DELPHI SERIES

FEATURES

- Efficiency up to 83%
- Industry standard form factor and pinout
- Body Size:
  32.3 x14.8 x10.2mm (1.27” x0.58” x0.40”)
- Input: 24V, 48V (4:1)
- Output: 3.3, 5, 12, 15, ±5, ±12, ±15V
- Low ripple and noise
- 1500V isolation
- UL 94V-0 Package Material
- ISO 9001 and ISO14001 certified manufacturing facility

Delphi DSIW200 Series DC/DC Power Modules: 24, 48Vin, 2~3W SMD

The Delphi DSIW2000, 24V and 48V 4:1 wide 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 DSIW2000 series operate from 24V or 48V (4:1) and provides 3.3V, 5V, 12V, or 15V of single output and ±5V, ±12V or ±15V of dual output in an industrial standard, plastic case encapsulated SMD. This series provides up to 3W of output power with 1500V isolation and a typical full-load efficiency up to 83%. 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_DSIW2000_12032008

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	DSIW2000 (Standard)			
		Min.	Typ.	Max.	Units
ABSOLUTE MAXIMUM RATINGS					
Input Voltage					
Transient	24V input model, 1000ms	-0.7		50	Vdc
Transient	48V input model, 1000ms	-0.7		100	Vdc
Internal Power Dissipation				2500	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		1500			Vdc
INPUT CHARACTERISTICS					
Operating Input Voltage	24V model	18	24	36	
	48V model	36	48	75	Vdc
Turn-On Voltage Threshold	24V model	4.5	6	8.5	Vdc
	48V model	8.5	12	17	Vdc
Turn-Off Voltage Threshold	24V model	---	---	8	Vdc
	48V model	---	---	16	Vdc
Maximum Input Current	Please see Model List table on page 6				
No-Load Input Current	24V model		20		mA
	48V model		10		mA
Input Reflected Ripple Current	24V model		10		%
	48V model		5		%
Short Circuit Input Power	All models			2	W
Reverse Polarity Input Current				1	A
OUTPUT CHARACTERISTICS					
Output Voltage Set Point Accuracy			±0.5	±1.0	%
Output Voltage Balance	Dual output models		±0.5	±2.0	%
Output Voltage Regulation					
Over Load	Io= min to max		±0.3	±1	%
Over Line	Vin= min to max		±0.2	±0.5	%
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, 0.47µF ceramic		50	75	mV
Peak-to-Peak, over line, load, temperature	Full Load, 0.47µF ceramic			100	mV
RMS	Full Load, 0.47µF ceramic			15	mV
Output Over Current/Power Protection	Auto restart	120			%
Output Short Circuit	Continuous				
Output Voltage Current Transient					
Step Change in Output Current	25% step change		±2	±6	%
Settling Time (within 1% Vout nominal)			150	500	uS
Maximum Output Capacitance	single output model			3000	µF
	dual output model, each output			180	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	1000			MΩ
Isolation Capacitance	100KHz, 1V		350	500	pF
FEATURE CHARACTERISTICS					
Switching Frequency			300		kHz
ON/OFF Control					
Logic Low (module is off)	Von/off at Ion/off=1.0mA	-0.7		0.8	V
Logic High (module is on)	Von/off at Ion/off=0.0 µA	2.5		5.5	V
ON/OFF Current	Logic High, Von/off=max			5	mA
Leakage Current	Ion/off at Von/off=0.0V			-400	uA
GENERAL SPECIFICATIONS					
MTBF	MIL-HDBK-217F; Ta=25°C, Ground Benign	1			M hours
Weight			8.8		grams
Case Material	Non-conductive black plastic				
Flammability	UL94V-0				
Input Fuse	24V model, 1000mA slow blown type				
	48V model, 500mA slow blown type				

