



DW3505A

Low Power LED Driver

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1. General Description

DW3505A is an instant On/Off LED driver for low power LED applications. At DW3505A 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. DW3505A easily provides users with a consistent current source. Users may adjust the output current up to 300mA 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 enable (EN) with Pulse Width Modulation. DW3505A can accommodate an input voltage up to 40V.

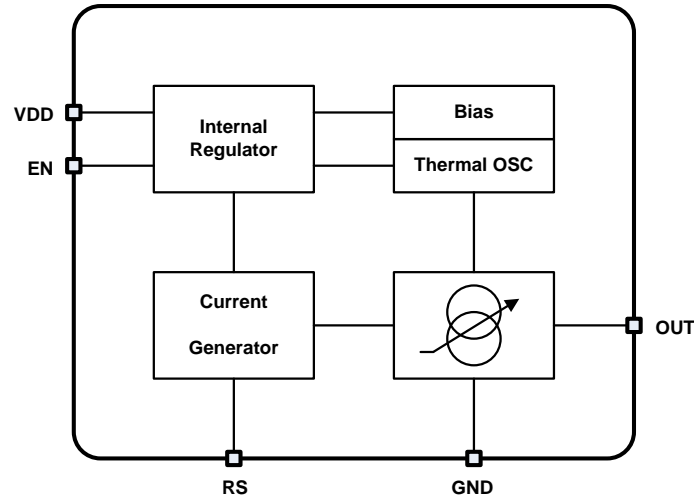
■ Features

- Providing a constant output current regardless of input voltage or load voltage changes
- 5V to 40V supply voltage
- Adjustable output current up to 300mA
- Built-in thermal derating circuit
- Available PWM dimming control
- Output current adjusted through an external resistor
- SOT89-5L Package

■ Applications

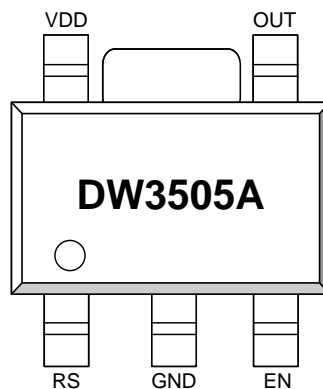
- LED light bulbs
- Signage and decorative LED lighting
- General lighting of flat panel displays
- RGB backlighting LED driver
- Current stabilizer with DC/DC or AC/DC
- Automotive lighting
- General purpose constant current source

2. Block Diagram



3. Pin Information

■ Pin Placement



SOT89 – 5L

■ Pin Description

No.	Pin Name	Description	Note
1	RS	Sets output current. Connect a resistor from RS to GND to set the LED bias current	
2	GND	Ground	
3	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.	
4	OUT	Output pin. Sink current is decided by the current on R _{SET} connected to RS	
5	VDD	Supply Voltage input	

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	66.87 °C/W
T _{JOPR}	Junction Operating temperature	-40~+125 °C
T _J	Junction temperature	+150 °C
T _{STG}	Storage Temperature	-55~+150 °C

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 °C 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			300	mA

6. Electrical Specification

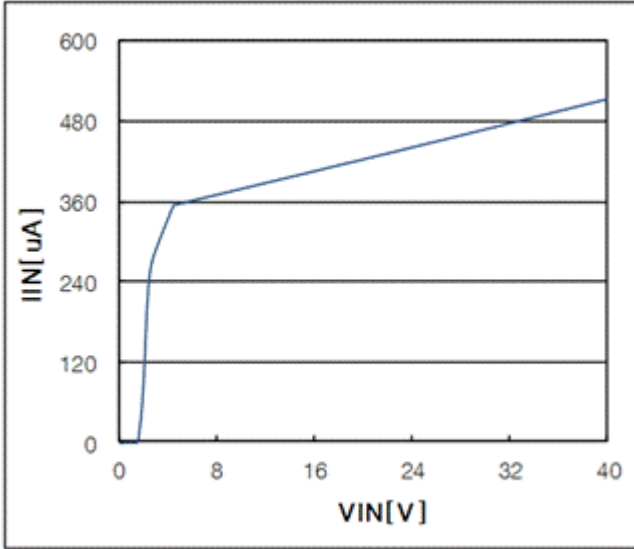
(VDD = 24V, typical values are at T_A=+25°C, unless otherwise specified.)

