FAIRCHILD
SEMICONDUCTOR™

March 1997

ML4830*

Electronic Ballast Controller

GENERAL DESCRIPTION

The ML4830 is a complete solution for a dimmable, high power factor, high efficiency electronic ballast. Contained in the ML4830 are controllers for "boost" type power factor correction as well as for a dimming ballast.

The Power factor circuit uses the average current sensing method with a gain modulator and over-voltage protection. This system produces power factors of better than 0.99 with low input current THD at > 95% efficiency. Special care has been taken in the design of the ML4830 to increase system noise immunity by using a high amplitude oscillator, and a gain modulator. An over-voltage protection comparator stops the PFC section in the event of sudden load decrease.

The ballast section provides for programmable starting scenarios with programmable preheat and lamp out-of-socket interrupt times. The IC controls lamp output through either frequency or Pulse Width control using lamp current feedback.

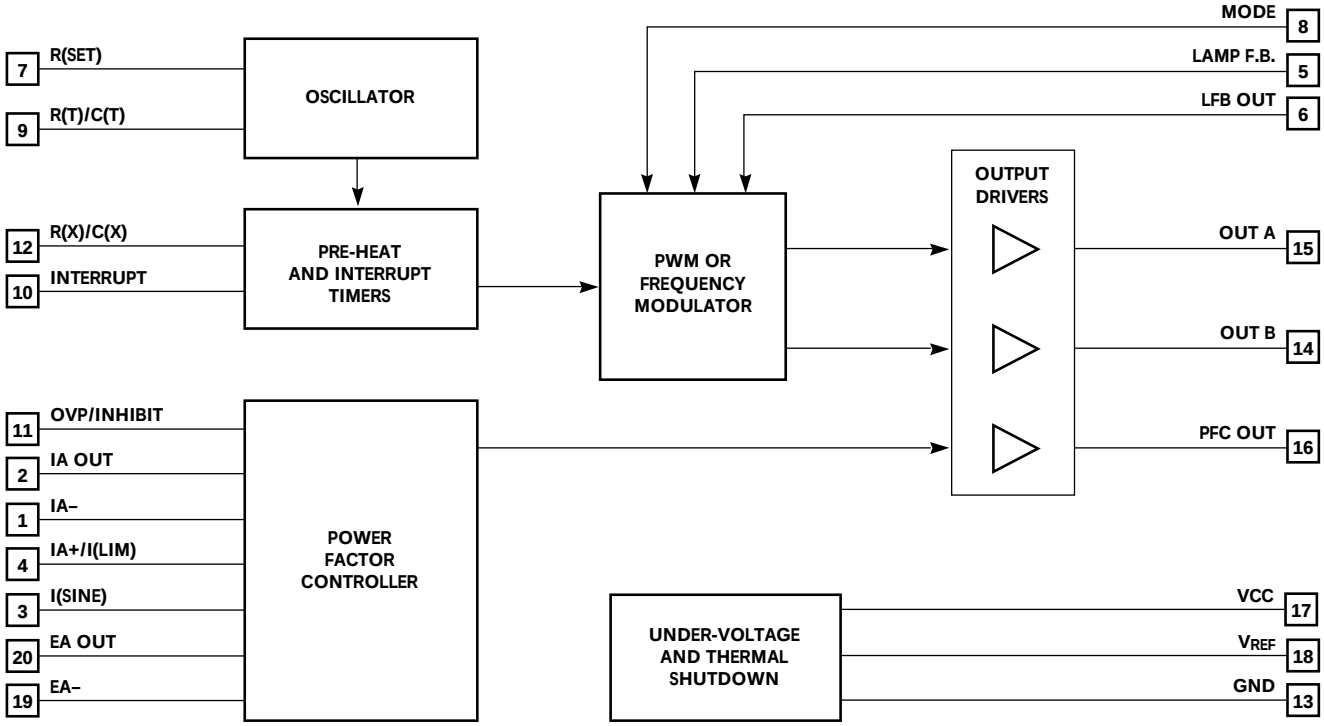
The ML4830 is designed using Micro Linear's Semi-Standard tile array methodology. Customized versions of this IC, optimized to specific ballast architectures can be made available. Contact Micro Linear or an authorized representative for more information.

FEATURES

- Complete Power Factor Correction and Dimming Ballast Control on one IC
- Low Distortion, High Efficiency Continuous Boost, Average Current sensing PFC section
- Programmable Start Scenario for Rapid or Instant Start Lamps
- Selectable Variable Frequency dimming and starting
- Programmable Restart for lamp out condition to reduce ballast heating
- Over-Temperature Shutdown replaces external heat sensor for safety
- PFC Over-Voltage comparator eliminates output "runaway" due to load removal
- Large oscillator amplitude and gain modulator improves noise immunity

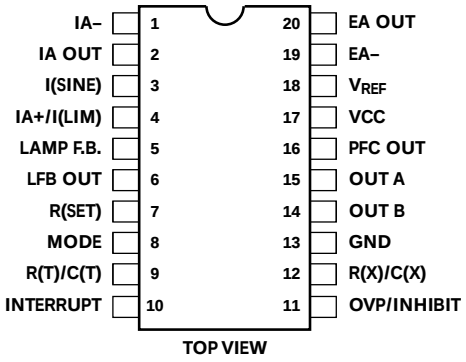
***This Part Is End Of Life As Of August 1, 2000**

BLOCK DIAGRAM

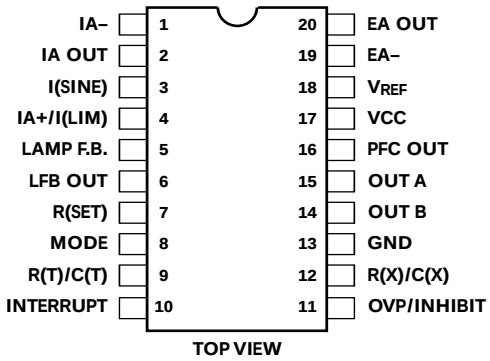


PIN CONFIGURATION

ML4830
20-PIN PDIP (P20)



ML4830
20-PIN PDIP (P20)



