# *High Current LED Driver*

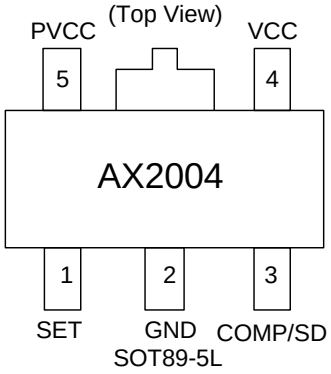
## ❖ GENERAL DESCRIPTION

AX2004 is a low dropout current regulator for high current LED Driver. The output current was decided by external resistor. Build-in thermal shutdown and current limit protection function.

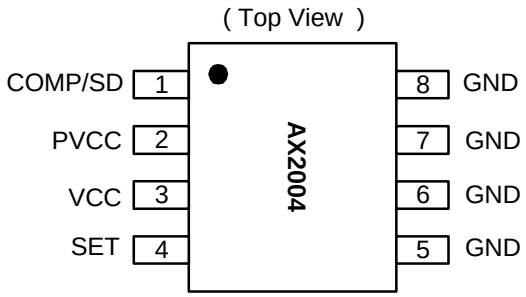
## ❖ FEATURES

- Input Voltage: 4V to 24V
- Up to 1A Maximum Output Current.
- 3% Output current setting accuracy.
- External resistor to set LED Current.
- Built-in thermal shutdown
- Available in SOT89-5L and SOP-8L Pb-Free Packages
- RoHS and Halogen free compliance

## ❖ PIN ASSIGNMENT



SOT89-5L



**SOP – 8L**

| Name | Description |
|---|---|
| GND | Ground |
| SET | LED current setting input. Connect a resistor from SET to GND to set LED current. |
| PVCC | The LEDs are connected from this pin to $V_{CC}$. |
| VCC | Input Supply Voltage |
| COMP/SD | Compensation pin and shutdown function. |

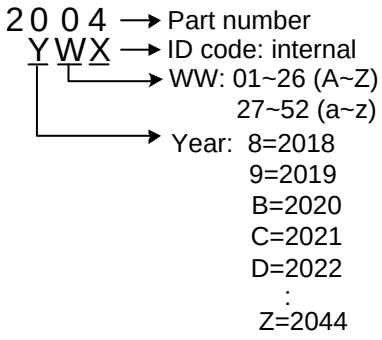
## ❖ ORDER/MARKING INFORMATION

**Order Information**

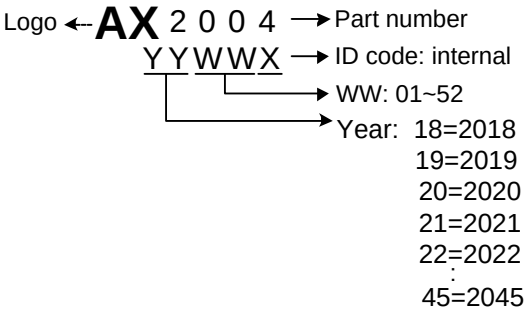
AX2004 X X X

- X (Package Type): S: SOP-8L; F5: SOT89-5L
- X (Packing): Blank : Tube; A : Taping

**Top Marking (SOT89-5L)**




**Top Marking (SOP-8L)**




## ❖ ABSOLUTE MAXIMUM RATINGS

| Characteristics | | Symbol | Rating | Unit |
|---|---|---|---|---|
| $V_{CC}$ Output Voltage | | $V_{CC}$ | -0.3 to 26 | V |
| PVCC Voltage | | $P_{VCC}$ | -0.3 to 24 | V |
| SET pin Voltage | | $V_{SET}$ | -0.3 to $V_{CC}$ | V |
| COMP pin Voltage | | $V_{COMP}$ | -0.3 to 6 | V |
| Max output current | | $I_{LED}$ | 1.5 | A |
| Operating Junction Temperature Range | | $T_{OP}$ | -40 to +125 | °C |
| Maximum junction Temperature | | $T_J$ | 150 | °C |
| Power Dissipation | SOP8 | $P_D$ | 1.4 | W |
| | SOT89 | | 1.05 | |
| Storage Temperature | | $T_{ST}$ | -65 to +150 | °C |
| Thermal Resistance from Junction to case | SOP-8L | $\theta_{JC}$ | 25 | °C/W |
| | SOT89-5L | | 50 | |
| Thermal Resistance from Junction to ambient | SOP-8L | $\theta_{JA}$ | 70 | °C/W |
| | SOT89-5L | | 80 | |

