# 3-TERMINAL 100mA POSITIVE VOLTAGE REGULATOR

## DESCRIPTION

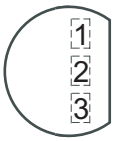
MC78L05 is a low current positive voltage regulator. It is designed for a wide range of applications.

These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, it can be used with power-pass elements to make high current voltage regulators. Each of these regulators can deliver up to 100mA output current.

The internal limiting and thermal shutdown features of this regulator makes it essentially immune to overload.

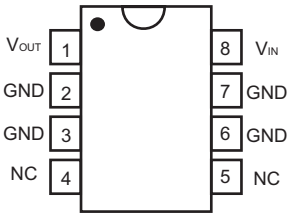
When used as a replacement for a zener diode-resistor combination, an effective improvement in output impedance can be obtained together with lower-bias current.

## PIN CONFIGURATION




1.Input
2.Ground
3.Output

**TO-92 (Top View)**




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

## FEATURES

- Output current up to 100mA
- No external components required
- Internal short circuit current limiting
- Internal thermal overload protection
- Output voltage offered in 5% tolerance
- Output voltage: 5V
- Pb-Free package

## APPLICATION

- Current regulator
- Adjustable output regulator
- Short circuit protection

## ORDERING INFORMATION

| Temperature Range | Package | | Orderable Device | Package Qty |
|---|---|---|---|---|
| 0°C to +70°C | SOP-8L | Pb-Free | MC78L05D | 75Units/Tube |
| | TO-92 | | MC78L05LP | 50Units/Tube |

## SCHEMATIC DIAGRAM

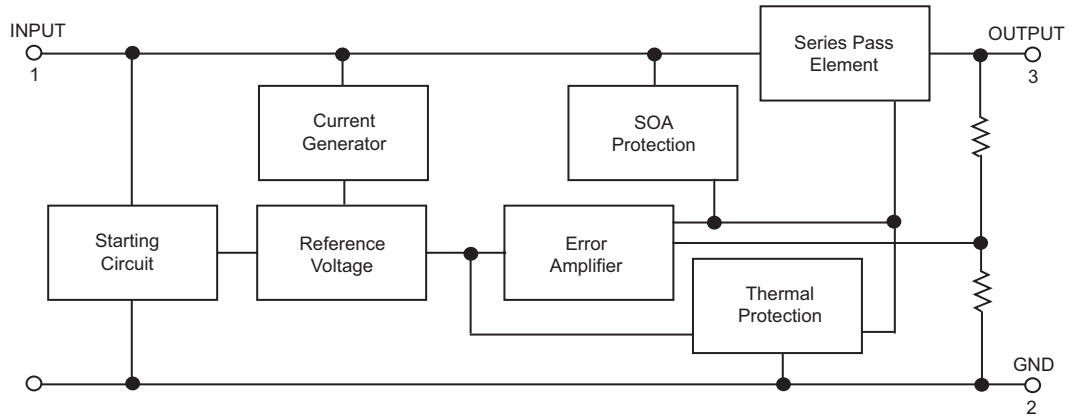



**Figure 1. Simplified Block Diagram**

## ABSOLUTE MAXIMUM RATINGS

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Input Voltage(DC) | $V_I$ | 30 | V |
| Power Dissipation | $P_D$ | Internally limited | |
| Maximum Operating Junction Temperature | $T_J$ | +150 | °C |
| Operating Ambient Temperature | $T_A$ | 0 to +70 | °C |
| Storage Temperature | $T_{STG}$ | -65 to +150 | °C |
| Soldering Temperature, 10 sec | $T_L$ | 260 | °C |

Maximum Ratings are those values beyond which damage to the device may occur.

## RECOMMENDED OPERATING CONDITIONS

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Input Voltage | $V_I$ | 7 | 20 | V |
| Output Current | $I_O$ | | 100 | mA |
| Operating Virtual Junction Temperature | $T_J$ | 0 | +125 | °C |

Functional operation should be restricted to the Recommended Operating Conditions.

