



### FEATURES

- Efficiency up to 92%
- Wide input range, 9V-36V
- Package Dimension:
  - Panel Mount: 100.0\*56.0\*19.0mm (3.94"\* 2.20"\*0.75")
  - Din Rail: 118.6\*67.1\*23.5mm (4.67"\*2.64"\*0.93")
- Over voltage protection, hiccup mode
- Over current protection, hiccup mode
- Positive or Negative Remote ON/OFF
- Without tantalum capacitor inside module
- Operating Temperature range - 40°C to +85°C
- Input to Output Isolation: 1500VDC
- RoHS Compliant
- 3 Years Product Warranty
- Heat-sink is option
- EN 50155 Certified for built-in module
- UL 60950-1 & CSA C22.2 No.60950-1-07(pending)
- CE Marked (pending)



The DR24/PM24 family is designed particularly for industrial applications where no PCB mounting is possible the module has to be mounted on a panel or din-rail. the highest power density (60W), isolated power converter. The DR24/PM24 series comes with a host of industry-standard features, such as over current protection, over voltage protection, over temperature protection and remote on/off. An optional heatsink is available for more extreme thermal requirements. All models have an ultra-wide 4:1 input voltage range (9V to 36V). With operating temperature of -40°C to +85°C, it is suitable for customers' critical applications, such as process control and automation, transportation, data communication and telecom equipment, test equipment, medical device and everywhere where space on the PCB is critical.

### Model List

| Model Number             | Input Voltage (Range) | Output Voltage | Output Current |      | Input Current (typ input voltage) |          | Load Regulation | Maxcapacitive Load (Cap ESR>=10mohm;Full load;5%overshoot of Vout at startup) | Efficiency (typ.) |
|--------------------------|-----------------------|----------------|----------------|------|-----------------------------------|----------|-----------------|---|-------------------|
|                          |                       |                | Max.           | Min. | @Max. Load                        | @No Load |                 |   |                   |
|                          |                       |                | VDC            | VDC  | mA                                | mA       |                 |   | mA(typ.)          |
| PM24S05012<br>DR24S05012 | 24<br>(9 ~ 36)        | 5V             | 12000          | 0    | 2700                              | 70       | ±25             | 20000   | 92 %              |
| PM24S12005<br>DR24S12005 |                       | 12V            | 5000           | 0    | 2695                              | 62       | ±60             | 6000  | 92.3%             |
| PM24S15004<br>DR24S12005 |                       | 15V            | 4000           | 0    | 2680                              | 62       | ±75             | 4000  | 92.8%             |
| PM24S24003<br>DR24S24003 |                       | 24V            | 2500           | 0    | 2688                              | 40       | ±120            | 2000  | 92.5%             |

### Input Characteristics

| Item                                   | Model               | Min. | Typ. | Max. | Unit |
|--|---------------------|------|------|------|------|
| Input Surge Voltage (100 msec)         | All Models          | ---  | ---  | 50   | VDC  |
| Input Turn-On Voltage Threshold        | All Models          | 8    | 8.5  | 9    | VDC  |
| Input Turn-Off Voltage Threshold       | All Models          | 7.2  | 7.7  | 8.2  | VDC  |
| Input Under-Voltage Lockout Hysteresis | All Models          | 0.2  | 1    | 1.5  | VDC  |
| Off-Converter Input Current            | All Models, Vin=24V | ---  | 10   | ---  | mA   |
| Reverse Polarity Input Current         | All Models          | ---  | ---  | 0.5  | A    |
| ON/OFF Control, Logic High             | All Models          | 2.4  | ---  | 10   | VDC  |
| ON/OFF Control, Logic Low              | All Models          | -0.7 | ---  | 0.8  | VDC  |

### Output Characteristics

| Item                           | Conditions                                | Min. | Typ. | Max. | Unit              |
|--------------------------------|---|------|------|------|-------------------|
| Output Voltage Accuracy        |   | ---  | ---  | ±1   | %Vo               |
| Line Regulation                | Vin=9V to 36V                             | ---  | ---  | ±0.2 | %Vo               |
| Total Output Voltage Range     | Over Load, Line and Temperature           | ---  | ---  | ±3   | %Vo               |
| Ripple & Noise                 | Vin=24V, Full Load                        | ---  | 100  | ---  | mV <sub>P-P</sub> |
| Dynamic load response          | 5V<br>50%-75% full load, 0.1A/uS          | ---  | 5    | ---  | %Vo               |
|                                | 12V,15V,24V<br>50%-75% full load, 0.1A/uS | ---  | 2.5  | ---  |                   |
| Output Over Current Protection | Output Voltage 10% Low, Hiccup            | 110  | ---  | 150  | %Io,max           |
| Short Output Protection        | Long Term, Auto-recovery                  |      |      |      |                   |
| Output Over-Voltage Protection | Hiccup, Auto-recovery                     | 115  | ---  | 140  | %Vo               |
| Output Trim Range              | Pout ≅ max rated power, Io ≅ Io,max       | -10  | ---  | +10  | %Vo               |

