SGS-THOMSON MICROELECTRONICS

GS120/175T48 Family

120W/175W DC-DC CONVERTERS FAMILY

Type	V_i	V_o	I_o
GS120T48-3.3 GS120T48-3.3E	38 to 60 V	3,35 V	35 A
GS175T48-5 GS175T48-5E	38 to 60 V	5,075 V	35 A
GS175T48-12 GS175T48-12E	38 to 60 V	12,0 V	15 A
GS175T48-15 GS175T48-15E	38 to 60 V	15,0 V	12 A

FEATURES

- UL, CSA, TUV approved
- High output power (up to 175W)
- High efficiency (82% typ. on GS175T48-5 module)
- Parallel operation with equal current sharing
- Synchronization pin
- Remote ON/OFF
- Remote load voltage sense compensation
- Output short-circuit protection
- Undervoltage lock-out
- Minimal overshoot during load transients
- Output overvoltage protection
- $500V_{DC}$ input to output isolation voltage
- Internal input and output filtering
- Softstart
- PCB or chassis mountable
- Optional additional finned heatsink
- Mechanical dimensions 125 • 66,5 • 19 (4,92 • 2,62 • 0,75)

DESCRIPTION

The GS120/175T48family includes 120/175W DC-DC converters used to generate fixed isolated output voltages with an output current up to 35A from a wide range input voltage (38 to 60V).
The suffix E Identifies the metric threading on the planar heatsink (see fig. 1).

OPTION

Type Ordering Number	Description	Thermal Resistance	Dimensions L • W • H mm (inches)
HS01	Additional finned heatsink (See fig. 7)	2.8°C/W	125 • 66.5 • 15 (4.92 • 2.62 • 0.59)

GS120T48-3.3 ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_i	Input Voltage	V_O = 3.35V I_O = 0 to 35A (Operating Conditions)	38	48	60	VDC
V_{iuv}	Input Undervoltage Lockout	Vo = 3.35V I_O = 0 to 35A	32	34	36	VDC
I_i	Average Input Current	V_i = 0 to 60V I_O = 35A			4.2	A
I_{ipk}	Inrush Transient Peak Current	V_i = 60V I_O = 35A			0.2	A^2s
I_{ir}	Reflected Input Current	V_i = 38 to 60V BW = 5Hz to 20MHz I_O = 35A (See fig. 2)			20	mApp
V_{ien}	Enable Input Voltage	V_i = 38 to 60V I_O = 0 to 35A	0		1.2	V
I_{ien}	Enable Input Current	V_i = 38 to 60V I_O = 0 to 35A V_{ien} = 0V			-1	mA
V_{iinh}	Inhibit Voltage	V_i = 38 to 60V I_O = 0 to 35A Vien = open	8		18	V
P_i	Input Power	V_i = 38 to 60V I_O = 0A (No Load)		1.5	2	W
V_O	Total Output Voltage Regulation	V_i = 38 to 60V I_O = 0 to 35A	3.25	3.35	3.45	V
V_{ost}	Short-term Output Voltage Regulation	V_i = 38 to 60V I_O = 0 to 35A	3.30	3.35	3.40	V
V_{ots}	Total Static Tolerance	V_i = 38 to 60V I_O = 0 to 35A	3.28	3.35	3.42	V
V_{ol}	Output Overvoltage Limit Initiation	V_i = 38 to 60V I_O = 0 to 35A	4	4.5	5.2	VDC
V_{or}	Output Ripple Voltage	V_i = 38 to 60V I_O = 35A		20	30	mVpp
V_{on}	Output Noise Voltage	V_i = 38 to 60V I_O = 35A		50	80	mVpp
ΔV_O	Total Remote Sense Compensation	V_i = 38 to 60V			0.6	V
δV_O	Peak Load Transient Response	V_i = 48V δI_O = 5A slope = 0.1A/µs			60	mVp
I_O	Output Current	V_i = 38 to 60V V_O = 3.35V	0		35	A
I_{ol}	Overcurrent Limit Initiation	V_i = 48V	36		39	A
I_{osc}	Shortcircuit Output Current	V_i = 48V V_O = 0.2 to 0.5V			51	A
t_s	Load Transient Settling Time	V_i = 48V δI_O = 5A slope = 0.1A/µs			200	µs
t_{on}	Turn-on Time	V_i = 48V I_O = 35A V_{ien} = from high to low			5	ms
		V_i = 0 to 60V I_O = 35A V_{ien} = low	3		10	
V_{is}	Isolation Voltage		500			V
f_s	Switching Frequency	V_i = 38 to 60V I_O = 0 to 35A	160	175	200	kHz
η	Efficiency	V_i = 38 to 60V I_O = 35A	76	77		%
R_{th}	Thermal Resistance	Case to Ambient		5.2		°C/W
T_{cop}	Operating Case Temperature Range		– 10		+85	°C
T_{stg}	Storage Temperature Range		– 40		+105	°C