## ELECTRICAL CHARACTERISTICS

($V_I$ =10V, $I_O$=40mA, $C_I$=0.33μF, $C_O$=0.1μF，0°C< $T_J$<+125°C, unless otherwise noted)

| Parameter | Symbol | Test Conditions(Note 1) | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Output Voltage(Note 2) | $V_O$ | $T_J$=25°C | | 4.8 | 5.0 | 5.2 | V |
| | | 1mA≤$I_O$≤40A, 7V≤$V_I$≤20V | | 4.75 | 5.0 | 5.25 | |
| | | 1mA≤$I_O$≤70mA | | 4.75 | 5.0 | 5.25 | |
| Line Regulation | $\Delta V_O$ | $T_J$=25°C | 7V≤$V_I$≤20V | | 32 | 150 | mV |
| | | | 8V≤$V_I$≤20V | | 26 | 100 | |
| Load Regulation | $\Delta V_O$ | $T_J$=25°C | 1mA≤Io≤100mA | | 15 | 60 | mV |
| | | | 1mA≤Io≤40mA | | 8 | 30 | |
| Bias Current | $I_B$ | $T_J$=25°C | | | 3.8 | 6 | mA |
| | | $T_J$=125°C | | | | 5.5 | |
| Bias Current Change | $\Delta I_B$ | 8V≤$V_I$≤20V | | | | 1.5 | mA |
| | | 1mA≤Io≤40mA | | | | 0.1 | |
| Output Noise Voltage | $V_n$ | $T_J$=25°C | 10Hz≤f≤100kHz | | 42 | | μV |
| Ripple Rejection | RR | $T_J$=25°C | f=120Hz, 8V≤$V_I$≤18V | 41 | 49 | | dB |
| Dropout Voltage | $V_D$ | $T_J$=25°C | | | 1.7 | | V |