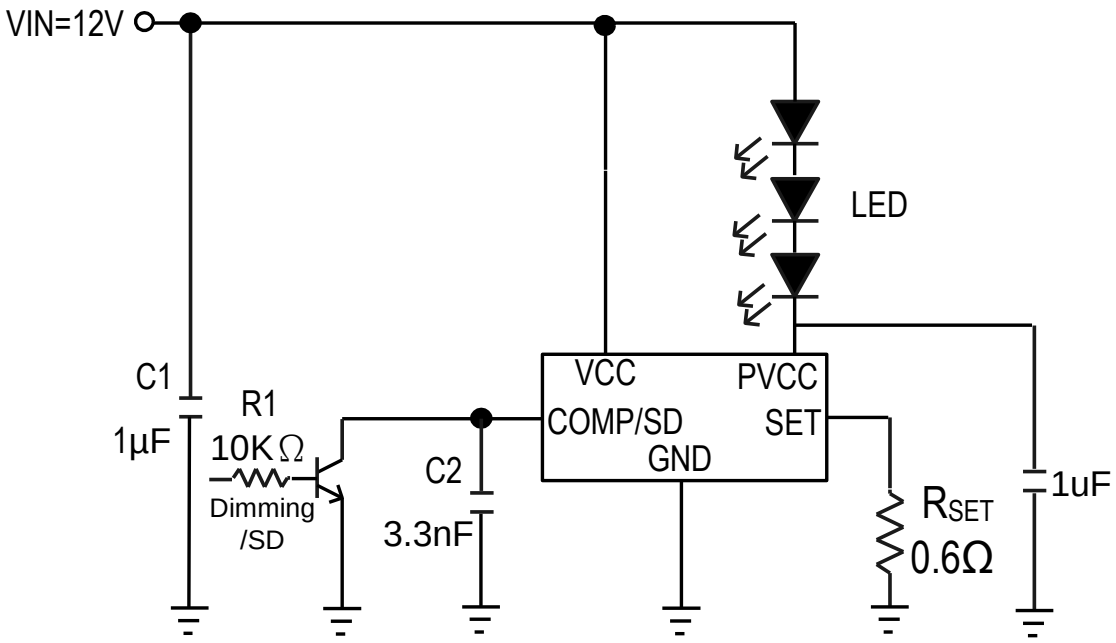
Note: $\theta_{JA}$ is measured with the PCB copper area(need connect to GND pins) of approximately 1.0 $in^2$ (Multi-layer)

## ❖ ELECTRICAL CHARACTERISTICS

($V_{CC}$ = 12V, $T_A$ = 25°C, unless otherwise specified)

| Characteristics | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CC}$ input voltage | $V_{CC}$ | $R_{SET}$ = 20Ω | 4 | - | 24 | V |
| Quiescent Current | $I_{CCQ}$ | LED open, $I_{OUT}$=0mA | - | 1.5 | 3 | mA |
| SET Voltage | $V_{SET}$ | $V_{CC}$-$V_{LED}$ > 2.5V | 204 | 210 | 216 | mV |
| Dropout Voltage | $PV_{CC}$ - $V_{SET}$ | $\Delta V_{SET}$=2%$V_{SET}$; $R_{SET}$ = 1Ω | - | 0.2 | 0.5 | V |
| Output Current limit | $C_L$ | | 1.2 | - | - | A |
| Dimming Frequency | $F_{DIM}$ | | - | - | 2 | KHZ |
| Comp Current | $I_{COMP}$ | $V_{COMP}$ = 0V, $V_{CC}$ = 12V | - | 80 | 120 | μA |
| Shutdown Current | $I_{VCC-SD}$ | $V_{COMP}$ = 0V | - | 1 | 2 | mA |
| | $I_{PVCC-SD}$ | | - | - | 1 | μA |
| Shutdown voltage | $V_{SD}$ | | - | - | 0.8 | V |
| Thermal shutdown | $T_{SD}$ | | - | 150 | - | °C |
| Thermal Shutdown Hysteresis | $T_{SH}$ | | - | 40 | - | °C |

