

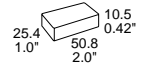
10 Watt DC-DC Converters

IML 10 Series

Wide input voltage ranges up to 75 V DC
1 or 2 outputs up to 30 V DC
1500 V DC I/O electric strength test voltage

- Electrical isolation, single and double output units
- Immunity to IEC/EN 61000-4-2, -3, -4, -5 and -6
- High efficiency (typ. 84%)
- Flex power: flexible load distribution
- No load and short-circuit proof
- High reliability and no derating
- Operating ambient temperature range $-25...60^{\circ}\text{C}$
- $2" \times 1"$ case with 10.5 mm profile
- Supplementary insulation

Safety according to IEC/EN 60950, UL 1950



Summary

The IML10 series of board mountable 10 Watt DC-DC converters has been designed according to the latest industry requirements and standards. The converters are particularly suitable for use in controlled environments, in battery supported applications in industry or telecommunications where high power density and outstanding reliability are required.

Providing 2 input voltage ranges, 18...36 and 36...75 V DC, the units are available with single and electrically isolated double outputs allowing the configuration of output voltages from 5 up to 30 V DC, with flexible load distribution on double output units. Features include efficient input and output filtering with transient and surge protection, low output ripple and noise, consistently high efficiency over the entire input voltage range, high reliability as well as excellent dynamic response to load and line changes.

The converters provide supplementary insulation with SELV outputs as e.g. required in battery supported systems

where the bus voltage may exceed the SELV limit of 60 V DC. They are designed and built according to the international safety standards IEC/EN 60950, UL 1950, CAN/CSA C22.2 No.950-95 and are LGA and UL marked. Approvals pending.

A special feature is their small case size, $2" \times 1"$ with 10.5 mm profile. The circuit comprises of integrated planar magnetics and all components are automatically assembled and solidly soldered onto a single PCB without any wire connections. Magnetic feedback ensures maximum reliability and repeatability in the control loop over all operating conditions. High efficiency, low heat dissipation and careful considerations of possible thermal stresses ensure the absence of hot spots providing high reliability. The thermal design allows operation at full load up to an ambient temperature of 60°C in free air without using any potting material. Optionally the IML 10 series is available as an open frame unit or with the industrial C pinout.

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Type Survey and Key Data

Table 1: Type survey

Output 1		Output 2		Output power $P_{o\text{ nom}}$ [W]	Input voltage $U_{i\text{ min}} \dots U_{i\text{ max}}$ [V DC]	Efficiency η_{typ} [%]	Type designation ²	Options
$U_{o\text{ nom}}$ [V DC]	$I_{o\text{ nom}}^1$ [A]	$U_{o\text{ nom}}$ [V DC]	$I_{o\text{ nom}}^1$ [A]					
3.3	2	-	-	6.6	18...36	81	24 IML 10-03-3	C, Z
3.3	2	-	-	6.6	36...75	82	48 IML 10-03-3	C, Z
5	1.9	-	-	9.5	18...36	81	24 IML 10-05-3	C, Z
5	1.9	-	-	9.5	36...75	82	48 IML 10-05-3	C, Z
12	0.9	-	-	10.8	18...36	84	24 IML 10-12-3C	
12	0.9	-	-	10.8	36...75	84	48 IML 10-12-3C	
15	0.7	-	-	10.5	18...36	84	24 IML 10-15-3C	
15	0.7	-	-	10.5	36...75	84	48 IML 10-15-3C	
5.1	1	3.3	1	8.8	36...75	80	48 IML 10-0503-3	C, Z
12	0.45	12	0.45	10.8	18...36	84	24 IML 10-12-12-3	C, Z
12	0.45	12	0.45	10.8	36...75	84	48 IML 10-12-12-3	C, Z
15	0.35	15	0.35	10.5	18...36	84	24 IML 10-15-15-3	C, Z
15	0.35	15	0.35	10.5	36...75	84	48 IML 10-15-15-3	C, Z

¹ Flexible load distribution on double outputs possible up to 75% of the total output power $P_{o\text{ nom}}$ on one of the 2 outputs. The other output should not exceed the difference to the total output power $P_{o\text{ nom}}$.

² For availability contact Power-One.

Type Key

Input voltage range U_i									
14...36 V DC	.....	24	_____						
36...75 V DC	.....	48	_____						
Series	.....	IML 10	_____						
Output voltage for output 1	.....	05, 12, 15	_____						
Dash: Designates double output unit with two independent electrically isolated outputs	.....	- 1	_____						
Output voltage for output 2	.....	12, 15	_____						
Operating ambient temperature range T_A									
-25...60°C	.....	-3	_____						
Options:									
C-pinout	.....	C	_____						
Open frame	.....	Z	_____						

1 Not applicable for -0503 models and option C.

For delivery lead times contact factory. Some types require a minimum order quantity.

Examples: 48 IML 10-15-15-3: DC-DC converter, input voltage range 36...75 V, 2 electrically isolated outputs each providing 15 V, 0.33 A, surface mount version.

