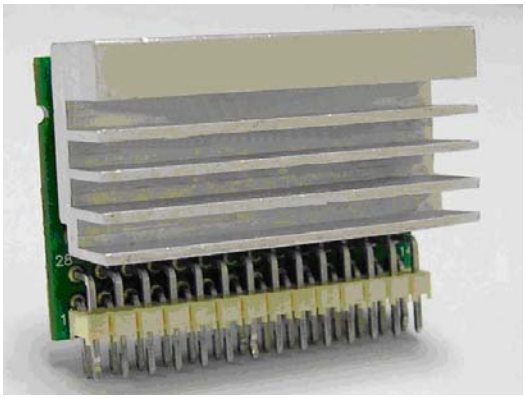
DELPHI SERIES



FEATURES

- High Efficiency: 94.3% @ 12Vin, 5.0V/20A out
- Input range: 10.8V~13.2V
- Output voltage programmable from 3.3Vdc to 5.0Vdc via external resistors
- No minimum load required
- Fixed frequency operation
- Input UVLO, output OCP, SCP, OVP
- Output OVP adjustable
- Remote On/Off (Positive logic)
- Power Good Function
- ROHS 6/6 lead free compliant
- ISO 9001, TL 9000, ISO 14001, QS9000, OHSAS18001 certified manufacturing facility

Delphi D12S100-1 Non-Isolated Point of Load DC/DC Modules: 10.8V~13.2Vin, 3.3V~5.0Vout, 20A

The D12S100-1, 10.8~13.2V input, single output, non-isolated point of load DC/DC converter is the latest offering from a world leader in power systems technology and manufacturing -- Delta Electronics, Inc. The D12S100-1 can provide up to 20A regulated output from 3.3V to 5.0V. With creative design technology and optimization of component placement, these converters possess outstanding electrical outstanding electrical and thermal performance, as well as extremely high reliability under highly stressful operating conditions.

OPTIONS

APPLICATIONS

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

DATASHEET
DS_D12S100-1_10222008

Delta Electronics, Inc.

TECHNICAL SPECIFICATIONS

(Ambient Temperature=25°C, minimum airflow=200LFM, nominal V_{in}=12Vdc unless otherwise specified.)

PARAMETER	NOTES and CONDITIONS	D12S100-1			
		Min.	Typ.	Max.	Units
ABSOLUTE MAXIMUM RATINGS					
Input Voltage		0		13.2	Vdc
Operating Temperature	Refer to Figure 18 for the measuring point	0		85	°C
Storage Temperature		-40		125	°C
INPUT CHARACTERISTICS					
Operating Input Voltage		10.8		13.2	Vdc
Input Under-Voltage Lockout					
Turn-On Voltage Threshold		9.5	10.0	11.0	Vdc
Turn-Off Voltage Threshold		8.5	9.0	9.5	Vdc
Maximum Input Current	Vin=12V, Vout=5V, Iout=20A			9.5	A
No-Load Input Current	Vin=12V, Vout=5V, Iout=0A			60	mA
Off Converter Input Current	Remote OFF		TBD		mA
OUTPUT CHARACTERISTICS					
Output Voltage Adjustment Range		3.3		5.0	Vdc
Output Voltage Set Point	With a 0.1% trim resistor	-1		+1	%Vo
Output Voltage Regulation					
Over Load	Io=Io_min to Io_max	-0.5		+0.5	%Vo
Over Line	Vin=Vin_min to Vin_max	-0.2		+0.2	%Vo
Total output range	Over load, line, temperature regulation and set point	-3.0		+3.0	%Vo
Output Voltage Ripple and Noise	12Vin, 5Vo, 20MHz bandwidth				
Peak-to-Peak	Full Load, 10µF & 1µF ceramic cap, 1200µF electrolytic cap			20	mV
RMS	Full Load, 10µF & 1µF ceramic cap, 1200µF electrolytic cap		TBD		mV
Output Current Range		0		20	A
Turn-On Over Shoot	All conditions		0.5		% of $Vo_{(set)}$
Output Voltage Under-shoot at Power-Off	All conditions			100	mV
Output short-circuit current, RMS value	Continuous		TBD		A
DYNAMIC CHARACTERISTICS					
Output Dynamic Load Response	12Vin, 10µF & 1µF ceramic cap, 1200µF electrolytic cap				
Step Change in Output Current, 5Vo	25% step load, 1A/µS		150	250	mV
Step Change in Output Current, 3.3Vo	25% step load, 1A/µS		100	150	mV
Turn-On Transient					
Rise Time	From 10% to 90% of $Vo_{(set)}$		12	20	ms
Start-Up Time, from input power	From Vin=12V to 90% of Vo		15	20	ms
Output Capacitive Load		140		5000	µF
EFFICIENCY					
Vo=3.3V	Vin=12V, Io=20A		92.5		%
Vo=5.0V	Vin=12V, Io=20A		94.3		%
FEATURE CHARACTERISTICS					
Switching Frequency			600		KHz
ON/OFF Control	Positive logic (internally pulled high)				
Logic High	Module On (or leave the pin open)	2.5			V
Logic Low	Module Off	0		0.8	V
Power Good Delay	within ±10% of $Vo_{(set)}$		5		ms
Over Current Protection (OCP)	Hiccup mode		150	180	%
Output Over Voltage Protection (OVP)	Latch mode, please see page 6 for adjusting the OVP setpoint		115	130	%
Input Under Voltage Protection (UVP)	Hiccup mode			9.5	V
GENERAL SPECIFICATIONS					
Calculated MTBF	25℃, 300LFM, 80% load		3.1		Mhours
Weight			TBD		grams

