CL1506

Non-isolated buckledConstant current driver

overview

CL1506It is a step-down constant current drive chip with excellent performance, which can realize high-precisionledConstant current drive. The chip works in the inductor current critical continuous mode (tm), the operating voltage covers85Vac~265Vac. The chip integrates500VPower devices, peripheral applications can achieve high-precision constant current without auxiliary winding detection and power supply, which greatly reduces external costs.

CL1506It has a variety of constant current auxiliary functions to achieve excellent linear compensation and high-precision constant current effects.CL1506operates in inductor current critical continuous mode (tm), the output current does not change with the change of inductance and load, and has excellent load regulation characteristics.

CL1506Integrating multiple protection functions greatly enhances the reliability of the system. Protection features includeledopen circuit protection,ledShort-circuit protection, under-voltage lockout, current sense resistor short-circuit protection and over-temperature regulation functions.

characteristic

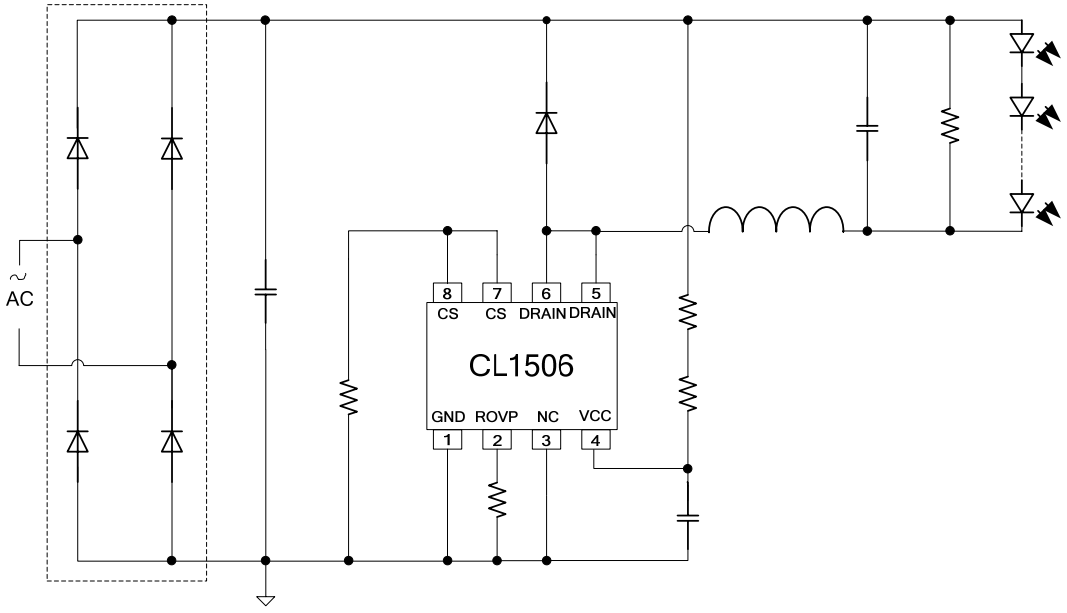
- Wide input voltage
- ±5%LEDOutput current accuracy
- internal integration500Vpower tube
- Chip ultra-low operating current
- Inductor current critical continuous mode (tm)
- without auxiliary winding
- Excellent Line Regulation and Load Regulation
- ledOpen/short circuit protection
- Current sense resistor short circuit protection
- undervoltage lockout (UVLO)
- Over temperature regulation function

Application range

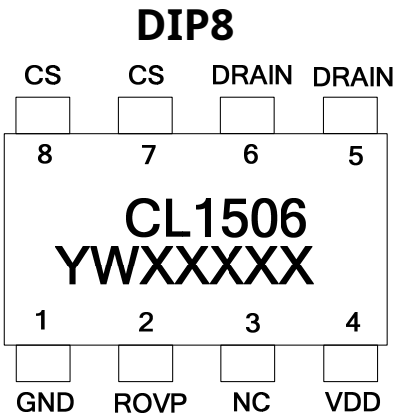
- ledcandle light
- ledBulb
- ledfluorescent lamp
- otherledillumination

