# DP34063

## 1.2A STEP-DOWN / STEP-UP / INVERTING DC-DC CONVERTER

### DESCRIPTION

The 34063 is a monolithic switching regulator control circuit containing the primary functions required for DC-DC converters. This device consists of internal temperature compensated reference, voltage comparator, controlled duty cycle oscillator with active current limit circuit, driver and high current output switch. The device is specifically designed to be used in Step-Down, Step-Up and Voltage-Inverting applications with a minimum number of external components.

The 34063 is available in 2 packages: SOP- 8 and DIP-8.

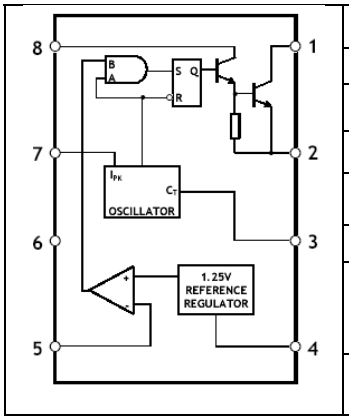
### FEATURES

- Operation from 3V to 40V
- Low Standby Current
- Current Limiting
- Output Switch Current to 1.2A
- Output Voltage Adjustable
- Operation Frequency up to 180 kHz ($C_T$ = 100pF)
- Precision 2% Reference

### APPLICATIONS

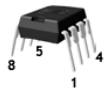
- Battery Chargers
- NICs/Switches/Hubs
- ADSL Modems
- Negative Voltage Power Supplies

### SCHEMATIC DIAGRAM AND PIN DESCRIPTION

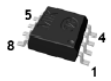



| | | |
|---|---|---|
| PIN 1 | Switch Collector | Internal switch transistor collector |
| PIN 2 | Switch Emitter | Internal switch transistor emitter |
| PIN 3 | Timing Capacitor | Timing Capacitor to control the switching frequency |
| PIN 4 | GND | Ground pin for all internal circuits |
| PIN 5 | Comparator Inverting Input | Inverting input pin for internal comparator |
| PIN 6 | $V_{CC}$ | Voltage supply |
| PIN 7 | $I_{PK}$ Sense | Peak Current Sense Input by monitoring the voltage drop across an external I sense resistor to limit the peak current through the switch |
| PIN 8 | Driver Collector | Voltage driver collector |

DIP-8




SOP-8




## Marking Information

SOP8


MC34063 for product name;The A represents the version

XXXXXX The first X reresents the last year,2014 is 4; The second X represents the month, in A-L 12 letters;The third and fourth X on behalf of the date, 01-31 said; The last two X represents the wafer batch code.

DIP8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## RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | 3 | 40 | V |
| $T_A$ | Ambient Temperature | -40 | 85 | °C |

## ABSOLUTE MAXIMUM RATINGS (NOTE 1)

| SYMBOL | PARAMETER | | VALUE | UNIT |
|---|---|---|---|---|
| $V_{CC}$ | Power Supply Voltage | | 40 | V |
| $V_{IR}$ | Comparator Input Voltage Range | | -0.3 to 40 | V |
| $V_C$ (SWITCH) | Switch Collector Voltage | | 40 | V |
| $V_E$ (SWITCH) | Switch Emitter Voltage (Vpin1= 40V) | | 40 | V |
| $V_{CE}$ (SWITCH) | Switch Collector to Emitter Voltage | | 40 | V |
| $V_C$ (DRIVER) | Driver Collector Voltage | | 40 | V |
| $I_C$ (DRIVER) | Driver Collector Current (NOTE 2) | | 100 | mA |
| $I_{SW}$ | Switch Current | | 1.2 | A |
| POWER DISSIPATION AND THERMAL CHARACTERISTICS | | | | |
| $P_D$ | DIP Package | Power Dissipation ($T_A$= 25°C) | 1.25 | W |
| $R_{\Theta JA}$ | | Thermal Resistance | 100 | °C/W |
| $P_D$ | SOP Package | Power Dissipation ($T_A$= 25°C) | 625 | mW |
| $R_{\Theta JA}$ | | Thermal Resistance | 160 | °C/W |
| $T_J$ | Operating Junction Temperature | | 150 | °C |
| $T_{STG}$ | Storage Temperature Range | | -65 to 150 | °C |
| ESD for 34063CM1K | | | 2000 | V |

SEE NOTES ON THE NEXT PAGE ...

