



LITIX™ - Interior Lighting



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Evolution of automotive lighting is driven by increasing number of light points / pixels per car and higher system complexity



Digitalization of light

- Adaptive driving beam (ADB)
- High-definition glare-free
- Digital-levelling headlamp
- Sharing information to traffic users
- Increased safety

Brand recognition & personalization

- Increasing number of light points
- Animations, light signature, user-centric scenarios
- Grille & logo illumination, colored light bar, tunable & high-power ambient light

Projection

- Lane and symbol projection
- Carpet light
- Sharing information to traffic users
- Increased safety

LED lighting continues to grow driven by the wish for stronger, safer and comfy lights like ADB and animation

Front Light

- 1 in 4 cars in 2031 will use matrix or pixel lights
- Greater China and Europe leading the trend

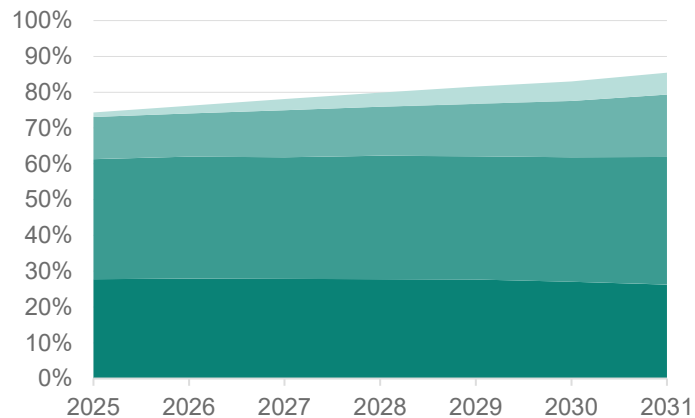
Rear Light

- Personalization and safety pushes growth
- 3 in 4 cars in 2031 utilizing LED for rear lighting

Interior Light

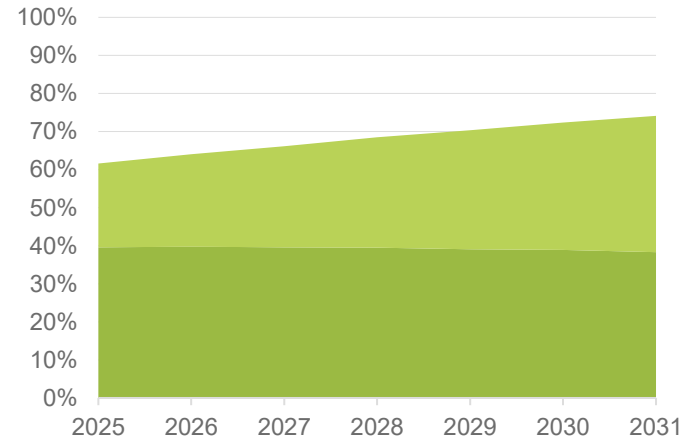
- Interior ambient lighting is being democratized across all price tiers, approaching 60% adoption by 2031

Light vehicles with LED front light functions



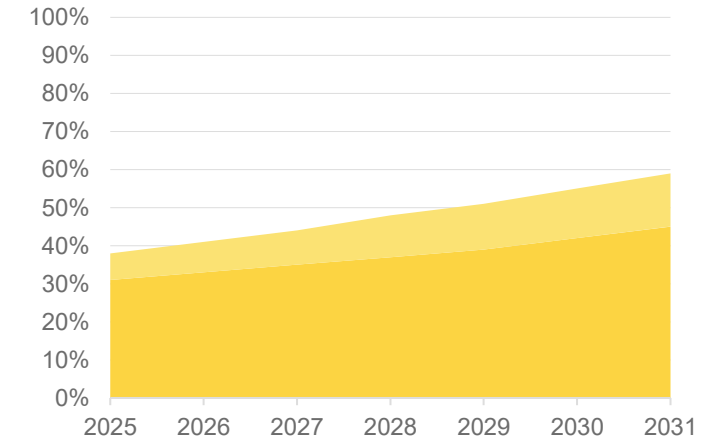
■ LED single light functions ■ Standard full LED headlight
■ Matrix headlight ■ Pixel lights

