

40W

AC-DC POWER SUPPLIES

The MCE40 series of PCB mount single output AC-DC medical power supplies delivers a power output of 40W and offers single output voltages ranging from 3.3V to 48VDC. The MCE40 series, which is available in open-frame and encapsulated mechanical formats, is specifically designed for medical applications with 2 x MOPP isolation and is approved for Class II applications.

With world-wide medical safety approvals, class B compliance for conducted and radiated emissions, high efficiency, high reliability, 4kVAC isolation, the MCE series benefits system designers with easy integration into a wide range of BF rated medical applications including imaging, patient treatment, surgical equipment and home healthcare applications.



Features

- Single outputs 3.3V to 48VDC
- Input range 80 to 264VAC
- Available in open frame and encapsulated formats
- High efficiency, up to 88%
- 4kVAC input to output isolation
- Class B conducted and radiated emissions
- IEC 60601-1 medical safety agency approvals, 2 x MOPP
- IEC class II insulation rating
- -25°C to +70°C operating temperature
- Overvoltage, overload and short circuit protection

Models & Ratings

| Model Number ⁽¹⁾ | Output Voltage | Output Current | Efficiency ⁽²⁾ | Output Power |
|-----------------------------|----------------|----------------|---------------------------|--------------|
| MCE40US03 | 3.3VDC | 9.10A | 79% | 30W |
| MCE40US05 | 5.0VDC | 8.00A | 84% | 40W |
| MCE40US09 | 9.0VDC | 4.44A | 85% | 40W |
| MCE40US12 | 12.0VDC | 3.33A | 86% | 40W |
| MCE40US15 | 15.0VDC | 2.66A | 87% | 40W |
| MCE40US24 | 24.0VDC | 1.66A | 88% | 40W |
| MCE40US48 | 48.0VDC | 0.82A | 88% | 40W |

Notes:

1. For Open Frame version add suffix -P to model number, e.g. MCE40US12-P.
2. Typical efficiency at 230VAC and full load.

Applications



Healthcare



Home
Healthcare



Medical
Diagnostic

Dimensions

MCE40:

3.46 x 1.50 x 1.12" (87.9 x 38.1 x 28.5mm)

MCE40-P:

3.35 x 1.38 x 1.09" (85.0 x 35.1 x 27.7mm)

Summary

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions | |
|-----------------------|---|---------|---------|-------|---|---|
| Input Voltage Range | 80 | | 264 | VAC | Derate from 100% at 90VAC to 90% at 80VAC | |
| No Load Input Power | | | 0.3 | W | | |
| Efficiency | | 86 | | % | Model dependent, see Models & Ratings | |
| Operating Temperature | -25 | | +70 | °C | 3V3 & 5V models | Derate output linearly from 100% at +45°C to 45% at +70°C |
| | | | | | Other models | Derate output linearly from 100% at 50°C to 50% at 70°C |
| EMC | EN55011 Level B Conducted & Radiated, EN61000-3-2, EN61000-3-3, EN60601-1-2 | | | | | |
| Safety Approvals | IEC60601-1, EN60601-1, ES60601-1 | | | | | |

Input

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---------------------------|---|---------|---------|-------|---|
| Input Voltage Range | 80 | | 264 | VAC | Derate from 100% at 90VAC to 90% at 80VAC |
| Input Frequency | 47 | | 63 | Hz | |
| Input Current - Full Load | | 0.7/0.4 | | A rms | At 115/230VAC |
| No Load Input Power | | | 0.3 | W | |
| Inrush Current | | | 40 | A | At 230VAC, cold start 25°C |
| Earth Leakage Current | | | | | Class II construction no earth |
| Input Protection | Internal T1.0 A/300 VAC fuse fitted in line and neutral | | | | |

Output

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|--------------------------|---------|---------|---------|--------------------|--|
| Output Voltage | 3.3 | | 48 | VDC | |
| Initial Set Accuracy | | | 1.5/1.0 | % | 1.5% for 3V3 & 5V models, 1% for others at 50% load |
| Minimum Load | 0 | | | A | No minimum load required |
| Line Regulation | | | 1 | % | |
| Load Regulation | | | 2 | | |
| Start Up Delay | | | 2 | s | |
| Start Up Rise Time | | | 35 | ms | |
| Hold Up Time | 8 | 14 | | ms | At full load and 115VAC |
| Transient Response | | | 4 | % | Deviation, recovery within 1% in less than 500µs for a 25% load change |
| Ripple & Noise | | | 100 | mV pk-pk | 3.3-5V models, 20MHz bandwidth |
| | | | 1 | % pk-pk | 9V to 48V models, 20MHz bandwidth |
| Patient Leakage Current | | 65 | | µA | At 264VAC, 60Hz |
| Overvoltage Protection | 115 | | 145 | % V _{nom} | 220% typical for 3V3 model, auto recovery |
| Overload Protection | 120 | | 200 | % | |
| Short Circuit Protection | | | | | Trip & Restart (hiccup mode) |
| Temperature Coefficient | | | 0.05 | %/°C | |

