DC-DC Converters

IMR 6-Family

Input to output isolation test voltage 500 V DC
Single or dual output

- Input voltage range up to 3:1
- Input filter
- High efficiency up to 75%
- Outputs short-circuit-proof
- No derating
- 2"× 2" plastic case
- Low cost

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Type Survey

Table 1: Type survey

Output $U_{o\ nom}$	Output $I_{o\ nom}$	Input voltage range U_i	Nominal input voltage $U_{i\ nom}$	Input to output isolation	Type
5 V	1000 mA	12 IMR 6: 9…18 V DC 24 IMR 6: 18…36 V DC 40 IMR 6: 20…60 V DC 48 IMR 6: 36…72 V DC	12 V DC 24 V DC 36 V DC 48 V DC	Test voltage: 500 V DC min. Resistance: 1000 MΩ min.	.. IMR 6-05-2
12 V	500 mA				.. IMR 6-12-2
15 V	400 mA				.. IMR 6-15-2
±5 V	±500 mA				.. IMR 6-0505-2
±12 V	±250 mA				.. IMR 6-1212-2
±15 V	±200 mA				.. IMR 6-1515-2

Description

The IMR 6 family of DC-DC converters have been developed for powering commercial type of electronic circuits, e.g. telephone systems components, industrial controllers and small appliances. They are suitable for applications with standard battery voltages. The IMR 6 converters feature good efficiency and good dynamic response to load changes and at start-up. The IMR 6 modules are short-circuit and no-load proof.

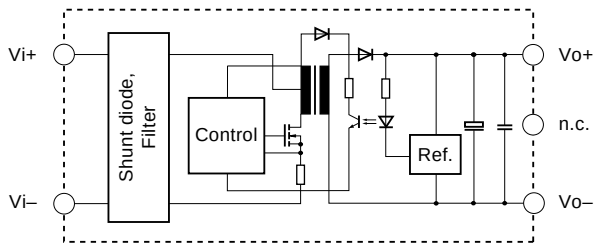

Fig. 1:
Single output converter block diagram

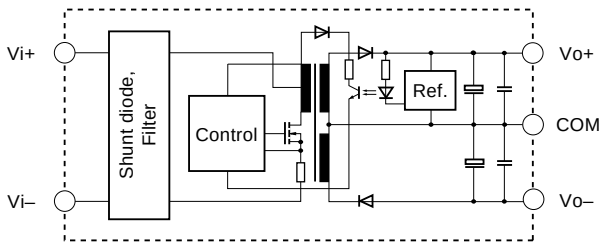

Fig. 2:
Dual output converter block diagram

Safety and Installation Instructions

Safety

If the output circuit of a DC-DC converter is operator-accessible according to the IEC 950 related safety standards, it shall be an SELV circuit (Safety Extra Low Voltage circuit, i.e. a circuit, separated from mains by at least basic insulation, that is so designed and protected that under normal and single fault conditions, the voltage between any two conductors and between any conductor and earth does not exceed DC 60 V).

In the following section an interpretation is provided of the IEC 950 safety standard with respect to the safety status of the output circuit. However, it is the sole responsibility of the installer or user to assure the compliance with the relevant and applicable safety standards.

If the following table is observed, the output of any DC-DC converter is considered to be an SELV.

Table 2: Insulation concept for SELV circuits

Nominal mains supply voltage (AC)	Minimum required grade of isolation, to be provided by the AC-DC front end, including mains supplied battery charger	Maximum output voltage from the front end	Minimum required safety status of the front end output circuit	Minimum required grade of isolation between the input and the output of the DC-DC converter, provided by the converter	Resulting safety status of the DC-DC converter output circuit
≤250 V	Basic	≤60 V	Earthed SELV circuit [1]	Operational	SELV circuit [2]
		≤72 V	Unearthed hazardous voltage secondary circuit [3]	Operational	Earthed SELV circuit [1 2]
	Double or reinforced	≤60 V	SELV circuit	Operational	SELV circuit [2]
		≤72 V	Double or reinforced insulated unearthed hazardous voltage secondary circuit, supplying an SELV circuit [4]	Operational	

[1] The earth connection has to be provided by the installer according to the relevant safety standard, e.g. IEC 950.
[2] The output has to be protected against overvoltages higher than 60 V by external means, e.g. an overvoltage suppressor diode.
[3] Has to be insulated from earth by at least basic insulation according to the relevant safety standard, based on the maximum input voltage of the DC-DC converter.
[4] Has to be insulated from earth by double or reinforced insulation according to the relevant safety standard, based on the maximum input voltage of the DC-DC converter.

6.3

Filter recommendations for compliance with EN 55022, class B

Electromagnetic emission requirements according to EN 55022, class B can be easely achieved by adding an external input filter consisting of two additional capacitors and current compensated circular choke.

