DELPHI SERIES

FEATURES

- High efficiency :
  85.5% @ 11Vin, 1.0V/40A out
- Small size and low profile:
  1.0” x 0.62” x 0.5”
  (25.4mm x 15.7mm x 12.7mm)
- Surface mount
- No minimum load required
- Input: UVLO, Output OCP/SCP, OVP, OTP
- Parallel Units
- ISO 9000, TL 9000, ISO 14001 certified manufacturing facility
- UL/cUL 60950-1 (US & Canada) Recognized, and TUV (EN60950-1) Certified
- CE mark meets 73/23/EEC and 93/68/EEC directives

D12S72, Non-Isolated, Power Block
DC/DC Power Modules: 7.0~13.2Vin, 0.8V~1.8V/40Aout

The Delphi D12S72, surface mounted, power block is the latest offering from a world leader in power systems technology and manufacturing — Delta Electronics, Inc. The D12S72 is the latest offering in the DXP30 family which was developed to address the ever-growing demands of increased current and power densities in networking applications while providing maximum flexibility for system configuration, its benefits can easily be applied to other applications transcending various market segments. The DXP family, containing all necessary power components and boasting of a USABLE (55˚C, 200LFM) current density of 64.5A/in^2 and a power density of up to 232W/in^3, is a building block for a new open Digital Power Architecture developed to work with either digital or analog controllers. Measured at 0.62”Wx1.0”Lx0.5”H and rated at 40A of output current, the D12S72 is designed to operate with an input voltage from 7V to 13.2V and provide an output voltage adjustable from 0.8V to 1.8V in digitally defined step resolution of 1.62mV. Multiple D12S72 can be used in parallel to serve applications where output currents are in excess of 40A with limitation imposed only by the control circuit, analog or digital. Designed for superior price/performance, the D12S72 can provide 1.8V and 40A full load in ambient temperature up to 55˚C with 200LFM airflow.

APPLICATIONS

- Telecom / DataCom
- Distributed power architectures
- Servers and workstations
- LAN / WAN applications
- Data processing applications

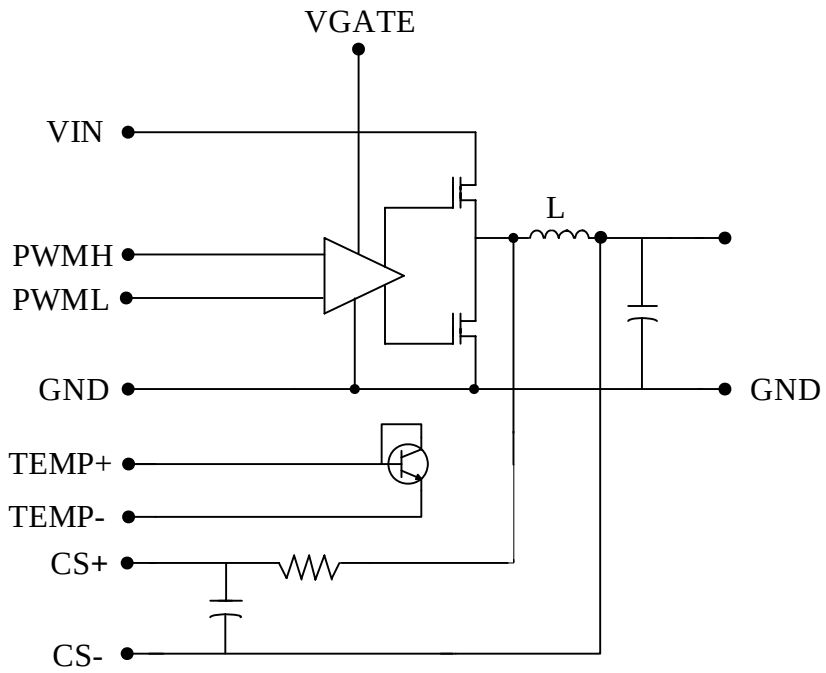
DATASHEET
DS_D12S72_02172009

Delta Electronics, Inc.

TECHNICAL SPECIFICATIONS

T_A = 25°C, airflow rate = 200 LFM, V_{in} = 11Vdc, nominal Vout unless otherwise noted.

PARAMETER	NOTES and CONDITIONS	D12S72			
		Min.	Typ.	Max.	Units
ABSOLUTE MAXIMUM RATINGS					
Input Voltage (Continuous)		0		15	Vdc
Operating Temperature	Refer to Figure 22 for the measuring point	0		110	°C
Storage Temperature		-40		125	°C
Gate Voltage		0		7	Vdc
INPUT CHARACTERISTICS					
Operating Input Voltage		7.0		13.2	V
Maximum Input Current	Vin=12V, Vout=1.0V, Iout=40A		3.90		A
PWM	Pin 4 and 5	4.5	5.0	5.5	V
PWMH, PWML logic low	PWMH or PWML	0		2	V
PWMH, PWML logic high	PWMH or PWML	3	3.5	5.5	V
Gate Voltage	Pin 3 (reference to ground), 6.4V recommended operating	4.5	6.4	7	Vdc
OUTPUT CHARACTERISTICS					
Output Voltage Adjustable Range		0.8	1.0	2.0	Vdc
Total Output Voltage Regulation	Total Regulation over load, line and temperature	-1		+1	%V
Output Voltage Ripple and Noise	3x 560μF OSCON and 320μF ceramic capacitor, BW=20MHz		40		mVpp
Output Voltage Overshoot	@ turn on		0.5		%
Output Current Range		0		40	A
Transient Response			TBD		mVpp
Inductor Value			400		nH
Inductor DCR			0.6		mΩ
Inductor Peak Current	Inductor temperature of 125°C			48	A
Temperature sense	25°C, 495μA bias current	TBD	TBD	TBD	V
EFFICIENCY					
	Vin=7V, Vo=1.0V, Io=40A		85.5		%
	Vin=11V, Vo=1.0V, Io=40A		85.5		%
	Vin=12V, Vo=1.0V, Io=40A		85.5		%
FEATURE CHARACTERISTICS					
Operating Frequency			400		kHz
GENERAL SPECIFICATIONS					
MTBF	Vo=1V, Io=40A, Ta=25℃		9.335		M hours
Weight			8		grams



