



3842 / 43/44/45

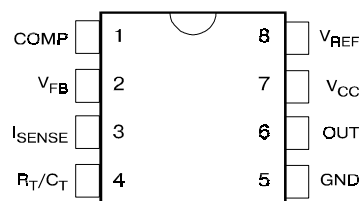
Description

The 3842A(AM)/43A(AM)/44A(AM)/45A(AM) are fixed frequency current mode PWM controller. They are specially designed for OFF-Line and DC to DC converter applications with a minimal external components. Internally implemented circuits include a trimmed oscillator for precise duty cycle control, a temperature compensated reference, high gain error amplifier, current sensing comparator, and a high current totem pole output ideally suited for driving a power MOSFET. Protection circuitry includes built undervoltage lockout and current limiting. The 3842A(AM) and 3844A(AM) have UVLO thresholds of 16 V (on) and 10 V (off). The corresponding thresholds for the 3843A(AM)/45A(AM) are 8.4V (on) and 7.6V (off). The MIK3842A(AM) and MIK3843A(AM) can operate within 100% duty cycle. The 3844A(AM) and UC3845A(AM) can operate within 50% duty cycle. The 384XA(AM) has Start-Up Current 0.17mA (typ).

Features

- Low Start-Up and Operating Current
- High Current Totem Pole Output
- Undervoltage Lockout With Hysteresis
- Operating Frequency Up To 300KHz (384XA)
500KHz (384XAM)

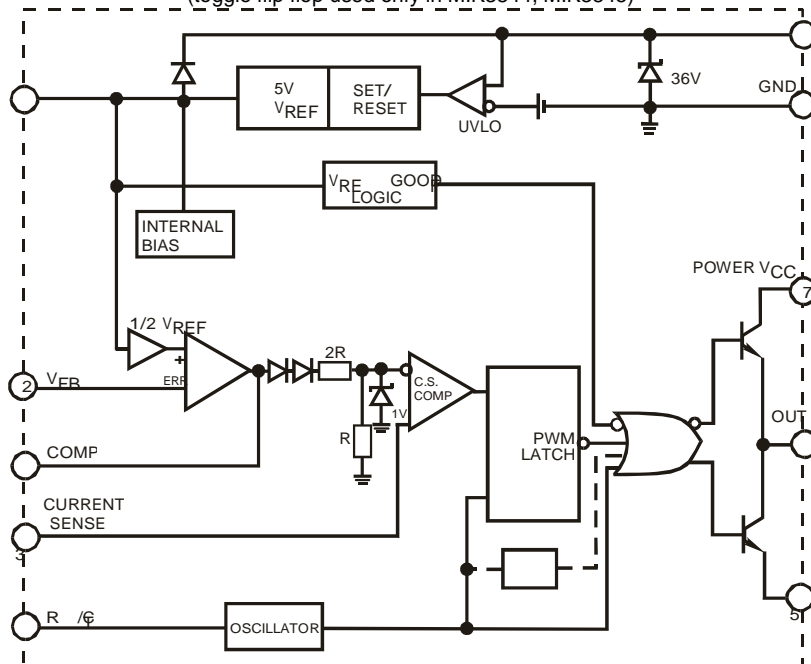
Pin Connection



Top view

Block diagram

(toggle flip flop used only in MIK3844, MIK3845)



Absolute Maximum Ratings

Symbol	Parameter	Maximum	Units
V_{CC}	Supply Voltage (low impedance source)	30	V
I_o	Output Current	± 1	A
V_i	Input Voltage (Analog Inputs pins 2,3)	-0.3 to 5.5	V
$I_{SINK(EA)}$	Error Amp Output Sink Current	10	mA
P_o	Power Dissipation ($T_A=25^\circ\text{C}$)	1	W
Tstg	Storage Temperature Range	-65 to 150	$^\circ\text{C}$
T_L	Lead Temperature (soldering 5 sec.)	260	$^\circ\text{C}$