The filter components should be placed as close as possible to the input of the converter.

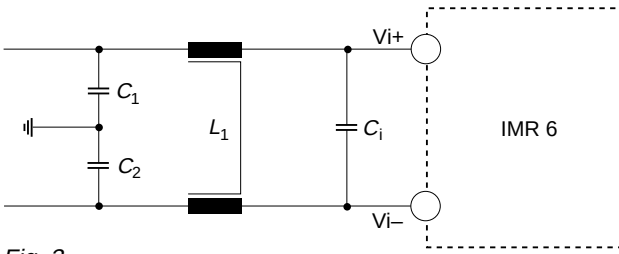

Fig. 3
Input filter arrangement for 12, 24 and 40 V DC types

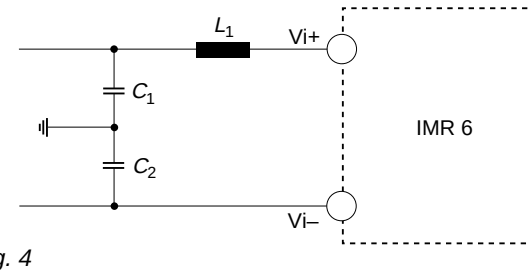

Fig. 4
Input filter arrangement for 48 V DC types

Table 3: Input filter components

Input voltage	C_1	C_2	Type	L_1	Type	C_i	Type
12, 24, 40 V DC	2.2 µF 100 V	2.2 µF 100 V	Siemens B 32522 C1225-K	2.2 mH	Siemens B 82722 A2202-N1	2.2 µF 100 V	Siemens B 32522 C1225-K
48 V DC	1 µF [1] 100 V	1 µF [1] 100 V	Siemens B 32522 C1105-K	0.5 mH	Ticomel SO 17-0.63 –500	–	

[1] Only valid for input voltages up to 60 V DC.

Connection in Series

The outputs of one or more units can be connected in series. No suppressor diodes are required. Melcher, however recommends to protect each individual output with a Zener diode or preferably a suppressor diode, to avoid reverse polarity that may occur if the output voltages do not rise sinultaneously.

Connection in Parallel

The outputs of several units can be connected in parallel. However, the use of a single unit with a higher power rating is a better choice, because of uneven power distribution among the outputs connected in parallel. It is recommended to select converters to be connected in parallel with very small output voltage differences at full load (i.e. < ±1%). A decoupling diode is not required but recommended.

Immunity to Environmental Conditions

Thermal Considerations

Table 4: Temperature specification

Characteristics		Conditions	min	max	Unit
T_A	Ambient temperature	$U_{i\,nom}$ $I_o = 0...I_{o\,nom}$	–10	50	°C
T_C	Case temperature		–10	80	
T_S	Storage temperature	Not operational	–25	100	

Table 5: MTBF

Values at specified Case Temperature	**Ground Benign**	**Ground Fixed**	**Ground Mobile**	Unit
	40°C	40°C	50°C	
MTBF according to MIL-HDBK-217F, N2	3'332'000	647'200	244'600	h

Electrical Input and Output Data

General condition:
– T_A = 25°C unless otherwise specified.

Table 6a: Input data

Input			**12 IMR 6**			**24 IMR 6**			Unit
Characteristics		Conditions	min	typ	max	min	typ	max	
U_i	Input voltage range	$T_{A\,min}...T_{A\,max}$, $I_o = 0...I_{o\,nom}$	9		18	18		36	V DC
$U_{i\,nom}$	Nominal input voltage			12			24		
$I_{i\,0}$	No load input current	$U_{i\,nom}$, $I_o = 0$		22			26		mA
$I_{i\,L}$	Input current limitation response	$U_{i\,nom}$, full load		1.25 $P_{i\,nom}$			1.25 $P_{i\,nom}$		W
$U_{i\,rev}$	Reverse input voltage protection	U_i = negative or reverse polarity		shunt diode use external fuse			shunt diode use external fuse		

Table 6b: Input data

Input			**40 IMR 6**			**48 IMR 6**			Unit
Characteristics		Conditions	min	typ	max	min	typ	max	
U_i	Input voltage range	$T_{A\,min}...T_{A\,max}$, $I_o = 0...I_{o\,nom}$	20		60	36		72	V DC
$U_{i\,nom}$	Nominal input voltage			38			48		
$I_{i\,0}$	No load input current	$U_{i\,nom}$, $I_o = 0$		26			26		mA
$I_{i\,L}$	Input current limitation response	$U_{i\,nom}$, full load		1.25 $P_{i\,nom}$			1.25 $P_{i\,nom}$		W
$U_{i\,rev}$	Reverse input voltage protection	U_i = negative or reverse polarity		shunt diode use external fuse			shunt diode use external fuse		

