



# MAP9000

## High Voltage AC LED Driver

MAP9000 – High Voltage AC LED Driver

### General Description

The MAP9000 is LED Driver which has high input voltage ranged from 90V to 270V. It can drive several series LEDs from rectified AC voltage.

The MAP9000 can achieve min 90% efficiency, 0.95 or higher power factor and low total harmonic distortion less than 20%.

The MAP9000 has higher LED current drive capability up to 240mA and the current can be adjustable with external resistors.

The MAP9000 is available in 6X6mm QFN 12Leads with Halogen-free (fully RoHS compliant).

For more information, please contact local MagnaChip sales office in world-wide or visit MagnaChip's website.

### Features

- Triac dimming (110Vac/120Vac only)
- Flicker-free
- EMI improvement
- Power variation:  $\pm 15\%$
- Constant output power control
- Higher power factor :  $> 0.95$
- Lower total harmonic distortion :  $< 20\%$
- Higher current drive capability  
Up to 240mA
- 6X6mm QFN 12Leads

### Applications

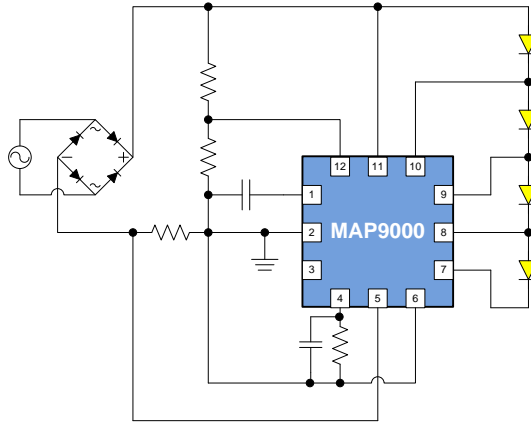
- AC LED Driver
- Lighting equipment
- LED Driver Power Supplies

### Ordering Information

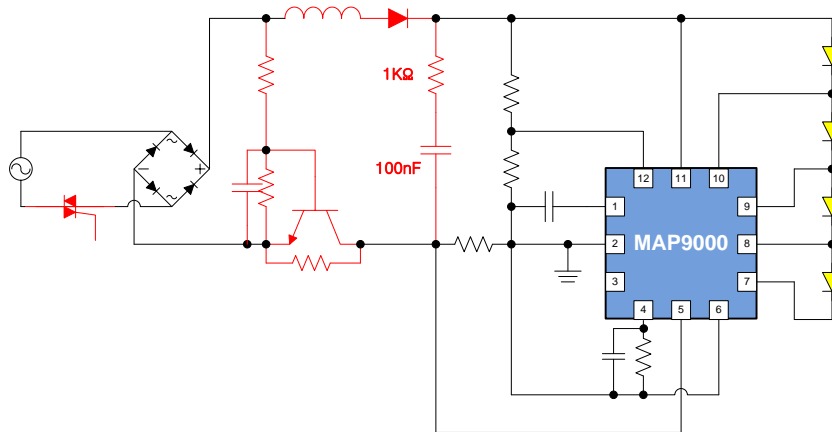
Part Number	Top Marking	Ambient Temperature Range	Package	RoHS Status
MAP9000QNRH	MAP9000	-30°C to +85°C	6X6mm QFN 12Leads	Halogen Free

