MINMAX®

MAU200 Series

Electric Characteristic Note

MAU200 Series EC Note

DC-DC CONVERTER 1W, SIP-Package, High Isolation

Features

- **Industrial Standard SIP-7 Package**
- **Unregulated Output Voltage**
- **I/O Isolation 3000 VDC**
- **Operating Ambient Temp. Range -40℃ to +90℃**
- **UL/cUL/IEC/EN 60950-1 Safety Approval**

Applications

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

Product Overview

The MINMAX MAU200 series is a range of 1W DC-DC converters in a small SIP Package featuring high I/O isolation of 3000VDC. An excellent efficiency allows an operating temperature range of –40°C to +90°C. These converters offer an economical solution for many applications where a voltage has to be isolated i.e for noise reduction, ground loop elimination, digital interfaces or for board level power distribution where a higher I/O-isolation is required.

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Model Selection Guide

Model Number	Input Voltage (Range)	Output Voltage	Output Current		Input Current		Load Regulation	Max. capacitive Load	Efficiency (typ.)
			Max.	Min.	@Max. Load	@No Load			@Max. Load
	VDC	VDC	mA	mA	mA(typ.)	mA(typ.)	% (max.)	μF	%
MAU201	5 (4.5 ~ 5.5)	3.3	260	5	235	30	10	220	73
MAU202		5	200	4	281		10		71
MAU203		9	110	2	260		8		76
MAU204		12	84	1.5	258		7		78
MAU205		15	67	1	258		7		78
MAU206		±5	±100	±2	278		10	100#	72
MAU207		±9	±56	±1	262		8		77
MAU208		±12	±42	±0.8	258		7		78
MAU209		±15	±34	±0.7	258		7		79
MAU211	12 (10.8 ~ 13.2)	3.3	260	5	96	12	8	220	74
MAU212		5	200	4	114		8		73
MAU213		9	110	2	106		5		78
MAU214		12	84	1.5	105		5		80
MAU215		15	67	1	104		5		80
MAU216		±5	±100	±2	113		8	100#	74
MAU217		±9	±56	±1	106		5		79
MAU218		±12	±42	±0.8	104		5		81
MAU219		±15	±34	±0.7	105		5		81
MAU221	24 (21.6 ~ 26.4)	3.3	260	5	49	7	8	220	73
MAU222		5	200	4	59		8		71
MAU223		9	110	2	54		5		76
MAU224		12	84	1.5	54		5		78
MAU225		15	67	1	53		5		79
MAU226		±5	±100	±2	58		8	100#	72
MAU227		±9	±56	±1	55		5		76
MAU228		±12	±42	±0.8	53		5		79
MAU229		±15	±34	±0.7	53		5		80

* Min. Output Current for Lower Load Regulation

For each output

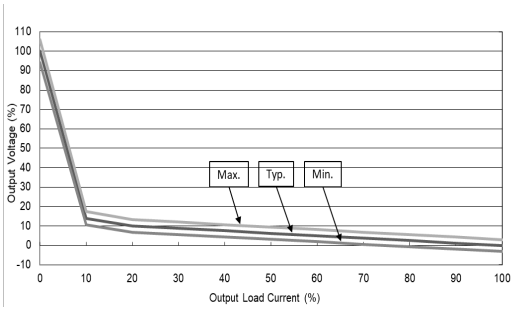
Input Specifications

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

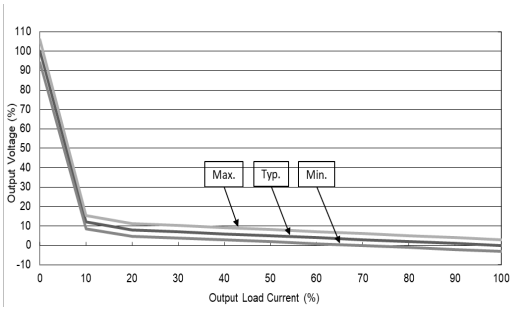
Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy		---	±1.0	±3.0	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads	---	±0.1	±1.0	%
Line Regulation	For Vin Change of 1%	---	±1.2	±1.5	%
Load Regulation	Io=20% to 100%	See Model Selection Guide			
Ripple & Noise	0-20 MHz Bandwidth	---	65	100	mV_{P-P}
Temperature Coefficient		---	±0.01	±0.02	%/℃
Short Circuit Protection	0.5 Second Max., Automatic Recovery				

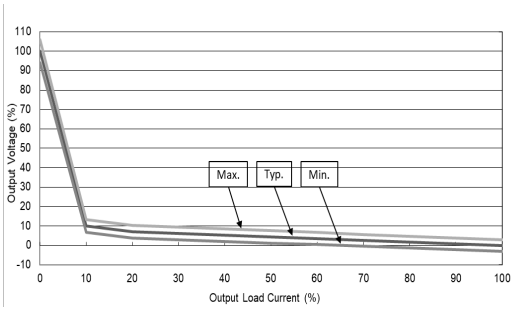
Output Voltage Tolerance



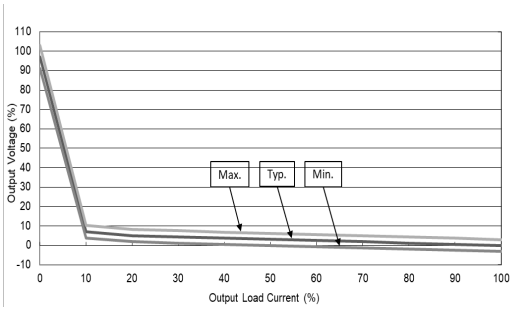
MAU201, MAU202, MAU206 Output Voltage VS Output Load Current



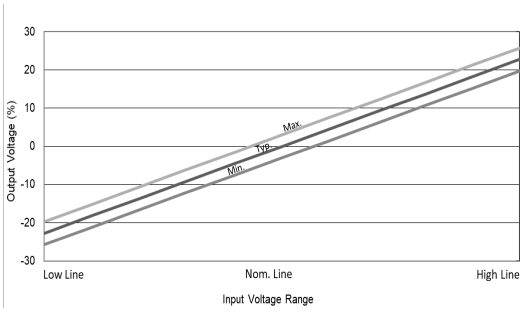
MAU203, MAU207, MAU211, MAU212, MAU216
MAU221, MAU222, MAU226
Output Voltage VS Output Load Current



MAU204, MAU205, MAU208, MAU209 Output Voltage VS Output Load Current



MAU213, MAU214, MAU215, MAU217, MAU218
MAU219, MAU223, MAU224, MAU225, MAU227
MAU228, MAU229
Output Voltage VS Output Load Current



Output Voltage VS Input Voltage Range

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds	3000	---	---	VDC
I/O Isolation Resistance	500 VDC	10	---	---	GΩ
I/O Isolation Capacitance	100kHz, 1V	---	60	100	pF
Switching Frequency		70	100	120	kHz
MTBF (calculated)	MIL-HDBK-217F@25°C, Ground Benign	2,000,000			Hours
Safety Approvals	UL/cUL 60950-1 recognition (CSA certificate), IEC/EN 60950-1(CB-report)				

Environmental Specifications

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range Nominal Vin, Load 100% Inom. (for Power Derating see relative Derating Curves)	-40	+90	℃
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 These power converters require a minimum output loading to maintain specified regulation, operation under no-load conditions will not damage these modules; however they may not meet all specifications listed.

3 We recommend to protect the converter by a slow blow fuse in the input supply line.

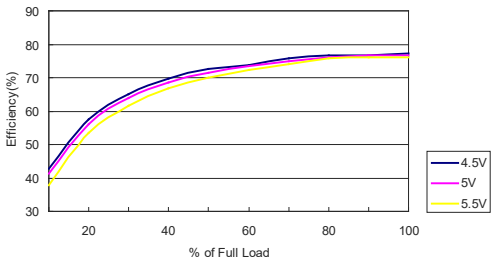
4 Other input and output voltage may be available, please contact MINMAX.

5 Specifications are subject to change without notice.

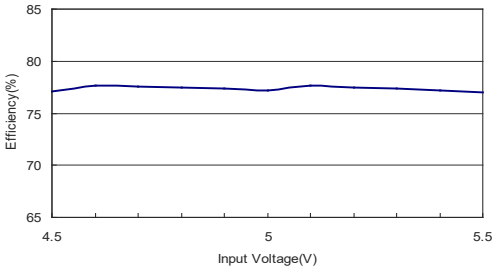
6 The repeated high voltage isolation testing of the converter can degrade isolation capability, to a lesser or greater degree depending on materials, construction, environment and and reflow solder process. Any material is susceptible to eventual chemical degradation when subject to very high applied 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

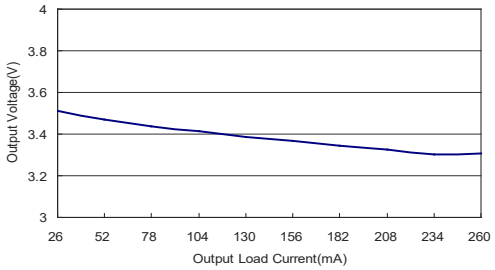
All test conditions are at 25°C The figures are identical for MAU201



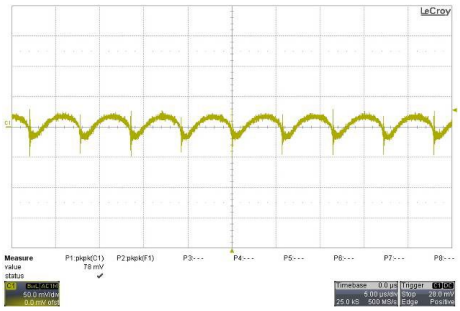
Efficiency Versus Output Current



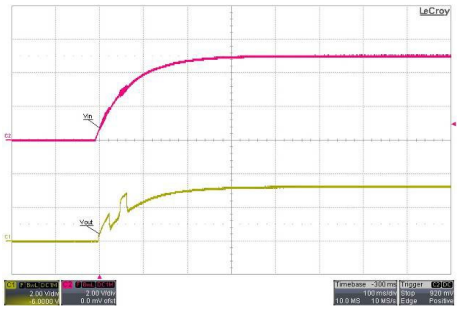
Efficiency Versus Input Voltage
Full Load



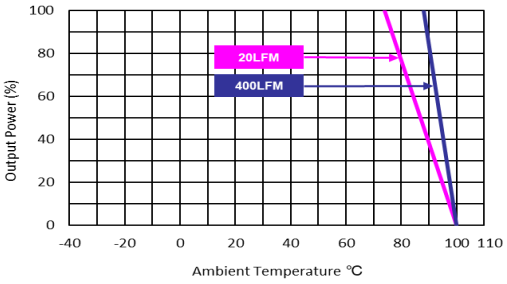
Output Voltage Versus Output Current



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



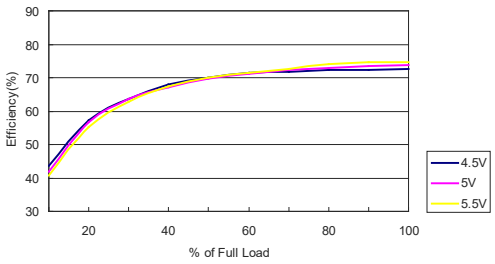
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



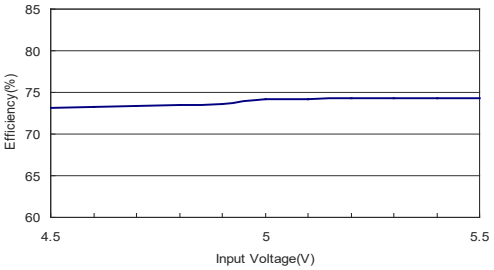
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

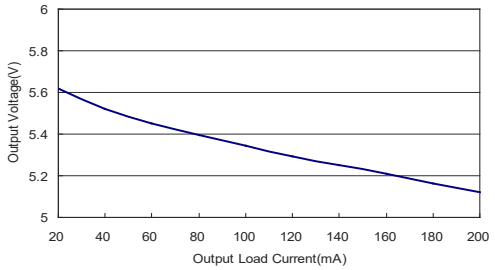
All test conditions are at 25°C The figures are identical for MAU202



