



## AMC34063A

### DC - DC CONVERTER CONTROL CIRCUITS

| DESCRIPTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | FEATURES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>The AMC34063A is designed for the applications which require DC - DC converters. It can be operated in a wide input range from 3.0V to 40V and has the controlled duty cycle oscillator, driver and high current output switch. Also, With the internal temperature compensation circuit, the AMC34063A provides an internally trimmed precision 2% reference voltage of 1.25V. These features make the AMC34063A suitable for step-up, step-down and voltage-inverting applications.</p> | <ul style="list-style-type: none"> <li>■ <b>Wide Input Operating Range: 3.0V to 40V</b></li> <li>■ <b>Output Switch Current up to 1.5A</b></li> <li>■ <b>100KHz operational Frequency</b></li> <li>■ <b>Low Standby Current</b></li> <li>□ <b>Internally trimmed 2% 1.25V Reference Voltage</b></li> <li>□ Adjustable Output Voltage</li> <li>□ Available in 8 Pin Plastic DIP and 8 Pin S.O Packages</li> <li>□ Direct pin-to-pin replacement for industrial product MC34063A.</li> </ul> |

| APPLICATIONS                                                                                                                | PACKAGE PIN OUT                                                                |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>□ Chargers</li> <li>□ Adaptors</li> <li>□ Mother Board</li> <li>□ Scanner</li> </ul> | <p><b>M PACKAGE<br/>(TOP VIEW)</b></p> <p><b>DM PACKAGE<br/>(TOP VIEW)</b></p> |

| ORDER INFORMATION                                                                                                        |          |                      |                    |
|--------------------------------------------------------------------------------------------------------------------------|----------|----------------------|--------------------|
| $T_A$ (°C)                                                                                                               | <b>M</b> | Plastic DIP<br>8-pin | <b>DM</b>          |
| <b>0 to 70</b>                                                                                                           |          | <b>AMC34063AM</b>    | <b>AMC34063ADM</b> |
| Note: All surface-mount packages are available in Tape & Reel. Append the letter "T" to part number (i.e. AMC34063ADMT). |          |                      |                    |

**ABSOLUTE MAXIMUM RATINGS**

|                                                |                  |
|------------------------------------------------|------------------|
| Power Supply Voltage ( $V_{CC}$ ) .....        | 40V              |
| Operating Junction temperature                 |                  |
| Plastic (M, DM Package) .....                  | 150 °C           |
| Storage Temperature Range .....                | -65 °C to 150 °C |
| Lead temperature (Soldering, 10 seconds) ..... | 300 °C           |

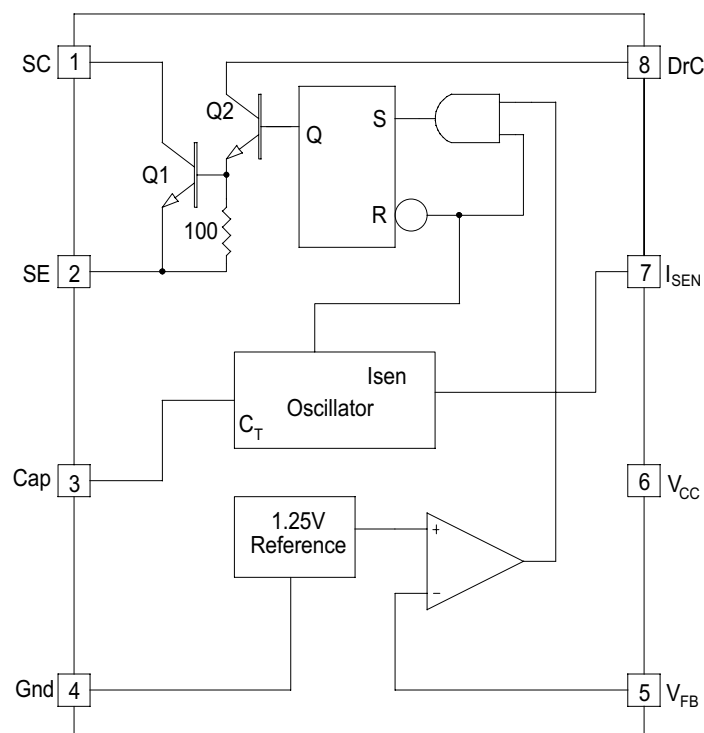
Note 1: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground.  
Currents are positive into, negative out of the specified terminal.

