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™

LXMG1620-01

Direct Drive Dual Lamp CCLF Inverter Module

NOT RECOMMENDED FOR NEW DESIGN
SEE LXMG1624-12-61

DESCRIPTION

The Dual Output Module Ideal for Desktop and Industrial Applications. The LXMG1620 Direct Drive™ Cold Cathode Fluorescent Lamp (CCFL) Inverter is a single module designed to drive two lamps and is targeted for use with desktop Liquid Crystal Display (LCD) and industrial LCD panels typically ranging in size from 10.4-inches to 17-inches. This two output inverter is the ideal solution to power virtually any two lamp application.

Direct Drive Technology. The module design is based on a new patented[1] Direct Drive topology, which provides a number of cost and performance advantages. The LXMG1620-01 Direct Drive inverters eliminate the classic resonant inductor and capacitors, thus reducing cost and allowing a substantial reduction in module size.

Fixed-Frequency Operation. Other benefits of this new topology are fixed-frequency operation and secondary-side strike-voltage regulation. Strike-voltage regulation minimizes corona discharge in the output transformer and related circuitry, providing longer life and higher reliability.

Fail-safe Feature For Multiple Lamp Applications.
    Our multi-output inverters are designed to keep your application operating at near normal brightness in the event that a lamp fails.

This allows the display to remain "on-line" until lamp replacement is convenient.
Dual Module Uses Standard Power Supply. The LXMG1620 module uses a standard 12V ±10% input supply. It also ensures nominal power consumption with 2 lamps requiring only 8 watts. Lamp current is fully regulated with respect to input voltage and output impedance variations.

Dimming Features. The LXMG1620 modules are equipped with a dimming input that permits brightness control from an external potentiometer or DC voltage. In addition, the sleep input reduces module power to a few microwatts in shut down mode. All LXMG1620 modules feature both output open and short-circuit protection.

The Most Efficient and Cost-effective Backlight Inverter for Desktop/ Industrial Applications. Microsemi's proprietary Direct Drive architecture is the highest efficiency, small form factor solution for all multiple lamp applications. The LXMG1620 is fully customizable (electronically and mechanically) to specific customer requirements.

[1]US Patent Numbers: 5923129 & 5930121

IMPORTANT: For the most current data, consult *MICROSEMI*'s website: **http://www.microsemi.com**
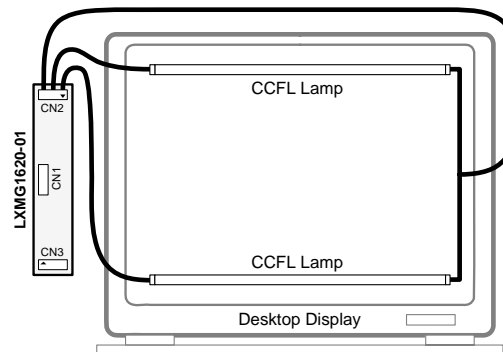
KEY FEATURES

- Drive Two Lamps With One Module
- Small, Compact Size
- High Efficiency
- Multiple Outputs Provide Easy LCD Connections
- Low EMI And Noise
- Low Power Sleep Mode
- Output Short And Open Circuit Protection
- 3:1 Dimming Control
- Adjustable Lamp Current Up To 6.0mA Per Lamp
- Long Lamp Life With Soft-Start And Accurate Lamp Current Regulation
- RoHS Compliant

APPLICATIONS

- Desktop LCD Monitors And Panels
- Industrial LCD Panels
- Hi-Brite Displays

BENEFITS

- Cool Operation
- Smooth, Easy-To-Use Brightness Control
- Single 12 Volt Supply

PRODUCT HIGHLIGHT

Dual Connector Configuration

CN2
LXMG1620-01
CN1
CN3
CCFL Lamp
CCFL Lamp
Desktop Display
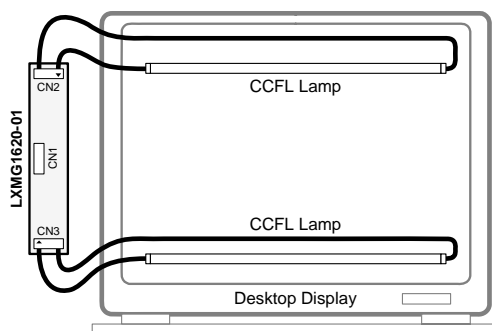
Single Connector Configuration

CN2
LXMG1620-01
CN1
CN3
CCFL Lamp
CCFL Lamp
Desktop Display

PACKAGE ORDER INFO

Part Number	Lamp Run Voltage	Lamp Current
LXMG1620-01	500-750V$_{RMS}$	6mA

This Part is Not Recommended for new design, see the LXMG1624-12-61

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ABSOLUTE MAXIMUM RATINGS

Input Supply Voltage (V_{IN}) ....-0.3V to 18V
Output Voltage, no load ....Internally Limited to $1800V_{RMS}$
Output Current ....$10mA_{RMS}$ (Internally Limited)
Output Power (Per Lamp) 6.0W
Input Signal Voltage, ($\overline{SLEEP}$ and BRITE Inputs)...-0.3V to V_{IN}
Ambient Operating Temperature.. 0°C to 70°C
Storage Temperature Range ....-40°C to 85°C

Note: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of specified terminal.

