

Smart Ambient Light -
The next step towards safety
Applications

amun OSRAM

OSIRE®

DMC LEDs

Melexis

INSPIRED ENGINEERING

MeLiBu™

by Melexis

LED Driver

ams and OSRAM at a glance



>5.5 bn

USD combined revenues 2020*

5,500+

Engineers

20,000+

Customers

~30,000

Employees

~60/40%

AIM/consumer revenue split H2 2020

40+

Major R&D locations

15,000+

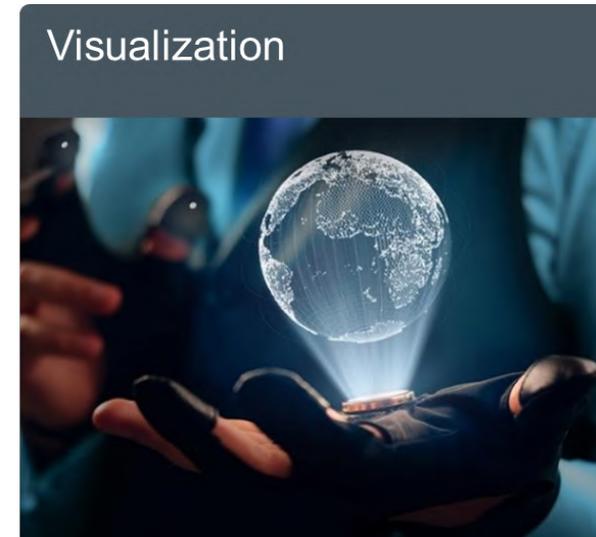
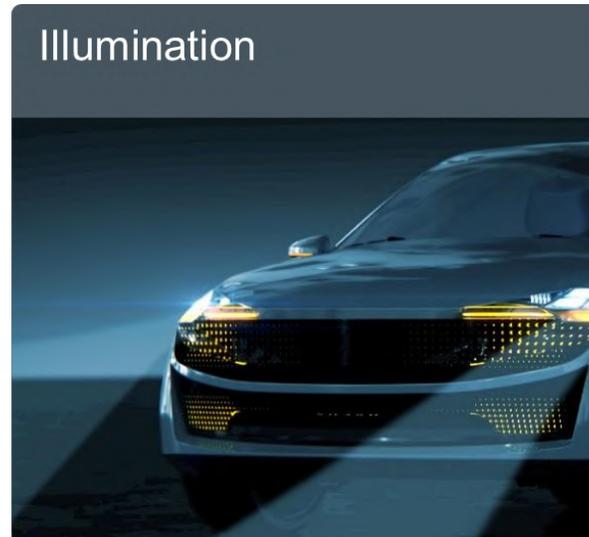
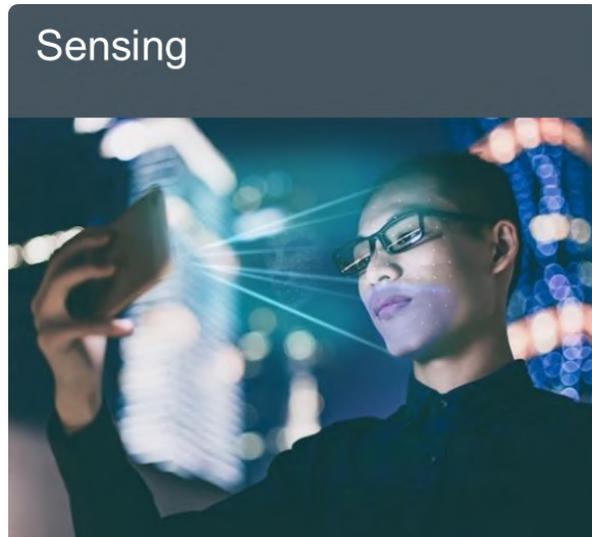
Patents granted and applied for

110+

Years design + manufacturing

AIM is Automotive, Industrial and Medical

Vision: Create the **uncontested leader** in optical solutions



Our mission is to create the uncontested leader in optical solutions through **bold investments** in disruptive innovation and **continuous transformation** delivering **best-in-class profitability and growth**.

