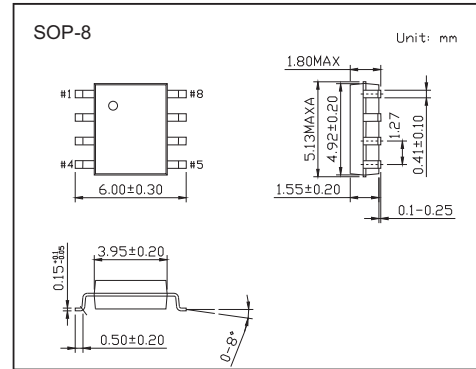


Power Factor Controllers

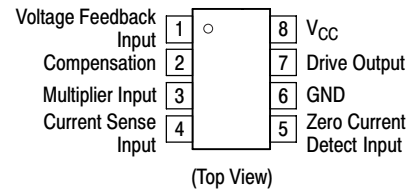
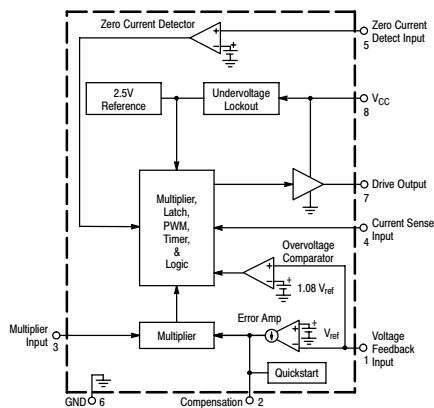
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■ Features

- Overvoltage Comparator Eliminates Runaway Output Voltage
- Internal Startup Timer
- One Quadrant Multiplier
- Zero Current Detector
- Trimmed 2% Internal Bandgap Reference
- Totem Pole Output with High State Clamp
- Undervoltage Lockout with 6.0 V of Hysteresis
- Low Startup and Operating Current



■ Functional Block Diagram



■ Absolute Maximum Ratings Ta = 25°C

Parameter	Symbol	Rating	Unit
Total Power Supply and Zener Current	(I _{cc} + I _z)	30	mA
Output Current, Source or Sink (Note 1)	I _o	500	mA
Current Sense, Multiplier, and Voltage Feedback Inputs	V _{in}	-1.0 to +10	V
Zero Current Detect Input High State Forward Current Low State Reverse Current	I _{in}	50 -10	mA
Power Dissipation @ TA = 70°C	P _D	450	mW
Thermal Resistance, Junction to Air	R _{θJA}	178	°C/W
Operating Junction Temperature	T _J	150	°C
Operating Ambient Temperature Range	T _A	0 to +85	°C
Storage Temperature Range	T _{stg}	-65 to +150	°C

NOTES: 1. Maximum package power dissipation limits must be observed.

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■ Electrical Characteristics ($V_{CC} = 12\text{ V}$ (Note 2), for typical values $T_A = 25^\circ\text{C}$, for min/max values T_A is the operating ambient temperature range that applies (Note 3), unless otherwise noted.)

