OSRAM KRTBI D2LM31.31

Datasheet

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Tobelbader Strasse 30, 8141 Premstaetten, Austria
Phone +43 3136 500-0
ams-osram.com

OSRAM

OSIRE® E3731i

KRTBI D2LM31.31

This device is especially designed for automotive interior applications requesting high dynamic RGB lighting scenarios. This device is an intelligent RGB device, incorporating besides R/G/B LEDs an IC from ams OSRAM. This embedded IC integrates the drivers for the three R/G/B LEDs. The embedded IC includes the optical measurement data of the three R/G/B LEDs as well. An external micro controller can address and control each device in a daisy chain architecture via an open system protocol. The open protocol allows the micro controller to read back these data and to run any color algorithm. It also allows to read back a temperature value to optimize this color algorithm.

Applications

- Ambient Lighting

Features

- Package: white SMD package, colorless clear silicone resin
- Chip technology: Thinfilm / ThinGaN
- Typ. Radiation: 120° (Lambertian emitter)
- Color: λ_{dom} = 626 nm (● red); λ_{dom} = 533 nm (● true green); λ_{dom} = 462 nm (● blue)
- Corrosion Robustness Class: 2B
- Qualifications: AEC-Q102-003 Qualified
- ESD: 2 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2); 500 V acc. to JESD22-C101 (CDM, Class C2)

AEC-Q102 QUALIFIED

Features

- Optical measurement data available at two setpoints (10 and 50 mA)
- Serial data communication via open system protocol (OSP)
- Integrated µDriver
- Needs 5V DC supply voltage
- Auto addressing of package inside daisy chain

Ordering Information

Type	Brightness I_F = 10 mA	Ordering Code
KRTBID2LM31.31-1R-JW+1G-J3+1B-5V		Q65113A6250
KRTBID2LM31.31-C5D7-JW+A5V9-13+R5S7-3Z		Q65113A6249
red	I_V = 320 … 900 mcd	
true green	I_V = 1000 … 2010 mcd	
blue	I_V = 125 … 355 mcd	

Typical brightness

T_S = 25 °C

Color	Current in mA	Value	Unit
red	10	560	mcd
true green	10	1460	mcd
blue	10	220	mcd
red	50	2520	mcd
true green	50	4300	mcd
blue	50	800	mcd

Relative Luminous Intensity

$I_v(50\ mA)/I_v(10\ mA) = f(I_F);\ T_S = 25\ °C$

Color	Current in mA	Value
red	50	4.5
true green	50	2.95
blue	50	3.65

Dominant wavelength

$\Delta\ \lambda\ dom = \lambda\ dom(50\ mA) - \lambda\ dom(10\ mA) = f(I_F);\ T_S = 25\ °C$

Color	Current in mA	Value	Unit
true green	50	-8	nm
blue	50	-2	nm

Absolute Maximum IC Ratings

Stresses beyond those listed under ”Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated under “operation Conditions” is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameter	Symbol		Values
DC supply voltage1	V_{DD}, V_{LED}	min.	-0.3 V
		max.	7.0 V
SIO Voltage	SIO1/2_n/p	min.	-0.3 V
		max.	VDD +0.3 V
Reverse voltage	V_R		Not designed for reverse operation
Operating Temperature	T_{op}	min.	-40 °C
		max.	110 °C
Storage Temperature	T_{stg}	min.	-40 °C
		max.	110 °C
Junction Temperature	T_j	min.	-40 °C
		max.	125 °C
ESD withstand voltage acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)	V_{ESD_HBM}	min. max.	-2 kV 2 kV
All Pads acc. to JESD22-C101 (CDM, Class C2)	V_{ESD_CDM}	min. max.	-500 V 500 V

Operating Conditions

Parameter	comment	Symbol		Values
Power Supply Voltage (dc)	DC supply voltage IC and LED	V_{DD}, V_{LED}	min. max.	4.5 V 5.5 V
Startup time	Device ready for commands, time after VDD > VGOOD level	t_{start}	typ.	1 ms
Supply current IC at mode: (PIN: VDD IC, VDD = 5V)				
uninitialized state (after POR)			typ.	2.05 mA
ACTIVE mode	LED driver off	I_{Ic_activ}	typ.	2.05 mA
ACTIVE mode	LED driver on, PWM >=1, Current comparators of LED drivers: Avg. current Red*0.11 Avg. current Green*0.11 Avg. current Blue*0.11	$I_{Ic\_LED\_ON}$	typ.	2.05+1.5 +avg current R,G,B *0.11 mA
SLEEP mode		I_{Ic_sleep}	typ.	2.05 mA
DEEPSLEEP mode		$I_{Ic\_deep\_sleep}$	typ.	1.9 mA
Junction Temperature		T_j	min. max.	-40 °C 125 °C

Start-up and power down description

Parameter	comment	Symbol		Values
Deglitch time to detect Undervoltage		t_{UV}	typ.	50 us
Detection hysteresis		V_{DET_HYST}	typ.	100 mV
VDD POR	address is lost	VPoR	typ.	1.2 V
VDD communication stop		VDD_{COM_STOP}	typ.	2.6 V
VDD under voltage level	LED driver are disabled at this level if selected	VDD_{UVLO}	min. max.	4.1 V 4.5 V
VDD normal voltage range		VDD_{GOOD}	min. max.	4.5 V 5.5 V

Characteristics

I_F = 10 mA; T_S = 25 °C

Parameter	Symbol		Values ● red	Values ● true green	Values ● blue
Peak Wavelength	λ_{peak}	typ.	635 nm	526 nm	456 nm
Dominant Wavelength [1]	λ_{dom}	min. typ. max.	620 nm 626 nm 632 nm	524 nm 533 nm 541 nm	449 nm 462 nm 473 nm
Viewing angle at 50% I_V	2φ	typ.	120 °	120 °	120 °
Reverse current [2]	I_R		Not designed for reverse operation	Not designed for reverse operation	Not designed for reverse operation
Real thermal resistance junction/solderpoint [3]	$R_{thJS\ real}$	typ. max.	84 K / W 117 K / W	48 K / W 65 K / W	47 K / W 64 K / W

Typical Dominant Wavelength[1]

Ts = 25 °C

Color	Current in mA	Value	Unit
● red	10	626	nm
● true green	10	533	nm
● blue	10	462	nm
● red	50	626	nm
● true green	50	525	nm
● blue	50	460	nm

Brightness Groups

Color of emission	Group	Luminous Intensity [4] I_F = 10 mA min. I_v	Luminous Intensity [4] I_F = 10 mA max. I_v
red	1R	320 mcd	900 mcd
red	C5	320 mcd	500 mcd
red	C7	360 mcd	560 mcd
red	C9	400 mcd	630 mcd
red	D	450 mcd	710 mcd
red	D5	500 mcd	800 mcd
red	D7	560 mcd	900 mcd
true green	1G	1000 mcd	2010 mcd
true green	V9	1000 mcd	1590 mcd
true green	AW	1120 mcd	1800 mcd
true green	A5	1250 mcd	2010 mcd
blue	1B	125 mcd	400 mcd
blue	R5	125 mcd	201 mcd
blue	R7	140 mcd	224 mcd
blue	R9	159 mcd	250 mcd
blue	S	180 mcd	280 mcd
blue	S5	201 mcd	315 mcd
blue	S7	224 mcd	355 mcd

Wavelength Groups

- red

Group	Dominant Wavelength [1] min. λ_{dom}	Dominant Wavelength [1] max. λ_{dom}
JP	620 nm	625 nm
MT	623 nm	629 nm
RW	627 nm	632 nm