## ❖ APPLICATION CIRCUIT

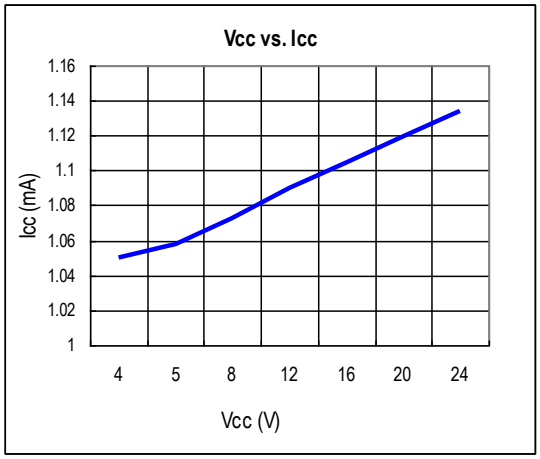


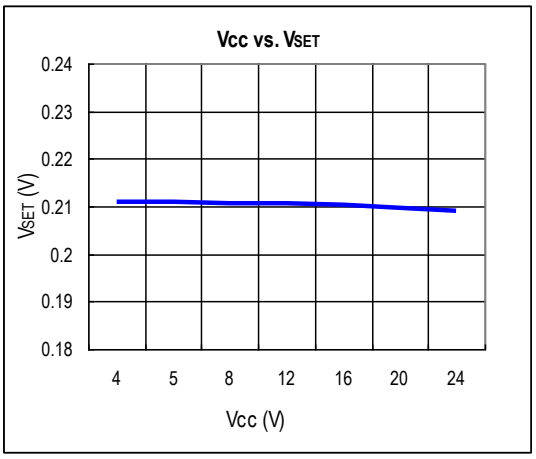

$$I_{LED} = \frac{V_{SET}}{R_{SET}}, V_{SET} = 0.21V$$

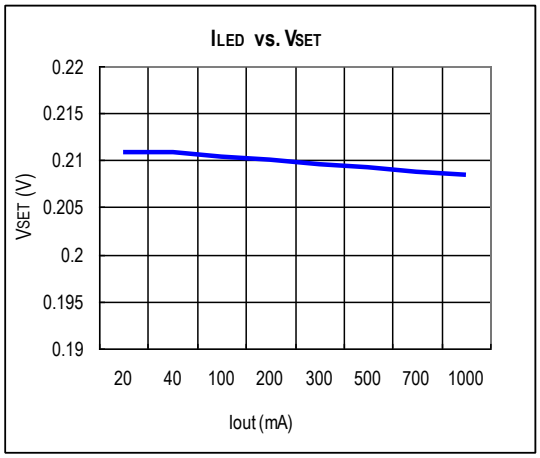
$$PD = (12V - VLED) \times I_{LED}$$

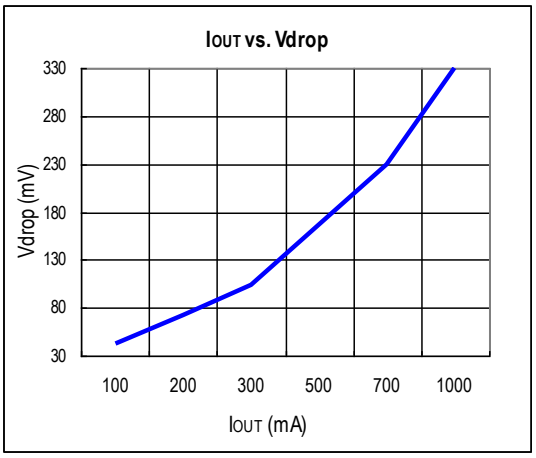
$$0.2\Omega \leqq R_{SET} \leqq 1K$$

