DW8501

High Power LED Driver

CONTENTS

1. General Description

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 V_F variations. DW8501 easily provides users with a consistent current source. Users may adjust the output current up to 1.5A through an external resistor R_S, 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 Can accommodate an input voltage up to 40V.

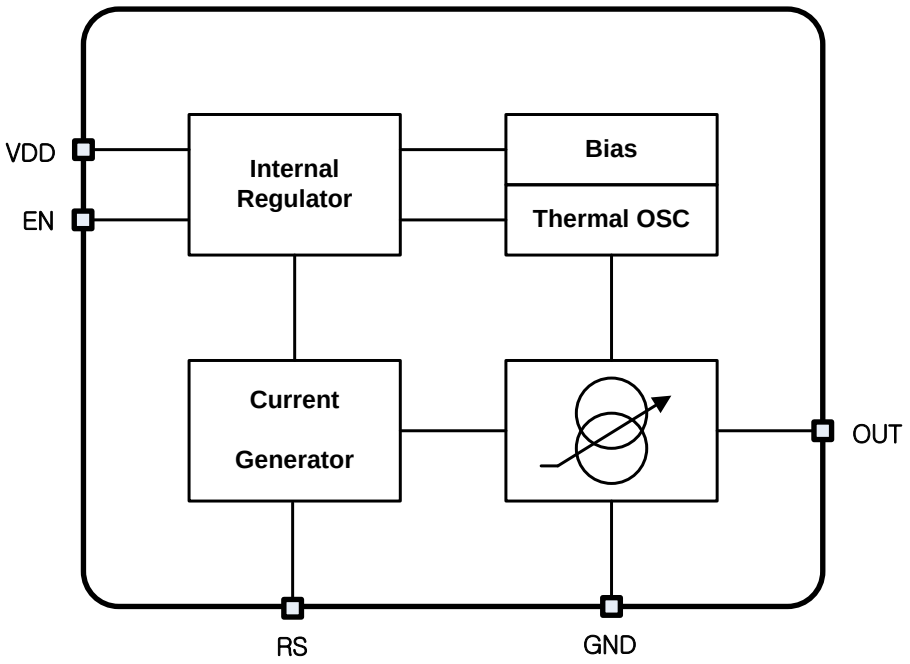
■ Features

- Providing a constant output current regardless of input voltage or load voltage changes
- 5V to 40V supply voltage
- Adjustable output current up to 1.5A
- Built-in thermal derating circuit
- Available PWM dimming control
- Output current adjusted through an external resistor
- TO252-5L, SOT223-5L Package

■ Applications

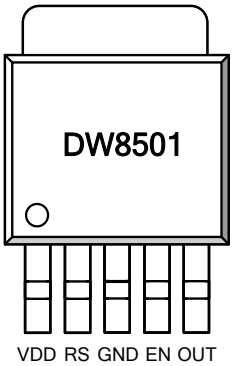
- LED light bulbs
- Signage and decorative LED lighting
- General lighting of flat panel displays
- RGB backlighting LED driver
- Current stabilizer with DC/DC or AC/DC
- General purpose constant current source

2. Block Diagram

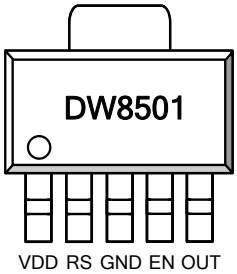


3. Pin Information

■ Pin Placement



TO252 – 5L



SOT223 – 5L

■ Pin Description

No.	Pin Name	Description	Note
1	VDD	Supply Voltage input	
2	RS	Sets output current. Connect a resistor from RS to GND to set the LED bias current	
3	GND	Ground	
4	EN	Output stage enable control pin. If not use dimming, connect to VDD. Dimming control is available by PWM(Pulse width modulation) under 30KHz typically.	
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(1)

Symbol	Parameter		Ratings
VDD	Supply voltage		41V
V_{EN}	Enable voltage		41V
V_{OUT}	Output voltage		23V
V_{RS}	Reference voltage		5V
θ_{JA}(2)	Package thermal resistance	TO-252-5L	38.59℃/W
		SOT-223-5L	80℃/W
T_{JOPR}	Junction Operating temperature		-40~+125℃
T_J	Junction temperature		+150℃
T_{STG}	Storage Temperature		-55~+150℃

Note (1) Stresses above the max. Values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.

