



# **Industrial Lighting Solutions**

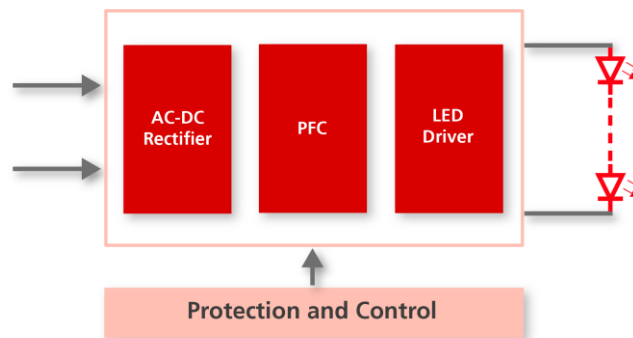
Lighting is an essential element in our present world. It plays a decisive role in our daily lives, right from low power indoor lighting at home or offices, to mid and high power outdoor lighting, industrial and horticulture lighting systems. Lighting accounts for about 15% of global electricity consumption.

A new era came with the light emitting diodes (LED). They consume little electricity, are long lasting, versatile and contain no toxic substances. LEDs have been successful in replacing the traditional lighting sources like fluorescent, Halogen, HID lamps and many other high density lighting applications. Other intelligent technologies such as digital lighting control systems and smart lighting solutions are emerging in the market, further ensuring an increase in efficiency, greater energy savings and thus lower the carbon emissions.

The discrete components always provide flexibility in choosing the perfect matching based on the circuit requirements. By choosing the best suited semiconductor components in the design, power losses decrease and energy savings can be pushed even further. Hence, the selection of the right components can also boost-up the overall performance.

Discover our wide range of silicon based, power discrete components like diodes and bridge rectifiers. Additionally, Diotec also offers a new product portfolio of MOSFETs and linear voltage regulators fitting perfectly into a broad range of industrial lighting applications.

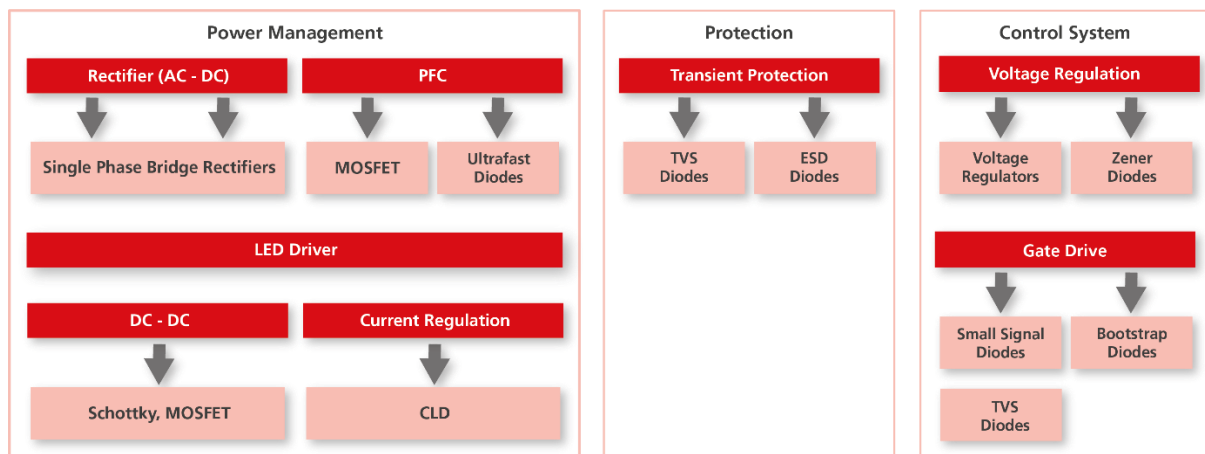
The following block diagram shows energy alteration procedure from an Alternating AC voltage to a Constant output current:



Block diagram for typical industrial lighting applications

The overall function of industrial lighting can be classified into three groups:

- 1) Power management system, which has different stages such as AC-DC rectification, power factor correction, DC-DC conversion. While auxiliary power supply can be arranged as an alternative/additional external source in parallel to the power supply.
- 2) Protection: Although the modern power supplies are reliable, there is a possibility for voltage transient peaks, induced from the unlikely events like lightning, short-circuit or even from unintended backwards power connection. By adding little extra protection circuitry, it is possible to protect the power supply from such voltage disturbances.
- 3) Controls and gate drive: Many lighting fixtures are now being integrated by intelligent lighting control systems that have sensors and wireless networked lighting systems. It would facilitate to improve the energy savings, efficiency and helps to optimize the usage. The light control function is performed by control and gate drive circuit.



## AC – DC Rectification

### Single Phase Bridge Rectifiers

Part No	Package	I <sub>FAV</sub>	V <sub>RRM</sub>
<b>MYS250 ... MYS380</b>	MicroDIL	1 A	600 ... 800 V
<b>MB6S ... MB10S</b>	TO-269AA/MiniDIL Slim	0.5 A	600 ... 1000 V
<b>S250 ... S500</b>	TO-269AA/MiniDIL Slim	0.8 A	600 ... 1000 V
<b>S125K, S250K</b>	TO-269AA/MiniDIL Slim	1 A	250 ... 600 V
<b>ABS6 ... ABS10</b>	ABS	0.8 A	600 ... 1000 V
<b>ABS15J ... ABS15M</b>	ABS	1.5 A	600 ... 1000 V
<b>B250S15A ... B500S15A</b>	SO-DIL Slim	1.5 A	600 ... 1000 V
<b>B250S2A ... B380S2A</b>	SO-DIL Slim	2.3 A	600 ... 800 V
<b>B250S ... B500S</b>	SO-DIL Slim	1 A	600 ... 1000 V
<b>B250D ... B500D</b>	DIL	1 A	600 ... 1000 V

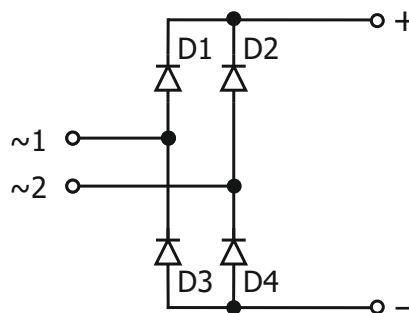
Part No	Package	I <sub>FAV</sub>	V <sub>RRM</sub>
<b>B250R ... 500R</b>	D9 x 5.1 (~WOG)	2 A	600 ... 1000 V

### Single Rectifiers

Part No	Package	I <sub>FAV</sub>	V <sub>RRM</sub>	E <sub>RSM</sub>
<b>S1J ... S2Y</b>	DO-214AC/SMA	1 A	600 ... 2000 V	N/A
<b>S2J ... S2Y</b>	DO-214AA/SMB	2 A	600 ... 2000 V	N/A
<b>S3J ... S3Y</b>	DO-214AB/SMC	3 A	600 ... 2000 V	N/A
<b>S5J ... S5Y</b>	DO-214AB/SMC	5 A	600 ... 2000 V	N/A
<b>SM4005 ... SM2000</b>	DO-213AB/ Melf	1 A	600 ... 2000 V	N/A
<b>AM2000 <sup>1)</sup></b>	DO-213AB/ Melf	1 A	1600 V	5 mJ
<b>BYG10J ... BYG10M <sup>1)</sup></b>	DO-214AB/SMA	1 A	600 ... 1000 V	20 mJ
<b>AL1J ... AL1M <sup>1)</sup></b>	DO-213AA/MiniMelf	1 A	600 ... 1000 V	20 mJ
<b>GL1J ... GL1M</b>	DO-213AA/MiniMelf	1 A	600 ... 1000 V	N/A
<b>SL1J ... SL1M</b>	SOD-123FL	1 A	600 ... 1000 V	N/A

