

MHP270 Single and Dual DC/DC Converters

270 VOLT INPUT – 65 WATT

FEATURES

Parallel operation with current share, up to 5 units (276 watts)

- Operating range -55° to +100°C
- Input voltage 160 to 400 VDC
- Transient protection 450 V for 50 ms
- Fully isolated, magnetic feedback
- Fixed high frequency switching
- Remote sense on single models
- Inhibit primary side and secondary side
- Sync In and Sync Out
- Indefinite short circuit protection
- High power density, up to 85% efficiency



MODELS VDC OUTPUT	
SINGLE	DUAL
5	±5
12	±12
15	±15
28	

DESCRIPTION

The MHP270 Series™ DC/DC converters provide up to 65 watts of output power over the full -55°C to 100°C temperature range. MHP270 models operate from a MIL-STD-704 nominal 270-volt DC power bus – from 160 to 400 VDC continuous operation with surges to 450 volts – and provide isolated outputs at 5, 12, 15, and 28 VDC. Parallel operation for all loading conditions is supported without any requirement for external components. The converters are available with standard screening or “ES” screening

MHP270 DC/DC converters are constant frequency, pulse width modulated switching power supplies which use a quasi-square wave, two-switch single-ended forward converter design. Tight load regulation is achieved through a wide-bandwidth magnetic feedback circuit.

Up to five single output MHP270 converters may be used in parallel to power a single load by simply connecting the share pins of all units. Units in this configuration have an 85% current sharing accuracy over 35% load to full load conditions.

MHP270 Series of converters feature a flexible synchronization scheme in which units may be synchronized to an external clock or to one another by using sync in and sync out pins provided on each unit. MHP270 converters have a nominal switching frequency of 525 kHz, but may be synchronized at any frequency from 475 to 575 kHz.

MHP270 converters meet a wide variety of military/aerospace performance and environmental specifications. Their continuous operation input voltage (160 to 400) meets the normal operating limits of MIL-STD-704. The unit shuts down above approximately 425 volts, but it is rated to withstand a surge of up to 450 volts for 50 msec. The units are built as fully hermetic thick film hybrids in our MIL-PRF-38534 certified facilities.

FEATURES

Undervoltage lock-out – shuts down when the input line voltage falls below approximately 120 VDC to provide smooth initialization.

Continuous short circuit protection – current limit set at approximately 125%.

Soft-start – controlled start-up at turn-on, release from inhibit and recovery from load fault conditions.

Remote sense – to provide automatic compensation for voltage drops on output lines on single output models.

VDC

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OPERATING CONDITIONS AND CHARACTERISTICS

Input Voltage Range

- 160 to 400 VDC continuous
- 450 VDC for 50 msec transient

Output Power

- 50 to 65 watts depending on model

Lead Soldering Temperature (10 sec)

- 300°C

Storage Temperature Range (Case)

- -65°C to +150°C

Case Operating Temperature (Tc)

- -55 to +100°C full power

Output Voltage Temperature Coefficient

- 100 ppm/°C typical

Current Limit

- 125% of full load typical

Isolation

- 100 megohm minimum at 500 V

Conversion Frequency

- Free run mode 525 kHz typical
 - 475 kHz. min., 575 kHz max
- External sync range: 475 to 575 kHz

Low Line Drop Out

- Vout drops 1% of nominal
- Input voltage 155 VDC max

Undervoltage Lockout

- Input voltage 110 VDC min

SYNC AND INHIBIT

Sync

- Sync In
 - Input frequency 475 to 575 kHz.
 - Duty cycle 40% min, 60% max
 - Active low 0.8 V max
 - Active high 4.5 V min, 10 V max
 - Referenced to input common

Sync Out

- Referenced to input common

Inhibit (INH1, INH2)

- Active low (output disabled)
 - INH1 referenced to input common
Active low 0.8 V max
Inhibit pin will source 15 mA max
 - INH2 referenced to output common
Active low 0.5 V max
Inhibit pin will source 15 mA max
- Active high (output enabled)
 - Open collector
 - Open pin voltage: INH1 = 12V typ, INH2 = 5 V typ

MECHANICAL AND ENVIRONMENTAL

Size (maximum)

