PFE850-12-054NA Short Form Data Sheet

850 Watts, 12 VDC Output

Features

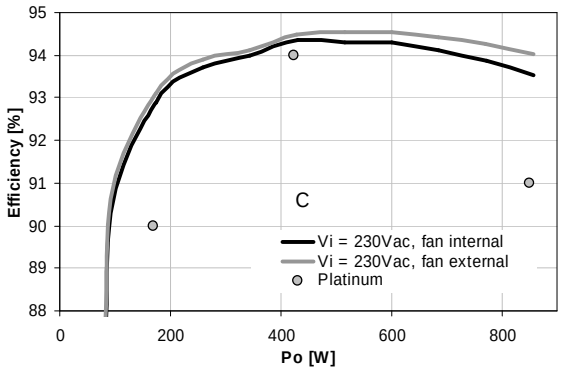
- Best-in-class, 80 PLUS certified “Platinum” efficiency
- Wide input voltage range: 90-264 VAC
- AC input with power factor correction
- Always-On 16.5W programmable standby output (3.3/5 V)
- Hot-plug capable
- Parallel operation with active digital current sharing
- Full digital controls for improved performance
- High density design: 19.8 W/in^3
- Small form factor: 54.5 x 40.0 x 321.5 mm
- I^{2}C communication interface for control, programming and monitoring with PSMI and PMBus™ protocol
- Overtemperature, output overvoltage and overcurrent protection
- 256 Bytes of EEPROM for user information
- 2 Status LEDs: AC OK and DC OK with fault signaling

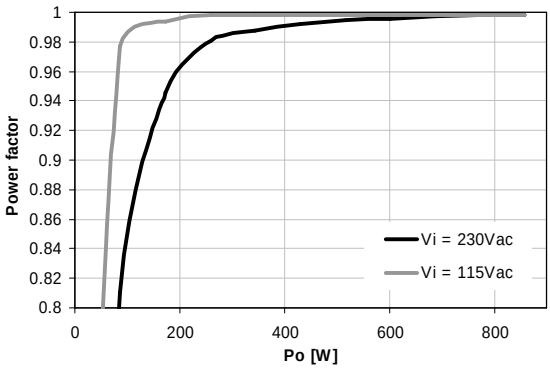
Applications

- High performance servers, routers, and switches.

Description

The PFE850-12-054NA is an 850 watt AC to DC power-factor-corrected (PFC) power supply that converts standard AC mains power into a main output of 12 VDC for powering intermediate bus architectures (IBA) in high performance and reliability servers, routers, and network switches. The PFE850-12-054NA meets international safety standards and displays the CE-Mark for the European Low Voltage Directive (LVD).





ORDERING INFORMATION

PFE	850	-	12	-	054	N	A	
Product Family PFE Front-Ends	**Power Level** 850W	**Dash**	**V1 Output** 12V	**Dash**	**Width** 54mm	**Airflow** N: normal R: reversed	**Input** A: AC D: DC	

1 ENVIRONMENTAL AND MECHANICAL

Parameter		Conditions / Description	Min	Nom	Max	Unit
T_A	Ambient temperature	$V_{i\,min}$ to $V_{i\,max}$, $I_{1\,nom}$, $I_{SB\,nom}$	0		+45	°C
T_{Aext}	Extended temp range	Derated output (850 to 800W output power)	+45		+65	°C
T_S	Storage temperature	Non-operational	-20		+70	°C
N_a	Audible noise	$V_{i\,nom}$, 50% $I_{o\,nom}$, T_A = 25°C		42		dBA
	Dimensions	Width		54.5		mm
		Height		40.0		mm
		Depth		321.5		mm
M	Weight			1.05		kg

2 INPUT SPECIFICATIONS

General Condition: T_A = 0… 45 °C unless otherwise noted.