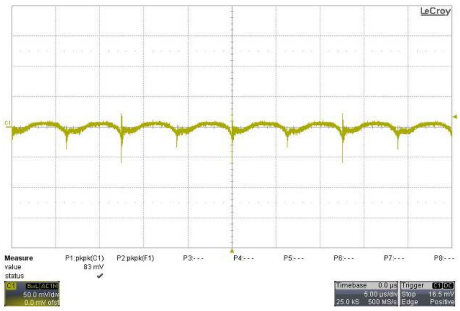
Efficiency Versus Output Current



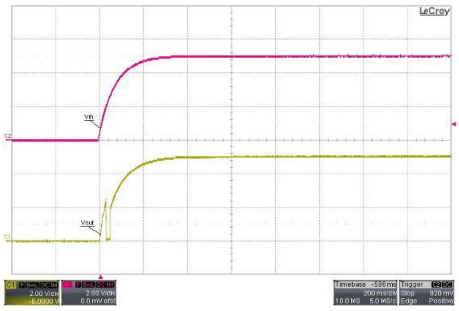
Efficiency Versus Input Voltage
Full Load



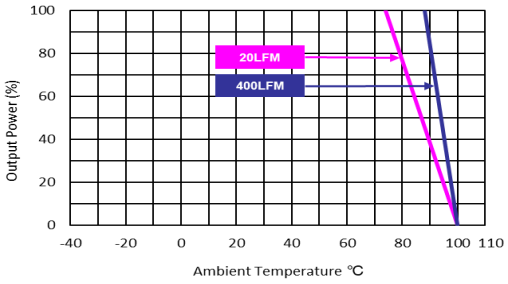
Output Voltage Versus Output Current



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



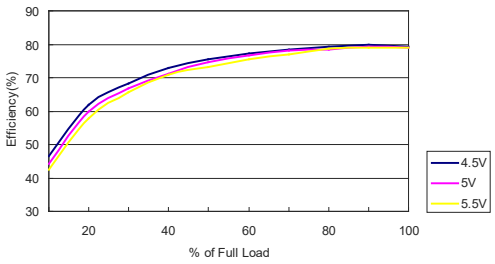
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



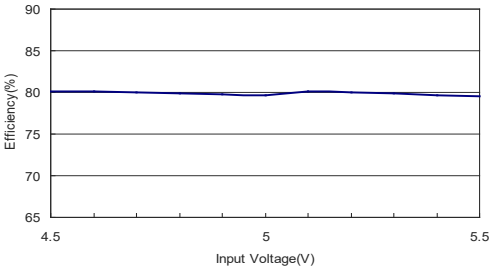
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

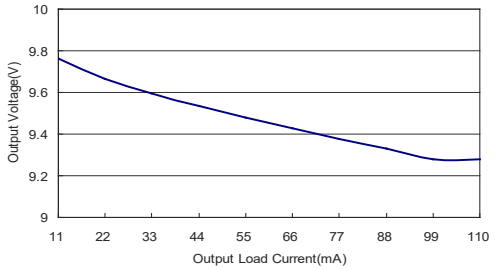
All test conditions are at 25°C The figures are identical for MAU203



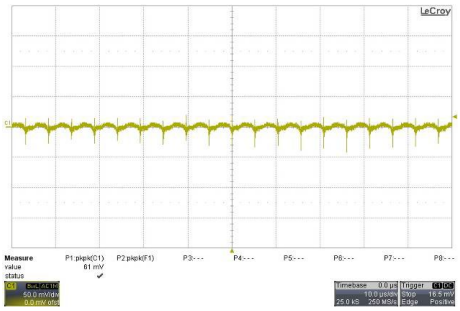
Efficiency Versus Output Current



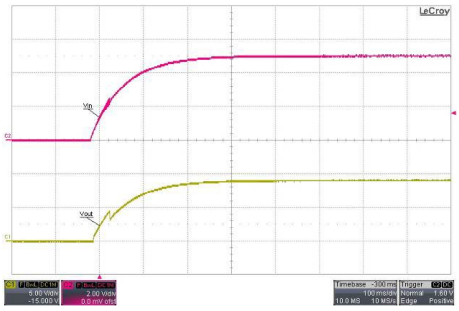
Efficiency Versus Input Voltage
Full Load



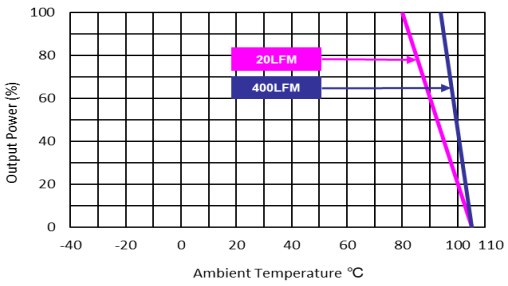
Output Voltage Versus Output Current



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



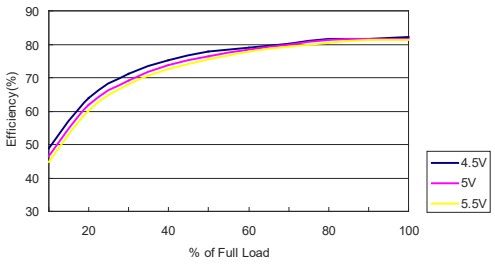
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



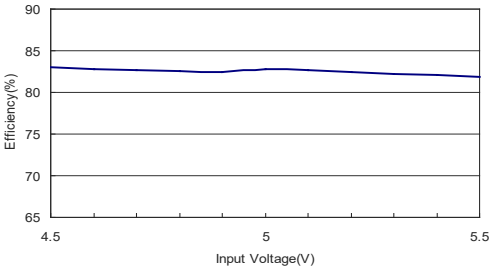
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

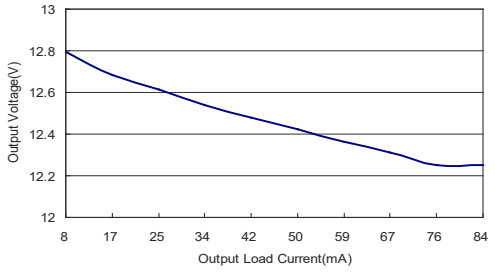
All test conditions are at 25°C The figures are identical for MAU204



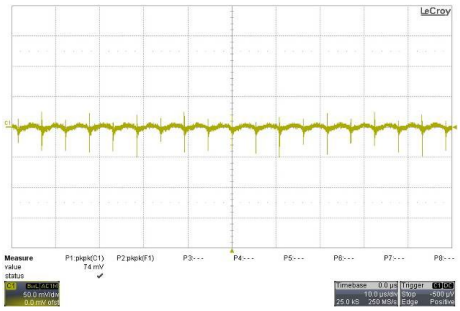
Efficiency Versus Output Current



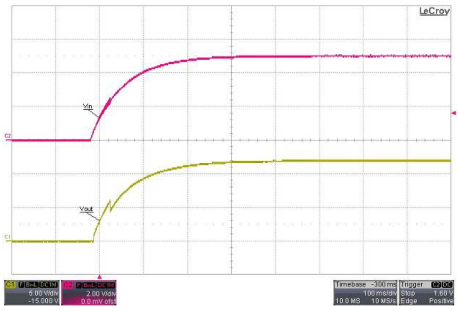
Efficiency Versus Input Voltage
Full Load



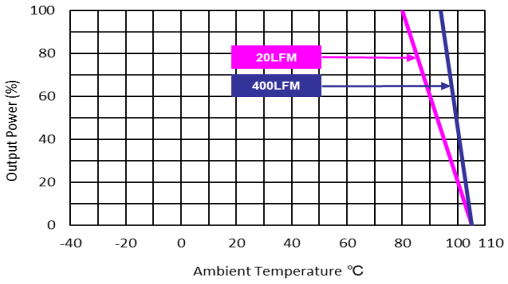
Output Voltage Versus Output Current



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



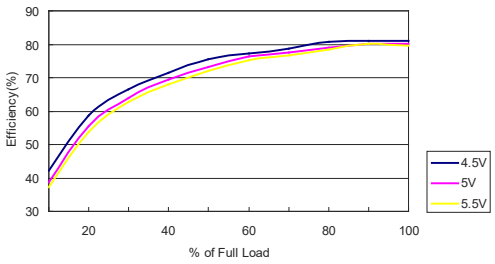
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



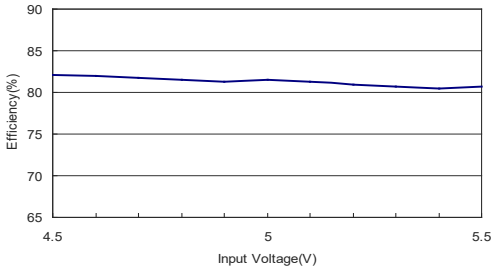
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

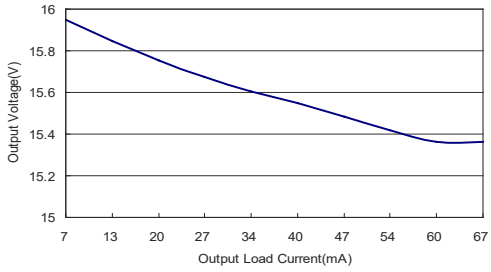
All test conditions are at 25°C The figures are identical for MAU205



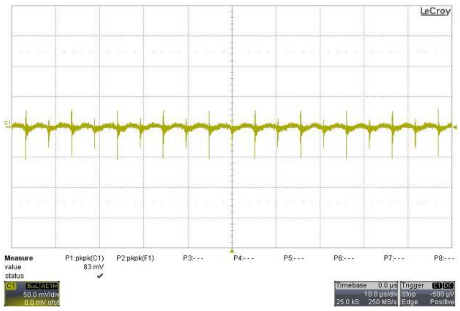
Efficiency Versus Output Current



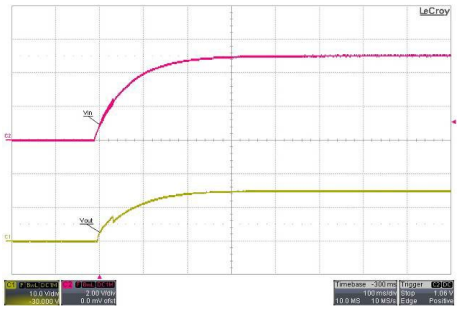
Efficiency Versus Input Voltage
Full Load



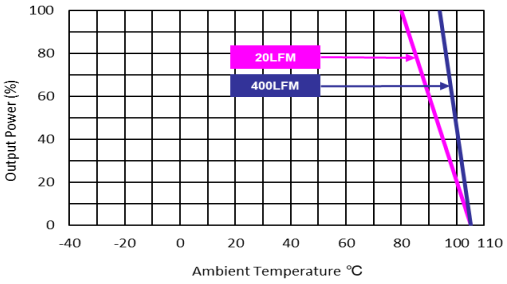
Output Voltage Versus Output Current



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



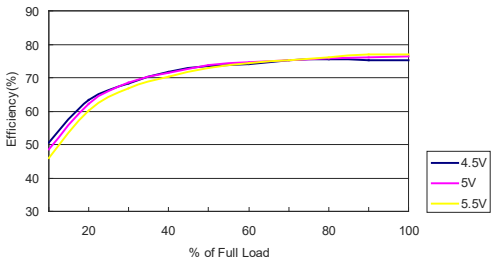
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



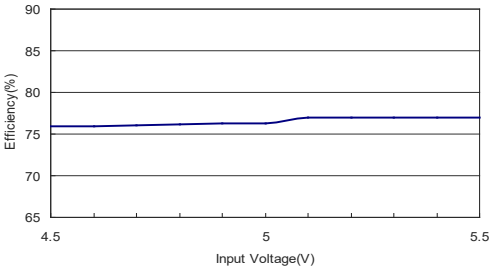
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

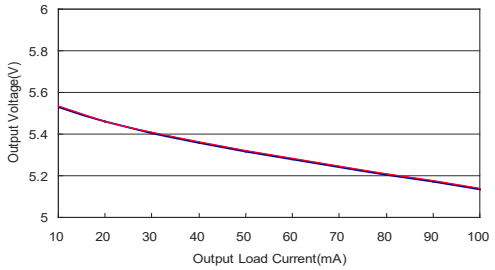
All test conditions are at 25°C The figures are identical for MAU206



