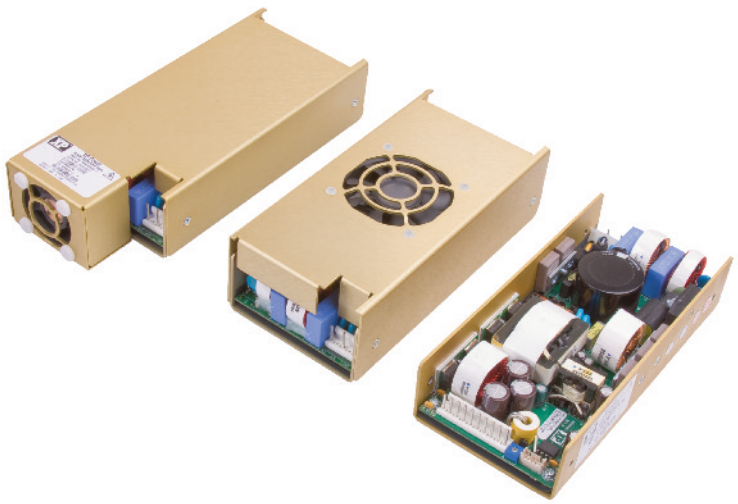
MFA350 Series



- Screw Terminals Available
- U Channel & Cover Fan Formats
- High Power Density 11.1 W/in^3
- 5 V Standby & 12 V Fan Outputs
- Active Current Share
- Remote On/Off
- AC & DC OK Signals
- –10 °C to +70 °C Operation
- Level B Conducted Emissions

The MFA350 has been designed with multiple mechanical options to facilitate its integration into a wide range of applications. Designers of these systems demand higher power from AC-DC units in industry-standard formats as processing power and functionality grows within tight space constraints. The MFA350 delivers over 350 W across the full universal AC input range from an industry-standard 3.2 x 6.8 inch (81.3 x 172.7 mm) footprint. It is 1.5 inches (38.1 mm) high and achieves 11.1 Watts per cubic inch power density without compromising performance or functionality.

With efficiency up to 88% at full load, the MFA350 operates up to 50 °C ambient and up to 70 °C ambient with derating. The main output is 12, 24 or 48 VDC but each power supply also has a 5 V, 0.3 A standby output and a 12 V, 1A output for powering fans. The unit incorporates a fully featured signal set including AC OK/DC OK, remote on/off and active current sharing.

Models and Ratings

Output Voltage V1	Maximum Output Current	Fan Output [2] V2	Standby Supply V3	Max Power 13 CFM Airflow	Model Number [1]
12.0 VDC	29.0 A	12 V/1 A	5 V/0.3 A	361 W	MFA350PS12
24.0 VDC	14.5 A	12 V/1 A	5 V/0.3 A	361 W	MFA350PS24
48.0 VDC	7.3 A	12 V/1 A	5 V/0.3 A	364 W	MFA350PS48

Notes

1. Units supplied with AMP/TE connections for J1 & J2 as standard. Add suffix '-S' to model number to replace with screw terminals. Add suffix '-TF' for covered version with top fan and suffix '-EF' for covered version with end fan. Example:- MFA350PS12-STF, 12 V unit fitted with screw terminals and top fan.
2. Not available for -TF & -EF versions.

Input Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage - Operating	85		264	VAC	Derate output power 10% < 90 VAC
Input Frequency	47	50/60	63	Hz	
Power Factor		>0.9			EN61000-3-2 class A
					EN61000-3-2 class C for loads ≥20%
Input Current - No Load		100		mA	
Input Current - Full Load		3.6/1.8		A	115/230 VAC
Inrush Current			60	A	230 VAC cold start
Earth Leakage Current		1		mA	230 VAC/50 Hz
Input Protection	T6.3A/250 V internal fuse in line				

Output Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage - V1	12		48	VDC	See Models and Ratings table
Initial Set Accuracy			±1 [V1], ±5 [V2] & ±3 [V3]	%	
Output Voltage Adjustment	±10			%	
Minimum Load	0				No minimum load required
Start Up Delay		1	2	s	90 VAC full load (see fig. 1)
Hold Up Time	16	20		ms	90 VAC full load (see fig. 2 & 3)
Drift			±0.2	%	After 20 min warm up
Line Regulation			±0.5[V1], ±3 [V2] & ±3 [V3]	%	
Load Regulation			±1 [V1], ±5 [V2] & ±3 [V3]	%	0-100% load. V2 10-100% load
Transient Response - V1			4	%	Recovery within 1% in less than 500 µs for a 50-75% and 75-50% load step
Over/Undershoot - V1			1	%	(see fig. 4)
Ripple & Noise			1 [V1 & V3] & 2 [V2]	% pk-pk	20 MHz bandwidth (see fig. 6 & 7)
Overvoltage Protection	115		140	%	Vnom DC. Output 1 only, recycle input to reset
Overload Protection	110		140	% I nom	Output 1 only, auto reset (see fig. 5)
Short Circuit Protection					Continuous
Temperature Coefficient			0.05	%/°C	
Overtemperature Protection		75		°C	Thermal sensor under PCB

Start Up Delay From AC Turn On

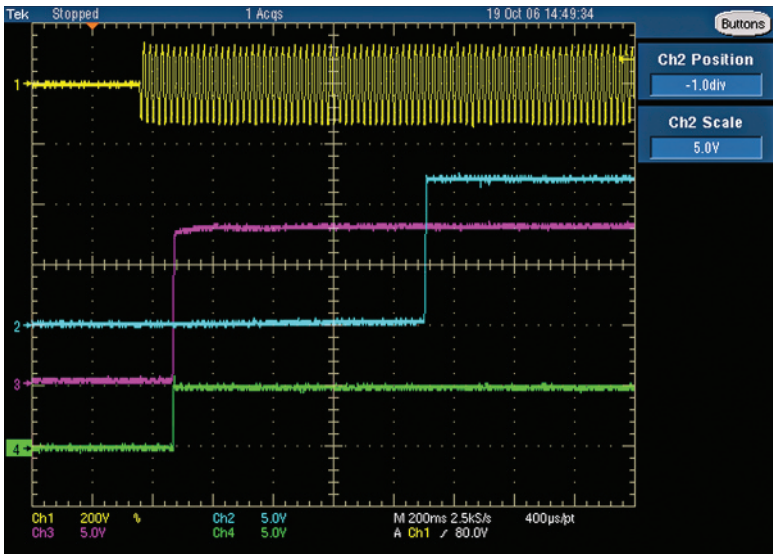


Figure 1
Example of start up all outputs

Hold Up Time From Loss of AC

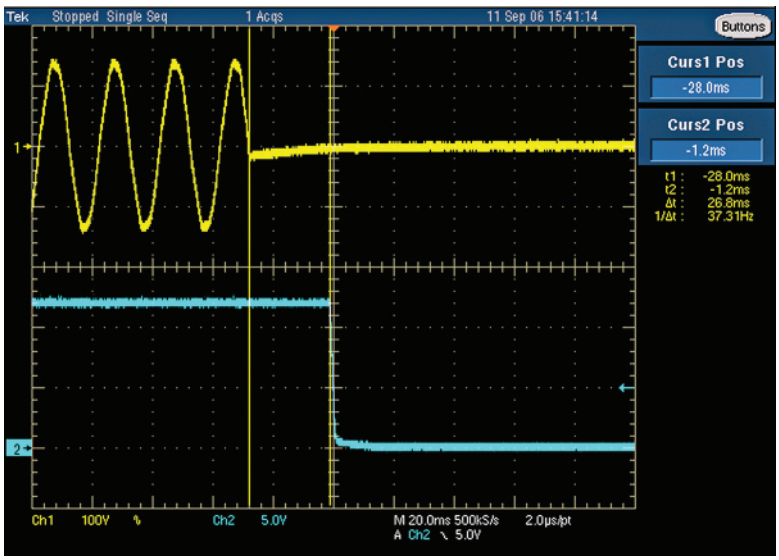


Figure 2
V1 hold up at full load with 90 VAC input (26.8 ms)

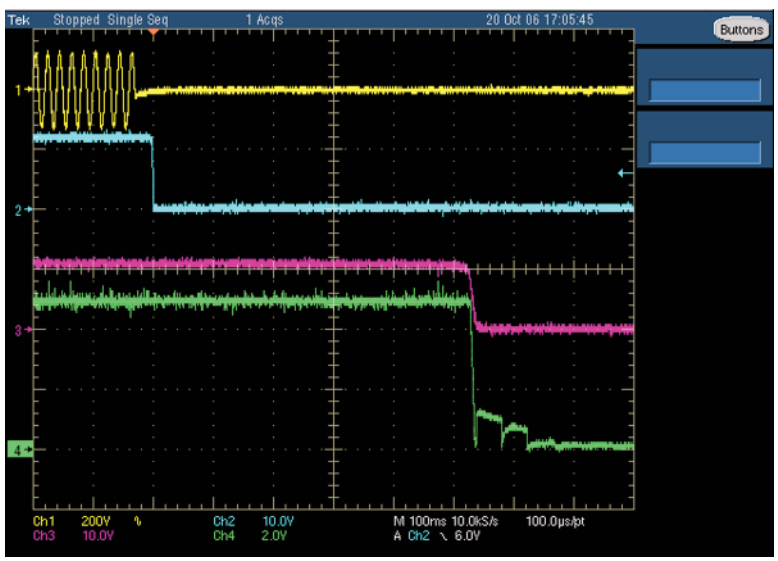


Figure 3
Full load 90 VAC input

Output Overshoot

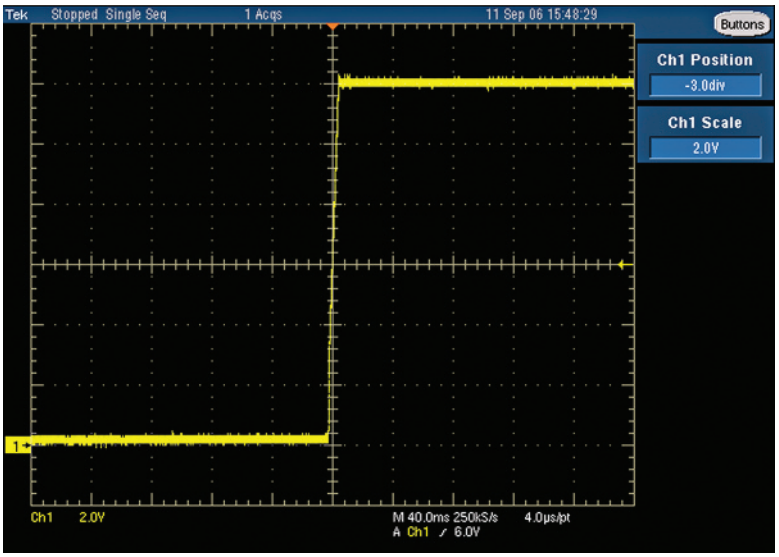


Figure 4
Typical Output Overshoot
(MFA350PS12)

