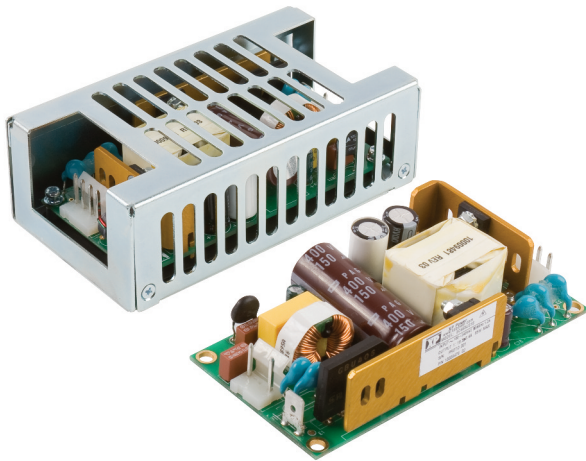


ECS65 Series



- IT & Medical Safety Approvals
- <0.5 W Standby Power
- 65 W Convection Cooled Rating
- Industry Standard 2.0" x 4.0" x 1.05" Format
- Low Earth Leakage Current
- Class B Radiated Emissions (-B models)
- Low Temperature Operation
- 3 Year Warranty

The ECS65 Series has been designed to minimise the no load power consumption (<0.5 W) and maximise efficiency in order to facilitate equipment design to the latest environmental legislation.

Approved for Class I applications, the ECS65 range of single output AC-DC, 65 W power supplies feature high power density in an industry standard 2 x 4" (51.0 mm x 102.0 mm) footprint. The 1.05" (27.0 mm) high, 1U compatible high-density power supplies meet EN55032 Level B emissions with low earth leakage currents of 110 μ A at 115 VAC or 210 μ A at 230 VAC. Making these switchers ideal for industrial, IT and medical applications.

The ECS65 series has single output versions from 12 V to 48 VDC which are adjustable by $\pm 10\%$. They are dual-fused for compliance with IEC60601-1 and with typical efficiencies at 88%, minimal waste heat is generated. The ECS65 delivers a full 65 W of power up to +50 °C and operates at up to +70 °C with derating.

Models and Ratings

Output Power - Convection Cooled	Output Voltage V1	Max Output Current	Model Number ¹⁾
65 W	12.0VDC	5.4 A	ECS65US12
65 W	15.0VDC	4.3 A	ECS65US15
65 W	18.5VDC	3.4 A	ECS65US18
65 W	24.0VDC	2.7 A	ECS65US24
65 W	28.0VDC	2.3 A	ECS65US28
65 W	48.0VDC	1.4 A	ECS65US48

Notes:
 1. For Class B radiated emissions models, add suffix -B to model number. For covered versions, add suffix '-C' to model number or order part no. ECM40/60 COVER for standalone cover. Derate output power by 20% with cover. The cover is not suitable for Class II installations.

Input Characteristics

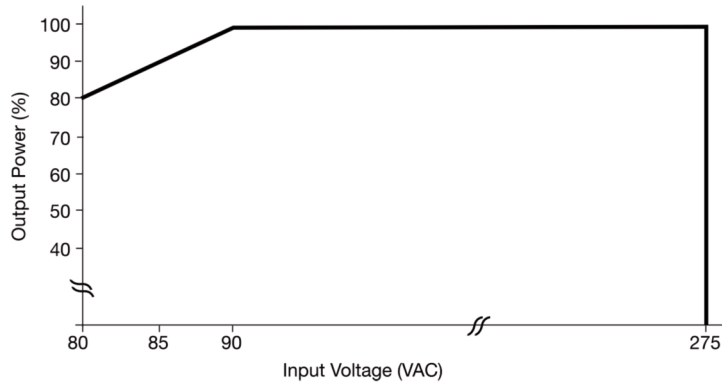
Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage - Operating	80	115/230	264	VAC	Derate output power < 90 VAC. See fig. 1
Input Frequency	47	50/60	400	Hz	400Hz for ECS65 only
Power Factor		>0.5			230 VAC, 100% load EN61000-3-2 class A compliant
Input Current - No Load		0.02/0.03		A	115/230 VAC
Input Current - Full Load		1.0/0.6		A	115/230 VAC
Inrush Current			40	A	230 VAC cold start, 25 °C
No Load Input Power		0.4	0.5	W	
Earth Leakage Current		110/210	260	µA	115/230 VAC/50 Hz (Typ.), 264 VAC/60 Hz (Max.)
		0.7/1.5		mA	115/230 VAC/400 Hz
Input Protection	T3.15A/250 V internal fuse in both line and neutral				

