

### Description

The LM2575/6 series switching regulators are monolithic integrated circuits designed for use in “buck” or “buck/boost” regulator applications requiring accurate output voltages over combined variations of line, load and temperature. This unique series greatly simplifies switching power supply design. The LM2575 has a maximum output current of 1A and the LM2576 is rated for 3A.

The LM2575/6 series miniconverters include a switching regulator and compensation network all within the same package. Just add a choke, catch diode and two capacitors to obtain an efficient DC-to-DC converter. The current limit and thermal shutdown features of the LM2575/6 series fully protect the device against overstress conditions.

The LM2575/6 series offers an alternative to popular 3 terminal linear regulators by providing higher efficiency with reduced heatsink size. In many applications a heat sink will not be required.

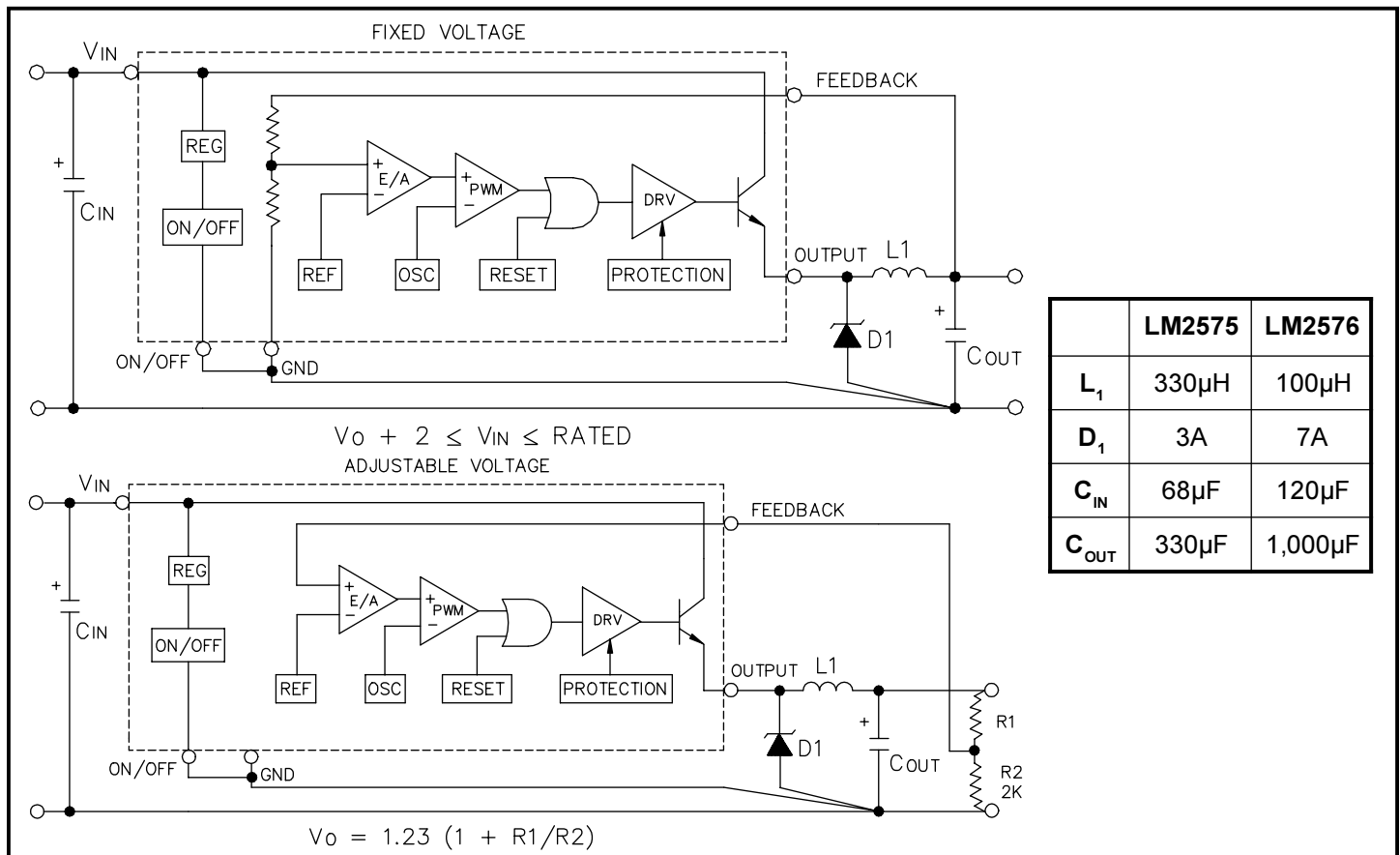
### Features

- ◆ Pin for pin replacement for National’s LM2575/6 series
- ◆ DC-to-DC buck or buck/boost converter requiring only 4 support components
- ◆ Fixed or adjustable voltages
- ◆ Preset output voltages of 3.3V, 5V and 12V
- ◆ Wide output voltage range, 1.23V to 35V
- ◆ 82% typical efficiency @ 5V out
- ◆ Wide input voltage range, 4V to 40V
- ◆ Inhibit/enable control pin
- ◆ Industrial temperature range
- ◆ TO-220 and TO-263 packages

### Applications

- ◆ Micro controller power supplies
- ◆ Medical equipment
- ◆ Industrial power supplies
- ◆ Instrumentation power supplies

### Typical Application Circuits



### Absolute Maximum Ratings

| Parameter  | Symbol        | Maximum                            | Units |
|--|---------------|------------------------------------|-------|
| Input Voltage  | $V_{IN}$      | 45                                 | V     |
| On/Off Pin Input Voltage                                   | $V_{ON/OFF}$  | $-0.3 \leq V_{ON/OFF} \leq V_{IN}$ | V     |
| Output Voltage to Common (Steady State)                    |               | -1                                 | V     |
| Power Dissipation  | $P_D$         | Internally Limited                 | W     |
| Thermal Resistance Junction to Ambient<br>TO-220<br>TO-263 | $\theta_{JA}$ | 55<br>60                           | °C/W  |
| Thermal Resistance Junction to Case<br>TO-220<br>TO-263    | $\theta_{JC}$ | 2.0<br>2.0                         | °C/W  |
| Operating Junction Temperature Range                       | $T_J$         | -40 to +125                        | °C    |
| Storage Temperature Range                                  | $T_{STG}$     | -65 to +150                        | °C    |
| Lead Temperature (Soldering) 10 Sec.                       | $T_{LEAD}$    | 300                                | °C    |
| ESD Rating (Human Body Model)                              | $V_{ESD}$     | 2                                  | kV    |

