

Single Stage LED Driver for MR16

General Description

The DS9581D is a dimmable LED Driver for MR16 application.

The DS9581D is highly compatible with ET (Electronic Transformer) and performs high Power Factor. The DS9581 VCC is supplied from the output that keeps tracking output power stable and sustaining the ET demand.

Through the unique close loop current control methodology, we can effectively maintain front end ET function and also stabilize the output LED current.

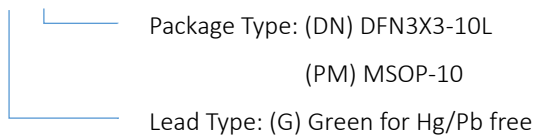
The DS9581D is embedded 60V MOSFET that is compatible in ET-TRIAC dimming applications.

Features

- High ET compatibility
- Support ET-TRIAC dimming applications
- 60V MOSFET inside
- Excellent Power Factor
- Thermal Shutdown Protection
- Thermal Fold-Back Protection
- DFN3X3-10L Package
- MSOP10 Package
- RoHS Compliant and Halogen Free

Ordering Information

DS9581D □ □



Applications

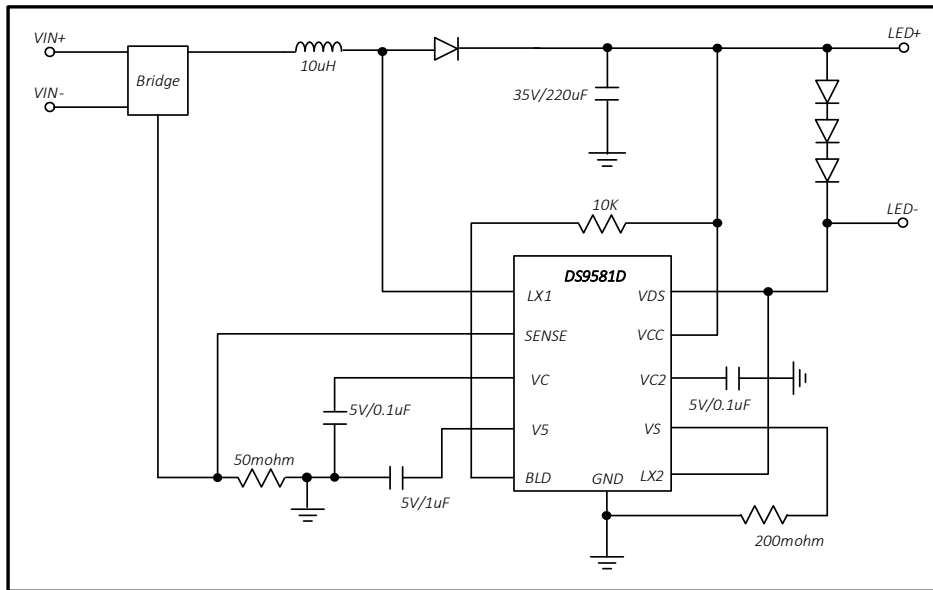
- MR16 Lighting
- High Power LED Lighting
- Architectural Lighting
- Automotive

