DELPHI SERIES

FEATURES

- Efficiency up to 81%
- Industry standard form factor and pinout
- Size: 19.5x6.1x10.2mm (0.77”x0.24”x0.40”)
- Input: 5V, 12V, 24V
- Output: 3.3, 5, 9, 12, 15, ±5, ±9, ±12, ±15V
- Low ripple and noise
- 3000V isolation
- UL 94V-0 Package Material
- ISO 9001 and ISO 14001 certified manufacturing facility

Delphi DAU200 Series DC/DC Power Modules: 5, 12, 24Vin, 1W SIP

The Delphi DAU200, 5V, 12V, and 24V input, single or dual output, SIP form factor, isolated DC/DC converter is the latest offering from a world leader in power systems technology and manufacturing — Delta Electronics, Inc. The DAU200 series operate from 5V, 12V, or 24V (±10%) and provides 3.3V, 5V, 9V, 12V, or 15V of single output or ±5V, ±9V, ±12V, or ±15V of dual output in an industrial standard, plastic case encapsulated SIP package. This series provides up to 1W of output power with 3000V isolation and a typical full-load efficiency up to 81%. 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_DAU200_05042009

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	DAU200 (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				450	mW
Operating Temperature	Ambient	-40		85	°C
	Case	-40		100	°C
Storage Temperature		-40		125	°C
Humidity				95	%
Lead Temperature in Assembly	1.5mm from case for 10 seconds			260	°C
Input/Output Isolation Voltage		3000			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		30		mA
	12V model		12		mA
	24V model		7		mA
Reverse Polarity Input Current				0.3	A
OUTPUT CHARACTERISTICS					
Output Voltage Set Point Accuracy			±1.0	±3.0	%
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		65	100	mV
Peak-to-Peak, over line, load, temperature	Full Load, 0.33µF ceramic			150	mV
RMS	Full Load, 0.33µF ceramic			5	mV
Output Short Circuit				0.5	Second
Maximum Output Capacitance	Single output models			220	µF
	Dual output models, each output			100	µF
EFFICIENCY					
100% Load	Please see Model List table on page 6				
ISOLATION CHARACTERISTICS					
Isolation Voltage	Input to output, 60 Seconds	3000			Vdc
Isolation Voltage Test	Flash Test for 1 seconds	3300			Vdc
Isolation Resistance	500VDC	10			GΩ
Isolation Capacitance	100KHz, 1V		60	100	pF
FEATURE CHARACTERISTICS					
Switching Frequency		70	100	120	kHz
GENERAL SPECIFICATIONS					
MTBF	MIL-HDBK-217F; Ta=25°C, Ground Benign	2			M hours
Weight	5V and 12V models		2.2		grams
	24V models		2.6		grams
Case Material	Non-conductive black plastic				
Flammability	UL94V-0				
Input Fuse	5V model, 500mA slow blown type				
	12V model, 200mA slow blown type				
	24V model, 100mA 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

