



AW1001

Up to 6MHz High Power Constant Current LED Driver with High Power Supply Ripple Rejection

Description

The AW1001 is a high power constant current LED driver IC with high power supply ripple rejection. It can operate up to 6MHz. It operates at high efficiency from 4V to 18V, and the output driving current up to 1A. The AW1001 features 5V/10mA on-chip regulator to power external circuit. The device requires only 5 external components while delivering an LED current with $\pm 5\%$ accuracy.

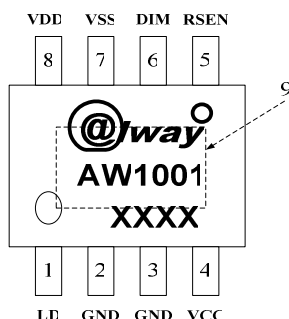
Applications

- High Power LED Driver
- Architectural, Industrial, and Ambient Lighting
- Lighting such as MR16, AR111 or other LED Lighting

Feature

- High power supply ripple rejection
- Only 5 external components required
- High-Side Current Sense
- Dedicated Dimming Control Input
- 20kHz Maximum Dimming Frequency
- Up to 6MHz Switching Frequency
- 5V, 10mA On-Chip Regulator to Power External Circuit
- ESD Protection HBM 3KV
- $\pm 5\%$ LED Current Accuracy
- Adjustable Constant LED Current
- High Efficiency
- 4V~18V Wide Operation Voltage Range
- Output Driving Current Up to 1A
- SOP8 with Thermal Pad Power Package
- -25°C to $+125^{\circ}\text{C}$ Operating Temperature Range

Pin Configuration



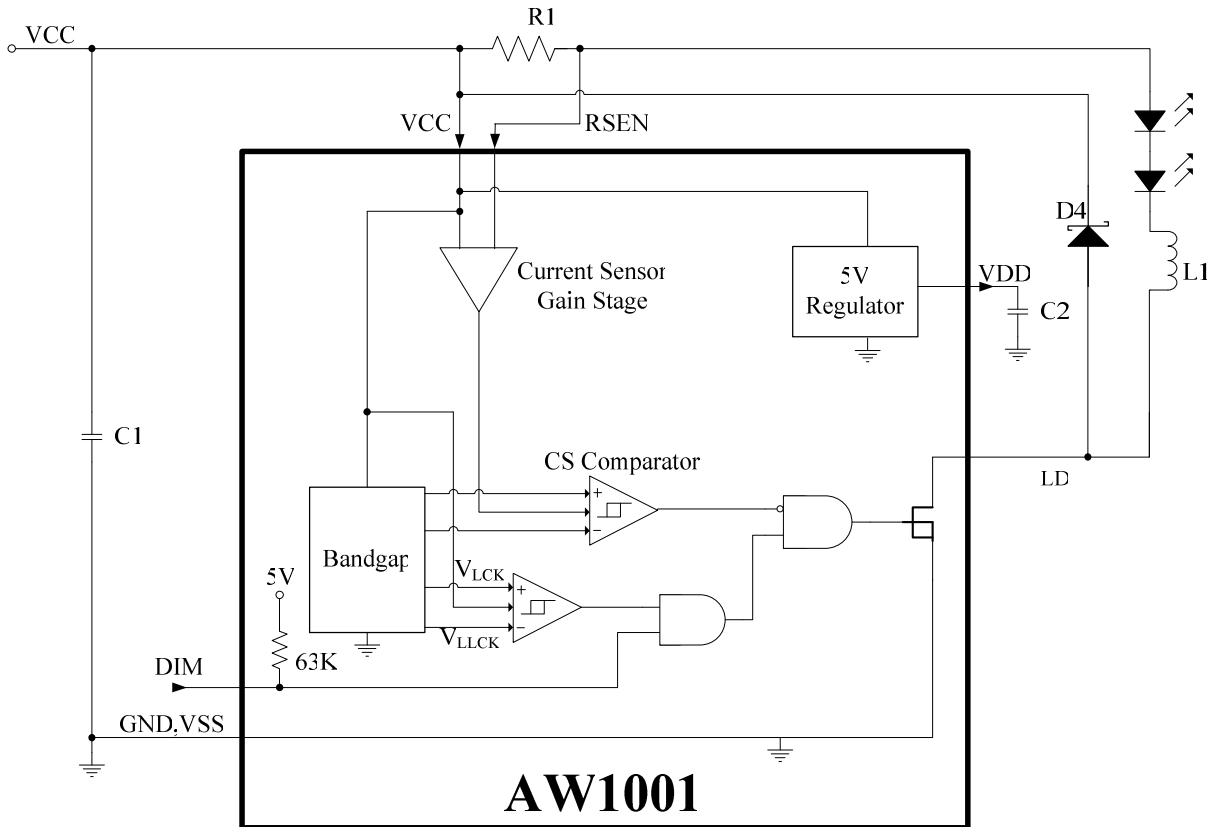
Pin	Name	Function
1	LD	Driver Output
2	GND	Ground
3	GND	Ground
4	VCC	Supply Voltage Input
5	RSEN	Current-Sense Input
6	DIM	Logic-Level Dimming input
7	VSS	Ground
8	VDD	5 Voltage Regulator Output
9	GND	Thermal PAD with Ground



