



MINMAX[®]

MAEU01-HI Series

Electric Characteristic Note

MAEU01-HI Series EC Note

DC-DC CONVERTER 1W, Ultra-High Insulation, SIP-Package

Features

- ▶ Industrial Standard SIP-7 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



Applications

- ▶ Distributed power architectures
- ▶ Workstations
- ▶ Computer equipment
- ▶ Communications equipment

Product Overview

The MINMAX MAEU01-HI series is a new range of high performance 1W DC-DC converter within encapsulated SIP-7 package which specifically design for high isolation applications where reinforced insulation and high working voltage are required. There are 9 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.

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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	%
MAEU01-05S05HI	5 (4.5 ~ 5.5)	5	200	4	253	50	220	79
MAEU01-05S12HI		12	84	1.68	252			80
MAEU01-05S15HI		15	68	1.36	252			81
MAEU01-12S05HI	12 (10.8 ~ 13.2)	5	200	4	105	35	220	79
MAEU01-12S12HI		12	84	1.68	104			81
MAEU01-12S15HI		15	68	1.36	108			79
MAEU01-24S05HI	24 (21.6 ~ 26.4)	5	200	4	55	20	220	76
MAEU01-24S12HI		12	84	1.68	53			79
MAEU01-24S15HI		15	68	1.36	54			79

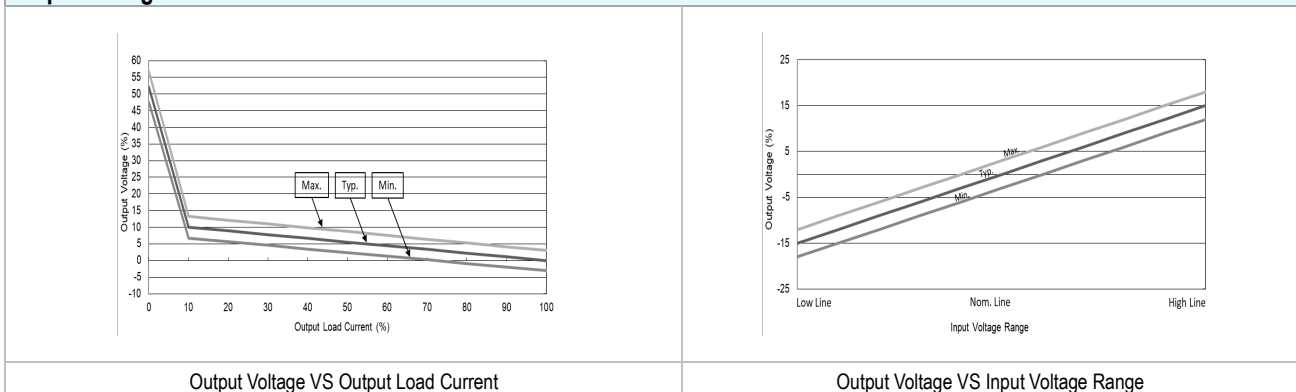
Input Specifications

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	VDC
	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.
Line Regulation	For Vin Change of 1%	---	±1.2	±1.5	%
Load Regulation	Io=10% to 100%	---	---	±10	%
Ripple & Noise	0-20 MHz Bandwidth	---	---	75	mV _{P-P}
Temperature Coefficient		---	±0.01	±0.02	%/°C
Short Circuit Protection	Continuous, Automatic Recovery				

Output Voltage Tolerance



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		---	60	---	kHz
MTBF (calculated)	MIL-HDBK-217F@25°C, Ground Benign	4,373,058	---	---	Hours