Block diagram of D12S72

ELECTRICAL CHARACTERISTICS CURVES

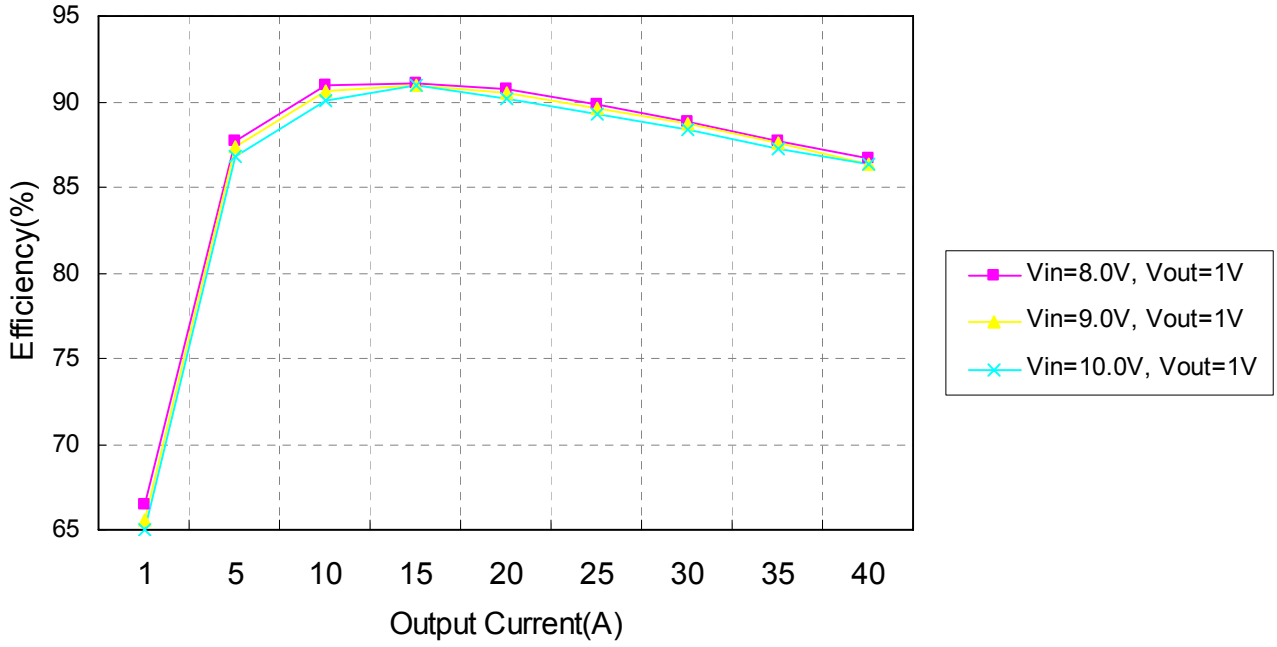


Figure 1: *Efficiency vs. load current for minimum, nominal, and maximum input voltage at 25°C.*

