Voltage Regulators, 1.0 A
Low-Dropout Positive,
Fixed and Adjustable

NCP1117LP

The NCP1117LP is the low power version of the popular NCP1117 family of low dropout voltage regulators, with reduced quiescent current. It is intended primarily for high volume consumer applications over the 0 to 125 degree temperature range. Capable of providing an output current in excess of 1 A, with a dropout voltage of 1.3 V at 1 A full current load, the series consists of an adjustable and five fixed voltage versions of 1.5 V, 1.8 V, 2.5 V, 3.3 V and 5.0 V.

Internal protection features consist of output current limiting and built-in thermal shutdown. The NCP1117LP series can operate up to 18 V max input voltage. The device is available in the popular SOT–223 and DPAK packages.

Features
- Output Current in Excess of 1.0 A
- 1.4 V Maximum Dropout Voltage at 1 A
- Quiescent Current over 10 times Lower than Traditional 1117
- Fixed Output Voltages of 1.5 V, 1.8 V, 2.5 V, 3.3 V and 5.0 V
- Adjustable Output Voltage Option
- No Minimum Load Requirement for Fixed Voltage Output Devices
- Good Noise Rejection
- Current Limit and Thermal Shutdown Protection
- Operation up to 18 V Input
- These are Pb-Free Devices

Applications
- TV and Monitors
- Set Top Boxes and Entertainment Devices
- Switching Power Supply Post Regulation
- Game Consoles and Consumer Applications
- Hard Drive Controllers

Figure 1. Fixed Output Regulator

Figure 2. Adjustable Output Regulator

TYPICAL APPLICATIONS
Table 1. PIN FUNCTION DESCRIPTION

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Pin Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adj (GND)</td>
<td>A resistor divider from this pin to the Vout pin and ground sets the output voltage (Ground only for Fixed−Mode).</td>
</tr>
<tr>
<td>2</td>
<td>Vout</td>
<td>The output of the regulator. A minimum of 10 μF capacitor (20 mΩ ≤ ESR ≤ 20 Ω) must be connected from this pin to ground to insure stability.</td>
</tr>
<tr>
<td>3</td>
<td>Vin</td>
<td>The input pin of regulator. Typically a large storage capacitor (20 mΩ ≤ ESR ≤ 20 Ω) is connected from this pin to ground to insure that the input voltage does not sag below the minimum dropout voltage during the load transient response. This pin must always be 1.3 V (typ.) higher than Vout in order for the device to regulate properly.</td>
</tr>
</tbody>
</table>

Table 2. MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>Rating</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Input Voltage</td>
<td>( V_{in} )</td>
<td>−0.3 to 18</td>
<td>V</td>
</tr>
<tr>
<td>Operating Junction Temperature Range</td>
<td>( T_{OP} )</td>
<td>0 to 125</td>
<td>°C</td>
</tr>
<tr>
<td>Operating Ambient Temperature Range</td>
<td>( T_{A} )</td>
<td>0 to 125</td>
<td>°C</td>
</tr>
<tr>
<td>Maximum Junction Temperature Range</td>
<td>( T_{J(max)} )</td>
<td>−55 to 150</td>
<td>°C</td>
</tr>
<tr>
<td>Power Dissipation and Thermal Characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>− Power Dissipation (Note 1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>− Thermal Resistance, Junction−to−Ambient (Note 2)</td>
<td>( P_{D} )</td>
<td>Internally Limited</td>
<td>W</td>
</tr>
<tr>
<td>− Thermal Resistance, Junction−to−Case</td>
<td>( R_{UA} )</td>
<td>108</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td>( R_{UC} )</td>
<td>15</td>
<td>°C/W</td>
</tr>
<tr>
<td>Electrostatic Discharge</td>
<td>ESD</td>
<td>2000</td>
<td>V</td>
</tr>
<tr>
<td>Machine Model</td>
<td></td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>( T_{STG} )</td>
<td>−65 to 150</td>
<td>°C</td>
</tr>
</tbody>
</table>

NOTE: This device series contains ESD protection and exceeds the following tests:
ESD HBM tested per AEC−Q100−002 (EIA/JESD22−A114)
ESD MM tested per AEC−Q100−003 (EIA/JESD22−A115)
Latch−up Current Maximum Rating: ≤ 150 mA per JEDEC standard: JESD78

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

NOTE: All voltages are referenced to GND pin.

