

DESCRIPTION

Single Output Inverter Ideal For Portable Applications. The LXM1610 series of Direct Drive™ CCFL (Cold Cathode Fluorescent Lamp) Inverter Modules are specifically designed for driving LCD backlight lamps. They excel in applications where critical parameters include dimmability, high efficiency and reliable fail-safe design in a small form factor. These inverters are recommended for use in panels with low-voltage insulation on the lamp return wire.

Wide Input Voltage Range. The modules convert unregulated DC voltage from the system battery or AC adapter directly to high-frequency, high-voltage waves required to ignite and operate CCFL lamps. Input voltage can range from 8 to 18 volts.

Direct Drive Technology. The module design is based on a new Direct Drive topology, which provides a number of cost and performance advantages. The LXM1610-01 series Direct Drive invert-

ers eliminate the classic resonant inductor and capacitors, thus reducing cost and allowing a 30% 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.

Dimming Features. The LXM1610 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 LXM1610 modules feature both output open and short-circuit protection. The LXM1610 is fully customizable (electronically and mechanically) to specific customer requirements.

KEY FEATURES

- 8V to 18V Input Voltage Range
- 30% Smaller Than CS-ZVS Models
- Versatile Brightness Control Input
- MicroAmp SLEEP Mode
- Open And Shorted Lamp Protection
- 8.3mm Max. Module Height, 16mm Width
- Fixed Frequency Operation

APPLICATIONS

- Notebook And Sub-Notebook Computers
- Portable Instrumentation
- Automotive Displays
- Desktop Displays
- Airline Entertainment Centers

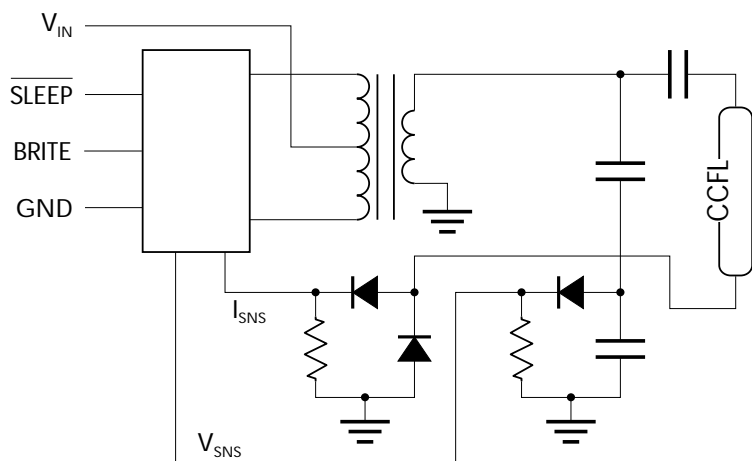
BENEFITS

- High Efficiency, Line Voltage Regulation And Sleep Mode Extend Computer Battery Life
- Smooth, Wide-Range Brightness Control Gives Your Product A High Quality Image
- Output Voltage Regulation Minimizes Corona Discharge For Long Life And High Reliability

NOTE: For current data & package dimensions, visit our web site: <http://www.linfinity.com>.

PRODUCT HIGHLIGHT

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 (I_{SNS} 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 LX1610 analog dimming inverters is typically 5:1 when driving 12.1 to 15 inch LCD 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 (V_{SNS}) takes control and regulates output voltage to $1650V_{RMS}$. This insures the lamp will ignite under worst case temperature 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.

MODULE ORDER INFORMATION

LXM1610-01

LXM1610-01

Not Recommended For New Design

DIRECT DRIVE CCFL INVERTER MODULE

PRODUCTION DATA SHEET

ABSOLUTE MAXIMUM RATINGS (Note 1)

Input Supply Voltage (V_{IN}).....	-0.3V to 18V
Output Voltage, no load	Internally Limited to $1800V_{RMS}$
Output Current.....	$10.0mA_{RMS}$ (Internally Limited)
Output Power	6.0W
Input Signal Voltage, (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 1. Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of the specified terminal.

RECOMMENDED OPERATING CONDITIONS (R.C.)

