

## **LINEAR ENCAPSULATED AC-DC POWER MODULES** **REGULATED, 5VDC-250VDC, PC CARD OR CHASSIS MOUNT** *EXTRA LOW NOISE, 2 MOPP MEDICAL APPLICATIONS*



### **FEATURES**

- 4000VAC Reinforced Insulation
- Meets IEC 60601-1 3<sup>rd</sup> Edition
- 2 MOPP
- 2 $\mu$ A Patient Leakage Current
- CE Certified
- Regulation Line and Load 0.02% to 0.2%
- Short Circuit Protection
- Single, Dual and Triple Outputs
- International Input Voltages Available Including Dual/Switchable Input Voltages
- Very Low RMS Output Noise (See Selection Guide)
- Optional Wide Operating Temperature Range
- Built for In-Device Operation
- Packages Available: PC Mount, Chassis Mount with Screw Terminals

## MEDICAL APPLICATIONS: P3/MHIA, P5/MHIA SERIES

**SELECTION GUIDE (SINGLE)** All specifications are typical at nominal input, full load and 25°C, unless otherwise noted.

Output (Vdc)	Output Current (mA)	Regulation (%)		Ripple & Noise (mV rms)	Case	Model Number	Slow Blow (A)
		Line	Load				
5	200	0.20	0.20	1.0	G, 1GT	P34-5SM/MHIA	1/32
	500	0.20	0.20	0.5	A, 1AT	P37/MHIA	1/16
	500	0.02	0.05	0.5	A, 1AT	P37-1/MHIA	1/16
	1000	0.20	0.20	1.0	B, 1BT	P38/MHIA	1/8
	1000	0.02	0.05	1.0	B, 1BT	P38-1/MHIA	1/8
	1000	0.02	0.05	0.5	C, 1CT	P38/1.56/MHIA	1/8
	2000	0.02	0.10	1.0	C, 1CT	P39/MHIA	1/4
	3000	0.02	0.15	1.0	D, 1DT	P39-3/MHIA	3/8
10	120	0.10	0.10	1.0	E, 1ET	P33-10SM/MHIA	1/32
	150	0.10	0.10	1.0	A, 1AT	P33-10S/MHIA	1/16
	250	0.10	0.10	1.0	B, 1BT	P34-10S/MHIA	1/16
	500	0.02	0.05	0.5	C, 1CT	P37-10S/MHIA	1/8
	1000	0.02	0.05	0.5	D, 1DT	P38-10S/MHIA	3/8
	1500	0.02	0.05	0.5	D, 1DT	P38-10SA/MHIA	1/4
12	100	0.10	0.10	1.0	E, 1ET	P32-12SM/MHIA	1/32
	120	0.02	0.10	1.0	A, 1AT	P33-12S/MHIA	1/16
	200	0.10	0.10	1.0	B, 1BT	P34-12S/MHIA	1/16
	500	0.02	0.10	0.5	C, 1CT	P37-12S/MHIA	1/5
	1000	0.10	0.10	1.0	D, 1DT	P38-12S/MHIA	3/10
15	80	0.10	0.10	1.0	E, 1ET	P33-15SM/MHIA	1/32
	120	0.02	0.10	1.0	A, 1AT	P33-12S/MHIA	1/16
	200	0.10	0.10	1.0	B, 1BT	P34-15S/MHIA	1/10
	300	0.10	0.10	1.0	C, 1CT	P35-15S/MHIA	1/8
	500	0.02	0.10	0.5	C, 1CT	P37-15S/MHIA	1/5
	800	0.02	0.10	1.0	D, 1DT	P38-15S/MHIA	3/10
18	50	0.10	0.10	1.0	E, 1ET	P32-18SM/MHIA	1/32
	50	0.02	0.05	1.0	A, 1AT	P32-18S/MHIA	1/32
	100	0.02	0.05	1.0	B, 1BT	P33-18S/MHIA	1/16
24	50	0.10	0.10	1.0	E, 1ET	P32-24SM/MHIA	1/32
	100	0.10	0.10	1.0	A, 1AT	P33-24S/MHIA	1/16
	200	0.10	0.10	1.0	B, 1BT	P34-24S/MHIA	1/8
	300	0.10	0.10	1.0	C, 1CT	P35-24S/MHIA	1/5
	500	0.10	0.10	1.0	D, 1DT	P37-24S/MHIA	1/4
	800	0.10	0.10	1.0	H, 1HT	P38-24S/MHIA	3/8
48	1000	0.10	0.10	1.0	H, 1HT	P39-24S/MHIA	1/2
	50	0.20	0.20	2.0	B, 1BT	P32-48S/MHIA	1/16
	100	0.20	0.20	2.0	B, 1BT	P33-48S/MHIA	1/8
	200	0.20	0.20	2.0	C, 1CT	P34-48S/MHIA	1/4
	50	0.05	0.20	2.0	B, 1BT	P32-50S/MHIA	1/16
50	100	0.05	0.20	2.0	B, 1BT	P33-50S/MHIA	1/8
	200	0.05	0.20	2.0	C, 1CT	P34-50S/MHIA	1/4
	300	0.20	0.20	3.0	D, 1DT	P35-50S/MHIA	3/8
	35	0.05	0.20	2.0	B, 1BT	P32-75S/MHIA	1/10
75	70	0.05	0.20	2.0	B, 1BT	P33-75S/MHIA	1/5
	150	0.05	0.20	2.0	C, 1CT	P34-75S/MHIA	3/10
	200	0.10	0.20	3.0	D, 1DT	P35-75S/MHIA	3/8
	25	0.05	0.20	2.0	B, 1BT	P32-100S/MHIA	1/16
100	50	0.05	0.20	2.0	B, 1BT	P33-100S/MHIA	1/8
	100	0.05	0.20	3.0	C, 1CT	P34-100S/MHIA	1/4
	150	0.10	0.20	3.0	D, 3DT	P35-100S/MHIA	3/8
	17	0.05	0.20	2.0	A, 1AT	P32-150S/MHIA	1/16
150	35	0.05	0.20	3.0	B, 1BT	P33-150S/MHIA	2/10
	70	0.05	0.20	3.0	C, 1CT	P34-150S/MHIA	1/4
	100	0.20	0.20	3.0	D, 1DT	P35-150S/MHIA	3/8
	15	0.05	0.20	3.0	B, 1BT	P32-180S/MHIA	1/16
180	30	0.05	0.20	3.0	B, 1BT	P33-180S/MHIA	1/5
	55	0.05	0.20	3.0	C, 1CT	P34-180S/MHIA	1/4
	80	0.10	0.20	3.0	D, 1DT	P35-180S/MHIA	3/8
	12	0.05	0.20	3.0	B, 1BT	P32-200S/MHIA	1/16
200	25	0.05	0.20	3.0	B, 1BT	P33-200S/MHIA	1/8
	50	0.05	0.20	3.0	C, 1CT	P34-200S/MHIA	1/4
	75	0.10	0.20	3.0	D, 1DT	P35-200S/MHIA	3/8
	10	0.05	0.20	3.0	B, 1BT	P32-250S/MHIA	1/16
250	20	0.05	0.20	3.0	B, 1BT	P33-250S/MHIA	1/8
	40	0.05	0.20	3.0	C, 1CT	P34-250S/MHIA	1/4
	60	0.10	0.20	3.0	D, 1DT	P35-250S/MHIA	3/8

