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Description

The PA2460 is a high-power and high-efficiency Power Amplifier (PA) IC for handheld applications in the 130MHz to 500MHz band. The design is based on Gallium Arsenide Hetero-junction Bipolar Transistor (GaAs HBT) process.

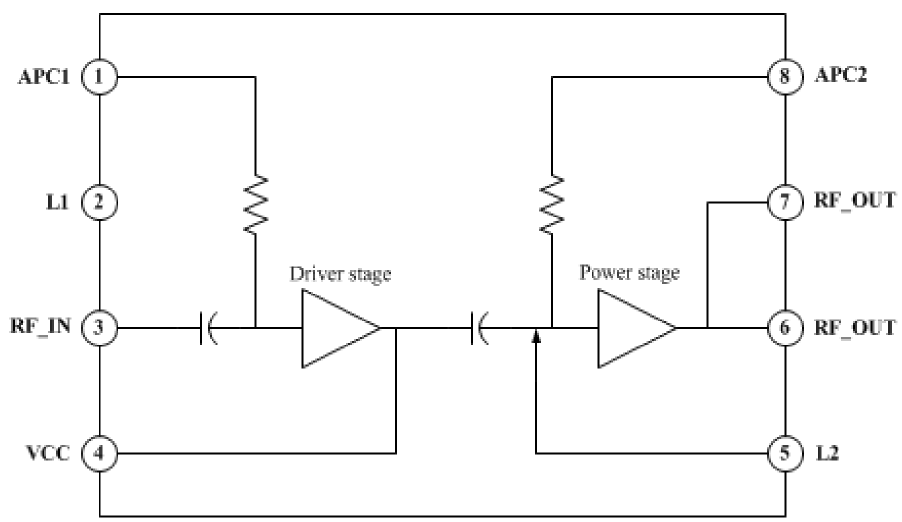
Features

- Single 2.7V to 6V Supply Voltage
- +33dBm Output Power for 3.5V to 6V
- 55% Efficiency
- 8-pin SOP(FD) package (5mm x 4mm)