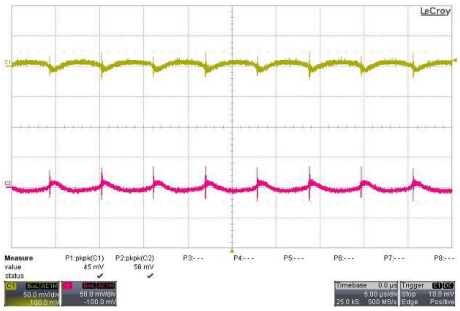
Efficiency Versus Output Current



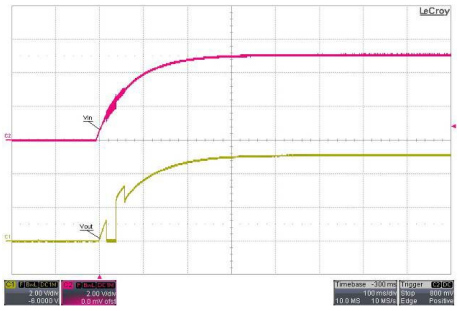
Efficiency Versus Input Voltage
Full Load



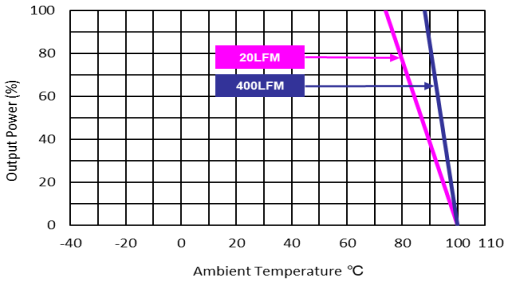
Output Voltage Versus Output Current



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



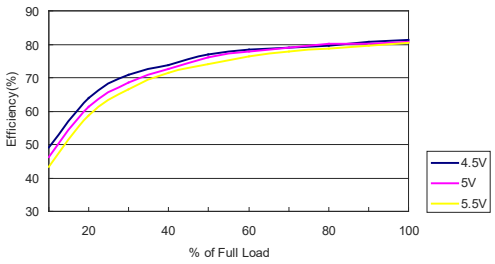
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



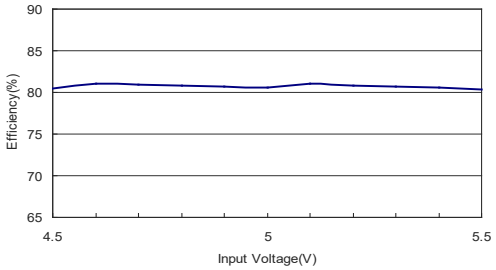
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

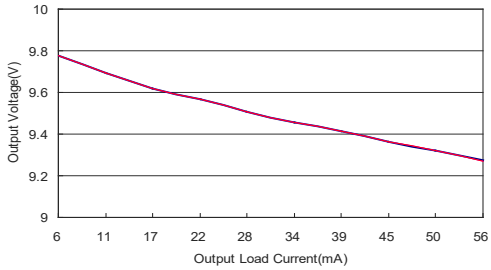
All test conditions are at 25°C The figures are identical for MAU207



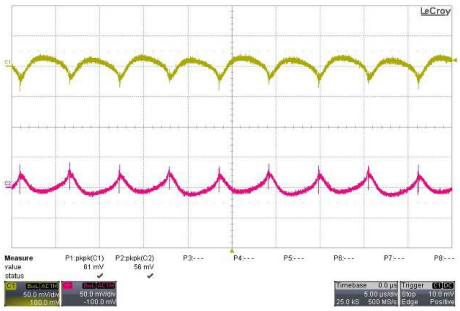
Efficiency Versus Output Current



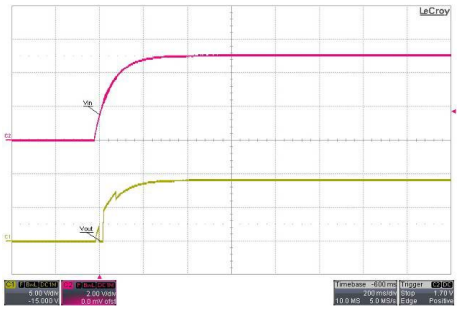
Efficiency Versus Input Voltage
Full Load



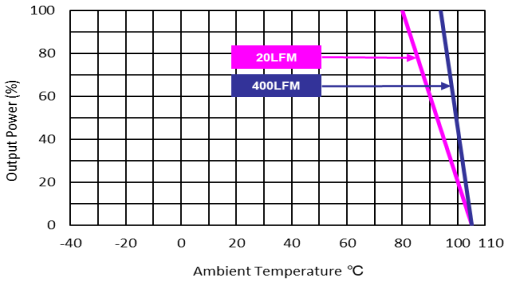
Output Voltage Versus Output Current



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



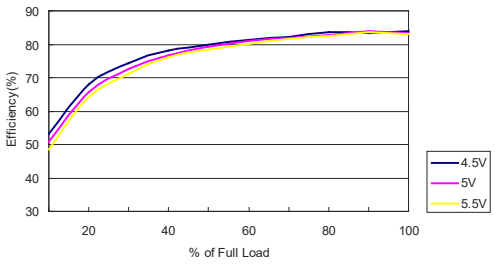
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



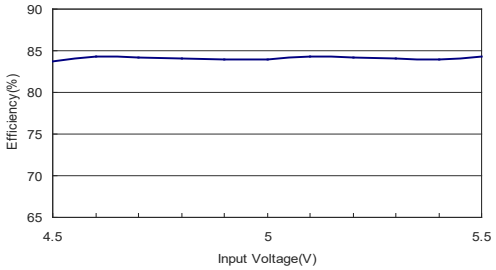
Derating Output Current Versus Ambient Temperature and Airflow
$V_{in}=V_{in\ nom}$

Characteristic Curves

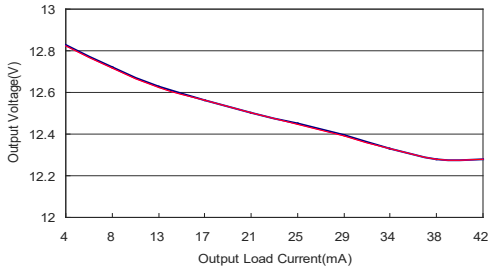
All test conditions are at 25°C The figures are identical for MAU208



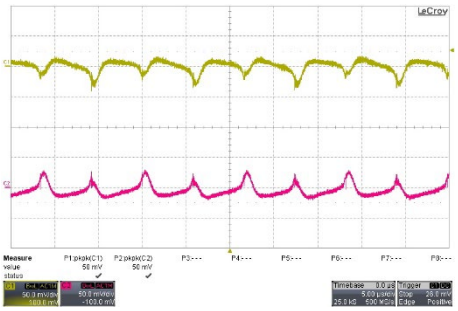
Efficiency Versus Output Current



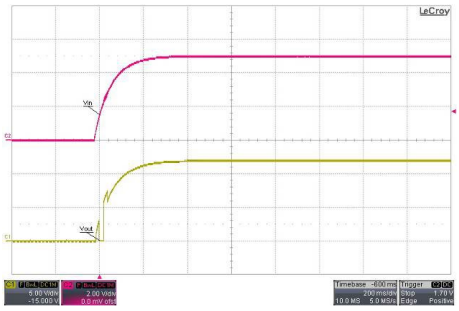
Efficiency Versus Input Voltage
Full Load



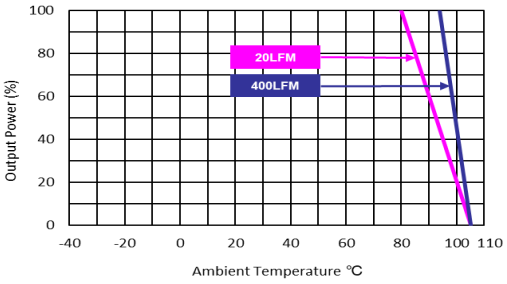
Output Voltage Versus Output Current



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



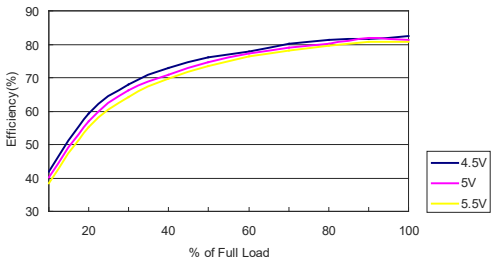
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



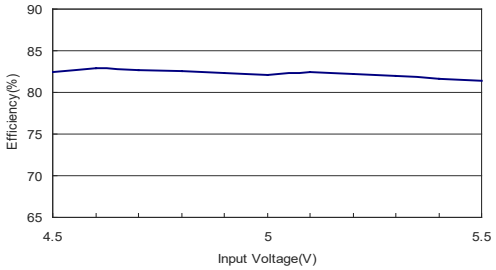
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

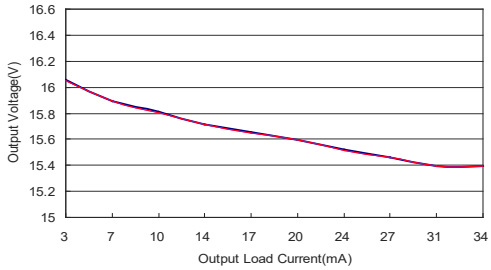
All test conditions are at 25°C The figures are identical for MAU209



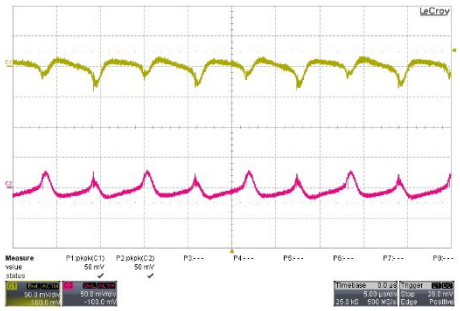
Efficiency Versus Output Current



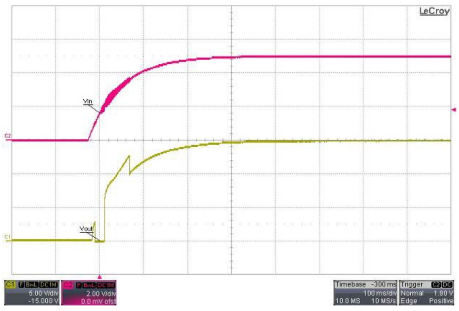
Efficiency Versus Input Voltage
Full Load



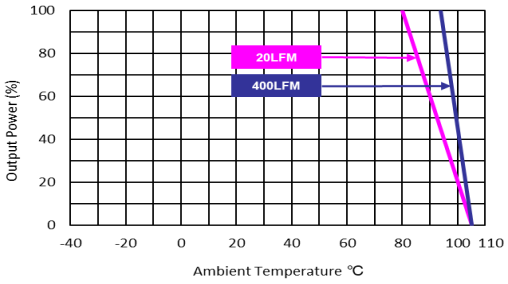
Output Voltage Versus Output Current



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



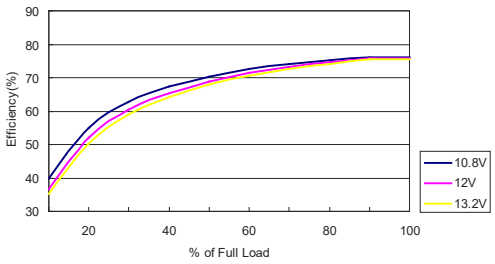
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



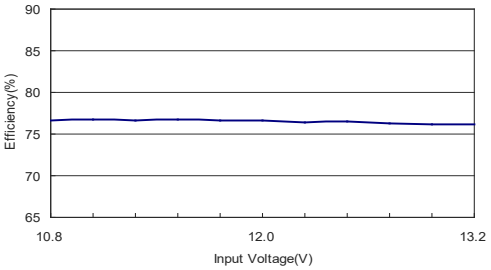
Derating Output Current Versus Ambient Temperature and Airflow
$V_{in}=V_{in\ nom}$

Characteristic Curves

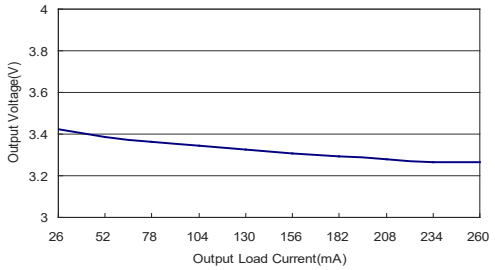
All test conditions are at 25°C The figures are identical for MAU211



