Designed and produced by Diodes Zetex Applications team, Oldham, UK

ZXLD1370EV3 EVALUATION BOARD USER GUIDE

9 AMP HIGH CURRENT BUCK LED DRIVER APPLICATION

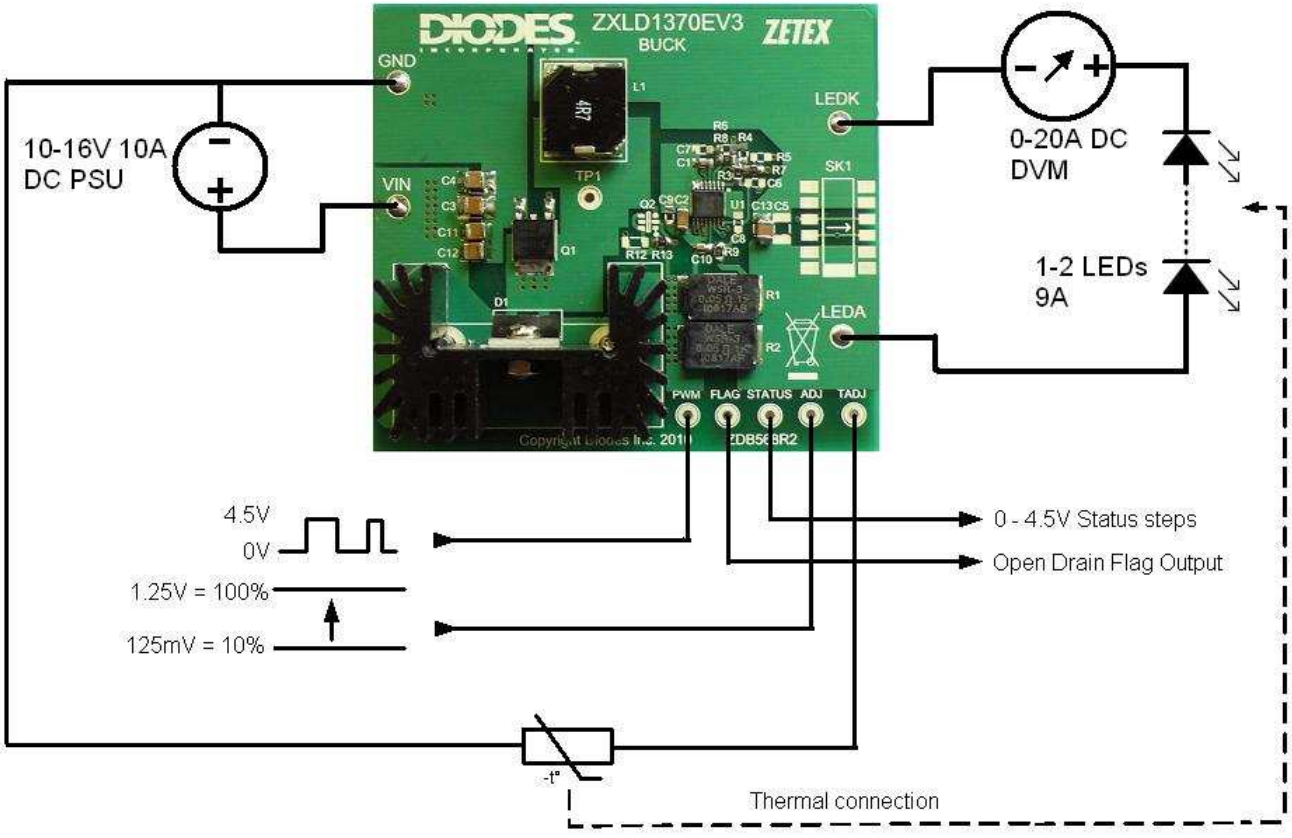


Fig. 1 ZXLD1370EV3 Evaluation board connection diagram

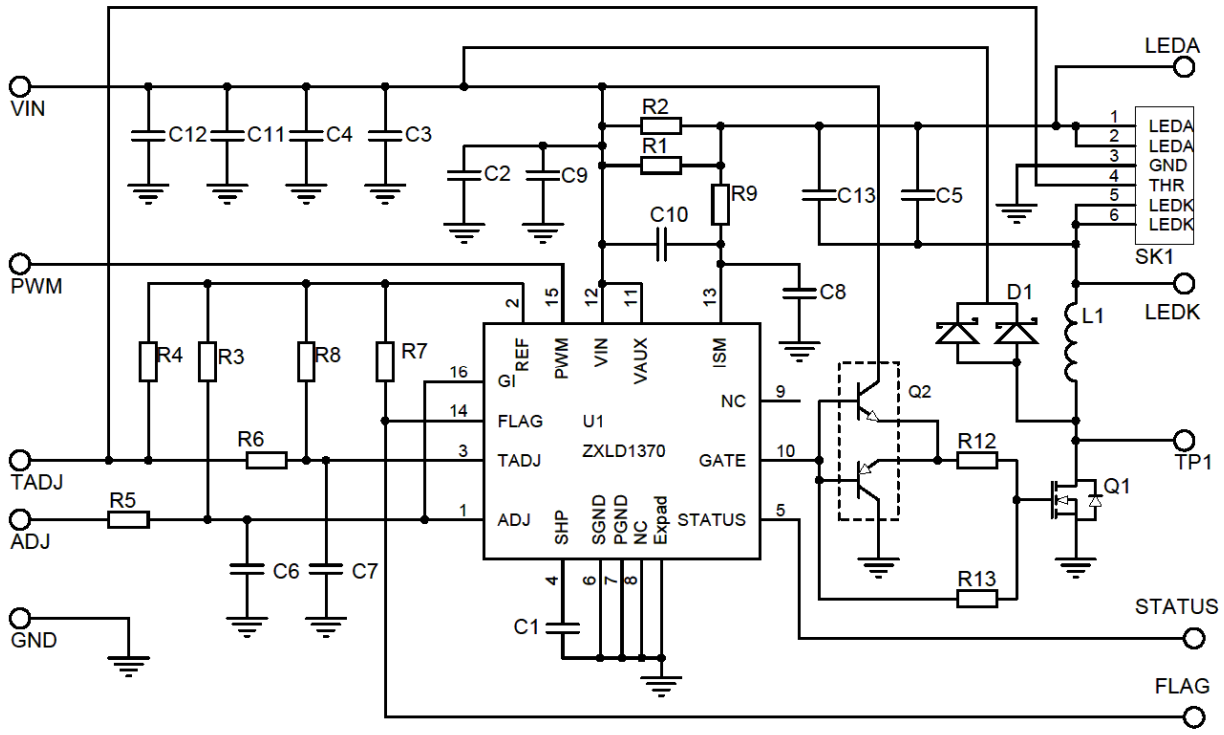


Fig. 2 ZXLD1370EV3 Schematic Diagram

PARTS LIST

Ref	Value	Package	Part Number	Manufacturer	Contact Details
U1	LED Driver Controller	TSSOP16L - EP	ZXLD1370	Diodes	www.diodes.com
Q1	30V Nch 20A MOSFET	DPAK	DMN3020LK3	Diodes	www.diodes.com
Q2	NOT FITTED				
D1	Freewheeling diode 20A X2 45V	TO220	MBR2045CTP	Diodes	www.diodes.com
L1	4.7uH 15A		SRP1270-4R7M 7443551470	Bourns Wurth	www.bourns.com www.we-online.com
C1	100pF 50V X7R	0805	Generic		www.murata.com
C2	4.7uF 25V X7R	1206	GRM31CR71E475KA88L	Murata	www.murata.com
C3 C4 C11 C12 C13	10uF 25V X7R	1210	GCM32ER71E106KA57L	Murata	www.murata.com
C5 C6 C7 C8 C9	NOT FITTED				
C10	10nF 50V X7R	0805	Generic		www.murata.com
R1 R2	0R05 1%	4527	WSR3R0500FEA WSR2R0500FEA	Vishay Vishay	www.vishay.com www.vishay.com
R3 R8	0R	0805	Generic		
R7	47K 1%	0805	Generic		
R9	33R 1%	0805	Generic		
R4 R5 R6 R12	NOT FITTED	1206			
R13	5R6 1%	0805	Generic		
HS1	Heatsnk for D1		6396BG	AVVID Thermalloy	

NOTES

The PCB is supplied with R3 and R8 0R0 resistors fitted.
The 'ADJ' pin and the 'TADJ' pin are disabled.
The LED current of the ZXLD1370EV3 boards = 9A with 2x // 0R05 = 0R025 (R1 & R2)

For other reference designs or more applications information, please see the ZXLD1370 datasheet.