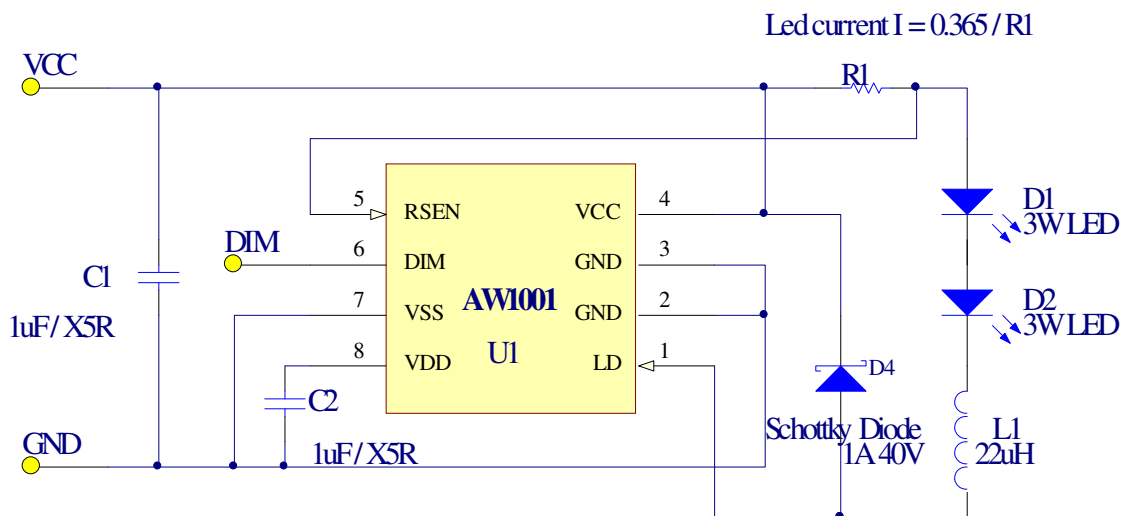
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Block Diagram



Typical Application Circuit





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Absolute Maximum Ratings

RSEN, LD to GND	-0.3V~+24V	Operation temperature range.....	-40°C~+125 °C
VDD, DIM to VSS & GND.....	-0.3V~+7V	Junction temperature.....	+150 °C
RSEN to VCC.....	-18V~+18V	Storage temperature range.....	-65 °C~+150 °C
Pin to Pin ESD rating (HBM).....	3KV	Lead temperature (Soldering, 10s).....	+300 °C
VDD, DIM , VCC, RSEN to GND & VSS maximum current.....	20mA		

Electrical Characteristics

(VCC=12V, V_{DIM}=VCC, C1=1uF, R1=0.51)

PARAMETER	SYM	CONDITIONS	MIN	TYP	MAX	UNITS
Power supply voltage	V _{VCC}		4	12	18	V
Maximum regulator current switching frequency	f _{SW}		0.4	3.33	6	MHz
Ground current	I _{GND}	LD open	2.5	3.5	5	mA
Supply current	I _{VCC}	LD open, RSEN=VCC-0.4	2.5	3.5	5	mA
Under voltage lockout	V _{LCK}		3.9	4	4.1	V
Above voltage leave-lockout	V _{LLCK}		3.3	3.4	3.5	V
Sense voltage threshold high	V _{RSENH}		VCC-310			mV
Sense voltage threshold low	V _{RSENL}		VCC-410			mV
Propagation delay to output switch on	t _{DPSON}		25			ns
Propagation delay to output switch off	t _{DPSOFF}		20			ns
Current-sense input current	I _{RSEN}				1	uA
Current-sense threshold hysteresis	I _{SHYS}		50		70	mV
Maximum dimming frequency	f _{DIM}		10		20	KHz
DIM input voltage high	V _{DIMH}		VDD-VDDx0.25			V
DIM input voltage low	V _{DIML}		VDDx0.25			V
DIM turn on switch delay	t _{DIMSON}		25			ns
DIM turn off switch delay	t _{DIMSOFF}		25			ns