GS175T48-5 ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_i	Input Voltage	V_O = 5.075V I_O = 0 to 35A (Operating Conditions)	38	48	60	VDC
V_{iuv}	Input Undervoltage Lockout	V_O = 5.075V I_O = 0 to 35A	32	34	36	VDC
I_i	Average Input Current	V_i = 0 to 60V I_O = 35A			6.1	A
I_{ipk}	Inrush Transient Peak Current	V_i = 60V I_O = 35A			0.2	A^2s
I_{ir}	Reflected Input Current	V_i = 38 to 60V BW = 5Hz to 20MHz I_O = 35A (See fig. 2)			30	mApp
V_{ien}	Enable Input Voltage	V_i = 38 to 60V I_O = 0 to 35A	0		1.2	V
I_{ien}	Enable Input Current	V_i = 38 to 60V I_O = 0 to 35A V_{ien} = 0V			-1	mA
V_{iinh}	Inhibit Voltage	V_i = 38 to 60V I_O = 0 to 35A V_{ien} = open	8		18	V
P_i	Input Power	V_i = 38 to 60V I_O = 0A (No Load)		1.5	2	W
V_O	Total Output Voltage Regulation	V_i = 38 to 60V I_O = 0 to 35A	4.94	5.075	5.21	V
V_{ost}	Short-term Output Voltage Regulation	V_i = 38 to 60V I_O = 0 to 35A	5.002	5.075	5.148	V
V_{ots}	Total Static Tolerance	V_i = 38 to 60V I_O = 0 to 35A	4.97	5.075	5.18	V
V_{ol}	Output Overvoltage Limit Initiation	V_i = 38 to 60V I_O = 0 to 35A	6	6.3	7	VDC
V_{or}	Output Ripple Voltage	V_i = 38 to 60V I_O = 35A		20	30	mVpp
V_{on}	Output Noise Voltage	V_i = 38 to 60V I_O = 35A		50	80	mVpp
ΔV_O	Total Remote Sense Compensation	V_i = 38 to 60V			0.6	V
δV_O	Peak Load Transient Response	V_i = 48V δI_O = 5A slope = 0.1A/µs			100	mVp
I_O	Output Current	V_i = 38 to 60V V_O = 5.075V	0		35	A
I_{ol}	Overcurrent Limit Initiation	V_i = 48V	36		39	A
I_{osc}	Shortcircuit Output Current	V_i = 48V V_O = 0.2 to 0.5V			51	A
t_s	Load Transient Settling Time	V_i = 48V δI_O = 5A slope = 0.1A/µs			250	µs
t_{on}	Turn-on Time	V_i = 48V I_O = 35A V_{ien} = from high to low			5	ms
		V_i = 0 to 60V I_O = 35A V_{ien} = low	3		10	
V_{is}	Isolation Voltage		500			V
f_s	Switching Frequency	V_i = 38 to 60V I_O = 0 to 35A	160	175	200	kHz
η	Efficiency	V_i = 38 to 60V I_O = 35A	81	82		%
R_{th}	Thermal Resistance	Case to Ambient		5.2		°C/W
T_{cop}	Operating Case Temperature Range		– 10		+85	°C
T_{stg}	Storage Temperature Range		– 40		+105	°C

GS175T48-12 ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C unless otherwise specified)

