



FEATURES

- Efficiency up to 92.8%
- Wide input range, 9V-36V
- Package with Industry Standard Pinout
- Package Dimension:
 - Without heat sink
50.8 x25.4 x10.5mm (2.0" x1.0" x0.41")
 - With heat sink
50.8 x25.4 x17.5mm (2.0" x1.0" x0.69")
- 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
- UL60950, 2nd Edition, (Approval pending)

The S24SP family, the highest power density (40W) industrial input range 2"X1" isolated power converter whose pinout follows industry standard. The S24SP 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.) |
| S24SP12004 | 24 (9 ~ 36) | 12V | 3500 | 0 | 1885 | 62 | ±60 | 6000 | 92.8% |

Input Characteristics

| Item | Conditions | Min. | Typ. | Max. | Unit |
|--|------------------|--------------------|------|------|------|
| Input Surge Voltage (100 msec) | | --- | --- | 50 | VDC |
| Input Turn-On Voltage Threshold | | 8 | 8.5 | 9 | VDC |
| Input Turn-Off Voltage Threshold | | 7 | 7.5 | 8 | VDC |
| Input Under-Voltage Lockout Hysteresis | | 0.4 | 1 | 1.7 | VDC |
| Off-Converter Input Current | Vin=24V | --- | 9.5 | --- | mA |
| Input reflected ripple current | with 12uH, 20MHz | --- | 9 | 20 | mA |
| Reverse Polarity Input Current | | --- | --- | 0.3 | A |
| ON/OFF Control, Logic High | Von/off | 2.4 | --- | 10 | VDC |
| ON/OFF Control, Logic Low | Von/off | -0.7 | --- | 0.8 | VDC |
| Input Filter | | Internal LC Filter | | | |

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 | --- | 70 | --- | mV _{P-P} |
| Dynamic load response | 50%-75% full load, 0.1A/uS | --- | 2 | --- | %Vo |
| Output Over Current Protection | Output Voltage 10% Low, Hiccup | 110 | --- | 230 | %Io,max |
| Short Output Protection | Long Term, Auto-recovery | | | | |
| Output Over-Voltage Protection | Hiccup, Auto-recovery | 115 | --- | 140 | %Vo |
| Output Trim Range | $P_{out} \cong \text{max rated power}$, $I_o \cong I_{o,max}$ | -10 | --- | +10 | %Vo |

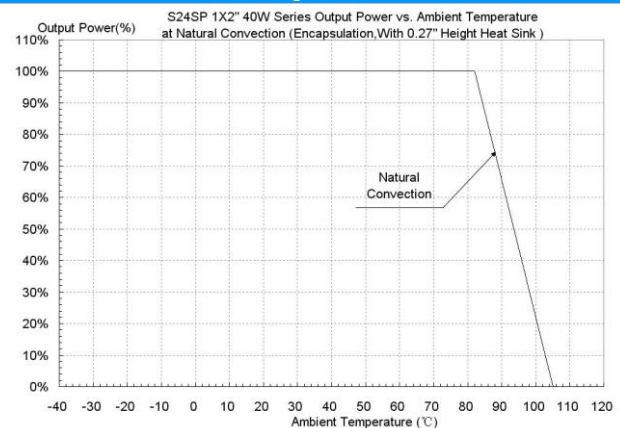
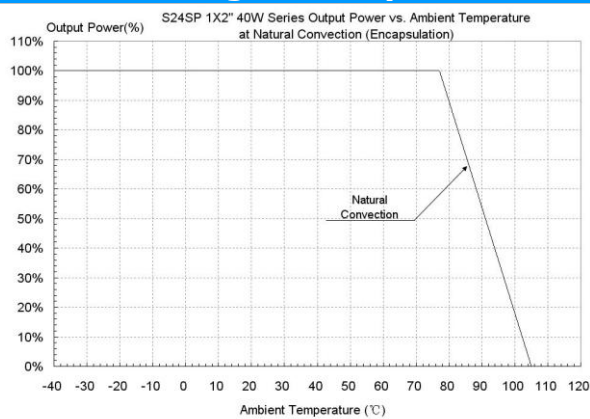
General Characteristics

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

Environmental Specifications

| Parameter | Conditions | Min. | Max. | Unit |
|---|---------------------|------|------|----------|
| Operating Temperature Range (with Derating) | Ambient | -40 | +85 | °C |
| Case Temperature | | --- | +105 | °C |
| Storage Temperature Range | | -50 | +125 | °C |
| Humidity (non condensing) | | --- | 95 | % rel. H |
| Cooling | Free-Air convection | | | |