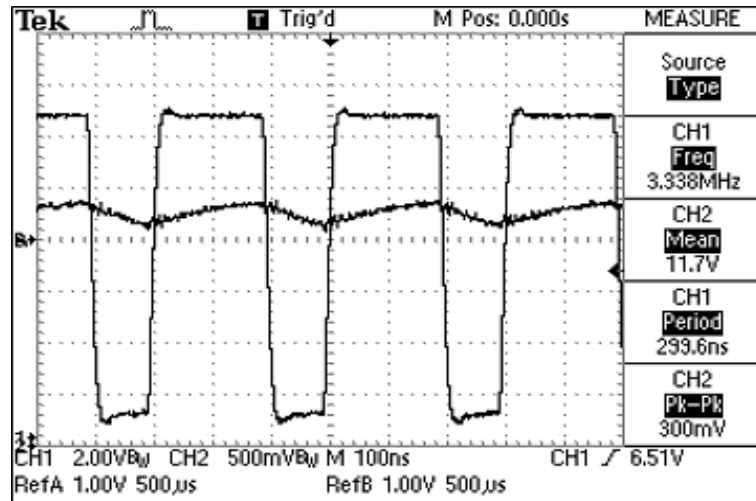
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DIM pin to VDD leakage	I_{DIMVDD}	Internal pull high		10	μA	
DIM pin to VSS leakage	I_{DIMVSS}			1	μA	
Internal 5V regulator voltage	V_{VDD}		4.75	5	5.25	V
Internal 5V regulator output current	I_{VDD}		7.5	10	12.5	mA
Internal 5V regulator start-up time	t_{REGSP}			50	1000	μs

Typical Operation Waveforms

L1=6.8 μH driving 3W LEDs (Current= 700mA) at 27°C.