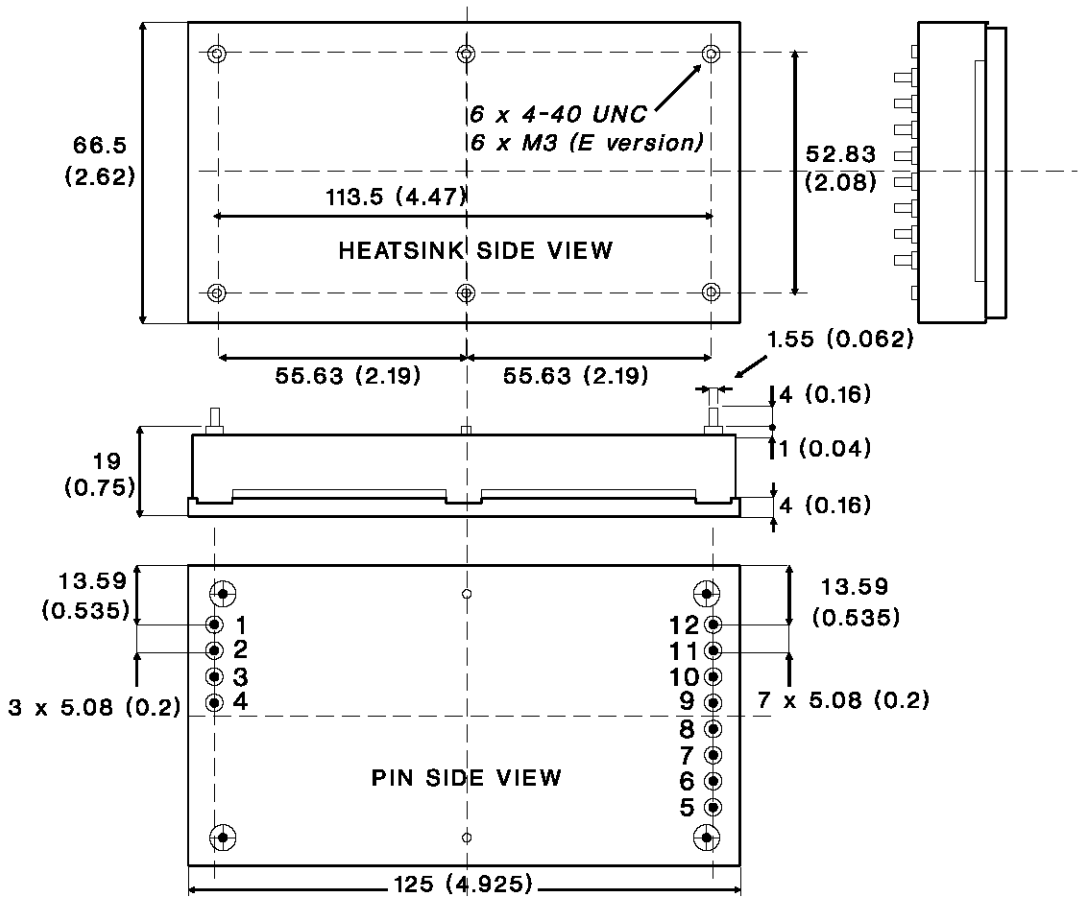
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_i	Input Voltage	V_O = 12V I_O = 0 to 15A (Operating Conditions)	38	48	60	VDC
V_{iuv}	Input Undervoltage Lockout	V_O = 12V I_O = 0 to 15A	32	34	36	VDC
I_i	Average Input Current	V_i = 0 to 60V I_O = 15A			5.5	A
I_{ipk}	Inrush Transient Peak Current	V_i = 60V I_O = 15A			0.2	A^2s
I_{ir}	Reflected Input Current	V_i = 38 to 60V BW = 5Hz to 20MHz I_O = 15A (See fig. 2)			20	mApp
V_{ien}	Enable Input Voltage	V_i = 38 to 60V I_O = 0 to 15A	0		1.2	V
I_{ien}	Enable Input Current	V_i = 38 to 60V I_O = 0 to 15A V_{ien} = 0V			-1	mA
V_{iinh}	Inhibit Voltage	V_i = 38 to 60V I_O = 0 to 15A V_{ien} = open	8		18	V
P_i	Input Power	V_i = 38 to 60V I_O = 0A (No Load)		1.5	2	W
V_O	Total Output Voltage Regulation	V_i = 38 to 60V I_O = 0 to 15A	11.4	12.0	12.6	V
V_{ost}	Short-term Output Voltage Regulation	V_i = 38 to 60V I_O = 0 to 15A	11.76	12.0	12.24	V
V_{ots}	Total Static Tolerance	V_i = 38 to 60V I_O = 0 to 15A	11.64	12.0	12.36	V
V_{ol}	Output Overvoltage Limit Initiation	V_i = 38 to 60V I_O = 0 to 15A	13.2	14	15	VDC
V_{or}	Output Ripple Voltage	V_i = 38 to 60V I_O = 15A		35	70	mVpp
V_{on}	Output Noise Voltage	V_i = 38 to 60V I_O = 15A		60	120	mVpp
ΔV_O	Total Remote Sense Compensation	V_i = 38 to 60V			0.6	V
δV_O	Peak Load Transient Response	V_i = 48V δI_O = 3A slope = 0.2A/µs			200	mVp
I_O	Output Current	V_i = 38 to 60V V_O = 12V	0		15	A
I_{ol}	Overcurrent Limit Initiation	V_i = 48V	16		19	A
I_{osc}	Shortcircuit Output Current	V_i = 48V			25	A
t_s	Load Transient Setting Time	V_i = 48V δI_O = 3A slope = 0.2A/µs			300	µs
t_{on}	Turn-on Time	V_i = 48V I_O = 15A V_{ien} = from high to low			5	ms
		V_i = 0 to 60V I_O = 15A V_{ien} = low	3		10	
V_{is}	Isolation Voltage		500			V
f_s	Switching Frequency	V_i = 38 to 60V I_O = 0 to 15A	160	175	200	kHz
η	Efficiency	V_i = 38 to 60V I_O = 15A	84	86		%
R_{th}	Thermal Resistance	Case to Ambient		5.2		°C/W
T_{cop}	Operating Case Temperature Range		– 10		+85	°C
T_{stg}	Storage Temperature Range		– 40		+105	°C

