

### Features

- Operation from 3.0V to 40V
- Short circuit current limiting
- Low standby current
- Output switch current of 1.2A without external transistors
- Frequency of operation from 100Hz to 100kHz
- Step-up, step-down or inverting switch regulators
- package: SOP8

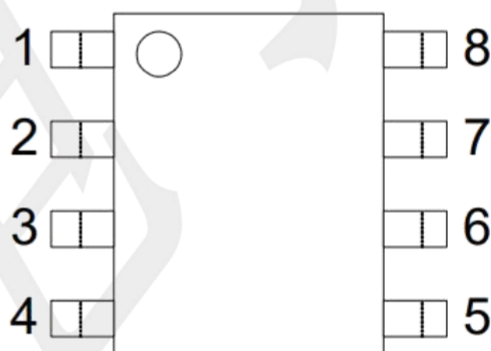
### Applications

- Battery Chargers
- NICs / Switches / Hubs
- LCD TV
- DSL Modem
- Access Point Router
- Negative Voltage Power Supplies
- Set Top Box

### General Description

The is a monolithic regulator subsystem, intended for use as DC to DC converter. This device contains a temperature compensated band gap reference, a duty-cycle control oscillator, driver and high current output switch. It can be used for step down, step-up or inverting switching regulators as well as for series pass regulators.