Light vehicles with LED rear light functions



■ Rear light static ■ Rear light dynamic

Light vehicles with LED interior light functions



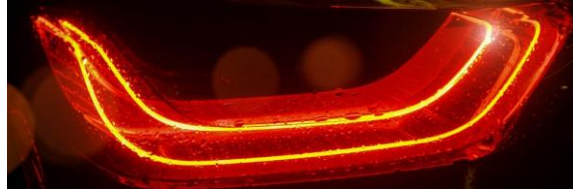
■ Ambient light static ■ Ambient light dynamic

Source: Infineon market model

Infiniteon has co-enabled the transition from halogen to LED and is still shaping the future of automotive lighting with tailored portfolio



LED as emerging lighting technology



LED as established lighting technology



Lighting beyond simple illumination



Lighting for V2X communication

2010

2018

Today

2030

1st Generation

Reliable and stable LED brightness



LITIX™ Basic current sources

- PWM operation
- Adjustable current output
- Protection mechanisms
- Simple diagnostics



LITIX™ Power DC-DC controllers

- Wide input voltage
- Different configurations
- Protection and diagnostics



Enable

2nd Generation

More LEDs per car & more diagnostics



LITIX™ Basic+ & Power Flex portfolio extension

- More channel variants
- Increased current capability
- Enhanced diagnostics



Extend

3rd Generation

Smart multichannel drivers



LITIX™ Pixel Rear

- Multichannel LED driver (16 ch)
- UART over CAN
- Advanced diagnostics
- Configurable current output



LITIX™ Interior

- Integrated MCU for high color quality



LITIX™ Pixel Front

- 16k pixel driver for Nichia's μPLS



Smarten up



High pixelated light sources for front and rear



Smarter drivers



SDV car architectures

Complexity

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With Infineon's LITIX™ scalable portfolio, all automotive lighting applications are addressed with best-fit devices



High-definition pixel light



(Matrix) front light



Rear light



Interior ambient light



LITIX™ Pixel Front

16k pixel driver for Nichia's μ PLS™

- Industry's first 45- μ m LED light source
- Stable brightness under high load contributions

4k pixel driver – coming soon

- Cost-effective light source

100k pixel driver – coming soon

- Higher resolution, increased field of view
- Less complex and more robust than digital micromirror device (DMD)



LITIX™ Power Flex

DC-DC supply pre-regulator

- 2-channel synchronous buck
- SPI
- Limp-home, analog & PWM dimming, EMC spread spectrum modulator



LITIX™ Power / Power Flex

Multi-topology DC-DC controller

- Up to 60 V input voltage
- Buck, boost, SEPIC, buck-boost
- Drive up to 32 pixels
- Protection and diagnostics



LITIX™ Basic & Basic+

Scalable high-/low-side drivers

- Up to 3-channel in/output, 400 mA/ch
- Built-in diagnostics & protection
- Best current accuracy and fault behavior in smallest package with power shift



LITIX™ Pixel Rear

- ASIL B development according to ISO 26262
- Lean wire-harness and 10-bit extensive diagnostics

16-channel low-side driver

- Up to 76.5 mA/ch configurable current
- OTP configuration

24- & 96-channel low-side driver – coming soon

- Up to 100 mA/ch
- MTP, ASIL B



LITIX™ Interior

3-ch LIN RGB driver

- Up to 50 mA/ch, 16-bit PWM
- Integrated Arm® Cortex®-M23 with 32 kB flash
- Highest color accuracy in smallest leaded package

4- & 12-ch LIN RGB(W) driver – coming soon

- Up to 60 mA/ch
- Up to 32 & 38 kB flash

42-ch Multi-RGB driver – coming soon

- 21 x 2 channels to drive up to 14 RGBs
- Up to 60 mA/ch
- Up to 38 kB flash
- ASIL B compliant

