVP / UVP)

The PSU overvoltage protection shall be locally sensed. The PSU shall shutdown in latched mode after an over voltage condition. This latch can be cleared by an AC power interruption.

OVP

Power supply latches off during output overvoltage, and restart by cycling the input or PSON/L, ON after a minimum OFF time of 1 second.

Note if the standby output (V_{SB}) was detected to be over-voltage and shutdown then the asserting edge of the PSON/L signal will re-enable the standby rail.

Parameter	Min	Nom	Max	Unit
V_O Output Overvoltage	13.3	/	14.5	V
$5V_{SB}$ Output Overvoltage	5.75	/	6.40	V

UVP

If the Vo output is below the regulation band then the output Vo will be latched off and only restarted by cycling the input or remote enable, ON after a minimum OFF time of 1 second.

If V_{SB} falls below the regulation band the power supply will not latch this output off but Vo will be turned off until the V_{SB} is back within range.

Over Current Protection (OCP)

DS760SL series includes internal current limit circuitry to prevent damage in the event of over current or short circuit.

The Vo over-current protection is a latched off type. When the over load condition is removed, the power supply can be restart by cycling the AC line or PSON/L, ON after a minimum OFF time of 1 second to reset the latch..

The V_{SB} over-current protection is auto-recovery once the fault is removed.

Parameter	Min	Nom	Max	Unit
V_O Output Overcurrent	65.42	/	80.99	A
$5V_{SB}$ Output Overvoltage	3.7	/	5.0	A

ELECTRICAL SPECIFICATIONS

Short Circuit Protection (SCP)

If a short circuit condition occurs to main Vo output, the power supply main output Vo will shut down within 50ms in order to reduce the power that can be delivered into the short. The V_{SB} will remain ON.

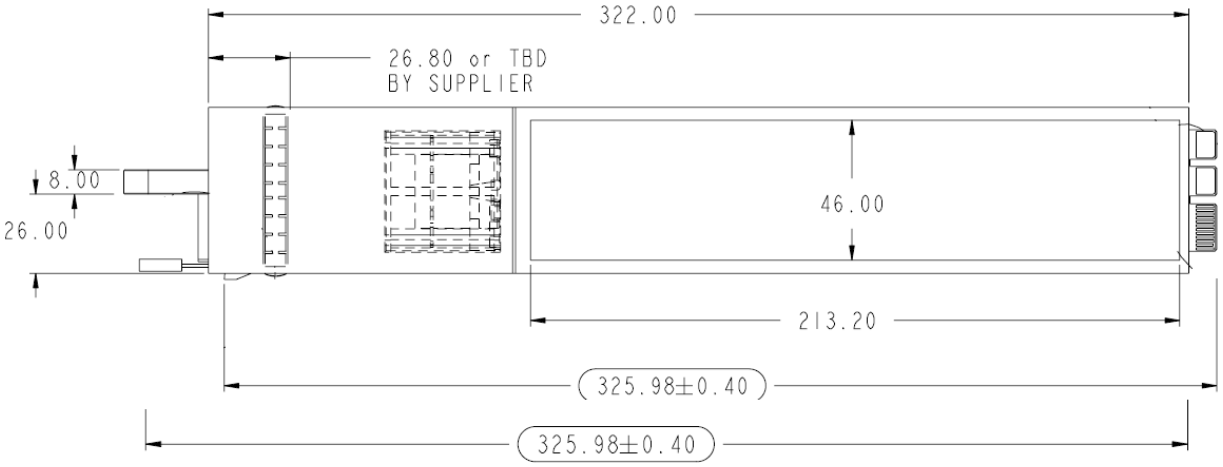
If a short circuit condition occurs to the V_{SB} output, the power supply will shut down with main output Vo turned off and the standby V_{SB} output will auto-recovery once the fault is removed.

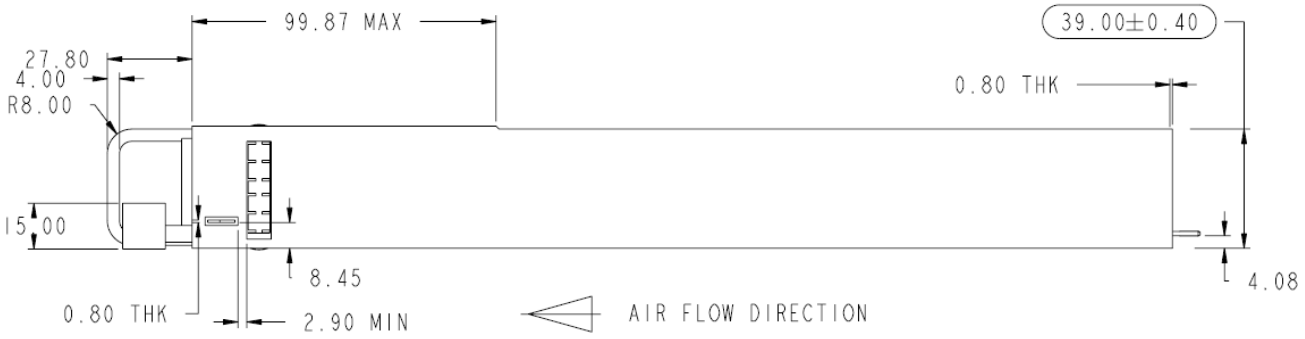
Over Temperature Protection (OTP)

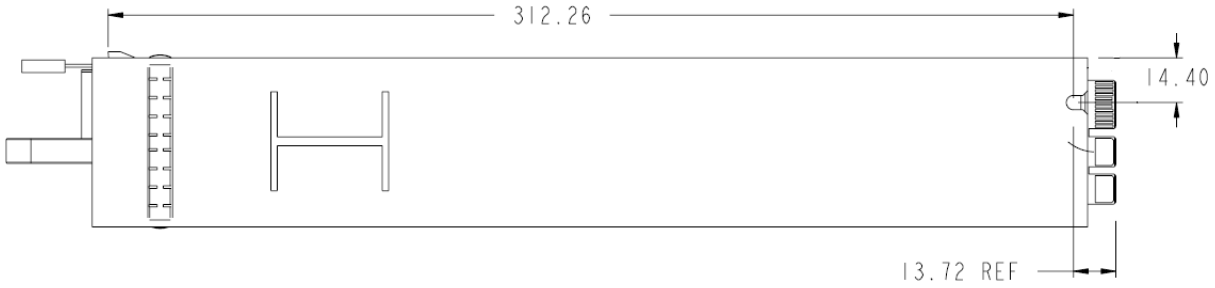
The DS760SL series power supply incorporated thermal protection to prevent damage or degradation due to overheating. The power supply will turn off if there is an over temperature condition or if the output connector exceeds 100 degrees C. The output connector temp. sensor is located on the output connector PCB area. Once the temperature of the power supply or connector is reduced within the normal limit, the power supply will restart automatically.

MECHANICAL SPECIFICATIONS

Mechanical Outlines

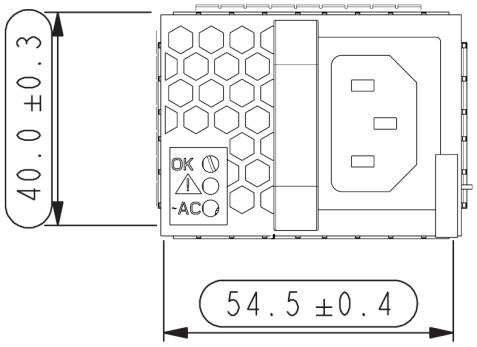


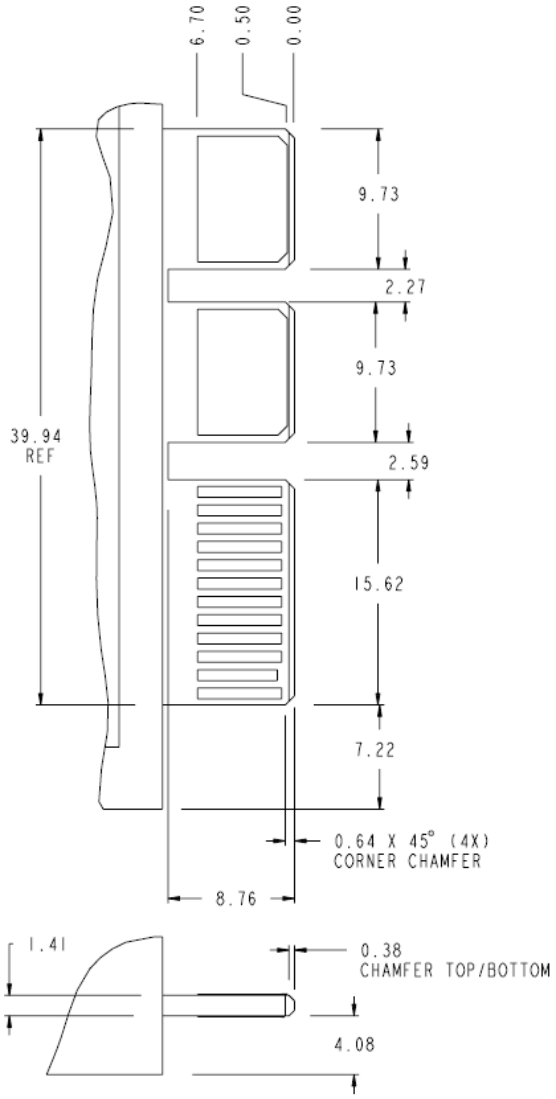




MECHANICAL SPECIFICATIONS

Mechanical Outlines





MECHANICAL SPECIFICATIONS

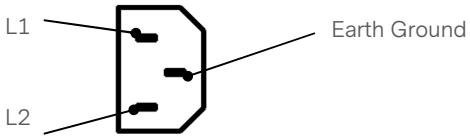
Connector Definitions

AC Input Connector

Pin 1 – L1

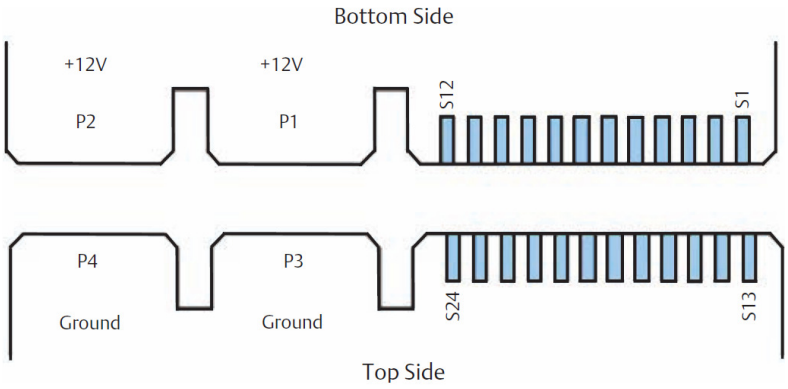
Pin 2 – L2

Pin 3 – Earth Ground



Output Connector - Power Blades

P1 – +12V
P2 – +12V
P3 – Ground
P4 – Ground



Output Connector - Control Signals

S1	–	+12V Sense
S2	–	+12V RTN Sense
S3	–	+12V Current Share
S4	–	SMB_ALERT/L
S5	–	SDA
S6	–	SCL
S7	–	PSKILL
S8	–	PSON/L
S9	–	PW_OK
S10	–	PS_A1
S11	–	+5.0V_STBY (VSB)
S12	–	+5.0V_STBY (VSB)
S13	–	Reserved
S14	–	PRESENT/L
S15	–	PS_A0
S16	–	Reserved
S17	–	Reserved for factory use
S18	–	EEPROM_WP
S19	–	ACOK/H
S20	–	Not used
S21	–	Not used
S22	–	Reserved for factory use
S23	–	+5.0V_STBY (VSB)
S24	–	+5.0V_STBY (VSB)

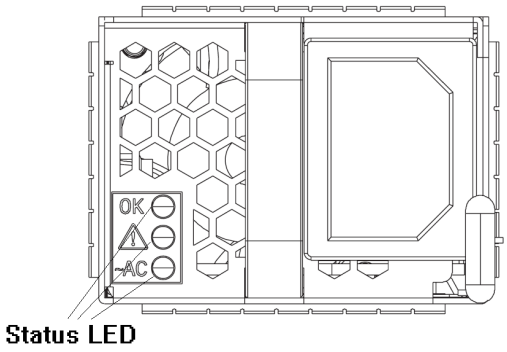
MECHANICAL SPECIFICATIONS

Power / Signal Mating Connectors and Pin Types

Table 5. Mating Connectors for DS760SL-3 Series		
Reference	**On Power Supply**	**Mating Connector or Equivalent**
AC Input Connector	IEC60320-C14	IEC60320-C13
Output Connector	MOLEX P/N 45984005	MOLEX P/N 45984-4343

MECHANICAL SPECIFICATIONS

LED Indicator Definitions



Status LED

Three status LEDs located at the front panel of the power supply beside the AC inlet provide status signal indication.

