MTR Single, Dual and Triple DC/DC Converters

28 VOLT INPUT – 30 WATT

FEATURES

- –55° to +125°C operation
- 16 to 40 VDC input
- Fully isolated
- Magnetic feedback
- Fixed frequency 600 kHz typical
- Topology – Single Ended Forward
- 50 V for up to 50 ms transient protection
- Inhibit and synchronization functions
- Indefinite short circuit protection
- Up to 30 watts output power
- Trim and remote sense on single output models
- Up to 84% efficiency



MODELS

VDC OUTPUT		
SINGLE	DUAL	TRIPLE
3.3	±5	+5 & ±12
5	±12	+5 & ±15
12	±15	
15		
18		

DESCRIPTION

The MTR Series™ of DC/DC converters offers up to 30 watts of output power from single, dual, or triple output configurations. They operate over the full military temperature range with up to 84% efficiency. MTR converters are packaged in hermetically sealed metal cases, making them ideal for use in military, aerospace and other high reliability applications.

CONVERTER DESIGN

The MTR converters are constant frequency, pulse-width modulated switching regulators which use a quasi-square wave, single ended, forward converter design. Tight load regulation is maintained via wide bandwidth magnetic feedback and, on single output models, through use of remote sense. On dual output models, the positive output is independently regulated and the negative output is cross regulated through the use of tightly coupled magnetics and shunt regulators. The MTR Series triple output DC/DC converter's design includes individual regulators on the auxiliary outputs which provide for no cross regulation error when a minimum 500 mA load is maintained on the main (+5) output.

Indefinite short circuit protection and overload protection are provided by a constant current-limit feature. This protective system senses current in the converter's secondary stage and limits it to approximately 115% of the maximum rated output current.

MTR converters are provided with internal filtering capacitors that help reduce the need for external components in normal operation. For systems that require compliance with MIL-STD-461C's CE03 standard, Interpoint offers filter/transient suppression modules (including the FMC-461, FMD-461 and FM-704A series filters) which will result in compliance. Contact your Interpoint representative for further details.

SYNCHRONIZATION

Synchronizing the converter with the system clock allows the designer to confine switching noise to clock transitions, minimizing interference and reducing the need for filtering. In sync mode, the converter will run at any frequency between 500 kHz and 675 kHz. The sync control operates with a quasi-TTL signal at any duty cycle between 40% and 60%. The sync pin must be connected to input common pin when not in use.

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

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OPERATING CONDITIONS AND CHARACTERISTICS

Input Voltage
- 16 to 40 VDC continuous
- 50 V for 50 msec transient

Output Power
- 25 to 30 watts depending on model

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

Storage Temperature Range (Case)
- –65°C to +135°C

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

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

Output Voltage Temperature Coefficient
- 100 ppm/°C typical single and dual outputs
- 200 ppm/°C main typical, 300 ppm/°C aux triple output typical

Input to Output Capacitance
- 50 pF typ (100 pF typical triple outputs)

Current Limit
- 115% of full load typical

Isolation
- 100 megohm minimum at 500 V

Audio Rejection
- 40 dB typ (50 dB typical triple output)l

Conversion Frequency
- Free run 550 min, 600 typical, 650 max kHz duals and singles
  Free run 525 min, 600 typical, 650 max kHz triples
- External sync 500 to 675 kHz singles and duals
  External sync 500 to 700 kHz triples

SYNC AND INHIBIT

Sync (500 to 675 kHz)
- Duty cycle 40% min, 60% max
- 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 (referenced to input common)
- Logic low (output disabled), ≤0.8 V
  Inhibit pin current
  8.0 mA max for singles & duals,
  6.0 mA for triples
- Logic high (output enabled)
  Input pin voltage, unit enabled, 9 to 11 V

MECHANICAL AND ENVIRONMENTAL

Size (maximum)

Non-flanged

Single and dual output	2.125 x 1.125 x 0.400 inches (53.98 x 28.58 x 10.16 mm) See case H2 for dimensions. MTR Dual with standard or ES screening, ht 0.417", (10.59 mm) See Case H4 for dimensions.
Triple output	1.950 x 1.350 x 0.405 inches (49.53 x 34.29 x 10.29 mm) See case F1 for dimensions.

Flanged

Single and dual output	2.910 x 1.125 x 0.400 inches (73.91 x 28.58 x 10.16 mm) See case K3 for dimensions. MTR Dual with standard or ES screening, ht. 0.417", (10.59 mm) See case K5 for dimensions.
Triple output	2.720 x 1.350 x 0.405 inches (69.09 x 34.29 x 10.29 mm) See case J1 for dimensions.

Weight (maximum)

Single and dual non-flanged 50 grams, flanged 52 grams
Triple non-flanged 58 grams, flanged 62 grams

Screening

Standard, ES, or /883 (Class H, QML). See “883, Class H, QML Products – Element Evaluation” and “883, Class H, QML Products – Environmental Screening” for more information.

MTR Single, Dual and Triple DC/DC Converters

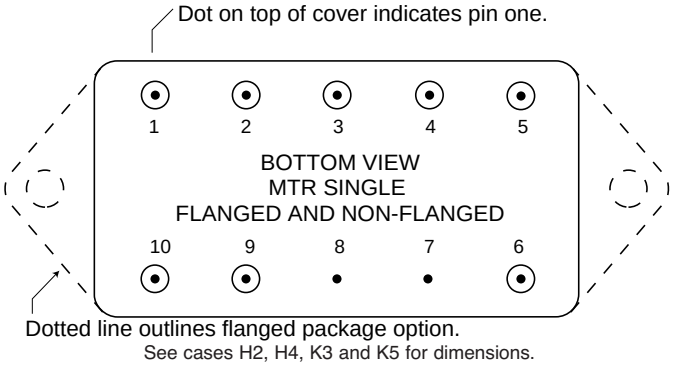
28 VOLT INPUT – 30 WATT

PIN OUT

Pin	Single Output	Dual Output	Triple Output
1	Positive Input	Positive Input	Positive Input
2	Inhibit	Inhibit	Main (+5) Output
3	Sense Return	Positive Output	Output Common
4	Output Common	Output Common	Neg. Aux. Output
5	Positive Output	Negative Output	Pos. Aux. Output
6	Positive Sense	Case Ground	Case Ground
7	Case Ground	Case Ground	Case Ground
8	Case Ground	Case Ground	Inhibit
9	Sync	Sync	Sync
10	Input Common	Input Common	Input Common

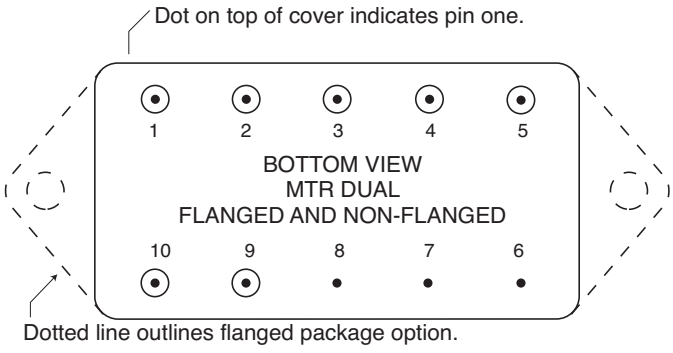
PINS NOT IN USE

Inhibit	Leave unconnected
Sync In	Connect to input common
Sense Lines	Must be connected to appropriate outputs



