RoHS COMPLIANT H F BFRs/CFRs/VC-Free

DW8501

High Power LED Driver

CONTENTS

1. General Description

The DW8501 is an instant On/Off LED driver for high power LED applications. At DW8501 output stage, one regulated current port is designed to provide a uniform and constant current sink for driving LEDs within a large range of VF variations. DW8501 easily provides users a consistent current source. User may adjust the output current from up to 1.5A through an external resistor ,RS, which gives users flexibility in controlling the light intensity of LEDs. In addition, users can precisely adjust LED brightness from 0% to 100% via output en-able (EN) with Pulse Width Modulation. DW8501 also guarantees that LEDs can be cascaded to maximum 40V at the output port.

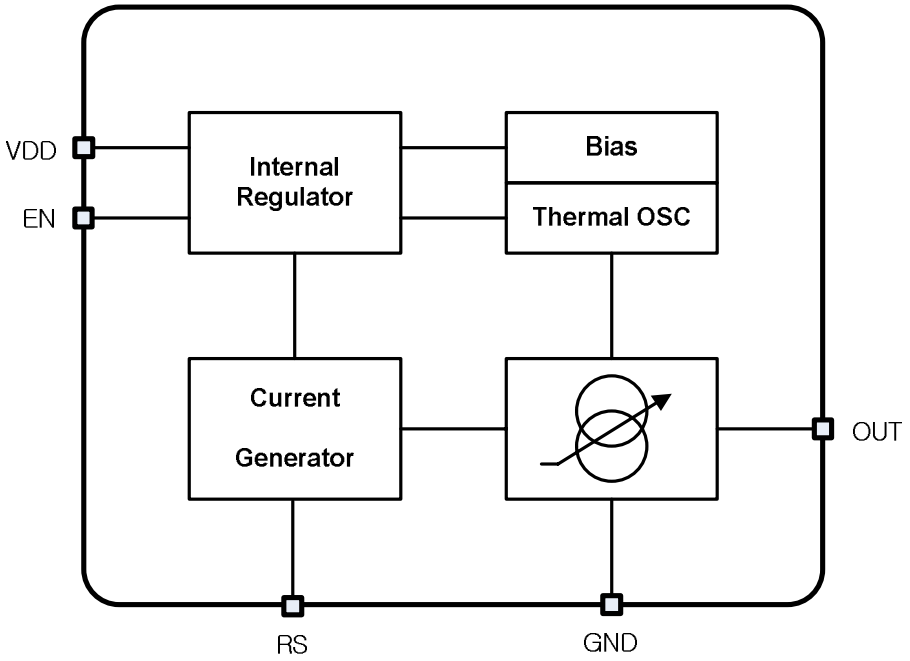
■ Features

- Constant output current invariant to supply and load voltage change
- 5V to 40V supply voltage
- Up to1.5A adjustable regulated output current
- Built-in thermal derating circuit
- Available PWM dimming control
- Output current adjusted through an external resistor
- TO-252, SOT-223 Package

■ Applications

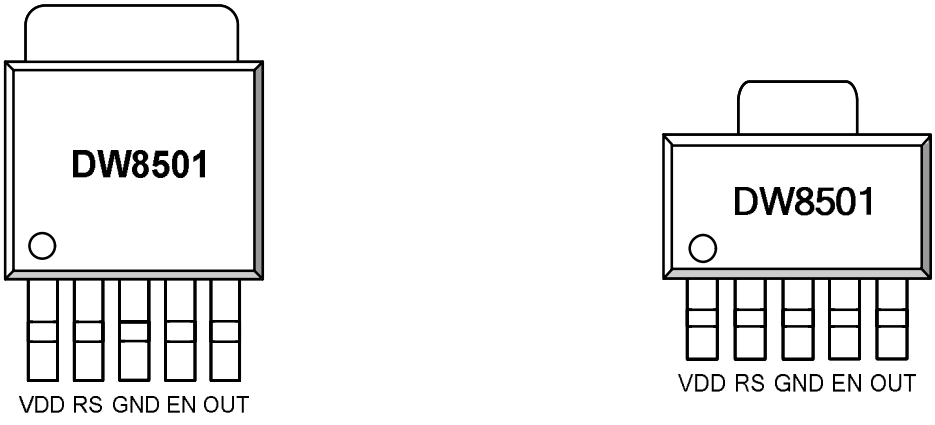
- LED light bulbs
- Signage and decorative LED lighting
- General lighting of flat panel displays
- RGB backlighting LED driver
- Current stabilizer with DC/DC or AC/DC
- General purpose constant current source

