S24SP12004 series

40W Single Output DC/DC Converter

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)

Security Lab Medical Metro Data Center Telecom Industrial Network

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			@Max. Load
	VDC	VDC	mA	mA	mA(typ.)	mA(typ.)	mV(max)	uF	%
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	Pout ≦ max rated power, Io ≦ Io.max	-10	---	+10	%Vo

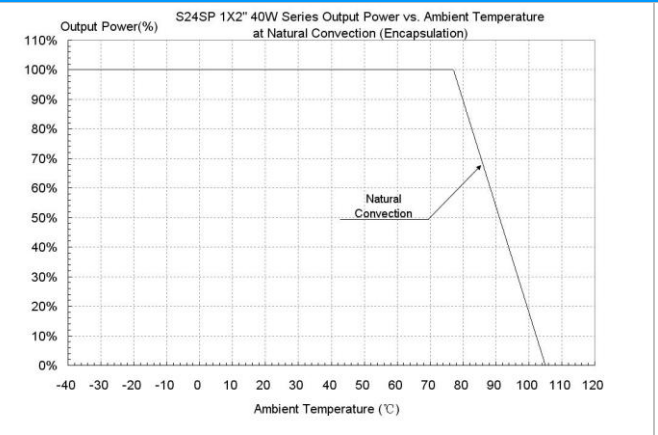
General Characteristics

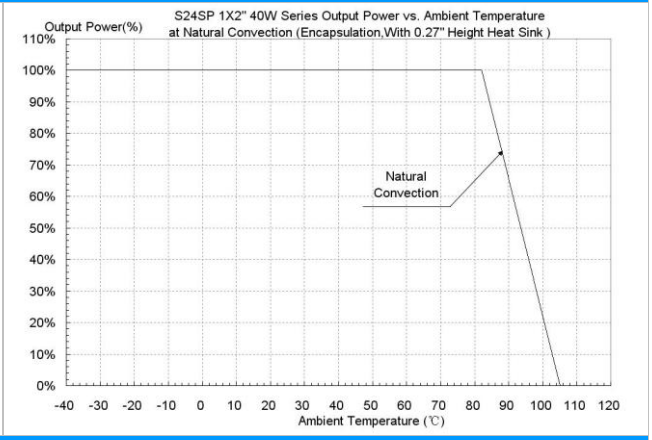
Item	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage (rated)		---	---	1500	VDC
I/O Isolation Resistance		10	---	---	MΩ
I/O Isolation Capacitance		---	1500	---	pF
Switching Frequency		---	330	---	KHz

