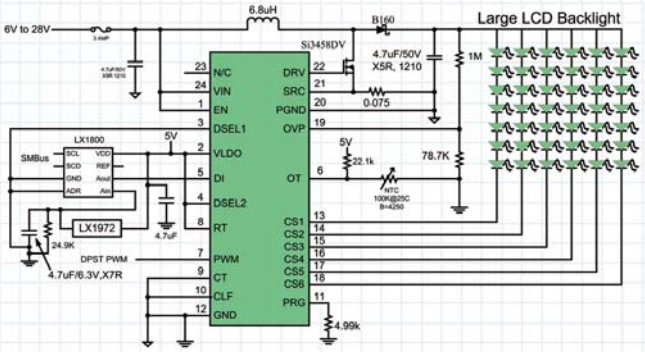
Multi-string High Precision Integrated LED Driver

LX1996™

The LX1996 is a compact white LED driver for notebook size displays. It is designed to drive up to six strings of LEDs with a variable DC current. The LX1996 consists of a boost converter and six precision current sources.

Key Features

- Up to 30mA LEDs with +/-0.5% precision current matching
- Wide input range 6.0V to 28V, -40 to +85C
- LED panel temperature compensation of LED current
- Direct ambient light sensor interface for brightness control
- Multi-mode dimming options by PWM or analog signal:
  - Up to 25kHz direct digital
  - Analog to digital or direct analog
  - Combined direct analog and digital
- Low standby current
- On-chip thermal shut-down
- Over-voltage protection
- Short-circuit protection
- Thermally efficient 24 pin 4x4mm MLPQ package



Benefits

- Provide homogenous backlight luminosity by precision current matching
- Eliminate the need for LED binning
- Protect LEDs with a thermal profile
- Save battery power with high efficiency over the full dimming range
- Reduce board space by minimizing external components

LED & CCFL Complete Backlight Driver Solutions

CCFL Inverters

Microsemi is pleased to offer turnkey CCFL inverter module solutions based on our patented technology and best in class CCFL ICs.

- Single, dual and quad lamp LCD panel backlighting solutions
- Input voltage sources options of 3.3V, 5V and 12V
- Output power management up to 6W per lamp (see table for lamp voltage/current combinations)
- Automatic strike voltage generation
- Open and short circuit fault detection with auto shutdown
- Analog or digital dimming versions for dimming ranging from 5:1+ to 100:1+
- Output open circuit voltage regulation to minimize corona discharge for high reliability and efficiency
- RangeMax®: Digital dimming design based on a patented “Burst Drive” concept that energizes the lamp while ensuring that no premature lamp degradation occurs, allowing significant power savings at lower dim levels. This allows smooth, flicker free full range brightness control
- PanelMatch™: an elegant and simple dual pin setting solution that permits the variation of the typical lamp current that can be driven up to 3mA. The *same* inverter module can than be used to drive different panels (simpler supply chain and reduced inventory carrying costs specifically for solutions integrators and distributors or customers using multiple displays).
- Wide temperature ranges: at least -20°C to +70°C and up to -30°C to +80°C on the newest designs
- RoHS and UL Certifications: all Microsemi inverter modules are RoHS compliant (LXMG “G”=Green) and UL60950 certified components (File E175910)