GS175T48-15 ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_i	Input Voltage	V_O = 15V I_O = 0 to 12A (Operating Conditions)	38	48	60	V_{DC}
V_{iuv}	Input Undervoltage Lockout	V_O = 15V I_O = 0 to 12A	32	34	36	V_{DC}
I_i	Average Input Current	V_i = 0 to 60V I_O = 12A			5.5	A
I_{ipk}	Inrush Transient Peak Current	V_i = 60V Io = 12A			0.2	A^2s
I_{ir}	Reflected Input Current	V_i = 38 to 60V I_O = 12A			20	mApp
V_{ien}	Enable Input Voltage	V_i = 38 to 60V I_O = 0 to 12A	0		1.2	V
I_{ien}	Enable Input Current	V_i = 38 to 60V I_O = 0 to 12A V_{ien} = 0V			-1	mA
V_{iinh}	Inhibit Voltage	V_i = 38 to 60V I_O = 0 to 12A Vien = open	8		18	V
P_i	Input Power	V_i = 38 to 60V I_O = 0A (No Load)		1.5	2	W
V_o	Total Output Voltage Regulation	V_i = 38 to 60V I_O = 0 to 12A	14.25	15.0	15.75	V
V_{ost}	Short-term Output Voltage Regulation	V_i = 38 to 60V I_O = 0 to 12A	14.7	15.0	15.3	V
V_{ots}	Total Static Tolerance	V_i = 38 to 60V I_O = 0 to 12A	14.55	15.0	15.45	V
V_{ol}	Output Overvoltage Limit Initiation	V_i = 38 to 60V I_O = 0 to 12A	16.5	17	18	V_{DC}
V_{or}	Output Ripple Voltage	V_i = 38 to 60V I_O = 12A		45	90	mVpp
V_{on}	Output Noise Voltage	V_i = 38 to 60V I_O = 12A		75	150	mVpp
ΔV_o	Total Remote Sense Compensation	V_i = 38 to 60V			0.6	V
δV_o	Peak Load Transient Response	V_i = 48V δI_O = 3A slope = 0.2A/µs			200	mVp
I_o	Output Current	V_i = 38 to 60V V_o = 15V	0		12	A
I_{ol}	Overcurrent Limit Initiation	V_i = 48V	13		16	A
I_{osc}	Shortcircuit Output Current	V_i = 48V V_O = 0.2 to 0.5V			21	A
t_s	Load Transient Settling Time	V_i = 48V δI_O = 3A slope = 0.2A/µs			300	µs
t_{on}	Turn-on Time	V_i = 48V I_O = 12A V_{ien} = from high to low			5	ms
		V_i = 0 to 60V I_O = 12A V_{ien} = low	3		10	
V_{is}	Isolation Voltage		500			V
f_s	Switching Frequency	V_i = 38 to 60V I_O = 0 to 12A	160	175	200	kHz
η	Efficiency	V_i = 38 to 60V I_O = 12A	86	88		%
R_{th}	Thermal Resistance	Case to Ambient		5.2		°C/W
T_{cop}	Operating Case Temperature Range		– 10		+85	°C
T_{stg}	Storage Temperature Range		– 40		+105	°C

CONNECTION DIAGRAM AND MECHANICAL DATA

Figure 1.