CL1506useDIP8encapsulation

typical application



Marking instructions and pin distribution

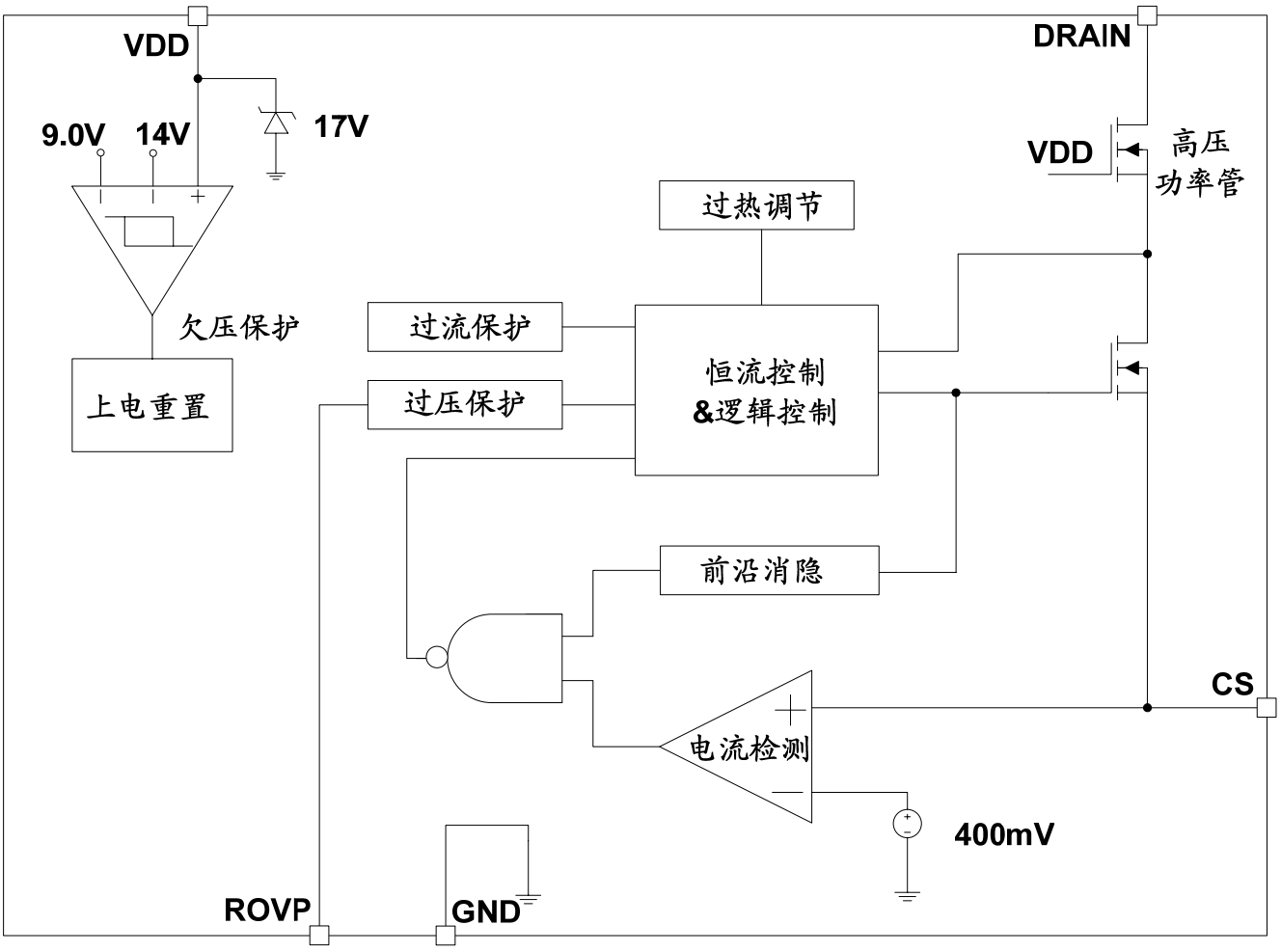


Pin Diagram	silk screen characters	Description of silk screen characters
left schematic	CL1506	Chip model
	Y	Year
	W	week number
	XXXXX	Production batch

Pin Description

pin number	Pin name	describe
1	GND	ground terminal
2	ROVP	Overvoltage protection setting terminal
3	NC	No connection, it is recommended to connect toGND
4	VDD	Chip power terminal
5,6	DRAIN	The drain of the internal high-voltage power transistor
7,8	CS	Current sampling terminal

Structure diagram



Maximum Ratings (Note)

parameter	scope
VDDPower terminal	- 0.3V to VDD_{CLAMP}
CScurrent sampling voltage	- 0.3 V to 6 V
ROVPport voltage	- 0.3 V to 8 V
DRAINport voltage	- 0.3 V to 500 V
PNJunction to Ambient Thermal Resistance	140°C/W
Operating Junction Temperature Range	- 40°Cto 150°C
Minimum/Maximum Storage Temperature	- 55°Cto 150°C

Package Dissipation Rating

encapsulation	$R_{\theta JA}$(°C/W)
DIP8	140

Note: Stresses beyond "Maximum Ratings" may damage the device. The device may operate within the recommended operating range, but its characteristics are not guaranteed. Operating at maximum rated conditions for extended periods of time time may affect device reliability.

