MP7530
30W Class D Mono Audio Amplifier

Monolithic Power Systems

General Description

The MP7530 is a fully integrated 30W Mono Class D Audio Amplifier. This simple, low cost amplifier utilizes a full bridge output structure with integrated 0.22Ω power MOSFETs. Using MPS' proprietary Analog Adaptive Modulation (AAM, Patent Pending) control scheme, the MP7530 provides ultra-high efficiency (>90%) while maintaining the low noise and high fidelity of a Class A/B Amplifier (<0.1% THD+N). The MP7530 also delivers excellent PSRR and fast response time while maintaining its high efficiency over a wide voltage range from a single-ended input power source.

Ordering Information

Part Number*	Package	Temperature
MP7530DWR	SOIC20WR	-40 to +85°C

* For Tape & Reel, use suffix –Z (MP7530DWR-Z)

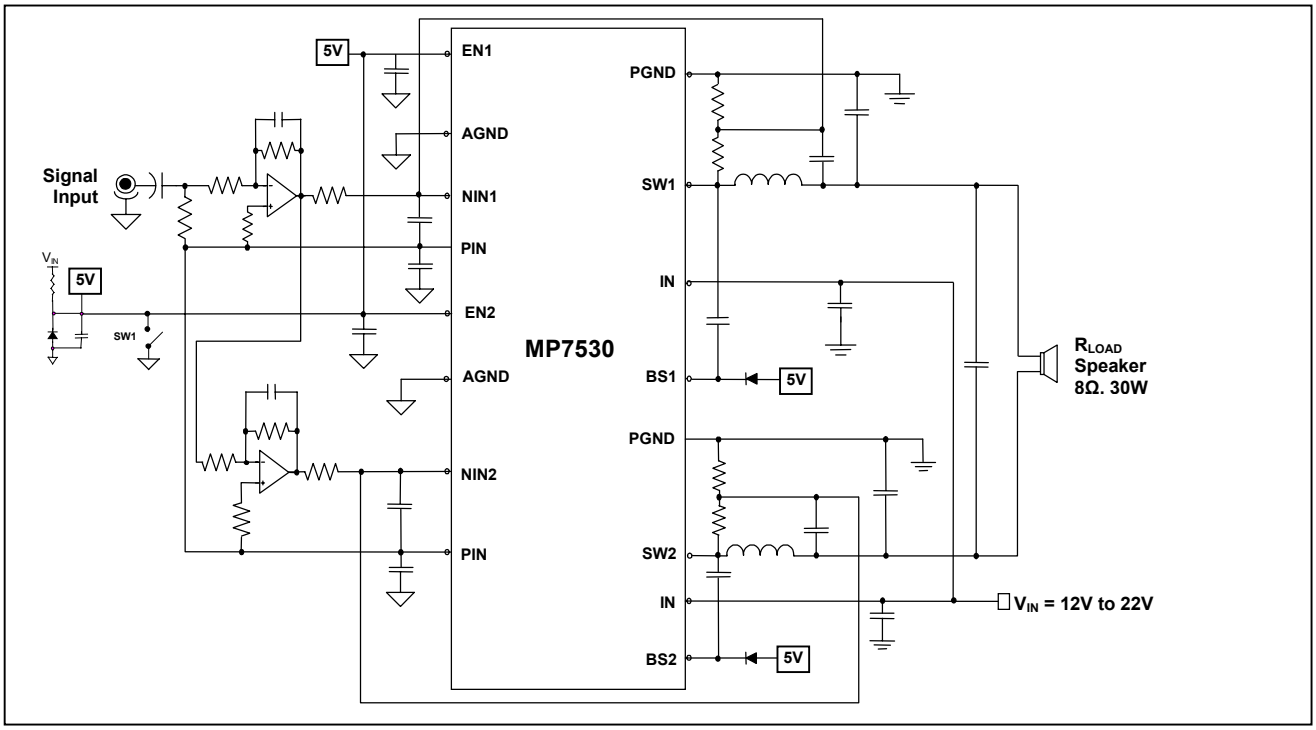
Features

- 92% Efficiency at 30W Output
- Oscillation Frequency to 1MHz
- Amplifies Full Audio Range with Low THD+N
  - Typical = 0.1% @ 10W
- 30W Output from 22V into an 8Ω load
- 12V to 22V Operation from Single Ended Input Power Supply
- Full Bridge Output Drive
- Integrated 0.22Ω MOSFETs
- Thermal Protection
- Cycle-by-Cycle Short Circuit Protection
- Standby Mode (Sleep)

