AMPSS™
Astec Modular Power Supply System

AL80A Enhanced Series

120-240W Output Power DC-DC Converter Module Technical Reference Manual

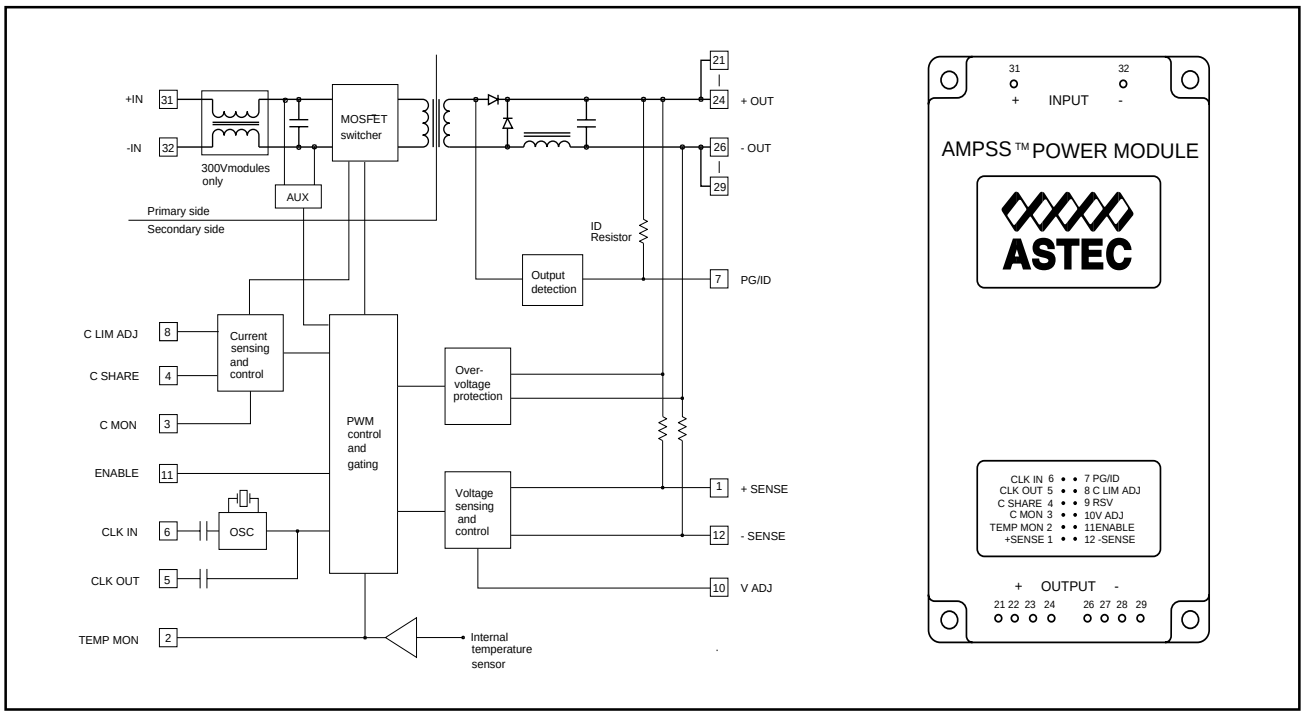
Series Highlights

- High Efficiency - up to 86%
- 85°C baseplate/case operating temperature
- Low output ripple and noise
- High Reliability - over 1 million hours MTBF
- Wide input voltage range
- Design to meet Telecom specifications

ASTEC

Contents

AL80A Enhanced Series DC-DC Converters



Introduction

The AL80A is an isolated, single output DC to DC converter module, providing up to 240W output. The AL80A features full safety isolated low voltage secondary side control and a baseplate/ case operating temperature of up to 85°C.

Special Features

- High Efficiency - up to 86%
- 500 KHz fixed frequency switching
- 85°C baseplate operating temperature (no derating)
- Low output ripple and noise
- Excellent transient response
- Safety isolated low voltage control
- High Reliability - over 1 million hours MTBF
- Wide input voltage range
- Parallelable with accurate current sharing
- Current and temperature monitoring outputs
- Regulation to zero load

Ordering Information

Model Number	Input Voltage	Output Voltage	Output Current	Output Power
AL80A-300L-020F60	300V	2.0V	60A	120W
AL80A-300L-033F50	300V	3.3V	50A	165W
AL80A-300L-050F40	300V	5V	40A	200W
AL80A-300L-120F18	300V	12V	18A	216W
AL80A-300L-150F16	300V	15V	16A	240W
AL80A-300L-063F34	300V	6.35V	34A	215W
AL80A-048L-050F40	48V	5V	40A	200W

Please contact Astec for information on other output voltages, power ranges and configurations.

Safety

UL:	UL1950
CSA:	CSA C22.2 No.950
VDE:	VDE 0805
	IEC950
	EN60950
CE:	CE Mark

Please contact Astec for information on specific module approvals.
Note: *Ensure all modules are used according to the Installation Instructions provided with each module.*

All modules are designed to meet the following specifications

ETS300-132-2
ETS300-386-1(1)
EN55022-A(1)
EN55022-B(1)
EN41003
IEC6100-44(1)
IEC6100-45(1)
IEC950
VDE0871-A(1)
VDE0878-A(1)
BTNR2511(5)(1)

(1) Require additional external circuitry for full compliance. Please refer to application section of this manual or contact technical support office for further information.

Electrical Specifications

Absolute Maximum Ratings – all models

Exceeding the specified absolute maximum ratings may severely damage the module. These ratings are intended as guidelines for absolute worst case operating conditions and are not to be interpreted as recommended operating condition

General	300V Input	48VInput
Continuous Input Voltage	400V	72V
Input Surge Voltage (1 sec)	425V	75V
Isolation, Input to Output*	2700VDC	2100VDC
Isolation Input to Baseplate*	2700VDC	2100VDC
Isolation, Output to Baseplate*	500VDC	500VDC
Operating Temperature (Baseplate)	-20 to 85°C	
Storage Temperature	-40 to 105°C	
Operating Relative Humidity (non-condensing)	10% to 95%	
Storage Relative Humidity (non-condensing)	95% Max	
Altitude (Operating)	< 3000m	
Altitude (Storage)	< 9000m	
Lead Temperature (soldering 5 Seconds)	235°C	

Secondary Control Pins	
+SENSE	V_o - 0.5 to V_o + 0.5 VDC
-SENSE	-0.5 to 0.5 VDC
TEMP MON	-0.5 to 7 VDC
C MON	-0.5 to 7 VDC
C SHARE	-0.5 to 7 VDC
CLK OUT	-50 to 50 VDC
CLK IN	-50 to 50 VDC
C LIM ADJ	-0.5 to 7 VDC
V ADJ	-0.5 to 7 VDC
PG/ID	0.5 to V_o + 0.5VDC
ENABLE	-0.5 to 20 VDC

Note : V_o = module output voltage
All voltage are with respect to negative output

Notes:

** For 300V input :*

All isolation barriers on 300V input modules have been designed and tested to meet 4242VDC as required by IEC950 for reinforced insulation. The complete module should NOT be subjected to a 3000VAC input-to-output test because this can result in input-baseplate-output breakdown. AMPSS DC-DC modules are CLASS I equipment. Power supply systems using AMPSS modules MUST also be CLASS I equipment. Each AMPSS DC-DC module is fully tested in factory according to the standards. Therefore power supply systems need only be subjected to Hi-Pot test for BASIC insulation which is 1500Vac (AC) input to GROUND.

Specifications

Electrical characteristics are guaranteed over the full baseplate/case temperature range (-20 to 85°C) and for the full range of input voltage (V_I) and for the full load range (0 to I_O rated). Except where indicated , +SENSE and -SENSE are connected to the output terminals at the point of measurement, ENABLE is connected to -SENSE. All other pins are left floating.

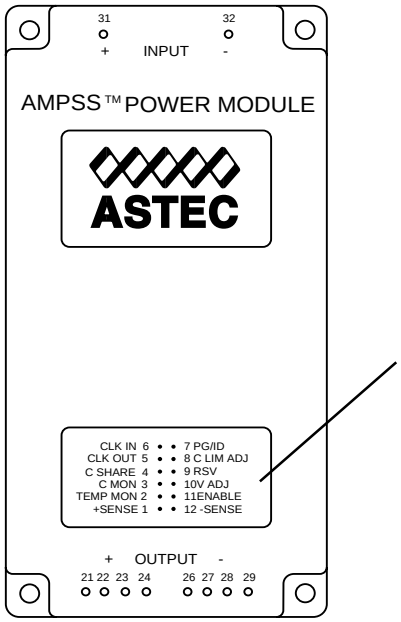
Definitions

V_I, V_O and I_O are actual operating conditions, V_{Inom}, V_{Onom} and I_{Orated} are nominal ratings.