DESCRIPTION

ZXLD1370EV3 is designed for LED Lighting applications which require a very high LED current such as LED projectors, entertainment lighting, emergency vehicle lighting etc. The LED current of this evaluation board is set at 9A with the input voltage ranging from 10V up to 18V.

OPERATION

In buck mode, the LED current is sensed by the resistor (R1 // R2). The 'GI' output drives the input of a comparator, and the 'ADJ'. 'GATE' drives the gate of the external NMOS switch transistor through the chip. When the NMOS switch is on, current flows from 'VIN', through (R1 // R2), the LED, the inductor and the switch to ground, and increases until a high value is reached. Then, 'GATE' goes low, the switch turns off and the current flows through (R1 // R2), the LED, the inductor and D1, back to 'VIN'. When the inductor current has gone low, 'GATE' goes high, the switch turns on, and the cycle repeats. The circuit oscillates. The average current in the LED equals the average of the maximum and minimum threshold currents. The ripple current (hysteresis) is equal to the difference between the thresholds. The control loop keeps the average LED current at the level set by the voltage on the 'ADJ' pin. Loop compensation is achieved by C1.

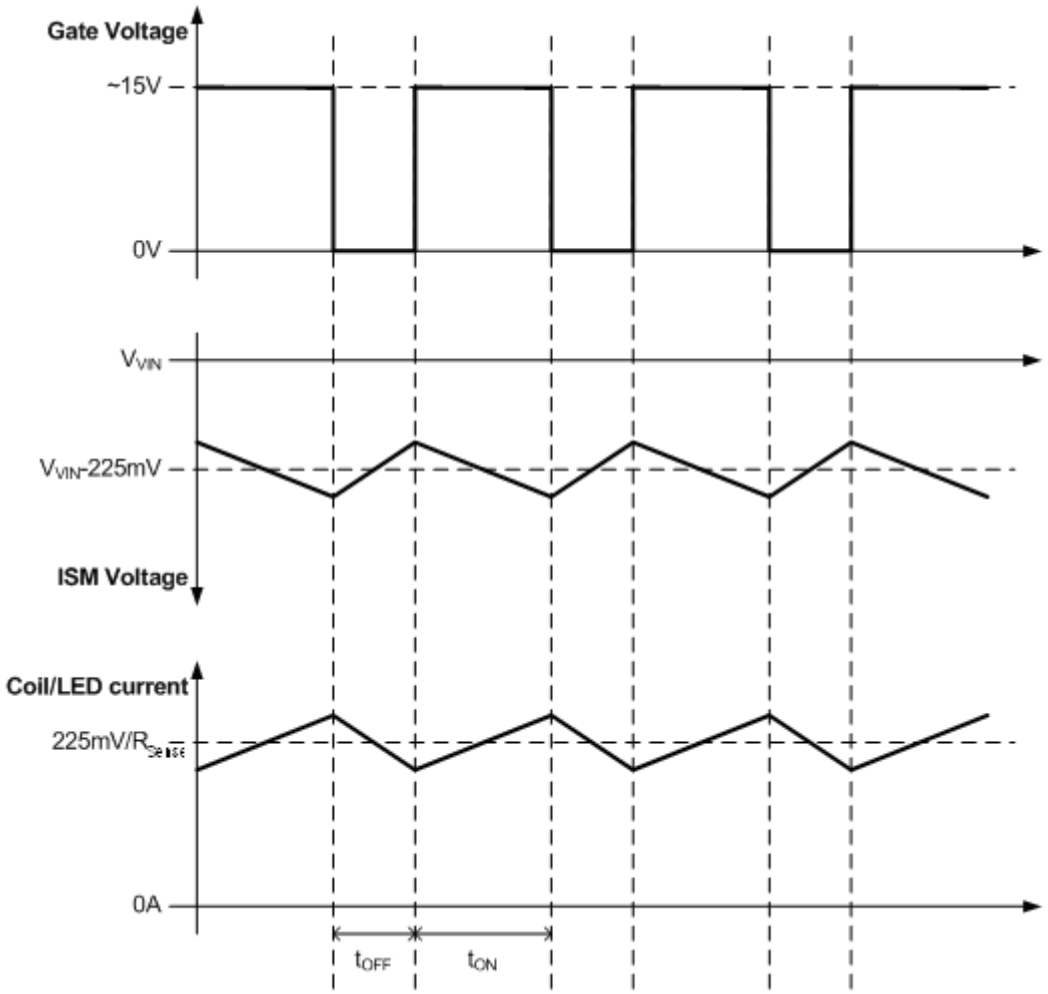


Fig. 3 Waveforms

ADJ Terminal (DC output current adjustment)
On the ZXLD1370EV3, R3 connects the 'ADJ' pin to 'V_{REF}' to give 100% LED current.
The 'ADJ' pin can be driven with an external DC voltage >=125mV and <=2.5V to adjust the LED current to >=10% and <=200% of the nominal value.
To do this, remove R3, fit R5 and apply an external DC voltage between 'ADJIN' and 'GND'.

The voltage 'V_{ADJ}' can be derived from a resistor-divider connected between 'REF' and 'GND'.

