



MINMAX[®]

MCWI03 Series

Electric Characteristic Note

MCWI03 Series EC Note

DC-DC CONVERTER 3W, SIP Package

Features

- ▶ Compact SIP-8 Package
- ▶ Encapsulated 3W Converter
- ▶ Ultra-wide 4:1 Input Voltage Range
- ▶ Fully Regulated Output Voltage
- ▶ I/O Isolation 1600 VDC
- ▶ Wide Operating Ambient Temp. Range
- ▶ Overload and Short Circuit Protection
- ▶ Remote On/Off Control
- ▶ UL/cUL/IEC/EN 62368-1, UL/cUL 60950-1 Safety Approval



Applications

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

Product Overview

The MINMAX MCWI03 Series is a compact 3W encapsulated DC-DC converter in a space-efficient SIP-8 package, engineered for demanding industrial, communication, and embedded applications. Featuring an ultra-wide 4:1 input voltage range, the series provides exceptional flexibility for systems operating under fluctuating or variable supply conditions. Its fully regulated output voltage and 1600 VDC I/O isolation ensure stable, reliable performance and strong noise immunity across diverse environments.

Designed for robust system integration, the MCWI03 Series includes overload and short-circuit protection, supports remote On/Off control, and operates across a wide ambient temperature range, making it ideal for compact, high-performance power architectures. Certified to UL/cUL/IEC/EN 62368-1 safety standards, it offers a dependable and compliant isolated power solution for next-generation electronic designs.

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Model Selection Guide

Model Number	Input Voltage (Range) VDC	Output Voltage VDC	Output Current		Input Current		Max. capacitive Load μ F	Efficiency (typ.) @Max. Load %
			Max.	Min.	@Max. Load mA(typ.)	@No Load mA(typ.)		
			mA	mA				
MCWI03-12S033	12 (4.5 ~ 18)	3.3	700	175	260	60	1760	74
MCWI03-12S05		5	600	150	320		1000	78
MCWI03-12S12		12	250	63	313		170	80
MCWI03-12S15		15	200	50	313		110	80
MCWI03-12D05		\pm 5	\pm 300	\pm 75	313		470 #	80
MCWI03-12D12		\pm 12	\pm 125	\pm 31	313		100 #	80
MCWI03-12D15		\pm 15	\pm 100	\pm 25	313		47 #	80
MCWI03-24S033	24 (9 ~ 36)	3.3	700	175	128	25	1760	75
MCWI03-24S05		5	600	150	156		1000	80
MCWI03-24S12		12	250	63	154		170	81
MCWI03-24S15		15	200	50	154		110	81
MCWI03-24D05		\pm 5	\pm 300	\pm 75	158		470 #	79
MCWI03-24D12		\pm 12	\pm 125	\pm 31	156		100 #	80
MCWI03-24D15		\pm 15	\pm 100	\pm 25	154		47 #	81
MCWI03-48S033	48 (18 ~ 75)	3.3	700	175	65	15	1760	74
MCWI03-48S05		5	600	150	79		1000	79
MCWI03-48S12		12	250	63	79		170	79
MCWI03-48S15		15	200	50	79		110	79
MCWI03-48D05		\pm 5	\pm 300	\pm 75	79		470 #	79
MCWI03-48D12		\pm 12	\pm 125	\pm 31	79		100 #	79
MCWI03-48D15		\pm 15	\pm 100	\pm 25	78		47 #	80

For each output

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Input Surge Voltage (1 sec. max.)	12V Input Models	-0.7	---	25	VDC
	24V Input Models	-0.7	---	50	
	48V Input Models	-0.7	---	100	
Start-Up Threshold Voltage	12V Input Models	3	4	4.5	
	24V Input Models	4.5	6	9	
	48V Input Models	8.5	12	18	
Under Voltage Shutdown	12V Input Models	---	3.5	4	
	24V Input Models	---	---	8	
	48V Input Models	---	---	16	
Short Circuit Input Power	All Models	---	---	2500	mW
Input Filter					Internal Capacitor

Remote On/Off Control

Parameter	Conditions	Min.	Typ.	Max.	Unit
Converter On	Under 0.6 VDC or Open Circuit				
Converter Off	2.7 to 15 VDC				
Device Standby Input Current	Nominal Vin	---	---	3	mA
Control Input Current (on)	Vin = 0V	---	---	1	mA
Control Input Current (off)	Vin = 5.0V	---	---	1	mA
Control Common	Referenced to Negative Input				

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy		---	---	±1.0	%Vnom.
Output Voltage Balance	Dual Output, Balanced Loads	---	±0.5	±2.0	%
Line Regulation	Vin=Min. to Max. @Full Load	---	±0.3	±0.5	%
Load Regulation	Io=25% to 100%	---	±0.5	±1.0	%
Ripple & Noise	0-20 MHz Bandwidth	---	---	75	mV _{P-P}
Transient Recovery Time	25% Load Step Change ⁽²⁾	---	300	500	µs
Transient Response Deviation		---	±3	±5	%
Temperature Coefficient		---	---	±0.02	%/°C
Over Load Protection	Foldback	110	140	---	%
Short Circuit Protection	Continuous, Automatic Recovery				

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	60 Seconds	1600	---	---	VDC
	1 Second	1920	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100kHz, 1V	---	200	---	pF
Switching Frequency		---	350	---	kHz
MTBF (calculated)	MIL-HDBK-217F@25°C, Ground Benign	897,989	---	---	Hours
Safety Approvals	UL/cUL 60950-1 recognition(CSA certificate)				
	UL/cUL 62368-1 recognition(UL certificate), IEC/EN 62368-1(CB-report)				

Environmental Specifications

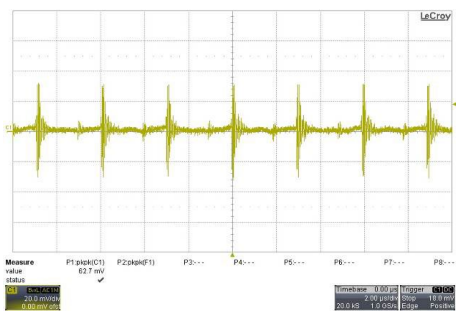
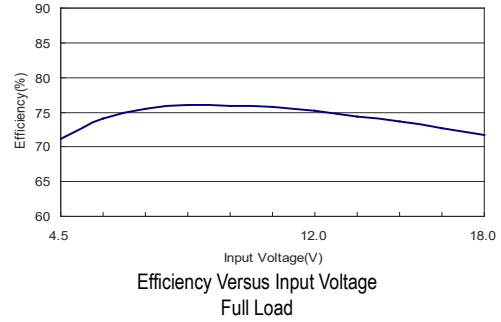
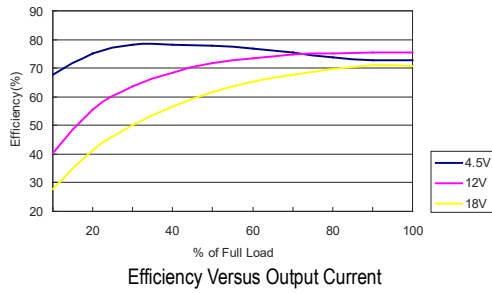
Parameter	Min.	Max.	Unit
Operating Ambient Temperature Range (For Power Derating see relative Derating Curve)	-40	+85	°C
Case Temperature	---	+100	°C
Storage Temperature Range	-55	+125	°C
Humidity (non condensing)	---	95	% rel. H
Lead Temperature (1.5mm from case for 10Sec.)	---	260	°C

Notes

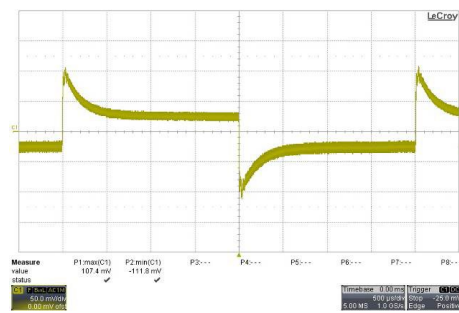
- Specifications typical at Ta=+25°C, resistive load, nominal input voltage and rated output current unless otherwise noted.
- Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.
- Ripple & Noise measured with a 1µF/50V M/C.
- Please do not operate the product without a minimum load condition.
- We recommend to protect the converter by a slow 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

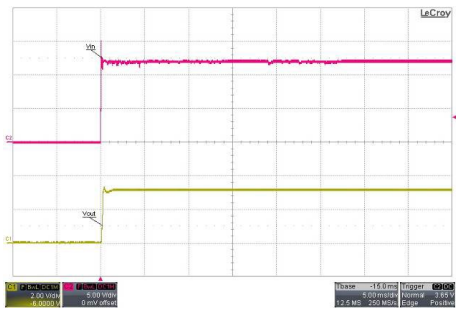
All test conditions are at 25°C The figures are identical for MCWI03-12S033



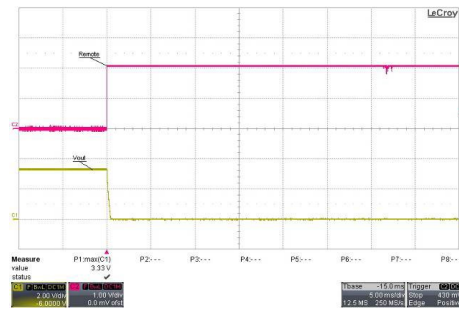
Typical Output Ripple and Noise
 $V_{in}=V_{in\ nom}$; Full Load



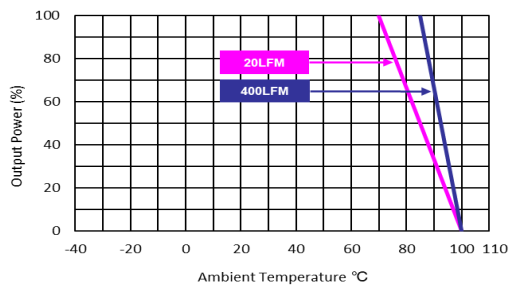
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



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



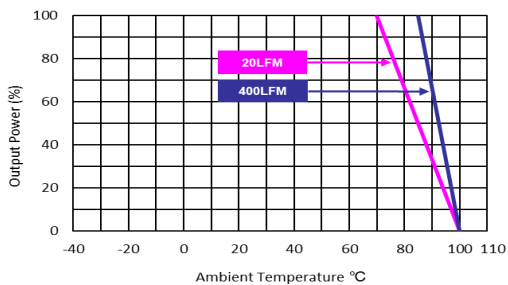
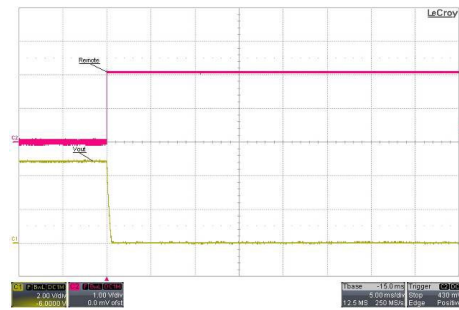
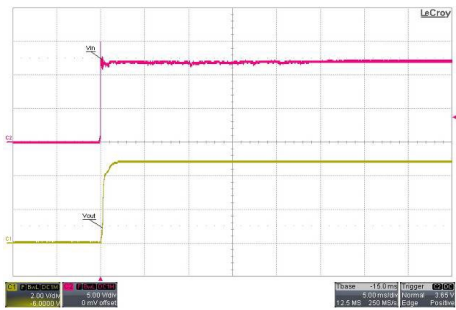
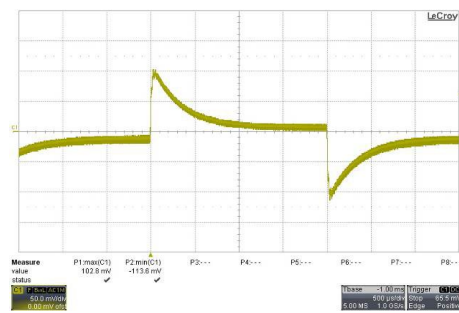
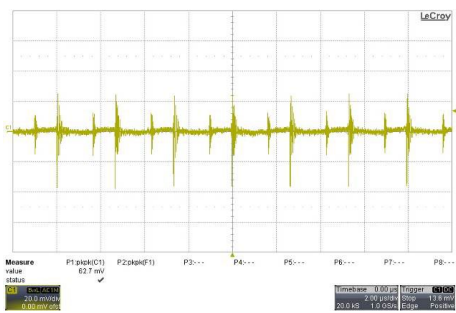
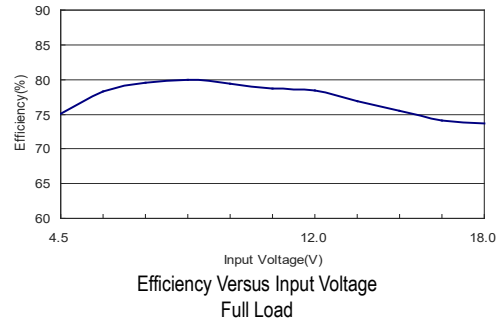
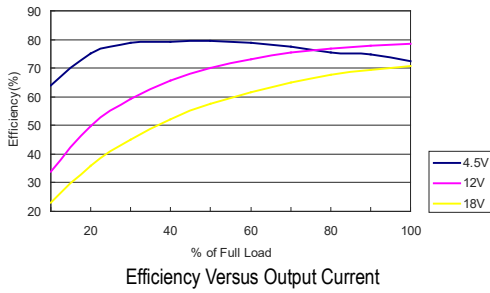
ON/OFF Voltage Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



