

GENERAL DESCRIPTION

The PT4108 is a compact, high efficiency, and low voltage step-up high brightness LED Driver with an Adaptive Current Mode PWM control loop. It comprises of an error amplifier, a ramp generator, a PWM comparator, a switch pass element and driver. It provides stable and high efficient operation over a wide range of load currents. The feedback loop is internally compensated to minimize component size. It provides a constant current drive for 3W LED with 2 Alkaline Cells or 1 lithium cell. It limits the output voltage to 5V if the output load is disconnected. The 500KHz high switching rate reduces the size of external components. Besides, the 25µA low quiescent current together with high efficiency maintains long battery lifetime. The LED current is set with one external resistors.

FEATURES

- Low Quiescent (Switch-off) Supply Current: 25µA
- High Supply Capability: Drive 3W LED with lithium cell or 2Alkaline Cell
- Zero Shutdown Mode Supply Current
- High efficiency up to 90%
- Fixed switching frequency: 500KHz
- Options for internal or external power switches
- MSOP-8 and SOT-89-5 packages are available

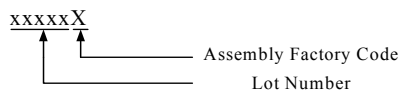
APPLICATION

- Portable lighting
- Rechargeable Flashlights

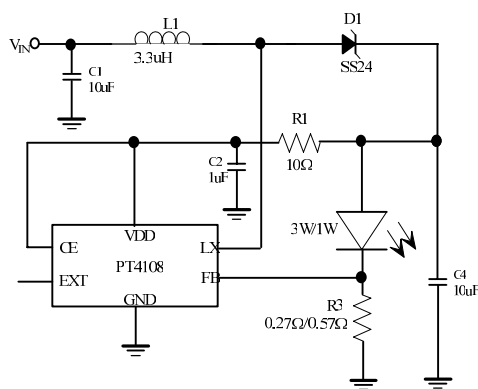
ORDERING INFORMATION

PACKAGE	TEMPERATURE RANGE	ORDERING PART NUMBER	TRANSPORT MEDIA	MARKING
MSOP-8	-40 °C to 85 °C	PT4108EMSH	Tape and Reel 3000 units	PT4108 xxxxxX
SOT-89-5	-40 °C to 85 °C	PT4108E89E	Tape and Reel 1000 units	PT4108 xxxxxX

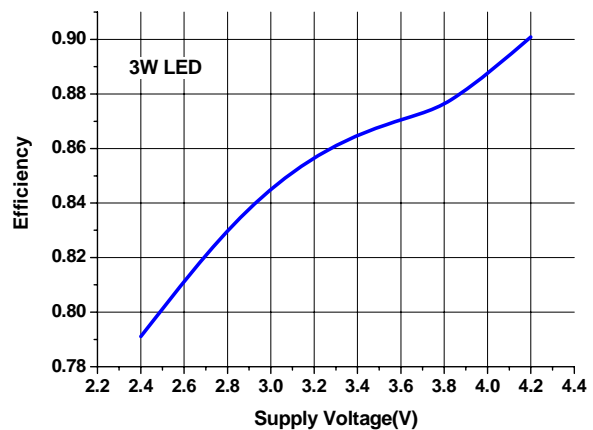
Note:



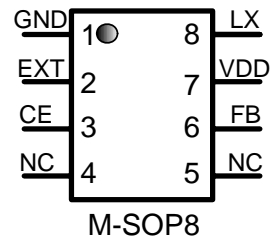
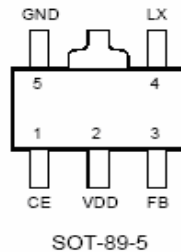
TYPICAL APPLICATION CIRCUIT



PT4108 Typical application



PIN ASSIGNMENT



PIN DESCRIPTIONS

Pin No.		PIN NAMES	DESCRIPTION
MSOP-8	SOT-89-5		
1	5	GND	Ground
2		EXT	Output pin for driving external power switch
3	1	CE	Chip enable, PT4108 gets into shutdown mode when CE pin is set to low
4		NC	Not Connected
5		NC	Not Connected
6	3	FB	Feedback input pin
7	2	VDD	Power Supply Pin
8	4	LX	Output of internal power switch

