UNITED STATES DISTRICT COURT

for the

EASTERN DISTRICT OF TEXAS

SINOTECHNIX, LLC *Plaintiff* v. SAMSUNG ELECTRONICS CO., LTD., et al. *Defendant*	))))))	Civil Action No. 2:24-cv-00544-JRG-RSP

SUBPOENA TO PRODUCE DOCUMENTS, INFORMATION, OR OBJECTS OR TO PERMIT INSPECTION OF PREMISES IN A CIVIL ACTION

To: LUMILEDS, LLC
370 West Trimble Road, San Jose, California, 95131

(Name of person to whom this subpoena is directed)

☑ *Production:* **YOU ARE COMMANDED** to produce at the time, date, and place set forth below the following documents, electronically stored information, or objects, and to permit inspection, copying, testing, or sampling of the material: See Attachments A-C

Place:	Date and Time:
Desmarais LLP 101 California St. San Francisco, CA	02/13/2025 5:00 pm

❒ *Inspection of Premises:* **YOU ARE COMMANDED** to permit entry onto the designated premises, land, or other property possessed or controlled by you at the time, date, and location set forth below, so that the requesting party may inspect, measure, survey, photograph, test, or sample the property or any designated object or operation on it.

Place:	Date and Time:

The following provisions of Fed. R. Civ. P. 45 are attached – Rule 45(c), relating to the place of compliance; Rule 45(d), relating to your protection as a person subject to a subpoena; and Rule 45(e) and (g), relating to your duty to respond to this subpoena and the potential consequences of not doing so.

Date: 02/05/2025

CLERK OF COURT

OR

Signature of Clerk or Deputy Clerk

/s/ Lee J. Matalon
Attorney's signature

The name, address, e-mail address, and telephone number of the attorney representing *(name of party)* Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. , who issues or requests this subpoena, are:

Lee J. Matalon, Desmarais LLP - 230 Park Ave, New York, NY 10169 - (212) 808-2918 - LMatalon@DLLP.com

Notice to the person who issues or requests this subpoena

If this subpoena commands the production of documents, electronically stored information, or tangible things or the inspection of premises before trial, a notice and a copy of the subpoena must be served on each party in this case before it is served on the person to whom it is directed. Fed. R. Civ. P. 45(a)(4).

Civil Action No. 2:24-cv-00544-JRG-RSP

PROOF OF SERVICE

(This section should not be filed with the court unless required by Fed. R. Civ. P. 45.)

I received this subpoena for *(name of individual and title, if any)* _____

on *(date)* _____ .

❒ I served the subpoena by delivering a copy to the named person as follows: _____

_____

_____ on *(date)* _____ ; or

❒ I returned the subpoena unexecuted because: _____

_____ .

Unless the subpoena was issued on behalf of the United States, or one of its officers or agents, I have also tendered to the witness the fees for one day's attendance, and the mileage allowed by law, in the amount of $ _____ .

My fees are $ _____ for travel and $ _____ for services, for a total of $ 0.00 .

I declare under penalty of perjury that this information is true.

Date: _____

_____
Server's signature

_____
Printed name and title

_____
Server's address

Additional information regarding attempted service, etc.:

Federal Rule of Civil Procedure 45 (c), (d), (e), and (g) (Effective 12/1/13)

(c) Place of Compliance.

(1) ***For a Trial, Hearing, or Deposition.*** A subpoena may command a person to attend a trial, hearing, or deposition only as follows:
(A) within 100 miles of where the person resides, is employed, or regularly transacts business in person; or
(B) within the state where the person resides, is employed, or regularly transacts business in person, if the person
(i) is a party or a party's officer; or
(ii) is commanded to attend a trial and would not incur substantial expense.

(2) ***For Other Discovery.*** A subpoena may command:
(A) production of documents, electronically stored information, or tangible things at a place within 100 miles of where the person resides, is employed, or regularly transacts business in person; and
(B) inspection of premises at the premises to be inspected.

(d) Protecting a Person Subject to a Subpoena; Enforcement.

(1) ***Avoiding Undue Burden or Expense; Sanctions.*** A party or attorney responsible for issuing and serving a subpoena must take reasonable steps to avoid imposing undue burden or expense on a person subject to the subpoena. The court for the district where compliance is required must enforce this duty and impose an appropriate sanction—which may include lost earnings and reasonable attorney's fees—on a party or attorney who fails to comply.

(2) ***Command to Produce Materials or Permit Inspection.***
(A) *Appearance Not Required.* A person commanded to produce documents, electronically stored information, or tangible things, or to permit the inspection of premises, need not appear in person at the place of production or inspection unless also commanded to appear for a deposition, hearing, or trial.
(B) *Objections.* A person commanded to produce documents or tangible things or to permit inspection may serve on the party or attorney designated in the subpoena a written objection to inspecting, copying, testing, or sampling any or all of the materials or to inspecting the premises—or to producing electronically stored information in the form or forms requested. The objection must be served before the earlier of the time specified for compliance or 14 days after the subpoena is served. If an objection is made, the following rules apply:
(i) At any time, on notice to the commanded person, the serving party may move the court for the district where compliance is required for an order compelling production or inspection.
(ii) These acts may be required only as directed in the order, and the order must protect a person who is neither a party nor a party's officer from significant expense resulting from compliance.

(3) ***Quashing or Modifying a Subpoena.***
(A) *When Required.* On timely motion, the court for the district where compliance is required must quash or modify a subpoena that:
(i) fails to allow a reasonable time to comply;
(ii) requires a person to comply beyond the geographical limits specified in Rule 45(c);
(iii) requires disclosure of privileged or other protected matter, if no exception or waiver applies; or
(iv) subjects a person to undue burden.
(B) *When Permitted.* To protect a person subject to or affected by a subpoena, the court for the district where compliance is required may, on motion, quash or modify the subpoena if it requires:
(i) disclosing a trade secret or other confidential research, development, or commercial information; or
(ii) disclosing an unretained expert's opinion or information that does not describe specific occurrences in dispute and results from the expert's study that was not requested by a party.
(C) *Specifying Conditions as an Alternative.* In the circumstances described in Rule 45(d)(3)(B), the court may, instead of quashing or modifying a subpoena, order appearance or production under specified conditions if the serving party:
(i) shows a substantial need for the testimony or material that cannot be otherwise met without undue hardship; and
(ii) ensures that the subpoenaed person will be reasonably compensated.

(e) Duties in Responding to a Subpoena.

(1) ***Producing Documents or Electronically Stored Information.*** These procedures apply to producing documents or electronically stored information:
(A) *Documents.* A person responding to a subpoena to produce documents must produce them as they are kept in the ordinary course of business or must organize and label them to correspond to the categories in the demand.
(B) *Form for Producing Electronically Stored Information Not Specified.* If a subpoena does not specify a form for producing electronically stored information, the person responding must produce it in a form or forms in which it is ordinarily maintained or in a reasonably usable form or forms.
(C) *Electronically Stored Information Produced in Only One Form.* The person responding need not produce the same electronically stored information in more than one form.
(D) *Inaccessible Electronically Stored Information.* The person responding need not provide discovery of electronically stored information from sources that the person identifies as not reasonably accessible because of undue burden or cost. On motion to compel discovery or for a protective order, the person responding must show that the information is not reasonably accessible because of undue burden or cost. If that showing is made, the court may nonetheless order discovery from such sources if the requesting party shows good cause, considering the limitations of Rule 26(b)(2)(C). The court may specify conditions for the discovery.

(2) ***Claiming Privilege or Protection.***
(A) *Information Withheld.* A person withholding subpoenaed information under a claim that it is privileged or subject to protection as trial-preparation material must:
(i) expressly make the claim; and
(ii) describe the nature of the withheld documents, communications, or tangible things in a manner that, without revealing information itself privileged or protected, will enable the parties to assess the claim.
(B) *Information Produced.* If information produced in response to a subpoena is subject to a claim of privilege or of protection as trial-preparation material, the person making the claim may notify any party that received the information of the claim and the basis for it. After being notified, a party must promptly return, sequester, or destroy the specified information and any copies it has; must not use or disclose the information until the claim is resolved; must take reasonable steps to retrieve the information if the party disclosed it before being notified; and may promptly present the information under seal to the court for the district where compliance is required for a determination of the claim. The person who produced the information must preserve the information until the claim is resolved.

(g) Contempt.
The court for the district where compliance is required—and also, after a motion is transferred, the issuing court—may hold in contempt a person who, having been served, fails without adequate excuse to obey the subpoena or an order related to it.

For access to subpoena materials, see Fed. R. Civ. P. 45(a) Committee Note (2013).