Parameter	Symbol	Test conditons	Min	Typ	Max	Unit
Voltage Feedback Input Threshold $T_A = 25^\circ\text{C}$ $T_A = T_{\text{low}} \text{ to } T_{\text{high}}$	V_{FB}		2.465	2.5	2.535	V
		$V_{CC} = 12\text{ V to } 28\text{ V}$	2.44		2.54	
Line Regulation	Reg_{line}	$V_{CC} = 12\text{ V to } 28\text{ V}$		1.0	10	mV
Input Bias Current	I_{IB}	$V_{FB} = 0\text{ V}$		-0.1	-0.5	μA
Transconductance	g_m		80	100	130	μmho
Output Current ---Source ---Sink	I_O	$V_{FB} = 2.3\text{ V}$ $V_{FB} = 2.7\text{ V}$		10 10		μA
Output Voltage Swing High State Low State	$V_{OH(ea)}$ $V_{OL(ea)}$	$V_{FB} = 2.3\text{ V}$ $V_{FB} = 2.7\text{ V}$	5.8	6.4 1.7	2.4	V
Voltage Feedback Input Threshold	$V_{FB(OV)}$		$1.065 V_{FB}$	$1.08 V_{FB}$	$1.095 V_{FB}$	V
Input Threshold	$V_{th(M)}$		$1.05 V_{OL(EA)}$	$1.05 V_{OL(EA)}$		V
Dynamic Input Voltage Range						
Multiplier Input (Pin 3)	$V_{Pin 3}$		0 to 2.5	0 to 3.5		V
Compensation (Pin 2)	$V_{Pin 2}$		$V_{th(M)}$ to $(V_{th(M)} + 1.0)$	$V_{th(M)}$ to $(V_{th(M)} + 1.5)$		
Multiplier Gain (Note 4)	K	$V_{Pin 3} = 0.5\text{ V}, V_{Pin 2} = V_{th(M)} + 1.0\text{ V}$	0.43	0.65	0.87	1/V
ZERO CURRENT DETECTOR						
Input Threshold Voltage (V_{in} Increasing)	V_{th}		1.3	1.6	1.87	V
Hysteresis (V_{in} Decreasing)	V_H		100	200	300	mV
Input Clamp Voltage High State Low State	V_{IH} V_{IL}	$I_{DET} = + 3.0\text{ mA}$ $I_{DET} = ? 3.0\text{ mA}$	6.1 0.3	6.7 0.7		V
CURRENT SENSE COMPARATOR						
Input Bias Current	I_{IB}	$V_{Pin 4} = 0\text{ V}$		-0.15	-1.0	μA
Input Offset Voltage		$V_{Pin 2} = 1.1\text{ V}, V_{Pin 3} = 0\text{ V}$		9.0	25	mV
Maximum Current Sense Input Threshold	$V_{th(max)}$	$V_{FB} = 0\text{ V}, \text{ and } V_{Pin 3} = 3.0\text{ V}$	1.3	1.5	1.8	
Delay to Output	$t_{PHL(in/out)}$			200	400	ns
DRIVE OUTPUT						
Output Voltage Low State High State	V_{OL} V_{OH}	$I_{Sink} = 20\text{ mA}$ $I_{Sink} = 200\text{ mA}$ $I_{Source} = 20\text{ mA}$ $I_{Source} = 200\text{ mA}$		0.3 2.4 10.3 8.4	0.8 3.3	V
Output Voltage --High State	$V_{O(max)}$	$V_{CC} = 30\text{ V}, I_{Source} = 20\text{ mA},$ $C_L = 15\text{ pF}$	14	16	18	V
Output Voltage Rise Time	t_r	$C_L = 1.0\text{ nF}$		50	120	ns
Output Voltage Fall Time	t_f	$C_L = 1.0\text{ nF}$		50	120	ns
Output Voltage with UVLO Activated	$V_{O(UVLO)}$	$V_{CC} = 7.0\text{ V}, I_{Sink} = 1.0\text{ mA}$		0.1	0.5	V

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■ Electrical Characteristics ($V_{CC} = 12\text{ V}$ (Note 2), for typical values $T_A = 25^\circ\text{C}$, for min/max values T_A is the operating ambient temperature range that applies (Note 3), unless otherwise noted.)

RESTART TIMER							
Restart Time Delay	tdLY		200	600		μs	
UNDERVOLTAGE LOCKOUT							
Startup Threshold (V_{CC} Increasing)	$V_{th(on)}$		11.5	13	14.5	V	
Minimum Operating Voltage After Turn?On (V_{CC} Decreasing)	$V_{Shutdown}$		7.0	8.0	9.0	V	
$V_{Shutdown}$	V_H		3.8	5.0	6.2	V	
TOTAL DEVICE							
Power Supply Current	I _{CC}	V _{CC} = 7.0 V	50 kHz, C _L = 1.0 nF	I _{CC} = 25 mA		mA	
Startup					0.25		0.4
Operating					6.5		12
Dynamic Operating			9	20			
Power Supply Zener Voltage	V _Z		30	36		V	

NOTES: 2.Adjust V_{CC} above the startup threshold before setting to 12 V.

