Universal High Brightness LED Driver

HV9910Q8

Features

- >90% efficiency
- 10V to 600V input range
- Constant current LED driver
- Applications from a few mA to more than 1A output
- LED string from one to hundreds of diodes
- Linear and PWM dimming capability
- Input voltage surge ratings up to 600V
- Over temperature protection

Applications

- DC/DC or AC/DC LED driver applications
- RGB backlighting LED driver
- Backlighting of flat panel displays
- General-purpose constant current source
- Signage and decorative LED lighting
- Automotive
- Chargers

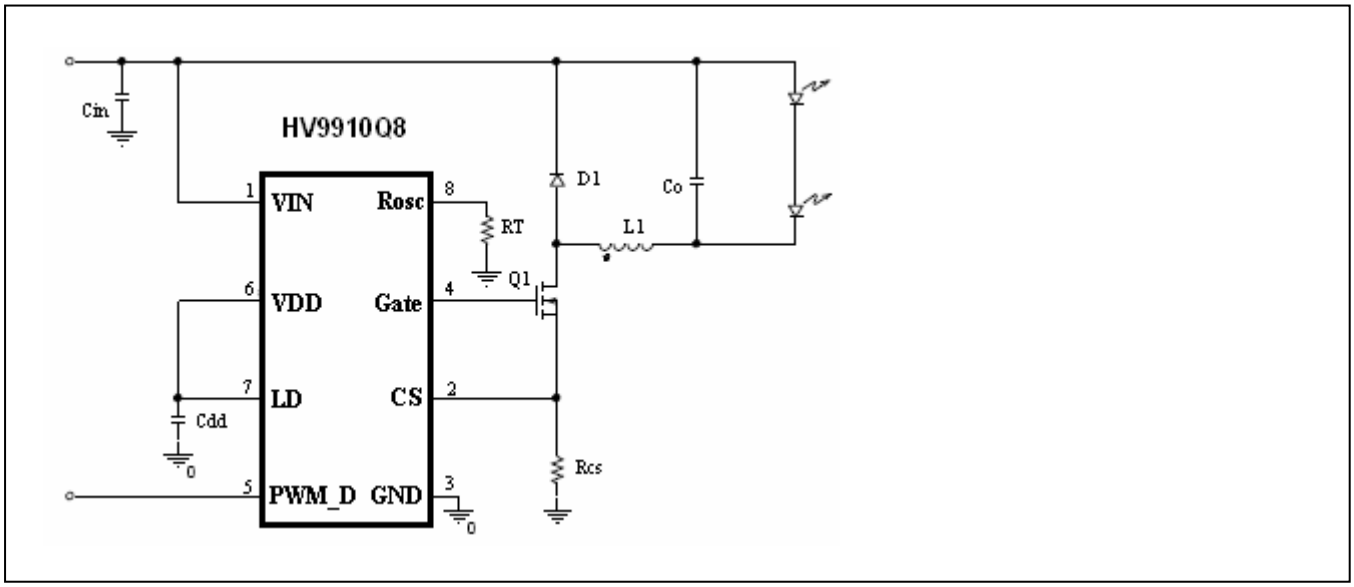
Description

The HV9910Q8 is a PWM high-efficiency LED driver control IC. It allows efficient operation of high-brightness (HB) LEDs from voltage sources ranging from 10VDC up to 600VDC. The HV9910Q8 controls an external MOSFET at fixed switching frequencies up to 300kHz. The frequency can be programmed using a single resistor. The LED string is driven at a constant current rather than a constant voltage, thus providing a constant light output and an enhanced reliability. The output current can be programmed between a few milliamps and up to more than 1A. The HV9910Q8 uses a rugged high-voltage junction isolated process that can withstand an input voltage surge up to 600V. The output current to a LED string can be programmed to any value between zero and its maximum value by applying an external control voltage at the linear dimming control input of the HV9910Q8. The HV9910Q8 provides a low-frequency PWM dimming input that can accept an external control signal with a duty ratio of 0-100% and a frequency of up to a few kilohertz.