## MEDICAL APPLICATIONS: P3/MHIA, P5/MHIA SERIES

### SELECTION GUIDE (DUAL) All specifications are typical at nominal input, full load and 25°C, unless otherwise noted.

Output (Vdc)	Output Current (mA)	Regulation (%)		Ripple & Noise (mV rms)	Case	Model Number	Slow Blow (A)
		Line	Load				
±5	±50	0.02	0.02	1.0	A, 2AT	P32-5/MHIA	1/32
	±100	0.10	0.10	1.0	A, 2AT	P33-5/MHIA	1/32
	±200	0.10	0.10	1.0	B, 2BT	P34-5/MHIA	1/16
	±300	0.02	0.05	0.5	C, 2CT	P35-5/MHIA	1/10
	±500	0.02	0.05	0.5	C, 2CT	P37-5/MHIA	1/8
	±1000	0.01	0.10	1.0	D, 2DT	P38-5/MHIA	1/4
±8	±500	0.10	0.10	2.0	D, 2DT	P37-8/MHIA	1/5
±10	±100	0.02	0.05	8.0	A, 2AT	P33-10/MHIA	1/16
±12	±25	0.10	0.10	2.0	G, 1GT	P31-12M/MHIA	1/32
	±25	0.02	0.05	0.5	A, 2AT	P31-12/MHIA	1/32
	±50	0.02	0.05	0.5	A, 2AT	P32-12/MHIA	1/32
	±100	0.10	0.10	1.0	A, 2AT	P33-12/MHIA	1/16
	±200	0.10	0.10	1.0	B, 2BT	P34-12/MHIA	1/8
	±300	0.10	0.10	1.0	C, 2CT	P35-12/MHIA	1/5
	±500	0.10	0.10	1.0	D, 2DT	P37-12/MHIA	3/10
	±800	0.10	0.10	1.0	D, 2DT	P38-12/MHIA	2/5
	±25	0.10	0.10	2.0	G, 1GT	P31-M/MHIA	1/32
	±25	0.20	0.20	1.0	A, 2AT	P31/MHIA	1/32
±15	±25	0.02	0.02	0.5	A, 2AT	P31-1/MHIA	1/32
	±50	0.20	0.20	1.0	A, 2AT	P32/MHIA	1/16
	±50	0.02	0.02	0.5	A, 2AT	P32-1/MHIA	1/16
	±100	0.20	0.20	1.0	A, 2AT	P33/MHIA	1/10
	±100	0.02	0.02	1.0	A, 2AT	P33-1/MHIA	1/10
	±200	0.20	0.20	1.0	B, 2BT	P34/MHIA	1/5
	±200	0.02	0.05	1.0	B, 2BT	P34-1/MHIA	1/5
	±350	0.20	0.20	1.0	C, 2CT	P35/MHIA	1/4
	±350	0.02	0.05	1.0	C, 2CT	P35-1/MHIA	1/4
	±500	0.10	0.10	1.0	D, 2DT	P37-15/MHIA	3/8
±18	±800	0.10	0.10	1.0	D, 2DT	P38-15/MHIA	1/2
	±50	0.10	0.10	1.0	A, 2AT	P32-18/MHIA	1/16
	±100	0.10	0.10	1.0	B, 2BT	P33-18/MHIA	1/10
±24	±50	0.10	0.10	1.0	B, 2BT	P32-24/MHIA	1/16
	±100	0.10	0.20	1.0	B, 2BT	P33-24/MHIA	1/8
	±200	0.10	0.20	1.0	C, 2CT	P34-24/MHIA	1/4