ELECTRICAL CHARACTERISTICS CURVES

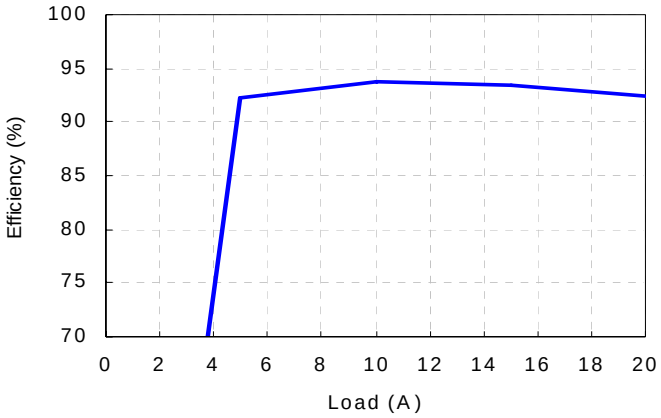


Figure 1: *Converter efficiency vs. output current (3.3V output, 12V input)*

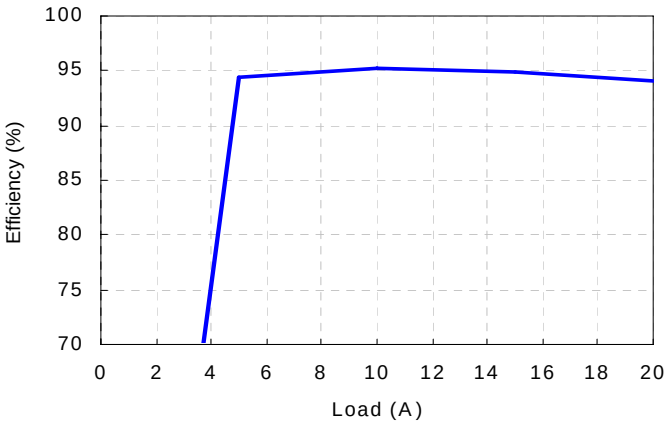


Figure 2: *Converter efficiency vs. output current (5V output, 12V input)*

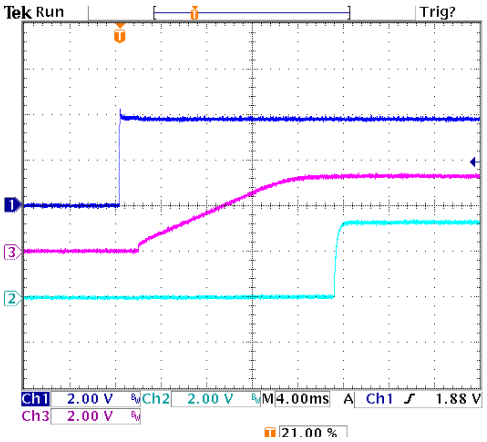


Figure 3: *Control turn on, 3.3V output (Ch1: Enable, Ch3: Vo, Ch2: PowerGood)*

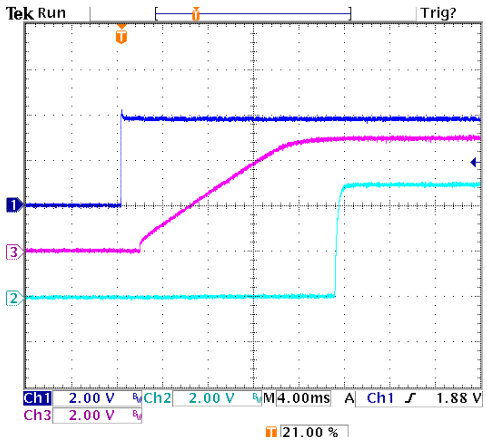


Figure 4: *Control turn on, 5V output (Ch1: Enable, Ch3: Vo, Ch2: PowerGood)*

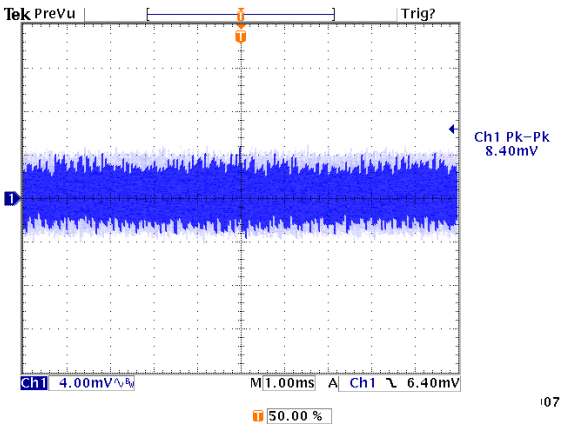


Figure 5: *Output ripple, Vin 10.8V, Vout 3.3V/20A (Reading: 8.40mVp-p)*

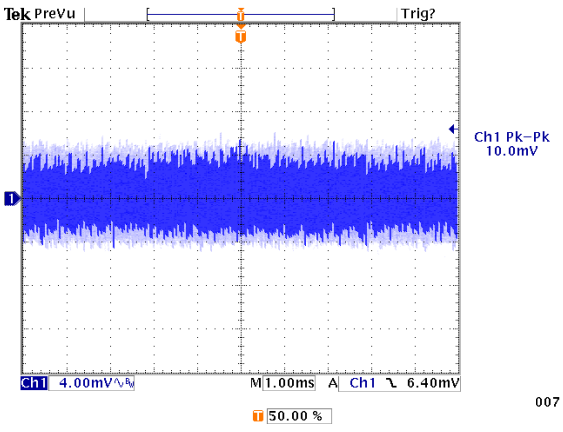


Figure 6: *Output ripple, Vin 10.8V, Vout 5.0V/20A (Reading: 10.0mVp-p)*

ELECTRICAL CHARACTERISTICS CURVES (CONTINUED)

