CAT37

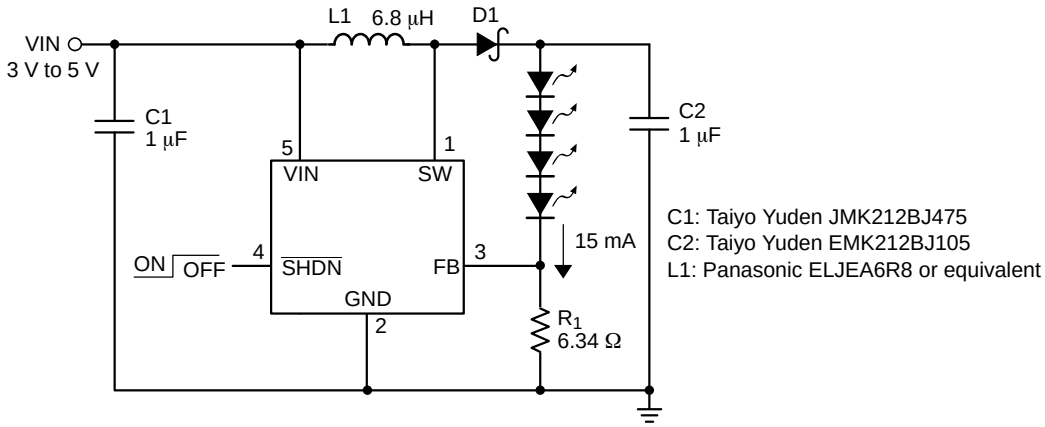
CMOS White LED Driver Boost Converter

The CAT37 is a DC/DC step up converter that delivers a regulated output current. Operation at a constant switching frequency of 1.2 MHz allows the device to be used with very small value external inductor and ceramic capacitors.

The CAT37 is targeted to drive multiple white light emitting diodes (LEDs) connected in series and provides the necessary regulated current to control the brightness and the color purity. An external resistor R1 controls the output current level. LED currents of up to 40 mA can be supported over a wide range of input supply voltages from 2.5 V to 7 V, making8(y.tF(/TT6 1 Tf1 0 0 10.70 283.32 Tm.0095 Tw[(Input V)132(oltage Operation down to 2.5 V)]TJ/F1 1 Tf12 0 0 12 59.76 26

2. NiPdAu Plated Finish (RoHS−compliant).

Publication Order Number:



[redacted]

1	SW	Switch pin. This is the drain of the internal power switch. For minimum EMI, minimize the trace area connected to this pin.
2	GND	Ground pin. Connect pin 2 to ground.
3	FB	LED (cathode) connection pin.
4	$\overline{SHDN}$	Shutdown pin.
5	VIN	Input supply pin. This pin should be bypassed with a capacitor to ground. A 1 μF capacitor mounted close to the pin is recommended.

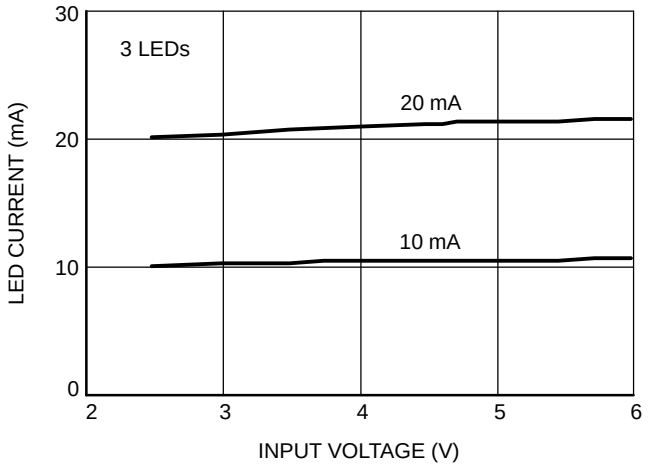
V_{IN}, FB, $\overline{SHDN}$ voltage	8	V
SW voltage	20	V
Storage Temperature Range	−65 to +160	°C
Junction Temperature	125	°C
Lead Soldering Temperature (10 secs)	300	°C
ESD Rating – Human Body Model	2000	V