UNITED STATES DISTRICT COURT

for the

EASTERN DISTRICT OF TEXAS

SINOTECHNIX, LLC *Plaintiff* v. SAMSUNG ELECTRONICS CO., LTD., et al. *Defendant*	))))))	Civil Action No. 2:24-cv-00544-JRG-RSP

SUBPOENA TO TESTIFY AT A DEPOSITION IN A CIVIL ACTION

To: LUMILEDS, LLC
370 West Trimble Road, San Jose, California, 95131
(Name of person to whom this subpoena is directed)

☑ Testimony: YOU ARE COMMANDED to appear at the time, date, and place set forth below to testify at a deposition to be taken in this civil action. If you are an organization, you must promptly confer in good faith with the party serving this subpoena about the following matters, or those set forth in an attachment, and you must designate one or more officers, directors, or managing agents, or designate other persons who consent to testify on your behalf about these matters: Documents and topics described in concurrent Subpoena to Produce Documents, Information or Objects

Place: Desmarais LLP 101 California St. San Francisco, CA	Date and Time: 02/20/2025 9:00 am

The deposition will be recorded by this method: Audio, Video, Stenographic

☐ *Production:* You, or your representatives, must also bring with you to the deposition the following documents, electronically stored information, or objects, and must permit inspection, copying, testing, or sampling of the material:

The following provisions of Fed. R. Civ. P. 45 are attached – Rule 45(c), relating to the place of compliance; Rule 45(d), relating to your protection as a person subject to a subpoena; and Rule 45(e) and (g), relating to your duty to respond to this subpoena and the potential consequences of not doing so.

Date: 02/05/2025

CLERK OF COURT

OR

	/s/ Lee J. Matalon
Signature of Clerk or Deputy Clerk	*Attorney's signature*

The name, address, e-mail address, and telephone number of the attorney representing *(name of party)* Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc., who issues or requests this subpoena, are:

Lee J. Matalon, Desmarais LLP - 230 Park Ave, New York, NY 10169 - (212) 808-2918 - LMatalon@DLLP.com

Notice to the person who issues or requests this subpoena

If this subpoena commands the production of documents, electronically stored information, or tangible things before trial, a notice and a copy of the subpoena must be served on each party in this case before it is served on the person to whom it is directed. Fed. R. Civ. P. 45(a)(4).

Civil Action No. 2:24-cv-00544-JRG-RSP

PROOF OF SERVICE

(This section should not be filed with the court unless required by Fed. R. Civ. P. 45.)

I received this subpoena for *(name of individual and title, if any)* _____ on *(date)* _____ .

❒ I served the subpoena by delivering a copy to the named individual as follows: _____

_____ on *(date)* _____ ; or

❒ I returned the subpoena unexecuted because: _____ .

Unless the subpoena was issued on behalf of the United States, or one of its officers or agents, I have also tendered to the witness the fees for one day's attendance, and the mileage allowed by law, in the amount of $ _____ .

My fees are $ _____ for travel and $ _____ for services, for a total of $ 0.00 .

I declare under penalty of perjury that this information is true.

Date: _____

_____
Server's signature

_____
Printed name and title

_____
Server's address

Additional information regarding attempted service, etc.:

Federal Rule of Civil Procedure 45 (c), (d), (e), and (g) (Effective 12/1/13)

(c) Place of Compliance.

(1) ***For a Trial, Hearing, or Deposition.*** A subpoena may command a person to attend a trial, hearing, or deposition only as follows:
(A) within 100 miles of where the person resides, is employed, or regularly transacts business in person; or
(B) within the state where the person resides, is employed, or regularly transacts business in person, if the person
(i) is a party or a party's officer; or
(ii) is commanded to attend a trial and would not incur substantial expense.

(2) ***For Other Discovery.*** A subpoena may command:
(A) production of documents, electronically stored information, or tangible things at a place within 100 miles of where the person resides, is employed, or regularly transacts business in person; and
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(A) *Appearance Not Required.* A person commanded to produce documents, electronically stored information, or tangible things, or to permit the inspection of premises, need not appear in person at the place of production or inspection unless also commanded to appear for a deposition, hearing, or trial.
(B) *Objections.* A person commanded to produce documents or tangible things or to permit inspection may serve on the party or attorney designated in the subpoena a written objection to inspecting, copying, testing, or sampling any or all of the materials or to inspecting the premises—or to producing electronically stored information in the form or forms requested. The objection must be served before the earlier of the time specified for compliance or 14 days after the subpoena is served. If an objection is made, the following rules apply:
(i) At any time, on notice to the commanded person, the serving party may move the court for the district where compliance is required for an order compelling production or inspection.
(ii) These acts may be required only as directed in the order, and the order must protect a person who is neither a party nor a party's officer from significant expense resulting from compliance.

(3) ***Quashing or Modifying a Subpoena.***

(A) *When Required.* On timely motion, the court for the district where compliance is required must quash or modify a subpoena that:

(i) fails to allow a reasonable time to comply;
(ii) requires a person to comply beyond the geographical limits specified in Rule 45(c);
(iii) requires disclosure of privileged or other protected matter, if no exception or waiver applies; or
(iv) subjects a person to undue burden.
(B) *When Permitted.* To protect a person subject to or affected by a subpoena, the court for the district where compliance is required may, on motion, quash or modify the subpoena if it requires:
(i) disclosing a trade secret or other confidential research, development, or commercial information; or
(ii) disclosing an unretained expert's opinion or information that does not describe specific occurrences in dispute and results from the expert's study that was not requested by a party.
(C) *Specifying Conditions as an Alternative.* In the circumstances described in Rule 45(d)(3)(B), the court may, instead of quashing or modifying a subpoena, order appearance or production under specified conditions if the serving party:
(i) shows a substantial need for the testimony or material that cannot be otherwise met without undue hardship; and
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(ii) describe the nature of the withheld documents, communications, or tangible things in a manner that, without revealing information itself privileged or protected, will enable the parties to assess the claim.
(B) *Information Produced.* If information produced in response to a subpoena is subject to a claim of privilege or of protection as trial-preparation material, the person making the claim may notify any party that received the information of the claim and the basis for it. After being notified, a party must promptly return, sequester, or destroy the specified information and any copies it has; must not use or disclose the information until the claim is resolved; must take reasonable steps to retrieve the information if the party disclosed it before being notified; and may promptly present the information under seal to the court for the district where compliance is required for a determination of the claim. The person who produced the information must preserve the information until the claim is resolved.

(g) Contempt.
The court for the district where compliance is required—and also, after a motion is transferred, the issuing court—may hold in contempt a person who, having been served, fails without adequate excuse to obey the subpoena or an order related to it.

For access to subpoena materials, see Fed. R. Civ. P. 45(a) Committee Note (2013).

Attachment A

Attachment A

Pursuant to Rules 34 and 45 of the Federal Rules of Civil Procedure, You are required to produce the documents requested below for inspection and copying. The requested documents are to be produced on or before February 13, 2025 at 5:00pm at Desmarais LLP, 101 California St., San Francisco, CA or at such other time and place as may be agreed by counsel. A copy of the Protective Order entered in this action for the protection of any requested proprietary, confidential, or commercially sensitive information is attached hereto as Attachment B.

DEFINITIONS AND INSTRUCTIONS

1. As used herein, "You" and "Your" means Lumileds LLC, and all of its predecessors (merged, acquired, or otherwise), successors, subsidiaries, parents, sisters, divisions, departments, partnerships, and affiliates thereof, and all officers, directors, principals, agents, employees, attorneys, and other persons acting on its behalf.

2. As used herein, "Samsung" means Samsung Electronics Co. Ltd. and all of its predecessors (merged, acquired, or otherwise), successors, subsidiaries, parents, sisters, divisions, departments, partnerships, and affiliates thereof, and all officers, directors, principals, agents, employees, attorneys, and other persons acting on its behalf.

3. As used herein, "Seoul Semiconductor" means Seoul Semiconductor Co., Ltd. and its predecessor or successor entities, and any of its subsidiaries, divisions, affiliates, and any present and former agents, employees, partners, attorneys, representatives, and any other person or entity acting in concert with Seoul Semiconductor Co., Ltd., on behalf of Seoul Semiconductor Co., Ltd., or within the control of Seoul Semiconductor Co., Ltd, including, but not limited to, Seoul Optodevice Co. Ltd. and Seoul Viosys Co. Ltd.

4. As used herein, "Related Publication(s)," as applied to a publication, means the identified publication and any publications concerning the same or related subject matter; and, as

applied to a patent or patent application or publication, further includes all patents in the same family or otherwise sharing a priority relationship including provisionals, continuations, continuations-in-part, divisionals, and foreign counterparts.

5. As used herein, "Relevant Publication(s)" include the publications included in Attachment C; all publications (including patents and patent applications or publications in any jurisdiction) describing any Relevant Product(s) or Similar Products; and any Related Publication(s). *See* Attachment C.

6. As used herein, "Similar Product(s)," as applied to a product, means the identified product and any products having similar structure, function, and/or manufacturing process.

7. As used herein, "Relevant Product(s)" refers to Lumileds Luxeon Emitter Batwing, Lambertian, and Side Emitting variations, Luxeon Direct, Luxeon DCC, Luxeon White, any products described in the Relevant Publications, and any Similar Products.

8. As used herein, "Relevant Date(s)" include October 7, 2004 and December 3, 2007.

9. As used herein, "and" and "or" shall be construed conjunctively and disjunctively, so as to acquire the broadest possible meaning.

10. As used herein, "any" and "all" shall be construed to mean "each and every," so as to acquire the broadest possible meaning.

11. As used herein, "each" and "every" mean "each and every."

12. As used herein, "include" and "including" shall be construed to mean "without limitation," so as to acquire the broadest possible meaning.

