DELPHI SERIES

FEATURES

- Efficiency up to 63%
- Industry standard form factor and pinout
- Body size:
  31.8 x20.3 x10.2mm (1.25” x0.80” x0.40”)
- Input: 5V, 12V, 24V (2:1)
- Output: 5, 12, 15, ±12, ±15V
- Output OCP, SCP
- Low ripple and noise
- 3000V isolation
- UL 94V-0 Package Material
- ISO 9001 and ISO14001 certified manufacturing facility

Delphi DS2D00R Series DC/DC Power Modules: 5, 12, 24, 48Vin, 2~3W DIP

The Delphi DS200R, 5V, 12V, 24V, and 48V (±10%) input, single or dual output, DIP form factor, isolated DC/DC converter is the latest offering from a world leader in power systems technology and manufacturing — Delta Electronics, Inc. The DS200R series operate from 5V, 12V, 24V, or 48V (±10%) and provides 5V, 12V, or 15V of single output or ±12V, or ±15V of dual output in an industrial standard, plastic case encapsulated DIP package. This series provides up to 2W of output power with 500V isolation and a typical full-load efficiency up to 62%. 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
- Telecom
- Data Networking

DATASHEET
DS_DS2D00R_12032008

Delta Electronics, Inc.

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TECHNICAL SPECIFICATIONS

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

PARAMETER	NOTES and CONDITIONS	DS2D00R (Standard)			
		Min.	Typ.	Max.	Units
ABSOLUTE MAXIMUM RATINGS					
Input Voltage					
Transient	5V input model, 1000ms	-0.7		7.5	Vdc
Transient	12V input model, 1000ms	-0.7		15	Vdc
Transient	24V input model, 1000ms	-0.7		30	Vdc
Internal Power Dissipation				3000	mW
Operating Temperature	Ambient	-25		85	°C
	Case	-25		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		500			Vdc
INPUT CHARACTERISTICS					
Operating Input Voltage	5V model	4.75	5	5.25	Vdc
	12V model	10.8	12	13.2	Vdc
	24V model	21.6	24	26.4	Vdc
Maximum Input Current	Please see Model List table on page 6				Vdc
No-Load Input Current	5V model		100		mA
	12V model		50		mA
	24V model		25		mA
Input Reflected Ripple Current	5V model		70		%
	12V model		30		%
	24V model		15		%
Short Circuit Input Power	All models			2.5	W
Reverse Polarity Input Current	All models			0.5	A
OUTPUT CHARACTERISTICS					
Output Voltage Set Point Accuracy			±2	±4	%
Output Voltage Balance	Dual output models		±1	±3	%
Output Voltage Regulation					
Over Load	Io=25% to 100%		±0.2	±0.5	%
Over Line	Vin= Vin,min to Vin,max		±0.2	±0.5	%
Over Temperature	Tc=-40°C to 71°C		±0.01	±0.02	%/C
Output Voltage Ripple and Noise	5Hz to 20MHz bandwidth				
Peak-to-Peak	Full Load, 0.47µF ceramic		40	50	mV
Peak-to-Peak, over line, load, temperature	Full Load, 0.47µF ceramic			75	mV
RMS	Full Load, 0.47µF ceramic			5	mV
Output Over Current/Power Protection	Auto restart	120			%
Output Short Circuit	Continuous				
Output Voltage Current Transient					
Step Change in Output Current	50% step change			±6	%
Settling Time (within 1% Vout nominal)				50	uS
Maximum Output Capacitance	Single output models			470	µF
	Dual output models, each output			220	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	1000			MΩ
Isolation Capacitance	100KHz, 1V		50	100	pF
FEATURE CHARACTERISTICS					
Switching Frequency		40	80		kHz
GENERAL SPECIFICATIONS					
MTBF	MIL-HDBK-217F; Ta=25°C, Ground Benign	0.8			M hours
Weight			12.1		grams
Case Material	Non-conductive black plastic				
Flammability	UL94V-0				
Input Fuse	5V model, 1000mA slow blown type				
	12V model, 750mA slow blown type				
	24V model, 350mA slow blown type				

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ELECTRICAL CHARACTERISTICS CURVES

