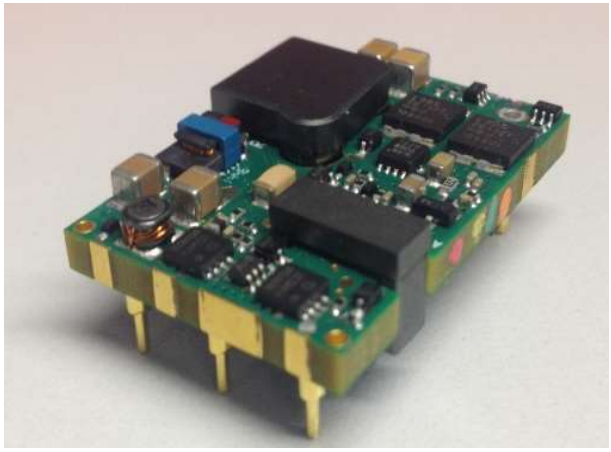
AVD85-48S05

85 Watts
Sixteenth-Brick Converter

Total Power: 85 Watts
Input Voltage: 36 to 75 Vdc
# of Outputs: Single



Special Features

- Delivering up to 17A output current
- Ultra-high efficiency 93.5% typ. at 50% load
- Wide input range: 36V ~ 75V
- Excellent thermal performance
- No minimum load requirement
- Basic isolation
- High power density
- Low output noise
- Reflow soldering-able
- RoHS 6 compliant
- Remote control function (negative logic)
- Remote output sense
- Trim function: 80% ~ 110%
- Input under voltage lockout
- Output over current protection
- Output short circuit protection
- Output over voltage protection
- Over temperature protection

Safety

IEC/EN/UL/CSA 60950
2006/95/EEC, 93/68/EEC
UL/TUV
UL94,V-0
CE Marking
EN55022 Class A

Product Descriptions

The AVD85-48S05 series is a single output DC/DC converter with standard sixteenth -brick form factor and pin configuration. It delivers up to 17A output current with 5V output. Above 93.5% efficiency and excellent thermal performance makes it an ideal choice to supply power in datacom and telecommunication applications and can operate over an ambient temperature range of -40 ^{O}C ~ +85 ^{O}C.

Applications

Telecom/ Datacom

ARTESYN™
An Advanced Energy Company

Model Numbers

Standard	Output Voltage	Structure	Remote ON/OFF logic	RoHS Status
AVD85-48S05-6L	5Vdc	Open-frame	Negative	R6
AVD85-48S05B-6L	5Vdc	Baseplate	Negative	R6
AVD85-48S05-TL	5Vdc	Open-frame	Negative	R6

Ordering information

AVD85	-	48	S	05	P	B	-	6	L
①		②	③	④	⑤	⑥		⑦	⑧

①	Model series	AVD: Standard sixteenth-brick series, 85: output power 85W
②	Input voltage	48: 36V ~ 75V input range, rated input voltage 48V
③	Output number	S: single output
④	Rated output voltage	05: 5V output
⑤	Remote ON/OFF logic	Default: negative logic; P: positive logic
⑥	Baseplate	B: with baseplate; default: open-frame
⑦	Pin length	T:SMT, 6: 3.8mm Pin Length
⑧	RoHS status	Y: Rohs, R5; L: RoHS, R6

Options

None

Electrical Specifications

Absolute Maximum Ratings

Stress in excess of those listed in the "Absolute Maximum Ratings" may cause permanent damage to the power supply. These are stress ratings only and functional operation of the unit is not implied at these or any other conditions above those given in the operational sections of this TRN. Exposure to any absolute maximum rated condition for extended periods may adversely affect the power supply's reliability.

Table 1. Absolute Maximum Ratings:

Parameter	Model	Symbol	Min	Typ	Max	Unit
Input Voltage						
Operating -Continuous	All	$V_{IN,DC}$	-	-	80	Vdc
Non-operating -100mS	All		-	-	100	Vdc
Maximum Output Power	All	$P_{O,max}$	-	-	85	W
Isolation Voltage[1]						
Input to outputs	All		-	-	2250	Vdc
Ambient Operating Temperature	All	T_A	-40	-	+85	^{O}C
Storage Temperature	All	T_{STG}	-55	-	+125	^{O}C
Voltage at remote ON/OFF pin	All		-0.3	-	5	Vdc
Humidity (non-condensing)						
Operating	All		-	-	95	%
Non-operating	All		-	-	95	%

Note 1 - 1mA for 60s, slew rate of 1500V/10s

Input Specifications

Table 2. Input Specifications:

Parameter	Conditions[1]	Symbol	Min	Typ	Max	Unit
Operating Input Voltage, DC	All	$V_{IN,DC}$	36	48	75	Vdc
Turn-on Voltage Threshold	$I_O = I_{O,max}$	$V_{IN,ON}$	31	-	36	Vdc
Turn-off Voltage Threshold	$I_O = I_{O,max}$	$V_{IN,OFF}$	30	-	35	Vdc
Lockout Voltage Hysteresis	$I_O = I_{O,max}$		1	-	3	V
Maximum Input Current ($I_O = I_{O,max}$)	$V_{IN,DC} = 36V_{DC}$	$I_{IN,max}$	-	-	4	A
Recommended Input Fuse	Fast blow external fuse recommended		-	-	5	A
Recommended External Input Capacitance	Low ESR capacitor recommended	C_{IN}	100	-	-	uF
Input Reflected Ripple Current	Through 12uH inductor		-	-	40	mA
Operating Efficiency	T_A=25 ^{O}C $I_O = I_{O,max}$ I_O = 50% $I_{O,max}$	η	- -	93 93.5	- -	% %

Note 1 - Ta = 25 ^{O}C, airflow rate = 400 LFM, Vin = 48Vdc, nominal Vout unless otherwise noted.

