MINMAX®

MTQZ50 Series

Electric Characteristic Note

MTQZ50 Series EC Note

DC-DC CONVERTER 50W, Railway Certified

Features

- ►**Industrial Standard Quarter Brick Package**
- ►**Wide Input Range 43-101VDC & 66-160VDC**
- ►**Excellent Efficiency up to 92%**
- ►**I/O Isolation 3000VAC with Reinforced Insulation**
- ►**Operating Ambient Temp. Range -40℃ to +85℃**
- ►**No Min. Load Requirement**
- ►**Under-voltage, Overload/Voltage/Temp. and Short Circuit Protection**
- ►**Remote On/Off, Output Voltage Trim, Output Sensing**
- ►**Vibration and Shock/Bump Test EN 61373 Approved**
- ►**Cooling, Dry & Damp Heat Test IEC/EN 60068-2-1, 2, 30 Approved**
- ►**Railway EMC Standard EN 50121-3-2 Approved**
- ►**Railway Certified EN 50155 (IEC60571) Approved**
- ►**Fire Protection Test EN 45545-2 Approved**
- ►**UL/cUL/IEC/EN 62368-1(60950-1) Safety Approval & CE Marking**

Applications

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

Product Overview

The MINMAX MTQZ50 series is a generation of high performance, convection-cooled 50W DC-DC converters designed specifically for railway applications. Both 72(43-101)VDC and 110(66-160)VDC input voltage range is popular in railway usage, and also available in Minmax product lines.
The converters conform to railway industry transient standard EN 50155 and complies also with EMC standard EN 50121-3-2. Advanced circuit topology provides a high efficiency up to 92% which allows operating temperatures range of -40℃ to +85℃. For improved heat dissipation the modules can be supplied with a heatsink. Further product features include high, reinforced insulation, remote On/Off control, under-voltage shutdown as well as overload, over voltage, over temperature and short circuit protection.

Table of contents

Model Selection Guide

Model Number	Input Voltage (Range)	Output Voltage	Output Current Max.	Input Current @Max. Load	Input Current @No Load	Reflected Ripple Current	Over Voltage Protection	Max. capacitive Load	Efficiency (typ.) @Max. Load
	VDC	VDC	mA	mA(typ.)	mA(typ.)	mA(typ.)	VDC	μF	%
MTQZ50-72S05	72 (43 ~ 101)	5	10000	771	50	35	6.2	17000	90
MTQZ50-72S12		12	4170	755	45		15	2950	92
MTQZ50-72S15		15	3330	754	45		18	1900	92
MTQZ50-72S24		24	2080	762	50		30	740	91
MTQZ50-110S05	110 (66 ~ 160)	5	10000	505	40	35	6.2	17000	90
MTQZ50-110S12		12	4170	500	35		15	2950	91
MTQZ50-110S15		15	3330	494	35		18	1900	92
MTQZ50-110S24		24	2080	499	40		30	740	91

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
General	Input Specifications comply to				
Input Surge Voltage (100ms. max)	72V Input Models	-0.7	---	165	VDC
	110V Input Models	-0.7	---	250	VDC
Start-up Threshold Voltage	72V Input Models	---	---	43	VDC
	110V Input Models	---	---	66	VDC
Under Voltage Shutdown	72V Input Models	---	40	---	VDC
	110V Input Models	---	63	---	VDC
Start-up Time	All Models	---	0.35	---	S
Input Filter	All Models	Internal Pi Type			

Remote On/Off Control

Parameter	Conditions	Min.	Typ.	Max.	Unit
Converter On	3.5V ~ 12V or Open Circuit				
Converter Off	0V ~ 1.2V or Short Circuit				
Control Input Current (on)	Vctrl = 5.0V	---	0.5	---	mA
Control Input Current (off)	Vctrl = 0V	---	-0.5	---	mA
Control Common	Referenced to Negative Input				
Standby Input Current	Nominal Vin	---	2.5	---	mA

Output Specifications

Parameter	Conditions / Model		Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy			---	---	±1.0	%Vnom.
Line Regulation	Vin=Min. to Max. @ Full Load		---	---	±0.2	%
Load Regulation	Io=0% to 100%		---	---	±0.3	%
Minimum Load	No minimum Load Requirement					
Ripple & Noise(3)	0-20 MHz Bandwidth	24V Output	---	---	150	mV P-P
		Other Output	---	---	100	mV P-P
Transient Recovery Time	25% Load Step Change (2)		---	250	---	μsec
Transient Response Deviation	25% Load Step Change (2)		---	±3	±5	%
Temperature Coefficient			---	---	±0.02	%/℃
Trim Up / Down Range (See Page 15)	% of Nominal Output Voltage		---	---	±10	%
Over Load Protection	Hiccup		---	150	---	%
Short Circuit Protection	Continuous, Automatic Recovery (Hiccup Mode 0.5Hz typ.)					

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	Reinforced Insulation, Rated For 60 Seconds	3000	---	---	VAC
Isolation Voltage Input/Output to case		1500	---	---	VDC
I/O Isolation Resistance	500 VDC	1000	---	---	MΩ
I/O Isolation Capacitance	100kHz, 1V	---	---	3000	pF
Switching Frequency		---	320	---	kHz
MTBF(calculated)	MIL-HDBK-217F@25℃ Full Load, Ground Benign	314,900			Hours
Safety Standards	cUL/UL 60950-1, IEC/EN 60950-1, EN 50155,IEC60571				
	UL/cUL 62368-1 recognition(UL certificate), IEC/EN 62368-1(CB-report)				

EMC Specifications

Parameter	Standards & Level			Performance
General	Compliance with EN 50121-3-2 Railway Applications			
EMI(5)	Conduction	EN 55032/11	With external components	Class A
	Radiation			
EMS(5)	EN 55024			
	ESD	EN 61000-4-2 air ± 8kV, Contact ± 6kV		A
	Radiated immunity	EN 61000-4-3 10V/m		A
	Fast transient	EN 61000-4-4 ±2kV		A
	Surge	EN 61000-4-5 ±2kV		A
	Conducted immunity	EN 61000-4-6 10Vrms		A
	PFMF	EN 61000-4-8 100A/m, 1000A/m For 1 Second		A

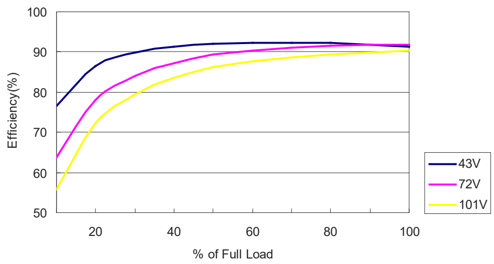
Environmental Specifications

Parameter	Conditions / Model	Min.	Max. without Heatsink	Max. with Heatsink	Unit
Operating Ambient Temperature Range Nominal Vin, Load 100% Inom. (for Power Derating see relative Derating Curves)	MTQZ50-72S12	-40	72	75	℃
	MTQZ50-72S15, MTQZ50-110S15				
	MTQZ50-72S24		68	71	
	MTQZ50-110S12, MTQZ50-110S24				
	MTQZ50-72S05, MTQZ50-110S05		63	67	
Thermal Impedance	20LFM Convection without Heatsink	7.5	---		℃/W
	20LFM Convection with Heatsink	6.8	---		
	100LFM Convection without Heatsink	6.1	---		
	100LFM Convection with Heatsink	4.1	---		
	200LFM Convection without Heatsink	5.3	---		
	200LFM Convection with Heatsink	3.3	---		
	400LFM Convection without Heatsink	3.9	---		
	400LFM Convection with Heatsink	2.2	---		
Base-plate Temperature Range		-40	+105		℃
Over Temperature Protection (Base Plate)		---	+110		℃
Storage Temperature Range		-50	+125		℃
Cooling	Compliance to IEC/EN 60068-2-1				
Dry Heat	Compliance to IEC/EN 60068-2-2				
Damp Heat	Compliance to IEC/EN 60068-2-30				
Shock & Vibration Test	Compliance to IEC/EN 61373				
Fire Protection Test	Compliance to EN 45545-2				
Operating Humidity (non condensing)		5	95		% rel. H
Lead Temperature (1.5mm from case for 10Sec.)		---	260		℃