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

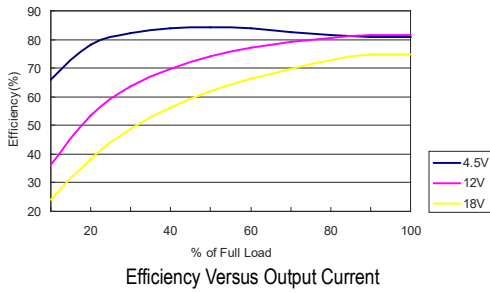
Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-12S05

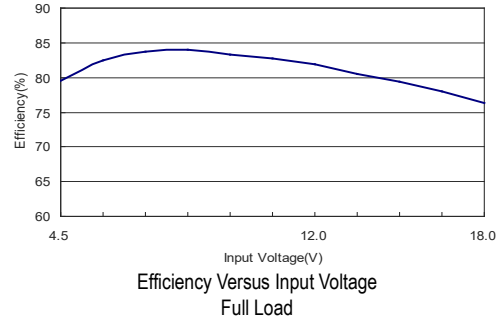


Characteristic Curves

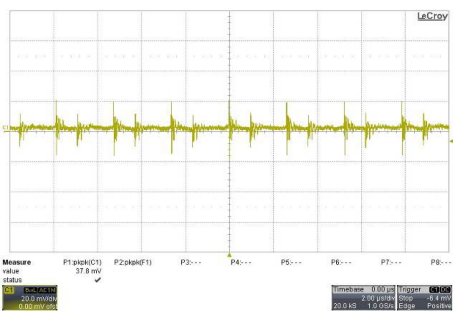
All test conditions are at 25°C The figures are identical for MCWI03-12S12



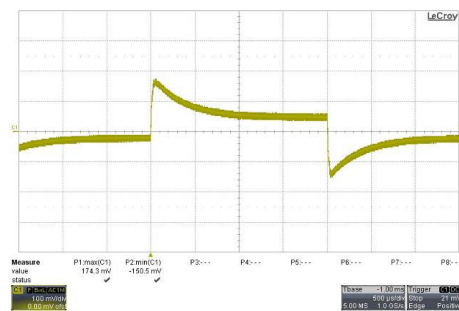
Efficiency Versus Output Current



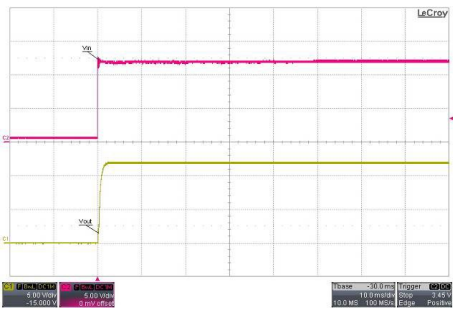
Efficiency Versus Input Voltage Full Load



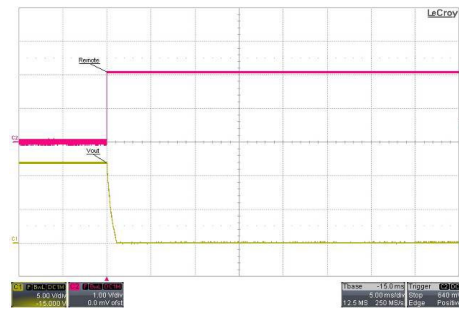
Typical Output Ripple and Noise
 $V_{in}=V_{in\ nom}$; Full Load



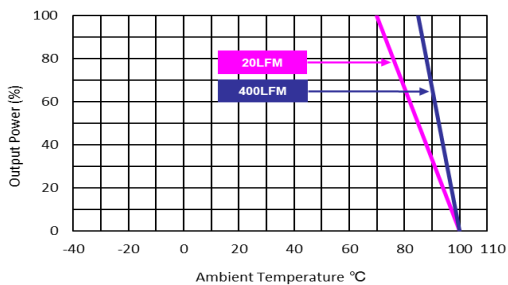
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



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



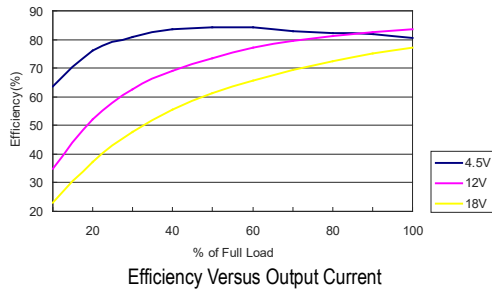
ON/OFF Voltage Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



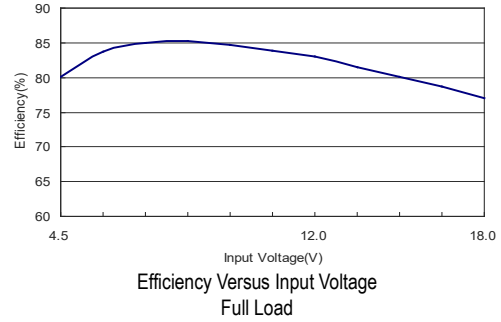
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

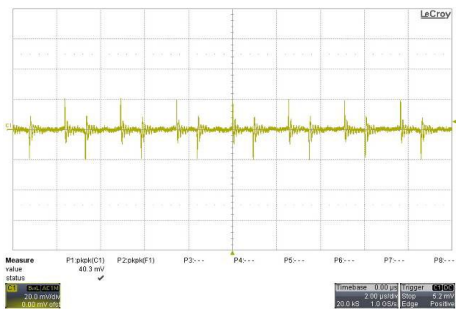
All test conditions are at 25°C The figures are identical for MCWI03-12S15



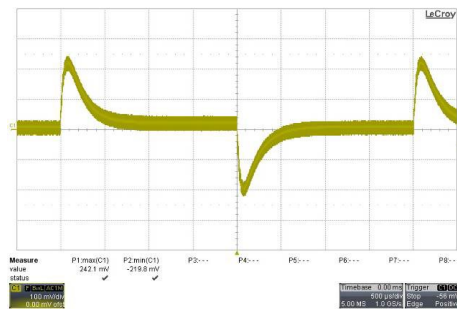
Efficiency Versus Output Current



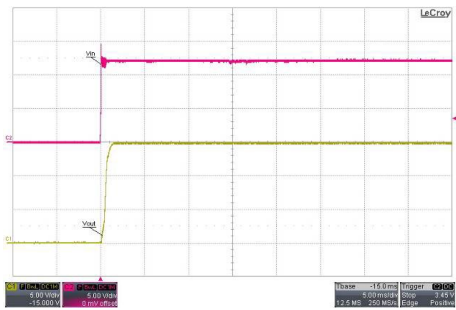
Efficiency Versus Input Voltage Full Load



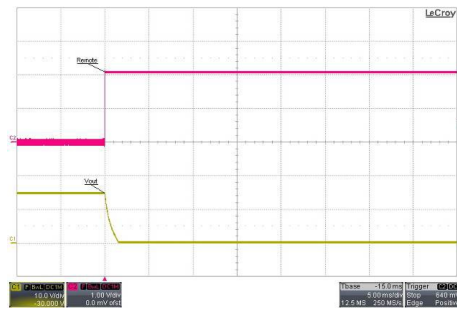
Typical Output Ripple and Noise
 $V_{in}=V_{in\ nom}$; Full Load



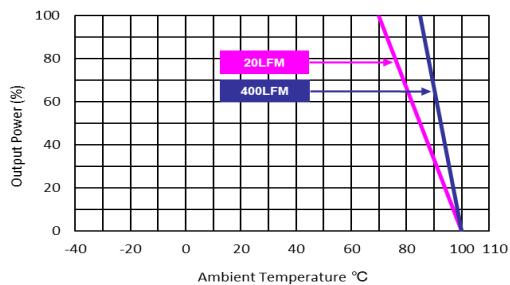
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



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



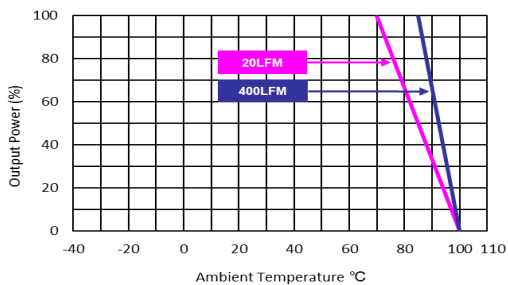
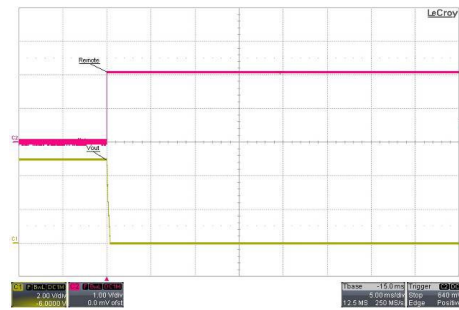
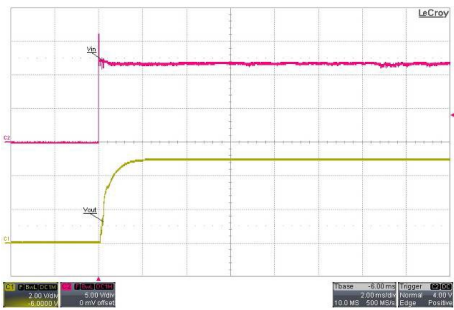
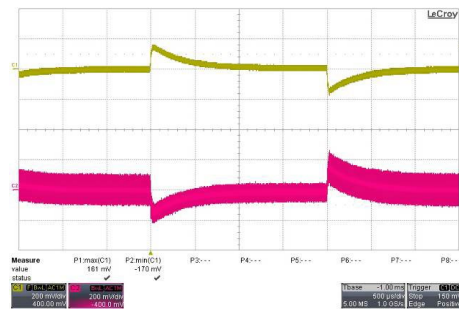
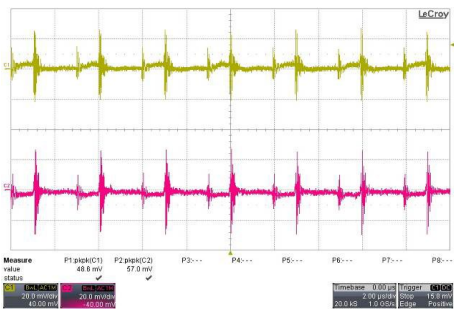
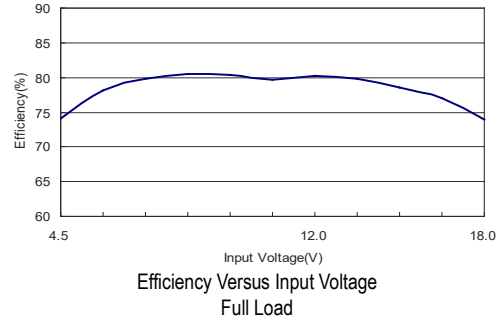
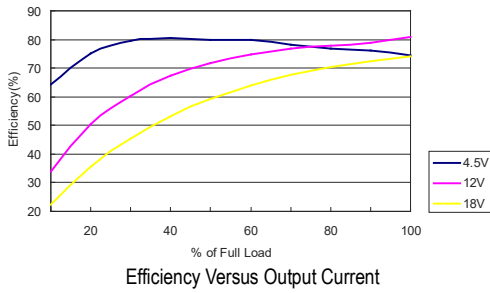
ON/OFF Voltage Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



