PEAK electronics

THE WORLD OF DC/DC-CONVERTERS

DC/DC-Converter
AC/DC-Converter

Switch-Regulator
L E D - Driver

DIN RAIL
Power Supply Moduls

Custom Design

PRODUCT OVERVIEW

DEVELOPMENT PRODUCTION AND DISTRIBUTION OF DC/DC-CONVERTERS

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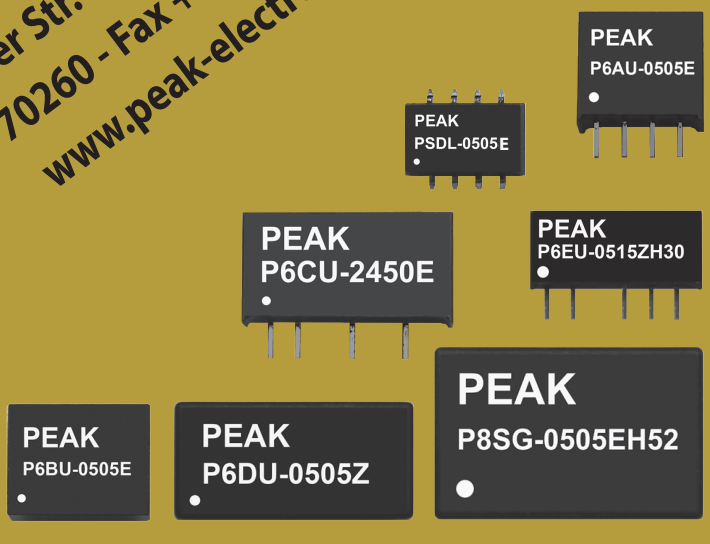

AC/DC-Converters

PPM-Sip Series

1,65-3 Watt

Features

- Wide Input Voltage: 100 - 400 V DC (85 - 264 V AC)
- Output: 3.3 V DC - 24 V DC
- Over voltage protection, Overload protection and short circuit protection
- High efficiency, High density
- Low loss, green power
- Multiple models available
- industrial level specifications
- low price

PPM-Dip Series

3 Watt

Features

- Universal Input: 85 - 264 V AC, 50/60 Hz
- AC and DC all in one (input from the same terminal)
- Low Ripple and Noise
- Over output voltage protection, short circuit protection and Over temperature
- High efficiency, High power density
- Low loss, green power
- Multiple models available
- industrial, medical level specifications
- 3 years warranty

PPM Series

4-25 Watt

Features

- Universal Input: 85 - 264 V AC, 50/60 Hz
- AC and DC all in one (input from the same terminal)
- Low Ripple and Noise
- Overload protection and short circuit protection
- High efficiency, High power density
- Low loss, green power
- Multiple models available
- Industrial level specifications
- 3 years warranty

PPMxx-S12-xxELF

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PPM-S12-SERIES Rev.07-2010

- ✓ **1.65 - 3 Watt**
- ✓ Univ. **100-400VDC** / **85-264VAC***
- ✓ **Single** Output
- ✓ **Over Temperature Protection**
- ✓ **Short Circuit Protection**
- ✓ **2 kV** AC I/O Isolation
- ✓ **High Efficiency** / **Density**

The PPM-S12-Series are high efficiency green power modules with miniature packaging provided by Peak. The features of this series are: wide input voltage, DC and AC all in one, high efficiency, high reliability, low loss, safety isolation etc. They are widely used in industrial, office and civil equipments, as well as applications where no special requirement for EMC performance. It is recommended to add EMI suppression circuit or take measure to shield when there is strict requirement for EMC performance.

All specifications typical at Ta=25℃, nominal input voltage and full load unless otherwise specified

Input Specifications

Input Voltage Range	100 – 400 VDC **or** 85 – 264 VAC* universal
Input Current	40mA, typ.
External Input Fuse (recommended)	0.5A / 250V

**** Attention: For AC-Input a capacitor between PIN 7 and PIN 10 is needed!! (See page 3)***

Output Specifications

Voltage Accuracy	±2%
Input variation	±0.5%, typ.
Load variation (10-100%)	±1%, typ.
Ripple and Noise (20Mhz bandwidth)	
3.3 / 5 / 9 VDC models	≤ 100mV pk-pk
12 VDC models	≤ 120mV pk-pk
15 VDC models	≤ 150mV pk-pk
24VDC models	≤ 240mV pk-pk
Short Circuit Protection	Continuous, auto recovery
Over Temperature Protection	150℃, max.

Common Specifications

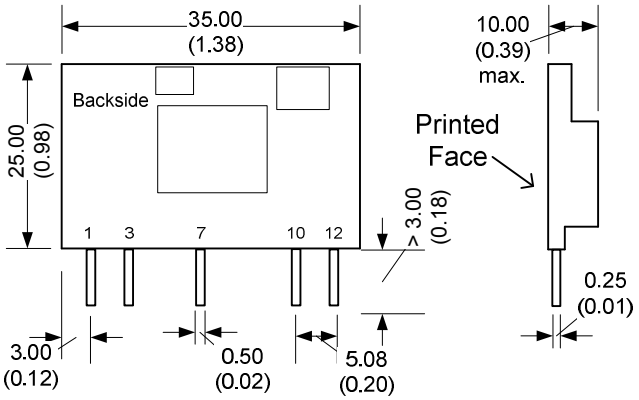
Temperature range	-40℃ to +85 ℃
Power derating	1.33% / ℃ (above 55℃)
Case temperature	+90℃, max.
Storage	-40℃ to +105 ℃
Humidity (non condensing)	85%, max.
Temperature Coefficient	0.02%/℃
Switching Frequency	100kHz, typ.
I/O Isolation Voltage	2000VAC / 1min.
Leakage current	None
Case Material	UL94V-0 rated
Reliability Calculated MTBF (MIL-HDBK-217F)	> 300,000 hrs

Selection Guide

Order #	Power (W)	Output Voltage (Vdc)	Output Current Full Load (mA)	Efficiency (%)
SINGLE OUTPUT				
PPM1.65-S12-3R3ELF	1.65	3.3	500	70
PPM2.5-S12-05ELF	2.5	5	500	70
PPM3-S12-09ELF	3	9	330	75
PPM3-S12-12ELF	3	12	250	78
PPM3-S12-15ELF	3	15	200	78
PPM3-S12-24ELF	3	24	125	78

If you need other specifications, please enquire.

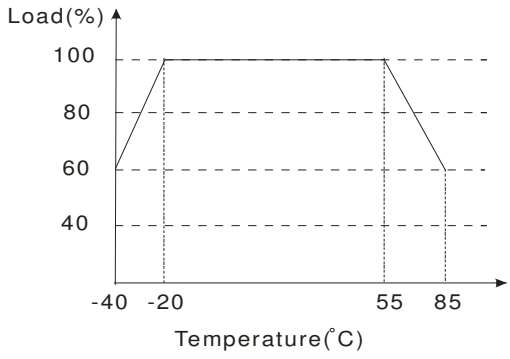
Package / Pinning / Derating



All dimensions are typical in millimeters (inches).
- Pin pitch tolerance: +/-0.35 (+/-0.014)
- Case tolerance +/-0.5 (+/-0.02)
Specification may change without notice.

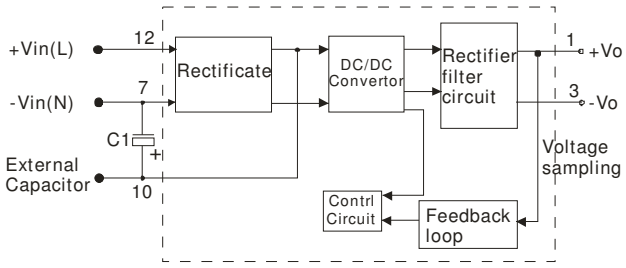
PPM - SIP12

PIN CONNECTIONS	
#	SINGLE
1	+Vout
3	- Vout
7	- Vin
10	CAP
12	+Vin

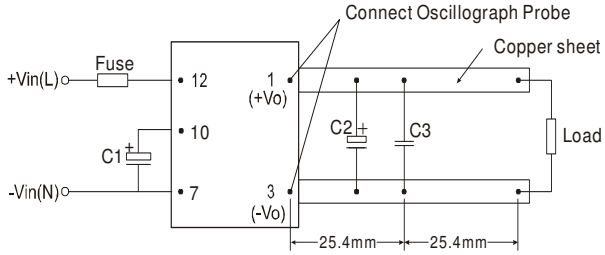


App Notes:

Structure Figure

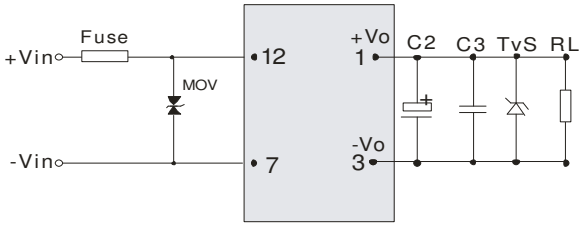


Anear Measure

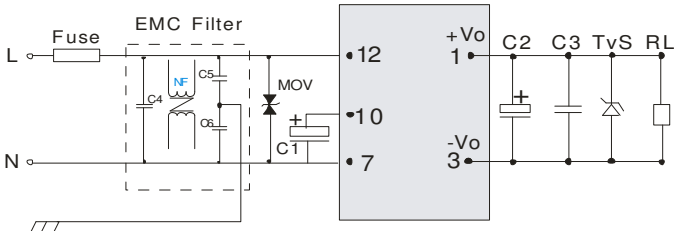


Typical Application

DC Input



AC Input



Attention: For AC-Input a capacitor (10uF/400V) between PIN 7 and PIN 10 is needed!!