Output Characteristics

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage - V1	12		48	VDC	See Models and Ratings table
Initial Set Accuracy			±1	%	50% load, 115/230 VAC
Output Voltage Adjustment	±10			%	Via potentiometer. See mech. details (page 9)
Minimum Load	0			A	
Start Up Delay		1		s	230 VAC full load (see fig.2)
Hold Up Time	16			ms	115 VAC full load (see fig.3)
Drift			±0.2	%	After 20 min warm up
Line Regulation			±0.5	%	90-264 VAC
Load Regulation			±1	%	0-100% 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		5		%	See fig.4
Ripple & Noise			1	% pk-pk	20 MHz bandwidth (see fig.5 & 6)
Overvoltage Protection	115		140	%	Vnom DC.
Overload Protection	110		160	% I nom	Auto reset (see fig.7)
Short Circuit Protection					Continuous, trip & restart (hiccup mode)
Temperature Coefficient			0.05	%/°C	
Overtemperature Protection				°C	Not fitted

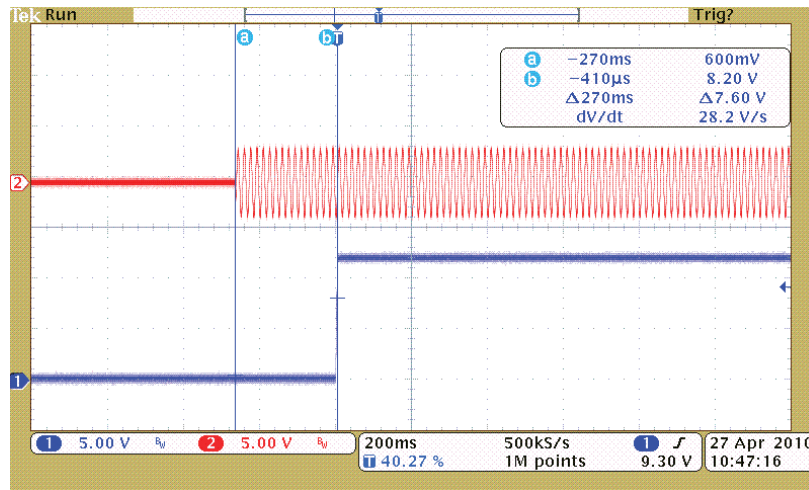
Input Voltage Derating

Figure 1



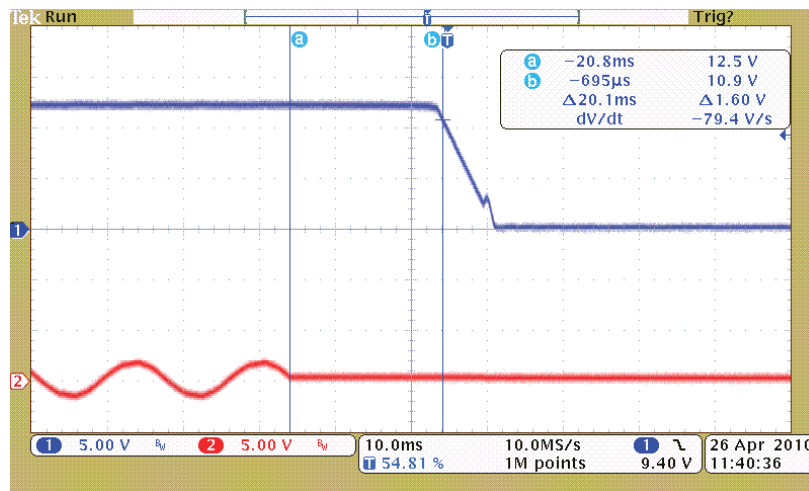
Start Up Delay From AC Turn On

Figure 2
Start up example from AC turn on
(230 VAC, 270 ms)



