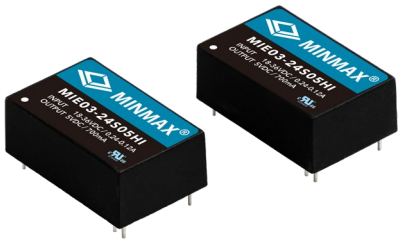
MINMAX®

MIE03-HI Series
Electric Characteristic Note

MIE03-HI Series EC Note

DC-DC CONVERTER 3.5W, Ultra-High Isolation, DIP Package

Features



- **Industrial Standard DIP-24 Package**
- **Wide 2:1 Input Voltage Range**
- **Fully Regulated Output Voltage**
- **Ultra-high I/O Isolation 9000VDC with Reinforced Insulation, rate for 1000Vrms Working Voltage**
- **Wide Operating Temperature Range**
- **No Min. Load Requirement**
- **Under-Voltage, Overload/Voltage and Short Circuit Protection**
- **Conducted EMI EN 55032 Class A Approved**
- **UL/cUL/IEC/EN 62368-1 & UL/cUL 60950-1 Safety Approval & CE Marking**

Applications

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

Product Overview

The MIE03-HI Series is a family of 3.5W isolated, fully regulated DC-DC converters in an industrial-standard DIP-24 package, designed for applications that demand exceptionally high isolation and compliance-ready performance. It supports a wide 2:1 input voltage range and provides stable regulated output, making it suitable for diverse industrial power environments.

Featuring ultra-high 9000VDC reinforced insulation with a rated 1000Vrms working voltage, the series helps deliver strong safety margin and superior isolation robustness. It also offers a wide operating temperature range, no minimum load requirement, and built-in protections including under-voltage, overload/over-voltage, and short-circuit protection. Compliance support includes conducted EMI EN 55032 Class A, plus UL/cUL/IEC/EN 62368-1 & UL/cUL 60950-1 safety approvals and CE marking.

Table of contents

Model Selection Guide P2
Input Specifications P2
Output Specifications P3
Isolation, Safety Standards P3
General Specifications P3
EMC Specifications P3
Environmental Specifications P3
Characteristic Curves P5
Package Specifications P30
Recommended Pad Layout P30
Test Setup P31
Technical Notes P31
Packaging Information for Tube P32
Wave Soldering Considerations P32
Hand Welding Parameter P32
Part Number Structure P33
MTBF and Reliability P33

Model Selection Guide

Model Number	Input Voltage (Range)	Output Voltage	Output Current	Input Current		Over Voltage Protection	Max. capacitive Load	Efficiency (typ.)
			Max.	@Max. Load	@No Load			@Max. Load
	VDC	VDC	mA	mA(typ.)	mA(typ.)	VDC	µF	%
MIE03-05S05HI	5 (4.5 ~ 9)	5	700	854	20	6.2	750	82
MIE03-05S058HI		5.8	600	849		6.2	560	82
MIE03-05S12HI		12	290	839		15	130	83
MIE03-05S15HI		15	235	839		18	100	84
MIE03-05S24HI		24	146	844		30	39	83
MIE03-05D12HI		±12	±145	829	35	±15	75#	84
MIE03-05D15HI		±15	±115	821		±18	56#	84
MIE03-12S05HI	12 (9 ~ 18)	5	700	356	8	6.2	750	82
MIE03-12S12HI		12	290	337		15	130	86
MIE03-12S15HI		15	235	338		18	100	87
MIE03-12S24HI		24	146	340		30	39	86
MIE03-12D12HI		±12	±145	333	13	±15	75#	87
MIE03-12D15HI		±15	±115	330		±18	56#	87
MIE03-24S05HI	24 (18 ~ 36)	5	700	178	6	6.2	750	82
MIE03-24S12HI		12	290	171		15	130	85
MIE03-24S15HI		15	235	169		18	100	87
MIE03-24S24HI		24	146	170		30	39	86
MIE03-24D12HI		±12	±145	167		±15	75#	87
MIE03-24D15HI		±15	±115	167		±18	56#	86
MIE03-48S05HI	48 (36 ~75)	5	700	89	4	6.2	750	82
MIE03-48S12HI		12	290	85		15	130	85
MIE03-48S15HI		15	235	86		18	100	85
MIE03-48S24HI		24	146	88		30	39	83
MIE03-48D12HI		±12	±145	86		±15	75#	84
MIE03-48D15HI		±15	±115	86		±18	56#	84

For each output

Input Specifications

Parameter	Conditions / Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	5V Input Models	-0.7	---	15	VDC
	12V Input Models	-0.7	---	25	
	24V Input Models	-0.7	---	50	
	48V Input Models	-0.7	---	100	
Start-Up Threshold Voltage	5V Input Models	---	---	4.5	
	12V Input Models	---	---	9	
	24V Input Models	---	---	18	
	48V Input Models	---	---	36	
Under Voltage Shutdown	5V Input Models	---	4	---	
	12V Input Models	---	8	---	
	24V Input Models	---	16	---	
	48V Input Models	---	34	---	
Start Up Time (Power On)	Nominal Vin and Constant Resistive Load	---	---	30	ms
Input Filter	All Models	Internal Pi Type			

Output Specifications

Parameter	Conditions		Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy			---	---	±1.0	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads		---	±0.5	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load		---	---	±0.5	%
Load Regulation	Io=0% to 100%		---	---	±0.5	%
Minimum Load	No minimum Load Requirement					
Load Cross Regulation (Dual Output)	Asymmetrical Load 25%/100% Full Load		---	---	±5.0	%
Ripple & Noise	0-20 MHz Bandwidth	Measured with a 1μF MLCC	---	---	70	mV_{P-P}
Transient Recovery Time	25% Load Step Change(2)		---	300	---	μs
Transient Response Deviation			---	±3	±5	%
Temperature Coefficient			---	±0.01	±0.02	%/℃
Over Load Protection			---	150	---	%
Short Circuit Protection	Continuous, Automatic Recovery (Hiccup Mode 0.5Hz typ.)					

Isolation, Safety Standards

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds Reinforced insulation, rated for 1000Vrms working voltage	5000	---	---	VAC
	Tested for 1 second	9000	---	---	VDC
I/O Isolation Resistance	500 VDC	10	---	---	GΩ
I/O Isolation Capacitance	100kHz, 1V	---	---	40	pF
Safety Approvals	UL/cUL 60950-1 recognition(UL certificate)				
	UL/cUL 62368-1 recognition(UL certificate), IEC/EN 62368-1(CB-report)				

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Switching Frequency		---	330	---	kHz
MTBF(calculated)	MIL-HDBK-217F@25℃, Ground Benign	5,815,448	---	---	Hours

EMC Specifications

Parameter	Standards & Level			Performance
$EMI_{(5)}$	Conduction	EN 55032	Without external components	Class A
	Radiation		With external components	
$EMS_{(5)}$	EN 55035			
	ESD	Direct discharge	Indirect discharge HCP & VCP	A
		EN 61000-4-2 Air ± 15kV	Contact ± 6kV	
	Radiated immunity	EN 61000-4-3 10V/m		A
	Fast transient	EN 61000-4-4 ±2kV		A
	Surge	EN 61000-4-5 ±2kV		A
	Conducted immunity	EN 61000-4-6 10Vrms		A
	PFMF	EN 61000-4-8 100A/m		A

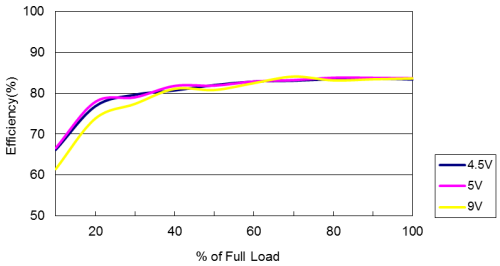
Environmental Specifications

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (For Power Derating see relative Derating Curve)	-40	+96	℃
Case Temperature	---	+105	℃
Storage Temperature Range	-50	+125	℃
Humidity (non condensing)	---	95	% rel. H
Lead Temperature (1.5mm from case for 10Sec.)	---	260	℃

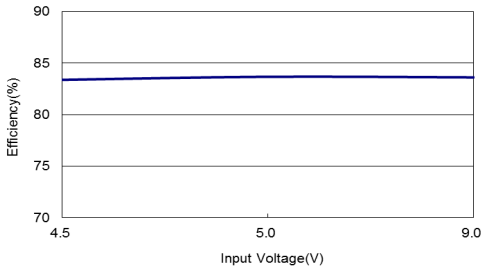
Notes	
1	Specifications typical at Ta=+25℃, resistive load, nominal input voltage and rated output current unless otherwise noted.
2	Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.
3	We recommend to protect the converter by a slow blow fuse 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.

Characteristic Curves

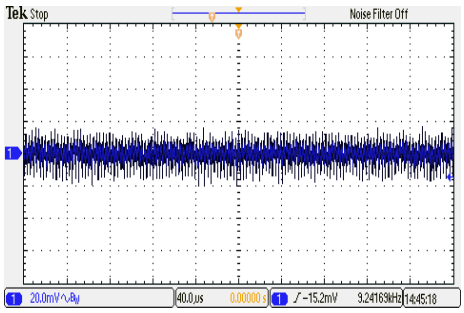
All test conditions are at 25°C The figures are identical for MIE03-05S05HI



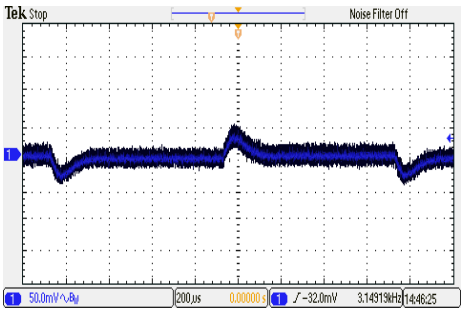
Efficiency Versus Output Current



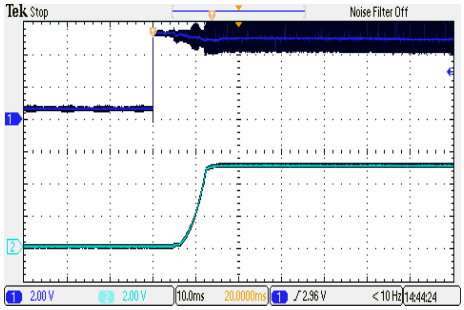
Efficiency Versus Input Voltage
Full Load



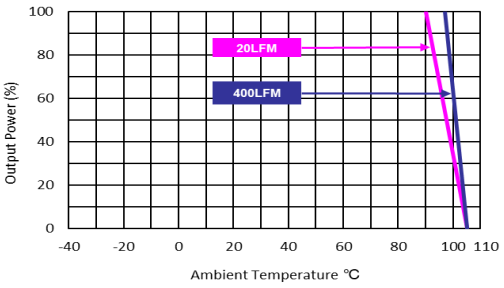
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



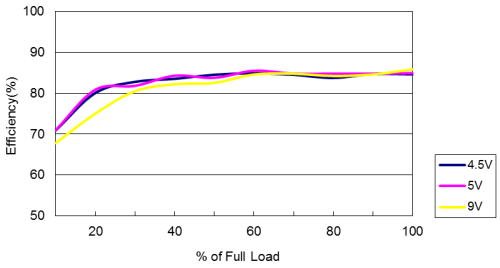
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



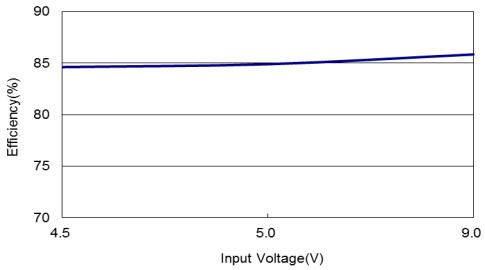
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

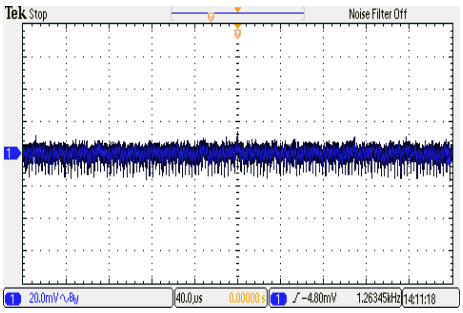
All test conditions are at 25°C The figures are identical for MIE03-05S058HI



