

## ◆ Description

The SN8500D is a high power PWM LED driver IC using a buck converter topology that is capable of driving up to 1.5A of output current. it operates from an input voltage range of 3Vdc to 40Vdc and generates a regulated programmable constant output current for high power LEDs. external resistor controlled the maximum output current to single LED or a LED string.

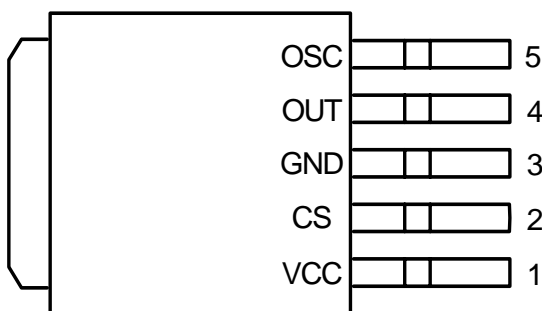
## ◆ Features

- Operation from 3.0V to 40V input.
- Low Standby Current
- High efficiency
- Output Switch Current to 1.5A
- Halogen-Free Package is Available

## ◆ Application

- Automotive and Marine Lighting
- High Power LED Driver
- Constant Current Source

## ◆ Pin Assignment & Description (Top View)



Package : TO-252-5L

Pin	Symbol	Description
1	VCC	Input Voltage
2	CS	Peak Current Sense Pin
3	GND	Ground
4	OUT	Output Pin
5	OSC	Oscillator Timing pin

## ◆ Ordering Information

Package Type	Device Name	Marking
TO-252-5L	SN8500D	SN8500---(1) YYWW---(2)

(1) Device Code, (2) Year & Week Code

## ◆ Absolute maximum ratings

[Ta=25°C]

Characteristic	Symbol	Rating	Unit
Power Supply Voltage	V <sub>CC(MAX)</sub>	40	V
Output Current	I <sub>OUT(MAX)</sub>	1.5	A
Thermal Resistance Junction-Ambient	R <sub>th(j-a)</sub> *	96.1	°C/W
Power Dissipation	P <sub>D</sub> *	1.3	W
Operating Temperature Range	T <sub>opr</sub>	-40 ~ +85	°C
Storage Temperature Range	T <sub>stg</sub>	-55 ~ +150	°C

\* Mounted on a glass epoxy circuit board of 30x30mm Pad dimension of 50mm<sup>2</sup>