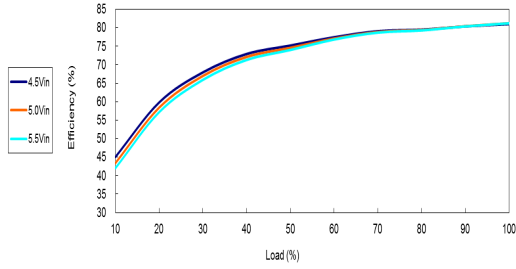
EMC Specifications				
Parameter	Standards & Level			Performance
EMI ⁽⁵⁾	Conduction	EN 55032	With external components	Class A
	Radiation		Without external components	
EMS ⁽⁵⁾	EN 55035			
	ESD	EN 61000-4-2 Air ± 15kV , Contact ± 8kV		A
	Radiated immunity	EN 61000-4-3 10V/m		A
	Fast transient	EN 61000-4-4 ±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 Temperature (1.5mm from case for 10Sec.)	---	260	°C	

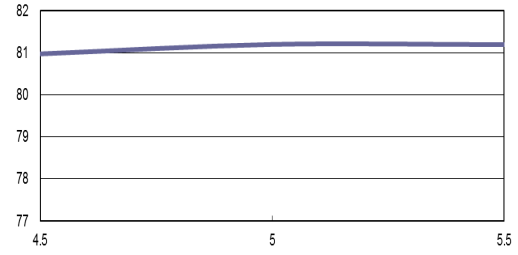
Notes	
1	Specifications typical at Ta=+25°C, resistive load, nominal input voltage and rated output current unless otherwise noted.
2	These power converters require a minimum output loading to maintain specified regulation, operation under no-load conditions will not damage these modules; however they 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.

Characteristic Curves

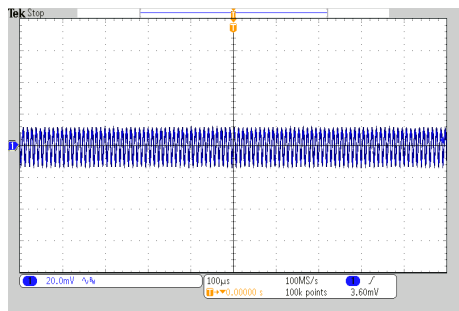
All test conditions are at 25°C The figures are identical for MAEU01-05S05HI



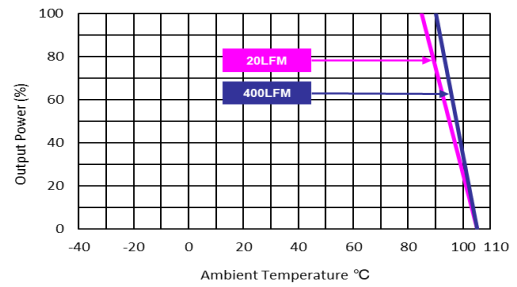
Efficiency Versus Output Current



Efficiency Versus Input Voltage Full Load



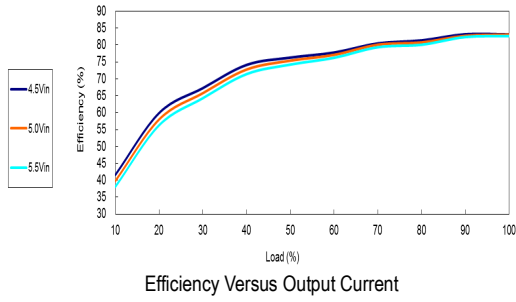
Typical Output Ripple and Noise
 $V_{in} = V_{in\ nom}$; Full Load



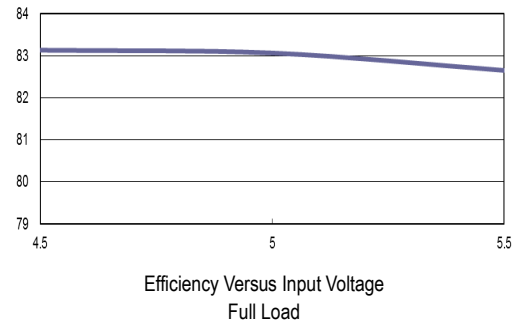
Derating Output Current Versus Ambient Temperature and Airflow
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Characteristic Curves