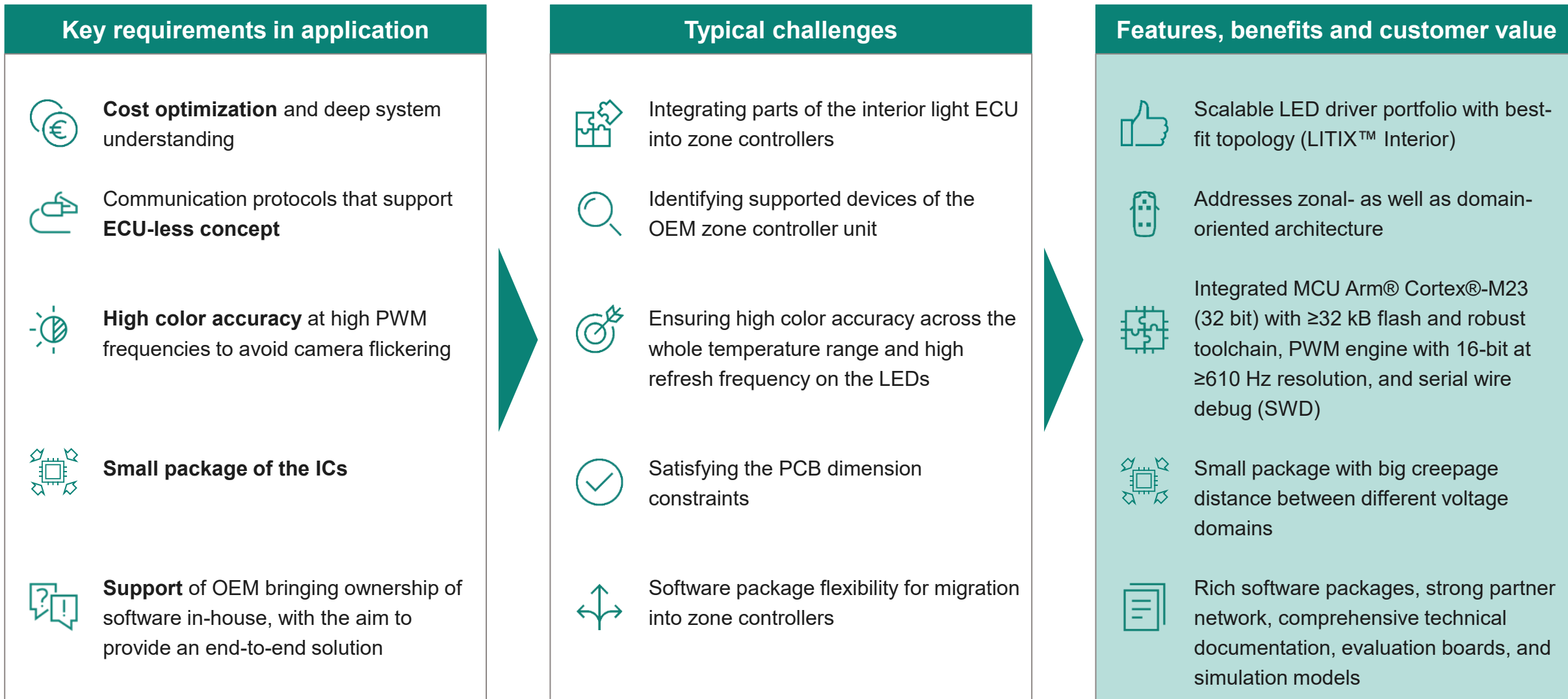
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Interior light



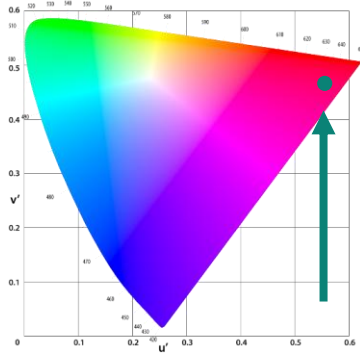
Infineon value proposition for LED interior light



Intelligent LED drivers are needed for Interior lighting applications

Standard LED drivers are NOT enough for required color accuracy

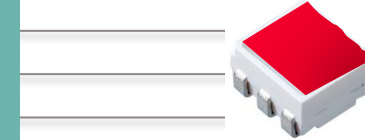
Network based control



Controller* sends a
Color Reference
e. g. $u' = 0.55$ $v' = 0.5$

*Controller could be a
LCM: Light Control Module
BCM: Body Control Module

“RGB driver color
system”