### Electrical Characteristics

Unless otherwise specified:  $V_{IN} = 12V$  for 3.3V, 5V and ADJ options and 25V for 12V option;  $V_{OUT} = 5V$  for ADJ option;  $T_A = 25^\circ C$ ;  $V_{IN}$  rated = 40V;  $I_O = 0.5$  to 3A (LM2576), 0.2 to 1A (LM2575). Values in **bold** apply over full operating temperature range.

| Parameter               | Symbol   | Test Conditions            | Min          | Typ   | Max          | Units |
|-------------------------|----------|----------------------------|--------------|-------|--------------|-------|
| Output Voltage          | $V_O$    | $I_O = 0.5A$               | 3.23         | 3.30  | 3.37         | V     |
| LM2576S-3.3             |          | 8V to $V_{IN}$ Rated       | 3.20         |       | 3.40         |       |
|                         |          |                            | <b>3.14</b>  |       | <b>3.47</b>  |       |
| Output Voltage          | $V_O$    | $I_O = 0.5A$               | 4.90         | 5.00  | 5.10         | V     |
| LM2576S-5.0             |          | 8V to $V_{IN}$ Rated       | 4.85         |       | 5.15         |       |
|                         |          |                            | <b>4.75</b>  |       | <b>5.25</b>  |       |
| Output Voltage          | $V_O$    | $I_O = 0.5A$               | 11.76        | 12.00 | 12.24        | V     |
| LM2576-12               |          | 15V to $V_{IN}$ Rated      | 11.52        |       | 12.48        |       |
|                         |          |                            | <b>11.40</b> |       | <b>12.60</b> |       |
| Feedback Voltage        | $V_{FB}$ | $I_O = 0.5A$               | 1.217        | 1.230 | 1.243        | V     |
| LM2576S-ADJ, $V_O = 5V$ |          | 8V to $V_{IN}$ Rated       | 1.193        |       | 1.267        |       |
|                         |          |                            | <b>1.180</b> |       | <b>1.280</b> |       |
| Feedback Bias Current   | $I_B$    | $V_{IN} = 12V, I_O = 0.5A$ |              | 50    | 100          | nA    |
| LM2576S-ADJ             |          |                            |              |       | <b>500</b>   |       |

**Electrical Characteristics (Cont.)**

Unless otherwise specified:  $V_{IN} = 12V$  for 3.3V, 5V and ADJ options and 25V for 12V option;  $V_{OUT} = 5V$  for ADJ option;  $T_A = 25^\circ C$ ;  $V_{IN}$  rated = 40V;  $I_o = 0.5$  to 3A (LM2576), 0.2 to 1A (LM2575). Values in **bold** apply over full operating temperature range.

| Parameter   | Symbol    | Test Conditions                                  | Min  | Typ        | Max          | Units |
|---|-----------|--|--|------------|--------------|-------|
| Output Voltage<br>LM2575S-3.3                             | $V_o$     | $I_o = 0.2A$                                     | 3.23   | 3.30       | 3.37         | V     |
|   |           | 8V to $V_{IN}$ Rated                             | 3.20   |            | 3.40         |       |
|   |           |  | <b>3.14</b>                                      |            | <b>3.47</b>  |       |
| Output Voltage<br>LM2575S-5.0                             | $V_o$     | $I_o = 0.2A$                                     | 4.90   | 5.00       | 5.10         | V     |
|   |           | 8V to $V_{IN}$ Rated                             | 4.85   |            | 5.15         |       |
|   |           |  | <b>4.75</b>                                      |            | <b>5.25</b>  |       |
| Output Voltage<br>LM2575-12                               | $V_o$     | $I_o = 0.2A$                                     | 11.76  | 12.00      | 12.24        | V     |
|   |           | 15V to $V_{IN}$ Rated                            | 11.52  |            | 12.48        |       |
|   |           |  | <b>11.40</b>                                     |            | <b>12.60</b> |       |
| Feedback Voltage<br>LM2575S-ADJ, $V_o = 5V$               | $V_{FB}$  | $I_o = 0.2A$                                     | 1.217  | 1.230      | 1.243        | V     |
|   |           | 8V to $V_{IN}$ Rated                             | 1.193  |            | 1.267        |       |
|   |           |  | <b>1.180</b>                                     |            | <b>1.280</b> |       |
| Feedback Bias Current<br>LM2575S-ADJ                      | $I_B$     | $V_{IN} = 12V, I_o = 0.2A$                       |  | 50         | 100          | nA    |
|   |           |  | <b>500</b>                                       |            |              |       |
| Efficiency/Option<br>3.3V<br>5V<br>12V<br>ADJ, $V_o = 5V$ | $\eta$    | $V_{IN} = 12V, I_o = 1A$ (LM2575, 3A for LM2576) |  | 77         |              | %     |
|   |           |  |  | 82         |              |       |
|   |           | $V_{IN} = 15V, I_o = 1A$ (LM2575, 3A for LM2576) |  | 88         |              |       |
|   |           |  | $V_{IN} = 12V, I_o = 1A$ (LM2575, 3A for LM2576) |            | 82           |       |
| Switching Frequency                                       | $f_{SX}$  |  | 47   | 52         | 58           | kHz   |
|   |           |  | <b>43</b>  |            | <b>62</b>    |       |
| Saturation Voltage <sup>(1)</sup>                         | $V_{SAT}$ | LM2575, $I_o = 1A$                               |  | <b>0.9</b> | <b>1.2</b>   | V     |
|   |           | LM2576, $I_o = 3A$                               |  | <b>0.9</b> | <b>1.4</b>   |       |
| Max. Duty Cycle (On) <sup>(3)</sup>                       | DC        |  | 93   | 98         |              | %     |
| Peak Current LM2575 <sup>(1)</sup>                        | $I_{CL}$  |  | 1.7  | 2.2        | 3.0          | A     |
|   |           |  | <b>1.3</b>                                       |            | <b>3.2</b>   |       |
| Peak Current LM2576 <sup>(1)</sup>                        | $I_{CL}$  |  | 4.2  | 5.8        | 6.9          | A     |
|   |           |  | <b>3.5</b>                                       |            | <b>7.5</b>   |       |