OSIRE[®] E3635 - Toplooker



- **Dimension:** 3.6 mm x 3.5 mm x 2.0 mm
- **6 lead** package
- **Gold** leadframe
- **Brightness @20mA**
 - Red: 500 – 1000 mcd
 - Green: 1590 – 2366 mcd
 - Blue: 224 – 710 mcd
- **Color range**
 - Red: 620 – 632 nm
 - Green: 519 – 546 nm
 - Blue: 447 – 476 nm
- **PPAP** available
- **Series** production

OSIRE[®] E5515 - Sidelooker



- **Dimension:** 5.5 mm x 1.8 mm x 1.5 mm
- **6 lead** package
- **Gold** leadframe
- **Brightness @20mA**
 - Red: 710 – 1590 mcd
 - Green: 2010 – 3200 mcd
 - Blue: 250 – 710 mcd
- **Color range**
 - Red: 620 – 632 nm
 - Green: 519 – 546 nm
 - Blue: 447 – 476 nm
- **PPAP** available
- **Series** production

OSIRE[®] E3323 - Enhanced functionality

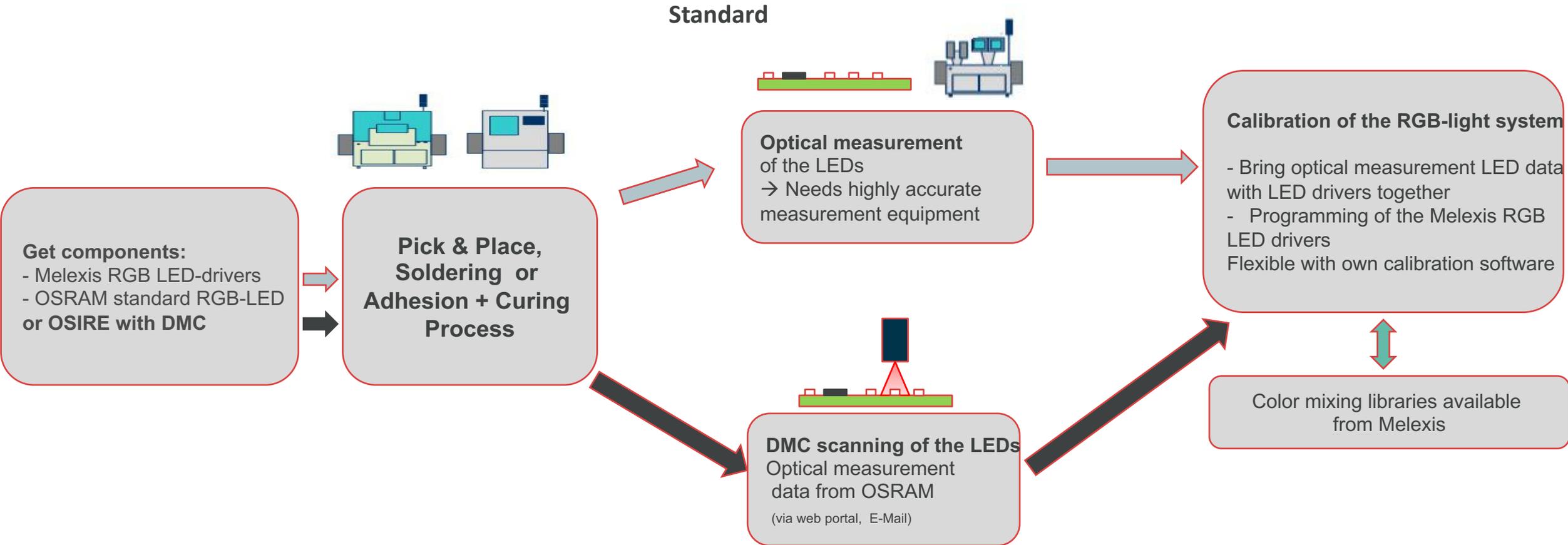


- **Dimension:** 3.3 mm x 2.3 mm x 0.7 mm
- **Triangle** and **Linear** chip configuration
- **Typ. Brightness@**