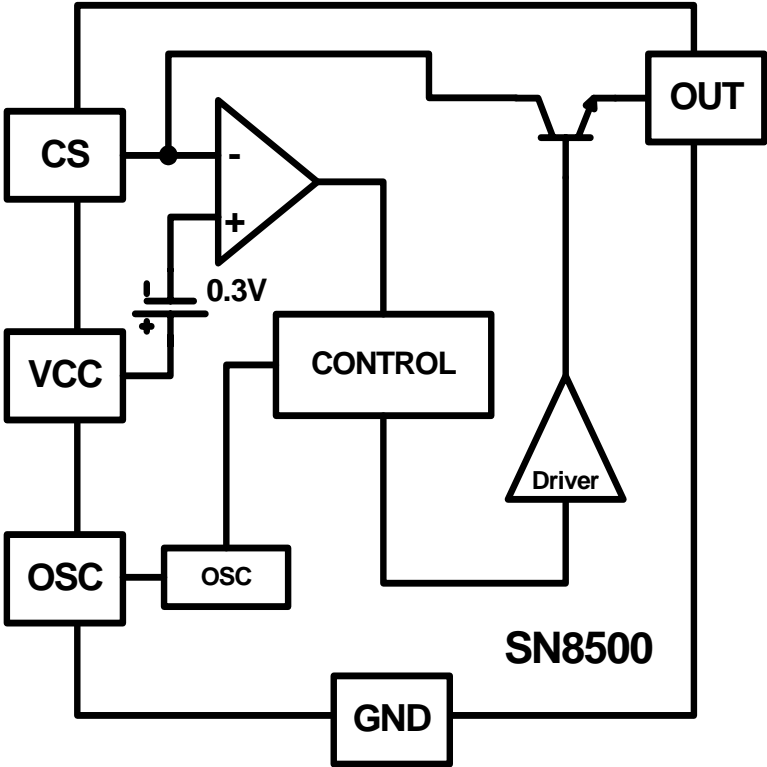
## ◆ Recommended operating conditions

Characteristic	Symbol	Rating		Unit
		Min	Max	
Power Supply Voltage	V <sub>CC</sub>	7	40	V
Output Current	I <sub>OUT</sub>	-	1.5	A
Dimming Frequency	F <sub>DIM</sub>	-	10	kHz

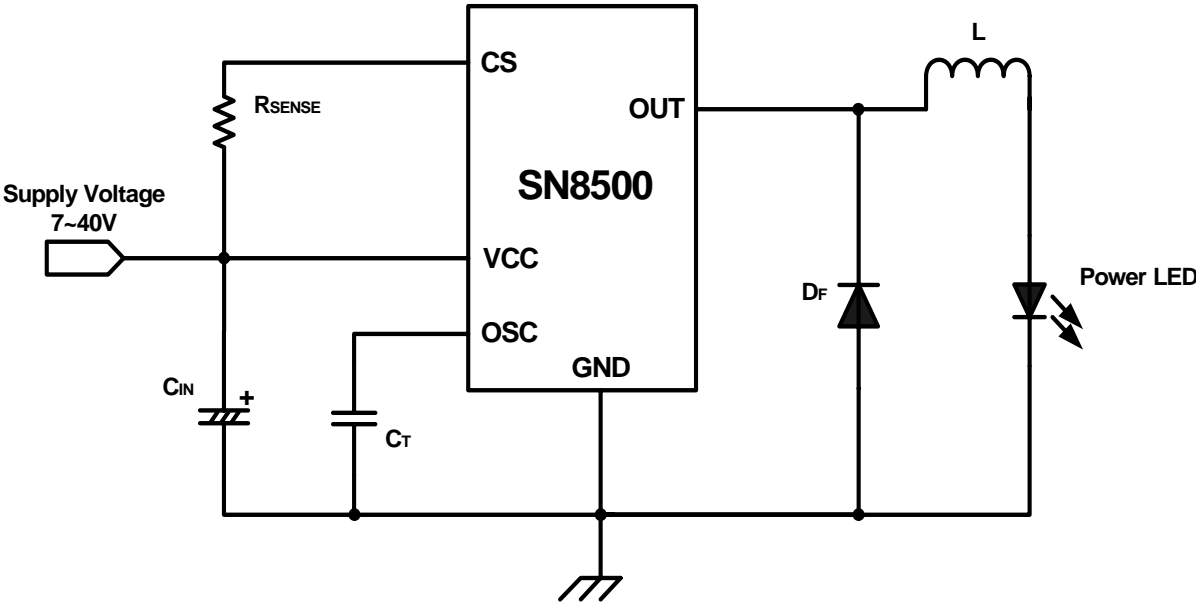
## ◆ Electrical Characteristics (Ta=25°C, unless otherwise noted.)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Current 1	I <sub>CC1</sub>	V <sub>CC</sub> =4V, Out=open	-	2.0	4.0	mA
Supply Current 2	I <sub>CC2</sub>	V <sub>CC</sub> =40V, Out=open	-	2.0	4.0	mA
Dropout Voltage	V <sub>drop</sub>	V <sub>CC</sub> =10V, I <sub>out</sub> =1A	-	1	1.3	V
Current Sense Voltage	V <sub>CS</sub>	V <sub>CC</sub> =10V, R <sub>out</sub> =820kΩ	270	300	330	mV
Maximum duty cycle	T <sub>DC</sub>	-	-	85	-	%
Current Sense Off Current	I <sub>CS(OFF)</sub>	V <sub>CC</sub> =40V, V <sub>OSC</sub> =1.5V	-	200	1000	μA
OSC ON Voltage	V <sub>OSC(on)</sub>	V <sub>CC</sub> =4V~40V	-	-	0.5	V
OSC OFF Voltage	V <sub>OSC(off)</sub>	V <sub>CC</sub> =4V~40V	1.5	-	-	V
OSC Charge Current	I <sub>CH</sub>	V <sub>CC</sub> =5V, V <sub>OSC</sub> =0.5V	24	35	42	μA
OSC Discharge Current	I <sub>DCH</sub>	V <sub>CC</sub> =5V, V <sub>OSC</sub> =1.5V	140	180	260	μA