RECOMMENDED OPERATING CONDITIONS

This module has been designed to operate over a wide range of input and output conditions. However, best efficiency and performance will be obtained if the module is operated under the condition listed in the 'R.C.' column. Min. and Max. columns indicate values beyond which the inverter, although operational, will not function optimally.

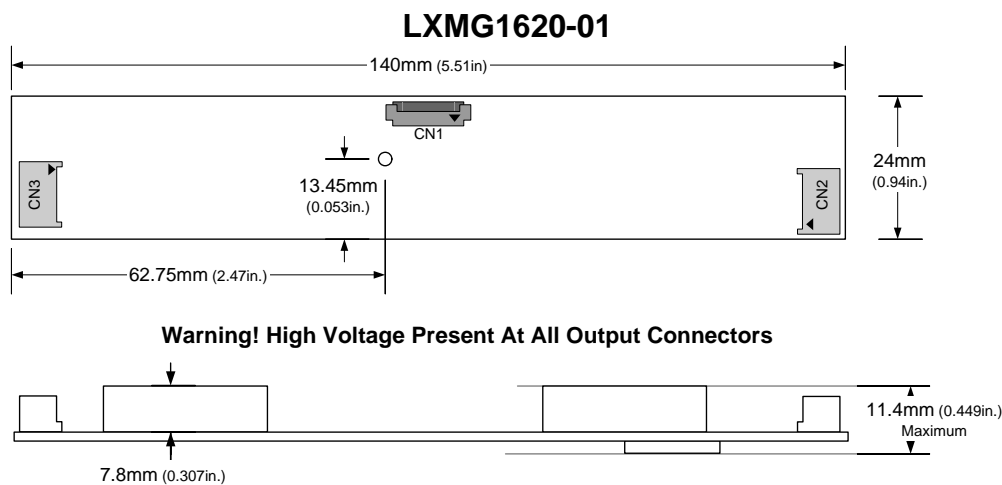| Parameter	Symbol	LXMG1620-01			Units
		Min	R.C.	Max	
Input Supply Voltage Range (Functional)	V_{IN}	10.2	12	16	V
Input Supply Voltage (Fully Regulated Lamp Current)		10.2	12	13.8	V
Output Power (Per Lamp)	P_O		4	5	W
Brightness Control Input Voltage Range	V_{BRT_ADJ}	0		5	V
Lamp Operating Voltage	V_{LAMP}	500	625	750	V_{RMS}
Lamp Current (Full Brightness – Per Lamp)	I_{OLAMP}		6		mA_{RMS}
Operating Ambient Temperature Range	T_A	0		70	°C

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, these specifications apply over the recommended operating conditions and 25°C ambient temperature for the LXMG1620-01.

Parameter	Symbol	Test Conditions	LXMG1620-01			Units
			Min	Typ	Max	
OUTPUT PIN CHARACTERISTICS						
Full Bright Lamp Current (Per Lamp)	$I_{L(MAX)}$	$V_{BRT\_ADJ} = 5.0V_{DC}$, $\overline{SLEEP}$ = HIGH, $V_{IN} = 12V_{DC}$	5.4	6.0	6.6	mA_{RMS}
Minimum Lamp Current (Per Lamp) Note 2	$I_{L(MIN)}$	$V_{BRT\_ADJ} = 0V_{DC}$, $\overline{SLEEP}$ = HIGH, $V_{IN} = 12V_{DC}$		0.5		mA_{RMS}
Lamp Start Voltage	V_{LS}	0°C < T_A < 40°C, V_{IN} > $10.8V_{DC}$	1500		1800	V_{RMS}
Operating Frequency	f_O	$V_{BRT\_ADJ} = 5.0V_{DC}$, $\overline{SLEEP}$ = HIGH $V_{IN} = 12V_{DC}$	52	57	62	KHz
BRITE INPUT						
Input Current	I_{BRT}	$V_{BRT\_ADJ} = 0V_{DC}$	-6	-8	-10	μA_{DC}
Input Voltage for Max. Lamp Current	V_C	$I_{O(LAMP)} = 100\%$		5.0		V_{DC}
Input Voltage for Min. Lamp Current	V_C	$I_{O(LAMP)}$ = Minimum		0		V_{DC}
$\overline{SLEEP}$ INPUT						
RUN Mode	$V_{\overline{SLEEP}(HI)}$		2.2		V_{IN}	V_{DC}
SLEEP Mode	$V_{\overline{SLEEP}(LO)}$		-0.3		0.8	V_{DC}
Input Current	$I_{\overline{SLEEP}}$	$\overline{SLEEP}$ = 5.0V	60	120	180	μA_{DC}
POWER CHARACTERISTICS						
Sleep Current	$I_{IN(MIN)}$	$V_{IN} = 12V_{DC}$, $\overline{SLEEP}$ = $0V_{DC}$	0	1	50	μA_{DC}

