TECHNICAL REFERENCE NOTE

ARTESYN DS3000TE-3 SERIES

3000 Watts Distributed Power System

PRODUCT DESCRIPTION

Advanced Energy's Artesyn DS3000TE-3 series bulk front end power AC-DC supply is designed to fully utilize the current capacity of standard C19/C20 AC inlet distribution connectors. It accepts 180 to 264 Vac input and provides a main 12.1 V output plus a 12 V standby output. Rated at 3,000 watts when operating from a 208 to 264 Vac input, the DS3000TE-3 is an 80PLUS Titanium power supply with a very high conversion efficiency of more than 96% at 50% load. Housed in a compact enclosure measuring just 4.15 x 2.78 x 11 in, the power supply has a power density of 24 watts per cubic in; six units can fit on a standard 19 in rack shelf, to provide a total of 18 kilowatts.

AT A GLANCE

Total Power

3000 Watts

Input Voltage

180 to 264 Vac

of Outputs

Main and Standby

SPECIAL FEATURES

- 3000W output power
- 6 units can fit in a 19 in rack for a total of 18KW
- High power and narrow form factor
- High density design: 24W/in^3
- Active power factor correction
- EN61000-3-2 harmonic compliance
- Inrush current control
- 80PLUS® Titanium efficiency
- N+N, N+1 redundant
- Hot-pluggable
- Active current sharing
- Full digital control
- Two-year warranty
- Accurate input power reporting
- Conducted/Radiated EMI EN55032 Class A limits + 6dB margin
- RoHS Compliance

SAFETY

- UL/cUL 60950-1 2nd Edit
- DEMKO+CB Report EN62368
- 80PLUS (Titanium)
- CE Mark
- CSA
- China CQC
- BSMI thru ETC
- KC
- MSIP (KC EMC)
- UKCA Mark

TYPICAL APPLICATIONS

- Industrial

MODEL NUMBERS

Standard	Output Voltage	Minimum Load[1]	Maximum Load	Stand-By Supply	Air Flow Direction
DS3000TE-3	12.1Vdc	1A	248A	12.0Vdc @ 4.5A	Forward (DC Connector to Red Handle)
DS3000TE-3-001	12.1Vdc	1A	244A	12.0Vdc @ 4.5A	Reverse (Blue Handle to DC Connector)

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

Options

None

ELECTRICAL SPECIFICATIONS

Absolute Maximum Ratings

Stress in excess of those listed in the "Absolute Maximum Ratings" may cause permanent damage to the power supply. These are stress ratings only and functional operation of the unit is not implied at these or any other conditions above those given in the operational sections of this TRN. Exposure to any absolute maximum rated condition for extended periods may adversely affect the power supply's reliability.

Table 1. Absolute Maximum Ratings

Parameter	Models	Symbol	Min	Typ	Max	Unit
Input Voltage AC continuous operation	All models	$V_{IN,AC}$	180	-	264	Vac
Maximum Output Power (Main + Standby)	DS3000TE-3 DS3000TE-3-001	$P_{O,max}$	- -	- -	3000 2960	W W
Isolation Voltage Input to outputs Input to safety ground	 All models All models		 3000 2138	 - -	 - -	 Vac Vac
Ambient Operating Temperature[1]	All models	T_A	0	-	40	°C
Storage Temperature	All models	T_{STG}	-40	-	90	°C
Operating Relative Humidity (non-condensing) Operating Non-operating	 All models All models		 5 5	 - -	 95 95	 % %
Altitude Operating Storage	 All models All models		 - -	 - -	 13200 50000	 Feet Feet

Note 1 - DS3000TE-3: 3000W from 0 to 40°C, derate output power by 2.5% per °C from 40°C to 50°C.
DS3000TE-3-001: 2960W from 0 to 40°C, derate output power by 2.5% per °C from 40°C to 50°C.

ELECTRICAL SPECIFICATIONS

Input Specifications

Table 2. Input Specifications

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Operating Input Voltage, AC[1, 2]	World wide Japan only	$V_{IN,AC}$	187 180	230 230	264 264	Vac Vac
Input AC Frequency	All	$f_{IN,AC}$	47	50/60	63	Hz
Turn-on Voltage	All		166	-	180	Vac
Turn-off Voltage	All		160	-	174	Vac
Input Under Voltage	All		170	-	179	Vac
Turn-on Delay (AC to main output)	All		1	-	2.5	Sec
Hold-up Time	$I_O = I_{O,max}$, $I_{SB} = I_{SB,max}$		11	-	-	mS
Maximum Input Current ($I_O = I_{O,max}$, $I_{SB} = I_{SB,max}$)	$V_{IN,AC}$ = 200Vac	$I_{IN,max}$	-	-	16	A
Standby Input Current (V_O = Off, I_{SB} = 0A)	All	$I_{IN,standby}$	-	-	410	mA_{RMS}
Standby Input Power (V_O = Off, I_{SB} = 0A)	All	$P_{IN,standby}$	-	-	25	W
No Load Input Current (V_O = On, I_O = 0A, I_{SB} = 0A)	All	$I_{IN,no-load}$	-	-	500	mA_{RMS}
Harmonic Line Currents	All	THD	Per EN / IEC 61000-3-2			
Power Factor	90% load and above	PF	-	0.97	-	
Startup Surge Current (Inrush) @ 25°C	$V_{IN,AC}$ = 264Vac	$I_{IN,surge}$	-	-	55	Apk
Input Fuse	Internal, 6.99 x 32.72 mm, Quick Acting 250Vac		-	20	-	A
Leakage Current to Earth Ground (Touch current per unit)	$V_{IN,AC}$ = 240Vac $f_{IN,AC}$ = 60Hz		-	-	0.58	mA
Operating Efficiency at 0°C to 40°C	$V_{IN,AC}$ = 230Vac $I_O = 10\%I_{O,max}$ $I_O = 20\%I_{O,max}$ $I_O = 50\%I_{O,max}$ $I_O = 100\%I_{O,max}$	η	- - - -	90 94 96 91	- - - -	% % % %
System Stability Phase Margin Gain Margin			 45 -	 - -	 - 12	 Ø dB

Note 1 - The power supply will operate over the entire input voltage range. Voltages are measured at the power supply AC inlet.
Note 2 - The power supply will continue to work when 264Vac < $V_{IN,AC}$ ≤ 276Vac. The ACOK signal and PMBus registers will set to indicate over voltage. The power supply will shutdown when input over voltage.

ELECTRICAL SPECIFICATIONS

Output Specifications

Table 3. Output Specifications

Parameter		Condition	Symbol	Min	Typ	Max	Unit
Factory Set Voltage		All	$\%V_O$	-0.2	-	+0.2	%
			$\%V_{SB}$	-2.0	-	+2.0	%
Output Regulation		Inclusive of set-point, temperature change, warm-up drift and dynamic load	V_O	11.5	12.1	12.7	Vdc
			V_{SB}	11.1	12.0	12.9	Vdc
Output Ripple, pk-pk		Measure with a 0.1uF ceramic capacitor in parallel with a 10uF tantalum capacitor, 0 to 20MHz bandwidth.	V_O	-	-	150	mV_{PK-PK}
			V_{SB}	-	-	120	mV_{PK-PK}
Output Current	DS3000TE-3	$V_{IN,AC}$ = 187-264Vac $V_{IN,AC}$ = 180-264Vac	I_O	0 0	- -	248 223	A
	DS3000TE-3-001	$V_{IN,AC}$ = 187-264Vac $V_{IN,AC}$ = 180-264Vac	I_O	0 0	- -	244 220	A
	All models		I_{SB}	0.5	-	4	A
Main Output Current Share Accuracy[1] (per unit)		10% to 100%$I_{O,max}$		-	-	12	A
Main Output Minimum Current Share Loading (per unit)		All		10	-	-	$\%I_{O,max}$
Number of Parallel Units		Main output current share connected		-	-	12	Units
Load Capacitance		Start up	C_O	1000	-	17000	uF
			C_{SB}	27	-	620	uF
Main Output Dynamic Response	Peak Deviation	50% load change, slew rate = 0.5A/uS, minimum allowable output capacitance of 2000uF	$\%V_O$	-4.2	-	4.2	%
Predicted MTBF		Telcordia SR232 at 40°C, nominal input, full load		400	-	-	KHrs
Electrolytic Capacitor Life		40°C ambient temperature, nominal input, 80% load		5	-	-	Years
Fan L10 Life[2]		40°C ambient temperature		50	-	-	KHrs
Minimum Life Expectancy		40°C ambient temperature, nominal input, 80% load, excluding fan		5	-	-	Years

Note 1 - Maximum difference between any two supplies.
Note 2 - A failure rate measure given in time period before 10% failure.

ELECTRICAL SPECIFICATIONS

Output Specifications

Table 3. Output Specifications Cont's						
Parameter	Condition	Symbol	Min	Typ	Max	Unit
Acoustic Noise	230Vac input, half load, 40°C ambient temperature, 6000ft		-	-	54	dB
	All		-	-	76	dB

ELECTRICAL SPECIFICATIONS

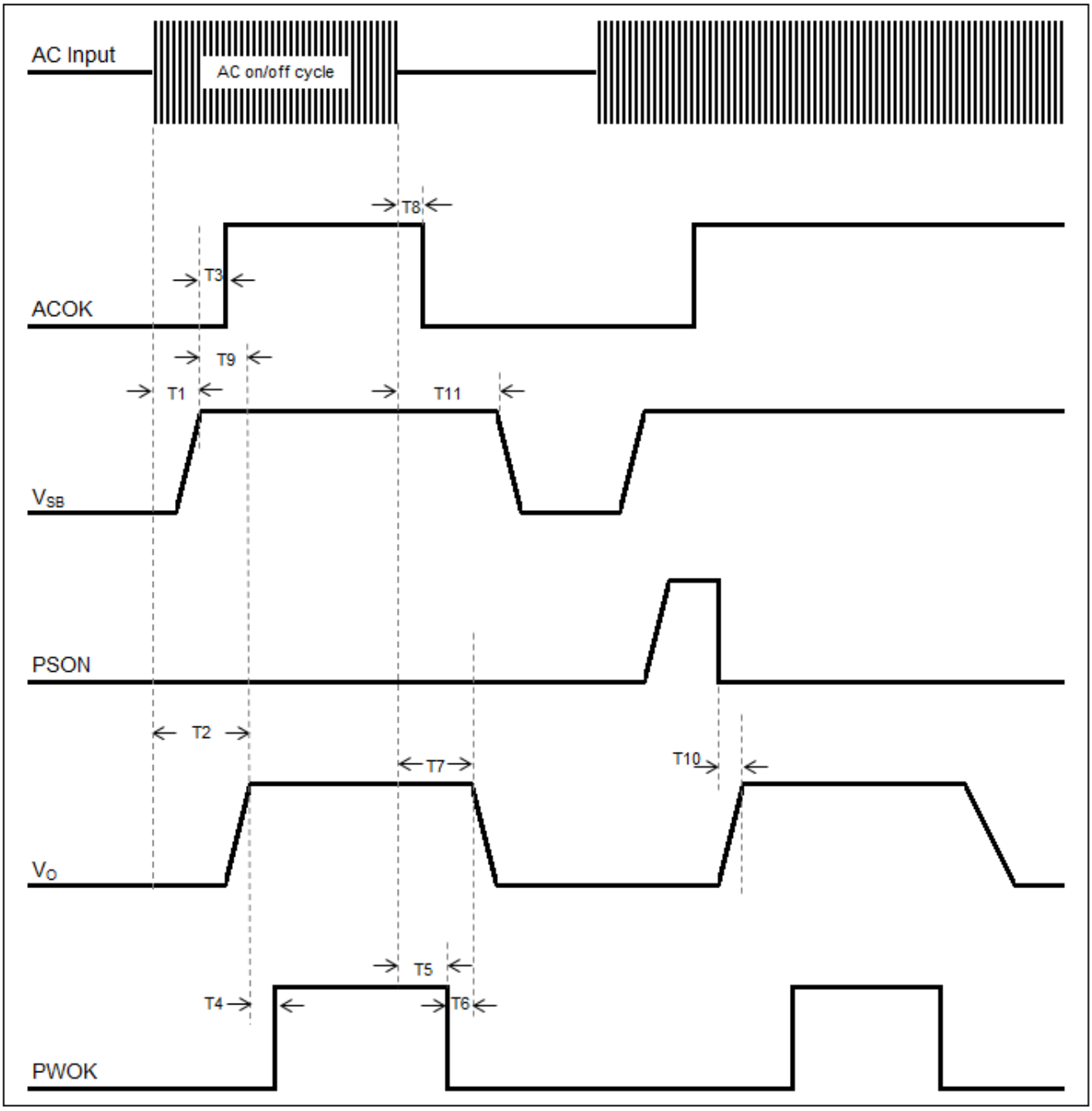
System Timing Specifications

Table 4. System Timing Specifications

Label	Parameter	Min	Typ	Max	Unit
T1	Delay from AC being applied to standby output being within regulation.	-	-	2000	mSec
T2	Delay from AC being applied to main output being within regulation.	-	-	2500	mSec
T3	Delay from standby output to ACOK assertion.	-	-	20	mSec
T4	Delay from output voltages within regulation limits to PWOK assertion.	100	-	1000	mSec
T5	Delay from loss of AC to de-assertion of PWOK.	10	-	-	mSec
T6	Delay from de-assertion of PWOK to main output voltage falling out of regulation due to AC loss.	1	-	990	mSec
T7	Delay from loss of AC to main output voltage falling out of regulation.	11	-	1000	mSec
T8	Delay from loss of AC to assertion of ACOK.	-	-	100	mSec
T9	Delay from standby output to main output voltage being within regulation.	-	-	300	mSec
T10	Delay from PSON assertion to main output voltage being within regulation.	-	-	150	mSec
T11	Delay from loss of AC to standby output voltage going out of regulation.	150	-	1200	mSec

