MWR Triple DC-DC Converters

14 TO 50 VOLT INPUT - 30 TO 35 WATT

FEATURES

- Input voltage range 14 to 50 volts
- Transient protection up to 80 volts for one second
- Indefinite short circuit protection
- -55°C to +125°C operation
- Magnetic feedback
- Synchronization
- Inhibit function
- Up to 33 W/in^3, 85% efficiency
- Undervoltage lockout
- Soft-start function limits inrush current during start-up

MODELS OUTPUT VOLTAGE (V)
TRIPLE
3.3 ±12
3.3 ±15
5 ±12
5 ±15

DESCRIPTION

The Interpoint® MWR Series™ of DC-DC converters offers up to 35 watts of power in a low profile package. They have a wide input voltage range of 14 to 50 volts and are capable of withstanding up to 80 volts for up to one second. The MWR converters are manufactured in our fully certified and qualified MIL-PRF-38534 Class H production facility and packaged in hermetically sealed, welded steel cases. Flanged and non-flanged cases are available. They are ideal for use in programs requiring high reliability, small size, and high efficiency.

CONVERTER DESIGN

MWR Series DC-DC converters are switching regulators that use 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 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. The design minimizes input ripple, greatly reduces output ripple and improves efficiency. See Figure 1 on page 2.

AUDIO REJECTION

The MWR converters' feed-forward compensation system provides excellent dynamic response and audio rejection. Audio rejection is typically 40 dB.

The MWR Series converters have internal filtering capacitors that help reduce the need for external components in normal operation. Use our FMCE-0328 EMI filter to meet the requirements of MIL-STD-461C CE03 and CS01 and MIL-STD-461D, E and F CE102 and CS101. Any of our Interpoint FMCE filters can be used to the rated current of the filter.

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 the inhibit pin is pulled below 0.8 volts. 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

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 270 kHz and 330 kHz. The sync control operates with a duty cycle between 40% and 60%.

PROTECTION FEATURES

All models include a soft-start function to prevent large current draw and minimize overshoot. The converters provide short circuit protection (by restricting the current) and output overload protection.

Indefinite short circuit protection restricts the output current to approximately 150% 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. For better protection, the current limit function of the main and the auxiliary sides are linked together. If one output goes to current limit, the other outputs will be turned off at the same time.

Undervoltage lockout with hysteresis prevents the units from operating below approximately 12 volts input voltage to keep system current levels smooth, especially during initialization or re-start operations.

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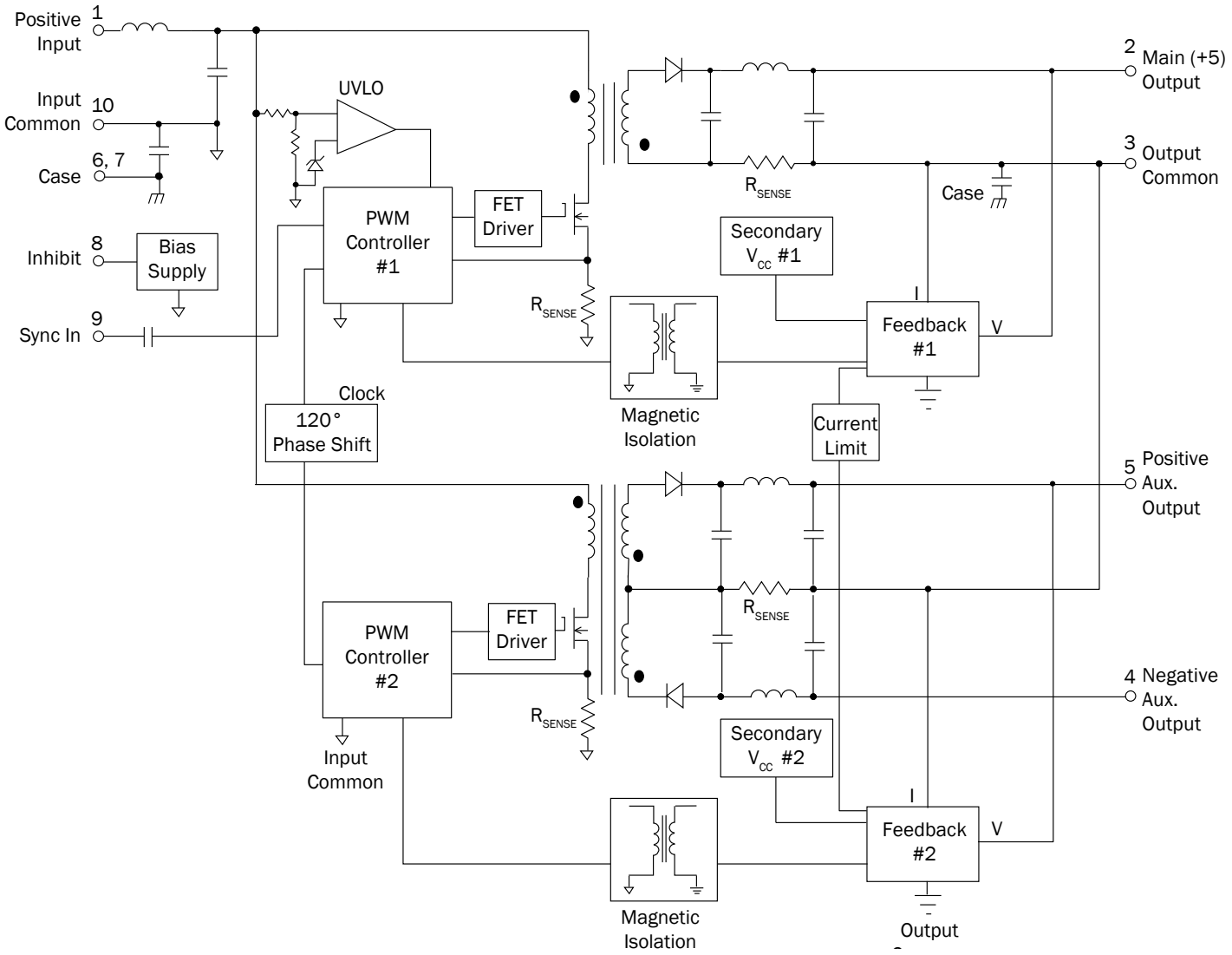

FIGURE 1: MWR BLOCK DIAGRAM

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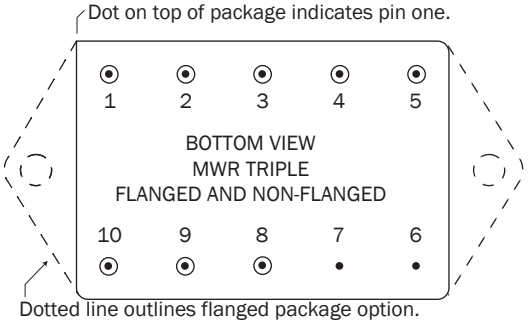
PIN OUT	
Pin	**Triple Output**
1	Positive Input
2	Main Output
3	Output Common
4	Neg. Aux. Output
5	Pos. Aux. Output
6	Case Ground
7	Case Ground
8	Inhibit
9	Sync. In
10	Input Common

TABLE 1: PIN OUT

PINS NOT IN USE	
Inhibit	Leave unconnected
Sync	Leave unconnected or tie to input common

TABLE 2: PINS NOT IN USE



See Figure 26 on page 21 and Figure 27 on page 22 for dimensions.

FIGURE 2: MWR TRIPLE

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MODEL NUMBERING KEY

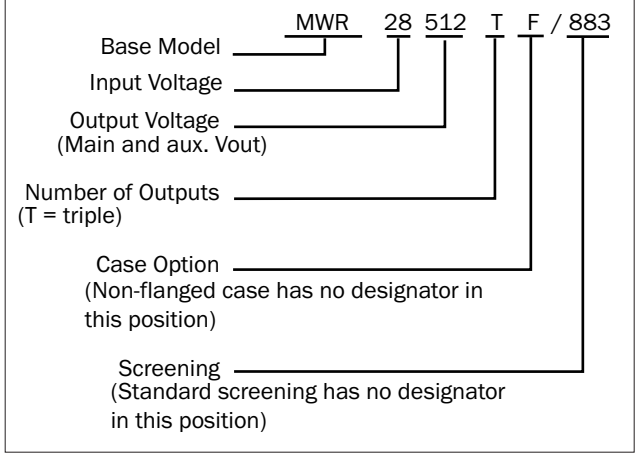

FIGURE 3: MODEL NUMBERING KEY

SMD NUMBERS	
STANDARD MICROCIRCUIT DRAWING (SMD)	**MWR SIMILAR PART**
5962-1722601HXC	MWR283R312T/883
5962-1722602HXC	MWR283R315T/883
5962-1722603HXC	MWR28512T/883
5962-1722604HXC	MWR28515T/883

SMD numbers shown are for screening level Class H, standard case (X), standard pin seal and non-solder dipped pins (C). For other options please refer to the SMD for the SMD number and the vendor similar number. All SMD numbers are listed on the SMD in the "Bulletin" which is the last page of the SMD. For exact specifications for an SMD product, refer to the SMD. SMDs can be downloaded from https://landandmaritimeapps.dla.mil/programs/smcr

TABLE 3: SMD CROSS REFERENCE

MODEL NUMBER OPTIONS

TO DETERMINE THE MODEL NUMBER ENTER ONE OPTION FROM EACH CATEGORY IN THE FORM BELOW.

CATEGORY	Base Model and Input Voltage	Output Voltage [1]	Number of Outputs [2]	Case Options [3]	Screening [4]
OPTIONS	MWR28	3R312, 3R315, 512, 515	T	(non-flanged, leave blank) F (flanged)	(standard, leave blank) ES 883
FILL IN FOR MODEL # [5]	MWR28	_____	_____	_____	/ _____

Notes
1. Output Voltage: An R indicates a decimal point. 3R312T has a 3.3 volt main and ±12 volt auxiliaries.
2. Number of Outputs: T is a triple output.
3. Case Options: For the standard case, Figure 26 on page 21, leave the case option blank. For the flanged case option, Figure 27 on page 22, insert the letter F in the Case Option position.
4. Screening: For standard screening leave the screening option blank. For other screening options, insert the desired screening level. For more information see Table 15 on page 23.
5. If ordering by model number add a "-Q" to request solder dipped leads (MWR28512T/883-Q).

