



Features

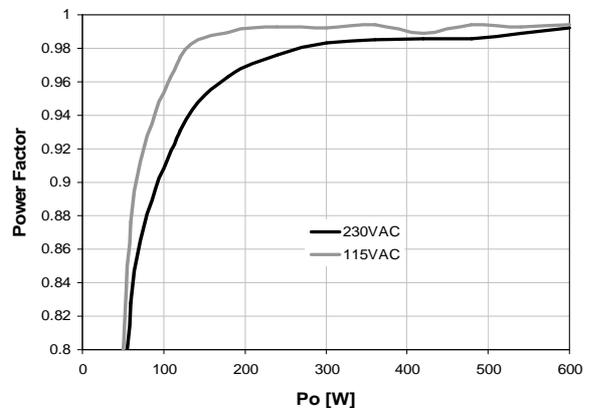
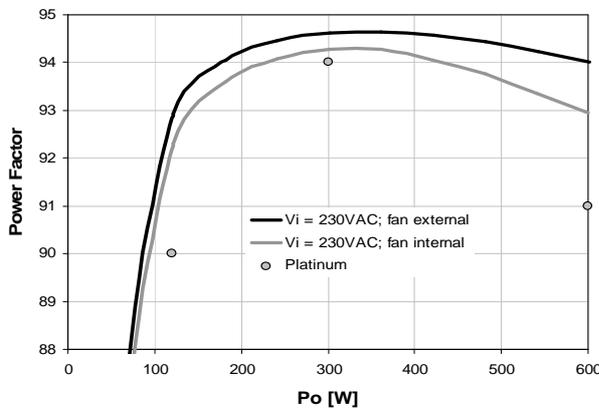
- Best-in-class, 80 PLUS certified “Platinum” efficiency
- Wide input voltage range: 90-264 VAC
- AC input with power factor correction
- Always-On 16.5W programmable standby output (3.3/5 V)
- Hot-plug capable
- Parallel operation with active digital current sharing
- Full digital controls for improved performance
- High density design: 14.0 W/in³
- Small form factor: 54.5 x 40.0 x 321.5 mm
- I²C communication interface for control, programming and monitoring with PSM1 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 PFE600-12-054NA is a 600 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 PFE600-12-054NA meets international safety standards and displays the CE-Mark for the European Low Voltage Directive (LVD).



ORDERING INFORMATION

PFE	600	-	12	-	054	N	A
Product Family PFE Front-Ends	Power Level 600W	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 $V_{i \max}$, $I_{1 \text{ nom}}$, $I_{SB \text{ nom}}$		0	+45	°C
$T_{A \text{ ext}}$	Extended temp range	Derated output (600 to 450W output power)		+45	+65	°C
T_S	Storage temperature	Non-operational		-20	+70	°C
N_a	Audible noise	$V_{i \text{ nom}}$, 50% $I_{o \text{ nom}}$, $T_A = 25^\circ\text{C}$			42	dBA
	Dimensions	Width			54.5	mm
		Height			40.0	mm
		Depth			321.5	mm
M	Weight				950	g

2 INPUT SPECIFICATIONS

General Condition: $T_A = 0 \dots 45^\circ\text{C}$ unless otherwise noted.