LED	Function	Color
OK	DCOK	Green
⚠	Fail	Yellow
~AC	ACOK	Green

Summary of Status Signals, Registers and LED indicators

Conditions	Status Signals		Status Register		Shutdown register					LED status		
	ACOK /H	PWOK /H	PSON	PWOK	Fan Fail	AC-Loss	0-Temp	0-Current	Fail	AC	DC	Fail
Normal operation	1	1	1	1	0	0	0	0	0	On	On	Off
Vo 12V over current	1	0	1	0	0	0	0	1	1	On	Off	On
AC Input Fail	0	0	1	0	0	1	0	0	1	Off	Off	Off
Fan blocked or running under speed. O/P's ok	1	1	1	1	0	0	0	0	0	On	On	Off
UV on Vo 12V & PS has latched off	1	0	1	0	0	0	0	0	1	On	Off	On
UV on Vsb +5.0 and PS Has Turned O#	1	0	1	0	0	0	0	0	1	On	Off	On
OV on V1 12V or Vsb +5.0 & PS has latched O#	1	0	1	0	0	0	0	0	1	On	Off	On
Over Temp and PS has turned O#	1	0	1	0	0	0	1	0	1	On	Off	On
Fan below shutdown limit	1	0	1	0	1	0	0	0	1	On	Off	On
No problems but PS is in standby mode	1	0	0	0	0	0	0	0	0	On	Off	Off

MECHANICAL SPECIFICATIONS

Weight

The DS760SL series weight is 2.19 lbs maximum.

ENVIRONMENTAL SPECIFICATIONS

EMC Immunity

DS760SL-3 series power supply is designed to meet the following EMC immunity specifications.

Table 6. Environmental Specifications

Document	Description
EN61000-3-2: 1995	Electromagnetic compatibility (EMC) - Part 3: Limits Section 2: Limits for harmonic current emissions (equipment input current up to and including 16A Amendment A1:1998 per phase) Amendment A2: 1998 Amendment A14:2000
EN61000-3-3: 1995	Electromagnetic compatibility (EMC) Part 3: Limits Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to and including 16A.
IEC1000-4 / 801	Industrial-Process Measurement and Control Equipment Immunity Requirements and Test Method.
EN61000-4	Industrial-Process Measurement and Control Equipment Immunity Requirements and Test Method.
EN61000-4-2: 1995	Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques. Section 2: Electrostatic discharge immunity test. Basic EMC Publication.
EN61000-4-3: 1995	Section 3: Radiated, radio frequency, electromagnetic field immunity test
EN61000-4-4: 1995	Section 4: Electrical fast transient / Burst immunity test. Basic EMC Publication.
EN61000-4-5: 1995	Section 5: Surge immunity test
EN61000-4-6: 1995	Section 6: Immunity to conducted disturbances induced by radio frequency fields
EN61000-4-8: 1995	Section 8: Power frequency magnetic field immunity test
EN61000-4-11: 1995	Section 11: Voltage dips, short interruptions and voltage variations immunity tests
CSA C108.8-M1983	Canadian Department of Communications Radio Interface Regulations
VCCI	Voluntary Control Council for Interference, Japanese EMI Regulations

ENVIRONMENTAL SPECIFICATIONS

Safety Certifications

The DS760SL 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 DS760SL Series Power Supply

Document	File #	Description
UL 60950-1 CSA-C22.2 No. 60950-1-03	E132002	United States and Canada Standard, Safety for information technology equipment.
EN60950-1:A11/2004	B090313890540	Harmonized European Standard, Safety for information technology equipment.
IEC60950-1		International Standard, Safety for Information Technology Equipment. (ITE)
CB Certificate and Report	SG-OF-02936	(All CENELEC Countries)
CHINA CCC Approval	2008010907283624	China Requirements
BSMI	C1337061600869	Taiwan bureau of standards, metrology and inspection.
GOST	8637846	Mandatory certification mark for all electrical products to be shipped into Russia
IRAM	211-238023-300	Electrical & electronic equipment that meet Argentina's requirements
KCC	AIL-7001497-J000(A)	Korea mandatory certification mark for all electrical products
TUV	B091113890647	German Safety of Equipment Act.
		The PSU will have Protective Earth and reinforced/double insulation between input and output. Work with TN supply systems.

ENVIRONMENTAL SPECIFICATIONS

EMI Emissions

The DS760SL-3 series has been designed to comply with the Class A limits of EMI requirements.

Conducted Emissions (CISPR22, EN55032)

The DS760SL-3 series power supplies comply with the Class A limits for conducted emissions with a margin of 3dB or greater as calculated according to the statistical methods described in EN55032.

Radiated Emissions (CISPR22, EN55022)

The DS760SL-3 series power supplies comply with the Class A limits for radiated emissions with a margin of 3dB or greater.

AC Harmonic Current Emissions (IEC 61000-3-2)

The DS760SL-3 series power supplies meet the AC Harmonic Current Emission Class A limits as adjusted for input voltage.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature

The DS760SL-3 series power supplies will start and operate within stated specifications at the below ambient temperature and altitude conditions:

0 to 40°C from 0 to 1800 meters altitude without derating in any output

0 to 38°C from 1800 to 3000 meters altitude without derating in any output

0 to 60°C from 0 to 1800 meters altitude with V_O derated to 40A and Vsb to 2.4A

0 to 40°C from 0 to 4000 meters altitude with V_O derated to 45A and Vsb to 2.4A

ENVIRONMENTAL SPECIFICATIONS

Storage and Shipping Temperature / Humidity

The DS760SL-3 series power supplies can be stored or shipped at temperatures between -40°C to +85°C and relative humidity from 5% to 95% non-condensing.

Altitude

The DS760SL-3 series power supplies will operate within specifications at altitudes up to 4,000 meters with the output derating defined in operating temperature section.

The power supply can be stored at altitudes of up to 13,000 meters above sea level.

Humidity

The DS760SL-3 series power supplies will operate within specifications when subjected to a relative humidity from 7% to 93% non condensing.

The DS760SL-3 series power supplies can be stored in a relative humidity from 5% to 95% non-condensing.

Vibration

The DS760SL-3 series power supplies will pass the following vibration specifications:

Non-operational - 5G sine sweep from 5Hz to 500Hz, dwelling at resonant frequencies for 1 hour each.

Acoustic Noise Emissions

When operated with specified cooling under any steady-state or repetitive dynamic load within the range specified in this document the power supply will meet the requirements below:

Model	Acoustic Requirements
DS760SL-3	The measured A-weighted sound power level (LwA) will not exceed 69dBA at an ambient/inlet air temperature of 23±2°C per ISO7779 and ISO9295. No prominent discrete tones will be emitted per ISO7779 Annex D, using a criterion of $(Lt - Ln)^3$ 3dB. The frequency of repetition is defined as 10 < fREP < 1/(2 * tRESPONSE) Hz
DS760SL-3-001	N/A

POWER AND CONTROL SIGNAL DESCRIPTIONS

AC Input Connector

This connector supplies the AC Mains to the DS760SL power supply.

Pin1 – L1
Pin2 – L2
Pin3 – Earth Ground

Output Connector – Power Blades

These pins provide the main output for the DS760SL.

P1 – +12V
P2 – +12V
P3 – Ground
P4 – Ground

Output Connector – Control Signals

The DS760SL series contains control signal header providing analogy control interface, standby power and I^2C interface. These are control signals which are directly connected from the system to the power supply.

+12V Sense, +12V RTN Sense - (Pins S1, S2)

The main output of the DS760SL-3 is equipped with a remote sensing capability that will compensate for a power path drop around the entire loop of 100mV. This feature is implemented by connecting the +12V Sense (pin S1) and the +12V RTN Sense (pin S2) 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 DS760SL-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 Current Share - (Pin S3)

Single wire parallel signal used for +12V output current sharing among the power supplies.

SMB_ALERT/L, SDA and SCL - (Pins S4, S5, S6)

Please refer to "Communication Bus Descriptions" section.

PSKILL - (Pin S7)

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).

PSON/L - (Pin S8)

This signal input pin controls the normal turning ON and Off of the +12V of the DS760SL-3 power supply. The power supply main output (V_O) will be enabled when this signal is pulled low, below 0.8V. The Power supply output (except V_{SB} output) will be disabled when this input is driven higher than 2.0V, or left open circuited.

POWER AND CONTROL SIGNAL DESCRIPTIONS

PW_OK - (Pin S9)

The PW_OK is an output signal driven high, by the power supply to indicate that all outputs are valid. If any of the power supply outputs fails below its regulation limits, this output will be driven low. The output signal is an open drain output internally pulled up in the power supply to internal standby supply 5.0V via a 1K ohm resistor. It is capable of driving the output below 0.4V with a load of 4mA.

PS_A1, PS_A0 - (Pins S10, S15)

Please refer to “Communication Bus Descriptions” section.

+5.0V_STBY - (Pins S11, S12, S23, S24)

The DS760SL-3 provides a regulated 5.0 volt 2.4 amp auxiliary output voltage to power critical circuitry that 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 main +12V output ground (P3, P4).

Reserved, Not Used - (Pins S13, S16, S17, S20, S21, S22)

These pins are reserved and might be connected internally in the power supply. No externally connection should be make to these pins.

PRESENT/L - (Pins S14)

This signal pin is connected to +12V output ground inside the power supply. 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.

EEPROM_WP - (Pin S18)

This signal is pulled up to internal standby 5.0V by a 3.74k resistor in the power supply to prevent data in the EEPROM from being over-written. If this signal is pulled down by the system, write cycles to the EEPROM are permitted.

ACOK/H - (Pin S19)

The ACOK signal is a normally HIGH level TTL logic signal when the AC input voltage is within the allowable limits. A TTL logic LOW level, with a 7mS early warning will be sent before the main output loses regulation. This signal is an open drain output internally pulled up in the power supply 5.0V via a 1K ohm resistor. It is capable of driving the output below 0.4V with a load of 4mA.

COMMUNICATION BUS DESCRIPTIONS

I²C Bus Signals

The DS760SL-3 power supply contains enhanced monitoring and control functions implemented via the I²C bus. The DS760SL-3 I²C functionality (PSMI and FRU data) can be accessed via the output connector control signals. The communication bus is powered either by the internal standby supply or from an external power source connected to the 5.0V STBY (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 5.0V STBY (VSB) 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.