Output Overload Characteristic

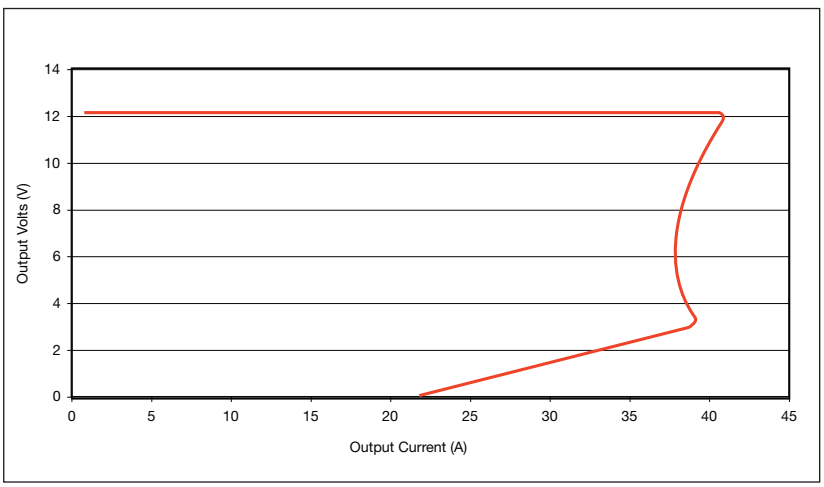


Figure 5

Output Ripple & Noise

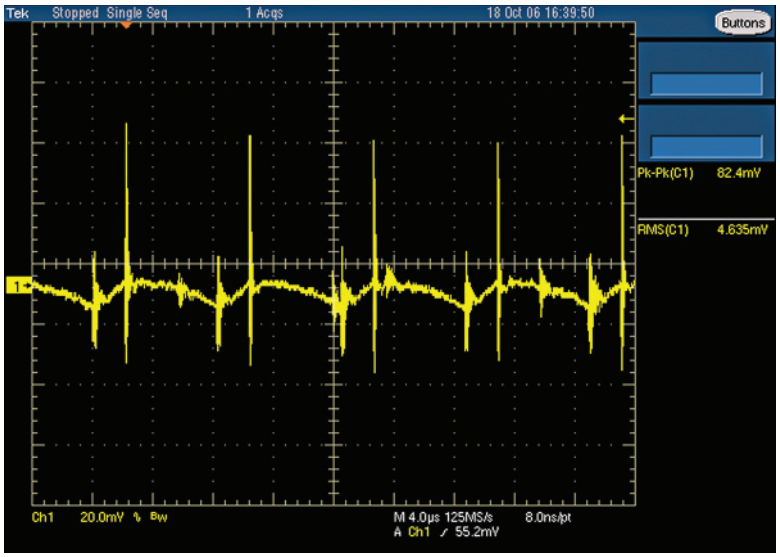


Figure 6
V1 MFA350PS12 (full load)
80 mV pk-pk ripple. 20 MHz BW

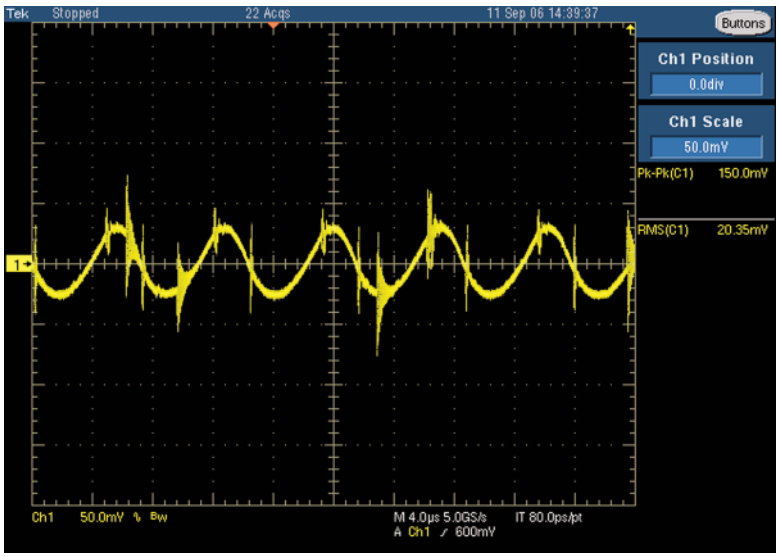


Figure 7
V1 MFA350PS48 (full load)
150 mV pk-pk ripple. 20 MHz BW

General Specifications

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		86		%	Full load (see fig. 8 & 9)
Isolation: Input to Output	3000			VAC	
Input to Ground	1500			VAC	
Output to Ground	100			VDC	
Switching Frequency: PFC		62		kHz	
Main Converter		157		kHz	
Power Density			11.1	W/in^3	
Mean Time Between Failure		460		kHrs	MIL-HDBK-217F, Notice 2 +25 °C GB
Weight			1.35 (612)	lb (g)	

Characteristic	Notes & Conditions
Signals	
AC OK/Powerfail	Open collector referenced to output 0V, transistor normally off when AC is good (see fig. 10, 16, 17 & 18) AC OK: Provides ≥ 5 ms warning of loss of output from AC failure
DC OK	Open collector referenced to 0 V, transistor normally off when DC is good (see fig. 11, 19 & 20). Provides warning of DC output failure
Remote On/Off (Inhibit/Enable)	Remotely switches outputs off, can also be configured as enable (see fig.12)
Current Share	Up to 3 supplies can be connected in parallel. Output current is shared within 10% at full load. Derate overall output current to 90% when used in parallel (see fig.13, 14 & 15)
Remote Sense	Compensates for 0.5 V total voltage drop

Efficiency Versus Load

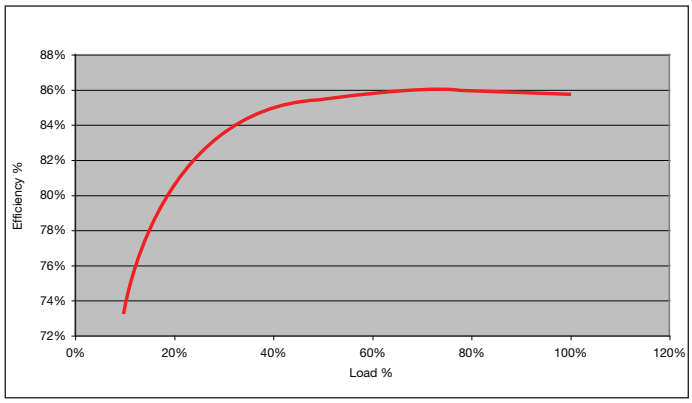


Figure 8
MFA350PS12 @ 230 VAC

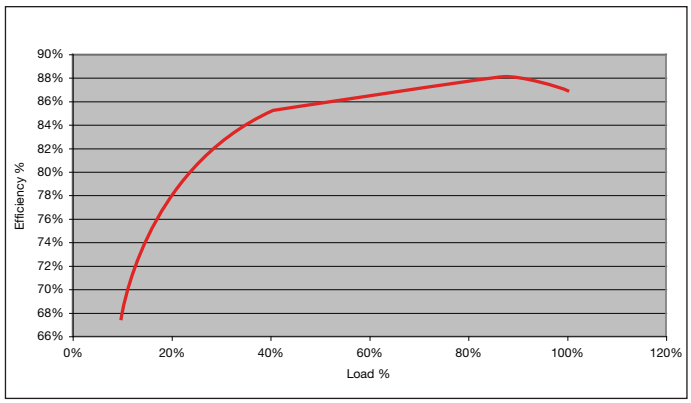


Figure 9
MFA350PS48 @ 230 VAC

Signals

AC OK/Power Fail

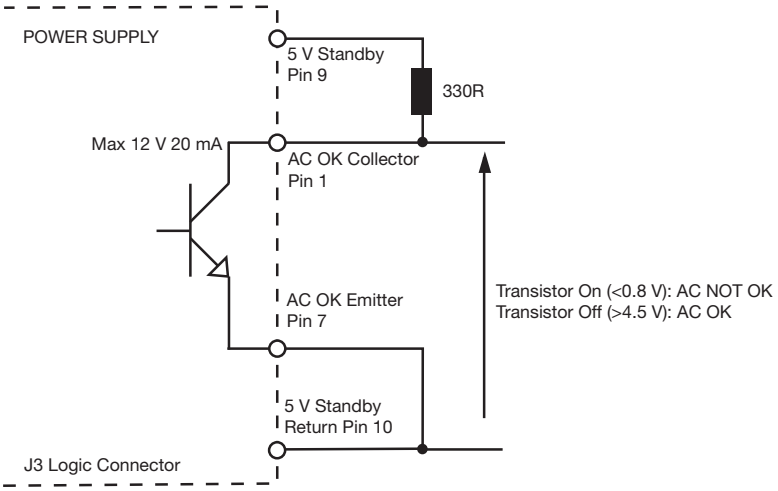


Figure 10

DC OK

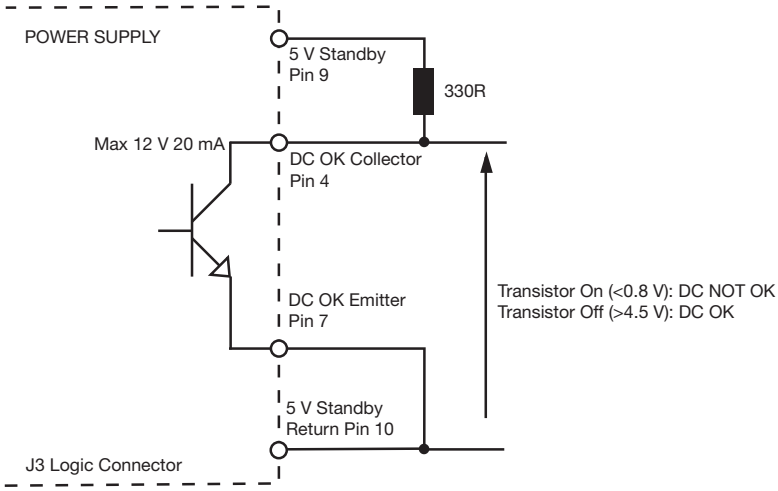


Figure 11

Remote On/Off (Inhibit)

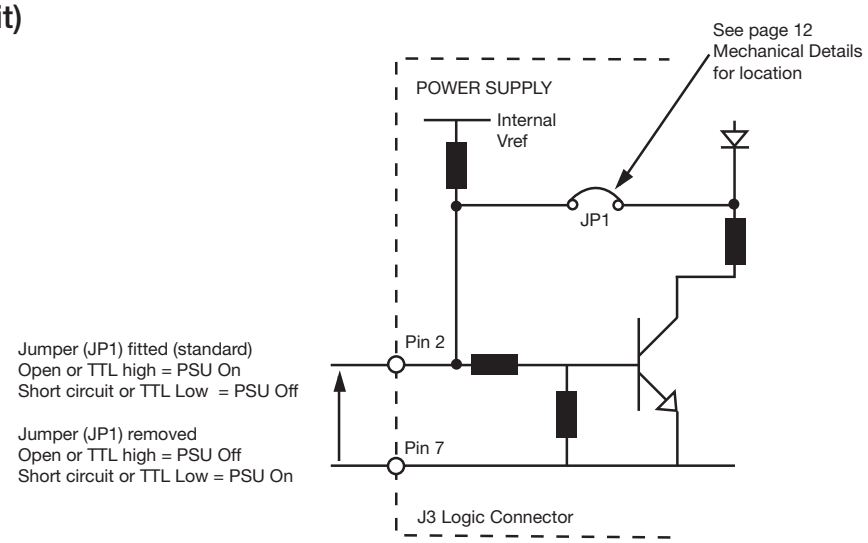


Figure 12

Signals

Parallel Load & Current Share Connections

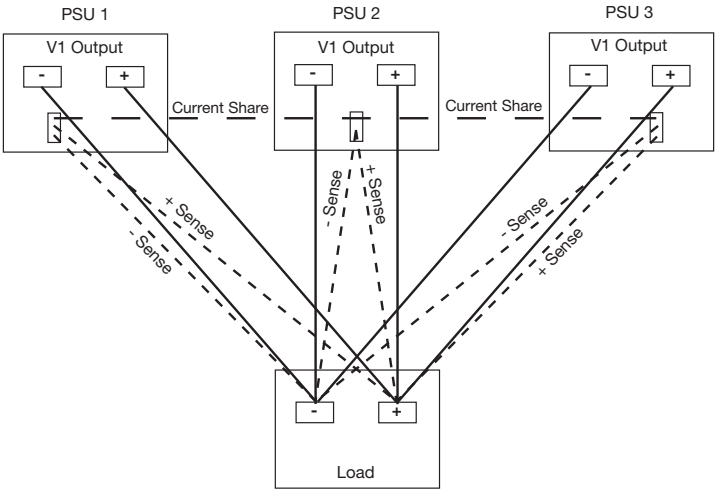


Figure 13

Parallel AC OK Connection (DC OK follows same format)

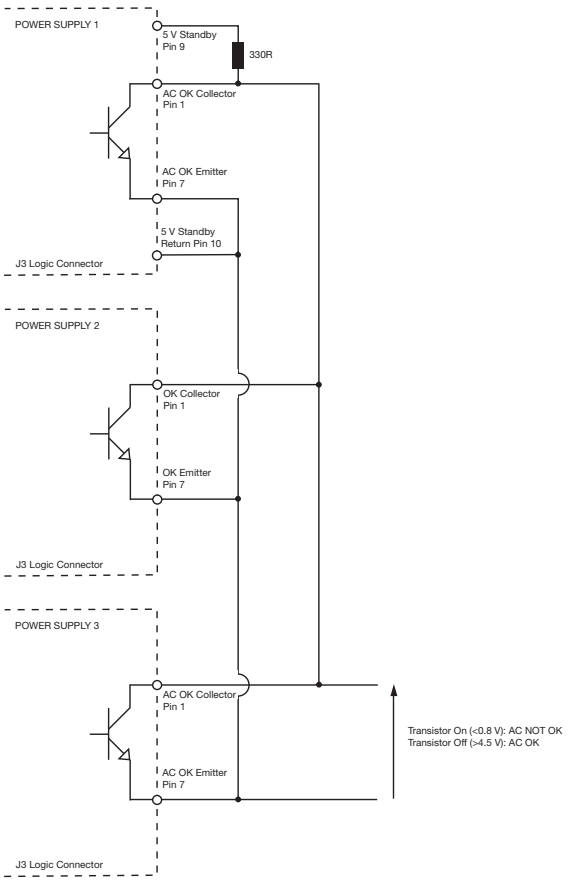


Figure 14

Parallel Remote On/Off (Inhibit) Connection

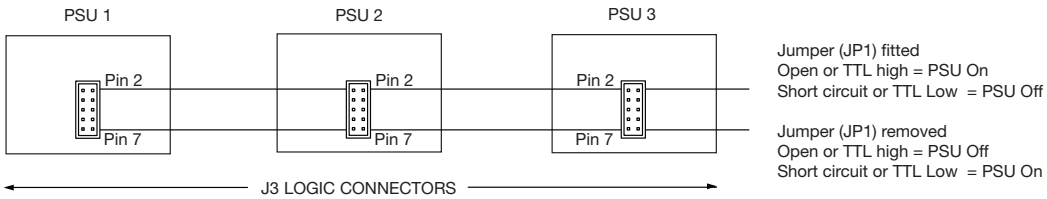


Figure 15

Jumper (JP1) fitted
Open or TTL high = PSU On
Short circuit or TTL Low = PSU Off

Jumper (JP1) removed
Open or TTL high = PSU Off
Short circuit or TTL Low = PSU On