### General Characteristics

| Item                          | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------|------------|------|------|------|------|
| I/O Isolation Voltage (rated) |            | ---  | ---  | 1500 | VDC  |
| I/O Isolation Resistance      |            | 10   | ---  | ---  | MΩ   |
| I/O Isolation Capacitance     |            | ---  | 6800 | ---  | pF   |
| Switching Frequency           |            | ---  | 330  | ---  | KHz  |

### Environmental Specifications

| Parameter                                   | Model      | Conditions          | Min. | Max. | Unit     |
|---|------------|---------------------|------|------|----------|
| Operating Temperature Range (with Derating) | All Models | Ambient             | -40  | +85  | °C       |
| Case Temperature                            | All Models |                     | ---  | +100 | °C       |
| Storage Temperature Range                   | PM series  |                     | -40  | +85  | °C       |
|   | DR series  |                     | -40  | +100 | °C       |
| Humidity (non condensing)                   | All Models |                     | ---  | 95   | % rel. H |
| Altitude                                    | All Models |                     |      | 2000 | m        |
| Cooling                                     | All Models | Free-Air convection |      |      |          |

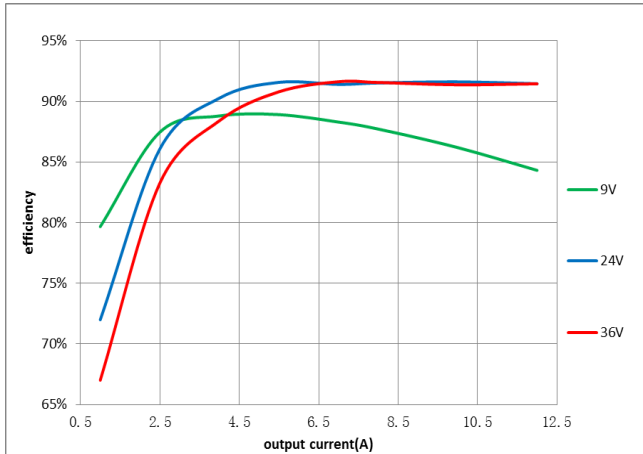
### EMC Specifications

| Parameter                   | Standards & Level   | Performance |
|-----------------------------|---|-------------|
| EMI                         | EN55022 ClassB  | compliance  |
| ESD                         | EN61000-4-2 air ± 8KV , Contact ± 6KV<br>Perf. Criteria B | compliance  |
| Radiated immunity           | EN61000-4-3 20V/m Perf. Criteria A                        | compliance  |
| Fast transient (See Note 5) | EN61000-4-4 ±2KV Perf. Criteria A                         | compliance  |
| Surge (See Note 5)          | EN61000-4-5 ±1KV Perf. Criteria A                         | compliance  |
| Conducted immunity          | EN61000-4-6 10V/m Perf. Criteria A                        | compliance  |

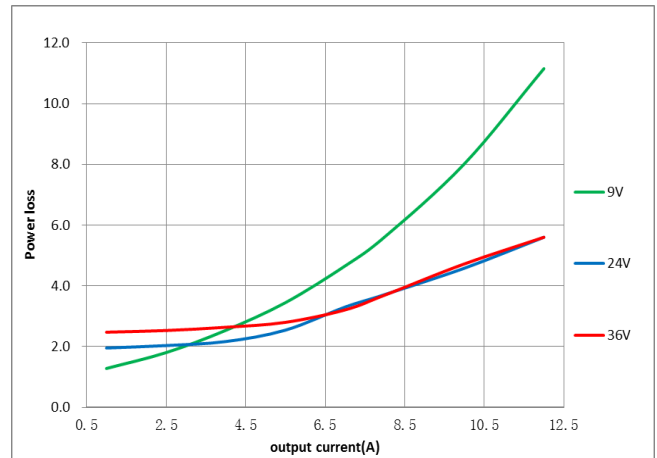
### Notes

- 1 Specifications typical at Ta=+25°C, resistive load, nominal input voltage and rated output current unless otherwise noted.
- 2 Ripple & Noise measurement bandwidth is 0-20MHz, with 10µF, tantalum capacitor and 1µF ceramic capacitor.
- 3 Specifications are subject to change without notice.

