iGL
Intelligent Green Lighting

Hard LED Strip Series
Dimming Specific: Chromatic & Luminance

Features

- Design for dimming application
- Serial interconnection length: 20m/per power module group
- High brightness LED as light source
- Dimming capability
  - Chromatic combination: RGB[0-255, 0-255, 0-255]
  - Brightness: [0-255]
- Easy for installation and maintainance
  - Full series of installation fixture
  - Large current throughput capability
- No visible gap between strips
- Network control option
  - 485 BUS interface
  - IR remote controller interface
  - Wireless remote controller interface
- Different network types
  - Broadcast
  - Duplex
- High uniformity
  - SNL[step non-linear error]< 0.2%
  - FRNL [full range non-linear error] < 0.2%
  - Difference of luminance output among strips: < 0.2%
- Adjustable light angle

Applications

- Outdoor decoration, especially high-end projects with brightness dimming and color changing requirement.
- In-door lighting, especially with dimming requirement
- Specific application with strict regulation on uniformity of brighteness and/or color in large areas

Standards compliable

- EN61347-1
- EN61347-2-12
- EN61000-3-2
- EN61003-3-3
- EN55015
- EN61547
- GB7000.X
- GB 50034-2004
- GBJ73-84

Product description

Two types of hard LED strips have been developed: one with dimming capability and another without dimming capability.

The luminance output of each LED has been calibrated with a precise test instrument, and output error of 0.2% has been achieved; Regardless of application quantity, the error tolerance of

Hard LED Strip Series
Dimming Specific: Chromatic & Luminance

luminance from each LED is lower than 0.2%.

The luminance output of each RGB chip inside a LED package has been calibrated and aligned to RGB[255:255:255] for a high precise color renderation. Regardless of application quantity, the error tolerance of luminance from each RGB chip is lower than 0.2%.

The hard LED strips can be connected in a network mode: broadcast and duplex. In broadcast mode, all hard LED strips receive instructions and display the luminance and color as defined; in duplex, besides of the display, all hard LED strips can send message upward to control center, including their working status, errors detected and warnings etc.

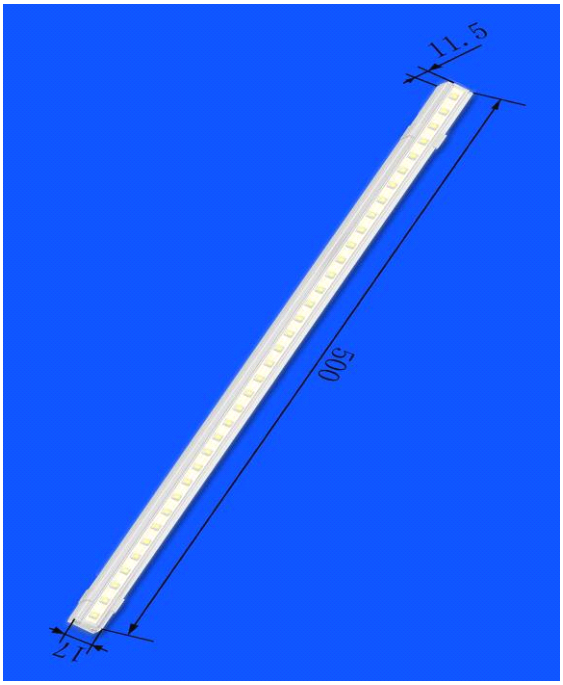
Independent relay module has been designed for network application. There are 3 communication types for relay: 485 BUS interface; Infrared interface; wireless interface. All can work in broadcast and/or duplex mode.