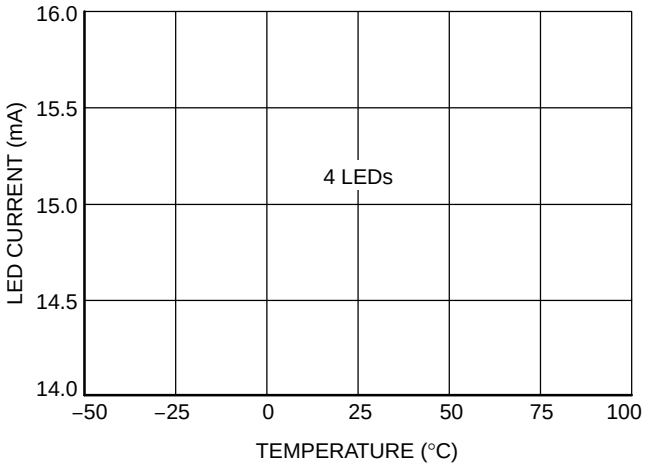
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

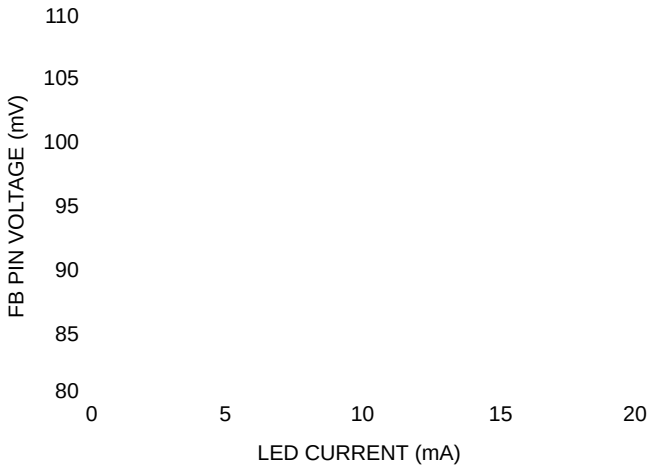
(Over recommended operating conditions unless otherwise specified. T_A = 25°C, V_{IN} = 3 V and $V_{\overline{SHDN}}$ = 3 V.)

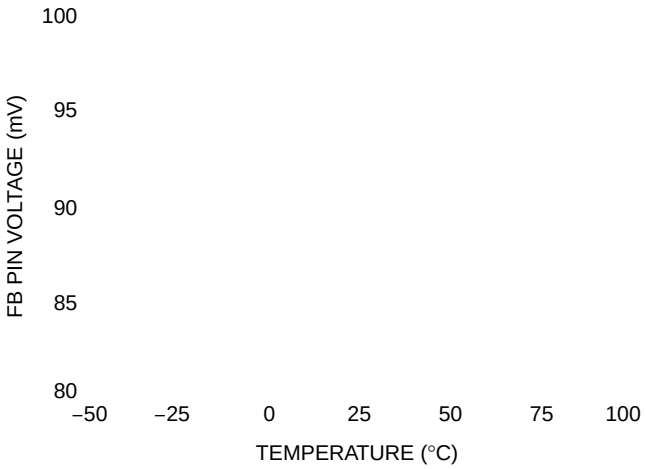
	Input Voltage Range		2.5		7	V
I_Q	Quiescent Current	V_{FB} = 0.2 V		0.5	0.7	mA
I_{SD}	Shutdown Current	V_{SHDN} = 0 V		0.05	1	μA