Table 7a: Output data

Output			.. IMR 6-05			.. IMR 6-12			.. IMR 6-15			Unit
Characteristics		Conditions	min	typ	max	min	typ	max	min	typ	max	
$U_{o\,nom}$	Nominal output voltage	$U_{i\,nom}$, $I_{o\,nom}$	4.90		5.10	11.76		12.24	14.70		15.30	V
$I_{o\,nom}$	Nominal output current	$U_{i\,min}$...$U_{i\,max}$		1000			500			400		mA
u_o	Output voltage noise	$U_{i\,nom}$ I_o = 0.2↔$I_{o\,nom}$ BW = 20 MHz		100	150		100	150		100	150	mV_{pp}
$\Delta U_{o\,U}$	Static line regulation	$U_{i\,min}$...$U_{i\,max}$ $I_{o\,nom}$			±1			±1			±1	%
$\Delta U_{o\,I}$	Static load regulation	$U_{i\,nom}$ I_o = 0 ↔ $I_{o\,nom}$		±2			±2			±2		
α_{uo}	Temperature coefficient	$U_{i\,nom}$, $I_{o\,nom}$			±0.02			±0.02			±0.02	%/K
f_s	Switching frequency		50			50			50			kHz
Efficiency												
η	– 12 IMR 6 types – other types	$U_{i\,nom}$, $I_{o\,nom}$		63 72			68 72			68 72		%

Table 7b: Output data

Output			.. IMR 6-0505			.. IMR 6-1212			.. IMR 6-1515			Unit
Characteristics		Conditions	min	typ	max	min	typ	max	min	typ	max	
$U_{o\,nom}$	Nominal output voltage	$U_{i\,nom}$, $I_{o\,nom}$	±4.90		±5.10	±11.76		±12.24	±14.70		±15.30	V
$I_{o\,nom}$	Nominal output current	$U_{i\,min}$...$U_{i\,max}$		±500			±250			±200		mA
u_o	Output voltage noise	$U_{i\,nom}$ I_o = 0.2↔$I_{o\,nom}$ BW = 20 MHz		100	150		100	150		100	150	mV_{pp}
$\Delta U_{o\,U}$	Static line regulation	$U_{i\,min}$...$U_{i\,max}$ $I_{o\,nom}$			±1			±1			±1	%
$\Delta U_{o\,I}$	Static load regulation	$U_{i\,nom}$, I_o = 0.2↔$I_{o\,nom}$		±5			±5			±5		
α_{uo}	Temperature coefficient	$U_{i\,nom}$, $I_{o\,nom}$			±0.02			±0.02			±0.02	%/K
f_s	Switching frequency		50			50			50			kHz
Efficiency												
η	– 12 IMR 6 types – other types	$U_{i\,nom}$, $I_{o\,nom}$		67 73			70 75			70 75		%

Mechanical Data

Dimensions in mm. Tolerances ±0.3 mm unless otherwise specified.

European Projection

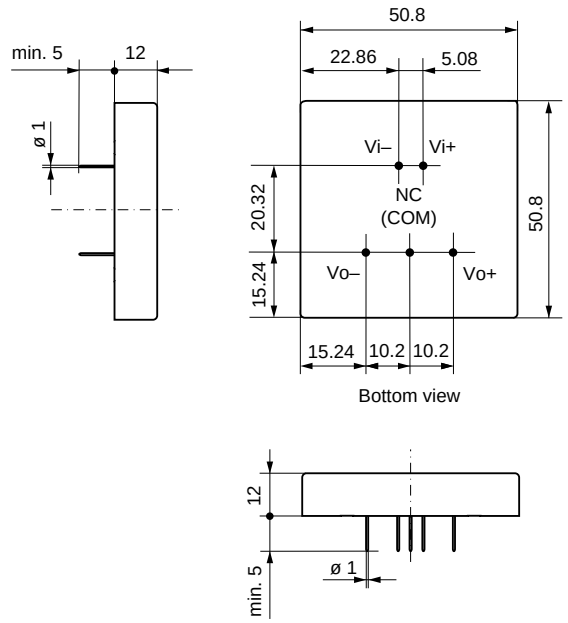

Fig. 5
Case 2"×2"
Weight: 50 g

Type Key and Product Marking

Type Key

Nominal input voltage in volt	12...48
Blank	
Family	IMR
Nominal output power in watt	6
Nominal output voltage for output 1 in volt	5...15
Nominal output voltage for output 2 in volt	5...15
Operational ambient temperature range	-2

24 IMR 6 - 12 12 -2

Product Marking

Main face: Melcher name, data code on separate label, type of converter, input voltage range and pin assignment.