

## M169 Series

### AC-DC POWER SUPPLY



#### DESCRIPTION:

The M169 is a series of mechanically robust, base plate cooled, high performance, 1kW single output AC to DC power supplies, for Navy shipboard, Airborne, and ground applications. The M169 converts 85 VAC -265 VAC /50-60Hz or 85 VAC -150 VAC /400Hz, to a well-regulated, filtered and protected DC Output.

#### FEATURES

- AC/DC Single output power supply up to 1kW
- 85VAC -265VAC /50-60Hz or 85VAC -150VAC / 400Hz Standard Input version, single-phase
- For extended input version - Please contact factory for more details
- High efficiency
- Wide input range
- High power factor
- Input / Output isolation
- Remote sense compensation
- Remote Inhibit (On/Off)
- External sync. capability
- EMI filters included
- Inrush Current Limiter
- Non-latching protections:
  - o Overload/Short-circuit
  - o Output Overvoltage
  - o Over Temperature
  - o Input Undervoltage Lockout

## HOW TO ORDER

PART NUMBER	Input		Output		Special features
	Voltage range	Frequency	Voltage	Current	
CF-02EM169-1	85-265VAC/Single phase	50/60/400Hz	5VDC	70 A	
CF-02EM169-2	85-265VAC/Single phase	50/60/400Hz	12 VDC	70 A	
CF-02EM169-3	85-265VAC/Single phase	50/60/400Hz	24 VDC	42 A	
CF-02EM169-4	85-265VAC/Single phase	50/60/400Hz	28 VDC	36 A	
CF-02EM169-5	85-265VAC/Single phase	50/60/400Hz	48VDC	21 A	
CF-02EM169-6	85-265VAC/Single phase	50/60/400Hz	270VDC	4 A	
CF-02EM169-7	85-265VAC/Single phase	50/60/400Hz	28 VDC	36 A	Parallel operation via output voltage droop. Voltage regulation is $\pm 2\%$ ..
CF-02EM169-8	85-265VAC/Single phase	50/60/400Hz	48 VDC	21 A	Parallel operation via output voltage droop. Voltage regulation is $\pm 2\%$ ..
CF-02EM169-9	85-265VAC/Single phase	50/60/400Hz	24 VDC	42 A	Parallel operation via output voltage droop. Voltage regulation is $\pm 2\%$ ..

## PRODUCT SPECIFICATIONS:

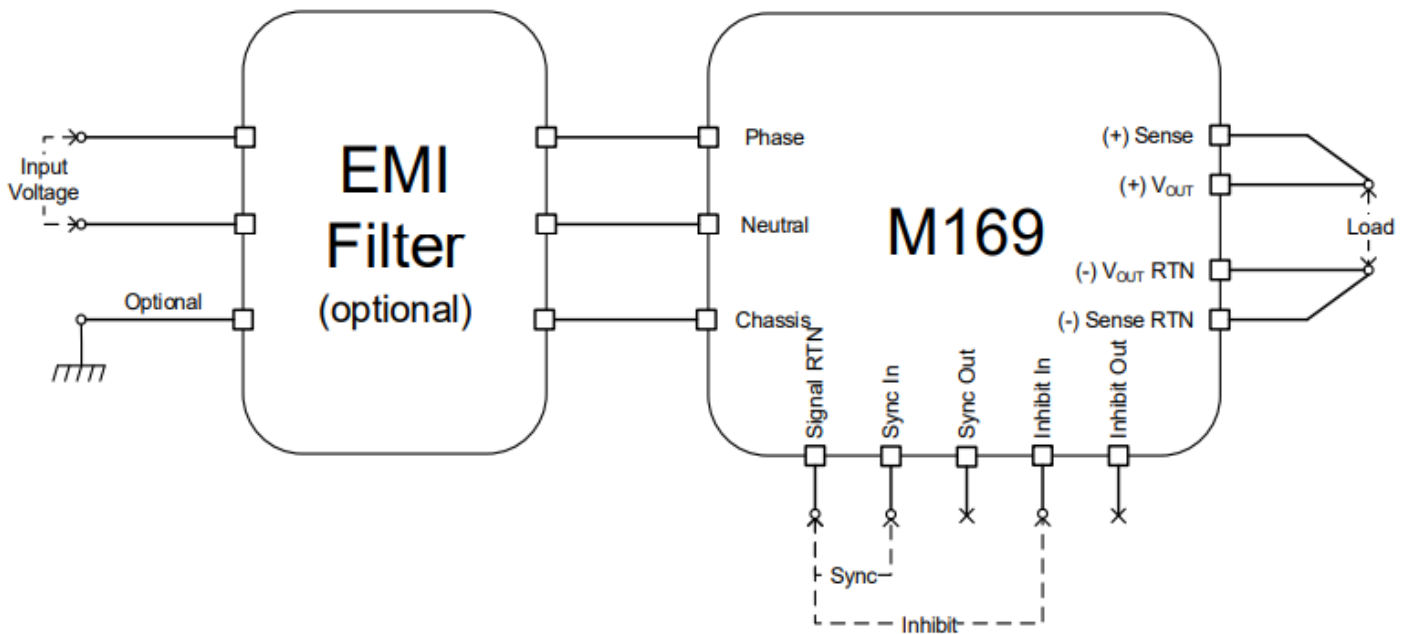
AC Input	Voltage Range	Option 1: 85 VAC -265 VAC /50 Hz - 60Hz / Single-phase Option 2: 85 VAC -150 VAC /400Hz / Single-phase For extended input version - Please contact factory for more details
	Isolation	1000VDC Input to Output 1000VDC Input and Case
	Spikes	Optional to withstand 1000 V spikes IAW MIL-STD-1399-300B. please consult factory

