

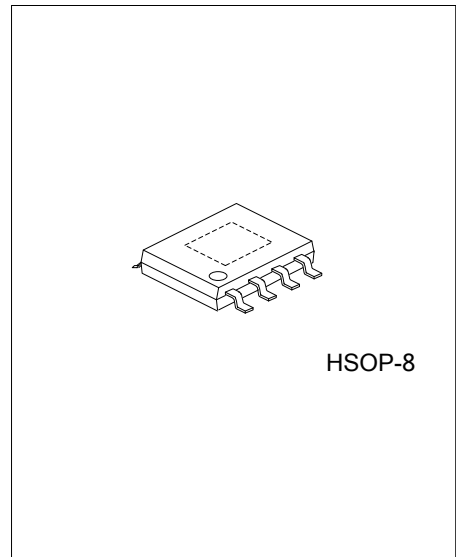


UL537

Preliminary

LINEAR INTEGRATED CIRCUIT

FOUR-CHANNEL HIGH VOLTAGE LINEAR CONSTANT CURRENT LED DRIVER



DESCRIPTION

The UTC **UL537** is multichannel channel high power factor high voltage linear constant current LED driver chip. **UL537** use linear constant current technology to set LED light string drive current with the external resistor. LED twinkle light adopts four period of structure. The solution can adapt to the application requirement of 3 ~ 15 watts of the LED lamps and lanterns with high power factor and low harmonic distortion.

UL537 have over temperature protection function. When the system temperature is too high, it reduce the output current to achieve the effect of lowering the temperature. Over temperature protection point can be set through the external resistors.

UL537 has the function of the line voltage compensation. When the input voltage is too high, it reduce the output current to ensure that the input power does not change with the input voltage. The amplitude of electric current reducing can be set through the external resistors.

UL537 has dimmer function, can be set power through external resistance or external PWM signal and realize various dimming applications from 1% ~ 100%.

UL537 has a low harmonic distortion mode and can achieve low harmonic distortion by external resistance divide VAC to connect the PWM.

FEATURES

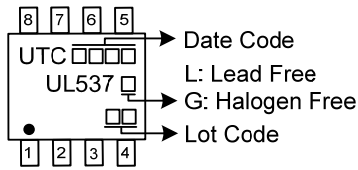
- * Output constant current :5~100mA
- * High precision constant current $\pm 5\%$
- * High PF and low harmonic distortion
- * Overheating protection function
- * Line voltage compensation function can be set
- * Realize stepless dimmer with PWM interface
- * Application solutions without EMI problems
- * The simple line and low cost power supply

ORDERING INFORMATION

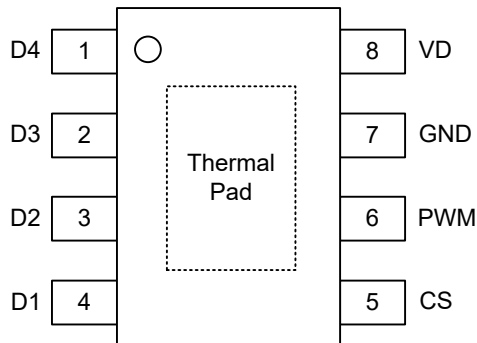
Ordering Number		Package	Packing
Lead Free	Halogen Free		
UL537L-SH2-R	UL537G-SH2-R	HSOP-8	Tape Reel

<p>UL537G-SH2-R</p> <ul style="list-style-type: none"> (1) Packing Type (2) Package Type (3) Green Package 	<ul style="list-style-type: none"> (1) R: Tape Reel (2) SH2: HSOP-8 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING



