

FEATURES

- ▶ Industrial Standard SMD Package
- ▶ Ultra-high I/O Isolation 8000VDC with Reinforced Insulation, rate for 480Vrms Working Voltage
- ▶ Operating Ambient Temp. Range -40°C to +95°C
- ▶ Short Circuit Protection
- ▶ UL/cUL/IEC/EN 62368-1 Safety Approval

NEW

PRODUCT OVERVIEW

The MINMAX MSCEU01-HI series is a new range of high performance 1W DC-DC converter within encapsulated SMD-14 package which specifically design for high isolation applications where reinforced insulation and high working voltage are required. There are 15 models available for input voltage of 5, 12, 24VDC. The I/O isolation is specified for 8000VDC with reinforced insulation, which rated for 480Vrms working voltage. Further features include short circuit protection and operating ambient temp. range by -40°C to 95°C.

These converters offer a cost-effective solution for wind turbine, solar panel, transportation systems, industrial control equipment where a high I/O isolation and insulation with working voltage is required.

Model Selection Guide

Model Number	Input Voltage (Range) VDC	Output Voltage VDC	Output Current mA	Input Current		Max. capacitive Load μF	Efficiency (typ.) %
				@Max. Load mA(typ.)	@No Load mA(typ.)		
MSCEU01-05S05HI	5 (4.5 ~ 5.5)	5	200	263	50	220	76
MSCEU01-05S12HI		12	84	252			80
MSCEU01-05S15HI		15	68	246			83
MSCEU01-05D12HI		±12	±42	252		100#	80
MSCEU01-05D15HI		±15	±33	236			84
MSCEU01-12S05HI	12 (10.8 ~ 13.2)	5	200	110	35	220	76
MSCEU01-12S12HI		12	84	106			79
MSCEU01-12S15HI		15	68	106			80
MSCEU01-12D12HI		±12	±42	106		100#	79
MSCEU01-12D15HI		±15	±33	103			80
MSCEU01-24S05HI	24 (21.6 ~ 26.4)	5	200	55	20	220	76
MSCEU01-24S12HI		12	84	53			80
MSCEU01-24S15HI		15	68	53			80
MSCEU01-24D12HI		±12	±42	53		100#	80
MSCEU01-24D15HI		±15	±33	52			80

For each output

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Input Voltage Range	5V Input Models	4.5	5	5.5	VDC
	12V Input Models	10.8	12	13.2	
	24V Input Models	21.6	24	26.4	
Input Surge Voltage (1 sec. max.)	5V Input Models	-0.7	---	9	
	12V Input Models	-0.7	---	18	
	24V Input Models	-0.7	---	30	
Input Filter	All Models	Internal Capacitor			

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy		---	±1.0	±3.0	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads	---	±0.1	±1.0	%
Line Regulation	For Vin Change of 1%	---	±1.2	±1.5	%
Load Regulation	Io=10% to 100%	See Model Selection Guide (Operation at lower load will not damage the converter, but it may not meet all specifications)			
Ripple & Noise	0-20 MHz Bandwidth	---	---	100	mV P-P
Temperature Coefficient		---	±0.01	±0.02	%/°C
Short Circuit Protection	Continuous, Automatic Recovery				

Isolation, Safety Standards

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds Reinforced insulation, rated for 480Vrms working voltage	3000	---	---	VAC
	Tested for 1 second	8000	---	---	VDC
I/O Isolation Resistance	500 VDC	10	---	---	GΩ
I/O Isolation Capacitance	100kHz, 1V	---	20	---	pF
Safety Approvals	UL/cUL 62368-1 recognition(UL certificate), IEC/EN 62368-1(CB-report)				

General Specifications

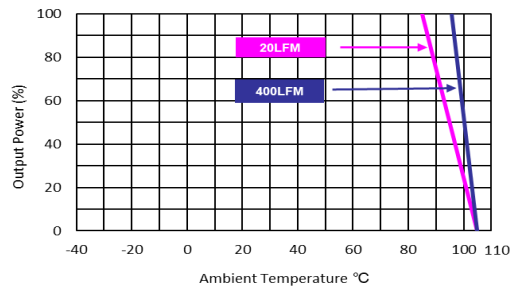
Parameter	Conditions	Min.	Typ.	Max.	Unit
Switching Frequency		---	55	---	kHz
MTBF (calculated)	MIL-HDBK-217F@25°C, Ground Benign	4,771,507	---	---	Hours
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1	Level 2			