SMB_ALERT/L - (Pin S4)

Interrupt signal indicating system should check the power supply status and warnings. This signal is an open drain output from the power supply. A pull up resistor should be located on the system side to standby V_{SB} Output.

SDA and SCL - (Pins S5, S6)

I²C serial data and clock bus - these pins are internally pulled up to 3.3V with a 100K resistor.

PS_A0, PS_A1 (I²C Address BIT 0, BIT1 Signals) - (Pins S15, S10)

These two input pins are the address lines A0 and A1 to indicate the slot position the power supply occupies in the power bay and define the power supply addresses for FRU data and PSMI 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 standby supply with a 10K resistor.

I²C Bus Communication Interval

The interval between two consecutive I²C communications to the power supply should be at least 200us to ensure proper monitoring functionality.

I²C Bus Signal Integrity

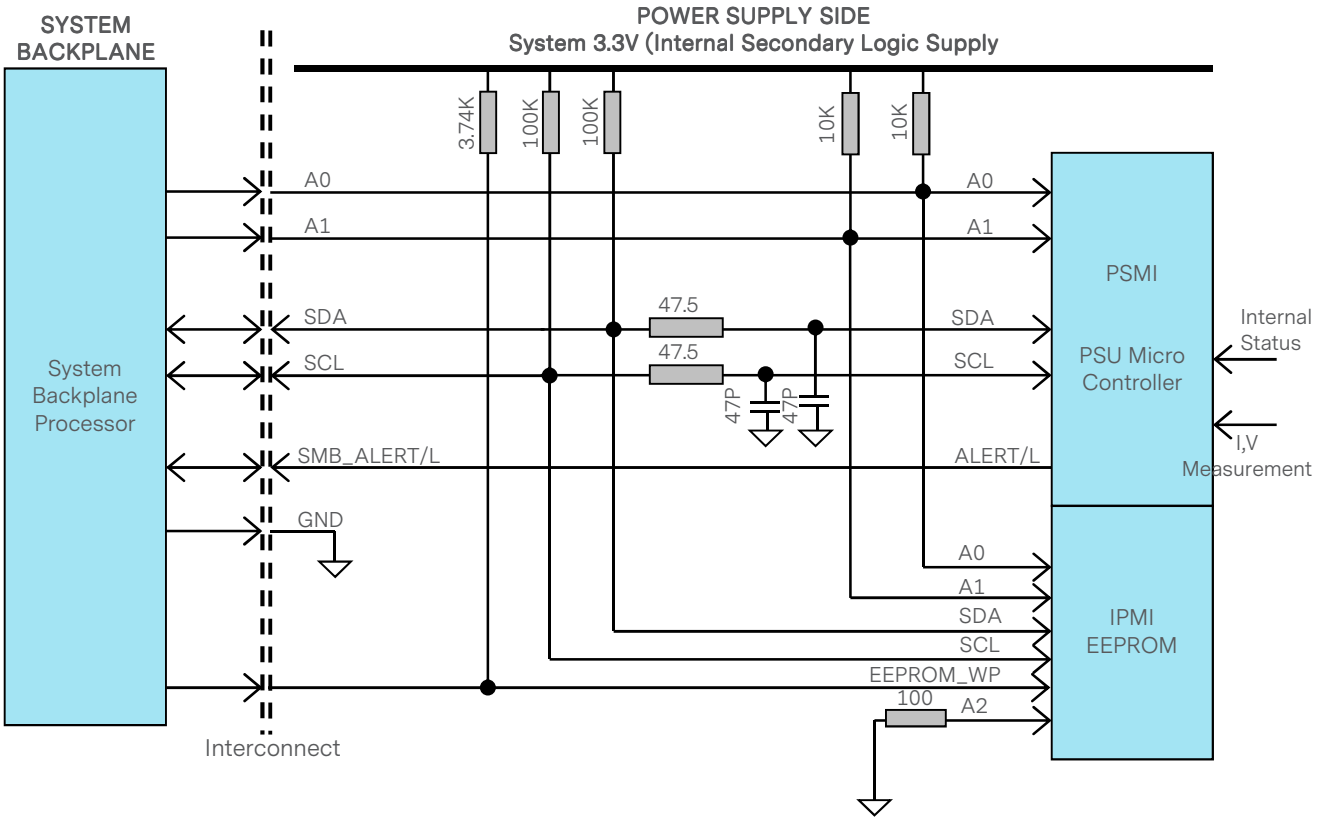
The noise on the I²C bus (SDA, SCL lines) due to the power supply will be less than 500mV peak to peak. This noise measurement should be made with an oscilloscope bandwidth limited to 100MHz. Measurements should be make at the power supply output connector with 3.2K ohm resistors pulled up to standby 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.

COMMUNICATION BUS DESCRIPTIONS

I²C Bus Internal Implementation, Pull-ups and Bus Capacitances

These signals are directly connected from the power supply(s) to system or each of the power supplies within system.



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}	-	47	-	pF
Recommended External Pull-up Resistor	1 PSU	R_{ext}	-	1.0	-	Kohm
	2 PSU	R_{ext}	-	0.5	-	Kohm

COMMUNICATION BUS DESCRIPTIONS

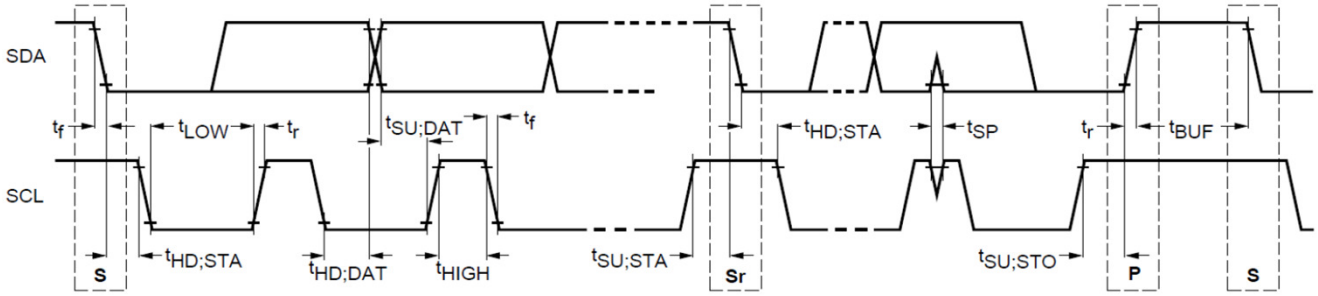
Logic Levels

DS760SL-3 series power supply I²C communication bus will respond to logic levels as per below:

Logic High: 5.0V nominal (Spec is 2.1V to 5.5V)**
Logic Low: 500mV nominal (Spec is 800mV max)**

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

Timings



Parameter	Symbol	Standard-Mode Specs		Actual Measured		Unit
		Min	Max			
SCL clock frequency	f_{SCL}	0	100	96.8		KHz
Hold time (repeated) START condition	$t_{HD;STA}$	4.0	-	4.3		uS
LOW period of SCL clock	t_{LOW}	4.7	-	13.5		uS
HIGH period of SCL clock	t_{HIGH}	4.0	50	4.4		uS
Setup time for repeated START condition	$t_{SU;STA}$	4.7	-	5.83		uS
Data hold time	$t_{HD;DAT}$	0	3.45	1.87		uS
Data setup time	$t_{SU;DAT}$	250	-	5765		nS
Rise time	t_r	-	1000	SCL = 972	SDA = 986	nS
Fall time	t_f	-	300	SCL = 148.5	SDA = 148	nS
Setup time for STOP condition	$t_{SU;STO}$	4.0	-	6.36		uS
Bus free time between a STOP and START condition	t_{BUF}	4.7	-	100		uS

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

COMMUNICATION BUS DESCRIPTIONS

Device Addressing

The DS760SL series will respond to supported commands on the I²C™ bus that are addressed according to pins A1 and A0 pins of output connector.

Address pins are held HIGH by default via pulled up to internal standby supply with a 10K resistor. To set the address as “0”, the corresponding address line should be pulled down to logic ground level. Below table show the address of the power supply with A0 and A1 pins set to either “0” or “1”:

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

Note: Default I²C address when A0 and A1 are left open.

COMMUNICATION BUS DESCRIPTIONS

System Management bus

Power Supply System Management Bus will be accessible within the following delays from events visible to the system.

Any EEPROM devices, measurement ports or other features will be accessible and valid with the same timing as for the status port.

Signal timing - status signals and ports

Event	Time	Max	Notes
AC applied to this PS, no other shared power sources	AC Input to status valid.	1.0s	AC input to status signals valid.
	AC Input to ports valid.	1.0s	AC input to status, control and measurement ports accessible and valid.
External shared power source provided	Shared Power to Status valid.	1.0s	Shared power to status signals valid.
	Shared Power to ports valid.	1.0s	Shared power to status, control and measurement ports accessible and valid.
PS inserted into active system	PRESENT to ON status valid.	1.0s	Hot plug to status signals valid.
	PRESENT to ON ports valid.	1.0s	Hot plug to status, control and measurement ports accessible and valid
PS turned on	STANDBY to ON status valid.	1.0s	PSON/L to status signals valid for ON condition.
	STANDBY to ON ports valid.	1.0s	PSON/L to status and measurement ports valid for ON condition.

COMMUNICATION BUS DESCRIPTIONS

FRU (EEPROM) Data

The FRU (Field Replaceable Unit) data format is compliant with the Intel IPMI v1.0 specification. The DS760SL-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 DS760SL-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.

DS760SL-3 series 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 - always 00H)	0	00
7	07	**ZERO CHECK SUM** (256 - (Sum of bytes 000d to 006d))	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** (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 15 bytes allocation 0**CFH (if used) (Default value is 0.)	207	CF
23	17	**CHASSIS SERIAL NUMBER BYTES** (Default value is 0.)	0	00
24	18		0	00
25	19		0	00
26	1A		0	00
27	1B		0	00
28	1C		0	00
29	1D		0	00
30	1E		0	00
31	1F		0	00
32	20		0	00
33	21		0	00
34	22		0	00
35	23		0	00
36	24		0	00
37	25		0	00