**THERMAL DATA****M PACKAGE:**

|                                                       |         |
|-------------------------------------------------------|---------|
| Thermal Resistance-Junction to Ambient, $\theta_{JA}$ | 95 °C/W |
|-------------------------------------------------------|---------|

**DM PACKAGE:**

|                                                       |          |
|-------------------------------------------------------|----------|
| Thermal Resistance-Junction to Ambient, $\theta_{JA}$ | 165 °C/W |
|-------------------------------------------------------|----------|

**BLOCK DIAGRAM****Pin Assignment Descriptions**

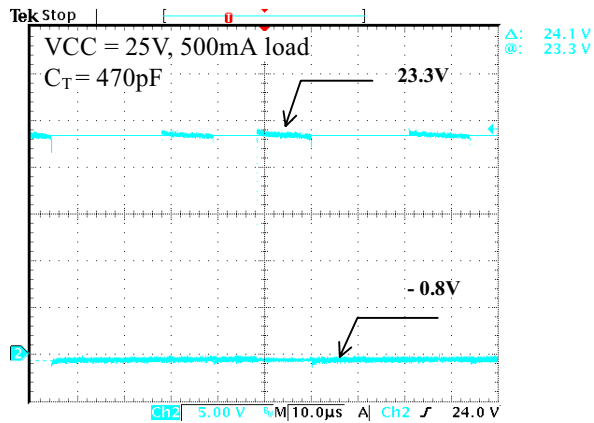
|                                           |                                               |
|-------------------------------------------|-----------------------------------------------|
| Pin 1 : SC - Switch Collector             | Pin 8 : DrC - Driver Collector                |
| Pin 2 : SE - Switch Emitter               | Pin 7 : $I_{SEN}$ - I Peak Sense              |
| Pin 3 : Cap - Oscillator Timing Capacitor | Pin 6 : $V_{CC}$ - Power Supply               |
| Pin 4 : Gnd - Ground                      | Pin 5 : $V_{FB}$ - Comparator inverting input |

| RECOMMENDED OPERATING CONDITIONS          |                  |                       |      |      |       |
|-------------------------------------------|------------------|-----------------------|------|------|-------|
| Parameter                                 | Symbol           | Recommended Operating |      |      | Units |
|                                           |                  | Min.                  | Typ. | Max. |       |
| Comparator Input Voltage                  | $V_{FB}$         | -0.3 to + 40          |      |      | V     |
| Switch Collector Voltage                  | $V_{C(switch)}$  |                       |      | 40   | V     |
| Switch Emitter Voltage ( $V_{Pin1}=40V$ ) | $V_{E(switch)}$  |                       |      | 40   | V     |
| Switch Collector to Emitter Voltage       | $V_{CE(switch)}$ |                       |      | 40   | V     |
| Driver Collector Voltage                  | $V_{C(driver)}$  |                       |      | 40   | V     |
| Driver Collector Current (Note 1)         | $I_{C(driver)}$  |                       |      | 100  | mA    |
| Switch Current                            | $I_{SW}$         |                       |      | 1.5  | A     |
| Timing Capacitor (connected to Cap pin)   | $C_T$            |                       | 1    |      | nF    |
| Operating Ambient Temperature Range       | $T_A$            | 0 to +70              |      |      | °C    |