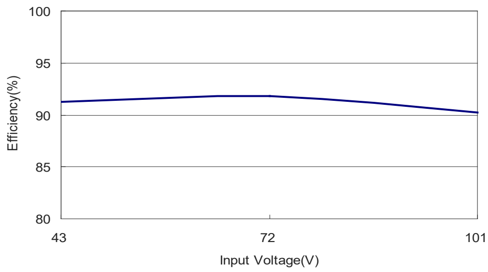
Notes	
1	Specifications typical at Ta=+25℃, resistive load, nominal input voltage and rated output current unless otherwise noted.
2	Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.
3	Ripple & Noise measurement with a 1μF MLCC and a 10μF Tantalum Capacitor.
4	Other input and output voltage may be available, please contact MINMAX.
5	The external components might be required to meet EMI/EMS standard for some of test items. Please contact MINMAX for the solution in detail.
6	It is necessary to parallel a capacitor across the input pins under normal operation. Minimum Capacitance: 68μF/ 200V.
7	Specifications are subject to change without notice.

Characteristic Curves

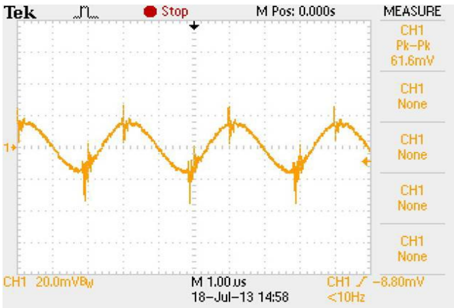
All test conditions are at 25℃ The figures are identical for MTQZ50-72S05



Efficiency Versus Output Current

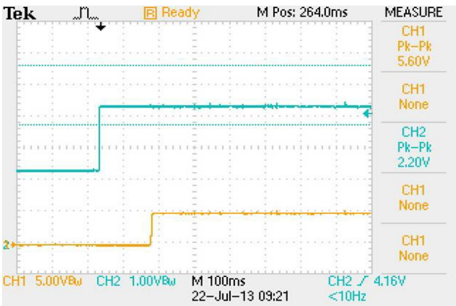


Efficiency Versus Input Voltage
Full Load

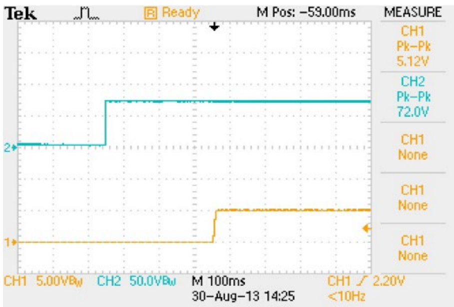


Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A

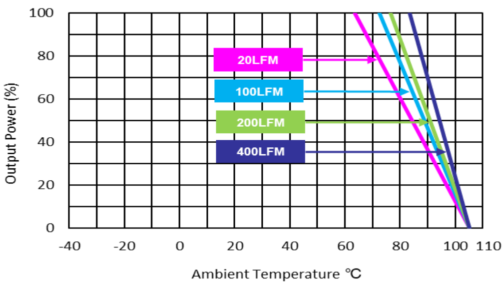
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in=}$ =$V_{in\ nom}$



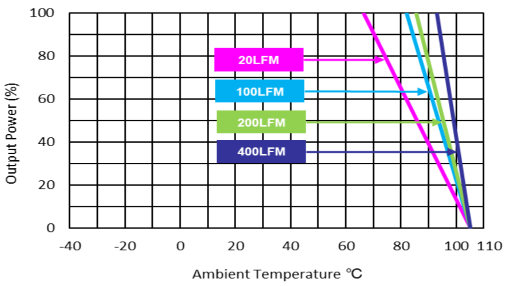
ON/OFF Voltage Start-Up and Output Rise Characteristic
$V_{in=}$ =$V_{in\ nom}$; Full Load



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



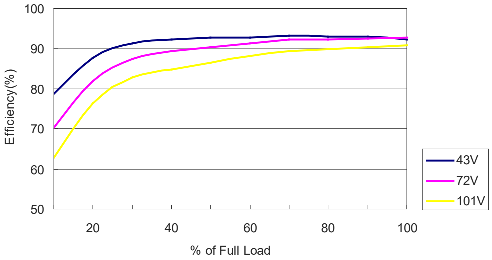
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$ (without heatsink)



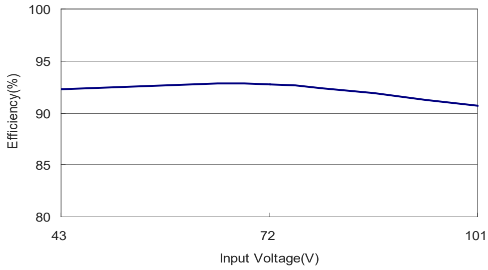
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$ (with heatsink)

Characteristic Curves

All test conditions are at 25℃ The figures are identical for MTQZ50-72S12



Efficiency Versus Output Current

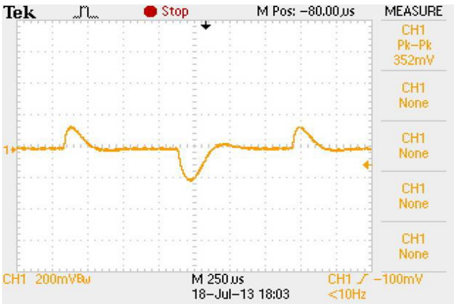


Efficiency Versus Input Voltage

Full Load

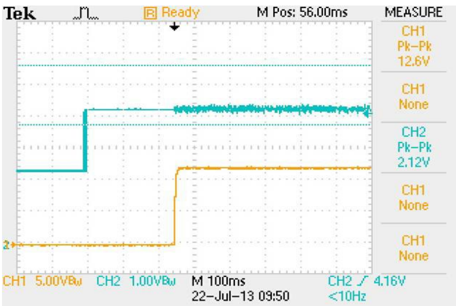
Typical Output Ripple and Noise.

