BROADBAND TELCOM POWER, INC

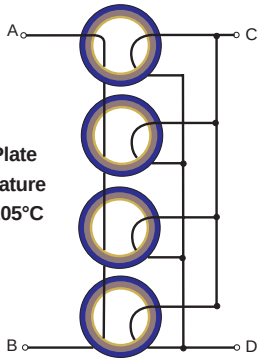
Low Cost Solutions To Modular Power Supplies

Flat Transformer Technology Features:

- 18 Vdc to 400 Vdc input
- 2.1 Vdc to 24.0 Vdc Output
- 105°C No de-rating
- Load/Line Regulation: ± 0.1%
- Peak to Peak Output Ripple: 1%
- Minimum Load: 0 Ampere
- Input Undervoltage Lockout
- Output Over Current Protection
- Output Over Voltage Protection
- Over temperature Shutdown
- Very Low Temperature Rise
- Switching Frequency: 300 kHz (fixed)
- High Efficiency: up to 90%
- Output Trimming and Remote Sensing
- Digital On/Off Control
- N + 1, Current Sharing

BAUART GEPRUFT TYPE APPROVED TUV Rheinland

200 Watts



Base Plate Temperature Up To 105°C

MTBF : Over 700,000 Hours (Per Mil-Std-217E)

400 Watts

Actual Size:

- Length: 4.6 in (116.8 mm)
- Width: 2.4 in (61.0 mm)
- Height: 0.5 in (12.7 mm)

BTCPower™

Model Numbering System

IMT 400 - XX - XX

Output Power (Watts) 200, 400	Nominal Input Voltage 24, 48, 72, 110, 150, 300 Vdc	Output Voltage 2.1, 3.3, 5.0, 12.0, 15.0, 24.0 Vdc

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Applications

- Telecommunication systems
- Distributed Power systems
- Industrial application
- Regulated DC power

Product Overview

The unique transformer technology is the basis of BTCPower's low cost, high performance, and high reliability DC-DC converter line. These converters are designed for telecommunication and industrial applications. The converter design utilizes a push-pull topology operating at a fixed switching frequency of 300 kHz. By using a fixed switching frequency, EMI filtering is made easier, and less expensive.

The core technology is a patented, modular, and very low noise **Flat Transformer™** which generates extremely low leakage inductance and inter-winding capacitance – a combination not available in conventional transformers. In addition, the Flat Transformer does not create hot spots, therefore, making the converters more reliable.

The use of direct bond aluminum base plates, forced current sharing in parallel rectifiers, and the absence of hot spots in the transformers allow the converter to have very low temperature gradients.

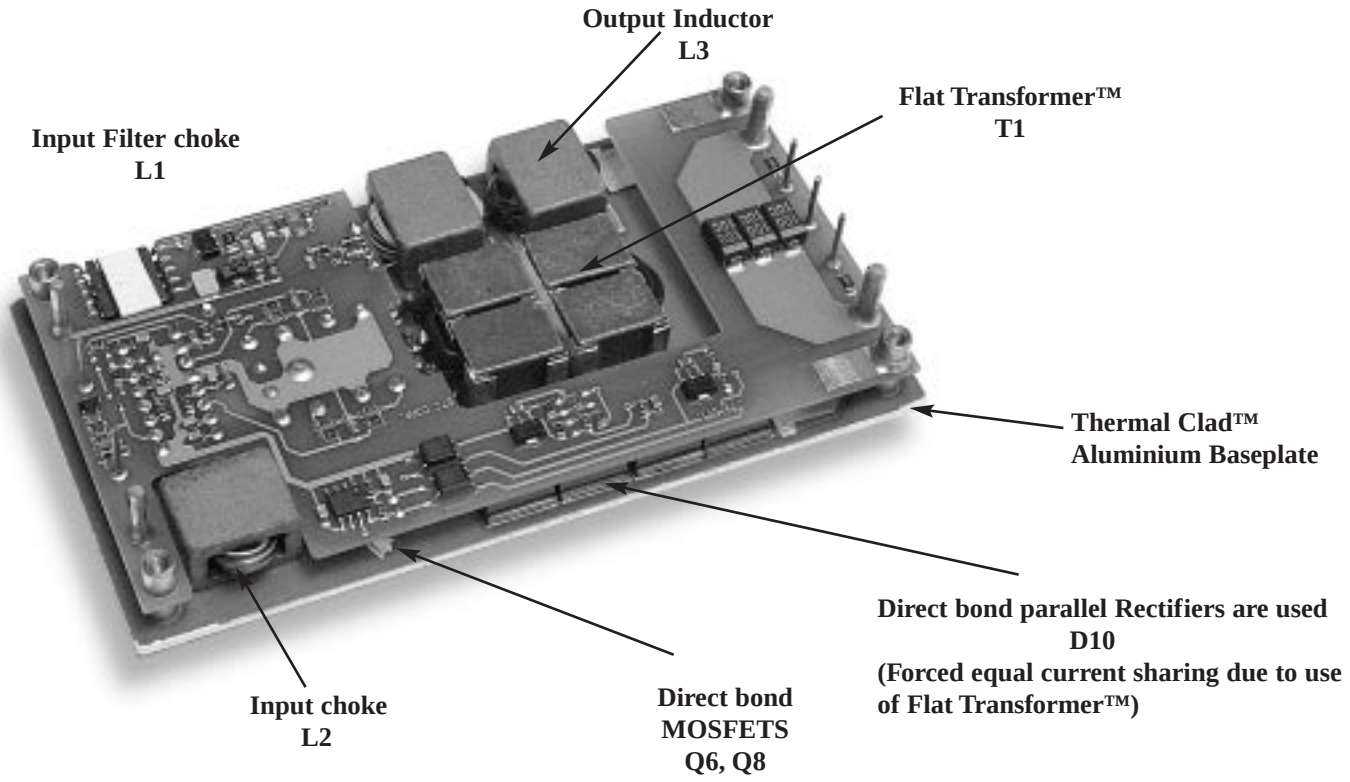
The converter's internal temperature rise is less than 10 °C above base plate temperature, allowing base plate temperature to be raised to 105 °C.