Wavelength Groups

- true green

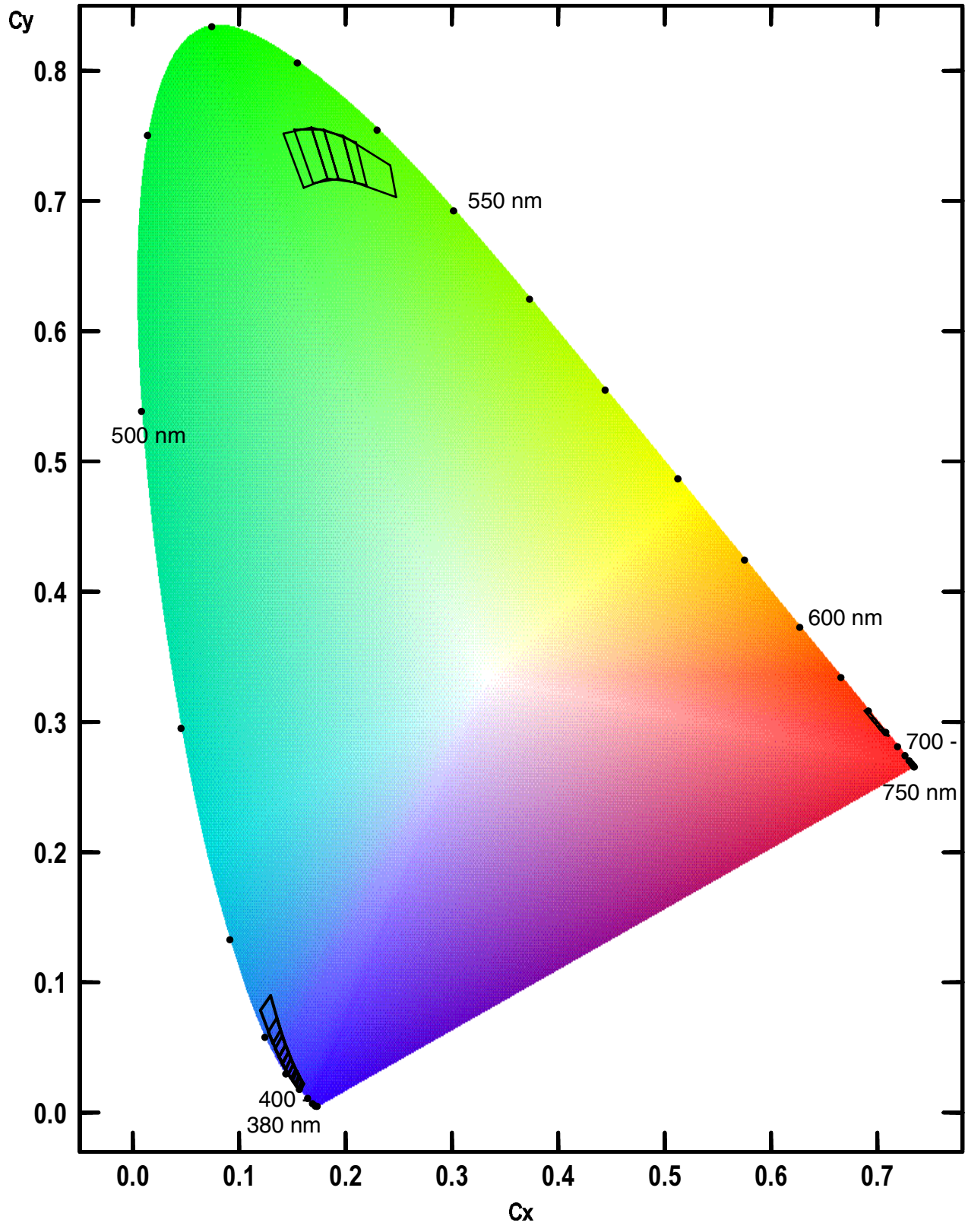
Group	Dominant Wavelength [1] min. λ_{dom}	Dominant Wavelength [1] max. λ_{dom}
JP	524 nm	529 nm
LR	526 nm	531 nm
PU	529 nm	534 nm
RW	531 nm	536 nm
U3	534 nm	541 nm

Wavelength Groups

- blue

Group	Dominant Wavelength [1] min. λ_{dom}	Dominant Wavelength [1] max. λ_{dom}
51	449 nm	453 nm
3C	451 nm	456 nm
AF	454 nm	459 nm
DH	457 nm	461 nm
FK	459 nm	463 nm
HM	461 nm	465 nm
KP	463 nm	467 nm
MS	465 nm	470 nm
QV	468 nm	473 nm

Chromaticity Coordinate Groups



Chromaticity Coordinate Groups

● red

Group	Cx	Cy
JP	0.6879	0.3086
	0.6915	0.3083
	0.7006	0.2993
	0.6969	0.2996
MT	0.6936	0.3030
	0.6972	0.3027
	0.7066	0.2934
	0.7028	0.2938
RW	0.7000	0.2966
	0.7037	0.2962
	0.7105	0.2895
	0.7067	0.2899

Chromaticity Coordinate Groups

● true green

Group	Cx	Cy
JP	0.1606	0.7102
	0.1415	0.7518
	0.1679	0.7565
	0.1831	0.7174
LR	0.1694	0.7136
	0.1517	0.7547
	0.1794	0.7549
	0.1933	0.7170
PU	0.1831	0.7174
	0.1678	0.7565
	0.1973	0.7500
	0.2091	0.7142
RW	0.1932	0.7170
	0.1794	0.7549
	0.2098	0.7449
	0.2196	0.7122

Chromaticity Coordinate Groups

- true green

Group	Cx	Cy
U3	0.2091	0.7142
	0.1974	0.7500
	0.2419	0.7273
	0.2474	0.7029

Chromaticity Coordinate Groups

- blue

Group	Cx	Cy
3C	0.1543	0.0317
	0.1588	0.0243
	0.1556	0.0186
	0.1500	0.0246
	0.1543	0.0317
51	0.1570	0.0268
	0.1606	0.0222
	0.1576	0.0168
	0.1534	0.0206
	0.1570	0.0268
AF	0.1509	0.0370
	0.1562	0.0285
	0.1524	0.0219
	0.1462	0.0293
	0.1509	0.0370
DH	0.1487	0.0414
	0.1532	0.0332
	0.1489	0.0262
	0.1436	0.0332
	0.1487	0.0414

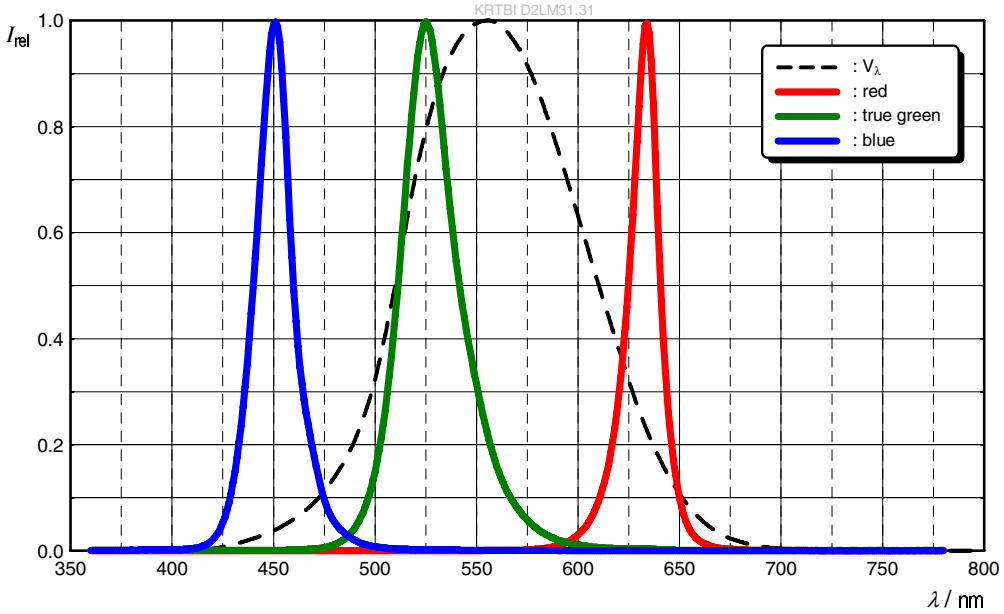
Chromaticity Coordinate Groups

- blue

Group	Cx	Cy
FK	0.1463	0.0463
	0.1509	0.0370
	0.1462	0.0293
	0.1407	0.0376
	0.1463	0.0463
HM	0.1436	0.0519
	0.1487	0.0414
	0.1436	0.0332
	0.1375	0.0428
	0.1436	0.0519
KP	0.1404	0.0588
	0.1463	0.0463
	0.1407	0.0376
	0.1338	0.0493
	0.1404	0.0588
MS	0.1354	0.0727
	0.1436	0.0519
	0.1375	0.0428
	0.1272	0.0620
	0.1354	0.0727
QV	0.1295	0.0899
	0.1389	0.0631
	0.1317	0.0532
	0.1199	0.0785
	0.1295	0.0899

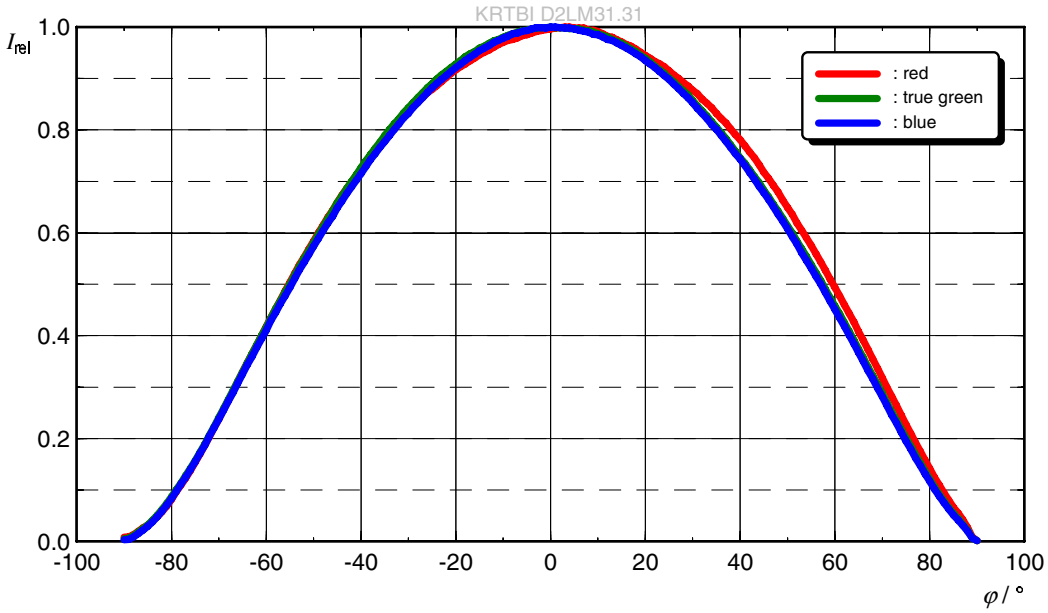
Relative Spectral Emission [5)]

