



MINMAX[®]

MSLU100 Series

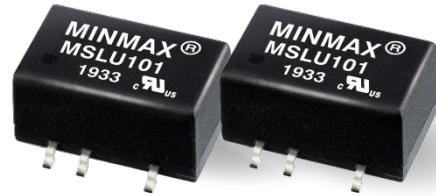
Electric Characteristic Note

MSLU100 Series EC Note

DC-DC CONVERTER 1W, SMD Package

Features

- ▶ Industrial SMD Package
- ▶ Unregulated Output Voltage
- ▶ I/O Isolation 1500 VDC
- ▶ Operating Ambient Temp. Range -40°C to +90°C
- ▶ Cleaning-washable Process Available(option)
- ▶ Qualified for Lead-free Reflow Solder Process
According to IPC/JEDEC J-STD-020D.1
- ▶ Tape & Reel Package Available
- ▶ UL/cUL/IEC/EN 62368-1(60950-1) Safety Approval



Applications

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

Product Overview

The MINMAX MSLU100 series is a range of 1W DC-DC converters in a SMD- Package featuring I/O isolation of 1500VDC. The very small footprint makes this product the ideal solution for many applications where a voltage has to be isolated i.e for noise reduction, ground loop elimination, in digital interfaces or where a converted voltage is required.

An excellent efficiency allows an operating temperature range of -40°C to +90°C. With a new package design these converters are fully qualified for the higher temperature profile used in lead-free reflow solder processes. For automated SMD production lines the product can be supplied in tape & reel package.

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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.	@No Load			@Max. Load	
	VDC	VDC	mA	mA(typ.)	mA(typ.)	%(max.)	μF	%	
MSLU101	5 (4.5 ~ 5.5)	3.3	300	271	30	10	33	73	
MSLU102		5	200	256		10		78	
MSLU103		9	110	254		10		78	
MSLU104		12	84	259		8		78	
MSLU105		15	67	254		7		79	
MSLU106		±5	±100	270		10		33#	74
MSLU108		±12	±42	259		8			78
MSLU109		±15	±33	254		7			78
MSLU111		12 (10.8 ~ 13.2)	3.3	300		112		15	8
MSLU112	5		200	109	8	76			
MSLU113	9		110	106	8	78			
MSLU114	12		84	106	5	79			
MSLU115	15		67	105	5	80			
MSLU116	±5		±100	113	8	33#	74		
MSLU118	±12		±42	108	5		78		
MSLU119	±15		±33	104	5		79		
MSLU154	15 (13.5 ~ 16.5)		12	84	86	14	5		33
MSLU155		15	67	86	5		78		
MSLU121	24 (21.6 ~ 26.4)	3.3	300	58	8	8	33	72	
MSLU122		5	200	54		8		78	
MSLU123		9	110	54		8		77	
MSLU124		12	84	55		5		77	
MSLU125		15	67	53		5		79	
MSLU126		±5	±100	57		8		33#	73
MSLU128		±12	±42	54		5			78
MSLU129		±15	±33	53		5			78

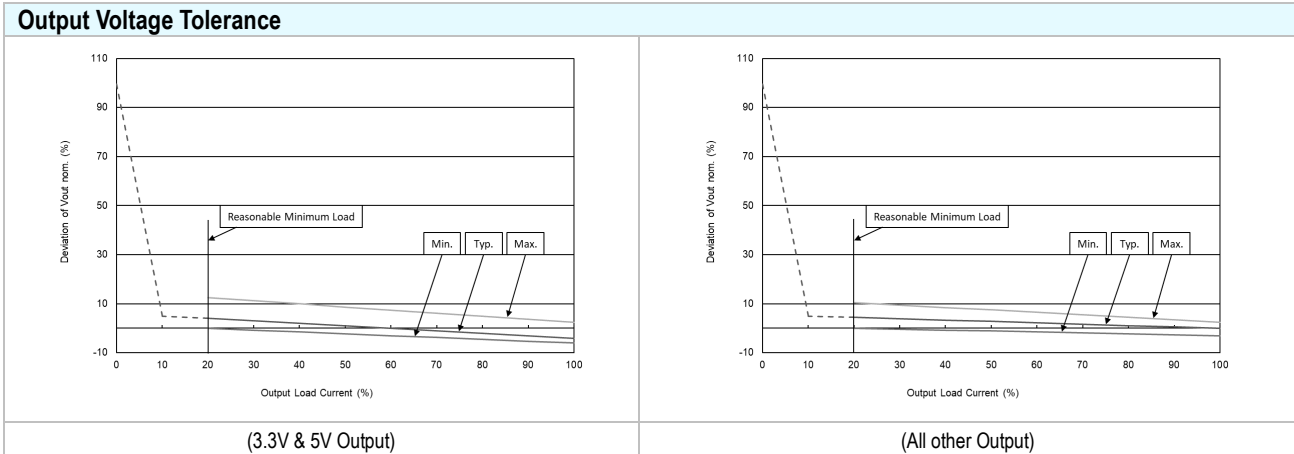
For each output

Input Specifications

Parameter	Conditions/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	
	15V Input Models	13.5	15	16.5	
	24V Input Models	21.6	24	26.4	
Input Surge Voltage (1 sec. max.)	5V Input Models	-0.7	---	9	VDC
	12V Input Models	-0.7	---	18	
	15V Input Models	-0.7	---	20	
	24V Input Models	-0.7	---	30	
Internal Filter	All Models	Internal Capacitor			

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
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 (Operation at lower load will not damage the converter, but it may not meet all specifications)			
Ripple & Noise	0-20 MHz Bandwidth	---	---	120	mV P-P
Temperature Coefficient		---	±0.01	±0.02	%/°C
Short Circuit Protection	0.5 Second Max., Automatic Recovery				



General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds	1500	---	---	VDC
	1 Second	1800	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100kHz, 1V	---	40	100	pF
Switching Frequency		50	100	140	kHz
MTBF (calculated)	MIL-HDBK-217F@25°C, Ground Benign	2,000,000	---	---	Hours
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1	Level 2			
Safety Approvals	UL/cUL 60950-1 recognition(CSA certificate), IEC/EN 60950-1(CB-report)				
	UL/cUL 62368-1 recognition(UL certificate), IEC/EN 62368-1(CB-report)				

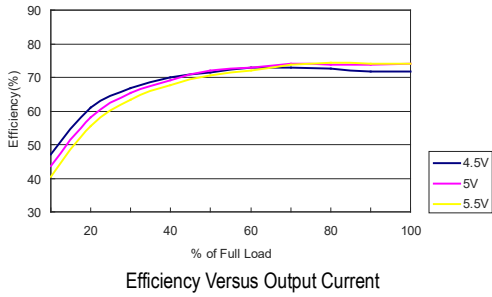
Environmental Specifications

Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (See Power Derating Curve)	-40	+90	°C
Case Temperature	---	+105	°C
Storage Temperature Range	-50	+125	°C
Humidity (non condensing)	---	95	% rel. H
Lead-free Reflow Solder Process	IPC/JEDEC J-STD-020D.1		

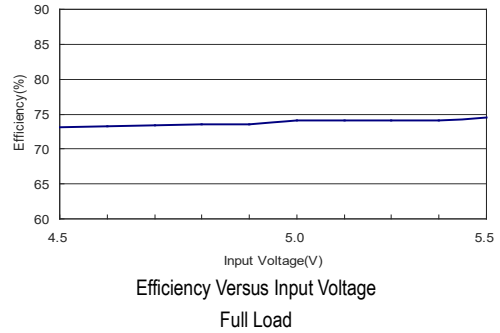
- ### Notes
- Specifications typical at Ta=+25°C, resistive load, nominal input voltage and rated output current unless otherwise noted.
 - These power converters require a minimum output loading to maintain specified regulation, operation under no-load conditions will not damage these modules; however they may not meet all specifications listed.
 - We recommend to protect the converter by a fast blow fuse in the input supply line.
 - Other input and output voltage may be available, please contact MINMAX.
 - Specifications are subject to change without notice.
 - The repeated high voltage isolation testing of the converter can degrade isolation capability, to a lesser or greater degree depending on materials, construction, environment and reflow solder process. Any material is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage. Furthermore, the high voltage isolation capability after reflow solder process should be evaluated as it is applied on system.

Characteristic Curves

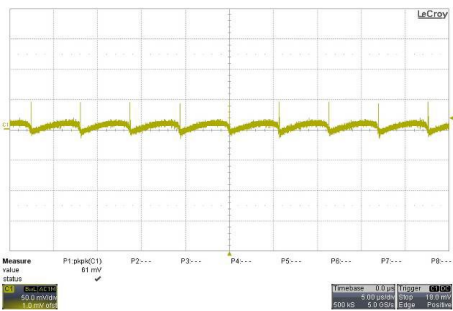
All test conditions are at 25°C The figures are identical for MSLU101



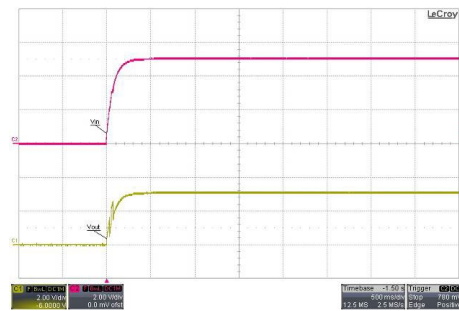
Efficiency Versus Output Current



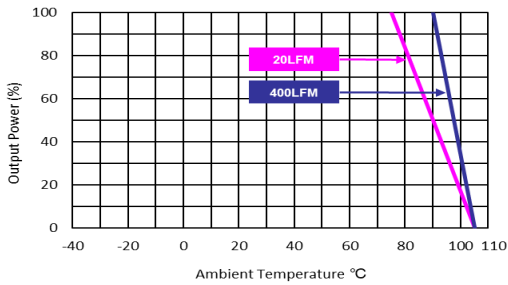
Efficiency Versus Input Voltage Full Load



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



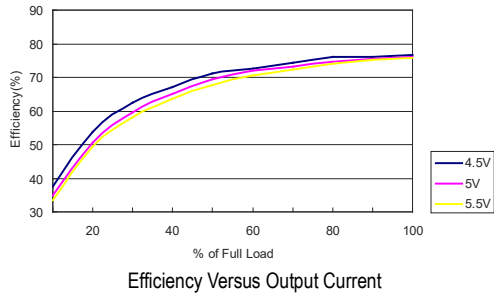
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



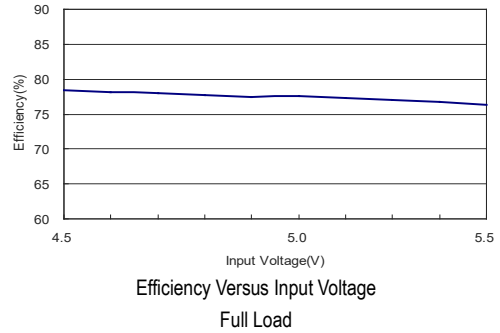
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

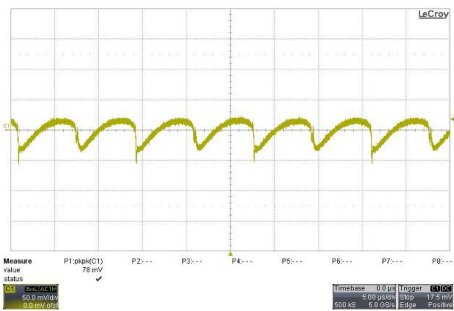
All test conditions are at 25°C The figures are identical for MSLU102