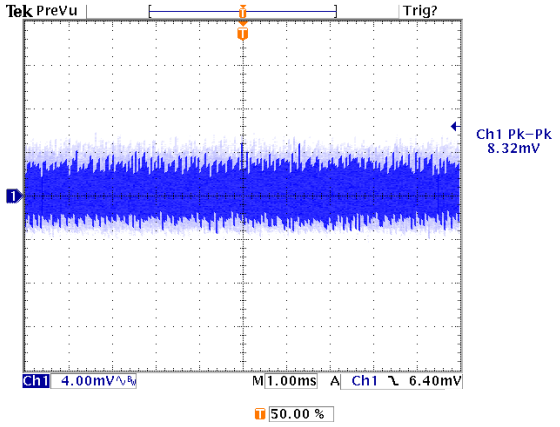


Figure 7: *Output ripple, Vin 12V, Vout 3.3V/20A (Reading: 8.32mVp-p)*

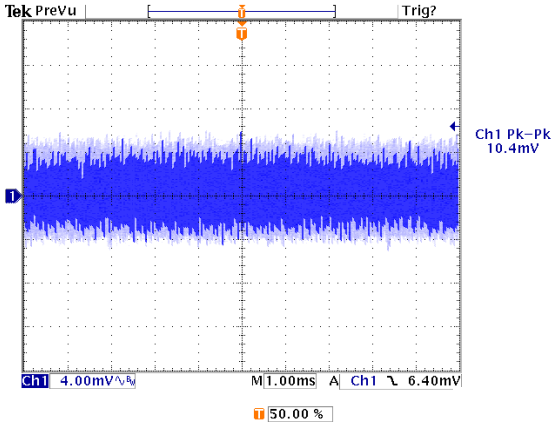


Figure 8: *Output ripple, Vin 12V, Vout 5.0/20A (Reading: 10.0mVp-p)*

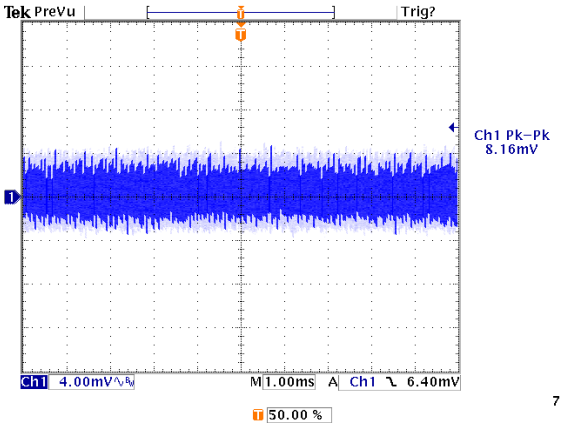


Figure 9: *Output ripple, Vin 13.2V, Vout 3.3V/20A (Reading: 8.16mVp-p)*

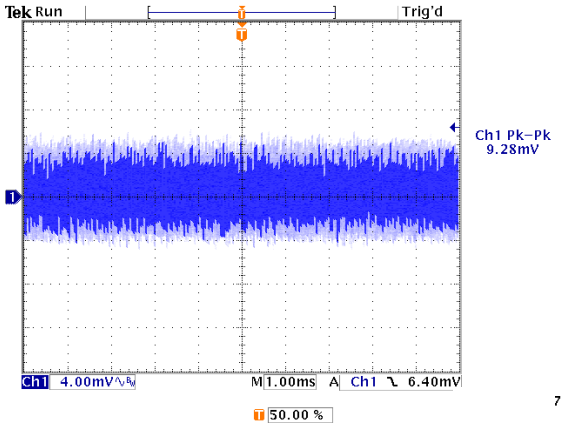