Pin Connections - all models

INPUT PINS

Pin No	Pin Name	Type	Description	Recommended Connections
31	+INPUT	Input	Power input - positive	A 220µF electrolytic capacitor connected between the +INPUT and -INPUT pins is recommended
32	-INPUT	Input	Power input - negative (return)	See + INPUT for recommendations



CONTROL PINS

Pin No	Pin Name	Type	Description	Recommended Connections
1	+SENSE	Input	Used for remote sense function to compensate for load bus resistance	If remote sensing is not required connect to +OUTPUT pins 21-24 of the module
2	TEMP MON	Output	Provides a voltage signal proportional to the internal absolute temperature of the module	Analog signal output. Leave unconnected if not used
3	C MON	Output	Provides a current signal proportional to the current being supplied by the module	Analog signal output. Leave unconnected if not used
4	C SHARE	Input/Output	Allows modules connected in parallel to accurately share current	Connect to C SHARE pins of other modules. Leave unconnected if not used
5	CLK OUT	Output	Provides a 1MHz clock output for synchronization with other modules	Capacitor coupled output. Leave unconnected if not used
6	CLK IN	Input	Accepts a 1MHz clock input for synchronization with other modules	Capacitor coupled input. Leave unconnected if not used
7	PG/ID	Output	High level output ($V_{PG/ID}$ = V_O) indicates module converter is running. Can also be used to identify the nominal output voltage of the module by measuring resistance between PG/ID and +SENSE	ID Resistance = [$V_{O\ (nom)}$]1KΩ. Leave unconnected if not used
8	C LIM ADJ	Input	Used to adjust the current limit set point	Leave unconnected if not used
9	RSV	-	Reserved	Leave unconnected
10	V ADJ	Input	Used to adjust module output voltage	Leave unconnected if not used
11	ENABLE	Input	Enables or disables the output of the module	Must be connected to -SENSE pin or driven to <0.8V w.r.t. -SENSE to enable the output of the module
12	-SENSE	Input/ Reference	Used for remote sense function to compensate for load bus resistance	If remote sensing is not required connect to -OUTPUT pins 26-29 of the module

OUTPUT PINS

Pin No	Pin Name	Type	Description	Recommended Connections
21-24	+OUTPUT	Output	Power output - positive	Ensure good electrical connection and sufficient copper on PCB layouts
26-29	-OUTPUT	Output	Power output - negative	See +OUTPUT for recommendations

CONTROL SIGNALS

Parameter	Conditions	Parameter	Min	Typ	Max	Units
TEMP MON - temperature monitor signal		$V_{T\ MON}$ sensitivity	9.8	10.0	10.2	mV/°C
		Source impedence		1		KΩ
C MON - current monitor signal	$I_O = I_{Orated}$	$I_{C\ MON}$	0.9	1.0	1.1	mA
		Measured Range	20		100	$\%I_{Orated}$
C SHARE - current share function	C SHARE pins of modules in parallel connected	C SHARE accuracy		±3%	±10	$\%I_{O\ ave}$
		Max no. of units			10	
CLK OUT - clock output		$V_{CLK\ OUT}$	3.3		5.1	Vp-p
	CLK IN open	Clock freq.	0.98	1.00	1.02	MHz
		Max fan out			2	
CLK IN - clock input		$V_{CLK\ IN}$	3.5		5.5	Vp-p
		Clock freq	0.9	1.0	1.1	MHz
PG/ID power good / Identification function	Converter running : $I_O \geq 5\%I_{Orated}$ for models with I_{Orated} I_O > 1A for models with I_{Orated} <20A	$V_{PG/ID}$		100		$\%V_O$
	Converter not running 300Vin	$V_{PG/ID}$			0.2	V
	Converter running 48Vin	$V_{PG/ID}$			1.0	V
	2.0V output	Resistance, PG/ID to +OUTPUT	1.96	2.0	2.04	KΩ
	2.2V output		2.16	2.20	2.24	KΩ
	3.3 V output		3.23	3.30	3.36	KΩ
	5V output		5.00	5.10	5.20	KΩ
	6.35V output		6.08	6.20	6.32	KΩ
	12V output		11.76	12.00	12.20	KΩ
	15V output		14.70	15.00	15.30	KΩ
C LIM ADJ - current limit adjustment	Short C LIM adjust to -SENSE	C LIM set point		20		$\%I_{Omax}$
	Connect a 1KΩ ± 1% from C LIM to -SENSE pin	C LIM set point		80		$\%I_{Omax}$
V ADJ - voltage adjust	Adjust using external resistor	V_O	90		110	$\%V_{Onom}$
ENABLE - module enable	Module enabled	V_{ENABLE}	0		0.8	V
	Module disabled	V_{ENABLE}	2		10	V
	V_{ENABLE} = 0.8V	ENABLE current source		100	150	µA

Insulation - all models

INSULATION

Parameter	Conditions	Min	Typ	Max	Units
Input-output insulation resistance	500VDC	10			MΩ
Input-baseplate insulation resistance	500VDC	10			MΩ
Output-baseplate insulation resistance	500VDC	10			MΩ

Electrical Specifications for 48V Input Models *(AL80A-048L-xxxFyy)*

INPUT CHARACTERISTICS

Parameter	Conditions	Min	Typ	Max	Units
Input voltage		36	48	72	V
Input surge voltage	(1 second)			75	V
Input low line power on voltage	Module power on	30		35	V
Input low line power off voltage	Module shutdown	80		90	%V_{Ion}
No load input power	$V_I = V_{Inom}$			10	W
Input capacitance				5	µF
Input current	Low line, nom V_O, max I_O AL80A-048L-050F40			 7.5	 A

TRANSIENT CHARACTERISTICS

Parameter	Conditions	Min	Typ	Max	Units
Turn-on time	V_I = 0 to V_{Inom}		1	10	msec
Transient response (25% to 75% load change @ 0.1A/µS, recovery to 1% V_O)	Step-load excursion AL80A-048L-050F40		150	250	mV
	Step-load response AL80A-048L-050F40			250	µS

Electrical Specifications for 48V Input Models *(Cont'd)*

OUTPUT CHARACTERISTICS

Parameter	Conditions	Min	Typ	Max	Units
Nominal (factory set) output voltage	AL80A-048L-050F40		5.0		V
Output voltage set point accuracy	T_C = +25°C, $V_I = V_{Inom}$, $I_O = I_{Orated}$	-1		1	%V_{Onom}
Remote sense compensation	$V_I = V_{Imin}$			0.5	V
Output voltage adjust		90		110	%V_{Onom}
Nominal (factory set) output overvoltage protection trip point	AL80A-048L-050F40	120	125	130	%V_{Onom}
Line regulation	V_{Imin} to V_{Imax}			0.2	%V_{Onom}
Load regulation	0 to I_{Omax}			0.2	%V_{Onom}
Noise and ripple	20MHz bandwidth AL80A-048L-050F40		100	150	mV
Output current	AL80A-048L-050F40	0		40	A
Output current limit	V_O dropped to 90% of V_{Onom}	105	110	115	%I_{Omax}
Short circuit current				160	%I_{Omax}
Temperature coefficient	Per °C Baseplate temperature			0.02	%V_O/°C
Overtemperature shutdown		87	95	110	°C
Efficiency	$V_O = V_{Onom}$, $V_I = V_{Inom}$, $I_O = I_{Orated}$ AL80A-048L-050F40	79	81		%

Electrical Specifications for 300V Input Models *(AL80A-300L-xxxFyy)*

INPUT CHARACTERISTICS

Parameter	Conditions	Min	Typ	Max	Units
Input voltage	All models	180	300	400	V
	except				
	AL80A-300L-063F34	205		400	V
	AL80A-300L-033F50	230		400	V
	AL80A-300L-020F60	230		400	V
Input surge voltage	(1 second)			425	V
Input low line power on voltage	Module power on	154		175	V
Input low line power off voltage	Module shutdown	80		90	%V_{Ion}
No load input power	$V_I = V_{Inom}$			5	W
Input capacitance				0.5	µF
Input current	Low line, nom V_O, max I_O				
	AL80A-300L-020F60			0.85	A
	AL80A-300L-033F50			1.00	A
	AL80A-300L-050F40			1.50	A
	AL80A-300L-063F34			1.60	A
	AL80A-300L-120F18			1.60	A
	AL80A-300L-150F16			1.75	A