13. As used herein, "document" has the same broad meaning as in Rule 34 of the Federal Rules of Civil Procedure. The term "document" also encompasses tangible things.

14. As used herein, “person” means any natural person or any business, legal, or governmental entity or association.

15. As used herein, “related” or “relating” to any given subject means, without limitation, identifying, describing, discussing, concerning, assessing, stating, reflecting, constituting, containing, embodying, tending to support or refute, or referring directly or indirectly to, in any way, the particular subject matter identified.

16. As used herein, “identify” as applied to an event means to provide a description of the event, the date of the event, the location of the event, and the individuals and entities participating in the event.

17. As used herein, the singular of any word shall include the plural, and the plural shall include the singular.

18. Pursuant to the requests herein, You are to produce any and all relevant documents within the Your possession, custody, or control, including documents located in the files of any and all of Your past and present association members, subsidiaries, parents, sisters, partnerships, directors, officers, agents, representatives, employees, attorneys, and accountants.

19. Produce each document in its entirety, without deletions, redactions, or exclusions, regardless of whether you deem part of a document outside of the scope of the requests.

20. Produce documents that identify the file or other source in which each document responsive to these requests is found or keep a record of such information.

21. Documents from any single file should be produced in the same order as they were found in such file, including any labels, files, folders, and/or containers in which such documents are located or with which such documents are associated. If copies of documents are produced in

lieu of the originals, such copies should be legible and bound or stapled in the same manner as the originals.

22. All documents that constitute electronically stored information, with that term having the meaning ascribed to it by the Federal Rules of Civil Procedure, shall be produced in an intelligible format.

23. If a document once existed, but has been lost, destroyed, erased, or otherwise is no longer in your possession, identify the document and state the details concerning the loss or destruction of such document, including the name and address of the present custodian of any such document known to You.

24. If, after conducting a reasonable investigation, a full answer cannot be provided for any request for the production of documents, state that such is the case and answer to the fullest extent possible, stating what responsive documents or information are available, what documents or information cannot be provided, and what efforts were made to obtain the unavailable documents or information.

25. If any of the documents requested herein are no longer in Your possession, custody, or control, identify for each such document the date, the type of the document, any senders and recipients, and any persons receiving any copies of each such document, and provide a summary of each such document's pertinent contents.

26. If any document responsive to these requests has been destroyed, describe the contents of the document, identify the location of any copies of the document, and the date of destruction of the document.

27. If any document is withheld on a claim of attorney/client privilege or work product immunity, provide a detailed privilege log that describes the nature and basis for your claim and

the subject matter of the document withheld, in a manner sufficient to disclose facts upon which You rely in asserting your claim and to identify the grounds and reasons for withholding the document. Such description should, at a minimum, include the date of the withheld document, an identification of each and every author of the document, an identification of each and every person who received the document, an identification of each and every person from whom the document was received, a description of the subject of the document, and further information relating to the document sufficient to explain the claim of privilege or immunity and to permit the adjudication of the propriety of that claim.

28. The document requests herein shall be deemed continuing, and it is requested that You provide supplemental responses and production as additional information or documents become available, in accordance with Rule 26(e) of the Federal Rules of Civil Procedure.

29. If a document is in a language other than English and an English translation exists, provide both documents.

DOCUMENT REQUESTS

1. All documents concerning the Relevant Product(s) and all Similar Products.

2. All Relevant Publication(s) and all Related Publications and documents concerning Relevant Publication(s) and Related Publications.

3. Documents sufficient to show public availability of the Relevant Publication(s) and all Related Publications prior to each Relevant Date.

4. Documents sufficient to show the structure, function, configuration, operation, material composition, manufacturing process, and supplier information for the Relevant Product(s) or any Similar Products prior to the Relevant Date(s).

5. Documents sufficient to show the structure and function of displays or display modules (including backlights) using the Relevant Product(s) or any Similar Products; including any diffusers, reflectors, LEDs or other light sources, light guides, LCD panels, and air gaps prior to the Relevant Date(s).

6. Documents sufficient to show the structure, function, configuration, operation, material composition, manufacturing process, and supplier information for all light emitting diodes (LEDs) contained in the Relevant Product(s) or any Similar Products prior to the Relevant Date(s).

7. Documents sufficient to show the structure, function, configuration, operation, material composition, manufacturing process, and supplier information for all lenses contained in the Relevant Product(s) or any Similar Products prior to the Relevant Date(s).

8. Documents sufficient to show the package structure of Relevant Products or any Similar Products, including any lead frames, resins/encapsulants, LED chips, and phosphors (including type, number, placement, and emission spectra) prior to the Relevant Date(s).

9. Documents sufficient to show the manufacturing process for the Relevant Products including the forming of semiconductor layers, the photoresist process (including shape and dimensions), and any baking or etching processes (including temperatures) prior to the Relevant Date(s).

10. Documents sufficient to show the date on which each of the Relevant Product(s) or any Similar Products were first sold, on sale, offered for sale, in public use, or otherwise available to the public in the United States (including, for example, product catalogs, announcements, invoices, and sales records).

11. Physical samples of each Relevant Product and any Similar Products.

12. All documents describing any communication between You and Seoul Semiconductor relating to any of Your products with an LED or lens (including the Relevant Product(s) and any Similar Products) before the Relevant Date(s), including but not limited to any discussion, negotiation, and final agreement for the demonstration, exhibition, or sale of any such product to Seoul Semiconductor.

13. Documents sufficient to show Your policies for documenting and maintaining records in the ordinary course of Your business.

14. Documents sufficient to establish authenticity (within the meaning of Fed. R. Evid. 901) of each document You produce in response to this subpoena.

Attachment C

Attachment C-1

LUMILEDS™

LIGHT FROM SILICON VALLEY

LED Backlighting from Revolution to Reality

Mark Pugh

The 6th Annual DisplaySearch US FPD Conference

NAVIGATING THE FUTURE

DISPLAYSEARCH

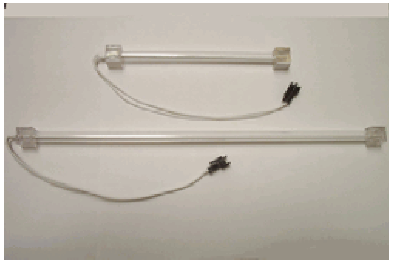
The Worldwide Leader in FPD Market Research and Consulting

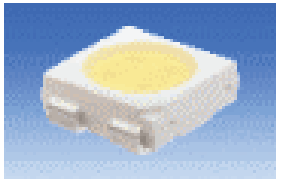
the Revolution

A disruptive technology battling an incumbent technology

Today:

CCFL dominate most LCD Backlight applications today >3” with small SMT LEDs winning most of the applications < 3”.

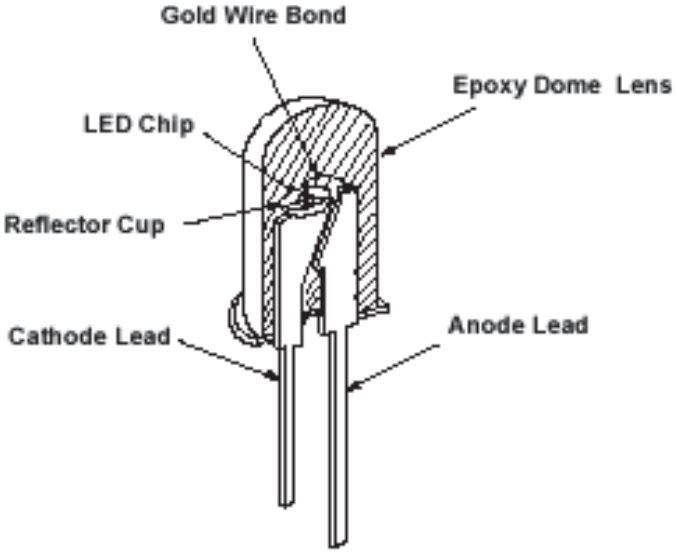




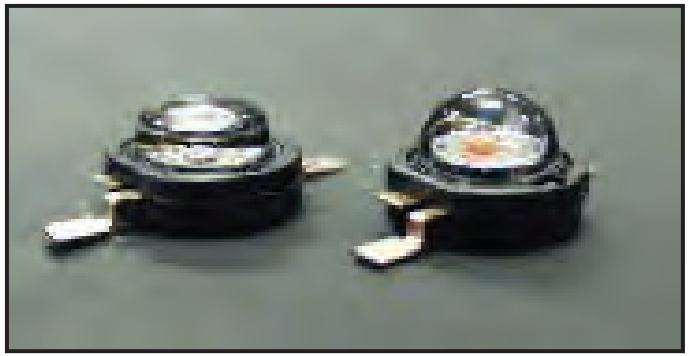
Tomorrow:

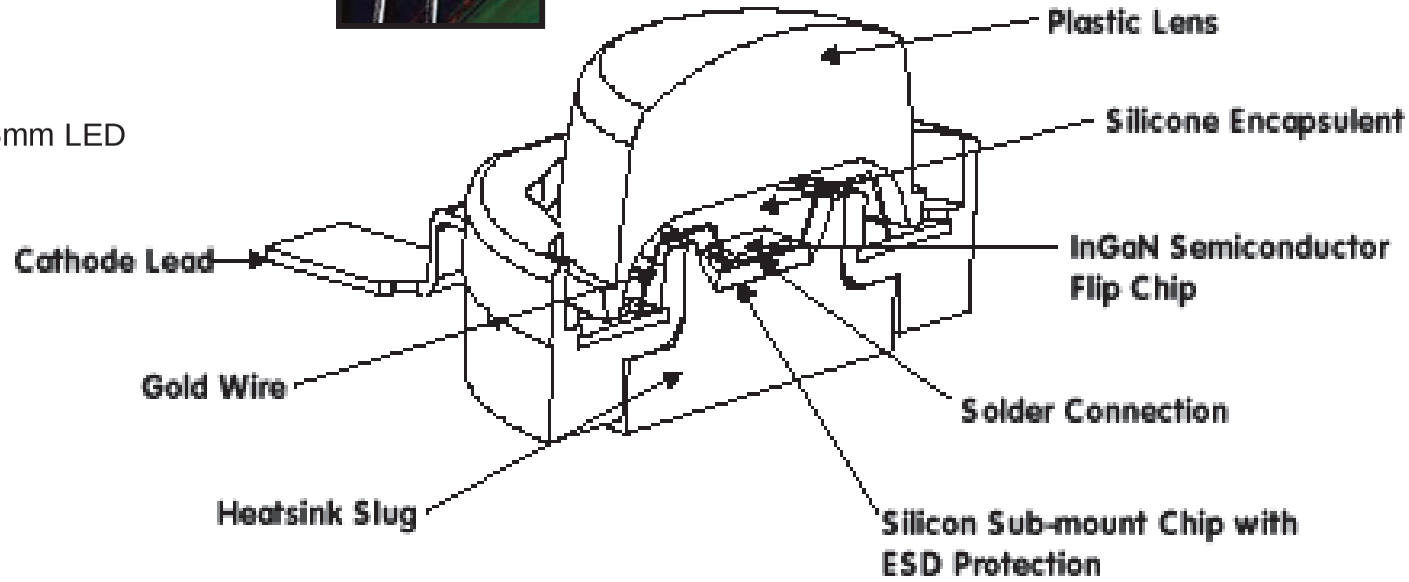
Power LEDs will enable new features and benefits and start to take market share in > 5” premium applications