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



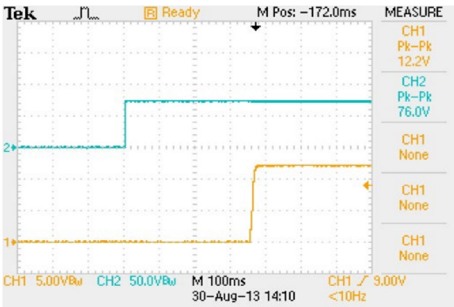
Transient Response to Dynamic Load Change

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



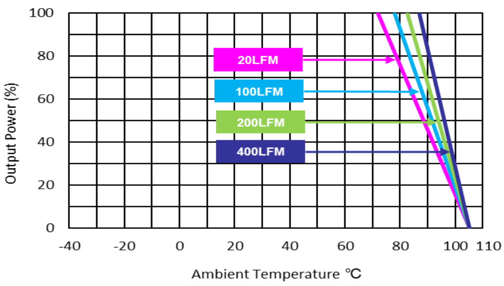
ON/OFF Voltage Start-Up and Output Rise Characteristic

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



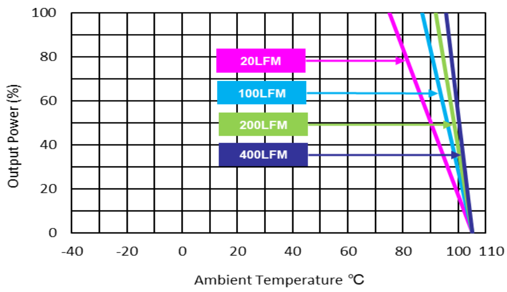
Typical Input Start-Up and Output Rise Characteristic

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



Derating Output Power Versus Ambient Temperature and Airflow

V_{in}=$V_{in\ nom}$ (without heatsink)

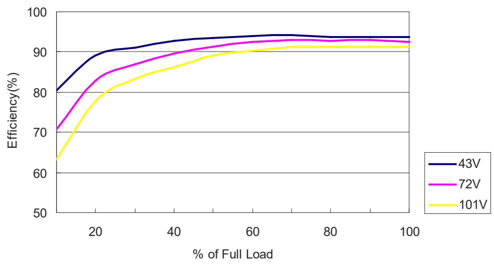


Derating Output Power Versus Ambient Temperature and Airflow

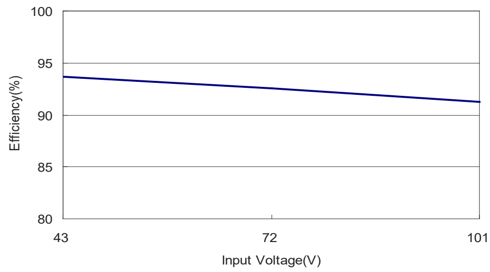
V_{in}=$V_{in\ nom}$ (with heatsink)

Characteristic Curves

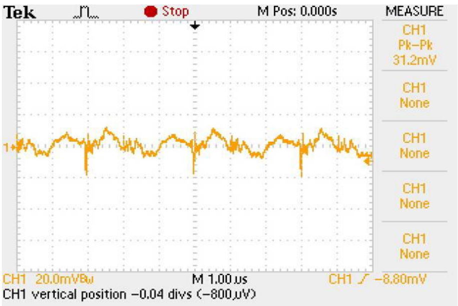
All test conditions are at 25℃ The figures are identical for MTQZ50-72S15



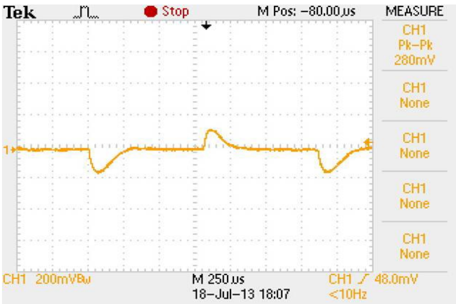
Efficiency Versus Output Current



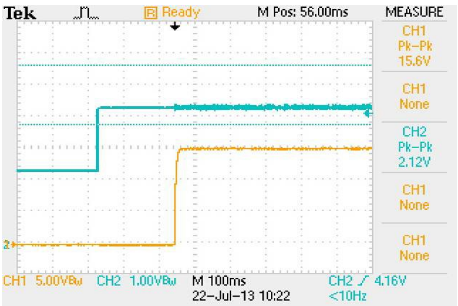
Efficiency Versus Input Voltage
Full Load



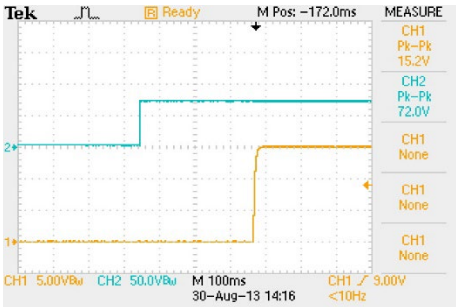
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



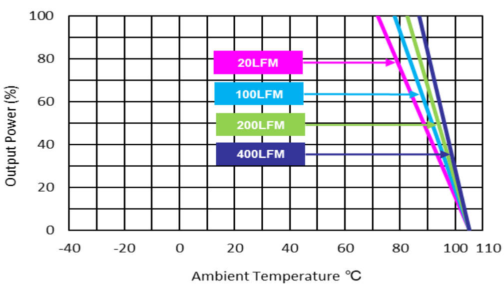
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}= =$V_{in\ nom}$



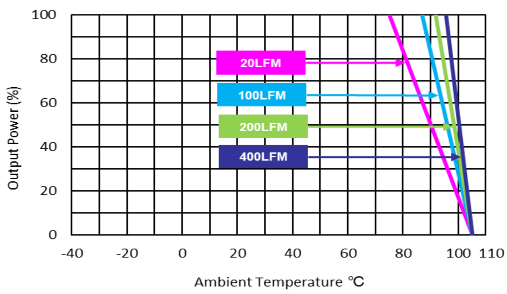
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in}= =$V_{in\ nom}$; Full Load



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



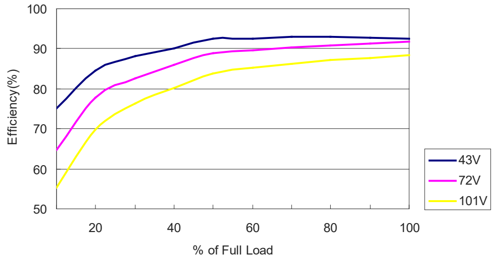
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$ (without heatsink)



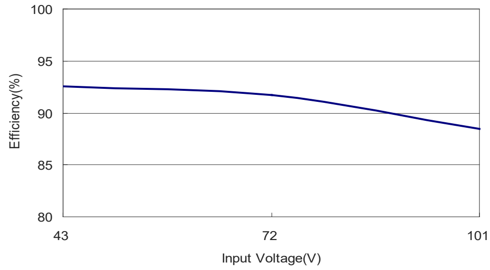
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$ (with heatsink)