### Pinout (top view)



SOP8

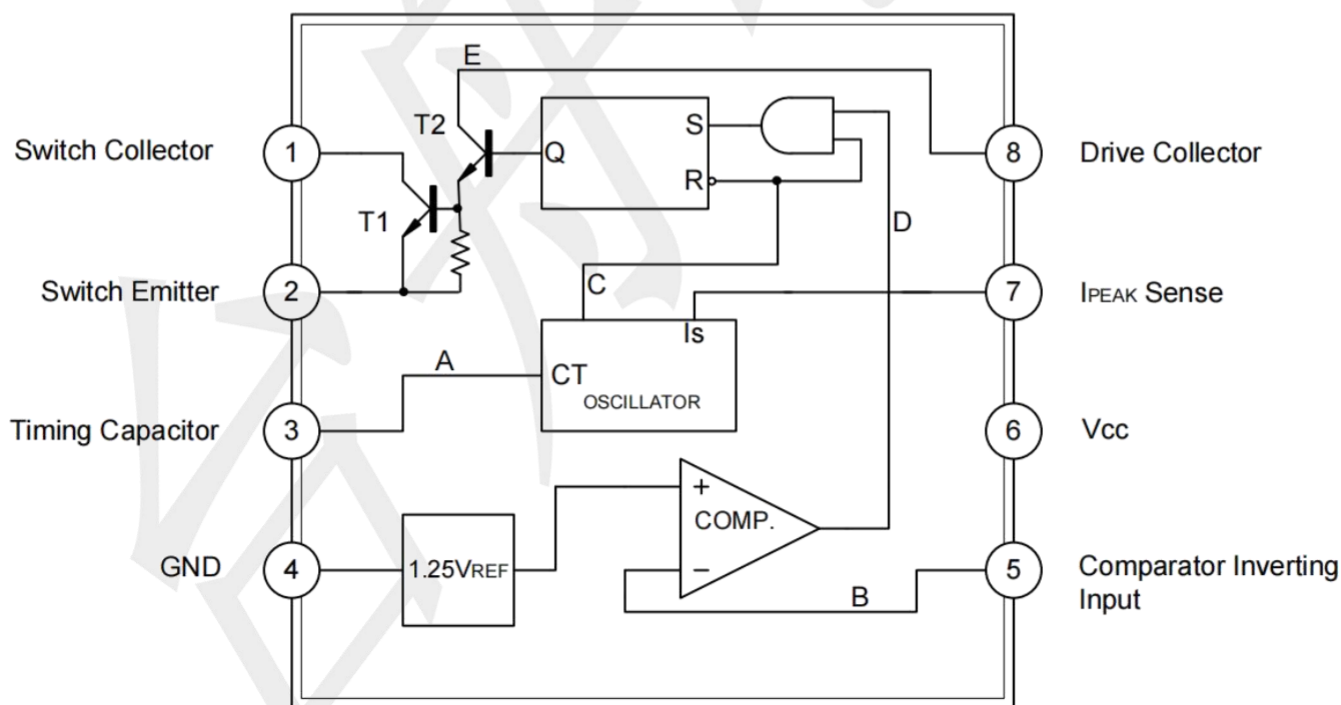
### Pin Configurations

| Pin Number | Pin Name | Pin Function                                                                                                      |
|------------|----------|-------------------------------------------------------------------------------------------------------------------|
| 1          | SC       | Internal Darlington pairs T1 collector                                                                            |
| 2          | SE       | Internal Darlington pairs T1 emitter                                                                              |
| 3          | CT       | The value of selected capacitor controls the internal oscillator run rate                                         |
| 4          | GND      | Analog ground pin.                                                                                                |
| 5          | CII      | Inverting input of comparator which can set & initiate the Darlington pairs output switch                         |
| 6          | VCC      | Power Supply Input.                                                                                               |
| 7          | IpK      | Current sense input to monitor the voltage drop across an external resistor placed in series with V <sub>CC</sub> |
| 8          | DC       | Internal Darlington pairs T1 collector                                                                            |

### Absolute Maximum Ratings ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified. )

| PARAMETER                                      | SYMBOL         | RATINGS    | UNIT                 |
|------------------------------------------------|----------------|------------|----------------------|
| Supply Voltage                                 | VCC            | 40         | V                    |
| Comparator Input Voltage                       | VIN(COMP)      | -0.3 ~ +40 | V                    |
| Switch Collector Voltage                       | VC(SW)         | 40         | V                    |
| Switch Emitter Voltage                         | VE(SW)         | 40         | V                    |
| Switch Collector to Emitter Voltage            | VCE(SW)        | 40         | V                    |
| Driver Collector Voltage                       | VC(DR)         | 40         | V                    |
| Switch Current                                 | ISW            | 1.2        | A                    |
| Power Dissipation ( $T_A=25^{\circ}\text{C}$ ) | P <sub>D</sub> | 625        | mW                   |
| Junction-to-Ambient                            | $\theta_{JA}$  | 160        | $^{\circ}\text{C/W}$ |
| Junction Temperature                           | T <sub>J</sub> | +150       | $^{\circ}\text{C}$   |
| Operating Temperature                          | TOPR           | 0 ~ +70    | $^{\circ}\text{C}$   |
| Storage Temperature                            | TSTG           | -65 ~ +150 | $^{\circ}\text{C}$   |