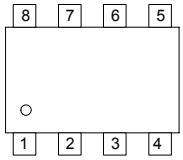
Ordering Information

Device	Package	Shipping
HV9910Q8-0-T3-G	SOP-8 (Pb-free lead plating and halogen-free package)	2500 pcs / tape & reel

Typical Application Circuit



Pin Description



Pin1: VIN	Pin5: PWM_D
Pin2: CS	Pin6: VDD
Pin3: Ground	Pin7: LD
Pin4: Gate	Pin8: Rosc

Absolute Maximum Ratings

Vin to GN..……-0.5~+600V
CS, LD, PWM_D, GATE to GND …… -0.3 V ~ VDD+0.3V
Continuous power dissipation (T_A=25°C)……..630mW
Operating temperature range ……- 40~+85°C
Junction temperature ……...+125°C
Storage temperature range ……..-65 ~ +150°C

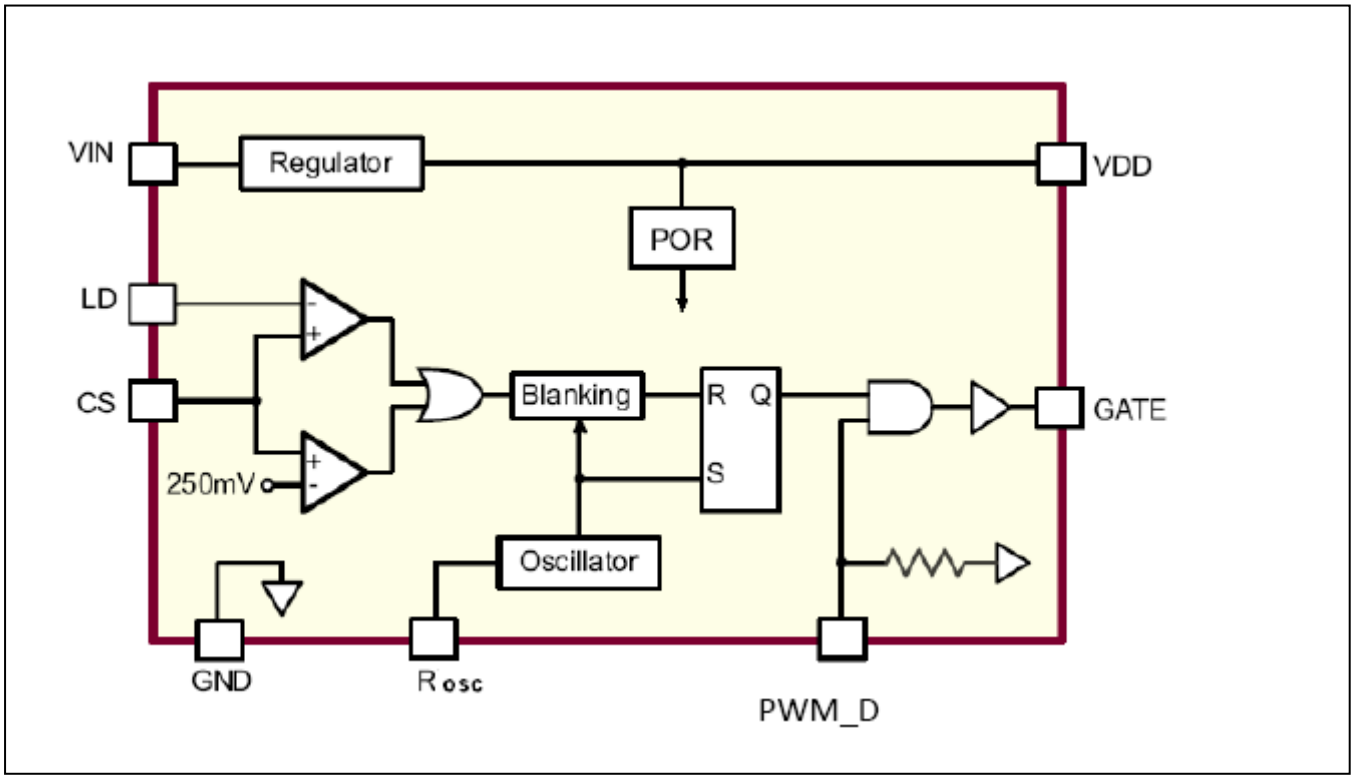
*Stress beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Electrical Characteristics (T_A=25°C, unless otherwise noted)

