

User's Manual



ANSI/AAMI ES60601-1 BS EN/EN60601-1 IEC60601-1 TPTC004



## Features

- 1.65"x0.88" compact size
- Medical safety approved (2 x MOPP) according to ANSI/AAMI ES60601-1 and IEC/BS EN/EN60601-1
- Suitable for BF application with appropriate system consideration
- No load power consumption<0.075W
- Extremely low leakage current
- Wide operating temp. range -40 ~ +85°C
- EMI class B for class II configuration
- Protections:  
Short circuit / Overload / Over voltage / Over temperature
- No minimum load required
- Typical lifetime > 52K hours
- 3 years warranty

## Applications

- Portable medical device
- Mobile clinical workstation
- Medical computer monitor
- Medical examination instrument

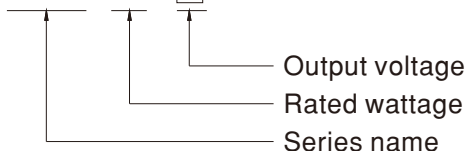
## GTIN CODE

MW Search: <https://www.meanwell.com/serviceGTIN.aspx>

## Description

MFM-05 is a 5W high density and small size (42\*22.3\*20.5mm) AC/DC on board type medical grade power supply series. It features the operation for 80~264VAC, a low no load power consumption less than 0.075W, a high efficiency up to 82%, Class II (no FG) double insulation, outstanding dissipation, 5G anti-vibration, high EMC performance, 4KVAC isolation, etc. The design observes IEC/BS EN/EN60601-1 and ANSI/AAMI ES60601-1 version three with 2xMOPP level and ultra-low leakage current (<80  $\mu$  A). It is very suitable for BF (patient contact) type medical device or relevant equipment.