TABLE 4: MODEL NUMBER OPTIONS

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TABLE 5: OPERATING CONDITIONS, ALL MODELS, 25°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

MWR SERIES		ALL MODELS			
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
LEAD SOLDERING TEMPERATURE [1]	10 SECONDS MAX.	—	—	300	°C
STORAGE TEMPERATURE [1]		-65	—	+150	°C
CASE OPERATING TEMPERATURE	FULL POWER	-55	—	+125	°C
	ABSOLUTE [1]	-55	—	+135	
DERATING OUTPUT POWER/CURRENT [1]	LINEARLY	From 100% at 125°C to 0% at 135°C			
ESD RATING [1, 2] MIL-PRF-38534, 3.9.5.8.2	MIL-STD-883, METHOD 3015 CLASS 2	2000 - 3999			V
ISOLATION: INPUT TO OUTPUT, INPUT TO CASE, OUTPUT TO CASE [3]	500 V AT 25°C	100	—	—	Megohms
UNDERVOLTAGE LOCKOUT [1] -55°C TO +125°C	RISING V_{IN} (TURN ON)	—	12.93	—	V
	FALLING V_{IN} (TURN OFF)	—	11.85	—	
CURRENT LIMIT [4, 5] % OF FULL LOAD	MAIN	—	150	—	%
	±AUX.	—	130	—	
AUDIO REJECTION [1]		—	40	—	dB
SWITCHING FREQUENCY	-55°C TO +125°C	260	—	340	kHz
SYNCHRONIZATION	INPUT FREQUENCY	270	—	330	kHz
	DUTY CYCLE [1]	40	—	60	%
	ACTIVE LOW	—	—	0.8	V
	ACTIVE HIGH [1]	4.5	—	5.0	
	REFERENCED TO	INPUT COMMON			
	IF NOT USED	LEAVE UNCONNECTED OR TIE TO INPUT COMMON			
INHIBIT ACTIVE LOW (OUTPUT DISABLED) Do not apply a voltage to the inhibit pin [7]	INHIBIT PIN PULLED LOW [6]	—	—	0.8	V
	INHIBIT PIN SOURCE CURRENT [1]	—	—	4	mA
	REFERENCED TO	INPUT COMMON			
INHIBIT ACTIVE HIGH (OUTPUT ENABLED) Do not apply a voltage to the inhibit pin [7]	INHIBIT PIN CONDITION	OPEN COLLECTOR OR UNCONNECTED			
	OPEN PIN VOLTAGE [1]	8.5	—	12	V

For mean time between failures (MTBF) contact Applications Engineering at powerapps@craneae.com.

Notes
1. Guaranteed by design and/or analysis. Not a production test.
2. Passes 2000 volts.
3. When testing isolation, input pins are tied together and output pins are tied together. They are tested against each other and against case. Discharge the pins before and after testing.
4. Current limit is defined as the point at which the output voltage decreases by 1%. For better protection, the current limit function of the main and the auxiliary sides are linked together. If one output goes to current limit, the other outputs will be turned off at the same time.
5. The over-current limit will trigger when the sum of the auxiliary outputs reach 130% (typical value) of the maximum rated “total” current of both outputs.
6. Tested with inhibit pin connected to input common.
7. An external inhibit interface should be used to pull the inhibit low or leave it floating. The inhibit pin can be left unconnected if not used.

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TABLE 6: ELECTRICAL CHARACTERISTICS -55°C TO +125°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

TRIPLE OUTPUT MODEL – MWR283R312T		3.3 (MAIN)			±12 (AUXILIARIES)			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	MAIN AND POS. AUX	3.23	3.30	3.37	11.76	12.00	12.24	V
	NEG. AUX.	—	—	—	11.70	12.00	12.30	
OUTPUT CURRENT	MAIN AND EITHER OUTPUT	—	—	3.0	—	±0.833	1.16 [1]	A
V_{IN} = 14 TO 50	MAX TOTAL AUX	—	—	—	—	—	1.67	
OUTPUT POWER	MAIN AND EITHER OUTPUT	—	—	10	—	±10	14 [1]	W
V_{IN} = 14 TO 50	MAX TOTAL AUX	—	—	—	—	—	20	
OUTPUT RIPPLE	T_C = 25°C	—	15	45	—	50	80	mV p-p
10 kHz - 20 MHz	T_C = -55°C TO +125°C	—	15	60	—	50	120	
LINE REGULATION	MAIN AND POS. AUX	—	5	25	—	5	50	mV
V_{IN} = 14 TO 50	NEG. AUX.	—	—	—	—	28	120	
LOAD REGULATION	MAIN AND +AUX., NL - FL	—	5	25	—	5	50	mV
BALANCED AUX.	-AUX., NL - FL	—	—	—	—	20	100	
CROSS REGULATION [2]	EFFECT ON	—	—	—	—	250	600	mV
T_C = 25°C	NEGATIVE AUXILIARY							
INPUT VOLTAGE	CONTINUOUS	14	28	50	—	—	—	V
	TRANSIENT 1 SEC [1]	—	—	80	—	—	—	V
INPUT CURRENT	NO LOAD	—	50	65	—	—	—	mA
	INHIBITED	—	2.5	4	—	—	—	
INPUT RIPPLE CURRENT [3]	10 kHz - 20 MHZ	—	36	100	—	—	—	mA p-p
EFFICIENCY [4]	T_C = 25°C	78	81	—	—	—	—	%
	T_C = -55°C TO +125°C	77	—	—	—	—	—	
LOAD FAULT [5, 6]	POWER DISSIPATION	—	6	9.5	—	5	9.5	W
	RECOVERY [1]	—	15	20	—	—	20	ms
STEP LOAD RESPONSE [6, 7]	TRANSIENT	—	±75	±350	—	±150	±600	mV pk
50% - 100% - 50%	RECOVERY	—	120	400	—	175	600	µs
STEP LINE RESPONSE [1, 6, 8]	TRANSIENT	—	±100	±400	—	±200	±400	mV pk
14 - 50 - 14 V_{IN}	RECOVERY	—	400	600	—	200	600	µs
START-UP [6, 9]	DELAY	—	15	20	—	—	20	ms
	OVERSHOOT [1]	—	5	33	—	5	60	mV pk
CAPACITIVE LOAD [1, 10]	25°C	—	—	1000	—	—	500	µF

Notes
1. Guaranteed by design and/or analysis. Not a production test.
2. Effect on -Vout for the following conditions. Percentages are of total aux. power (20 W). Conditions are referenced to balanced aux. loads of 50%/50%.
   +Po = 70%, -Po = 30%
   +Po = 30%, -Po = 70%
3. At loads <20% of full load, higher input ripple current is possible.
4. The efficiency of the converter with all outputs at full load.
5. Each output tested separately.
6. Recovery and startup times are measured from application of the transient or change in condition to the point at which V_{OUT} is within 1% of final value.
7 Step load test is performed at 10 microseconds typical.
8. Step line test is performed at 100 microseconds ± 20 microseconds.
9. Tested on release from inhibit.
10. No effect on dc performance. Applies to each auxiliary.

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TABLE 7: ELECTRICAL CHARACTERISTICS -55°C TO +125°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

TRIPLE OUTPUT MODEL – MWR283R315T		3.3 (MAIN)			±15 (AUXILIARIES)			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	MAIN AND POS. AUX	3.23	3.30	3.37	14.70	15.00	15.30	V
	NEG. AUX.	–	–	–	14.62	15.00	15.38	
OUTPUT CURRENT	MAIN AND EITHER OUTPUT	–	–	3.0	–	±0.667	0.93 [1]	A
V_{IN} = 14 TO 50	MAX TOTAL AUX	–	–	–	–	–	1.34	
OUTPUT POWER	MAIN AND EITHER OUTPUT	–	–	10	–	±10	14 [1]	W
V_{IN} = 14 TO 50	MAX TOTAL AUX	–	–	–	–	–	20	
OUTPUT RIPPLE	T_C = 25°C	–	15	45	–	35	80	mV p-p
10 kHz - 20 MHz	T_C = -55°C TO +125°C	–	15	60	–	35	100	
LINE REGULATION	MAIN AND POS. AUX	–	5	25	–	5	50	mV
V_{IN} = 14 TO 50	NEG. AUX.	–	–	–	–	25	120	
LOAD REGULATION	MAIN AND +AUX., NL - FL	–	5	25	–	5	50	mV
BALANCED AUX.	-AUX., NL - FL	–	–	–	–	28	100	
CROSS REGULATION [2]	EFFECT ON	–	–	–	–	250	600	mV
T_C = 25°C	NEGATIVE AUXILIARY							
INPUT VOLTAGE	CONTINUOUS	14	28	50	–	–	–	V
	TRANSIENT 1 SEC [1]	–	–	80	–	–	–	
INPUT CURRENT	NO LOAD	–	50	70	–	–	–	mA
	INHIBITED	–	2.5	4	–	–	–	
INPUT RIPPLE CURRENT [3]	10 kHz - 20 MHz	–	36	100	–	–	–	mA p-p
EFFICIENCY [4]	T_C = 25°C	79	82	–	–	–	–	%
	T_C = -55°C TO +125°C	78	–	–	–	–	–	
LOAD FAULT [5, 6]	POWER DISSIPATION	–	6	9.5	–	5	9.5	W
	RECOVERY [1]	–	15	20	–	–	20	ms
STEP LOAD RESPONSE [6, 7]	TRANSIENT	–	±75	±350	–	±175	±600	mV pk
50% - 100% - 50%	RECOVERY	–	120	400	–	145	600	µs
STEP LINE RESPONSE [1, 6, 8]	TRANSIENT	–	±100	±400	–	±200	±400	mV pk
14 - 50 - 14 V_{IN}	RECOVERY	–	400	600	–	200	700	µs
START-UP [6, 9]	DELAY	–	15	20	–	–	20	ms
	OVERSHOOT [1]	–	5	33	–	5	70	mV pk
CAPACITIVE LOAD [1, 10]	25°C	–	–	1000	–	–	500	µF

Notes
1. Guaranteed by design and/or analysis. Not a production test.
2. Effect on -Vout for the following conditions. Percentages are of total aux. power (20 W). Conditions are referenced to balanced aux. loads of 50%/50%.
   +Po = 70%, -Po = 30%
   +Po = 30%, -Po = 70%
3. At loads <20% of full load, higher input ripple current is possible.
4. The efficiency of the converter with all outputs at full load.
5. Each output tested separately.
6. Recovery and startup times are measured from application of the transient or change in condition to the point at which V_{OUT} is within 1% of final value.
7 Step load test is performed at 10 microseconds typical.
8. Step line test is performed at 100 microseconds ± 20 microseconds.
9. Tested on release from inhibit.
10. No effect on dc performance. Applies to each auxiliary.