ELECTRICAL CHARACTERISTICS CURVES

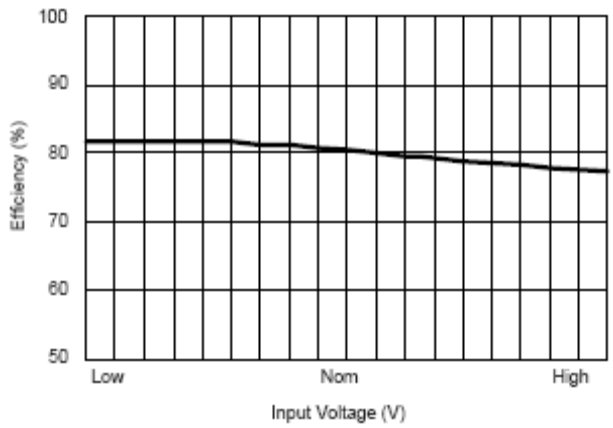


Figure 1: *Efficiency vs. Input Voltage (Single Output)*

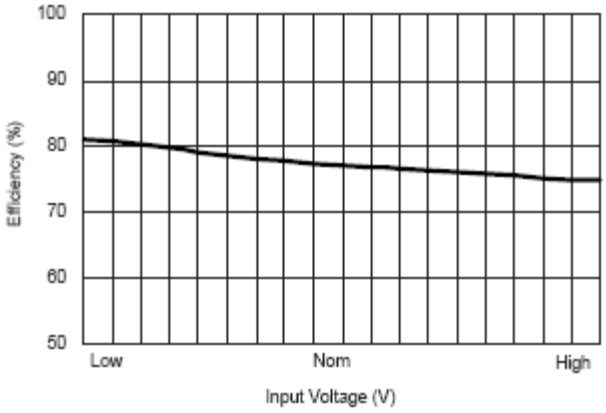


Figure 2: *Efficiency vs. Input Voltages (Dual Output)*

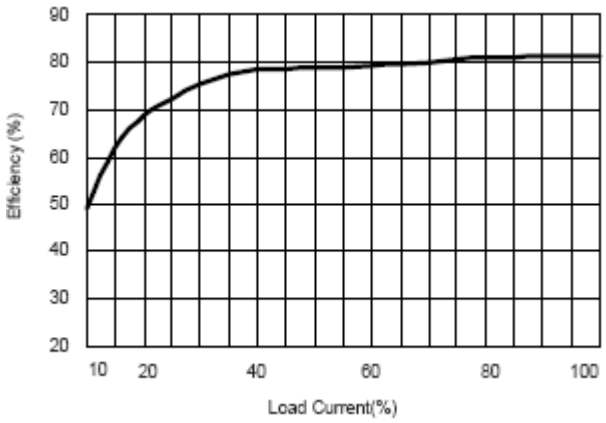


Figure 3: *Efficiency vs. Output Load (Single Output)*

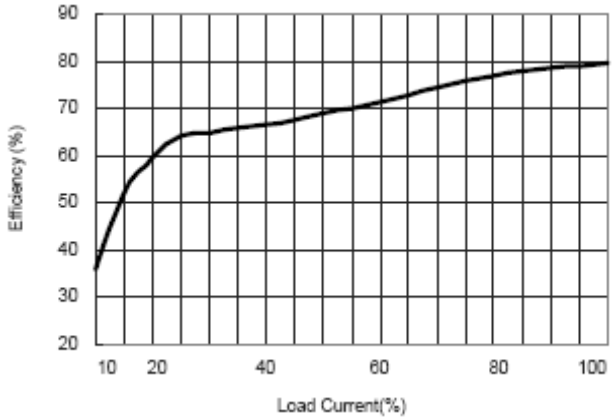
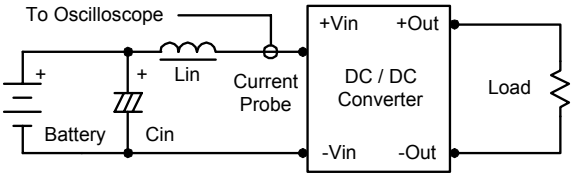