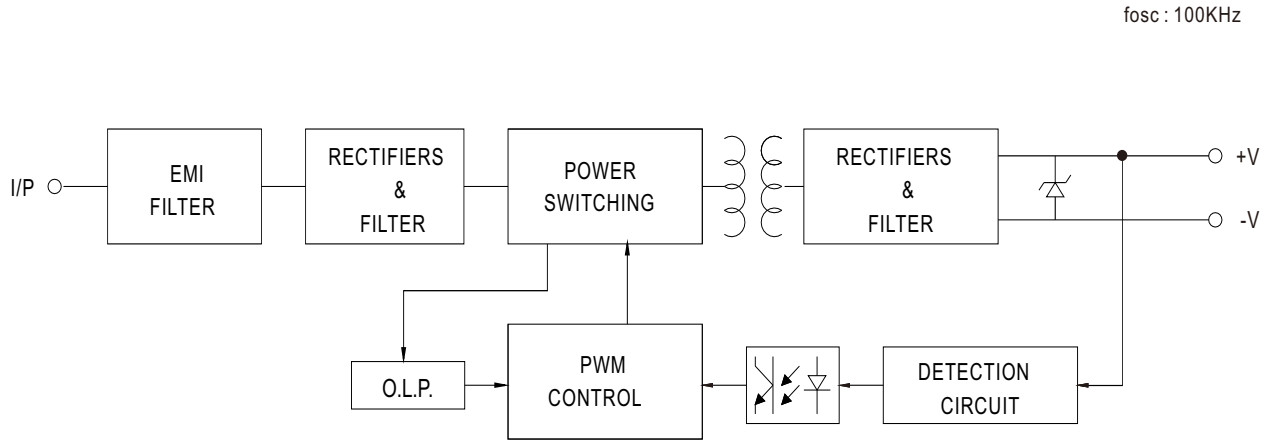
## Model Encoding

**MFM - 05 - 5**


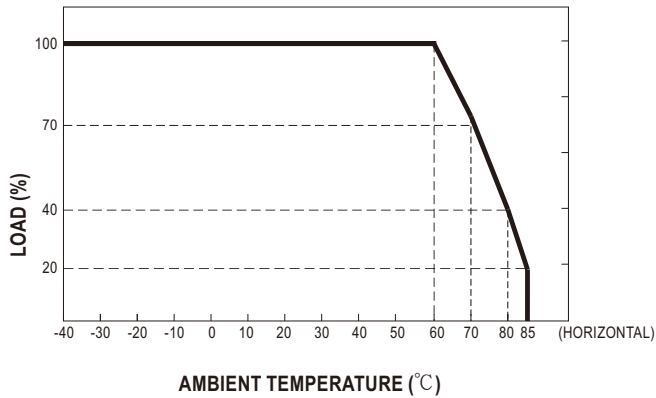
**SPECIFICATION**

| MODEL                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | MFM-05-3.3                                                                                                               | MFM-05-5                                                                                                                                                                    | MFM-05-12    | MFM-05-15    | MFM-05-24                                                                 |  |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|---------------------------------------------------------------------------|--|
| OUTPUT               | DC VOLTAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3.3V                                                                                                                     | 5V                                                                                                                                                                          | 12V          | 15V          | 24V                                                                       |  |
|                      | RATED CURRENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1.25A                                                                                                                    | 1A                                                                                                                                                                          | 0.42A        | 0.33A        | 0.23A                                                                     |  |
|                      | CURRENT RANGE <small>Note.2</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0 ~ 1.25A                                                                                                                | 0 ~ 1A                                                                                                                                                                      | 0 ~ 0.42A    | 0 ~ 0.33A    | 0 ~ 0.23A                                                                 |  |
|                      | PEAK CURRENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1.38A                                                                                                                    | 1.1A                                                                                                                                                                        | 0.46A        | 0.36A        | 0.25A                                                                     |  |
|                      | RATED POWER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 4.1W                                                                                                                     | 5W                                                                                                                                                                          | 5W           | 5W           | 5.5W                                                                      |  |
|                      | PEAK LOAD(10sec.) <small>Note.3</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 4.6W                                                                                                                     | 5.5W                                                                                                                                                                        | 5.5W         | 5.4W         | 6W                                                                        |  |
|                      | RIPPLE & NOISE (max.) <small>Note.4</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 100mVp-p                                                                                                                 | 100mVp-p                                                                                                                                                                    | 150mVp-p     | 150mVp-p     | 180mVp-p                                                                  |  |
|                      | VOLTAGE TOLERANCE <small>Note.5</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ±2.5%                                                                                                                    | ±2.5%                                                                                                                                                                       | ±2.5%        | ±2.5%        | ±2.5%                                                                     |  |
|                      | LINE REGULATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ±0.3%                                                                                                                    | ±0.3%                                                                                                                                                                       | ±0.3%        | ±0.3%        | ±0.3%                                                                     |  |
|                      | LOAD REGULATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ±0.5%                                                                                                                    | ±0.5%                                                                                                                                                                       | ±0.5%        | ±0.5%        | ±0.5%                                                                     |  |
|                      | SETUP, RISE TIME                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1000ms, 30ms/230VAC      1000ms, 30ms/115VAC at full load                                                                |                                                                                                                                                                             |              |              |                                                                           |  |
|                      | HOLD UP TIME (Typ.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 40ms/230VAC      12ms/115VAC at full load                                                                                |                                                                                                                                                                             |              |              |                                                                           |  |
| INPUT                | VOLTAGE RANGE <small>Note.6</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 80 ~ 264VAC                                                                                                              |                                                                                                                                                                             |              |              |                                                                           |  |
|                      | FREQUENCY RANGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 47 ~ 440Hz                                                                                                               |                                                                                                                                                                             |              |              |                                                                           |  |
|                      | EFFICIENCY (Typ.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 74%                                                                                                                      | 78%                                                                                                                                                                         | 80%          | 81%          | 82%                                                                       |  |
|                      | AC CURRENT (Typ.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0.2A/115VAC      0.1A/230VAC                                                                                             |                                                                                                                                                                             |              |              |                                                                           |  |
|                      | INRUSH CURRENT (Typ.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | COLD START    25A/115VAC      45A/230VAC                                                                                 |                                                                                                                                                                             |              |              |                                                                           |  |
|                      | LEAKAGE CURRENT (max.) <small>Note.7</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Touch current <80μA/264VAC                                                                                               |                                                                                                                                                                             |              |              |                                                                           |  |
| PROTECTION           | OVERLOAD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 110% ~ 180% rated output power<br>Protection type : Hiccup mode, recovers automatically after fault condition is removed |                                                                                                                                                                             |              |              |                                                                           |  |
|                      | OVER VOLTAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3.8 ~ 5V                                                                                                                 | 5.75 ~ 6.8V                                                                                                                                                                 | 13.8 ~ 16.2V | 17.3 ~ 20.3V | 27.6 ~ 32.4V                                                              |  |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Protection type : Shut off o/p voltage, clamping by zener diode                                                          |                                                                                                                                                                             |              |              |                                                                           |  |
|                      | OVER TEMPERATURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Protection type : Shut down o/p voltage, recovers automatically after temperature goes down                              |                                                                                                                                                                             |              |              |                                                                           |  |
| ENVIRONMENT          | WORKING TEMP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -40 ~ +85℃ (Refer to "Derating Curve")                                                                                   |                                                                                                                                                                             |              |              |                                                                           |  |
|                      | WORKING HUMIDITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 20 ~ 90% RH non-condensing                                                                                               |                                                                                                                                                                             |              |              |                                                                           |  |
|                      | STORAGE TEMP., HUMIDITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | -40 ~ +100℃, 10 ~ 95% RH non-condensing                                                                                  |                                                                                                                                                                             |              |              |                                                                           |  |