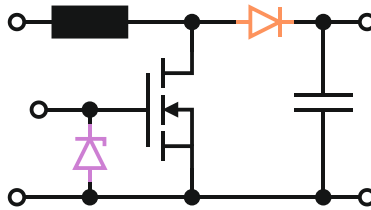
<sup>1)</sup> Controlled Avalanche

Part No	Package	I <sub>FAV</sub>	V <sub>RRM</sub>
<b>1N4005 ... 1N4007</b>	DO-41	1 A	600 ... 1000 V
<b>1N5397 ... 1N5399</b>	DO-15	1.5 A	600 ... 1000 V
<b>1N5061 ... 1N5062</b>	DO-15	1.5 A	600 ... 800 V
<b>1N5406K ... 1N5408K</b>	DO-15	1.5 A	600 ... 1000 V
<b>BY253 ... BY255</b>	~DO-201	3 A	600 ... 1300 V



Typical 1~ bridge circuit

## Power Factor Correction (PFC)



Required at high power lighting assemblies. Operation frequencies are high: For reduction of power losses in the switch (affected highly by reverse recovery behaviour of the diode!), the boost diode must have very low reverse recovery but also low forward voltage drop. Superfast efficient rectifiers fulfil this requirement.

### MOSFETs\*

Part no	Package	$I_D$	$V_{DS}$	$R_{DS(on)}$
<b>DIJ004N80</b>	ITO-220AB	4 A	800 V	2.8 $\Omega$
<b>DIJ006N80</b>	ITO-220AB	6 A	800 V	1.4 $\Omega$
<b>DIJ010N80</b>	ITO-220AB	10 A	800 V	0.9 $\Omega$

\*under development

### Superfast Efficient Rectifiers

Part no	Package	$I_{FAV}$	$V_{RRM}$	$T_{rr}$
<b>MUR460</b>	DO-201	4 A	600 V	50 ns
<b>UGB8JT</b>	D2PAK	8 A	600 V	35 ns
<b>UFT800J</b>	TO-220AC	8 A	600 V	35 ns
<b>MUR860</b>	TO-220AC	8 A	600 V	50 ns
<b>MURF2060CT</b>	ITO-220AB	20 A	600 V	25 ns

**LED Driver**

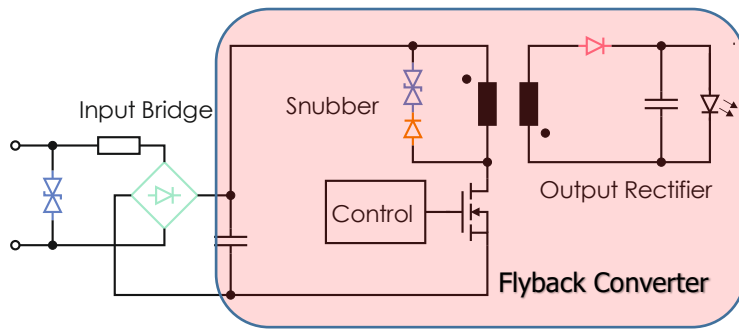


Fig: Typical Flyback circuit for high power applications

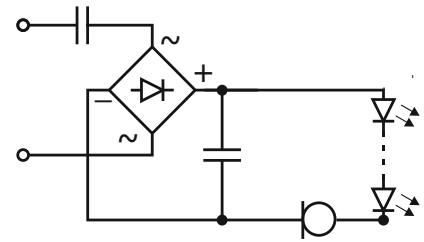


Fig: Typical LED driver circuit for low power applications

**Schottky Output Rectifiers**

Part no	Package	I <sub>FAV</sub>	V <sub>RRM</sub>
<b>SKL34 ... SKL36</b>	SOD-123F	3 A	40 ... 60 V
<b>SK34SMA-3G ... SK315SMA</b>	DO-214AC/SMA	3 A	40 ... 150 V
<b>SK420</b>	DO-214AB/SMC	4 A	200 V
<b>SK54-3G ... SK515</b>	DO-214AA/SMB	5 A	40 ... 150 V
<b>SK84-3G ... SK815</b>	DO-214AB/SMC	8 A	40 ... 150 V

-3G: 3rd Generation Schottky Technology with low V<sub>F</sub> and low I<sub>R</sub>