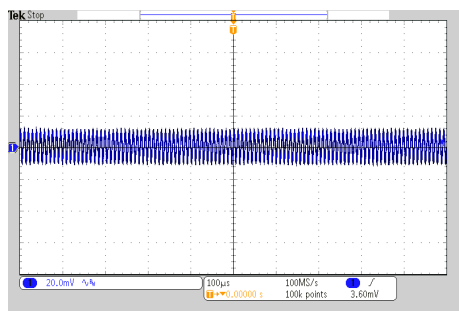
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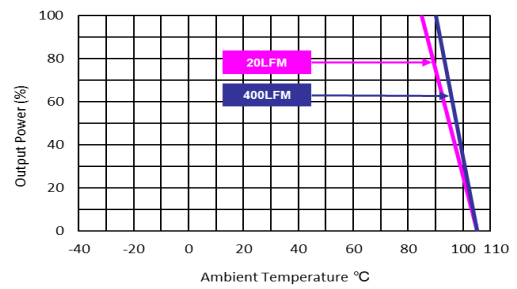
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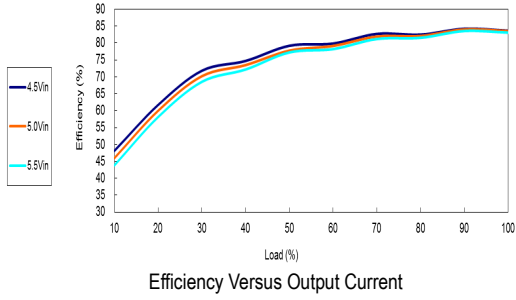
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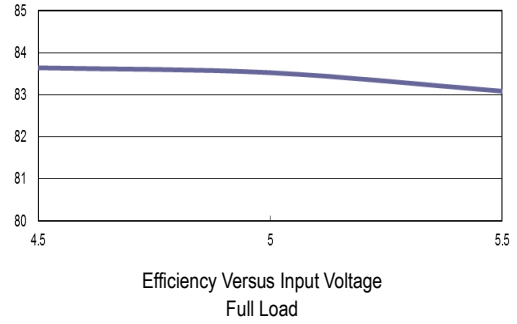
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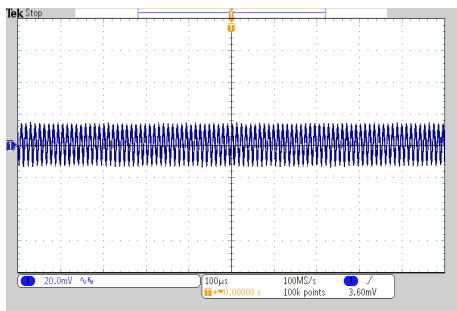
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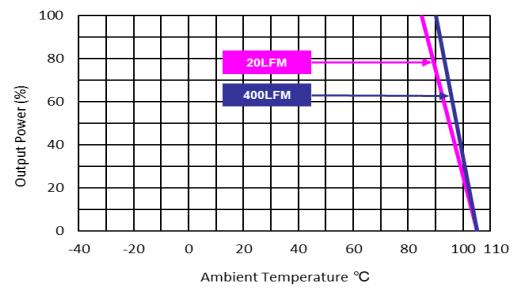
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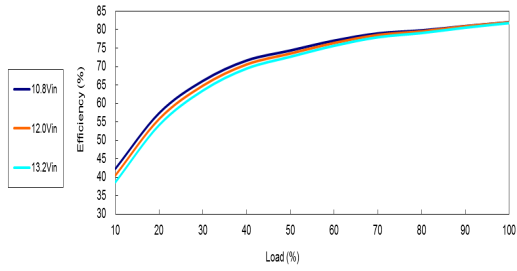
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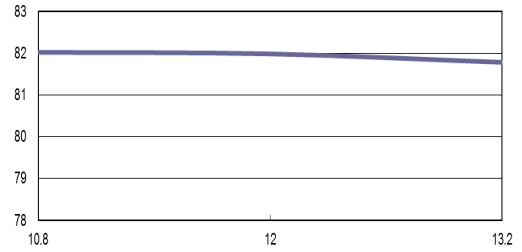
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Characteristic Curves

