

Ultra Low Dropout 2A CMOS LDO

General Description

The BM9165 series are high performance linear voltage regulators that provide ultra low-dropout voltage, high output current in lowest output voltage. It operates from an input of 1.4V to 5.5V and provides output current up to 2A thus is suitable to drive digital circuits requiring **low voltage at high currents**.

The BM9165 has superior regulation over variations in line and load. Also it provides fast respond to step changes in load. Other features include over-current and over-temperature protection. The adjustable version has enable pin to reduce power consumption in shutdown mode.

The devices are available ADJ output, and via external R adjust output voltage from 0.6V to $V_{in}-0.3V$, 0.6V is the reference voltage. The BM9165 have enable function, that is good for portable system for main chip on and off.

In order to have lower dropout and bigger current output V_{en} should 0.8~1.0V higher than V_{in} , but can work if same. Power pad sop8 can output over 2A and 1.8A without the pad.

Ordering Information

BM9165 □ □ □ □

Packing mode
T: tube, 100pcs / tube
R: tape & reel, 2.5K pcs / reel

Volage output:
10: 1.05V/ADJ
12: 1.2V / ADJ
18: 1.8V / ADJ
25: 2.5V / ADJ

Package SOP8 and pins type
A: with power pad, package A

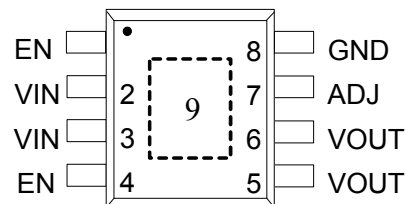
Features

- 300mV Dropout @ 2A (1.2V output)
- <300 μ A Low Ground Pin Current
- Excellent Line and Load Regulation
- 0.1 μ A Quiescent Current in Shutdown Mode
- Guaranteed >2A Output Current
- Fixed Output Voltages: 1.05V, 1.2V, 1.8V, 2.5V
- Adjustable Output Voltage from 0.6V to 4.5V
- Over-Temperature/Over-Current Protection

Applications

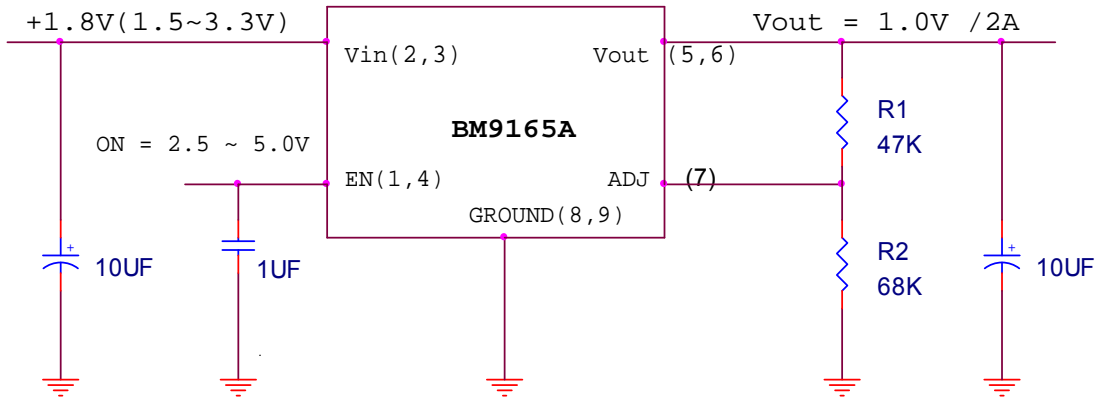
- Card reader and Battery-Powered Equipment
- Mother Board/Graphic Card
- LCD-TV, NET BOOK, USB Net card
- NET-BOOK, pin-pin with RT9025, RT9018

