Technical Specification

AES15W2 Series

15W, Universal Input AC/DC Converters

FEATURES

- Wide input range: 85-265VAC/120-370VDC
- 15W isolated outputs
- Efficiency up to 84%
- Single, bipolar and dual outputs: 5, 12, 15, 24, ±5, ±12, ±15, 5/15VDC, isolated
- Fixed switching frequency, predicted EMI
- Stable @ no-load operation
- Reinforced isolation: 3KVAC I/O
- Impact size, 2.44"×1.77"×0.89"
- Extensive self-protection, OCP and short circuit protection
- Outstanding thermal performance, full power @70°C ambient temperature
- Fully encapsulated, high reliability
- Compliance with IEC/EN 62368-1 safety standard

PRODUCT OVERVIEW

The AES15W2 series use advanced power processing, control and packaging technologies to provide the high performance, flexibility, reliability and cost effectiveness of a mature power converter. Wide input range of 85-265VAC/120-370VDC (220VAC nominal) is ideal for automation, power grid, industrial control, data acquisition, signal control, instrumentation, test and measurement, and distribution power system.

A wealth of self-protection features included over temperature shutdown, over current protection with "hiccup" autorestart technique, and indefinite short-circuit protection.

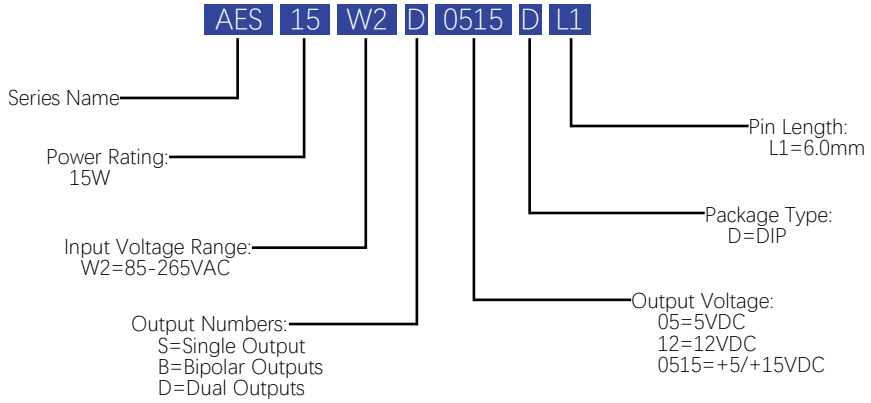
Advanced fully encapsulated package technology provides outstanding thermal performance, delivers full power @ 70℃ ambient temperature, no need for extra heat-sink, which is ideal for ruggedized applications involving harsh environments.

The AES15W2 series are designed to safety standards IEC/EN 62368-1.

Models Selections

Basic Models	Input Voltage [VAC]	Input Voltage Range [VAC]/[VDC]	Output Voltage [VDC]	Output Current [A]	Capacitive Load Max. [μF]	Efficiency typ. [%]	Package [inch]
AES15W2S05	220	85-265/120-370	5	3.00	2200	76	2.44"×1.77"×0.89"
AES15W2S12	220	85-265/120-370	12	1.25	470	80	
AES15W2S15	220	85-265/120-370	15	1.00	470	81	
AES15W2S24	220	85-265/120-370	24	0.65	220	84	
AES15W2B05	220	85-265/120-370	±5	±1.50	±2200	76	
AES15W2B12	220	85-265/120-370	±12	±0.63	±470	81	
AES15W2B15	220	85-265/120-370	±15	±0.50	±470	83	
AES15W2D0515	220	85-265/120-370	+5/+15	1.8/0.4	2200/470	80	

Model Numbering



Absolute Maximum Ratings

Parameters	Conditions	Min.	Typ.	Max.	Units
Operating Case Temperature		-40		95	°C
Operating Environment Temperature		-40		70	°C
Storage Temperature Range		-40		85	°C
Soldering Temperature	Wave Soldering < 10s			260	°C