EMC Specifications

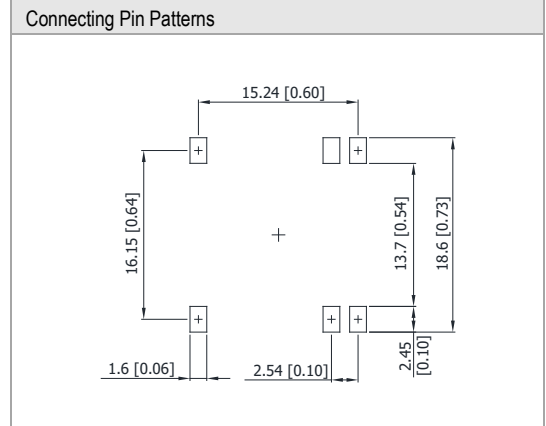
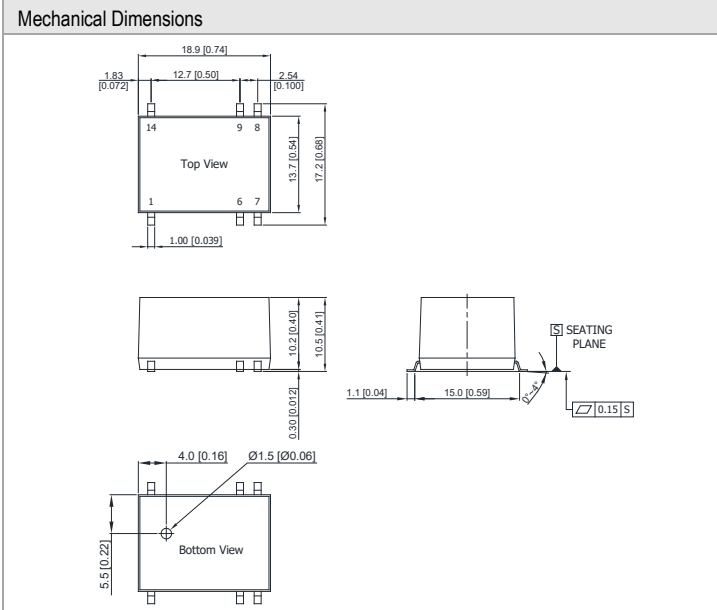
Parameter	Standards & Level		Performance
EMI (5)	Conduction	EN 55032	With external components
	Radiation		Without external components
EMS (5)	EN 55035		
	ESD	EN 61000-4-2 Air ± 15kV , Contact ± 8kV	A
	Radiated immunity	EN 61000-4-3 10V/m	A
	Fast transient	EN 61000-4-4 ±2kV	A
	Surge	EN 61000-4-5 ±1kV	A
	Conducted immunity	EN 61000-4-6 10Vrms	A
	PFMF	EN 61000-4-8 100A/m (1 min.), 1000A/m (1 sec.)	A

Environmental Specifications

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	-40	+95	°C
Case Temperature	---	+105	°C
Storage Temperature Range	-50	+125	°C
Humidity (non condensing)	---	95	% rel. H
Lead-free Reflow Solder Process	IPC/JEDEC J-STD-020D.1		

Power Derating Curve

Notes

- 1 Specifications typical at $T_a = +25^\circ\text{C}$, resistive load, nominal input voltage and rated output current unless otherwise noted.
- 2 These power converters require a minimum output loading to maintain specified regulation, operation under no-load conditions will not damage these modules; however they may not meet all specifications listed.
- 3 We recommend to protect the converter by a slow blow fuse in the input supply line.
- 4 Other input and output voltage may be available, please contact MINMAX.
- 5 The external components might be required to meet EMI/EMS standard for some of test items. Please contact MINMAX for the solution in detail.
- 6 Specifications are subject to change without notice.
- 7 The repeated high voltage isolation testing of the converter can degrade isolation capability, to a lesser or greater degree depending on materials, construction, environment and reflow solder process. Any material is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage. Furthermore, the high voltage isolation capability after reflow solder process should be evaluated as it is applied on system.