◆ Functional block diagram



◆ Typical Application



## ◆ Application Information

### 1) Input Capacitor

The input capacitor ( $C_{IN}$ ) reduces the ripple of the input current drawn from the input supply and reduces noise injection into the IC. The reflected ripple voltage will be smaller when an input capacitor with larger capacitance is used. The capacitors should be placed close to the  $V_{CC}$  and GND.

### 2) Current-Sense Resistor

The sense resistor  $R_{sense}$  can be obtained as follows

$$R_{sense} = 300\text{mV} / (I_{AVG} + 0.5 \times I_{RIPPLE})$$

Thus target average LED current 700mA and ripple current 100mA then the result

$$R_{sense} = 300\text{mV} / (700\text{mA} + 0.5 \times 100\text{mA}) = 0.4\ \Omega$$

When selecting the sense resistor, low-inductance resistors, such as surface-mount metal film resistors, are preferred.

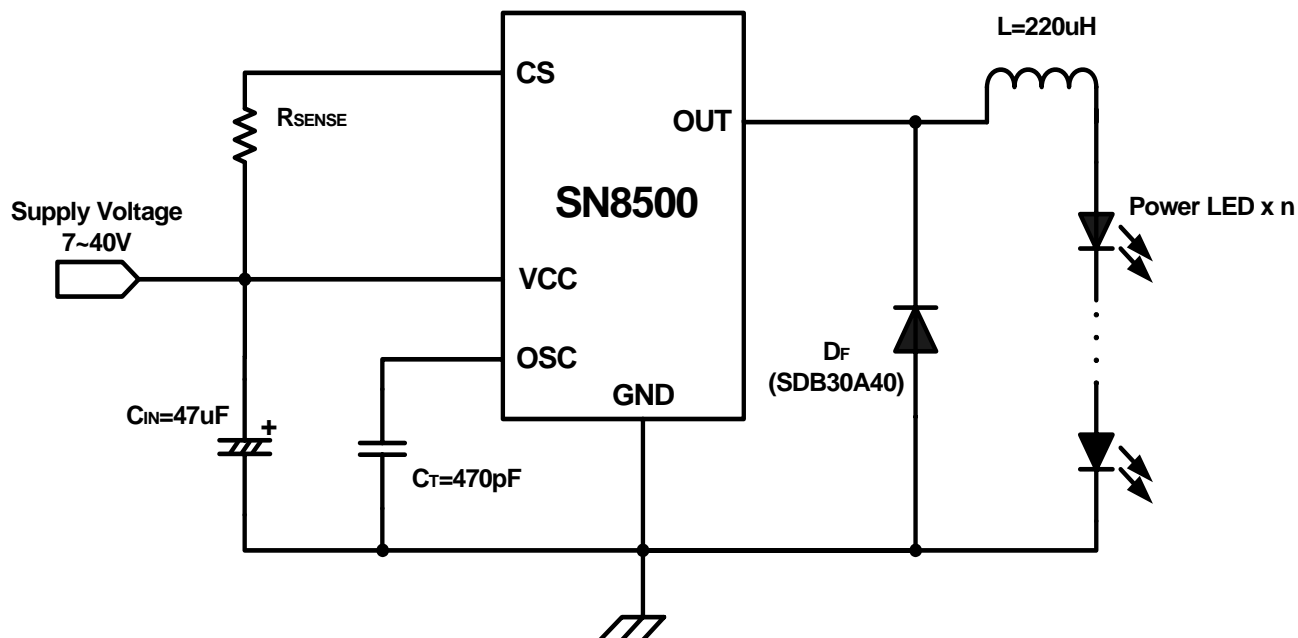
### 3) Output inductor

The value of the inductor is not fixed and can be adjusted freely in order to make tradeoffs among size, cost, and efficiency. Although lower inductor values will minimize size and cost, they will also reduce efficiency due to higher peak currents. On the other hand, higher inductor values will increase efficiency, but at some point the resistive losses due to the extra turns of wire will exceed the benefit gained from lower AC current levels. Also, high inductor values can affect the load-transient response of the converter.

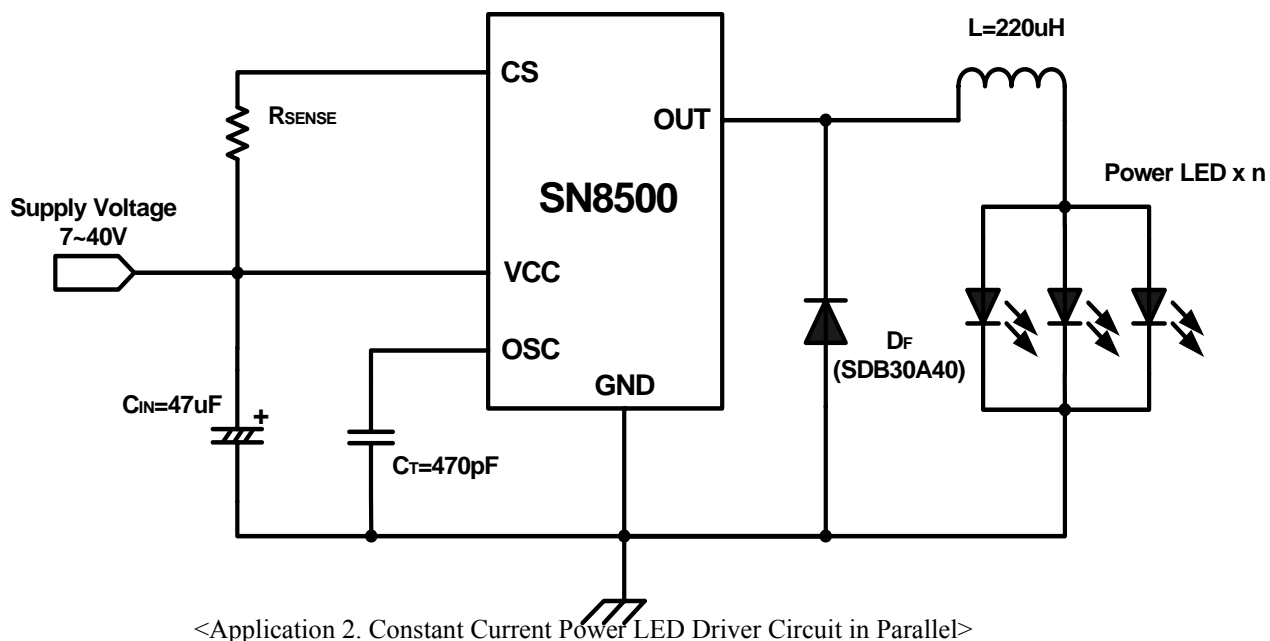
### 4) Freewheeling diode

The schottky barrier diode SDB30A40(40V, 3A) was recommended for freewheeling diode