Output Specifications

Table 3. Output Specifications:

Parameter		Conditions[1]	Symbol	Min	Typ	Max	Unit
Factory Set Voltage		$V_{IN,DC}$ = 48V_{DC} I_O= 100% $I_{O,max}$	V_O	4.92	5.00	5.08	Vdc
Total Output Range		Over sample, line, load, temperature & life	V_O	4.85	5.00	5.15	Vdc
Output Voltage Line Regulation		All	%V_O	-	-	0.2	%
Output Voltage Load Regulation		All	%V_O	-	-	0.5	%
Output Voltage Temperature Regulation		All	%V_O	-	-	0.02	%/^{O}C
Output Voltage Trim Range		All	V_O	4	-	5.5	V
Output Ripple, pk-pk		Measure with a 1uF ceramic capacitor in parallel with a 10uF tantalum capacitor, 0 to 20MHz bandwidth	V_O	-	80	-	mV_{PK-PK}
Output Current		All	I_O	0	-	17	A
Output DC current-limit inception[2]		All		18.7		28.9	A
V_O Load Capacitance[3]		All	C_O	220	1000	10000	uF
V_O Dynamic Response	Peak Deviation	25%~50%~25% 50%~75%~50% 25% load change slew rate = 0.1A/us	±V_O	-	-	150	mV
	Settling Time		T_s	-	-	200	uSec
	Peak Deviation	25%~50%~25% 50%~75%~50% 25% load change slew rate = 1A/us	±V_O	-	-	300	mV
	Settling Time		T_s	-	-	200	uSec
Turn-on transient	Rise time	I_O = I_{max}	T_{rise}	-	-	50	mS
	Turn-on delay time	I_O = I_{max}	$T_{turn-on}$	-	-	100	mS
	Output voltage overshoot	I_O = 0	%V_O	-	-	5	%
Switching frequency		All	f_{SW}	-	240	-	KHz
Remote ON/OFF control (Positive logic)	Off-state voltage	All		-0.3	-	1.2	V
	On-state voltage	All		3.5	-	5	V

Note 1 - Ta = 25 ^{O}C, airflow rate = 300 LFM, Vin = 48Vdc, nominal Vout unless otherwise noted.

Note 2 - Hiccup: auto-restart when over-current condition is removed

Note 3 - High frequency and low ESR is recommended.

Output Specifications

Table 3. Output Specifications, con't:

Parameter		Condition	Symbol	Min	Typ	Max	Unit
Remote ON/OFF control (Negative logic)	Off-state voltage	All		3.5	-	5	V
	On-state voltage	All		-0.3	-	1.2	V
Output over-voltage protection[4]		All	$\%V_O$	116	-	150	%
Output over-temperature protection[5]		No baseplate	T	110	-	135	^OC
		Baseplate		85		125	^OC
Over-temperature hysteresis		All	T	5	-	-	^OC
Output voltage remote sense range		All	%Vo	-	-	5	%
MTBF		Telcordia SR-332-2006; 80% load, 300LFM, 40 ^OC T_A		-	2.0	-	10^6 h

Note 4 - Hiccup: auto-restart when over-voltage condition is removed.
Note 5 - Auto recovery.

AVD85-48S05 Series Performance Curves

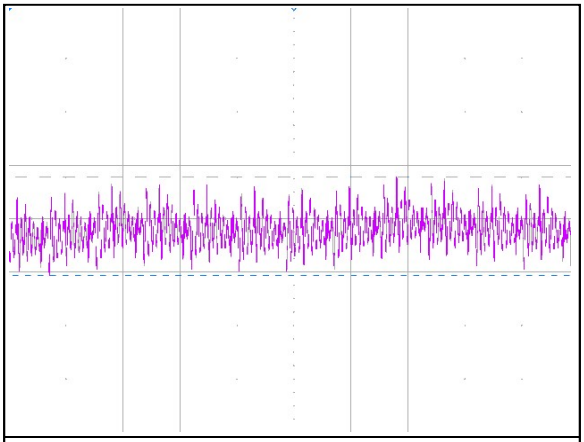


Figure 1: AVD85-48S05 Series Input Reflected Ripple Current Waveform

Ch 1: Iin (5uS/div, 10mA/div)

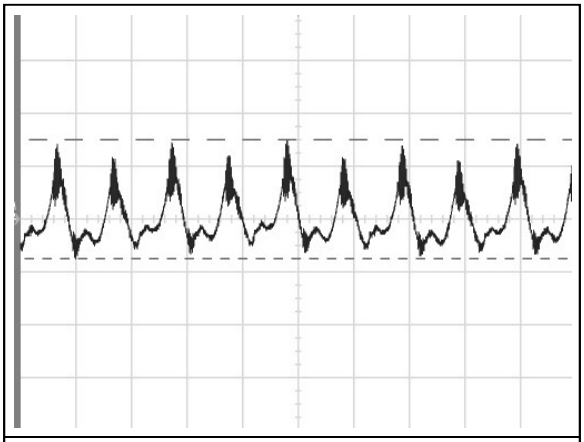


Figure 2: AVD85-48S05 Series Ripple and Noise Measurement

Ch 1: Vo (2uS/div, 20mV/div)

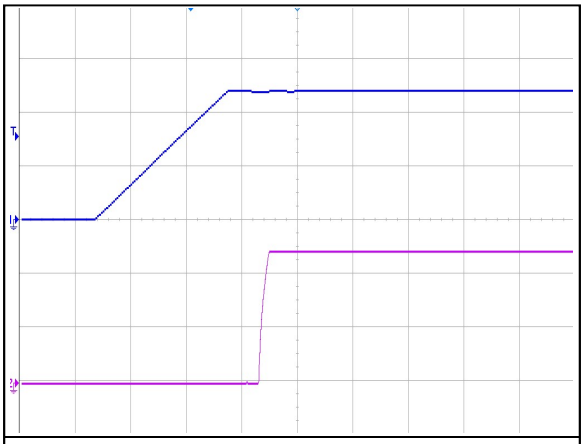


Figure 3: AVD85-48S05 Series Output Voltage Startup Characteristic (20mS/div)

Ch 1: Vin (20V/div) Ch 2: Vo (2V/div)

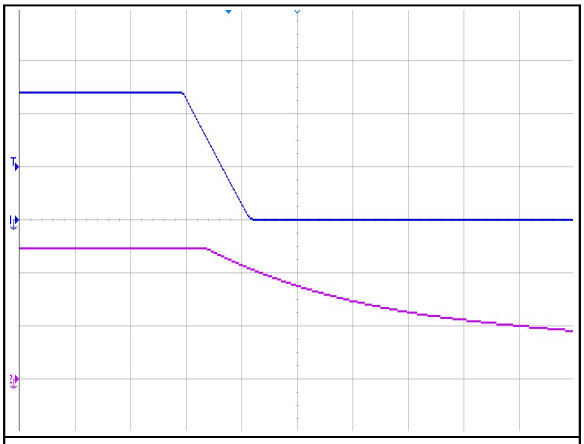


Figure 4: AVD85-48S05 Series Turn Off Characteristic (100mS/div)

