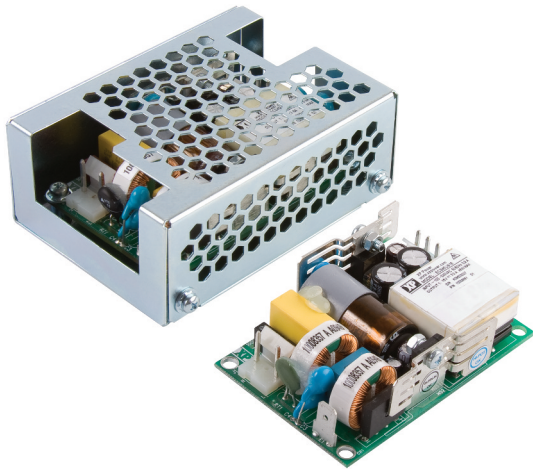


ECS25,45 & 60 Series



- IT & Medical Safety Approvals
- Very Small 2.0" x 3.0" Format
- Low Standby Power
- 25, 45 & 60 W – Convection Cooled Ratings
- High Convection Cooled Power Density up to 9.5 W/in³
- Class I & Class II Installations
- -20 °C to +70 °C Operation
- Low Earth Leakage Current
- 3 Year Warranty

The ECS25, 45 & 60 Series has been designed to minimise the no load power consumption and maximise efficiency in order to facilitate equipment design to the latest environmental legislation.

Approved for Class I and Class II applications, this range of single output AC-DC power supplies feature very high convection cooled power density in an industry leading 2" x 3" (51.0 mm x 76.2 mm) footprint. The very low profile, 1U compatible supplies meet EN55011/32 Level B conducted emissions with low earth leakage currents of 80 µA at 115 VAC or 160 µA at 230 VAC. Making these switchers ideal for industrial, IT and medical applications.

The series has single output versions from 5 V to 48 VDC, adjustable by ±10%. They are dual-fused for compliance with IEC60601-1 and efficiency up to 89%, so minimal excess heat is generated. They will deliver up to 60 W of power at +50 °C and up to +70 °C with derating.

Models and Ratings

| Output Power - Convection Cooled | Output Voltage V1 | Max Output Current | Model Number ¹⁾ |
|----------------------------------|-------------------|--------------------|----------------------------|
| 25 W | 12.0VDC | 2.08 A | ECS25US12 |
| 25 W | 15.0VDC | 1.67 A | ECS25US15 |
| 25 W | 24.0VDC | 1.04 A | ECS25US24 |
| 25 W | 48.0VDC | 0.52 A | ECS25US48 |
| 30 W | 5.0VDC | 6.00 A | ECS45US05 |
| 45 W | 12.0VDC | 3.75 A | ECS45US12 |
| 45 W | 15.0VDC | 3.00 A | ECS45US15 |
| 45 W | 24.0VDC | 1.90 A | ECS45US24 |
| 45 W | 48.0VDC | 0.95 A | ECS45US48 |
| 40 W | 5.0VDC | 8.00 A | ECS60US05 ¹ |
| 60 W | 12.0VDC | 5.00 A | ECS60US12 |
| 60 W | 15.0VDC | 4.00 A | ECS60US15 |
| 60 W | 24.0VDC | 2.50 A | ECS60US24 |
| 60 W | 48.0VDC | 1.25 A | ECS60US48 |

Notes

1. For covered versions, add suffix '-C' to model number or order part number ECS25-60 COVER KIT for standalone cover. Not suitable for use in class II installations, derate output power by 20% with cover.