Parameter	Conditions / Description	Min	Nom	Max	Unit	
$V_{i \text{ nom}}$	Nominal input voltage	100	230	240	VAC	
V_i	Input voltage ranges	Normal operating ($V_{i \min}$ to $V_{i \max}$)		90	264	VAC
$I_{i \text{ max}}$	Max input current			8.5	A_{rms}	
$I_{i \text{ p}}$	Inrush Current Limitation	$V_{i \min}$ to $V_{i \max}$, 90° , $T_{\text{NTC}} = 25^\circ\text{C}$			40	A_p
F_i	Input frequency	47	50/60	64	Hz	
PF	Power Factor	$V_{i \text{ nom}}$, 50Hz, $> 0.2 I_{1 \text{ nom}}$		0.9		W/VA
$V_{i \text{ on}}$	Turn-on input voltage ¹⁾	Ramping up		80	87	VAC
$V_{i \text{ off}}$	Turn-off input voltage ¹⁾	Ramping down		75	85	VAC
η	Efficiency without fan	$V_{i \text{ nom}}$, $0.1 \cdot I_{x \text{ nom}}$, $V_{x \text{ nom}}$, $T_A = 25^\circ\text{C}$			85.4	%
		$V_{i \text{ nom}}$, $0.2 \cdot I_{x \text{ nom}}$, $V_{x \text{ nom}}$, $T_A = 25^\circ\text{C}$			92.8	
		$V_{i \text{ nom}}$, $0.5 \cdot I_{x \text{ nom}}$, $V_{x \text{ nom}}$, $T_A = 25^\circ\text{C}$			94.5	
		$V_{i \text{ nom}}$, $I_{x \text{ nom}}$, $V_{x \text{ nom}}$, $T_A = 25^\circ\text{C}$			94.0	
T_{hold}	Hold-up Time	After last AC zero point, $V_1 > 10.8 \text{ V}$, V_{SB} within regulation, $V_i = 230 \text{ VAC}$, $P_{x \text{ nom}}$		20		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: $T_a = 0 \dots +45 \text{ }^\circ\text{C}$ unless otherwise noted.