ABSOLUTE MAXIMUM RATINGS (Note 1)

SYMBOL	ITEMS	VALUE	UNIT
V_{DD}	Supply Voltage	-0.3~7.0	V
V_{LX}	LX Pin Switch Voltage	-0.3~7.0	V
V_{IO}	Voltage on other I/O Pins	-0.3 to (VDD+0.3)	V
I_{OUT}	LX Pin Output Current	2.5	A
I_{EXT}	EXT Pin Drive Current	300	mA
P_{TR1}	Package Thermal Resistance, MSOP-8 θ_{JA}	190	$^{\circ}C/W$
P_{TR2}	Package Thermal Resistance, SOT-89-5 θ_{JA}	100	$^{\circ}C/W$
T_{STG}	Storage Temperature	-65 to 150	$^{\circ}C$
T_{Solder}	Lead temperature (Soldering)	260 $^{\circ}C$, 10s	

RECOMMENDED OPERATING RANGE

SYMBOL	ITEMS	VALUE	UNIT
V _{DD}	V _{DD} Supply Voltage	+2.0 ~ +4.2	V
T _{OPT}	Operating Temperature Range	-40 to +85	°C
	ESD Susceptibility (Note 2)	3	kV

Note 1: Absolute Maximum ratings are threshold limit values that must not be exceeded even for an instant under any conditions. Moreover, such values for any two items must not be reached simultaneously. Operation above these absolute maximum ratings may cause degradation or permanent damage to the device. These are stress ratings only and do not necessarily imply functional operation below these limits. Recommended Operating Range indicates conditions for which the device is functional, but do not guarantee specific performance limits. 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 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 2: Human body model, 100pF discharged through a 1.5kΩ resistor.

ELECTRICAL CHARACTERISTICS (V_{DD}=3V) (Note 3, 4)

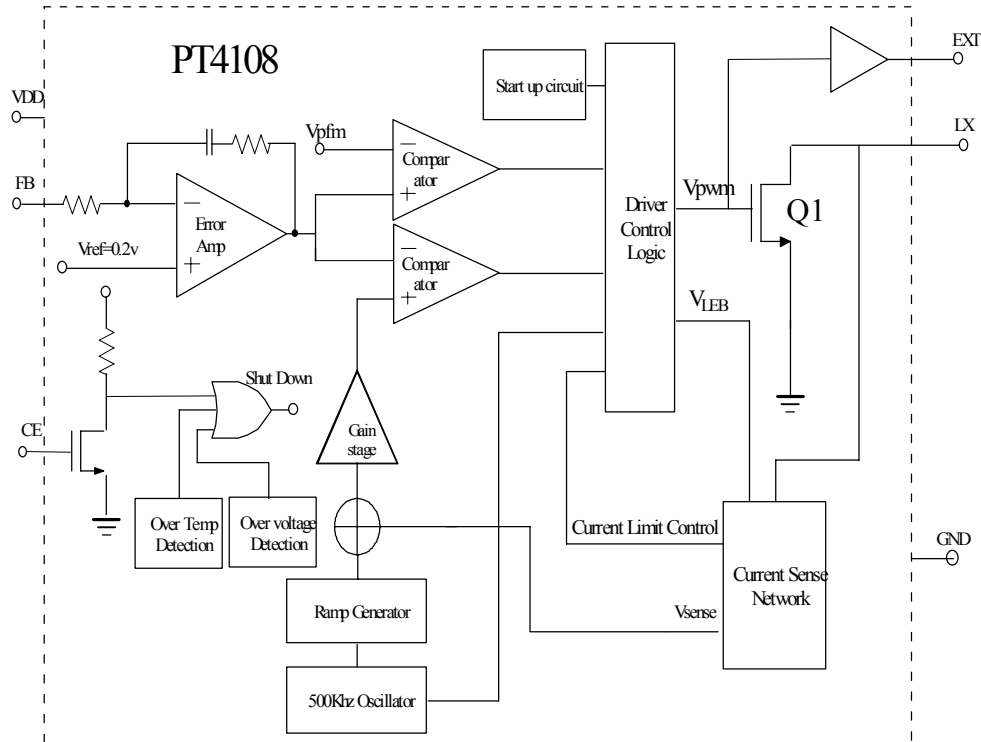
The following specifications apply for V_{IN}=V_{CE}=3V, 1W LED output, and T_A=25°C, unless otherwise specified.