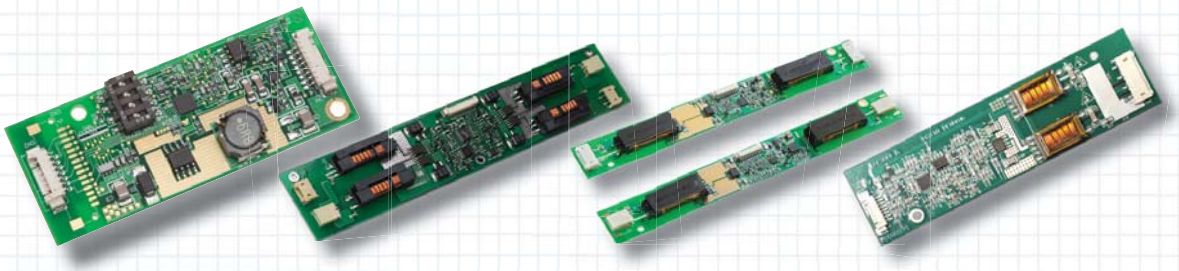
LED Inverters

Microsemi also offers integrated solutions for light-emitting diode (LED) backlit panels. These solutions are designed to provide outstanding performance and functionality in demanding LCD TV, notebook computer, automotive, and many other display applications. The products can easily be enhanced with the addition of Microsemi’s complementary light sensor and color management system solutions. The LXMG1960-28 solution is based on our high-performance LX1996™ LED driver and can drive up to six-strings in 3.5- to 7-inch LED backlit panels.

Selection Guide

Type	Output Strings**	Range VIN [V]*	Range VOUT [V]*	Progr. IOUT [mA]*	String to String I Matching	Max Dimming	Operating Temp [°C]*	Base PN	Status/Highlight	DIMENSIONS (L,W,H) [mm]
LED Driver Modules	Up to 3	[4.75 -->28]	[V_{IN} --> 35V]	15 to 50mA in 5mA steps	1% Typ	1000:1	[-30,80]	LXMG1930-28-0x	NEW: STAYLIT, LED Over Temperature Protection Available!	69 x 27.9 x6
	Up to 6			10 to 25mA in 1mA steps				LXMG1960-28-0x		