ELECTRICAL SPECIFICATIONS

System Timing Diagram



ELECTRICAL SPECIFICATIONS

DS3000TE-3 Performance Curves

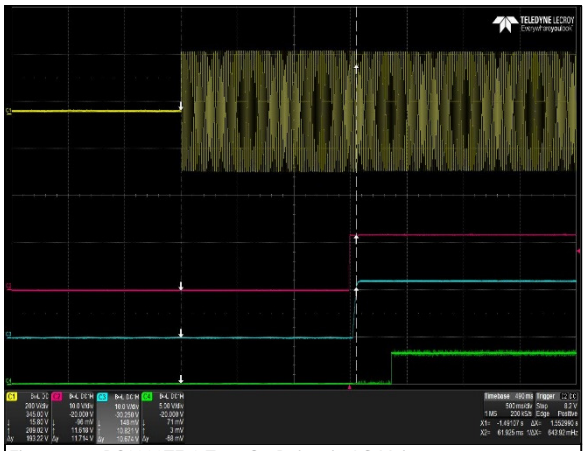


Figure 1: DS3000TE-3 Turn-On Delay via AC Mains

Vin = 180Vac | Full Load: I_O = 223A | I_{SB} = 4.5A

Ch 1: AC Mains | Ch 2: V_{SB} | Ch 3: V_O | Ch 4: PWOK

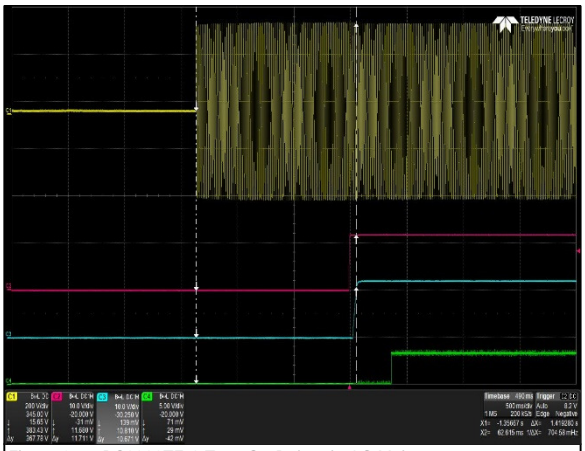


Figure 2: DS3000TE-3 Turn-On Delay via AC Mains

Vin = 264Vac | Full Load: I_O = 248A | I_{SB} = 4.5A

Ch 1: AC Mains | Ch 2: V_{SB} | Ch 3: V_O | Ch 4: PWOK

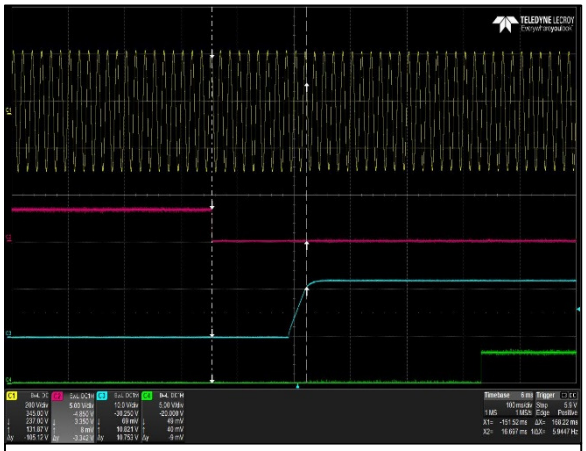


Figure 3: DS3000TE-3 Turn-on delay via PSON

Vin = 180Vac | Full Load: Io = 223A | I_{SB} = 4.5A

Ch 1: AC Mains | Ch 2: PSON | Ch 3: V_O | Ch 4: PWOK

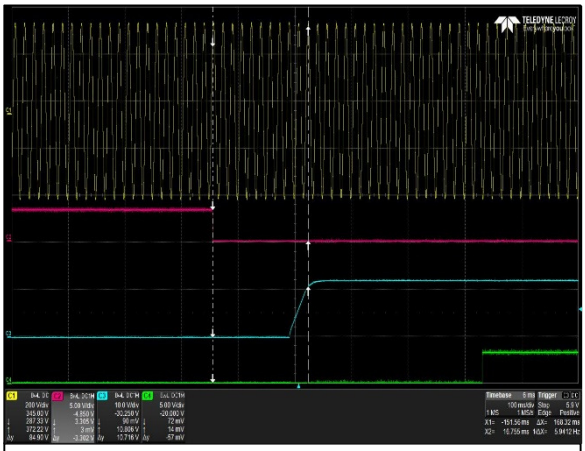


Figure 4: DS3000TE-3 Turn-on delay via PSON

Vin = 264Vac | Full Load: Io = 248A | I_{SB} = 4.5A

Ch 1: AC Mains | Ch 2: PSON | Ch 3: V_O | Ch 4: PWOK

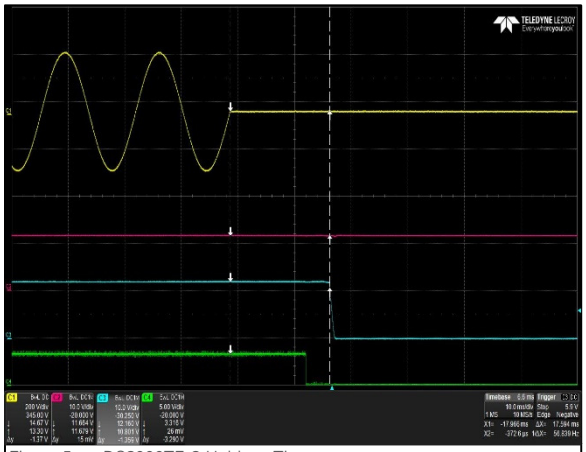


Figure 5: DS3000TE-3 Hold-up Time

Vin = 180Vac/0° | fin = 63Hz | Load: I_O = 223A | I_{SB} = 4.5A

Ch 1: AC Mains | Ch 2: V_{SB} | Ch 3: V_O | Ch 4: PWOK

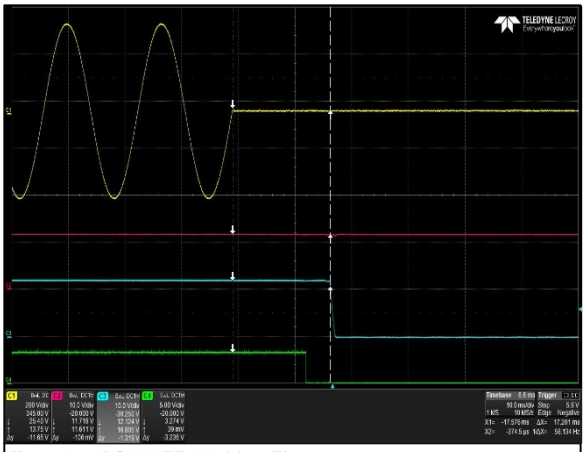


Figure 6: DS3000TE-3 Hold-up Time

Vin = 264Vac/0° | fin = 47Hz | Load: I_O = 248A | I_{SB} = 4.5A

Ch 1: AC Mains | Ch 2: V_{SB} | Ch 3: V_O | Ch 4: PWOK

ELECTRICAL SPECIFICATIONS

DS3000TE-3 Performance Curves

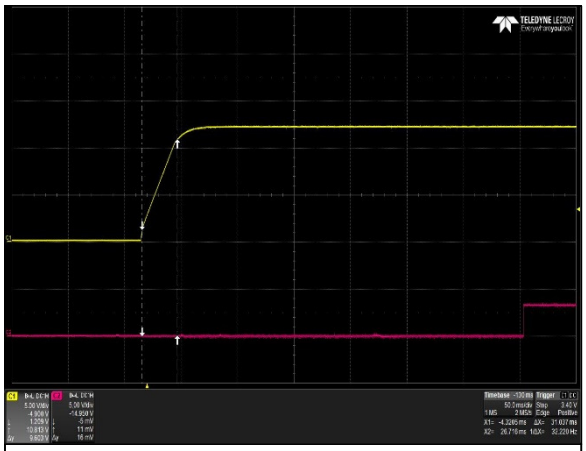


Figure 7: DS3000TE-3 Output Voltage Startup Characteristic
Vin = 180Vac Full Load: I_O = 223A I_{SB} = 4.5A
Ch 1: V_O Ch 2: PWOK

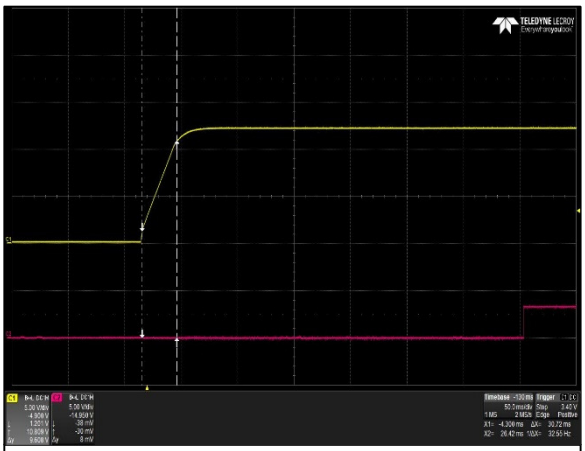


Figure 8: DS3000TE-3 Output Voltage Startup Characteristic
Vin = 264Vac Full Load: I_O = 248A I_{SB} = 4.5A
Ch 1: V_O Ch 2: PWOK

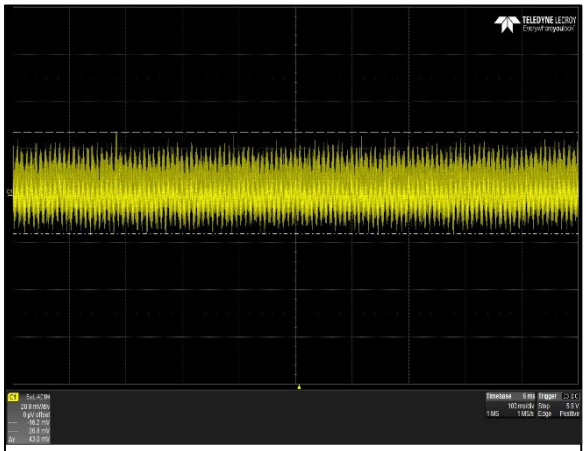


Figure 9: DS3000TE-3 Ripple and Noise Measurement
Vin = 180Vac Full Load: I_O = 223A I_{SB} = 4.5A
Ch 1: V_O

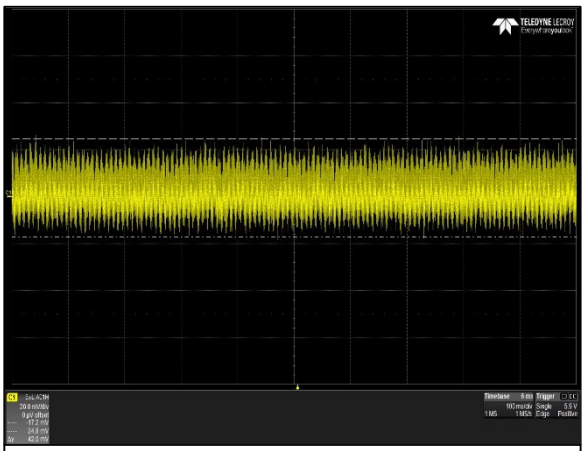


Figure 10: DS3000TE-3 Ripple and Noise Measurement
Vin = 264Vac Full Load: I_O = 248A I_{SB} = 4.5A
Ch 1: V_O

Figure 11: DS3000TE-3 Turn Off Characteristic via PSON
Vin = 180Vac Full Load: I_O = 223A I_{SB} = 4.5A
Ch 1: PSON Ch 2: V_O Ch 3: PWOK

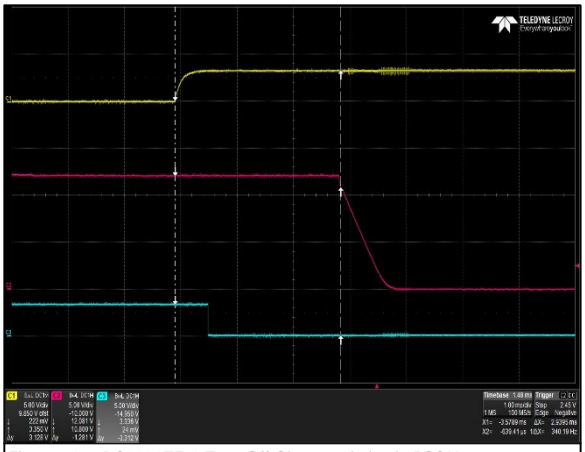


Figure 12: DS3000TE-3 Turn Off Characteristic via PSON
Vin = 264Vac Full Load: I_O = 248A I_{SB} = 4.5A
Ch 1: PSON Ch 2: V_O Ch 3: PWOK

ELECTRICAL SPECIFICATIONS

DS3000TE-3 Performance Curves

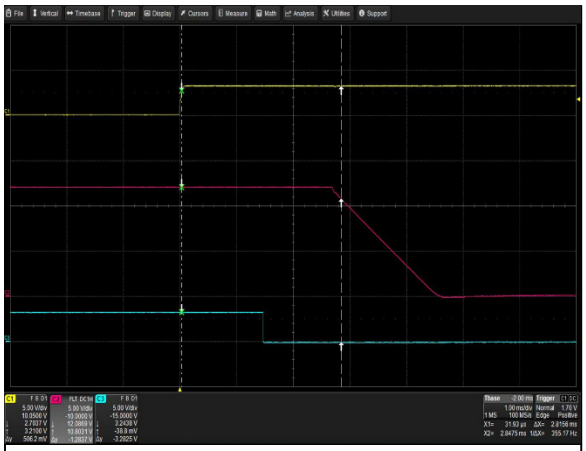


Figure 13: DS3000TE-3 Turn Off Characteristic via PSKILL
Vin = 180Vac Load: I_O = 223A I_{SB} = 4.5A
Ch 1: PSKILL Ch 2: V_O Ch 3: PWOK

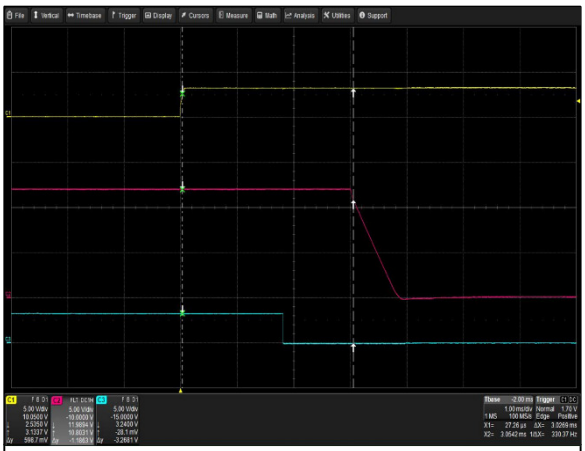


Figure 14: DS3000TE-3 Turn Off Characteristic via PSKILL
Vin = 264Vac Load: I_O = 248A I_{SB} = 4.5A
Ch 1: PSKILL Ch 2: V_O Ch 3: PWOK

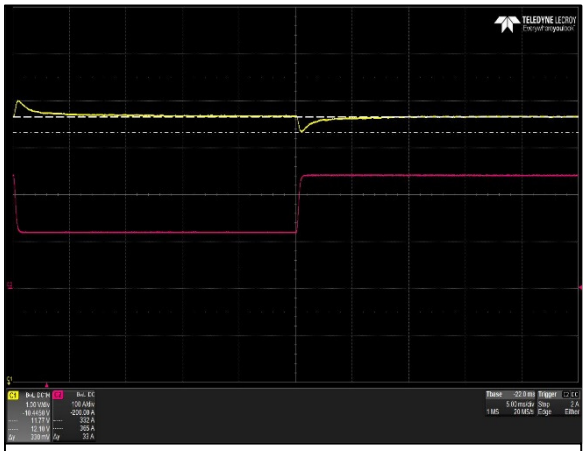


Figure 15: DS3000TE-3 Transient Response - V_O Deviation
50% to 100% load change 0.5A/uS slew rate Vin = 230Vac
Ch 1: V_O Ch 2: I_O Output capacitance = 1000uF

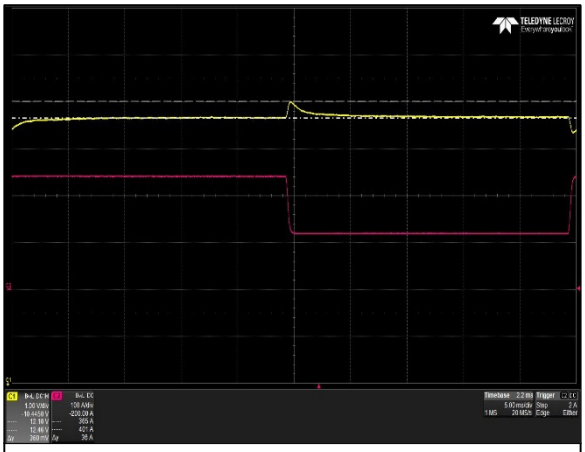


Figure 16: DS3000TE-3 Transient Response - V_O Deviation
100% to 50% load change 0.5A/uS slew rate Vin = 230Vac
Ch 1: V_O Ch 2: I_O Output capacitance = 1000uF

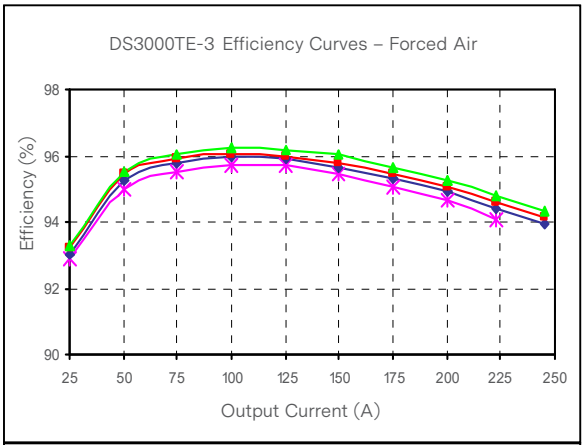


Figure 17: DS3000TE-3 Efficiency Curve @ 25°C
180Vac 220Vac 240Vac 264Vac
Loading: I_{O_MAIN} = 10%$I_{O,MAX}$ increment to 248A

ELECTRICAL SPECIFICATIONS

Protection Function Specifications

Input Fuse

DS3000TE-3 series power supply is equipped with an internal non user serviceable 20A Fast Acting 250Vac fuse to IEC 127 for fault protection on L line input.

