Microcircuit IZ7150, IZ7150A (functional equvivalent AMC7150 ф. ADDtek) - LED (Light Emitting Diode) driver with peak output current 0,8 A (IZ7150A) & 1,5 A. (IZ7150).

Microcircuit designed for driving of power LEDs in the wide range of supply voltages and load currents with peak output currents 0,8 & 1,5 A. Main application areas are automotive, DC/DC LED driver, lighting equipments and light indicators.

Main features:

- Supply voltage from 4,0 to 40 V;
- Output driving current up to 0,8 A (IZ7150A), 1,5 A (IZ7150);
- Current consumption 4 mA;
- ESD protection up to 2kV;
- Temperature range from - 40 to +85 °C;
- Only 5 external components required.

Table 1 – Contact pad description

Contact pad number	Symbol	Function
01	V_{CC}	Supply voltage input
02, 03, 04, 05	CS	Current sensor input
09, 15	GND	Ground
06, 07	OUT	Driver output
08	OSC	Oscillator output
Note – Contact pads 10 – 14 are purposed only for testing during IC manufacturing and are not used by customer		

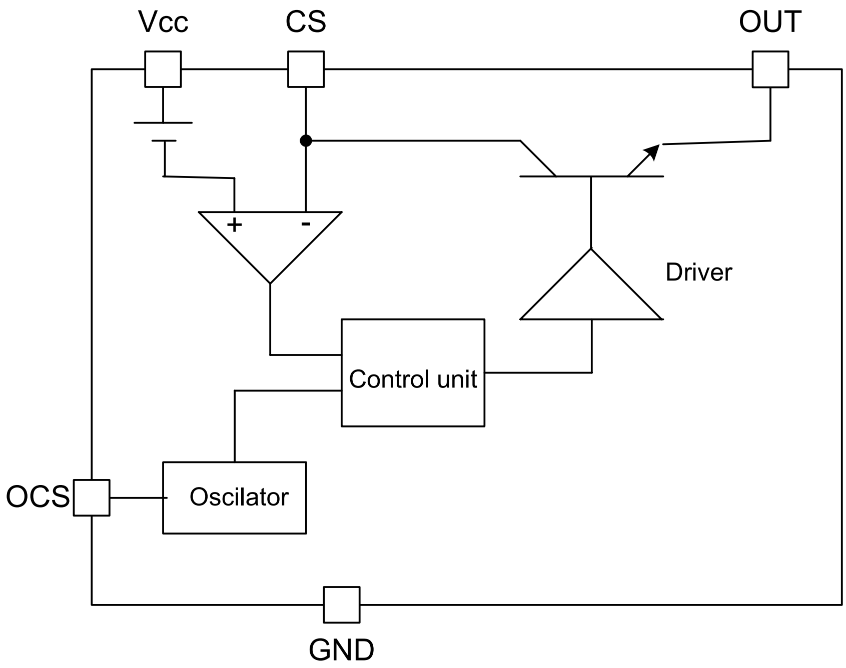


Fig. 1 – Block diagram

Table 3 - Recommended operation conditions

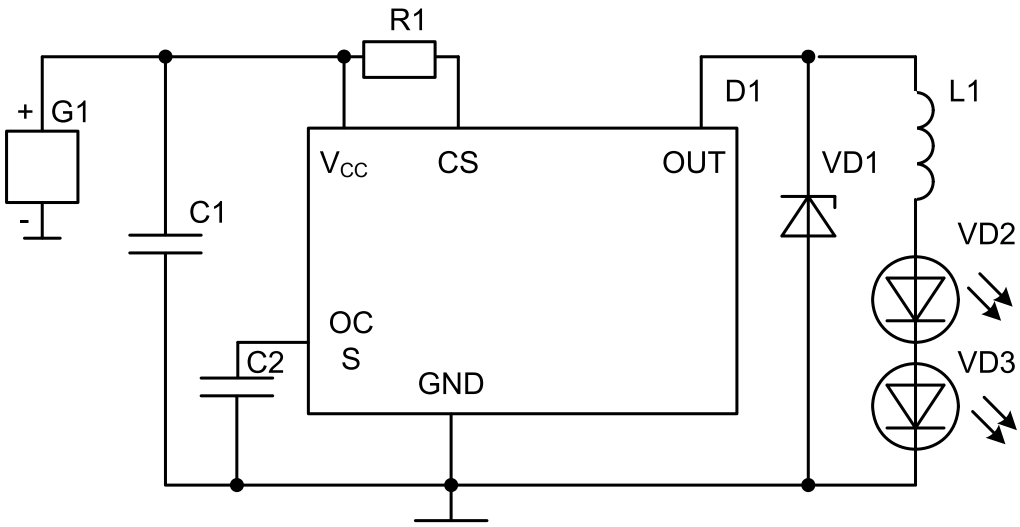
Parameter	Symbol	Target		Unit
		Min	Max	
Supply voltage	U_{CC}	4,0	40	V
Junction temperature	T_J	—	125	^oC