## ELECTRICAL CHARACTERISTICS

$V_{CC}$ = 5V, $T_A$ = -40 TO 85°C, UNLESS OTHERWISE SPECIFIED

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| **OSCILLATOR** | | | | | | |
| $F_{OSC}$ | Frequency | Vpin5 = 0V; $T_A$ = 25°C; $C_T$ = 1 nF | 30 | 38 | 45 | kHz |
| $I_{CHG}$ | Charge Current | $V_{CC}$ = 5.0V to 40V; $T_A$ = 25°C | 30 | 38 | 45 | µA |
| $I_{DISCHG}$ | Discharge Current | $V_{CC}$ = 5.0V to 40V; $T_A$ = 25°C | 180 | 240 | 290 | µA |
| $I_{DISCHG}/I_{CHG}$ | Discharge to Charge Current Ratio | Pin 7 to $V_{CC}$ ; $T_A$ = 25°C | 5.2 | 6.5 | 7.5 | - |
| $V_{IPK(SENCE)}$ | Current Limit Sense Voltage | $I_{CHG}$ = $I_{DISCHG}$; $T_A$ = 25°C | 250 | 300 | 350 | mV |
| **OUTPUT SWITCH** (NOTE 3) | | | | | | |
| $V_{CE(SAT)}$ | Saturation Voltage, Darlington connection | $I_{SW}$ = 1.2A; Pins 1,8 connected. | - | 1.0 | 1.3 | V |
| $V_{CE(SAT)}$ | Saturation Voltage (see NOTE 4) | $I_{SW}$ = 1.2 A; Rpin 8 = 82Ω to $V_{CC}$; Forced β = 20 | - | 0.45 | 0.8 | V |
| $h_{FE}$ | DC Current Gain | $I_{SW}$ = 1.2 A; $V_{CE}$ = 5.0 V $T_A$ = 25°C | 50 | 75 | - | - |
| $I_{C(OFF)}$ | Collector Off-State Current | $V_{CE}$ = 40 V | - | 0.01 | 100 | µA |
| **COMPARATOR** | | | | | | |
| $V_{TH}$ | Threshold Voltage | $T_A$ = 25°C | 1.225 | 1.25 | 1.275 | V |
| | | $T_A$= -40°C to +85°C | 1.210 | | 1.290 | |
| $REG_{LINE}$ | Threshold Voltage Line Regulation | $V_{CC}$ = 3V to 40 V | - | 1.4 | 5 | mV |
| $I_{IB}$ | Input Bias Current | $V_{IN}$ = 0 V | - | -20 | -400 | nA |
| **TOTAL DEVICE** | | | | | | |
| $I_{CC}$ | Supply Current | $V_{CC}$ = 5.0 V to 40 V; $C_T$ = 1.0 nF; Pin 7 = $V_{CC}$; Vpin 5 > Vth; Pin 2 = GND; other pins open | - | - | 4 | mA |

SEE NOTES ON THE NEXT PAGE ...

## ELECTRICAL CHARACTERISTICS (CONTINUED)

### NOTES

**1**: Stresses greater than those listed under «Absolute Maximum Ratings» may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under «Recommended Operating Conditions» is not implied. Exposure to «Absolute Maximum Ratings» for extended periods may affect device reliability.

**2**: Maximum package power dissipation limits must be observed.

**3**: Low duty cycle pulse technique are used during test to maintain junction temperature as close to ambient temperature as possible.

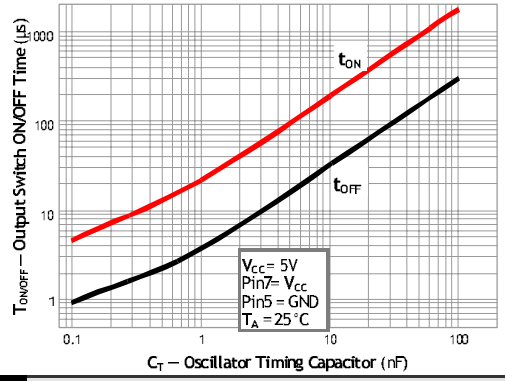
**4**: If the output switch is driven into hard saturation (non-Darlington configuration) at low switch currents (≤ 300mA) and high driver currents (≥ 30mA), it may take up to 2.0µs for it to come out of saturation. This condition will shorten the off time at frequencies 30 kHz, and is magnified at high temperatures. This condition does not occur with a Darlington configuration, since the output switch cannot saturate. If a non-Darlington configuration is used, the following output drive condition is recommended:

Forced β of output switch: $$\frac{I_{C(OUTPUT)}}{I_{C(DRIVER)} - 7.0mA^{*}} \geq 10$$

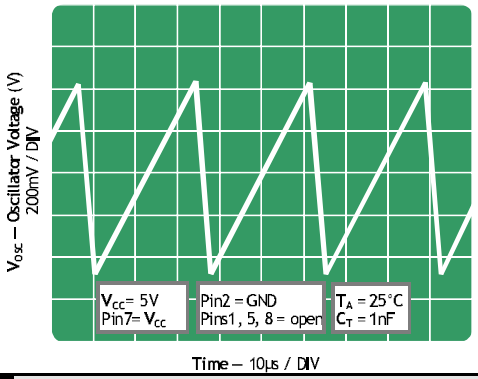
* The 100Ω resistor in the emitter of the driver device requires about 7 mA before the output switch conducts.

## TYPICAL PERFORMANCE CHARACTERISTICS

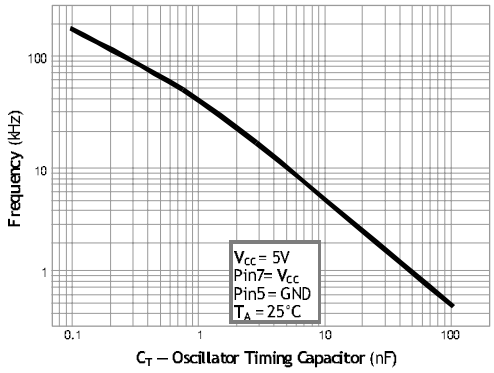
**A** OUTPUT SWITCH ON-OFF TIME versus OSCILLATOR TIMING CAPACITOR