Package T. Dimensions in mm (inches).

PIN DESCRIPTION

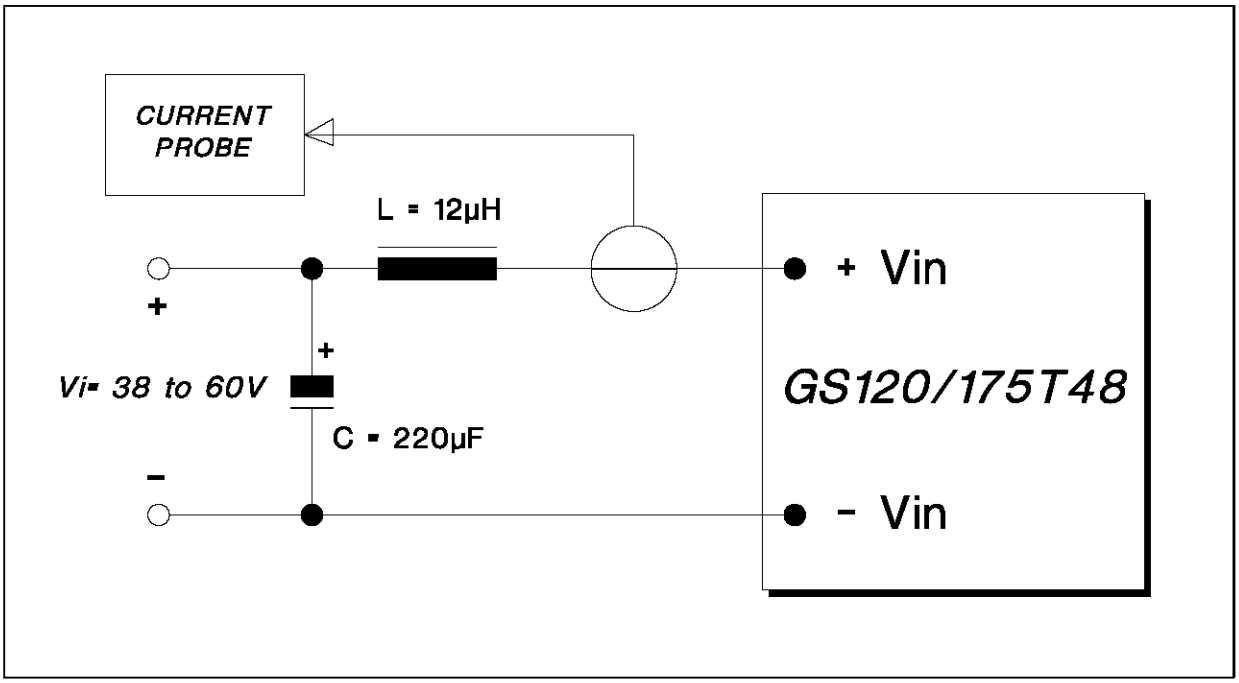
Pin	Function	Description
1	- IN	Negative input voltage.
2	+ IN	Positive input voltage. Unregulated input voltage (typically 48V) must be applied between pin 1-2.
3	ON/OFF	The converter is ON (Enable) when the voltage applied to this pin with reference to pin 1 is lower than 1.2V (see Vien). The converter is OFF (Inhibit) for a control voltage in the range of 8 to 18V. When the pin is unconnected the converter is OFF (Inhibit).
4	CASE	Case connection pin.
5	SYNC	Synchronization pin. See figures 3, 4, 5, 6. Open when not used.
6	PARALLEL	Parallel output. See figures 3, 4, 5, 6. Open when not used.
7	+ SENSE	Senses the remote load high side. To be connected to pin 11,12 when remote sense is not used.
8	- SENSE	Senses the remote load return. To be connected to pin 9,10 when remote sense is not used. In parallel configuration, take care to connect all -S pins together (see figures 3,4,5,6).
9,10	- OUT	Fixed output voltage return.
11,12	+ OUT	Fixed output voltage.