CH1: LD pin waveform, CH2: RSEN pin waveform

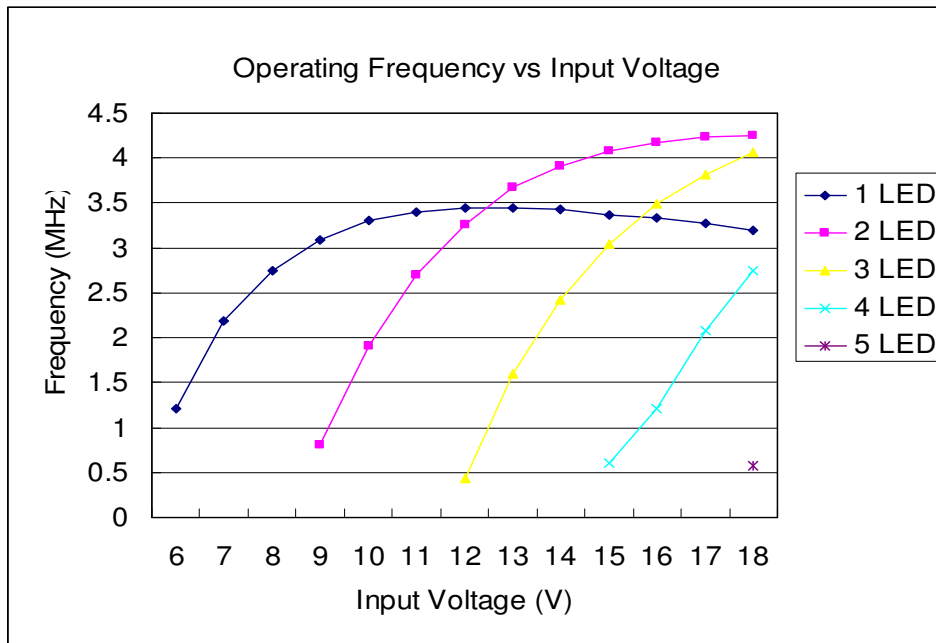
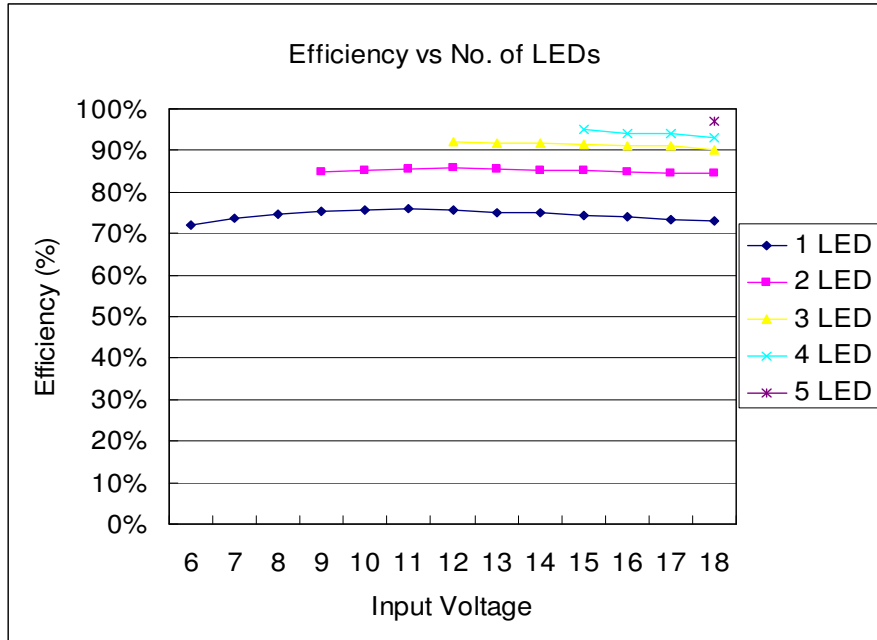