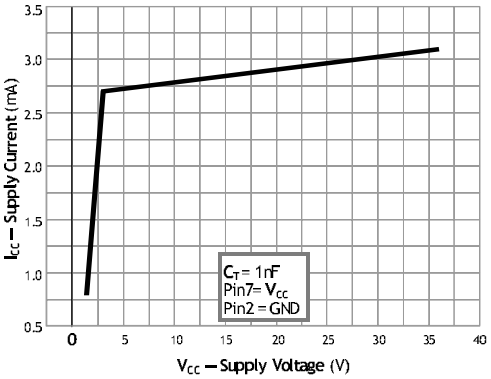

**B** TIMING CAPACITOR WAVEFORM



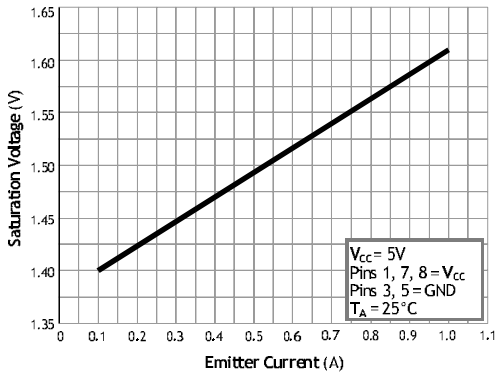

**C** OSCILLATOR FREQUENCY versus TIMING CAPACITOR



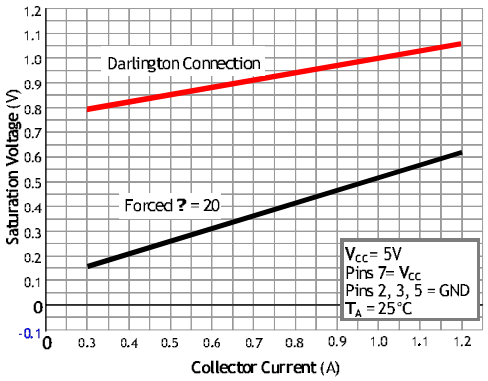

**D** STANDBY SUPPLY CURRENT versus SUPPLY VOLTAGE



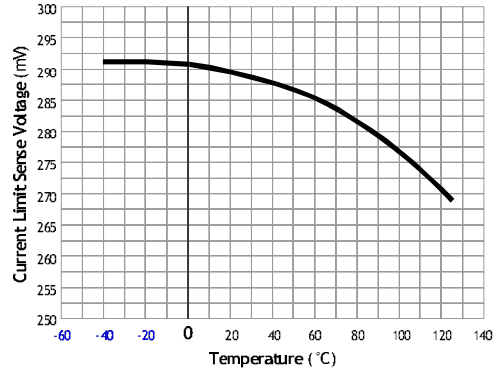

**E** EMITTER FOLLOWER CONFIGURATION OUTPUT SATURATION VOLTAGE vs. EMITTER CURRENT




**F** COMMON EMITTER CONFIGURATION OUTPUT SWITCH SATURATION VOLTAGE vs. COLLECTOR CURRENT

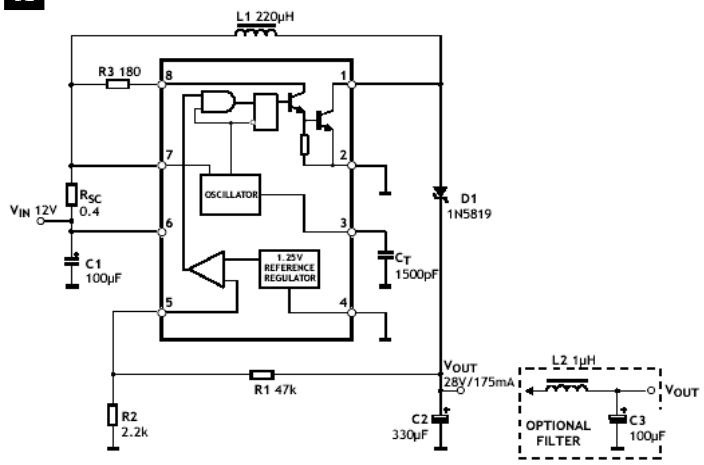



**G** CURRENT LIMIT SENSE VOLTAGE versus TEMPERATURE



## TYPICAL APPLICATIONS

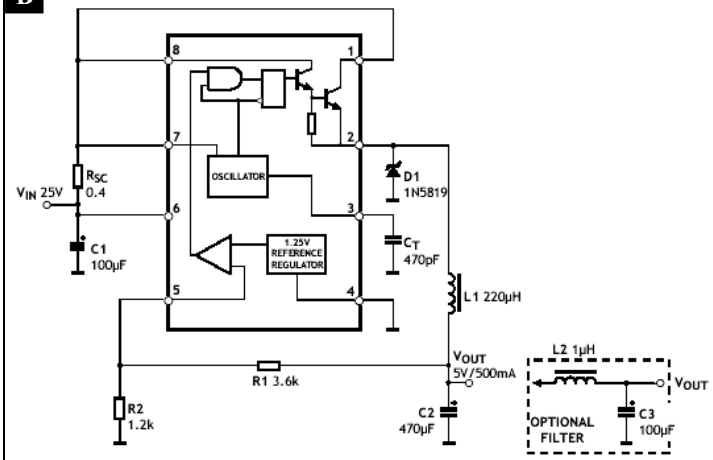
### A STEP-UP CONVERTER




This is a typical step-up converter configuration. In the steady state, if the resistor divider voltage at pin 5 is greater than the voltage in the non-inverting input, which is 1.25V deter-mined by the internal reference, the output of the comparator will go low. At the next switching period, the output switch will not conduct and the output voltage will eventually drop below its nominal voltage until the divider voltage at pin 5 is lower than 1.25V.

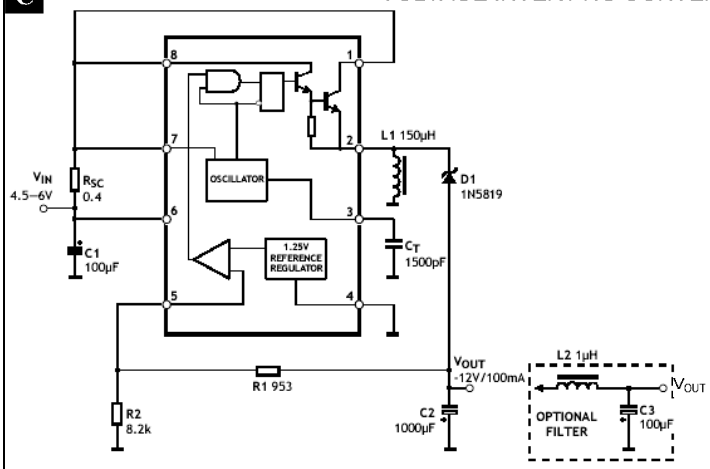
Then the output of the comparator will go high, the output switch will be allowed to conduct. Since
Vpin5 = $V_{OUT}$ * R2/(R1+R2) = 1.25(V), the output voltage can be decided by
$V_{OUT}$ = 1.25 * (R1+R2)/R2 (V).