Figure 4: *Efficiency vs. Output Load (Dual Output)*

Test Configurations

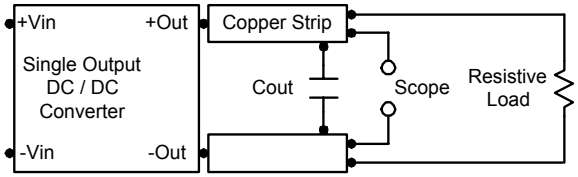


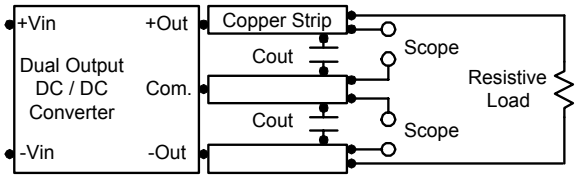
Input Reflected-Ripple Current Test Setup

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 0.47uF ceramic capacitor is placed between the terminals shown below.





Design & Feature Considerations

The DSIW2000 circuit block diagrams are shown in Figures 5 and 6.

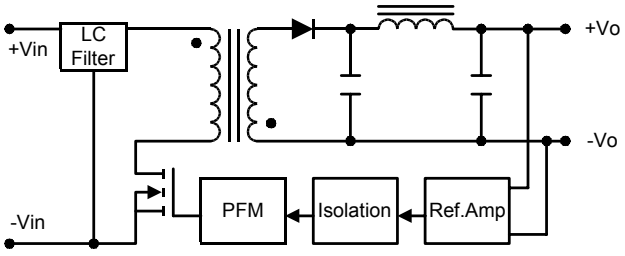


Figure 5: *Block diagram of DSIW2000 single output modules.*

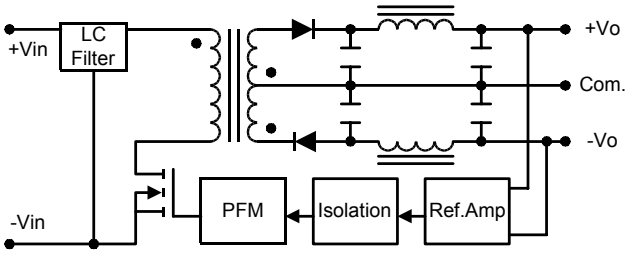
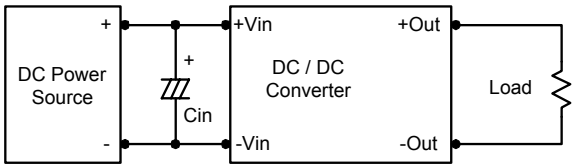


Figure 6: *Block diagram of DSIW2000 dual output modules*

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 4.7uF for the 24V input devices, and a 2.2uF for the 48V devices.

Design & Feature Considerations

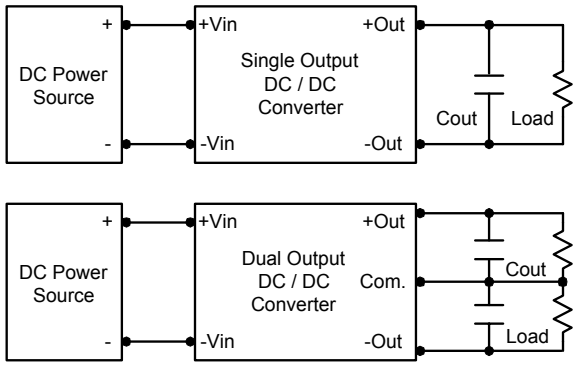
Maximum Capacitive Load

The DSIW2000 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.

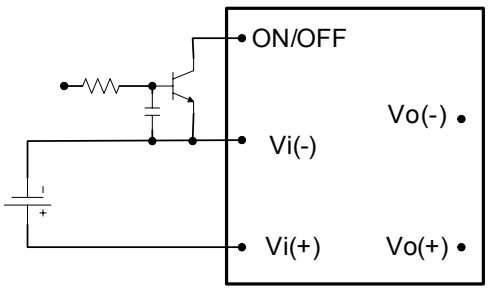
To reduce output ripple, it is recommended to use 3.3uF capacitors at the output.