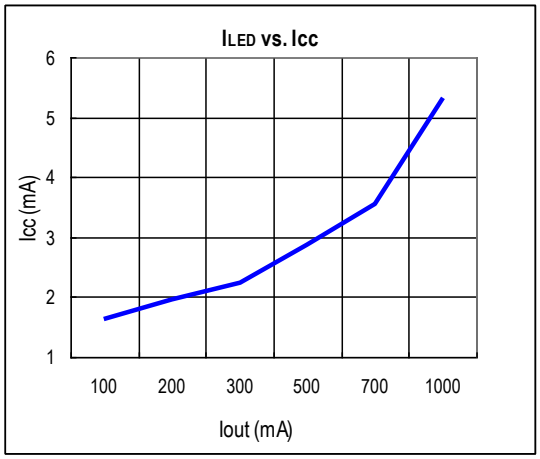
## ❖ TYPICAL CHARACTERISTICS

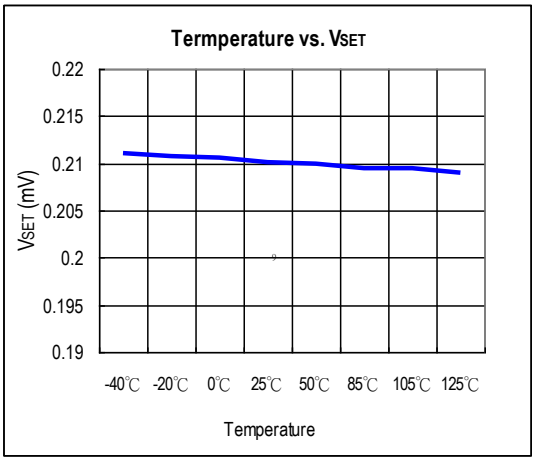


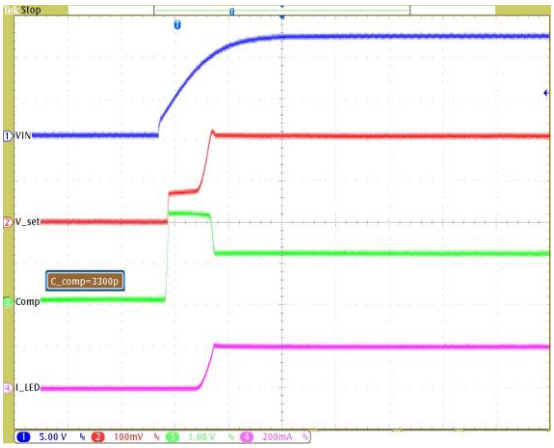



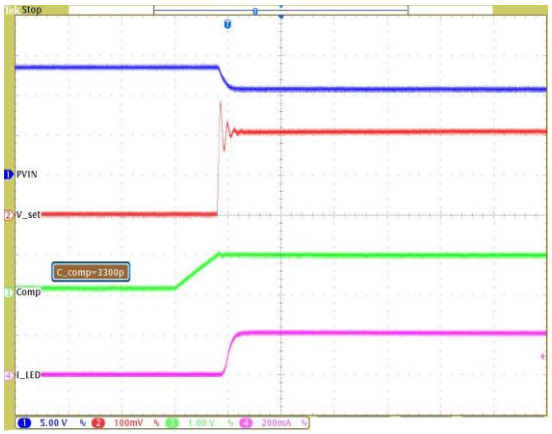



## ❖ TYPICAL CHARACTERISTICS (CONTINUOUS)

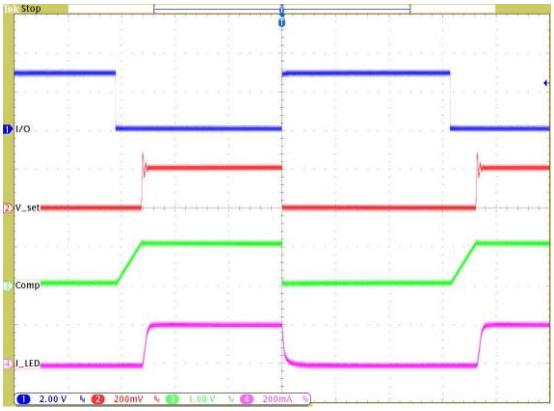
Start up



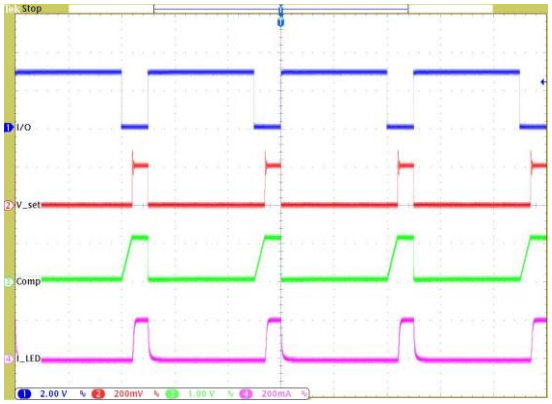