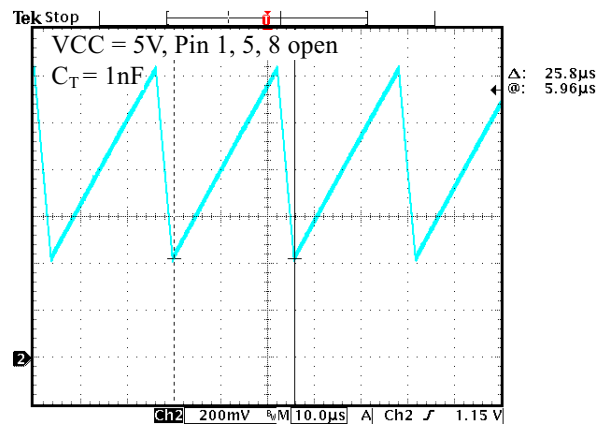
**Note 1:** Maximum package power dissipation limits must be observed.

| ELECTRICAL CHARACTERISTICS                                                       |                                       |                                                                                                                                                                 |           |      |       |       |
|----------------------------------------------------------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------|-------|-------|
| V <sub>CC</sub> =5.0 V, T <sub>A</sub> =0°C to 70°C, unless otherwise specified. |                                       |                                                                                                                                                                 |           |      |       |       |
| Parameter                                                                        | Symbol                                | Test Conditions                                                                                                                                                 | AMC34063A |      |       | Units |
|                                                                                  |                                       |                                                                                                                                                                 | Min.      | Typ. | Max.  |       |
| <b>OSCILLATOR</b>                                                                |                                       |                                                                                                                                                                 |           |      |       |       |
| Frequency                                                                        | f <sub>osc</sub>                      | V <sub>Pin 5</sub> = 0 V, C <sub>T</sub> = 1.0 nF, T <sub>A</sub> = 25 °C                                                                                       | 24        | 33   | 42    | KHz   |
| Charge Current                                                                   | I <sub>chg</sub>                      | V <sub>CC</sub> = 5.0 V to 40 V, T <sub>A</sub> = 25 °C                                                                                                         | 24        | 35   | 42    | μA    |
| Discharge Current                                                                | I <sub>dischg</sub>                   | V <sub>CC</sub> = 5.0 V to 40 V, T <sub>A</sub> = 25 °C                                                                                                         | 140       | 220  | 260   | μA    |
| Discharge to Charge Current Ratio                                                | I <sub>dischg</sub> /I <sub>chg</sub> | Pin 7 to V <sub>CC</sub> , T <sub>A</sub> = 25 °C                                                                                                               | 5.2       | 6.5  | 7.5   | -     |
| Current Limit Sense Voltage                                                      | V <sub>sense</sub>                    | I <sub>chg</sub> = I <sub>dischg</sub> , T <sub>A</sub> = 25 °C                                                                                                 | 250       | 300  | 350   | mV    |
| <b>OUTPUT SWITCH</b>                                                             |                                       |                                                                                                                                                                 |           |      |       |       |
| Saturation Voltage, Darlington Connection                                        | V <sub>CE(sat)</sub>                  | I <sub>SW</sub> = 1.0 A, Pins 1, 8 connected                                                                                                                    | -         | 1.0  | 1.3   | V     |
| Saturation Voltage                                                               | V <sub>CE(sat)</sub>                  | I <sub>SW</sub> = 1.0 A, R <sub>pin 8</sub> =82 Ω to V <sub>CC</sub> ,<br>Forced β = 20                                                                         | -         | 0.45 | 0.7   | V     |
| DC Current Gain                                                                  | h <sub>FE</sub>                       | I <sub>SW</sub> = 1.0 A, V <sub>CE</sub> = 5.0 V, T <sub>A</sub> = 25 °C                                                                                        | 50        | 75   | -     | -     |
| Collector Off—State Current                                                      | I <sub>C(off)</sub>                   | V <sub>CE</sub> = 40 V                                                                                                                                          | -         | 0.01 | 100   | μA    |
| <b>COMPARATOR</b>                                                                |                                       |                                                                                                                                                                 |           |      |       |       |
| Threshold Voltage                                                                | V <sub>th</sub>                       | T <sub>A</sub> = 25 °C                                                                                                                                          | 1.225     | 1.25 | 1.275 | V     |
|                                                                                  |                                       | T <sub>A</sub> =0 °C to 70 °C                                                                                                                                   | 1.21      | -    | 1.29  |       |
| Threshold Voltage Line Regulation                                                | Reg <sub>line</sub>                   | V <sub>CC</sub> = 3.0 V to 40 V                                                                                                                                 | -         | 1.4  | 5.0   | mV    |
| Input Bias Current                                                               | I <sub>IB</sub>                       | V <sub>FB</sub> = 0 V                                                                                                                                           | -         | -20  | -400  | nA    |
| <b>TOTAL DEVICE</b>                                                              |                                       |                                                                                                                                                                 |           |      |       |       |
| Supply current                                                                   | I <sub>CC</sub>                       | V <sub>CC</sub> = 5.0 V to 40 V,<br>C <sub>T</sub> = 1.0nF, Pin 7 = V <sub>CC</sub> ,<br>V <sub>FB</sub> > V <sub>th</sub> , Pin 2= Gnd, remaining<br>pins open | -         | -    | 4.0   | mA    |