Pin Description

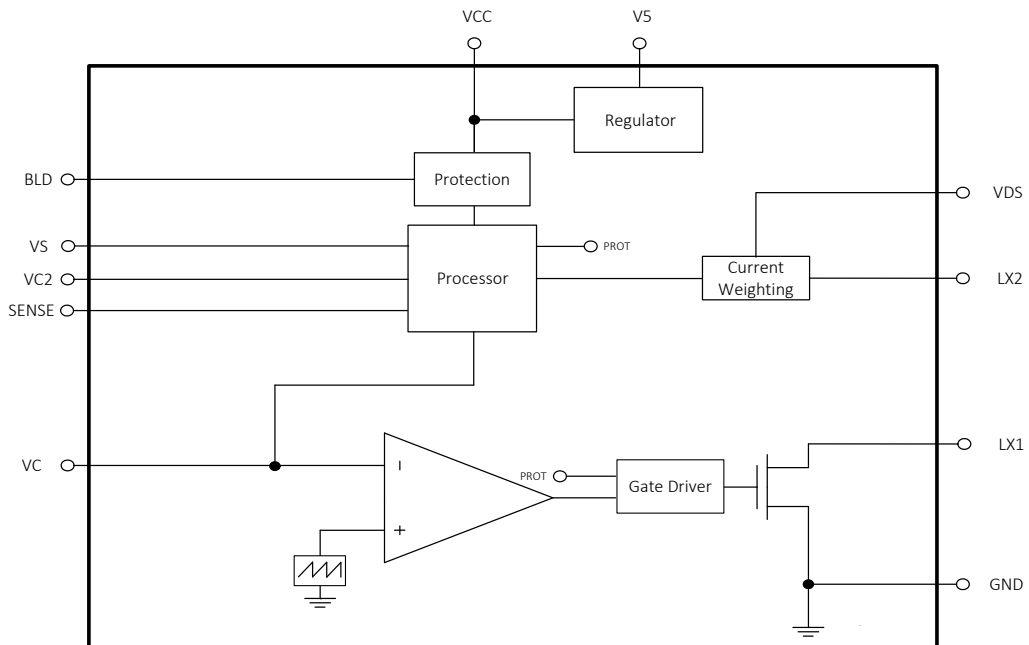


- PIN1: The MOSFET Drain
- PIN2: Current Sense Input
- PIN3: Compensation network
- PIN4: 5V LDO output
- PIN5: Bleeder pin
- PIN6: The MOSFET Drain
- PIN7: The MOSFET Source
- PIN8: Compensation network
- PIN9: VCC Power pin
- PIN10: MOSFET VDS pin
- PIN11: Ground

System Application



Block Diagram



Absolute Maximum Ratings

LX1, LX2-----	-0.3V to 65V
VCC-----	-0.3V to 60V
SENSE-----	-3V to 0.3V
VC, V5, VS, VDS-----	-0.3V to 6V

Recommended Operating Conditions

Input Voltage Supply-----	4V to 55V
Junction Temperature Range-----	-40 °C to 125 °C

Electrical Characteristics

(Vin=20V, TA=25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
UVLO ON	V _{UV.ON}			4.2		V
UVLO OFF	V _{UV.OFF}			4		V
VCC Shut Down Current	I _{SD}				3	uA
VCC Quiescent Current	I _Q			0.6		mA
VCC Operating Current	I _{OP}			1		mA
VCC Max Operating Current	I _{OP.MAX}			1.2		mA
VCC OVP Level	V _{OVP}			58		V
VCC OVP Recovery Level	V _{OVP.RETURN}			28		V
VS OVP High level	V _{OVP.VS.H}			2.2		V
VS OVP Low level	V _{OVP.VS.L}			1.9		V
VS Close Loop Sense Voltage	V _{VS.SENSE}			195		mV
VS Pin Leakage Current	I _{VS.LEAK}				0.1	uA
LX1 Rds.on	R _{DS.LX1}			150		mohm
LX1 Leakage Current	I _{LX1.LEAK}				0.1	uA
LX2 Rds.on	R _{DS.LX2}			200		mohm
LX2 Leakage Current	I _{LX2.LEAK}				0.1	uA

Application Guideline

DS9581D can function in various switching frequency by properly selecting the inductor value and save the PCB space. The unique input/output current control system can enhance the ET compatibility and make output current high precision. Usually, switching frequency as 2MHz is good for the ET. For the EMI consideration, it can be easily pass by internal soft gate driver.

HV MOSFET

DS9581D has 60V MOSFET by the latest technology, it can minimize the channel Rds.on in high voltage condition. The ultra low Rds.on bring higher efficiency and lower extra heat.

LDO 5V (Low Drop-Out)

DS9581D has a high voltage LDO, which can provide 5V power for MCU and reference voltage for extra system design. 1uF cap is recommended for most application.

UVLO (Under Voltage Lock-Out)

In order to protect the system, DS9581D should be turned on by 4.2V UVLO-ON and 4V UVLO-OFF. The hysteresis window is 200mV to keep system stable.

OVP (Over Voltage Protection)

DS9581D VCC OVP can protect the boost system especially system no load. Trigger voltage is 58V and the return voltage is 28V as hiccup mode. It can protect system and lower the dissipation.

OCP (Over Current Protection)

DS9581D has OCP function by sensing output. It can clamp the output current immediately if over current condition appear. The OCP setting point is proportional to the output current. In the most condition, it can function by 120% output current and protect the system.

OTP (Over Temperature Protection)

For general LED lighting, it comes always high ambient temperature problem. It is necessary for the application and DS9581D will shut down when junction temperature exceed 155°C and recovery when junction temperature below 120°C. The OTP behaves as hiccup mode, turn on for couple seconds then turn off for couple seconds. Please always confirm the heat sink is good and it can satisfied the environment. The recommend operating junction temperature is below 90°C.