EMC Compliance

Conducted Emission	EN55032	Class B (with external filter)
Radiated Emission	EN55032	Class B (with external filter)
Conducted Susceptibility	IEC/EN61000-4-6	10Vrms, Criteria A
Radiated Susceptibility	IEC/EN61000-4-3	3V/m, Criteria A
EFT	IEC/EN61000-4-4	±2KV, Criteria A (With external filter)
Surge	IEC/EN61000-4-5	Line to line ±1KV, line to PE ±2KV
ESD	IEC/EN61000-4-2	±4KV Contact ±8KV Air Criteria A
Voltage Fluctuations	IEC/EN61000-3-3	Complies
Voltage Dips, Interruptions	IEC/EN61000-4-11	Class 2, Criteria B

General Specifications					
Parameters	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	Input to output		3000		VAC
	Input to PE		1500		VAC
	Output to PE		500		VAC
	Vout1 to Vout2		500		VDC
Isolation Resistance (Viso=500VDC)	Input to output		10		MΩ
	Input to PE		10		MΩ
	Output to PE		10		MΩ
Leakage Current				2	mA
Isolation Safety Rating	Reinforced insulation				
Switching Frequency			100		KHz
Vibration	IEC61373:1999 Category I, Class B, Body mounted				
Shock	IEC61373:1999 Category I, Class B, Body mounted				

Input Specifications					
Parameters	Conditions	Min.	Typ.	Max.	Units
Operating Voltage Range		85	220	265	VAC
		120		370	VDC
Rise Time		20			mS

Performance Data (5 Vout Type)

Output Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Output Power				15	W
Output Voltage Setpoint		4.85	5.00	5.15	V
Vout Accuracy		-3		+3	%
Line Regulation		-0.5		+0.5	%
Load Regulation		-1		+1	%
Temperature Coefficient		-0.02		+0.02	% of Vout /°C
Total Regulation		-5		+5	%
Over Current Protection	Hiccup	120			% of Iout
Short Circuit Protection	Hiccup, auto recover				
Ripple & Noise Max. ①				100	mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response			500		μS
Capacitive Load		0		2200	μF
Minimum Load	No minimum load requirement				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 17 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 Type)

Output Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Output Power				15	W
Output Voltage Setpoint		11.64	12.00	12.36	V
Vout Accuracy		-3		+3	%
Line Regulation		-0.5		+0.5	%
Load Regulation		-1		+1	%
Temperature Coefficient		-0.02		+0.02	% of Vout /°C
Total Regulation		-5		+5	%
Over Current Protection	Hiccup	120			% of Iout
Short Circuit Protection	Hiccup, auto recover				
Ripple & Noise Max. ①				120	mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response			500		μS
Capacitive Load		0		470	μF
Minimum Load	No minimum load requirement				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 17 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 Type)

Output Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Output Power				15	W
Output Voltage Setpoint		14.55	15.00	15.45	V
Vout Accuracy		-3		+3	%
Line Regulation		-0.5		+0.5	%
Load Regulation		-1		+1	%
Temperature Coefficient		-0.02		+0.02	% of Vout /°C
Total Regulation		-5		+5	%
Over Current Protection	Hiccup	120			% of Iout
Short Circuit Protection	Hiccup, auto recover				
Ripple & Noise Max. ①				150	mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response			500		μS
Capacitive Load		0		470	μF
Minimum Load	No minimum load requirement				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 17 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 Type)

Output Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Output Power				15	W
Output Voltage Setpoint		23.28	24.00	24.72	V
Vout Accuracy		-3		+3	%
Line Regulation		-0.5		+0.5	%
Load Regulation		-1		+1	%
Temperature Coefficient		-0.02		+0.02	% of Vout /°C
Total Regulation		-5		+5	%
Over Current Protection	Hiccup	120			% of Iout
Short Circuit Protection	Hiccup, auto recover				
Ripple & Noise Max. ①				240	mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response			500		μS
Capacitive Load		0		220	μF
Minimum Load	No minimum load requirement				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 17 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 Type)

Output Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Output Power				15	W
Output Voltage Setpoint		±4.85	±5.00	±5.15	V
Vout Accuracy		-3		+3	%
Line Regulation		-0.5		+0.5	%
Load Regulation		-1		+1	%
Temperature Coefficient		-0.02		+0.02	% of Vout /°C
Total Regulation		-5		+5	%
Over Current Protection	Hiccup	120			% of Iout
Short Circuit Protection	Hiccup, auto recover				
Ripple & Noise Max. ①				100	mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response			500		μS
Capacitive Load		0		±2200	μF
Minimum Load	No minimum load requirement				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 17 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 Type)