3. $T_{low} = 0^\circ\text{C}$, $T_{high} = +85^\circ\text{C}$.

4. $K = \text{Pin 4 Threshold} / V_{Pin 3} (V_{Pin 2} - V_{th(M)})$

■ TypIacl Characteristics

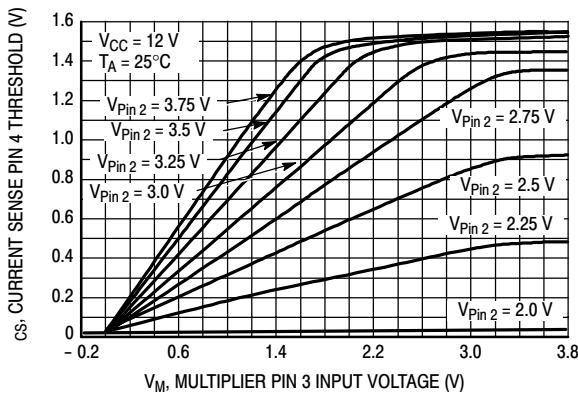


Figure 3. Current Sense Input Threshold versus Multiplier Input

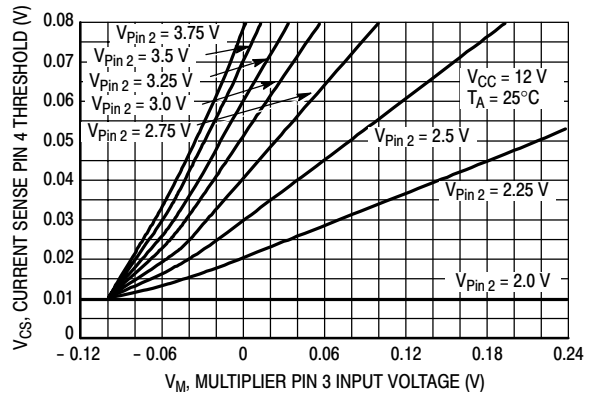


Figure 4. Current Sense Input Threshold versus Multiplier Input, Expanded View

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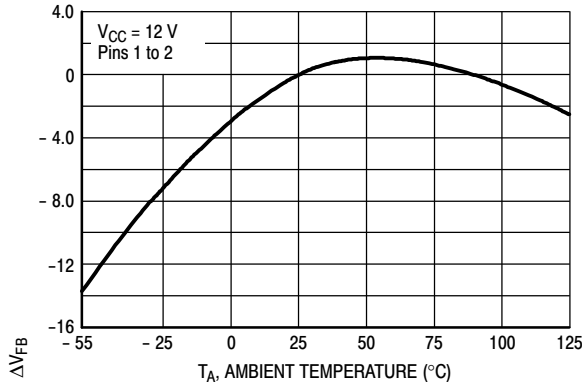