(2) θ_{JA} 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. PCB dimension is 100mmx100mmx1.6mm and 4 layers.

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

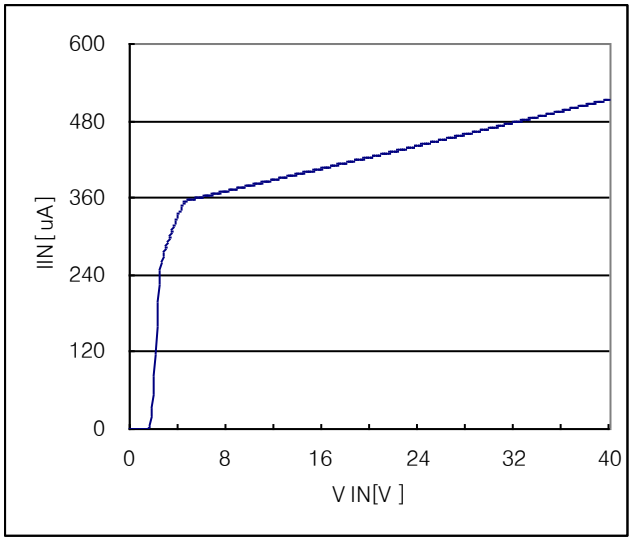
(VDD = 24V, typical values are at T_A=+25℃, unless otherwise specified.)

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 Dropout Voltage	V_{DROP}	V_{DD}=40V , I_{SET}=300mA	-	270	-	mV
Thermal Derating	T_D		-	140	-	℃
Thermal Derating Hysteresis	T_{DHYS}		-	15	-	℃
R_{SET} Voltage	V_{SET}		0.58	0.61	0.64	V
Output Current by R_{SET}	I_{OUT}	2KΩ	295	305	315	mA

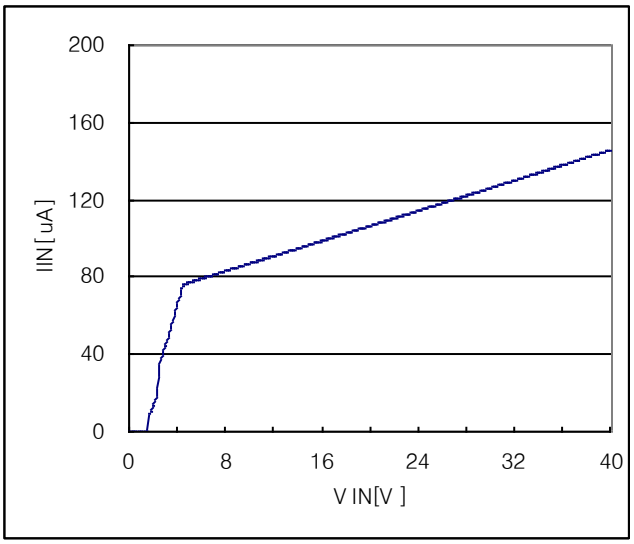
Note : Output dropout voltage : 90% x I_{OUT}