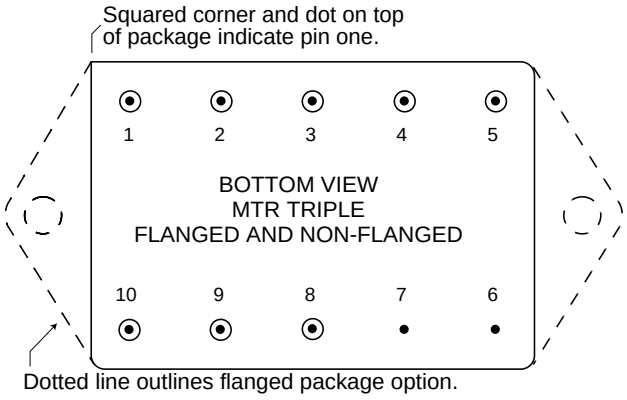
See cases H2, H4, K3 and K5 for dimensions.

FIGURE 1: PIN OUT SINGLE OUTPUT MODELS



See cases H2, H4, K3 and K5 for dimensions.

FIGURE 2: PIN OUT DUAL OUTPUT MODELS

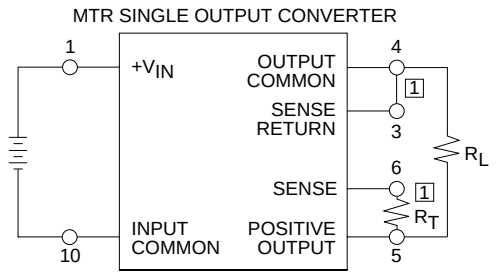


See cases F1 and J1 for dimensions.

FIGURE 3: PIN OUT TRIPLE OUTPUT MODELS

MTR Single, Dual and Triple DC/DC Converters

28 VOLT INPUT – 30 WATT



EXTERNAL TRIM CONNECTION

[1] Make connections at converter.

Trim Formulas

Vout = desired output voltage; Rt = trim resistor

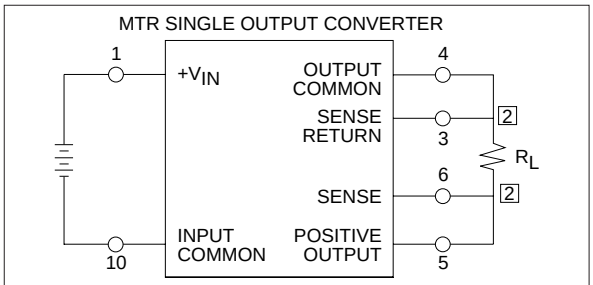
$$3.3V: Rt = \frac{1300 * Vout - 4304}{1.2475}$$

$$5V: Rt = \frac{1300 * Vout - 6512}{1.2475}$$

$$12V: Rt = \frac{1300 * Vout - 15631}{1.2475}$$

$$15V: Rt = \frac{1300 * Vout - 19498}{1.2475}$$

FIGURE 4: TRIM CONNECTION[1, 2, 3]



REMOTE SENSE CONNECTION

[2] Make connections at load.

FIGURE 5: REMOTE SENSE CONNECTION

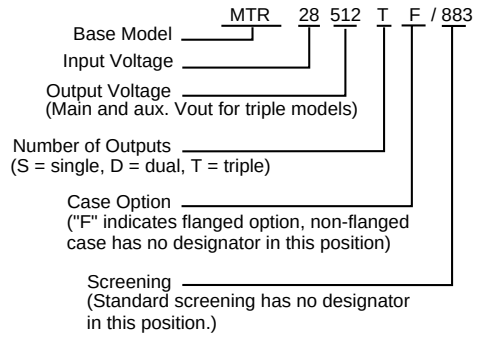
Notes for Remote Sense and Trim

1. When trimming output voltage and/or remote sensing, the total output voltage increase must be less than 0.6 volts at the converters pins to maintain specified performance.
2. If neither voltage trim nor remote sense will be used, connect pin 3 to pin 4 and pin 5 to pin 6 or the output voltage will increase by 1.2 volts.
3. CAUTION: The converter will be permanently damaged if the positive remote sense (pin 6) is shorted to ground. Damage may also result if the output common or positive output is disconnected from the load with the remote sense leads connected to the load.

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MODEL NUMBERING KEY



SMD NUMBERS

Standard Microcircuit Drawing (SMD)	MTR Series Similar Part
5962-0150101HXC	MTR283R3S/883
5962-9306801HXC	MTR2805S/883
5962-9306901HXC	MTR2812S/883
5962-9307001HXC	MTR2815S/883
5962-9320201HXC	MTR2818S/883
5962-9320501HXC	MTR2805D/883
5962-9307101HXC	MTR2812D/883
5962-9307201HXC	MTR2815D/883
5962-9307301HXC	MTR28512T/883
5962-9307401HXC	MTR28515T/883

To indicate the flanged case option change the “X” to “Z” In the SMD number. The SMD number shown is for Class H screening, non-flanged. For exact specifications for an SMD product, refer to the SMD drawing. SMDs can be downloaded from: http://www.dscc.dla.mil/programs/smcr

Model Selection

MTR28 _____ _____ _____ _____

Base model *Vout value* *number of outputs* *case option* *screening*

Choose one from each of the following rows

Vout value	for singles or duals: 5, 12, or 15		for triples*: 512 or 515
Number of outputs	S (single)	D (dual)	or T (triple)
Case option	non-flanged case option, leave blank		F (flanged case option)
Screening	standard screening, leave blank		/ES (ES screening), /883 (Class H, QML)

* for triple output models “5” indicates the main voltage, “12” or“15” indicate the ± auxiliary voltages.

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Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, free run, unless otherwise specified.