Pin Configurations



Package A

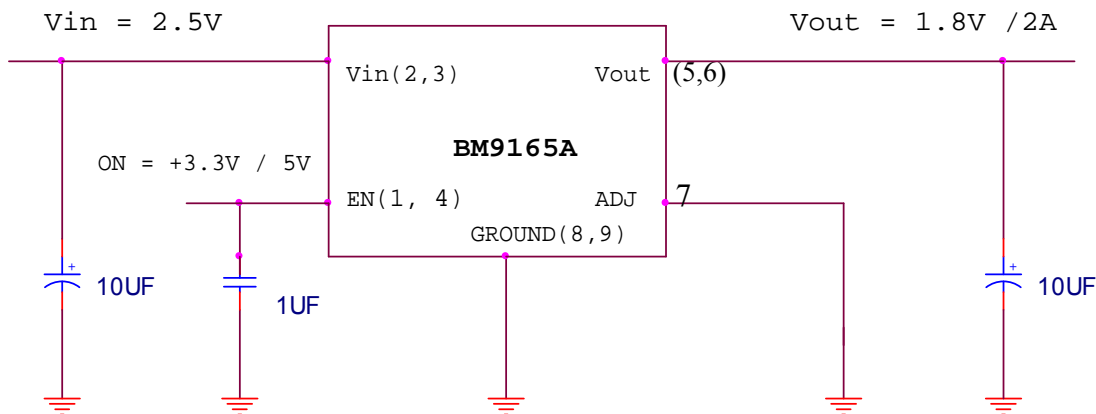
Application of BM9165A



如果客户板上只有一组电压 V1 (V1=<+5V), 请把 V1 直接接 EN 脚;VI 串联 2 个 SS24 的二极管到 VIN 脚.

$$V_{out} = 0.6 * (1 + R1 / R2)$$

Above is adjustable output and below is the fixed 1.8V voltage output circuit



如果客户板上只有一组电压 V1 (V1=<+5V), 请把 V1 直接接 EN 脚;VI 串联 2 个 SS24 的二极管到 VIN 脚.

Important NOTES:

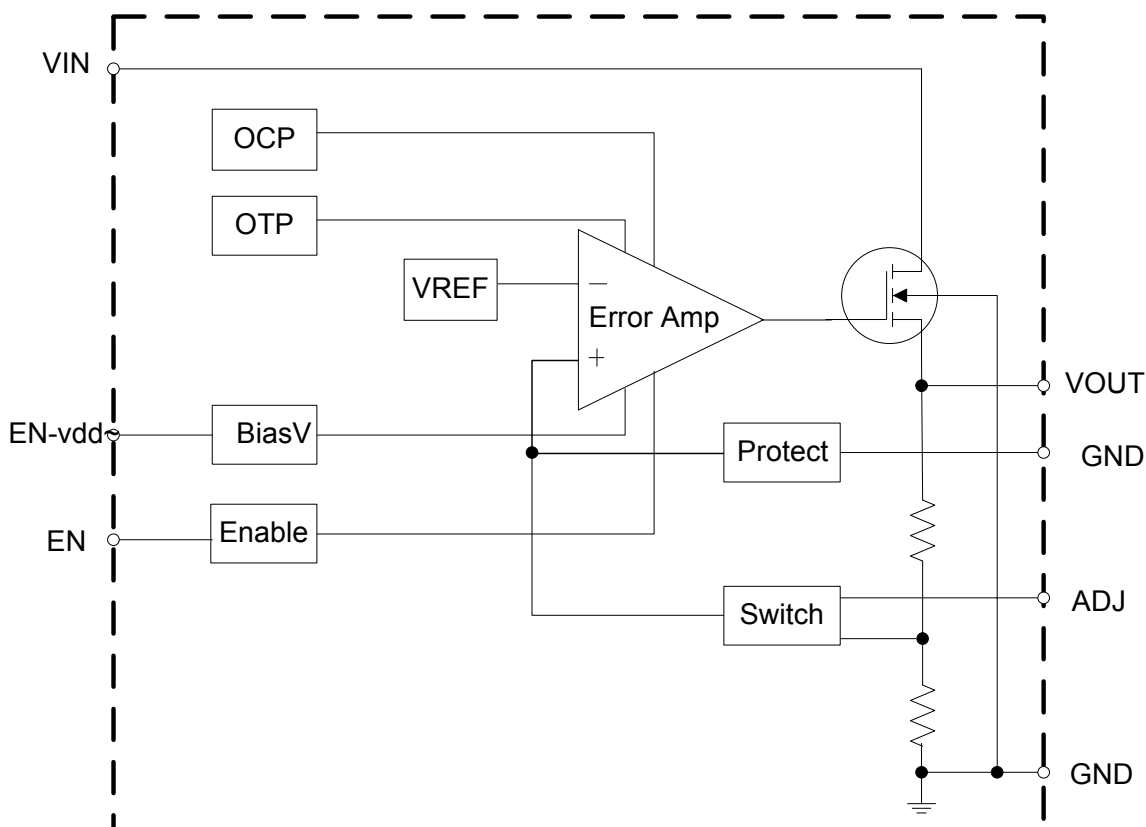
In order to get better dropout and larger output current, keep Ven higher +0.8V or more than Vin, which also result in better output ripple.

