MINMAX®

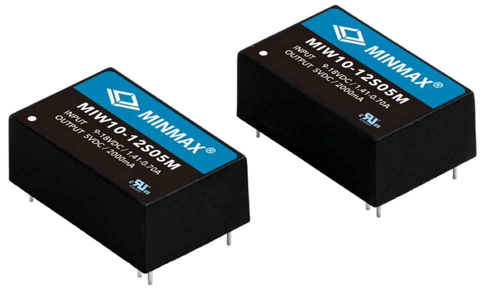
MIW10M Series

Electric Characteristic Note

MIW10M Series EC Note

DC-DC CONVERTER 10W, DIP Package

Features



- ►**Industrial Standard DIP-24 Package**
- ►**Wide 2:1 Input Voltage Range**
- ►**Fully Regulated Output Voltage**
- ►**I/O Isolation 5000VAC with Reinforced Insulation, rated for 250Vrms Working Voltage**
- ►**Creepage & Clearance Distance meet 8mm**
- ►**Low I/O Leakage Current < 2μA**
- ►**Operating Ambient Temp. Range -40℃ to +90℃**
- ►**No Min. Load Requirement**
- ►**Under-Voltage, Overload/Voltage and Short Circuit Protection**
- ►**EMI Emission EN 55011 Class A Approved**
- ►**Medical EMC Standard with 4th Edition of EMI EN 55011 and EMS EN 60601-1-2 Approved**
- ►**Medical Safety with 2xMOPP per 3.2 Edition of IEC/EN 60601-1 & ANSI/AAMI ES60601-1 Approved with CE Marking**
- ►**Risk Management Report Acquisition according to ISO 14971**

Applications

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

Product Overview

Introducing the MINMAX MIW10M series – an advanced range of high-performance 10W medical-approved isolated DC-DC converters encapsulated in a DIP-24 package, meticulously crafted for medical applications. With a diverse range of 24 models supporting input voltages of 12, 24, and 48VDC, featuring a wide 2:1 input range and fixed output voltage, this series ensures adaptability to various specifications in the medical device realm.

The MIW10M series boasts an I/O isolation specified for 5000VAC with reinforced insulation, rated for a reliable 250Vrms working voltage. Advanced features include under-voltage, overload, over-voltage, and short-circuit protection, along with no minimum load requirement, EMI emission EN 55011 class A approval, low leakage current of 2μA max, and an operating ambient temperature range from -40℃ to +90℃ without derating, achieved through high efficiency up to 89%.

Aligned with the 4th edition medical EMC standard, the MIW10M series holds medical safety approval with 2xMOPP (Means Of Patient Protection) per the 3.2 Edition of IEC/EN 60601-1 & ANSI/AAMI ES 60601-1, incorporating an 8mm creepage and clearance.

In adherence to ISO 14971 Medical Device Risk Management, the MIW10M series undergoes a comprehensive risk assessment process. This ensures not only compliance with high-performance standards but also alignment with the stringent safety benchmarks outlined in ISO 14971. Elevate your medical devices with the MINMAX MIW10M series – a integration of advanced technology, safety, performance, and meticulous Medical Device Risk Management Report Acquisition.

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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	%
MIW10-12S033M	12 (9 ~ 18)	3.3	2700	917	12	3.9	4700	81
MIW10-12S05M		5	2000	992		6.2	3300	84
MIW10-12S051M		5.1	2000	1012		6.2	3300	84
MIW10-12S12M		12	833	957		15	560	87
MIW10-12S15M		15	666	946		18	360	88
MIW10-12S24M		24	416	945		27	140	88
MIW10-12D12M		±12	±416	945		±15	280#	88
MIW10-12D15M		±15	±333	957		±18	180#	87
MIW10-24S033M	24 (18 ~ 36)	3.3	2700	458	8	3.9	4700	81
MIW10-24S05M		5	2000	490		6.2	3300	85
MIW10-24S051M		5.1	2000	500		6.2	3300	85
MIW10-24S12M		12	833	473		15	560	88
MIW10-24S15M		15	666	473		18	360	88
MIW10-24S24M		24	416	473		27	140	88
MIW10-24D12M		±12	±416	473		±15	280#	88
MIW10-24D15M		±15	±333	478		±18	180#	87
MIW10-48S033M	48 (36 ~ 75)	3.3	2700	229	6	3.9	4700	81
MIW10-48S05M		5	2000	245		6.2	3300	85
MIW10-48S051M		5.1	2000	250		6.2	3300	85
MIW10-48S12M		12	833	237		15	560	88
MIW10-48S15M		15	666	237		18	360	88
MIW10-48S24M		24	416	239		27	140	87
MIW10-48D12M		±12	±416	239		±15	280#	87
MIW10-48D15M		±15	±333	239		±18	180#	87

For each output

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	12V Input Models	-0.7	---	25	VDC
	24V Input Models	-0.7	---	50	
	48V Input Models	-0.7	---	100	
Start-Up Threshold Voltage	12V Input Models	---	---	9	
	24V Input Models	---	---	18	
	48V Input Models	---	---	36	
Under Voltage Shutdown	12V Input Models	---	8	---	
	24V Input Models	---	16	---	
	48V Input Models	---	33	---	
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		---	---	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load		---	---	±0.5	%
Load Regulation	Io=0% to 100%	Single Output	---	---	±0.5	%
		Dual Output	---	---	±1.0	%
Load Cross Regulation (Dual Output Models)	Asymmetrical Load 25/100% Full Load		---	---	±5.0	%
Minimum Load	No minimum Load Requirement					
Ripple & Noise	0-20 MHz Bandwidth	Measured with a 10μF MLCC	---	50	---	mV P-P
Transient Recovery Time	25% Load Step Change		---	300	---	μs
Transient Response Deviation			---	±3	±5	%
Temperature Coefficient			---	±0.01	±0.02	%/℃
Over Load Protection	Hiccup		---	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 250Vrms working voltage	5000	---	---	VAC
Leakage Current	240VAC, 60Hz	---	---	2	μA
I/O Isolation Resistance	500 VDC	10	---	---	GΩ
I/O Isolation Capacitance	100kHz, 1V	---	---	20	pF
Safety Standards	ANSI/AAMI ES 60601-1, CAN/CSA-C22.2 No. 60601-1				
	IEC/EN 60601-1 3.2 Edition 2xMOPP				
Safety Approvals	ANSI/AAMI ES 60601-1 2xMOPP recognition (UL certificate), IEC/EN 60601-1 3.2 Edition (CB-report)				

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Switching Frequency		---	240	---	kHz
MTBF(calculated)	MIL-HDBK-217F@25℃, Ground Benign	3,816,975	---	---	Hours

EMC Specifications

Parameter	Standards & Level			Performance
EMI	Conduction	EN 55011	Without external components	Class A
	Radiation			
EMS(5)	EN 60601-1-2			
	ESD	Direct discharge	Indirect discharge HCP & VCP	A
		EN 61000-4-2 Air ± 15kV	Contact ± 8kV	
	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 30A/m		A

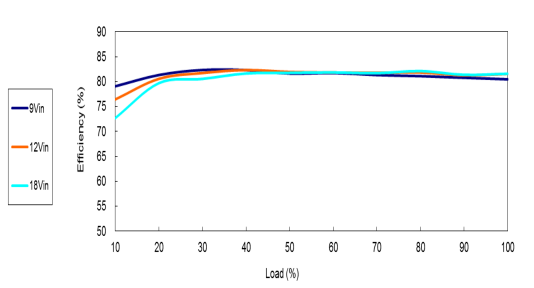
Environmental Specifications				
Parameter	Conditions	Min.	Max.	Unit
Operating Ambient Temperature Range Nominal Vin, Load 100% Inom. (for Power Derating see relative Derating Curves)	MIW10-12S033M, MIW10-24S033M, MIW10-48S033M	-40	+60	℃
	MIW10-12S05M, MIW10-12S051M, MIW10-24S05M MIW10-24S051M, MIW10-48S05M, MIW10-48S051M		+65	
	MIW10-12S12M, MIW10-12S15M, MIW10-12S24M MIW10-12D12M, MIW10-12D15M, MIW10-24S12M MIW10-24S15M, MIW10-24S24M, MIW10-24D12M MIW10-24D15M, MIW10-48S12M, MIW10-48S15M MIW10-48S24M, MIW10-48D12M, MIW10-48D15M		+75	
Case Temperature		---	105	℃
Storage Temperature Range		-50	+125	℃
Humidity (non condensing)		---	95	% rel. H
Altitude		---	5000	m
Lead Temperature (1.5mm from case for 10Sec.)		---	260	℃

Notes

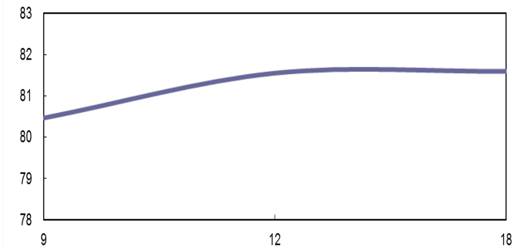
1 Specifications typical at Ta=+25℃, resistive load, nominal input voltage and rated output current unless otherwise noted.
2 Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.
3 We recommend to protect the converter by a slow blow fuse in the input supply line.
4 Other input and output voltage may be available, please contact MINMAX.
5 The external components might be required to meet 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

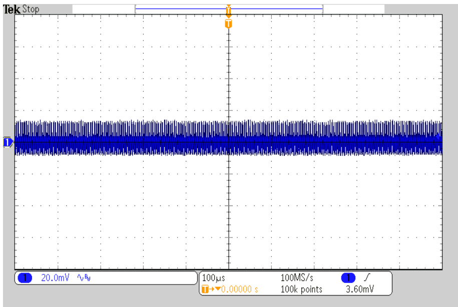
All test conditions are at 25℃ The figures are identical for MIW10-12S033M



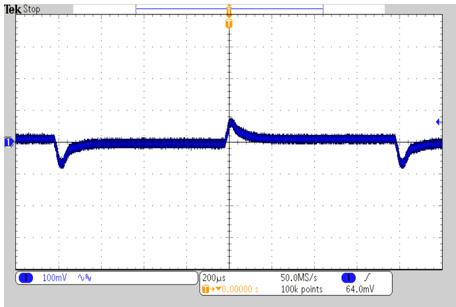
Efficiency Versus Output Current



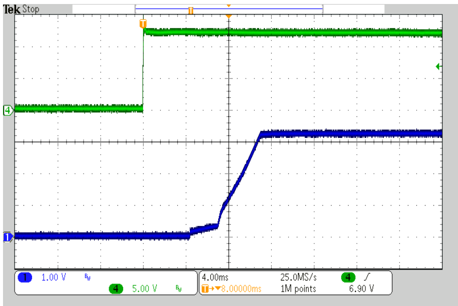
Efficiency Versus Input Voltage
Full Load



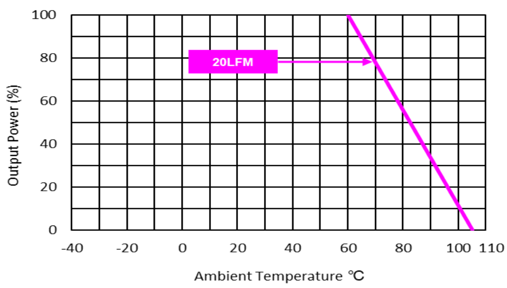
Typical Output Ripple and Noise
$V_{in}=V_{in\ nom}$; Full Load



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



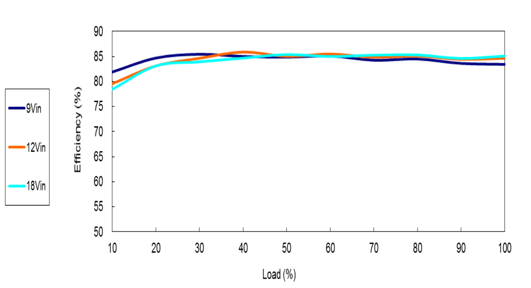
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