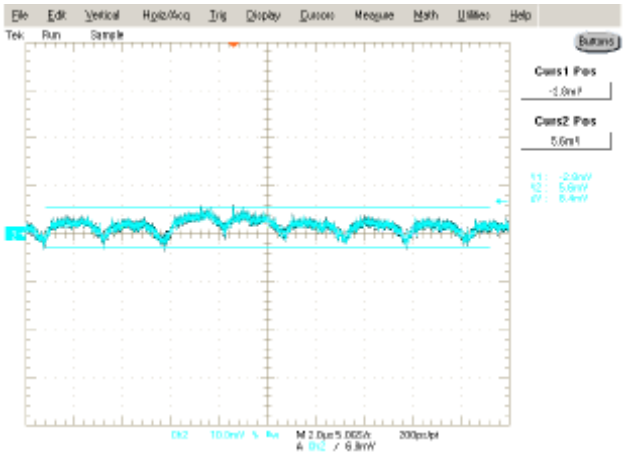


Figure 2*: Output Ripple & Noise, Vin=8.0V*
Load: 40A, CH2: Vout, Reading: 8.4mV

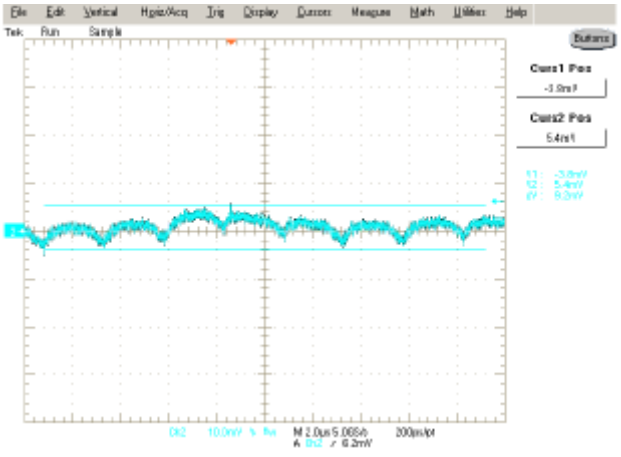


Figure 3: *Output Ripple & Noise, Vin=9.0V*
Load: 40A, CH2: Vout, Reading: 9.2mV

ELECTRICAL CHARACTERISTICS CURVES

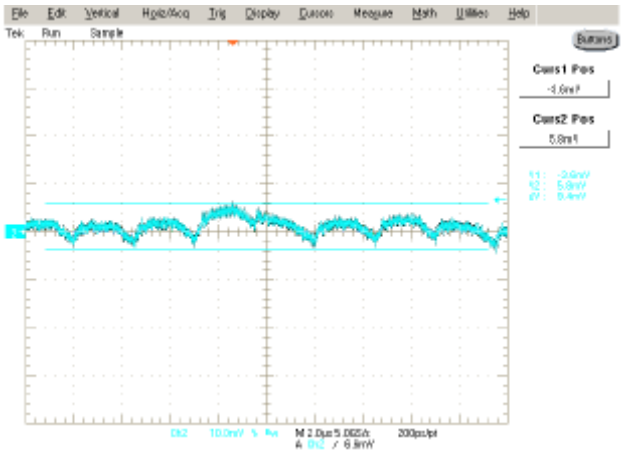


Figure 4: *Output Ripple & Noise, Vin=10V, Load: 40A, CH2: Vout, Reading: 9.4mV*

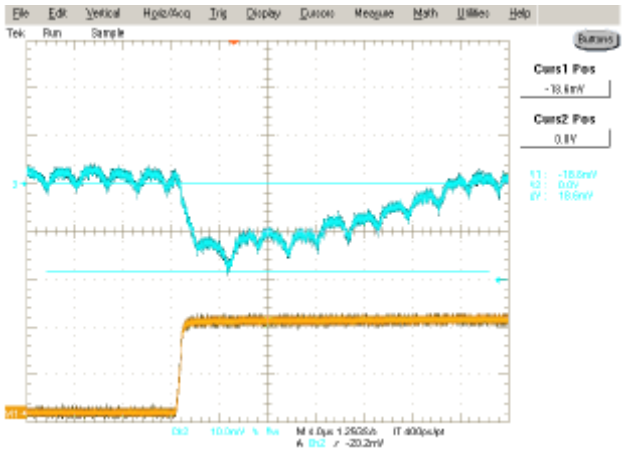


Figure 5: *Dynamic, Vin=8.0V, Load: 30->40A*
Top: Vout, Bottom: Iout, Reading: 18.6mV

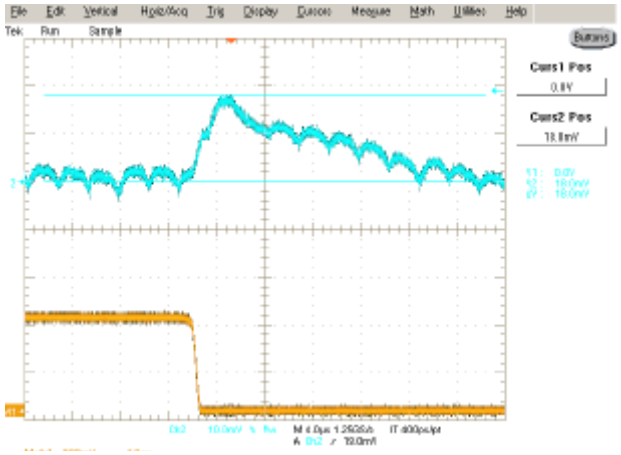


Figure 6: *Dynamic, Vin=8.0V, Load: 40->30A*
Top: Vout, Bottom: Iout, Reading: 18.0mV

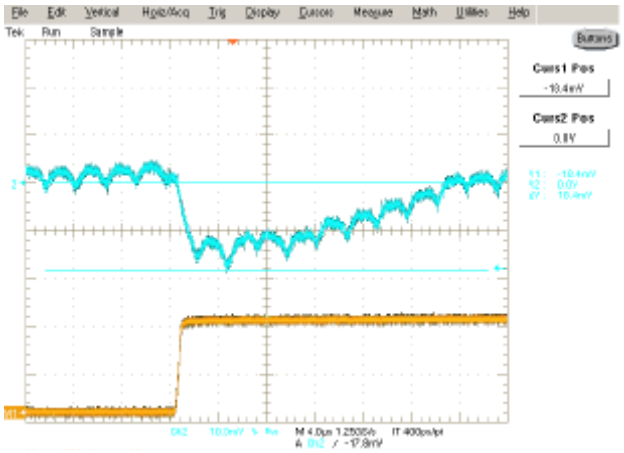


Figure 7: *Dynamic, Vin=9.0V, Load: 30->40A*
Top: Vout, Bottom: Iout, Reading: 18.4mV

Figure 8: *Dynamic, Vin=9.0V, Load: 40->30A*
Top: Vout, Bottom: Iout, Reading: 18.4mV

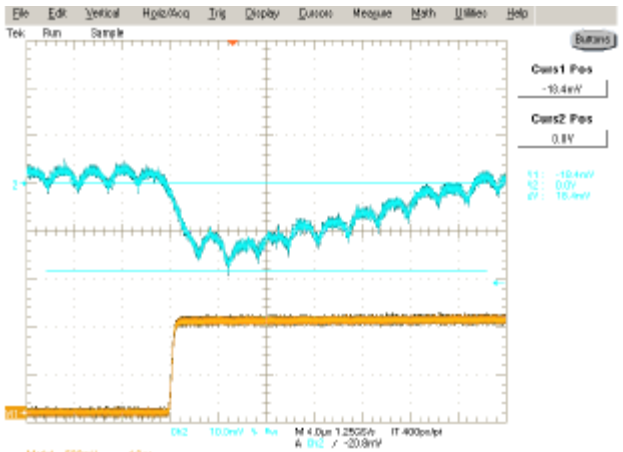


Figure 9: *Dynamic, Vin=10.0V, Load: 30->40A*
Top: Vout, Bottom: Iout, Reading: 18.4mV