PIN DESCRIPTION

PIN#	NAME	FUNCTION
1	IA–	Inverting input of the PFC average current error amplifier
2	IA OUT	Output and compensation node of the PFC average current error amplifier
3	I(SINE)	PFC gain modulator input
4	IA+/I(LIM)	Non-Inverting input of the PFC average current error amplifier and input of peak current limit comparator
5	LAMP F.B.	Inverting input of an Error Amplifier used to sense (and regulate) lamp arc current. Also the input node for dimming control
6	LFB OUT	Output from the Lamp Current Error Amplifier used for lamp current loop compensation
7	R(SET)	External resistor which sets oscillator FMAX, and R(X)/C(X) charging current
8	MODE	Controls how the Lamp Current Error Amp and preheat timers modulate the ballast outputs. Two Variable Frequency and 1 PWM mode are available through this pin
9	R(T)/C(T)	Oscillator timing components
10	INTERRUPT	A voltage of greater than V_{REF} resets the chip and causes a restart after a delay of 3 times the start interval. Used for lamp-out detection and restart
11	OVP/ INHIBIT	When the voltage of this pin exceeds 5V, the PFC output is inhibited. When the voltage exceeds 6.7V, the IC function is inhibited and the IC is reset. This pin can be used for a remote ballast shutdown.
12	R(X)/C(X)	Sets the timing for the preheat, dimming lockout and interrupt
13	GND	IC Ground
14	OUT B	Ballast MOSFET drive output
15	OUT A	Ballast MOSFET drive output
16	PFC OUT	Power Factor MOSFET drive output
17	VCC	Positive Supply for the IC
18	V_{REF}	Buffered output for the 7.5V voltage reference
19	EA–	Inverting input to PFC error amplifier
20	EA OUT	PFC Error Amplifier output and compensation node

ABSOLUTE MAXIMUM RATINGS

Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

Supply Current (I_{CC}) 75mA
Output Current, Source or Sink (Pins 14)
DC 250mA
Output Energy (capacitive load per cycle)..... 1.5 mJ
Gain Modulator I(SINE) Input (Pin 3) ..... 10 mA
Amplifier Source Current (Pin 6, 20) ..... 50 mA
Analog Inputs (Pins 1, 5, 10, 11, 19) .... –0.3V to VCC –2V
Pin 4 input voltage .....–3V to 5V

Junction Temperature ..... 150°C
Storage Temperature Range .....–65°C to +150°C
Lead Temperature (Soldering 10 Sec.) ..... +260°C
Thermal Resistance (θ_{JA})
Plastic DIP–P ..... 65°C/W
Plastic SOIC..... 80°C/W

OPERATING CONDITIONS

Temperature Range
ML4830C ..... 0°C to 85°C

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, R(SET) = 26kΩ, R(T) = 52.3kΩ, C(T) = 470pF, T_J = Junction Operating Temperature Range, I_{CC} = 25mA

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Amplifiers (Pins 1, 2, 5, 6, 19, 20)					
Input Offset Voltage			±3.0	±10.0	mV
Input Bias Current			–0.3	–1.0	µA
Open Loop Gain		65	90		dB
PSRR	$V_{CCZ} – 3V < V_{CC} < V_{CCZ} – 0.5V$	70	100		dB
Output Low		0		0.5	V
Output High		7.2	7.5		V
Source Current	V_{OUT} = 7V	–4	–7		mA
Sink Current	V_{OUT} = 1.5V	5	10		mA
	V_{OUT} = 0.2V	10			µA
Slew Rate			1.5		V/µs
Unity Gain Bandwidth			3.0		MHz
Gain Modulator					
Output Voltage (Note 1)	I_{SINE} = 100µA, V_{PIN20} = 3V		80		mV
	I_{SINE} = 300µA, V_{PIN20} = 3V		255		mV
	I_{SINE} =100µA, V_{PIN20} = 6V		220		mV
	I_{SINE} = 300µA, V_{PIN20} = 6V		660		mV
Output Voltage Limit	I_{SINE} = 600µA, V_{PIN19} = 0V		0.88		V
Offset Voltage	I_{SINE} = 0, V_{PIN19} = 0V			15	mV
	I_{SINE} = 150µA, V_{PIN19} = 8V			15	mV
I(SINE) Input Voltage	I_{SINE} = 200µA	0.8	1.4	1.8	V

Note 1: Measured at Pin 1 with Pins 1 and 2 shorted together and Pin 4 at GND.

ELECTRICAL CHARACTERISTICS (Continued)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Oscillator					
Initial accuracy	T_A = 25°C, PWM or Dimming Lockout	72	80	88	KHz
Voltage stability	V_{CCZ} – 3V < V_{CC} <V_{CCZ} – 0.5V		1		%
Temperature stability			2		%
Total Variation	Line, temperature	68		92	KHz
Ramp Valley to Peak			2.5		V
C(T) Charging Current (FM Modes)	V_{PIN8} = 0V, V_{PIN9} = 2.5V, V_{PIN12} = 0.9V, Preheat		–94		µA
	V_{PIN8} = 0V, V_{PIN9} = 2.5V, Max. dimming		–188		µA
C(T) Discharge Current	V_{PIN8} = 0V, V_{PIN9} = 2.5V		5		mA
Output Drive Deadtime			0.2		µs
R(SET) Voltage			2.5		V
Reference Section					
Output Voltage	T_A = 25°C, I_O = 1mA	7.4	7.5	7.6	V
Line regulation	V_{CCZ} – 3V < V_{CC} , V_{CCZ} – 0.5V		2	10	mV
Load regulation	1mA < I_O < 20mA		2	15	mV
Temperature stability			0.4		%
Total Variation	Line, load, temp	7.35		7.65	V
Output Noise Voltage	10Hz to 10KHz		50		µV
Long Term Stability	T_J = 125°C, 1000 hrs		5		mV
Short Circuit Current	V_{CC} < V_{CCZ} – 0.5V, V_{REF} = 0V		–40		mA
Preheat and Interrupt Timer (Pin 10) (R(X) = 590Ký, C(X) = 5.6µF)					
Initial Preheat Period			0.8		s
Subsequent Preheat Period			0.7		s
Start Period			2.1		s
Interrupt Period			6.3		s
Pin 12 Charging Current			–23		µA
Pin 12 Open Circuit Voltage	V_{CC} = 12.3V in UVLO	0.4	0.9	1.1	V
Pin 12 Maximum Voltage		7.0	7.3	7.7	V
Input Bias Current	V_{PIN12} = 1.2V		–0.1		µA
Preheat Lower Threshold			1.18		V
Preheat Upper Threshold			3.36		V
Interrupt Recovery Threshold			1.18		V
Start Period End Threshold			6.6		V