Ch 1: Vin (20V/div) Ch 2: Vo (2V/div)

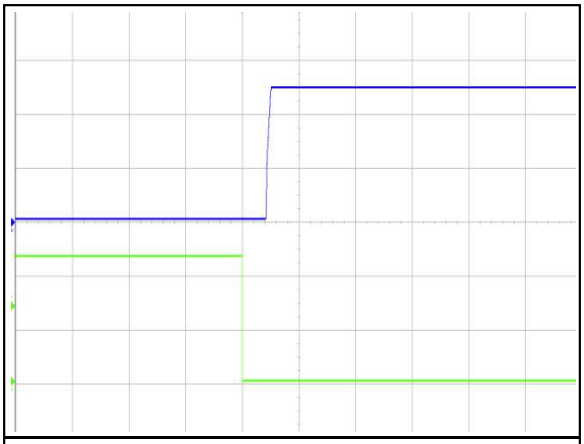


Figure 5: AVD85-48S05 Series Remote ON Waveform (50mS/div)

Ch 1: Vo (2V/div) Ch 3: Remote ON (2V/div)

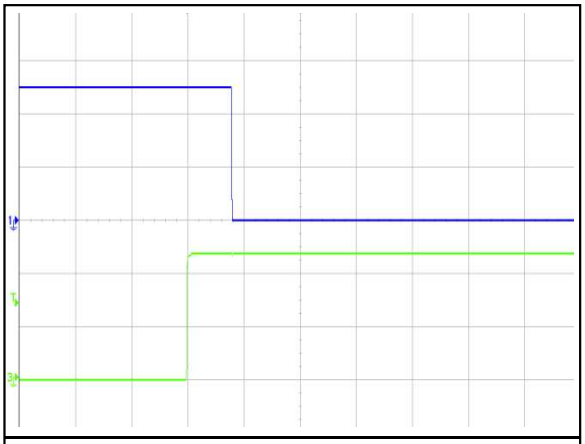


Figure 6: AVD85-48S05 Series Remote OFF Waveform (20mS/div)

Ch 1: Vo (2V/div) Ch 3: Remote ON (2V/div)

AVD85-48S05 Series Performance Curves

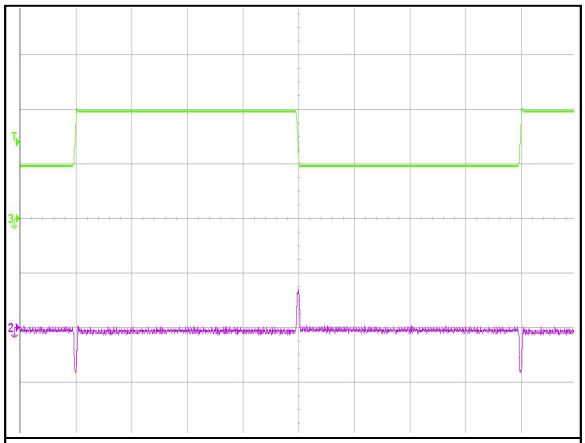


Figure 7: AVD85-48S05 Series Transient Response (1mS/div)
25%~50%~25% load change, 0.1A/uS slew rate
Ch 2: Vo (50mV/div) Ch 3: Io (5A/div)

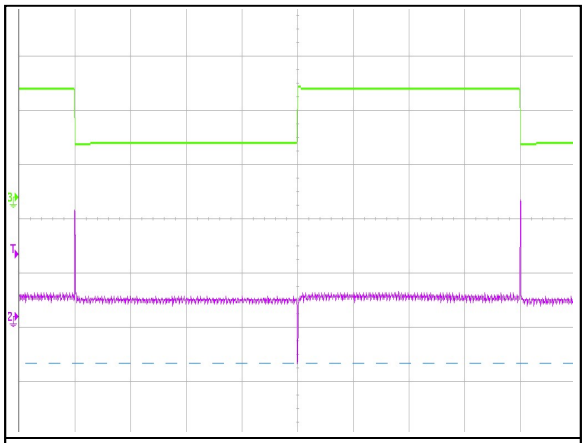


Figure 8: AVD85-48S05 Series Transient Response (1mS/div)
25%~50%~25% load change, 1A/uS slew rate
Ch 1: Io (50mV/div) Ch 3: Io (5A/div)

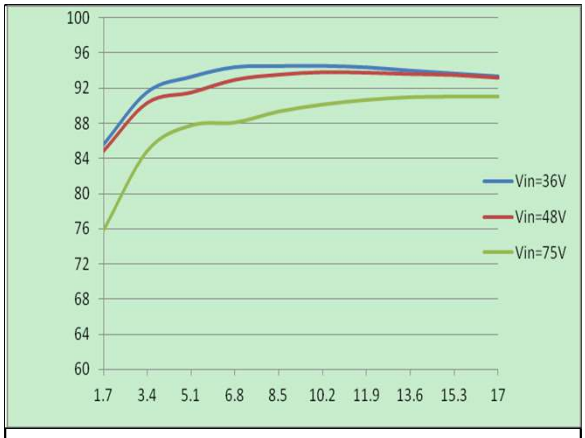
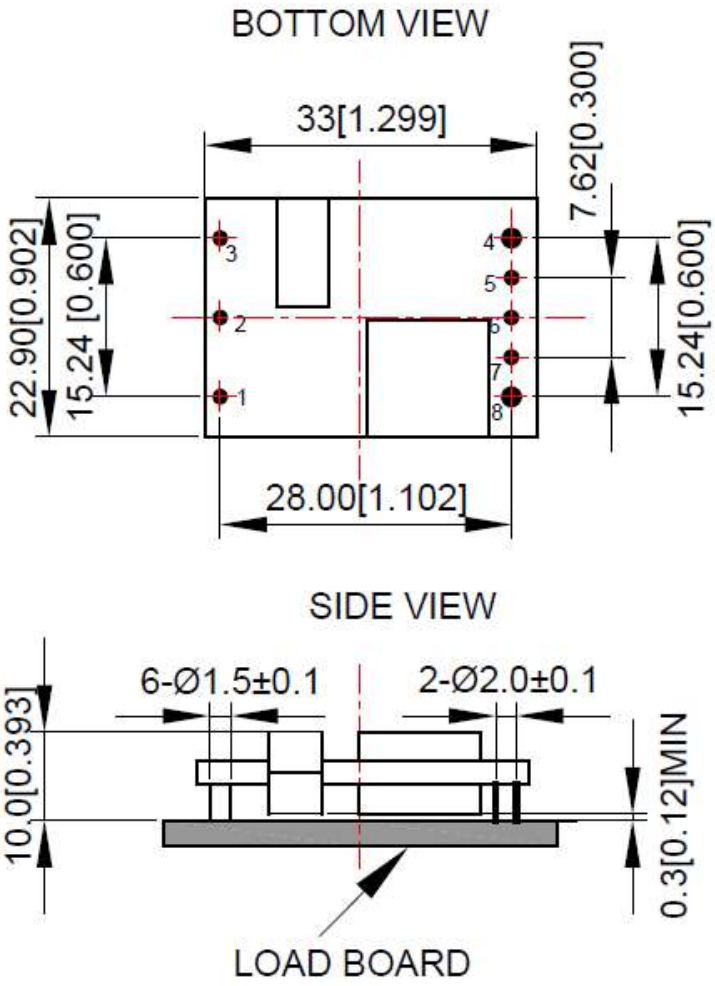