'ADJ' has a high impedance within its normal operating voltage range. An internal 2.6V clamp protects the device against high input voltages and limits the maximum output current to about 4% above the maximum current set by 'V_{ADJ}' if the maximum input voltage is exceeded.

PWM Terminal (PWM output current control/dimming)
The LED current can be adjusted digitally, by applying a low frequency PWM logic signal to the 'PWM' pin to turn the controller on and off. This will produce an average output current proportional to the duty cycle of the control signal. During PWM operation, the device remains powered-up and only the output is switched by the control signal.

The device can be shut down by taking the 'PWM' pin to to <0.4V with a short to 0V or via a suitable open collector NPN, or open drain NMOS transistor, for >15ms. In shutdown, most of the circuitry inside the device is off and the quiescent current will be typically 90µA.

TADJ Terminal (Thermal control of LED current)

The Thermal control circuit monitors the voltage on the 'TADJ' pin and reduces the output current linearly if the voltage on 'TADJ' < 625mV. An NTC thermistor and resistor can be connected to set the voltage on the 'TADJ' pin = 625mV at the required threshold temperature. This will give 100% LED current below the threshold temperature and <100% current above it as shown in the graph. The temperature threshold can be changed by adjusting the value of Rth and/or the thermistor to suit the LED used.

On the ZXLD1370EV3, Rth is 1K3 (R4). To use Thermal control, remove R8, fit R6, and fit a 10K NTC (Negative Temperature Coefficient) type thermistor between 'TADJ' and 'GND'. This will set the threshold temperature to ~90ºC.