	<u>10mA</u>	<u>50mA</u>
– Red:	560 mcd	2700 mcd
– Green:	1460 mcd	4140 mcd
– Blue:	220 mcd	770 mcd
- **PPAP** available
- **Size** of DMC: 1.6mm x 0.4 mm
- **Access to look-up file** provided by Osram OS
 - First step: Via Mail
 - Second step: Web portal
- **Test Data** available at **2 set points** (10 and 50 mA)

(Pocket number) and DMC ID			Barcode product label information				Colorimetric (Cx and Cy)								Luminous intensity Iv in cd					Forward Voltage in V												
Calendar Week	Pocket Position	DMC	Delivery ID	Handling Unit	Reel Label	Dry Pack Label	Product Box Label	Parameter grouping	CX	CX	CX	CX	CX	CX	CY	CY	CY	CY	CY	CY	IV	IV	IV	IV	IV	IV	UF	UF	UF	UF	UF	UF
								Chip color	BLUE	BLUE	GREEN	GREEN	RED	RED	BLUE	BLUE	GREEN	GREEN	RED	RED	BLUE	BLUE	GREEN	GREEN	RED	RED	BLUE	BLUE	GREEN	GREEN	RED	RED
202001	1	NRW1E1101	5001387488	76018924	1011650275002	1011650275020	1011650275023		0,01	0,05	0,01	0,05	0,01	0,05	0,01	0,05	0,01	0,05	0,01	0,05	0,01	0,05	0,01	0,05	0,01	0,05	0,01	0,05	0,01	0,05	0,01	0,05
									0,1331	0,1386	0,2039	0,1614	0,6941	0,695	0,0599	0,0506	0,7343	0,7219	0,3048	0,3043	0,2703	0,8977	1,2328	3,6439	0,5629	2,6489	2,6873	2,8976	2,4485	2,8404	1,9351	2,306

Process flow of a RGB light system



New way with OSIRE® DMC

→ No optical measurement at TIER1/2 required

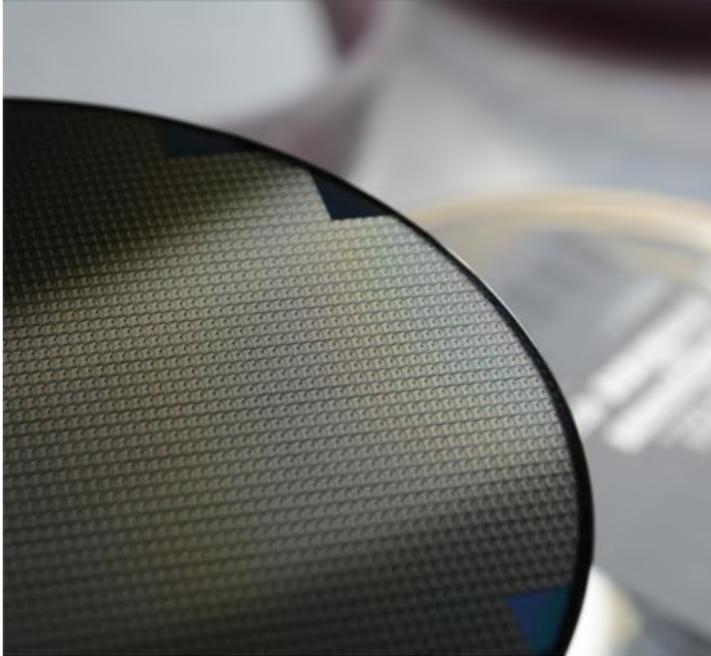


Melexis

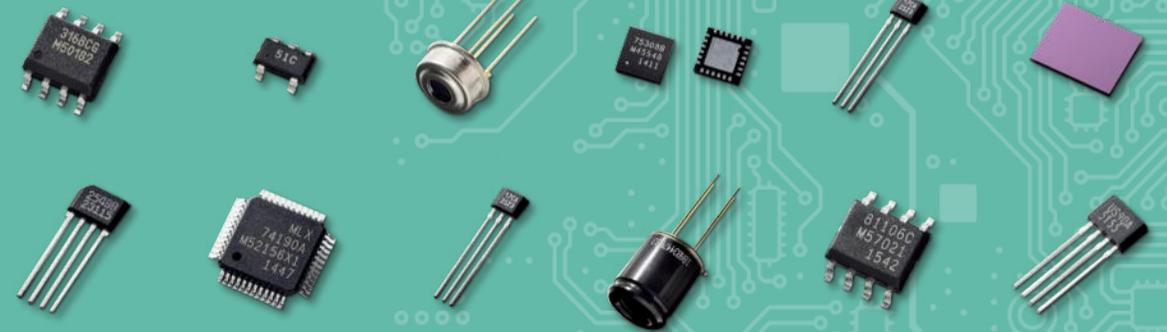
INSPIRED ENGINEERING

RGB LED Lighting in Automotive Environment takes the next step towards safety applications

Melexis - What do we do? And why?



