

## 1.5A POWER LED DRIVER

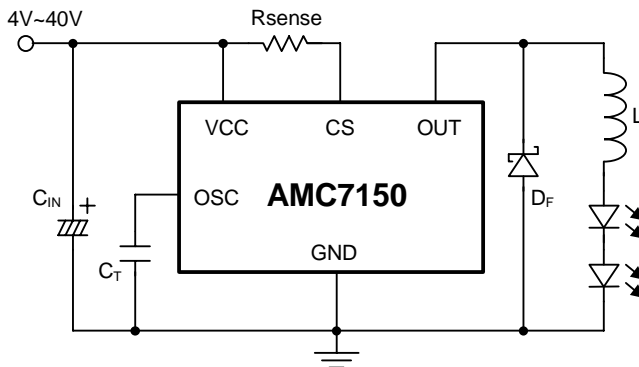
### DESCRIPTION

AMC7150 is a PWM power LED driver IC. The driving current from few milliamps up to 1.5A. It allows high brightness power LED operating at high efficiency from 4Vdc to 40Vdc. Up to 200KHz external controlled operation frequency. External resistor controlled the maximum output current to single LED or a LED string.

### FEATURES

- Only 5 external components required.
- Output driving peak current up to 1.5A.
- 4V ~ 40V wide operation voltage range.
- ESD protection HBM 2KV
- TO-252 5-pin power package.

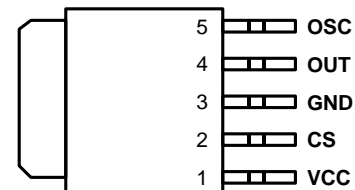
### TYPICAL APPLICATION



### APPLICATIONS

- DC/DC LED driver
- Automotive Lighting
- Decorative Lighting
- MR16

### PACKAGE PIN OUT



TO-252-5L (Top View)

### ORDER INFORMATION

Current Sense Voltage ( $V_{CC} - V_{CS}$ )	<b>DL</b>	TO-252 5-pin
300 ~ 360mV		AMC7150DLF
300 ~ 320mV		AMC7150ADLF
320 ~ 340mV		AMC7150BDLF
340 ~ 360mV		AMC7150CDLF

Note: 1. All surface-mount packages are available in Tape & Reel. Append the letter "T" to part number (i.e. AMC7150DLFT).  
 2. The letter "F" is marked for Lead Free process.

**POWER DISSIPATION TABLE**

Package	$\theta_{JA}$ ( $^{\circ}\text{C W}$ )	Derating factor (mW/ $^{\circ}\text{C}$ ) $T_A \geq 25^{\circ}\text{C}$	$T_A \leq 25^{\circ}\text{C}$ Power rating (mW)	$T_A = 70^{\circ}\text{C}$ Power rating (mW)	$T_A = 85^{\circ}\text{C}$ Power rating (mW)
DLF	80	12.5	1560	1000	812

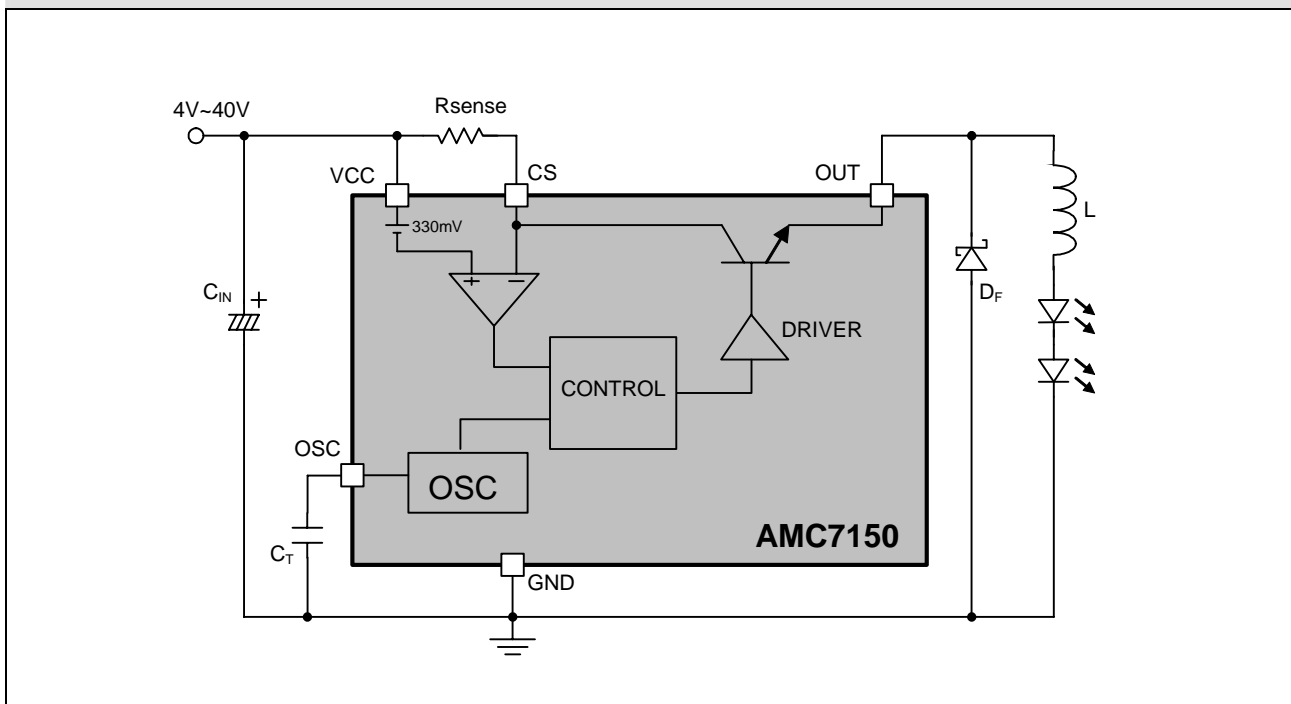
Note :