TRANSIENT CHARACTERISTICS

Parameter	Conditions	Min	Typ	Max	Units
Turn-on time	V_I = 0 to V_{Inom}		1	10	msec
Transient response	Step-load excursion				
	AL80A-300L-020F60		100	200	mV
(25% to 75% load change @	AL80A-300L-033F50		100	200	mV
0.1A/µS, recovery to 1% V_O)	AL80A-300L-050F40		100	200	mV
	AL80A-300L-063F34		190	317	mV
	AL80A-300L-120F18		360	600	mV
	AL80A-300L-150F16		450	750	mV
	Step-load response				
	All modules			250	µS
	except				
	AL80A-300L-033F50			600	µS
	AL80A-300L-020F60			600	µS

Electrical Specifications for 300V Input Models *(Cont'd)*

OUTPUT CHARACTERISTICS

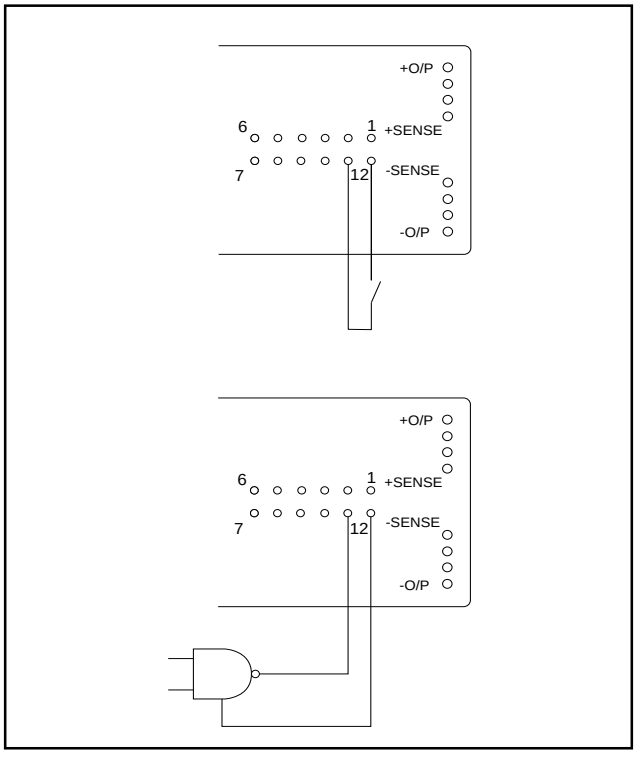
Parameter	Conditions	Min	Typ	Max	Units
Nominal (factory set) output voltage	AL80A-300L-020F60		2.0		V
	AL80A-300L-033F50		3.3		V
	AL80A-300L-050F40		5.0		V
	AL80A-300L-063F34		6.35		V
	AL80A-300L-120F18		12.0		V
	AL80A-300L-150F16		15.0		V
Output voltage set point accuracy	T_C = +25°C, $V_I = V_{Inom}$, $I_O = I_{Orated}$	-1		1	%V_{Onom}
Remote sense compensation	$V_I = V_{Imin}$			0.5	V
Output voltage adjust		90		110	%V_{Onom}
Nominal (factory set) output overvoltage protection trip point	All models except :	120	125	130	%V_{Onom}
	AL80A-300L-020F60	140	150	160	%V_{Onom}
	AL80A-300L-033F50	130	138	145	%V_{Onom}
	AL80A-300L-063F34	120	127	134	%V_{Onom}
Line regulation	V_{Imin} to V_{Imax}				
	All modules except			0.2	%V_O
	AL80A-300L-020F60			10	mV
	AL80A-300L-033F50			10	mV
Load regulation	0 to I_{Omax}				
	All modules except			0.4	%V_O
	AL80A-300L-020F60			15	mV
	AL80A-300L-033F50			15	mV
Noise and ripple	20MHz bandwidth				
	AL80A-300L-020F60		100	150	mV
	AL80A-300L-033F50		100	150	mV
	AL80A-300L-050F40		100	150	mV
	AL80A-300L-063F34		127	190	mV
	AL80A-300L-120F18		240	360	mV
	AL80A-300L-150F16		300	450	mV
Output current	AL80A-300L-020F60	0		60	A
	AL80A-300L-033F50	0		50	A
	AL80A-300L-050F40	0		40	A
	AL80A-300L-063F34	0		34	A
	AL80A-300L-120F18	0		18	A
	AL80A-300L-150F16	0		16	A
Output current limit	V_O dropped to 90% of V_{Onom}	105	110	115	%I_{Omax}
Short circuit current				150	%I_{Omax}
Temperature coefficient	Per °C Baseplate temperature			0.02	%V_O/°C
Overtemperature shutdown	All models	87	95	110	°C
Efficiency	$V_O = V_{Onom}$, $V_I = V_{Inom}$, $I_O = I_{Orated}$				
	AL80A-300L-020F60	67	69		%
	AL80A-300L-033F50	77	79		%
	AL80A-300L-050F40	81	83		%
	AL80A-300L-063F34	80	82		%
	AL80A-300L-120F18	84	86		%
	AL80A-300L-150F16	84	86		%

Functional Description

This section explains how to implement the functions found on the AL80A Enhanced Series.

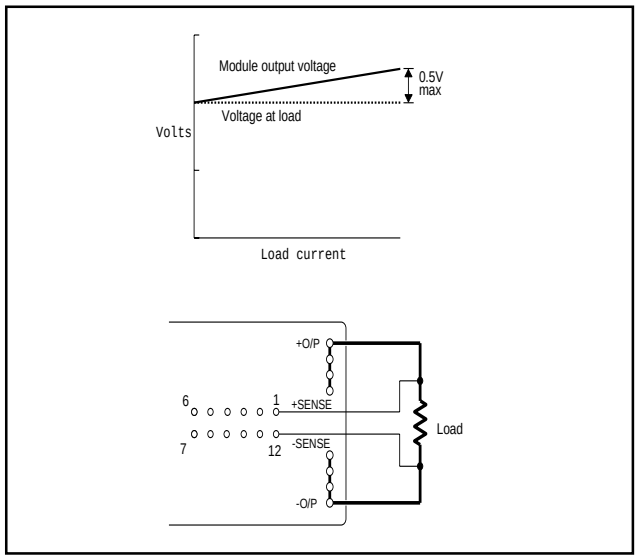
Enable Control (ENABLE)

The enable pin is a TTL compatible input used to turn the output of the module on or off. The module output is enabled when the ENABLE pin is connected to -SENSE or driven to a logic low of <0.8V (but not negative) with respect to -SENSE.
The output is disabled when the enable pin is open or driven to a logic high >2V with respect to -SENSE. All monitoring and housekeeping functions (including clock signals) continue to operate normally.



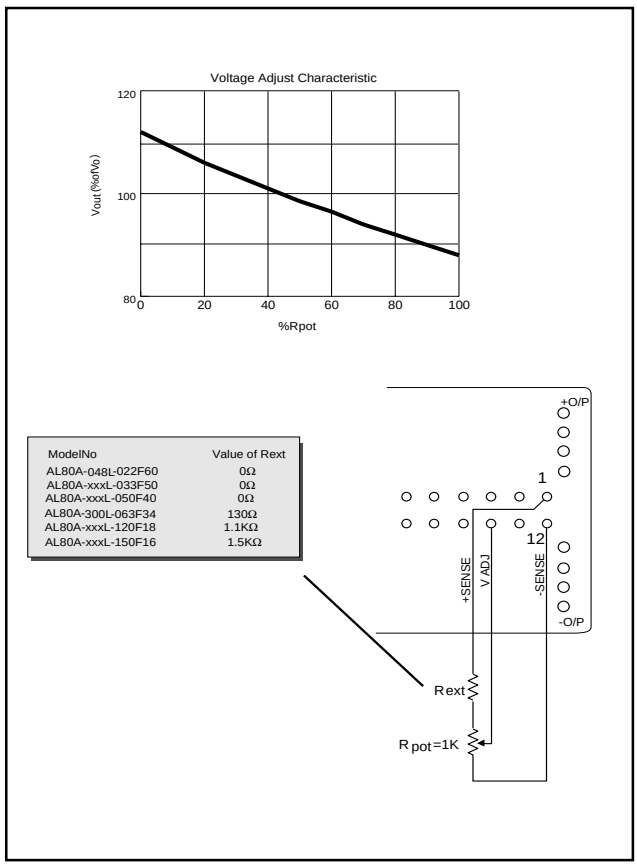
Remote Sense (+SENSE, -SENSE)

