



# AMC3842B/43B

## CURRENT MODE PWM CONTROLLER

DESCRIPTION	FEATURES
<p>The AMC3842B/43B are fixed frequency current-mode PWM controllers specially designed for OFF-Line switching power supply and DC-to-DC converters with a minimum number of external components. These devices feature a trimmed oscillator for precise duty cycle control, a temperature compensated reference, high gain error amplifier, current sensing comparator, and high current totem pole output which is suitable for driving MOSFETs. The under voltage lock-out (U.V.L.O.) is designed to operated with 200µA typ. start-up current, allowing an efficient bootstrap supply voltage design. The U.V.L.O. thresholds for the AMC3842B are 16V (on) and 10V (off) which are ideal for off-line applications. The corresponding typical threshold for the AMC3843B are 8.4V (on) and 7.6V (off). The AMC3842B/43B can operated within 100% duty cycle.</p>	<ul style="list-style-type: none"> <li>■ <b>Low Start-Up current ( typ. 200µA)</b></li> <li>■ <b>Optimized for Off-Line and DC-to-DC Converters</b></li> <li>■ <b>Maximum Duty Cycle</b></li> <li>■ <b>U.V.L.O. with Hysteresis</b></li> <li>□ Operating Frequency Up to 500KHz</li> <li>□ Internal Trimmed Bandgap Reference</li> <li>□ High Current Totem Pole Output</li> <li>□ Error Amplifier With Low Output Resistance</li> <li>□ Available in 8-Pin Plastic DIP and Surface Mount 14-Pin S.O.I.C.</li> <li>□ Identical pin assignment to earlier UC384X series.</li> </ul>

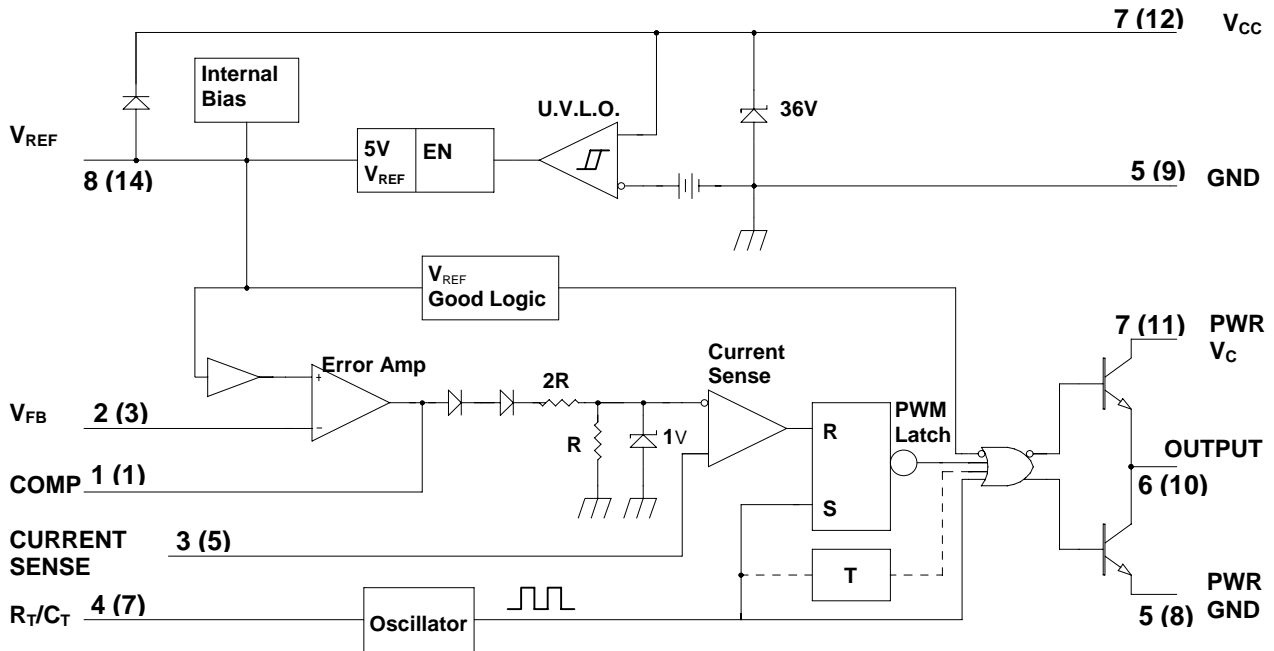
APPLICATIONS	PACKAGE PIN OUT												
<ul style="list-style-type: none"> <li>■ Off-line flyback or forward converters.</li> <li>■ DC-to-DC buck or boost converter.</li> <li>■ Monitor Power Supply</li> </ul>	<p style="text-align: center;">8-Pin Plastic DIP (Top View)</p> <p style="text-align: center;">14-Pin Plastic S.O.I.C. Surface Mount (Top View)</p> <p style="text-align: center;">8-Pin Plastic S.O.I.C. Surface Mount (Top View)</p>												
AVAILABLE OPTIONS													
<table border="1"> <thead> <tr> <th>Device</th> <th>Start-UP Voltage</th> <th>Hysteresis</th> <th>Max. Duty Cycle</th> </tr> </thead> <tbody> <tr> <td>AMC3842B</td> <td>16V</td> <td>6V</td> <td>&lt; 100%</td> </tr> <tr> <td>AMC3843B</td> <td>8.4V</td> <td>0.8V</td> <td>&lt; 100%</td> </tr> </tbody> </table>	Device	Start-UP Voltage	Hysteresis	Max. Duty Cycle	AMC3842B	16V	6V	< 100%	AMC3843B	8.4V	0.8V	< 100%	
Device	Start-UP Voltage	Hysteresis	Max. Duty Cycle										
AMC3842B	16V	6V	< 100%										
AMC3843B	8.4V	0.8V	< 100%										