$I_{rel} = f(\lambda)$; I_F = 10 mA; T_S = 25 °C



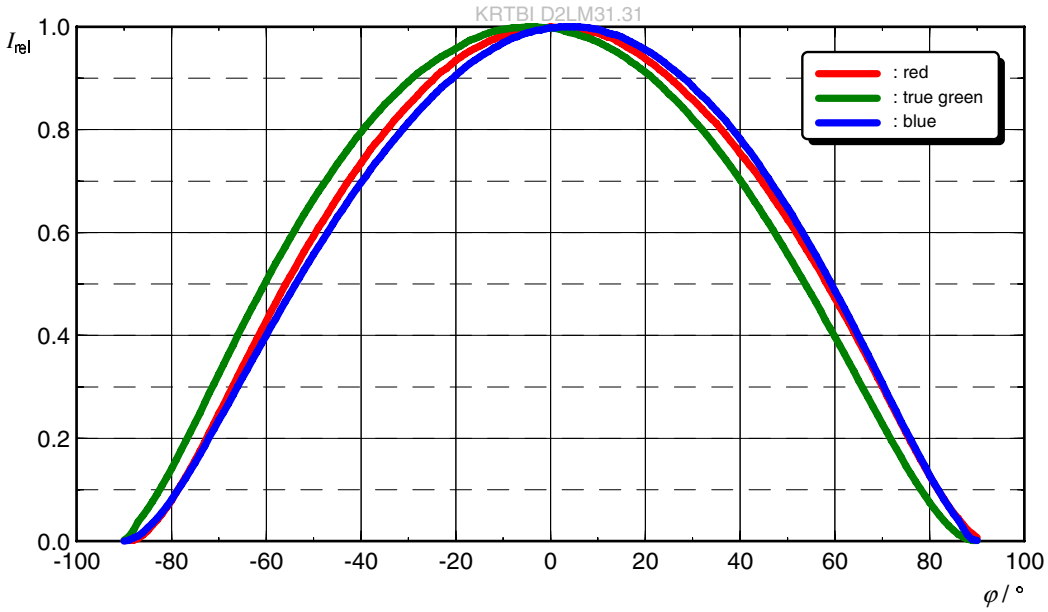
Radiation Characteristic (horizontal) [5)]

$I_{rel} = f(\phi)$; $T_S = 25$ °C



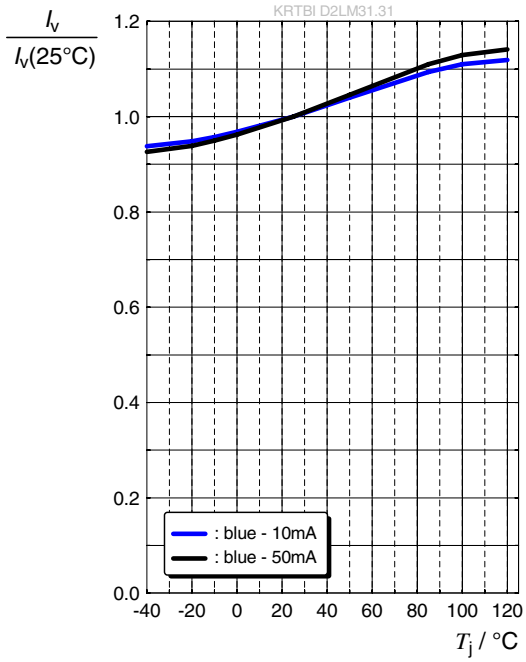
Radiation Characteristic (vertical) [5)]

$I_{rel} = f(\phi)$; $T_S = 25$ °C



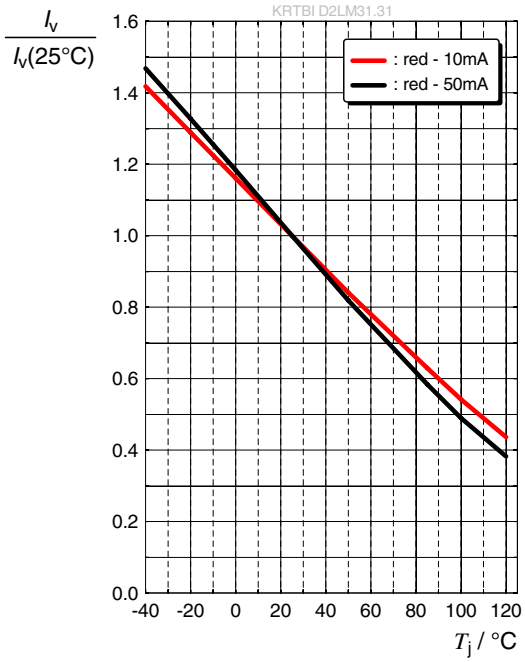
Relative Luminous Intensity 5)

$I_V/I_V(25°C)=f(T_j)$; blue



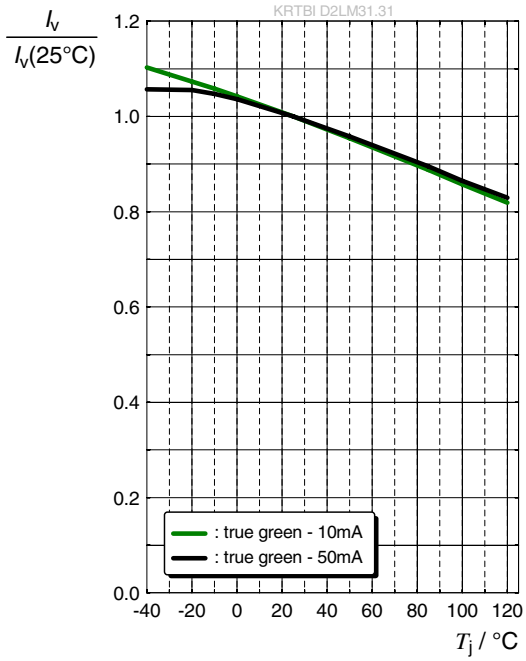
Relative Luminous Intensity 5)

$I_V/I_V(25°C) = f(T_j)$; red



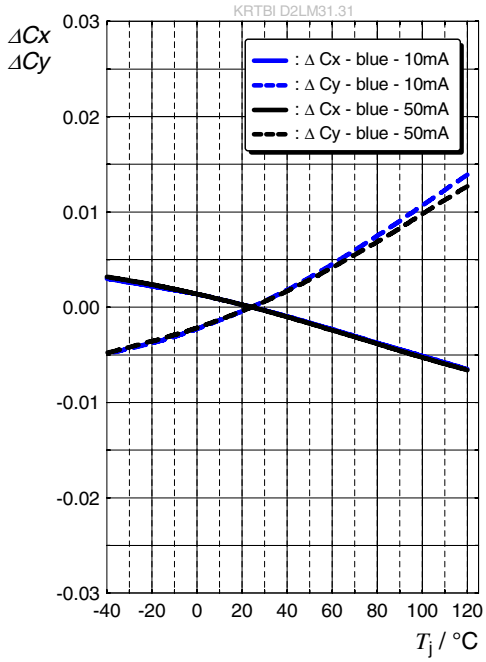
Relative Luminous Intensity 5)

$I_V/I_V(25°C)=f(T_j)$; true green



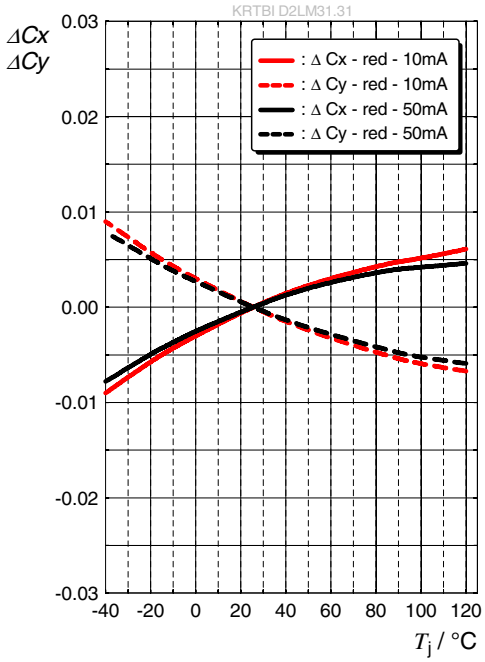
Chromaticity Coordinate Shift [5)]

ΔCx, ΔCy = f(T_j); blue



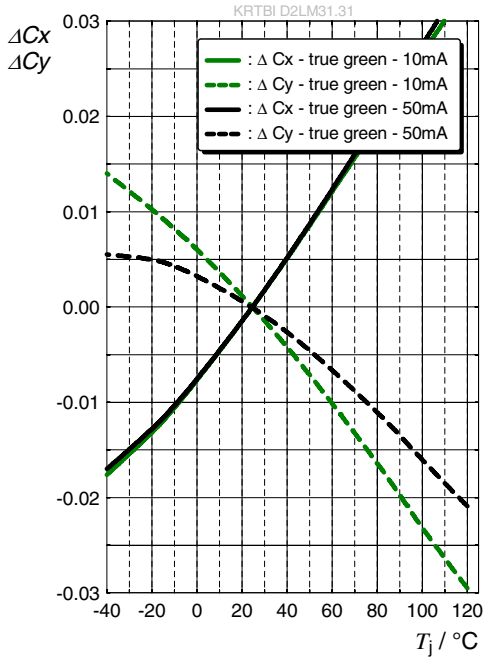
Chromaticity Coordinate Shift [5)]

