# HBL5006 Series

# LED Shunt

The HBL5006 Series are electronic shunts which provide a current bypass in the case of LEDs going into open circuit. LEDs are by nature quite fragile when subjected to transients and surge conditions. There are also many cases where high reliability of the LED lighting must be maintained such as in headlights, lighthouses, bridges, aircraft, runways and so forth. In these cases the low cost addition of the shunt device will provide full assurance that an entire string of LEDs will not extinguish should one LED fail open. The shunt device is also applicable to other loads where circuit continuity is required. The devices are designed to be used with LED string currents from 50 to 350 mA.

### Features

- Protection for the Following IEC Standards:
  IEC 61000−4−2 (Level 4)
  ISO 10605
- Low ESD Clamping Voltage
- Automatically Resets Itself if the LED Heals Itself or is Replaced
- ON−State Voltage Typically 1.1 V
- OFF−State Current less than 1.0 μA
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free and are RoHS Compliant

### Typical Applications

- LEDs where Preventive Maintenance is Impractical
- LED Headlights in Automobiles
- Automotive LED Applications
- LEDs with High Reliability Requirements
- Crowbar Protection for Open Circuit Conditions
- Overvoltage Protection for Sensitive Circuits

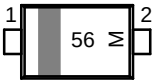
**ON Semiconductor®**

**http://onsemi.com**

**MARKING DIAGRAMS**

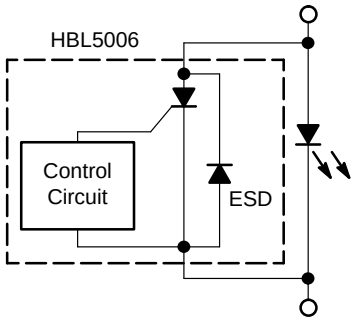
**SOD−323**
**CASE 477**

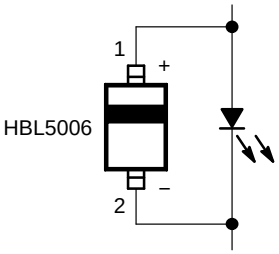

**SOD−523**
**CASE 502**




**SOD−923**
**CASE 514AB**


XX = Specific Device Code
M = Date Code




Apply heat sinking to pin 2

**ORDERING INFORMATION**

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

**MAXIMUM RATINGS**

| Rating | | Symbol | Value | Unit |
|---|---|---|---|---|
| On−State Current, ($T_A$ = 25°C) (Note 2) | SOD−323 (Note 1)<br>SOD−323 (Note 2)<br><br>SOD−523 (Note 1)<br>SOD−523 (Note 2)<br><br>SOD−923 (Note 1)<br>SOD−923 (Note 2) | $I_{T(AVG)}$ | 250<br>200<br><br>300<br>250<br><br>350<br>300 | mA |
| Thermal Resistance, Junction−to−Air (All Packages) | SOD−323 (Note 1)<br>SOD−323 (Note 2)<br><br>SOD−523 (Note 1)<br>SOD−523 (Note 2)<br><br>SOD−923 (Note 1)<br>SOD−923 (Note 2) | $\theta_{JA}$ | 435<br>550<br><br>360<br>435<br><br>285<br>360 | °C/W |
| Operating Temperature Range | (Note 3) | $T_J$ | −40 to 150 | °C |
| Non−Operating Temperature Range | | $T_J$ | 150 | °C |
| Lead Temperature, Soldering (10 Sec) | | $T_L$ | 260 | °C |
| IEC 61000−4−2 Contact (ESD)<br>IEC 61000−4−2 Air (ESD) | | ESD<br>ESD | ±15<br>±15 | kV |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Mounted onto a 2−layer, 1000 $mm^2$ per layer, 3 oz Cu, FR4 PCB with pin 2 connected to the heat sink and pin 1 only connected to a signal trace. The heat sinking must be connected to pin 2, which is the LED cathode connection.
   Normally this device would be mounted on the same copper heat sink and adjacent to the LED(s). If the LED(s) were to go open, then the HBL shunt would now dissipate the power using the same copper heat sink. Since the shunt has a voltage that is nominally 30% of the LED, then the power dissipation would be much lower, and easily handled by the same heat sink as the LED.
2. Mounted onto a 2−layer, 50 $mm^2$ per layer, 1 oz Cu, FR4 PCB.
3. Max operating temperature for DC conditions is 150°C, but not to exceed 175°C for pulsed conditions with low duty cycle or non−repetitive.