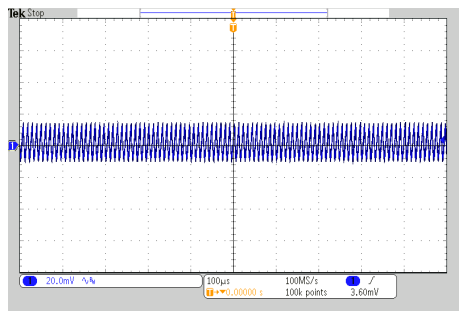
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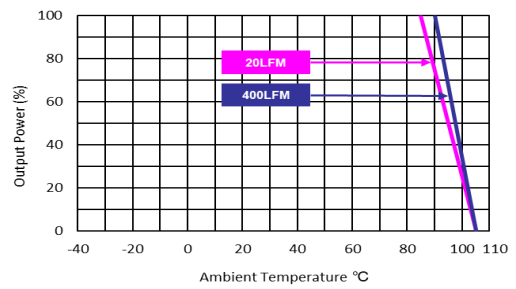
Efficiency Versus Output Current



Efficiency Versus Input Voltage Full Load



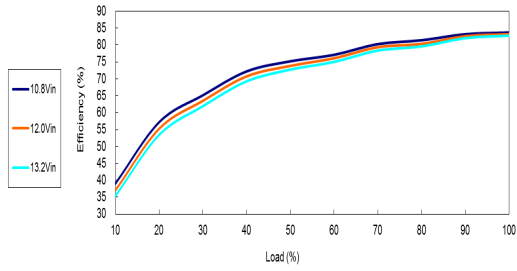
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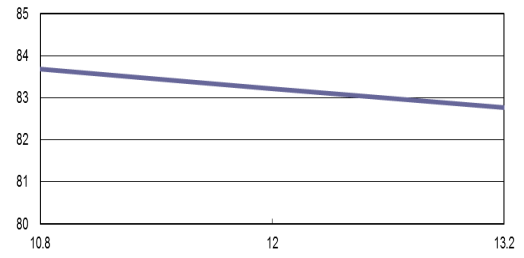
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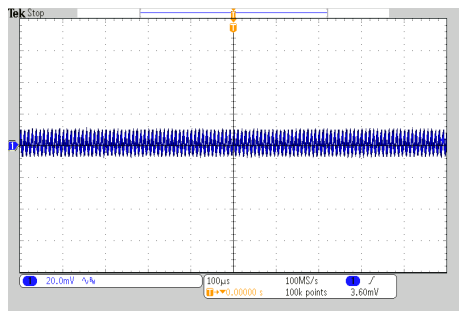
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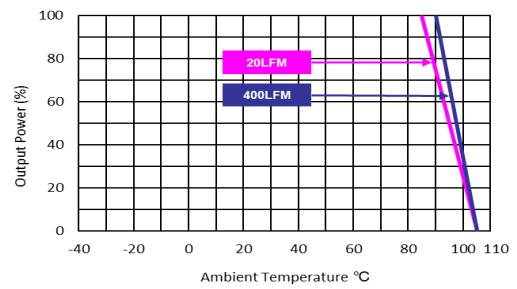
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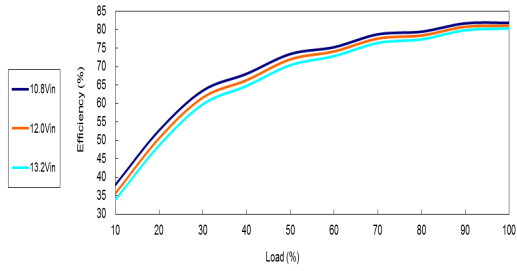
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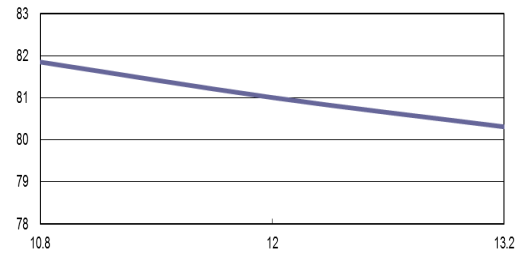