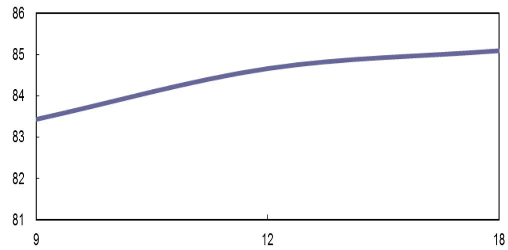
Derating Output Power Versus Ambient Temperature
$V_{in}=V_{in\ nom}$

Characteristic Curves

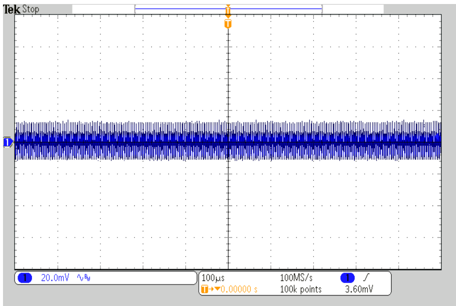
All test conditions are at 25℃ The figures are identical for MIW10-12S05M



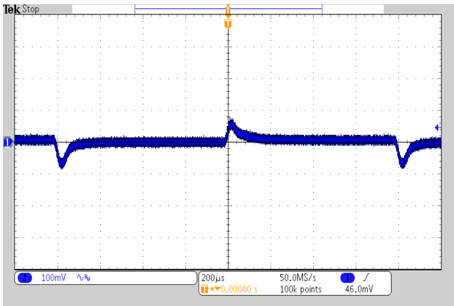
Efficiency Versus Output Current



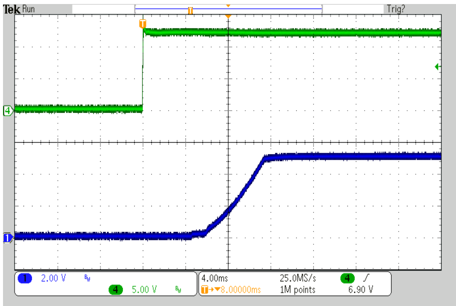
Efficiency Versus Input Voltage
Full Load



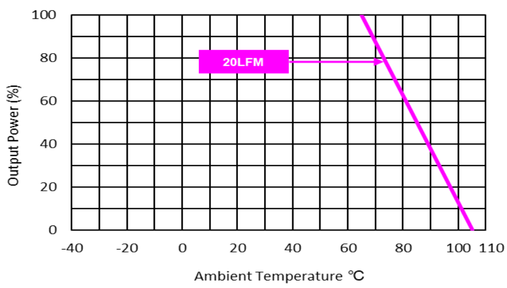
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



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



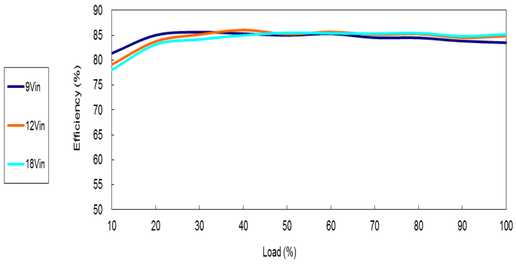
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



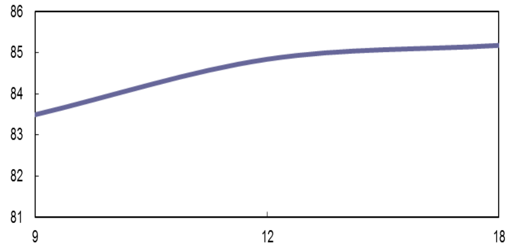
Derating Output Power Versus Ambient Temperature
V_{in}=$V_{in\ nom}$

Characteristic Curves

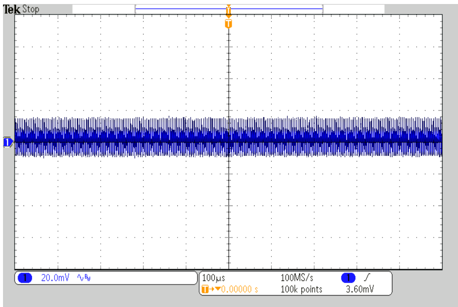
All test conditions are at 25℃ The figures are identical for MIW10-12S051M



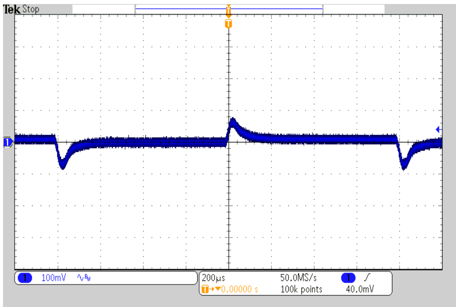
Efficiency Versus Output Current



Efficiency Versus Input Voltage
Full Load



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



Transient Response to Dynamic Load Change
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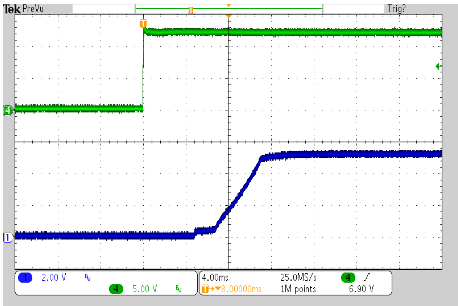
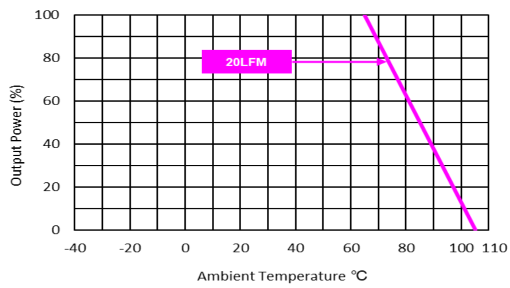


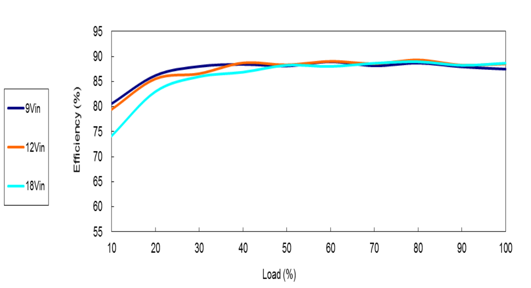
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



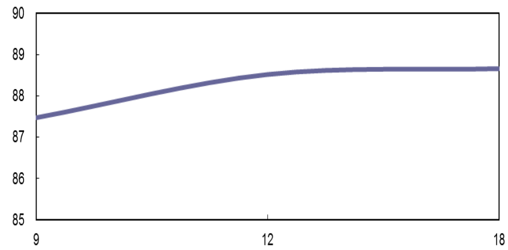
Derating Output Power Versus Ambient Temperature
V_{in}=$V_{in\ nom}$

Characteristic Curves

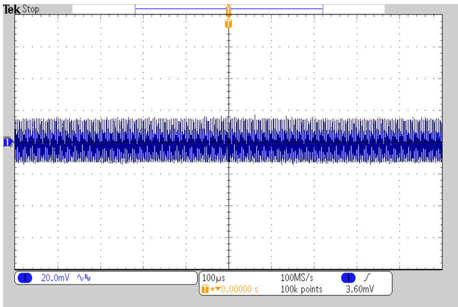
All test conditions are at 25℃ The figures are identical for MIW10-12S12M



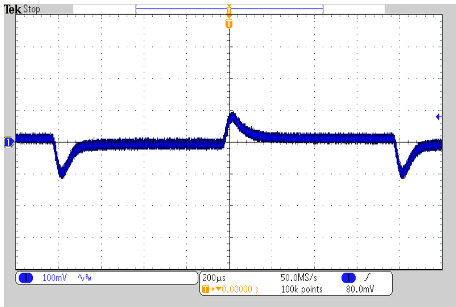
Efficiency Versus Output Current



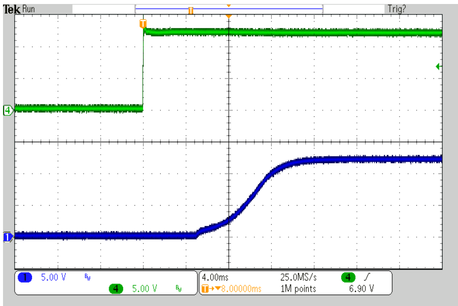
Efficiency Versus Input Voltage
Full Load



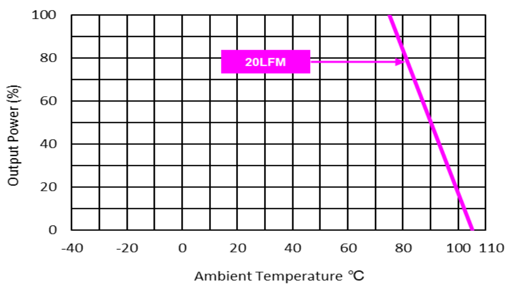
Typical Output Ripple and Noise
$V_{in}=V_{in\ nom}$; Full Load



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



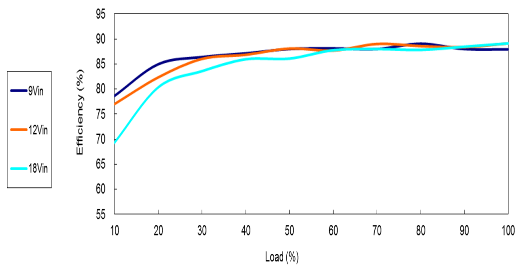
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



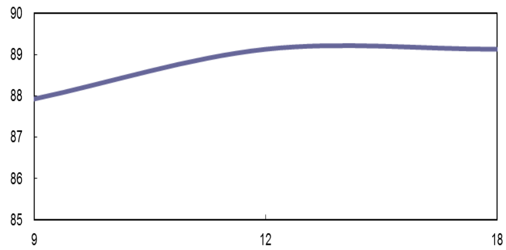
Derating Output Power Versus Ambient Temperature
$V_{in}=V_{in\ nom}$

Characteristic Curves

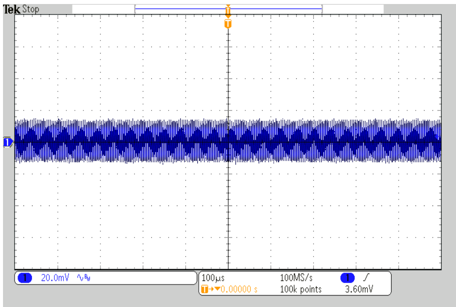
All test conditions are at 25℃ The figures are identical for MIW10-12S15M



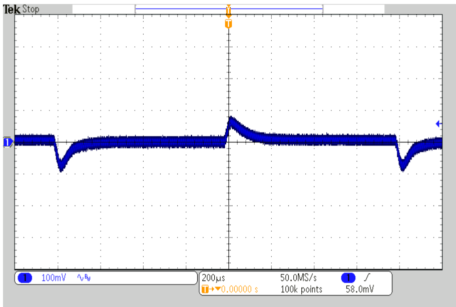
Efficiency Versus Output Current



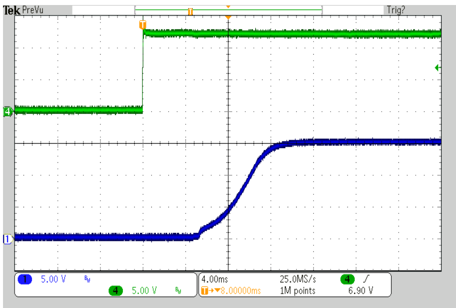
Efficiency Versus Input Voltage
Full Load