ELECTRICAL CHARACTERISTICS CURVES

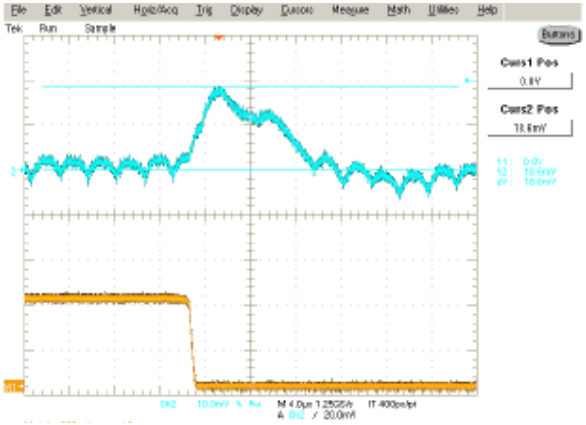


Figure 10: *Dynamic, Vin=10.0V, Load: 40->30A*
Top: Vout, Bottom: Iout, Reading: 18.6mV

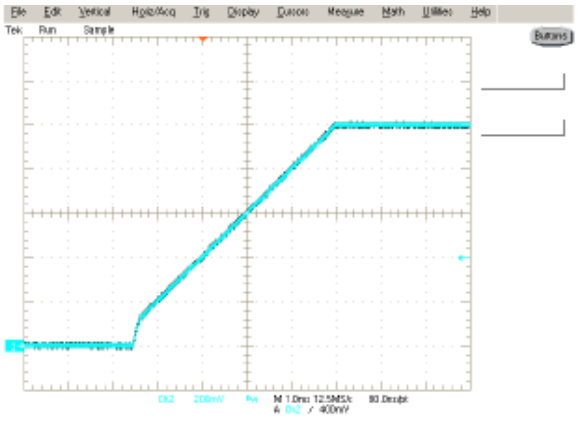


Figure 11: *Turn on, Vin=8.0V, Load: 40A, CH2: Vout*

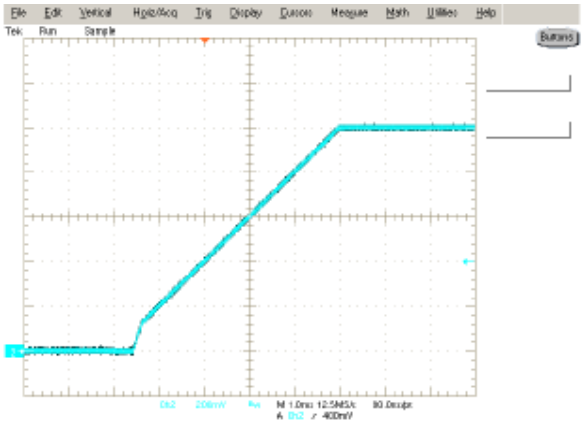


Figure 12: *Turn on, Vin=9.0V, Load: 40A, CH2: Vout*

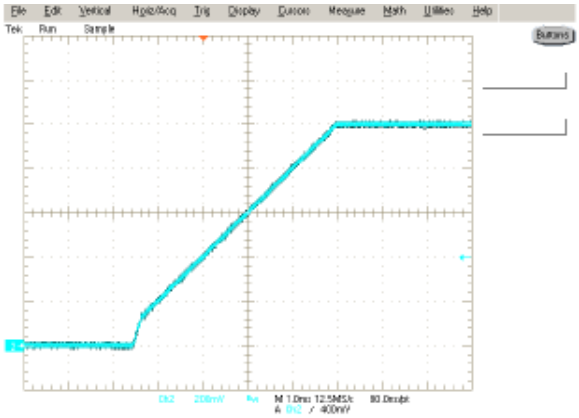


Figure 13: *Turn on, Vin=10.0V, Load: 40A, CH2: Vout*

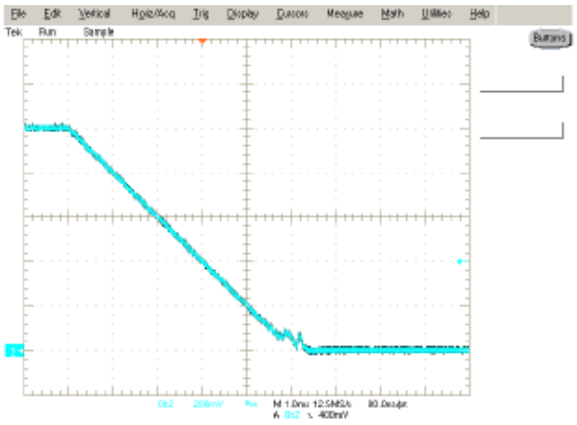


Figure 14: *Turn off, Vin=8.0V, Load: 40A, CH3: Vout*

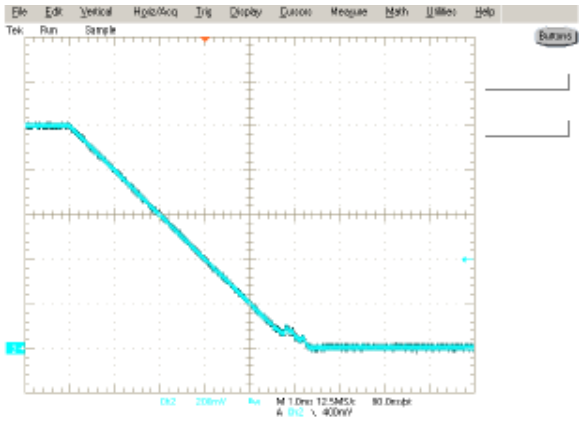


Figure 15: *Turn off, Vin=9.0V, Load: 40A, CH3: Vout*

ELECTRICAL CHARACTERISTICS CURVES

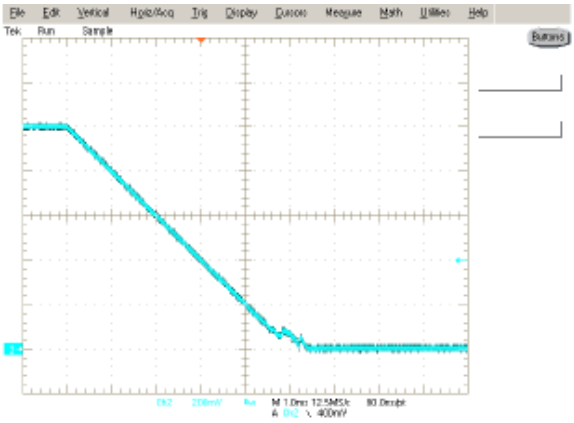


Figure 16: *Turn off, Vin=10.0V, Load: 40A, CH3: Vout*

TEST CONFIGURATIONS

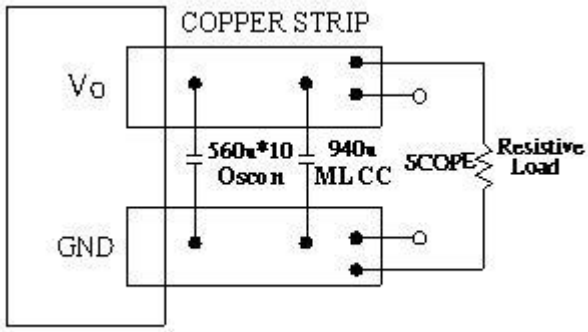


Figure 17: *Peak-peak output ripple & noise and startup transient measurement test setup*

Note: 10pcs 560μF OSCON, 8pcs 47μF 1210 MLCC and 26pcs 22uF 1206 MLCC capacitor in the module output. Scope measurement should be made by using a BNC connector.

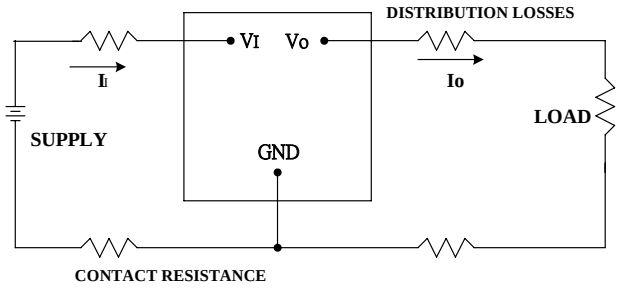


Figure 18: *Output voltage and efficiency measurement test setup*

Note: All measurements are taken at the module terminals. When the module is not soldered (via socket), place Kelvin connections at module terminals to avoid measurement errors due to contact resistance.

$$\eta = (\frac{Vo \times Io}{Vi \times Ii}) \times 100 \quad \%$$

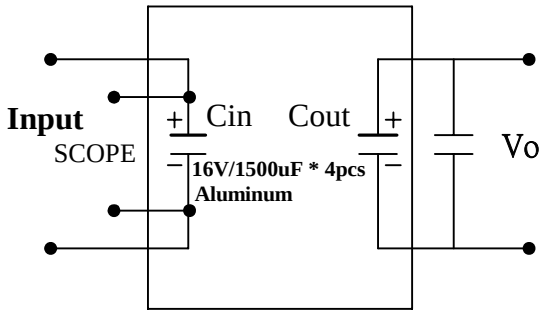


Figure 19: *Peak-peak Input ripple & noise measurement test setup*

Note: 4pcs 1,500μF Aluminum in the module input. Scope measurement should be made by using a BNC connector.

DESIGN CONSIDERATIONS

The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the module. An input capacitance must be placed close to the modules input pins to filter ripple current and ensure module stability in the presence of inductive traces that supply the input voltage to the module.

