

POE-AF Specification

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1. Product Overview

The POE-AF is designed as an embedded isolated Powered Device (PD) Module of Power over Ethernet (PoE) system. The Power Sourcing Equipment (PSE) of the PoE system provide power supply for IP terminal devices (e.g. IP Phone, IP Camera) via conventional Category 5 Ethernet cable connected with POE-AF module. The POE-AF module compliant with IEEE802.3af power classification and provides a Class 3 signature.

The POE-AF module compliant with PoE applications of 10M/100M/1000M Ethernet environments which also support PSE Alternative A and B connection. The POE-AF is small in size and low cost, it is really easy to design the PD application of PoE by adding one output decoupling capacitor only.

The DC/DC converter of the POE-AF module operates over a wide input voltage range and provides a regulated output. In addition, the DC/DC converter also has built-in output short-circuit protection.

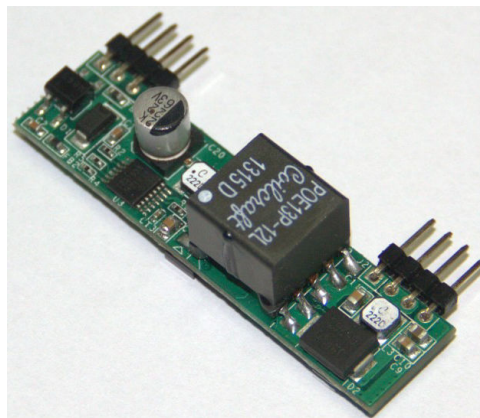


Figure 1-1POE-AF Module

2. Product Feature

- Standardization: IEEE802.3af fully compliant

- Safety: perfect short-circuit protection, isolation level 1500V
- Compatibility: support 10M/100M/1000M Power over Ethernet
- Small in size, SIL package: 56mm (L) x 14mm (W), easy integration
- Low cost, only need external one output decoupling capacitor
- Internal build-in 2 channel bridge rectifiers, perfectly support end-span and mid-span mode

3. Application Fields

- IP Phone
- Wireless Access Point (AP)
- IP Camera
- Safety System
- Access Control
- Point of Sale System (POS)
- Network Attached Storage (NAS)

4. Functional Description

A standard Cat.5 Ethernet cable has four differential signal twisted pairs. For 10M/100M Ethernet, it only uses two of the four pairs (the twisted pairs of pins 1/2 and pins of 3/6 in RJ45 connector) in the cable for data transmission while 1000M Ethernet uses all four pairs for data transmission. According to the rules of IEEE802.3af, the PSE devices only have two power supply mode, the Power through the “spare pair” and the Power through the “data pair”. The POE-AF module integrated 2 channel internal bridge rectifiers which make it compliant with the PSE device of different power supply configuration. With this great advantage, the design of PD application will be easier for developers.

For 10M/100M PoE System, the PSE devices can use two power supply modes, the Power through the “spare pair” and the Power through the “data pair”.

- (1) Power through the “spare pair”: the twisted pair on pins 4/5 is connected to form the positive electric power supply, while the pair on pins 7/8 is connected to form the negative supply.
- (2) Power through the “data pair”: extract positive electric power supply from the center tap (primary side) of the transformer and then connect to the twisted pair on pins 1/2; extract negative supply from the center tap (primary side) of the transformer and then connect to the twisted pair on pins 3/6.

The two power supply modes are show in Figure 4-1.

