PFE1100-12-054ND

1100W, 12V_{DC} Output

FEATURES

- Best-in-class, 80 PLUS certified “Platinum” efficiency
- Best-in-class, “Platinum level” efficiency
- Wide input voltage range: 40 – 72 VDC
- Always-On 16.5W programmable standby output (3.3/5 V)
- Hot-plug capable
- Parallel operation with active digital current sharing
- High density design: 25.6 W/in3
- Small form factor: 54.5 x 40.0 x 321.5 mm
- I2C 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: IN OK and OUT OK with fault signaling

DESCRIPTION

The PFE1100-12-054ND is an 1100 watt DC to DC power supply that converts DC input into a main output of 12 VDC for powering intermediate bus architectures (IBA) in high performance and reliability servers, routers, and network switches. The PFE1100-12-054ND meets international safety standards and displays the CE-Mark for the European Low Voltage Directive (LVD).

APPLICATIONS

- High performance servers
- Routers
- Switches

1 ORDERING INFORMATION

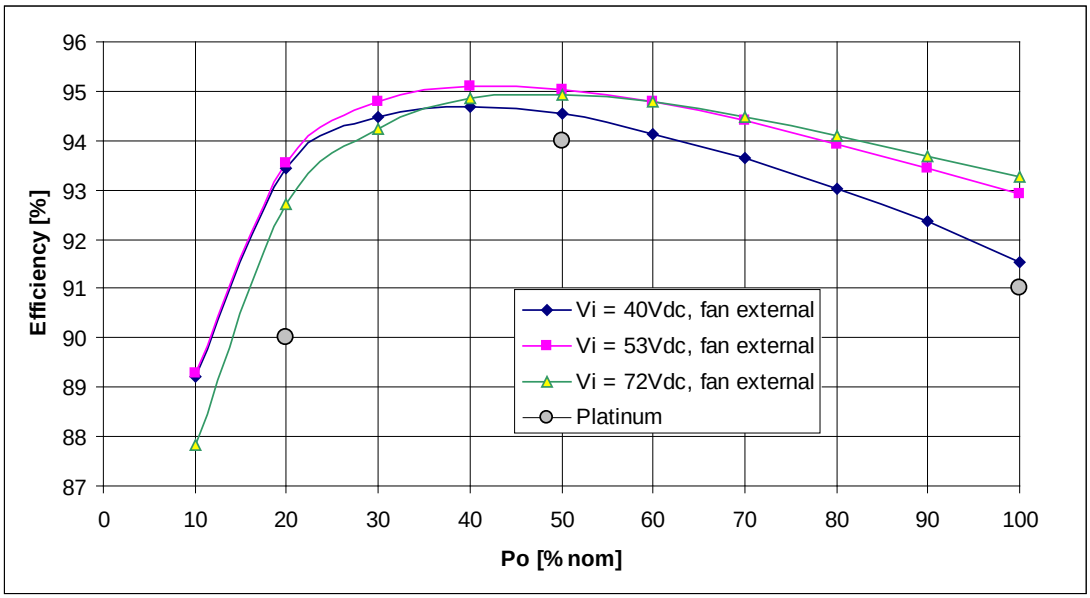
PFE	1100	-	12	-	054	N	D
Product Family PFE Front-Ends	Power Level 1100 W	Dash	V1 Output 12 V	Dash	Width 54 mm	Airflow N: Normal R: Reversed	Input A: AC D: DC

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			53		VDC
V_i	Input voltage ranges	Normal operating ($V_{i\,min}$ to $V_{i\,max}$)	40		72	VDC
$I_{i\,max}$	Max input current				33	A_{rms}
$I_{i\,p}$	Inrush Current Limitation	$V_{i\,min}$ to $V_{i\,max}$			60	A_p
$V_{i\,on}$	Turn-on input voltage[1]	Ramping up	42		45	VDC
$V_{i\,off}$	Turn-off input voltage[1]	Ramping down	37		40	VDC
η	Efficiency without fan	$V_{i\,nom}$, 0.1·$I_{x\,nom}$, $V_{x\,nom}$, T_A = 25 °C		89.3		%
		$V_{i\,nom}$, 0.2·$I_{x\,nom}$, $V_{x\,nom}$, T_A = 25 °C		93.5		
		$V_{i\,nom}$, 0.5·$I_{x\,nom}$, $V_{x\,nom}$, T_A = 25 °C		95		
		$V_{i\,nom}$, $I_{x\,nom}$, $V_{x\,nom}$, T_A = 25 °C		92.9		
T_{hold}	Hold-up Time	V_1 > 10.8 V, V_{SB} within regulation, V_i = 53 VDC, $P_{x\,nom}$	5			ms