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	Recommended Operating Conditions			Units
		Min.	R.C.	Max.	
Input Supply Voltage Range (Functional)	V_{IN}	8	12	18	V
Input Supply Voltage (Fully Regulated Lamp Current)	V_{IN}	9	12	16	V
Output Power	P_O		4	5	W
Brightness Control Input Voltage Range	$V_{BRT ADJ}$	0.0		2.5	V
Lamp Operating Voltage	V_{LAMP}	540	675	800	V_{RMS}
Lamp Current - Full Brightness	I_{OLAMP}		7.0		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 LXM1610.

Parameter	Symbol	Test Conditions	LXM1610-01			Units
			Min.	Typ.	Max.	
Output Pin Characteristics						
Full Bright Lamp Current	$I_L (MAX)$	$V_{BRT ADJ} = 2.5V_{DC}$, SLEEP = HIGH, $V_{IN} = 9V_{DC}$	6.3	7.0	7.7	mA_{RMS}
Minimum Lamp Current (Note 2)	$I_L (MIN)$	$V_{BRT ADJ} = 0V_{DC}$, SLEEP = HIGH, $V_{IN} = 9V_{DC}$	2.0	2.5	3.0	mA_{RMS}
Lamp Start Voltage	V_{LS}	0°C < T_A < 40°C	1500		1800	V_{RMS}
Operating Frequency	f_O	$V_{BRT ADJ} = 2.5V_{DC}$, SLEEP = HIGH, $V_{IN} = 12V_{DC}$	52	57	62	KHz
BRITE Input						
Input Current	I_{BRT}	$V_{BRT ADJ} = 0V_{DC}$		-62		μA_{DC}
Input Voltage for Max. Lamp Current	V_C	$I_O (LAMP) = 100\%$		2.5		V_{DC}
Input Voltage for Min. Lamp Current	V_C	$I_O (LAMP) = \text{Minimum}$		0		V_{DC}
SLEEP Input						
RUN Mode	$V_{SLEEP (HI)}$		2.2		V_{IN}	V_{DC}
SLEEP Mode	$V_{SLEEP (LO)}$		-0.3		0.8	V_{DC}
Input Current	I_{SLEEP}	SLEEP = 5.0V		120	180	μA_{DC}
Power Characteristics						
Sleep Current	$I_{IN (MIN)}$	$V_{IN} = 15V_{DC}$, SLEEP ≤ 0.8V		10	50	μA_{DC}
V_{REF} Output						
V_{REF} Output Voltage	V_{REF}	$R_L \geq 1M\Omega$	4.9	5.1	5.3	V_{DC}
V_{REF} Source Impedance	R_{REF}			10		Ω

Note 2. Minimum lamp current required to maintain even light output may vary with display panel.

DIRECT DRIVE CCFL INVERTER MODULE

PRODUCTION DATA SHEET

FUNCTIONAL PIN DESCRIPTION

Conn.	Pin	Description
CN1		
CN1-1 CN1-2	V_{IN}	Input Power Supply. ($8V \leq V_{IN} \leq 18V$)
CN1-3 CN1-4	GND	Power Supply Return.
CN1-5N	\overline{SLEEP}	ON/OFF Control. ($2.2V < \overline{SLEEP} < V_{IN} = ON$, $-0.3V < \overline{SLEEP} < 0.8V = OFF$)
CN1-6N	BRITE	Brightness Control (0 to $2.5V_{DC}$). $2.5V_{DC}$ gives maximum lamp current.
CN1-7N	AGND	Analog Ground. Use for BRITE signal return only.
CN1-8N	V_{REF}	5.1V Reference Output Voltage.
CN2		
CN2-1N	V_{HI}	High voltage connection to high side of lamp. Connect to lamp terminal with shortest lead length. DO NOT connect to ground.
CN2-2N	V_{LO}	Connection to low side of lamp. Connect to lamp terminal with longer lead length. DO NOT connect to Ground.

