

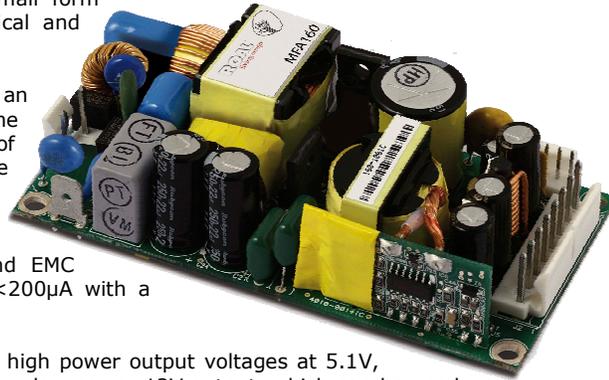
DESCRIPTION

The MFA160 is a series of high efficiency, small form factor AC-DC power supplies for use in medical and dental applications.

Offering 160W of regulated DC power from in an industry standard 2x4x1 inch open-frame footprint, the MFA160 series offers designers of medical and dental electronic equipment the opportunity to reduce the system form factor and increase performance.

The MFA160 complies with IEC601 safety and EMC certification, offers a low leakage current of <math><200\mu\text{A}</math> with a creepage and clearance of >8mm.

The MFA160 series is available in four different high power output voltages at 5.1V, 12V, 24V or 48V and is equipped with an auxiliary low power 12V output, which can be used as the supply voltage for an external fan.



2 YEAR WARRANTY

KEY FEATURES

160W PFC Power Supply
 Very small form factor of 2 x 4 x 1 in
 Extremely high efficiency >90% (typ.)
 5.1V, 12V, 24V and 48V standard output variants
 RoHS-6 Compliant (Directive 2002/95/EC)

Universal Input Voltage Range
 OVP and Short Circuit Protection
 Over Temperature Protection
 Auxiliary Fan +12V Output

TARGET APPLICATIONS

Medical Electronics
 Dental Electronics

Lab Equipment
 Healthcare Diagnostics

MODELS AND OUTPUT SPECIFICATIONS

Model	V1	I1 Current ¹		V1 Ripple ⁴ Pk-Pk	V2	I2 Current ¹	
		Convection	Fan Cooled ^{2,3}			Convection	Fan Cooled ^{2,3}
MFA160-US05	5.1V	15.6A	19.6A	50mV	12V	0.5A	0.5A
MFA160-US12	12V	8,3A	13,3A	120mV	12V	0.5A	0.5A
MFA160-US24	24V	4,2A	6,66A	240mV	12V	0.5A	0.5A
MFA160-US48	48V	2,1A	3,33A	480mV	12V	0.5A	0.5A

¹ The combined output power of V1 and V2 must not exceed 80W for 5V model or 100W for 12V, 24V and 48V models when convection cooled.

² The combined output power of V1 and V2 must not exceed 100W for 5V model or 160W for 12V, 24V and 48V at 400LFM.

³ The fan is rated at 200LFM for the 5V unit and 500LFM for 12V, 24V and 48V units.

⁴ Measured at 20MHz Bandwidth.

INPUT SPECIFICATIONS

Specification	Test Conditions / Notes	Minimum	Nominal	Maximum	Units
AC Input Voltage		90	115/230	264	Vac
DC Input Voltage		170		370	Vdc
Input Frequency		47		63	Hz
Input Current	100/200Vac			2.5/1.25	A
Inrush Current	230Vac Cold start, No Damage				
Efficiency	20% load, 115Vac		84%		
5V Unit	50% load, 115Vac		88.5%		
	100% load, 115Vac		88%		
Efficiency	20% load, 115Vac		87.5%		
12V,24V, 48V Units	50% load, 115Vac		90.5%		
	100% load, 115Vac		90%		
Power Factor	90 Vac		0.98		
Harmonic Current Limit	Complies with EN-61000-3-2		D		
No Load Power Consumption	115Vac		2.5		W
	230Vac		2.3		W
Leakage Current	264Vac, 60Hz			200	μA