Luxeon "Power LED" Technology



Cross section view of 5mm LED

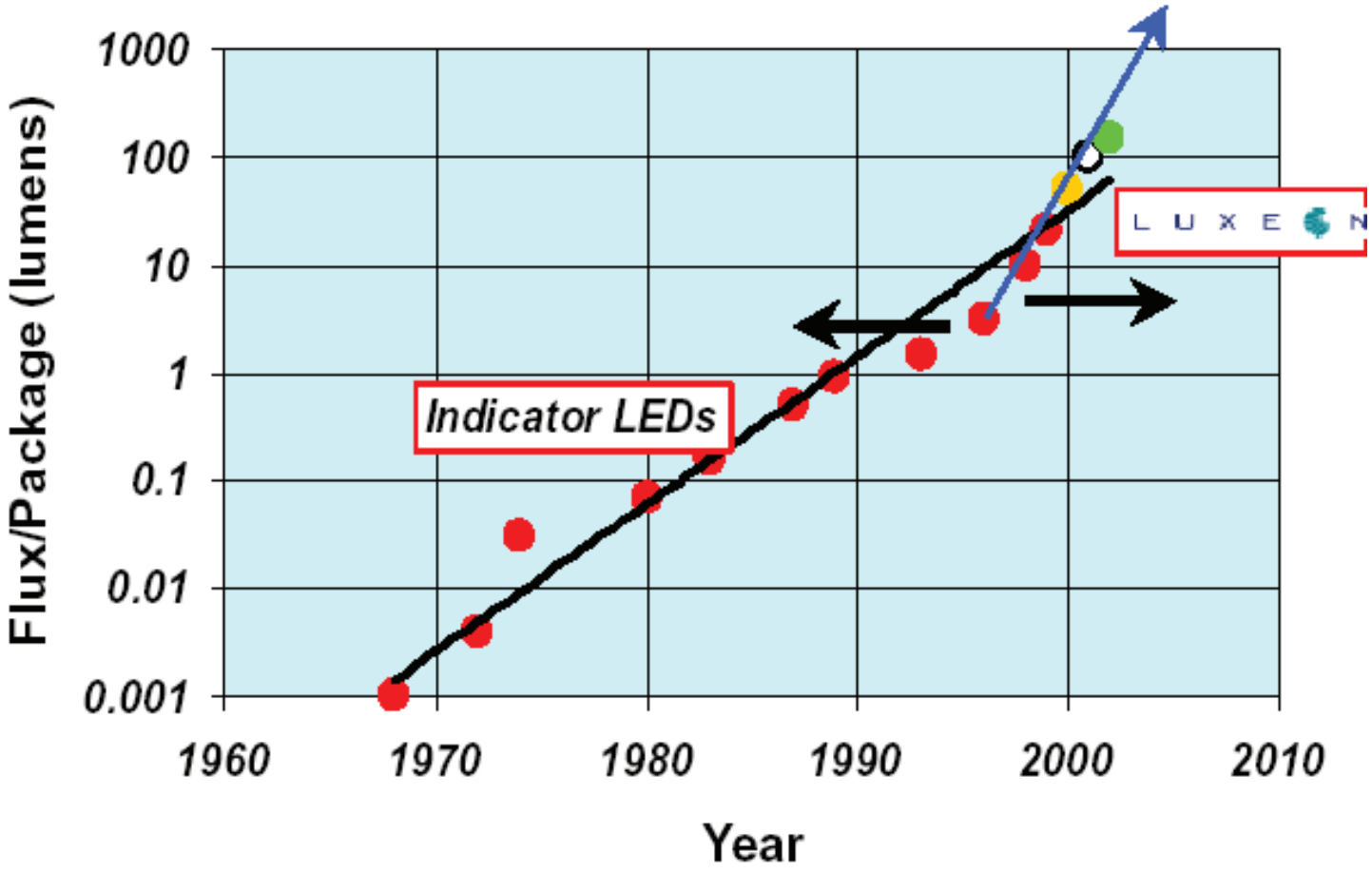




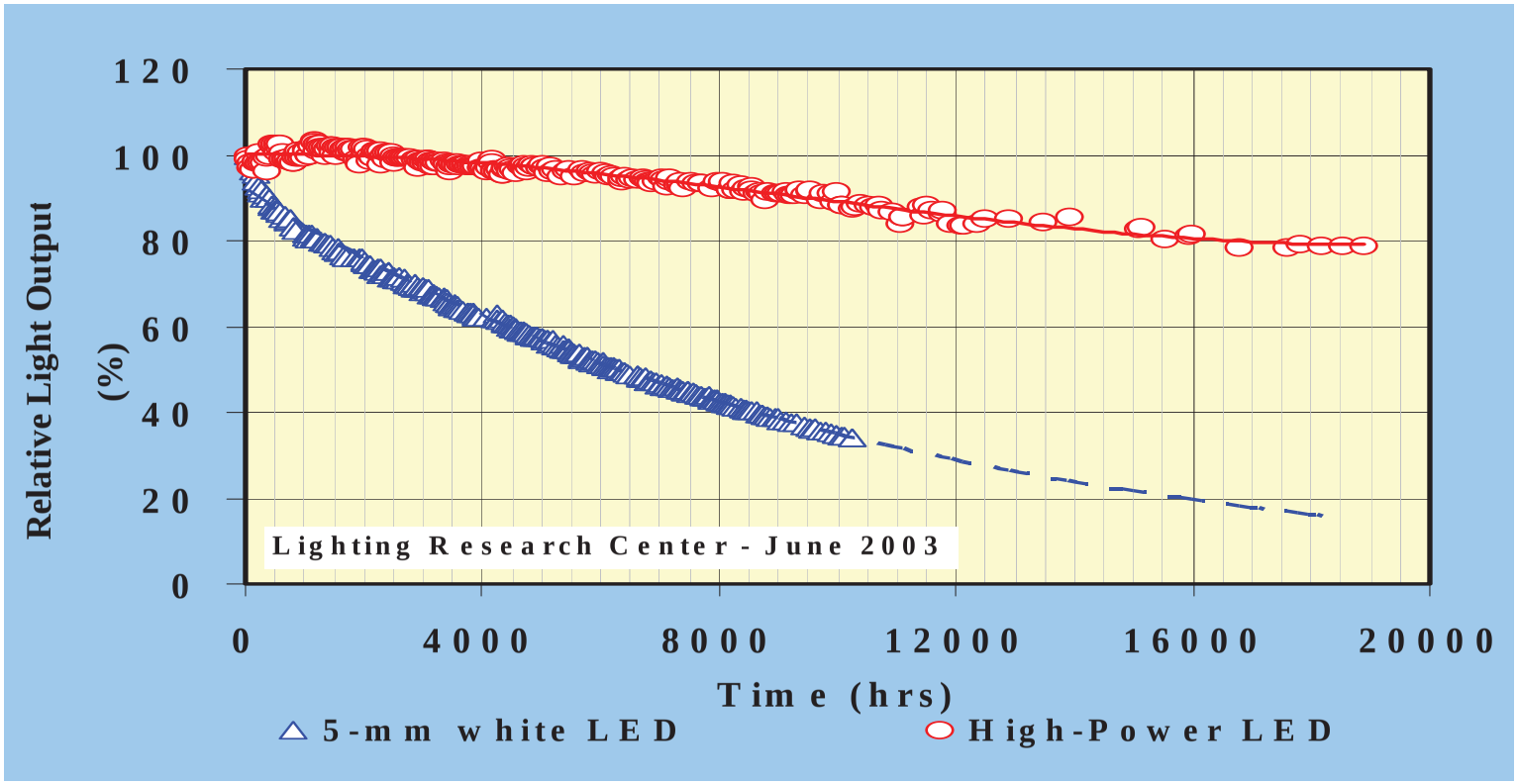
Cross section view of Luxeon Emitter

LED Technology

LED Flux per package has doubled every 18-24 months for 30+ years



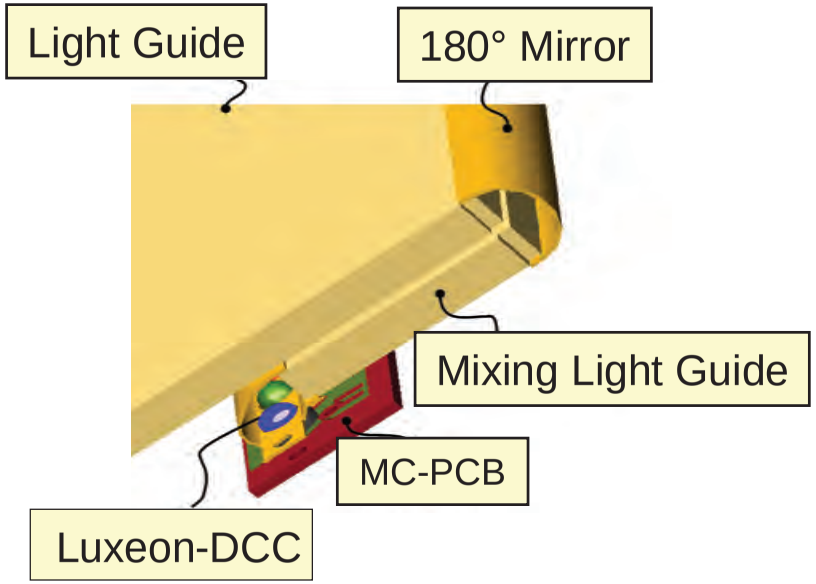
LED Lumen Maintenance



- *White Luxeon LEDs have superior lumen maintenance to epoxy encapsulated (5mm, surface mount, etc.) LEDs by design*
- *Ongoing tests show Luxeon is stable through ~20,000 hours by which time 5mm LEDs have degraded >70% and Incandescent bulbs have died*
- *Luxeon (colored and white) is expected to show an astounding 70% average lumen maintenance (30% degradation) even after 50,000 hours*

RGB LED Edge-lighting: for 7” to 23” Displays

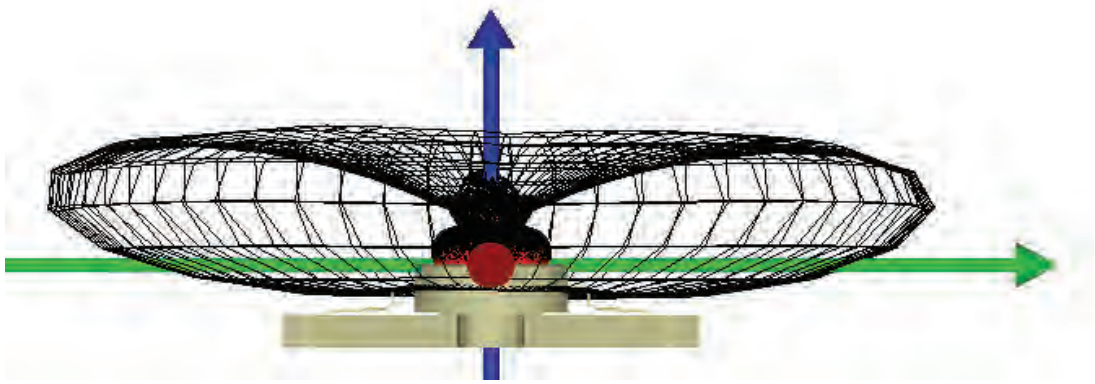
Example of a Luxeon-DCC

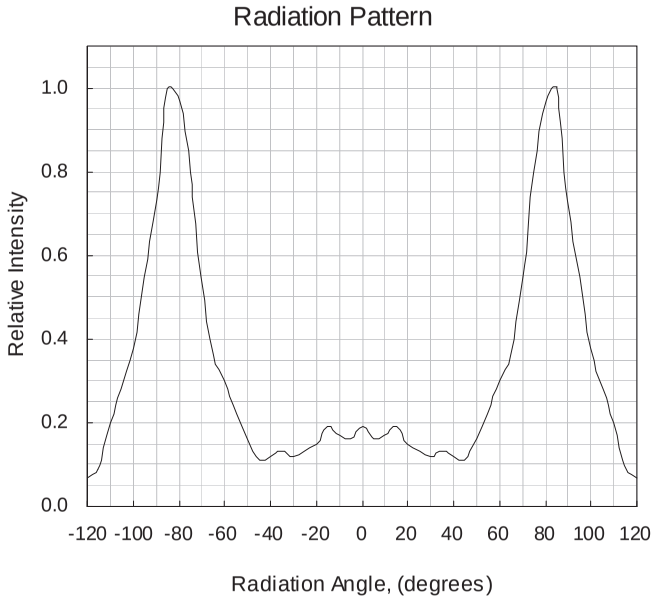


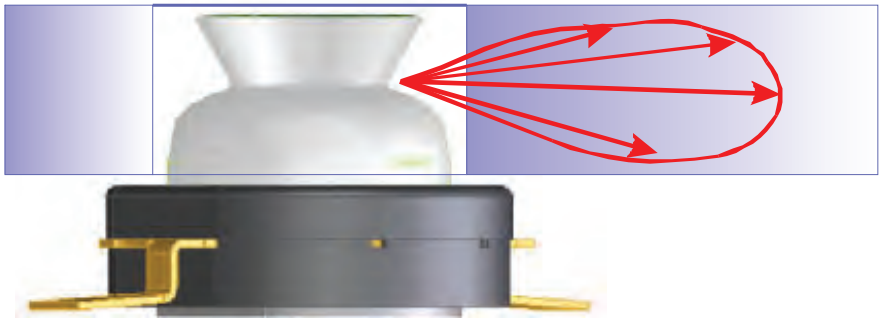
Reference design of a backlight using Luxeon-DCC

- **Emitters on the Luxeon DCC board are Luxeon I Lambertian and are specifically matched to optimal color uniformity and white point**
- **Can be implemented with optical feedback to maintain color and brightness uniformity over the <u>entire</u> life of the LCD display**