Parameter	Conditions / Description	Min	Nom	Max	Unit		
Main Output V_1							
$V_{1 \text{ nom}}$	Nominal output voltage	$0.5 \cdot I_{1 \text{ nom}}, T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	12.0		VDC		
$V_{1 \text{ set}}$	Output setpoint accuracy		-0.5	+0.5	% $V_{1 \text{ nom}}$		
$dV_{1 \text{ tot}}$	Total regulation	$V_{1 \text{ min}}$ to $V_{1 \text{ max}}, 0$ to $100\% I_{1 \text{ nom}}, T_{a \text{ min}}$ to $T_{a \text{ max}}$		-1	+1	% $V_{1 \text{ nom}}$	
$P_{1 \text{ nom}}$	Nominal output power	$V_1 = 12 \text{ VDC}$			600	W	
$I_{1 \text{ nom}}$	Nominal output current	$V_1 = 12 \text{ VDC}$			50.0	ADC	
$V_{1 \text{ pp}}$	Output ripple voltage	$V_{1 \text{ nom}}, I_{1 \text{ nom}}, 20 \text{ MHz BW}, 2\text{Pcs } 47\mu\text{F}/16\text{V}/\text{X5R}/1210$ at V_1			150	mVpp	
$dV_{1 \text{ Load}}$	Load regulation	$V_1 = V_{1 \text{ nom}}, 0 - 100\% I_{1 \text{ nom}}$			33	mV	
$dV_{1 \text{ Line}}$	Line regulation	$V_1 = V_{1 \text{ min}} \dots V_{1 \text{ max}}$			0	mV	
$I_{1 \text{ max}}$	Current limitation	$T_a < 45 \text{ }^\circ\text{C}$		52.5		55	ADC
dI_{share}	Current sharing	Deviation from $I_{1 \text{ tot}} / N, I_1 > 10\text{A}$		-3		+3	A
dV_{dyn}	Dynamic load regulation	$\Delta I_1 = 50\% I_{1 \text{ nom}}, I_1 = 5 \dots 100\% I_{1 \text{ nom}}, dI/dt = 1 \text{ A}/\mu\text{s},$ recovery within 1% of $V_{1 \text{ nom}}$		-0.6		0.6	V
T_{rec}	Recovery time					1	ms
$t_{\text{AC } V_1}$	Start-up time from AC	$V_1 = 10.8 \text{ VDC}$				2	sec
$t_{V_1 \text{ rise}}$	Rise time	$V_1 = 10 \dots 90\% V_{1 \text{ nom}}$			1	10	ms
C_{Load}	Capacitive loading V_1	$T_a = 25 \text{ }^\circ\text{C}$				30000	μF
Standby Output V_{SB}							
$V_{\text{SB nom}}$	Nominal output voltage	$0.5 \cdot I_{\text{SB nom}}, T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	$V_{\text{SB_SEL}} = 1$		3.3		VDC
			$V_{\text{SB_SEL}} = 0$		5.0		VDC
$V_{\text{SB set}}$	Output setpoint accuracy			$V_{\text{SB_SEL}} = 0 / 1$	-0.5	+0.5	% $V_{\text{SB nom}}$
$dV_{\text{SB tot}}$	Total regulation	$V_{i \text{ min}}$ to $V_{i \text{ max}}, 0$ to $100\% I_{\text{SB nom}}, T_{a \text{ min}}$ to $T_{a \text{ max}}$		-1		+1	% $V_{\text{SB nom}}$
$P_{\text{SB nom}}$	Nominal output power	$V_{\text{SB_SEL}} = 0 / 1$			16.5		W
$I_{\text{SB nom}}$	Nominal output current	$V_{\text{SB}} = 3.3 \text{ VDC}$			5		ADC
		$V_{\text{SB}} = 5.0 \text{ VDC}$			3.3		ADC
$V_{\text{SB pp}}$	Output ripple voltage	$V_{\text{SB nom}}, I_{\text{SB nom}}, 20 \text{ MHz BW}, 10\mu\text{F}/16\text{V}/\text{X7R}/1206$ at V_{SB}				40	mVpp
dV_{SB}	Droop	$0 - 100\% I_{\text{SB nom}}$	$V_{\text{SB_SEL}} = 1$		67		mV
			$V_{\text{SB_SEL}} = 0$		44		mV
$I_{\text{SB max}}$	Current limitation	$V_{\text{SB_SEL}} = 1$		5.25		6	ADC
		$V_{\text{SB_SEL}} = 0$		3.45		4.3	ADC
$dV_{\text{SB dyn}}$	Dynamic load regulation	$\Delta I_{\text{SB}} = 50\% I_{\text{SB nom}}, I_{\text{SB}} = 5 \dots 100\% I_{\text{SB nom}}, dI/dt = 0.5 \text{ A}/\mu\text{s},$ recovery within 1% of $V_{1 \text{ nom}}$		-3		3	% $V_{\text{SB nom}}$
T_{rec}	Recovery time					250	μs
$t_{\text{AC } V_{\text{SB}}}$	Start-up time from AC	$V_{\text{SB}} = 90\% V_{\text{SB nom}}$				2	sec
$t_{V_{\text{SB}} \text{ rise}}$	Rise time	$V_{\text{SB}} = 10 \dots 90\% V_{\text{SB nom}}$			4	20	ms

Parameter	Conditions / Description	Min	Nom	Max	Unit
Standby Output V_{SB} (Cont.)					
C_{Load}	Capacitive loading			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 PFE600-12-054NA 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 PFE600-12-054NA 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.

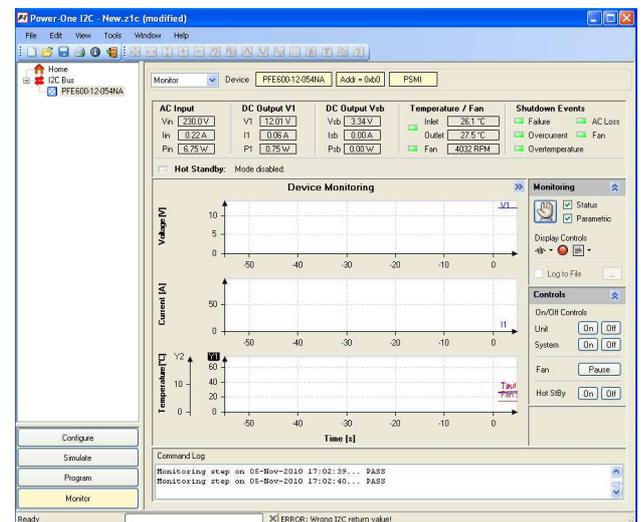


Figure 1: I²C Bus to DSP and EEPROM

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.

