

Size: 2.28in x 1.45in x 0.50in
(57.9mm x 36.8mm x 12.7mm)

FEATURES

- Quarter Brick Package
- Wide Input Range
- High Efficiency
- No Minimum Load Requirement
- Remote On/Off
- Over Load, Over Voltage, Short Circuit, and Over Temperature Protection
- Fire Protection and RoHS & REACH Compliance
- cUL/UL 60950-1, IEC/EN60950-1, EN50155, and IEC 60571 Safety Approvals

DESCRIPTION

The DCMQ50 series of DC/DC railway converters offers 50 watts of output power in a 2.28" x 1.45" x 0.50" standard quarter brick package. This series consists of single output models with a wide input range and high efficiency. Each model has remote on/off, fire protection, and optional heatsink. They also have over load, over voltage, short circuit, and over temperature protection and are RoHS & REACH compliant. This series has cUL/UL 60950-1, IEC/EN60950-1, EN50155, and IEC 60571 safety approvals.

MODEL SELECTION TABLE

Model Number[1]	Input Voltage Range	Output Voltage	Input Current		Max. Output Current	Over Voltage Protection	Max. Capacitive Load	Efficiency	Reflected Ripple Current	Output Power
			No Load	Max Load						
DCMQ50-72S05	72VDC (43~101VDC)	5VDC	50mA	771mA	10000mA	6.2VDC	17000µF	90%	35mA	50W
DCMQ50-72S12		12VDC	45mA	755mA	4170mA	15VDC	2950µF	92%		
DCMQ50-72S15		15VDC	45mA	754mA	3330mA	18VDC	1900µF	92%		
DCMQ50-72S24		24VDC	50mA	762mA	2080mA	30VDC	740µF	91%		
DCMQ50-110S05	110VDC (66~160VDC)	5VDC	40mA	505mA	10000mA	6.2VDC	17000µF	90%	35mA	50W
DCMQ50-110S12		12VDC	35mA	500mA	4170mA	15VDC	2950µF	91%		
DCMQ50-110S15		15VDC	35mA	494mA	3330mA	18VDC	1900µF	92%		
DCMQ50-110S24		24VDC	40mA	499mA	2080mA	30VDC	740µF	91%		

SPECIFICATIONS

All specifications are based on 25°C, Resistive Load, Nominal Input Voltage, and Rated Output Current unless otherwise noted.
We reserve the right to change specifications based on technological advances.

SPECIFICATION	TEST CONDITIONS	Min	Typ	Max	Unit
INPUT SPECIFICATIONS					
Input Voltage Range	72V Input Models	43	72	101	VDC
	110V Input Models	66	110	160	
Input Surge Voltage (100ms. Max)	72V Input Models	-0.7		165	VDC
	110V Input Models	-0.7		250	
Start-Up Threshold Voltage	72V Input Models			43	VDC
	110V Input Models			66	
Under Voltage Shutdown	72V Input Models		40		VDC
	110V Input Models		63		
Input Filter	All Models	Internal Pi Type			
OUTPUT SPECIFICATIONS					
Output Voltage		See Table			
Voltage Accuracy				±1.0	%Vnom.
Line Regulation	Vin=Min. to Max. @Full Load			±0.2	%
Load Regulation	Io=0% to 100%			±0.3	%
Output Power		See Table			
Output Current		See Table			
Minimum Load		No Minimum Load Requirement			
Maximum Capacitive Load		See Table			
Ripple & Noise (20MHz bandwidth)[2]	24V Output			150	mVp-p
	Other Outputs			100	
Transient Recovery Time[3]	25% Load Step Change		250		µsec
Transient Response Deviation	25% Load Step Change		±3	±5	%
Start-Up Time	All Models		0.35		S
Temperature Coefficient				±0.02	%/ºC
Trim Up/Down Range	% of Nominal Output Voltage			±10	%

