PT4404

Low Dropout Adjustable 350mA Current Regulator

GENERAL DESCRIPTION

PT4404 is a low dropout current regulator with an adjustable constant sink current sink of up to 350mA. The dropout voltage at 350mA is typically 110mVwith the quiescent current of only 100μA. The enable pin is used to shutdown the chip or control the LED brightness with a PWM signal.

The built-in thermal shutdown protection shuts down the chip when the chip temperature exceeds 150°C. An external resistor can be used to set the output current level. The PT4404 is packaged with SOT-89-5.

FEATURES

- Supply voltage range: 2.7V-5.5V
- Current sink set by external resistor
- 110mV Low Dropout voltage for 350mA current output
- 100uA quiescent current
- 0.1uA shutdown current
- Built-in thermal shutdown protection
- SOT-89-5 Package

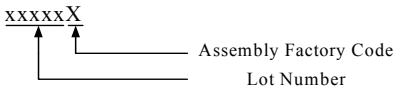
APPLICATION

- Power LED Driver
- Constant current sink

ORDERING INFORMATION

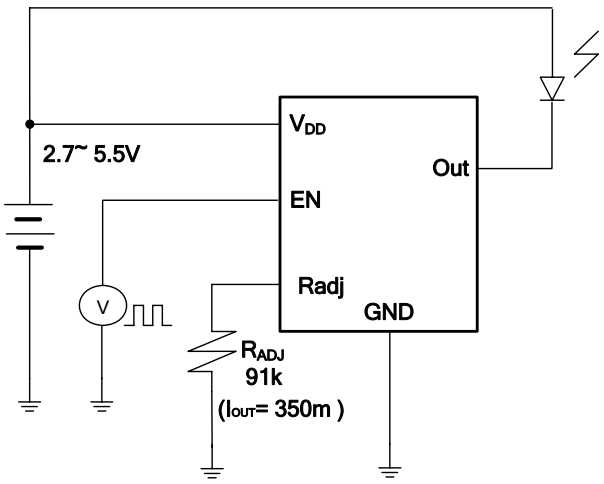
PACKAGE	TEMPERATURE RANGE	ORDERING PART NUMBER	TRANSPORMEDIA	MARKING
SOT-89-5	-40 °C to 85 °C	PT4404E89E	Tape and Reel 1000 units	PT4404 xxxxxX

Note:

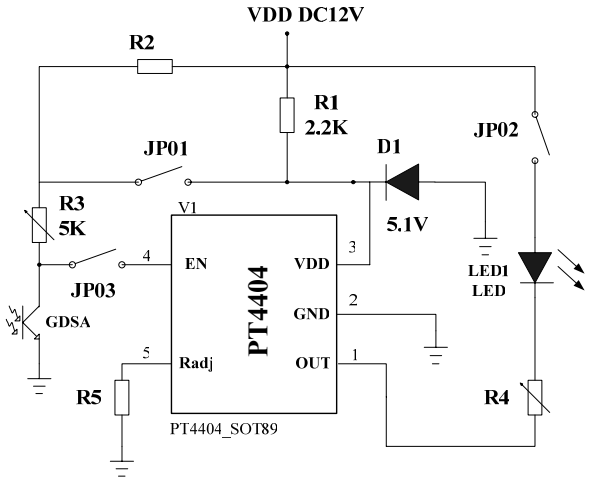


TYPICAL APPLICATION CIRCUIT

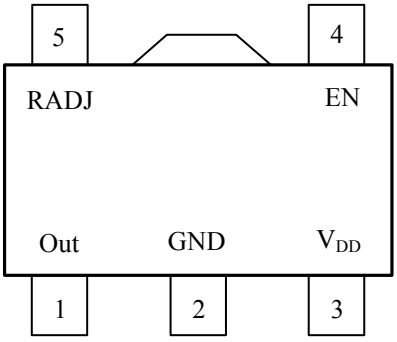
VDD≤5.5V:



VDD>5.5V:



PIN ASSIGNMENT



SOT-89-5

PIN DESCRIPTIONS

SYMBOL	SOT-89-5	DESCRIPTION
V_{DD}	3	Power Supply
GND	2	Ground
OUT	1	Adjustable Sink Current Output up to 350mA
RADJ	5	Connecting to an External Resistor for Setting Output Current
EN	4	Enable Input Logic, Enable High

ABSOLUTE MAXIMUM RATINGS (Note 1)

SYMBOL	ITEMS	VALUE	UNIT
V_{DD}	Supply Voltage	-0.3 to 6.5	V
V_{OUT}	Out Voltage	-0.3 to 6.5	V
P_{DMAX}	Power Dissipation (Note 2)	Internally Limited	W
P_{TR}	Thermal Resistance, SOT-89-5 θ_{JA}	45	°C /W
T_J	Operation Junction Temperature Range	-40 to 150	°C
T_{STG}	Storage Temperature	-55 to 150	°C
	ESD Susceptibility (Note 3)	2	kV