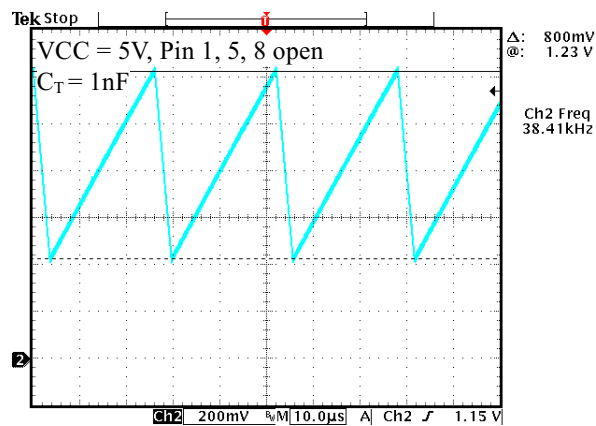
**CHARACTERIZATION CURVES**



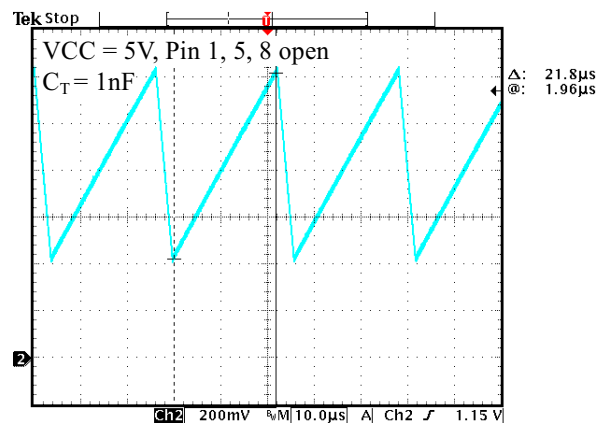
**SE pin (PIN#2) waveform**  
**on 5V step down converter**