ΔCx, ΔCy = f(T_j); red



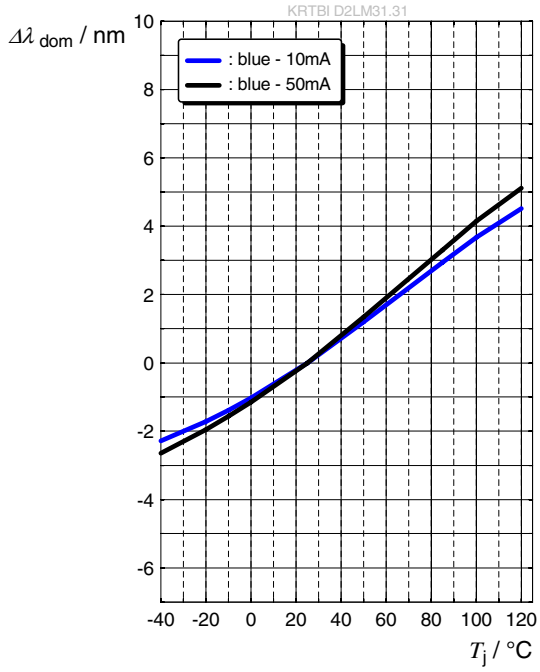
Chromaticity Coordinate Shift [5)]

ΔCx, ΔCy = f(T_j); true green



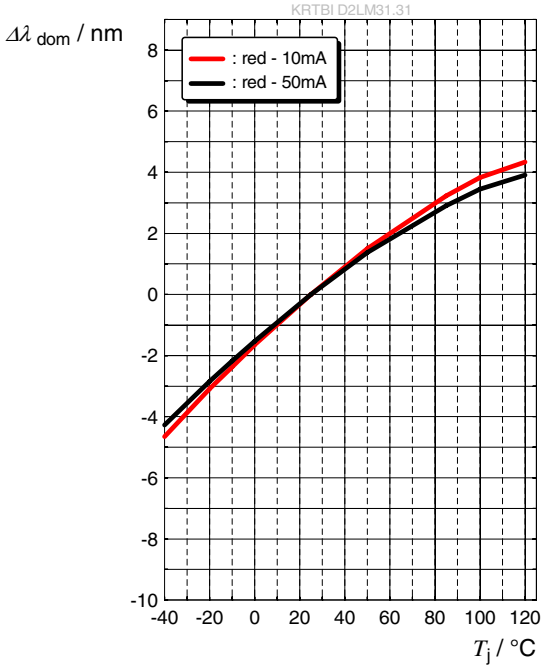
Dominant Wavelength 5)

$\Delta\lambda_{dom} = \lambda_{dom} - \lambda_{dom}(25°C) = f(T_j)$



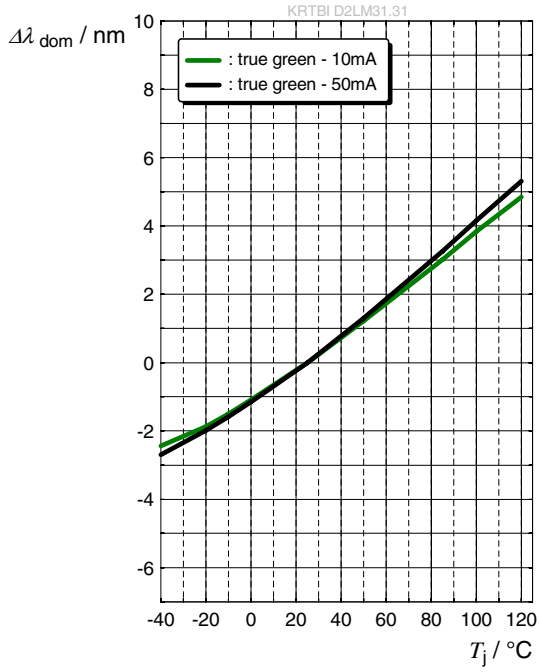
Dominant Wavelength 5)

$\Delta\lambda_{dom} = \lambda_{dom} - \lambda_{dom}(25\ °C) = f(T_j)$



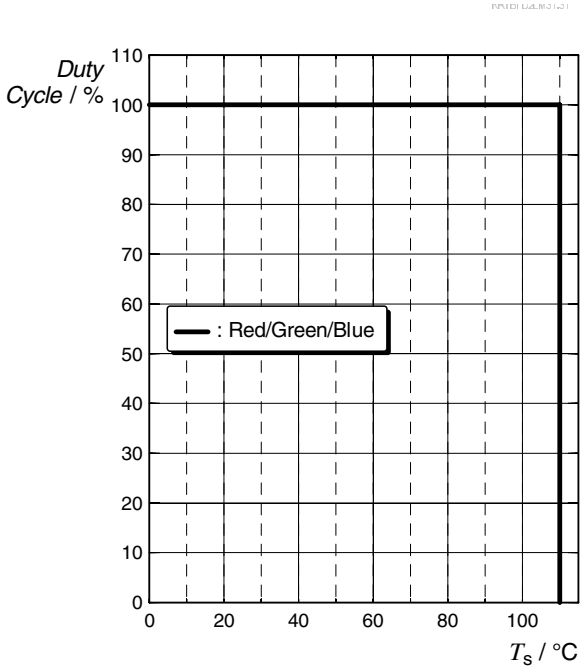
Dominant Wavelength 5)

$\Delta\lambda_{dom} = \lambda_{dom} - \lambda_{dom}(25\ °C) = f(T_j)$

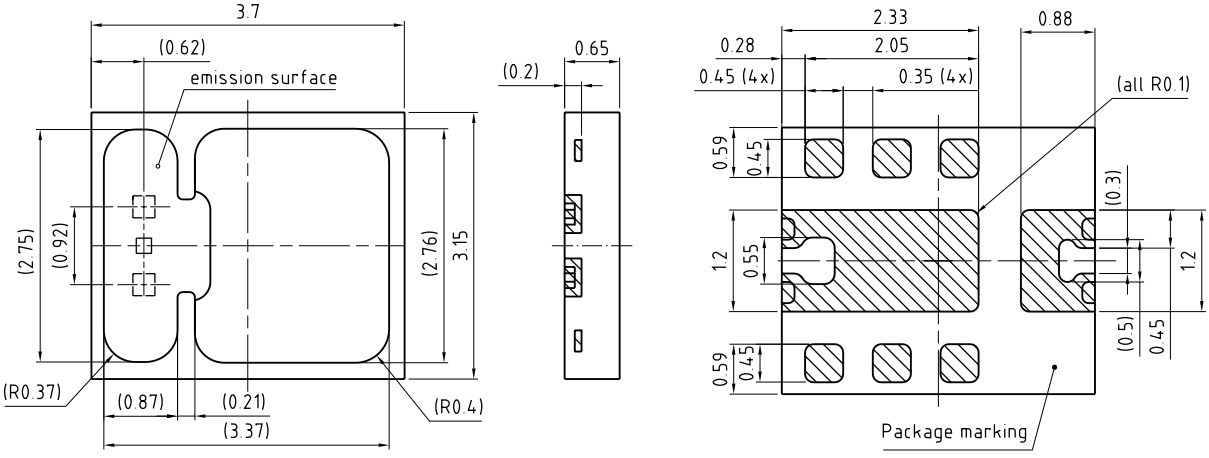


Permissible Pulse Handling Capability

Current setting = 50mA red - green - blue



Dimensional Drawing [6)]



general tolerance ±0.1
lead finish Au

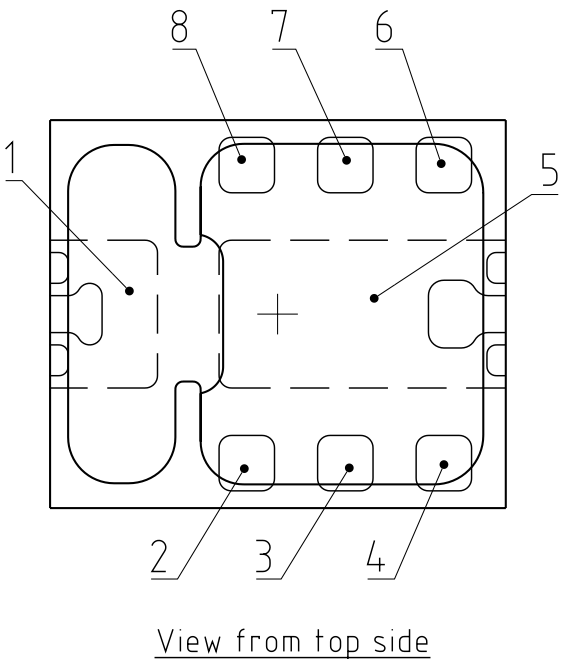
C67062-A0425-A2-01

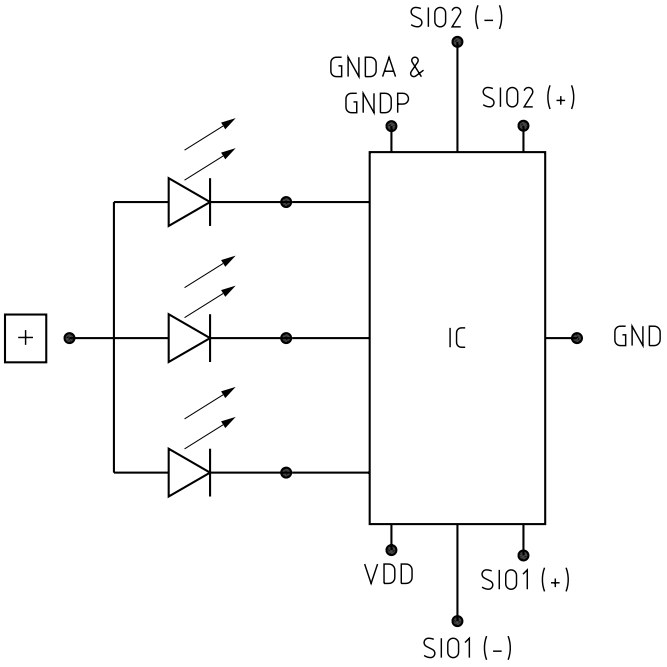
Further Information:

Approximate Weight: 22.2 mg

Corrosion test: Class: 2B
Test condition: 25°C / 75 % RH / 10 ppm H_2S / 21 days (IEC 60068-2-43)

Electrical Internal Circuit

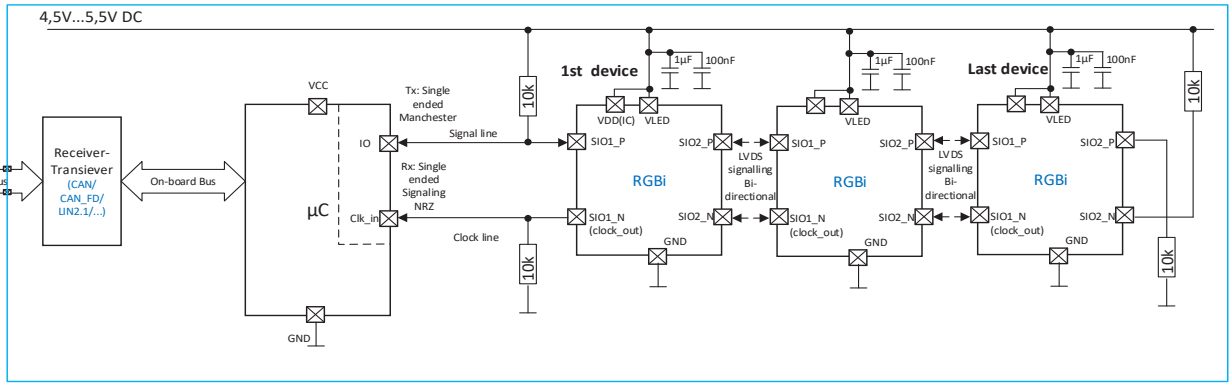




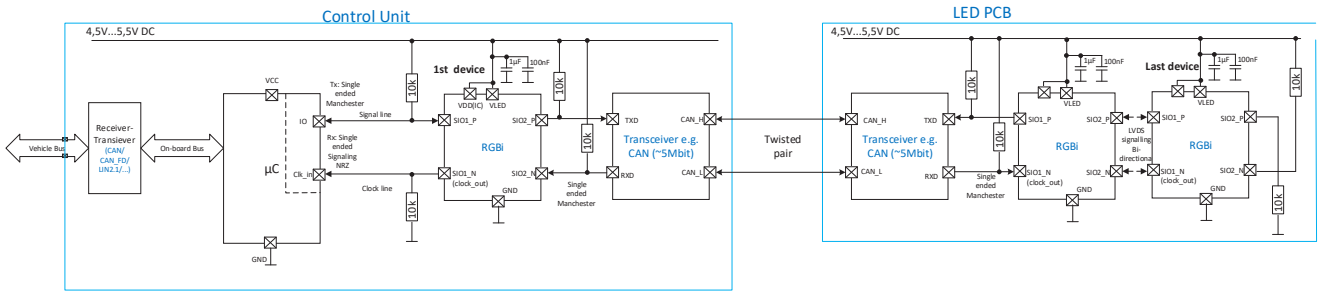
Pin	Description
1	VLED
2	VDD (IC)
3	SIO1 (-)
4	SIO1 (+)
5	NA (pull to GND)
6	SIO2 (+)
7	SIO2 (-)
8	GNDA & GNDP

Application Description

A typ. application is a dynamic ambient light with more than 50 LEDs/PCB.
First device in a daisy chain communicates with uC via single-ended interface. In forward direction (MCU -> chain) it is asynchronous Manchester coded signal. In backward direction it is synchronous communication. Device sends messages back to MCU per request only. (Master slave system)
Between devices in both directions the communication uses LVDS physical layer and telegrams are also Manchester coded.



Application with Transceivers



To allow a communication over cable between RGBi devices a connectivity to transceiver e.g. CAN FD via single ended Manchester coded communication is an option. The protocol will not change to a CAN protocol.

Temperature sensor

The T-sensor is included in the IC and trimmed at production.
The performance is stable over the full temperature range with an 8bit register for readout.
Readout is possible during sleep or active device state, the device must be addressed.
Calculation ADC value to °C
Temperature [°C]= 1.08 x ADC readout value – 126°C
Accuracy: +-5°C within range -40°C - +125°C

One Time Programming Memory

OTP includes optical measurement data of Red, Green & Blue for 10mA & 50mA. This allows a PWM calculation or calibration of each RGBi within the MCU to achieve a very accurate color setpoint.

Parameter	Comment	Symbol		Values
Optical data size		M_LED_cal	typ.	168 bit
ID size		M_ID		21 bit
VDD voltage range for readout	See VDDGOOD	VDD	min. typ. max	4.5 V 5 V 5.5 V

Single Ended, LVDS Link and Data Structure

Overview

- Bi-directional and uni-directional (loop back to master MCU)
- LVDS - differentiell Manchester coded
- Single ended – Manchester coded & Manchester decoded (NRZ, clock & data)
  Push-pull interface, clock is invertible
- Communication direction and SIO connection is flexible
- Communication speed is typ. 2,4Mbps Manchester coded

Communication modes

Each one of the 2 available SIO interfaces do support 4 different modes.
Each SIO only can operate in semi-duplex mode meaning it either does receive or transmit a telegram at the same time. However, it is possible that a device does receive a telegram at one SIO and start transmitting at the other SIO interface.
The 4 communication modes are:

1. “LVDS-mode”: The SIO communication is using LVDS signaling for transmitting and receiving a communication telegram. The bit stream is using Manchester encoding to transfer DATA & CLK on the same line.
2. “MCU-mode-normal”:In this mode a SIO is using single-ended mode for the signaling. Received telegrams are Manchester encoded on SIOx_P port. For transmitting, the device is decoding the Manchester signal, SIOx_P will deliver the DATA in NRZ format and SIOx_N delivers the corresponding clock.
3. “MCU-mode-EOL(EndOfLine)”:
   This is similar to “MCU mode, normal” but the SIO port does consider itself to be at the end of the daisy chain. This is needed for READ ONLY.
4. “CAN-mode”:
   In this mode, it is possible to communicate via a CAN FD transceiver. SIOx_P is always in output state and transmits telegram as Manchester encoded signals (single-ended), SIOx_N is always in input state and receives telegrams as Manchester encoded signal (single-ended).

Communication mode selection

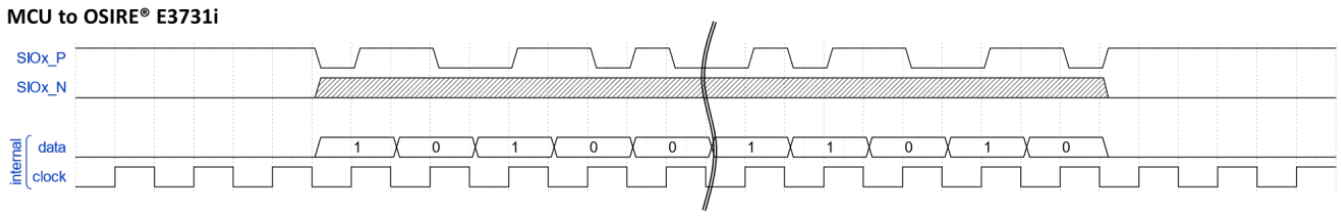
Communication mode auto detection takes place during initialization phase via voltage level check on SIOx_x and this mode cannot be changed during the operation cycle. After a HW Reset (POR) the Initialization with mode selection takes place again.

SIO_P State	SIO_N State	Signal level	RX encoding	TX encoding	SIO_P type	SIO_N type	Application case
		LVDS	Manchester	Manchester	bidirectional	bidirectional	LVDS
pull up	pull down	Single ended	Manchester on SIO_P	Data on SIO_P; Clock on SIO_N	bidirectional	Output or inactive	MCU mode normal
pull down	pull up	Single ended	-	Data on SIO_P; Clock on SIO_N	Output	Output	End of Line, MCU mode EOL
pull up	pull up	Single ended	Manchester on SIO_N	Manchester on SIO_P	Output only	Input only	CAN mode (ext. transceiver)

Single-ended communication physical layer and bit coding

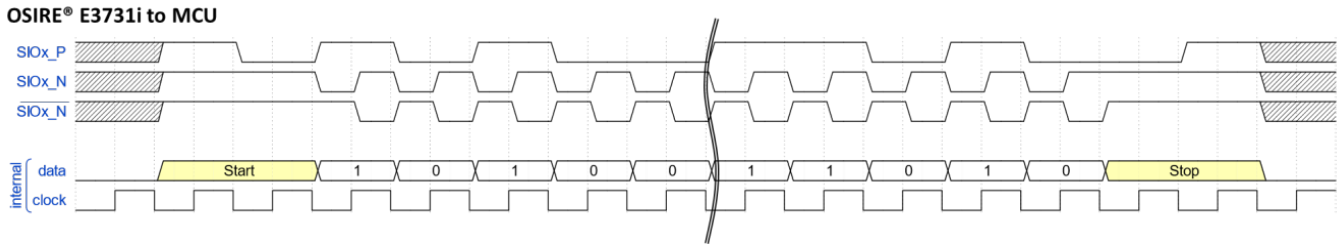
Single ended communication in the master->slave direction is performed using Manchester encoding. In that case a bit stream is sent via SIOx_P only; SIOx_N of the device is ignored. Slave-master communication is performed with NRZ coding. In that case SIOx_N provides a clock signal. The clock signal is inverted if it's selected via setup register. Communication Data rate effective is typ. 2.4Mbps.