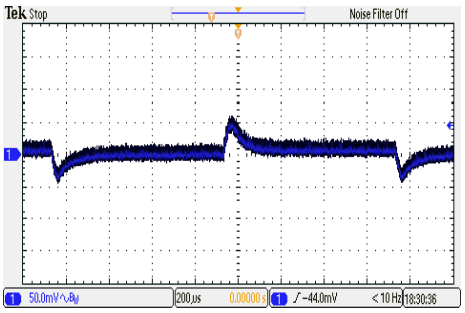
Efficiency Versus Output Current



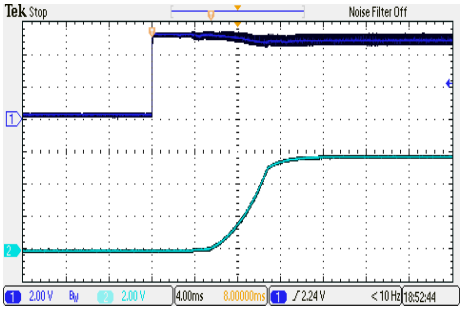
Efficiency Versus Input Voltage
Full Load



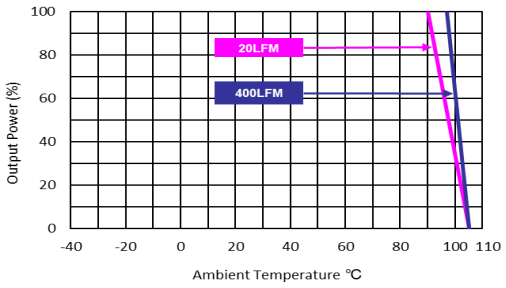
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



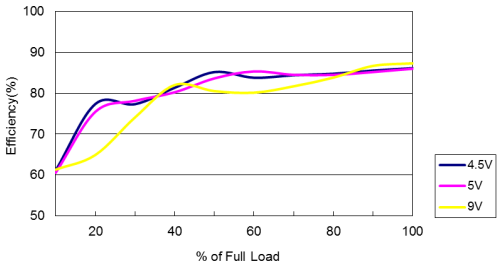
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



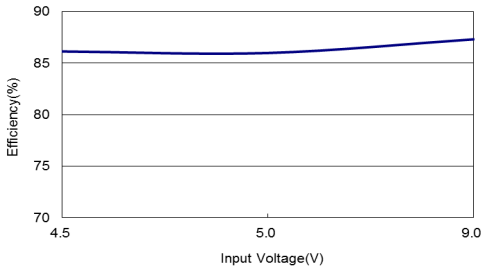
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

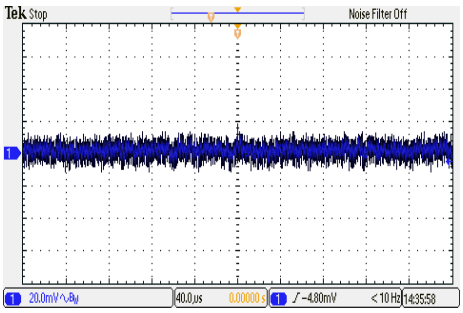
All test conditions are at 25°C The figures are identical for MIE03-05S12HI



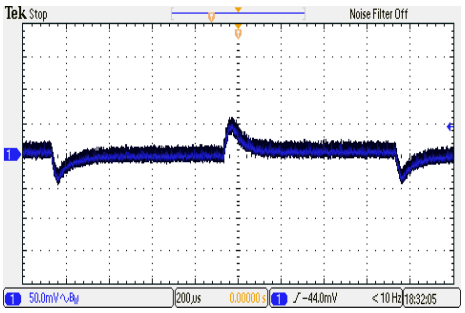
Efficiency Versus Output Current



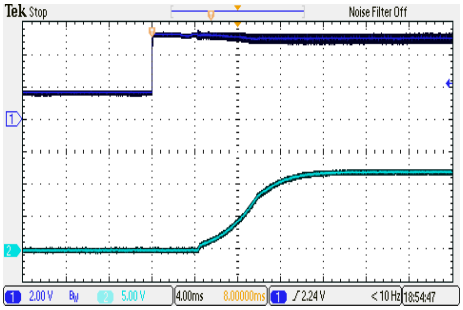
Efficiency Versus Input Voltage
Full Load



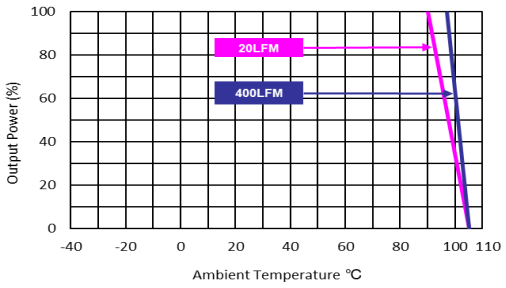
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



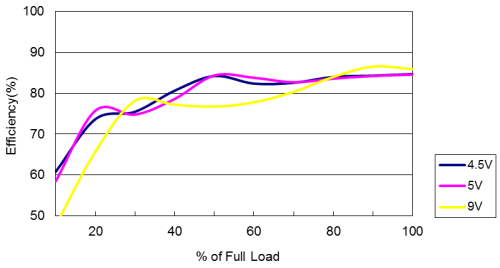
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



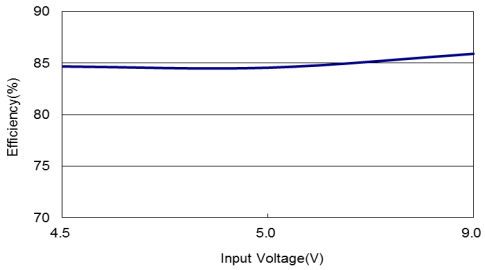
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

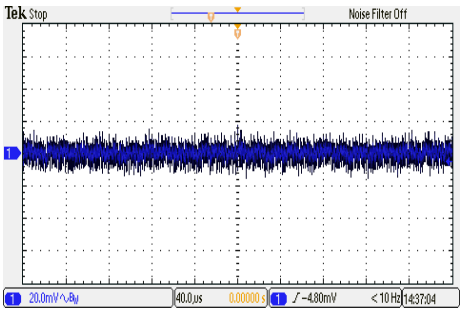
All test conditions are at 25°C The figures are identical for MIE03-05S15HI



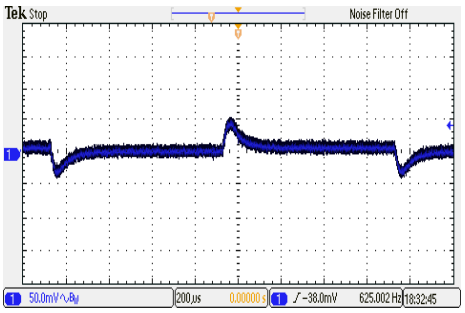
Efficiency Versus Output Current



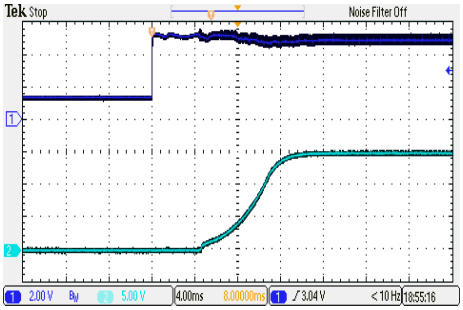
Efficiency Versus Input Voltage
Full Load



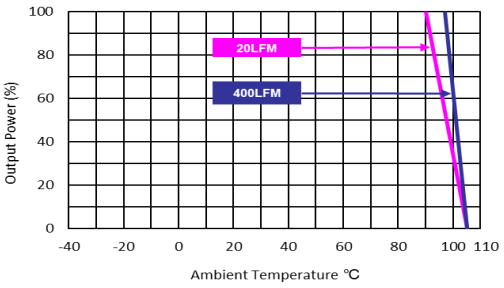
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



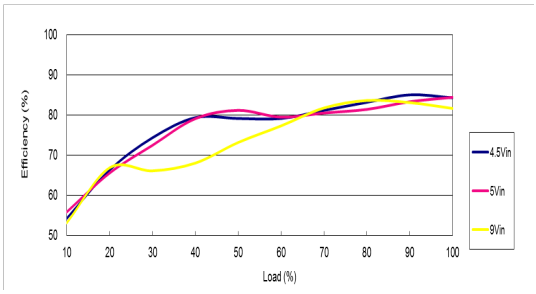
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



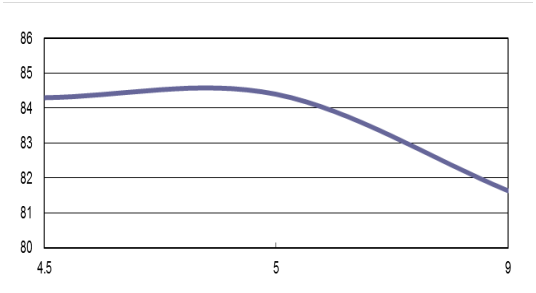
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

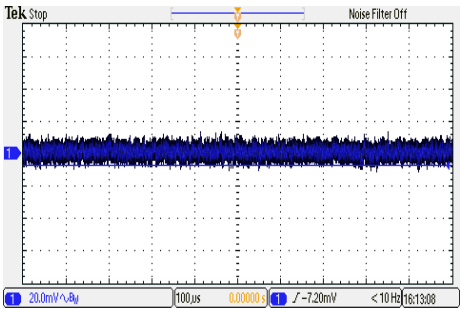
All test conditions are at 25°C The figures are identical for MIE03-05S24HI



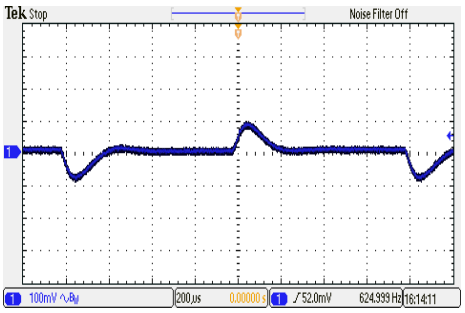
Efficiency Versus Output Current



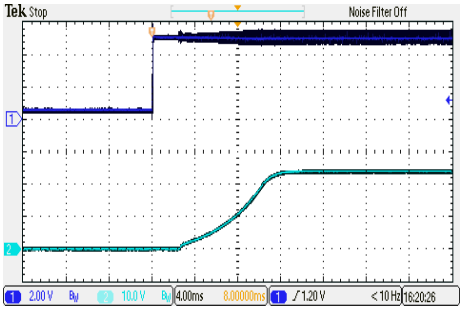
Efficiency Versus Input Voltage
Full Load



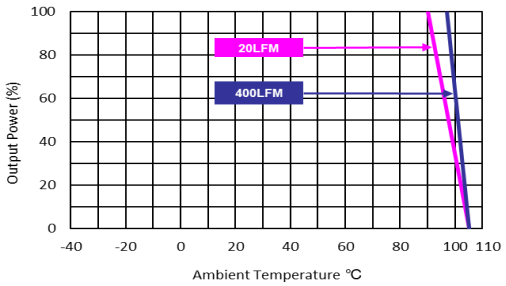
Typical Output Ripple and Noise
$V_{in}=V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



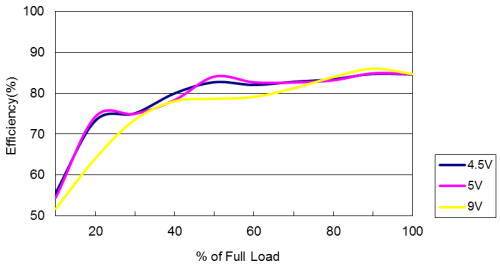
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



