DELPHI SERIES

FEATURES

- Efficiency up to 80%
- Industry standard form factor and pinout
- Case size:
  Single output:
  13.7 x9.3 x8.7mm (0.54” x0.37” x0.34”)
  Dual output:
  16.3 x9.3 x8.7mm (0.64” x0.37” x0.34”)
- Low cost
- Input: 5V, 12V, 24V
- Output: 3.3, 5, 12, ±5, ±12, ±15V
- Low ripple and noise
- 1500V isolation
- UL 94V-0 Package Material
- ISO 9001 and ISO14001 certified manufacturing facility

Delphi DSLU400 Series DC/DC Power Modules: 5, 12, 24Vin, 2W SMD

The Delphi DSLU400, 5V, 12V, and 24V input, single or dual output, SMD form factor, isolated DC/DC converter is the latest offering from a world leader in power systems technology and manufacturing — Delta Electronics, Inc. The DSLU400 series operate from 5V, 12V, or 24V (±10%) and provides 3.3V, 5V or 12V of single output or ±5V, ±12V or ±15V of dual output in an industrial standard, plastic case encapsulated SMD package. This series provides up to 2W of output power with 1500V isolation and a typical full-load efficiency up to 80%. With creative design technology and optimization of component placement, these converters possess outstanding electrical and thermal performance, as well as extremely high reliability under highly stressful operating conditions.

OPTIONS

APPLICATIONS

- Industrial
- Transportation
- Process/ Automation

DATASHEET
DS_DSLU400_04202009

Delta Electronics, Inc.

TECHNICAL SPECIFICATIONS

T_A = 25°C, airflow rate = 0 LFM, nominal Vin, nominal Vout, resistive load unless otherwise noted.

PARAMETER	NOTES and CONDITIONS	DSLU400 (Standard)			
		Min.	Typ.	Max.	Units
ABSOLUTE MAXIMUM RATINGS					
Input Voltage					
Transient	5V input model, 1000ms	-0.7		9	Vdc
Transient	12V input model, 1000ms	-0.7		18	Vdc
Transient	24V input model, 1000ms	-0.7		30	
Internal Power Dissipation				650	mW
Operating Temperature	Ambient	-25		75	°C
	Case	-25		90	°C
Storage Temperature		-40		125	°C
Humidity				95	%
Lead Temperature in Assembly	1.5mm from case for 10 seconds			300	°C
Input/Output Isolation Voltage		1500			Vdc
INPUT CHARACTERISTICS					
Operating Input Voltage	5V input model	4.5	5	5.5	Vdc
	12V input model	10.8	12	13.2	Vdc
	24V input model	21.6	24	26.4	Vdc
Maximum Input Current	Please see Model List table on page 6				
No-Load Input Current	5V model		60		mA
	12V model		30		mA
	24V model		15		mA
Reverse Polarity Input Current				0.3	A
OUTPUT CHARACTERISTICS					
Output Voltage Balance	Dual output models		±0.1	±1.0	%
Output Voltage Regulation					
Over Load	Io=20% to 100%, please see page 6				
Over Line	For Vin change of 1%		±1.2	±1.5	%
Over Temperature	Tc=-40°C to 100°C		±0.01	±0.02	%/C
Output Voltage Ripple and Noise	5Hz to 20MHz bandwidth				
Peak-to-Peak	Full Load, 0.33µF ceramic		100	120	mV
Peak-to-Peak, over line, load, temperature	Full Load, 0.33µF ceramic			200	mV
RMS	Full Load, 0.33µF ceramic			15	mV
Output Short Circuit				0.5	Second
Maximum Output Capacitance	Single output models, 3.3V & 5V			47	µF
	Single output models, 12V			10	µF
	Dual output models, ±5V, each output			10	µF
	Dual output models, ±12V & ±15V, each output			4.7	µF
EFFICIENCY					
100% Load	Please see Model List table on page 6				
ISOLATION CHARACTERISTICS					
Isolation Voltage	Input to output, 60 Seconds	1500			Vdc
Isolation Voltage Test	Flash Test for 1 seconds	1650			Vdc
Isolation Resistance	500VDC	10			GΩ
Isolation Capacitance	100KHz, 1V		60	100	pF
FEATURE CHARACTERISTICS					
Switching Frequency		50	100	120	kHz
GENERAL SPECIFICATIONS					
MTBF	MIL-HDBK-217F; Ta=25°C, Ground Benign	2			M hours
Weight	Single output models		1.5		grams
	Dual output models		2.2		grams
Case Material	Non-conductive black plastic				
Flammability	UL94V-0				
Input Fuse	5V model, 1000mA slow blown type				
	12V model, 500mA slow blown type				
	24V model, 200mA slow blown type				

Notes:

1. These power converters require a minimum output load to maintain specified regulation (please see page 6 for the suggested minimum load). Operation under no-load conditions will not damage these modules; however, they may not meet all specifications listed above.