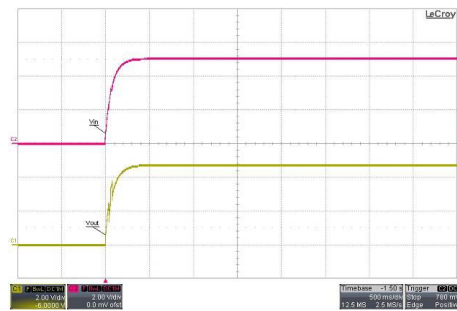
Efficiency Versus Output Current



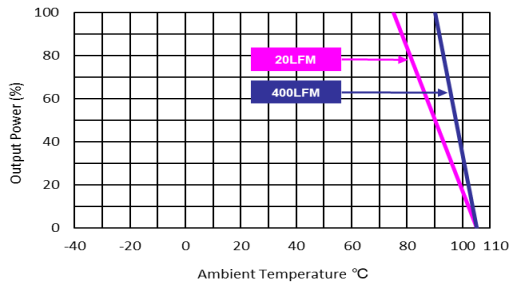
Efficiency Versus Input Voltage Full Load



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



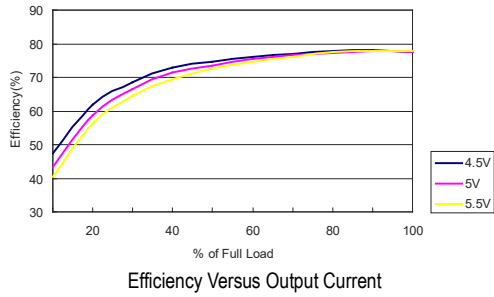
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



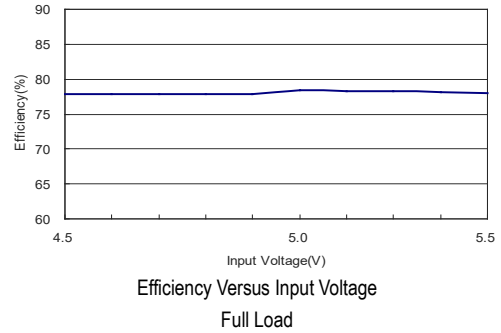
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

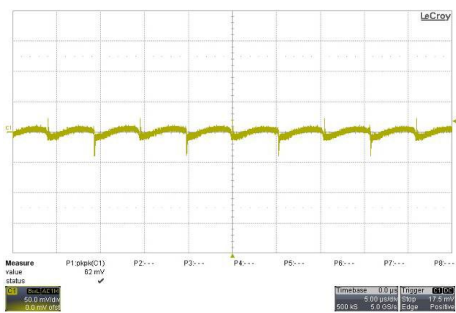
All test conditions are at 25°C The figures are identical for MSLU103



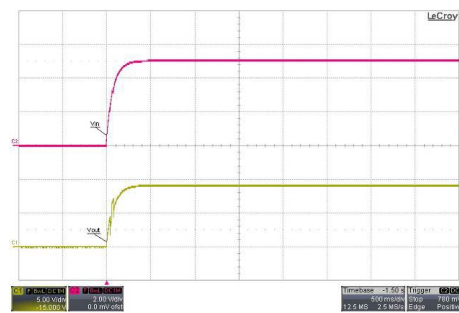
Efficiency Versus Output Current



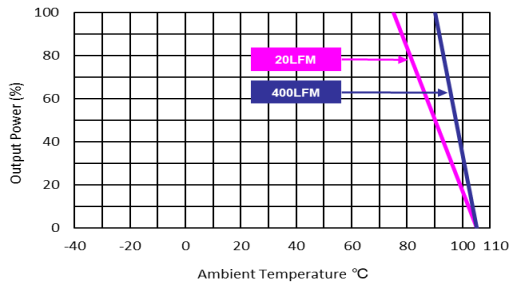
Efficiency Versus Input Voltage Full Load



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



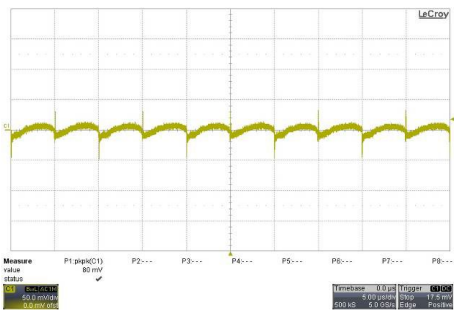
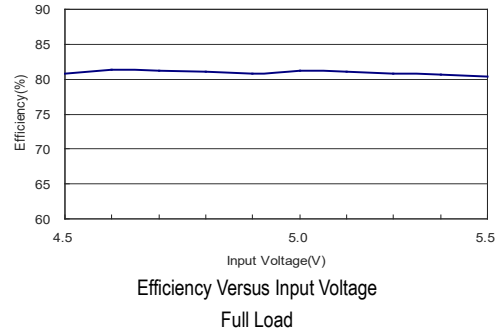
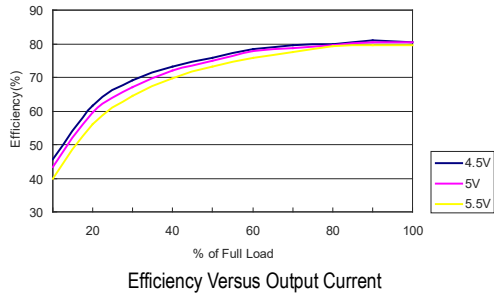
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



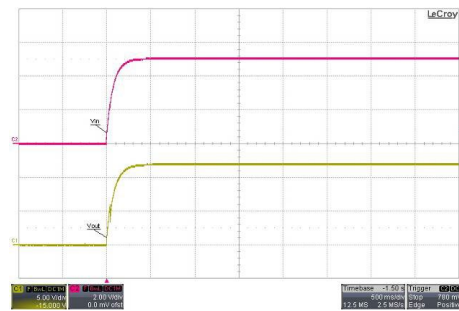
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

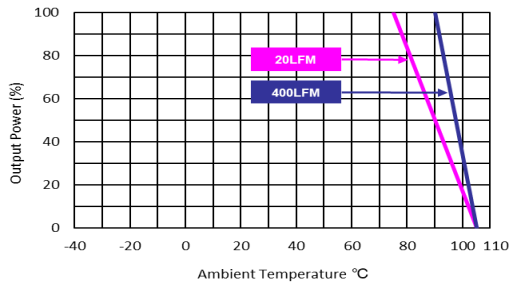
All test conditions are at 25°C The figures are identical for MSLU104



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



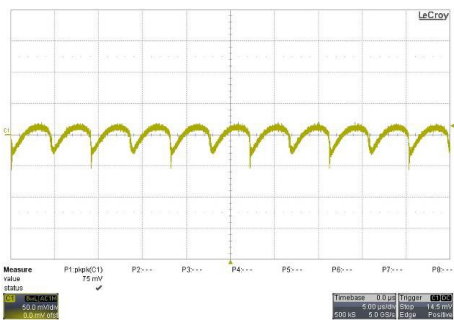
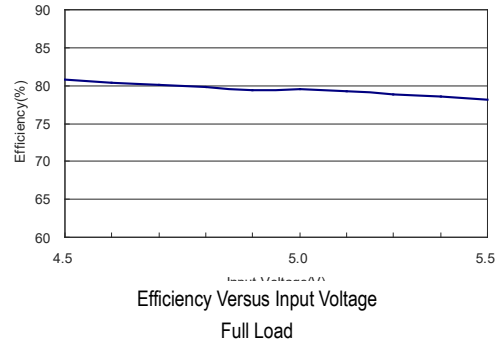
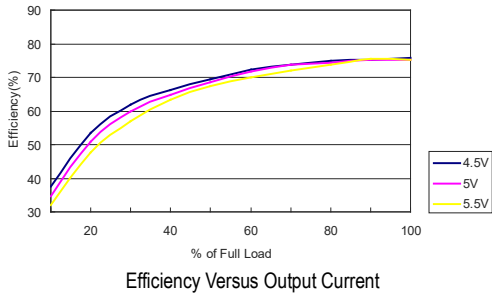
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



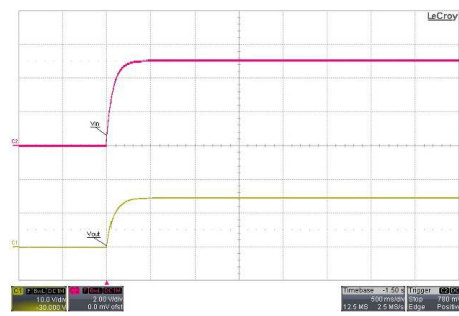
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

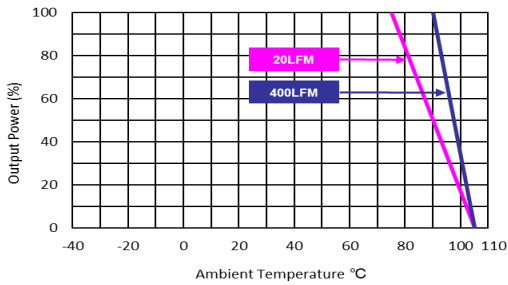
All test conditions are at 25°C The figures are identical for MSLU105



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



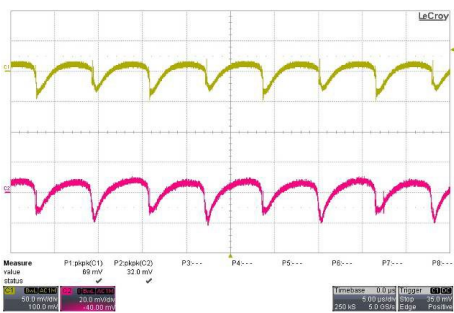
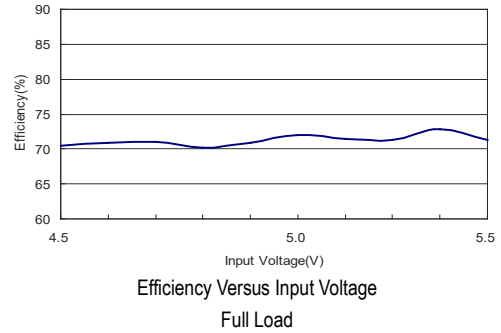
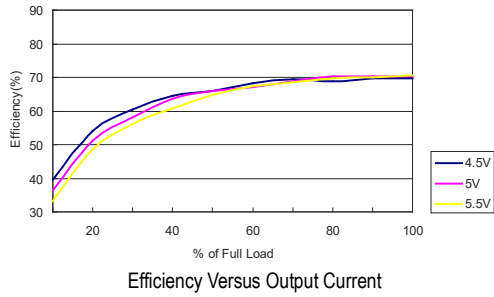
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



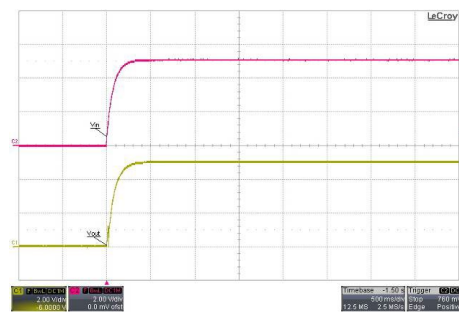
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

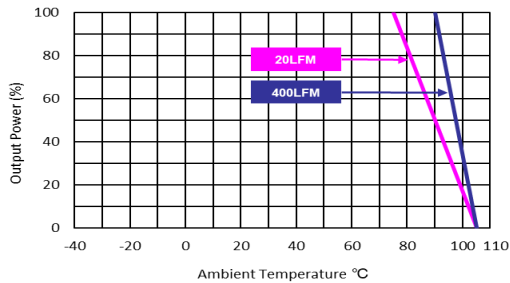
All test conditions are at 25°C The figures are identical for MSLU106