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} = 203.3mA,	-	-	3	V
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
EN Input High Voltage	V _{IH}		2	-	-	V
EN Input Low Voltage	V _{IL}		-	-	0.8	V
LED Output Dropout Voltage	V _{DROP}	V _{DD} =40V, I _{SET} =203.3mA	-	183	-	mV
Thermal Derating	T _D		-	140	-	°C
Thermal Derating hysteresis	T _{DHYS}		-	15	-	°C
R _{SET} Voltage	V _{SET}		0.58	0.61	0.64	V
Output Current by R _{SET}	I _{OUT}	3KΩ	193.1	203.3	213.5	mA

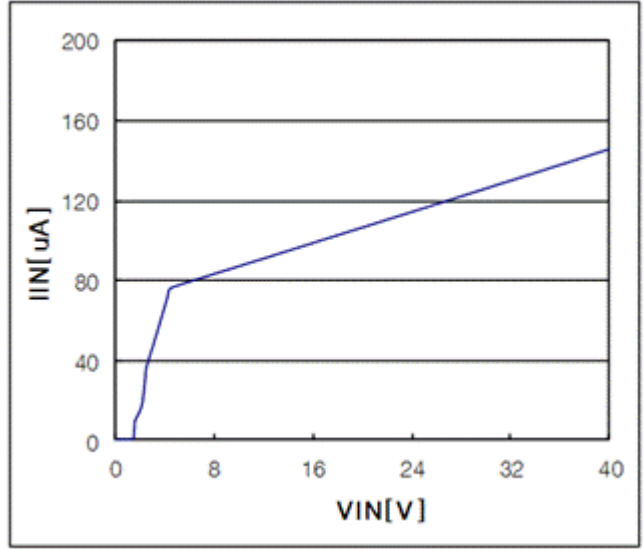
Note : Output dropout voltage : 90% x I_{OUT}

7. Typical Operating Characteristics

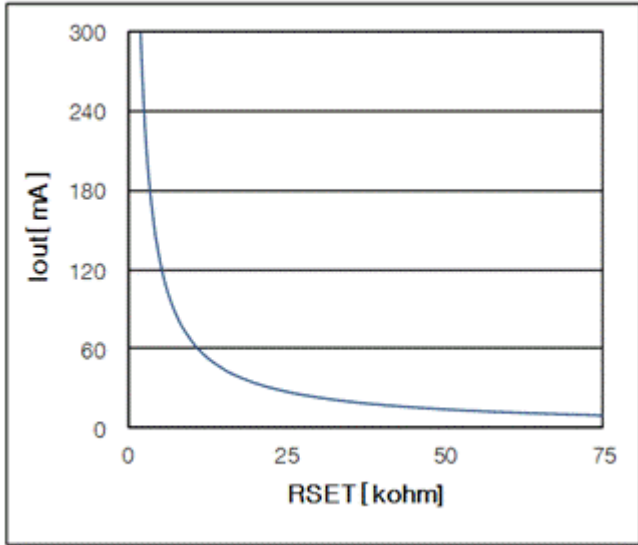
($V_{DD} = 12V$, $V_{OUT} = 2V$, typical values are at $T_A = +25^\circ C$, unless otherwise specified.)