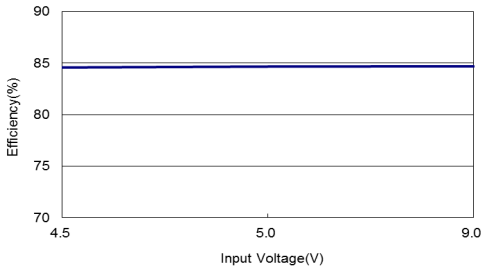
Derating Output Power Versus Ambient Temperature and Airflow
$V_{in}=V_{in\ nom}$

Characteristic Curves

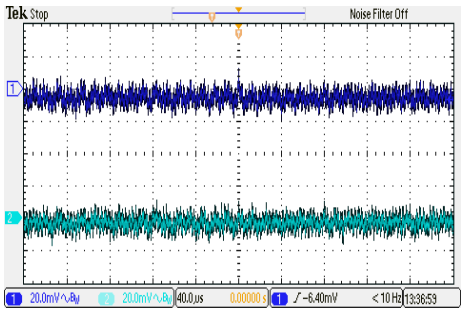
All test conditions are at 25℃ The figures are identical for MIE03-05D12HI



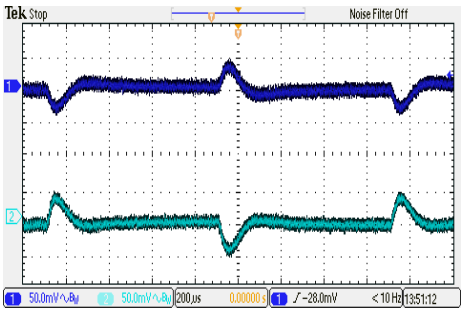
Efficiency Versus Output Current



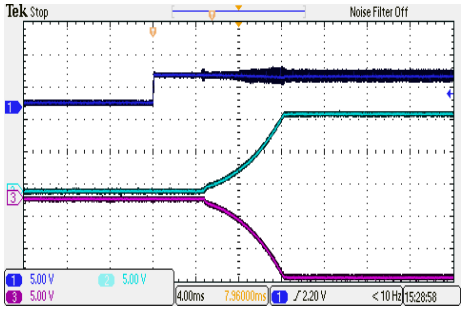
Efficiency Versus Input Voltage
Full Load



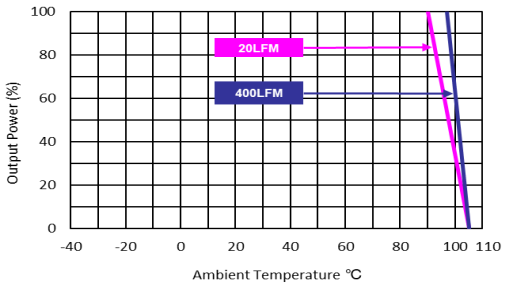
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



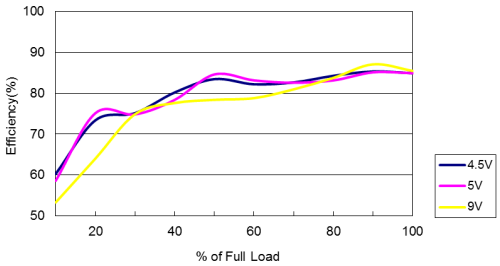
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



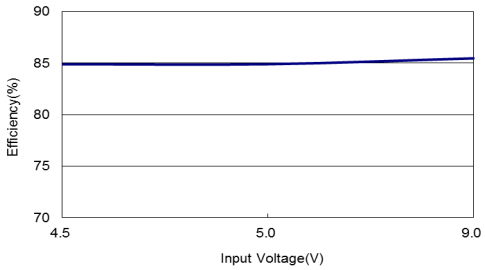
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

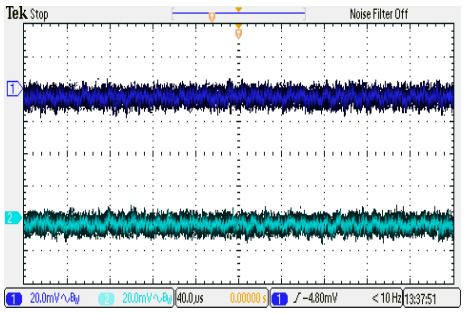
All test conditions are at 25°C The figures are identical for MIE03-05D15HI



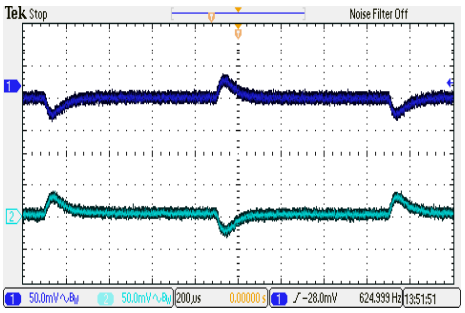
Efficiency Versus Output Current



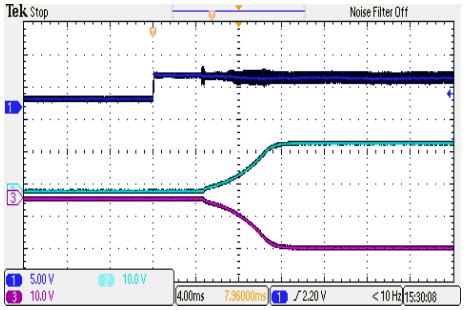
Efficiency Versus Input Voltage
Full Load



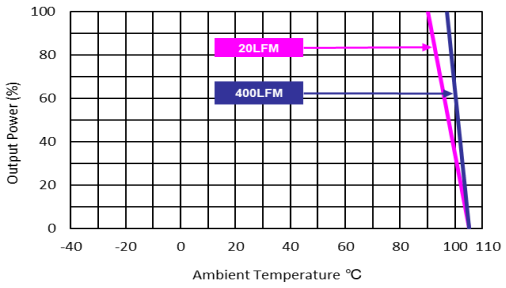
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



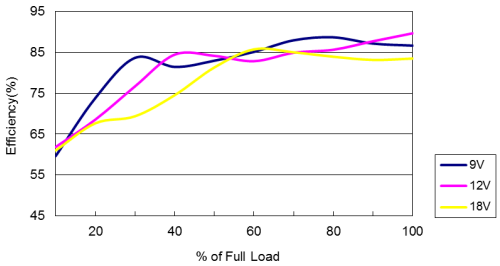
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



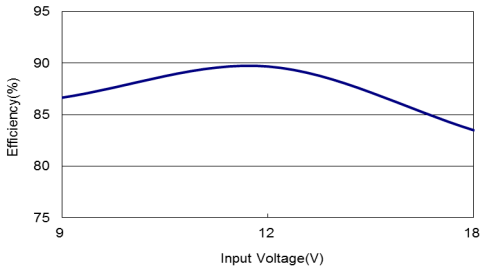
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

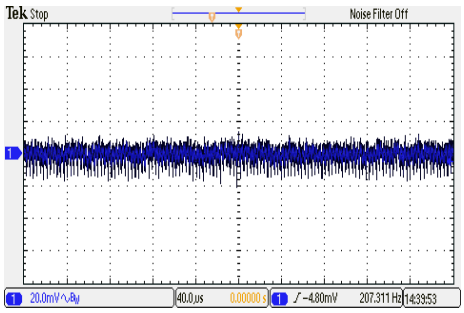
All test conditions are at 25°C The figures are identical for MIE03-12S05HI



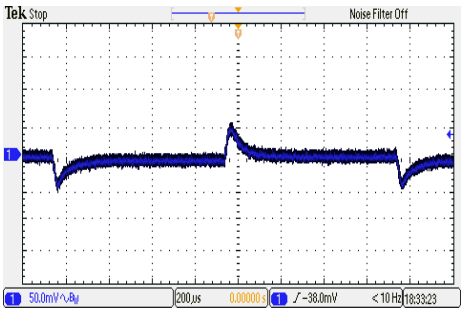
Efficiency Versus Output Current



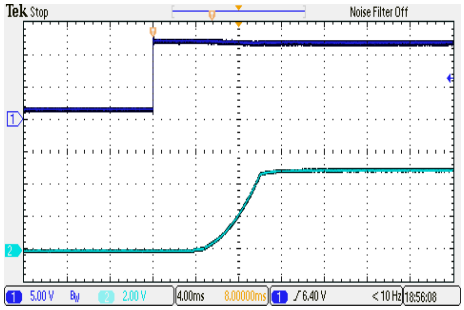
Efficiency Versus Input Voltage
Full Load



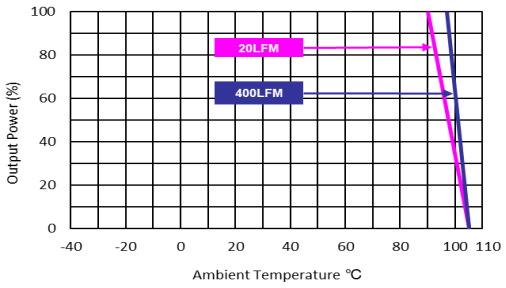
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



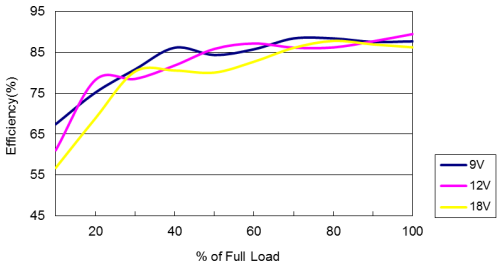
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



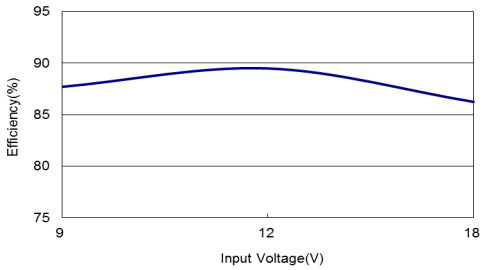
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

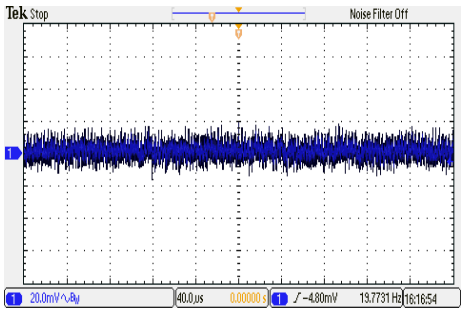
All test conditions are at 25℃ The figures are identical for MIE03-12S12HI



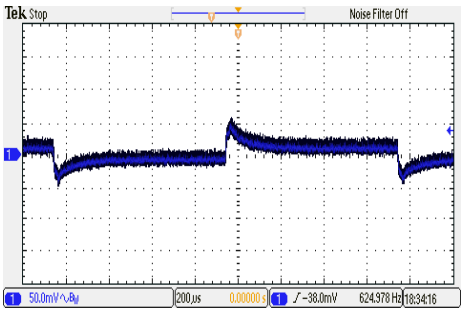
Efficiency Versus Output Current



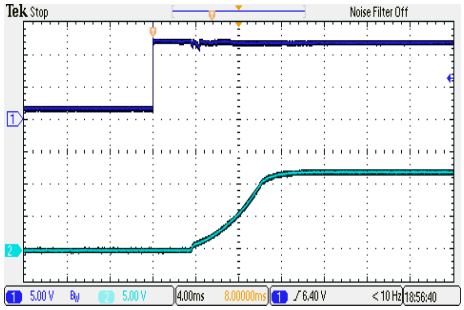
Efficiency Versus Input Voltage
Full Load



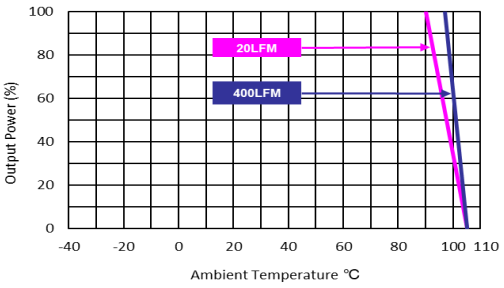
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



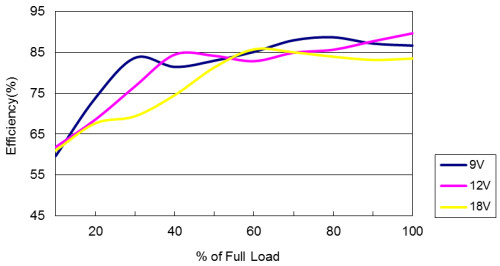
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