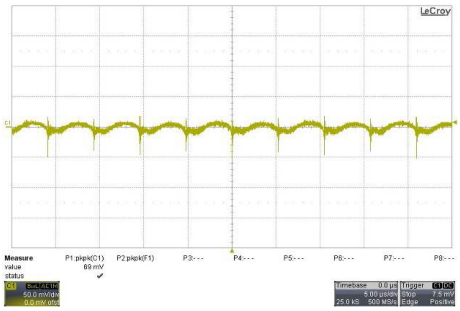
Efficiency Versus Output Current



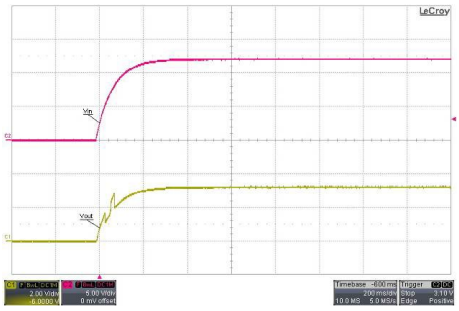
Efficiency Versus Input Voltage
Full Load



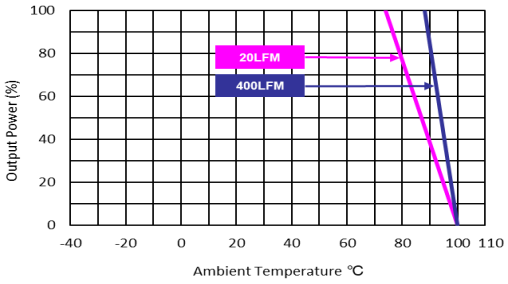
Output Voltage Versus Output Current



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



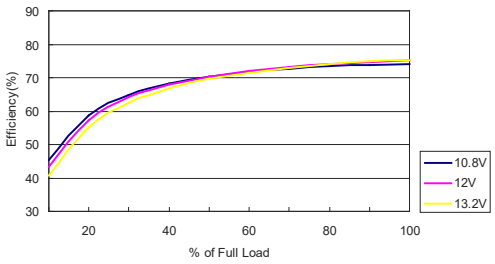
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



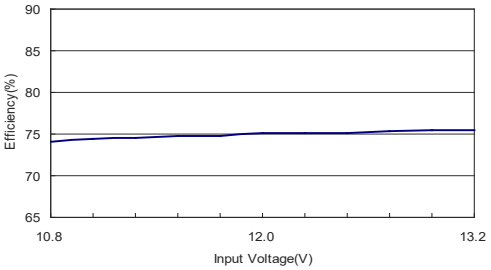
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

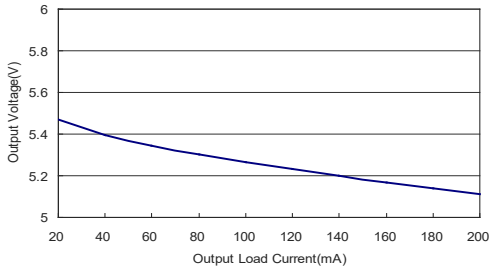
All test conditions are at 25°C The figures are identical for MAU212



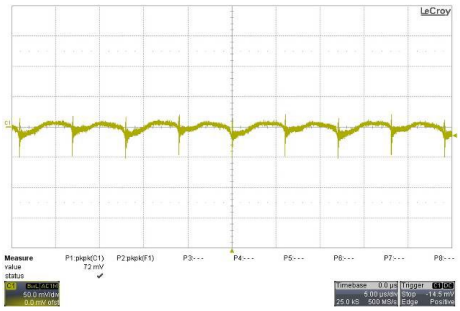
Efficiency Versus Output Current



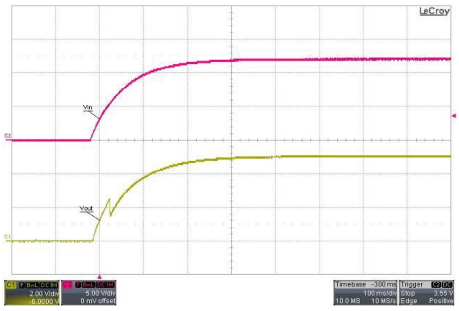
Efficiency Versus Input Voltage
Full Load



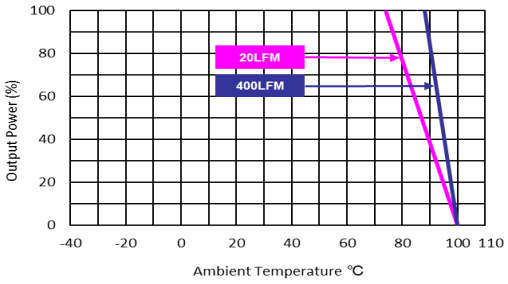
Output Voltage Versus Output Current



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



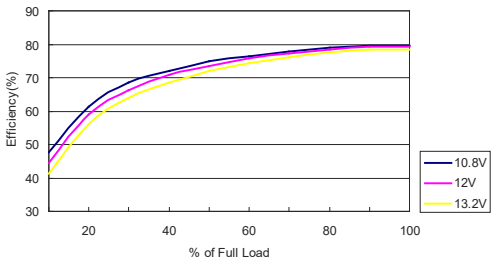
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



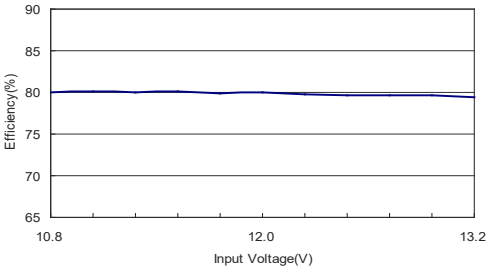
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

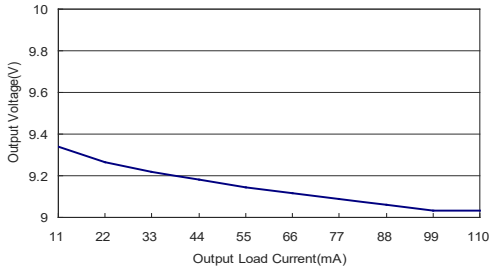
All test conditions are at 25°C The figures are identical for MAU213



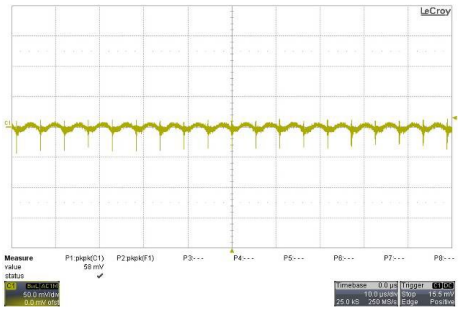
Efficiency Versus Output Current



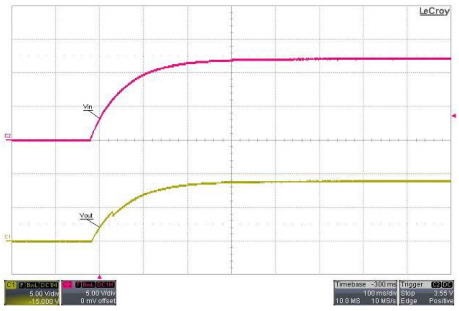
Efficiency Versus Input Voltage
Full Load



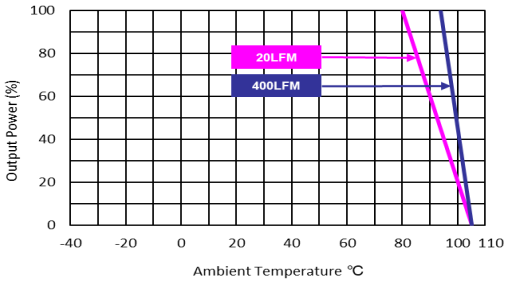
Output Voltage Versus Output Current



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



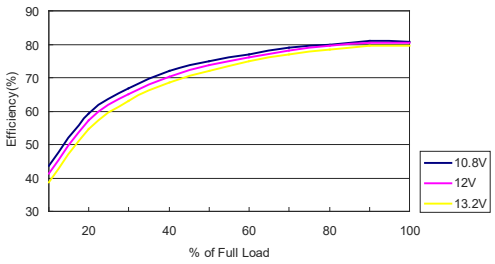
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



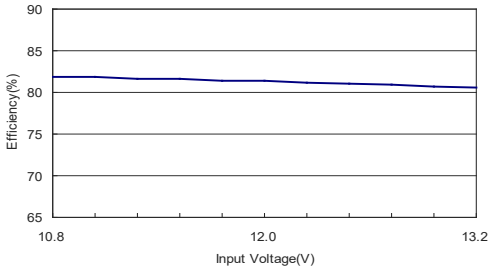
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

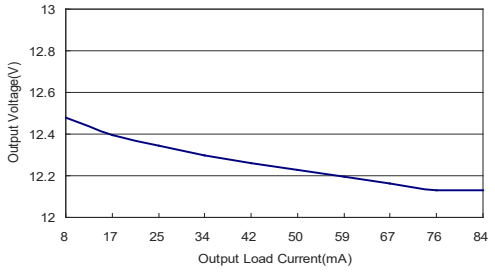
All test conditions are at 25°C The figures are identical for MAU214



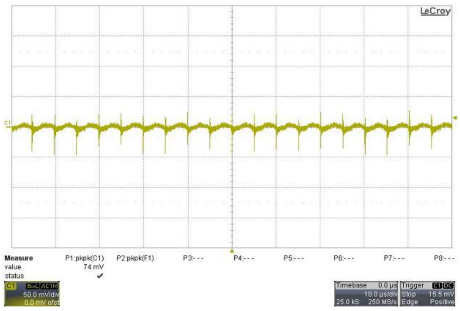
Efficiency Versus Output Current



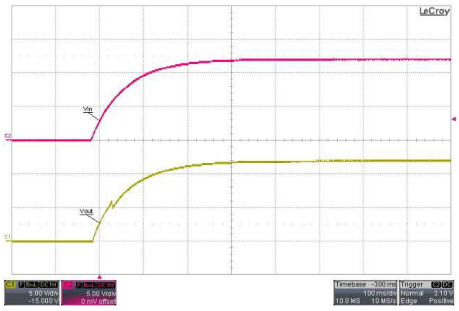
Efficiency Versus Input Voltage
Full Load



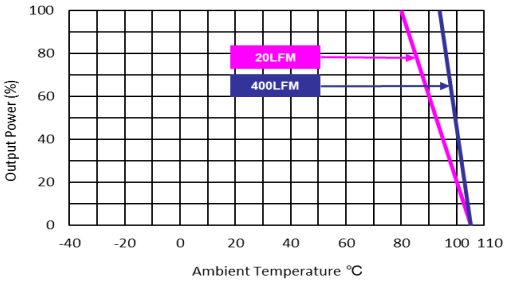
Output Voltage Versus Output Current



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



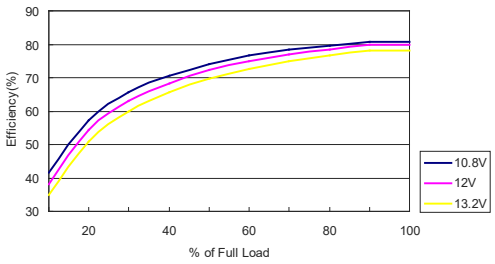
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



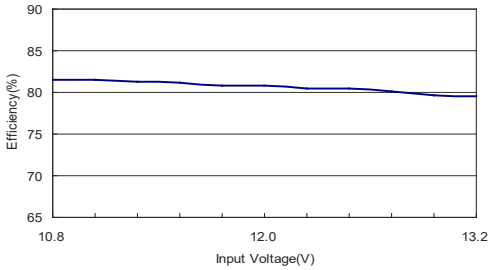
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

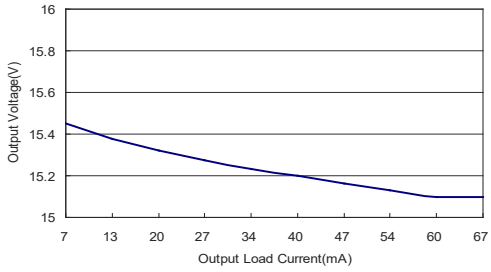
All test conditions are at 25°C The figures are identical for MAU215