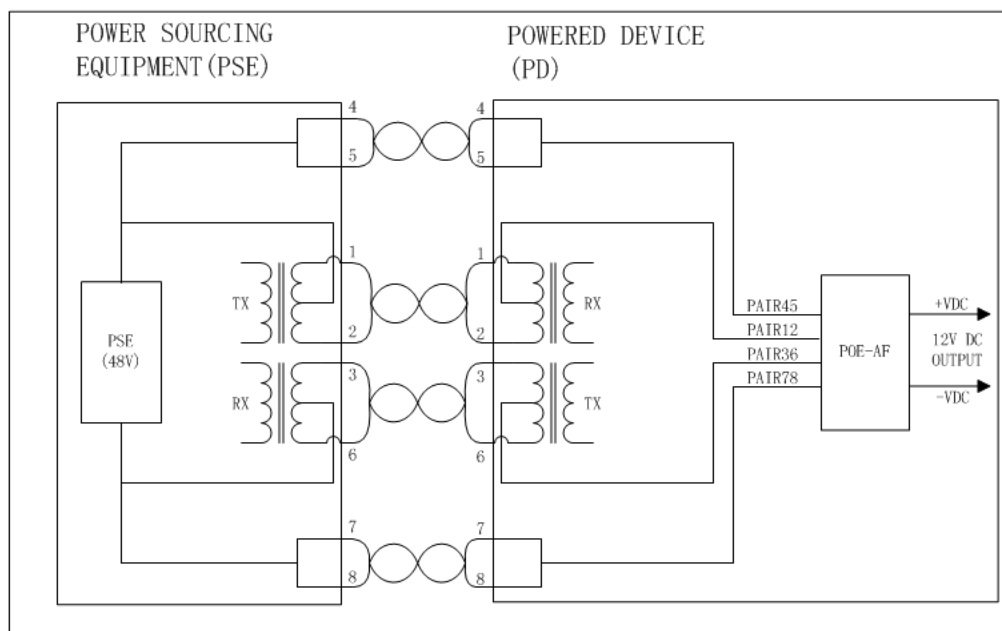


Figure 4-110M/100MPoE System Block Diagram

For 1000M PoE System, the PSE devices only use the “data pair” for power supply due to 1000M Ethernet uses all four pairs for data transmission. As a result, the 1000M Ethernet have two configurations.

- (1) Extract positive electric power supply from the center tap (primary side) of the transformer and then connect to the twisted pair on pins 1/2; extract negative supply from the center tap (primary side) of the transformer and then connect to the twisted pair on pins 3/6.
- (2) Extract positive electric power supply from the center tap (primary side) of the transformer and then connect to the twisted pair on pins 4/5; extract negative supply from the center tap (primary side) of the transformer and then connect to the twisted pair on pins 7/8.

The two configurations are show in Figure 4-2.

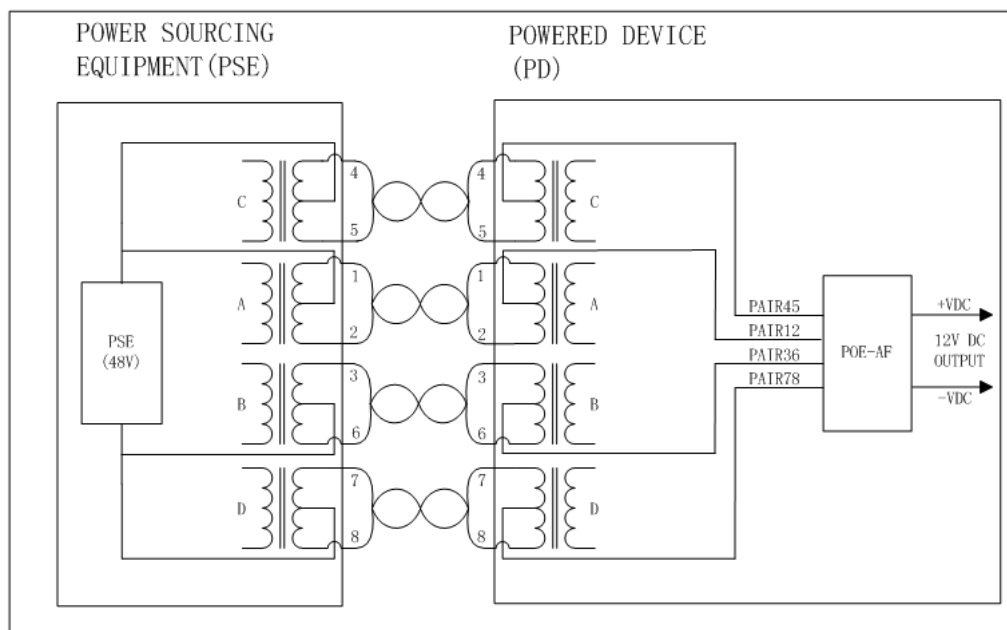


Figure 4-2: 1000MPoE System Block Diagram

5. Electrical Characteristics

5.1. Absolute Maximum Ratings⁽¹⁾

No.	Parameter	Symbol	Min	Max	Units
1	DC Supply Voltage	V_{CC}	-0.3	58	V
2	DC Supply Voltage Surge for 1ms	V_{SURGE}	-0.6	80	V
3	Storage Temperature	T_S	-40	+100	°C