COMMUNICATION BUS DESCRIPTIONS

DS760SL-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
38	26	**End Tag** (0C1h if used)	0	00
39	27	**CHKSUM** (From 08d to 38d if used)	255	FF
		PRODUCT INFORMATION AREA, 80 BYTES		
40	28	**FORMAT VERSION NUMBER**	1	01
41	29	**PRODUCT INFO AREA LENGTH** (In multiples of 8 bytes) 80 bytes are allocated. 80-Byte / 8 = 0AH.	10	0A
42	2A	**Language (English = 19H)**	25	19
43	2B	**MANUFACTURER NAME TYPE / LENGTH** (0C7H) 7:6 - (11)b, 8-Bit ASCII+Latin 1, 5:0 - (000111)b, 7-Byte Allocation	199	C7
		MANUFACTURER NAME		
44	2C	"E" = 45H	69	45
45	2D	"M"= 4DH	77	4D
46	2E	"E" = 45H	69	45
47	2F	"R" = 52H	82	52
48	30	"S" = 53H	83	53
49	31	"O" = 4FH	79	4F
50	32	"N" = 4EH	78	4E
51	33	**PRODUCT NAME Type/Length** (0CEH) 7-6: (11)b, 8-Bit ASCII+LATIN1, 5-0: (000110)b, 14-Byte Allocation	206	CE
52	34	**Product Name**	68	44
53	35	"D"= 44H	83	53
54	36	"S"= 53H	55	37
55	37	"7"= 37H	54	36
56	38	"6"= 36H	48	30
57	39	"0"= 30H	83	53
58	3A	"S"= 53H	76	4C
59	3B	"L"= 4CH	45	2D
60	3C	" -"= 2DH	51	33
61	3D	"3"= 33H	00	00
62	3E		00	00
63	3F		00	00
64	40		00	00
65	41		00	00
66	42	**PRODUCT PART/MODEL NUMBER** Type/Length (0CAH) 7-6: (11)b, 8-Bit ASCII+LATIN1, 5-0: (000110)b, 6-Byte Allocation	PER UNIT	
67	43	**POWER SUPPLY SPARE KIT NUMBER**	00	00
68	44	NOT APPLICABLE	00	00
69	45		00	00
70	46		00	00
71	47		00	00
72	48		00	00
73	49	**PRODUCT VERSION NUMBER** Type/Length (0C2H) 7-6: (11)b, 8-Bit ASCII+LATIN1, 5-0: (000010)b, 2-Byte Allocation	194	C2
74	4A	***SHOULD TRACK MODEL REVISION indicated on BOM**	PER UNIT	
75	4B		PER UNIT	
76	4C	**PRODUCT SERIAL NUMBER Type/Length (0CDH)** *PRODUCT SERIAL NUMBER IS BASED ON ASTEC SERIAL NUMBER FORMAT P/N: 41700201000 7-6: (11)b, 8-Bit ASCII+LATIN1, 5-0: (001101)b, 13-Byte Allocation	205	CD

COMMUNICATION BUS DESCRIPTIONS

DS760SL-3 series FRU (EEPROM) Data:

OFFSET (DEC)	OFFSET (HEX)	DEFINITION (REMARKS)	SPEC VALUE (DEC)	SPEC VALUE (HEX)
		PRODUCT SERIAL NUMBER: Model ID		
77	4D	"1" = 49H	73	49
78	4E	"0" = 49H	48	30
79	4F	"8" = 49H	56	38
80	50	"0" = 49H	48	30
81	51	**PRODUCT SERIAL NUMBER: MANUFACTURING YEAR AND WEEK CODE** *REFER TO 4170020100 FOR DETAILS	PER UNIT	
82	52		PER UNIT	
83	53	**PRODUCT SERIAL NUMBER: UNIQUE SERIAL NUMBER** *REFER TO EN2274B FOR DETAILS	PER UNIT	
84	54		PER UNIT	
85	55		PER UNIT	
86	56		PER UNIT	
87	57	**PRODUCT SERIAL NUMBER: MODEL REVISION**	PER UNIT	
88	58	***SHOULD TRACK MODEL REVISION indicated on BOM**	PER UNIT	
		PRODUCT SERIAL NUMBER MANUFACTURING LOCATION *** REFER TO EN2274B FOR DETAILS**		
89	59	"Z" = 5AH (Z for ZhongShan China)	90	5A
90	5A	**ASSET TAG** 7-6: (11)b, 8-Bit ASCII+LATIN1, 5-0: (001000)b, 8-Byte Allocation	200	C8
91	5B	**NO ASSET TAG**	00	00
92	5C		00	00
93	5D		00	00
94	5E		00	00
95	5F		00	00
96	60		00	00
97	61		00	00
98	62		00	00
99	63	**FRU FILE ID** 7-6: (11)b, 8-Bit ASCII+LATIN1, 5-0: (010001)b, 17-Byte Allocation REFER TO IPS FOR LATEST FRU FILE NAME	209	D1
100	64	"D"= 44H	68	44
101	65	"S"= 53H	83	53
102	66	"7"= 37H	55	37
103	67	"6"= 36H	54	36
104	68	"0"= 30H	48	30
105	69	"S"= 53H	83	53
106	6A	"L"= 4CH	76	4C
107	6B	" -"= 2DH	45	2D
108	6C	"3"= 33H	51	33
109	6D	"R"= 52H "Should track latest FRU File ID on Spec. 1.1"	82	52
110	6E	"E"= 45H	69	45
111	6F	"V"= 56H	86	56
112	70	"1 "= 31H	PER	UNIT
113	71	"C"= 43H	PER	UNIT
114	72		00	00
115	73		00	00
116	74		00	00
117	75	**END OF FIELD MARKER**	193	C1
118	76	**RESERVED**	00	00
119	77	**ZERO CHECK SUM** (256-(Sum of bytes 40d to 118d))	PER UNIT	

COMMUNICATION BUS DESCRIPTIONS

DS760SL-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
MULTI RECORD AREA: Power Supply Information 72 Bytes				
POWER SUPPLY RECORD HEARDER				
120	78	**RECORD TYPE ID** (0X00 = Power Supply Information)	00	00
121	79	7: (0)b, End of List 6-4: (000)b, Reserved 3-0: (0010)b, Record Format Version	02	02
122	7A	**RECORD LENGTH:** 24 Bytes	24	18
123	7B	**RECORD CHECKSUM** (Zero Checksum From 125d to 148d)	69	45
124	7C	**HEADER CHECKSUM** (Zero Checksum From 120d to 123d)	161	A1
POWER SUPPLY RECORD				
125 126	7D 7E	**Overall Capacity (Watts)** 15-12: (0000)b, reserved 11-0: (1011111000)b, 760W = 02F8H Stored with LSB first then MSB	248 002	F8 02
127 128	7F 80	**Peak VA** (Watts) 15-12: (0000)b, reserved 11-0: (1101110000)b, 880W =0370H Stored with LSB first then MSB	112 003	70 03
129	81	**INRUSH CURRENT** (Amps) 25Amps = 19H	25	19
130	82	**INRUSH INTERVAL** (ms) 200ms = C8H	200	C8
131 132	83 84	**LOW END INPUT VOLTAGE RANGE 1** 90V = 9000(×10mV) = 2328H STORED WITH LSB FIRST THEN MSB	40 35	28 23
133 134	85 86	**HIGH END INPUT VOLTAGE RANGE 1** 264V = 26400(×10mV) = 6720H STORED WITH LSB FIRST THEN MSB	32 103	20 67
135 136	87 88	**LOW END INPUT VOLTAGE RANGE 2** 0V = 0(×10mV) = 0H, no voltage range 2 STORED WITH LSB FIRST THEN MSB	00 00	00 00
137 138	89 8A	**HIGH END INPUT VOLTAGE RANGE 2** 0V = 0(×10mV) = 0H, no voltage range 2 STORED WITH LSB FIRST THEN MSB	00 00	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 De-asserted (0) Indicates Failure = 1) 3: (1)b, Hot Swap / Redundancy Support 2: (0)b, Auto Switch Support 1: (1)b, Power Factor Correction Support 0: (0)b, Predictive Fail Support	27	1B
143 144 145	8F 90 91	**Peak Wattage Capacity and Holdup Time** 15-12: (0000)b, 12 mSeconds = 0CH 11-0: (1001011000)b, 760Watts = 02F8H Stored with LSB first then MSB.	12 248 002	0C F8 02
146 147	92 93	**Combined Wattage** NOT APPLICABLE	00 00	00 00

COMMUNICATION BUS DESCRIPTIONS

DS760SL-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
148	94	**PREDICTIVE FAIL TACHOMETER LOWER THRESHOLD** Not applicable	00	00
		12V DC OUTPUT RECORD HEADER		
149	95	**RECORD TYPE ID** (0X01 = DC OUPUT)	001	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	002	02
151	97	**Record Length: 13 Bytes**	13	0D
152	98	**Record Checksum** (Zero Checksum From 154d to 166d)	28	1C
153	99	**Header Checksum** (Zero Checksum From 149d to 152d)	212	D4
		+12V DC OUTPUT RECORD		
164	9A	**+12V Output Information** 7: (0)b, standby 6-4: (000)b, reserved 3-0: (0001)b, output number 1 = 001b	001	01
		NOMINAL VOLTAGE		
155 156	9B 9C	12.00V = 1200 (x10mV) = 04B0H Stored with LSB first then MSB.	176 004	B0 04
157 158	9D 9E	**Maximum Negative Voltage Deviation** 11.88V = 1188 (x10mV) = 04A4H. Stored with LSB first then MSB.	164 004	A4 04
159 160	9F A0	**Maximum Positive Voltage Deviation** 12.12V = 1212 (x10mV) = 04BCH Stored with LSB first then MSB.	188 004	BC 04
161 162	A1 A2	**Ripple And Noise pk-pk 10Hz to 30MHz** (mV) 100mV = 0064H Stored with LSB first then MSB.	100 000	64 00
163 164	A3 A4	**Minimum Current Draw** (10mA) 5.0A = 500 (x10mA) = 01F4H Stored with LSB first then MSB.	244 001	F4 01
165 166	A5 A6	**Maximum Current Draw** (10mA) 62.3A = 6230 (x10mA) = 1856H Stored with LSB first then MSB.	086 024	56 18
		5V0SB DC OUTPUT RECORD HEADER		
167	A7	**Record Type ID** (0x01 = DC Output)	001	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	001	01
170	AA	Record Checksum (Zero Checksum From 172d to 191d)	074	4A
171	AB	Header Checksum (Zero Checksum From 167d to 170d)	031	1F
		5V0SB DC OUTPUT RECORD		
172	AC	**5V0SB 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** 5.00V = 500 (x10mV) = 01F4H Stored with LSB first then MSB.	244 001	F4 01

COMMUNICATION BUS DESCRIPTIONS

DS760SL-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		Maximum Negative Voltage Deviation		
175	AF	5.25V = 525 (x10mV) = 020DH	013	0D
176	B0	Stored with LSB first then MSB.	002	02
		Maximum Positive Voltage Deviation		
177	B1	4.75V = 475 (x10mV) = 01DBH	219	DB
178	B2	Stored with LSB first then MSB.	001	01
		Ripple And Noise pk-pk 10Hz to 30MHz (mV)		
179	B3	100mV = 0064H	100	64
180	B4	Stored with LSB first then MSB.	000	00
		Minimum Current Draw (10mA)		
181	B5	000 = 0000H	000	00
182	B6	**Stored with LSB first then MSB.**	000	00
		Maximum Current Draw (10mA)		
183	B7	2.40A = 240(x 10mA) = 00F0H	240	F0
184	B8	Stored with LSB first then MSB.	000	00
185	B9	**Reserved**	00	00
186	BA	**Reserved**	00	00
187	BB	**Reserved**	00	00
188	BC	**Reserved**	00	00
189	BD	**Reserved**	00	00
190	BE	**Reserved**	00	00
191	BF	**Reserved**	00	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.	001	01
193	C1		0	00
194	C2		0	00
195	C3		0	00
196	C4		0	00
197	C5		0	00
198	C6		0	00
199	C7		0	00
200	C8		0	00
201	C9		0	00
202	CA		0	00
203	CB		0	00
204	CC		0	00
205	CD		0	00
206	CE		0	00
207	CF		0	00
208	D0		0	00
209	D1		0	00
210	D2		0	00
211	D3		0	00
212	D4		0	00
213	D5		0	00
214	D6		0	00
215	D7		0	00
216	D8		0	00
217	D9		0	00
218	DA		0	00
219	DB		0	00
220	DC		0	00

COMMUNICATION BUS DESCRIPTIONS

DS760SL-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
221	DD		0	00
222	DE		0	00
223	DF		0	00
224	E0		0	00
225	E1		0	00
226	E2		0	00
227	E3		0	00
228	E4		0	00
229	E5		0	00
230	E6		0	00
231	E7		0	00
232	E8		0	00
233	E9		0	00
234	EA		0	00
235	EB		0	00
236	EC		0	00
237	ED		0	00
238	EE		0	00
239	EF		0	00
240	F0		0	00
241	F1		0	00
242	F2		0	00
243	F3		0	00
244	F4		0	00
245	F5		0	00
246	F6		0	00
247	F7		0	00
248	F8		0	00
249	F9		0	00
250	FA		0	00
251	FB		0	00
252	FC		0	00
253	FD		0	00
254	FE		0	00
255	FF	**CHECKSUM :** (From 192 to 254 if used)	PER UNIT	

COMMUNICATION BUS DESCRIPTIONS

FRU (EEPROM) Data

The FRU (Field Replaceable Unit) data format is compliant with the Intel IPMI v1.0 specification. The DS760SL-3-001 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 DS760SL-3-001 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.

