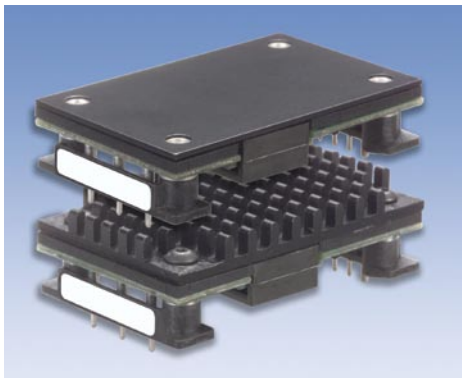
# DORADO MV DC/DC CONVERTERS
## 24V Input – 12VDC – 8A Output

bel POWER PRODUCTS

GMDC12V08

## GMDC12V08 – 1/4 Brick Dorado MV Series

- Industry standard pinout and footprint
- High efficiency: 86% at 12V, 8A; 88% at 12V, 4A
- Very low common-mode noise for a commercial DC/DC converter
- Constant switching frequency
- Remote sense
- Single board design
- Optional low profile heat sink for improved thermal performance
- Header with M3 metal inserts for mechanical connection to PCB
- Optional low profile



## Control Functions

- Uses innovative control and power topology for lower parts count
- Microprocessor controlled
- Primary-side enable, choice of logic
- Industry standard output trim

## Protection Features

- Over temperature protection
- Over voltage protection
- Over current protection
- Over/Under input voltage protection

## Typical Characteristics

- Output setpoint accuracy: ± 1.5%
- Load regulation: ± 0.25%
- Line regulation: ± 0.25%
- Regulation over line, load and temperature: ± 3%
- Low output ripple

ISO 9001 CERTIFIED ORGANISATION

Certified to ISO 9001:2000

## Ordering Information

| Standard Model Number | Input Voltage | Output Voltage | Max Current |
|---|---|---|---|
| GMDC12V08* | 24V | 12V | 8A |

* **Options:**

**P** = Positive Logic Version; High = On

**E** = 0.18" Pins (± .01")
**M** = 0.145" Pins (± .01")

**S** = 0.12" Pins (± .01")
**R** = Heat Sink-Ready

**Example Part Number:**
(All options)

**GMDC12V08 PSR 00X**

Part Number

Options:
- Positive Logic Version
- Optional Pin Lengths
  - **E** = 0.18"
  - **M** = 0.145"
  - **S** = 0.12"
- Heat Sink-Ready
- Heat Sink
  - 001 = 0.25"
  - 002 = 0.50"
  - 003 = 1.00"
  - 004 = 0.13"

## Dorado MV Heat Sink Part Numbers

| Part Number | Height | Typical Thermal Performance | |
|---|---|---|---|
| | | Natural Convection Power Dissipation† | Forced Convection Thermal Resistance‡ |
| 001 | 0.25" | 5W | 5.8° C/W |
| 002 | 0.50" | 7W | 3.2° C/W |
| 003 | 1.00" | 11W | 2.0° C/W |
| 004 | 0.13" | TBD | TBD |

† @ 60° C rise heat sink to ambient ‡ @ 300'/min.

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## Input Specifications

| Parameter | Min | Typical | Max | Units |
|---|---|---|---|---|
| Operating Input Voltage | 18 | 24 | 36 | $V_{DC}$ |
| Input Current | | | 4 | A |
| Input Capacitance | | 6 | | µF |
| Input Hysteresis, Low Line | | 1 | | $V_{DC}$ |

$V_{IN}$ = 24$V_{DC}$, $T_A$@25˚ C, 300 LFM Airflow, $V_{OUT}$ = 12$V_{DC}$, $I_{OUT}$ = 8A unless otherwise noted.
Available output power depends on ambient temperature and good thermal management.
(See application graphs for limits.)