ORDER INFORMATION						
T <sub>A</sub> (°C)	<b>M</b>	Plastic DIP-8 8-pin	<b>D</b>	Plastic SO-14 14-pin	<b>DM</b>	Plastic SO-8 8-pin
	<b>0 to 70</b>	<b>AMC384XBM</b>	<b>0 to 70</b>	<b>AMC384XBD</b>	<b>0 to 70</b>	<b>AMC384XBDM</b>
		<b>AMC384XBMF(Lead Free)</b>		<b>AMC384XBDF(Lead Free)</b>		<b>AMC384XBDMF(Lead Free)</b>
Note: 1.All surface-mount packages are available in Tape & Reel. Append the letter "T" to part number (i.e. AMC384XBTD, or AMC384XBDMT). 2.The letter "F" is marked for Lead Free process.						

<b>ABSOLUTE MAXIMUM RATINGS</b> (Note 1)	
Supply voltage, $V_{CC}$	35V
Output current, $I_O$	$\pm 1A$
Analog inputs, $V_I$	-0.3V to 6.3V
Error amp output sink current, $I_{SINK(EA)}$	10mA
Power dissipation ( $T_A = 25^\circ C$ ), $P_D$	1W
Maximum juncture temperature, $T_J$	150°C
Storage temperature range	-65°C to 150°C
Lead temperature (soldering, 10 seconds)	260°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.	

<b>THERMAL DATA</b>	
<b>M PACKAGE:</b>	
Thermal Resistance-Junction to Ambient, $\theta_{JA}$	95 °C/W
<b>D PACKAGE:</b>	
Thermal Resistance-Junction to Ambient, $\theta_{JA}$	120 °C/W
<b>DM PACKAGE:</b>	
Thermal Resistance-Junction to Ambient, $\theta_{JA}$	165 °C/W
Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$ . The $\theta_{JA}$ numbers are guidelines for the thermal performance of the device/pc-board system. All of the above assume no ambient airflow.	

### BLOCK DIAGRAM



( ) are 14 Pin S.O.I.C. pin number

Note 2 :V<sub>CC</sub> and PWR V<sub>C</sub> are internally connected for 8 pin packages.

Note 3 :PWR GND and GND are internally connected for 8 pin packages.

Note 4 :U.V.L.O. is 16V for 3842B and 8.4V for 3843B.

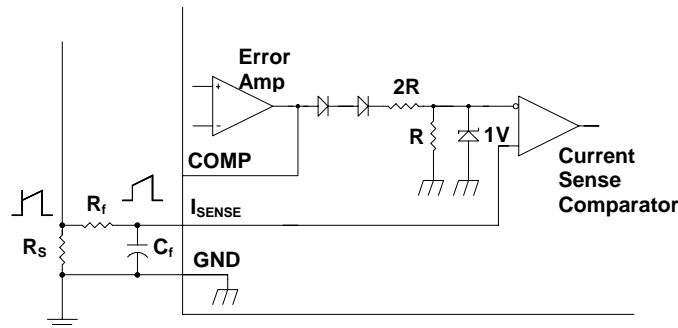
Note 5 :Hysteresis is 6V for 3842B and 0.8V for 3843B.