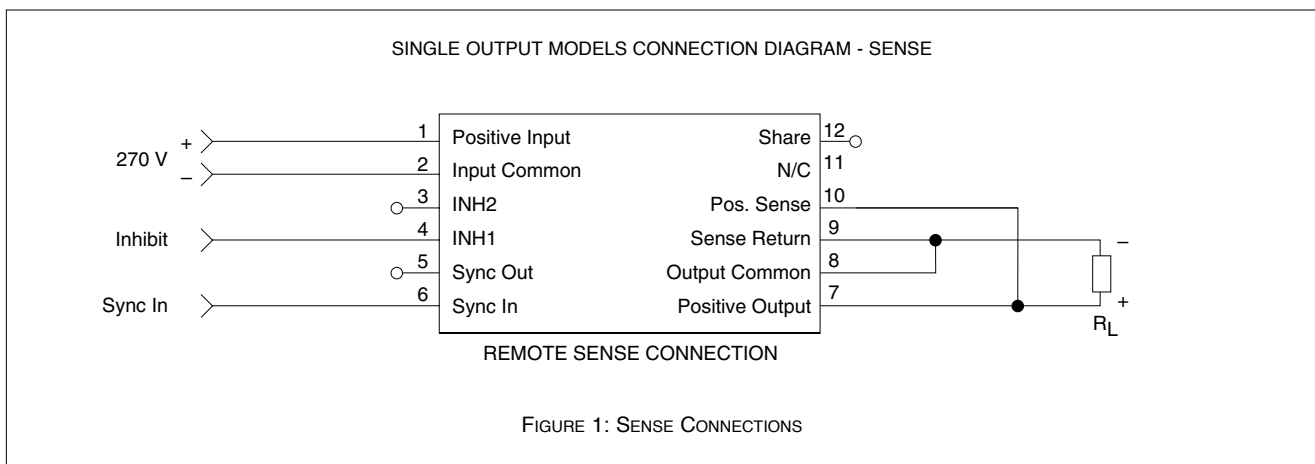
- 3.005 x 1.505 x 0.400 inches (76.33 x 38.23 x 10.16 mm)
- See case U for dimensions.

Weight (maximum)

- 86 grams max

Screening

- Standard or ES. See "MHP270 (Standard and /ES, non-QML Products" screening table for more information, page 10.



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PIN OUT		
Pin	Single Output	Dual Output
1	Positive Input	Positive Input
2	Input Common	Input Common
3	Inhibit 2 (INH2)	Inhibit 2 (INH2)
4	Inhibit 1 (INH1)	Inhibit 1 (INH1)
5	Sync Out	Sync Out
6	Sync In	Sync In
7	Positive Output	Positive Output
8	Output Common	Output Common
9	Sense Return	Negative Output
10	Positive Sense	No connection
11	No connection	No connection
12	Share	Share

PINS NOT IN USE	
Inhibit (INH1, INH2)	Leave unconnected
Sync Out	Leave unconnected
Sync In	Connect to input common
Share	Leave unconnected
Sense Lines	Must be connected to appropriate outputs