Recommended scope of work

symbol	parameter	parameter range	one bit
I_{LED_1}	ledOutput current@V_{out}=150V (Input voltage 175V~265V, ambient temperature80°C)	<300	mA
I_{LED_2}	ledOutput current@V_{out}=72V (Input voltage 175V~265V, ambient temperature80°C)	<400	mA
V_{LED_MIN}	lowestledload voltage	> 15	V

electrical characteristics

(Ambient temperature =25℃,VDD=15V)

symbol	parameter	Test Conditions	minimum value	typical value.	maximum value	unit
VDDVoltage						
VDD_{CLAMP}	VDDClamping voltage	I_{VDD}=1.0mA		17		V
$VDD_{UV(OFF)}$	exit undervoltage lockout voltage	VDDvoltage rise		14		V
$VDD_{UV(ON)}$	into the undervoltage lockout voltage	VDDvoltage drop		9		V
I_{START}	Starting current	VDD = $VDD_{\_UV(OFF)}$-1V		110	170	uA
I_{OP}	Working current	f_{OP}=70kHz		100	150	uA
CScurrent sampling						
V_{CS_TH}	Current Sense Threshold Voltage		390	400	410	mV
V_{CS_SHORT}	Current detection when the load is short-circuited threshold voltage			200		mV
t_{LEB}	leading edge blanking time			350		ns
t_{DELAY}	turn off delay			200		ns
internal time control						
t_{OFF_MIN}	Minimum off time			4.5		us
t_{OFF_MAX}	maximum off time			240		us
t_{ON_MAX}	maximum on time			40		us
V_{ROVP}	ROVPelectric potential			0.5		V
power tube						
R_{DS_ON}	Power tube conduction resistance	V_{GS}=15V/I_{DS}=0.5A		1.9	2.5	Ω
BV_{DS}	Power tube breakdown voltage	V_{GS}=0V/I_{DS}=250uA	500			V
I_{DS}	Power tube leakage current	V_{GS}=0V/V_{DS}=500V			1	uA
Overtemperature regulation						
T_{REG}	overheat regulation temperature			150		℃

Instructions for use

CL1506is a high precision step-downledConstant current driver chip, integrated500Vpower tube.CL1506operates in inductor current critical mode (tm), the peak current detection method is adopted, no auxiliary winding power supply is required, few external components can be realized, and the system has the advantage of low cost.

●chip start

The chip charges the voltage stabilizing capacitor through the busbar through the start-up resistor, and pulls upVDDVoltage. whenVDDvoltage rises until the chip exitsUVLOAfter the mode, the chip startup is completed.CL1506built in17VA regulator circuit for clampingVDDpotential.CL1506The working current is very small and no auxiliary winding is needed for power supply.

●onstant current work

CL1506operates in inductor current critical mode (tm) , the peak current detection circuit passes through the350nsdetected after the leading edge blanking time of theCSterminal voltage, when CSThe peak terminal voltage is higher than the400mVthreshold,CL1506will turn off the power transistor. The formula for

calculating the peak current of the inductor is:

$$I_{PEAK}= \frac{400}{R_{CS}}(mA)$$

in,$I_{PEAK}$is the inductor peak current,$R_{CS}$is the current sense resistor. led

The current formula is:

$$I_{led} =\frac{I_{PEAK}}{2}$$

in,I_{led}forledcurrent.

●nergy storage inductance

CL1506operates in inductor current critical mode (tm), so when the power tube is turned on, the inductor current rises. The formula for the turn-on time of the power tube is:

$$t_{ON}= \frac{LxI_{PEAK}}{V_{IN}-V_{led}}$$

in,$V_{IN}$is the input voltage of the system after passing through the rectifier bridge;LSystem working inductance;V_{led}forledThe operating pressure drop across the lamp.