Part no	Package	I <sub>FAV</sub>	V <sub>RRM</sub>
<b>PPS1040-3G ... PPS1060</b>	Power SMD	10 A	40 ... 60 V
<b>PPS1540 ... PPS1560</b>	Power SMD	15 A	40 ... 60 V
<b>SK1040 ... SK10100D1</b>	D-PAK	10A	40 ... 100 V
<b>SK1040D2-3G ... SK100D2</b>	D2-PAK single	10A	40 ... 100 V
<b>SK4040CD2-3G ... SK4045CD2-3G</b>	D2-PAK dual	2x 20A	40 ... 45 V
<b>SBT1040-3G ... SBT10100</b>	TO-220AC	10A	40 ... 100 V
<b>SBCT1040-3G ... SBCT10100</b>	TO-220AB dual	2x 5A	40 ... 100 V

-3G: 3rd Generation Schottky Technology with low V<sub>F</sub> and low I<sub>R</sub>

**MOSFETs\***

Part no	Package	I <sub>D</sub>	V <sub>DS</sub>	R <sub>DS(on)</sub>
<b>DIJ004N80</b>	ITO-220AB	4 A	800 V	2.8 Ω
<b>DIJ006N80</b>	ITO-220AB	6 A	800 V	1.4 Ω
<b>DIJ010N80</b>	ITO-220AB	10 A	800 V	0.9 Ω

\*under development

**CLD (Constant Current Regulator)**

Part no	Package	I <sub>Pnom</sub>	V <sub>AK</sub>
<b>CL10MD ... 30MD</b>	DO-213AA/MiniMelf	20 ... 40 mA	90 V
<b>CL15M35 ... 40M35</b>	DO-214AC/SMA	15 ... 40 mA	90 V
<b>CL15M45 ... 40M45</b>	DO-214AA/SMB	15 ... 40 mA	90 V

## Controls and Gate Drive

### Voltage Regulators\*

Part no	Package	I <sub>out</sub>	V <sub>out</sub>
<b>LDI1117 Series</b>	SOT-89, SOT-223	0.8 A	Adj, 1.2 ... 5 V
<b>DI78L05 Series</b>	SO-8, SOT-89	0.1 A	3.3 V ... 24 V
<b>DI79L Series</b>	TO-92	0.1 A	5V ... 24 V
<b>DI78M Series</b>	SO8, SOT-89	0.5 A	5V ... 24 V
<b>DI6206 Series</b>	SOT-23	0.2 A	1.2 V ... 5.0V

\* under development

### Zener Diodes

Part no	Package	P <sub>tot</sub>	V <sub>Z</sub>
<b>MM3Z</b>	SOD-323	300 mW	2.4 ... 47 V
<b>BZT52</b>	SOD-123	500 mW	2.4 ... 75 V
<b>ZMC</b>	Micro Melf	500 mW	2.4 ... 75 V

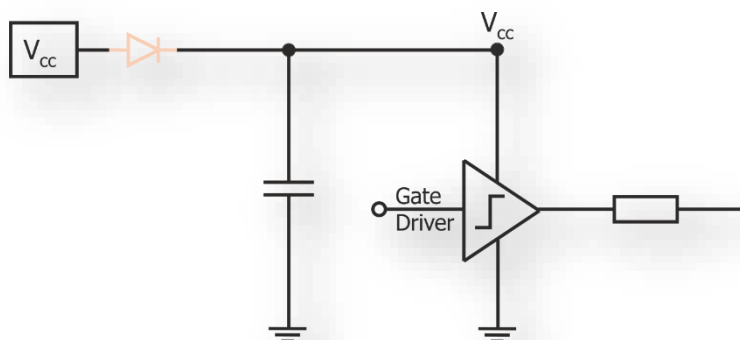
### Small Signal Diodes

Part no	Package	I <sub>FAV</sub>	V <sub>RRM</sub>
<b>1N4148WS</b>	SOD-323	150 mA	100 V
<b>BAT54A</b>	SOT-23	200 mA	30 V
<b>BAV99</b>	SOT-23	215 mA	85 V