External Capacitor Typical Value

Output Voltage	C1	C2	C3	FUSE	TVS
3.3V	10μF/400V	150μF/25V	0.1μF/50V (Ceramic Capacitor)	0.5A/250V	P4KE6.8A
5V					
9V					P4KE12A
12V					P4KE20A
15V		100μF/35V			
24V					P4KE33A

Note:
1. Filtering capacitors C1, C2 are electrolytic capacitors, C1 is used for AC input, when input voltage is below 100VAC, the value of C1 is 22μF/400V. C2 is recommended to use high frequency and low impedance electrolytic capacitors. For capacitance and current of capacitor please refer to manufacture's datasheet. Voltage derating of capacitor should be 80% or above. C3 is ceramic capacitor. It is used to filter high frequency noise. TVS is a recommended component to protect post-circuits (if converter fails).
2. MOV: Voltage dependent resistor, model 471KD05. It is used to protect converter in lightning strike and surge.
3. If EMC performance is required, it's recommended to add "EMC filter" at the input side. C4: X capacitor: 0.1μF/275V C5,C6: Y capacitor: 220pF/2000V NF: Common-mode choke, recommended parameter: 10mH-30mH

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PPM-Series **PPM03-S-xxELF** **3 W AC/DC CONVERTER SINGLE OUTPUT**

Input Specifications

Input voltage range		85- 264 VAC, 110- 370 VDC
Input frequency		47- 440 Hz
Input current		110 VAC 230 VAC 65mA , typ. 30mA , typ.
Inrush current		110 VAC 230 VAC 10A, typ. 20A, typ.
External input fuse(recommended)	PPM03-S-xxELF	0.5A/250V slow blow

Output Specifications

Voltage set accuracy		± 2%, typ. (± 3% at 3.3 Vout)
Input variation		± 0.5%, typ.
Load variation (10-100%)	Single output models	± 1%, typ.
Ripple& noise (p-p)	20MHz Bandwidth	30mV, typ.
Short circuit protection		Continuous, and auto resume
Over temperature protection		150℃, max.
Over output voltage protection		Chip lock up

General Specifications

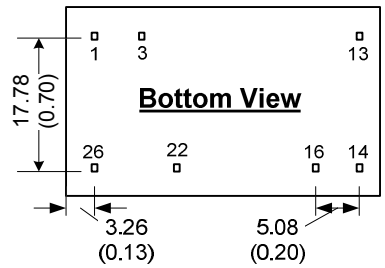
Temperature ranges	Operating : Power derating above 55℃: Storage: Case temperature:	 -25℃ to +70℃ 2% / ℃ -40℃ to +105℃ +95℃ max
Weight		~ 25g
Hold-up time	(Vin=230VAC)	50ms(typ.)
Humidity (non condensing)		95%(max)
Temperature coefficient		0.02% /℃
Switching frequency		100kHz, typ.
Efficiency		See table
I/O-isolation voltage		3000 VAC / 1Min
Leakage current		None
Case material		UL 94V-0 rated
Install		PCB
MTBF		>200,000h @25℃
RoHS compliant		Soldering 260℃ / max. 10 sec.

Examples of Partnumbers/Modelcode

PART NO.	Power (Watt)	OUTPUT (Volt)	RIPPLE AND NOISE (typ..)	EFFICIENCY (% min.)
PPM03-S-3.3ELF	2.3	3.3V / 700mA	30mV	63
PPM03-S-05ELF	3	5V / 600mA	30mV	72
PPM03-S-09ELF	3	9V / 330mA	30mV	74
PPM03-S-12ELF	3	12V / 250mA	30mV	76
PPM03-S-15ELF	3	15V / 200mA	30mV	76
PPM03-S-24ELF	3	24V / 125mA	30mV	78

Other specifications please enquire.

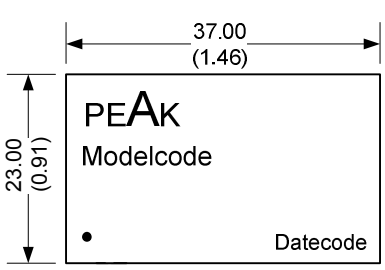
Dimensions / Pinning

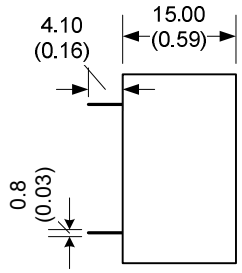


All dimensions are typical in millimeters (inches).
- Pin diameter: 0.5 +/-0.05 (0.02 +/-0.002)
- Pin pitch tolerance: +/-0.35 (+/-0.014)
- Case tolerance +/-0.5 (+/-0.02)

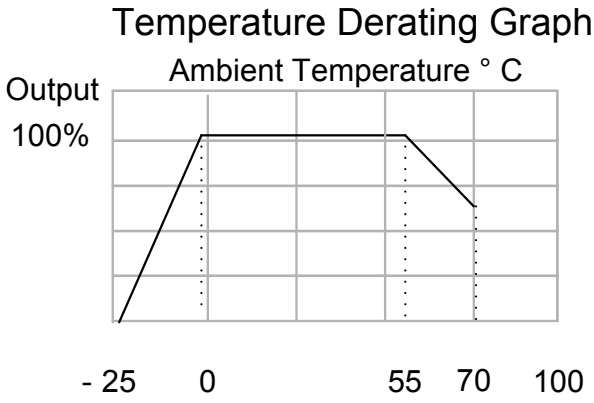
Specification may change without notice.

DIP26 – PLASTIC CASE



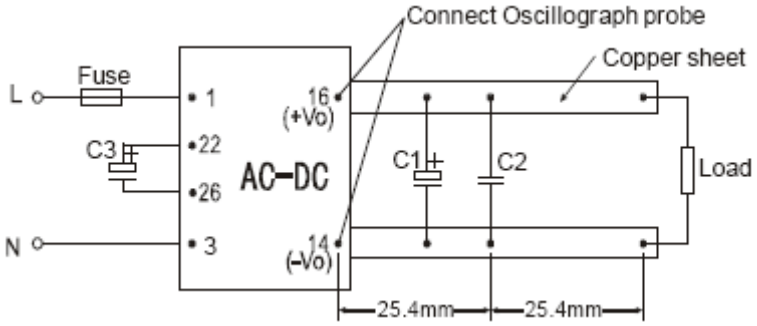


PINNING PPM03-S-xxELF	
#	*Single out*
1	AC (L)
3	AC (N)
13	No Connection
14	- V Output
16	+V Output
22	+Vin (DC)
26	- Vin (DC)

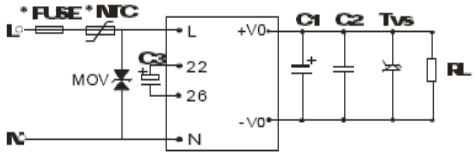


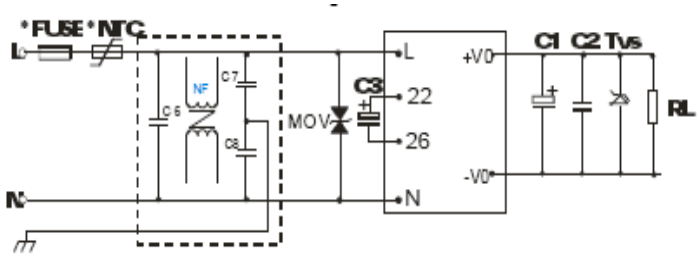
App Notes

Measure



Typical Applications PPM-Series





External Typical Value

Model	C1	C2	C3	TVS
PPM03-S-3.3ELF	150	0.1	4.7/400V	P4KE6.8A
PPM03-S-05ELF	150	0.1	4.7/400V	P4KE6.8A
PPM03-S-09ELF	120	0.1	4.7/400V	P4KE12A
PPM03-S-12ELF	120	0.1	4.7/400V	P4KE20A
PPM03-S-15ELF	120	0.1	4.7/400V	P4KE20A
PPM03-S-24ELF	68	0.1	4.7/400V	P4KE30A

Note

1. Output filtering capacitors C1, C3 is electrolytic capacitors, It is recommended to use high frequency and low impedance electrolytic capacitors. For capacitance and current of capacitor please refer to manufacture's datasheet. Voltage derating of capacitor should be 80% or above. C2 is ceramic capacitor, it is used to filter high frequency noise. TVS is a recommended component to protect post-circuits (when converter fails).
2. MOV is required to PPM03 models, model: 471KD05, it is used to protect the device under surge.
3. It is recommended to connect FUSE, the parameter for PPM03 models is 0.5A/250V slow blow. External input NTC is recommended to use 5D-14 or 10Ω/2W wire-round resistor.
4. If EMC performance is required, recommended to add "EMC filter" at the input end C6:X capacitor, recommended parameter 0.1uF/275V; C7,C8:Y capacitor, recommended parameter 220pF/2000V;

NF: common model choke, recommended inductance is about 10mH-30mH.