USER NOTES

Reflected Input Current

The reflected input current measurement (Iir, see Electrical Characteristics) is performed according to the test set-up of fig. 2.

Figure 2.



Softstart

To avoid heavy inrush current the output voltage rise time is 10ms maximum in any condition of load.

Remote Sensing

The remote voltage sense compensation range is for a total drop of 0.6V equally shared between the load connecting wires.

It is a good practice to shield the sensing wires to avoid oscillations.

See the connection diagram on figures 3, 4, 5, 6.

Remote ON/OFF

The module is controlled by the voltage applied between the ON/OFF pin and -IN pin.

The converter is ON (Enable) when the voltage applied is lower than 1.2 V (see Vien on Electrical Characteristics).

The converter is OFF (Inhibit) for a control voltage in the range of 8 to 18V (see Viinh).

When the pin is unconnected the converter is OFF. Maximum sinking current is 1mA.

Module Protection

The module is protected against occasional and permanent shortcircuits of the output pins to ground, as well as against output current overload. It uses a current limiting protection circuitry, avoiding latch-up problems with certain type of loads.

A crowbar output overvoltage protection is activated when the output voltage exceeds the specified values (see Electrical Characteristics).

Parallel Operation

To increase available output regulated power, the module features the parallel connection possibility with equal current sharing and maximum deviation of 10% (two modules in parallel).

See the connection diagram on figures 3, 4, 5, 6.

Figure 3.

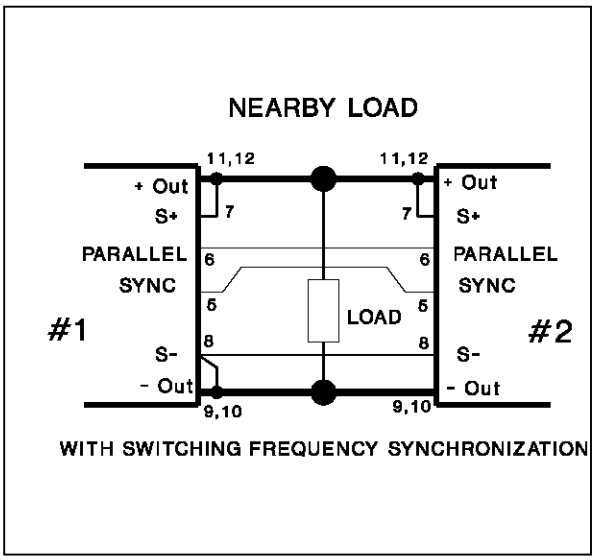


Figure 4.

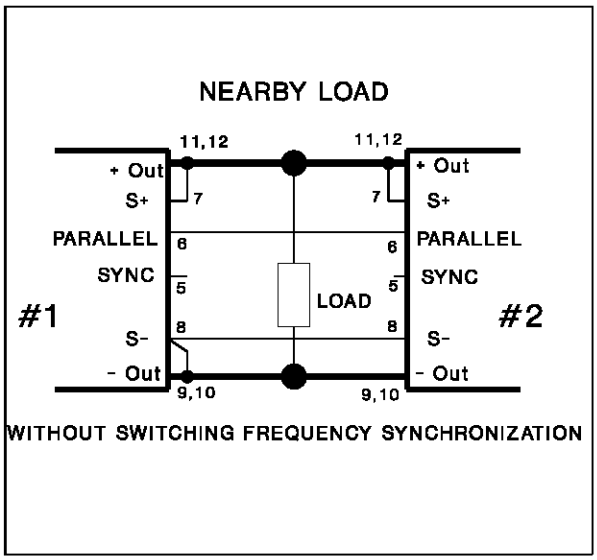


Figure 5.