TSD to Release



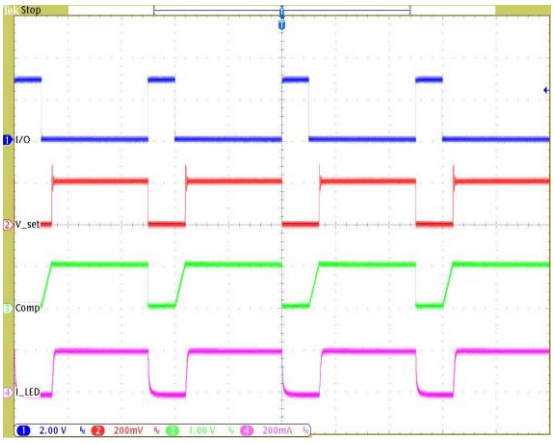

2KHz Dimming Duty 50%




2KHz Dimming Duty 20%

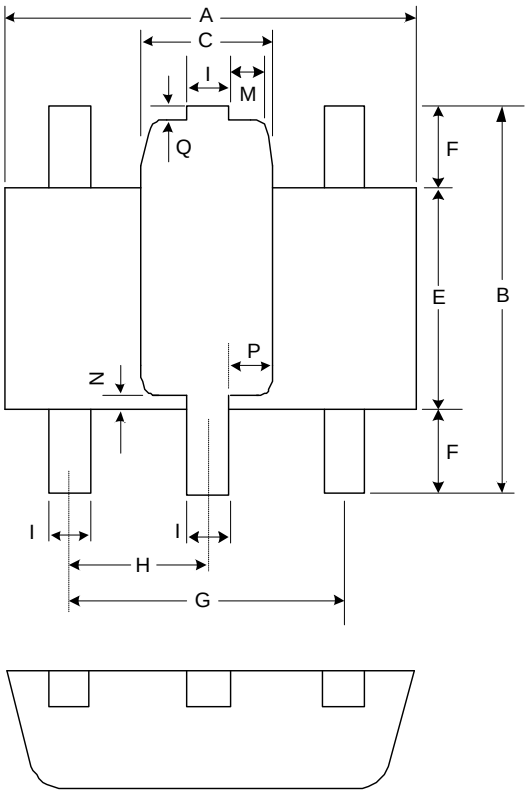


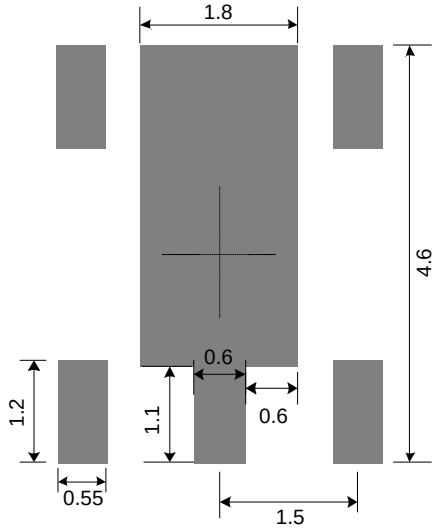

2KHz Dimming Duty 80%



## ❖ PACKAGE OUTLINES

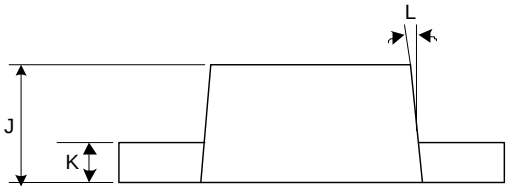
### (1) SOT89-5L




Land Pattern Recommendation (Unit: mm)