DC Output	Voltage Regulation	Up to $\pm 1\%$ (no load to full load, $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ and over normal input voltage range).
	Remote Sense	The SENSE is used to achieve accurate load regulations at load terminals (this is done by connecting the pins directly to the load's terminals). For output voltage above 8V, the use of remote sense has a max limit of 0.25V voltage dropout between converter's output and load terminals. For output voltage below 8V, the use of remote sense has a max limit of 0.5V voltage dropout between converter's output and load terminals. When not used connect SENSE to OUT and SENSE RTN to OUT RTN.
	Ripple and Noise	(max. 1%) measured at load across 1 $\mu\text{F}$ and 0.1 $\mu\text{F}$ ceramic capacitors.
	Isolation	200VDC Output and Case. (At M169-105 it is 500VDC)
	Current Limit & Overload	Output turns off and on periodically (hiccup) until fault is condition removed. Protection threshold set at $120\% \pm 10\%$ of maximum current
	Efficiency	Up to 85-87% - typical (nominal input voltage, full load, room temperature)
	Overvoltage Protection	<b>Active Over-Voltage Protection</b> Internal control shuts output down if voltage exceeds $110\% \pm 5\%$ of nominal. <b>Passive Over-Voltage Protection</b> A transorb, rated to $120\% \pm 10\%$ of nominal voltage, is placed across the output
	Over Temp. Protection	Unit shuts down if baseplate temperature exceeds $100 \pm 5^{\circ}\text{C}$ . Automatic recovery upon cooldown to below $90 \pm 5^{\circ}\text{C}$ .