24 IML 10-1212-3C: DC-DC converter, input voltage range 18...36 V, C-pinout with outputs ± 12 V, ± 0.45 A.

Mechanical Data

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

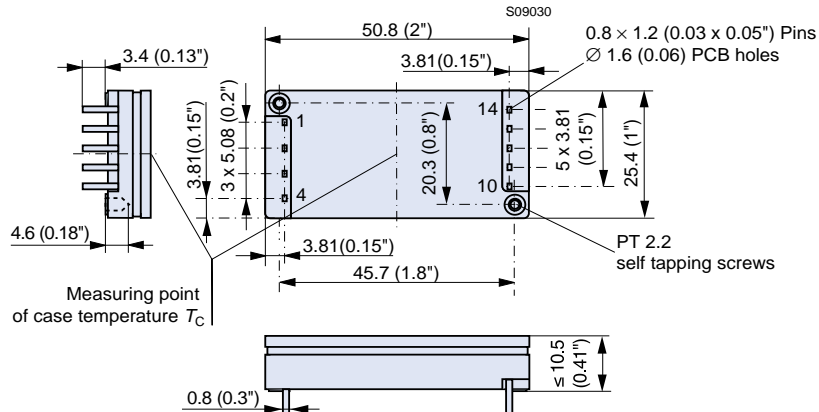


Fig. 1
Case IML 10 with standard soldering pins
Weight: <20 g

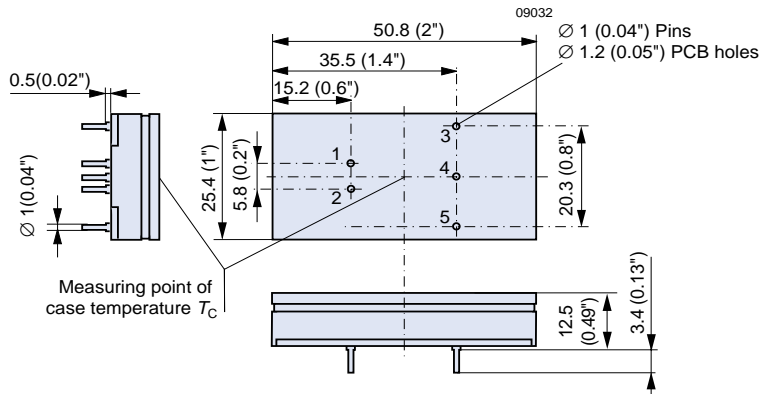


Fig. 2
Case IML 10 with C pinout (option C) for double output units, pins 6 and 7 are not fitted.
With single output units pins 4, 6 and 7 are not fitted.
Weight: <24 g

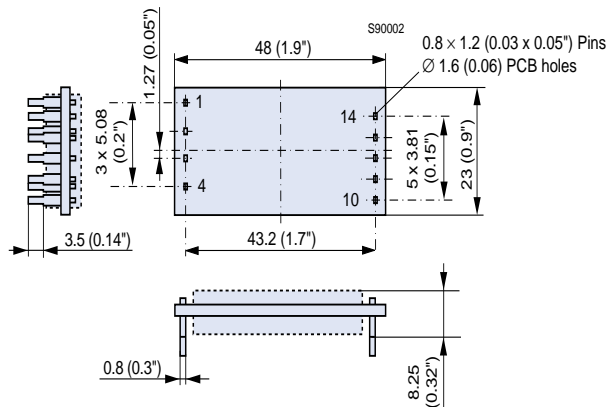


Fig. 3
Open frame
Weight: <20 g

Safety and Installation Instructions

Table 2: Pin allocation IML

Pin	Single output	0503 types	Double outputs
1	Vi+	Vi+	Vi+
2	Vi-	Vi-	Vi-
3	n.c.	n.c.	n.c.
4	n.c.	n.c.	n.c.
10	Vo-	Go	Vo1-
11	Vo+	Vo1+	Vo1+
12	Vo-	Go	Vo2-
13	n.c.	Vo2+	Vo2+
14	n.c.	n.c.	n.c.

Table 3: C pinout (option C)

Pin	Single output	Dual output
1	Vi+	Vi+
2	Vi-	Vi-
3	Vo+	Vo+
4	no pin	Go
5	Vo-	Vo-

Installation Instruction

Installation of the DC-DC converters must strictly follow the national safety regulations in compliance with the enclosure, mounting, creepage, clearance, casualty, markings and segregation requirements of the end-use application.

Connection to the system shall be made via a printed circuit board according to: *Mechanical Data*.

The units should be connected to a secondary circuit. Check for hazardous voltages before altering any connections.

Do not open the module.

Ensure that a unit failure (e.g. by an internal short-circuit) does not result in a hazardous condition. See also: *Safety of operator accessible output circuit*.