SINGLE OUTPUT MODELS		MTR283R3S			MTR2805S			MTR2812S			MTR2815S			MTR2818S			
PARAMETER	**CONDITION**	**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**UNITS**
OUTPUT VOLTAGE		3.27	3.30	3.34	4.95	5.00	5.05	11.88	12.00	12.12	14.85	15.00	15.15	17.82	18.00	18.18	VDC
OUTPUT CURRENT[2]	V_{IN} = 16 to 40 VDC	0	—	6.06	0	—	5.0	0	—	2.5	0	—	2.0	0	—	1.67	A
OUTPUT POWER[2]	V_{IN} = 16 to 40 VDC	0	—	20	0	—	25	0	—	30	0	—	30	0	—	30	W
OUTPUT RIPPLE	10 kHz – 2 MHz	—	15	40	—	35	50	—	25	40	—	25	40	—	—	40	mV p-p
VOLTAGE	Tc = –55°C TO +125°C	—	—	50	—	50	90	—	40	90	—	40	90	—	—	90	
LINE REGULATION[3]	Vin = 16 to 40 VDC	—	5	10	—	10	50	—	10	50	—	10	50	—	—	50	mV
	Tc = –55°C TO +125°C	—	—	10	—	15	50	—	15	50	—	15	50	—	—	50	
LOAD REGULATION	NO LOAD TO FULL	—	2	10	—	5	50	—	5	50	—	5	50	—	—	50	mV
	Tc = –55°C TO +125°C	—	—	10	—	15	50	—	15	50	—	15	50	—	—	50	
INPUT VOLTAGE[2]	CONTINUOUS	16	28	40	16	28	40	16	28	40	16	28	40	16	28	40	VDC
NO LOAD TO FULL	TRANSIENT 50 ms	—	—	50	—	—	50	—	—	50	—	—	50	—	—	50	V
INPUT CURRENT[2]	NO LOAD	—	30	75	—	35	75	—	35	75	—	35	75	—	—	75	mA
	INHIBITED	—	7	8	—	3	8	—	3	8	—	3	8	—	—	8	mA
INPUT RIPPLE CURRENT	10 kHz – 10 MHz Tc = –55°C TO +125°C	—	25	50	—	20	50	—	20	50	—	20	50	—	—	50	mA p-p
EFFICIENCY		74	76	—	76	78	—	80	83	—	81	84	—	81	84	—	%
LOAD FAULT[4]	SHORT CIRCUIT POWER DISSIPATION	—	10	—	—	10	—	—	10	—	—	10	—	—	10	W	
	RECOVERY[1, 2, 5]	—	1.4	6	—	1.4	5	—	1.4	5	—	1.4	5	—	1.4	5	ms
STEP LOAD RESP.	50% – 100% – 50% TRANSIENT	—	±125	±250	—	±200	±300	—	±250	±400	—	±350	±500	—	—	±600	mV pk
	RECOVERY[1, 4]	—	—	200	—	60	200	—	60	200	—	60	200	—	60	—	µs
STEP LINE RESP.[1]	16 – 40 – 16 VDC TRANSIENT[6]	—	—	±300	—	±200	±300	—	±400	±500	—	±500	±600	—	±500	—	mV pk
	RECOVERY[5]	—	—	300	—	—	300	—	—	300	—	—	300	—	300	—	µs
START-UP[2, 7]	DELAY	—	1.4	5	—	1.4	5	—	1.4	5	—	1.4	5	—	—	5	ms
	OVERSHOOT FULL LOAD[1]	—	0	50	—	0	50	—	0	120	—	0	150	—	0	—	mV pk
	NO LOAD[1]	—	33	150	—	50	250	—	120	600	—	150	750	—	—	—	
CAPACITIVE LOAD[1]	NO EFFECT ON DC PERFORMANCE	—	—	300	—	—	300	—	—	3000	—	—	3000	—	—	2000	µF

Notes

1. Guaranteed, not tested.

2. Tc = –55°C to +125°C
3. Operation is limited below 16V (see Figure 22).
4. Indefinite short circuit protection not guaranteed above 125°C case.
5. Recovery time is measured from application of the transient to point at which Vout is within 1% of final value.
6. Transition time ≥10 µs.
7. Tested on release from inhibit.

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Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, free run, unless otherwise specified.

DUAL OUTPUT MODELS			MTR2805D			MTR2812D			MTR2815D			
PARAMETER	**CONDITIONS**		**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**UNITS**
OUTPUT VOLTAGE		$+V_{OUT}$	4.95	5.00	5.05	11.88	12.00	12.12	14.85	15.00	15.15	VDC
		$-V_{OUT}$	4.92	5.00	5.08	11.82	12.00	12.18	14.77	15.00	15.23	
OUTPUT CURRENT[2, 3]	V_{IN} = 16 TO 40 VDC		0	2.5	4.5	0	1.25	2.25	0	1.0	1.8	A
OUTPUT POWER[2, 3]	V_{IN} = 16 TO 40 VDC		0	—	25	0	—	30	0	—	30	W
OUTPUT RIPPLE	10 kHz - 2 MHz		—	20	40	—	30	80	—	25	80	mV p-p
VOLTAGE +/– V_{OUT}	Tc = –55°C TO +125°C		—	40	90	—	40	120	—	40	120	
LINE REGULATION[4]		$+V_{OUT}$	—	10	50	—	10	50	—	10	50	mV
V_{IN} = 16 TO 40 VDC		$-V_{OUT}$	—	50	100	—	50	150	—	50	180	
	Tc = –55°C	$+V_{OUT}$	—	10	50	—	10	50	—	10	50	
	TO +125°C	$-V_{OUT}$	—	50	100	—	50	150	—	50	180	
LOAD REGULATION		$+V_{OUT}$	—	5	50	—	15	50	—	15	50	mV
NO LOAD TO FULL		$-V_{OUT}$	—	25	100	—	30	150	—	30	180	
	Tc = –55°C	$+V_{OUT}$	—	5	50	—	15	50	—	15	50	
	TO +125°C	$-V_{OUT}$	—	25	100	—	30	150	—	30	180	
CROSS REGULATION[1]	SEE NOTE 5		—	7	12	—	4	8.3	—	3	8	%
EFFECT ON $-V_{OUT}$	SEE NOTE 6		—	4	6	—	4	6	—	4	6	
INPUT VOLTAGE[2]	CONTINUOUS		16	28	40	16	28	40	16	28	40	VDC
NO LOAD TO FULL	TRANSIENT 50 ms		0	—	50	0	—	50	0	—	50	V
INPUT CURRENT	NO LOAD		—	35	75	—	50	75	—	50	75	mA
	INHIBITED		—	3	8	—	3	8	—	3	8	mA
INPUT RIPPLE CURRENT[2]	10 kHz - 10 MHz		—	15	50	—	20	50	—	20	50	mA p-p
EFFICIENCY			76	78	—	78	81	—	80	83	—	%
LOAD FAULT[7]	POWER DISSIPATION SHORT CIRCUIT[2]		—	10	—	—	10	—	—	10	—	W
	RECOVERY[1]		—	1.4	5.0	—	1.4	5.0	—	1.4	5.0	ms
STEP LOAD	50 – 100 – 50% BALANCED											
RESPONSE ± V_{OUT}	TRANSIENT		—	±200	±300	—	±150	±300	—	±200	±400	mV pk
	RECOVERY[1, 8]		—	100	200	—	100	200	—	100	200	µs
STEP LINE[1]	16 – 40 – 16 V_{IN}											
RESPONSE ± V_{OUT}	TRANSIENT[9]		—	±200	±400	—	±200	±400	—	±400	±500	mV pk
	RECOVERY[8]		—	—	300	—	—	300	—	—	300	µs
START–UP[2, 10]	DELAY		—	1.4	5	—	1.4	5	—	1.4	5	ms
	OVERSHOOT FULL LOAD[1]		—	0	50	—	0	120	—	0	150	mV pk
	NO LOAD[1]		—	50	250	—	120	600	—	150	750	
CAPACITIVE LOAD[1]	NO EFFECT ON DC PERFORMANCE		—	—	500	—	—	500	—	—	500	µF

Notes

1. Guaranteed, not tested.

2. Tc = –55°C to +125°C.
3. Up to 90% of the total output current/power is available from either output providing the positive output is carrying at least 10% of the total output power.
4. Operation is limited below 16 V (see Figure 22).
5. Effect on negative Vout from 50%/50% loads to 80%/20% or 20%/80% loads.
6. Effect on negative Vout from 50%/50% loads to 90%/10% or 10%/90% loads.
7. Indefinite short circuit protection not guaranteed above 125°C case.
8. Recovery time is measured from application of the transient to point at which Vout is within 1% of final value.
9. Transition time ≥ 10 µs.
10. Tested on release from inhibit.