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TABLE 8: ELECTRICAL CHARACTERISTICS -55°C TO +125°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

TRIPLE OUTPUT MODEL – MWR28512T		5 (MAIN)			±12 (AUXILIARIES)			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	MAIN AND POS. AUX	4.90	5.00	5.10	11.76	12.00	12.24	V
	NEG. AUX.	—	—	—	11.70	12.00	12.30	
OUTPUT CURRENT	MAIN AND EITHER OUTPUT	—	—	3.0	—	±0.833	1.16 [1]	A
V_{IN} = 14 TO 50	MAX TOTAL AUX	—	—	—	—	—	1.67	
OUTPUT POWER	MAIN AND EITHER OUTPUT	—	—	15	—	±10	14 [1]	W
V_{IN} = 14 TO 50	MAX TOTAL AUX	—	—	—	—	—	20	
OUTPUT RIPPLE	T_C = 25°C	—	20	45	—	50	80	mV p-p
10 kHz - 20 MHz	T_C = -55°C TO +125°C	—	20	60	—	50	120	
LINE REGULATION	MAIN AND POS. AUX	—	5	25	—	5	50	mV
V_{IN} = 14 TO 50	NEG. AUX.	—	—	—	—	28	120	
LOAD REGULATION	MAIN AND +AUX., NL - FL	—	5	25	—	5	50	mV
BALANCED AUX.	-AUX., NL - FL	—	—	—	—	20	100	
CROSS REGULATION [2]	EFFECT ON	—	—	—	—	250	600	mV
T_C = 25°C	NEGATIVE AUXILIARY							
INPUT VOLTAGE	CONTINUOUS	14	28	50	—	—	—	V
	TRANSIENT 1 SEC [1]	—	—	80	—	—	—	
INPUT CURRENT	NO LOAD	—	50	70	—	—	—	mA
	INHIBITED	—	2.5	4	—	—	—	
INPUT RIPPLE CURRENT [3]	10 kHz - 20 MHz	—	40	100	—	—	—	mA p-p
EFFICIENCY [4]	T_C = 25°C	81	84	—	—	—	—	%
	T_C = -55°C TO +125°C	80	—	—	—	—	—	
LOAD FAULT [5, 6]	POWER DISSIPATION	—	7	9.5	—	5	9.5	W
	RECOVERY [1]	—	15	20	—	—	20	ms
STEP LOAD RESPONSE [6, 7]	TRANSIENT	—	±75	±350	—	±150	±600	mV pk
50% - 100% - 50%	RECOVERY	—	230	400	—	175	600	µs
STEP LINE RESPONSE [1, 6, 8]	TRANSIENT	—	±100	±400	—	±200	±400	mV pk
14 - 50 - 14 V_{IN}	RECOVERY	—	400	900	—	200	600	µs
START-UP [6, 9]	DELAY	—	15	20	—	—	20	ms
	OVERSHOOT [1]	—	5	50	—	5	60	mV pk
CAPACITIVE LOAD [1, 10]	25°C	—	—	1000	—	—	500	µF

Notes
1. Guaranteed by design and/or analysis. Not a production test.
2. Effect on -Vout for the following conditions. Percentages are of total aux. power (20 W). Conditions are referenced to balanced aux. loads of 50%/50%.
   +Po = 70%, -Po = 30%
   +Po = 30%, -Po = 70%
3. At loads <20% of full load, higher input ripple current is possible.
4. The efficiency of the converter with all outputs at full load.
5. Each output tested separately.
6. Recovery and startup times are measured from application of the transient or change in condition to the point at which V_{OUT} is within 1% of final value.
7 Step load test is performed at 10 microseconds typical.
8. Step line test is performed at 100 microseconds ± 20 microseconds.
9. Tested on release from inhibit.
10. No effect on dc performance. Applies to each auxiliary.

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TABLE 9: ELECTRICAL CHARACTERISTICS -55°C TO +125°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

TRIPLE OUTPUT MODEL – MWR28515T		5 (MAIN)			±15 (AUXILIARIES)			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	MAIN AND POS. AUX	4.90	5.00	5.10	14.70	15.00	15.30	V
	NEG. AUX.	—	—	—	14.62	15.00	15.38	
OUTPUT CURRENT	MAIN AND EITHER OUTPUT	—	—	3.0	—	±0.667	0.93 [1]	A
V_{IN} = 14 TO 50	MAX TOTAL AUX	—	—	—	—	—	1.34	
OUTPUT POWER	MAIN AND EITHER OUTPUT	—	—	15	—	±10	14 [1]	W
V_{IN} = 14 TO 50	MAX TOTAL AUX	—	—	—	—	—	20	
OUTPUT RIPPLE	T_C = 25°C	—	20	45	—	35	80	mV p-p
10 kHz - 20 MHz	T_C = -55°C TO +125°C	—	20	60	—	35	100	
LINE REGULATION	MAIN AND POS. AUX	—	5	25	—	5	50	mV
V_{IN} = 14 TO 50	NEG. AUX.	—	—	—	—	28	120	
LOAD REGULATION	MAIN AND +AUX., NL - FL	—	5	25	—	50	50	mV
BALANCED AUX.	-AUX., NL - FL	—	—	—	—	25	100	
CROSS REGULATION [2]	EFFECT ON	—	—	—	—	250	600	mV
T_C = 25°C	NEGATIVE AUXILIARY							
INPUT VOLTAGE	CONTINUOUS	14	28	50	—	—	—	V
	TRANSIENT 1 SEC [1]	—	—	80	—	—	—	
INPUT CURRENT	NO LOAD	—	50	70	—	—	—	mA
	INHIBITED	—	2.5	4	—	—	—	
INPUT RIPPLE CURRENT [3]	10 kHz - 20 MHz	—	40	100	—	—	—	mA p-p
EFFICIENCY [4]	T_C = 25°C	82	85	—	—	—	—	%
	T_C = -55°C TO +125°C	81	—	—	—	—	—	
LOAD FAULT [5, 6]	POWER DISSIPATION	—	7	9.5	—	5	9.5	W
	RECOVERY [1]	—	15	20	—	—	20	ms
STEP LOAD RESPONSE [6, 7]	TRANSIENT	—	±75	±350	—	±175	±600	mV pk
50% - 100% - 50%	RECOVERY	—	230	400	—	145	600	µs
STEP LINE RESPONSE [1, 6, 8]	TRANSIENT	—	±100	±400	—	±200	±400	mV pk
14 - 50 - 14 V_{IN}	RECOVERY	—	400	900	—	200	700	µs
START-UP [6, 9]	DELAY	—	15	20	—	—	20	ms
	OVERSHOOT [1]	—	5	50	—	5	70	mV pk
CAPACITIVE LOAD [1, 10]	25°C	—	—	1000	—	—	500	µF

Notes
1. Guaranteed by design and/or analysis. Not a production test.
2. Effect on -Vout for the following conditions. Percentages are of total aux. power (20 W). Conditions are referenced to balanced aux. loads of 50%/50%.
   +Po = 70%, -Po = 30%
   +Po = 30%, -Po = 70%
3. At loads <20% of full load, higher input ripple current is possible.
4. The efficiency of the converter with all outputs at full load.
5. Each output tested separately.
6. Recovery and startup times are measured from application of the transient or change in condition to the point at which V_{OUT} is within 1% of final value.
7 Step load test is performed at 10 microseconds typical.
8. Step line test is performed at 100 microseconds ± 20 microseconds.
9. Tested on release from inhibit.
10. No effect on dc performance. Applies to each auxiliary.

MWR Triple DC-DC Converters

14 TO 50 VOLT INPUT - 30 TO 35 WATT

TABLE 10: OPERATING CONDITIONS, ALL MODELS, 25°C CASE, 42 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

MWR SERIES		ALL MODELS			
PARAMETER [1]	CONDITIONS	MIN	TYP	MAX	UNITS
LEAD SOLDERING TEMPERATURE [1]	10 SECONDS MAX.	—	—	300	°C
STORAGE TEMPERATURE [1]		-65	—	+150	
CASE OPERATING TEMPERATURE	FULL POWER	-55	—	+125	°C
	ABSOLUTE [1]	-55	—	+135	
DERATING OUTPUT POWER/CURRENT [1]	LINEARLY	From 100% at 125°C to 0% at 135°C			
ESD RATING [1, 2] MIL-PRF-38534, 3.9.5.8.2	MIL-STD-883, METHOD 3015 CLASS 2	2000 - 3999			V
ISOLATION: INPUT TO OUTPUT, INPUT TO CASE, OUTPUT TO CASE [3]	500 V AT 25°C	100	—	—	Megohms
UNDERVOLTAGE LOCKOUT [1] -55°C TO +125°C	RISING V_{IN} (TURN ON)	—	12.93	—	V
	FALLING V_{IN} (TURN OFF)	—	11.85	—	
CURRENT LIMIT [4, 5] % OF FULL LOAD	MAIN	—	150	—	%
	±AUX.	—	130	—	
AUDIO REJECTION [1]		—	40	—	dB
SWITCHING FREQUENCY	-55°C TO +125°C	260	—	340	kHz
SYNCHRONIZATION	INPUT FREQUENCY	270	—	330	kHz
	DUTY CYCLE [1]	40	—	60	%
	ACTIVE LOW	—	—	0.8	V
	ACTIVE HIGH [1]	4.5	—	5.0	
	REFERENCED TO	INPUT COMMON			
	IF NOT USED	LEAVE UNCONNECTED OR TIE TO INPUT COMMON			
INHIBIT ACTIVE LOW (OUTPUT DISABLED) Do not apply a voltage to the inhibit pin [7]	INHIBIT PIN PULLED LOW [6]	—	—	0.8	V
	INHIBIT PIN SOURCE CURRENT [1]	—	—	4	mA
	REFERENCED TO	INPUT COMMON			
INHIBIT ACTIVE HIGH (OUTPUT ENABLED) Do not apply a voltage to the inhibit pin [7]	INHIBIT PIN CONDITION	OPEN COLLECTOR OR UNCONNECTED			
	OPEN PIN VOLTAGE [1]	8.5	—	12	V

For mean time between failures (MTBF) contact Applications Engineering at powerapps@craneae.com

Notes
1. Guaranteed by design and/or analysis. Not a production test.
2. Passes 2000 volts.
3. When testing isolation, input pins are tied together and output pins are tied together. They are tested against each other and against case. Discharge the pins before and after testing.
4. Current limit is defined as the point at which the output voltage decreases by 1%. For better protection, the current limit function of the main and the auxiliary sides are linked together. If one output goes to current limit, the other outputs will be turned off at the same time.
5. The over-current limit will trigger when the sum of the auxiliary outputs reach 130% (typical value) of the maximum rated "total" current of both outputs.
6. Tested with inhibit pin connected to input common.
7. An external inhibit interface should be used to pull the inhibit low or leave it floating. The inhibit pin can be left unconnected if not used.

42 volt specifications are for reference only and are not guaranteed.