Over Voltage / Under Voltage Protection (OVP / UVP)

The power supply will provide 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 will not cause the standby output to shutdown.

OVP

Parameter	Min	Nom	Max	Unit
V_O Output Overvoltage	14.0	/	15.0	V
V_{SB} Output Overvoltage	14.0	/	15.0	V

UVP

Parameter	Min	Nom	Max	Unit
V_O Output Under-voltage	9.6	/	10.5	V
V_{SB} Output Under-voltage	9.2	/	10.1	V

Over Temperature Protection (OTP)

The DS3000TE-3 series power supply will internally protect itself against over temperature conditions. The shutdown temperature will be greater than the maximum specified chassis temperature under all conditions and no component will be over stressed at the shutdown temperature. There are three over-temperature protection sensors for the main output, the PFC circuit and on the standby output. When one of the sensing circuits has reached the OTP limit, all outputs will shut down and remain off until the over-temperature condition no longer exists. A suitable hysteresis point between the OTP threshold and the recovery point will be set to ensure there is no frequent on-off cycling of the outputs. The temperature recovery point will be set well within the supply operating temperature range. Upon reaching the temperature recovery point, all outputs will auto-recover. It is desirable that the over temperature warning alarm is asserted about more than 1 second before the supply shut down. Any OTP fault will be reported in the PMBus™ status flag, without discriminating on which OTP sensing circuit was triggered.

Short Circuit Protection (SCP)

The DS3000TE-3 series power supply will withstand a continuous short circuit applied to any output during start-up or while running, and the short circuit will not cause any damage to the power supply (connectors, components, PCB traces, etc.). A short circuit is defined as an impedance on main output of 0.01 ohm 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 10.0A. The maximum average current, taking into account the “hiccup” duty cycle, must be less than rated output current. The power supply will recover automatically when the error condition is removed and never latch off requiring a manual AC power cycle. Excessive peak currents due to the discharge of output capacitors are not controllable in the event of short circuit at the output.

ELECTRICAL SPECIFICATIONS

Over Current Protection (OCP)

DS3000TE-3 series include internal current limit circuitry to prevent damage in the event of overload or short circuit. Recovery is automatic when the overload is removed if the overload lasts for 200ms or less, and if it is less than or equal to 270A, otherwise it will latch. If the overload is over 270A, or lasts over 200ms, the power supply will shutdown within 10ms. The supply will continue to auto retry to power up under the following conditions:

a) The off time in between retries will be at least 15 seconds.

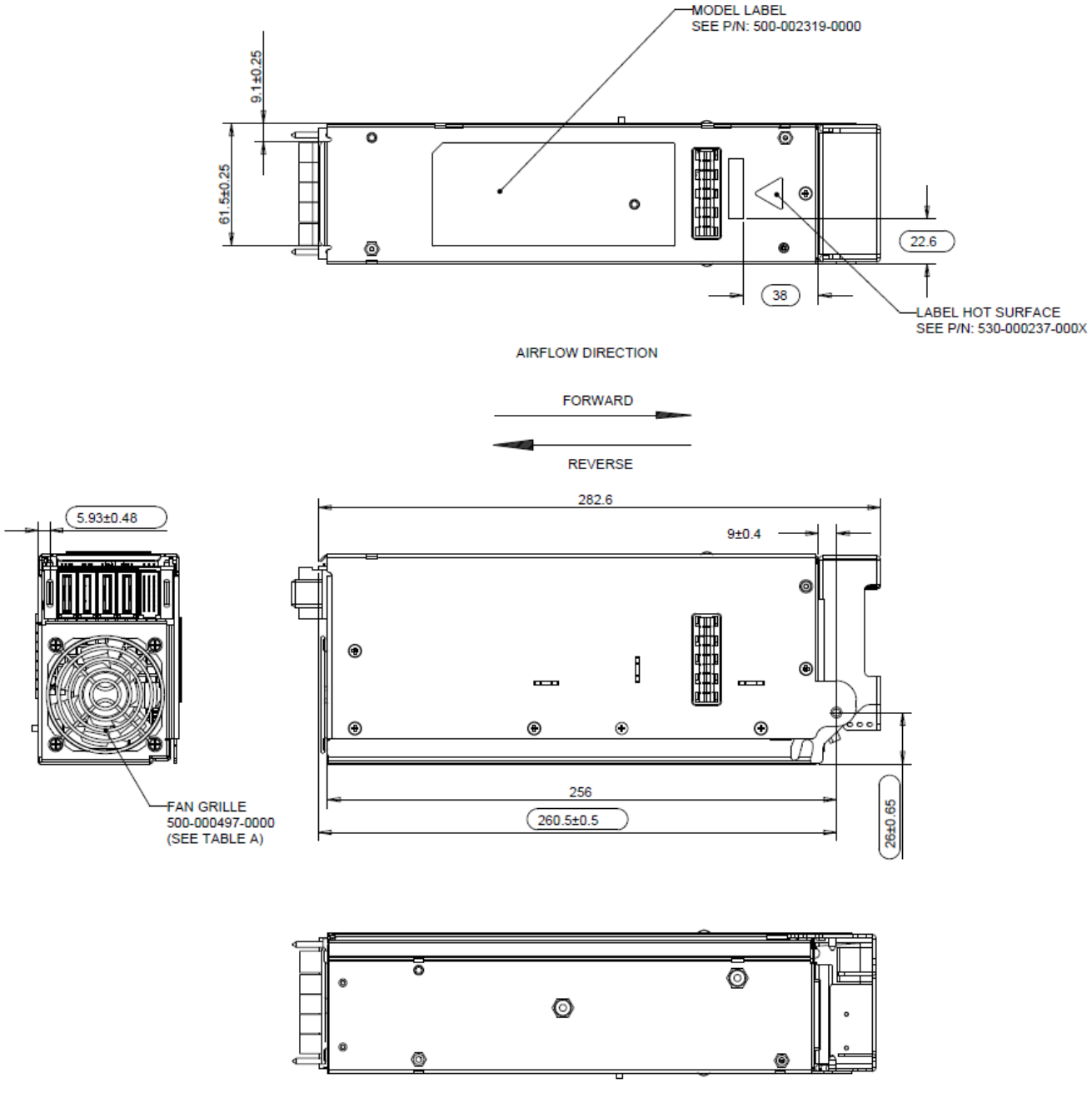
b) The off time in between retries if necessary can be set longer by the supply microchip to avoid heating up the power supply.

A fault in the main output will not cause the standby output to shut down. No damage will happen to the supply as the result of either short term or long term overload of the outputs.

The standby output will have an OCP limit from 111% to 155% (5A-7A) and will auto-recover when the overload is removed. A fault in the standby output will shutdown the main output and will auto-recover as well when the overload on the standby is removed.

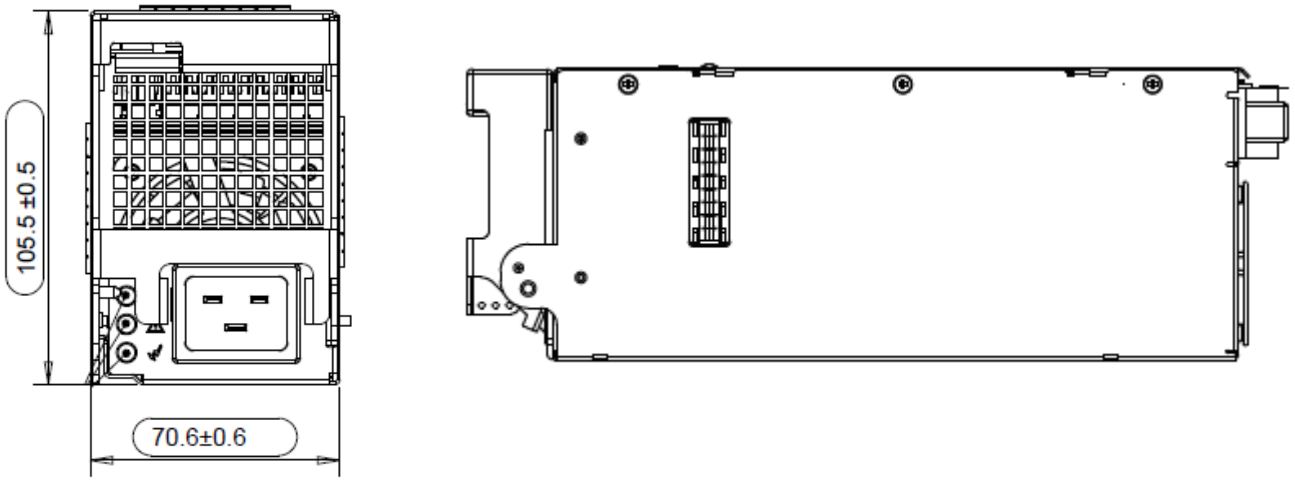
MECHANICAL SPECIFICATIONS

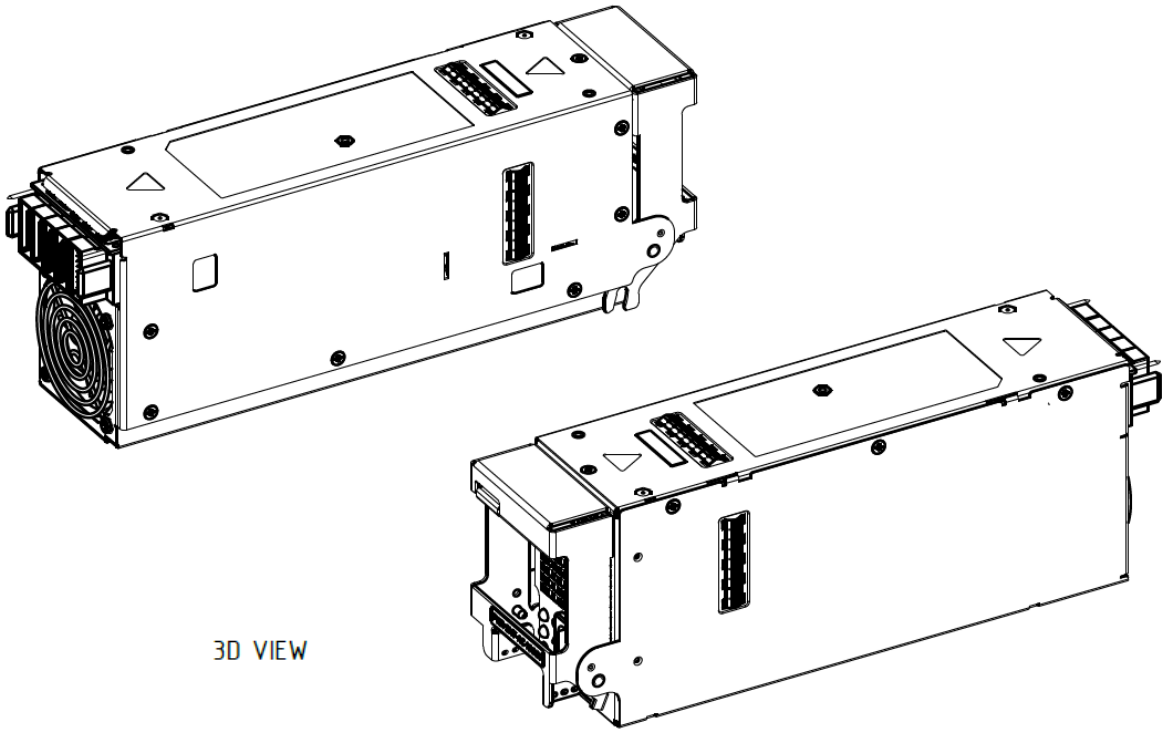
Mechanical Outlines (unit: mm)



MECHANICAL SPECIFICATIONS

Mechanical Outlines (unit: mm)





MECHANICAL SPECIFICATIONS

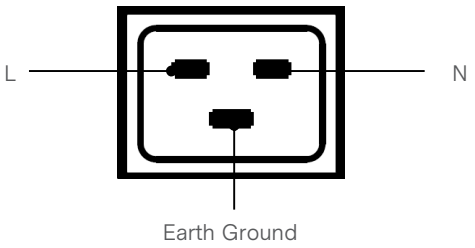
Connector Definitions

AC Input Connector

Pin 1 – Line

Pin 2 – Neutral

Pin 3 – Earth Ground



Output Connector - Power Blades

PB1 – Return (Max 150Amp)

PB2 – Return (Max 150Amp)

PB3 – +Main Output ($12.1V_O$, Max 150Amp)

PB4 – +Main Output ($12.1V_O$, Max 150Amp)

Output Connector - Control Signals

A1 – PWOK (short pin)

A2 – PS_KILL (short pin)

A3 – PS_PRESENT (short pin)