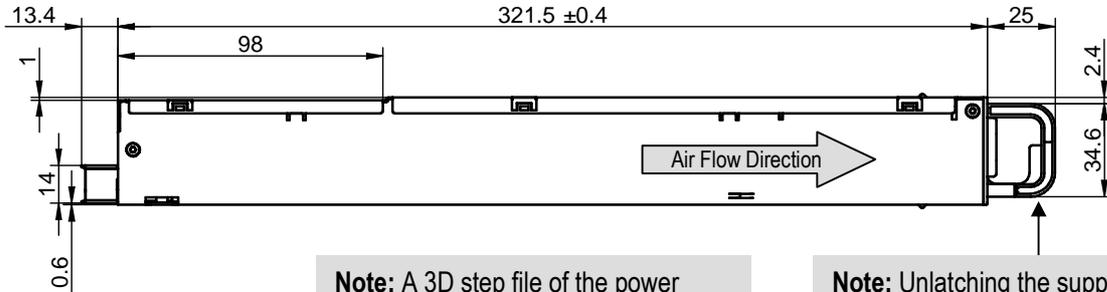
Test	Standard / Description	Criteria
ESD Contact Discharge	IEC / EN 61000-4-2, ± 8 kV, 25+25 discharges per test point (metallic case, LEDs, connector body)	B
ESD Air Discharge	IEC / EN 61000-4-2, ± 15 kV, 25+25 discharges per test point (non-metallic user accessible surfaces)	B
Radiated Electromagnetic Field	IEC / EN 61000-4-3, 10 V/m, 1 kHz/80% Amplitude Modulation, 1 μ s 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	A
	2: Vi 230V, 100% Load, Phase 0°, Dip 100%, Duration 20 ms	A
	3: Vi 230V, 100% Load, Phase 0°, Dip 100%, Duration >20ms	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