MWR Triple DC-DC Converters

14 TO 50 VOLT INPUT - 30 TO 35 WATT

TABLE 11: ELECTRICAL CHARACTERISTICS -55°C TO +125°C CASE, 42 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

TRIPLE OUTPUT MODEL – MWR283R312T		3.3 (MAIN)			±12 (AUXILIARIES)			UNITS
PARAMETER [1]	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	MAIN AND POS. AUX	3.23	3.30	3.37	11.76	12.00	12.24	V
	NEG. AUX.	—	—	—	11.70	12.00	12.30	
OUTPUT CURRENT	MAIN AND EITHER OUTPUT	—	—	3.0	—	±0.833	1.16 [1]	A
V_{IN} = 14 TO 50	MAX TOTAL AUX	—	—	—	—	—	1.67	
OUTPUT POWER	MAIN AND EITHER OUTPUT	—	—	10	—	±10	14 [1]	W
V_{IN} = 14 TO 50	MAX TOTAL AUX	—	—	—	—	—	20	
OUTPUT RIPPLE	T_C = 25°C	—	20	45	—	60	80	mV p-p
10 kHz - 20 MHz	T_C = -55°C TO +125°C	—	20	60	—	60	120	
LINE REGULATION	MAIN AND POS. AUX	—	5	25	—	5	50	mV
V_{IN} = 14 TO 50	NEG. AUX.	—	—	—	—	30	120	
LOAD REGULATION	MAIN AND +AUX., NL - FL	—	4	25	—	5	50	mV
BALANCED AUX.	-AUX., NL - FL	—	—	—	—	30	150	
CROSS REGULATION [2]	EFFECT ON	—	—	—	—	250	600	mV
T_C = 25°C	NEGATIVE AUXILIARY							
INPUT VOLTAGE	CONTINUOUS	14	42	50	—	—	—	V
	TRANSIENT 1 SEC [1]	—	—	80	—	—	—	
INPUT CURRENT	NO LOAD	—	25	65	—	—	—	mA
	INHIBITED	—	3.5	4	—	—	—	
INPUT RIPPLE CURRENT [3]	10 kHz - 20 MHz	—	32	100	—	—	—	mA p-p
EFFICIENCY [4]	T_C = 25°C	78	81	—	—	—	—	%
	T_C = -55°C TO +125°C	77	—	—	—	—	—	
LOAD FAULT [5, 6]	POWER DISSIPATION	—	6.5	9.5	—	7	9.5	W
	RECOVERY [1]	—	15	20	—	—	20	ms
STEP LOAD RESPONSE [6, 7]	TRANSIENT	—	±80	±350	—	±150	±600	mV pk
50% - 100% - 50%	RECOVERY	—	160	400	—	—	600	µs
STEP LINE RESPONSE [1, 6, 8]	TRANSIENT	—	±100	±400	—	±200	±400	mV pk
14 - 50 - 14 V_{IN}	RECOVERY	—	400	600	—	200	600	µs
START-UP [6, 9]	DELAY	—	15	20	—	5	20	ms
	OVERSHOOT [1]	—	5	33	—	5	60	mV pk
CAPACITIVE LOAD [1, 10]	25°C	—	—	1000	—	—	500	µF

Notes
1. Guaranteed by design and/or analysis. Not a production test.
2. Effect on -Vout for the following conditions. Percentages are of total aux. power (20 W). Conditions are referenced to balanced aux. loads of 50%/50%.
   +Po = 70%, -Po = 30%
   +Po = 30%, -Po = 70%
3. At loads <20% of full load, higher input ripple current is possible.
4. The efficiency of the converter with all outputs at full load.
5. Each output tested separately.
6. Recovery and startup times are measured from application of the transient or change in condition to the point at which V_{OUT} is within 1% of final value.
7 Step load test is performed at 10 microseconds typical.
8. Step line test is performed at 100 microseconds ± 20 microseconds.
9. Tested on release from inhibit.
10. No effect on dc performance. Applies to each auxiliary.

42 volt specifications are for reference only and are not guaranteed.

MWR Triple DC-DC Converters

14 TO 50 VOLT INPUT - 30 TO 35 WATT

TABLE 12: ELECTRICAL CHARACTERISTICS -55°C TO +125°C CASE, 42 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

TRIPLE OUTPUT MODEL – MWR283R315T		3.3 (MAIN)			±15 (AUXILIARIES)			UNITS
PARAMETER [1]	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	MAIN AND POS. AUX	3.23	3.30	3.37	14.70	15.00	15.30	V
	NEG. AUX.	—	—	—	14.62	15.00	15.38	
OUTPUT CURRENT	MAIN AND EITHER OUTPUT	—	—	3.0	—	±0.667	0.93 [1]	A
V_{IN} = 14 TO 50	MAX TOTAL AUX	—	—	—	—	—	1.34	
OUTPUT POWER	MAIN AND EITHER OUTPUT	—	—	10	—	±10	14 [1]	W
V_{IN} = 14 TO 50	MAX TOTAL AUX	—	—	—	—	—	20	
OUTPUT RIPPLE	T_C = 25°C	—	20	45	—	30	80	mV p-p
10 kHz - 20 MHz	T_C = -55°C TO +125°C	—	20	60	—	30	100	
LINE REGULATION	MAIN AND POS. AUX	—	5	25	—	5	50	mV
V_{IN} = 14 TO 50	NEG. AUX.	—	—	—	—	30	120	
LOAD REGULATION	MAIN AND +AUX., NL - FL	—	4	25	—	5	50	mV
BALANCED AUX.	-AUX., NL - FL	—	—	—	—	25	150	
CROSS REGULATION [2]	EFFECT ON	—	—	—	—	250	600	mV
T_C = 25°C	NEGATIVE AUXILIARY							
INPUT VOLTAGE	CONTINUOUS	14	42	50	—	—	—	V
	TRANSIENT 1 SEC [1]	—	—	80	—	—	—	
INPUT CURRENT	NO LOAD	—	25	70	—	—	—	mA
	INHIBITED	—	3.5	4	—	—	—	
INPUT RIPPLE CURRENT [3]	10 kHz - 20 MHz	—	32	100	—	—	—	mA p-p
EFFICIENCY [4]	T_C = 25°C	79	82	—	—	—	—	%
	T_C = -55°C TO +125°C	78	—	—	—	—	—	
LOAD FAULT [5, 6]	POWER DISSIPATION	—	6.5	9.5	—	5	9.5	W
	RECOVERY [1]	—	15	20	—	—	20	ms
STEP LOAD RESPONSE [6, 7]	TRANSIENT	—	±80	±350	—	±150	±600	mV pk
50% - 100% - 50%	RECOVERY	—	160	400	—	—	600	µs
STEP LINE RESPONSE [1, 6, 8]	TRANSIENT	—	±100	±400	—	±200	±400	mV pk
14 - 50 - 14 V_{IN}	RECOVERY	—	400	600	—	200	700	µs
START-UP [6, 9]	DELAY	—	15	20	—	15	20	ms
	OVERSHOOT [1]	—	5	33	—	5	70	mV pk
CAPACITIVE LOAD [1, 10]	25°C	—	—	1000	—	—	500	µF

Notes
1. Guaranteed by design and/or analysis. Not a production test.
2. Effect on -Vout for the following conditions. Percentages are of total aux. power (20 W). Conditions are referenced to balanced aux. loads of 50%/50%.
   +Po = 70%, -Po = 30%
   +Po = 30%, -Po = 70%
3. At loads <20% of full load, higher input ripple current is possible.
4. The efficiency of the converter with all outputs at full load.
5. Each output tested separately.
6. Recovery and startup times are measured from application of the transient or change in condition to the point at which V_{OUT} is within 1% of final value.
7 Step load test is performed at 10 microseconds typical.
8. Step line test is performed at 100 microseconds ± 20 microseconds.
9. Tested on release from inhibit.
10. No effect on dc performance. Applies to each auxiliary.

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MWR Triple DC-DC Converters

14 TO 50 VOLT INPUT - 30 TO 35 WATT

TABLE 13: ELECTRICAL CHARACTERISTICS -55°C TO +125°C CASE, 42 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

TRIPLE OUTPUT MODEL – MWR28512T		5 (MAIN)			±12 (AUXILIARIES)			UNITS
PARAMETER [1]	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	MAIN AND POS. AUX	4.90	5.00	5.10	11.76	12.00	12.24	V
	NEG. AUX.	–	–	–	11.70	12.00	12.30	
OUTPUT CURRENT	MAIN AND EITHER OUTPUT	–	–	3.0	–	±0.833	1.16 [1]	A
V_{IN} = 14 TO 50	MAX TOTAL AUX	–	–	–	–	–	1.67	
OUTPUT POWER	MAIN AND EITHER OUTPUT	–	–	15	–	±10	14 [1]	W
V_{IN} = 14 TO 50	MAX TOTAL AUX	–	–	–	–	–	20	
OUTPUT RIPPLE	T_C = 25°C	–	21	45	–	60	80	mV p-p
10 kHz - 20 MHz	T_C = -55°C TO +125°C	–	21	60	–	60	120	
LINE REGULATION	MAIN AND POS. AUX	–	5	25	–	5	50	mV
V_{IN} = 14 TO 50	NEG. AUX.	–	–	–	–	30	120	
LOAD REGULATION	MAIN AND +AUX., NL - FL	–	5	25	–	5	50	mV
BALANCED AUX.	-AUX., NL - FL	–	–	–	–	30	150	
CROSS REGULATION [2]	EFFECT ON	–	–	–	–	250	600	mV
T_C = 25°C	NEGATIVE AUXILIARY							
INPUT VOLTAGE	CONTINUOUS	14	42	50	–	–	–	V
	TRANSIENT 1 SEC [1]	–	–	80	–	–	–	
INPUT CURRENT	NO LOAD	–	40	70	–	–	–	mA
	INHIBITED	–	3.5	4	–	–	–	
INPUT RIPPLE CURRENT [3]	10 kHz - 20 MHz	–	30	100	–	–	–	mA p-p
EFFICIENCY [4]	T_C = 25°C	81	84	–	–	–	–	%
	T_C = -55°C TO +125°C	80	–	–	–	–	–	
LOAD FAULT [5, 6]	POWER DISSIPATION	–	7.3	9.5	–	7	9.5	W
	RECOVERY [1]	–	15	20	–	–	20	ms
STEP LOAD RESPONSE [6, 7]	TRANSIENT	–	±80	±350	–	±150	±600	mV pk
50% - 100% - 50%	RECOVERY	–	230	600	–	–	600	µs
STEP LINE RESPONSE [1, 6, 8]	TRANSIENT	–	±100	±400	–	±200	±400	mV pk
14 - 50 - 14 V_{IN}	RECOVERY	–	400	900	–	200	600	µs
START-UP [6, 9]	DELAY	–	15	20	–	5	20	ms
	OVERSHOOT [1]	–	5	50	–	5	60	mV pk
CAPACITIVE LOAD [1, 10]	25°C	–	–	1000	–	–	500	µF

Notes
1. Guaranteed by design and/or analysis. Not a production test.
2. Effect on -Vout for the following conditions. Percentages are of total aux. power (20 W). Conditions are referenced to balanced aux. loads of 50%/50%.
   +Po = 70%, -Po = 30%
   +Po = 30%, -Po = 70%
3. At loads <20% of full load, higher input ripple current is possible.
4. The efficiency of the converter with all outputs at full load.
5. Each output tested separately.
6. Recovery and startup times are measured from application of the transient or change in condition to the point at which V_{OUT} is within 1% of final value.
7 Step load test is performed at 10 microseconds typical.
8. Step line test is performed at 100 microseconds ± 20 microseconds.
9. Tested on release from inhibit.
10. No effect on dc performance. Applies to each auxiliary.

