



Features

- >90% Efficiency
- 8V to 450V input range
- Constant-current LED driver
- Applications from a few mA to more than 1A Output
- LED string from one to hundreds of diodes
- PWM Low-Frequency Dimming via Enable pin
- Input Voltage Surge ratings up to 450V

Applications

- DC/DC or AC/DC LED Driver applications
- RGB Backlighting LED Driver
- Back Lighting of Flat Panel Displays
- General purpose constant current source
- Signage and Decorative LED Lighting
- Automotive
- Chargers

Description

The An9910 is a PWM high-efficiency LED driver control IC. It allows efficient operation of High Brightness (HB) LEDs from voltage sources ranging from 8VDC up to 450VDC. The An9910 controls an external MOSFET at fixed switching frequency up to 300 kHz. The frequency can be programmed using a single resistor. The LED string is driven at constant current rather than constant voltage, thus providing constant light output and enhanced reliability. The output current can be programmed between a few milliamps and up to more than 1.0A.

Absolute Maximum Ratings

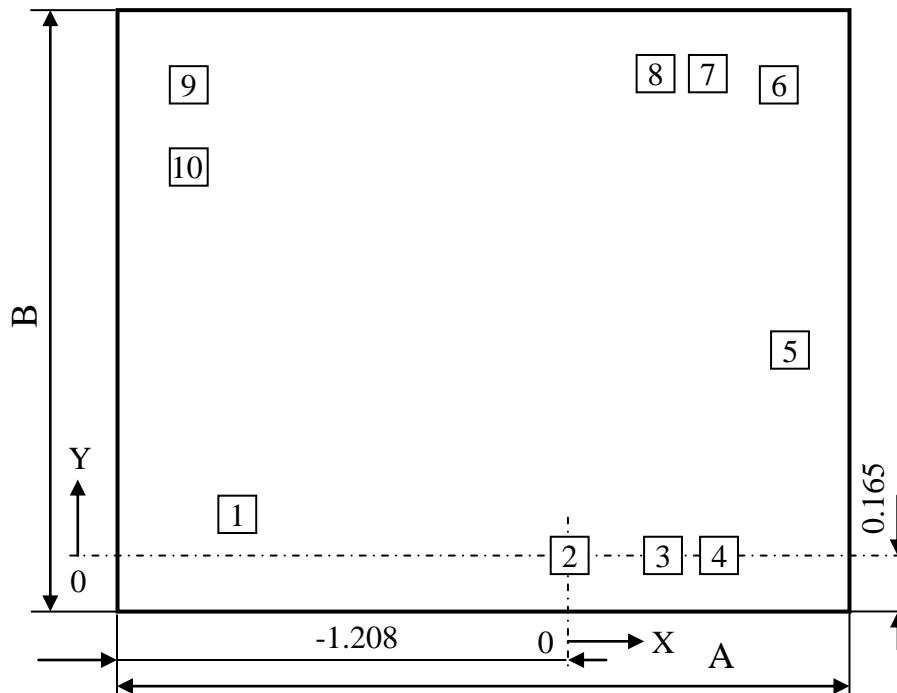
V _{IN} to GND	-0.5V to +470V
CS.....	-0.3V to V _{DD} + 0.3V
LD, PWM_D to GND.....	-0.3V to (V _{DD} - 0.3V)
GATE to GND	-0.3V to (V _{DD} + 0.3V)
V _{DD MAX}	13.5V
ESD Capability, all pads except Pad 1 (V _{IN}) and Pad 7,8 (V _{DD}).....	2.0kV
Maximum Voltage on Pad 1 (V _{IN}) and Pad 7,8 (V _{DD}).....	470V
Continuous Power Dissipation (T _A = +25°C) (Note 1)	
16-Pin SO (derate 7.5mW/°C above +25°C).....	750mW
8-Pin DIP (derate 9mW/°C above +25°C).....	900mW
8-Pin SO (derate 6.3mW/°C above +25°C).....	630mW
Operating Temperature Range	-40°C to +85°C
Junction Temperature.....	+125°C
Storage Temperature Range	-65°C to +150°C