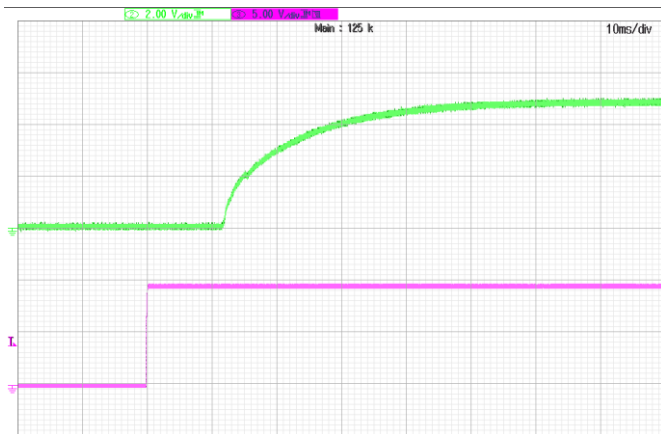
### ELECTRICAL CHARACTERISTICS CURVES - S24SP05012, 9-36VIN, 5V/12A



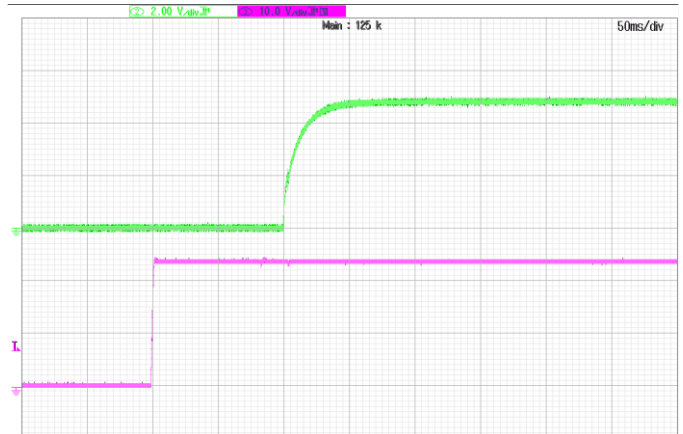
Efficiency vs. load current for various input voltage at 25°C.



Power dissipation vs. load current at 25°C.

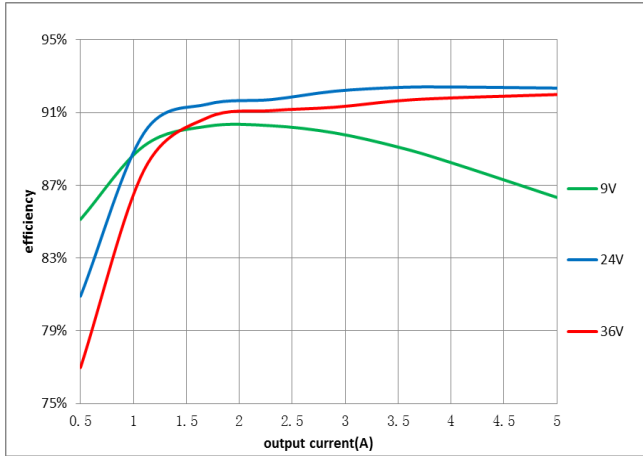


Turn-on transient at full load current (10ms/div).  
Top Trace: Vout; 2V/div; Bottom Trace: ON/OFF input: 5V/div.

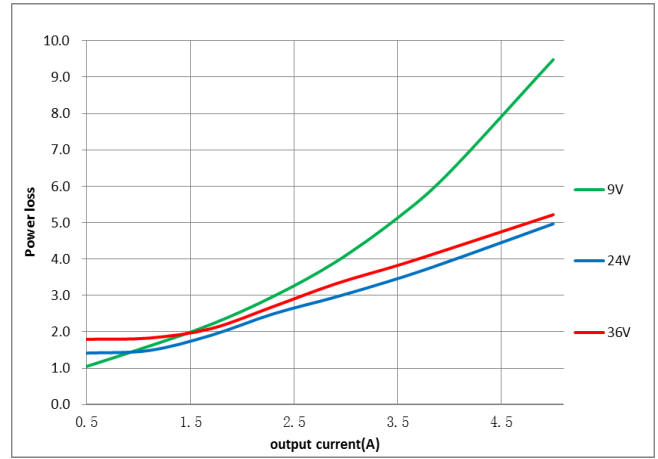


Turn-on transient at full load current (50ms/div).  
Top Trace: Vout; 2V/div; Bottom Trace: input voltage: 10V/div.