### Simplified Application Circuit

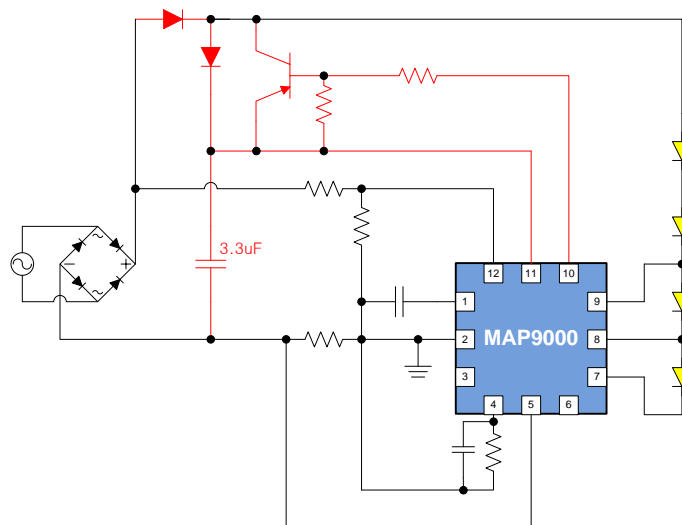
- AC Direct



- Triac Dimming (110Vac/120Vac only)

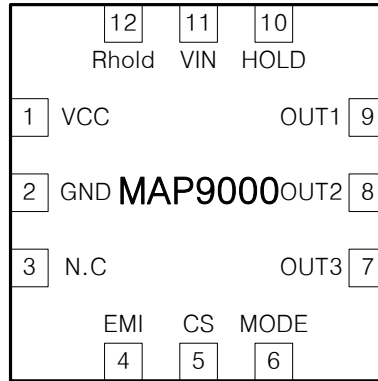


- Flicker-free



## Pin Configuration & Description

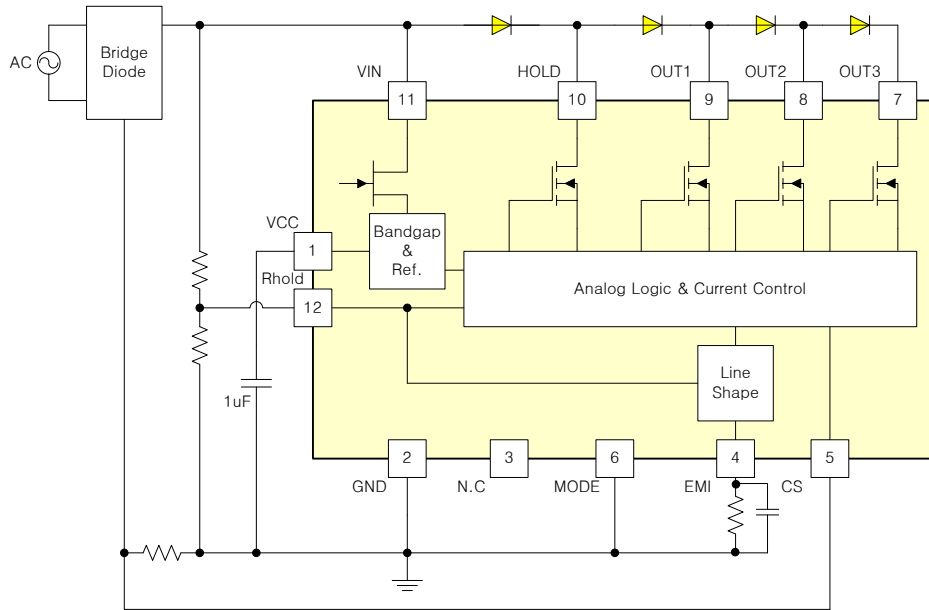
### - Pin Configuration



### - Pin Description

Pin		Descriptions
1	VCC	VCC
2	GND	Ground
3	N.C	No Connection
4	EMI	EMI improvement
5	CS	Current sensing
6	MODE	Flicker-free mode
7	OUT3	Output – 3
8	OUT2	Output – 2
9	OUT1	Output – 1
10	HOLD	Holding-up current
11	VIN	VCC charging
12	Rhold	HOLD turn-on voltage

