4 Channels Pulse Dimming Current Source for WLED Driver

General Description

The RP2404 low-dropout bias supply for white LEDs is a high-performance alternative to the simple ballast resistors used in conventional white LED designs. The RP2404 uses an internal resistor to set the bias current for 4LEDs, which are matched to 2%. The RP2404's advantages over ballast resistors include much lower bias variation with supply voltage variation, significantly lower dropout voltage , and in some applictions, significantly improved efficiency.

RP2404 is available in WQFN 3X3-16L package. It provides the best backlighting solution with high efficiency and smallest board space for portable application.

Ordering Information

RP2404 □□

- Package Type
  QW: WQFN 3X3-16L
- Operating Temperature Range
  G: Green (Halogen Free with Commercial Standard

Note :

Richpower Green products are :

- RoHS compliant and compatible with the current requirements of IPC/JEDEC J-STD-020.
- Suitable for use in SnPb or Pb-free soldering processes.

Features

- **Low 50mV Dropout at 20mA**
- **16 Steps Pulse Dimming**
- **2% LED Current Matching**
- **2.7V to 4.5V Supply Voltage Range**
- **Thermal Shutdown Protection**

Applications

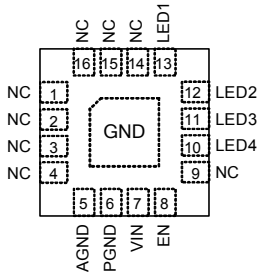
- Camera Phone, Smart Phone, MP3
- White LED Backlighting

Marking Information

For marking information, contact our sales representative directly or through a Richpower distributor located in your area.

Pin Configurations

(TOP VIEW)



WQFN 3x3-16L

Typical Application Circuit

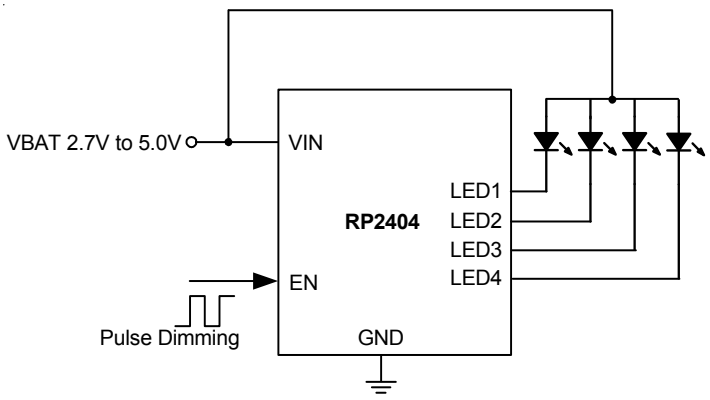


Figure 1. Application circuit of RP2404

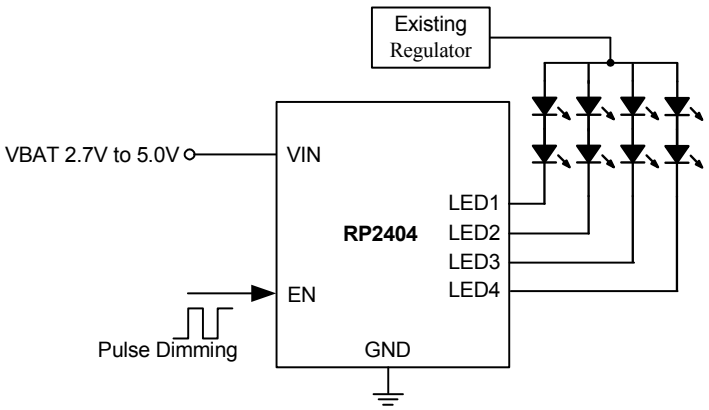
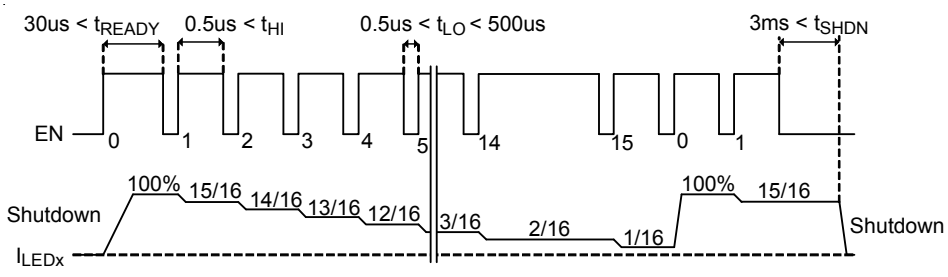