3842 / 43/44/45

Electrical characteristics

(* $V_{CC}=15V$, $R_T=10k\Omega$, $C_T=3.3nF$, $T_A=0^{\circ}C$ to $+70^{\circ}C$, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ	Max	Units	
Reference Section							
Reference Output Voltage	V_{REF}	$T_J = 25^{\circ}C$, $I_{REF} = 1\text{ mA}$	4.9	5.0	5.1	V	
Line Regulation	ΔV_{REF}	$12V \leq V_{CC} \leq 25\text{ V}$		6.0	20	mV	
Load Regulation	ΔV_{REF}	$1\text{ mA} \leq I_{REF} \leq 20\text{mA}$		6.0	25		
Short Circuit Output Current	I_{SC}	$T_A = 25^{\circ}C$		-100	-180	mA	
Oscillator Section							
Oscillation Frequency	f	$T_J = 25^{\circ}C$	MIK384XA	47	50	57	KHz
			MIK384XAM	47	52	57	
Frequency Change with Voltage	$\Delta f/\Delta V_{CC}$	$12V \leq V_{CC} \leq 25\text{ V}$		0.05	1.0	%	
Oscillator Amplitude	$V_{(OSC)}$	(peak to peak)		1.6		V	
Error Amplifier Section							
Input Bias Current	I_{BIAS}	$V_{FB}=3V$		-0.1	-2	μA	
Input Voltage	$V_{(I.E.A)}$	$V_{pin1} = 2.5V$	2.42	2.5	2.58	V	
Open Loop Voltage Gain	A_{VOL}	$2V \leq V_o \leq 4V$	65	90		dB	
Power Supply Rejection Ratio	PSRR	$12V \leq V_{CC} \leq 25\text{ V}$	60	70			
Output Sink Current	I_{SINK}	$V_{pin2} = 2.7V$, $V_{pin1} = 1.1V$	2	7		mA	
Output Source Current	I_{SOURCE}	$V_{pin2} = 2.3V$, $V_{pin1} = 5V$	-0.5	-1.0		mA	
High Output Voltage	V_{OH}	$V_{pin2} = 2.3V$, $R_L = 15K\Omega$ to GND	5.0	6.0		V	
Low Output Voltage	V_{OL}	$V_{pin2} = 2.7V$, $R_L = 15K\Omega$ to PIN 8		0.8	1.1		
Current Sense Section							
Gain	G_V	(Note 1 & 2)	2.85	3.0	3.15	V/V	
Maximum Input Signal	$V_{(MAX)}$	$V_{pin1} = 5V$ (Note1)	0.9	1.0	1.1	V	
Supply Voltage Rejection	SVR	$12V \leq V_{CC} \leq 25\text{ V}$ (Note 1)		70		dB	
Input Bias Current	I_{BIAS}	$V_{pin3} = 3V$		-3.0	-10	μA	
Output Section							
Low Output Voltage	V_{OL}	$I_{SINK} = 20\text{ mA}$		0.08	0.4	V	
		$I_{SINK} = 200\text{ mA}$		1.4	2.2		
High Output Voltage	V_{OH}	$I_{SINK} = 20\text{ mA}$	13	13.5		V	
		$I_{SINK} = 200\text{ mA}$	12	13.0			
Rise Time	t_r	$T_J = 25^{\circ}C$, $C_L = 1nF$ (Note 3)		45	150	nS	
Fall Time	t_f	$T_J = 25^{\circ}C$, $C_L = 1nF$ (Note 3)		35	150		
Undervoltage Lockout Section							
Start Theshold	$V_{TH(ST)}$	MIK3842A(AM)/44A(AM)	14.5	16.0	17.5	V	
		MIK3843A(AM)/45A(AM)	7.8	8.4	9.0		
Min. Operating Voltage (After Turn On)	$V_{OPR(min)}$	MIK3842A(AM)/44A(AM)	8.5	10	11.5	V	
		MIK3843A(AM)/45A(AM)	7.0	7.6	8.2		
PWM Section							
Max. Duty Cycle	$D_{(MAX)}$	MIK3842A(AM)/43A(AM)	95	97	100	%	
		MIK3844A(AM)/45A(AM)	47	48	50		
Min. Duty Cycle	$D_{(MAX)}$			0			
Total Standby Current							
Start-Up Current	I_{ST}	MIK384XA(AM)		0.17	0.3	mA	
Operating Supply Current	$I_{CC(OPR)}$	$V_{pin3} = V_{pin2} = 0V$		13	17		
Zener Voltage	V_Z	$I_{CC}=25\text{ mA}$	30	38		V	

* - Adjust V_{CC} above the start threshold before setting it to 15V.

Note 1: Parameter measured at trip point of latch with $V_{pin2}=0$.