Package Specifications


- ▶ All dimensions in mm (inches)
- ▶ Tolerance: X.X±0.5 (X.XX±0.02)
X.XX±0.25 (X.XXX±0.01)
- ▶ Pins ±0.05 (±0.002)

Pin Connections		
Pin	Single Output	Dual Output
1	-Vin	-Vin
6	NC	Common
7	NC	-Vout
8	+Vout	+Vout
9	-Vout	Common
14	+Vin	+Vin

Physical Characteristics	
Case Size	: 18.9x13.7x10.2 mm (0.74x0.54x0.40 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Pin Material	: Phosphor Bronze
Weight	: 4.1g

NC: No Connection

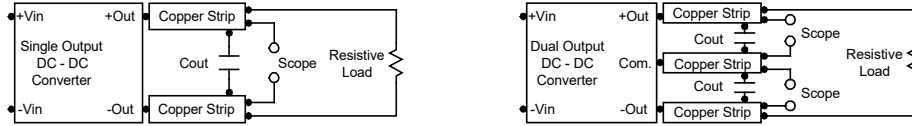
Order Code Table

Standard	For water-washable process
MSCEU01-05S05HI	MSCEU01-05S05HI-W
MSCEU01-05S12HI	MSCEU01-05S12HI-W
MSCEU01-05S15HI	MSCEU01-05S15HI-W
MSCEU01-05D12HI	MSCEU01-05D12HI-W
MSCEU01-05D15HI	MSCEU01-05D15HI-W
MSCEU01-12S05HI	MSCEU01-12S05HI-W
MSCEU01-12S12HI	MSCEU01-12S12HI-W
MSCEU01-12S15HI	MSCEU01-12S15HI-W
MSCEU01-12D12HI	MSCEU01-12D12HI-W
MSCEU01-12D15HI	MSCEU01-12D15HI-W
MSCEU01-24S05HI	MSCEU01-24S05HI-W
MSCEU01-24S12HI	MSCEU01-24S12HI-W
MSCEU01-24S15HI	MSCEU01-24S15HI-W
MSCEU01-24D12HI	MSCEU01-24D12HI-W
MSCEU01-24D15HI	MSCEU01-24D15HI-W

Test Setup

Peak-to-Peak Output Noise Measurement Test

Refer to the output specifications or add 4.7 μ F capacitor if the output specifications undefine Cout. Scope measurement should be made by using a BNC socket, measurement bandwidth is 0-20 MHz. Position the load between 50 mm and 75 mm from the DC-DC Converter.



Technical Notes

Maximum Capacitive Load

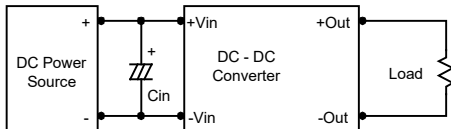
The MSCEU01-HI series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. For optimum performance we recommend 100 μ F maximum capacitive load for dual outputs and 220 μ F capacitive load for single outputs. The maximum capacitance can be found in the data sheet.

Input Source Impedance

The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module.

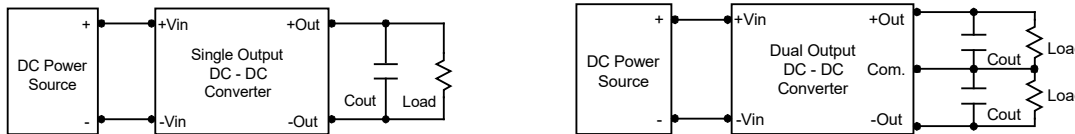
In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.

Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1.0 Ω at 100 kHz) capacitor of a 2.2 μ F for the 5V input devices, a 1.0 μ F for the 12V input devices and a 0.47 μ F for the 24V input devices.



Output Ripple Reduction

A good quality low ESR capacitor placed as close as practicable across the load will give the best ripple and noise performance. To reduce output ripple, it is recommended to use 3.3 μ F capacitors at the output.



Thermal Considerations

Many conditions affect the thermal performance of the power module, such as orientation, airflow over the module and board spacing. To avoid exceeding the maximum temperature rating of the components inside the power module, the case temperature must be kept below 105 $^{\circ}$ C. The derating curves are determined from measurements obtained in a test setup.