### Schottky Diodes

Part no	Package	I <sub>FAV</sub>	V <sub>RRM</sub>
<b>BAT54A</b>	SOT-23	200 mA	30 V
<b>BAS40-05</b>	SOT-23	200 mA	40 V

### Bootstrap Diodes



Part no	Package	I <sub>FAV</sub>	V <sub>RRM</sub>
<b>FR2T5MA ... FR2YSMA (Fast)</b>	DO-214AC/SMA	1 A	1300 ... 2000 V
<b>BYG23T (Superfast / Avalanche)</b>	DO-214AC/SMA	1A	1300V

## Protection

### Ultrafast Diodes (Snubber)

Part no	Package	I <sub>FAV</sub>	V <sub>RRM</sub>	V <sub>RRM</sub>
<b>EGL1J ... EGL1M</b>	DO-213AA/MiniMelf	1 A	600 ... 1000 V	75 ns
<b>USL1J ... USL1M</b>	SOD-123F	1 A	600 ... 1000 V	75 ns
<b>SUF4006 ... SUF4007</b>	DO-213AB/Melf	1 A	600 ... 1000 V	75 ns
<b>US1J ... US1M</b>	DO-214AC/SMA	1 A	600 ... 1000 V	75 ns
<b>US3J ... US3M</b>	DO-214AB/SMC	3 A	600 ... 1000 V	75 ns

### TVS Diodes (Snubber/Gate protection)

Part no	Package	P <sub>PPM</sub>	V <sub>WM</sub>	V <sub>BR</sub>
<b>TGL34-6.8 ... TGL34-200CA</b>	DO-213AA/MiniMelf	150 W	5.5 ... 171 V	6.8 ... 200 V
<b>SMF5.0 ... SMF220CA</b>	SOD-123FL	200 W	5.0 ... 220 V	6.8 ... 260 V
<b>TGL41-6.8 ... TGL41-520C</b>	DO-213AB/Melf	400 W	5.5 ... 423 V	6.8 ... 520 V
<b>P4SMAJ5.0 ... P4SMA550CA</b>	DO-214AC/SMA	400 W	5.0 ... 495 V	6.8 ... 550 V
<b>P6SMBJ5.0 ... P6SMB550CA</b>	DO-214AA/SMB	600 W	5.0 ... 495 V	6.8 ... 550 V
<b>1.5SMCJ5.0 ... 1.5SMCJ550CA</b>	DO-214AB/SMC	1500 W	5.0 ... 495 V	6.8 ... 550 V

### TVS and Fast/Ultrafast (Snubber) in *a single package!*

Part no	Package	P <sub>PPM</sub>	V <sub>R</sub>	V <sub>BR</sub>
<b>TGL200F10</b>	DO-213AB/Melf	300 W	1000 V	200 V
<b>TGL200U06</b>	DO-213AB/Melf	300 W	600 V	200 V
<b>PKC-136</b>	DO-15/ DO-204AC	600 W	700 V	160 V

### ESD Protection

Part no	Package	P <sub>PPM</sub>	V <sub>BR Min</sub>	C <sub>j</sub>
<b>ESD3Z5V0 ... ESD3Z12</b>	SOD-323	350 W	6, 13.3 V	350, 150 pF
<b>ESD5Z3V3 ... ESD5Z12</b>	SOD-523	158 ... 240 W	3.3 ... 12 V	55 ... 105 pF
<b>ESD3B5V0 ... ESD3B24WS</b>	SOD-323	350 W	6.0 ... 26.7 V	50 ... 200 pF
<b>ESD3V3CA... ESD36CA</b>	SOT-23	200 W	3.3 ... 36 V	60 ... 600 pF
<b>ESDB3V3 ... ESDB24C</b>	SOT-23	200 ... 350 W	3.3 ... 24 V	11 ... 101 pF

#### Disclaimer

This application note describes device proposals and shall not be considered as assured and proven solution for any circuit. No warranty or guarantee, expressed or implied is made regarding the capacity, performance or suitability of any device, circuit etc.