Parameter		Conditions / Description	Min	Nom	Max	Unit
$V_{i\,nom}$	Nominal input voltage		100	230	230	VAC
V_i	Input voltage ranges	Normal operating ($V_{i\,min}$ to $V_{i\,max}$)	90		264	VAC
$V_{i\,red}$	Derated input voltage range	Derated output (850 to 600W output power)	90		115	VAC
$I_{i\,max}$	Max input current				13	A_{rms}
$I_{i\,p}$	Inrush Current Limitation	$V_{i\,min}$ to $V_{i\,max}$, 90°, T_{NTC} = 25°C			40	A_p
F_i	Input frequency		47	50/60	64	Hz
PF	Power Factor	$V_{i\,nom}$, 50Hz, > 0.3 $I_{1\,nom}$	0.96			W/VA
$V_{i\,on}$	Turn-on input voltage[1)]	Ramping up	80		87	VAC
$V_{i\,off}$	Turn-off input voltage[1)]	Ramping down	75		85	VAC
η	Efficiency without fan	$V_{i\,nom}$, 0.1·$I_{x\,nom}$, $V_{x\,nom}$, T_A = 25 °C		89.7		%
		$V_{i\,nom}$, 0.2·$I_{x\,nom}$, $V_{x\,nom}$, T_A = 25 °C		93.1		
		$V_{i\,nom}$, 0.5·$I_{x\,nom}$, $V_{x\,nom}$, T_A = 25 °C		94.4		
		$V_{i\,nom}$, $I_{x\,nom}$, $V_{x\,nom}$, T_A = 25 °C		93.9		
T_{hold}	Hold-up Time	After last AC zero point, V_1 > 10.8 V, V_{SB} within regulation, V_i = 230 VAC, $P_{x\,nom}$	12			ms

[1)] The Front-End is provided with a minimum hysteresis of 3 V during turn-on and turn-off within the ranges.

3 OUTPUT SPECIFICATIONS

General Condition: T_a = 0 … +45 °C unless otherwise noted.

Parameter		Conditions / Description		Min	Nom	Max	Unit
Main Output **V_1**							
$V_{1\ nom}$	Nominal output voltage	0.5 ·$I_{1\ nom}$, T_{amb} = 25 °C			12.0		VDC
$V_{1\ set}$	Output setpoint accuracy			-0.5		+0.5	% $V_{1\ nom}$
d$V_{1\ tot}$	Total regulation	$V_{i\ min}$ to $V_{i\ max}$, 0 to 100% $I_{1\ nom}$, $T_{a\ min}$ to $T_{a\ max}$		-1		+1	% $V_{1\ nom}$
$P_{1\ nom}$	Nominal output power	V_1 = 12 VDC			840		W
$I_{1\ nom}$	Nominal output current	V_1 = 12 VDC			70		ADC
$v_{1\ pp}$	Output ripple voltage	$V_{1\ nom}$, $I_{1\ nom}$, 20 MHz BW, 2Pcs 47µF/16V/X5R/1210 at V_1				150	mVpp
d$V_{1\ Load}$	Load regulation	V_i = $V_{i\ nom}$, 0 - 100 % $I_{1\ nom}$			47		mV
d$V_{1\ Line}$	Line regulation	V_i = $V_{i\ min}$... $V_{i\ max}$			0		mV
$I_{1\ max}$	Current limitation	V_i = $V_{i\ min}$... $V_{i\ max}$, T_a < 45 °C		74		78	ADC
dI_{share}	Current sharing	Deviation from $I_{1\ tot}$ / N, I_1 > 10%		-3		+3	A
dV_{dyn}	Dynamic load regulation	ΔI_1 = 50% $I_{1\ nom}$, I_1 = 5 … 100% $I_{1\ nom}$, dI_1/dt = 1 A/µs, recovery within 1% of $V_{1\ nom}$		-0.6		0.6	V
T_{rec}	Recovery time					1	ms
$t_{AC\ V1}$	Start-up time from AC	V_1 = 10.8 VDC				2	sec
$t_{V1\ rise}$	Rise time	V_1 = 10…90% $V_{1\ nom}$			1	10	ms
C_{Load}	Capacitive loading	T_a = 25 °C				30000	µF
Standby Output **V_{SB}**							
$V_{SB\ nom}$	Nominal output voltage	0.5 ·$I_{SB\ nom}$, T_{amb} = 25 °C	VSB_SEL = 1		3.3		VDC
			VSB_SEL = 0		5.0		VDC
$V_{SB\ set}$	Output setpoint accuracy		VSB_SEL = 0 / 1	-0.5		+0.5	% $V_{1\ nom}$
$dV_{SB\ tot}$	Total regulation	$V_{i\ min}$ to $V_{i\ max}$, 0 to 100% $I_{SB\ nom}$, $T_{a\ min}$ to $T_{a\ max}$		-1		+1	% V_{SBnom}
$P_{SB\ nom}$	Nominal output power	VSB_SEL = 0 / 1			16.5		W
$I_{SB\ nom}$	Nominal output current	V_{SB} = 3.3 VDC			5		ADC
		V_{SB} = 5.0 VDC			3.3		ADC
$V_{SB\ pp}$	Output ripple voltage	$V_{SB\ nom}$, $I_{SB\ nom}$, 20 MHz BW, 10µF/16V/X7R/1206 at V_{SB}				80	mVpp
dV_{SB}	Droop	0 - 100 % $I_{SB\ nom}$	VSB_SEL = 1		67		mV
			VSB_SEL = 0		44		mV
$I_{SB\ max}$	Current limitation	VSB_SEL = 1		5.25		6	ADC
		VSB_SEL = 0		3.45		4.3	ADC
dV_{SBdyn}	Dynamic load regulation	ΔI_{SB} = 50% $I_{SB\ nom}$, I_{SB} = 5 … 100% $I_{SB\ nom}$, dI_o/dt = 0.5 A/µs, recovery within 1% of $V_{1\ nom}$		-3		3	% V_{SBnom}
T_{rec}	Recovery time					250	µs
$t_{AC\ VSB}$	Start-up time from AC	V_{SB} = 90% $V_{SB\ nom}$				2	sec
$t_{VSB\ rise}$	Rise time	V_{SB} = 10…90% $V_{SB\ nom}$			4	20	ms