Signals

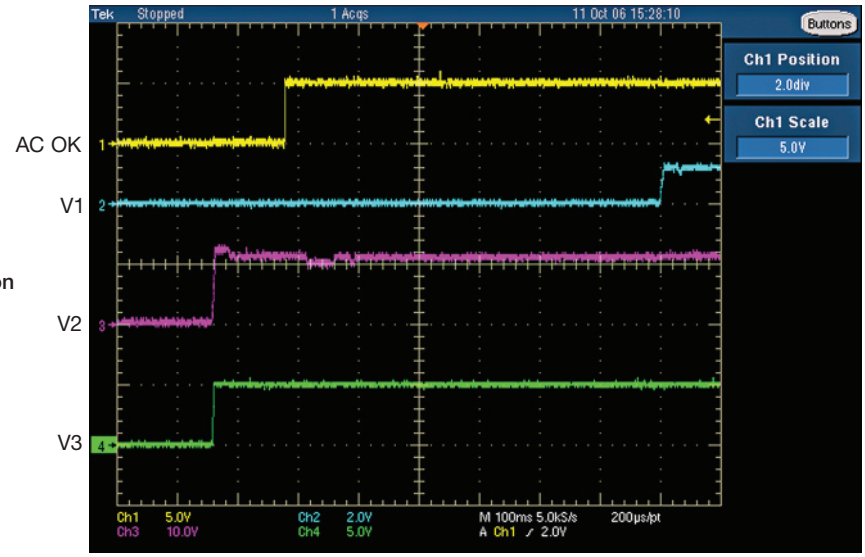


Figure 16
AC OK signal at AC switch on

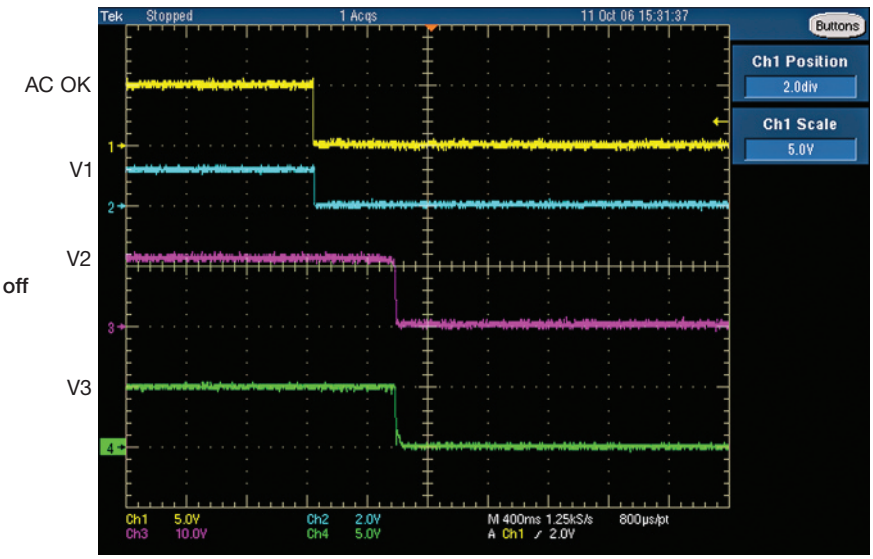


Figure 17
AC OK signal at AC switch off

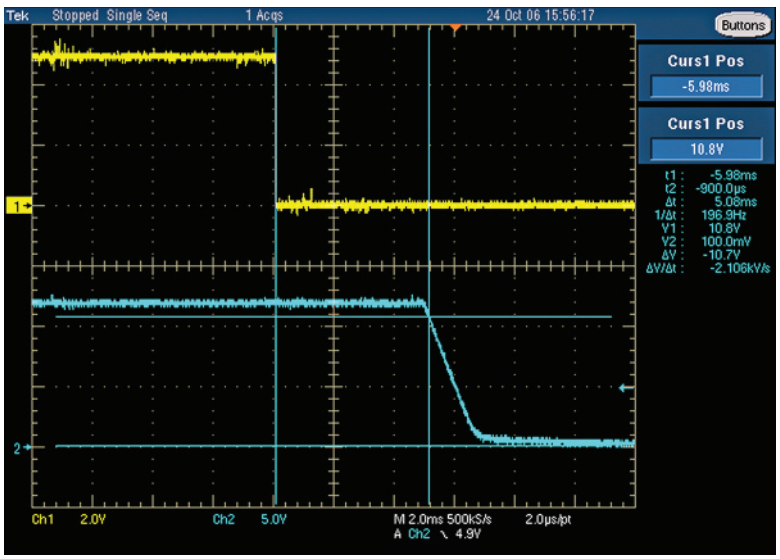


Figure 18
V1 warning time at AC OK signal
90 VAC full load (MFA350PS12)

Signals

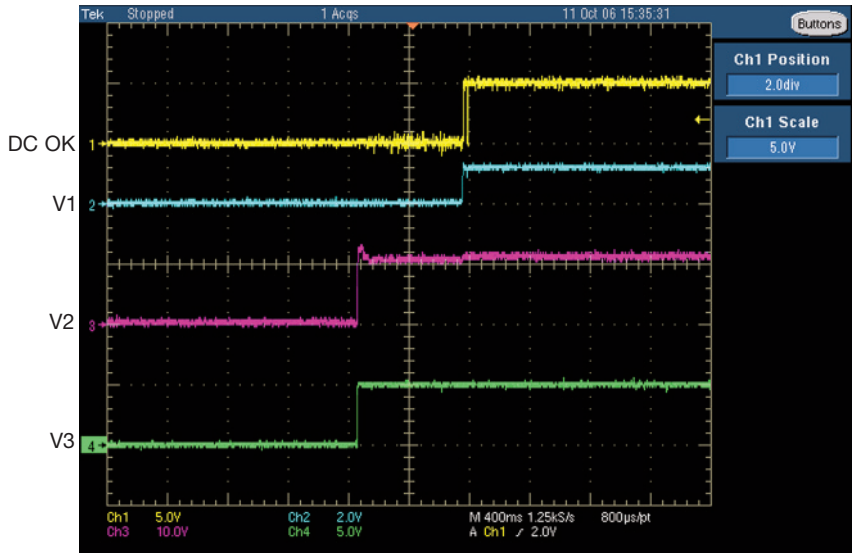


Figure 19
DC OK at AC switch on

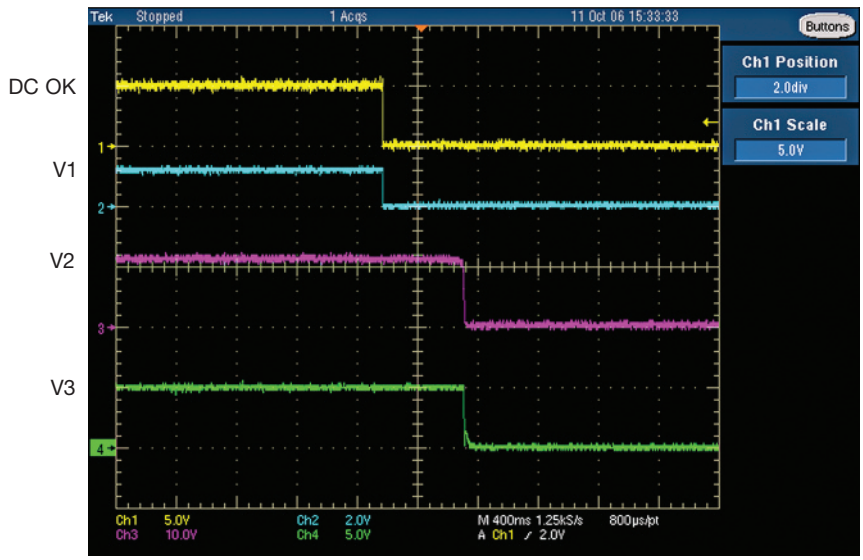


Figure 20
DC OK at AC switch off

Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Temperature	-10		+70	°C	Derate linearly from +50 °C at 2.5%/°C to 50% at 70 °C when forced cooled. See Thermal Considerations.
Storage Temperature	-20		+85	°C	
Cooling	13			CFM	U Channel Version. -TF & -EF models have integral fan. See Thermal Considerations for U Channel.
Humidity	5		95	%RH	Non-condensing
Operating Altitude			3000	m	
Shock					3 x 30 g/11 ms shocks in both +ve & -ve directions along the 3 orthogonal axis, total 18 shocks.
Vibration					Single axis 10-500 Hz at 2 g x 10 sweeps

Electromagnetic Compatibility - Immunity

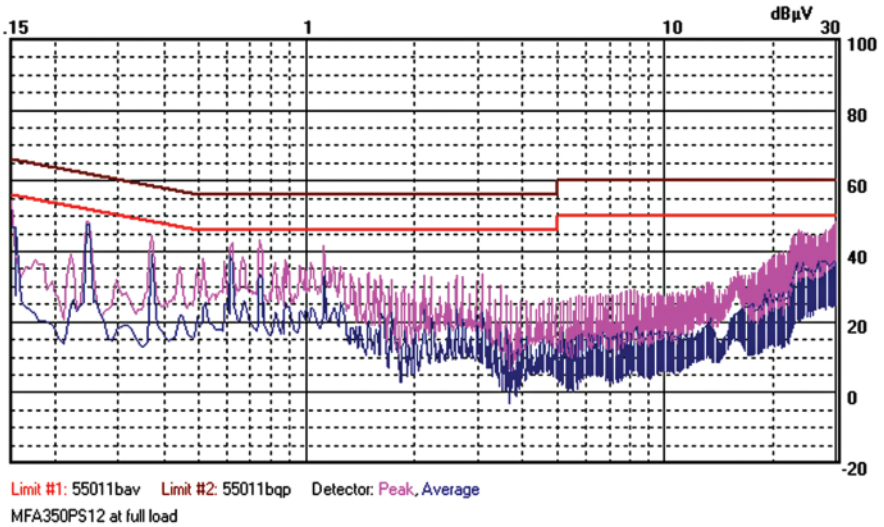
Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Harmonic Current	EN61000-3-2	Class A		
		Class C		For loads ≥20%
EFT	EN61000-4-4	3	A	
Surges	EN61000-4-5	Installation Class 3	A	
Conducted	EN61000-4-6	10 V rms	A	
Dips and Interruptions	EN61000-4-11	30% 10 ms	A	
		60% 100 ms	B	
		100% 5000 ms	B	

Electromagnetic Compatibility - Emissions

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Conducted	EN55032	Class B		See fig. 21
Radiated	EN55032	Class A		
Voltage Fluctuations	EN61000-3-3			