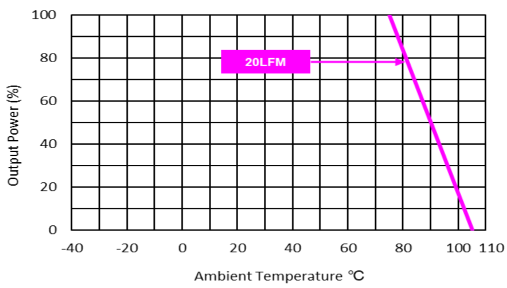
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



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



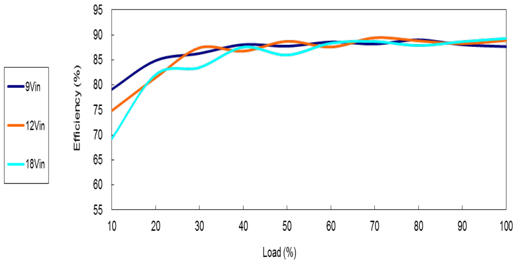
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



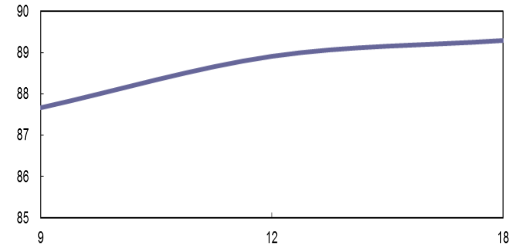
Derating Output Power Versus Ambient Temperature
V_{in}=$V_{in\ nom}$

Characteristic Curves

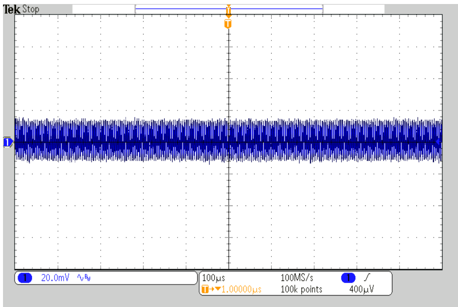
All test conditions are at 25℃ The figures are identical for MIW10-12S24M



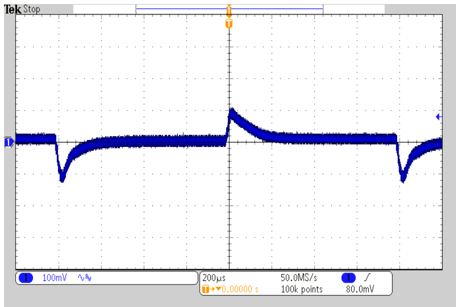
Efficiency Versus Output Current



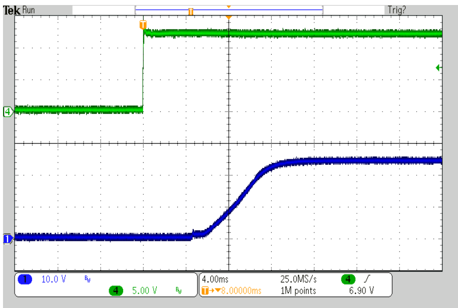
Efficiency Versus Input Voltage
Full Load



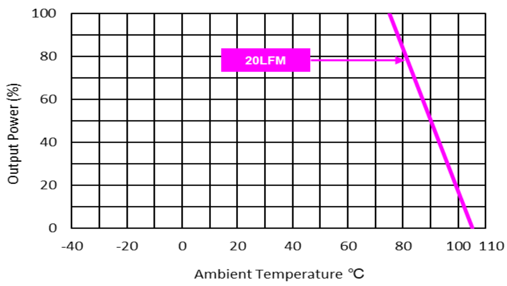
Typical Output Ripple and Noise
$V_{in}=V_{in\ nom}$; Full Load



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



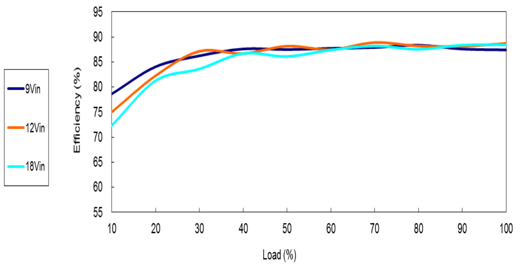
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



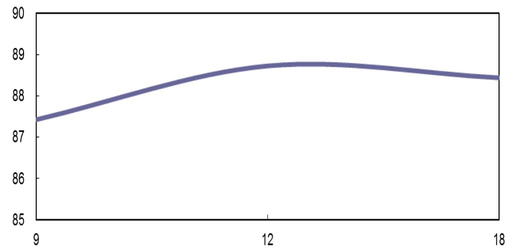
Derating Output Power Versus Ambient Temperature
$V_{in}=V_{in\ nom}$

Characteristic Curves

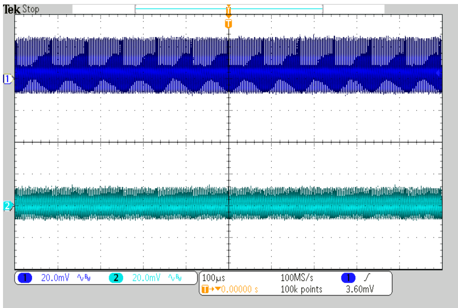
All test conditions are at 25℃ The figures are identical for MIW10-12D12M



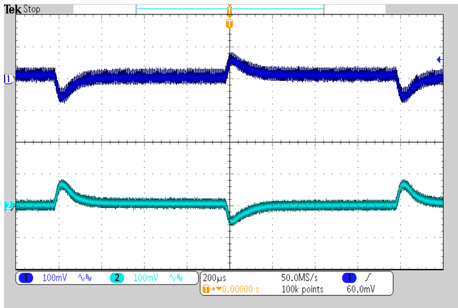
Efficiency Versus Output Current



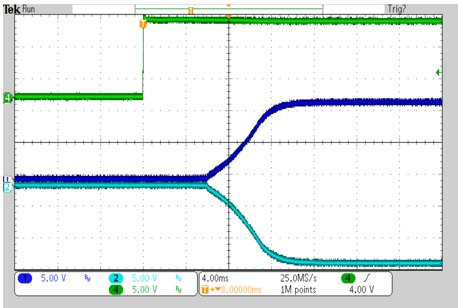
Efficiency Versus Input Voltage
Full Load



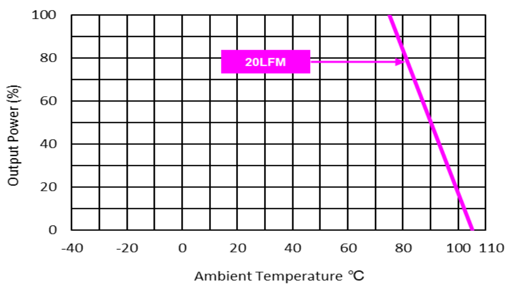
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



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



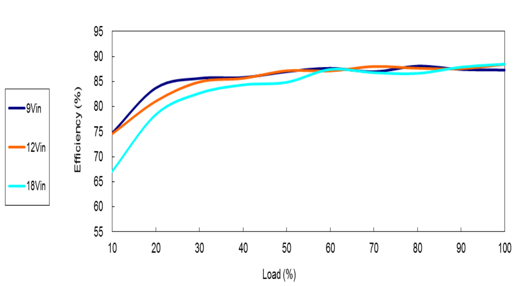
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



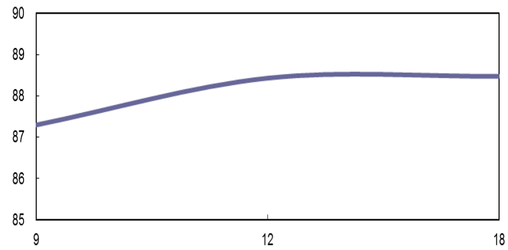
Derating Output Power Versus Ambient Temperature
V_{in}=$V_{in\ nom}$

Characteristic Curves

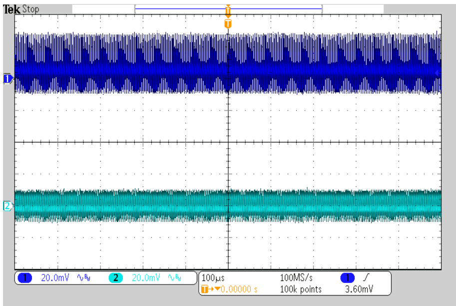
All test conditions are at 25℃ The figures are identical for MIW10-12D15M



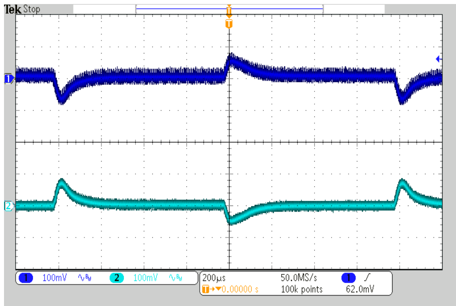
Efficiency Versus Output Current



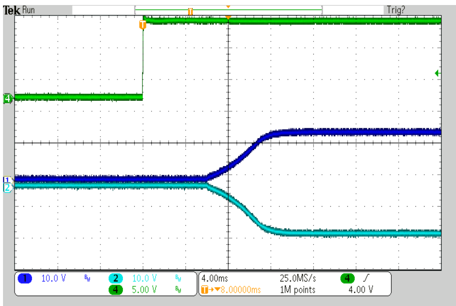
Efficiency Versus Input Voltage
Full Load



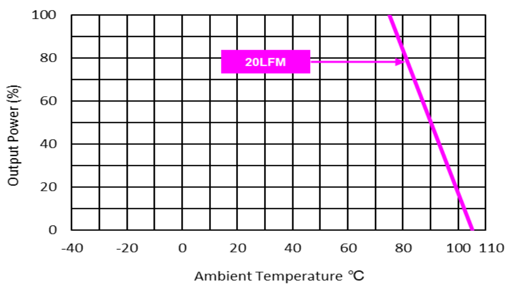
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



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



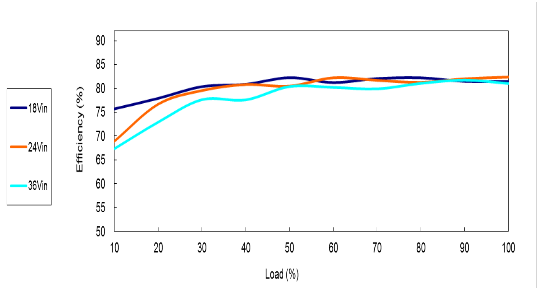
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



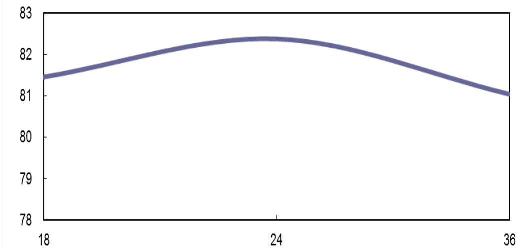
Derating Output Power Versus Ambient Temperature
V_{in}=$V_{in\ nom}$

Characteristic Curves

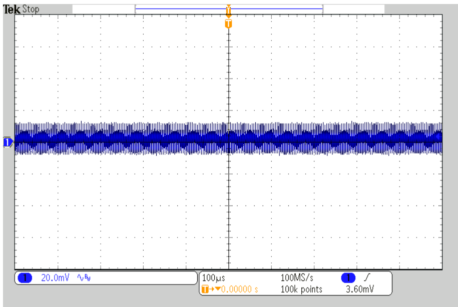
All test conditions are at 25℃ The figures are identical for MIW10-24S033M