Table 5-1

Note:

- (1) Exceeding the above ratings may cause permanent damage to the product.
Functional operation under these conditions is not implied. Maximum ratings assume free airflow.

5.2. Recommended Operating Conditions

No.	Parameter	Symbol	Min	Typ	Max	Units
1	Input Supply Voltage ⁽¹⁾	V_{IN}	36	48	57	V
2	Under Voltage Lockout	V_{LOCK}	30		36	V
3	Operating Temperature	T_{OP}	-40	25	85	°C

Table 5-2

Note:

- (1) With minimum load.

5.3. DC Electrical Characteristics

No.	Parameter	Symbol	Min	Typ ⁽¹⁾	Max	Units	Test Comment
1	Nominal Output Voltage	+VDC		12		V	/
2	Output Current ($V_{IN}=48V$)	PWR			1.08	A	
3	Line Regulation	T_{LINE}		0.1		%	@50% Load
4	Load Regulation	V_{LOAD}		1		%	$V_{IN}=48V$
5	Output Ripple and Noise	V_{RN}		100		mV _{p-p}	@Max load ⁽²⁾
6	Minimum Load	R_{LOAD}	50			mA	
7	Short-Circuit Duration ⁽³⁾	T_{SC}			∞	sec	
8	Efficiency @ 80% Load	EFF		79		%	
9	Isolation (I/O)	V_{ISO}			1500	V _{dc}	Impulse Test
10	Temperature Coefficient	TC		0.02		%	Per °C

Table 5-3

Note:

- (1) Typical figures are at 25°C with a nominal 48V supply and are for design aid only. Not Guaranteed.
- (2) The output ripple and noise can be reduced with an external filter, see application note.
- (3) Continuous short circuit duration is applicable at 25°C ambient temperature in free air. At higher temperatures or with restricted airflow (e.g. in a sealed enclosure) the duration will need to be limited to avoid overheating.

6. Dimension

PCB dimension: 56mm x 14mm x 16.25mm

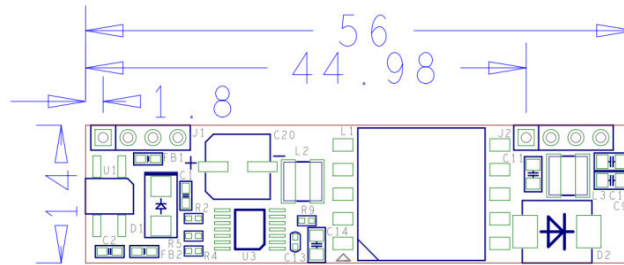


Figure 6-1

7. Connector Description

No.	Description	Note
CON1	POE-AF module input connector	
CON2	POE-AF module output connector	

Table 7-1

8. Pin Description

8.1. CON1

Pin	Name	Description	Note
1	PAIR12	PAIR12 is an input pin. This input pin is used in conjunction with PAIR36 and connects to the center tap (primary side) of	

		the transformer connected to pins 1&2 of the RJ45 connector.	
2	PAIR36	PAIR36 is an input pin. This input pin is used in conjunction with PAIR12 and connects to the centre tap (primary side) of the transformer connected to pins 3&6 of the RJ45 connector.	
3	PAIR45	<p>1*. PAIR45 is an input pin. This input pin is used in conjunction with PAIR78 and connects to pin 4&5 of the RJ45 connector directly.</p> <p>2*. PAIR45 is an input pin. This input pin is used in conjunction with PAIR78 and connects to the center tap (primary side) of the transformer connected to pins 4&5 of the RJ45 connector.</p>	
4	PAIR78	<p>1*. PAIR78 is an input pin. This input pin is used in conjunction with PAIR45 and connects to pin 7&8 of the RJ45 connector directly.</p> <p>2*. PAIR78 is an input pin. This input pin is used in conjunction with PAIR45 and connects to the center tap (primary side) of the transformer connected to pins 7&8 of the RJ45 connector.</p>	

Table 8-1

Note:

1*.The placement is suitable for 10M/100M Ethernet.