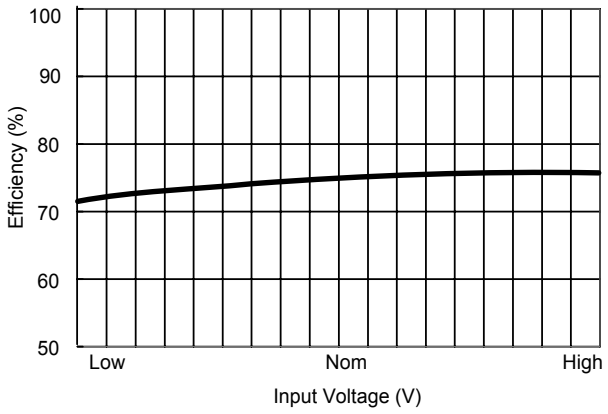


Figure 1: *Efficiency vs. Input Voltage (Single Output)*

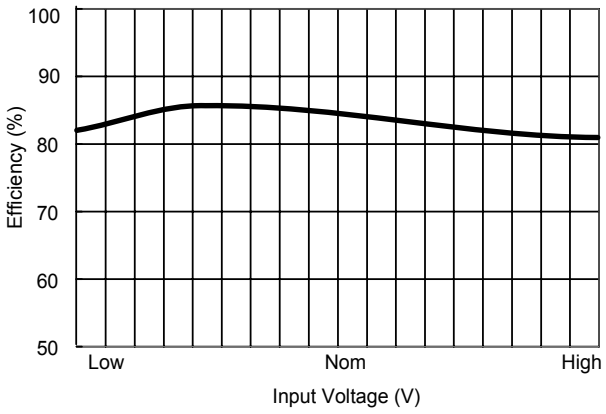


Figure 2: *Efficiency vs. Input Voltage (Dual Output)*

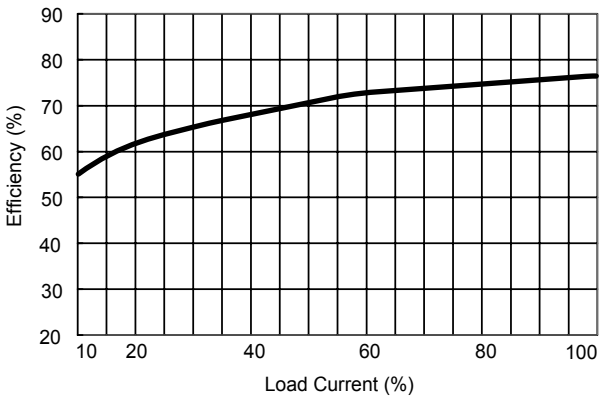


Figure 3: *Efficiency vs. Output Load (Single Output)*

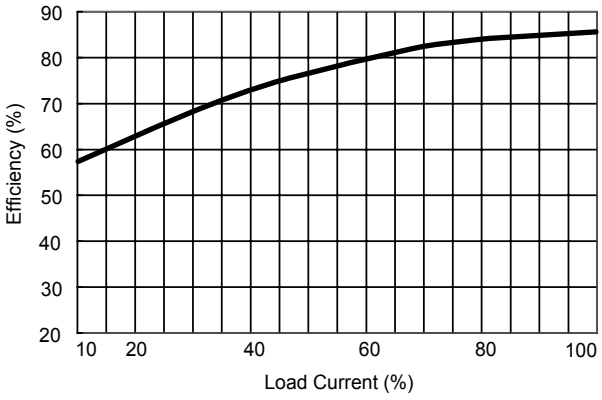


Figure 4: *Efficiency vs. Output Load (Dual Output)*

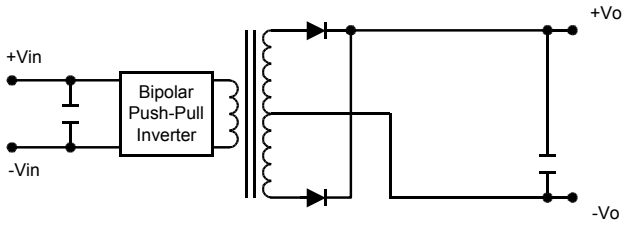


Figure 5: *Block diagram of DAU200 single output modules.*

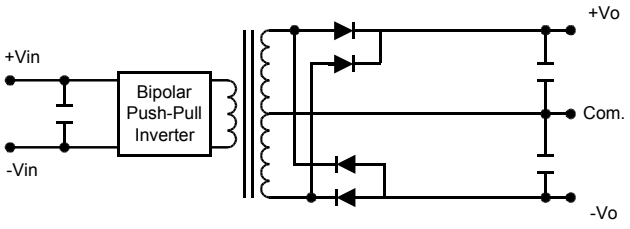


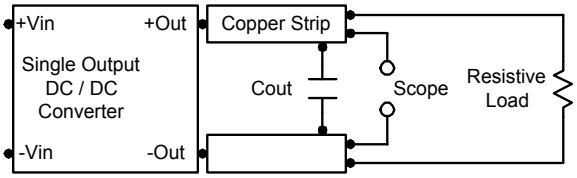
Figure 6: *Block diagram of DAU200 dual output modules.*

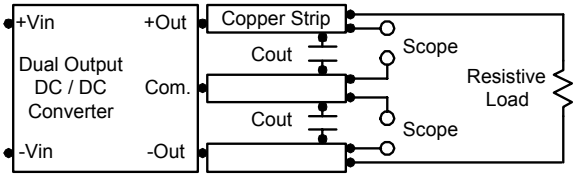
Design & Feature Considerations

The DAU200 circuit block diagrams are shown in Figures 5 and 6.