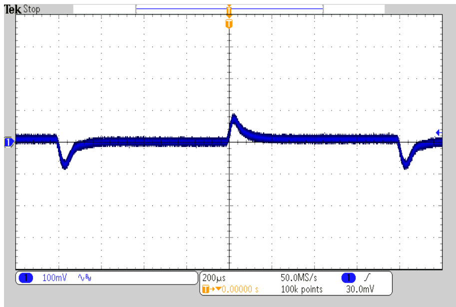
Efficiency Versus Output Current



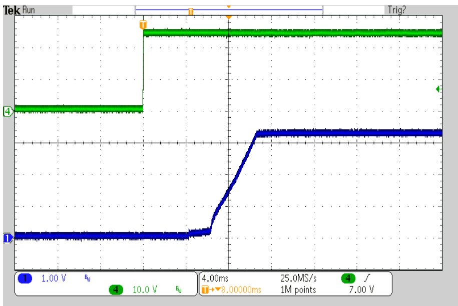
Efficiency Versus Input Voltage
Full Load



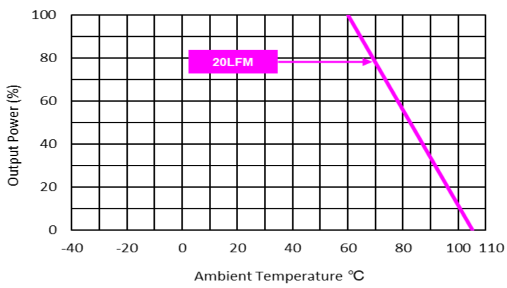
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



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



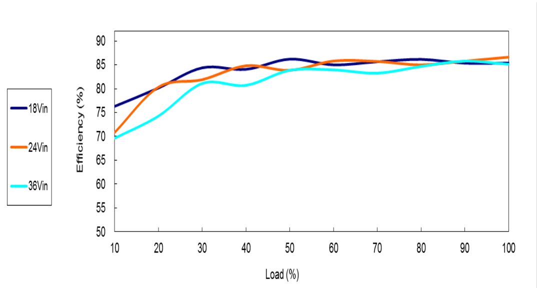
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



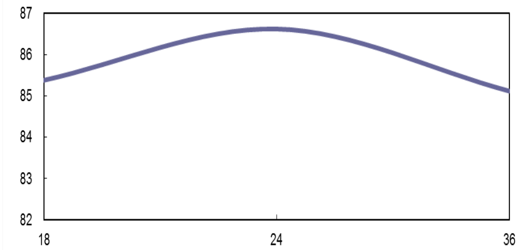
Derating Output Power Versus Ambient Temperature
V_{in}=$V_{in\ nom}$

Characteristic Curves

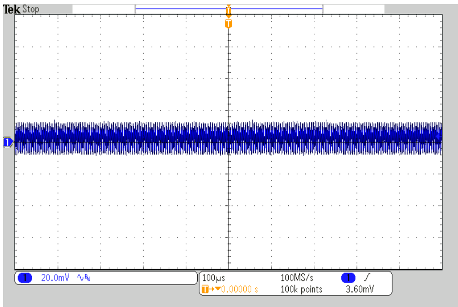
All test conditions are at 25℃ The figures are identical for MIW10-24S05M



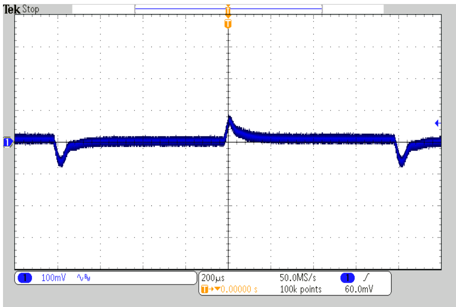
Efficiency Versus Output Current



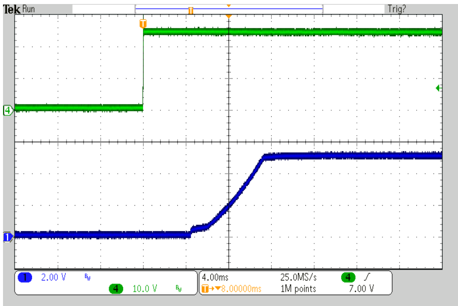
Efficiency Versus Input Voltage
Full Load



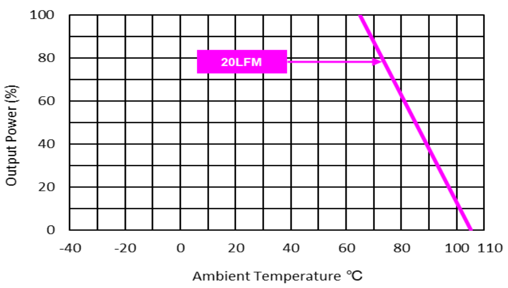
Typical Output Ripple and Noise
$V_{in}=V_{in\ nom}$; Full Load



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



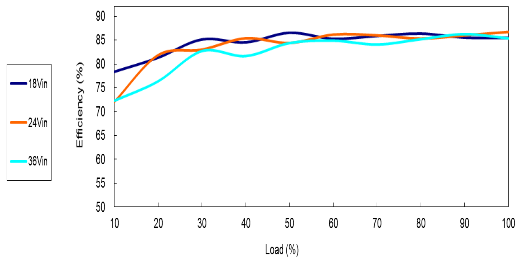
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



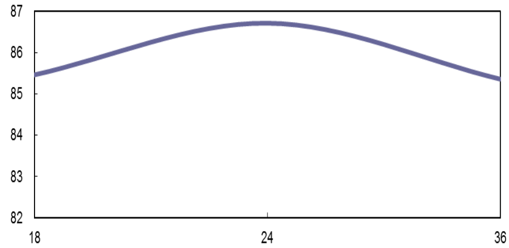
Derating Output Power Versus Ambient Temperature
$V_{in}=V_{in\ nom}$

Characteristic Curves

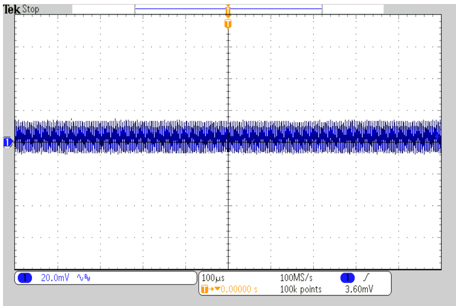
All test conditions are at 25℃ The figures are identical for MIW10-24S051M



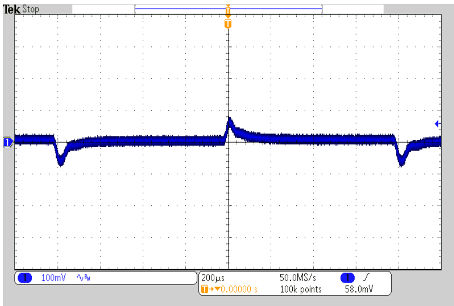
Efficiency Versus Output Current



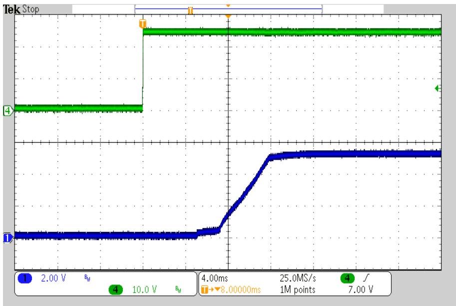
Efficiency Versus Input Voltage
Full Load



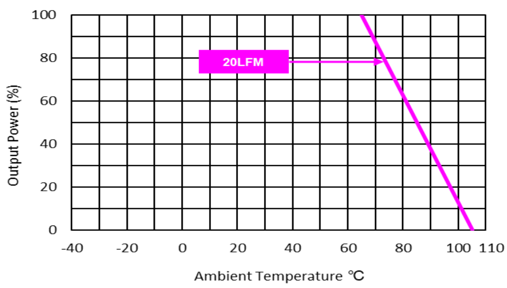
Typical Output Ripple and Noise
$V_{in}=V_{in\ nom}$; Full Load



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



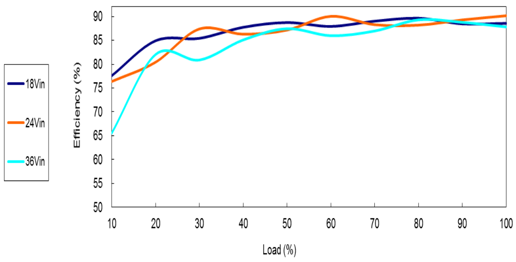
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



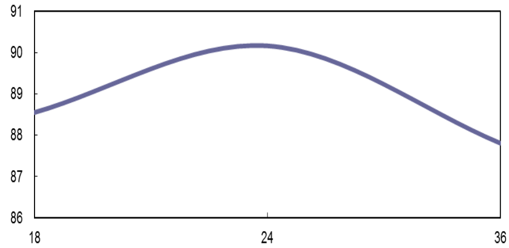
Derating Output Power Versus Ambient Temperature
$V_{in}=V_{in\ nom}$

Characteristic Curves

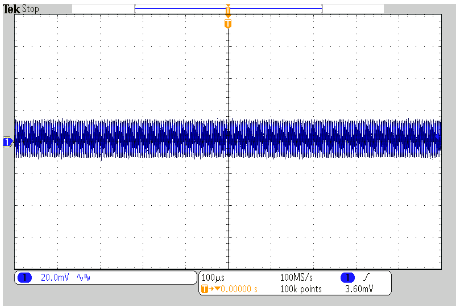
All test conditions are at 25℃ The figures are identical for MIW10-24S12M



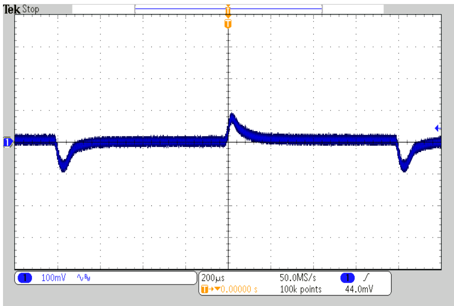
Efficiency Versus Output Current



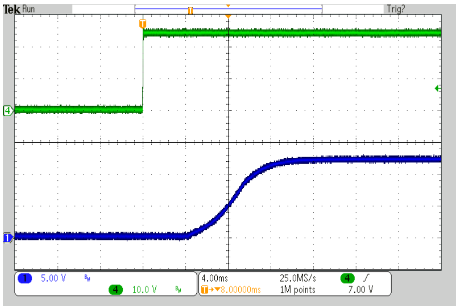
Efficiency Versus Input Voltage
Full Load



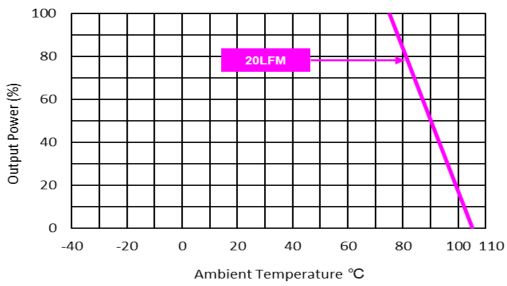
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



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



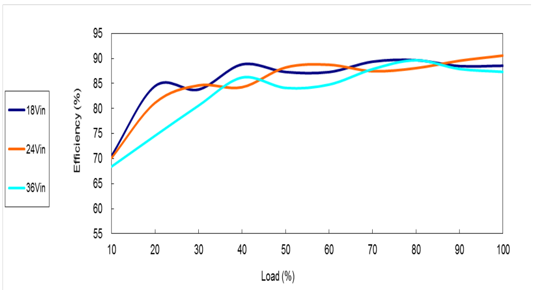
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



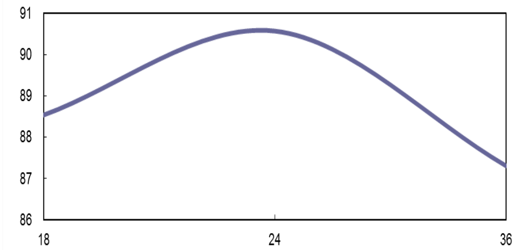
Derating Output Power Versus Ambient Temperature
V_{in}=$V_{in\ nom}$