2. Block Diagram



3. Pin Information

■ **Pin placement and IC dimension**



■ **Pin Description**

No.	Pin Name	Description	Note
1	VDD	Supply Voltage input	
2	RS	Output current set input. Connect a resistor from RS to GND to set the LED bias current	
3	GND	Ground	
4	EN	Output stage enable control pin. High enable the OUT pin. Dimming control is possible by PWM(Pulse width modulation). Typically, It operates under 30KHz.	
5	OUT	Output pin. Sink current is decided by the current on R_{SET} connected to RS	
6	HS	Heat sink, normally connected GND	

4. Absolute Maximum Ratings

Symbol	Parameter		Ratings
VDD	Supply voltage		41V
V_{EN}	Enable voltage		41V
V_{OUT}	Output voltage		23V
VRS	Reference voltage		5V
θ_{JA}	Package thermal resistance	TO-252-5L	38.59℃/W
		SOT-223-5L	80℃/W
T_{OPR}	Operating temperature		-40~+85℃
T_J	Junction temperature		+150℃
T_{STG}	Storage Temperature		-55~+150℃

Note 1. θja is measured in the convection at Ta=30℃ on a high effective thermal conductivity test board(4 Layers, 2S2P) of JEDEC 51-7 thermal measurement standard.
2. PCB dimension is 100x100x1.6mm and 4 layers.

■ Absolute Maximum Ratings

Use of the IC in excess of absolute maximum ratings such as the applied voltage or operating temperature range (T_J) may result in IC damage. Assumptions should not be made regarding the state of the IC (short mode or open mode) when such damage is suffered. The implementation of a physical safety measure such as a fuse should be considered when use of the IC in a special mode when the absolute maximum ratings may be exceeded is anticipated.

5. Recommended Operating Condition

Symbol	Parameter	Min.	Typ.	Max.	Unit
VDD	Supply voltage	5		40	V
V_{EN}	Enable voltage			40	V
I_{OUT}	Output sink current			1.5	A

6. Electrical Specification

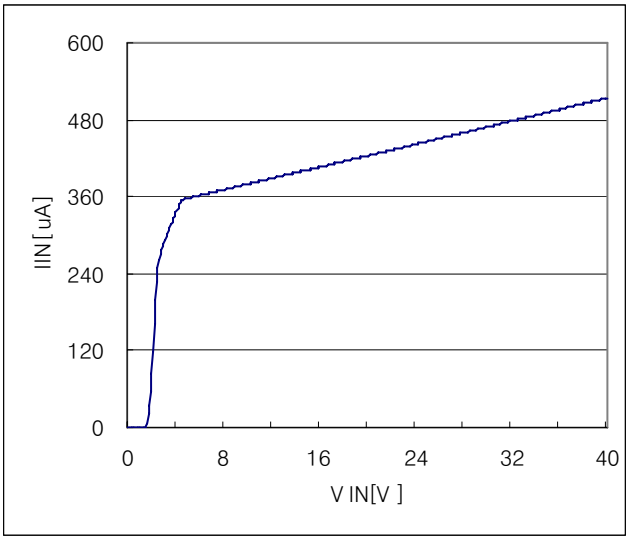
(VDD = 24V, T_A = -35℃~+85℃, unless otherwise specified. Typical values are at T_A=+25℃)