**Electrical Characteristics (Cont.)**

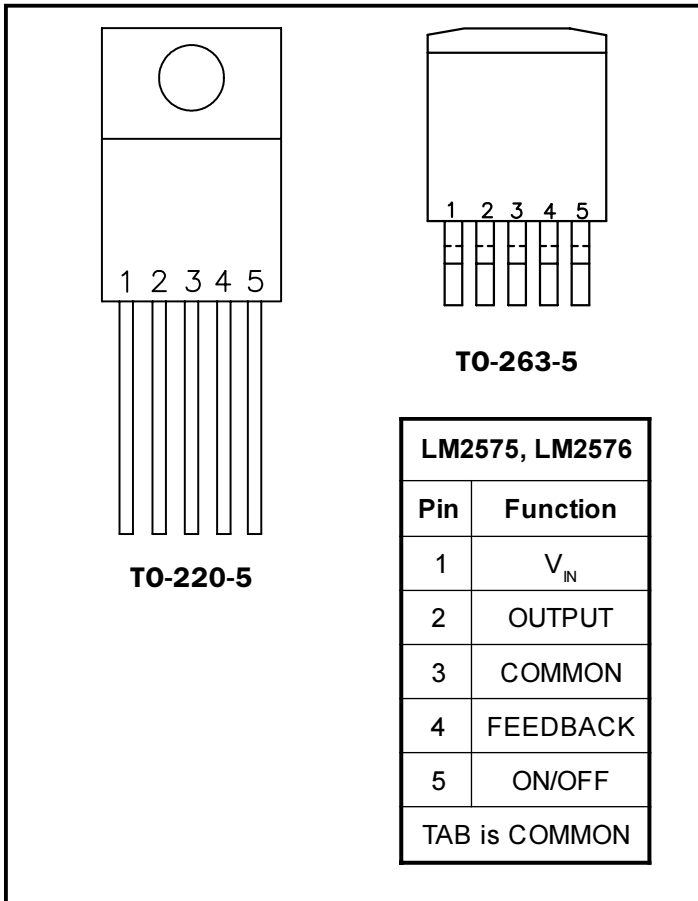
Unless otherwise specified:  $V_{IN} = 12V$  for 3.3V, 5V and ADJ options and 25V for 12V option;  $V_{OUT} = 5V$  for ADJ option;  $T_A = 25^\circ C$ ;  $V_{IN\ rated} = 40V$ ;  $I_O = 0.5$  to 3A (LM2576), 0.2 to 1A (LM2575). Values in **bold** apply over full operating temperature range.

| Parameter                                      | Symbol     | Test Conditions          | Min        | Typ | Max        | Units   |
|--|------------|--------------------------|------------|-----|------------|---------|
| Output Leakage Current <sup>(2)</sup>          | $I_L$      | $V_{IN} = V_{IN\ Rated}$ |            |     | 2          | mA      |
| Output = 0V                                    |            |                          |            | 7.5 | 30         |         |
| Output = -1V                                   |            |                          |            |     |            |         |
| Quiescent Current <sup>(2)</sup>               | $I_Q$      |                          |            | 5   | 10         | mA      |
|  |            |                          |            |     | <b>12</b>  |         |
| Standby Quiescent Current<br>(On/Off Pin = 5V) | $I_{STBY}$ |                          |            | 50  |            | $\mu A$ |
|  |            |                          |            |     |            |         |
| On/Off Pin Logic Input Level                   | $V_{IH}$   |                          | 2.2        | 1.4 |            | V       |
|  |            |                          | <b>2.4</b> |     |            |         |
|  | $V_{IL}$   |                          |            | 1.2 | 1.0        | V       |
|  |            |                          |            |     | <b>0.8</b> |         |
| On/Off Pin Input Current                       | $I_{IH}$   | $V_{ON/OFF} = 5V$ (Off)  |            | 12  | 30         | $\mu A$ |
|  | $I_{IL}$   | $V_{ON/OFF} = 0V$ (On)   |            | 0   | 10         |         |

**Notes:**

- (1) Output sourcing current, resistive load, no inductor or capacitor.
- (2) Feedback =  $V_O + 1.0V$ .
- (3) Feedback = 0V.