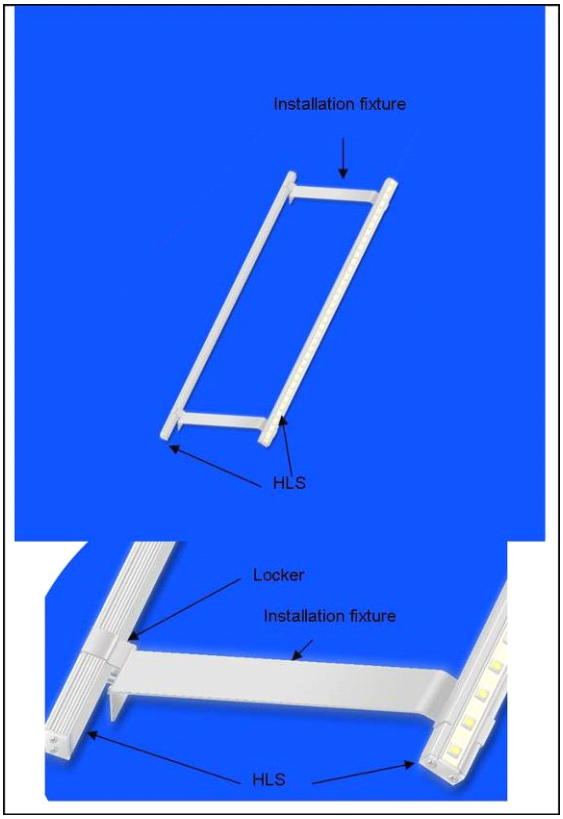
Different cable and terminals have been used for networked hard LED strips. For details, please refer to accessory chapter.

Different fixtures have been used for installation and light angle adjustment, please refer to installation and maintenance chapter.

There exist a series of hard LED strips, to choose , please refer to selection guide chapter.

Product Picture





iGL
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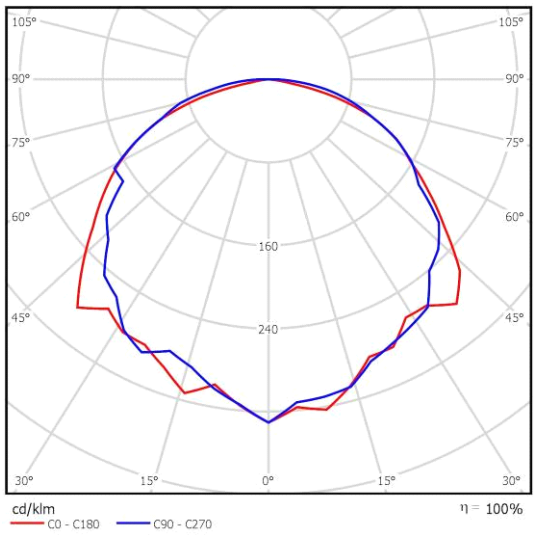
Hard LED Strip Series
Dimming Specific: Chromatic & Luminance

- Al frame
- Sealed by epoxy
- Stainless steel installation fixture
- IP68

Light Distribution Curve



Installation and Maintainance

It is easy and simple to get the Hard LED strip work, while more attention should be paid on network solution.

To make it easy:

- Send your solution to engineeirng solution department for review
- Select proper modules
- Install as instructed

Installation steps:

- Determine the location of power module and touch-screen (or PC)
- Connect T cable with power module and control unit [Touch screen or PC]
- Connect hard-LED strips, maximum connection length is 20m with one power module.
- Connect HLS with relay modules
- Connect all cable terminals
- Power on
- Make corrections if necessary

Certification

- CE (under test for approval)
- 3C (under test for approval)
- UL (under test for approval)

Ordering Guides

Hard LED strips

HLS- 7010- NW

Hard LED Strip

7010: 70PCS LED, 10*10cm Length
4910: 49PCS LED, 10*10cm Length
3510: 35PCS LED, 10*10cm Length
3505: 35PCS LED, 5*10cm Length

NW: Neutral White
CW: Cold white
WW: Warm White
R: Red
G:Green
B: Blue
RGB: RGB Chip integrated

- The whole strip can be cut off to segments of different length.

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Intelligent Green Lighting

Hard LED Strip Series
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Product series		7010	4910	3510	3505
Without dimmering (mm)	min	100	142.9	200	100
	Available	100*[1-10]	142.9*[1-7]	200*[1-5]	100*[1-5]
With dimmering (mm)	min	400	400	400	400
	Available	400+100*[0-6]	400+142.9*[0-4]	400-200*[0-3]	400+100*[0-1]

- The LEDs with different color and different color temperature are available
- Two different types of strips are available
  - Without dimming
  - With dimming
    - Dimming only on luminance
    - Digital dimming of RGB chip respectively as RGB [255:255:255]