Table 4 - Maximum Ratings

Parameter	Symbol	Target		Unit
		Min	Max	
Supply voltage	U_{CC}	-0,3	40	V
Output voltage	U_O	-0,3	40	V
Junction temperature	T_J	—	150	^oC
Storage temperature	T_{STG}	-60	150	^oC

Table 5 - Electric parameters

Symbol	Parameter	Testing mode	Value		Ambient temperature, °C	Unit
			Min	Max		
I_{CC}	Supply current	$4,0\ V \le U_{CC} \le 40\ V$	-	4,0 4,4	25 ± 10 -40; 85	mA
U_{DP}	Output saturation voltage IZ7150	U_{CC} = 5,0 V I_O = 1,0 A	-	1,3 1,4		V
		I_O = 1,5 A		3,0 3,0		
	IZ7150A	I_O= 0,5 A		1,3 1,4		
		I_O= 0,8 A		3,0 3,0		
I_{OL}	Output leakage current	U_{CC} = 40 V	-	300 330		μA
U_{CS}	Current sensor voltage	U_{CC} = 5,0 V	300 270	360 396		mV
DC_{MAX}	Max duty cycle	U_{CC} = 5,0 V	50	99	25 ± 10; -40; 85	%
I_{CH}	Capacitor charging current	U_{CC} = 5,0 V	20	50		μA



C1 – capacitor 47 μF ± 10%;
C2 – capacitor 680 pF ± 10%;
D1 – microcircuit ;
G1 – supply voltage source from 4,0 to 40 V;
L1 – inductance coil 220 μH ± 10%;
R1 – resistor 330 mΩ ± 1%;
VD1 – Zener diode with stabilization voltage 40 V (1N5819 or equivalent);
VD2, VD3 - LEDs

Fig. 2 – Application diagram

Functionality

Starting current is regulated in the range from few milliamps up to 1,5 A. The regulation is performed by means of PWM (pulse-width modulation).Load is repetitively connected to the supply voltage via output switch. Changing of pulses porosity, adjusts average output voltage that allows regulating of output current. Inductive energy storage is applied in the circuit because of output voltage is pulse

Input decoupling capacitor

Input decoupling capacitor C1 regulates the input voltage and rejects switching interference.

Limiting diode

Zener diode with fast recovering VD1 is recommended as limiting diode. High reverse recovery current will cause on R1 voltage drop more than 330 mV, therefore switch that has to be on will turned off.

LED driving current

Resistor R1 determine max output peak current to the LED.

Output peak current $I_{O,}$ flowing thought the LED, can be calculated by formula:

$$I_O = \frac{330mV}{R1} \ .$$

Average LED current is determined by amplitude of oscillating (pulsating) current, that depends on inductivity of coil L1. For example , average current of LED is 550 mA (pulsating) current is 100 mA. Then:

$$R1 = \frac{330mV}{550mA + 0,5 \times 100mA} = 0,55\Omega \ .$$

In order to driving current not exceed recommended max rating 1,5 A for IZ7150, (0,8 A for IZ7150A), R1 value has to be more than 200 mΩ.