SPECIFICATIONS

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SPECIFICATION	TEST CONDITIONS		Min	Typ	Max	Unit
REMOTE ON/OFF CONTROL						
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
PROTECTION						
Short Circuit Protection	Hiccup Mode 0.5Hz typ.		Automatic Recovery			
Over Load Protection	Hiccup			150		%
Over Voltage Protection			See Table			
Over Temperature Protection	Base Plate				+110	ºC
ENVIRONMENTAL SPECIFICATIONS						
Operating Temperature			Min	Max. Without Heatsink	Max. With Heatsink	Unit
	Natural Convection, Nominal Vin, Load 100% Inom.	DCMQ50-72S12, 72S15, 110S15	-40	72	75	ºC
		DCMQ50- 72S24, 110S12, 110S24	-40	68	71	
		DCMQ50-72S05, 110S05	-40	63	67	
Storage Temperature			-50		+125	ºC
Thermal Impedance	Natural Convection without Heatsink		7.5			ºC/W
	Natural 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	
Operation Humidity	Non-Condensing		5		95	%RH
Lead Temperature	1.5mm for Case for 10Sec.				260	ºC
Cooling			Compliance to IEC/EN60068-2-1			
Dry Heat			Compliance to IEC/EN60068-2-2			
Damp Heat			Compliance to IEC/EN60068-2-30			
Shock & Vibration Test			Compliance to IEC/EN 61373			
Fire Protection			Compliance to EN45545-2			
MTBF	MIL-HDBK-217F@25ºC Full Load, Ground Benign		314,900 Hours			
GENERAL SPECIFICATIONS						
Typical Efficiency	@Max Load		See Table			
Switching Frequency				320		KHz
Isolation Voltage	Reinforced Insulation, Rated for 60 Seconds		3000			VACrms
Isolation Resistance	500VDC		1000			MΩ
Isolation Capacitance	100KHz, 1V				3000	pF
PHYSICAL SPECIFICATIONS						
Weight			2.15oz (61g)			
Dimensions (L x W x H)			2.28in x 1.45in x 0.50in (57.9mm x 36.8mm x 12.7mm)			
Case Material			Aluminum Frame with Black Anodized Coating			
Base Material	Top Side		Aluminum Plate			
	Bottom Side		Non-Conductive Black Plastic Base Plate			
Potting Material			Epoxy (UL94-V0)			
SAFETY CHARACTERISTICS						
Safety Approvals	cUL/UL 60950-1, IEC/EN 60950-1, EN50155, IEC60571					
EMI	Conduction & Radiation: EN55022, EN55011, FCC Part 15					Class A
ESD	EN61000-42	Air±8kV Contact±6kV				Class A
Radiated Immunity	EN61000-4-3	10V/m				Class A
Fast Transient[5]	EN61000-4-4	±2kV				Class A
Surge[5]	EN61000-4-5	±2kV				Class A
Conducted Immunity	EN61000-4-6	10Vrms				Class A

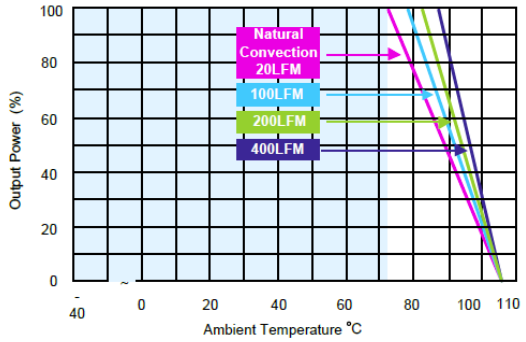
NOTES

1. Heatsink is available for models. To indicate heatsink, add –HS to end of model name.
2. Ripple & Noise measurement with 1µF MLCC and a 10µF tantalum capacitor.
3. Transient recovery time is measured to within 1% error band for a step change in output load of 75% to 100%.
4. Other input and output voltage may be available, please contact factory.
5. To meet EN61000-4-4 & EN61000-4-5 by adding capacitor across the input pins. Suggested Capacitor: 470µF/200V.
6. Parallel capacitor across the input pins under specification testing. Suggested capacitor: 68µF/200V.
7. Natural convection is about 20LFM but is not equal to still air (0 LFM).

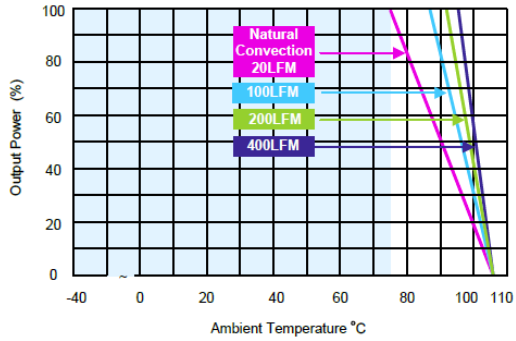
**Due to advances in technology, specifications subject to change without notice.*

DERATING CURVES

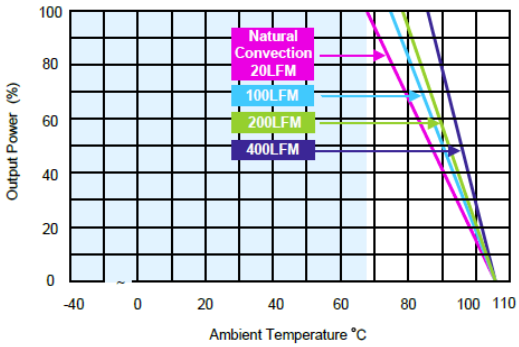
DCMQ50-72S12, 72S15, 110S15
Derating Curve without Heatsink