**ELECTRICAL CHARACTERISTICS** (Unless otherwise noted: $T_A$ = 25°C)

| Symbol | Characteristics | Package | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{BR}$ | Breakdown Voltage: The minimum voltage across the device in or at the breakdown region. Measured at $I_{BR}$ = 1 mA. | SOD−323 | 6.2 | 7.0 | | V |
| | | SOD−523 | 6.2 | 7.0 | | |
| | | SOD−923 | 6.2 | 7.0 | | |
| $I_H$ | Holding Current: The minimum current required to maintain the device in the on-state. | SOD−323 | | 25 | 40 | mA |
| | | SOD−523 | | 25 | 40 | |
| | | SOD−923 | | 25 | 40 | |
| $I_L$ | Latching Current: The minimum current required to turn from the off-state to the on-state. | SOD−323 | | 9.0 | | mA |
| | | SOD−523 | | 9.0 | | |
| | | SOD−923 | | 9.0 | | |
| $V_{BO}$ | Breakover Voltage: The voltage across the device in the breakover region. | SOD−323 | 6.5 | 7.2 | 8.0 | V |
| | | SOD−523 | 6.5 | 7.2 | 8.0 | |
| | | SOD−923 | 6.5 | 7.2 | 8.0 | |
| $I_R$ | Off−State Current: The dc value of current that results from the application of the off-state voltage. Measured at 3.3 V. | SOD−323 | | | 1.0 | μA |
| | | SOD−523 | | | 1.0 | |
| | | SOD−923 | | | 1.0 | |
| $V_T$ | On−State Voltage. Measured at 100 mA. | SOD−323 | 0.9 | 1.1 | 1.3 | V |
| | | SOD−523 | 0.9 | 1.1 | 1.3 | |
| | | SOD−923 | 0.9 | 1.1 | 1.3 | |
| $V_C$ | Clamping Voltage TLP (Note 4) | SOD−323 | | 6.5<br>11.2 | | V |
| | $I_{PP}$ = 8 A } IEC 6100−4−2 Level 2 equivalent (±4 kV Contact, ±4 kV Air) | SOD−523 | | 6.5<br>11.2 | | |
| | $I_{PP}$ = 16 A } IEC 6100−4−2 Level 4 equivalent (±8 kV Contact, ±15 kV Air) | SOD−923 | | 6.5<br>11.2 | | |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. ANSI/ESD STM5.5.1 − Electrostatic Discharge Sensitivity Testing using Transmission Line Pulse (TLP) Model TLP conditions: $Z_0$ = 50 Ω, $t_p$ = 100 ns, $t_r$ = 4 ns, averaging window; $t_1$ = 30 ns to $t_2$ = 60 ns.