The converters are manufactured in an ISO 9001 approved facility utilizing advanced automated surface mount technology and state of the art in-process test procedures.

Objective

The chief objective of the IMT series converters is to reduce costs, while improving high performance and reliability. This will enable "brick" type modular DC-DC converters to be cost effective in the manufacturing of quick turn around custom power supplies.

IMT 200 and IMT 400



Competitive Advantages:

1) BTCPower's DC-DC Converters are low cost, and can be delivered in a timely manner because readily available standard off the shelf components are used. No special custom parts are used.

2) BTCPower's DC-DC Converters are extremely reliable because of the lower temperature gradient and even thermal loading:

- ▲ The highly de-rated multiple parallel rectifiers receive exact same shared currents from the use of the Flat Transformer technology. This ensures even thermal loading on the rectifiers.
- ▲ The Flat Transformer technology uses multiple cores. This coupled with the absence of many turns eliminates hot spots in the transformer windings.
- ▲ All heat generating components such as the Flat Transformers, inductors, rectifiers, and Mosfets are directly solder-bonded onto the aluminum base plate for maximum transfer of heat out of the converter.

3) BTCPower's DC-DC Converters utilize simple push pull topology with fewer components. The fixed switching frequency ensures easier and less expensive EMI filtering. In addition, negligible leakage inductance of Flat Transformers reduces the switching losses.

132 To 240 Watts Model Selection Chart

See IMT 200 Series Outline Drawing For Dimensions

Model	Input Voltage (Vdc)	Input Current (Amperes)	Output Voltage (Vdc)	Output Current (Amperes)	Output Power (Watts)
IMT-200-24-3.3	18-36	10.5	3.3	40	132
IMT-200-24-5	18-36	11.0	5	30	150
IMT-200-24-10	18--36	13.5	10	20	200
IMT-200-24-12	18-36	14.5	12	17	204
IMT-200-48-3.3	36-72	7.0	3.3	50	165
IMT-200-48-5	36-72	7.5	5	40	200
IMT-200-48-10	36-72	7.0	10	20	200
IMT-200-48-12	36-72	7.0	12	17	204
IMT-200-72-3.3	50-100	4.5	3.3	50	165
IMT-200-72-5	50-100	5.5	5	40	200
IMT-200-72-10	50-100	5.0	10	20	200
IMT-200-72-12	50-100	5.5	12	17	204
IMT-200-150-3.3	100-200	2.5	3.3	50	165
IMT-200-150-5	100-200	2.5	5	40	200
IMT-200-150-10	100-200	2.5	10	20	200
IMT-200-150-12	100-200	2.5	12	17	204
IMT-200-150-15	100-200	2.0	15	10	150
IMT-200-300-3.3	200-400	.75	3.3	50	165
IMT-200-300-5	200-400	.86	5	40	200
IMT-200-300-10	200-400	.82	10	20	200
IMT-200-300-12	200-400	.83	12	17	204
IMT-200-300-15	200-400	.62	15	10	150
IMT-240-110-10	66-160	4.5	10	24	240
IMT-240-48-24	36-72	7.8	24	10	240
IMT-210-24-14	18-36	14.5	14	15	210
IMT-240-150-24	100-200	2.8	24	10	240

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High Current Series
Model Selection Chart
See IMT 400 Series Outline Drawing For Dimensions

Model	Input Voltage (Vdc)	Output Voltage (Vdc)	Output Current (Amperes)	Output Power (Watts)
IMT-400-300-5	200-400	5	80	400
IMT-400-300-12	200-400	12	34	408
IMT-400-300-15	200-400	15	27	405
IMT-400-48-5	36-72	5	80	400
IMT-400-48-12	36-72	12	34	408
IMT-400-48-15	36-72	15	27	405
IMT-400-48-24	36-72	24	17	408
IMT-400-300-24	200-400	24	17	408
IMT-380-300-3.8	200-400	3.8	100	380
IMT-360-48-3.6	36-72	3.6	100	360
IMT-250-48-2.5	36-72	2.5	100	250
IMT-210-300-2.1	200-400	2.1	100	210

210 Watts to 408 Watts
IMT 400 Series

The above models have larger input and output pins.

Electrical Characteristics

1. **Input Voltage —** Please refer to Model Selection Charts: IMT 200 and IMT 400
2. **Output Voltage (without trimming) ± 1% of Nominal —** Please refer to Model Selection Chart.
3. **Output Current —** Please refer to Model Selection Chart.

4. Mechanical

Parameters		Units
Dimension	116.8(L) x 61.0(W) x 12.7(H)	mm
	4.6(L) x2.4 (W) x 0.5(H)	inches
Weight	226	grams
	0.10	lbs
Mounting screw type	M3	
Suggested screw torque	8.0	m-Kg

See mechanical drawing.