LED Light Source for Automotive and Industrial Displays

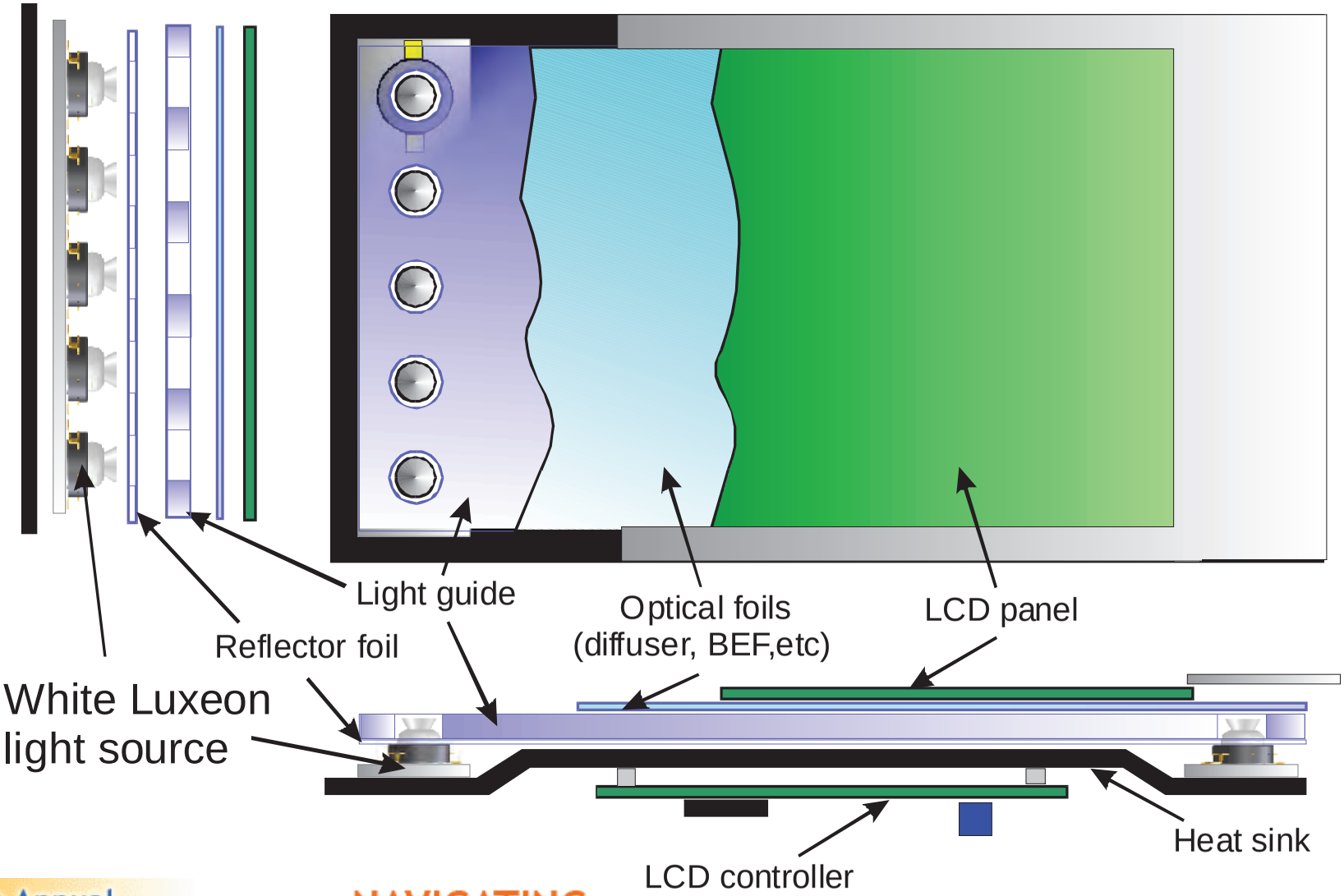






- **Coupling into a light guide is easy with simple through holes**
- **Light guide can be as thin as 3.5 mm**
- **Coupling efficiency around 80%**

Automotive LED Backlight Reference Design



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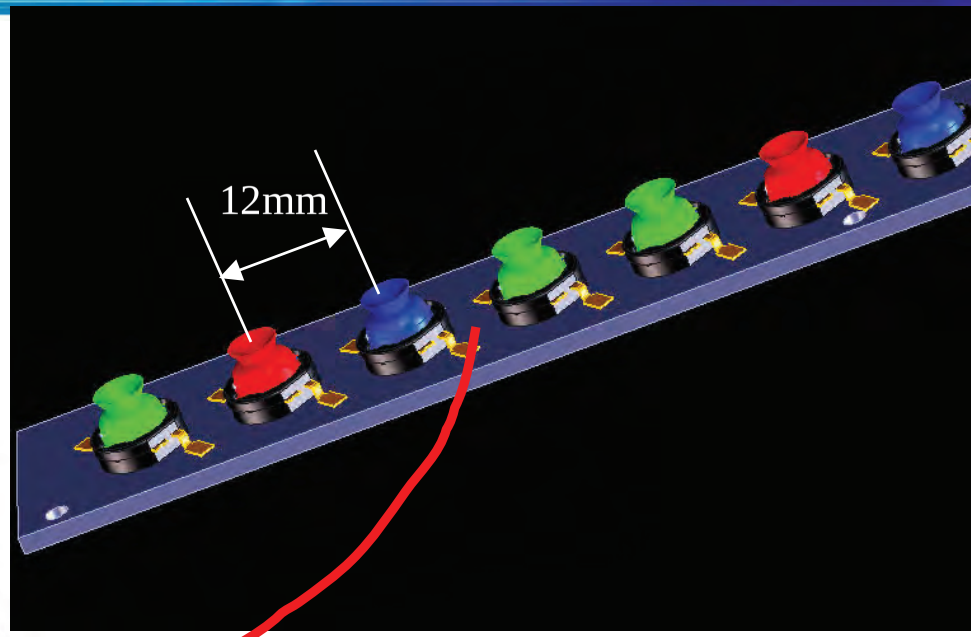
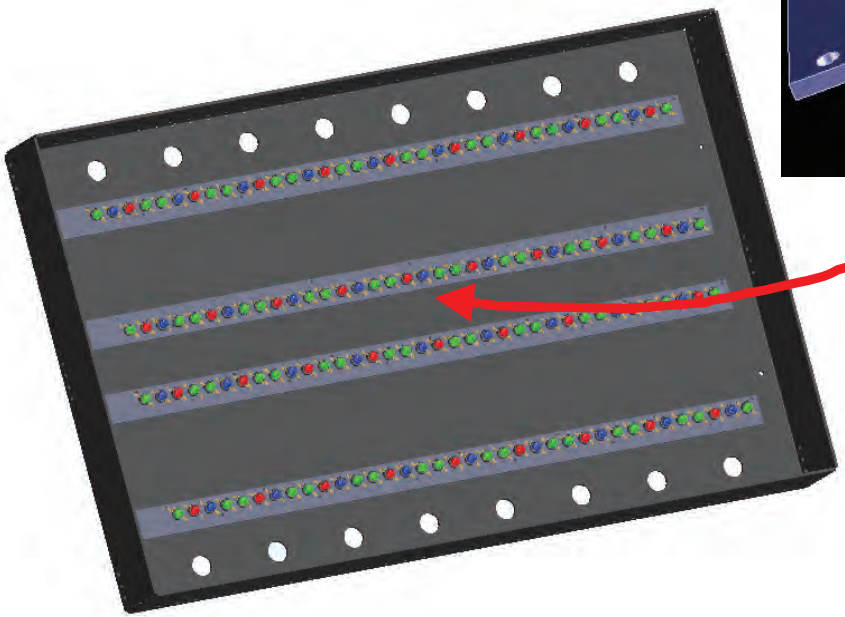
Luxeon Direct – for Large LCD TVs

Luxeon Side-emitters

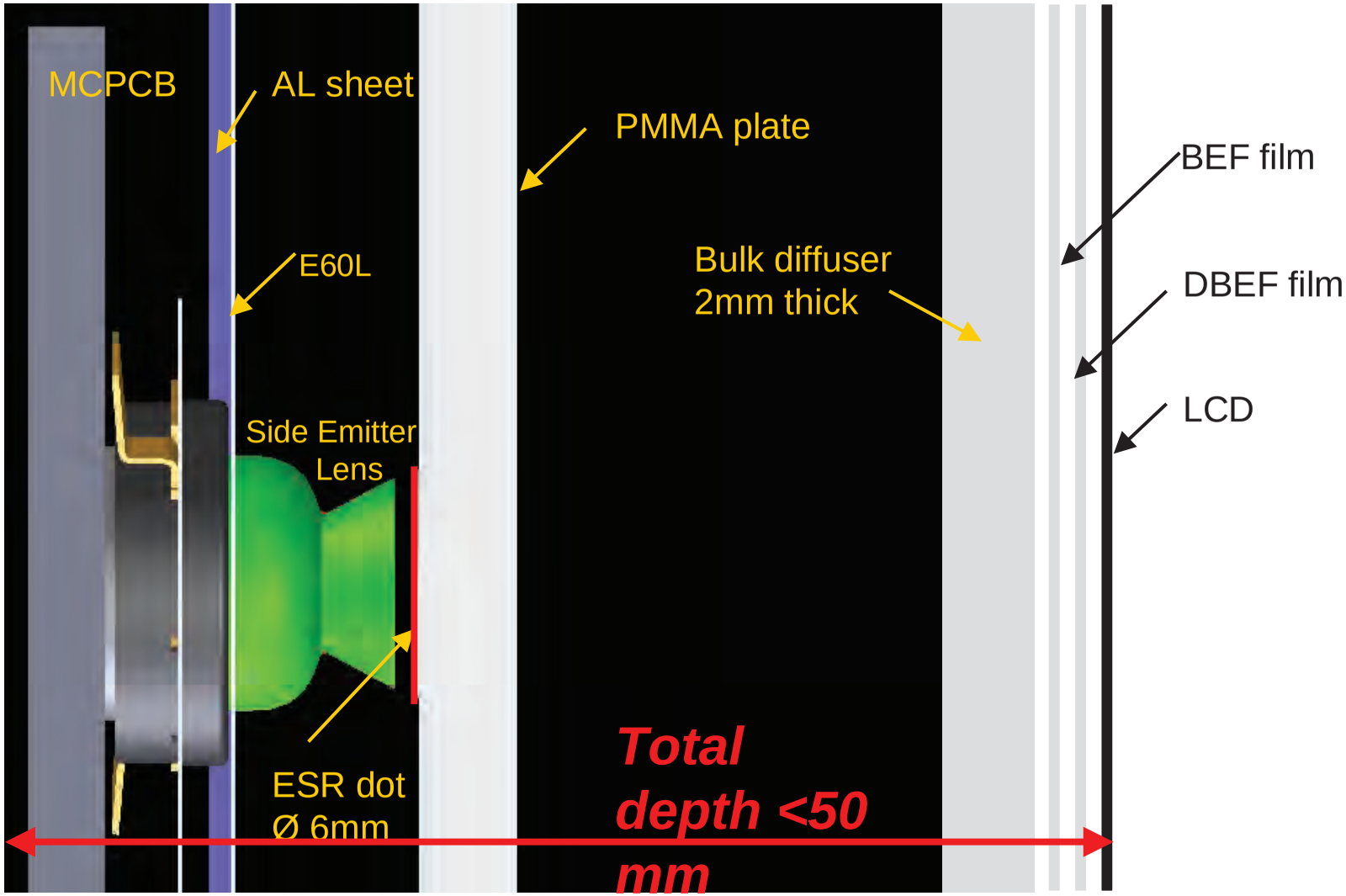
- Color sequence – GRBG…
- Pitch = 12-16 mm center to center