Input Characteristics

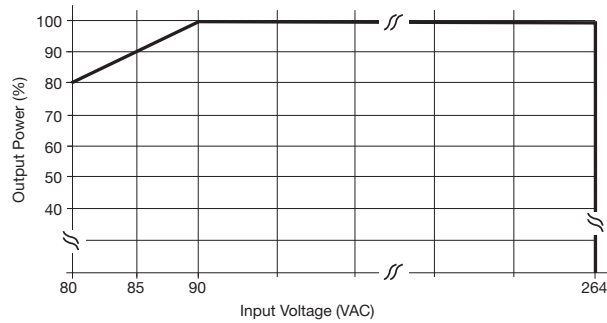
| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---------------------------|---|-------------------------------------|---------|----------|--|
| Input Voltage - Operating | 80 | 115/230 | 264 | VAC | Derate output power < 90 VAC. See fig. 1 |
| Input Frequency | 47 | 50/60 | 400 | Hz | Agency approval 47-63 Hz |
| Power Factor | | >0.5 | | | 230 VAC, 100% load EN61000-3-2 class A compliant |
| Input Current - No Load | | 0.01/0.02 | | A | 115/230 VAC |
| Input Current - Full Load | | 0.45/0.25 0.75/0.45 0.95/0.60 | | A | 115/230 VAC - ECS25 115/230 VAC - ECS45 115/230 VAC - ECS60 |
| Inrush Current | | | 40 | A | 230 VAC cold start, 25 °C |
| No Load Input Power | | 0.3 | 0.5 | W | 115/230 VAC |
| Earth Leakage Current | | 80/160 0.6/1.2 | 260 | µA mA | 115/230 VAC/50 Hz (Typ.), 264 VAC/60 Hz (Max.) 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 | 5.0 | | 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 | | 3 | | % | See fig.4 |
| Ripple & Noise | | | 1 | % pk-pk | 20 MHz bandwidth (see fig.5 & 6) |
| Overvoltage Protection | 115 | | 140 | % | Vnom DC. |
| Overload Protection | 110 | | 200 | % 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 |

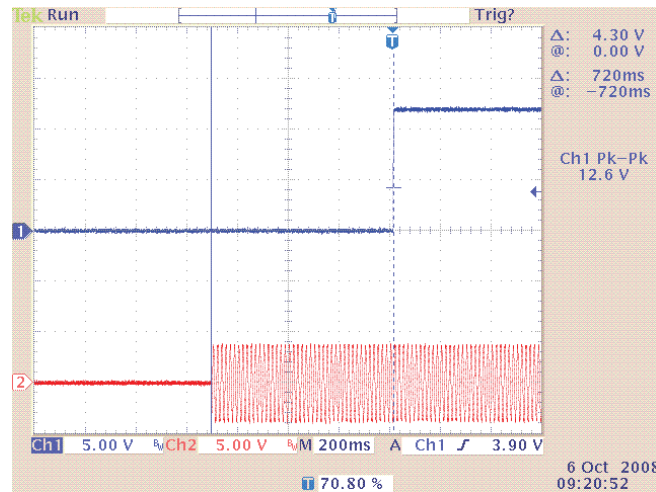
Input Voltage Derating

Figure 1



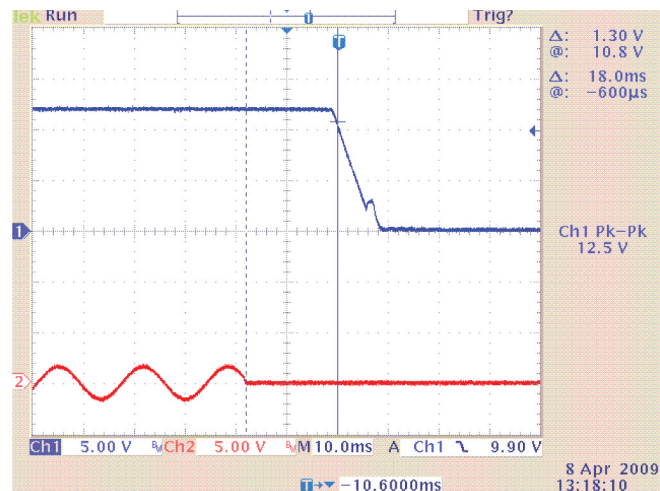
Start Up Delay From AC Turn On

Figure 2
Start up example from AC turn on
(230 VAC, 720 ms)