Inductor

The Inductor L1 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 U_L over one time period must be zero:

$$\int_0^{Ts} U_L dt = \int_0^{T_{ON}} U_L dt + \int_{Ton}^{Ts} U_L dt = 0 \, ,$$

Where, $T_S = T_{ON} + T_{OFF}$

Therefore

$$\frac{Ton}{Toff} = \frac{U_{LED} + U_F}{U_{CC} - U_R - U_{SAT} - U_{LED}} \, ,$$

Where, U_{LED} is the total forward voltage (at expecting current) of the LED string,

U_F is the forward voltage of the flywheel diode VD1,

U_R is the peak value of the voltage drop across R1 which is 300mV,

U_{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 C1, the switch turn-on time can also be known by $Ton = D \times Ts = \frac{D}{f}$,

Where duty cycle $D = \frac{Ton}{Ton + Toff}$

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

$$L = \frac{U_{CC} - U_R - U_{SAT} - U_{LED}}{I_{PK}} \times T_{ON}$$

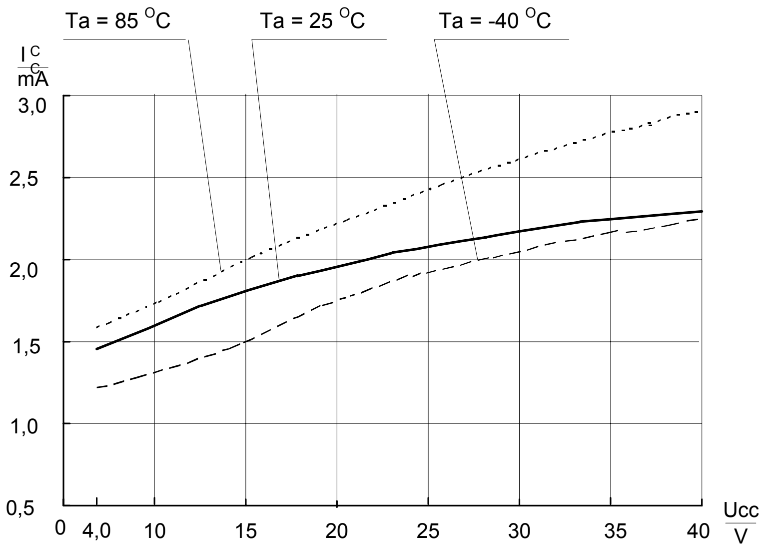
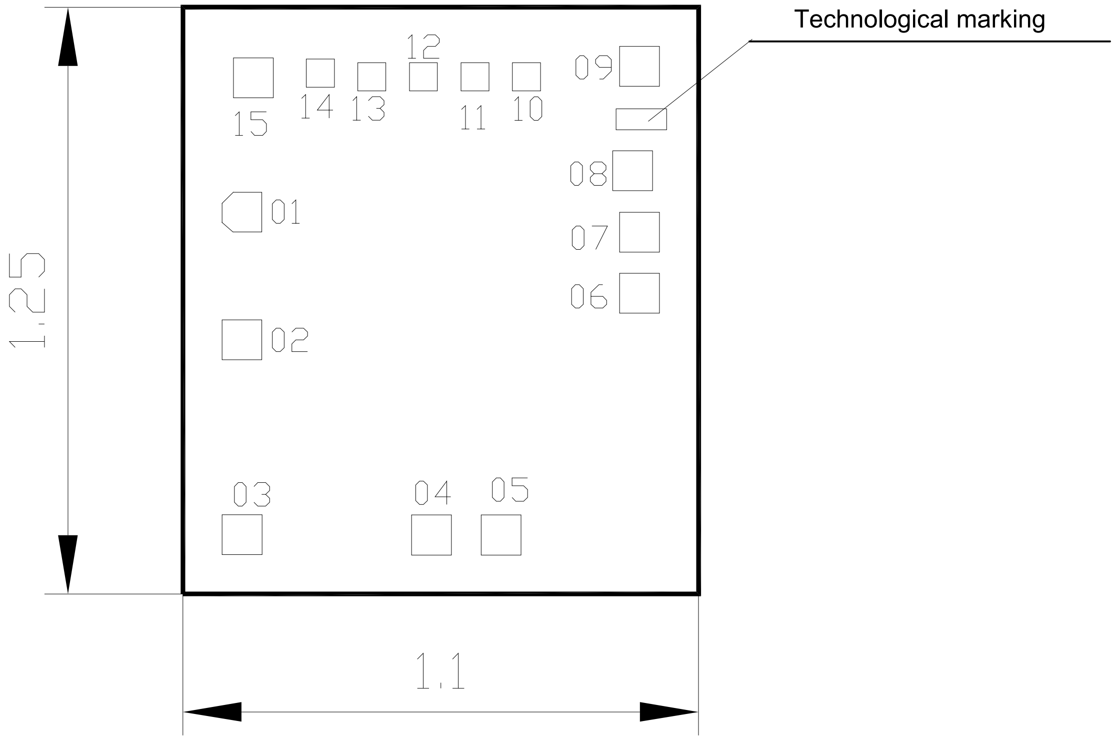