**Cap pin (PIN#3) waveform**

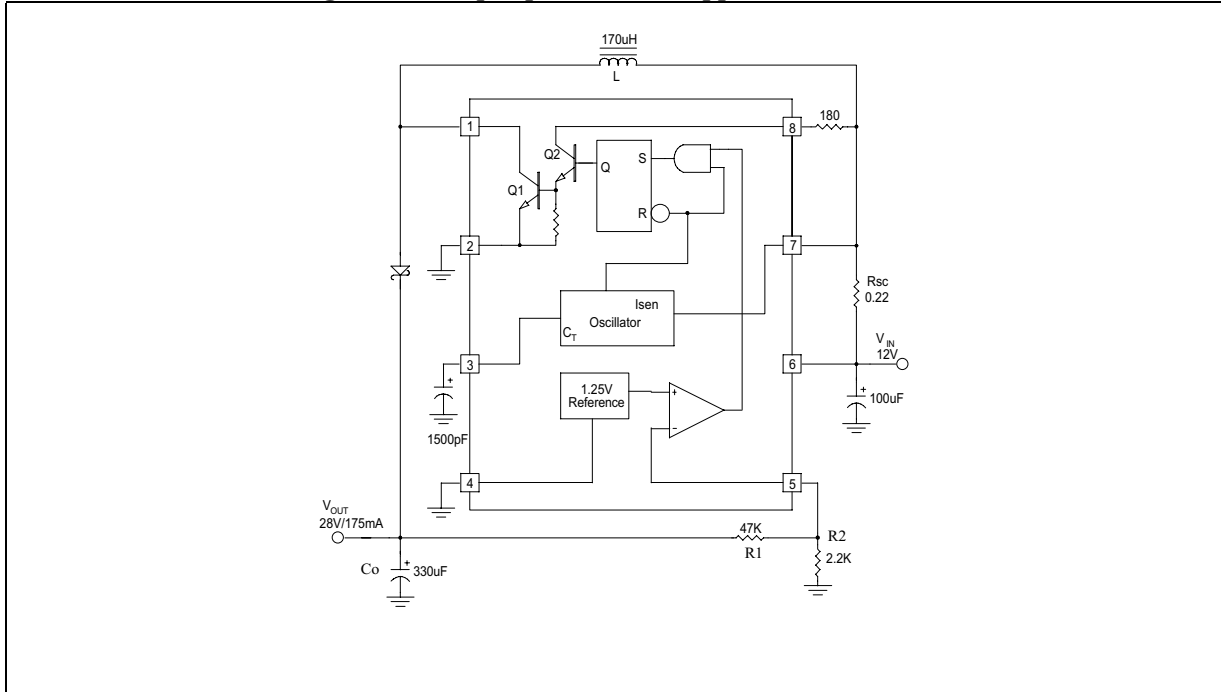


**Cap pin (PIN#3) waveform**

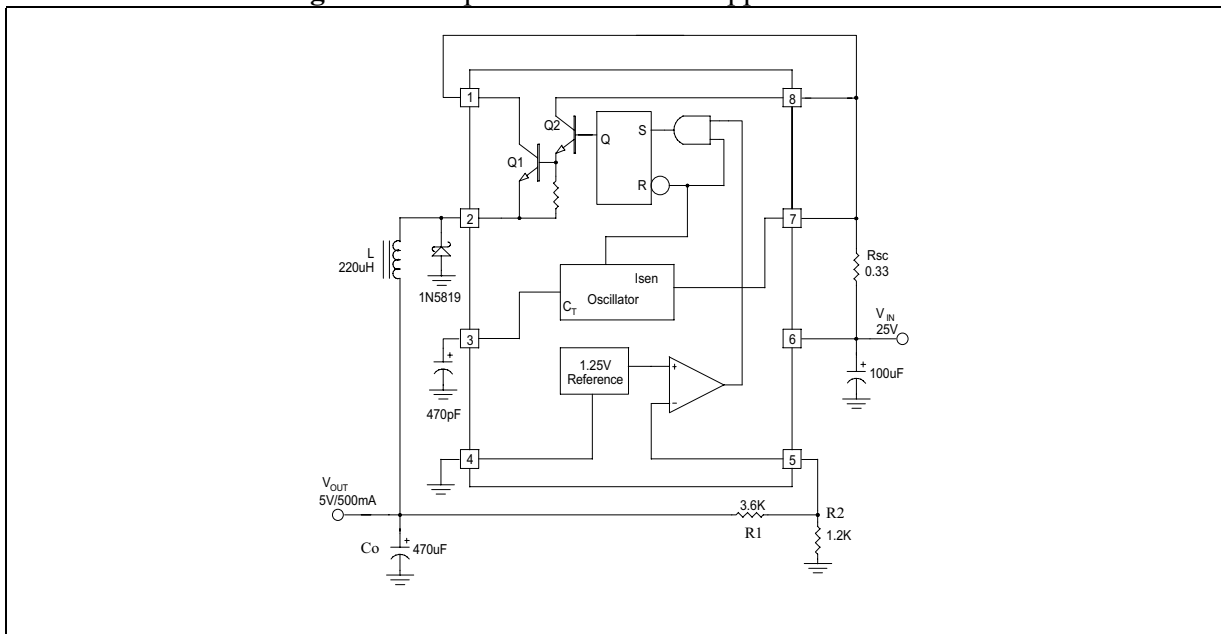


**Cap pin (PIN#3) waveform**

**Figure 1 – Step-Up Converter Application Circuits**



**Figure 2 – Step-Down Converter Application Circuit**



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**Typical Design Reference Table:**

| Calculation        | Step-Down                                                                               | Step-Up                                                                       | Voltage-Inverting                                                             |
|--------------------|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| $t_{on}/t_{off}$   | $\frac{V_{out} + V_F}{V_{in(min)} - V_{sat} - V_{out}}$                                 | $\frac{V_{out} + V_F - V_{in(min)}}{V_{in(min)} - V_{sat}}$                   | $\frac{ V_{out}  + V_F}{V_{in} - V_{sat}}$                                    |
| $t_{on} + t_{off}$ | $\frac{1}{f}$                                                                           | $\frac{1}{f}$                                                                 | $\frac{1}{f}$                                                                 |
| $t_{off}$          | $\frac{t_{on} + t_{off}}{t_{on}/t_{off} + 1}$                                           | $\frac{t_{on} + t_{off}}{t_{on}/t_{off} + 1}$                                 | $\frac{t_{on} + t_{off}}{t_{on}/t_{off} + 1}$                                 |