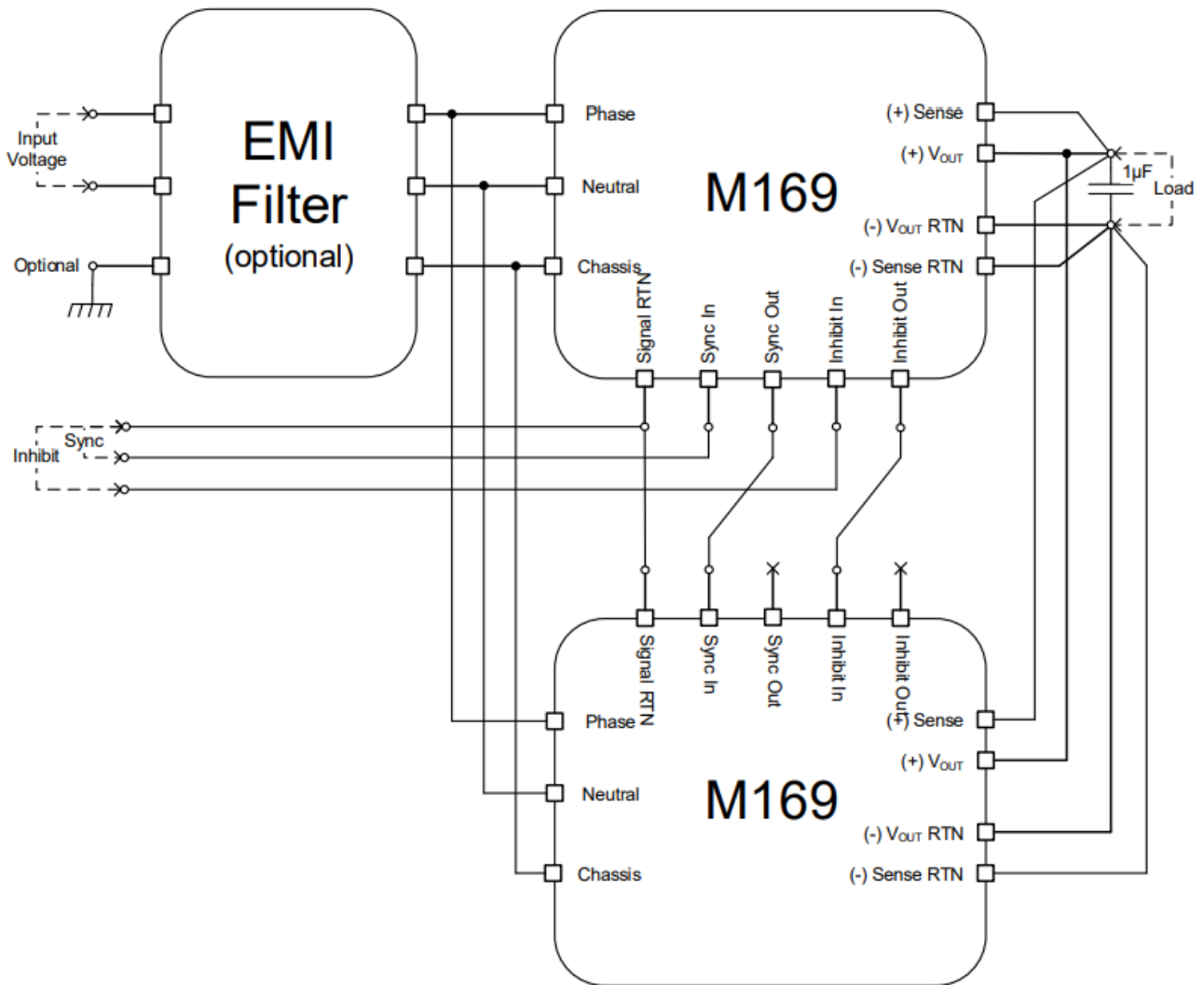
Control & Indication	ON/OFF input	<p>The INHIBIT IN signal is used to turn the power supply ON and OFF.</p> <p>TTL “1” or OPEN – will turn on the power supply. (For normal operation leave the signal not connected.)</p> <p>TTL “0” – will turn off the power supply.</p> <p>Ground reference for the INHIBIT IN signal is SIGNAL RTN (pin #1).</p> <p>Optional on/off ENABLE IN signal - Please consult factory:</p> <p>TTL “0” or OPEN – will turn on the power supply. (For normal operation leave the signal not connected.)</p> <p>TTL “1” – will turn off the power supply.</p> <p>Ground reference for the ENABLE IN signal is SIGNAL RTN (pin #1).</p>
	INHIBIT OUT	<p>Used when connecting two units or more in parallel. Connect this signal to the INHIBIT IN pin of the slave unit (see diagram below).</p> <p>This signal synchronizes the shutdown and startup of the units.</p>
	SYNC IN	<p>The SYNC IN signal is used to allow the power supply frequency to sync with the system frequency. The system frequency should be 250 kHz <math>\pm</math> 10 kHz. When not connected the power supply will work at 250 kHz <math>\pm</math> 10 kHz.</p>
	SYNC OUT	<p>The SYNC OUT signal is used to sync the system with the power supply frequency.</p>
	SIGNAL RTN	<p>The SIGNAL RTN is a floated ground.</p> <p>This pin is used as ground return for SYNC IN, SYNC OUT, INHIBIT IN and INHIBIT OUT signals.</p>
	Environment Designed to meet MILSTD-810F	Temperature
Humidity		<p>Method 507.4</p> <p>Procedure I</p> <p>Up to 95% RH</p>
Salt-fog		<p>Method 509.5</p>
Altitude		<p>Method 500.4</p> <p>Procedures I – up to 70,000 ft. (non-operational)</p> <p>Procedure II – up to 40,000 ft. (operational)</p>