Junction Temperature Calculation:  $T_J = T_A + (P_D \times \theta_{JA})$ .

$P_D$ : Power Dissipation,  $T_A$ : Ambient temperature,  $\theta_{JA}$ : Thermal Resistance-Junction to Ambient

The  $\theta_{JA}$  numbers are guidelines for the thermal performance of the device/PC-board system.

All of the above assume no ambient airflow.

**BLOCK DIAGRAM**


**PIN DESCRIPTION**

Pin Number	Pin Name	Pin Function
1	VCC	Input Voltage 4V ~ 40V
2	CS	Peak current senses pin.
3	GND	Ground
4	OUT	Driver output pin.
5	OSC	Oscillator timing capacitor.

**ABSOLUTE MAXIMUM RATINGS**

Input Voltage, VCC	-0.3V to 40V
Output Voltage, OUT	-0.3V to 40V
Maximum Junction Temperature, T <sub>J</sub>	150°C
Storage Temperature Range	-40°C to 150°C
Lead Temperature (soldering, 10 seconds)	260°C

Note:

Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground.  
Currents are positive into, negative out of the specified terminal.

**RECOMMENDED OPERATING CONDITIONS**

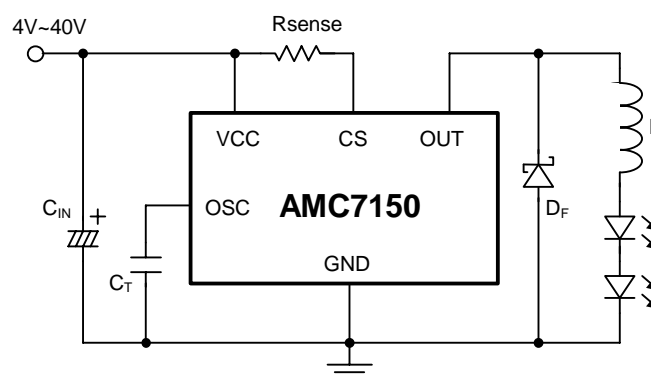
Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VCC	4		40	V
Output current	I <sub>OUT</sub>			1.5	A
Operating free-air temperature range	T <sub>a</sub>	-40		85	°C

**ELECTRICAL CHARACTERISTICS**

VCC=5V, T <sub>A</sub> =25°C. (Unless otherwise noted)							
Parameter	Symbol	Condition	Min	Typ	Max	Unit	Apply Pin
Supply Current	I <sub>CC</sub>	VCC=4~40V			4	mA	VCC
Output Drop-out Voltage	V <sub>DP</sub>	I <sub>OUT</sub> =1A, V <sub>CS</sub> -V <sub>OUT</sub>		1	1.31	V	OUT
Output Off Current	I <sub>OFF</sub>	V <sub>CS</sub> -V <sub>OUT</sub> = 40V		200	300	μA	
Current Sense Voltage	V <sub>CC</sub> -V <sub>CS</sub>	AMC7150	300	330	360	mV	CS
		AMC7150A	300	310	320	mV	
		AMC7150B	320	330	340	mV	
		AMC7150C	340	350	360	mV	
Maximum duty cycle	T <sub>DC</sub>	V <sub>CS</sub> =VCC		85		%	OSC
OSC Charge Current	I <sub>CH</sub>			35		uA	

**APPLICATION INFORMATION**
**Low Voltage DC/DC Application**

The AMC7150 was designed for power LED driving application. Only 5 external components were required for low voltage application. Fig.1 shows the typical application circuit for input voltage range from 4V to 40V. Buck power conversion topology was used and total forward voltage (at expecting current) of the LED string should lower than supply voltage by 1.6V at least.


**Input Bypass Capacitor**

The input by-pass capacitor  $C_{IN}$  holds the input voltage and filters out the switching noise of AMC7150.

**Flywheel Diode**

The fast recovery diode was recommended for flywheel diode  $D_F$ . This is because the high reverse recovery current will cause the voltage drop across  $R_{sense}$  being higher than 330mV, and consequently the switch will be turned off which has just been turned on.