Figure 9: AVD85-48S05 Series Efficiency Curves @ 25 ^{O}C, 200LFM, Vo=5V
Loading: Io = 10% increment to 17A

Mechanical Specifications

Mechanical Outlines – Surface Mounted Module

AVD85-48S05TL



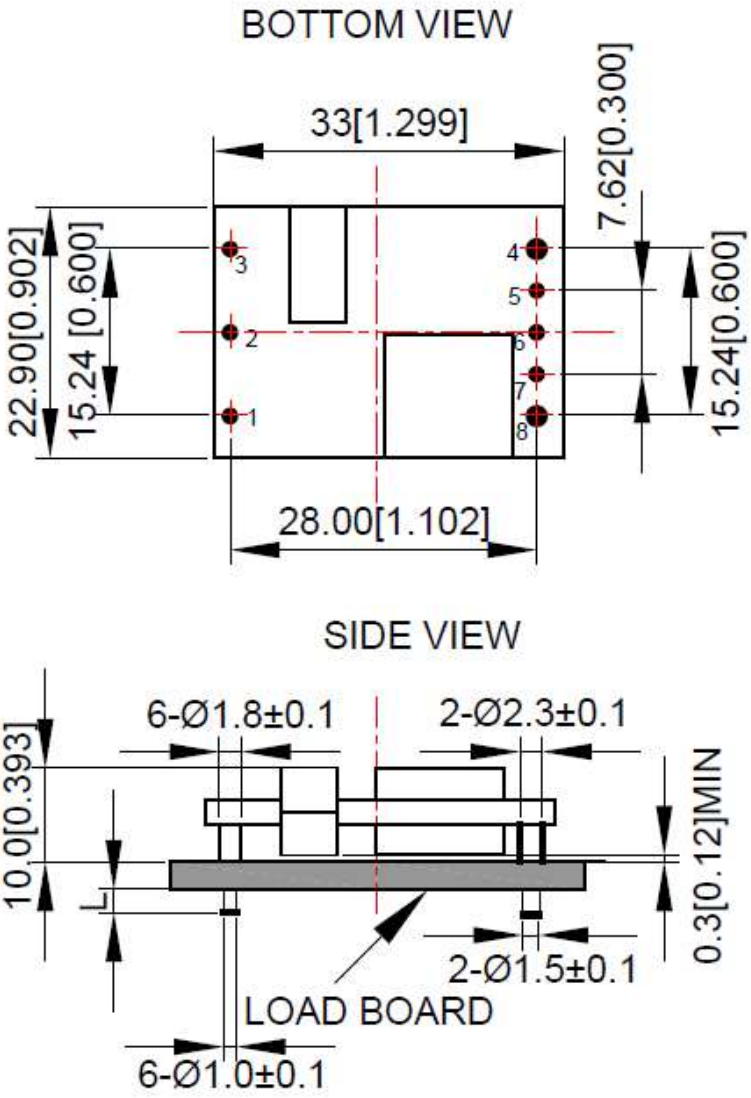
UNIT: mm[inch]

BOTTOM VIEW: pin on upside

TOLERANCE: X.Xmm±0.5mm[X.XX in.±0.02in.]
X.XXmm±0.25mm[X.XXX in.±0.01in.]

Mechanical Outlines – Open Frame Module

AVD85-48S05-6L



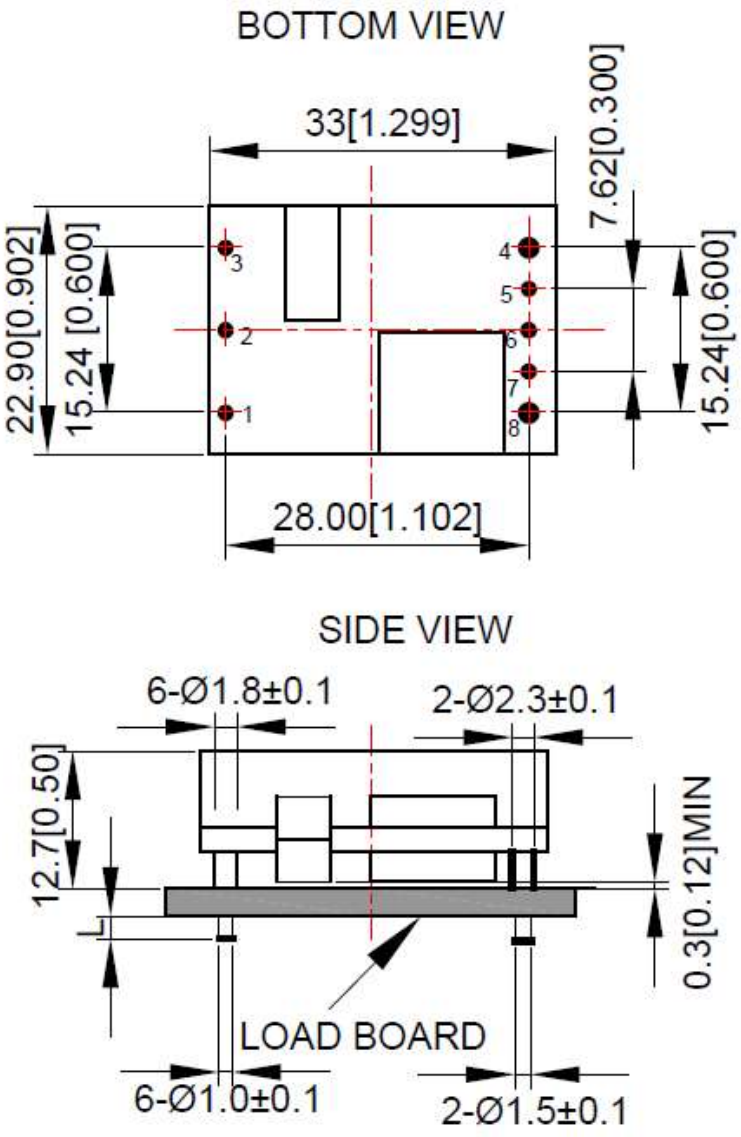
UNIT: mm[inch]