- 1: 为了低压输出的电流更大, 输入输出压差更小, 请保持 EN 脚加个对地电容并且: Ven>Vin.
- 2: EN脚电流有300uA左右, 给EN端逻辑控制信号加1K上拉电阻, 不用该功能时直接接到 3.3V/ 5V.
- 3: 没有单独 ADJ 的版本, 可调 ADJ 脚直接接地就是固定电压输出, 如本页第2张图; 如果ADJ脚不接地, 外加 R1 和 R2电阻, 输出电压就成为可调节的, 如本页的第1张图.
- 4: 当Ven=Vin, 输出在1A时, 输入输出压差是1V左右, 和S1172几乎一样; 2A时压差是1.7V; Ven>Vin+0.8, 1A 时, 压差<0.2V. 低压输出大电流时, 功耗非常小, 能替代高效率 DC-DC.

Functional Pin Description

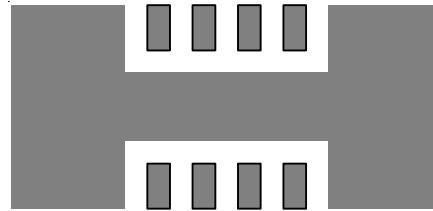
| Pin Name | Pin Function |
|----------|--|
| EN | Chip Enable Control Input. Logic enable On logic 3.3V / 5V. Note that the device will be in the unstable state if the pin is not connected. |
| VIN | Supply Input |
| GND | Common Ground |
| VOUT | Regulator Output |
| ADJ | The output voltage is set by the internal feedback resistors when this pin grounded. If external feedback resistors are applied, the output voltage will be: $V_{OUT} = 0.6 \times (1 + \frac{R_1}{R_T}) \text{ Volts}$ |

Functional Block Diagram



Absolute Maximum Ratings (Note 1)

- Supply Input Voltage ----- 6V
- Package Thermal Resistance
SOP8 with power pad 8, θ_{JA} ----- 50°C/W (75°C/W without power pad)



- Power Dissipation, $PD@T_A = 25^\circ C$

if PCB Copper Area = 70mm², $\theta_{JA} = 50^\circ C/W$

- SOP8 with power pad ----- $P_{max} = (125 - 25) / 50 = 2W$ (1.3W without power pad)
- Lead Temperature (Soldering, 10 sec.) ----- 260°C
- Junction Temperature ----- 150°C
- Storage Temperature Range ----- -65°C to 150°C
- ESD Susceptibility (Note 2)
HBM (Human Body Mode) ----- 2kV
MM (Machine Mode) ----- 200V

Recommended Operating Conditions (Note 3)

- Supply Input Voltage ----- 1.3V to 5.5V
- Junction Temperature Range ----- -40°C to 125°C

Electrical Characteristics

($V_{IN} = V_{OUT} + 0.7V$, $C_{IN} = C_{OUT} = 10\mu F$ (Ceramic), $T_A = 25^\circ C$ unless otherwise specified)

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Units |
|--|-------------------|--|-----|-------|------|---------|
| Output Voltage Accuracy (Fixed Output Voltage) | ΔV_{OUT} | $I_{OUT} = 10mA$ | -2 | 0 | +2 | % |
| Output Voltage Range (Adjustable) | V_{OUT_ADJ} | | 0.6 | -- | 4.5 | V |
| Quiescent Current (Note 6) | I_Q | $I_{OUT} = 0mA$, Enable | -- | 250 | | μA |
| Standby Current | I_{STBY} | $V_{IN} = 5.5V$, Shutdown | -- | 0.1 | 1 | μA |
| Current Limit | I_{LIM} | | 2.5 | 3 | 3.5 | A |
| Dropout Voltage (Note 4) | | $I_{OUT} = 0.5A$ | -- | 100 | | mV |
| | | $I_{OUT} = 1.0A$ | -- | 180 | | |
| | | $I_{OUT} = 2A$ | | 300 | | |
| Line Regulation | ΔV_{LINE} | $V_{OUT} + 0.5V < V_{IN} < 5.5V$ $I_{OUT} = 10mA$ | -- | 0.035 | 0.18 | %/V |
| Load Regulation (Note 5) (Fixed Output Voltage) | ΔV_{LOAD} | $1mA < I_{OUT} < 2A$ | -- | 15 | 35 | mV |