Characteristic	Symbol	Condition	Min	Typ	Max	Unit
Input supply voltage	V_{DD}		5	-	40	V
Output linearity voltage	V_{OUT_LINE}	V_{DD}=24V, I_{SET}= 300mA,	-	-	3	V
Output current	I_{OUT}		-	-	1.5	A
Quiescent current	I_{Q_ON}	EN = 24V	0.8	1	1.5	mA
	I_{Q_OFF}	EN = 0V	85	120	250	uA
EN input leakage current	I_{EN_LIK}		30	45	60	uA
Input high voltage	V_{IH}		2	-	-	V
Input low voltage	V_{IL}		-	-	0.8	V
LED output drop-out voltage	V_{DROP}	V_{DD}=40V , I_{SET}=300mA	-	270	-	mV
Thermal derating	T_D		-	140	-	℃
Thermal derating hysteresis	T_{DHYS}		-	15	-	℃
Rset Voltage	V_{SET}		0.59	0.61	0.63	V
Output current	I_{OUT}	2KΩ	295	305	315	mA

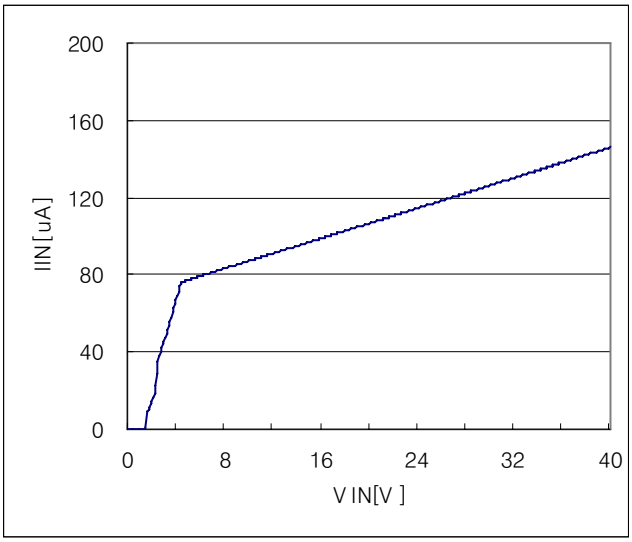
Note：Output dropout voltage：90% x I_{OUT}

7. Typical Operating Characteristics

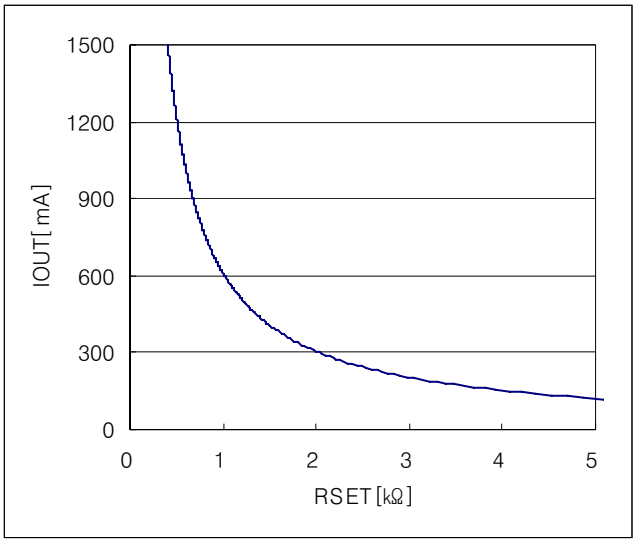
(V_{DD} = 12V, V_{OUT} =2V, Ta = -35℃~+85℃, unless otherwise specified. Typical values are at T_A=+25℃)



