Industrial DC/DC CONVERTER
MGDI-25 Wide Input : 25W POWER

Industrial Grade ■

GAÏA CONVERTER

4:1 Wide Input
Single, Bi & Triple Outputs
Metallic Case - 1.500 VDC Isolation

- Wide input range
- Nominal power up to 25 W
- Wide temperature range : -40°C/+ 95° case
- High efficiency (typ. 84%)
- Soft start
- Galvanic isolation 1.500 VDC according to EN 60950
- Integrated LC EMI filter
- Permanent short circuit protection
- No optocoupler for high reliability

1- General

The MGDI-25 wide input series is a complete line of DC/DC power modules designed for use in distributed power architecture and are particularly suitable for mobile or ground fixed applications in transportation, industrial and telecommunication areas. These modules use a high frequency fixed swiching technic at 250KHz providing excellent reliability, low noise characteristics and high power density. Standard models are available with wide input voltage range of 9-36,16-40 and 18-75 volts. The series include single bi and triple output voltage choices of 3,3, 5, 12, 15 volts.
No external heatsink is required for the MGDI-25 series to supply 25W output power over the full temperature range.
The MGDI-25 series is designed in conformity with safety standards EN60950 and UL1950.

All the modules are designed with LC network filters to minimize reflected input current ripple and output voltage ripple according to EN55022 and FCC Part 15J standard.
The modules include a soft-start, and a permanent short circuit protection to ensure efficient module protection. The soft-start allows current limitation and eliminates inrush current during start-up. The short circuit protection completely protects the modules against short-circuits of any duration by a shut-down and restores to normal when the overload is removed.
The design has been carried out with surface mount components and is manufactured in a fully automated process to guarantee high quality. Each module is tested with a GAIA converter automated test equipment.

5

2- Product Selection

Single output model	:	MGDSI-25- ☐ — ☐
Bi output model	:	MGDBI-25- ☐ — ☐
Triple output model	:	MGDTI-25- ☐ — ☐

Input Voltage Range

Permanent	Transient
H : 9-36 VDC	40 VDC/100 ms
J : 16-40 VDC*	45 VDC/100 ms
O : 18-75 VDC	/

* for 45 Vdc consult factory

Output

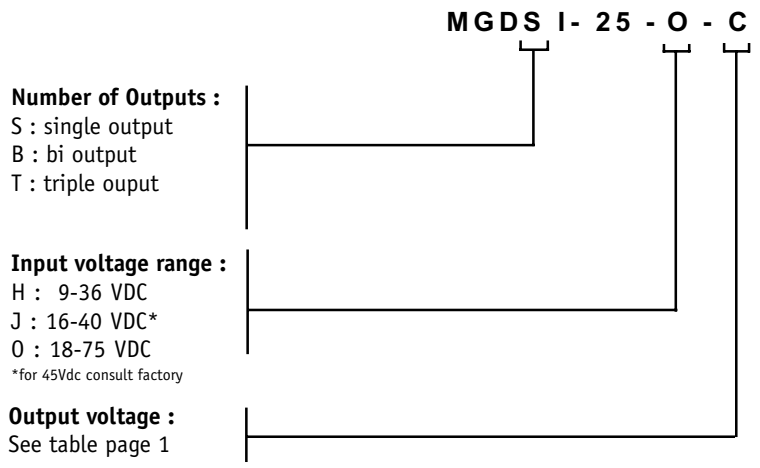
B	: 3,3 VDC
C	: 5 VDC or +/-5 VDC
E	: 12 VDC or +/-12 VDC
F	: 15 VDC or +/-15 VDC
BE	: 3,3 VDC and +/-12 VDC
BF	: 3,3 VDC and +/-15 VDC
CE	: 5 VDC and +/-11,5 VDC
CF	: 5 VDC and +/-14,6 VDC

For locations, phone, fax, E-Mail see back cover

2-Product Selection (continued)