Connect the +SENSE and -SENSE pins of the AL80A directly to the load to allow the module to compensate for the voltage drop across the conductors carrying the load current. If remote sensing is not required (for example if the load is close to the module) the sense pins should be connected directly to the module's output pins to ensure accurate regulation.
Note: *If the sense leads fail open circuit, the module will revert to local sense at the output pins. Incorrect connection of sense leads may damage the module*



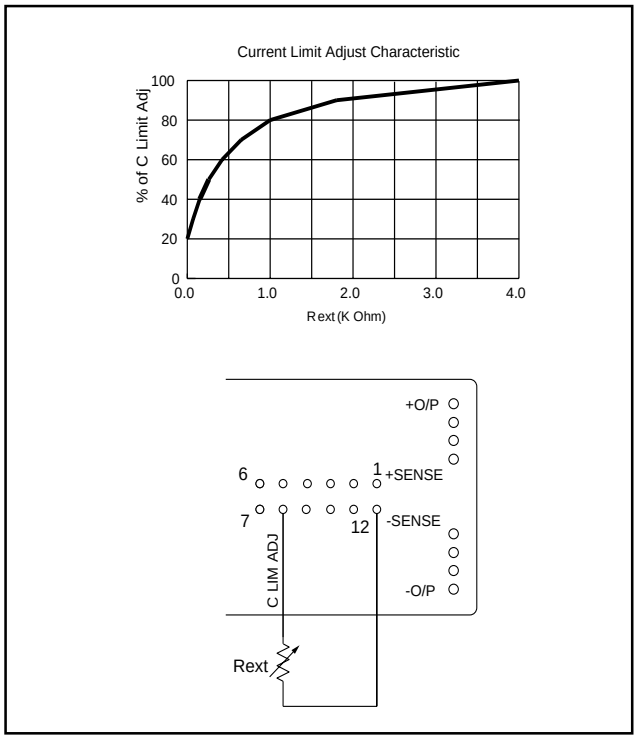
Output Voltage Adjustment (V ADJ)

The output voltage of the module may be accurately adjusted by up to ±10% of the nominal factory set output. Adjustment can be made using a 1K Ohm trimming potentiometer connected as indicated above.

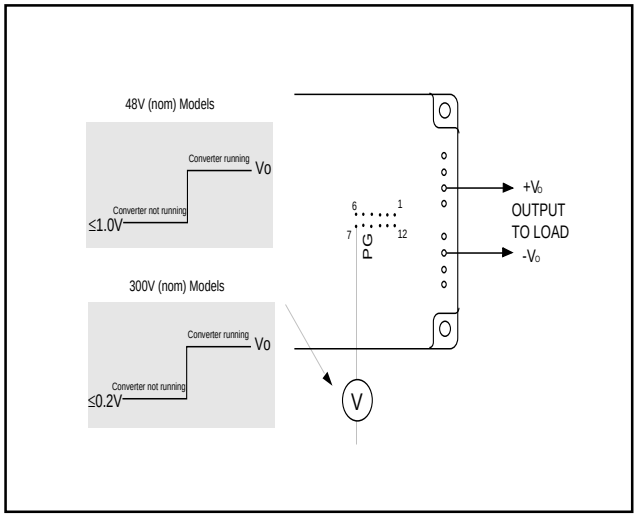


Current Limit Adjustment (C LIM ADJ)

A constant current limiting circuit protects the module under overload or short circuit conditions.
With the C LIM pin left unconnected the current limit is factory set to 110% of the module's rated output, but may be adjusted across the range 20% to 100% using a resistor connected between C LIM and -SENSE as shown.



Power Good/Identification (PG/ID)

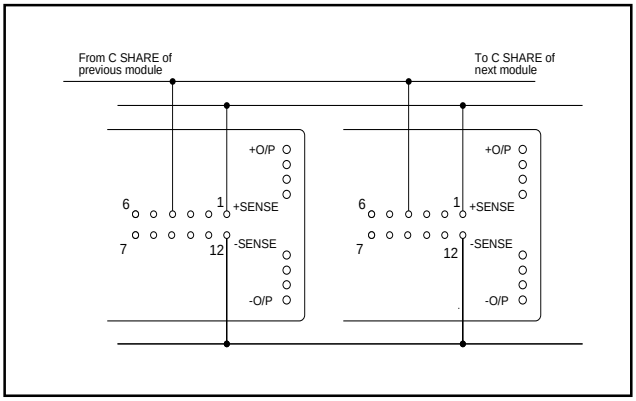


This pin provides an indication that the module's converters are working, and can also be used to identify the factory set output voltage of the module. The PG/ID pin goes high to the level of the output voltage (V_O) to indicate that the module is operating and delivering power. The output goes low if the converters stop operating due to a fault such as an overtemperature or overvoltage condition. The PG/ID pin will also go low if the module is disabled via the ENABLE pin.
The resistance between the PG/ID pin and the +SENSE of the module can be used to determine the output voltage of the module. With no power applied the output voltages and resistances are as shown in the table below:

Output Voltage (V)	Resistance (KΩ)
2.0	2.0
2.2	2.2
6.3	6.2
3.3	3.3
5	5.1
12	12
15	15

Current Sharing (C SHARE)

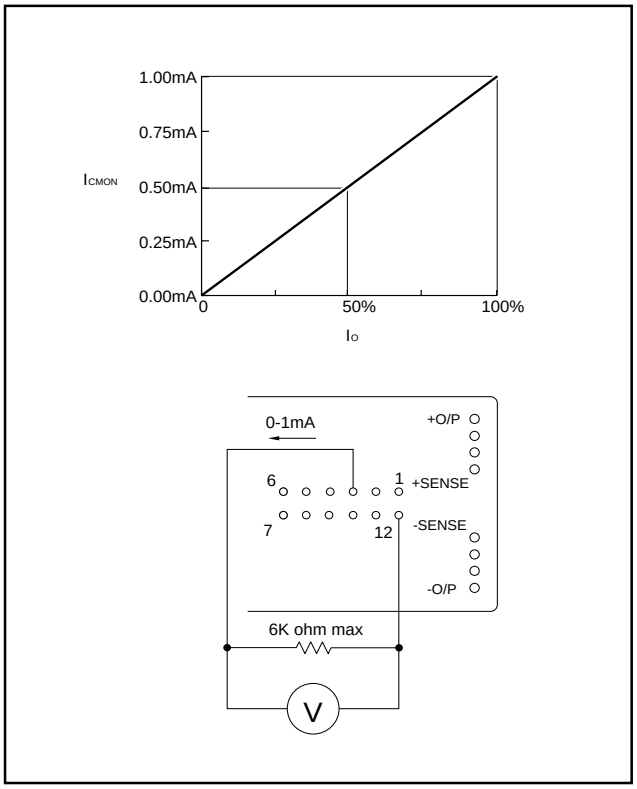
To ensure that all modules in a parallel system accurately share current, the C SHARE pins on each module should be connected together.
The voltage on the C SHARE pins represents the average load current per module. Each module compares this average with its own current and adjusts its output voltage to correct the error. In this way the module maintains accurate current sharing even under variable or light load conditions.



Note: *The -SENSE and +SENSE pins of each module must also be connected to a common load point to ensure accurate current sharing.*

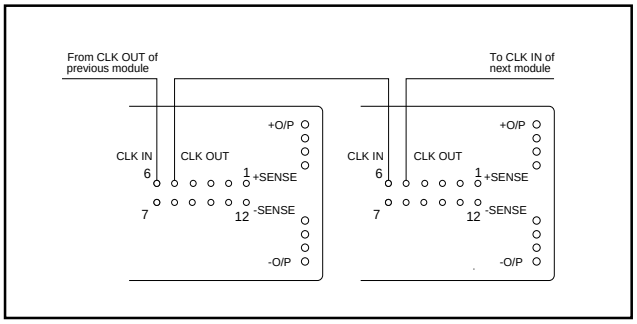
Current Monitoring (C MON)

The C MON pin provides an indication of the amount of current supplied by the module. The output of the C MON pin is a current source proportional to the output current of the module, where 0.2 to 1mA = 20 to 100% $I_{O\ rated}$.
The C MON output can be paralleled with C MON outputs from other modules to indicate the total current supplied in a paralleled system.