Applications

- DVD Systems
- Multimedia & Desktop Computers
- Television and Home Stereos
- DVD and VCD players
- Game Machine

Figure 1: Typical Application Circuit



Absolute Maximum Ratings

Supply Voltage (V_{IN})	-0.3V to 30V
Switch Voltage (V_{SW})	-0.3V to 30V
Enable Voltage (V_{EN})	-0.3V to 6V
BS to SW Voltage	-0.3V to 6V
V_{NIN}, V_{PIN}	-0.3V to V_{EN}+0.3V
Power Dissipation **(Note 1)**	1.2W
Junction Temperature	150°C
Storage Temperature	55°C to +150°C

Recommended Operating Conditions

Supply Voltage (V_{IN})	12V to 25V
Enable Voltage (V_{EN})	4.75V to 6V
Audio Input Signal	0V to 2.5V
Operating Temperature	-40°C to +85°C

Package Thermal Characteristics

Thermal resistance θ_{JA} **(Note1)**	105°C/W

Electrical Characteristics (Figure 2 Circuit, V_{IN}=22V, V_{EN}=5V unless otherwise specified T_A=25°C)

Parameters	Symbol	Condition	Min	Typ	Max	Units
Voltage Supply						
V_{IN} Standby Current	$I_{IN (OFF)}$	V_{EN}=0V			10	μA
V_{IN} Quiescent Current	$I_{IN (ON)}$	V_{NIN}=5V			100	μA
V_{IN} Operating Range	V_{IN}		12		22	V
Output Drivers						
On Resistance	R_{ON}	V_{EN}=5V		0.22		Ω
Short Circuit Current	I_{SC}			5		A
Inputs						
PIN Reference Voltage	V_{REF}	Average of rising and falling values. V_{NIN}=1V		2.08		V
NIN1-NIN2 Offset Voltage	V_{IOS}	V_{PIN}=2V	-20		20	mV
NIN Input Common Mode Voltage Range	V_{CM}		0	2.0	2.5	V
NIN Input Current	I_{NIN}	V_{NIN}=V_{PIN}=2V			1	μA
Enable Voltage (IC supply)	V_{EN}		4.75		6	V
Enable Current	I_{EN}			10		mA
Thermal Shutdown						
Shutdown Temperature	T_{SD}			150		°C

Operating Performance (V_{IN}=22 V, R_{LOAD}= 8Ω (Note 2), Figure 2 Circuit, T_A=25 °C)

Power Output	P_{OUT}	f =1KHz @10% THD+N		30		W
THD+N	THD+N	P_{OUT}=10W, f =1KHz		0.1		%
Power Supply Rejection	PSRR	f =100Hz, V_{IN-AC}=1V, V_{IN-DC}=22V		60		dB
Closed Loop Voltage Gain	A_{VOL}			33		dB
Efficiency	η	f =1KHz		90		%
Frequency Response Bandwidth			20		20000	Hz
Dynamic Range				80		dB

Note 1: Package dissipation can be increased (Thermal resistance decreased) by the addition of a heat sink. (See package drawing)

Note 2: If the application requires R_L<8Ω, please contact factory. R_L is a resistor not a speaker for test purposes.

Pin Description

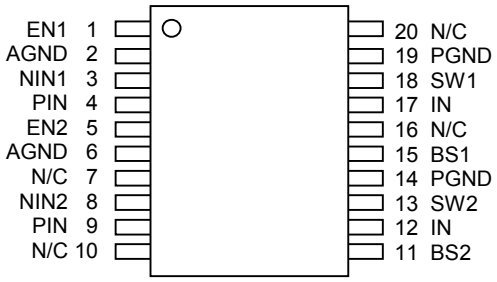


Table 1: MP7530 Pin Description

Pin No.	Pin Name	Pin Function
7,10,16, 20	N/C	Not Connected
1	EN1	Enable Pin, 5V=On
2, 6	AGND	Analog Ground
3	NIN1	Input to the amplifier
4, 9	PIN	Common-mode reference voltage for the amplifier input. Externally connect both PIN pins together.
5	EN2	Enable Pin, 5V=On
8	NIN2	Input to the amplifier
11	BS2	Bootstrap pin for Output FET. 0.22μF to SW2
12, 17	IN	Power Supply (12V-22V)
13	SW2	Output (Pulse Out). Output connected to inductor.
14, 19	PGND	Power Ground
15	BS1	Bootstrap pin for Output FET. 0.22μF to SW1
18	SW1	Output (Pulse Out). Output connected to inductor.