| $t_{on}$           | $(t_{on} + t_{off}) - t_{off}$                                                          | $(t_{on} + t_{off}) - t_{off}$                                                | $(t_{on} + t_{off}) - t_{off}$                                                |
| $C_T$              | $4.0 \times 10^{-5} t_{on}$                                                             | $4.0 \times 10^{-5} t_{on}$                                                   | $4.0 \times 10^{-5} t_{on}$                                                   |
| $I_{pk( switch )}$ | $2I_{out(max)}$                                                                         | $2I_{out(max)} (t_{on}/t_{off} + 1)$                                          | $2I_{out(max)} (t_{on}/t_{off} + 1)$                                          |
| $R_{SC}$           | $0.3/I_{pk( switch )}$                                                                  | $0.3/I_{pk( switch )}$                                                        | $0.3/I_{pk( switch )}$                                                        |
| $L_{(min)}$        | $\left( \frac{(V_{in(min)} - V_{sat} - V_{out})}{I_{pk( switch )}} \right) t_{on(max)}$ | $\left( \frac{(V_{in(min)} - V_{sat})}{I_{pk( switch )}} \right) t_{on(max)}$ | $\left( \frac{(V_{in(min)} - V_{sat})}{I_{pk( switch )}} \right) t_{on(max)}$ |
| $C_O$              | $\frac{I_{pk( switch )} (t_{on} + t_{off})}{8V_{ripple(pp)}}$                           | $9 \frac{I_{out} t_{on}}{V_{ripple(pp)}}$                                     | $9 \frac{I_{out} t_{on}}{V_{ripple(pp)}}$                                     |

$V_F$ : Forward Voltage drop of the output rectifier

$V_{sat}$ : Saturation voltage of the output switch.