Typical EMC Plot

Figure 21

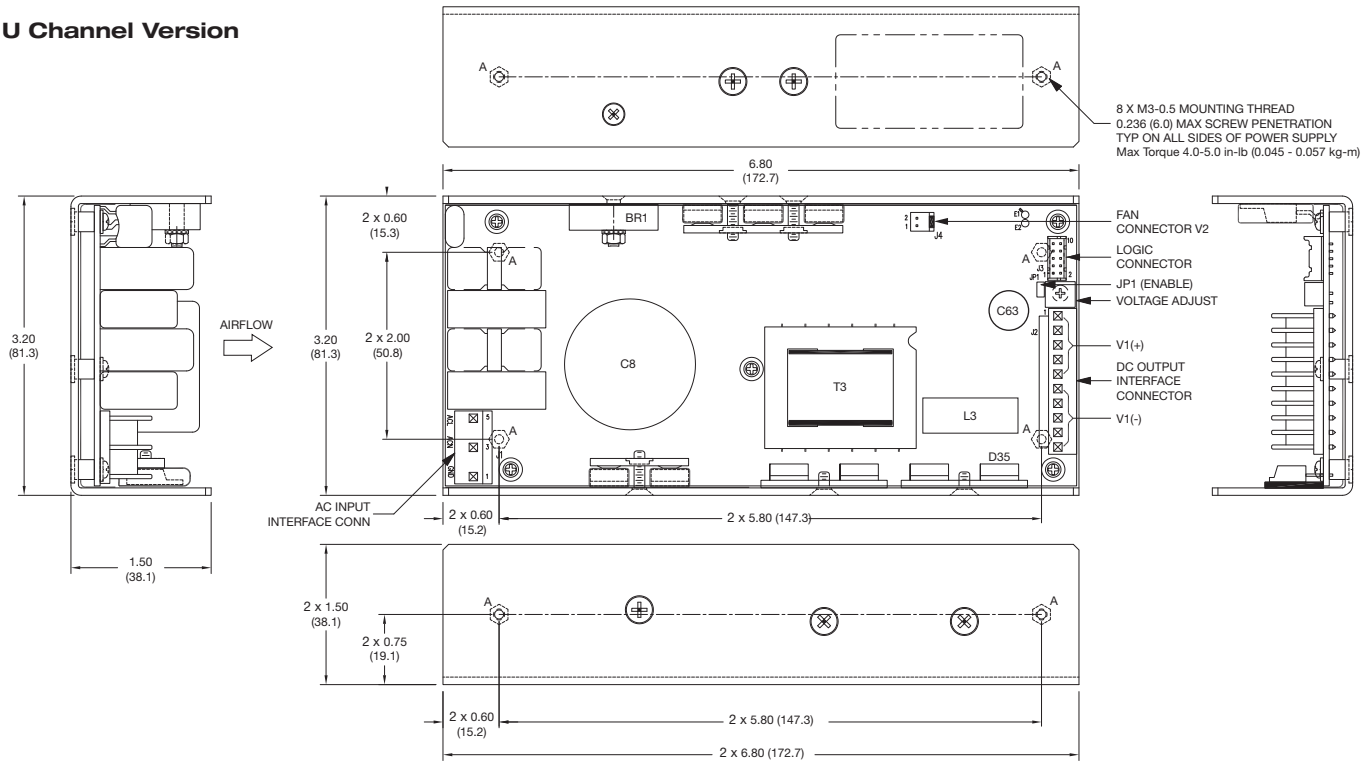


Safety Agency Approvals

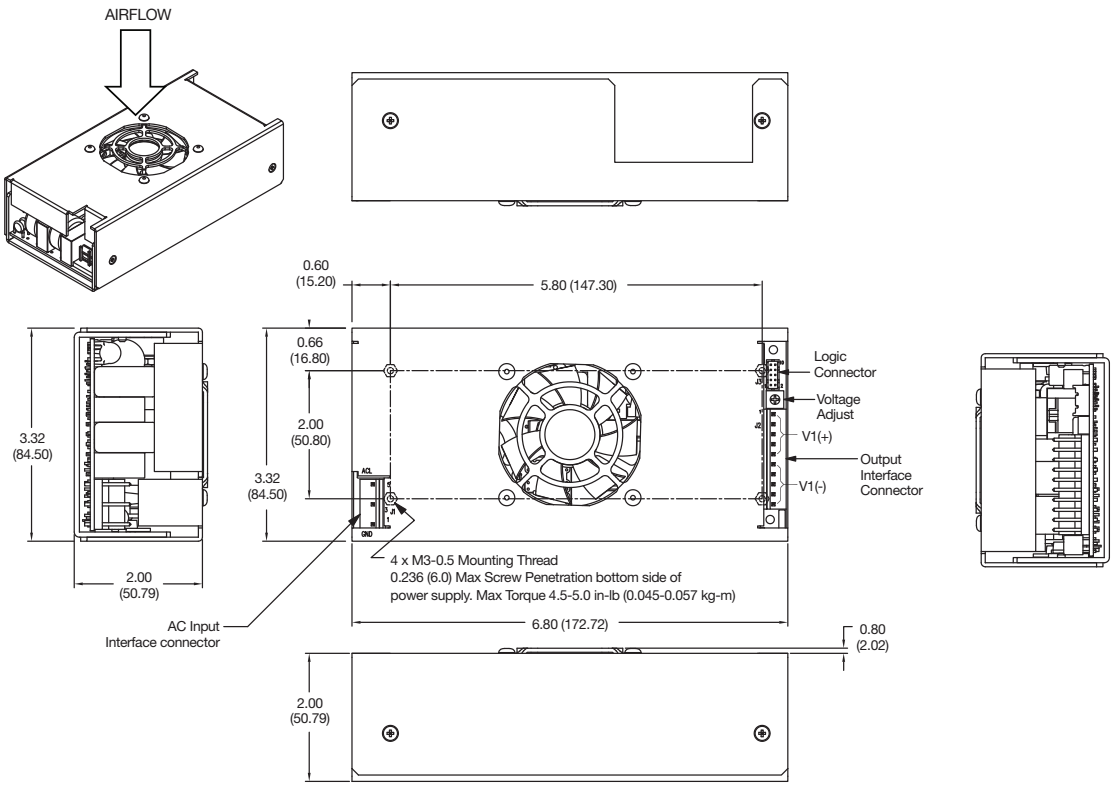
Safety Agency	Safety Standard	Category
CB Report	IEC60950-1:2005 Ed 2 / IEC62368-1:2014	Information Technology
CSA	CAN/CSA C22.2 No. 62368-1-14	Information Technology
UL	UL 62368-1	Information Technology
TUV	EN62368-1:2014/A11:2017	Information Technology
CE	LVD	

Mechanical Details

U Channel Version



Top Fan Version (Suffix TF)

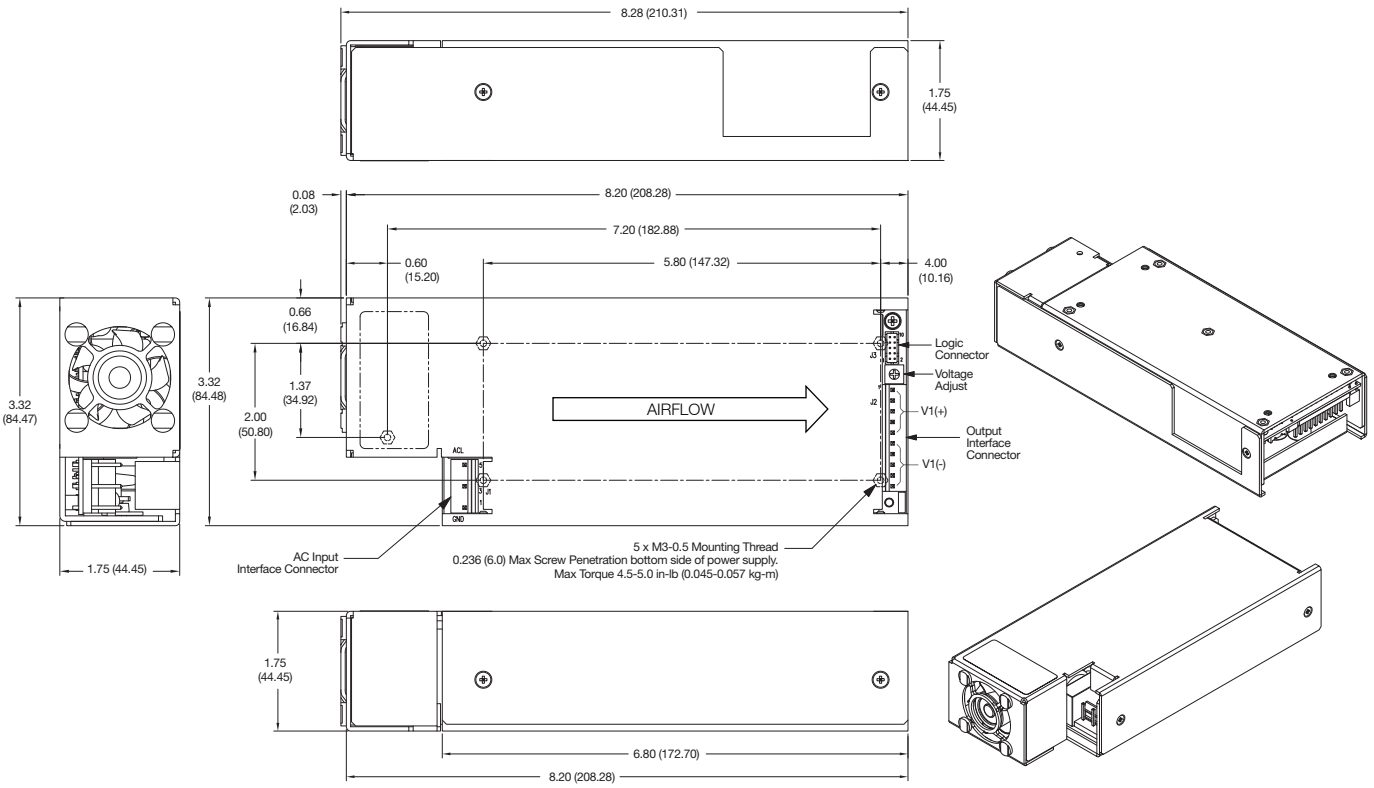


Notes

1. All dimensions in inches (mm).
2. Tolerance: X.XX = ±0.02 (±0.50), X.XXX = ±0.01 (±0.25)

Mechanical Details

End Fan Version (Suffix EF)



Notes
1. All dimensions in inches (mm).
2. Tolerance: X.XX = ±0.02 (±0.50), X.XXX = ±0.01 (±0.25)

Mechanical Details - Pin Connections

PIN CONNECTIONS AC INPUT J1 AMP/TE CONN = 640445-5	
1	GND
3	Neutral
5	Line

Mating Parts:
AMP/TE CONN Housing = 640250-5
Contact 350980-1

Option '-S' screw terminals
Phoenix Contact:
MKDS 1/5-3.81 or similar accepts 26-16 AWG wire (contacts 2 & 4 removed)

Max Torque 1.73 in-lb (0.02 kg-m)

PIN CONNECTIONS DC OUTPUT J2 AMP/TE CONN = 1-640445-0	
1	+V1
2	+V1
3	+V1
4	+V1
5	+V1
6	-V1
7	-V1
8	-V1
9	-V1
10	-V1

Mating Parts:
AMP/TE CONN = 1-640250-0
Contact 350980-1

Option '-S' screw terminals
2 x Phoenix Contact:
MKDS 1/5-3.81 or similar accepts 26-16 AWG wire

Max Torque 1.73 in-lb (0.02 kg-m)

PIN CONNECTIONS LOGIC CONNECTOR J3 JST B10B-PHDSS (LF) (SN)	
1	AC OK
2	ROF (Inhibit/Enable)
3	Current Share
4	DC OK
5	Not used
6	+Sense
7	-Sense
8	Not Used
9	5 V Standby V3
10	5 V Standby Return V3

Mating Parts:
JST Housing PHDR-10VS
Contact SPHD-001T-P0.5

PIN CONNECTIONS FAN OUTPUT J4 Molex 22-04-1021	
1	-V2
2	+V2

Mating Parts:
Molex Housing 22-01-1024
Contact 08-70-0057

Thermal Considerations (U Channel)

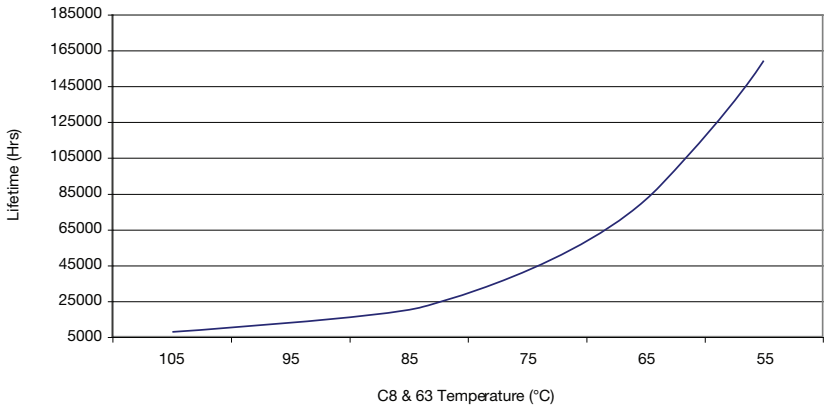
In order to ensure correct and reliable operation of the PSU in the most adverse conditions permitted in the end-use equipment, the temperature of the components listed in the table below must not be exceeded. See drawing on page 12 for component locations. Temperature should be monitored using K type thermocouples placed on the hottest part of the component (out of any direct air flow).