## ◆ Application Guide

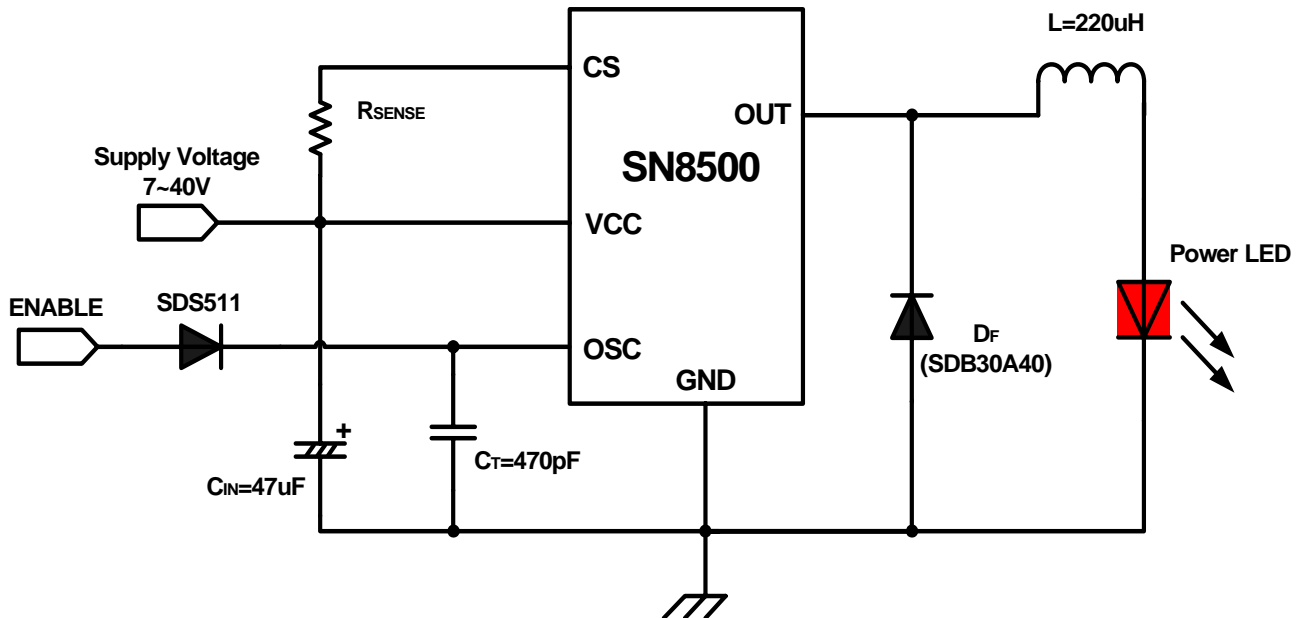


<Application 1. Constant Current Power LED Driver Circuit in Series>

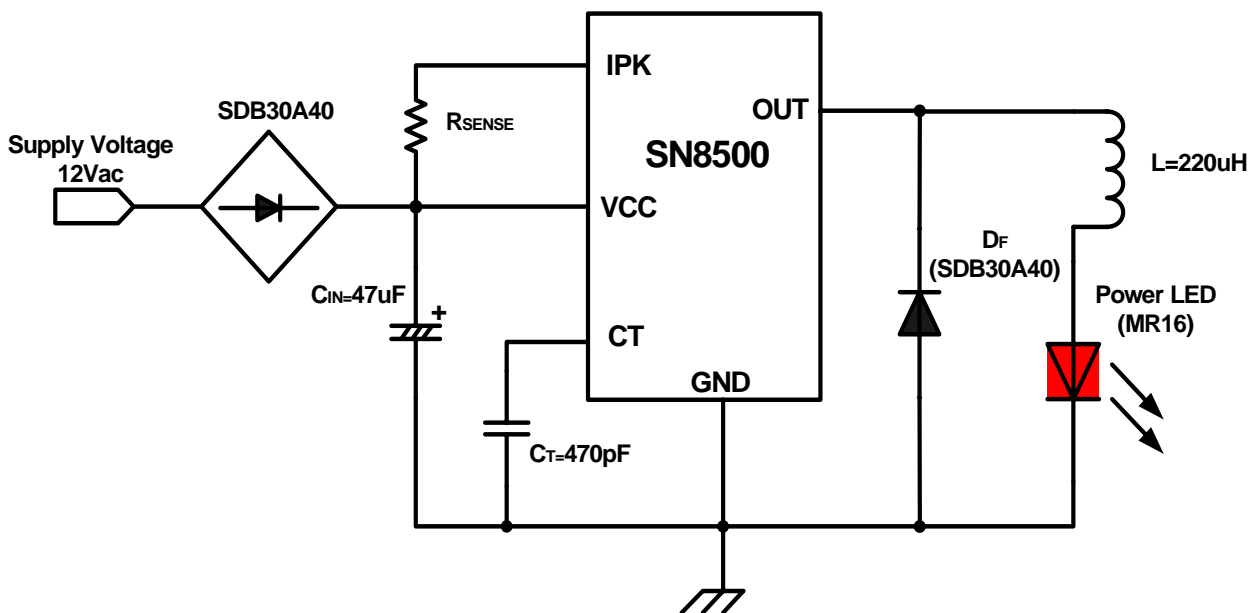


<Application 2. Constant Current Power LED Driver Circuit in Parallel>