### SELECTION GUIDE (TRIPLE) All specifications are typical at nominal input, full load and 25°C, unless otherwise noted.

Output (Vdc)	Output Current (mA)	Regulation (%)		Ripple & Noise (mV rms)	Case	Model Number	Slow Blow (A)
		Line	Load				
5/±12	250/±60	0.02	0.10	1.0	C, 3CT	P51-12/MHIA	1/10
	250/±120	0.02	0.10	1.0	C, 3CT	P52-12/MHIA	1/10
	300/±180	0.02	0.10	1.0	C, 3CT	P53-12L/MHIA	1/5
	500/±120	0.02	0.10	1.0	C, 3CT	P53-12/MHIA	1/5
	1000/±150	0.02	0.10	1.0	D,3DT	P53-1280/MHIA	1/4
5/±15	250/±50	0.02	0.10	1.0	C, 3CT	P51-15/MHIA	1/10
	250/±100	0.02	0.10	1.0	C, 3CT	P52-15/MHIA	1/10
	300/±150	0.02	0.10	1.0	C, 3CT	P53-15L/MHIA	1/5
	500/±100	0.02	0.10	1.0	C, 3CT	P53-15/MHIA	1/5
	1000/±150	0.02	0.10	1.0	D, 3DT	P53-1580/MHIA	1/4

**Note:**

- Case style ending with letter "T" (Chassis mounted units with terminal barrier strip) are designated by the suffix "T". Case styles A,B,C,D,G and E (PC card mounting) do not require suffixing.
- Most competitors pinouts available--contact factory.
- For 400HZ, use suffix "04" after model number.
- For wide operating temperature range, use "W" suffix after model number.

**CAUTION:** This power module is not internally fused. An input line fuse must always be used.

## MEDICAL APPLICATIONS: P3/MHIA, P5/MHIA SERIES

### Input Specifications

Input voltage range, Vac	105-125	50-60Hz
		400Hz available
	See chart on pg. 5	
	International and dual input voltages available.	
Output voltage regulation point, Vac	90	
Maximum operating voltage, Vac	130	
Start up time, ms	Instantaneous	
Input surge voltage, Vdc	1000	

### Output Specifications

Output power, Watts	Varies by unit	
Voltage accuracy, %	±1	@ FL for Singles
Line regulation, %	±0.2	Single Output
Load regulation, %	±0.2	Single Output
Ripple and noise, mV RMS	1 Typ.	
Temperature coefficient, %/°C	±0.02 Typ.	
Transient response recovery time, µs	0.02	
Over voltage protection, V	5	Standard
	5.75	Maximum
	Other	Specify OVP on part number
Output current, %	130	
Protection	Short circuit protection	

### General Specifications

Leakage current, µA	2		
Isolation voltage, Vac	4000	Input/Output	
Isolation resistance, Mohms	50		
Operating frequency, hz	50-60		
	400 available		
Clearance/creepage	2 MOPP		
Design meet safety standard	UL 60601-1 3rd Edition, 2 MOPP, CE		

### Environmental Specifications

Operating temperature range, °C		-25 Min.	+71 Max.
	Optional	-40 Min.	+85 Max.
Storage temperature range, °C		-25 Min.	+85 Max.
Cooling	Free Air Convection		
Relative humidity, %	Non-condensing		99

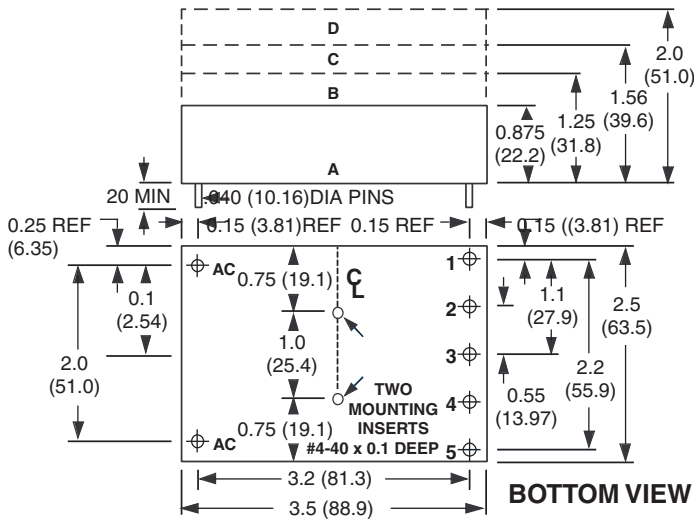
### Physical Specifications

Case material	Phenolic plastic
Base material	Fr-4
Potting material	Silicon, UL 94VO QMF22
Weight	Varies by unit, call factory
Dimensions	See pages 5-6
MTBF, Hrs.	200,000