BOTTOM VIEW: pin on upside

TOLERANCE: X.Xmm±0.5mm[X.XX in.±0.02in.]
X.XXmm±0.25mm[X.XXX in.±0.01in.]

Mechanical Outlines – Baseplate Module

AVD85-48S05B-6L



UNIT: mm[inch]

BOTTOM VIEW: pin on upside

TOLERANCE: X.Xmm±0.5mm[X.XX in.±0.02in.]
X.XXmm±0.25mm[X.XXX in.±0.01in.]

Pin Designations

Pin No	Name	**Function**
1	Vin+	Positive input voltage
2	Remote On/Off	ON/OFF control terminal
3	Vin-	Negative input voltage
4	Vo-	Negative output voltage
5	Sense-	Negative remote sense
6	Trim	Output voltage trim
7	Sense+	Positive remote sense
8	Vo+	Positive output voltage

Pin Designations

Device code suffix	L
-4	±0.25mm
-6	±0.25mm
-8	±0.25mm
None	±0.25mm

Environmental Specifications

EMC Immunity

AVD85-48S05 series power supply is designed to meet the following EMC immunity specifications:

Table 4. Environmental Specifications:

Document	Description	Criteria
EN55022 DC input port, Class A Limits	Conducted Emission	/
IEC/EN 61000-4-2 Enclosure Port, Level 3	Immunity to Electrostatic Discharge	B
IEC/EN 61000-4-6, DC input port, Level 2	Immunity to Continuous Conducted Interference	A
IEC/EN 61000-4-4 DC input port, Level3	Immunity to Electrical Fast Transient	B
IEC/EN 61000-4-5 DC input port Line to Ground(earth): 650V Line to Line: 650V	Immunity to Surges	B
EN61000-4-29 DC input port	Immunity to Voltage Dips and Short Interruptions and Voltage Variations	B

Criterion A: Normal performance during and after test.

Criterion B: For EFT and surges, low-voltage protection or reset is not allowed. Temporary output voltage fluctuation ceases after disturbances ceases, and from which the EUT recovers its normal performance automatically. For Dips and ESD, output voltage fluctuation or reset is allowed during the test, but recovers to its normal performance automatically after the disturbance ceases.

Criterion C: Temporary loss of output, the correction of which requires operator intervention.

Criterion D: Loss of output which is not recoverable, owing to damage of hardware.

EMC Test Conditions

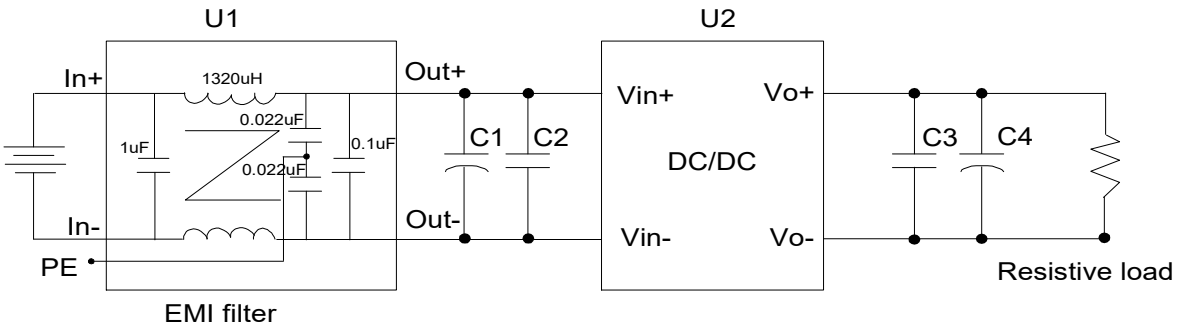


Figure 10 EMC test configuration

U1: Input EMC filter

U2: Module to test, AVD85-48S05

C1~ C4: See Figure 15

Safety Certifications

The AVD85-48S05 series power supply is intended for inclusion in other equipment and the installer must ensure that it is in compliance with all the requirements of the end application. This product is only for inclusion by professional installers within other equipment and must not be operated as a stand alone product.

Table 5. Safety Certifications for AVD85-48S05 series power supply system

Document	File #	Description
UL/CSA 60950		US and Canada Requirements
EN60950		European Requirements
IEC60950		International Requirements
CE		CE Marking

Operating Temperature

The AVD85-48S05 series power supplies will start and operate within stated specifications at an ambient temperature from -40 ^{O}C to 85 ^{O}C under all load conditions. The storage temperature is -55 ^{O}C to 125 ^{O}C.

Thermal Considerations – Open-Frame module

The converter is designed to operate in different thermal environments and sufficient cooling must be provided. Proper cooling can be verified by measuring the temperature at the test points as shown in the figure 11. The temperature at these test points should not exceed the maximum values in Table 6.