Figure 2: Reference design for 8Ω, 30W Mono Bridged Audio Amplifier

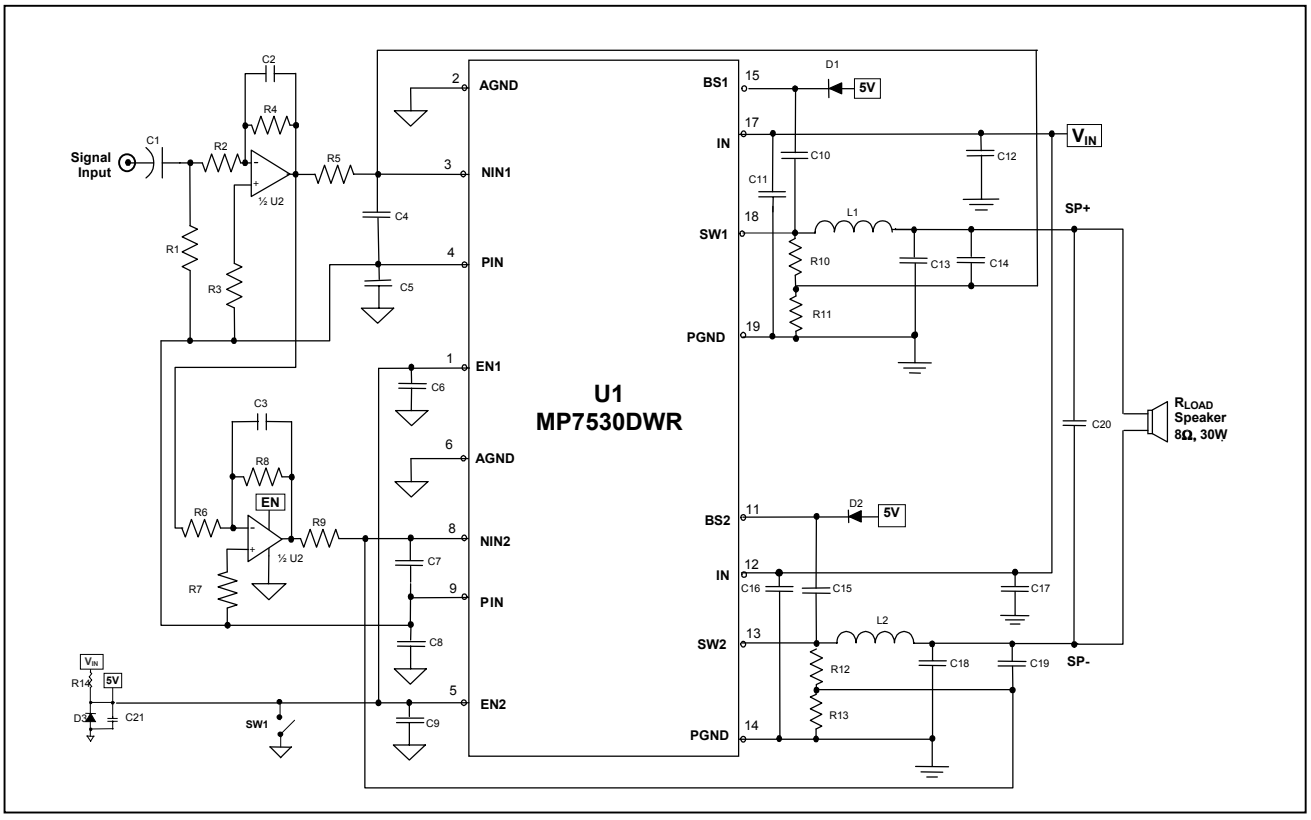


Figure 3: Basic Biasing Operation

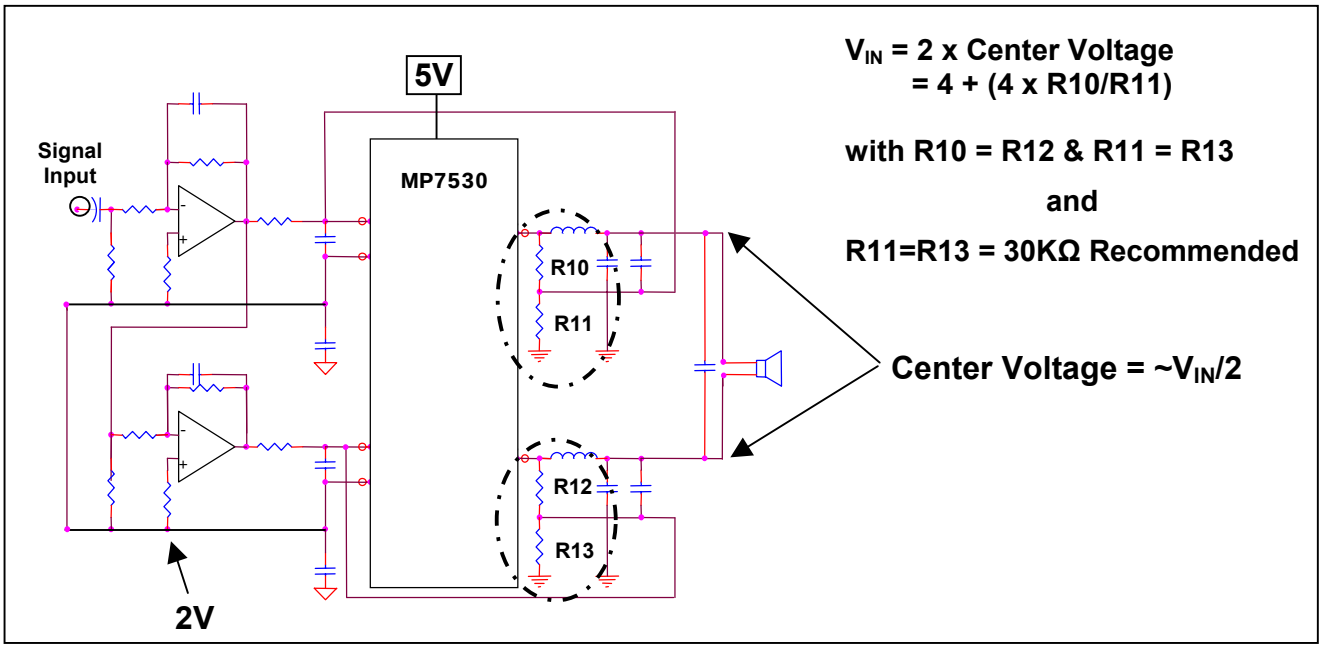


Table 2: Bill of Materials for Figure 2, 30W/8Ω Load Mono Reference Design

Parts	Quantity	Components
Semiconductors		
IC MP7530DWR Class D Amplifier	1	U1
IC LM833 Dual Op Amp	1	U2
Capacitors		
CAP 0.47µF (25V Film)	3	C13, C18, C20
CAP 1.0µF (10V Ceramic)	8	C1, C5, C6, C8, C9, C11, C16, C17
CAP 0.22µF(10V Ceramic)	2	C10, C15
CAP 1.5nF (16V Ceramic)	2	C4, C7
CAP 47pF (16V Ceramic)	2	C2, C3
CAP 27pF (25V Ceramic)	2	C14, C19
CAP 1000µF (25V Electrolytic)	1	C12
Resistors		
R 130KΩ, (1% or Better)	2	R10, R12
R 30KΩ, (1% or Better)	2	R11, R13
R 5.1KΩ, 5%	2	R7, R14
R 7.5KΩ, 5%	3	R3, R5, R9
R 10KΩ, 5%	5	R1, R2, R4, R6, R8
Inductor		
L 10µH, 3A	2	L1, L2
Diode		
SW Diode	2	D1, D2
5V Zener Diode	1	D3