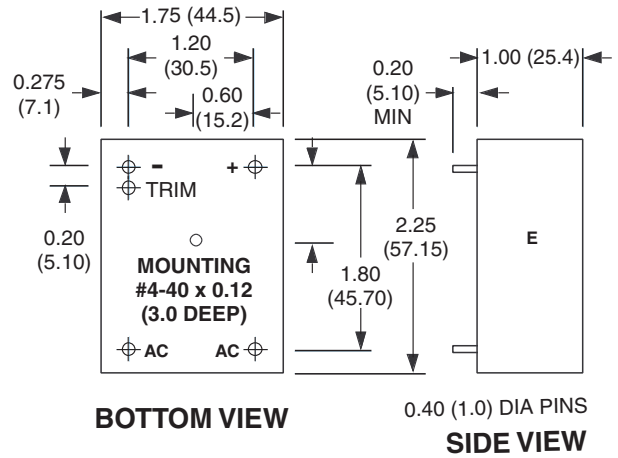
**MEDICAL APPLICATIONS: P3/MHIA, P5/MHIA SERIES**

**Mechanical Drawing**

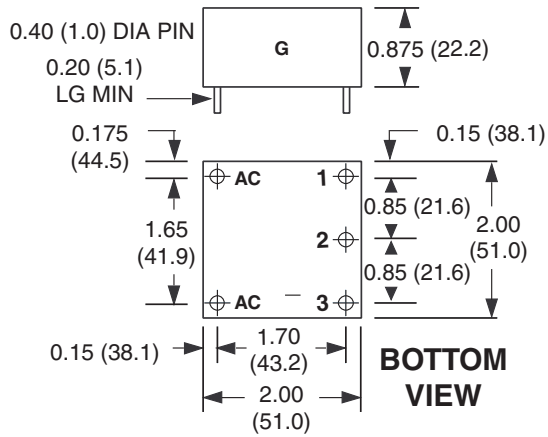
**Case A, B, C, D**



**Case E**



**Case G**



**P34-5SM: ① + 5VDC ② and ③ COM**  
**P31-M + P31-12M: ① - 15VDC ② COM**  
**③ + 15VDC**

- All dimensions in inch (mm)
- Most competitors pinouts available- contact factory

**I/O CONNECTIONS**

PIN	SINGLE	DUAL	TRIPLE
1	-Vdc*	-Vdc*	Com (5)
2	No Pin	No Pin	+5Vdc
3	Com*	Com*	-12/-15
4	No Pin	No Pin	CMN (12/15)
5	+Vdc	+Vdc	+12/+15

\* Vdc internally connected to COM for single output units

**OPTIONS**

INPUT VOLTAGE	SUFFIX
220Vac	X
230Vac	XA
240Vac	XE
100Vac	Q
100/220Vac	QX
115/220	AX

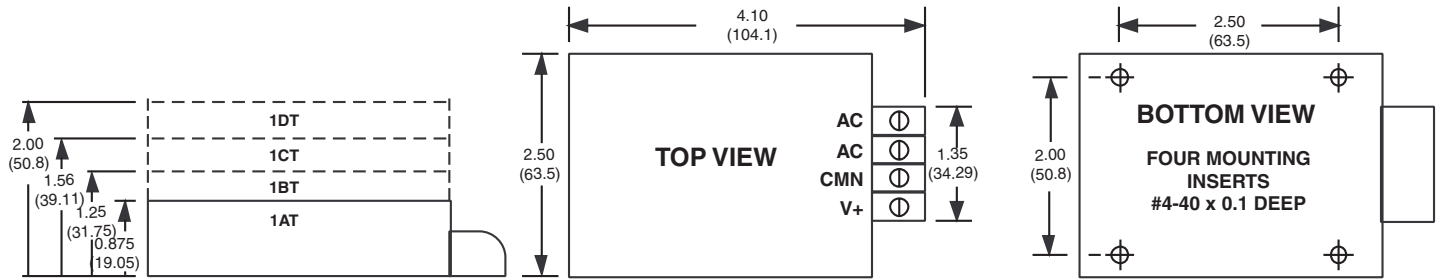
**OPTIONS AVAILABLE**

Alternate Pin-Out	22
Chassis mounting with terminal barrier strip (case styles ending with letter "T")	T
Finger Safe Chassis Mount Terminal Barrier Strip	FST
Wide Operating Temperature Range	W
400Hz	04

