Technical Specification

EUC6W24 Series

4:1 Wide Input, Isolated 6Watts DC/DC Converters

FEATURES

- Low cost
- 4:1 wide input range: 9-36VDC
- 6W isolated output
- Single & bipolar outputs: 3.3, 5, 9, 12, 15, 24, ±5, ±9, ±12, ±15, ±24Volts DC
- Efficiency up to 87%
- Remote on/off control
- 1500VDC I/O isolation
- Industrial standard footprint: SIP8
- UVLO, OCP and short protection
- Operation temperature range: -40°C to +85°C
- Fully encapsulated, high reliability
- MTBF ⩾ 1 MHrs

PRODUCT OVERVIEW

The EUC6W24 series are highly reliable, and efficient isolated DC/DC converter. Wide input range of 9-36V (24V nominal) is ideal for automation, power grid, railway, semiconductor equipment, instrumentation, test and measurement, and distribution power system.

The self-protection features included input under-voltage lockout, overcurrent protection with “hiccup” autorestart technique and short-circuit protection. The operation temperature is -40°C to +85°C.

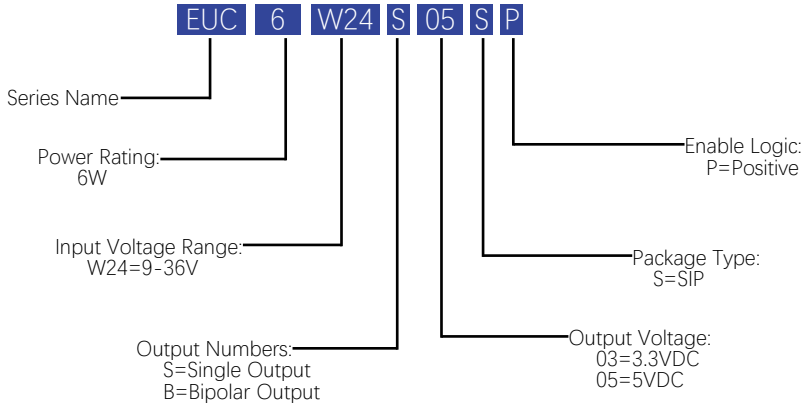
Advanced fully encapsulated package technology provides outstanding EMC and thermal performance, which is ideal for ruggedized applications involving harsh environments.

The EUC6W24 series are designed to safety standards UL62368-1.

Models Selections

Basic Models	Input Voltage [VDC]	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [A]	Efficiency Typ. [%]	Capacitive Load Max [μF]	Package [inch]
EUC6W24S03	24	9-36	3.3	1.5	78	1800	0.87"×0.47"×0.37" SIP8
EUC6W24S05	24	9-36	5	1.2	82	1000	
EUC6W24S09	24	9-36	9	0.667	84	470	
EUC6W24S12	24	9-36	12	0.5	86	470	
EUC6W24S15	24	9-36	15	0.4	87	220	
EUC6W24S24	24	9-36	24	0.25	85	100	
EUC6W24B05	24	9-36	±5	±0.6	80	±470	
EUC6W24B09	24	9-36	±9	±0.333	83	±220	
EUC6W24B12	24	9-36	±12	±0.25	83	±120	
EUC6W24B15	24	9-36	±15	±0.2	83	±100	
EUC6W24B24	24	9-36	±24	±0.125	82	±68	

Model Numbering



Absolute Maximum Ratings					
Parameters	Conditions	Min.	Typ.	Max.	Units
Input Voltage Continuous		-0.7		36	VDC
Input Voltage Transient(< 100ms)				50	VDC
Operating Environment Temperature		-40		85	°C
Storage Temperature Range		-55		125	°C
Soldering Temperature	Wave soldering < 10s			300	°C

Safety and EMC Compliance		
Conducted Emission	EN55032	Class B (With external filter)
Radiated Emission	EN55032	Class B (With external filter)
Conducted Susceptibility	IEC6100-4-6	10Vrms Criteria A
Radiated Susceptibility	IEC6100-4-3	10V/m Criteria A
EFT	IEC6100-4-4	±2KV Criteria A (With external filter)
Surge	IEC6100-4-5	±2KV Criteria A (With external filter)
ESD	IEC6100-4-2	Contact: ±4KV Air: ±6KV Criteria B
Isolation Safety Rating	Basic insulation	

General Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage (Test for 1 minute)	Input to output	1500			VDC
	Input to case	1500			VDC
	Output to case	500			VDC
Isolation Resistance (Viso=500VDC)	Input to output	1000			MΩ
	Input to case	1000			MΩ
	Output to case	1000			MΩ
Isolation Capacitance	Input to output		120		pF
Switching Frequency			300		KHz
Start-up Delay	From undervoltage shutdown recovery to 10% Vout			50	mS
Rise Time	From 10% Vout to 90% Vout capacitive load			70	mS
Remote On/Off Control	Positive Logic, ON state	Open or 3.5 ≤ Vr ≤ 12			VDC
	Positive Logic, OFF state	Short or 0 ≤ Vr ≤ 0.7			VDC
Vibration	IEC 60068-2-64, Environmental Testing - Part 2				
Shock (Operational)	IEC 60068-2-27, Environmental Testing- Part 2.27				

Input Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Operating Voltage Range		9	24	36	VDC
Start-up Threshold		8	8.8	9	VDC
Under Voltage Shutdown		7.5	8.0	8.5	VDC
Input Current @ No Load				50	mA
Input Current @ Min. Line				0.98	A
Input Reflected Ripple Current (Peak-Peak)			40		mA
Power Loss @ No Load				0.5	W
Recommended Input Fuse			2		A
Recommended External Input Capacitance	1μF CBB and 100μF E-cap used in combination		100		μF

Performance Data (3.3 Vout Model)

Output Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Output Voltage Setpoint		2.97	3.30	3.63	V
Vout Accuracy		-1.0		+1.0	%
Line Regulation		-1.0		+1.0	%
Load Regulation		-1.5		+1.5	%
Temperature Coefficient		-0.03		+0.03	%of Vout/°C
Total Regulation		-3		+3	%
Ripple & Noise Max. ①			50		mV pk-pk
Dynamic Load Peak Deviation		-8		+8	%
Dynamic Load Response				500	μS
Over Current Protection	Hiccup, Auto-recover	110	160	230	%
Short Circuit Protection	Continuous				
Capacitive Load				1800	μF
Minimum Load	No minimum load required				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 18 for more details.

All specifications are tested at 25 ℃ ambient temperature, nominal input voltage, rated output current conditions unless otherwise specified.

Performance Data (5 Vout Model)

Output Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Output Voltage Setpoint		4.95	5.00	5.05	V
Vout Accuracy		-1.0		+1.0	%
Line Regulation		-1.0		+1.0	%
Load Regulation		-1.5		+1.5	%
Temperature Coefficient		-0.03		+0.03	%of Vout/°C
Total Regulation		-3		+3	%
Ripple & Noise Max. ①			50		mV pk-pk
Dynamic Load Peak Deviation		-8		+8	%
Dynamic Load Response				500	μS
Over Current Protection	Hiccup, Auto-recover	110	160	230	%
Short Circuit Protection	Continuous				
Capacitive Load				1000	μF
Minimum Load	No minimum load required				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 18 for more details.

All specifications are tested at 25 ℃ ambient temperature, nominal input voltage, rated output current conditions unless otherwise specified.

Performance Data (9 Vout Model)

Output Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Output Voltage Setpoint		8.91	9.00	9.09	V
Vout Accuracy		-1.0		+1.0	%
Line Regulation		-1.0		+1.0	%
Load Regulation		-1.5		+1.5	%
Temperature Coefficient		-0.03		+0.03	%of Vout/°C
Total Regulation		-3		+3	%
Ripple & Noise Max. ①			50		mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response				500	μS
Over Current Protection	Hiccup, Auto-recover	110	160	230	%
Short Circuit Protection	Continuous				
Capacitive Load				470	μF
Minimum Load	No minimum load required				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 18 for more details.

All specifications are tested at 25℃ ambient temperature, nominal input voltage, rated output current conditions unless otherwise specified.

Performance Data (12 Vout Model)

Output Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Output Voltage Setpoint		11.88	12.00	12.12	V
Vout Accuracy		-1.0		+1.0	%
Line Regulation		-1.0		+1.0	%
Load Regulation		-1.5		+1.5	%
Temperature Coefficient		-0.03		+0.03	%of Vout/°C
Total Regulation		-3		+3	%
Ripple & Noise Max. ①			50		mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response				500	μS
Over Current Protection	Hiccup, Auto-recover	110	160	230	%
Short Circuit Protection	Continuous				
Capacitive Load				470	μF
Minimum Load	No minimum load required				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 18 for more details.

All specifications are tested at 25℃ ambient temperature, nominal input voltage, rated output current conditions unless otherwise specified.