Control units and network modules

HLS- ICU- PW

Hard LED Strip

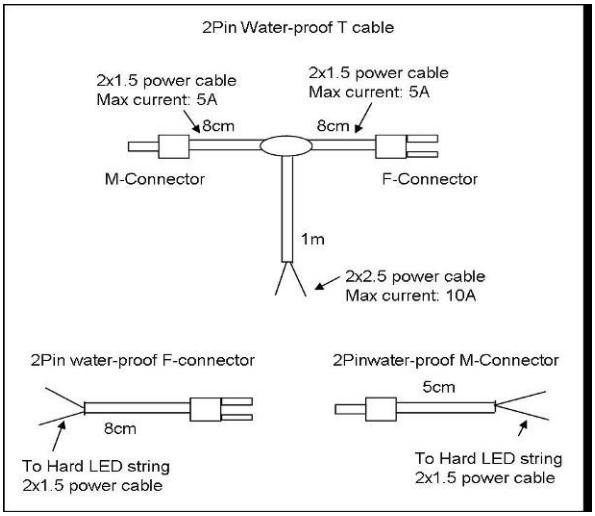
ICU: Intelligent control unit
IP:Installation parts
RLY: Relay

PW: Dimmering as a whole
PC: chromatic dimming of RGB respectively
CTS: Touch screen with 485 cable bus interface
IRTS: Touch Screen with Infrared interface
WLTS:Touch Screen with Wireless Ihnterface
C: Relay with 485 bus cable
IR: relay with infrared interface
WL: relay with wireless interface
LK: position locker
AA: Ilight angle adjustment
DAA: Dual light angle adjustment
MA: magnetic parts attached to HLS
MF: magnetic fixture to support HLS
CT2: "T" interface with 2 cables
CT4: "T" interface with 4 cables
CT: 485 bus cable terminal

- Three network types with relay modules support
  - 485 BUS network
  - Infrared network
  - Wireless network
- Two work modes of network
  - Broadcast
  - Duplex
- Cable terminals are required for 485 BUS network solution
- Different topologies have been chosen to match customer requirements
- Different data rate for network solution
  - 1.2Kbps
  - 15Kbps
  - 500Kbps (designed per customer's SPEC only, not available on open market)

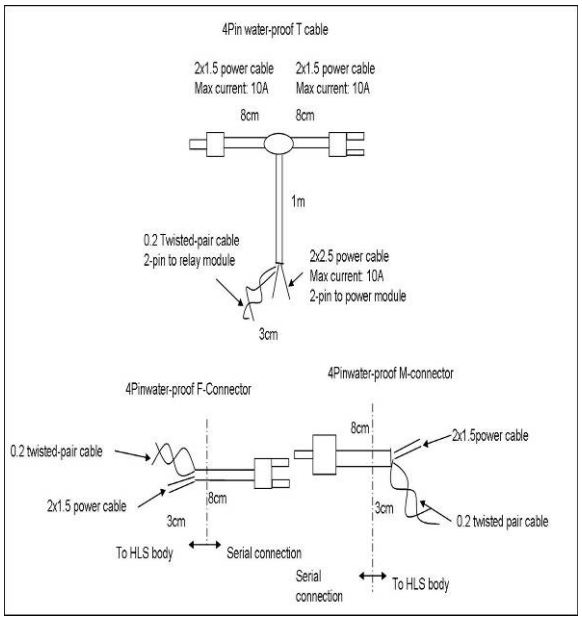
Accessory- cables

Cables for no dimming application



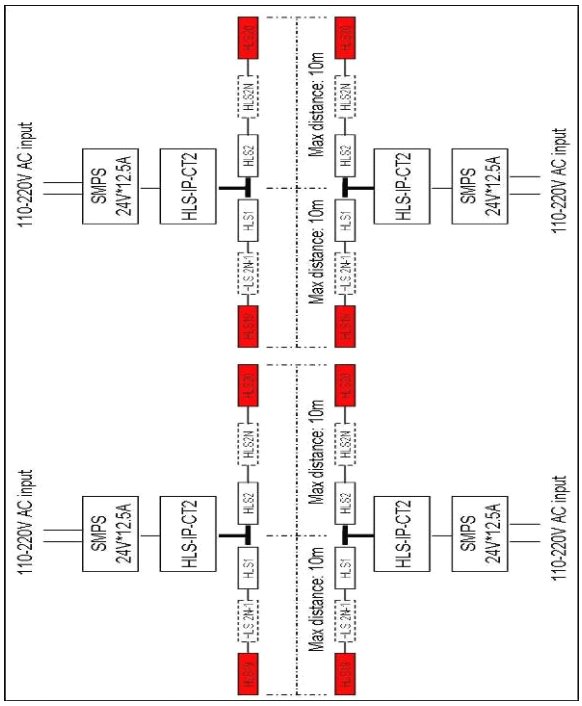
Hard LED Strip Series
Dimming Specific: Chromatic & Luminance

