FEATURES

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

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)	Output Voltage	Output Current		Input Current		Max. capacitive Load	Efficiency (typ.)
			Max.	Min.	@Max. Load	@No Load		@Max. Load
	VDC	VDC	mA	mA	mA(typ.)	mA(typ.)	μF	%
MSCEU01-05S05HI	5 (4.5 ~ 5.5)	5	200	4	263	50	220	76
MSCEU01-05S12HI		12	84	1.68	252			80
MSCEU01-05S15HI		15	68	1.36	246			83
MSCEU01-05D12HI		±12	±42	±0.84	252		100#	80
MSCEU01-05D15HI		±15	±33	±0.66	236			84
MSCEU01-12S05HI	12 (10.8 ~ 13.2)	5	200	4	110	35	220	76
MSCEU01-12S12HI		12	84	1.68	106			79
MSCEU01-12S15HI		15	68	1.36	106			80
MSCEU01-12D12HI		±12	±42	±0.84	106		100#	79
MSCEU01-12D15HI		±15	±33	±0.66	103			80
MSCEU01-24S05HI	24 (21.6 ~ 26.4)	5	200	4	55	20	220	76
MSCEU01-24S12HI		12	84	1.68	53			80
MSCEU01-24S15HI		15	68	1.36	53			80
MSCEU01-24D12HI		±12	±42	±0.84	53		100#	80
MSCEU01-24D15HI		±15	±33	±0.66	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%	---	---	±10	%
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			

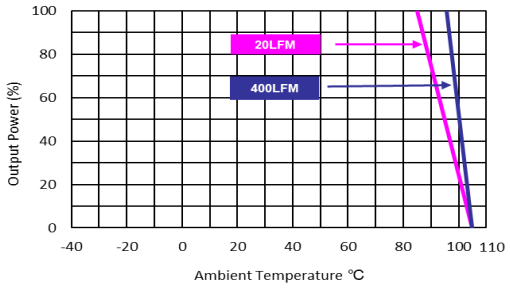
Environmental Specifications

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		

EMC Specifications

Parameter	Standards & Level			Performance
EMI	Conduction	EN 55032	With external components	Class A(5)
	Radiation		Without external components	
EMS	EN 55024, EN 55035			
	ESD	EN 61000-4-2 Air ± 15kV , Contact ± 8kV		A
	Radiated immunity	EN 61000-4-3 10V/m		A
	Fast transient (6)	EN 61000-4-4 ±2kV		A
	Surge (6)	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

Power Derating Curve

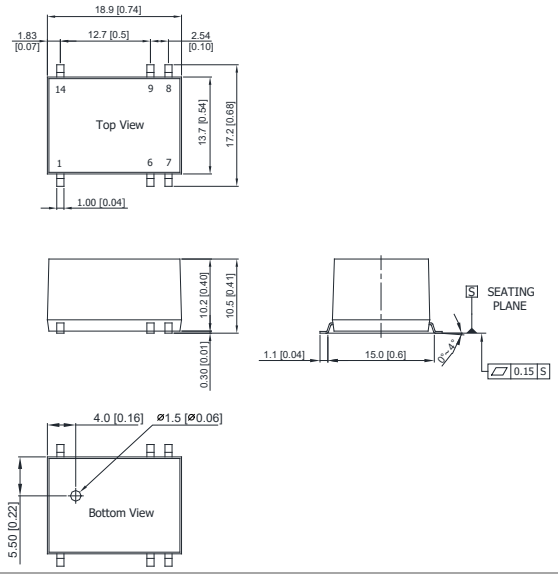


Notes

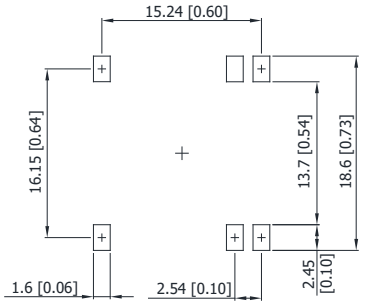
1 Specifications typical at Ta=+25℃, resistive load, nominal input voltage and rated output current unless otherwise noted.
2 These power converters require a minimum output loading to maintain specified regulation, operation under no-load conditions will not damage these modules; however they may not 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 To meet EN 55032 Class A an external filter, please contact MINMAX.
6 To meet EN 61000-4-4 & EN 61000-4-5 an external capacitor across the input pins is required, please contact MINMAX.
7 Specifications are subject to change without notice.

Package Specifications

Mechanical Dimensions



Connecting Pin Patterns



- 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

NC: No Connection

Physical Characteristics

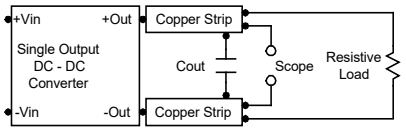
Case Size	:	18.9x13.7x10.2 mm (0.74x0.54x0.40 inches)
Case Material	:	Non-Conductive Black Plastic (flammability to UL 94V-0 rated)
Pin Material	:	Phosphor Bronze with Tin Plate Over Copper Subplate
Weight	:	4.1g

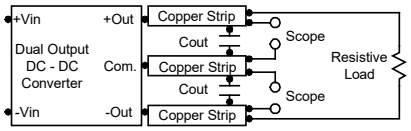
Order Code Table	
Standard	For water-washable process
MSCEU01-05S05HI	MSCEU01-05S05HI-W
MSCEU01-05S12HI	MSCEU01-05S12HI-W
MSCEU01-05S15HI	MSCEU01-05S15HI-W
MSCEU01-05D12HI	MSCEU01-05D12HI-W
MSCEU01-05D15HI	MSCEU01-05D15HI-W
MSCEU01-12S05HI	MSCEU01-12S05HI-W
MSCEU01-12S12HI	MSCEU01-12S12HI-W
MSCEU01-12S15HI	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 4.7μF 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.





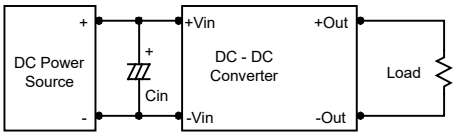
Technical Notes

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 100μF maximum capacitive load for dual outputs and 220μF capacitive load for single outputs. The maximum capacitance can be found in the data sheet.

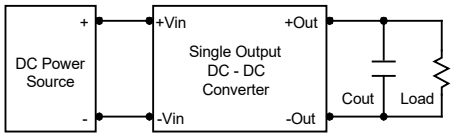
Input Source Impedance

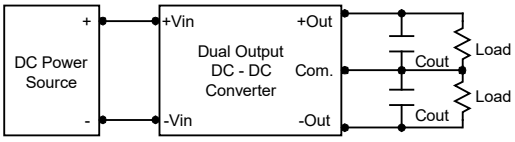
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup. 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 < 1.0Ω at 100 KHz) capacitor of a 2.2μF for the 5V input devices, a 1.0μF for the 12V input devices and a 0.47μF 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 3.3μF 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°C. The derating curves are determined from measurements obtained in a test setup.