7. Typical Operating Characteristics

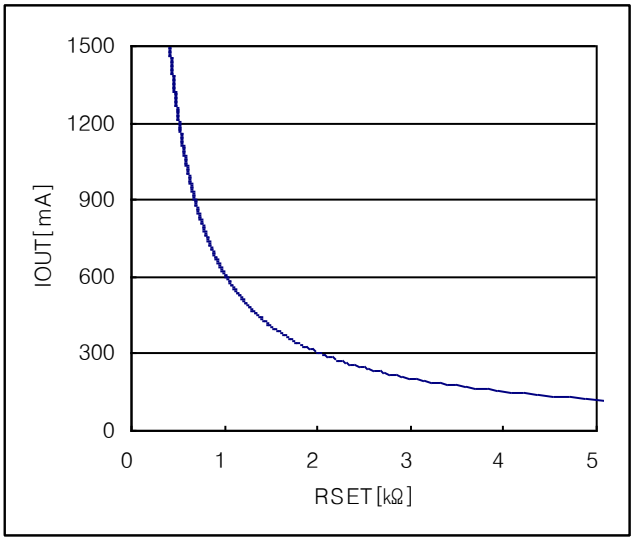
(V_{DD} = 12V, V_{OUT} =2V, typical values are at T_A=+25℃, unless otherwise specified.)