1. The maximum package power dissipation is:

\[
P_D = \frac{T_{J(max)} - T_A}{R_{UA}}
\]

2. \( R_{UA} \) on a 100 x 100 mm PCB Cu thickness 1 oz; \( T_A = 25°C \)
### Table 3. ELECTRICAL CHARACTERISTICS

(Cin = 10 µF, Cout = 10 µF, for typical value TA = 25°C, for min and max values TA is the operating ambient temperature range that applies unless otherwise noted.)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Conditions</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Voltage, Adjustable Output Devices</td>
<td>NCP1117–ADJ, TJ = 25°C, (Vin – Vout) = 1.5 V, Io = 10 mA</td>
<td>V_ref</td>
<td>1.225</td>
<td>1.250</td>
<td>1.275</td>
<td>V</td>
</tr>
<tr>
<td>Output Voltage, Fixed Output Devices</td>
<td>NCP1117–1.5, TJ = 25°C, 3 V ≤ Vin ≤ 12 V, Io = 10 mA</td>
<td>V_out</td>
<td>1.470</td>
<td>1.5</td>
<td>1.530</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>NCP1117–1.8, TJ = 25°C, 3.3 V ≤ Vin ≤ 12 V, Io = 10 mA</td>
<td></td>
<td>1.760</td>
<td>1.8</td>
<td>1.840</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>NCP1117–2.5, TJ = 25°C, 4 V ≤ Vin ≤ 12 V, Io = 10 mA</td>
<td></td>
<td>2.450</td>
<td>2.5</td>
<td>2.550</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>NCP1117–3.3, TJ = 25°C, 4.8 V ≤ Vin ≤ 12 V, Io = 10 mA</td>
<td></td>
<td>3.235</td>
<td>3.3</td>
<td>3.365</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>NCP1117–5.0, TJ = 25°C, 6.5 V ≤ Vin ≤ 12 V, Io = 10 mA</td>
<td></td>
<td>4.900</td>
<td>5</td>
<td>5.100</td>
<td>V</td>
</tr>
<tr>
<td>Line Regulation, Adjustable &amp; Fixed</td>
<td>NCP1117–XXX, TJ = 25°C, Vout + 1.5 V &lt; Vin &lt; 12 V, Io = 10 mA</td>
<td>Regline</td>
<td>0.2</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Load Regulation (Note 3)</td>
<td>NCP1117–ADJ, TJ = 25°C, 10 mA &lt; Io &lt; 1 A, Vin = 3.3 V</td>
<td>Regload</td>
<td>1</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NCP1117–1.5, TJ = 25°C, 10 mA &lt; Io &lt; 1 A, Vin = 3 V</td>
<td></td>
<td>12</td>
<td>15</td>
<td>mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NCP1117–1.8, TJ = 25°C, 10 mA &lt; Io &lt; 1 A, Vin = 3.3 V</td>
<td></td>
<td>15</td>
<td>18</td>
<td>mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NCP1117–2.5, TJ = 25°C, 10 mA &lt; Io &lt; 1 A, Vin = 4 V</td>
<td></td>
<td>20</td>
<td>25</td>
<td>mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NCP1117–3.3, TJ = 25°C, 10 mA &lt; Io &lt; 1 A, Vin = 4.7 V</td>
<td></td>
<td>26</td>
<td>33</td>
<td>mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NCP1117–5.0, TJ = 25°C, 10 mA &lt; Io &lt; 1 A, Vin = 6.5 V</td>
<td></td>
<td>40</td>
<td>50</td>
<td>mV</td>
<td></td>
</tr>
<tr>
<td>Dropout Voltage (Vin – Vout), Adjustable &amp; Fixed</td>
<td>NCP1117–XXX, Iout = 1 A, TA = 25°C, ∆Vout = Vout – 100 mV</td>
<td></td>
<td>1.3</td>
<td>1.4</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Current Limit, Adjustable &amp; Fixed</td>
<td>NCP1117–XXX, Vin = 7 V, TJ = 25°C</td>
<td>Iout</td>
<td>1.1</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Load Current (Note 4)</td>
<td>NCP1117–XXX, 0°C ≤ TJ ≤ 125°C</td>
<td>I_Lmin</td>
<td>1</td>
<td>5</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>Quiescent Current</td>
<td>NCP1117–fixed, Vin = 12 V, Io = 10 mA</td>
<td>I_QFIX</td>
<td>550</td>
<td>700</td>
<td>μA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NCP1117–ADJ, I_QADJ</td>
<td>I_QADJ</td>
<td>30</td>
<td>50</td>
<td>μA</td>
<td></td>
</tr>
<tr>
<td>Thermal Regulation (Note 5)</td>
<td>NCP1117–XXX, TA = 25°C, T = 30 ms pulse</td>
<td></td>
<td>0.008</td>
<td>0.04</td>
<td>%W</td>
<td></td>
</tr>
<tr>
<td>Ripple Rejection</td>
<td>NCP1117–XXX, F = 120 Hz, Cout = 25 µF tantalum, Iout = 1 A, Vin = Vout + 3 V</td>
<td>RR</td>
<td>60</td>
<td></td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td>Thermal Shutdown</td>
<td>NCP1117–XXX, Tshdn</td>
<td>T_shdn</td>
<td>165</td>
<td></td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Thermal Hysteresis</td>
<td>NCP1117–XXX, T_hyst</td>
<td>T_hyst</td>
<td>10</td>
<td></td>
<td>°C</td>
<td></td>
</tr>
</tbody>
</table>