Figure 1 – Efficiency



[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			1080		W
$I_{1\ nom}$	Nominal output current	V_1 = 12 VDC			90.0		ADC
$v_{1\ pp}$	Output ripple voltage	$V_{1\ nom}$, $I_{1\ nom}$, 20 MHz BW, 10nF/16V/X7R/1210 + 10uF/16V at V_1				150	mVpp
d$V_{1\ Load}$	Load regulation	V_i = $V_{i\ nom}$, 0 - 100 % $I_{1\ nom}$			80		mV
d$V_{1\ Line}$	Line regulation	V_i =$V_{i\ min}$...$V_{i\ max}$			10		mV
$I_{1\ max}$	Current limitation			95		105	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 DC	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				10 000	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	% $V_{1\ nom}$
d$V_{SB\ tot}$	Total regulation	$V_{i\ min}$ to $V_{i\ max}$, 0 to 100% $I_{SB\ nom}$, $T_{a\ min}$ to $T_{a\ max}$		-2		+2	%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, 10nF/16V/X7R/1210 + 10uF/16V at V_{SB}				100	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 DC input	V_{SB} = 90% $V_{SB\ nom}$				2	sec
Standby Output V_{SB} *(Cont.)*							
$t_{VSB\ rise}$	Rise time	V_{SB} = 10…90% $V_{SB\ nom}$		4		10	ms
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
IN LED (INPUT OK)	
DC Line within range	Solid Green
DC Line UV condition	Off
Redundant Operation - PSU1 operating and PSU2 has input power removed	Solid Yellow (PSU2) [1]
OUT LED [2] (OUTPUT OK)	
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)
Redundant Operation - PSU1 operating and PSU2 has input power removed	Off (PSU2)

[1] The LEDs will be ON till input power from PSU1 is removed.
[2] 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 DC 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

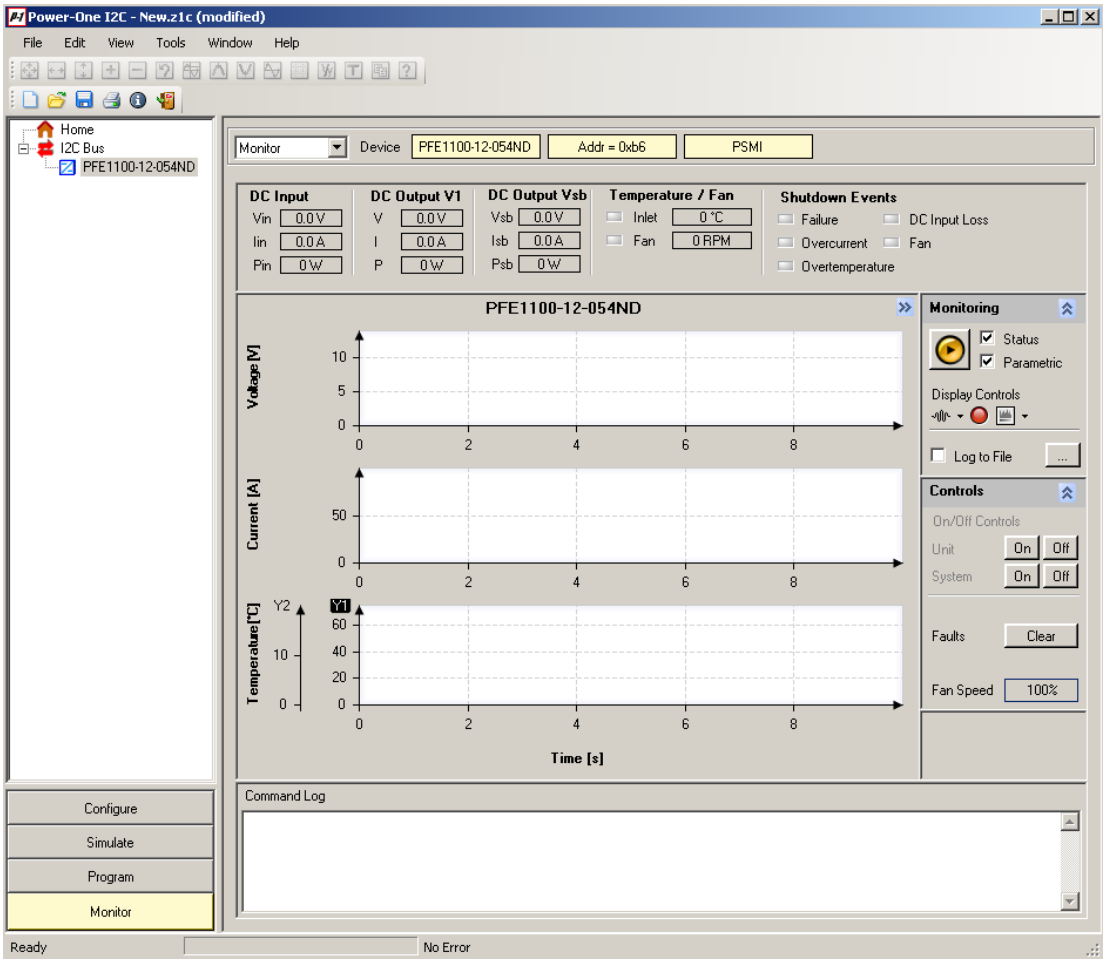
Power-One provides with its "Power-One I²C Utility" a Windows® XP/Vista/Win7 compatible graphical user interface allowing the programming and monitoring of the PFE1100-12-054ND Front-End. The utility can be downloaded on www.power-one.com and supports both the PSMI and PMBus™ protocols.