SYMBOL	ITEMS	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V _{ST}	Start-UP Voltage				1.5	V
V _{DD}	Operating VDD Range	V _{DD} pin voltage	2		4.2	V
I _{OFF}	Shutdown Current I(V _{DD})	CE Pin= 0V		0.01	1	μA
I _{SWITCH}	Continuous Switching Current(V _{DD})		0.4	0.55	0.7	mA
V _{FB}	Feedback Reference Voltage	Closed Loop	0.19	0.2	0.21	V
F _S	Switching Frequency		425	500	575	kHz
D _{MAX}	Maximum Duty		85	94		%
	LX ON Resistance to V _{DD}			0.1	0.3	Ω
I _{LIMIT}	Current Limit Setting			2		A
V _{EN_L}	CE Pin Trip Level low				0.4	V
V _{EN_H}	CE Pin Trip Level high		1.5			V
V _{OV}	Over Voltage Protection	V _{IN} =V _{CE} =5V	4.2	4.7	5.2	V
TS	Temperature Stability for VFB		--	125	--	ppm/ °C
ΔTSD	Thermal Shutdown Hysteresis		--	10	--	°C

Note 3: Typical parameters are measured at 25°C and represent the parametric norm.

Note 4: Datasheet specifications with min/max limits are guaranteed by design, test, or statistical analysis.

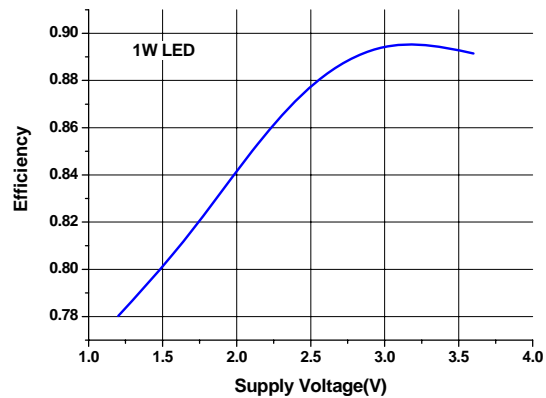
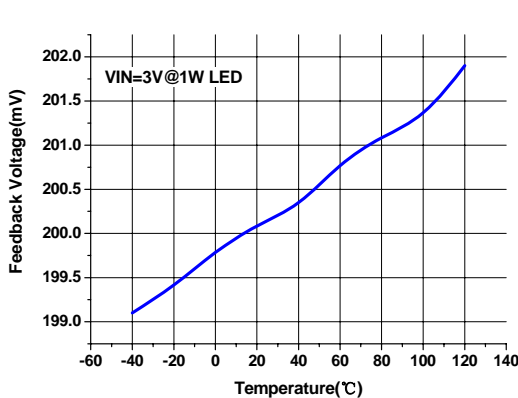
SIMPLIFIED BLOCK DIAGRAM



OPERATION DESCRIPTION

When connected according to Typical Application Circuit, a boost LED driver is formed, which drive a 1W/3W LED. The output current is regulated by controlling the Q1 on time t_{on} in a negative-feedback loop. If LED current increases, the on time is automatically increased to deliver the greater required energy to the load. If V_{in} decreases, and if t_{on} were not changed, the peak current and hence also the energy stored in L1 would decrease and the LED current would decrease. But the negative-feedback loop senses a slightly decreased output voltage and increases t_{on} to maintain LED current constant.

TYPICAL PERFORMANCE CHARACTERISTICS



APPLICATION INFORMATION

1) OUTPUT CURRENT SETTING

Referring to Typical Application Circuit, the output current of switching regulator (V_{out}) is set with following equation:

$$I_{out} = V_{fb} / R3$$

2) VDD FILTER RESISTOR SELECTION

Referring to Typical Application Circuit, the VDD filter resistor R1 is selected with proper value. In the typical application, the resistor with 10Ω is good.