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



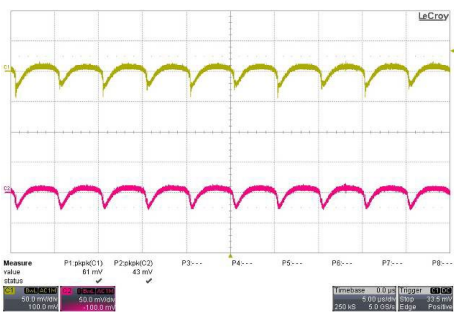
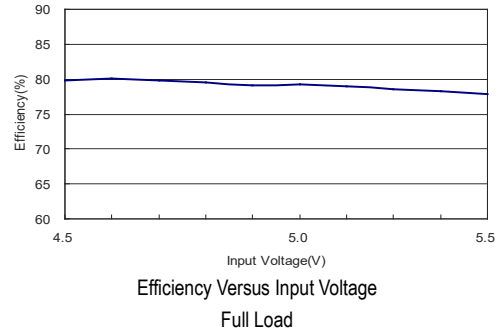
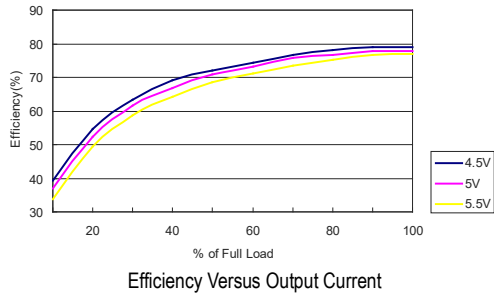
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



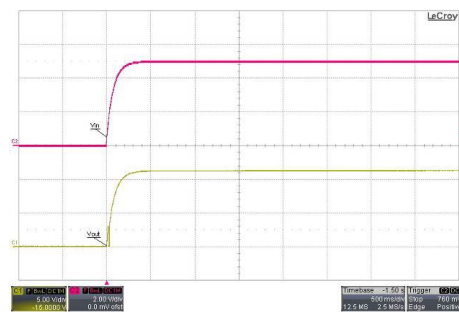
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

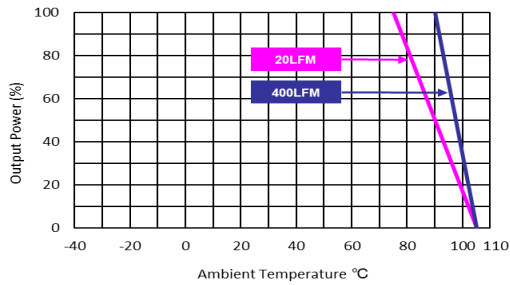
All test conditions are at 25°C The figures are identical for MSLU108



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



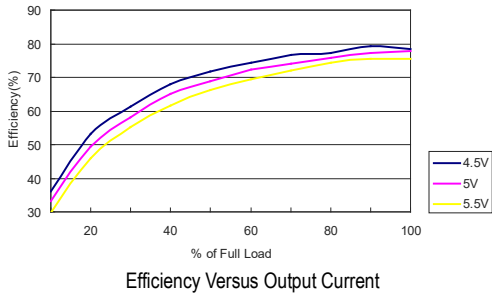
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



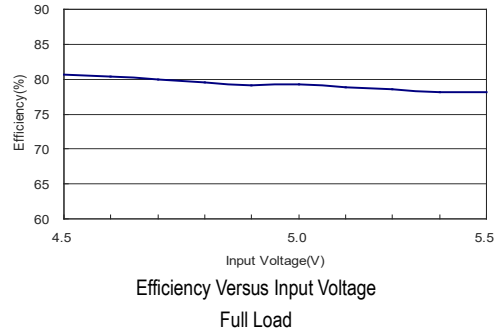
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

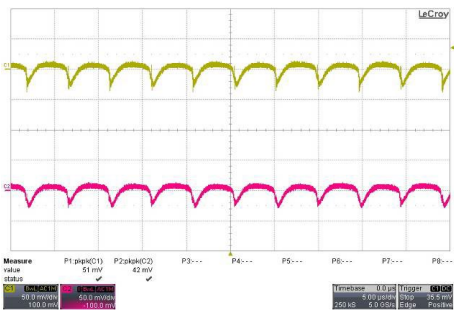
All test conditions are at 25°C The figures are identical for MSLU109



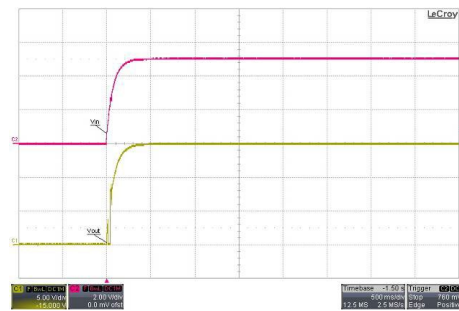
Efficiency Versus Output Current



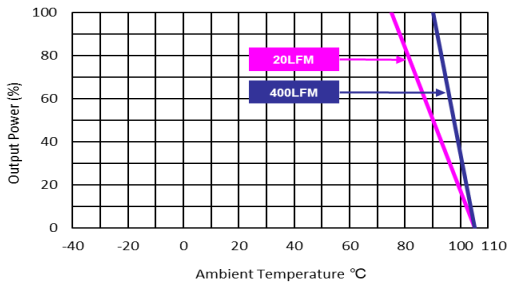
Efficiency Versus Input Voltage Full Load



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



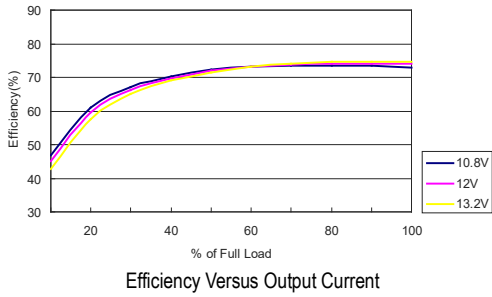
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in nom}$; Full Load



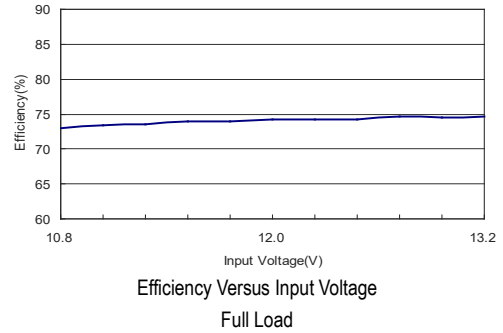
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in nom}$

Characteristic Curves

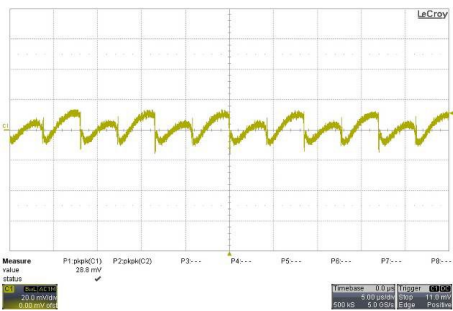
All test conditions are at 25°C The figures are identical for MSLU111



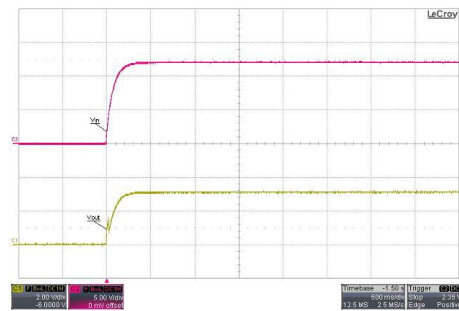
Efficiency Versus Output Current



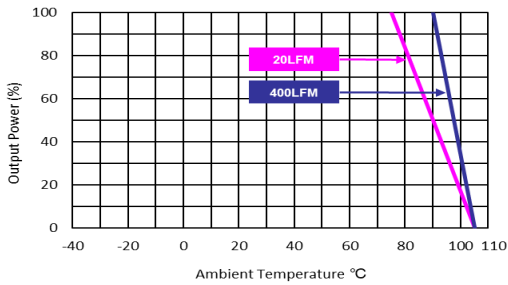
Efficiency Versus Input Voltage Full Load



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



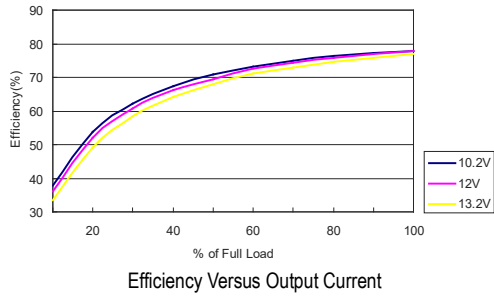
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



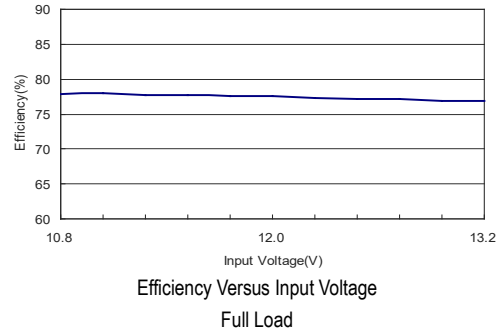
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

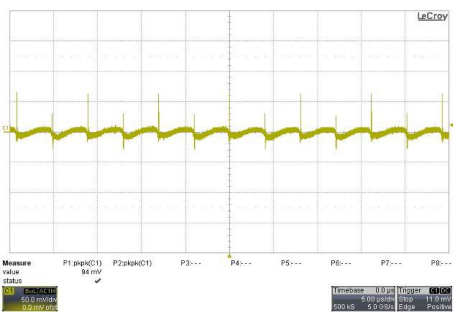
All test conditions are at 25°C The figures are identical for MSLU112



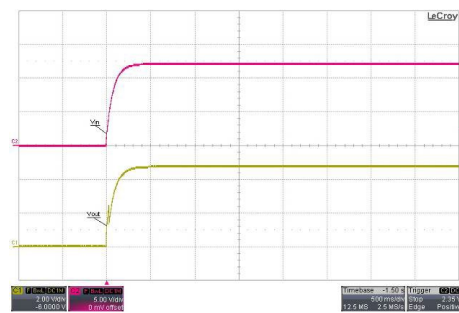
Efficiency Versus Output Current



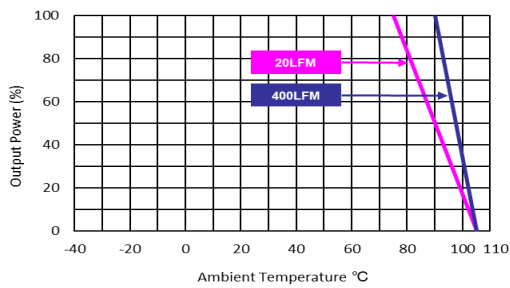
Efficiency Versus Input Voltage Full Load



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



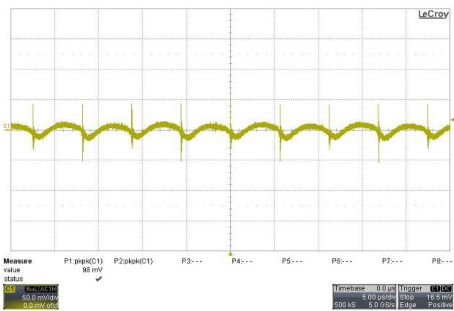
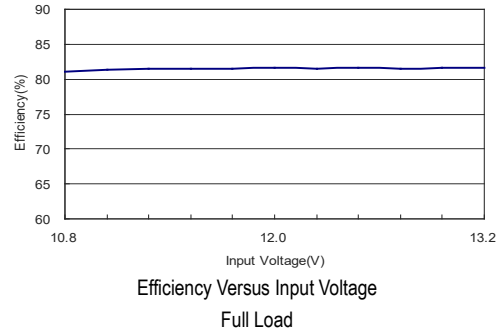
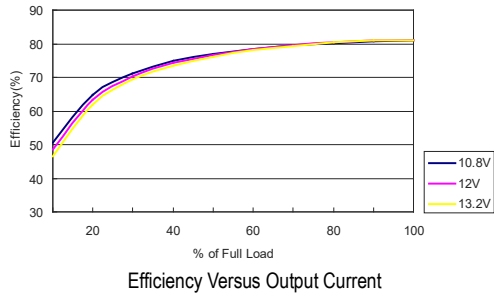
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