RECOMMENDED OPERATING RANGE

SYMBOL	ITEMS	VALUE	UNIT
V_{DD}	V_{DD} Supply Voltage	+2.7 to +6.0	V
T_{OPT}	Operating Temperature	-40 to +85	°C

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. 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: The maximum power dissipation must be derated at elevated temperatures and is dictated by T_{JMAX}, θ_{JA}, and the ambient temperature T_A. The maximum allowable power dissipation is $P_{DMAX} = (T_{JMAX} - T_A)/ \theta_{JA}$ or the number given in Absolute Maximum Ratings, whichever is lower.

Note 3: Human body model, 100pF discharged through a 1.5kΩ resistor.

ELECTRICAL CHARACTERISTICS (Note 4, 5)

The following specifications apply for R_{ADJ} =91k Ω, T_A=25 °C, unless specified otherwise.

SYMBOL	ITEMS	CONDITIONS	Min.	Typ.	Max.	UNIT
V_{DD}	Input Voltage		2.7		5.5	V
I_Q	No load Operating Current	No any connection to Out		100		uA
I_{SD}	Shutdown Current	EN = 0		0.1	1	uA
	Load Regulation	V_{OUT} = 0.2 to 4V		1		mA/V
	Line Regulation	V_{DD} = 3 to 6V V_{OUT} = 0.2V		3		mA/V
I_{OUT}	The output current of pin out	Dropout voltage = 500mV	336	350	364	mA
V_{DP} (Note 6)	Minimum Dropout voltage	I_{OUT} =0.9×Maximum(I_{OUT})		110		mV
I_T	Output current temperature coefficient			100		ppm/°C
V_{ENL}	EN Maximum Low Level Threshold	V_{DD} = 5V			1.4	V
V_{ENH}	EN Minimum High Level Threshold	V_{DD} = 5V	1.8			V

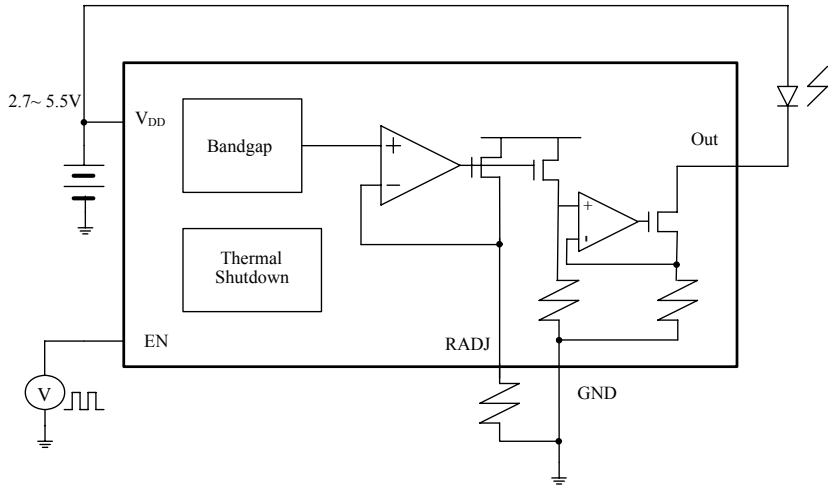
Note 3: Human body model, 100pF discharged through a 1.5kΩ resistor.

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

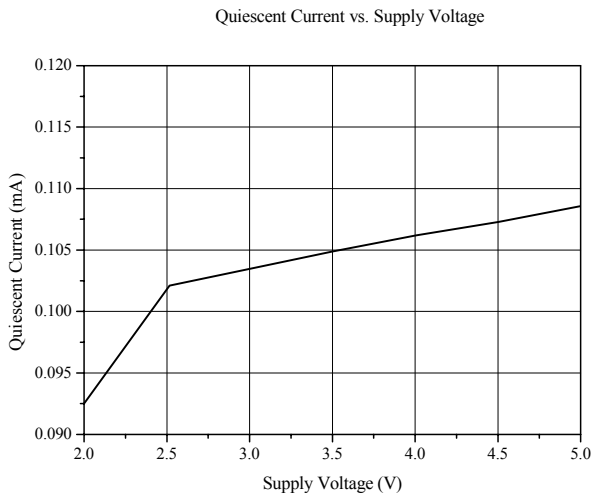
Note 5: Datasheet min/max specification limits are guaranteed by design, test, or statistical analysis.