Temperature Measurements (Ambient ≤ 50 °C)	
Component	**Max Temperature °C**
T3	90 °C
BR1	105 °C
D35	85 °C
L3	90 °C

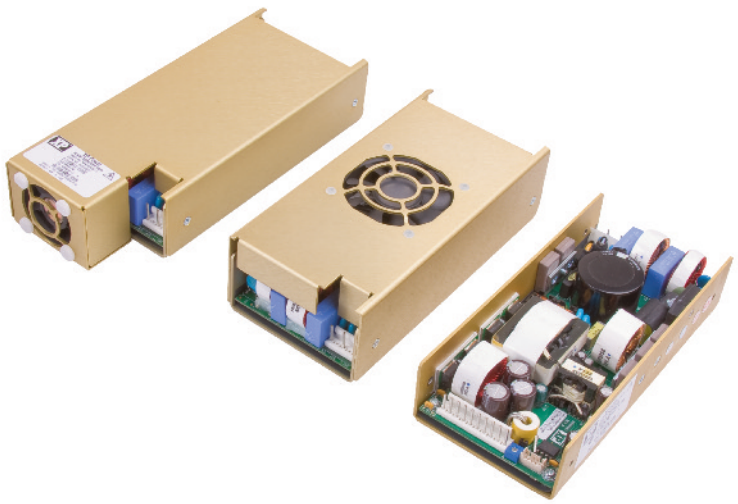
Service Life

The estimated service life of the MFA350 is determined by the cooling arrangements and load conditions experienced in the end application. Due to the uncertain nature of the end application this estimated service life is based on the actual measured temperature of two key capacitors within the product when installed in the end application. The highest of the two component temperatures should be used. The graph below expresses the estimated lifetime for a given component temperature and assumes continuous operation at this temperature.

Estimated Service Life vs Component Temperature



MFA350 Series



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- High Power Density 11.1 W/in^3
- 5 V Standby & 12 V Fan Outputs
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24.0 VDC	14.5 A	12 V/1 A	5 V/0.3 A	361 W	MFA350PS24
48.0 VDC	7.3 A	12 V/1 A	5 V/0.3 A	364 W	MFA350PS48

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					EN61000-3-2 class C for loads ≥20%
Input Current - No Load		100		mA	
Input Current - Full Load		3.6/1.8		A	115/230 VAC
Inrush Current			60	A	230 VAC cold start
Earth Leakage Current		1		mA	230 VAC/50 Hz
Input Protection	T6.3A/250 V internal fuse in line				

Output Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage - V1	12		48	VDC	See Models and Ratings table
Initial Set Accuracy			±1 [V1], ±5 [V2] & ±3 [V3]	%	
Output Voltage Adjustment	±10			%	
Minimum Load	0				No minimum load required
Start Up Delay		1	2	s	90 VAC full load (see fig. 1)
Hold Up Time	16	20		ms	90 VAC full load (see fig. 2 & 3)
Drift			±0.2	%	After 20 min warm up
Line Regulation			±0.5[V1], ±3 [V2] & ±3 [V3]	%	
Load Regulation			±1 [V1], ±5 [V2] & ±3 [V3]	%	0-100% load. V2 10-100% load
Transient Response - V1			4	%	Recovery within 1% in less than 500 µs for a 50-75% and 75-50% load step
Over/Undershoot - V1			1	%	(see fig. 4)
Ripple & Noise			1 [V1 & V3] & 2 [V2]	% pk-pk	20 MHz bandwidth (see fig. 6 & 7)
Overvoltage Protection	115		140	%	Vnom DC. Output 1 only, recycle input to reset
Overload Protection	110		140	% I nom	Output 1 only, auto reset (see fig. 5)
Short Circuit Protection					Continuous
Temperature Coefficient			0.05	%/°C	
Overtemperature Protection		75		°C	Thermal sensor under PCB

Start Up Delay From AC Turn On

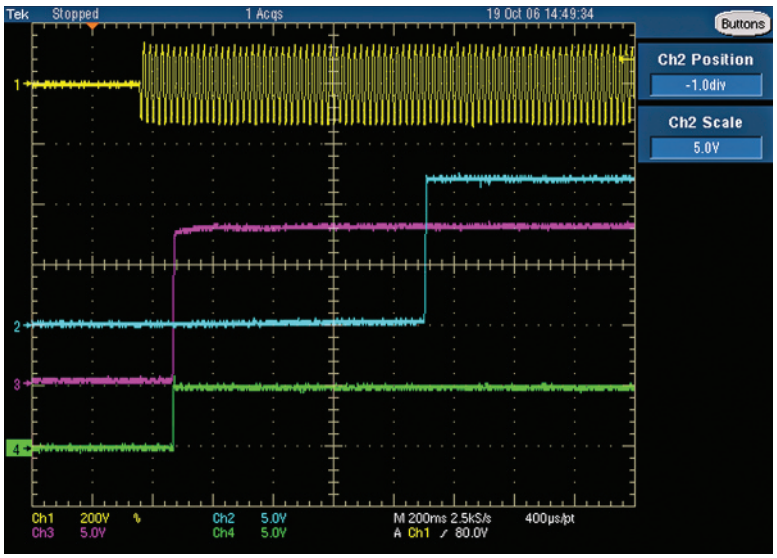


Figure 1
Example of start up all outputs

Hold Up Time From Loss of AC

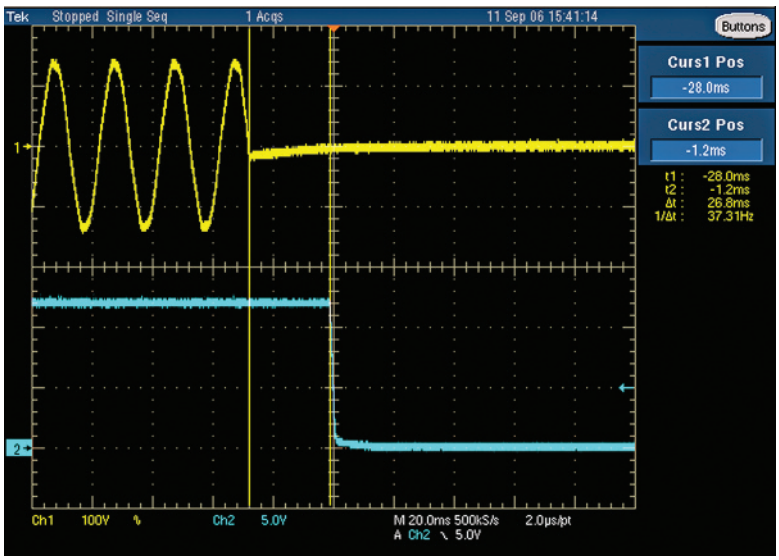


Figure 2
V1 hold up at full load with 90 VAC input (26.8 ms)

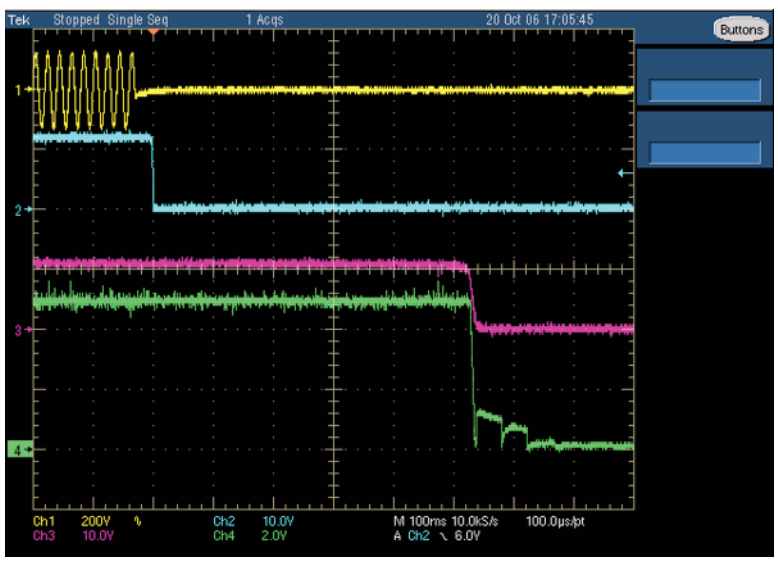


Figure 3
Full load 90 VAC input

Output Overshoot

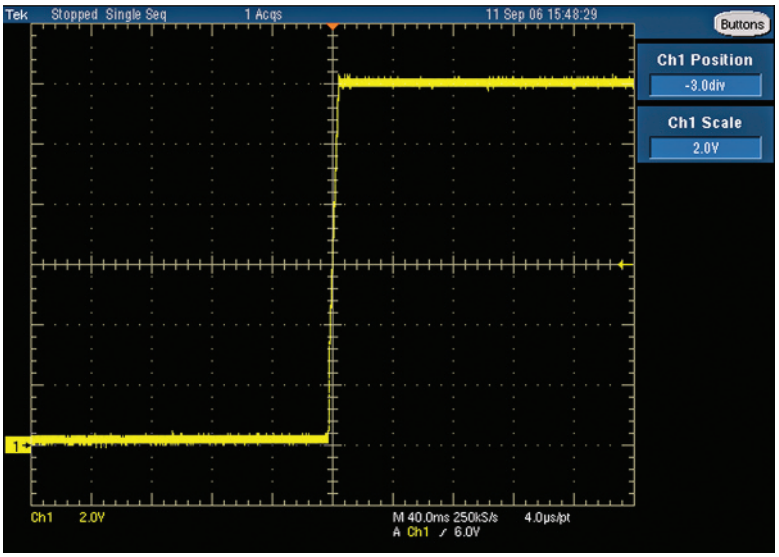


Figure 4
Typical Output Overshoot
(MFA350PS12)