B1 – RETURN

B2 – ISHARE

B3 – RETURN

C1 – PS_INTERRUPT

C2 – RETURN

C3 – ACOK

D1 – RETURN

D2 – PSON

D3 – RESERVED

E1 – SDA

E2 – SCL

E3 – A0

F1 – RESERVED

F2 – A1

F3 – A2

G1 – RESERVED

G2 – RESERVED

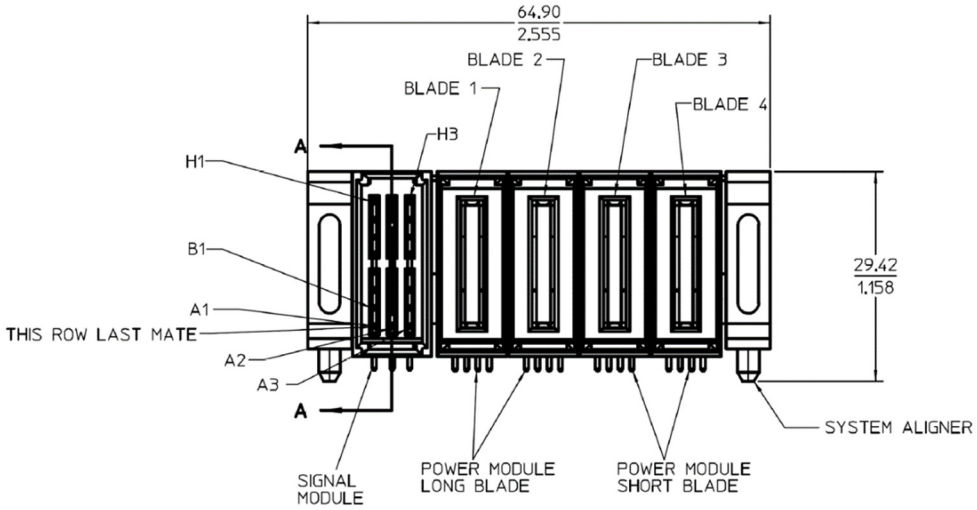
G3 – RESERVED

H1 – $12V_{SB}$

H2 – $12V_{SB}$

H3 – $12V_{SB}$

Power Supply Output Card Edge



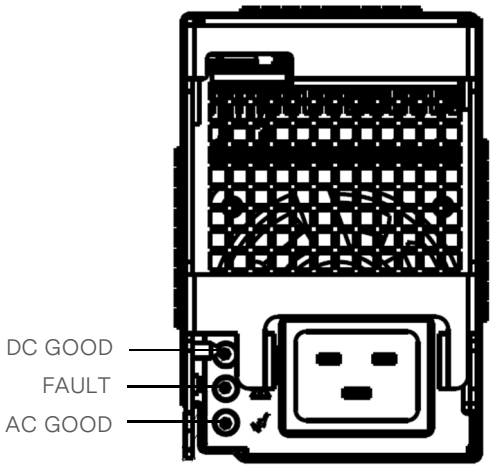
MECHANICAL SPECIFICATIONS

Power / Signal Mating Connectors and Pin Types

Table 5. Mating Connectors for DS3000TE-3 Series		
Reference	On Power Supply	Mating Connector or Equivalent
AC Input Connector	IEC320-C20	IEC320-C19
Output Connector	75555-104	75541-104REVB1

MECHANICAL SPECIFICATIONS

LED Indicator Definitions



Three user-friendly LEDs for status and diagnostics shows status of input power, output power and alarm condition valuable troubleshooting aid to reduce system downtime. The status LED conditions is shown on the below table.

Conditions	AC GOOD LED	DC GOOD LED	FAULT LED
Symbol			
Color	Green	Green	Amber
AC Input = OFF	Off	Off	Off
AC Input = ON, V_{SB} = ON, V_O = OFF	On	Off	Off
AC Input = ON, V_{SB} = ON, V_O = ON	On	On	Off
V_O or V_{SB} = OCP / OVP / OTP / FAN FAULT (Fault of any kind; supply in chassis)	Off	Off	Blinking (1.5 Sec on, 1.5 Sec off)
Power supply plugged in to a live chassis, with no AC cord	Off	Off	Off
Power supply has AC power but not plugged in to the chassis	Blinking (1.5 Sec on, 1.5 Sec off)	Off	Off

MECHANICAL SPECIFICATIONS

Weight

The maximum weight of DS3000TE-3 series power supply is 6.615lbs / 3000g.

ENVIRONMENTAL SPECIFICATIONS

EMC Immunity

DS3000TE-3 series power supply is designed to meet the following EMC immunity specifications.

Table 6. Environmental Specifications

Document	Description
FCC 47 CFR Part 15 Subpart B / CISPR 22/EN55032, Class A	Conducted and Radiated EMI Limits
EN61000-3-2	Harmonics Currents <16 Amps per phase
EN61000-3-3	Voltage Fluctuations <16 Amps per phase
EN61000-4-2	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Electrostatic discharge immunity test: +/-15KV air, +/-8KV contact discharge. Performance - Criteria A
EN61000-4-4	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Electrical fast transient/burst immunity test: +/-2KV for AC power port. Performance - Criteria B +/- 0.5KV for DC power, I/O and signal ports. Performance - Criteria A
EN61000-4-5	Electromagnetic Compatibility (EMC) - Testing and measurement Techniques: Surge AC - 2KV common mode and 1KV differential mode for AC ports Performance - Criteria A
GR-1089	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Surge AC - 2KV common mode and 1KV differential mode for AC ports Performance - Criteria A
EN61000-4-11	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Voltage dips and interruptions: >30% reduction for 500ms, Criteria C; >95% reduction for 10ms, Criteria A (self-recoverable only); >95% reduction for 500ms, Criteria C (self-recoverable only)
EN55032	Information Technology Equipment - Immunity Characteristics, Limits and Method of Measurements

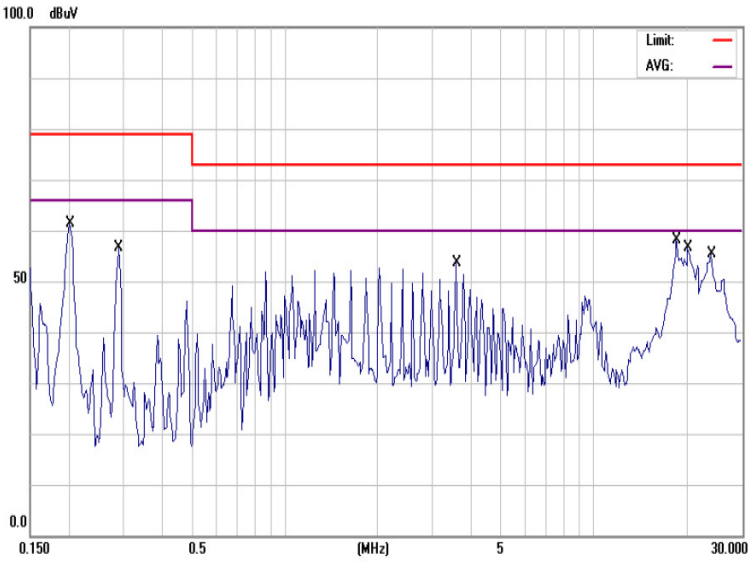
ENVIRONMENTAL SPECIFICATIONS

EMI Emissions

DS3000TE-3 series power supply complies 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 3000W 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 DS3000TE-3 series power supply has internal EMI filters to ensure the convertor's conducted EMI levels comply with EN55032 (FCC Part 15) Class A limits 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 220Vac input.

Note: The first red line refers to Artesyn Quasi Peak margin, which is 6dB below the CISPR 22 international limit. The second purple line refers to the Artesyn Average margin, which is 6dB below the CISPR international limit. The scan curve indicates peak detector measurement.

Table 7. Conducted EMI Emission Specifications of The DS3000TE-3 Series Power Supply

Parameter	Model	Symbol	Min	Typ	Max	Unit
FCC 47 CFR 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 is evaluated in a system environment. The applicable standard is EN55032 Class A (FCC 47 CFR15 Subpart B and EN300 386) Class A with 6dB margin. Testing AC-DC convertors as a stand-alone component to the exact requirements of EN55032 can be difficult, because the standard calls for 1m leads to be attached to the input and outputs and aligned such as to maximize the disturbance. In such a set-up, it is possible to form a perfect dipole antenna that very few AC-DC convertors could pass. However, the standard also states that an attempt should be made to maximize the disturbance consistent with the typical application by varying the configuration of the test sample.

ENVIRONMENTAL SPECIFICATIONS

Safety Certifications

The DS3000TE-3 series power supply is intended for inclusion in other equipment and the installer ensures 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 not be operated as a stand alone product.

Table 8. Safety Certifications for DS3000TE-3 Series Power Supply

Document	File #	Description
UL/cUL60950	E186249-A292-UL-X6	US and Canada Requirements
EN62368		European Requirements
CB Certificate and Report	DK-45042-A2-UL	(All CENELEC Countries)
DEMKO		
CHINA CQC Approval	CQC15001130760	China Requirements
KC (K60950-1)	YU10485-16003	Korea Requirements
BSMI thru ETC	CI33416160276700	Taiwan Requirements
CE Mark (LVD+RoHS)	16290	
UKCA Mark		UK Requirements

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature

The DS3000TE-3 power supply can start and operate within stated specifications at an ambient temperature from 0°C to 40°C under all load conditions with internal fan.

Forced Air Cooling

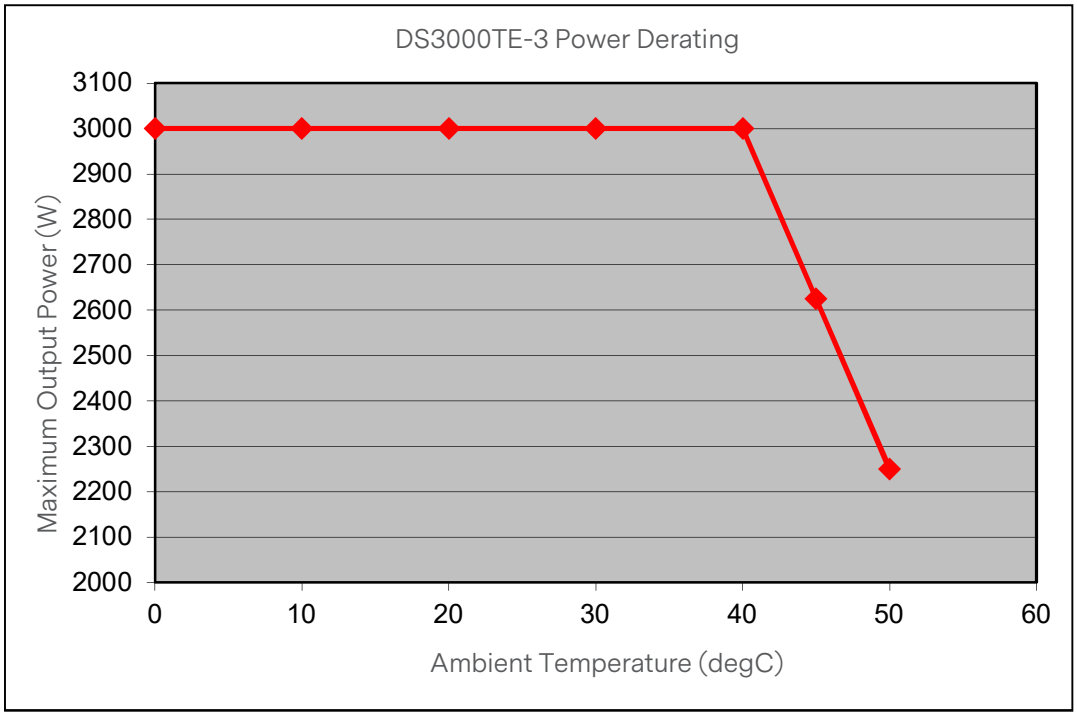
DS3000TE-3 series power supply includes internal cooling fans as part of the power supply assembly to provide forced air-cooling to maintain and control temperature of devices and ambient temperature in the power supply to appropriate levels. The standard direction of airflow is from the DC connector end to the AC connector end of the power supply.

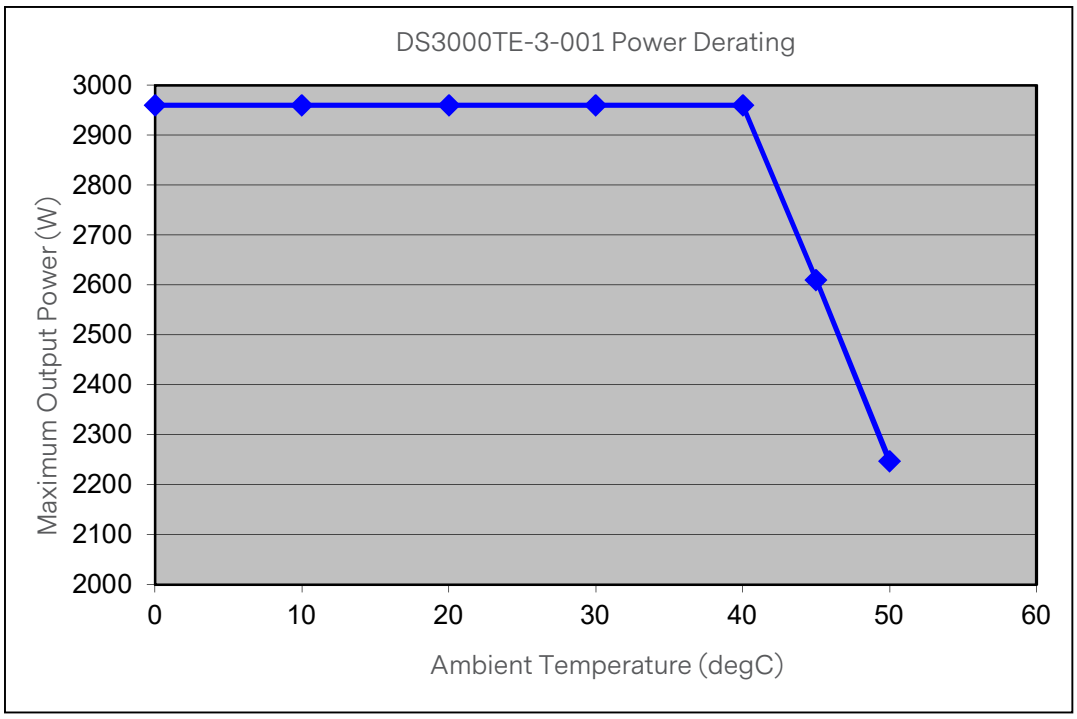
The cooling fan is a variable speed fan. In standby mode power supply fan will operate at minimum speed to maintain component reliability at all load, line and ambient conditions. When 12V output is enabled, power supply fan will operate at minimum achievable fan speed. Power supply fan speed control 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

DS3000TE-3 series total output power will be derated according to the curve shown below. DS3000TE-3 can provide derated output power from 40°C up to 50°C ambient temperature max. DS3000TE-3-001 can provide derated output power from 40°C up to 50°C ambient temperature max.





ENVIRONMENTAL SPECIFICATIONS

Storage and Shipping Temperature

The DS3000TE-3 series power supply can be stored or shipped at temperatures between -40°C to +90°C and relative humidity from 5% to 95% non-condensing.

Altitude

DS3000TE-3 power supply operates within specifications at altitudes up to 13200 feet (4000m) above sea level. And the power supply will not be damaged when stored at altitudes of up to 50000 feet (15000m) above sea level.

