

# EMERALD TECH

## Technical Specification

EMQ110050M20P, EMQ110050M20N

110V Input 5V/20A Output



## High Efficiency Military DC/DC Converter

Up to 120 Watts

Size (Max.): 3.00 x 1.50 x 0.40 in (76.5 x 38.2 x 10.0 mm)  
Weight: 100 grams maximum

### Description

The EMQ family of high current, high efficiency DC/DC converters offer current levels that exceed other military quarter-bricks and are comparable to existing half-bricks. They are targeted specifically at the aerospace, aircraft, portable weaponry industry and distributed power markets. With a wide input voltage range of 18-36VDC, 36-75VDC, 88-132VDC they are available with output voltage of 3.3, 5, 12 and 15 Volts. All models feature an input filter, input undervoltage lockout, output overvoltage protection, overtemperature protection, output current limiting and short circuit protection. The fully enclosed, encapsulated construction with aluminum heat spreader design achieves efficient heat transfer with no hot spots. The use of patent-pending hybrid planar transformer technology and other patent-pending design concepts facilitate maximum power delivery with the highest efficiency up to 90% - 92%. The converters combine creative design concepts with high derating engineering practices to offer very high reliability, high performance and low cost solution to systems designers requiring maximum power in compact spaces.

### Applications

- Aerospace, Aircraft
- Complex power system
- Portable weaponry
- Distributed Power Architecture

### Features

- Delivers up to 20A in quarter brick size
- Fully Isolated
- Fixed frequency, 400 KHz typical
- Magnetic coupling, no optocouplers
- High efficiency patented topology
- Can operate without airflow or heat sink
- No minimum load required
- 5V output model.
- Wide input operating range 88-132V
- -55° C to +125°C ambient operation
- Remote sense to compensate line drop
- Synchronization function
- Current sharing – Paralleable up to 800 watts.
- Output adjustable of +/-10% nominal range
- 500V, 10M $\Omega$  input-to-output isolation
- Full enclosed, encapsulated construction with heat spreader for low temperature rise
- Output overcurrent and overvoltage protection
- Indefinite short circuit protection
- Over Temperature protection
- Input Under voltage protection
- MTBF of 1,000,000 hours @ 50° C ( Bellcore )

**EMERALD TECH.** No.A-3, Xiuzhou High-Tech Industrial Park, Jiaxing City, ZJ 314001 China  
Tel.: 86-573-2790696 • Fax: 86-573-2790698 • www.emeraldtech.com • Email: [sales@emeraldtech.com](mailto:sales@emeraldtech.com) • EMQ

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**EMERALTECH**

**Product Brief**

## CONVERTER SELECTION

Typical @  $T_a=+25^{\circ}\text{C}$  under nominal line voltage and 75% load conditions, unless noted.

Model	Input				Output		Efficiency 75% Load
	Voltage (VDC)		Current (A)		Voltage	Current	
	Nominal	Range	No load	Full load	(Volts)	(Amps)	(%)
<b>EMQ110050M20P</b>	110	88-132	0.1	4.1	5	20	91

For negative logic feature add designator N as suffix to model number, i.e., EMQ110050M20N.