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. Low duty cycle pulse techniques are used during testing to maintain the junction temperature as close to ambient as possible.

4. Guaranteed by design.

5. Thermal Regulation is defined as the change in output voltage at a time after a change in power dissipation is applied, excluding load or line regulation effects. Specifications are for a current pulse equal to I_Lmax at VIN - VIN + 1.5 V for T = 30 msec. Guaranteed by characterization.
NCP1117LP

TYPICAL CHARACTERISTICS

**Figure 4. Dropout Voltage vs. Temperature**

$I_{\text{load}} = 10 \text{ mA}$

**Figure 5. Dropout Voltage vs. Temperature**

$I_{\text{load}} = 1 \text{ A}$

**Figure 6. Line Regulation vs. Temperature**

$I_{\text{load}} = 10 \text{ mA}$

**Figure 7. Load Regulation vs. Temperature**

$I_{\text{load}} = 1 \text{ A}$

**Figure 8. Output Voltage vs. Temperature**

$I_{\text{load}} = 10 \text{ mA}$

**Figure 9. Output Short Circuit Current vs. Temperature**
**TYPICAL CHARACTERISTICS**

**Figure 10. Quiescent Current vs. Temperature**
- $I_{\text{load}} = 10 \text{ mA}$

**Figure 11. Dropout Voltage vs. Output Current**
- $\Delta V_{\text{out}} = V_{\text{out}} - 100 \text{ mV}$
- $C_{\text{in}} = C_{\text{out}} = 10 \mu\text{F}$
- $T_J = 25^\circ\text{C}$

**Figure 12. Equivalent Series Resistance vs. Output Current**
- Region of Instability
- Region of Stability

**Figure 13. Output Capacitance vs. ESR**
- ESR, EQUIVALENT SERIES RESISTANCE ($\Omega$)
- $V_{\text{in}} = 3 \text{ V}$
- $V_{\text{out}} = 1.25 \text{ V}$
- $I_{\text{load}} = 5 \text{ mA} - 1 \text{ A}$
- $C_{\text{in}} = C_{\text{out}} = 10 \mu\text{F}$ MLCC
- $T_J = 25^\circ\text{C}$