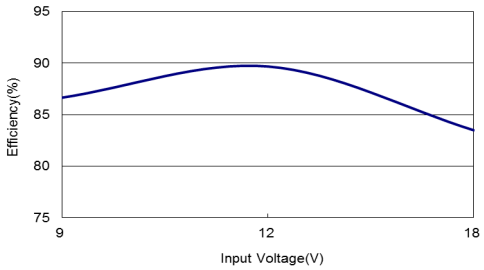
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

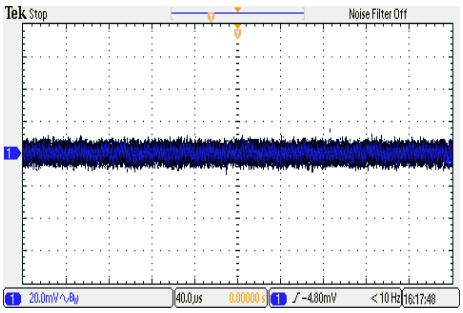
All test conditions are at 25℃ The figures are identical for MIE03-12S15HI



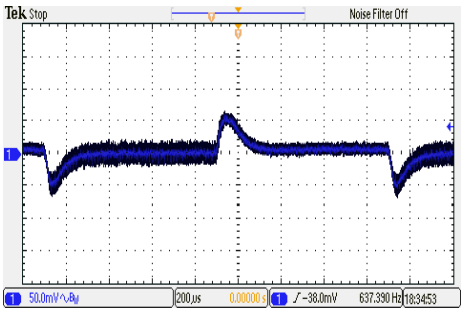
Efficiency Versus Output Current



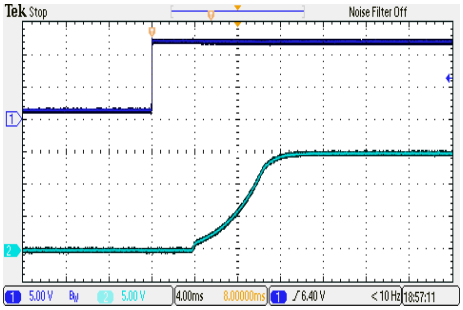
Efficiency Versus Input Voltage
Full Load



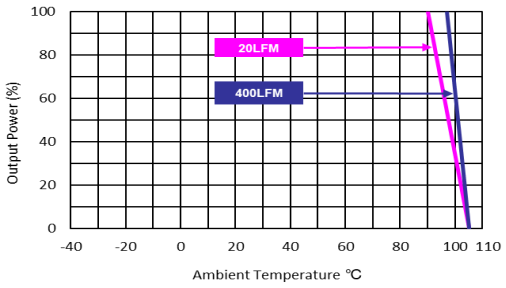
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



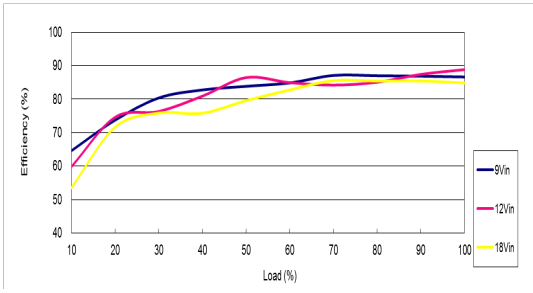
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



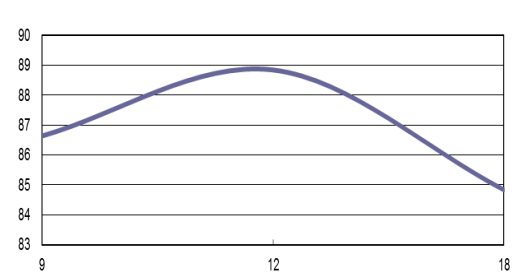
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

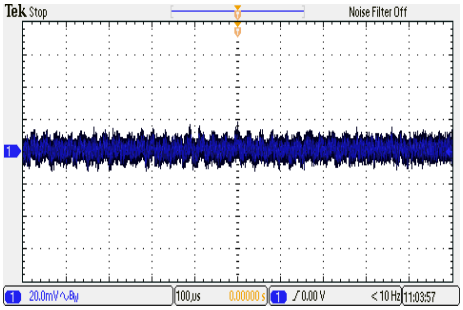
All test conditions are at 25°C The figures are identical for MIE03-12S24HI



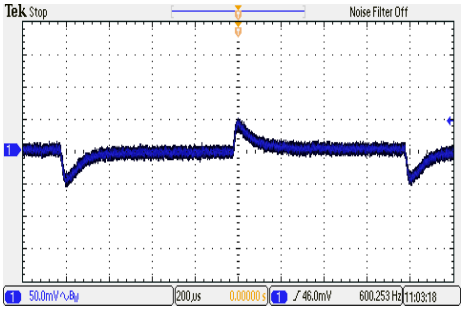
Efficiency Versus Output Current



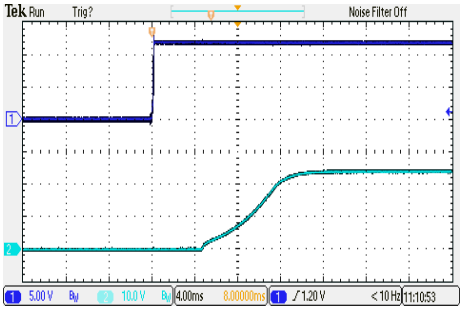
Efficiency Versus Input Voltage
Full Load



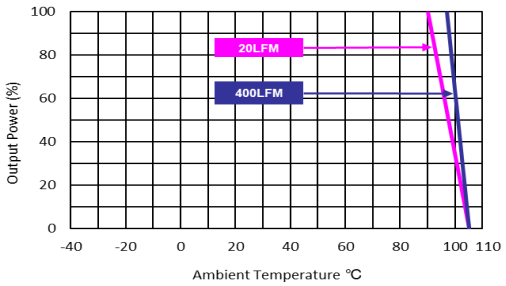
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



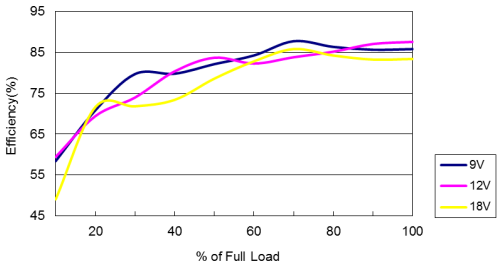
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



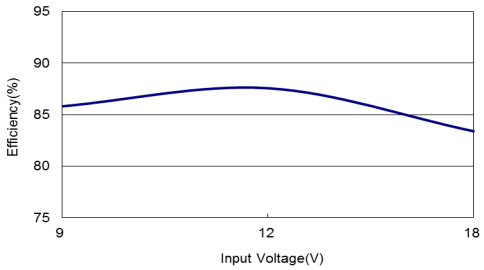
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

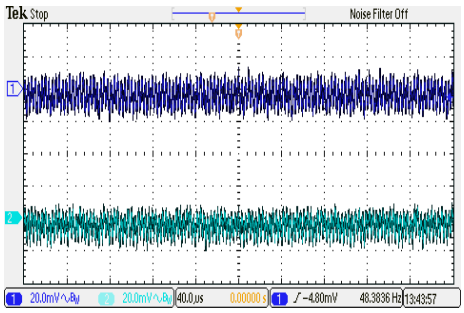
All test conditions are at 25℃ The figures are identical for MIE03-12D12HI



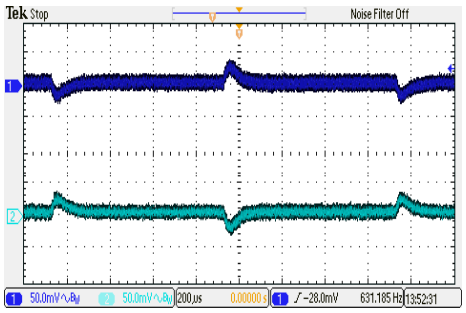
Efficiency Versus Output Current



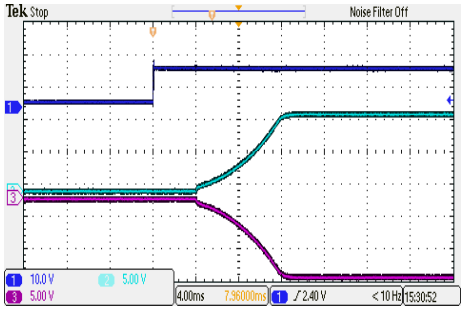
Efficiency Versus Input Voltage
Full Load



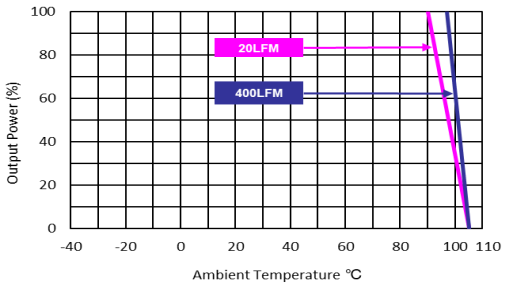
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



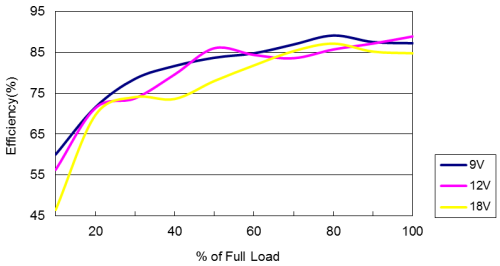
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



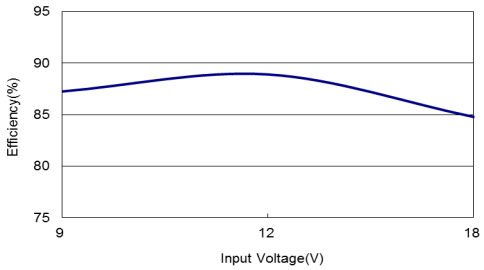
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

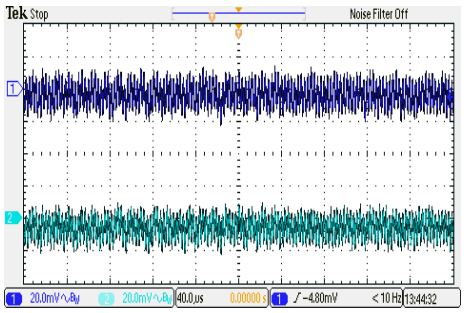
All test conditions are at 25℃ The figures are identical for MIE03-12D15HI



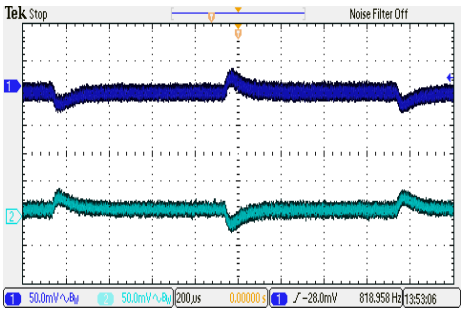
Efficiency Versus Output Current



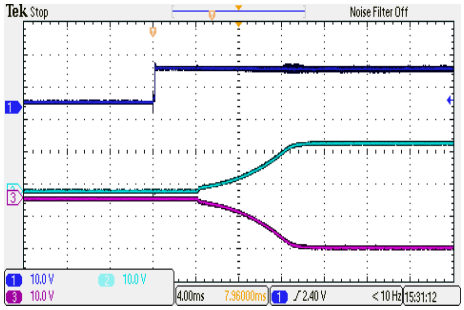
Efficiency Versus Input Voltage
Full Load



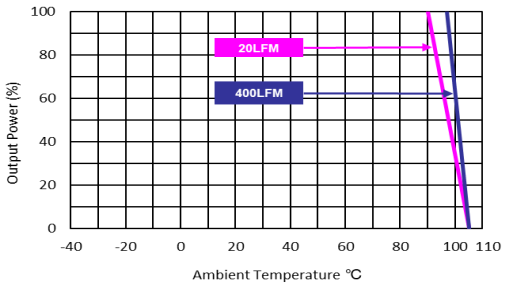
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