Cables for dimming application



Network demonstration

Network topology for no dimming application

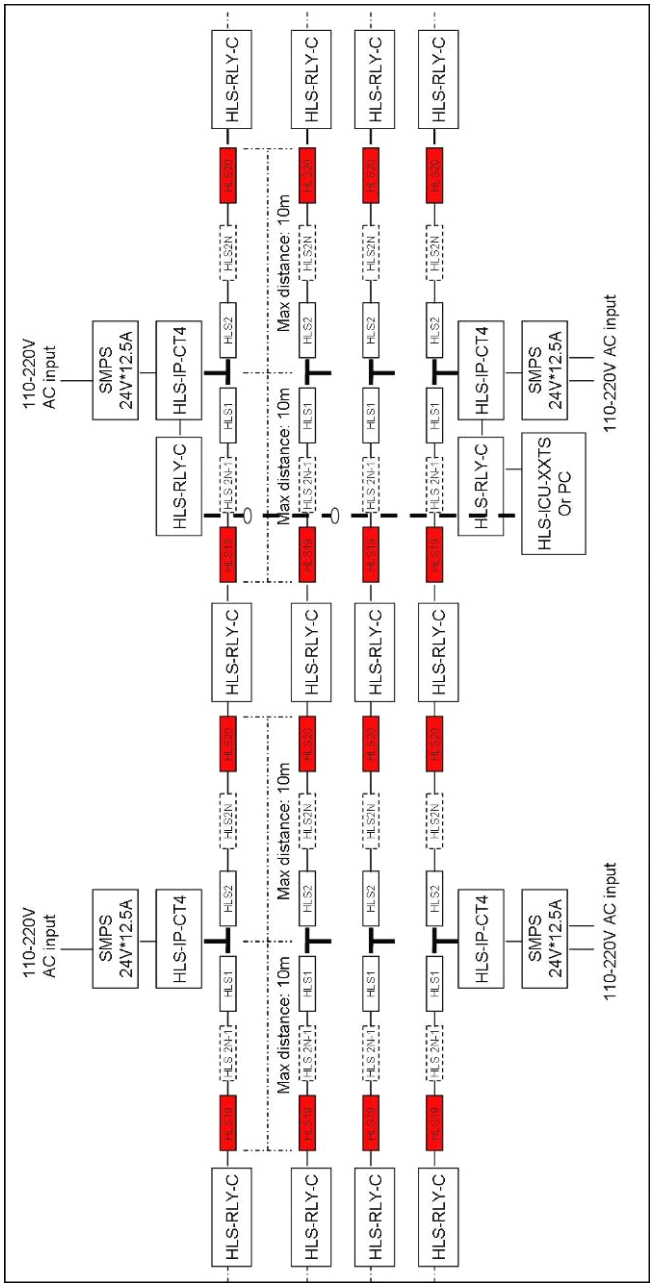


A relay has been inserted every 20m of HLS, in which the power cable has been terminated by OPEN connection, while twisted pair has been terminated by a resistor.

Different twisted pair need a resistor of different value to terminate.

All connectors openning in air are water-proof parts, and need careful operations.

Network topology for dimming application



iGL
Intelligent Green Lighting

Hard LED Strip Series
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Technical Parameters

HLS-7010 series

		Conditions	Unit	Min	Typ	Max
Mechanical parameters						
Length			mm	999	1000	1001
width			mm		17	17.5
Depth			mm		11.5	12
Cable length			mm		100	
Weight			Kg		0.2	
Electrical parameters						
Input Voltage				24	24	26
Input Power			W		12.6	13
Voltage Ripple			mV		150	
Connection Length			m			10
Light Parameters						
LED TYPE					5050	
LED Qty			PCS		70	
LED ARRAY					7*10	
LED Unit Format					7S10P	
Lum Flux Total		Test @25℃	Lm		1260	
Lum Flux Effective		Test @25℃	Lm	1000	1071	
Dimming Percentage	no other PCBA		%		0	
	with PCBA[HLS-ICU-PW] random combination	W, R, G, B	%			
	with PCBA[HLS-ICU-PC] digital combination	[RGB]	[X:X:X]	[0:0:0]		[255:255:255]
Color tunning	with PCBA[HLS-ICU-PW] random combination	33333	%	0		100
	with PCBA[HLS-ICU-PC] digital combination	[RGB]	[X:X:X]	[0:0:0]		[255:255:255]
	SNL, step non-linear error	[RGB]	%		0.2	
	FRNL,Full range non-linear error	[RGB]	%		0.2	
Color Temperature for white LED only			K	3500		6500
Light Angle			Degree	115	120	160
General						
IP Level					**68**	
Working temperature		Test @25℃	℃		48	
Working Life		Test @25℃	Year		3	