The following characteristics are measured under the following conditions unless specified otherwise:
Ambient Temperature: 25°C, Nominal Line and Full Load.

5. Input Characteristics

Parameters	Minimum	Typical	Maximum	Units
Reflected ripple current		30	35	mA
No load power consumption	**Please refer to Table 2**			
Input ripple rejection (120Hz)	30	35		dB
Input ripple rejection (1kHz)	25	30		dB

6. Output Characteristics

Parameters	Minimum	Typical	Maximum	Units	Test Conditions
Setpoint accuracy	99	100	101	%V_{NOM}	
Load regulation			0.1	%V_{NOM}	10% to 100% load
Line regulation			0.1	%V_{NOM}	Low line to high line
Output ripple & noise p-p		1.0	2.0	%V_{NOM}	20 MHz bandwidth
Output temperature drift		0.01	0.02	% /°C	T_{BASE}= 30 to 90°C
Start-up overshoot			25	mV	10% to 100% load
Transient response:-					75% to 100% load change 2.5 A / us
Settling time		100	200	µsec	
Over/under-shoot		300	500	mV	
Trimming range	**Please refer to Table 2 Trim down to 30% is available**				
Remote sense compensation		0.1	0.15	V	Plus complete trim range

7. Gate Control Characteristics

Parameters	Minimum	Typical	Maximum	Units	Test Conditions
Gate in Voltage for ON state	3.5	5.0	7.0	V	
Gate in Voltage for OFF state	0.0		1.35	V	

Active high (or open) in Gate-In Control Pin. Low logic level (0 to 1.8V) will disable the converter.

8. Isolation Characteristics

Parameters	Minimum	Typical	Maximum	Units	Test Conditions
Isolation (Input to output)	3,750			Vac	
Isolation (Input to baseplate)	2,500			Vac	
Isolation (output to baseplate)	500			Vac	
Capacitance (Input to output)		10	15	pF	
Insulation resistance (Input to output)		50		MΩ	

9. Protection Characteristics

Parameters	Minimum	Typical	Maximum	Units	Test Conditions
OVP (Over Voltage Protection) setpoint	120	125	140	%V_{NOM}	
OCP (Over Current Protection) setpoint	110	115	120	%Full load	
OTP (Over Temp. Protection) setpoint	90	100	105	°C	Base plate temp.
Long-term short-circuited current	**Please refer to Table 2**				OTP will occur

Once the protection circuit is activated, the converter will shut down. To reset the converter, remove the fault and turn the power off. Then turn the power on again (non auto-recovery type).

10. Thermal Characteristics

Parameters	Minimum	Typical	Maximum	Units	Test Conditions
Efficiency	**Please refer to Table 2**				
Thermal resistance (without heat sink)		5.0		°C / W	Free air
Thermal resistance (with heat sink)		3.0		°C / W	See Heat sink dimension

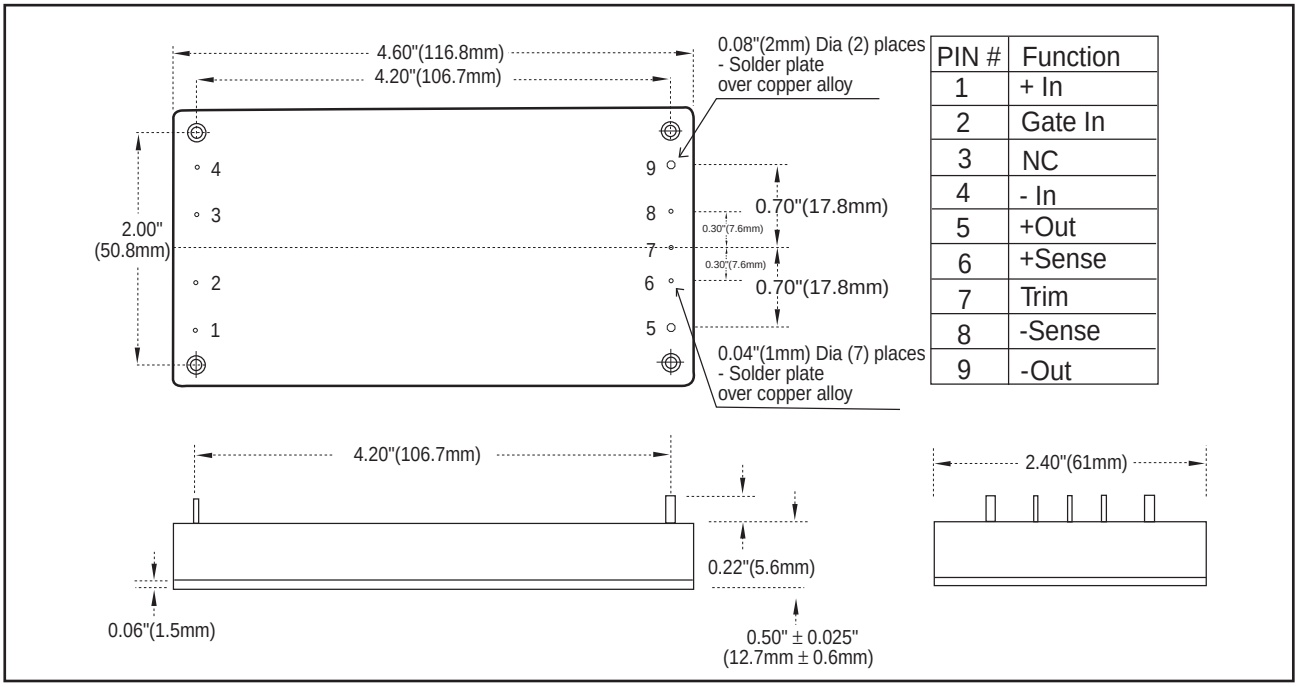
11. Environmental

Parameters	Minimum	Maximum	Units
Storage Temperature	-40	125	°C
Operating Temperature	-25 - 40 is available as an option	105	°C
Storage Humidity	0	95	%
Operating Humidity	0	95	%