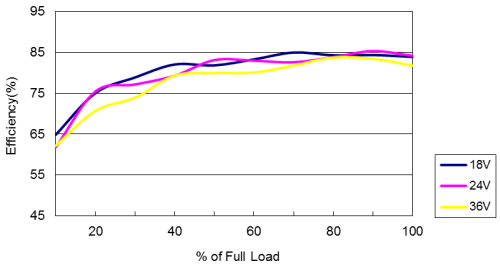
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



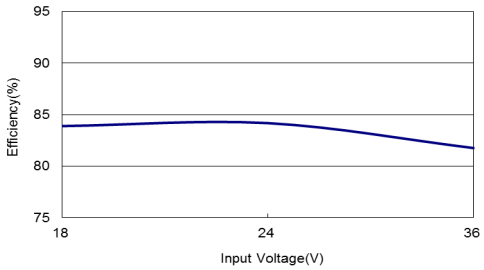
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

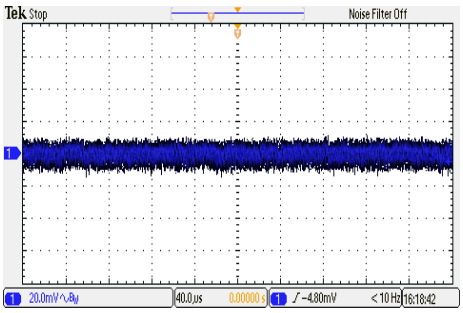
All test conditions are at 25°C The figures are identical for MIE03-24S05HI



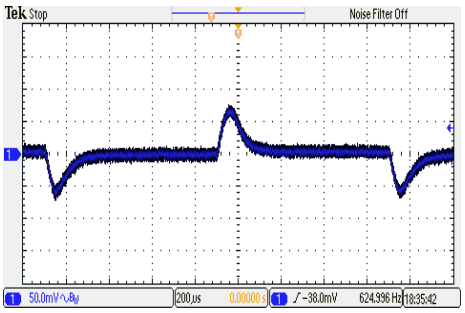
Efficiency Versus Output Current



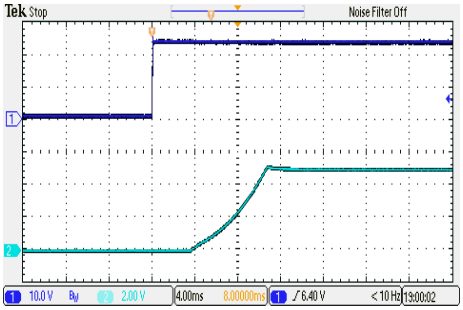
Efficiency Versus Input Voltage
Full Load



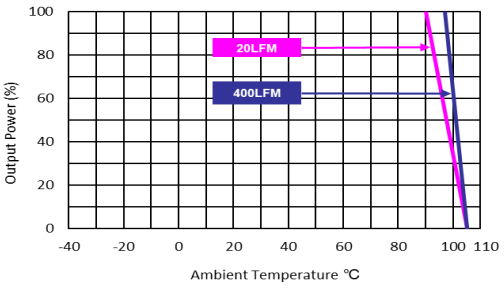
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



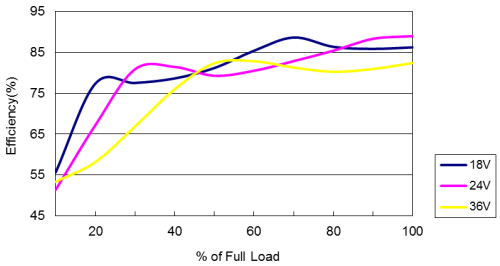
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



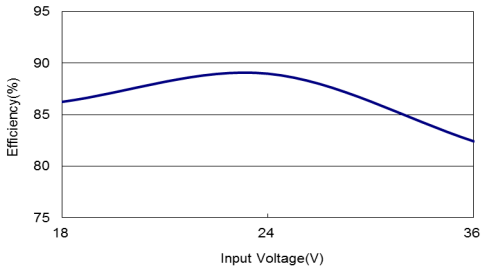
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

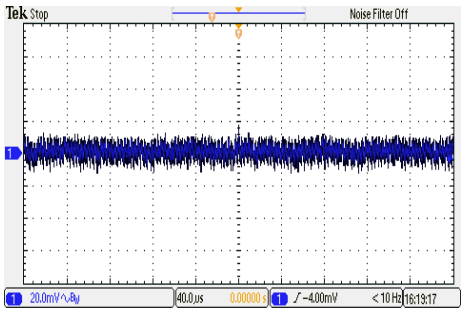
All test conditions are at 25°C The figures are identical for MIE03-24S12HI



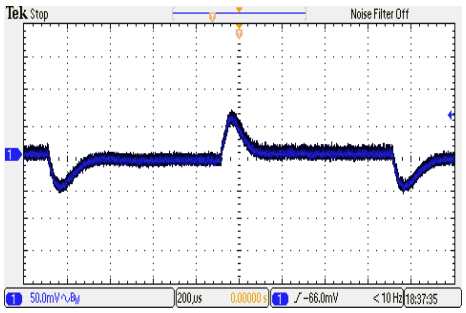
Efficiency Versus Output Current



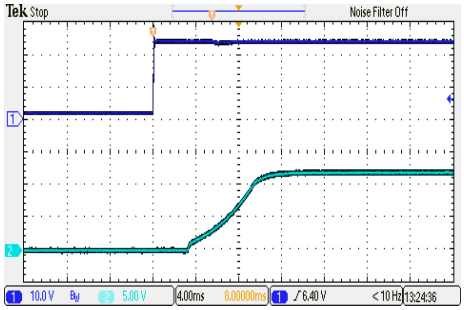
Efficiency Versus Input Voltage
Full Load



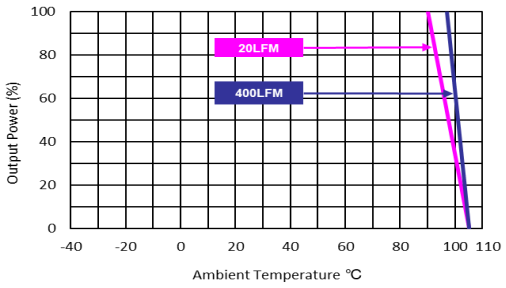
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



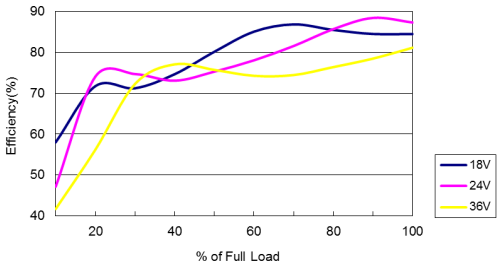
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



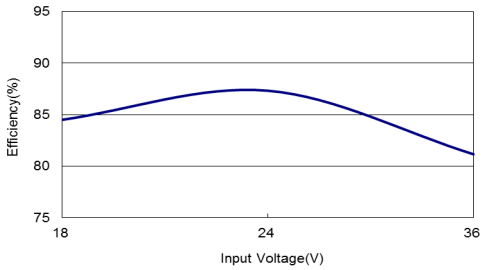
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

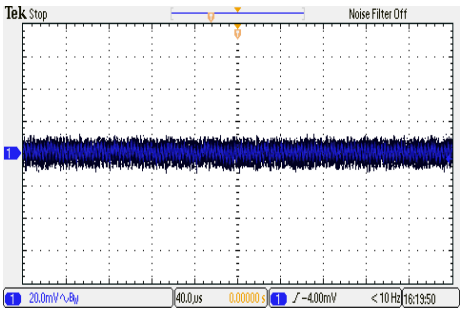
All test conditions are at 25°C The figures are identical for MIE03-24S15HI



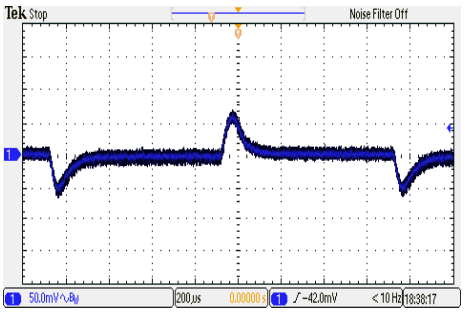
Efficiency Versus Output Current



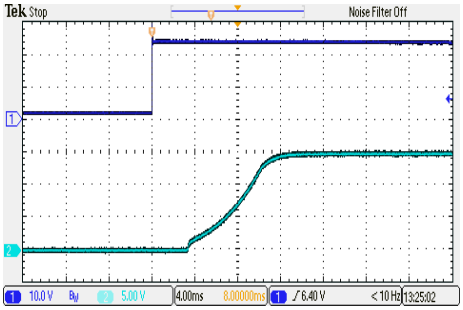
Efficiency Versus Input Voltage
Full Load



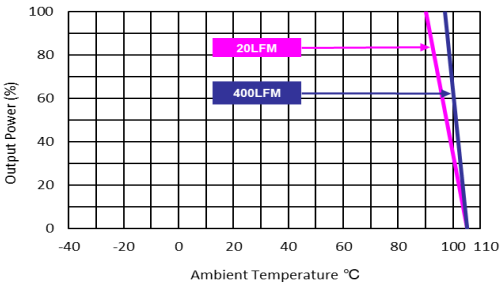
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



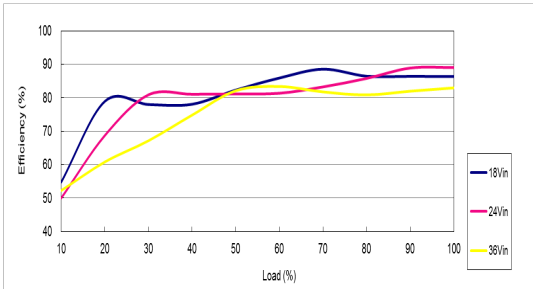
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



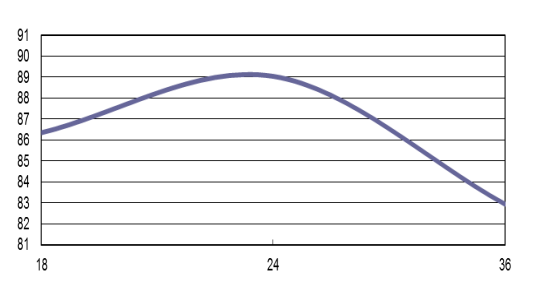
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

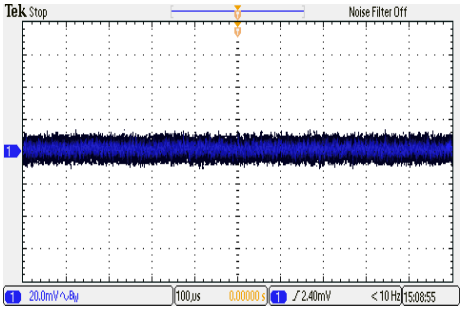
All test conditions are at 25°C The figures are identical for MIE03-24S24HI



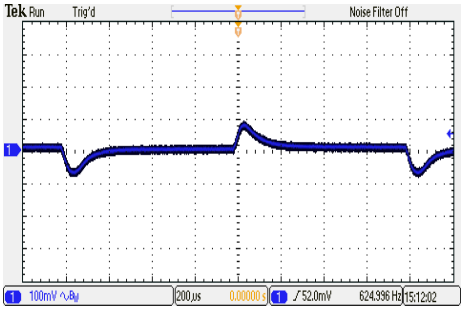
Efficiency Versus Output Current



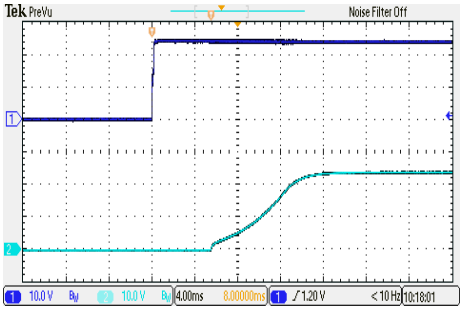
Efficiency Versus Input Voltage
Full Load