ELECTRICAL CHARACTERISTICS (Continued)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
OVP/Inhibit Comparator (Pin 11)					
OVP Threshold		4.87	5.0	5.13	V
Hysteresis			0.5		V
Input Bias Current			-0.3	–2	µA
Propagation Delay			500		ns
Shutdown Threshold		6.36	6.7	7.04	V
Shutdown Hysteresis		0.7	1.2	1.7	V
PWM Comparator (PWM Mode)					
Start Period Duty Cycle		40	50	60	%
Outputs					
Output Voltage Low	I_{OUT} = 20mA		0.4	0.8	V
	I_{OUT} = 200mA		2.1	3.0	V
Output Voltage High	I_{OUT} = –20mA	V_{CC} – 2.5	V_{CC} – 1.9		V
	I_{OUT} = –200mA	V_{CC} – 3.0	V_{CC} – 2.2		V
Output Voltage Low in UVLO	I_{OUT} = 10mA, V_{CC} = 8V		0.8	1.5	V
Output Rise/Fall Time	C_L = 1000pF		50		ns
Under-Voltage Lockout and Bias Circuits					
IC Shunt Voltage (V_{CCZ})	I_{CC} = 25mA	12.8	13.5	14.2	V
V_{CCZ} Load Regulation	25mA < I_{CC} < 68mA		150	300	mV
V_{CCZ} Total Variation	Load, Temp	12.4		14.6	V
Start-up Current	V_{CC} - 12.3V		1.3	1.7	mA
Operating Current	V_{CC} = V_{CCZ} – 0.5V		15	19	mA
Start-up Threshold			V_{CCZ} – 0.5		V
Shutdown Threshold			V_{CCZ} – 3.5		V
Shutdown Temperature (T_J)			120		°C
Hysteresis (T_J)			30		°C

FUNCTIONAL DESCRIPTION

OVERVIEW

The ML4830 consists of an Average Current controlled continuous boost Power Factor front end section with a flexible ballast control section. Start-up and lamp-out retry timing are controlled by the selection of external timing components, allowing for control of a wide variety of different lamp types. The ballast control section can be set up to adjust lamp power using either Pulse Width (PWM) or frequency modulation (FM). Either non-overlapping or overlapping conduction can be selected for the FM mode. This allows for the IC to be used with a variety of different ouput networks.

POWER FACTOR SECTION

The ML4830 Power Factor section is an average current sensing boost mode PFC control circuit which is architecturally similar to that found in the ML4821. For detailed information on this control architecture, please refer to Application Note 16 and the ML4821 data sheet.

GAIN MODULATOR

The ML4830 gain modulator provides high immunity to the disturbances caused by high power switching. The rectified line input sine wave is converted to a current via a dropping resistor. In this way, small amounts of ground noise produce an insignificant effect on the reference to the PWM comparator.

The output of the gain modulator appears as a voltage across the 14K resistor (Figure 1) on the positive terminal of IA to form the reference for the current error amplifier. When the loop is in regulation, the negative voltage on IA+/I(LIM) (Pin 4) keeps the positive terminal of IA at 0V.

$$V_{MUL} \approx 0.034 \times I(SINE) \times (VEA - 1.1) \times (14k\Omega) \quad (1)$$

where: I(SINE) is the current in the dropping resistor, V(EA) is the output of the error amplifier (Pin 20).

The output of the gain modulator is limited to 0.88V.

AVERAGE CURRENT AND OUTPUT VOLTAGE REGULATION

The PWM regulator in the PFC Control section will act to offset the positive voltage caused by the multiplier output by producing an offsetting negative voltage on the current sense resistor at Pin 4. A cycle-by-cycle current limit is included to protect the MOSFET from high speed current transients. When the voltage at Pin 4 goes negative by more than 1V, the PFC cycle is terminated.

For more information on compensating the average current and boost voltage error amplifier loops, see Application Note 16 .

OVERVOLTAGE PROTECTION AND INHIBIT

The OVP/INHIBIT pin serves to protect the power circuit from being subjected to excessive voltages if the load should change suddenly (lamp removal). A divider from the high voltage DC bus (Figure 8: R14, R24) sets the OVP trip level. When the voltage on Pin 11 exceeds 5V, the PFC transistor is inhibited. The ballast section will continue to operate. If Pin 11 is driven above 6.8V, the IC is inhibited and goes into the low quiescent mode. The OVP threshold should be set to a level where the power components are safe to operate, but not so low as to interfere with the boost voltage regulation loop (R11, R12, R23).

BALLAST OUTPUT SECTION

The IC controls output power to the lamps in one of three different modes. The Mode pin (Pin 8) sets the operating mode of the IC. With Pin 8 at GND, the output section is in the Frequency Modulation mode with non-overlapping conduction, which means that both ballast output drivers will be low during t_{DIS} (Figure 2). In the overlapping mode (VCO-O), Pin 8 is left open and the transition from OUT A high to OUT B high occurs with no dead time. This mode is typically used in current fed ballast topologies.