Clock Signals (CLK IN, CLK OUT)

The module's internal clock is accurate and stable over its full operating range and synchronization is not normally required, but it can reduce noise in paralleled systems.



Clock signals can be wired in series (the CLK OUT pin of one module to the CLK IN pin of the next etc) in which case all the modules will be synchronized with the first module in the chain. Alternatively, an external clock signal of 5Vpk-pk at 1MHz±10% can be connected to the CLK IN pins of all the modules.

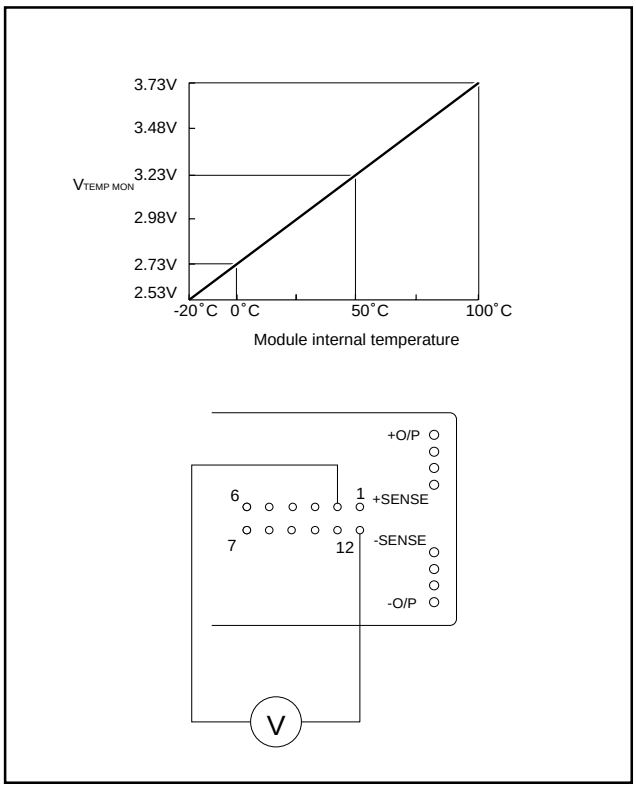
If the clock input to any module fails, the module will automatically switch back to its internal clock and will continue to operate normally. The CLK IN and CLK OUT signals are AC coupled, so any module can clock another module regardless of polarity.

Temperature Monitoring (TEMP MON)

The TEMP MON pin provides an indication of the module's internal temperature.The voltage at the TEMP MON pin is proportional to the temperature of the module interior at 10mV per °C, where:

Module temperature (°C) = ($V_{TEMP\ MON}$ x 100) - 273

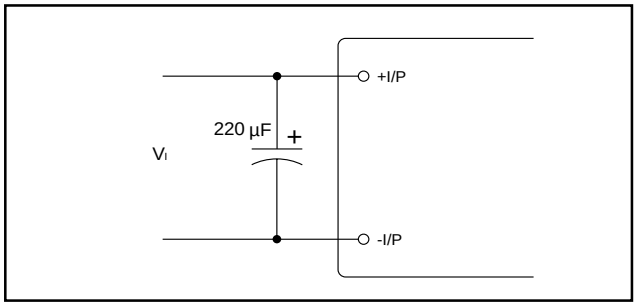
The temperature monitor signal can be used by thermal management systems (e.g. to control a variable speed fan). It can also be used for overtemperature warning circuits and for thermal design verification of prototype power supplies and heatsinks.



Design Considerations

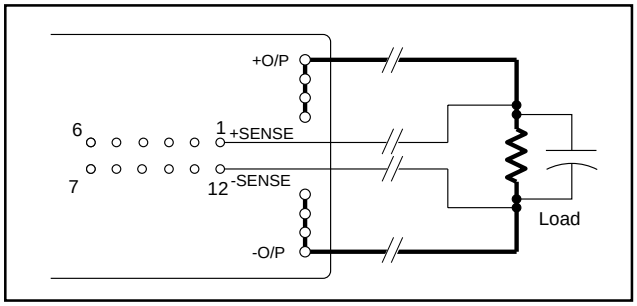
Input Bulk Capacitors

Electrolytic bulk reservoir capacitors placed close to the module input pins are recommended to ensure the module is fed with a low source impedance. For the AL80A Enhanced Series module typical values are 220µF/100V for 48V modules and 220µF/450V for 300V modules.



Remote Loads

If the sensed load is some distance from the module, the module's output voltage may rise sufficiently to trigger the OVP protection circuit during a step load change due to bus inductance. Fitting a decoupling capacitor at the load can reduce this effect.
It should be noted that a distributed power solution, using AMPSS™ modules placed close to their loads, will optimize transient response.

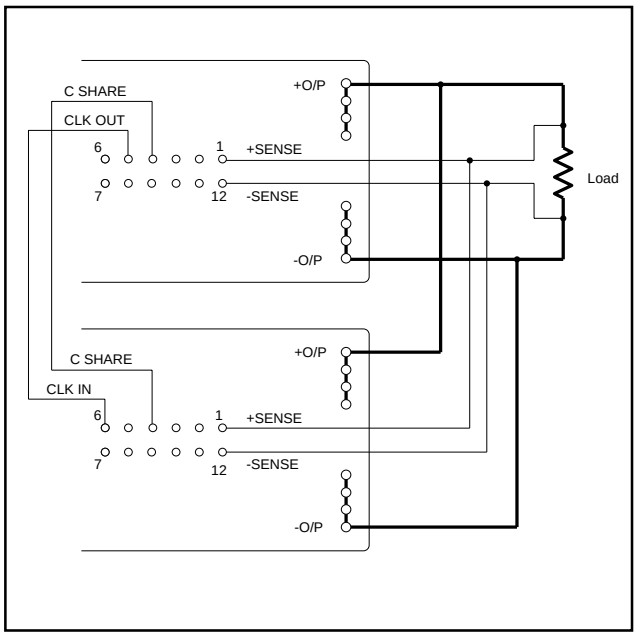


Input Fusing

AMPSS modules do not have an in-line fuse fitted internally. In order to comply with CSA, VDE and UL safety regulations it is recommended that a fuse of the following rating be fitted at the module's input.

Input	Fuse Rating
300V	10A / 250V
48V	10A / 250V

Parallel Connection Considerations



A master-slave configuration is not required for AMPSS™ modules. AL80A modules may be connected in parallel using a simple, single wire connection.

Current Sharing

In multi-module paralleled systems, all modules will share current to within ± 3% (typical) of the average load current per module when the C SHARE pins of each module are connected together.
The +SENSE and -SENSE pins of each module should be connected to common points as close as possible to the load.

Synchronization

Modules are synchronized by connecting the CLK OUT pin of one module to the CLK IN pin of the next. Consecutively connected modules operate out of phase with each other, resulting in ripple cancellation at the inputs and outputs of paralleled modules. If the clock input to a module fails, it will automatically revert to its internal clock and continue to operate normally.

Input Undervoltage Protection

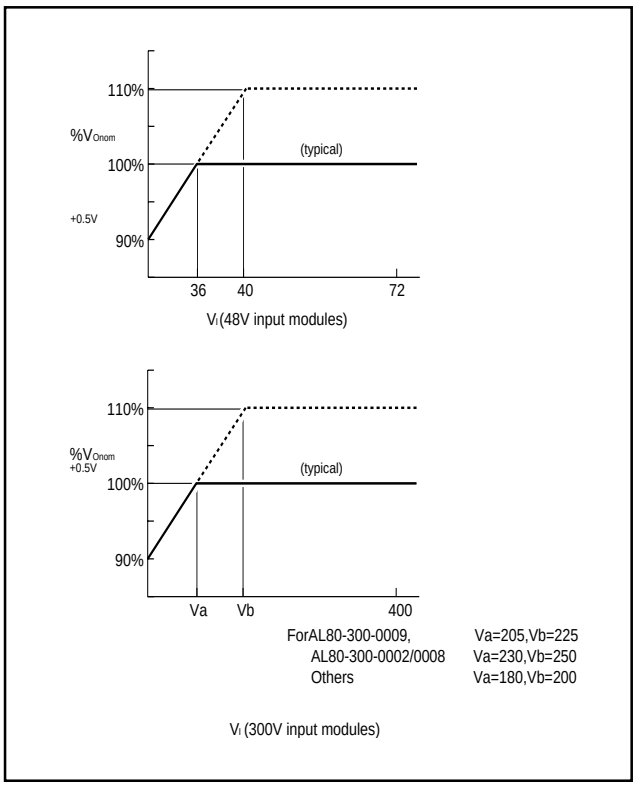
An input undervoltage protection circuit protects the module under low input voltage conditions. Hysteresis is built into the AL80A Enhanced Series module to allow for high levels of ripple on the input supply voltage without causing the module to cycle on and off. Typically 300V modules will turn on when the input exceeds 160V and turn off below 140V. 48V modules will turn on above 33V and turn off below 28V (see Electrical Specifications for exact figures).