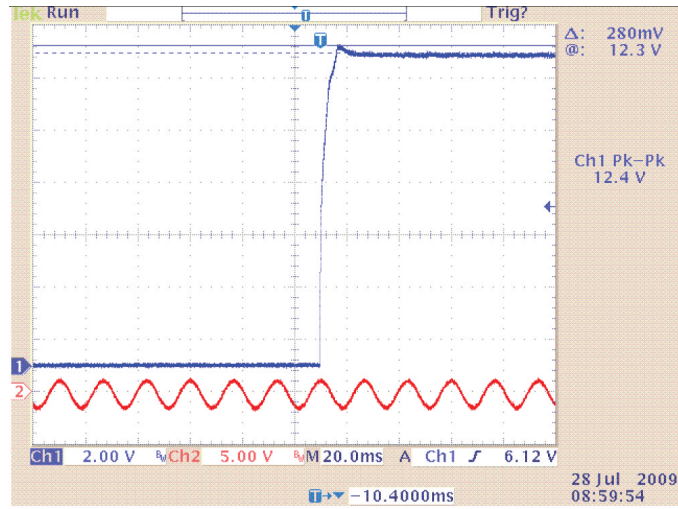
Hold Up Time From Loss of AC

Figure 3
Hold up example ECS45 at 45 W
load with 115 VAC input (17.2ms)



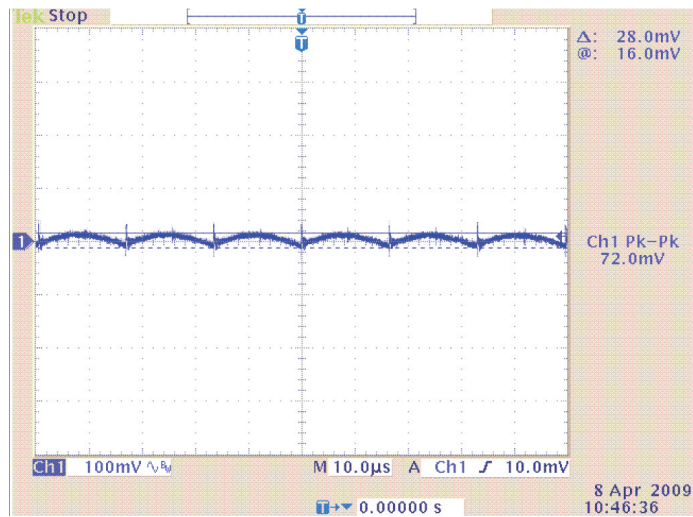
Typical Output Overshoot

Figure 4
Typical Output Overshoot
(ECS45US12, 230 VAC)



Output Ripple & Noise

Figure 5
ECS45US12 (45 W)
72 mV pk-pk ripple. 20 MHz BW



Output Ripple & Noise cont.