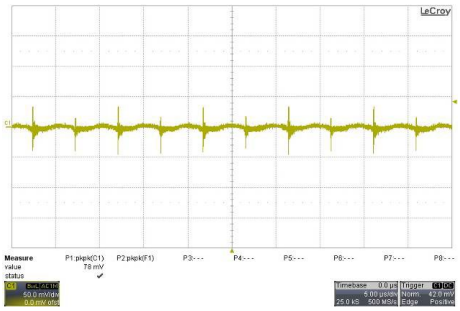
Efficiency Versus Output Current



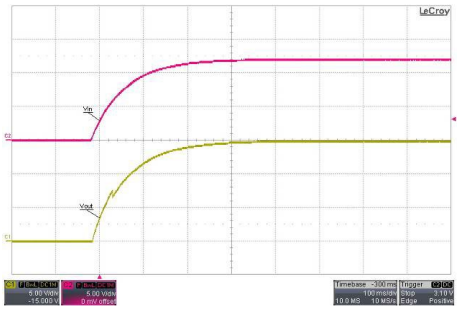
Efficiency Versus Input Voltage
Full Load



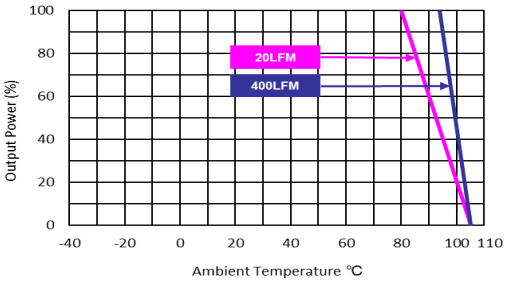
Output Voltage Versus Output Current



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



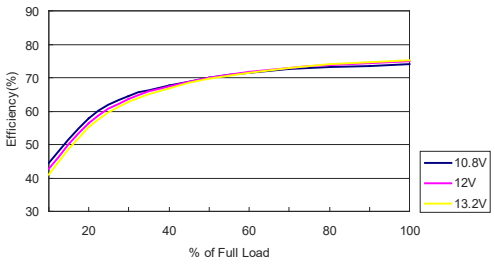
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



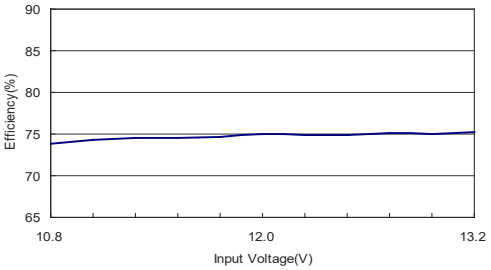
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

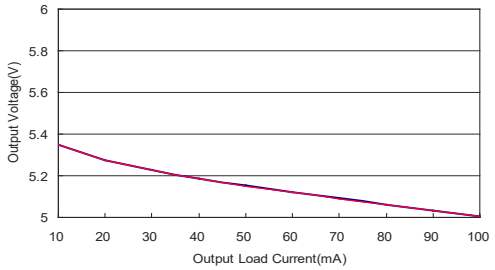
All test conditions are at 25°C The figures are identical for MAU216



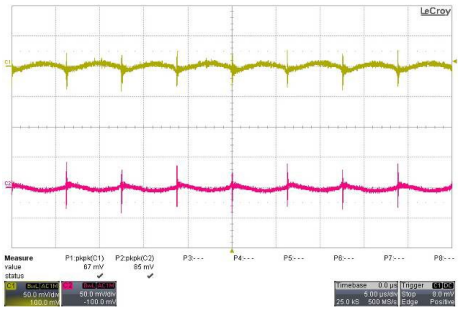
Efficiency Versus Output Current



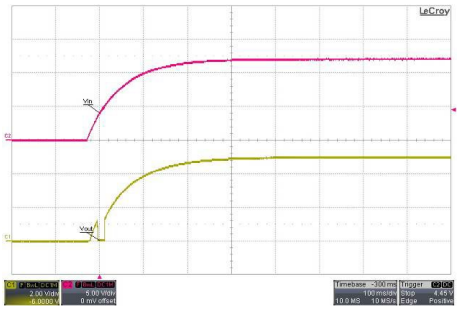
Efficiency Versus Input Voltage
Full Load



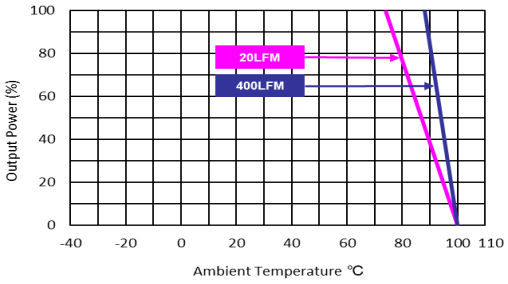
Output Voltage Versus Output Current



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



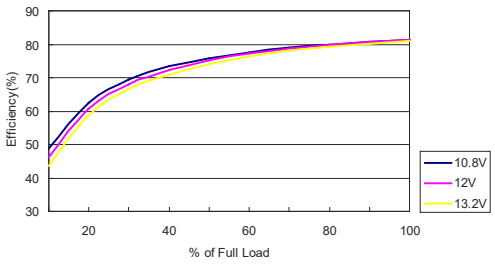
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



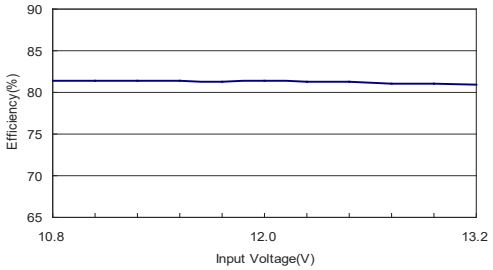
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

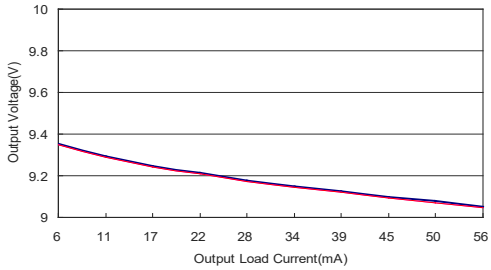
All test conditions are at 25°C The figures are identical for MAU217



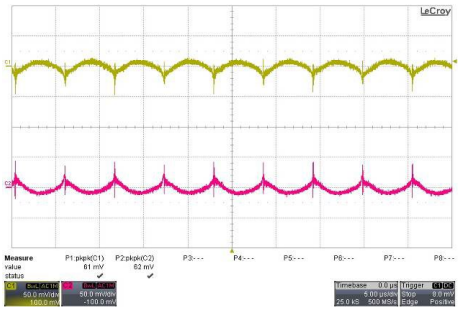
Efficiency Versus Output Current



Efficiency Versus Input Voltage
Full Load

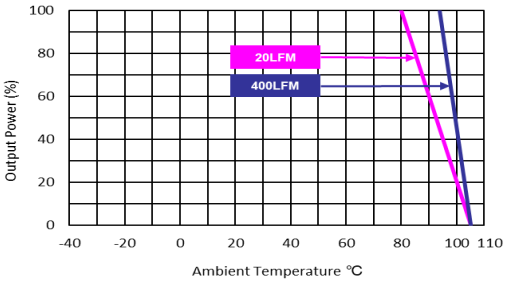


Output Voltage Versus Output Current



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

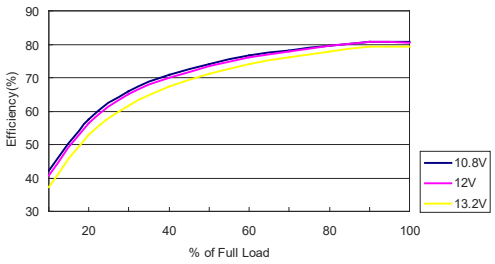
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



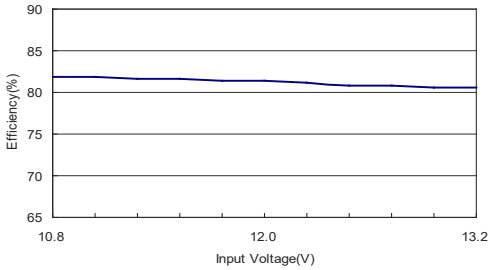
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

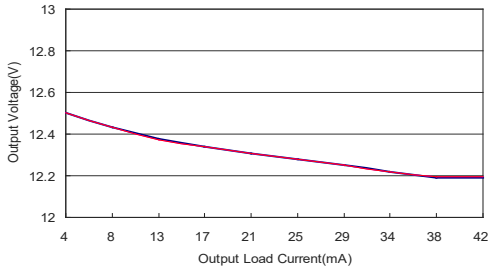
All test conditions are at 25°C The figures are identical for MAU218



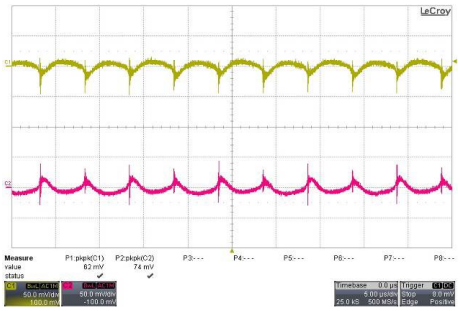
Efficiency Versus Output Current



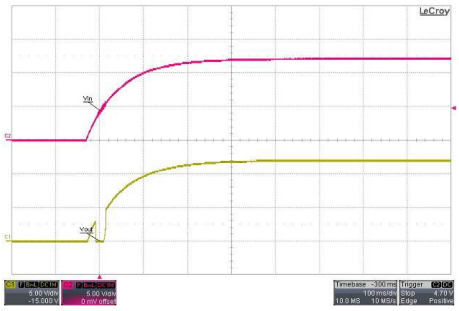
Efficiency Versus Input Voltage
Full Load



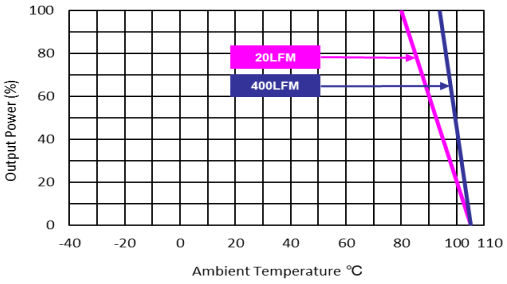
Output Voltage Versus Output Current



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



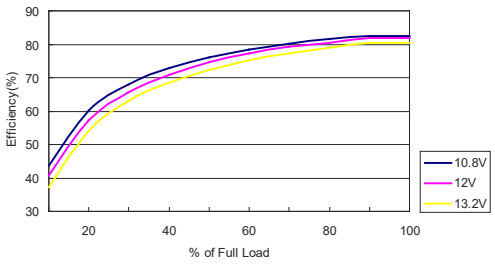
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



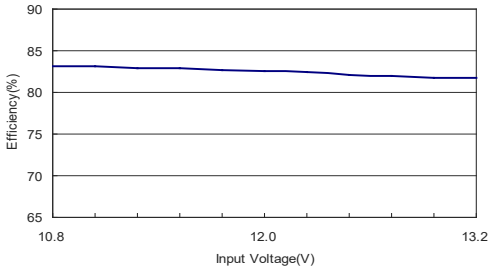
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

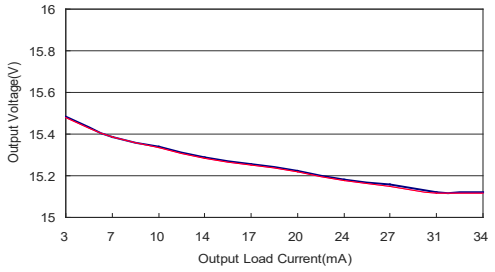
All test conditions are at 25°C The figures are identical for MAU219



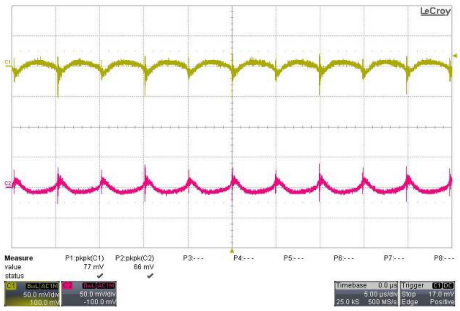
Efficiency Versus Output Current



Efficiency Versus Input Voltage
Full Load

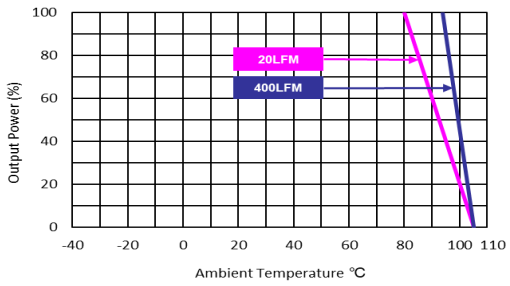


Output Voltage Versus Output Current



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

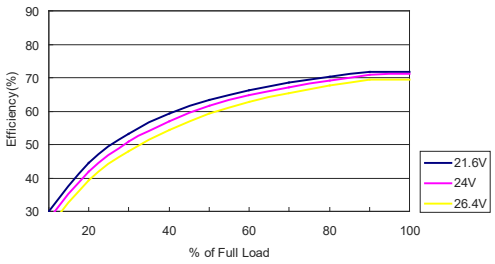
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