MCU transmitting – single ended Manchester coded out:

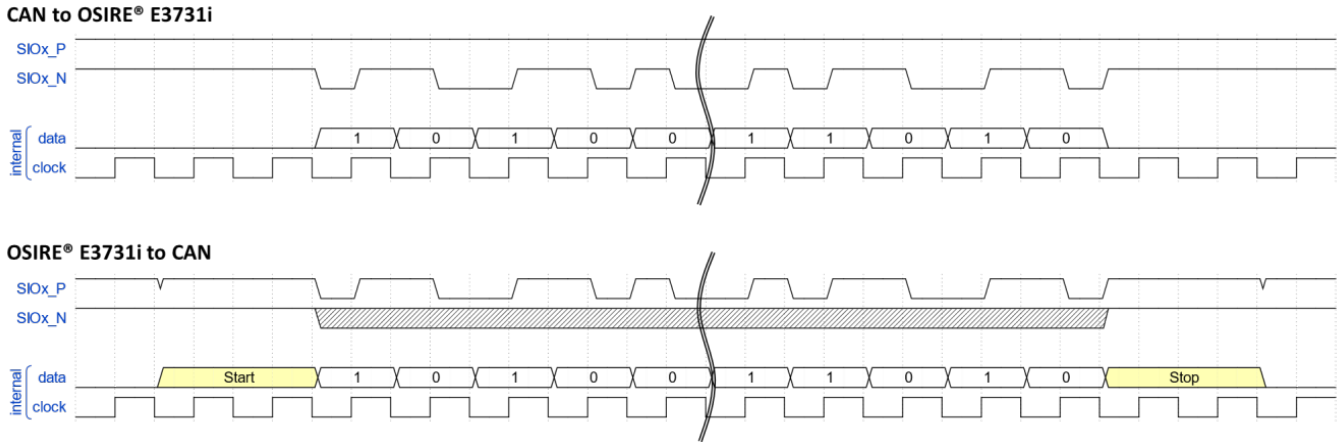


MCU receiving – single ended Manchester decoded in (NRZ – clock & data receiving)

The receiving clock could be inverted via setup register



Transceiver – single ended Manchester coded out & in

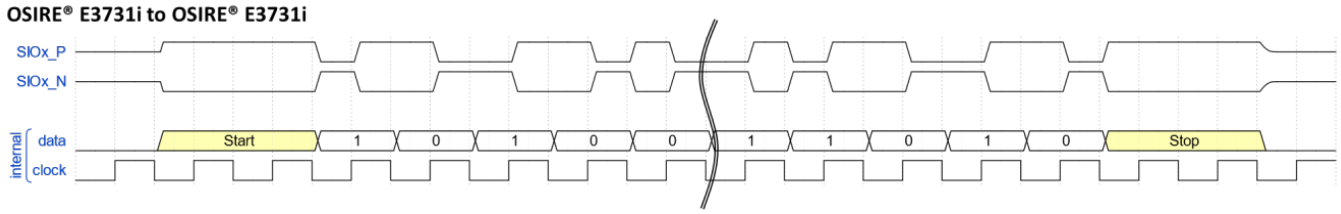


If a transceiver is detected on SIOx the output and input message is via single ended Manchester encoded communication with typ. 2.4 Mbit/s data transfer rate. For the transceiver the data transfer rate depends on the data signal due to the Manchester encoded data. Means up to the double transfer rate is needed (4.8 Mbit/s). Requires a 5 Mbit/s transceiver

Differential communication physical layer and bit coding

Physical layer

For differential communication the termination resistance R_term_LVDS is 200 Ohm, differential voltage V_diff_LVDS is app. 300 mV, data rate is typ. 2.4 Mbps. Common mode voltage is typ.1.2 V, it means the max voltage on the communication lines during communication is typ. 1.35 V and the min. voltage is typ. 1.05 V



Physical layer parameters

Parameter	Symbol	Comment		Values
Threshold on SIOx_x to detect communication mode (high)	V_th_se_high	Detection via pull up to VCC (typ.10k)	min.	2.85 V
Threshold on SIOx_x to detect communication mode (low)	V_th_se_low	Detection via pull down to GND (typ10k)	max.	0.7 V
Output low level for pin SIOx_P and SIOx_N for single-ended communication	V_SIOx_P/N(O,L)		max.	0.7 V
Output high level for pin SIOx_P and SIOx_N for single-ended communication	V_SIOx_P/N(O,H)		Min.	VDD - 0.7 V
data rate for slave->master direction (internally generated)	f_com_int		typ.	2.4 Mbps
Clock period for single ended communication Manchester decoded device			typ.	417 ns
data rate for MCU ->slave communication	f_com_m		min. typ. max.	2.23 Mbps 2.43 Mbps 2.62 Mbps
Minimum Time between two messages sent from MCU (fast forwarding)				8.3 µs
High level input voltage single ended communication	Vin_high_se	CMOS logic	min.	2.0 V
Low level input voltage for single ended communication	Vin_low_se	CMOS logic	max.	0.8 V
LVDS common mode voltage with active communication	V_LVDS_com		typ.	1.2 V
LVDS common mode voltage with no active communication	V_LVDS_off		typ.	0
LVDS differential voltage	V_LVDS_diff		typ.	300 mV
LVDS termination resistance	R_LVDS	Included in IC	typ.	200 Ohm
LVDS Tx current	I_LVDS_TX		typ.	1.5 mA
Max number of addresses	Max_address		typ.	1000

Transceiver connectivity typ. CAN FD

Parameter	Symbol	Comment		Values
Data rate (real)			min. typ. max.	2.31 Mbps 2.43 Mbps 2.55 Mbps
Data rate (signal)		Manchester coded signal = data rate x2	min. max.	2.31 Mbps 5.1 Mbps
Allowed duty cycle variance on receiver	$DUTY_{RX}$		min. max.	40 % 55 %
Duty cycle variance on transmitter	$DUTY_{TX}$		typ.	50 %

Constant current LED drivers

Overview

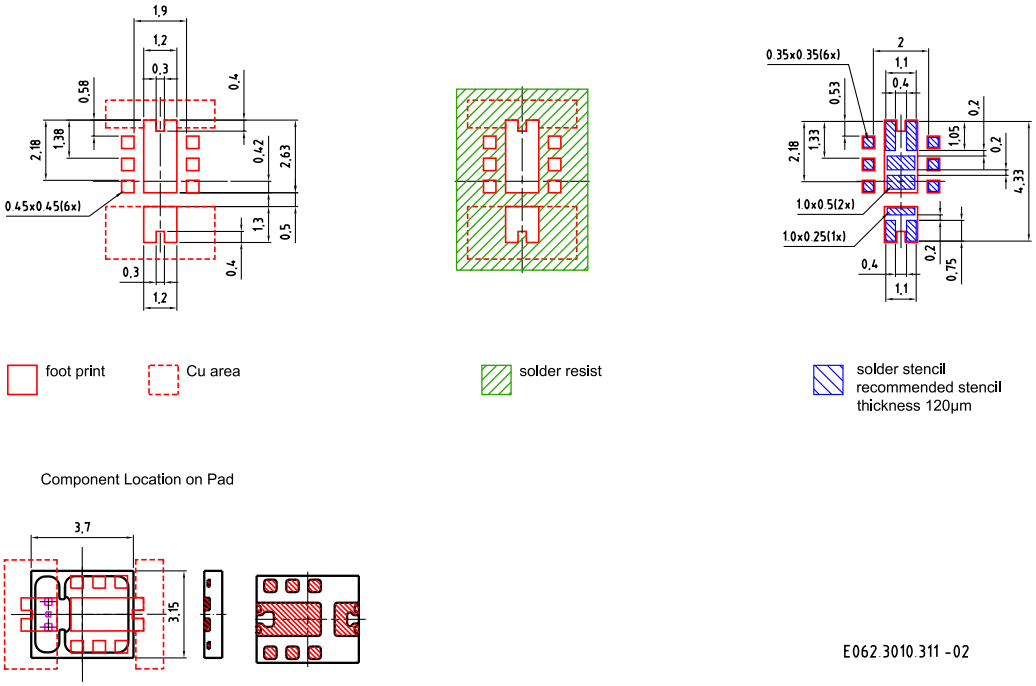
- 3 channel constant current LED drivers (high stability over full temperature range)
- PWM controlled
- 15bit PWM engine
- 500 Hz & 1000 Hz mode

Description

There are 3 integrated current sink drivers to activate three LED's. The drivers can be set for 2 current settings via command. The current drivers are controlled by a PWM with a frequency of 500 Hz or 1000 Hz. Received PWM setting is latched till the next PWM command. Current driver activation is performed with phase shift to avoid high di/dt.