<b>Environment Designed to meet MILSTD-810F</b>	Mechanical Shock	Method 516.5 Procedure I 30 g, 11 ms terminal peak saw-tooth
	Vibration	Method 514.5 Procedure I Category 24 - General minimum integrity exposure
	Fungus	Does not support fungus growth, in accordance with the guidelines of MIL-STD-454, Requirement 4
<b>EMI</b>	MIL-STD-461F	Designed to meet* MIL-STD-461F CE101, CE102, CS101, CS114, CS115, CS116, RE101, RS101, RS103
<b>Reliability</b>	150,000 hours, calculated per MIL-STD-217F Notice 2 at +85°C baseplate, Ground Fixed environment.	
<b>Form factor</b>	5.51" wide, 1.50" high and 9.84" deep. For detailed dimensions and tolerances see Drawing: M169001	
<b>Weight</b>	1.92kg (4.25lbr)	

**TYPICAL STAND-ALONE CONNECTION DIAGRAM:**



## TYPICAL PARALLEL CONNECTION DIAGRAM:



## PIN ASSIGNMENT: J1 - INPUT CONNECTOR

Connector type: M24308/24-38F or eq.  
 Mates with: M24308/2-2F or eq.

Pin #	Function	P
1	PHASE	~
2	PHASE	~
3	PHASE	~
4	N.C.	
5	NEUTRAL	0

Pin #	Function	P
6	NEUTRAL	0
7	N.C.	
8	CHASSIS	
9	PHASE	~
10	PHASE	~

Pin #	Function	P
11	N.C.	
12	NEUTRAL	0
13	NEUTRAL	0
14	NEUTRAL	0
15	N.C.	

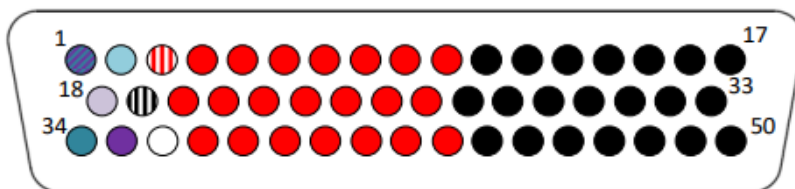
Note: All pins with identical function/designation should be connected together for optimal performance.

CHASSIS Note: Chassis PIN  
 This pin is connected to the converter's chassis.

## PIN ASSIGNMENT: J2 - OUTPUT CONNECTOR

Connector type: M24308/23-41F or eq.  
 Mates with: M24308/4-5F or eq.

Pin #	Function	P	Pin #	Function	P	Pin #	Function	P
1	SIGNAL RTN	-	18	INHIBIT OUT	+	35	INHIBIT IN	+
2	SYNC OUT	+	19	SENSE RTN	-	36	N.C.	
3	SENSE	+	20	OUT	+	37	OUT	+
4	OUT	+	21	OUT	+	38	OUT	+
5	OUT	+	22	OUT	+	39	OUT	+
6	OUT	+	23	OUT	+	40	OUT	+
7	OUT	+	24	OUT	+	41	OUT	+
8	OUT	+	25	OUT	+	42	OUT	+
9	OUT	+	26	OUT	+	43	OUT	+
10	OUT	+	27	OUT RTN	-	44	OUT RTN	-
11	OUT RTN	-	28	OUT RTN	-	45	OUT RTN	-
12	OUT RTN	-	29	OUT RTN	-	46	OUT RTN	-
13	OUT RTN	-	30	OUT RTN	-	47	OUT RTN	-
14	OUT RTN	-	31	OUT RTN	-	48	OUT RTN	-
15	OUT RTN	-	32	OUT RTN	-	49	OUT RTN	-
16	OUT RTN	-	33	OUT RTN	-	50	OUT RTN	-
17	OUT RTN	-	34	SYNC IN	+			



**Note:** All pins with identical function/designation should be connected together for optimal performance.

### CHASSIS Note: Chassis PIN

This pin is connected to the converter's chassis.

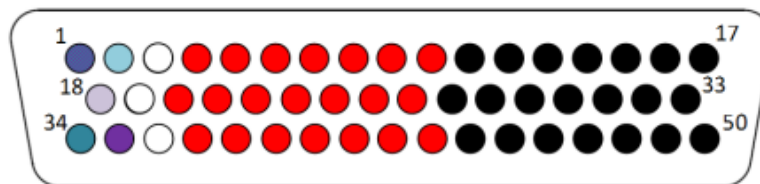


HV option: High voltage version (100 to 300 VDC)