Input Fuse

To prevent excessive current flowing through the input supply line in case of a short-circuit across the converter input an external fuse should be installed in a non earthed input supply line. We recommend a fast acting fuse F2A for 24 IML 10 types and F1A for 48 IML 10 types.

Cleaning Agents

In order to avoid possible damage, any penetration of cleaning fluids has to be prevented, since the power supplies are not hermetically sealed.

Standards and approvals

All DC-DC converters are pending to be UL recognized according to UL 1950, UL recognized for Canada to CAN/CSA C22.2 No. 950-95 and LGA approved to IEC/EN 60950 standards.

The units have been evaluated for:

- Building in
- Supplementary insulation input to output, based on their maximum input voltage
- The use in a pollution degree 2 environment
- Connecting the input to a secondary circuit which is subject to a maximum transient rating of 1500 V

The DC-DC converters are subject to manufacturing surveillance in accordance with the above mentioned UL, CSA, EN and ISO 9001 standards.

Isolation

The electric strength test is performed as factory test in accordance with IEC/EN 60950 and UL 1950 and should not be repeated in the field. Power-One will not honour any guarantee claims resulting from electric strength field tests.

Table 4: Electric strength test voltages, clearance and creepage distances

Characteristic	I/O	O/O	Unit
Electric strength test voltage 1 s	1.2	0.1	kV _{rms}
	1.5	0.15	kV DC
Coupling capacitance	≈1.2	-	nF
Isulation resistance at 500 V DC	>100	-	MΩ
Partial discharge extinction voltage	Consult factory	-	kV

Protection Degree

The protection degree of the DC-DC converters is IP 30.

Safety of operator accessible output circuit

If the output circuit of a DC-DC converter is operator accessible, it shall be an SELV circuit according to IEC/EN 60950 related safety standards

The insulation concept table below shows some possible installation configurations, compliance with which causes the output circuit of the DC-DC converter to be an SELV circuit according to IEC/EN 60950 up to a configured output voltage (sum of nominal voltages if in series or +/- configuration) of 30 V.

However, it is the sole responsibility of the installer to ensure the compliance with the relevant and applicable safety regulations. More information is given in: *Technical Information: Safety*.

Table 5: Insulation concept leading to an SELV output circuit

Conditions	Front end			DC-DC converter	Result
Supply voltage	Minimum required grade of isolation, to be provided by the AC-DC front end, including mains supplied battery charger	Maximum DC output voltage from the front end ¹	Minimum required safety status of the front end output circuit	Measures to achieve the specified safety status of the output circuit	Safety status of the DC-DC converter output circuit
Mains ≤250 V AC	Basic	≤60 V	Earthed SELV circuit ²	Operational insulation, provided by the DC-DC converter	SELV circuit
		>60 V	Hazardous voltage secondary circuit	Input fuse ³ output suppressor diode(s) ⁴ , and earthed output circuit(s) ²	Earthed SELV circuit
	Double or reinforced	≤60 V	SELV circuit	Operational insulation, provided by the DC-DC converter	SELV circuit
		>60 V	TNV-2 circuit Double or reinforced insulated unearthed hazardous voltage secondary circuit ⁵	Supplementary insulation, based on the maximum input voltage, provided by the DC-DC converter	

¹ The front end output voltage should match the specified input voltage range of the DC-DC converter.

² The earth connection has to be provided by the installer according to the relevant safety standard, e.g. IEC/EN 60950.

³ The installer shall provide an approved fuse (type with the lowest rating suitable for the application) in the non-earthed input line directly at the input of the DC-DC converter (see fig.: *Schematic safety concept*). For UL's purpose, the fuse needs to be UL-listed. See also: *Input Fuse*.

⁴ Each suppressor diode should be dimensioned in such a way, that in the case of an insulation fault the diode is able to limit the output voltage to SELV (<60 V) until the input fuse blows (see fig.: *Schematic safety concept*).

⁵ Has to be insulated from earth by basic insulation according to the relevant safety standard, based on the maximum output voltage from the front end.

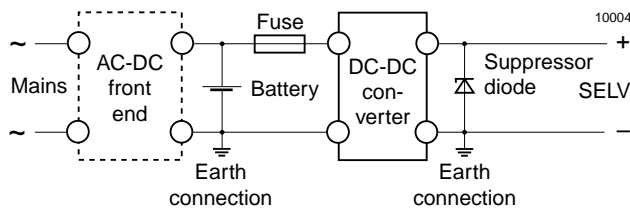


Fig. 4

Schematic safety concept. Use fuse, suppressor diode and earth connection as per table: Safety concept leading to an SELV output circuit.

Description of Options

Table 6: Survey of options

Option	Function of option
C	C-pinout
Z	Open frame

Option C

The C-pinout configures the electrically isolated double outputs to the "industrial pinout" Vo1+, Vo2– with common ground Go. With the C-pinout the converter height is increased by the adapter PCB (see also: *Mechanical Data*).

Accessories

Mounting supports for chassis and DIN-rail mounting.