DS760SL-3-001 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 - always 00H)	0	00
7	07	**ZERO CHECK SUM** (256 - (Sum of bytes 000d to 006d))	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** (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 15 bytes allocation 0**CFH (if used) (Default value is 0.)	0	00
23	17	**CHASSIS SERIAL NUMBER BYTES** (Default value is 0.)	0	00
24	18		0	00
25	19		0	00
26	1A		0	00
27	1B		0	00
28	1C		0	00
29	1D		0	00
30	1E		0	00
31	1F		0	00
32	20		0	00
33	21		0	00
34	22		0	00
35	23		0	00
36	24		0	00
37	25		0	00

COMMUNICATION BUS DESCRIPTIONS

DS760SL-3-001 FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
38	26	**End Tag** (0C1h if used)	0	00
39	27	**CHKSUM** (From 08d to 38d if used)	255	FF
		PRODUCT INFORMATION AREA, 80 BYTES		
40	28	**FORMAT VERSION NUMBER**	1	01
41	29	**PRODUCT INFO AREA LENGTH** (In multiples of 8 bytes) 80 bytes are allocated. 80-Byte / 8 = 0AH.	10	0A
42	2A	**Language (English = 19H)**	25	19
43	2B	**MANUFACTURER NAME TYPE / LENGTH** (0C7H) 7:6 - (11)b, 8-Bit ASCII+Latin 1, 5:0 - (000111)b, 7-Byte Allocation	199	C7
		MANUFACTURER NAME		
44	2C	"E" = 45H	69	45
45	2D	"M"= 4DH	77	4D
46	2E	"E" = 45H	69	45
47	2F	"R" = 52H	82	52
48	30	"S" = 53H	83	53
49	31	"O" = 4FH	79	4F
50	32	"N" = 4EH	78	4E
51	33	**PRODUCT NAME Type/Length** (0CEH) 7-6: (11)b, 8-Bit ASCII+LATIN1, 5-0: (000110)b, 14-Byte Allocation	206	CE
52	34	**Product Name**	68	44
53	35	"D"= 44H	83	53
54	36	"S"= 53H	55	37
55	37	"7"= 37H	54	36
56	38	"6"= 36H	48	30
57	39	"0"= 30H	83	53
58	3A	"S"= 53H	76	4C
59	3B	"L"= 4CH	45	2D
60	3C	" -"= 2DH	51	33
61	3D	"3"= 33H	45	2D
62	3E	"-"= 2DH	48	30
63	3F	"0"= 30H	48	30
64	40	"0"= 30H	49	31
65	41	"1"= 31H	00	00
66	42	**PRODUCT PART/MODEL NUMBER** Type/Length (0CAH) 7-6: (11)b, 8-Bit ASCII+LATIN1, 5-0: (000110)b, 6-Byte Allocation	PER UNIT	
67	43	**POWER SUPPLY SPARE KIT NUMBER**	00	00
68	44	NOT APPLICABLE	00	00
69	45		00	00
70	46		00	00
71	47		00	00
72	48		00	00
73	49	**PRODUCT VERSION NUMBER** Type/Length (0C2H) 7-6: (11)b, 8-Bit ASCII+LATIN1, 5-0: (000010)b, 2-Byte Allocation	194	C2
74	4A	**PRODUCT VERSION NUMBER / AUTO REV**	PER UNIT	
75	4B	*SHOULD TRACK MODEL REVISION indicated on BOM	PER UNIT	
76	4C	**PRODUCT SERIAL NUMBER Type/Length (0CDH)** *PRODUCT SERIAL NUMBER IS BASED ON ASTEC SERIAL NUMBER FORMAT P/N: 41700201000 7-6: (11)b, 8-Bit ASCII+LATIN1, 5-0: (001101)b, 13-Byte Allocation	205	CD

COMMUNICATION BUS DESCRIPTIONS

DS760SL-3-001 FRU (EEPROM) Data:

OFFSET (DEC)	OFFSET (HEX)	DEFINITION (REMARKS)	SPEC VALUE (DEC)	SPEC VALUE (HEX)
		PRODUCT SERIAL NUMBER: Model ID		
77	4D	"1" = 47H	73	49
78	4E	"1" = 31H	49	31
79	4F	"3" = 33H	51	33
80	50	"1" = 31H	49	31
81	51	**PRODUCT SERIAL NUMBER: MANUFACTURING YEAR AND WEEK CODE**	PER UNIT	
82	52	*REFER TO 4170020100 FOR DETAILS	PER UNIT	
83	53	**PRODUCT SERIAL NUMBER: UNIQUE SERIAL NUMBER**	PER UNIT	
84	54	*REFER TO 4170020100 FOR DETAILS	PER UNIT	
85	55		PER UNIT	
86	56		PER UNIT	
87	57	**PRODUCT SERIAL NUMBER: MODEL REVISION**	PER UNIT	
88	58	*SHOULD TRACK MODEL REVISION indicated on BOM	PER UNIT	
		PRODUCT SERIAL NUMBER MANUFACTURING LOCATION *REFER TO EN2274B FOR DETAILS		
89	59	"Z" = 5AH (Z for ZhongShan China)	90	5A
90	5A	**ASSET TAG** 7-6: (11)b, 8-Bit ASCII+LATIN1, 5-0: (001000)b, 8-Byte Allocation	200	C8
91	5B	**NO ASSET TAG**	00	00
92	5C		00	00
93	5D		00	00
94	5E		00	00
95	5F		00	00
96	60		00	00
97	61		00	00
98	62		00	00
99	63	**FRU FILE ID** 7-6: (11)b, 8-Bit ASCII+LATIN1, 5-0: (010001)b, 17-Byte Allocation REFER TO IPS FOR LATEST FRU FILE NAME	209	D1
100	64	"D"= 44H	68	44
101	65	"S"= 53H	83	53
102	66	"7"= 37H	55	37
103	67	"6"= 36H	54	36
104	68	"0"= 30H	48	30
105	69	"S"= 53H	83	53
106	6A	"L"= 4CH	76	4C
107	6B	"-"= 2DH	45	2D
108	6C	"3"= 33H	51	33
109	6D	"-"= 2DH	45	2D
110	6E	"0"= 30H	48	30
111	6F	"0"= 30H	48	30
112	70	"1"= 31H	49	31
113	71	"R"= 52H "Should track latest FRU File ID on Spec. 1.1"	82	52
114	72	"E"= 45H	69	45
115	73	"V"= 56H	86	56
116	74	"B"= 42H	PER	UNIT
117	75	**END OF FIELD MARKER**	193	C1
118	76	**RESERVED**	00	00
119	77	**ZERO CHECK SUM** (256-(Sum of bytes 40d to 118d))	PER UNIT	

COMMUNICATION BUS DESCRIPTIONS

DS760SL-3-001 FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
MULTI RECORD AREA: Power Supply Information 72 Bytes				
POWER SUPPLY RECORD HEARDER				
120	78	**RECORD TYPE ID** (0X00 = Power Supply Information)	00	00
121	79	7: (0)b, End of List 6-4: (000)b, Reserved 3-0: (0010)b, Record Format Version	02	02
122	7A	**RECORD LENGTH:** 24 Bytes	24	18
123	7B	**RECORD CHECKSUM** (Zero Checksum From 125d to 148d)	63	3F
124	7C	**HEADER CHECKSUM** (Zero Checksum From 120d to 123d)	167	A7
POWER SUPPLY RECORD				
125 126	7D 7E	**Overall Capacity (Watts)** 15-12: (0000)b, reserved 11-0: (1001011000)b, 600W =0258H Stored with LSB first then MSB	88 02	58 02
127 128	7F 80	**Peak VA** (Watts) 15-12: (0000)b, reserved 11-0: (1010110111)b, 695W =02B7H Stored with LSB first then MSB	183 002	B7 02
129	81	**INRUSH CURRENT** (Amps) 25Amps = 19H	25	19
130	82	**INRUSH INTERVAL** (ms) 200ms = C8H	200	C8
131 132	83 84	**LOW END INPUT VOLTAGE RANGE 1** 90V = 9000(×10mV) = 2328H STORED WITH LSB FIRST THEN MSB	40 35	28 23
133 134	85 86	**HIGH END INPUT VOLTAGE RANGE 1** 264V = 26400(×10mV) = 6720H STORED WITH LSB FIRST THEN MSB	32 103	20 67
135 136	87 88	**LOW END INPUT VOLTAGE RANGE 2** 0V = 0(×10mV) = 0H, no voltage range 2 STORED WITH LSB FIRST THEN MSB	00 00	00 00
137 138	89 8A	**HIGH END INPUT VOLTAGE RANGE 2** 0V = 0(×10mV) = 0H, no voltage range 2 STORED WITH LSB FIRST THEN MSB	00 00	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 De-asserted (0) Indicates Failure = 1) 3: (1)b, Hot Swap / Redundancy Support 2: (0)b, Auto Switch Support 1: (1)b, Power Factor Correction Support 0: (0)b, Predictive Fail Support	27	1B
143 144 145	8F 90 91	**Peak Wattage Capacity and Holdup Time** 15-12: (0000)b, 12 mSeconds = 0CH 11-0: (1001011000)b, 760Watts = 0258H Stored with LSB first then MSB.	12 248 002	0C F8 02
146 147	92 93	**Combined Wattage** NOT APPLICABLE	00 00	00 00

COMMUNICATION BUS DESCRIPTIONS

DS760SL-3-001 FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
148	94	**PREDICTIVE FAIL TACHOMETER LOWER THRESHOLD** Not applicable	00	00
		12V DC OUTPUT RECORD HEADER		
149	95	**RECORD TYPE ID** (0X01 = DC OUPUT)	001	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	002	02
151	97	**Record Length: 13 Bytes**	13	0D
152	98	**Record Checksum** (Zero Checksum From 154d to 166d)	83	53
153	99	**Header Checksum** (Zero Checksum From 149d to 152d)	157	9D
		+12V DC OUTPUT RECORD		
164	9A	**+12V Output Information** 7: (0)b, standby 6-4: (000)b, reserved 3-0: (0001)b, output number 1 = 001b	001	01
		NOMINAL VOLTAGE		
155 156	9B 9C	12.00V = 1200 (x10mV) = 04B0H Stored with LSB first then MSB.	176 004	B0 04
157 158	9D 9E	**Maximum Negative Voltage Deviation** 11.88V = 1188 (x10mV) = 04A4H. Stored with LSB first then MSB.	164 004	A4 04
159 160	9F A0	**Maximum Positive Voltage Deviation** 12.12V = 1212 (x10mV) = 04BCH Stored with LSB first then MSB.	188 004	BC 04
161 162	A1 A2	**Ripple And Noise pk-pk 10Hz to 30MHz** (mV) 100mV = 0064H Stored with LSB first then MSB.	100 000	64 00
163 164	A3 A4	**Minimum Current Draw** (10mA) 5.0A = 500 (x10mA) = 01F4H Stored with LSB first then MSB.	244 001	F4 01
165 166	A5 A6	**Maximum Current Draw** (10mA) 49.0A = 4900 (x10mA) = 1324H Stored with LSB first then MSB.	036 019	24 13
		5V0SB DC OUTPUT RECORD HEADER		
167	A7	**Record Type ID** (0x01 = DC Output)	001	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	020	14
170	AA	Record Checksum (Zero Checksum From 172d to 191d)	074	4A
171	AB	Header Checksum (Zero Checksum From 167d to 170d)	031	1F
		5V0SB DC OUTPUT RECORD		
172	AC	**5V0SB 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** 5.00V = 500 (x10mV) = 01F4H Stored with LSB first then MSB.	244 001	F4 01