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MWR Triple DC-DC Converters

14 TO 50 VOLT INPUT - 30 TO 35 WATT

TABLE 14: ELECTRICAL CHARACTERISTICS -55°C TO +125°C CASE, 42 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.

TRIPLE OUTPUT MODEL – MWR28515T		5 (MAIN)			±15 (AUXILIARIES)			UNITS
PARAMETER [1]	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	MAIN AND POS. AUX	4.90	5.00	5.10	14.70	15.00	15.30	V
	NEG. AUX.	—	—	—	14.62	15.00	15.38	
OUTPUT CURRENT	MAIN AND EITHER OUTPUT	—	—	3.0	—	±0.667	0.93 [1]	A
V_{IN} = 14 TO 50	MAX TOTAL AUX	—	—	—	—	—	1.34	
OUTPUT POWER	MAIN AND EITHER OUTPUT	—	—	15	—	±10	14 [1]	W
V_{IN} = 14 TO 50	MAX TOTAL AUX	—	—	—	—	—	20	
OUTPUT RIPPLE	T_C = 25°C	—	21	45	—	30	80	mV p-p
10 kHz - 20 MHz	T_C = -55°C TO +125°C	—	21	60	—	30	100	
LINE REGULATION	MAIN AND POS. AUX	—	5	25	—	5	50	mV
V_{IN} = 14 TO 50	NEG. AUX.	—	—	—	—	30	120	
LOAD REGULATION	MAIN AND +AUX., NL - FL	—	5	25	—	5	50	mV
BALANCED AUX.	-AUX., NL - FL	—	—	—	—	25	150	
CROSS REGULATION [2]	EFFECT ON	—	—	—	—	250	600	mV
T_C = 25°C	NEGATIVE AUXILIARY							
INPUT VOLTAGE	CONTINUOUS	14	42	50	—	—	—	V
	TRANSIENT 1 SEC [1]	—	—	80	—	—	—	
INPUT CURRENT	NO LOAD	—	40	70	—	—	—	mA
	INHIBITED	—	3.5	4	—	—	—	
INPUT RIPPLE CURRENT [3]	10 kHz - 20 MHz	—	30	100	—	—	—	mA p-p
EFFICIENCY [4]	T_C = 25°C	82	84	—	—	—	—	%
	T_C = -55°C TO +125°C	81	—	—	—	—	—	
LOAD FAULT [5, 6]	POWER DISSIPATION	—	7.3	9.5	—	5	9.5	W
	RECOVERY [1]	—	15	20	—	—	20	ms
STEP LOAD RESPONSE [6, 7]	TRANSIENT	—	±80	±350	—	±150	±600	mV pk
50% - 100% - 50%	RECOVERY	—	230	600	—	145	600	µs
STEP LINE RESPONSE [1, 6, 8]	TRANSIENT	—	±100	±400	—	±200	±400	mV pk
14 - 50 - 14 V_{IN}	RECOVERY	—	400	900	—	200	700	µs
START-UP [6, 9]	DELAY	—	15	20	—	15	20	ms
	OVERSHOOT [1]	—	5	50	—	5	70	mV pk
CAPACITIVE LOAD [1, 10]	25°C	—	—	1000	—	—	500	µF

Notes
1. Guaranteed by design and/or analysis. Not a production test.
2. Effect on -Vout for the following conditions. Percentages are of total aux. power (20 W). Conditions are referenced to balanced aux. loads of 50%/50%.
   +Po = 70%, -Po = 30%
   +Po = 30%, -Po = 70%
3. At loads <20% of full load, higher input ripple current is possible.
4. The efficiency of the converter with all outputs at full load.
5. Each output tested separately.
6. Recovery and startup times are measured from application of the transient or change in condition to the point at which V_{OUT} is within 1% of final value.
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8. Step line test is performed at 100 microseconds ± 20 microseconds.
9. Tested on release from inhibit.
10. No effect on dc performance. Applies to each auxiliary.

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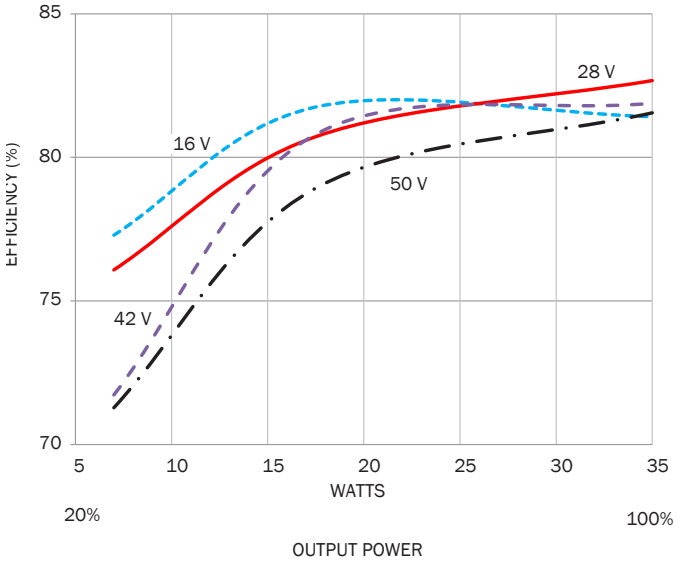
MWR Triple DC-DC Converters

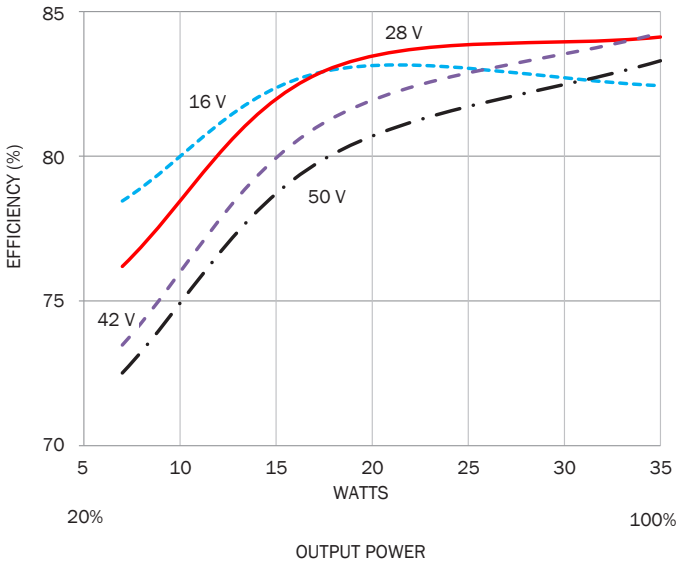
14 TO 50 VOLT INPUT - 30 TO 35 WATT

TYPICAL PERFORMANCE PLOTS: 25°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.
FOR REFERENCE ONLY, NOT GUARANTEED SPECIFICATIONS.



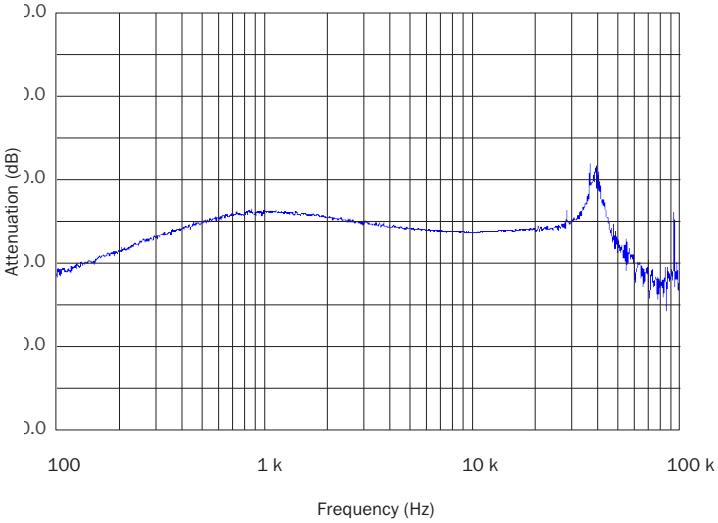
MWR283R312T EFFICIENCY

FIGURE 4



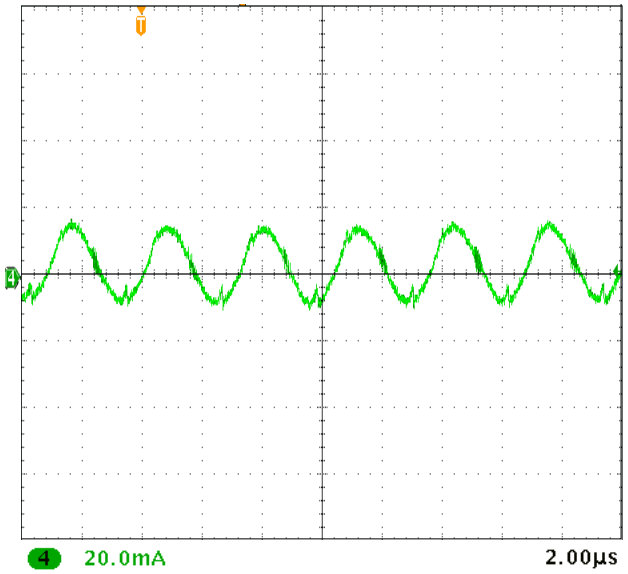
MWR28515T EFFICIENCY

FIGURE 5



MWR28515T AUDIO REJECTION WITH FMCE-0528

FIGURE 6



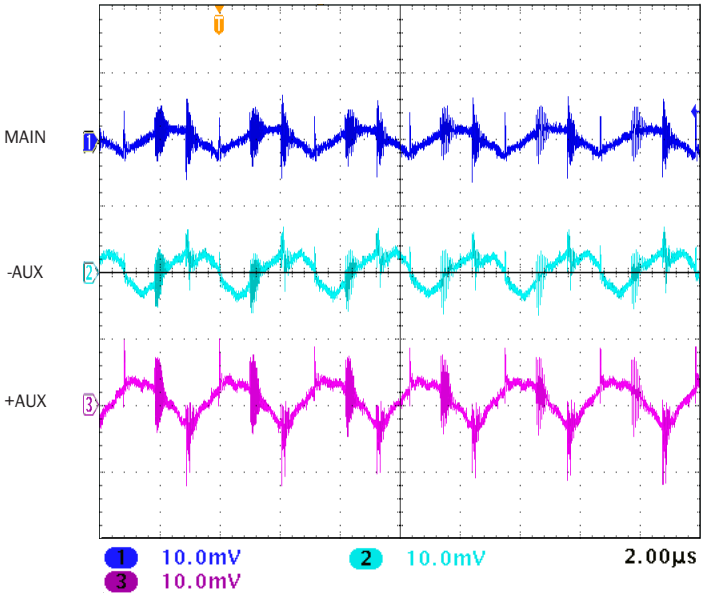
UNITS ARE PER DIVISION
MWR28515T INPUT RIPPLE