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

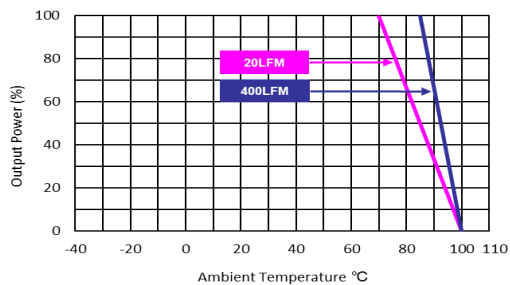
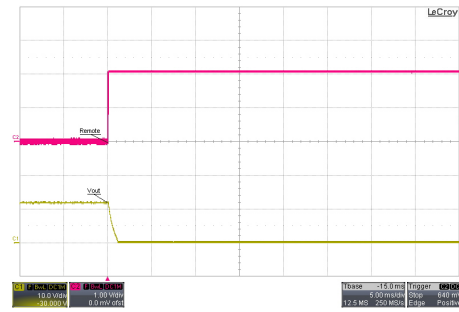
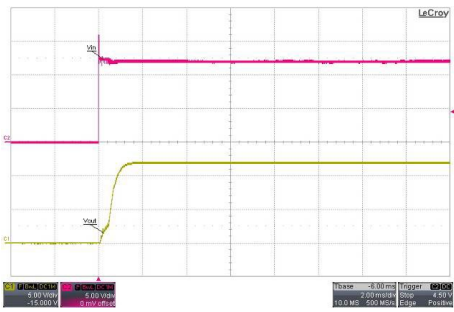
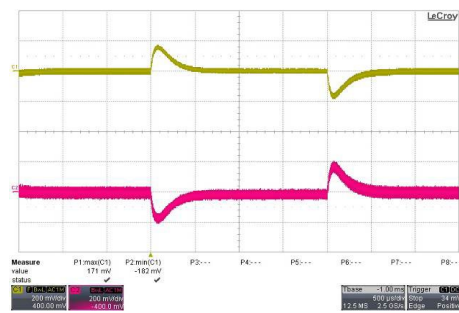
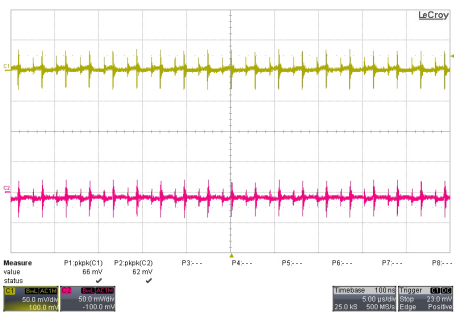
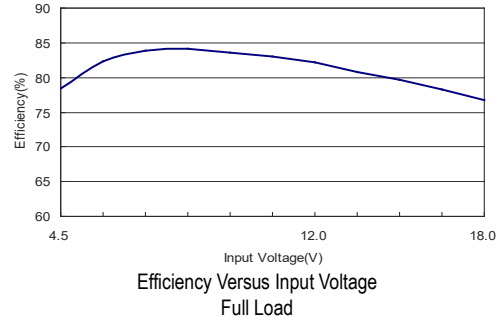
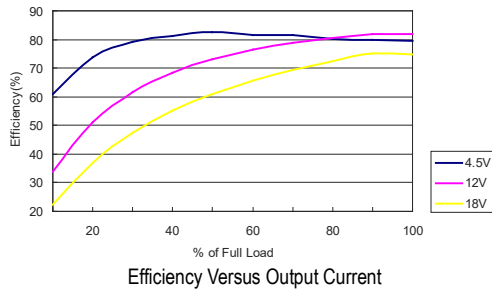
Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-12D05



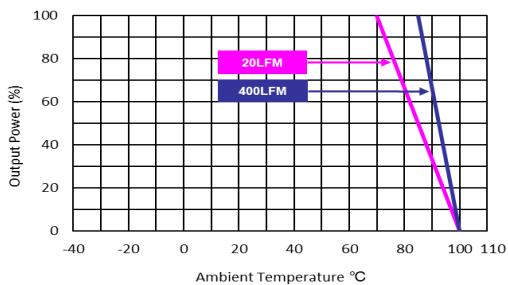
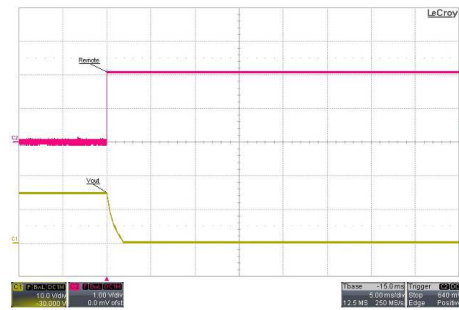
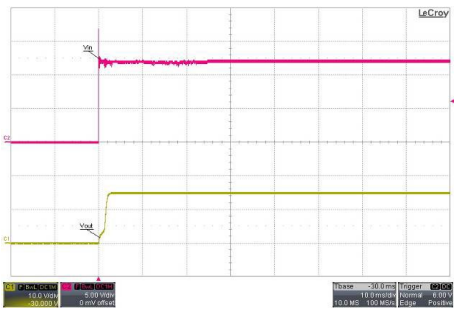
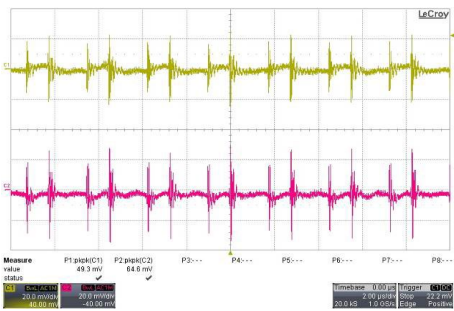
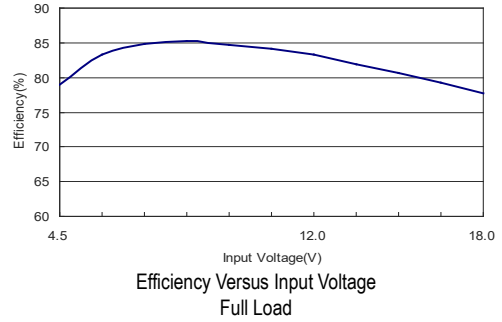
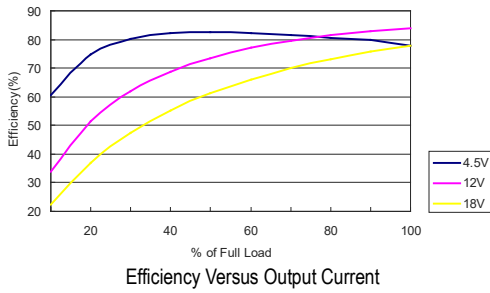
Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-12D12



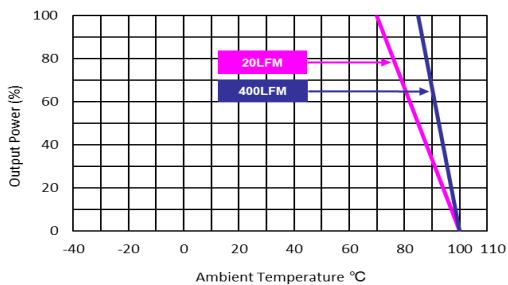
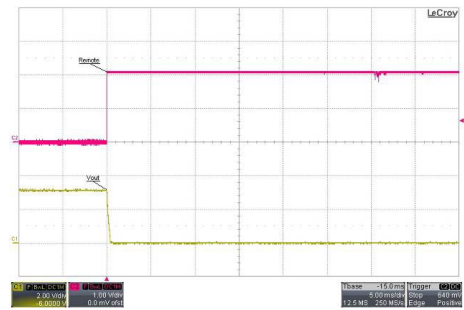
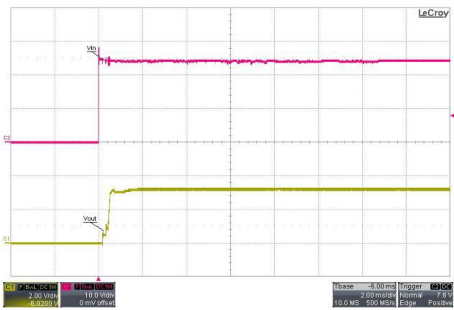
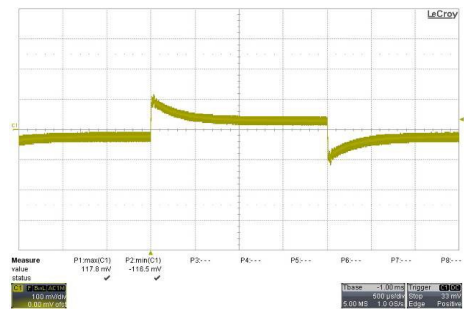
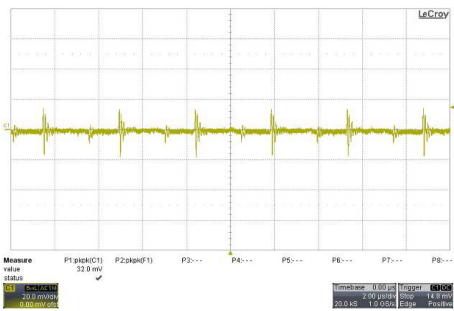
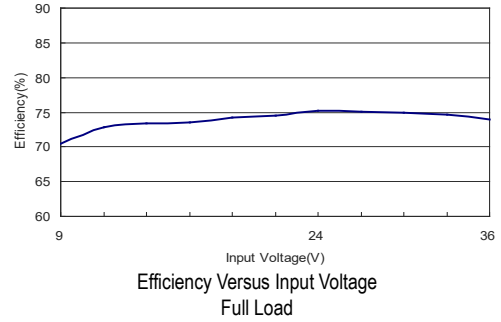
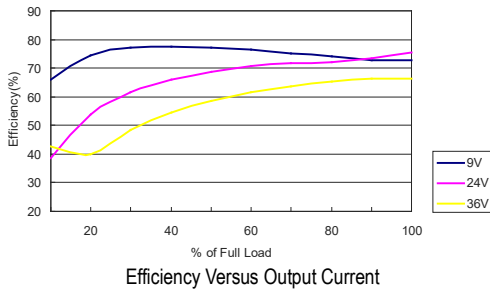
Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-12D15