Figure 10: *Output ripple, Vin 13.2V, Vout 5.0/20A (Reading: 9.28mVp-p)*

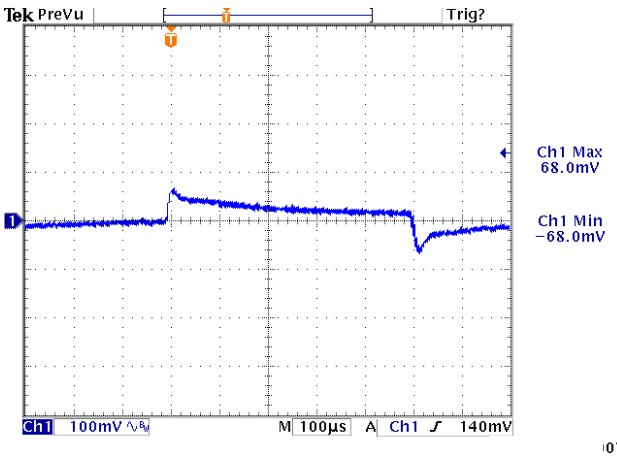


Figure 11: *Dynamic Load Response, Vin 12V, Vout 3.3V, Load 0A~5A, Ch1: Vout (Reading: 68mV, -68mV)*

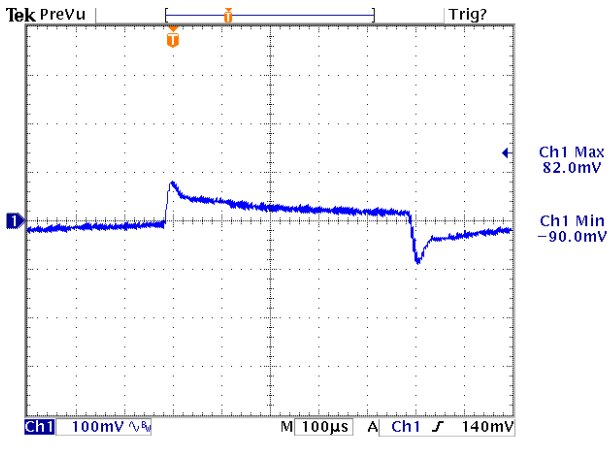


Figure 12: *Dynamic Load Response, Vin 12V, Vout 5.0V, Load 0A~5A, Ch1: Vout (Reading: 82mV, -90mV)*