COMMUNICATION BUS DESCRIPTIONS

DS760SL-3-001 FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
175 176	AF B0	**Maximum Negative Voltage Deviation** 5.25V = 525 (x10mV) = 020DH Stored with LSB first then MSB.	013 002	0D 02
177 178	B1 B2	**Maximum Positive Voltage Deviation** 4.75V = 475 (x10mV) = 01DBH Stored with LSB first then MSB.	219 001	DB 01
179 180	B3 B4	**Ripple And Noise pk-pk 10Hz to 30MHz** (mV) 100mV = 0064H Stored with LSB first then MSB.	100 000	64 00
181	B5	**Minimum Current Draw** (10mA) 000 = 0000H	000	00
182	B6	**Stored with LSB first then MSB.**	000	00
183 184	B7 B8	**Maximum Current Draw** (10mA) 2.40A = 240(x 10mA) = 00F0H Stored with LSB first then MSB.	240 000	F0 00
185	B9	**Reserved**	00	00
186	BA	**Reserved**	00	00
187	BB	**Reserved**	00	00
188	BC	**Reserved**	00	00
189	BD	**Reserved**	00	00
190	BE	**Reserved**	00	00
191	BF	**Reserved**	00	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.	001	01
193	C1		0	00
194	C2		0	00
195	C3		0	00
196	C4		0	00
197	C5		0	00
198	C6		0	00
199	C7		0	00
200	C8		0	00
201	C9		0	00
202	CA		0	00
203	CB		0	00
204	CC		0	00
205	CD		0	00
206	CE		0	00
207	CF		0	00
208	D0		0	00
209	D1		0	00
210	D2		0	00
211	D3		0	00
212	D4		0	00
213	D5		0	00
214	D6		0	00
215	D7		0	00
216	D8		0	00
217	D9		0	00
218	DA		0	00
219	DB		0	00
220	DC		0	00

COMMUNICATION BUS DESCRIPTIONS

DS760SL-3-001 FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
221	DD		0	00
222	DE		0	00
223	DF		0	00
224	E0		0	00
225	E1		0	00
226	E2		0	00
227	E3		0	00
228	E4		0	00
229	E5		0	00
230	E6		0	00
231	E7		0	00
232	E8		0	00
233	E9		0	00
234	EA		0	00
235	EB		0	00
236	EC		0	00
237	ED		0	00
238	EE		0	00
239	EF		0	00
240	F0		0	00
241	F1		0	00
242	F2		0	00
243	F3		0	00
244	F4		0	00
245	F5		0	00
246	F6		0	00
247	F7		0	00
248	F8		0	00
249	F9		0	00
250	FA		0	00
251	FB		0	00
252	FC		0	00
253	FD		0	00
254	FE		0	00
255	FF	**CHECKSUM :** (From 192 to 254 if used)	PER UNIT	

PSMI INTERFACE

The power supply will have a Power Supply Management Interface (PSMI) compliant with design guide V2.12. PSMI is a register based interface with an access protocol as shown in the diagrams below.

For format details and contents refer the PSMI design guide. Any registers not specified will return 0x00.

READ Protocol

S	Slave Addr	W	A	Register number	A	S	Slave Addr	R	A	Low order data byte	A	High order data byte	A	P

WRITE Protocol

S	Slave Addr	W	A	Register number	A	Low order data byte	A	High order data byte	A	P

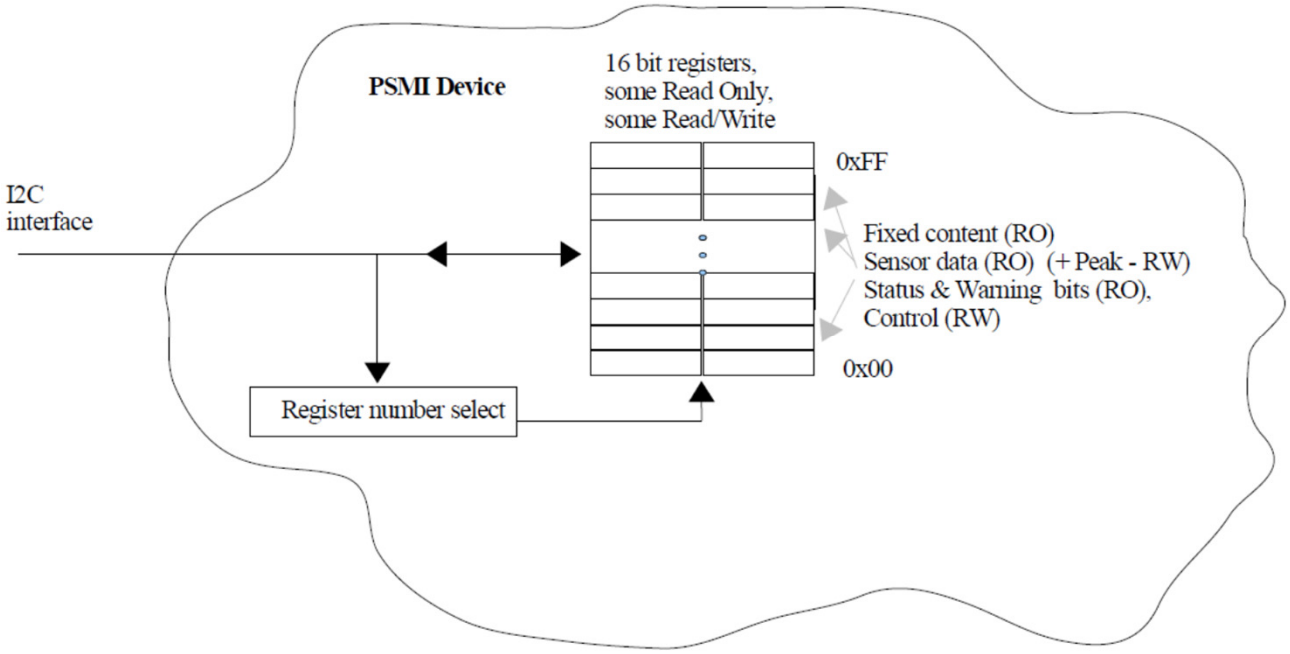
S = Start condition

P = Stop condition

W = Write

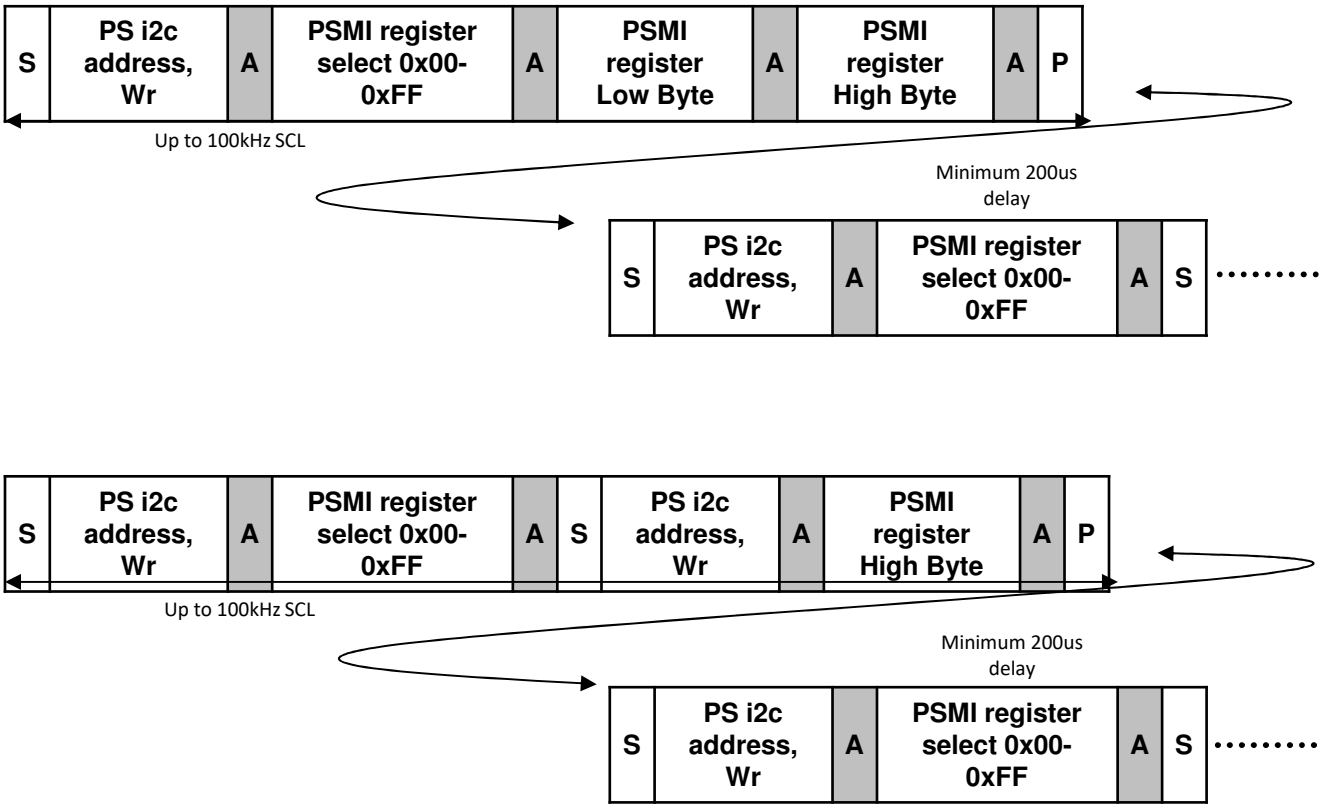
R = Read

A = Acknowledge



PSMI INTERFACE

Write to PSMI register, no repeated address, without stop



S: Start condition

P: Stop condition

A: Acknowledge

N: Not Acknowledge

Grey: driven by power supply

PSMI INTERFACE

Register Definition

PSMI Register Address		Register Groups
0x00	0x05	Sensor (Temperature)
0x06	0x1F	PSMI Capability
0x20	0x23	Sensor (Fan Speed)
0x24	0x27	Control (Fan Speed)
0x28	0x32	Sensor (Voltage)
0x33	0x3D	Sensor (Current)
0x3E	0x52	PSMI Header
0x53	0x5D	Sensor (Peak Current)
0x5E	-	Shutdown
0x5F	0x61	Warning
0x62	-	Status
0x63	-	Control
0x64	0xBF	PS Capability Records
0xC0	0xDF	Custom Registers
0xE0	0xFF	PS Capability Records (2)

PSMI INTERFACE

PSMI Header

The PSMI device shall include the discovery key (“PSMI”), PSMI specification revision number, power supply code revision, and optionally LANA Enterprise ID. All registers are read only.