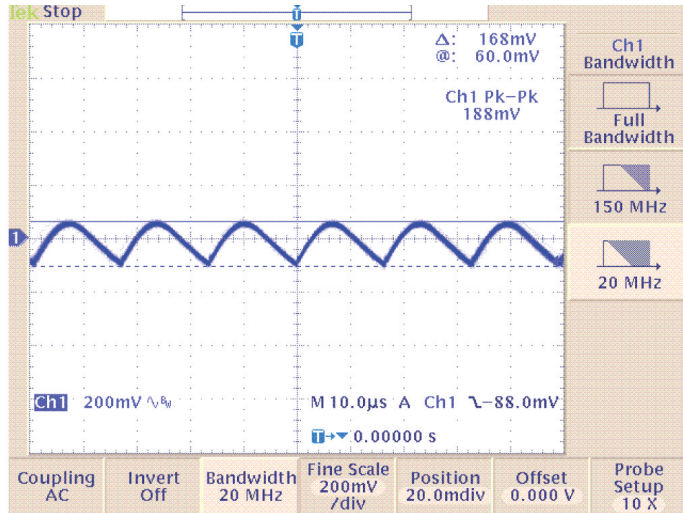


Figure 6
 ECS45US48 (45 W)
 188 mV pk-pk ripple. 20 MHz BW

Output Overload Characteristic

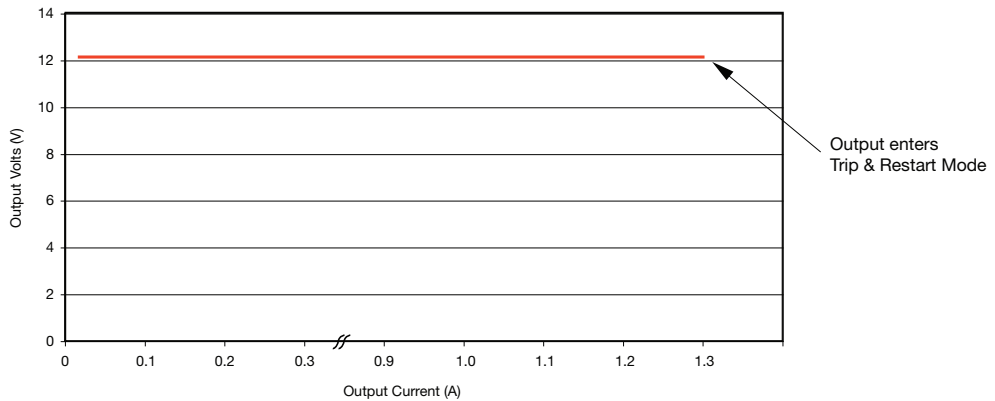


Figure 7
 Typical Overload
 Characteristic
 (ECS45US12 shown)

General Specifications

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---------|---------|------------|-------------------|-----------------------------------|
| Efficiency | | 87 | | % | 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 | | | 7.9 | W/in ³ | |
| Mean Time Between Failure | | 1072 | | kHrs | MIL-HDBK-217F, Notice 2 +25 °C GB |
| | | 660 | | | MIL-HDBK-217F, Notice 2 +50 °C GB |
| Weight | | | 0.22 (100) | lb (g) | |