5. PPM03 models: Terminals 22 and 26 are internal rectification and filtering terminals. To protect the models further, it is recommended to connect an electrolytic capacitor C3 (it is recommended to be 4.7uF/400V). If operation voltage of the module is between 160~264VAC, C3 can be removed.

PPMxx-X-xxELF

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PPM-SERIES Rev.07-2010

- ✓ **4 - 25 Watt**
- ✓ Univ. **85-264VAC** and **50/60Hz**
- ✓ **Single** Output
- ✓ **Overload Protection**
- ✓ **3 kV** AC I/O Isolation
- ✓ Low Ripple and Noise
- ✓ **High Efficiency**

The PPM-Series are high efficiency green power moduls with various packaging provided by Peak. The features of this series are: wide input voltage, DC and AC all in one, high efficiency, high reliability, low loss, safety isolation etc. They are widely used in industrial, office and civil equipments. EMC and safety standards meet international standards IEC61000 UL60950 and IEC60950, and Multi-certificate is in processing.

All specifications typical at Ta=25℃, nominal input voltage and full load unless otherwise specified

Input Specifications

Input Voltage Range	85 – 264 VAC **or** 120 – 370 VDC universal	
Input Frequency	47 – 63 Hz	
Input (Inrush) Current	110 VAC	230 VAC
PPM05 models	120mA (10A), typ.	70mA (20A), typ.
PPM10 models	230mA (10A), typ.	120mA (20A), typ.
PPM15 models	250mA (10A), typ.	140mA (20A), typ.
PPM20 models	330mA (16A), typ.	180mA (30A), typ.
PPM25 models	420mA (16A), typ.	230mA (30A), typ.
External Input Fuse (recommended)		
PPM05 models	1A / 250V slow blow	
PPM10 / 15 models	2A / 250V slow blow	
PPM20 / 25 models	3.15A / 250V slow blow	

Output Specifications

Voltage Accuracy	±2%
Input variation	±0.5%
Load variation (10-100%)	±1%
Minimum load	0%
Ripple and Noise (20Mhz bandwidth)	≤ 100mV pk-pk
Short Circuit Protection	Continuous, auto recovery
Over Current Protection	≥ 110% Io
Over output voltage protection	
3.3 / 5VDC models	≤7.5VDC
9VDC models	≤12VDC
12 / 15VDC models	≤20VDC
24VDC models	≤30VDC
48VDC models	≤60VDC

PPMxx-X-xxELF

Common Specifications

Temperature range	-25℃ to +70 ℃
Power derating	3.75% / ℃ (above 55℃)
PPM20-D-05ELF:	2.25% / ℃ (above 50℃)
Case temperature	+90℃ (max)
Storage	-25℃ to +105 ℃
Hold up Time	80mS, typ. (230VAC)
Humidity (non condensing)	85%, max.
Temperature Coefficient	0.02%/℃ (main output)
Switching Frequency	150kHz, max.
I/O Isolation Voltage	3000VAC / 1min.
Leakage current	0.3mA RMS typ. (230VAC / 50Hz)
EMI / RFI conducted	EN55022, level B
EMC compliance	
ESD	IEC/EN 61000-4-2 level 3 6KV/8KV
RF	IEC/EN 61000-4-3
EFT / bursts	IEC/EN 61000-4-4 level 3 2KV
Surge	IEC/EN 61000-4-5 level 3 1KV / 2KV
Safety Standarts	IEC60950, EN60950, UL60950
Safety Approvals	EN60950, IEC60950, UL60950
Safety Class	CLASS 1 (PPM15 models single out: CLASS 2)
Case Material	UL94V-0 rated
Reliability Calculated MTBF (MIL-HDBK-217F)	> 300,000 hrs
Weight	50g (PPM05) 70g (PPM10)
	80g (PPM15) 120g (PPM20/25)

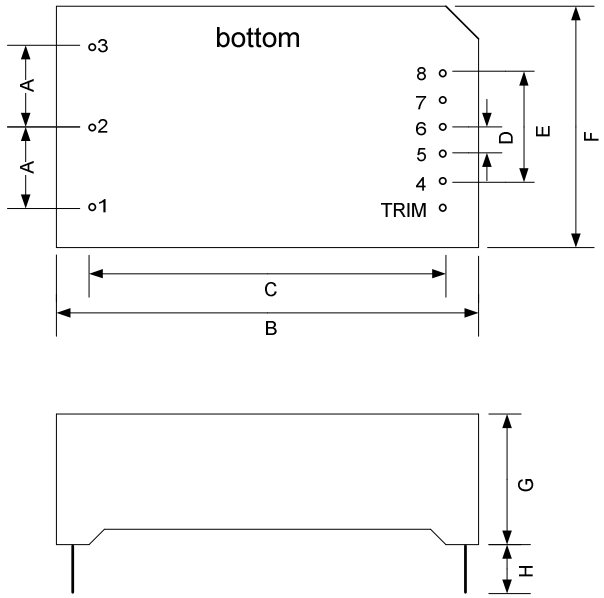
Notes:

Selection Guide
Single Output

Order #	Power (W)	Output Voltage (Vdc)	Output Current Full Load (mA)	Efficiency (%)
SINGLE OUTPUT				
PPM05-A-3R3ELF	4	3.3	1250	70
PPM05-A-05ELF	5	5	1000	75
PPM05-A-09ELF	5	9	550	77
PPM05-A-12ELF	5	12	420	79
PPM05-A-15ELF	5	15	330	80
PPM05-A-24ELF	5	24	230	82
PPM10-B-3R3ELF	6.6	3.3	2000	70
PPM10-B-05ELF	10	5	2000	76
PPM10-B-09ELF	10	9	1100	78
PPM10-B-12ELF	10	12	900	80
PPM10-B-15ELF	10	15	700	81
PPM10-B-24ELF	10	24	450	82
PPM15-C-3R3ELF	9.9	3.3	3000	73
PPM15-C-05ELF	15	5	2800	76
PPM15-C-09ELF	15	9	1600	78
PPM15-C-12ELF	15	12	1250	80
PPM15-C-15ELF	15	15	1000	80
PPM15-C-24ELF	15	24	625	84
PPM15-C-48ELF	15	48	320	85
PPM20-D-3R3ELF	13.5	3.3	4100	73
PPM20-D-05ELF	20	5	3500	75
PPM20-D-12ELF	20	12	1600	81
PPM20-D-15ELF	20	15	1300	83
PPM20-D-24ELF	20	24	850	85
PPM25-D-05ELF	25	5	4100	74
PPM25-D-12ELF	25	12	2100	82
PPM25-D-15ELF	25	15	1600	83
PPM25-D-24ELF	25	24	1100	85
PPM25-D-48ELF	25	48	500	87

If you need other specifications, please enquire.

Package / Pinning / Derating



No.	PPM05-**A**
A	12.5
B	48.5
C	40.5
D	4.0
E	16.0
F	36.0
G	20.5
H	min. 6.0

No.	PPM10-**B**
A	17.5
B	55.0
C	47.0
D	5.0
E	20.0
F	45.0
G	20.5
H	min. 6.0

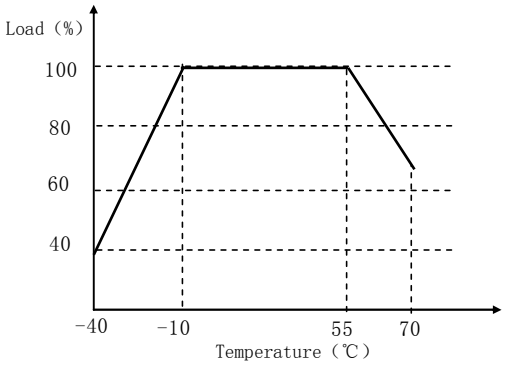
No.	PPM15-**C**
A	17.5
B	62.0
C	54.0
D	5.0
E	20.0
F	48.0
G	22.5
H	min. 6.0

No.	PPM20/25-**D**
A	20.0
B	70.0
C	62.0
D	5.75
E	23.0
F	48.0
G	23.5
H	min. 6.0

PIN CONNECTIONS	
#	SINGLE
1	Ground*
2	AC (N)
3	AC (L)
4	- Vout
5	No Pin
6	No Pin
7	No Pin
8	+Vout
TRIM	TRIM**

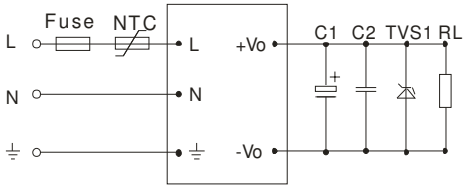
* No Ground for PPM15-C-xxELF

** Only for PPM20/25-D-xxELF



App Notes:

(Single Output)