Remote On/Off

The DSIW200 has positive remote on/off logic. Positive logic remote on/off turns the module on during a logic high voltage on the remote on/off pin, and off during a logic low.

Remote on/off can be controlled by an external switch between the on/off terminal and the -Vin terminal. The switch can be an open collector or equivalent.



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.

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'').

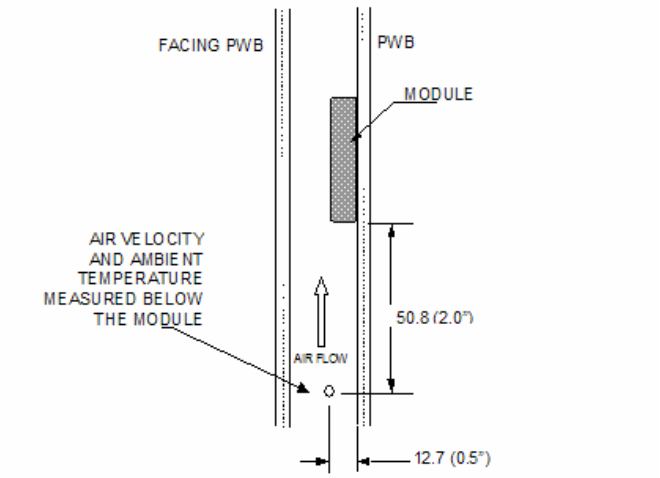


Figure 7: *Wind tunnel test setup*

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

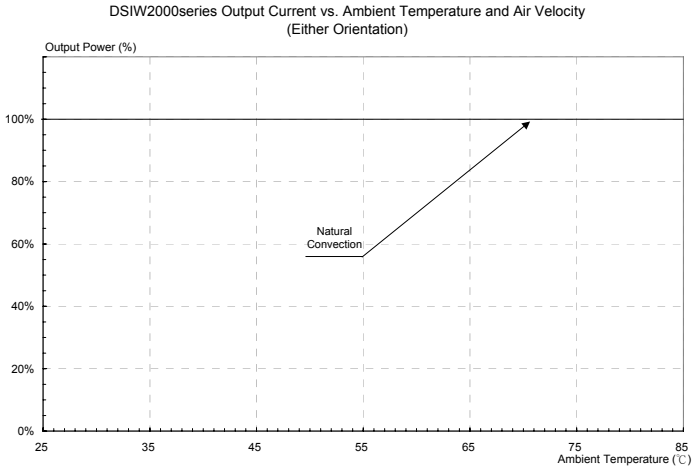
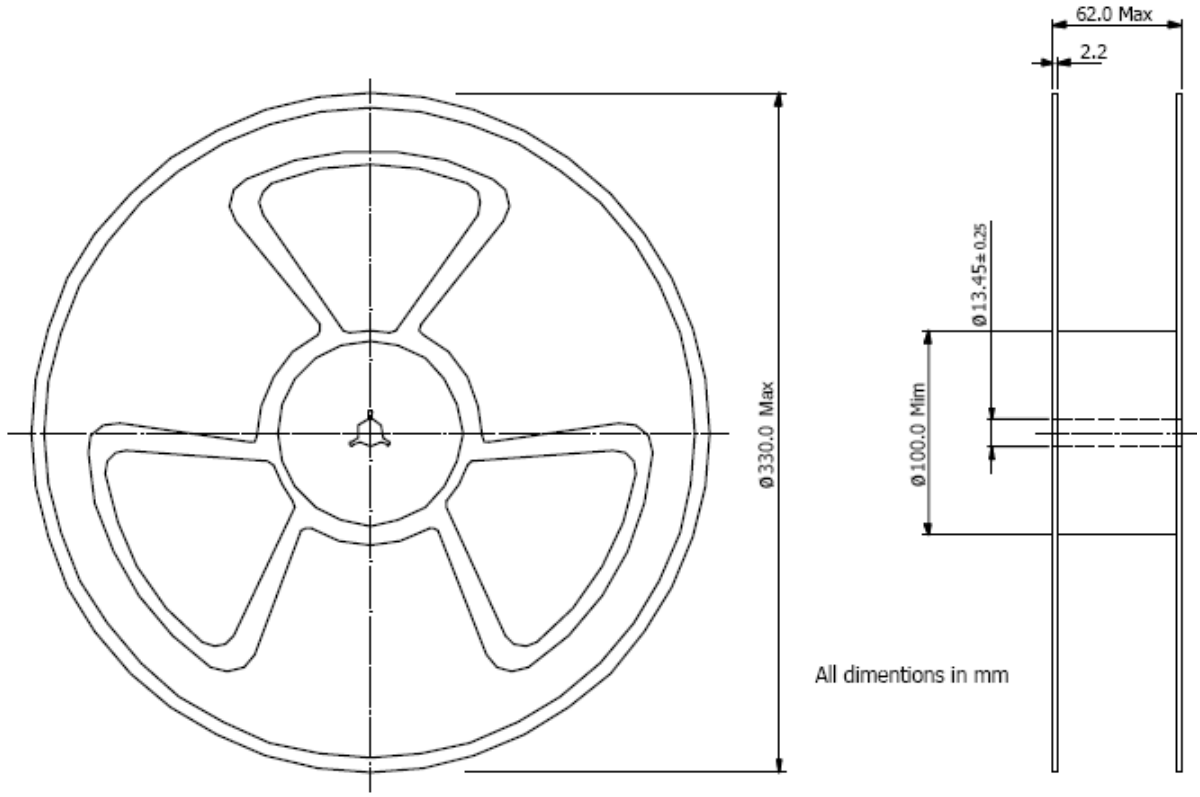