**Notes:**

**1.** Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

**2.** This specification applies only for DC power dissipation permitted by absolute maximum ratings.

## TYPICAL PERFORMANCE CHARACTERISTICS

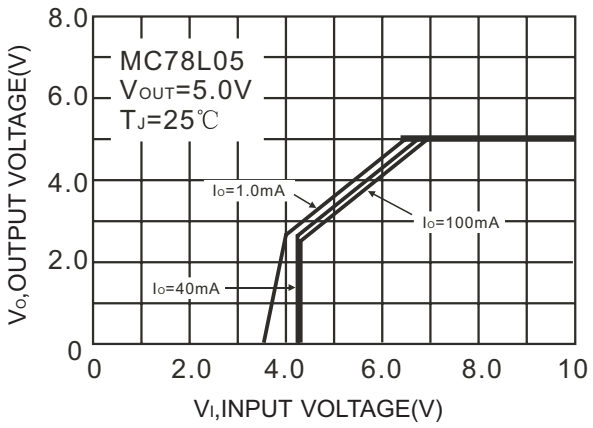



**Figure 2. Dropout Characteristics**

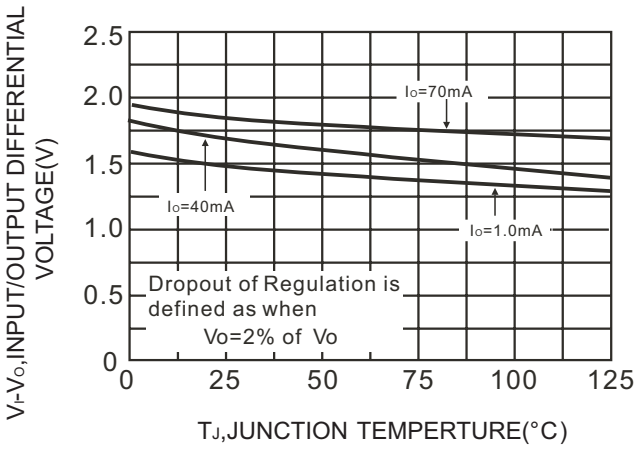



**Figure 3. Dropout Voltage versus Junction Temperature**

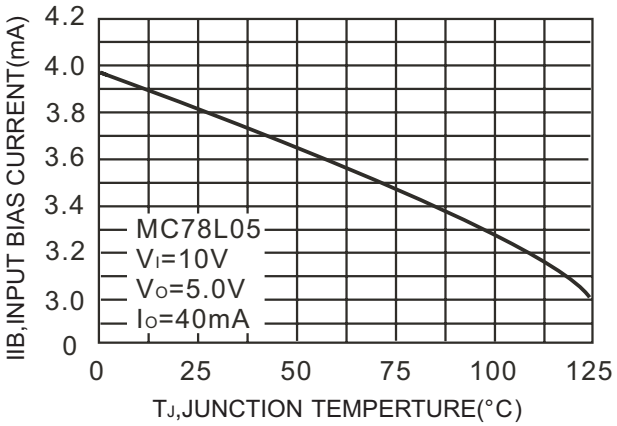



**Figure 4. Input Bias Current versus Ambient Temperature**

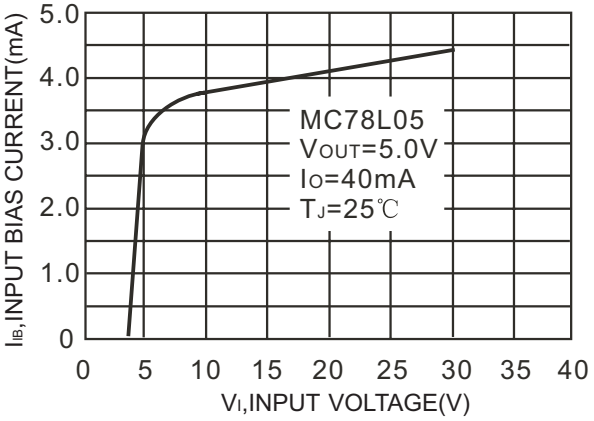



**Figure 5. Input Bias Current versus Input Voltage**

## TYPICAL APPLICATION

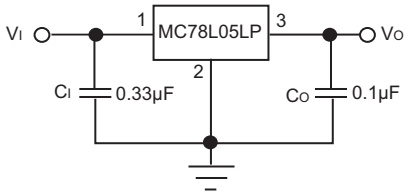



**Figure 6. Fixed Output Regulator**

**Notes:**

**1.**A common ground is required between the input and the output voltages.

**2.**The input voltage must remain typically 2.0V above the output voltage even during the low point on the input ripple voltage.

