



***Microsemi***  
***Integrated Products***

# Managing Light: CCFL Products

RangeMAX CCFL Inverter Modules and Controllers

Product Roadmap

System Engineering the Optimum Inverter

Automotive Applications

Other Power Management Products

Summary



# CCFL Inverter Solution Options

- Standard / Evaluation:
  - Standard inverter modules (U.S. Distribution)
  - PanelMatch Inverter Family
- Custom:
  - Inverters available for custom opportunities
  - Unique form factor and/or electrical requirement
  - Typically involves full panel characterization
- Kit:
  - Reference design support for “kit” solution (controller + transformer)
  - Allows integration of IC into Customer’s PCB



# RangeMax™ CCFL Inverter Products

- **RangeMax™ Inverter Control ICs**
  - LX1686
    - Digital Dimming CCFL Controller
  - LX1688
    - Multiple Lamp CCFL Controller
  - LX1689
    - Integrated 3rd Generation CCFL Controller
  - LX1691/92
    - Available Now
- **PanelMatch™ Inverter Modules**
  - LXM1617 and LXM1618 Series
    - (Single Lamp) CCFL Programmable Inverter Modules
  - LXM1623 and LXM1624 Series
    - (Dual Lamp) CCFL Programmable Inverter Modules
  - LXM1643 and LXM1644 Series
    - (Quad Lamp) CCFL Programmable Inverter Modules



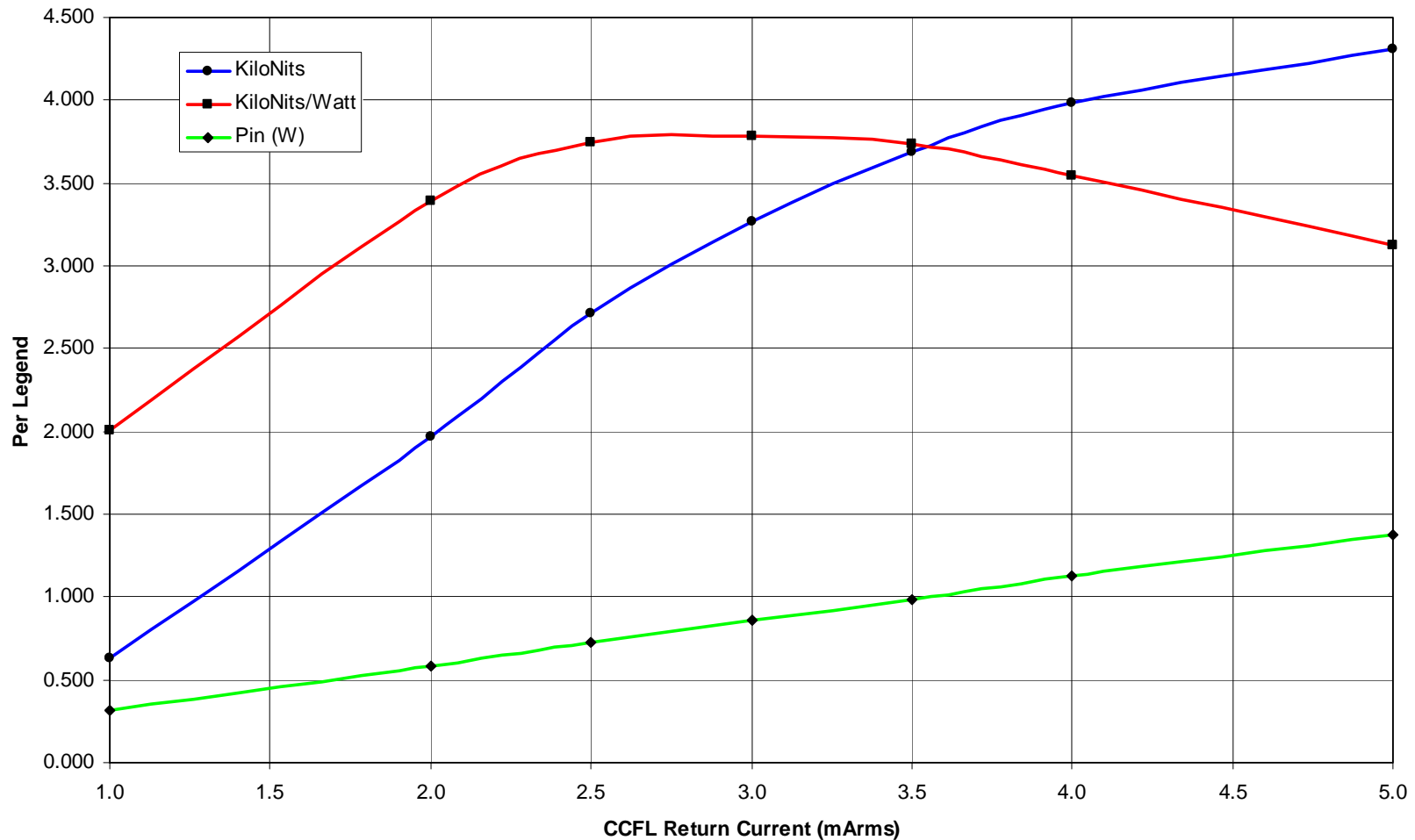


# RangeMax™

- RangeMAX is a new family of CCFL inverters and controllers from Microsemi that use digital dimming techniques to provide a smooth, jitter free, wide brightness range.
- RangeMAX is a technology that provides Advanced Power Management capabilities not possible with conventional inverters.
- Additional Features of RangeMAX
  - Digital Dimming - Driving a CCFL using fixed lamp current duty cycle control to regulate display brightness
  - Patented lamp strike generation technique
  - Highly integrated design provides small form factor
  - State of the art magnetics - eliminates corona discharge
  - Direct drive, high efficiency
  - Excellent color and clarity at low light levels

# Complete Panel Characterization

3.2" FPD CCFL Performance at 25.0°C  
NO LCD, Reflector Assembly Only

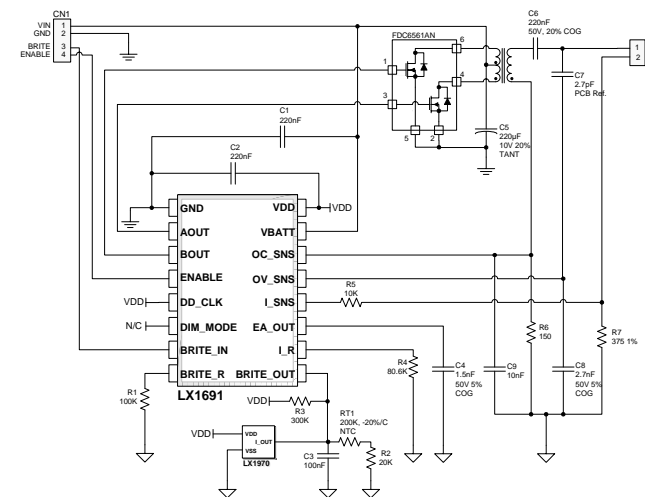


## RangeMAX Single Output Inverters

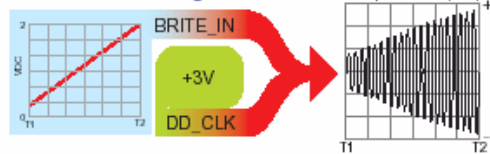
<i>Inverter</i>	<i>Type</i>	<i>IC</i>	<i>Layout</i>	<i>L x W x H (mm)</i>	<i>Area (mm<sup>2</sup>)</i>	<i>Components (Misc+Cap+Res=Total)</i>
LXM1611	Discrete dim, 4-5W, single	LX1585	Two sided	100 x 16 x 7.3	3200 (1600x2)	22+27+73 = 122
LXM1612-12-01	Integrated dim, 4W, single	LX1686	Single sided	126 x 16 x 8	2016	17+20+37 = 74
LXM1615-03-01	Integrated dim, 1.5-2W, single	LX1686	Single sided	94 x 15 x 4.6	1410	11+20+20 = 51
LXM1617	Fully integrated, 1W, single	LX1689	Single sided	67 x 10 x 4.5	670	3+8+7 = 18

# CCFL Controllers

Controller	Key Feature	Application
LX1686 24-TSSOP	Wide range, digital dimming	General purpose, automotive
LX1688 24-TSSOP	Synchronize frequency and phase	Multiple lamp, LCD TV
LX1689 20-TSSOP	Integrated, low component count	Handheld, portable
LX1691 16-TSSOP	Integrated, dual dimming, low cost	General purpose



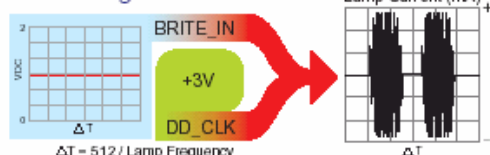
### Traditional Analog



### External Digital



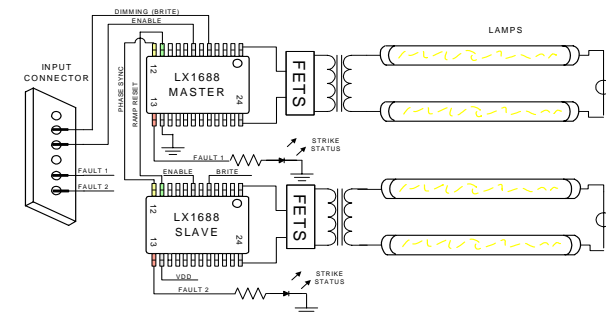
### Internal Digital



### Direct PWM (Analog)



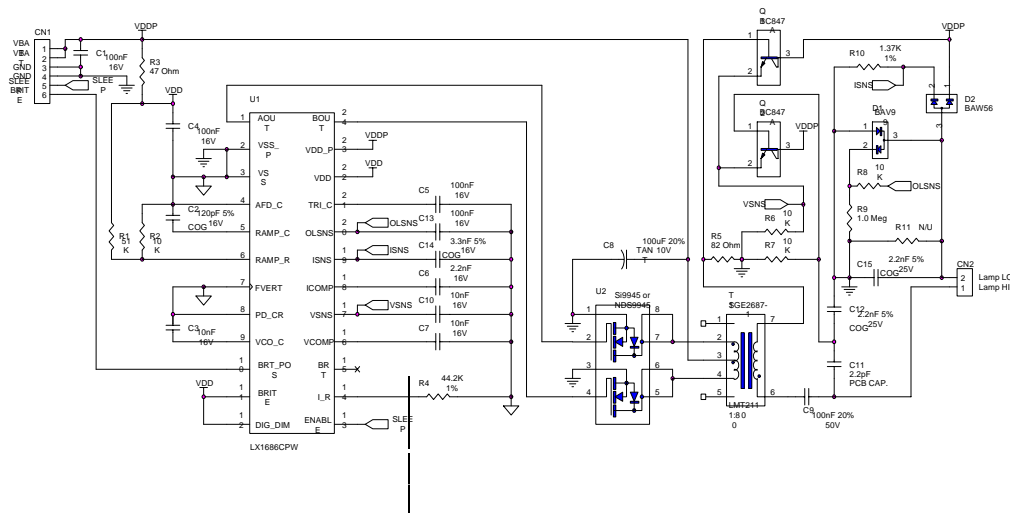
Four of Six Dimming Modes



# LX1686 Digital Dimming CCFL Controller

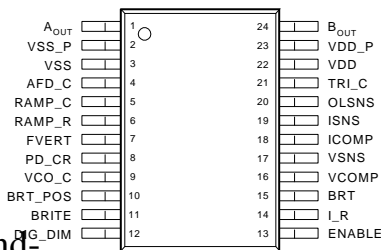
## FEATURES

- RangeMAX™ Wide Range Dimming (>100:1)
- Synchronizable to Display Video Frequency
- High Voltage Feedback Loop Directly Controls Maximum Open Lamp
- User Programmable Fixed Frequency Operation
- Under-Voltage Lockout Feature With Power-Up Reset
- Built-In Soft-Start Feature
- Operates With 3.3V or 5V power Supplies
- 100mA Output Drive Capability



## APPLICATIONS

- Notebooks & Desktop Computer Monitors
- Instrumentation Display
- Low Ambient Light Displays
- (Aircraft, Automobiles, and Hand-Held Equipment)



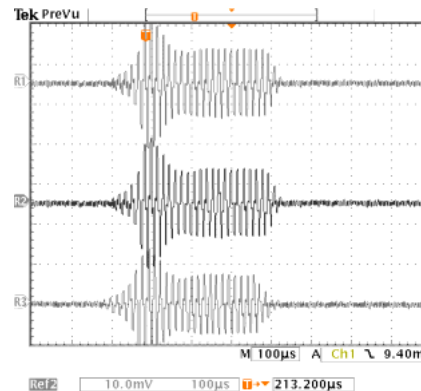
PACKAGE ORDER INFO		
T <sub>J</sub> (°C)	PW	Plastic TSSOP 24-PIN
0 to 85		LX1686CPW
-40 to 85		LX1686IPW

Note: Available in Tape & Reel.  
Append the letter "T" to the part number. (i.e. LX1686CPWT)

# LX1688 Multiple Lamp CCFL Controller

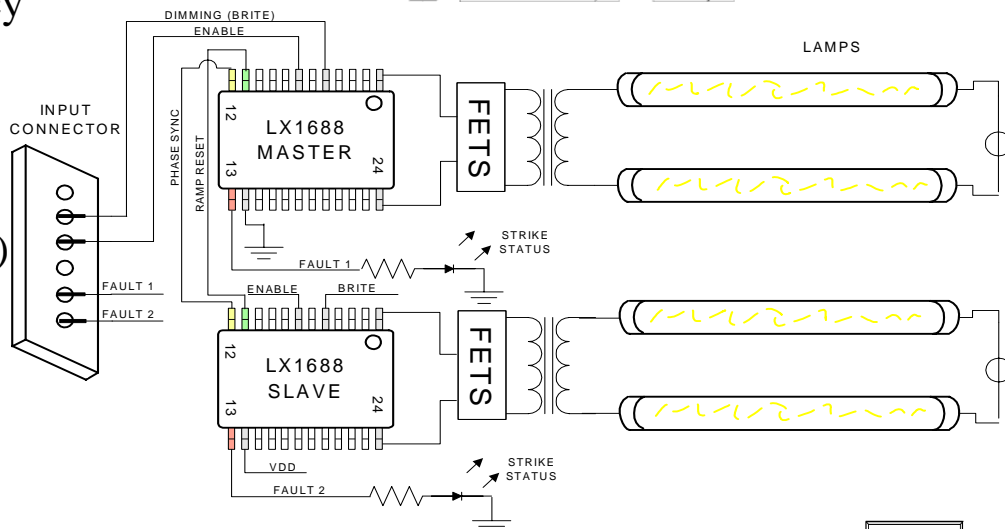
- FEATURES

- Provision to synchronize lamp current & frequency with slave controllers
- Dimming with analog (3:1) or external digital (PWM) methods (>100:1)
- Programmable Fixed frequency
- Adjustable Power-up reset
- ENABLE/BRITE Polarity Selection
- Open lamp timeout circuitry
- Switched VDD output (10mA)