### BLOCK DIAGRAM



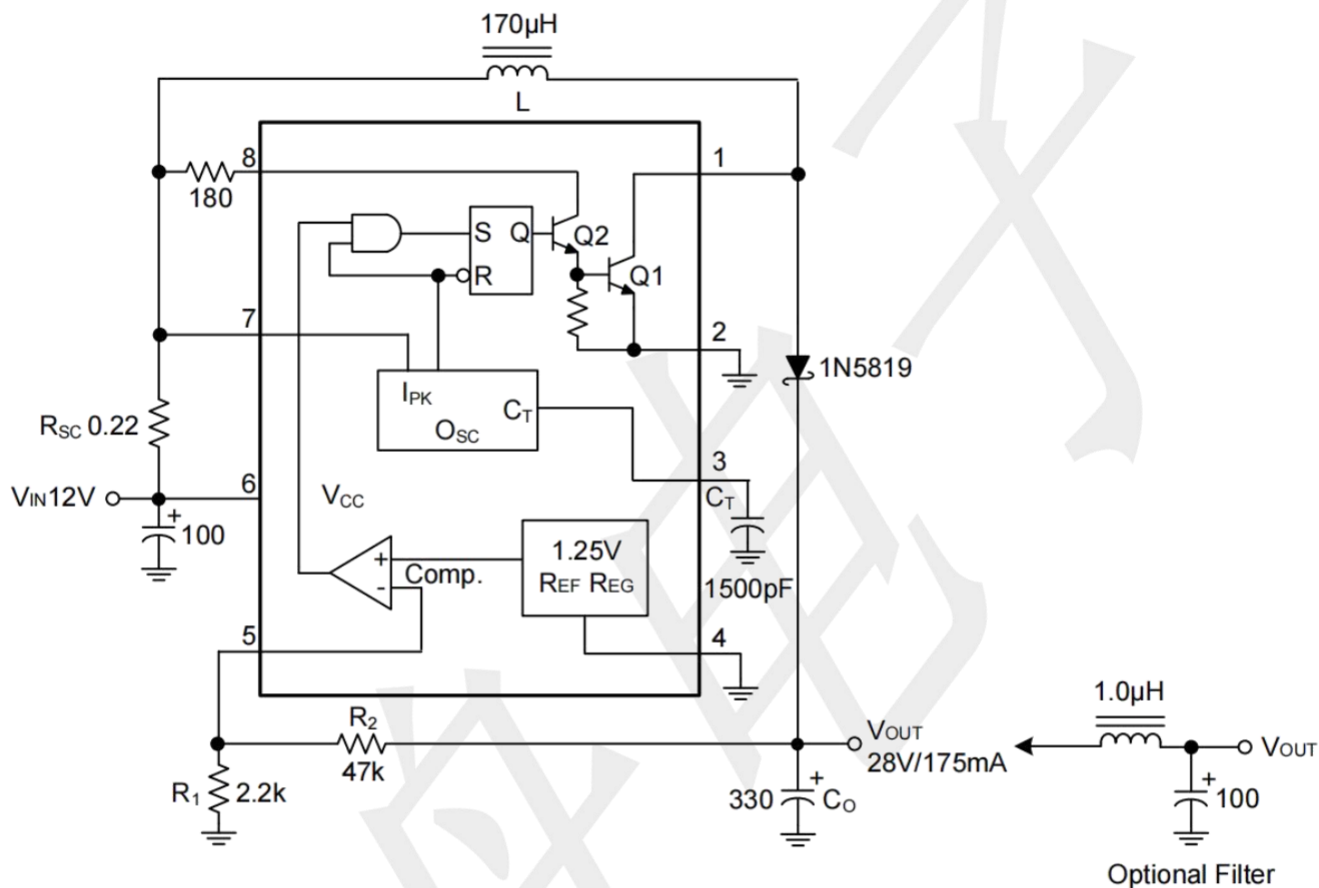
### Electrical Characteristics

( $V_{CC}=5.0V$ ,  $T_A=0\sim+70^{\circ}C$ , unless otherwise specified)

| PARAMETER                          | SYMBOL         | TEST CONDITIONS                                                                 | MIN  | TYP  | MAX  | UNIT    |
|------------------------------------|----------------|---------------------------------------------------------------------------------|------|------|------|---------|
| <b>OSCILLATOR</b>                  |                |                                                                                 |      |      |      |         |
| Maximum Oscillator Frequency       | $F_{OSC}$      | $V_{PIN\ 5}=0V$ , $C_T=1.0nF$ , $T_A=25^{\circ}C$                               | 24   | --   | 42   | kHz     |
| Charging Current                   | $I_{CHG}$      | $V_{CC}=5$ to $40V$ , $T_A=25^{\circ}C$                                         | 22   | 31   | 42   | $\mu A$ |
| Discharging Current                | $I_{DISCHG}$   | $V_{CC}=5$ to $40V$ , $T_A=25^{\circ}C$                                         | 140  | 190  | 260  | $\mu A$ |
| Oscillator Amplitude               | $V_{OSC}$      | $T_A=25^{\circ}C$                                                               | --   | 0.5  | --   | V       |
| Discharge to Charge Current Ratio  | K              | $V_7=V_{CC}$ , $T_A=25^{\circ}C$                                                | 5.2  | 6.1  | 7.5  | --      |
| Current limit Sense Voltage        | $V_{SENSE}$    | $I_{CHG}=I_{DISCHG}$ , $T_A=25^{\circ}C$                                        | 250  | 300  | 350  | mV      |
| <b>OUTPUT SWITCH</b>               |                |                                                                                 |      |      |      |         |