Characteristic Curves

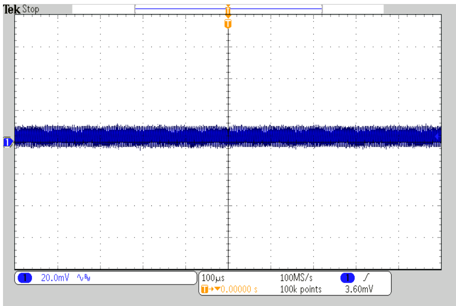
All test conditions are at 25℃ The figures are identical for MIW10-24S15M



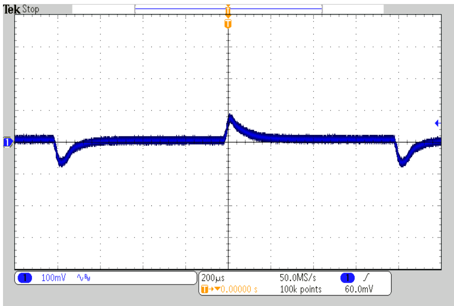
Efficiency Versus Output Current



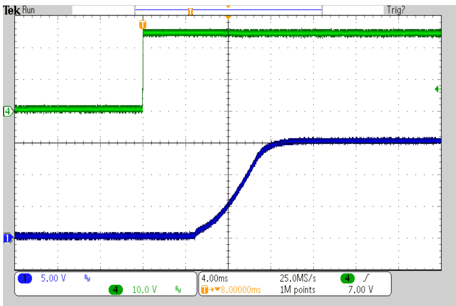
Efficiency Versus Input Voltage
Full Load



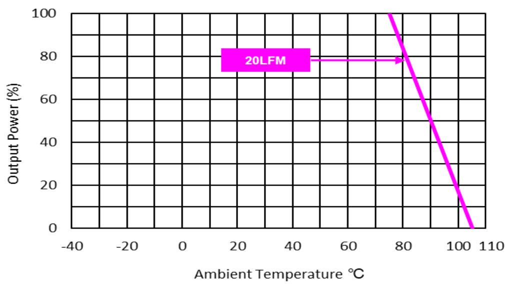
Typical Output Ripple and Noise
$V_{in}=V_{in\ nom}$; Full Load



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



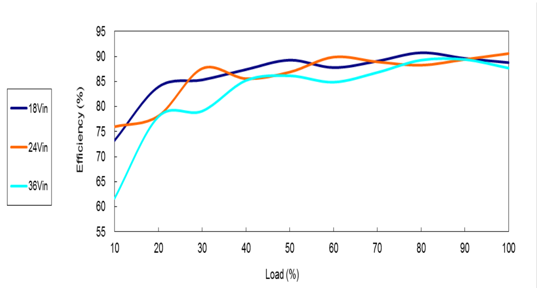
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



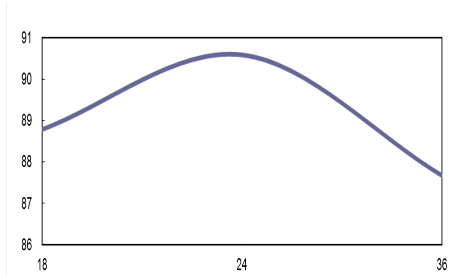
Derating Output Power Versus Ambient Temperature
$V_{in}=V_{in\ nom}$

Characteristic Curves

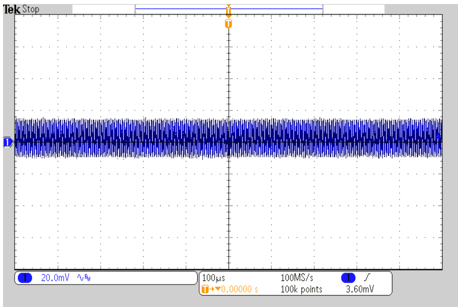
All test conditions are at 25℃ The figures are identical for MIW10-24S24M



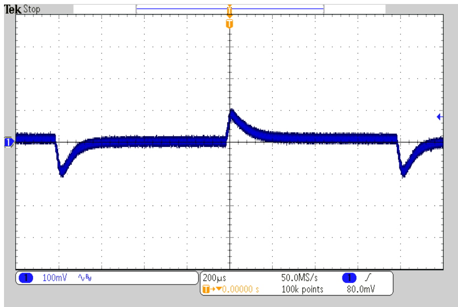
Efficiency Versus Output Current



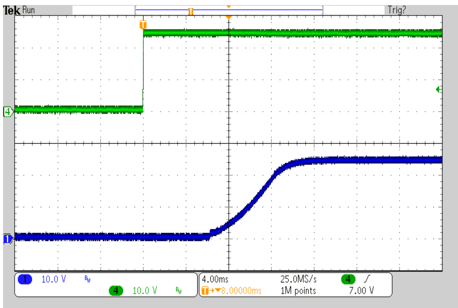
Efficiency Versus Input Voltage
Full Load



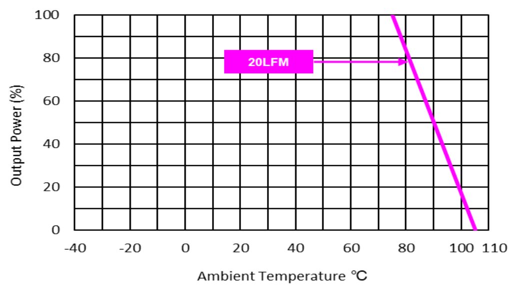
Typical Output Ripple and Noise
$V_{in}=V_{in\ nom}$; Full Load



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



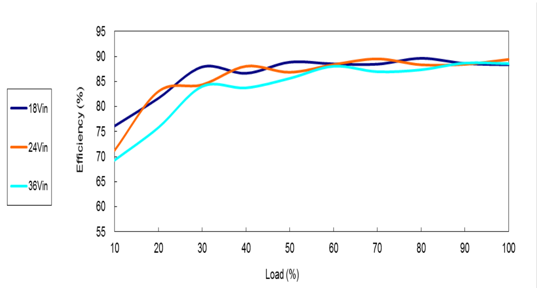
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



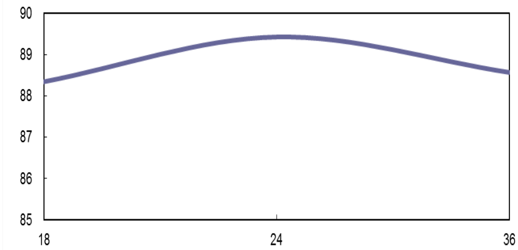
Derating Output Power Versus Ambient Temperature
$V_{in}=V_{in\ nom}$

Characteristic Curves

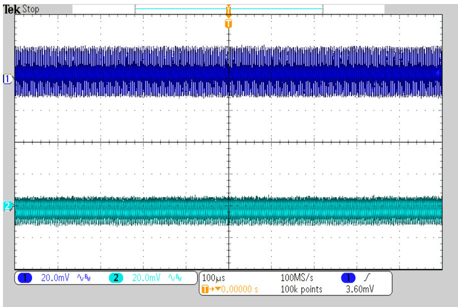
All test conditions are at 25℃ The figures are identical for MIW10-24D12M



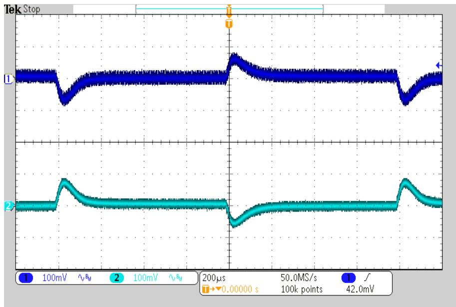
Efficiency Versus Output Current



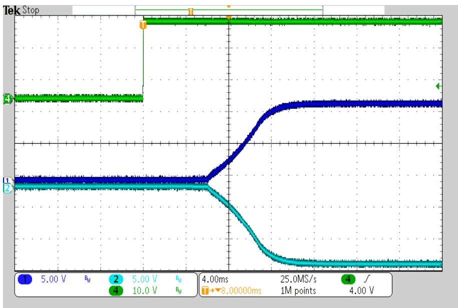
Efficiency Versus Input Voltage
Full Load



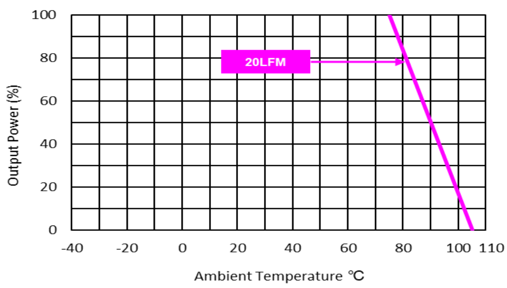
Typical Output Ripple and Noise
$V_{in}=V_{in\ nom}$; Full Load



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



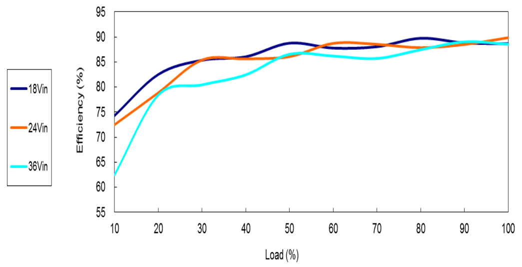
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



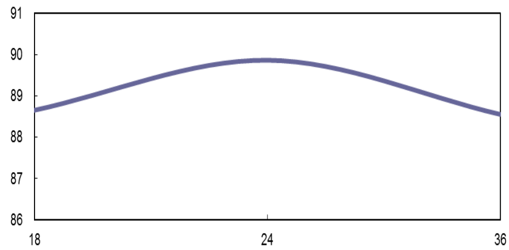
Derating Output Power Versus Ambient Temperature
$V_{in}=V_{in\ nom}$

Characteristic Curves

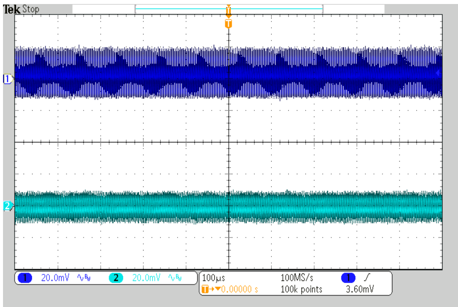
All test conditions are at 25℃ The figures are identical for MIW10-24D15M



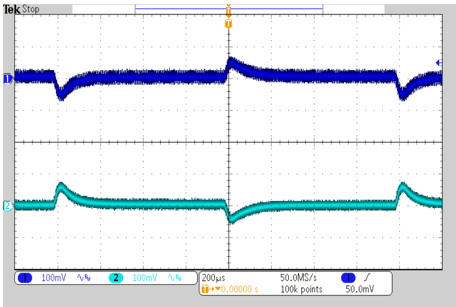
Efficiency Versus Output Current



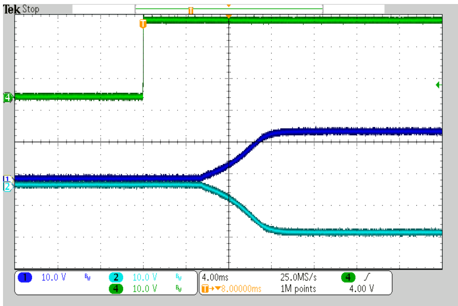
Efficiency Versus Input Voltage
Full Load



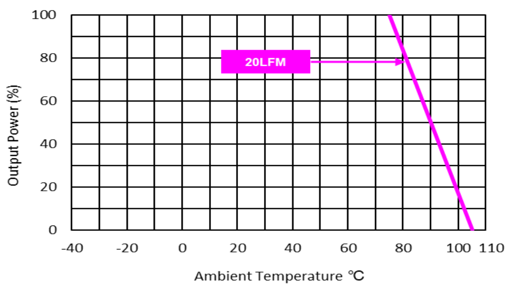
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