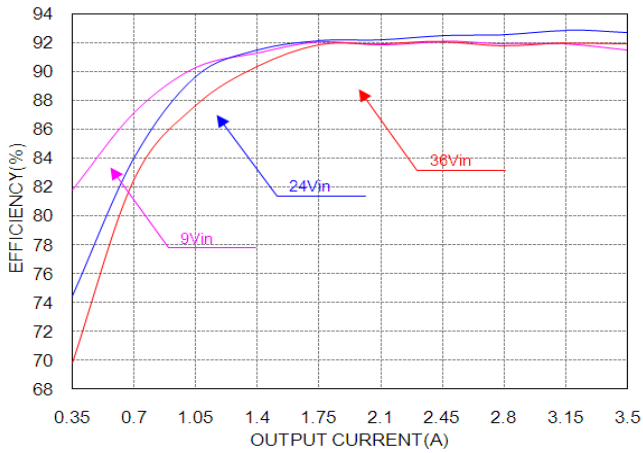
Power Derating Curves (No Heat Sink and With Heat Sink)



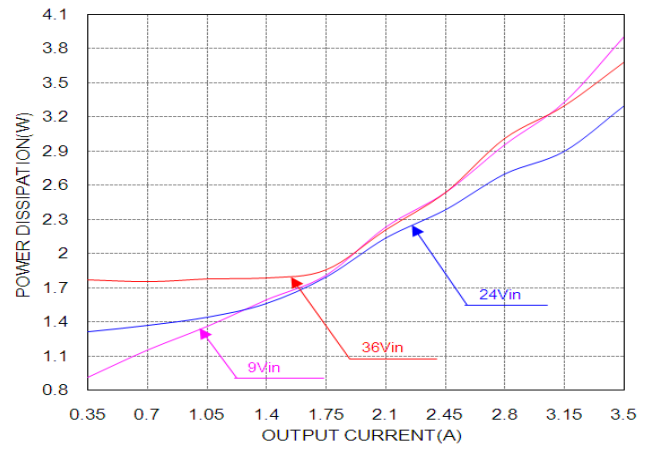
Notes

- 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 DC/DC converters should be externally fused at the front end for protection.
- 4 Specifications are subject to change without notice.

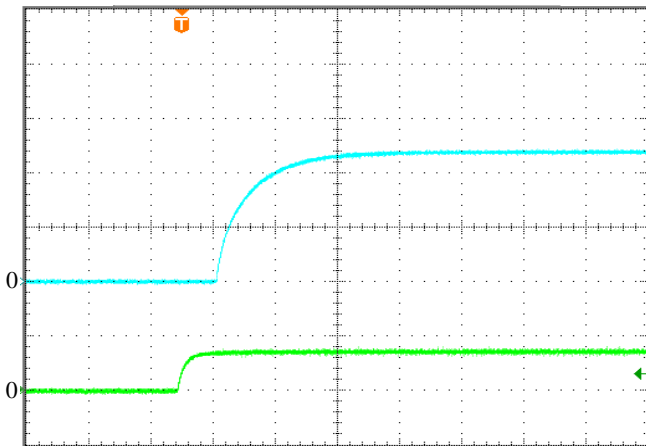
ELECTRICAL CHARACTERISTICS CURVES - S24SP12004, 9-36VIN, 12VOUT/3.5A



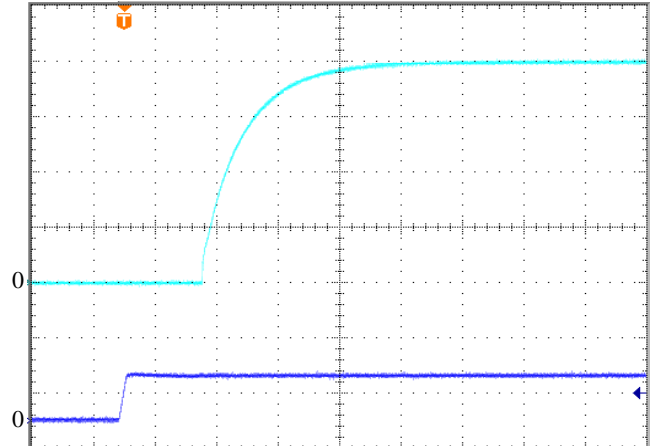
Efficiency vs. load current for various input voltage at 25°C.