### Functional Block Diagram



### Absolute Maximum Ratings

PARAMETER		VALUE	UNIT
VIN		700	V
HOLD, OUT1, OUT2, OUT3		-0.3 ~ 700	V
EMI		-0.3 ~ 6	V
VCC, Rhold, MODE		20	V
Operating Temperature Range		-40 ~ 125	°C
Junction Temperature Range		-40 ~ 150	°C
Storage Temperature Range		-65 ~ 150	°C
Lead Temperature(soldering, 10sec )		260	°C
ESD Susceptibility	HBM All Pins (Note 1)	±2000	V
	MM All Pins (Note 2)	±200	V
	CDM All Pins (Note 3)	±1000	V

**Note 1:** ESD tested per JESD22A-114.

**Note 2:** ESD tested per JESD22A-115.

**Note 3:** ESD tested per JESD22C-101E

### Thermal Resistance

PARAMETER		VALUE	UNIT
Thermal Resistance ( $\theta_{JA}$ ) , (Note4)	6X6mm QFN 12Leads	63	°C/W
Thermal Resistance ( $\theta_{JT}$ ) , (Note5)		8.7	°C/W

**Note 4:** Multi-layer PCB based on JEDEC standard (JESD51-7)

**Note 5:** The Metal PCB' diameter is 70mm and height is 1.6t.

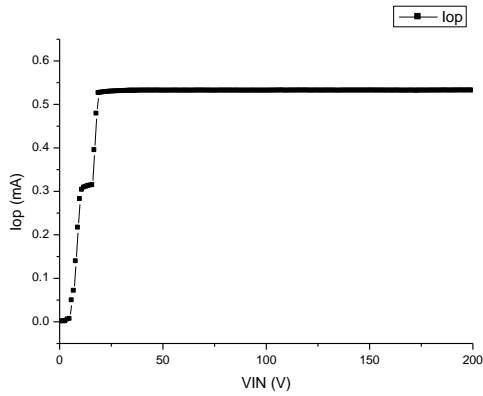
## Electrical Characteristics

Ta = 25°C, CS Resistance = 6.8Ω unless otherwise specified

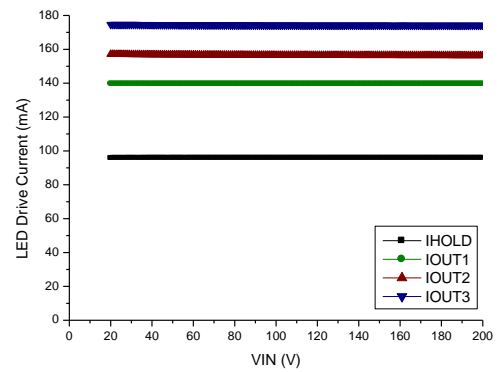
SYMBOL	PARAMETER	TEST CONDITION	MIN	TYP	MAX	UNIT
<b>Supply</b>						
V <sub>VIN</sub>	Input voltage range	Note 6	50		700	V
V <sub>VCC</sub>	Operating voltage		-	15	-	V
I <sub>VCC</sub>	Input current		300	600	900	uA
V <sub>UVLO</sub>	Under voltage lockout	UVLO_H	-	12	-	V
		UVLO_L	-	10	-	V
<b>Driver Section</b>						
R <sub>hold</sub>	Rhold reference voltage	V <sub>VIN</sub> = 200V, V <sub>GND</sub> = 0V		5.2		V
I <sub>D Leak</sub>	Driver Leakage current	V <sub>VIN</sub> = 200V, V <sub>GND</sub> = 0V, HOLD & OUT1 ~ 3 = 400V	-	-	10	uA
I <sub>HOLD</sub>	HOLD current	V <sub>VIN</sub> = 200V, HOLD = 40V MODE = 0V, R <sub>hold</sub> = 0V	78.3	86.3	94.2	mA
I <sub>OUT1</sub>	Driver 1 current	V <sub>VIN</sub> = 200V, OUT1 = 40V R <sub>hold</sub> = 0V	119.3	128.0	136.7	mA
I <sub>OUT2</sub>	Driver 2 current	V <sub>VIN</sub> = 200V, OUT2 = 40V R <sub>hold</sub> = 0V	146.0	155.2	164.3	mA
I <sub>OUT3</sub>	Driver 3 current	V <sub>VIN</sub> = 200V, OUT3 = 40V R <sub>hold</sub> = 0V	178.7	186.2	193.6	mA
I <sub>OUT_SUM</sub>	-	I <sub>HOLD</sub> + I <sub>OUT1</sub> + I <sub>OUT2</sub> + I <sub>OUT3</sub>	531.0	556.0	581.0	mA