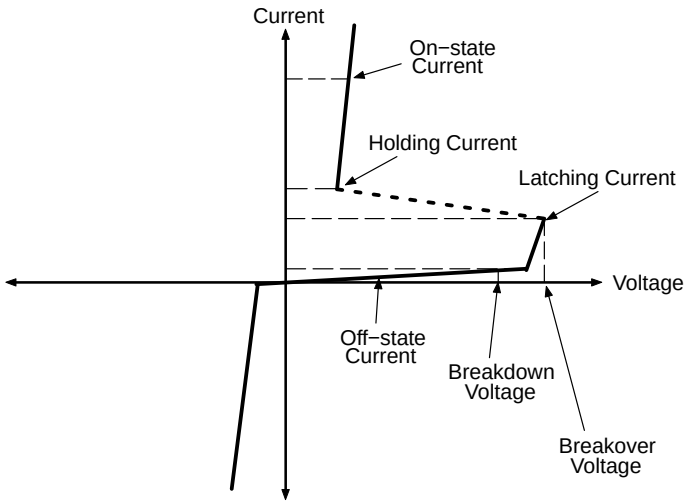



**Figure 1. I−V Characteristics**

## TYPICAL APPLICATION CIRCUIT

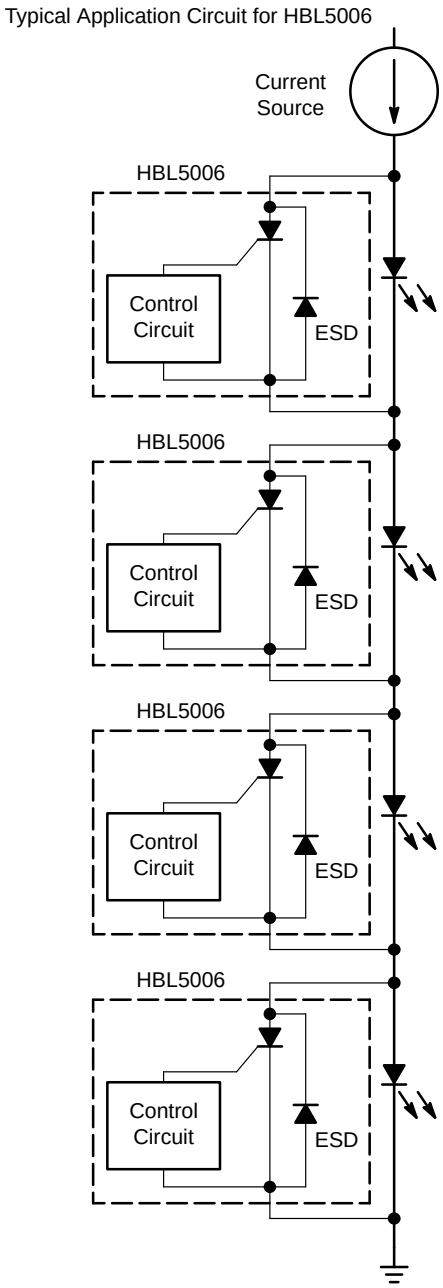



**Figure 2. Typical Application Circuit**

## DEVICE ORDERING INFORMATION

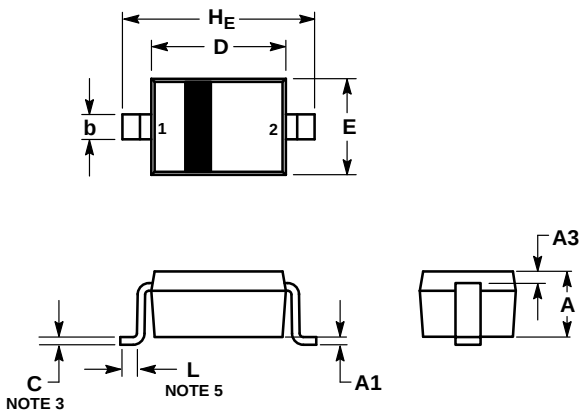
| Device | Marking | Package | Shipping† |
|---|---|---|---|
| HBL5006HT1G | HD | SOD−323 (Pb−Free) | 3000 / Tape & Reel |
| SZHBL5006HT1G* | HD | | |
| HBL5006XV2T1G | 56 | SOD−523 (Pb−Free) | 3000 / Tape & Reel |
| SZHBL5006XV2T1G* | 56 | | |
| HBL5006P2T5G | LD | SOD−923 (Pb−Free) | 8000 / Tape & Reel |
| SZHBL5006P2T5G* | LD | | |

†For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

*SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable.

## PACKAGE DIMENSIONS

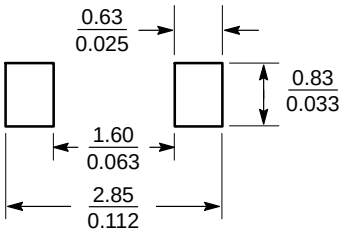
**SOD−323**
CASE 477−02
ISSUE H




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. LEAD THICKNESS SPECIFIED PER L/F DRAWING WITH SOLDER PLATING.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
5. DIMENSION L IS MEASURED FROM END OF RADIUS.

| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| DIM | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.80 | 0.90 | 1.00 | 0.031 | 0.035 | 0.040 |
| A1 | 0.00 | 0.05 | 0.10 | 0.000 | 0.002 | 0.004 |
| A3 | | 0.15 REF | | | 0.006 REF | |
| b | 0.25 | 0.32 | 0.4 | 0.010 | 0.012 | 0.016 |
| C | 0.089 | 0.12 | 0.177 | 0.003 | 0.005 | 0.007 |
| D | 1.60 | 1.70 | 1.80 | 0.062 | 0.066 | 0.070 |
| E | 1.15 | 1.25 | 1.35 | 0.045 | 0.049 | 0.053 |
| L | 0.08 | | | 0.003 | | |
| $H_E$ | 2.30 | 2.50 | 2.70 | 0.090 | 0.098 | 0.105 |