Parameter	comment	Symbol		Values
Peak current setting 1	"nightmode" set via PWM command	I_dr_1	min. max.	9.5 mA 10.5 mA
Peak current setting 2	"daymode" set via PWM command	I_dr_2	min. max.	47.5 mA 52.5 mA
PWM frequency 1	Set by setup register	f_dr_1	min.	500 Hz
PWM frequency 2	Set by setup register	f_dr_2	min.	1000 Hz
PWM frequency accuracy		f_tol	min. max.	-5 % 5 %
PWM resolution 1	For f_dr_1	PWM_1		15 bit
PWM resolution 2	For f_dr_2	PWM_2		14 bit
Min PWM value	Recommended for open/short detection	PWM_value	min.	64 LSB
Rise time 1 (default)	For I_dr_1 (typ. 10mA)	t_rise_1	typ.	50 ns
Fall time 1 (default)	For I_dr_1 (typ. 10mA)	t_fall_1	typ.	50 ns
Rise time 2 (default)	For I_dr_2 (typ. 50mA)	t_rise_2	typ.	50 ns
Fall time 2 (default)	For I_dr_2 (typ. 50mA)	t_fall_2	typ.	50 ns
Phase shift between driver LED1(Red), LED2(Blue) and LED3(Green) current sink.		phase_shift_sink	typ.	1/3 period

Recommended Solder Pad [6)]



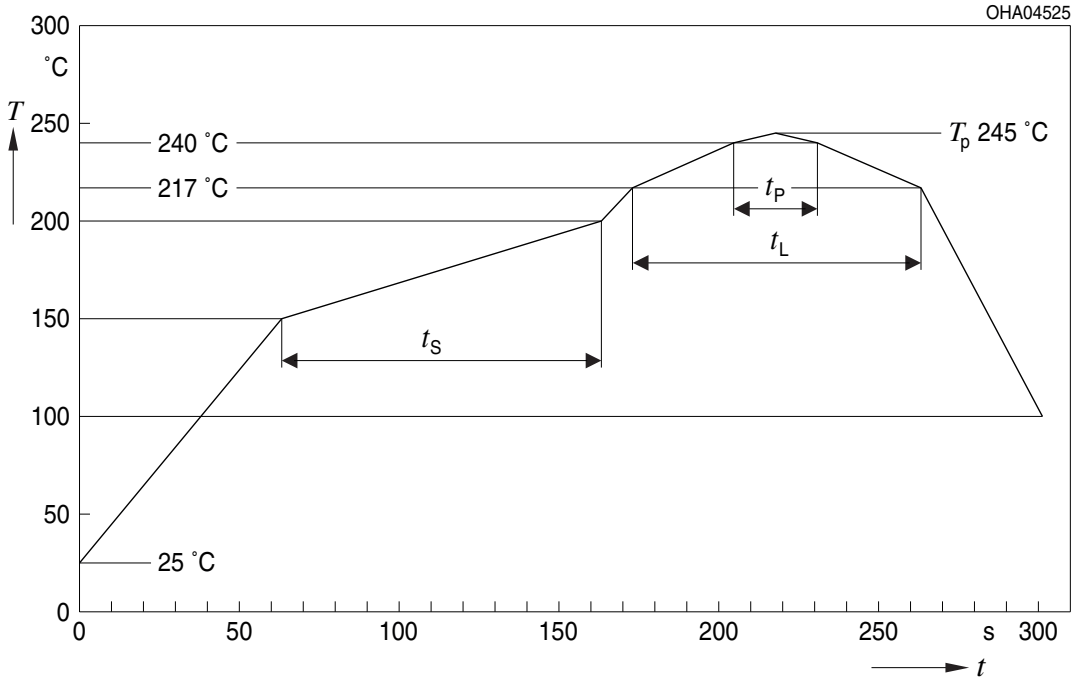
Component Location on Pad

E062.3010.311 -02

For superior solder joint connectivity results we recommend soldering under standard nitrogen atmosphere. Package not suitable for ultra sonic cleaning.

Reflow Soldering Profile

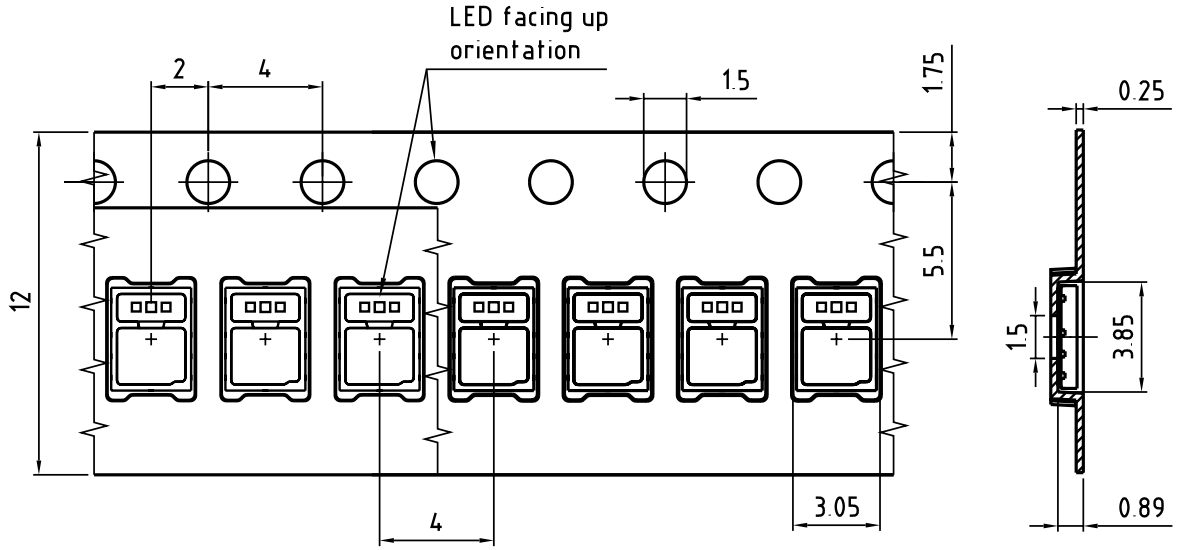
Product complies to MSL Level 2 acc. to JEDEC J-STD-020E



Profile Feature	Symbol	Pb-Free (SnAgCu) Assembly			Unit
		Minimum	Recommendation	Maximum	
Ramp-up rate to preheat*) 25 °C to 150 °C			2	3	K/s
Time t_S T_{Smin} to T_{Smax}	t_S	60	100	120	s
Ramp-up rate to peak*) T_{Smax} to T_P			2	3	K/s
Liquidus temperature	T_L		217		°C
Time above liquidus temperature	t_L		80	100	s
Peak temperature	T_P		245	260	°C
Time within 5 °C of the specified peak temperature T_P - 5 K	t_P	10	20	30	s
Ramp-down rate* T_P to 100 °C			3	6	K/s
Time 25 °C to T_P				480	s

All temperatures refer to the center of the package, measured on the top of the component
* slope calculation DT/Dt: Dt max. 5 s; fulfillment for the whole T-range

Taping [6)]



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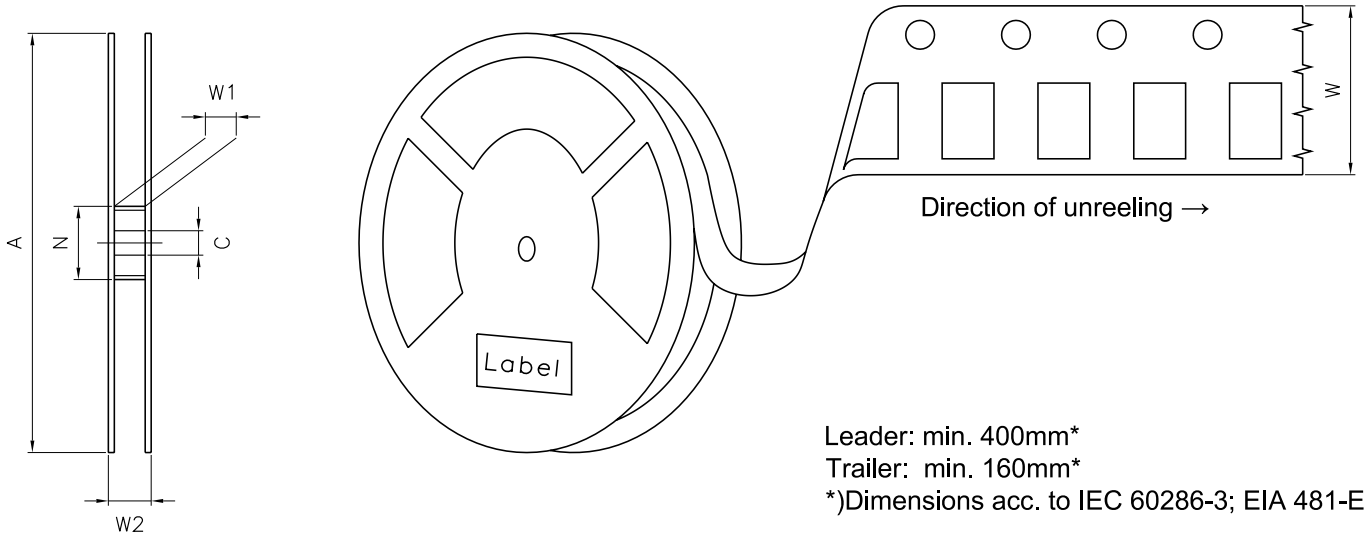
Tape and Reel [7)]