Input range	Output	Current	Reference
9-36 VDC	3,3 VDC	6 A	MGDSI-25-H-B
9-36 VDC	5 VDC	5 A	MGDSI-25-H-C
9-36 VDC	12 VDC	2 A	MGDSI-25-H-E
9-36 VDC	15 VDC	1,65 A	MGDSI-25-H-F
9-36 VDC	+/- 5 VDC	+/- 2,5 A	MGDBI-25-H-C
9-36 VDC	+/- 12 VDC	+/- 1 A	MGDBI-25-H-E
9-36 VDC	+/- 14 VDC	+/- 0,825 A	MGDBI-25-H-F
9-36 VDC	3,3 & +/- 12 VDC	3 A & +/- 0,5 A	MGDTI-25-H-BE
9-36 VDC	3,3 & +/- 15 VDC	3 A & +/- 0,4 A	MGDTI-25-H-BF
9-36 VDC	5 & +/- 11,5 VDC	2,5 A & +/- 0,5 A	MGDTI-25-H-CE
9-36 VDC	5 & +/- 14,6 VDC	2,5 A & +/- 0,4 A	MGDTI-25-H-CF
16-40 VDC	3,3 VDC	6 A	MGDSI-25-J-B
16-40 VDC	5 VDC	5 A	MGDSI-25-J-C
16-40 VDC	12 VDC	2 A	MGDSI-25-J-E
16-40 VDC	15 VDC	1,65 A	MGDSI-25-J-F
16-40 VDC	+/- 5 VDC	+/- 2,5 A	MGDBI-25-J-C
16-40 VDC	+/- 12 VDC	+/- 1 A	MGDBI-25-J-E
16-40 VDC	+/- 15 VDC	+/- 0,825 A	MGDBI-25-J-F
16-40 VDC	3,3 & +/- 12 VDC	3 A & +/- 0,5 A	MGDTI-25-J-BE
16-40 VDC	3,3 & +/- 15 VDC	3 A & +/- 0,4 A	MGDTI-25-J-BF
16-40 VDC	5 & +/- 11,5 VDC	2,5 A & +/- 0,5 A	MGDTI-25-J-CE
16-40 VDC	5 & +/- 14,6 VDC	2,5 A & +/- 0,4 A	MGDTI-25-J-CF
18-75 VDC	3,3 VDC	6 A	MGDSI-25-O-B
18-75 VDC	5 VDC	5 A	MGDSI-25-O-C
18-75 VDC	12 VDC	2 A	MGDSI-25-O-E
18-75 VDC	15 VDC	1,65 A	MGDSI-25-O-F
18-75 VDC	+/- 5 VDC	+/- 2,5 A	MGDBI-25-O-C
18-75 VDC	+/- 12 VDC	+/- 1 A	MGDBI-25-O-E
18-75 VDC	+/- 15 VDC	+/- 0,825 A	MGDBI-25-O-F
18-75 VDC	3,3 & +/- 12 VDC	3 A & +/- 0,5 A	MGDTI-25-O-BE
18-75 VDC	3,3 & +/- 15 VDC	3 A & +/- 0,4 A	MGDTI-25-O-BF
18-75 VDC	5 & +/- 11,5 VDC	2,5 A & +/- 0,5 A	MGDTI-25-O-CE
18-75 VDC	5 & +/- 14,6 VDC	2,5 A & +/- 0,4 A	MGDTI-25-O-CF

Converter Selection Chart



5

For locations, phone, fax, E-Mail see back cover

3- Electrical Specifications

Data are valid at +25°C, unless otherwise specified.