Safety Compliance

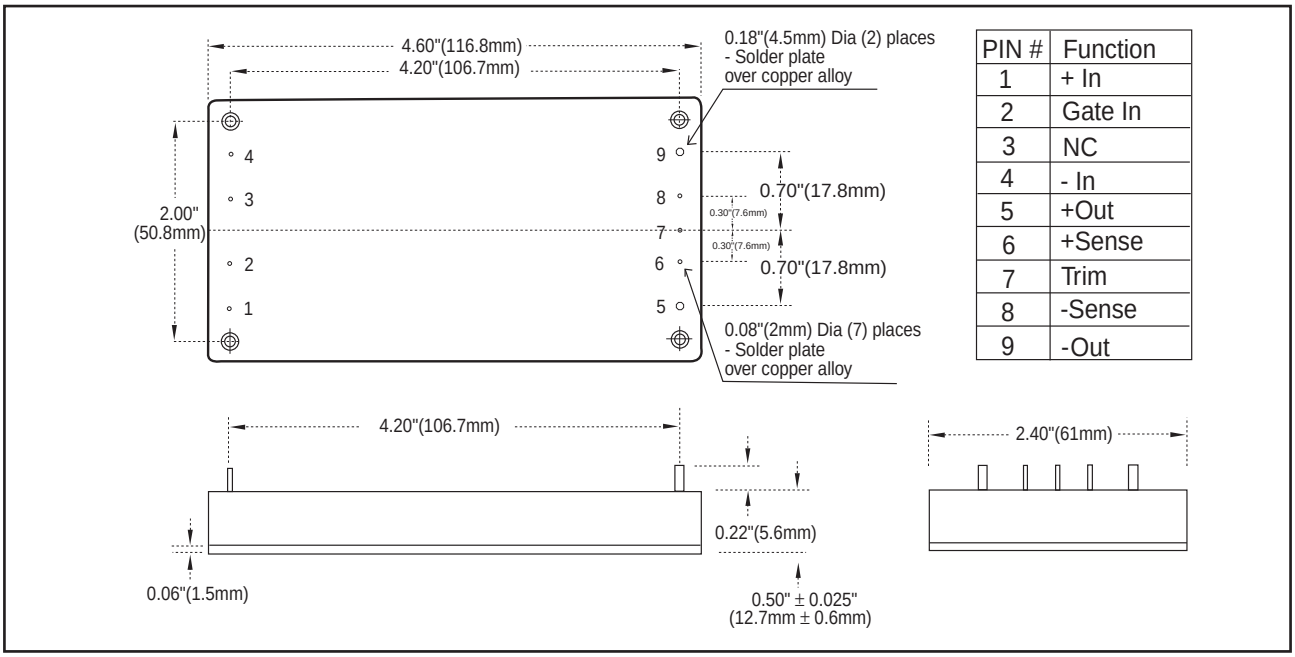
- **UL : 1950**
- **CSA : 950**
- **TUV : EN60950**
- **CE : Marked**

Mechanical Drawing: IMT 200 Outline Drawing



PIN #	Function
1	+ In
2	Gate In
3	NC
4	- In
5	+Out
6	+Sense
7	Trim
8	-Sense
9	-Out

Mechanical Drawing: IMT 400 Outline Drawing



PIN #	Function
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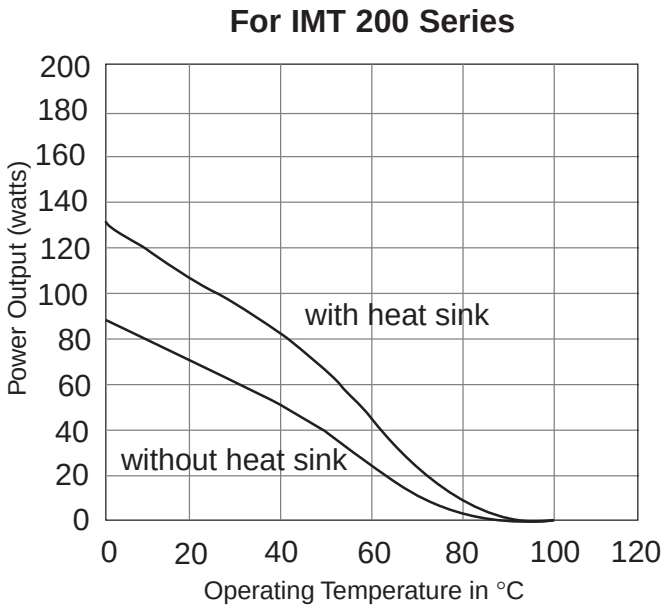
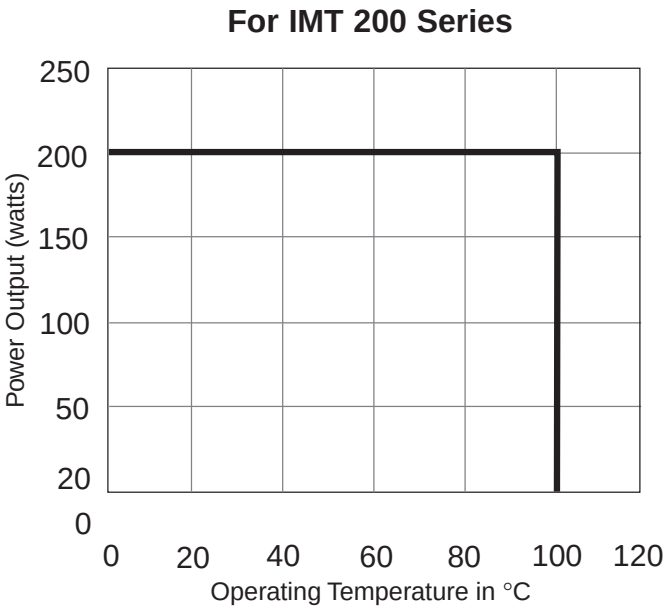
Thermal Consideration: IMT 200 Series

