

# LCM-120 Line Conditioning Module

## 28 VOLT INPUT – 120 WATT

### FEATURES

**Powers dc-dc converters requiring 28 Vin**

**Input voltage 12 to 50 VDC**

- Operating temperature -55° to +125°C
- Works through transients of up to 80 V for up to 120 ms
- Inhibit function
- Synchronization function
- Undervoltage lockout



MODELS	
VDC Output	
LCM-120	24 to 36 VDC

### DESCRIPTION

The LCM-120™ line conditioning module is a non-isolated dc-dc converter used to extend the input voltage range of Interpoint's dc-dc converters. The LCM-120 delivers up to 120 watts of throughput power from a 12 to 50 volt dc source in one of three modes:

- 12 to 24 volts input – internal boost converter delivers 24 V
- 24 to 36 volts input – input is connected directly to output
- 36 to 50 volts input – internal buck converter delivers 36 V

### CONVERTER DESIGN

The LCM-120 module is protected by internal current limit circuitry which limits current according to input voltage. This feature also allows safe charging of large external capacitors. Because current is sensed between input common and output common there is normally no external connection made between these pins. (Note: If an external connection between input and output common is desired, the resistance of this external connection must be greater than 1 ohm.) The LCM module will work through up to an 80 volt transient for up to 120 milliseconds while holding the output at 36 VDC.

### FEATURES

Features include an under voltage lockout, an inhibit input, a synchronization input and a power fail flag output. Under voltage lockout prevents start-up for inputs less than 12 volts dc and will shut down the converter for an input of less than 10 volts dc. The inhibit input, when connected to input common, disables the internal converter and opens the output power path while leaving the power fail flag unaffected. Inhibit is normally left open or

pulled up with a resistor. The sync input allows synchronization of the LCM-120 module's internal clock to an external pulse source with LSTTL level voltages and a 40% to 60% duty cycle. When unused, the sync should be left unconnected. The power fail flag output is a fully isolated NPN opto-coupler transistor rated to 18 volts dc. It will drive an external LSTTL load low if the LCM-120 module's input voltage drops below 10 volts dc and will remain active until the module output voltage also drops below 10 volts dc.

### LOW $V_{IN}$ AND HEAVY LOADS

When the LCM-120 module is operated at 12 volts in and 120 watts output, line loss can become a major concern. The module will output 24 volts at 120 watts. Allowing for efficiency, the input current will be  $120 \text{ watts} / 0.88 / 12 = 11.36 \text{ A}$ . If the resistance in the line from the power source to the LCM-120 is 0.05 ohms, the line loss at 12 volts from the power source will be  $(0.05 \cdot 11.36) = 0.57 \text{ volts}$ . The LCM-120 module will see 11.43 volts and will not start up.

### EXTERNAL CAPACITANCE

Interpoint recommends a minimum output capacitance of 330 uF and a total ESR of at least 0.25 ohms to ensure stability of the LCM-120 module's boost converter. For very low ESR capacitors, an external series resistor (non-inductive) may be used to obtain the minimum total ESR. The maximum recommended capacitance is 1 F.