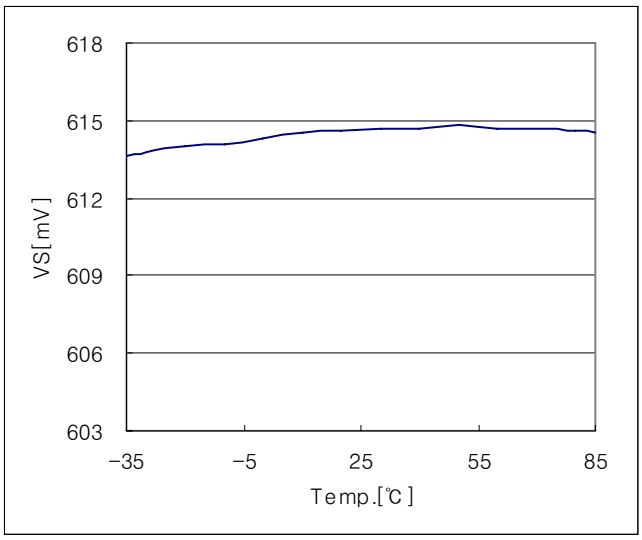
Quiescent vs. VIN



Ishutdown vs. VIN



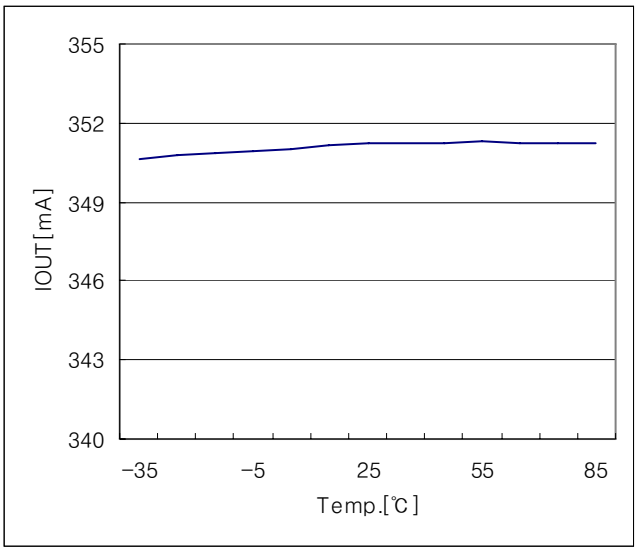
IOUT vs. Rset



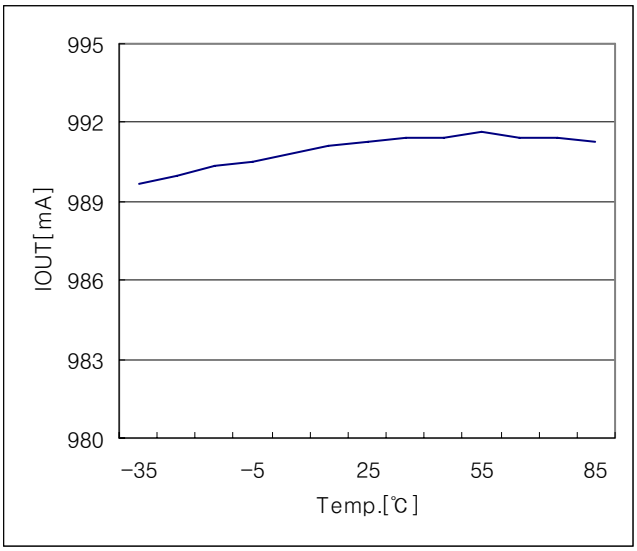
Vreference vs. Temperature

7.1. Typical Operating Characteristics (Continued)

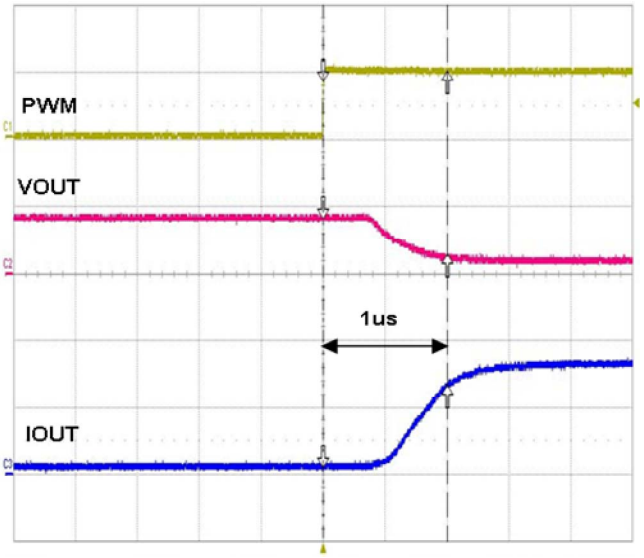
(V_{DD} = 12V, V_{OUT} =2V, Ta = -35℃~+85℃, unless otherwise specified. Typical values are at T_A=+25℃)