Characteristic Curves

All test conditions are at 25℃ The figures are identical for MTQZ50-72S24

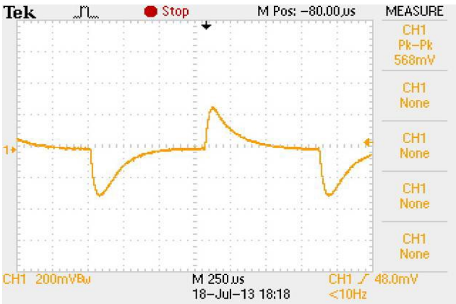


Efficiency Versus Output Current

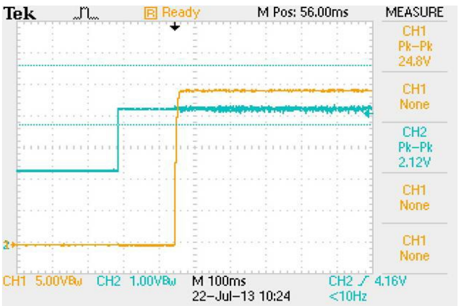


Efficiency Versus Input Voltage
Full Load

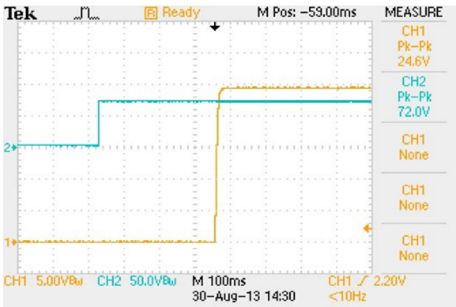
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



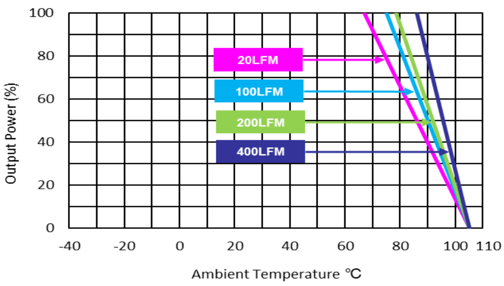
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}= =$V_{in\ nom}$



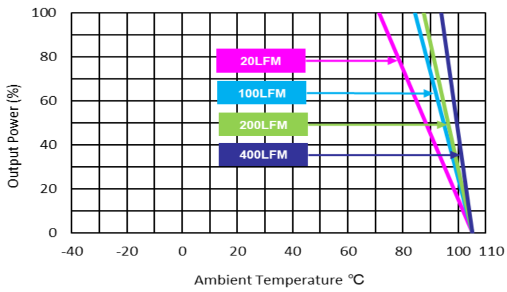
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in}= =$V_{in\ nom}$; Full Load



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



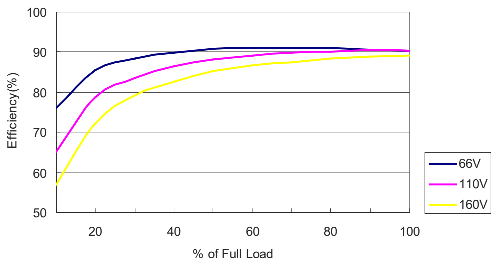
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$ (without heatsink)



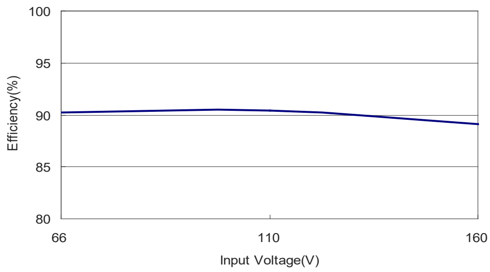
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$ (with heatsink)

Characteristic Curves

All test conditions are at 25℃ The figures are identical for MTQZ50-110S05

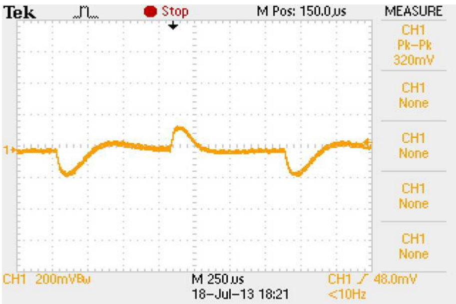


Efficiency Versus Output Current

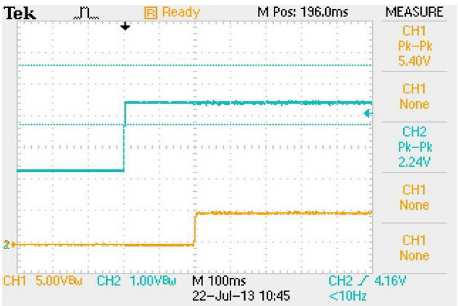


Efficiency Versus Input Voltage
Full Load

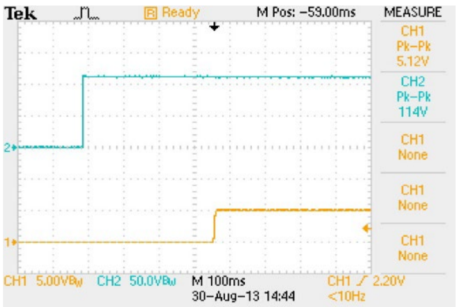
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



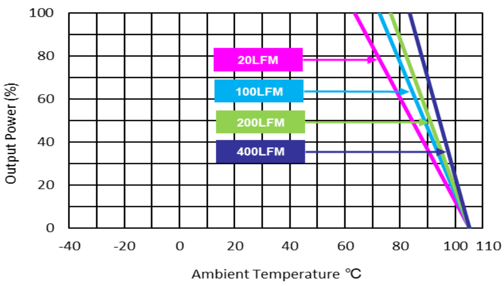
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in=}$ =$V_{in\ nom}$



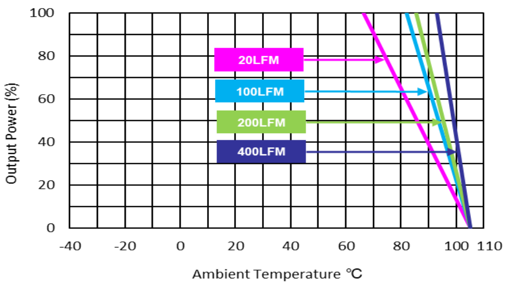
ON/OFF Voltage Start-Up and Output Rise Characteristic
$V_{in=}$ =$V_{in\ nom}$; Full Load



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



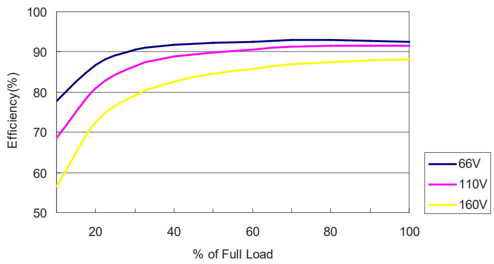
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$ (without heatsink)



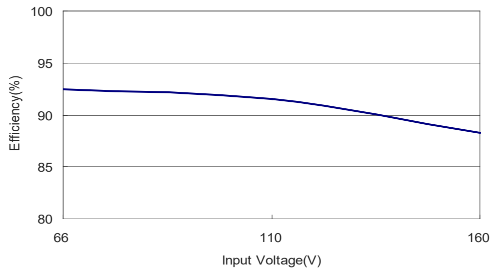
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$ (with heatsink)

Characteristic Curves

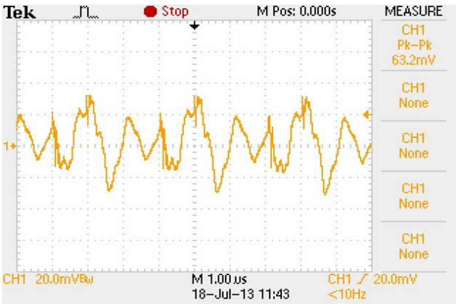
All test conditions are at 25℃ The figures are identical for MTQZ50-110S12