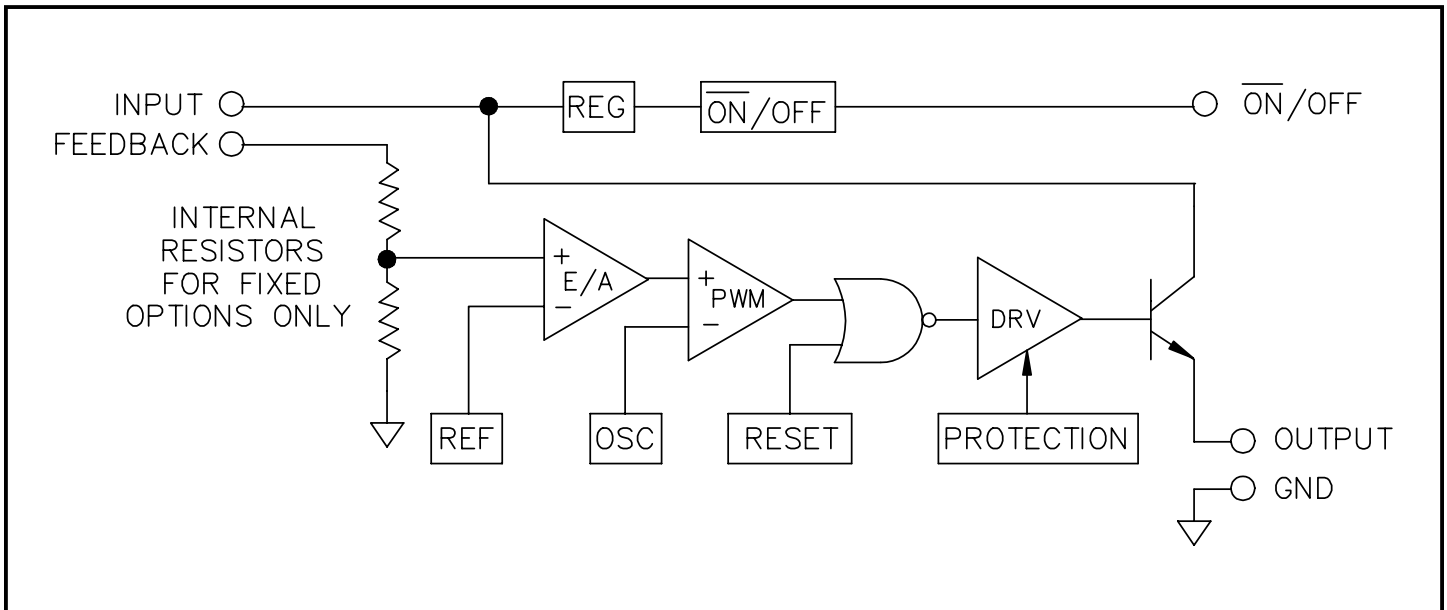
### Pin Configurations



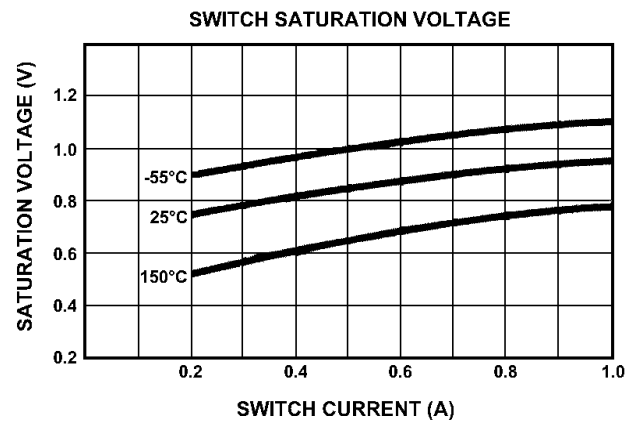
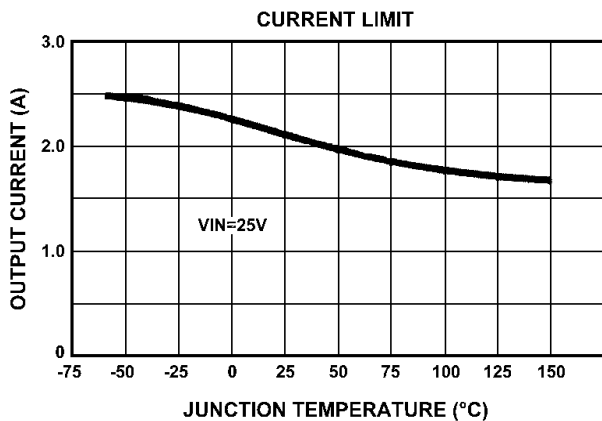
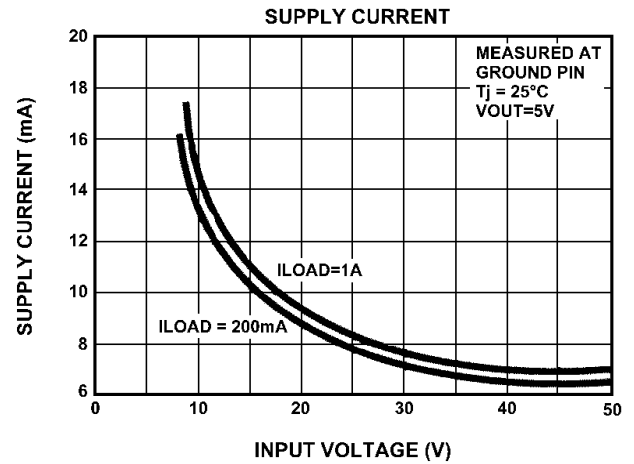
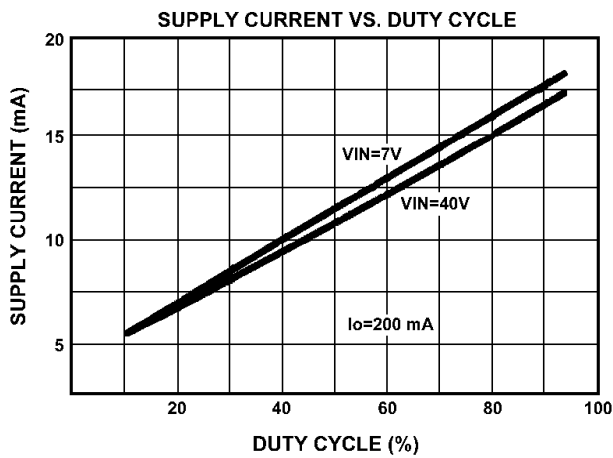
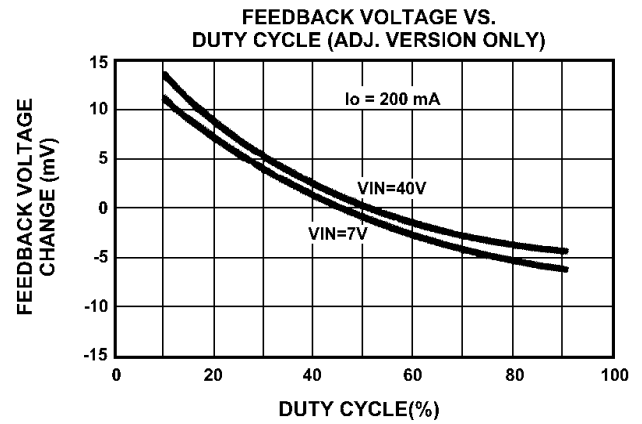
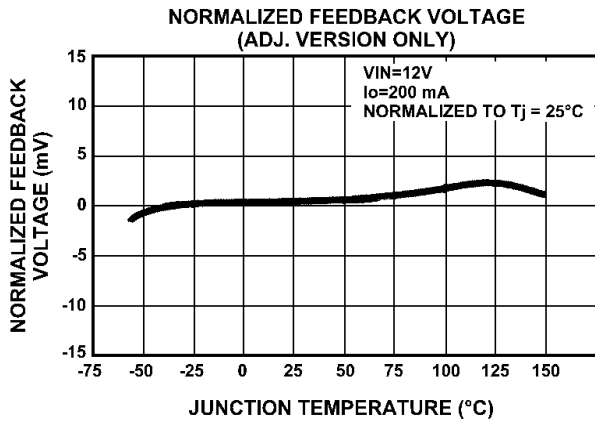
### Ordering Information

(1) -XX = Voltage Option. Available voltages are 3.3V (-3.3), 5V (-5.0), 12V (-12), and ADJ (-ADJ), which is adjustable between 1.23V and 35V.