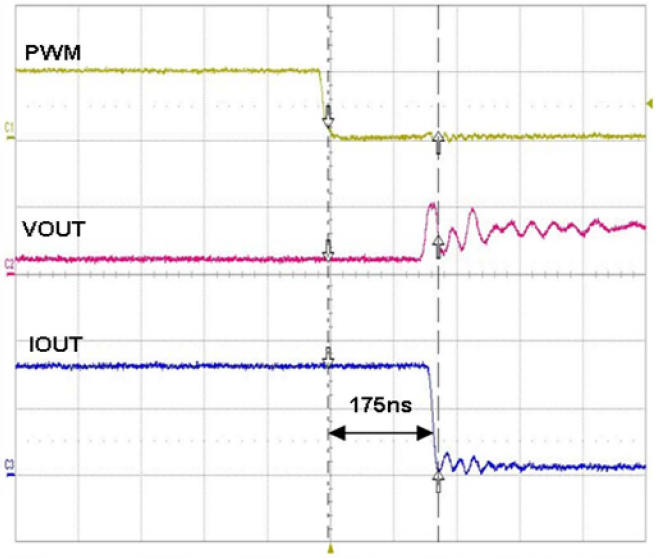
IOUT vs. Temperature



IOUT vs. Temperature



PWM Rising Time



PWM Falling Time

8. Typical Applications circuit

※ LED VF = 3.3V, IF = 20mA

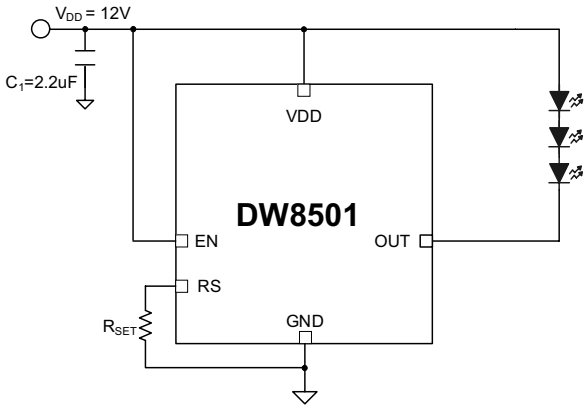


Figure 1. VDD=12V

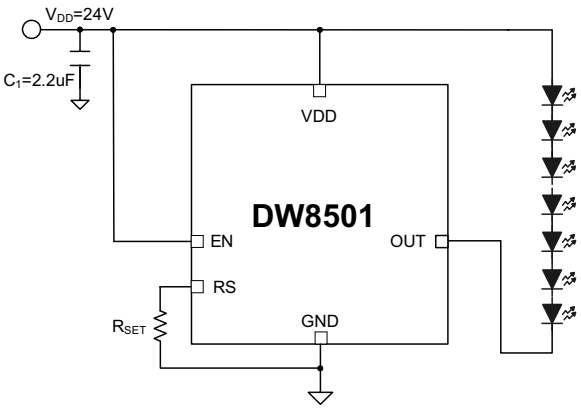


Figure 2. VDD=24V

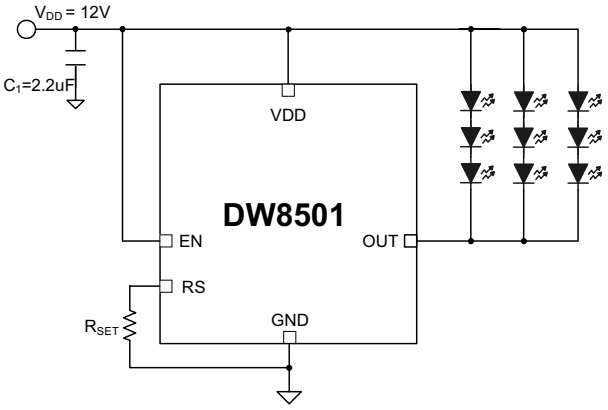


Figure 3. VDD=12V, 9 LED

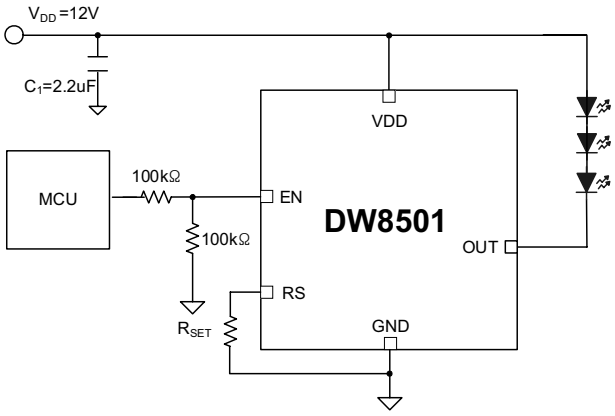


Figure 4. PWM Dimming Typical Application