HLS-4910 series

		Conditions	Unit	Min	Typ	Max
Mechanical parameters						
Length			mm	999	1000	1001
width			mm		17	17.5
Depth			mm		11.5	12
Cable length			mm		100	
Weight			Kg		0.2	
Electrical parameters						
Input Voltage				24	24	26
Input Power			W		8.8	9
Voltage Ripple			mV		150	
Connection Length			m			10
Light Parameters						
LED TYPE					5050	
LED Qty			PCS		49	
LED ARRAY					7*7	
LED Unit Format					7S7P	
Lum Flux Total		Test @25℃	Lm		882	
Lum Flux Effective		Test @25℃	Lm	700	749.7	
Dimming Percentage	no other PCBA		%		0	
	with PCBA[HLS-ICU-PW] random combination	W, R, G, B	%		100	
	with PCBA[HLS-ICU-PC] digital combination	[RGB]	[X:X:X]	[0:0:0]		[255:255:255]
Color tunning	with PCBA[HLS-ICU-PW] random combination		%	0		100
	with PCBA[HLS-ICU-PC] digital combination	[RGB]	[X:X:X]	[0:0:0]		[255:255:255]
	SNL, step non-linear error	[RGB]	%		0.2	
	FRNL,Full range non-linear error	[RGB]	%		0.2	
Color Temperature for white LED only			K	3500		6500
Light Angle			Degree	115	120	160
General						
IP Level					**68**	
Working temperature		Test @25℃	℃		45	
Working Life		Test @25℃	Year		3	

HLS-3510 series

Hard LED Strip Series
Dimming Specific: Chromatic & Luminance

		Conditions	Unit	Min	Typ	Max
Mechanical parameters						
Length			mm	999	1000	1001
width			mm		17	17.5
Depth			mm		11.5	12
Cable length			mm		100	
Weight			Kg		0.2	
Electrical parameters						
Input Voltage				24	24	26
Input Power			W		6.3	7
Voltage Ripple			mV		150	
Connection Length			m			10
Light Parameters						
LED TYPE					5050	
LED Qty			PCS		35	
LED ARRAY					7*5	
LED Unit Format					7S5P	
Lum Flux Total		Test @25℃	Lm		630	
Lum Flux Effective		Test @25℃	Lm	500	535.5	
Dimming Percentage	no other PCBA		%		0	
	with PCBA[HLS-ICU-PW] random combination	W, R, G, B	%		100	
	with PCBA[HLS-ICU-PC] digital combination	[RGB]	[X:X:X]	[0:0:0]		[255:255:255]
Color tunning	with PCBA[HLS-ICU-PW] random combination		%	0		100
	with PCBA[HLS-ICU-PC] digital combination	[RGB]	[X:X:X]	[0:0:0]		[255:255:255]
	SNL, step non-linear error	[RGB]	%		0.2	
	FRNL,Full range non-linear error	[RGB]	%		0.2	
Color Temperature for white LED only			K	3500		6500
Light Angle			Degree	115	120	160
General						
IP Level					**68**	
Working temperature		Test @25℃	℃		42	
Working Life		Test @25℃	Year		3	