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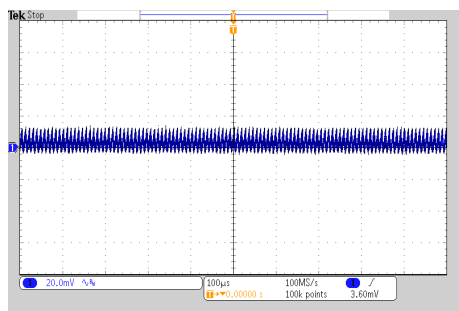
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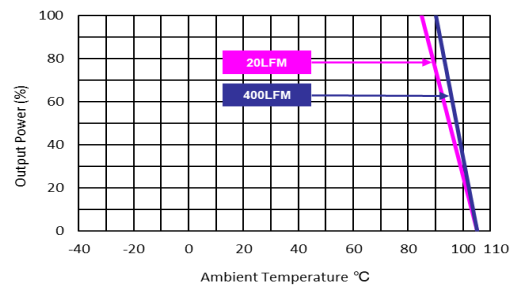
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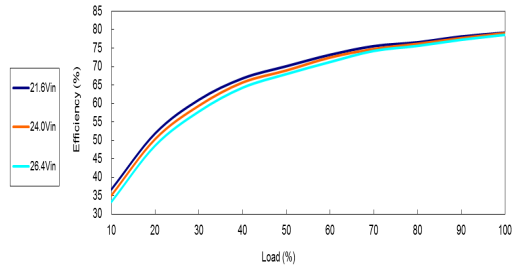
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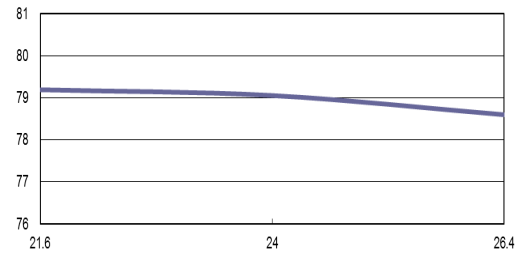
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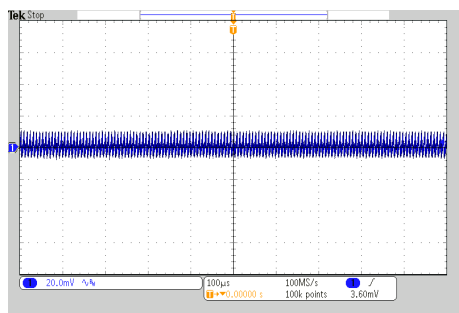
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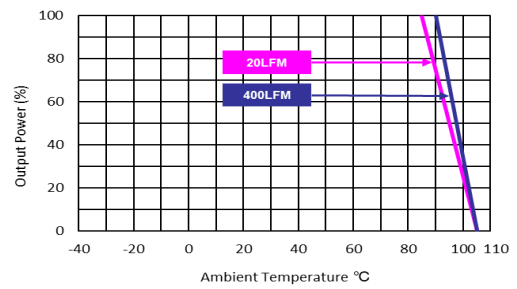
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Efficiency Versus Input Voltage Full Load