# LCM-120 Line Conditioning Module

## 28 VOLT INPUT – 120 WATT

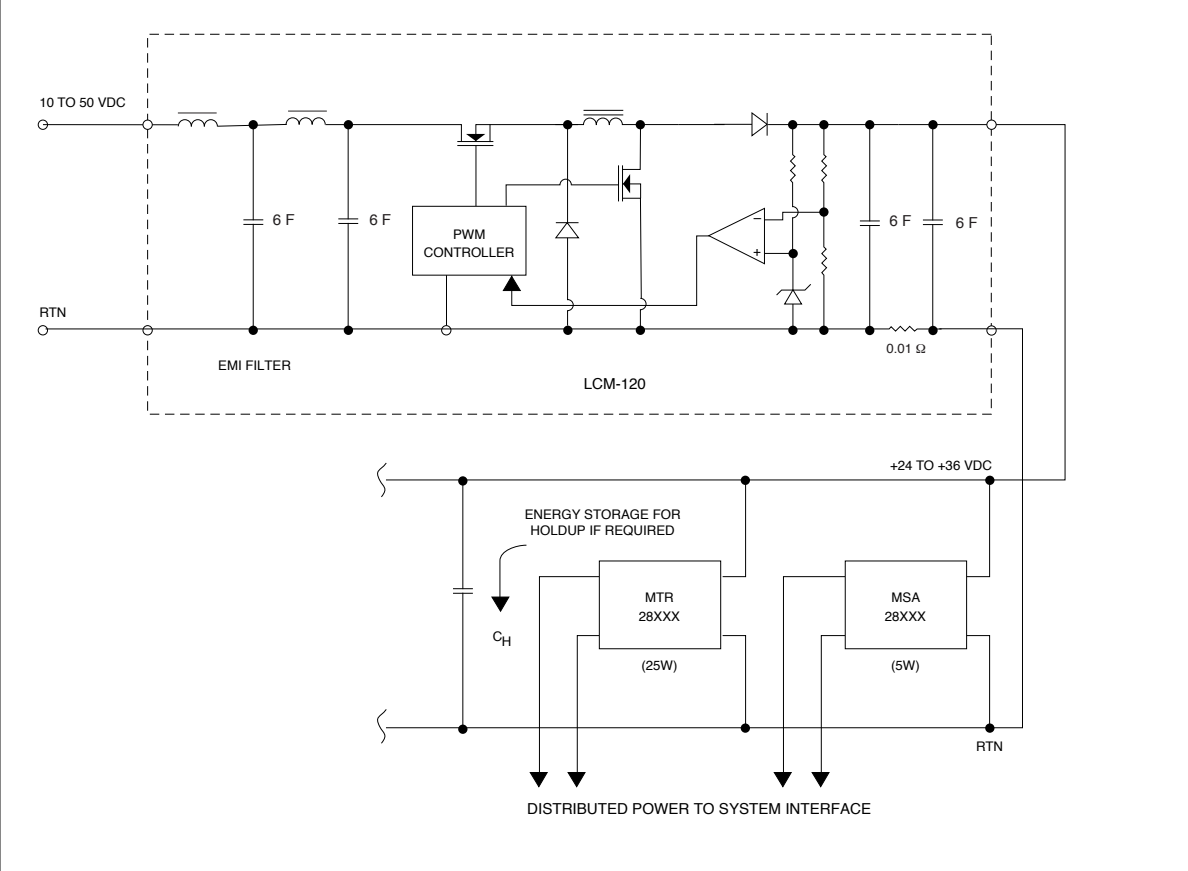


FIGURE 1: SYSTEM BLOCK DIAGRAM

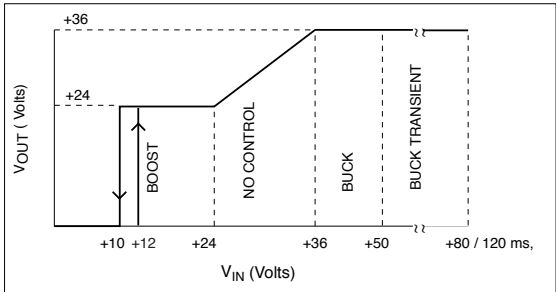


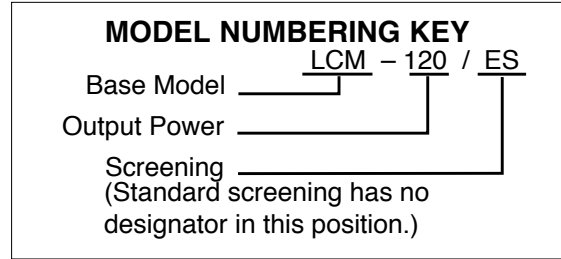
FIGURE 2: OUTPUT VOLTAGE

# LCM-120 Line Conditioning Module

## 28 VOLT INPUT – 120 WATT

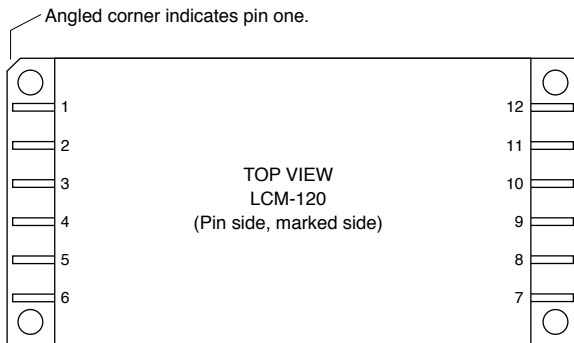
PIN OUT	
Pin	LCM-120
1	Positive Input
2	Positive Input
3	Input Common
4	Input Common
5	Output Common
6	Positive Output
7	No Connection
8	No Connection
9	Power Fail Flag Return
10	Power Fail Flag Output
11	Inhibit
12	Sync

TABLE 1: OUTPUT VOLTAGE



Note: There is only one LCM-120 model.

FIGURE 4: MODEL NUMBERING KEY



See "Figure 5: Case U" on page 6 for dimensions.