**Figure 14. Ripple Rejection vs. Output Current**
- $f_{\text{ripple}} = 120 \text{ Hz}$
- $C_{\text{in}} = C_{\text{out}} = 22 \mu\text{F}$ Tantalum
- $V_{\text{in}} - V_{\text{out}} = 3 \text{ V}$
- $T_A = 25^\circ\text{C}$

**Figure 15. Ripple Rejection vs. Output Current**
- $f_{\text{ripple}} = 120 \text{ Hz}$
- $C_{\text{in}} = C_{\text{out}} = 22 \mu\text{F}$ Tantalum
- $V_{\text{in}} - V_{\text{out}} = 3 \text{ V}$
- $T_A = 25^\circ\text{C}$
TYPICAL CHARACTERISTICS

Figure 16. Ripple Rejection vs. Frequency – $V_{\text{out}} = 1.5$ V

Figure 17. Output Spectral Noise Density vs. Frequency – $V_{\text{out}} = 1V5$

Figure 18. Line Transient Response – $V_{\text{out}} = 1.5$ V

Figure 19. Line Transient Response – $V_{\text{out}} = 1.5$ V

Figure 20. Line Transient Response – $V_{\text{out}} = 1.8$ V

Figure 21. Line Transient Response – $V_{\text{out}} = 1.8$ V
NCP1117LP

TYPICAL CHARACTERISTICS

Figure 22. Line Transient Response – $V_{out} = 2.5\, V$

Figure 23. Line Transient Response – $V_{out} = 2.5\, V$

Figure 24. Line Transient Response – $V_{out} = 3.3\, V$

Figure 25. Line Transient Response – $V_{out} = 3.3\, V$

Figure 26. Line Transient Response – $V_{out} = 5.0\, V$

Figure 27. Line Transient Response – $V_{out} = 5.0\, V$
TYPICAL CHARACTERISTICS

Figure 28. Load Transient Response – $V_{out} = 1.8$ V

Figure 29. Load Transient Response – $V_{out} = 2.5$ V

Figure 30. Load Transient Response – $V_{out} = 3.3$ V

Figure 31. Load Transient Response – $V_{out} = 5.0$ V

* Tantalum Capacitors
Figure 32. SOT–223 Thermal Resistance and Maximum Power Dissipation vs. P.C.B. Copper Length

Theta JA curve with PCB cu thk 2.0 oz
Power curve with PCB cu thk 1.0 oz
Theta JA curve with PCB cu thk 1.0 oz
Power curve with PCB cu thk 2.0 oz
NCP1117LP

APPLICATIONS INFORMATION

Introduction
The NCP1117LP is a low dropout positive fixed or adjustable mode regulator with 1 A output capability. This LDO is guaranteed to have a significant reduction in dropout voltage along with enhanced output voltage accuracy and temperature stability when compared to older industry standard three-terminal adjustable regulators.

These devices contain output current limiting, safe operating area compensation and thermal shutdown protection making them designer friendly for powering numerous consumer and industrial products. The NCP1117LP series is pin compatible with the older NCP1117.

Output Voltage
The typical application circuits for the fixed and adjustable output regulators are shown in Figures 33 and 34. The adjustable devices are floating voltage regulators. They develop and maintain the nominal 1.25 V reference voltage between the output and adjust pins. The reference voltage is programmed to a constant current source by resistor R1, and this current flows through R2 to ground to set the output voltage. The programmed current level is usually selected to be greater than the specified 5.0 mA minimum that is required for regulation. Since the adjust pin current, I_adj, is significantly lower and constant with respect to the programmed load current, it generates a small output voltage error that can usually be ignored. For the fixed output devices R1 and R2 are included within the device and the ground current I_gnd is 550 μA (typ).

External Capacitors
Input bypass capacitor C_in may be required for regulator stability if the device is located more than a few inches from the power source. This capacitor will reduce the circuit’s sensitivity when powered from a complex source impedance and significantly enhance the output transient response. The input bypass capacitor should be mounted with the shortest possible track length directly across the regulator’s input and ground terminals. A 10 μF ceramic or tantalum capacitor should be adequate for most applications.

