DESIGN IDEA

Diotec Semiconductor

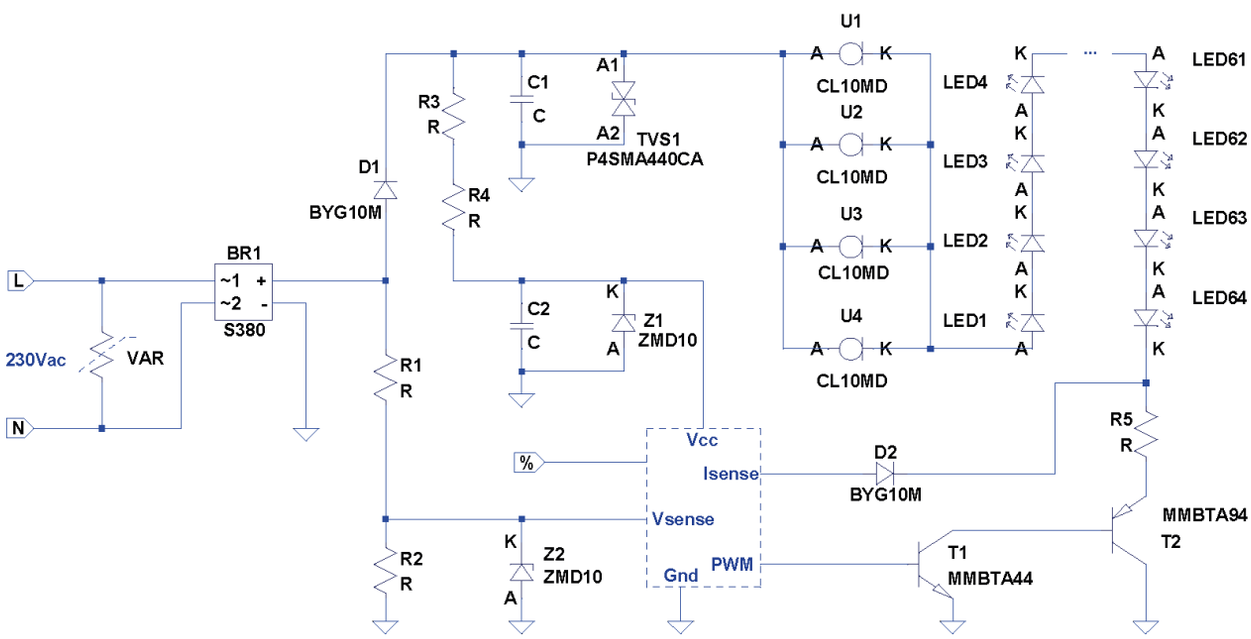
Dimmable LED Driver Circuit

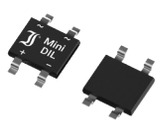
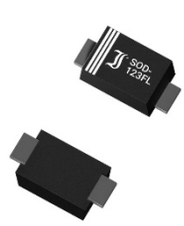
Current Limiting Diodes (CLD), also known as Constant Current Regulators (CCR), can be used to drive LED strips used in modern lighting systems. They can be easily switched in parallel in order to achieve any driving current required for the used LED type. Their disadvantage is temperature dependency of regulation current, as well as inability to provide a dimming functionality. There is a wide variety of LED driving ICs available, using pulse width modulation (PWM) for dimming LED lamps. Switching frequency is high enough to avoid any flickering of the lamps. Dimming level is either taken from the traditional phase-angle-controlled mains, or from analogue/digital signals provided from smart home systems.

The below design idea shows the combination of any suitable LED driving IC together with CLDs.

The CLDs provide a rough controlled regulation current, and cover the voltage ripple on input capacitor C1. The two complimentary high voltage transistors T1 and T2 are not used in linear mode, but in power saving on/off switch mode, controlled by the PWM signal of the IC. Dimming level can be either derived from phase-angle-controlled mains via voltage divider R1 and R2 and Zener diode Z2, or directly via an analogue/digital signal to the IC (input „%“). Avalanche rated diodes D1 and D2 are used to avoid damage by the high frequent / high level switching voltage.

The following pages show main parameters of below parts as well as alternative device proposals for that circuit.



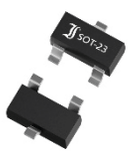
Input Rectifier (BR1)	V_{RRM} [V]	I_{FAV} [A]	Package
S380	800	0.8	**TO-269AA (MiniDIL)**
MB10S	1000	0.5	
S1M (4x)	1000	1	**DO-214AC (SMA)** 
SL1M (4x)	1000	1	**SOD-123FL** 
GL1M (4x)	200	1	**DO-213AA (Plastic MiniMELF)** 
SM4007 (4x)	1000	1	**DO-213AB (Plastic MELF)** 

Avalanche Diodes (D1, D2)	V_{DSS} [V]	I_D [A]	Outline
BYG10M	1000	1	DO-214AC (SMA) 
AL1M	1000	1	DO-213AA (Plastic MiniMELF) 

TVS Diode (TVS1)	V_{BR} [V]	P_{PPM} [W]	Outline
P4SMA440CA	440	400	DO-214AC (SMA) 
TGL41-440CA	440	400	DO-213AB (Plastic MELF) 

Current Limiting Diodes (U1, U2, U3, U4)	I_{Pnom} [mA]	P_{tot} [W]	Outline
CL20M35	20	1	**DO-214AC (SMA)** 
CL10MD	20	1	**DO-213AA (Plastic MiniMELF)** 

Zener Diodes (Z1, Z2)	V_Z [V]	P_{tot} [W]	Outline
Z1SMA10	10	1	**DO-214AC (SMA)** 
ZMD10	10	1	**DO-213AA (Plastic MiniMELF)** 

High Voltage Transistors (T1, T2)	V_{CEO} [V]	I_C [mA]	Outline
MMBTA44	400	300	**SOT-23** 
MMBTA94	400	300	