TYPICAL APPLICATIONS

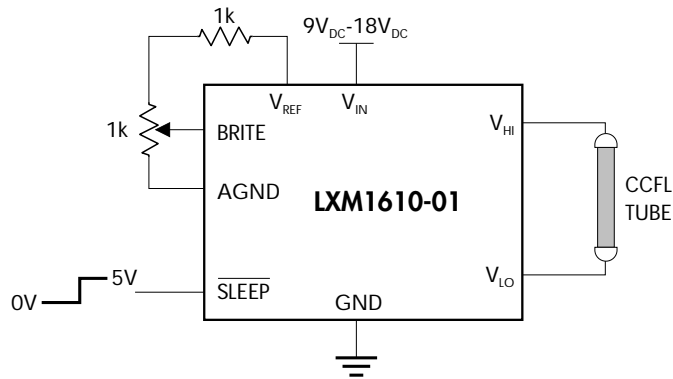


FIGURE 1 — Potentiometer Brightness Control

LXM1610-01

Not Recommended For New Design

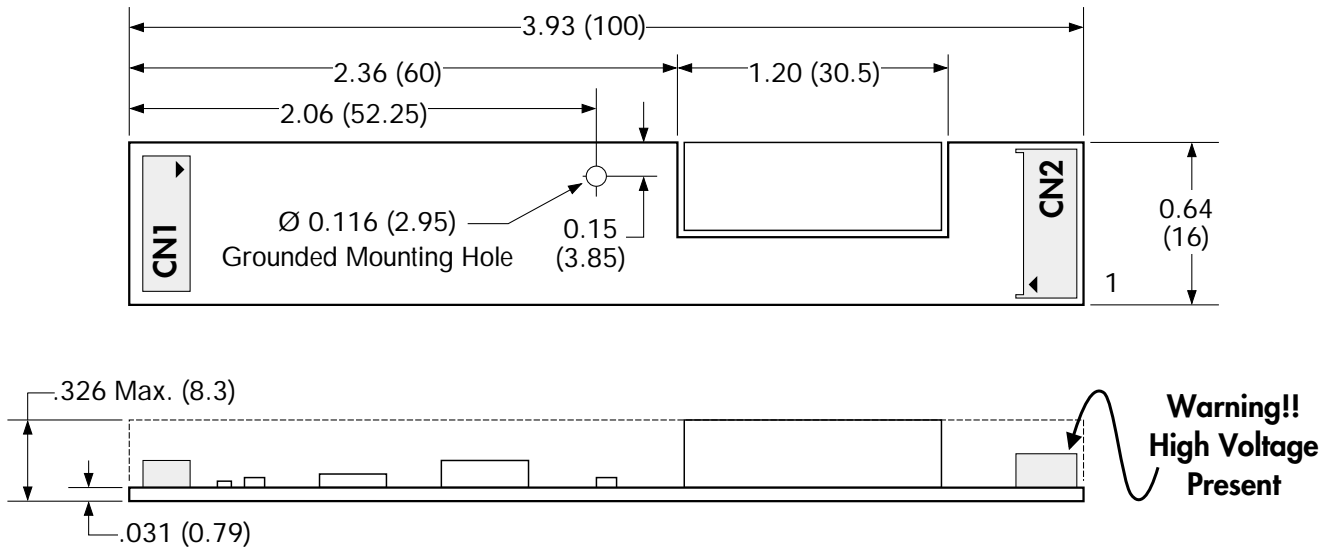
DIRECT DRIVE CCFL INVERTER MODULE

PRODUCTION DATA SHEET

PHYSICAL DIMENSIONS

LXM1610-01

All dimensions are in inches (mm).



Connectors:

CN1 = MOLEX 53261-0890N

CN2 = JST SM02(8.0)B-BHS--1TBN

Recommended Mate:

Pins: 50079-8100*, Housing: 51021-0800

* Loose (-8000, Chain) Recommended #26 AWG wiring

Pins: 5BH-001T-P0.5, Housing: BHR-03VS-1

RangeMAX and Direct Drive are trademarks of Linfinity Microelectronics Inc.

PRODUCTION DATA - Information contained in this document is proprietary to Linfinity and is current as of publication date. This document may not be modified in any way without the express written consent of Linfinity. Product processing does not necessarily include testing of all parameters. Linfinity reserves the right to change the configuration and performance of the product and to discontinue product at any time.