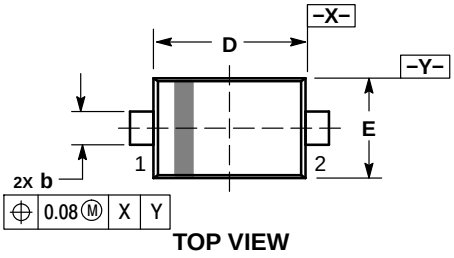
## SOLDERING FOOTPRINT*



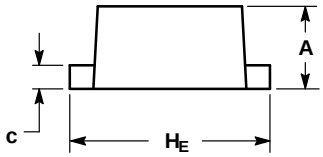

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

## PACKAGE DIMENSIONS

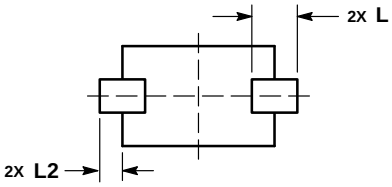
**SOD−523**
CASE 502
ISSUE E




**TOP VIEW**




**SIDE VIEW**

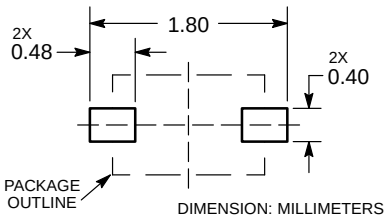



**BOTTOM VIEW**

NOTES:
6. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
7. CONTROLLING DIMENSION: MILLIMETERS.
8. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
9. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| | MILLIMETERS | | |
|---|---|---|---|
| DIM | MIN | NOM | MAX |
| A | 0.50 | 0.60 | 0.70 |
| b | 0.25 | 0.30 | 0.35 |
| c | 0.07 | 0.14 | 0.20 |
| D | 1.10 | 1.20 | 1.30 |
| E | 0.70 | 0.80 | 0.90 |
| $H_E$ | 1.50 | 1.60 | 1.70 |
| L | 0.30 REF | | |
| L2 | 0.15 | 0.20 | 0.25 |

**RECOMMENDED SOLDERING FOOTPRINT***

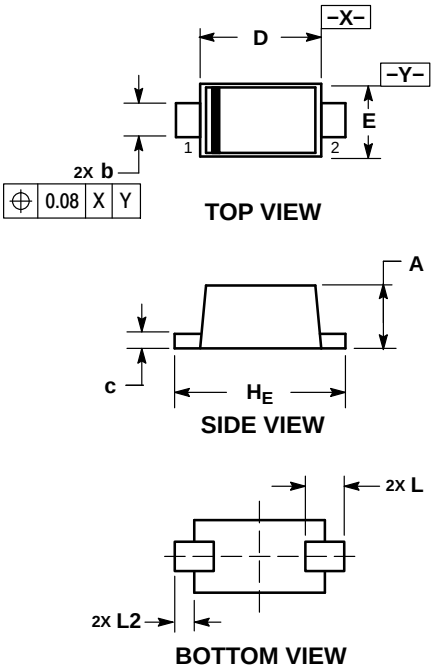



DIMENSION: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

## PACKAGE DIMENSIONS

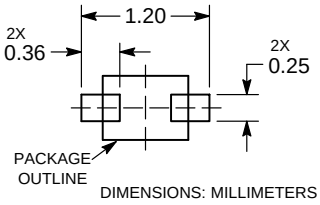
**SOD−923**
CASE 514AB
ISSUE C




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| DIM | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.34 | 0.37 | 0.40 | 0.013 | 0.015 | 0.016 |
| b | 0.15 | 0.20 | 0.25 | 0.006 | 0.008 | 0.010 |
| c | 0.07 | 0.12 | 0.17 | 0.003 | 0.005 | 0.007 |
| D | 0.75 | 0.80 | 0.85 | 0.030 | 0.031 | 0.033 |
| E | 0.55 | 0.60 | 0.65 | 0.022 | 0.024 | 0.026 |
| $H_E$ | 0.95 | 1.00 | 1.05 | 0.037 | 0.039 | 0.041 |
| L | 0.19 REF | | | 0.007 REF | | |
| L2 | 0.05 | 0.10 | 0.15 | 0.002 | 0.004 | 0.006 |

### SOLDERING FOOTPRINT*




DIMENSIONS: MILLIMETERS

See Application Note AND8455/D for more mounting details

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



**PUBLICATION ORDERING INFORMATION**

**LITERATURE FULFILLMENT**:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
**Phone**: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
**Fax**: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
**Email**: orderlit@onsemi.com

**N. American Technical Support**: 800−282−9855 Toll Free USA/Canada
**Europe, Middle East and Africa Technical Support:**
Phone: 421 33 790 2910
**Japan Customer Focus Center**
Phone: 81−3−5817−1050

**ON Semiconductor Website**: **www.onsemi.com**

**Order Literature**: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative

**HBL5006/D**

Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

**Данный компонент на территории Российской Федерации**

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

http://moschip.ru/get-element

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

**Офис по работе с юридическими лицами:**

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9