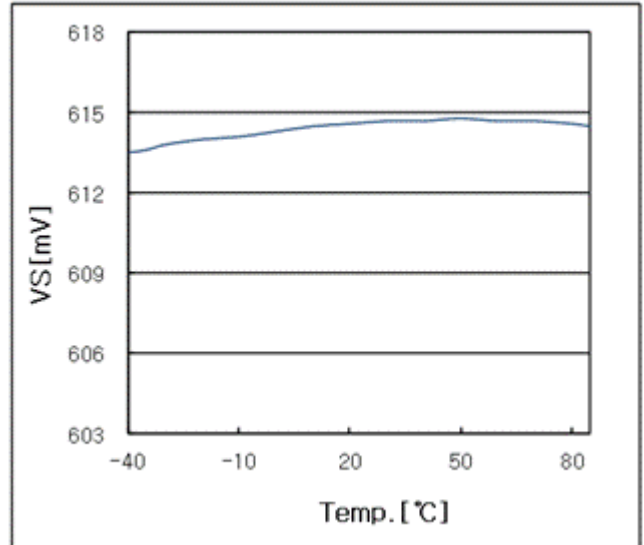
Quiescent vs. VIN



Ishutdown vs. VIN



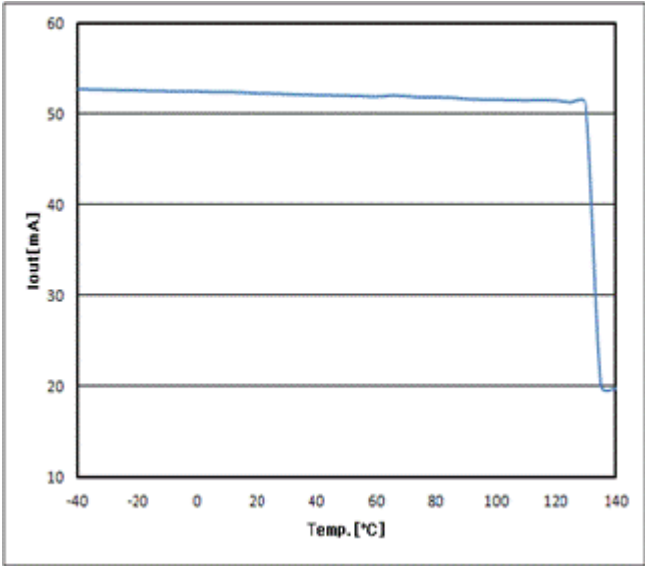
IOUT vs. Rset



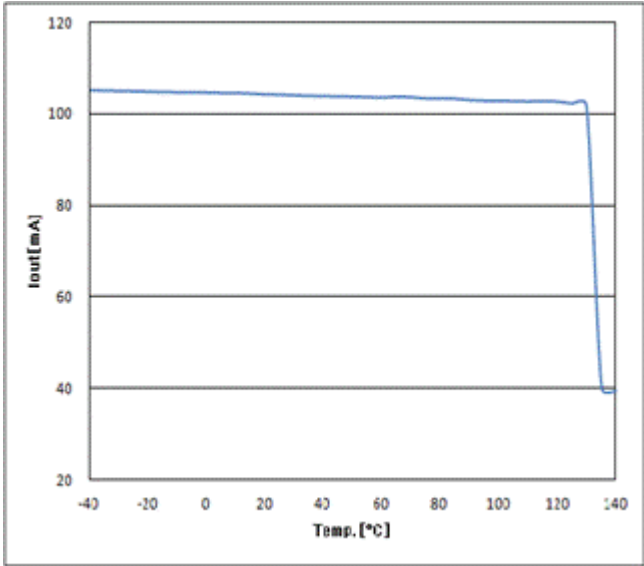
Vreference vs. Temperature

7.1. Typical Operating Characteristics

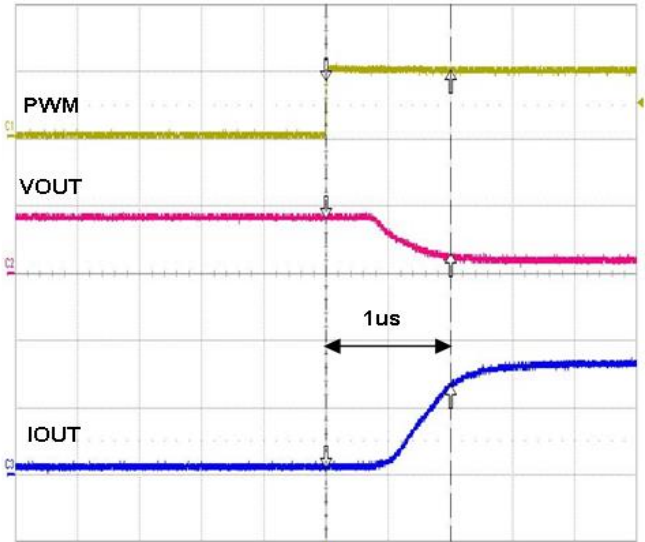
($V_{DD} = 12V$, $V_{OUT} = 2V$, typical values are at $T_A = +25^\circ C$, unless otherwise specified.)