Figure 3. Voltage Feedback Input Threshold Change versus Temperature

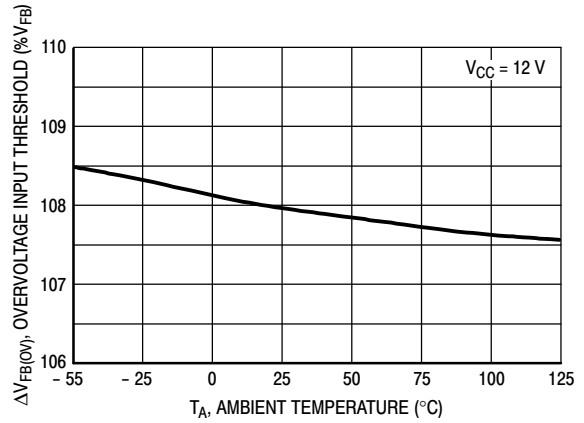


Figure 4. Overvoltage Comparator Input Threshold versus Temperature

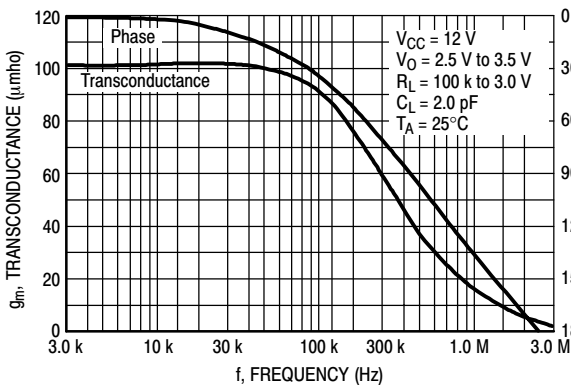


Figure 5. Error Amp Transconductance and Phase versus Frequency

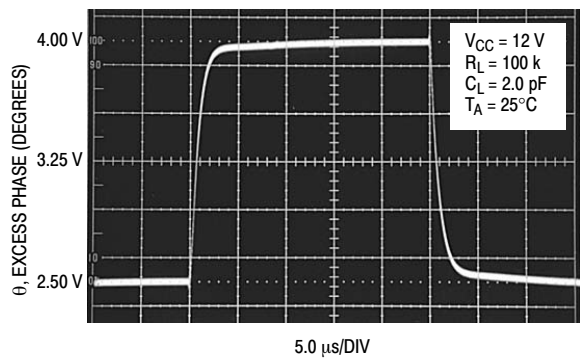


Figure 6. Error Amp Transient Response

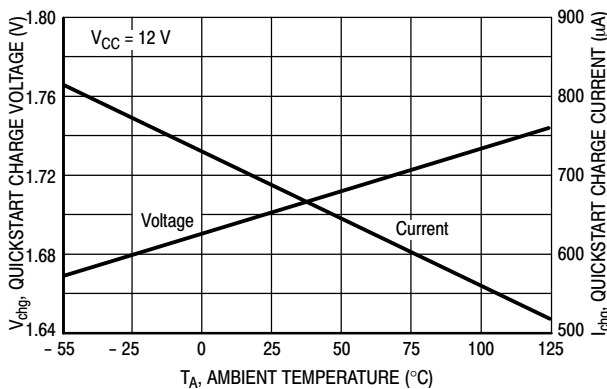


Figure 7. Quickstart Charge Current versus Temperature

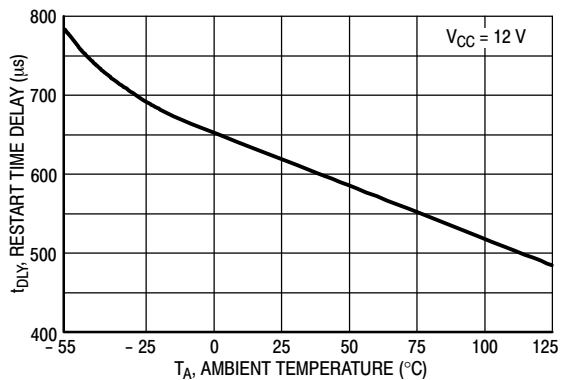


Figure 8. Restart Timer Delay versus Temperature

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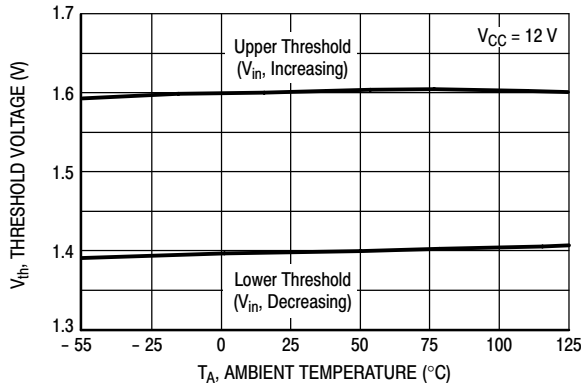