Overtemperature Protection

If the module's internal temperature exceeds 87°C, the module will latch OFF. To reset the module the input supply must be cycled off and then on again, or toggle ENABLE OFF/ON allowing a period of time for the module to cool down.
Overtemperature shutdown can also be programmed to occur at lower temperatures by using the TEMP MON output to control the ENABLE pin.

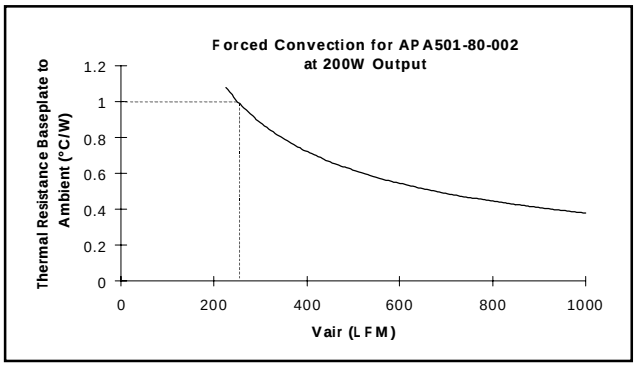
Break Regulation

AL80A Enhanced Series modules are designed to deliver full rated output current at up to 0.5V above $V_{O\ nom}$ at the minimum specified input voltage.



Thermal Data

Natural convection thermal impedance of the AL80A package without a heatsink is approximately 4°C/W.



A standard horizontal fin heatsink available from Astec (part number APA501-80-002) with 11mm fins and 8mm pitch, will reduce module thermal impedance to 1°C /W with a forced air flow of 250LPM when mounted with a thermal pad (ASTEC P/N APA502-80-001) between heatsink and module.

MTBF

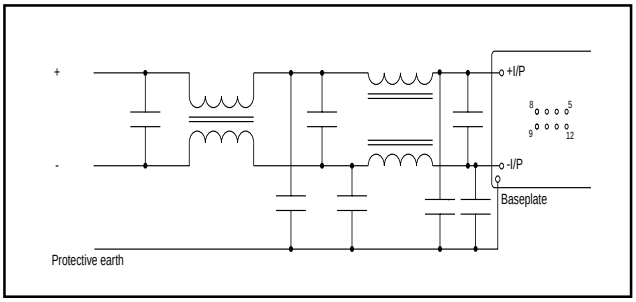
Predicted MTBF for the AL80A Enhanced Series is greater than 1,000,000 hours at maximum rated output and 50°C baseplate temperature. Calculated MTBF by MIL-HDBK-217E under ground benign conditions is 200,000 hours.

Output Ripple and Noise

AL80A Enhanced Series modules are designed to generate very low ripple and noise. When mounted on logic boards, for example, sufficient decoupling is normally provided by the components used to decouple the logic ICs, and no additional decoupling is required.

Conducted EMI

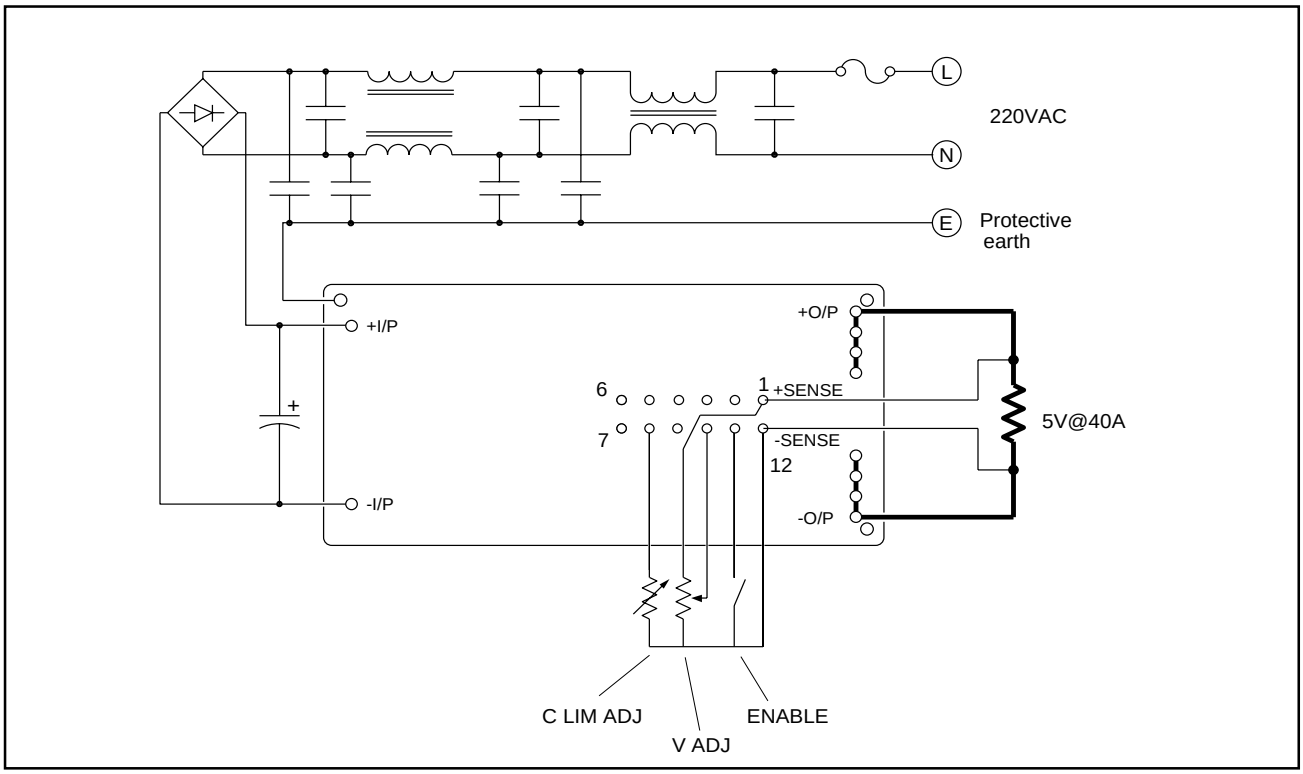
Although AMPSS™ modules contain both common mode and differential mode input EMI filtering, power supply systems using these modules will require additional EMI filtering to enable the system to meet relevant EMI standards.