## Output Specifications

| Parameter | Min | Typical | Max | Units |
|---|---|---|---|---|
| Regulation Over Line, Load & Temperature | 97 | | 103 | $\%V_{NOM}$ |
| Voltage Ripple | | | 20 | $mV_{RMS}$ |
| Voltage Ripple, 20MHz BW | | | 60 | $mV_{P-P}$ |
| Current Range | 0 | | 8 | A |
| Current Limit Inception | 105 | 120 | | $\%I_{OUT}$ |
| Output Transient Response, 50% to 75% Load Change, 1A/µsec | | | 5 | $\%V_{OUT}$ |
| Settling Time to ± 1% | | | 400 | µS |
| Turn-on Time to 98% Vnom | | | 300 | mS |
| Output Overshoot at Turn-on | | | 0 | $\%V_{OUT}$ |
| Trim Range | 60 | | 110 | $\%V_{OUT}$ |
| Over Voltage Protection, Latching | | 125 | | $\%V_{OUT}$ |

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## Isolation Specifications

| Parameter | Min | Typical | Max | Units |
|---|---|---|---|---|
| Isolation Test Voltage, Input/Baseplate/Output (Basic) | 2000 | | | $V_{DC}$ |
| Isolation Resistance | 10 | | | MΩ |

## Features

| Parameter | Min | Typical | Max | Units |
|---|---|---|---|---|
| Over Temperature Protection, Thermal Sensor[1] | | | 117 | ° C |
| Switching Frequency, Fixed | | 300 | | kHz |

1. PCB less than 130° C.

## General Specifications

| | |
|---|---|
| Operating Temperature | -40° C to + 100° C |
| Storge Temperature | -55° C + 125° C |
| Relative Humidity | 10% to 95% RH, Non-condensing |
| Vibration | 2 to 9 Hz, 3mm disp., 9 to 200 Hz, 1g |
| Material Flammability | UL V-0 |
| Weight | 30 grams |
| MTBF Telcordia (Bellcore) | 2.0 million hours |

## Approvals and Standards

| |
|---|
| UL and c-UL Recognized Component, TUV, UL60950, CSA 22.2 No. 950, IEC/EN 60950** |
| **EMC Characteristics:** |
| Designed to meet emission and immunity requirements per EN55022, CISPR 22, Class B, and CISPR 24. |

** An external fuse shall be used to comply with the requirements.

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## Application Notes

# CoolConverter™

**Bel Power's Proprietary CoolConverter™**

- Patented single-stage power conversion architecture, control and magnetic design allow unprecedented power density and efficiency in an isolated power supply.
- An advanced microcontroller reduces parts count while adding features, performance and flexibility in the design.
- Low common-mode noise results from lower capacitance in the transformer from balanced winding design.

## Protection and Control

**Valid Input Voltage Range**

The converter measures the input voltage and will not allow operation outside of the input voltage specification. As shown by the graphs, hysteresis is added to both the high and low voltage to prevent the converter from turning on and off repeatedly when the voltage is held near either voltage extreme. At low line, this assures the maximum input current is not exceeded; at high line, this assures the semiconductor devices in the converter are not damaged by excessive voltage stress.

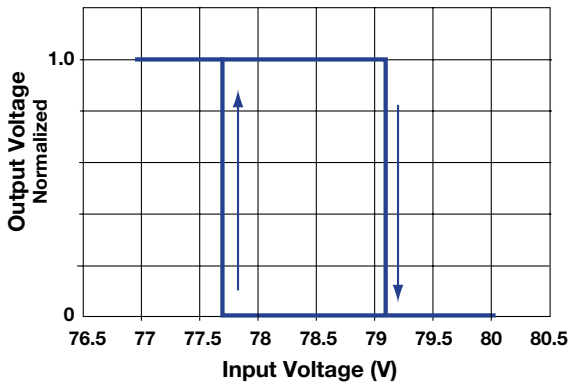
**ON/OFF Logic Option**

The ON/OFF control logic can be either Negative (standard) or Positive to enable the converter. For Negative logic, the ON/OFF pin is brought to below 1.0V with respect to the –INPUT pin to enable the converter. The pull-down must be able to sink 100µA. For Positive logic, the ON/OFF pin is brought to greater than 4.0V with respect to the –INPUT pin and be limited to less than 10V. To request the Positive logic version, add the suffix (P) to the standard part number. The ON/OFF pin has a built-in pull-up resistor of approximately 100kΩ to +5V.