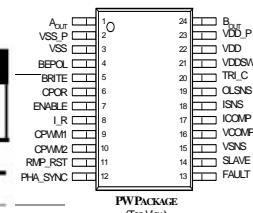


- APPLICATIONS

- Desktop LCD Monitors
- Multiple lamp panels
- Low Ambient Light Displays
- High Efficiency
- Improved Lamp Strike Capability
- Improved Over-Voltage Control

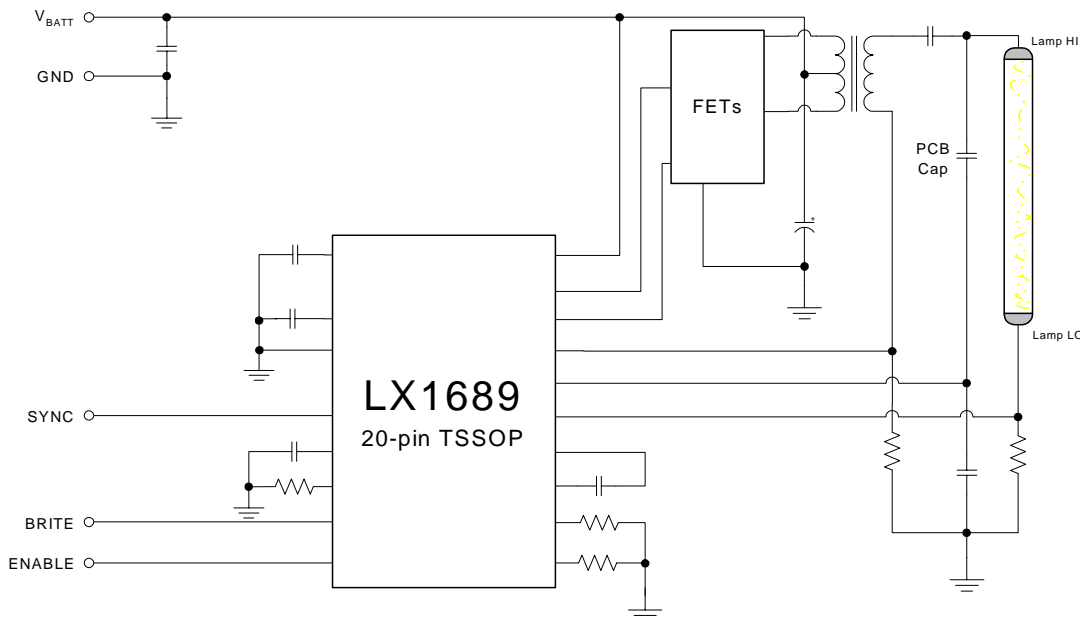


PACKAGE ORDER INFO			
T <sub>J</sub> (°C)	MIN V <sub>DD</sub>	MAX V <sub>DD</sub>	PW Plastic TSSOP 24-Pin
0 to 70	3.0V	5.5V	LX1688CPW
-40 to 85	3.0V	5.5V	LX1688IPW



# LX1689 Highly Integrated Controller

- Targeted at the PDA/handheld/portable market. Also used for notebooks or space critical applications.
- On board LDO's permit direct connection to any supply from 3 to 28V.
- Savings of from 15 to 30 external components depending on module requirements.



## *Complete Inverter BOM*

1	LX1689CPW
1	Transformer
1	Dual FET
7	Resistors
8	Capacitors

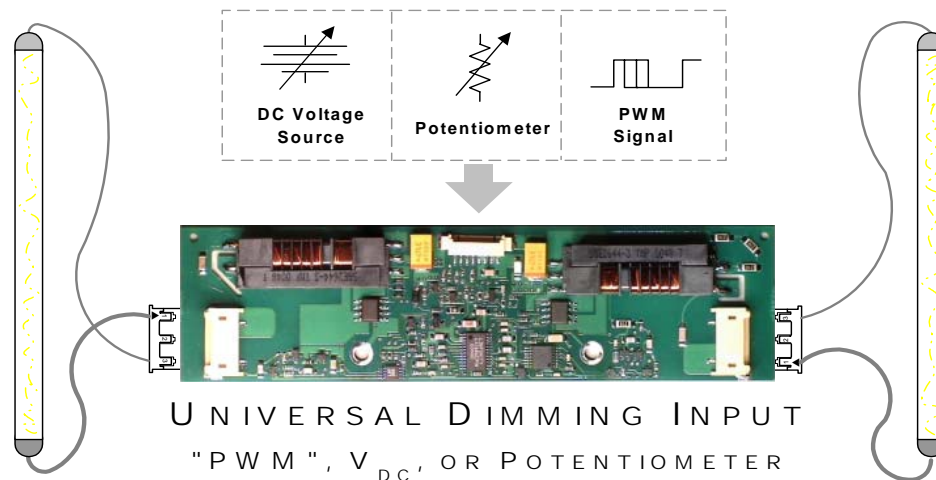
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18 Components Total



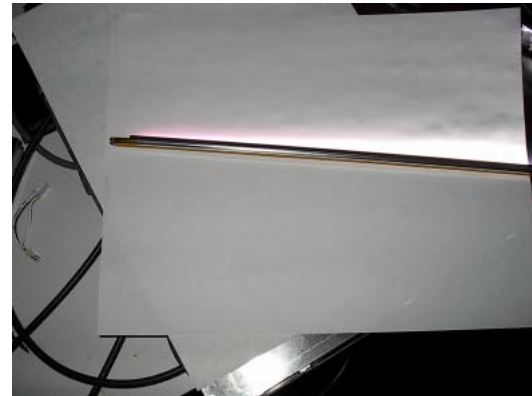
# System Engineering the Optimum CCFL Inverter

Inverters have a host of electrical, mechanical, and reliability requirements that must be *system engineered* in concert with the backlight assembly and the end product to enable the optimum lighting system; whether it be for an LCD television, a desktop monitor, a notebook, or a PDA.



# CCFL Inverter Functions

- Provide a bright, evenly lit display
  - Maximize lamp efficiency (minimize heat, more NITS displays)
  - Closely match brightness of all lamps (thermometer, floating vs. grounded returns), current sharing tolerance
- Provide wide range jitter free dimming
  - Viewing comfort
  - Power savings
  - Lamp life conservation
  - Survive and report lamp faults
  - Arc detect, open and shorted lamps, and wires
  - Intermittent lamp connectors
  - Shut down if fault persists (all lamps or some lamps turn off)
  - Under voltage protection (shut off module)



# Microsemi Inverter Innovations

- Single Stage Topology
  - Direct drive designs maximize system efficiency and extend battery life
- Digital Dimming/Wide Range Brightness
  - RangeMAX dimming technology provides smooth, jitter free, wide range brightness range and advanced power management capability
- Lamp Strike Technique
  - Patented resonant lamp strike generation ensures lamp will strike over cold temperature or CCFL end of life shifts without unnecessary voltage stresses or wasted efficiency
- Industry Benchmark Efficiency
  - Topology results in best optical efficiency (nits/watt) available

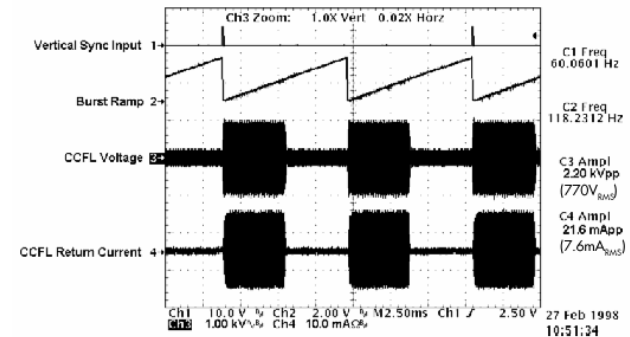
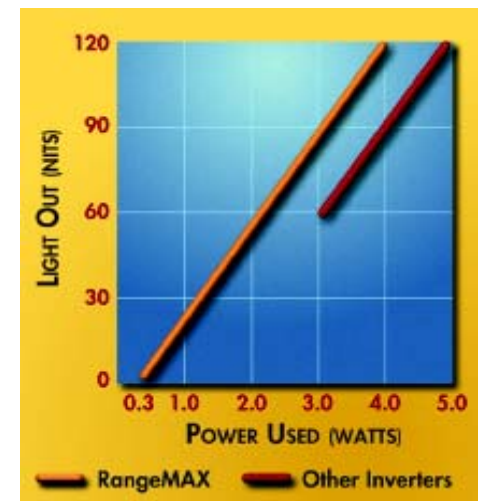
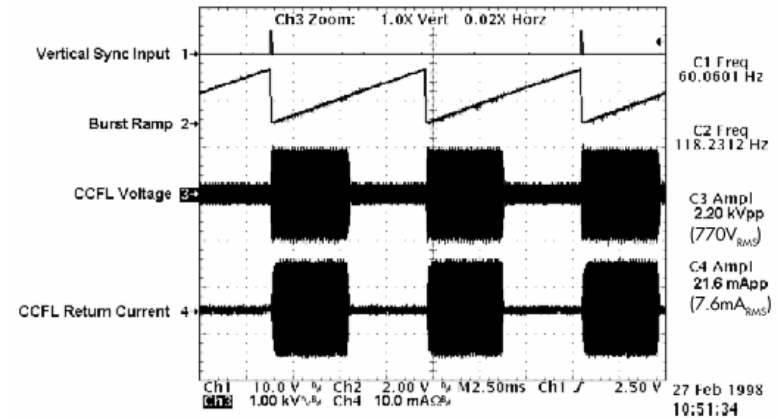
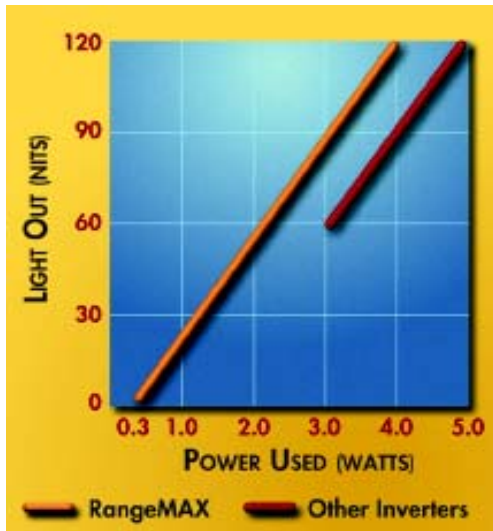


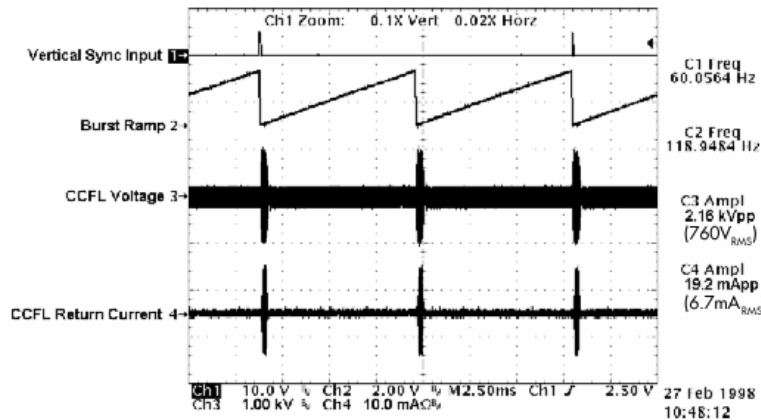
FIGURE 3 — 50% Burst Duty Cycle



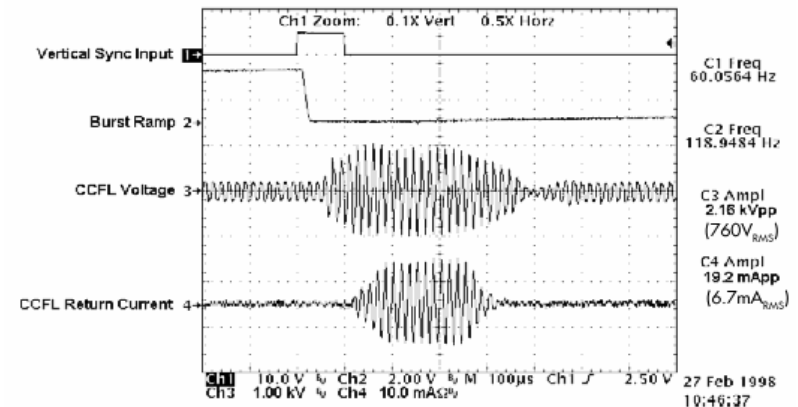
# High Efficiency, Wide Range/Digital Dimming