### B STEP-DOWN CONVERTER




This is a typical step-down converter configuration. The working process in the steady state is similar to step-up converter,
Vpin5 = $V_{OUT}$ * R2/(R1+R2) = 1.25 (V),
the output voltage can be decided by
$V_{OUT}$ = 1.25 * (R1+R2)/R2 (V).

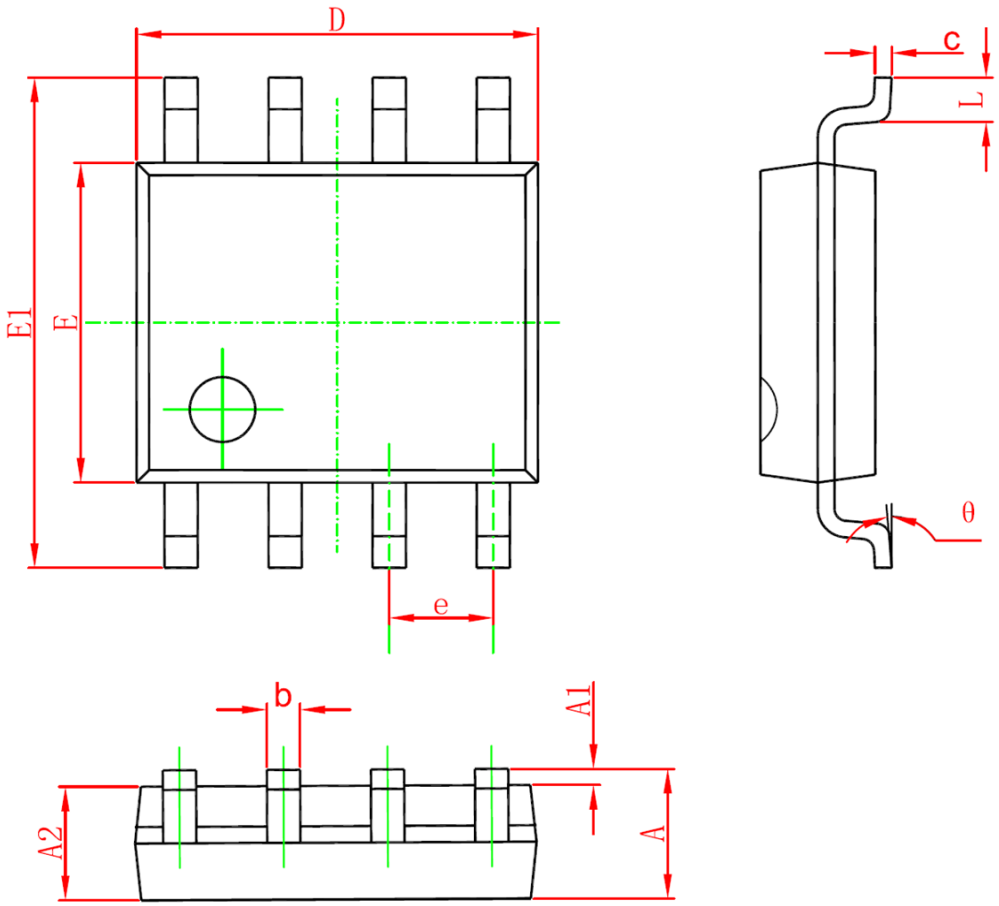
### C VOLTAGE INVERTING CONVERTER




This is a typical inverting converter configuration. The working process in the steady state is similar to step-up converter, the difference in this situation is that the voltage at the non-inverting pin of the comparator is equal to 1.25V+$V_{OUT}$, then
Vpin5=$V_{OUT}$ * R2/(R1+R2) = 1.25V+$V_{OUT}$,
so the output voltage can be decided by
$V_{OUT}$ = -1.25 * (R1+R2)/R1 (V).