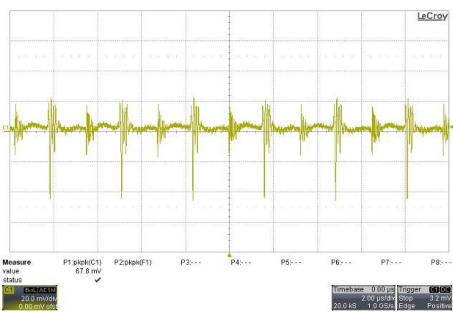
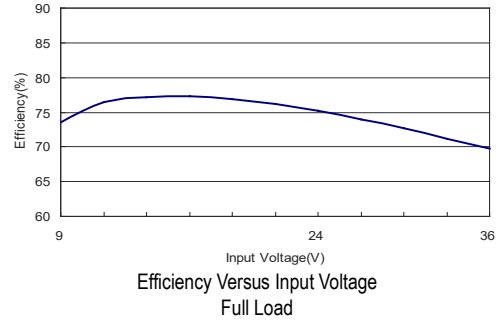
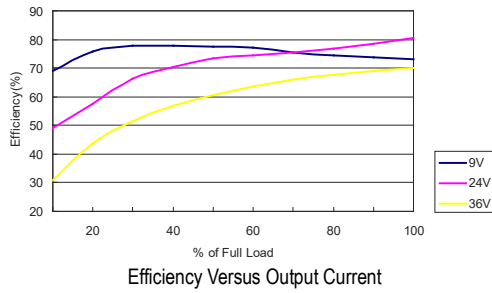
Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-24S033

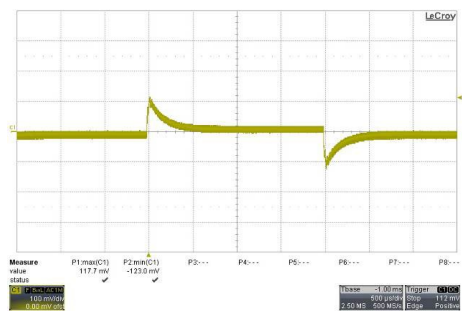


Characteristic Curves

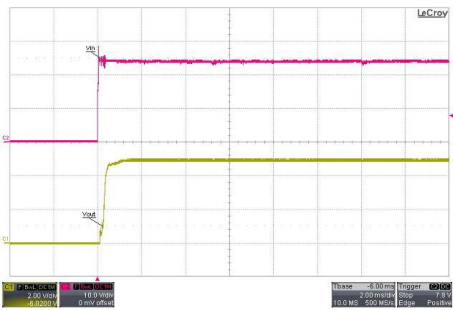
All test conditions are at 25°C The figures are identical for MCWI03-24S05



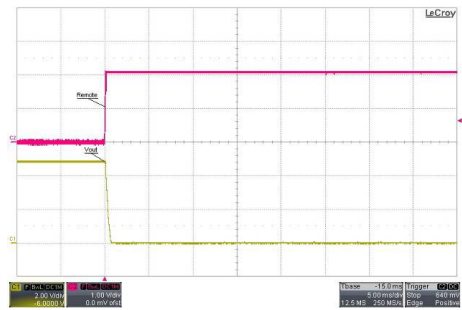
Typical Output Ripple and Noise
 $V_{in}=V_{in\ nom}$; Full Load



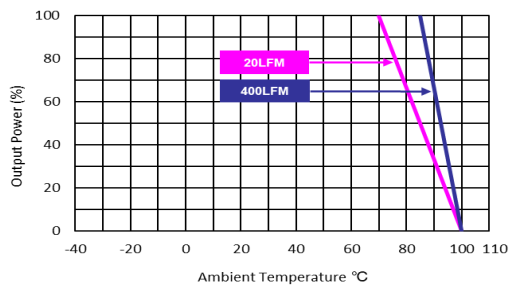
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load; $V_{in}=V_{in\ nom}$



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



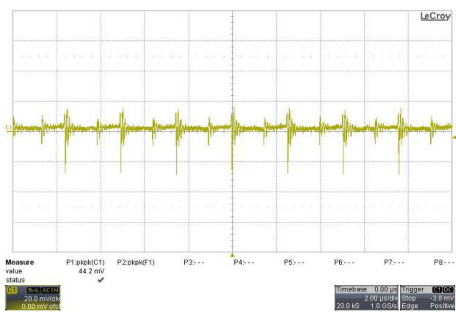
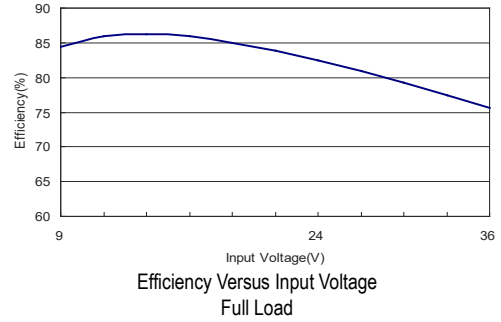
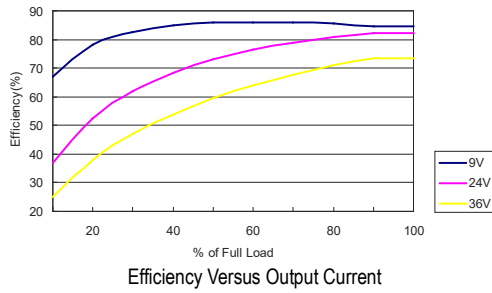
ON/OFF Voltage Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



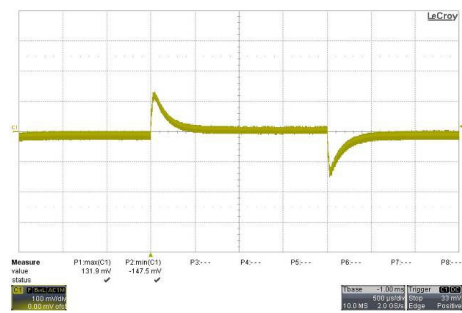
Derating Output Current Versus Ambient Temperature and Airflow
 $V_{in}=V_{in\ nom}$

Characteristic Curves

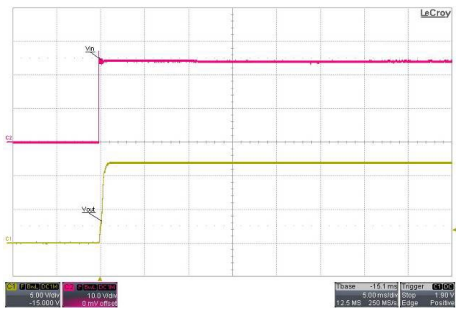
All test conditions are at 25°C The figures are identical for MCWI03-24S12



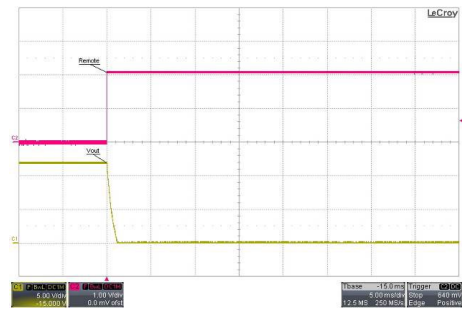
Typical Output Ripple and Noise
 $V_{in}=V_{in\ nom}$; Full Load



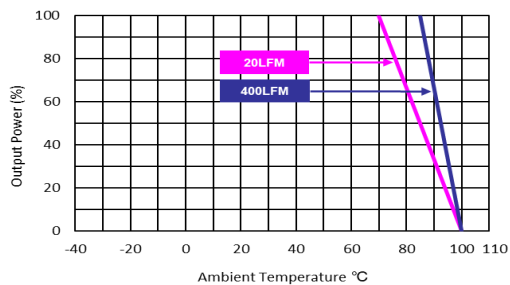
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load; $V_{in}=V_{in\ nom}$



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



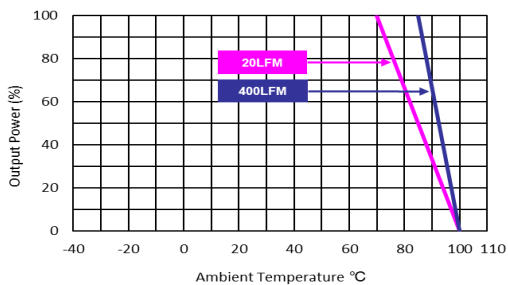
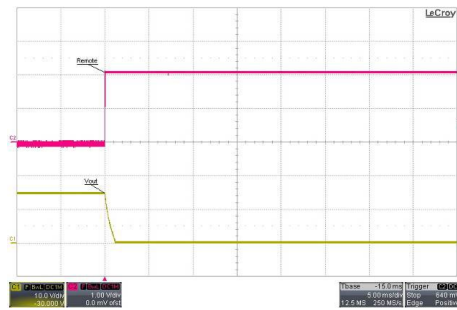
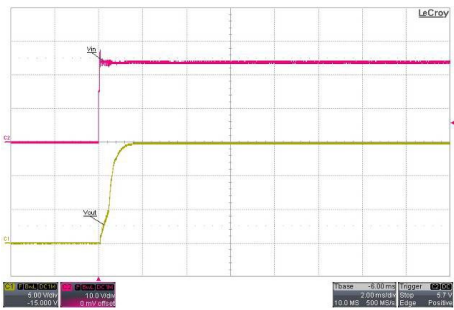
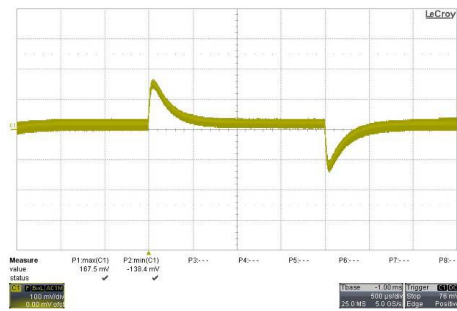
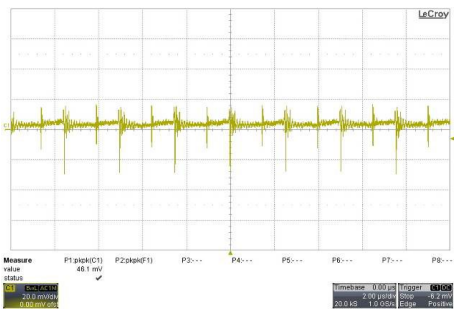
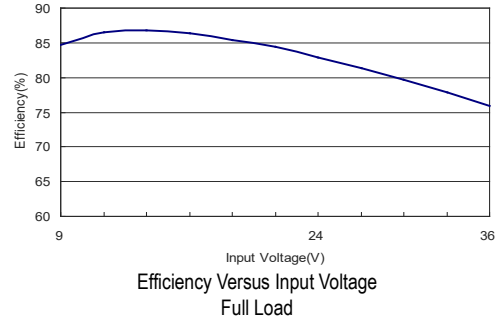
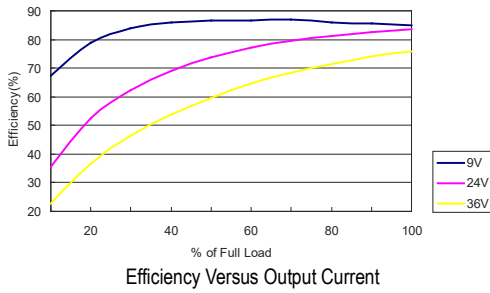
ON/OFF Voltage Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