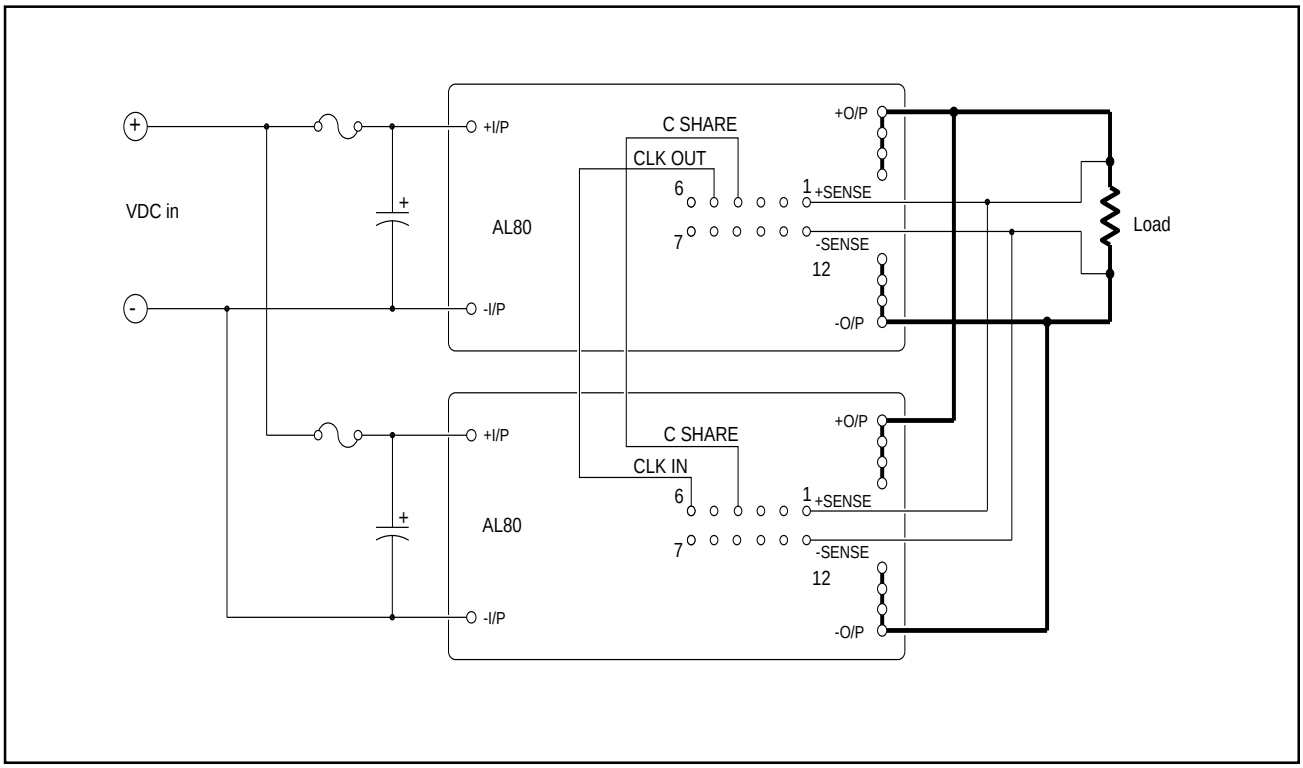
AL80A modules have an effective input to ground (baseplate) capacitance of 450pF. This should be accounted for when calculating the maximum EMI 'Y' capacitance to meet ground leakage current specifications.

Application Examples

AC Input Design



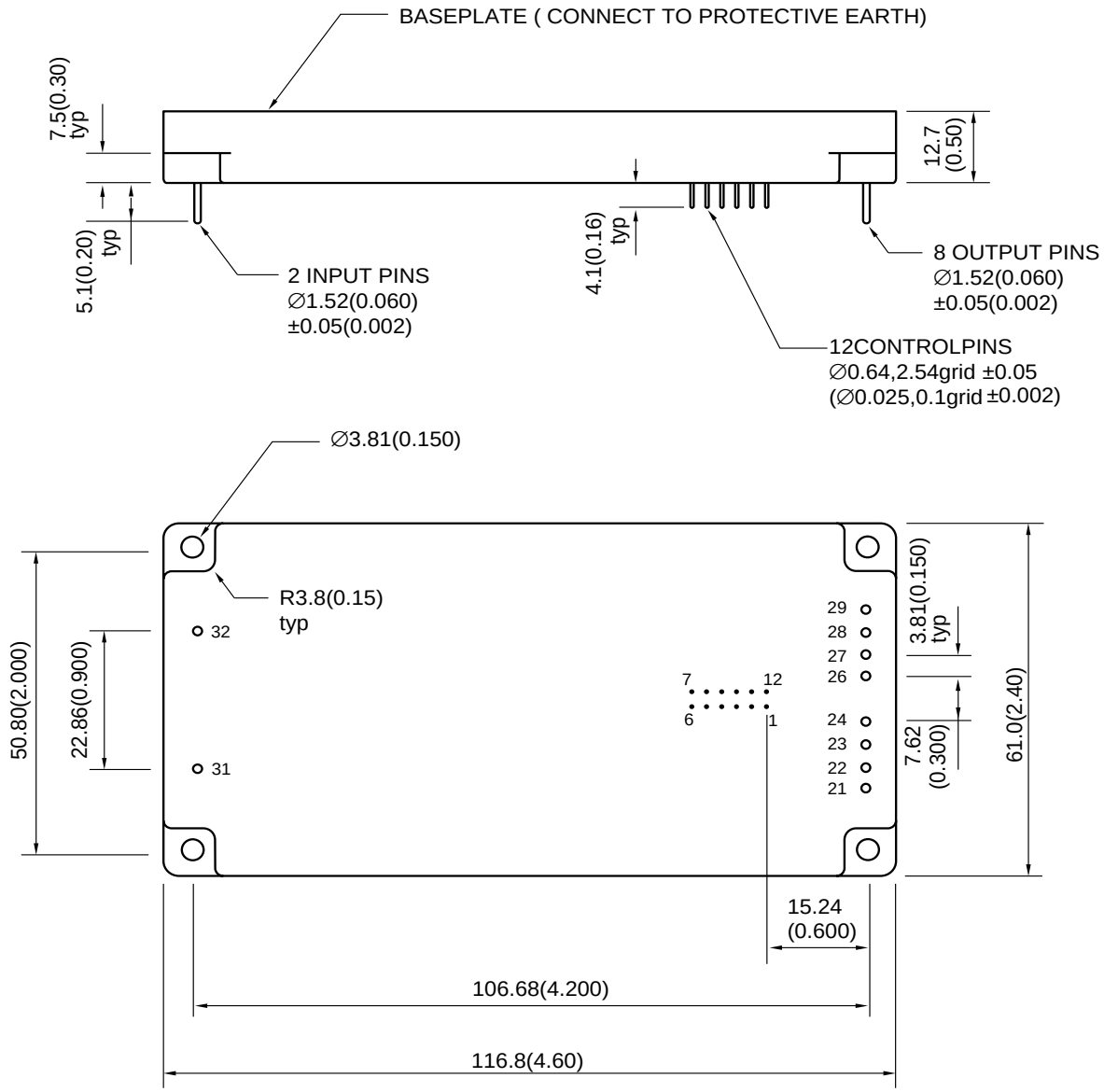
Parallel Connection Design



Mechanical Information

Dimensions

The dimensions are given in mm (inches). Note that the baseplate must be connected to protective earth before power is supplied to the module.

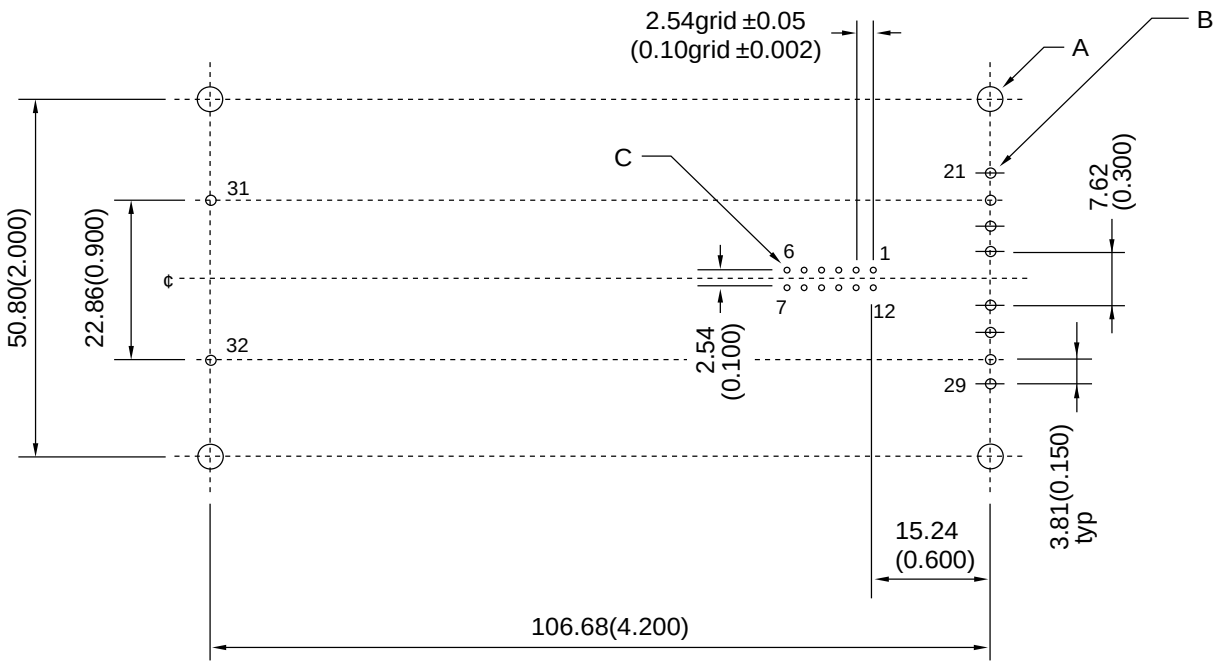


Notes:
1. All dimensions in mm and (inches)
2. Baseplate must be connected to protective earth
3. General tolerance: .X ±0.5(0.02)
   .XX ±0.25(0.010)
4. Surface Flatness: Concave 0.12mm max
   Convex 0.38mm max

Recommended PCB Layout

The AL80A Enhanced Series module may be mounted to a board either by soldering or by using spring sockets.