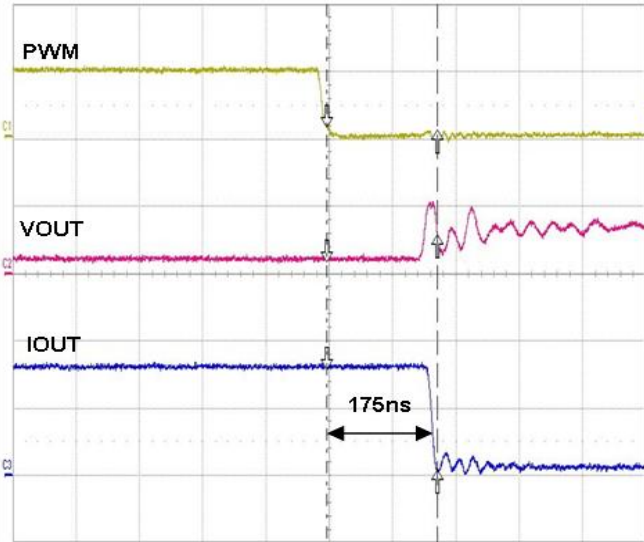
IOUT vs. Temperature



IOUT vs. Temperature



PWM Rising Time



PWM Falling Time

8. Typical Applications circuit

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

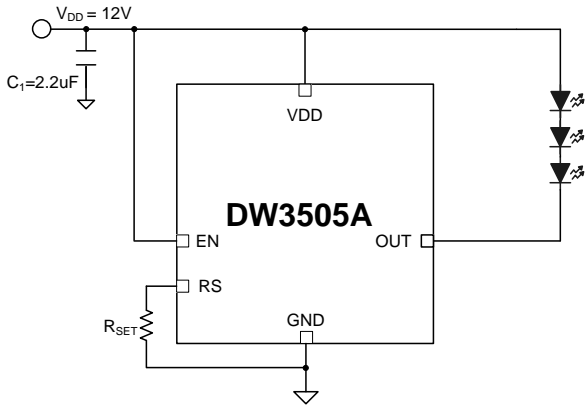


Figure 1. VDD=12V

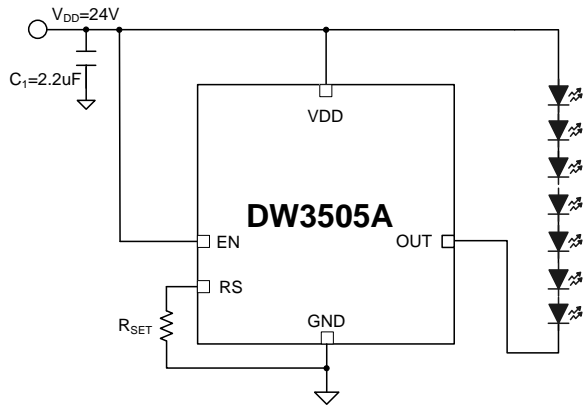


Figure 2. VDD=24V

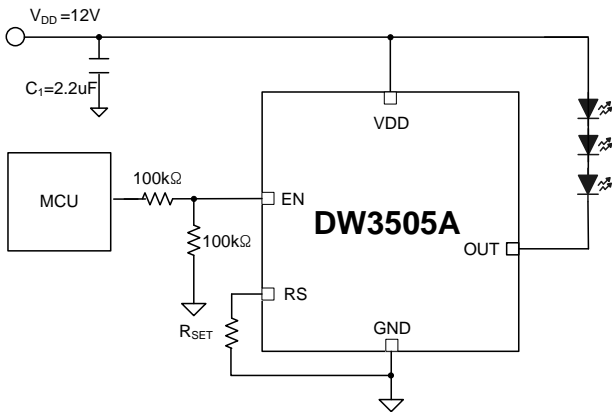


Figure 3. PWM Dimming Typical Application

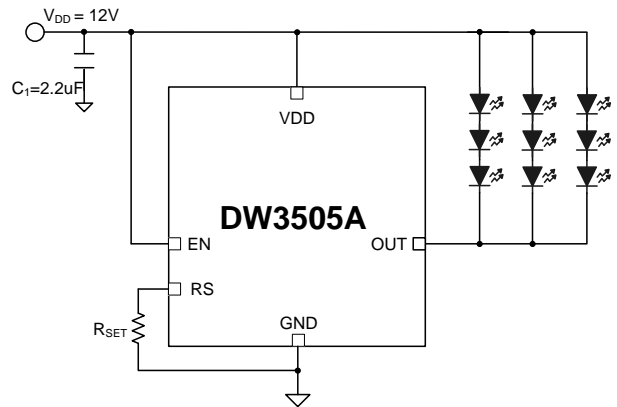


Figure 4. VDD=12V, 9 LED

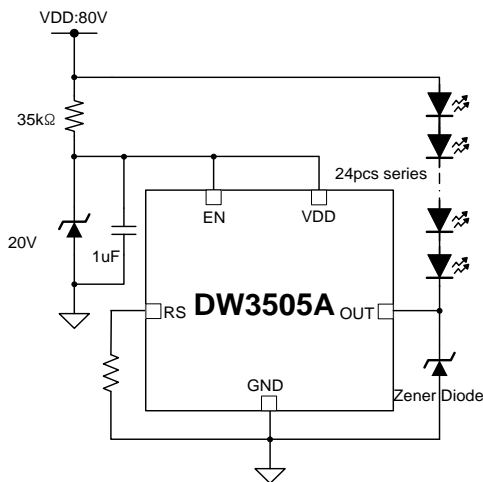


Figure 5. High Voltage Application ($V_{DD} \geq 35V$)