HLS-3505 series

		Conditions	Unit	Min	Typ	Max
Mechanical parameters						
Length			mm	499	500	501
width			mm		17	17.5
Depth			mm		11.5	12
Cable length			mm		100	
Weight			Kg		0.1	
Electrical parameters						
Input Voltage				24	24	26
Input Power			W		6.3	13
Voltage Ripple			mV		150	
Connection Length			m			10
Light Parameters						
LED TYPE					5050	
LED Qty			PCS		35	
LED ARRAY					7*5	
LED Unit Format					7S5P	
Lum Flux Total		Test @25℃	Lm		630	
Lum Flux Effective		Test @25℃	Lm	500	535.5	
Dimming Percentage	no other PCBA		%		0	
	ith PCBA[HLS-ICU-PW] random combination	W, R, G, B	%		100	
	with PCBA[HLS-ICU-PC] digital combination	[RGB]	[X:X:X]	[0:0:0]		[255:255:255]
Color tunning	ith PCBA[HLS-ICU-PW] random combination		%	0		100
	with PCBA[HLS-ICU-PC] digital combination	[RGB]	[X:X:X]	[0:0:0]		[255:255:255]
	SNL, step non-linear error	[RGB]	%		0.2	
	FRNL,Full range non-linear error	[RGB]	%		0.2	
Color Temperature for white LED only			K	3500		6500
Light Angle			Degree	115	120	160
General						
IP Level					**68**	
Working temperature		Test @25℃	℃		47	
Working Life		Test @25℃	Year		3	

*The functiuon filled in red is not available

Notes

- All parts are under 24V, safe for hand operation
- Do not focus on the LED for long time in short distance
- Contact us for any network solution, the topology is simple, while the implementation should be done by trained technicians.
- There exist potential danger for any serial connection longer than 20m with one power supply module.

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NOTE on Delivery Date and Price

Color tunning	Price	Delivery Date
Random combination	Quotation *1.0	Normal Schedule
Digital combination [RGB]+W, error tolerance >1%	Quotation *1.1	Schedule + 1 Week
Digital combination [RGB]+W, error tolerance <0.2%	Quotation *1.3	Schedule + 4 Weeks
Digital combination Other colors of LED except {[RGB]+W,} error tolerance <0.2%	Quotation *1.75	Schedule +12Weeks

Product Series and selection guide

NO.	Model	Function	Dimming Options
1	HLS-7010-NW	Neutral white, Length 1m, 70PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
2	HLS-7010-CW	Cold white, Length 1m, 70PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
3	HLS-7010-WW	Warm white, Length 1m, 70PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
4	HLS-7010-R	Red, Length 1m, 70PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
5	HLS-7010-G	Green, Length 1m, 70PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
6	HLS-7010-B	Blue, Length 1m, 70PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
7	HLS-7010-RGB	RGB combined, Length 1m, 70PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
8	HLS-4910-NW	Neutral white, Length 1m, 49PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
9	HLS-4910-CW	Cold white, Length 1m, 49PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
10	HLS-4910-WW	Warm white, Length 1m, 49PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
11	HLS-4910-R	Red, Length 1m, 49PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
12	HLS-4910-G	Green, Length 1m, 49PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
13	HLS-4910-B	Blue, Length 1m, 49PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
14	HLS-4910-RGB	RGB combined, Length 1m, 49PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
15	HLS-3510-NW	Neutral white, Length 1m, 35PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
16	HLS-3510-CW	Cold white, Length 1m, 35PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
17	HLS-3510-WW	Warm white, Length 1m, 35PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
18	HLS-3510-R	Red, Length 1m, 35PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC

19	HLS-3510-G	Green, Length 1m, 35PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
20	HLS-3510-B	Blue, Length 1m, 35PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
21	HLS-3510-RGB	RGB combined, Length 1m, 35PCS 5050 LED	HLS-ICU-PW, HLS-ICU-PC
22	HLS-3505-NW	Neutral white, Length 0.5m, 35PCS 5050 LED	HLS-ICU-PW
23	HLS-3505-CW	Cold white, Length 0.5m, 35PCS 5050 LED	HLS-ICU-PW
24	HLS-3505-WW	Warm white, Length 0.5m, 35PCS 5050 LED	HLS-ICU-PW
25	HLS-3505-R	Red, Length 0.5m, 35PCS 5050 LED	HLS-ICU-PW
26	HLS-3505-G	Green, Length 0.5m, 35PCS 5050 LED	HLS-ICU-PW
27	HLS-3505-B	Blue, Length 0.5m, 35PCS 5050 LED	HLS-ICU-PW
28	HLS-3505-RGB	RGB combined, Length 0.5m, 35PCS 5050 LED	HLS-ICU-PW
29	HLS-ICU-PW	Control PCBA for dimming as a whole	
30	HLS-ICU-PC	Control PCBA for dimming of RGB independently	
31	HLS-RLY-C	Relay of 485 BUS	
32	HLS-RLY-IR	Relay of infrared communication	
33	HLS-RLY-WL	Relay of wireless communication	
34	HLS-ICU-CTS	Central control unit of 485 BUS, with Touch screen	
35	HLS-ICU-IRTS	Infrared Central control unit, with Touch screen	
36	HLS-ICU-WLTS	Wireless Central control unit, with Touch screen	
37	HLS-IP-LK	Installation fixture, locker	
38	HLS-IP-AA	Installation fixture, Light angle adjustment	
39	HLS-IP-DAA	Installation fixture, Light angle adjustment for Dual strips	
40	HLS-IP-MA	Installation fixture,magnetic attachment to hard strips “N”	
41	HLS-IP-MF	Installation fixture,magnetic support part “S”	
42	HLS-IP-CT2	Installation fixture, 2.5 power cable*2	
43	HLS-IP-CT4	Installation fixture, 2.5 power cable*2 + twisted pair *1	
44	HLS-IP-CT	Installation fixture,cable terminals	