Parameter		Conditions / Description	Min	Nom	Max	Unit
Standby Output V_{SB} (Cont.)						
C_{Load}	Capacitive loading	T_{amb} = 25 °C			10000	µF

4 SIGNALING AND CONTROL

4.1 FRONT LEDS

Table 1: LED Status

Operating Condition	LED Signaling
AC LED	
AC Line within range	Solid Green
AC Line UV condition	Off
DC LED [1]	
PSON High	Blinking Yellow (1:1)
Hot-Standby Mode	Blinking Yellow/Green (1:2)
V_1 or V_{SB} out of regulation	Solid Yellow
Over temperature shutdown	
Output over voltage shutdown (V_1 or V_{SB})	
Output over current shutdown (V_1 or V_{SB})	
Fan error (>15%)	
Over temperature warning	Blinking Yellow/Green (2:1)
Minor fan regulation error (>5%, <15%)	Blinking Yellow/Green (1:1)

[1] The order of the criteria in the table corresponds to the testing precedence in the controller.

The front-end has 2 front LEDs showing the status of the supply. LED number one is green and indicates AC power is on or off, while LED number two is bi-colored: green and yellow, and indicates DC power presence or fault situations. For the position of the LEDs see Figure 5.

4.2 GRAPHICAL USER INTERFACE

Power-One provides with its "Power-One I²C Utility" a Windows® XP/Vista/Win7 compatible graphical user interface allowing the programming and monitoring of the PFE850-12-054NA Front-End. The utility can be downloaded on www.power-one.com and supports both the PSMI and PMBus™ protocols.

The GUI allows automatic discovery of the units connected to the communication bus and will show them in the navigation tree. In the monitoring view the power supply can be controlled and monitored.

If the GUI is used in conjunction with the PFE850-12-054NA Evaluation Kit it is also possible to control the PSON pin(s) of the power supply.

Further there is a button to disable the internal fan for approximately 10 seconds. This allows the user to take input power measurements without fan consumptions to check efficiency compliance to the Climate Saver Computing Platinum specification.