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

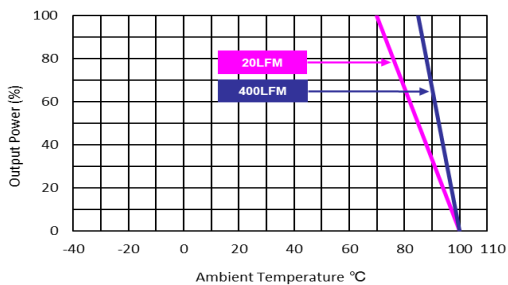
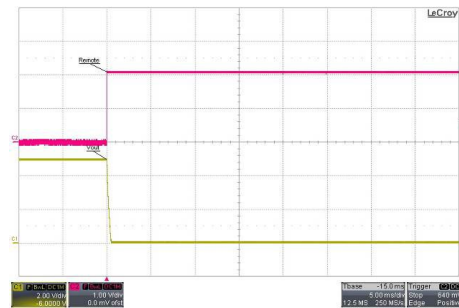
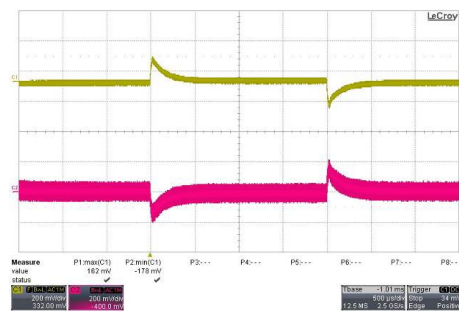
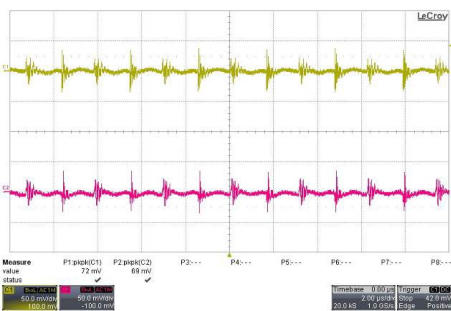
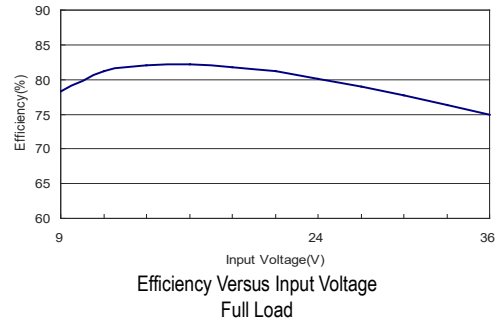
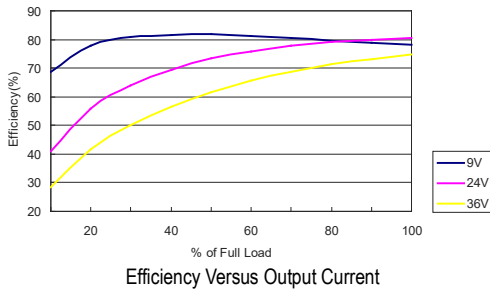
Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-24S15



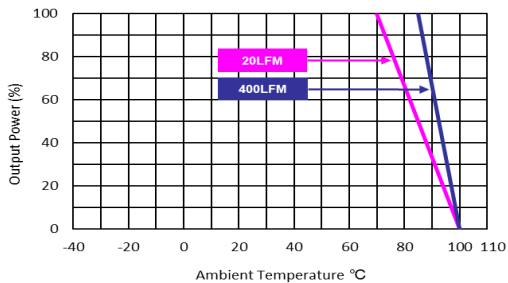
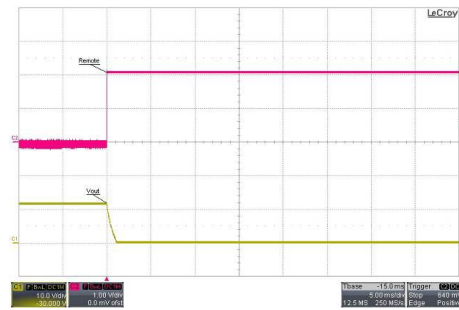
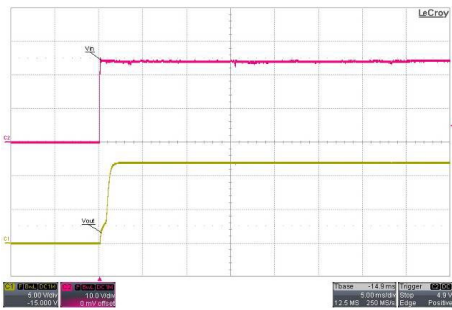
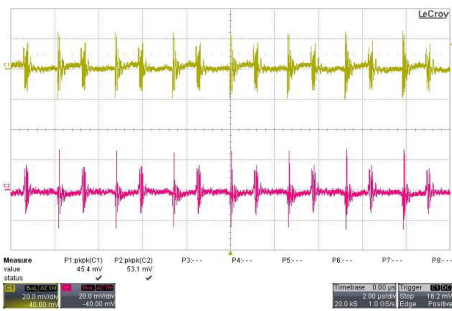
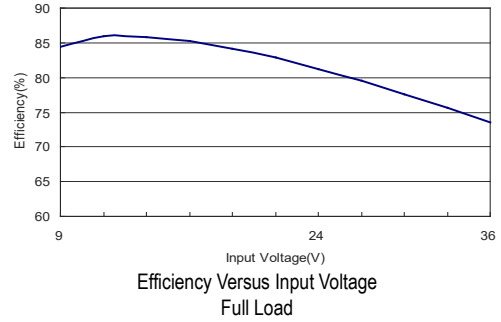
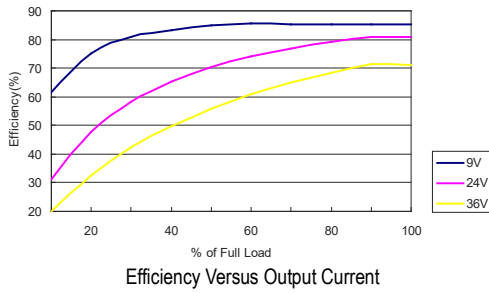
Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-24D05



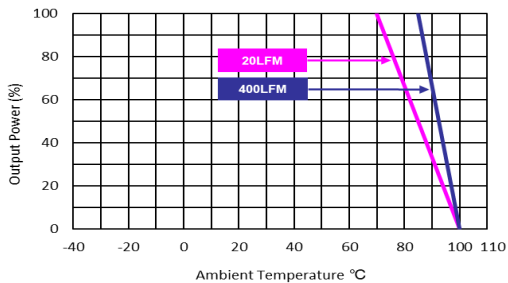
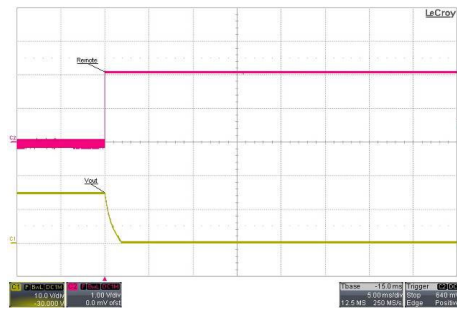
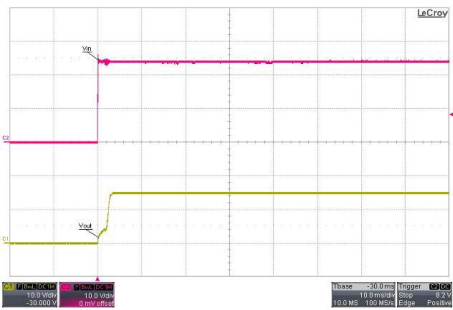
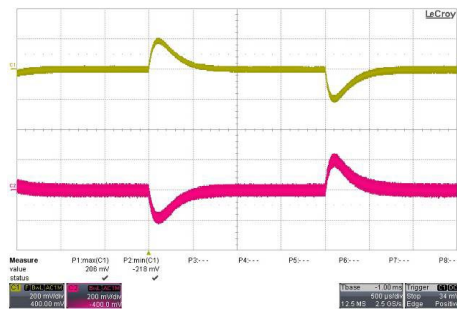
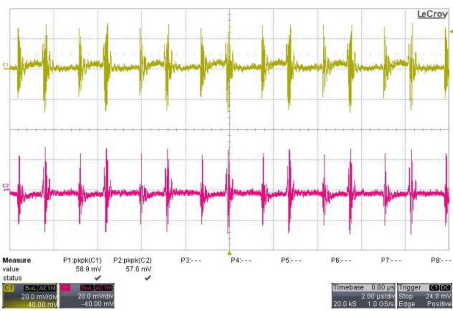
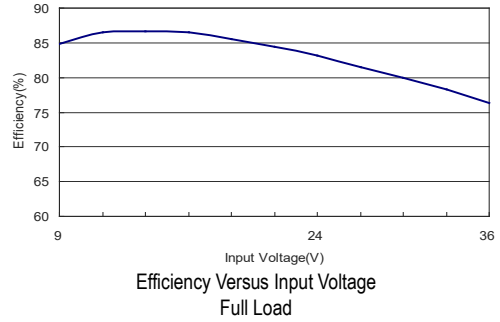
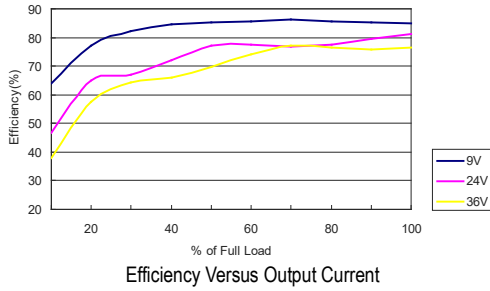
Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-24D12



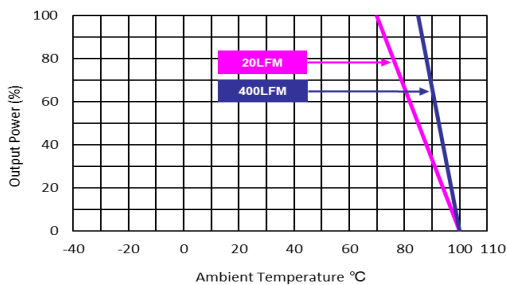
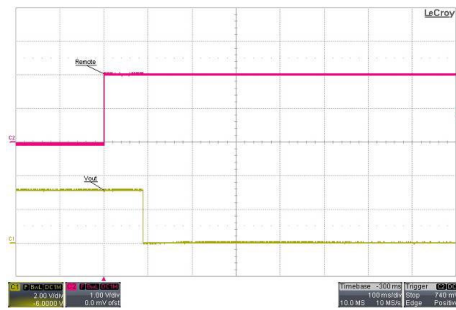
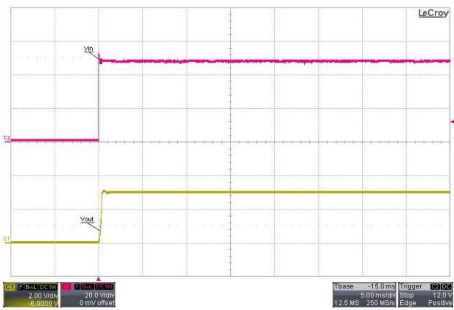
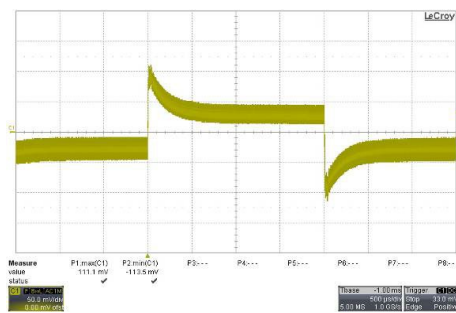
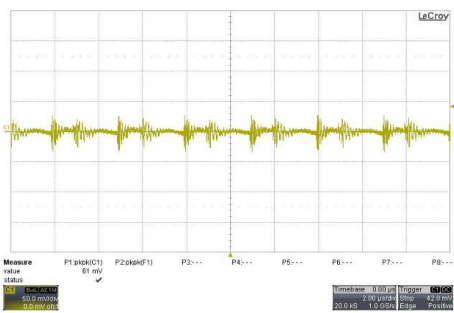
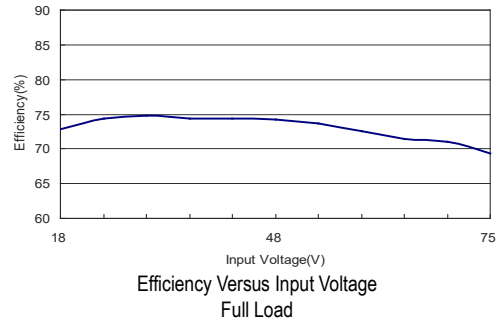
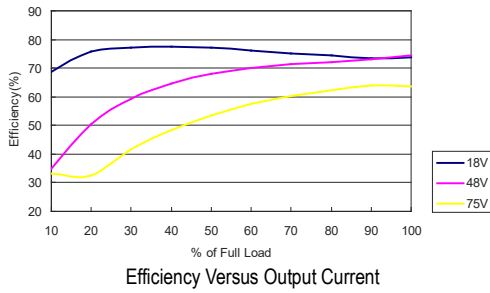
Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-24D15