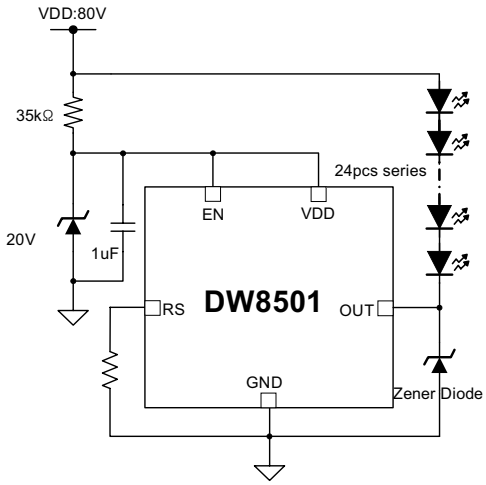


Figure 5. High Voltage Application (VDD≥35V)

9. Detailed Descriptions

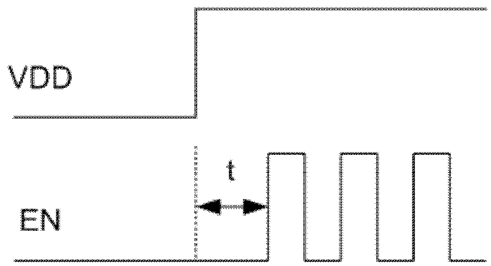
■ Setting Output Current

Iout [mA] = (610[mV]/Rset[ohm])X 1000

Rset (KΩ)	Iout (mA)
4	152
2	305
1.22	500
1.02	598
0.76	802
0.68	897
0.61	1000

■ Power sequence

There is an electrostatic diode between VDD and EN.
When dimming control, It must input EN signal after inputs VDD. (t ≥ 1ms)
If not use Dimming control, EN connect to VDD.