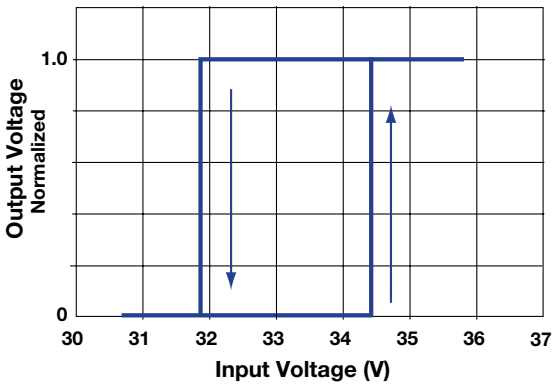
**Output Over Voltage Protection**

The output voltage is constantly monitored by the microprocessor with a redundant secondary-side measurement circuit that both shuts down the duty cycle and triggers the microprocessor to shut down. If the output voltage exceeds the over voltage specification, the microprocessor will latch the converter off. To turn the converter on required either cycling the ON/OFF pin or power to the converter. This advanced feature prevents the converter from damaging the load if there is a converter failure or application error. If non-latching is required, consult factory.

**Over Voltage Hysteresis**




**Under Voltage Hysteresis**




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# CoolConverter™

## Protection and Control

### Thermal Shutdown

The printed circuit board temperature is measured using a semiconductor sensor. If the maximum rated temperature is exceeded, the converter is latched off. To re-enable the converter requires cycling the ON/OFF pin or power to the converter. If non-latching is required, consult factory.

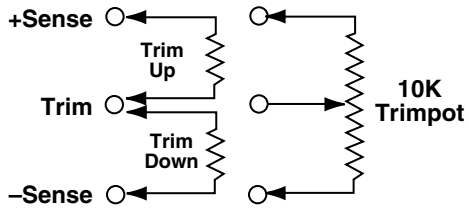
### Remote Sense

The output voltage is regulated at the point where the sense pins connect to the power output pins. Total sense compensation should not exceed 0.4V or 10% of Vout, whichever is greater.

### Safety

An external input fuse must always be used to meet these safety requirements.

### External Output Trimming



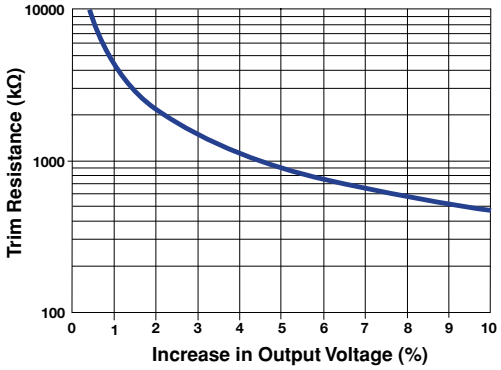

### Trim

To trim the output voltage higher, connect the required trim resistor from the Trim pin to the +Sense pin. To trim the output voltage lower, connect the required trim resistor from the Trim pin to the –Sense pin. See the diagrams at right.