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**Specifications** ($T_A = 25^\circ\text{C}$ unless noted otherwise)

Symbol	Description	Min	Typ	Max	Units	Conditions
V_{INDC}	Input DC supply voltage range	8.0		450	V	DC input voltage
I_{INsd}	Shut-Down mode supply current		0.5	1	mA	Pin PWM_D to GND, $V_{\text{IN}} = 8\text{V}$
V_{DD}	Internally regulated voltage	7.0	7.5	8.0	V	$V_{\text{IN}} = 8\text{-}450\text{V}$, $I_{\text{DD(ext)}} = 0$, pin Gate open
V_{DDmax}	Maximal pin V_{DD} voltage			13.5	V	When an external voltage applied to pin V_{DD}
$I_{\text{DD(ext)}}$	V_{DD} current available for external circuitry ¹			1.0	mA	$V_{\text{IN}} = 8\text{-}100\text{V}$
UVLO	V_{DD} undervoltage lockout threshold	6.45	6.7	6.95	V	V_{IN} rising
ΔUVLO	V_{DD} undervoltage lockout hysteresis		500		mV	V_{IN} falling
$V_{\text{EN(lo)}}$	Pin PWM_D input low voltage			1.0	V	$V_{\text{IN}} = 8\text{-}450\text{V}$
$V_{\text{EN(hi)}}$	Pin PWM_D input high voltage	2.4			V	$V_{\text{IN}} = 8\text{-}450\text{V}$
R_{EN}	Pin PWM_D pull-down resistance	50	100	150	k Ω	$V_{\text{EN}} = 5\text{V}$
$V_{\text{CS(hi)}}$	Current sense pull-in threshold voltage	225	250	275	mV	@ $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$
$V_{\text{GATE(hi)}}$	GATE high output voltage	$V_{\text{DD}} - 0.3$		V_{DD}	V	$I_{\text{OUT}} = -10\text{ mA}$
$V_{\text{GATE(lo)}}$	GATE low output voltage	0		0.3	V	$I_{\text{OUT}} = 10\text{ mA}$
fosc	Oscillator frequency	20 80	25 100	30 120	kHz	Rosc = 1.00 M Ω Rosc = 226 k Ω
D_{MAXht}	Maximum Oscillator PWM Duty Cycle			100	%	$F_{\text{PWMhf}} = 25\text{kHz}$, at GATE, CS to GND
V_{LD}	Linear Dimming pin voltage range	0		250	mV	@ $T_A = < 85^\circ\text{C}$, $V_{\text{IN}} = 12\text{V}$
T_{BLANK}	Current sense blanking interval	150	215	280	ns	$V_{\text{CS}} = 0.55V_{\text{LD}}$, $V_{\text{LD}} = V_{\text{DD}}$
t_{DELAY}	Delay from CS trip to GATE lo			300	ns	$V_{\text{IN}} = 12\text{V}$, $V_{\text{LD}} = 0.15$, $V_{\text{CS}} = 0$ to 0.22V after T_{BLANK}
t_{RISE}	GATE output rise time ²		30	50	ns	$C_{\text{GATE}} = 500\text{pF}$, 10% to 90% V_{GATE}
t_{FALL}	GATE output fall time ²		30	50	ns	$C_{\text{GATE}} = 500\text{pF}$, 90% to 10% V_{GATE}

note¹ Also limited by package power dissipation limit, whichever is lower

PAD DIAGRAM

1. Chip size: $X=1.88\text{ mm}$, $Y=1.54\text{ mm}$ (without scribe line width).
2. Scribe line width: $X=80\text{ }\mu\text{m}$, $Y=80\text{ }\mu\text{m}$
3. Pad size: $100\text{ }\mu\text{m} \times 100\text{ }\mu\text{m}$
4. Substrate to GND.
5. Wafer thickness: $460\text{ }\mu\text{m}$