Efficiency Versus Output Current

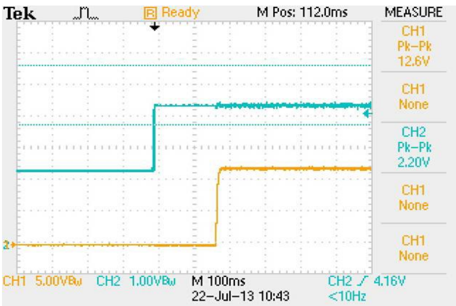


Efficiency Versus Input Voltage
Full Load

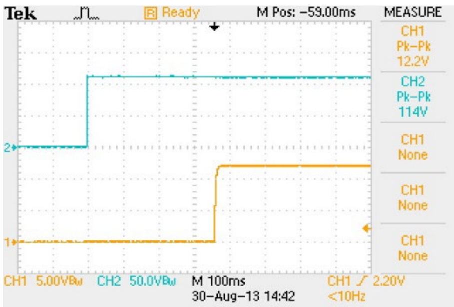


Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A

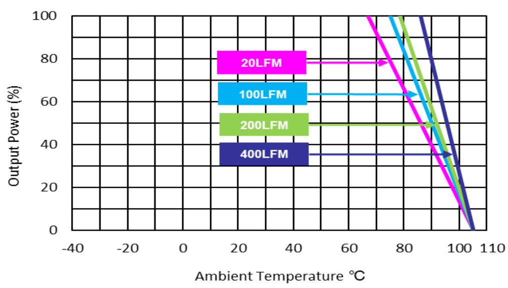
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in=}$ =$V_{in\ nom}$



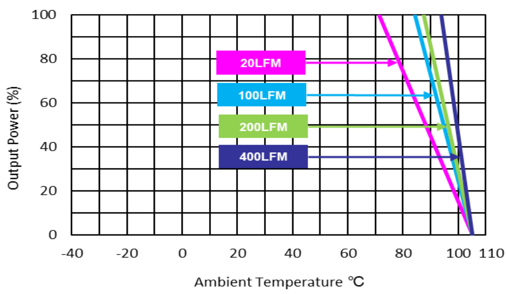
ON/OFF Voltage Start-Up and Output Rise Characteristic
$V_{in=}$ =$V_{in\ nom}$; Full Load



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



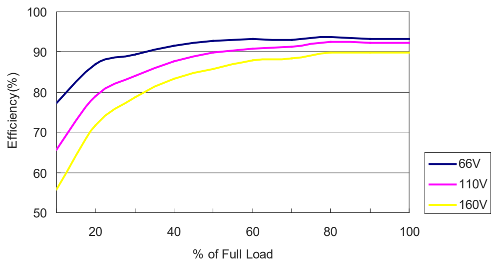
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$ (without heatsink)



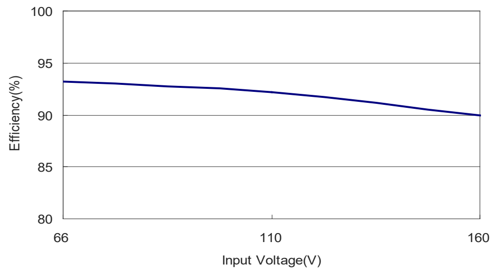
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$ (with heatsink)

Characteristic Curves

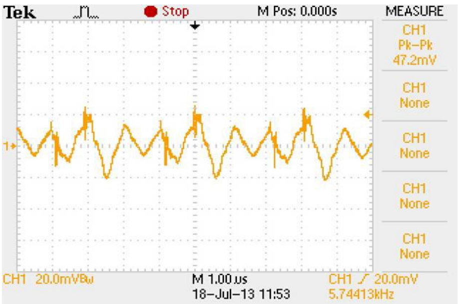
All test conditions are at 25℃ The figures are identical for MTQZ50-110S15



Efficiency Versus Output Current

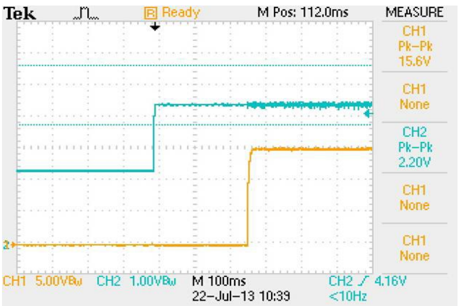


Efficiency Versus Input Voltage
Full Load

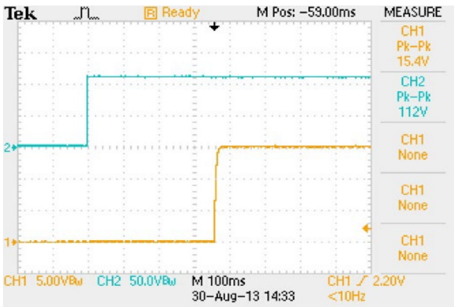


Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A

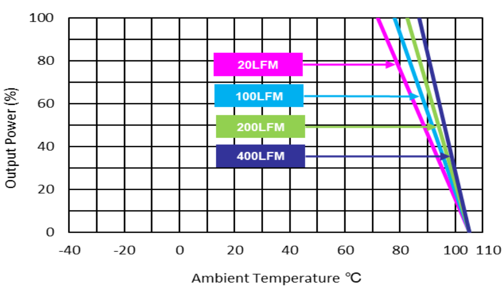
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}= =$V_{in\ nom}$



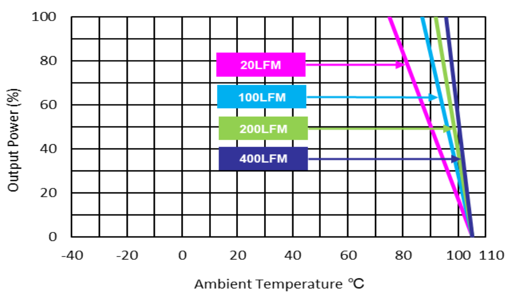
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in}= =$V_{in\ nom}$; Full Load



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



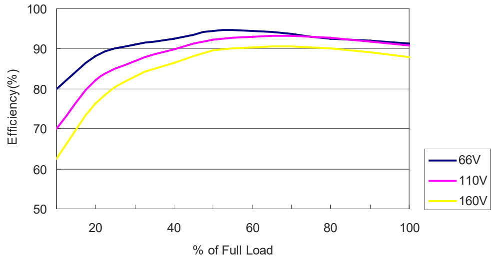
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$ (without heatsink)



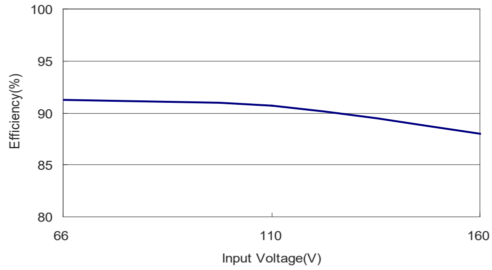
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$ (with heatsink)