General

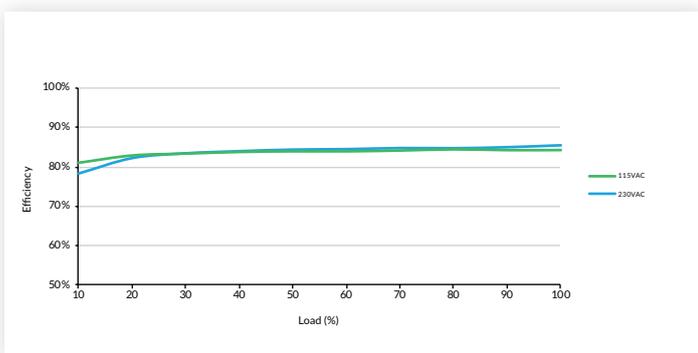
| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|----------------------------|---------|-------------|---------|-------------------|--|
| Efficiency | | 86 | | % | Model dependent |
| Isolation: Input to Output | 4000 | | | VAC | 2 x MOPP, suitable for BF applications |
| Switching Frequency | 17 | | 75 | kHz | Varies with load |
| Power Density | | | 7.7 | W/in ³ | For '-P' version |
| Mean Time Between Failure | 550 | 600 | | khrs | MIL-HDBK-217F, +25°C GB |
| Weight | | 0.187 (85) | | lb (g) | Open frame versions (-P) |
| | | 0.419 (190) | | | Encapsulated version |

Environmental

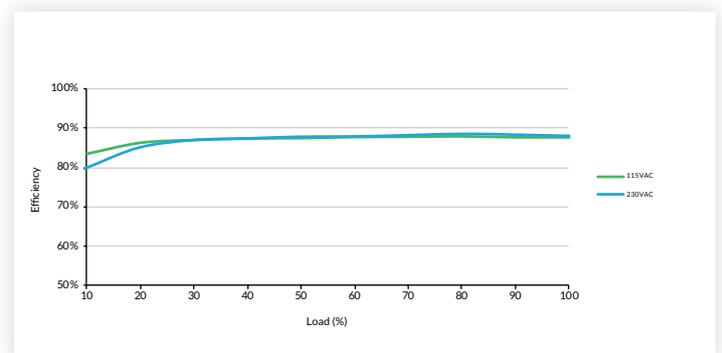
| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions | |
|-----------------------|--|---------|---------|-------|--------------------|---|
| Operating Temperature | -25 | | +70 | °C | 3V3 & 5V models | Derate output linearly from 100% at +45°C to 45% at +70°C |
| | | | | | Other models | Derate output linearly from 100% at 50°C to 50% at 70°C |
| Storage Temperature | -40 | | +85 | °C | | |
| Cooling | Convection-cooled | | | | | |
| Humidity | | | 95 | %RH | Non-condensing | |
| Operating Altitude | | | 5000 | m | | |
| Shock | IEC68-2-27, 30g, 11ms half sine, 3 times in each of 6 axes | | | | | |
| Vibration | IEC68-2-6, 2g, 10Hz to 500kHz, 10 mins/cycle, 60 mins each cycle | | | | | |

Efficiency Graphs

MCE40US12-P



MCE40US24-P



EMC: Emissions

| Phenomenon | Standard | Test Level | Notes & Conditions |
|------------------|-------------|------------|--|
| Conducted | EN55011 | Class B | If output is connected to ground, additional external components will be required. See application notes |
| Radiated | EN55011 | Class B | |
| Harmonic Current | EN61000-3-2 | Class A | |
| Voltage Flicker | EN61000-3-3 | | |

EMC: Immunity

| Phenomenon | Standard | Test Level | Criteria | Notes & Conditions |
|------------------------|--------------------------|--|----------|--------------------|
| Medical | EN60601-1-2 | As below | As below | |
| ESD Immunity | EN61000-4-2 | $\pm 8\text{kV}$ contact, $\pm 15\text{kV}$ air discharge | A | |
| Radiated Immunity | EN61000-4-3 | 10 V/m | A | |
| EFT/Burst | EN61000-4-4 | 3 | A | |
| Surge | EN61000-4-5 | 2 | A | Line to line |
| Conducted | EN61000-4-6 | 10Vrms | A | |
| Magnetic Fields | EN61000-4-8 | 30A/m | A | |
| Dips and Interruptions | EN61000-4-11 (115VAC) | 70% U_T (80.5VAC) for 100ms | A | |
| | | 40% U_T (46VAC) for 200ms | B | |
| | | <5% U_T (0VAC) for 10ms | A | |
| | | <5% U_T (0VAC) for 5000ms | B | |
| | EN61000-4-11 (230VAC) | 70% U_T (161VAC) for 100 ms | A | |
| | | 40% U_T (92VAC) for 200ms | A | |
| | | <5% U_T (0VAC) for 10ms | A | |
| | | <5% U_T (0VAC) for 5000ms | B | |