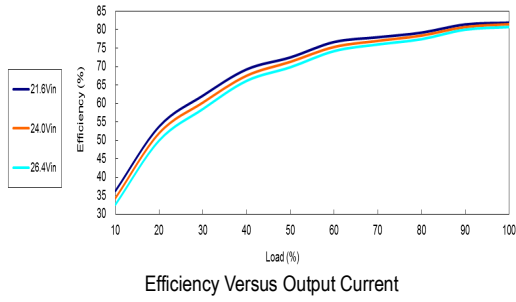
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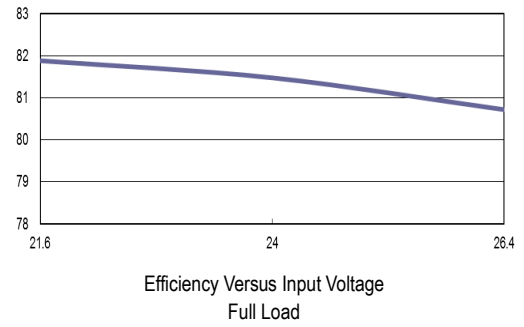
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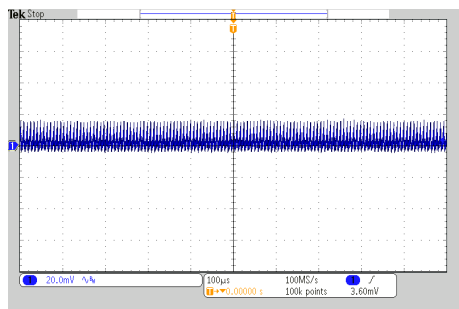
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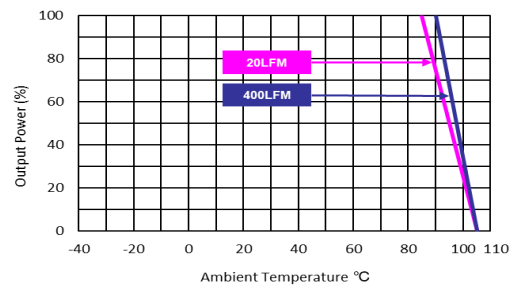
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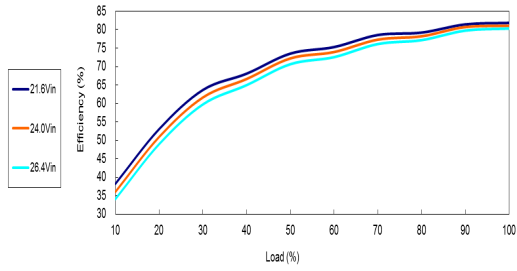
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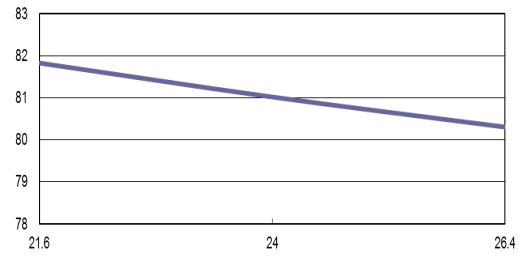
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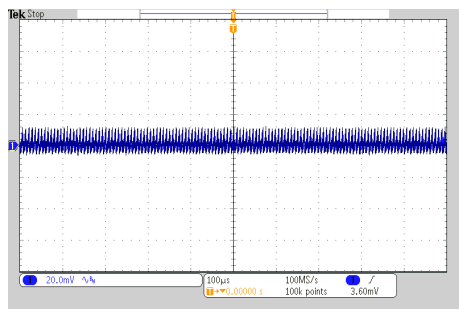
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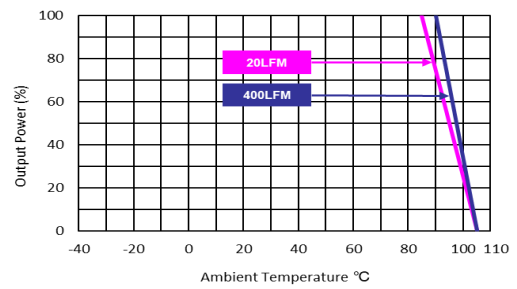
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Efficiency Versus Input Voltage Full Load