| Saturation Voltage 1 (Note)        | $V_{CE(SAT)1}$ | $I_{SW}=1.0A$ , $V_{C(DRIVER)}=V_{C(SW)}$                                       | --   | 1.0  | 1.3  | V       |
| Saturation Voltage 2 (Note)        | $V_{CE(SAT)2}$ | $I_{SW}=1.0A$ , $V_{C(DRIVER)}=50mA$                                            | --   | 0.45 | 0.7  | V       |
| DC Current Gain (Note)             | $G_I(DC)$      | $I_{SW}=1.0A$ , $V_{CE}=5.0V$ , $T_A=25^{\circ}C$                               | 50   | 120  | --   | --      |
| Collector Off State Current (Note) | $I_{C(OFF)}$   | $V_{CE}=40.0V$ , $T_A=25^{\circ}C$                                              | --   | 0.01 | 100  | $\mu A$ |
| <b>COMPARATOR</b>                  |                |                                                                                 |      |      |      |         |
| Threshold Voltage                  | $V_{THD}$      | $T_A=25^{\circ}C$                                                               | 1.23 | 1.25 | 1.27 | V       |
|                                    |                | $T_A=0\sim70^{\circ}C$                                                          | 1.21 | 1.25 | 1.29 | V       |
| Threshold Voltage Line Regulation  | $V_{THD}$      | $V_{CC}=3\sim40V$                                                               | --   | 2.0  | 5.0  | mV      |
| Input Bias Current                 | $I_{I(BIAS)}$  | $V_{IN}=0V$                                                                     | --   | 50   | 400  | nA      |
| <b>TOTAL DEVICE</b>                |                |                                                                                 |      |      |      |         |
| Supply Current                     | $I_{CC}$       | $V_{CC}=5\sim40V$ , $C_T=0.001$<br>$V_7=V_{CC}$ , $V_C>V_{THD}$ ,<br>$Pin2=GND$ | --   | 2.5  | 4.0  | mA      |