Peak-to-Peak Output Noise Measurement

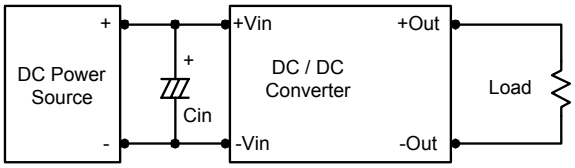
Scope measurement should be made by using a BNC socket, measurement bandwidth is 0-20 MHz. Position the load between 50 mm and 75 mm from the DC/DC Converter. A Cout of 0.33uF ceramic capacitor is placed between the terminals shown below.





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.

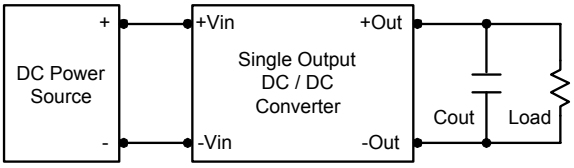
Maximum Capacitive Load

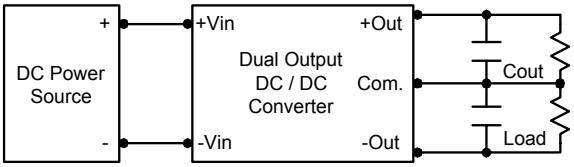
The DAU200 series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. For optimum performance we recommend 100uF maximum capacitive load for dual outputs and 220uF capacitive load for single outputs.

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 1.0uF 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'').