**FIGURE 3** — 50% Burst Duty Cycle



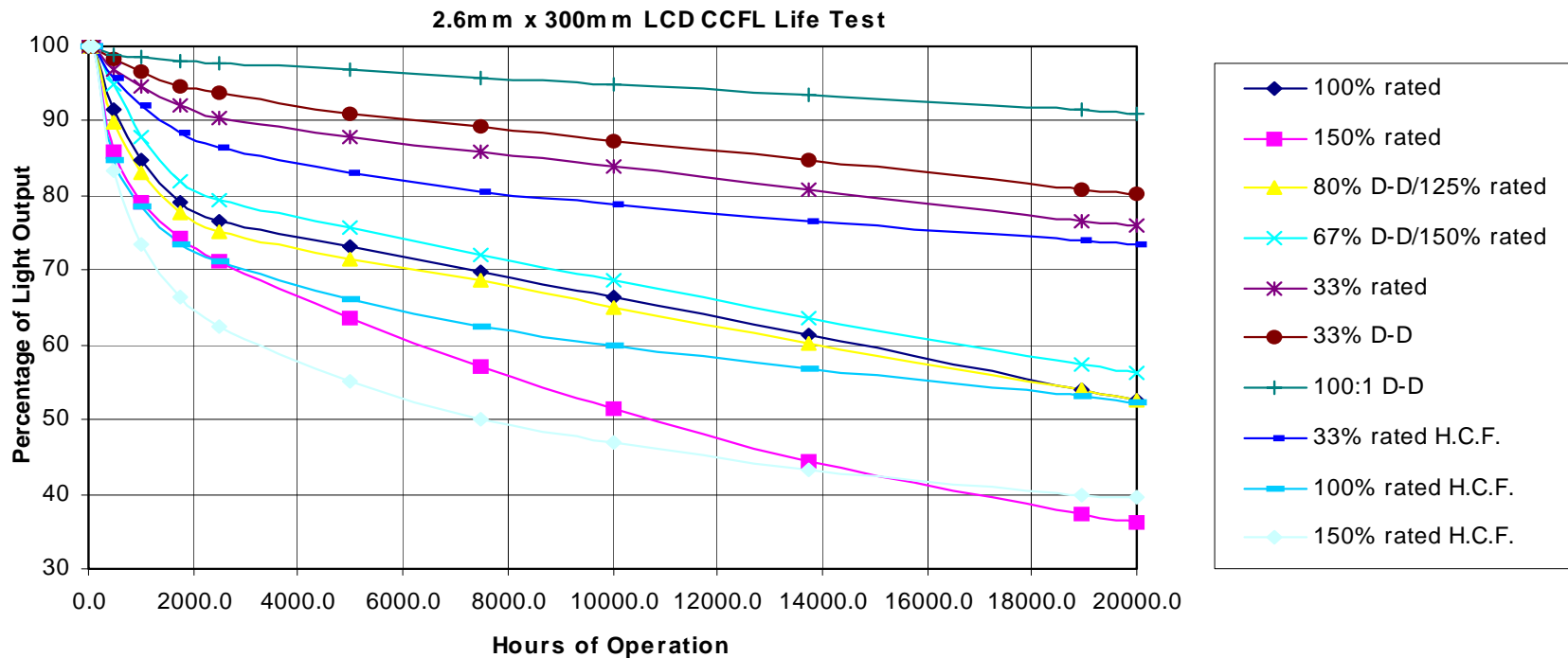
**FIGURE 4** — 2% Burst Duty Cycle



**FIGURE 5** — 2% Burst Duty Cycle (Expanded Time Base)

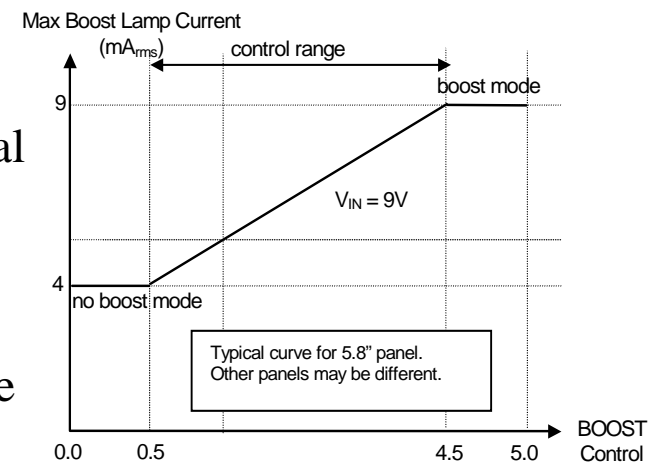
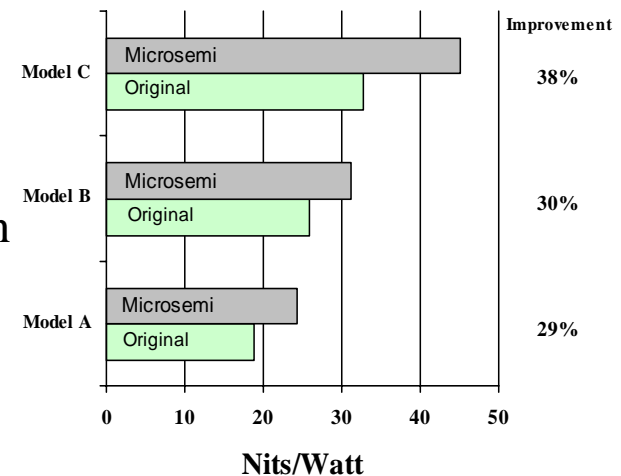
# Lamp Life

- Lamps love digital dimming. 100:1 (2% burst /100% amplitude) provides >80% or >90% light output after 20k hours.
- Lamps do not like 150% overdrive, especially with high crest factor.
- Panels prefer sine waves. 100% rated amplitude was typically 5%-10% more light compared to the “high crest factor” setting.



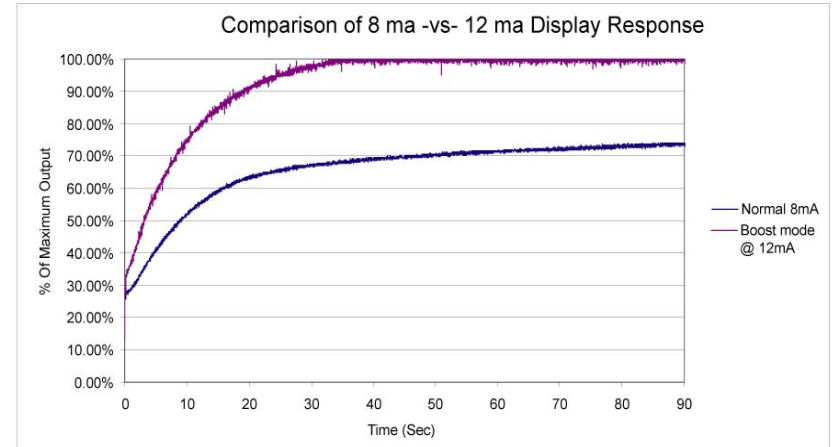
# Microsemi Inverter Innovations

- Open Circuit Voltage Regulation
  - Current and voltage feedback for accurate regulation with complete open and short protection for safety and certifications
- Instant Bright/Dual Drive Mode Technology
  - Guarantees instant light output over wide temperature range applications
- Highly Integrated Design
  - Lowest component count solutions support critical form factor requirements
- Transformer
  - Magnetics designed to eliminate corona discharge for high reliability



# CCFL Inverter Functions

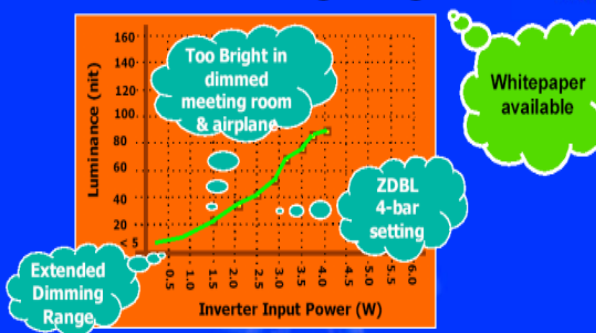
- ‘Low bright’ or ‘lights off’ lamp saver mode
- Automatic Brightness Control
  - Shut down when user inactive, quickly resume to full brightness on demand



Hardware Optimizations – Optimize Backlight Inverter

Intel Developer Forum Spring 2002

## Extended Dimming Range



Extended Dimming Range enables Optimal Backlight power management

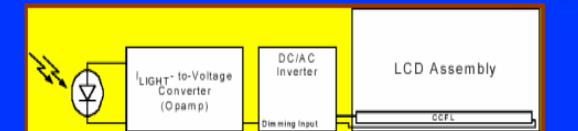
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Hardware Optimizations – Optimize Backlight Inverter

Intel Developer Forum Spring 2002

## Automatic Backlight Control (ABC)



- Light Sensor senses Ambient Light Condition & Converts to Analog Voltage
- DC/AC Inverter adjusts output power & Brightness Level accordingly
  - If Ambient Light is High, increase brightness
  - If Ambient is Low, decrease brightness
- Integrated Light-to-SMBus (L-to-S) sample in Q1'02
  - SMC or Graphic Controller interface with L-to-S
  - LCD Brightness level is optimally controlled

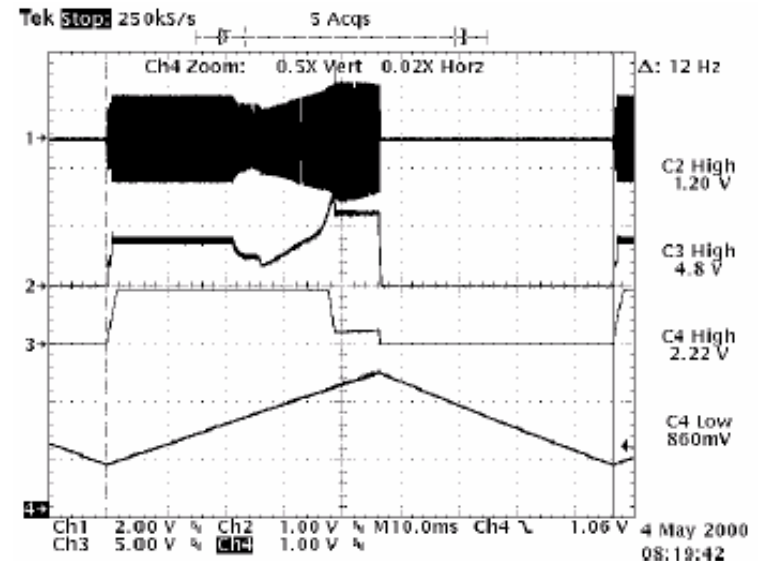
ABC with Ambient Light Sensor extends battery life

Intel Labs

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# CCFL Inverter Functions

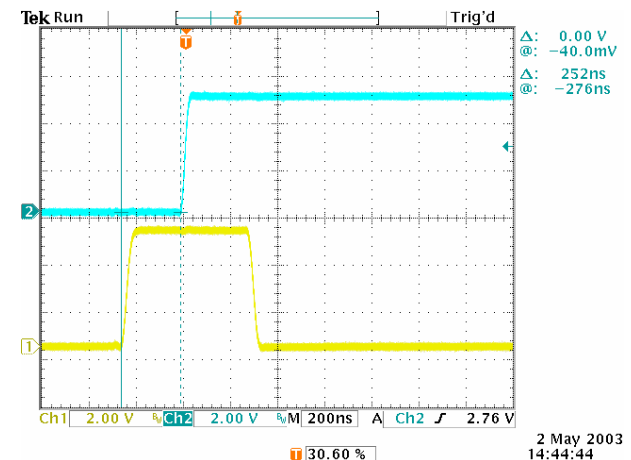
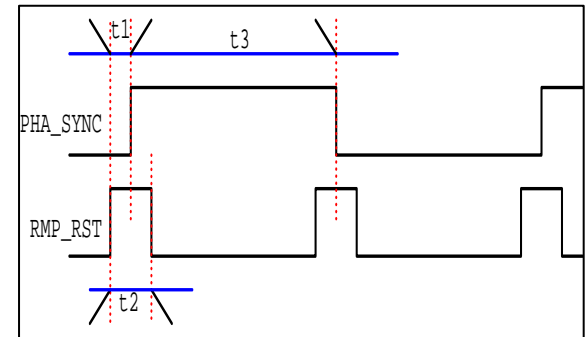
- Powerful and reliable lamp striking
  - Strike power should be generated only when needed
    - improves electrical efficiency via lower parasitic losses
    - Increases reliability via lowered voltage stresses
  - Must strike lamp at cold temperature and end of life
- Minimize emissions
  - Electromagnetic and electrostatic field containment
- Pass agency testing
  - UL, FCC, TUV, etc.



Chan 1 TP4 (capacitive divider)  
Chan 2 P14 (VSNS)  
Chan 3 P15 (VCOMP)  
Chan 4 P24 (TRI\_C)

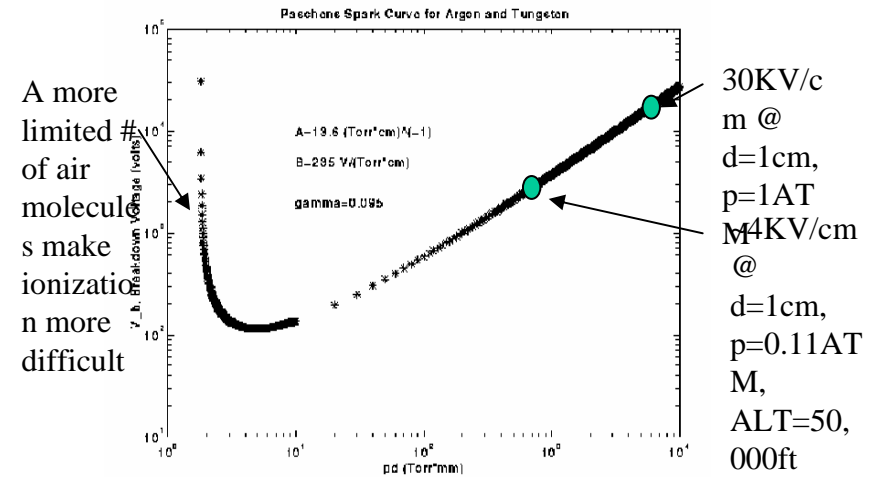
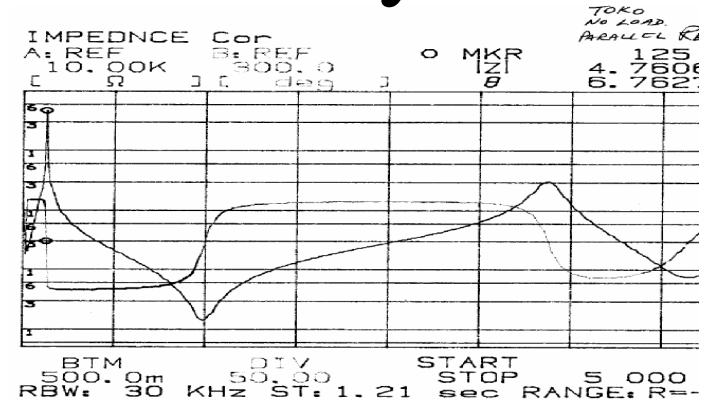
# CCFL Inverter Functions

- Minimize electrical interference with host system
  - Synchronize to a horizontal frequency: duty cycle, burst frequency, any skips in sync signal?
  - Power supply noise and ripple can disturb downstream audio and video signals
  - Radiated high frequency noise can disturb sensitive receivers
  - Upstream power supply noise or level shifts can cause backlight brightness to flicker
  - Power sequence (enable, sync)
  - Inrush current (digital dimming with staggered phases)



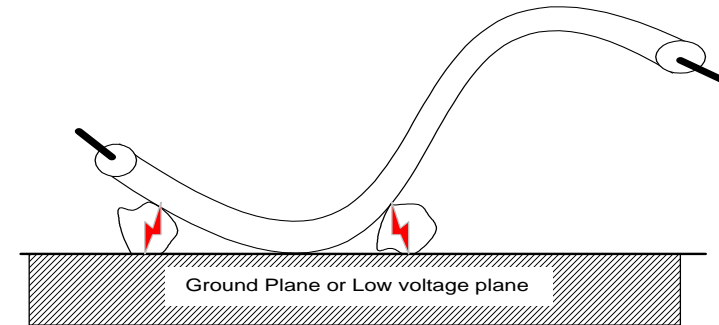
# CCFL Inverter Reliability

- Most inverter failures involve high voltage or high power components
  - HV transformers
  - Ballast capacitors
  - PCB insulation
  - Intermittent opens in lamp connections



# CCFL Inverter Reliability

- High voltage transformers are biggest failure problem
- Exposure to continuous high voltage generates corona discharge that destroys insulation
- Even momentary exposure to over stress can cause arcing and instant destruction
- Transformer drive transistor failure is often a secondary result of transformer failures
- Control IC failure is often a secondary result of drive transistor failure



Corona is caused by the electric field next to an object exceeding the breakdown value for air (or whatever it is immersed in).