Type	Typ V_{IN} [V]	Range V_{IN} [V]	V_{LAMP} Range [V]	Typ I_{OLAMP} [mA]	V_{LS} [V] Min/Typ	Max Dimming	Operating Temp [°C]	Base PN	Status	DIMENSIONS (L,W,H) [mm]
CCFL Single Lamp	3.3	[3.0 --> 3.6]	[325,435]	3.5 to 5.0	1000/1200	<5:1	[-30,80]	LXMG1618A-03-2x	NEW - "A" Series	86 x 16 x 4.7
						100:1		LXMG1617A-03-2x		
	5	[4.75 --> 5.25]				<5:1		LXMG1618A-05-2x		
						100:1		LXMG1617A-05-2x		
			[465,635]	5.0 to 6.5	1300/1400	<5:1		LXMG1618A-05-4x		86 x 16 x 6.2
						100:1		LXMG1617A-05-4x		
			[545,735]	5.0 to 8.0	1500/1650	<5:1		LXMG1618A-05-6x		100 x 16 x 7.5
						100:1		LXMG1617A-05-6x		
		[4.75 --> 5.50]	**[300,750]**	**4.0 to 7.0**	**1500/1650**	50:1		LXMG1811-05-6x / 6xS	NEW - "LXMG181x" Series	100 x 16 x 6.0
	12	[10.8 --> 13.2]	[465,635]	5.0 to 6.5	1300/1400	<5:1		LXMG1618A-12-4x	NEW - "A" Series	86 x 16 x 6.2
						100:1		LXMG1617A-12-4x		
			[545,735]	5.0 to 8.0	1500/1650	<5:1		LXMG1618A-12-6x		100 x 16 x 7.5
						100:1		LXMG1617A-12-6x		
		[9.0 --> 16.80]	**[300,750]**	**4.0 to 7.0**	**1500/1650**	50:1		LXMG1813-12-6x / 6xS	NEW - "LXMG181x" Series	100 x 16 x 6.0
		[9.0 --> 16.0]	[500,1000]	3.8 to 8.8	/2000	100:1	[-40,85]	LXMG1614E-14-11	AUTOMOTIVE	130 x 23 x 8.5
CCFL Dual Lamp	5	[4.75 --> 5.25]	[320,420]	5.0 to 6.0	1250/1400	100:1	[-30,80]	LXMG1626-05-46	STAYLIT	113 x 30 x 6.5
			[385,485]					LXMG1626-05-45		
			[350,530]	5.0 to 6.5		50:1		LXMG1627-05-4x	NEW	134 x 30 x 8
			[450,610]		1400/1600			LXMG1627-05-44		108.7 x 22.35 x 10.2
			[460,620]	5.0 to 7.0	1450/1600	100:1	[-20,70]	LXMG1626-05-67	Active	133 x 25 x 7.5
					1350/1500			LXMG1626-05-66		133 x 25 x 7.5
			[510,690]	5.0 to 6.5	1400/1500			LXMG1626-05-65		
			[480,720]	5.0 to 8.0	1400/1650	50:1	[-30, 80]	LXMG1627-05-6x	NEW	165 x 21 x 10
	12	[10.8 --> 13.2]	[,1250]	3.5 to 5.0		100:1	[-20,70]	LXMG1626-12-64	Active	165 x 21 x 7.5
			[320,420]	5.0 to 6.0	1250/1400		[-30,80]	LXMG1626-12-46	STAYLIT	113 x 30 x 6.5
			[385,485]					LXMG1626-12-45		113 x 30 x 6.2
			[350,500]	6	1500/1650		[0,70]	LXMG1621-02	See LXMG1626-12-45/46	124 x 32 x 8.5
			[350,530]	5.0 to 6.5	1250/1400	<5:1	[-30,80]	LXMG1624-12-4x		134 x 30 x 8
						50:1		LXMG1627-12-4x	NEW	115 x 30 x 6.5
			[450,610]		1400/1600			LXMG1627-12-44		108.7 x 22.35 x 10.2
			[460,620]	5.0 to 7.0	1450/1600	100:1	[-20,70]	LXMG1626-12-66	Active	133 x 25 x 7.5
								LXMG1626-12-67		
			[470,640]	6	1500/1650		[0,70]	LXMG1621-04	See LXMG1626-12-66	124 x 32 x 8.5
			[480,720]	5.0 to 8.0	1500/1650	<5:1	[-30,80]	LXMG1628-12-6x	NEW	165 x 21 x 10
						50:1		LXMG1627-12-6x		165 x 21 x 7.5
			[500,750]	7	1500/1650	100:1	[0,70]	LXMG1621-01	See LXMG1626-12-65	124 x 32 x 8.5
			[510,690]	5.0 to 6.5	1450/1650		[-20,70]	LXMG1626-12-65	Active	133 x 25 x 7.5
CCFL Quad Lamp	12		[530,720]	5.0 to 8.0	1500/1650	50:1		LXMG1643-12-61		188 x 36 x 8
			[530,730]					LXMG1643-12-62		
								LXMG1643-12-63		
								LXMG1643-12-64		188 x 42 x 8



Complete Backlight Driver Solutions

StayLIT™

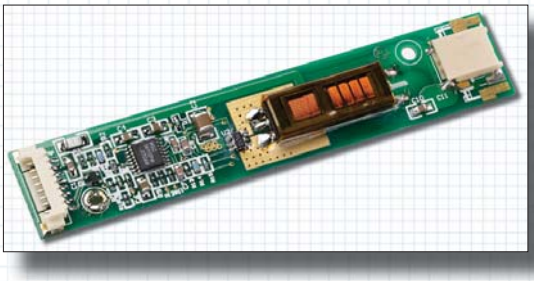
StayLIT™ is a specially designed fault detection and management circuit for multi-lamp LCD panels, initially adopted on dual lamp inverter modules (LXMG1626-05-45, LXMG1626-12-45, LXMG1626-05-46, LXMG1626-12-46).

The StayLIT™ circuit detects the abnormal behavior of any of the two lamps (open/short status), resizes and redirects the output power to the remaining working lamp while providing a "fault" signal. The remaining working lamp is not overdriven and therefore it's not prematurely damaged and can be dimmed as in the normal operation mode. The end customer will see very little difference (lower brightness of the display) but the service group will be notified of the need to change the lamp.