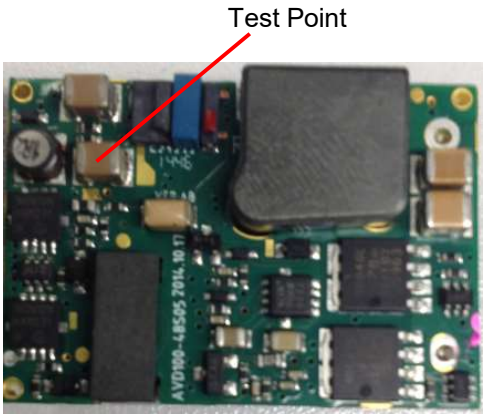


Figure 11 Temperature test point

Table 6. Temperature limit of the test points

Test Point	Temperature Limit
Test point	115 ^{O}C

For a typical application, figure 12 shows the derating of output current vs. ambient air temperature at different air velocity.

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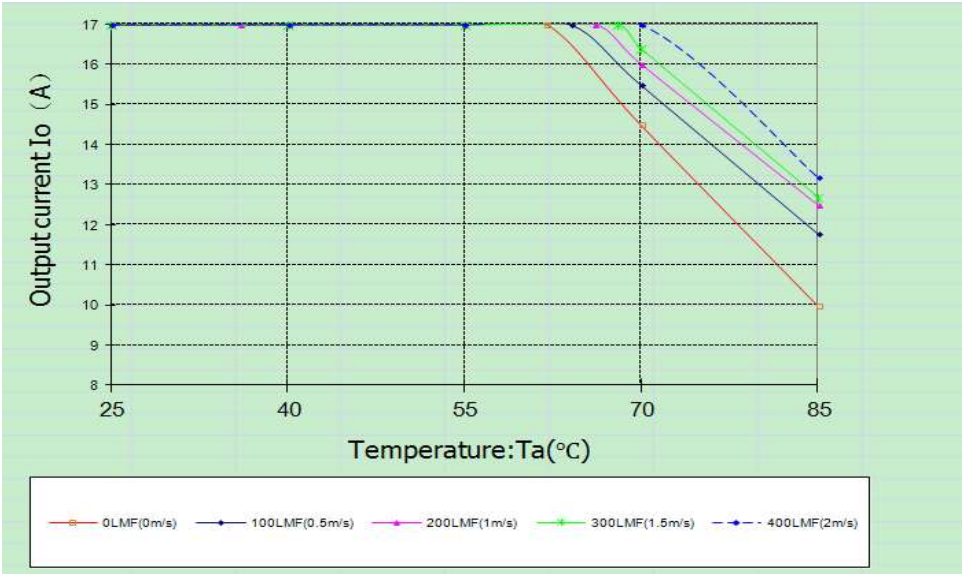

Figure 12 Output power derating, 48Vin, air flowing across the converter from pin 3 to pin 1

Thermal Considerations – Baseplate module

The converter is designed to operate in different thermal environments and sufficient cooling must be provided. Proper cooling can be verified by measuring the temperature at the test points as shown in the figure 13. The temperature at these test points should not exceed the maximum values in Table 7.

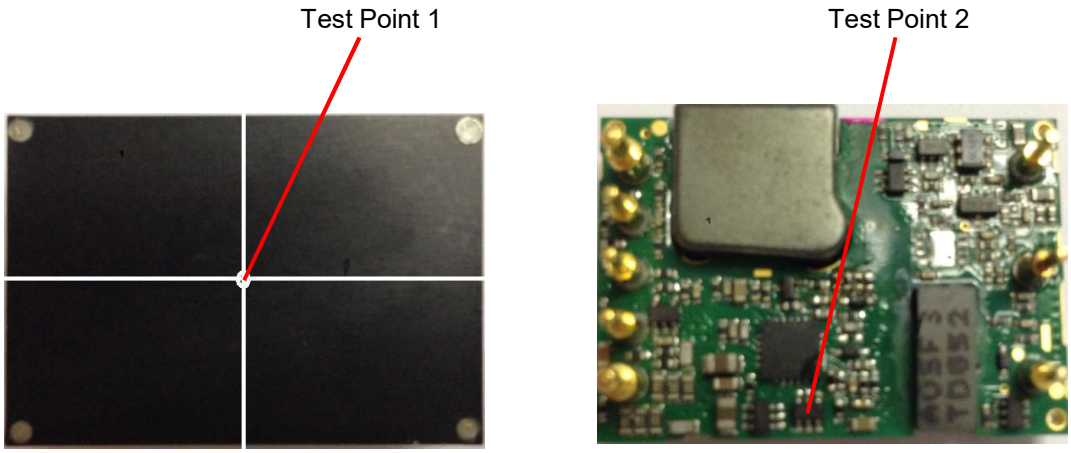

Figure 13 Temperature test point

Table 7. Temperature limit of the test points

Test Point	Temperature Limit
Test point 1	108 °C
Test point 2	113 °C

For a typical application, figure 14 shows the derating of output current vs. ambient air temperature at different air velocity.

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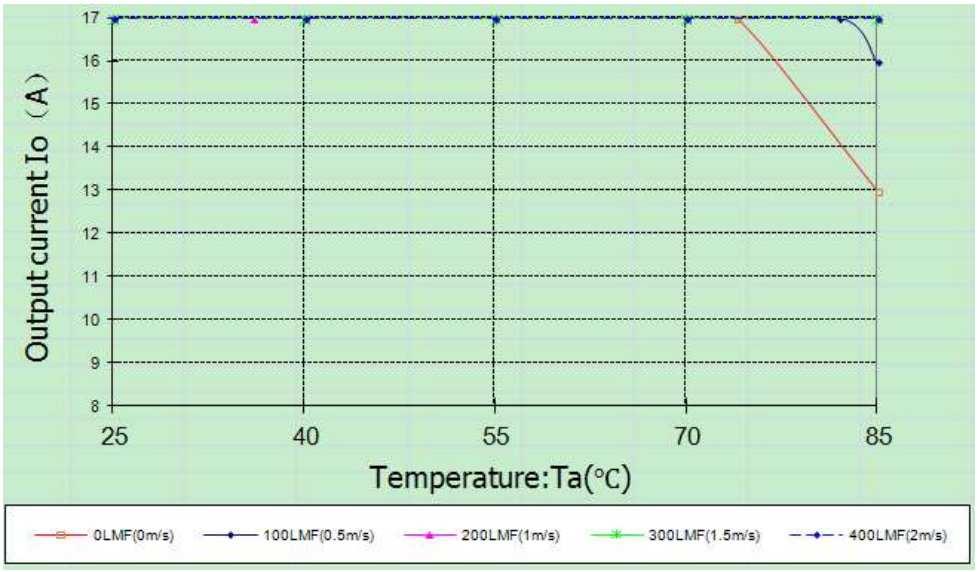