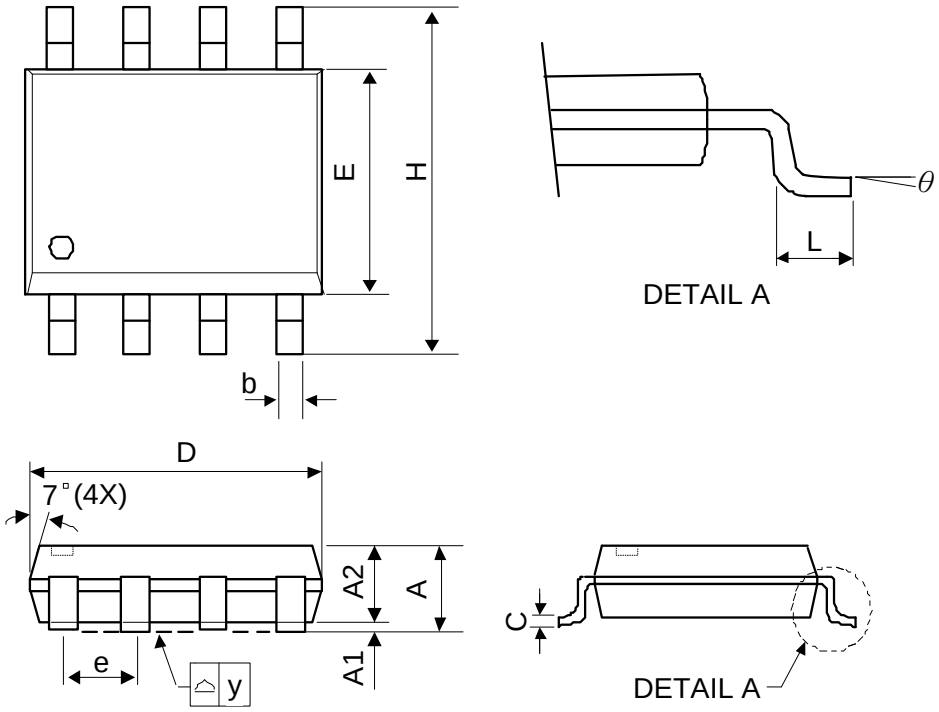





| Symbol | Dimensions in Millimeters | | | Dimensions in Inches | | |
|---|---|---|---|---|---|---|
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| A | 4.4 | 4.5 | 4.6 | 0.173 | 0.177 | 0.181 |
| B | 4.05 | 4.15 | 4.25 | 0.159 | 0.163 | 0.167 |
| C | 1.4 | 1.6 | 1.7 | 0.055 | 0.062 | 0.067 |
| E | 2.4 | 2.5 | 2.6 | 0.094 | 0.098 | 0.102 |
| F | 0.8 | - | - | 0.031 | - | - |
| G | 3.00 REF. | | | 0.118 REF. | | |
| H | 1.50 REF. | | | 0.059 REF. | | |
| I | 0.36 | 0.46 | 0.53 | 0.014 | 0.018 | 0.02 |
| J | 1.4 | 1.5 | 1.6 | 0.055 | 0.059 | 0.063 |
| K | 0.35 | 0.39 | 0.43 | 0.014 | 0.015 | 0.017 |
| L | 8° TYP. | | | 8° TYP. | | |
| M | 0.38 | 0.47 | 0.6 | 0.015 | 0.019 | 0.024 |
| N | 0.2 | 0.18 | 0.4 | 0.008 | 0.007 | 0.026 |
| P | 0.48 | 0.57 | 0.67 | 0.019 | 0.022 | 0.027 |
| Q | - | - | 0.4 | - | - | 0.016 |