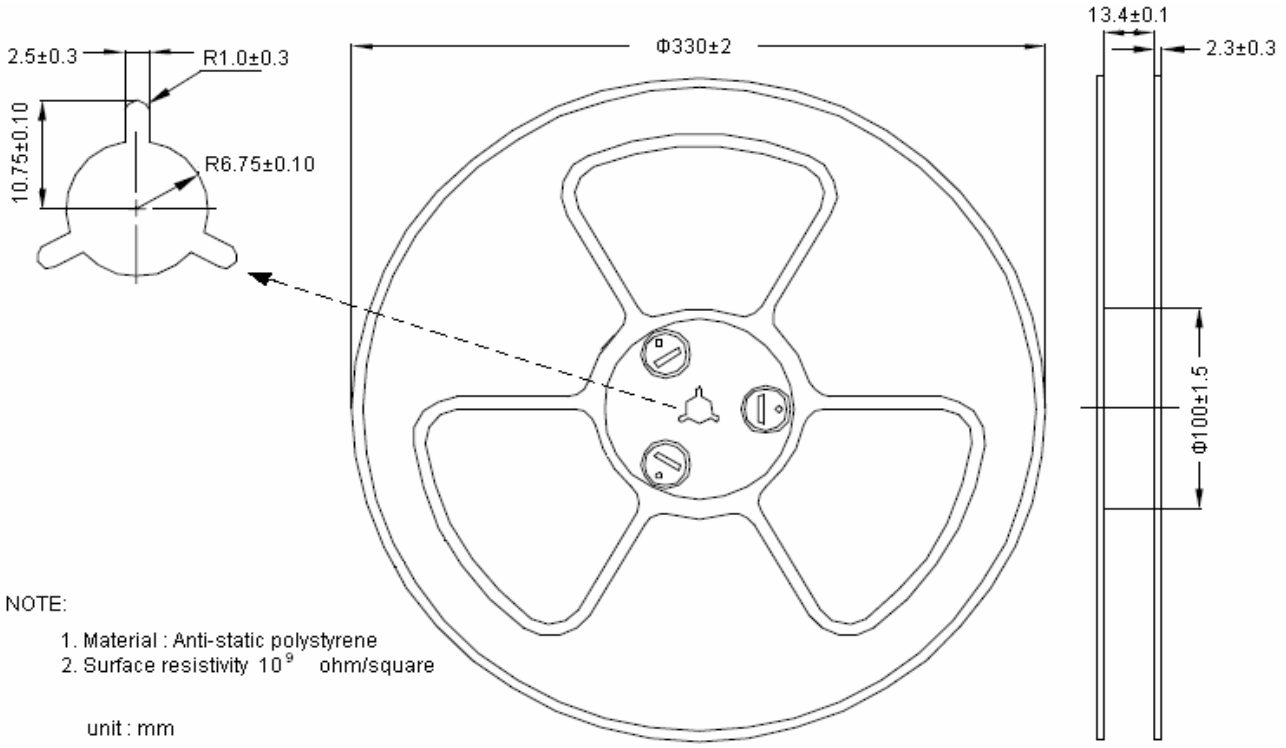
Parameter	Test Condition	Symbol	Min.	Typ.	Max.	Unit
Input DC supply voltage range	DC input voltage	V_{INDC} *	10	-	600	V
Shut down mode supply current	Pin PWM_D to GND, V_{IN}=8V	I_{INSD}	0.5	-	1	mA
Internally regulated voltage	V_{IN}=10 to 600V, $I_{DD(ext)}$=0, pin Gate open	V_{DD}	7	7.5	8	V
Load regulation of V_{DD}	$I_{DD(ext)}$=0 to 1mA, 500pF at GATE, R_{OSC}=226kΩ, PWM_D=V_{DD}	$\triangle V_{DD, load}$	0	-	100	mV
Maximum pin V_{DD} voltage	When an external voltage is applied to pin V_{DD}	$V_{DD, max}$	-	-	10	V
V_{DD} current available for external circuitry	V_{IN}=10 to 100V	$I_{DD(ext)}$	-	-	0.7	mA
V_{DD} under voltage lockout threshold	V_{IN} rising	UVLO	6.45	6.7	6.95	V
V_{DD} under voltage lockout hysteresis	V_{IN} falling	△UVLO	-	500	-	mV
Pin PWM_D input low voltage	V_{IN}=10 to 600V	$V_{EN(lo)}$	-	-	0.8	V
Pin PWM_D input high voltage	V_{IN}=10 to 600V	$V_{EN(hi)}$	2	-	-	V
Pin PWM_D pull down resistance	V_{EN}=5V	R_{EN}	50	100	150	kΩ
Current sense pull-in threshold voltage	T_A=-40°C ~ +85°C	$V_{CS(hi)}$	225	250	275	mV
GATE high output voltage	I_{OUT}=10mA	$V_{GATE(hi)}$	V_{DD}-0.3	-	V_{DD}	V
GATE low output voltage	I_{OUT}=-10mA	$V_{GATE(lo)}$	0	-	0.3	V
Oscillator frequency	R_{OSC}=1MΩ R_{OSC}=226kΩ	f_{OSC}	20 80	25 100	30 120	kHz
Maximum oscillator PWM duty cycle	F_{PWMhf}=25kHz, at GATE, CS to GND	D_{MAXhf}	-	-	100	%
Pin LD(Linear Dimming) voltage range	T_A<85°C, V_{IN}=12V	V_{LD}	0	-	250	mV
Current sense blanking interval	V_{CS}=0.55V_{LD}, V_{LD}=V_{DD}	T_{BLANK}	150	215	280	ns
Delay from CS to GATE lo	V_{IN}=12V, V_{LD}=0.15V, V_{CS}=0 to 0.22V after T_{BLANK}	t_{DELAY}	-	-	300	ns
GATE output rise time	C_{GATE}=500pF, V_{DD}=7.5V	t_{RISE}	30	-	50	ns
GATE output fall time	C_{GATE}=500pF, V_{DD}=7.5V	t_{FALL}	30	-	50	ns