Figure 14 Output power derating, 48Vin, air flowing across the converter from pin 3 to pin 1

Qualification Testing

Parameter	Unit (pcs)	Test condition
Halt test	4-5	$T_{a,min}$-35 ^{O}C to $T_{a,max}$+30 ^{O}C, 10 ^{O}C step, V_{in} = min to max, 0 ~ 100% load
Vibration	3	Frequency range: 5Hz ~ 20Hz, 20Hz ~ 200Hz, A.S.D: 1.0m^2/s^3, -3db/oct, axes of vibration: X/Y/Z. Time: 30min/axis
Mechanical Shock	3	30g, 6ms, 3axes, 6directions, 3time/direction
Thermal Shock	3	-55 ^{O}C to 125 ^{O}C, unit temperature 20cycles
Thermal Cycling	3	-40 ^{O}C to 85 ^{O}C, temperature change rate: 1^{O}C/min, cycles: 2cycles
Humidity	3	40 ^{O}C, 95%RH, 48h
Solder Ability	15	IPC J-STD-002C-2007

Application Notes

Typical Application

Below is the typical application of the AVD85-48S05 series power supply.

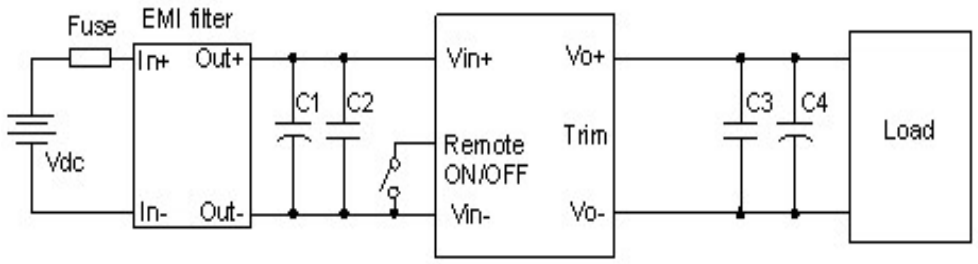

Figure 15 Typical application

C1: 100μF/100V electrolytic capacitor; P/N: UPW2A101MHD (Nichicon) or equivalent caps

C2, C3: 1μF/100V X7R ceramic capacitor, P/N: C3216X7R2A105KT0L0S (TDK) or equivalent caps

C4:1000μF/10V electrolytic capacitor, P/N: UPM1A102MHD (Nichicon) or equivalent caps

Fuse: External fast blow fuse with a rating of 5A. The recommended fuse model is 0451005.MRSN from LITTLEFUSE.

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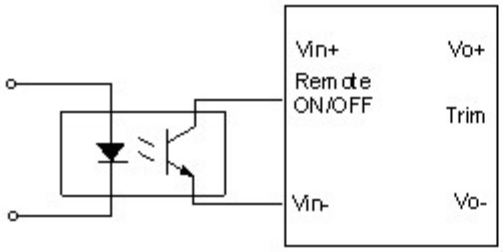
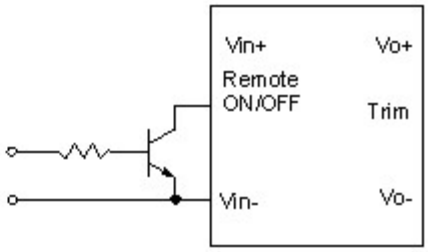
Remote ON/OFF

Negative remote ON/OFF logic is available in AVD85-48S05 series. The logic is CMOS and TTL compatible.

The voltage between pin Remote ON/OFF and pin Vin- must not exceed the range listed in table 3 to ensure proper operation. The external Remote ON/OFF circuit is highly recommended as shown in figure 16.



Isolated remote ON/OFF circuit



Non-isolated remote ON/OFF circuit

Figure 16 External Remote ON/OFF circuit

Trim Characteristics

Connecting an external resistor between Trim pin and Vo- pin will decrease the output voltage. While connecting it between Trim and Vo+ will increase the output voltage. The following equations determine the external resistance to obtain the trimmed output voltage.

$$R_{adj-down} = \frac{510}{\Delta} - 10.2(K\Omega)$$

$$R_{adj-up} = \frac{5.1 \times V_{nom} \times (100 + \Delta)}{1.225 \times \Delta} - \frac{510}{\Delta} - 10.2(K\Omega)$$

△:Output e rate against nominal output voltage.

$$\Delta = \frac{100 \times (V_{nom} - V_0)}{V_{nom}}$$

V_{nom}: Nominal output voltage.

For example, to get 5.5V output, the trimming resistor is

$$\Delta = \frac{100 \times (V_{nom} - V_0)}{V_{nom}} = \frac{100 \times (5.5 - 5)}{5} = 10$$

$$R_{adj-up} = \frac{5.1 \times 5 \times (100 + 10)}{1.225 \times 10} - \frac{510}{10} - 10.2 = 167.78(K\Omega)$$

When trimming up, the output current should be decreased accordingly so as not to exceed the maximum output power.