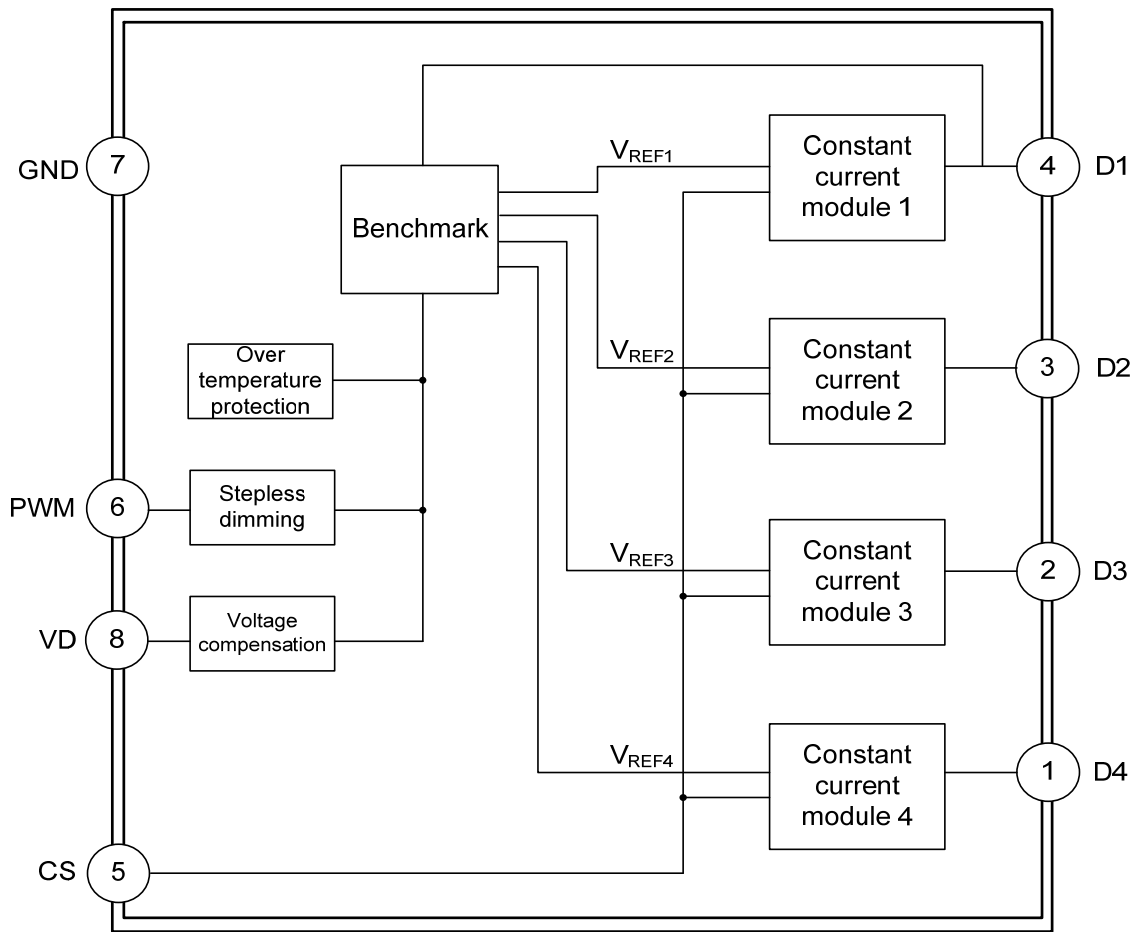
PIN CONFIGURATIONS



PIN DESCRIPTION

PIN NO	PIN NAME	PIN DESCRIPTION
1	D4	The fourth section of high voltage constant current source port, links led twinkle light.
2	D3	The third section of high voltage constant current source port, links led twinkle light.
3	D2	The second section of high voltage constant current source port, links led twinkle light.
4	D1	The first section of high voltage constant current source port, links led twinkle light.
5	CS	Port for LED drive current seting, external sampling resistor to ground.
6	PWM	Dimming port, external PWM signal received by the RC filter PWM port, cannot suspended.
7	GND	Chip Ground.
8	VD	Line voltage compensation range set port, external resistance to D4.
Exposed Pad	Thermal Pad	Application must be connected to GND.

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING ($T_A=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
High Voltage Pin Pressure (D1 / D2)	V_{D12}	650	V
High Voltage Pin Pressure (D3 / D4)	V_{D34}	500	V
LOW Voltage Pin Pressure (CS / PWM / VD)	V_{CS}	10	V
Junction Temperature	T_J	+150	$^{\circ}\text{C}$
Operating Temperature	T_{OPR}	-40 ~ +150	$^{\circ}\text{C}$
Storage Temperature	T_{STG}	-65~ +150	$^{\circ}\text{C}$