ELECTRICAL CHARACTERISTICS CURVES (CONTINUED)

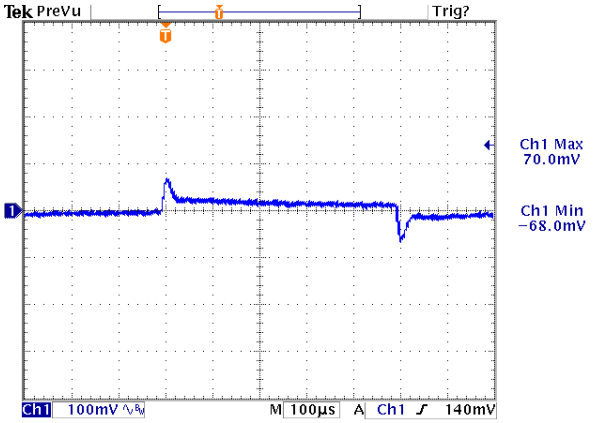


Figure 13: *Dynamic Load Response, Vin=12V, Vout=3.3V, Load 15A~20A, Ch1: Vout (Reading: 70mV, -68mV)*

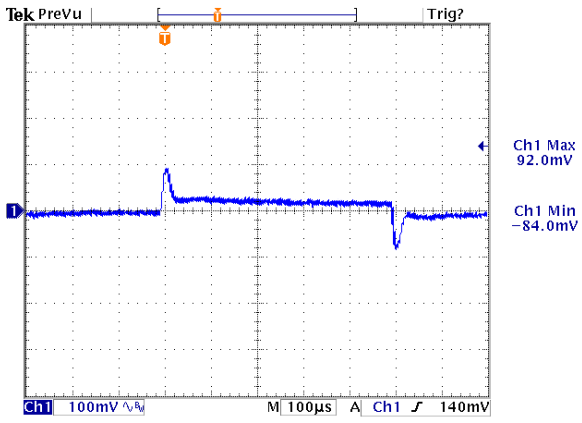


Figure 14: *Dynamic Load Response, Vin 12V, Vout=5.0V, Load 15A~20A, Ch1: Vout (Reading: 92mV, -84mV)*

DESIGN CONSIDERATIONS

The D12S100-1 uses single phase and voltage mode controlled buck topology. The output can be adjusted in the range of 3.3Vdc to 5.0Vdc by a resistor from Trim pin to Ground.

The converter can be turned ON/OFF by remote control with positive on/off (ENABLE pin) logic. The converter DC output is disabled when the signal is driven low (below 0.8V). The module will turn on when this pin is floating.

The converter can protect itself by entering hiccup mode against over current and over voltage condition.

Safety Considerations

It is recommended that the user to provide a very fast-acting type fuse in the input line for safety. The output voltage set-point and the output current in the application could define the amperage rating of the fuse.

FEATURES DESCRIPTIONS

Enable (On/Off)

The D12S100-1 has positive on/off logic. The D12S100-1 is turned on if the ENABLE pin is floating. Pulling the pin low will turn off the unit. With the active high function, the output is guaranteed to turn on if the ENABLE pin is driven above 1.2V. The output will be turned off if the ENABLE pin voltage is pulled below 0.8V

The ENABLE input can be driven in a variety of way as shown in Figure 15.

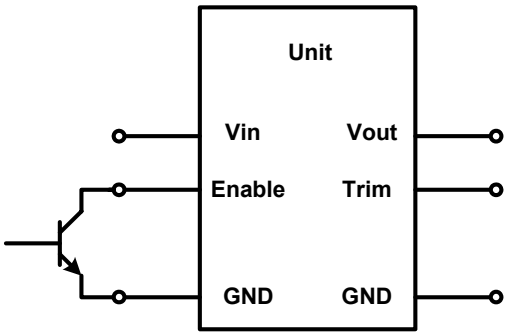


Figure 15. Enable Input drive circuit for D12S100-1

Input Under-Voltage Lockout

The input under-voltage lockout prevents the converter from being damaged while operating when the input voltage is too low. Default lockout range is between 10.0V and 9.0V.