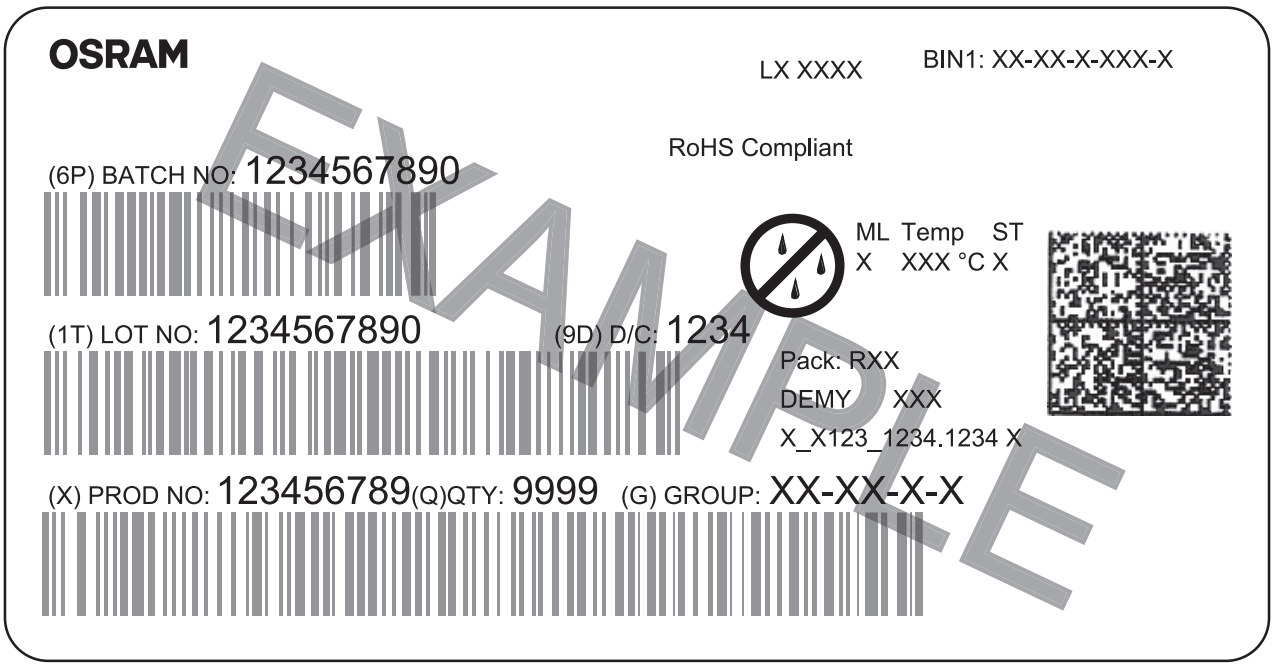


Leader: min. 400mm*
Trailer: min. 160mm*
*)Dimensions acc. to IEC 60286-3; EIA 481-E

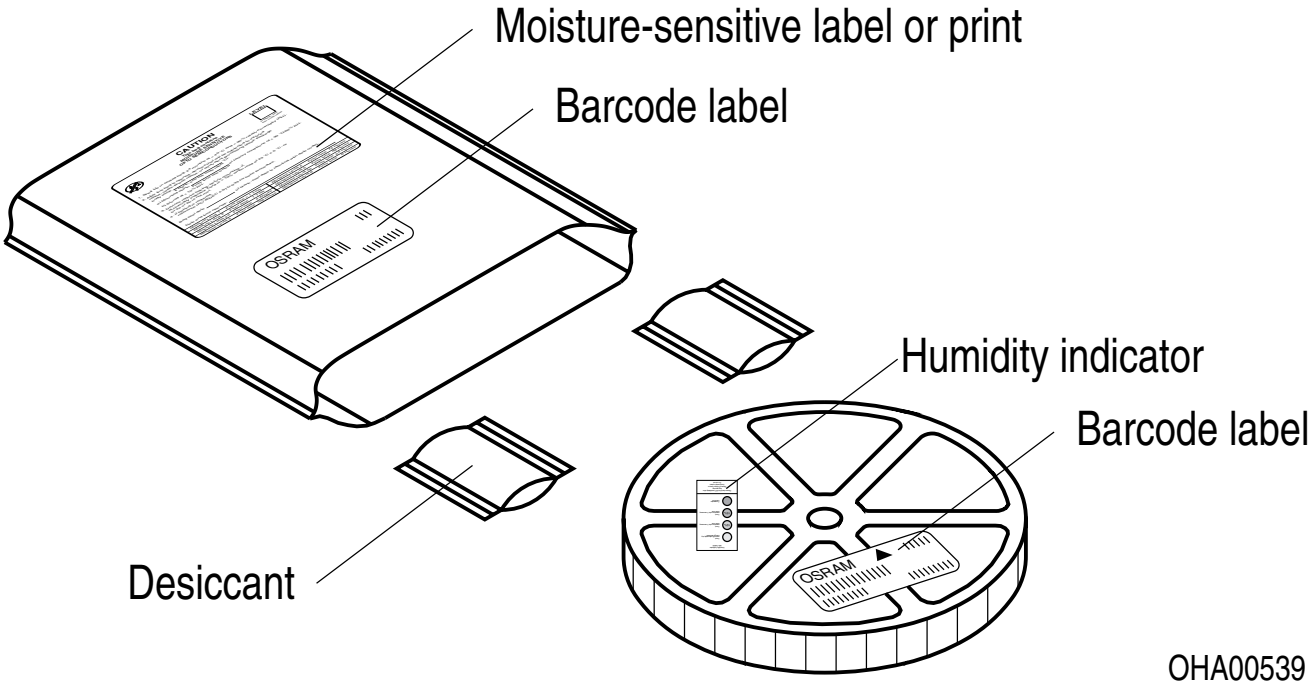
Reel Dimensions

A	W	N_{min}	W_1	$W_{2\,max}$	Pieces per PU
180 mm	12 + 0.3 / - 0.1 mm	60 mm	12.4 + 2 mm	18.4 mm	2000

Barcode-Product-Label (BPL)



Dry Packing Process and Materials [6)]



Moisture-sensitive product is packed in a dry bag containing desiccant and a humidity card according JEDEC-STD-033.

Notes

The evaluation of eye safety occurs according to the standard IEC 62471:2006 (photo biological safety of lamps and lamp systems). Within the risk grouping system of this IEC standard, the device specified in this data sheet fall into the class **low risk (exposure time 100 s)**. Under real circumstances (for exposure time, conditions of the eye pupils, observation distance), it is assumed that no endangerment to the eye exists from these devices. As a matter of principle, however, it should be mentioned that intense light sources have a high secondary exposure potential due to their blinding effect. When looking at bright light sources (e.g. headlights), temporary reduction in visual acuity and afterimages can occur, leading to irritation, annoyance, visual impairment, and even accidents, depending on the situation.

Subcomponents of this device contain, in addition to other substances, metal filled materials including silver. Metal filled materials can be affected by environments that contain traces of aggressive substances. Therefore, we recommend that customers minimize device exposure to aggressive substances during storage, production, and use. Devices that showed visible discoloration when tested using the described tests above did show no performance deviations within failure limits during the stated test duration. Respective failure limits are described in the IEC60810.

For further application related information please visit https://ams-osram.com/support/application-notes

Disclaimer

Attention please!

The information describes the type of component and shall not be considered as assured characteristics.
Terms of delivery and rights to change design reserved. Due to technical requirements components may contain dangerous substances.
For information on the types in question please contact our Sales Organization.
If printed or downloaded, please find the latest version on our website.

Packing

Please use the recycling operators known to you. We can also help you – get in touch with your nearest sales office. By agreement we will take packing material back, if it is sorted. You must bear the costs of transport. For packing material that is returned to us unsorted or which we are not obliged to accept, we shall have to invoice you for any costs incurred.

Product and functional safety devices/applications or medical devices/applications

Our components are not developed, constructed or tested for the application as safety relevant component or for the application in medical devices.
Our products are not qualified at module and system level for such application.

In case buyer – or customer supplied by buyer – considers using our components in product safety devices/ applications or medical devices/applications, buyer and/or customer has to inform our local sales partner immediately and we and buyer and /or customer will analyze and coordinate the customer-specific request between us and buyer and/or customer.

Glossary

1) **Wavelength:** The wavelength is measured at a current pulse of typically 15 ms with maximum PWM rate driven by IC, with an internal reproducibility of ±0.5 nm and an expanded uncertainty of ±1 nm (acc. to GUM with a coverage factor of k = 3).

2) **Reverse Operation:** Not designed for reverse operation. Continuous reverse operation can cause migration and damage of the device.

3) **Thermal Resistance:** Rth max is based on statistic values (6σ) used for Derating.

4) **Brightness:** Brightness values are measured during a current pulse of typically 15 ms with maximum PWM rate driven by IC, with an internal reproducibility of ±8 % and an expanded uncertainty of ±11 % (acc. to GUM with a coverage factor of k = 3)

5) **Typical Values:** Due to the special conditions of the manufacturing processes of semiconductor devices, the typical data or calculated correlations of technical parameters can only reflect statistical figures. These do not necessarily correspond to the actual parameters of each single product, which could differ from the typical data and calculated correlations or the typical characteristic line. If requested, e.g. because of technical improvements, these typ. data will be changed without any further notice.

6) **Tolerance of Measure:** Unless otherwise noted in drawing, tolerances are specified with ±0.1 and dimensions are specified in mm.

7) **Tape and Reel:** All dimensions and tolerances are specified acc. IEC 60286-3 and specified in mm.

Revision History

Version	Date	Change
1.0	2023-07-26	Initial Version

EU RoHS and China RoHS compliant product
此产品符合欧盟 RoHS 指令的要求；
按照中国的相关法规和标准，
不含有毒有害物质或元素。

Published by ams-OSRAM AG
Tobelbader Strasse 30, 8141 Premstaetten, Austria
Phone +43 3136 500-0
ams-osram.com