Altitude	Models	Input Voltage Range	Maximum Output Power (W)	Minimum Air Inlet Temperature (degC)	Maximum Air Inlet Temperature (degC)
6600 feet (2000m)	DS3000TE-3	208-240Vac	3000	0	40
		180-208Vac	2700		
	DS3000TE-3-001	208-240Vac	2960	0	30
		180-208Vac	2664		
13200 feet (4000m)	DS3000TE-3	208-240Vac	3000	0	40
		180-208Vac	2700		
	DS3000TE-3-001	208-240Vac	2770	0	30
		180-208Vac	2500		

Humidity

Operating: DS3000TE-3 series power supply operates with no degradation of performance while operating in range of 5%RH to 95%RH non-condensing.

Non-Operating: DS3000TE-3 series power supply operates with no degradation of performance while operating in range of 5%RH to 95%RH non-condensing.

Vibration

The DS3000TE-3 series power supply will be subjected to random non-operational and non-operation vibration at levels according to the NEBS GR-63 and IPC9592 requirements. The power supply module will also be subjected to a swept sinusoidal vibration test at acceleration amplitude of 0.5g from 5 to 200Hz and back to 5Hz at 0.1 octave/minute, performed for 90 minutes for each of the three mutually perpendicular axes.

ENVIRONMENTAL SPECIFICATIONS

Operating Random Vibration

Acceleration	0.5		gRMS
Frequency Range	5-200		Hz
Duration	90		mins
Direction	Rotating each axis on vertical vibration		
PSD Profile	**FREQ (Hz)**	**SLOPE (db/oct)**	**PSD (g^2/Hz)**
	5	/	0.00003
	10-50	/	0.0004
	100	/	0.00003

Shock

The DS3000TE-3 power supply will pass the following shock specifications. All components within the power supply will be appropriately secured to prevent failure resulting from these tests. At the conclusion of any of the below referenced shock tests listed, the power supply will be powered up under maximum rated load and will perform within specification.

Non-Operating Half-Sine Shock

Acceleration	30	G
Duration	18	mSec
Pulse	Half-sine	
Number of Shock	3 shocks on each of 6 faces	

Operating Half-Sine Shock

Acceleration	15	G
Duration	11	mSec
Pulse	Half-sine	
Number of Shock	3 shocks on each of 6 faces	

POWER AND CONTROL SIGNAL DESCRIPTIONS

AC Input Connector

This connector supplies the AC Mains to the DS3000TE-3 series power supply.

Pin 1 – L
Pin 2 – N
Pin 3 – Earth Ground

Output Connector – Power Blades

These pins provide the main output for the DS3000TE-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 DS3000TE-3 series power supply. The Main Output (V_O) is electrically isolated from the power supply chassis.

PB1	–	Return
PB2	–	Return
PB3	–	+ Main Output (V_O)
PB4	–	+ Main Output (V_O)

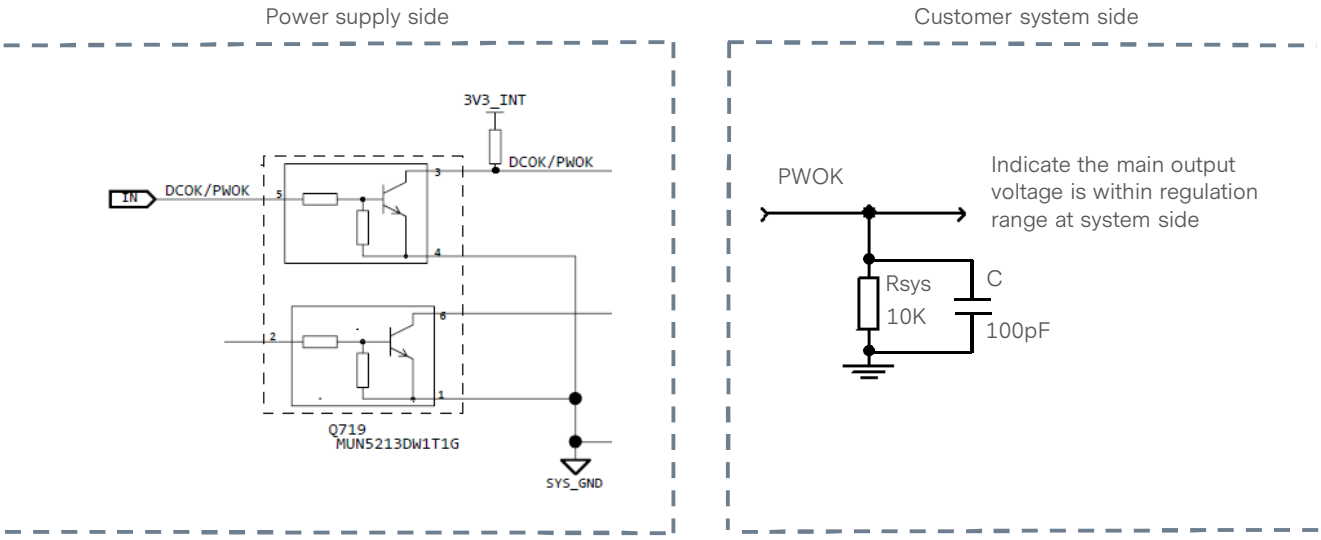
Output Connector – Control Signals

The DS3000TE-3 series power supply contains a 24 pins control signal header providing an analogue control interface and I^2C interface signal connections.

PWOK - (Pin A1)

The PWOK signal used to indicate that main output voltage is within regulation range. The PWOK 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. If the AC power is lost, this signal is driven low at least 20ms before the standby output goes below regulation range.

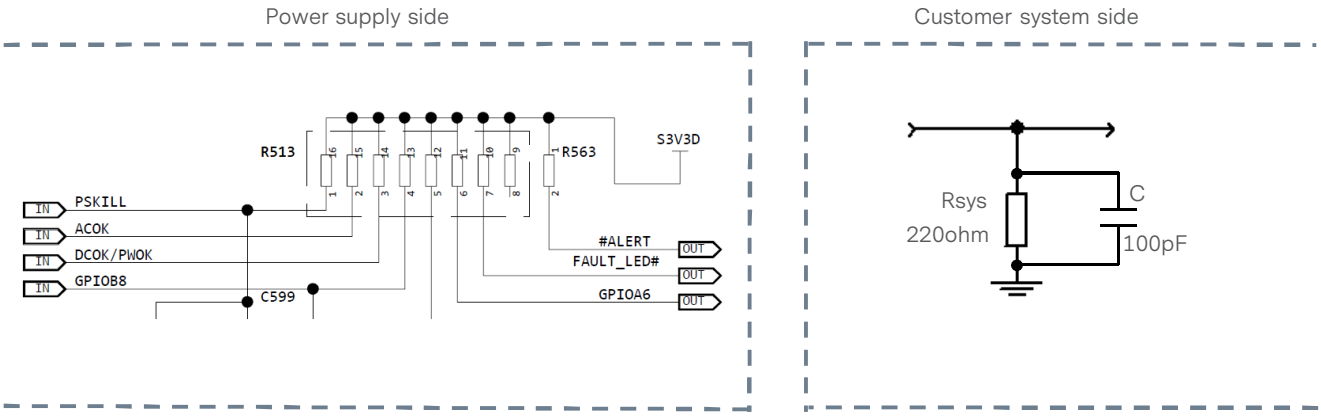
This is an open collector/drain output. This pin is pulled high by a 1.0Kohm resistor connected to 3.3V inside the power supply. It is recommended that this pin be connected to a 100pF decoupling capacitor and pulled down by a 10Kohm resistor.



POWER AND CONTROL SIGNAL DESCRIPTIONS

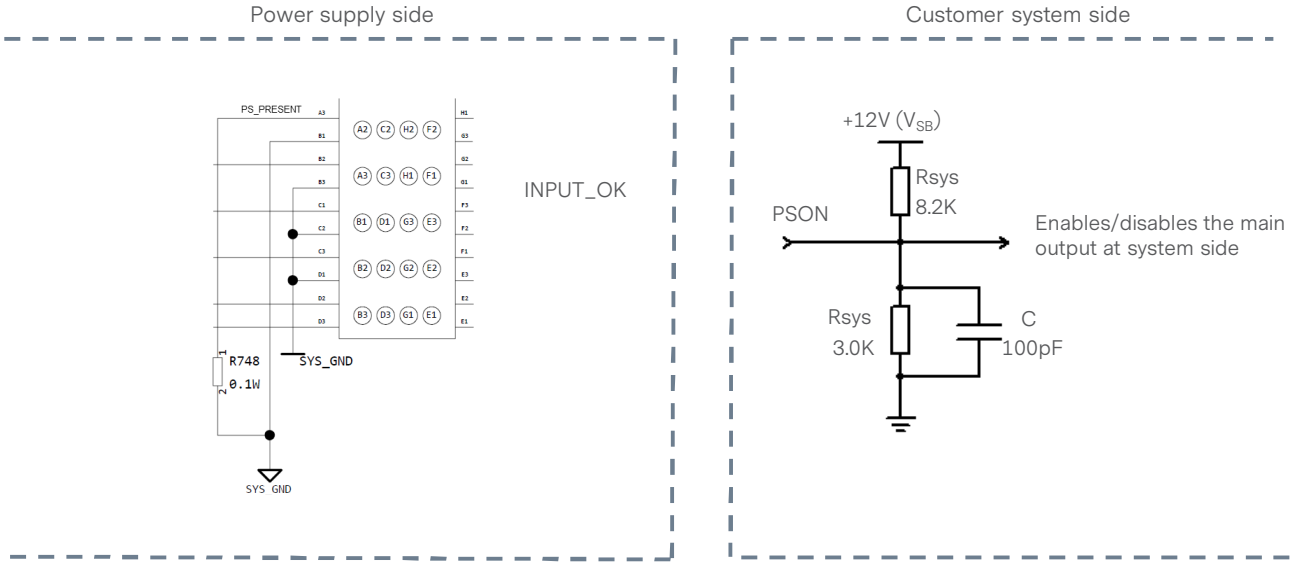
PSKILL - (Pin A2)

The PSKILL input signal has a short pin in the output connector, ANDed with PSON. It functions as the first break and last mate pin, thus, supports hot-swap capability. This enables or disables the main +12V output of the power supply. When this signal is shorted to ground by the system, the main +12V output will be enabled. Power supply has 1Kohm pull-up resistor to internal 3.3V bias. This signal is pulled to ground at the system side with a 220ohm resistor. A 100pF decoupling capacitor is also recommended. Standby output will remain on after the main +12V output disabled.



PRESENT - (Pin A3)

This input signal pin is grounded inside the power supply via 50ohm resistor. It can be used to sense PSU seated by using a suitable pull-up to standby with a noise filter capacitor connected to standby return. Signal used to indicate to the system that a power supply is inserted in the power bay. 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.



POWER AND CONTROL SIGNAL DESCRIPTIONS

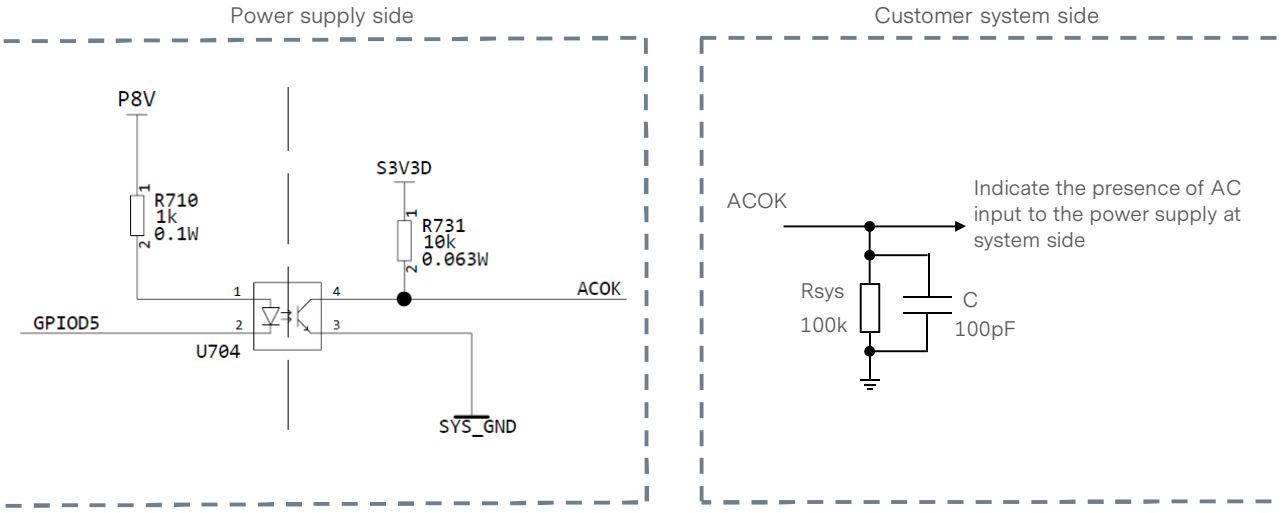
ISHARE - (Pin B2)

The DS3000TE-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. This signal is an analog bus which will allow two or more power supplies to share the system load current. It will have a voltage which is directly proportional to supplied current. A linear slope from minimum load to full load is expected. The system will continue to work with the ISHARE signal wrongly driven high or shorted to ground. The chassis must support routing this signal to all chassis power supplies. If one of the supplies fails, the remaining supply must pick up the entire load without any of the outputs dropping out of regulation.

ACOK - (Pin C3)

The ACOK is an open collector output signal which is normally LOW (<0.4V) whenever input AC voltage is within allowable limits. This signal will go HIGH (>2.0V) within 6ms from loss of AC. Power supply has internal 10Kohm pull-up resistor to internal 3.3V bias. Additional pull-up on system side may be added but current-limited to 0.7mA. Suitable noise filter capacitor connected to standby return line is recommended on system side.

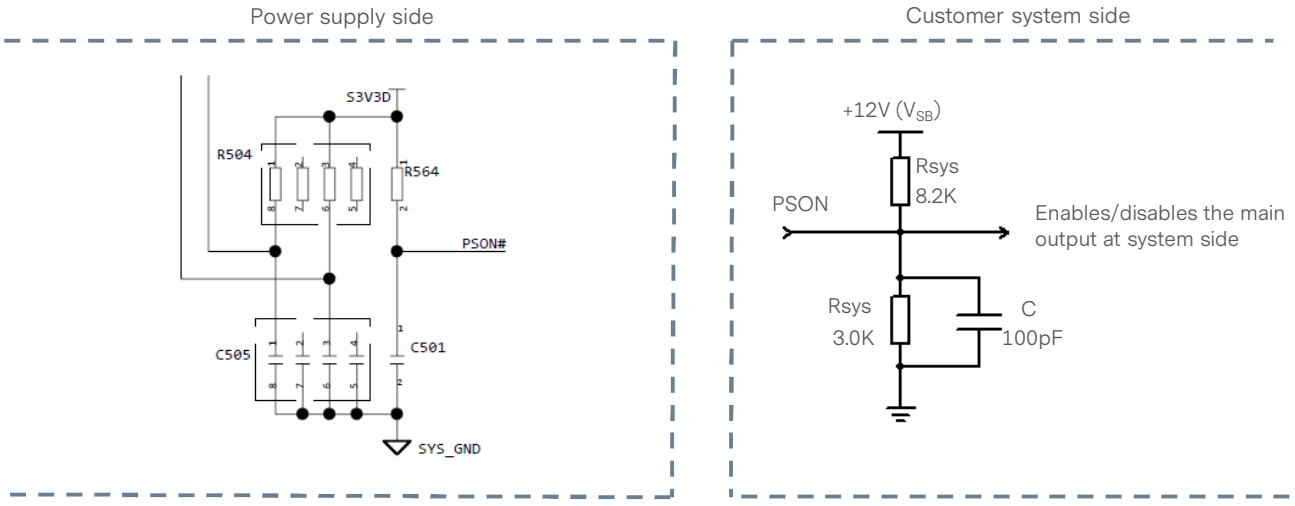
It is recommended that this pin be connected to a 100pF decoupling capacitor and pulled down by a 100Kohm resistor.