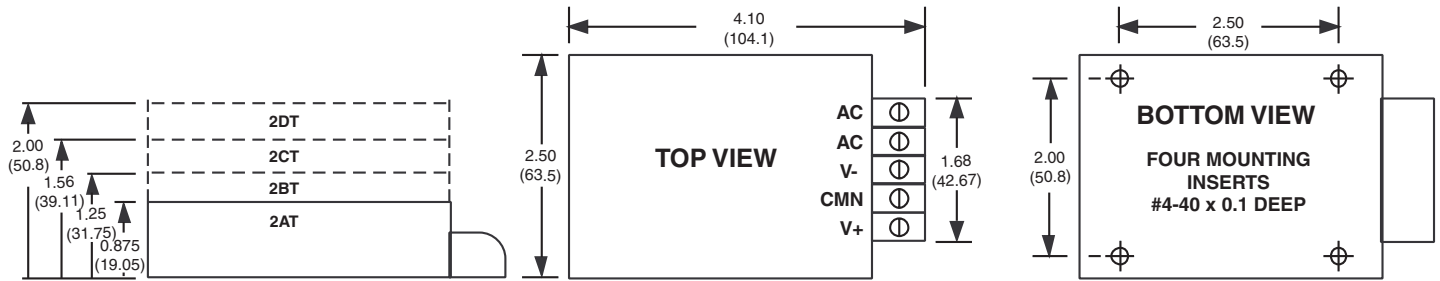
**MEDICAL APPLICATIONS: P3/MHIA, P5/MHIA SERIES**