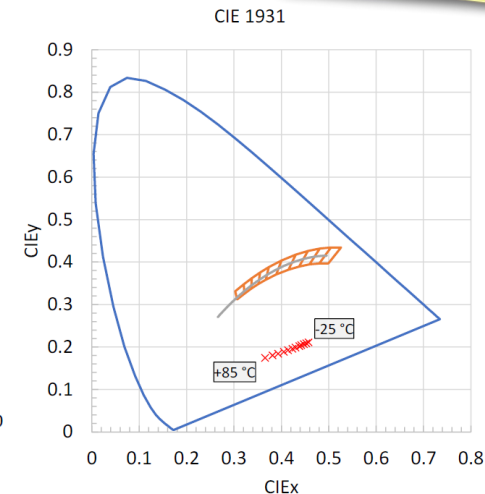
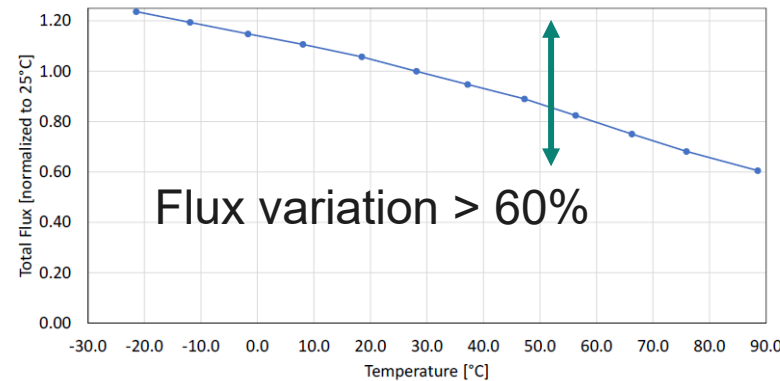
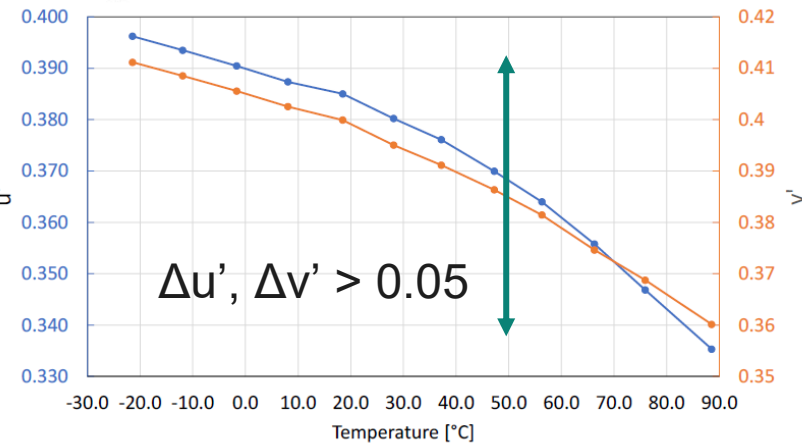


$\Delta u'v' < 0.01$
application
requirement

Temperature Drifts compensation



Nichia RGB LED NSSM313A-V1

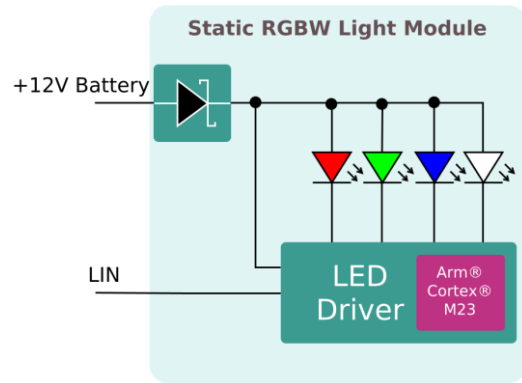


Intelligent
LED driver need for:
— Color accuracy
— BUS interface

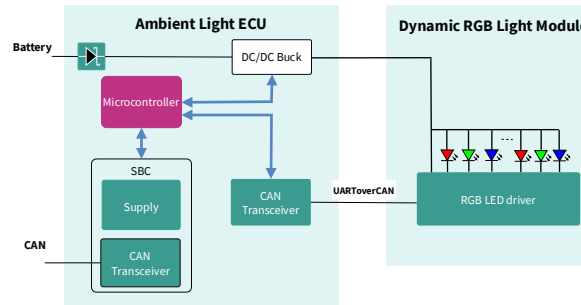
+ binning
+ lifetime degradation
+ peak current
dependencies