POWER AND CONTROL SIGNAL DESCRIPTIONS

PSON - (pin D2)

This signal input pin controls the normal turning ON and Off of the main output of the DS3000TE-3 power supply, ANDed with PSKILL. The power supply main output will be enabled when this signal is pulled low to below 0.8V. The power supply main output will be disabled when this input is driven higher than 2.0V, or left open. This signal can be pulled high to 3.3V maximum. The standby output is not affected by this signal. 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.



SDA, SCL and PS_INTERRUPT - (Pins E1, E2 and C1)

Please refer to "Communication Bus Descriptions" section.

A0, A1 and A2 - (Pins E3, F2 and F3)

Please refer to “Communication Bus Descriptions” section.

COMMUNICATION BUS DESCRIPTIONS

I²C Bus Signals

The DS3000TE-3 series power supply contains enhanced monitor and control functions implemented via the I²C bus. The DS3000TE-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 DC 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 E1, E2)

I²C serial data and clock bus - these pins are internally pulled up to internal 3.3V supply with a 2.2Kohm resistor. These pins must be pulled-up by a 22Kohm resistor to 3.3V and a 200pF decoupling capacitor at the system side.

Refer to the communication interface specifications for more details.

PS_INTERRUPT - (Pin C1)

PS_INTERRUPT is used to indicate to the system that a change in power supply status has 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. Three conditions can de-assert this signal: AC recycle, PSON recycle or issuance of a CLEAR_FAULTS PMBus command.

A0, A1, A2 (I²C Address) - (pins E3, F2, F3)

These input pins are the address lines A0, A1 and A2 to indicate the slot position the power supply occupies in the power bay and define the power supply addresses for FRU data and PMBus™ data communication. This allows the system to assign different addresses for each power supply. During I²C communication between system and power supplies, the system will be the master and power supplies will be slave.

They are internally pulled up to internal 3.3V supply with a 1K resistor.

I²C Bus Communication Interval

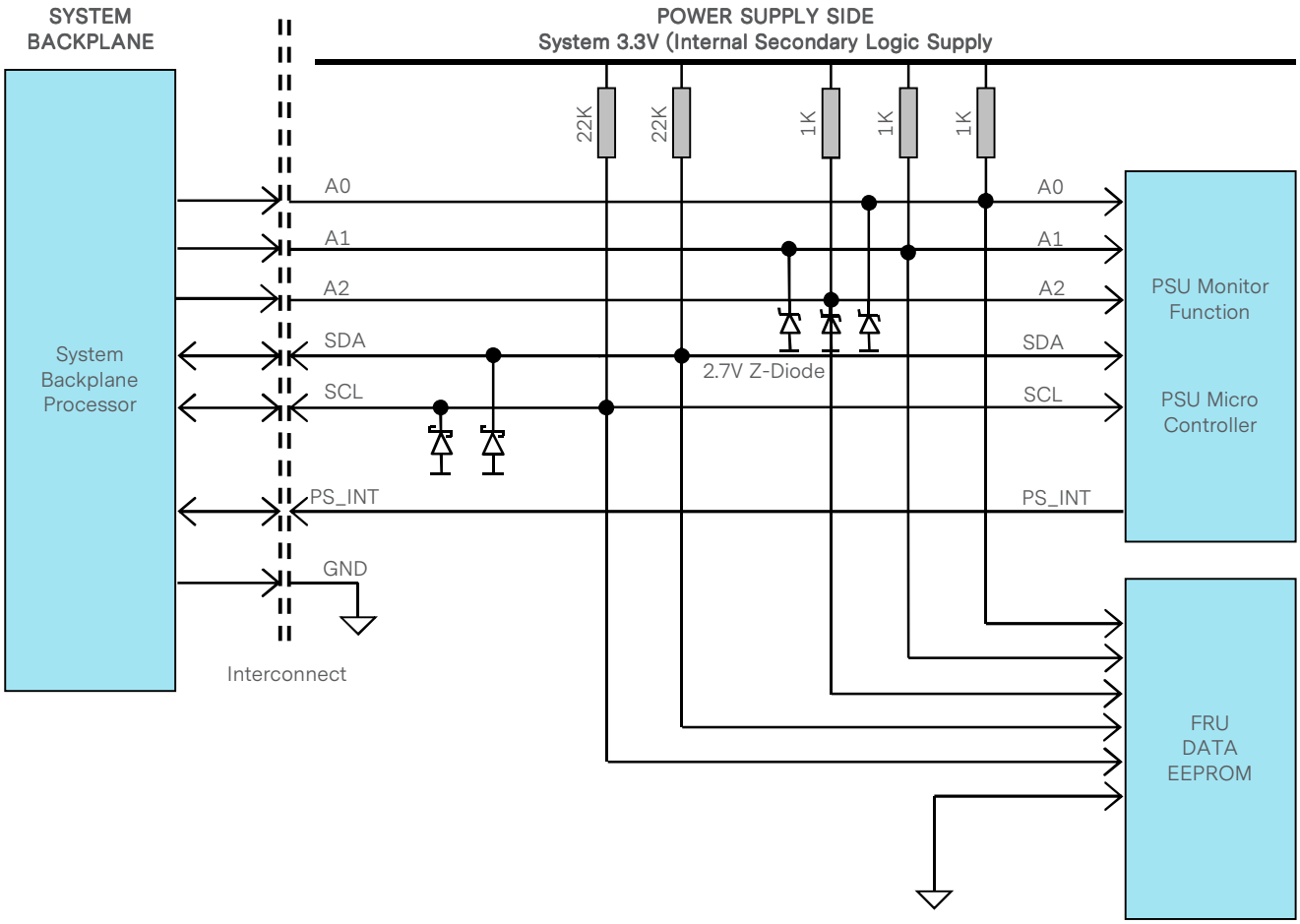
The interval between two consecutive I²C communications to the power supply must be at least 15ms to ensure proper monitoring functionality.

I²C Bus Signal Integrity

The noise on the I²C bus (SDA, SCL lines) due to the power supply will be less than 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 22Kohm resistors pulled up to standby output and a decoupling 47pF ceramic capacitors to standby output return.

COMMUNICATION BUS DESCRIPTIONS

I²C Bus Internal Implementation, Pull-ups and Bus Capacitances



I²C Bus - Recommended external pull-ups

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

Parameter	Condition	Symbol	Min	Type	Max	Unit
SDA, SCL Internal Pull-up Resistor		R_{int}	-	22	-	Kohm
SDA, SCL Recommended External Bus Capacitance		C_{int}	-	33	-	pF
Recommended External Pull-up Resistor	1 to 12 PSU	R_{ext}	-	2.2	-	Kohm

COMMUNICATION BUS DESCRIPTIONS

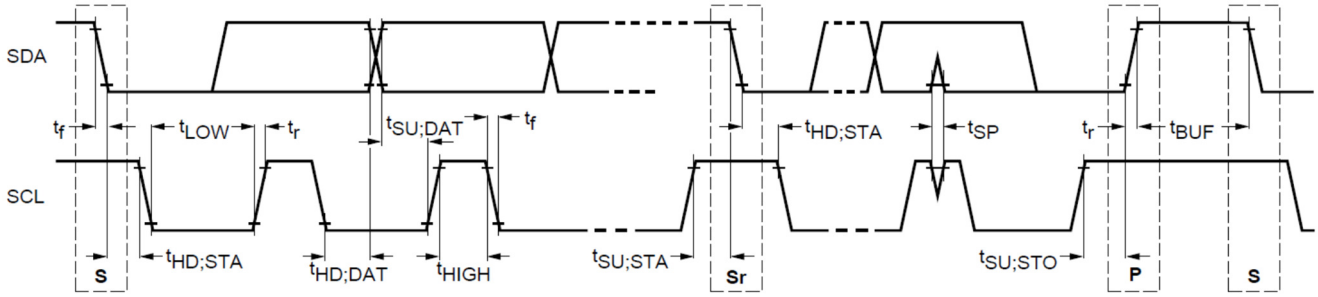
Logic Levels

DS3000TE-3 series power supply I²C communication bus will respond to logic levels as per below:

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

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

Timings



Parameter	Symbol	Standard-Mode Specs		Actual Measured		Unit
		Min	Max			
SCL clock frequency	f_{SCL}	0	100	100		KHz
Hold time (repeated) START condition	$t_{HD;STA}$	4.0	-	4.7		uS
LOW period of SCL clock	t_{LOW}	4.7	-	15.3		uS
HIGH period of SCL clock	t_{HIGH}	4.0	-	4.8		uS
Setup time for repeated START condition	$t_{SU;STA}$	4.7	-	4.9		uS
Data hold time	$t_{HD;DAT}$	0	3.45	230		uS
Data setup time	$t_{SU;DAT}$	250	-	4680		nS
Rise time	t_r	-	1000	SCL = 867	SDA = 830	nS
Fall time	t_f	-	300	SCL = 175	SDA = 151	nS
Setup time for STOP condition	$t_{SU;STO}$	4.0	-	5.5		uS
Bus free time between a STOP and START condition	t_{BUF}	4.7	-	30.8		mS

COMMUNICATION BUS DESCRIPTIONS

Device Addressing

The DS3000TE-3 series power supply will respond to supported commands on the I^2C bus that are addressed according to pins A2, A1 and A0 of output connector.

Address pins are held HIGH by default via pulled up to internal 3.3V supply with a 1K resistor. To set the address as “0”, the corresponding address line should be pulled down to logic ground level. Below tables show the address of the power supply with A0, A1 and A2 pins set to either “0” or “1”.

PSU Slot	Slot ID Bits			PMBus™ Address		EEPROM (FRU) Address	
	A2	A1	A0	WRITE	READ	WRITE	READ
1	0	0	0	0xB0	0xB1	0xA0	0xA1
2	0	0	1	0xB2	0xB3	0xA2	0xA3
3	0	1	0	0xB4	0xB5	0xA4	0xA5
4	0	1	1	0xB6	0xB7	0xA6	0xA7
5	1	0	0	0xB8	0xB9	0xA8	0xA9
6	1	0	1	0xBA	0xBB	0xAA	0xAB
7	1	1	0	0xBC	0xBD	0xAC	0xAD
8	1	1	1	0xBE	0xBF	0xAE	0xAF

Note 1 - Default address when A0, A1 and A2 are left open.

COMMUNICATION BUS DESCRIPTIONS

Reporting Functions

The power supply will have enhanced monitor and control functions implemented via the PMBus. This will use the SDA and SCL pins. The power supply monitor will operate as a PMBus slave device. The accuracy of the report functions will be as follows:

Firmware Reporting And Monitoring			
Output loading	**0% to 20%**	**20% to 50%**	**50% to 100%**
Input voltage	±3%		
Input current	±0.55A	±4%	±4%
Input power	±20W at less than 100W input	±5%	±5%
Output voltage	±2%		
Output current	±2.5A	±4%	±2%
Temperature	±2.5^{O}C		
E_{IN}	±15%	±5%	
E_{out}	±10%	±5%	
Fan accuracy	±200RPM		

The telemetry circuit and supply controller powered either by its own AC or from the chassis 12V supply must report the same information and accuracy at all times. Unplugging or plugging the AC cord while the supply is plugged in to a live chassis must not affect reporting and/or fan operation or RPM.

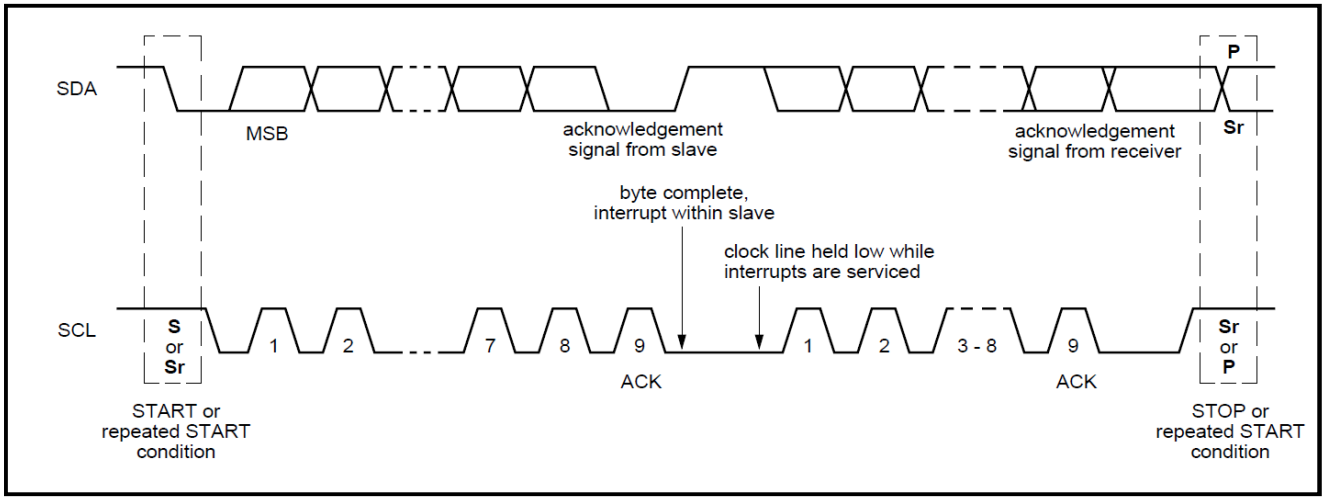
COMMUNICATION BUS DESCRIPTIONS

I²C Clock Synchronization

The DS3000TE-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 DS3000TE-3 series is 25 milliseconds.

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



COMMUNICATION BUS DESCRIPTIONS

FRU (EEPROM) Data

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

The DS3000TE-3 series uses 1 page of EEPROM for FRU purpose. A page of EEPROM contains up to 256 byte-sized data locations.

Where:

OFFSET -The OFFSET denotes the address in decimal format of a particular data byte within DS3000TE-3 series 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.