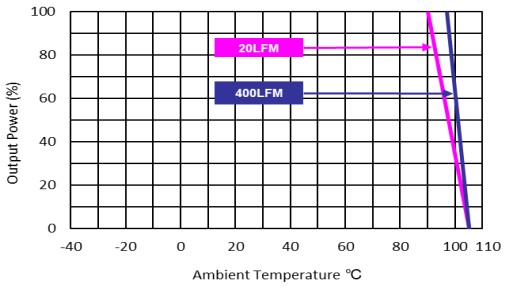
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



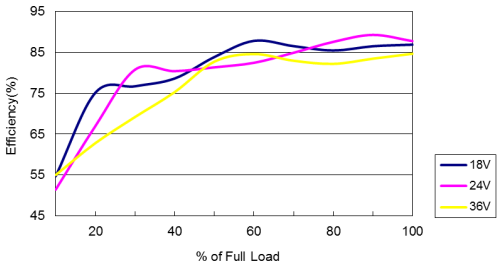
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



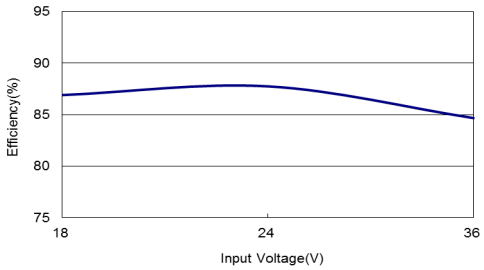
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

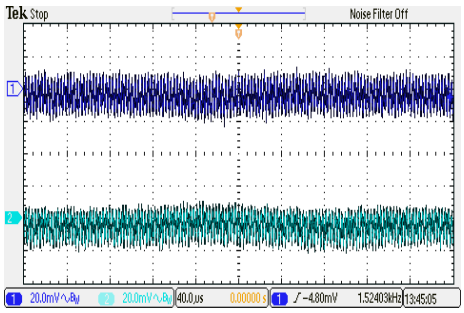
All test conditions are at 25℃ The figures are identical for MIE03-24D12HI



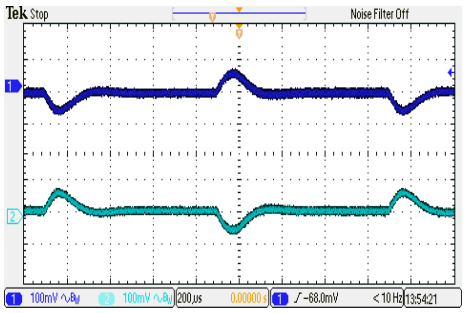
Efficiency Versus Output Current



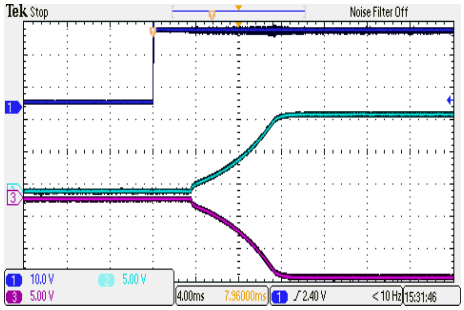
Efficiency Versus Input Voltage
Full Load



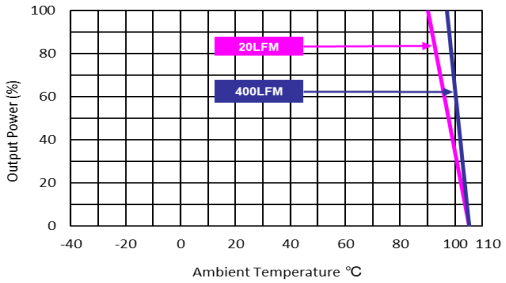
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



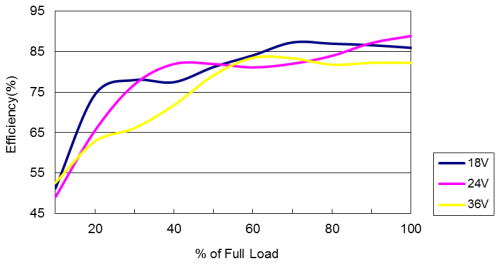
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



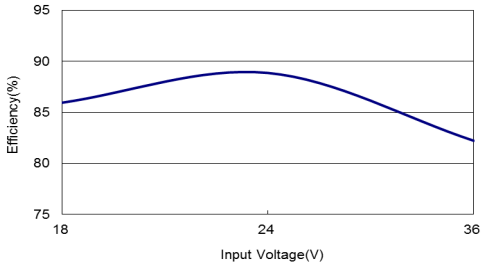
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

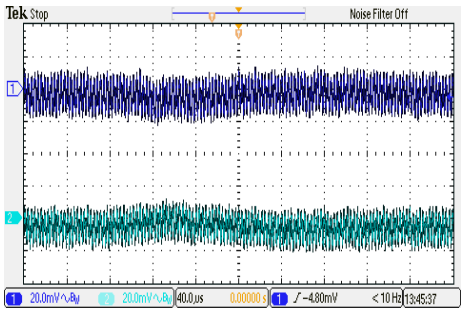
All test conditions are at 25℃ The figures are identical for MIE03-24D15HI



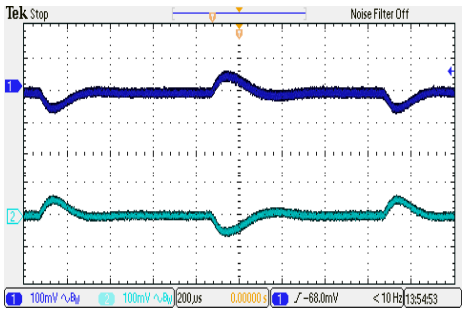
Efficiency Versus Output Current



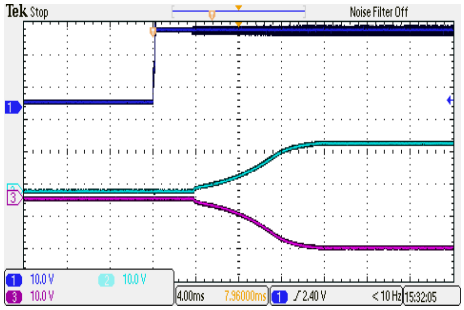
Efficiency Versus Input Voltage
Full Load



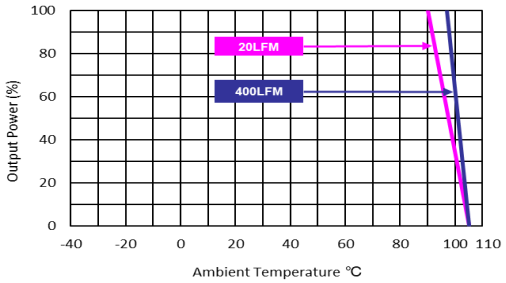
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



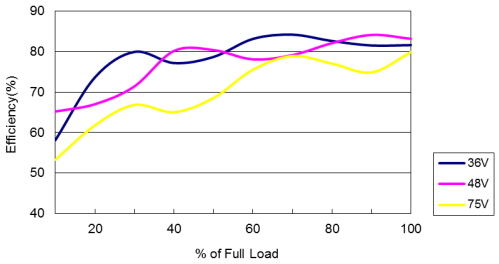
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



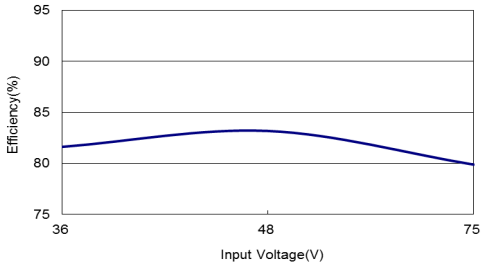
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

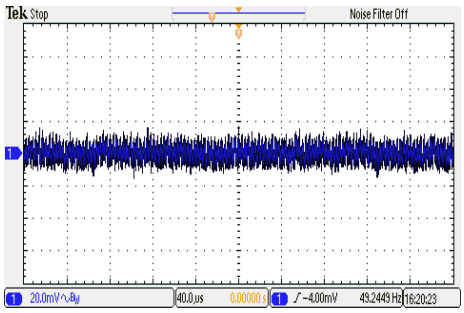
All test conditions are at 25℃ The figures are identical for MIE03-48S05HI



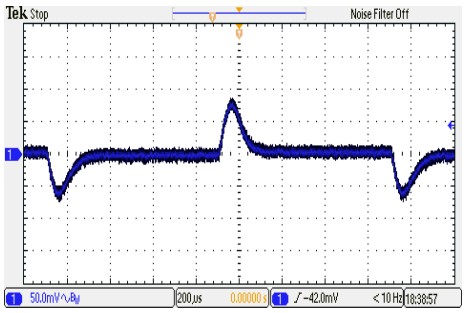
Efficiency Versus Output Current



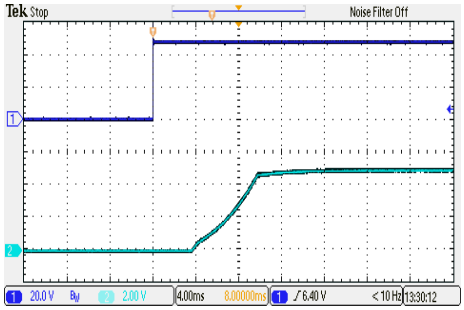
Efficiency Versus Input Voltage
Full Load



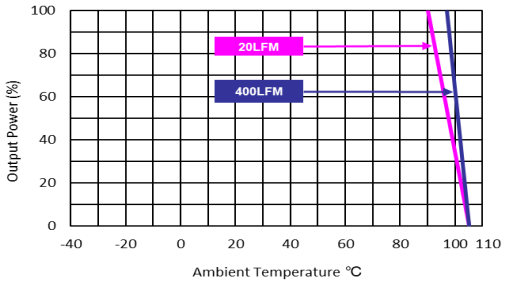
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



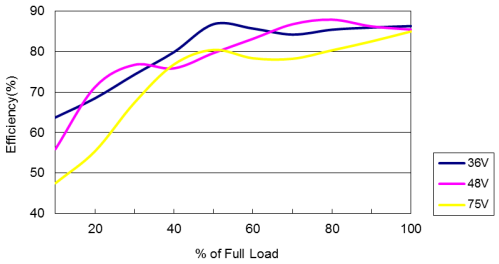
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



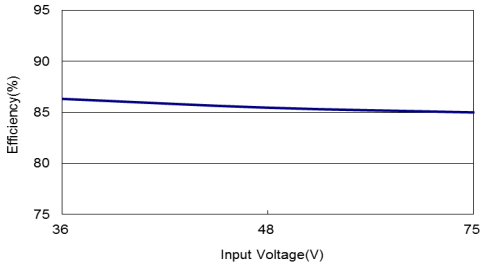
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

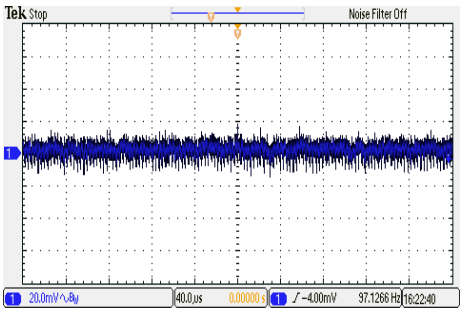
All test conditions are at 25°C The figures are identical for MIE03-48S12HI



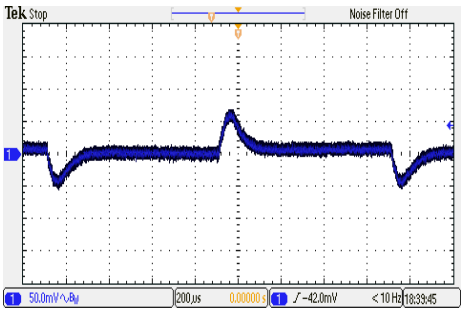
Efficiency Versus Output Current



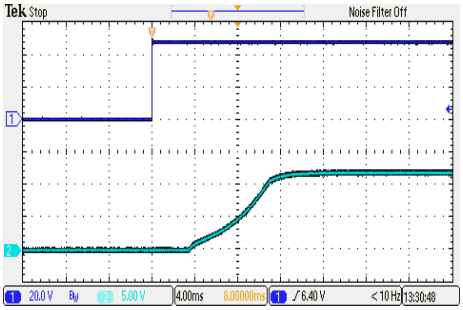
Efficiency Versus Input Voltage
Full Load