The output ripple will increase linearly for fixed and adjustable devices as the ratio of output voltage to the reference voltage increases. For example, with a 5 V regulator, the output ripple will increase by 5 V/1.25 V or 4 and the ripple rejection will decrease by 20 log of this ratio or 12 dB. The loss of ripple rejection can be restored to the values shown with the addition of bypass capacitor C_adj, shown in Figure 34. The reactance of C_adj at the ripple frequency must be less than the resistance of R1. The value of R1 can be selected to provide the minimum required load current to maintain regulation and is usually in the range of 100 Ω to 200 Ω.

\[
C_{\text{adj}} > \frac{1}{2\pi \cdot f_{\text{ripple}} \cdot R_1}
\]

The minimum required capacitance can be calculated from the above formula. When using the device in an application that is powered from the AC line via a transformer and a full wave bridge, the value for C_adj is:

\[
f_{\text{ripple}} = 120 \text{ Hz}, \ R_1 = 120 \ \Omega, \ \text{then} \ C_{\text{adj}} > 11.1 \ \mu F
\]

The value for C_adj is significantly reduced in applications where the input ripple frequency is high. If used as a post regulator in a switching converter under the following conditions:

\[
f_{\text{ripple}} = 50 \text{ kHz}, \ R_1 = 120 \ \Omega, \ \text{then} \ C_{\text{adj}} > 0.027 \ \mu F
\]
Protection Diodes

The NCP1117LP family has two internal low impedance diode paths that normally do not require protection when used in the typical regulator applications. The first path connects between \( V_{out} \) and \( V_{in} \), and it can withstand a peak surge current of about 15 A. Normal cycling of \( V_{in} \) cannot generate a current surge of this magnitude. Only when \( V_{in} \) is shorted or crowbarred to ground and \( C_{out} \) is greater than 50 \( \mu \)F, it becomes possible for device damage to occur. Under these conditions, diode D1 is required to protect the device. The second path connects between \( C_{adj} \) and \( V_{out} \), and it can withstand a peak surge current of about 150 mA. Protection diode D2 is required if the output is shorted or crowbarred to ground and \( C_{adj} \) is greater than 1.0 \( \mu \)F.

Load Regulation

The NCP1117LP series is capable of providing excellent load regulation; but since these are three terminal devices, only partial remote load sensing is possible. There are two conditions that must be met to achieve the maximum available load regulation performance. The first is that the top side of programming resistor \( R_1 \) should be connected as close to the regulator case as practicable. This will minimize the voltage drop caused by wiring resistance \( R_{W+} \) from appearing in series with reference voltage that is across \( R_1 \). The second condition is that the ground end of \( R_2 \) should be connected directly to the load. This allows true Kelvin sensing where the regulator compensates for the voltage drop caused by wiring resistance \( R_{W-} \).

Thermal Considerations

This series contains an internal thermal limiting circuit that is designed to protect the regulator in the event that the maximum junction temperature is exceeded. When activated, typically at 165°C, the regulator output switches off and then back on as the die cools. As a result, if the device is continuously operated in an overheated condition, the output will appear to be oscillating. This feature provides protection from a catastrophic device failure due to accidental overheating. It is not intended to be used as a substitute for proper heatsinking. The maximum device power dissipation can be calculated by:

\[
P_D = \frac{T_{J(max)} - T_A}{R_{JA}}
\]

The devices are available in surface mount SOT-223 package. This package has an exposed metal tab that is specifically designed to reduce the junction to air thermal resistance, \( R_{JA} \), by utilizing the printed circuit board copper as a heat dissipater. Figure 32 shows typical \( R_{JA} \) values that can be obtained from a square pattern using economical single sided 1.0 oz and 2.0 oz copper board material. The final product thermal limits should be tested and quantified in order to insure acceptable performance and reliability. The actual \( R_{JA} \) can vary considerably from the graphs shown. This will be due to any changes made in the copper aspect ratio of the final layout, adjacent heat sources, and air flow.

\[
I_{out} = \frac{V_{ref}}{R} + I_{adj}
\]
Resistor R2 sets the maximum output voltage. Each transistor reduces the output voltage when turned on.