Characteristic Curves

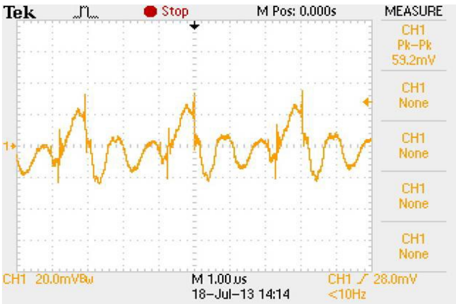
All test conditions are at 25℃ The figures are identical for MTQZ50-110S24



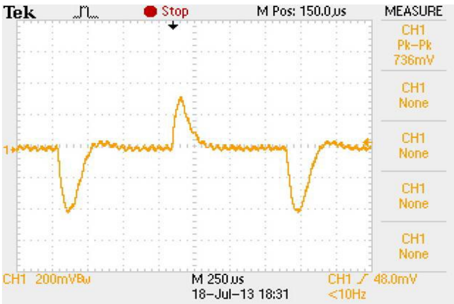
Efficiency Versus Output Current



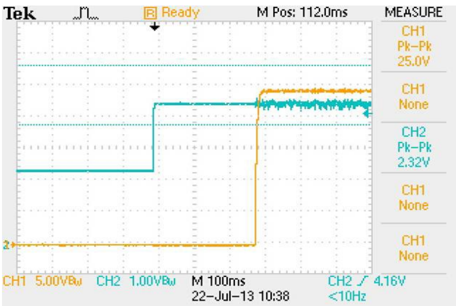
Efficiency Versus Input Voltage
Full Load



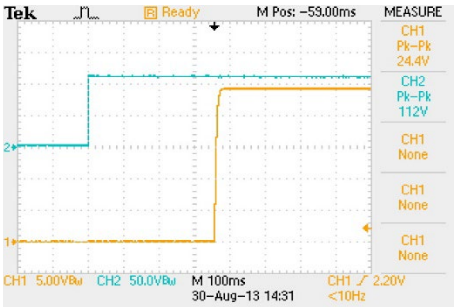
Typical Output Ripple and Noise.
V_{in} =$V_{in\ nom}$; Full Load; T_A



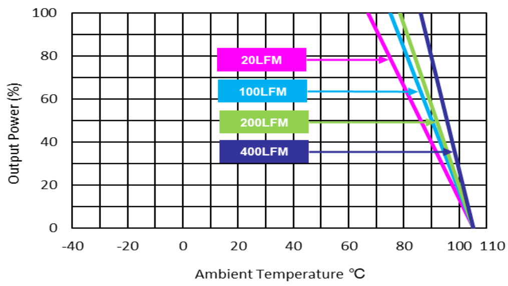
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; V_{in}= $V_{in\ nom}$



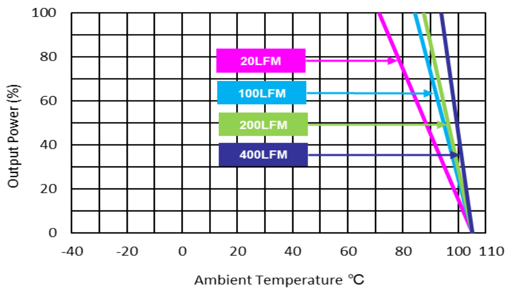
ON/OFF Voltage Start-Up and Output Rise Characteristic
V_{in}= $V_{in\ nom}$; Full Load



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



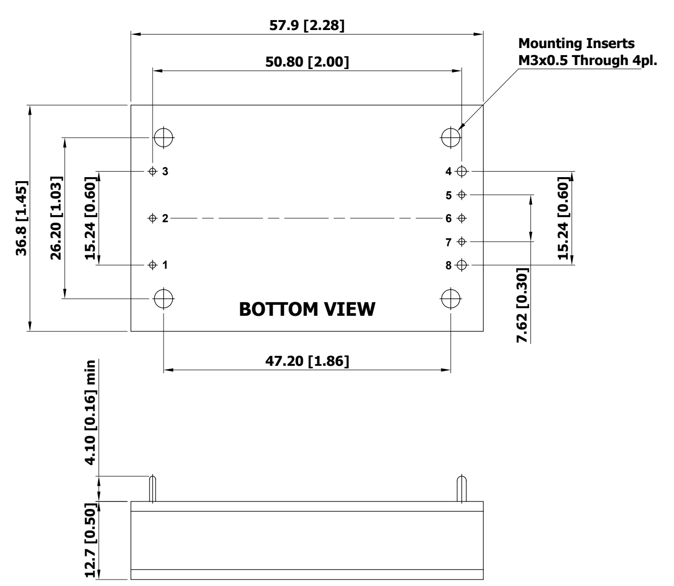
Derating Output Power Versus Ambient Temperature and Airflow
V_{in}=$V_{in\ nom}$ (without heatsink)



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

Package Specifications

Mechanical Dimensions



Pin Connections

Pin	Function	Diameter mm (inches)
1	+Vin	Ø 1.0 [0.04]
2	Remote On/Off	Ø 1.0 [0.04]
3	-Vin	Ø 1.0 [0.04]
4	-Vout	Ø 1.5 [0.06]
5	* -Sense	Ø 1.0 [0.04]
6	Trim	Ø 1.0 [0.04]
7	* +Sense	Ø 1.0 [0.04]
8	+Vout	Ø 1.5 [0.06]

* If remote sense not used the +sense should be connected to +output and –sense should be connected to –output
Maximum output deviation is 10% inclusive of trim

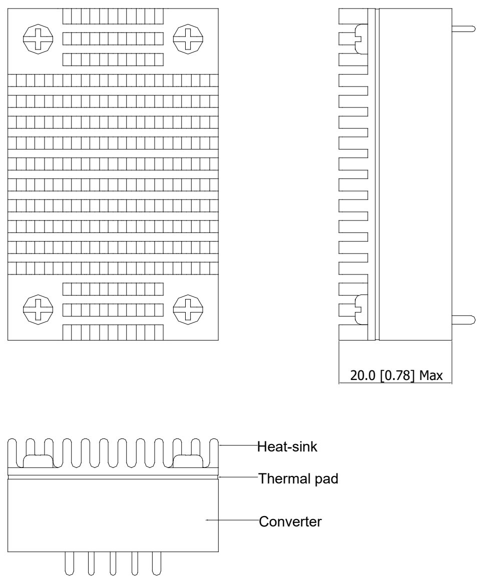
* Please refer to page 6 for pcb installation of power module according to the pictures of standard kit or heatsink kit from end users.