**Trim-up**

$$R_{TRIM\text{-}UP} = \left\{ \frac{12\,(100+\Delta\%)}{1.25\Delta\%} - \frac{(100+2\Delta\%)}{\Delta\%} \right\} 5.11k\Omega$$

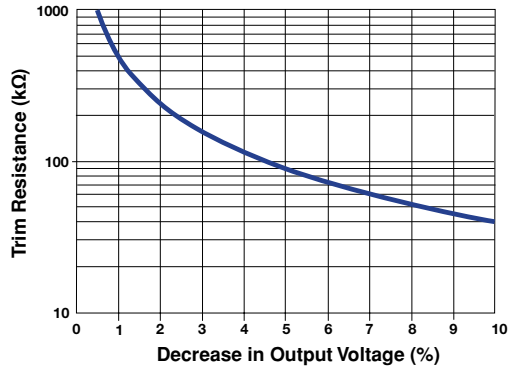
**12.0V Trim-up**




**Trim-down**

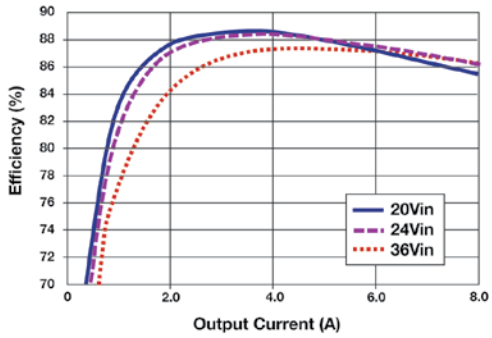
$$R_{TRIM\text{-}DOWN} = \left\{ \frac{100}{\Delta\%} - 2 \right\} 5.11k\Omega$$

**Trim-down**

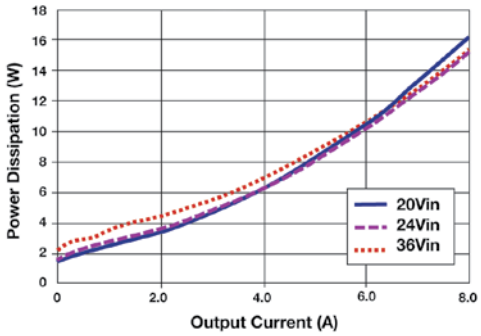



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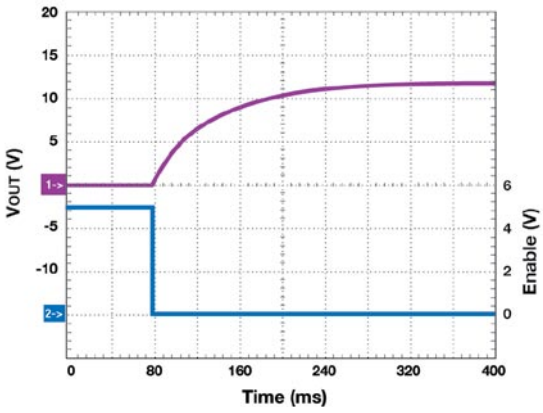
## Efficiency Data