Thermal control by LED current reduction

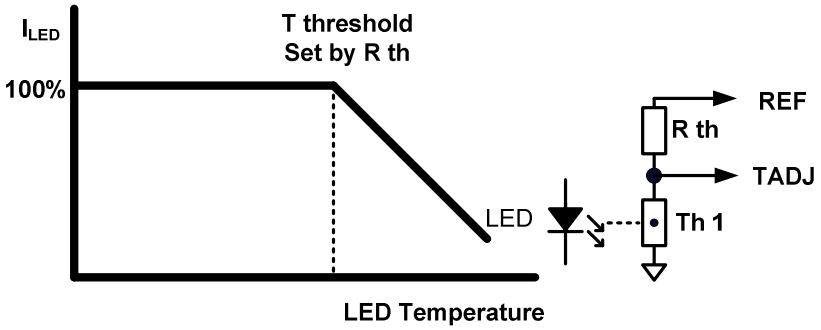
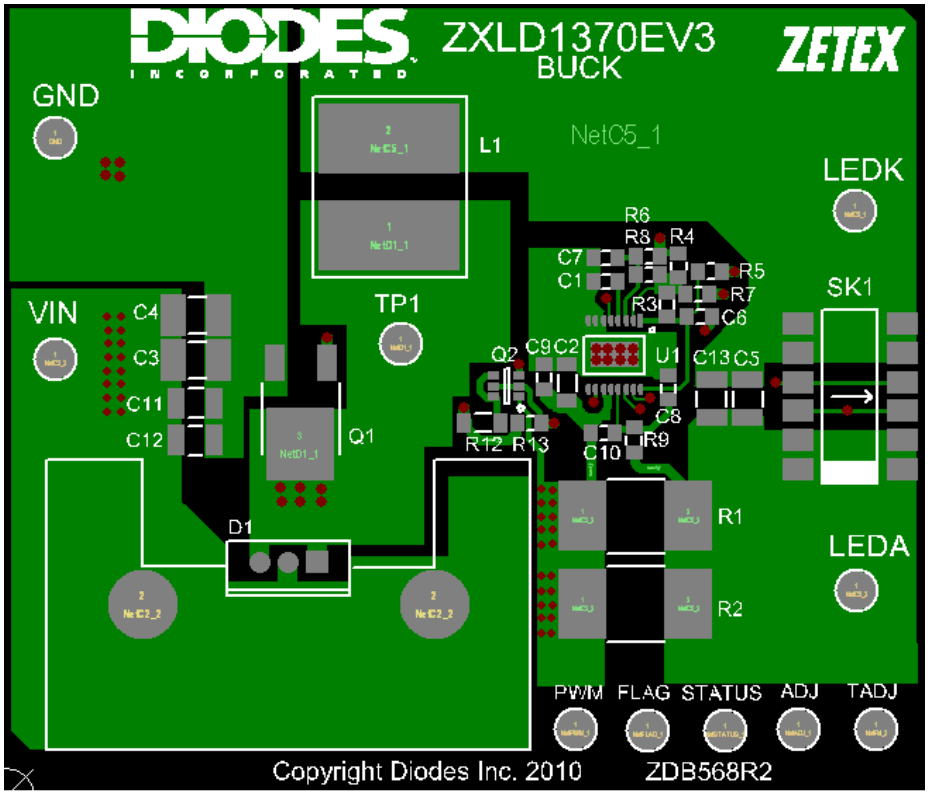
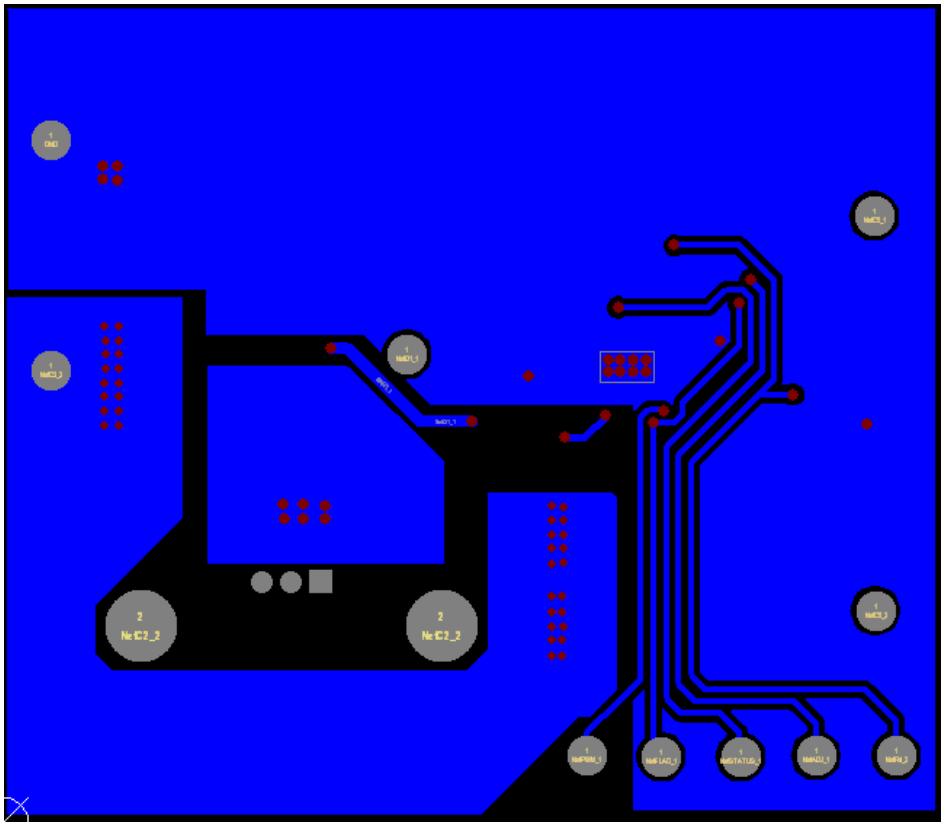


Fig. 4 Thermal control

The Thermal Control feature can be disabled by connecting 'TADJ' to 'REF' through the jumper resistor R8.

BOARD LAYOUT





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