FIGURE 7

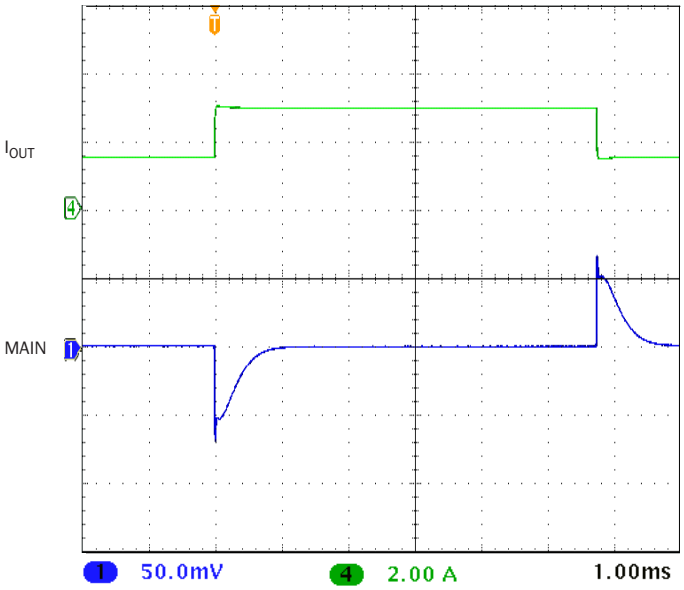
MWR Triple DC-DC Converters

14 TO 50 VOLT INPUT - 30 TO 35 WATT

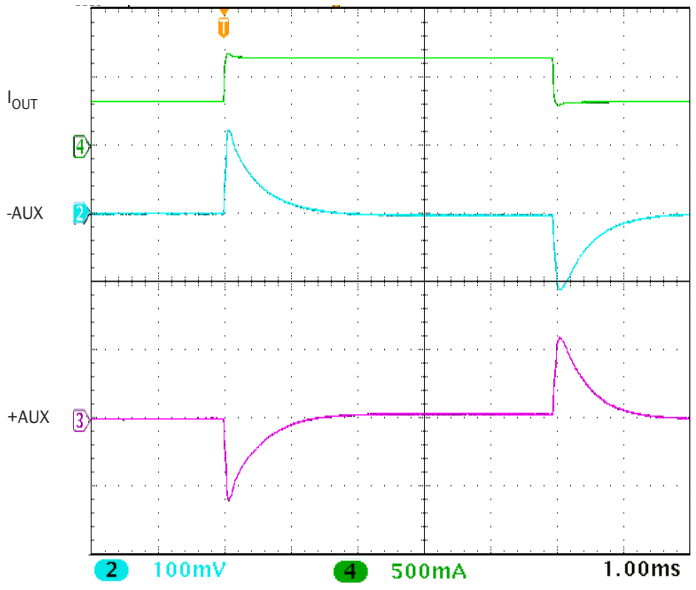
TYPICAL PERFORMANCE PLOTS: 25°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.
FOR REFERENCE ONLY, NOT GUARANTEED SPECIFICATIONS.



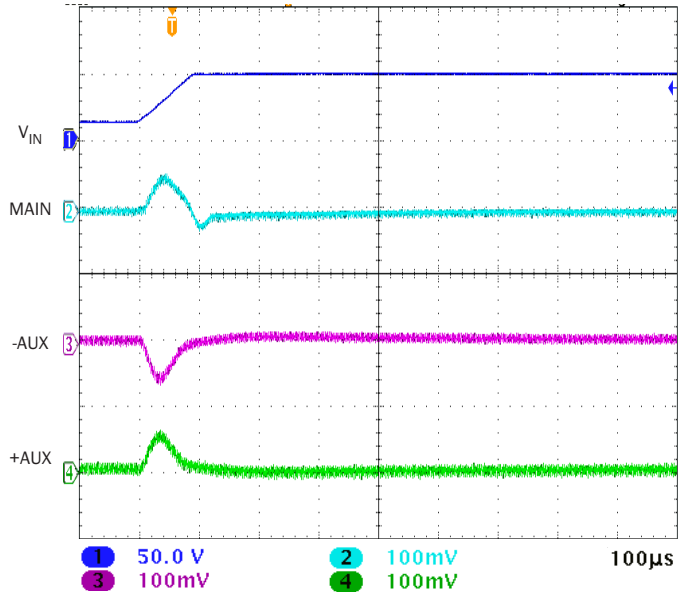
UNITS ARE PER DIVISION
MWR28515T OUTPUT RIPPLE
FIGURE 8



UNITS ARE PER DIVISION, 10 µS SLEW RATE
MWR28515T STEP LOAD MAIN, 50% - 100% - 50%
FIGURE 9



UNITS ARE PER DIVISION, 10 µS SLEW RATE
MWR28515T STEP LOAD ±AUX., 50% - 100% - 50%
FIGURE 10

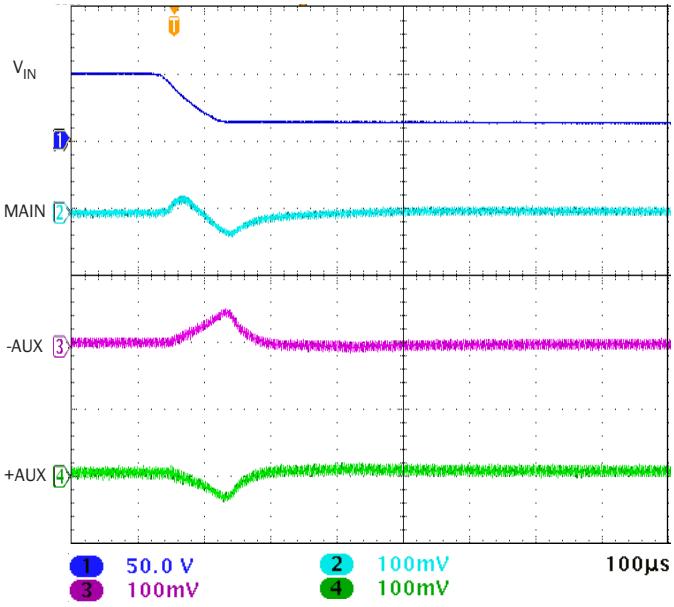


UNITS ARE PER DIVISION
MWR28515T STEP LINE 14 V_{IN} TO 50 V_{IN}
FIGURE 11

MWR Triple DC-DC Converters

14 TO 50 VOLT INPUT - 30 TO 35 WATT

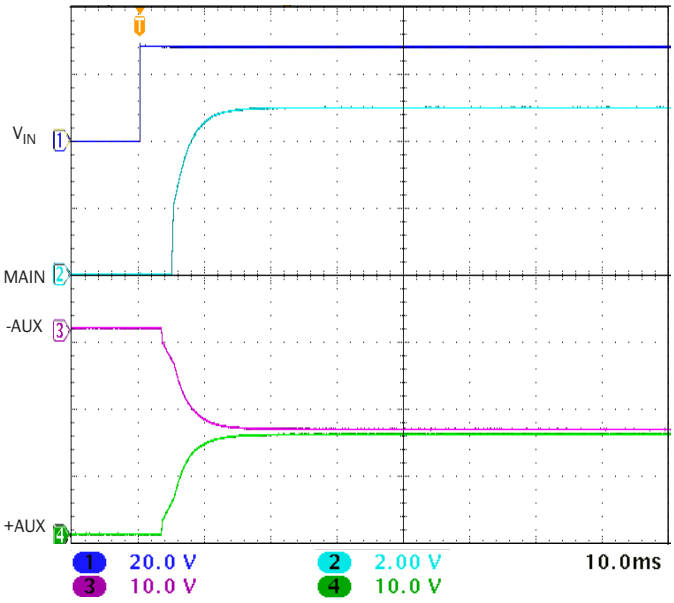
TYPICAL PERFORMANCE PLOTS: 25°C CASE, 28 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.
FOR REFERENCE ONLY, NOT GUARANTEED SPECIFICATIONS.



UNITS ARE PER DIVISION

MWR28515T STEP LINE 50 V_{IN} TO 14 V_{IN}

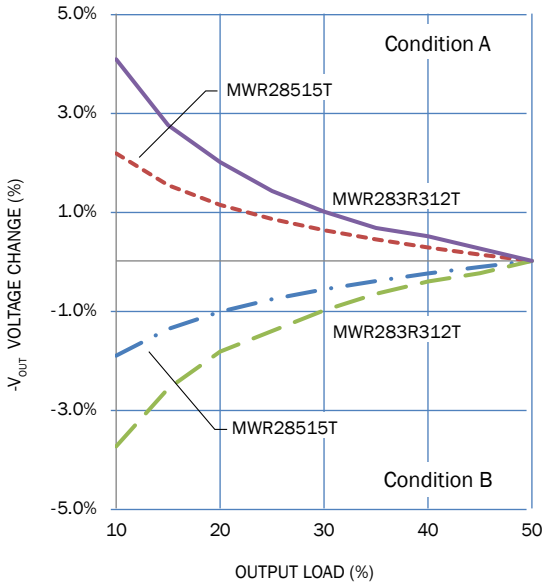
FIGURE 12



UNITS ARE PER DIVISION

MWR28515T START-UP INTO FULL LOAD

FIGURE 13



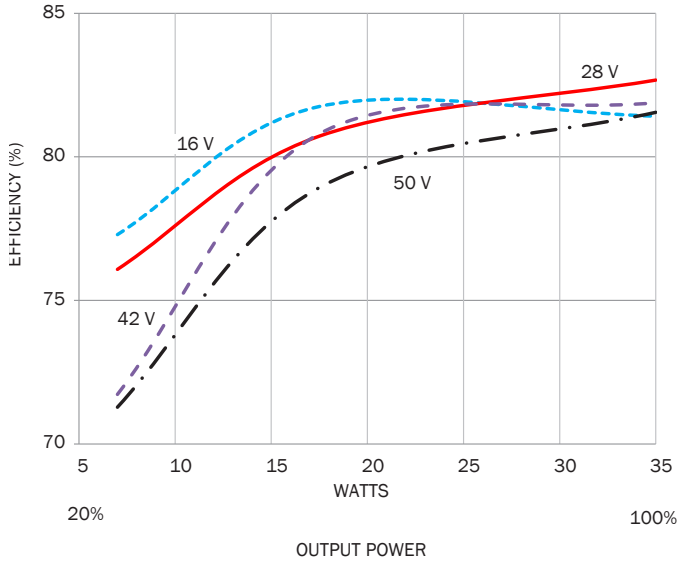
CONDITION A LOAD: -V 50%, +V 50% TO 10%
CONDITION B LOAD: +V 50%, -V 50% TO 10%
CROSS REGULATION

