

MDI's Low Voltage DC-DC Converter Series

In response to customer requests, MDI extended the line of 28 VDC full featured hybrid DC-DC Converters to a low input voltage range, 8 to 40 VDC. This represents a five to one operating range, a wider range than virtually all hybrid DC-DC Converters.

These DC-DC Converters were derived from MDI's line of 28 VDC nominal full featured parts. The modifications to the full featured family occurred in several areas. The nature of the modifications should be understood by the user so that full benefit can be derived from these parts.

1. In order to use established input EMI filter components, the current rating of the filter is rated at the current that flows at an input voltage of 16 VDC. As the input voltage is reduced below 16 VDC towards 8 VDC, the input current would proportionally increase if the output power remained constant. Therefore, to keep the input filter current from exceeding the 16 VDC values, the power delivered from these low input voltage DC-DC Converters is derated linearly below 16 VDC, to 50% of rated power at 8 VDC. The user may need to consider the derating at low voltage and use appropriately rated part.

2. To allow operation at low voltage, the primary to secondary turns ratio of the main transformer was reduced, in most cases, by 50%. Reducing the primary to secondary turns ratio by 50% doubles the peak currents drawn from the input capacitors at any given input voltage. The higher peak currents cause an approximate 6 dB increase in low frequency conducted emissions, as compared standard 28 VDC range parts. However, the switching frequency of the parts is increased to 300 kHz as compared to the 180 kHz to 200 kHz of the standard 28 VDC parts. This mitigates the effect of the increased input pulse current.

3. To achieve a lower voltage drop in the input switching FET despite the increased current, a lower voltage rated FET is normally used. This FET prevents the part from being used in the presence of 80 or 100 VDC surges.

4. Housekeeping voltage to start the PWM function of the converter is provided by bipolar transistor start circuit. In normal operation, a regenerative winding derived from the main power transformer takes over, bypassing the bias supplied by the start circuit. In the low voltage line, the start circuit has been modified, eliminating all unnecessary voltage drops. In addition, a constant current diode is used in lieu of a resistor in the base of the start circuit. Over temperature extremes, it takes in excess of 9.5 VDC to start the DC-DC Converter. However, once running, the converter can operate down to 8 VDC, since the regenerative winding supplies housekeeping voltage to power the PWM stage.

5. In the low voltage family of converters, the inhibit function found in the standard 28 VDC units has been changed to the "inhibit-not" function. This means that the converters will inhibit when their inhibit pin (pin 2) is connected to the input return. An open collector transistor with a minimum 20 VDC rating is recommended for this function. The "inhibit-

not" function has a higher transient noise immunity than the inhibit function, therefore it was established for these units.

Table 9
Available low Voltage
DC/DC Converters

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| 5W | 3061 |
| 6.5W | 3062 |
| 20W | 3113 |
| 30W | 3378 |
| 50W | 3114 |