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## Description

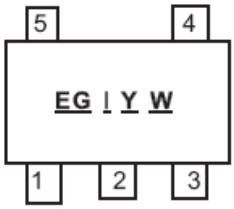
The PAM2800 is a high-power white LED driver with 350mA constant rated source current. It features high-efficiency and low quiescent current, making it ideal for battery-powered applications.

## Features

- High Efficiency 92%
- Up to 350mA Constant Source Current
- Low Quiescent Current: Typ. 65µA
- 0.5µA Shutdown Current
- Short Circuit Protection
- Open Load LED Protection
- Thermal Protection
- Space Saving Package SOT25
- Pb-Free Package
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

## Pin Assignments

Top View
SOT23-5




## Applications

- High Power White LED Driver

## Ordering Information

**PAM2800 X X X X**

| Pin Configuration | Package Type | Number of Pins | Shipping Package |
|---|---|---|---|
| A Type: | A: SOT-23 | B: 5 | R: Tape & Reel |

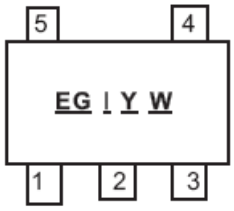
1. VIN
2. GND
3. EN
4. FB
5. VOUT

| Part Number | Output Current | Marking | Package Type | Standard Package |
|---|---|---|---|---|
| PAM2800AABR | 350mA | EGAYW | SOT25 | 3,000 Units/Tape & Reel |

Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

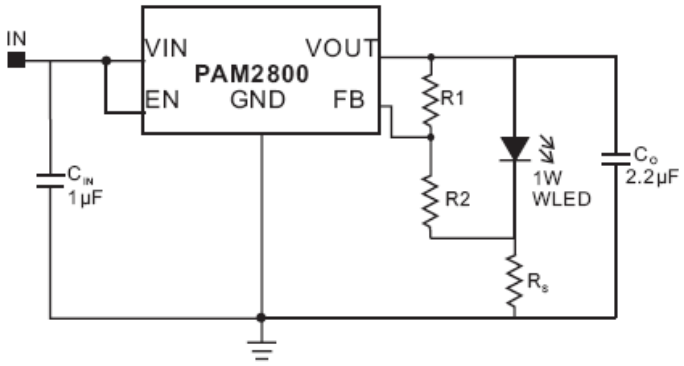
## Marking Information

Top View
SOT23-5




EG: Product Code of PAM2800
I: Current Code
Y: Year
W: Week

## Typical Applications Circuit



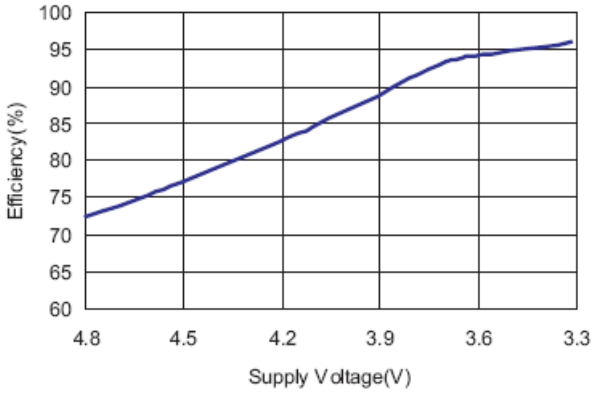




**Figure 1**

## Pin Description

| Pin Number | Pin Name | Function |
|---|---|---|
| 1 | VIN | Input |
| 2 | GND | Ground |
| 3 | EN | Chip Enable (Active High) |
| 4 | FB | Feedback |
| 5 | VOUT | Output |

## Absolute Maximum Ratings (@$T_A$ = +25°C, unless otherwise specified.)

These are stress ratings only and functional operation is not implied. Exposure to absolute maximum ratings for prolonged time periods may affect device reliability. All voltages are with respect to ground.

| Parameter | Rating | Unit |
|---|---|---|
| Input Voltage | 6 | V |
| Output Current | 350 | mA |
| Output Pin Voltage | GND -0.3 to $V_{IN}$ +0.3 | V |
| Lead Soldering Temperature | 300, (5sec) | °C |
| Storage Temperature | -65 to +150 | °C |

## Recommended Operating Conditions (@$T_A$ = +25°C, unless otherwise specified.)

| Parameter | Rating | Unit |
|---|---|---|
| Maximum Supply Voltage | 5.5 | V |
| Junction Temperature | -40 to +125 | °C |
| Operation Temperature | -40 to +85 | |