OUTPUT SPECIFICATIONS

Specification	Test Conditions / Notes	Minimum	Nominal	Maximum	Units
Output Voltage V1	5.1V	5.05	5.1	5.15	V
	12V	11.88	12	12.12	V
	24V	23.76	24	24.24	V
	48V	47.52	48	48.48	V
Output Power V1	5.1V Unit			80	W
Convection Rating	12V, 24V, 48V Units			100	W
Output Power V1	5.1V Unit			100	W
500 LFM Fan Rating	12V, 24V, 48V Units			160	W
Output Voltage V2	All Models			12	V
Output Current V2	All Models, from convection to 500LFM cooling			0.5	A
Voltage Set Point Accuracy	Main Output (V1)			±1%	
Voltage Adjustment Range	Main Output (V1)			±10%	
Line regulation	90Vac-264Vac (V1)			±0,1%	
Load Regulation	V1			±1%	
	V2 at 50% Load			±20%	
Cross Regulation	V1: Test at 50% Full Load on V1 and 0-100% Load Swing on V2			±1%	
Cross Regulation	V2: Test at 50% Full Load on V2 and 0-100% Load Swing on V1			±15%	
Transient Response (Voltage Deviation)	50% Load Changes at 0.1A/μs 5V at 2000μF Load / Iout>1A 12V at 1000μF Load / Iout>1A 24V at 470μF Load / Iout>0.5A 48V at 220μF Load / Iout>0.5A			±5%	
Ripple & Noise	Peak-peak 20MHz Bandwidth			1%	
Rise Time	230Vac at Minimum Load	0,2		20	ms
Start-up Delay				500	ms
Turn-on Overshoot	Percentage of V1		10%		
	Percentage of V2		30%		
Hold-up Time	5V Unit at Full Load	22			ms
	12V, 24V, 48V Units at Full Load	16			ms
Minimum Load		0			A
Temperature Drift		-0,25		+0,25	mV/°C

PROTECTION FEATURES & SAFETY APPROVALS

Specification	Test Conditions / Notes	Minimum	Nominal	Maximum	Units
Input Under Voltage Lockout	Auto Recovery, Hiccup Mode	60	75		Vac
Input Fuse	Line and Neutral		2.5		A
Over Current Protection	Auto Recovery, Hiccup Mode	110		130%	I _{max}
Over Voltage Protection	Under fault conditions, the maximum voltage			130%	V _{1max}
Short Circuit Protection	Auto Recovery, Hiccup Mode		Yes		
Over Temperature Protection	Shutdown with Auto Recovery			Yes	
Isolation Input/Output		4000			Vac
Isolation Input/Ground		1500			Vac
Isolation V1/V2		100			Vdc
Isolation Output/Ground		500			Vac
Creepage & Clearance		8			mm
Safety Approvals	cCSA _{US} , Nemko, CB Certificate				
Safety Standards	IEC60601-1, EN60601-1, UL60601-1, CSA22.2 No. 601				
Agency File Numbers	CSA File No: 243118 Nemko Test Report: 104219 Nemko Certificate: P08209295 CB Cert: N047638				

ELECTRO-MAGNETIC COMPATABILITY EMC

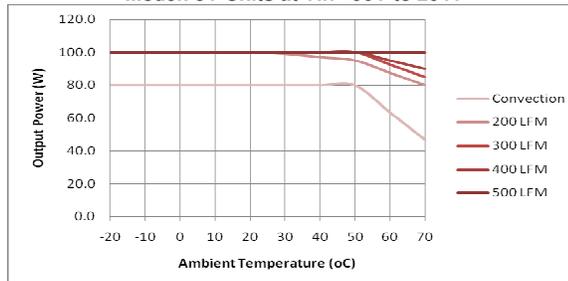
Specification	Test Conditions / Notes	Standard	Performance criteria
Conducted EMI	Class B	EN55022 EN60601-1-2	B
Radiated EMI	At 10m distance	EN55022	A
Line Voltage Fluctuation & Flicker	At 20%, 50% and 100% Maximum Load	EN61000-3-3	A
ESD	15kV air discharge, 8kV contact at any point of System Level 4	EN61000-4-2	A
Harmonic Current Emission	All Load Conditions	EN61000-3-2	D
Radiated Field	3V/m, 80-2500MHz, 1KHz/2Hz 80% AM modulation. Dwell time is 3 sec for 2 Hz modulation Dwell time is 1 sec for 1KHz modulation	EN61000-4-3	A
EFT	2KV on AC and DC 5KHz repetition 1KV on I/O	EN61000-4-4	A
Surge	2KV CM, 1KV DM (5min surges at each phase angle)	EN61000-4-5	A
Conducted RF Immunity	3Vrms, 0,15-80MHz, 1KHz/2Hz 80% AM modulation	En61000-4-6	A
Magnetic Field Immunity	50 and 60 Hz, 3A/m	EN61000-4-8	A
Dips and Interruptions	Dip to 40% for 5 cycles (100ms) Dip to 70% for 25 cycles (500ms) Drop-out to 5% for 10 ms Interrupts > 95% for 5 s	EN61000-4-11 EN61000-4-11 EN61000-4-11 EN61000-4-11	B B B C