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Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, free run, unless otherwise specified.

TRIPLE OUTPUT MODELS			MTR28512T			MTR28515T			
PARAMETER	**CONDITION**		**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**UNITS**
OUTPUT VOLTAGE	MAIN		4.95	5.0	5.05	4.95	5.0	5.05	VDC
	+ AUXILIARY		11.82	12.0	12.18	14.77	15.0	15.23	
	– AUXILIARY		11.82	12.0	12.18	14.77	15.0	15.23	
OUTPUT CURRENT[2]	MAIN		0.3	—	4.0	0.3	—	4.0	A
V_{IN} = 16 TO 40	+ AUXILIARY		—	0.416	0.750	—	0.333	0.600	
	– AUXILIARY		—	0.416	0.750	—	0.333	0.600	
OUTPUT POWER[2]	MAIN		—	20	20	—	20	20	W
V_{IN} = 16 TO 40	+ AUXILIARY		—	5	9	—	5	9	
	– AUXILIARY		—	5	9	—	5	9	
	TOTAL		—	—	30	—	—	30	
OUTPUT RIPPLE	10 kHz to 2 MHz	MAIN	—	50	125	—	50	125	mV p-p
VOLTAGE		± AUXILIARY	—	20	60	—	20	60	
LINE REGULATION	MAIN		—	10	20	—	10	20	mV
V_{IN} = 16 TO 40	±AUXILIARY		—	25	75	—	30	75	
LOAD REGULATION[3, 4]	MAIN		—	10	50	—	10	50	mV
	± AUXILIARY		—	30	75	—	30	75	
INPUT VOLTAGE	CONTINUOUS		16	28	40	16	28	40	VDC
	TRANSIENT 50 ms		—	—	50	—	—	50	
INPUT CURRENT	NO LOAD		—	70	100	—	70	120	mA
	INHIBITED		—	3.0	6	—	3.0	6	mA
INPUT RIPPLE CURRENT	10 kHz TO 10 MHz		—	20	45	—	20	45	mA p-p
EFFICIENCY			72	75	—	73	75	—	%
LOAD FAULT[5]	POWER DISSIPATION SHORT CIRCUIT ALL OUTPUTS SHORTED TOTAL		—	14	—	—	14	—	W
	RECOVERY EACH OUTPUT[1]		—	4	6.0	—	4	6.0	ms
STEP LOAD RESPONSE	TRANSIENT[6]	MAIN	—	150	250	—	150	250	mV pk
		± AUXILIARY	—	500	800	—	500	800	
	RECOVERY[7]	MAIN	—	0.05	0.10	—	0.05	0.10	ms
		± AUXILIARY	—	3	4	—	2	4	
STEP LINE RESPONSE[1]	TRANSIENT	MAIN	—	150	250	—	150	250	mV pk
V_{IN} = 16 TO 40		± AUXILIARY	—	100	250	—	100	250	
START-UP[8]	DELAY		—	4	6.0	—	4	6.0	ms
	OVERSHOOT	MAIN[1]	—	0	500	—	0	500	mV
		± AUXILIARY[1]	—	0	1500	—	0	1500	

Notes

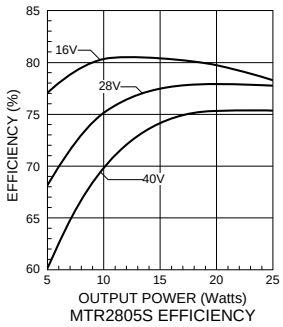
1. Guaranteed, not tested.

2. The sum of the two aux outputs is not to exceed 10 watts. The maximum load per aux output is 9 watts.
3. To maintain regulation when operating the ±Aux at full load, a minimum load of 300 mA is required on the main.
4. Measured on each output one at a time with the other outputs at full load.
5. Indefinite short circuit protection not guaranteed above 125°C (case).
6. Response of each output as all outputs are simultaneously transitioned.
   Main: 50% - 100% - 50% of main full load
   Auxiliaries: 25% - 50% - 25% each, of total auxiliary full load
7. Recovery time is measured from application of the transient to point at which Vout is within 1% of regulation.
8. Tested on release from inhibit.