* Also limited by package power dissipation limit, whichever is lower.

Block Diagram



Reel Dimension

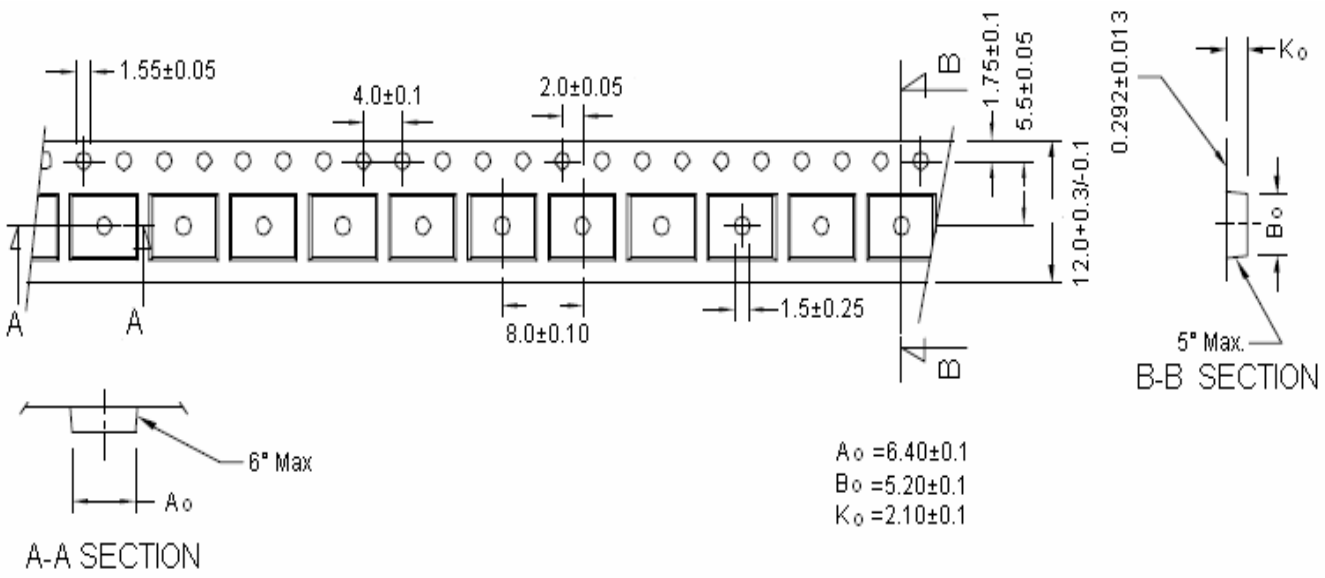


NOTE:

1. Material : Anti-static polystyrene
2. Surface resistivity 10^9 ohm/square

unit : mm