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 PFE1100-12-054ND 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 5 seconds (not implemented yet). This allows the user to take input power measurements without fan consumptions to check efficiency compliance to the Climate Saver Computing Platinum specification.

Figure 2: I²C Bus to uC (Graphical User Interface)



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 Input DC port ±1 kV, 1 minute DC port ±0.5 kV, 1 minute	B
Surge	IEC / EN 61000-4-5 Line to earth: ±0.5 kV Line to line: ±0.5 kV	B
RF Conducted Immunity	IEC/EN 61000-4-6, Level 3, 10 Vrms, CW, 0.1 … 80 MHz	A

5.2 EMISSION

TEST	STANDARD / DESCRIPTION	CRITERIA
Conducted Emission	EN55022 / CISPR 22: 0.15 … 30 MHz, QP and AVG, single unit, V_i = 53 VDC, $P_{x\ nom}$	Class A 6 dB margin
	EN55022 / CISPR 22: 0.15 … 30 MHz, QP and AVG, 2 units in rack system, V_i = 53 VDC, $P_{x\ nom}$	Class A 6 dB margin
Radiated Emission	EN55022 / CISPR 22: 30 MHz … 1 GHz, QP, single unit, V_i = 53 VDC, $P_{x\ nom}$	Class A 6 dB margin
	EN55022 / CISPR 22: 30 MHz … 1 GHz, QP, 2 units in rack system, V_i = 53 VDC, $P_{x\ nom}$	Class A 6 dB margin
Acoustical Noise	Sound power statistical declaration (ISO 9296, ISO 7779, IS9295) @ 50% load	62 dBA

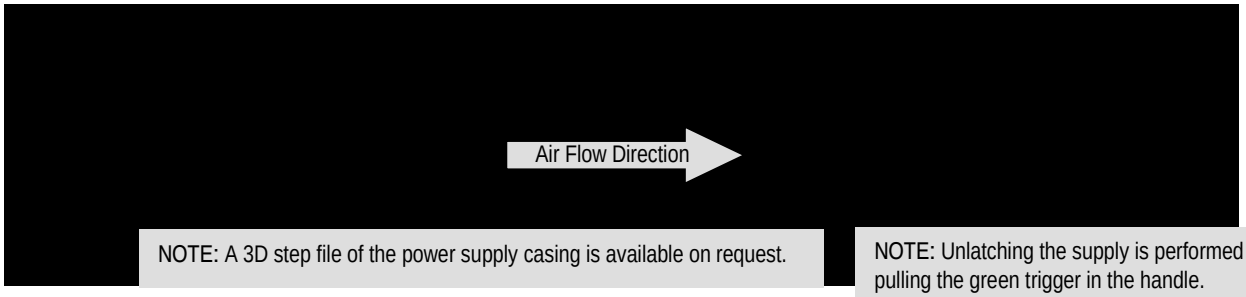
6 ENVIRONMENTAL

PARAMETER		DESCRIPTION / CONDITION	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	+45		+65	°C
		$V_{i\ min}$ to $V_{i\ max}$ / I_1 < 77A, $I_{SB\ nom}$			+55	°C
		$V_{i\ min}$ to $V_{i\ max}$ / I_1 < 35A, $I_{SB\ nom}$			+65	°C
T_S	Storage Temperature	Non-operational	-20		+70	°C
N_a	Audible Noise	Sound power @$V_{i\ nom}$, 50% $I_{o\ nom}$, T_A = 25°C		62		dBA

7 MECHANICAL

PARAMETER		DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
	Dimensions	Width		54.5		mm
		Height		40.0		
		Depth		321.5		
M	Weight			1.12		kg