Three segments: static to set the ambient color, dynamic to enrich the driving experience, functional illumination to provide basic lights

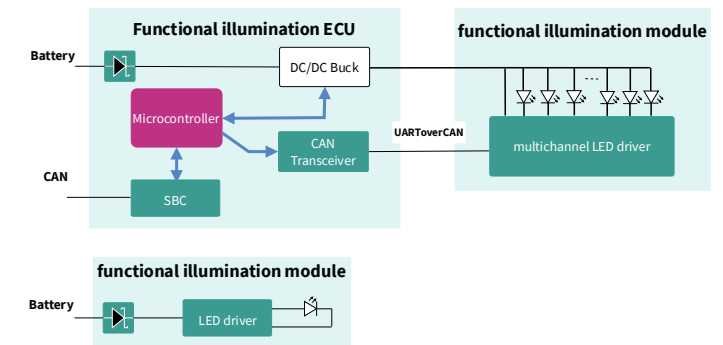
Static Ambient Light



Dynamic Ambient Light



Functional illumination



Ambient lighting served with scalable family of **LIN RGBW** multichannel LED drivers



Dynamic animations and HMI extension done via **ECU** to control multichannel **UARToverCAN RGB** LED drivers



Functional illumination served with different technologies: **multichannel linear** (eventually with LIN or UARToverCAN)

16-bit PWM at 610 Hz and 32 kB flash enable best-in-class color accuracy within $\pm 0.01u'v'$ – our design-in tools ensure accelerated T2M



Key requirements		Our offer		Your value
 Best color accuracy		– MCU Arm® Cortex®-M23 (32-bit) with up to 38 kB flash and robust toolchain – Serial wire debug (SWD) – PWM engine with 16-bit @ 610 Hz resolution		– No compromise in color accuracy requirements (within $\pm 0.01u'v'$, ability to store LED color calibration data) – Fully in line with OEM requirements
 Small footprint		– Smallest leaded package TFDSO-16 or TFDSO-24		– Best-fit for any space critical application – Cost effective package handling, soldering and solder inspection thanks to leaded package
 Supply security		– Dual-fab front-end strategy for LITIX™ Interior		– Business continuity
 Design-in support		– Various design-in collaterals (e.g. demo code, PDL + configuration tool) – Reference designs – Partnership with external lab for OEM specific code development		– Accelerated time-to-market – Know-how build-up from Infineon's experts

TLD4020-3ET – high color accuracy through integrated MCU and LIN interface in the smallest leaded package



LITIX™ Interior
TLD4020-3ET

LED driver for RGB
ambient lighting



Integrated MCU

Arm® Cortex®-M23 with 32 kB flash



3-channel driver

50 mA each & 16-bit PWM engine at 610 Hz



LIN interface

with LIN-Auto-Addressing



11-bit ADC

differential measurement 0–8 V



2 extra GPIO pins

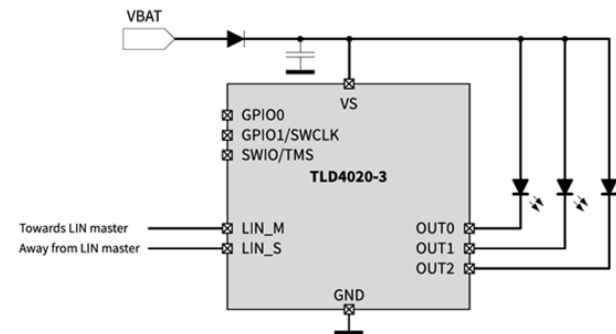
for extra sense and control



[Read more](#)

In serial
production!