Register Number	Name	Register Description	
		Bits 0 - 7	Bits 8 - F
0x3E	Discovery key 1-2	"P"	"S"
0x3F	Discovery key 3-4	"M"	"I"
0x40	PSMI version	Major version 0x02	Minor version 0x12
0x41	PSU code version	Major version to be defined by supplier	Minor version to be defined by supplier
0x42	Supplier ID	Reserved for LANA Enterprise ID LS	Reserved for LANA Enterprise ID
0x43	Supplier ID 2	Reserved for LANA Enterprise ID	Reserved for LANA Enterprise ID
0x44 - 0x52	Reserved	0x0000	

PSMI INTERFACE

PSMI Sensors

Register Number	Name	Register Description	
		Bits 0 - 7	Bits 8 - F
0x06	Thermal sensor configuration	To be defined by supplier. Expected to be 1 fan sensor, 1 temperature sensor no association between sensors and fans.	
0x07	Temperature sensor types	To be defined by supplier. Expected to be internal.	
0x08	T1 temperature sensor offset	Not present, 0x0000.	
0x09 - 0x0B	T2, T3, T4 temperature sensor offset	Not present, 0x0000.	
0x0C	Fan 1, 2 resolution register	Not present, 0x0000.	
0x0D	Fan 3, 4 resolution register	Not present, 0x0000.	
0x0E	F1 config	0x3E80	
0x0F - 0x11	F2, F3, F4 config	Not present, 0x0000.	
0x12	Voltage / Current sensor configuration.	0x0E32. 2 outputs, 2 output voltage sensor, 1 output current sensor, input voltage sensor, input current sensor, peak current sensor.	
0x13	Fan associations	0x0000	
0x14	F1, F2 cont	0x0000	
0x15	F3, F4 cont	0x0000	
0x16	Shutdown events register capability	0x001F	
0x17	Status capability	0x0071	
0x18	Control / Record capability	0x0111	
0x19	Warning events capability	0x1891	
0x1A - 0x1F	Reserved	0x0000	

PSMI INTERFACE

Sensor data shall be updated at least once every 250ms for temperatures, currents and voltages. Fan data shall be updated at least once a second. Data representation shall be 16 bits however the sensor resolution shall be 8 bits or greater were specified and placed into the 16 bits format as individually defined below.

- Temperature sensor data shall be relative to a target defined in the PS capability section. The actual temperature is the value from the register plus the offset defined in the PSMI capabilities section (register 0x08).

Sensor	Range	Resolution	Register	Error
Relative temperature to T1 target in PSMI capability	-20^{O}C~+15^{O}C	0.25^{O}C	0x00	+/-1^{O}C over range from -20^{O}C to +15^{O}C from target temperature

MSB Upper nibble					MSB Lower nibble					LSB Upper nibble					LSB Lower nibble				
X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X	
Sign	Integer value (0-511)									Fractional value (1/64C)									

- Fan rotation in RPM shall be available.

Sensor	Range	Resolution	Register	Error
F1 Sensor	0 - 65635RPM	TBD	0x20	TBD

MSB Upper nibble					MSB Lower nibble					LSB Upper nibble					LSB Lower nibble				
X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X	
Integer value (0 - 65535)																			

- Output current for V1 shall be measured and represented as below.

Sensor	Range	Resolution	Register	Error
V1 Current	0 - 1024A	0.34A	0x33 Peak in 0x53	+/-5% Rated Current

The peak register shall be reset at power on or if the peak register is written to

MSB Upper nibble					MSB Lower nibble					LSB Upper nibble					LSB Lower nibble				
X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X	
Integer value (0 - 1023)										Fractional value (1 / 64A)									

PSMI INTERFACE

- Input current for the power supply shall be measured and represented as below

Sensor	Range	Resolution	Register	Error
Input Current	0 - 1024A RMS	0.06A	0x3D Peak in 0x5D	+/-5% Rated Current

MSB Upper nibble					MSB Lower nibble					LSB Upper nibble					LSB Lower nibble			
X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X
Integer value (0 - 1023)										Fractional value (1 / 64A)								

The peak register shall be reset at power on or if the peak register is written to.

The input current register value (not peak register) shall be averaged over at least 2 seconds.

- Input voltage for the power supply shall be measured and represented as below.

Sensor	Range	Resolution	Register	Error
Input Voltage	0 - 320VAC RMS	1.26VAC	0x32 (RO)	+/-5% Rated Voltage

MSB Upper nibble					MSB Lower nibble					LSB Upper nibble					LSB Lower nibble			
X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X
Sign	Integer value (0 - 1023)													Fractional value (1 / 32V)				

Note the sign is always 0 (positive) for the AC RMS input.

- Output voltage for the power supply shall be measured and represented as below.

Sensor	Range	Resolution	Register	Error
Output Voltage	+/-128V	1/190 rated voltage	0x28 (RO)	+/-2%

MSB Upper nibble					MSB Lower nibble					LSB Upper nibble					LSB Lower nibble			
X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X
Sign	Integer value (0 - 127)									Fractional value (1 / 256V)								

PSMI INTERFACE

Register Number	Name	Register Description	
		Bits 0 - 7	Bits 8 - F
0x00	T1 temperature	Relative temperature to T1 target	
0x01 - 0x05	T2, T3, T4 reserved	Not used 0x0000	
0x20	F1 sense	F1 speed in RPM	
0x21 - 0x23	F2, F3, F4 sense	Not used 0x0000	
0x28	V1 output voltage	V1 output voltage	
0x29 - 0x31	V2 - V10 output voltage	Not used 0x0000	
0x32	Input voltage	Input voltage	
0x33	V1 output current	V1 output current	
0x34 - 0x3C		Not used 0x0000	
0x3D	Input current	Input current	
0x53	V1 output current Peak	V1 peak output current Read / Write	
0x54 - 0x5C		Not used 0x0000 Read / Write	
0x5D	Input current Peak	Peak input current Read / Write	

PSMI INTERFACE

PSMI Shutdown

The power supply shall provide a shutdown event register (0x5E, R/W) which will maintain data while the standby rail is present even if the AC supply to the power supply is lost. The register will be cleared at initial power on, when PSON is cycled, and if 1 is written to the associated bit.

Shutdown register 0x5E bit	Name	Detail
0	Failure	1 - if the power supply not supplying output due to internal shutdown including over current, over temperature, over or under voltage, fan failure, device failure. Also AC failure 0 - if no faults
1	Over Current	1 - if any output has over current (note 5.0Vstby must still power the interface) 0 - if normal operation
2	Over Temperature	1 - if PS shutdown due to over temperature 0 - if normal operation
3	AC Loss	1 - if PS shutdown for AC loss, not asserted for momentary loss of AC where PS does not shutdown 0 - for normal operation
4	Fan Failure	1 - if PS shutdown due to fan failure 0 - if normal operation
5 - F	Reserved	Must return 0

PSMI INTERFACE

PSMI Warning

The power supply shall provide shutdown event register for thermal warnings, output over current warnings, and input warnings (0x5F, 0x60, 0x61, R/W) which will maintain data while the standby rail is present even if the AC supply to the power supply is lost. The register will be cleared at initial power on, when PSON is cycled, and if 1 is written to the associated bit.

Thermal warning register 0x5F bit	Name	Detail
0	T1 cont warning	1 - if the power supply temperature has exceeded the maximum value in the PS capabilities registers 0 - if not exceeded the temperature
1 - 3	Not used	Must return 0
4	F1 warning	1 - if fan failure is predicted 0 - if normal operation
5 - F	Not used or reserved	Must return 0

Current warning register 0x60 bit	Name	Detail
0	V1 current warning	1 - if the power supply output on V1 has exceeded the maximum value in the PS capabilities registers 0 - if not exceeded the current limit
1 - F	Not used	Must return 0

Input warning register 0x61 bit	Name	Detail
0	Input over current warning	1 - if the power supply input current has exceeded the maximum value in the PS capabilities register 0 - if not exceeded the current limit
1 - 2	Not used	Must return 0
3	Input under voltage warning	1 - if the power supply input voltage was below the minimum value in the PS capabilities register 0 - if not dropped below the minimum input voltage limit
4 - F	Not used	Must return 0

PSMI INTERFACE

PSMI Status

The power supply shall provide a status register which will maintain data while the standby rail is present even if the AC supply to the power supply is lost. The register will be cleared at initial power on and when PSON is asserted.

Status register 0x62 bit	Name	Detail
0 RO	RPMI over-ride	1 - if fan speed over-ride is in operation 0 - if fan speed over-ride is not in operation
1 - 3 RO	Not used	Must return 0
4 RO	PW_OK	1 - if the power supply PW_OK is asserted 0 - if the power supply PW_OK is not asserted
5 RO	PSON/L	1 - if the PSON/L signal to the power supply is asserted 0 - if the PSON/L signal to the power supply is not asserted
6 R/W	SMB_ALERT/L	1 - if the power supply SMB_ALERT/L interrupt to the system is asserted, caused by an event and latched on. 0 - if the power supply SMB_ALERT/L is not asserted This bit shall be reset to 0 by power cycle or writing 1 to this register bit
7, 8 RO	Power supply operating range	Input operating range - It has only one range so always 00b
9 RO	Redundancy	Must return 0 - only used on PDB
A - F RO	Not used	Must return 0

PSMI INTERFACE

PSMI Control

The power supply shall provide registers for fan speed control and miscellaneous control items, the miscellaneous control register shall be reset on initial power on and maintain values whenever 5V standby is present.

Fan speed Control register 0x24 bit	Name	Detail
0 - 7	F1 cont	Fan speed increase function shall be available with the control represented as an 8 bits number giving the % duty cycle for the PWM (0 = 0%, 255 = 100%)
8 - E	Not used	Must return 0

Register Number	Name	Register Description	
		Bits 0 - 7	Bits 8 - F
0x25 - 0x27	F2, F3, F4 speed control	Not used 0x0000	

Control register 0x63 bit	Name	Detail
0	RPMI over-ride	1 - if fan speed over-ride is in operation 0 - if fan speed over-ride is not in operation
1 - 3	Not used	Must return 0
4	Shutdown LED status	1 - if shutdown LED is turned on by the system 0 - if controlled by the power supply (Default) This will turn on the Amber Fail LED. Note either shutdown or warning LED control shall turn that LED on Amber
5	Warning LED status	1 - if warning LED is turned on by the system 0 - if controlled by the power supply (Default)
6	Shutdown event mask	1 - if shutdown events cause an interrupt (Default) 0 - if shutdown events do not cause an interrupt
7	Warning event mask	1 - if warning events cause an interrupt (Default) 0 - if warning events do not cause an interrupt
8 - F	Reserved	Must return 0

PSMI INTERFACE

PSMI Power Supply Capability Records

The power supply shall implement the registers in the table below, other registers within the power supply capabilities. Records are not used and shall return 0 if read. All registers in this section are defined as read only. Data formats are defined in the PSMI design guide.