**3.**$C_I$ is required if regulator is located in appreciable distance from power supply filter.

**4.**$C_O$ improves stability and transient response. Values of less than 0.1μF could cause instability.

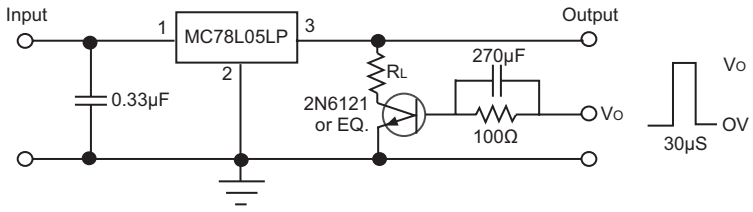



**Figure 7. Load Regulation**

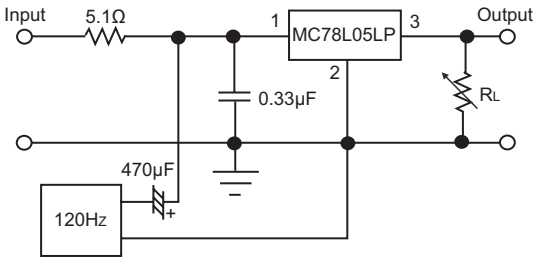



**Figure 8. Ripple Rejection**

## TYPICAL APPLICATION(CONTINUED)

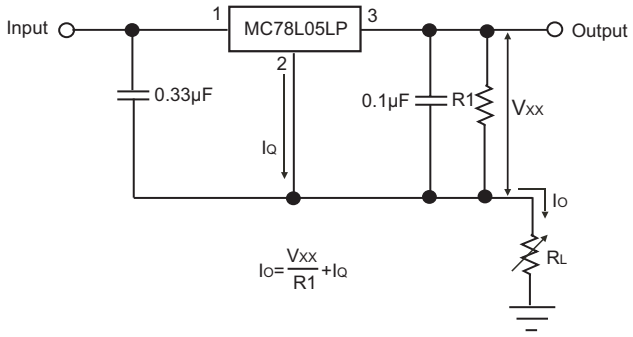