We create innovative
micro-electronic solutions
for the best imaginable future



The Melexis portfolio



Automotive



Transportation



Smart applications



Smart buildings



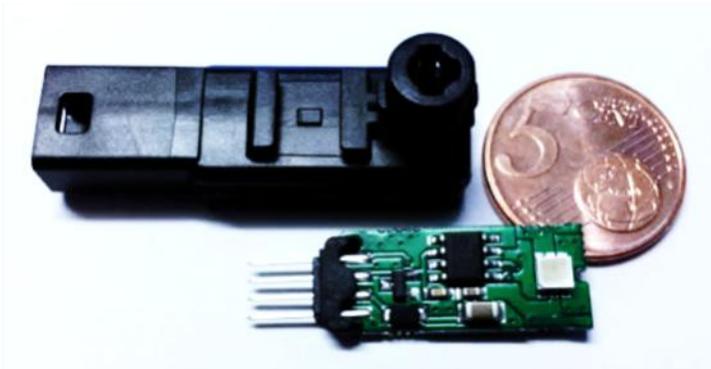
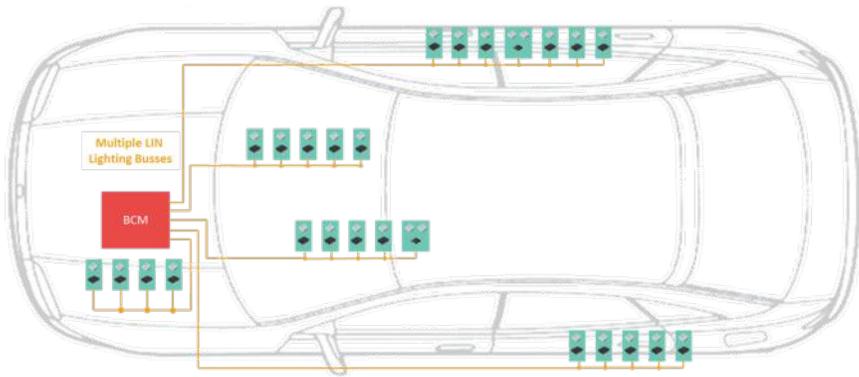
Industry



Medical

Automotive RGB LED Lighting

Considerations for the Application



- **Wiring across the car by using standard bus system**
- **Very cost sensitive**
- **Easy to use**
- **Easy to implement**
- **Fulfil tight space requirements**
- **Fusion of safety display function with ambient light**
 - **ISO26262 (ASIL) Grade applications**

Automotive RGB LED Lighting

Considerations for Automotive Performance



- Consumer LED stripes available from many suppliers
- Huge differences from LED to LED, temp, voltage effects ...