Figure 9. Zero Current Detector Input Threshold Voltage versus Temperature

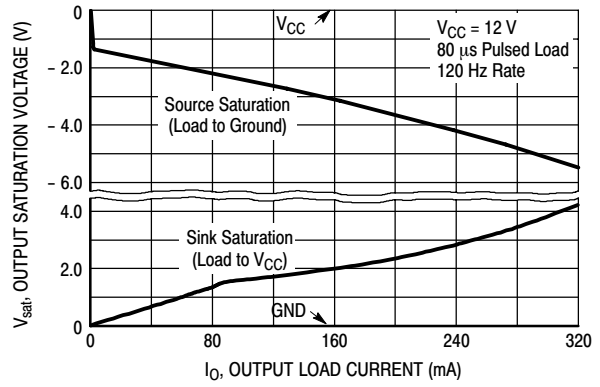


Figure 10. Output Saturation Voltage versus Load Current

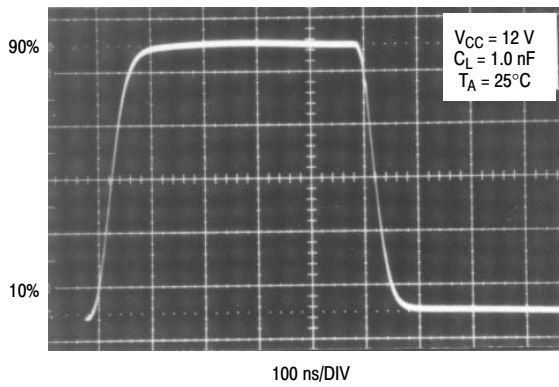


Figure 11. Drive Output Waveform

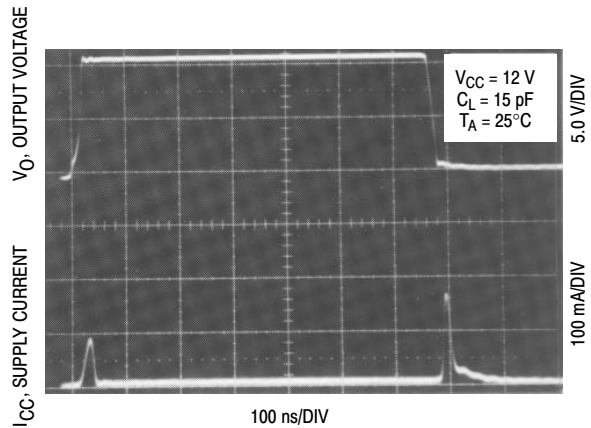