- All dimensions in mm (inches)
- Tolerance: X.X±0.5 (X.XX±0.02)
  X.XX±0.25 (X.XXX±0.01)
- Pin diameter tolerance: X.X±0.05 (X.XX±0.002)

Physical Characteristics

Case Size	:	57.9x36.8x12.7 mm (2.28x1.45x0.50 inches)
Case Material	:	Metal With Non-Conductive Baseplate
Top Side Base Material	:	Aluminum Plate
Bottom Side Base Material	:	Non-conductive Black Plastic Base Plate
Pin Material (Input)	:	Copper Alloy
Pin Material (Output)	:	Copper
Potting Material	:	Epoxy (UL94-V0)
Weight	:	61g

Heatsink (Option –HS)



Physical Characteristics

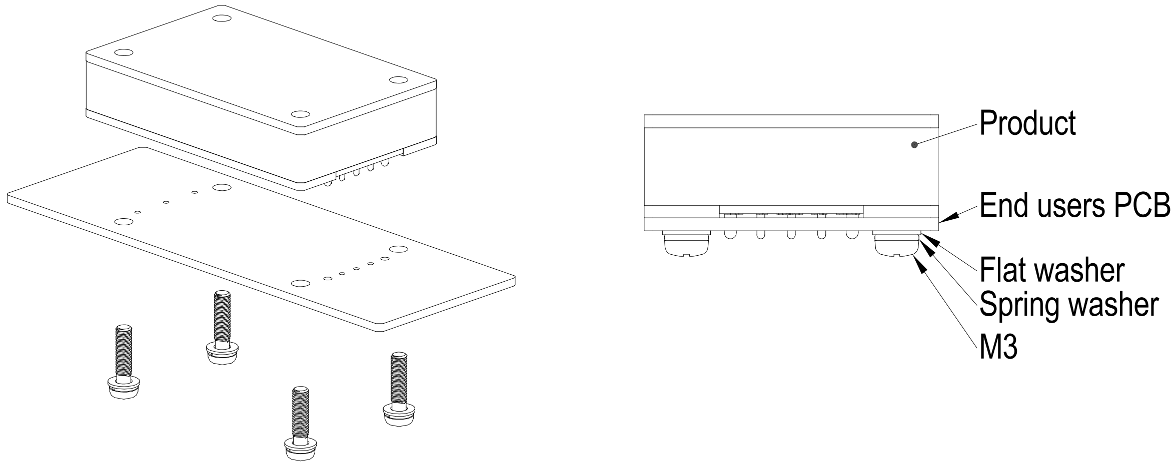
Heatsink Material	:	Aluminum
Finish	:	Black Anodized Coating
Weight	:	13g

- The advantages of adding a heatsink are:

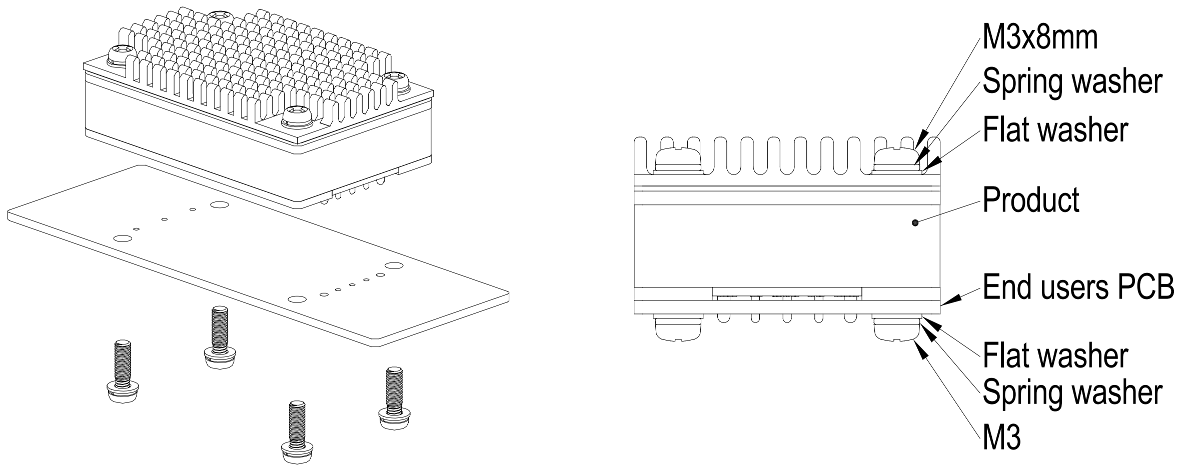
1. To improve heat dissipation and increase the stability and reliability of the DC-DC converters at high operating temperatures.
2. To increase operating temperature of the DC-DC converter, please refer to Derating Curve.

PCB Installation of End Users

Standard Kit

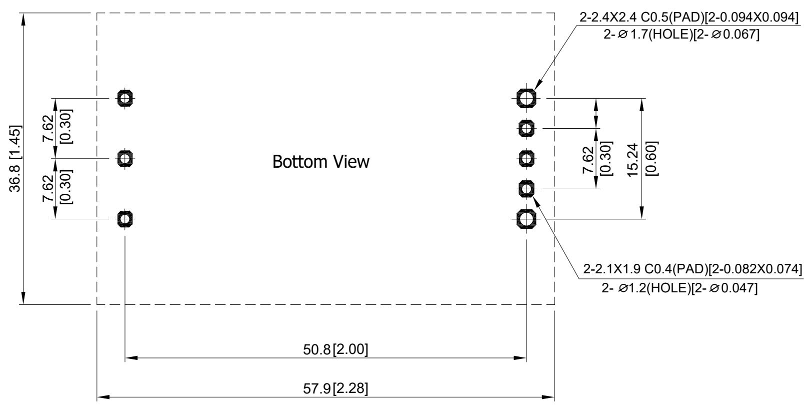


Heatsink Kit



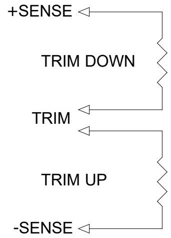
1. Please evaluates mechanical stress (vibration, shock, bump) during field applications.
2. It has to equip with installation kit if escess the guaranteed specifications, please contacts MINMAX for detail information.
3. Applied torque per screw 9 kgf.cm min.

Recommended Pad Layout



External Output Trimming

Output can be externally trimmed by using the method shown below

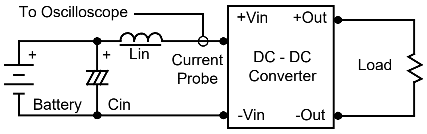


	MTQZ50-XXS05		MTQZ50-XXS12		MTQZ50-XXS15		MTQZ50-XXS24	
Trim Range (%)	Trim down (kΩ)	Trim up (kΩ)	Trim down (kΩ)	Trim up (kΩ)	Trim down (kΩ)	Trim up (kΩ)	Trim down (kΩ)	Trim up (kΩ)
1	138.88	106.87	413.55	351.00	530.73	422.77	598.66	487.14
2	62.41	47.76	184.55	157.50	238.61	189.89	267.78	218.02
3	36.92	28.06	108.22	93.00	141.24	112.26	157.49	128.31
4	24.18	18.21	70.05	60.75	92.56	73.44	102.34	83.46
5	16.53	12.30	47.15	41.40	63.35	50.15	69.25	56.55
6	11.44	8.36	31.88	28.50	43.87	34.63	47.19	38.61
7	7.79	5.55	20.98	19.29	29.96	23.54	31.44	25.79
8	5.06	3.44	12.80	12.37	19.53	15.22	19.62	16.18
9	2.94	1.79	6.44	7.00	11.41	8.75	10.43	8.70
10	1.24	0.48	1.35	2.70	4.92	3.58	3.08	2.72

Test Setup

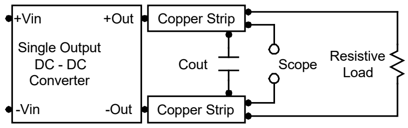
Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with a inductor Lin (4.7μH) and Cin (220μF, ESR < 1.0Ω at 100 kHz) to simulate source impedance. Capacitor Cin, 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 1μF ceramic capacitor and a 10μF tantalum 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

Positive logic remote on/off turns the module on during a logic high voltage on the remote on/off pin, and off 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 low is 0V to 1.2V. A logic high is 3.5V to 12V. The maximum sink current at the on/off terminal (Pin 2) during a logic low is -500**μ**A.