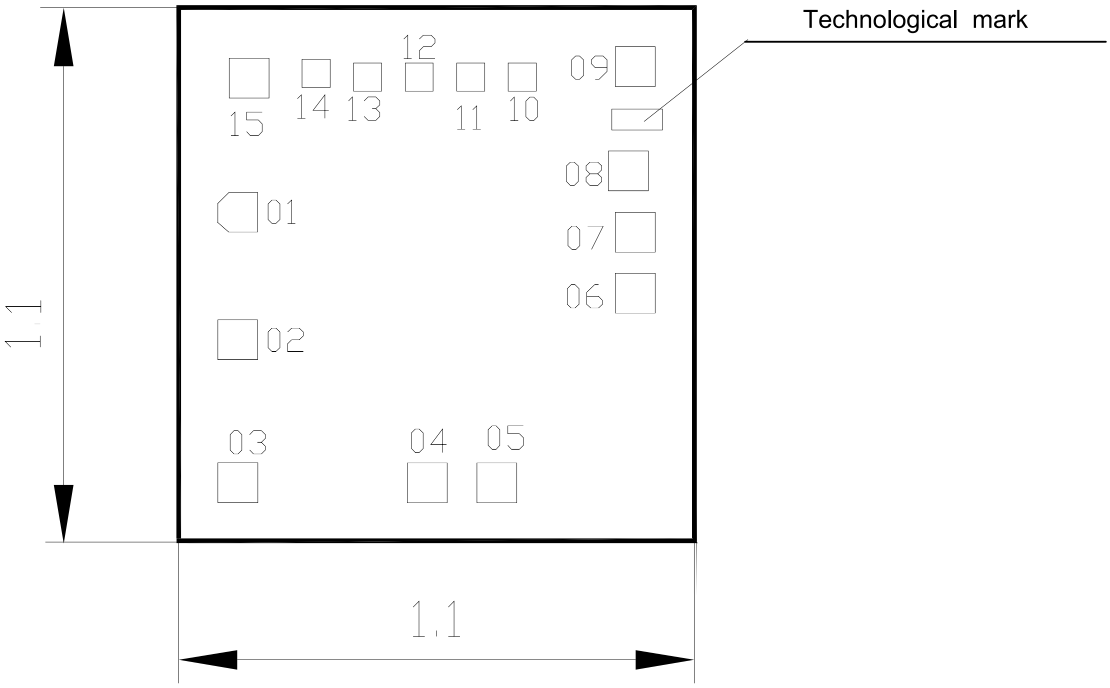
Fig. 3 – Supply current as a function of supply voltage



Technological mark "7150" coordinates, mm: x = 0,924, y =0,989.
Die thickness 0,35 ± 0,02 mm.

Pad number	Contact pad coordinates (left bottom corner), mm	
	X	Y
01	0,0835	0,7710
02	0,0835	0,4990
03	0,0835	0,0835
04	0,4875	0,0835
05	0,6365	0,0835
06	0,9315	0,5980
07	0,9315	0,7280
08	0,9170	0,8590
09	0,9315	1,0815
10	0,7030	1,0720
11	0,5930	1,0720
12	0,4830	1,0720
13	0,3730	1,0720
14	0,2630	1,0795
15	0,1080	1,0570
Note– Contact pad coordinates are indicated under layer "Metallization"		

Fig. 4 – IZ7150 chip and contact pad layout



Technological mark “7150A” coordinates, mm: x = 0,915, y =0,739.
Die thickness 0,35 ± 0,02 mm.

Pad number	Contact pad coordinates (left bottom corner), mm	
	X	Y
01	0,0835	0,5210
02	0,0835	0,0835
03	0,2135	0,0835
04	0,9315	0,3480
05	0,9315	0,4780
06	0,9170	0,6090
07	0,9315	0,8315
08	0,7030	0,8220
09	0,5930	0,8220
10	0,4830	0,8220
11	0,3730	0,8220
12	0,2630	0,8295
13	0,1080	0,8070
Note– Contact pad coordinates are indicated under layer “Metallization”		

Fig. 5 – IZ7150A chip and contact pad layout