## Thermal Information

| Parameter | Symbol | Package | Max | Unit |
|---|---|---|---|---|
| Thermal Resistance (Junction to Case) | $\theta_{JC}$ | SOT25 | 130 | °C/W |
| Thermal Resistance (Junction to Ambient) | $\theta_{JA}$ | SOT25 | 250 | |
| Internal Power Dissipation | $P_D$ | SOT25 | 400 | mW |

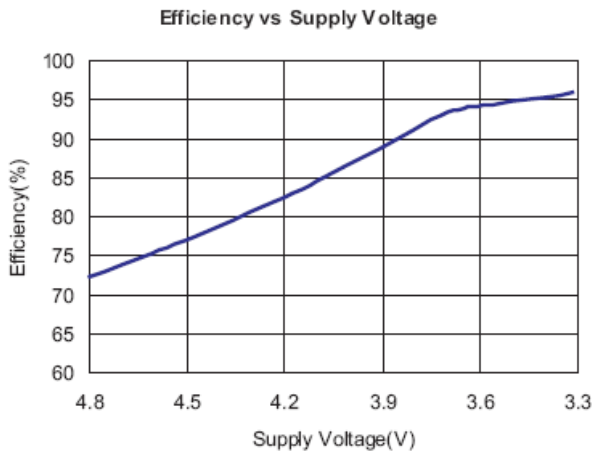
## Electrical Characteristics (@$T_A$ = +25°C, $V_{IN}$ = 3.7V, $C_{IN}$ = 1µF, $C_O$ = 2.2µF, unless otherwise specified.)

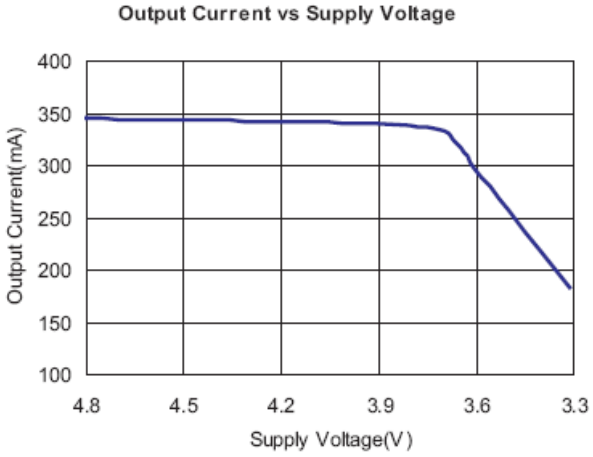
| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Input Voltage | $V_{IN}$ | - | - | - | 5.5 | V |
| Feedback Voltage (Note 4) | $V_{FB}$ | - | - | 1.12 | - | V |
| Output Current | $I_O$ | - | 300 | - | - | mA |
| Quiescent Current | $I_Q$ | No Load | - | 65 | 90 | µA |
| Efficiency | Eff | - | 90 | 92 | - | % |
| Overtemperature Shutdown | OTS | $I_O$ = 1mA | - | 150 | - | °C |
| Overtemperature Hysteresis | OTH | $I_O$ = 1mA | - | 30 | - | °C |

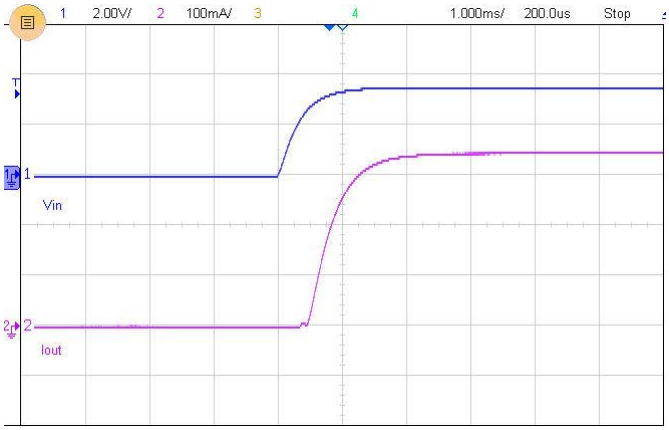
Note: 4. Feedback voltage tolerance ±3%.

## Typical Performance Characteristics

($@T_A$ = +25°C, $C_{IN}$ =1µF, $C_O$ = 2.2µF, R1 = 62kΩ, R2 = 33kΩ, RS = 0.22Ω, unless otherwise specified.)




**Startup time**

## Application Information

In the typical application (see Figure 1), the LED current will come to constant current level little by little after the device is powered. A 62KΩ resistor is recommended for R1, the value for R2 should be adjusted around 33KΩ due to LED forward voltage from lot-to-lot or brand-to-brand.

### Power Dissipation and Thermal Consideration

Thermal protection limits power dissipation in the PAM2800. When the operation junction temperature exceeds +150°C, the OTP (Overtemperature Protection) starts the thermal shutdown and turns the pass transistor off. The pass transistor resumes operation after the junction temperature drops below +120°C.