FIGURE 3: PIN OUT

MODEL NUMBER OPTIONS		
TO DETERMINE THE MODEL NUMBER ENTER ONE OPTION FROM EACH CATEGORY IN THE FORM BELOW.		
CATEGORY	Base Model	Screening <sup>1</sup>
<b>OPTIONS</b>	LCM-120	(standard, leave blank) ES
<b>FILL IN FOR MODEL #</b>	LCM-120	/ _____

Notes:  
1. Screening: For standard screening leave the screening option blank. For other screening options, insert the desired screening level. For more information see "Table 6: Environmental Screening" on page 7.

TABLE 3: MODEL NUMBER OPTIONS

PINS NOT IN USE	
Inhibit	Leave unconnected
"No Connection" pin	Leave unconnected
Sync	Leave unconnected

TABLE 2: PINS NOT IN USE

# LCM-120 Line Conditioning Module

## 28 VOLT INPUT – 120 WATT

TABLE 4: OPERATING CONDITIONS 25°C CASE, 28 VDC VIN, UNLESS OTHERWISE SPECIFIED.

PARAMETER	CONDITIONS	MODELS HEAD			UNITS
		MIN	TYP	MAX	
LEAD SOLDERING TEMPERATURE <sup>1</sup>	10 seconds max.	—	—	300	°C
STORAGE TEMPERATURE <sup>1</sup>		-65	—	+150	°C
CASE OPERATING TEMPERATURE <sup>1</sup>	FULL POWER	-55	—	+125	°C
	ABSOLUTE	-55	—	+135	
DERATING OUTPUT POWER/CURRENT <sup>1</sup>	LINEARLY	From 100% at 125°C to 0% at 135°C			
ISOLATION, ANY PIN TO CASE EXCEPT CASE PIN	@ 500 VDC AT 25°C	100	—	—	Megohms
CONVERSION FREQUENCY	FREE RUN -55° TO +125°C	—	600	—	kHz
SYNCHRONIZATION <sup>1</sup>	INPUT FREQUENCY	550	—	600	kHz
	DUTY CYCLE	40	—	60	%
	ACTIVE LOW	—	—	0.8	VDC
	ACTIVE HIGH	4.5	—	—	
	REFERENCED TO	INPUT COMMON			
	IF NOT USED	LEAVE UNCONNECTED			
INHIBIT ACTIVE LOW (OUTPUT DISABLED) Do not apply a voltage to the inhibit pin	INHIBIT PIN PULLED LOW <sup>1</sup>	—	—	1.3	VDC
	REFERENCED TO	INPUT COMMON			
INHIBIT ACTIVE HIGH (OUTPUT ENABLED) Do not apply a voltage to the inhibit pin	INHIBIT PIN CONDITION	OPEN COLLECTOR OR UNCONNECTED			
	OPEN PIN VOLTAGE <sup>1</sup>	—	10	—	V

## Notes

1. Guaranteed by design. Not an in-line test.

# LCM-120 Line Conditioning Module

## 28 VOLT INPUT – 120 WATT

TABLE 5: ELECTRICAL CHARACTERISTICS: 25°C CASE, 28 VDC VIN, 100% LOAD, FREE RUN, UNLESS OTHERWISE SPECIFIED.

LINE CONDITIONING MODULE		INPUT VOLTAGE	LCM-120			UNITS
PARAMETER	CONDITIONS	AS A CONDITION	MIN	TYP	MAX	
OUTPUT VOLTAGE	CONTINUOUS	12 to 24	23	24	24.5	VDC
		24 to 36	$V_{OUT} = V_{IN} - 1 V$			
		36 to 50	35	36	37.5	
	TRANSIENT 120 ms <sup>1</sup>	50 to 80	—	36	—	
OUTPUT POWER <sup>1</sup>		12 to 50	—	—	120	W
OUTPUT RIPPLE <sup>1</sup>	FULL LOAD BW = 10 kHz to 2 MHz	12 to 24	—	150	—	mV p-p
		24 to 36	—	50	—	
		36 to 50	—	1500	—	
INPUT VOLTAGE	CONTINUOUS		12	28	50	VDC
	TRANSIENT 120 ms <sup>1</sup>		—	—	80	V
INPUT CURRENT	NO LOAD	12	—	125	180	mA
		24 <sup>1</sup>	—	65	85	
		36 <sup>1</sup>	—	20	—	
	INHIBITED <sup>1</sup> PIN 11 = 0 V	12	—	50	—	
		24	—	24	—	
		36	—	18	—	
INPUT RIPPLE <sup>1</sup>	FULL LOAD BW = 10 kHz to 10 MHz		—	150	—	mA p-p
EFFICIENCY <sup>1</sup>	FULL LOAD	12	—	88	—	%
		24	—	95	—	
		36	—	90	—	
INHIBIT PIN CURRENT <sup>1</sup>	INHIBITED, PIN 11 = 0 V	12 to 80	—	1	—	mA
POWER FAIL FLAG THRESHOLD <sup>1</sup>	$V_{OUT} > 10$ , PIN 6 FLAG CURRENT = 0.4 mA	< 9.5	—	0.4, pin 10	—	VDC
POWER FAIL THRESHOLD (V)	$V_{IN}$ FALLING		—	9.5	10	VDC
UNDERVOLTAGE LOCKOUT <sup>1</sup>	$V_{IN}$ RISING		—	11.5	12	VDC
OUTPUT CAPACITOR <sup>1</sup>	ESR > 0.25 OHMS		330	—	1,000,000	$\mu F$