FIGURE 14

MWR Triple DC-DC Converters

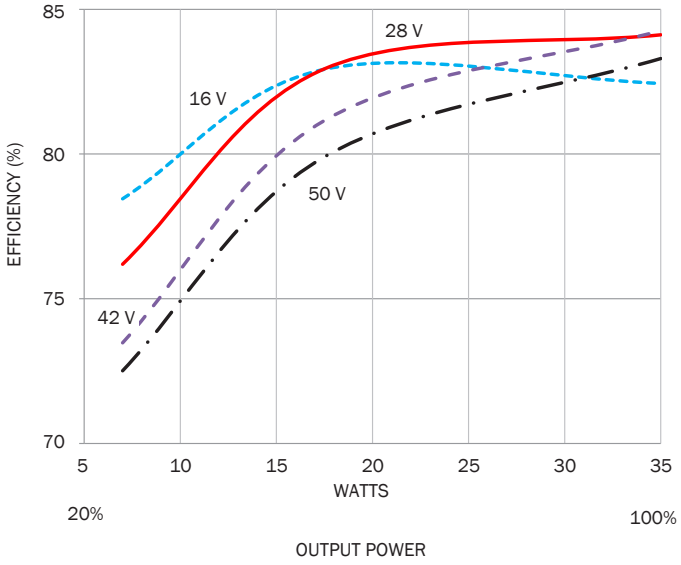
14 TO 50 VOLT INPUT - 30 TO 35 WATT

TYPICAL PERFORMANCE PLOTS: 25°C CASE, 42 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.
FOR REFERENCE ONLY, NOT GUARANTEED SPECIFICATIONS.



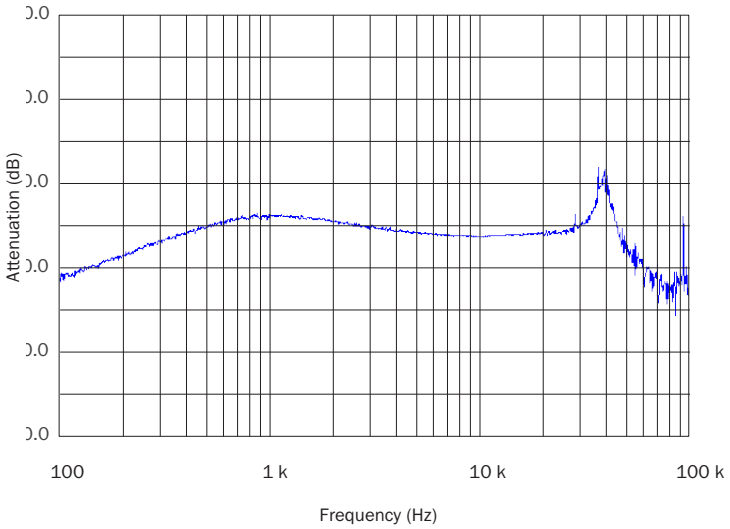
MWR283R312T EFFICIENCY

FIGURE 15



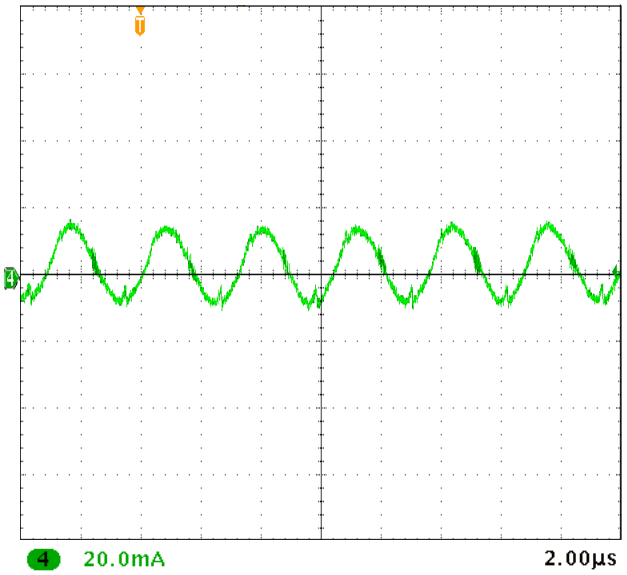
MWR28515T EFFICIENCY

FIGURE 16



MWR28515T AUDIO REJECTION WITH FMCE-0528

FIGURE 17



UNITS ARE PER DIVISION

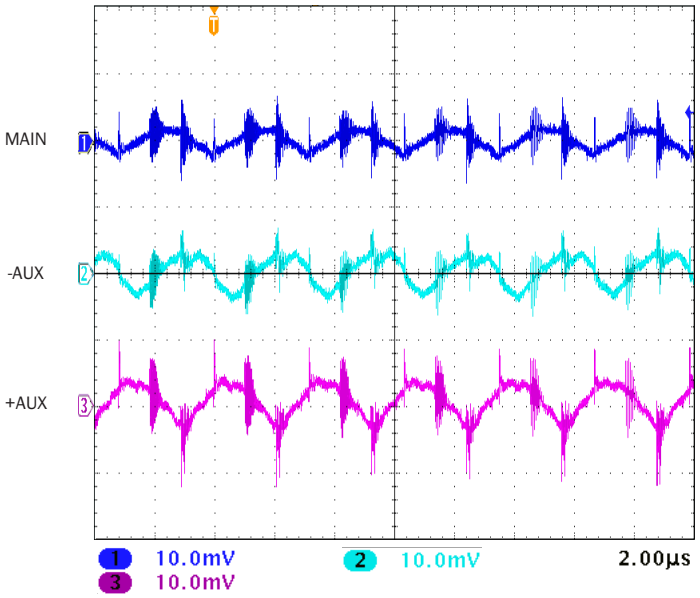
MWR28515T INPUT RIPPLE

FIGURE 18

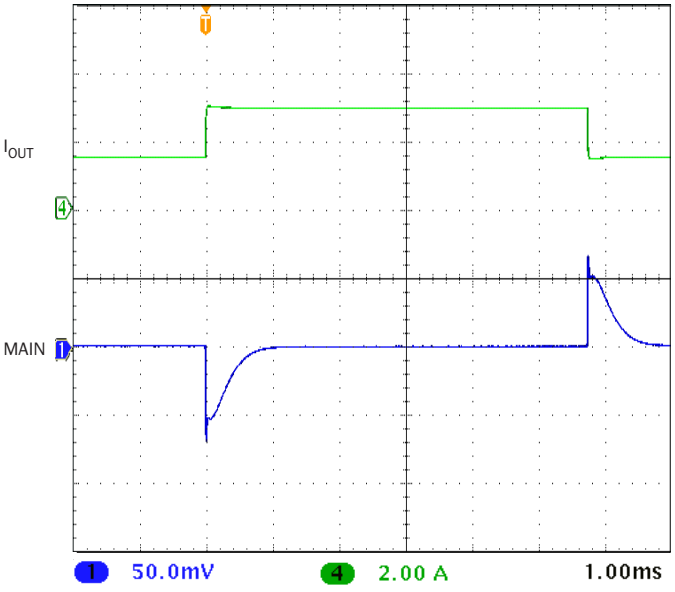
MWR Triple DC-DC Converters

14 TO 50 VOLT INPUT - 30 TO 35 WATT

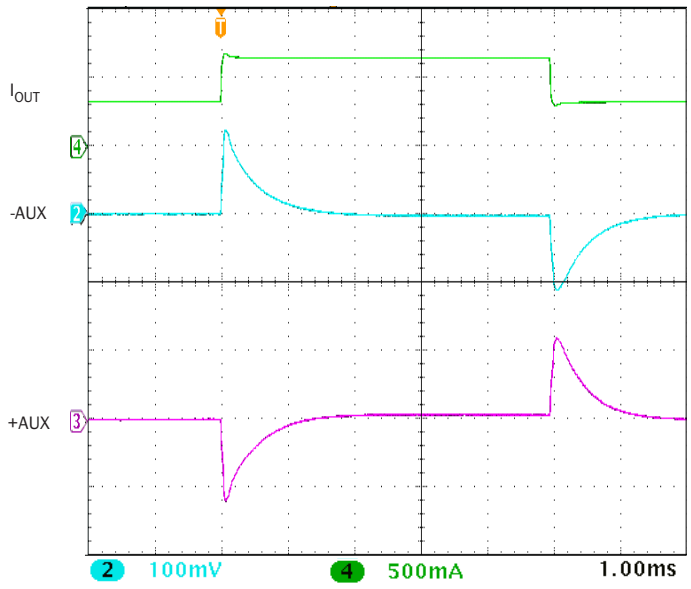
TYPICAL PERFORMANCE PLOTS: 25°C CASE, 42 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.
FOR REFERENCE ONLY, NOT GUARANTEED SPECIFICATIONS.