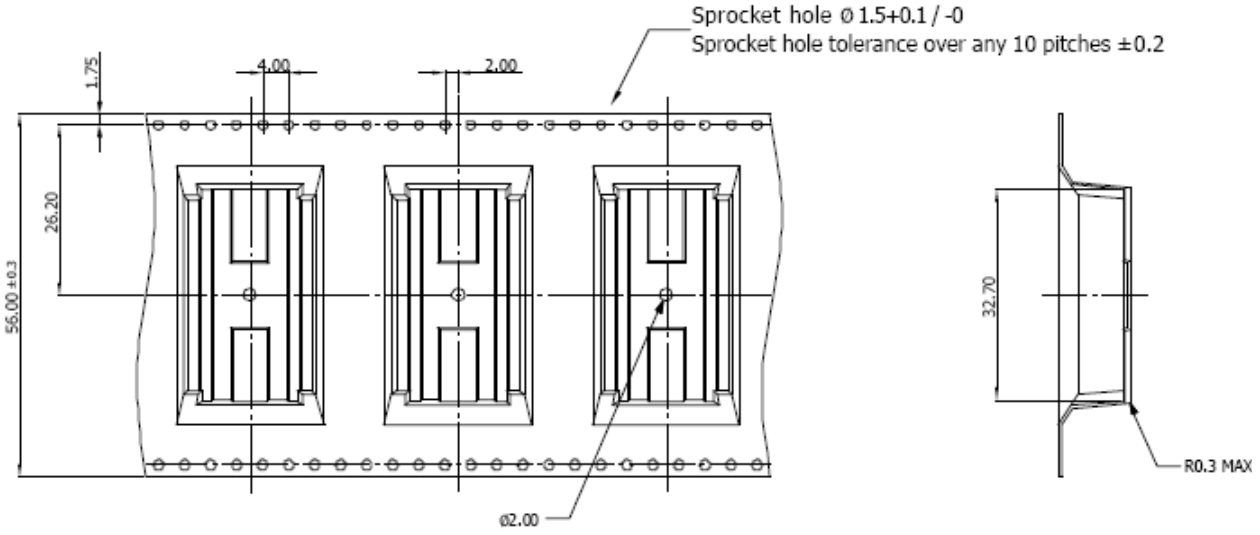
Figure 8: *Derating Curve*

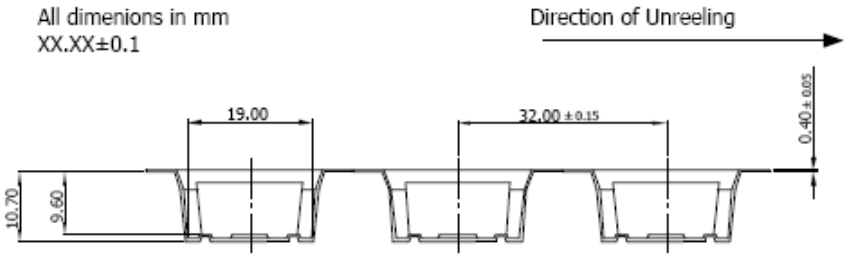
MODEL LIST

MODEL NAME	INPUT		OUTPUT			Full Load Efficiency
	Vdc (V)	Max (mA)	Vdc (V)	Max (mA)	Min (mA)	%
DSIW2021	24 (9 ~ 36)	138	3.3	750	75	75
DSIW2022		158	5	600	60	79
DSIW2023		154	12	250	25	81
DSIW2024		154	15	200	20	81
DSIW2025		160	±5	±300	±30	78
DSIW2026		154	±12	±125	±12.5	81
DSIW2027		154	±15	±100	±10	81
DSIW2031	48 (18 ~ 75)	68	3.3	750	75	76
DSIW2032		78	5	600	60	80
DSIW2033		75	12	250	25	83
DSIW2034		75	15	200	20	83