Thermal Application

For the system PCB design, input power and the heat should be consider. For example,

TA=25°C,

Thermal resistor of DFN3x3 θ_{JA} is 60 °C/W,

JEDEC 51-7 4layers PCB,

The max PD(Max)= (125°C – 25°C) / (60°C/W) = 1.67W.

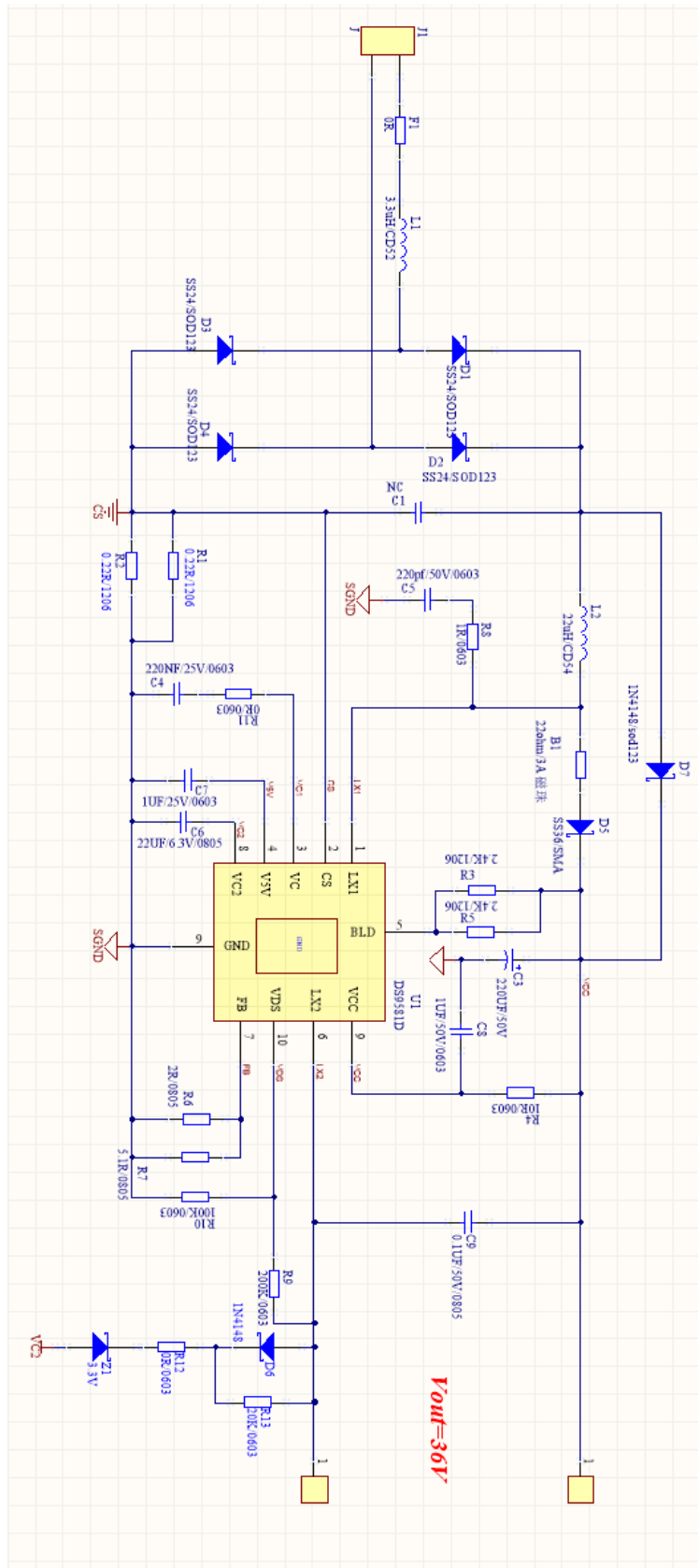
Thermal resistor of MSOP10 θ_{JA} is 48 °C/W,

JEDEC 51-7 4layers PCB,

The max PD(Max)= (125°C – 25°C) / (48°C/W) = 2.08W.

Please note the junction temperature is proportional to the input power.

