MWR Triple DC/DC Converters–PRELIMINARY

28 VOLT INPUT – 35 WATT

FEATURES

- –55°C to +125°C operation
- 14 to 50 VDC input
- Will withstand transients up to 80 V for up to 1 sec.
- Magnetic feedback
- Synchronization
- Inhibit function
- Output short circuit protection
- Up to 33 W/in^3, 85% efficiency
- Undervoltage lockout



MODELS VDC OUTPUT
TRIPLE
3.3 ± 12
3.3 ± 15
5 ± 12
5 ±15

DESCRIPTION

The MWR Series™ of high frequency DC/DC converters offers a wide input voltage range of 14 to 50 volts and up to 35 watts of output power. The units are capable of withstanding short term transients up to 80 volts. The package is a hermetically sealed, welded metal case. Flanged and non-flanged models are available.

CONVERTER DESIGN

MWR Series DC/DC converters are switching regulators that use continuous flyback conversion topology with a clock frequency of approximately 300 kHz. MWR Series converters incorporate two internal converters with one converter phase shifted approximately 120° from the other to create a dual phase/phase-shifted operation. Each of the internal converters operates at the clock frequency. This proprietary technology eliminates cross regulation, minimizes input ripple, greatly reduces output ripple and improves efficiency. This design provides completely independent regulation with no cross regulation effect between the main and auxiliary outputs and no minimum loading required on the main output.

LOW NOISE, HIGH AUDIO REJECTION

The MWR converters' feed-forward compensation system provides excellent dynamic response and noise rejection. Audio rejection is typically 40 dB. Typical output voltage response for a 50% to 100% step load transient is as low as 2% with a 400 μs recovery time. Input ripple current is typically 50 mA p-p with output ripple voltage typically 30 mV p-p.

INHIBIT FUNCTION

MWR converters provide an inhibit terminal that can be used to disable internal switching, resulting in no output and very low quiescent input current. The converter is inhibited when a TTL compatible low (≤0.8 – output disabled) is applied to the inhibit pin. The unit is enabled when the pin, which is internally connected to a pull-up resistor, is left unconnected or is connected to an open-collector gate. The open circuit output voltage associated with the inhibit pin is 8.5 to 12 V. In the inhibit mode, a maximum of 4 mA must be sunk from the inhibit pin.

SYNCHRONIZATION

A synchronization feature is included with the MWR Series that allows the user to match the switching frequency of the converter to the frequency of the system clock. An external synchronization feature is included that allows the user to adjust the nominally 300 kHz operating frequency to any frequency within the range of 260 kHz to 340 kHz. This is initiated by applying a TTL compatible input of the desired frequency to pin 9.

SHORT CIRCUIT PROTECTION

MWR Series converters provide short circuit protection by restricting the output current to approximately 115% of the full load output current. The output current is sensed in the secondary stage to provide highly predictable and accurate current limiting, and to eliminate foldback characteristics.

UNDERVOLTAGE LOCKOUT

Undervoltage lockout with hysterisis prevents the units from operating below approximately 13.5 VDC input voltage to keep system current levels smooth, especially during initialization or re-start operations.

Crane Aerospace & Electronics
Electronics Group (Interpoint Brand)
PO Box 97005 • Redmond WA 98073-9705
425.882.3100 • electronics@craneae.com
www.craneae.com

MWR Triple DC/DC Converters–PRELIMINARY

28 VOLT INPUT – 35 WATT

OPERATING CONDITIONS AND CHARACTERISTICS

Input Voltage Range
- 14 to 50 VDC continuous
- 80 V for up to 1 sec transient

Output Power
- up to 35 watts, depending on model

Power Dissipation (Pd)
- 10 W

Lead Soldering Temperature (10 sec per lead)
- 300 °C

Storage Temperature Range (Case)
- –65 °C to +150 °C

Case Operating Temperature (Tc)
- –55°C to +125°C full power
- –55°C to +135°C absolute

Derating Output Power/Current (Tc)
- Linearly from 100% at 125 °C to 0% at 135 °C