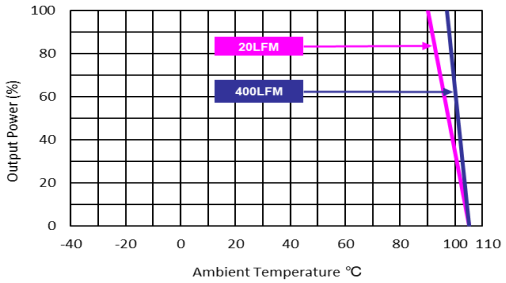
Typical Output Ripple and Noise
$V_{in}=V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



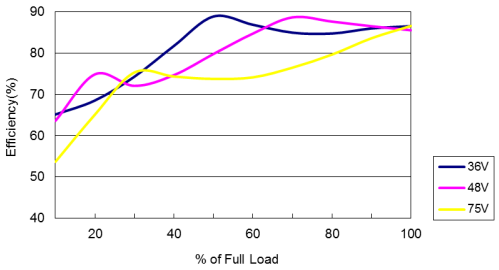
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



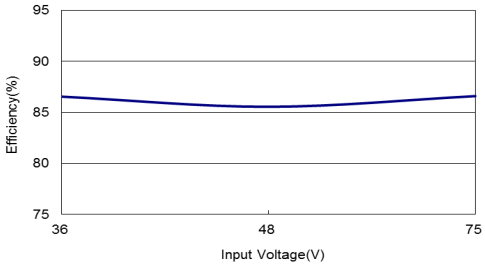
Derating Output Power Versus Ambient Temperature and Airflow
$V_{in}=V_{in\ nom}$

Characteristic Curves

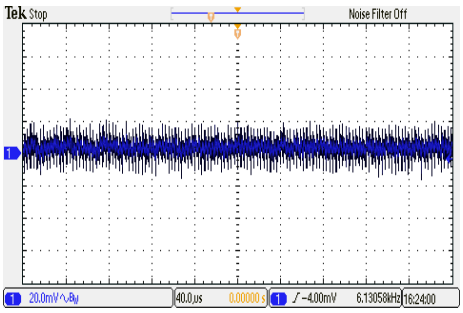
All test conditions are at 25°C The figures are identical for MIE03-48S15HI



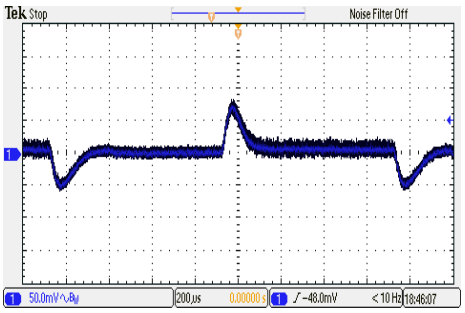
Efficiency Versus Output Current



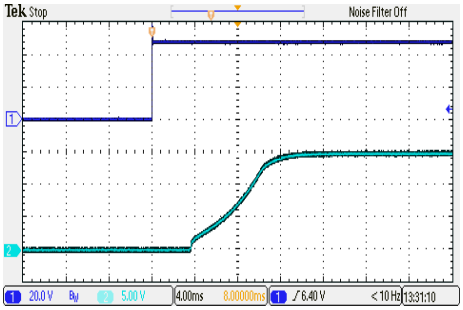
Efficiency Versus Input Voltage
Full Load



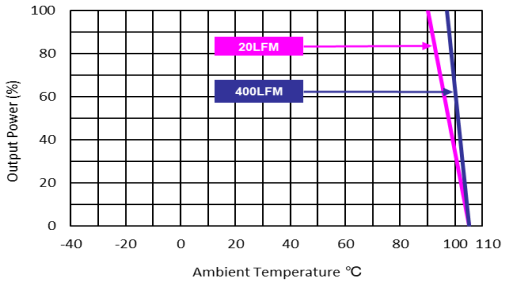
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



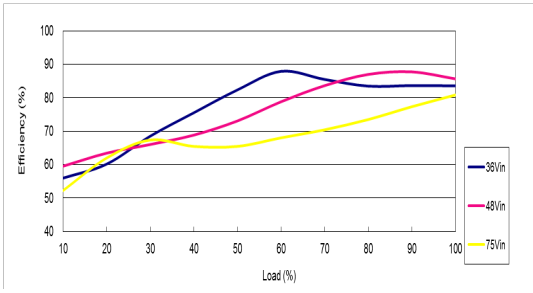
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



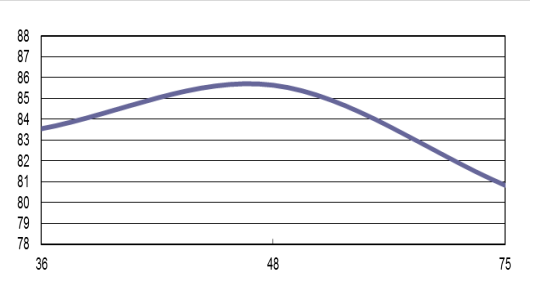
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

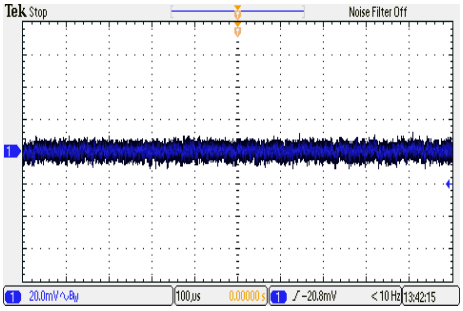
All test conditions are at 25°C The figures are identical for MIE03-48S24HI



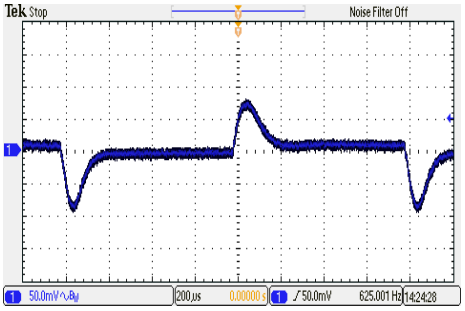
Efficiency Versus Output Current



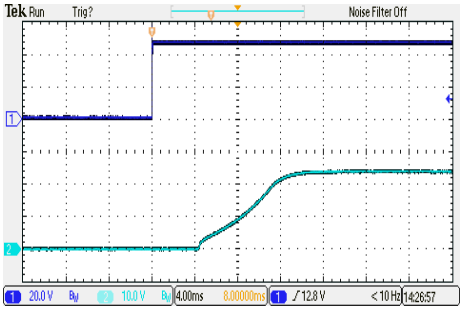
Efficiency Versus Input Voltage
Full Load



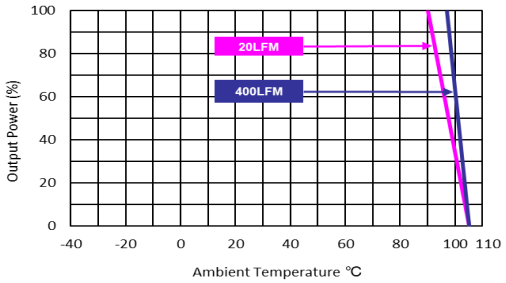
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



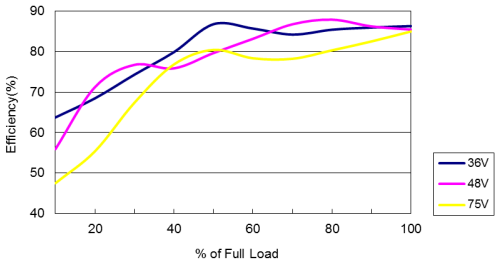
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



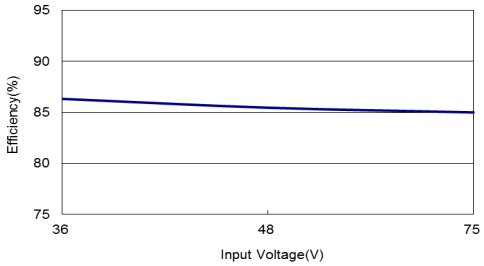
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

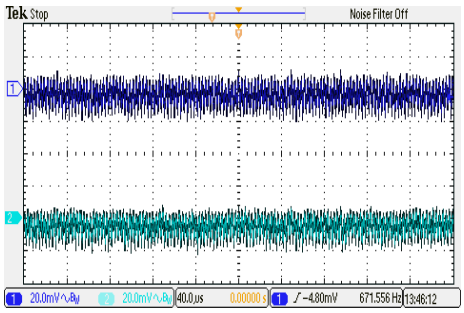
All test conditions are at 25℃ The figures are identical for MIE03-48D12HI



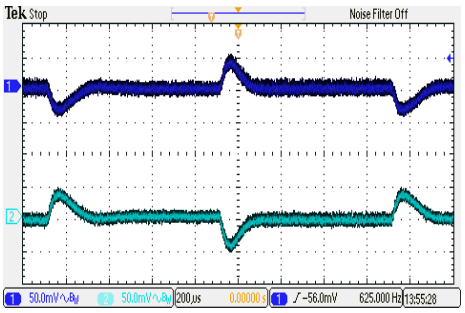
Efficiency Versus Output Current



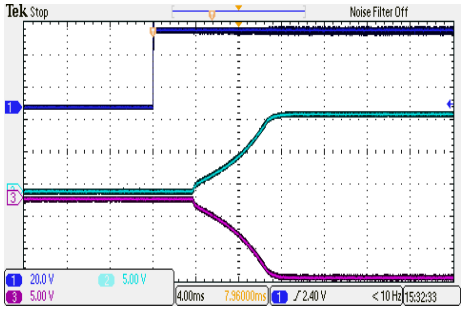
Efficiency Versus Input Voltage
Full Load



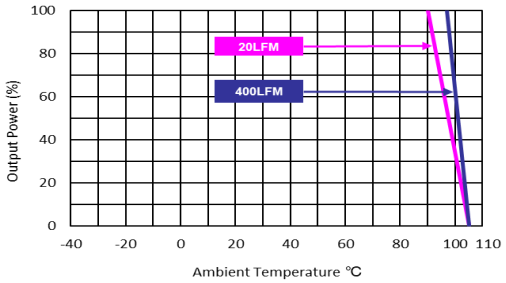
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



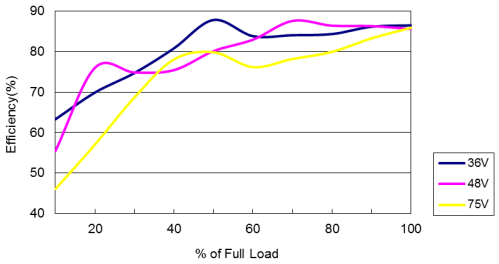
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



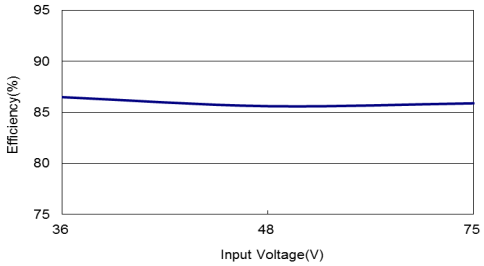
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

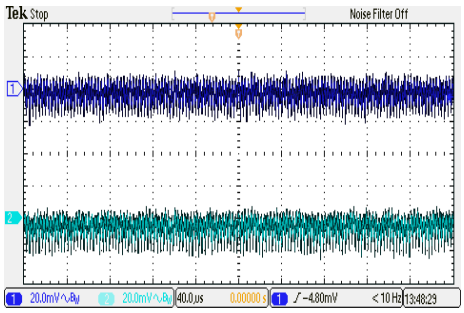
All test conditions are at 25°C The figures are identical for MIE03-48D15HI