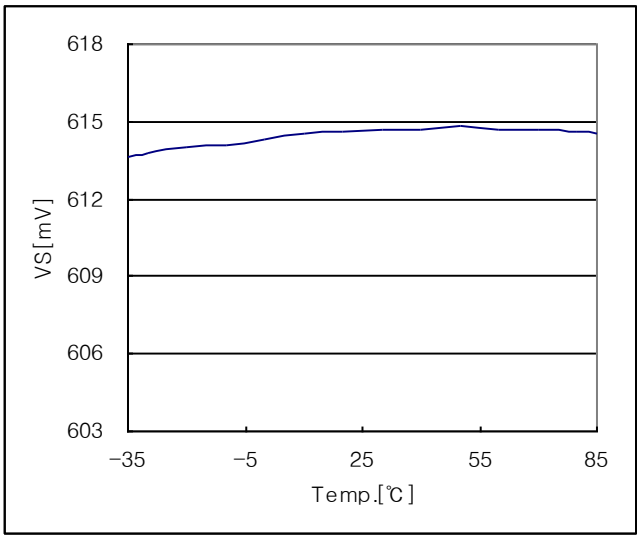
Quiescent vs. VIN



Ishutdown vs. VIN



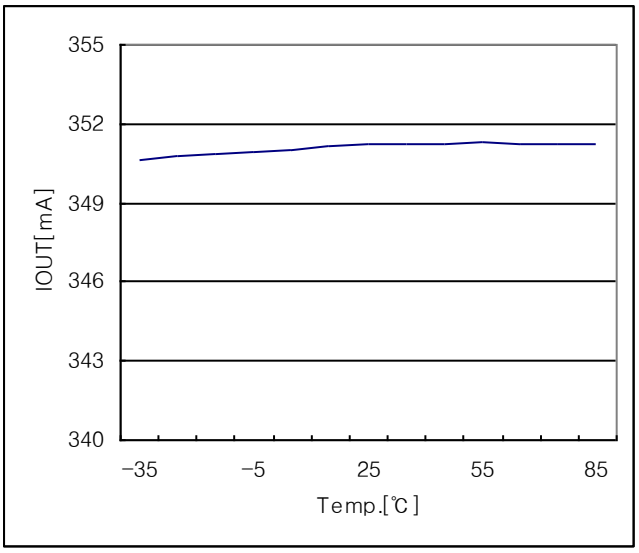
IOUT vs. R_{SET}



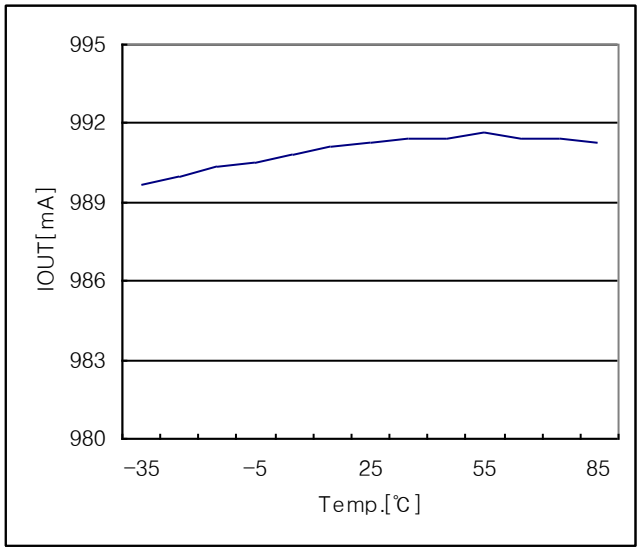
Vreference vs. Temperature

7.1. Typical Operating Characteristics

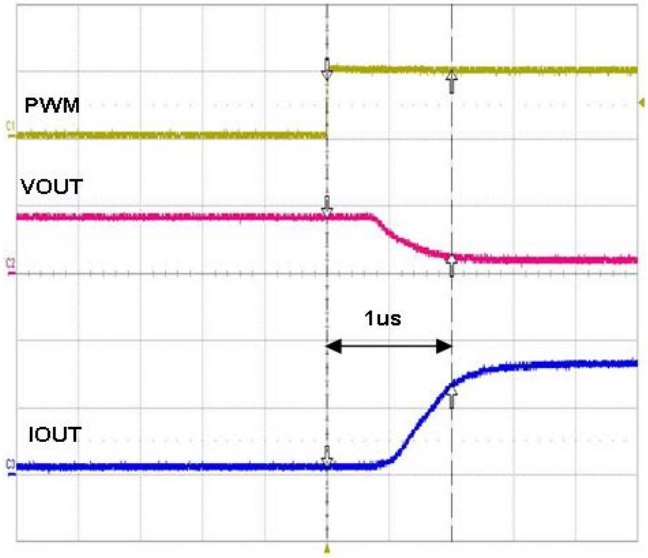
(V_{DD} = 12V, V_{OUT} =2V, typical values are at T_A=+25℃, unless otherwise specified.)



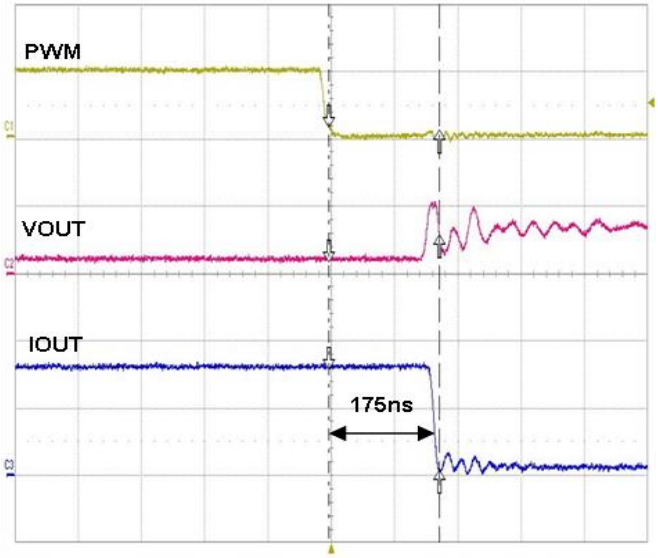
IOUT vs. Temperature



IOUT vs. Temperature



PWM Rising Time



PWM Falling Time

8. Typical Applications circuit

(LED V_F = 3.3V, I_F = 20mA)