### ELECTRICAL CHARACTERISTICS CURVES - S24SP12005, 9-36VIN, 12V/5A



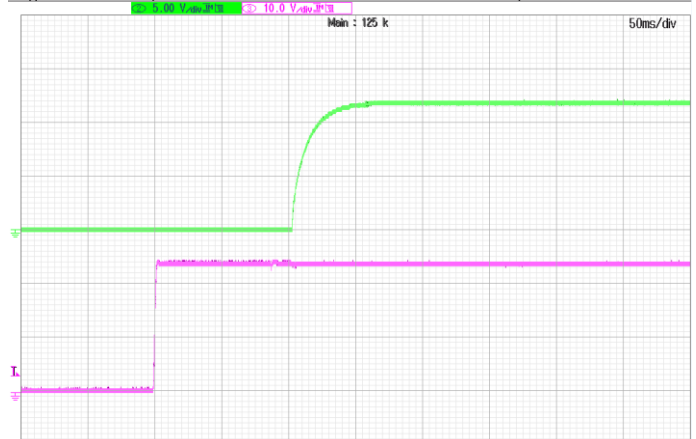
Efficiency vs. load current for various input voltage at 25°C.



Power dissipation vs. load current at 25°C.

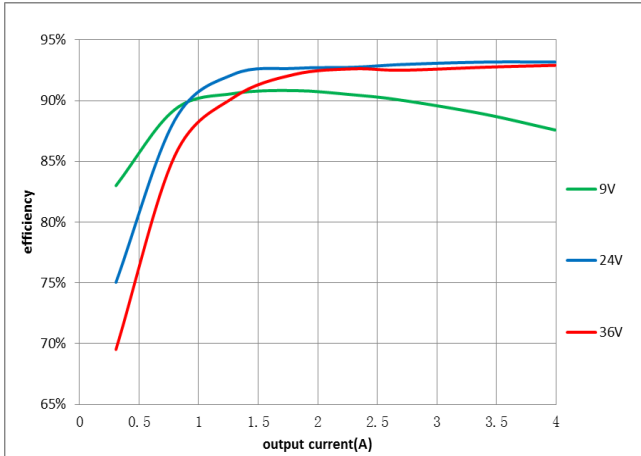


Turn-on transient at full load current (10ms/div).  
Top Trace: Vout; 2V/div; Bottom Trace: ON/OFF input: 5V/div.

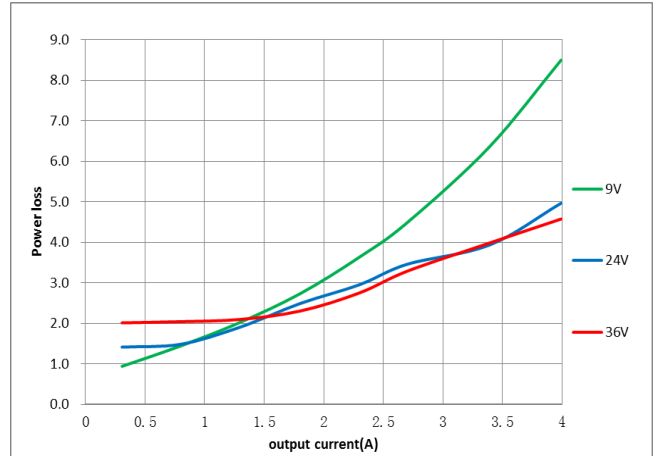


Turn-on transient at full load current (50ms/div).  
Top Trace: Vout; 2V/div; Bottom Trace: input voltage: 10V/div.

