SWITCH Lighting®

LED Tips & Tricks

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LED Tips & Tricks Contents

Common terms used in LED lighting

Term	Units	Definition
LED		Light Emitting Diode (clever bit of glowing silicon)
Light Output	Lumen	The total amount of light given out by the light – the flow of light
Light Level	Lux	The amount of light arriving at a surface some distance away - Lux is Lm/m2
CCT – Colour Temperature	K	The colour temperature of the white light. Most popular domestic lighting is 3000K (2700K is warm white -> 5000K is quite a cold white).
CRI – Colour Rendering Index		The ability of a white light to render (reflect) colours properly: • <80 Poor colours • 80+ Better (Classic) • 90+ Good (Professional) • 96+ Excellent (Art)
R9		The amount of RED light, often missing in poor quality LED lights, leaving dull colours
Beam Angle	degree	The total angle of the light beam at the half brightness points, i.e. 60 means +/- 30
Low & Ultra Low Glare		Special design to minimize the glare from the lights at wider angles
IC-F & IC-4		Insulation Coverable Standard IC-F is the current standard, IC-4 will soon replace it
Luminaire power	W	The actual power used by each light fitting on its own
System Power	W	The total power of the light including the driver
Efficacy	L/W	The amount of light per Watt of system power used (similar to efficiency)
PF – Power Factor		An indication of how efficiently the AC power source is used
Expected life (L70, TM21)	Hours	The predicted life of the LED as it slowly reduces to 70% of its initial brightness (L70). TM21 is a standard governing how this prediction is calculated.
HCB	mm	Height clearance to building elements allowed between the top of the light and any flammable building elements such as wooden joists or battens
SCB	mm	Side clearance to building elements, allowed between the side of the light and any flammable building elements such as wooden joists or battens
IP Rating		Dust and waterproofing standard: • IP44 is splash-proof • IP65 is dust and water-resistant (to water jets) • IP67 is dust and waterproof • IP67 (front face) means only the front face is waterproof

Causes of flashes or intermittent operation

Occasional flicker or flashing effects can have a number of possible causes:

- **Incompatible Dimmer**
  This is the most common cause by far
  Choose a dimmer module compatible with the product being installed (see tables page 5)
- **Interference on 230V supply**
  Caused by ripple current control (usually early morning and evening only, rarely a problem)
  Electrical noise from heavy machinery or pumps (e.g. big irrigation pumps)
  Contact Switch Lighting for advice

Flicker

The term Flicker is used to refer to repetitive flicker usually caused by the 230V AC supply. It usually results in 100 Hz flicker of lighting. It is desirable that flicker is kept below 20% to avoid being noticeable. Some people are more sensitive to flicker than others. All Switch Lighting **E-LIGHTZ** and **D-LIGHTZ** are low flicker designs.

Marker-LIGHTZ (SL231/SL241)

These useful little lights use an incredibly small amount of power and over 50 can be installed on small cable. Ten of these lights running 24/7 all year long will cost less than $1 to run for the year. These lights are great for marking paths. They are not bright enough to illuminate objects – for this use **SL201.**

LED Protector (SLP350/SLP700)

This device will prevent a lot of failures caused by intermittent connections during installation and subsequently due to damage.

It has been specially designed by Switch to protect strings of constant current lights, such as the **SL201**. In operation it acts like an incredibly fast fuse, isolating the lights from fault surges before they can do any damage. Often fault surges happen during installation due to intermittent wiring connections.

It is resettable by simply cycling the power on/off and has an LED indicator built in to indicate when a fault has been detected. It should be specified for all **SL201** and any other series connected LED system at 350mA or 700mA.

LED Tester (SLAT301)

This versatile tool can be used to safely test most LEDs up to 40 Volts. The test current is controlled at just 5mA so that damage cannot be caused by reversed or intermittent connection.

This is a great little test box to check out the system **BEFORE** connecting the driver and for general fault finding. Features include: battery powered, auto switch off and short and open circuit faults indicator.

Dimming Switch Lighting lights (standard drivers)

Dimmer modules must be compatible with the LED Driver in use. We test a range of dimmer options so you don't have to. Please stick with our recommendations to avoid problems.

