PT4412

White/Blue LED Driver for Li-Io Battery Applications

GENERAL DESCRIPTION

The PT4412 is a series of White/Blue LED drivers. There is no external component needed, which helps to lower the system cost significantly. The circuit is optimized to provide over 90% efficiency. The PT4412 is ideal to drive white LEDs used for Li-ion battery powered LCD displays. The LED brightness can be adjusted in real time through a PWM signal at the EN pin. The target end applications are small color LCD displays in mobile phones, smart phone, digital cameras, PDA etc. PT4412 is available in SOT23-6 package.

FEATURES

- No external component required
- Fixed 20mA and 15mA sinking current
- Individual current sink circuit for each output to prevent short/open circuit on LEDs
- PTC LED current for luminosity compensation
- 4 channels available
- PWM tuned LED brightness through EN pin
- Supply voltage range 2.7V~6.0V
- 0.1uA standby current

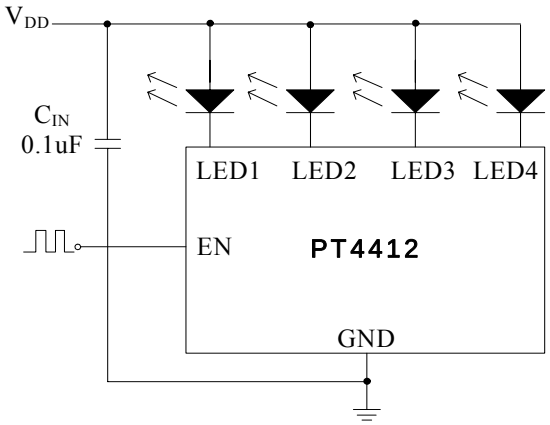
APPLICATIONS

- Small Size Color LCD Backlights
- Mobile Phone, Smart Phone, PDA etc. Backlights

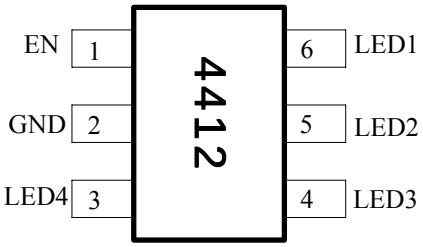
ORDERING INFORMATION

PACKAGE	TEMPERATURE RANGE	LED CURRENT	PART NUMBER	TRANSPORT MEDIA
SOT-23-6	-40℃ to 85℃	20mA	PT4412E23F-20	Tape and Reel, 3000 units
		15mA	PT4412E23F-15	

TYPICAL APPLICATIONS



PIN ASSIGNMENT



SOT23-6

PIN DESCRIPTIONS

SYMBOL	SOT23-6	DESCRPTION
EN	1	Chip Enable (Active High)
GND	2	Ground
LED1~ LED4	3~6	Output Pin. Connect to LED's cathode.

ABSOLUTE MAXIMUM RATINGS (Note 1)

PARAMETER		VALUE	UNIT
V_{EN} Range		-0.3~6.5V	V
V_{LEDn} Range		-0.3~6.5V	V
Maximum Junction Temp.		150	°C
Storage Temp.		-40~150	°C
Lead Temp.		260	°C
Maximum Power Dissipation	SOT23-6	568	mW

RECOMMENDED OPERATING RANGE (Note 2)

PARAMETER		VALUE	UNIT
V_{IN} Range		-0.3~6.0V	V
V_{EN} Range		-0.3~5.5V	V
Thermal Resistance, θ_{JA}	SOT23-6	220	°C/W
Operating Temp.		-40~85	°C

Note 1: Junction Temperature: $T_J = T_A + P_D \times \Theta_{JA}$
P_D: Power Dissipation, T_A: Ambient Temperature, Θ_{JA}: Thermal resistance of Junction to Ambient
The numbers are guidelines for the thermal performance of the device/PC-board system

Note 2: Recommended operating Range indicates conditions for which the device is functional, but does not guarantee specific performance limits.