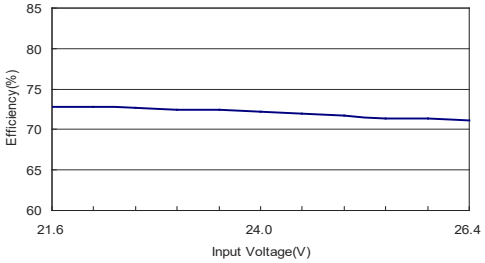
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

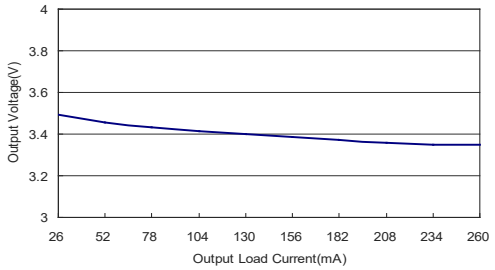
All test conditions are at 25°C The figures are identical for MAU221



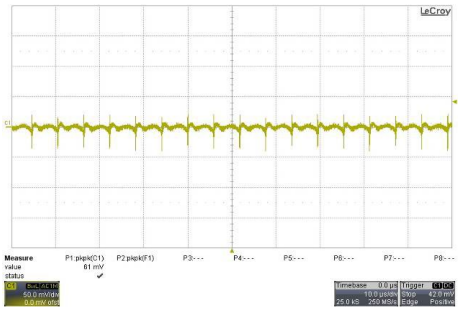
Efficiency Versus Output Current



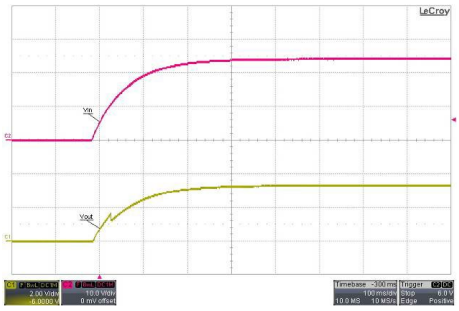
Efficiency Versus Input Voltage
Full Load



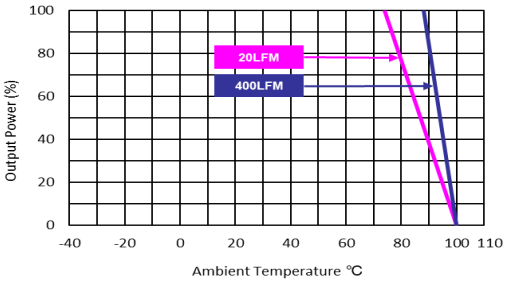
Output Voltage Versus Output Current



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



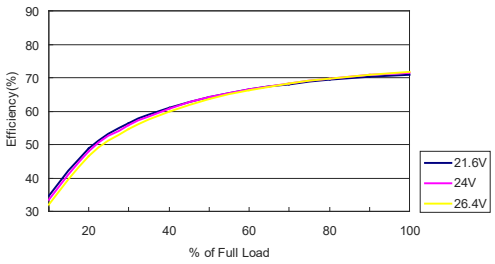
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



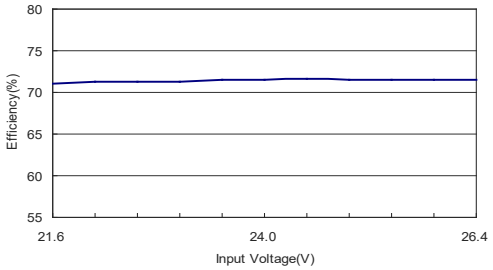
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

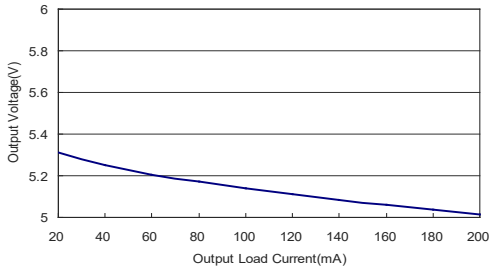
All test conditions are at 25°C The figures are identical for MAU222



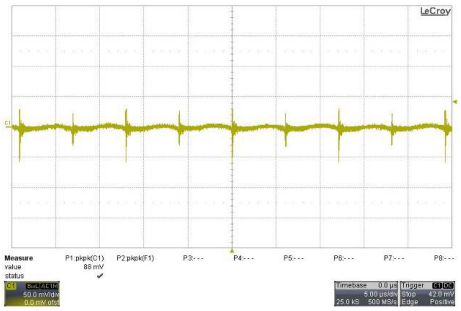
Efficiency Versus Output Current



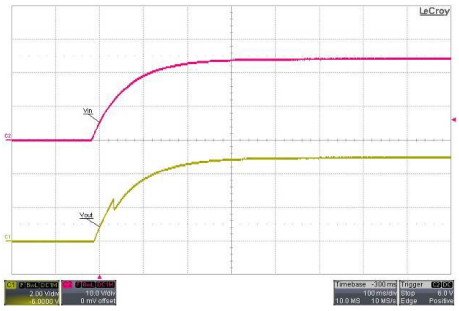
Efficiency Versus Input Voltage
Full Load



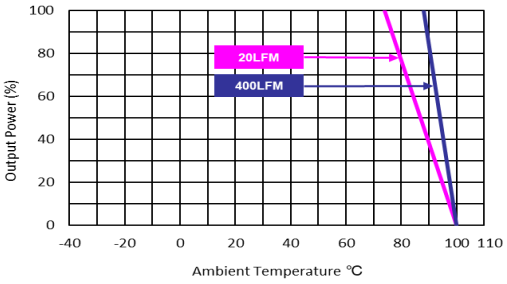
Output Voltage Versus Output Current



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



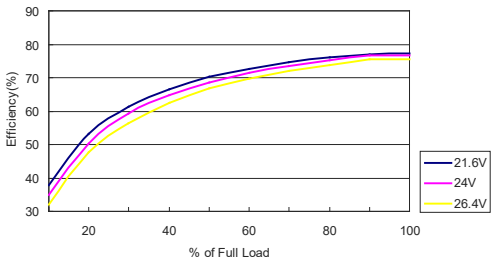
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



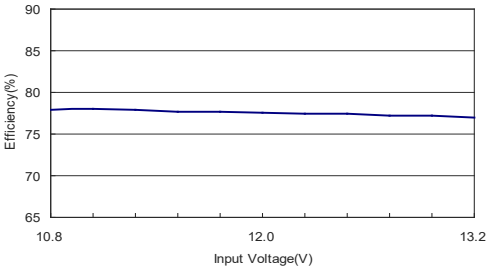
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

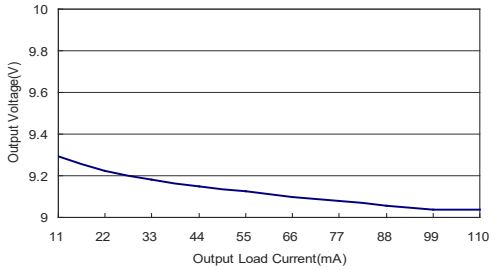
All test conditions are at 25°C The figures are identical for MAU223



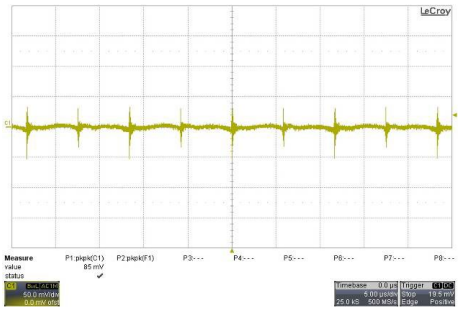
Efficiency Versus Output Current



Efficiency Versus Input Voltage
Full Load

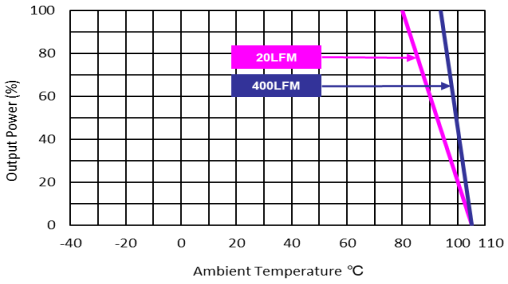


Output Voltage Versus Output Current



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

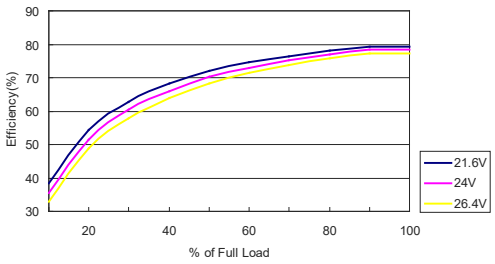
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



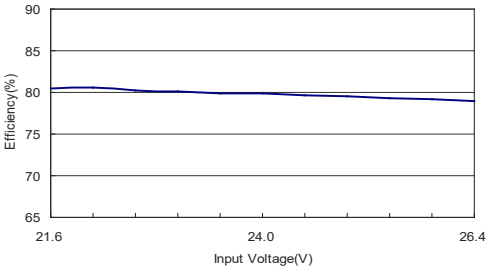
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

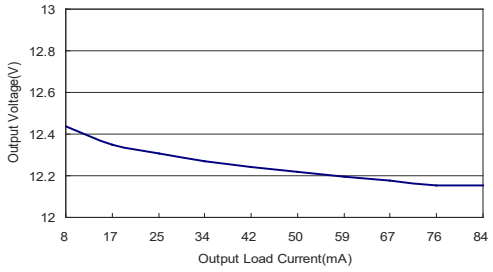
All test conditions are at 25°C The figures are identical for MAU224



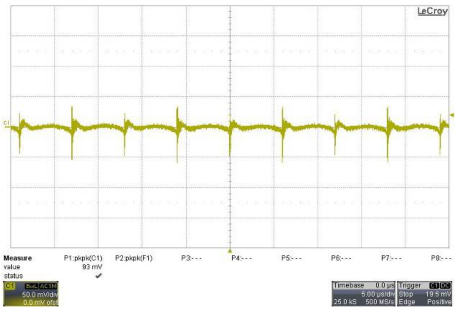
Efficiency Versus Output Current



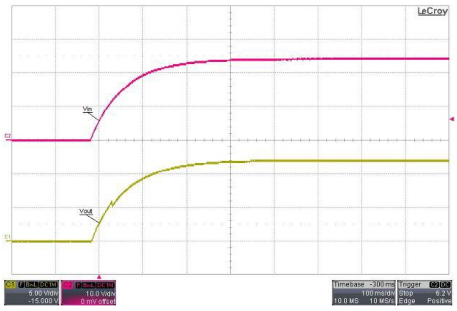
Efficiency Versus Input Voltage
Full Load



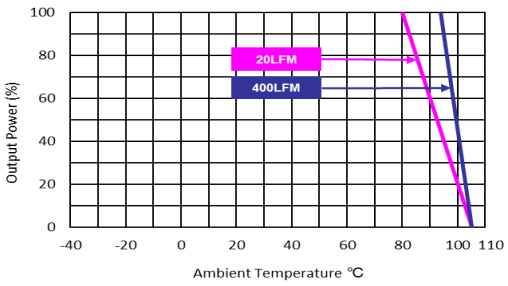
Output Voltage Versus Output Current



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



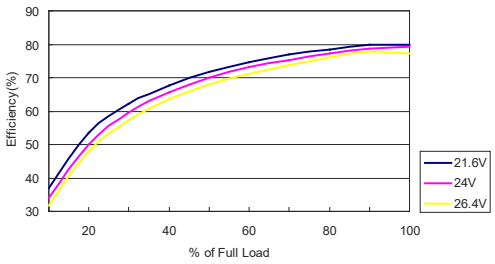
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