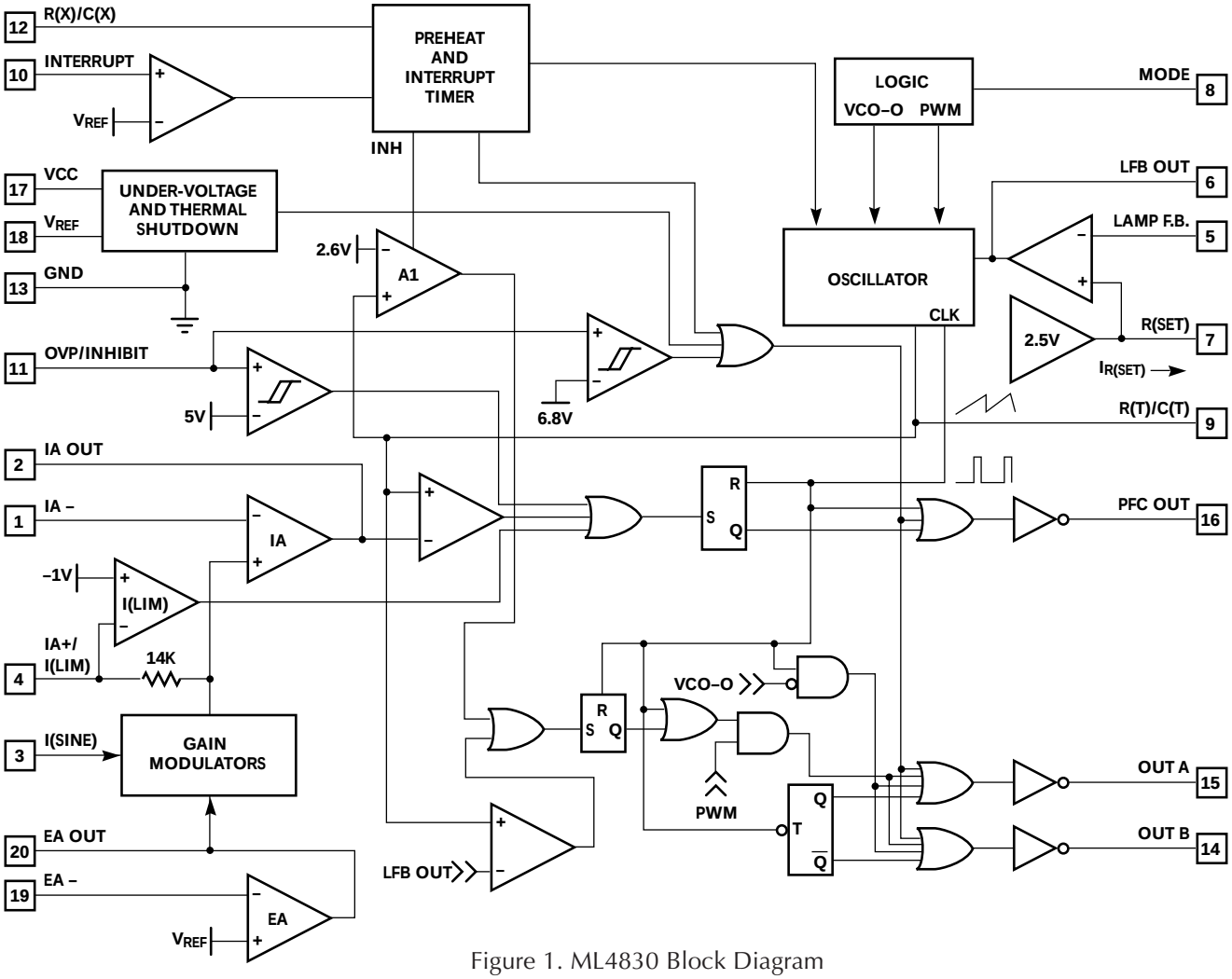


Figure 1. ML4830 Block Diagram

Mode	Pin 8	Definition
VCO	GND	Frequency Modulation
VCO-O	OPEN	Overlapping VCO F.M.
PWM	VREF	Pulse Width Modulation

Table 1. ML4830 Operating Modes

OSCILLATOR

In Table 1 above, the two VCO frequency ranges are controlled by the output of the LFB amplifier (Pin 6). As lamp current decreases, Pin 6 rises in voltage, causing the C(T) charging current to decrease, thereby causing the oscillator frequency to decrease. Since the ballast output network attenuates high frequencies, the power to the lamp will be increased.

In PWM Mode, I_{CHG} is 0 so the oscillator's frequency is set per (1) below.

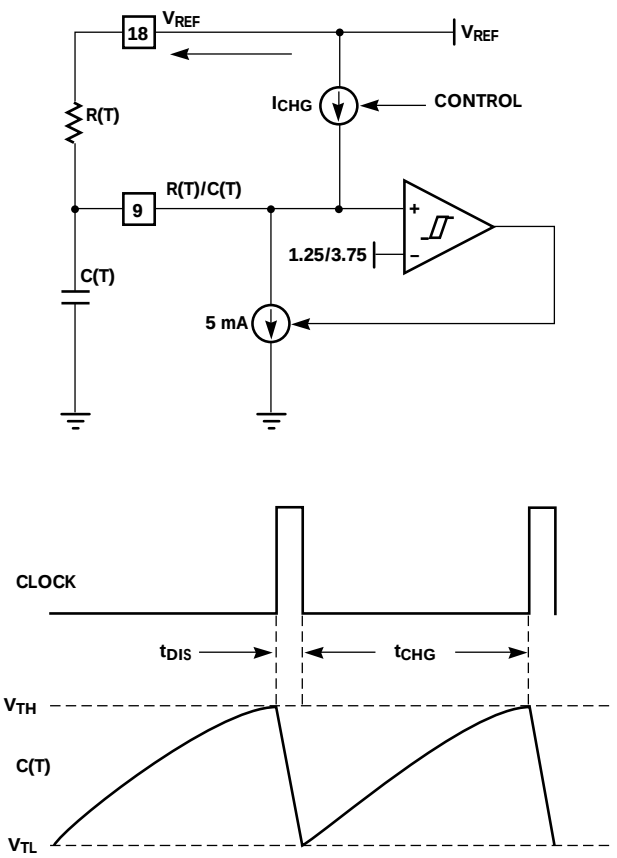


Figure 2. Oscillator Block Diagram and Timing

Also, in both VCO modes, the when LFB OUT is high, I_{CHG} = 0 and the minimum frequency occurs. The charging current varies according to two control inputs to the oscillator:

1. The output of the preheat timer
2. The voltage at Pin 6 (lamp current output)

In preheat condition, charging current is fixed at

$$I_{CHG(PREHEAT)} = \frac{2.5}{R(SET)} \quad (1)$$

In running mode, charging current decreases as the V_{PIN7} rises from 0V to V_{OH} of trhe LAMP FB amplifier. The highest frequency will be attained when I_{CHG} is highest, which is attained when V_{PIN6} is at 0V:

$$I_{CHG(0)} = \frac{5}{R(SET)} \quad (2)$$

The oscillator frequency is determined by the following equations:

$$F_{OSC} = \frac{1}{t_{CHG} + t_{DIS}} \quad (3)$$

and

$$t_{CHG} = R_T C_T \ln\left(\frac{6.25 + I_{CHG} R_T}{3.75 + I_{CHG} R_T}\right) \quad (4)$$

The oscillator's minimum frequency is set when I_{CHG} = 0 where:

$$F_{OSC} \cong \frac{1}{0.51 \times R_T C_T} \quad (5)$$

This assumes that $t_{CHG} >> t_{DIS}$.

Highest lamp power, and lowest output frequency are attained when V_{PIN6} is at its maximum output voltage (V_{OH}).

In this condition, the minimum operating frequency of the ballast is set per (5) above.

For the IC to be used effectively in dimming ballasts with higher Q output networks a larger C_T value and lower R_T value can be used, to yield a smaller frequency excursion over the control range (V_{PIN6}). The discharge current is set to 5mA. Assuming that $I_{DIS} >> I_{RT}$:

$$t_{DIS(VCO)} \cong 490 \times C_T \quad (6)$$

IC BIAS, UNDER-VOLTAGE LOCKOUT AND THERMAL SHUTDOWN

The IC includes a shunt regulator which will limit the voltage at VCC to 13.5 (V_{CCZ}). The IC should be fed with a current limited source, typically derived from the ballast transformer auxiliary winding. When VCC is below V_{CCZ} – 0.7V, the IC draws less than 1.7mA of quiescent current and the outputs are off. This allows the IC to start using a "bleed resistor" from the rectified AC line.