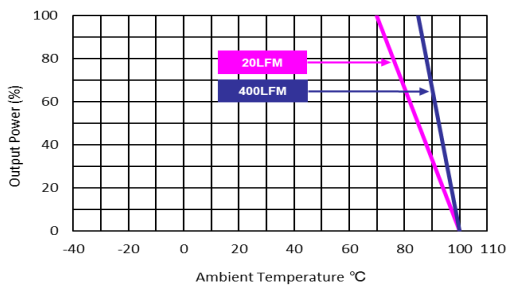
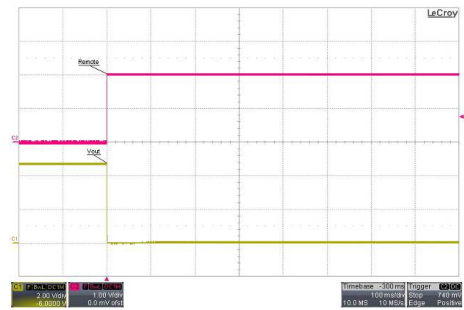
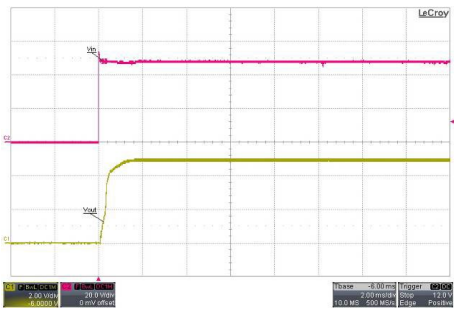
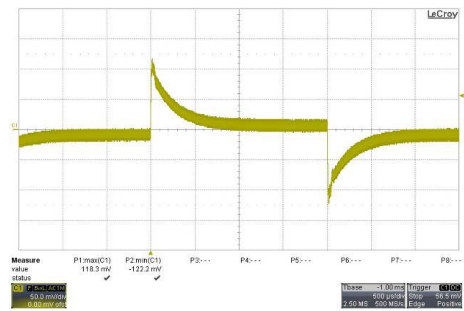
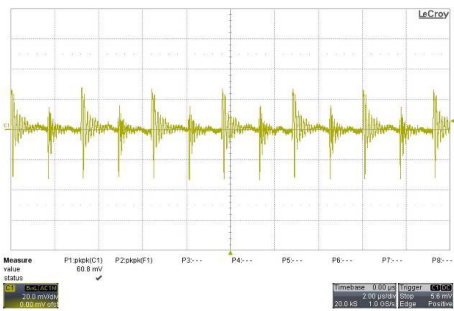
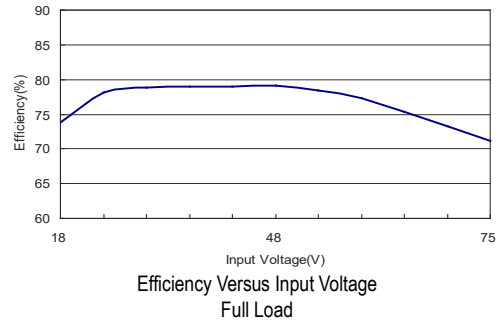
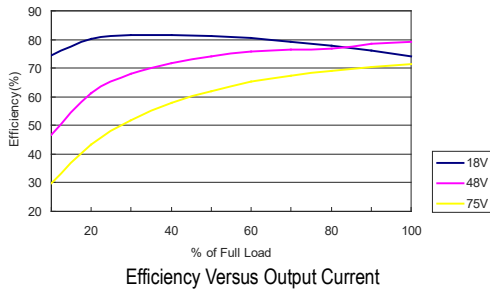
Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-48S033



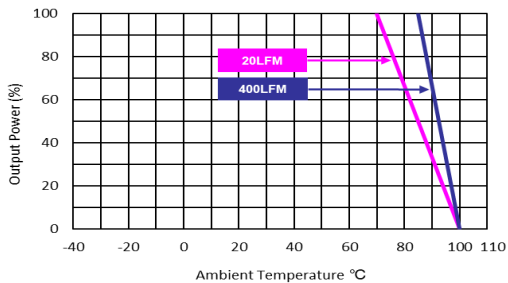
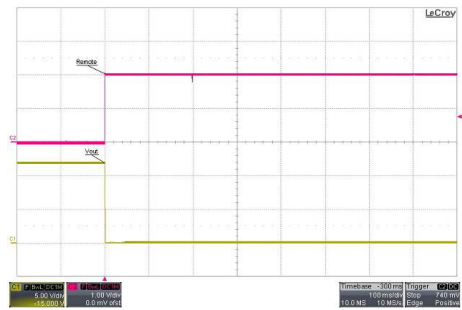
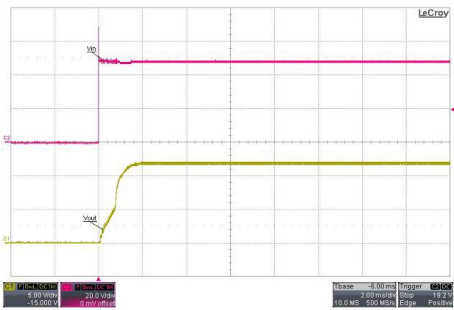
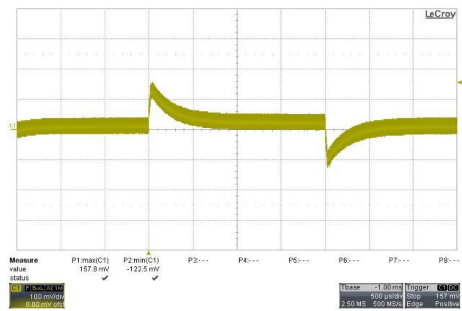
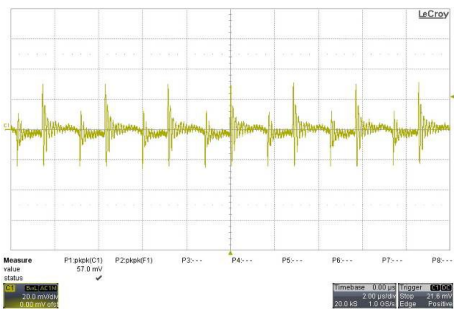
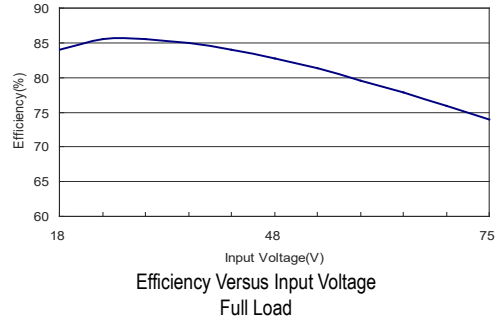
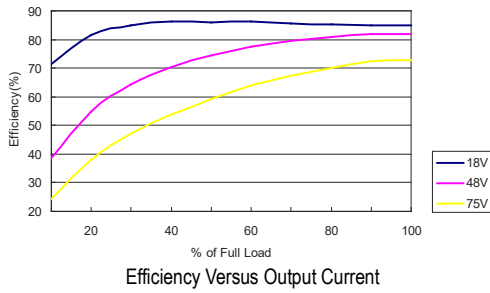
Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-48S05



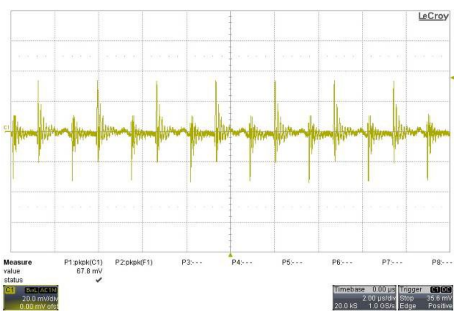
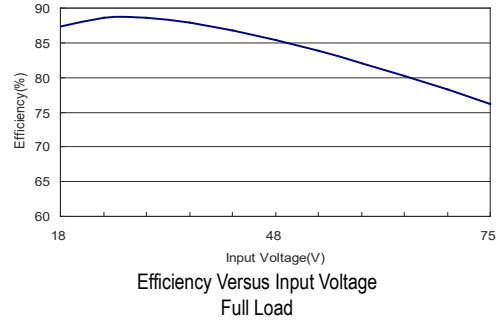
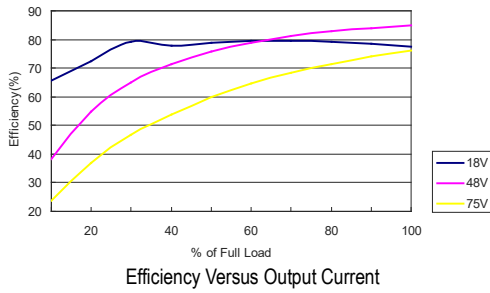
Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-48S12



Characteristic Curves

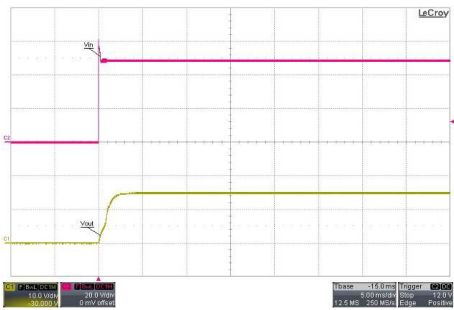
All test conditions are at 25°C The figures are identical for MCWI03-48S15



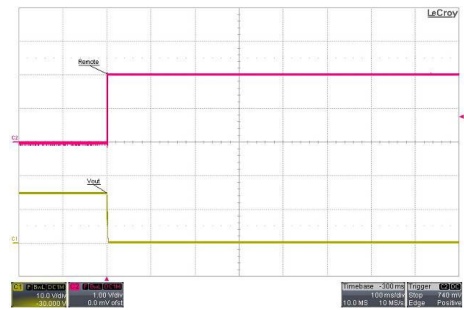
Typical Output Ripple and Noise
 $V_{in}=V_{in\ nom}$; Full Load



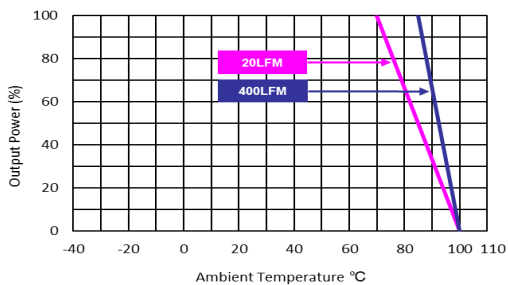
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