Note 2: Gain defined as $A=\Delta V_{pin1}/\Delta V_{pin3}$; $0 \leq V_{pin3} \leq 0.8V$.

Note 3: These parameters, although guaranteed, are not 100% tested in production.

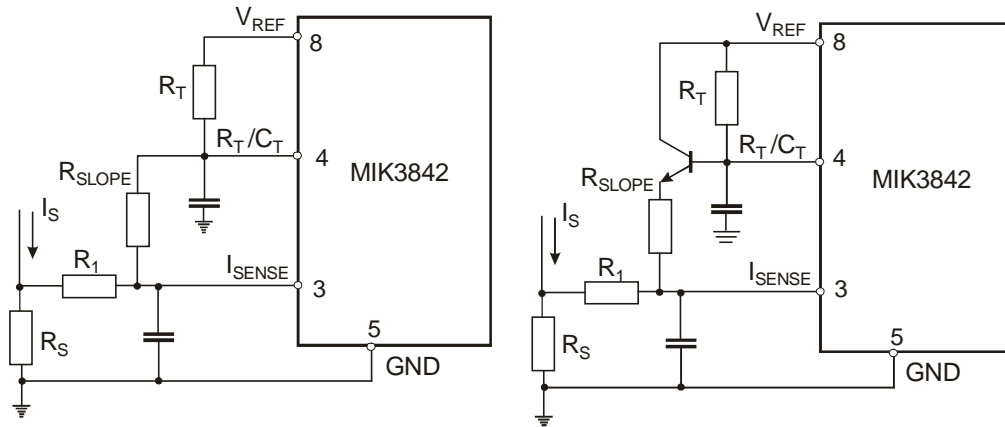
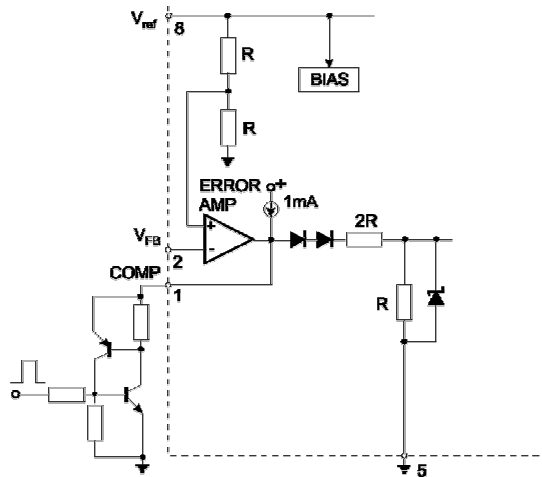
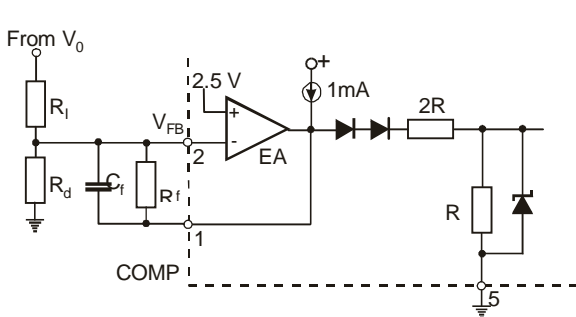


Figure 4. Slope Compensation Techniques

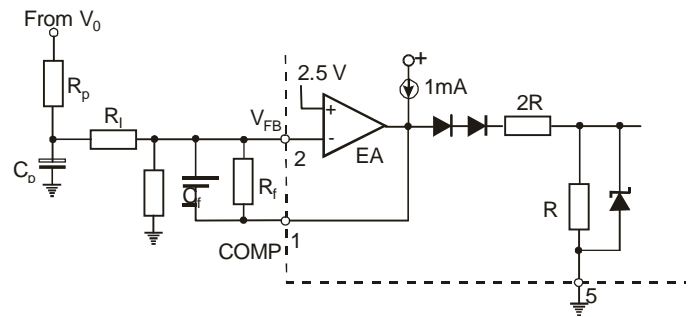


SCR must be selected for a holding current of less than 0.5mA.
The simple two transistor circuit can be used in place of the SCR as shown.

Figure 5. Latched Shutdown



Error Amp compensation circuit for stabilizing any current-mode topology except for boost and flyback converters operating with continuous inductor current.