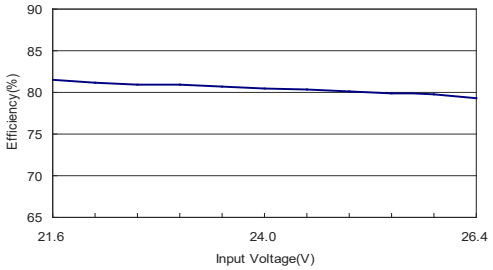
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

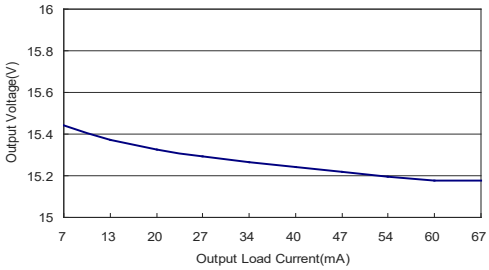
All test conditions are at 25°C The figures are identical for MAU225



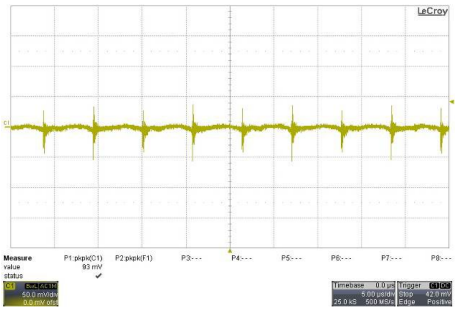
Efficiency Versus Output Current



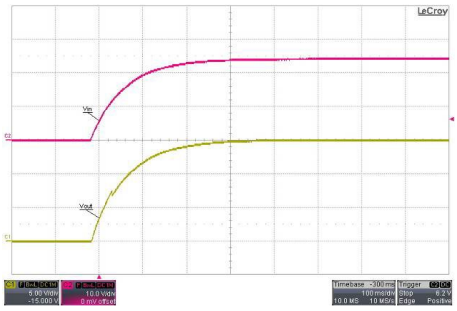
Efficiency Versus Input Voltage
Full Load



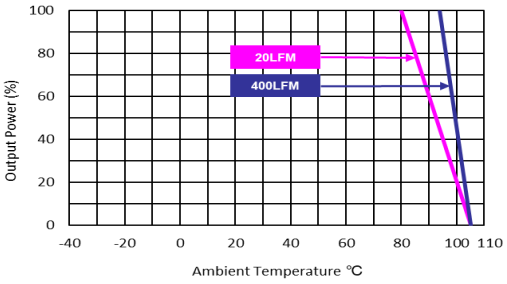
Output Voltage Versus Output Current



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



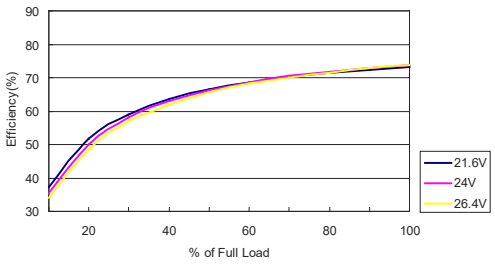
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



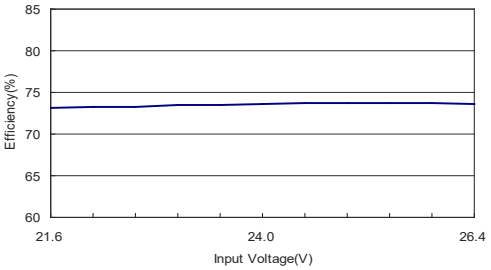
Derating Output Current Versus Ambient Temperature and Airflow
$V_{in}=V_{in\ nom}$

Characteristic Curves

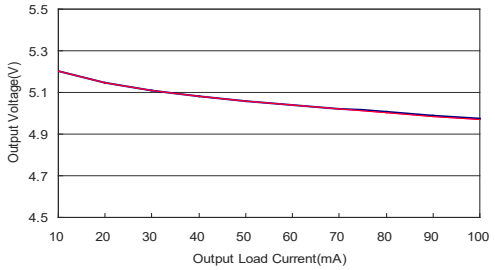
All test conditions are at 25°C The figures are identical for MAU226



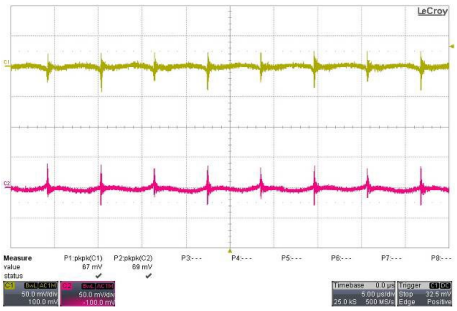
Efficiency Versus Output Current



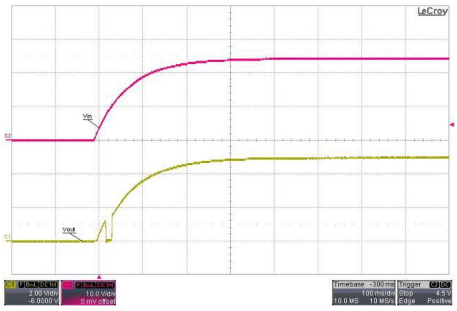
Efficiency Versus Input Voltage
Full Load



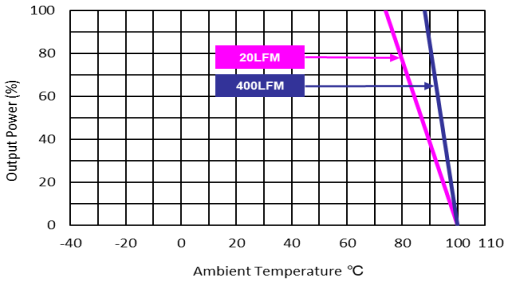
Output Voltage Versus Output Current



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



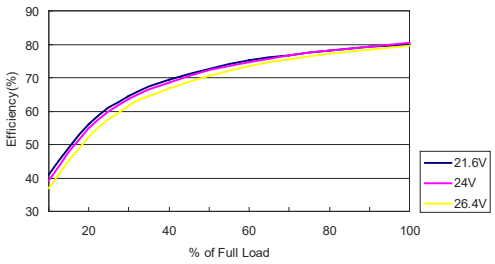
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



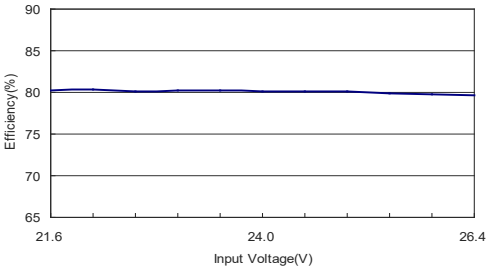
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

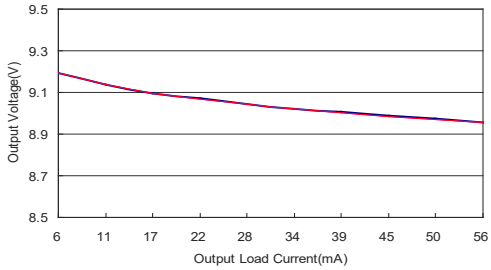
All test conditions are at 25°C The figures are identical for MAU227



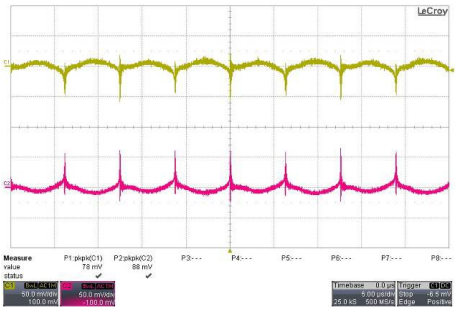
Efficiency Versus Output Current



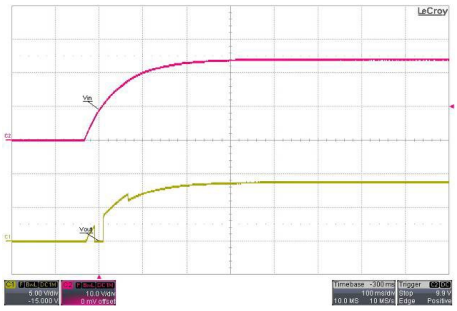
Efficiency Versus Input Voltage
Full Load



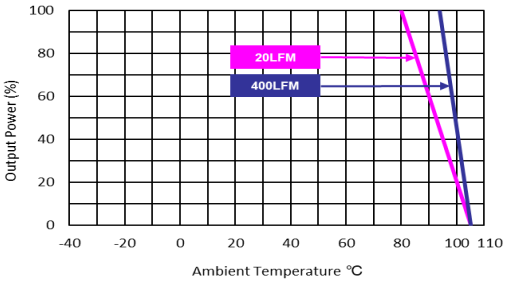
Output Voltage Versus Output Current



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



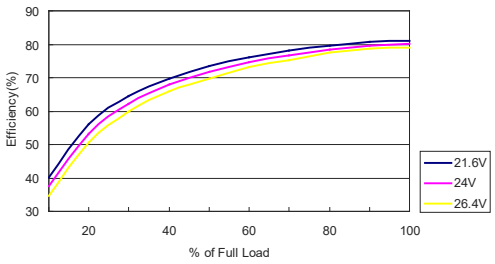
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



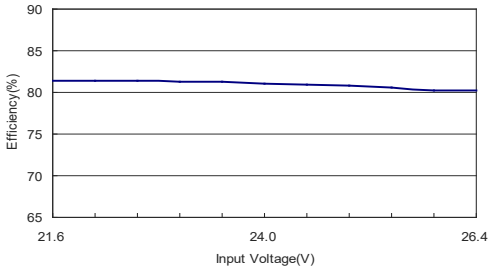
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$

Characteristic Curves

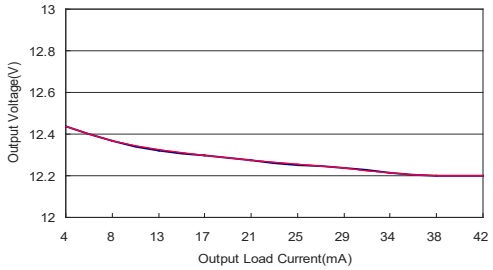
All test conditions are at 25°C The figures are identical for MAU228



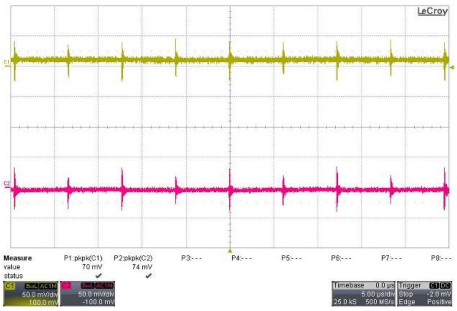
Efficiency Versus Output Current



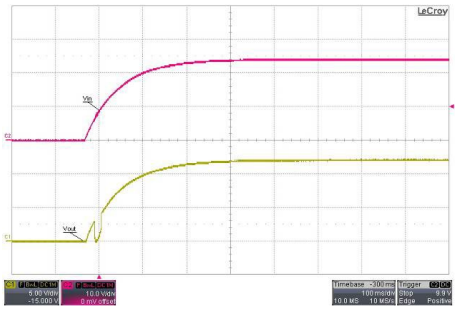
Efficiency Versus Input Voltage
Full Load



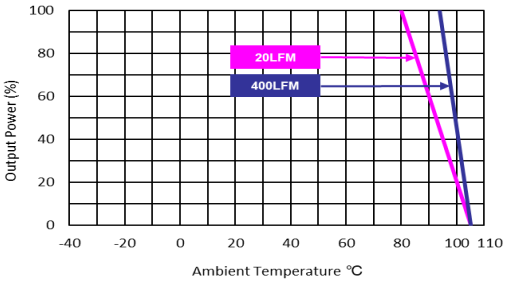
Output Voltage Versus Output Current



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



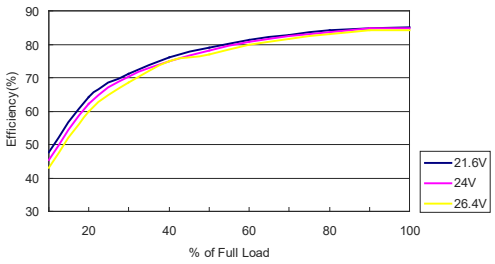
Typical Input Start-Up and Output Rise Characteristic
$V_{in}=V_{in\ nom}$; Full Load