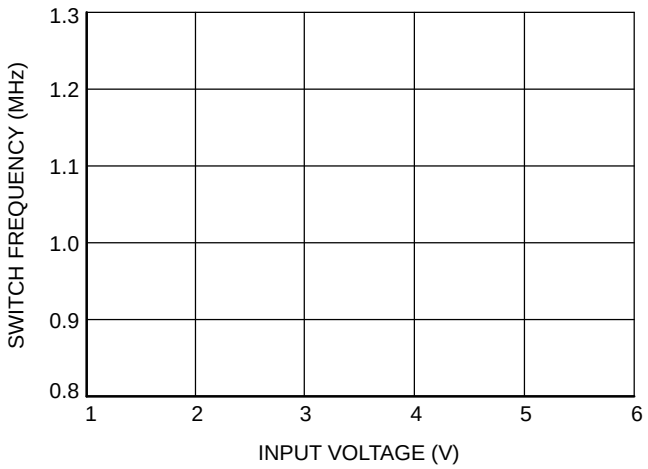
(V_{IN} = 3.6 V, T_{AMB} = 25°C, C_{IN} = 4.7 μF, C_{OUT} = 1 μF, L = 6.8 μH, unless otherwise specified.)

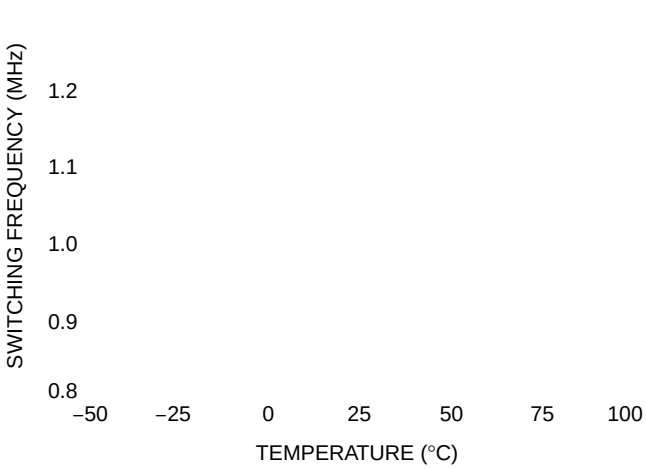




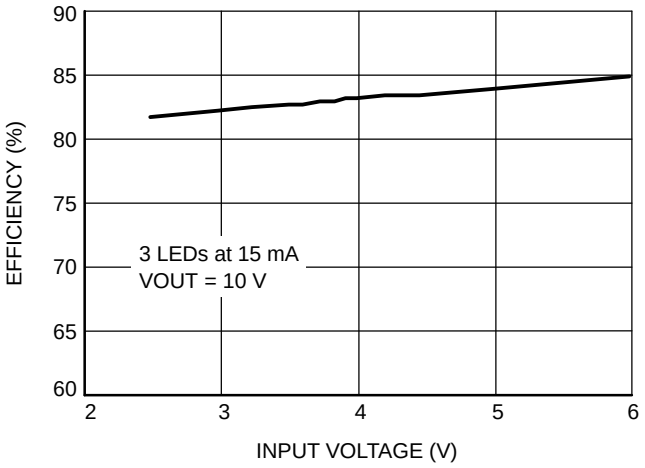


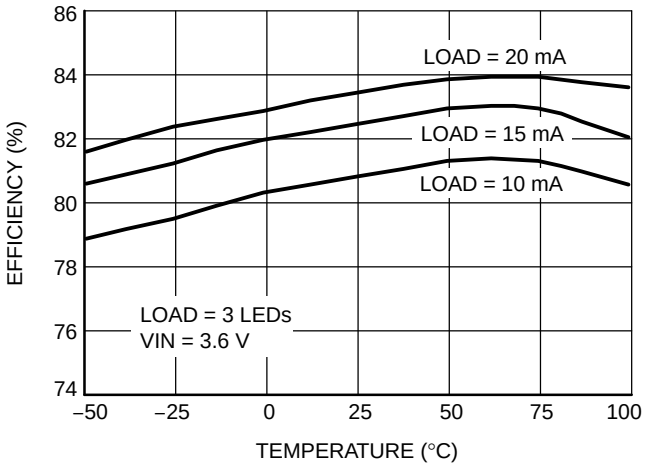


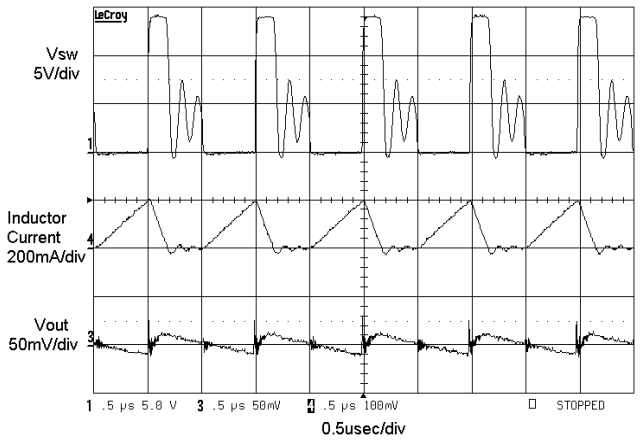


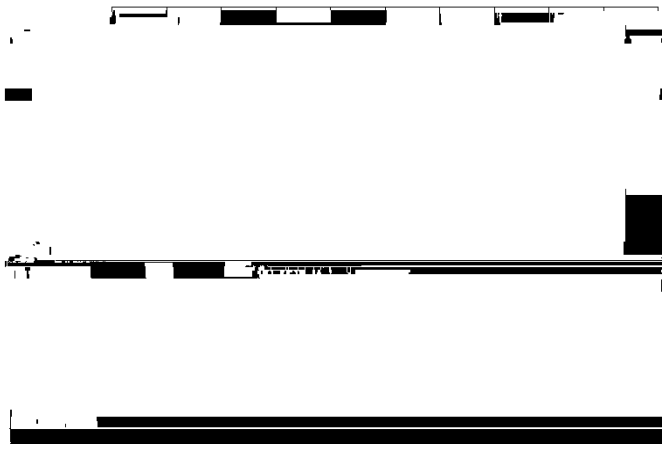


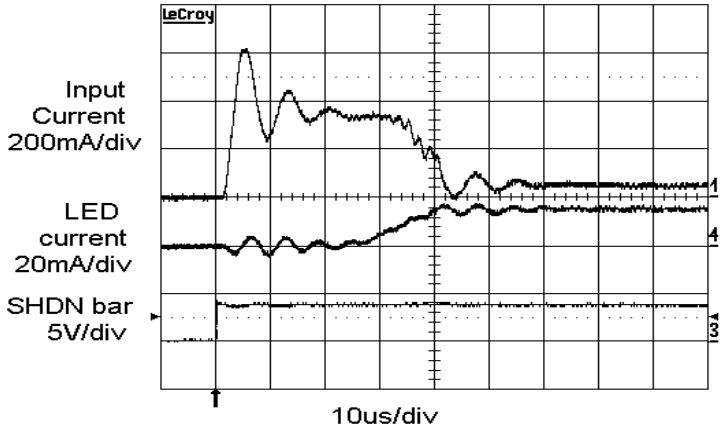
(V_{IN} = 3.6 V, T_{AMB} = 25°C, C_{IN} = 4.7 μF, C_{OUT} = 1 μF, L = 6.8 μH, unless otherwise specified.)











The CAT37 device is a high efficiency, constant frequency, current regulating boost driver for white LEDs.

The device includes a switch and an internally compensated loop for the regulation of the current in the LEDs.

Operation can be best understood by examining the block diagram. The FB pin is regulated at 95 mV and the current through the external resistor will set the regulated current in the LEDs at:

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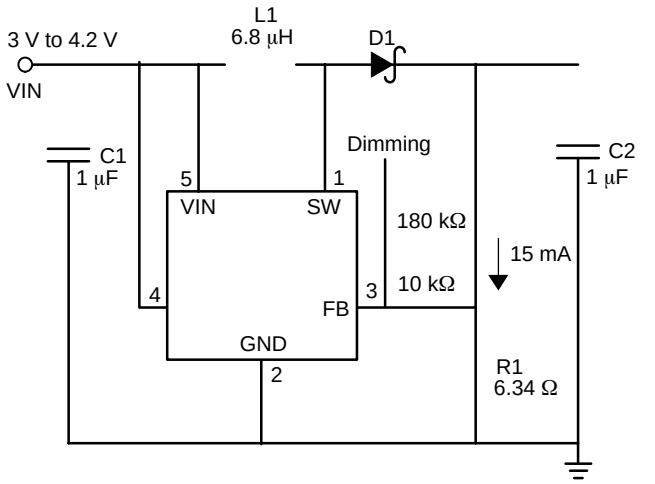
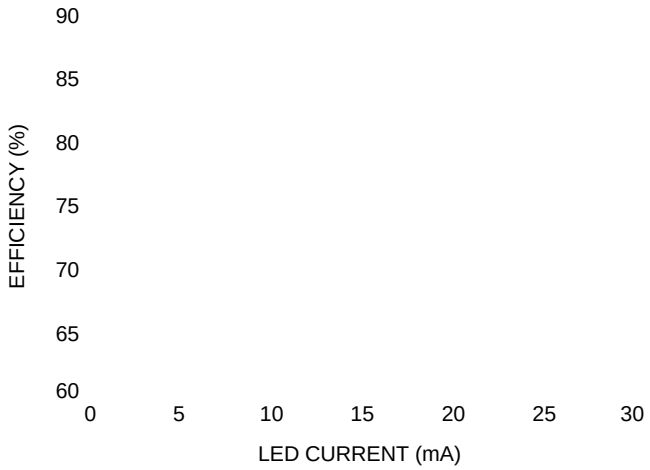
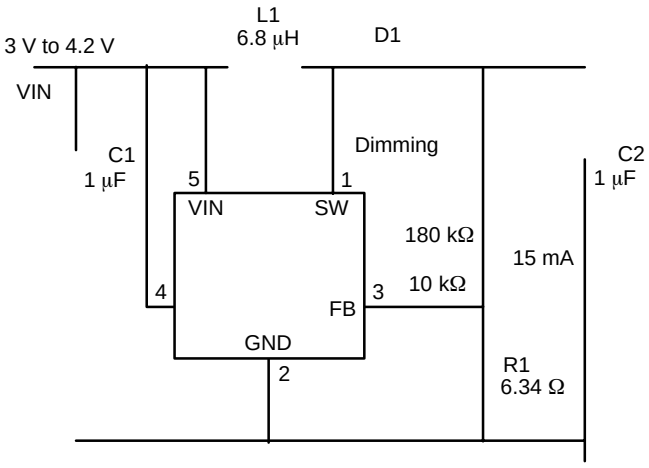
Low ESR (equivalent series resistance) capacitors should be used at the output to minimize the output ripple voltage. The low ESR and small package options available with multilayer ceramic capacitors make them excellent choices. The X5R and X7R capacitor types are preferred because

Dimming the LEDs can be done by applying a variable DC voltage as shown on Figure 14. As the V_{DC} increase the voltage across R1 decreases and therefore lower the LED current. The resistors R2 and R3 must be large enough so that their current (tens of μA) is much smaller than the LED current but much larger than the FB leakage current (I_{FB}). When adjusting V_{DC} between 0 V and 2 V, the resistors shown on Figure 14 will set the LED current between 0 mA and 15 mA.

PWM brightness control provides the widest dimming range (greater than 20:1). By turning the LEDs ON and OFF


3 V to 4.2 V
VIN
L1
6.8 µH
D1
C1
1 µF
5
VIN
SW
1
Dimming
180 kΩ
10 kΩ
15 mA
C2
1 µF
4
FB
3
GND
2
R1
6.34 Ω


EFFICIENCY (%)
90
85
80
75
70
65
60
0
5
10
15
20
25
30
LED CURRENT (mA)


3 V to 4.2 V
VIN
L1
6.8 µH
D1
C1
1 µF
5
VIN
SW
1
Dimming
180 kΩ
10 kΩ
15 mA
C2
1 µF
4
FB
3
GND
2
R1
6.34 Ω

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