ENVIRONMENTAL SPECIFICATIONS

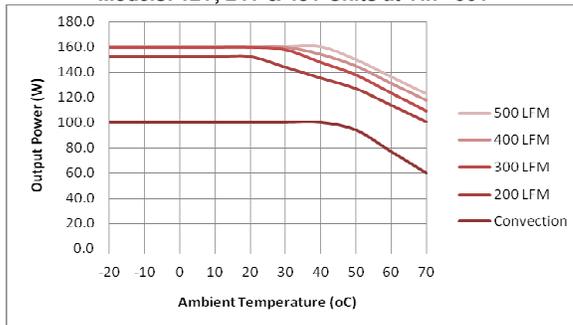
Specification	Test Conditions / Notes	Min	Nominal	Max	Units
Operating Temperature Range	No de-rating up to 50°C	-20		50	°C
De-rated Operating Temperature Range	Linearly de-rate from full load at 50°C to 60% load at 70°C			70	°C
Storage Temperature Range		-40		85	°C
Humidity	RH, Non-condensing Operating			90	%
	Non-operating			95	%
Operating Altitude				3000	m
Shock	Operating: Half-sine 11ms, 2 shock on each axis			10	G
	Non-operating: Half-sine 2ms, 2 shock on each axis			140	G
Vibration	Operating: 5-500Hz, 3 axis			2	G
MTBF	75% Full Load, Nominal Vin, 25°C, MIL-HDBK-217-E-1	235000			Hours
Cooling	See Graph and Application Notes	Convection		500	LFM

COOLING & POWER DERATING CURVES

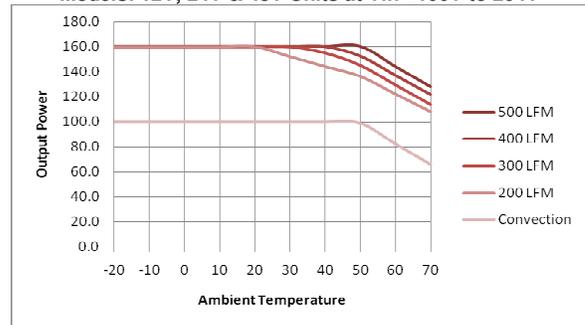
Model: 5V Units at Vin =90V to 264V



Models: 12V, 24V & 48V Units at Vin =90V

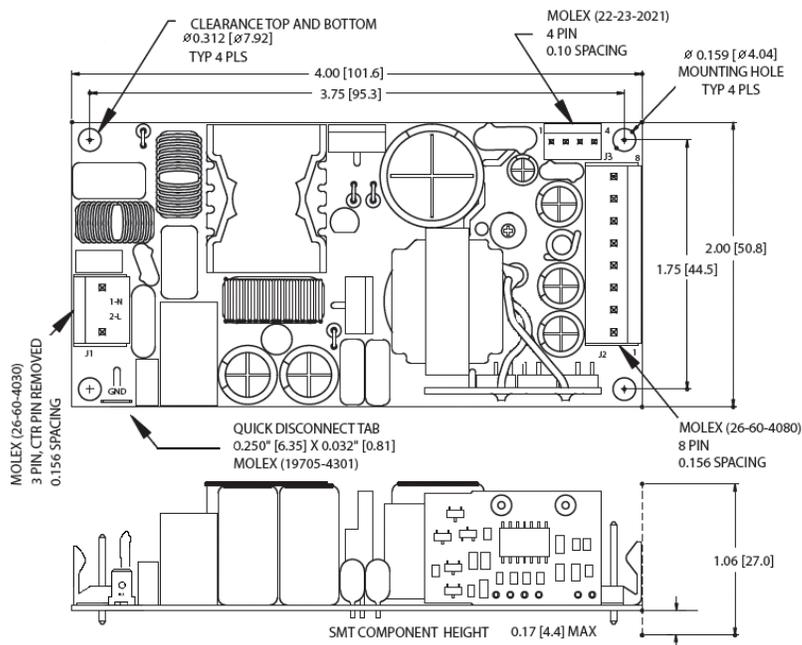


Models: 12V, 24V & 48V Units at Vin =100V to 264V



MECHANICAL SPECIFICATION

Connector	Manufacturer and Part Number
Input Connector J1	Molex 26-60-4030 or equivalent
J1 Mating Connector	Molex 09-91-0300 (Crimp Terminal Housing) Molex 08-50-0105 (Crimp Terminal, 18-24 AWG)
Ground Connector GND	Molex 19705-4301 or equivalent
Ground Mating Connector	Molex 0190030001 or equivalent
Output Connector J2	Molex 26-60-4080 or equivalent
J2 Mating Connector	Molex 09-91-0800 (Crimp Terminal Housing) Molex 08-50-0105 (Crimp Terminal, 18-24 AWG)
Output Connector J3	Molex 22-23-2041 or equivalent
J3 Mating Connector	Molex 22-01-2047 (Crimp Terminal Housing) Molex 08-50-0113 (Crimp Terminal, 22-30 AWG)



Recommended Air Flow Direction

Input Connector J1	
Pin Number	Pin Function
1	AC Neutral
2	AC Line

Input Ground Connector GND	
Pin Number	Pin Function
GND	AC Ground

Output Connector J2	
Pin Number	Pin Function
1	DC Return
2	DC Return
3	DC Return
4	DC Return
5	V1
6	V1
7	V1
8	V1

Output Connector J3	
Pin Number	Pin Function
1	Ground
2	Ground
3	12V (Fan)
4	12V (Fan)

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