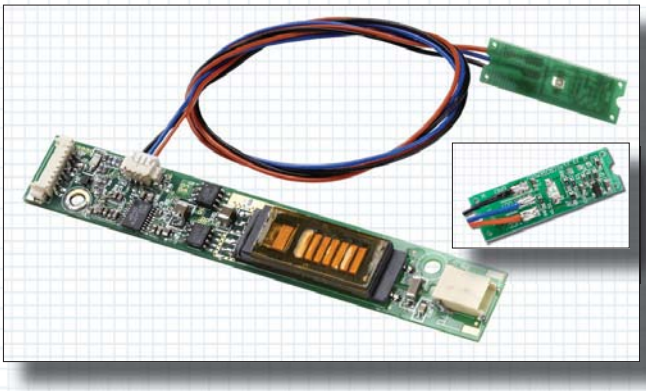
This feature is found to be a must for Medical, Banking and POS systems providers where the continuous operation of the LCD display is of major importance.

"A" Series *New! Single Lamp Inverters*

New single lamp inverters, LXMG1617A/LXMG1618A ("A" Series). A drop-in upgraded replacement of the previous LXMG1617/LXMG1618 offerings. By integrating the newest CCFL IC and the long experience Microsemi is now able to offer wider dimming range and extended temperature range to its customers at a minimal or no re-design cost.



LXMG181X™ & VEasyLIT™ *New! Single Lamp Inverters*



The LXMG181x Series is designed to enhance the current offering: the customer will benefit from a wider input voltage range (VIN) at fully regulated lamp current, and an enhanced Lamp Driving capability (see the range of VLAMP and the Striking capability). Fewer part numbers (4 instead of 24) will be able to drive an extended list of displays thus greatly simplifying the customer supply change and minimizing the need of re-qualification and redesign of the backlight driving units in case a display is changed. Distributors and integrators dealing with multiple displays will now be able to stock a lower number of parts to meet their needs. When ordering the inverter as a standalone and not as part of the VEasyLIT kit, please use part numbers without the final "S", i.e. LXMG1811-05-61.

The biggest advantage of the LXMG181X series though lies in its availability in a ready and easy to use kit (VEasyLIT™): the customer can order the inverter (i.e. LXMG1811-05-61S) and a light sensor board (LXMG1800_LS) which can be hooked up to the inverter by simply joining the provided connectors. This small light sensor board can mounted easily in the product's bezel with the addition of a small hole or light diffuser so ambient light can be detected. It includes user adjustable gain settings to adjust for the product's typical ambient lighting conditions.

LXMG1960™ & LXMG1930™

High Performance LED System Solutions

Key Features & Benefits

- All products support a wide input voltage range (4.75V-28V) and output ooltage up to 35V
- Flexible Design allows matching to a wide variety of panels
  - 1 to 6 output strings (strings can also be combined or left selectively unused)
  - Current per string can be easily programmed in steps of 1mA (LXMG1960) or 5mA (LXMG1930)
- 1% typical string-to-string current matching
- Multiple dimming methods such as DC voltage, PWM signal and potentiometer
- Combined analog and digital dimming can provide for greater than 1000:1 ratio
- Multiple protections including OVP (Over Voltage) and input to monitor and manage LED pver temperature events

Selection Guide

Feature	LXMG1960-28-0X	LXMG1930-28-0X
LED Strings (up to)	6	3
Wide Input Voltage	4.75V-28V	
Output voltage per string up to	35V	
Maximum Current per String	25mA Max/ 10mA min	50mA Max/ 15mA min
Programmable LED string current to match various panel requirements (increments of)	1mA	5mA
Typical string to string current matching	1%	
StayLIT™ - continued operation in case of one or more LED short or open	Yes	
Dimming Method	Supports multiple methods of dimming such as PWM, DC voltage and potentiometer	
Output LED short protection and over voltage protection	Available	
Over LED temperature protection*	Available	

* IC over temperature protection is available and separate