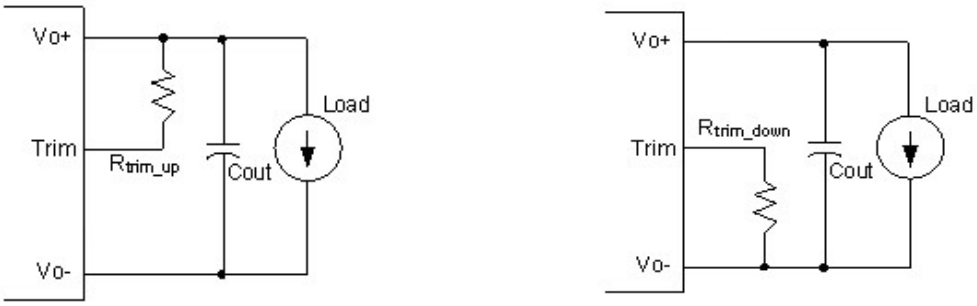


Figure 17 Trim up and trim down

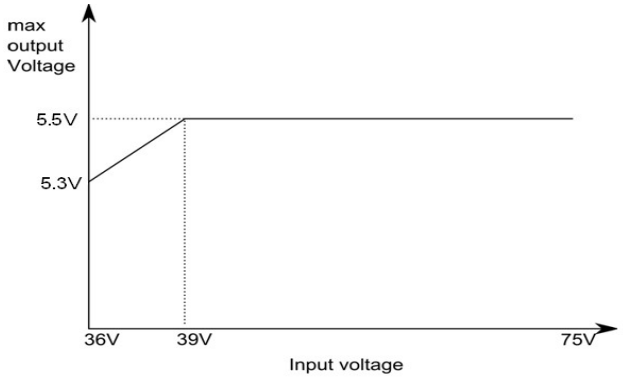


Figure 18. Trimming up the output voltage

Input Ripple & Inrush Current and Output Ripple & Noise Test Configuration

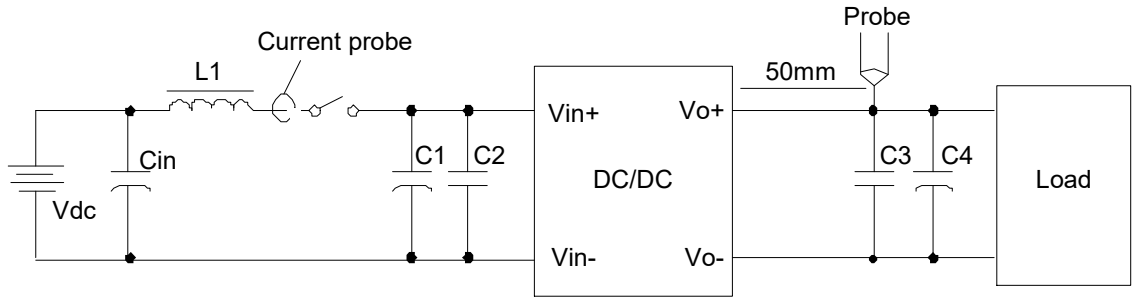


Figure 19 Input ripple & output ripple & noise test configuration

Vdc: DC power supply
L1: 12uH
Cin: 100uF/100V typical
C1 ~ C4: See Figure 15
Note - Using a coaxial cable with series 50ohm resistor and 0.68uF ceramic capacitor or a ground ring of probe to test output ripple & noise is recommended

Soldering

√R6 Wave Soldering

The product is intended for standard manual or wave soldering.

When wave soldering is used, the temperature on pins is specified to maximum 260 ^{O}C for maximum 7s.

When soldering by hand, the iron temperature should be maintained at 300 ^{O}C ~ 380 ^{O}C and applied to the converter pins for less than 10s. Longer exposure can cause internal damage to the converter.

Cleaning of solder joint can be performed with cleaning solvent IPA or similative.

	Product requirement	Product Name
R6	Wave soldering	AVD85-48S05B-6L AVD85-48S05-6L

√R6 Reflow/Wave Soldering

The product is intended for standard manual, reflow or wave soldering.

When wave soldering is used, the temperature on pins is specified to maximum 260 ^{O}C for maximum 7s.

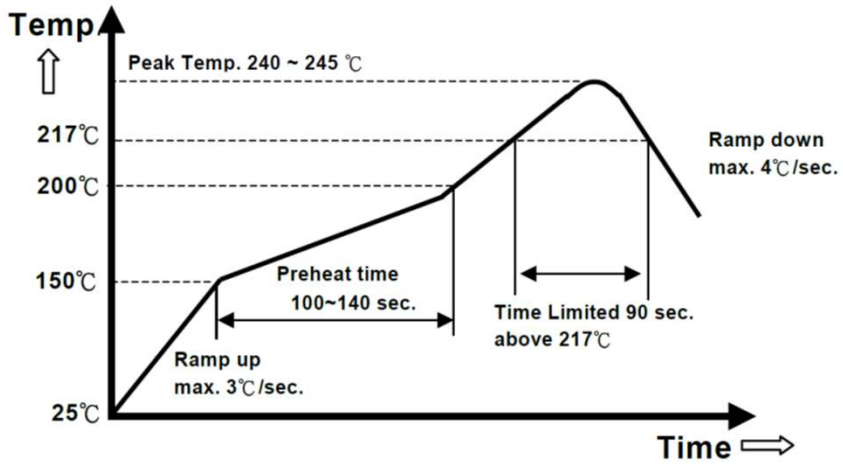
When soldering by hand, the iron temperature should be maintained at 300 ^{O}C ~ 380 ^{O}C and applied to the converter pins for less than 10s. Longer exposure can cause internal damage to the converter.

Cleaning of solder joint can be performed with cleaning solvent IPA or similative.
below products are intended for standard reflow soldering.

The below products are intended for standard reflow soldering.

	Product requirement	Product Name
R6	Reflow or wave soldering	AVD85-48S05-6L AVD85-48S05-TL

When reflow soldering is used, Please refer to following fig for recommended temperature profile parameters.



Hazardous Substances Announcement (RoHS of China R6)

Parts	Hazardous Substances					
	Pb	Hg	Cd	Cr^{6+}	PBB	PBDE
AVD85-48S05	x	x	x	x	x	x

x: Means the content of the hazardous substances in all the average quality materials of the part is within the limits specified in SJ/T-11363-2006

√: Means the content of the hazardous substances in at least one of the average quality materials of the part is outside the limits specified in SJ/T11363-2006

Artesyn Embedded Technologies has been committed to the design and manufacturing of environment-friendly products. It will reduce and eventually eliminate the hazardous substances in the products through unremitting efforts in research. However, limited by the current technical level, the following parts still contain hazardous substances due to the lack of reliable substitute or mature solution:

1. Solders (including high-temperature solder in parts) contain plumbum.
2. Glass of electric parts contains plumbum.
3. Copper alloy of pins contains plumbum

Record of Revision and Changes

Issue	Date	Description	Originators
1.2	10.18.16	Update Mechanical outlines	Steven. D
1.3	12.17.19	Update the soldering information	Viktor. G

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