TLD4020-3ET enables the best color-fidelity and offers the maximal application flexibility in the smallest leaded package



Dimming



Color
mixing



Color
compensation



Smooth
color
transition



TFDSO-16

4.4 × 2.8 × 0.95 mm³

FP: 4.4 × 4.9 mm²



LITIX™ Interior static light portfolio overview

Specifications	TLD4020-3ET	TLD4020-4ET	TLD4030-12ES
Topology	Linear	Linear	Linear
Channel	3	4	12
Max. output current per channel	50 mA	60 mA	60 mA
PWM engine	16-bit at 610 Hz	16-bit at 610 Hz	16-bit at 610 Hz
MCU	Integrated Arm® Cortex®-M23 with 32 kB flash	Integrated Arm® Cortex®-M23 with 32 kB flash	Integrated Arm® Cortex®-M23 with 38 kB flash
Interface	LIN with LIN-auto-addressing	LIN with LIN-auto-addressing	LIN with LIN-auto-addressing
Package	TFDSO-16	TFDSO-16	TSDSO-24

Coming Soon

Coming Soon

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TLD40X0STD – one evaluation platform to serve all LITIX™ LIN RGB drivers



TLD40X0STD Evaluation platform



One main board
TLD40X0STD_EVAL



On-board XMC™ Link debugger
based on SEGGER J-Link



Bootstrap loader connector
for uIO stick v2



GPIO interfaces
to evaluate various use cases

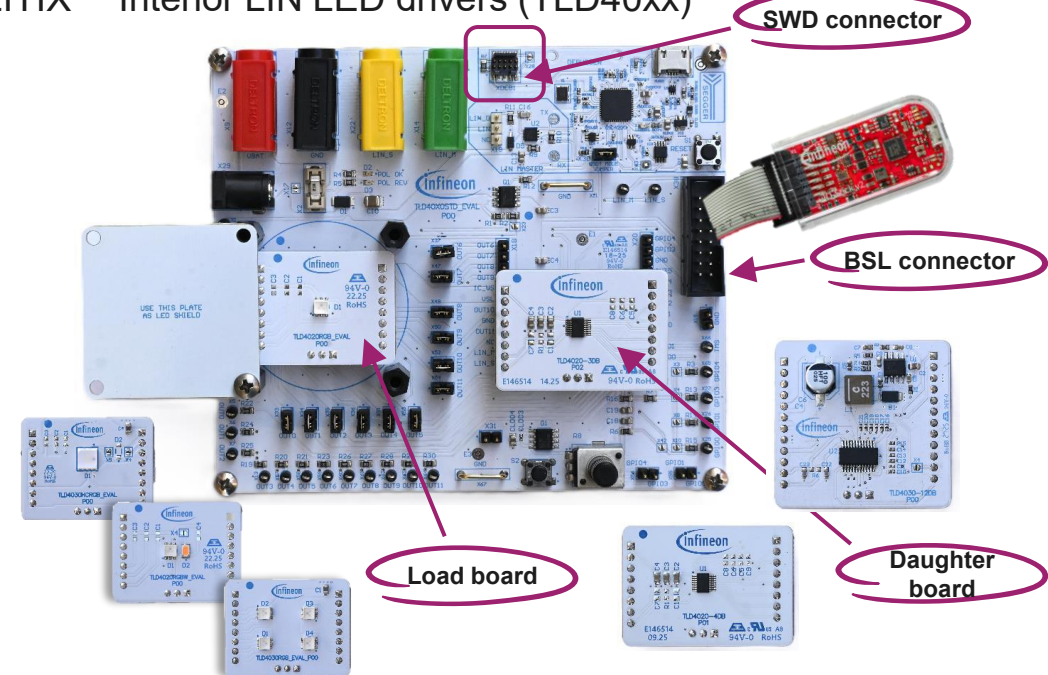


Set of load & daughter boards

TLD4020-3DB
TLD4020-4DB
TLD4030-12DB
TLD4020RGB_EVAL
TLD4020_RGBW_EVAL
TLD4030RGB_EVAL
TLD4030HCRGB_EVAL
TLD40x0LLS_EVAL

Samples
available!