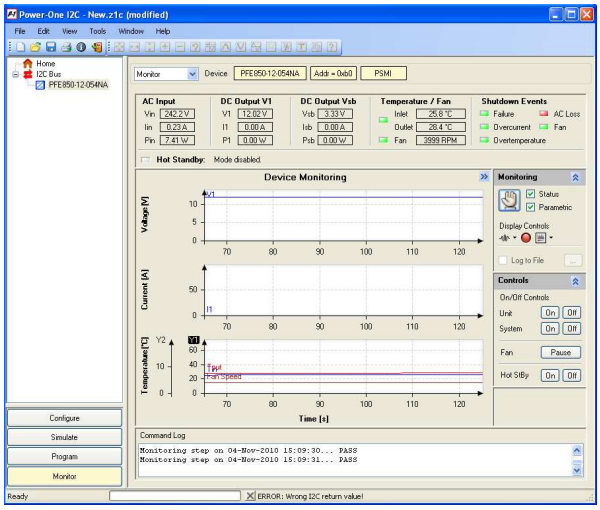


Figure 1: I²C Bus to DSP and EEPROM

The monitoring screen also allows to enable the hot-standby mode on the power supply. The mode status is monitored and by changing the load current it can be monitored when the power supply is being disabled for further energy savings. This obviously requires 2 power supplies being operated as a redundant system (like the evaluation kit).

Note: The user of the GUI needs to ensure that only one of the power supplies have the hot-standby mode enabled.

5 ELECTROMAGNETIC COMPATIBILITY

5.1 IMMUNITY

Note: Most of the immunity requirements are derived from EN 55024:1998/A2:2003.

Test	Standard / Description	Criteria
ESD Contact Discharge	IEC / EN 61000-4-2, ±8 kV, 25+25 discharges per test point (metallic case, LEDs, connector body)	B
ESD Air Discharge	IEC / EN 61000-4-2, ±15 kV, 25+25 discharges per test point (non-metallic user accessible surfaces)	B
Radiated Electromagnetic Field	IEC / EN 61000-4-3, 10 V/m, 1 kHz/80% Amplitude Modulation, 1 µs Pulse Modulation, 10 kHz…2 GHz	A
Burst	IEC / EN 61000-4-4, level 3 AC port ±2 kV, 1 minute DC port ±1 kV, 1 minute	B
Surge	IEC / EN 61000-4-5 Line to earth: level 3, ±2 kV Line to line: level 2, ±1 kV	B
RF Conducted Immunity	IEC/EN 61000-4-6, Level 3, 10 Vrms, CW, 0.1 … 80 MHz	A
Voltage Dips and Interruptions	IEC/EN 61000-4-11 1: Vi 230V, 100% Load, Phase 0°, Dip 100%, Duration 10 ms 2: Vi 230V, 100% Load, Phase 0°, Dip 100%, Duration 20 ms 3: Vi 230V, 100% Load, Phase 0°, Dip 100%, Duration >20ms	A VSB: A, V1: B VSB, V1: B

5.2 EMISSION

Test	Standard / Description	Criteria
Conducted Emission	EN55022 / CISPR 22: 0.15 … 30 MHz, QP and AVG, single unit	Class A 6 dB margin
	EN55022 / CISPR 22: 0.15 … 30 MHz, QP and AVG, 2 units in rack system	Class A 6 dB margin
Radiated Emission	EN55022 / CISPR 22: 30 MHz … 1 GHz, QP, single unit	Class A 6 dB margin
	EN55022 / CISPR 22: 30 MHz … 1 GHz, QP, 2 units in rack system	Class A 6 dB margin
Harmonic Emissions	IEC61000-3-2, Vin = 100 VAC/ 60 Hz, 100% Load	Class A
	IEC61000-3-2, Vin = 120 VAC/ 60 Hz, 100% Load	Class A
	IEC61000-3-2, Vin = 200 VAC/ 60 Hz, 100% Load	Class A
	IEC61000-3-2, Vin = 230 VAC/ 50 Hz, 100% Load	Class A
	IEC61000-3-2, Vin = 240 VAC/ 50 Hz, 100% Load	Class A
Acoustical Noise	Sound power statistical declaration (ISO 9296, ISO 7779, IS9295) @ 50% load	42 dBA
AC Flicker	IEC / EN 61000-3-3, dmax < 3.3%	PASS