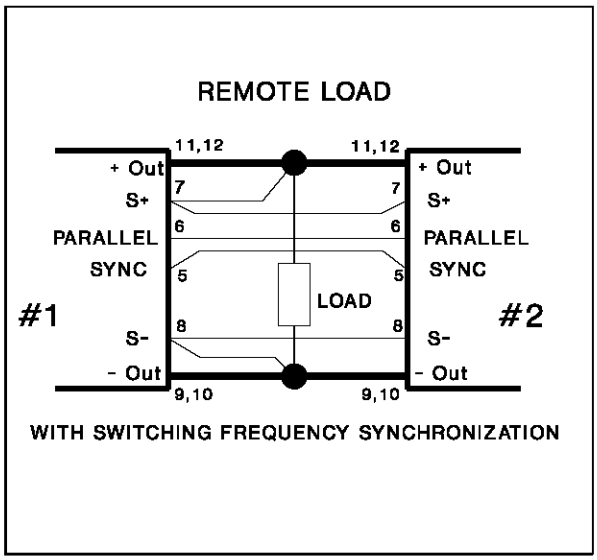
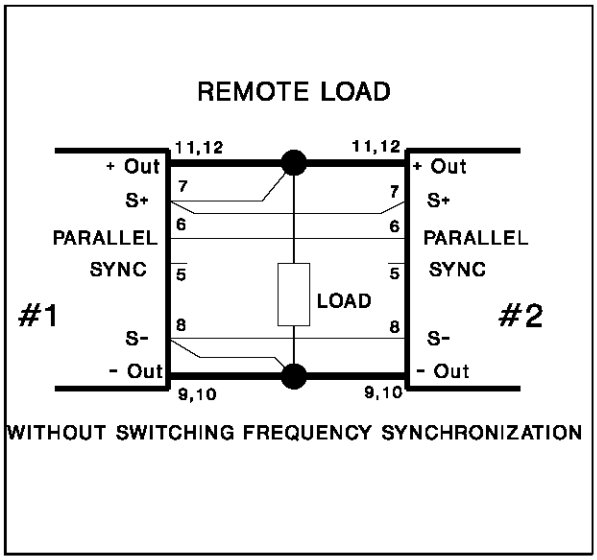


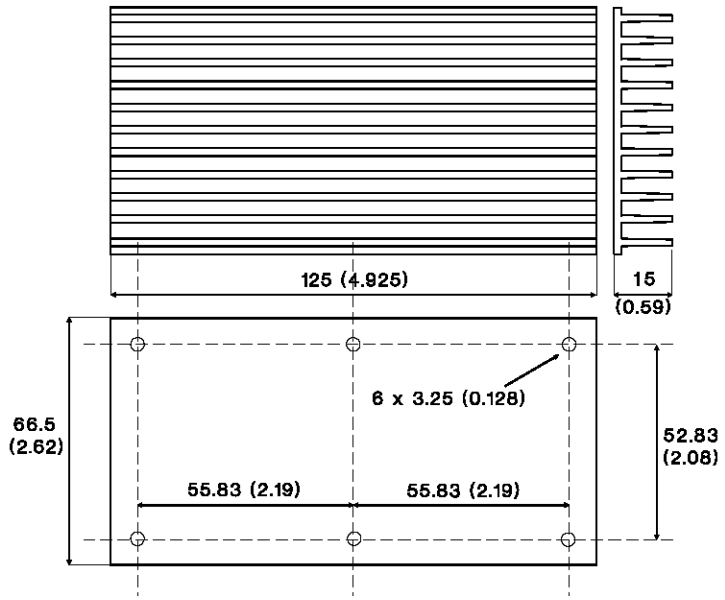
Figure 6.



Finned heatsink option

An additional finned heatsink is available (type ordering number HS01) to allow the user to decrease the total thermal resistance of the module to a typical value of 2.8 °C/W. The heatsink is suitable both for standard (4-40 UNC threading) and E version (M3 threading); screw length in the range of 6 to 8 mm (0.24 to 0.32”). See fig. 7.

Figure 7. - HS01 Heatsink.



Dimensions in mm (inches).

Thermal Characteristics

Following figures show the behaviour at still air and forced ventilation operation of the GS175T48-5 module (typical efficiency 82%) without (fig. 8) and with the additional finned HS01 heatsink (fig. 9)

Figure 8. - GS175T48-5 with stadard flat heatsink.

