



### 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, 2<sup>nd</sup> Edition, (Approval pending)

The S24SP family, the highest power density (60W) 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 $\geq$ 10mohm; Full load; 5% overshoot of Vout at startup)	Efficiency (typ.)
			Max.	Min.	@Max. Load	@No Load			@Max. Load
	VDC	VDC	mA	mA	mA(typ.)	mA(typ.)	mV(max)	$\mu$ F	%
S24SP12005	24 (9 ~ 36)	12V	5000	0	2695	62	$\pm$ 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 12 $\mu$ H, 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	---	100	---	mV <sub>P-P</sub>
Dynamic load response	50%-75% full load, 0.1A/μS	---	2.5	---	%Vo
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	$P_{out} \leq \text{max rated power}$ , $I_o \leq I_{o,max}$	-10	---	+10	%Vo

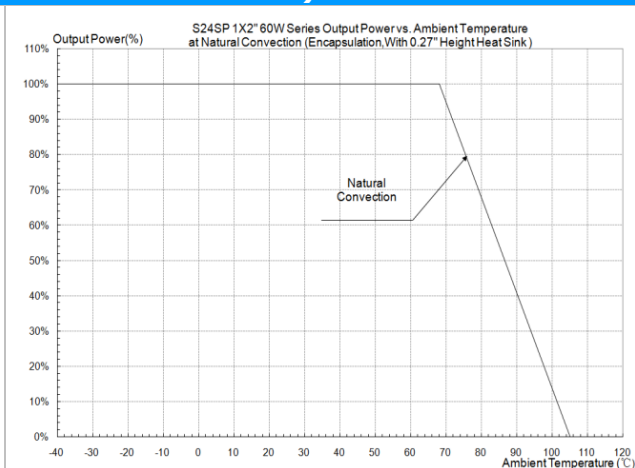
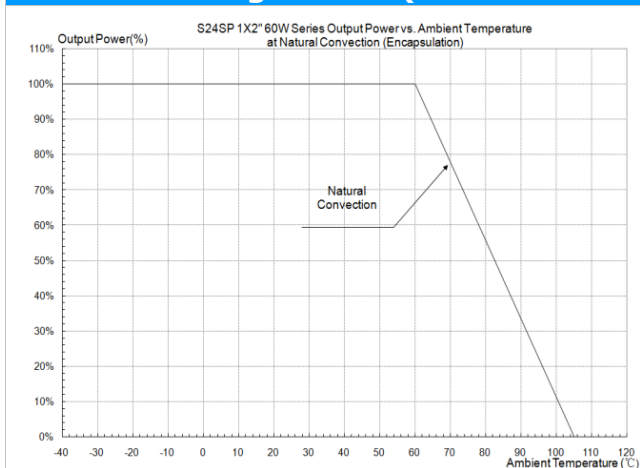
### General Characteristics

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			

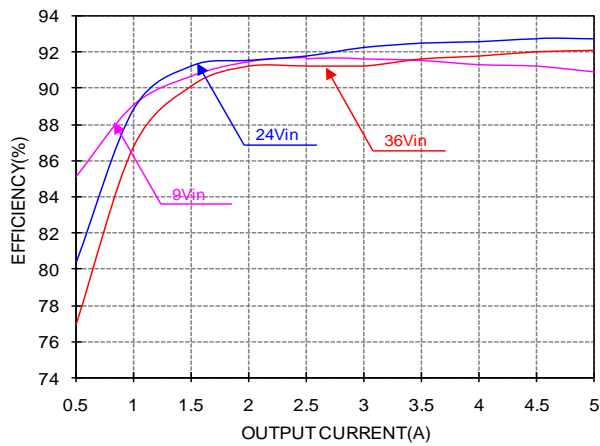
### Power Derating Curves (No Heat Sink and With Heat Sink)



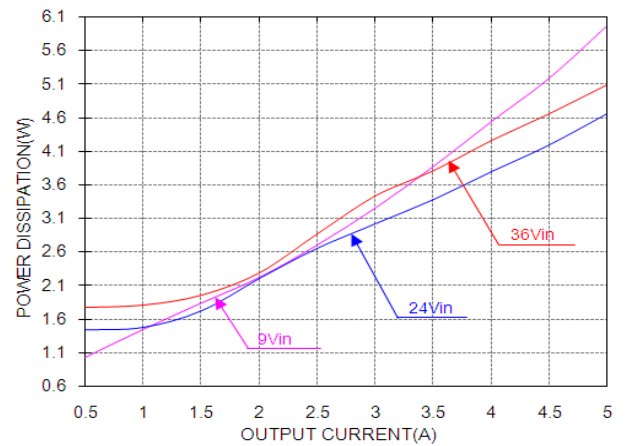
### Notes

- Specifications typical at Ta=+25°C, resistive load, nominal input voltage and rated output current unless otherwise noted.
- Ripple & Noise measurement bandwidth is 0-20MHz, with 10μF, tantalum capacitor and 1μF ceramic capacitor.
- DC/DC converters should be externally fused at the front end for protection.
- Specifications are subject to change without notice.