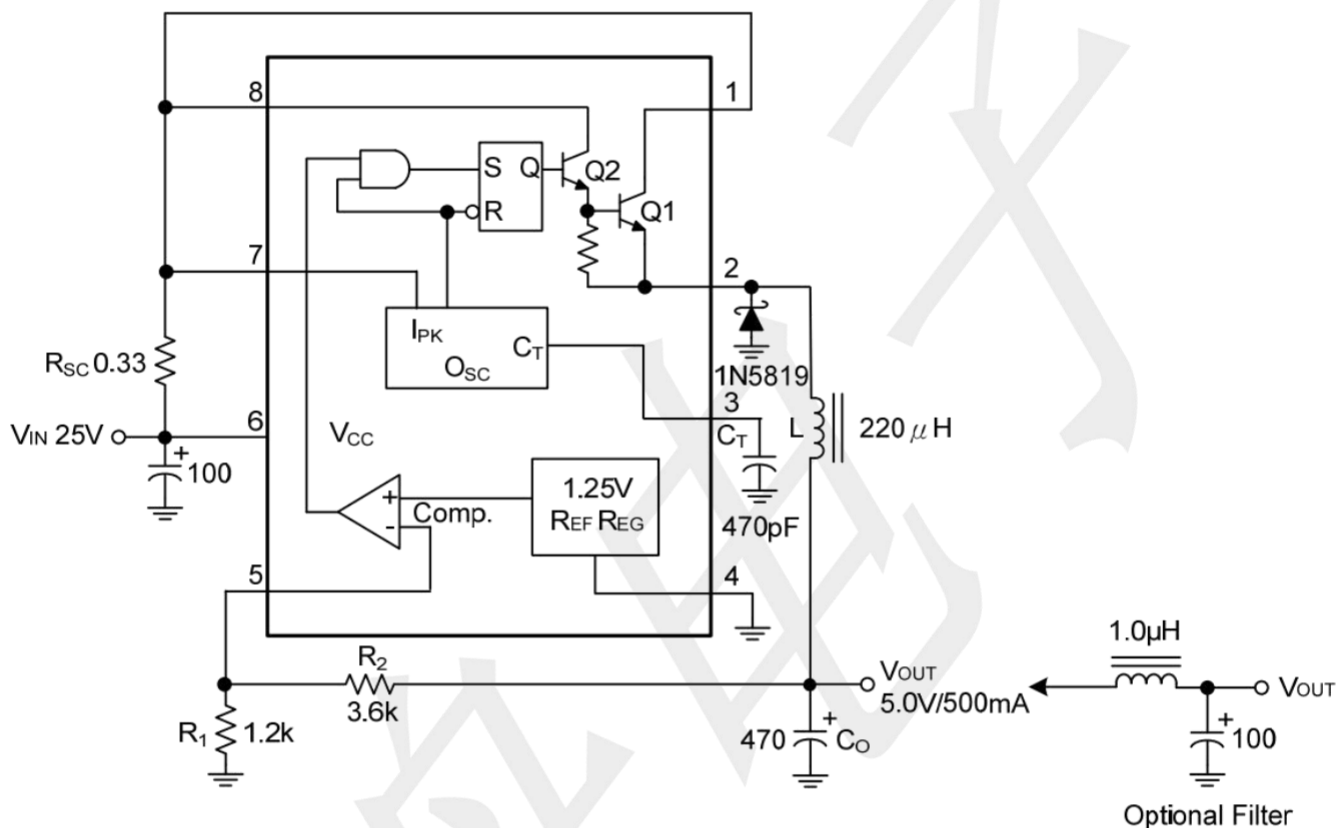
Note: Output switch tests are performed under pulsed conditions to minimize power dissipation.