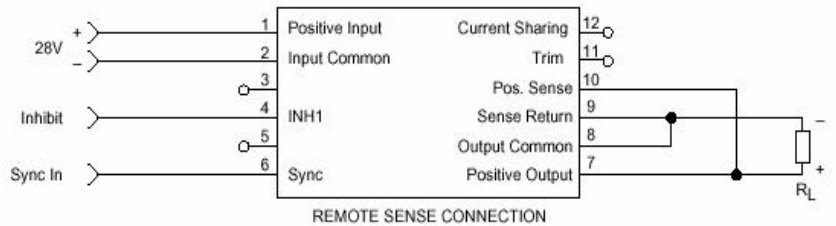
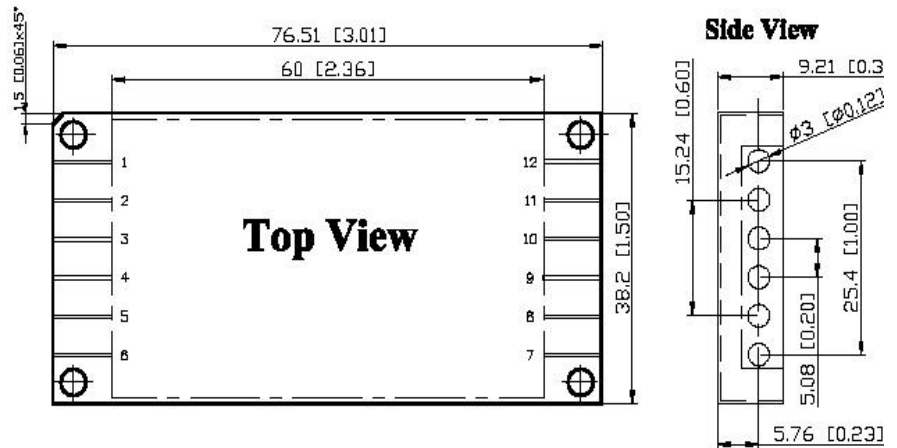
Consult factory for other output voltage configurations.

## Outline Information and Summary Specifications

Pin Connection	
Pin#	Function
1	Positive Input ( Vin + )
2	Input Common ( Vin - )
3	
4	Inhibit ( INHB )
5	
6	Sync In/Out ( SYNC )
7	Positive Output ( Vout + )
8	Output Common ( Vout - )
9	Sense Return ( S - )
10	Positive Sense ( S + )
11	Trim ( TRIM )
12	Current Sharing ( LSHR )

### Notes:

- 1). All dimensions are in inches [mm]
- 2). All pins are dia. 0.040 [1.02]
- 3). Pin material: Brass
- 4). Pin finish: Gold plated
- 5). Heat spreader (baseplate) material: Aluminum
- 6). Weight: 100 gram Max



### Thermal Derating

Vin = 110V
Full load (20A) from $-55^{\circ}\text{C}$ to $125^{\circ}\text{C}$ base plate temperature, Linearly derate to zero from $125^{\circ}\text{C}$ to $135^{\circ}\text{C}$ .

The information and specifications contained in this specification are believed to be accurate and reliable at the time of publication. Specifications are subject to change without notice.

## Technical Specification

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Product Brief

## Electrical Specification

Typical test data at Ta=25°C, Vin=110V unless otherwise noted.

PARAMETER	NOTES	MIN	TYP	MAX	UNIT
<b>Absolute maximum rating</b>					
Input voltage		0		120	V
Operating case temperature		-55		125	°C
Storage temperature		-65		150	°C
Humidity				95	%
<b>Input characteristics</b>					
Operating input voltage range		88	110	132	V
Turn on voltage threshold		14	15	16	V
Turn off voltage threshold		13	14	15	V
Transient withstand	Transient duration: 100ms			100	V
Maximum input current	100% load, 110Vin		2.1	2.1	A
Off converter input current	110Vin		9	14	A
<b>Output characteristics</b>					
Output voltage set point			2	3.5	mA
Output voltage line regulation	88-132 Vin	4.950	5.00	5.050	V
Output voltage load regulation	10%-100%Load		±0.5	±1.0	%
Output voltage trim range	Percentage of normal output		±0.5	±1.0	%
Output voltage ripple and noise	20MHz bandwidth, 75% Load, 110Vin	-15		+10	%
Output over power protection			75	100	mV(pk-pk)
Over-voltage protection		110	120	130	%
Output current range		5.6	5.8	6.1	V
Over-temperature protection		0		20	A
Temperature coefficient			135	140	°C
Capacitive Load				±0.05	%/°C
<b>Output dynamic characteristics</b>					
Startup time	5% to 95% of the output voltage	0		15,000	μF
Transient recovery time			20	30	ms
Transient Peak	50% - 75% - 50% load (2.0A/us)		400	500	μs
<b>Efficiency (see efficiency curve)</b>					
75% load efficiency	110 Vin		280	350	mv pk
<b>Isolation characteristics</b>					
Isolation voltage (primary to secondary)	1minute		91		%
Isolation voltage (primary to case)	1minute		500		VDC
Isolation voltage (secondary to case)	1minute		250		VDC
Isolation resistance	500VDC, Primary to secondary		250		VDC
Isolation capacitance	Primary to secondary	10			MΩ
<b>Feature Characteristics</b>					
Switching frequency				1000	pF
ON/OFF control (Positive logic) Converter On (Open = on) Converter Off	EMQ110050M20P	360	400	440	KHz
ON/OFF control (Negative logic) Converter On (Open = on) Converter Off	EMQ110050M20N	2.5 -1.0		7 1.2	V V
Calculated MTBF	Bellcore @ 50°C	-1.0 2.5		1.2 7	V V
Weight			1,000,000		Hrs