Performance Data (15 Vout Model)

Output Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Output Voltage Setpoint		14.85	15.00	15.15	V
Vout Accuracy		-1.0		+1.0	%
Line Regulation		-1.0		+1.0	%
Load Regulation		-1.5		+1.5	%
Temperature Coefficient		-0.03		+0.03	%of Vout/°C
Total Regulation		-3		+3	%
Ripple & Noise Max. ①			50		mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response				500	μS
Over Current Protection	Hiccup, Auto-recover	110	160	230	%
Short Circuit Protection	Continuous				
Capacitive Load				220	μF
Minimum Load	No minimum load required				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 18 for more details.

All specifications are tested at 25℃ ambient temperature, nominal input voltage, rated output current conditions unless otherwise specified.

Performance Data (24 Vout Model)

Output Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Output Voltage Setpoint		23.76	24.00	24.24	V
Vout Accuracy		-1.0		+1.0	%
Line Regulation		-1.0		+1.0	%
Load Regulation		-1.5		+1.5	%
Temperature Coefficient		-0.03		+0.03	%of Vout/°C
Total Regulation		-3		+3	%
Ripple & Noise Max. ①			50		mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response				500	μS
Over Current Protection	Hiccup, Auto-recover	110	160	230	%
Short Circuit Protection	Continuous				
Capacitive Load				100	μF
Minimum Load	No minimum load required				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 18 for more details.

All specifications are tested at 25℃ ambient temperature, nominal input voltage, rated output current conditions unless otherwise specified.

Performance Data (±5 Vout model)

Output Specifications					
Parameters	Conditions	Min.	Typ.	Max.	Units
Output Voltage Setpoint		±4.95	±5.00	±5.05	V
Vout Accuracy		-1.0		+1.0	%
Line Regulation		-1.0		+1.0	%
Load Regulation		-1.5		+1.5	%
Temperature Coefficient		-0.03		+0.03	%of Vout/°C
Total Regulation		-3		+3	%
Ripple & Noise Max. ①			50		mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response				500	μS
Over Current Protection	Hiccup, Auto-recover	110	160	230	%
Short Circuit Protection	Continuous				
Capacitive Load				±470	μF
Minimum Load	No minimum load required				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 18 for more details.

All specifications are tested at 25℃ ambient temperature, nominal input voltage, rated output current conditions unless otherwise specified.

Performance Data (±9 Vout model)

Output Specifications					
Parameters	Conditions	Min.	Typ.	Max.	Units
Output Voltage Setpoint		±8.91	±9.00	±9.09	V
Vout Accuracy		-1.0		+1.0	%
Line Regulation		-1.0		+1.0	%
Load Regulation		-1.5		+1.5	%
Temperature Coefficient		-0.03		+0.03	%of Vout/°C
Total Regulation		-3		+3	%
Ripple & Noise Max. ①			50		mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response				500	μS
Over Current Protection	Hiccup, Auto-recover	110	160	230	%
Short Circuit Protection	Continuous				
Capacitive Load				±220	μF
Minimum Load	No minimum load required				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 18 for more details.

All specifications are tested at 25℃ ambient temperature, nominal input voltage, rated output current conditions unless otherwise specified.

Performance Data (±12 Vout model)

Output Specifications					
Parameters	Conditions	Min.	Typ.	Max.	Units
Output Voltage Setpoint		±11.88	±12.00	±12.12	V
Vout Accuracy		-1.0		+1.0	%
Line Regulation		-1.0		+1.0	%
Load Regulation		-1.5		+1.5	%
Temperature Coefficient		-0.03		+0.03	%of Vout/°C
Total Regulation		-3		+3	%
Ripple & Noise Max. ①			50		mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response				500	μS
Over Current Protection	Hiccup, Auto-recover	110	160	230	%
Short Circuit Protection	Continuous				
Capacitive Load				±120	μF
Minimum Load	No minimum load required				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 18 for more details.

All specifications are tested at 25℃ ambient temperature, nominal input voltage, rated output current conditions unless otherwise specified.

Performance Data (±15 Vout model)

Output Specifications					
Parameters	Conditions	Min.	Typ.	Max.	Units
Output Voltage Setpoint		±14.85	±15.00	±15.15	V
Vout Accuracy		-1.0		+1.0	%
Line Regulation		-1.0		+1.0	%
Load Regulation		-1.5		+1.5	%
Temperature Coefficient		-0.03		+0.03	%of Vout/°C
Total Regulation		-3		+3	%
Ripple & Noise Max. ①			50		mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response				500	μS
Over Current Protection	Hiccup, Auto-recover	110	160	230	%
Short Circuit Protection	Continuous				
Capacitive Load				±100	μF
Minimum Load	No minimum load required				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 18 for more details.