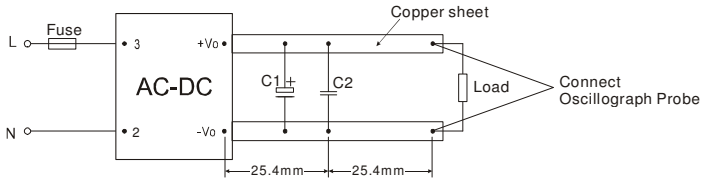


Remark:
1. Output filtering capacitors C1, C2 and C3 are electrolytic capacitors, It is recommended to use high frequency and low impedance electrolytic capacitors. For capacitance and current of capacitor please refer to manufacture's datasheet. Voltage derating of capacitor should be 80% or above. C2,C4,C6 are use to filter high frequency noise. TVS is recommended component to protect post-circuits (if converter fails).
2. External input NTC is recommended to use 5D-9 (Only PPM10 models and PPM15 models)

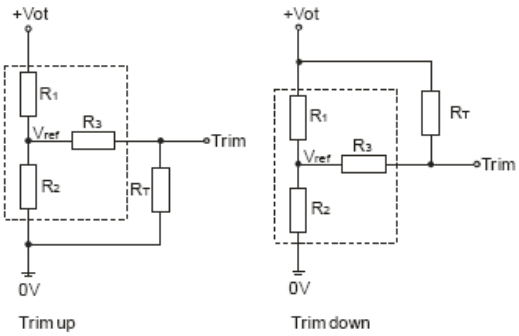
EXTERNAL CAPACITORS TYPICAL VALUE (μF)

MODEL	C1
PPM05-A-3R3ELF	330
PPM05-A-05ELF	330
PPM05-A-09ELF	120
PPM05-A-12ELF	120
PPM05-A-15ELF	68
PPM05-A-24ELF	68
PPM10-B-3R3ELF	470
PPM10-B-05ELF	330
PPM10-B-09ELF	120
PPM10-B-12ELF	120
PPM10-B-15ELF	120
PPM10-B-24ELF	68
PPM15-C-3R3ELF	680
PPM15-C-05ELF	680
PPM15-C-09ELF	470
PPM15-C-12ELF	220
PPM15-C-15ELF	220
PPM15-C-24ELF	68
PPM15-C-48ELF	33
PPM20-D-3R3ELF	330
PPM20-D-05ELF	330
PPM20-D-12ELF	220
PPM20-D-15ELF	220
PPM20-D-24ELF	220
PPM25-D-05ELF	330
PPM25-D-12ELF	330
PPM25-D-15ELF	330
PPM25-D-24ELF	120
PPM25-D-48ELF	68

Parallel Lines Measure



TRIM Application and TRIM Calculation



	3.3V	5V	12V	15V	24V	48V
R1(KΩ)	2	3.3	3.8	7.5	8.6	1.2
R2(KΩ)	1.2	3.3	1	1.5	1	22
R3(KΩ)	1	1	1	1	1	1.2
Vref(V)	1.24	2.5	2.5	2.5	2.5	2.5
Vot(V)	Output voltage of Trim, variation ≤ ±10%					

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \qquad a = \frac{Vref}{Vot - Vref} \cdot R_1$$

$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \qquad a = \frac{Vot - Vref}{Vref} \cdot R_2$$

Note: Value for R1, R2, R3, and Vref refer to the table.
R_T: Resistance of Trim
a: User-defined parameter, no actual meanings.

PPMxx-X-xxZLF

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PPM-SERIES Rev.07-2010

- ✓ **5 - 20 Watt**
- ✓ Univ. **85-264VAC** and **50/60Hz**
- ✓ **Dual** Output
- ✓ **Overload Protection**
- ✓ **3 kV** AC I/O Isolation
- ✓ Low Ripple and Noise
- ✓ **High Efficiency**

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All specifications typical at Ta=25℃, nominal input voltage and full load unless otherwise specified

Input Specifications

Input Voltage Range	85 – 264 VAC **or** 120 – 370 VDC universal	
Input Frequency	47 – 63 Hz	
Input (Inrush) Current	110 VAC	230 VAC
PPM05 models	120mA (10A), typ.	70mA (20A), typ.
PPM10 models	230mA (10A), typ.	120mA (20A), typ.
PPM15 models	250mA (10A), typ.	140mA (20A), typ.
PPM20 models	330mA (16A), typ.	180mA (30A), typ.
External Input Fuse (recommended)		
PPM05 models	1A / 250V slow blow	
PPM10 / 15 models	2A / 250V slow blow	
PPM20 models	3.15A / 250V slow blow	

Output Specifications

Voltage Accuracy	±2% (main output)
Input variation	±0.5% (main output) ±1.5% (supplement output)
Load variation (10-100%)	±2% (Balanced load)
Minimum load	10%
Ripple and Noise (20Mhz bandwidth)	≤ 100mV pk-pk (main output)
Short Circuit Protection	Continuous, auto recovery
Over Current Protection	≥ 110% Io
Over output voltage protection	
5VDC models	≤7.5VDC
12 / 15VDC models	≤20VDC
24VDC models	≤30VDC

PPMxx-X-xxZLF

Common Specifications

Temperature range	-25℃ to +70 ℃
Power derating	3.75% / ℃ (above 55℃)
Case temperature	+90℃ (max)
Storage	-25℃ to +105 ℃
Hold up Time	80mS, typ. (230VAC)
Humidity (non condensing)	85%, max.
Temperature Coefficient	0.02%/℃ (main output) 0.15%/℃ (supplement output)
Switching Frequency	150kHz, max.
I/O Isolation Voltage	3000VAC / 1min.
Leakage current	0.3mA RMS typ. (230VAC / 50Hz)
EMI / RFI conducted	EN55022, level B
EMC compliance	
ESD	IEC/EN 61000-4-2 level 3 6KV/8KV
RF	IEC/EN 61000-4-3
EFT / bursts	IEC/EN 61000-4-4 level 3 2KV
Surge	IEC/EN 61000-4-5 level 3 1KV / 2KV
Safety Standarts	IEC60950, EN60950, UL60950
Safety Approvals	EN60950, IEC60950, UL60950
Safety Class	CLASS 1
Case Material	UL94V-0 rated
Reliability Calculated MTBF (MIL-HDBK-217F)	> 300,000 hrs
Weight	50g (PPM05) 70g (PPM10) 80g (PPM15) 120g (PPM20)

Notes:

Selection Guide

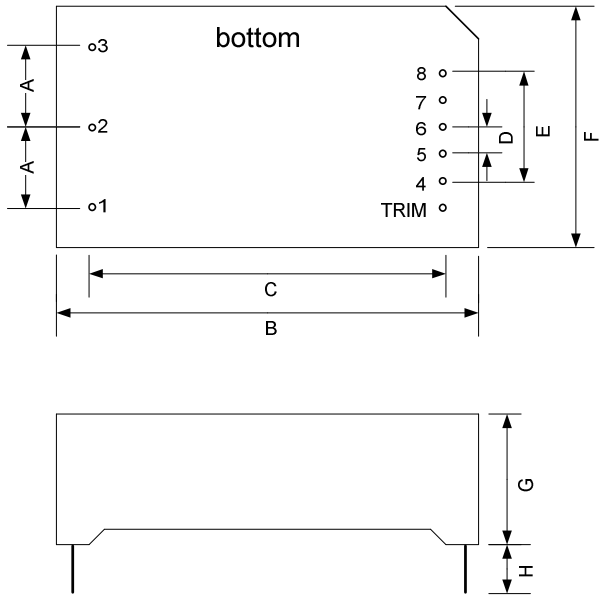
Dual Output

Order #	Power (W)	Output Voltage (Vdc)	Output Current Full Load (mA)	Efficiency (%)
DUAL OUTPUT				
PPM05-A-05ZLF	5	± 5	± 500	75
PPM05-A-12ZLF	5	± 12	± 210	79
PPM05-A-15ZLF	5	± 15	± 160	79
PPM05-A-24ZLF	5	± 24	± 100	80
PPM10-B-05ZLF	10	± 5	± 1000	76
PPM10-B-12ZLF	10	± 12	± 450	80
PPM10-B-15ZLF	10	± 15	± 350	81
PPM10-B-24ZLF	10	± 24	± 200	84
PPM15-C-05ZLF	15	± 5	± 1500	76
PPM15-C-12ZLF	15	± 12	± 650	81
PPM15-C-15ZLF	15	± 15	± 500	83
PPM20-D-05ZLF	20	± 5	± 2000	75
PPM20-D-12ZLF	20	± 12	± 830	82
PPM20-D-15ZLF	20	± 15	± 650	83

If you need other specifications, please enquire.