Safety Considerations

For safety-agency approval the power module must be installed in compliance with the spacing and separation requirements of the end-use safety agency standards.

For the converter output to be considered meeting the requirements of safety extra-low voltage (SELV), the input must meet SELV requirements. The power module has extra-low voltage (ELV) outputs when all inputs are ELV.

The input to these units is to be provided with a maximum 15A time-delay fuse in the ungrounded lead.

FEATURES DESCRIPTIONS

Over-Current Protection

To provide protection in an output over load fault condition, the unit is equipped with internal over-current protection. When the over-current protection is triggered, the unit will be shutdown and restart by input or OUTEN on/off. The units operate normally once the fault condition is removed.

Over-Temperature Protection

To provide additional over-temperature protection in a fault condition, the unit is equipped with a latching thermal shutdown circuit. The shutdown circuit engages when the temperature of monitored component exceeds approximately 135℃. The shutdown unit will restart by input or OUTEN on/off while the temperature lower than 125C.

THERMAL CONSIDERATIONS

Thermal management is an important part of the system design. To ensure proper, reliable operation, sufficient cooling of the power module is needed over the entire temperature range of the module. Convection cooling is usually the dominant mode of heat transfer.

Hence, the choice of equipment to characterize the thermal performance of the power module is a wind tunnel.

Thermal Testing Setup

Delta's DC/DC power modules are characterized in heated wind tunnels that simulate the thermal environments encountered in most electronics equipment.

The following figures show the wind tunnel characterization setup. The power module is mounted on Primarion test board and is horizontally positioned within the wind tunnel.