## Power Dissipation

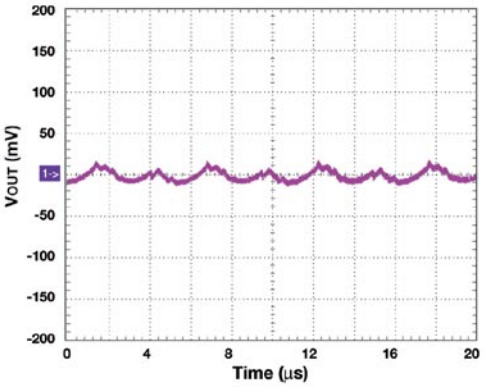



## Start Up



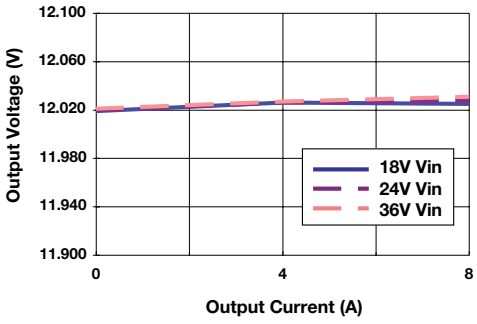

1. $V_{OUT}$ 12V/div 80ms/div
2. $I_{OUT}$ 8A/div

## Voltage Ripple

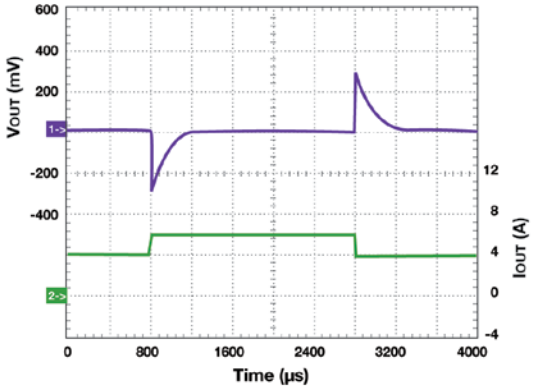



1. $V_{OUT}$ 12mV/div 20µS/div

## Line/Load Regulation




## Transient Response

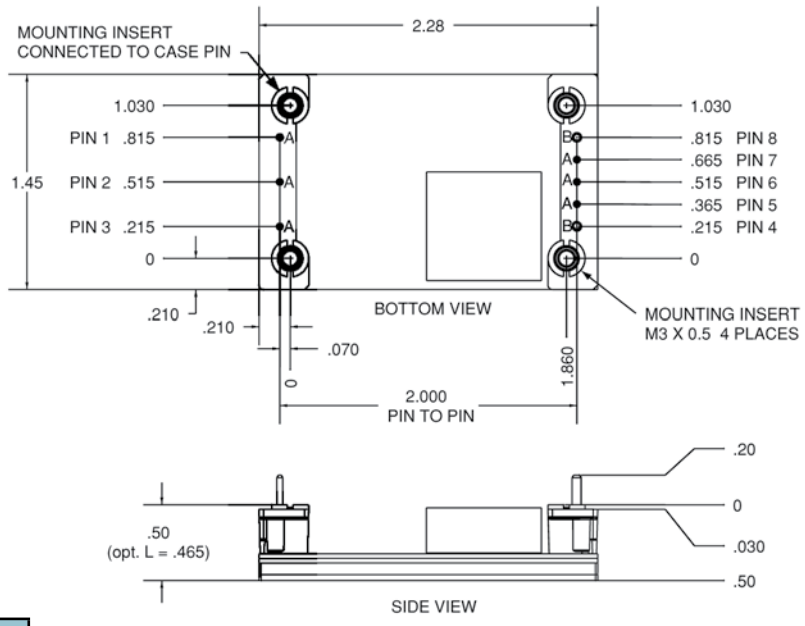



1. $V_{OUT}$ 200mV/div 1µs/div
2. Enable 100mV/div

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## Mechanical

**GMDC12V08**




## Pin Configuration – Bottom View

| Pin | Function | Pin Dia. (In.) |
|---|---|---|
| 1 | + Input | 0.040 |
| 2 | On/Off | 0.040 |
| 3 | – Input | 0.040 |
| 4 | – Output | 0.060 |
| 5 | – Sense | 0.040 |
| 6 | Trim | 0.040 |
| 7 | + Sense | 0.040 |
| 8 | + Output | 0.060 |

Notes:
1. Mechanical tolerances
   x.xxx in. = ± 0.005 in.
   x.xx in = ± 0.01 in.
2. Pin material: Brass with tin/lead plating over nickel
3. Workmanship: Meets or exceeds IPC-A-610B Class II
4. "A" = 0.040" dia. pins
5. "B" = 0.060" dia. pins
6. Min. screw length for heat sink attachment
   = 4.5mm + heat sink flange + locking hardware

**RoHS Compliance**
Complies with the European Directive 2002/95/EC, calling for the elimination of lead and other hazardous substances from electronic products. These parts are not however compatible with the higher temperatures associated with lead free solder processes and must be soldered using a reflow profile with a peak temperature of no more than 240˚C.

RoHS 2002/95/EC


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