Output Voltage Temperature Coefficient
- 100 ppm/°C typical
- 150 ppm/°C maximum

Input to Output Capacitance
- 60 pF typical

Current Limit
- 115% of full load typical

Isolation
- 100 megohm minimum at 500 VDC
- Any pin to case, except case pin

Audio Rejection
- 40 dB typical

Conversion Frequency (55°C to +125°C Tc)
- Free run 300 kHz typical
  260 kHz min, 340 kHz max

Inhibit Pin Voltage (unit enabled)
- 8.5 to 12 V

Undervoltage Lockout
- 13.5 V input typical

SYNC AND INHIBIT

Sync In (260 to 340 kHz)
- Duty cycle 40% to 60%
- Logic low 0.8 V max
- Logic high 4.5 V min, 5 V max
- Referenced to input common
- If not used, connect to input common

Inhibit TTL Open Collector
- Logic low (output disabled)
  Logic low voltage ≤0.8 V
  Inhibit pin current 4.0 mA max
- Referenced to input common
- Logic high (output enabled)
  Open collector or leave unconnected

MECHANICAL AND ENVIRONMENTAL

Size (maximum)

Non-flanged:
1.950 x 1.350 x 0.405 inches (49.530 x 34.29 x 10.287 mm)
See Case F1 for dimensions.

Flanged:
2.720 x 1.350 x 0.405 inches (69.088 x 34.29 x 10.287)
See case J1 for dimensions.

Weight (maximum)

Non-flanged: 58 grams maximum
Flanged: 62 grams maximum

Screening

Standard or ES. See “125 °C Non-QML Products—Environmental Screening (Standard and ES)” for more information.

MWR Triple DC/DC Converters–PRELIMINARY

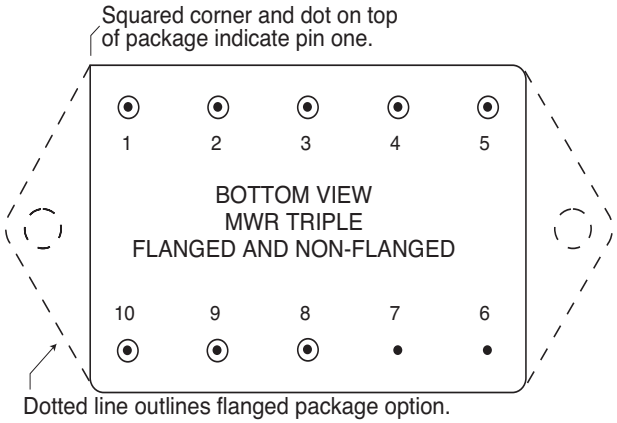
28 VOLT INPUT – 35 WATT

PIN OUT

Pin	MWR Triple
1	Positive Input
2	Main Output
3	Output common
4	Neg. Aux Output
5	Pos. Aux Output
6	Case Ground
7	Case Ground
8	Inhibit
9	Sync. In
10	Input common

PINS NOT IN USE

Inhibit	If not used, leave unconnected
Sync In	If not used, leave unconnected



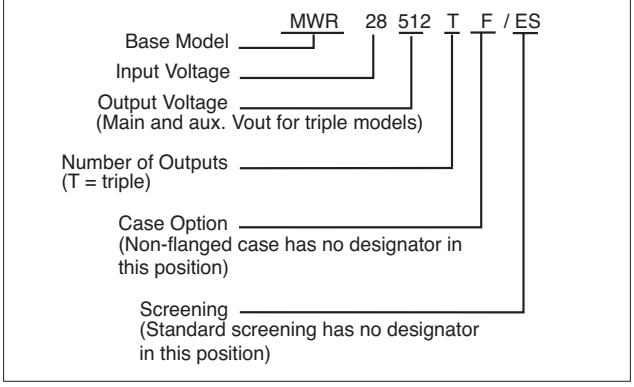
See cases F1 and J1 for dimensions.

FIGURE 1: PIN OUT

MWR Triple DC/DC Converters–PRELIMINARY

28 VOLT INPUT – 35 WATT

MODEL NUMBERING KEY



MODEL SELECTION

MWR28	_____	-	_____	/	_____
base model	*V_{out} value*		*case option*		*screening*

Choose one from each of the following rows:

*V_{out} value**	3R312, 3R315, 512, 515 "R" = decimal point, 3R3 = 3.3 VDC
Number of outputs	T (triple)
Case option	non-flanged case, leave blank or F (flanged case)
Screening	standard screening, leave blank /ES (ES screening)

* for V_{out}, "3R3" and "5" indicate the main voltage, "12" and "15" indicate the ± auxiliary voltages.