RECOMMENDED OPERATING CONDITIONS					
Parameter	Symbol	Recommended Operating Conditions			Units
		Min.	Typ.	Max.	
Supply Voltage	$V_{CC} / V_C$			30	V
Input Voltage	$V_{I,R_T/C_T}$	0		5.5	V
	$V_{I,I_{SENSE}/V_{FB}}$				
Output Voltage	$V_O$ , Output	0		30	V
Supply Current	$I_{CC}$			25	mA
Average Output Current	$I_O$			200	mA
Reference Output Current	$I_{O(REF)}$			-20	mA
Timing Capacitor	$C_T$	1			nF
Oscillator Frequency	$f_{OSC}$		100	500	KHz
Operating Free-air Temperature	$T_A$	0		70	°C

ELECTRICAL CHARACTERISTICS						
Unless otherwise specified, these specifications apply over the operating ambient temperature for AMC384XB with $0^\circ\text{C} \leq T_A \leq 70^\circ\text{C}$ ; $V_{CC} = 15\text{V}$ (note 6); $R_T = 10\text{K}$ ; $C_T = 3.3\text{nF}$ . Low duty cycle pulse testing techniques are used which maintains junction and case temperatures equal to the ambient temperature.						
Parameter	Symbol	Test Conditions	AMC384XB			Units
			Min.	Typ.	Max.	
<b>Reference Section</b>						
Reference output Voltage	$V_{REF}$	$T_J = 25^\circ\text{C}$ , $I_{REF} = 1\text{mA}$	4.9	5.0	5.1	V
Line Regulation		$12\text{V} \leq V_{CC} \leq 25\text{V}$ , $T_J = 25^\circ\text{C}$		6	20	mV
Load Regulation		$1\text{mA} \leq I_{REF} \leq 20\text{mA}$		6	25	mV
Short Circuit Output Current	$I_{SC}$	$T_J = 25^\circ\text{C}$	-30	-100	-180	mA
<b>Oscillator Section</b>						
Oscillation Frequency	$f$	$T_J = 25^\circ\text{C}$		52		KHz
Frequency Change with Voltage		$12\text{V} \leq V_{CC} \leq 25\text{V}$		0.2	1.0	%
Frequency Change with Temperature (note 7)		$T_{MIN} \leq T_A \leq T_{MAX}$		5		%
Peak-to-peak Amplitude At $R_T/C_T$	$V_{OSC}$			1.7		V
<b>Current Sense Section</b>						
Gain (note 8 & 9)	$A_{VOL}$		2.85	3.00	3.15	V/V
Maximum Input Signal (note 8)	$V_{I(MAX)}$	COMP = 5V	0.9	1.0	1.1	V
Power Supply Rejection Ratio (note 8)	PSRR	$12\text{V} \leq V_{CC} \leq 25\text{V}$ (note 8)		70		dB
Input Bias Current	$I_{BIAS}$			-3.0	-10	$\mu\text{A}$