Carrier Tape Dimension



Notes:

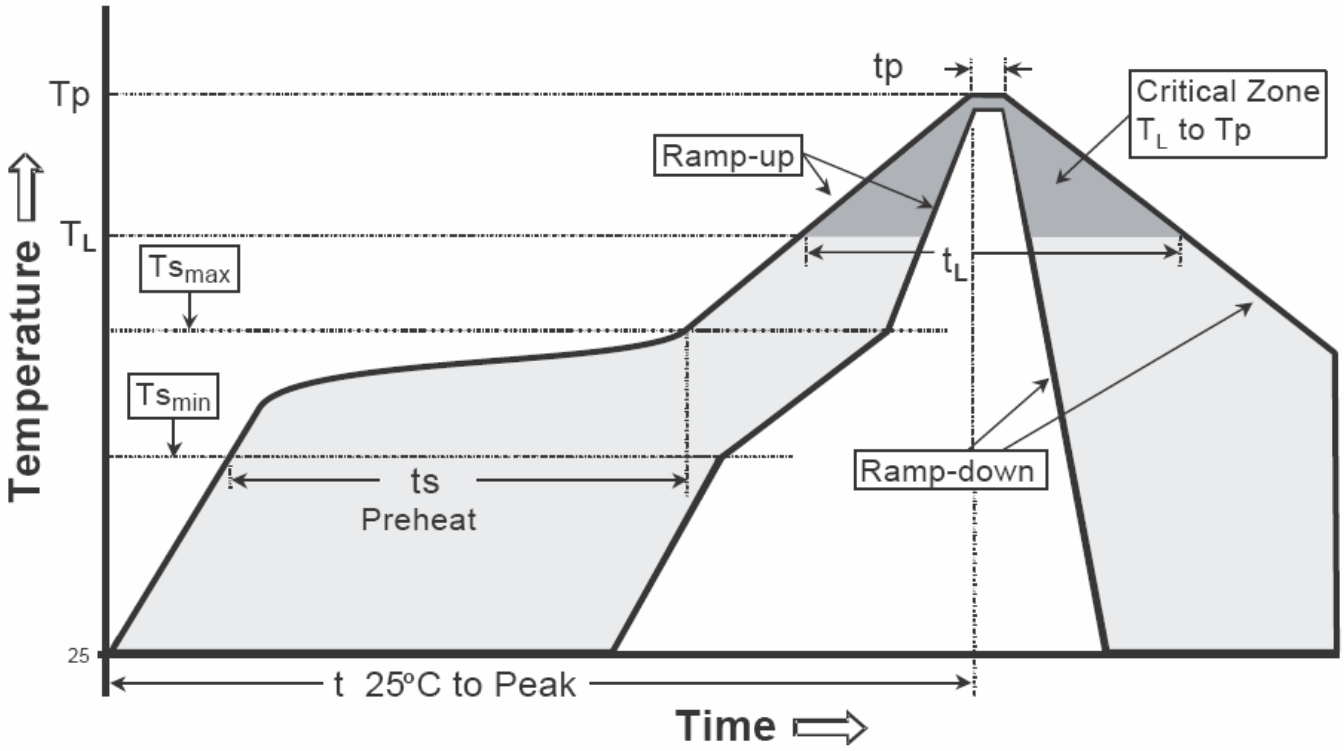
1. 10 sprocket hole pitch cumulative tolerance ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material: conductive black polystyrene
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