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



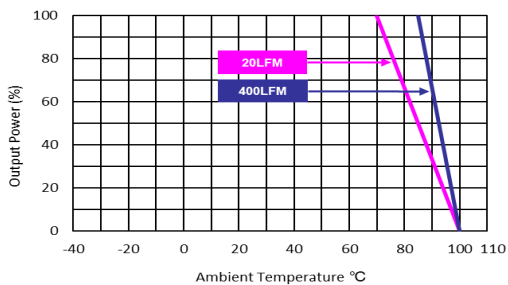
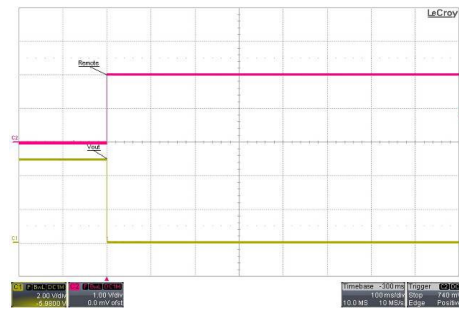
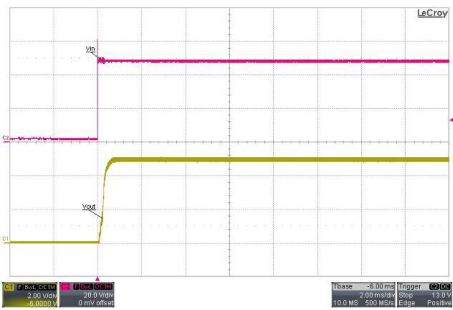
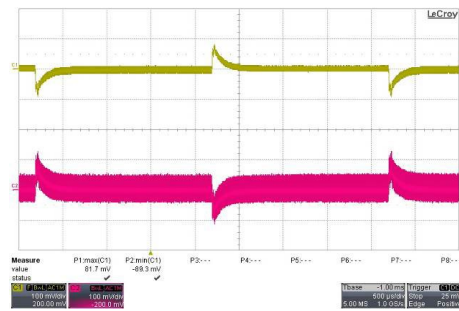
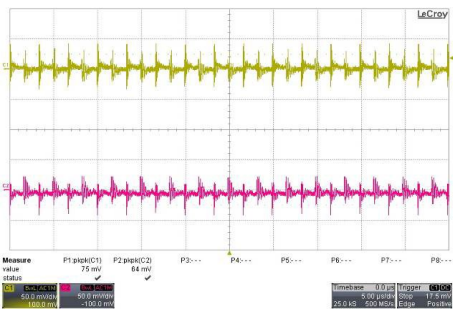
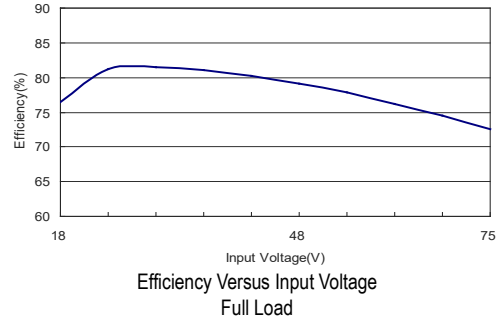
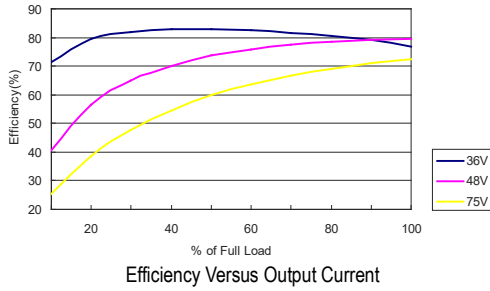
ON/OFF Voltage Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



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

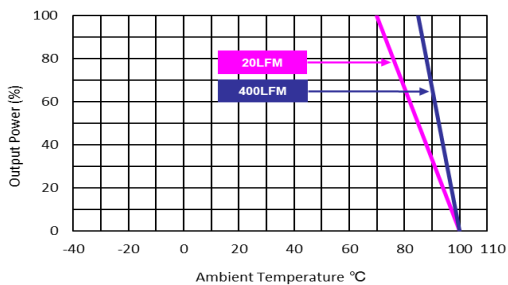
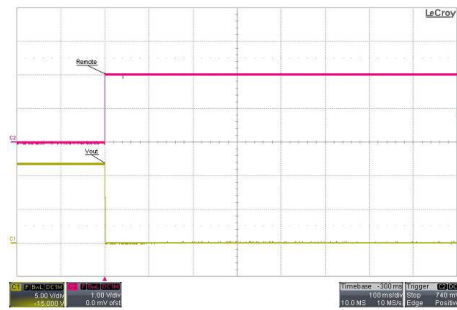
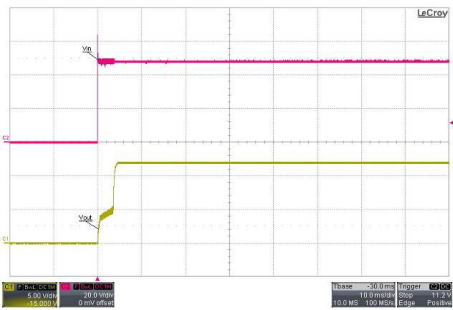
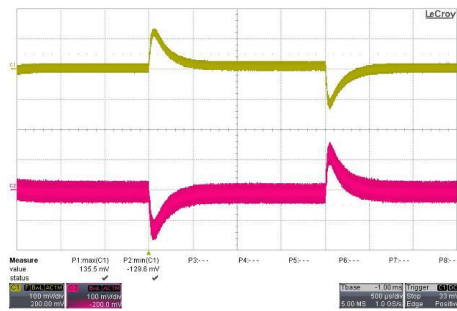
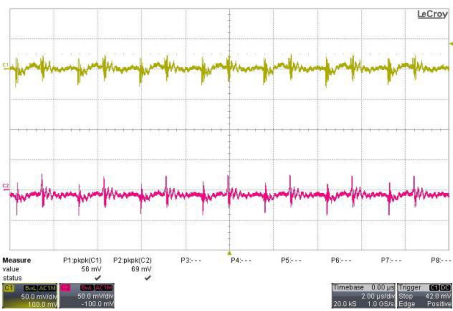
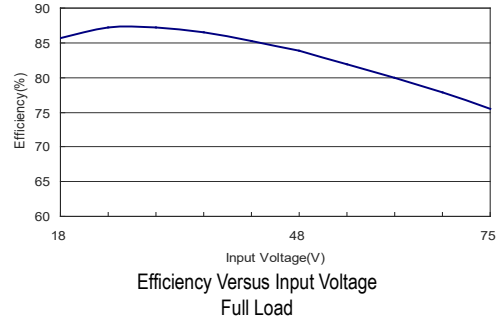
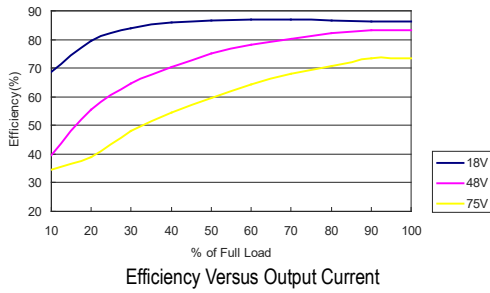
Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-48D05



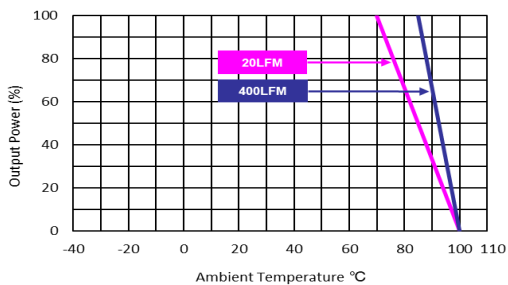
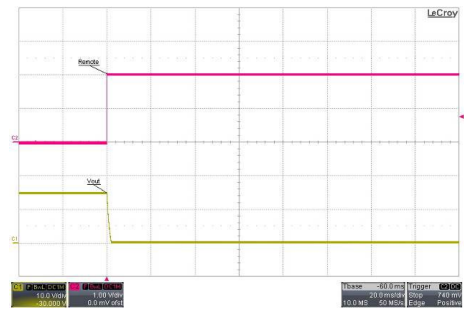
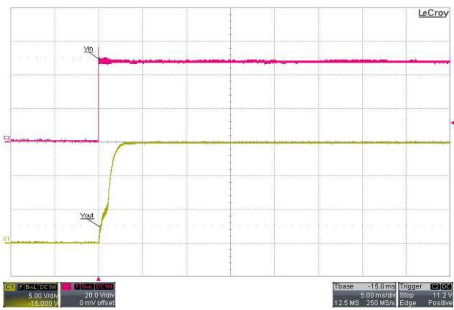
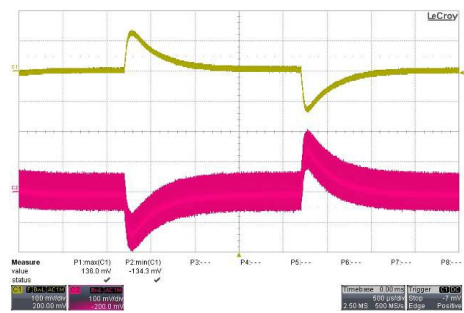
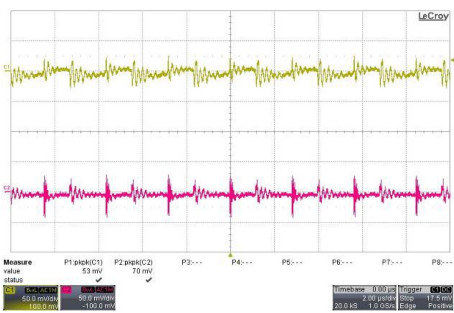
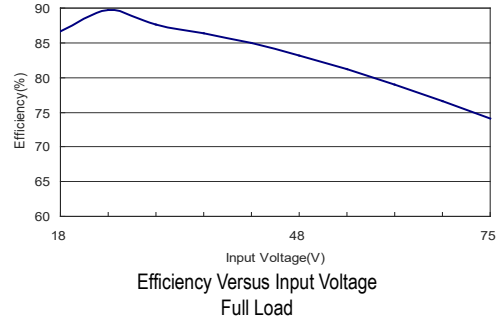
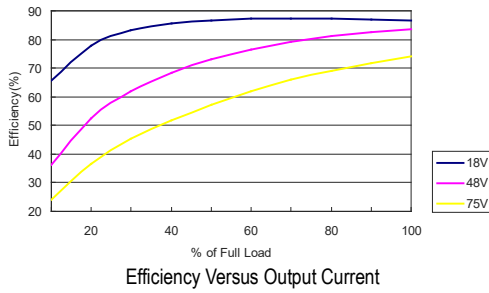
Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-48D12

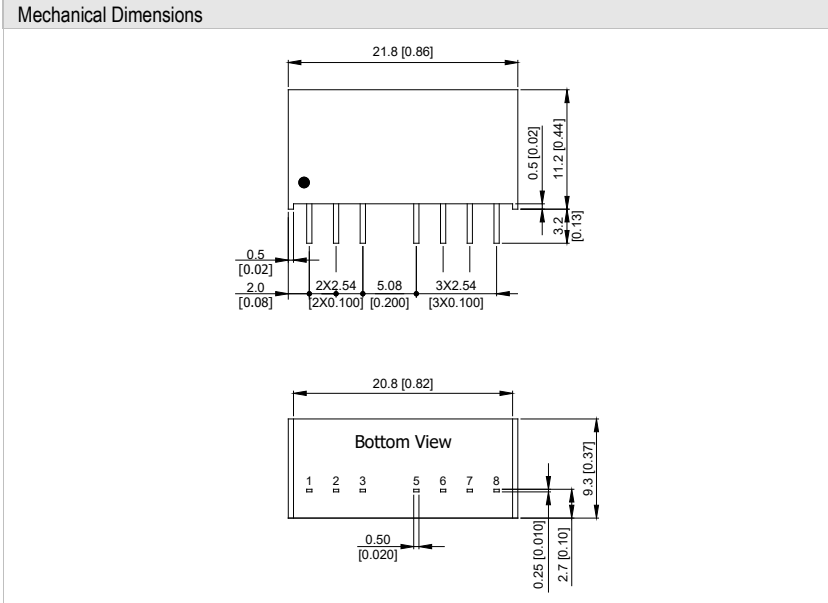


Characteristic Curves

All test conditions are at 25°C The figures are identical for MCWI03-48D15



Package Specifications



Pin Connections

Pin	Single Output	Dual Output
1	-Vin	-Vin
2	+Vin	+Vin
3	Remote On/Off	Remote On/Off
5	NC	NC
6	+Vout	+Vout
7	-Vout	Common
8	NC	-Vout