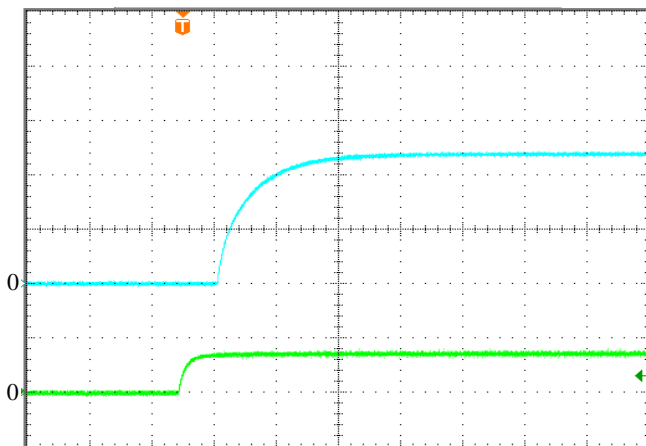
### ELECTRICAL CHARACTERISTICS CURVES - S24SP12005, 9-36VIN, 12V/5A



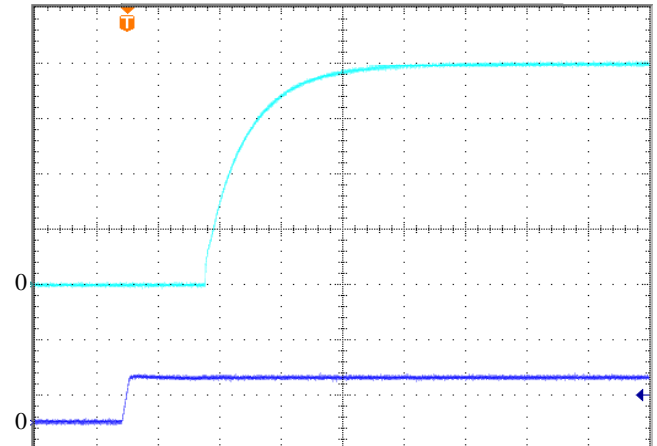
Efficiency vs. load current for various input voltage at 25°C.



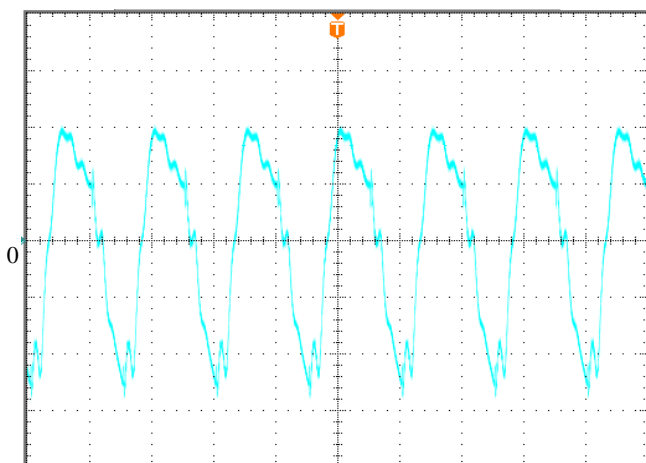
Power dissipation vs. load current at 25°C.