**Power Supply Options (Chassis)**

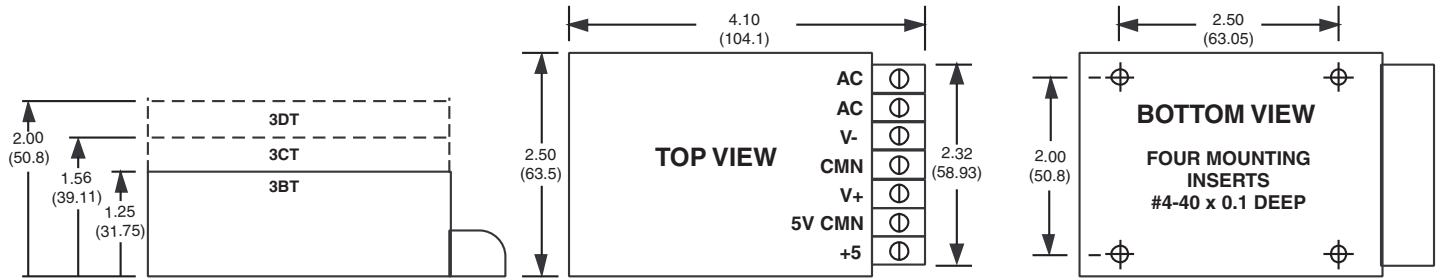
**Single Output**



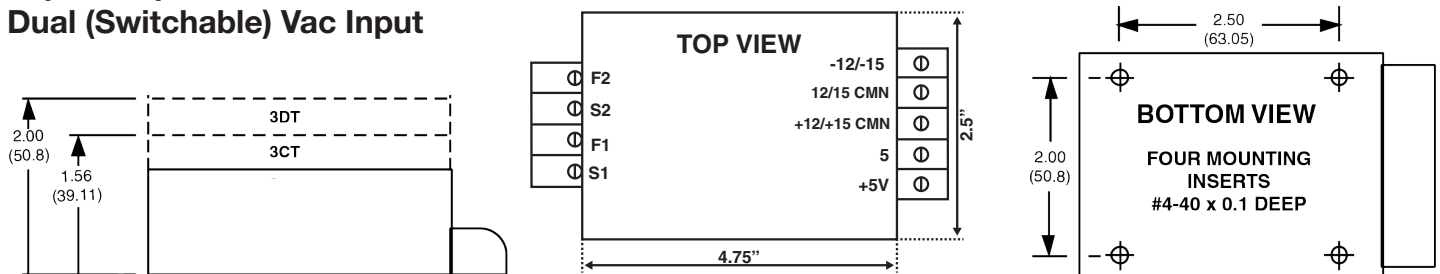
**Dual Output**



**Triple Output**



**Triple Output  
Dual (Switchable) Vac Input**

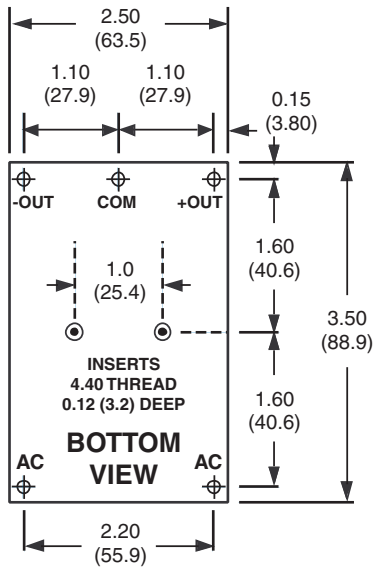


1. All dimensions in inch (mm)

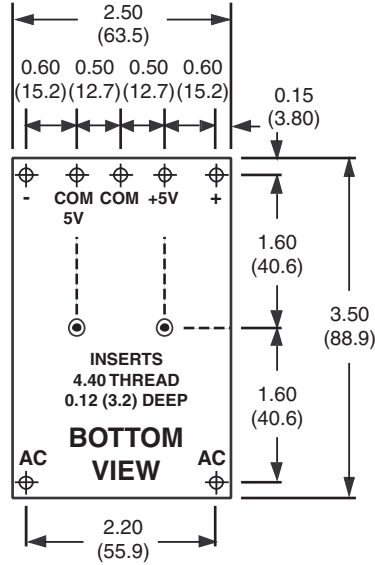
**MEDICAL APPLICATIONS: P3/MHIA, P5/MHIA SERIES**

**Power Supply Options (Alternate Pin-Out)**

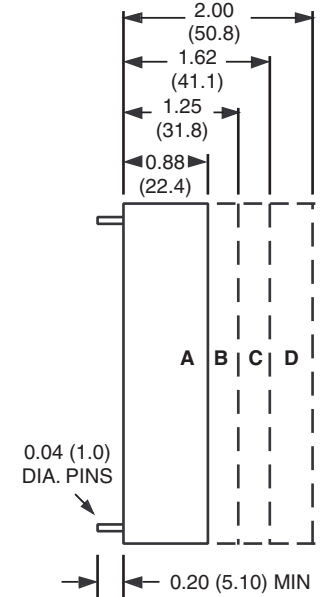
**Single and Dual Output**



**Triple Output**



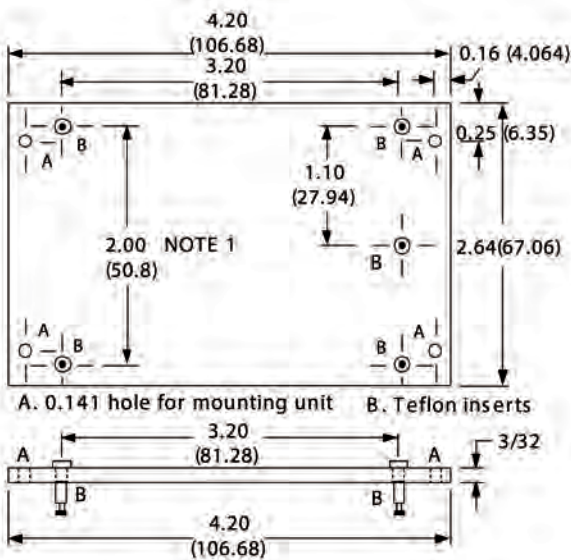
**Side View**



1. All dimensions in inch (mm)
2. No connection for single output units
3. To specify alternate pin-out use suffix "22"

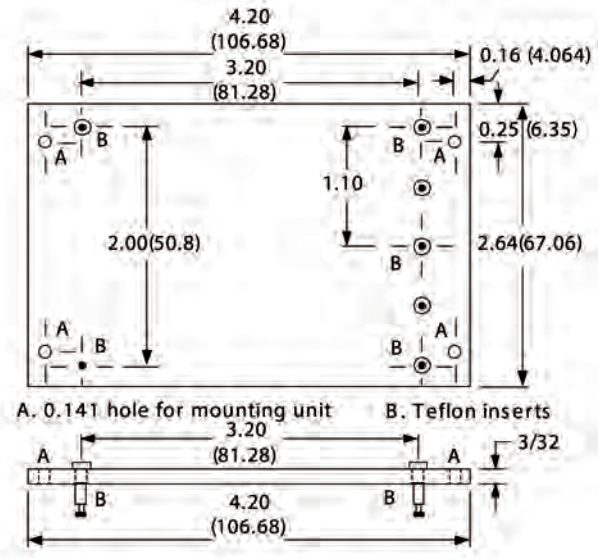
**Sockets**

**S-5**



1. All dimensions in inch (mm)
2. For 2.2" AC pin spacing specify S-5/22

**S-7**



1. All dimensions in inch (mm)