DS3000TE-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) 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	01
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** (Default value is 0.)	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 13 14 15 16 17 18 19 20 21	0C 0D 0E 0F 10 11 12 13 14 15	**CHASSIS PART NUMBER BYTES** (Default value is 0.)	0 0 0 0 0 0 0 0 0 0	00 00 00 00 00 00 00 00 00 00
22	16	**CHASSIS SERIAL NUMBER** Type/Length Type = “ASCII+LATIN1” = (11)b length = 15 bytes = (001111)b	207	CF

COMMUNICATION BUS DESCRIPTIONS

DS3000TE-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
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
38	26	**End Tag** (0C1h if used)	193	C1
39	27	**CHKSUM** (Bytes from 8 to 38))	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
		MANUFACTURER'S NAME 5 bytes sequence		
44	2C	"A“ = 41h	65	41
45	2D	"R“ = 52h	82	52
46	2E	"T“ = 54h	84	54
47	2F	"E“ = 45h	69	45
48	30	"S“ = 53h	83	53
49	31	"Y“ = 59h	89	59
50	32	"N“ = 4Eh	78	4E
51	33	**PRODUCT NAME** Type/Length (CFH) Type = "ASCII+LATIN1" = (11)b length = 15 bytes = (001111)b	207	CF
		PRODUCT NAME BYTES (15 bytes sequence)		
52	34	"D“ = 44H	68	44
53	35	"S“ = 53H	83	53
54	36	"3" = 33H	51	33
55	37	"0" = 30H	48	30
56	38	"0" = 30H	48	30
57	39	"0" = 30H	48	30
58	3A	“T" = 54H	84	54
59	3B	"E" = 45H	69	45
60	3C	"-" = 2DH	45	2D
61	3D	"3" = 33H	51	33
62	3E	**Last four characters will be based on the last four characters of the**	45	2D
63	3F	**variant**	52	34
64	40	**Ex. -001 for DS3000TE-3-001.**	48	30
65	41	**For DS3000TE-3-SP, use only DS3000TE-3**	49	31
66	42	**For DS3000TE-3-001-SP, use only DS3000TE-3-001**	32	20
67	43	**PRODUCT PART/MODEL NUMBER** Type/Length Type = "ASCII+LATIN1" = (11)b length = 15 bytes = (001111)b	207	CF

COMMUNICATION BUS DESCRIPTIONS

DS3000TE-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		PRODUCT PART/MODEL NUMBER BYTES		
68	44	"D" = 44H	68	44
69	45	"S" = 53H	83	53
70	46	"3" = 33H	51	33
71	47	"0" = 30H	48	30
72	48	"0" = 30H	48	30
73	49	"0" = 30H	48	30
74	4A	"T" = 54H	80	54
75	4B	"E" = 45H	69	45
76	4C	"-" = 2DH	45	2D
77	4D	"3" = 33H	51	33
78	4E	**Last four characters will be based on the last four characters of the**	45	2D
79	4F	**variant**	52	34
80	50	**Ex. -001 for DS3000TE-3-001.**	48	30
81	51	**For DS3000TE-3-SP, use only DS3000TE-3**	49	31
82	52	**For DS3000TE-3-001-SP, use only DS3000TE-3-001**	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 Bom Revision		
84	54	X	88	58
85	55	X	88	58
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 = K553 (DS3000TE-3), K554 (-001), K871 (-403),		
		K879 (-001), K880 (-SP), K881 (-001-SP)		
		Example below		
87	57	"K" = 4B	76	4C
88	58	"5" = 35	51	33
89	59	"5" = 35	48	30
90	5A	"3" = 33	52	34
		MANUFACTURING YEAR AND WEEK CODE		
91	5B	"W" = 57h (Per unit)	87	57
92	5C	"W" = 57h (Per unit)	87	57
		UNIQUE SERIAL NUMBER		
		"SSSS"		
93	5D	"S" = 53H (Per unit)	83	53
94	5E	"S" = 53H (Per unit)	83	53
95	5F	"S" = 53H (Per unit)	83	53
96	60	"S" = 53H (Per unit)	83	53
		MODEL REVISION, Astec Model Rev,		
		See latest model rev ipro Bom revision		
97	61	X	88	58
98	62	X	88	58
		MANUFACTURING LOCATION		
		"Z" for "Zhongshan" In Decimal = 090, In Hex = 5AH		
99	63	"L" for "Laguna" In Decimal = 760, In Hex = 4CH	76	4C
100	64	**End Tag**	193	C1
101	65	PAD (reserved). Default value is 0.	0	00
102	66		0	00
103	67	**ZERO CHECK SUM (256 – (Sum of bytes 40 to 102)) per unit** Zero Check Sum: will follow check sum calculation as per IPMI v1.1 specs	179	B3

COMMUNICATION BUS DESCRIPTIONS

DS3000TE-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		MULTI RECORD AREA, 88 BYTES		
		Power Supply Record Header		
104	68	Record type = 00 for power supply	0	00
105	69	End of list / Record format version number	2	02
106	6A	Record length of power supply record	24	18
107	6B	Record CHECKSUM of power supply record (Zero CHECKSUM) (256-(sum of bytes 109 to 132)	98	62
108	6C	Header CHECKSUM of power supply record header (Zero CHECKSUM) (256-(sum of bytes 104 to 107)	132	84
		POWER SUPPLY RECORD		
		Overall Capacity of The Power Supply 2 bytes sequence		
109	6D	**DS3000TE-3//-SP/-403 = 3000W = 0BB8H; DS3000TE-3-001/-001/-001-SP = 2960W = 0B90H**	184	B8
110	6E	3000W = 0BB8H; 2730W = 0AAAH.	11	0B
		Peak VA, 4224VA = 2480H		
111	6F	2 bytes sequence	128	80
112	70	In Decimal = 128, 016; In Hex = B8H, 0BH	16	10
113	71	**Inrush Current,** 55A In Decimal = 55, In Hex = 37H	55	37
114	72	**Inrush Interval, 10mS** In Decimal = 010 In Hex = 0AH	10	0
		Low End Input Voltage Range 1(10mV), (180V/10mV) 18000 = 4650H		
115	73	2 bytes sequence	80	50
116	74	Stored with LSB first then MSB.	70	46
		High End Input Voltage Range 1(10mV), (264V/10mV) 26400 = 6720H		
117	75	2 bytes sequence	32	20
118	76	Stored with LSB first then MSB.	103	67
		Low End Input Voltage Range 1(10mV),		
119	77	2 bytes sequence	0	00
120	78		0	00
		High End Input Voltage Range 1(10mV),		
121	79	2 bytes sequence	0	00
122	7A		0	00
		Low End Input Frequency Range,		
123	7B	47Hz = 2FH	47	2F
		Low End Input Frequency Range,		
124	7C	63Hz = 3FH	63	3F
		AC Dropout Tolerance in ms,		
125	7D	10mS = 0AH	10	0A
		Binary Flags, "1" indicates function supported and a "0" indicates function not supported.		
126	7E	Bits 7-5: RESERVED, write as 000B Bit 4: Tachometer Pulses Per Rotation / Predictive Fail Polarity BIT =1 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	30	1E
		Peak Wattage Capacity and Holdup Time		
127	7F	15-12: (0001)b, hold up time in Seconds 0.1Sec	184	B8
128	80	11-0: (101010001100)b, peak capacity in Watts = 3000W	11	0B

COMMUNICATION BUS DESCRIPTIONS

DS3000TE-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		Combined Wattage		
129	81	Byte 1: 0000 0000 = 00H = 00d (12V – voltage1)	0	00
130	82	Byte 2 and Byte 3: 00H, 00H	144	B8
131	83		11	0B
		Predictive Fail Tachometer Lower Threshold, not applicable.		
132	84	Predictive failure is not supported.	0	00
		12V DC OUTPUT RECORD HEADER		
133	85	Record type = 01 for DC output record	1	01
134	86	End of list /Record format version number for 12V DC output record	2	02
135	87	Record length of 12V DC output record	13	0D
136	88	Record CHECKSUM of 12V DC output record (Zero CHECKSUM) (256-(sum of bytes 138 to 150)	38	26
137	89	Header CHECKSUM of 12V DC output record header (Zero CHECKSUM) (256-(sum of bytes 133 to 136)	202	CA
		12V DC 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
		Nominal Voltage (10mV), (12.1V / 10mV) 1210 = 04BAH 2 bytes sequence		
139	8B	In Decimal: 186, 004	186	BA
140	8C	In Hex: BAH, 04H	4	04
		Maximum Negative Voltage Deviation (11.5V / 10mV), 1150 = 047EH 2 bytes sequence		
141	8D	In Decimal: 126, 004	126	7E
142	8E	In Hex: 7EH, 04H	4	04
		Maximum Positive Voltage Deviation (11.5V / 10mV), 1270 =04F6H 2 bytes sequence		
143	8F	In Decimal: 246, 004	246	F6
144	90	In Hex: F6H, 04H	4	04
		Ripple and Noise pk-pk (mV), 150 = 0078H 2 bytes sequence		
145	91	In Decimal: 150, 000	150	96
146	92	In Hex: 96H, 00H	0	00
		Minimum Current Draw (10mA), 00 = 0000H 2 bytes sequence		
147	93	In Decimal: 00, 000	0	00
148	94	In Hex: 00H, 00H	0	00
149	95	**Maximum Current Draw (10mA),**	168	A8
150	96	2 bytes sequence	97	61
		V_{SB} OUTPUT RECORD HEADER		
151	97	Record type = 01 for DC output record	1	01
152	98	End of list / Record format version number for 3V3SB output record	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)	9	09
155	9B	Header CHECKSUM of 3V3SB output record header (Zero CHECKSUM) (256-(sum of bytes 151 to 154)	231	E7
		V_{SB} OUTPUT RECORD		
156	9C	**Output Information, 002 = 02H** Bit 7: Standby information = 1B Bits 6-4: Reserved, write as 000B Bits 3-0: Output number 1 = 0010B	130	82

COMMUNICATION BUS DESCRIPTIONS

DS3000TE-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
		Nominal Voltage (10mV), (12V / 10mV) 1200 = 04B0H		
		2 bytes sequence		
157	9D	In Decimal: 176, 004	176	B0
158	9E	In Hex: B0H, 04H	4	04
		Maximum Negative Voltage Deviation (10mV), 1140 = 0474H		
		2 bytes sequence		
159	9F	In Decimal: 116, 004	116	74
160	A0	In Hex: 74H, 04H	4	04
		Maximum Positive Voltage Deviation (10mV), 1260 =04ECH		
		2 bytes sequence		
161	A1	In Decimal: 236, 004	236	EC
162	A2	In Hex: ECH, 04H	4	04
		Ripple and Noise pk-pk (mV), 150 = 96H		
		2 bytes sequence		
163	A3	In Decimal: 150, 000	150	96
164	A4	In Hex: 96H, 00H	0	00
		Minimum Current Draw (10mA), (0.1A / 10mA) 10 = 000AH		
		2 bytes sequence		
165	A5	In Decimal: 010, 000	0	00
166	A6	In Hex: 0AH, 00H	0	00
		Maximum Current Draw (4A), (4.5A / 10mA) 450 = 01C2H		
		2 bytes sequence		
167	A7	In Decimal: 194, 001	194	C2
168	A8	In Hex: C2H, 01H	1	01
		OEM RECORD HEADER		
167	A7	Record type = C0H for OEM Record	192	C0
168	A8	End of list / Record format version number for 3.3Vsb output record	130	82
169	A9	Record length of OEM record	42	2A
170	AA	Record CHECKSUM of OEM record (Zero CHECKSUM)	0	00
171	AB	Header CHECKSUM of OEM record header (Zero CHECKSUM)	148	94
		(256-(sum of bytes 169 to 172)		
		OEM RECORD		
172	AC	Manufacturer ID (3 bytes, default is 0)	0	00
173	AD	RESERVED	0	00
174	AE	RESERVED	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	PAD (reserved), default value is 0.	0	00
186	BA		0	00
187	BB		0	00
188	BC		0	00
189	BD		0	00
190	BE		0	00
191	BF		0	00
192	C0		0	00
193	C1		0	00
194	C2		0	00
195	C3		0	00

COMMUNICATION BUS DESCRIPTIONS

DS3000TE-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
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
251	FB		0	00

COMMUNICATION BUS DESCRIPTIONS

DS3000TE-3 series FRU (EEPROM) Data:

OFFSET		DEFINITION	SPEC VALUE	
(DEC)	(HEX)	(REMARKS)	(DEC)	(HEX)
253	FD		0	00
254	FE		0	00
255	FF		0	00

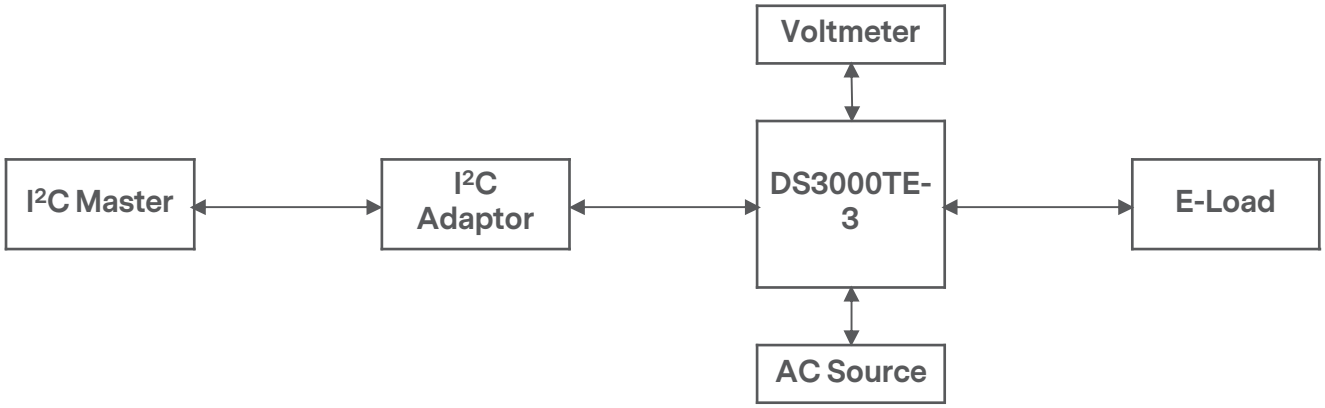
PMBus™ SPECIFICATIONS

The DS3000TE-3 series is compliant with the industry standard PMBus™ protocol for monitoring and control of the power supply via the I²C interface port.