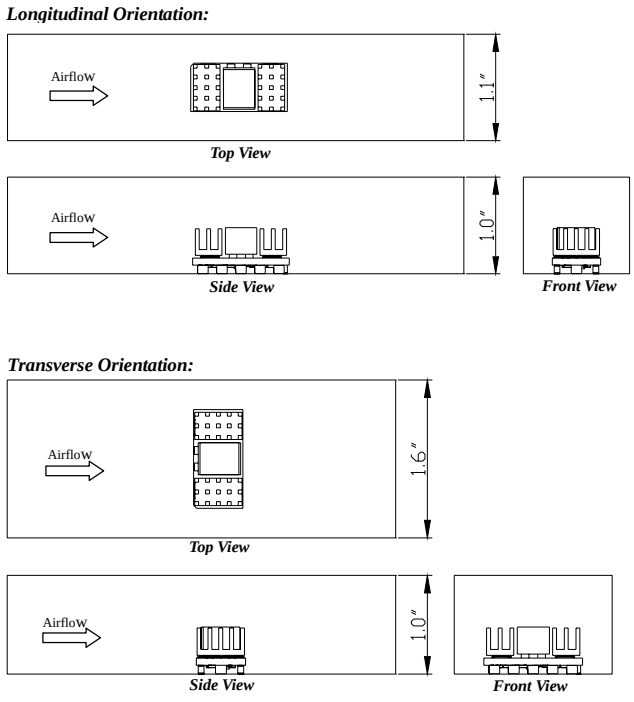


Figure 20: *Wind Tunnel*

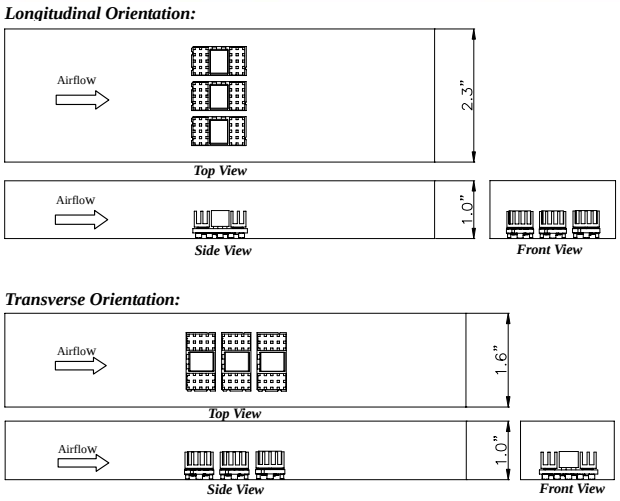


Figure 21: *Wind Tunnel Test Setup (Parallel Module)*

Thermal De-rating

The module's maximum hot spot temperature is +110°C. To enhance system reliability, the power module should always be operated below the maximum operating temperature. If the temperature exceeds the maximum module temperature, reliability of the unit may be affected.

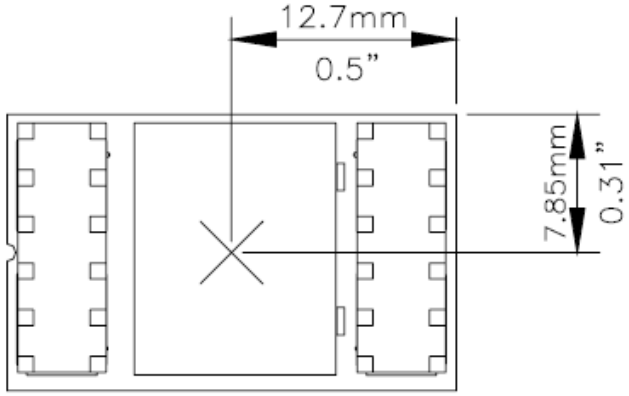


Figure 22: *Temperature measurement location*
The allowed maximum hot spot temperature is defined at 110℃

THERMAL CURVES

Single Module (Longitudinal Orientation)

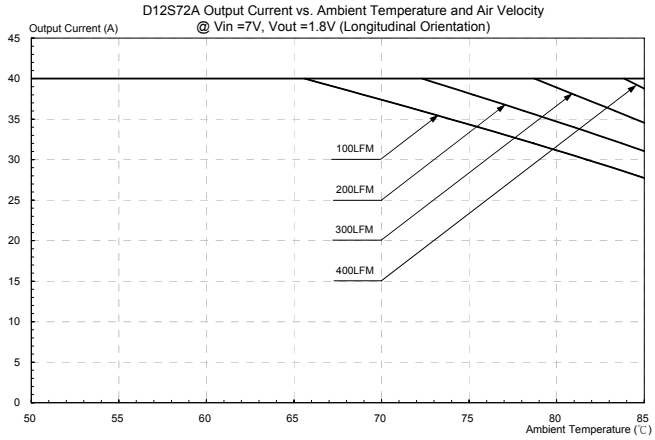


Figure 23: *Output current vs. ambient temperature and air velocity@ V_{in}=7V, V_{out}=1.8V (Longitudinal Orientation)*

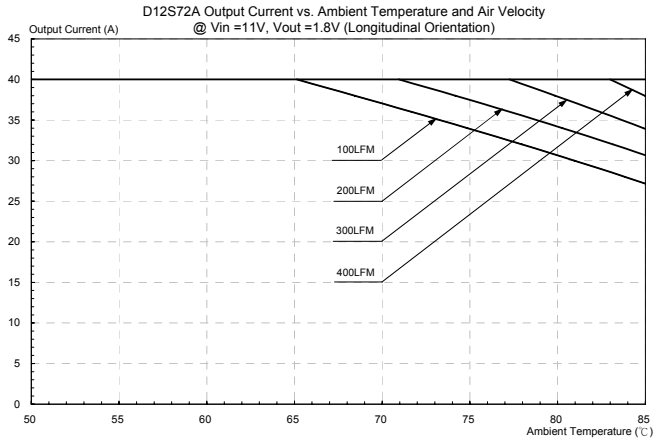


Figure 24: *Output current vs. ambient temperature and air velocity@ V_{in}=11V, V_{out}=1.8V (Longitudinal Orientation)*