MTR Single, Dual and Triple DC/DC Converters

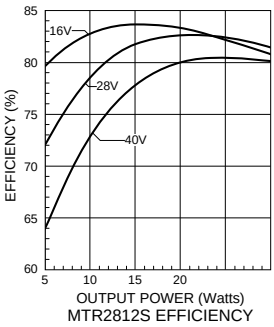
28 VOLT INPUT – 30 WATT

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



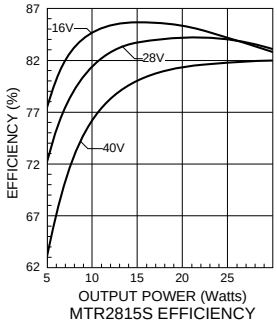
MTR2805S EFFICIENCY

FIGURE 6



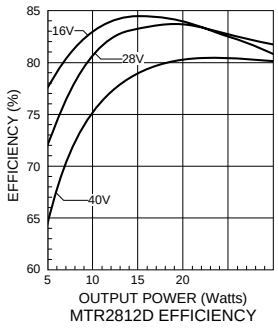
MTR2812S EFFICIENCY

FIGURE 7



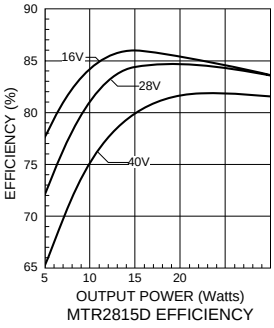
MTR2815S EFFICIENCY

FIGURE 8



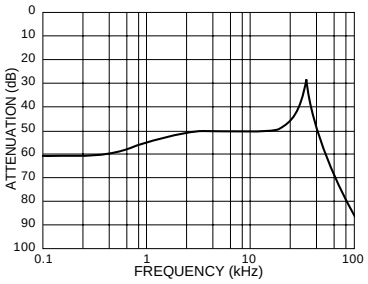
MTR2812D EFFICIENCY

FIGURE 9



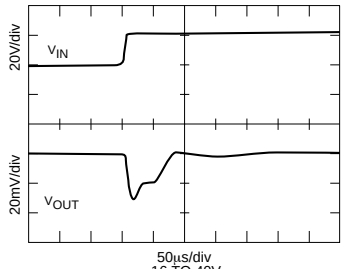
MTR2815D EFFICIENCY

FIGURE 10



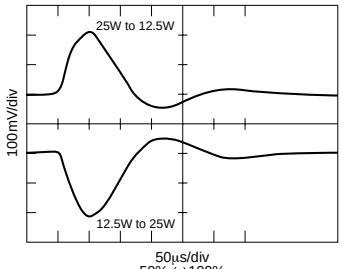
AUDIO REJECTION, MTR SERIES

FIGURE 11



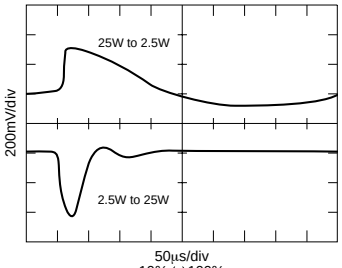
MTR2805S STEP LINE RESPONSE

FIGURE 12



MTR2805S STEP LOAD RESPONSE

FIGURE 13



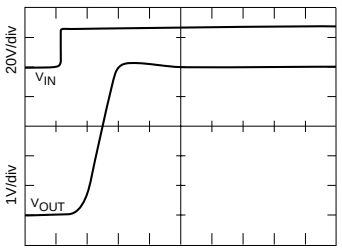
MTR2805S STEP LOAD RESPONSE

FIGURE 14

MTR Single, Dual and Triple DC/DC Converters

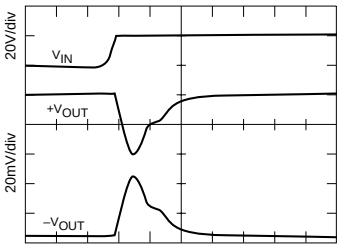
28 VOLT INPUT – 30 WATT

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



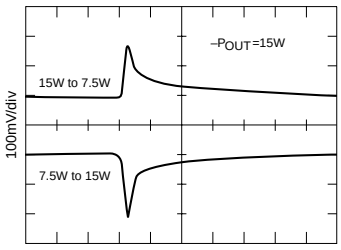
MTR2805S TURN-ON INTO NO LOAD

FIGURE 15



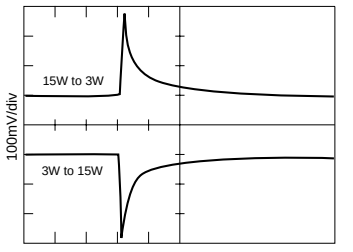
MTR2815D STEP LINE RESPONSE

FIGURE 16



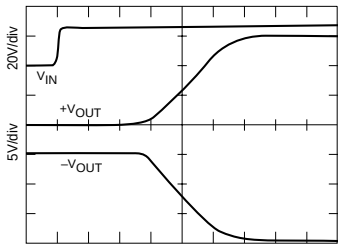
MTR2815D +V_{OUT} STEP LOAD RESPONSE

FIGURE 17



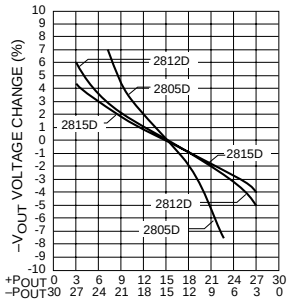
MTR2815D +V_{OUT} STEP LOAD RESPONSE

FIGURE 18



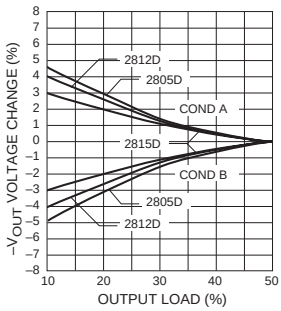
MTR2815D TURN-ON INTO NO LOAD

FIGURE 19



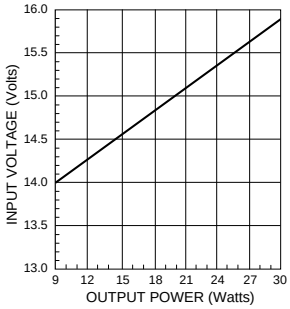
10% to 90% LOAD +V
90% to 10% LOAD –V
CROSS REGULATION

FIGURE 20



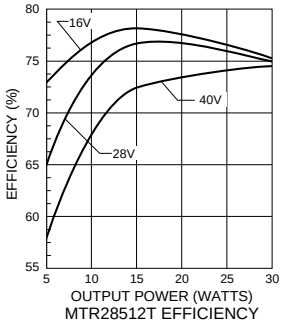
COND. B: 50% LOAD +V, 50% to 10% –V
COND. A: 50% LOAD –V, 50% to 10% +V
CROSS REGULATION

FIGURE 21



1% DROP
MTR SINGLES AND DUALS
LOW LINE DROPOUT

FIGURE 22



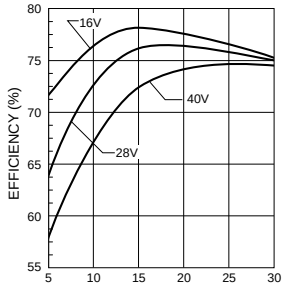
MTR28512T EFFICIENCY

FIGURE 23

MTR Single, Dual and Triple DC/DC Converters

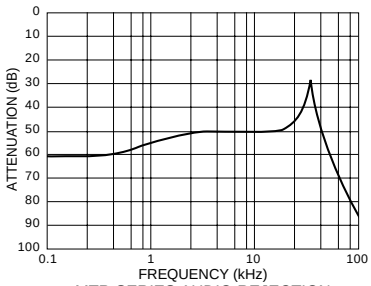
28 VOLT INPUT – 30 WATT

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



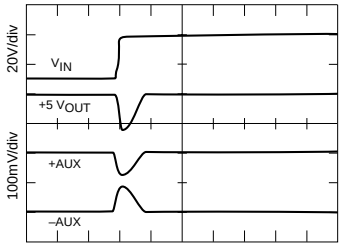
MTR28515T EFFICIENCY

FIGURE 24



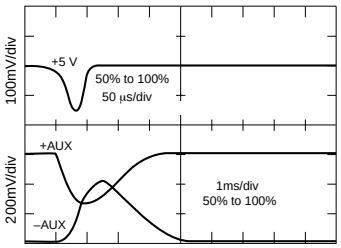
MTR SERIES AUDIO REJECTION

FIGURE 25



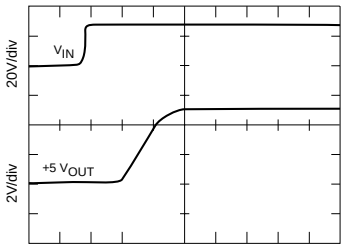
16V TO 40V
MTR28515T STEP LINE RESPONSE

FIGURE 26



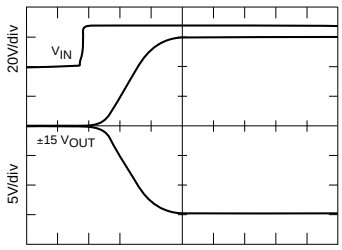
50% ↔ 100%
MTR28515T STEP LOAD RESPONSE

FIGURE 27



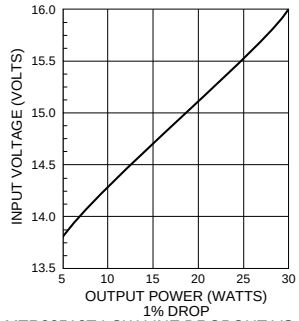
MTR28515T, MAIN (+5) TURN-ON INTO FULL LOAD