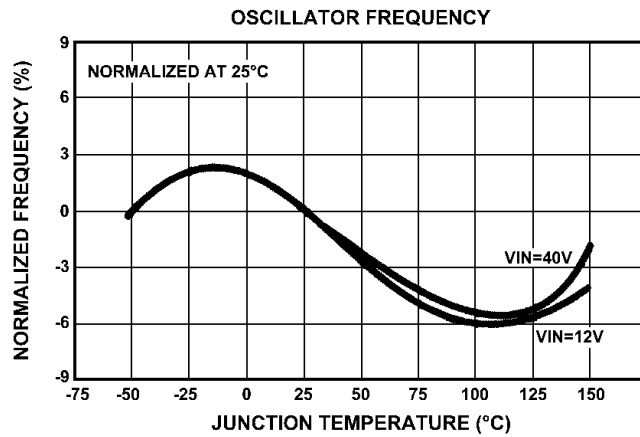
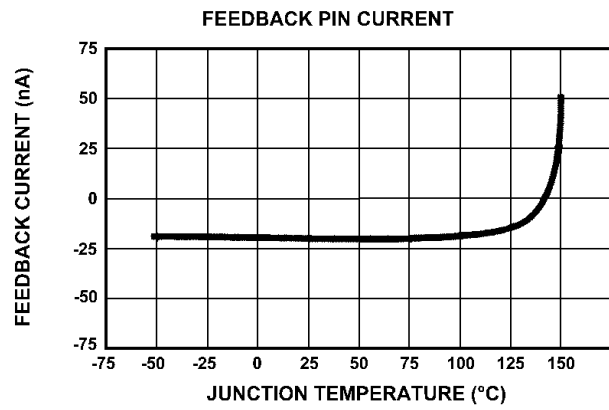
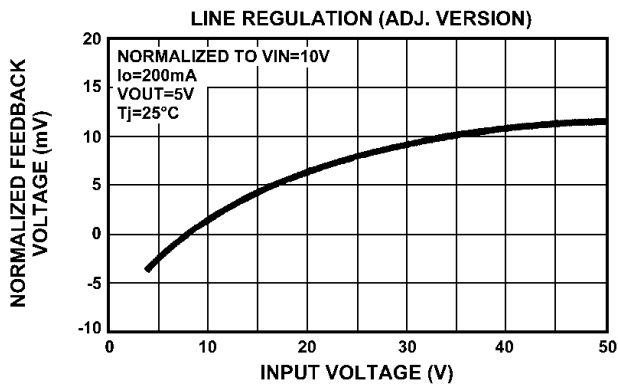
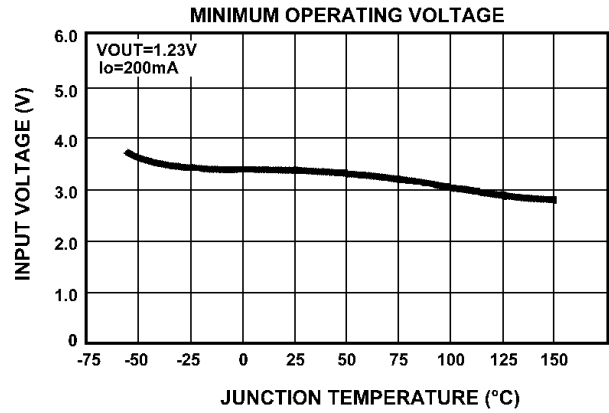
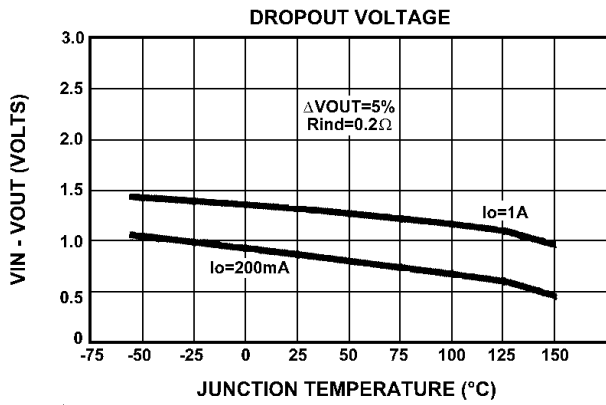
### Block Diagram



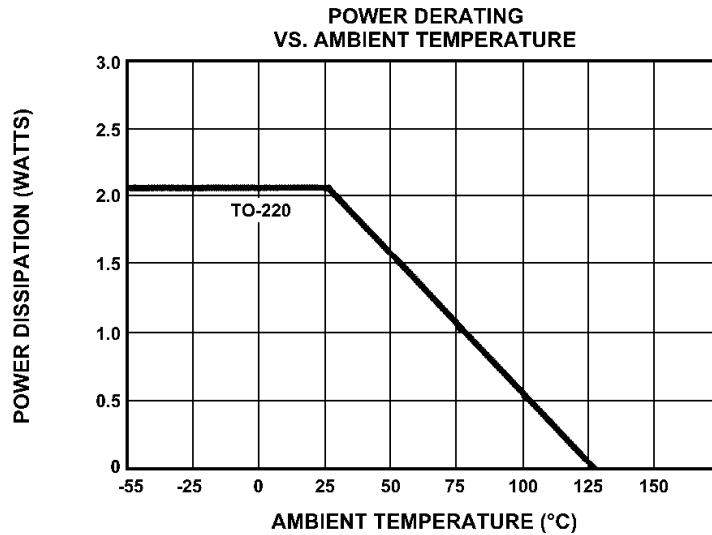
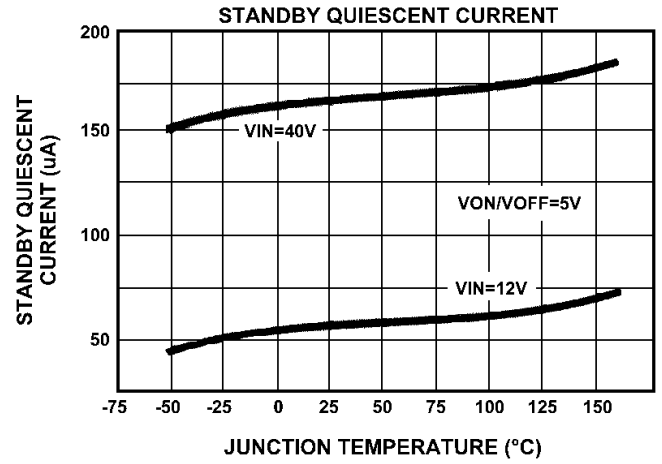
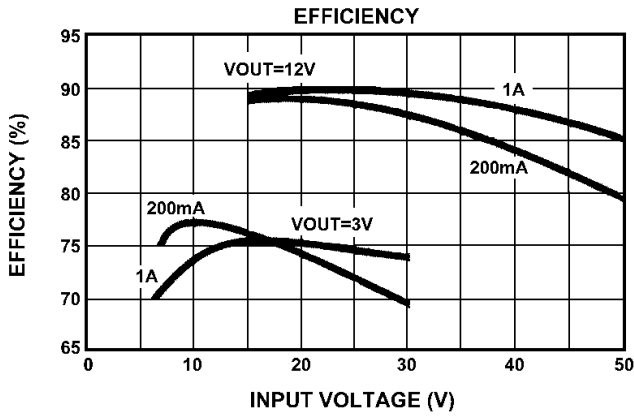
## Typical Characteristics - LM2575