Output Overload Characteristic

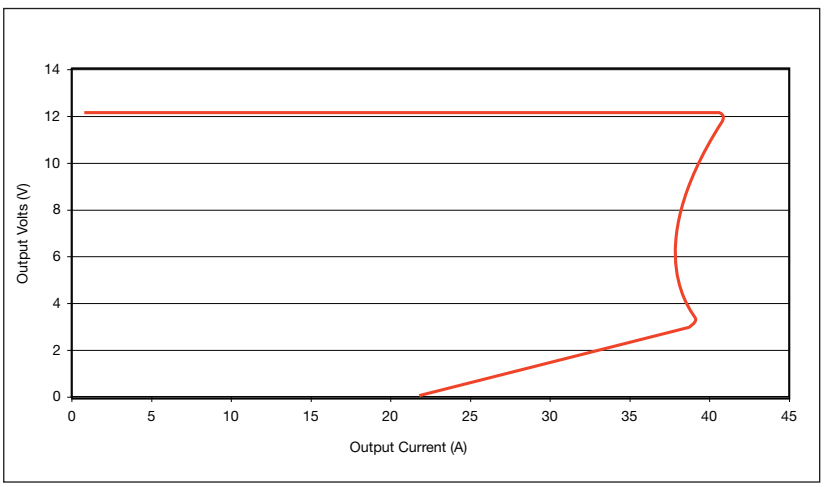


Figure 5

Output Ripple & Noise

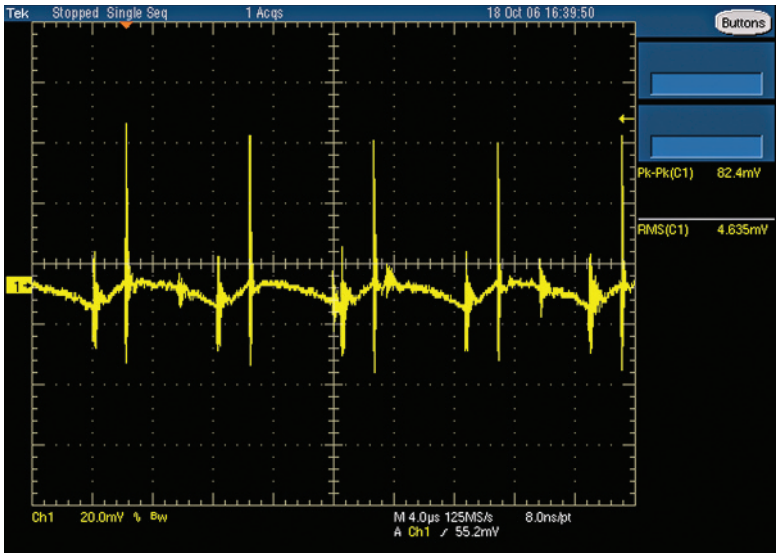


Figure 6
V1 MFA350PS12 (full load)
80 mV pk-pk ripple. 20 MHz BW

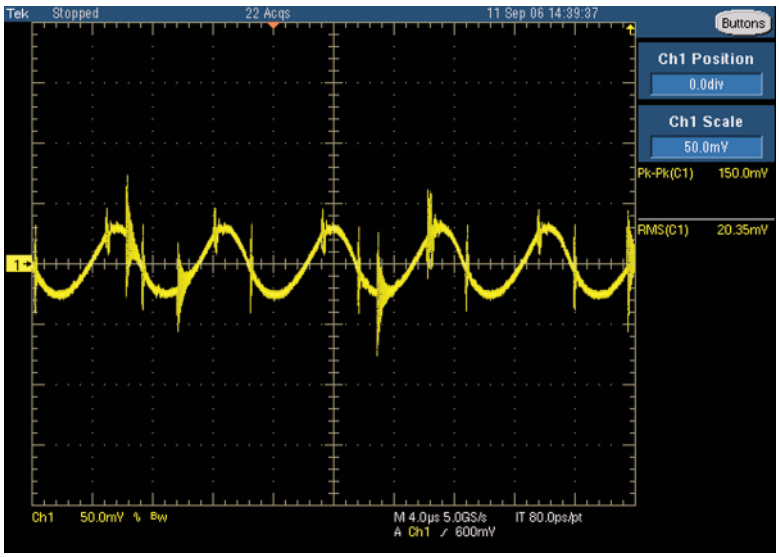


Figure 7
V1 MFA350PS48 (full load)
150 mV pk-pk ripple. 20 MHz BW

General Specifications

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		86		%	Full load (see fig. 8 & 9)
Isolation: Input to Output	3000			VAC	
Input to Ground	1500			VAC	
Output to Ground	100			VDC	
Switching Frequency: PFC		62		kHz	
Main Converter		157		kHz	
Power Density			11.1	W/in^3	
Mean Time Between Failure		460		kHrs	MIL-HDBK-217F, Notice 2 +25 °C GB
Weight			1.35 (612)	lb (g)	

Characteristic	Notes & Conditions
Signals	
AC OK/Powerfail	Open collector referenced to output 0V, transistor normally off when AC is good (see fig. 10, 16, 17 & 18) AC OK: Provides ≥ 5 ms warning of loss of output from AC failure
DC OK	Open collector referenced to 0 V, transistor normally off when DC is good (see fig. 11, 19 & 20). Provides warning of DC output failure
Remote On/Off (Inhibit/Enable)	Remotely switches outputs off, can also be configured as enable (see fig.12)
Current Share	Up to 3 supplies can be connected in parallel. Output current is shared within 10% at full load. Derate overall output current to 90% when used in parallel (see fig.13, 14 & 15)
Remote Sense	Compensates for 0.5 V total voltage drop

Efficiency Versus Load

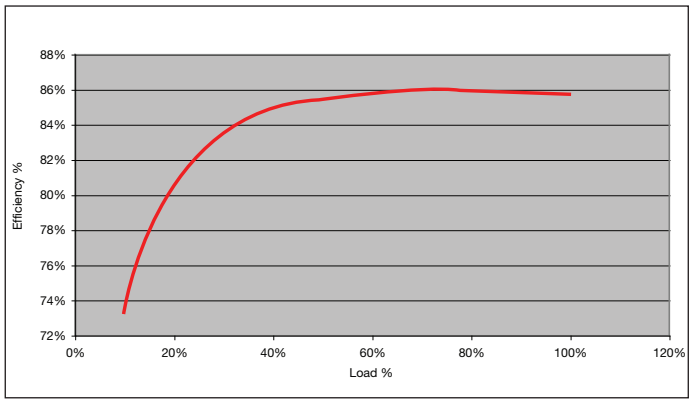


Figure 8
MFA350PS12 @ 230 VAC

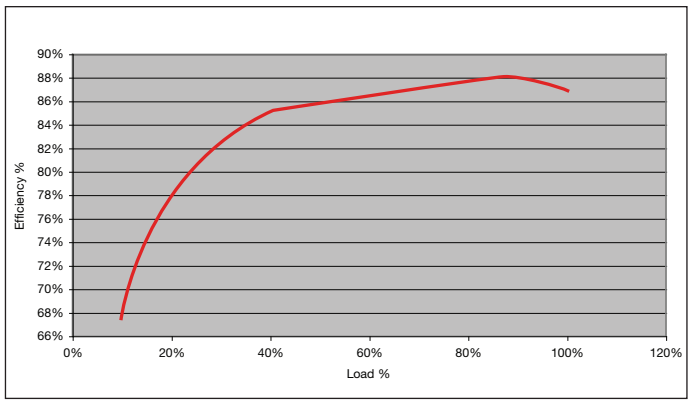


Figure 9
MFA350PS48 @ 230 VAC

Signals

AC OK/Power Fail

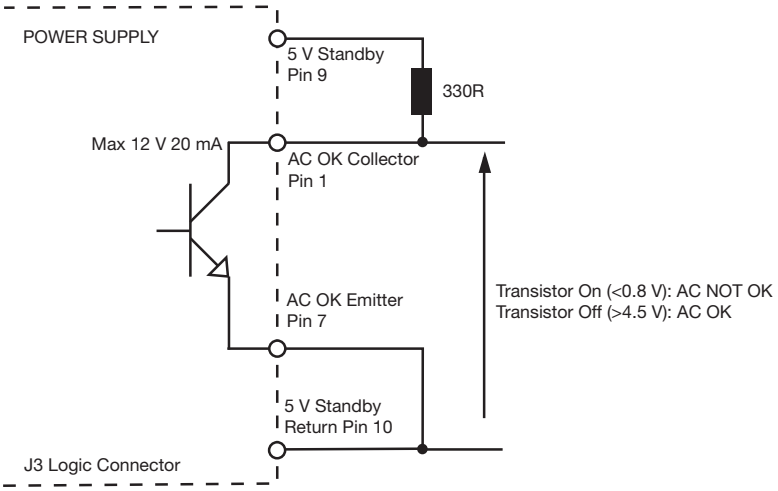


Figure 10

DC OK

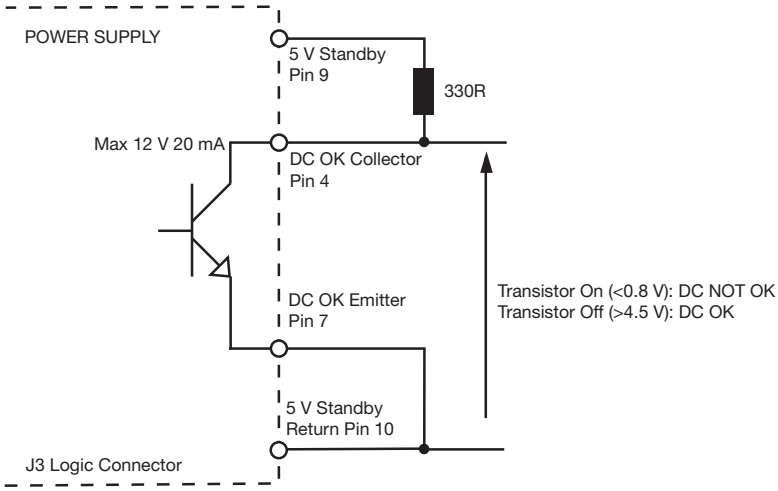


Figure 11

Remote On/Off (Inhibit)

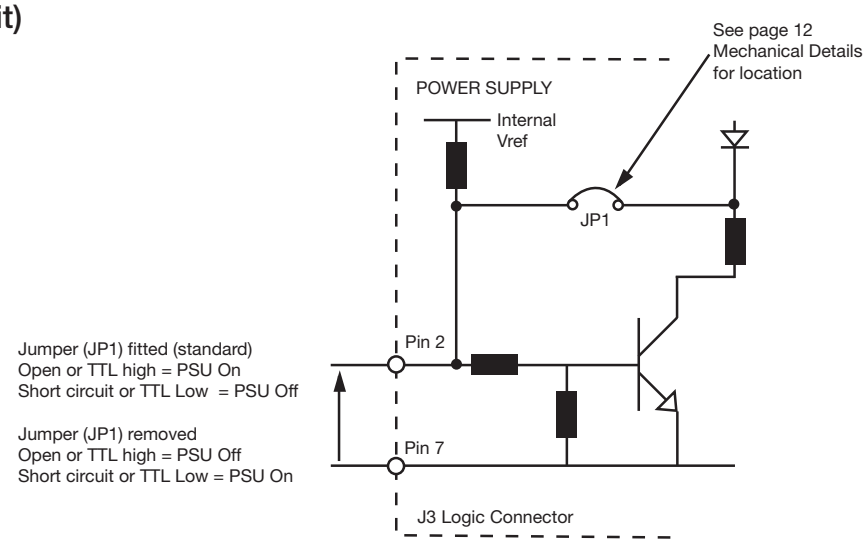


Figure 12

Signals

Parallel Load & Current Share Connections

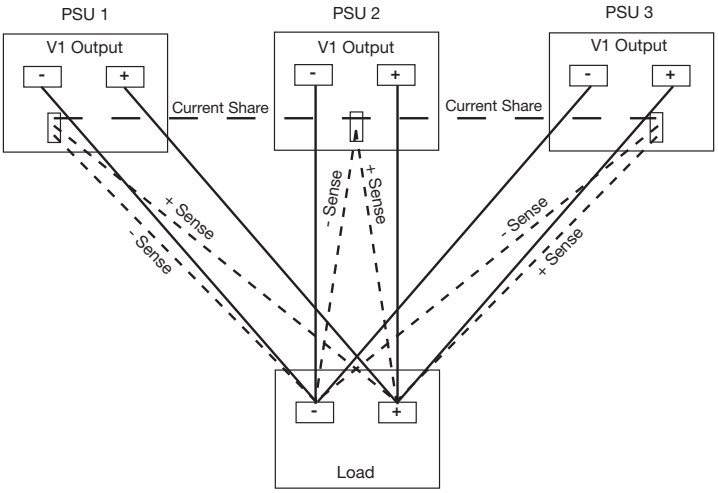


Figure 13

Parallel AC OK Connection (DC OK follows same format)

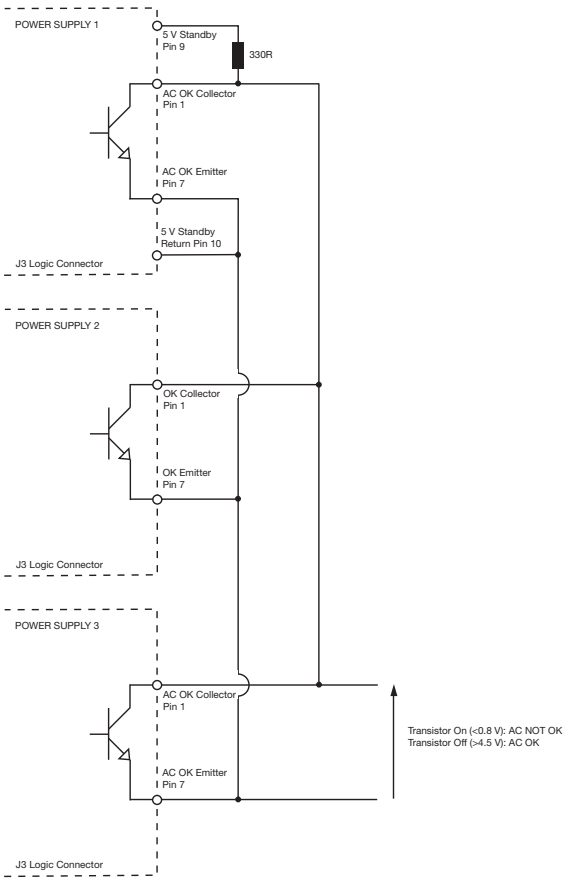


Figure 14

Parallel Remote On/Off (Inhibit) Connection

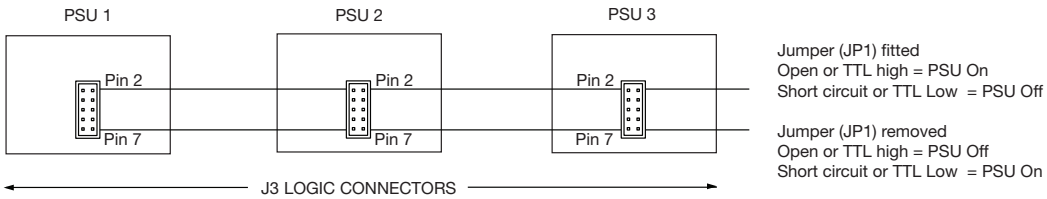


Figure 15

Jumper (JP1) fitted
Open or TTL high = PSU On
Short circuit or TTL Low = PSU Off

Jumper (JP1) removed
Open or TTL high = PSU Off
Short circuit or TTL Low = PSU On