Output Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Output Power				15	W
Output Voltage Setpoint		±11.64	±12.00	±12.36	V
Vout Accuracy		-3		+3	%
Line Regulation		-0.5		+0.5	%
Load Regulation		-1		+1	%
Temperature Coefficient		-0.02		+0.02	% of Vout /°C
Total Regulation		-5		+5	%
Over Current Protection	Hiccup	120			% of Iout
Short Circuit Protection	Hiccup, auto recover				
Ripple & Noise Max. ①				120	mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response			500		μS
Capacitive Load		0		±470	μF
Minimum Load	No minimum load requirement				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 17 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 Type)

Output Specifications

Parameters	Conditions	Min.	Typ.	Max.	Units
Output Power				15	W
Output Voltage Setpoint		±14.55	±15.00	±15.45	V
Vout Accuracy		-3		+3	%
Line Regulation		-0.5		+0.5	%
Load Regulation		-1		+1	%
Temperature Coefficient		-0.02		+0.02	% of Vout /°C
Total Regulation		-5		+5	%
Over Current Protection	Hiccup	120			% of Iout
Short Circuit Protection	Hiccup, auto recover				
Ripple & Noise Max. ①				150	mV pk-pk
Dynamic Load Peak Deviation		-5		+5	%
Dynamic Load Response			500		μS
Capacitive Load		0		±470	μF
Minimum Load	No minimum load requirement				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 17 for more details.

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

Performance Data (+5/+15 Vout Type)

Output Specifications

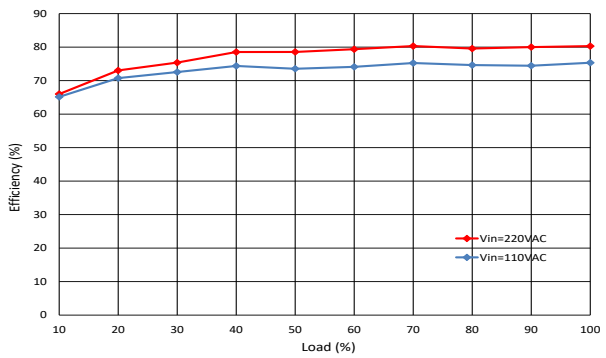
Parameters	Conditions	Min.	Typ.	Max.	Units
Output Power				15	W
Output Voltage Setpoint	Vout1	4.85	5.00	5.15	V
	Vout2	14.45	15.00	15.55	V
Vout Accuracy		-3		+3	%
Line Regulation		-0.5		+0.5	%
Load Regulation		-1		+1	%
Temperature Coefficient		-0.02		+0.02	% of Vout /°C
Total Regulation		-5		+5	%
Over Current Protection	Hiccup	120			% of Iout
Short Circuit Protection	Hiccup, auto recover				
Ripple & Noise Max. ①	Vout1			100	mV pk-pk
	Vout2			150	mV pk-pk
Dynamic Load Peak Deviation ②		-5		+5	%
Dynamic Load Response			500		μS
Capacitive Load	Vout1	0		2200	μF
	Vout2	0		470	μF
Minimum Load	No minimum load requirement				

Notes
① Ripple & noise is tested with certain filter parameters, please see output ripple & noise in technical notes on page 17 for more details.
② The load of vout1 is set from 50%-75%-50% of Imax, di/dt=0.1A/μS, Cout=68μF, the Vout2 is half load, Cout=68μF, please refer to dynamic waveforms in performance data on page 12 for details.