## Typical Characteristics - LM2575 (Cont.)

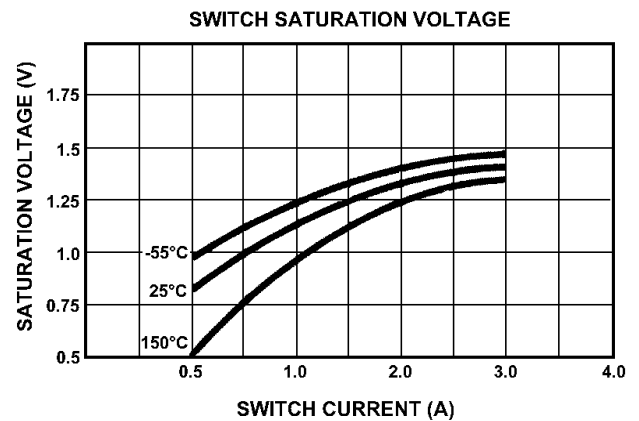
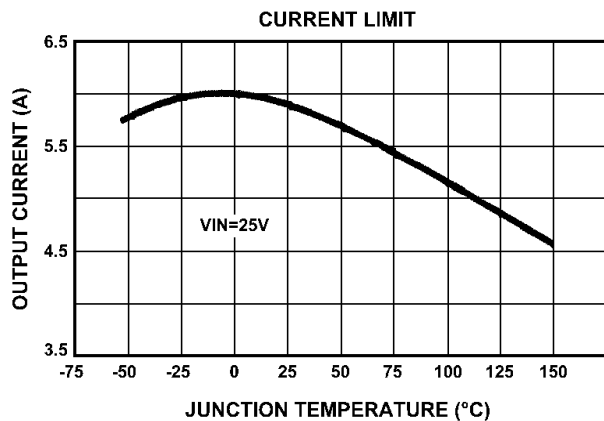
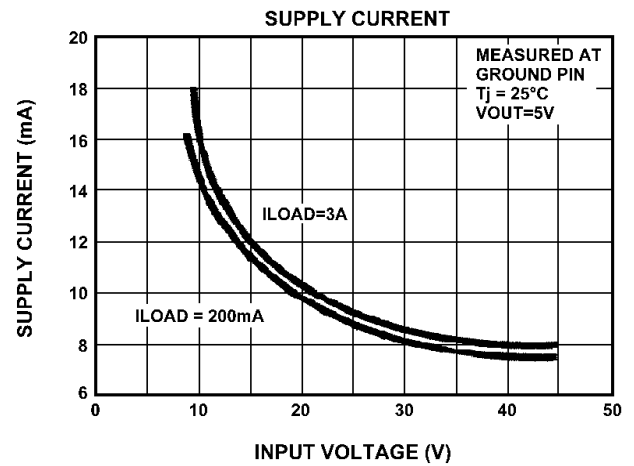
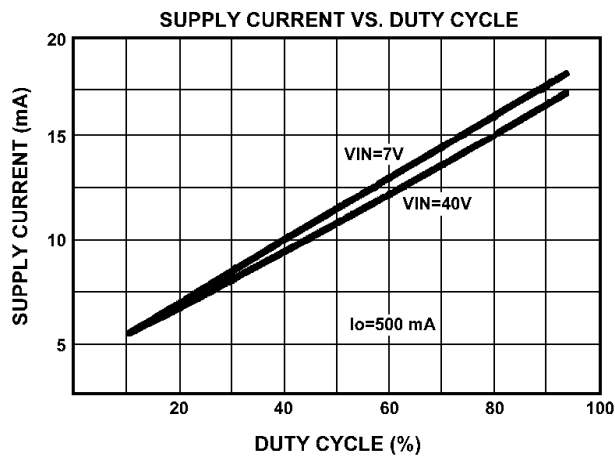
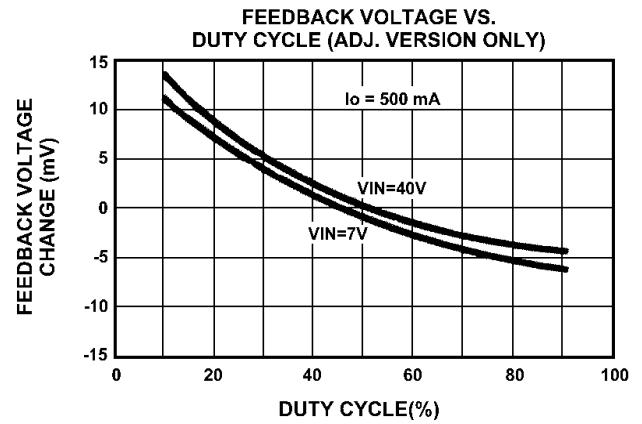
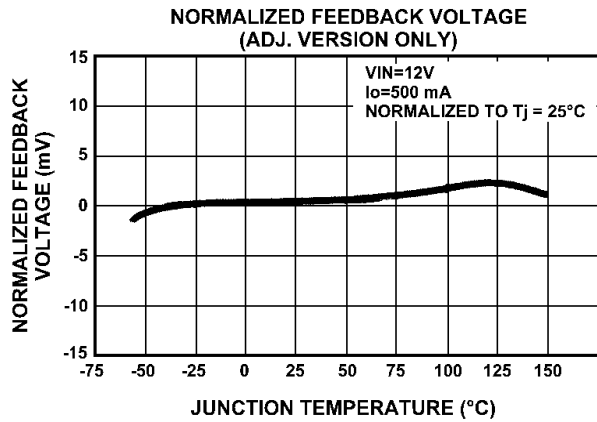