FIGURE 28



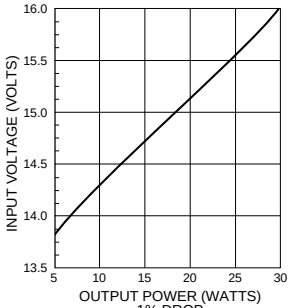
MTR28515T, AUX. (±15)TURN-ON INTO FULL LOAD

FIGURE 29



1% DROP
MTR28512T LOW LINE DROPOUT VS. LOAD

FIGURE 30



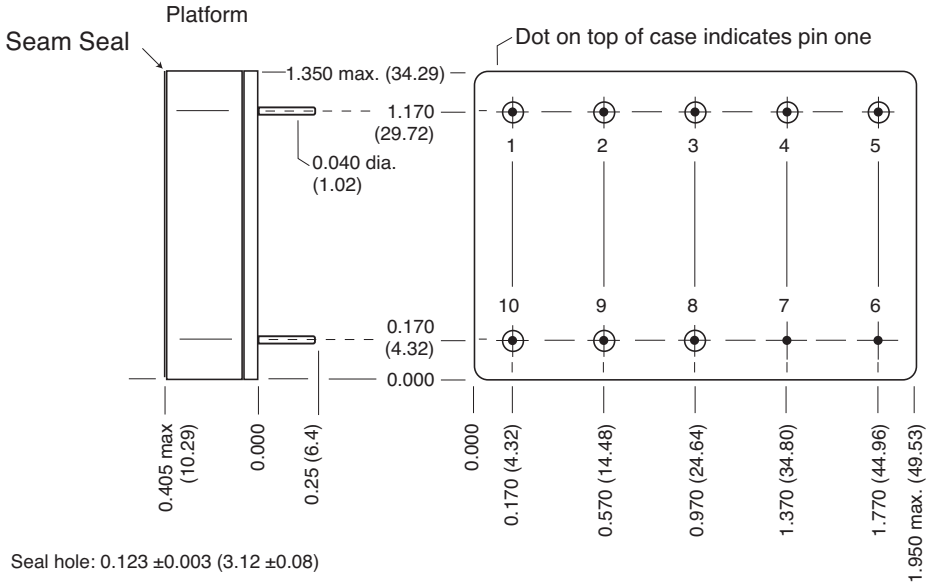
1% DROP
MTR28515T LOW LINE DROPOUT VS. LOAD

FIGURE 31

MTR Single, Dual and Triple DC/DC Converter Cases

28 VOLT INPUT – 30 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

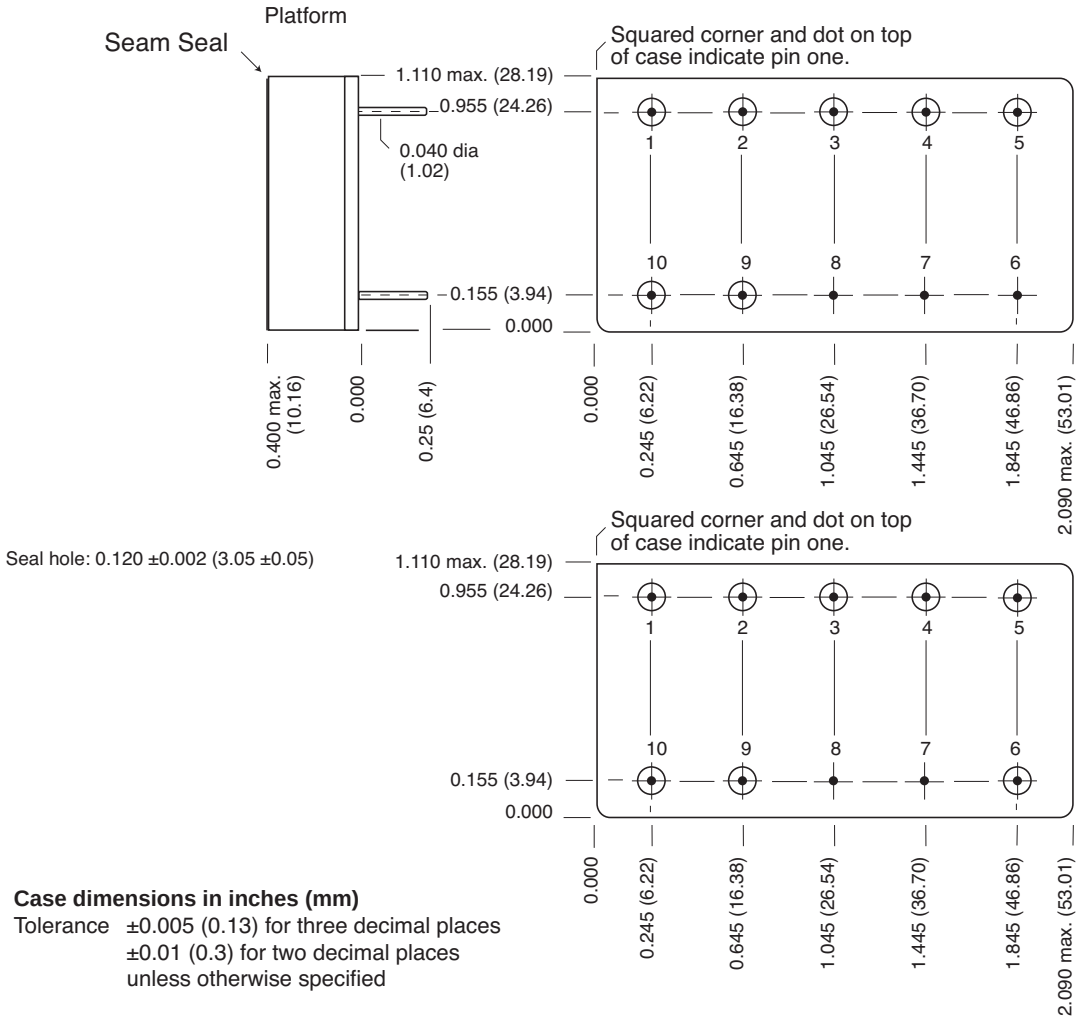
Case F1, Rev C, 20051216
Please refer to the numerical dimensions for accuracy. All information is believed to be accurate, but no responsibility is assumed for errors or omissions. Interpoint reserves the right to make changes in products or specifications without notice.
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FIGURE 32: CASE F1 – TRIPLE MODELS