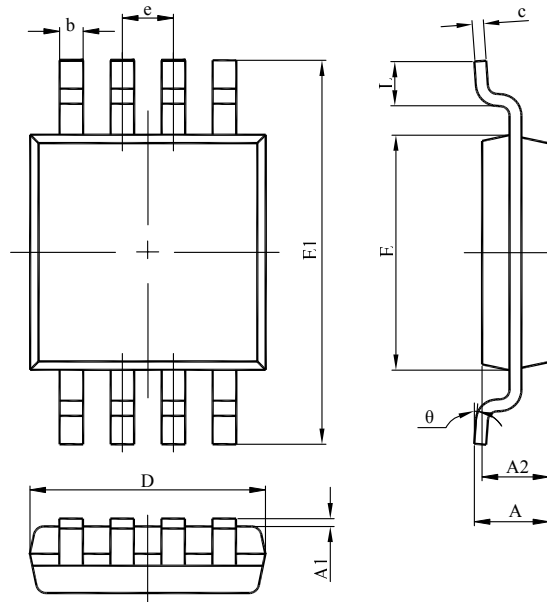
3) PCB Layout Guide

PCB Layout shall follow these guidelines for better system stability:

- A full GND plane without any gap break.
- VDD to GND bypass Cap – The $1 \mu\text{F}$ MLCC noise bypass Cap between VDD pin (pin 7 for MSOP-8 or pin 2 for SOT-89-5) and GND pin (pin 1 for MSOP-8 or pin 5 for SOT-89-5) shall have short and wide connections.
- V_{in} to GND bypass Cap – Add a Cap close to the inductor when V_{in} is not an ideal voltage source.
- Minimize the FB node copper area and keep it far away from noise sources.
- Minimize the parasitic capacitance connected to LX and EXT nodes to reduce the switch loss.

PACKAGE INFORMATION

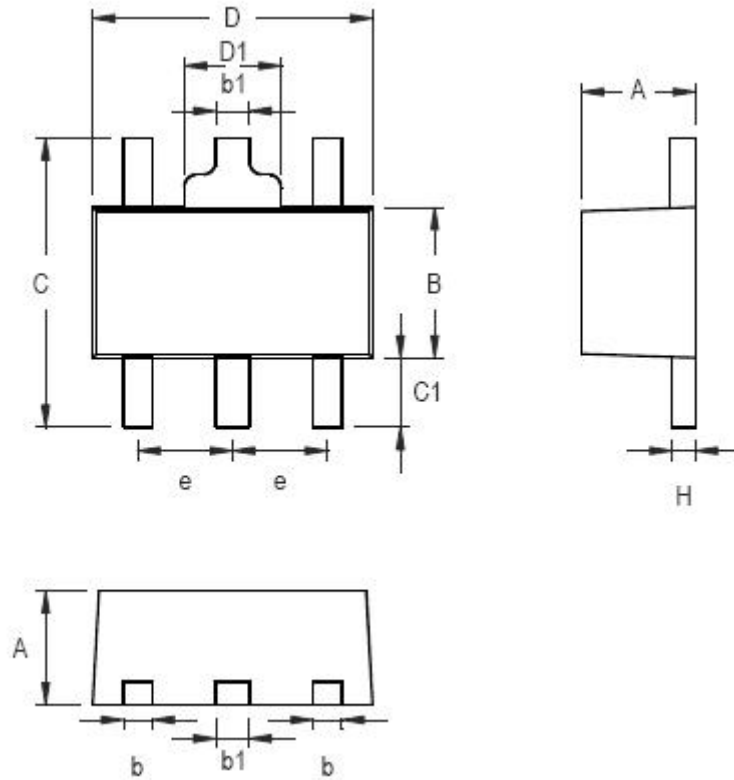
MSOP-8 Package



SYMBOL	MILLIMETERS		INCHS	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.650(BSC)		0.026(BSC)	
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

PACKAGE INFORMATION

SOT-89-5 Package



SYMBOL	MILLIMETERS		INCHS	
	MIN	MAX	MIN	MAX
A	1.400	1.600	0.055	0.063
b	0.460	0.520	0.014	0.020
B	2.400	2.600	0.094	0.102
b1	0.406	0.533	0.016	0.021
C		4.250		0.167
C1	0.800		0.031	
D	4.400	4.600	0.173	0.181
D1		1.700		0.067
e	1.400	1.600	0.055	0.063
H	0.380	0.430	0.014	0.017