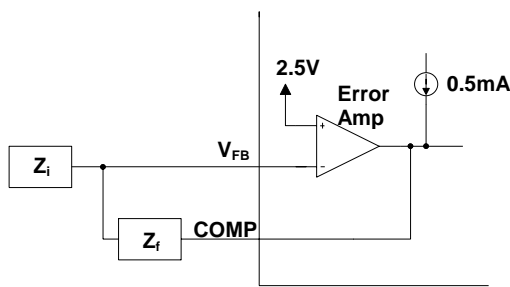
<b>ELECTRICAL CHARACTERISTICS (Continued)</b>						
<b>Error Amplifier Section</b>						
Input Bias Current	$I_{BIAS}$			-0.1	-2	$\mu A$
Input Voltage	$V_{I(EA)}$	COMP = 2.5V	2.42	2.50	2.58	V
Open Loop Voltage Gain	$G_{VO}$	$2V \leq V_O \leq 4V$	65	90		dB
Unity Gain Bandwidth (note 7)	UGBW	$T_J = 25^\circ C$	0.7	1		MHz
Power Supply Rejection Ratio	PSRR	$12V \leq V_{CC} \leq 25V$	60	70		dB
Output Sink Current	$I_{SINK}$	$V_{FB} = 2.7V, COMP = 1.1V$	2	7		mA
Output Source Current	$I_{SOURCE}$	$V_{FB} = 2.3V, COMP = 5.0V$	-0.5	-1.0		mA
High Output Voltage	$V_{OH}$	$V_{FB} = 2.3V, R_L = 15K\Omega$ to GND	5	6		V
Low Output Voltage	$V_{OL}$	$V_{FB} = 2.7V, R_L = 15K\Omega$ to $V_{REF}$		0.7	1.1	V
<b>Output Section</b>						
Output Low Level	$V_{OL}$	$I_{SINK} = 20mA$		0.1	0.4	V
		$I_{SINK} = 200mA$		1.4	2.2	
Output High Level	$V_{OH}$	$I_{SOURCE} = 20mA$	13	13.5		V
		$I_{SOURCE} = 200mA$	12	13.0		
Rise Time (note 7)	$t_r$	$T_J = 25^\circ C, C_L = 1nF$		50	150	ns
Fall Time (note 7)	$t_f$	$T_J = 25^\circ C, C_L = 1nF$		50	150	ns
<b>Under-Voltage Lockout Section</b>						
Start Threshold	$V_{TH(ST)}$	AMC3842B	14.5	16.0	17.5	V
		AMC3843B	7.8	8.4	9.0	
Min. Operating Voltage		AMC3842B	8.5	10	11.5	V
		AMC3843B	7.0	7.6	8.2	
<b>PWM Section</b>						
Maximum Duty Cycle		AMC3842B/43B	94	97	100	%
<b>Total Standby Current</b>						
Startup Current		AMC3842B		0.2	0.35	mA
		AMC3843B		0.5	1.0	
Operating Supply Current	$I_{CC}$	$V_{FB} = I_{SENSE} = 0V$		14	17	mA
Zener Voltage	$V_Z$	$I_{CC} = 25mA$	30	35		V
<p>note 6: Adjust <math>V_{CC}</math> above the start threshold before setting at 15V</p> <p>note 7: These parameters, although guaranteed, are not 100% tested in production prior to shipment</p> <p>note 8: Parameters are measured at trip point of latch with <math>V_{FB} = 2V</math></p> <p>note 9: Gain is measured between <math>I_{SENSE}</math> and COMP with the input changing from 0V to 0.8V</p>						