**Figure 9. Constant Current Regulator**

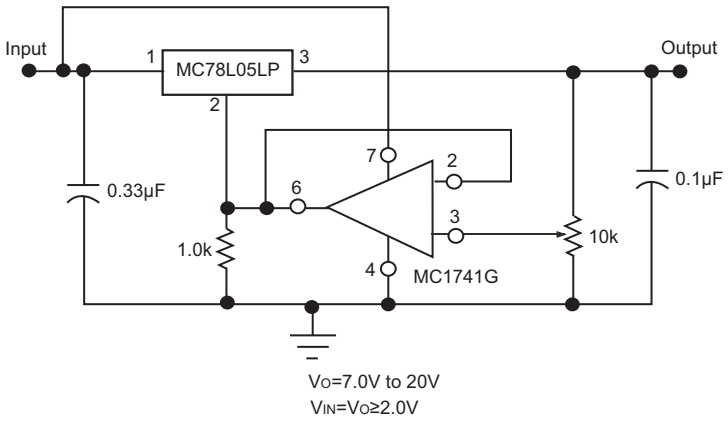



**Figure 10. Adjustable Output Regulator**

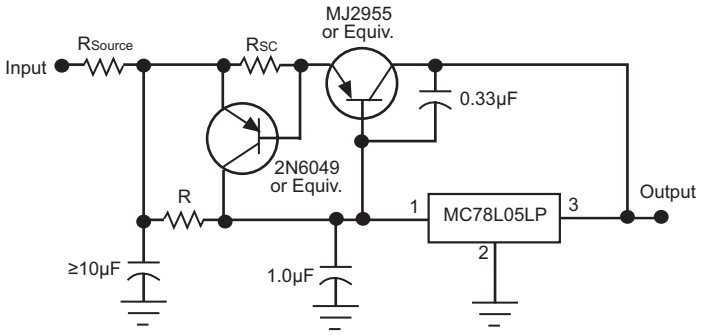



**Figure 11. Short Circuit Protection**

## TYPICAL APPLICATION(CONTINUED)

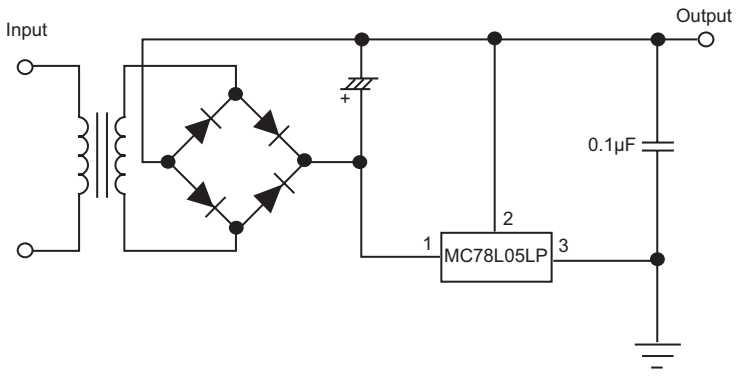



**Figure 12. Negative Output Voltage Circuit**

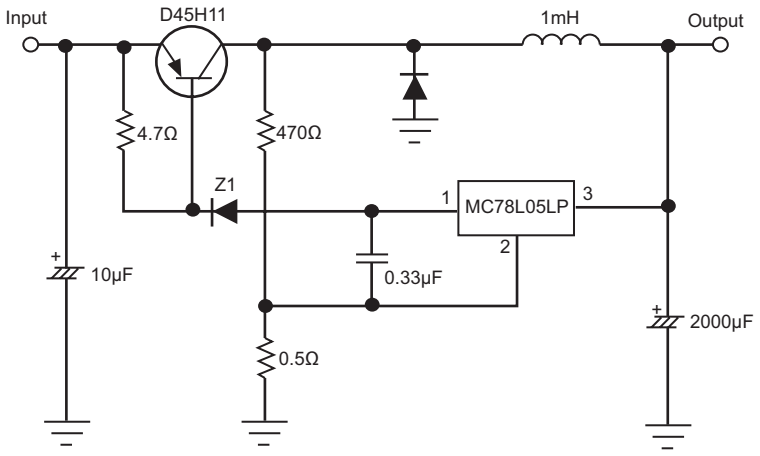
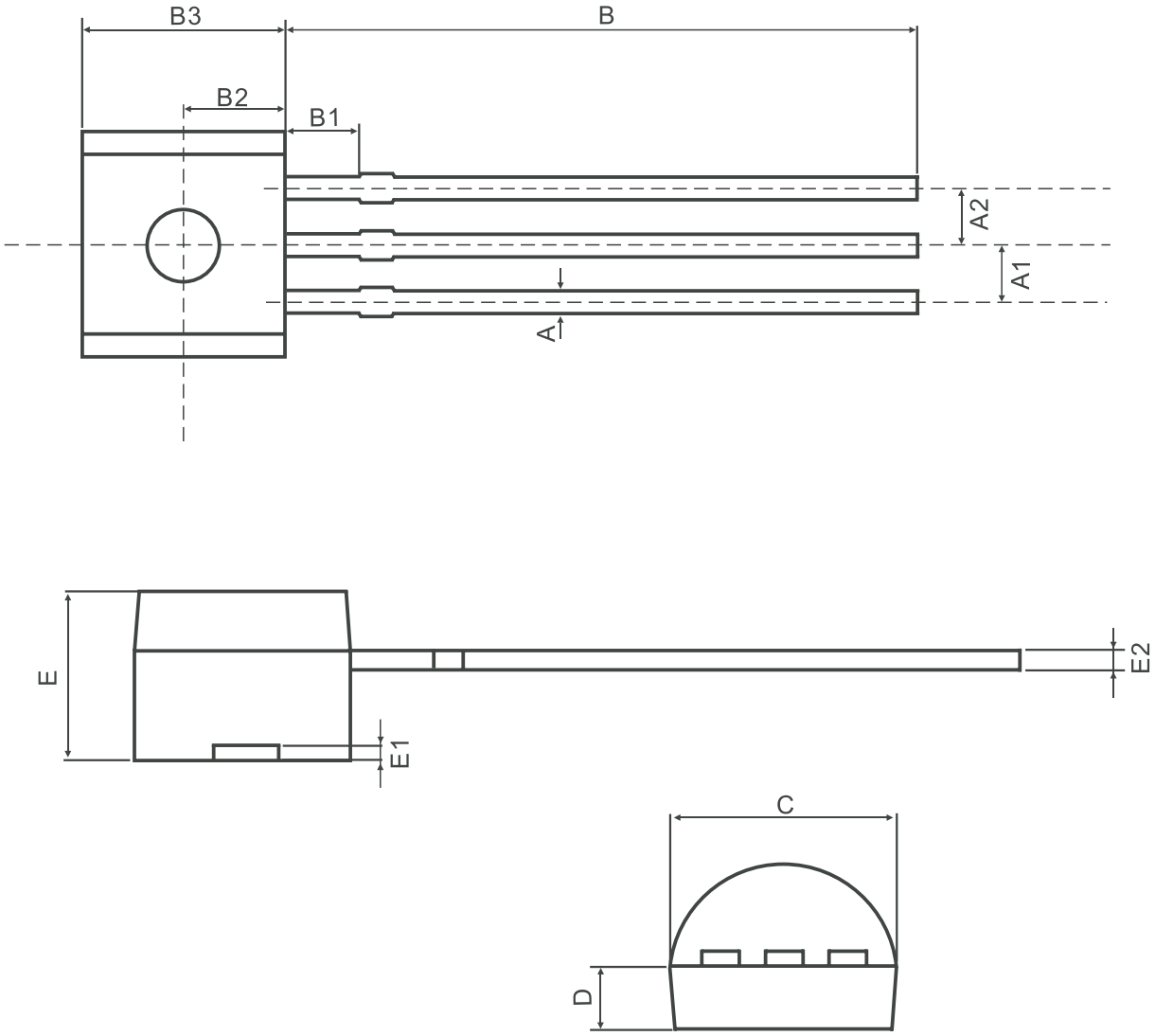