ELECTRICAL CHARACTERISTICS (Note 3,4,5)

Unless otherwise specified: V_{DD}=3.7V, EN= V_{DD}, T_A=25°C。

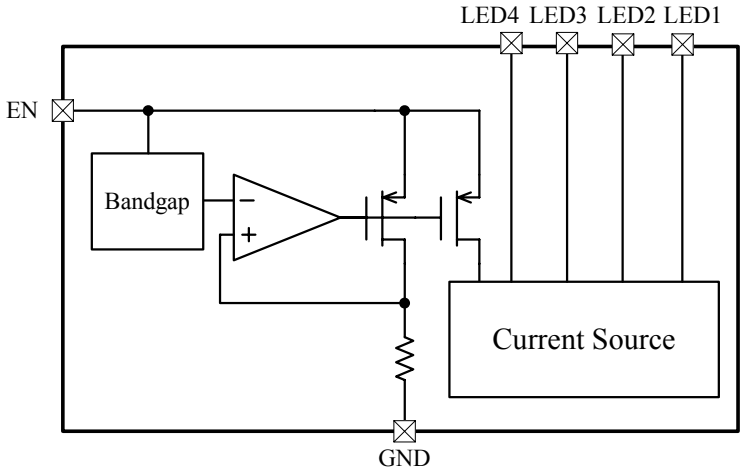
SYMBOL	PARAMETER		CONDITION	MIN.	TYP.	MAX.	UNIT
V_{DD}	Input Voltage			2.7		6.0	V
V_{LEDL}	LED Dropout Voltage		I_{LEDn} = 20mA V_{LEDn} @I_{LEDn} = 90% × $I_{LED(nom)}$		75	90	mV
I_{LED}	LED Sink Current	PT4412E23F-20		18	20	22	mA
		PT4412E23F-15		13.5	15	16.5	
D_{LED}	LED Sink Current Deviation		Measure [$I_{LEDn(max)}$ - $I_{LEDn(average)}$] and [$I_{LEDn(average)}$ - $I_{LEDn(min)}$]			±3	%
I_{DD}	Supply Current				260	380	uA
I_{SHUT}	Shutdown Current				0.1	1	uA
I_{EN}	Maximum Input Current at EN		EN = 0		±1		nA
V_{IL}	Maximum Low Input Level at EN					0.4	V
V_{IH}	Minimum High Input Level at EN			2			V

Note 3: Electrical Characteristics state DC and AC electrical specifications under particular test conditions which guarantee specific performance limits. This assumes that the device is within the recommended operating Range. Specifications are not guaranteed for parameters where no limit is given, however, the typical value is a good indication of device performance.

Note 4: Typicals are measured at 25˚C and represent the parametric norm.

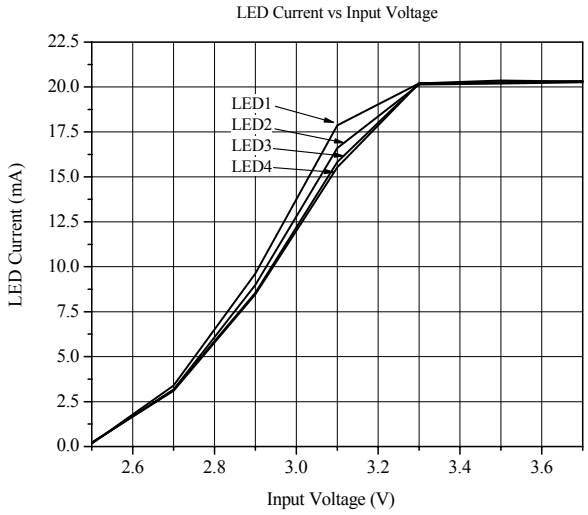
Note 5: Datasheet min/max specification limits are guaranteed by design, test, or statistical analysis.