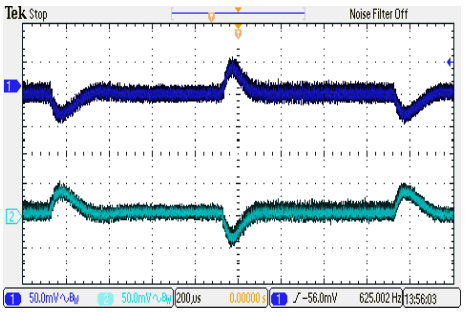
Efficiency Versus Output Current



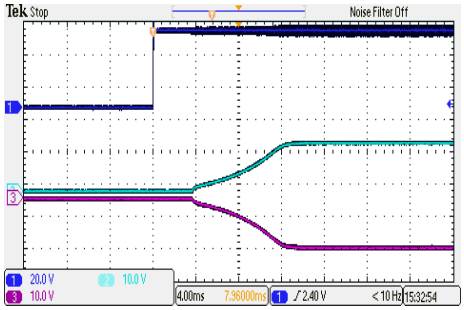
Efficiency Versus Input Voltage
Full Load



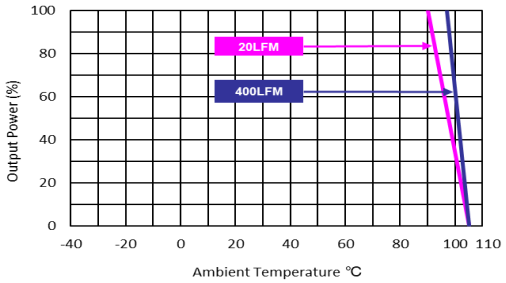
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}=$V_{in\ nom}$



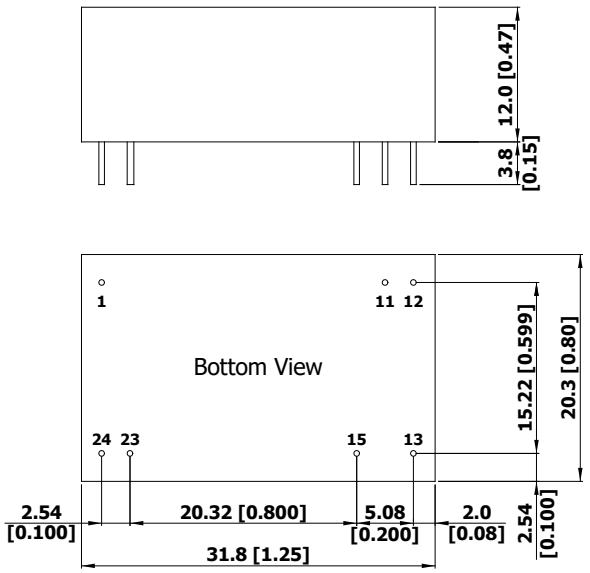
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



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

Package Specifications

Mechanical Dimensions



Pin Connections

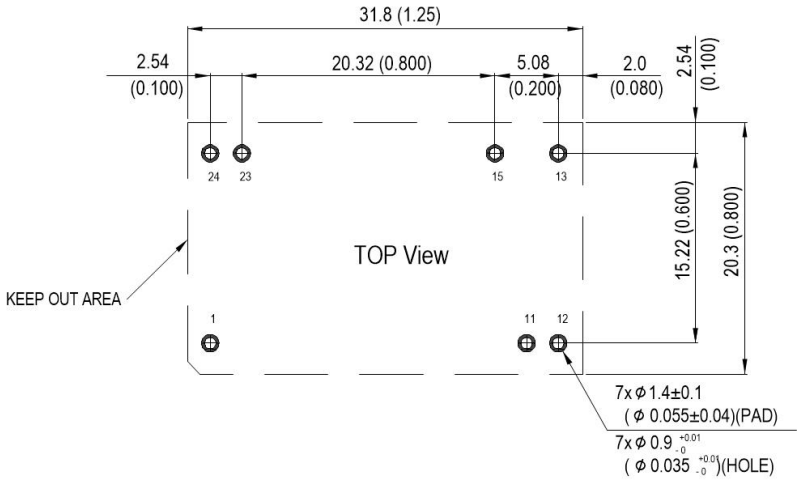
Pin	Single Output	Dual Output	Diameter mm (inches)
1	+Vin	+Vin	Ø 0.6 [0.02]
11	No Pin	Common	Ø 0.6 [0.02]
12	-Vout	No Pin	Ø 0.6 [0.02]
13	+Vout	-Vout	Ø 0.6 [0.02]
15	No Pin	+Vout	Ø 0.6 [0.02]
23	-Vin	-Vin	Ø 0.6 [0.02]
24	-Vin	-Vin	Ø 0.6 [0.02]

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)
  X.XX±0.25 (X.XXX±0.010)
- Pin diameter tolerance: X.X±0.05 (X.XX±0.002)

Physical Characteristics

Case Size	:	31.8x20.3x12.0mm (1.25x0.80x0.47 inches)
Case Material	:	Plastic resin (flammability to UL 94V-0 rated)
Pin Material	:	Copper Alloy
Weight	:	15.5g

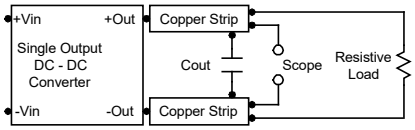
Recommended Pad Layout

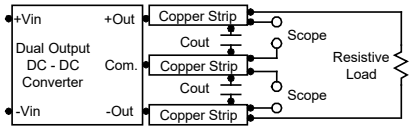


Test Setup

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

Overload Protection

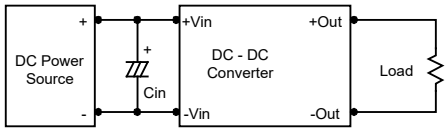
To provide hiccup mode protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure overload for an unlimited duration.

Overvoltage Protection

The output overvoltage clamp consists of control circuitry, which is independent of the primary regulation loop, that monitors the voltage on the output terminals. The control loop of the clamp has a higher voltage set point than the primary loop. This provides a redundant voltage control that reduces the risk of output overvoltage. The OVP level can be found in the output data.

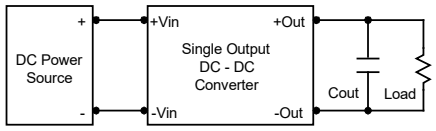
Input Source Impedance

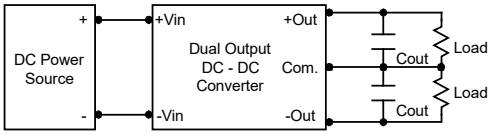
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor on the input to insure startup. By using a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 kHz) capacitor of a 22µF for the 5V input devices and a 10µF for the 12V input devices and a 4.7µF for the 24V input devices and a 2.2µF for the 48V devices, capacitor mounted close to the power module helps ensure stability of the unit.



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 1µF capacitors at the output.



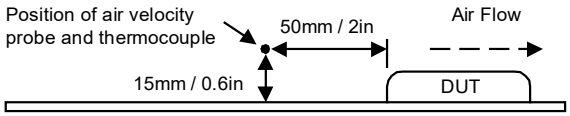


Maximum Capacitive Load

The MIE03-HI series has limitation of maximum connected capacitance on the output. The power module may operate in current limiting mode during start-up, affecting the ramp-up and the startup time. Connect capacitors at the point of load for best performance. The maximum capacitance can be found in the data sheet.

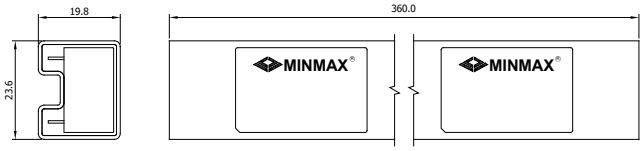
Thermal Considerations

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.

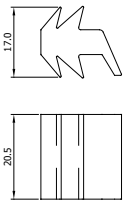


Packaging Information for Tube

Tube



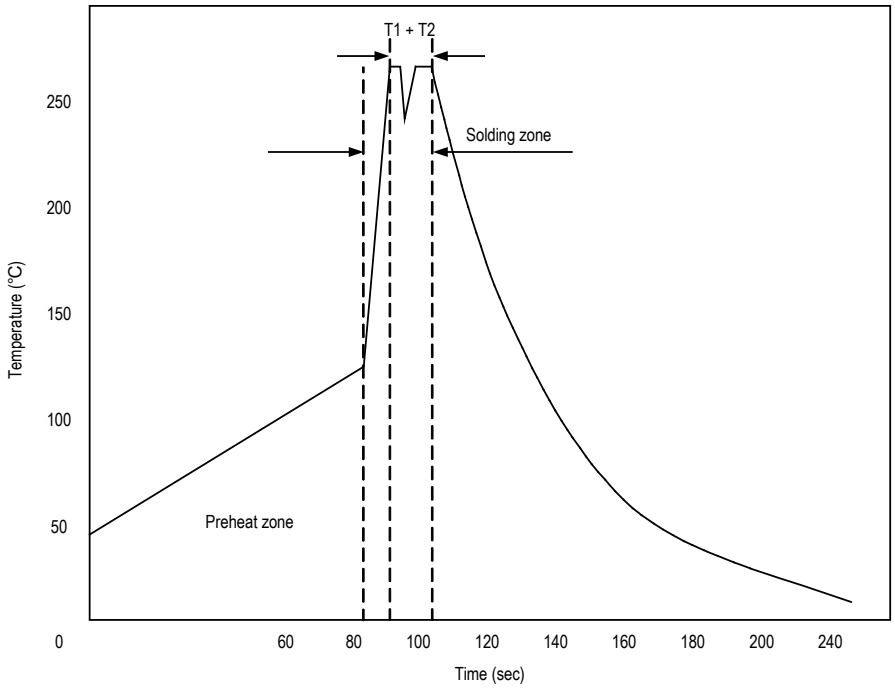
Plug



Unit: mm
10 PCS per TUBE

Wave Soldering Considerations

Lead free wave solder profile



Zone	Reference Parameter
Preheat	Rise temp. speed：3℃/sec max.
zone	Preheat temp.：100~130℃
Actual	Peak temp.：250~260℃
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℃

Part Number Structure

M	I	E	03	-	05	S	05	HI
	Package Type DIP-24	Application Ultra-High Isolation Wide 2:1 Input Voltage Range	Output Power 3.5 Watt		Input Voltage Range 05: 4.5 ~ 9 VDC 12: 9 ~ 18 VDC 24: 18 ~ 36 VDC 48: 36 ~ 75 VDC	Output Quantity S: Single D: Dual	Output Voltage 05: 5 VDC 058: 5.8 VDC 12: 12 VDC 15: 15 VDC 24: 24 VDC	I/O Isolation Voltage 9000 VDC

MTBF and Reliability

The MTBF of MIE03-HI series of DC-DC converters has been calculated using

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

Model	MTBF	Unit
MIE03-05S05HI	5,815,448	Hours
MIE03-05S058HI	5,815,624	
MIE3-05S12HI	6,550,077	
MIE03-05S15HI	6,469,133	
MIE03-05S24HI	6,546,715	
MIE03-05D12HI	6,243,079	
MIE03-05D15HI	6,125,684	
MIE03-12S05HI	6,276,235	
MIE03-12S12HI	6,935,581	
MIE03-12S15HI	6,842,047	
MIE03-12S24HI	6,796,996	
MIE03-12D12HI	6,599,533	
MIE03-12D15HI	6,490,243	
MIE03-24S05HI	6,277,101	
MIE03-24S12HI	6,841,141	
MIE03-24S15HI	6,842,430	
MIE03-24S24HI	6,807,236	
MIE03-24D12HI	6,629,863	
MIE03-24D15HI	6,411,241	
MIE03-48S05HI	6,323,086	
MIE03-48S12HI	6,715,023	
MIE03-48S15HI	6,756,621	
MIE03-48D12HI	6,445,972	
MIE03-48D15HI	6,336,217	
MIE03-48S24HI	6,635,998	