DS3000TE-3 Series PMBus™ General Instructions

Equipment Setup

The following is typical I²C communication setup:



PMBus™ Writing Instructions

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

Disable Write Protect (command 10h) by writing any of the following accordingly:

Levels: 00h - Enable writing to all writeable commends

20h - Disables write except 10h, 01h, 00h, 02h and 21h commands

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

80h - Disable write except 0x00h

To save changes on the USER PMBus™ Table:

Use send byte command: 15h STORE_USER_ALL

To save changes on the DEFAULT PMBus™ Table:

Use send byte command: 11h STORE_DEFAULT_ALL

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

PMBus™ SPECIFICATIONS

The DS3000TE-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
00h	PAGE	00	R	1		Default: 00h
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				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	00				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		S			

PMBus™ SPECIFICATIONS

The DS3000TE-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 00h - Enables write to all writeable commands.
15h	STORE_USER_ALL		S	0		Copies the operating memory table to the matching USER non-volatile memory.
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					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. Valid range is 11.4 to 12.6V.
24h	VOUT_MAX	1933	R	2	Linear	Read only (12.6V)
30h	COEFFICIENTS	-	BW	6		Use to retrieve the m, b and R coefficients, needed for DIRECT data format
	byte 1:2					m low byte, m high byte
	byte 3:4					b low byte, b high byte
	byte 5					R byte
35h	VIN_ON	EAC0	R	2	Linear	Sets the value of input, in volts, at which the unit should start. ACGOOD 88Vdc
36h	VIN_OFF	EA98	R	2	Linear	Sets the value of input, in volts, at which the unit should stop power conversion. ACBAD 83Vac

PMBus™ SPECIFICATIONS

The DS3000TE-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
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. Default: 0%. Valid range: 0 - 100%.
40h	VOUT_OV_FAULT_LIMIT	1B99	R/W	2	Linear	Sets output over voltage threshold. (13V) Valid range: 12.8V to 14V
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	1D28	R/W	2	Linear	Sets over-voltage warning threshold. (14V) Valid range: 12.8 to 14V
44h	VOUT_UV_FAULT_LIMIT	1467	R/W	2	Linear	Sets under-voltage fault threshold. (10V) Valid range: 10.2 to 11V
45h	VOUT_UV_FAULT_RESPONSE	80	R	1		Turn PSU OFF.
46h	IOUT_OC_FAULT_LIMIT	FA1C at high line EBB0 at low line	R/W	2	Linear	Sets the over current threshold in Amps. (270A for hi line and 118A for low line)
47h	IOUT_OC_FAULT_RESPONSE	C0	R	1		OCP ride through, if OCP persists.
4Ah	IOUT_OC_WARN_LIMIT	F3E8 at high line EBB0 at low line	R/W	2	Linear	Sets the over current warning threshold in Amps. (250A for hi line and 112A for low line)
4Fh	OT_FAULT_LIMIT	E320	R/W	2	Linear	Secondary ambient temperature fault threshold, in degree C. (50degC) Valid Range: 50 to 95°C

PMBus™ SPECIFICATIONS

The DS3000TE-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
50h	OT_FAULT_RESPONSE	B8	R	1		Turn PSU OFF and will retry indefinitely. Supported enable/disable of protection and recoverability.
51h	OT_WARN_LIMIT	E2D0	R/W	2	Linear	Secondary ambient temperature warning threshold, in degree C. Operating limit (45degC) Valid Range: 43 to 60°C
55h	VIN_OV_FAULT_LIMIT	FA26	R/W	2	Linear	Sets input over-voltage threshold. (275Vac)
56h	VIN_OV_FAULT_RESPONSE	00	R	1		
58h	VIN_UV_WARN_LIMIT	EA90	R/W	2	Linear	Default: 82Vac
59h	VIN_UV_FAULT_LIMIT	EA80	R/W	2	Linear	Default: 80Vac
5Ah	VIN_UV_FAULT_RESPONSE	C0	R	1		
5Eh	POWER_GOOD_ON	1785	R/W	2	Linear	Sets the threshold by which the Power Good default: 11V
5Fh	POWER_GOOD_OFF	1467	R/W	2	Linear	Sets the threshold by which the Power Good default: 10V
60h	TON_DELAY	0BE8	R/W	2	Linear	Sets the time (sec), from start condition (Power ON) until the output starts to rise. (2.2sec max) Default=2000ms
61h	TON_RISE	E320	R	2	Linear	Sets the time (ms), for the output rises from 0 to regulation. Default=50ms
62h	TON_MAX_FAULT_LIMIT	120D	R/W	2	Linear	Default: 2100ms Min: 2000ms Max: 3000ms
63h	TON_MAX_FAULT_RESPONSE	C0	R			
64h	TOFF_DELAY	DAE0	R/W	2	Linear	Sets the time (ms), from a stop condition (power OFF) until the output starts to drop (converter OFF). Default=23ms Min: 0ms Max: 50ms
78h	STATUS_BYTE	00	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.

PMBus™ SPECIFICATIONS

The DS3000TE-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
79h	STATUS_WORD	0000	R	2		Summary of units fault and warning status.
	b15 - VOUT					An output voltage fault or warning has occurred.
	b14 - IOUT/POUT					An output current or power fault or warning has occurred.
	b13 - INPUT					An input voltage, current or power fault or warning as occurred.
	b12 - MFR					A manufacturer specific fault or warning has occurred.
	b11 - POWER_GOOD#					The POWER_GOOD signal is de-asserted.
	b10 - FANS					A fan or airflow fault or warning has occurred.
	b9 - OTHER					Not supported
	b8 - UKNOWN					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.
7Ah	STATUS_VOUT	00	R/W	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 that the highest permissible voltage. Not supported
	b2					TON_MAX_FAULT
	b1					TOFF_MAX warning Not supported
	b0					Not supported

PMBus™ SPECIFICATIONS

The DS3000TE-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
7Bh	STATUS_IOUT	00	R/W	1		Output current related faults and warnings
	b7					IOUT over current fault
	b6					IOUT over current and low voltage shutdown fault Not supported
	b5					IOUT over current warning
	b4					IOUT under current fault Not supported
	b3					Current share fault Not supported
	b2					Power Limiting. Not supported
	b1					POUT over power fault Not supported
	b0					POUT over power warning
7Ch	STATUS_INPUT	00	R/W	1		Input related faults and warnings
	b7					VIN over voltage fault
	b6					VIN over voltage warning Not supported
	b5					VIN under voltage warning
	b4					VIN under voltage fault
	b3					Unit is OFF for insufficient input Voltage.
	b2					IIN overcurrent fault. Not supported
	b1					IIN overcurrent warning Not supported
	b0					PIN overpower warning. Not supported
7Dh	STATUS_TEMPERATURE	00	R/W	1		Temperature related faults and warnings
	b7					Over temperature fault
	b6					Over temperature warning
	b5					Under temperature warning. Not supported
	b4					Under temperature fault. Not supported
	b3:0					Reserved
7Eh	STATUS_CML	00	R/W	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
	b3					Not supported
	b2					Not supported
	b1					Not supported
	b0					Not supported

PMBus™ SPECIFICATIONS

The DS3000TE-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
80h	STATUS_MFR_SPECIFIC	00	R/W	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
	b0					MFR SPECIFIC FAULT. For trouble shooting
81h	STATUS_FANS_1_2	00	R/W	1		
	b7					Fan 1 fault
	b6					Fan 2 fault
	b5					Fan 1 warning
	b4					Fan 2 warning
	b3					Fan_1 speed overridden
	b2					Fan_2 speed overridden
	b1					Not used
	b0					Not used
86h	READ_EIN	-	R	2	Linear	Returns the accumulated input power over time.
87h	READ_EOUT	-	R	2	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	PSU's inter hot spot temperature typically that of the main output rall heat sink. Format is Linear-11.
8Eh	READ_TEMPERATURE_2	-	R	2	Linear	PSU's system side air inlet or internal ambient temperature. Format is Linear-11.
90h	READ_FAN_SPEED_1	-	R	2	Linear	Speed of fan 1
96h	READ_POUT	-	R	2	Linear	Returns the output power, in Watts.
97h	READ_PIN	-	R	2	Linear	Returns the input power, in Watts.
98h	PMBUS_REVISION	22	R	1	Linear	Reads the PMBus revision number.
	b7:5	0001				Part 1 revision 0000 - Revision 1.0 0001 - Revision 1.1
	b4:0	0001				Part 2 revision 0000 - Revision 1.0 0001 - Revision 1.1

PMBus™ SPECIFICATIONS

The DS3000TE-3 Series Supported PMBus™ Command List:

Command Code	Command Name	Default Value	Access Type	Data Bytes	Data Format	Description
99h	MFR_ID	"ARTESYN"	BR	-	ASCII	Abbrev or symbol of manufacturers name
9Ah	MFR_MODEL	"DS3000TE-3"	BR	15	ASCII	Manufacturers model number ASCII format
9Ch	MFR_LOCATION	"Philippines"	BR/BW	6	ASCII	Manufacturers facility ASCII format
A0h	MFR_VIN_MIN	EAD0	R	2	Linear	Minimum input voltage (180Vdc)
A1h	MFR_VIN_MAX	FA10	R	2	Linear	Maximum input voltage (264Vdc)
A2h	MFR_IIN_MAX	DA30	R	2	Linear	Maximum input current (17.5A)
A3h	MFR_PIN_MAX	134B at high line 0B14 at low line	R	2	Linear	Maximum input power (3372W for hi line and 1576W for low line)
A4h	MFR_VOUT_MIN	1747	R	2	Linear	Minimum output voltage regulation window (11V)
A5h	MFR_VOUT_MAX	1933	R	2	Linear	Maximum output voltage regulation window (12.6V)
A6h	MFR_IOUT_MAX	F3E8 at high line EB60 at low line	R	2	Linear	Maximum output current (250A for hi line and 248A for low line)
A7h	MFR_POUT_MAX	12EE at high line 0AA3 at low line	R	2	Linear	Maximum output power (3000W for hi line and 1350W for low line)
A8h	MFR_TAMBIENT_MAX	E280	R	2	Linear	Maximum operating ambient temperature (secondary ambient) (40degC)
A9h	MFR_TAMBIENT_MIN	000A	R	2	Linear	Minimum operating ambient temperature (secondary ambient) (0degC)
AAh	MFR_EFFICIENCY_LL		BR	14		Default: 115V, 270W, 88%; 675W, 91%; 1350W, 89%.
ABh	MFR_EFFICIENCY_HL		BR	14		Default: 230V, 600W, 90%; 1500W, 94%; 3000W, 91%.
B0h	USER_DATA_00		BR/BW			
E0h	FW_PRI_VERSION		BR	8	ASCII	
E1h	FW_SEC_VERSION		BR	8	ASCII	
E2h	CONFIG_UNLOCK_CODE		BR	4	ASCII	
F1h	ISP_UNLOCK_CODE		BR/BW	4	ASCII	00h, 00h, 00h, 00h
F2h	ISP_CTRL_CMD		W	1		
F3h	ISP_STATUS_BYTE		R	1		
F4h	ISP_FLASH_ADDR		BR/BW	4	Direct	
F5h	ISP_FLASH_DATA.		BR/BW	4	Direct	

APPLICATION NOTES

Current Sharing

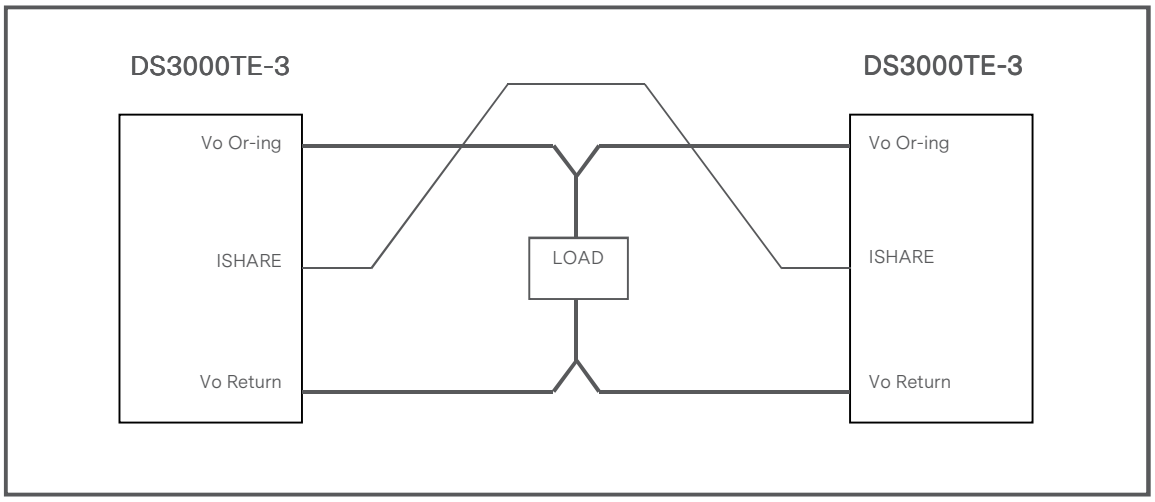
The DS3000TE-3 series' main output V_O is equipped with current sharing capability. This will allow up to 12 power supplies to be connected in parallel for higher power application, and more typically total of 8 in M+N mode in parallel. Current share accuracy is maximum 12A difference between any two supplies from 10% to 100% load per power supply unit. The current share signal Ishare, is expected to be a stable DC signal (oscillation free) and will be within the voltage range specified below. It will be capable of sinking 0.4mA and sourcing 4mA. The waveform for this signal will be provided to confirm stability during parallel mode operation.

Load of One Power Supply Unit	Minimum Ishare Voltage (V)	Typical Ishare Voltage (V)	Maximum Ishare Voltage (V)
100%	7.75	8	8.25
50%	3.85	4	4.15
0%	0	0.8	1.0
Load sharing Bandwidth (Hz)	-	400	-

Redundancy / Fault Tolerance

The DS3000TE-3 series power supplies is able to current share with 2(1+1) up to 12(6+6) power supplies in parallel and operate in a hot swap/redundant N+N configuration where N=1, 2, 3, 4, 5 or 6. The $12V_{SB}$ 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.

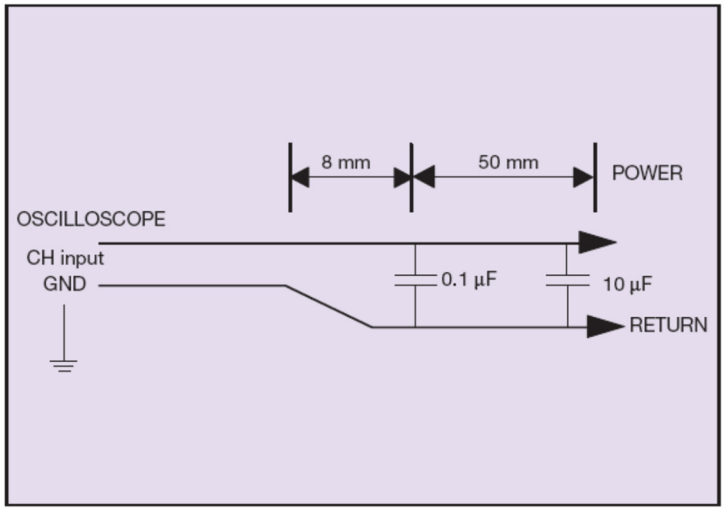
All power supply outputs will be designed for redundant mode operation. No internal failure in any power supply in this configuration will cause the bus voltage to fall below the regulation limits specified. All output voltages will stay within the regulation limits during cold swapping or hot swapping 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 DS3000TE-3 series. When measuring output ripple and noise, a scope jack in parallel with a 0.1uF ceramic chip capacitor, and a 10uF tantalum capacitor will be used. Oscilloscope can be set to 20MHz bandwidth for this measurement.



RECORD OF REVISION AND CHANGES

Issue	Date	Description	Originators
1.0	04.10.2017	First Issue	D. Hou
1.1	01.21.2021	Update 01h command	C. Liu
1.2	03.04.2021	Update cover and back cover	C. Liu
1.3	04.28.2022	Add UKCA Mark	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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