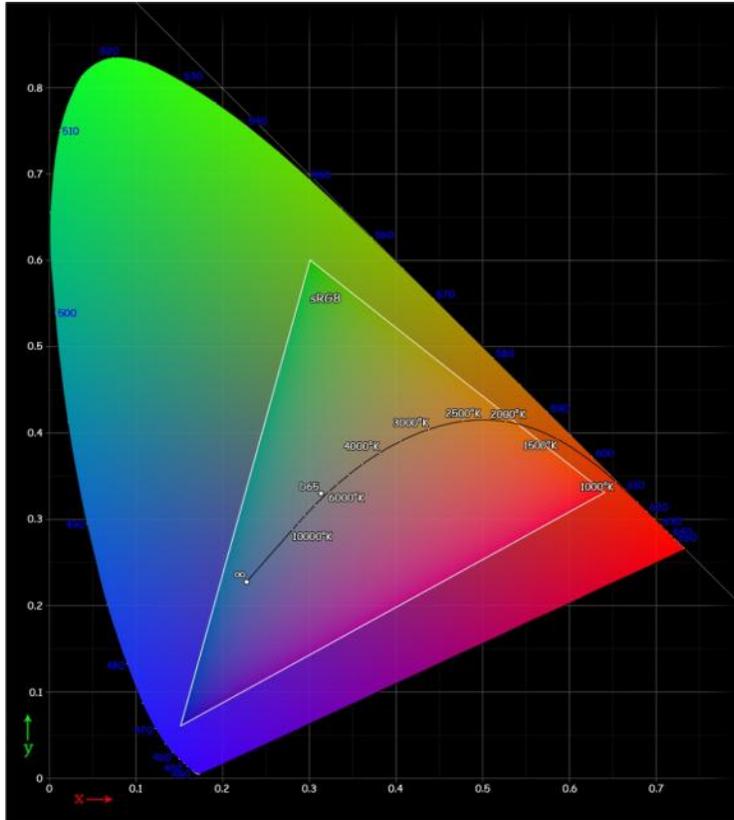
RGB LED used for automotive is a completely different world !



- Automotive harsh environment
- Wide operating range
- Very high accuracy of color mixing
- EMC/ESD robustness
- Huge temperature range
- Smart connectivity
 - Communication via LIN or MeLiBu™

Automotive RGB LED Lighting

Lighting Performance/Color Mixing



CIE Diagram

- **LED characteristics to consider for homogeneous ambient lighting**
 - Temperature dependencies of LED chips
 - Forward current dependencies of LED chips
 - Binning size determining color gamut
- **Additional aspects to achieve high accuracy of color points**
 - Taking human eye behavior into account
 - High resolution of LED current control

Light for advanced communication functions and functional/safety light

MeLiBu™
by Melexis

The new standard system of smart embedded lighting with safety support

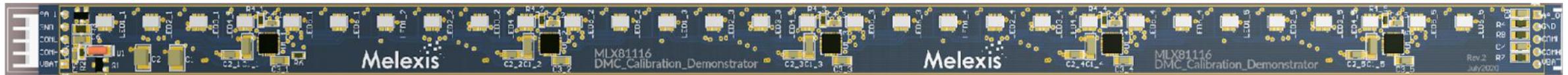
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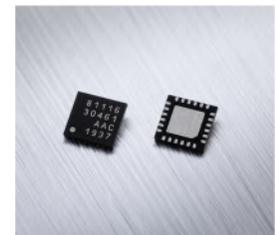
Smart Light PCB Example