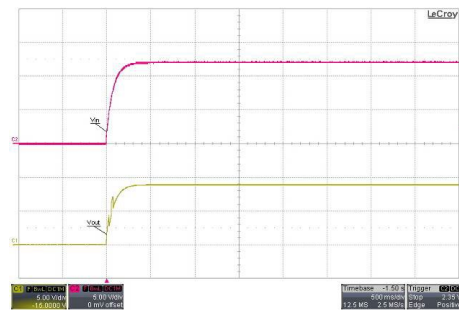
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

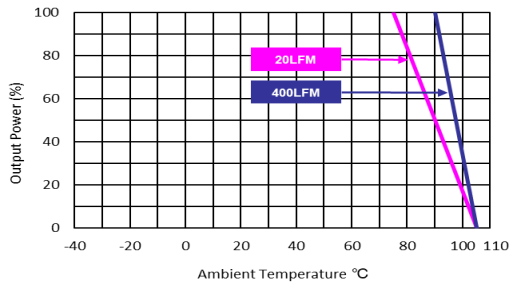
All test conditions are at 25°C The figures are identical for MSLU113



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



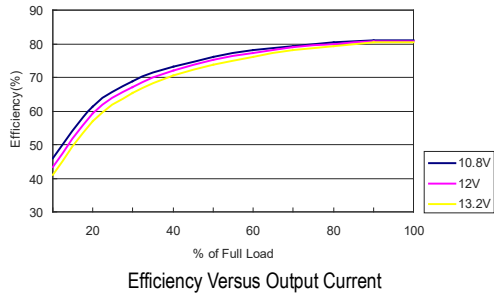
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



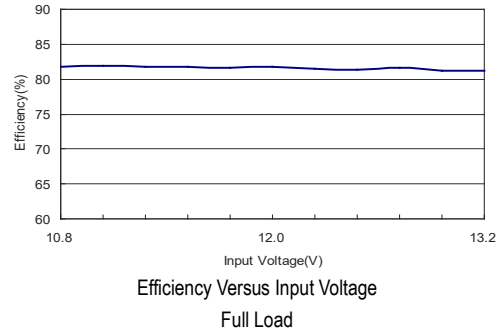
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

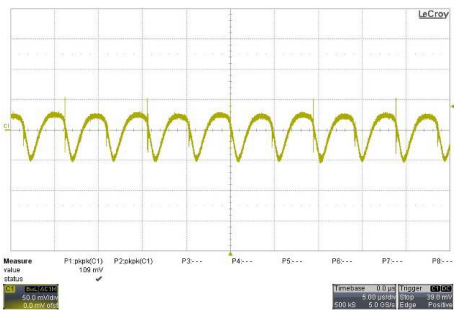
All test conditions are at 25°C The figures are identical for MSLU114



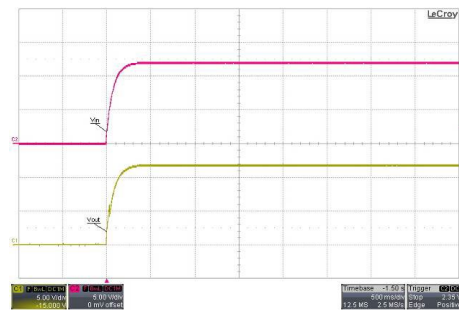
Efficiency Versus Output Current



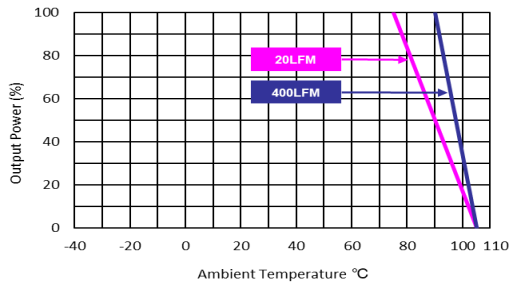
Efficiency Versus Input Voltage Full Load



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



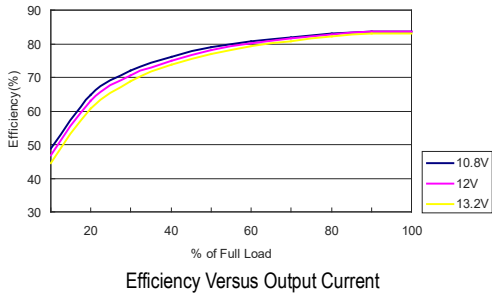
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



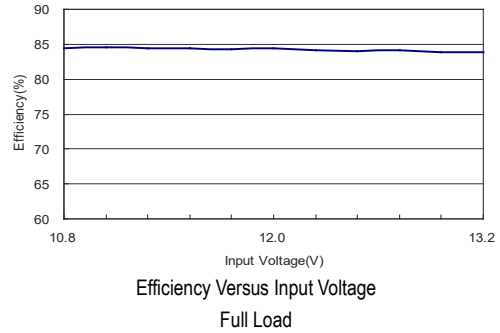
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

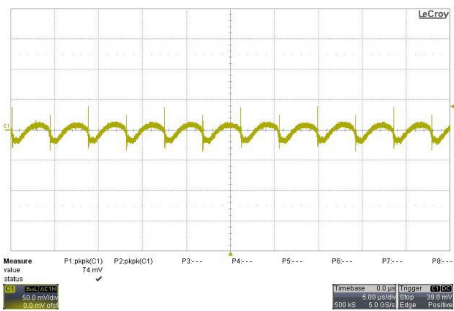
All test conditions are at 25°C The figures are identical for MSLU115



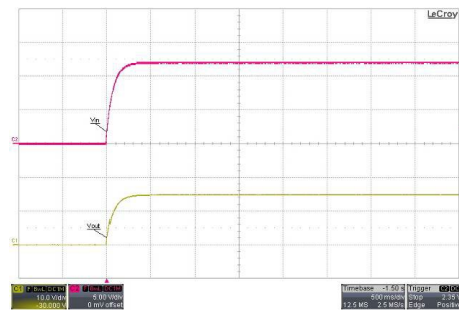
Efficiency Versus Output Current



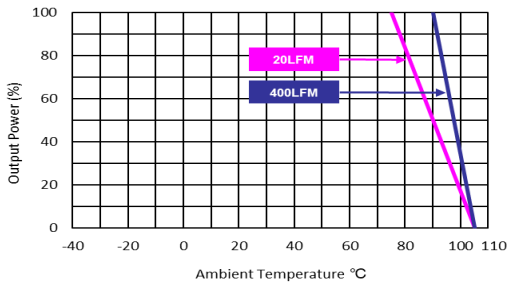
Efficiency Versus Input Voltage Full Load



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



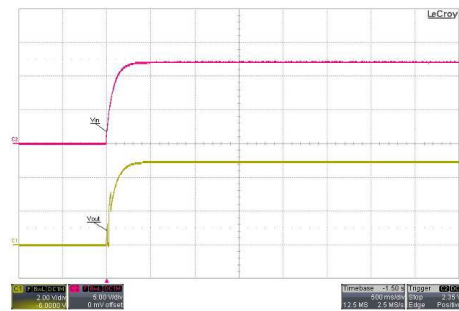
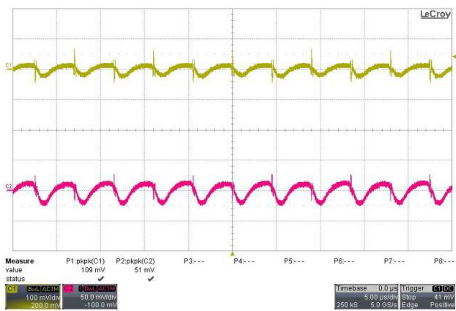
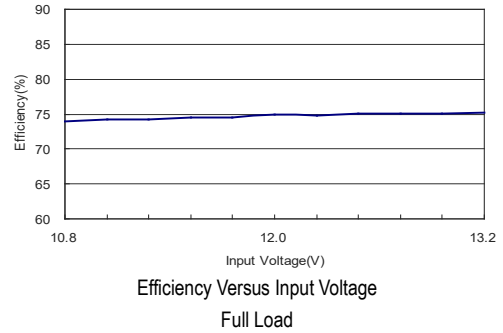
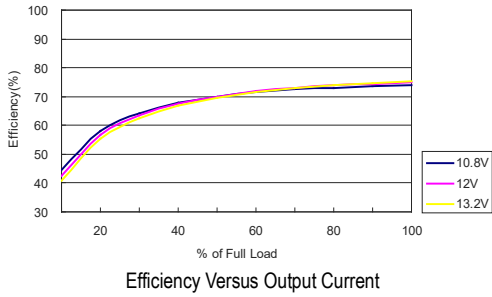
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



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

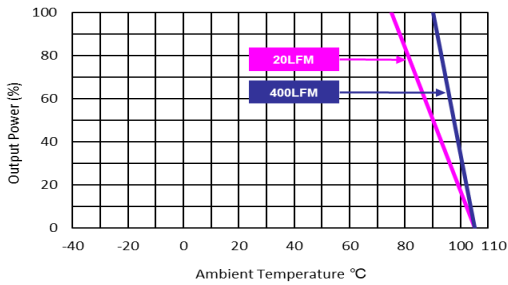
Characteristic Curves

All test conditions are at 25°C The figures are identical for MSLU116



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

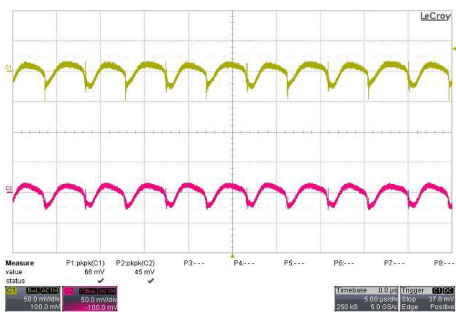
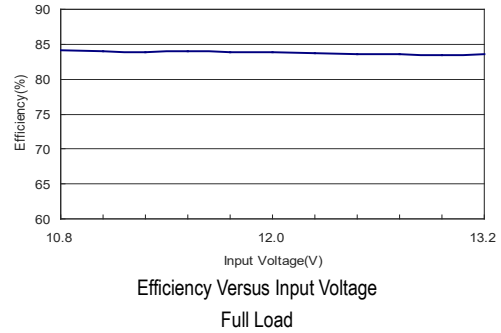
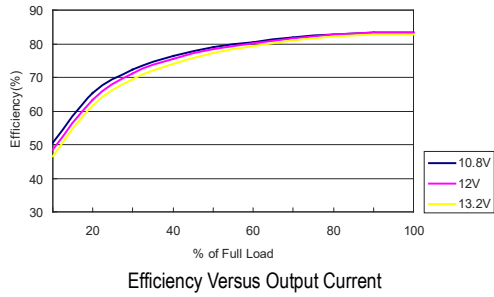
Typical Input Start-Up and Output Rise Characteristic
V_{in}=V_{in nom}; Full Load



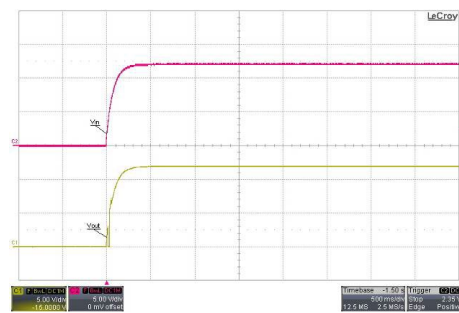
Derating Output Current Versus Ambient Temperature and Airflow
V_{in}=V_{in nom}