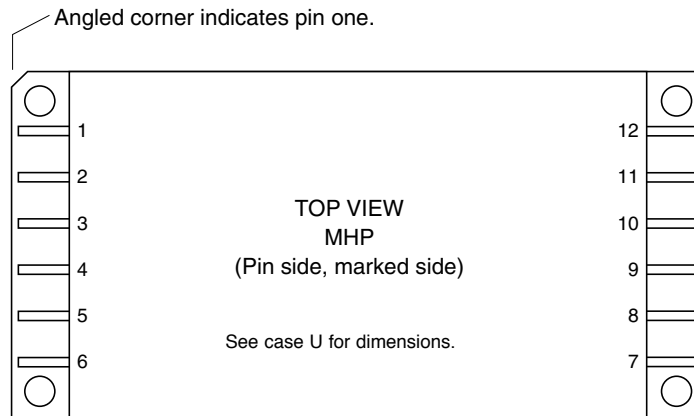
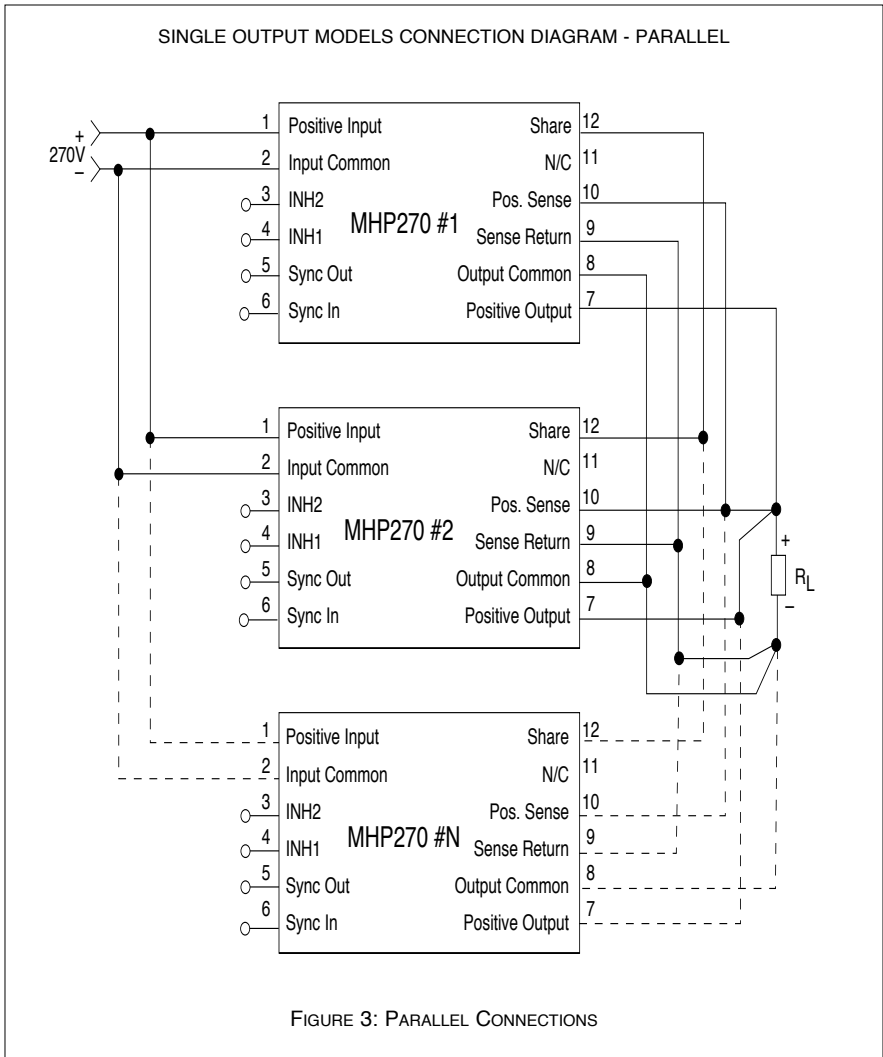


FIGURE 2: PIN OUT

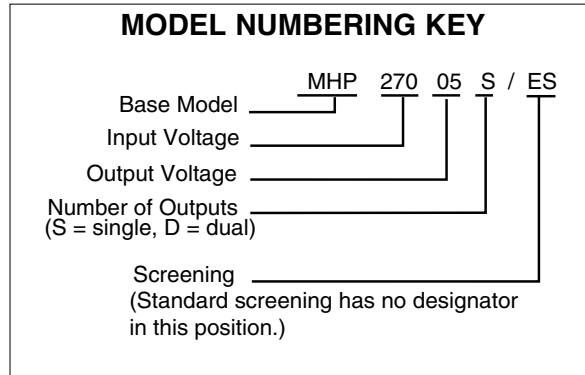
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MODEL SELECTION

MHP270 _____ _____ / _____
 Base model V_{out} value number of outputs screening

Choose one from each of the following rows

V_{out} value	<u>singles: 5,12,15, 28</u>	<u>duals: 5,12,15</u>
Number of outputs	<u>S (single) or D (dual)</u>	
Screening	<u>standard screening, leave blank</u> /ES (ES screening)	

MHP270 Single and Dual DC/DC Converters

270 VOLT INPUT – 65 WATT

Electrical Characteristics: 25°C Tc, 270 VDC Vin, 100% load, free run, unless otherwise specified.