Models				Single output MGDSI-25		
Parameter	**Conditions**	**Limit or typical**	**Units**	**25-H-**	**25-J-**	**25-O-**
Input						
Nominal input voltage	Full temperature range	Nominal	VDC	20	24	48
Permanent input voltage range (Ui)	Full temperature range	Min.-Max.	VDC	9-36	16-40	18-75
Extended permanent input voltage	Full temperature range	Min.-Max.	VDC	9-36	16-45	18-75
Transient input voltage	Full load	Maximum	VDC/s	40/0,1	45/0,1	/
Start up input voltage	Full load	Minimum	VDC	8,5	15,5	17,5
Start up time	Ui nominal within 3 ms Nominal output Full load : resistive	Maximum	ms	30	30	30
Reflected ripple current	Ui nominal, full load BW=20MHz	Maximum	mA pp	300	300	300
Input current in short circuit mode (Average value)	Ui nominal Short-circuit	Typical	mA	40	40	40
No load input current	Ui nominal No load	Maximum	mA	60	60	60
Output						
Output voltage	Full temperature range Ui min. to max. 75% load	Nominal Nominal Nominal Nominal	VDC VDC VDC VDC	3,3 5 12 15	3,3 5 12 15	3,3 5 12 15
Set Point accuracy for primary and secondary output	Ambient temperature : +25°C Ui nominal 75% load	Maximum	%	+/-2	+/-2	+/-2
Output power primary output and secondary output	Full temperature range Ui min. to max.	Maximum Maximum	W W	25	25	25
Output current * 3,3 V output 5V output 12V output 15V output	Full temperature range Ui min. to max.	 Maximum Maximum Maximum Maximum	 mA mA mA mA	 6.000 5.000 2.000 1.650	 6.000 5.000 2.000 1.650	 6.000 5.000 2.000 1.650
Ripple output voltage ** 3,3V, 5V output 12V output 15V output	 Ui nominal Full load BW=20MHz	 Maximum Maximum Maximum	 mV pp mV pp mV pp	 50 100 150	 50 100 150	 50 100 150
Line regulation	Ui min.to max. Full load	Maximum	%	+/-1	+/-1	+/-1
Load regulation on primary and secondary outputs	Ui nominal 25% to full load	Maximum	%	+/-2,5	+/-2,5	+/-2,5
Cross load output regulation	Ui nominal Primary output : nominal Secondary output : 25% to full load	Maximum	%	/	/	/
Efficiency 3.3V output 5V output 12 and 15V output	Ui nominal Full load	Typical	%	 80 83 85	 80 83 85	 80 83 85
Maximum admissible Capacitive load 3.3V, 5V output 12 and 15V output	 Ui nominal Full load Per output	 Maximum Maximum	 µF µF	 2.000 470	 2.000 470	 2.000 470

Note * : For 9-36 VDC input range modules a derating has to be observed with a power decreasing linearly from 25W at 13 VDC down to 20W at 9 VDC input voltage.

Note ** : The ripple output voltage is the periodic AC component imposed on the output voltage, an aperiodic and random component (noise) has also to be considered. This noise can be reduced by adding an external capacitance (typically 10nF/rated voltage depending on isolation requirement) connected between the pin Gin and the pin Gout of the converter. This capacitance should be layed-out as close as possible from the converter.

For locations, phone, fax, E-Mail see back cover

3- Electrical Specifications

Data are valid at +25°C, unless otherwise specified.