Switch Light Type	Compatible Dimmers				
All E-LIGHTZ (SL35, SL40) All D-LIGHTZ (Fixed and Tiltable) sLED (SL50, 55, 56) sLED DOME (SLED215F, 315F, 315T, 415F, 515F) ZELA (Fixed and Tiltable)	**Description**	**Model**	**Max%**	**Min%**	**Stability**
	Clipsal trailing edge	32E450TM	97	11	✓
	Clipsal universal	32E450UDM	96	12	✓
	Clipsal universal push button	31E2PUDM	96	9	✓
	Clipsal LED dimmer	32ELEDM	96	5	✓
	Legrand/HPM	EM400TR	94	6	✓
	Legrand push button	EM400A3P	92	5	✓
	Kiwi dimmer	K005U	96	5	✓
	Home DL dimmer	HLDIM-EXCL	96	0	✓
	PDL trailing edge	624M/824M	97	11	✓
	PDL universal	654M/854M	96	12	✓
	PDL leading edge	634LM	94	9	✓
	PDL universal push button	654PBM	96	9	✓
	PDL universal ICON	354RDMLED-VW	94	1	✓
	PDL universal ICON push button	354PBDMUN-VW	94	9	✓
SL900 with SL500D driver Dimmers marked (*)may not turn on until the brightness is adjusted to > 7%	**Description**	**Model**	**Max%**	**Min%**	**Stability**
	Clipsal trailing edge	32E450TM	97	11	✓
	Clipsal universal	32E450UDM	96	12	✓
	Clipsal universal push button	31E2PUDM	96	9	✓
	Clipsal LED dimmer*	32ELEDM	96	5	✓
	PDL trailing edge	624M/824M	97	11	✓
	PDL universal	654M/854M	96	12	✓
	PDL leading edge*	634LM	94	9	✓
	PDL universal push button	654PBM	96	9	✓
	Legrand/HPM*	EM400TR	94	6	✓
	Legrand push button*	EM400A3P	92	5	✓
	Kiwi dimmer*	K005U	100	6	✓
	Home DL dimmer*	HLDIM-ECL	100	4	✓
SL201, SL614, SL900 Used with L05021 350mA driver	**Description**	**Model**	**Max%**	**Min%**	**Stability**
	PDL 654M Universal	28	4	Slight start-up flash then stable	
	Clipsal 32E450TM Trailing	23	4	Stable	
	HPM CAT400T	15	4	Stable	

Please check website for latest information

Dimming Switch Lighting lights (Dali driver IE-12D)

Compatibility with Switch Lighting luminaires:

Output current has been preset. Do not change! Refer to table below to determine how many series connected lights may be used. Make all connections before applying power.

Switch Light Type	Driver Current		Lights	
Type	min	max	min	max
D-LIGHTZ	180	300	1	1
E-LIGHTZ	180	300	1	1
E-LIGHTZ-Mini	180	230	1	1
ZELA Fixed	180	230	1	1
ZELA (all other models)	180	260	1	1
SL900	180	350	2	3
SL900	500	500	2	2
SL201/211/ SLDL614T	180	350	5	11
SLDL614T	500	500	5	7
SLBL122F/123F	180	500	3	3

Switch Light Order Code	
Suffix	Driver Current
D02	180mA
D03	230mA
D04	260mA
D05	300mA
D06	500mA
D07	350mA

Unsuitable use:

The following lights are not suitable for use with this DALI driver:

SL41, SL910, SL231/241, SL224/234 SLBL120F/121F

Constant current vs constant voltage outdoor lights from Switch Lighting

Ensure you match lights with the correct driver

Constant current (SL201/SL211/SL614/SL900/SLBL122F/SLBL123F)

- Series wiring for multiple lights
- Smaller cable required for long runs
- Less fault tolerant – single fault can put all lights out
- Easily damaged during install – reversed or live connection destroys lights
- Use LED Protector (SLP350/SLP700) & LED Tester (SLAT301) to check wiring first

Constant voltage (SL41/SL224/SL234/SL231/SL241/SL910)