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

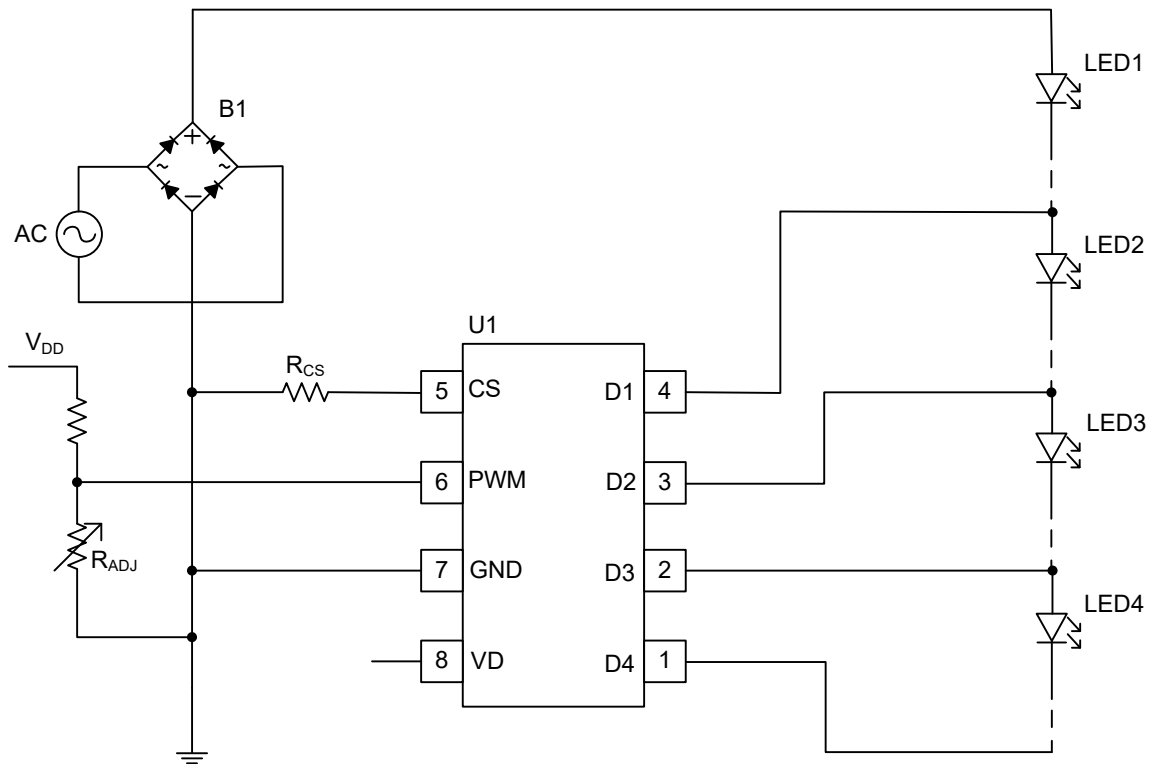
■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Maximum Junction to Case	θ_{JC}	40	$^{\circ}\text{C}/\text{W}$