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



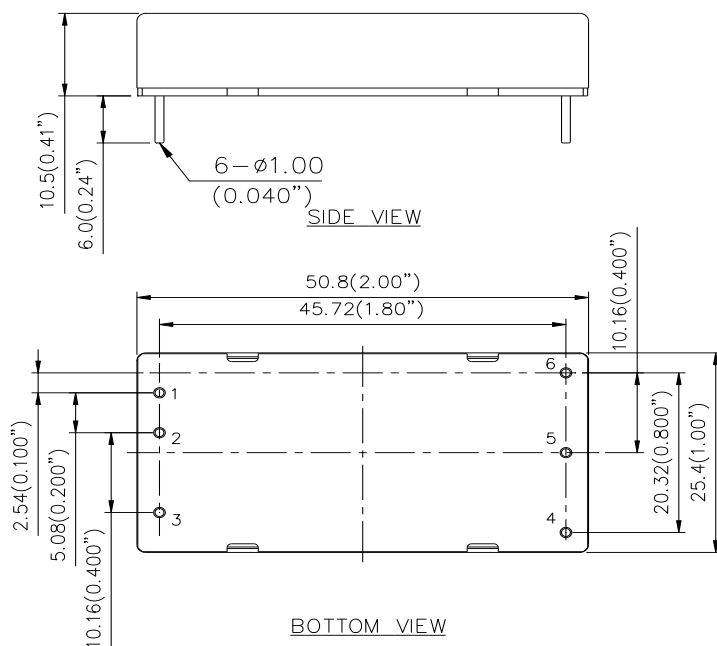
Turn-on transient at full load current (20 ms/div).  
Top Trace: Vout; 3V/div; Bottom Trace: input voltage: 30V/div.



Output voltage ripple at nominal input voltage and max load current (20 mV/div, 2us/div)  
Load cap: 10 $\mu$ F, tantalum capacitor and 1 $\mu$ F 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+

#### Physical outline

Case Size: 50.8\*25.4\*9.5(2.0"\*1.0"\*0.38")

Case material: Al alloy, anodize black

Baseplate material: Non-conductive FR-4

Pin material: Brass; finish: Matte Tin plating and Nickel under plating

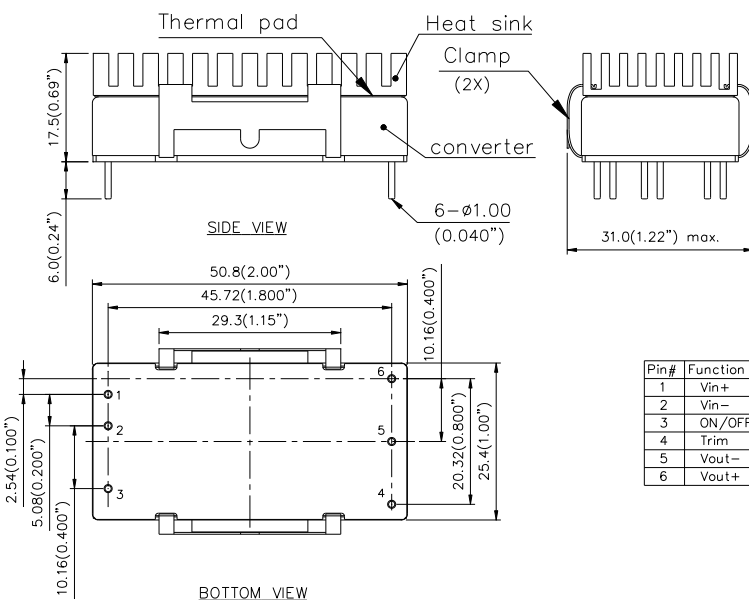
Pin length: refer part numbering system

Weight: 34grams

- 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

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

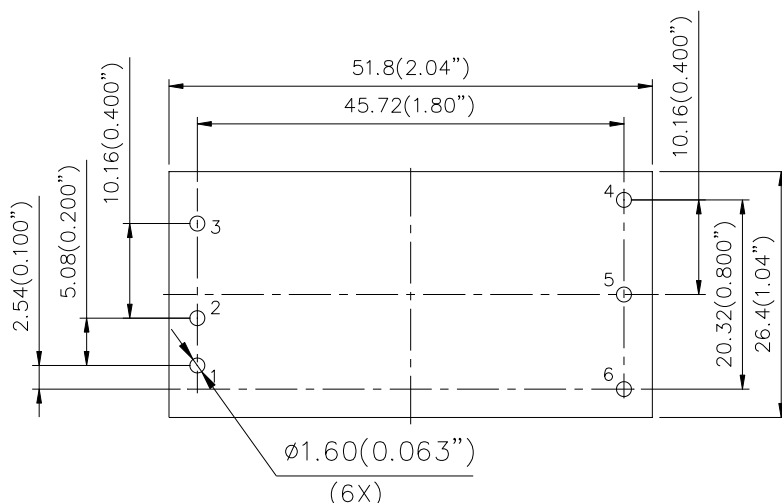
#### Note:

- add heat sink to help heat dissipation and increase reliability of convert operating at high ambient temperature
- please refer derating curve while upgrade the operating temperature of converter
- heat sink will be mounted for volume orders, separated heat sink only be supplied for prototype
- 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	05	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	05 - 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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### 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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