Use of DMC OSIRE[®] LEDs and MeLiBu LED driver

OSRAM OSIRE[®] E3323
with DMC

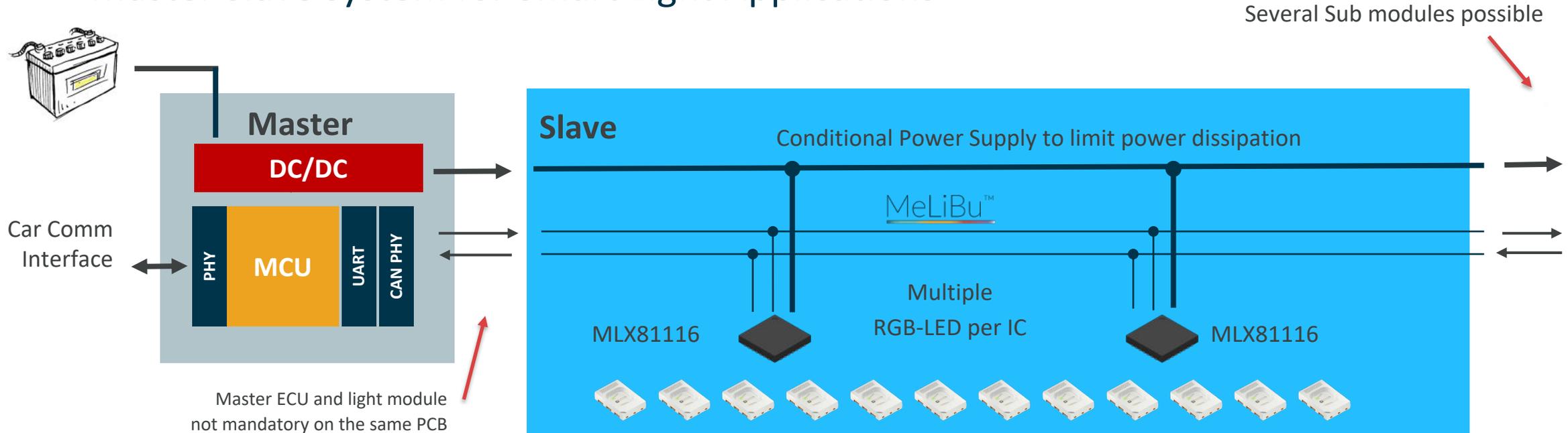


Melexis MLX81116
6 RGB Channel Automotive LED Driver
with MeLiBu[™] high speed communication interface



MLX81116 – Multi-Channel LED Driver with MCU and MeLiBu™

Master Slave system for Smart Light Applications



Master

- Standard MCU with UART
- CAN PHY for connection to MeLiBu™
- DC/DC converter to minimize power dissipation
 - DC/DC voltage can be >5V to support line drops
- Any standard bus as car interface

Smart LED Module

- Embedded MCU enables flexible system design, easy function updates and advanced diagnosis
- Simple external protection @connector because of integrated 12V boardnet robustness
- Integrated temperature compensation of every color channel
- Very high LED current resolution enables daylight visibility as well as huge dimming range
- Direct use of DMC provided calibration data to control color mixing algorithm
 - Support of two calibration points (10mA/50mA) enables 32-bit overall color/dimming range
 - No optical customer calibration needed
- Integrated CAN-FD PHY -> Real bus system with fail safe function
- Advanced safety support - ASIL B