Models				Bi output MGDBI-25			Triple output MGDTI-25		
Parameter	**Conditions**	**Limit or typical**	**Units**	**25-H-**	**25-J-**	**25-O-**	**25-H-**	**25-J-**	**25-O-**
Input									
Nominal input voltage	Full temperature range	Nominal	VDC	20	24	48	20	24	48
Permanent input voltage range (Ui)	Full temperature range	Min.-Max.	VDC	9-36	16-40	18-75	9-36	16-40	18-75
Extended permanent input voltage	Full temperature range	Min.-Max.	VDC	9-36	16-45	18-75	9-36	16-45	18-75
Transient input voltage	Full load	Maximum	VDC/s	/	/	/	/	/	/
Start up input voltage	Full load	Minimum	VDC	8,5	15,5	17,5	8,5	15,5	17,5
Start up time	Ui nominal Nominal output Full load : resistive	Maximum	ms	30	30	30	30	30	30
Reflected ripple current	Ui nominal, full load BW=20MHz	Maximum	mA pp	300	300	300	300	300	300
Input current in short circuit mode (Average value)	Ui nominal Short-circuit	Typical	mA	40	40	40	40	40	40
No load input current	Ui nominal No load	Maximum	mA	60	60	60	60	60	60
Output									
Output voltage	Full temperature range Ui min. to max. 75% load	Nominal Nominal Nominal Nominal	VDC VDC VDC VDC	/ / +/-12 +/-15	/ / +/-12 +/-15	/ / +/-12 +/-15	3,3&+/-12 3,3&+/-15 5&+/-11,5 5&+/-14,6	3,3&+/-12 3,3&+/-15 5&+/-11,5 5&+/-14,6	3,3&+/-12 3,3&+/-15 5&+/-11,5 5&+/-14,6
Set Point accuracy for primary and secondary output	Ambient temperature : +25°C Ui nominal 75% load	Maximum	%	+/-2	+/-2	+/-2	+/-2	+/-2	+/-2
Output power primary output and secondary output	Full temperature range Ui min. to max.	Maximum Maximum	W W	12,5 12,5	12,5 12,5	12,5 12,5	12,5 +/-6,25	12,5 +/-6,25	12,5 +/-6,25
Output current * 3,3 V output 5V output 12V output 15V output	Full temperature range Ui min. to max.	Maximum Maximum Maximum Maximum	mA mA mA mA	/ +/-2.500 +/-1.000 +/-825	/ +/-2.500 +/-1.000 +/-825	/ +/-2.500 +/-1.000 +/-825	see		section 2
Ripple output voltage ** 3,3V, 5V output 12V output 15V output	Ui nominal Full load BW=20MHz	Maximum Maximum Maximum	mV pp mV pp mV pp	50 100 150	50 100 150	50 100 150	50 100 150	50 100 150	50 100 150
Line regulation	Ui min.to max. Full load	Maximum	%	+/-1	+/-1	+/-1	+/-1	+/-1	+/-1
Load regulation on primary and secondary outputs	Ui nominal 25% to full load	Maximum	%	+/-2,5	+/-2,5	+/-2,5	+/-3	+/-3	+/-3
Cross load output regulation	Ui nominal Primary output : nominal Secondary output : 25% to full load	Maximum	%	+/-0,5	+/-0,5	+/-0,5	+/-0,5	+/-0,5	+/-0,5
Efficiency 3.3V output 5V output 12 and 15V output	Ui nominal Full load	Typical	%	/ / 85	/ / 85	/ / 85	80	83	83
Maximum admissible Capacitive load 3.3V, 5V output 12 and 15V output	Ui nominal Full load Per output	Maximum Maximum	µF µF	1.000 220	1.000 220	1.000 220	2.200 100	2.200 100	2.200 100

Note * : For 9-36 VDC input range modules a derating has to be observed with a power decreasing linearly from 25W at 13 VDC down to 20W at 9 VDC input voltage.

Note ** : The ripple output voltage is the periodic AC component imposed on the output voltage, an aperiodic and random component (noise) has also to be considered. This noise can be reduced by adding an external capacitance (typically 10nF/rated voltage depending on isolation requirement) connected between the pin Gin and the pin Gout of the converter. This capacitance should be layed-out as close as possible from the converter.

For locations, phone, fax, E-Mail see back cover

4- Functional Characteristics

Characteristics	Conditions	Limit or typical	Performances
Electric strength test voltage	Nominal	Minimum	1.500 VDC / 1 min
Isolation resistance	500 VDC	Minimum	100 Mohm
Short circuit protection	Short circuit	Auto restart	Permanent
Switching frequency	No load to full load	Nominal	250 KHz

5- Thermal and Reliability Characteristics

Characteristics	Conditions	Limit or typical	Performances
Operating ambient temperature range	Ambient temperature*	Minimum Maximum	-40°C +71°C
Operating case temperature range	Case temperature	Minimum Maximum	-40°C +95°C
Storage temperature range	Non functionning	Minimum Maximum	-40°C +105°C
Mean time between faillure According to MIL-HDBK-217F	Ground fixed (Gf) Ground mobile (Gm)	Case at 40°C Case at 85°C Case at 40°C Case at 85°C	925.000 Hrs 370.000 Hrs 445.000 Hrs 148.000 Hrs

* The upper temperature range depends on configuration, the user must assure a max. case of +95°C