Characteristic Curves

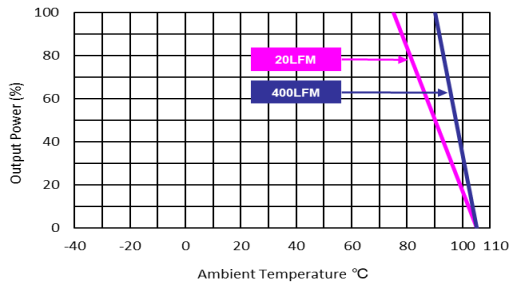
All test conditions are at 25°C The figures are identical for MSLU118



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



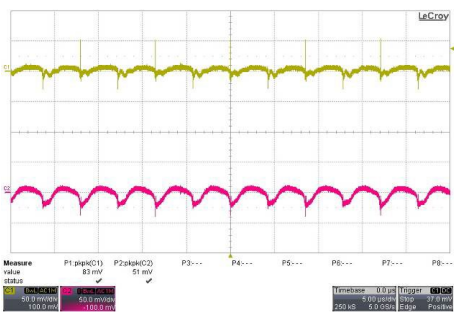
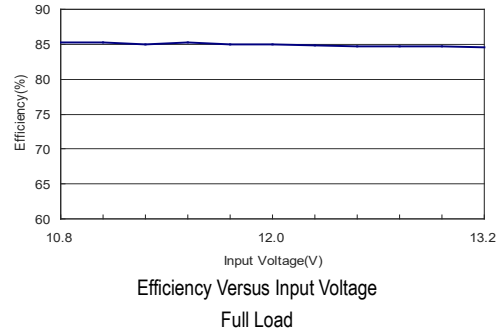
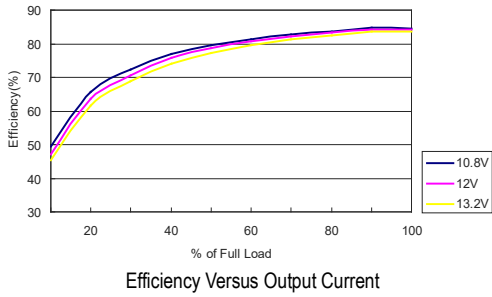
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in nom}$; Full Load



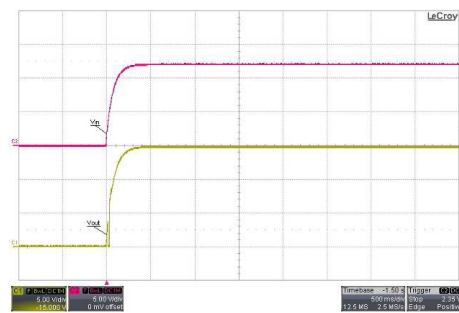
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in nom}$

Characteristic Curves

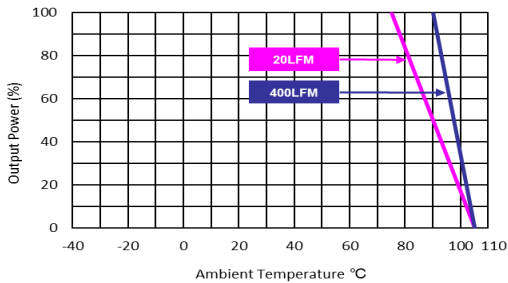
All test conditions are at 25°C The figures are identical for MSLU119



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



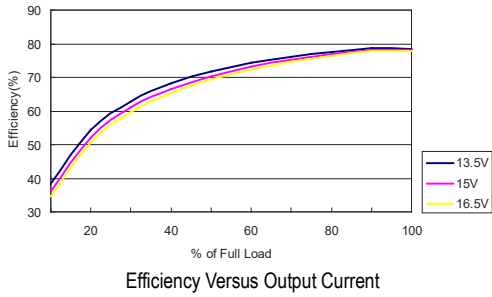
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}; Full\ Load$



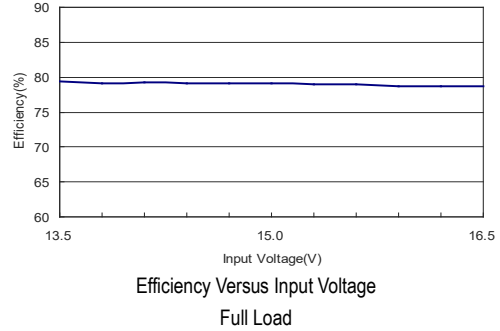
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

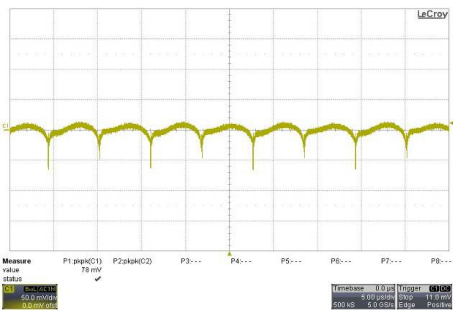
All test conditions are at 25°C The figures are identical for MSLU154



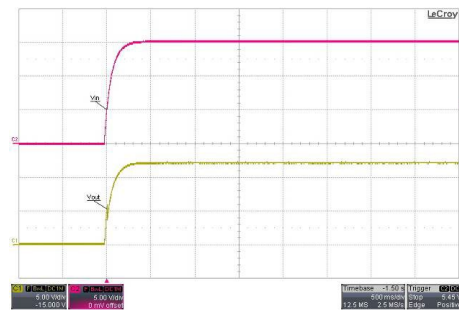
Efficiency Versus Output Current



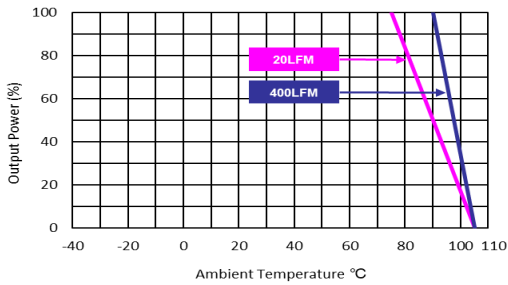
Efficiency Versus Input Voltage Full Load



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



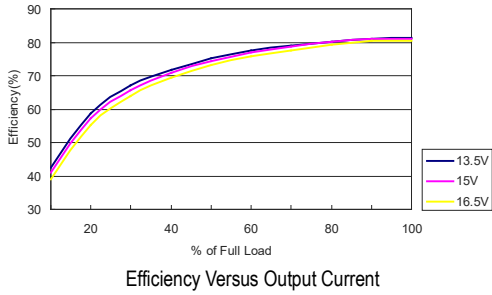
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



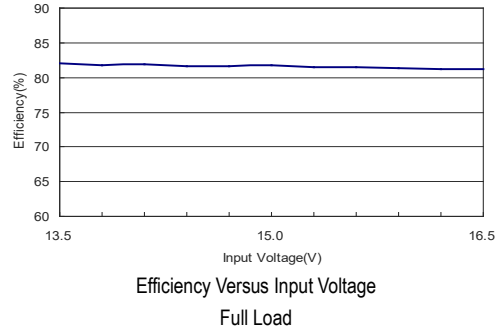
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

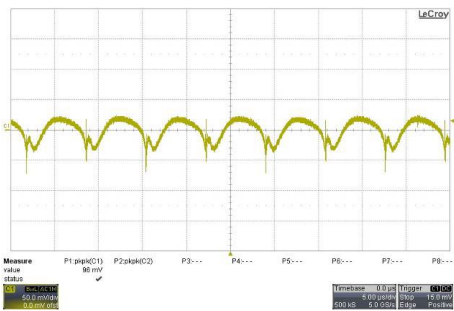
All test conditions are at 25°C The figures are identical for MSLU155



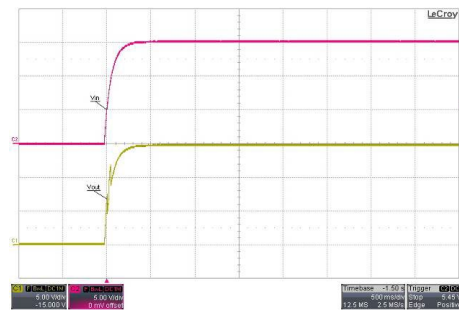
Efficiency Versus Output Current



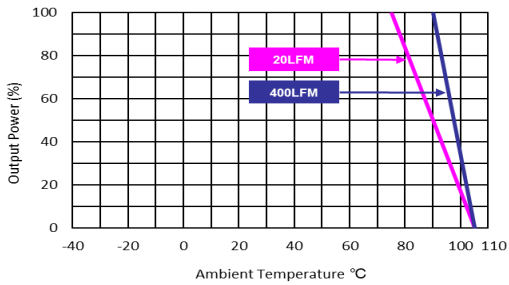
Efficiency Versus Input Voltage Full Load



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



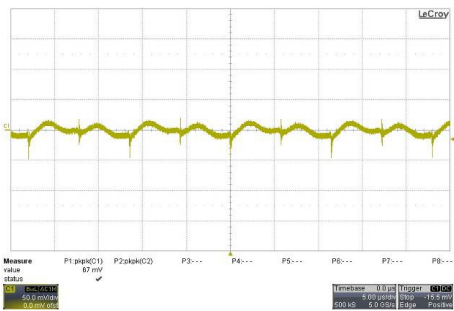
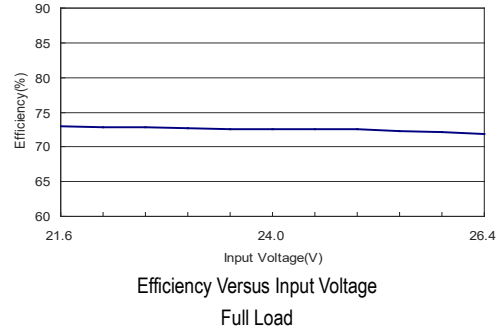
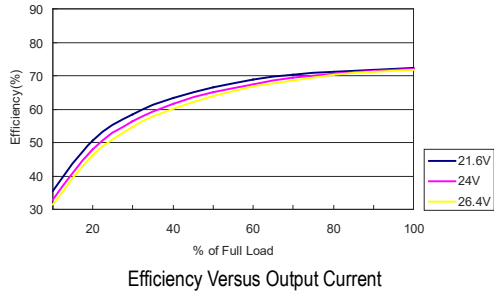
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



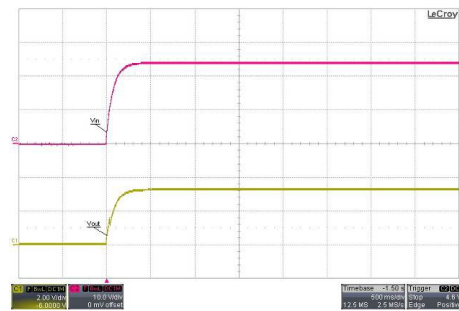
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

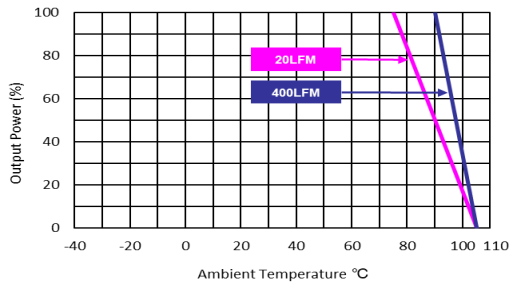
All test conditions are at 25°C The figures are identical for MSLU121