SINGLE OUTPUT MODELS		MHP27005S			MHP27012S			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		4.95	5.00	5.05	11.88	12.00	12.12	VDC
OUTPUT CURRENT	V _{IN} = 160 TO 400 VDC	0	—	10	0	—	5	A
OUTPUT POWER	V _{IN} = 160 TO 400 VDC	0	—	50	0	—	60	W
OUTPUT RIPPLE	10 kHz - 2 MHz	—	—	50	—	—	50	mV p-p
LINE REGULATION	V _{IN} = 160 TO 400 VDC	—	—	50	—	—	120	mV
LOAD REGULATION	NO LOAD TO FULL	—	—	50	—	—	120	mV
INPUT VOLTAGE	CONTINUOUS	160	270	400	160	270	400	VDC
	TRANSIENT 50 msec. ¹	—	—	450	—	—	450	V
INPUT CURRENT	NO LOAD	—	—	20	—	—	20	mA
	INHIBITED-INH1	—	—	8	—	—	10	
	INHIBITED-INH2	—	—	15	—	—	15	
INPUT RIPPLE CURRENT	10 kHz - 10 MHz	—	—	50	—	—	50	mA p-p
EFFICIENCY		76	—	—	81	—	—	%
LOAD FAULT	POWER DISSIPATION SHORT CIRCUIT	—	—	30	—	—	35	W
STEP LOAD RESPONSE	50% - 100% - 50% TRANSIENT	—	—	300	—	—	700	mV pk
	RECOVERY ²	—	—	300	—	—	500	μs

Notes

1. Unit will shut down above approximately 425V but will be undamaged and will restart when voltage drops into normal range.

2. Recovery time is measured from application of the transient to the point at which Vout is within 1% of final value.

MHP270 Single and Dual DC/DC Converters

270 VOLT INPUT – 65 WATT

Electrical Characteristics: 25°C Tc, 270 VDC Vin, 100% load, free run, unless otherwise specified.

SINGLE OUTPUT MODELS		MHP27015S			MHP27028S			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		14.85	15.00	15.15	27.72	28.00	28.28	VDC
OUTPUT CURRENT	V _{IN} = 160 TO 400 VDC	0	—	4.33	0	—	2.32	A
OUTPUT POWER	V _{IN} = 160 TO 400 VDC	0	—	65	0	—	65	W
OUTPUT RIPPLE	10 kHz - 2 MHz	—	—	75	—	—	280	mV p-p
LINE REGULATION	V _{IN} = 160 TO 400 VDC	—	—	150	—	—	280	mV
LOAD REGULATION	NO LOAD TO FULL	—	—	150	—	—	280	mV
INPUT VOLTAGE	CONTINUOUS	160	270	400	160	270	400	VDC
	TRANSIENT 50 msec. ¹	—	—	450	—	—	450	V
INPUT CURRENT	NO LOAD	—	—	20	—	—	20	mA
	INHIBITED–INH1	—	—	7	—	—	10	
	INHIBITED–INH2	—	—	15	—	—	15	
INPUT RIPPLE CURRENT	10 kHz - 10 MHz	—	—	45	—	—	70	mA p-p
EFFICIENCY		80	—	—	80	—	—	%
LOAD FAULT	POWER DISSIPATION SHORT CIRCUIT	—	—	45	—	—	45	W
STEP LOAD RESPONSE	50% - 100% - 50% TRANSIENT	—	—	700	—	—	1800	mV pk
	RECOVERY ²	—	—	300	—	—	1000	μs

Notes

1. Unit will shut down above approximately 425V but will be undamaged and will restart when voltage drops into normal range.

2. Recovery time is measured from application of the transient to point the point at which Vout is within 1% of final value.

MHP270 Single and Dual DC/DC Converters

270 VOLT INPUT – 65 WATT

Electrical Characteristics: 25°C Tc, 270 VDC Vin, 100% load, free run, unless otherwise specified.