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

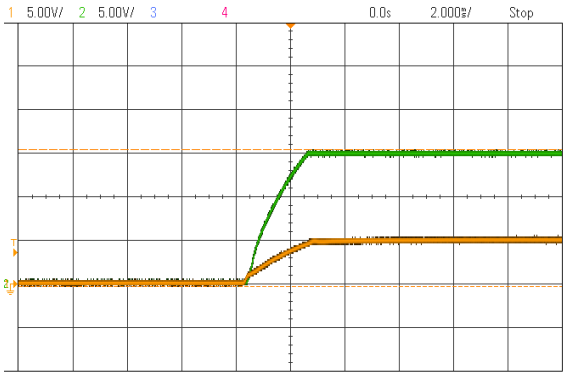
Performance Data (+5/+15 Vout Type)

EFFICIENCY VS LOAD



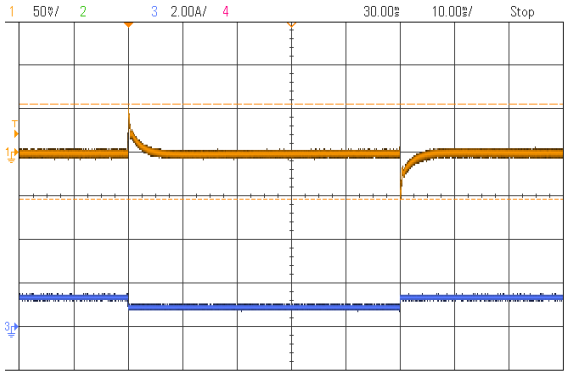
START UP

Ch1: Vout1 Ch2: Vout2



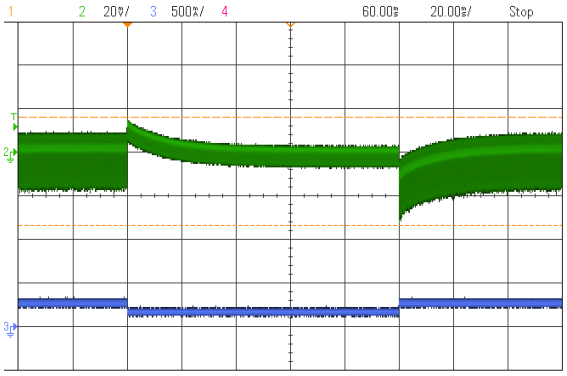
DYNAMIC RESPONSE Ch1: Vout1 Ch3: Iout1

50%~75%~50% of I_{max}, di/dt=0.1A/μs



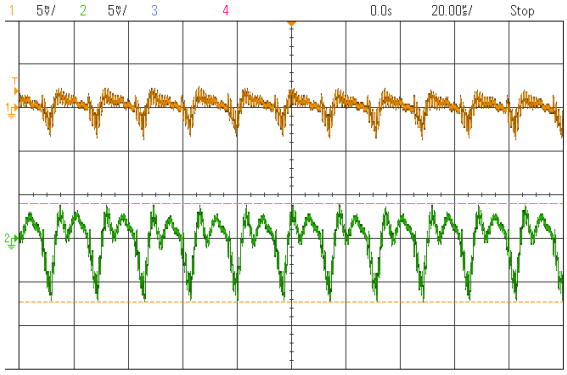
DYNAMIC RESPONSE Ch2: Vout2 Ch3: Iout2