**Note 6:** Stress beyond the maximum ratings listed above may incur permanent damage to the device. Operating above the recommended conditions for extended time may stress the device and affect device reliability. Also the device may not operate normally above the recommended operating conditions. These are stress ratings only.

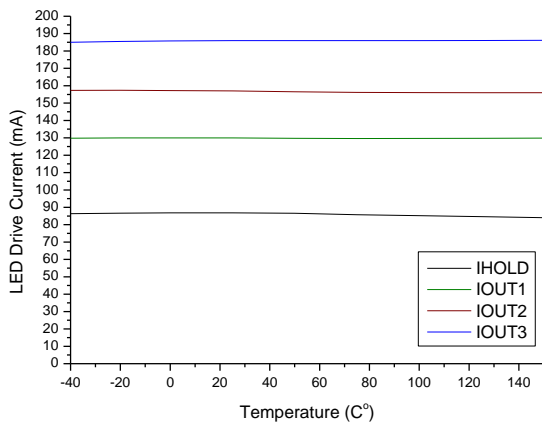
### Typical Operating Characteristics



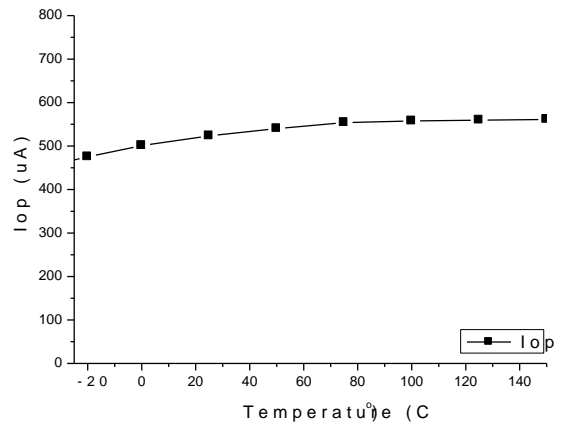
Operate Current Vs. Input Voltage



LED Drive current Vs. Input Voltage



LED Drive current Vs. temperature

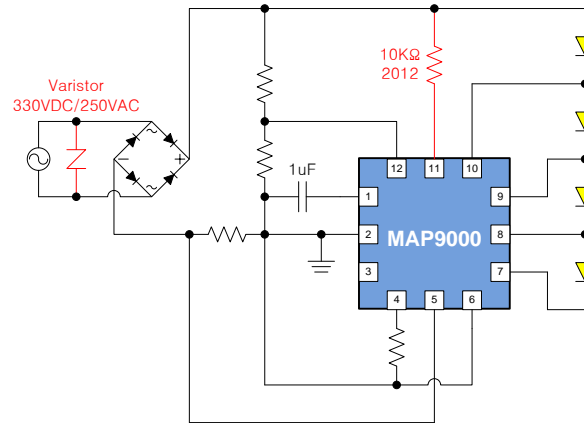


Operate Current Vs. temperature

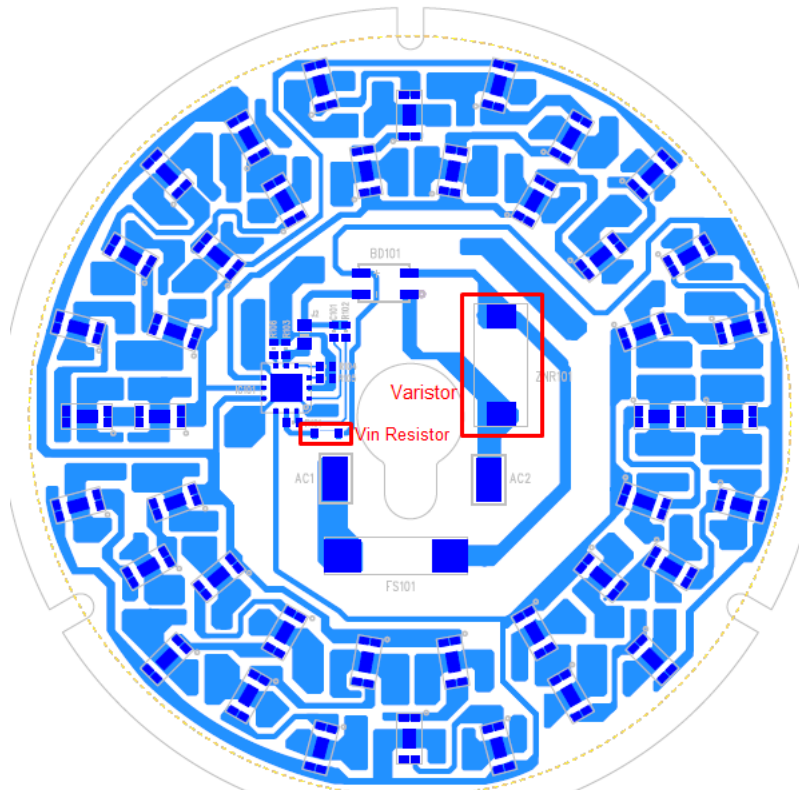