MTR Single, Dual and Triple DC/DC Converter Cases

28 VOLT INPUT – 30 WATT

BOTTOM VIEW CASE H2



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

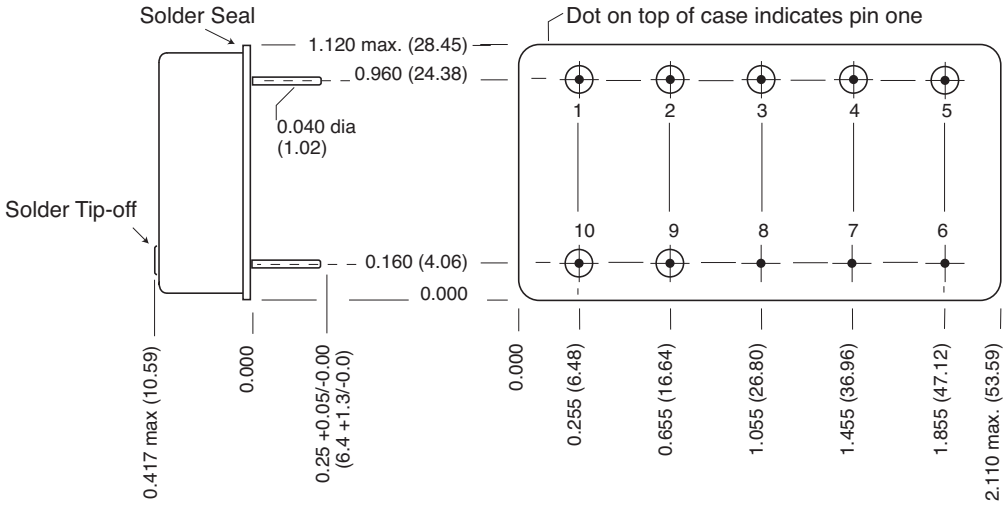
Case H2, Rev C - 20060109
Please refer to the numerical dimensions for accuracy. All information is believed to be accurate, but no responsibility is assumed for errors or omissions. Interpoint reserves the right to make changes in products or specifications without notice.
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FIGURE 33: CASE H2 – DUAL MODELS

MTR Single, Dual and Triple DC/DC Converter Cases

28 VOLT INPUT – 30 WATT

BOTTOM VIEW CASE H4



Seal hole: 0.091 ±0.005 (2.31 ±0.13)

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/Tin
Cover	Cold Rolled Steel/Nickel/Tin
Pins	#52 alloy compression glass seal

Case H4, Rev C - 20060110
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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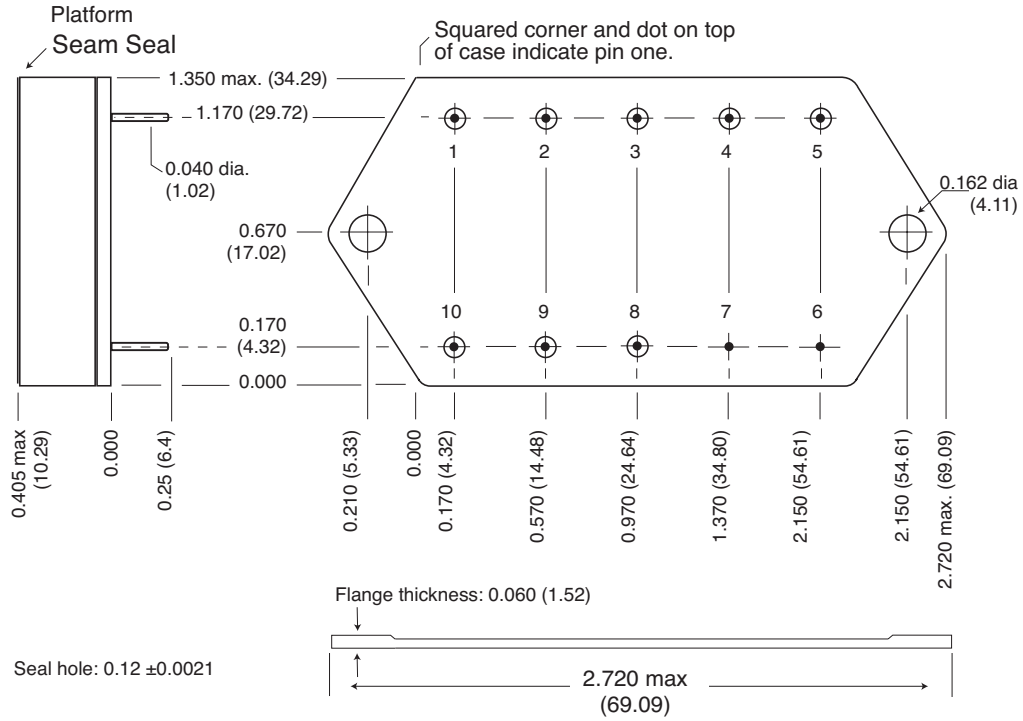
FIGURE 34: CASE H4 – DUAL MODELS

MTR Single, Dual and Triple DC/DC Converter Cases

28 VOLT INPUT – 30 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 C, 20060109 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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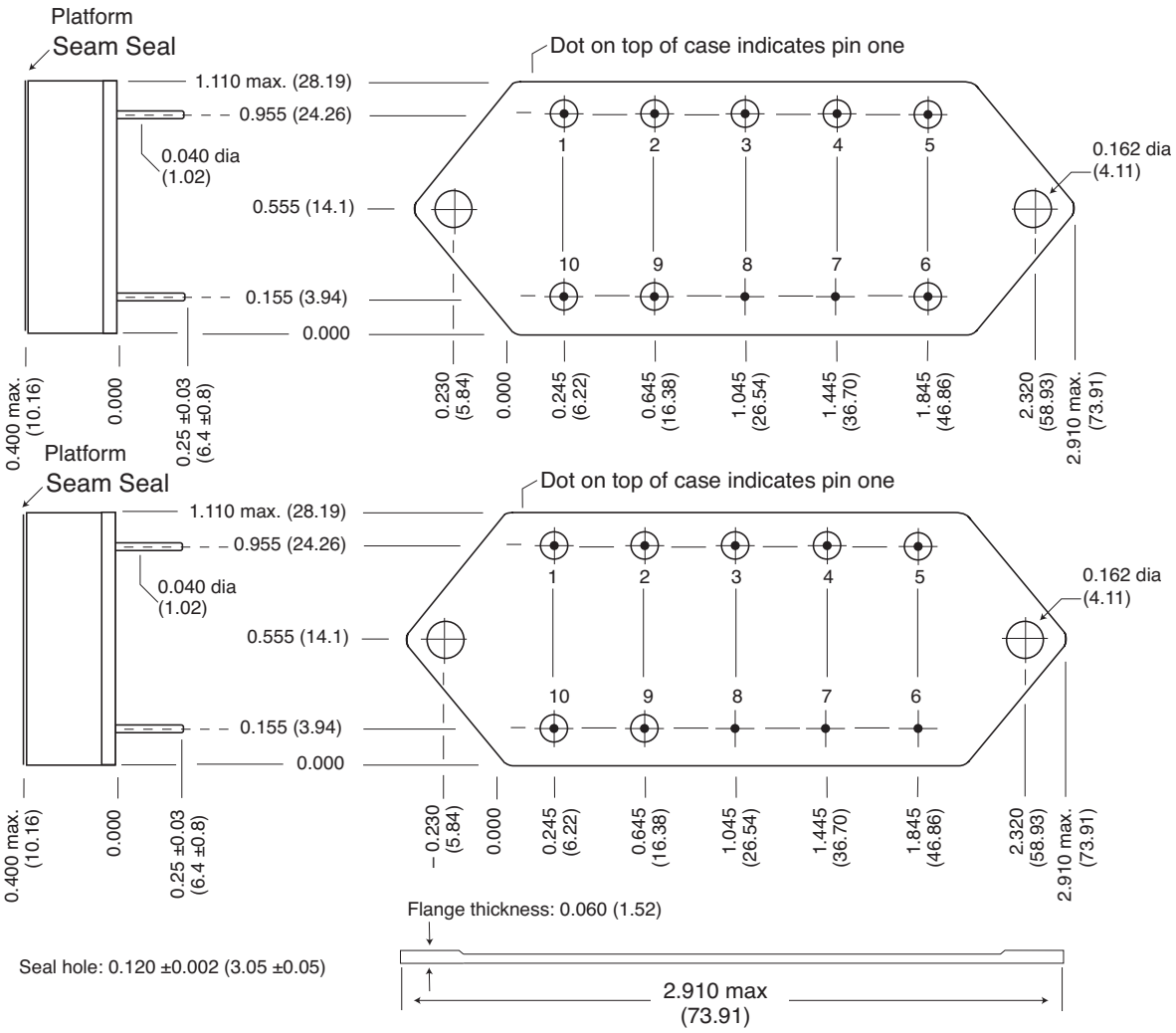
FIGURE 35: CASE J1 – TRIPLE MODELS