Signals

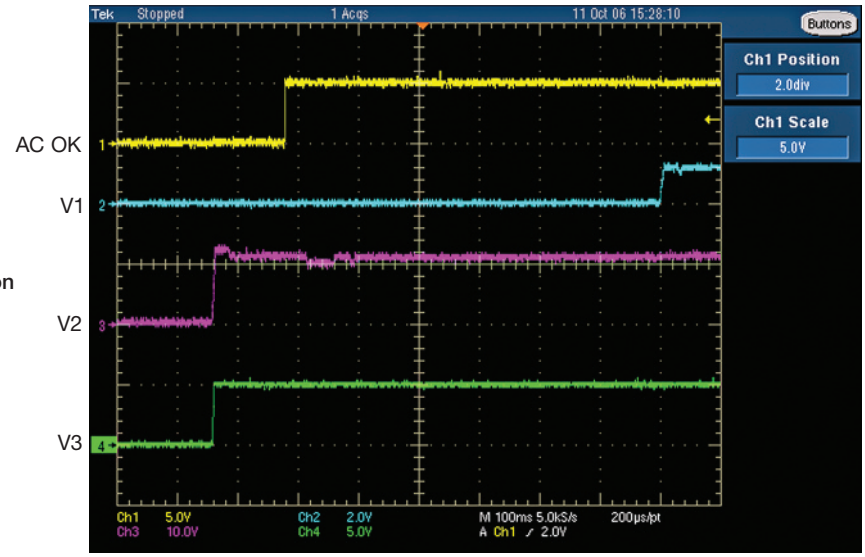


Figure 16
AC OK signal at AC switch on

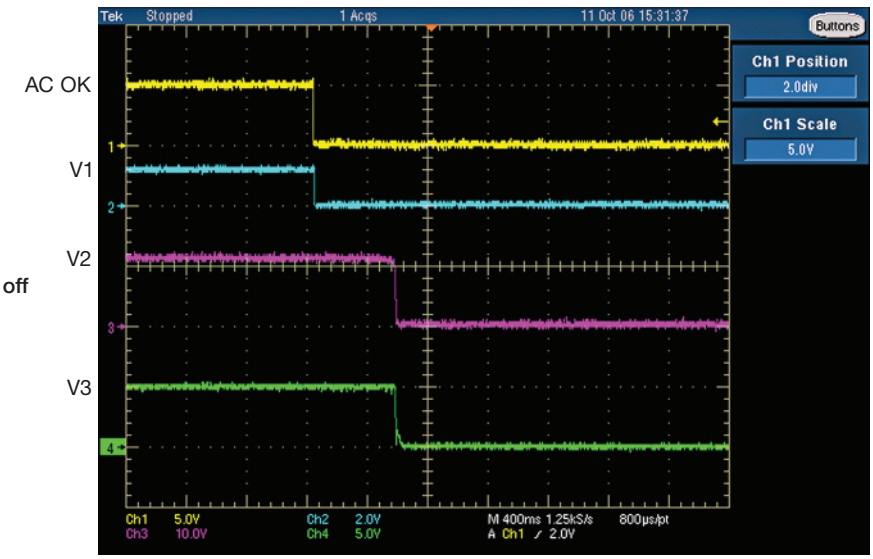


Figure 17
AC OK signal at AC switch off

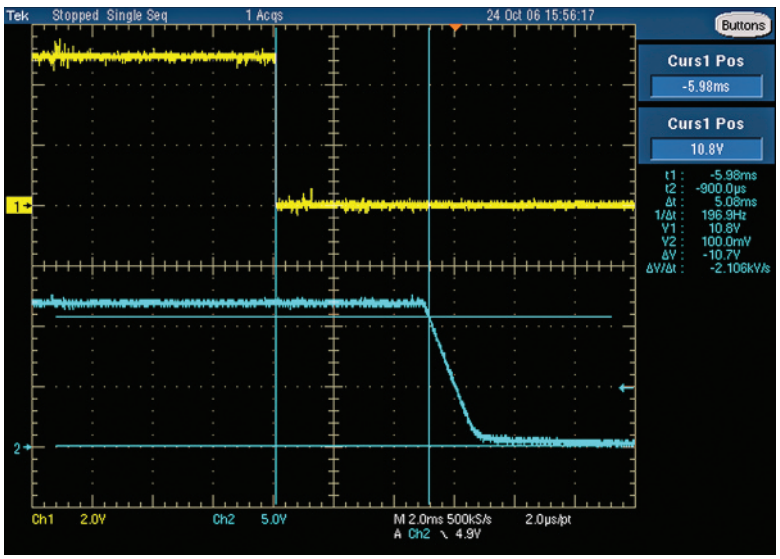


Figure 18
V1 warning time at AC OK signal
90 VAC full load (MFA350PS12)

Signals

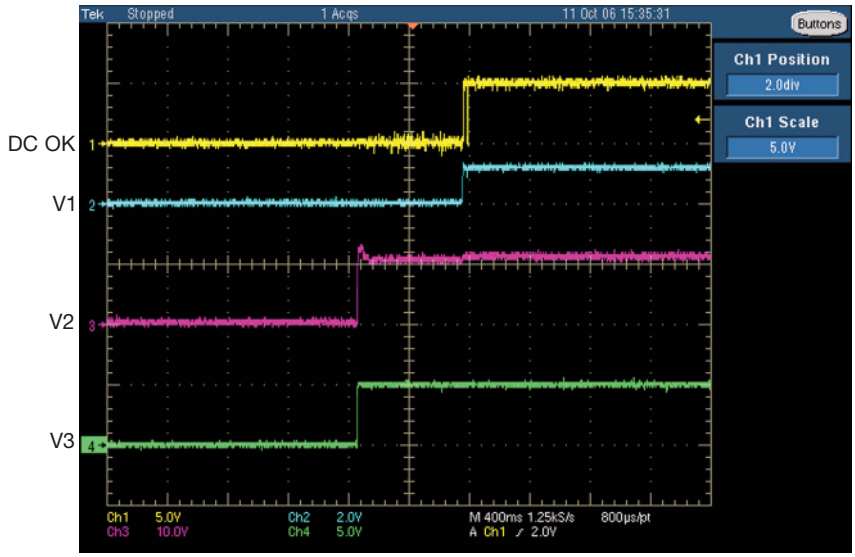


Figure 19
DC OK at AC switch on

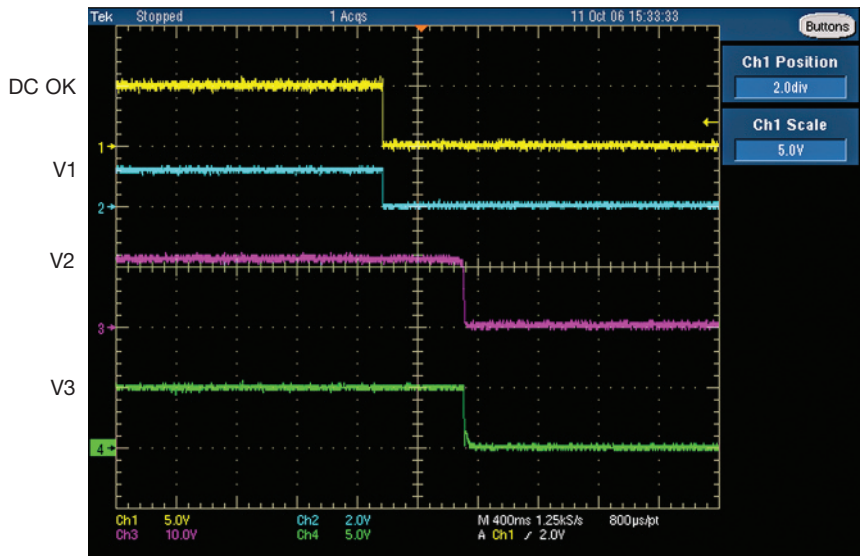


Figure 20
DC OK at AC switch off

Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Temperature	-10		+70	°C	Derate linearly from +50 °C at 2.5%/°C to 50% at 70 °C when forced cooled. See Thermal Considerations.
Storage Temperature	-20		+85	°C	
Cooling	13			CFM	U Channel Version. -TF & -EF models have integral fan. See Thermal Considerations for U Channel.
Humidity	5		95	%RH	Non-condensing
Operating Altitude			3000	m	
Shock					3 x 30 g/11 ms shocks in both +ve & -ve directions along the 3 orthogonal axis, total 18 shocks.
Vibration					Single axis 10-500 Hz at 2 g x 10 sweeps

Electromagnetic Compatibility - Immunity

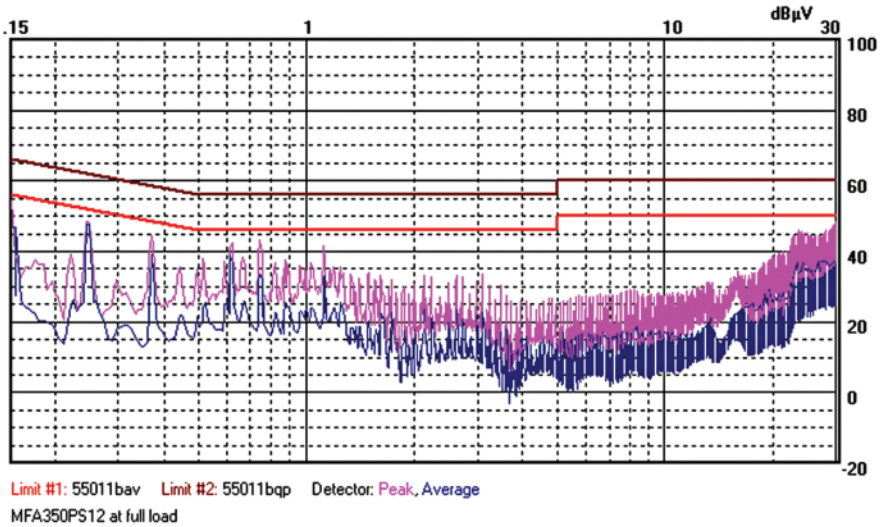
Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Harmonic Current	EN61000-3-2	Class A		
		Class C		For loads ≥20%
EFT	EN61000-4-4	3	A	
Surges	EN61000-4-5	Installation Class 3	A	
Conducted	EN61000-4-6	10 V rms	A	
Dips and Interruptions	EN61000-4-11	30% 10 ms	A	
		60% 100 ms	B	
		100% 5000 ms	B	

Electromagnetic Compatibility - Emissions

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Conducted	EN55032	Class B		See fig. 21
Radiated	EN55032	Class A		
Voltage Fluctuations	EN61000-3-3			