Figure 12. Drive Output Cross Conduction

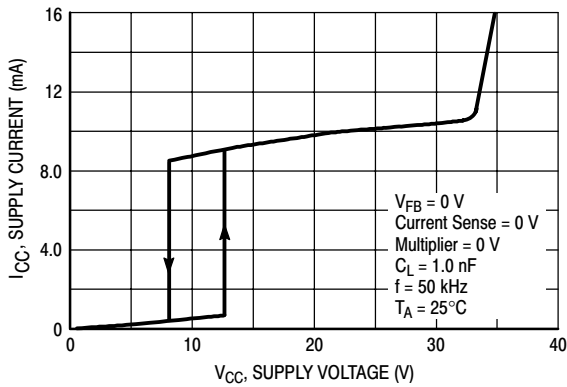


Figure 13. Supply Current versus Supply Voltage

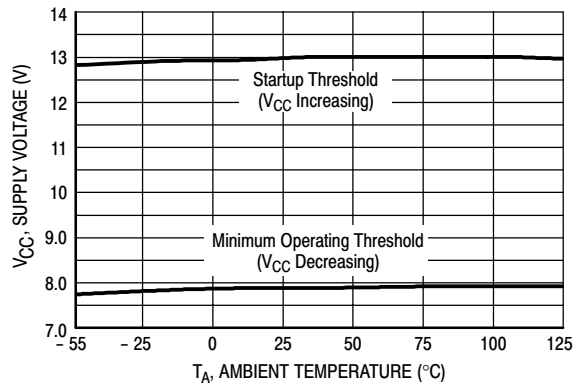


Figure 14. Undervoltage Lockout Thresholds versus Temperature

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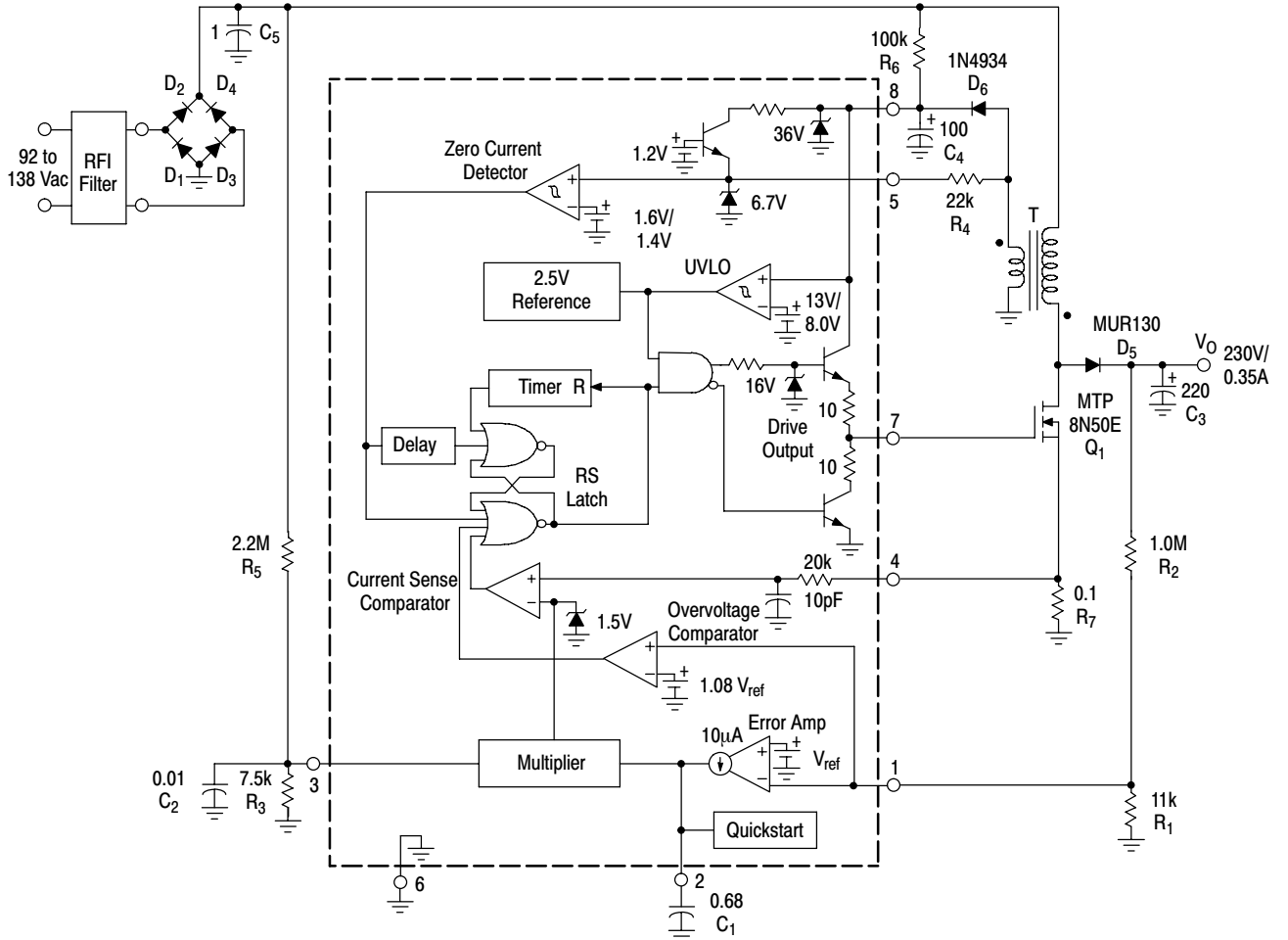