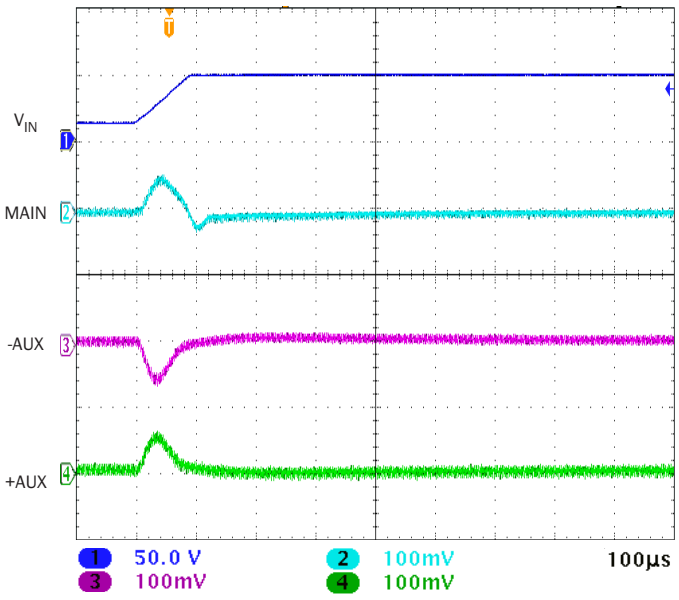
UNITS ARE PER DIVISION
MWR28515T OUTPUT RIPPLE
FIGURE 19



UNITS ARE PER DIVISION, 10 µS SLEW RATE
MWR28515T STEP LOAD MAIN, 50% - 100% - 50%
FIGURE 20



UNITS ARE PER DIVISION, 10 µS SLEW RATE
MWR28515T STEP LOAD ±AUX., 50% - 100% - 50%
FIGURE 21

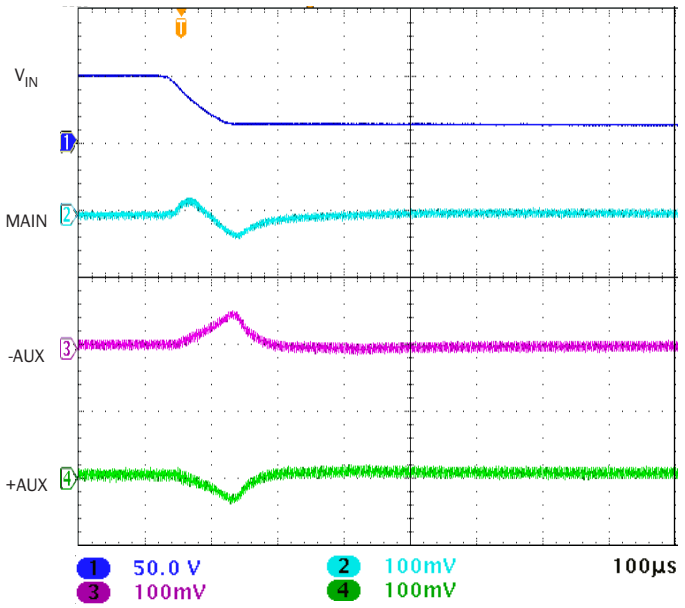


UNITS ARE PER DIVISION
MWR28515T STEP LINE 14 V_{IN} TO 50 V_{IN}
FIGURE 22

MWR Triple DC-DC Converters

14 TO 50 VOLT INPUT - 30 TO 35 WATT

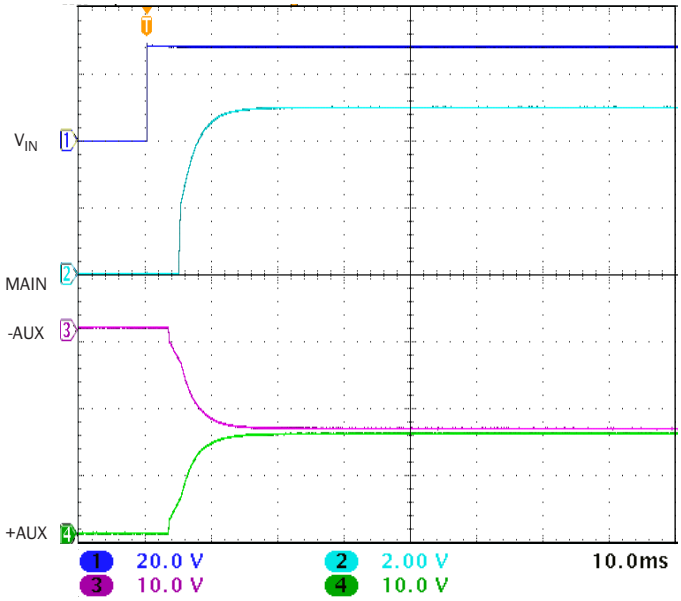
TYPICAL PERFORMANCE PLOTS: 25°C CASE, 42 VIN, 100% LOAD, UNLESS OTHERWISE SPECIFIED.
FOR REFERENCE ONLY, NOT GUARANTEED SPECIFICATIONS.



UNITS ARE PER DIVISION

MWR28515T STEP LINE 50 V_{IN} TO 14 V_{IN}

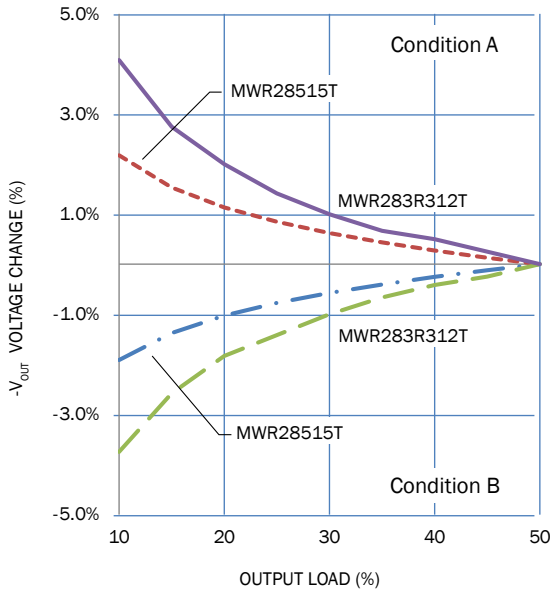
FIGURE 23



UNITS ARE PER DIVISION

MWR28515T START-UP INTO FULL LOAD

FIGURE 24

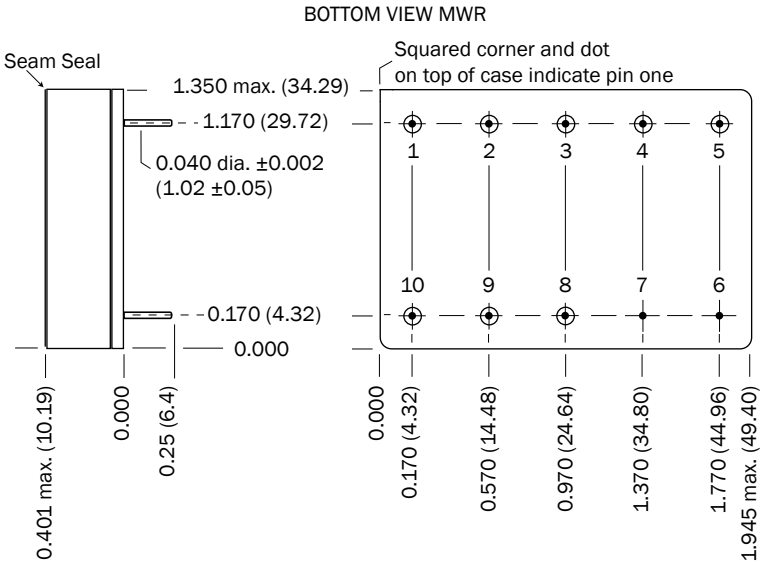


CONDITION A LOAD: -V 50%, +V 50% TO 10%
CONDITION B LOAD: +V 50%, -V 50% TO 10%
CROSS REGULATION

FIGURE 25

MWR Triple DC-DC Converters

14 TO 50 VOLT INPUT - 30 TO 35 WATT



Weight: 58 grams max.

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 Gold plating of 50 - 150 microinches is included in pin diameter Seal hole 0.120 ±0.002 (3.05 ± 0.05)

Please refer to the numerical dimensions for accuracy.

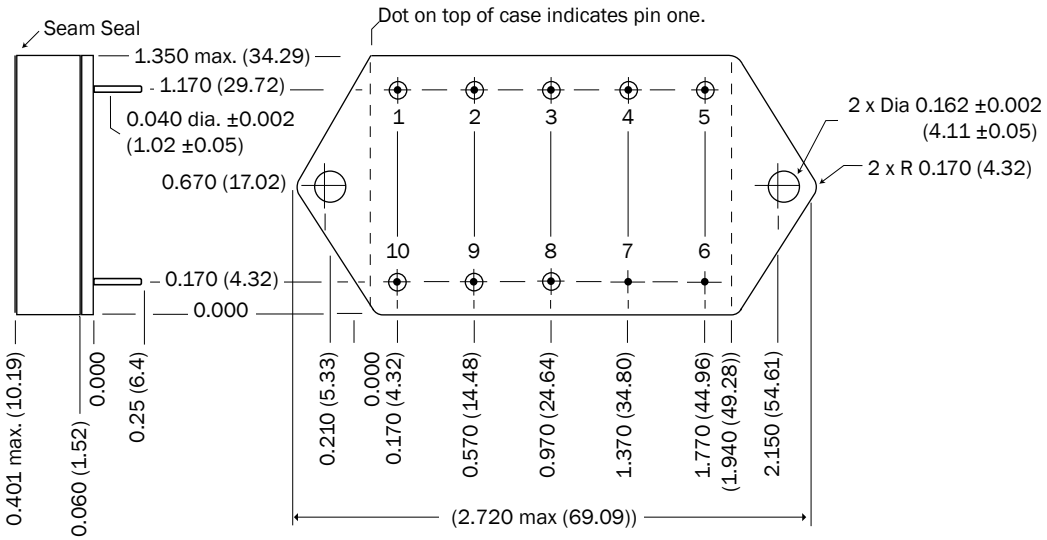
FIGURE 26: MWR

MWR Triple DC-DC Converters

14 TO 50 VOLT INPUT - 30 TO 35 WATT

BOTTOM VIEW MWR FLANGED

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



Weight: 60 grams maximum

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
Gold plating of 50 - 150 microinches included in pin diameter
Seal Hole: 0.120 ±0.002 (3.04 ±0.05)

Please refer to the numerical dimensions for accuracy.

FIGURE 27: MWR FLANGED

MWR Triple DC-DC Converters

14 TO 50 VOLT INPUT - 30 TO 35 WATT

ELEMENT EVALUATION TABLES FOR QML PRODUCTS ARE IN "APP-009 QUALITY AND CERTIFICATION", APPENDIX A, IN COMPLIANCE WITH MIL-PRF-38534 REVISION L. (LINK HTTPS://WWW.CRANEAE.COM/QUALITY-ASSURANCE-MODULAR-POWER)

ENVIRONMENTAL SCREENING HIGH RELIABILITY STANDARD, /ES, /SX AND /883 (CLASS H)

	NON-QML [1]			CLASS H QML [2, 3]
TEST PERFORMED	**STANDARD**	**/ES**	**/SX [4]**	**/883**
Pre-cap Inspection, Method 2017, 2032	■	■	■	■
Temperature Cycle (10 times)				
Method 1010, Cond. C, -65°C to +150°C, ambient			■	■
Method 1010, Cond. B, -55°C to +125°C, ambient		■		
Constant Acceleration				
Method 2001, 3000 g			■	■
Method 2001, 500 g		■		
PIND, Test Method 2020, Cond. A			■ [5]	■ [5]
Burn-in Method 1015, +125°C case, typical [6]				
96 hours		■		
160 hours			■	■
Final Electrical Test, MIL-PRF-38534, Group A,				
Subgroups 1 through 6, -55°C, +25°C, +125°C case			■	■
Subgroups 1 and 4, +25°C case	■	■		
Hermeticity Test, Method 1014				
Gross Leak, Cond. C_1, fluorocarbon		■	■	■
Fine Leak, Cond. A_2, helium		■	■	■
Gross Leak, Dip	■			
Final visual inspection, Method 2009	■	■	■	■

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

Notes
1. Non-QML products may not meet all of the requirements of MIL-PRF-38534.
2. All processes are QML qualified and performed by certified operators.
3. A QML products which has an SMD number is marked "QML". A QML product which does not have an SMD number is marked per MIL-PRF-38534 table III.

TABLE 15: ENVIRONMENTAL SCREENING HIGH RELIABILITY STANDARD, /ES AND /883 (CLASS H)