## Typical Characteristics - LM2575 (Cont.)

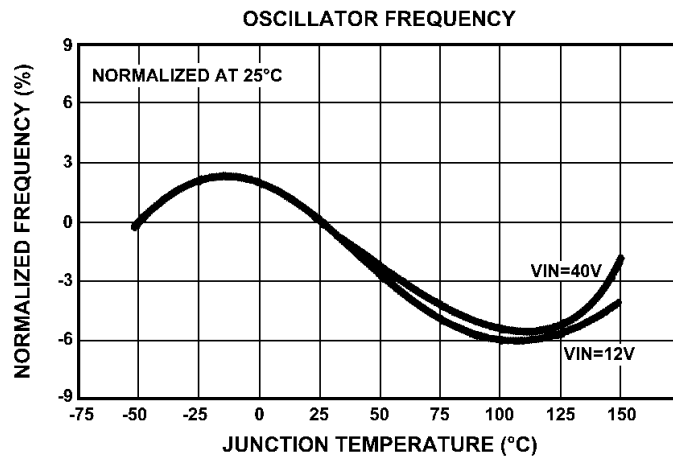
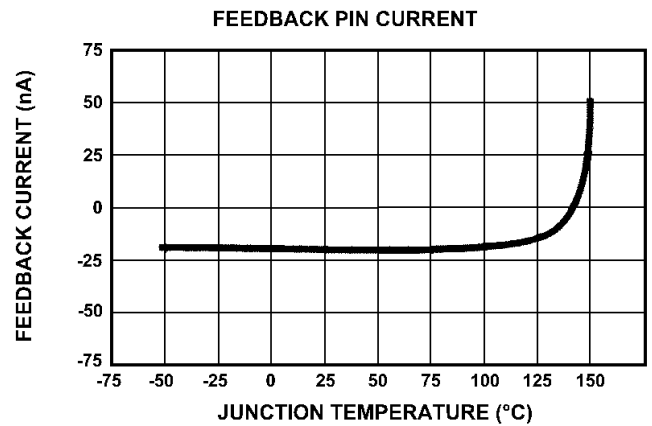
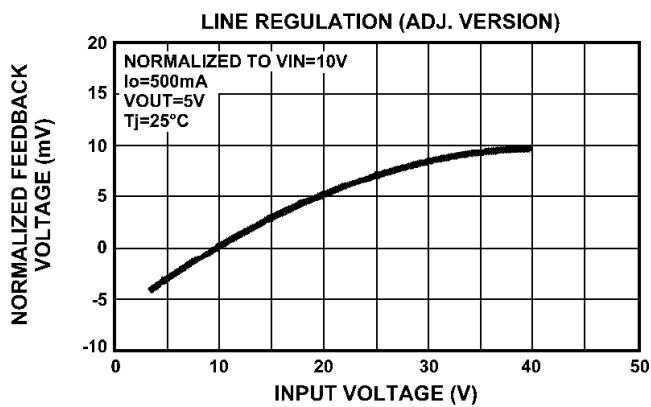
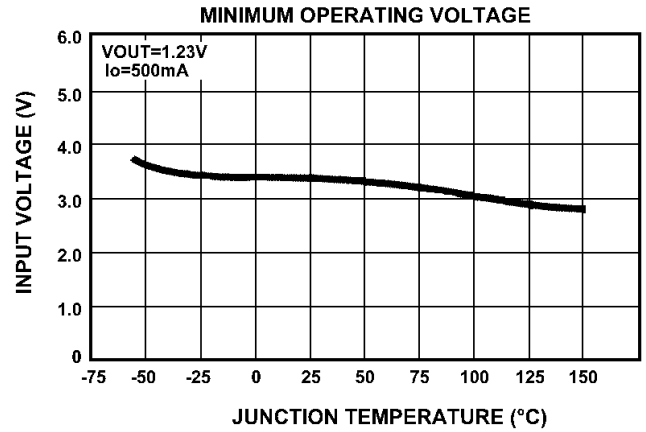
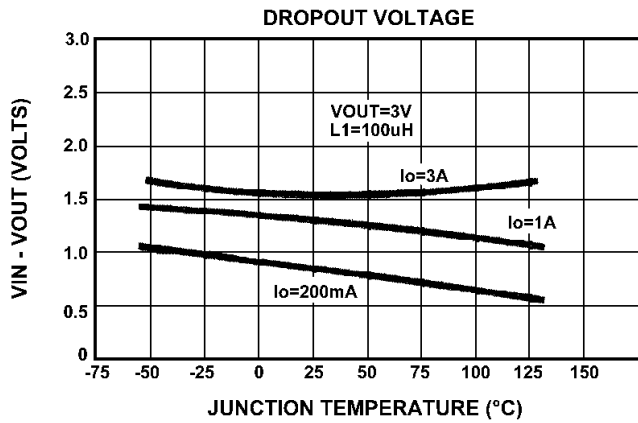




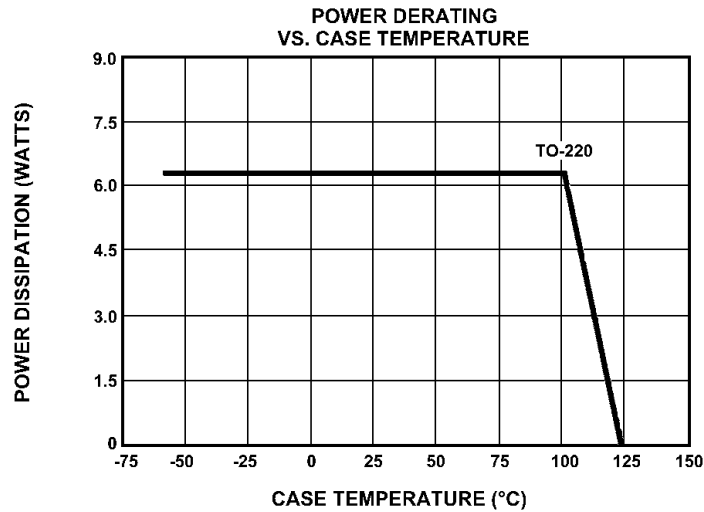
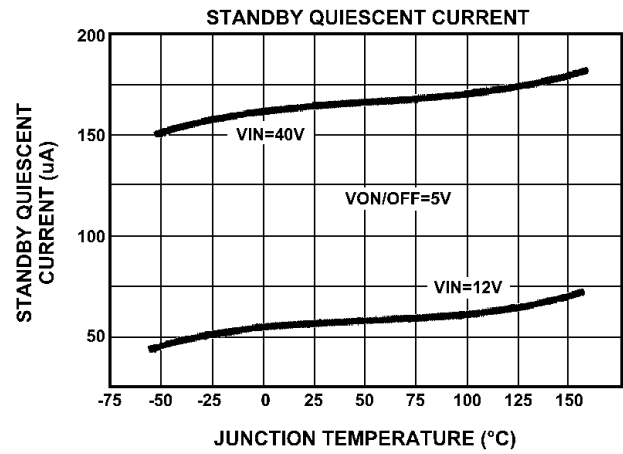
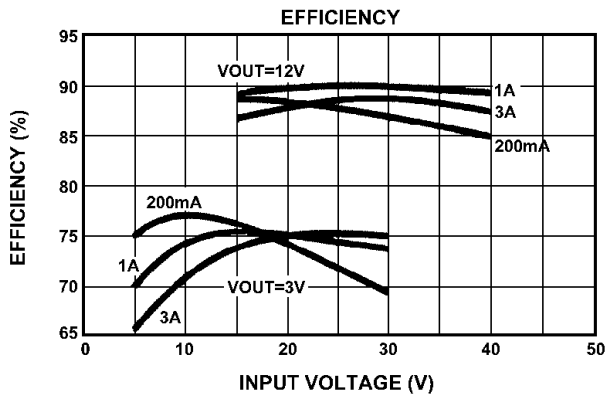
## Typical Characteristics - LM2576