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



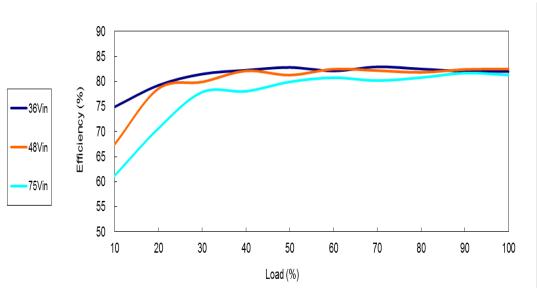
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



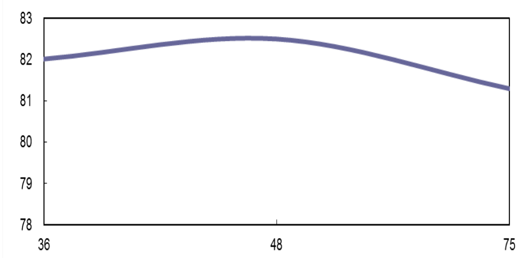
Derating Output Power Versus Ambient Temperature
V_{in}=$V_{in\ nom}$

Characteristic Curves

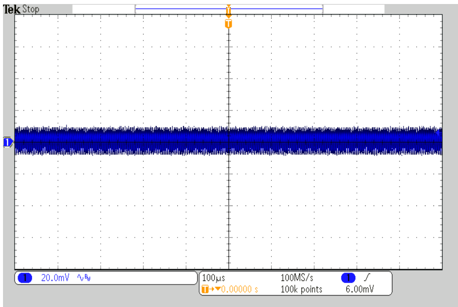
All test conditions are at 25℃ The figures are identical for MIW10-48S033M



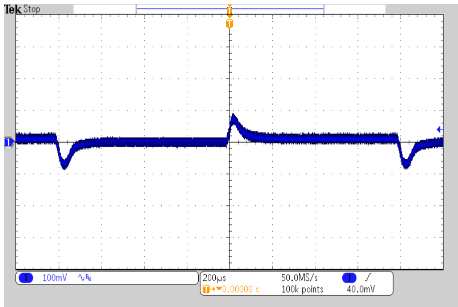
Efficiency Versus Output Current



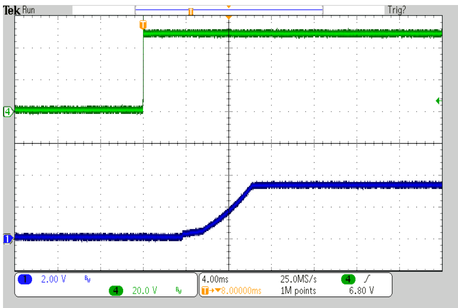
Efficiency Versus Input Voltage
Full Load



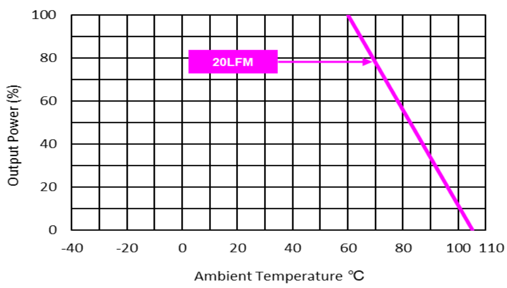
Typical Output Ripple and Noise
$V_{in}=V_{in\ nom}$; Full Load



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



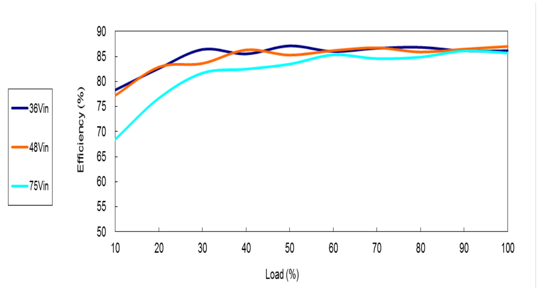
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



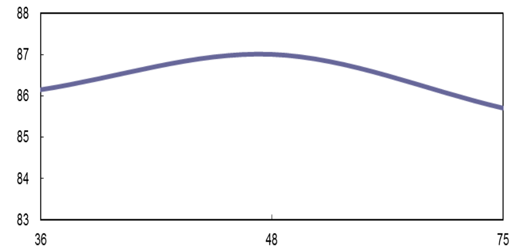
Derating Output Power Versus Ambient Temperature
$V_{in}=V_{in\ nom}$

Characteristic Curves

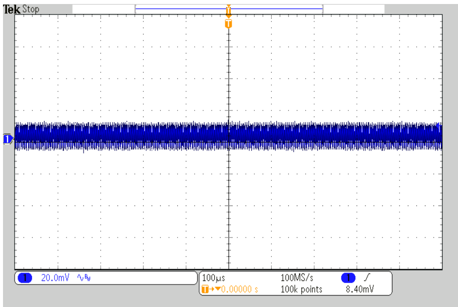
All test conditions are at 25℃ The figures are identical for MIW10-48S05M



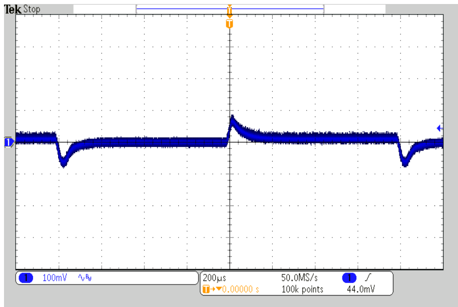
Efficiency Versus Output Current



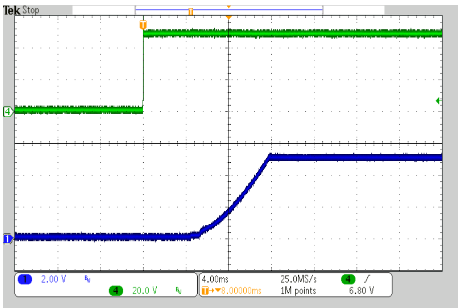
Efficiency Versus Input Voltage
Full Load



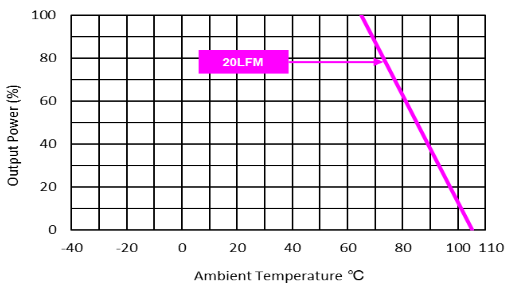
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



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



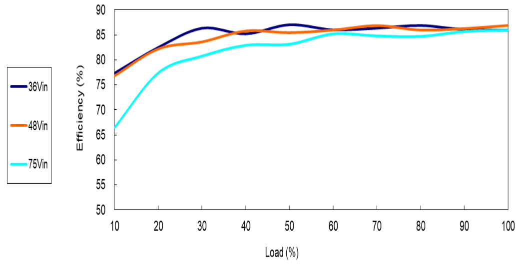
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



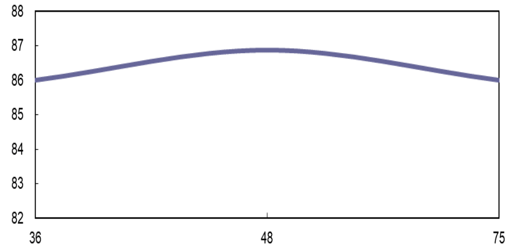
Derating Output Power Versus Ambient Temperature
V_{in}=$V_{in\ nom}$

Characteristic Curves

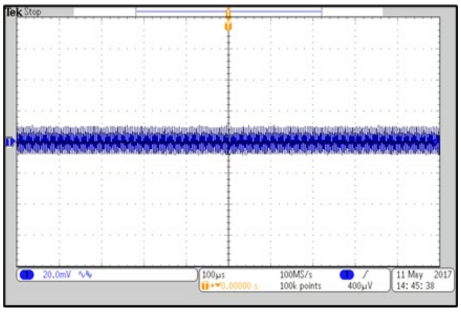
All test conditions are at 25℃ The figures are identical for MIW10-48S051M



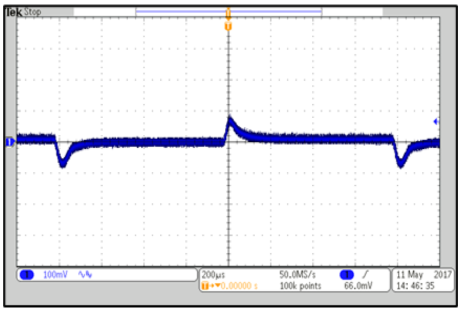
Efficiency Versus Output Current



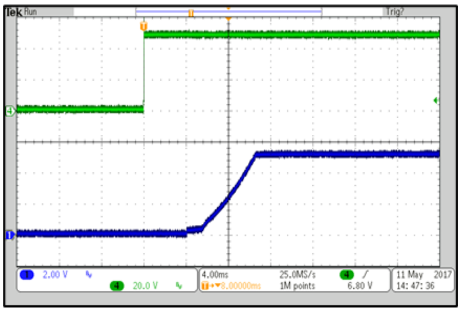
Efficiency Versus Input Voltage
Full Load



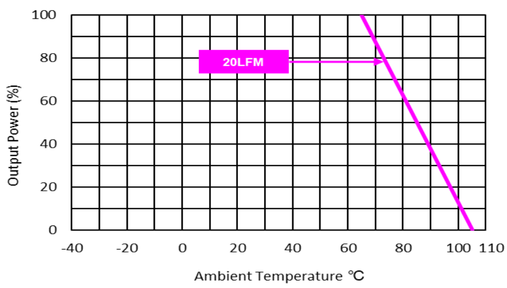
Typical Output Ripple and Noise
$V_{in}=V_{in\ nom}$; Full Load



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



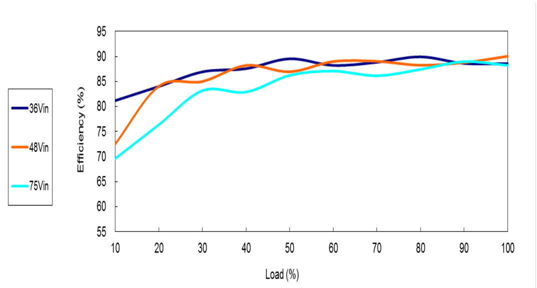
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



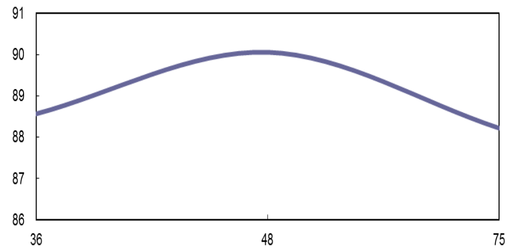
Derating Output Power Versus Ambient Temperature
$V_{in}=V_{in\ nom}$

Characteristic Curves

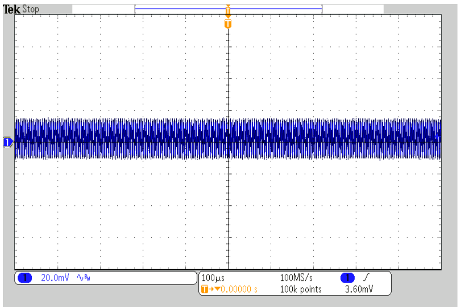
All test conditions are at 25℃ The figures are identical for MIW10-48S12M