The TLD40X0STD evaluation platform is designed to facilitate the development and testing of the LITIX™ Interior LIN LED drivers (TLD40xx)



LITIX™ Interior TLD40xx go-to-market tool: simplify your development journey with PC tools for LIN RGB driver ICs



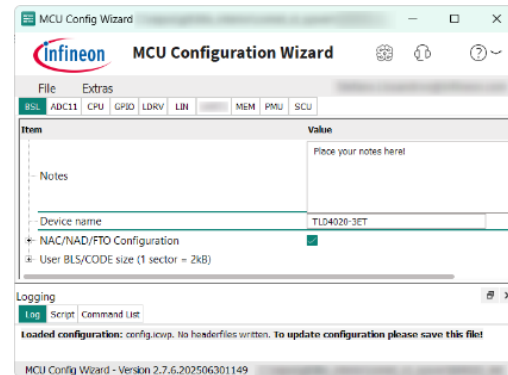
Development Toolchain Excellence



Keil µVision | IAR Embedded Workbench

- Cutting-edge IDEs built for Cortex cores
- Comprehensive debuggers and static/dynamic code analysis tools
- Optimized compilers & middleware integration

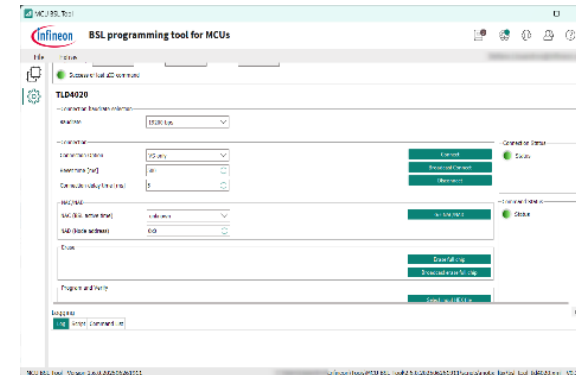
Seamless Device Configurations



Infineon MCU Configuration Wizard

- Easy visual register settings creation
- Fast configuration integration with Keil/IAR
- Intuitive code generation & save-ready configuration

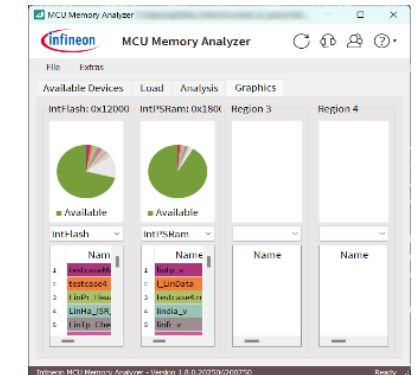
Effortless Programming Tools for MCUs



Infineon BSL programming tool for MCUs

- Features robust flashing, programming, and configuration capabilities
- Simple interfacing via uIO v2 stick

Efficient Debugging & Memory Analysis



Infineon MCU Memory Analyzer

- Detailed views of memory regions & linker file insights
- Advanced allocation visuals (e.g., pie charts)
- Support for standard formats (.axf, .out, .elf)

Infinite Smart Power LED Tools cover the full customer design journey with LITIX™ development



Simulation & Modeling Tools



Infineon Automotive Power Explorer		LITIX™ Basic+, LITIX™ Pixel Rear support. Integrates the Power Shift Dimensioning and Power Dissipation modules
Infineon Power DC-DC Designer		LITIX™ Power Flex
Infineon SLS Dimensioning Tool		LITIX™ Basic+

Configuration Tools



Configuration Wizard for LED		LITIX™ Power Flex
Infineon LITIX™ Pixel Rear Config Wizard		LITIX™ Pixel Rear
High Definition Streaming Wizard		LITIX™ Pixel Front (only restricted release)
Infineon MCU Configuration Wizard		LITIX™ Interior

Utility Tools



Infineon BSL programming tool for MCUs		LITIX™ Interior
Infineon Report Tool		LITIX™ Power, LITIX™ Power Flex, LITIX™ Basic, LITIX™ Basic+
HSLI Protocol Analyzer		LITIX™ Pixel Rear, LITIX™ Interior
Infineon MCU Memory Analyzer		LITIX™ Interior



Infineon
Developer Center

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[MOSFET Selection Table](#)

[OPTIREG™ System Basis Chips](#)