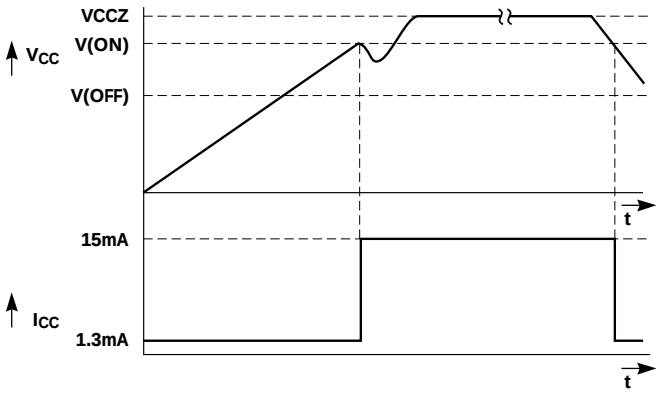


Figure 3. Typical V_{CC} and I_{CC} waveforms when ML4830 is started with a bleed resistor from the rectified AC line and bootstrapped from the ballast transformer.

To help reduce ballast cost, the ML4830 includes a temperature sensor which will inhibit ballast operation if the IC's junction temperature exceeds 120°C. In order to use this sensor in lieu of an external sensor, care should be taken when placing the IC to ensure that it is sensing temperature at the physically appropriate point in the ballast. The ML4830's die temperature can be estimated with the following equation:

$$T_J \cong T_A \times P_D \times 65°C/W \qquad (7)$$

STARTING, RE-START, PREHEAT AND INTERRUPT

The lamp starting scenario implemented in the ML4830 is designed to maximize lamp life and minimize ballast heating during lamp out conditions.

The circuit in Figure 4 controls the lamp starting scenarios: Filament preheat and Lamp Out interrupt. C(X) is charged

with a current of $\frac{I_{R(SET)}}{4}$ or $\frac{0.625}{R(SET)}$ and discharged

through R(X). The voltage at C(X) is initialized to 0.7V (V_{BE}) at power up. The time for C(X) to rise to 3.4V is the filament preheat time. During that time, the oscillator

charging current (I_{CHG}) is $\frac{2.5}{R(SET)}$ in both VCO modes.

This will produce a high frequency (or low duty cycle) for filament preheat, but will not produce sufficient voltage to ignite the lamp.

After cathode heating, the inverter frequency drops to F_{MIN} causing a high voltage to appear to ignite the lamp. If the voltage does not drop when the lamp is supposed to have ignited, the lamp voltage feedback coming into Pin 10 rises to above V_{REF}, the C(X) charging current is shut off and the inverter is inhibited until C(X) is discharged by R(X) to the 1.2V threshold. Shutting off the inverter in this manner prevents the inverter from generating excessive heat when the lamp fails to strike or is out of socket. Typically this time is set to be fairly long by choosing a large value of R(X).

LFB OUT is ignored until C(X) reaches 6.8V threshold. The lamps are therefore driven to full power and then dimmed. The C(X) pin is clamped to about 7.5V.

A timing diagram of lamp ignition and restart sequences provided by the circuit of Figure 4 is given in Figure 7.

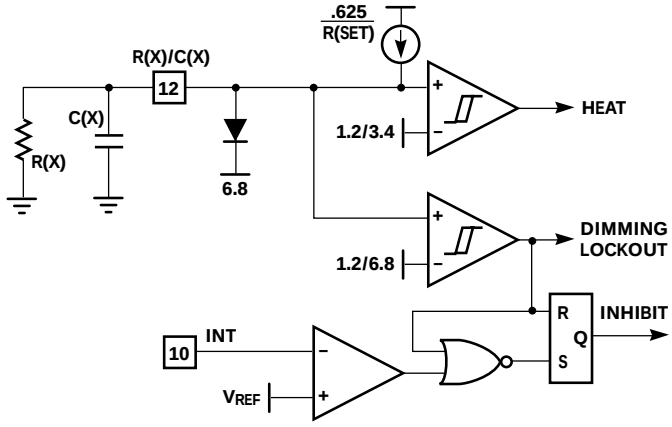


Figure 4. Lamp Preheat and Interrupt Timers

Mode	PWM	FM
Preheat	50%	$\frac{[F(MAX) \text{ to } F(MIN)]}{2}$
Dimming Lock-out	D(MAX)%	F(MIN)
Dimming Control	0 to D(MAX)%	F(MIN) to F(MAX)

Figure 5. Lamp Starting Summary

A summary of the lamp starting scenarios are given in figure 5 for both PWM and Frequency Modulation modes. The PWM duty cycle is defined as:

$$\text{Duty Cycle} = \frac{t_{ON}}{t_{CLK}}$$

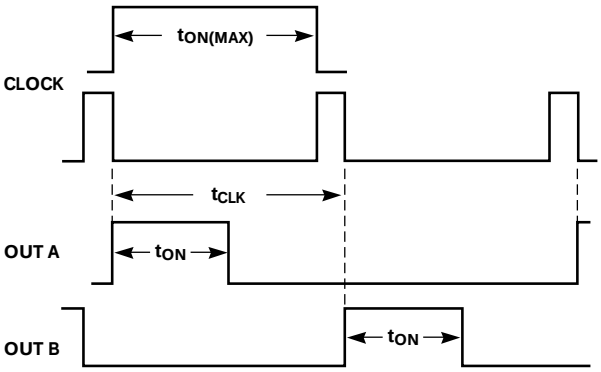


Figure 6. Definition of Duty Cycles

SEMI-STANDARD CAPABILITIES

The ML4830 is designed to work in a wide variety of electronic ballast applications. For high volume, cost sensitive applications, a ballast design can be implemented and debugged using the ML4830. From that design, Micro Linear can produce a reduced feature set, optimized ballast IC design quickly and easily with low risk.

Contact your Micro Linear representative or call Micro Linear for more information on Semi-Standard options.