Efficiency Versus Load

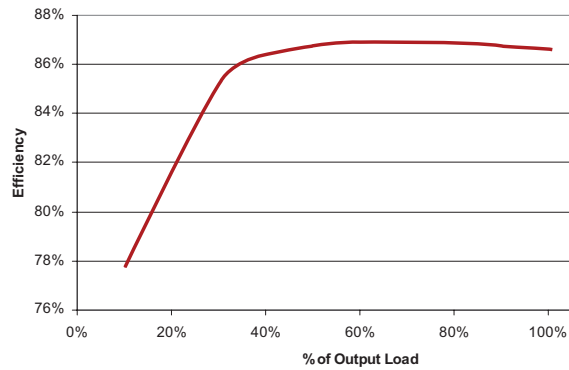


Figure 8
ECS45US12 at 230 VAC

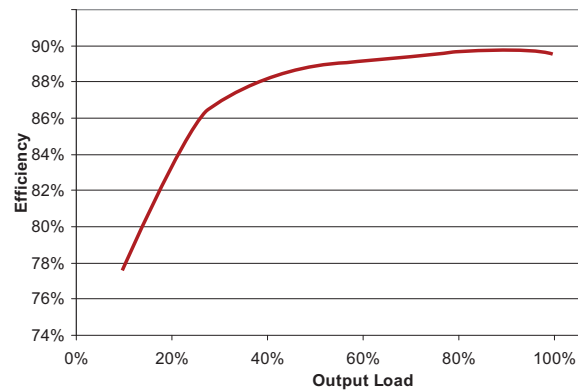


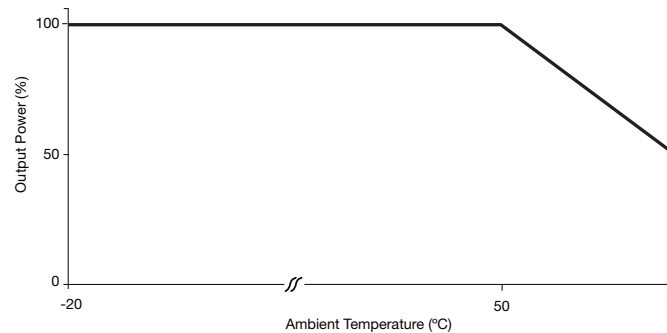
Figure 9
ECS45US48 at 230 VAC

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 | | |
| 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 45% 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 | | |
| Radiated | EN55011/32 | Class B | | ECS25 |
| | | Class A | | ECS45/ECS60 |
| Voltage Fluctuations | EN61000-3-3 | | | |

Safety Agency Approvals

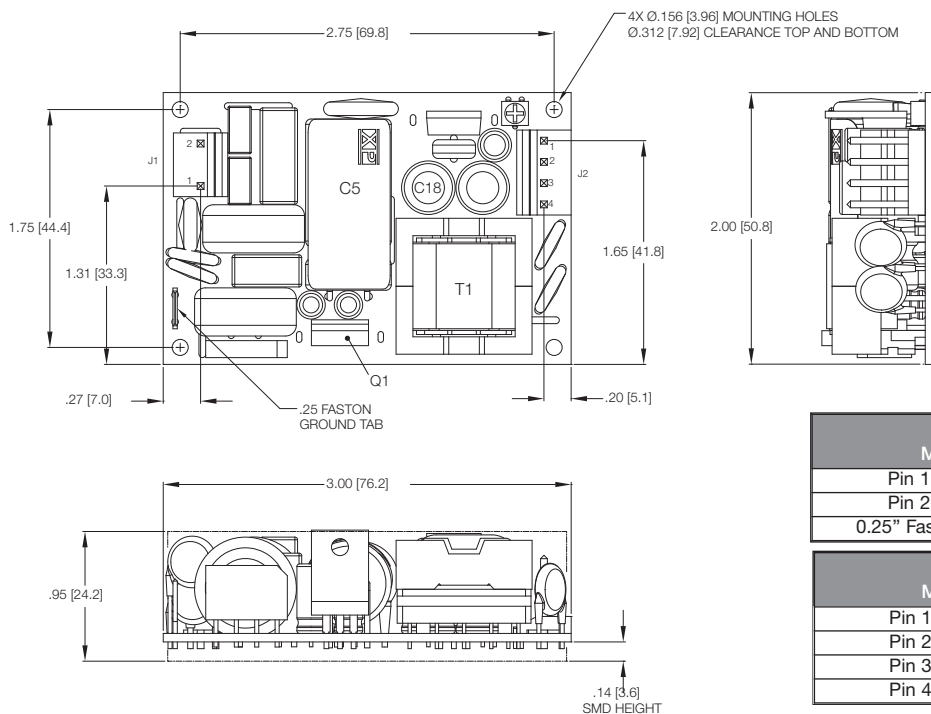
| Safety Agency | Safety Standard | Category |
|---------------|---|------------------------|
| CB Report | IEC60950-1:2005 Ed 2 / IEC62368-1:2014 | Information Technology |
| UL | UL 62368-1 & CAN/CSA C22.2 No. 62368-1-14 | Information Technology |
| TUV | EN62368-1:2014/A11:2017 | Information Technology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

| Safety Agency | Safety Standard | Category |
|---------------|---|----------|
| CB Report | IEC60601-1 Ed 3 Including Risk Management | Medical |
| UL | ANSI/AAMI ES60601-1:2005 & CSA C22.2, No.60601-1:08 | Medical |
| TUV | EN60601-1/A12:2006 | 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 | IEC60950-1:2005 Ed 2 / IEC62368-1:2014 & IEC60601-1 Ed 2 | See safety agency conditions of acceptability for details |