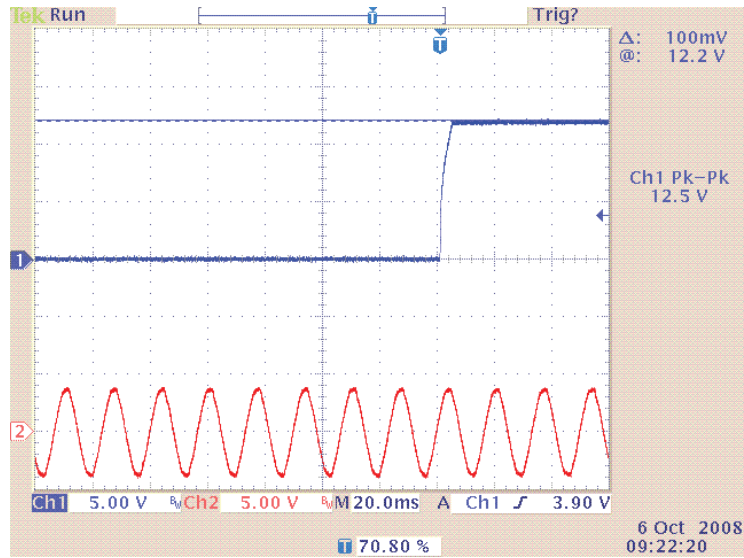
Hold Up Time From Loss of AC

Figure 3
Hold up example at 65 W load
with 115 VAC input (20.1 ms)



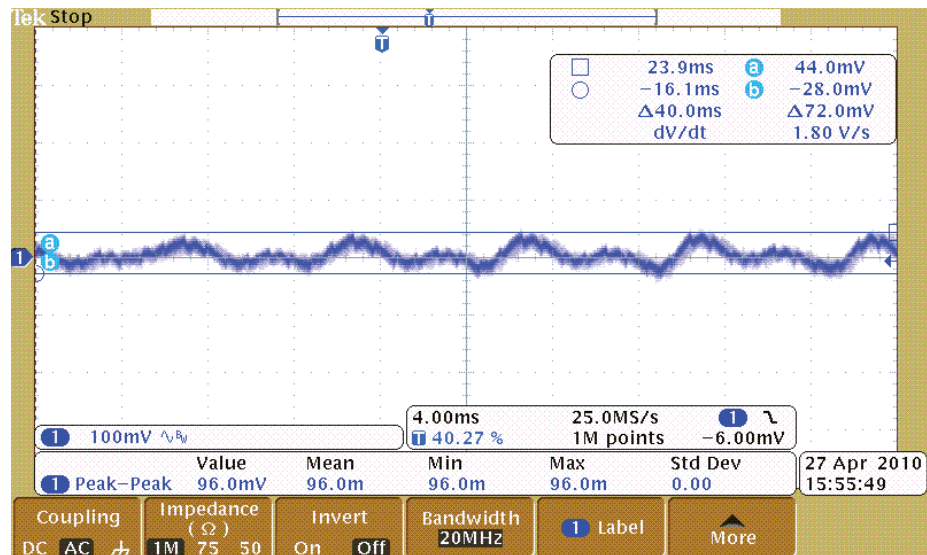
Typical Output Overshoot

Figure 4
Typical Output Overshoot
(ECS65US12, 230 VAC)