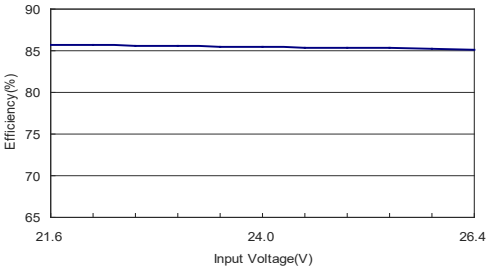
Derating Output Current Versus Ambient Temperature and Airflow
$V_{in}=V_{in\ nom}$

Characteristic Curves

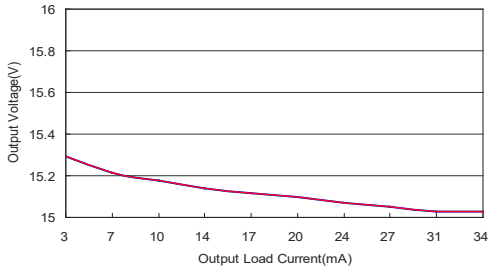
All test conditions are at 25°C The figures are identical for MAU229



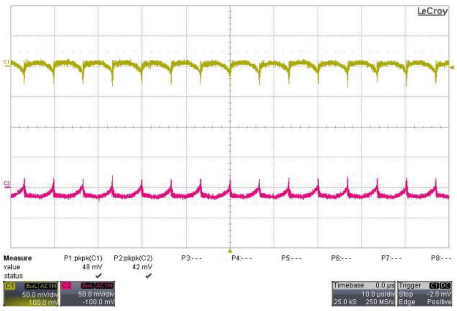
Efficiency Versus Output Current



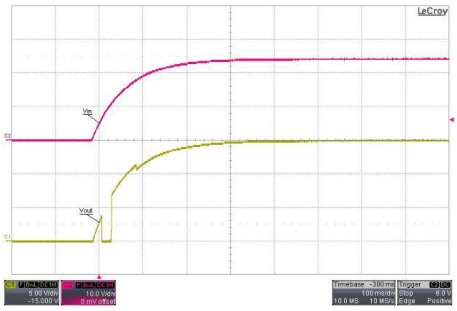
Efficiency Versus Input Voltage
Full Load



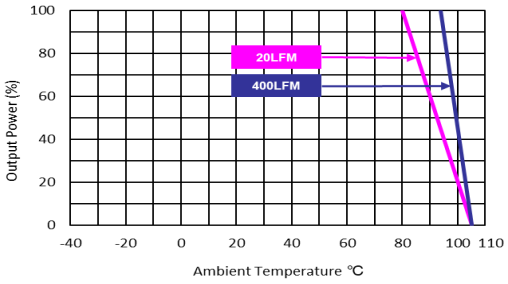
Output Voltage Versus Output Current



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



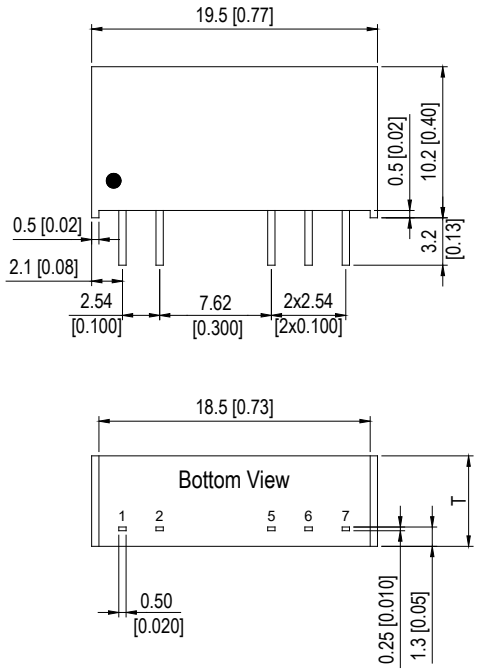
Typical Input Start-Up and Output Rise Characteristic
V_{in}=$V_{in\ nom}$; Full Load



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

Package Specifications

Mechanical Dimensions



Pin Connections

Pin	Single Output	Dual Output
1	+Vin	+Vin
2	-Vin	-Vin
5	-Vout	-Vout
6	No Pin	Common
7	+Vout	+Vout

T: 6.1mm(0.24 inch) for 5V&12V Input Models

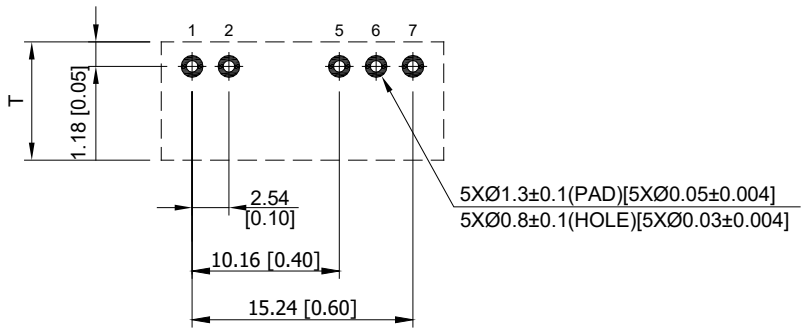
T: 7.1mm(0.28 inch) for 24V Input Models

- All dimensions in mm (inches)
- Tolerance: X.X±0.25 (X.XX±0.01)
  X.XX±0.13 (X.XXX±0.005)
- Pins ±0.05(±0.002)

Physical Characteristics

Case Size (5V&12V Input)	:	19.5x6.1x10.2mm (0.77x0.24x0.40 inches)
Case Size (24V Input)	:	19.5x7.1x10.2mm (0.77x0.28x0.40 inches)
Case Material	:	Non-Conductive Black Plastic (flammability to UL 94V-0 rated)
Pin Material	:	Alloy 42
Weight (5V&12V Input)	:	2.2g
Weight (24V Input)	:	2.6g

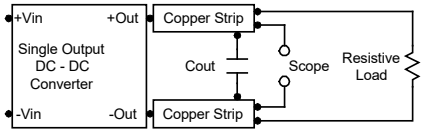
Recommended Pad Layout for Single & Dual Output Converter

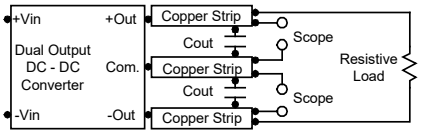


Test Setup

Peak-to-Peak Output Noise Measurement Test

Use a Cout 0.33µF ceramic capacitor. Scope measurement should be made by using a BNC socket, measurement bandwidth is 0-20 MHz. Position the load between 50 mm and 75 mm from the DC-DC Converter.





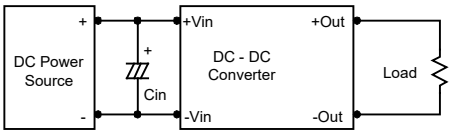
Technical Notes

Maximum Capacitive Load

The MAU200 series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. For optimum performance we recommend 100µF maximum capacitive load for dual outputs and 220µF capacitive load for single outputs. The maximum capacitance can be found in the data sheet.

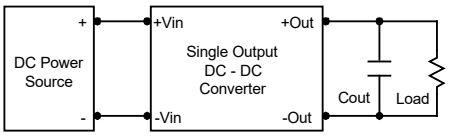
Input Source Impedance

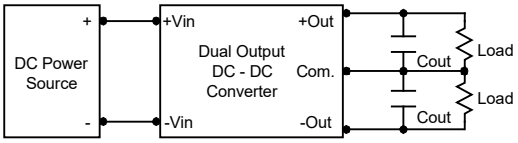
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.
Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance (ESR < 1.0Ω at 100 kHz) capacitor of a 2.2µF for the 5V input devices, a 1.0µF for the 12V input devices and a 0.47µF for the 24V devices.



Output Ripple Reduction

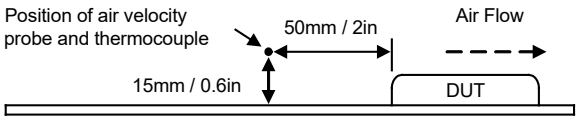
A good quality low ESR capacitor placed as close as practicable across the load will give the best ripple and noise performance. To reduce output ripple, it is recommended to use 1.0µF capacitors at the output.



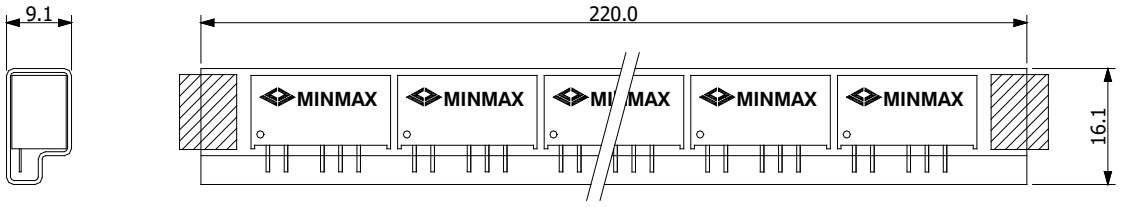


Thermal Considerations

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



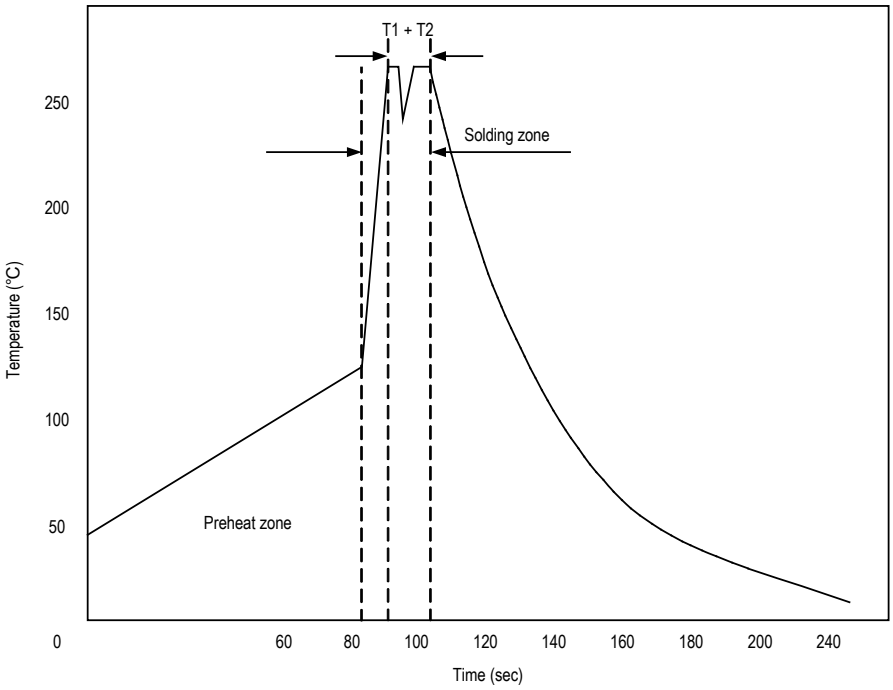
Packaging Information



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	A	U	20	1

Package Type
SIP-7

Output Regulation
Unregulated

Input Voltage Range

20:	4.5	~	5.5	VDC
21:	10.8	~	13.2	VDC
22:	21.6	~	26.4	VDC

Output Voltage

1:	3.3	VDC
2:	5	VDC
3:	9	VDC
4:	12	VDC
5:	15	VDC
6:	±5	VDC
7:	±9	VDC
8:	±12	VDC
9:	±15	VDC

MTBF and Reliability

The MTBF of MAU200 series of DC-DC converters has been calculated using

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

Model	MTBF	Unit
MAU201	5,992,510	Hours
MAU202	5,780,347	
MAU203	4,212,743	
MAU204	2,928,258	
MAU205	2,393,776	
MAU206	5,641,749	
MAU207	4,253,057	
MAU208	3,013,182	
MAU209	2,466,852	
MAU211	6,033,182	
MAU212	5,818,182	
MAU213	4,232,804	
MAU214	2,937,936	
MAU215	2,400,240	
MAU216	5,677,786	
MAU217	4,273,504	
MAU218	3,023,431	
MAU219	2,473,717	
MAU221	5,494,506	
MAU222	5,315,614	
MAU223	3,960,396	
MAU224	2,804,066	
MAU225	2,310,136	
MAU226	5,198,181	
MAU227	3,996,004	
MAU228	2,881,844	
MAU229	2,378,122	