## Recommended Surge Protection Circuit

### 1. Circuit Diagram

The surge test using our demo-board and pass 0.5KV surge voltage at input wattage 16W



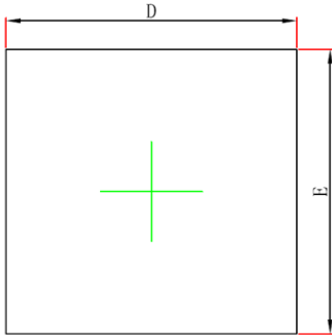
### 2. Demo-board layout



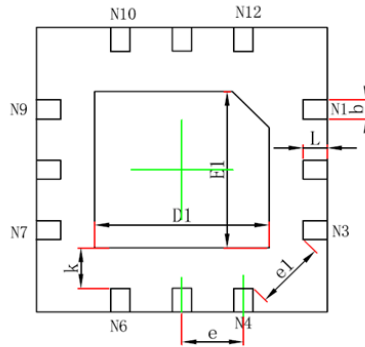


## Physical Dimensions

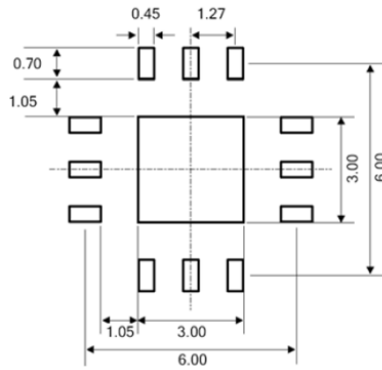
### 1) QFN 6x6 12LD



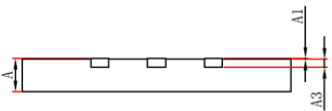
TOP VIEW



BOTTOM VIEW



LAND PATTERN RECOMMENDATION



SIDE VIEW

Symbol	Dimension [mm]	
	min	max
A	0.70	0.90
A1	0.00	0.05
A3	0.203REF.	
D	5.90	6.10
E	5.90	6.10
D1	3.50	3.70
E1	3.20	3.40
k	0.20MIN.	
b	0.35	0.45
e	1.27TYP	
e1	1.45TYP	
L	0.42	0.58

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