Environmental Specifications

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

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

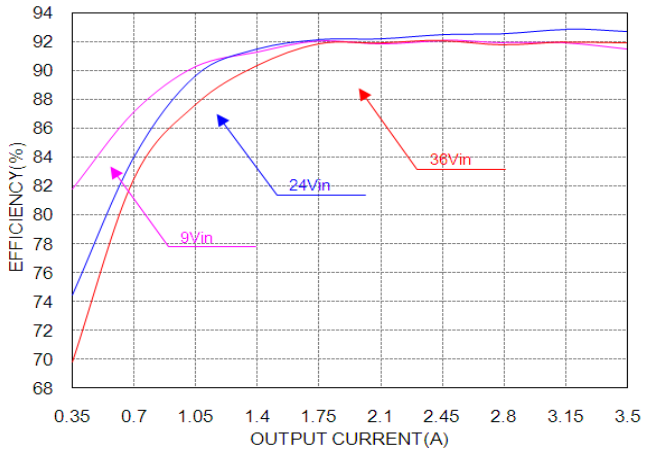




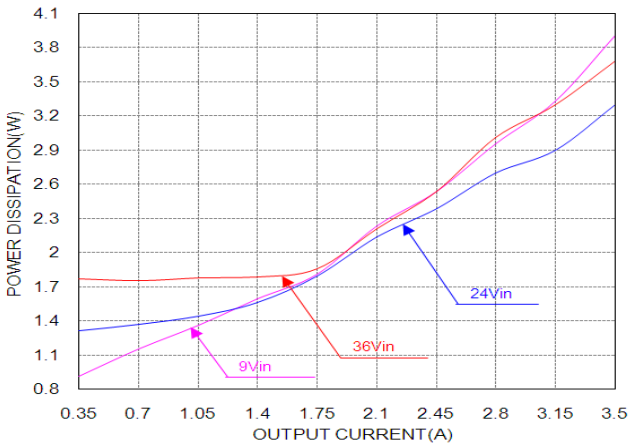
Notes

1 Specifications typical at Ta=+25℃, 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.

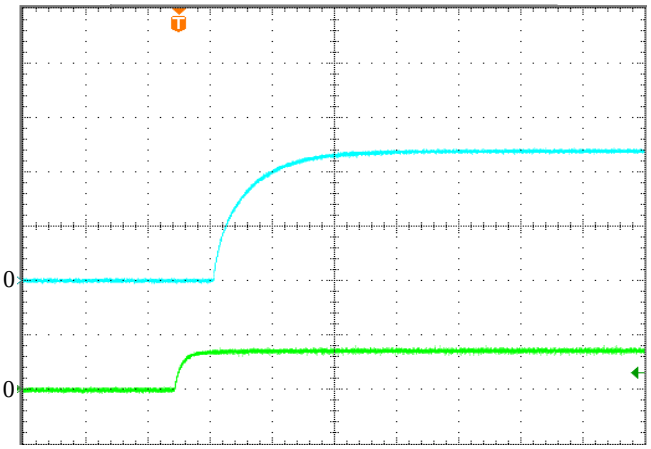
ELECTRICAL CHARACTERISTICS CURVES - S24SP12004, 9-36VIN, 12VOUT/3.5A



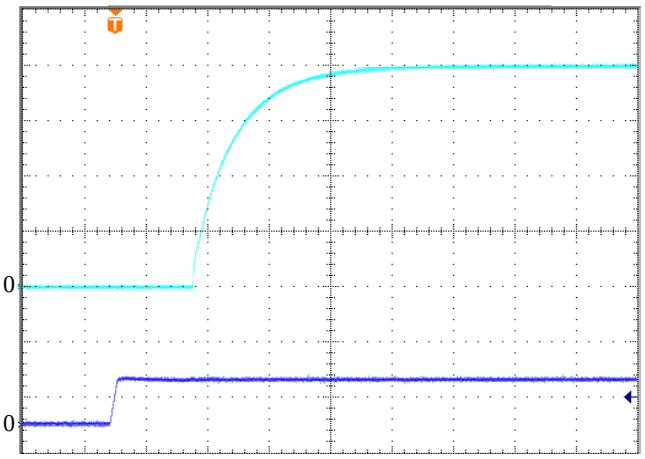
Efficiency vs. load current for various input voltage at 25°C.



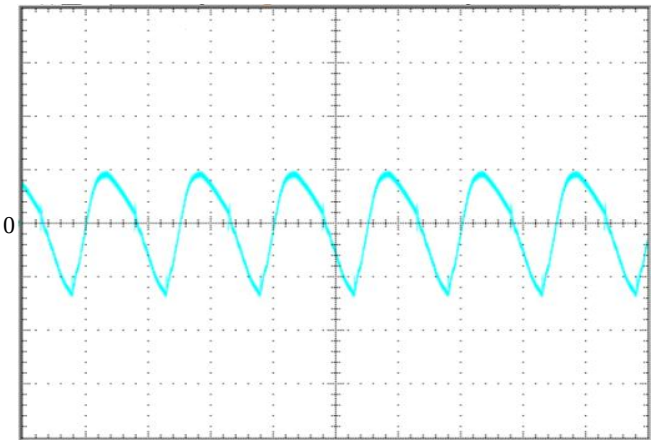
Power dissipation vs. load current at 25°C.