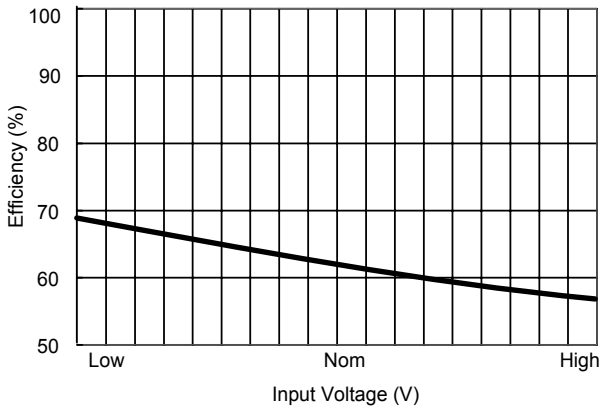

Figure 1: *Efficiency vs. Input Voltage (Single Output)*

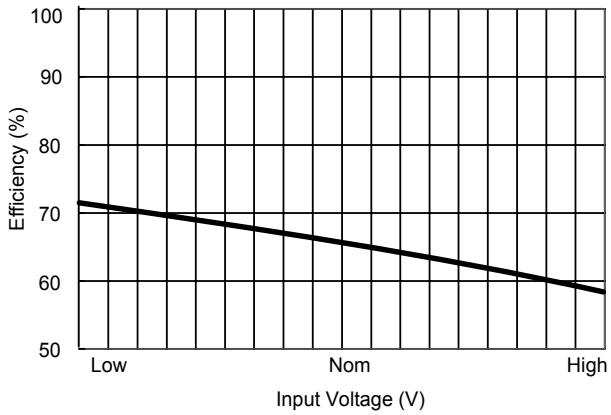

Figure 2: *Efficiency vs. Input Voltage (Dual Output)*

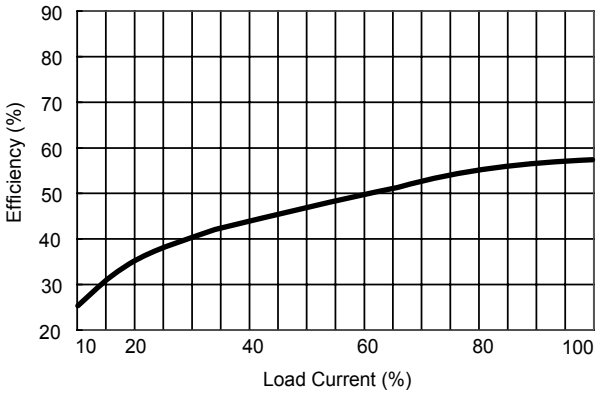

Figure 3: *Efficiency vs. Output Load (Single Output)*

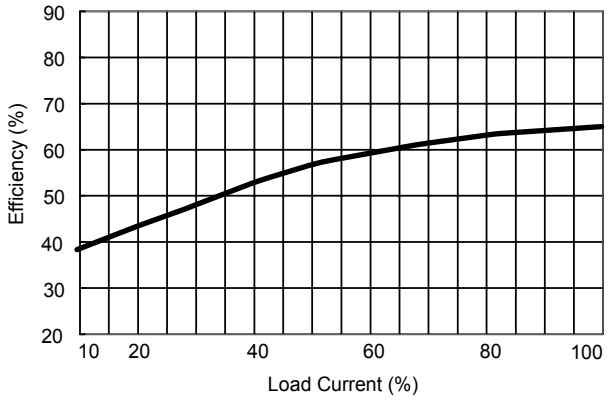

Figure 4: *Efficiency vs. Output Load (Dual Output)*

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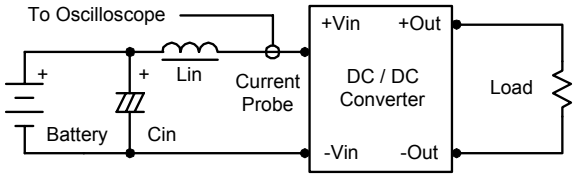
Test Configurations

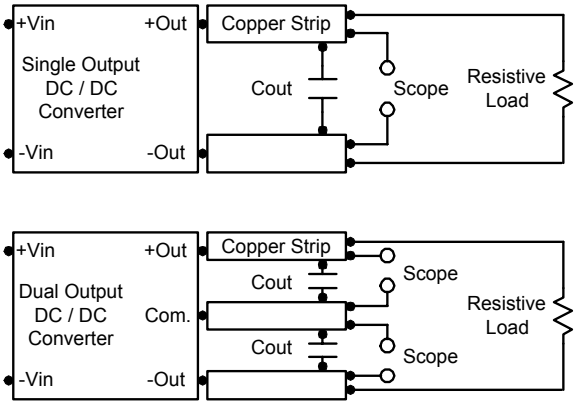
Input Reflected-Ripple Current Test Setup



Input reflected-ripple current is measured with a inductor Lin (4.7uH) and Cin (220uF, ESR < 1.0Ω at 100 KHz) to simulate source impedance. Capacitor Cin is to offset possible battery impedance. Current ripple is measured at the input terminals of the module and measurement bandwidth is 0-500 KHz.