*Red-word series have been developed per customers’ requirement, please contact Engineering Solution Department for detail

*Black-word Series are ready for open market

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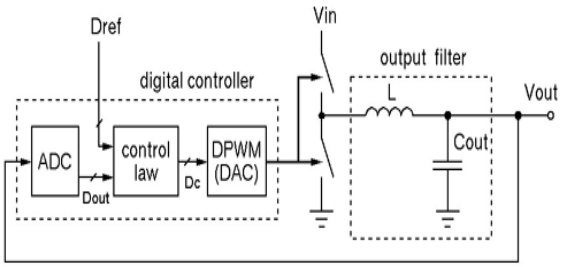
Digital PWM technology Brief

Digital PWM (Pulse Width Modulation) is attractive for their low power dissipation, immunity to analog component variations, compatibility with digital systems, and ability to implement sophisticated control schemes.

The quantization of the output voltage (Vout) in digital controllers can result in periodic oscillations of Vout (limit cycling) at frequencies lower than the PWM switching frequency, producing possibly undesirable output noise and electro-magnetic interference (EMI).

Controlled digital dither can increase the effective resolution of digital PWM (DPWM) modules, while minimizing the dither ripple incurred on the regulated output voltage

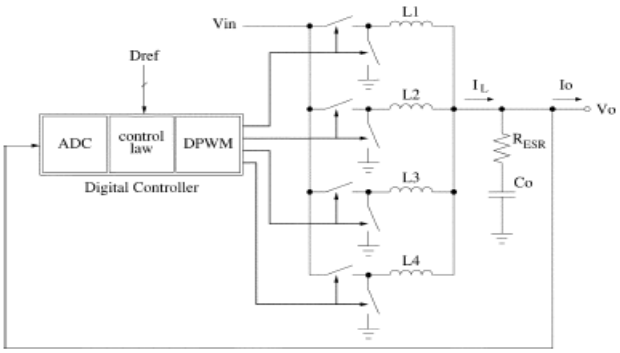
By dynamically adjusting parameters such as the synchronous rectification dead time and the current sharing in multi-phase converters, the power dissipation can be minimized



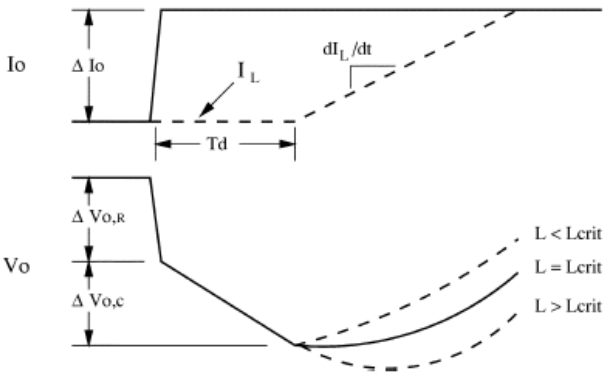
Multiphase converter has been used for high power requirement, while many elements have to be taken into consideration for a balanced output.

- Difference of load
- Difference of LC
- Difference of Jitter on duty and timing
- Random noise effect

The control of DPWM is a complicated algorithm, while current DSP can take this job done easily.



