



### Description

SE34063 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.

SE34063 is the enhanced version with the ability to work in higher frequency.

SE34063 is available in 2 packages: SOP- 8 and DIP-8.

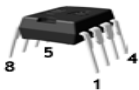

### Features

- 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 (CT = 100pF)
- Precision 2% Reference

### Application

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

### Schematic Diagram And Pin Description

| Package  | Pin Number | Pin Name                   | Pin Function Description   |
|--|------------|----------------------------|--|
| <br>DIP-8 | 1          | Switch Collector           | Internal switch transistor collector   |
|  | 2          | Switch Emitter             | Internal switch transistor emitter   |
|  | 3          | Timing Capacitor           | Timing Capacitor to control the switching frequency  |
|  | 4          | GND                        | Ground pin for all internal circuits   |
| <br>SOP-8 | 5          | Comparator Inverting Input | Inverting input pin for internal comparator  |
|  | 6          | V <sub>CC</sub>            | Voltage supply   |
|  | 7          | I <sub>PK</sub> Sense      | Peak Current Sense Input by monitoring the voltage drop across an external I sense resistor to limit the peak current through the switch |
|  | 8          | Driver Collector           | Voltage driver collector   |

### Ordering Information

| Part Number | Marking Information | Package | Remarks   |
|-------------|---------------------|---------|---|
| SE34063F    | SE34063             | SOP-8   | YYWW means Production batch<br>LF means Lead-free |
| SE34063D    | YYWW-LF             | DIP-8   |   |

### Recommended Operating Conditions

| Symbol          | Parameter           | Min | Max | Unit |
|-----------------|---------------------|-----|-----|------|
| V <sub>CC</sub> | Supply Voltage      | 3   | 40  | V    |
| T <sub>A</sub>  | Ambient Temperature | -40 | 85  | °C   |



**Absolute Maximum Ratings** (Note 1)

| Symbol   | Parameter                                   | Max                                      | Units      |              |
|--|---|--|------------|--------------|
| $V_{CC}$   | 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 ( $V_{pin1} = 40V$ ) | 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          |              |
| <b>Power Dissipation And Thermal Characteristics</b> |   |  |            |              |
| $P_D$  | DIP Package                                 | Power Dissipation ( $T_A = 25^\circ C$ ) | 1.25       | W            |
| $R_{JA}$   |   | Thermal Resistance                       | 100        | $^\circ C/W$ |
| $P_D$  | SOP Package                                 | Power Dissipation ( $T_A = 25^\circ C$ ) | 625        | mW           |
| $R_{JA}$   |   | Thermal Resistance                       | 160        | $^\circ C/W$ |
| $T_J$  | Operating Junction Temperature              |  | 150        | $^\circ C$   |
| $T_{STG}$  | Storage Temperature Range                   |  | -65 to 150 | $^\circ C$   |
| ESD for SE34063                                      |   |  | 2000       | V            |

SEE NOTES ON THE NEXT PAGE ...

**Electrical Characteristic**

$V_{CC} = 5V$ ,  $T_A = 25^\circ C$ , unless otherwise noted;

| Symbol                        | Parameter                                    | Test Conditions   | Min | Typ  | Max | Unit    |
|-------------------------------|--|---|-----|------|-----|---------|
| <b>Oscillator</b>             |  |   |     |      |     |         |
| $F_{OSC}$                     | Frequency                                    | $V_{pin5} = 0V$ ; $T_A = 25^\circ C$ ; $C_T = 1 nF$                             | 30  | 38   | 45  | kHz     |
| $I_{CHG}$                     | Charge Current                               | $V_{CC} = 5.0V$ to $40V$ ; $T_A = 25^\circ C$                                   | 30  | 38   | 45  | $\mu A$ |
| $I_{DISCHG}$                  | Discharge Current                            | $V_{CC} = 5.0V$ to $40V$ ; $T_A = 25^\circ C$                                   | 180 | 240  | 290 | $\mu A$ |
| $I_{DISCHG}/I_{CHG}$          | Discharge to Charge Current                  | Ratio Pin 7 to $V_{CC}$ ; $T_A = 25^\circ C$                                    | 5.2 | 6.5  | 7.5 | -       |
| $V_{IPK(SENCE)}$              | Current Limit Sense Voltage                  | $I_{CHG} = I_{DISCHG}$ ; $T_A = 25^\circ C$                                     | 250 | 300  | 350 | mV      |
| <b>Output Switch</b> (Note 3) |  |   |     |      |     |         |
| $V_{CE(SAT)}$                 | Saturation Voltage,<br>Darlington connection | $I_{SW} = 0.8A$ ; Pins 1,8 connected  | -   | 1.0  | 1.3 | V       |
| $V_{CE(SAT)}$                 | Saturation Voltage<br>(see NOTE 4)           | $I_{SW} = 0.8 A$ ; $R_{pin 8} = 82 \Omega$ to $V_{CC}$ ;<br>Forced $\beta = 20$ | -   | 0.45 | 0.8 | V       |
| $h_{FE}$                      | DC Current Gain                              | $I_{SW} = 0.8 A$ ; $V_{CE} = 5.0 V$ ; $T_A = 25^\circ C$                        | 50  | 75   | -   | -       |
| $I_{C(OFF)}$                  | Current Collector Off-State                  | $V_{CE} = 40 V$   | -   | 0.01 | 100 | $\mu A$ |