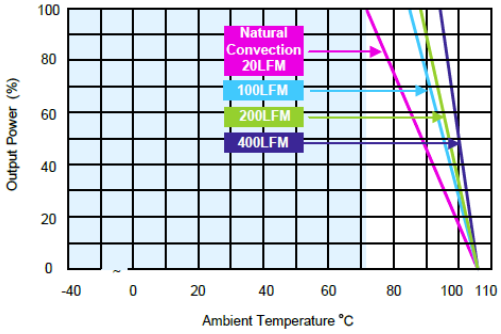
DCMQ50-72S12, 72S15, 110S15
Derating Curve with Heatsink



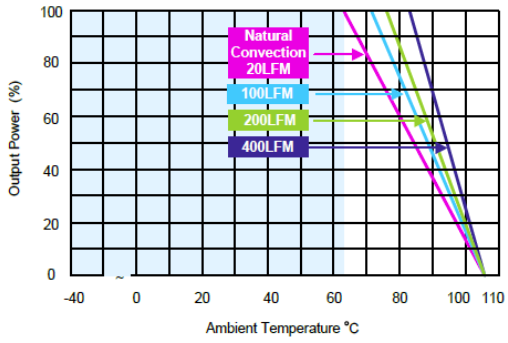
DCMQ50-75S24, 110S12, 110S24
Derating Curve with Heatsink



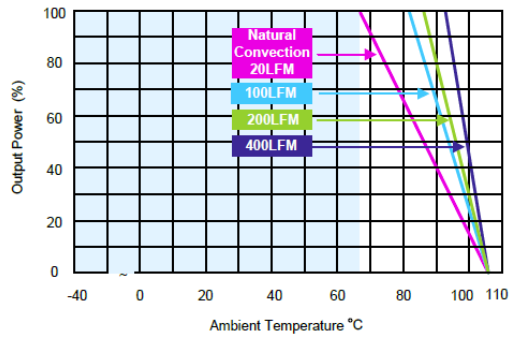
DCMQ50-72S24, 110S12, 110S24
Derating Curve with Heatsink



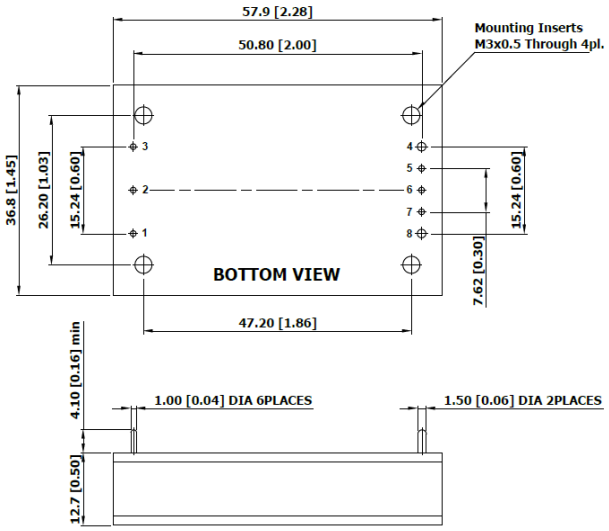
DCMQ50-72S05, 110S05
Derating Curve without Heatsink



DCMQ50-72S05, 110S05
Derating Curve with Heatsink



MECHANICAL DRAWINGS



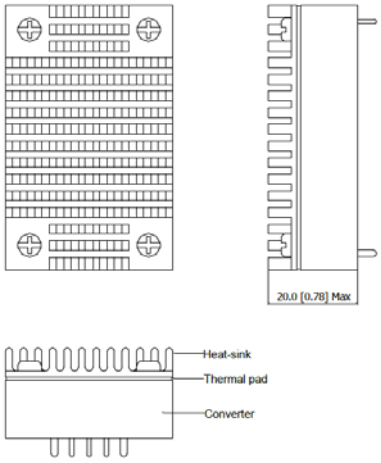
Pin Connections

Pin	Function
1	+Vin
2	Remote On/Off
3	-Vin
4	-Vout
5	*-Sense
6	Trim
7	*+Sense
8	+Vout

***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.

Notes:
All dimensions in mm (inches)
Tolerance: X.X±0.5 (X.XX±0.02)
X.XX±0.25 (X.XXX±0.01)
Pin Diameter Ø1.0 ±0.05 (0.04±0.002)
Pin Diameter Ø1.5 ±0.05 (0.06±0.002)

Heatsink (Option –HS)

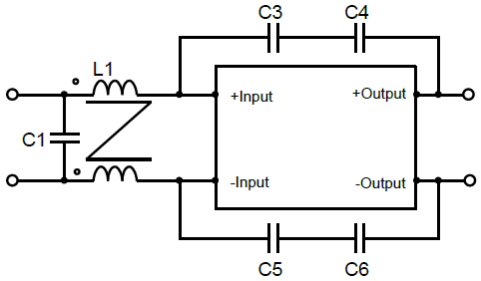


Heatsink Material: Aluminum
Finish: Black Anodized Coating
Weight: 13g

Advantages of adding heatsink:
Improves heat dissipation and increases the stability and reliability of the DC/DC converters at high operating temperatures.