6 MECHANICAL

6.1 DIMENSIONS

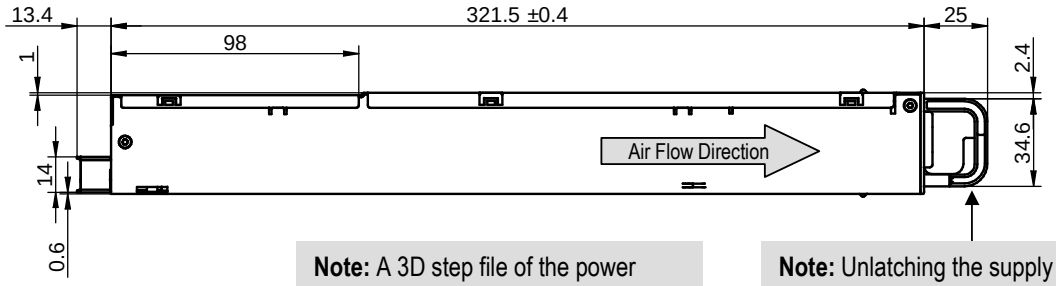


Figure 2: Side view 1

Note: A 3D step file of the power supply casing is available on request.

Note: Unlatching the supply is performed by pulling the green trigger in the handle.

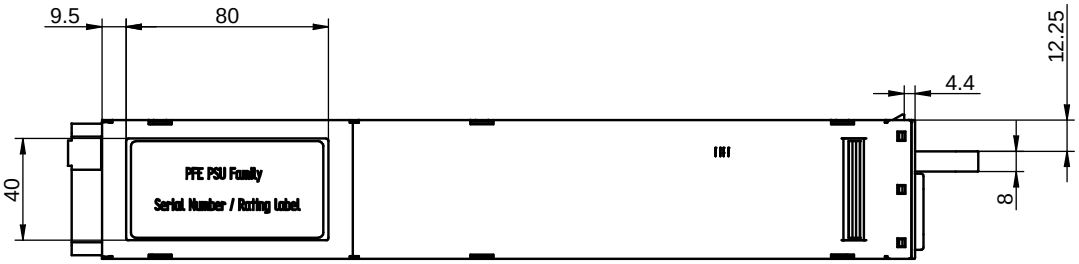


Figure 3: Top view

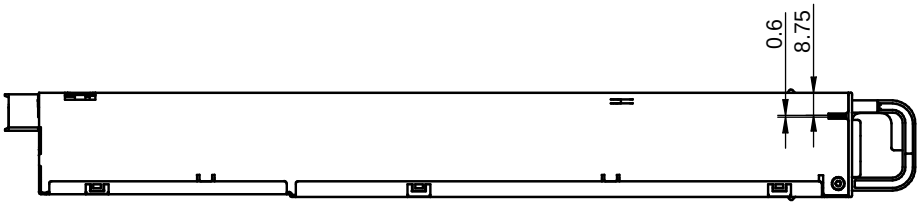


Figure 4: Side view 2

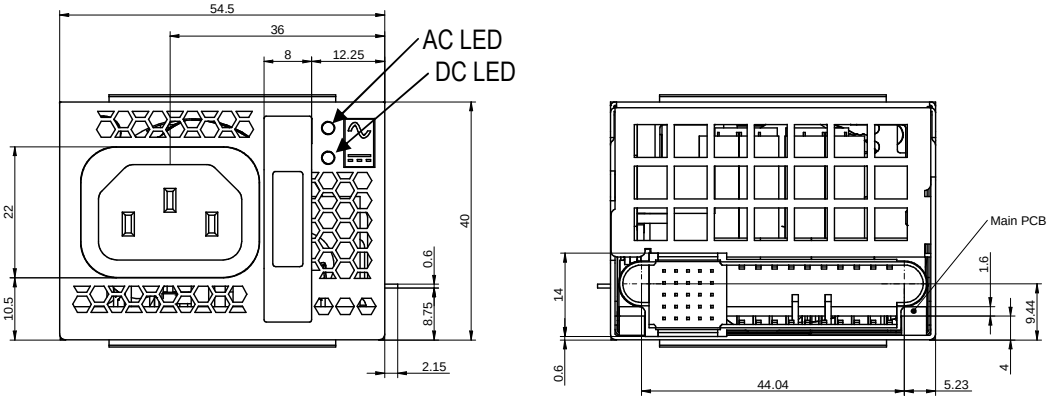
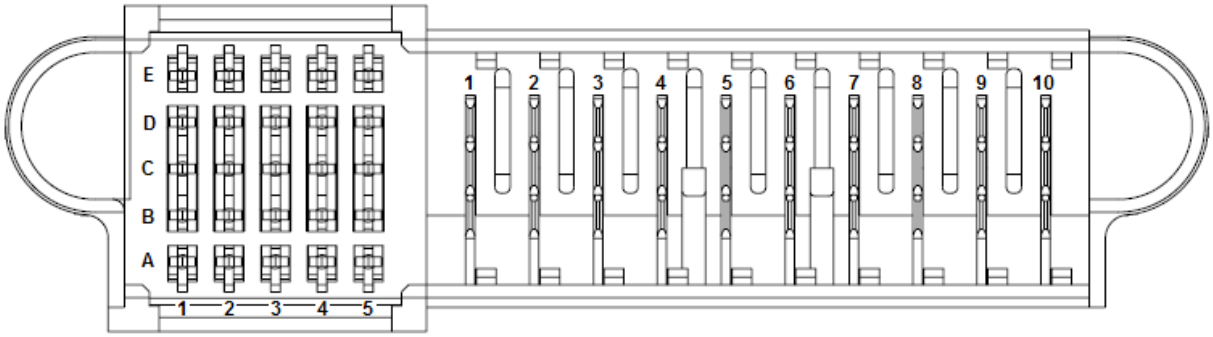


Figure 5: Front view

6.2 CONNECTIONS



Unit: Tyco Electronics P/N 2-1926736-3
Counter part: Tyco Electronics P/N 2-1926733-5

Note: Column 5 is lagging (short pins)

Pin	Name	Description
Output		
6, 7, 8, 9, 10	V1	+12 VDC main output
1, 2, 3, 4, 5	PGND	Power ground (return)
Control Pins		
A1	VSB	Standby positive output (+3.3/5 V)
B1	VSB	Standby positive output (+3.3/5 V)
C1	VSB	Standby positive output (+3.3/5 V)
D1	VSB	Standby positive output (+3.3/5 V)
E1	VSB	Standby positive output (+3.3/5 V)
A2	SGND	Signal ground (return)
B2	SGND	Signal ground (return)
C2	HOTSTANDBYEN	Hot standby enable signal
D2	VSB_SENSE_R	Standby output negative sense
E2	VSB_SENSE	Standby output positive sense