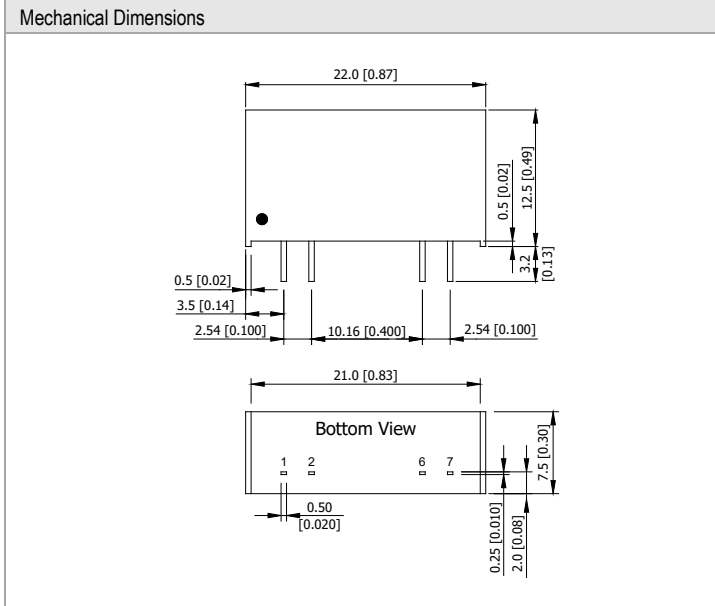


Typical Output Ripple and Noise
 $V_{in} = V_{in\ nom}$; Full Load



Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in} = V_{in\ nom}$

Package Specifications



Pin Connection

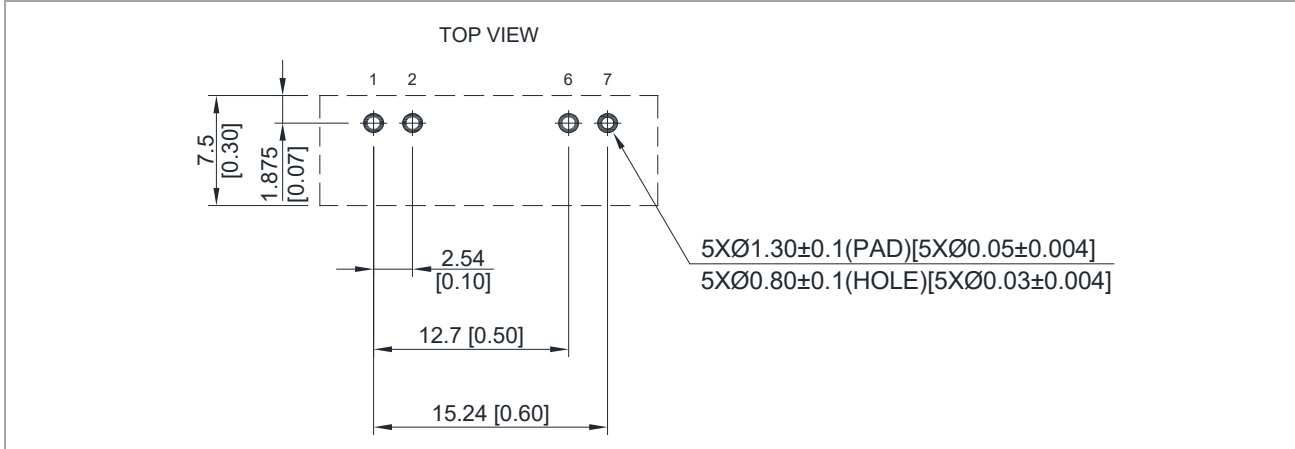
Pin	Function
1	+Vin
2	-Vin
6	-Vout
7	+Vout

- ▶ 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)

Physical Characteristics

Case Size	: 22.0x7.5x12.5mm (0.87x0.30x0.49 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Pin Material	: Alloy 42
Weight	: 4.1g

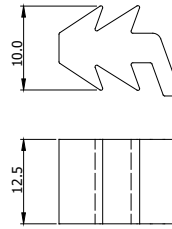
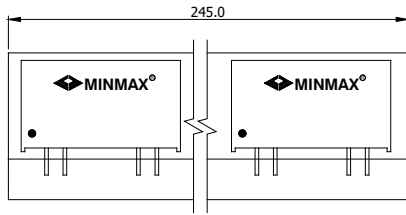
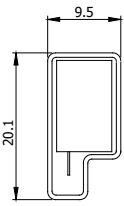
Recommended Pad Layout