## Notes

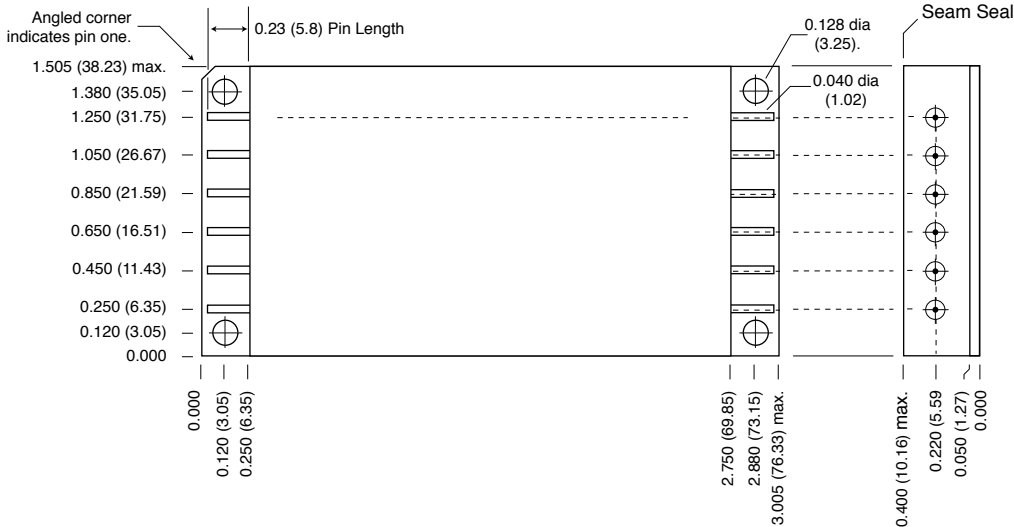
1. Guaranteed by design. Not an in-line test.

# LCM-120 Line Conditioning Module Cases

## 28 VOLT INPUT – 120 WATT

### TOP VIEW CASE U\* Flanged case, short-leaded

\*Does not require designator in Case Option position of model number.



**Weight:** 95 grams maximum

**Case dimensions in inches (mm)**  
Tolerance  $\pm 0.005$  (0.13) for three decimal places  
 $\pm 0.01$  (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  $\pm 0.002$  (3.05  $\pm 0.05$ )

Case U, Rev H, 2013.06.04  
Please refer to the numerical dimensions for accuracy.

FIGURE 5: CASE U

# LCM-120 Line Conditioning Module

## 28 VOLT INPUT – 120 WATT

### STANDARD AND /ES (NON-QML) ENVIRONMENTAL SCREENING <sup>1, 2</sup>

TEST PERFORMED	NON-QML	
	STANDARD	/ES
<b>Pre-cap Inspection</b> Method 2017, 2032	■	■
<b>Temperature Cycle (10 times)</b> Method 1010, Cond. B, -55°C to +125°C, ambient		■
<b>Constant Acceleration</b> Method 2001, 500 g		■
<b>Burn-in</b> Method 1015 <sup>3</sup> 96 hours		■
<b>Final Electrical Test MIL-PRF-38534, Group A</b> Subgroups 1 and 4: +25°C case	■	■
<b>Hermeticity Test</b>		
Fine Leak, Method 1014, Cond. A		■
Gross Leak, Method 1014, Cond. C		■
Gross Leak, Dip	■	
<b>Final visual inspection</b> Method 2009	■	■

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

Notes:

1. "Non-QML" Refers to products that do not offer QML screening.
2. Standard and /ES, non-QML products, may not meet all of the requirements of MIL-PRF-38534.
3. Burn-in temperature designed to bring the case temperature to the maximum case temperature of the product. Refer to the specific product information for the maximum case temperature. Burn-in is a powered test.

TABLE 6: ENVIRONMENTAL SCREENING