All specifications are tested at 25 ℃ ambient temperature, nominal input voltage, rated output current conditions unless otherwise specified.

Performance Data (±24 Vout model)

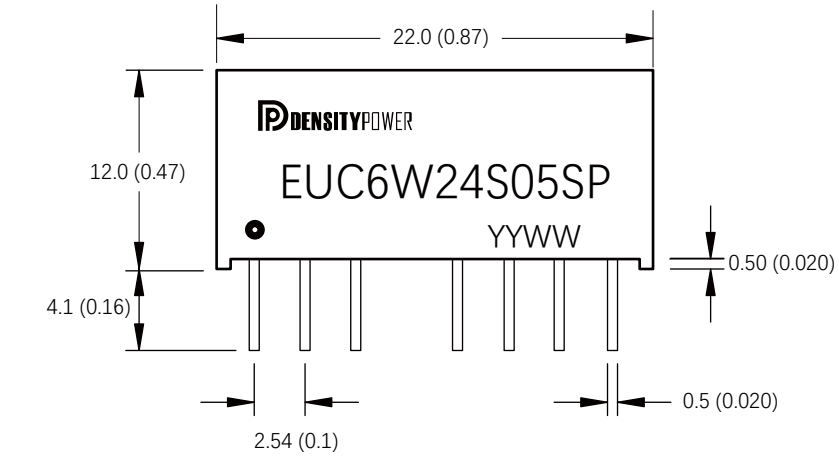
Output Specifications					
Parameters	Conditions	Min.	Typ.	Max.	Units
Output Voltage Setpoint		±23.76	±24.00	±24.24	V
Vout Accuracy		-1.0		+1.0	%
Line Regulation		-1.0		+1.0	%
Load Regulation		-1.5		+1.5	%
Temperature Coefficient		-0.03		+0.03	%of Vout/°C
Total Regulation		-3		+3	%
Ripple & Noise Max. ①			50		mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response				500	μS
Over Current Protection	Hiccup, Auto-recover	110	160	230	%
Short Circuit Protection	Continuous				
Capacitive Load				±68	μF
Minimum Load	No minimum load required				

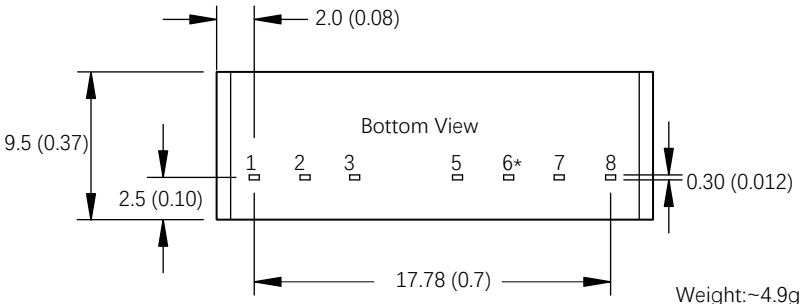
Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 18 for more details.

All specifications are tested at 25 ℃ ambient temperature, nominal input voltage, rated output current conditions unless otherwise specified.

Mechanical Specifications

MECHANICAL DIMENSIONS

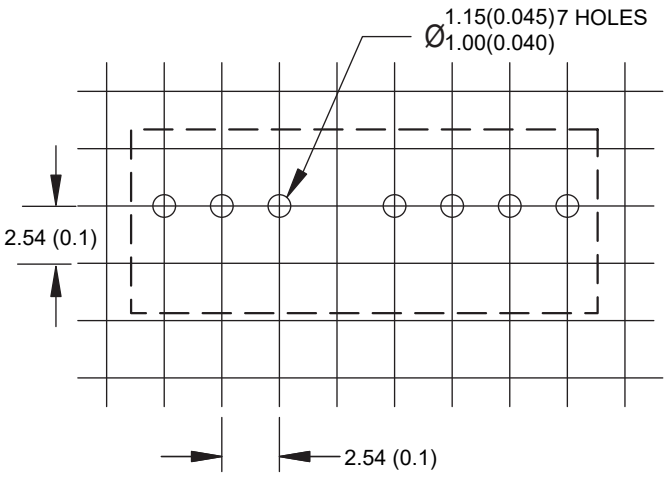




Dimensions are in mm (inches)