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



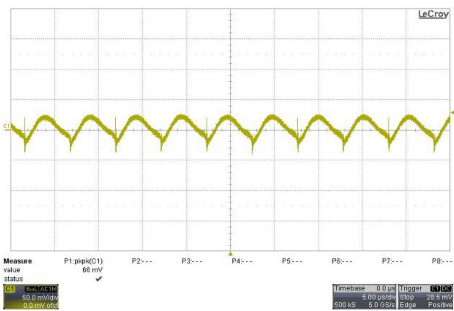
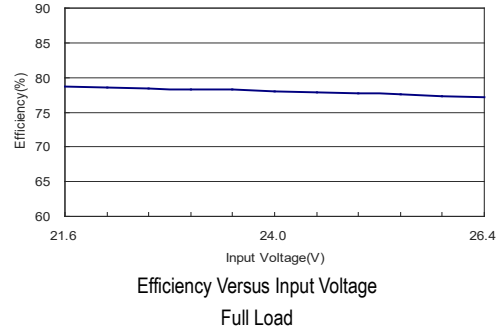
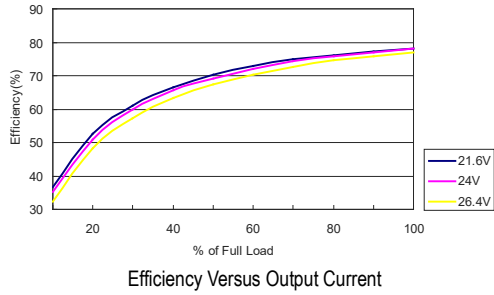
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in nom}$; Full Load



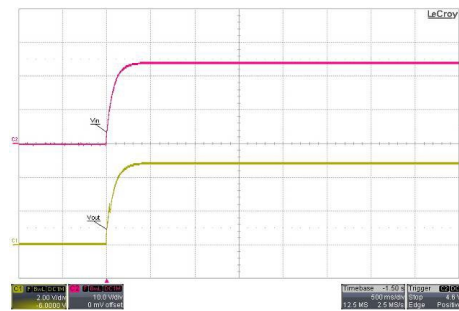
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in nom}$

Characteristic Curves

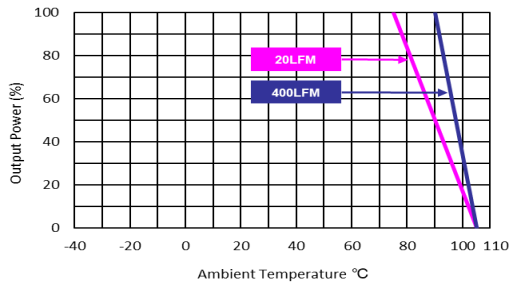
All test conditions are at 25°C The figures are identical for MSLU122



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



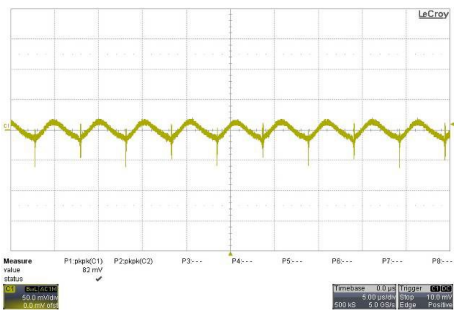
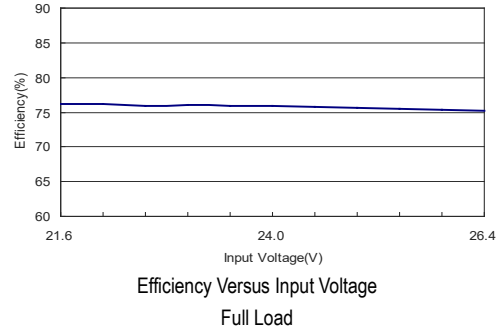
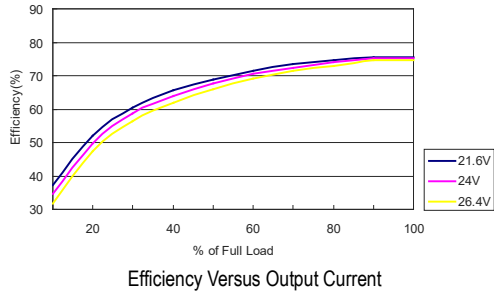
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



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

Characteristic Curves

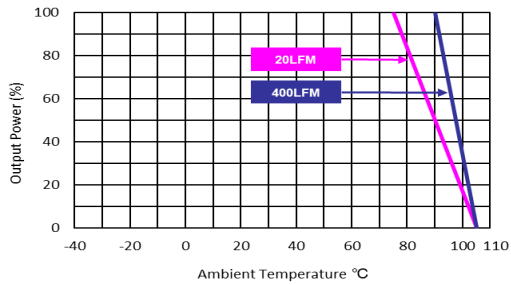
All test conditions are at 25°C The figures are identical for MSLU123



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



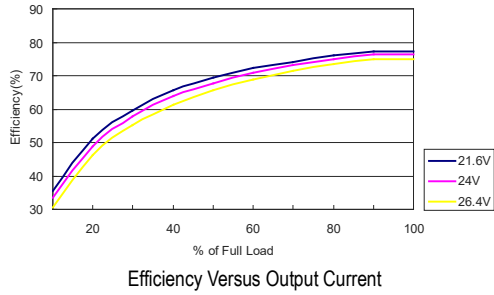
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



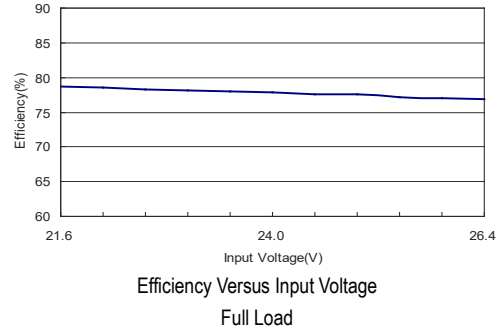
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

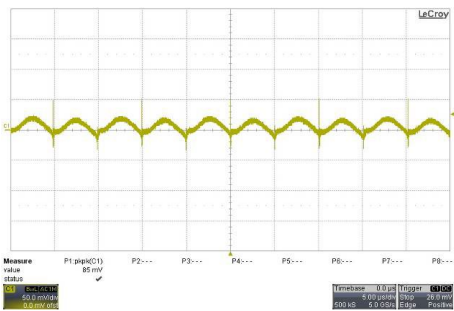
All test conditions are at 25°C The figures are identical for MSLU124



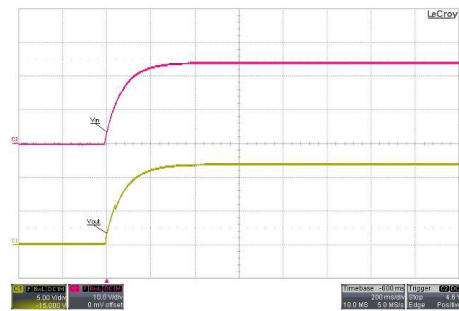
Efficiency Versus Output Current



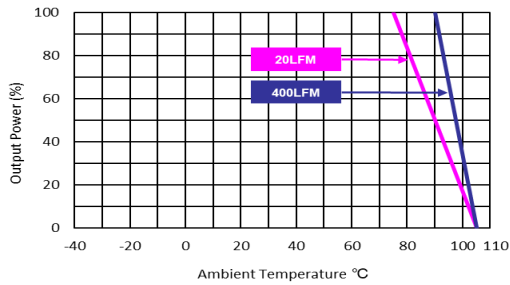
Efficiency Versus Input Voltage Full Load



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



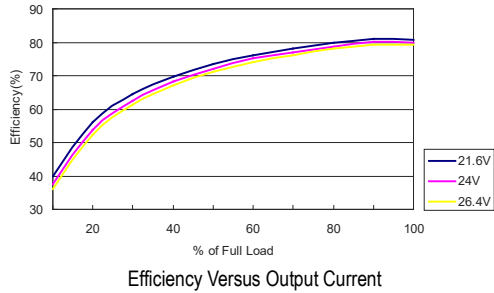
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



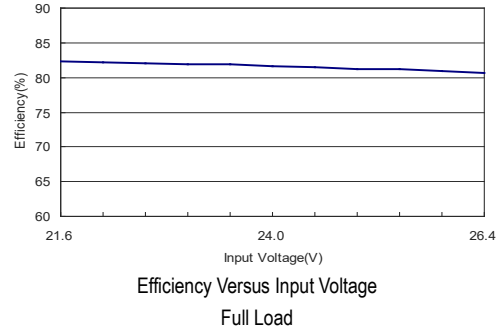
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

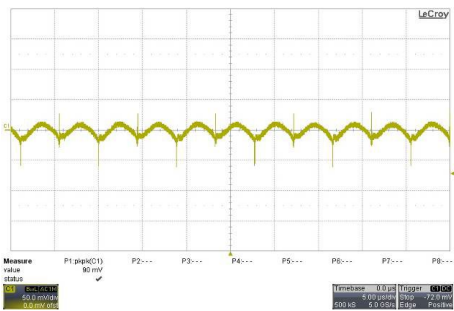
All test conditions are at 25°C The figures are identical for MSLU125



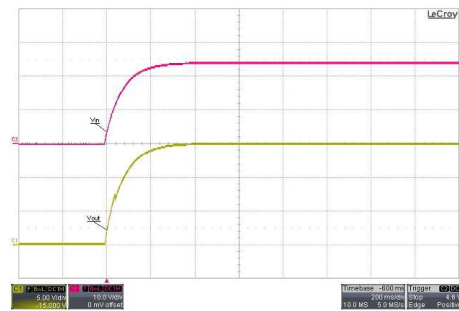
Efficiency Versus Output Current



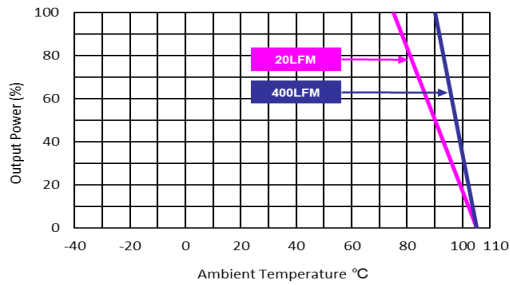
Efficiency Versus Input Voltage Full Load



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



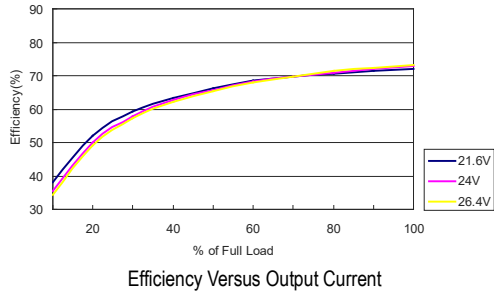
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in nom}$; Full Load



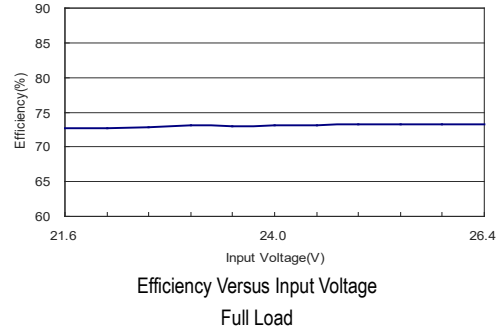
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in nom}$

Characteristic Curves

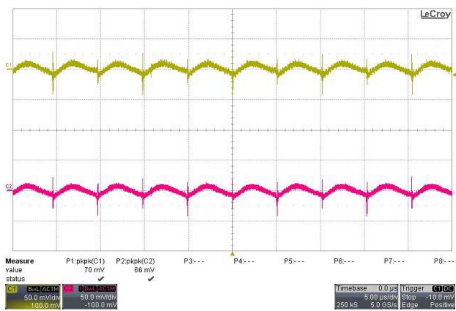
All test conditions are at 25°C The figures are identical for MSLU126