Performance Characteristics for Figure 2

Figure 4: Phase, Gain versus Frequency

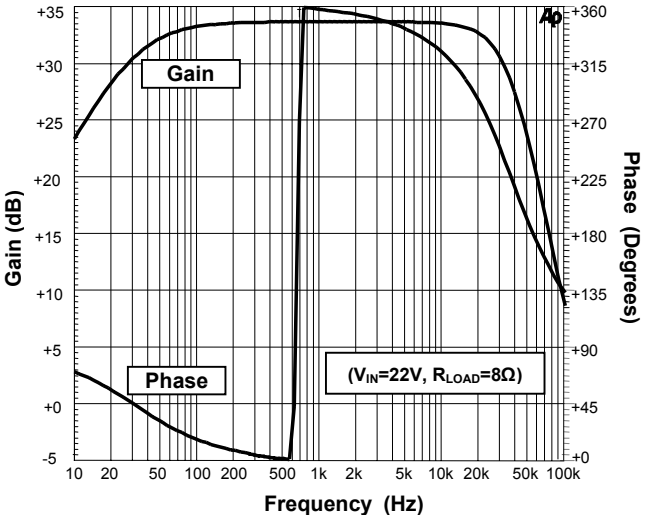
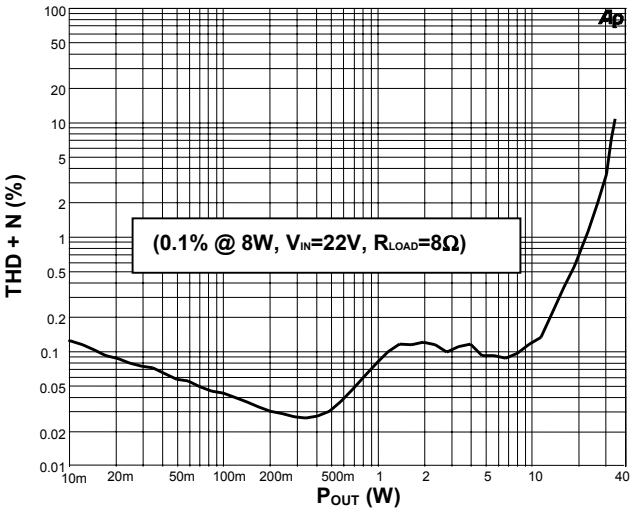