**Electrical Characteristic (Continued)**

| Comparator          |                                   |  |       |      |       |    |
|---------------------|-----------------------------------|--|-------|------|-------|----|
| V <sub>TH</sub>     | Threshold Voltage                 | T <sub>A</sub> = 25°C  | 1.225 | 1.25 | 1.275 | V  |
| REG <sub>LINE</sub> | Threshold Voltage Line Regulation | V <sub>CC</sub> = 3V to 40 V   | -     | 1.4  | 5     | mV |
| I <sub>IB</sub>     | Input Bias Current                | V <sub>IN</sub> = 0 V  | -     | -20  | -400  | nA |
| Total Device        |                                   |  |       |      |       |    |
| I <sub>CC</sub>     | Supply Current                    | V <sub>CC</sub> = 5.0 V to 40 V; C <sub>T</sub> = 1.0nF, Pin 7 = V <sub>CC</sub> ; V <sub>pin 5</sub> > V <sub>th</sub> ; Pin 2 = GND; other pins open | -     | -    | 4     | mA |

**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:

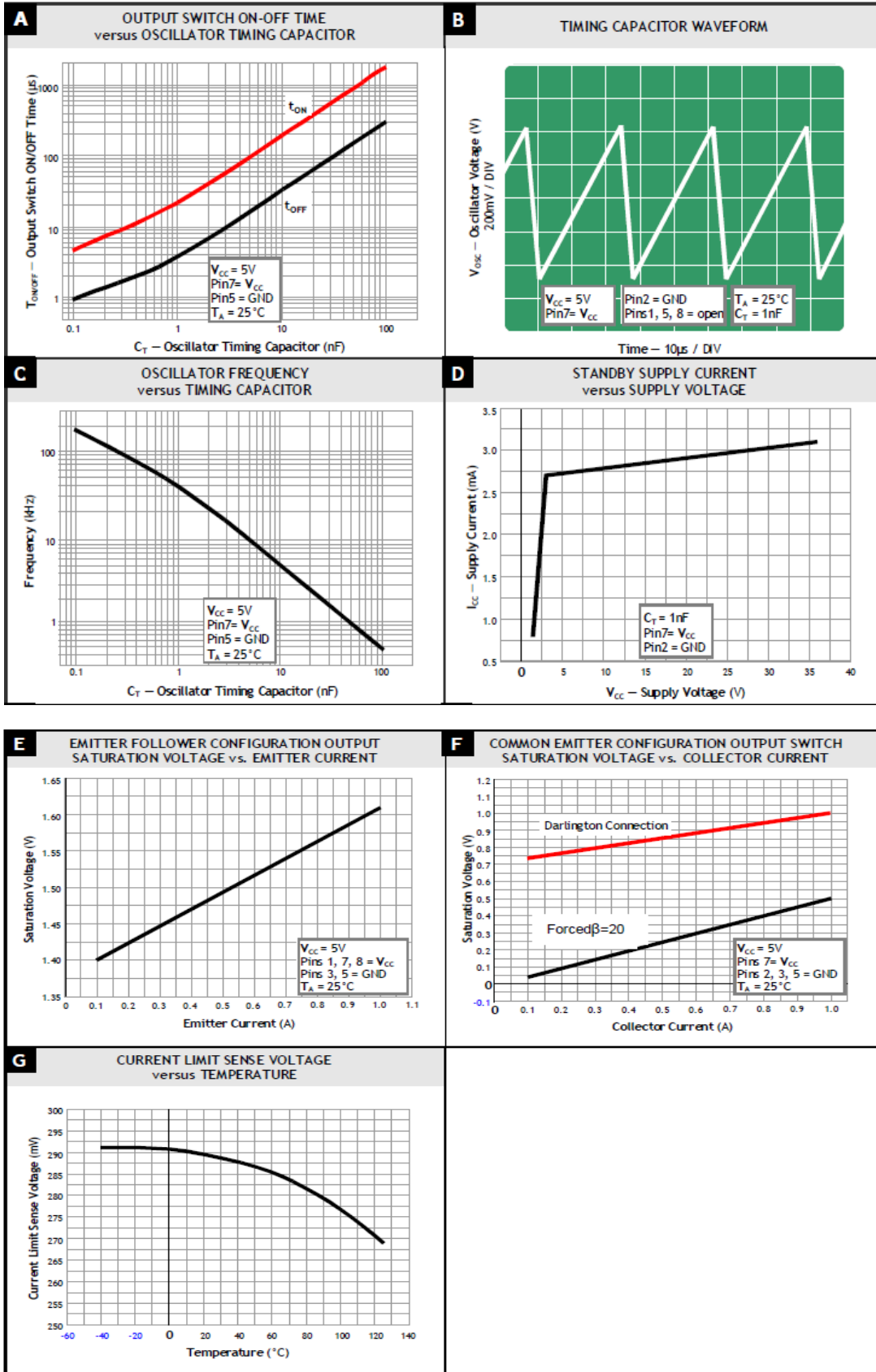
Forced β of output switch: 10

$$\frac{I_{C(OUTPUT)}}{I_{C(DRIVER)} - 7.0mA} \geq 10$$

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



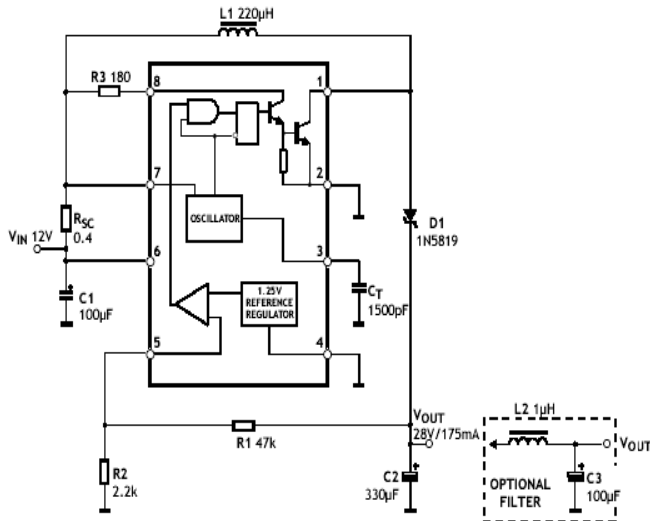
### Typical Performance Characteristics





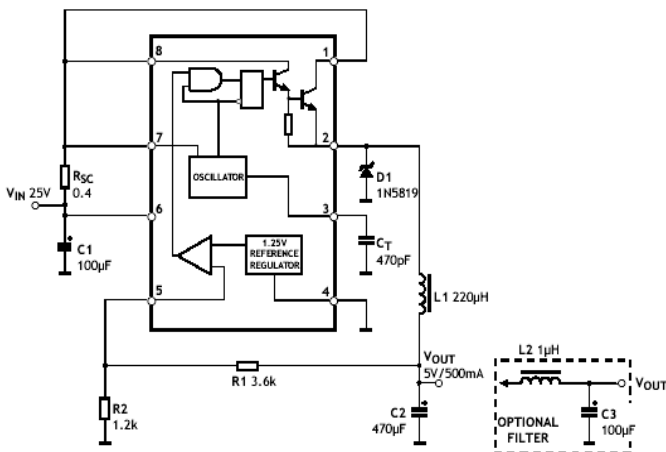
## Typical Applications

### STEP-UP CONVERTER



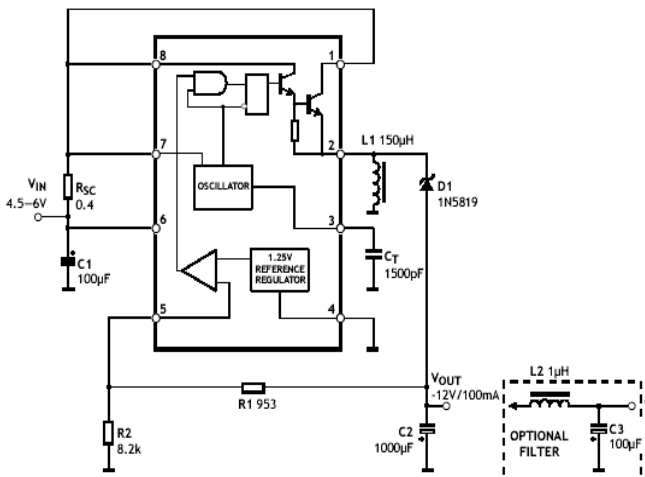
This is a typical step-up converter configuration. In the steady state, if the resistor divider voltage at pin 5 is greater than the voltage in the non-inverting input, which is 1.25V determined by the internal reference, the output of the comparator will go low. At the next switching period, the output 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  $V_{pin5} = V_{OUT} * R2 / (R1 + R2) = 1.25(V)$ , the output voltage can be decided by  $V_{OUT} = 1.25 * (R1 + R2) / R2 (V)$ .