50%~75%~50% of I_{max}, di/dt=0.1A/μs

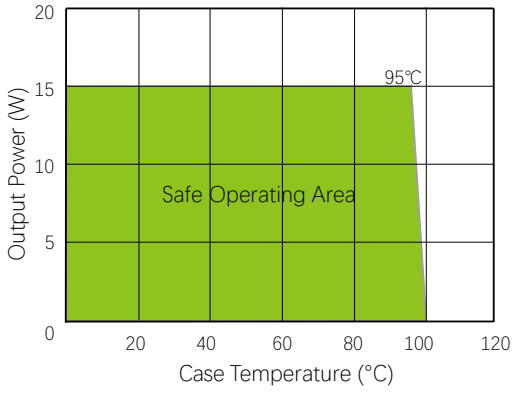


RIPPLE & NOISE 20MHz BANDWIDTH

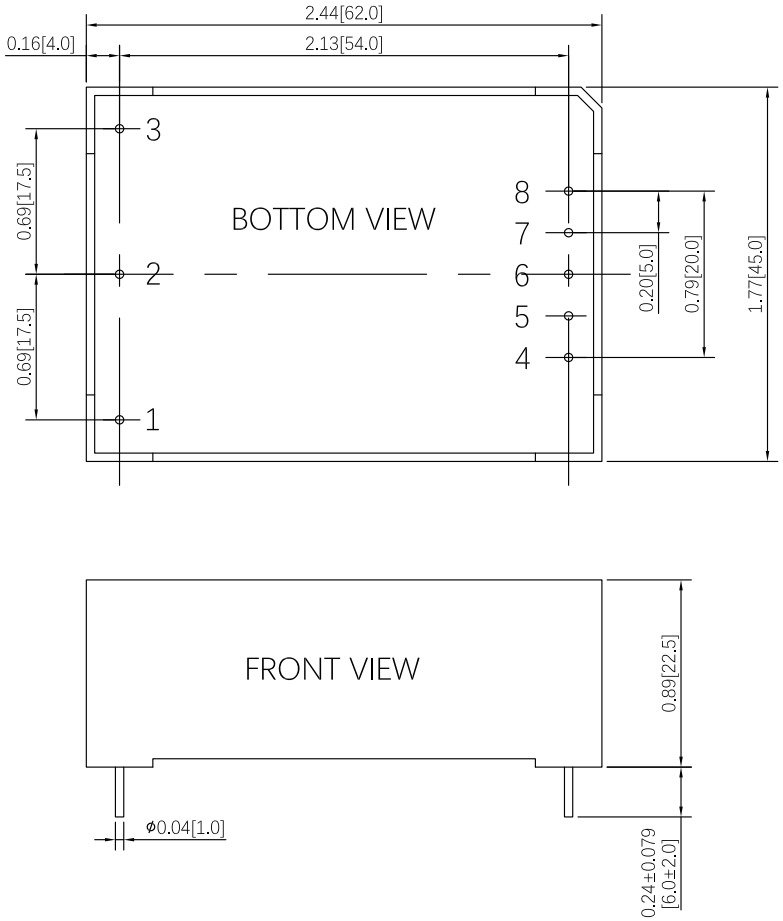
Ch1: Vout1 Ch2: Vout2



THERMAL DERATING



Mechanical Specifications



PIN:
PIN1~PIN8: Φ0.04inch
Material: Copper Alloy
Finish: Matte Tin Over Nickel Plate

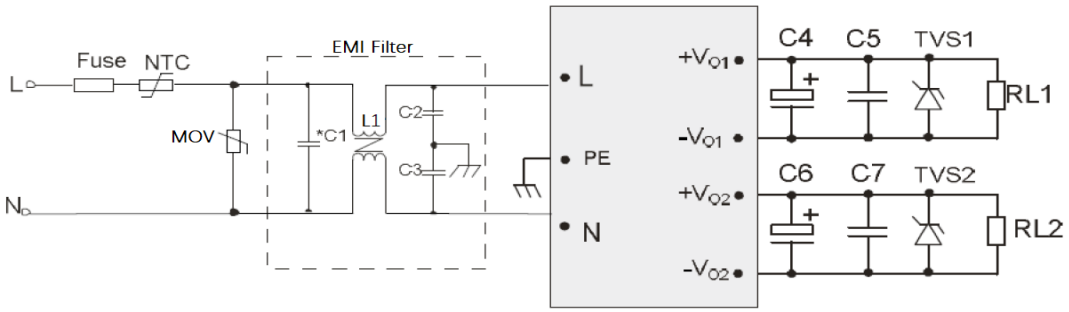
TOLERANCE:
X.XX=±0.02[0.5]
X.XXX= ±0.010[0.25]

Dimensions are in inches [mm]
Weight: ~80g.