2. For 2.2" AC pin spacing specify S-7/22

## MEDICAL APPLICATIONS: P3/MHIA, P5/MHIA SERIES

### Bench Adapter



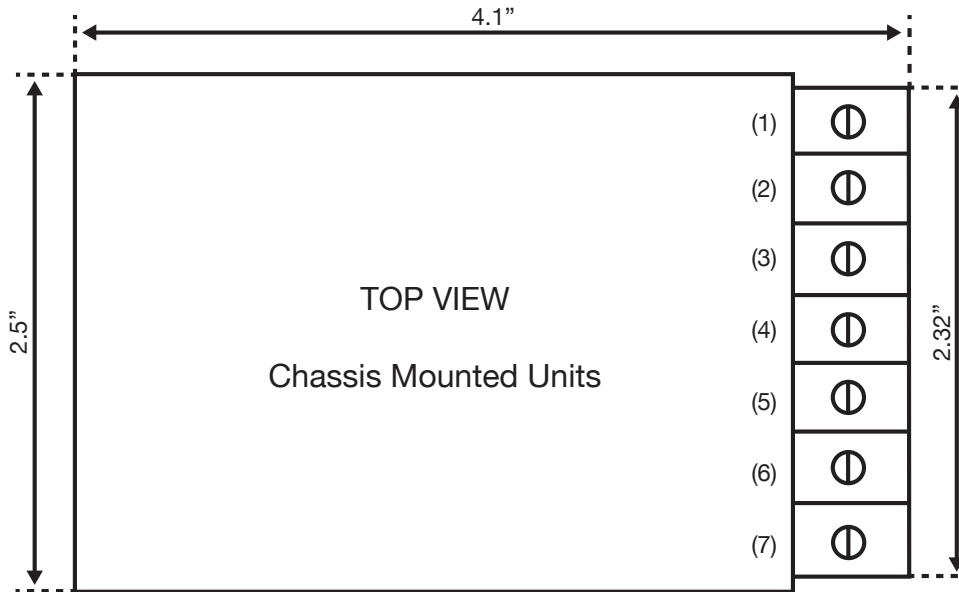
1. Designed for all Single and Dual Linear Power Supplies in Cases A, B, C and D.
2. Model M-5 (2.0" AC Pin Spacing)
3. Model M-5/22 (2.2" AC Pin Spacing)



## MEDICAL APPLICATIONS: P3/MHIA, P5/MHIA SERIES

### Wiring Instructions for AC-DC Linear Power Modules with Dual/Switchable AC Input Voltages

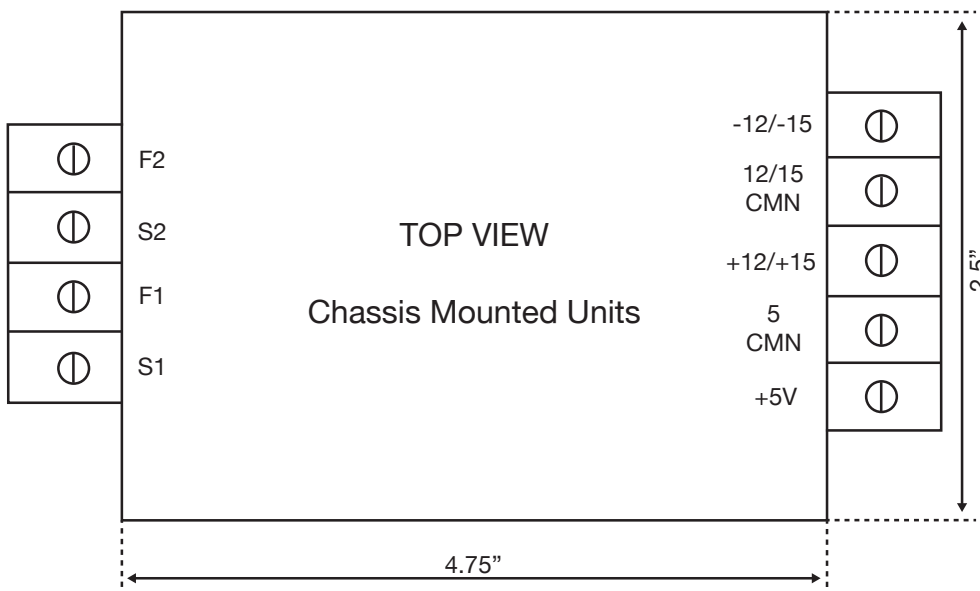
#### Single and Dual Output Chassis Mount 115/220Vac Input



1. For 220V Operation Jumper "f1" to S2"
2. Apply 220V Excitation Across "S1" and "F2"
3. For 115V Operation Jumper "S1" to "S2" and "F1" to F2"
4. Apply 115V excitation across "S1" and "F1"
5. Case Height dimensions can be: 1.25", 1.56" or 2.0" depending on model

Terminal	Single Voltage	Dual V0
1	S1	S1
2	F1	F1
3	S2	S2
4	F2	F2
5	NC	-V0
6	CMN	CMN
7	+Vout	+V0