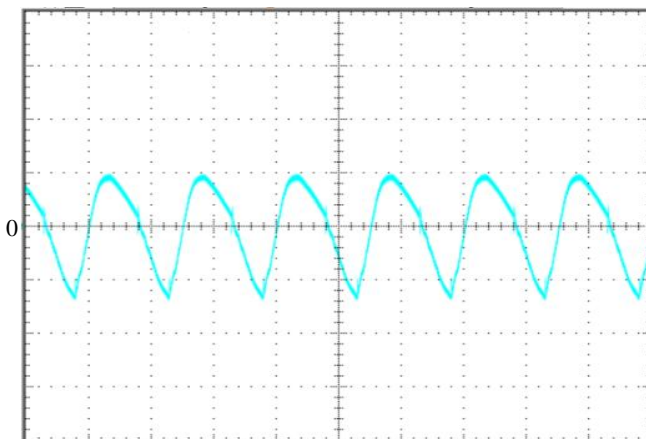
Power dissipation vs. load current at 25°C.



Turn-on transient at full load current (20ms/div).
Top Trace: Vout; 5V/div; Bottom Trace: ON/OFF input: 5V/div.

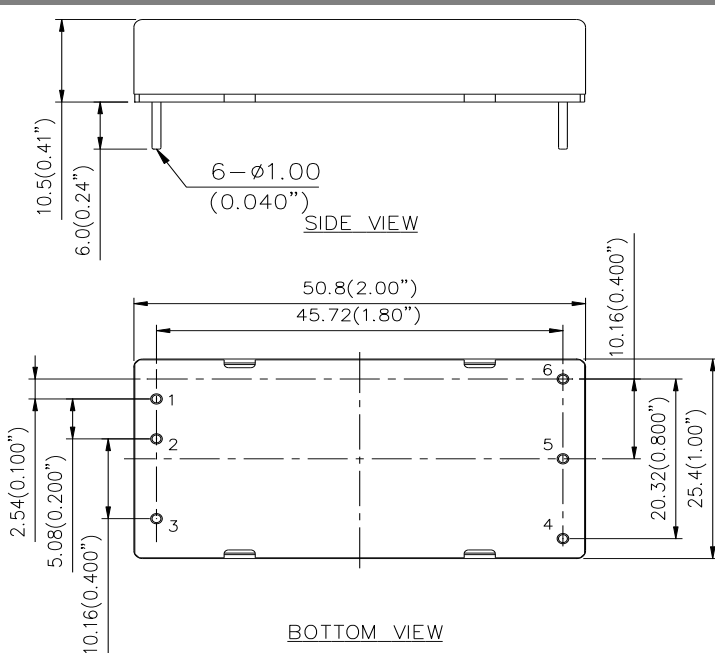


Turn-on transient at full load current (20 ms/div).
Top Trace: Vout; 3V/div; Bottom Trace: input voltage: 30V/div.

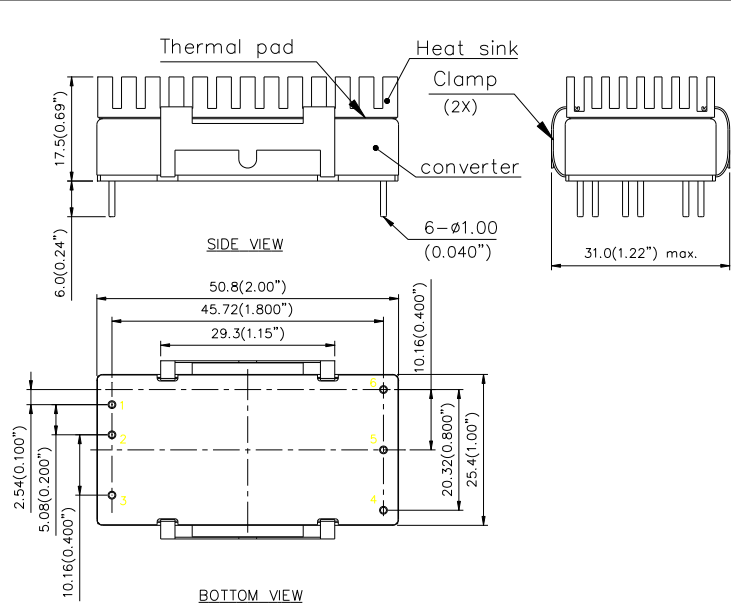


Output voltage ripple at nominal input voltage and max load current (20 mV/div, 2us/div)
Load cap: 10μF, tantalum capacitor and 1μF ceramic capacitor.
Bandwidth: 20 MHz.

