• These are Pb–Free and Halide–Free Devices

Voltage Feedback Input

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#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Total Power Supply and Zener Current	$(I_{CC} + I_Z)$	30	mA
Output Current, Source or Sink (Note 1)	Ι <sub>Ο</sub>	500	mA
Current Sense, Multiplier, and Voltage Feedback Inputs	V <sub>in</sub>	-1.0 to +10	V
Zero Current Detect Input High State Forward Current Low State Reverse Current	l <sub>in</sub>	50 -10	mA
Power Dissipation and Thermal Characteristics P Suffix, Plastic Package, Case 626 Maximum Power Dissipation @ $T_A = 70^{\circ}C$ Thermal Resistance, Junction–to–Air D Suffix, Plastic Package, Case 751 Maximum Power Dissipation @ $T_A = 70^{\circ}C$ Thermal Resistance, Junction–to–Air	P <sub>D</sub> R <sub>JA</sub> P <sub>D</sub> R <sub>JA</sub>	800 100 450 178	mW °C/W mW °C/W
Operating Junction Temperature	Τ <sub>J</sub>	+150	°C
Operating Ambient Temperature (Note 4) MC34262 MC33262	T <sub>A</sub>	0 to + 85 - 40 to +105	°C
Storage Temperature	T <sub>stg</sub>	– 65 to +150	°C
ESD Protection (Note 2) Human Body Model ESD Machine Model ESD Charged Device Model ESD	HBM MM CDM	2000 200 2000	V V V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

 Maximum package power dissipation limits must be observed.
ESD protection per JEDEC JESD22–A114–F for HBM, per JEDEC JESD22–A115–A for MM, and per JEDEC JESD22–C101D for CDM. This device contains latchup protection and exceeds 100 mA per JEDEC Standard JESD78.

**ELECTRICAL CHARACTERISTICS** ( $V_{CC}$  = 12 V (Note 3), for typical values  $T_A$  = 25°C, for min/max values  $T_A$  is the operating ambient temperature range that applies (Note 4), unless otherwise noted.)

	Characteristic	Symbol	Min	Тур	Max	Unit
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ERROR AMPLIFIER

Voltage Feedback Input Threshold

T<sub>A</sub> = 25°C  $T_A = T_{low}$  to  $T_{high}$  (V<sub>CC</sub> = 12 V to 28 V)



1									









Figure 15. Undervoltage Lockout Thresholds

### **Operating Description**

The MC34262, MC33262 contain many of the building blocks and protection features that are employed in modern high performance current mode power supply controllers. There are, however, two areas where there is a major difference when compared to popular devices such as the UC3842 series. Referring to the block diagrams in Figures 20, 21, and 22 note that a multiplier has been added to the current sense loop and that this device does not contain an oscillator. The reasons for these differences will become apparent in the following discussion. A description of each of the functional blocks is given below.



Figure 18. Active Power Factor Correction Preconverter

A significant reduction in line current distortion can be attained by forcing the preconverter to switch as the ac line voltage crosses through zero. The forced switching is achieved by adding a controlled amount of offset to the Multiplier and Current Sense Comparator circuits. The equation shown below accounts for the built–in offsets and is accurate to within ten percent. Let  $V_{th(M)} = 1.991$  V

#### Zero Current Detector

The MC34262 operates as a critical conduction current mode controller, whereby output switch conduction is initiated by the Zero Current Detector and terminated when the peak inductor current reaches the threshold level established by the Multiplier output. The Zero Current Detector initiates the next on-time by setting the RS Latch at the instant the inductor current reaches zero. This critical conduction mode of operation has two significant benefits. First, since the MOSFET cannot turn-on until the inductor A Quickstart circuit has been incorporated to optimize converter startup. During initial startup, compensation capacitor  $C_1$  will be discharged, holding the error amp output below the Multiplier threshold. This will prevent Drive Output switching and delay bootstrapping of capacitor  $C_4$  by diode  $D_6$ . If Pin 2 does not reach the multiplier threshold before  $C_4$  discharges below the lower UVLO threshold, the converter will "hiccup" and experience a significant startup delay. The Quickstart circuit is designed to precharge  $C_1$  to 1.7 V, Figure 8. This level is slightly below the Pin 2 Multiplier threshold, allowing immediate Drive Output switching and bootstrap operation when  $C_4$  crosses the upper UVLO threshold.