When the power tube is turned off, the inductor current starts to drop. The power tube off time formula is:

$$t_{OFF}= \frac{LxI_{PEAK}}{V_{led}}$$

The selected value of the energy storage inductance is:

$$L = \frac{V_{led}\times(V_{IN}-V_{led})}{fxI_{PAEK}xV_{IN}}$$

CL1506The minimum off time and the maximum off time of the power tube are set internally, which are respectively4.5usand240us. If the inductance of the energy storage inductor is small,t_{OFF} will be less than the minimum off-time, the system will enter the inductor current discontinuous mode (DCM),ledThe output current will be smaller than the design value; if the energy storage inductance value is large, t_{OFF}will be greater than the maximum off-time, the system will enter the inductor current continuous mode (CCM),ledThe output current will be larger than the design value, so please pay extra attention when designing the system.

undervoltage lockout (UVLO)

InternalUVLOThe circuit will detectVDDpin voltage,CL1506entry and exitUVLOThe voltage is fixed at9Vand14V.

outputledovervoltage protection

CL1506already setupROVPThe voltage of the pin during normal operation is0.5V, outputledThe overvoltage protection function can be set byROVPThe resistance value of the pin to the ground is realized.

$$R_{OVP} = 5x\frac{LxV_{CS\_TH}x10}{R_{CS}xV_{OVP}} \quad _6(k\Omega)$$

in,R_{OVP}forROVPresistance between pin to ground,R_{CS}forCSpin-to-ground current sense resistor,V_{CS_TH}forCSpin current sense threshold voltage,V_{OVP} for outputledprotection voltage.

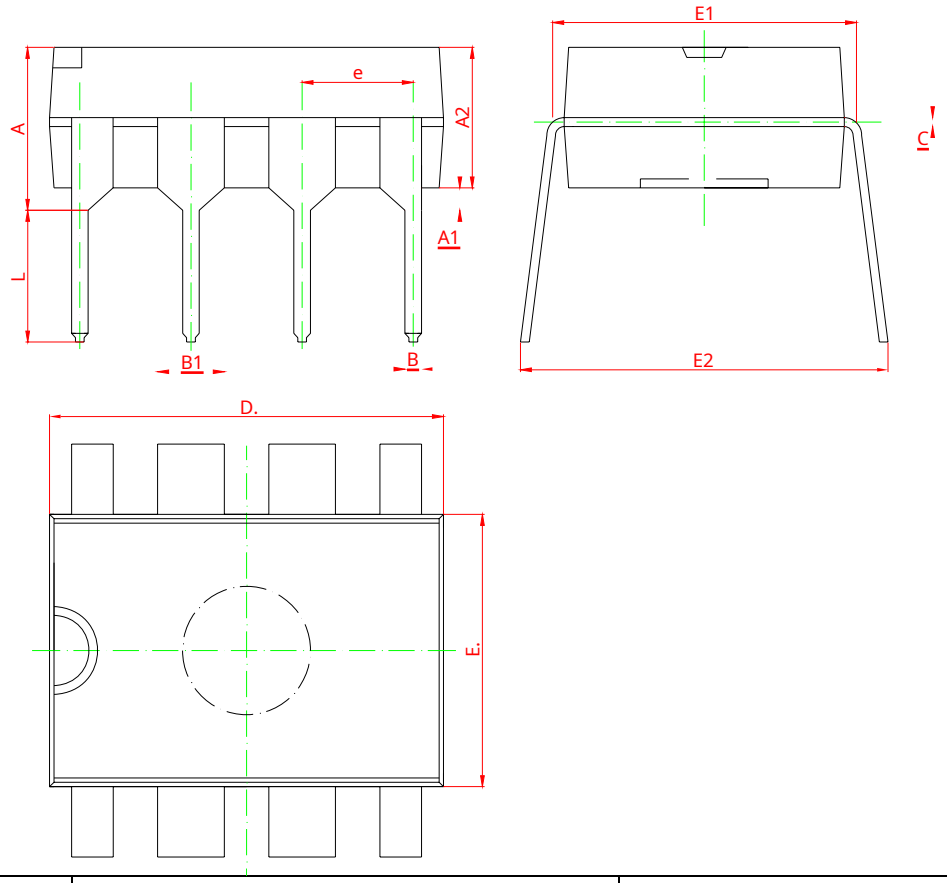
over temperature regulation function

When the chip temperature is too high, the chip will reduce the output current to achieve the purpose of controlling the output power and temperature rise, and keep the chip temperature at the set value to improve the reliability of the chip.

protection control

The reliability of a good power supply system is realized by its rich protection functions. For example: inledWhen open, it will trigger the output overvoltage protection logic and stop the switching action. existledshort circuit, the system will operate at5kHz,CSThe shutdown threshold is limited to200mV. current sense resistorR_{CS}Short circuit or transformer saturation,CL1506The protection logic will be triggered and the switching action will be stopped. After the system enters the protection state,VDDvoltage begins to decrease, reachingUVLOAfter that, the system restarts. When the fault is removed, the system resumes normal operation.

Package Description:DIP8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524(BSC)		0.060(BSC)	
C	0.204	0.360	0.008	0.014
D.	9.000	9.400	0.354	0.370
E.	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540(BSC)		0.100(BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354

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