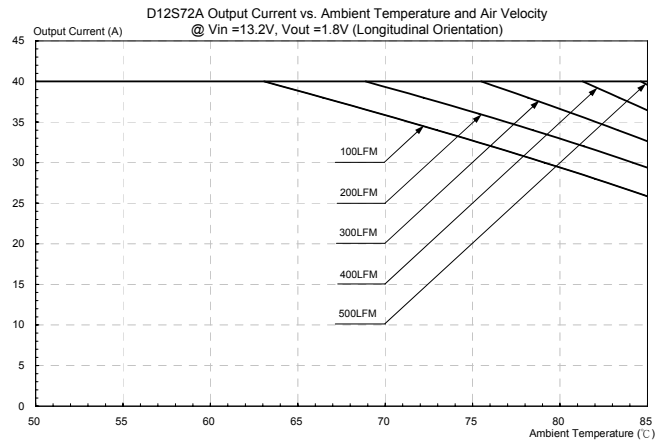


Figure 25: *Output current vs. ambient temperature and air velocity@ V_{in}=13.2V, V_{out}=1.8V (Longitudinal Orientation)*

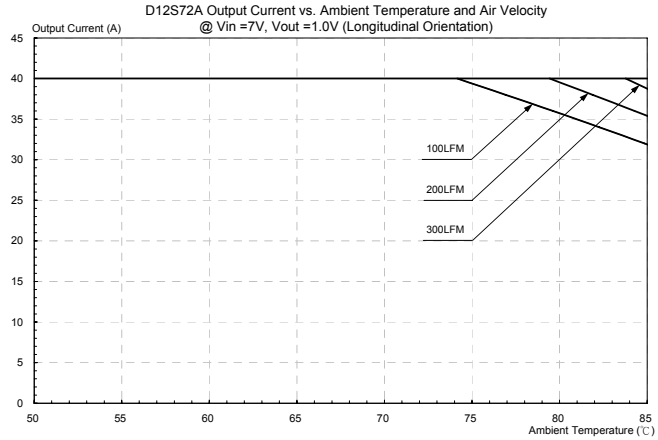


Figure 26: *Output current vs. ambient temperature and air velocity@ V_{in}=7V, V_{out}=1.0V (Longitudinal Orientation)*

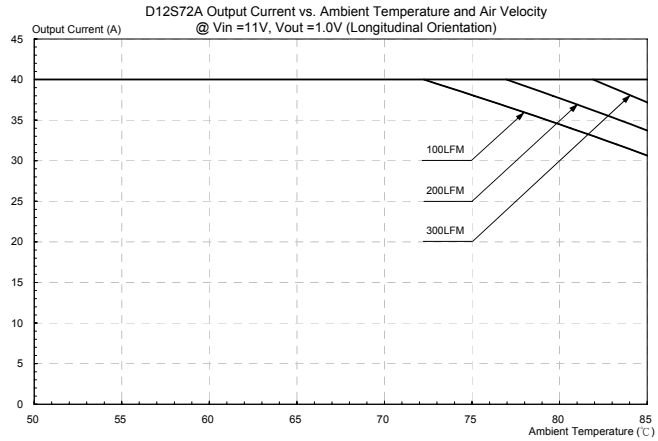


Figure 27: *Output current vs. ambient temperature and air velocity@ V_{in}=11V, V_{out}=1.0V (Longitudinal Orientation)*

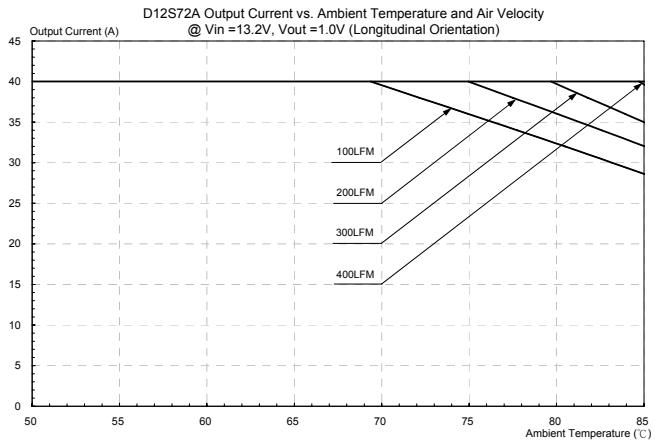
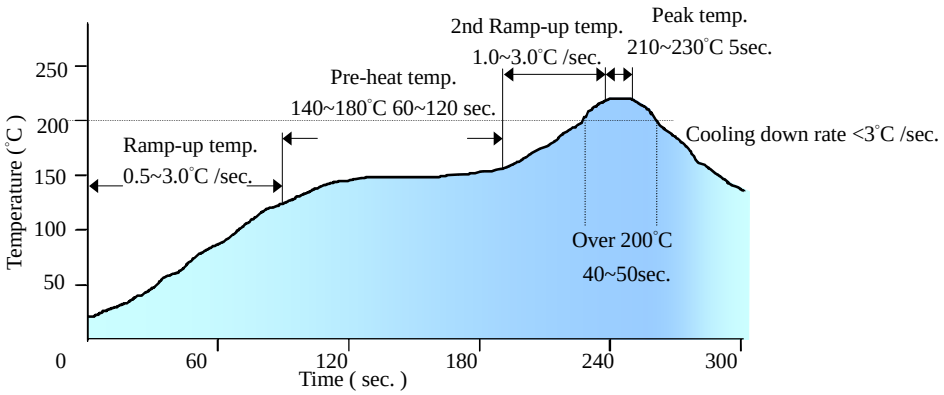