#### **Drive Output**

The MC34262/MC33262 contain a single totem-pole output stage specifically designed for direct drive of power

MOSFETs. The Drive Output is capable of up to  $\pm$ 500 mA peak current with a typical rise and fall time of 50 ns with a 1.0 nF load. Additional internal circuitry has been added to keep the Drive Output in a sinking mode whenever the Undervoltage Lockout is active. This characteristic eliminates the need for an external gate pulldown resistor. The totem–pole output has been optimized to minimize cross–conduction current during high speed operation. The addition of two 10  $\Omega$  resistors, one in series with the source output transistor and one in series with the sink output transistor, helps to reduce the cross–conduction current and radiated noise by limiting the output rise and fall time. A 16 V clamp has been incorporated into the output stage to limit the high state V<sub>OH</sub>. This prevents rupture of the MOSFET gate when V<sub>CC</sub> exceeds 20 V.

#### **APPLICATIONS INFORMATION**

The application circuits shown in Figures 20, 21 and 22 reveal that few external components are required for a complete power factor preconverter. Each circuit is a peak detecting current-mode boost converter that operates in critical conduction mode with a fixed on-time and variable off-time. A major benefit of critical conduction operation is that the current loop is inherently stable, thus eliminating the need for ramp compensation. The application in Figure 20 operates over an input voltage range of 90 Vac to 138 Vac and provides an output power of 80 W (230 V at 350 mA) with an associated power factor of approximately

0.998 at nominal line. Figures 21 and 22 are universal input preconverter examples that operate over a continuous input voltage range of 90 Vac to 268 Vac. Figure 21 provides an output power of 175 W (400 V at 440 mA) while Figure 22 provides 450 W (400 V at 1.125 A). Both circuits have an observed worst-case power factor of approximately 0.989. The input current and voltage waveforms of Figure 21 are shown in Figure 23 with operation at 115 Vac and 230 Vac. The data for each of the applications was generated with the test set-up shown in Figure 25.

### Table 1. Design Equations

Notes	Calculation	Formula
Calculate the maximum required output power.	Required Converter Output Power	$P_O = V_O I_O$
Coloulated at the minimum required on line voltage		

Calculated at the minimum required ac line voltage for output regulation. Let the efficiency  $\eta$  = 0.92 for



Figure 20. 80 W Power Factor Controller





Figure 26. Error Amp Compensation

The Error Amp output is a high impedance node and is susceptible to noise pickup. To minimize pickup, compensation capacitor C<sub>1</sub> must be connected as close to Pin 2 as possible with a short, heavy ground returning directly to Pin 6. When operating at high ac line, the voltage at Pin 2 may approach the lower threshold of the Multiplier,  $\approx 2.0$  V. If there is excessive ripple on Pin 2, the Multiplier will be driven into cut–off causing circuit instability, high distortion and poor power factor. This problem can be eliminated by increasing the value of C<sub>1</sub>.



Figure 27. Current Waveform Spike Suppression



(Top View)



NOTE: Use 2 oz. copper laminate for optimum circuit performance.



### **DEVICE ORDERING INFORMATION**

Device	Operating Temperature Range	Package	Shipping <sup>†</sup>		
MC34262DG		SOIC-8 (Pb-Free)	98 Units / Rail		
MC34262DR2G	$T_A = 0^{\circ}C$ to +85°C	SOIC-8 2500 / Tape & Reel (Pb-Free)			
MC34262PG		PDIP–8 50 Units / Rail (Pb–Free)			
MC33262DG		SOIC-8 (Pb-Free)	98 Units / Rail		
MC33262DR2G	T 40°C to 1105°C	SOIC-8 (Pb-Free)	2500 / Tape & Reel		
MC33262PG		PDIP-8 (Pb-Free)	50 Units / Rail		
MC33262CDR2G		SOIC-8 (Pb-Free)	2500 / Tape & Reel		

+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.



**0.010** 

SIDE VIEW

CAMBM

NOTE 6

	INC	HES		
DIM	MIN	MAX		
Α		0.210		
A1	0.015			
A2	0.115	0.195	2.92	4.95
b	0.014	0.022		
С	0.008	0.014		
D	0.355	0.400		
D1	0.005			
Е	0.300	0.325		
е	0.100	BSC		
L	0.115	0.150	2.92	3.81
		0		0

DATE 22 APR 2015

# GENERIC MARKING DIAGRAM\*

Ъ	Д	Д	┛
XX	хх>	κxx	XX
Þ		A	WL
0	Y١	٢WV	٧G
ſ	Ъ	Ъ	Г

- XXXX = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- YY = Year
- WW = Work Week
- G = Pb–Free Package



DATE 16 FEB 2011



SEATING PLANE



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