For continuous operation, the junction temperature should be maintained below +125°C. The power dissipation is defined as:

$$P_D = (V_{IN} - V_{OUT}) * I_O + V_{IN} * I_{GND}$$

The maximum power dissipation depends on the thermal resistance of IC package, PCB layout, the rate of surrounding airflow and temperature difference between junction and ambient. The maximum power dissipation can be calculated by the following formula:

$$P_{D(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA}$$

Where $T_{J(MAX)}$ is the maximum operation junction temperature +125°C. $T_A$ is the ambient temperature, and is the thermal resistance from the junction to the ambient.

For example, as $\theta_{JA}$ is +250°C/W for SOT25, based on the standard JEDEC 51-3 for a single layer thermal test board, the maximum power dissipation for SOT25 package at $T_A$ = +25°C can be calculated by following formula:

$$P_{D(MAX)} = (125°C - 25°C) / 250 = 0.4W$$

To calculate the junction temperature of the PAM2800 SOT25 package, if we use input voltage $V_{IN}$ = 4V at an output current $I_O$ = 300mA and the case temperature $T_A$ = 40°C measured by the thermal couple while operating, the power dissipation is defined as:

$$P_D = (4V - 2.8V) * 300mA + 4V * 70\mu A \approx 360mW$$

### Setting the $I_{LED}$ Current

The LED current is set by the use of an external resistor, $R_S$. This resistor supplies the bias current of the PAM2800 together with current regulator to set the LED current.

$I_{LED} \approx (V_{OUT} - (1+ R1/R2)* V_{FB})/ R_S$

The external resistor, $R_S$ is determined by this equation:

$R_S \approx (V_{OUT} - (1+ R1/R2)* V_{FB})/ I_{LED}$

For example: $V_{OUT} \approx$ 3.3V for 1 LED, $V_{FB}$ = 1.12 (Typ. value from page 3), $R_2$ = 33kΩ, $R_1$ = 62kΩ, and $I_{LED}$ = 350mA

$R_S \approx (V_{OUT} - (1+ R1/R2)* V_{FB})/ I_{LED}$

$R_S \approx (3.3 - (1+ (62k/33k))*1.12)/0.35$

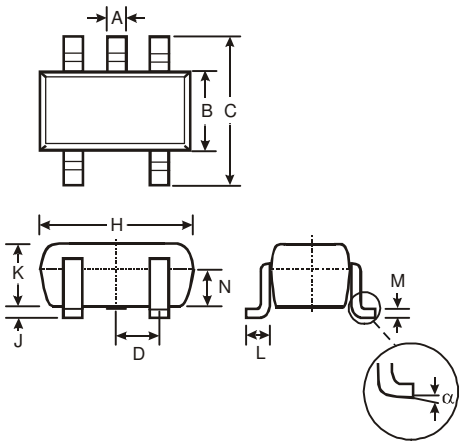
$\approx 0.22\Omega$

Notes: 1. $V_{OUT}$ is approximately the LED forward voltage drop minus $V_S$ which is insignificant.

2. If the $V_{OUT}$ is lower than 3.3V, then the ratio of R1 and R2 needs to be adjusted to keep the $((1+ R1/R2)* V_{FB})$ term smaller than $V_{OUT}$.

## Package Outline Dimensions (All dimensions in mm.)

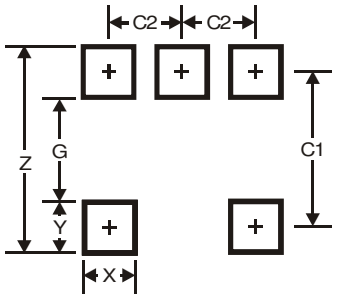
Please see http://www.diodes.com/package-outlines.html for the latest version.




| SOT25 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.35 | 0.50 | 0.38 |
| **B** | 1.50 | 1.70 | 1.60 |
| **C** | 2.70 | 3.00 | 2.80 |
| **D** | - | - | 0.95 |
| **H** | 2.90 | 3.10 | 3.00 |
| **J** | 0.013 | 0.10 | 0.05 |
| **K** | 1.00 | 1.30 | 1.10 |
| **L** | 0.35 | 0.55 | 0.40 |
| **M** | 0.10 | 0.20 | 0.15 |
| **N** | 0.70 | 0.80 | 0.75 |
| **α** | 0° | 8° | - |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.




| Dimensions | Value |
|---|---|
| **Z** | 3.20 |
| **G** | 1.60 |
| **X** | 0.55 |
| **Y** | 0.80 |
| **C1** | 2.40 |
| **C2** | 0.95 |

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