Notes:

Package / Pinning / Derating



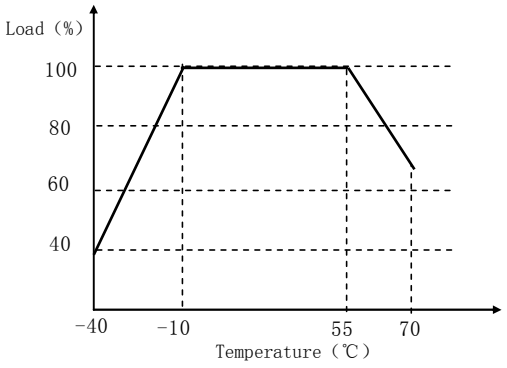
No.	PPM05-**A**
A	12.5
B	48.5
C	40.5
D	4.0
E	16.0
F	36.0
G	20.5
H	min. 6.0

No.	PPM10-**B**
A	17.5
B	55.0
C	47.0
D	5.0
E	20.0
F	45.0
G	20.5
H	min. 6.0

No.	PPM15-**C**
A	17.5
B	62.0
C	54.0
D	5.0
E	20.0
F	48.0
G	22.5
H	min. 6.0

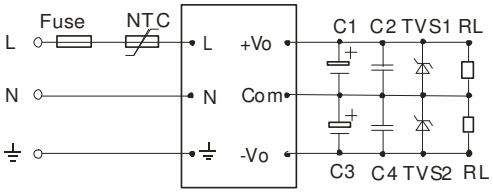
No.	PPM20-**D**
A	20.0
B	70.0
C	62.0
D	5.75
E	23.0
F	48.0
G	23.5
H	min. 6.0

PIN CONNECTIONS	
#	DUAL
1	Ground
2	AC (N)
3	AC (L)
4	- Vout
5	No Pin
6	Common
7	No Pin
8	+Vout
TRIM	No Pin



App Notes:

(Dual Output)

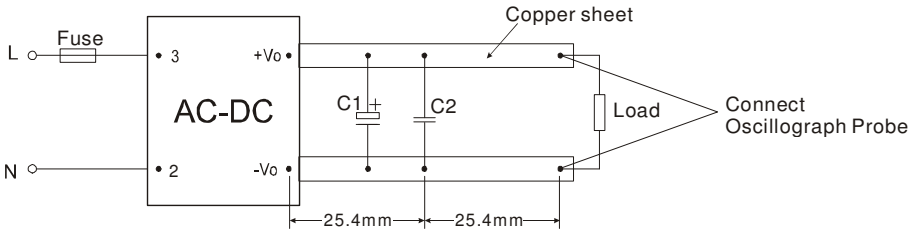


Remark:
1. Output filtering capacitors C1, C2 and C3 are electrolytic capacitors, It is recommended to use high frequency and low impedance electrolytic capacitors. For capacitance and current of capacitor please refer to manufacture's datasheet. Voltage derating of capacitor should be 80% or above. C2,C4,C6 are use to filter high frequency noise. TVS is recommended component to protect post-circuits (if converter fails).
2. External input NTC is recommended to use 5D-9 (Only PPM10 models and PPM15 models)

EXTERNAL CAPACITORS TYPICAL VALUE (µF)

MODEL	C1	C3
PPM05-A-05ZLF	120	120
PPM05-A-12ZLF	68	68
PPM05-A-15ZLF	47	47
PPM05-A-24ZLF	10	10
PPM10-B-05ZLF	220	220
PPM10-B-12ZLF	120	120
PPM10-B-15ZLF	47	47
PPM10-B-24ZLF	33	33
PPM15-C-05ZLF	470	470
PPM15-C-12ZLF	220	220
PPM15-C-15ZLF	120	120
PPM20-D-05ZLF	470	470
PPM20-D-12ZLF	120	120
PPM20-D-15ZLF	68	68

Parallel Lines Measure



Notes:

PPMxx-X-xxDLF

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- ✓ **Overload Protection**
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All specifications typical at Ta=25℃, nominal input voltage and full load unless otherwise specified

Input Specifications

Input Voltage Range	85 – 264 VAC **or** 120 – 370 VDC universal	
Input Frequency	47 – 63 Hz	
Input (Inrush) Current	110 VAC	230 VAC
PPM05 models	120mA (10A), typ.	70mA (20A), typ.
PPM10 models	230mA (10A), typ.	120mA (20A), typ.
PPM15 models	250mA (10A), typ.	140mA (20A), typ.
PPM20 models	330mA (16A), typ.	180mA (30A), typ.
External Input Fuse (recommended)		
PPM05 models	1A / 250V slow blow	
PPM10 / 15 models	2A / 250V slow blow	
PPM20 models	3.15A / 250V slow blow	

Output Specifications

Voltage Accuracy	±2% (main output)
Input variation	±0.5% (main output) ±1.5% (supplement output)
Load variation (10-100% Balance Load)	Vo1: ±3% ±Vo2: ±5%
Minimum load	10%
Ripple and Noise (20Mhz bandwidth)	≤ 100mV pk-pk (main output)
Short Circuit Protection	Continuous, auto recovery
Over Current Protection	≥ 110% Io
Over output voltage protection	
5VDC models	≤7.5VDC
12 / 15VDC models	≤20VDC
24VDC models	≤30VDC

PPMxx-X-xxDLF

Common Specifications

Temperature range	-25℃ to +70 ℃
Power derating	3.75% / ℃ (above 55℃)
Case temperature	+90℃ (max)
Storage	-25℃ to +105 ℃
Hold up Time	80mS, typ. (230VAC)
Humidity (non condensing)	85%, max.
Temperature Coefficient	0.02%/℃ (main output) 0.15%/℃ (supplement output)
Switching Frequency	150kHz, max.
I/O Isolation Voltage	3000VAC / 1min.
Leakage current	0.3mA RMS typ. (230VAC / 50Hz)
EMI / RFI conducted	EN55022, level B
EMC compliance	
ESD	IEC/EN 61000-4-2 level 3 6KV/8KV
RF	IEC/EN 61000-4-3
EFT / bursts	IEC/EN 61000-4-4 level 3 2KV
Surge	IEC/EN 61000-4-5 level 3 1KV / 2KV
Safety Standarts	IEC60950, EN60950, UL60950
Safety Approvals	EN60950, IEC60950, UL60950
Safety Class	CLASS 1
Case Material	UL94V-0 rated
Reliability Calculated MTBF (MIL-HDBK-217F)	> 300,000 hrs
Weight	50g (PPM05) 70g (PPM10) 80g (PPM15) 120g (PPM20)

Notes:

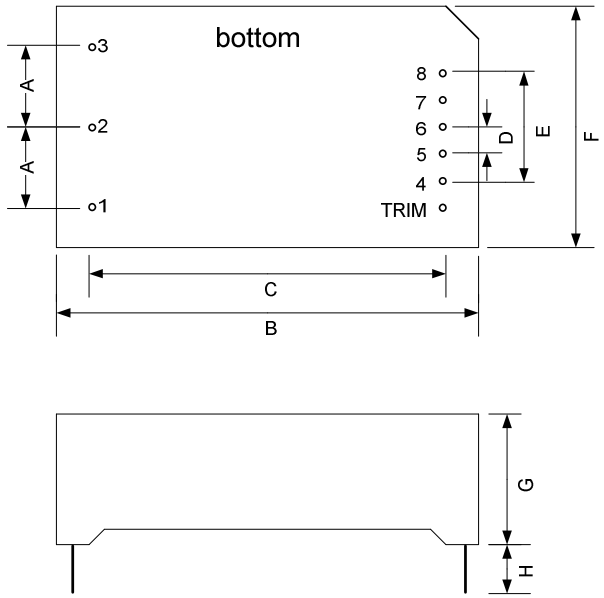
Selection Guide
Triple Output

Order #	Power (W)	Out1 / Out2 Voltage (VDC)	Out1 / Out2 Current Full Load (mA)	Efficiency (%)
TRIPLE OUTPUT				
PPM05-A-0505DLF	5	5 / ± 5	800 / ± 100	70
PPM05-A-0512DLF	5	5 / ± 12	600 / ± 100	73
PPM05-A-0515DLF	5	5 / ± 15	600 / ± 80	74
PPM05-A-0524DLF	5	5 / ± 24	600 / ± 50	75
PPM10-B-0512DLF	10	5 / ± 12	1000 / ± 200	75
PPM10-B-0515DLF	10	5 / ± 15	900 / ± 200	75
PPM15-C-0505DLF	15	5 / ± 5	2000 / ± 500	75
PPM15-C-0512DLF	15	5 / ± 12	2000 / ± 200	77
PPM15-C-0515DLF	15	5 / ± 15	1800 / ± 200	78
PPM15-C-0524DLF	15	5 / ± 24	2000 / ± 100	78
PPM20-D-0512DLF	20	5 / ± 12	2000 / ± 400	75
PPM20-D-0515DLF	20	5 / ± 15	2000 / ± 300	76
PPM20-D-0524DLF	20	5 / ± 24	2000 / ± 200	77

If you need other specifications, please enquire.