2. These DC/DC converters should be externally fused at the front end for protection.

ELECTRICAL CHARACTERISTICS CURVES

TBD

Figure 1: *Efficiency vs. Input Voltage (Single Output)*

TBD

Figure 2: *Efficiency vs. Input Voltage (Dual Output)*

TBD

Figure 3: *Efficiency vs. Output Load (Single Output)*

TBD

Figure 4: *Efficiency vs. Output Load (Dual Output)*

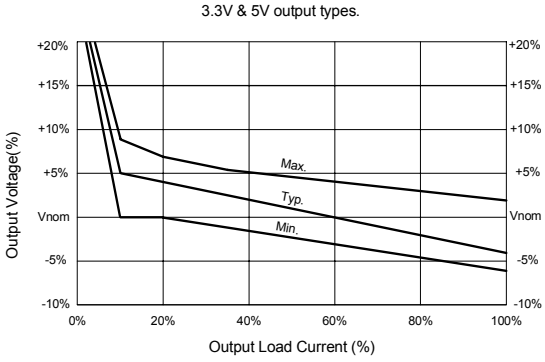


Figure 5: *Output Tolerance (3.3V & 5V)*

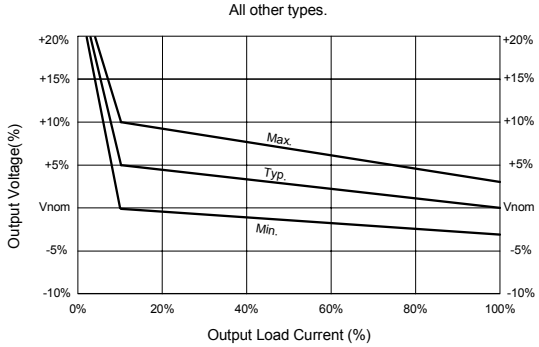


Figure 6: *Output Tolerance (all other outputs).*

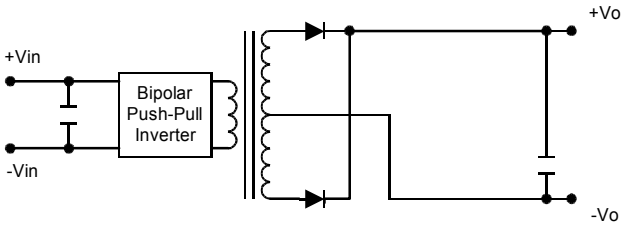


Figure 7: *Block diagram of DSLU300 single output modules.*

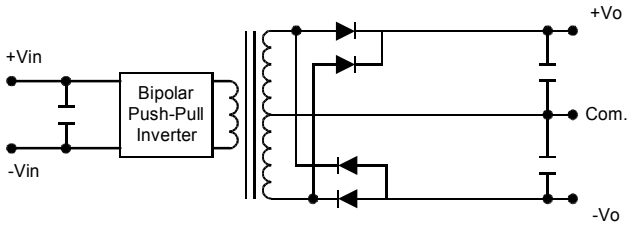


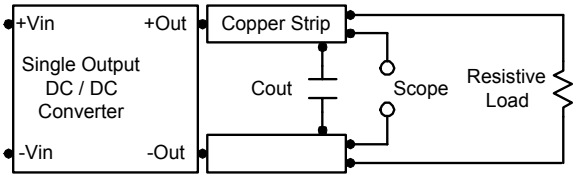
Figure 8: *Block diagram of DSLU300 dual output modules.*

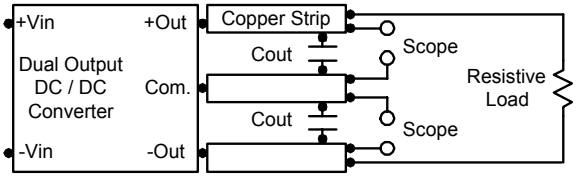
Design & Feature Considerations

The DSLU400 circuit block diagrams are shown in Figures 7 and 8.