Register Number	Name	Register Description	
		Bits 0 - 7	Bits 8 - F
0x64	T1 target	Defined by suppliers, operating temperature of T1 sensor, must be lower than shutdown limit.	
0x65 - 0x67	T2, 3, 4 target	Not used 0x0000	
0x68	F1 min	Defined by supplier, minimum fan speed in RPM (0 - 65535RPM)	
0x69 - 0x6B	F2, 3, 4 min	Not used 0x0000	
0x6C	Fan sound	0x00 max	0x00 min
0x6D	V1 output max voltage	From regulation specification	
0x6E	V1 output min voltage	From regulation specification	
0x6F	Vsb output max voltage	From regulation specification	
0x70	Vsb output min voltage	From regulation specification	
0x71 - 0x80	Vout 3-10 limits	Not used 0x0000	
0x81	Iout1 @ V-input R1	Set to 62.3A for DS760SL-3; Set to 49.0A for DS760SL-3-001	
0x82	Iout2 @ V-input R1	Set to 2.4A	
0x83 - 0x84	Iout 3-10 @ V-input R1	Not used 0x0000	
0x8B - 0x94	Iout 1-10 @ V-input R2	Not used 0x0000	
0x95 - 0x9E	Iout 1-10 @ V-input R3	Not used 0x0000	
0x9F	First input current limit	Defined by supplier as maximum rated input current at 90VAC	
0xA0	Second input current limit	Not used 0x0000	
0xA1	Third input current limit	Not used 0x0000	
0xA2	First input voltage min	Set to 90VAC	
0xA3	Second input voltage min	Not used 0x0000	
0xA4	Third input voltage min	Not used 0x0000	
0xA5	First output power limit	Set to 760W for DS760SL-3; Set to 600W for DS7690SL-3-001	

PSMI INTERFACE

Register Number	Name	Register Description	
		Bits 0 - 7	Bits 8 - F
0xA6	First output power limit	Not used 0x0000	
0xA7	First output power limit	Not used 0x0000	
0xA8	Combined output power limit1	0x0000 no combined limit	
0xA9	Combined outputs for power limit1	0x0000 no combined limit	
0xAA	Combined output power limit2	0x0000 no combined limit	
0xAB	Combined outputs for power limit2	0x0000 no combined limit	
0xAC	Output1 current sensor bandwidth	Defined by supplier	
0xAD	Input current sensor bandwidth	Defined by supplier	
0xAE	High line light load output power	STS #7	
0xAF	High line mid-load output power	STS #6	
0xB0	High line max load output power	STC #3	
0xB1	High line efficiency1	High line light load efficiency. Defined by supplier. The efficiency data is returned as an 8-bit binary value with each 1 bit increment representing (1/256%)	High line mid load efficiency. Defined by supplier.
0xB2	High line efficiency2	High line max load efficiency. Defined by supplier.	0x00
0xB3	Low line light load output power	STC # 5	
0xB4	Low line mid-load output power	STS #4	
0xB5	Low line max load output power	STC #2	
0xB6	Low line efficiency1	Low line light load efficiency. Defined by supplier. The efficiency data is returned as an 8-bit binary value with each 1 bit increment representing (1/256%)	Low line mid load efficiency. Defined by supplier.
0xB7	Low line efficiency2	Low line max load efficiency Defined by supplier	0x00
0xB8	V1 (12V) load share accuracy	To be defined by supplier (must be 5.4A or better) represented as a range 0 to 25.5A in 0.1A increments	0x00

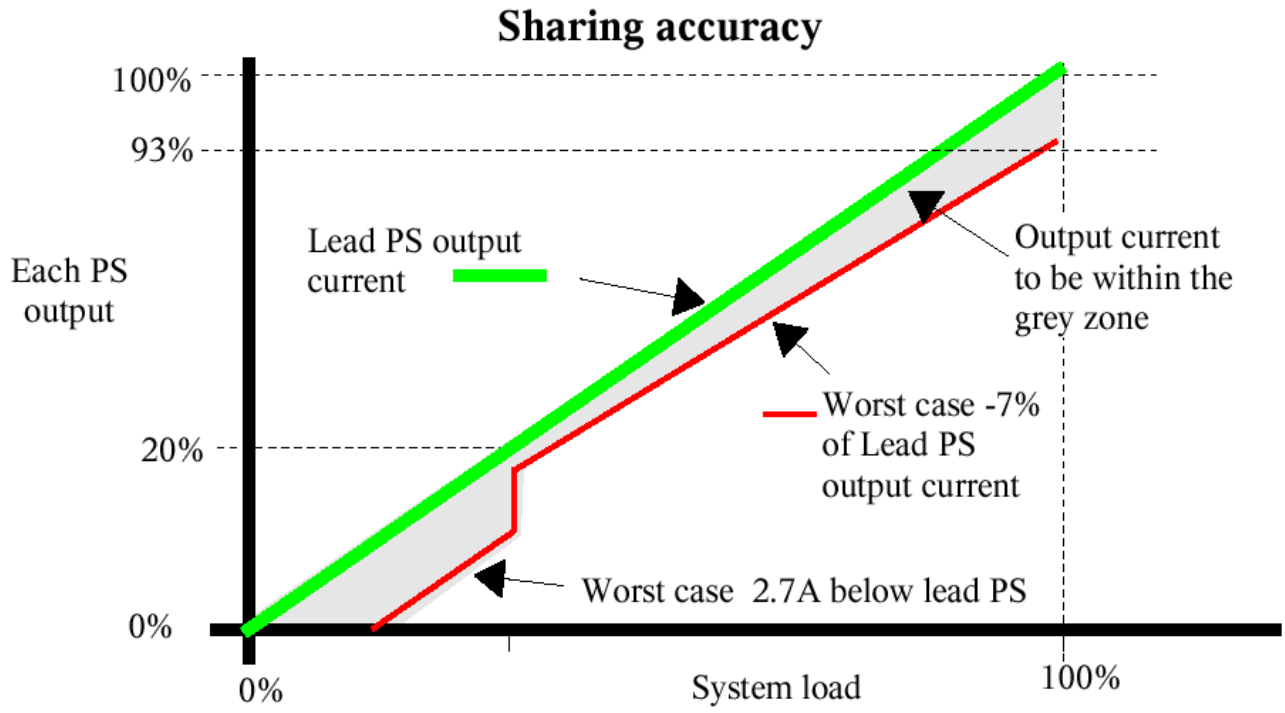
PSMI INTERFACE

Register Number	Name	Register Description	
		Bits 0 - 7	Bits 8 - F
0xB8 - 0xBB	V2, V3, V4 load share accuracy	Not used 0x0000	0x00
0xBC	Redundancy configuration	Not used 0x0000 (PDB use only)	
0xBD - 0xBF	Not used	Not used 0x0000	
0xE0 - 0xFF	Not used	Not used 0x0000	

APPLICATION NOTES

Current Sharing

The DS760SL series' main output is equipped with current sharing capability. This will allow up to 4 power supplies to be connected in parallel for higher power application. All outputs with active current sharing will share load current within 10% of the average current at operating load. This will be valid for all loads greater than 20% rated output. For loads less than 20% of rated output the share will be 5% of the full rated output.

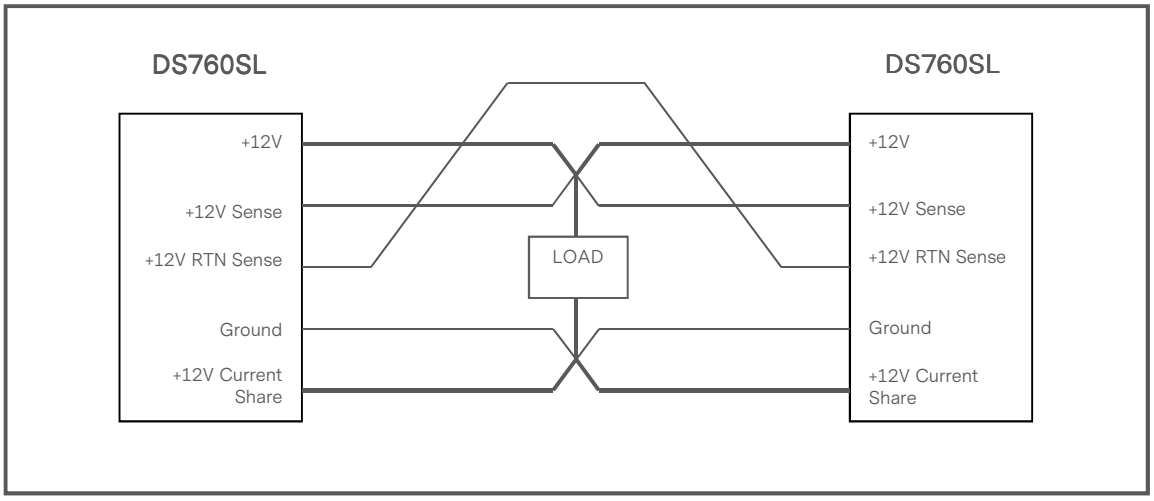


All outputs with active current sharing will share load current within 10% of the average current at operating load. This shall be valid for all loads greater than 20% rated output. For loads less than 20% of rated output the share shall be 5% of the full rated output.

APPLICATION NOTES

Redundancy / Fault Tolerance

The DS760SL series power supplies can be connected in the following to provide redundancy/fault tolerance operation:



The main output will be capable of operating in a redundant current share mode. A maximum of 4 power supplies may be operated in parallel. All outputs will incorporate an isolation device for fault isolation. Filter capacitors that are located after the isolation device will be of high reliability and will be de-rated sufficiently to minimize failures.

Outputs of two (or more) supplies connected in parallel must meet the regulation requirements of a single supply. Under normal operation with two (or more) supplies running in parallel the outputs must share load current. If one of the supplies fails the remaining supply (supplies) must pick up the entire load without causing the output to go out of regulation. A defective supply that is connected to the output voltage bus will cause no adverse effect on bus or the operation of the remaining functional supply (supplies).

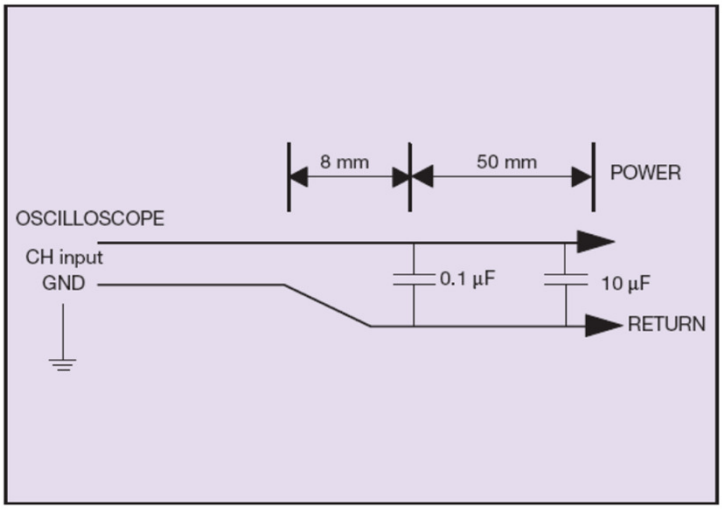
When the parallel units operate within the specified input, output conditions, power up and power down conditions the power supplies will not exhibit any instability. The bus voltage will be within the regulation band, and the bus's periodic and random deviation will meet individual differential supply specification requirements. At initial start-up the load will be limited to the rating of one power supply.

Output	Voltage (V)	For N power supplies in parallel combined current (A)	Load step current (A)
Vo	12.0	2 PS - 118.37	31.2
V_{SB}	5.0	2 PS - 4	1.2

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 DS760SL series. When measuring output ripple and noise, a scope jack in parallel with a 0.1uF ceramic chip capacitor, and a 10uF aluminum electrolytic capacitor should be used. Oscilloscope should be set to 20MHz bandwidth for this measurement.



RECORD OF REVISION AND CHANGES

Issue	Date	Description	Originators
1.0	08.09.2010	First issue	A. Fu
1.1	08.20.2013	Update to the Artesyn template	A. Fu
1.2	09.11.2014	Update the typo error	A. Fu
1.3	07.08.2016	Update the system timing	A. Fu
1.4	03.04.2019	Update PSU output voltage PSMI specification	E. Wang
1.5	03.03.2021	Update cover and back cover	C. Liu

ABOUT ADVANCED ENERGY

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

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

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