Error Amp compensation circuit for stabilizing current-mode boost and flyback topologies operating with continuous inductor current.

Figure 6. Error Amplifier Compensation

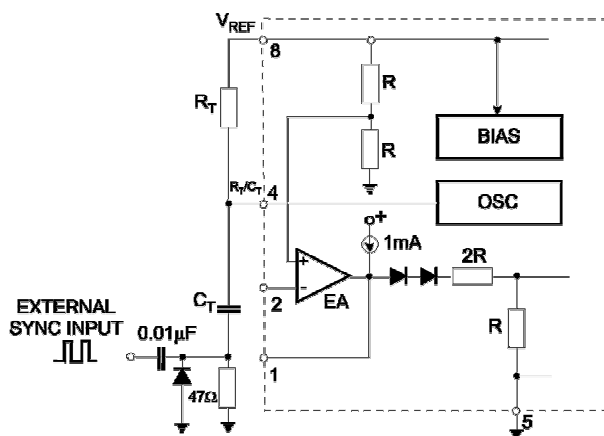


Figure 7. External Clock Synchronization

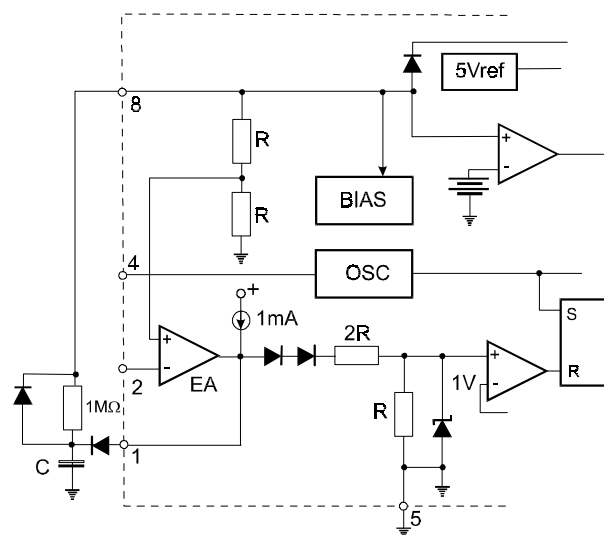


Figure 8. Soft-Start Circuit



Typical Performance Characteristics

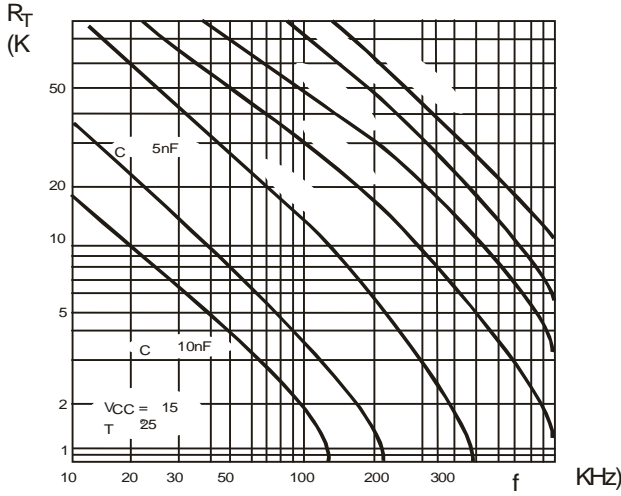


Figure 1. Timing Resistor vs. Oscillator Frequency.

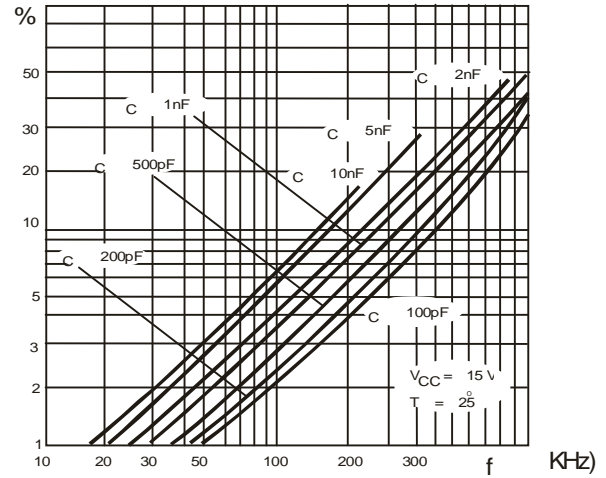


Figure 2. Output Dead-Time vs. Oscillator Frequency.