Figure 2. Application circuit of RP2404 with existing Regulator

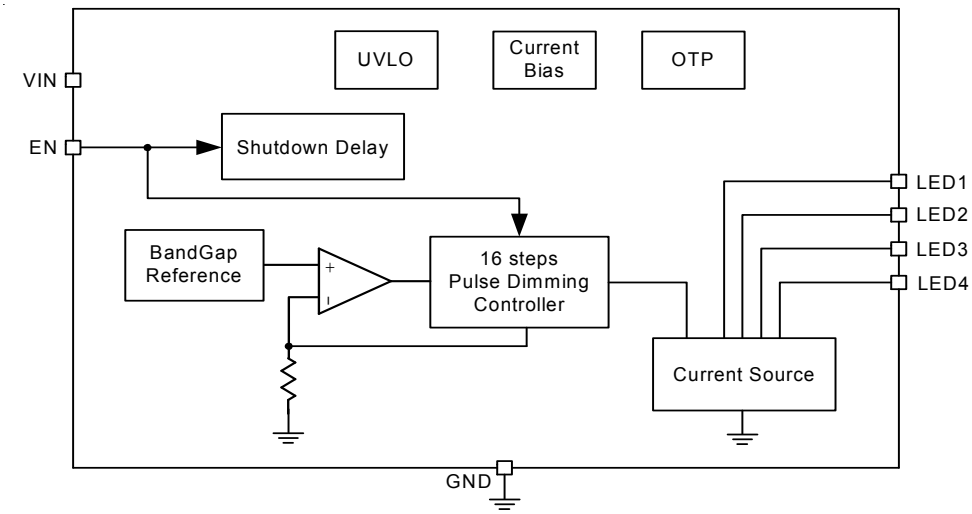
Timing Diagram (16-steps Pulse Dimming and Shutdown Delay)



Functional Pin Description

Pin Number	Pin Name	Pin Function
1,2,3,4,,9,14,15,16	NC	No Internal Connection.
5	AGND	Power Ground.
6	PGND	Power Ground.
7	VIN	Power Input.
8	EN	Enable Input.
10	LED 4	Current Sink for LED4. (If not in use, let this pin floating or connect to VIN)
11	LED 3	Current Sink for LED3. (If not in use, let this pin floating or connect to VIN)
12	LED 2	Current Sink for LED2. (If not in use, let this pin floating or connect to VIN)
13	LED 1	Current Sink for LED1. (If not in use, let this pin floating or connect to VIN)
Exposed Pad	GND	Exposed pad should be soldered to PCB board and connected to GND.

Function Block Diagram



Absolute Maximum Ratings (Note 1)

- Supply Input Voltage ---------- –0.3V to 5V
- Output Voltage(V_{OUT}) ---------- –5V to 0.3V
- Power Dissipation, P_D @ T_A = 25°C
  WQFN 3x3-16L ---------- 1.47W
- Package Thermal Resistance (Note 4)
  WQFN 3x3-16L, θ_{JA} ---------- 68°C/W
- Lead Temperature (Soldering, 10 sec.) ---------- 260°C
- Storage Temperature Range ---------- –65°C to 150°C
- ESD Susceptibility (Note 2)
  HBM (Human Body Mode) ---------- 2kV
  MM (Machine Mode) ---------- 200V

Recommended Operating Conditions (Note 3)

- Ambient Temperature Range ---------- –40°C to 85°C
- Junction Temperature Range ---------- –40°C to 125°C

Electrical Characteristics

(V_{IN} = 3.6V, V_F = 3.5V , unless otherwise specified)