Figure 39. Digitally Controlled Regulator

Output Voltage Control

V_{\text{out(Off)}} = V_{\text{ref}}

Figure 40. Regulator with Shutdown

Figure 41. Adjusting Output of Fixed Voltage Regulators

DEVICE ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Device</th>
<th>Package</th>
<th>Shipping†</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCP1117LPST15T3G</td>
<td>SOT–223 (Pb–Free)</td>
<td>4000 / Tape &amp; Reel</td>
</tr>
<tr>
<td>NCP1117LPST18T3G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCP1117LPST25T3G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCP1117LPST33T3G</td>
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<td></td>
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<td>NCP1117LPST50T3G</td>
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<tr>
<td>NCP1117LPSTADT3G</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCP1117LPDT18RKG</td>
<td>DPAK (Pb–Free)</td>
<td>2500 / Tape &amp; Reel</td>
</tr>
<tr>
<td>NCP1117LPDT33RKG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NCP1117LPDTADJRKG</td>
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</tr>
</tbody>
</table>

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.
NCP1117LP

PACKAGE DIMENSIONS

DPAK (SINGLE GAUGE)
CASE 369C
ISSUE G

NOTES:

2. CONTROLLING DIMENSION INCHES.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DIMENSIONS A AND B ARE DETERMINED AT DATUM PLANE H.
7. OPTIONAL MOLD FEATURE.

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 2:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

STYLE 3:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

STYLE 4:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE

STYLE 5:
PIN 1. GATE
2. ANODE
3. CATHODE
4. ANODE

STYLE 6:
PIN 1. MT1
2. COLLECTOR
3. GATE
4. COLLECTOR

STYLE 7:
PIN 1. GATE
2. CATHODE
3. ANODE
4. CATHODE

STYLE 8:
PIN 1. N/C
2. CATHODE
3. ANODE
4. CATHODE

STYLE 9:
PIN 1. ANODE
2. CATHODE
3. RESISTOR ADJUST
4. CATHODE

STYLE 10:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE

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RECOMMENDED MOUNTING FOOTPRINT*

*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOA
THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM1.

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XXXXXX = Device Code
A = Assembly Location
L = Wafer Lot
Y = Year
WW = Work Week
G = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, “G” or microdot “*”, may or may not be present. Some products may not follow the Generic Marking.

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SOT-223
CASE 318H
ISSUE B

DATE 13 MAY 2020

NOTES:
2. CONTROLLING DIMENSION MILLIETERS.
3. DIMENSIONS I & I1 ARE DETERMINED AT DATUM H. DIMENSIONS DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. SHALL NOT EXCEED 0.23 mm PER SIDE.
4. LEAD DIMENSIONS b AND I1 DO NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION IS 0.08 mm PER SIDE.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. AL IS DEFINED AS THE VERTICAL DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT OF THE PACKAGE BODY.
7. POSITIONAL TOLERANCE APPLIES TO DIMENSIONS b AND I1.

<table>
<thead>
<tr>
<th>DIM</th>
<th>MIN</th>
<th>NOM.</th>
<th>MAX.</th>
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<tbody>
<tr>
<td>A</td>
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<td>---</td>
<td>1.80</td>
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<tr>
<td>A1</td>
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<td>0.06</td>
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<td>b</td>
<td>0.60</td>
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<tr>
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<td>0.25</td>
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</table>

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A = Assembly Location
Y = Year
W = Work Week
XXXXX = Specific Device Code
* = Pb-Free Package
(Note: Microdot may be in either location)

This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, “G” or microdot “*”, may or may not be present. Some products may not follow the Generic Marking.

RECOMMENDED MOUNTING FOOTPRINT
For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SDLTERTM/D.

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DESCRIPTION: SOT-223

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