◆ Application Guide



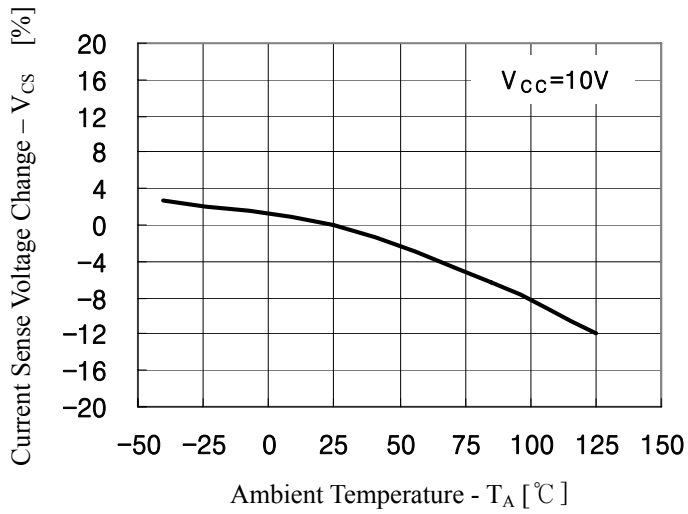
<Application 3. LED Driver Circuit with PWM Dimming Function >



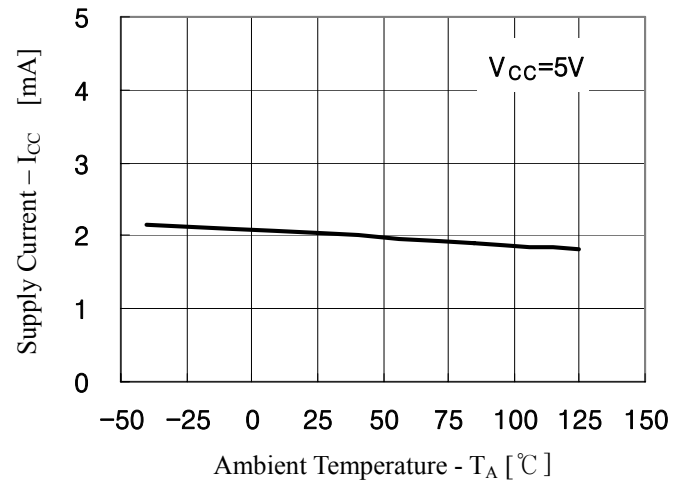
<Application 4. Constant Current LED Driver Circuit for MR16>