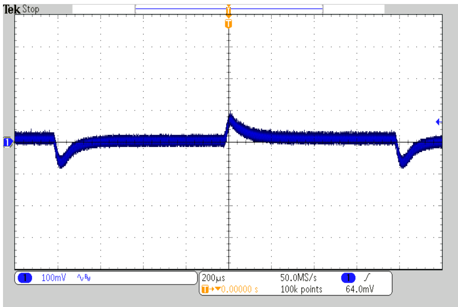
Efficiency Versus Output Current



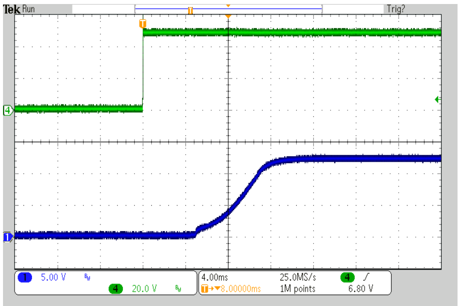
Efficiency Versus Input Voltage
Full Load



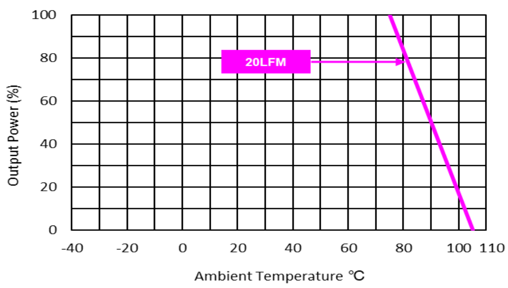
Typical Output Ripple and Noise
$V_{in}=V_{in\ nom}$; Full Load



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



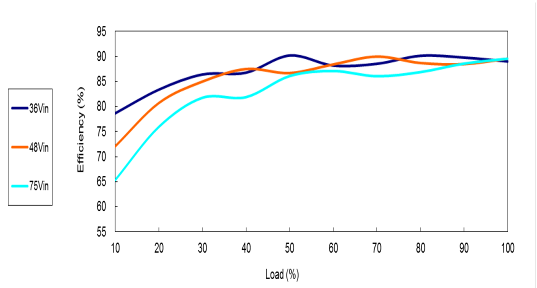
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



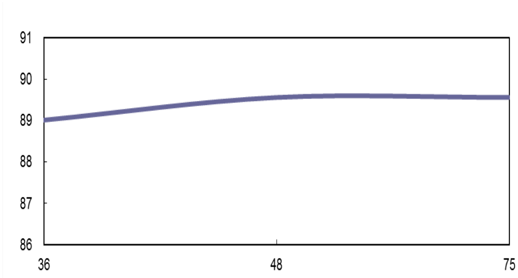
Derating Output Power Versus Ambient Temperature
$V_{in}=V_{in\ nom}$

Characteristic Curves

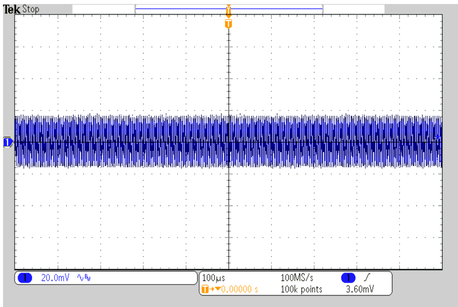
All test conditions are at 25℃ The figures are identical for MIW10-48S15M



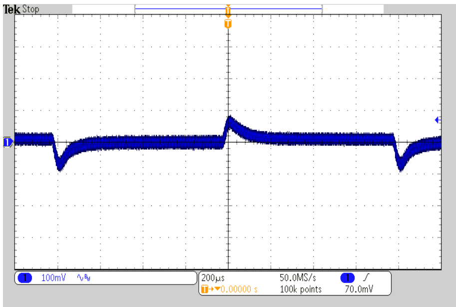
Efficiency Versus Output Current



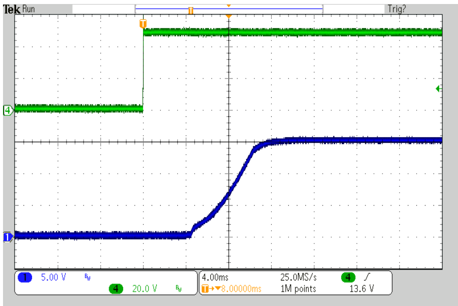
Efficiency Versus Input Voltage
Full Load



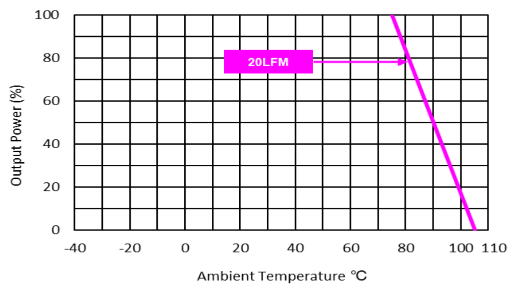
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



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



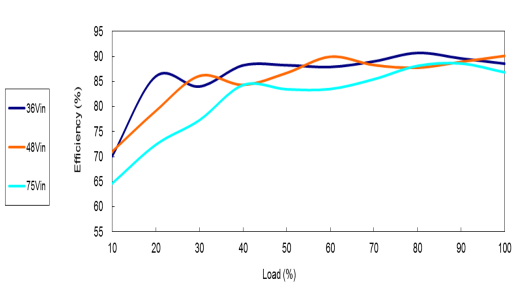
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



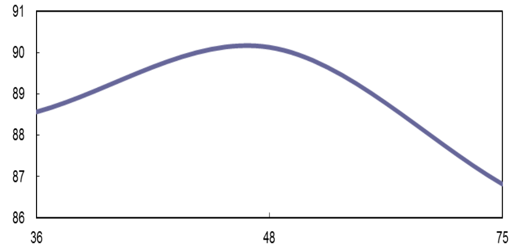
Derating Output Power Versus Ambient Temperature
V_{in}=$V_{in\ nom}$

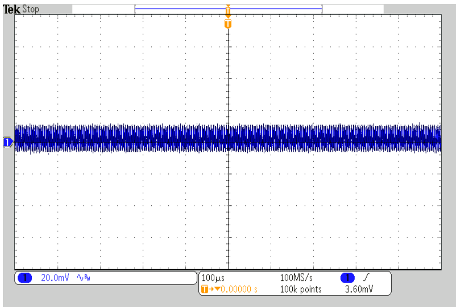
Characteristic Curves

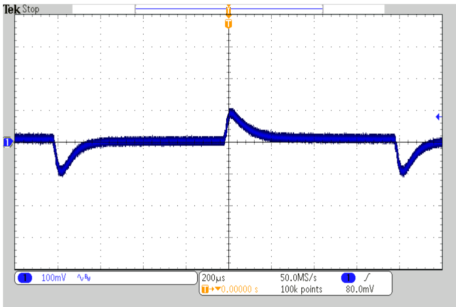
All test conditions are at 25℃ The figures are identical for MIW10-48S24M

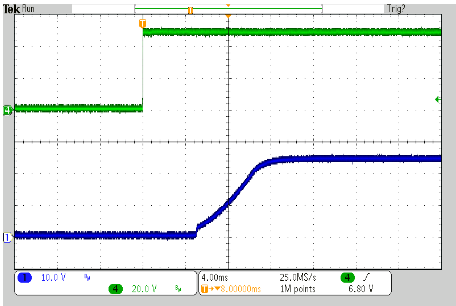


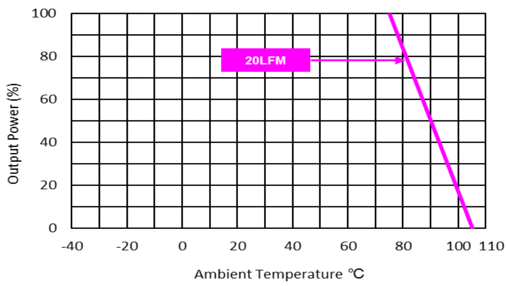
Efficiency Versus Output Current


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 ; $V_{in}=V_{in\ nom}$

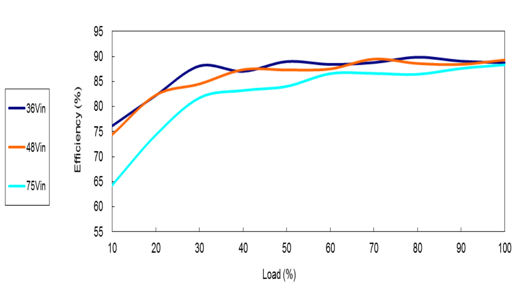

Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



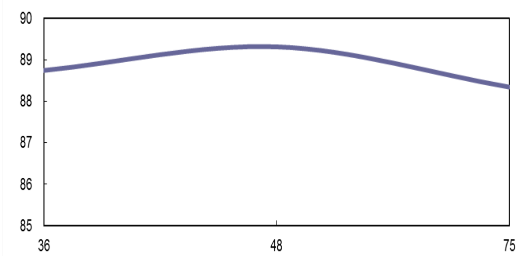
Derating Output Power Versus Ambient Temperature
$V_{in}=V_{in\ nom}$

Characteristic Curves

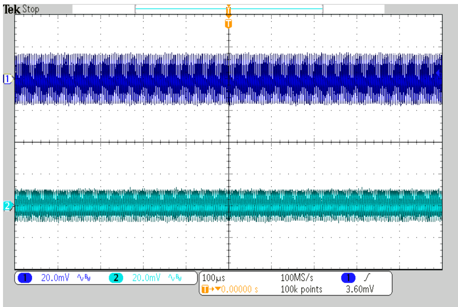
All test conditions are at 25℃ The figures are identical for MIW10-48D12M



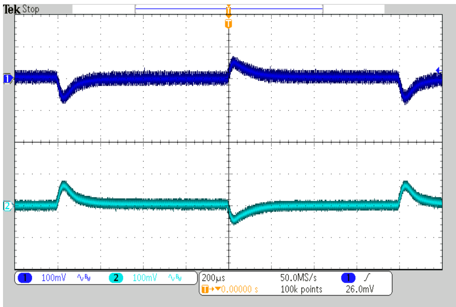
Efficiency Versus Output Current



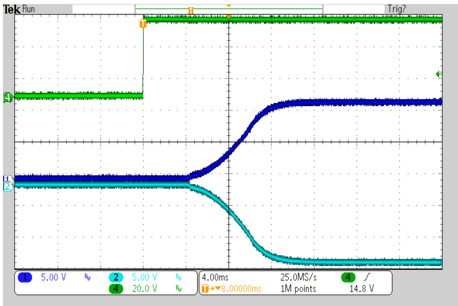
Efficiency Versus Input Voltage
Full Load



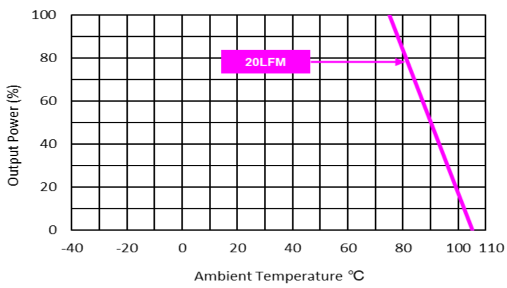
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



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



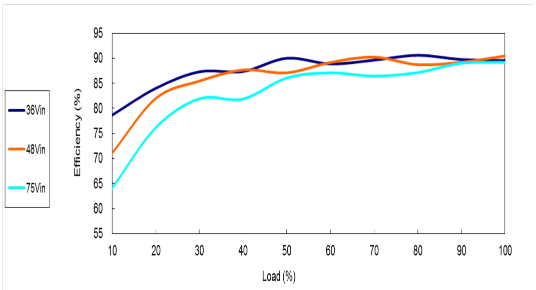
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



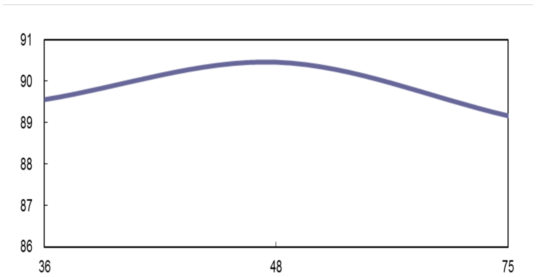
Derating Output Power Versus Ambient Temperature
V_{in}=$V_{in\ nom}$