JEDEC outline: NA

## (2) SOP-8L

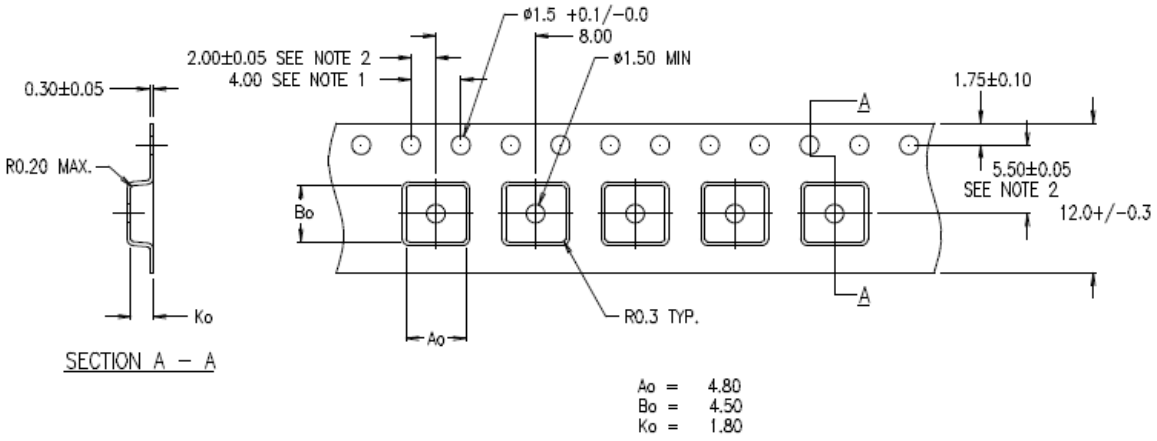


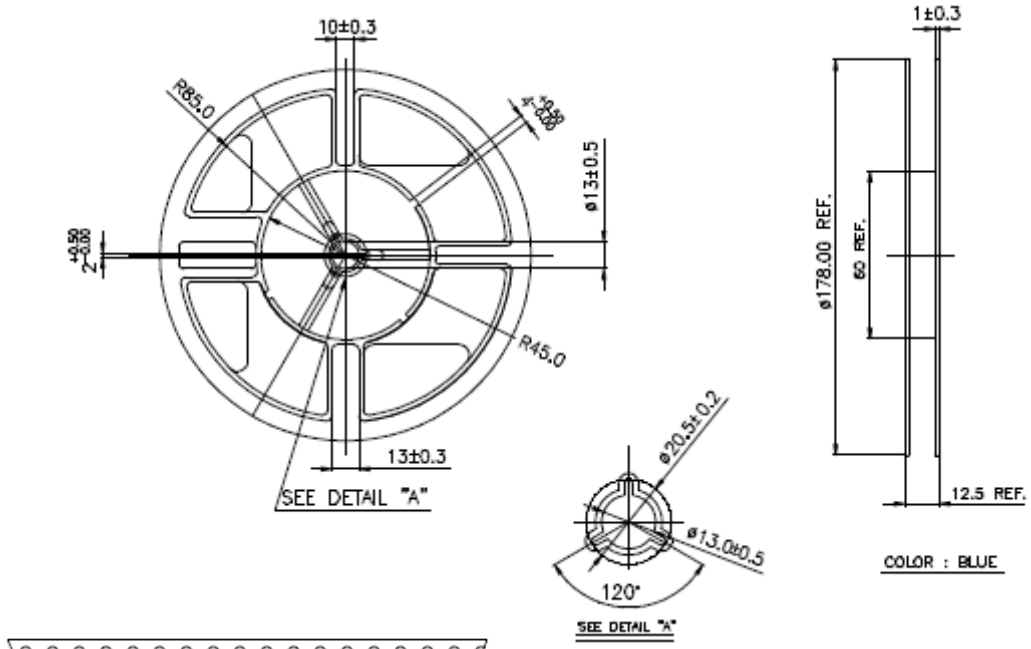

| Symbol | Dimensions in Millimeters | | | Dimensions in Inches | | |
|---|---|---|---|---|---|---|
| | Min. | Nom. | Max. | Min. | Nom. | Max. |
| A | - | - | 1.75 | - | - | 0.069 |
| A1 | 0.1 | - | 0.25 | 0.04 | - | 0.1 |
| A2 | 1.25 | - | - | 0.049 | - | - |
| C | 0.1 | 0.2 | 0.25 | 0.0075 | 0.008 | 0.01 |
| D | 4.7 | 4.9 | 5.1 | 0.185 | 0.193 | 0.2 |
| E | 3.7 | 3.9 | 4.1 | 0.146 | 0.154 | 0.161 |
| H | 5.8 | 6 | 6.2 | 0.228 | 0.236 | 0.244 |
| L | 0.4 | - | 1.27 | 0.015 | - | 0.05 |
| b | 0.31 | 0.41 | 0.51 | 0.012 | 0.016 | 0.02 |
| e | 1.27 BSC | | | 0.050 BSC | | |
| y | - | - | 0.1 | - | - | 0.004 |
| $\theta$ | $0^o$ | - | $8^o$ | $0^o$ | - | $8^o$ |

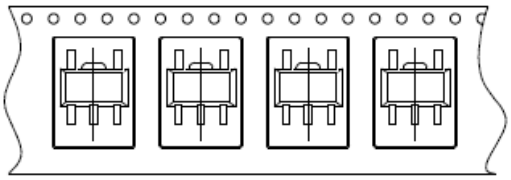
Mold flash shall not exceed 0.25mm per side
JEDEC outline: MS-012 AA