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SPARE TABLE

Conn	Pin	Description
CN1		
CN1-1, 2	VIN	Input Power Supply (10.2V < VIN < 16V)
CN1-3, 4	GND	Power Supply Return
CN1-5	$\overline{SLEEP}$	ON/OFF Control (2.2V < $\overline{SLEEP}$ < VIN – ON, -0.3V < $\overline{SLEEP}$ < 0.8V - OFF
CN1-6	BRITE	Brightness Control (-0.3V to 5.0VDC) 5.0VDC gives maximum lamp current.
CN1-7, 8	N.C.	Leave Unconnected.

CN2 and CN3: Refer to figure 1

PHYSICAL DIMENSIONS

LXMG1620-01

140mm (5.51in)

24mm (0.94in.)

13.45mm (0.053in.)

CN1

CN3 CN2

62.75mm (2.47in.)

Warning! High Voltage Present At All Output Connectors

11.4mm (0.449in.) Maximum

7.8mm (0.307in.)

All dimensions are in millimeters, inches are for reference only.

FAILSAFE FEATURES FOR MULTIPLE LAMP OPERATION

Our multi-output inverters are designed to keep your application operating at near normal brightness in the event that a lamp fails. This allows the display to remain "on-line" until lamp replacement is convenient.

Microsemi "pairs" the lamps so that if one lamp in the pair breaks, most of its current is added to the good lamp. CCFLs will respond with more brightness for a period of time. Operating time in this mode will be a function of the lamps age but should be typically in the order of hundreds of hours.

This operating characteristic can provide adequate display performance for a limited, but useful period of time. Shortening of the lamp life in this mode is typically not a concern as it is recommended that all lamps in a display be replaced at the same time.
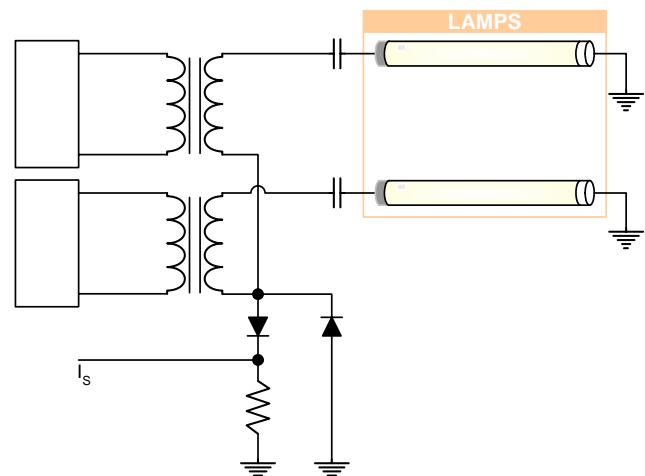

LAMPS

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Figure 1 – Dual Output Stage

APPLICATIONS

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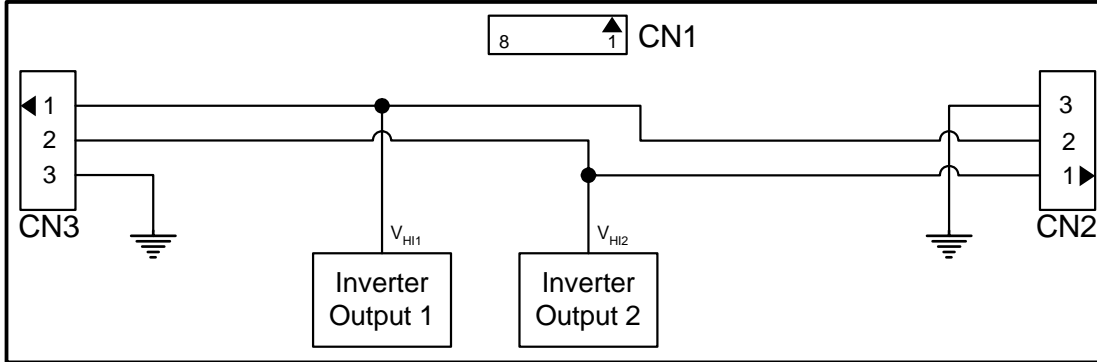## CONNECTOR SCHEMATIC