PIN CONNECTIONS					
Single Output		Bipolar Outputs		Dual Outputs	
Pin	Function	Pin	Function	Pin	Function
1	PE	1	PE	1	PE
2	AC (N)	2	AC (N)	2	AC (N)
3	AV (L)	3	AV (L)	3	AC (L)
4	-Vout	4	-Vout	4	-Vout1
5	N/A	5	N/A	5	+Vout1
6	N/A	6	COM	6	N/A
7	N/A	7	N/A	7	-Vout2
8	+Vout	8	+Vout	8	+Vout2

Emissions Performance

Density Power measures its products for conducted emissions and radiated emission against the EN55032 standards. The AC/DC converter passed EN55032 conducted emission and radiated emission Class B with add the recommended EMI filter shows as below:



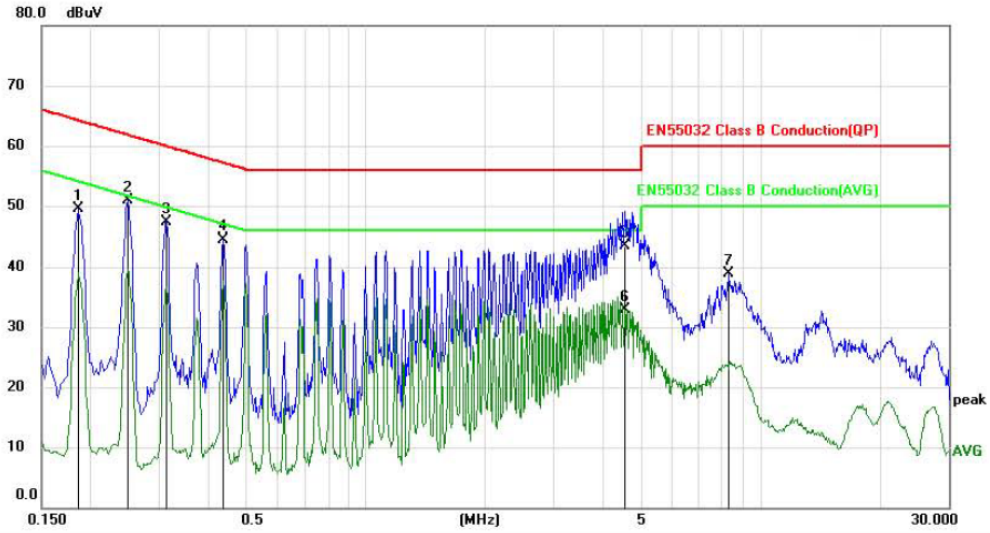
Conducted Emissions and Radiated Emission Test Circuit

Recommended Filter Parameters

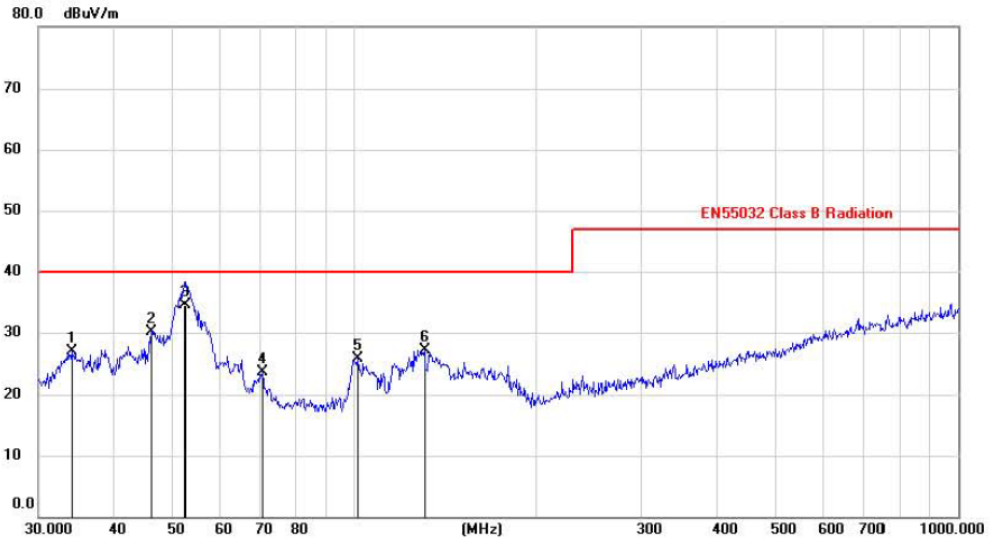
REFERENCE	DESCRIPTION	REFERENCE	DESCRIPTION
Fuse	FUSE, 3.15A/250V, Slow-blown	C4	470μF
NTC	Thermistor, 5D-9	C6	100μF
MOV	Piezoresistor, S20K300	C5, C7	0.1μF
C1	0.22μF/275VAC, X2	L1	10~30mH, 15mH commode choke
C2	2200PF/400VAC, Y2	TVS1	TVS, 5.8V
C3	2200PF/400VAC, Y2	TVS2	TVS, 17.5V
NOTE	In case that custormer requires special EMC performance for particular applications, please optimize the EMI filter or contact our FAE for support.		