Tolerance:
X.X=±0.5 (0.02)
X.XXX= ±0.25 (0.010)
Pin dimension: ±0.1 (0.0039)

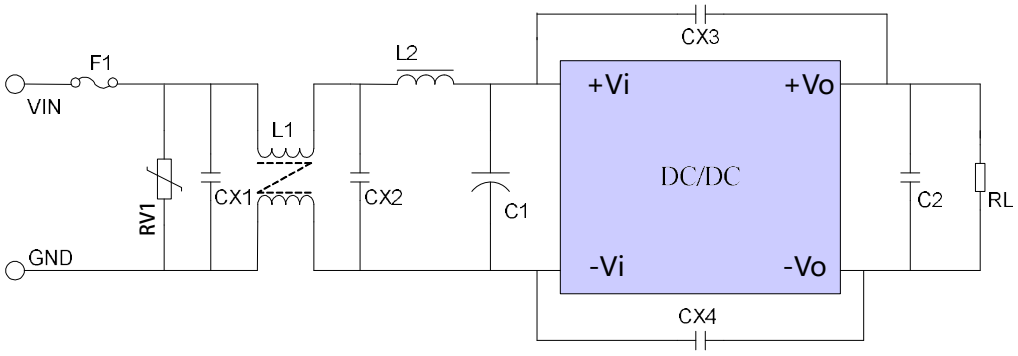
RECOMMENDED FOOTPRINT DETAILS



PIN CONNECTIONS		
	Single Output	Bipolar Outputs
Pin	Function	Function
1	-Vi	-Vi
2	+Vi	+Vi
3	RC	RC
4	NP	NP
5	NC	NC
6	+Vo	+Vo
7	-Vo	COM
8	NC	-Vo

Conducted Emission

Density Power measures its products for conducted emissions against the EN55032 standards. The EUT is supplied with 24VDC and is loaded to the maximum rating 6 Watts. The following EMI filter components were employed and the result can meet class B.



Conducted Emission Test Circuit

EMI Filter Components List

REFERENCE	DESCRIPTION
RV1	THINKING: TVR14560
CX1, CX2	Ceramic 1210 50V 2.2μF
CX3, CX4	Ceramic 1260 2KV 1000pF
C1	50V 100μF
L1	2mH/1A
L2	4.7μH/1A
C2	According to the capacitive load in the specification

Technical Notes

INPUT FUSING

Certain applications may require fuse at the inputs of power conversion components. Fuses should also be used when there is possibility of sustained input voltage reversal which is not current limited. The EUC6W24 modules are not internally fused. We strongly recommend a slow-blown fuse to be used in the ungrounded input supply line.
For safety agency approvals, the installer must install the converter in compliance with the end user safety standard.

TYPICAL APPLICATION CONNECTION

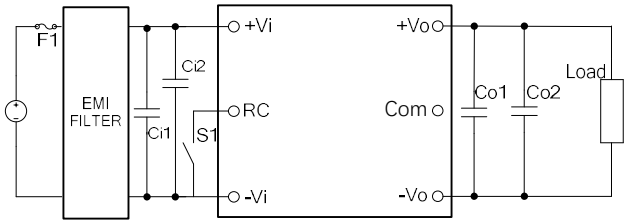


Figure 1· Typical Application Connection

In order to prevent the input line from causing the input oscillation, it is recommended to add the input capacitor close to the input of the module. Similarly, the output capacitor is added to the output of the module. Specific recommended parameters: input capacitance Ci1=100μF electrolytic capacitor, Ci2 = 1uF CBB capacitor. Output Capacitance Co1=10uF tantalum capacitor, Co2 ESR <0.1Ω. Please refer to capacitive load for details.

REFLECTED RIPPLE CURRENT

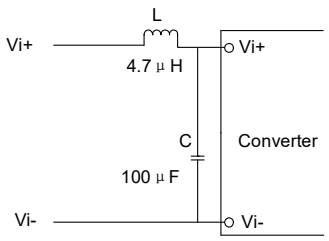


Figure 2· Reflected Ripple Current

Add LC filter at the front of the power module to reduce the interference of reflected ripple current on the DC bus, recommended value of L and C with appropriate current and voltage rating as below: L: 4.7μH; C: 100μF.

REMOTE CONTROL FUNCTION

Module Power Remote Control or called ON/OFF pin is for the user to control the power output. There are two general control logics, positive logic or negative logic control. Recommend to use optocoupler to control remote pin as below.