MWR Triple DC/DC Converters–PRELIMINARY

28 VOLT INPUT – 35 WATT

Electrical Characteristics: -55°C to +125°C Tc, 28 VDC Vin, 100% load, free run, unless otherwise specified.

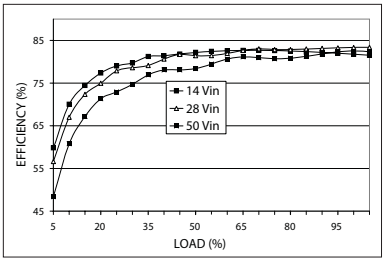
TRIPLE OUTPUT MODELS			MWR283R312T			MWR283R315T			MWR28512T			MWR28515T			UNITS
PARAMETER	CONDITIONS		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	MAIN		3.27	3.3	3.33	3.27	3.3	3.33	4.95	5.00	5.05	4.95	5.00	5.05	VDC
	+ AUXILIARY		11.88	12	12.12	14.85	15	15.15	11.88	12	12.12	14.85	15	15.15	
	- AUXILIARY		-12.18	-12	-11.82	-15.23	-15	-14.71	-12.18	-12	-11.82	-15.23	15	-14.77	
OUTPUT CURRENT VIN = 14 TO 50 VDC	MAIN		—	—	3	—	—	3	—	—	3	—	—	3	A
	EITHER AUXILIARY[1]		—	—	1.17	—	—	0.93	—	—	1.17	—	—	0.93	
	TOTAL OF AUXILIARIES		—	—	1.67	—	—	1.33	—	—	1.67	—	—	1.34	
OUTPUT POWER VIN = 14 TO 50 VDC	MAIN		—	—	10	—	—	10	—	—	15	—	—	15	W
	TOTAL OF AUXILIARIES		—	—	20	—	—	20	—	—	20	—	—	20	
	TOTAL		—	—	30	—	—	30	—	—	35	—	—	35	
OUTPUT RIPPLE 10 KHZ - 20 MHZ	MAIN		—	—	45	—	—	45	—	—	45	—	20	45	mV p-p
	± AUXILIARY		—	—	80	—	—	80	—	20	80	—	40	80	
LINE REGULATION VIN = 14 TO 50 VDC	MAIN		—	—	15	—	—	15	—	—	15	—	—	15	mV
	+ AUXILIARY		—	—	35	—	—	35	—	—	35	—	—	35	
	- AUXILIARY		—	—	90	—	—	100	—	—	90	—	—	100	
LOAD REGULATION NO LOAD TO FULL	MAIN		—	—	20	—	—	20	—	—	20	—	—	20	mV
	+ AUXILIARY		—	—	40	—	—	40	—	—	40	—	—	40	
	- AUXILIARY		—	—	220	—	—	220	—	—	220	—	—	220	
CROSS REGULATION[2]	EFFECT ON -V_{OUT}		—	—	5	—	—	5	—	—	5	—	—	5	%
INPUT VOLTAGE	CONTINUOUS		14	28	50	14	28	50	14	28	50	14	28	50	VDC
	TRANSIENT 1 SEC[1]		—	—	80	—	—	80	—	—	80	—	—	80	
INPUT CURRENT	NO LOAD		—	50	65	—	50	65	—	40	65	—	50	65	mA
	INHIBITED		—	2.5	4	—	2.5	4	—	2.5	4	—	2.5	4	
INPUT RIPPLE	10 KHZ - 20 MHZ TC = -55°C TO + 125°C		—	60	90	—	60	90	—	45	90	—	60	85	mA p-p
EFFICIENCY			78	81	—	79	82	—	81	84	—	82	85	—	%
LOAD FAULT	SHORT CIRCUIT[3]		—	—	9	—	—	9	—	—	9	—	—	9	W
	RECOVERY[1]		—	15	20	—	15	20	—	15	20	—	15	20	µs
STEP LOAD RESPONSE	50%-100%-50% TRANSIENT	MAIN	—	100	300	—	100	300	—	100	300	—	100	300	mV pk
		± AUX.	—	200	550	—	200	550	—	200	550	—	200	550	
	RECOVERY	MAIN	—	200	350	—	200	350	—	200	350	—	200	350	µs
		± AUX.	—	300	550	—	300	550	—	300	550	—	300	550	
STEP LINE RESPONSE[1]	15-50-15 VDC TRANSIENT	MAIN	—	100	TBD	—	100	TBD	—	100	TBD	—	100	TBD	mV pk
		± AUX.	—	200	TBD	—	200	TBD	—	200	TBD	—	200	TBD	
	RECOVERY	MAIN	200	400	TBD	200	400	TBD	200	400	TBD	200	400	TBD	µs
		± AUX.	—	200	TBD	—	200	TBD	—	200	TBD	—	200	TBD	
START-UP	DELAY		—	15	20	—	15	20	—	15	20	—	15	20	µs
	OVERSHOOT[1]		—	0	50	—	0	50	—	0	50	—	0	50	mV pk
CAPACITANCE[1]	MAXIMUM OUTPUT		—	—	1000	—	—	1000	—	—	1000	—	—	1000	µF