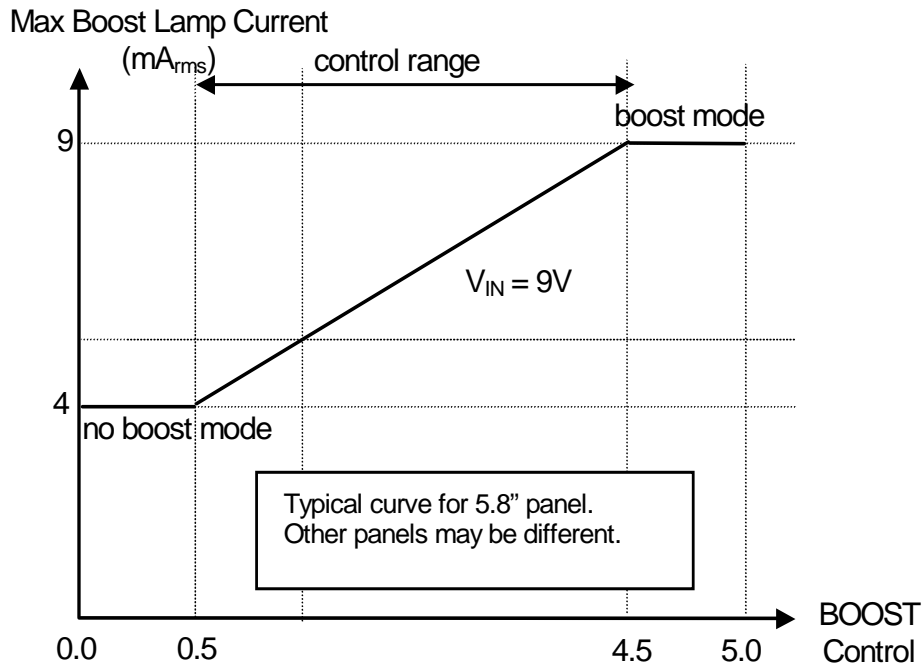
## CCFL Inverter Cost

- Microsemi recognizes the need for low cost.
- Our current solutions are competitive in cost and superior in performance.
- The Product roadmap will produce new totally system engineered solutions this year that are even higher performance at dramatically lower cost.



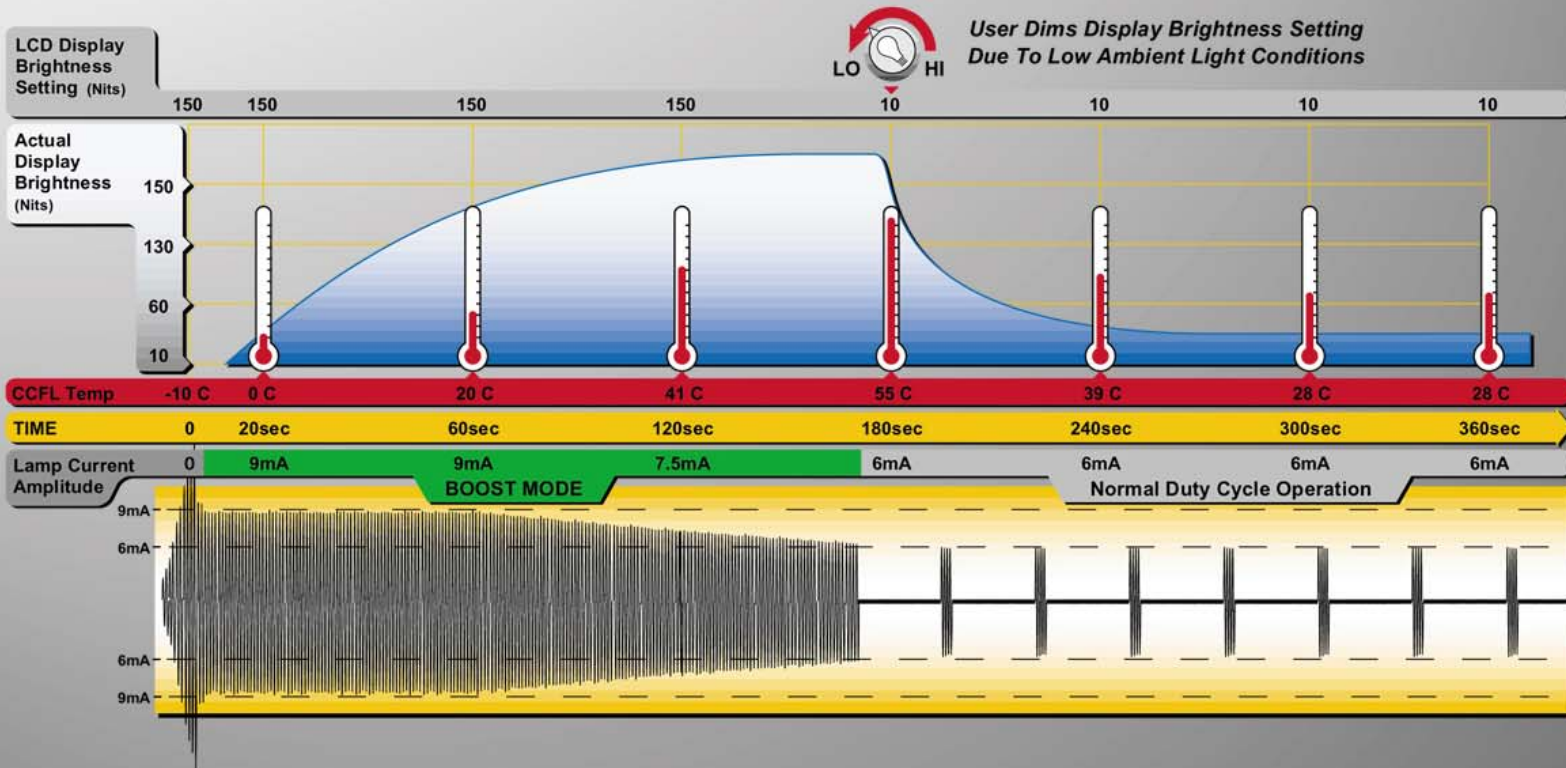
# Automotive Application Requirements

# Wide Temperature, and Wide Dimming Applications

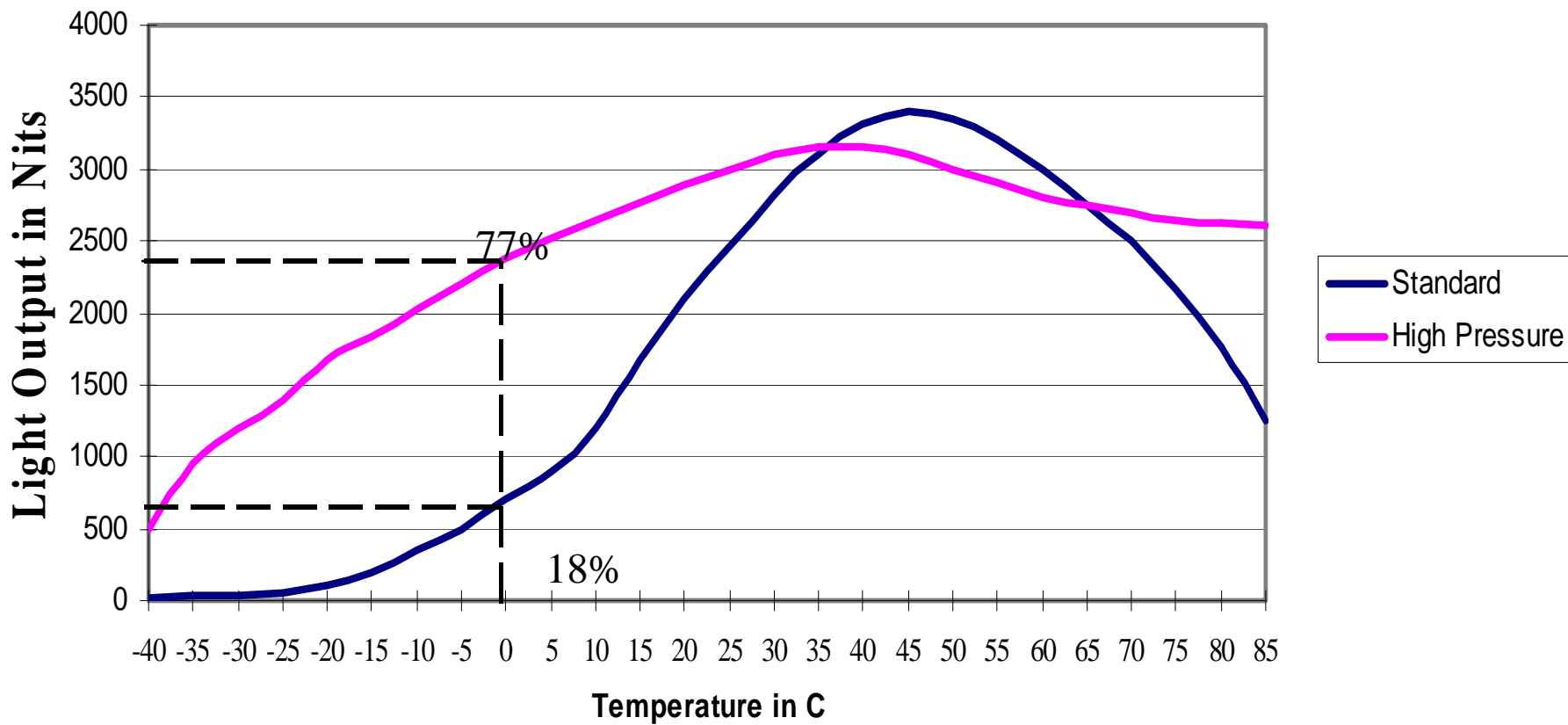


# Automotive Requirements

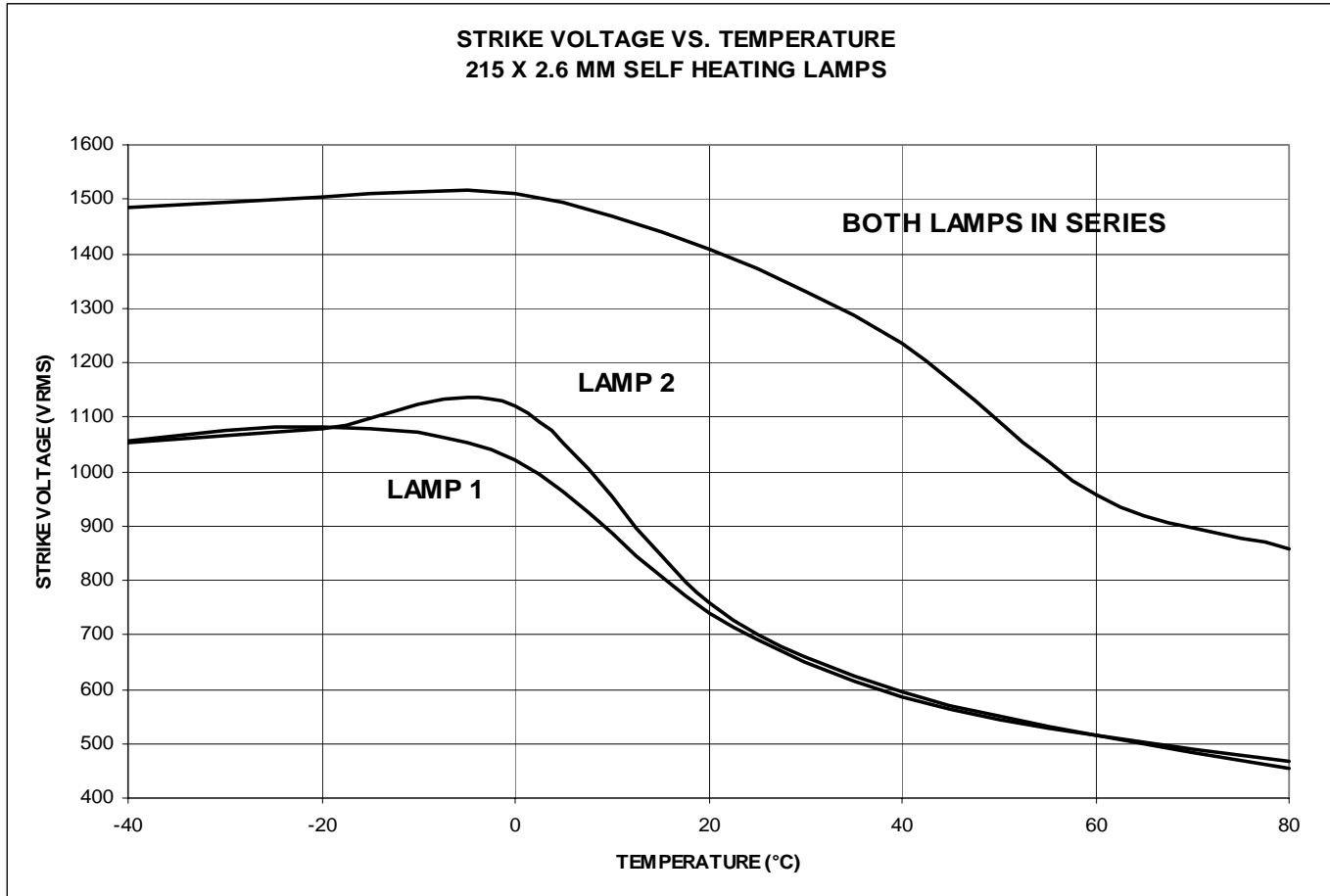
LCD Application: AutoPC with GPS Navigation System    Time: 7:15 p.m., December 4, 2001  
 Place: Sioux Falls, South Dakota    Temp: -10 C



## Light Output Vs. Temperature



# Strike Voltage Change Over Temp



# Automotive Module Development History

- Microsemi introduced the “Hi Pressure/Self Heating inverter technology to the market in 1998. This replaced a “problematic” resistive wire approach that many customers were developing
- Customer feedback was good on initial won initial programs with Visteon, Delphi and numerous German and European automakers despite additional hurdles to overcome.
- High pressure lamp technology begins new automotive standard.
- Sharp and Philips product sets industry benchmarks and exceeds performance of other current automotive systems (boost mode, dim range, fault detection/shutdown)
- Thermal detection and light detection become future critical aspect for “Auto” market

# Microsemi Automotive Position

- Microsemi CCFL solutions in approx 36 vehicles at this time
  - Business level has doubled in past year
- LX1686/LX1688 is dominant control IC. LX1689 used in several niche, low performance applications
- Module component counts (BOM) range from 85 to 131 depending on module functionality
- Dimming range trend, (worldwide) is moving to a higher level .
  - Greater than ( > ) 100:1 at the system level (200:1 + at the inverter level)
- EMI, Fault detection, design complexity and cost continue to dominate “problems/issues”
- Development efforts continue
  - LX1696 controller will release to production in 2005-Q3
  - Mercury free LED and Xenon efforts underway
  - Automatic brightness, optical feedback system in development
    - Availability of Xenon sample material is limited

# Future Improvements

- Design Complexity
- EMI
- Cost
- Quality/Reliability

# Typical CCFL Solution Topologies

Controller	Package	Typical Applications Topology
<b>LX1686</b>	<b>TSSOP24</b>	<b>Direct Drive, Half Bridge, Full Bridge</b>
<b>LX1688</b>	<b>TSSOP24</b>	<b>Direct Drive, HB, FB, Multi controllers</b>
<b>LX1689</b>	<b>TSSOP20</b>	<b>Direct Drive, HB, FB</b>
<b>LX1691</b>	<b>TSSOP16</b>	<b>Low cost, Direct Drive, HB, FB</b>
<b>LX1696*</b>	<b>TSSOP16</b>	<b>Automotive, Full Bridge, Resonant</b>
<b>LX1695</b>	<b>SOIC</b>	<b>Royer Supervisor</b>