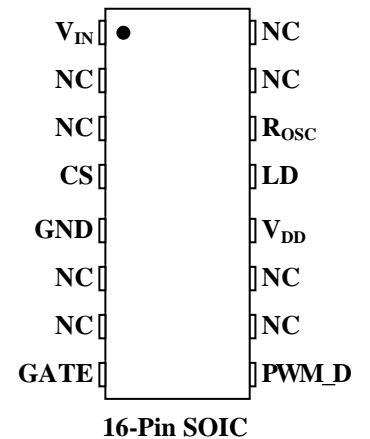
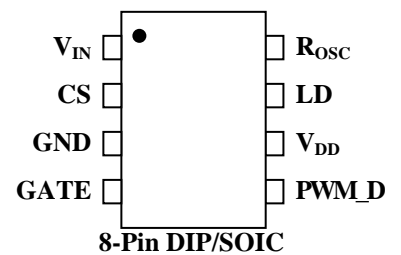
Pad Location

Pad	Pad name	X(μm)	Y(μm)
1	V _{IN}	-887.5	110
2	CS	0	0
3	GND	255.5	0
4	GND	395.5	0
5	GATE	587.0	544.5
6	PWM_D	556.5	1259.5
7	V _{DD}	375.5	1290
8	V _{DD}	235.5	1290
9	LD	-1012.5	1260.5
10	Rosc	-1012.5	1044.5

Pinout

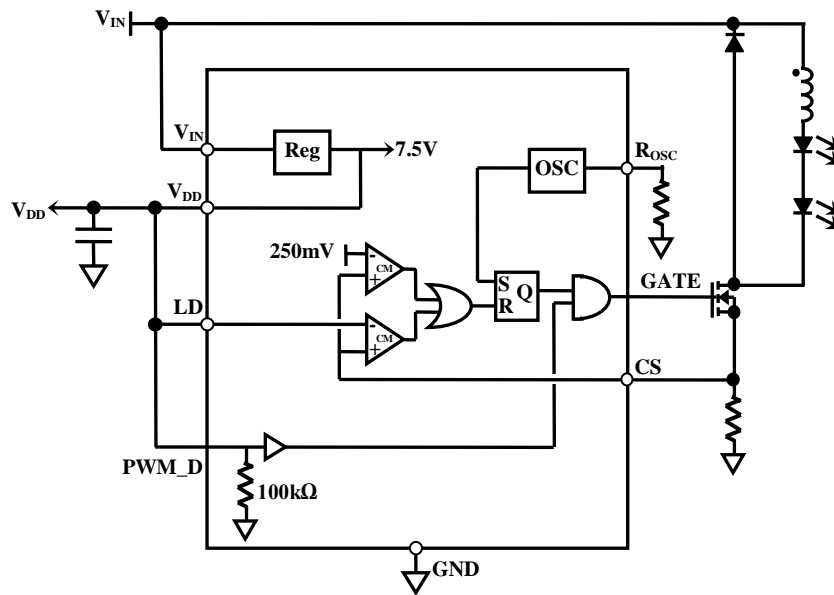
Name	SO-8 DIP-8	SO-16	Pad	Description
V _{IN}	1	1	1	Input voltage 8V to 450V DC
CS	2	4	2	Senses LED string current
GND	3	5	3,4	Device ground
GATE	4	8	5	Drives the gate of the external MOSFET
PWM_D	5	9	6	Low Frequency PWM Dimming pin, also Enable input. Internal 100kΩ pull-down to GND
V _{DD}	6	12	7,8	Internally regulated supply voltage. 7.5V nominal. Can supply up to 1mA for external circuitry. A sufficient storage capacitor is used to provide storage when the rectified AC input is near the zero crossings.
LD	7	13	9	Linear Dimming by changing the current limit threshold at current sense comparator
Rosc	8	14	10	Oscillator control. A resistor connected between this pin and ground sets the PWM frequency.

No Connects (NC) are not internally connected and may be used for pass-thru PCB traces





Block Diagram & Typical Application



Photo