**Application Information**

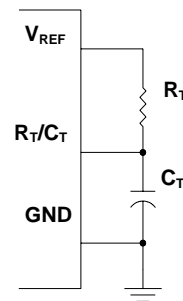


**Fig. 1. Current Sense Circuit**

Peak current ( $I_S$ ) is set by:  $I_{S(MAX)} = 1V/R_S$

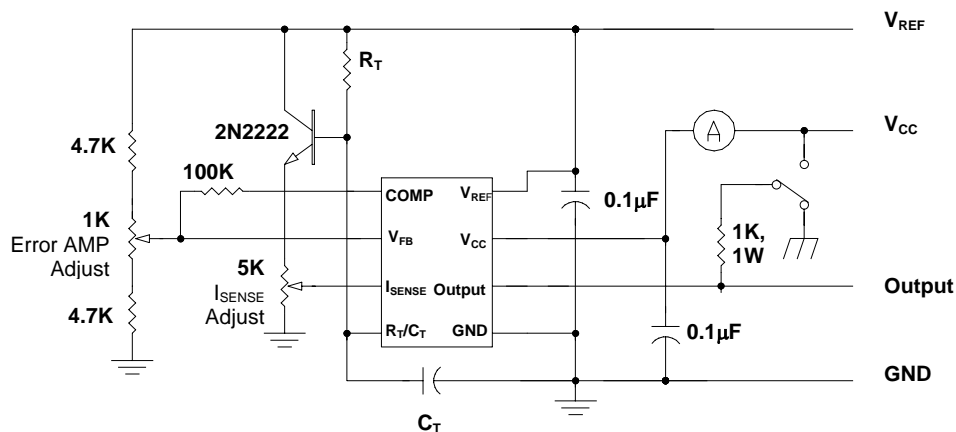


**Fig. 2. Error Amplifier Configuration** - the amplifier can source or sink up to 0.5mA



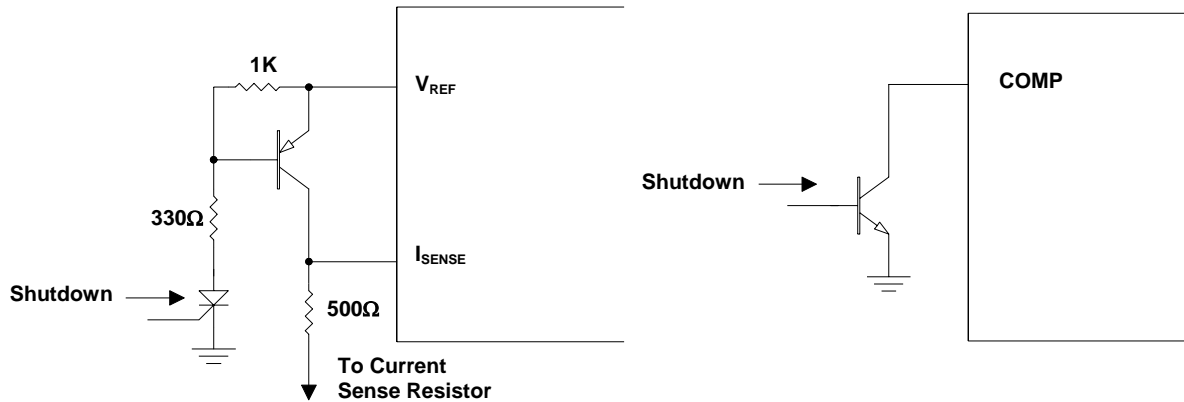
**Fig. 3. Oscillator Section**

For  $R_T < 5K$ ,  $f = \frac{1.72}{R_T C_T}$

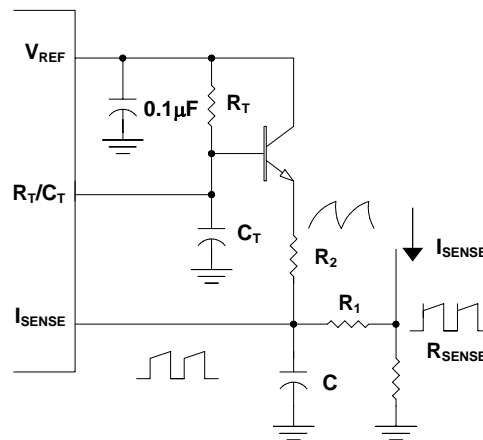


**Fig. 4. Open-loop laboratory test fixture:** Careful grounding techniques are necessary for high peak currents associated with capacitive loads. Timing and bypass capacitors should be connected to GND pin in a single point ground. The transistor and 5K potentiometer are used to sample the oscillator waveform and apply an adjustable ramp to the  $I_{SENSE}$  pin