*\* Half and Full Bridge can be configured*

# LX1696 Project Update

- Systems engineering is evaluating silicon. Full functionality.
- Limited samples available March 1
- Final silicon in May.
- Release to production in August
- Microsemi is interested in “select” Beta Sites for this solution evaluation

# Strategic Plan

- Design Complexity
  - LX1696 will reduce component count by 45 – 60 devices
  - Protection, Timeout and Shut Down function is integrated into controller
  - Topology is designed for 5 - 20 Volt operation
  - Optical feedback is showing potential for simplification
- EMI
  - Full Bridge Resonant architecture provides sinusoidal waveform over entire voltage range
  - Shields and “line” protection requirements will remain
  - New continuous mode architecture
- Cost
  - Lower component BOM cost
  - New transformers available to replace “dual” approach (12watt)
  - Elimination of current sense element in many designs
- Quality
  - QS9000 certification completed (TS16949 certification scheduled for 2005)
  - Additions to automotive Quality staff to handle growth in business
  - DPPM in 200 range with active plan to reduce below 100
  - New control IC’s developed within QS9000 system
  - Integration of fault/shutdown circuitry and elimination of selected high voltage magnetics
  - New generation magnetics

# LX1686 to LX1696 Comparison

- LX1686
  - High crest factors at 8-17 volt input (Direct Drive)
  - High EMI issues due to drive waveform and half bridge architecture
  - Dim Range-
    - Ext PWM design.
    - Internal PWM
  - V synch capable in internal dim mode
  - No internal open lamp shutdown
  - No internal short detection circuitry
  - No internal circuitry for timeout and strike trial
  - No internal UV lockout circuitry ( low vehicle battery)
  - No internal OV clamp or shutdown
- LX1696
  - Sinusoidal from 5 - 24 volts input
  - Reduced Component Count
  - Reduced EMI
  - Dim Range-
    - Ext PWM design. - No Change
    - Internal PWM - Slight improve
  - Integrated Programmable Fault shutdown
    - Open lamp (1)
    - Integrated short circuit protection (1)
    - Integrated timer and timeout control (1)
  - Not required due to low  $V_{in}$  design (2)
  - Not required due to 24 Volt operation (2)
    - (1) provides reduction of 30 discrete components
    - (2) provides reduction of approx 20 discrete components

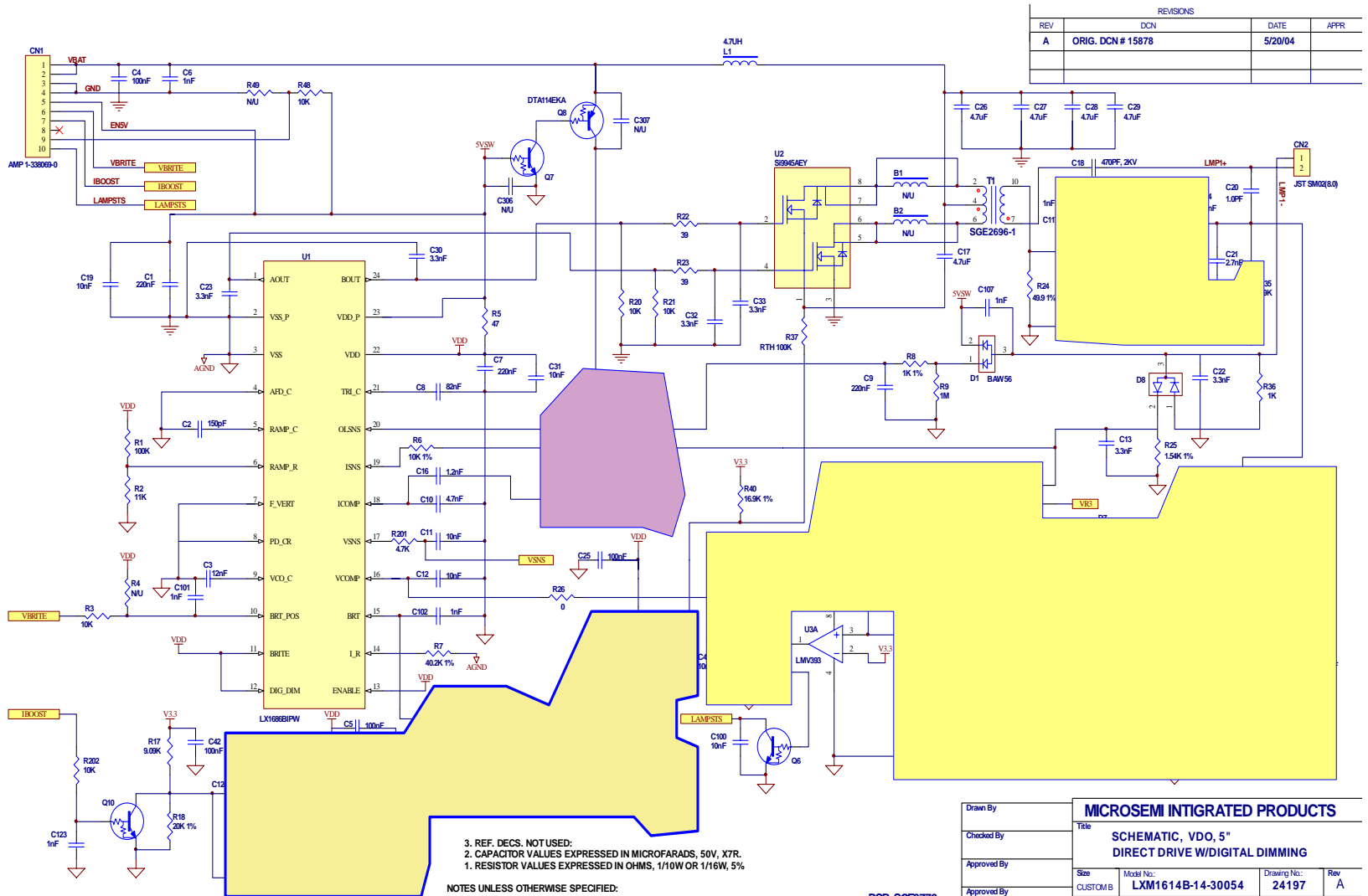
# Solution Comparison

	<b>LX1686B based</b>	<b>LX1696 Based</b>	<b>Diff</b>
<b>Res</b>	45	20	25
<b>Cap</b>	51	24	27
<b>TR</b>	11	6	5
<b>Diode</b>	7	6	1
<b>XFMR</b>	1	1	0
<b>IC</b>	1	1	0
<b>FET</b>	1	2	-1
<b>Linear Ics</b>	3	1	2
<b>Connectors</b>	2	2	0
<b>Inductor</b>	1	1	0
<b>PCB</b>	1	1	0
<b>Total</b>	<b>124</b>	<b>65</b>	<b>59</b>

Note: LX1686B based – LXM1614B-14-30054 Module



# Integrated into LX1696 or improved



REVISIONS			
REV	DCN	DATE	APPR
A	ORIG. DCN # 15878	5/20/04	

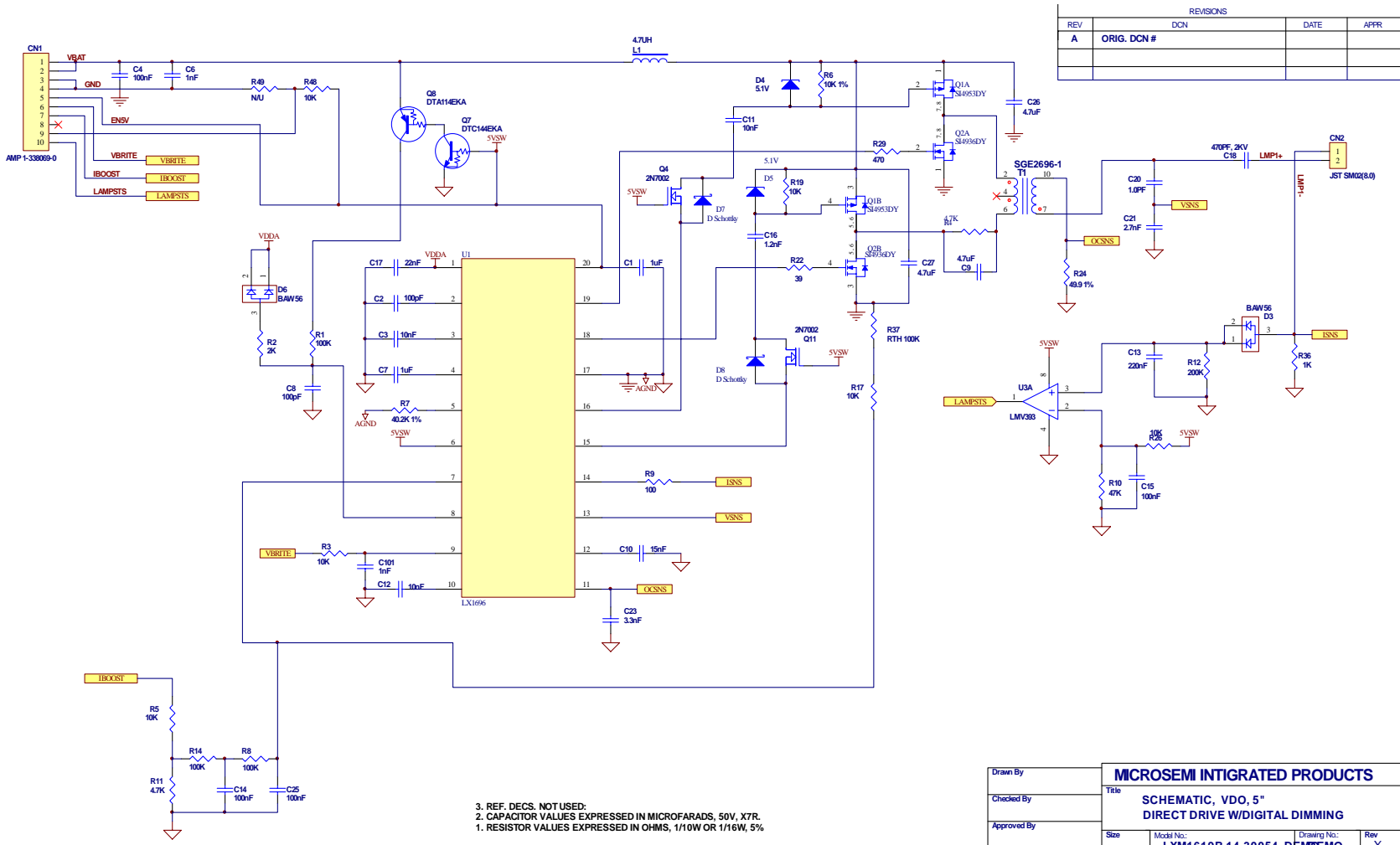
Drawn By	<b>MICROSEMI INTEGRATED PRODUCTS</b>			
Checked By	Title <b>SCHEMATIC, VDO, 5" DIRECT DRIVE W/DIGITAL DIMMING</b>			
Approved By	Size	Model No:	Drawing No:	Rev
Approved By	CUSTOM B	LXM1614B-14-30054	24197	A
File: 24197A_DUMP.SCH	Date: 1/24/2005	SHEET 1 OF 1		

PCB: SGE2772



# Microsemi

## LX1696 Based Solution



REVISIONS			
REV	DCN	DATE	APPR
A	ORIG. DCN #		

3. REF. DECS. NOT USED:  
 2. CAPACITOR VALUES EXPRESSED IN MICROFARADS, 50V, X7R.  
 1. RESISTOR VALUES EXPRESSED IN OHMS, 1/10W OR 1/16W, 5%

NOTES UNLESS OTHERWISE SPECIFIED:

PCB: SGE2772

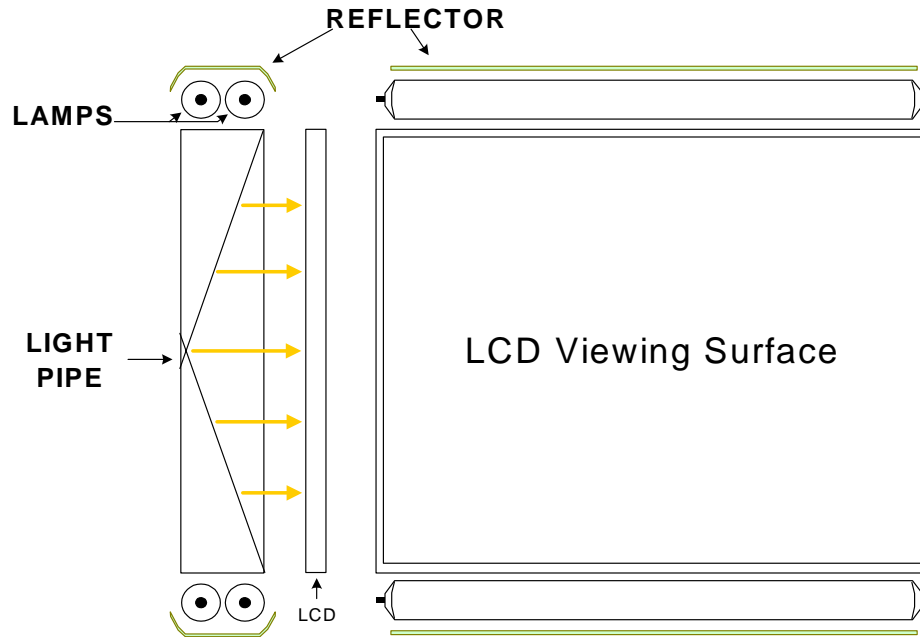
Drawn By	MICROSEMI INTEGRATED PRODUCTS			
Checked By	Title			
Approved By	SCHEMATIC, VDO, 5" DIRECT DRIVE W/DIGITAL DIMMING			
Approved By	Size	Model No.	Drawing No.	Rev
	CUSTOM B	LXM1619B-14-30054_DEM	DEM050	X
	File: LX1696_ref.SCH	Date: 1/24/2005	SHEET 1 OF 1	