MTR Single, Dual and Triple DC/DC Converter Cases

28 VOLT INPUT – 30 WATT

BOTTOM VIEW CASE K3

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

Materials

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

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.

Case K3, Rev C, 20060110

Please refer to the numerical dimensions for accuracy.

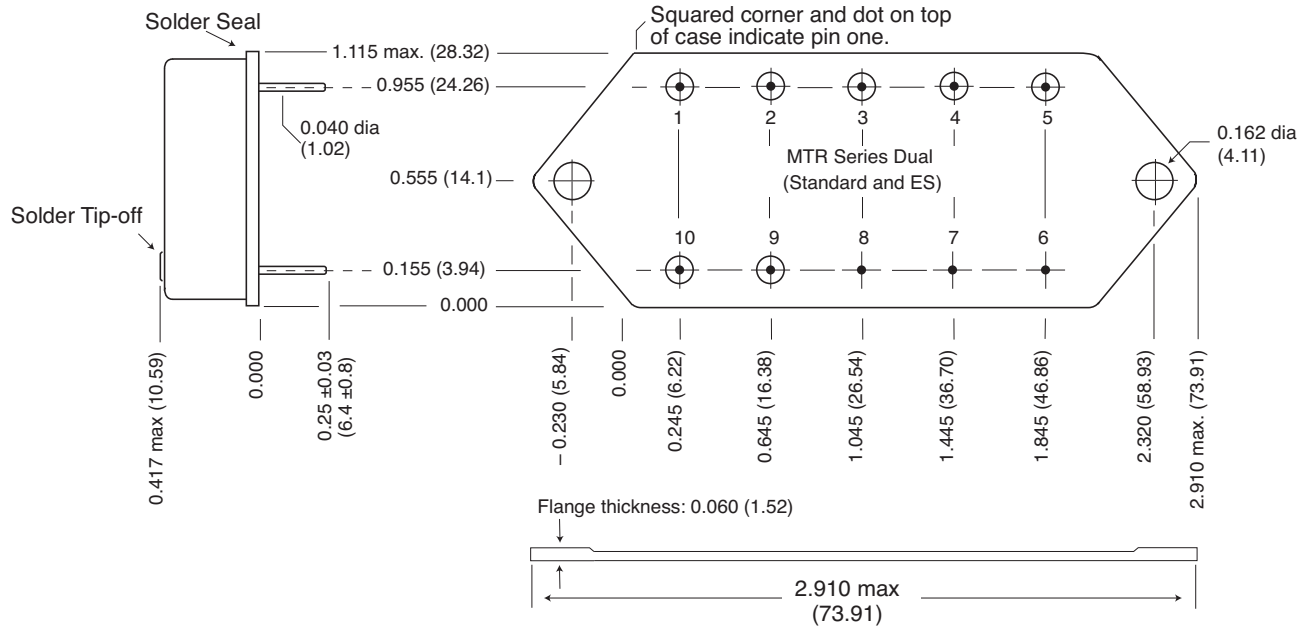
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FIGURE 36: CASE K3 – SINGLE MODELS

MTR Single, Dual and Triple DC/DC Converter Cases

28 VOLT INPUT – 30 WATT

BOTTOM VIEW CASE K5
Flanged cases: Designator “F” required in Case Option position of model number.



Seal hole: 0.091 ±0.001 (2.31 ±0.03)

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/Tin
Cover Cold Rolled Steel/Nickel/Tin
Pins #52 alloy compression glass seal

Case K3, Rev C, 20060109
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 37: CASE K5 – SINGLE MODELS

MTR Single, Dual and Triple DC/DC Converters

28 VOLT INPUT – 30 WATT

883, Class H, QML Products – Element Evaluation

Element Evaluation Test Performed (Component Level)	Standard (non-QML)[1]		Class H, QML	
	M/S[2]	P[3]	M/S[2]	P[3]
Element Electrical (probe)	yes	no	yes	yes
Element Visual	no	no	yes	yes
Internal Visual	no	no	yes	no
Final Electrical	no	no	yes	yes
Wire Bond Evaluation[4]	no	no	yes	yes
SLAM™/C-SAM: Input Capacitors only (Add'l test, not req. by H or K)	no	no	no	yes

Definitions:
Element Evaluation: Component testing/screening per MIL-STD-883 as determined by MIL-PRF-38534
SLAM™: Scanning Laser Acoustic Microscopy
C-SAM: C - Mode Scanning Acoustic Microscopy

Notes:
1. Non-QML products do no meet all of the requirements of MIL-PRF-38534
2. M/S = Active components (Microcircuit and Semiconductor Die)
3. P = Passive components
4. Not applicable to EMI filters that have no wire bonds

MTR Single, Dual and Triple DC/DC Converters

28 VOLT INPUT – 30 WATT

883, CLASS H, QML PRODUCTS – ENVIRONMENTAL SCREENING

TEST	125°C STANDARD non-QML	125°C /ES non-QML	Class H /883 QML
Pre-cap Inspection			
Method 2017, 2032	yes	yes	yes
Temperature Cycle (10 times)			
Method 1010, Cond. C, -65°C to 150°C, ambient	no	no	yes
Method 1010, Cond. B, -55°C to 125°C, ambient	no	yes	no
Constant Acceleration			
Method 2001, 3000 g	no	no	yes
Method 2001, 500g	no	yes	no
Burn-In			
Method 1015, 160 hours at 125°C case, typical	no	no	yes
96 hours at 125°C case, typical	no	yes	no
Final Electrical Test MIL-PRF-38534, Group A			
Subgroups 1 through 6: -55°C, +25°C, +125°C case	no	no	yes
Subgroups 1 and 4: +25°C case	yes	yes	no
Hermeticity Test			
Fine Leak, Method 1014, Cond. A	no	yes	yes
Gross Leak, Method 1014, Cond. C	no	yes	yes
Gross Leak, Dip (1 x 10^{-3})	yes	no	no
Final Visual Inspection			
Method 2009	yes	yes	yes

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

MTR Single, Dual and Triple. Rev G - 20060505. This revision supercedes all previous releases. All technical 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. MTR Series is a trademark of Interpoint. Copyright © 1994 - 2006 Interpoint Corporation. All rights reserved. **www.craneae.com**

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