Over-Current and Short-Circuit Protection

The D12S100-1 modules have non-latching over-current and short-circuit protection circuitry. When over current condition occurs, the module goes into the non-latching hiccup mode. When the over-current condition is removed, the module will resume normal operation.

An over current condition is detected by measuring the voltage drop across the Rds(on) of Low side MOSFET. Rds(on) is affected by temperature, therefore ambient temperature will affect the current limit inception point.

Output Capacitance

The D12S100-1 requires minimum 140µF output capacitance for stable operation

FEATURES DESCRIPTIONS (CON.)

Output Voltage Programming

The output voltage of the D12S100-1 is trimmable by connecting an external resistor between the trim(+) pin and GND pin as shown Figure 16 and the typical trim resistor values are shown in Table 1.

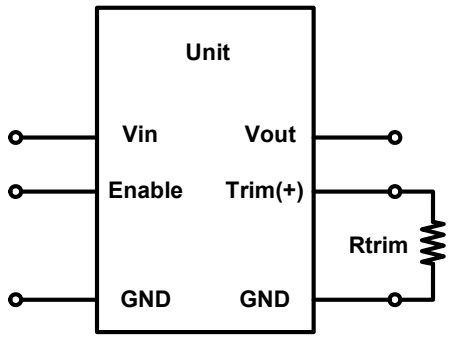


Figure 16. Trimming Output Voltage

The D12S100-1 module has a trim range of 3.3V to 5.0V. The trim resistor equation for the D12S100-1 A is :

$$Rtrim(\Omega) = \frac{1.18}{Vout - 0.59}$$

Note:

Vout is the output voltage set point.

The resistor shall be 0.1% or better tolerance part.

Output Voltage	Rtrim (Ω)
3.3	432
5.0	267

Table 1. Typical trim resistor values

Power Good

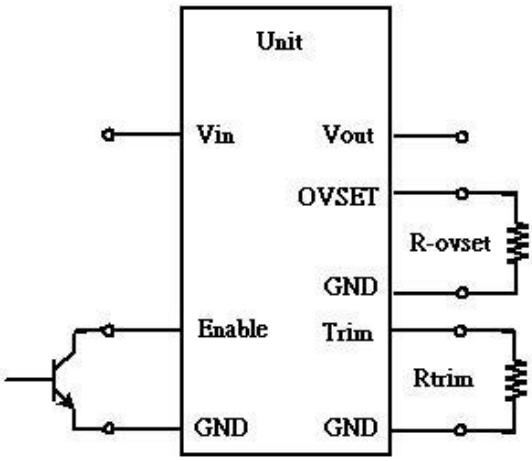
The converter provides an open collector signal called Power Good. The converter will sink less than 1μA as a logic high and sink at least 1mA as a logic low. A logic low must be less than 0.4V while sinking 1mA.

The power good signal is pulled low when an input under voltage, output over voltage or output over current conditions is detected or when the converter is disabled by ENABLE.

Output Over Voltage Protection (OVP)

The converter will shut down when an output over voltage protection is detected. Once the OVP condition is detected, controller will stop all PWM outputs, turn on low-side MOSFET and pull low the PGOOD signal to prevent any damage to load.

The OVP set point can be adjusted by connecting a **R-ovset** resistor from OV_set pin to ground.



The OV_Set resistor value for 115% OVP is:

R-ovset = 0.917x10K ÷ (Vox115% - 0.917)

The resistor shall be with 0.2% or better tolerance.

OUTPUT	OV_Set resistor for 115%
3.30V	3.16KΩ
5.00V	1.91KΩ

Paralleling

D12S100-1converters do not have built-in current sharing (paralleling) ability. Hence, paralleling of multiple D12S100-1 A converter is not recommended.

THERMAL CONSIDERATION

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.

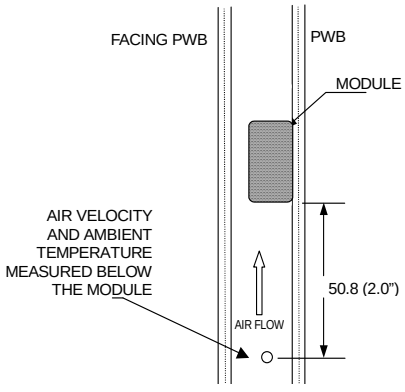
Thermal Testing Setup

Delta's DC/DC power modules are characterized in heated vertical wind tunnels that simulate the thermal environments encountered in most electronics equipment. This type of equipment commonly uses vertically mounted circuit cards in cabinet racks in which the power modules are mounted.