Notes:
1. Guaranteed by design, not tested
2. Effect on negative Vout from 50%/50% loads to 70%/30% or 30%/70% loads.
3. Specification applies to both main and auxiliary outputs, tested separately.

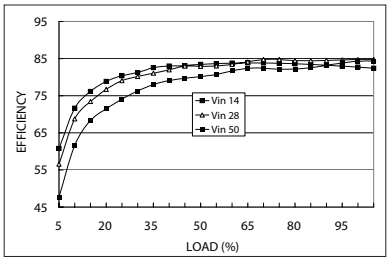
MWR Triple DC/DC Converters–PRELIMINARY

28 VOLT INPUT – 35 WATT

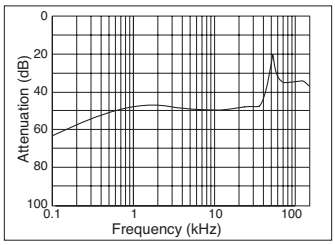
Typical Performance Curves: 25°C Tc , 28 VDC Vin, 100% load, 20 MHz BW, free run, unless otherwise specified.



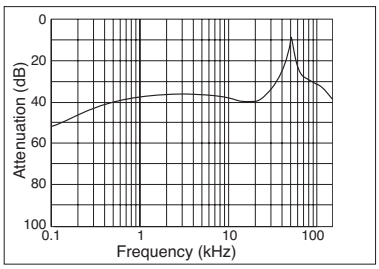
MWR283R312T Efficiency
FIGURE 2



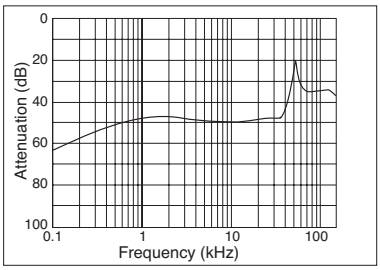
MWR2815T Efficiency
FIGURE 3



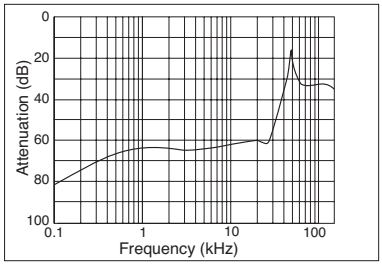
MWR283R312T Audio Rejection
FIGURE 4



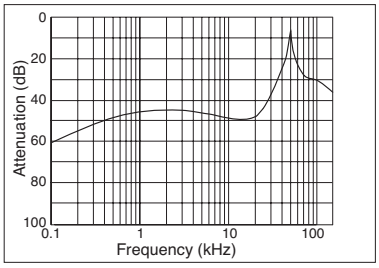
MWR283R312T Audio Rejection
FIGURE 5



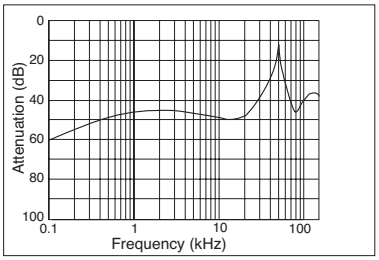
MWR283R312T Audio Rejection
FIGURE 6



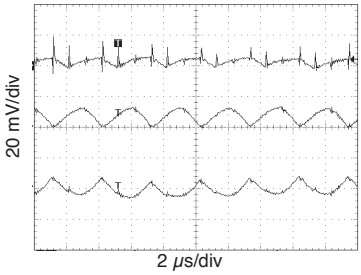
MWR283R5156T Audio Rejection
FIGURE 7