EXTERNAL FILTER

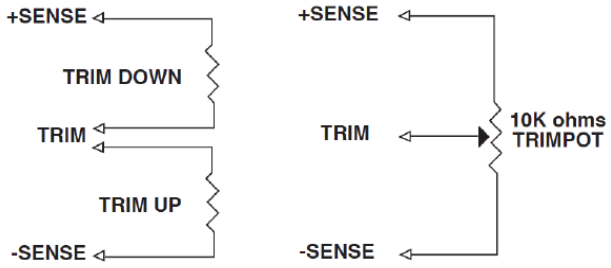
External Filter meets Conducted and Radiated EMI EN55011 & EN55022 Class A; FCC part 15 Level A



Model	L1	C1	C3	C4	C5	C6
DCMQ50-72SXX	450µH/450µH	CHEMI-CON KXG Series 68µF/200V	2200pF 3KV	2200pF 3KV	2200pF 3KV	2200pF 3KV
DCMQ50-110SXX						

EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed by using the method shown below.



DCMQZ50-XXS05 Trim Table

Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	138.88	62.41	36.92	24.18	16.53	11.44	7.79	5.06	2.94	1.24	KΩ
Trim Up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Ru=	106.87	47.76	28.06	18.21	12.30	8.36	5.55	3.44	1.79	0.48	KΩ

DCMQZ50-XXS12 Trim Table

Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	413.55	184.55	108.22	70.05	47.15	31.88	20.98	12.80	6.44	1.35	KΩ
Trim Up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Ru=	351.00	157.50	93.00	60.75	41.40	28.50	19.29	12.37	7.00	2.70	KΩ

DCMQZ50-XXS15 Trim Table

Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	530.73	238.61	141.24	92.56	63.35	43.87	29.96	19.53	11.41	4.92	KΩ
Trim Up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Ru=	422.77	189.89	112.26	73.44	50.15	34.63	23.54	15.22	8.75	3.58	KΩ

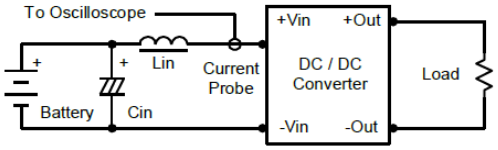
DCMQZ50-XXS024 Trim Table

Trim Down	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox0.99	Vox0.98	Vox0.97	Vox0.96	Vox0.95	Vox0.94	Vox0.93	Vox0.92	Vox0.91	Vox0.90	Volts
Rd=	598.66	267.78	157.49	102.34	69.25	47.19	31.44	19.62	1.43	3.08	KΩ
Trim Up	1	2	3	4	5	6	7	8	9	10	%
Vout=	Vox1.01	Vox1.02	Vox1.03	Vox1.04	Vox1.05	Vox1.06	Vox1.07	Vox1.08	Vox1.09	Vox1.10	Volts
Ru=	487.14	218.02	128.31	83.46	56.55	38.61	25.73	16.18	8.70	2.72	KΩ

TEST SETUP

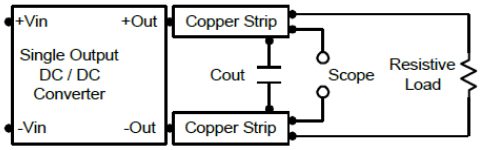
Input Reflected Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor Lin (4.7µH) and Cin (220µF, ESR <1.0Ω at 100KHz) to simulate source impedance. Capacitor Cin, offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500KHz.



Peak-to-Peak Output Noise Measurement Test

Use a 1µF ceramic capacitor and a 10µF tantalum capacitor. Scope measurement should be made using a BNC socket, measurement bandwidth is 0-20MHz. Position the load between 50mm and 75mm 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 -500µA.

Overload Protection

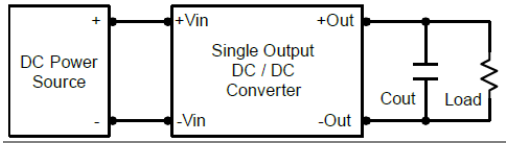
To provide hiccup mode protection in a fault (output overload) condition, the unit is equipped with internal current limiting circuitry and can endure overload for an unlimited duration.

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 levels can be found in 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.

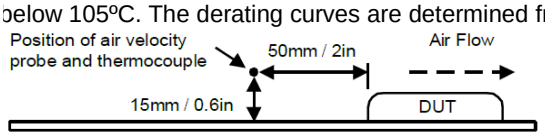


Maximum Capacitive Load

The DCMQ50 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 105ºC. The derating curves are determined from measurements obtained in a test setup.



COMPANY INFORMATION

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