Figure 2 – LXMG1620-01 Connector Schematic

Connectors:

CN1 = MOLEX 53261-0871

CN2, CN3 = JST SM03(4.0)B-BHS-1-TB(LF)(SN)
            Or
        Yeon Ho 20015WR-07A00

Mates With:

Pins: 50079-8100*, Housing: 51021-0800
*Loose (-8000, Chain) Recommended #26 AWG wiring

JST BHR-03VS-1

Connections Rules
1. Always install two (2) lamps. Operating with only one lamp may overdrive lamp current at maximum brightness settings.
2. Verify lamp wiring before connecting lamps to the inverter module. Connecting both lamps to one of the two inverter output circuits will result in reduced brightness. The LXMG1620-01 module connectors are wired per industry standard. The lamp hot wires (high voltage wires) are always on pin 1 or 2, and the cold wire (low voltage wire) is always on pin 3.

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DIRECT DRIVE OUTPUT ARCHITECTURE

Direct Drive architecture includes two load feedback control loops to provide uncompromised CCFL ignition and operation characteristics.

Lamp current is regulated in the CCFL return lead (ISNS loop) to insure constant light output with changing lamp parameters and power supply voltage. This also allows accurate and repeatable brightness control. Dimming ratio with the LXMG1620 analog dimming inverters is typically 6:1 when driving dual LCD lamp panels.

If no current flows in the CCFL return path because of an unstruck or failed lamp, the inverter applies full strike voltage potential. The output voltage feedback loop (VSNS) takes control and regulates output voltage to 1650VRMS. This insures the lamp will ignite under worst case temperatures and aging conditions.

Because output voltage is actively regulated, it will never exceed component and panel insulation ratings. This prevents destructive corona discharge to insure long term reliability of the system.
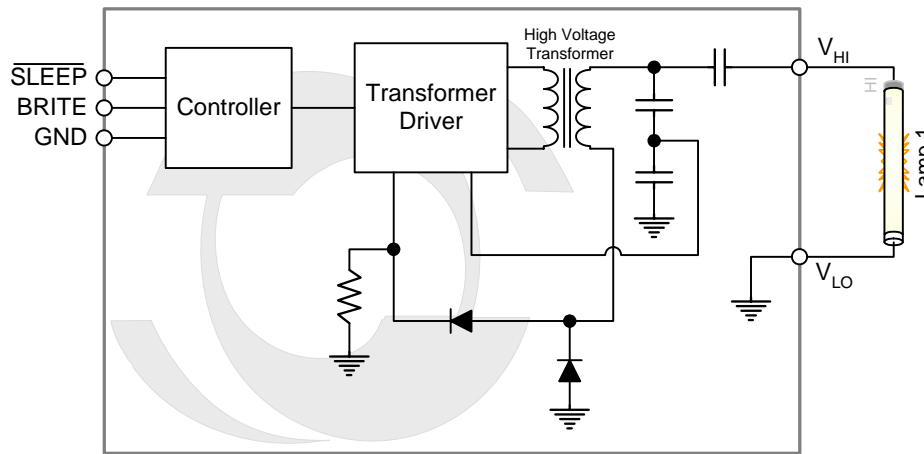
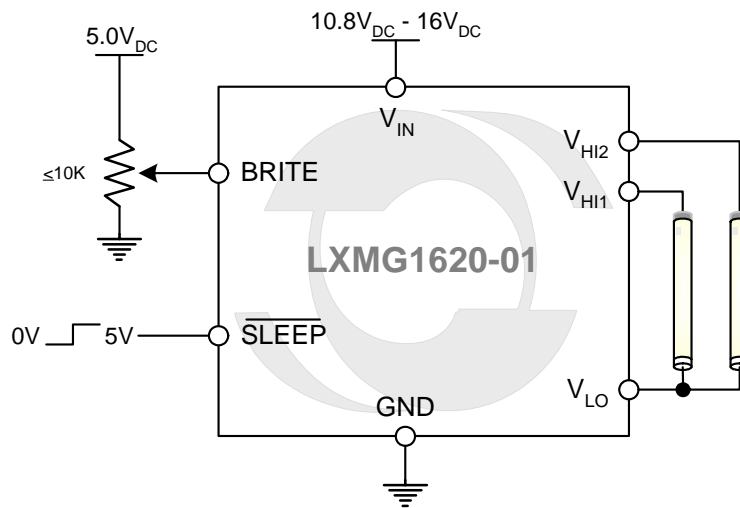**Figure 3 –** LXMG1620 Block Diagram
(Only One Lamp Shown)

TYPICAL APPLICATION

Figure 4 – Typical Application

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