**Application Information** (continued)

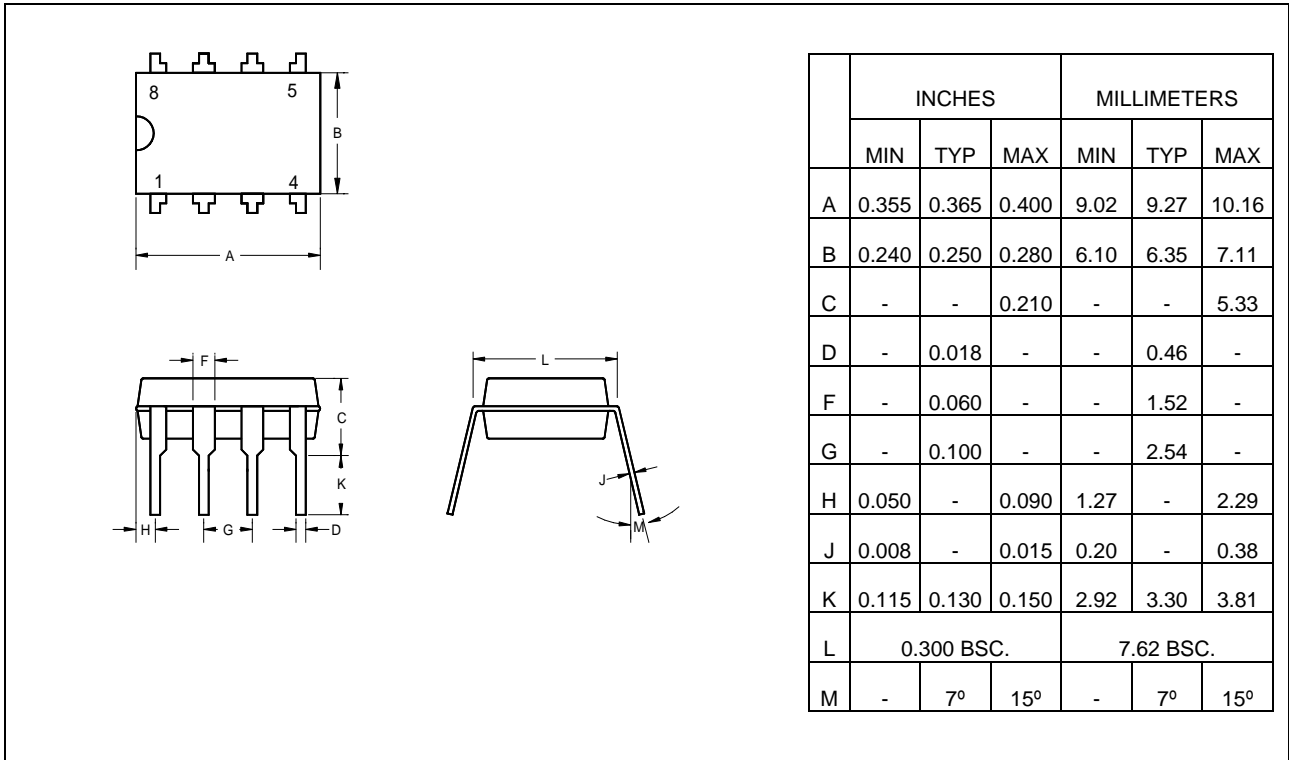


**Fig. 5. Shutdown Techniques** - there are two ways to shutdown the PWM controller: 1) raise the voltage at  $I_{SENSE}$  above 1V or, 2) pull the COMP below a voltage two diodes above ground.