Graph A shows the output power derating (in watts) with heat sink and without heat sink at various ambient temperatures in still air condition. If an appropriate forced air is used with or without a heat sink, there is no power deration as illustrated in Graph B. In such a case, the converter can be operated at its full output power rating.

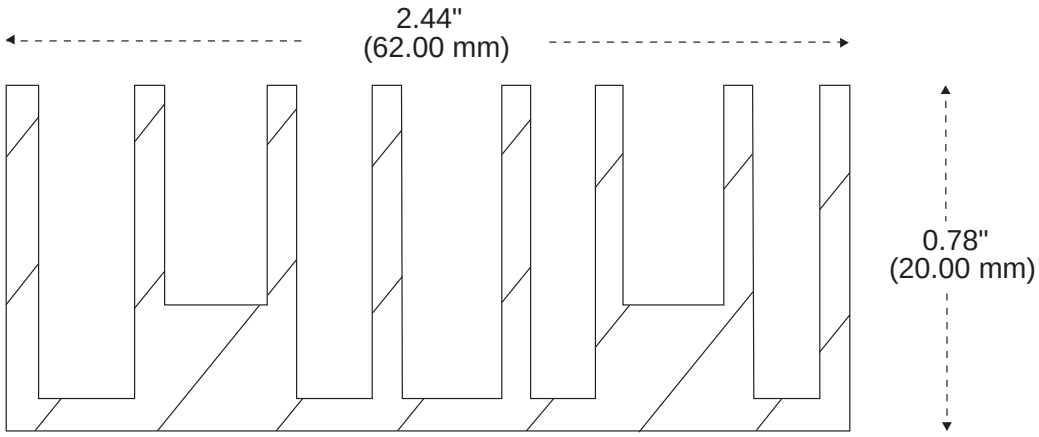


Graph A: Output Power Derating in Still Air



Graph B: Output Power With Forced Air

Heat Sink



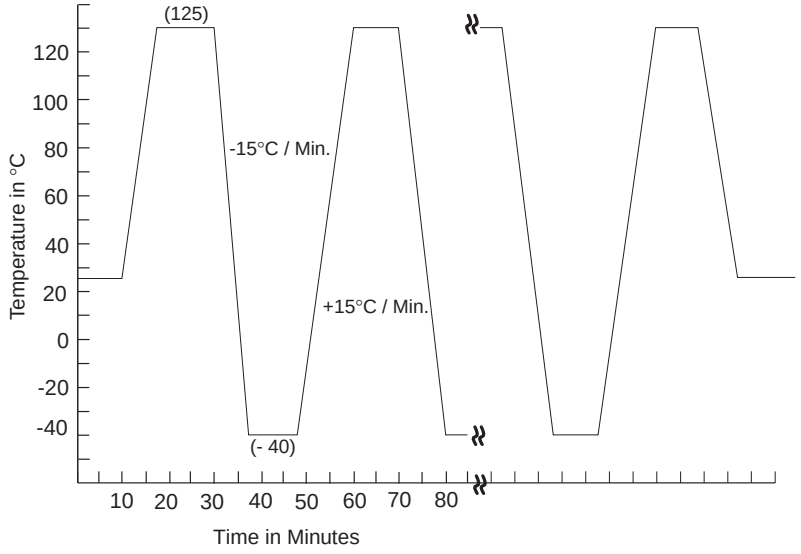
Heat Sink material : Aluminum Extrusion
Heat Sink Dimensions (WxHxL) : 2.44” x 0.78” x 4.6”
(62 x 20 x 117 in mm)

Weight : 135 g (0.06 Ibs)

Thermal Impedance = 3.0°C / W

The converter can be operated at full-load with appropriate forced air cooling or by using a lower thermal resistance heat sink.

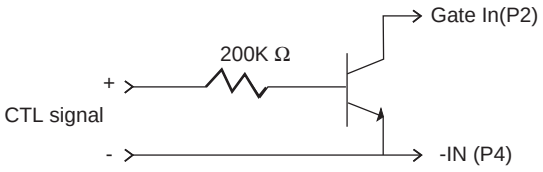
Reliability (thermal cycling)

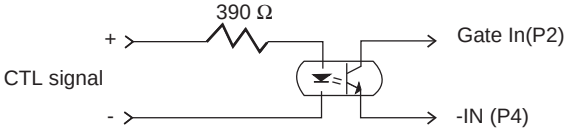


Thermal cycling is in accordance with MIL-STD-883E. A minimum of 10 cycles is used during the test.