Materials :
Control pins are tin plated phospher-bronze.
Input and output pins are tin plated copper.



VIEW FROM PCB COMPONENT SIDE

NOTES:
1. PCB COMPONENT SIDE VIEW IS SHOWN.
2. ALL DIMENSIONS IN mm AND (INCHES).
3. GENERAL TOLERANCE: .XX±0.1(0.006).

RECOMMENDED HOLE SIZE TABLE:-

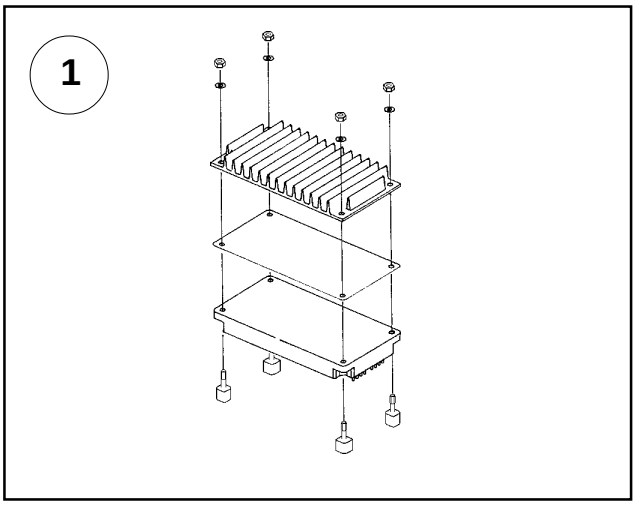
	A	B	C
HOLE SIZE FOR PCB DIRECT SOLDERING	∅2.00+0.15/-0 (∅0.079+0.006/-0)	∅2.00+0.15/-0 (∅0.079+0.006/-0)	∅1.00+0.15/-0 (∅0.039+0.006/-0)
HOLE SIZE FOR SPRING SOCKET MOUNTING*		∅2.67±0.05 (∅0.105±0.002)	∅1.37±0.05 (∅0.054±0.002)
HOLE SIZE FOR M3.5 MACHINE SCREW	∅4.5+0.08/-0 (∅0.177+0.0031/-0) FOR M3.5		

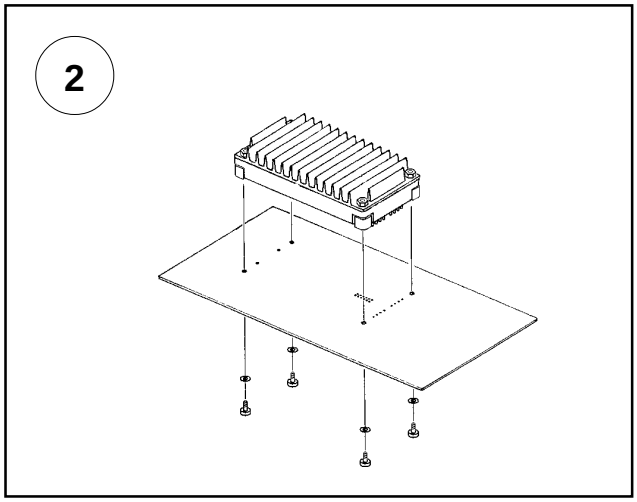
*Spring sockets are available from Astec in packs of 20 control pin sockets and 15 power pin sockets, part no. APA504-00-001. Sockets are not suitable for output current greater than10A per pin.

Heatsink Mounting Information

Heatsinks for AMPSS™ modules are available in a variety of sizes and fin orientation. Mounting kits and thermal pads are also available. The table below shows the options available for AL80A Enhanced Series.
A heatsink mounting kit provides the most convenient way to mount the heatsink to the module and then mount the assembly onto a circuit board

AMPSS™ modules may be retained by their input and output pins only, or may be fixed to the board using bolts screwed into the tapped studs which are provided as part of the mounting kit. In both cases the studs provide clearance between the module and the circuit board to facilitate PCB cleaning operations.
Note: *baseplate and heatsink must be connected to protective earth*



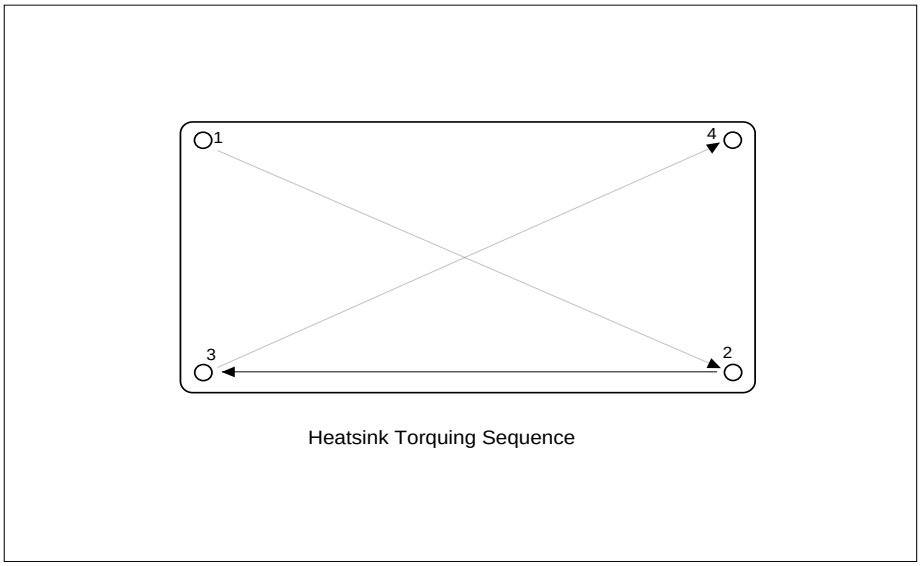


Description	Model Number	Dimensions		Free air thermal resistance
		inches	mm	
Heatsink, "80" size, vertical fin.	APA501-80-001	4.53x2.32x0.6	115x59x15	2.7°C/W
Heatsink, "80" size, horizontal fin	APA501-80-002	4.53x2.32x0.6	115x59x15	2.4°C/W
Heatsink, "80" size, vertical fin.	APA501-80-003	4.53x2.32x0.9	115x59x22.5	2.2°C/W
Heatsink, "80" size, horizontal fin	APA501-80-004	4.53x2.32x0.9	115x59x22.5	2.0°C/W
Heatsink, "80" size, vertical fin.	APA501-80-005	4.53x2.32x1.5	115x59x37	2.0°C/W
Heatsink, "80" size, horizontal fin	APA501-80-006	4.53x2.32x1.5	115x59x37	1.7°C/W
Heatsink, "80" size, low profile	APA501-80-007	4.55x3.50x0.5	115.6x89x12	2.2°C/W
Thermal Pad, "80" size	APA502-80-001			
Mounting Kit, Tapped Studs	APA503-00-001			
Mounting Kit, Solder Studs	APA503-00-002			
Mounting Kit, Tapped Studs for low profile heatsink	APA503-00-007			
Mounting Kit, Solder Studs for low profile heatsink	APA503-00-008			
Spring Sockets (20 cont. 15pwr)	APA504-00-001			

To provide optimal thermal contact between heatsink and module, it is recommended that the mating surface of the heatsink should have a surface flatness of no greater than 0.1mm. The use of a thermal pad or thermal grease is also recommended.

The recommended torque of using AMPSS mounting kit for module/heatsink is:

Screw size	Torque
M3	4-6kg-cm (3.5-5.2 lb-in)
M3.5	6-8kg-cm (5.2-6.9 lb-in)



Heatsink Torquing Sequence

It is assumed that all four mounting screws are being torqued to a common surface.

Other thermal management schemes are at customer discretion as long as the maximum thermal rating of the
specific module is not exceeded.

For further information contact :

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