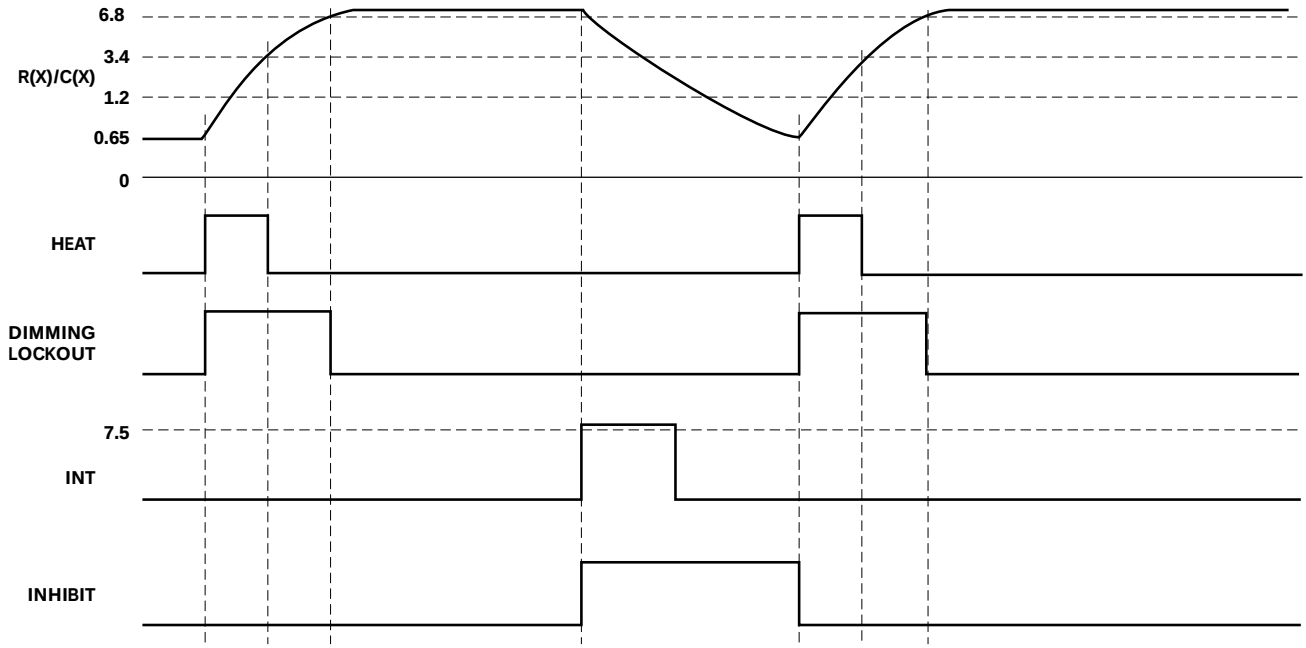


Figure 7. Lamp Starting and Restart Timing

APPLICATIONS

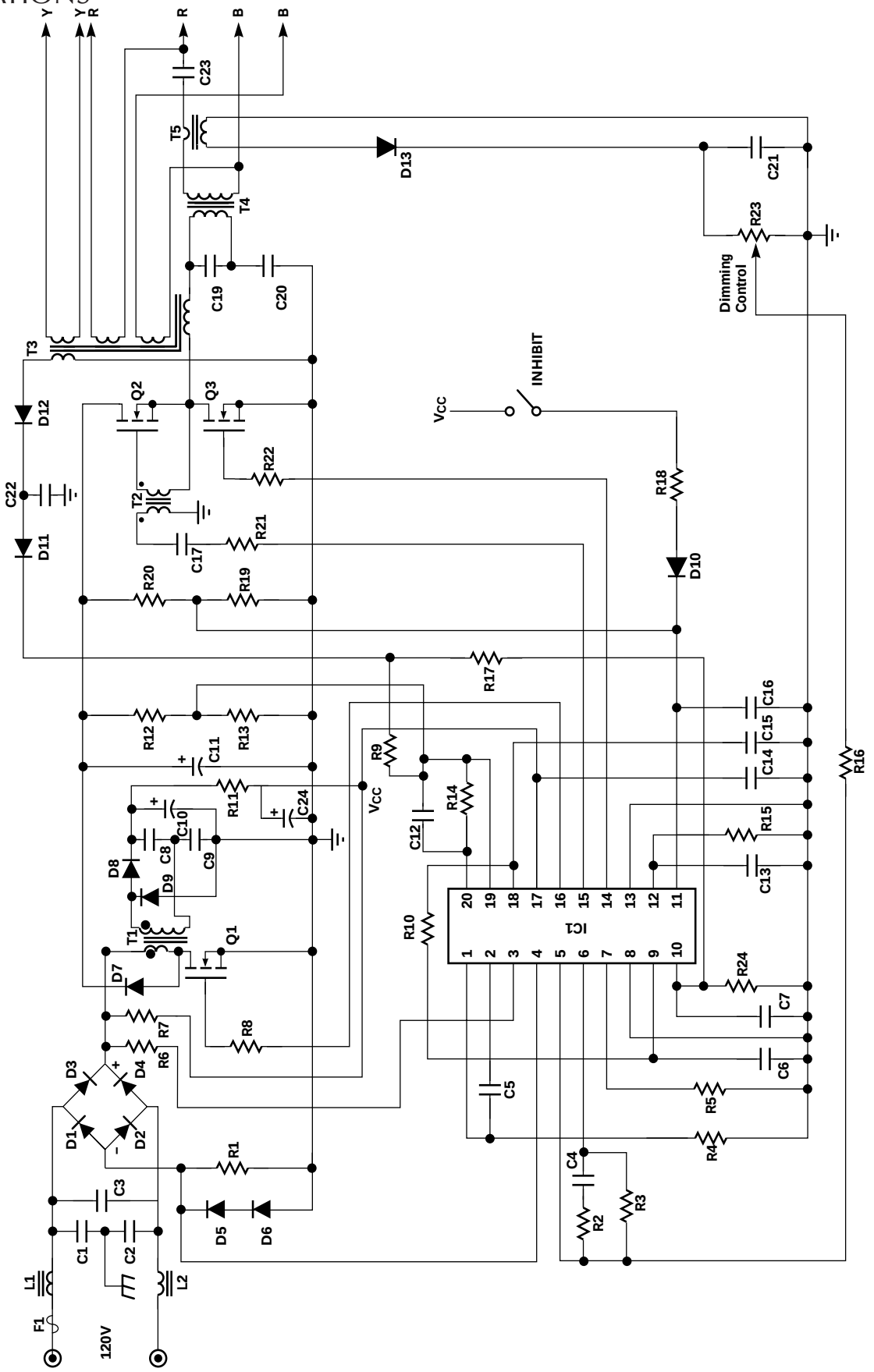


Figure. 8 Typical Application: 2-Lamp Isolated Dimming Ballast with Active Power Factor Correction for 120VAC Input

APPLICATIONS (continued)

The schematic (Figure 8) and the bill of materials on the following pages represents a complete parts list for the schematic (Figure 8). Designators refer to Micro Linear's "rev B" PCB.