6- Environmental and Electromagnetic Interference Qualification

Characteristics	Conditions	Severity	Test procedure
Humidity	Damp heat Temperature	93 % H.R 56 Days 40°C	IEC 68-2-3
Vibration (Sinusoidal)	Number of cycle Frequency Amplitude /acceleration	10 cycles in each axis 10 to 60 Hz/ 60 to 2000 Hz 0.7 mm/10 g	IEC 68-2-6
Shock (Half sinus)	Number of shocks Peak acceleration Duration	3 shocks in each axis 100 g 6 ms	IEC 68-2-27
Bump (Half sinus)	Number of bumps Peak acceleration Duration	2000 Bumps in each axis 25 g 6 ms	IEC 68-2-29
Conducted noise emission	Frequency range 150 KHz to 30 MHz	Class A compliance with external capacitance Class B compliance with external filter KG9502	EN55022 and FCC part 15J
Radiated noise emission	Frequency range 30 MHz to 1.000 MHz	Class A compliance stand alone	EN55022 and FCC part 15J
Electrical discharge susceptibility	Air discharge level +/-4 KV Contact discharge level +/- 2KV Air discharge level 8 KV Contact discharge level 4 KV	sanction A sanction A sanction B sanction B	EN55082-2 with : EN61000-4-2 IEC 801-2
Electrical field susceptibility	Antenna at 1 m Wave form : AM modulated 80 %, 1KHz Test : 26 KHz to 1 GHz	Value 10V/m	EN55082-2 with : EN61000-4-3 IEC801-3
Electrical fast transient susceptibility	Level 1 : 0.5 KV Level 3 : 2 KV	sanction A sanction B	EN55082-2 with : EN61000-4-4 IEC801-4

For locations, phone, fax, E-Mail see back cover

7- Application Notes

7-1 Short Circuit Protection

The short circuit protection device protects each output individually against short circuits of any duration and restores the module to normal operation when the short circuit is removed.

7-2 Custom Output

Any of the bi output converters can be configured to produce output of 10V (+/-5 output models),
24V (+/-12V output models), or 30V (+/-15V output models) by connecting the load across the output (+) and the output (-) with either output grounded, and leaving the common pin open.

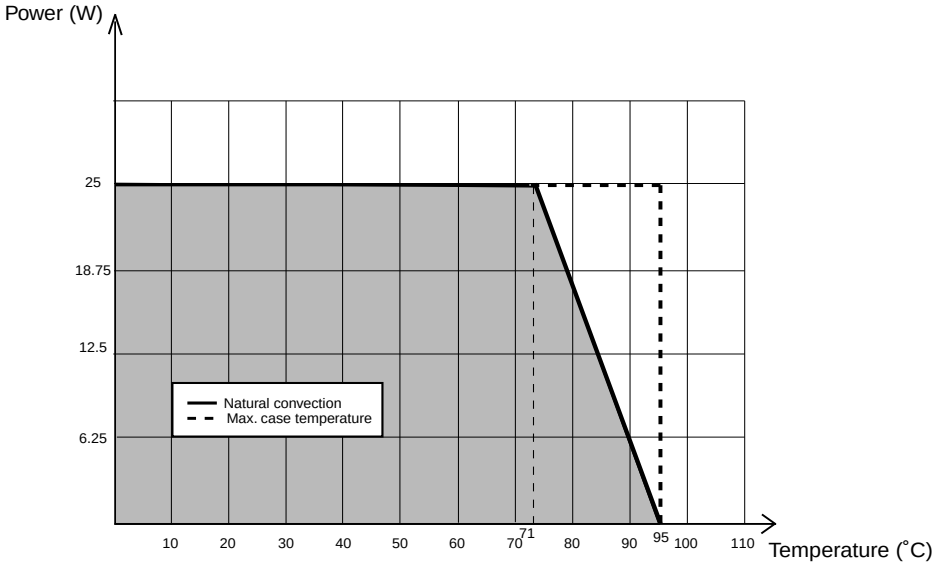
7-3 Safety

The MGDI-25 series is recognized according to UL1950, EN60950 and EN41003.
The isolation voltage is an operational insulation in accordance with EN60950 and the DC/DC module shall be installed in an end-use equipement.