6 MECHANICAL

6.1 DIMENSIONS



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 2: Side view 1

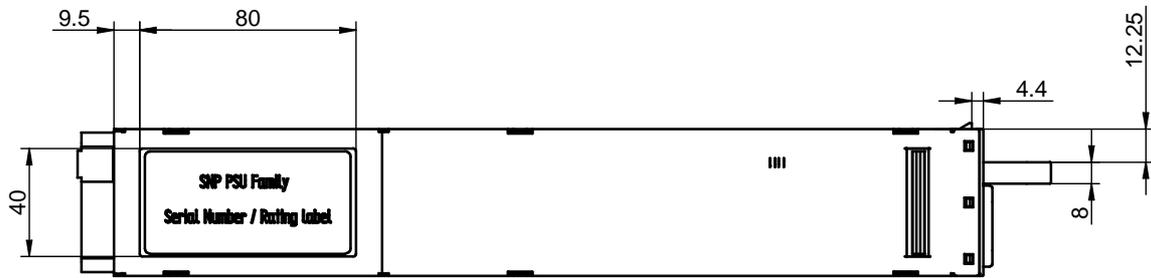


Figure 3: Top view

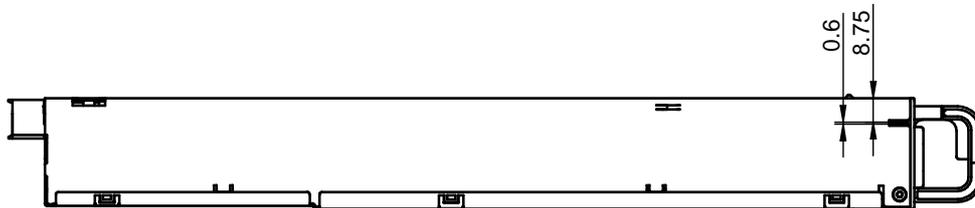


Figure 4: Side view 2

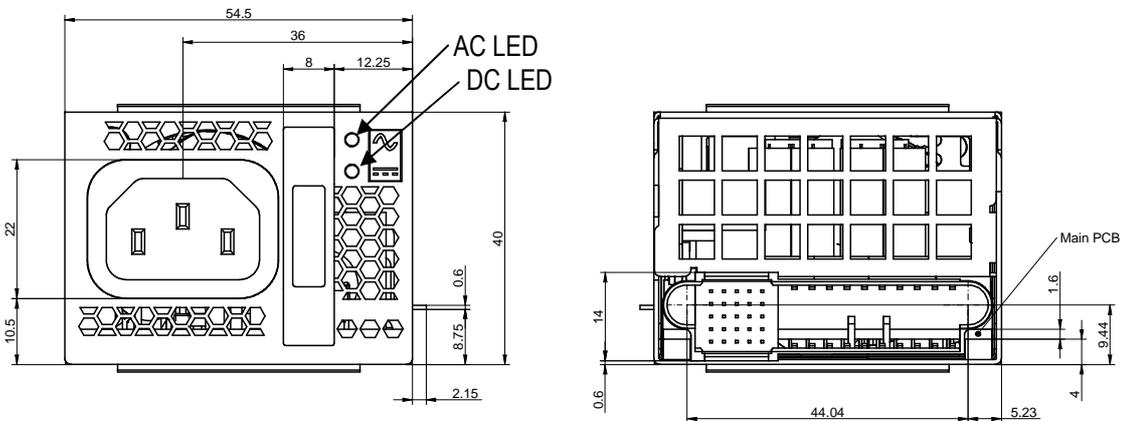
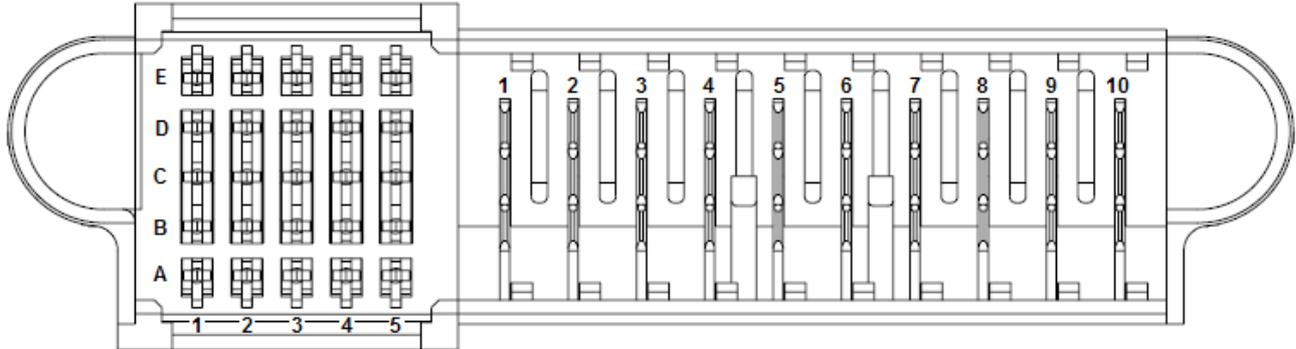


Figure 5: Front view

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 ² C address and protocol selection (select by a pull down resistor)
B3	nc	Reserved
C3	SDA	I ² C data signal line
D3	V1_SENSE_R	Main output negative sense
E3	V1_SENSE	Main output positive sense
A4	SCL	I ² C 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 I ² C units)	N/A	www.power-one.com
	USB to I²C Converter Master I ² C device to program, control and monitor I ² C units in conjunction with the <i>Power-One I²C Utility</i>	ZM-00056	Power-One
	Dual Connector Board Connector board to operate 2 PFE units in parallel. Includes an on-board USB to I ² C converter (use <i>Power-One I²C Utility</i> as desktop software).	SNP-OP-BOARD-01	Power-One

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