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.



Design & Feature Considerations

The DS2D00R circuit block diagrams are shown in Figures 5 and 6.

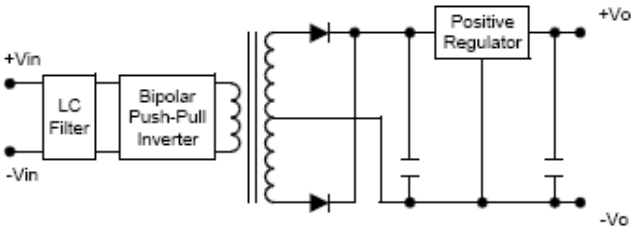


Figure 5: *Block diagram of DS2D00R single output modules.*

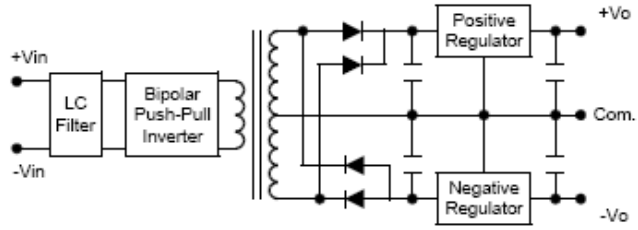
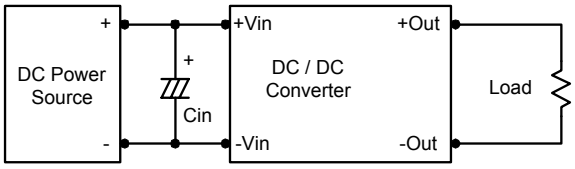


Figure 6: *Block diagram of DS2D00R dual output modules.*

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.

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Design & Feature Considerations

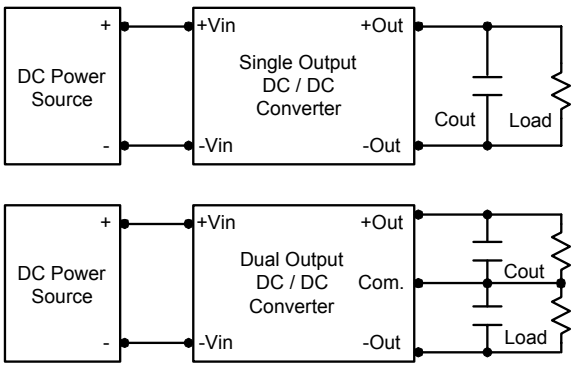
Maximum Capacitive Load

The DS2D00R 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. The maximum allowed capacitive load is listed in table on page 2.

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 1.5uF capacitors at the output.



Overcurrent Protection

To provide protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure current limiting for an unlimited duration. At the point of current-limit inception, the unit shifts from voltage control to current control. The unit operates normally once the output current is brought back into its specified range.

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.

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.

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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'').