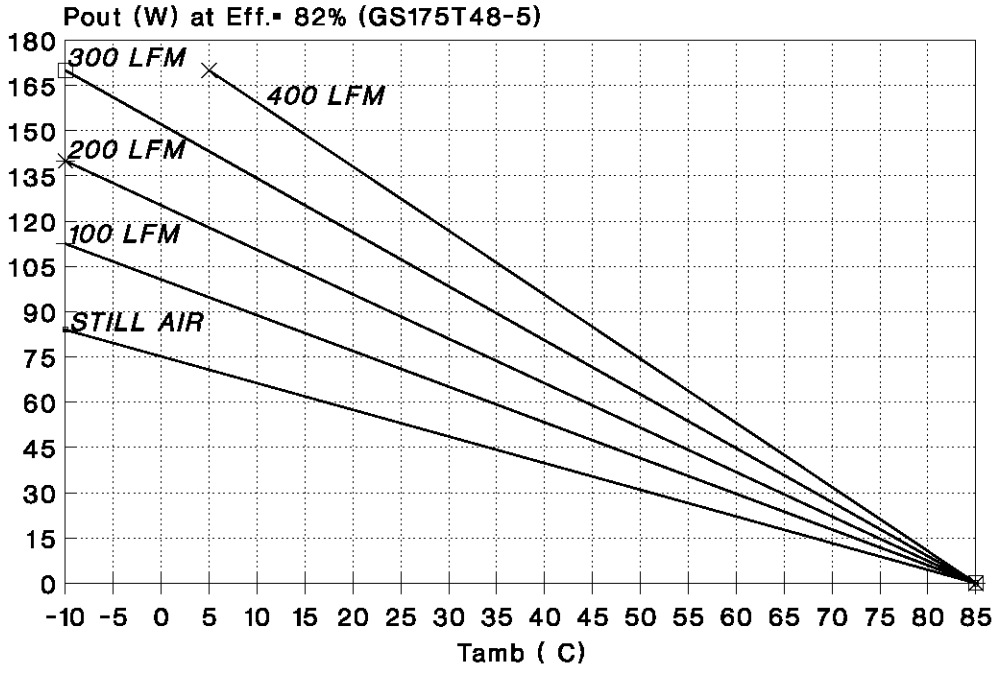
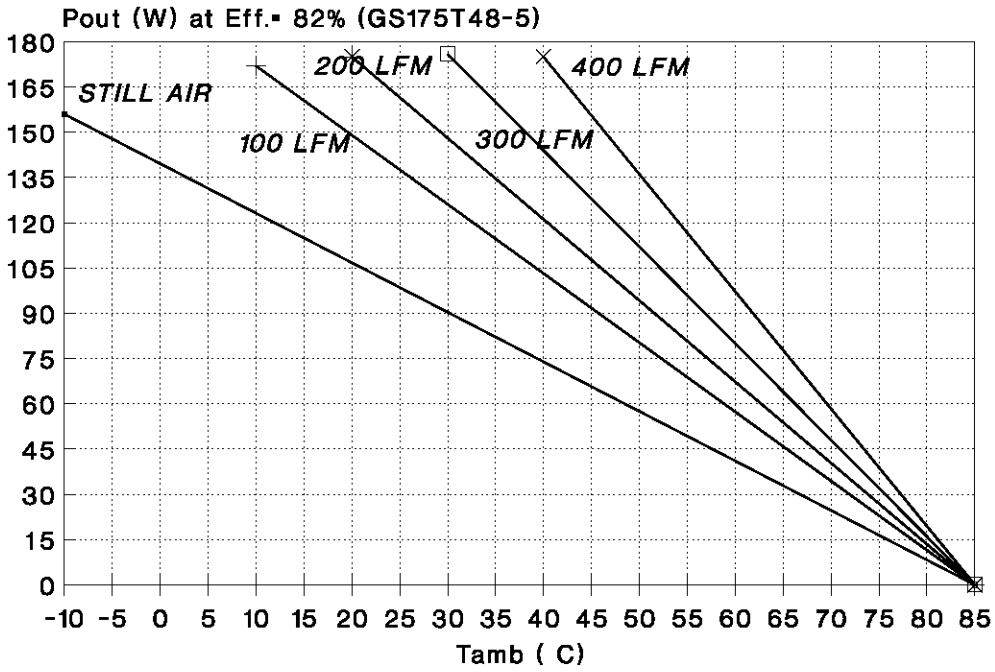


Figure 9. - GS175T48-5 with additional HS01 finned heatsink



Safety approvals

The converter is agency certified to the following safety requirements.

Agency	Requirements	License Number
UL	UL-STD-1950	E141284
CSA	CSA-STD-C22.2 No.234 (level 3)	LR 99794-2
TUV	EN 60950 DIN VDE 0805	R 9272137

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