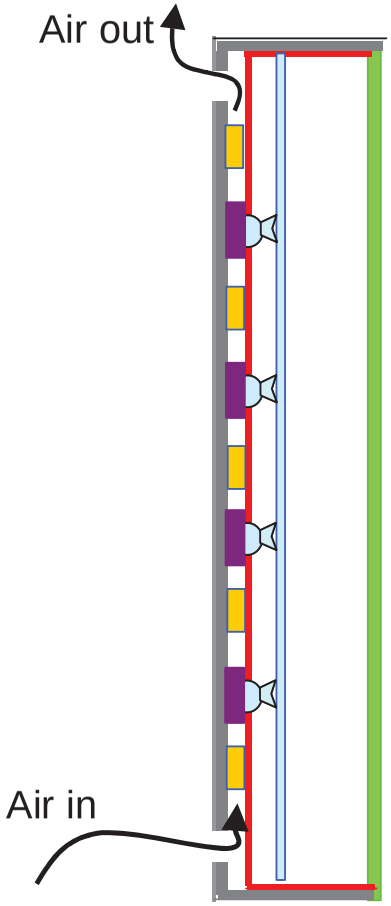


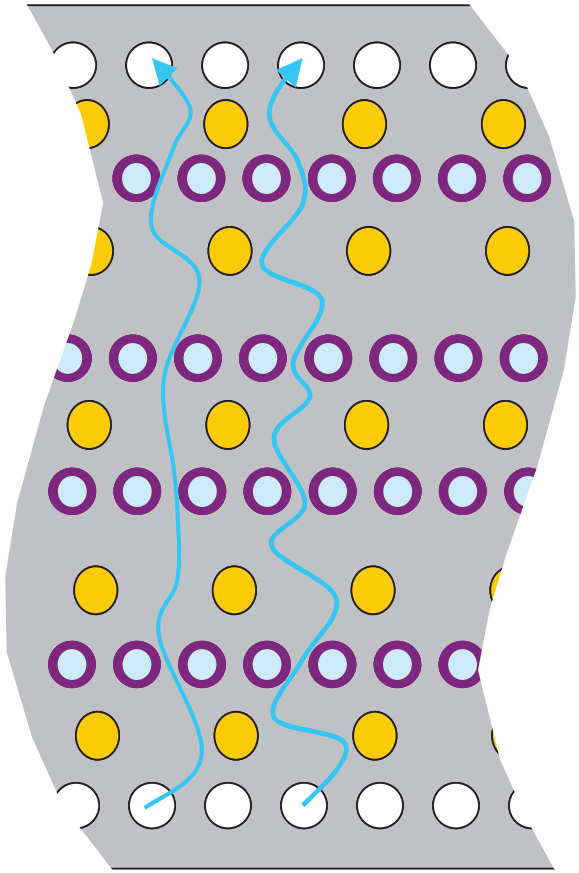
Luxeon Direct Optical Concept

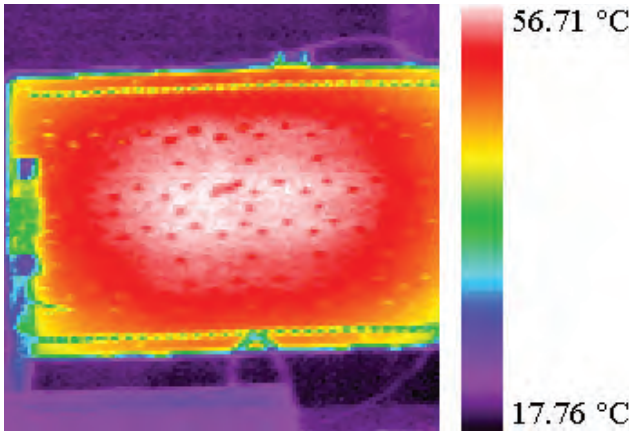
(cross section)



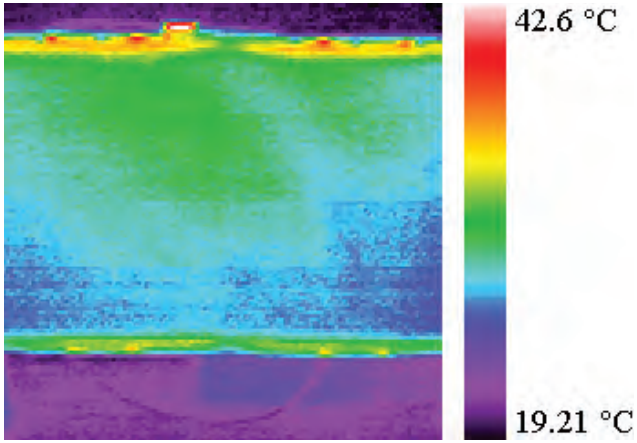
Thermal management







CCD image of back



CCD image of front

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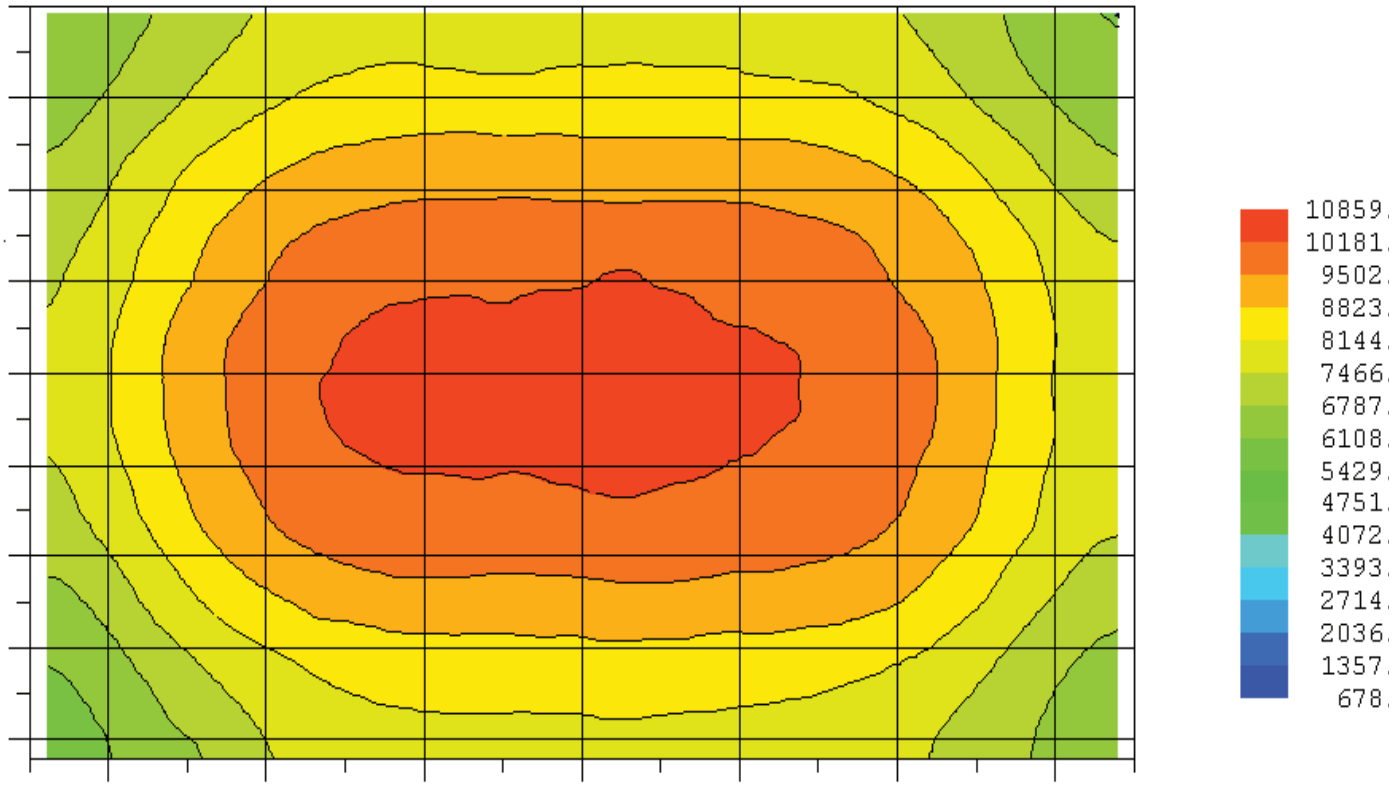
Light distribution, example 32”



		Nits	Nits/watt
	Peak luminance	10860	68
Backlight brightness	Center luminance	10742	67
	Average luminance	8689	54
LED power backlight		**160**	Watt