## ◆ Electrical Characteristic Curves

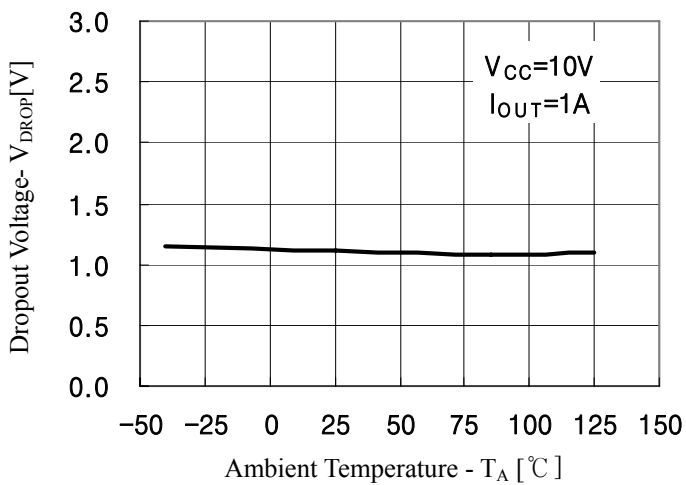
**Fig.1  $V_{CS}$  vs  $T_A$**



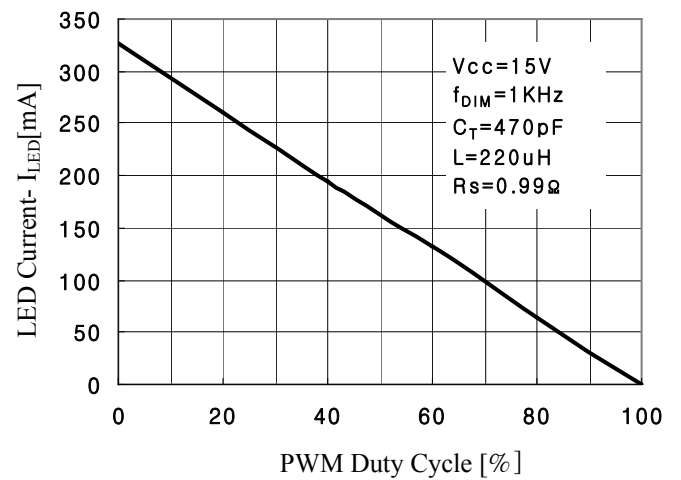
**Fig.2  $I_{CC}$  vs  $T_A$**



**Fig.3 Dropout Voltage vs  $T_A$**

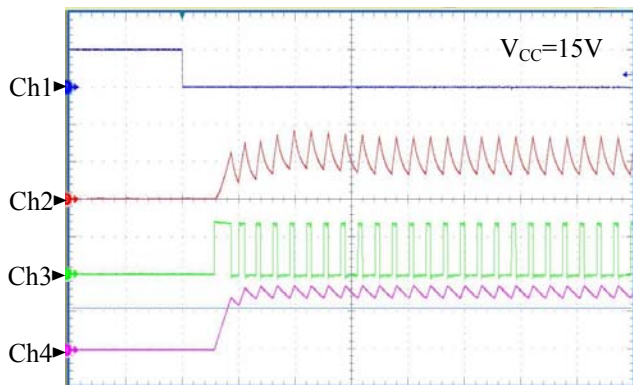


**Fig.4 LED Current vs PWM Duty**



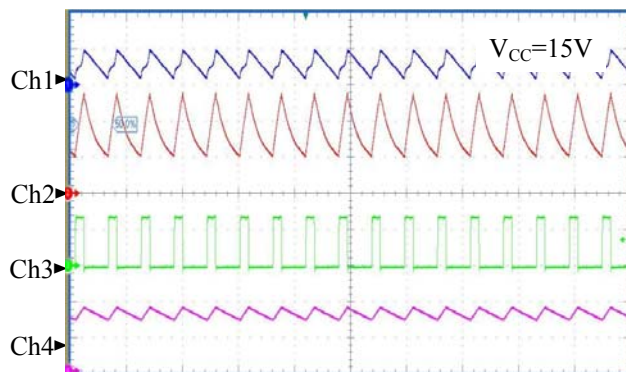
## ◆ Electrical Characteristic Curves

**Fig.5 Start-up Waveform**



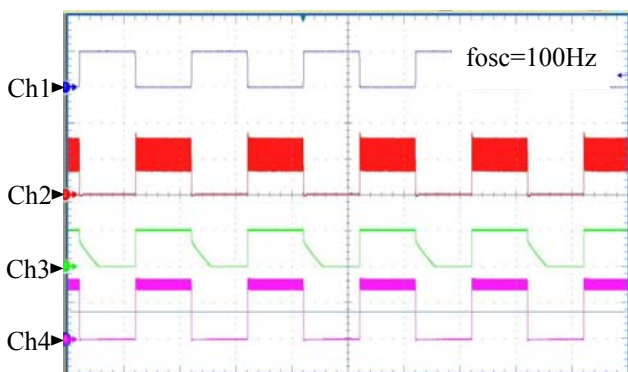
Ch1 : OSC, 2V/Div  
 Ch2 :  $I_{IN}$ , 80mA/Div  
 Ch3 :  $V_{OUT}$ , 10V/Div  
 Ch4 :  $I_{OUT}$ , 200mA/Div

**Fig.6 Normal Operating Waveform**



Ch1 : OSC, 2V/Div  
 Ch2 :  $I_{IN}$ , 50mA/Div  
 Ch3 :  $V_{OUT}$ , 10V/Div  