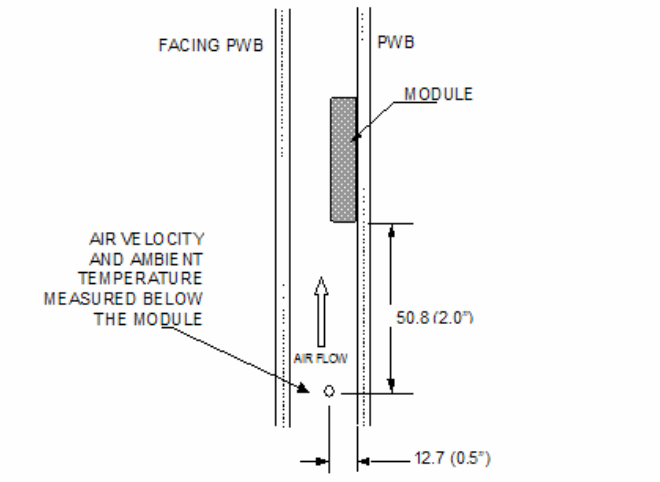


Figure 7: *Wind tunnel test setup*

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

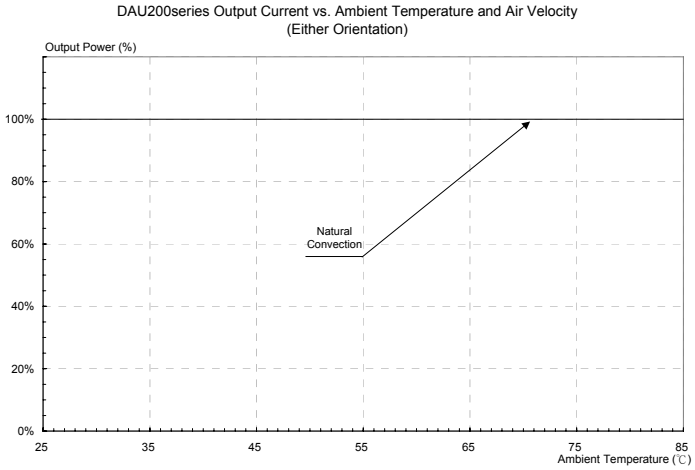
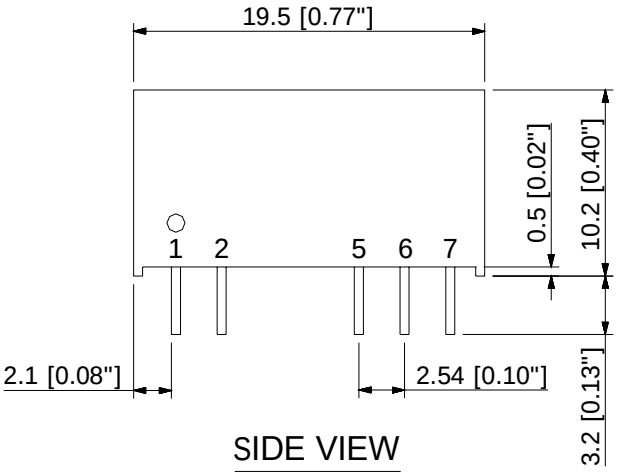


Figure 8: *Derating Curve (Vin=5V, Vout=3.3V)*

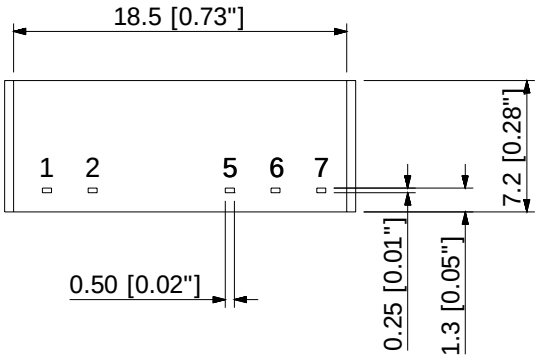
MODEL LIST

	INPUT		OUTPUT			Full Load Efficiency	Load Regulation
	Vdc (V)	Imax (mA)	Vdc (V)	Imax (mA)	Imin (mA)	%	%
DAU201	5 (4.5 ~ 5.5)	235	3.3	260	5	73	10
DAU202		281	5	200	4	71	10
DAU203		260	9	110	2	76	8
DAU204		258	12	84	1.5	78	7
DAU205		258	15	67	1	78	7
DAU206		278	±5	±100	±2	72	10
DAU207		262	±9	±56	±1	77	8
DAU208		258	±12	±42	±0.8	78	7
DAU209		258	±15	±34	±0.7	79	7
DAU211	12 (10.8 ~ 13.2)	96	3.3	260	5	74	8
DAU212		114	5	200	4	73	8
DAU213		106	9	110	2	78	5
DAU214		105	12	84	1.5	80	5
DAU215		104	15	67	1	80	5
DAU216		113	±5	±100	±2	74	8
DAU217		106	±9	±56	±1	79	5
DAU218		104	±12	±42	±0.8	81	5
DAU219		105	±15	±34	±0.7	81	5
DAU221	24 (21.6 ~ 26.4)	49	3.3	260	5	73	8
DAU222		59	5	200	4	71	8
DAU223		54	9	110	2	76	5
DAU224		54	12	84	1.5	78	5
DAU225		53	15	67	1	79	5
DAU226		58	±5	±100	±2	72	8
DAU227		55	±9	±56	±1	76	5
DAU228		53	±12	±42	±0.8	79	5
DAU229		53	±15	±34	±0.7	80	5

MECHANICAL DRAWING



SIDE VIEW



BOTTOM VIEW

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.)

PIN#	SINGLE	DUAL
1	Vin (+)	Vin (+)
2	Vin (-)	Vin (-)
5	Vout (-)	Vout (-)
6	No PIN	COMMON
7	Vout (+)	Vout (+)

Notes:
Dimensions are in millimeters and inches
Tolerance: X.X ± 0.25mm (X.XX ± 0.01 in)
X.XX ± 0.13mm (X.XXX ± 0.005 in)
Pin diameter ±0.05mm (±0.002 in)

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WARRANTY

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