A3	APS	I^2C address and protocol selection (select by a pull down resistor)
B3	nc	Reserved
C3	SDA	I^2C data signal line
D3	V1_SENSE_R	Main output negative sense
E3	V1_SENSE	Main output positive sense
A4	SCL	I^2C clock signal line
B4	PSON	Power supply on input (connect to A2/B2 to turn unit on)
C4	SMB_ALERT	SMB Alert signal output
D4	nc	Reserved
E4	ACOK	AC input OK signal
A5	PSKILL	Power supply kill (lagging pin)
B5	ISHARE	Current share bus (lagging pin)
C5	PWOK	Power OK signal output (lagging pin)
D5	VSB_SEL	Standby voltage selection (lagging pin)
E5	PRESENT_L	Power supply present (lagging pin)

7 ACCESSORIES

Item	Description	Ordering Part Number	Source
	**Power-One I²C Utility** Windows XP/Vista/7 compatible GUI to program, control and monitor PFE Front-Ends (and other I²C units)	N/A	www.power-one.com
	**USB to I²C Converter** Master I²C device to program, control and monitor I²C units in conjunction with the *Power-One I²C Utility*	ZM-00056	Power-One
	**Dual Connector Board** Connector board to operate 2 PFE units in parallel. Includes an on-board USB to I²C converter (use *Power-One I²C Utility* as desktop software).	SNP-OP-BOARD-01	Power-One