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Vivid Colors

from Saturated Red, Green and Blue Luxeon Lightsource

CCFL

LUXEON

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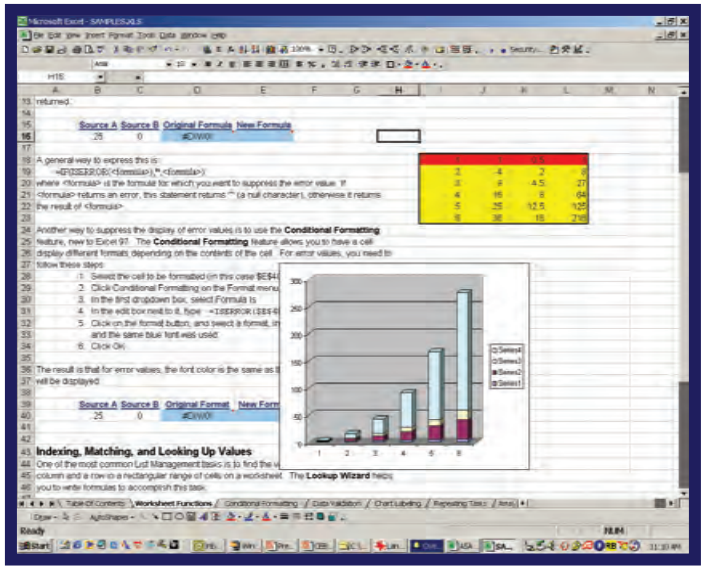
Flexible White

Optimized settings depending on application



Spreadsheet: 9600K

Movie: 6500K

LUXEON

never before possible backlights

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Reduced Motion Artifacts

Without Brightness or Lifetime Penalty

Backlight Constant-On

Backlight Blinking with Fast-Switching

LUXEON

(simulated)

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. . . to Reality

Automotive Displays in cars next year

- High brightness: 350-500 nits
- Rugged and robust
- Wide operating temperature range
- Cold start
- High dimming ratio
- No Mercury
- Low voltage (safety)
- Low EMI (interference with video and navigation electronics)

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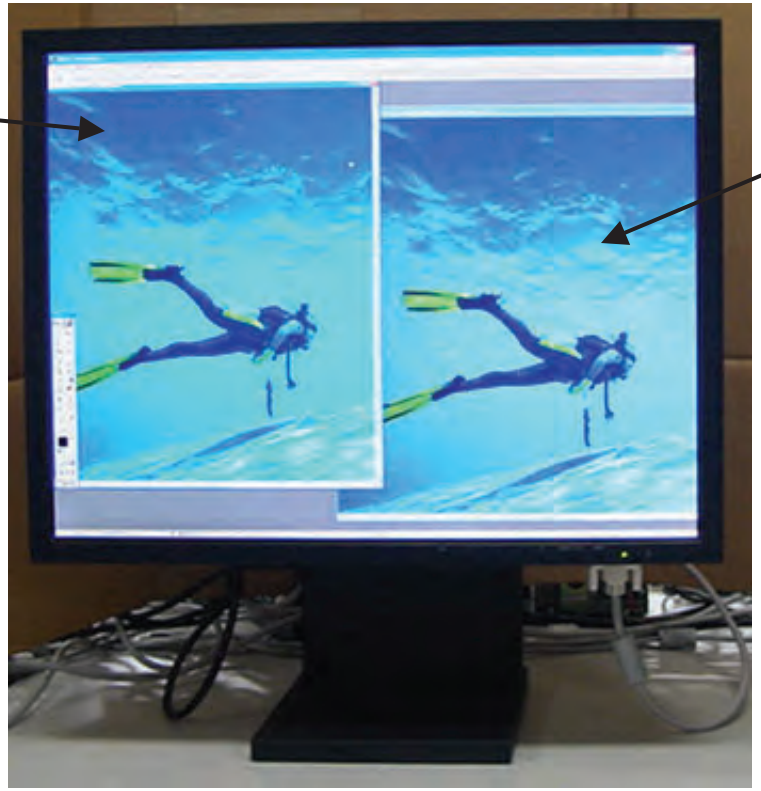
. . . to Reality

NEC/MITSUBISHI
NEC-MITSUBISHI ELECTRIC VISUAL SYSTEMS

21.3” Monitor UXGA
With 110% Adobe RGB (105% to NTSC)

• Adobe RGB color space picture



• sRGB color space picture

. . . to Reality

32” LCD TV Retrofitted by Lumileds

Color Gamut
100% NTSC

LED Power
~ 160 Watts

Conclusions

1. LED backlit displays will be available to consumers in less than 1 year in the following markets:
   - Automotive, Industrial, Desktop Monitors, and TVs
2. Luxeon RGB direct backlight technology for large LCD displays now meets the challenges for large size LCD-TV's
   - Brightness and Uniformity
   - Power and Temperature
   - Is scalable to larger sizes
3. It also enables front of screen performance beyond state of the art through
   - Huge Color Gamut (>100% NTSC/EBU/sRGB/Adobe RGB)
   - Dynamic Whitepoint/color/brightness control in the backlight
   - Less noise (solid state solution, no inverter)

Thank You

Attachment C-2

LUMILEDS™
LIGHT FROM SILICON VALLEY

PRESS CONTACTS:
Mindy Franklin 847/415-9328
Jason Ovitt 847/415-9326
mindy@sspr.com / jason@sspr.com

Lumileds' Luxeon LEDs Power World's First LED-Based TVs from Sony

Luxeon High Power LEDs Deliver the Richest, Most Saturated Color Ever Seen on a Television

San Jose, California and Tokyo, Japan -- (August 25, 2004) --- Lumileds Lighting announced today that its high-power Luxeon® LEDs are illuminating the world's first LED backlight for LCD home televisions. The Luxeon lit system delivers the most vivid colors ever seen on a television—expanding the gamut of reproducible hues by as much as 45 percent—offering realism never before possible with conventional technologies.

The Luxeon light source is integrated in Sony's 40" and 46" QUALIA series televisions. This light source was jointly developed and optimized for Sony's television application.

"Sony's QUALIA 005 and the Triluminos backlight are the latest examples of never before possible applications enabled by Luxeon," said Menko de Roos, Executive Vice President of New Business Development at Lumileds. "Consumer expectations will forever be changed by Sony's implementation of Luxeon LEDs and the on-screen performance that viewers are treated to. We are pleased to have worked with Sony on this groundbreaking technology."

Wider Color Gamut – More Control – Better Performance

The unique color attributes of Luxeon LEDs enable significantly improved performance and expand the achievable color gamut. The display system in the QUALIA 005 televisions delivers a color gamut that is 105% of the NTSC color space. By comparison, conventional technologies can only reproduce 65-75% of the NTSC color space. There are significantly more hues and tones available in a wider color

gamut allowing for finer and more exact color definition. For the viewer, this means that on-screen color is virtually lifelike. Everything from skin tones to foliage to the sky appear true to our visual senses. No conventionally lit displays or televisions can offer similar performance.

Additionally, Luxeon significantly improves both sRGB and Adobe® RGB color performance. QUALIA 005 is measured at 150% of sRGB. Luxeon can also be used to match Adobe RGB color space ensuring that on-screen representation matches printed output.

The use of Luxeon also allows for full control of the backlight system so that the white-point, color and brightness can be optimized for every application. The settings for movies, electronic games, photo images and home video can be controlled and customized for optimum viewing effect.

Jointly Developed Light Source

Lumileds' provided the Luxeon reference design, prototypes and its knowledge-base in solid-state light sources for backlight applications. Sony provided its experience in quality television designs and systems engineering to ensure that the final product offered the ultimate quality and experience for users. The Triluminos™ backlight, developed in months, takes full advantage of the high-power Luxeon LEDs and the nature of solid-state technology.

Environmentally Friendly

Luxeon LEDs are mercury free making them much safer for the environment. Because the lifetime of the backlight system is significantly extended, less waste material will be produced. Additionally, there is no UV radiation in the light from Luxeon nor is there any forward heat. This allows for greater flexibility in system design and a wider variety of applications.

Visit Lumileds at Ceatec, Japan October 5-9, stand 8D15 to learn more about Lumileds Luxeon technology and its applications.

About Luxeon LEDs

Luxeon LEDs are the world's brightest LEDs and have enabled a wide variety of new applications in the display, automotive, camera phone and general lighting markets. Luxeon LEDs offer up to 120 lumens of directed light and industry leading lumen maintenance. Luxeon are more rugged and energy efficient than conventional light sources as well as digitally controllable so that they can be infinitely dimmed and tuned for absolute color and white point control.

For additional information about Luxeon LEDs and their use in backlight systems for displays and televisions, please visit our web site www.lumileds.com/televisions.

About Lumileds Lighting

Lumileds Lighting is the world's leading manufacturer of high-power LEDs and a pioneer in the use of solid-state lighting solutions for everyday purposes including automotive lighting, camera flash, LCD displays and televisions, portable lighting, projection and general lighting. The company's patented Luxeon Power Light Sources are the first to combine the brightness of conventional lighting with the small footprint, long life and other advantages of LEDs. Lumileds also supplies core LED material and LED packaging, and manufactures billions of LEDs annually. Lumileds is headquartered in San Jose, California, with operations in the Netherlands, Japan and Malaysia and sales offices throughout the world. For more information, call Lumileds at 408-435-6111 or visit www.lumileds.com.

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