DUAL OUTPUT MODELS ¹		MHP27005D			MHP27012D			MHP28015D			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
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	V _{IN} = 160 TO 400 VDC	0	±5	8.0	0	±2.5	4.0	0	±2.16	3.46	A
OUTPUT POWER ²	V _{IN} = 160 TO 400 VDC	0	—	50	0	—	60	0	—	65	W
OUTPUT RIPPLE ±V _{OUT}	10 kHz - 2 MHz	—	50	100	—	50	125	—	50	125	mV p-p
LINE REGULATION ±V _{OUT}	V _{IN} = 160 TO 400 VDC	—	—	100	—	—	120	—	—	150	mV
LOAD REGULATION ³ ±V _{OUT}	NO LOAD TO FULL	—	—	100	—	—	120	—	—	150	mV
CROSS REGULATION ⁴	EFFECT ON -V _{OUT}	—	—	1000	—	—	800	—	—	750	mV
INPUT VOLTAGE	CONTINUOUS	160	270	400	160	270	400	160	270	400	VDC
	TRANSIENT 50 msec. ⁴	0	—	450	0	—	450	0	—	450	V
INPUT CURRENT	NO LOAD	—	—	20	—	—	20	—	—	20	mA
	INHIBITED-INH1	—	—	10	—	—	10	—	—	8	
	INHIBITED-INH2	—	—	15	—	—	15	—	—	15	
INPUT RIPPLE CURRENT	10 kHz - 10 MHz	—	—	60	—	—	60	—	—	60	mA p-p
EFFICIENCY	BALANCED LOAD	74	—	—	81	—	—	82	—	—	%
LOAD FAULT	POWER DISSIPATION SHORT CIRCUIT	—	—	30	—	—	35	—	—	45	W
STEP LOAD RESPONSE ±V _{OUT}	50% - 100% - 50% ⁶ TRANSIENT	—	—	300	—	—	900	—	—	900	mV pk
	RECOVERY ⁷	—	—	300	—	—	500	—	—	500	μs

Notes

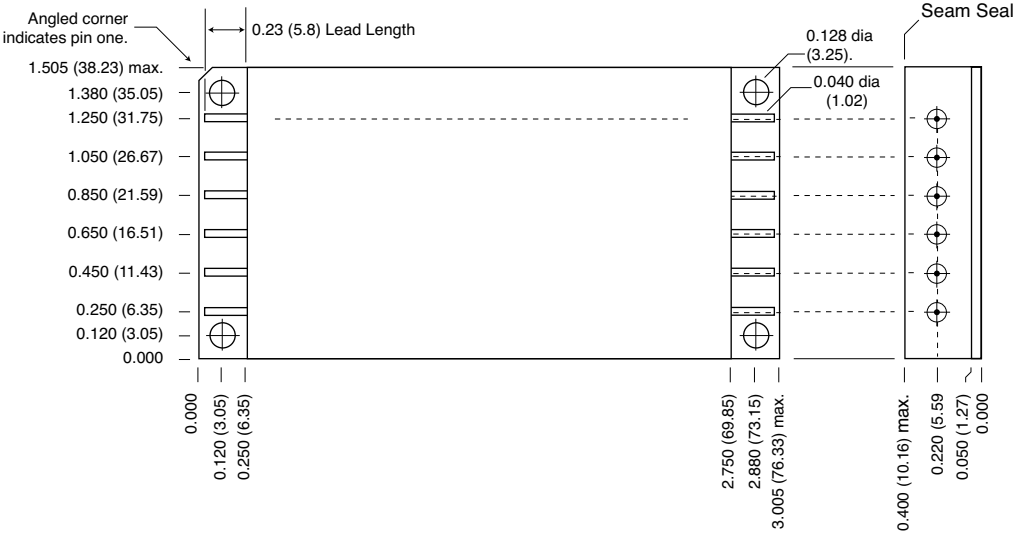
- Share operation not characterized for dual outputs.
- Up to 80% of the total output power is available from either output provided that the opposite output is simultaneously carrying 20% of the total output power. One of the outputs must always provide a minimum of 20% of the total output power to meet cross regulation. Negative V_{out} cross regulation is referenced to 50%/50% balanced loads (at 100% of total rated output power - full load).
- Assumes balanced loads on the outputs.
- Effect on the negative output from 50%/50% loads to 70%/30% or 70%/30% loads.
- Unit will shut down above approximately 425V but will be undamaged and will restart when voltage drops into normal range.
- Second output at 50%
- Recovery time is measured from application of the transient to point at which V_{out} is within 1% of final value.

MHP270 Single and Dual DC/DC Converter Cases

270 VOLT INPUT – 65 WATT

TOP VIEW CASE U Flanged case, short-leaded

*Case U does not require designator 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/Nickel/Gold; compression glass seal

Case U, Rev C, 20060302
 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 4: CASE U

MHP270 Single and Dual DC/DC Converters

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MHP270 (STANDARD AND /ES, NON-QML) PRODUCTS ENVIRONMENTAL SCREENING

TEST PERFORMED	MHP270 STANDARD NON-QML ¹	MHP270 /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 Method 1015, 100°C case, typical 96 hours	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. Standard and /ES, non-QML products, do not meet all of the requirements of MIL-PRF-38534.