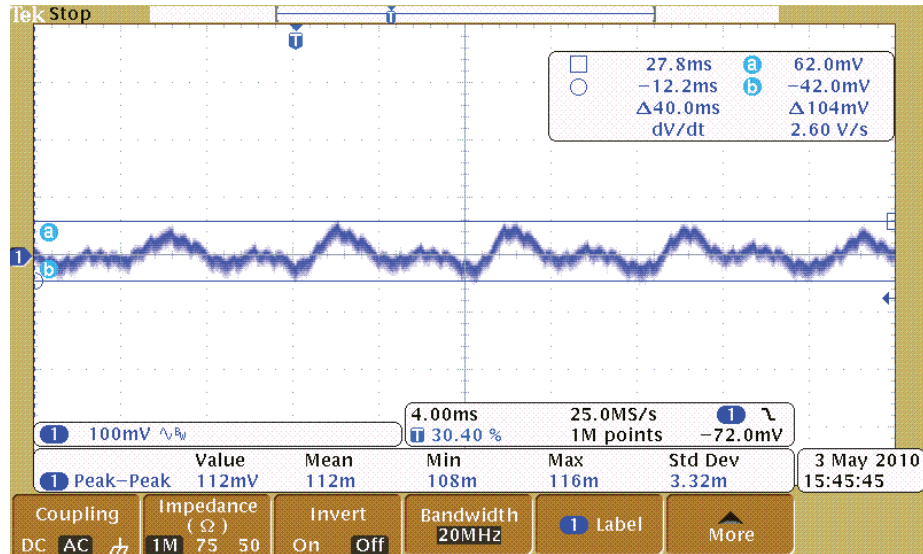
Output Ripple & Noise

Figure 5
ECS65US12 (65 W)
96 mV pk-pk ripple. 20 MHz BW



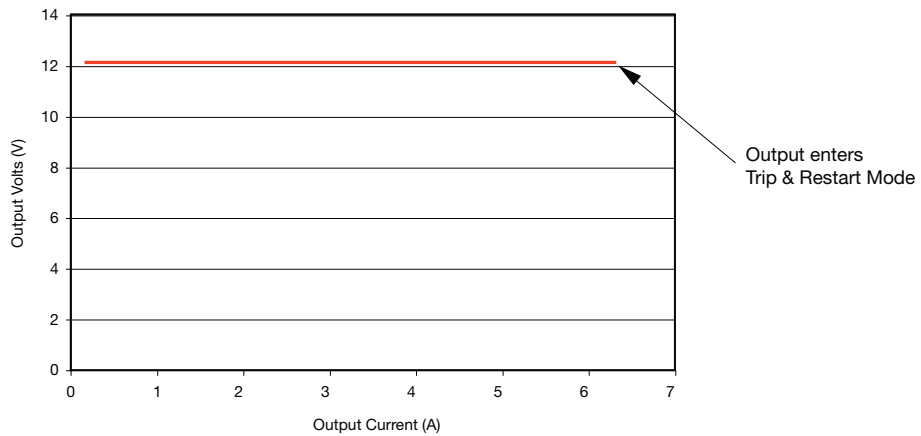
Output Ripple & Noise cont.

Figure 6
ECS65US24 (65 W)
112 mV pk-pk ripple. 20 MHz BW



Output Overload Characteristic

Figure 7
Typical Overload
Characteristic
(ECS65US12 shown)



General Specifications

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		88		%	Full load (see fig.8 & 9)
Isolation: Input to Output Input to Ground Output to Ground	4000			VAC	
	1500			VAC	
	500			VDC	
Switching Frequency		65		kHz	
Power Density			7.7	W/in ³	
Mean Time Between Failure		850		kHrs	MIL-HDBK-217F, Notice 2 +25 °C GB
Weight			0.28 (125)	lb (g)	