2*.The placement is suitable for 1000M Ethernet.

8.2. CON2

Pin	Name	Description	Note
1	-VDC	DC Return.	
2	+VDC	DC Output.	
3	+VDC	DC Output. Internally connected to pin 2.	
4	-VDC	DC Return. Internally connected to pin 1.	

Table 8-2

9. Typical Application Circuit

The application of POE-AF module is very simple. It only need to add a 470uF output decoupling capacitor and positioned as close to the output pins as possible.

The Figure 9-1 shows 10M/100M Ethernet POE-AF module typical application circuit.

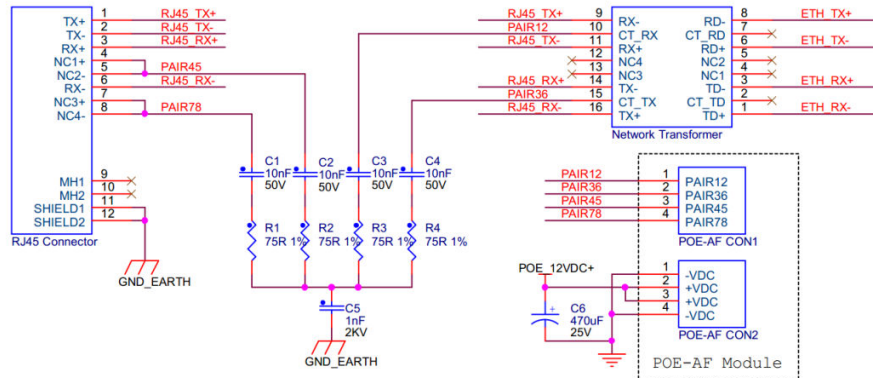


Figure 9-110M/100M PoE Application Circuit

The Figure 9-2 shows 1000M Ethernet POE-AF module typical application circuit.

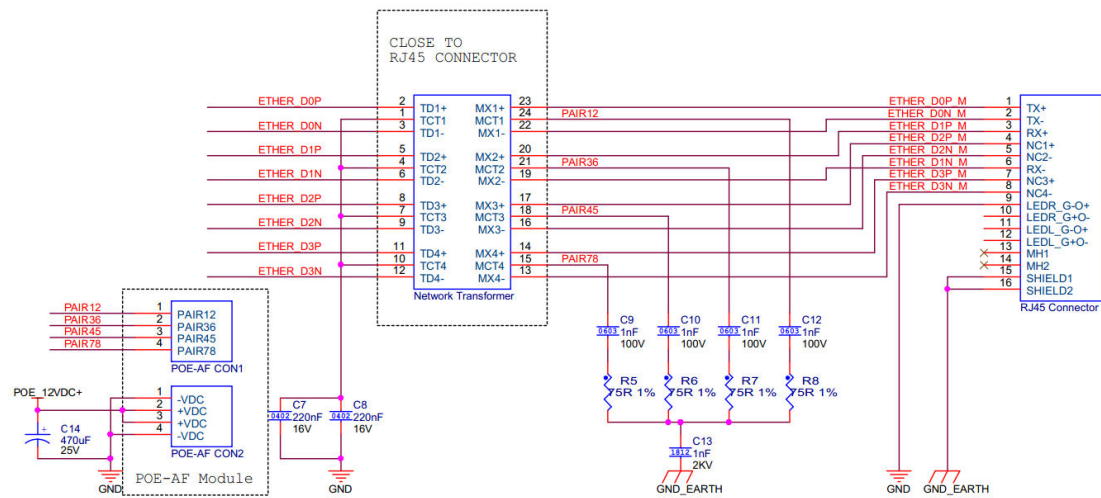


Figure 9-21000M PoE Application Circuit