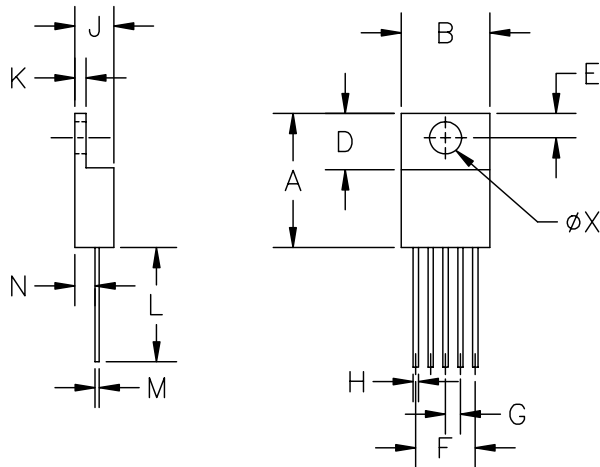


## Typical Characteristics - LM2576 (Cont.)



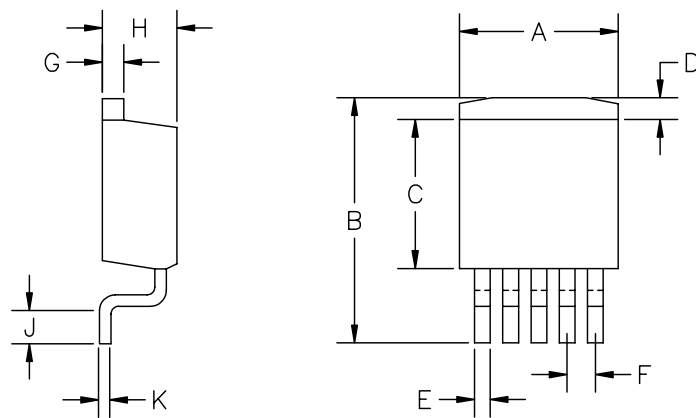
## Typical Characteristics - LM2576 (Cont.)





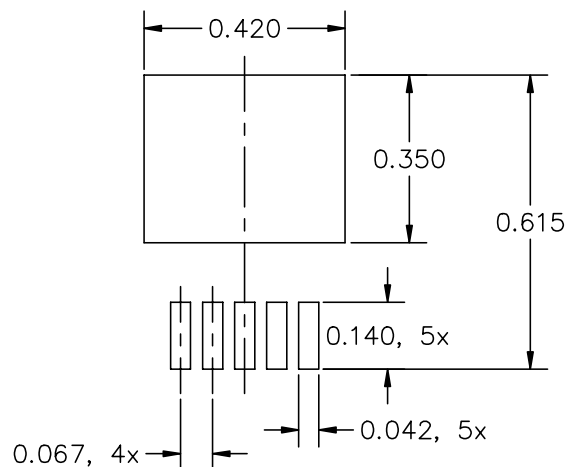
| DIM <sup>N</sup> | INCHES |      | MM    |       | NOTE |
|------------------|--------|------|-------|-------|------|
|                  | MIN    | MAX  | MIN   | MAX   |      |
| A                | .560   | .650 | 14.22 | 16.51 | —    |
| B                | .380   | .420 | 9.65  | 10.67 | —    |
| D                | .230   | .260 | 5.84  | 6.60  | —    |
| E                | .100   | .135 | 2.54  | 3.43  | —    |
| F                | .263   | .273 | 6.68  | 6.94  | —    |
| G                | .062   | .072 | 1.57  | 1.83  | —    |
| H                | .025   | .040 | .63   | 1.02  | —    |
| J                | .140   | .190 | 3.55  | 4.83  | —    |
| K                | .045   | .055 | 1.14  | 1.40  | —    |
| L                | .540   | .560 | 13.72 | 14.22 | —    |
| M                | .014   | .022 | .35   | .56   | —    |
| N                | .080   | .120 | 2.03  | 3.05  | —    |
| φX               | .139   | .161 | 3.53  | 4.09  | —    |

JEDEC TO-220

**Outline Drawing - TO-220-5**
**Outline Drawing - TO-263-5**


| DIM <sup>N</sup> | INCHES |      | MM    |       | NOTE |
|------------------|--------|------|-------|-------|------|
|                  | MIN    | MAX  | MIN   | MAX   |      |
| A                | .380   | .405 | 9.65  | 10.29 | —    |
| B                | .575   | .625 | 14.60 | 15.88 | —    |
| C                | .325   | .380 | 8.25  | 9.66  | —    |
| D                | —      | .055 | —     | 1.40  | —    |
| E                | .020   | .039 | .50   | .99   | —    |
| F                | .060   | .072 | 1.52  | 1.83  | —    |
| G                | .045   | .055 | 1.14  | 1.40  | —    |
| H                | .160   | .190 | 4.06  | 4.83  | —    |
| J                | .090   | .110 | 2.28  | 2.80  | —    |
| K                | .018   | .029 | .457  | .736  | —    |

JEDEC TO-263

**Minimum Land Pattern - TO-263-5**


NOTE: ALL DIMENSIONS ARE IN INCHES