|                      | TEMP. COEFFICIENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ±0.03%/℃ (0 ~ 60℃)                                                                                                       |                                                                                                                                                                             |              |              |                                                                           |  |
|                      | SOLDERING TEMPERATURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 260℃ ±5℃/10sec.max.                                                                                                      |                                                                                                                                                                             |              |              |                                                                           |  |
|                      | VIBRATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 10 ~ 500Hz, 5G 10min./1cycle, period for 60min. each along X, Y, Z axes                                                  |                                                                                                                                                                             |              |              |                                                                           |  |
|                      | OPERATING ALTITUDE <small>Note.8</small>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 5000 meters                                                                                                              |                                                                                                                                                                             |              |              |                                                                           |  |
|                      | SAFETY & EMC<br>(Note 9)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | SAFETY STANDARDS                                                                                                         | IEC60601-1, BS EN/EN60601-1, EAC TP TC 004, UL ANSI/AAMI ES60601-1(3.1 version), CAN/CSA-C22 3 <sup>rd</sup> Edition approved ; Design refer to BS EN/EN60335-1(by request) |              |              |                                                                           |  |
| ISOLATION LEVEL      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Primary-Secondary: 2xMOPP                                                                                                |                                                                                                                                                                             |              |              |                                                                           |  |
| WITHSTAND VOLTAGE    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | I/P-O/P:4KVAC                                                                                                            |                                                                                                                                                                             |              |              |                                                                           |  |
| ISOLATION RESISTANCE |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | I/P-O/P:100M Ohms / 500VDC / 25℃ / 70% RH                                                                                |                                                                                                                                                                             |              |              |                                                                           |  |
| EMC EMISSION         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Parameter                                                                                                                | Standard                                                                                                                                                                    |              |              | Test Level / Note                                                         |  |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Conducted                                                                                                                | BS EN/EN55011 (CISPR11)                                                                                                                                                     |              |              | Class B                                                                   |  |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Radiated                                                                                                                 | BS EN/EN55011 (CISPR11)                                                                                                                                                     |              |              | Class B                                                                   |  |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Harmonic Current                                                                                                         | BS EN/EN61000-3-2                                                                                                                                                           |              |              | Class A                                                                   |  |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Voltage Flicker                                                                                                          | BS EN/EN61000-3-3                                                                                                                                                           |              |              | -----                                                                     |  |
| EMC IMMUNITY         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | BS EN/EN60601-1-2                                                                                                        |                                                                                                                                                                             |              |              |                                                                           |  |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Parameter                                                                                                                | Standard                                                                                                                                                                    |              |              | Test Level / Note                                                         |  |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ESD                                                                                                                      | BS EN/EN61000-4-2                                                                                                                                                           |              |              | Level 4, 15KV air ; Level 4, 8KV contact                                  |  |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | RF field susceptibility                                                                                                  | BS EN/EN61000-4-3                                                                                                                                                           |              |              | Level 3, 10V/m( 80MHz~2.7GHz )<br>Table 9, 9~28V/m( 385MHz~5.78GHz )      |  |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | EFT bursts                                                                                                               | BS EN/EN61000-4-4                                                                                                                                                           |              |              | Level 3, 2KV                                                              |  |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Surge susceptibility                                                                                                     | BS EN/EN61000-4-5                                                                                                                                                           |              |              | Level 3, 1KV/Line-Line                                                    |  |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Conducted susceptibility                                                                                                 | BS EN/EN61000-4-6                                                                                                                                                           |              |              | Level 3, 10V                                                              |  |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Magnetic field immunity                                                                                                  | BS EN/EN61000-4-8                                                                                                                                                           |              |              | Level 4, 30A/m                                                            |  |
|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Voltage dip, interruption                                                                                                | BS EN/EN61000-4-11                                                                                                                                                          |              |              | 100% dip 1 periods, 30% dip 25 periods,<br>100% interruptions 250 periods |  |
|                      | OTHERS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | MTBF                                                                                                                     | 9337.3K hrs min.    Telcordia SR-332 (Bellcore) ; 1799.5K hrs min.    MIL-HDBK-217F (25℃)                                                                                   |              |              |                                                                           |  |
| DIMENSION            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 42*22.3*20.5mm (L*W*H) or 1.65**0.88*0.80" inch                                                                          |                                                                                                                                                                             |              |              |                                                                           |  |
| PACKING              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.018Kg; 270pcs/5.8Kg/0.94CUFT                                                                                           |                                                                                                                                                                             |              |              |                                                                           |  |
| NOTE                 | 1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25℃ of ambient temperature.<br>2. No minimum load required.<br>3. 33% Duty cycle maximum within every 30 seconds. Average output power should not exceed the rated power<br>4. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1μf & 47μf parallel capacitor.<br>5. Tolerance : includes set up tolerance, line regulation and load regulation.<br>6. Derating may be needed under low input voltages. Please check the derating curve for more details.<br>7. Touch current was measured from primary input to DC output.<br>8. The ambient temperature derating of 3.5℃/1000m with fanless models and of 5℃/1000m with fan models for operating altitude higher than 2000m(6500ft).<br>9. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives. For guidance on how to perform these EMC tests, please refer to "EMI testing of component power supplies."<br>(as available on <a href="http://www.meanwell.com">http://www.meanwell.com</a> )<br>※ Product Liability Disclaimer : For detailed information, please refer to <a href="https://www.meanwell.com/serviceDisclaimer.aspx">https://www.meanwell.com/serviceDisclaimer.aspx</a> |                                                                                                                          |                                                                                                                                                                             |              |              |                                                                           |  |