Notes:

Package / Pinning / Derating



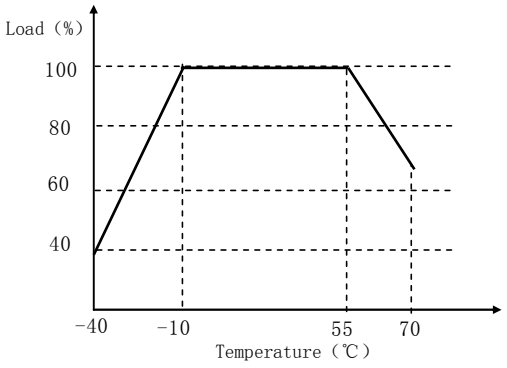
No.	PPM05-**A**
A	12.5
B	48.5
C	40.5
D	4.0
E	16.0
F	36.0
G	20.5
H	min. 6.0

No.	PPM10-**B**
A	17.5
B	55.0
C	47.0
D	5.0
E	20.0
F	45.0
G	20.5
H	min. 6.0

No.	PPM15-**C**
A	17.5
B	62.0
C	54.0
D	5.0
E	20.0
F	48.0
G	22.5
H	min. 6.0

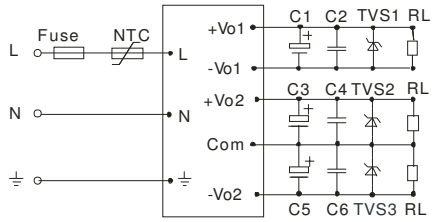
No.	PPM20-**D**
A	20.0
B	70.0
C	62.0
D	5.75
E	23.0
F	48.0
G	23.5
H	min. 6.0

PIN CONNECTIONS	
#	TRIPLE
1	Ground
2	AC (N)
3	AC (L)
4	- Vout 1
5	+Vout 1
6	- Vout 2
7	Common
8	+Vout 2
TRIM	No Pin



App Notes:

(Triple Output)



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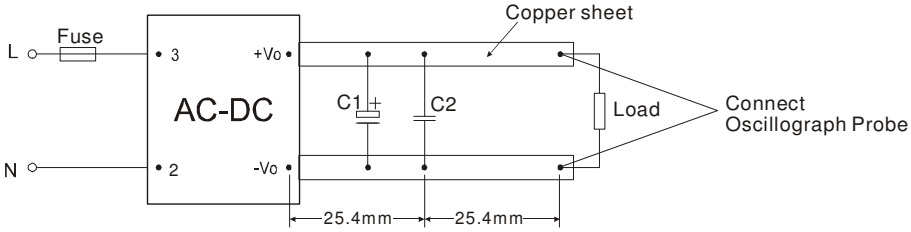
2. External input NTC is recommended to use 5D-9 (Only PPM10 models and PPM15 models)

EXTERNAL CAPACITORS TYPICAL VALUE (µF)

MODEL	C1	C3	C5
PPM05-A-0505DLF	220	22	22
PPM05-A-0512DLF	120	22	22
PPM05-A-0515DLF	120	22	22
PPM05-A-0524DLF	120	22	22
PPM10-B-0512DLF	220	68	68
PPM10-B-0515DLF	220	47	47
PPM15-C-0505DLF	470	220	220
PPM15-C-0512DLF	470	120	120
PPM15-C-0515DLF	470	120	120
PPM15-C-0524DLF	470	120	120
PPM20-D-0512DLF	330	120	120
PPM20-D-0515DLF	330	120	120
PPM20-D-0524DLF	330	47	47

Parallel Lines Measure



Notes:

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All specifications typical at Ta=25℃, nominal input voltage and full load unless otherwise specified

Input Specifications

Input Voltage Range	85 – 264 VAC **or** 120 – 370 VDC universal	
Input Frequency	47 – 63 Hz	
Input (Inrush) Current	110 VAC	230 VAC
PPM05 models	120mA (10A), typ.	70mA (20A), typ.
PPM10 models	230mA (10A), typ.	120mA (20A), typ.
PPM15 models	250mA (10A), typ.	140mA (20A), typ.
PPM20 models	330mA (16A), typ.	180mA (30A), typ.
External Input Fuse (recommended)		
PPM05 models	1A / 250V slow blow	
PPM10 / 15 models	2A / 250V slow blow	
PPM20 models	3.15A / 250V slow blow	

Output Specifications

Voltage Accuracy	±2% (main output)
Input variation	±0.5% (main output) ±1.5% (supplement output)
Load variation (10-100% balanced load)	Vo1: ±3% Vo2: ±5%
Minimum load	10%
Ripple and Noise (20Mhz bandwidth)	≤ 100mV pk-pk (main output)
Short Circuit Protection	Continuous, auto recovery
Over Current Protection	≥ 110% Io
Over output voltage protection	
5VDC models	≤7.5VDC
12 / 15VDC models	≤20VDC
24VDC models	≤30VDC

PPMxx-X-xxZSLF

Common Specifications

Temperature range	-25℃ to +70 ℃
Power derating	3.75% / ℃ (above 55℃)
Case temperature	+90℃ (max)
Storage	-25℃ to +105 ℃
Hold up Time	80mS, typ. (230VAC)
Humidity (non condensing)	85%, max.
Temperature Coefficient	0.02%/℃ (main output) 0.15%/℃ (supplement output)
Switching Frequency	150kHz, max.
I/O Isolation Voltage	3000VAC / 1min.
Leakage current	0.3mA RMS typ. (230VAC / 50Hz)
EMI / RFI conducted	EN55022, level B
EMC compliance	
ESD	IEC/EN 61000-4-2 level 3 6KV/8KV
RF	IEC/EN 61000-4-3
EFT / bursts	IEC/EN 61000-4-4 level 3 2KV
Surge	IEC/EN 61000-4-5 level 3 1KV / 2KV
Safety Standarts	IEC60950, EN60950, UL60950
Safety Approvals	EN60950, IEC60950, UL60950
Safety Class	CLASS 1
Case Material	UL94V-0 rated
Reliability Calculated MTBF (MIL-HDBK-217F)	> 300,000 hrs
Weight	50g (PPM05) 70g (PPM10) 80g (PPM15) 120g (PPM20)

Notes:

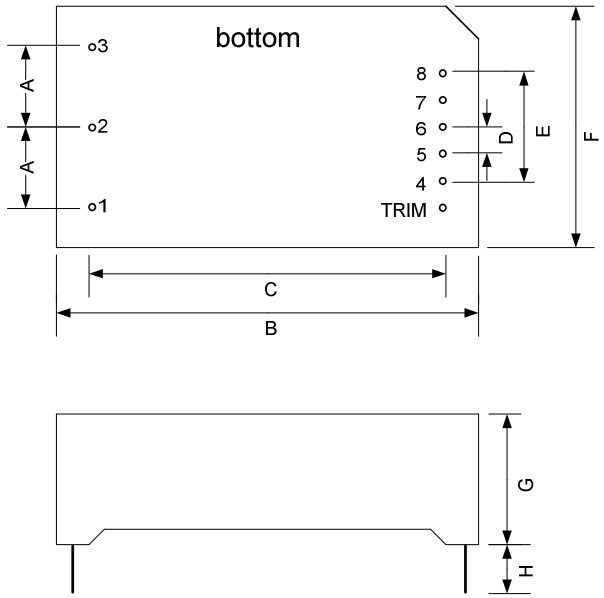
Selection Guide
Dual Separate Output

Order #	Power (W)	Out1 / Out2 Voltage (VDC)	Out1 / Out2 Current Full Load (mA)	Efficiency (%)
DUAL SEPARATE OUTPUT				
PPM05-A-0505ZSLF	5	5 / 5	900 / 100	71
PPM05-A-0512ZSLF	5	5 / 12	750 / 100	73
PPM05-A-0515ZSLF	5	5 / 15	700 / 100	73
PPM05-A-0524ZSLF	5	5 / 24	600 / 100	75
PPM10-B-0505ZSLF	10	5 / 5	1800 / 200	75
PPM10-B-0512ZSLF	10	5 / 12	1500 / 200	79
PPM10-B-0515ZSLF	10	5 / 15	1400 / 200	79
PPM10-B-0524ZSLF	10	5 / 24	1000 / 200	81
PPM15-C-0505ZSLF	15	5 / 5	2200 / 800	76
PPM15-C-0512ZSLF	15	5 / 12	2000 / 400	80
PPM15-C-0515ZSLF	15	5 / 15	2000 / 300	80
PPM15-C-0524ZSLF	15	5 / 24	2000 / 200	81
PPM20-D-0512ZSLF	20	5 / 12	2500 / 600	75
PPM20-D-0524ZSLF	20	5 / 24	2500 / 300	77

If you need other specifications, please enquire.

Notes:

Package / Pinning / Derating



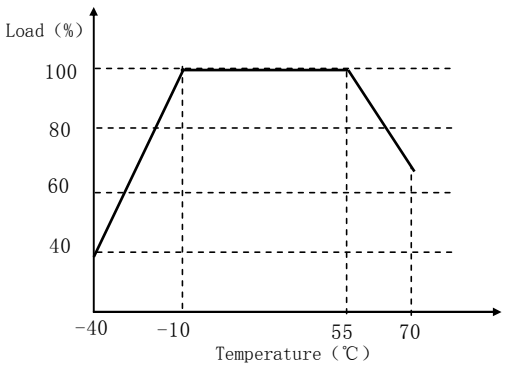
No.	PPM05-**A**
A	12.5
B	48.5
C	40.5
D	4.0
E	16.0
F	36.0
G	20.5
H	min. 6.0

No.	PPM10-**B**
A	17.5
B	55.0
C	47.0
D	5.0
E	20.0
F	45.0
G	20.5
H	min. 6.0

No.	PPM15-**C**
A	17.5
B	62.0
C	54.0
D	5.0
E	20.0
F	48.0
G	22.5
H	min. 6.0

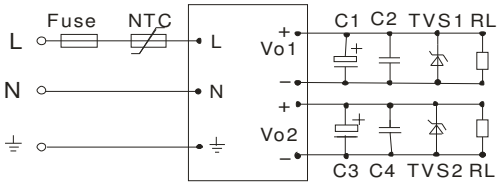
No.	PPM20-**D**
A	20.0
B	70.0
C	62.0
D	5.75
E	23.0
F	48.0
G	23.5
H	min. 6.0