Figure 5: THD+N vs P_{OUT}



Performance Characteristics for Figure 2

Figure 6: THD + N, P_{OUT} vs Frequency

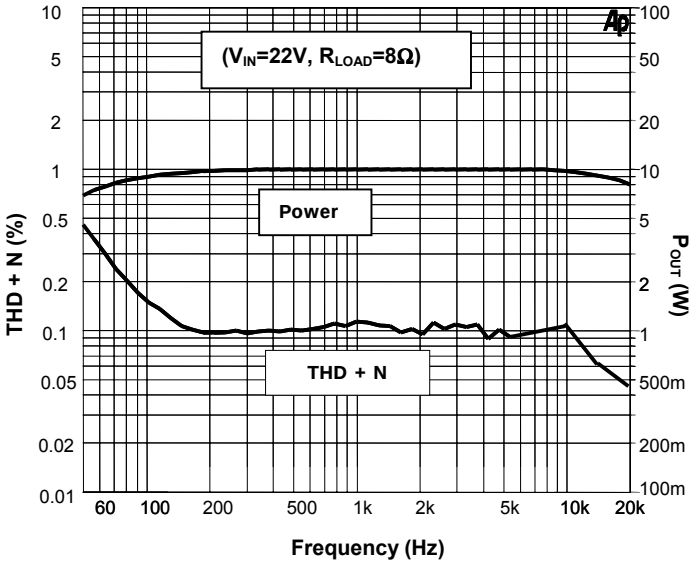


Figure 7: Signal to Noise Ratio @ 30W

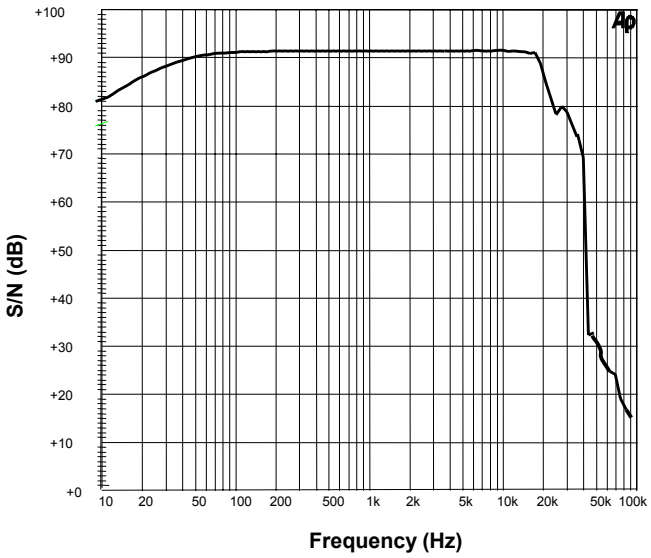
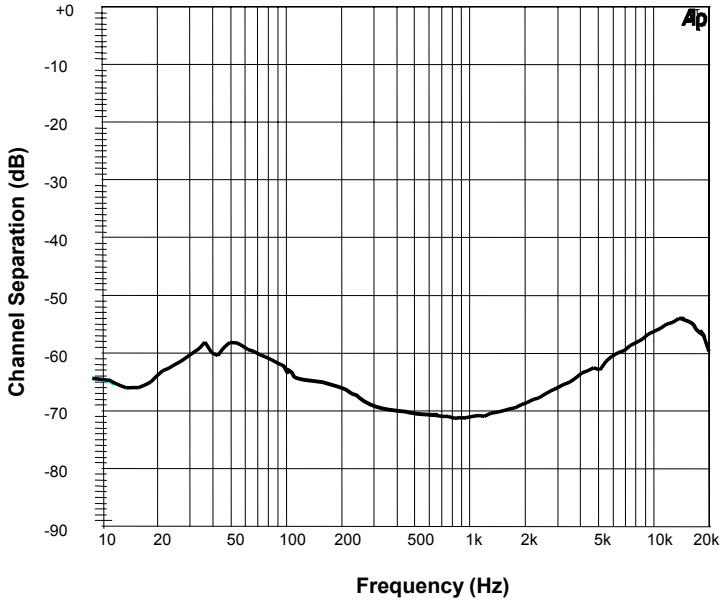