The following figure shows the wind tunnel characterization setup. The power module is mounted on a test PWB and is vertically positioned within the wind tunnel. The space between the neighboring PWB and the top of the power module is constantly kept at 6.35mm (0.25'').

Thermal Derating

Heat can be removed by increasing airflow over the module. 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.



Note: Wind Tunnel Test Setup Figure Dimensions are in millimeters and (Inches)

Note: Wind tunnel test setup figure dimensions are in millimeters and (Inches)

Figure 17: *Wind tunnel test setup*

THERMAL CURVES

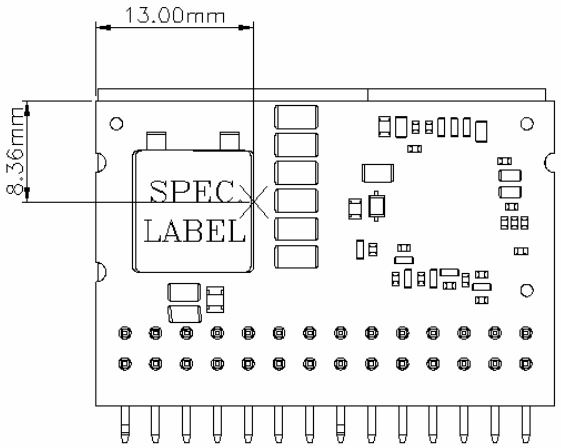


Figure 18: *Temperature measurement location. The allowed maximum hot spot temperature is defined at 110 ℃.*

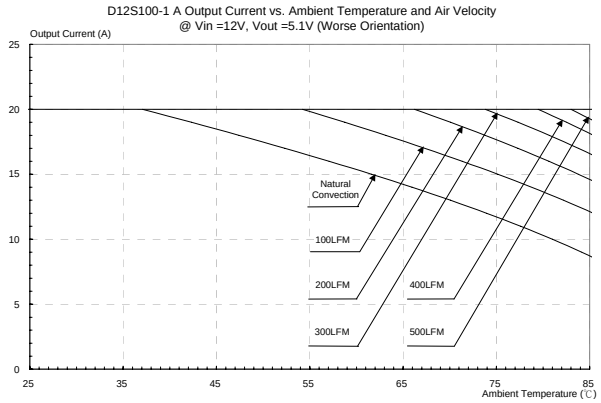


Figure 19: *Output current vs. ambient temperature and air velocity @Vin=12V, Vout=5.0V (Worse Orientation)*