### STEP-UP CONVERTER



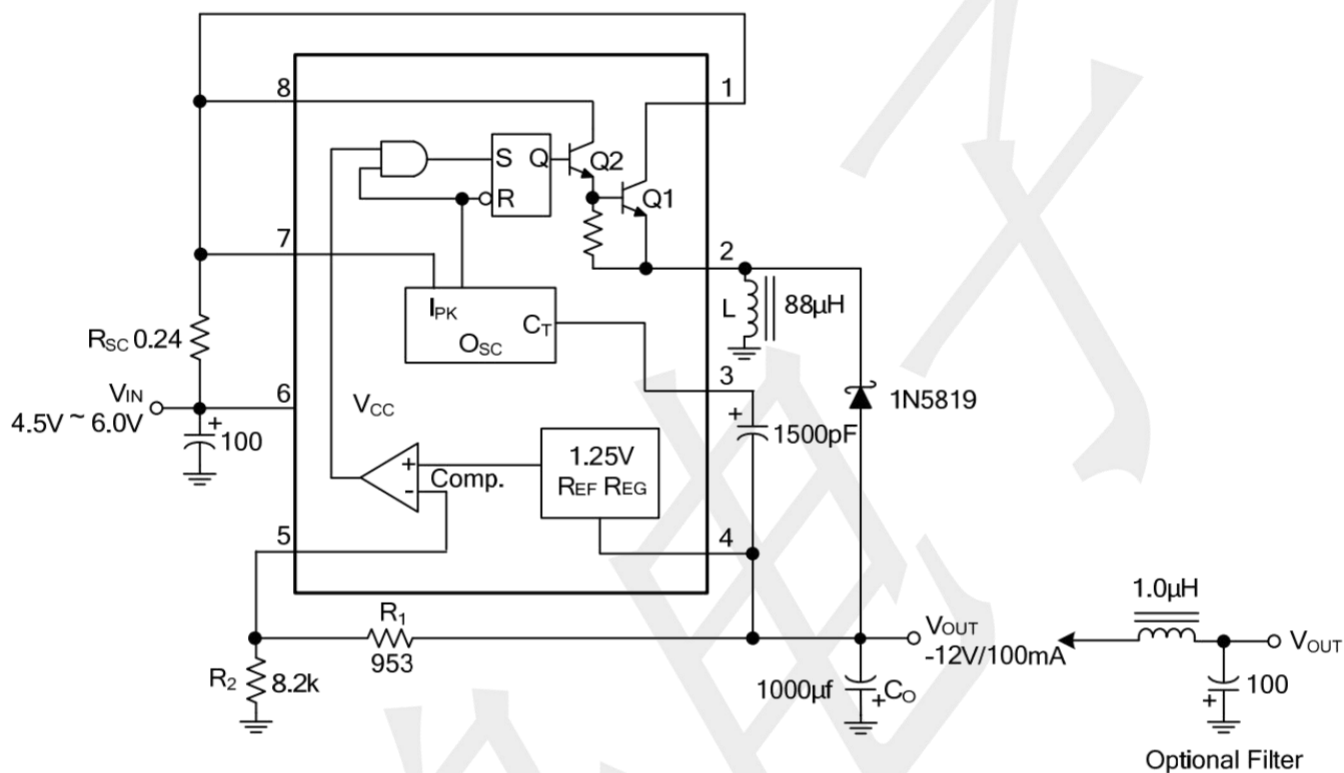
| TEST                               | CONDITIONS                                   | RESULTS              |
|------------------------------------|----------------------------------------------|----------------------|
| Line Regulation                    | $V_{IN} = 8.0V \sim 16V$ , $I_{OUT} = 175mA$ | $30mV = \pm 0.05\%$  |
| Load Regulation                    | $V_{IN} = 12V$ , $I_{OUT} = 75mA \sim 175mA$ | $10mV = \pm 0.017\%$ |
| Output Ripple                      | $V_{IN} = 12V$ , $I_{OUT} = 175mA$           | $400mV_{P-P}$        |
| Efficiency                         | $V_{IN} = 12V$ , $I_{OUT} = 175mA$           | $87.7\%$             |
| Output Ripple With Optional Filter | $V_{IN} = 12V$ , $I_{OUT} = 175mA$           | $40mV_{P-P}$         |