Characteristic Curves

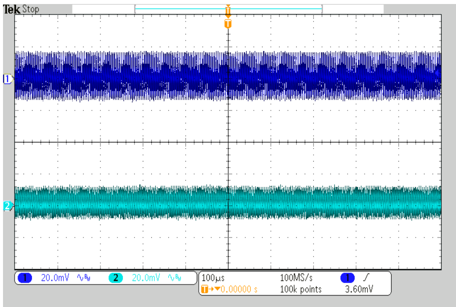
All test conditions are at 25℃ The figures are identical for MIW10-48D15M



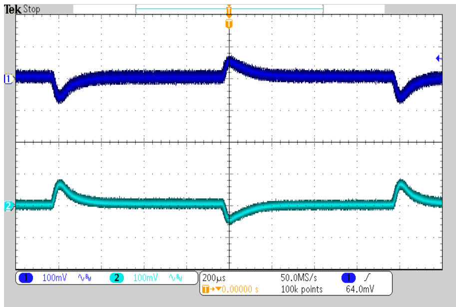
Efficiency Versus Output Current



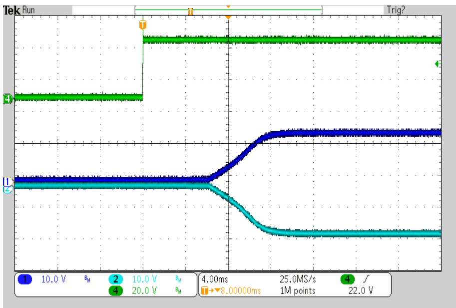
Efficiency Versus Input Voltage
Full Load



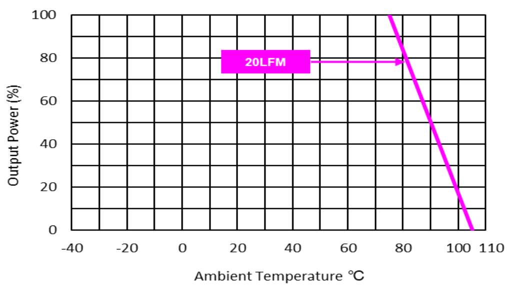
Typical Output Ripple and Noise
V_{in}=$V_{in\ nom}$; Full Load



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



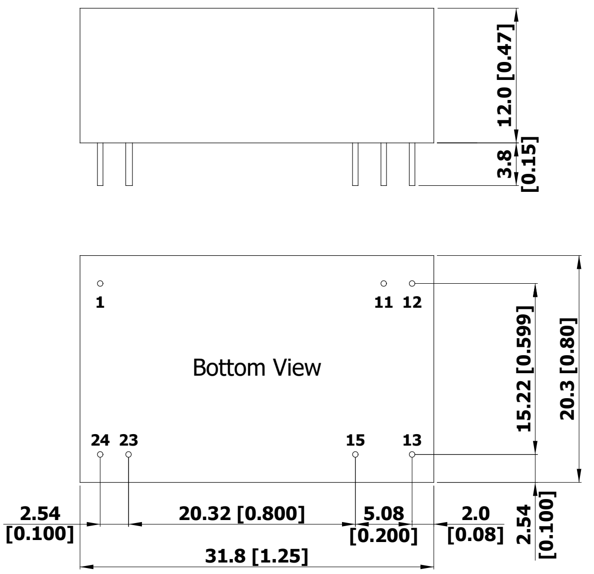
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



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

Package Specifications

Mechanical Dimensions



Pin Connections

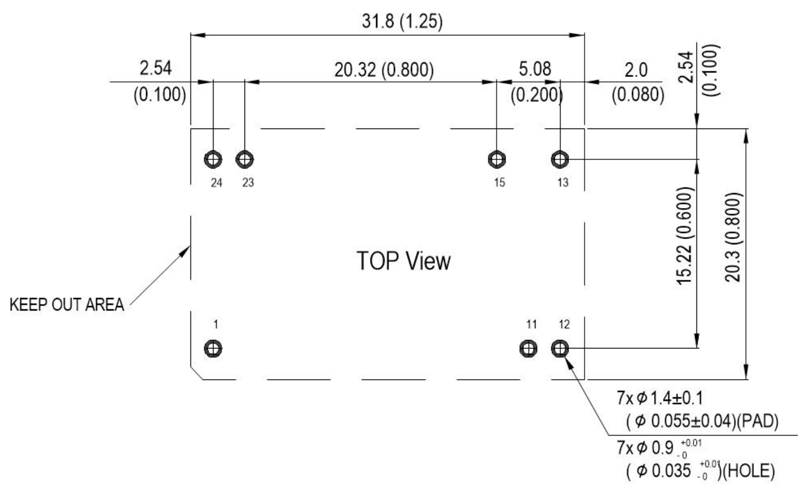
Pin	Single Output	Dual Output	Diameter mm (inches)
1	+Vin	+Vin	Ø 0.6 [0.02]
11	No Pin	Common	Ø 0.6 [0.02]
12	-Vout	No Pin	Ø 0.6 [0.02]
13	+Vout	-Vout	Ø 0.6 [0.02]
15	No Pin	+Vout	Ø 0.6 [0.02]
23	-Vin	-Vin	Ø 0.6 [0.02]
24	-Vin	-Vin	Ø 0.6 [0.02]

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)
  X.XX±0.25 (X.XXX±0.01)
- 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	:	16g

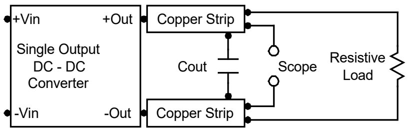
Recommended Pad Layout for Single & Dual Output Converter

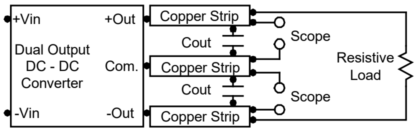


Test Setup

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

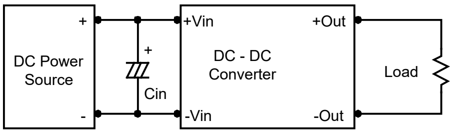
To provide hiccup mode protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure overload for an unlimited duration.

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.

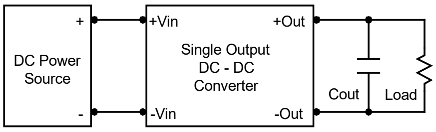
Input Source Impedance

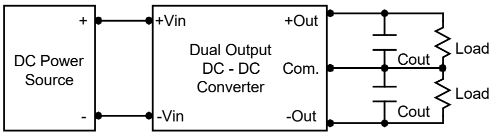
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor on the input to insure startup. By using a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 kHz) capacitor of a 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 4.7μF capacitors at the output.



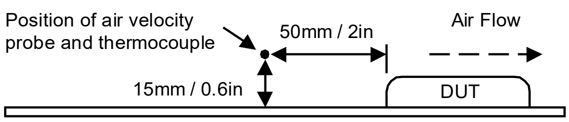


Maximum Capacitive Load

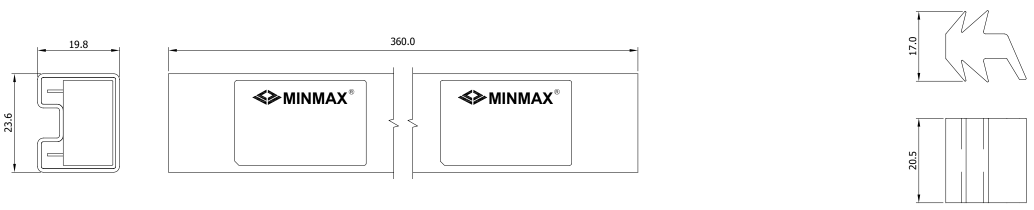
The MIW10M series has limitation of maximum connected capacitance on the output. The power module may operate in current limiting mode during start-up, affecting the ramp-up and the startup time. Connect capacitors at the point of load for best performance. The maximum capacitance can be found in the 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.



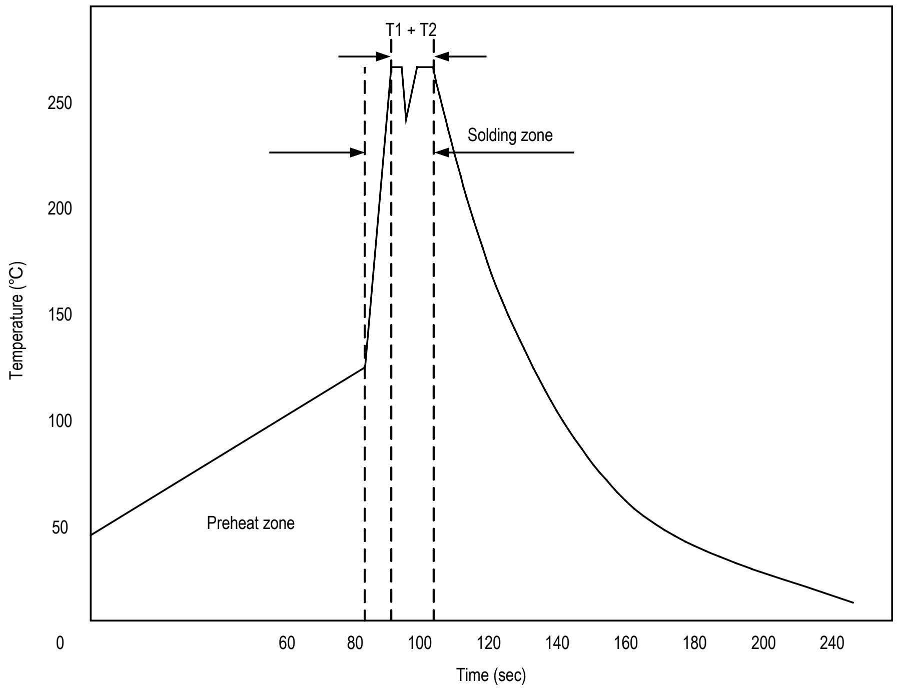
Packaging Information for Tube



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	I	W	10	-	12	S	033	M
	Package Type DIP-24	Wide 2:1 Input Voltage Range	Output Power 10 Watt		Input Voltage Range 12: 9 ~ 18 VDC 24: 18 ~ 36 VDC 48: 36 ~ 75 VDC	Output Quantity S: Single D: Dual	Output Voltage 033: 3.3 VDC 05: 5 VDC 051: 5.1 VDC 12: 12 VDC 15: 15 VDC 24: 24 VDC	Application Medical

MTBF and Reliability

The MTBF of MIW10M series of DC-DC converters has been calculated using

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

Model	MTBF	Unit
MIW10-12S033M	3,817,105	Hours
MIW10-12S05M	4,110,702	
MIW10-12S051M	4,110,702	
MIW10-12S12M	4,820,866	
MIW10-12S15M	5,062,197	
MIW10-12S24M	5,062,831	
MIW10-12D12M	4,865,451	
MIW10-12D15M	4,632,330	
MIW10-24S033M	3,817,350	
MIW10-24S05M	4,343,843	
MIW10-24S051M	4,343,843	
MIW10-24S12M	5,062,687	
MIW10-24S15M	5.062,294	
MIW10-24S24M	5,062,845	
MIW10-24D12M	4,865,539	
MIW10-24D15M	4,632,415	
MIW10-48S033M	3,816,975	
MIW10-48S05M	4,345,130	
MIW10-48S051M	4,345,130	
MIW10-48S12M	5,062,050	
MIW10-48S15M	5,061,657	
MIW10-48S24M	4,818,238	
MIW10-48D12M	4,632,913	
MIW10-48D15M	4,632,488	