Mechanical Drawing(without heat sink)

| Mechanical Dimensions | | Pin Connections | |
|--|-------|-----------------|----------|
|  | | Pin | Function |
| | | 1 | Vin+ |
| | | 2 | Vin- |
| | | 3 | On/off |
| | | 4 | Trim |
| | | 5 | Vout- |
| 6 | Vout+ | | |
| <p>Physical outline</p> <p>Case Size: 50.8*25.4*9.5(2.0"*1.0"*0.38")</p> <p>Case material: Al alloy, anodize black</p> <p>Baseplate material: Non-conductive FR-4</p> <p>Pin material: Brass; finish: Matte Tin plating and Nickel under plating</p> <p>Pin length: refer part numbering system</p> <p>Weight: 34grams</p> <ul style="list-style-type: none"> ➤ All dimensions in mm (inches) ➤ Tolerance: X.X±0.5 (X.XX±0.02) X.XX±0.25 (X.XXX±0.010) ➤ Pins Diameter : ±0.10(±0.004) | | | |

Mechanical Drawing(with heat sink)

| Mechanical Dimensions | | Physical Outline | |
|--|--|--------------------------------|-----------------------|
|  | | 1 | Heat sink |
| | | Material: Al-6063 | |
| | | Finish: anodize black | |
| | | Weight: 10.3grams | |
| | | 2 | Clamp |
| | | Material: spring steel | |
| | | Finish: Nickel plating | |
| | | 3 | Thermal pad |
| | | Material: Sil-pad | |
| | | Thermal conductivity: 1.6W/m-K | |
| | | 4 | Model weight: 46grams |
| <ul style="list-style-type: none"> ➤ All dimensions in mm (inches) ➤ Tolerance: X.X±0.5 (X.XX±0.02) X.XX±0.25 (X.XXX±0.010) | | | |

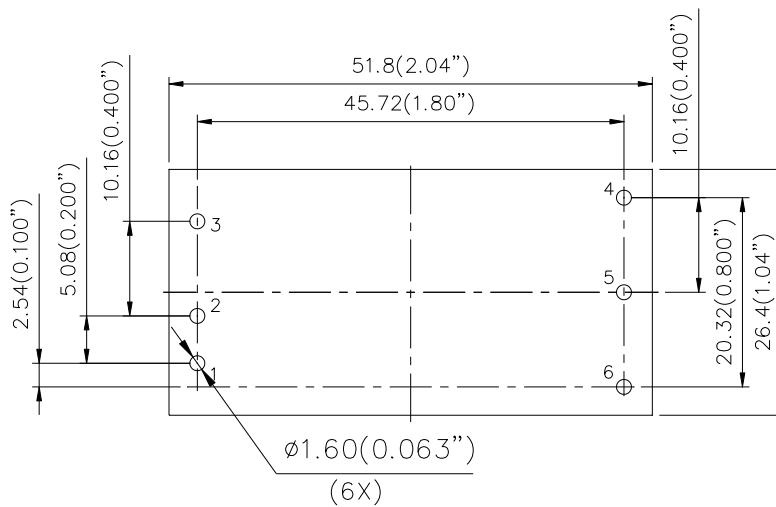
Note:

1. add heat sink to help heat dissipation and increase reliability of convert operating at high ambient temperature
2. please refer derating curve while upgrate the operating temperature of converter
3. heat sink will be mounted for volume orders, separated heat sink only be supplied for prototype
4. for model with heat sink option, the recommended layout only need note the length more larger than without heat sink

Application notice:

For modules with through-hole pins, they are intended for wave soldering assembly onto system boards; please do not subject such modules through reflow temperature profile.

Recommended layout refer below



| Pin# | Function |
|------|----------|
| 1 | Vin+ |
| 2 | Vin- |
| 3 | ON/OFF |
| 4 | Trim |
| 5 | Vout- |
| 6 | Vout+ |

Part Numbering System

| S | 24 | S | P | 120 | 04 | P | D | F | A |
|-------------|---------------|------------------|-------------------|----------------|----------------|--------------|------------|--------------------------|---------------------------------|
| Form factor | Input voltage | Number of output | Product series | Output voltage | Output current | On/off logic | Pin length | | Option Code |
| S | 24 – 9~36V | S - Single | P - Series Number | 120 – 12V | 04 – 3.5A | N - Negative | D - 0.24" | F - RoHS 6/6 (Lead Free) | A – Standard. (with metal case) |
| | | | | | | P – Positive | T - 0.22" | | |
| | | | | | | | R - 0.17" | | H – With heat sink |

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JONHON

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