# 封装外形图和尺寸

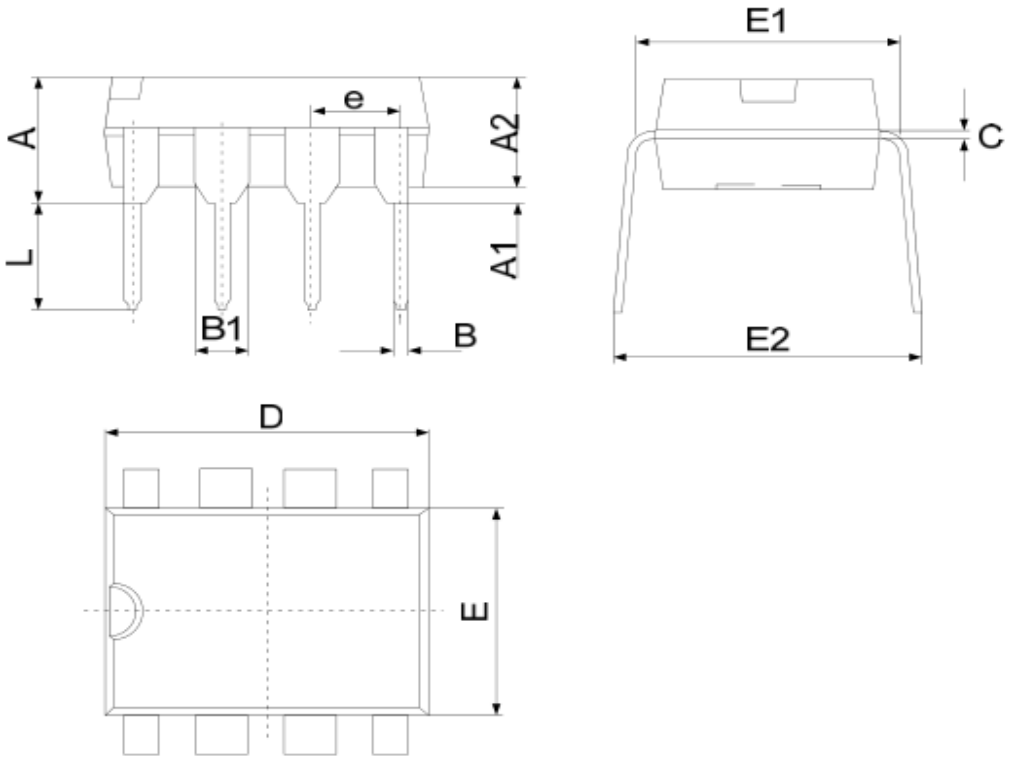
SOP8




| 符号 | mm | | inches | |
|---|---|---|---|---|
| | 最小值 | 最大值 | 最小值 | 最大值 |
| A | 1. 350 | 1. 750 | 0. 053 | 0. 069 |
| A1 | 0. 100 | 0. 250 | 0. 004 | 0. 010 |
| A2 | 1. 350 | 1. 550 | 0. 053 | 0. 061 |
| b | 0. 330 | 0. 510 | 0. 013 | 0. 020 |
| c | 0. 170 | 0. 250 | 0. 006 | 0. 010 |
| D | 4. 700 | 5. 100 | 0. 185 | 0. 200 |
| E | 3. 800 | 4. 000 | 0. 150 | 0. 157 |
| E1 | 5. 800 | 6. 200 | 0. 228 | 0. 244 |
| e | 1. 270 (BSC) | | 0. 050 (BSC) | |
| L | 0. 400 | 1. 270 | 0. 016 | 0. 050 |
| θ | 0° | 8° | 0° | 8° |

# 封装外形图和尺寸

DIP8




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 3.710 | 5.334 | 0.146 | 0.216 |
| A1 | 0.381 | | 0.015 | |
| A2 | 3.175 | 3.600 | 0.125 | 0.142 |
| B | 0.350 | 0.650 | 0.014 | 0.026 |
| B1 | 1.524(BSC) | | 0.060(BSC) | |
| C | 0.200 | 0.360 | 0.008 | 0.014 |
| D | 9.000 | 10.160 | 0.354 | 0.400 |
| E | 6.200 | 6.600 | 0.244 | 0.260 |
| E1 | 7.320 | 7.920 | 0.288 | 0.312 |
| e | 2.540(BSC) | | 0.100(BSC) | |
| L | 2.921 | 3.810 | 0.115 | 0.150 |
| E2 | 8.200 | 9.525 | 0.323 | 0.375 |