7-4 Ambient versus Case Temperature

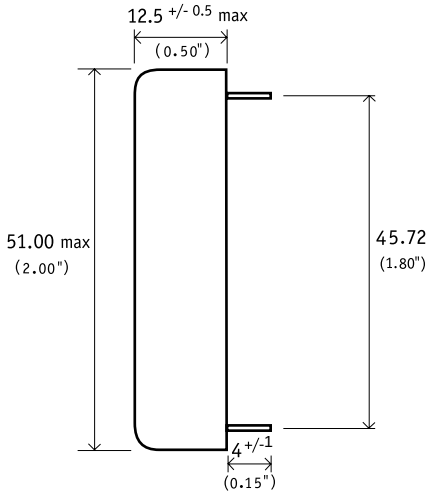
The MGDI-25 series operating **case** temperature at full load must not exceed 95°C. The maximum **ambient** temperature admissible for the DC/DC converter corresponding to the maximum operating case temperature of 95°C depends on the ambient airflow, the unit mounting/orientation, the cooling features and the power dissipated. Thermal calculation shows two areas of operation :

- a normal operation area in a free natural ambient convection (grey area in the following graph)
- an area with cooling features (air flow or heatsink) ensuring a maximum case temperature below 95°C at full load (white area in the following graph).

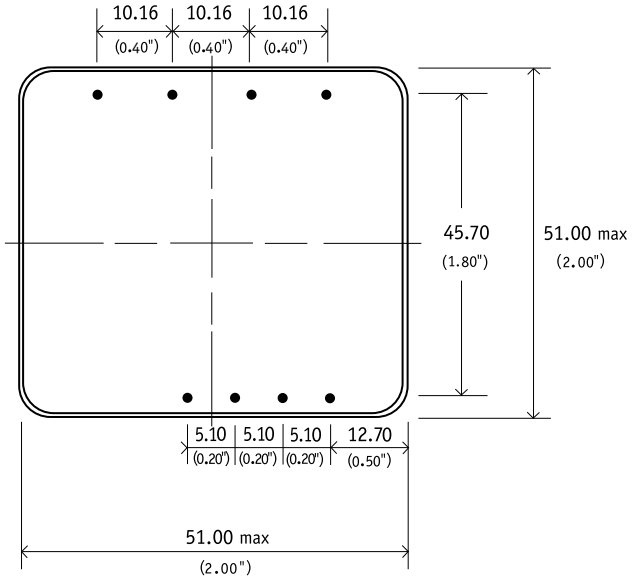


8- Dimensions

Dimension are given in mm (inches). Tolerance : +/- 0.2 mm (+/- 0.01 “) unless otherwise indicated.
Weight : 80 grams (2.8 Ozs) max.



Pin dimensions : ∅ 1 mm (0.04 ")

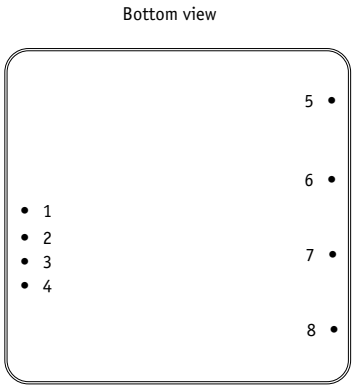


Metallic case black anodized coating solder plated pin

9- Product Marking

Upper face : Company logo, module reference, location of manufacturing
Side face : Date code : year and week of manufacturing

10- Connections



Basic pinning

Pin	Single Output	Bi Output	Triple Output
1	+ input (Vi)	+ input (Vi)	+ input (Vi)
2	- input (Gi)	- input (Gi)	- input (Gi)
3	Case	Case	Case
4	Non connected	Non connected	Non connected
5	Non connected	Output (+Vo)	Output 2 + (+V2)
6	Output (Vo)	Common (Go)	Output 1 (+V1)
7	Common (Go)	Output (-Vo)	Common (G1/2)
8	Non connected	Non connected	Output 2 - (-V2)

For locations, phone, fax, E-Mail see back cover

For more detailed specifications and applications information, contact :

International Headquarters
Marketing and Sales department
GAÏA Converter - France
Address : B.P. 26 - 33186 LE HAILLAN - FRANCE
Tel. : + (33)-5-57-92-12-80
Fax : + (33)-5-57-92-12-89

North American Headquarters
GAÏA Converter Canada, Inc
Address : 6611 Thimens
ST-LAURENT, QUEBEC - CANADA H4S 1W2
Tel. : (514)-333-3169
Fax : (514)-333-4519

Represented by :

Printed in France by Gaia Converter FC99-023.03/03 Revision F Graphisme : Philippe Clicq