# Summary

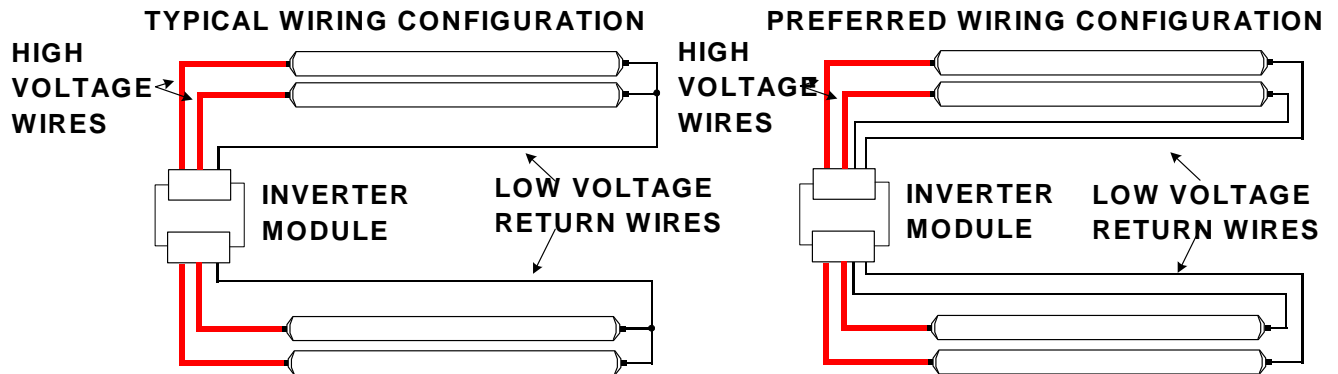
- Development efforts in place to support next generation products
- Improved reliability and EMI performance due to new architectures
- Simplified designs due to architectures
- LCD television growth will improve automotive display cost structure
- LX1696 Automotive Prototype modules will be available in
  - 2005-Q2
- EMI data will be available in July timeframe
- IC and transformer developments capable of providing 30% to 40% saving at module level
- Looking for strong Mercury free partner
- We will continue to innovate products in this marketplace

# Inverter Topologies and Current Balance Techniques

# Desktop monitor & LCD-TV CCFL inverters

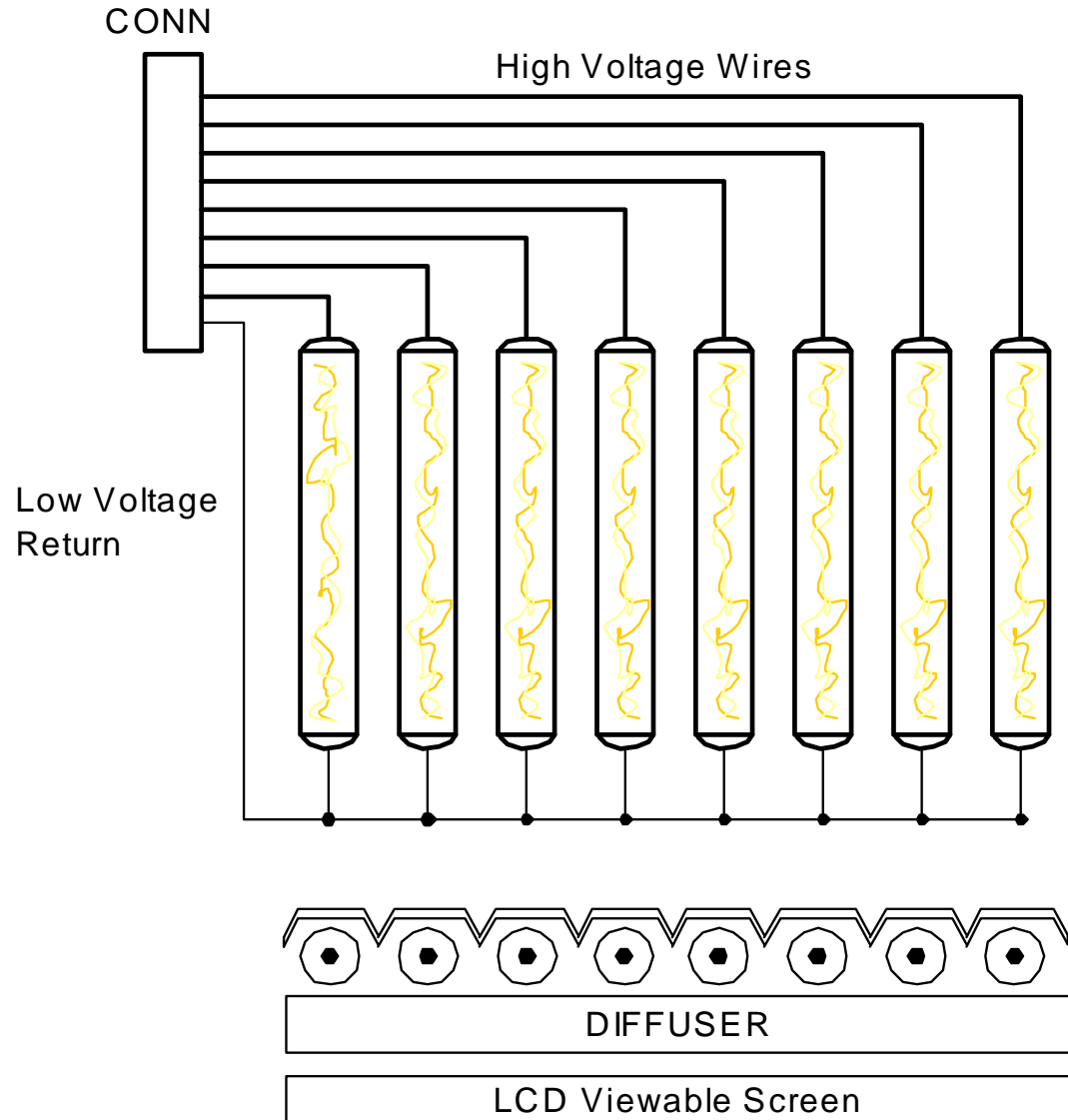


**Four lamp edge lit:  
2 top, 2 bottom**



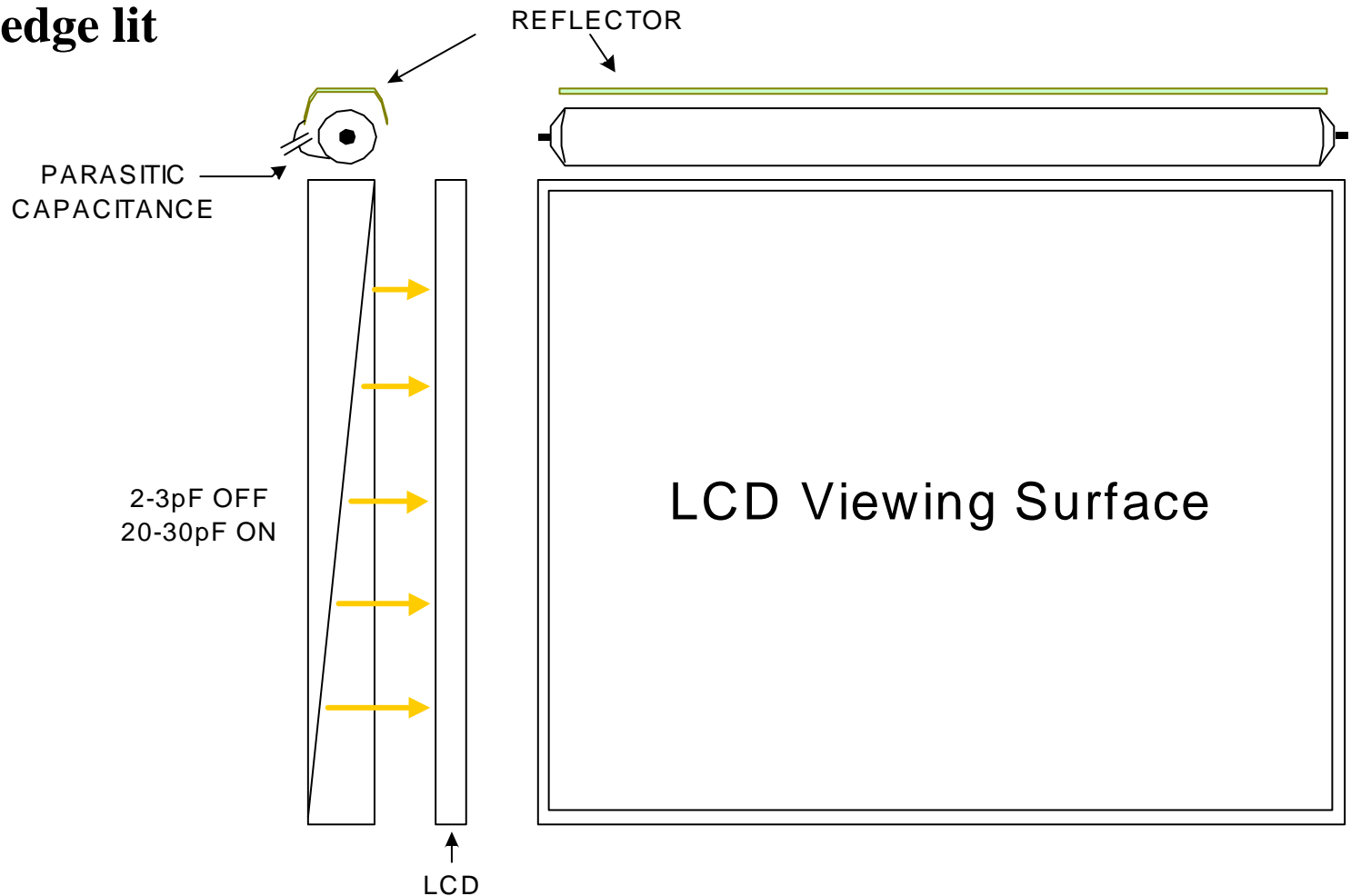
# Desktop monitor & LCD-TV CCFL inverters

**Eight lamp back lit:  
evenly distributed**



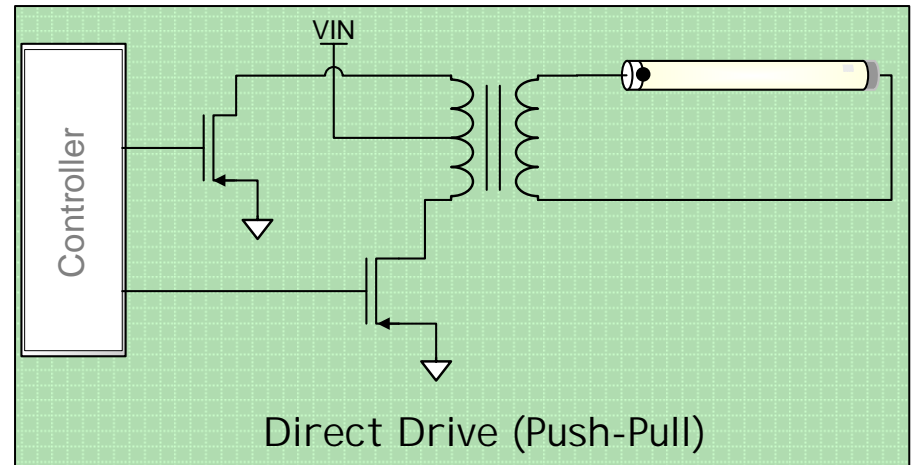
# Notebook CCFL Inverters

## Single lamp, edge lit



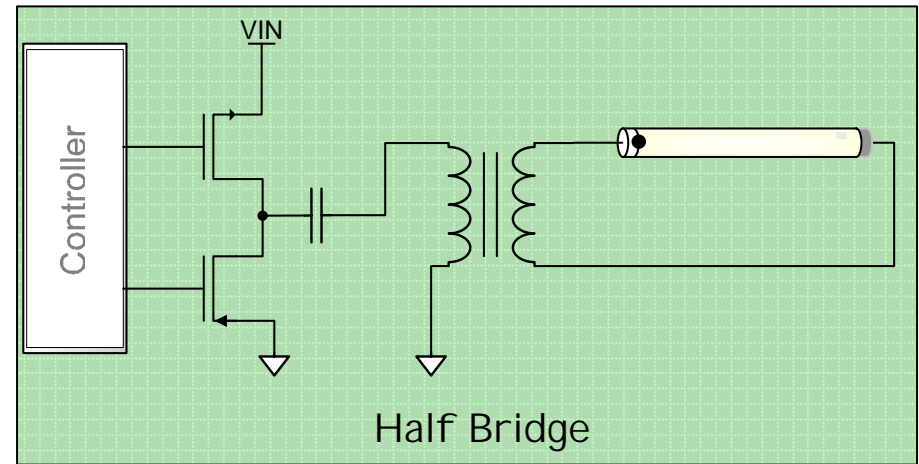
# Inverter Topology

- Best for Narrow VIN Range
- Lowest Component Count
- Lowest BOM Cost
- High Efficiency (nits/watt)
- High VDS Rating Required
- Higher Switching Losses
- Higher EMI



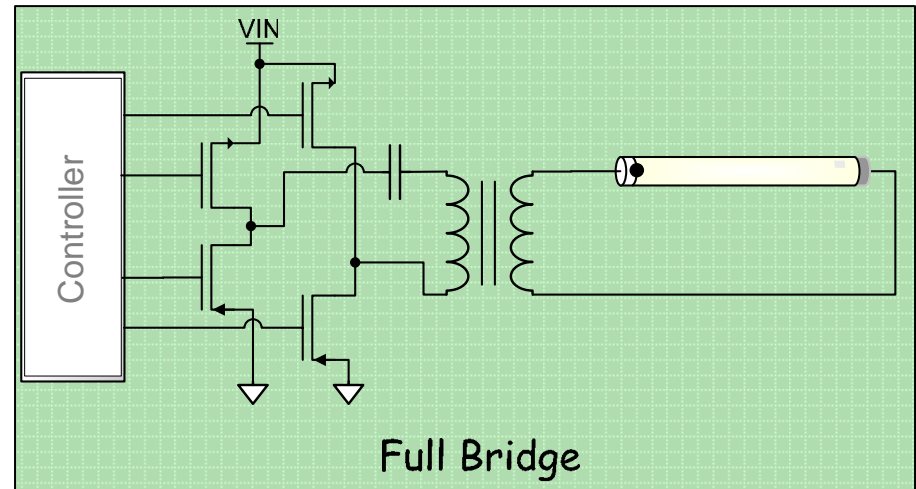
# Inverter Topology

- Best for  $V_{IN} > 40VDC$
- Moderate Component Count
- Moderate BOM Cost
- High Efficiency
- Moderate VDS Rating Required
- Moderate MOSFET Losses
- Moderate EMI



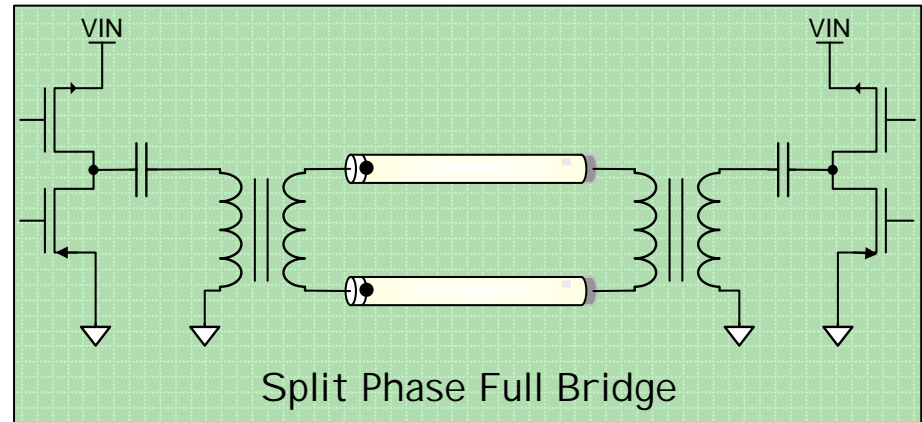
# Inverter Topology

- Supports Wide VIN Range
- Good Current Waveform
- Low VDS Rating
- High Efficiency
- Low MOSFET Losses
- Low EMI
- Higher Component Count
- Higher BOM Cost (MOSFETs, Gate Drivers)