The diagram of multi-phase DPWM technology



The transient response of DPWM

The advantage of DPWM

- Tunning continuously with high precision
- High speed
- Support complicated display requirement
- Parameters can be adjusted dynamically for defined optimization purpose

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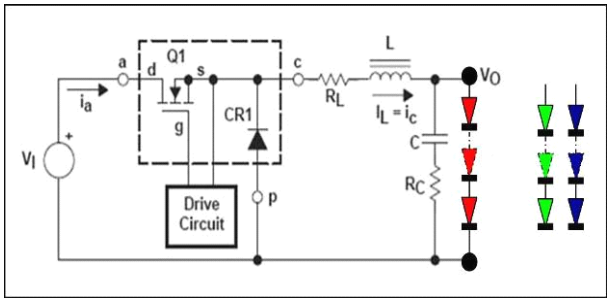
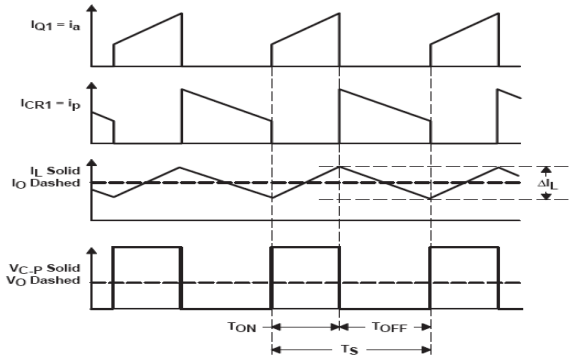
BUCK driver and dimming

BUCK converter can be used as a dimming driver as designed.

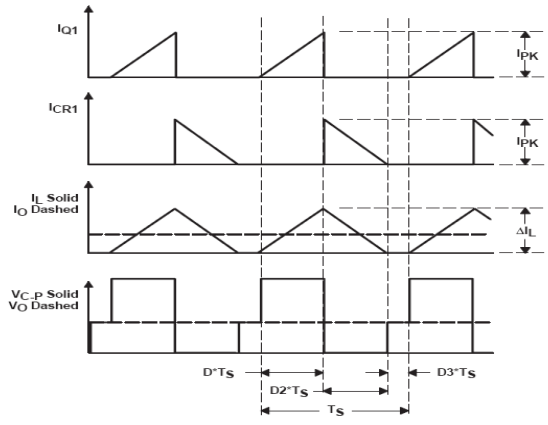


Buck converter work in 2 modes: continuous conduction mode and discontinuous conduction mode. In each mode, the current is tunnable by a PWM control signal in gate of POWER MOSFET

Continuous conduction mode: waveform as following



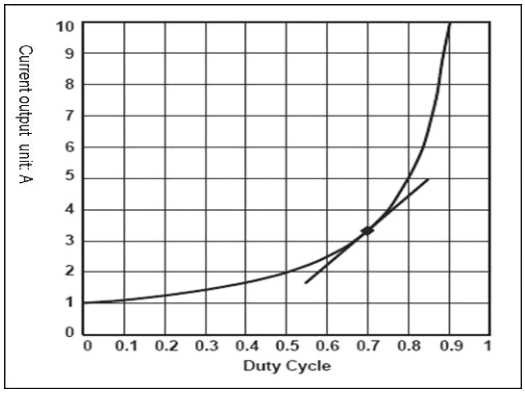
Discontinuous conduction mode: wave form as following.

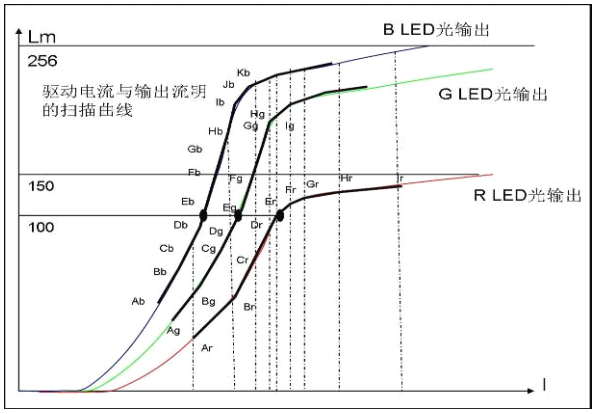


Different work modes depends on the work status of POWER MOSFET, and nearly all parameters of components will be modified.

To get a fine dimming, signal processing flow must be designed carefully.

- Digital input to PWM
- PWM to current output
- Current to luminance output
- The different chracteristics of RGB LED chip for luminance output



By changing the duty, the output current [the same for output luminance]can be controlled, and a table is required to map the digital instruction to correct luminance output

- Non-linearity
- Different maximum luminance output of RGB LED must be aligned
- Different maximum luminance output of HLS must be aligned