Figure 15. 80 W Power Factor Controller

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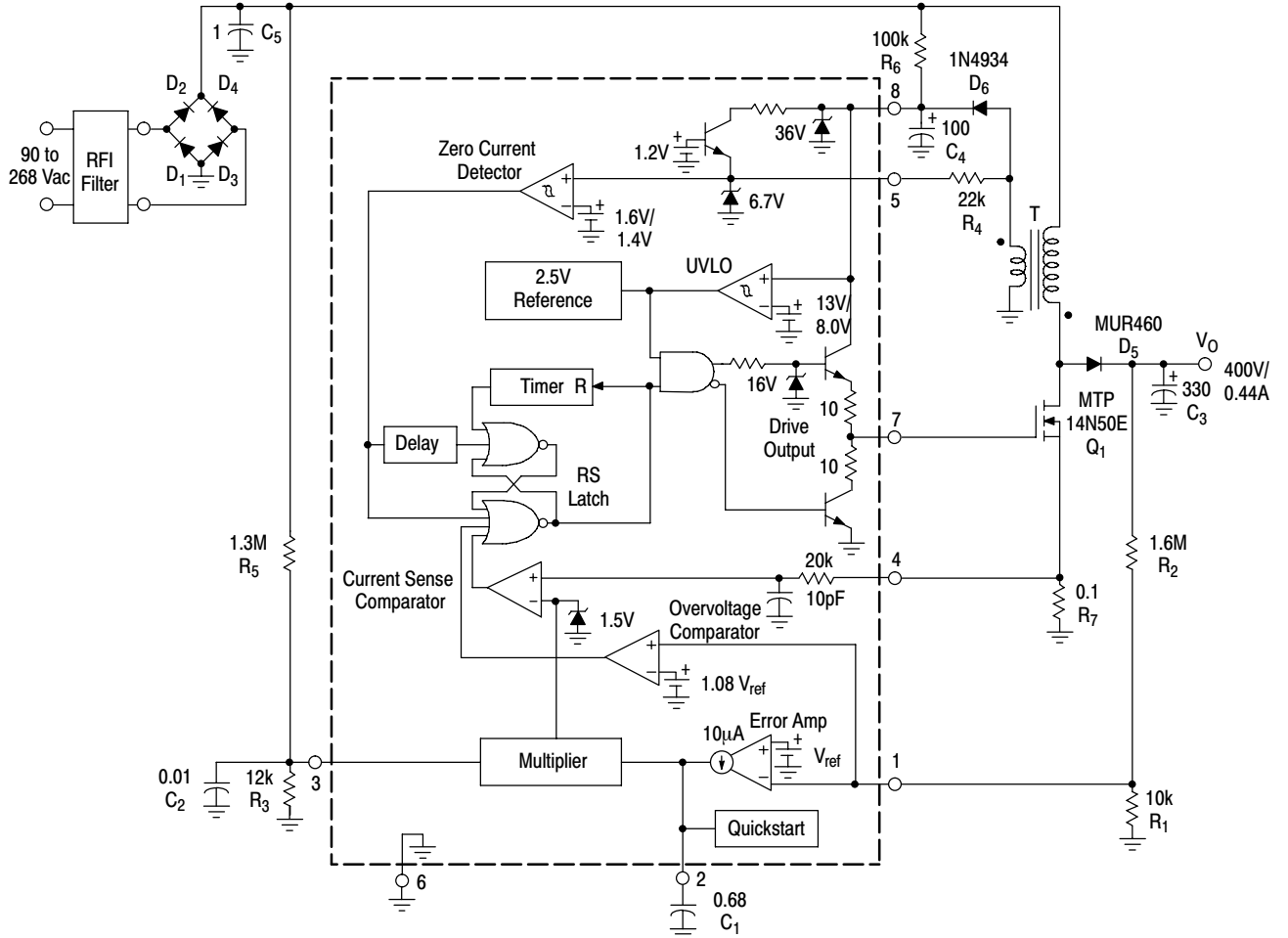