Peak-to-Peak Output Noise Measurement

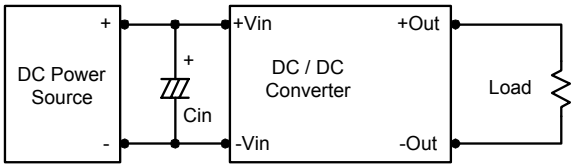
Scope measurement should be made by using a BNC socket, measurement bandwidth is 0-20 MHz. Position the load between 50 mm and 75 mm from the DC/DC Converter. A Cout of 0.33uF ceramic capacitor is placed between the terminals shown below.





Input Source Impedance

The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module.



In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.

Capacitor mounted close to the input of the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 KHz) capacitor of a 2.2uF for the 5V input devices, a 1.0uF for the 12V input devices, and a 0.47uF for the 24V devices.

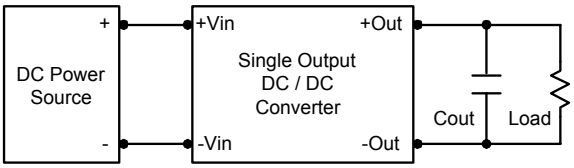
Maximum Capacitive Load

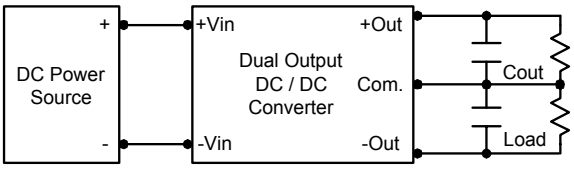
The DSLU400 series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time.

Output Ripple Reduction

A good quality low ESR capacitor placed as close as practicable across the load will give the best ripple and noise performance.

To reduce output ripple, it is recommended to use 1.5 uF capacitors at the output.





Soldering and Cleaning Considerations

Post solder cleaning is usually the final board assembly process before the board or system undergoes electrical testing. Inadequate cleaning and/or drying may lower the reliability of a power module and severely affect the finished circuit board assembly test. Adequate cleaning and/or drying is especially important for un-encapsulated and/or open frame type power modules. For assistance on appropriate soldering and cleaning procedures, please contact Delta's technical support team.

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 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 facing PWB and PWB is constantly kept at 25.4mm (1'').

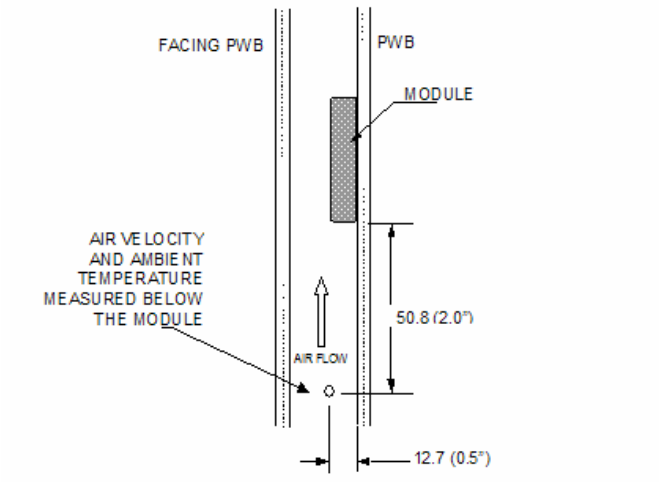


Figure 9: *Wind tunnel test setup*

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.