Figure 3 - Side View 1



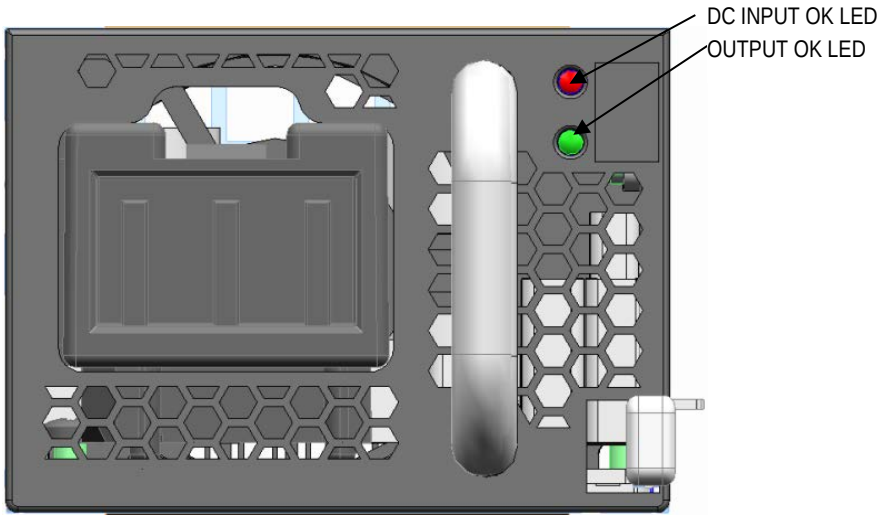
NOTE: A 3D step file of the power supply casing is available on request.

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

Figure 4 - Top View

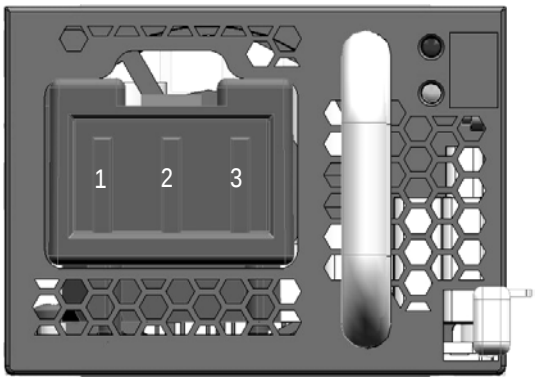
Figure 5- Side View 2

Figure 6 - Front and Rear View



8 CONNECTIONS

8.1 INPUT CONNECTOR

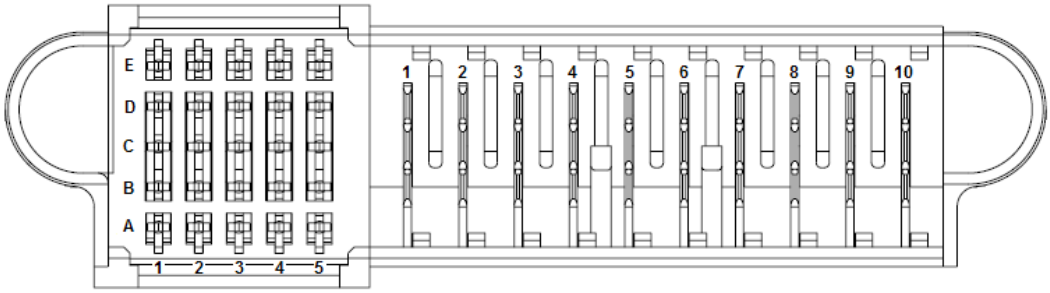


Unit: China Aviation (JOHNON OPTRONIC) P/N DP5ZJW0300-001

Counter part: China Aviation (JOHNON OPTRONIC) P/N DP5TJY0300-001 (provided)

PIN	NAME	DESCRIPTION
		Input
1	Vin+	Input positive
2	Vin-	Input negative
3	PE	Ground ⏚

8.2 OUTPUT CONNECTOR



Unit: Tyco Electronics P/N 2-1926736-3 Note: Column 5 is lagging (short pins)

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

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

PIN	NAME	DESCRIPTION
D2	VSB_SENSE_R	Standby output negative sense
E2	VSB_SENSE	Standby output positive sense
A3	APS	I²C address and protocol selection (select by a pull down resistor)
B3	nc	Reserved
C3	SDA	I²C data signal line
D3	V1_SENSE_R	Main output negative sense
E3	V1_SENSE	Main output positive sense
A4	SCL	I²C 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	INOK	DC 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)

9 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