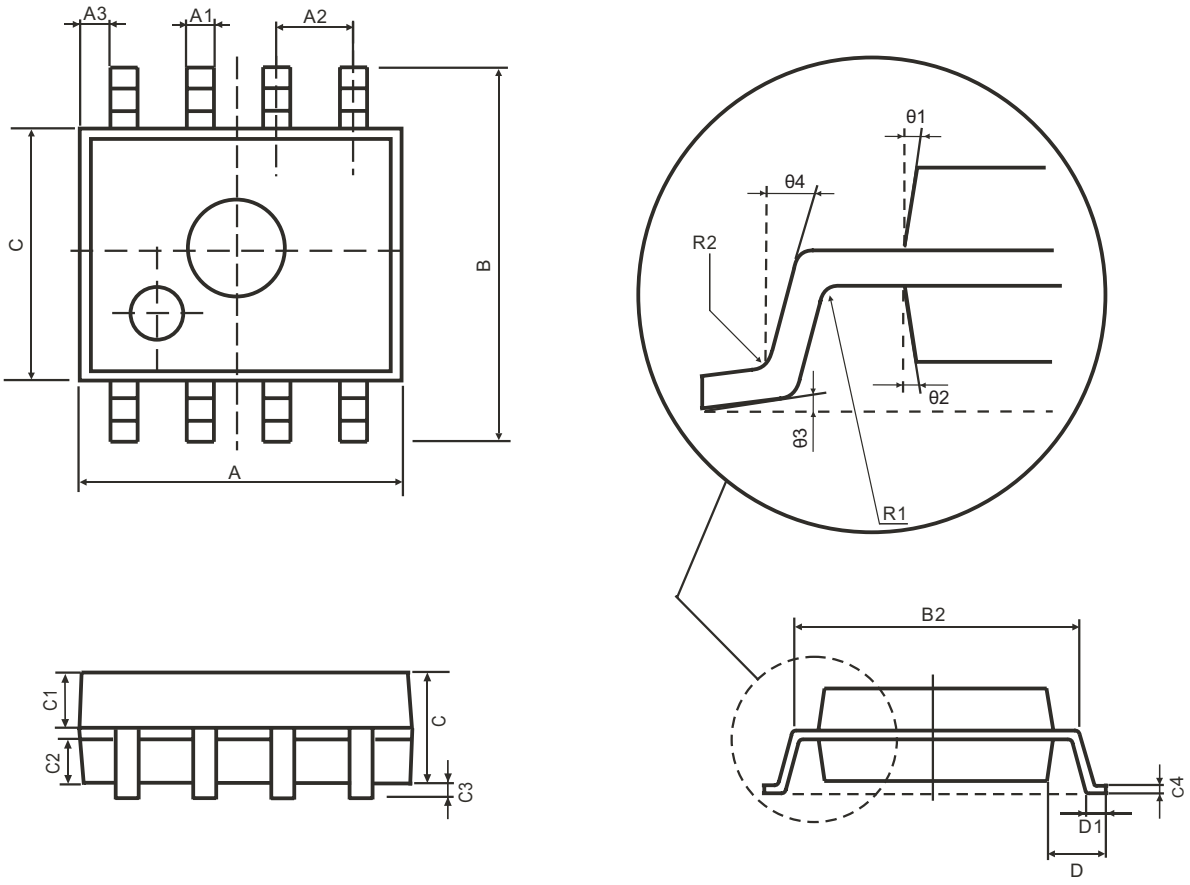

**Figure 13. Switching Regulator**

## PHYSICAL DIMENSIONS
## TO-92




| Symbol | Dimension(mm) | | Symbol | Dimension(mm) | |
|---|---|---|---|---|---|
| | Min | Max | | Min | Max |
| A | 2.55(TYP) | | C | 4.59 | 4.61 |
| A1 | 1.25 | 1.30 | D | 1.27 | 1.28 |
| A2 | 1.25 | 1.30 | E | 3.59 | 3.61 |
| B | 12.7 | - | E1 | 0.25(TYP) | |
| B1 | 1.54(TYP) | | E2 | 0.45(TYP) | |
| B2 | 2.29(TYP) | | | | |
| B3 | 4.69 | 4.71 | | | |

## SOP8L




| Symbol | Dimension(mm) | | Symbol | Dimension(mm) | |
|---|---|---|---|---|---|
| | Min | Max | | Min | Max |
| A | 4.95 | 5.15 | C3 | 0.05 | 0.20 |
| A1 | 0.37 | 0.47 | C4 | 0.20(TYP) | |
| A2 | 1.27(TYP) | | D | 1.05(TYP) | |
| A3 | 0.41(TYP) | | D1 | 0.40 | 0.60 |
| B | 5.80 | 6.20 | R1 | 0.07(TYP) | |
| B1 | 3.80 | 4.00 | R2 | 0.07(TYP) | |
| B2 | 5.0(TYP) | | θ1 | 17°(TYP) | |
| C | 1.30 | 1.50 | θ2 | 13°(TYP) | |
| C1 | 0.55 | 0.65 | θ3 | 4°(TYP) | |
| C2 | 0.55 | 0.65 | θ4 | 12°(TYP) | |