**LED Driving Current**

The peak current  $I_{PK}$  flow though LEDs was decided by:

$$I_{PK} = \frac{330mV}{R_{sense}}$$

The average current on LEDs was determined by the peak-to-peak ripple current that was decided by inductor L. Assume the target average current 550mA on LEDs and ripple current 100mA then the  $R_{sense}$  should be:

$$R_{sense} = \frac{330mV}{550mA + 0.5 \cdot 100mA} = 0.55\Omega$$

The  $R_{sense}$  value should higher than  $200m\Omega$  so that driving current won't over the recommended maximum driving current 1.5A.

**Inductor**

The Inductor L stores energy during switch turn-on period and discharge driving current to LEDs via flywheel diode while switch turn-off. In order to reduce the current ripple on LEDs, the L value should high enough to keep the system working at continuous-conduction mode that inductor current won't fall to zero.

Since in steady-state operation the waveform must repeat from one time period to the next, the integral of the inductor voltage  $v_L$  over one time period must be zero:

$$\int_0^{T_s} v_L dt = \int_0^{t_{ON}} v_L dt + \int_{t_{ON}}^{T_s} v_L dt = 0 \quad \text{Where } T_s = t_{ON} + t_{OFF}$$

Therefore

$$\frac{t_{ON}}{t_{OFF}} = \frac{V_{LED} + V_F}{V_{CC} - V_{Rsense} - V_{SAT} - V_{LED}}$$

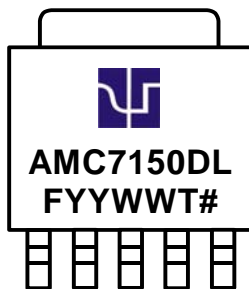
Where,  $V_{LED}$  is the total forward voltage (at expecting current) of the LED string,  $V_F$  is the forward voltage of the flywheel diode  $D_F$ ,  $V_{Rsense}$  is the peak value of the voltage drop across  $R_{sense}$  which is 300mV, and  $V_{SAT}$  is the saturation voltage of the switch which has a typical value of 1V.

Since the operation frequency  $f$  is determined by choosing appropriate value for timing capacitor  $C_T$ , the switch turn-on time can also be known by

$$t_{ON} = D \cdot T_s = \frac{D}{f} \quad \text{Where } D(\text{Dutycycle}) = \frac{t_{ON}}{t_{ON} + t_{OFF}}$$

With knowledge of the peak switch current and switch on time, the value of inductance can be calculated.

$$L = \frac{V_{CC} - V_{Rsense} - V_{SAT} - V_{LED}}{I_{PK}} \cdot t_{ON}$$

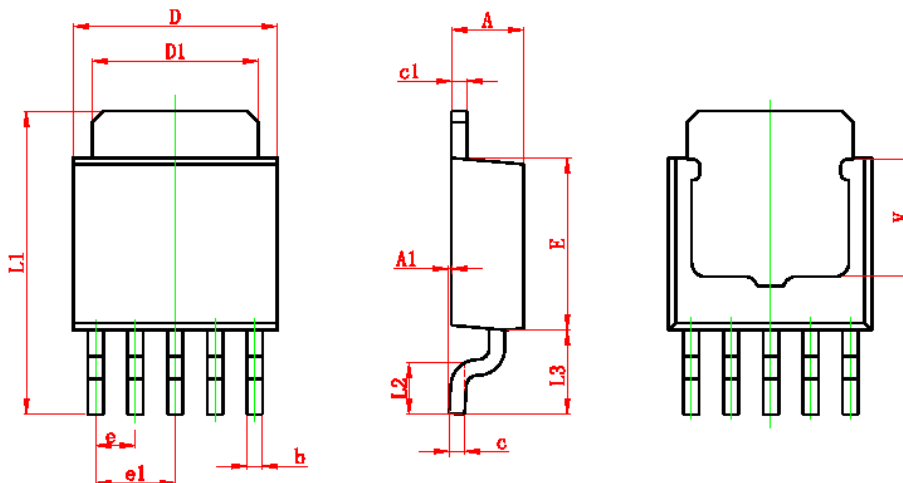
**PACKAGE**
**Top Marking for TO-252-5L**

**F : Lead Free**
**YY : Year Code**
**WW : Week Code**
**T : Trace Code**
**# : Rank of Current Sense Voltage**

Blank = 300 ~ 360mV (No Rank);

A = 300 ~ 320mV (Rank A);

B = 320 ~ 340mV (Rank B);

C = 340 ~ 360mV (Rank C);

**5-Pin Surface Mount TO-252 ( DL )**


Symbol	Dimensions in Millimeters		Dimensions in Inches	
	MIN	MAX	MIN	MAX
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
B	0.400	0.600	0.016	0.024
C	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
E	1.270 TYP		0.050 TYP	
e1	2.540 TYP		1.000 TYP	
L1	9.500	9.900	0.374	0.390
L2	1.400	1.780	0.055	0.070
L3	2.550	2.900	0.100	0.114
V	3.800 REF		0.150 REF	

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