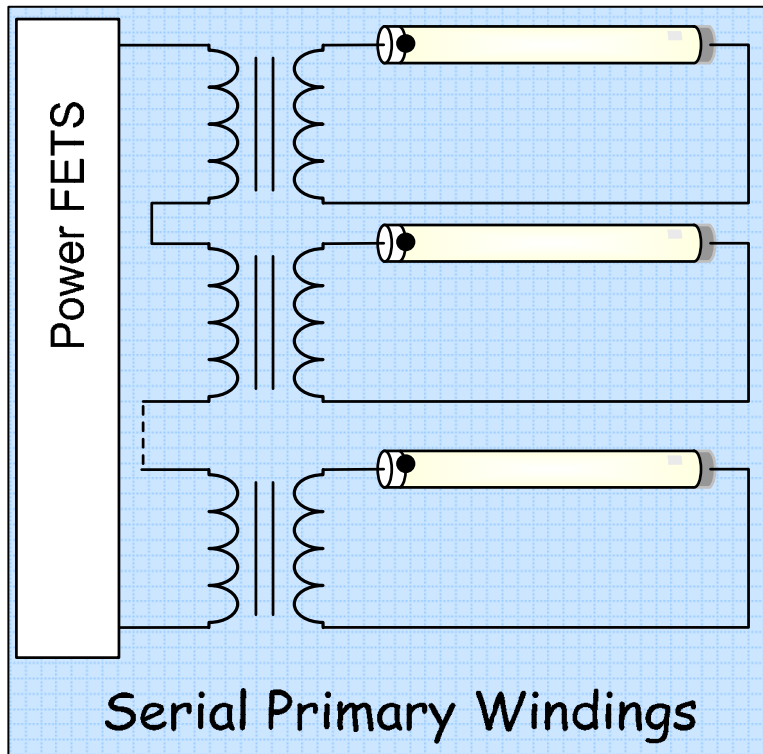


# Inverter Topology

- Even Lighting with Long Lamps
- Floating Lamp Loads (Reduced Parasitic Losses)
- Same Performance as Full Bridge
- Load May Also be Grounded
- 2 Lamps / 1 Controller



# Lamp Current Balance Methods



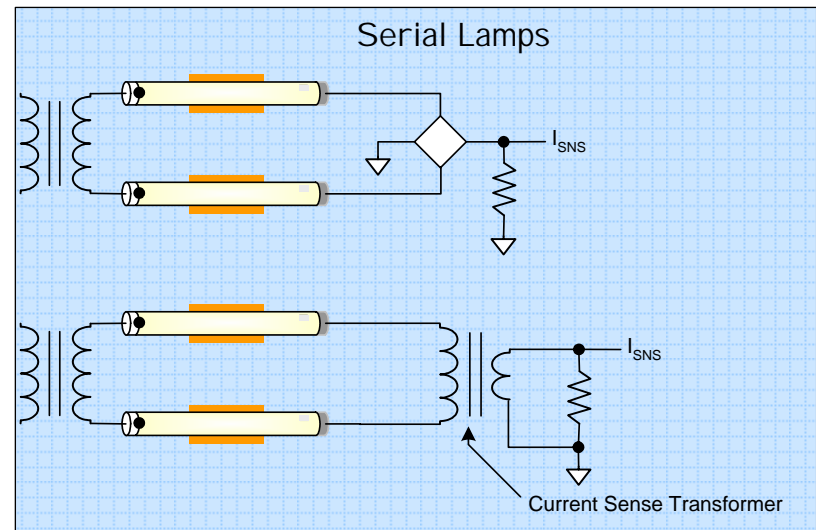
- For Matched Transformers

$$I_{\text{SEC}} = I_{\text{PRI}} / \text{Turns Ratio}$$

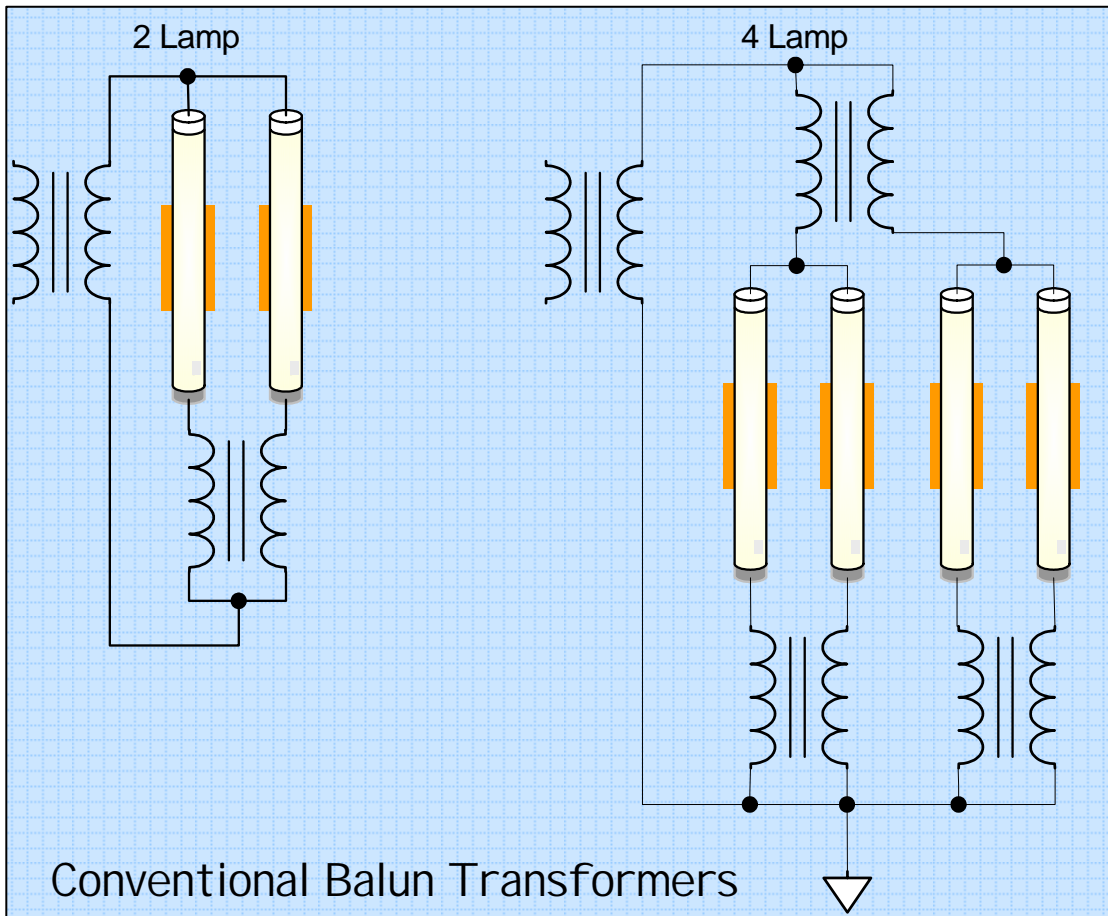
# Lamp Current Balance Methods

- 2 Lamps / Transformer
- Grounded and Floating Configurations
  - (Floating may Require HV Current Sense Transformer)

$$V_{\text{STRIKE}(2)} \approx V_{\text{STRIKE}(1)} + V_{\text{RUN}} \\ \approx 1.5 \times \text{SingleLampStrike}$$



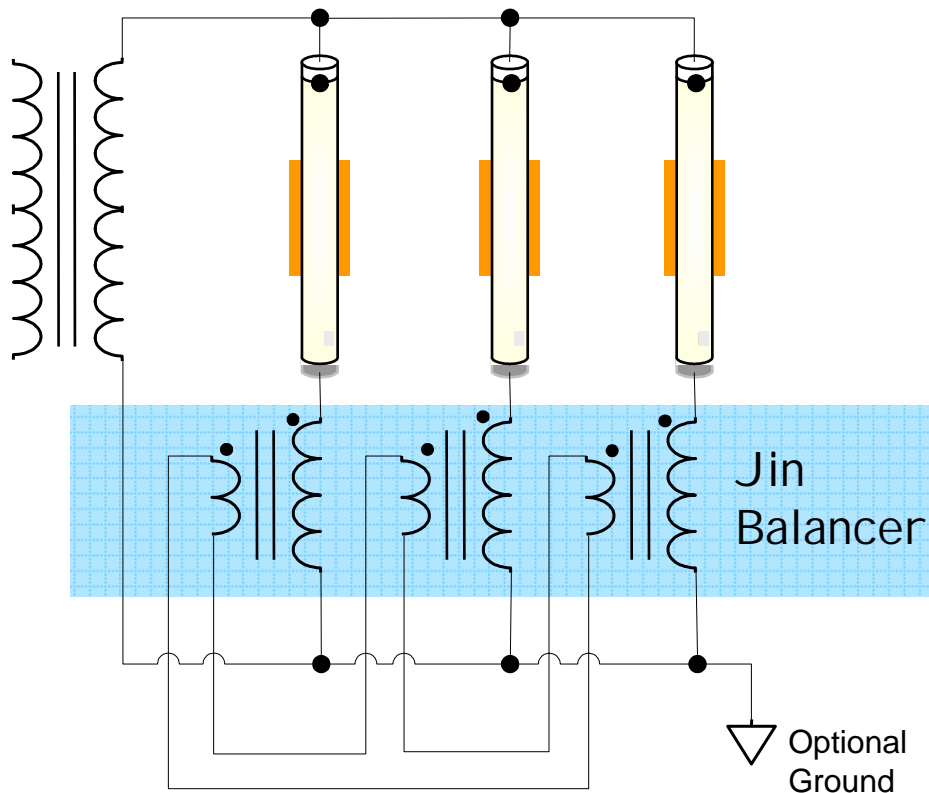
# Lamp Current Balance Methods



- Number Baluns =  $N-1$   
( $N$ =number of Lamps)
- Lower Cost Than One Transformer / Lamp

# Lamp Current Balance Methods

*Microsemi Patent Protected*

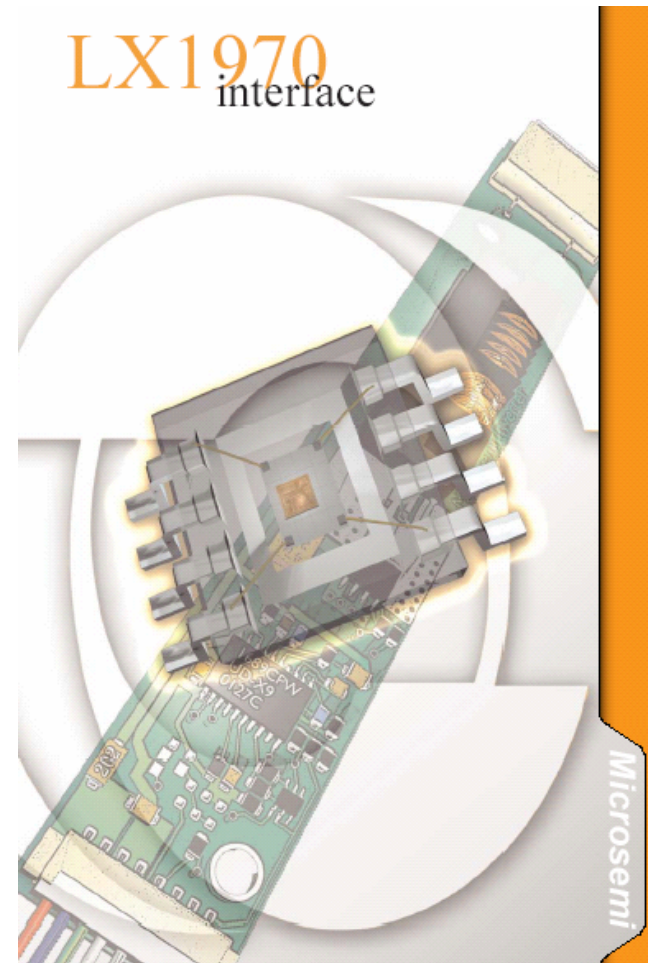


The "Jin Balancer"

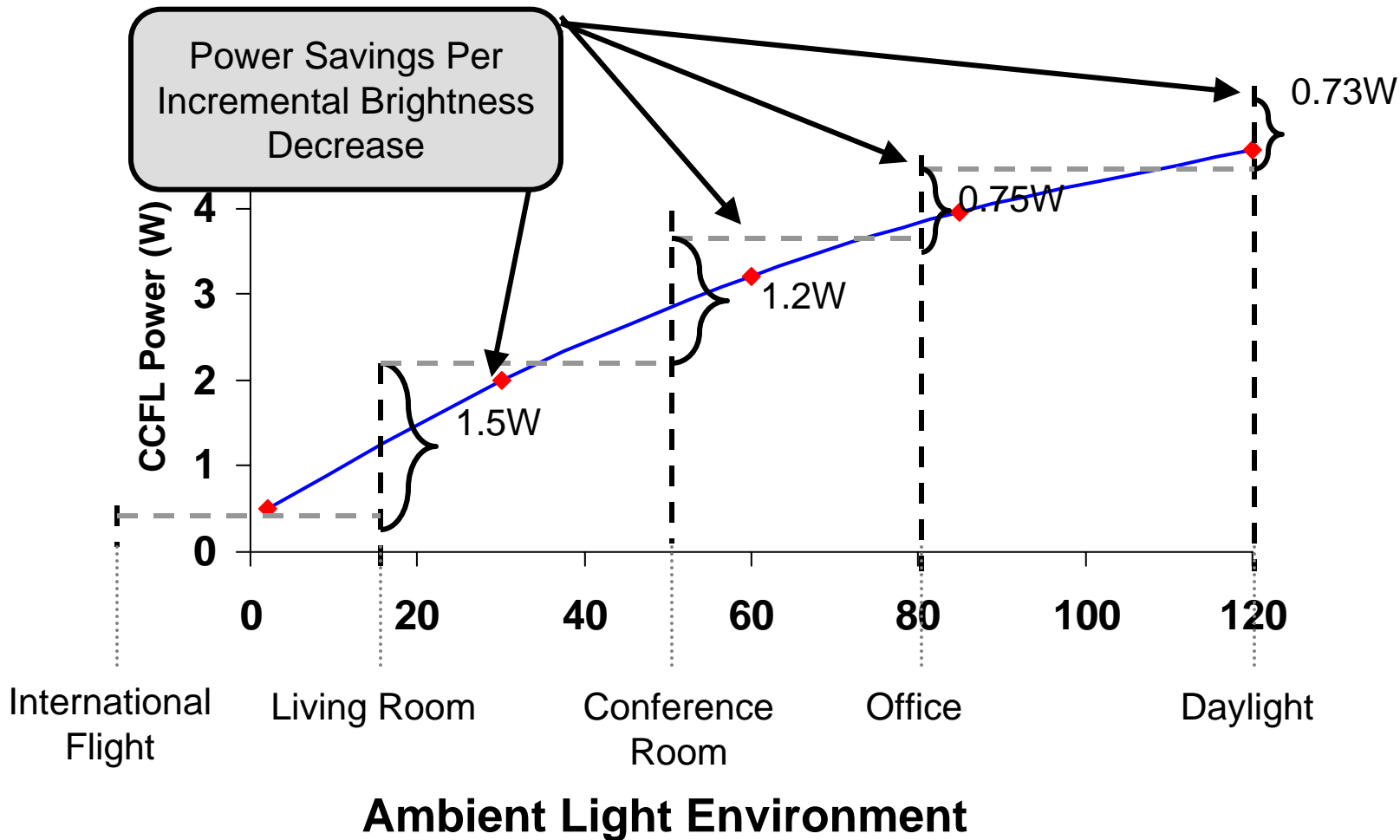
- Forces All Lamp Currents to Same Value by Adjusting Lamp Voltage
- Lower Cost Than 1 Transformer per Lamp
- Allows Floating and Grounded Lamp
- Works With Any Number of Lamps from Two and Up
- Easy Fault Detection