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### Basic operation and functions

The **EMQ family** uses a number of proprietary technologies to achieve high efficiency, high output current operations. The whole unit switches at the fixed frequency with a predictable EMI performance. The transformer secondary output is processed with synchronous rectifier to achieve high efficiency power conversion at high output current.

The product offers most complete control and protection functions with the pin outs as described below:

#### Input Power ( pin1, pin2 )

Input power terminals. Vin+ (pin1) must be connected to Positive input voltage; Vin- (pin2) must be connected to Negative input voltage.

#### Output Power ( pin7, pin8 )

Output power terminals. Vout+ (pin7) is the positive output voltage terminal; Vout- is the negative output voltage terminal.

#### Inhibit ( pin 4 )

This pin is a TTL compatible inhibit terminal (INHB) to disable the power converter, resulting in a very low quiescent input current. Options of positive or negative logic are available with the signal levels as specified in the electric parameter table. In both cases open terminal allows the unit to continue its operation.

#### Current Sharing ( pin 12)

Multiple EMQ converters can be used in parallel to drive a common load (see Figure 2). In this mode of operation EMQ converters offer a single bus share control configuration by just connecting the LSHR terminal of the paralleled converters together, as shown in Fig.2.

When paralleled, 95% of the total combined power ratings of the EMQ converters are available at the load. Overload and short circuit performance are not adversely affected during parallel operation.

#### Remote Sense ( pin 9, pin 10 )

Remote sense allows the user to maintain accurate output voltage at the remote load terminals regardless of the line drop.

To achieve this the Sense- (pin9) and Sense+ (pin10) should be connected at the load terminals or at the point where the regulation is needed as shown on Fig. 1.

If remote Sense is not required, the Sense- pin must be connected to the Vout- pin (pin8), and the Sense+ pin must be connected to the Vout+ pin (pin 7) to ensure that the unit will regulate at the specified output voltage. If these connections are not made, the unit's output voltage will not be maintained at the specified value.

The unit output over voltage protection senses the terminal voltage across Vout+ and Vout-, and not across the sense lines, so the resistance between the output pins of the unit and the load should be minimized to prevent unwanted triggering of OVP.

Also when using the remote sense function, the output power must be taken care of, as not to exceed the maximum power capability of the unit.

#### Output Voltage Trim (pin 11)

Permits the user to adjust the output voltage up or down to satisfy specific custom voltage requirement. The adjustment range is from + 10% to -15%.

Output voltage can be adjusted up or down by connecting a trim resistor between Trim and Vout+ or Vout- terminal respectively as shown in Fig.3.

Leave Trim pin ( Pin 11) open for normal output voltage.

When trimming up, care must be taken not to exceed the unit OVP threshold.