 Ch4 :  $I_{OUT}$ , 200mA/Div

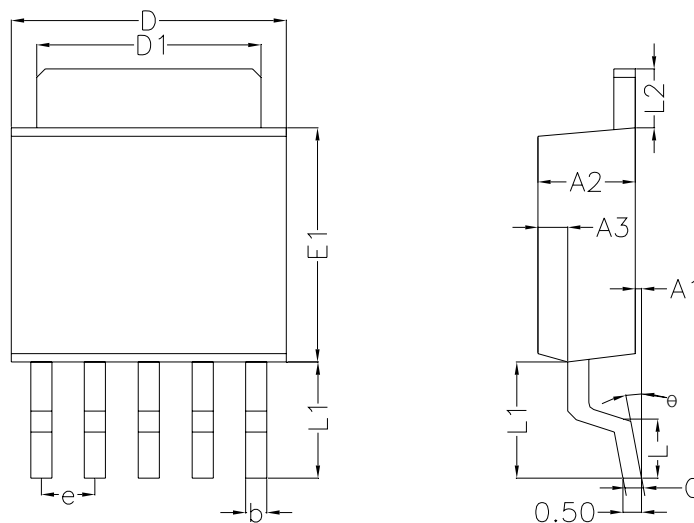
**Fig.7 Dimming Waveform**



Ch1 : OSC, 5V/Div  
 Ch2 :  $I_{IN}$ , 80mA/Div  
 Ch3 :  $V_{LED}$ , 3V/Div  
 Ch4 :  $I_{LED}$ , 200mA/Div

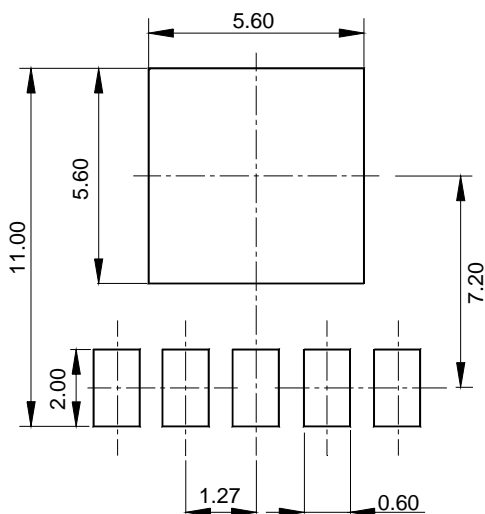


## ◆ TO-252-5L Outline Dimension (Unit : mm)



SYMBOL	MILLIMETER(mm)			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A1	0.05	0.15	0.25	
A2	2.10	2.30	2.50	
A3	0.50	0.60	0.70	
b	0.46	-	0.60	
C	0.49	-	0.56	
D	6.30	6.50	6.70	
D1	5.30REF			
E1	5.30	5.50	5.70	
e	1.27BSC			
L	1.40	1.50	1.60	
L1	3.00	3.10	3.20	
L2	1.40BSC			
θ	0 °	-	8 °	

### ※ Recommend PCB solder land [Unit: mm]



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