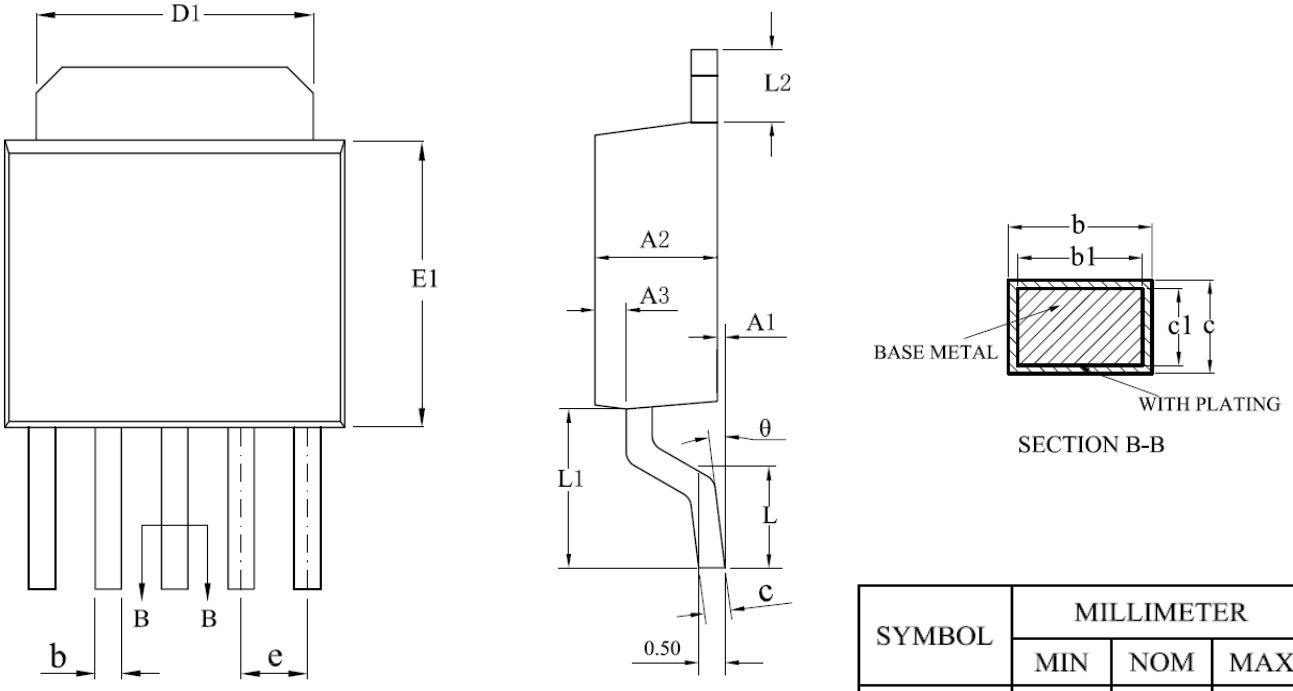


Dimming Power sequence

10. Package Dimension

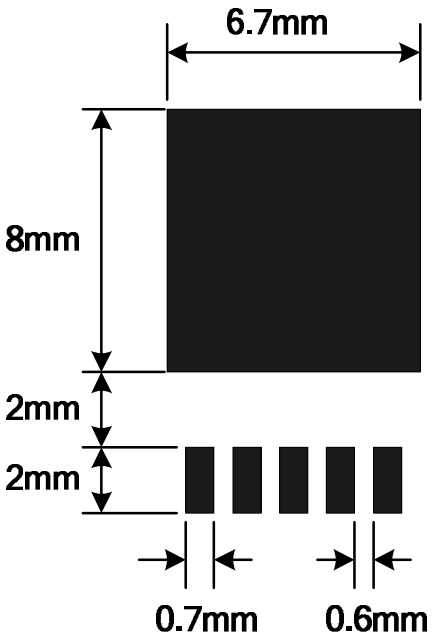
Package Dimension

- Package Name : TO-252-5L
- Package Size : 6.5mm * 10mm, Thickness : 2.3mm
- Pin Pitch : 1.27mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A1	0.05	0.15	0.25
A2	2.10	2.30	2.50
A3	0.50	0.60	0.70
b	0.46	—	0.60
b1	0.45	0.50	0.55
c	0.49	—	0.56
c1	0.48	0.50	0.52
D	6.30	6.50	6.70
D1	5.30REF		
E1	5.30	5.50	5.70
e	1.27BSC		
L	1.40	1.50	1.60
L1	3.00	3.10	3.20
L2	1.40BSC		
θ	0	—	8°