Emissions Performance

Conducted Emission Test Results:



Radiated Emission Test Results:



Technical Notes

INPUT FUSING

Certain applications may require fuse at the inputs of power conversion components. The AES15W2 modules are not internally fused. We strongly recommend a slow-blown fuse to be used.
For safety agency approvals, the installer must install the converter in compliance with the end user safety standard.

TYPICAL APPLICATION CONNECTION

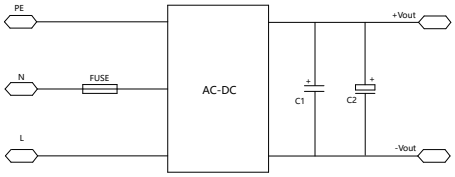


Figure 1·Typical Application Connection (Single Output)

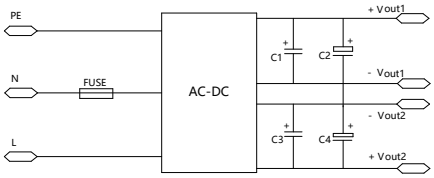


Figure 2·Typical Application Connection (Common Ground)

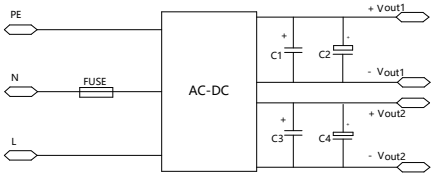


Figure 3·Typical Application Connection (Vout1 and Vout2 Isolated)

Figure 1 shows the typical use of the single output module connection. Figure 2 shows the typical use of the bipolar outputs module connection. The outputs are used as common ground. Figure 3 shows the typical use of the dual outputs module connection. The Vout1 and Vout2 are isolated.

OUTPUT RIPPLE & NOISE

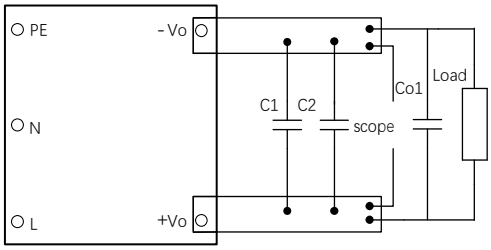


Figure 4· Output Ripple (Single Output)

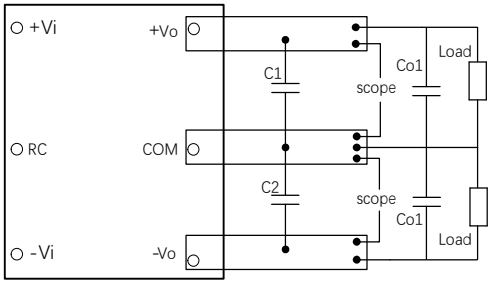


Figure 4· Output Ripple (Common Ground)

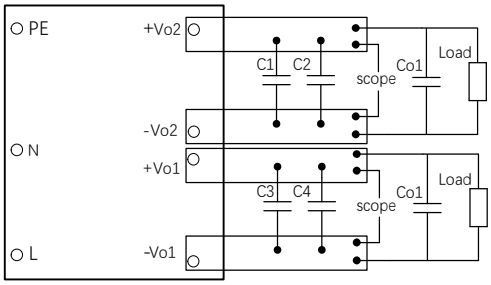


Figure 4· Output Ripple (Vout1 and Vout2 Isolated)

These AES15W2 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 (& C3 & C4) shown in the figures above. The scope's bandwidth is set to 20MHz.
External output capacitors are required to further reduce the ripple & noise. The output capacitors

Technical Notes

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 a “hiccup mode” where it repeatedly turns on and off until the short circuit 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.

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