Mechanical Details - ECS25



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

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

Notes

- All dimensions in inches (mm).
Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)
- Weight 0.22 lbs (100 g)

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
Faston ground tab requires insulated receptacle

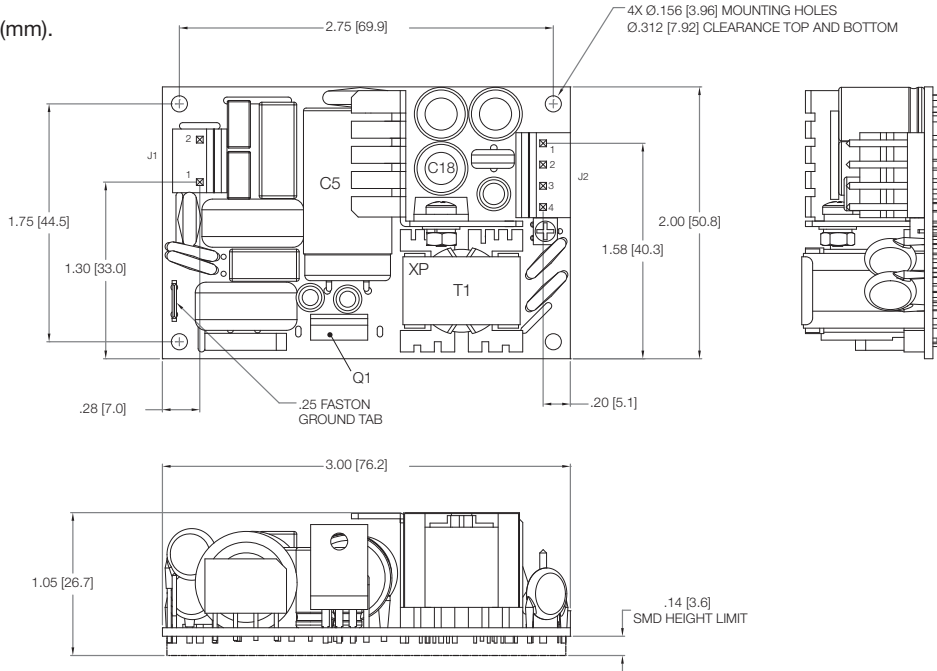
Mechanical Details - ECS45US05

Weight: 2.20 lbs (1000 g)
 Dimensions shown in inches (mm).

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

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

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
 Faston ground tab requires insulated receptacle