MWR283R515T Audio Rejection
FIGURE 8



MWR283R515T Audio Rejection
FIGURE 9

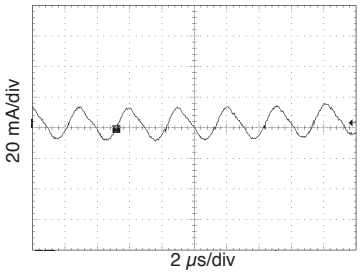


MWR283R312T Output Ripple
FIGURE 10

MWR Triple DC/DC Converters–PRELIMINARY

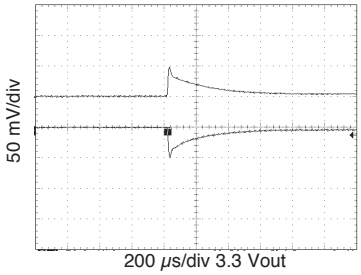
28 VOLT INPUT – 35 WATT

Typical Performance Curves: 25°C Tc , 28 VDC Vin, 100% load, 20 MHz BW, free run, unless otherwise specified.



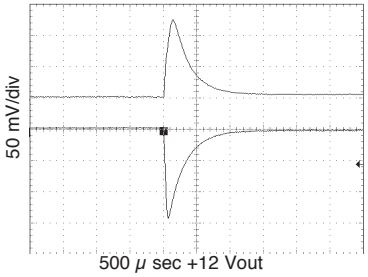
MWR283R312T Input Ripple

FIGURE 11



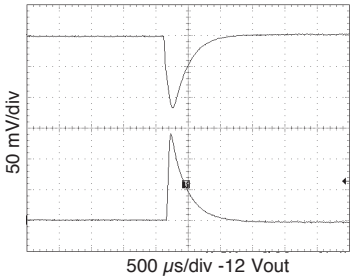
MWR283R312T Step Load Response

FIGURE 12



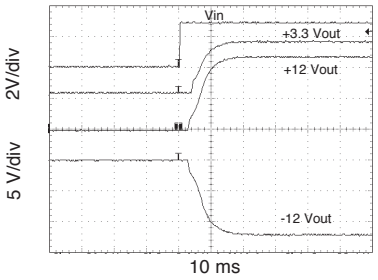
MWR283R312T Step Load Response

FIGURE 13



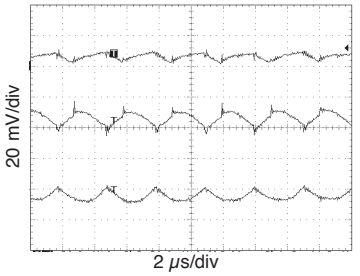
MWR28312T Step Load Response

FIGURE 14



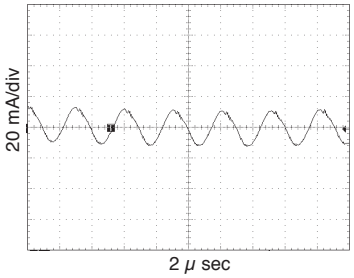
MWR283R312T Turn On Delay

FIGURE 15



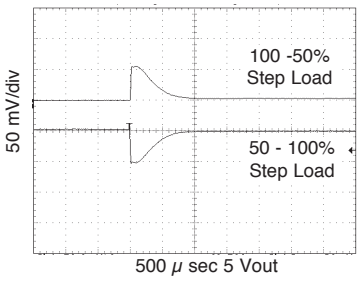
MWR283R515T Output Ripple (Vout)

FIGURE 16



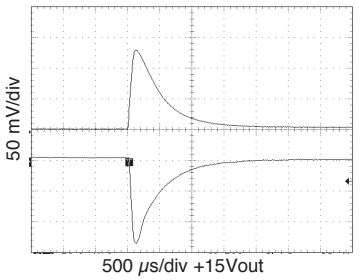
MWR283R515T Input Ripple (lin)