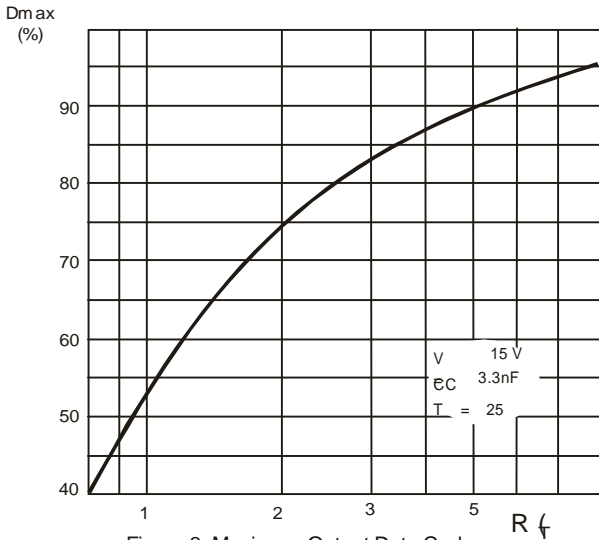


Figure 3. Maximum Output Duty Cycle vs. Timing Resistor (MIK3842/4-3)

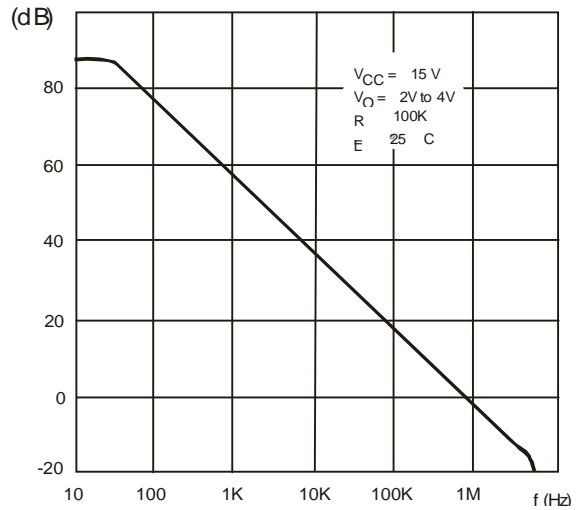


Figure 4. Error Amp Open-Loop Gain vs. Frequency.

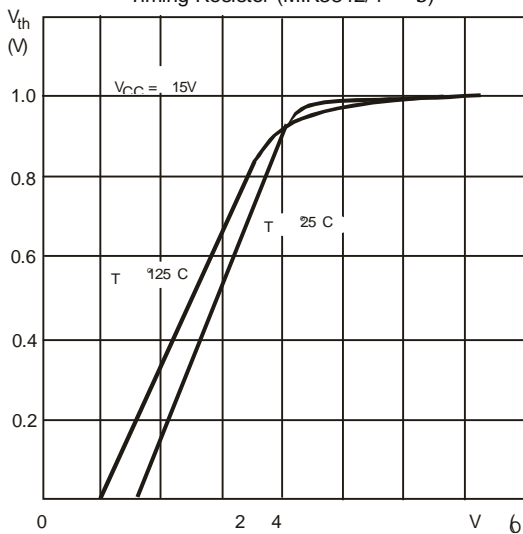


Figure 5. Current Sense Input Threshold vs. Error Amp Output Voltage.

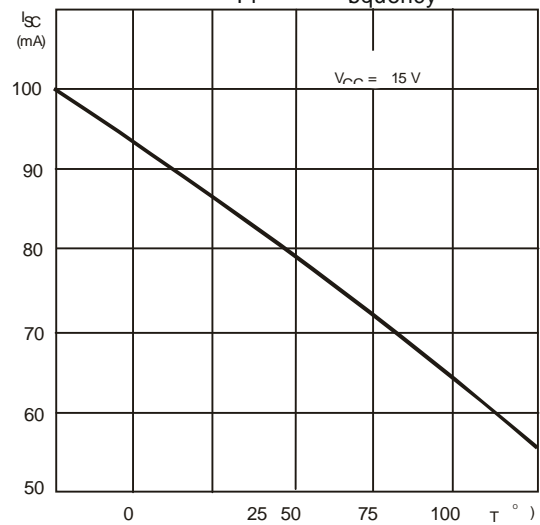


Figure 6. Reference Short Circuit Current vs. Temperature.