Efficiency Versus Load

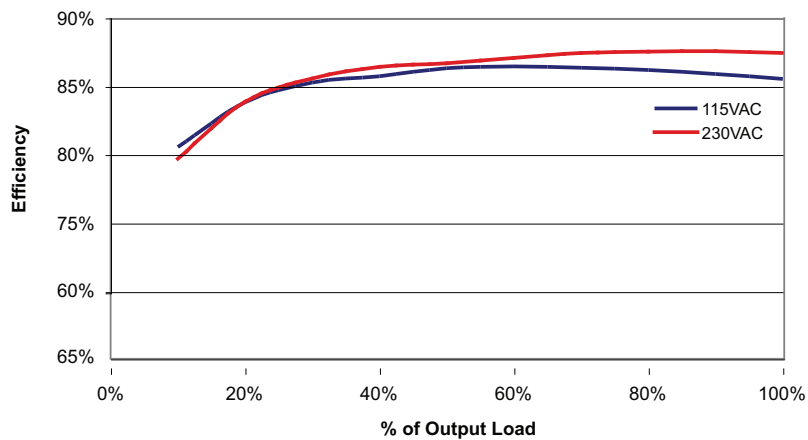


Figure 8 - ECS65US12

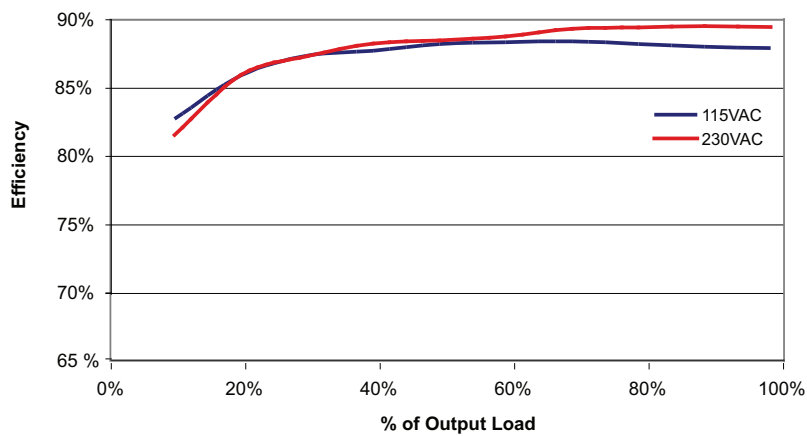


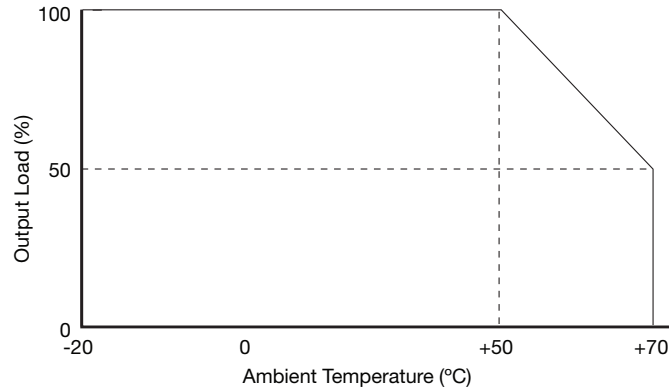
Figure 9 - ECS65US24

Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Temperature	-20		+70	°C	Derate linearly from +50 °C at 2.5%/°C to 50% at 70 °C. (See fig.10 & Thermal Considerations)
Storage Temperature	-40		+85	°C	
Cooling					Convection Cooled See fig.10 & Thermal Considerations
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					Three axis 5-500 Hz at 2 g x 10 sweeps

Derating Curve

Figure 10



Electromagnetic Compatibility - Immunity

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Low Voltage PSU EMC	EN61204-3	High severity level	as below	
Harmonic Current	EN61000-3-2	Class A		
ESD Immunity	EN61000-4-2	±6 kV Contact ±15 kV Air Discharge	A	
Radiated	EN61000-4-3	3	A	
EFT	EN61000-4-4	3	A	
Surges	EN61000-4-5	Installation class 3	A	
Conducted	EN61000-4-6	3	A	
Dips and Interruptions	EN61000-4-11	Dip: 30% 10 ms	A	
		Dip: 60% 100 ms	B	
		Dip: 100% 5000 ms	B	
	EN60601-1-2	Dip: 30% 500 ms	A	
		Dip: 60% 100 ms	A	Load derating with 115 VAC input (typically 80% derate dependant on model & load)
		Dip: 100% 10 ms	A	
		Int.: >95% 5000 ms	B	