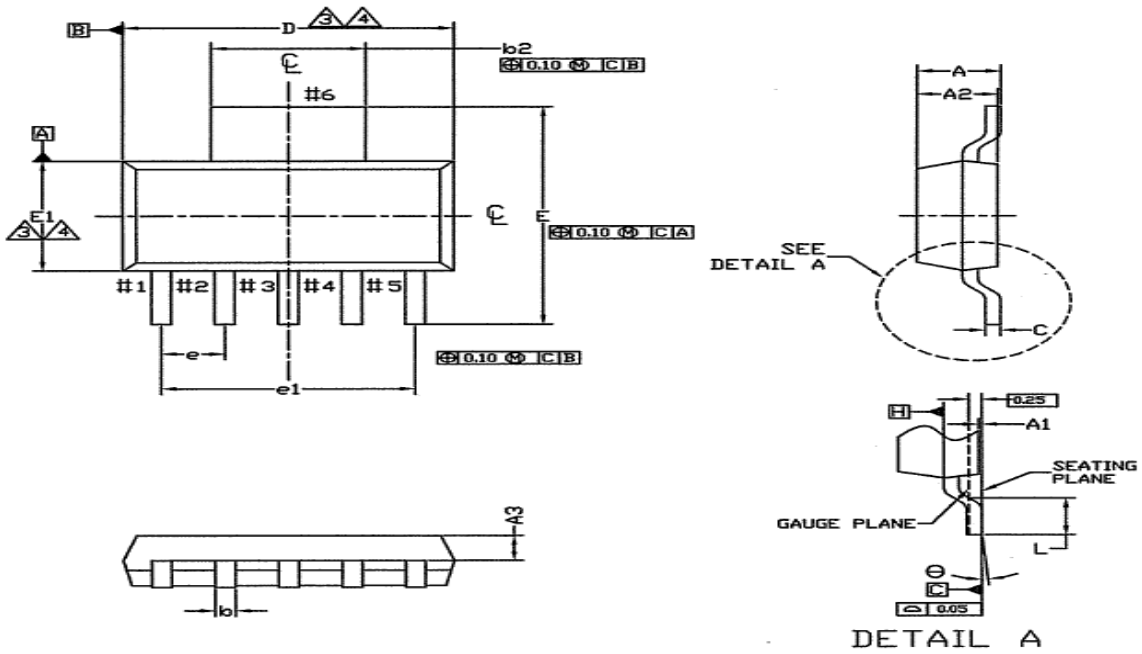
Foot Print



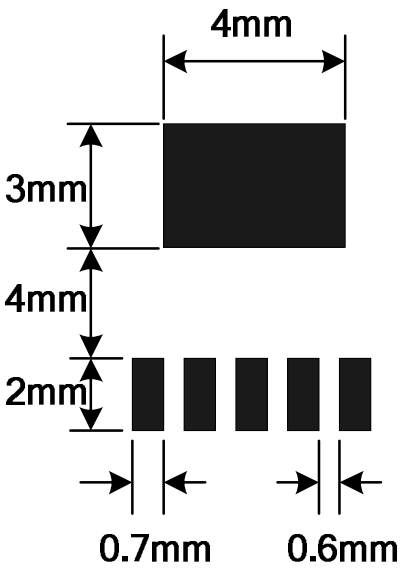
10.1. Package Dimension (Continued)

Package Dimension

- Package Name : SOT-223-5L
- Package Size : 6.5mm * 7mm, Thickness : 1.8mm
- Pin Pitch : 1.27mm



Foot Print



SYMBOL	ALL DIMENSIONS IN MILLIMETERS		
	MINIMUM	NORMAL	MAXIMUM
A	-	-	1.80
A1	0.02	0.06	0.10
A2	1.55	1.60	1.65
A3		0.90 REF.	
b	0.41	0.457	0.51
b2	2.95	3.00	3.05
c	0.24	0.28	0.32
D	6.45	6.50	6.55
E	6.86	7.00	7.26
E1	3.45	3.50	3.55
e		1.27 BSC.	
e1		5.08 BSC.	
L	0.91	-	1.14
θ	0°	4°	8°