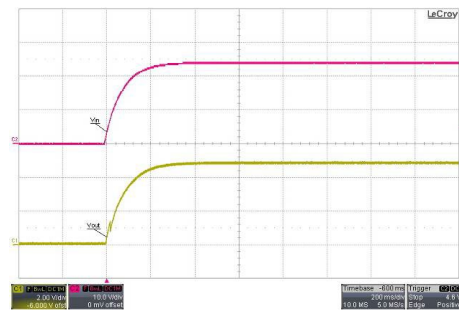
Efficiency Versus Output Current



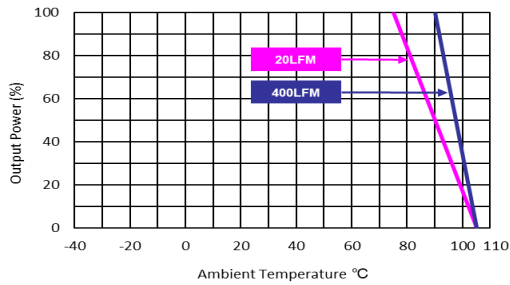
Efficiency Versus Input Voltage Full Load



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



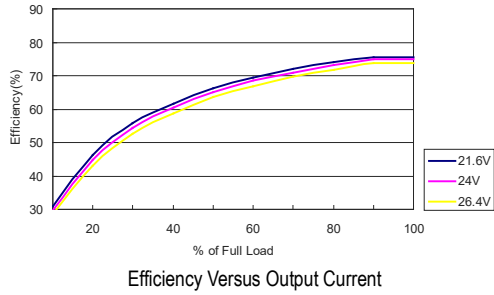
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



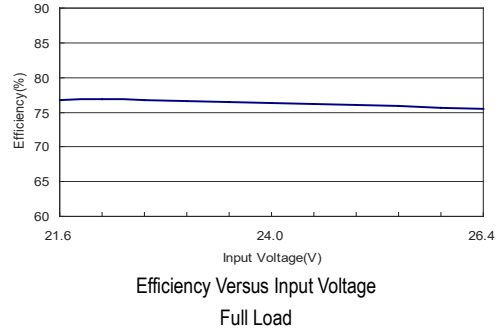
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

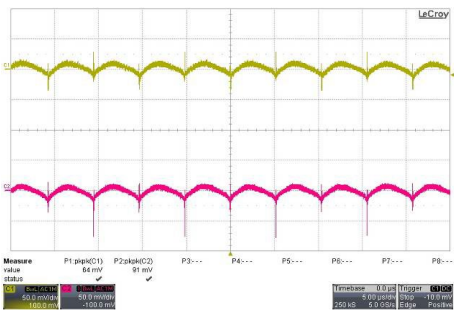
All test conditions are at 25°C The figures are identical for MSLU128



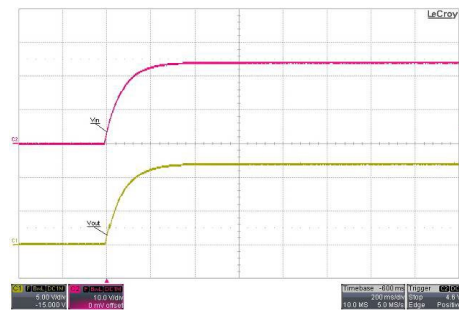
Efficiency Versus Output Current



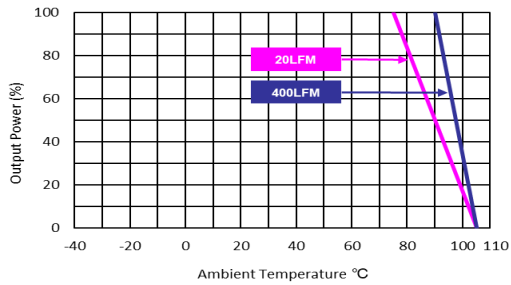
Efficiency Versus Input Voltage Full Load



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



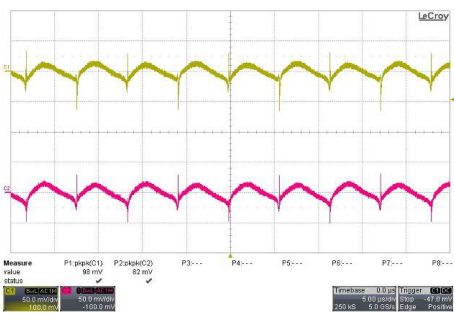
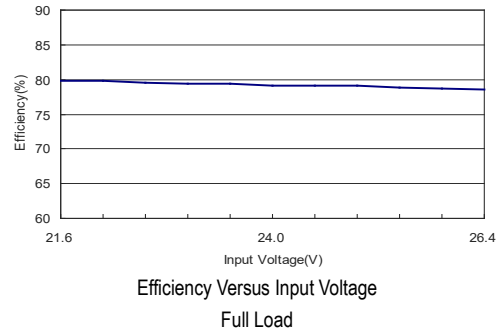
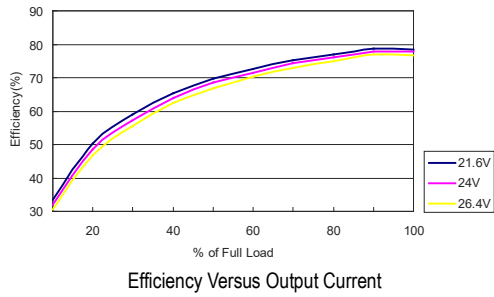
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



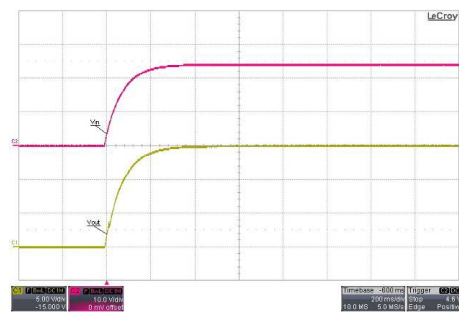
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

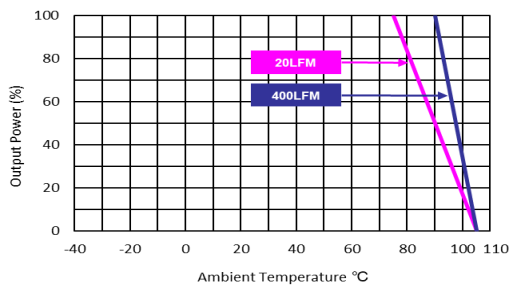
All test conditions are at 25°C The figures are identical for MSLU129



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



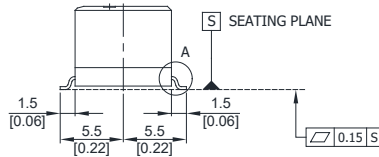
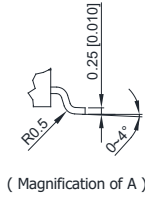
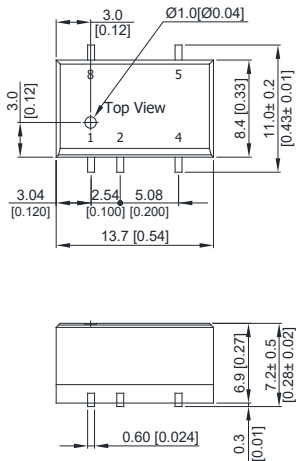
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



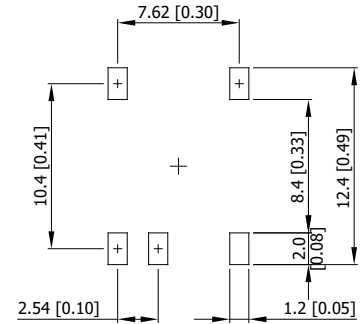
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Package Specifications

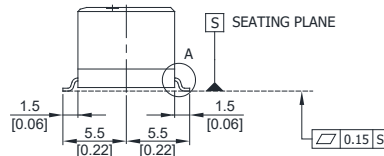
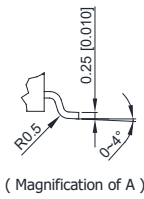
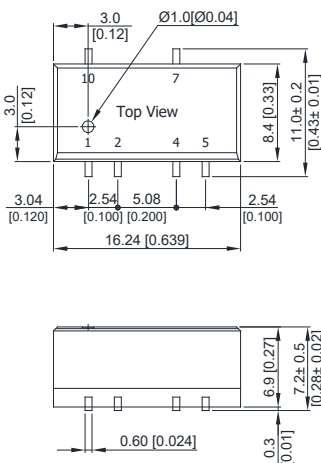
Mechanical Dimensions (Single Output)



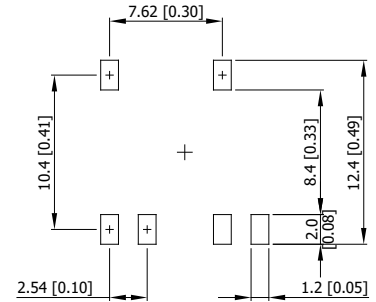
Connecting Pin Patterns



Mechanical Dimensions (Dual Output)



Connecting Pin Patterns



- ▶ 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)

Pin Connections

Pin	Single Output	Dual Output
1	-Vin	-Vin
2	+Vin	+Vin
3	No Pin	No Pin
4	-Vout	Common
5	+Vout	-Vout
6	No Pin	No Pin
7	No Pin	+Vout
8	NA	No Pin
9	---	No Pin
10	---	NA

NA : Not Available for Electrical Connection

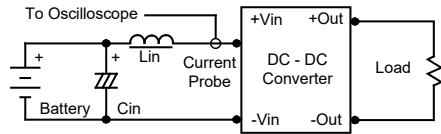
Physical Characteristics

Case Size (Single Output)	: 13.7x8.4x6.9mm (0.54x0.33x0.27 inches)
Case Size (Dual Output)	: 16.24x8.4x6.9mm (0.64x0.33x0.27 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Pin Material	: Phosphor Bronze
Weight (Single Output)	: 1.7g
Weight (Dual Output)	: 2.0g

Test Setup

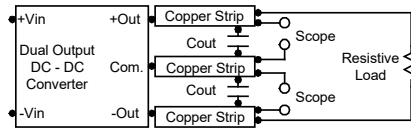
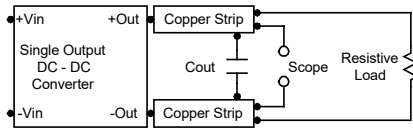
Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor L_{in} (4.7 μ H) and C_{in} (220 μ F, ESR < 1.0 Ω at 100 kHz) to simulate source impedance. Capacitor C_{in} offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500 kHz.



Peak-to-Peak Output Noise Measurement Test

Use a C_{out} 0.33 μ F 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.



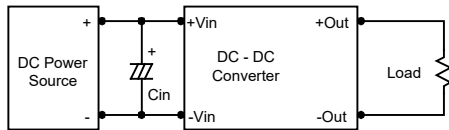
Technical Notes

Maximum Capacitive Load

The MSLU100 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 33 μ F maximum capacitive load. The maximum capacitance can be found in the data sheet.

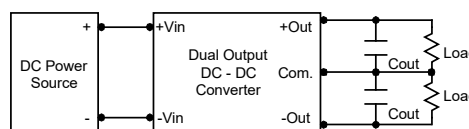
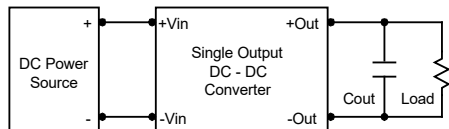
Input Source Impedance

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 < 1.0 Ω at 100 kHz) capacitor of a 2.2 μ F for the 5V input devices, a 1.0 μ F for the 12V input devices and a 0.47 μ F for the 24V input devices.



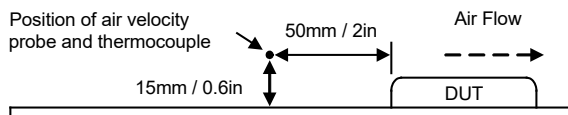
Output Ripple Reduction

A good quality low ESR capacitor placed as close as practicable across the load will give the best ripple and noise performance. To reduce output ripple, it is recommended to use 3.3 μ F capacitors at the output.