Uni : millimeter

Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

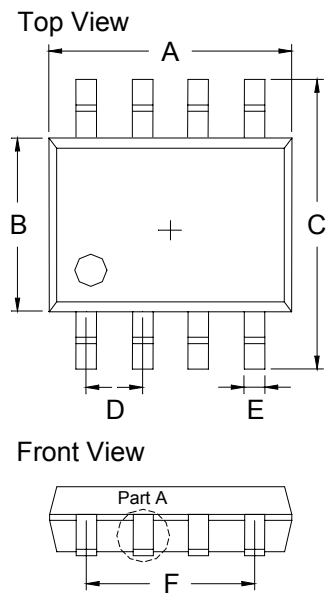
Recommended temperature profile for IR reflow

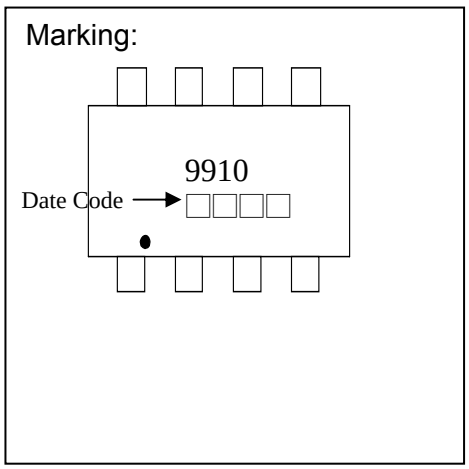


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(T_S min) −Temperature Max(T_S max) −Time($t_{s\ min}$ to $t_{s\ max}$)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (T_L) − Time (t_L)	 183°C 60-150 seconds	 217°C 60-150 seconds
Peak Temperature(T_P)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

SO-8 Dimension





8-Lead SO-8 Plastic Package
CYStek Package Code: Q8

*: Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1909	0.2007	4.85	5.10	I	0.0019	0.0078	0.05	0.20
B	0.1515	0.1555	3.85	3.95	J	0.0118	0.0275	0.30	0.70
C	0.2283	0.2441	5.80	6.20	K	0.0074	0.0098	0.19	0.25
D	0.0480	0.0519	1.22	1.32	L	0.0145	0.0204	0.37	0.52
E	0.0145	0.0185	0.37	0.47	M	0.0118	0.0197	0.30	0.50
F	0.1472	0.1527	3.74	3.88	N	0.0031	0.0051	0.08	0.13
G	0.0570	0.0649	1.45	1.65	O	0.0000	0.0059	0.00	0.15
H	0.1889	0.2007	4.80	5.10					

Notes: 1.Controlling dimension: millimeters.
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material:

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.