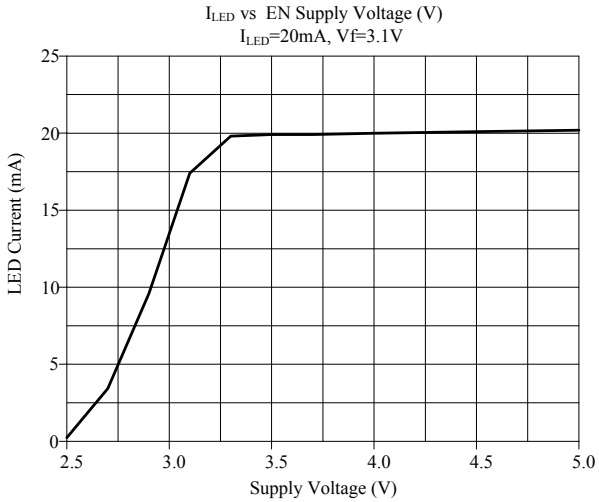
SIMPLIFIED BLOCK DIAGRAM

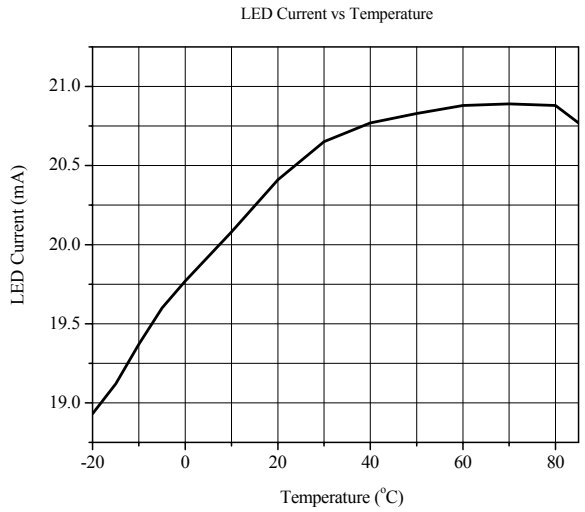


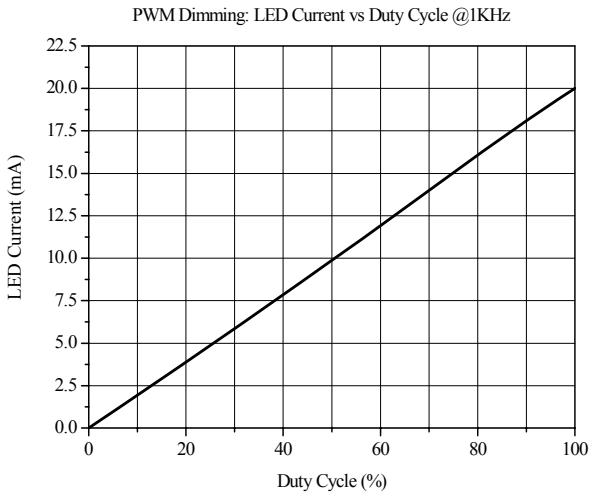
TYPICAL PERFORMANCE CHARACTERISTICS

Unless otherwise specified: V_{DD}=3.7V, Vf=3.1V, T_A=25°C。

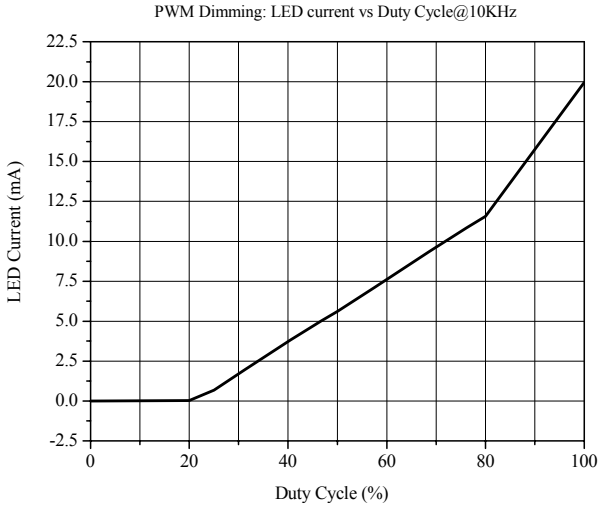


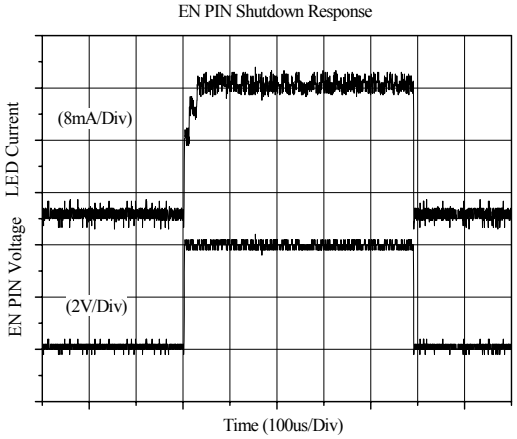


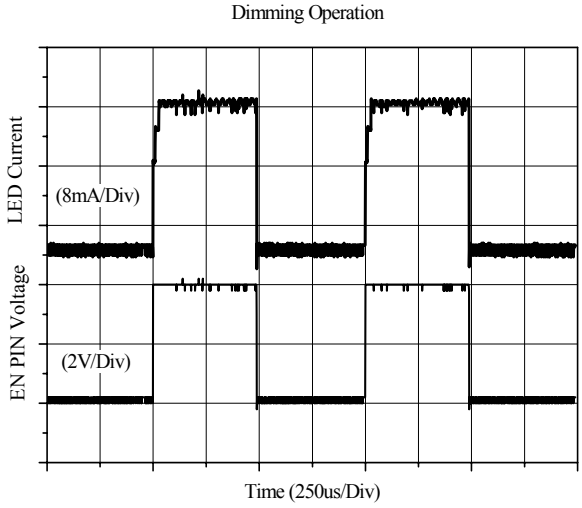




TYPICAL PERFORMANCE CHARACTERISTICS (Continued)







APPLICATION INFORMATION

Supply Voltage and Li-ion Battery Low Warning

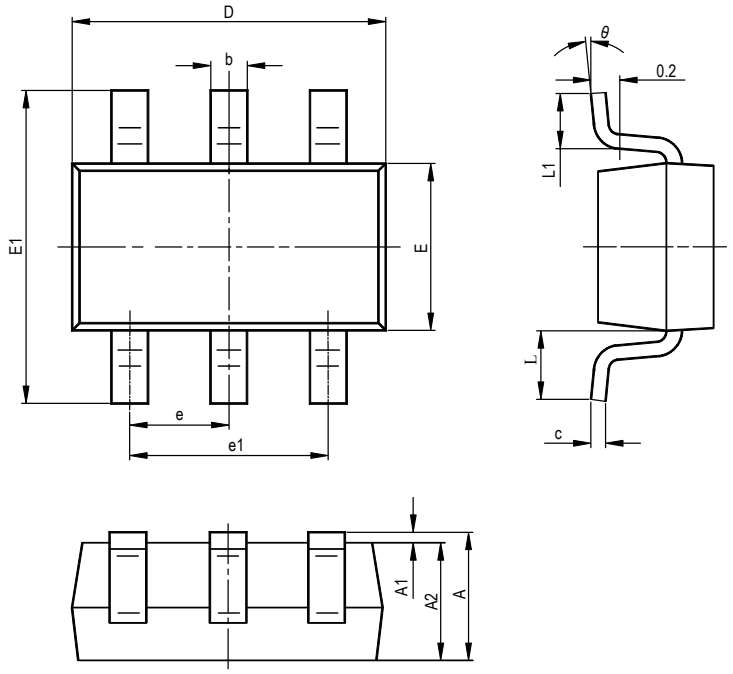
PT4412 works with supply voltage range from 2.7V to 6V. The white/blue LED forward voltage is in the range of 2.9V to 3.5V at 20mA current. The supply voltage range and LED forward voltage (V_f) should be set to fully utilize Li-ion battery energy. For example, the maximum white LED forward voltage limit at 3.2V (@ 20mA) when Li-ion battery discharge reaches 3.275V(normally around 1% ~ 3% power left in the battery). When Li-ion battery voltage is lower than the presetted low level, the LED current(brightness) will start to decrease.

Enable (EN Pin)

The EN pin of PT4412 serves two functions. One is the enable and disable of the device the other is the output sink current programming of the device. The other one is the tuning of LED currents if connected to a pulse width modulated (PWM) signal. As a result, the brightness of LEDs is adjusted through a PWM signal generated from a baseband or MCU chip. The adequate PWM frequency should be less than 20KHz in order to keep the LED current matching between LEDs. The PWM duty cycle can be changed from 5% to 95%

PACKAGE INFORMATION

SOT23-6



SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°