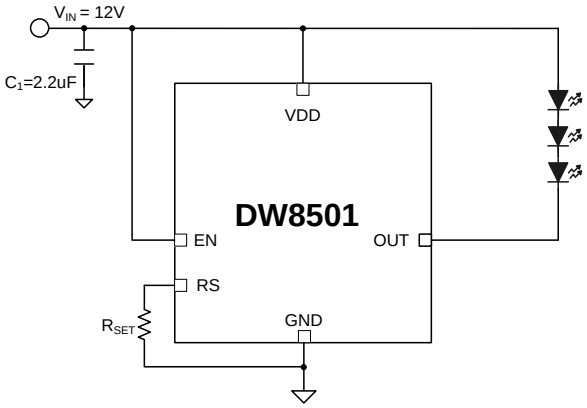


Figure 1. V_{IN}=12V

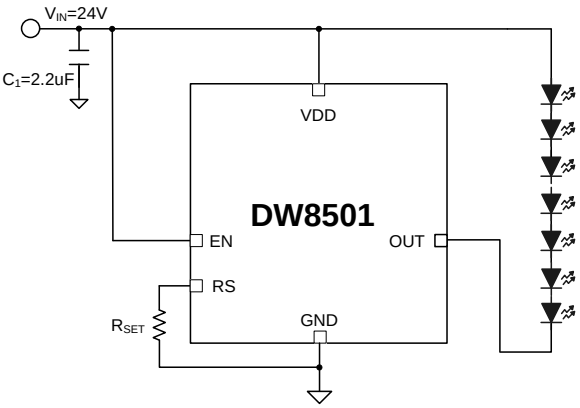


Figure 2. V_{IN}=24V

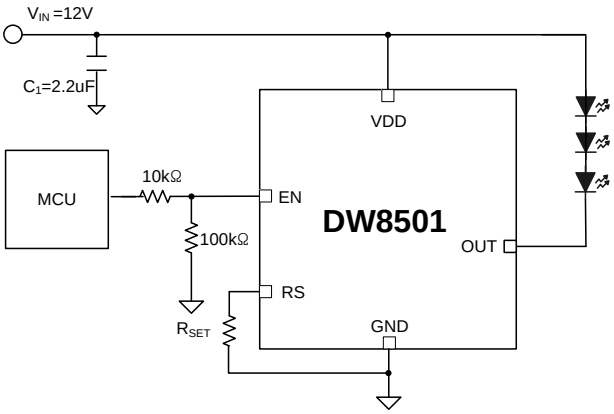


Figure 3. PWM Dimming Typical Application

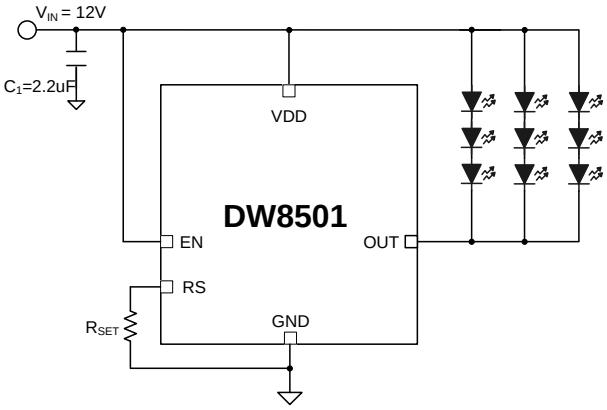


Figure 4. V_{IN}=12V, 9 LED

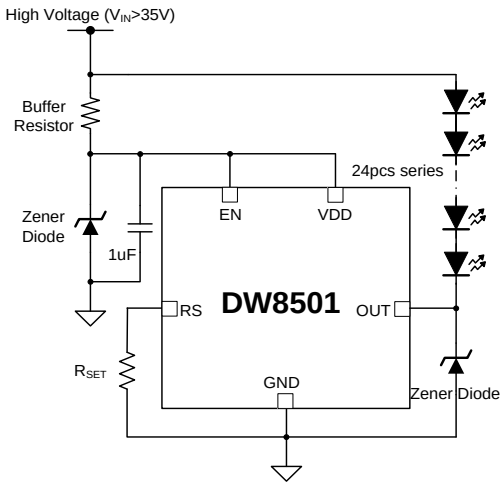


Figure 5. High Voltage Application (V_{IN}≥35V)