PIN CONNECTIONS	
#	DUAL SEP
1	Ground
2	AC (N)
3	AC (L)
4	- Vout 1
5	+Vout 1
6	No Pin
7	- Vout 2
8	+Vout 2
TRIM	No Pin



App Notes:

(Dual Separate Output)

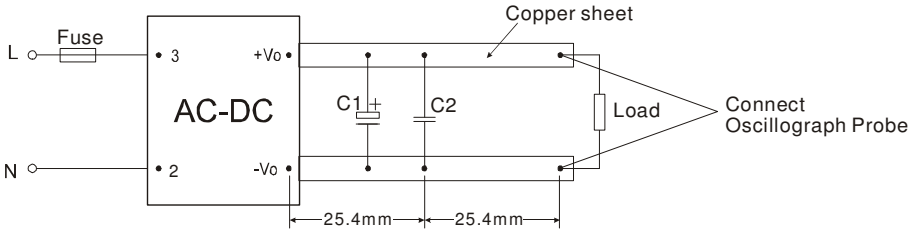


Remark:
1. Output filtering capacitors C1, C2 and C3 are electrolytic capacitors, It is recommended to use high frequency and low impedance electrolytic capacitors. For capacitance and current of capacitor please refer to manufacture's datasheet. Voltage derating of capacitor should be 80% or above. C2,C4,C6 are use to filter high frequency noise. TVS is recommended component to protect post-circuits (if converter fails).
2. External input NTC is recommended to use 5D-9 (Only PPM10 models and PPM15 models)

EXTERNAL CAPACITORS TYPICAL VALUE (µF)

MODEL	C1	C3
PPM05-A-0505ZSLF	220	22
PPM05-A-0512ZSLF	220	22
PPM05-A-0515ZSLF	120	22
PPM05-A-0524ZSLF	120	22
PPM10-B-0505ZSLF	220	68
PPM10-B-0512ZSLF	220	68
PPM10-B-0515ZSLF	220	47
PPM10-B-0524ZSLF	220	47
PPM15-C-0505ZSLF	470	470
PPM15-C-0512ZSLF	470	220
PPM15-C-0515ZSLF	470	120
PPM15-C-0524ZSLF	470	47
PPM20-D-0512ZSLF	330	220
PPM20-D-0524ZSLF	330	120

Parallel Lines Measure



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PPM-Series **PPM05-E-xxELF** **5 W AC/DC CONVERTER SINGLE OUTPUT**

Input Specifications

Input voltage range	85- 264 VAC, 110- 370 VDC
Input frequency	47- 440 Hz
Input current	110 VAC 230 VAC 110mA , typ. 70mA , typ.
Inrush current	110 VAC 230 VAC 10A, typ. 20A, typ.
External input fuse(recommended)	1A/250V slow blow

Output Specifications

Voltage set accuracy		± 2%, typ. (± 3% at 3.3 Vout)
Input variation		± 0.5%, typ.
Load variation (10-100%)		± 1%, typ.
Ripple& noise (p-p)	20MHz Bandwidth	30mV, typ.
Short circuit protection		Continuous, and auto resume
Over temperature protection		150℃, max.
Over output voltage protection		Diode clamp and chip lock up

General Specifications

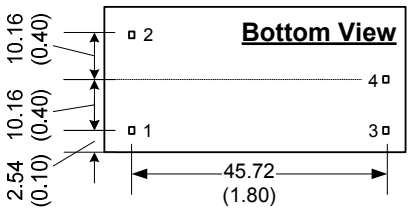
Temperature ranges		
	Operating :	-25℃ to +70℃
	Power derating above 55℃:	2% / ℃
	Storage:	-40℃ to +105℃
	Case temperature:	+95℃ max
Weight		~ 35g
Hold-up time	(Vin=230VAC)	50ms(typ.)
Humidity		95%(max)
Temperature coefficient		0.02% /℃
Switching frequency		100kHz, typ.
Efficiency		See table
I/O-isolation voltage		4000 VAC / 1Min
Leakage current		None
EMI/RFI conducted		EN55011, level A
EMC compliance	ESD	IEC/EN 61000-4-2 level 4 8kV/15kV
	RF	IEC/EN 61000-4-3
	Surge*	IEC/EN 61000-4-4 level 4 4kV
	Surge*	IEC/EN 61000-4-5 level 4 2kV/4kV
Case material		UL 94V-0 rated
Install		PCB
MTBF		>200,000h @25℃
RoHS compliant		Soldering 260℃ / max. 10 sec.

Examples of Partnumbers/Modelcode

PART NO.	Power (Watt)	OUTPUT (Volt)	RIPPLE AND NOISE (typ..)	EFFICIENCY (% min.)
PPM05-E-3.3ELF	4.2	3.3V / 1250mA	30mV	66
PPM05-E-05ELF	5	5V / 1000mA	30mV	72
PPM05-E-09ELF	5	9V / 550mA	30mV	74
PPM05-E-12ELF	5	12V / 420mA	30mV	76
PPM05-E-15ELF	5	15V / 333mA	30mV	76
PPM05-E-24ELF	5.5	24V / 230mA	30mV	78

Other specifications please enquire.

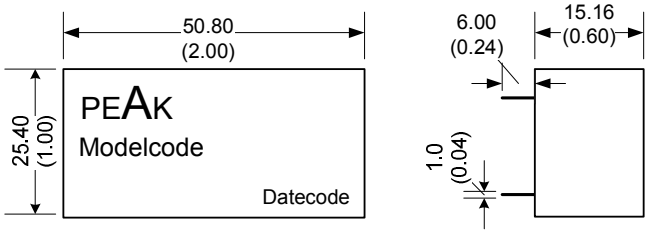
Dimensions / Pinning



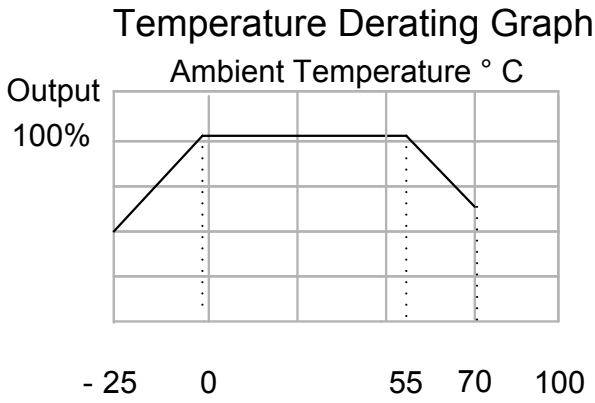
All dimensions are typical in millimeters (inches).
- Pin diameter: 0.5 +/-0.05 (0.02 +/-0.002)
- Pin pitch tolerance: +/-0.35 (+/-0.014)
- Case tolerance +/-0.5 (+/-0.02)

Specification may change without notice.

2" x 1" – PLASTIC CASE

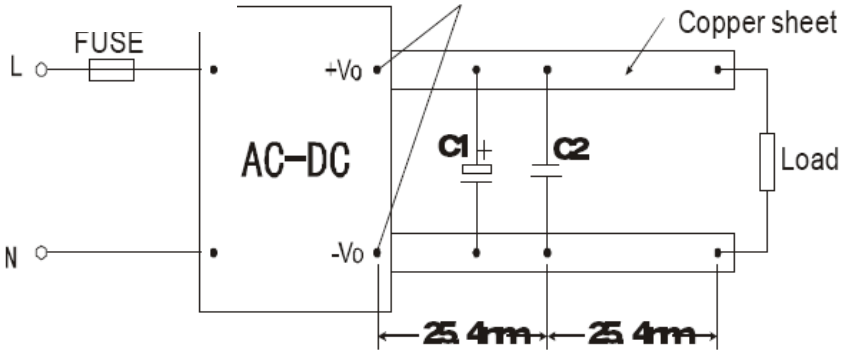


PINNING PPM05-E-xxELF	
#	*Single out*
1	AC (N)
2	AC (L)
3	+V Output
4	- V Output

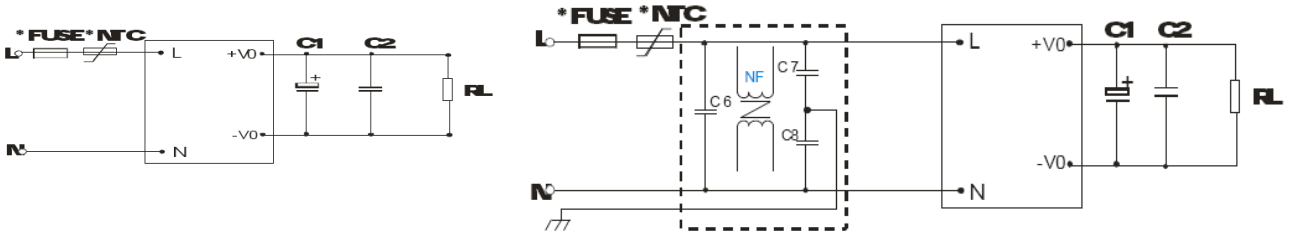


App Notes

Measure



Typical Applications PPM-Series



External Typical Value

Model	C1	C2
PPM05-E-3.3ELF	47	0.1
PPM05-E-05ELF	47	0.1
PPM05-E-09ELF	33	0.1
PPM05-E-12ELF	33	0.1
PPM05-E-15ELF	33	0.1
PPM05-E-24ELF	10	0.1

Note

- Output filtering capacitors C1, C3 is electrolytic capacitors, it is recommended to use high frequency and low impedance electrolytic capacitors. For capacitance and current of capacitor please refer to manufacture's datasheet. Voltage derating of capacitor should be 80% or above. C2 is ceramic capacitor, it is used to filter high frequency noise. TVS is a recommended component to protect post-circuits (when converter fails).
- It is recommended to connect FUSE, the parameter for PPM05 models is 1A/250V slow blow. External input NTC is recommended to use 5D-14 or 10Ω/2W wire-round resistor.
- If EMC performance is required, recommended to add "EMC filter" at the input end
C6:X capacitor, recommended parameter 0.1uF/275V;
C7,C8:Y capacitor, recommended parameter 220pF/2000V;
NF: common model choke, recommended inductance is about 10mH-30mH.