#### Triple Output Chassis Mount 115/220Vac Input

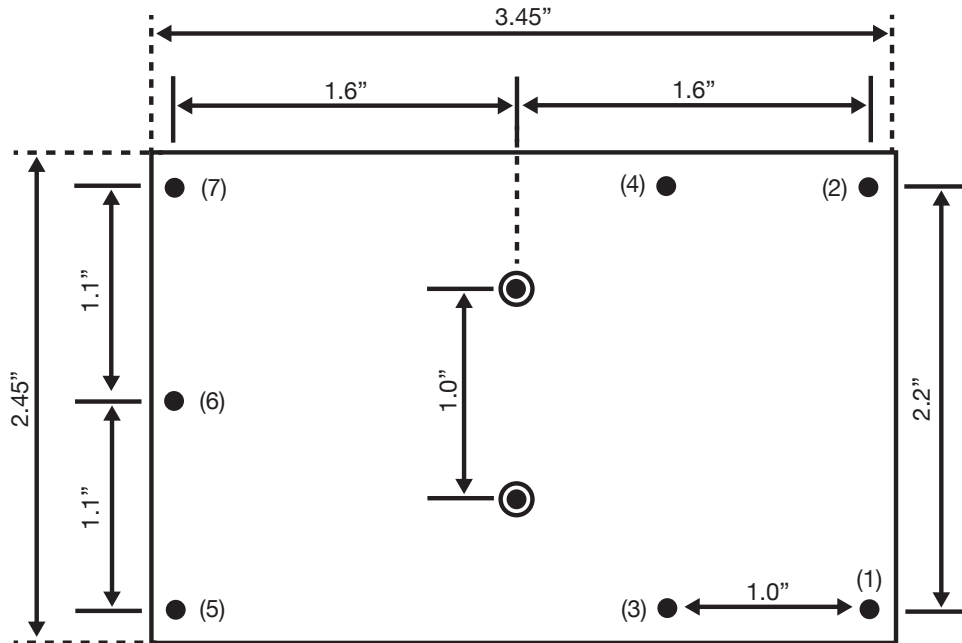


1. Case Height dimensions can be: 1.56" or 2.0" depending on model
2. Wire primaries in parallel for 115Vin Series for 220Vin
3. S = Start of Primary Winding
4. F = Finish of Primary Winding
5. For lower voltage operation wire AC Input in parallel and connect S1 and S2 and F1 and F2 together and excite across
6. For higher voltage operation put winding in series, wire F1 to S2 and excite S1 and F2

## MEDICAL APPLICATIONS: P3/MHIA, P5/MHIA SERIES

### Wiring Instructions for AC-DC Linear Power Modules with Dual/Switchable AC Input Voltages (cont.)

#### Single and Dual Output PC Mount 115/220Vac Input

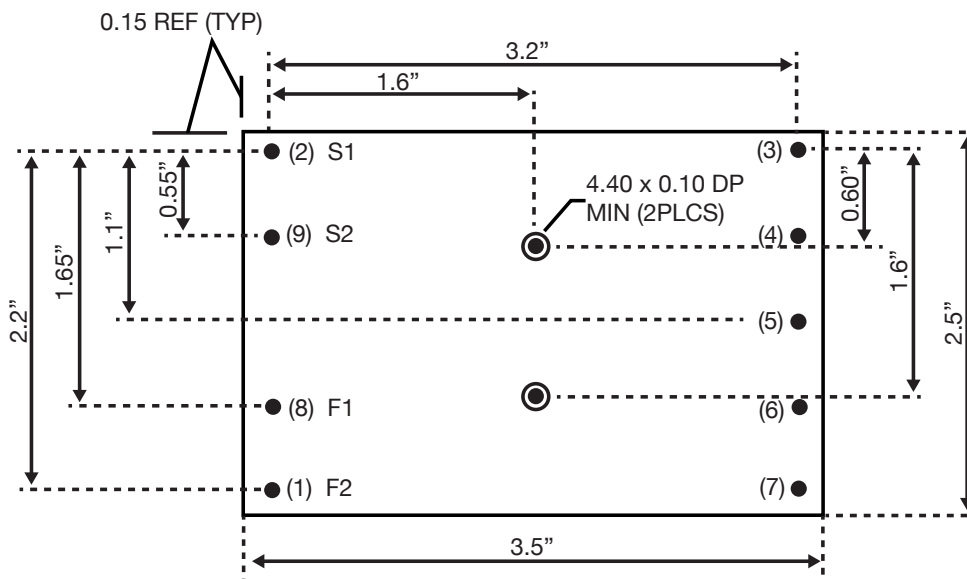


- Case height dimensions can be: 1.25", 1.56" or 2.0" depending on model

#### Connections

PIN 1	Start Winding 1
PIN 2	Finish Winding 1
PIN 3	Finish Winding 2
PIN 4	Start Winding 2
PIN 5 + PIN 6	Common Out for Single V
PIN 5	For Dual Vout -Vout
PIN 6	For Dual Vout CMN
PIN 7	For Single/ Dual +Vout

#### Triple Output PC Mount 115/220Vac Input



- Case height: 2.0"
- Pin 5-15 VDC Output -12 or -15
- Pin 6±15 VDC Return CMN 12/15
- Pin 7+15 VDC Output +12 or +15
- For 115V Input jumper 2 to 9 and 1 to 8
- For 220V Input jumper 8 to 9

#### Connections

Pin 1	F/N Winding 2
Pin 2	Start Winding 1
Pin 3	5 VDC Return
Pin 4	+5 VDC Output
Pin 8	FIN Winding 1
Pin 9	Start Winding 2