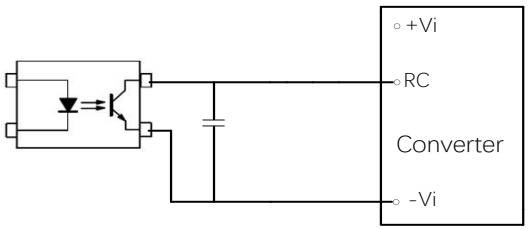


Figure 3· Remote Control Circuit

Remote Control Pin can be connected in parallel for multiple converters which with the same Remote Control characters. However, when several converters share the same remote control circuit, the total sink and source current must be taken into consideration, and make sure that the opto-coupler has enough drive capability.
To reduce external PCB trace interference, it is recommended to add high frequency bypass capacitor between RC pin and -Vi, recommended capacitor value is 100-1000pF.

INPUT UNDERVOLTAGE SHUTDOWN AND START-UP THRESHOLD

Once operating, module will not turn off until the input voltage drops below the Undervoltage Shutdown threshold. Subsequent re-start will not occur until the input is brought back up to the Start-Up Threshold. This built in hysteresis prevents any unstable on/off situations from occurring at a single input voltage.

Technical Notes

OUTPUT RIPPLE & NOISE

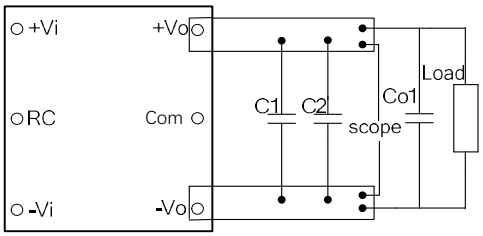


Figure 4· Output Ripple & Noise

These EUC6W24 modules' output ripple and noise is measured at the rated input voltage and output current, along with 10uF and 0.1uF MLCC used in parallel with appropriate voltage ratings and placed as C1&C2 shown in the figure above. The scope's bandwidth is set to 20MHz.

External output capacitors are required to reduce the ripple & noise. The output capacitors should be low ESR and appropriate frequency response with appropriate voltage ratings, and must be located as close to the converters as possible, also PCB layout must be taken into consideration.

CURRENT LIMITING

The output voltage remains constant as the output current increases. However, once the output current is over the specified Output DC Current Limit, the converter turns off.

The converter then enters into “hiccup mode” where it repeatedly turns on and off until the overload condition is removed. This prevents excessive heating of the converter or the load board.

SHORT CIRCUIT CONDITION

When the converter is in current-limit mode, the output voltage will drop as the output current demand increases and then the converter will be shut down.If the short-circuit condition persists, another shutdown cycle will be initiated. This on/off cycling is referred to as "hiccup" mode. The hiccup cycling reduces the average output current, thereby preventing internal temperatures from rising to excessive levels. The module is capable of enduring an indefinite short circuit output condition.

THERMAL CONSIDERATIONS

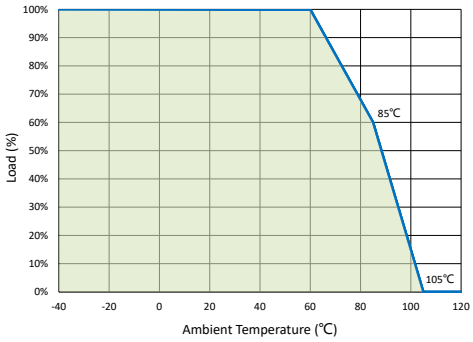


Figure 5· Thermal Derating Curve

The maximum operating case temperature, Tcase is 105 ºC. As long as the user’s thermal environment keeps Tcase < 105 ºC, the converter can deliver its full rated power. A power derating curve can be calculated for the converter. It is only necessary to determine the thermal resistance, RTHcase of the converter case to ambient air for a given airflow. The following formula can be used to determine the maximum power the converter can dissipate for a given thermal condition if its case is to be no higher than 105 ºC.

$$Pdiss = \frac{105 - Tamb}{RTHcase}$$

This value of power dissipation can then be used in conjunction with the Power Loss vs Load curve to determine the maximum load power that the converter can deliver in the given thermal condition. For convenience, power derating curves for an encased converter are provided for each output voltage module.

This product is subject to the following operating requirements and the Life and Safety Critical Application Sales Policy:
Refer to: http://www.densitypower.com