TABLE 1: PARTS LIST FOR THE ML4830 TYPICAL APPLICATION

CAPACITORS

QTY.	REF.	DESCRIPTION	MFR.	PART NUMBER
2	C1, 2	3.3nF, 125VAC, 10%, ceramic, "Y" capacitor	Panasonic	ECK-DNS332ME
1	C3	0.33µF, 250VAC, "X", capacitor	Panasonic	ECQ-U2A334MV
4	C4, 8, 9, 12, 22	0.1µF, 50V, 10%, ceramic capacitor	AVX	SR215C104KAA
1	C5	47nF, 50V, 10%, ceramic capacitor	AVX	SR211C472KAA
1	C6	1.5µF, 50V, 2.5%, NPO ceramic capacitor	AVX	RPE121COG152
2	C7	1µF, 50V, 20%, ceramic capacitor	AVX	SR305E105MAA
1	C10	100µF, 25V, 20%, electrolytic capacitor	Panasonic	ECE-A1EFS101
1	C11	100µF, 250V, 20%, electrolytic capacitor	Panasonic	ECE-S2EG101E
1	C13	4.7µF, 50V, 20%, electrolytic capacitor	Panasonic	ECE-A50Z4R7
3	C14, 15, 17	0.22µF, 50V, 10%, ceramic capacitor	AVX	SR305C224KAA
1	C16	1.5µF, 50V, 10%, ceramic capacitor	AVX	SR151V152KAA
1	C19	22nF, 630V, 5%, polypropylene capacitor	WIMA	MKP10, 22nF, 630V, 5%
1	C20	0.1µF, 250V, 5%, polypropylene capacitor	WIMA	MKP10, 0.1µF, 250V, 5%
1	C21	0.01µF, 50V, 10%, ceramic capacitor	AVX	SR211C103KAA
1	C24	220µF, 16V, 20%, electrolytic capacitor	Panasonic	ECE-A16Z220
RESISTORS:				
1	R1	0.5Ω, 5%, 1/2W, metal film resistor	NTE	
1	R2	4.3K, 1/4W, 5%, carbon film resistor	Yageo	4.3K-Q
1	R3	47K, 1/4W, 5%, carbon film resistor	Yageo	47K-Q
1	R4	12K, 1/4W, 5%, carbon film resistor	Yageo	12K-Q
1	R5	20K, 1/4W, 1%, metal film resistor	Dale	SMA4-20K-1
1	R6	360K, 1/4W, 5%, carbon film resistor	Yageo	360K-Q
1	R7	36K, 1W, 5%, carbon film resistor	Yageo	36KW-1-ND
3	R8, 22, 11	22Ω, 1/4W, 5%, carbon film resistor	Yageo	22-Q
1	R9	402K, 1/4W, 1%, metal film resistor	Dale	SMA4-402K-1
1	R10, 13	17.8K, 1/4W, 1%, metal film resistor	Dale	SMA4-17.8K-1
1	R12, 20	475K, 1/4W, 1%, metal film resistor	Dale	SMA4-475K-1

TABLE 1: PARTS LIST FOR ML4830 TYPICAL APPLICATION (Continued)

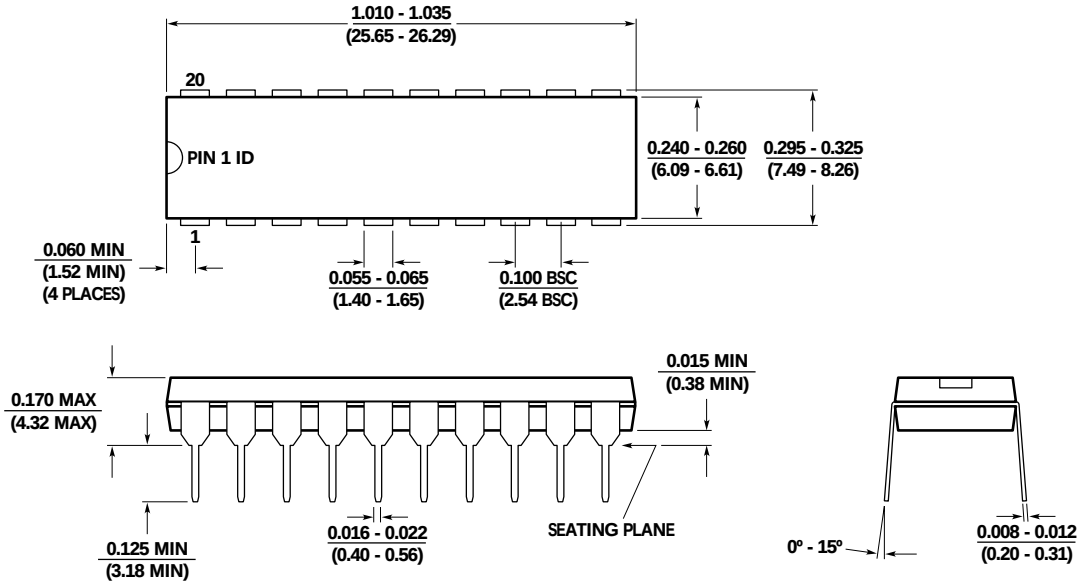
QTY.	REF.	DESCRIPTION	MFR.	PART NUMBER
RESISTORS: (Continued)				
4	R14	100K, 1/4W, 5%, carbon film resistor	Yageo	100K-Q
1	R15	681K, 1/4W, 5%, carbon film resistor	Yageo	681K-Q
1	R16, 19	10K, 1/4W, 1%, metal film resistor	Dale	SMA4-10K-1
1	R18	4.7K, 1/4W, 5%, carbon film resistor	Tageo	681K-Q
1	R21	33Ω, 1/4W, 5%, carbon film resistor	Yageo	33-Q
1	R23	25K, pot (for dimming adjustment)	Bourns	3386P-253-ND
DIODES:				
4	D1, 2, 3, 4	1A, 600V, 1N4007 diode (or 1N5061 as a substitute)	Motorola	1N4007TR
2	D5, 6	1A, 50V (or more), 1N4001 diodes	Motorola	1N4001TR
1	D7	3A, 400V, BYV26C or BYT03 400 fast recovery or MUR440 Motorola ultra Fast diode	GI	BYV26C
6	D8, 9, 10, 11 12, 13	0.1A, 75V, 1N4148 signal diode	Motorola	1N4148TR
IC's:				
1	IC1	ML4830, Electronic Ballast Controller IC	Micro Linear	ML4830CP
TRANSISTORS:				
3	Q1, 2, 3	3.3A, 400V, IRF720 power MOSFET	IR	IR720
MAGNETICS:				
1	T1	T1 Boost Inductor, E24/25, 1mH, Custom Coils P/N 5039 or Coiltronics P/N CTX05-12538-1 E24/25 core set, TDK PC40 material 8-pin vertical bobbin (Cosmo #4564-3-419), Wind as follows: 195 turns 25AWG magnet wire, start pin #1, end pin #4 1 layer mylar tape 14 turns 26AWG magnet wire, start pin #3, end pin #2 NOTE: Gap for 1mH ±5%		
1	T2	T2 Gate Drive Xfmr, L_{PRI} = 3mH, Custom Coils P/N 5037 or Coiltronics P/N CTX05-12539-1 Toroid Magnetics YW-41305-TC Wind as follows: Primary = 25 turns 30AWG magnet wire, start pin #1, end pin #4 Secondary = 50 turns 30AWG magnet wire, start pin #5, end pin #8		