Typical EMC Plot

Figure 21

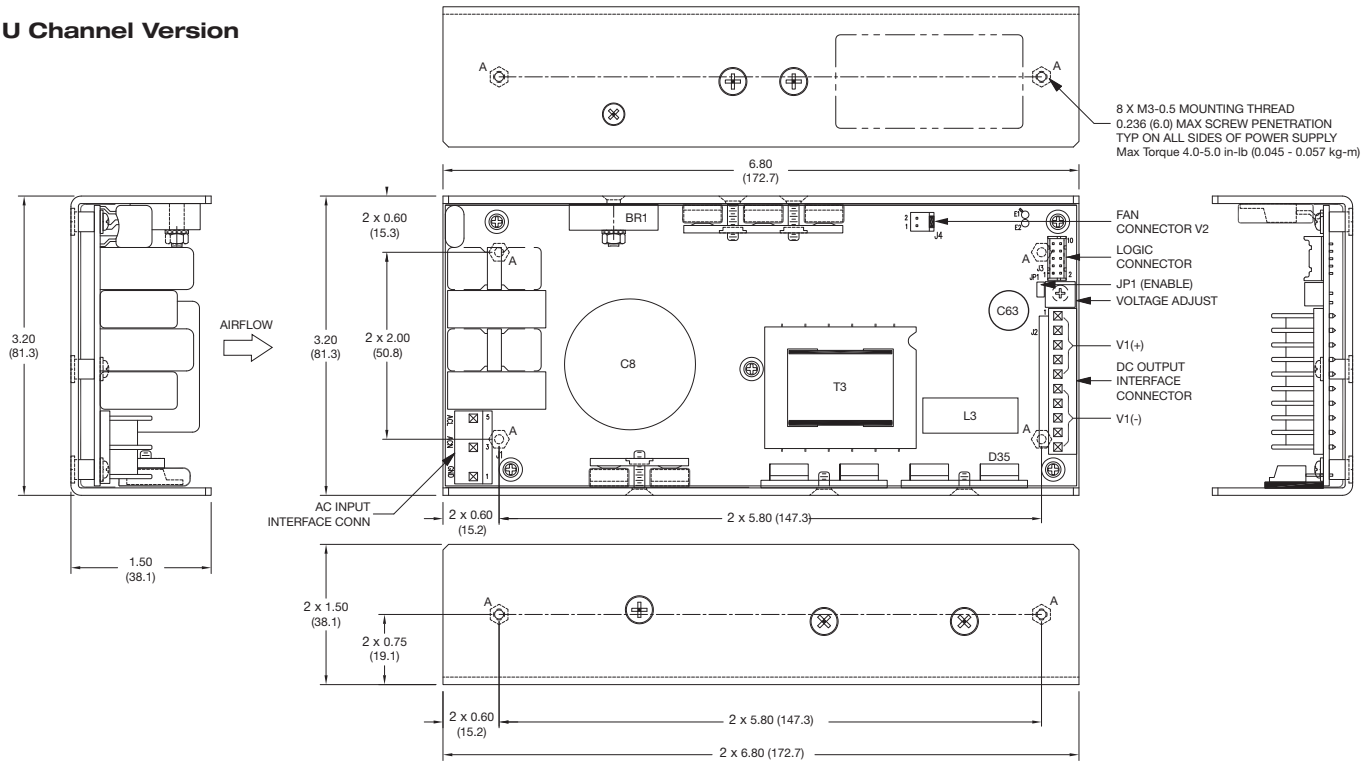


Safety Agency Approvals

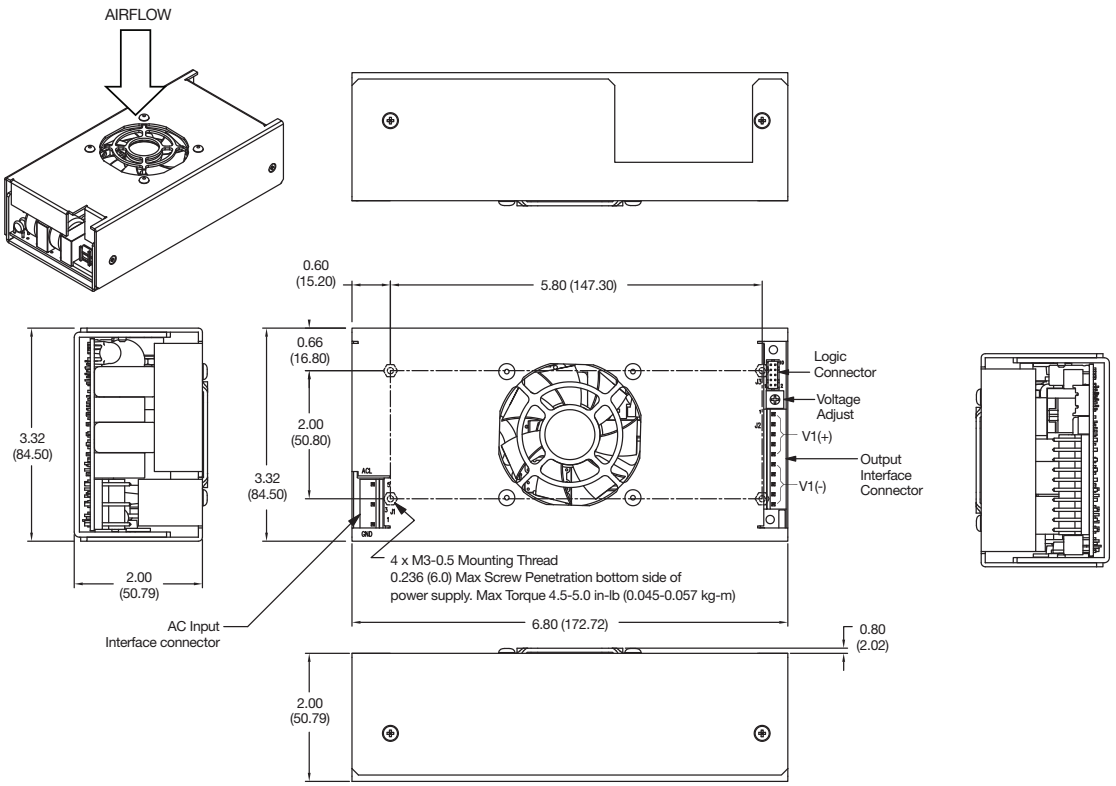
Safety Agency	Safety Standard	Category
CB Report	IEC60950-1:2005 Ed 2 / IEC62368-1:2014	Information Technology
UL/CSA	UL 62368-1 / CAN/CSA C22.2 No. 62368-1-14	Information Technology
TUV	EN62368-1:2014/A11:2017	Information Technology
CE	LVD	

Mechanical Details

U Channel Version



Top Fan Version (Suffix TF)

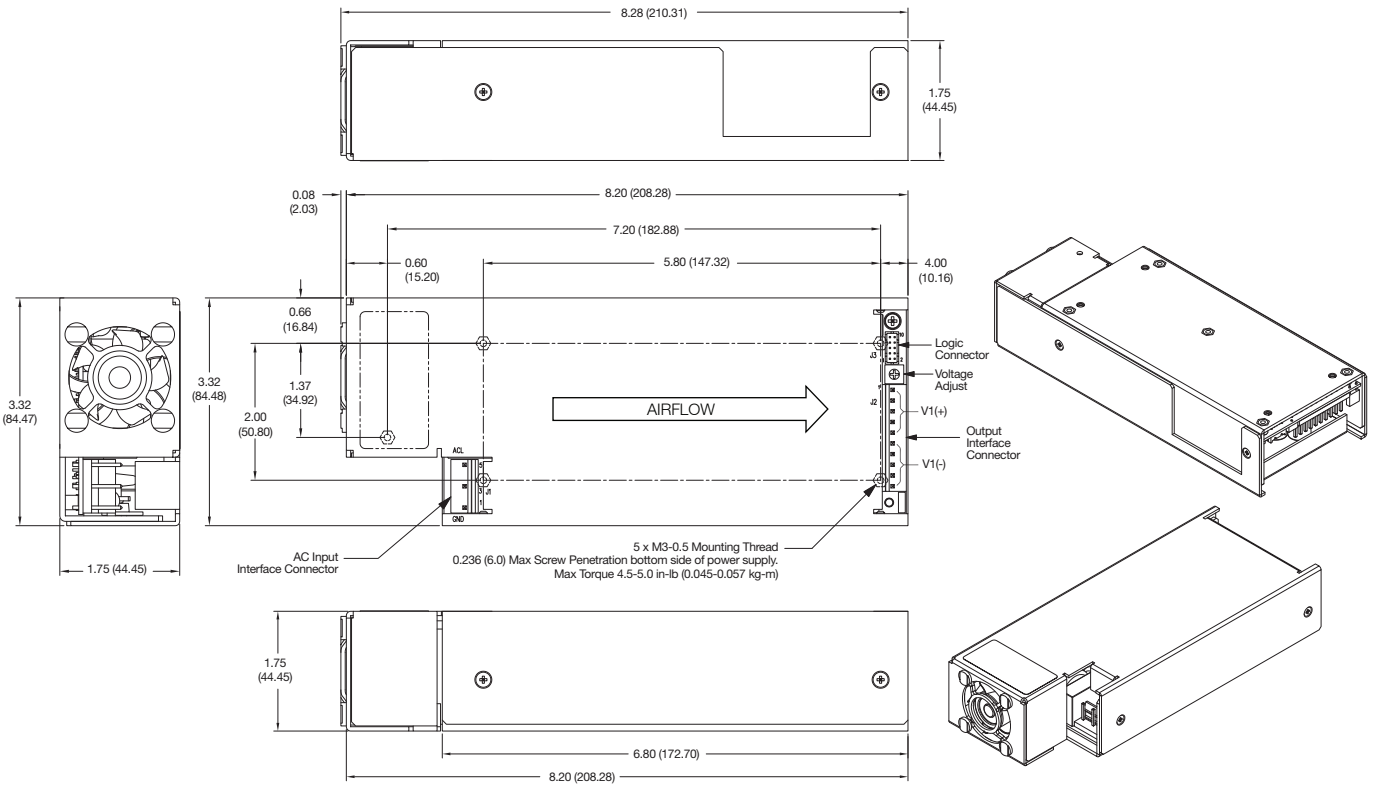


Notes

1. All dimensions in inches (mm).
2. Tolerance: X.XX = ±0.02 (±0.50), X.XXX = ±0.01 (±0.25)

Mechanical Details

End Fan Version (Suffix EF)



Notes
1. All dimensions in inches (mm).
2. Tolerance: X.XX = ±0.02 (±0.50), X.XXX = ±0.01 (±0.25)

Mechanical Details - Pin Connections

PIN CONNECTIONS AC INPUT J1 AMP/TE CONN = 640445-5	
1	GND
3	Neutral
5	Line

Mating Parts:
AMP/TE CONN Housing = 640250-5
Contact 350980-1

Option '-S' screw terminals
Phoenix Contact:
MKDS 1/5-3.81 or similar accepts 26-16 AWG wire (contacts 2 & 4 removed)

Max Torque 1.73 in-lb (0.02 kg-m)

PIN CONNECTIONS DC OUTPUT J2 AMP/TE CONN = 1-640445-0	
1	+V1
2	+V1
3	+V1
4	+V1
5	+V1
6	-V1
7	-V1
8	-V1
9	-V1
10	-V1

Mating Parts:
AMP/TE CONN = 1-640250-0
Contact 350980-1

Option '-S' screw terminals
2 x Phoenix Contact:
MKDS 1/5-3.81 or similar accepts 26-16 AWG wire

Max Torque 1.73 in-lb (0.02 kg-m)

PIN CONNECTIONS LOGIC CONNECTOR J3 JST B10B-PHDSS (LF) (SN)	
1	AC OK
2	ROF (Inhibit/Enable)
3	Current Share
4	DC OK
5	Not used
6	+Sense
7	-Sense
8	Not Used
9	5 V Standby V3
10	5 V Standby Return V3

Mating Parts:
JST Housing PHDR-10VS
Contact SPHD-001T-P0.5

PIN CONNECTIONS FAN OUTPUT J4 Molex 22-04-1021	
1	-V2
2	+V2

Mating Parts:
Molex Housing 22-01-1024
Contact 08-70-0057

Thermal Considerations (U Channel)

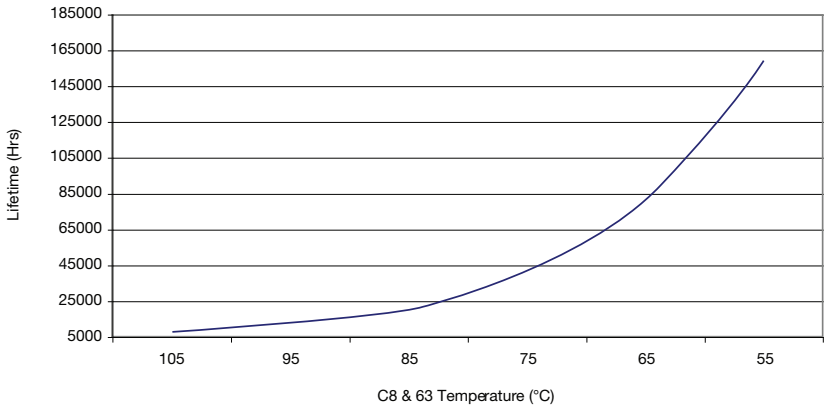
In order to ensure correct and reliable operation of the PSU in the most adverse conditions permitted in the end-use equipment, the temperature of the components listed in the table below must not be exceeded. See drawing on page 12 for component locations. Temperature should be monitored using K type thermocouples placed on the hottest part of the component (out of any direct air flow).

Temperature Measurements (Ambient ≤ 50 °C)	
Component	**Max Temperature °C**
T3	90 °C
BR1	105 °C
D35	85 °C
L3	90 °C

Service Life

The estimated service life of the MFA350 is determined by the cooling arrangements and load conditions experienced in the end application. Due to the uncertain nature of the end application this estimated service life is based on the actual measured temperature of two key capacitors within the product when installed in the end application. The highest of the two component temperatures should be used. The graph below expresses the estimated lifetime for a given component temperature and assumes continuous operation at this temperature.

Estimated Service Life vs Component Temperature



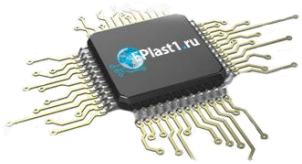
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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