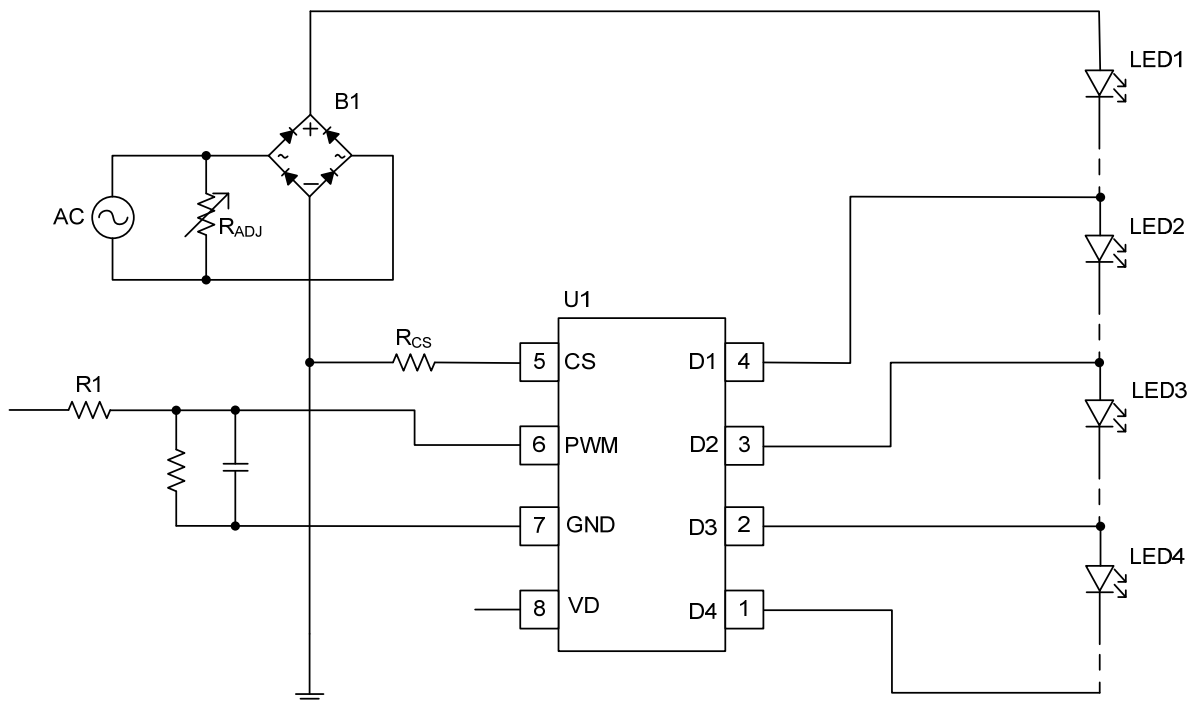
■ ELECTRICAL CHARACTERISTICS ($T_A=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Line Voltage	VAC	AC 200~270V	50	311	400	V
Quiescent Current	I_Q	D1=30V, PWM=1.2V		143	170	μA
D1 Input Voltage	V_{D1}		30			V
CS Port Voltage	V_{REF1}	D1=30V, PWM=1.2V, $R_{CS}=100\Omega$		542		mV
	V_{REF2}	D1=D2=30V, PWM=1.2V, $R_{CS}=100\Omega$		685		mV
	V_{REF3}	D1=D3=30V, PWM=1.2V, $R_{CS}=100\Omega$		808		mV
	V_{REF4}	D1=D4=30V, PWM=1.2V, $R_{CS}=100\Omega$		856		mV
PWM Port Voltage	V_{PWM}			1.2		V
PWM Dimming Range	R_{TN}		20		100	%
Turning Point of Temperature Protection	T_{SW}			120		$^{\circ}\text{C}$