Communication – Fast and Robust

Via the Melexis Light Bus - MeLiBu™



- ✔ Simplicity of Protocol
- ✔ Self Synchronizing Feature
- ✔ Easy to use



- ✔ High Speed Feature
- ✔ Automotive proven PHY
- ✔ EMC/ESD Robustness

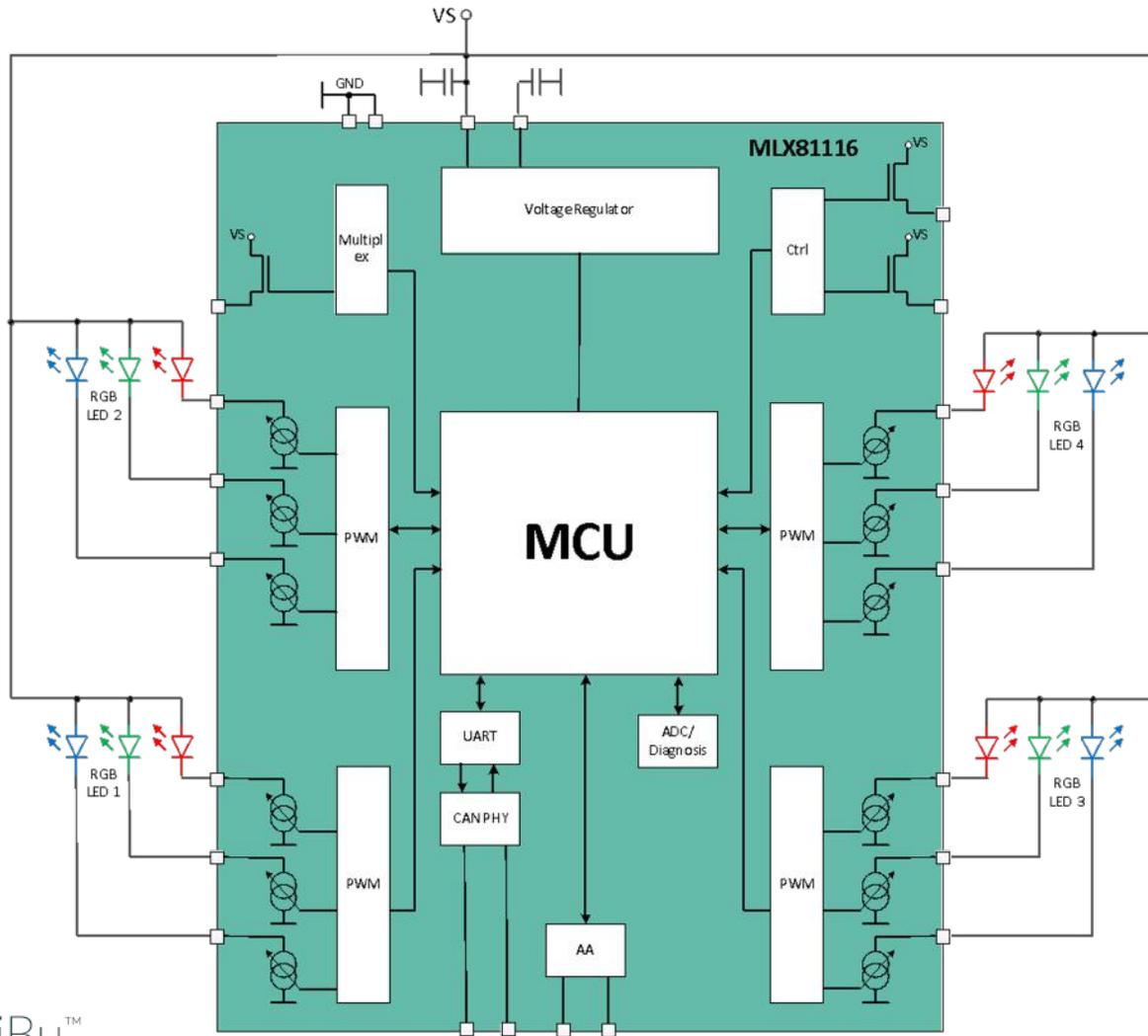


MeLiBu™

This is not a concept ! - It's in volume production

MLX81116 – Multi-Channel LED Driver with MCU

Control of four RGB LEDs with one LED driver IC



- 5.5...18V supply voltage (40V proof)
- MCU for extended LED control algorithm, color mixing and full diagnosis
- Storage of DMC data directly within LED driver
- Low side programmable calibrated current sources for LED control
- Color mixing accuracy of <1% delta UV
- Direct and multiplex LED drive without additional external components
- 16-bit color/intensity control per calibration point
- Red/Green and Blue LED temperature compensation without additional external components
- LEDs fully diagnosable (Short circuit, broken line, threshold monitor)
- MeLiBu™ communication interface
- Real Time update of all RGB LEDs without delay
- Developed according ISO26262 (ASIL-B ready)
- QFN4x4 package, 24pins

Summary Requirements

Lighting goes safety/ASIL

- More and more fusion of safety applications with ambient light
 - Safety critical car status information display with the integrated ambient light
 - Requires Intelligent/Smart lighting functions
 - Examples are already on the road
 - VW ID.3/ID.4 - communication Light
 - Daimler S-Class - Connected Light
 - Seat Leon – Blind Spot Detection
- Products necessary developed according ISO26262 up to ASIL-B
 - LED driver needs to support advanced diagnosis capability
 - Adaptable to different safety cases depending on application requirements
- Robust communication system supporting fail save operation
 - Differential bus connection with high thresholds (EMC robust)
 - No communication daisy chain

MeLiBu™/OSIRE®

The perfect couple for advanced safety

- Fully integrated smart LED driver
- **MeLiBu™** CAN-FD over UART communication enables **ASIL-B** at very high robustness and low BOM
- Real differential bus structure enables simple wiring harness
 - **Delay free communication** system between RGB LEDs
- **DMC** (Dot Matrix Code) gives access to the LED **calibration data**
- Optical measurement data with high accuracy at 50mA and 10mA provided by OSRAM OS
 - Calibration data can be directly used by LED driver to allow **delta UV** accuracy of color mixing < **0.01**
 - Calibration data are stored within the LED driver and used for temperature compensated color mixing
 - No need for optical measurement or burn in at EOL at Tier1/2
- Full 16bit resolution for **10mA** as well as **50mA** setting → 32-bit overall color/dimming range
 - **Synchronous switching** from 10mA to 50mA **without color/intensity change** glare-free night operation

Contact Details



<https://www.melexis.com/contact>



<https://www.osram.com/os/contact/index.jsp>