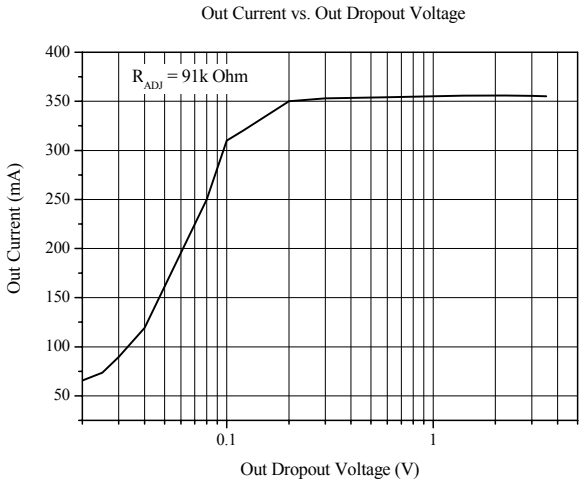
Note 6: Dropout Voltage is defined as: the out pin voltage when the current of current sink drop to 0.9 × Maximum (I_{OUT}) under 2.7 V input supply.

SIMPLIFIED BLOCK DIAGRAM



TYPICAL PERFORMANCE CHARACTERISTICS





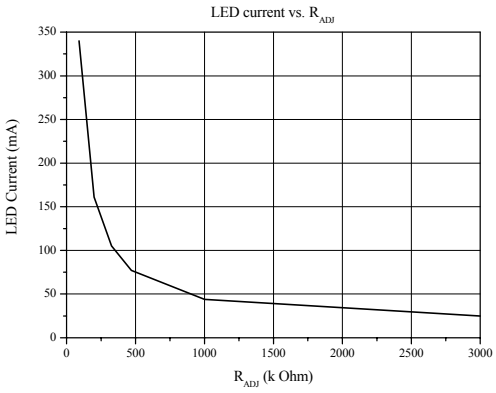
APPLICATION INFORMATION

Set the LED current by R_{ADJ}:

The PT4404 can be set to a fixed output current by a resister R_{ADJ} connected from RADJ pin to GND pin. The output current can be programmed between a few milliamps and up to more than 350mA. The current into LED can be calculated by the formula as below:

I_{OUT} = 31850 (V)/ R_{ADJ} (Ω)

Figure 1 shows the typical value of R_{ADJ} versus LED current.



The Maximum Power Dissipation on Regulator:

$P_{D(MAX)} = V_{OUT(MAX)} \times I_{OUT(NOM)} + V_{IN(MAX)} \times I_Q$

$V_{OUT(MAX)}$ = the maximum voltage on output pin;
$I_{OUT(NOM)}$ = the nominal output current;
I_Q = the quiescent current the regulator consumes at $I_{OUT(MAX)}$;
$V_{IN(MAX)}$ = the maximum input voltage.

Thermal Consideration:

The PT4404 has internal thermal limiting circuitry designed to protect the device under overload conditions. However, maximum junction temperature ratings should not be exceeded under continuous normal load conditions. The thermal protection circuit of PT4404 prevents the device from damage due to excessive power dissipation. When the device temperature rises to approximately 150°C, the regulator will be turned off. When power consumption is over about 1.33W (SOT-89-5 package, at T_A=60°C), additional heat sink is required to control the junction temperature below 120°C.

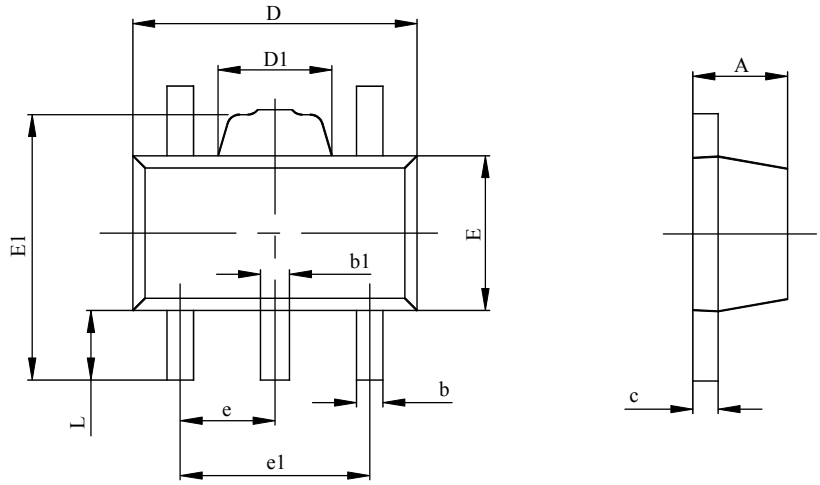
The junction temperature is: $T_J = P_D (\theta_{JA}) + T_A$

P_D : Dissipated power

θ_{JA}: Thermal resistance from the junction to ambient

PACKAGE INFORMATION

SOT-89-5 Package



SYMBOL	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.360	0.560	0.014	0.022
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.400.	1.800	0.055	0.071
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	2.900	3.100	0.114	0.122
L	0.900	1.100	0.035	0.043