# LX1970 Ambient Light Detector

- Typical Display Users will not adjust display brightness levels to match ambient light conditions
- When users do make adjustments, they will not dim the system to the same level as an “automatic” control system. The eye begins rapidly adjusting to the display brightness level and the end user does not take advantage of the lower level or the reduced power
- *Automatic Brightness can enhance ergonomics, save power, extend battery life and provide end product differentiation*

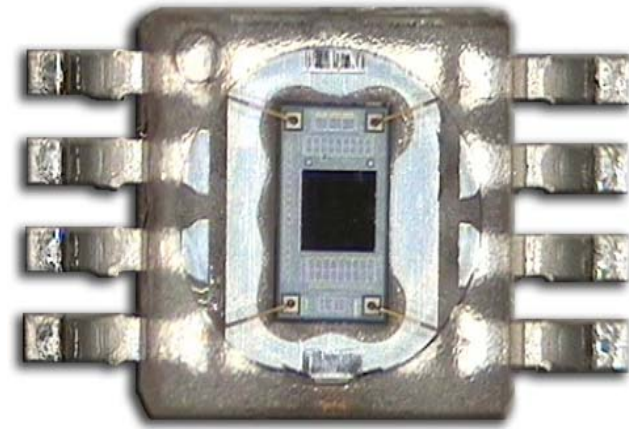
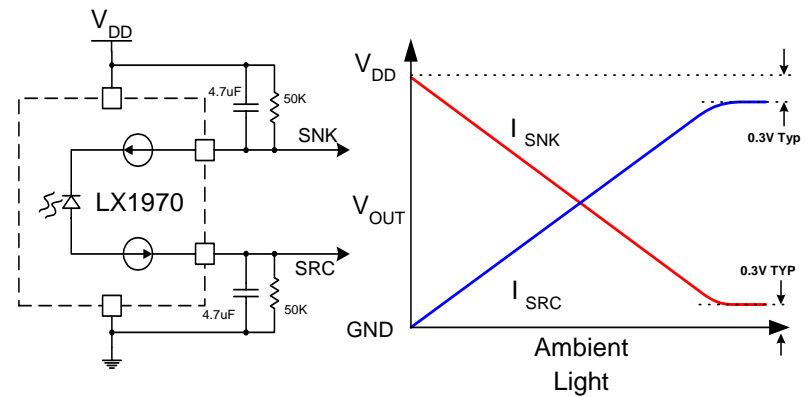


# Ambient Brightness vs. CCFL Power Consumption (auto-mode)



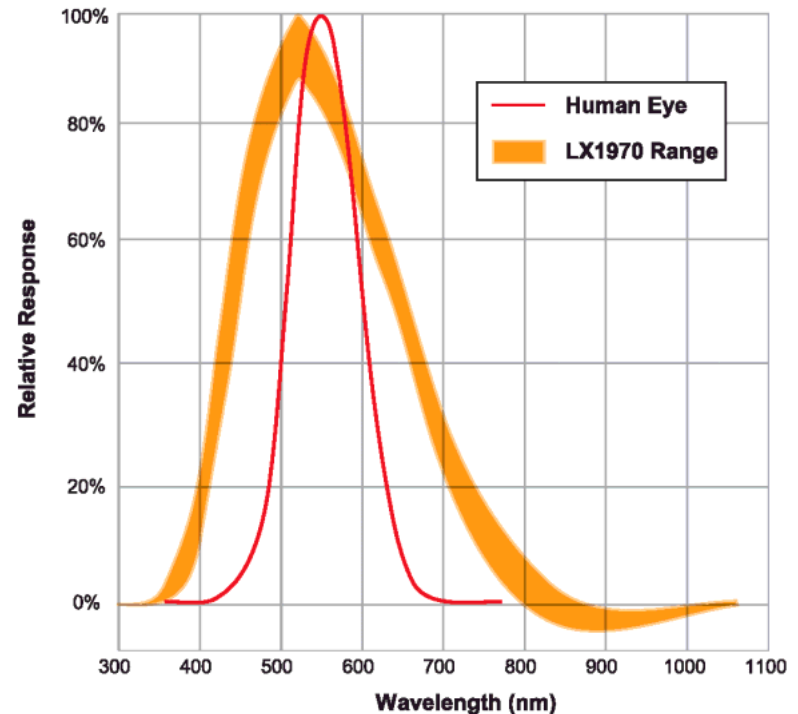
# LX1970

- World's Best Ambient Light Sensor
- Available Now
- Easiest Implementation
- Lowest Cost
  - The LX1970 Is Not A Phototransistor!!
- Current Source Outputs
- Will Alter Any Brightness Adjustment Signal For Any Application
- Smallest PCB Area Implementation

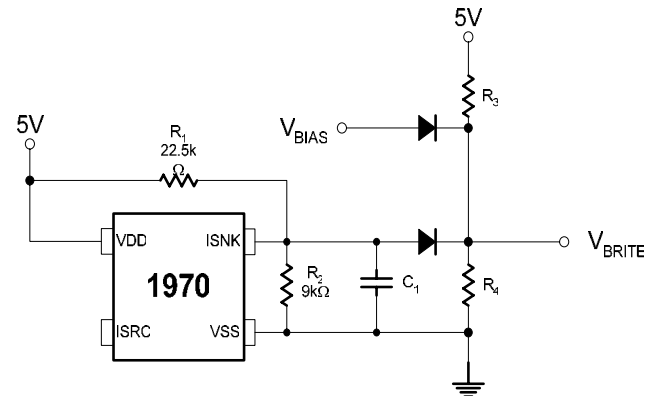
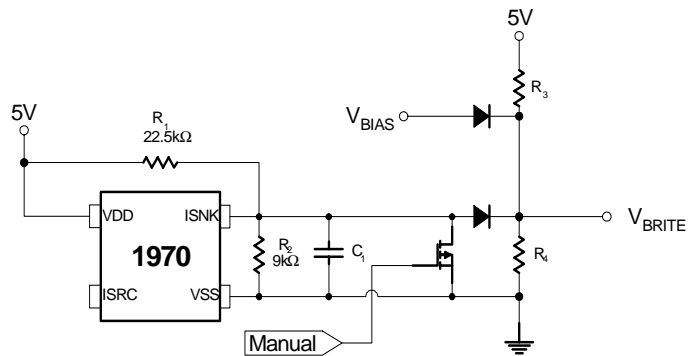
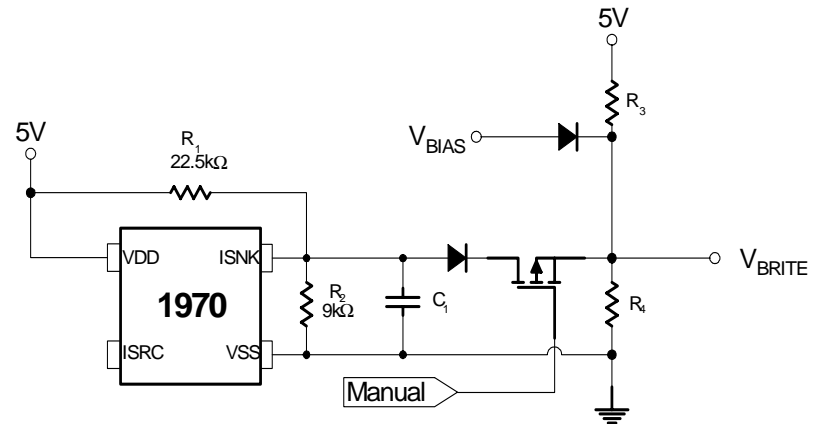
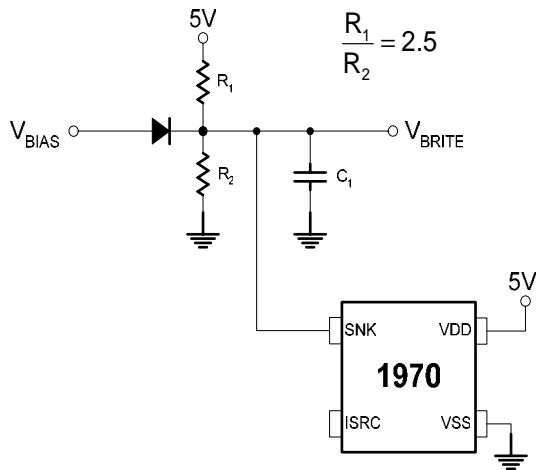


# LX1970

- Human Eye Response
  - Eliminates interference from UV and IR Sources
  - IR sources can be IRDA, Heat, security alarms.
  - UV sources are typically fluorescent lights.
  - The sun has the whole spectrum.

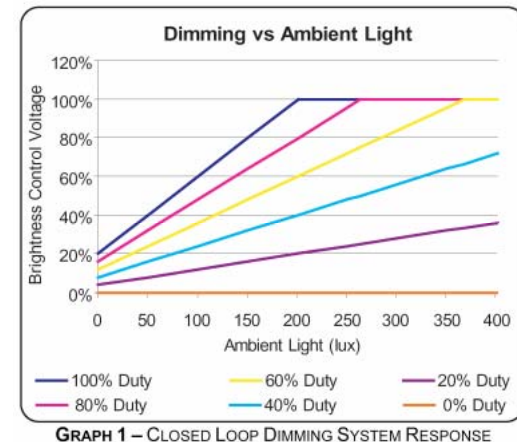
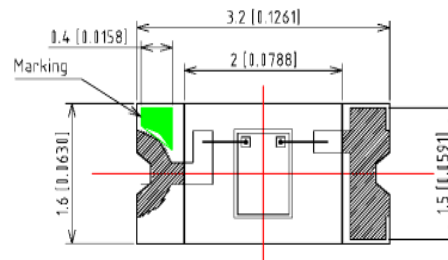
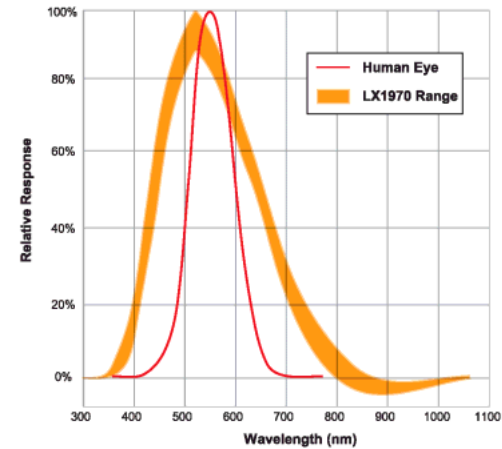


# Applications



# LX1972

- Key Features
  - 1206 Package
  - Two-pin
  - Same Spectral Response In a much smaller package– No UV/IR
  - Still integrates the gain amplifier
  - Cost competitive with a traditional silicon photodiode
  - Total Power used is 600 $\mu$ W Max
- Applications
  - Cell phone
  - DSC
  - PDA
  - Notebook



GRAPH 1 – CLOSED LOOP DIMMING SYSTEM RESPONSE

# LED Drivers

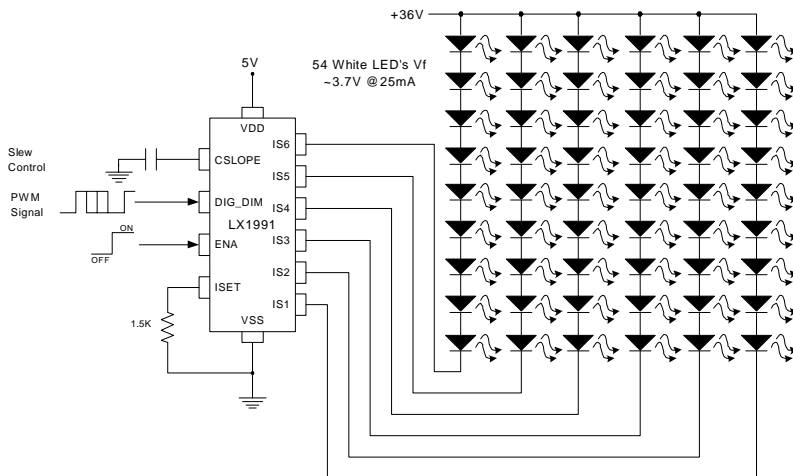
- Parallel Drive (Current)

- LX1990:

- 2.7-5Vin
- Dual output
- Iout up to 30mA/ch
- Analog and Digital Dim

- LX1991:

- 6 outputs, 40Vout
- 50 White, Blue; 100 Green, Red, Yellow
- 500:1 Dimming



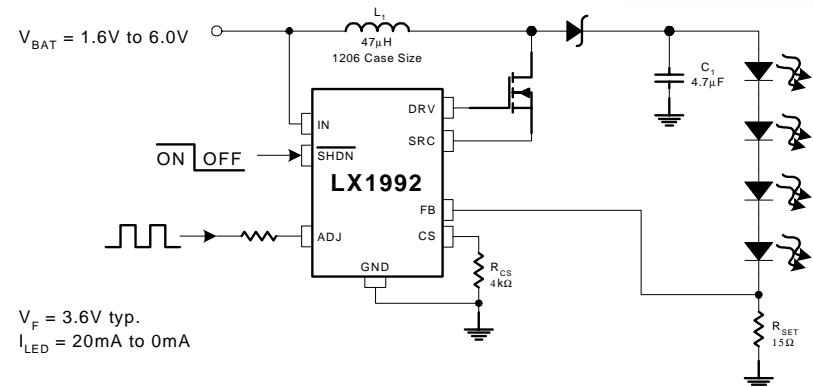
- Series Drive (Voltage)

- LX1994:

- 1.6-6Vin
- Programmable output Current
- Ext. MOSFET needed
  - Iout max 150mA

- LX1995:

- Internal MOSFET
- Iout max 30mA
- Easy design



# Summary

- Microsemi continues to innovate and provide CCFL controllers to the display world with a new objective toward “performance/price” goals
- RangeMAX is the highest efficiency inverter on the market and will expand into other end product areas with dedicated focus teams
- Microsemi is positioned with a revised product roadmap and applications support to develop a “Partnership”
- Many new products including a complete set of Power Management building blocks and next generation controllers for lighting with complete solutions