Electromagnetic Compatibility - Emissions

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
Conducted	EN55011/32	Class B		See fig. 11
Radiated	EN55011/32	Class A		
		Class B		ECS65-B models
Voltage Fluctuations	EN61000-3-3			

Typical EMC Plot

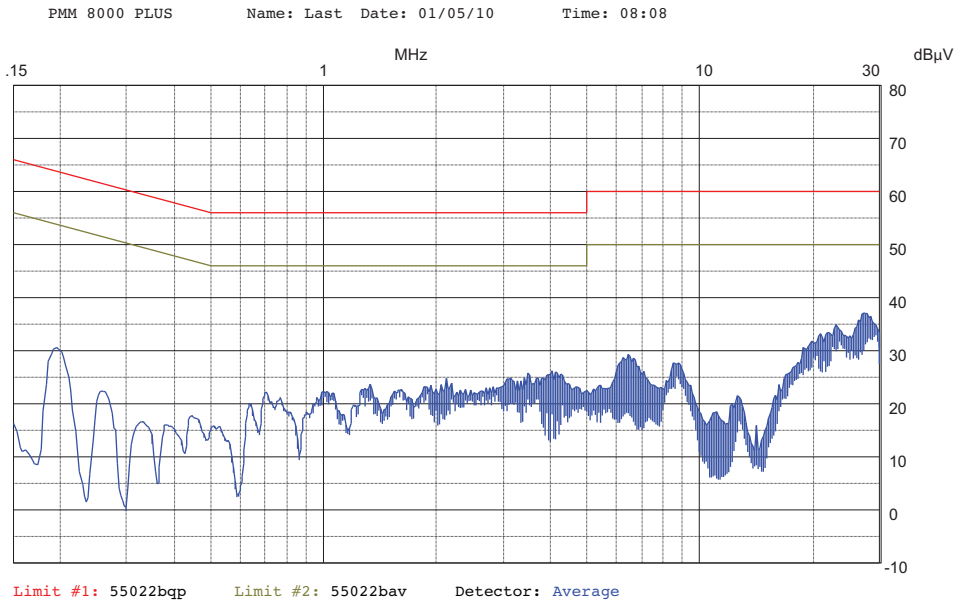


Figure 11
Typical conducted noise plot

Safety Agency Approvals

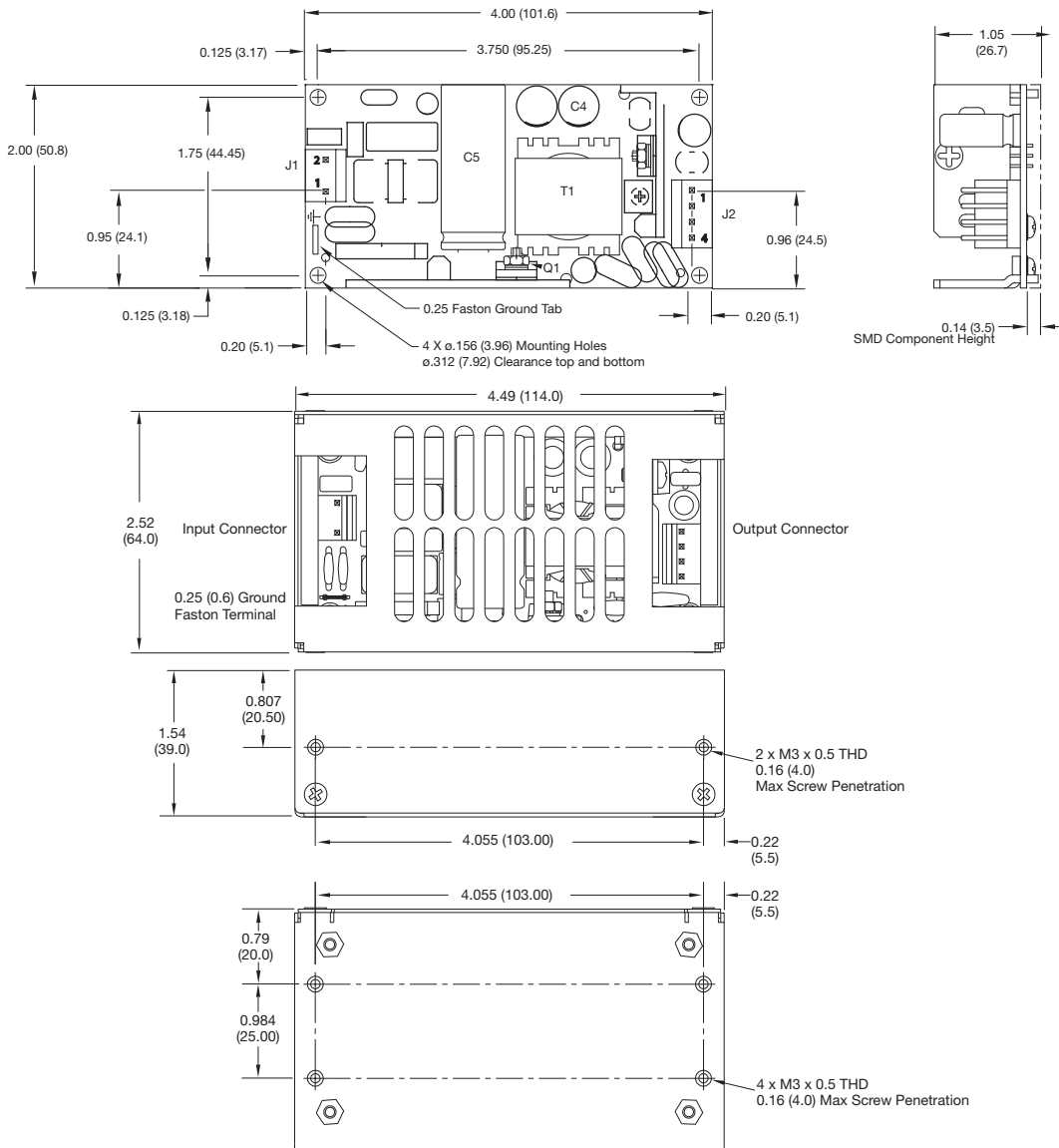
Safety Agency	Safety Standard	Category
CB Report	IEC60950-1:2005 Ed 2 / IEC62368-1:2014	Information Technology
UL	UL 62368-1 & CAN/CSA C22.2 No. 62368-1-14	Information Technology
TUV	EN62368-1:2014/A11:2017	Information Technology
CE	LVD	

Safety Agency	Safety Standard	Category
CB Report	Certificate #US/17857/UL, IEC60601-1 Ed 3 Including Risk Management	Medical
UL	UL File # E146893, ANSI/AAMI ES 60601-1:2005 & CSA C22.2 No. 60601-1:08	Medical
TUV	EN60601-1:2006	Medical

Means of Protection		Category
Primary to Secondary	2 x MOPP (Means of Patient Protection)	IEC60601-1 Ed 3
Primary to Earth	1 x MOPP (Means of Patient Protection)	
Secondary to Earth	1 x MOPP (Means of Patient Protection)	

Equipment Protection Class	Safety Standard	Notes & Conditions
Class I (& Class II, B Models)	IEC60950-1:2005 Ed 2 / IEC62368-1:2014 & IEC60601-1 Ed 3	See safety agency conditions of acceptability for details

Mechanical Details



Input Connector J1 Molex PN 09-65-2038	
Pin 1	Line
Pin 2	Neutral
0.25" Faston	Earth

J1 mates with Molex Housing PN 09-50-1031, J2 mates with Molex Housing PN 09-50-1041 and both with Molex Series 5194 Crimp Terminals

Output Connector J2 Molex PN 09-65-2048	
Pin 1	+V1
Pin 2	+V1
Pin 3	RTN
Pin 4	RTN

Notes

1. All dimensions in inches (mm).
Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)

2. Weight: 0.28 lbs (125 g) & with cover 0.66 lbs (300 g)

Thermal Considerations

In order to ensure safe 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 9 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
T1	110 °C
C5	100 °C
C4	100 °C
Q1	110 °C