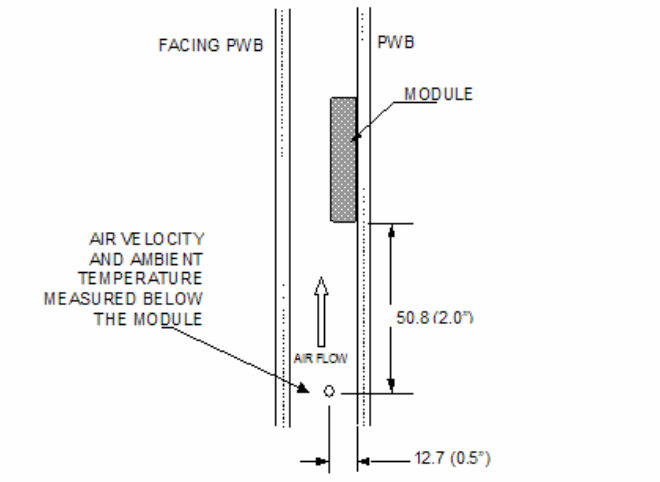

Figure 7: *Wind tunnel test setup*

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

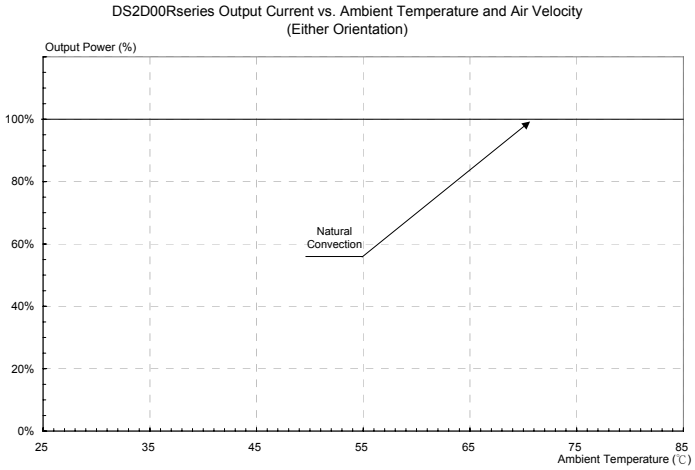

Figure 8: *Derating Curves (Single output)*

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MODEL LIST

	INPUT		OUTPUT			Full Load Efficiency
	Vdc (V)	Max (mA)	Vdc (V)	Max (mA)	Min (mA)	%
DS2D01R	5 (4.75 ~ 5.25)	666	5	400	0	60
DS2D02R		628	12	165		63
DS2D03R		633	15	133		63
DS2D04R		642	±12	±83		62
DS2D05R		639	±15	±66		62
DS2D06R	12 (10.8 ~ 13.2)	277	5	400	0	60
DS2D07R		262	12	165		63
DS2D08R		397	15	200		63
DS2D09R		268	±12	±83		62
DS2D10R		403	±15	±100		62
DS2D11R	24 (21.6 ~ 26.4)	138	5	400	0	60
DS2D12R		131	12	165		63
DS2D13R		198	15	200		63
DS2D14R		134	±12	±83		62
DS2D15R		202	±15	±100		62

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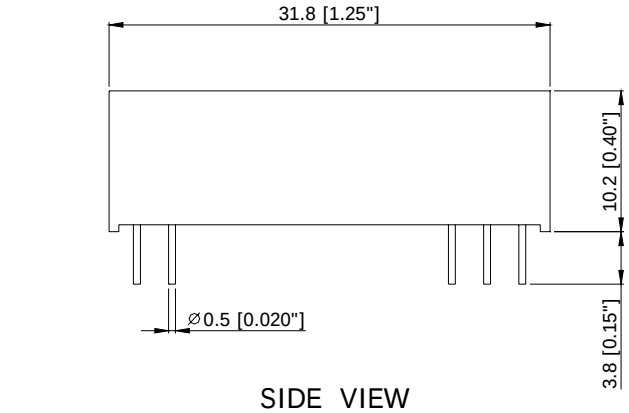
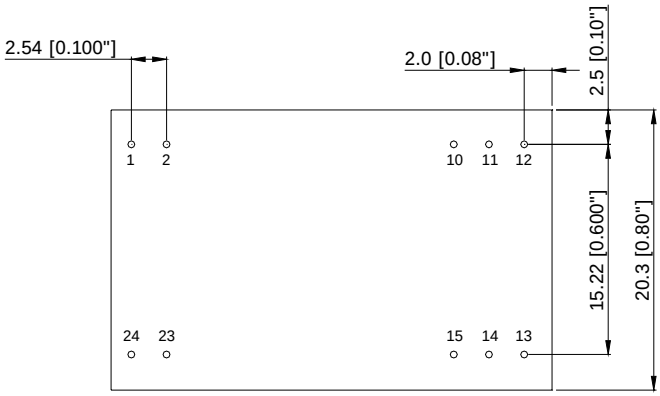
MECHANICAL DRAWING



SIDE VIEW



BOTTOM 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 Output	Dual Output
1	+Vin	+Vin
2	+Vin	+Vin
10	NC	Common
11	NC	Common
12	-Vout	NC
13	+Vout	-Vout
14	NC	NC
15	NC	+Vout
23	-Vin	-Vin
24	-Vin	-Vin

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WARRANTY

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