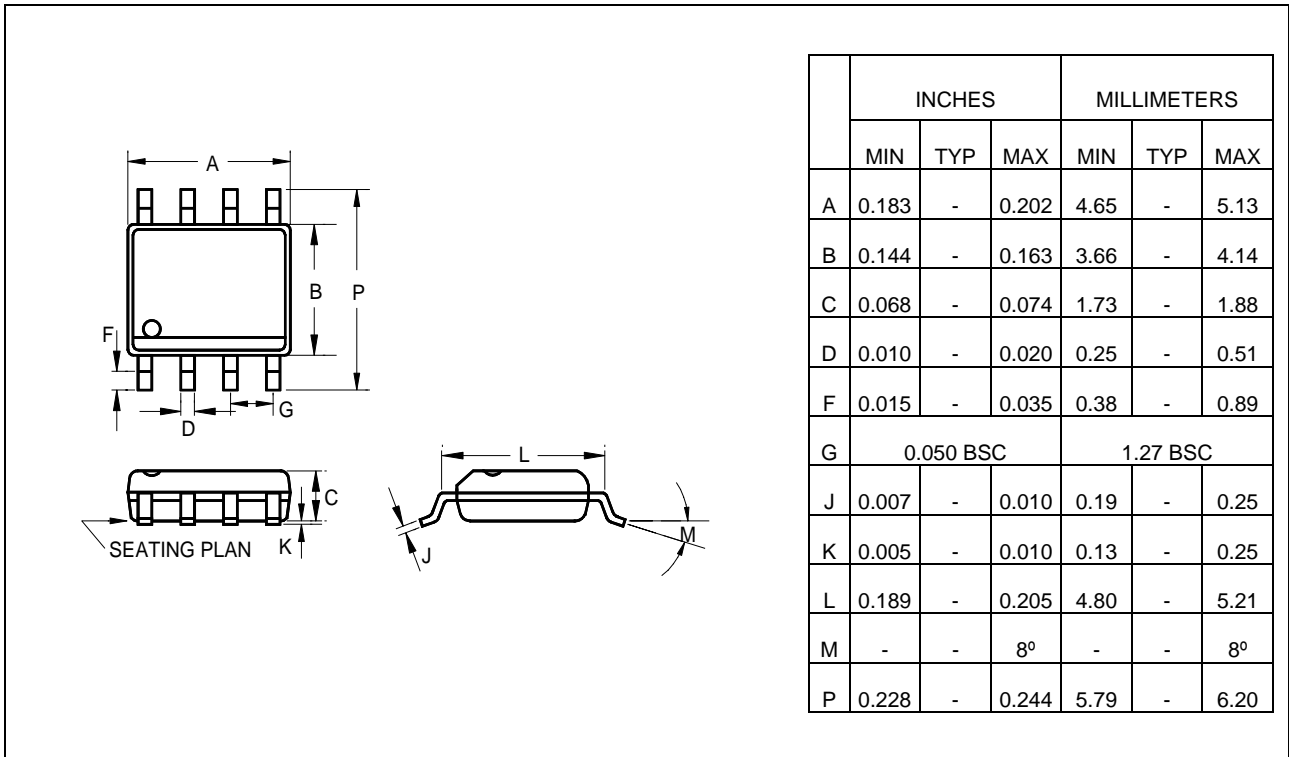


**Fig 6. Slop Compensation** – To achieve duty cycles over 50% for some applications , the above slope compensation technique is suggested by resistively summing a fraction of the oscillator ramp with the current sense signal.

**8-Pin Plastic DIP**

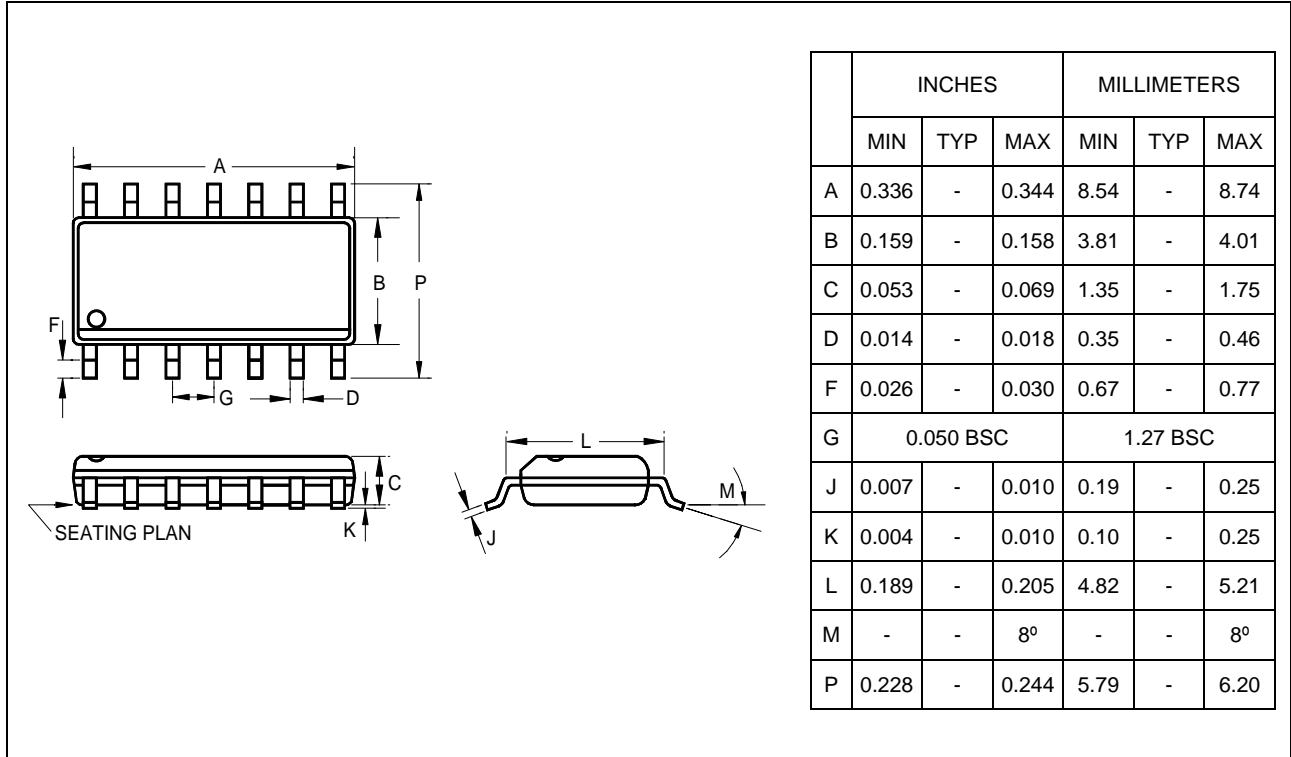


**8-Pin Plastic S.O.I.C.**





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



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