Figure 8: 30W Channel Separation



Performance Characteristics for Figure 2

Figure 9: Efficiency versus P_{OUT} @ R_{LOAD}=8Ω

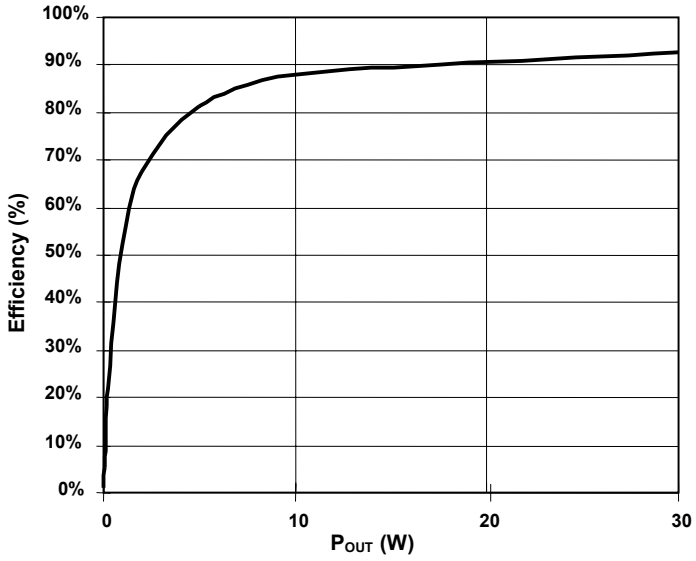


Figure 10: Quiescent Frequency vs C7

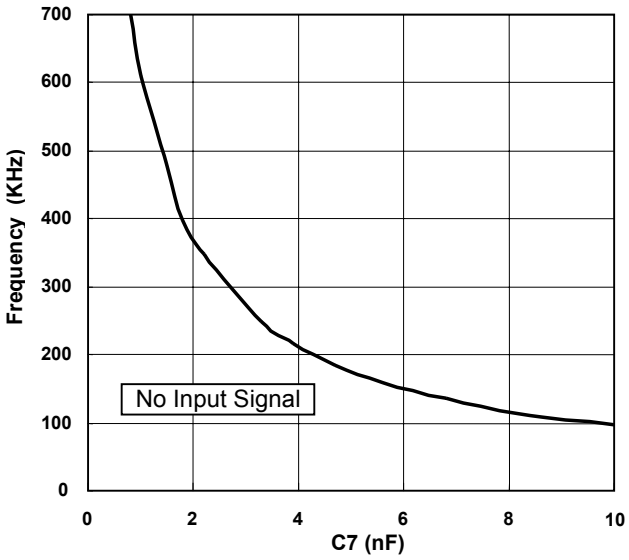
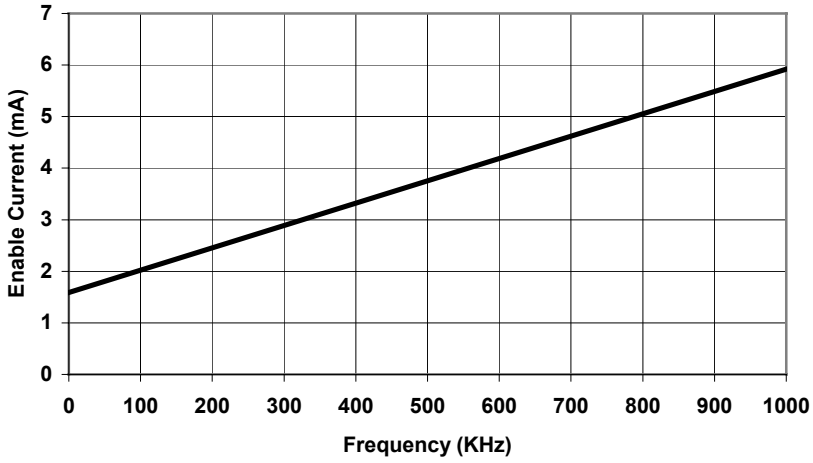


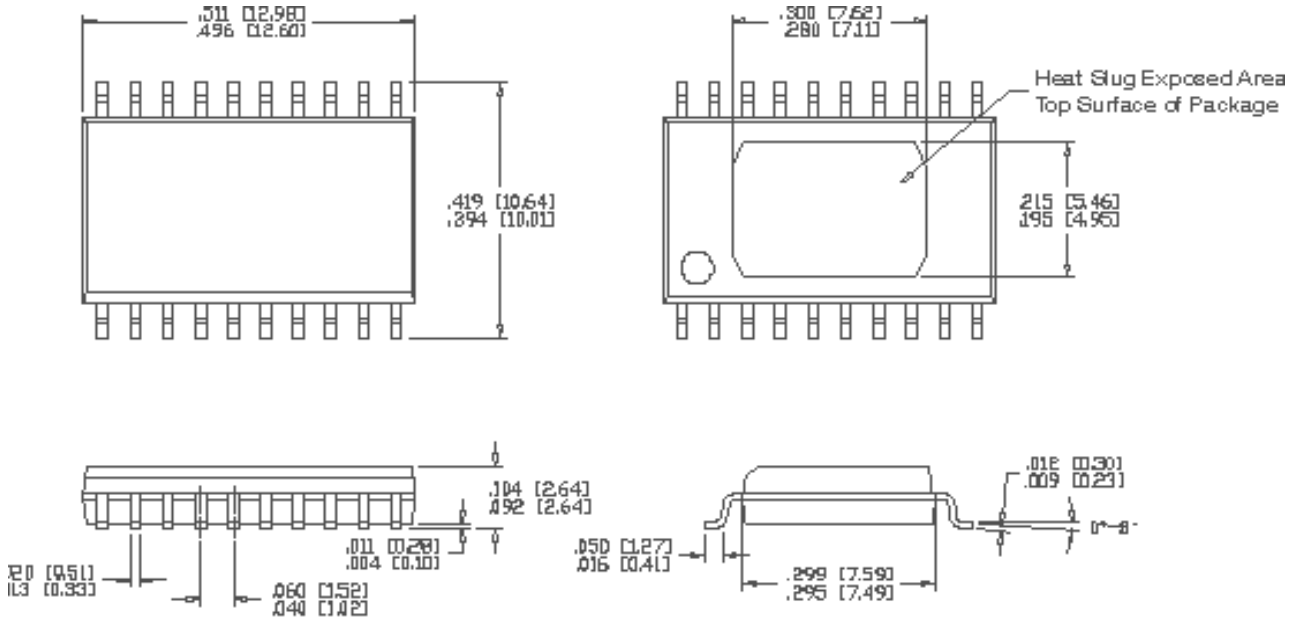
Figure 11: Enable Current vs Frequency



Package Information

SOIC20WR

(with Heat Slug, Reverse Lead Bend)



Note: A heat sink can be attached to the **TOP** of the package to improve the power dissipation.