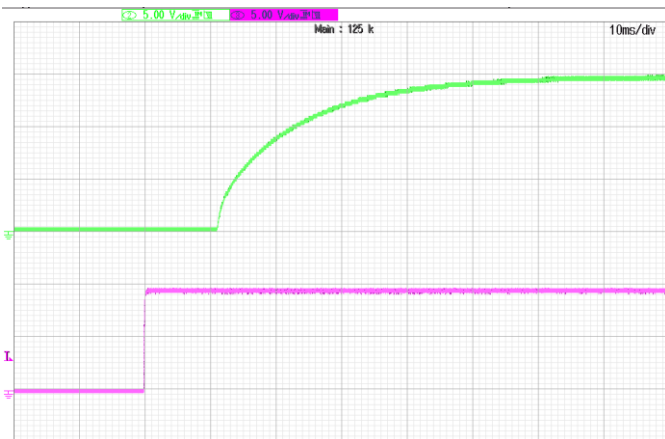
### ELECTRICAL CHARACTERISTICS CURVES - S24SP15004, 9-36VIN, 15V/4A



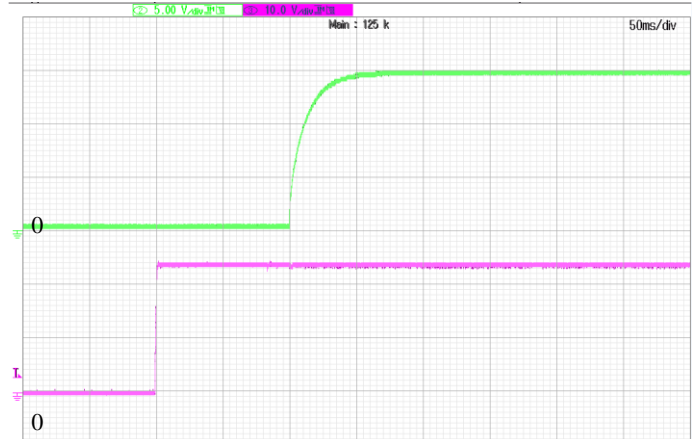
Efficiency vs. load current for various input voltage at 25°C.



Power dissipation vs. load current at 25°C.

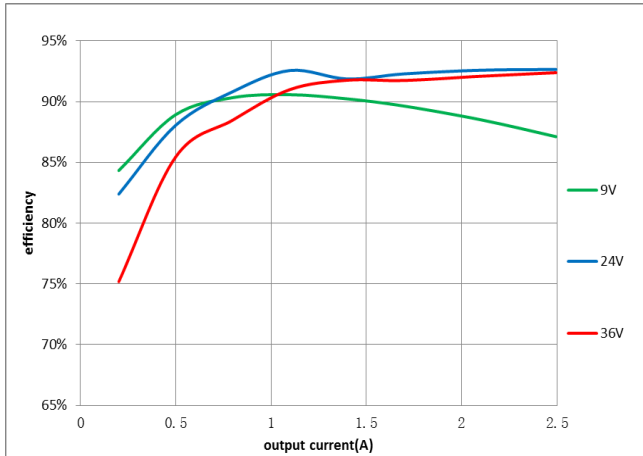


Turn-on transient at full load current (10ms/div).  
Top Trace: Vout; 5V/div; Bottom Trace: ON/OFF input: 5V/div.

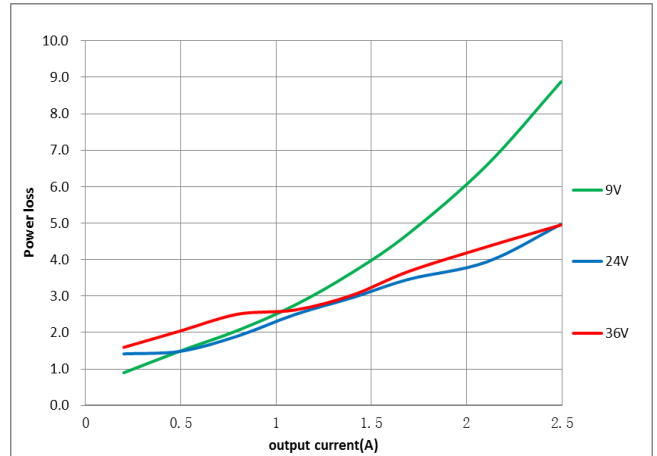


Turn-on transient at full load current (50ms/div).  
Top Trace: Vout; 5V/div; Bottom Trace: input voltage: 10V/div.