Pin #	Function	P
1	SIGNAL RTN	-
2	SYNC OUT	+
3	N.C.	+
4	OUT	+
5	OUT	+
6	OUT	+
7	OUT	+
8	OUT	+
9	OUT	+
10	OUT	+
11	OUT RTN	-
12	OUT RTN	-
13	OUT RTN	-
14	OUT RTN	-
15	OUT RTN	-
16	OUT RTN	-
17	OUT RTN	-

Pin #	Function	P
18	INHIBIT OUT	+
19	N.C.	-
20	OUT	+
21	OUT	+
22	OUT	+
23	OUT	+
24	OUT	+
25	OUT	+
26	OUT	+
27	OUT RTN	-
28	OUT RTN	-
29	OUT RTN	-
30	OUT RTN	-
31	OUT RTN	-
32	OUT RTN	-
33	OUT RTN	-
34	SYNC IN	+

Pin #	Function	P
35	INHIBIT IN	+
36	N.C.	
37	OUT	+
38	OUT	+
39	OUT	+
40	OUT	+
41	OUT	+
42	OUT	+
43	OUT	+
44	OUT RTN	-
45	OUT RTN	-
46	OUT RTN	-
47	OUT RTN	-
48	OUT RTN	-
49	OUT RTN	-
50	OUT RTN	-



**Note:** All pins with identical function/designation should be connected together for optimal performance.

**CHASSIS Note: Chassis PIN**

This pin is connected to the converter's chassis.

## BIT (connector J2, pin 3) [HIGH VOLTAGE VERSION ONLY]

Description: The BIT signal indicates failure when one of the following occurs:

- o Input voltage falls below  $85 \pm 5$  Vrms or rises above  $255 \pm 5$  Vrms.
- o Output voltage falls below Under-Voltage Limit threshold or rises above Over-Voltage Limit threshold for at least 100ms.

Operation: This signal can be in one of two states:

Fail: Pins BIT and BIT RTN open

Good: Pins BIT and BIT RTN are shorted together through an internal phototransistor.

Signal Type: Opto-isolated open collector.

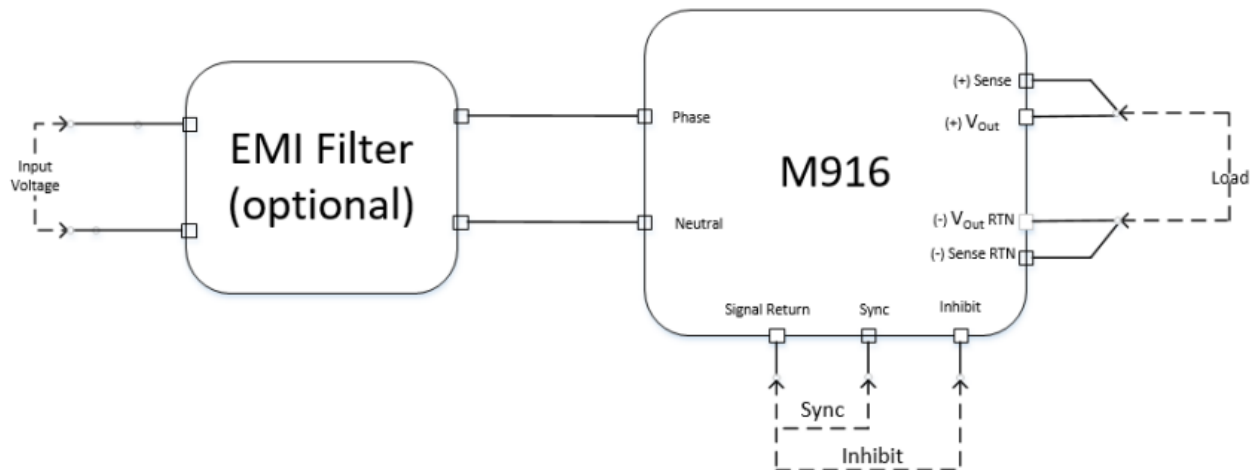
Polarity of externally applied voltage is (+) to BIT pin and (-) to BIT RTN pin.

Absolute maximum voltage allowable across pins BIT and BIT RTN: 30V.