TABLE 1: PARTS LIST FOR ML4830 TYPICAL APPLICATION (Continued)

QTY.	REF.	DESCRIPTION	MFR.	PART NUMBER
MAGNETICS: (Continued)				
1	T3	T3 Inductor, L_{PRI} = 1.66mH, Custom Ciols P/N 5041 or Coiltronics P/N CTX05-12547-1 E24/25 core set, TDK PC40 material 10 pin horizontal bobbin (Plastron #0722B-31-80) Wind as follows: 1st: 170T of 25AWG magnet wire; start pin #10, end pin #9. 1 layer of mylar tape 2nd: 5T of #32 magnet wire; start pin #2, end pin #1 1 layer of mylar tape 3rd: 3T of #30 Kynar coated wire; start pin #4, end pin #5 4th: 3T of #30 Kynar coated wire; start pin #3, end pin #6 5th: 3T of #30 Kynar coated wire; start pin #7, end pin #8 NOTE: Gap for 1.66mH ±5% (pins 9 to 10)		
1	T4	T4 Power Xfmr, L_{PRI} = 3.87mH, Custom Ciols P/N 5038 or Coiltronics P/N CTX05-12545-1 E24/25 core set, TDK PC40 material 8 pin vertical bobbin (Cosmo #4564-3-419) Wind as follows: 1st: 200T of 30AWG magnet wire; start pin #1, end pin #4. 1 layer of mylar tape 2nd: 300T of 32AWG magnet wire; start pin #5, end pin #8 NOTE: Gap for inductance primary: (pins 1 to 4) @ 3.87mH ±5%		
1	T5	T5 Current Sense Inductor, Custom Coils P/N 5040 or Coiltronics P/N CTX05-12546-1 Toroid Magnetics YW-41305-TC Wind as follows: Primary = 3T 30AWG magnet coated wire, start pin #1, end pin #4 Secondary = 400T 35AWG magnet wire, start pin #5, end pin #8		
INDUCTORS:				
2	L1, 2	EMI/RFI Inductor, 600µH, DC resistance = 0.45ý	Prem. Magnetics	SPE116A
FUSES:				
1	F1	2A fuse, 5 x 20mm miniature	Littlefuse	F948-ND
2		Fuse Clips, 5 x 20mm, PC Mount		F058-ND
HARDWARE:				
1		Single TO-220 Heatsink	Aavid Eng.	PB1ST-69
2		Double TO-220 Heatsink	IERC	PSE1-2TC
3		MICA Insulators	Keystone	4673K-ND

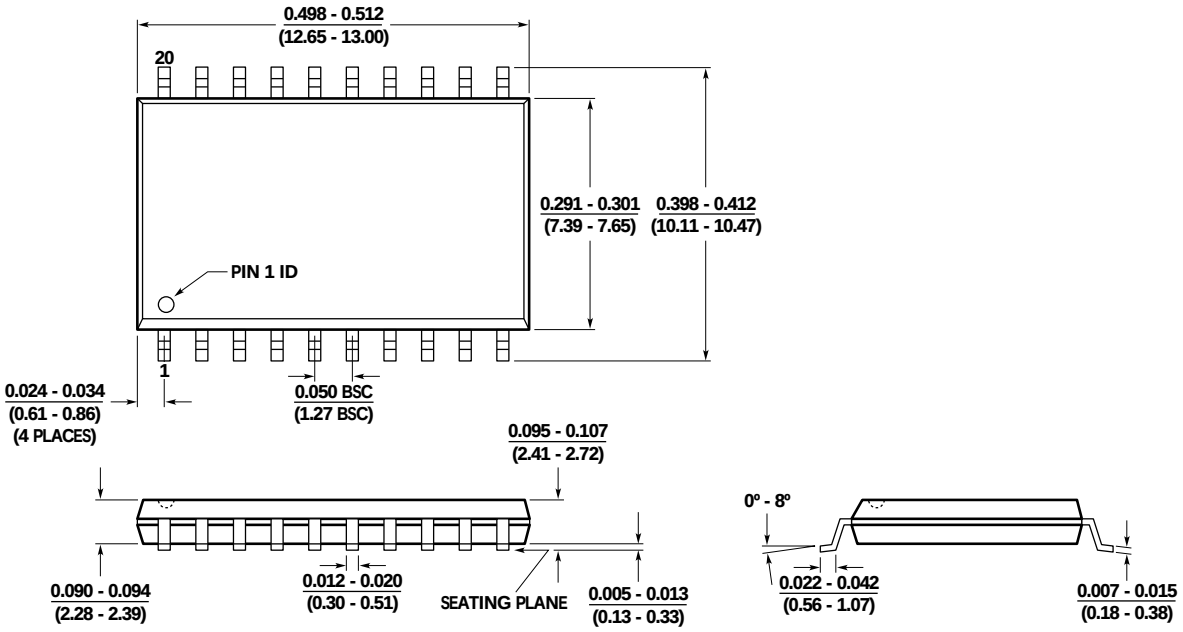
PHYSICAL DIMENSIONS **inches (millimeters)**

Package: P20
20-Pin PDIP



PHYSICAL DIMENSIONS **inches (millimeters)**

Package: S20
20-Pin SOIC



ORDERING INFORMATION

PART NUMBER	TEMPERATURE RANGE	PACKAGE
ML4830CP (EOL)	0°C to 85°C	Molded PDIP (P20)
ML4830CS (Obsolete)	0°C to 85°C	Molded SOIC (S20)