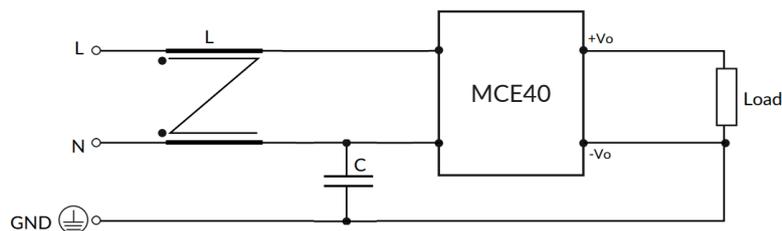
Safety Approvals

| Certification | Standard | Notes & Conditions |
|---------------|-----------------------------------|--------------------|
| CB | IEC60601-1 | Medical, 2 x MOPP |
| UL | ES60601-1/CSA-C22.2 No.60601-1:14 | Medical, 2 x MOPP |
| TUV | EN60601-1 | Medical, 2 x MOPP |
| CE | Meets all applicable directives | |
| UKCA | Meets all applicable legislation | |

Application Notes

EMC with output grounded

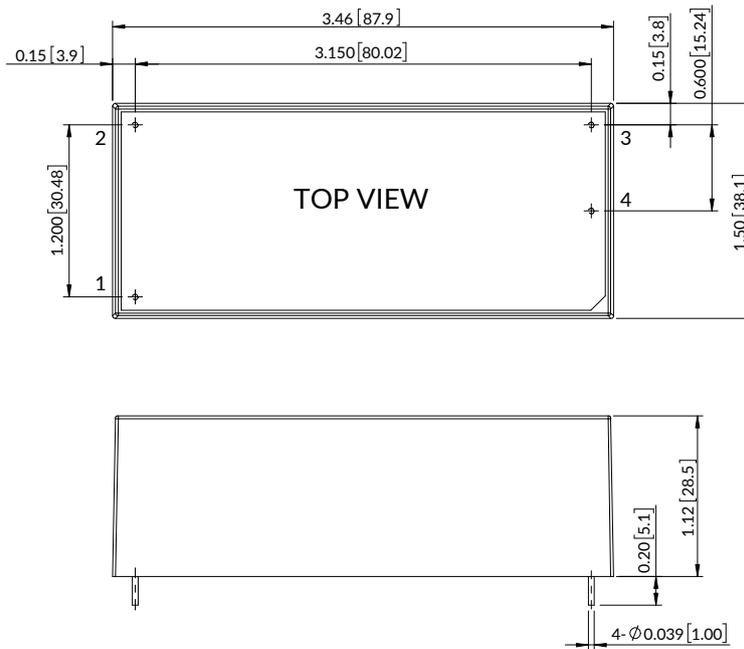
EMC with output grounded. This product is designed for class II operation, but if there is a requirement to connect the output to ground then additional components as shown below can be added to improve emissions.



Suggested value - C: Y1 cap, 10mm. 1000pF/400VAC, 20% CD TDK.
 - L: CMCK DIP UU-9.8 $\Phi 0.35 \times 60\text{T}$ 10mH (min)

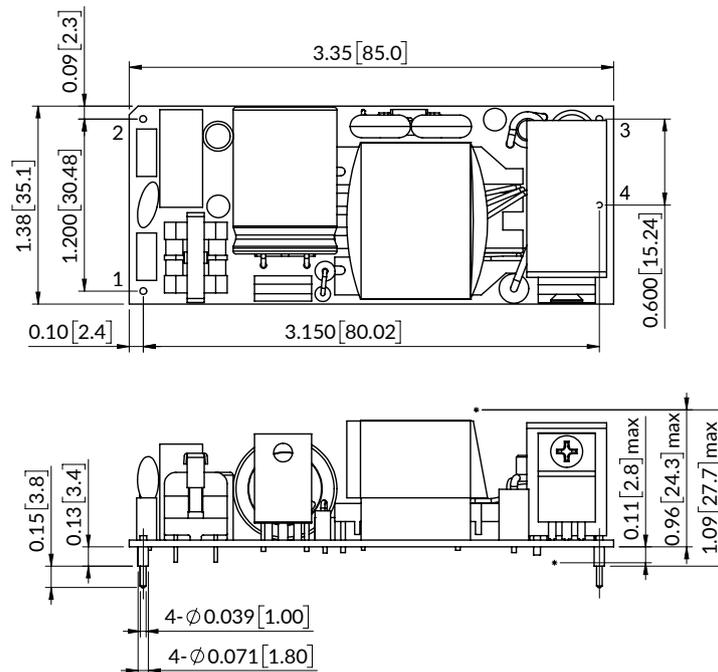
Mechanical Details

Encapsulated



| Pin Connections | |
|-----------------|--------|
| Pin | Single |
| 1 | ACL |
| 2 | ACN |
| 3 | +Vout |
| 4 | -Vout |

Open Frame (-P)



Notes:

1. Dimensions in inches (mm).
2. Weight: Open frame versions (-P): 0.187lbs (85g) Encapsulated: 0.419lbs (190g)
3. Tolerances: x.xx = ± 0.02 (x.x = ± 0.5) x.xxx = ± 0.01 (x.xx = ± 0.25)