9. Detailed Descriptions

■ Setting Output Current

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

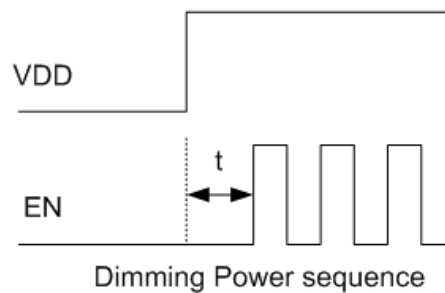
R _{SET} (KΩ)	I _{OUT} (mA)
10	61
6	101.7
4	152.5
3	203.3
2	305

■ Power Sequence

There is an electrostatic diode between VDD and EN.

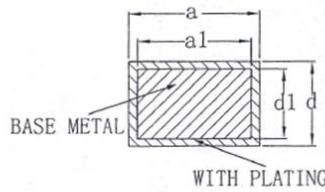
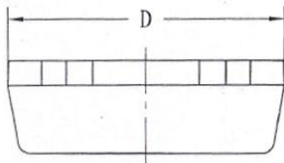
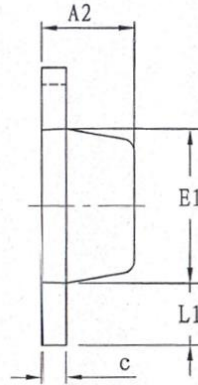
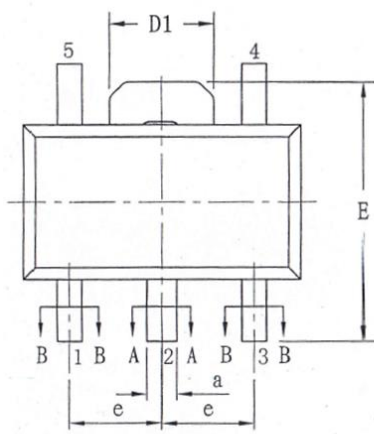
When dimming control, It must input EN signal after inputs VDD. (t ≥ 1ms)

If not use Dimming control, EN connect to VDD.

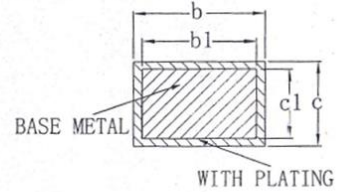


10. Package Dimension

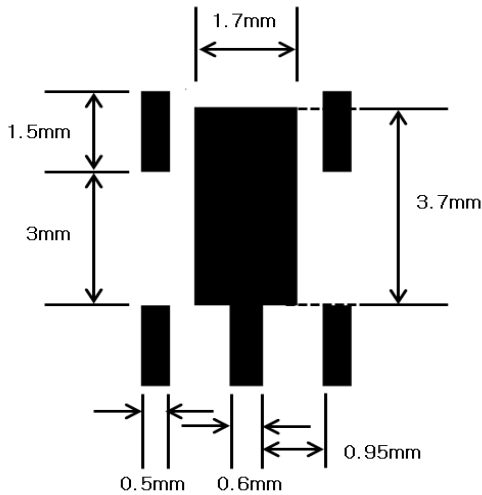
Package Name : SOT89-5L
 Package Size : 4.5mm * 4.5mm, Thickness : 1.5mm
 Pin Pitch : 1.5mm



SECTION A-A



SECTION B-B



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A2	1.40	1.50	1.60
b	0.38	--	0.47
b1	0.37	0.40	0.43
c	0.36	--	0.46
c1	0.35	0.38	0.41
a	0.46	--	0.56
a1	0.45	0.48	0.51
d	0.36	--	0.46
d1	0.35	0.38	0.41
D	4.30	4.50	4.70
D1	1.70REF		
E	4.00	4.20	4.40
E1	2.30	2.50	2.70
e	1.50BSC		
L1	0.80	1.00	1.20