Overload Protection

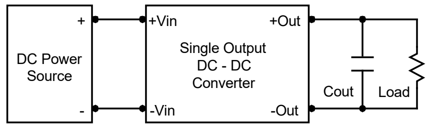
To provide hiccup mode protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure overload for an unlimited duration.

Overvoltage Protection

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

Output Ripple Reduction

A good quality low ESR capacitor placed as close as practicable across the load will give the best ripple and noise performance. To reduce output ripple, it is recommended to use 4.7μF capacitors at the output.

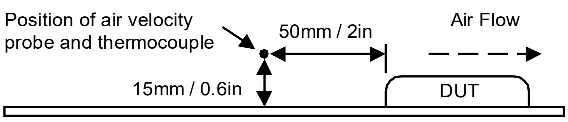


Maximum Capacitive Load

The MTQZ50 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.

Thermal Considerations

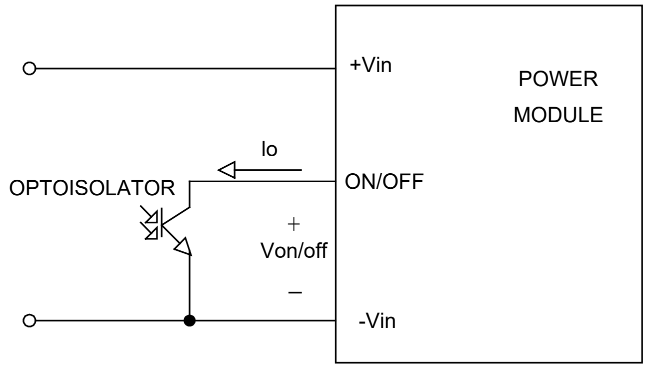
Many conditions affect the thermal performance of the power module, such as orientation, airflow over the module and board spacing. To avoid exceeding the maximum temperature rating of the components inside the power module, the case temperature must be kept below 105°C. The derating curves are determined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



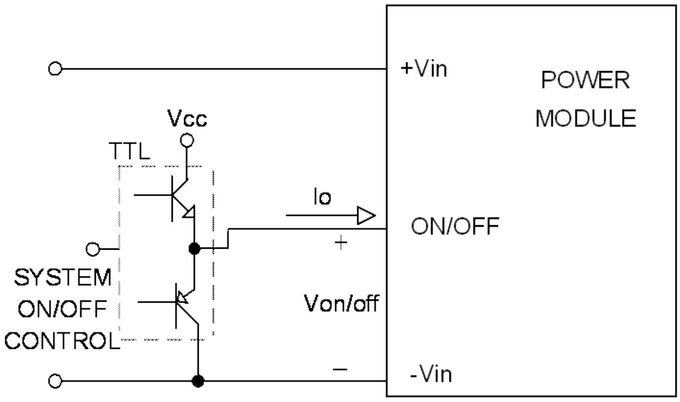
Remote On/Off Implementation

With suffix-RC, 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 (Von/off) that referenced to GND. If not using the remote on/off feature, please open circuit between on/off pin and -Vin pin to turn the module on.

Remote ON/OFF implementation

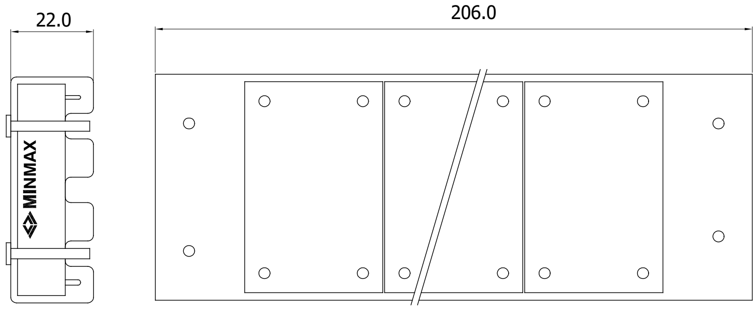


Isolated-Closure Remote ON/OFF



Level Control Using TTL Output

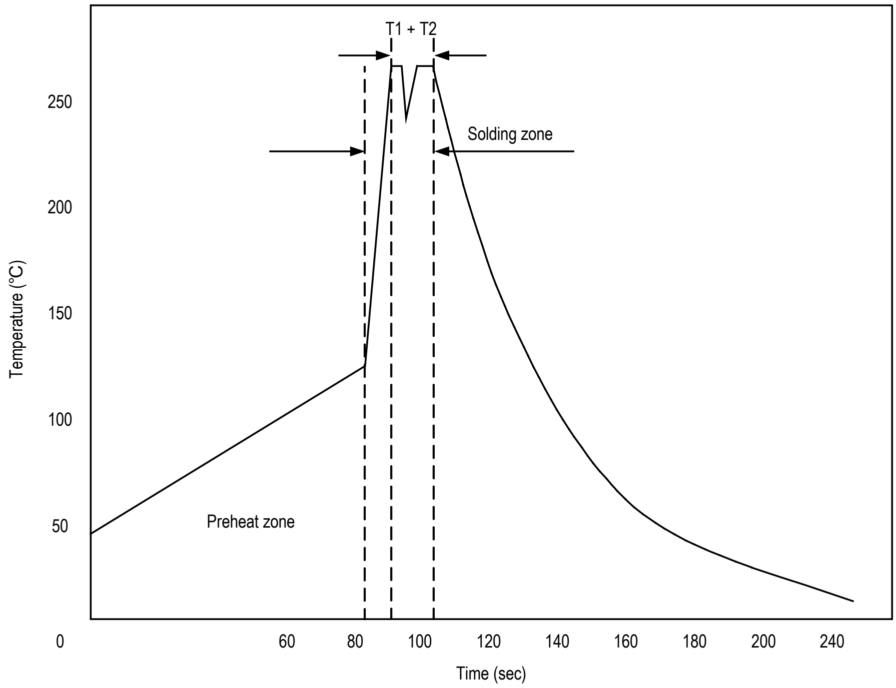
Packaging Information



Unit: mm
5 PCS per TUBE

Wave Soldering Considerations

Lead free wave solder profile



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

Hand Welding Parameter

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

Hand Welding: Soldering iron：Power 60W

Welding Time: 2~4 sec

Temp.: 380~400°C

Part Number Structure

M	TQ	Z	50	-	72	S	05
	Package Type Quarter Brick	Application Railway Wide 2:1 Input Voltage Range	Output Power 50 Watt		Input Voltage Range 72: 43 ~ 101 VDC 110: 66 ~ 160 VDC	Output Quantity S: Single	Output Voltage 05: 5 VDC 12: 12 VDC 15: 15 VDC 24: 24 VDC

MTBF and Reliability

The MTBF of MTQZ50 series of DC-DC converters has been calculated using

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

Model	MTBF	Unit
MTQZ50-72S05	315,900	Hours
MTQZ50-72S12	482,900	
MTQZ50-72S15	460,200	
MTQZ50-72S24	420,100	
MTQZ50-110S05	314,900	
MTQZ50-110S12	431,500	
MTQZ50-110S15	456,100	
MTQZ50-110S24	414,200	