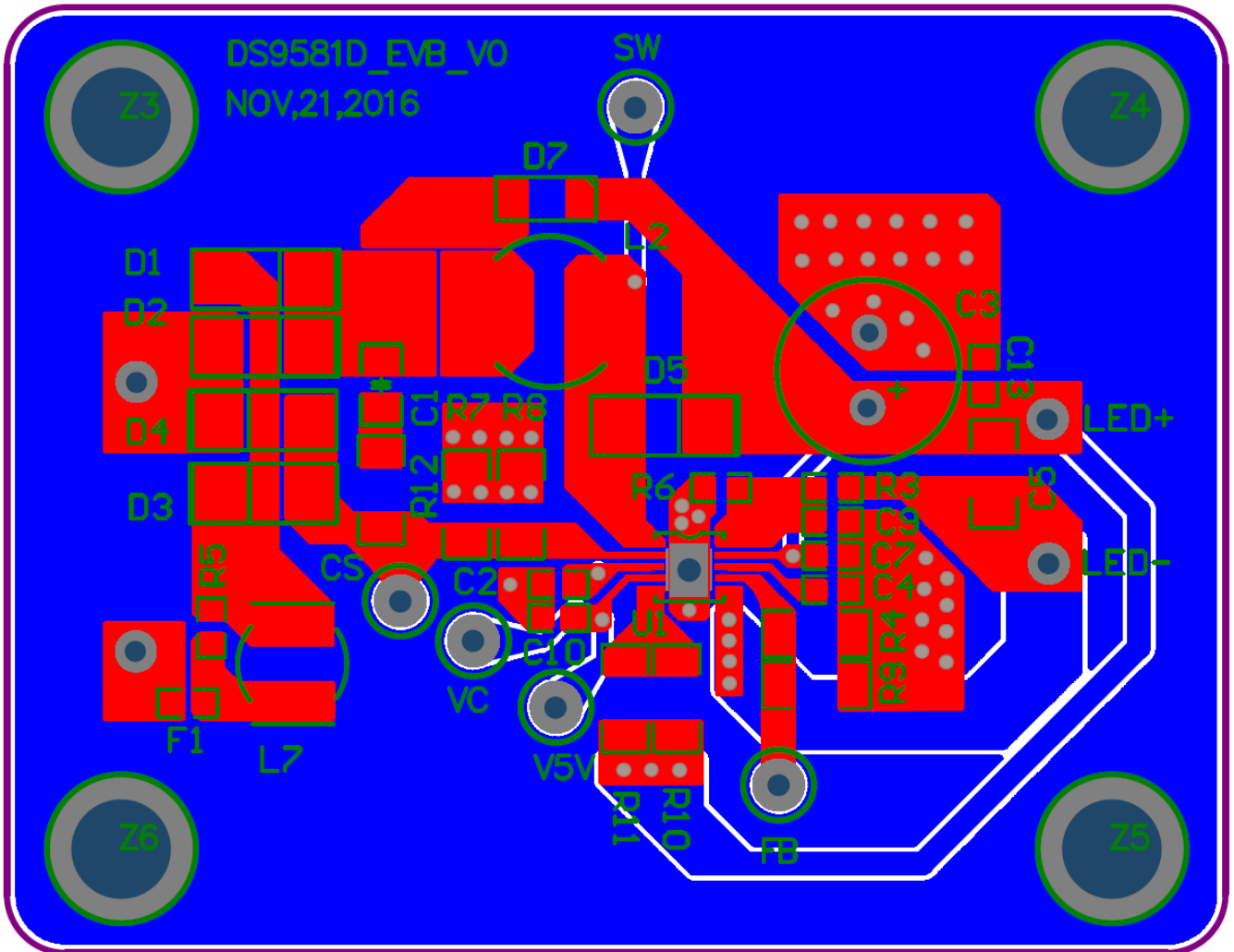
Reference Application Circuit



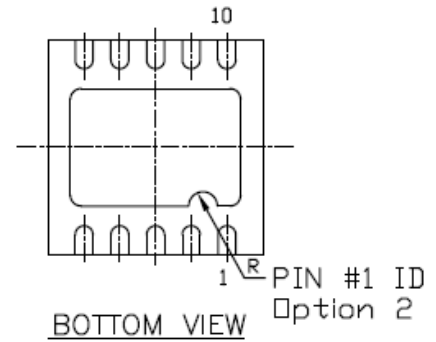
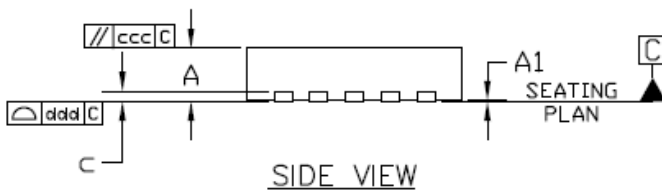
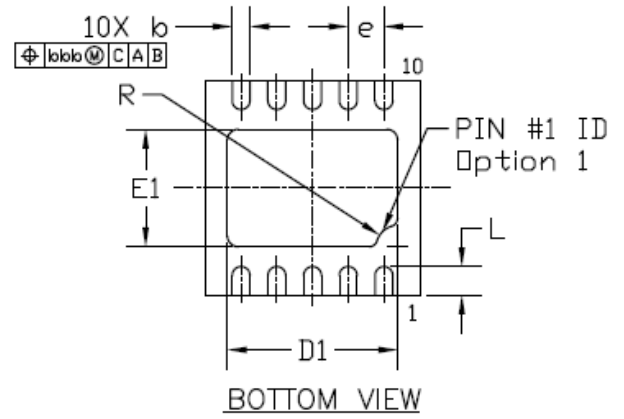
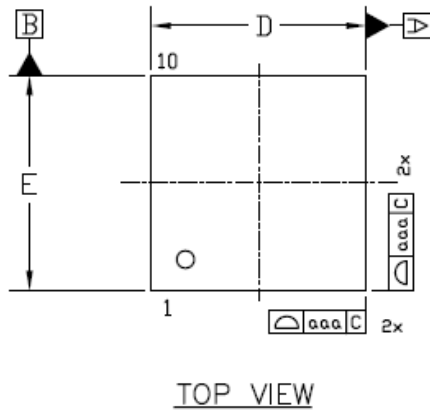
Layout Consideration

For the layout consideration, the big current path should be as short as possible, like CS pin.

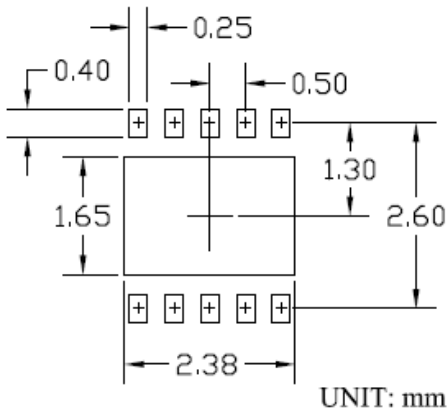
Put the sampling resistor close to VDS pin is recommended.



Package Information: DFN3*3

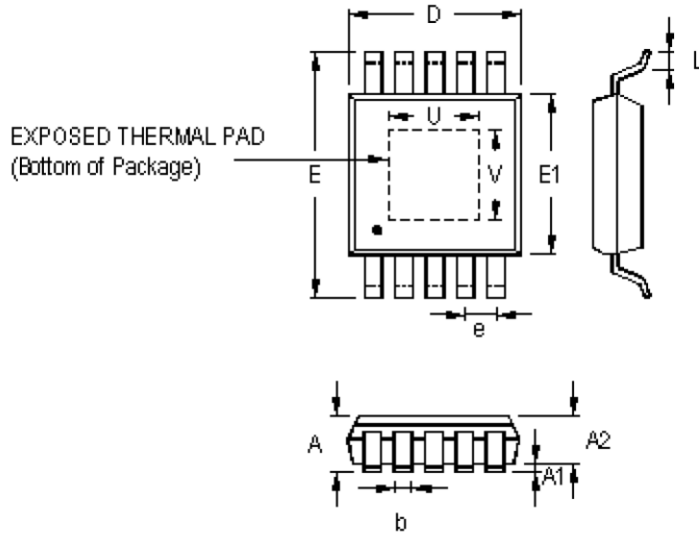


RECOMMENDED LAND PATTERN



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00	0.02	0.05	0.000	0.001	0.002
b	0.18	0.25	0.30	0.007	0.010	0.012
c	—	0.15	0.20	—	0.006	0.008
D	3.00 BSC			0.118 BSC		
D1	2.23	2.38	2.48	0.088	0.094	0.098
E	3.00 BSC			0.118 BSC		
E1	1.50	1.65	1.75	0.059	0.065	0.069
e	0.50 BSC			0.020 BSC		
L	0.30	0.40	0.50	0.012	0.016	0.020
R	0.20			0.008		
aaa	0.15			0.006		
bbb	0.10			0.004		
ccc	0.10			0.004		
ddd	0.08			0.003		

Package Information: MSOP10



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.810	1.100	0.032	0.043
A1	0.000	0.150	0.000	0.006
A2	0.750	0.950	0.030	0.037
b	0.170	0.270	0.007	0.011
D	2.900	3.100	0.114	0.122
e	0.500		0.020	
E	4.800	5.000	0.189	0.197
E1	2.900	3.100	0.114	0.122
L	0.400	0.800	0.016	0.031
U	1.300	1.700	0.051	0.067
V	1.500	1.900	0.059	0.075