Packaging Information for Tube

Tube

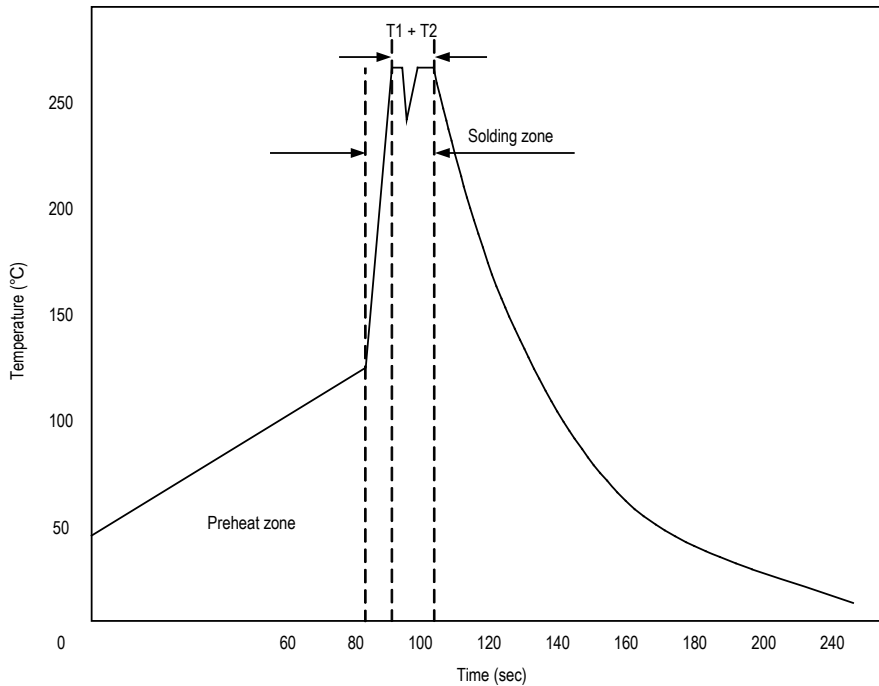
Plug



Unit: mm
10 PCS per TUBE

Wave Soldering Considerations

Lead free wave solder profile



Zone	Reference Parameter
Preheat	Rise temp. speed : 3°C/sec max.
zone	Preheat temp. : 100~130°C
Actual	Peak temp. : 250~260°C
heating	Peak time(T1+T2) : 4~6 sec

Hand Welding Parameter

Reference Solder: Sn-Ag-Cu : Sn-Cu : Sn-Ag

Hand Welding: Soldering iron : Power 60W

Welding Time: 2~4 sec

Temp.: 380~400°C

Part Number Structure

M	A	EU	01	-	05	S	05	HI
Package Type SIP-7	Application Ultra-High Isolation	Output Power 1 Watt			Input Voltage Range 05: 4.5 ~ 5.5 VDC 12: 10.8 ~ 13.2 VDC 24: 21.6 ~ 26.4 VDC	Output Quantity S: Single	Output Voltage 05: 5 VDC 12: 12 VDC 15: 15 VDC	I/O Isolation Voltage 8000 VDC
	±10% Input Range							
	Output Regulation Unregulated							

MTBF and Reliability

The MTBF of MAEU01-HI series of DC-DC converters has been calculated using

MIL-HDBK 217F NOTICE2, Operating Temperature 25°C, Ground Benign.

Model	MTBF	Unit
MAEU01-05S05HI	4,573,386	Hours
MAEU01-05S12HI	4,629,678	
MAEU01-05S15HI	4,681,932	
MAEU01-12S05HI	4,573,298	
MAEU01-12S12HI	4,695,408	
MAEU01-12S15HI	4,548,605	
MAEU01-24S05HI	4,373,058	
MAEU01-24S12HI	4,563,621	
MAEU01-24S15HI	4,548,908	