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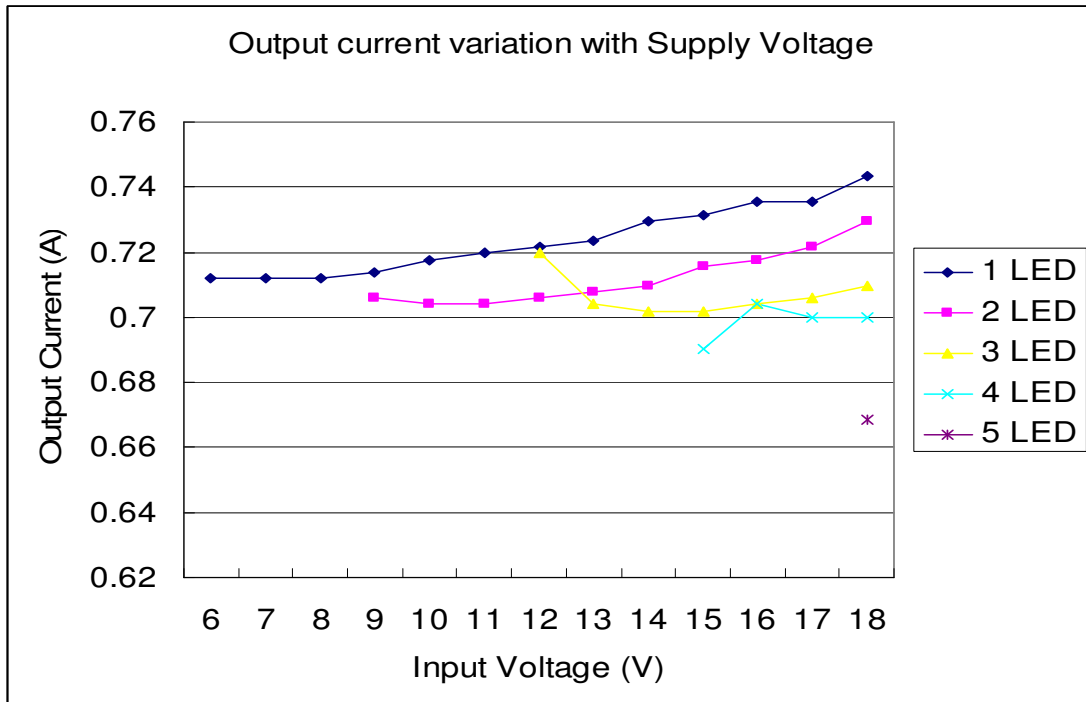
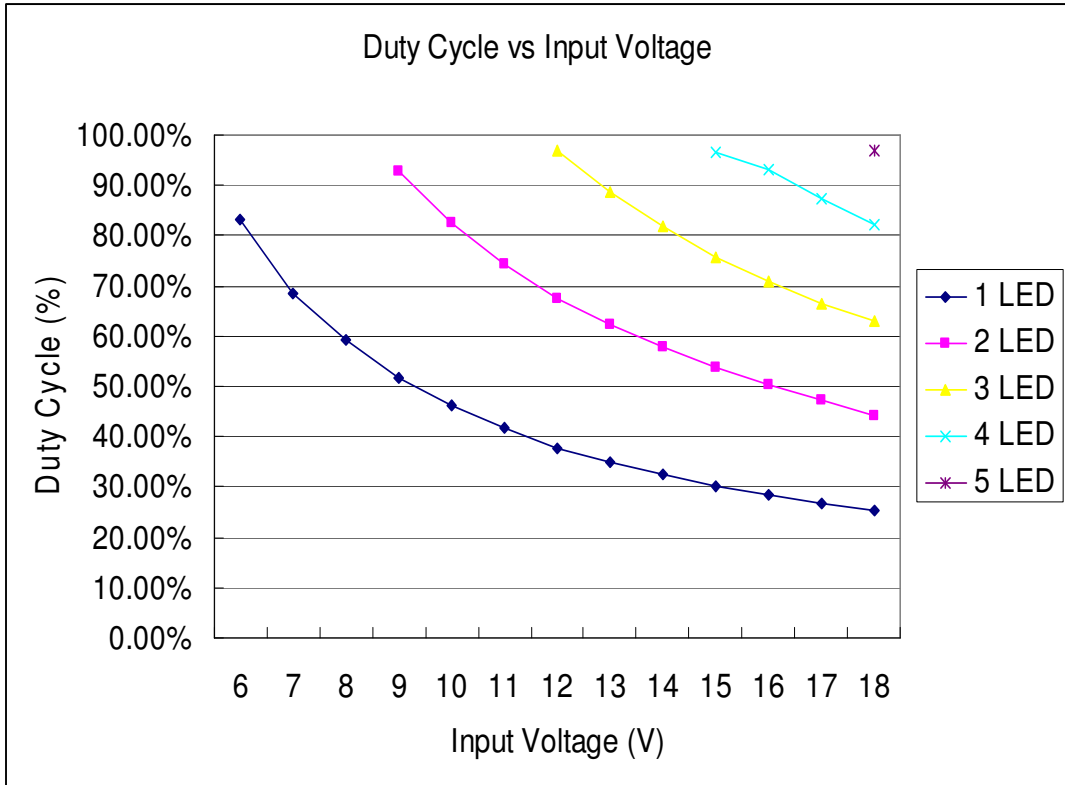
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