FIGURE 17



MWR283R515T Step Load Response

FIGURE 18



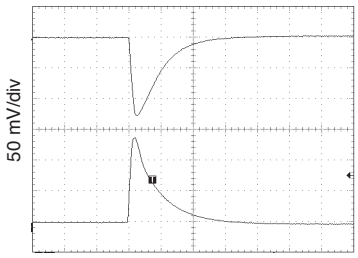
MWR283R515T Step Load Response

FIGURE 19

MWR Triple DC/DC Converters–PRELIMINARY

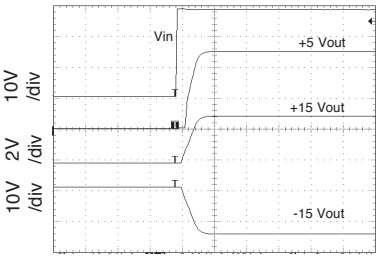
28 VOLT INPUT – 35 WATT

Typical Performance Curves: 25°C Tc , 28 VDC Vin, 100% load, 20 MHz BW, free run, unless otherwise specified.



MWR28515T Step Load Response

FIGURE 20



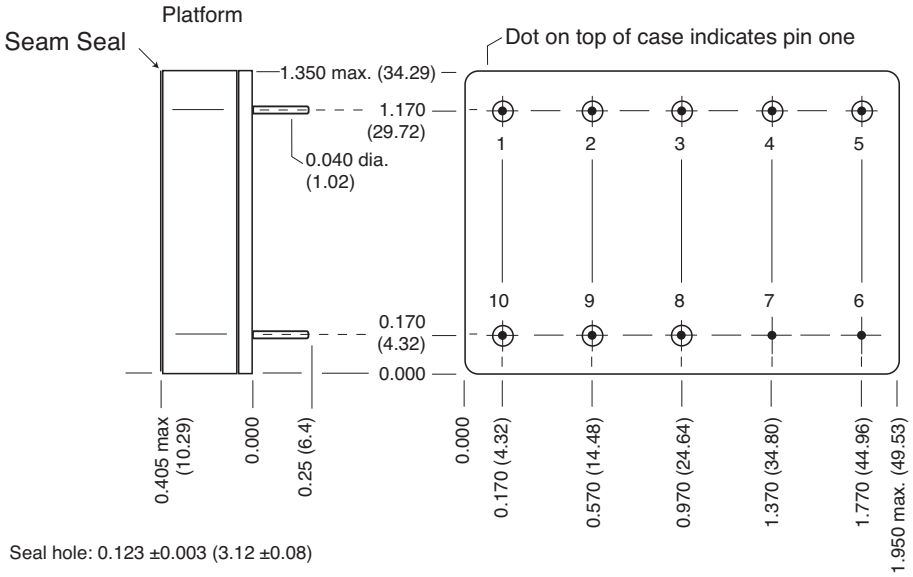
MWR28515T Turn On Delay

FIGURE 21

MWR Triple DC/DC Converter Cases–PRELIMINARY

28 VOLT INPUT – 35 WATT

BOTTOM VIEW CASE F1



Seal hole: 0.123 ±0.003 (3.12 ±0.08)

Case dimensions in inches (mm)
Tolerance ±0.005 (0.13) for three decimal places
±0.01 (0.3) for two decimal places
unless otherwise specified

CAUTION
Heat from reflow or wave soldering may damage the device.
Solder pins individually with heat application not exceeding 300°C for 10 seconds per pin.

Materials

Header	Cold Rolled Steel/Nickel/Gold
Cover	Kovar/Nickel
Pins	#52 alloy/Gold ceramic seal