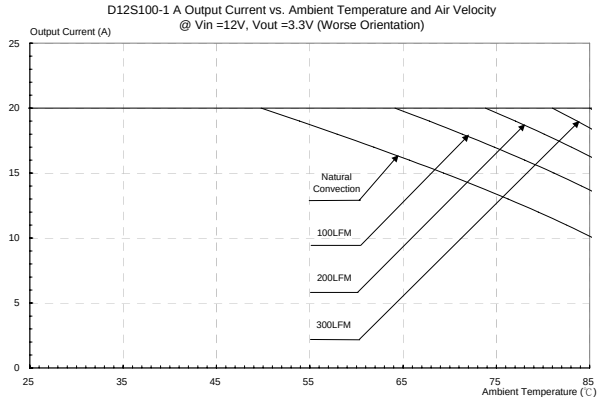
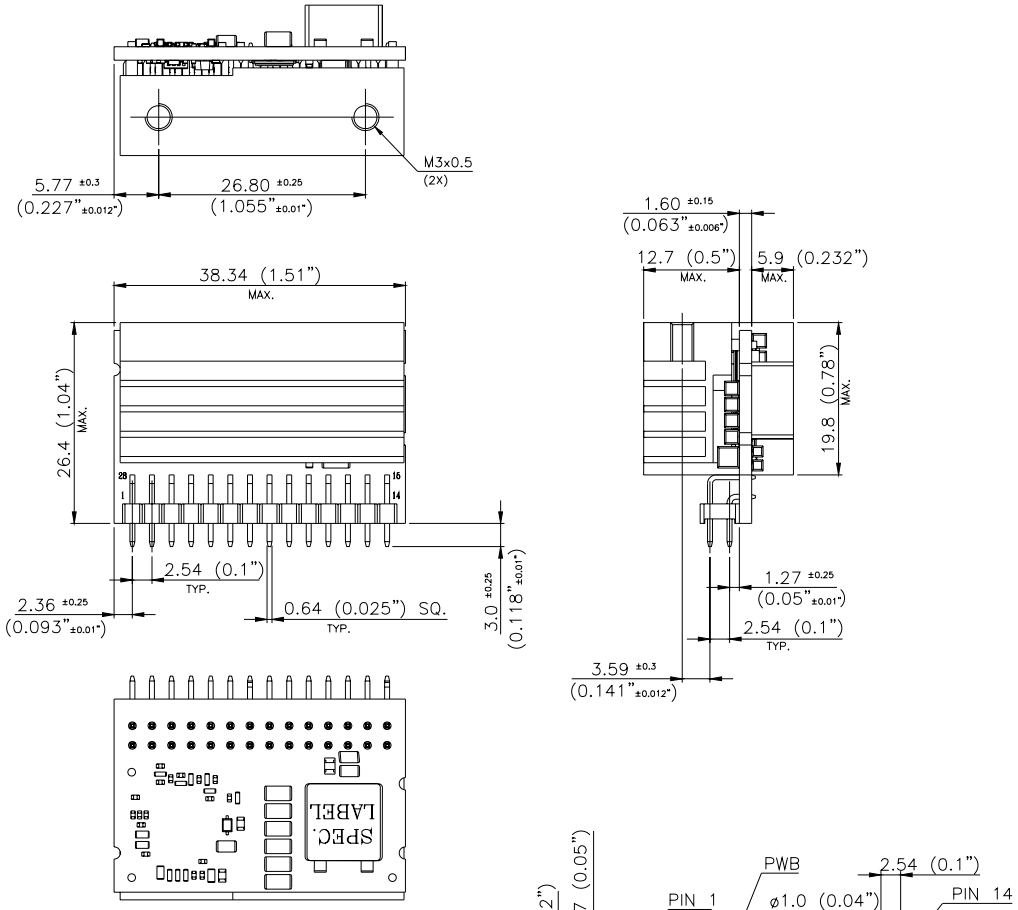
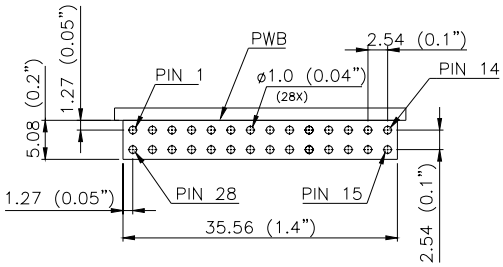


Figure 20: *Output current vs. ambient temperature and air velocity@ Vin=12V, Vout=3.3V (Worse Orientation)*

MECHANICAL DRAWING





P.W.B. BOARD HOLE LAYOUT

PIN#	Function	PIN#	Function
1	VCC	28	NC
2	ENABLE	27	NC
3	PGOOD	26	NC
4	SENSE	25	NC
5	OV_ Set	24	Vin
6	TRIM	23	Vin
7	RTN	22	Vin
8	RTN	21	Vin
9	RTN	20	RTN
10	RTN	19	RTN
11	RTN	18	RTN
12	Vo	17	Vo
13	Vo	16	Vo
14	Vo	15	Vo

NOTES:
DIMENSIONS ARE IN MILLIMETERS AND (INCHES)
TOLERANCES: X.Xmm±0.5mm(X.XX in.±0.02 in.)
X.XXmm±0.25mm(X.XXX in.±0.010 in.)

PART NUMBERING SYSTEM

D	12	S	100	1A
Type of Product	**Input Voltage**	**Number of Outputs**	**Product Series**	**Option Code**
D - DC/DC modules	12 - 10.8 ~13.2V	S- Single	100 - 100W (5V/20A) max	A - standard

MODEL LIST

Model Name	Input Voltage	Output Voltage	Output Current	Leed Free
D12S100-1 A	10.8V~ 13.2V	3.3V~5.0V	20A	RoHs 6

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Fax: +886 3 4513485
Email: DCDC@delta.com.tw

WARRANTY

Delta offers a two (2) year limited warranty. Complete warranty information is listed on our web site or is available upon request from Delta.

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