To be continue

| Parameter | | Symbol | Test Conditions | Min | Typ | Max | Units |
|------------------------------|--------------------|-----------------|---------------------------------|-------|------|-------|---------|
| Thermal Shutdown Temperature | | T_{SD} | | -- | 150 | -- | °C |
| Thermal Shutdown Hysteresis | | ΔT_{SD} | | -- | 20 | -- | °C |
| EN Threshold | Logic-Low Voltage | V_{IL} | $V_{IN} = 5.5V$ | -- | -- | 0.4 | V |
| | Logic-High Voltage | V_{IH} | $V_{IN} = 5.5V$ | 1.5 | -- | -- | |
| Enable Pin Current | | I_{EN} | $V_{IN} = 5.5V, \text{ Enable}$ | -- | 0.1 | 1 | μA |
| ADJ | | | | | | | |
| Reference Voltage Tolerance | | V_{REF} | | 0.587 | 0.6 | 0.613 | V |
| Adjust Pin Current | | I_{ADJ} | $V_{ADJ} = V_{REF}$ | -- | 10 | 100 | nA |
| Adjust Pin Threshold | | $V_{TH(ADJ)}$ | | 0.05 | 0.15 | 0.2 | V |

Note 1. Stresses listed as the above "Absolute Maximum Ratings" may cause permanent damage to the device. These are for stress ratings. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may remain possibility to affect device reliability.

Note 2. Devices are ESD sensitive. Handling precaution recommended.

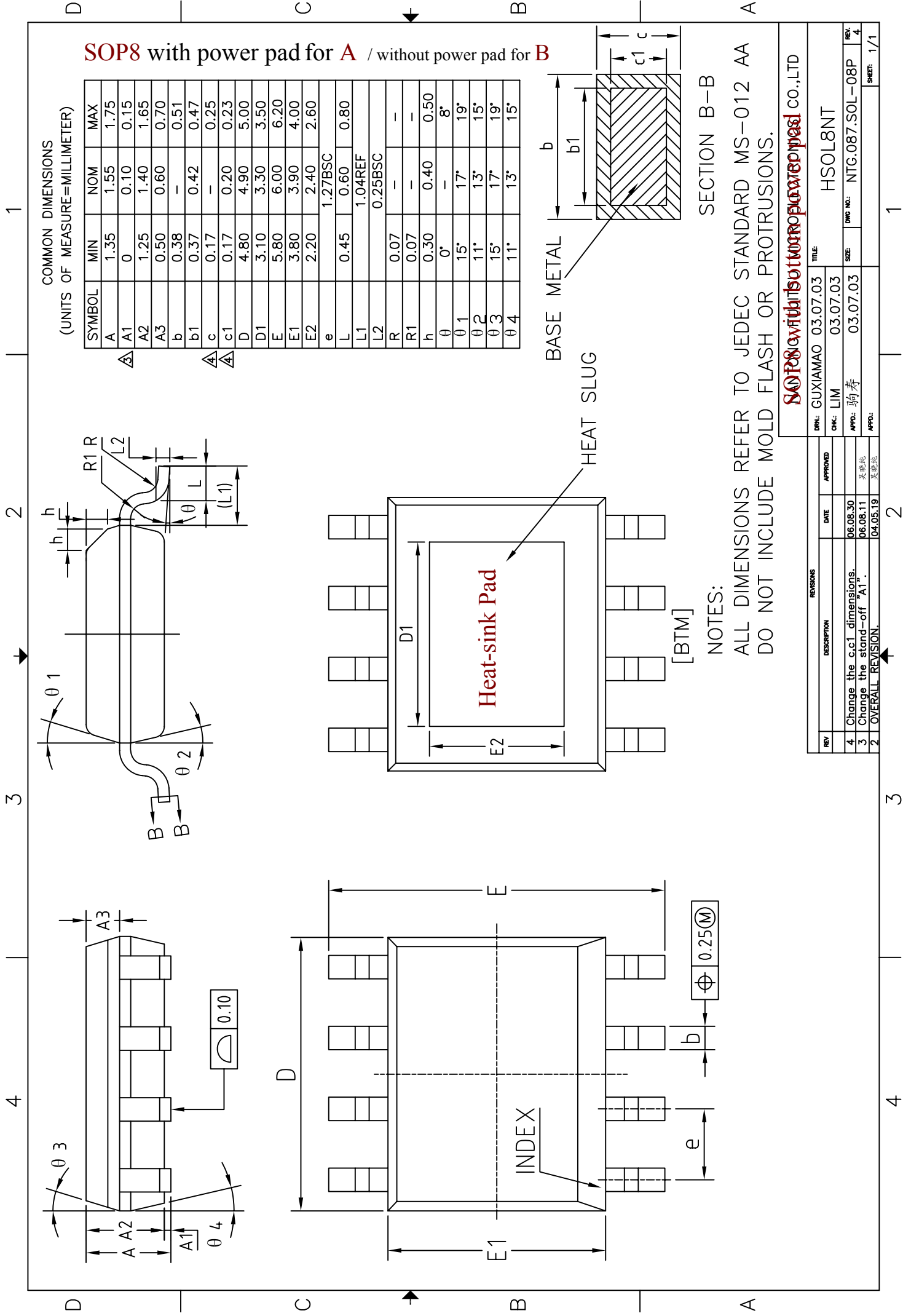
Note 3. The device is not guaranteed to function outside its operating conditions.