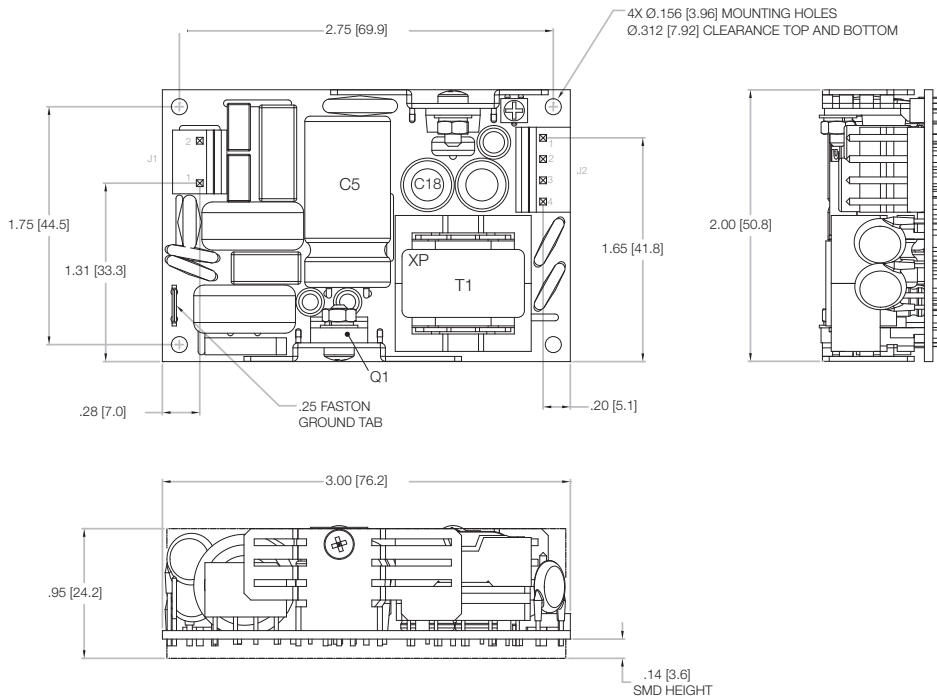


ECS45US other models

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

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

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
 Faston ground tab requires insulated receptacle



Notes

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

2. Weight: 0.22 lbs (100 g)

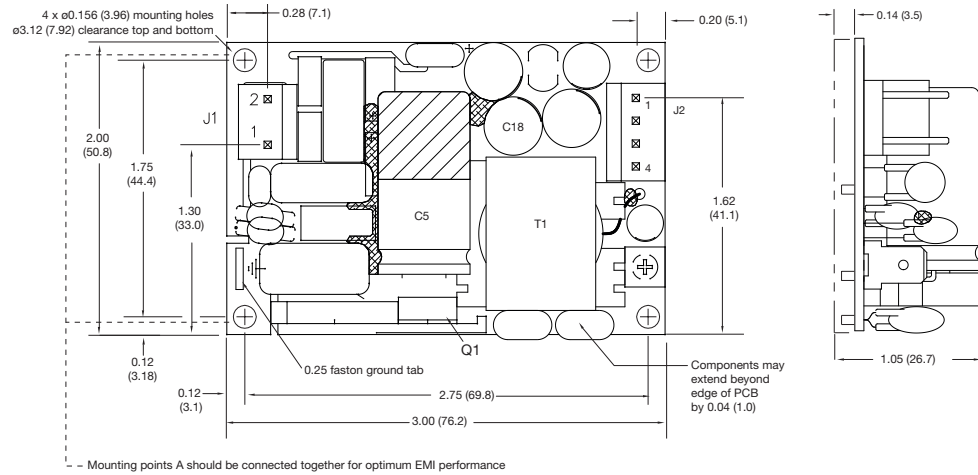
Mechanical Details - ECS60US05

| 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

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

J2 mates with Molex Housing PN 09-50-1041 and both with Molex Series 5194 Crimp Terminals
Faston ground tab requires insulated receptacle



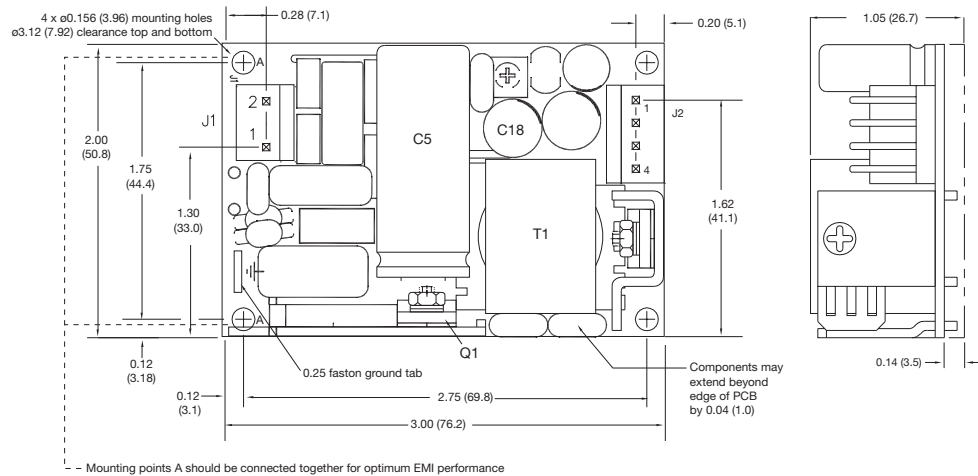
ECS60US other models

| 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

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

J2 mates with Molex Housing PN 09-50-1041 and both with Molex Series 5194 Crimp Terminals
Faston ground tab requires insulated receptacle