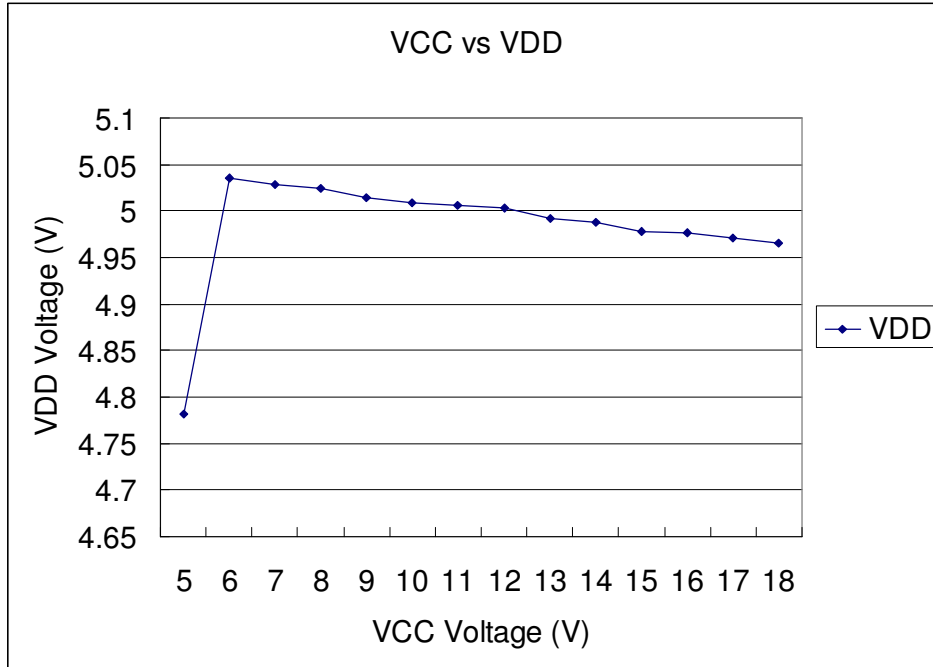
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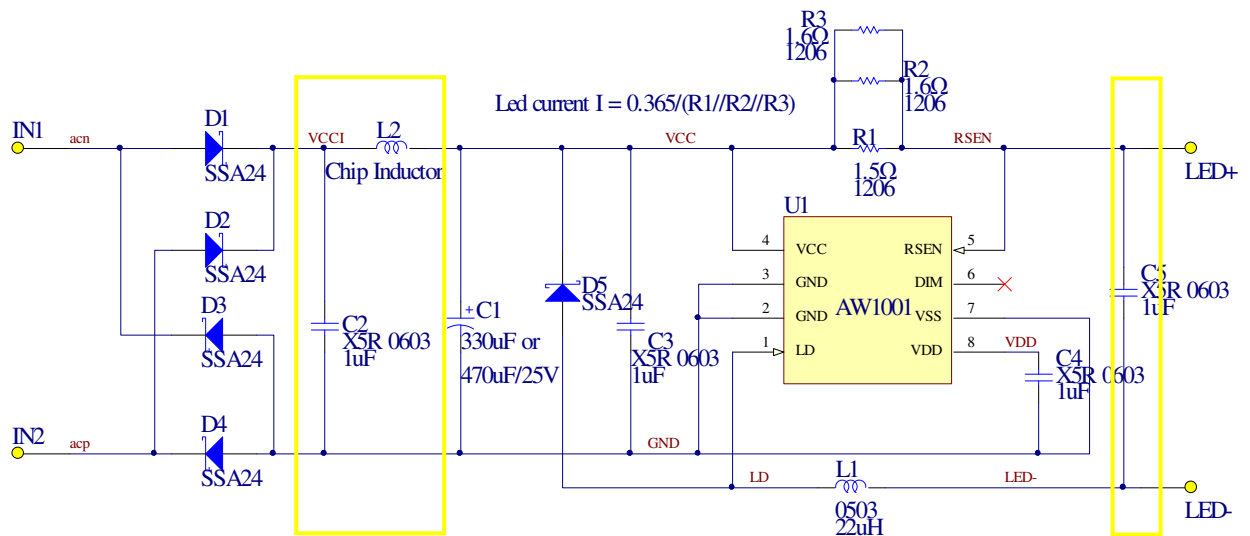