DSIW2035		78	±5	±300	±30	80
DSIW2036		75	±12	±125	±12.5	83
DSIW2037		75	±15	±100	±10	83

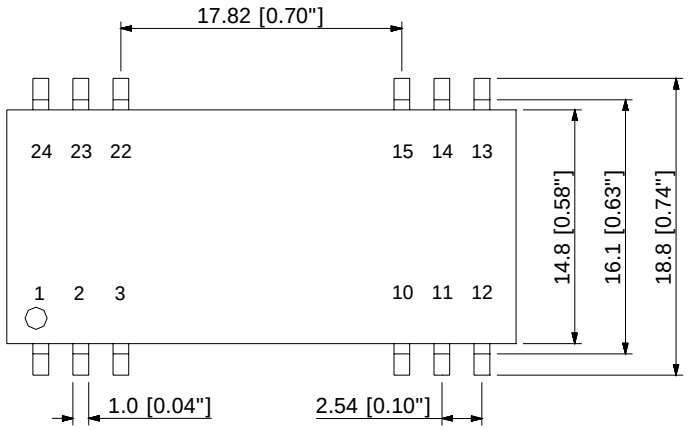
PACKAGE: TAPE & REEL



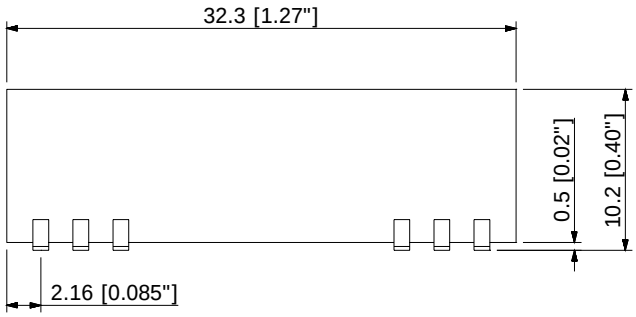




MECHANICAL DRAWING



TOP VIEW



SIDE 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
3	On/Off	On/Off
10	NC	Common
11	NC	NC
12	NC	-Vout
13	+Vout	+Vout
14	NC	NC
15	-Vout	Common
22	NC	NC
23	+Vin	+Vin
24	+Vin	+Vin

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WARRANTY

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