- Parallel wiring for multiple lights
- Larger cable required for long runs
- More fault tolerant
  A single fault will normally only put one light out
- More rugged during install
  Reversed or live connection does not destroy lights
- Use LED Tester to check wiring (SLAT307)

To calculate the cable size required calculate the total current by multiplying the number of lights by the current per light:

Type	12V system: current per light (Amps)	24V system: current per light (Amps)
SL231/SL241	0.002	0.001
SL41	0.13	Do not use
SLBL120F/SLBL121F/ SL224/SL234/SL910	0.44	0.22

Constant current cable size guide

(gives maximum end-to-end cable length vs wire CSA)

	Cable Size (mm2)				
Current	0.3mm2	0.5mm2	1mm2	1.5mm2	2.5mm2
350mA	35m	60m	120m	190m	320m
500mA	20m	30m	60m	95m	160m
700mA	20m	30m	60m	95m	160m

Size guide – constant voltage

Table 1 - evenly spaced lights (table shows maximum volt drop at cable end)

		Total cable length (m)								
No. of lights	Total current	10	20	30	40	50	60	80	100	150
v	0.1	0.04	0.09	0.13	0.17	0.22	0.26	0.35	0.44	0.65
2	0.3	0.07	0.13	0.20	0.26	0.33	0.39	0.52	0.65	0.98
3	0.4	0.09	0.17	0.26	0.35	0.44	0.52	0.70	0.87	0.87
4	0.5	0.11	0.22	0.33	0.44	0.55	0.65	0.87	0.73	0.65
5	0.7	0.13	0.26	0.39	0.52	0.65	0.79	0.70	0.87	0.79
6	0.8	0.15	0.31	0.46	0.61	0.76	0.92	0.81	0.61	0.92
7	0.9	0.17	0.35	0.52	0.70	0.87	0.70	0.93	0.70	0.65
8	1.0	0.20	0.39	0.59	0.79	0.98	0.79	0.63	0.79	0.74
9	1.2	0.22	0.44	0.65	0.87	0.73	0.87	0.70	0.87	0.82
10	1.3	0.24	0.48	0.72	0.96	0.80	0.96	0.77	0.96	0.90
11	1.4	0.26	0.52	0.79	0.70	0.87	0.63	0.84	0.65	0.98
12	1.6	0.28	0.57	0.85	0.76	0.95	0.68	0.91	0.71	0.71
13	1.7	0.31	0.61	0.92	0.81	0.61	0.73	0.98	0.76	0.76
14	1.8	0.33	0.65	0.98	0.87	0.65	0.79	0.65	0.82	0.82
15	2.0	0.35	0.70	0.70	0.93	0.70	0.84	0.70	0.87	0.87
16	2.1	0.37	0.74	0.74	0.99	0.74	0.89	0.74	0.93	0.93
17	2.2	0.39	0.79	0.79	0.63	0.79	0.94	0.79	0.98	0.98
18	2.3	0.41	0.83	0.83	0.66	0.83	0.99	0.83	0.69	0.78
19	2.5	0.44	0.87	0.87	0.70	0.87	0.65	0.87	0.73	0.82
20	2.6	0.46	0.92	0.92	0.73	0.92	0.69	0.92	0.76	0.86
21	2.7	0.48	0.96	0.96	0.77	0.96	0.72	0.96	0.80	0.90
22	2.9	0.50	0.67	0.60	0.80	0.63	0.75	0.67	0.84	0.94
23	3.0	0.52	0.70	0.63	0.84	0.65	0.79	0.70	0.87	0.98
24	3.1	0.55	0.73	0.65	0.87	0.68	0.82	0.73	0.59	
25	3.3	0.57	0.76	0.68	0.91	0.71	0.85	0.76	0.95	
26	3.4	0.59	0.79	0.71	0.94	0.74	0.88	0.79	0.98	
27	3.5	0.61	0.81	0.73	0.98	0.76	0.92	0.81	1.02	
28	3.6	0.63	0.84	0.76	0.63	0.79	0.95	0.84	1.05	
29	3.8	0.65	0.87	0.79	0.65	0.82	0.98	0.87	1.09	
30	3.9	0.68	0.90	0.81	0.68	0.85	1.01	0.90	1.13	