Note 4. The dropout voltage is defined as $V_{IN} - V_{OUT}$, which is measured when V_{OUT} is $V_{OUT(NORMAL)} - 100mV$.

Note 5. Regulation is measured at constant junction temperature by using a 20ms current pulse. Devices are tested for load regulation in the load range from 10mA to 2A.

Note 6. Quiescent, or ground current, is the difference between input and output currents. It is defined by $I_Q = I_{IN} - I_{OUT}$ under no load condition ($I_{OUT} = 0mA$). The total current drawn from the supply is the sum of the load current plus the ground pin current.

Note 7. PCB 上, BM9165 管脚边上的敷铜的面积越大, 散热速度越快
管脚焊盘越大(特别是靠边管脚焊盘),热阻就越小,输出电流更大.



SOP8 with power pad for A / without power pad for B

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN | NOM | MAX |
|---------|---------|------|------|
| A | 1.35 | 1.55 | 1.75 |
| A1 | 0 | 0.10 | 0.15 |
| A2 | 1.25 | 1.40 | 1.65 |
| A3 | 0.50 | 0.60 | 0.70 |
| b | 0.38 | - | 0.51 |
| b1 | 0.37 | 0.42 | 0.47 |
| c | 0.17 | - | 0.25 |
| c1 | 0.17 | 0.20 | 0.23 |
| D | 4.80 | 4.90 | 5.00 |
| D1 | 3.10 | 3.30 | 3.50 |
| E | 5.80 | 6.00 | 6.20 |
| E1 | 3.80 | 3.90 | 4.00 |
| E2 | 2.20 | 2.40 | 2.60 |
| e | 1.27BSC | | |
| L | 0.45 | 0.60 | 0.80 |
| L1 | 1.04REF | | |
| L2 | 0.25BSC | | |
| R | 0.07 | - | - |
| R1 | 0.07 | - | - |
| h | 0.30 | 0.40 | 0.50 |
| theta | 0° | - | 8° |
| theta 1 | 15° | 17° | 19° |
| theta 2 | 11° | 13° | 15° |
| theta 3 | 15° | 17° | 19° |
| theta 4 | 11° | 13° | 15° |

SECTION B-B

NOTES:

ALL DIMENSIONS REFER TO JEDEC STANDARD MS-012 AA
DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

| | | | |
|--------------------------|--|--------------------------|--|
| DRAWN: GUXIAMAO 03.07.03 | | TITLE: HSOL8NT | |
| CHK: LIM 03.07.03 | | DWG NO.: NTC.087.SOL-08P | |
| APPD: 驹寿 03.07.03 | | REV: 4 | |
| APPD: | | SHEET: 1/1 | |

| REV | DESCRIPTION | REVISIONS | DATE | APPROVED |
|-----|-----------------------------|-----------|----------|----------|
| 4 | Change the c.c1 dimensions. | | 06.08.30 | |
| 3 | Change the stand-off 'A1'. | | 06.08.11 | 吴晓光 |
| 2 | OVERALL REVISION. | | 04.05.19 | 吴晓光 |

SOP8 with ~~without~~ power pad