Parameter	Test Conditions	Min	Typ	Max	Units
Input Power Supply					
Input Supply Voltage		2.7	--	4.5	V
Under-Voltage Lockout Threshold	V_{IN} Falling	1.8	2.1	2.4	V
Under-Voltage Lockout Hysteresis		--	100	--	mV
Quiescent Current	I_{LEDX} = 5mA, V_{IN} = 4.5V	--	--	600	µA
Shutdown Current	V_{IN} = 4.5V	--	0.1	1	µA
LED Current					
I_{LEDX} Accuracy	I_{LEDX} =20mA, (For internal Rest and external Rest)	-5	0	+5	%
Current Matching	I_{LEDX} =20mA, (For internal Rest and external Rest)	-2	0	+2	%
Drop-out Voltage	I_{LEDX} =20mA X 0.9	--	50	100	mV

To be continued

Parameter	Test Conditions	Min	Typ	Max	Units
Enable					
EN High Level Input Voltage	V_{IN}	1.2	--	--	V
EN Low Level Input Voltage	V_{IL}	--	--	0.4	V
EN Low Time for Dimming		0.5	30	--	μS
EN High Time for Dimming		0.5	--	--	μS
EN Low to Shutdown Delay	T_{SHDN}	3	--	--	mS
EN High Level Input Current	I_{IH} (V_{IH} =1.2V)	--	5	10	μA
EN Low Level Input Current	I_{IL} (V_{IL} =0.4V)	--	5	10	μA
Protection					
Thermal Shutdown		--	160	--	°C
Thermal Shutdown Hysteresis		--	20	--	°C

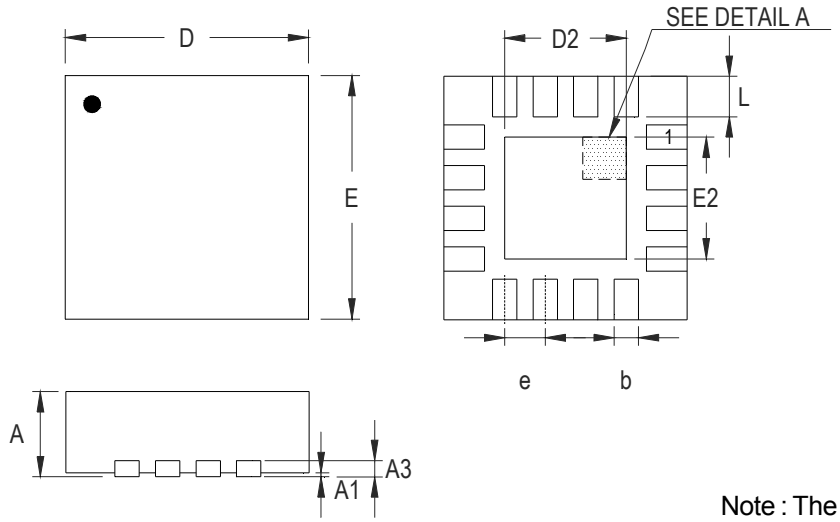
Note 1. Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

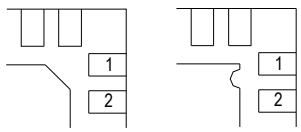
Note 2. Devices are ESD sensitive. Handling precaution recommended.

Note 3. The device is not guaranteed to function outside its operating conditions.

Note 4. θ_{JA} is measured in the natural convection at T_A = 25°C on a low effective thermal conductivity test board (Single Layer, 1S) of JEDEC 51-3 thermal measurement standard.

Outline Dimension





DETAIL A

Pin #1 ID and Tie Bar Mark Options

Note : The configuration of the Pin #1 identifier is optional, but must be located within the zone indicated.

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A3	0.175	0.250	0.007	0.010
b	0.180	0.300	0.007	0.012
D	2.950	3.050	0.116	0.120
D2	1.300	1.750	0.051	0.069
E	2.950	3.050	0.116	0.120
E2	1.300	1.750	0.051	0.069
e	0.500		0.020	
L	0.350	0.450	0.014	0.018

W-Type 16L QFN 3x3 Package

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