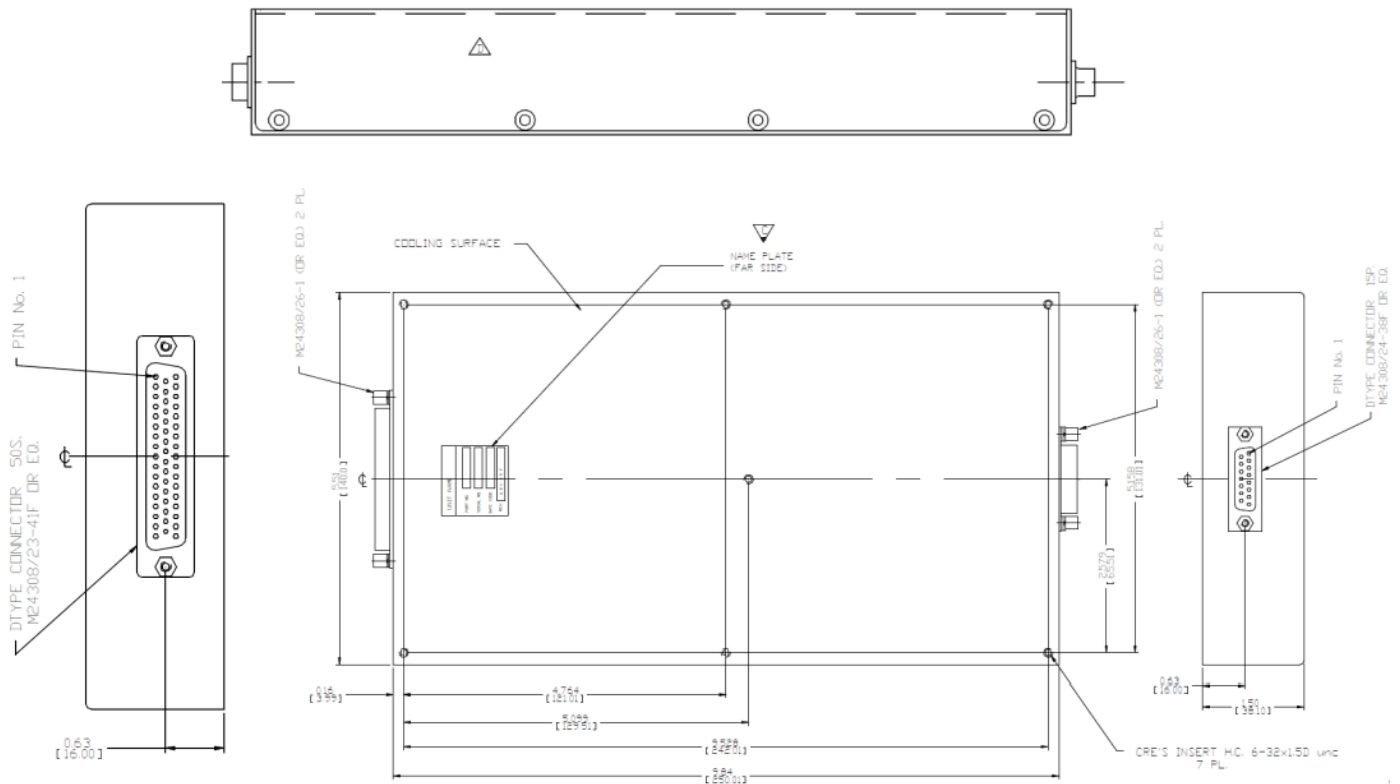
Absolute maximum current allowable through pins BIT and BIT RTN: 10mA.

Return line: This signal is referenced to BIT RTN (connector J2, pin 15).

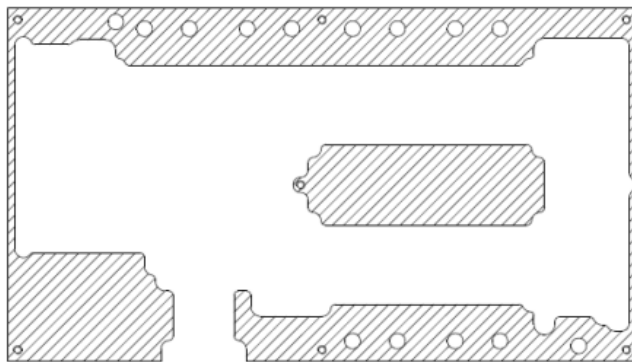
## TYPICAL CONNECTION DIAGRAM:



## OUTLINE DRAWING:



## HEAT DISSIPATION SURFACE:



Dissipation Area  
21.08 in<sup>2</sup>  
(13,600 mm<sup>2</sup>)

### Notes

1. Dimensions are in inches [mm]
2. Tolerance is:  
.XX ± .02 in  
.XXX ± .01 in
3. Weight: 4.25 lbs [1922 g]

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