■ TYPICAL APPLICATIONS CIRCUITS



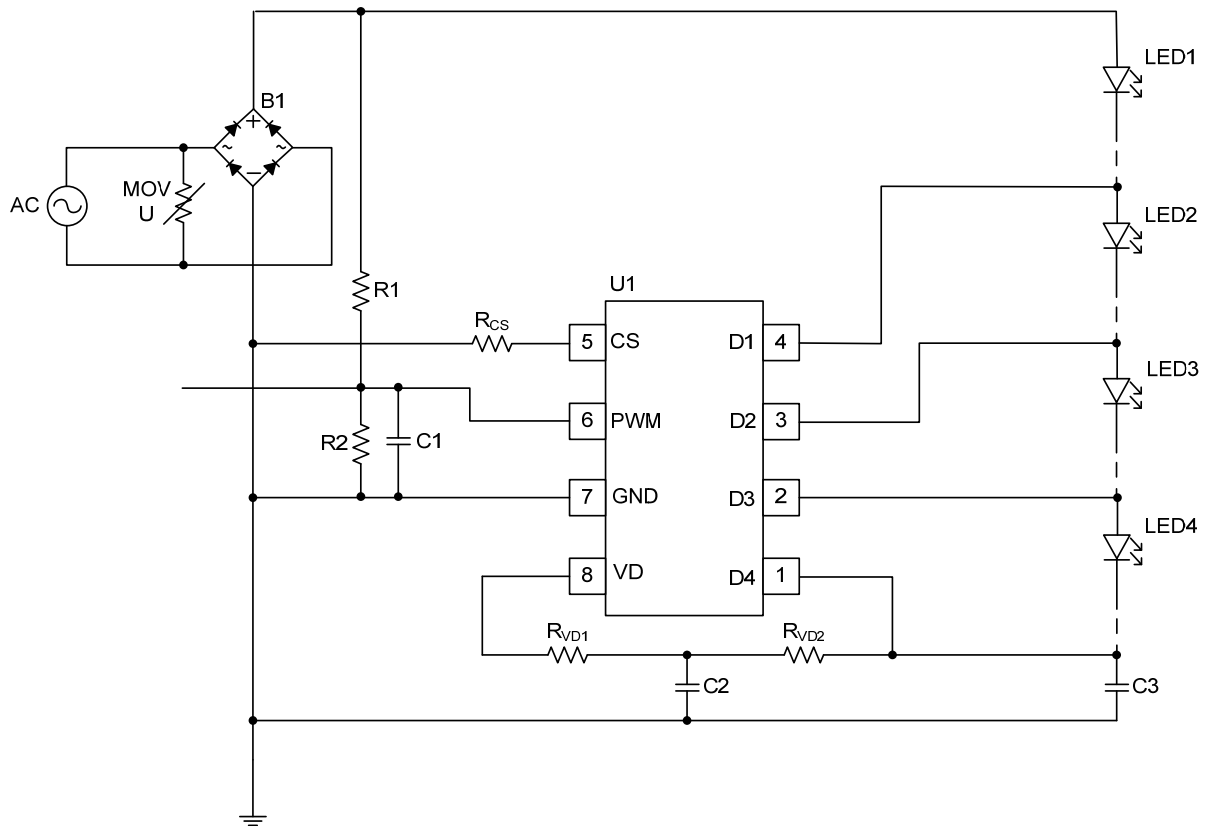
■ AC220V 12W PWM APPLICATIONS



BOM

Element No	Species	Element Specification
MOV	Varistor	7D471(Select based on surge protection requirements)
B1	SMD rectifier bridge	MB6F/600V/0.8A
R _{cs}	SMD resistance	1206/ 10.5R/1%
R1	SMD resistance	0805/10K/5% (Select based on the V _h of PWM signal)
R2	SMD resistance	0805/2K/5% (Select based on the V _h of PWM signal)
C1	SMD capacitor	0805/2.2uF/16V
U1	Drive chip	UL537 / HSOP-8
LED1~LED4	LEDS	260V LED depart 4 segments

■ AC220V 12W LOW HARMONIC DISTORTION



BOM

Element No	Species	Element Specification
MOV	Varistor	7D471(Select based on surge protection requirements)
B1	SMD rectifier bridge	MB6F/600V/0.8A
Rcs	SMD resistance	1206/ 10.5R/1%
RVD1	SMD resistance	1206/10K/5%
RVD2	SMD resistance	1206/150K/5%(Select based on range of compensation)
R1	SMD resistance	1206/2M/1%
R2	SMD resistance	1206/9.1K/1%
C1	SMD capacitor	0805/47nF/16V
C2	SMD capacitor	0805/330nF/16V
C3	SMD capacitor	0805/10nF/1KV
U1	Drive chip	UL537 / HSOP-8
LED1~LED4	LEDS	260V LED depart 4 segments

■ APPLICATION INFORMATION

After the system is powered on, the chip is powered by D1. When the D1 voltage exceeds 30V, the internal voltage of the chip is stable, and the chip starts to work. **UL537** chooses a specific constant current module to turn on according to the voltage change of rectifier waveform, so as to change the number of LED lights accessed: when the input voltage is low, some LED lights are on; when the input voltage is high, most or all of the LED lights are on. Compared with single-stage high voltage linear constant current drive, **UL537** has high power factor and low harmonic distortion without filling valley capacitor. Meanwhile, it can increase the lighting time of the LED lamp in the whole AC cycle, thereby improving the utilization of the LED and the total output lumen.

The drive current setting

UL537 use CS to connect the sampling resistor then set LED light string of drive current. When the LED segment is turned on, each output current is calculated as follows:

$$I_{LED(n)} = \frac{V_{REF(n)}}{R_{CS}}$$

In formula, n=1,2,3,4 and each segment is the reference voltage.

Over temperature protection setting

UL537 has over temperature protection function. When the system temperature decreases the output current, it controls the output power and temperature rise to keep temperature of power supply in the set value and improve the reliability of the system. The over temperature protection point is 140°C.

Line voltage compensation setting

UL537 has a line voltage compensation function. When the fourth LED strings (D4 port connection) is lit, **UL537** detection voltage D4 end, then reduce the LED current according to the D4 terminal voltage level. So IC can assure the basic input power does not vary with line voltage. VD pin connect external resistor to the D4 pin to regulate, then adjust current magnitude. Regulate relationship as the following formula.

$$V_{REF4} = 0.9 - \frac{1.5K\Omega}{R_{VD}} \times VD4$$

Stepless dimming function

UL537 has dimming function. The output power can be linearly changed by adjusting the voltage applied to the PWM port through external resistance, and the adjusting range is 20%~100%. **UL537** can also realize the dimming of PWM signal control. The external input PWM signal is connected to the dimming port through the RC filter circuit, and the voltage of the PWM port can be adjusted by controlling the duty cycle of the PWM signal, thus the linear change of the output power can be realized.

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