Gate Control

A remote on-off Control Pin is provided to enable or disable the converter. When the Gate-In Pin 2 is at logic high (2.8 to 7V) or open circuited, the converter is enabled. At logic low (<2.8V) the converter is then disabled. If the control signal has a common return with the primary side, one can use a NPN transistor circuit to enable/disable the converter. If the control signal is from the secondary, or anywhere else, an optical couple circuit can be used.





Output Trimming

Approximately ±10% output voltage trimming can be achieved by adding a potentiometer. The recommended circuit connection technique is shown below: The suggested minimum resistance value is 5.1 KΩ.

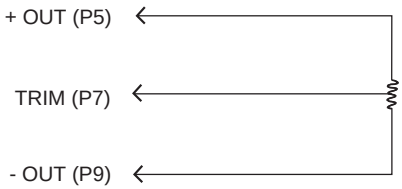


Table 2A. Electrical Characteristics

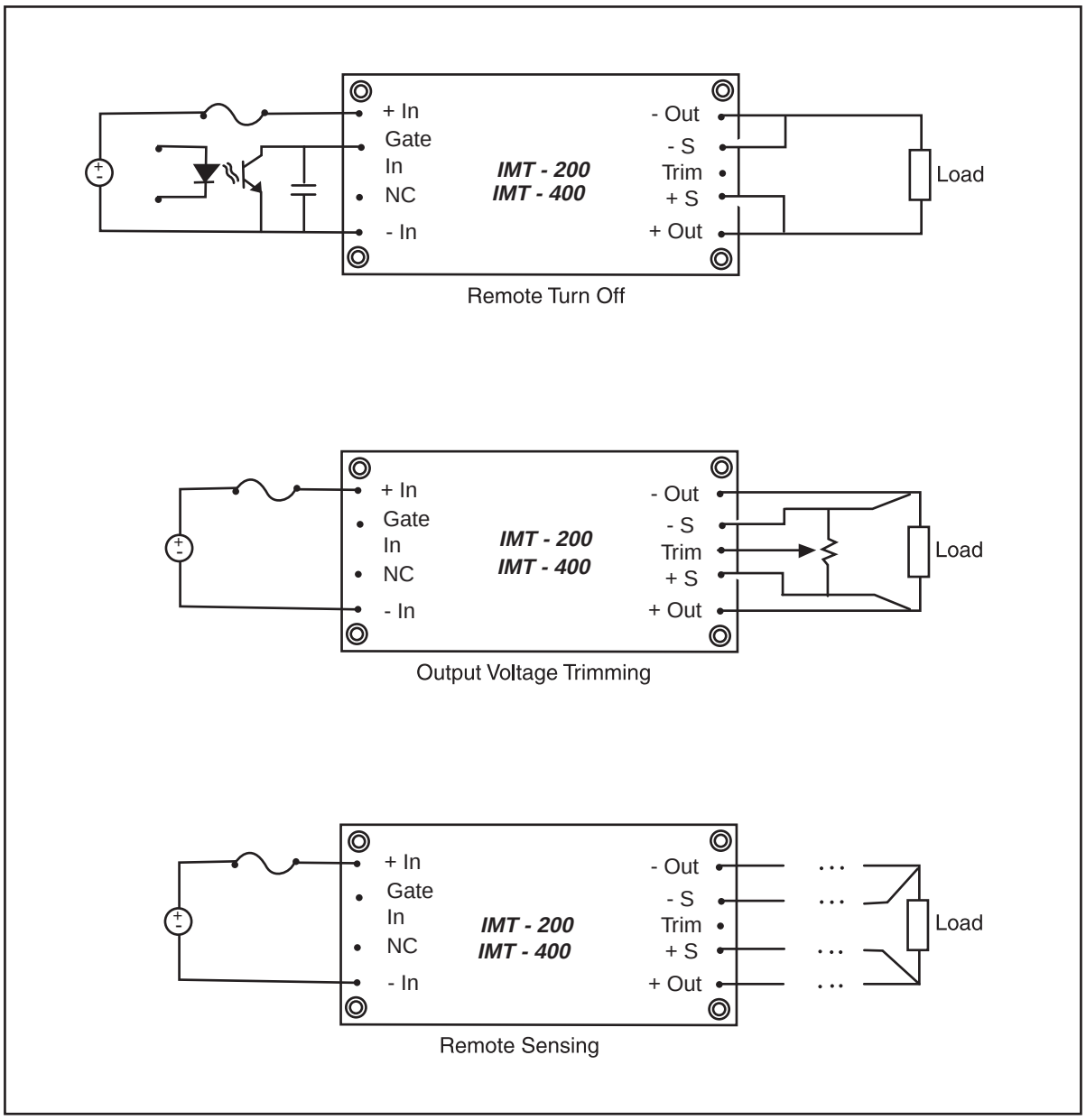
Model	No load Power Consumption (Watts)		Output Voltage Trimming Range (%V_{NOM})		Long-term Short-circuited Current (Amperes)	Typical Efficiency (%)
	Typical	Max.	* Min.	Max.	Max.	
IMT-200-24-3.3	0.4	0.6	-5	+8	0.10	75
IMT-200-24-5	0.4	0.6	-5	+8	0.10	82
IMT-200-24-10	0.5	0.8	-8	+8	0.10	82
IMT-200-24-12	0.5	0.8	-8	+8	0.10	85
IMT-200-48-3.3	0.5	0.8	-6	+9	0.10	75
IMT-200-48-5	0.5	0.8	-8	+8	0.10	82
IMT-200-48-10	0.5	0.8	-8	+10	0.10	85
IMT-200-48-12	0.6	0.9	-8	+10	0.10	87
IMT-200-72-3.3	0.5	0.8	-6	+9	0.05	78
IMT-200-72-5	0.5	0.8	-8	+10	0.05	82
IMT-200-72-10	0.6	0.9	-8	+10	0.05	85
IMT-200-72-12	0.6	0.9	-8	+10	0.05	86
IMT-200-150-3.3	0.5	0.9	-6	+9	0.02	75
IMT-200-150-5	0.5	0.9	-8	+10	0.02	80
IMT-200-150-10	0.5	0.9	-8	+10	0.02	83
IMT-200-150-12	0.8	1.2	-8	+10	0.02	85
IMT-200-150-15	0.8	1.2	-8	+10	0.02	83
IMT-200-300-3.3	1.0	1.5	-6	+9	0.01	72
IMT-200-300-5	1.0	1.5	-6	+9	0.01	78
IMT-200-300-10	1.0	1.5	-8	+10	0.01	80
IMT-200-300-12	1.0	1.5	-8	+10	0.01	81
IMT-200-300-15	1.0	1.5	-8	+10	0.01	80
IMT-210-300-2.1	1.2	1.8	-8	+10	0.01	70
IMT-240-110-10	0.6	0.9	-8	+10	0.02	85