Figure 16. 175 W Universal Input Power Factor Controller

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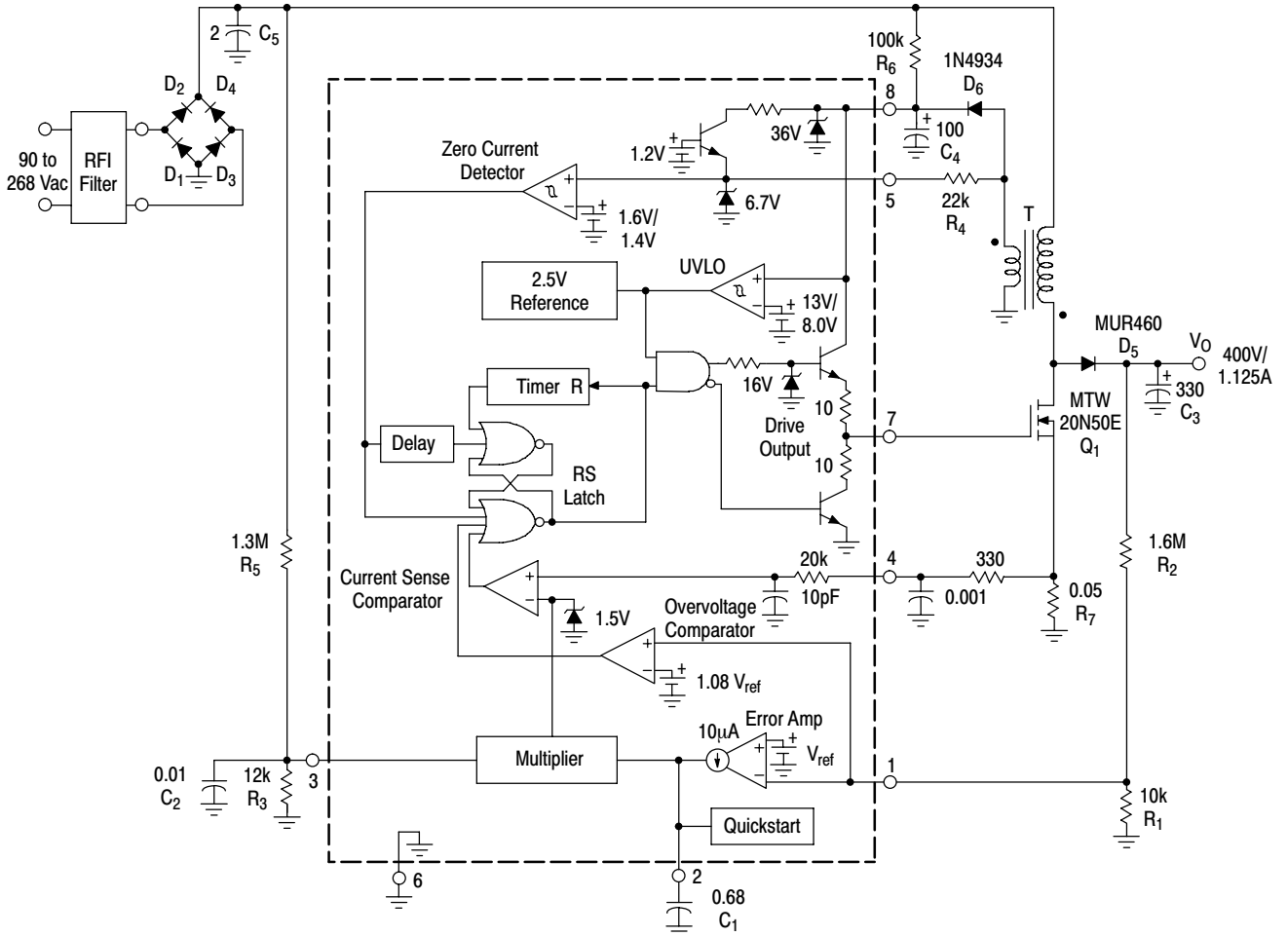


Figure 17. 450 W Universal Input Power Factor Controller