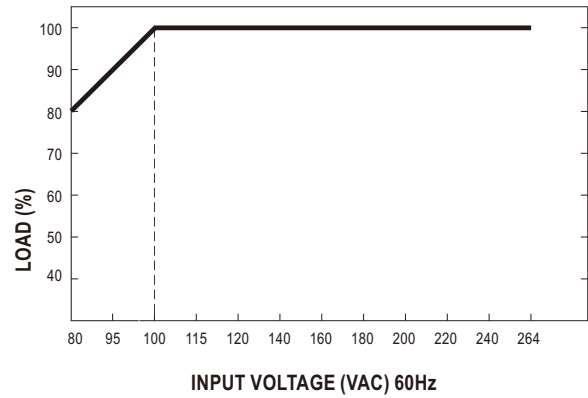
## Block Diagram



## Derating Curve

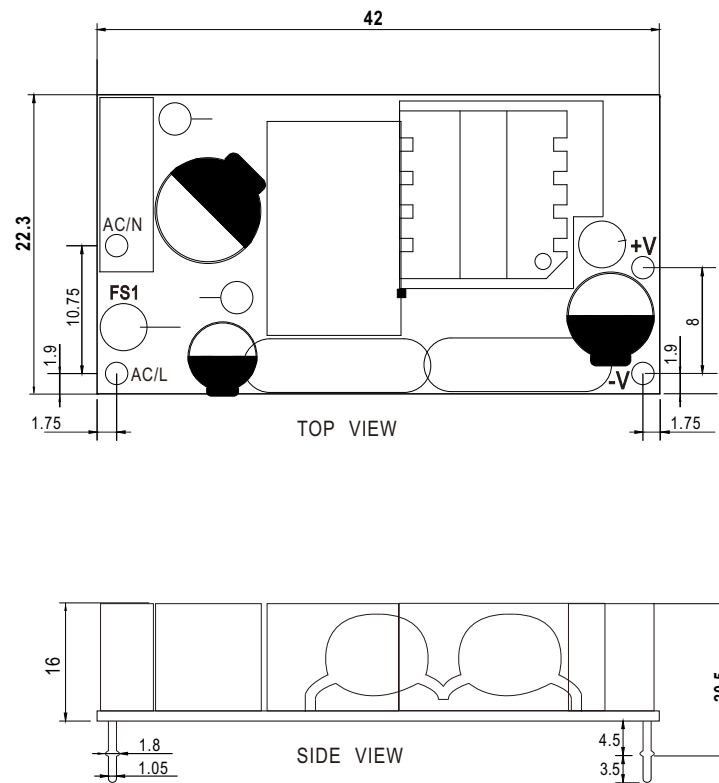


## Output Derating VS Input Voltage



## Mechanical Specification

Unit: mm



## Installation Manual

Please refer to : <http://www.meanwell.com/manual.html>