### STEP-DOWN CONVERTER



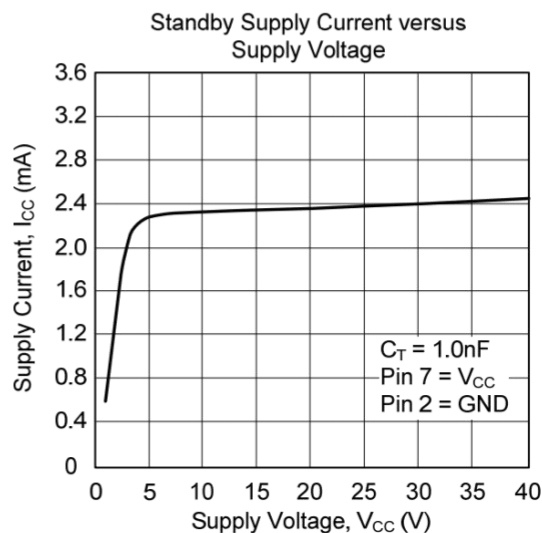
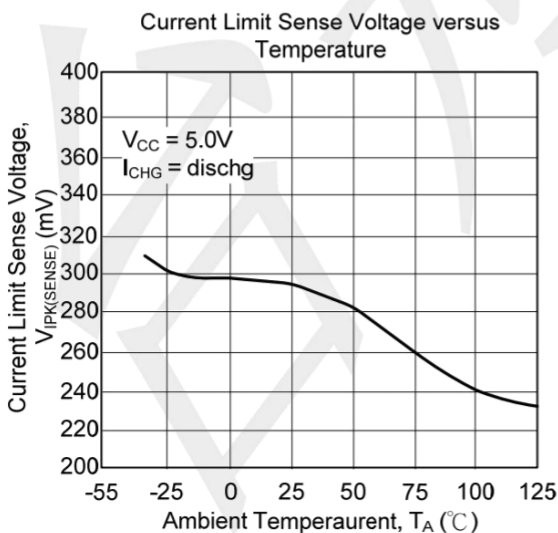
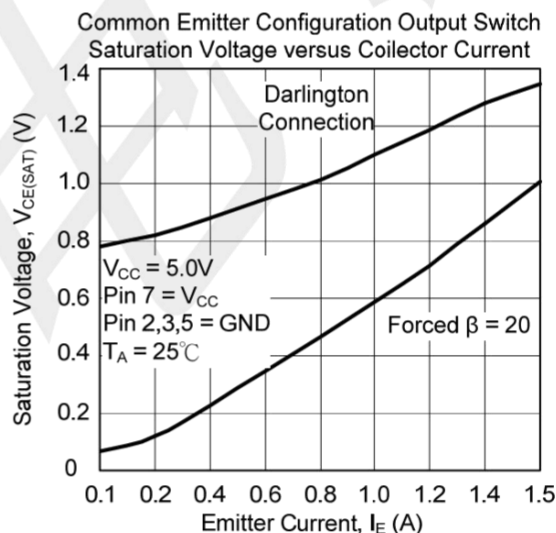
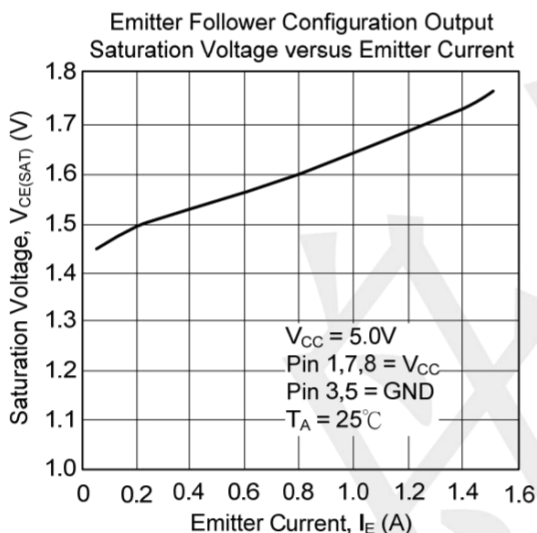
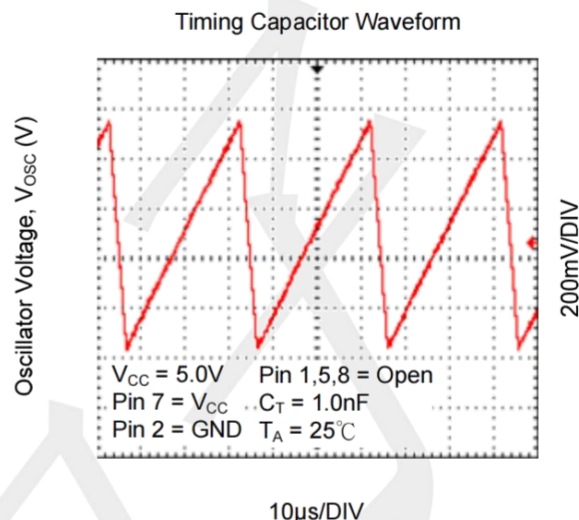
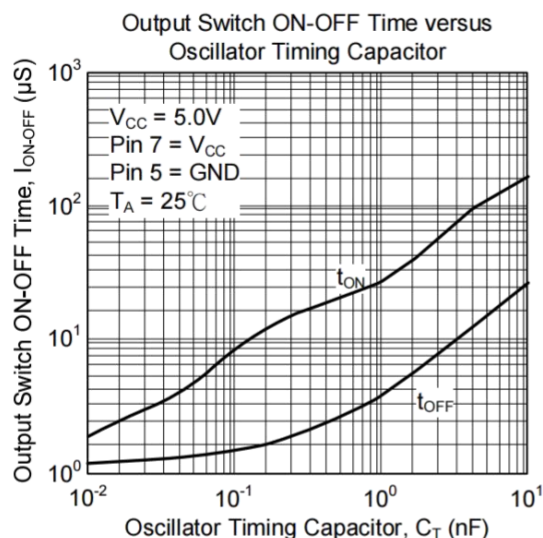
| TEST                               | CONDITIONS                                   | RESULTS              |
|------------------------------------|----------------------------------------------|----------------------|
| Line Regulation                    | $V_{IN} = 15V \sim 25V$ , $I_{OUT} = 500mA$  | $12mV = \pm 0.12\%$  |
| Load Regulation                    | $V_{IN} = 25V$ , $I_{OUT} = 50mA \sim 500mA$ | $3.0mV = \pm 0.03\%$ |
| Output Ripple                      | $V_{IN} = 25V$ , $I_{OUT} = 500mA$           | $120mV_{P-P}$        |
| Short Circuit Current              | $V_{IN} = 25V$ , $R_L = 0.1\Omega$           | 1.1A                 |
| Efficiency                         | $V_{IN} = 25V$ , $I_{OUT} = 500mA$           | 83.7%                |
| Output Ripple With Optional Filter | $V_{IN} = 25V$ , $I_{OUT} = 500mA$           | $40mV_{P-P}$         |