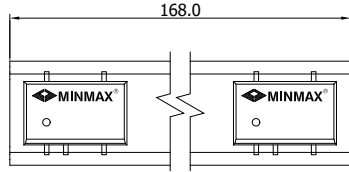
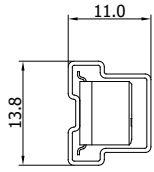
Thermal Considerations

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.

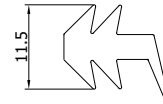


Packaging Information for Tube (Single Output)

Tube



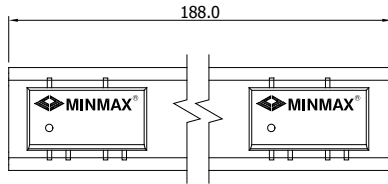
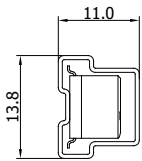
Plug



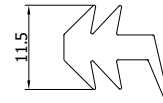
Unit: mm
10 PCS per TUBE

Packaging Information for Tube (Dual Output)

Tube



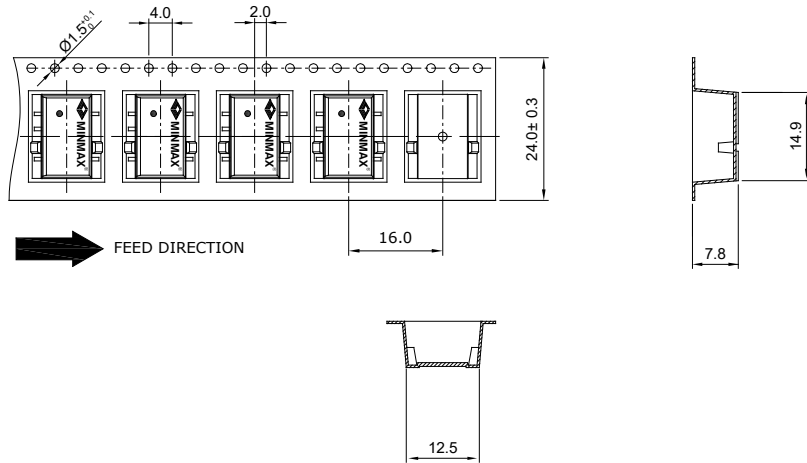
Plug



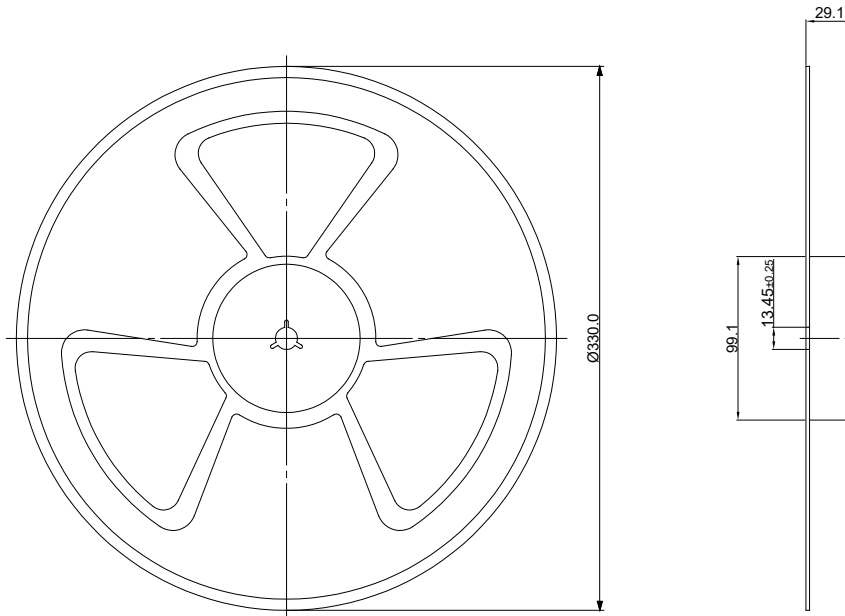
Unit: mm
10 PCS per TUBE

Packaging Information for Tape & Reel (Single Output)

Tape



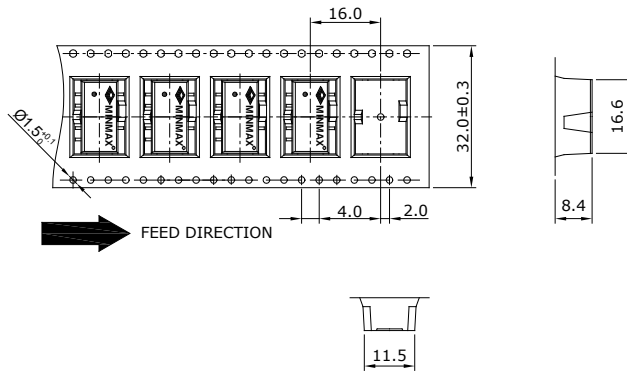
Reel



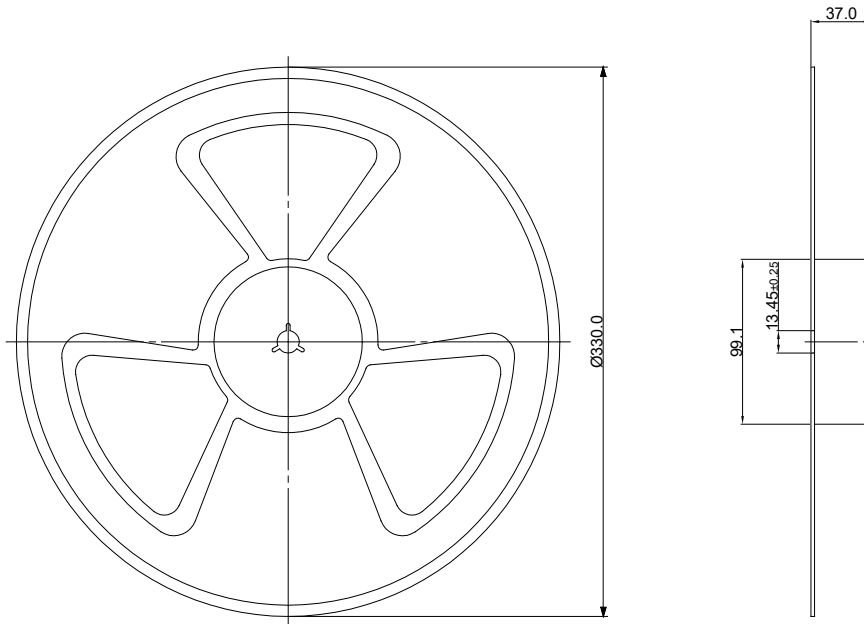
Packaging Style	Quantity
With Heatsink Tube	N/A
Tape and Reel to IEC 286-3 Specifications	500

Packaging Information for Tape & Reel (Dual Output)

Tape



Reel



Packaging Style	Quantity
With Heatsink Tube	N/A
Tape and Reel to IEC 286-3 Specifications	450

Soldering and Reflow Considerations

Profile	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate(T_s max. To T_p)	3°C/second max.	3°C/second max.
Preheat <ul style="list-style-type: none"> · Temperature Min (T_{smin}) · Temperature Max (T_{smax}) · Time (T_{smin} to T_{smax}) (ts) 	100°C 150°C 60~120 seconds	150°C 200°C 60~180 seconds
Time maintained above: <ul style="list-style-type: none"> · Temperature (T_L) · Time (t_L) 	183°C 60~150 seconds	217°C 60~150 seconds
Peak Temperature (T_p)	See Table 4-1	See Table 4-2
Time within 5°C of actual Peak Temperature (t_p) ²	10~30 seconds	20~40 seconds
Ramp-down Rate	6°C/second max.	6°C/second max.
Time 25°C to Peak Temperature	6 minutes max.	8 minutes max.

Note 1: All temperatures refer to topside of the package, measured on the package body surface.

Note 2: Time within 5°C of actual peak temperature (t_p) specified for the reflow profiles is a "supplier" minimum and "user" maximum.

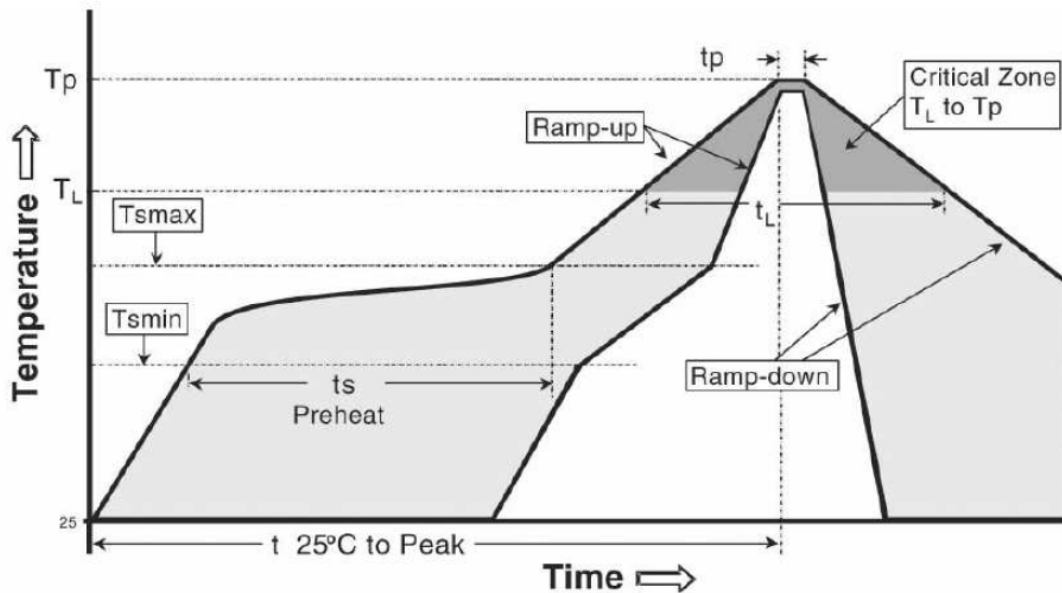


Table 4-1 SnPb Eutectic Process-Classification Temperatures (T_c)

Package Thickness	Volume mm ³	Volume mm ³
<2.5mm	<350	≥350
≥2.5mm	235°C	220°C
	220°C	220°C

Table 4-2 Pb-Free Process-Classification Temperatures (T_c)

Package Thickness	Volume mm ³	Volume mm ³	Volume mm ³
<1.6mm	<350	350-2000	>2000
1.6mm-2.5mm	260°C	260°C	260°C
>2.5mm	260°C	250°C	245°C
	250°C	245°C	245°C

Part Number Structure

M	SL	U	10	1
	Package Type SMD-8 (Single) SMD-10 (Dual)	Output Regulation Unregulated	Input Voltage Range 10: 4.5 ~ 5.5 VDC 11: 10.8 ~ 13.2 VDC 15: 13.5 ~ 16.5 VDC 12: 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 8: ±12 VDC 9: ±15 VDC

MTBF and Reliability

The MTBF of MSLU100 series of DC-DC converters has been calculated using

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

Model	MTBF	Unit
MSLU101	5,116,959	Hours
MSLU102	5,120,702	
MSLU103	5,143,277	
MSLU104	5,169,867	
MSLU105	5,169,867	
MSLU106	5,116,959	
MSLU108	5,120,702	
MSLU109	5,120,702	
MSLU111	5,162,242	
MSLU112	5,166,052	
MSLU113	5,200,595	
MSLU114	5,216,096	
MSLU115	5,166,052	
MSLU116	5,162,242	
MSLU118	5,166,052	
MSLU119	5,166,052	
MSLU154	5,247,376	
MSLU155	5,247,376	
MSLU121	5,247,376	
MSLU122	5,251,313	
MSLU123	5,275,057	
MSLU124	5,303,031	
MSLU125	5,251,313	
MSLU126	5,247,376	
MSLU128	5,251,313	
MSLU129	5,251,313	