** Trim down to - 30% is available as an option.*

Table 2B. Electrical Characteristics

Model	No load Power Consumption (Watts)		Output Voltage Trimming Range (%V_{NOM})		Long-term Short-circuited Current (Amperes)	Typical Efficiency (%)
	Typical	Max.	Min.	Max.	Max.	
IMT-360-48-3.6	0.5		-30	+10	0.10	75
IMT-250-48-2.5	0.93		-20	+10	0.10	72
IMT-210-300-2.1	1.07		-9.5	+11	0.01	70
IMT-380-300-3.8	1.13		-30	+10	0.10	72
IMT-400-48-24	0.93		-30	+10	0.10	86
IMT-400-48-5	0.53		-30	+10	0.10	80
IMT-400-300-5	0.91		-30	+10	0.01	81
IMT-210-24-14	0.76		-30	+10	0.05	84
IMT-240-48-24	1.4		-30	+10	0.04	85
IMT-240-150-24	3.1		-30	+10	0.01	88

IMT - 200
Application Circuits 1



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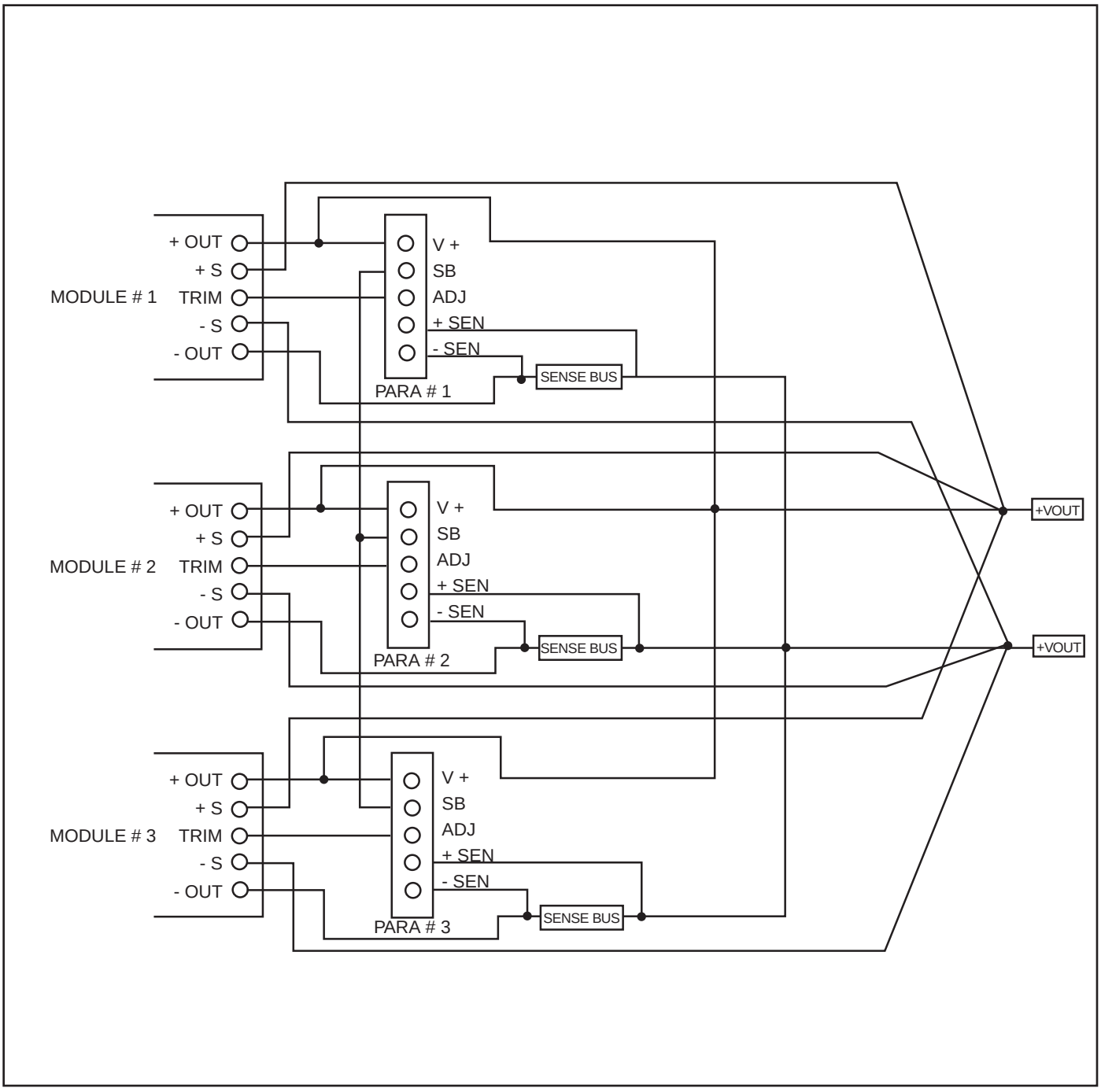
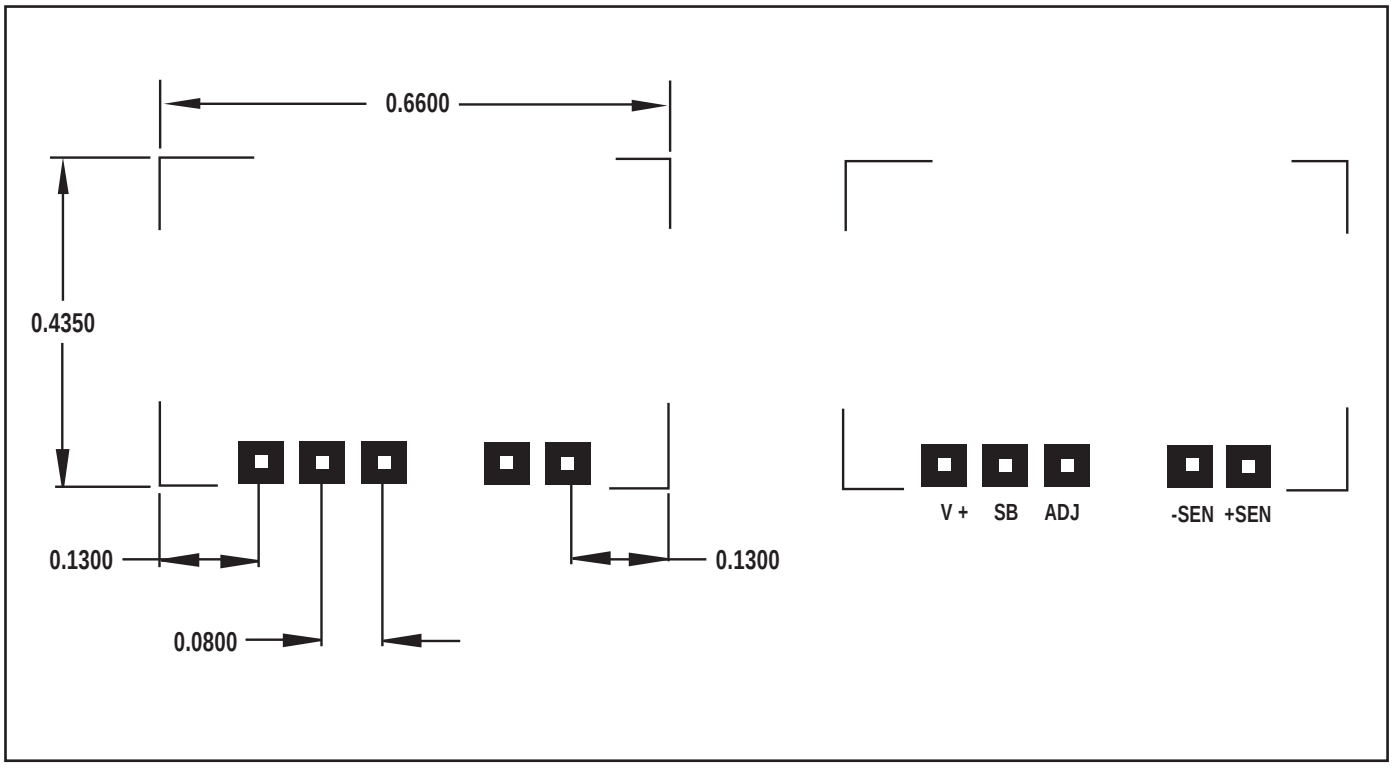
Application Circuit 2

N + 1 and Paralleling Circuit



External current share circuit can be used to parallel IMT 200 and IMT 400 modules using trim pin. A detailed application note on Current Sharing is available. Please request for AN01 or download from our website

Current Share Module PN: CS01 Outline Drawing



Resistance Value of Sense Bus Vs. Different Outputs

Vo	Io	Resistance of Sense Bus
3.3V	50A	0.66mΩ
3.3V	40A	0.825mΩ
5V	40A	1.25mΩ
5V	30A	1.67mΩ
10V	20A	5mΩ
12V	17A	7mΩ
15V	10A	15mΩ

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