## ❖ Carrier tape dimension

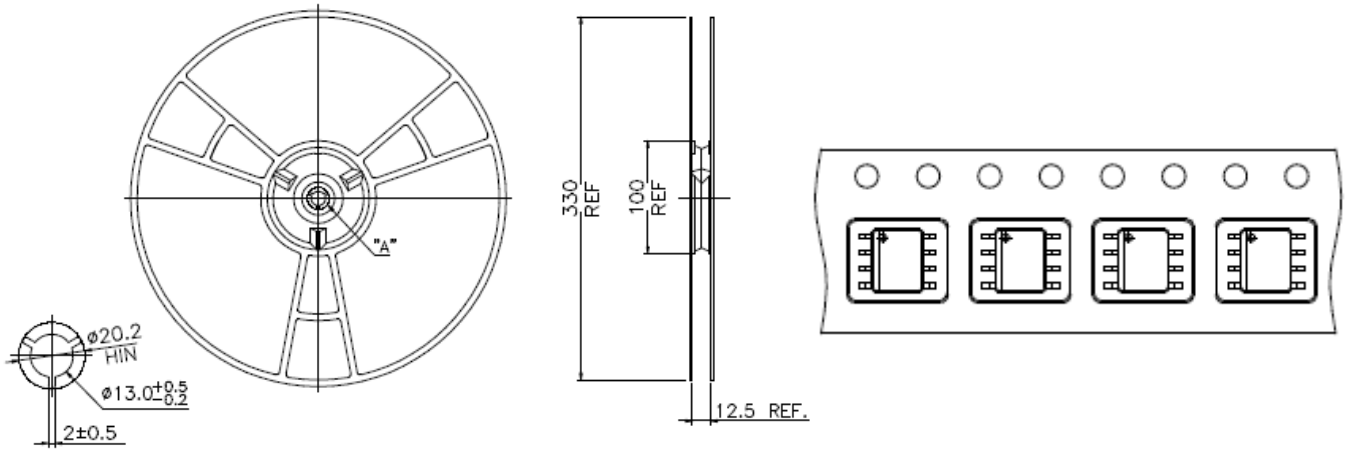
### SOT89-5L

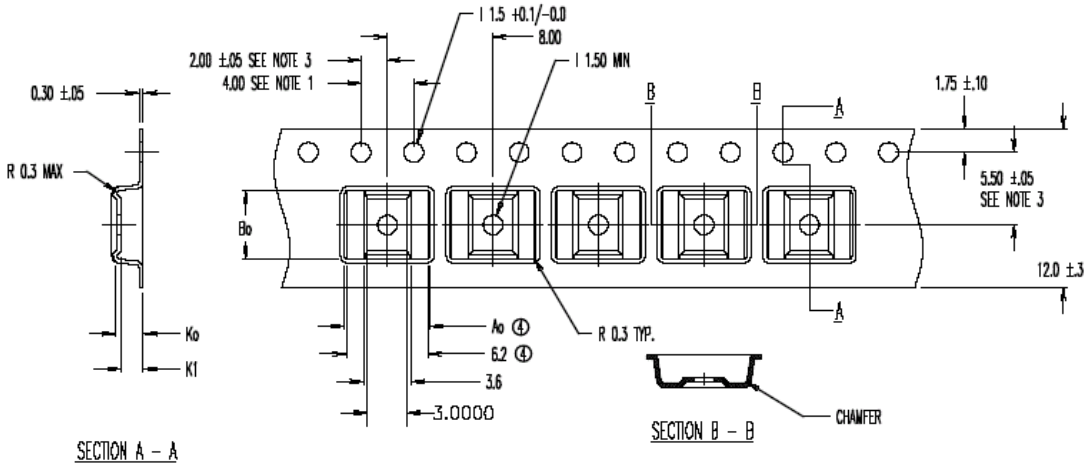


## SOP8L




④① Ao = 6.50
Bo = 5.20
Ko = 2.10
K1 = 1.70

Notes:

1. 10 sprocket hole pitch cumulative tolerance ± 0.2mm
2. Camber not to exceed 1mm in 100mm.
3. Material: Anti-Static Black Advantek Polystyrene.
4. Ao and Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.