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



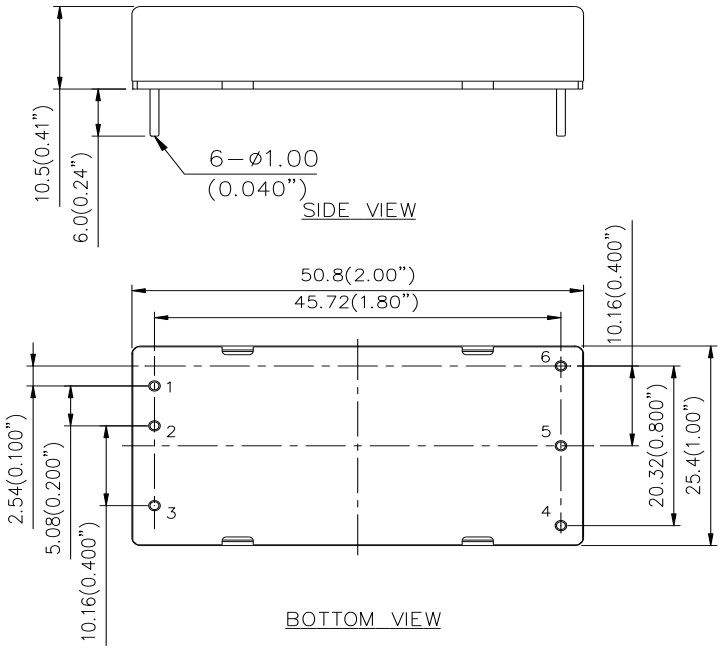
Turn-on transient at full load current (20 ms/div).
Top Trace: Vout; 3V/div; Bottom Trace: input voltage: 30V/div.



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+

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

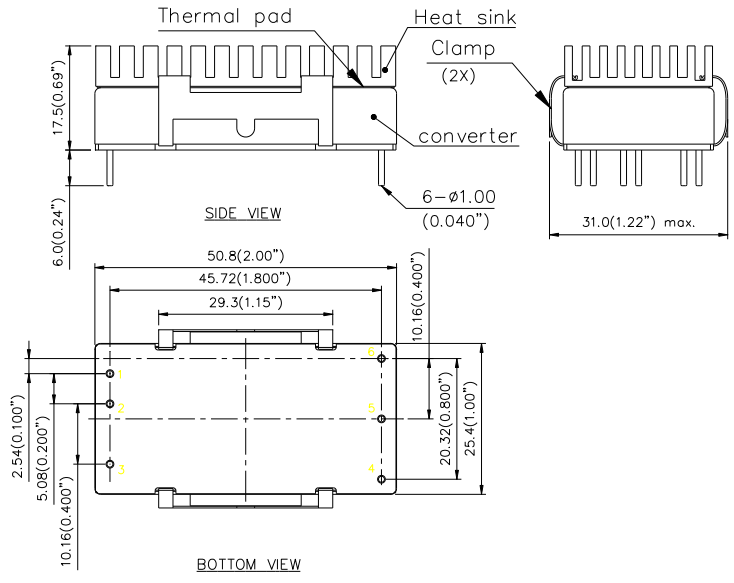
Pin length: refer part numbering system

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)

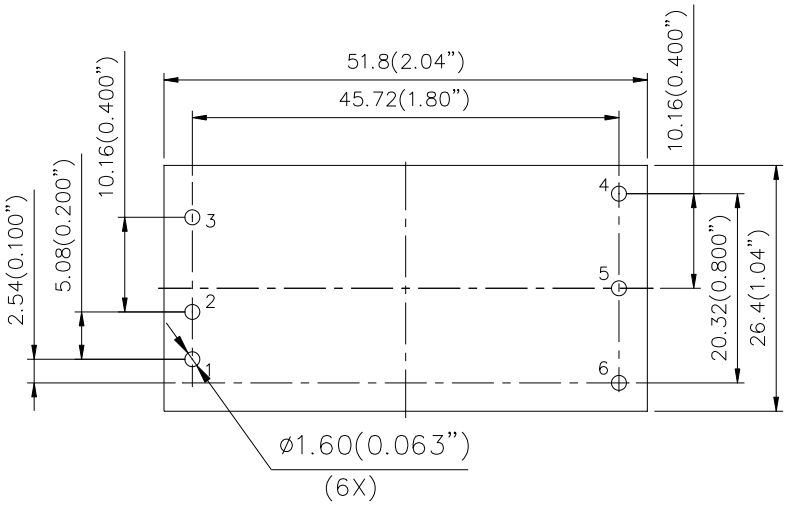
Note:

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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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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