9. Detailed Descriptions

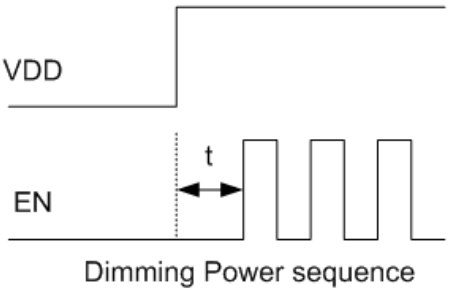
■ Setting Output Current

I_{OUT} [mA] = (610[mV]/R_{SET}[ohm])X 1000

R_{SET} (KΩ)	I_{OUT} (mA)
4	152
2	305
1.22	500
1.02	598
0.76	802
0.68	897
0.61	1000

■ Power Sequence

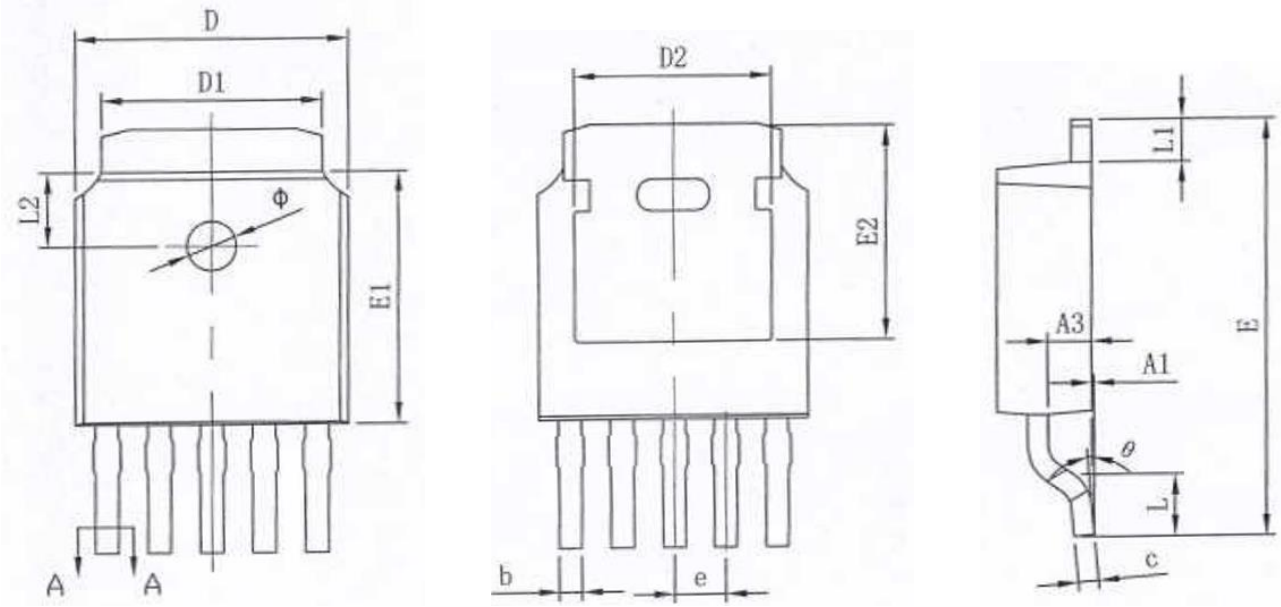
There is an electrostatic diode between VDD and EN.
When dimming control, It must input EN signal after inputs VDD. (t ≥ 1ms)
If not use Dimming control, EN connect to VDD.