### ELECTRICAL CHARACTERISTICS CURVES - S24SP24003, 9-36VIN, 24V/2.5A



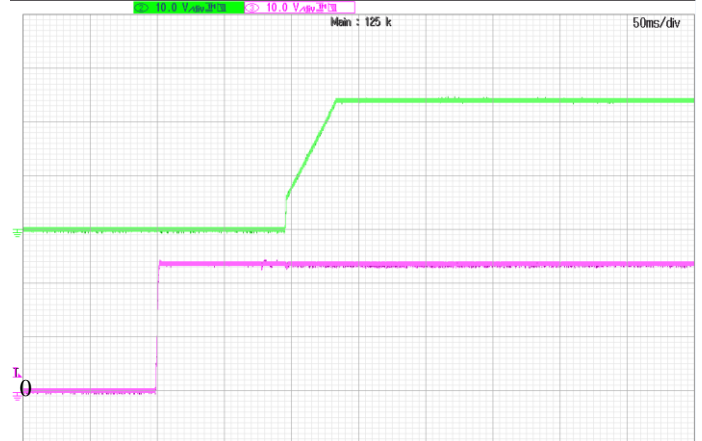
Efficiency vs. load current for various input voltage at 25°C.



Power dissipation vs. load current at 25°C.



Turn-on transient at full load current (10ms/div).  
Top Trace: Vout; 10V/div; Bottom Trace: ON/OFF input: 5V/div.



Turn-on transient at full load current (50ms/div).  
Top Trace: Vout; 10V/div; Bottom Trace: input voltage: 10V/div.

### FEATURES DESCRIPTIONS

#### Over-Current Protection

The modules include an internal output over-current protection circuit, which will endure current limiting for an unlimited duration during output overload. If the output current exceeds the OCP set point, the modules will shut down (hiccup mode).

The modules will try to restart after shutdown. If the overload condition still exists, the module will shut down again. This restart trial will continue until the overload condition is corrected.

#### Over-Voltage Protection

The modules include an internal output over-voltage protection circuit, which monitors the voltage on the output terminals. If this voltage exceeds the over-voltage set point, the modules will shut down, and then restart after a hiccup-time (hiccup mode).

If latch mode is needed, please contact with Delta.

#### Over-Temperature Protection

The over-temperature protection consists of circuitry that provides protection from thermal damage. If the temperature exceeds the over-temperature threshold the module will shut down. The module will restart after the temperature is within specification.

#### Remote On/Off

The remote on/off feature on the module can be either negative or positive logic depend on the part number options on the last page.

- ❖ For Negative logic version, turns the module on during an external logic low and off during a logic high. If the remote on/off feature is not used, please short the on/off pin to  $V_i$  (-).
- ❖ For Positive logic version, turns the modules on during an external logic high and off during a logic low. If the remote on/off feature is not used, please leave the on/off pin to floating.

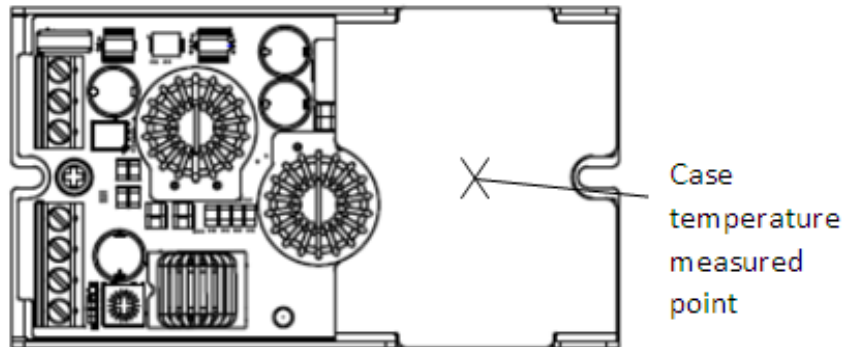
Remote on/off can be controlled by an external switch between the on/off terminal and the  $V_i$  (-) terminal. The switch can be an open collector or open drain.

#### Output Voltage Adjustment (TRIM)

Turn potentiometer on front panel:  
clockwise to increase voltage value;  
counter clockwise to decrease voltage value.  
(only for single output modules)

### THERMAL CONSIDERATIONS

To enhance system reliability, the power module's case temperature should always be operated below 100°C. If the case temperature exceeds the maximum operating temperature, reliability of the unit may be affected.



### THERMAL CURVES

The module is tested in the temperature chamber under natural convection.