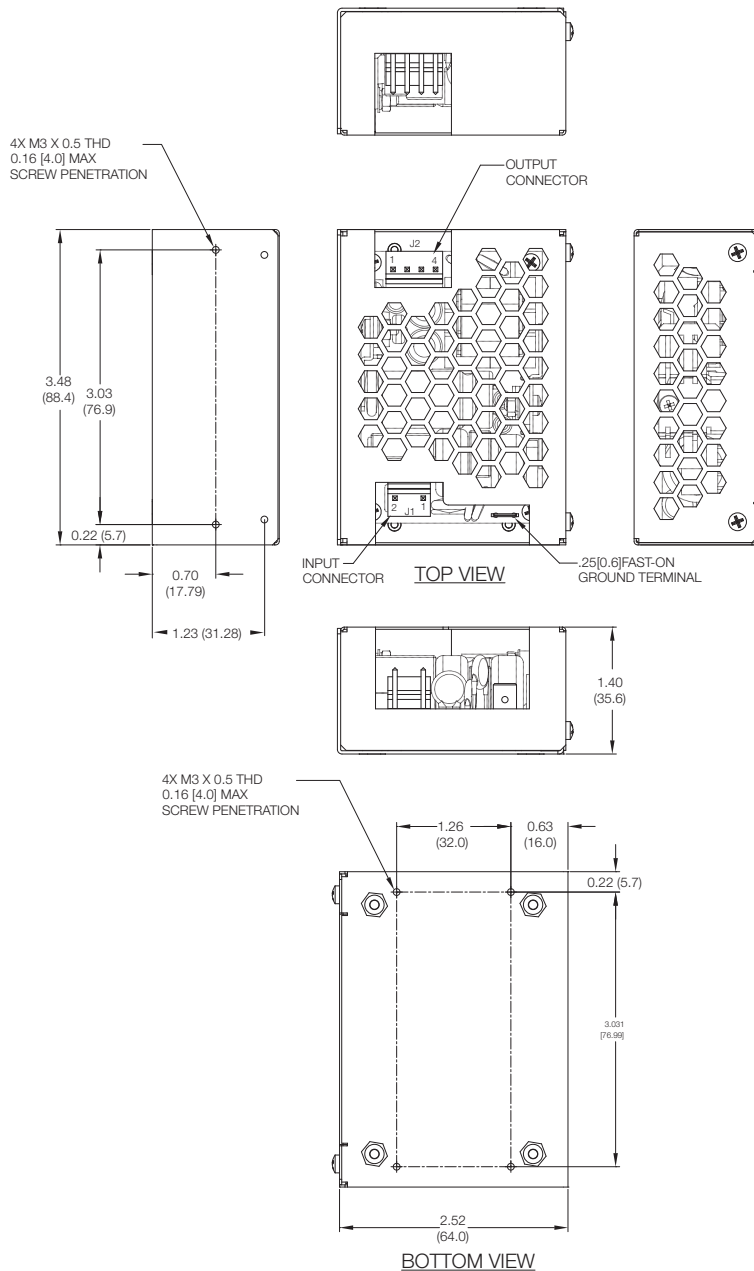


Notes

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

2. Weight: 0.22 lbs (100 g)

Covered Version - All models



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 mechanical drawings 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 | 120 °C |
| Q1 | 110 °C |
| C5 | 105 °C |
| C18 | 105 °C |

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