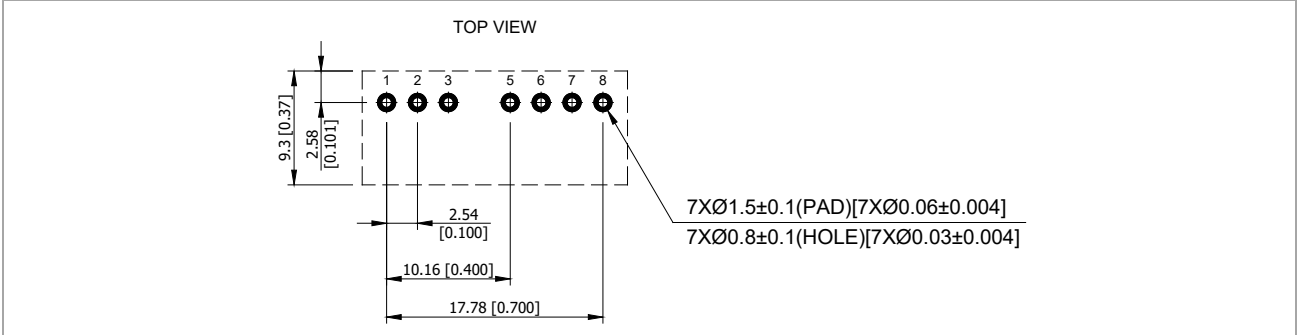
NC: No Connection

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: X.X±0.5 (X.XX±0.02)
X.XX±0.25 (X.XXX±0.010)
- ▶ Pins ±0.1(±0.004)

Physical Characteristics

Case Size	: 21.8x9.3x11.2 mm (0.86x0.37x0.44 inches)
Case Material	: Non-Conductive Black Plastic (flammability to UL 94V-0 rated)
Pin Material	: Alloy 42
Weight	: 4.8g

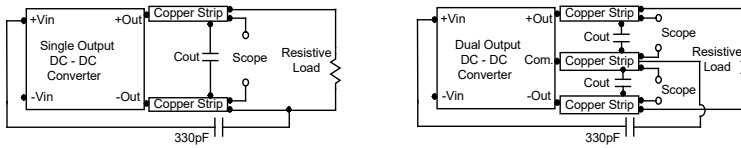
Recommended Pad Layout



Test Setup

Peak-to-Peak Output Noise Measurement Test

Use a Cout 0.47 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

Remote On/Off

Negative logic remote on/off turns the module off during a logic high voltage on the remote on/off pin, and on during a logic low. To turn the power module on and off, the user must supply a switch to control the voltage between the on/off terminal and the -Vin terminal. The switch can be an open collector or equivalent. A logic high is 2.7V to 15V. A logic low is under 0.6 VDC or open circuit, drops down to 0VDC by 2mV/°C. The maximum sink current at on/off terminal during a logic low is 1 mA. The maximum allowable leakage current of the switch at on/off terminal= (under 0.6VDC or open circuit) is 1mA.

Maximum Capacitive Load

The MCWI03 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. The maximum capacitance can be found in the data sheet.

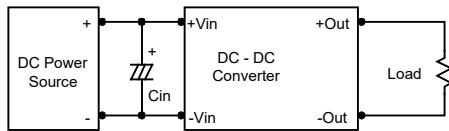
Overcurrent Protection

To provide protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure current limiting for an unlimited duration. At the point of current-limit inception, the unit shifts from voltage control to current control. The unit operates normally once the output current is brought back into its specified range.

Input Source Impedance

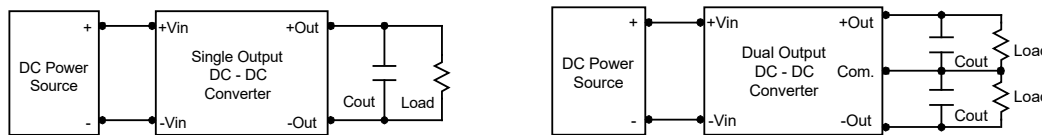
The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.

Capacitor mounted close to the power module helps ensure stability of the unit, it is commended to use a good quality low Equivalent Series Resistance (ESR < 1.0 Ω at 100 kHz) capacitor of a 3.3 μ F for the 12V input devices and a 1.5 μ F for the 24V and 48V devices.



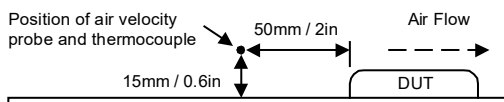
Output Ripple Reduction

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 100°C. The derating curves are determined from measurements obtained in a test setup.



Remote ON/OFF Implementation

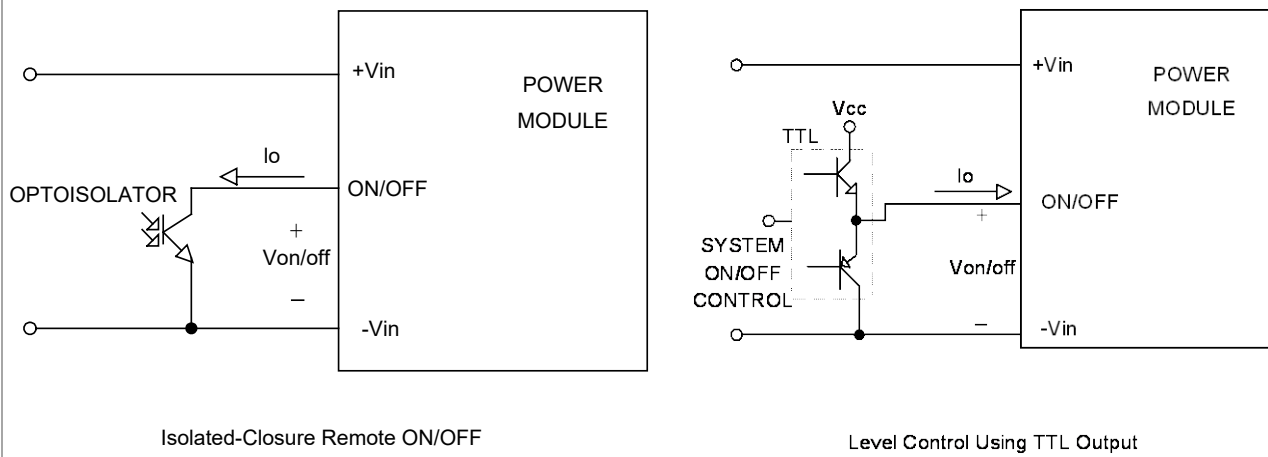
The positive logic remote ON/OFF control circuit is included.

Turns the module ON during logic High on the ON/Off pin and turns OFF during logic Low. The ON/OFF input signal ($V_{on/off}$) that referenced to GND. If not using the remote on/off feature, please open circuit between on/off pin and $-V_{in}$ pin to turn the module on.

The negative logic remote ON/OFF control circuit is included.

Turns the module ON during logic Low on the On/Off pin and turns OFF during logic High. The On/Off pin is an open collector/drain logic input signal ($V_{on/off}$) that referenced to GND. If not using the remote on/off feature. Please short circuit between on/off pin and $-V_{in}$ pin to turn the module on.

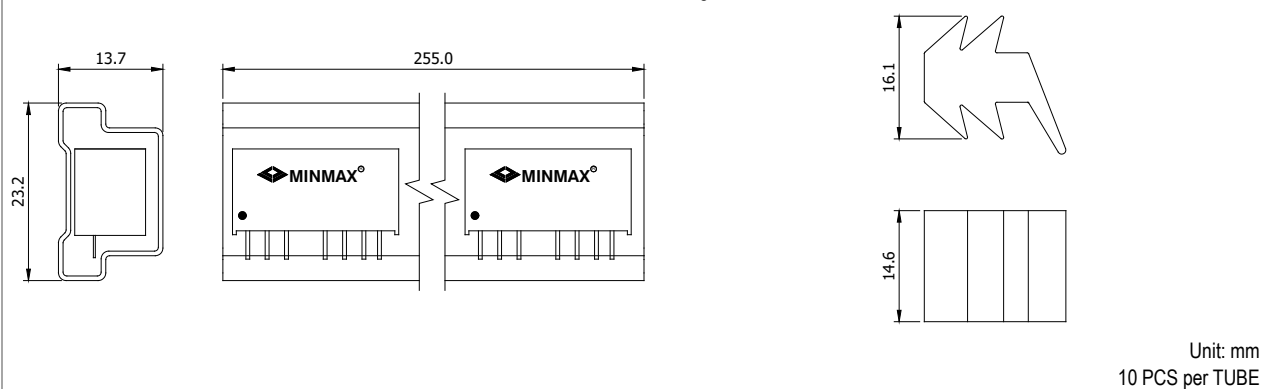
Remote ON/OFF implementation



Packaging Information for Tube

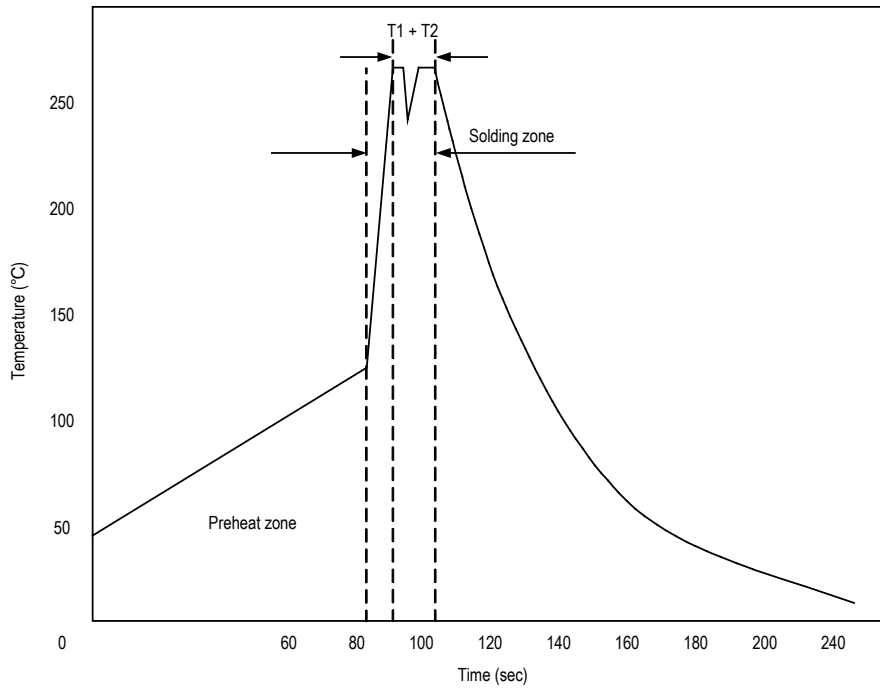
Tube

Plug



Wave Soldering Considerations

Lead free wave solder profile



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

Hand Welding Parameter

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

Hand Welding: Soldering iron : Power 60W

Welding Time: 2~4 sec

Temp.: 380~400°C

Part Number Structure

M	C	WI	03	-	12	S	033
Package Type SIP-8	Ultra-wide 4:1 Input Voltage Range	Output Power 3 Watt	Input Voltage Range			Output Quantity	Output Voltage
			12: 4.5 ~ 18 VDC			S: Single	033: 3.3 VDC
			24: 9 ~ 36 VDC			D: Dual	05: 5 VDC
			48: 18 ~ 75 VDC				12: 12 VDC
							15: 15 VDC

MTBF and Reliability

The MTBF of MCWI03 series of DC-DC converters has been calculated using

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

Model	MTBF	Unit
MCWI03-12S033	897,989	Hours
MCWI03-12S05	1,018,123	
MCWI03-12S12	1,102,901	
MCWI03-12S15	1,104,362	
MCWI03-12D05	947,418	
MCWI03-12D12	1,015,641	
MCWI03-12D15	1,026,694	
MCWI03-24S033	944,555	
MCWI03-24S05	1,043,950	
MCWI03-24S12	1,120,951	
MCWI03-24S15	1,120,951	
MCWI03-24D05	962,464	
MCWI03-24D12	1,061,797	
MCWI03-24D15	1,041,884	
MCWI03-48S033	959,509	
MCWI03-48S05	1,035,197	
MCWI03-48S12	1,128,668	
MCWI03-48S15	1,150,219	
MCWI03-48D05	953,380	
MCWI03-48D12	977,135	
MCWI03-48D15	1,036,269	