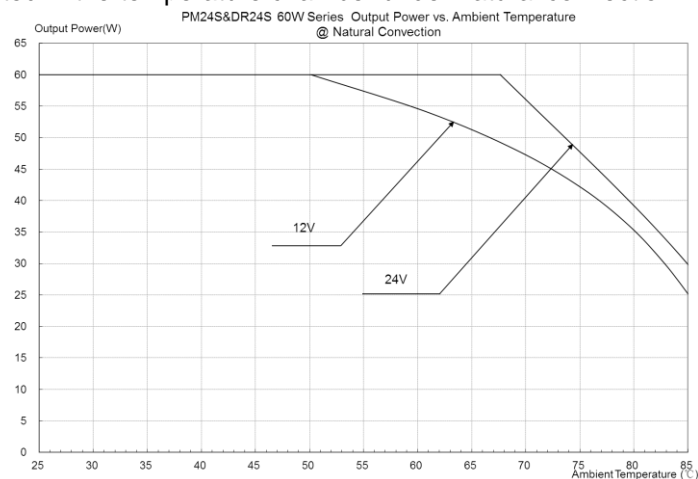
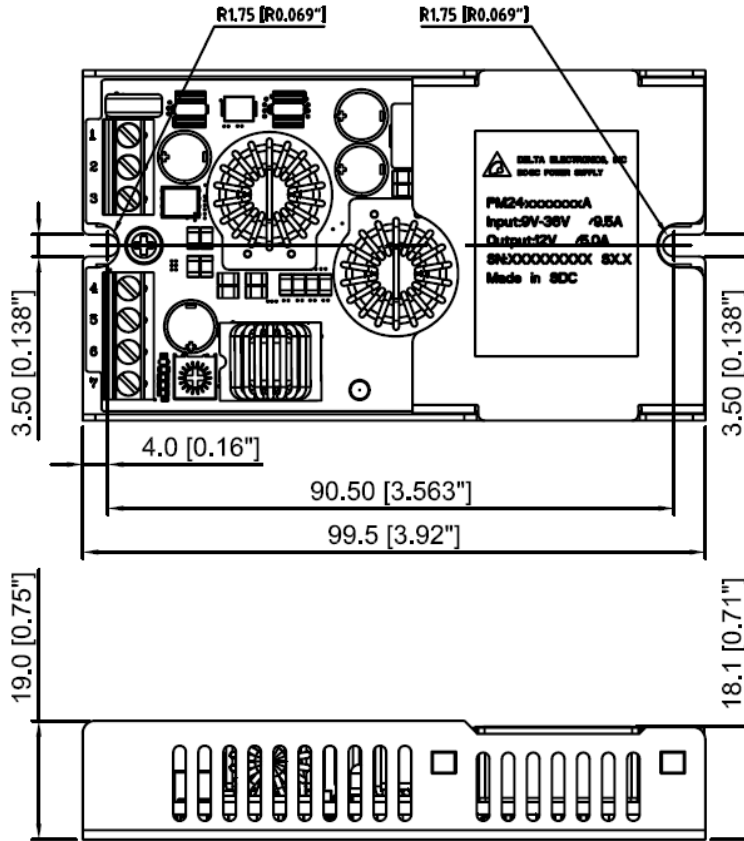


Figure1: PM24S&DR24S 60W series Output power vs Ambient temperature@Natural convection



### Mechanical Drawing (Panel-mount Package)

Mechanical Dimensions



| Pin Connections |                                  |                                |
|-----------------|----------------------------------|--------------------------------|
| Pin             | Function for Single Output model | Function for Dual Output model |
| 1               | Vin+                             | Vin+                           |
| 2               | Vin-                             | Vin-                           |
| 3               | On/off                           | On/off                         |
| 4               | Vout-                            | Vout-                          |
| 5               | Vout-                            | Common                         |
| 6               | Vout+                            | Vout+                          |
| 7               | Vout+                            | NC                             |

Product Size: 100.0\*56.0\*19.0(3.94\*\* 2.20\*\*0.75")