Case F1, Rev C, 20051216
Please refer to the numerical dimensions for accuracy. All information is believed to be accurate, but no responsibility is assumed for errors or omissions. Interpoint reserves the right to make changes in products or specifications without notice.
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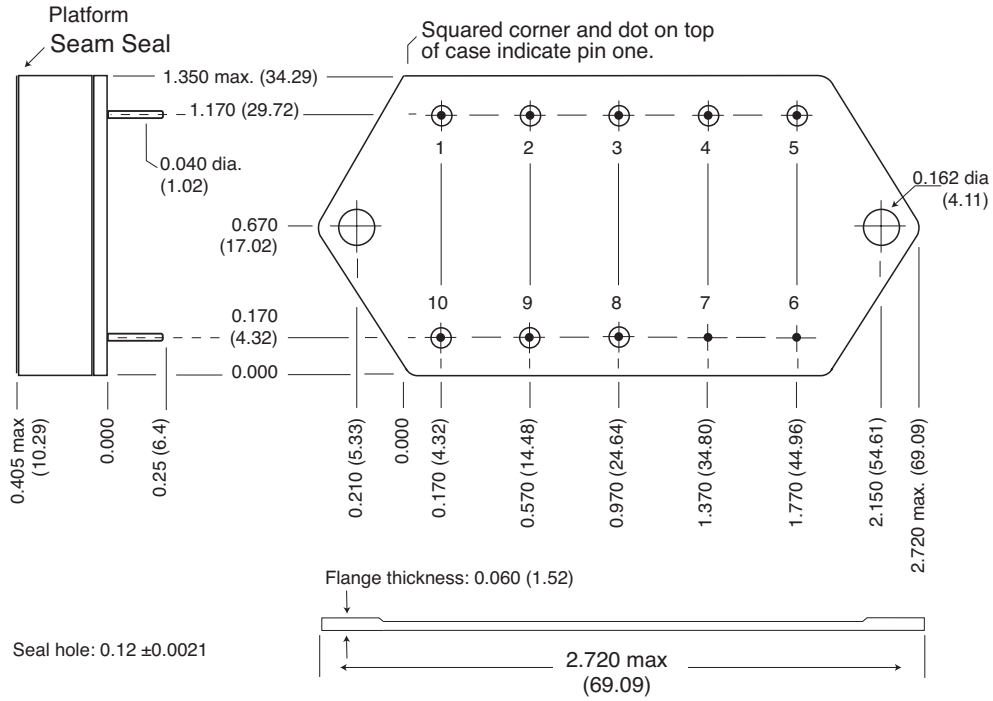
FIGURE 22: CASE F1

MWR Triple DC/DC Converter Cases–PRELIMINARY

28 VOLT INPUT – 35 WATT

BOTTOM VIEW CASE J1

Flanged cases: Designator "F" required in Case Option position of model number.



Case dimensions in inches (mm)
Tolerance ±0.005 (0.13) for three decimal places
±0.01 (0.3) for two decimal places
unless otherwise specified

CAUTION
Heat from reflow or wave soldering may damage the device.
Solder pins individually with heat application not exceeding 300°C for 10 seconds per pin.

Materials
Header Cold Rolled Steel/Nickel/Gold
Cover Kovar/Nickel
Pins #52 alloy/Gold ceramic seal

Case J1, Rev D, 20060710 MHV only.
Please refer to the numerical dimensions for accuracy. All information is believed to be accurate, but no responsibility is assumed for errors or omissions. Interpoint reserves the right to make changes in products or specifications without notice.
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FIGURE 23: CASE J1

MWR Triple DC/DC Converters–PRELIMINARY

28 VOLT INPUT – 35 WATT

125°C NON-QML PRODUCTS— ENVIRONMENTAL SCREENING (STANDARD AND ES)

TEST	125°C STANDARD non-QML[1]	125°C /ES non-QML[1]
Pre-cap Inspection Method 2017, 2032	yes	yes
Temperature Cycle (10 times) Method 1010, Cond. B, -55°C to 125°C, ambient	no	yes
Constant Acceleration Method 2001, 500 g	no	yes
Burn-In 96 hours, typical case temperature 125°C case[2, 3]	no	yes
Final Electrical Test MIL-PRF-38534, Group A Subgroups 1 and 4: +25°C case	yes	yes
Hermeticity Test Fine Leak, Method 1014, Cond. A Gross Leak, Method 1014, Cond. C Gross Leak, Dip (1 x 10^{-3})	 no no yes	 yes yes no
Final Visual Inspection Method 2009	yes	yes

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

Notes:
1. Non-QML products do not meet all of the requirements of MIL-PRF-38534
2. Burn-in is still air with an ambient temperature designed to bring the case temperature to 125°C

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