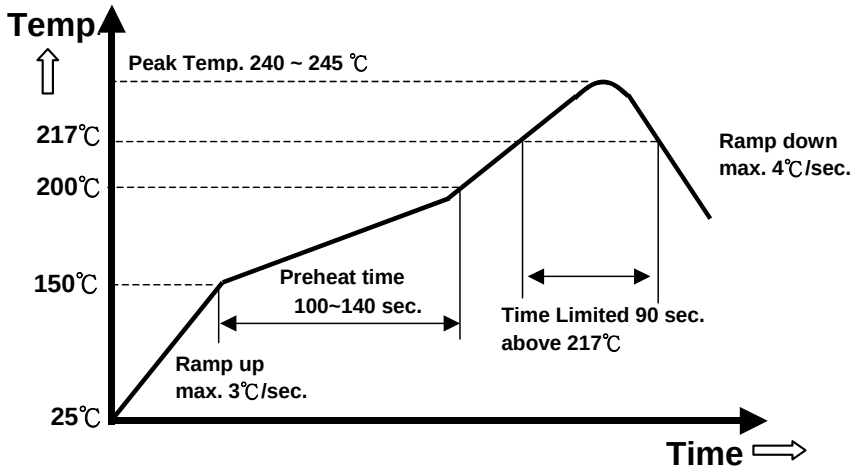
Figure 28: *Output current vs. ambient temperature and air velocity@ V_{in}=13.2V, V_{out}=1.0V (Longitudinal Orientation)*

LEADED (Sn/Pb) PROCESS RECOMMEND TEMP. PROFILE



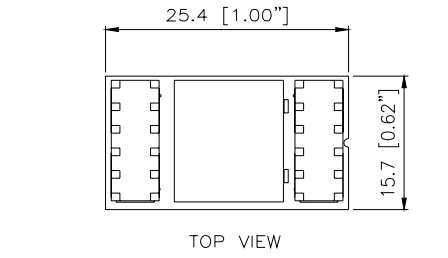
Note: The temperature refers to the pin of D12S72 A/B, measured on the pin +Vout joint.

LEAD FREE (SAC) PROCESS RECOMMEND TEMP. PROFILE

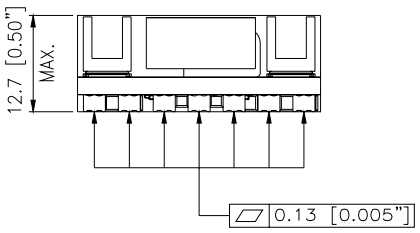


Note: The temperature refers to the pin of D12S72 B, measured on the pin +Vout joint.

MECHANICAL DRAWING

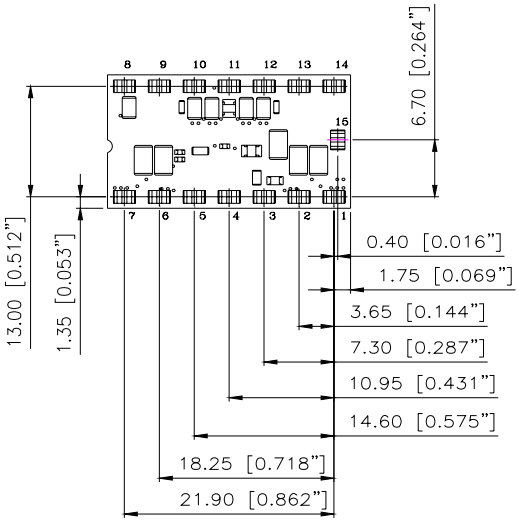


TOP VIEW

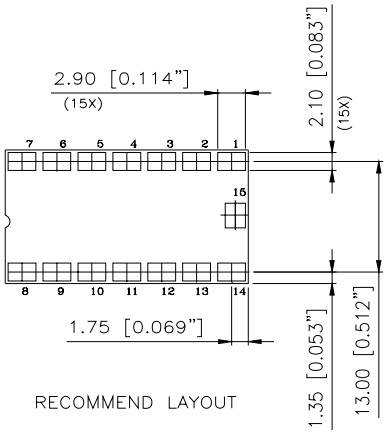


FRONT VIEW

PIN#	Function
1	Vin
2	GND
3	+7Vin
4	PWML
5	PWMH
6	GND
7	Vin
8	+Cs
9	GND
10	Cs−
11	Vout
12	Vout
13	GND
14	Temp−
15	Temp+



BOTTOM VIEW



RECOMMEND LAYOUT

Note : ALL DIMENSIONS ARE IN MILLIMETERS (INCHES)

TOLERANCE : X.X mm ± 0.5mm (X.XX in. ± 0.02 in.)

X.XX mm ±0.25 mm (X.XXX in. ± 0.010 in.)

PIN DESCRIPTION

Pin	Label	Type	Description
1	Vin	I	Power Input, Voltage range from 7V to 13.2V
2	GND	PWG	Power Ground
3	Gate Voltage	I	Voltage range from 4.5V to 7V
4	PWML	I	Separator PWM signal for high efficiency
5	PWMH	I	Separator PWM signal for high efficiency
6	GND	PWG	Power Ground
7	Vin	I	Power Input, Voltage range from 7V to 13.2V
8	Cs+	O	Choke Current Sense
9	GND	PWG	Power Ground
10	Cs-	O	Choke Current Sense
11	Vout	O	Power Output
12	Vout	O	Power Output
13	GND	PWG	Power Ground
14	Temp-	O	Support Temperature Sense
15	Temp+	O	Support Temperature Sense

PART NUMBERING SYSTEM

D	12	S	72	A
Type of Product	**Input Voltage**	**Number of Outputs**	**Product Series**	**Option Code**
D - DC/DC modules	12 - 7 ~13.2V	S - Single	72 - 72W (1.8V/40A) max	A- Standard, RoHS 5/6 B- Standard, RoHS 6/6

MODEL LIST

Model Name	Input Voltage	Output Voltage	Output Current	RoHS	Total Height	Efficiency 11Vin, 1.0Vout @ 100% load
D12S72 A	7.0 ~ 13.2Vdc	0.8V ~ 1.8V	40A	RoHS 5/6	0.5"	85.5%
D12S72 B	7.0 ~ 13.2Vdc	0.8V ~ 1.8V	40A	RoHS 6/6	0.5"	86.5%

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