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MR16 LED Reference Design





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Part Reference	Value	Description	Source
U1		AW1001 High Power LED Driver IC	AlwayTek 永利科技
D1, D2, D3, D4, D5	If=2A, Vr=40V	SSA24(SMA) Schottky Diode	Vishay
C1	330uF or 470uF/25V	Aluminum Electrolytic Capacitor	Nippon Chemicon KZH Series
C2, C3, C4, C5	1uF/25V	SMD 0603 X5R	Panasonic
R1, R2, R3	1.5Ω, 1.6Ω, 1.6Ω	Resistor, 1%, 1206	YAGEO
L1	22uH	SMD 0503 or 0705 Power Inductor	CHILISIN Electronics Corp.
L2	1.2uH, 1A, Rdc<0.1Ω	Chip Inductor	

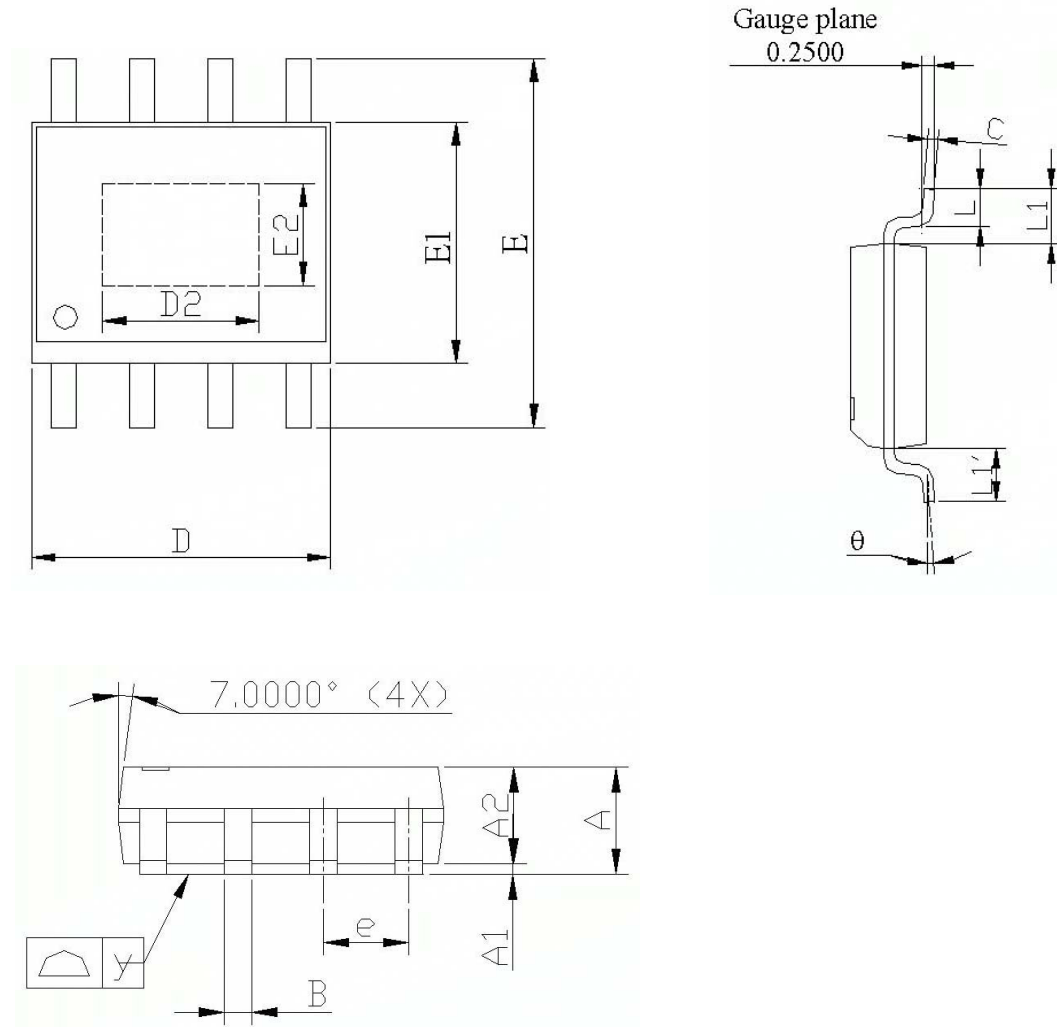
Parts List for the 5W MR16 LED Lamp Driver Circuit



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SOP8(Exposed Pad) Package Outline



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.40	1.50	1.60	0.055	0.059	0.063
A1	0.00	---	0.10	0.000	---	0.004
A2	---	1.45	---	---	0.057	---
B	0.33	---	0.51	0.013	---	0.020
C	0.19	---	0.25	0.007	---	0.010
D	4.80	---	5.00	0.189	---	0.197
D2	3.20	3.30	3.40	0.126	0.130	0.134



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E	5.80	6.00	6.20	0.228	0.236	0.244
E1	3.80	3.90	4.00	0.150	0.153	0.157
E2	2.30	2.40	2.50	0.091	0.095	0.099
e	---	1.27	---	---	0.050	---
L	0.40	---	1.27	0.016	---	0.050
y	---	---	0.10	---	---	0.004
Θ	0°	---	8°	0°	---	8°
L1-L1'	---	----	0.12	---	---	0.005
L1	1.04REF			0.041REF		

IR Reflow Profiles:

Standard(JEDEC J-STD-020)	Pb-Free Assembly
Average Ramp-Up Rate($T_{s_{max}}$ to T_p)	3°C/second max
Preheat	
-Temperature Min($T_{s_{min}}$)	150°C
-Temperature Max($T_{s_{max}}$)	200°C
-Time($t_{s_{min}}$ to $t_{s_{max}}$)	60-120 seconds
Time maintained above	
-Temperature(T_L)	217°C
-Time(t_L)	60-150 seconds
Peak Temperature(T_p)	260°C±2°C
Time within 5°C of actual Peak Temperature(t_p)	More than 30 seconds
Ramp-Down Rate	6°C/second max
Time 25°C to Peak Temperature	8 minutes max



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