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PPM-Series **PPM10-F-xxELF** **10 W AC/DC CONVERTER SINGLE OUTPUT**

Input Specifications

Input voltage range	85- 264 VAC, 120- 370 VDC
Input frequency	47- 440 Hz
Input current	110 VAC 230 VAC 230mA , typ. 150mA , typ.
Inrush current	110 VAC 230 VAC 10A, typ. 20A, typ.
External input fuse(recommended)	2A/250V slow blow

Output Specifications

Voltage set accuracy		± 2%, typ. (± 3% at 3.3 Vout)
Input variation		± 0.5%, typ.
Load variation (10-100%)		± 1%, typ.
Ripple& noise (p-p)	20MHz Bandwidth	50mV, typ.
Short circuit protection		Continuous, and auto resume
Over current protection		>110% Io

General Specifications

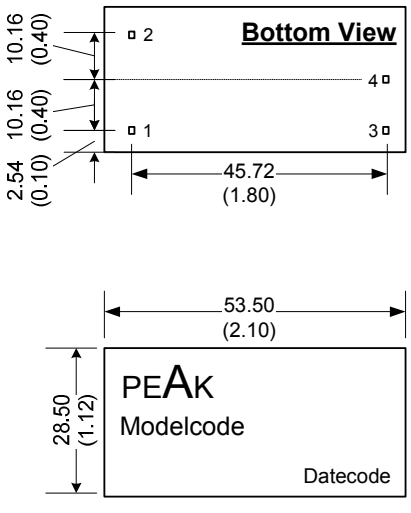
Temperature ranges		
	Operating :	-25℃ to +70℃
	Power derating above 55℃:	2% / ℃
	Storage:	-40℃ to +105℃
	Case temperature:	+95℃ max
Weight		~ 50g
Hold-up time	(Vin=230VAC)	50ms(typ.)
Humidity		95%(max)
Temperature coefficient		0.02% /℃
Switching frequency		60kHz, typ.
Efficiency		See table
I/O-isolation voltage		4000 VAC / 1Min
Leakage current		0.1mA, typ.
EMI/RFI conducted		EN55011, level B
EMC compliance	ESD	IEC/EN 61000-4-2 level 4 8kV/15kV
	RF	IEC/EN 61000-4-3
	*Electrical fast transients/burst on mainsline	IEC/EN 61000-4-4 level 4 4kV
	*Surge	IEC/EN 61000-4-5 level 4 2kV/4kV
Safety standards		IEC60601, EN60601, UL60950
Safety approvals		EN60601, UL60950
Safety class		Class II
Case material		UL 94V-0 rated
Install		PCB
MTBF		>200,000h @25℃
RoHS compliant		Soldering 260℃ / max. 10 sec.

Examples of Partnumbers/Modelcode

PART NO.	Power (Watt)	OUTPUT (Volt)	RIPPLE AND NOISE (typ..)	EFFICIENCY (% min.)
PPM10-F-3.3ELF	6.6	3.3V / 2000mA	50mV	70
PPM10-F-05ELF	10	5V / 2000mA	50mV	74
PPM10-F-09ELF	10	9V / 1100mA	50mV	76
PPM10-F-12ELF	10	12V / 900mA	50mV	76
PPM10-F-15ELF	10	15V / 700mA	50mV	78
PPM10-F-24ELF	10	24V / 450mA	50mV	80

Other specifications please enquire.

Dimensions / Pinning

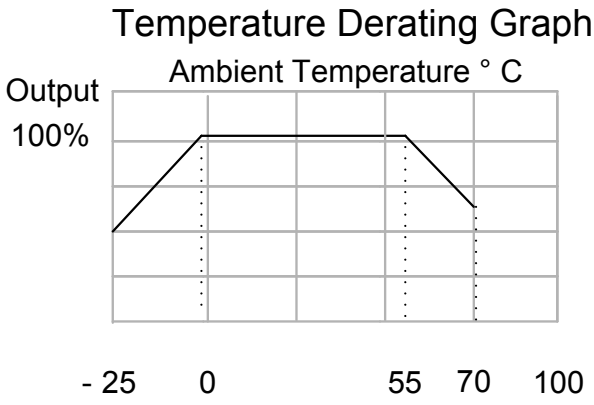


All dimensions are typical in millimeters (inches).
- Pin diameter: 1.0 +/-0.10 (0.04 +/-0.004)
- Pin pitch tolerance: +/-0.35 (+/-0.014)
- Case tolerance +/-0.5 (+/-0.02)

Specification may change without notice.

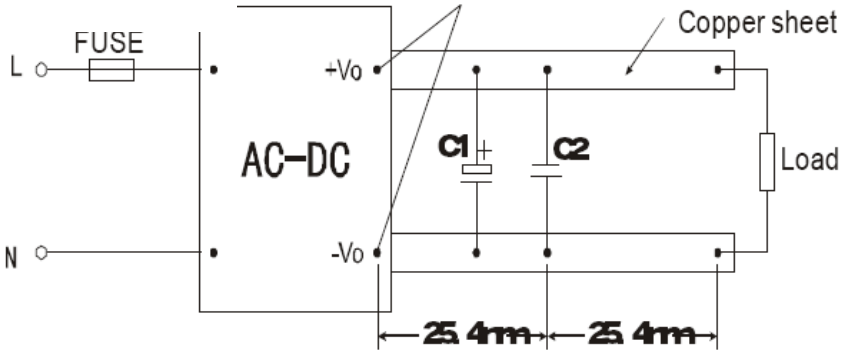
2" x 1" – PLASTIC CASE

PINNING PPM05-E-xxELF	
#	*Single out*
1	AC (N)
2	AC (L)
3	+V Output
4	- V Output



App Notes

Measure



Typical Applications PPM-Series

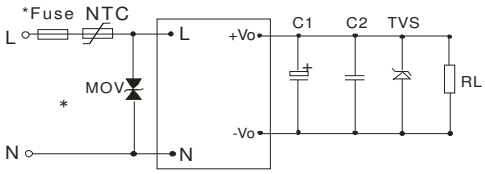


Figure 1

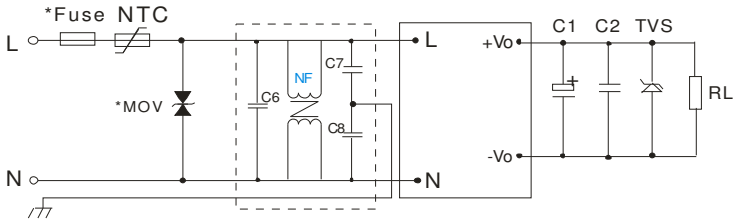


Figure 2

External Typical Value

Model	C1	C2	TVS
PPM10-F-3.3ELF	220µF/10V	0.1µF/50V	P6KE6.8A
PPM10-F-05ELF	220µF/10V	0.1µF/50V	P6KE6.8A
PPM10-F-09ELF	120µF/25V	0.1µF/50V	P6KE12A
PPM10-F-12ELF	120µF/25V	0.1µF/50V	P6KE20A
PPM10-F-15ELF	120µF/25V	0.1µF/50V	P6KE20A
PPM10-F-24ELF	68µF/35V	0.1µF/50V	P6KE30A

Note

1.Output filtering capacitors C1 is electrolytic capacitors. It is recommended to use high frequency and low impedance electrolytic capacitors. For capacitance and current of capacitor, please refer to manufacture's datasheet. Voltage derating of capacitor should be 80% or above. C2 is ceramic capacitor - it is used to filter high frequency noise. TVS is a recommended component to protect post-circuits (if converter fails).

2. MOV is required for PPM10-F-xxELF models. Model 471KD05 is used to protect the device under surge.

3. It is recommended to connect FUSE (2A/250V slow blow). External input NTC model is recommended to use (5D-9).

4. If common requirement to EMC performance, refer to figure 1, if higher requirement to EMC performance, refer to figure 2.

C6:X capacitor, recommended parameter 0.1uF/275V;

C7,C8:Y capacitor, recommended parameter 2200pF/400V;

NF: common model choke, recommended inductance is about 10mH-30mH.