### STEP-DOWN CONVERTER



This is a typical step-down converter configuration. The working process in the steady state is similar to step-up converter,  $V_{pin5} = V_{OUT} * R2 / (R1 + R2) = 1.25 (V)$ , the output voltage can be decided by  $V_{OUT} = 1.25 * (R1 + R2) / R2 (V)$ .

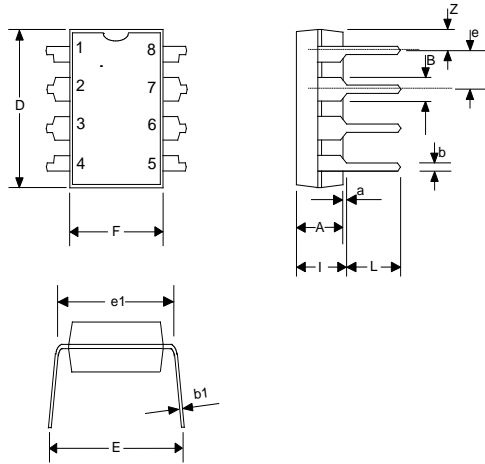
### VOLTAGE INVERTING CONVERTER



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 noninverting pin of the comparator is equal to  $1.25V + V_{OUT}$ , then  $V_{pin5} = V_{OUT} * R2 / (R1 + R2) = 1.25V + V_{OUT}$ , so the output voltage can be decided by  $V_{OUT} = -1.25 * (R1 + R2) / R1 (V)$ .

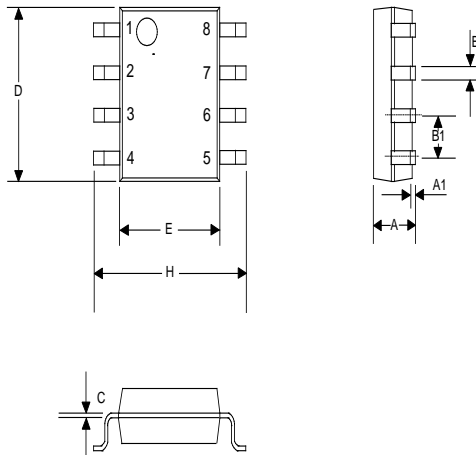


**Outline Drawing DIP-8**



| DIM | INCHES |       | MM    |       |
|-----|--------|-------|-------|-------|
|     | MIN    | MAX   | MIN   | MAX   |
| A   | 0.131  |       | 3.32  |       |
| a   | 0.020  |       | 0.51  |       |
| B   | 0.045  | 0.065 | 1.15  | 1.65  |
| b   | 0.014  | 0.022 | 0.35  | 0.55  |
| b1  | 0.008  | 0.012 | 0.204 | 0.304 |
| D   |        | 0.430 |       | 10.92 |
| E   | 0.313  | 0.384 | 7.95  | 9.75  |
| e   | 0.100  |       | 2.54  |       |
| e1  | 0.300  |       | 7.62  |       |
| F   |        | 0.260 |       | 6.60  |
| I   |        | 0.200 |       | 5.08  |
| L   | 0.125  | 0.150 | 3.18  | 3.81  |
| Z   |        | 0.060 |       | 1.52  |

**Outline Drawing SOP-8**



| DIM <sup>N</sup> | INCHES    |        | MM       |      |
|------------------|-----------|--------|----------|------|
|                  | MIN       | MAX    | MIN      | MAX  |
| A                | 0.0532    | 0.0688 | 1.35     | 1.75 |
| A1               | 0.0040    | 0.0098 | 0.10     | 0.25 |
| B                | 0.0130    | 0.0200 | 0.33     | 0.51 |
| B1               | 0.050 BSC |        | 1.27 BSC |      |
| C                | 0.0075    | 0.0098 | 0.19     | 0.25 |
| D                | 0.1890    | 0.1968 | 4.80     | 5.00 |
| H                | 0.2284    | 0.2440 | 5.80     | 6.20 |
| E                | 0.1497    | 0.1574 | 3.80     | 4.00 |



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