**The following power supply characteristics must be chosen:**

$V_{in}$  - Nominal input voltage

$V_{out}$  - Desired output voltage,  $|V_{out}| = 1.25(1 + R1/R2)$

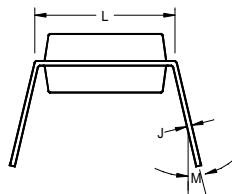
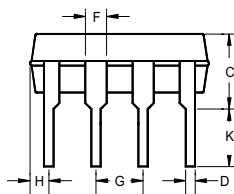
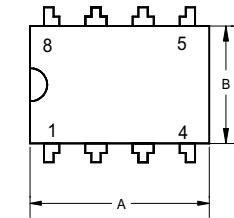
$I_{out}$  - Desired output current.

$f_{min}$  - Minimum desired output switching frequency at the selected values of  $V_{in}$  and  $I_O$

$V_{ripple(pp)}$  - Desired peak - to - peak output ripple voltage.

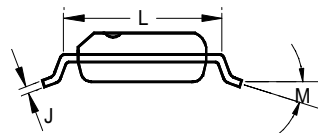
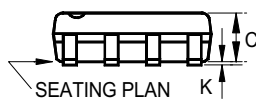
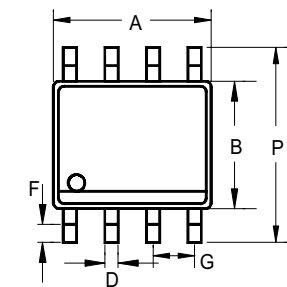
**Application concerns:**

To get the best regulation performance, Low ESR capacitors at  $V_{out}$  are suggested.

**8-Pin Plastic DIP**

|   | INCHES     |       |       | MILLIMETERS |      |       |
|---|------------|-------|-------|-------------|------|-------|
|   | MIN        | TYP   | MAX   | MIN         | TYP  | MAX   |
| A | 0.355      | 0.365 | 0.400 | 9.02        | 9.27 | 10.16 |
| B | 0.240      | 0.250 | 0.280 | 6.10        | 6.35 | 7.11  |
| C | -          | -     | 0.210 | -           | -    | 5.33  |
| D | -          | 0.018 | -     | -           | 0.46 | -     |
| F | -          | 0.060 | -     | -           | 1.52 | -     |
| G | -          | 0.100 | -     | -           | 2.54 | -     |
| H | 0.050      | -     | 0.090 | 1.27        | -    | 2.29  |
| J | 0.008      | -     | 0.015 | 0.20        | -    | 0.38  |
| K | 0.115      | 0.130 | 0.150 | 2.92        | 3.30 | 3.81  |
| L | 0.300 BSC. |       |       | 7.62 BSC.   |      |       |
| M | -          | 7°    | 15°   | -           | 7°   | 15°   |

Note: For 8-pin Plastic package, 60 units per tube

**8-Pin Plastic S.O.I.C.**

|   | INCHES    |     |       | MILLIMETERS |     |      |
|---|-----------|-----|-------|-------------|-----|------|
|   | MIN       | TYP | MAX   | MIN         | TYP | MAX  |
| A | 0.183     | -   | 0.202 | 4.65        | -   | 5.13 |
| B | 0.144     | -   | 0.163 | 3.66        | -   | 4.14 |
| C | 0.068     | -   | 0.074 | 1.73        | -   | 1.88 |
| D | 0.010     | -   | 0.020 | 0.25        | -   | 0.51 |
| F | 0.015     | -   | 0.035 | 0.38        | -   | 0.89 |
| G | 0.050 BSC |     |       | 1.27 BSC    |     |      |
| J | 0.007     | -   | 0.010 | 0.19        | -   | 0.25 |
| K | 0.005     | -   | 0.010 | 0.13        | -   | 0.25 |
| L | 0.189     | -   | 0.205 | 4.80        | -   | 5.21 |
| M | -         | -   | 8°    | -           | -   | 8°   |
| P | 0.228     | -   | 0.244 | 5.79        | -   | 6.20 |

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