Case material: Aluminum alloy

Baseplate material: Aluminum alloy

Input terminal: M3 Screw Terminal

Input wire range: 28~16 AWG

Output Terminal: M3 Screw Terminal

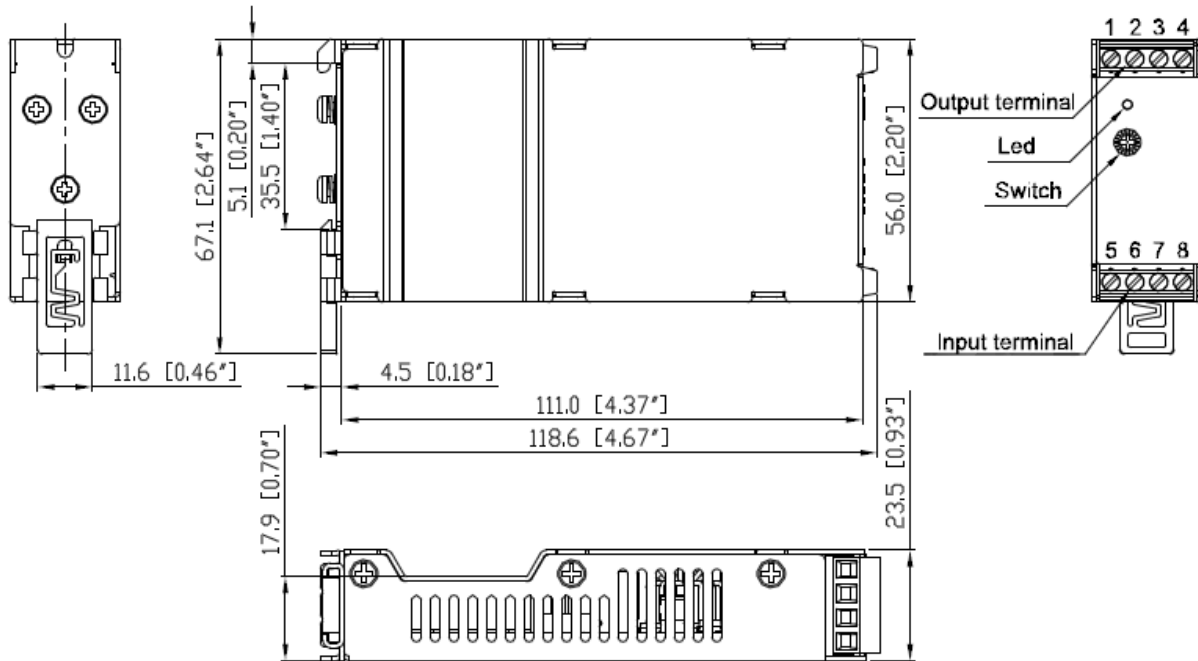
Output wire range: 28~16 AWG

Weight: 114 grams

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)  
X.XX±0.25 (X.XXX±0.010)

### Mechanical Drawing (Din-rail Package)

#### Mechanical Dimensions



| Pin Connections |                                  |                                |
|-----------------|----------------------------------|--------------------------------|
| Pin             | Function for Single Output model | Function for Dual Output model |
| 1               | Vout-                            | NC                             |
| 2               | Vout-                            | Vout-                          |
| 3               | Vout+                            | COM                            |
| 4               | Vout+                            | Vout+                          |
| 5               | On/off                           | On/off                         |
| 6               | Vin-                             | Vin-                           |
| 7               | Vin-                             | Vin-                           |
| 8               | Vin+                             | Vin+                           |

#### Physical outline

Product Size: 118.6\*67.1\*23.5(4.67\*\*2.64\*\*0.93")

Case material: Aluminum alloy

Baseplate material: Aluminum alloy

Input terminal: M3 Screw Terminal

Input wire range: 28~16 AWG

Output Terminal: M3 Screw Terminal

Output wire range: 28~16 AWG

Weight: 135 grams

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)  
X.XX±0.25 ( X.XXX±0.010)

### Part Numbering System

| PM               | 24            | S                | 050            | 12             | P                            | A                  | F                        | A                   |
|------------------|---------------|------------------|----------------|----------------|------------------------------|--------------------|--------------------------|---------------------|
| Form factor      | Input voltage | Number of output | Output voltage | Output current | On/off logic                 | Terminal Type      | RoHS                     | Option Code         |
| PM - Panel Mount | 24 - 9~36V    | S - Single       | 050 - 5V       | 12 - 12A       | N - Negative<br>P - Positive | A - Screw terminal | F - RoHS 6/6 (Lead Free) | A - With EMI filter |

| DR                  | 24            | S                | 240            | 08             | P                            | A                  | F                        | A                   |
|---------------------|---------------|------------------|----------------|----------------|------------------------------|--------------------|--------------------------|---------------------|
| Form factor         | Input voltage | Number of output | Output voltage | Output current | On/off logic                 | Terminal Type      | RoHS                     | Option Code         |
| DR - Din-rail Mount | 24 - 9~36V    | S - Single       | 240 - 24V      | 08 - 8A        | N - Negative<br>P - Positive | A - Screw terminal | F - RoHS 6/6 (Lead Free) | A - With EMI filter |

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### WARRANTY

Delta offers a three (3) years limited warranty. Complete warranty information is listed on our web site or is available upon request from Delta.

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