THERMAL CURVES

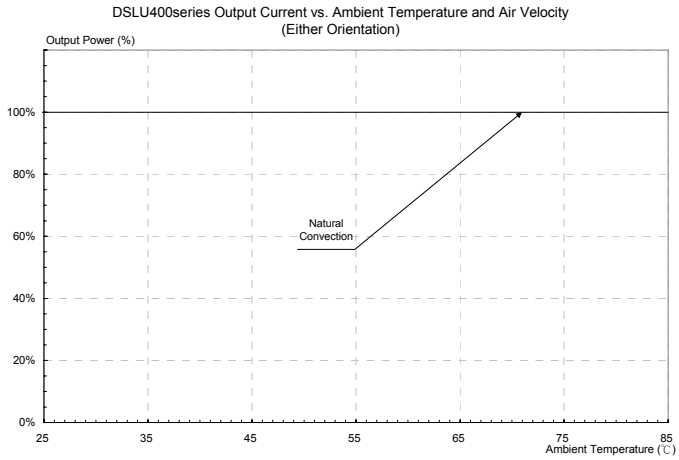


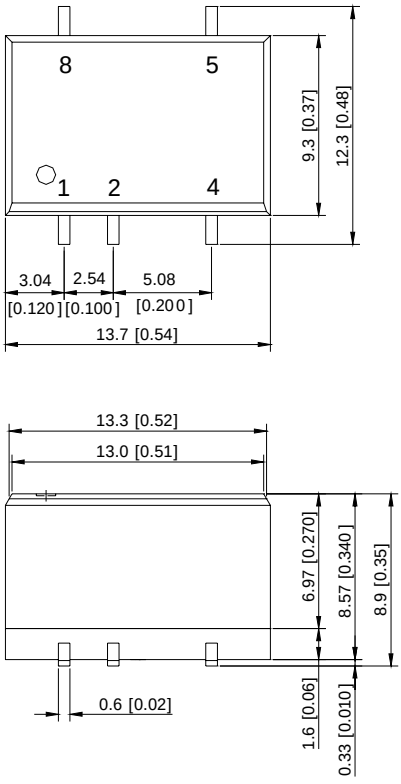
Figure10: *Derating Curve*

MODEL LIST

MODEL NAME	INPUT		OUTPUT			Load Regulation	Full Load Efficiency
	Vdc (V)	Max (mA)	Vdc (V)	Max (mA)	Min (mA)	%	%
DSLU401	5 (4.5 ~ 5.5)	471	3.3	500	10	11	70
DSLU402		548	5	400	8	11	73
DSLU404		514	12	165	3	11	77
DSLU406		541	±5	±200	±4	10	74
DSLU408		524	±12	±83	±1.5	7	76
DSLU409		521	±15	±66	±1	7	76
DSLU411	12 (10.8 ~ 13.2)	191	3.3	500	10	8	72
DSLU412		222	5	400	8	8	75
DSLU414		209	12	165	3	5	79
DSLU418		208	±12	±83	±1.5	5	80
DSLU419		206	±15	±66	±1	5	80
DSLU421	24 (21.6 ~ 26.4)	96	3.3	500	10	8	72
DSLU422		111	5	400	8	8	75
DSLU424		105	12	165	3	5	79
DSLU428		105	±12	±83	±1.5	5	79
DSLU429		104	±15	±66	±1	5	79

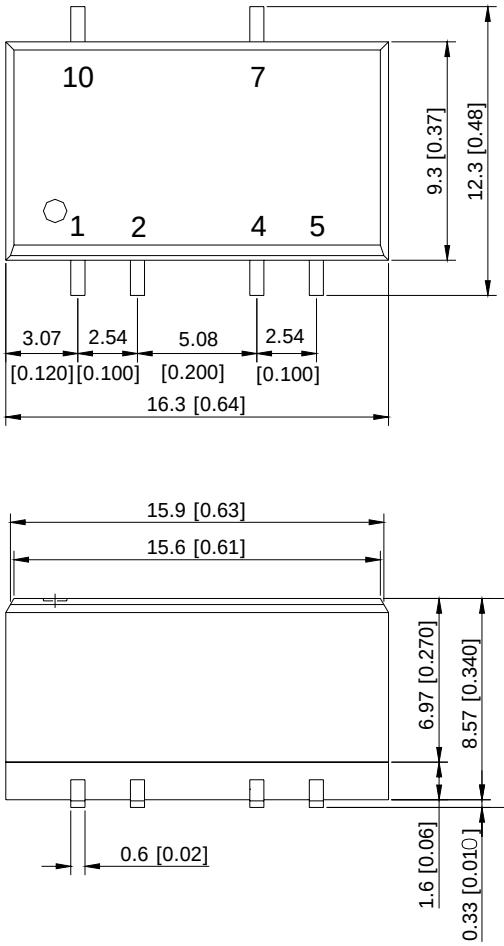
MECHANICAL DRAWING

Single Output



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.)

Dual Output



Pin	Single Output	Dual Output
1	-Vin	-Vin
2	+Vin	+Vin
4	-Vout	Common
5	+Vout	-Vout
7	No Pin	+Vout
8	NA	No Pin
10	No Pin	NA

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.)

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WARRANTY

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