1.0mm² 1.5mm² 2.5mm² 4.0mm² 6.0mm² 8.0mm²

Table 2 - lights are near far end of the cable (table shows maximum volt drop at cable end)

		Total cable length (m)								
No. of lights	Total current	10	20	30	40	50	60	80	100	150
1	0.1	0.04	0.09	0.13	0.17	0.22	0.26	0.35	0.44	0.65
2	0.3	0.09	0.17	0.26	0.35	0.44	0.52	0.70	0.87	0.87
3	0.4	0.13	0.26	0.39	0.52	0.65	0.79	0.70	0.87	0.79
4	0.5	0.17	0.35	0.52	0.70	0.87	0.70	0.93	0.70	0.65
5	0.7	0.22	0.44	0.65	0.87	0.73	0.87	0.70	0.87	0.82
6	0.8	0.26	0.52	0.79	0.70	0.87	0.63	0.84	0.65	0.98
7	0.9	0.31	0.61	0.92	0.81	0.61	0.73	0.98	0.76	0.57
8	1.0	0.35	0.70	0.70	0.93	0.70	0.84	0.70	0.87	0.65
9	1.2	0.39	0.79	0.79	0.63	0.79	0.94	0.79	0.98	0.74
10	1.3	0.44	0.87	0.87	0.70	0.87	0.65	0.87	0.73	0.82
11	1.4	0.48	0.96	0.96	0.77	0.96	0.72	0.96	0.80	0.90
12	1.6	0.52	0.70	0.63	0.84	0.65	0.79	0.70	0.87	0.98
13	1.7	0.57	0.76	0.68	0.91	0.71	0.85	0.76	0.95	
14	1.8	0.61	0.81	0.73	0.98	0.76	0.92	0.81	0.76	
15	2.0	0.65	0.87	0.79	0.65	0.82	0.98	0.87	0.82	
16	2.1	0.70	0.93	0.84	0.70	0.87	0.70	0.93	0.87	
17	2.2	0.74	0.99	0.89	0.74	0.93	0.74	0.99	0.93	
18	2.3	0.79	0.63	0.94	0.79	0.98	0.79	0.79	0.98	
19	2.5	0.83	0.66	0.99	0.83	0.69	0.83	0.83		
20	2.6	0.87	0.70	0.65	0.87	0.70	0.87	0.87		
21	2.7	0.92	0.73	0.69	0.92	0.76	0.92	0.92		
22	2.9	0.96	0.77	0.72	0.96	0.80	0.96	0.96		
23	3.0	0.67	0.80	0.75	0.67	0.84	1.00	1.00		
24	3.1	0.70	0.84	0.79	0.70	0.87	0.79			
25	3.3	0.73	0.87	0.82	0.73	0.91	0.82			
26	3.4	0.76	0.91	0.85	0.76	0.95	0.85			
27	3.5	0.79	0.94	0.88	0.79	0.98	0.88			
28	3.6	0.81	0.98	0.92	0.81	0.76	0.92			
29	3.8	0.84	1.01	0.95	0.84	0.79	0.95			
30	3.9	0.87	1.05	0.98	0.87	0.82	0.98			

1.0mm² 1.5mm² 2.5mm² 4.0mm² 6.0mm² 8.0mm²

Example 1:
10 x SL41 lights evenly distributed along a 50m cable. 10 x 0.13A = 1.3Amps.
Use Table 1 to determine we need 1.5mm2 CSA for the cable cores @ 50metres.

Example 2:
As with Example 1 however all lights near end of cable.
Use Table 2. Now we need 2.5mm2 CSA for each core of the cable.

Contact Switch Lighting for longer cable runs.

How many lights per driver?

Please refer to the Switch Lighting Driver Table document for additional detailed driver information to address driver-related questions.

Switch Lighting Driver Table
230VAC Constant Current Driver Table
LED Current Selection Table
SE-40-300-1050-W1A Output Voltage - Output Current Graph
SLiC-700E Max Output Voltage
230VAC Constant Voltage Drivers Table
Low Voltage DC-DC Converter Constant Current Driver Table
Driver Dip Switch & Output Tables
Discontinued Drivers

Scan the QR code to view the Switch Lighting Driver Table online