### VOLTAGE INVERTING CONVERTER



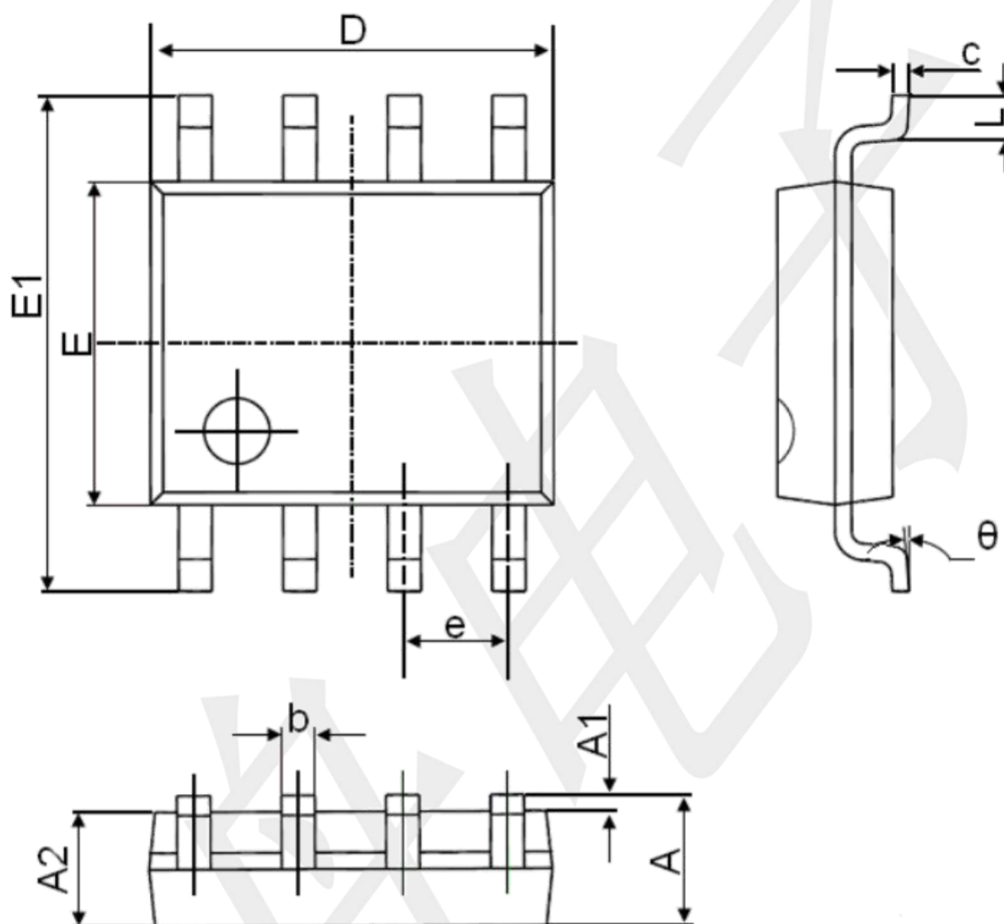
| TEST                               | CONDITIONS                                    | RESULTS               |
|------------------------------------|-----------------------------------------------|-----------------------|
| Line Regulation                    | $V_{IN} = 4.5V \sim 6.0V$ , $I_{OUT} = 100mA$ | $3.0mV = \pm 0.012\%$ |
| Load Regulation                    | $V_{IN} = 5.0V$ , $I_{OUT} = 10mA \sim 100mA$ | $0.022V = \pm 0.09\%$ |
| Output Ripple                      | $V_{IN} = 5.0V$ , $I_{OUT} = 100mA$           | $500mV_{P-P}$         |
| Short Circuit Current              | $V_{IN} = 5.0V$ , $R_L = 0.1\Omega$           | $910mA$               |
| Efficiency                         | $V_{IN} = 5.0V$ , $I_{OUT} = 100mA$           | $62.2\%$              |
| Output Ripple With Optional Filter | $V_{IN} = 5.0V$ , $I_{OUT} = 100mA$           | $70mV_{P-P}$          |

### TYPICAL CHARACTERISTICS



### Package Outline Dimensions (unit: mm)

#### SOP8



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| 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°    |