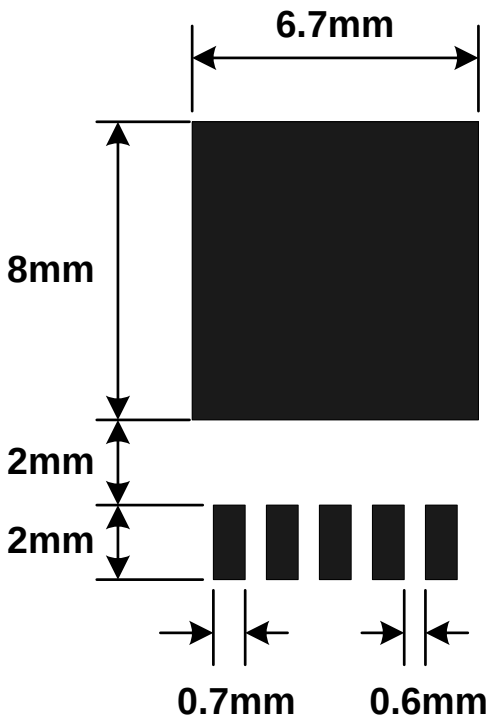


Dimming Power sequence

10. Package Dimension

Package Name : TO252-5L
Package Size : 6.6mm * 10.1mm, Thickness : 2.3mm
Pin Pitch : 1.27mm

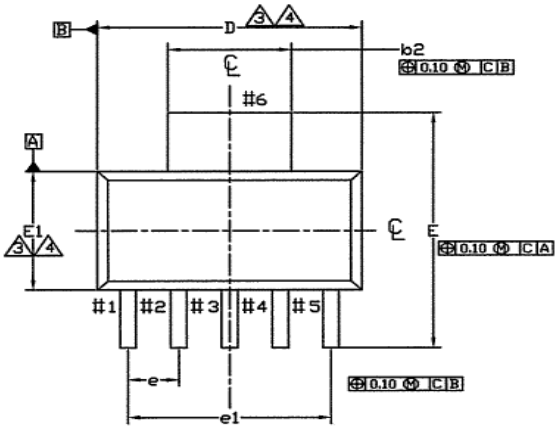


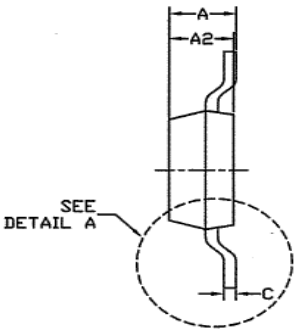


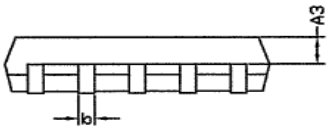
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A1	0.00	——	0.10
A2	2.20	2.30	2.40
A3	1.02	1.07	1.12
b	0.55	——	0.64
b1	0.54	0.56	0.59
c	0.49	——	0.56
c1	0.48	0.51	0.52
D	6.50	6.60	6.70
D1	5.33 REF.		
D2	4.83 REF.		
E	9.90	10.10	10.30
E1	6.00	6.10	6.20
E2	5.30REF		
e	1.27BSC		
L	1.40	1.50	1.60
L1	1.02REF.		
L2	1.70	1.80	1.90
θ	0	——	8°
ø	1.20×0.1±0.05P		

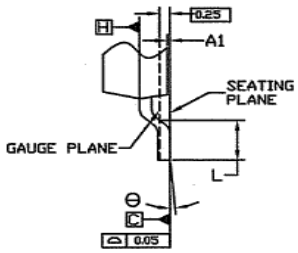
10.1 Package Dimension

Package Name : SOT223-5L
Package Size : 6.5mm * 7mm, Thickness : 1.8mm
Pin Pitch : 1.27mm

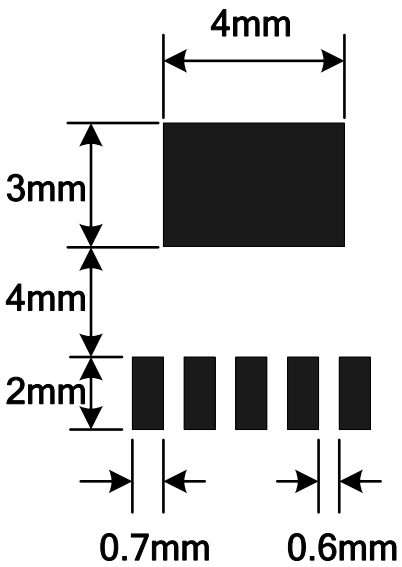








DETAIL A



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°