3842/43/44/45

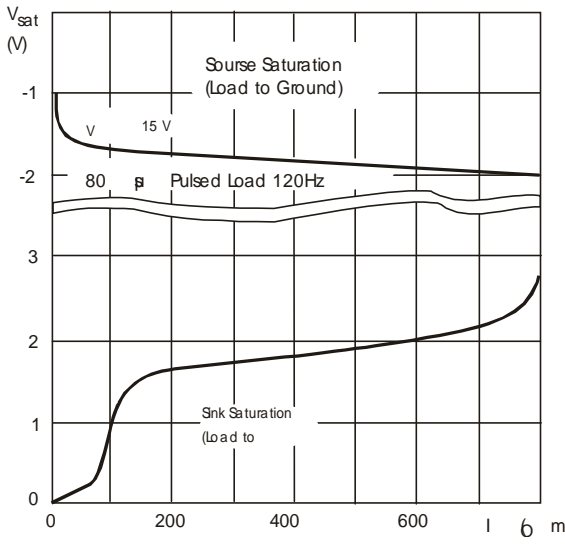


Figure 7 Output Saturation Voltage vs. Load

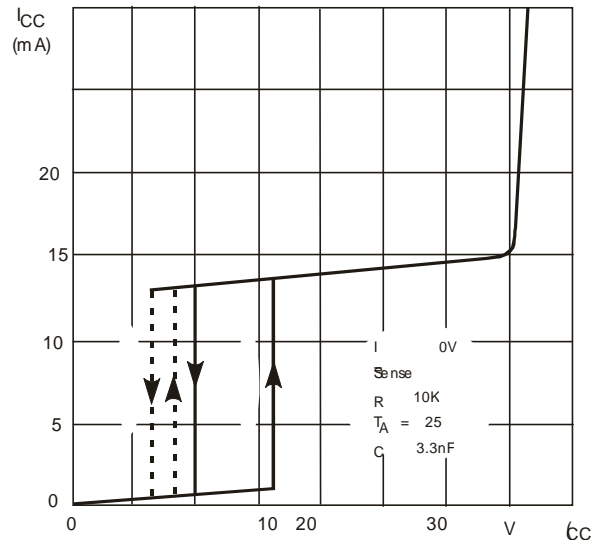


Figure 8 Supply Current vs. Supply

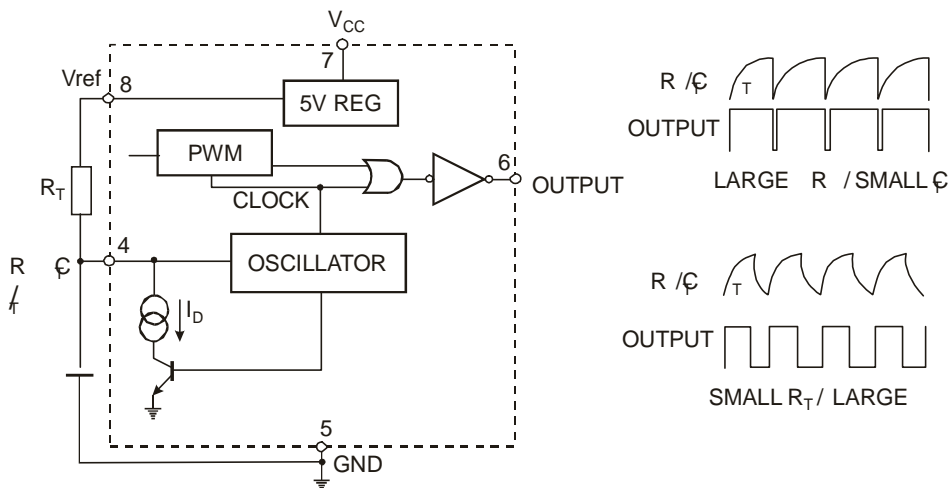


Figure 9. Oscillator and Output Waveforms

Ordering Information

ORDERING NUMBER	PACKAGE	MARKING
3842/43/44/45	SOP-8 / DIP-8	KA3842/43/44/45

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