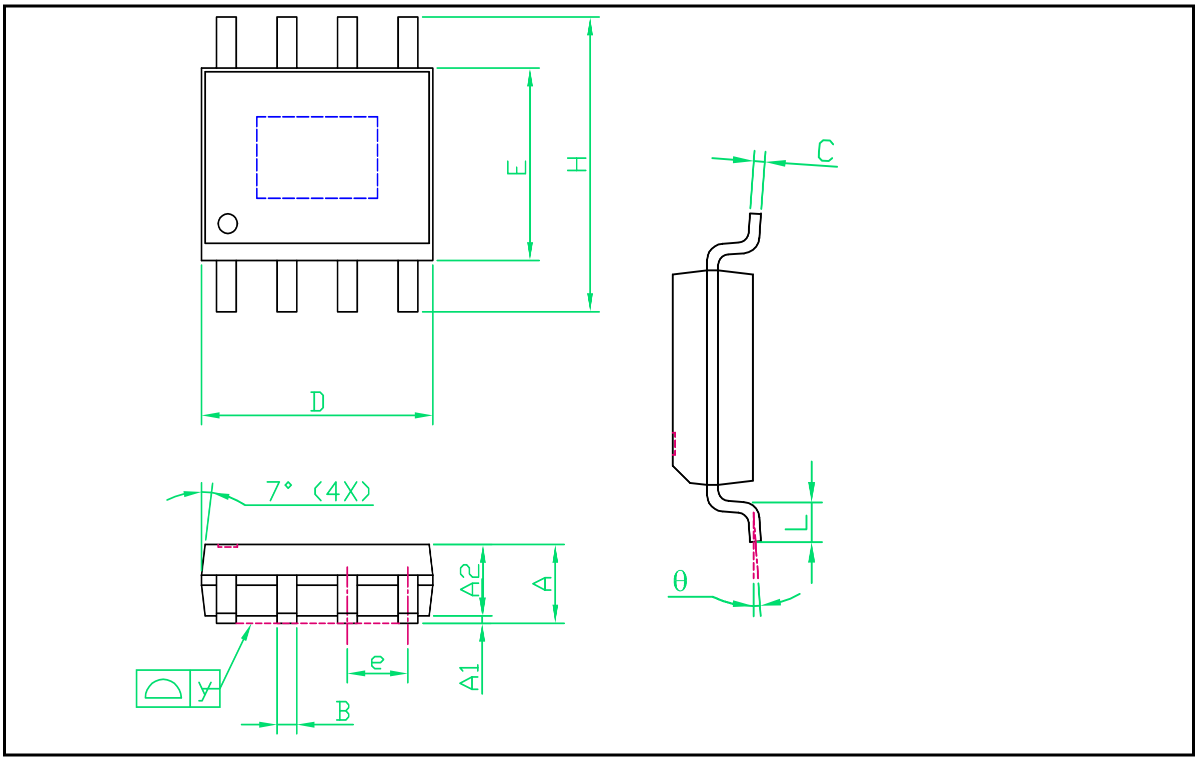
Applications

- FRS, GMRS Handsets
- Commercial and Consumer Systems
- Portable Battery-Powered Equipment
- Long distance Remote Control

Block Diagram



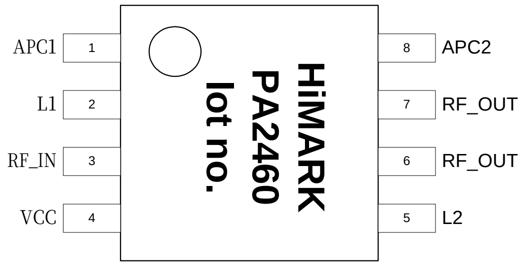
Package and Pin Assignment: 8-Pin SOP(FD)



Symbols	Dimensions in mm			Dimensions in inch		
	min.	nom.	max.	min.	nom.	max.
A	1.45	1.50	1.55	0.057	0.059	0.061
A1	0.00	---	0.10	0.000	—	0.004
A2	---	1.45	---	---	0.057	---
B	0.33	---	0.51	0.013	---	0.020
C	0.19	---	0.25	0.007	---	0.010
D	4.80	---	5.00	0.189	---	0.197
E	3.80	---	4.00	0.150	---	0.157
e	—	1.27	—	—	0.050	—
H	5.80	---	6.20	0.228	---	0.244
L	0.40	—	1.27	0.016	—	0.050
y	—	—	0.10	—	—	0.004
θ	0°	—	8°	0°	—	8°

Pin Descriptions

Number	Name	I/O	Description
1	APC1	I	Analog Power Control
2	L1	I	Matching Inductor
3	RF_IN	I	RF input
4	VCC	Power	Power supply for PA
5	L2	I	Matching Inductor
6	RF_OUT	O	RF output
7	RF_OUT	O	RF output
8	APC2	I	Analog Power Control



Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply Voltage	V_{CC}	0 to 6	V
Supply current	I_{CC}	1000@3.5V	mA
		850@6V	mA
Power Control Voltage Range	V_{APC}	0.2 to 1.45	V
Input Power	P_{IN}	10	dBm
Operating Temperature Range	T_{OPR}	-40 to 100	°C
Storage Temperature Range	T_{STG}	–55 to 125	°C
Soldering Temperature Range	T_{SLD}	255	°C
Soldering Time Range	t_{SLD}	10	s

Electrical Characteristics

(V_{CC} = 3.5V, V_{SS} = 0V, T_A = 25°C, RL=50 Ohm, unless otherwise noted.)

Parameter	Symbol	Condition	Value			Unit
			min.	typ.	max.	
VCC Supply Voltage	V_{CC}		2.7		4.8	V
Frequency Range	f_{RF}		130		500	MHz
Input Power	P_{IN}	P_{OUT}=33dBm	5		9	dBm
Output Power	P_{OUT}	P_{IN}=5dBm	33		34	dBm
		P_{IN}=5dBm,Vcc=2.7V, V_{APC}=1.4V		30		dBm
Efficiency		P_{IN}=5dBm,P_{OUT}=33dBm	57	63	70	%
Current Consumption	I_{CC}	P_{OUT}=33dBm	820	900	1000	mA
Control Voltage Range	V_{APC}		0.2		1.45	V
Full Power Control Voltage		P_{OUT}=33dBm	1.35	1.4	1.45	V
Control Current into V_{APC}	I_{APC}	P_{OUT}=33dBm	15	20	25	mA
Isolation		P_{IN}=5dBm, APC=0.2V	-40	-30	-25	dB
Noise Floor		P_{IN}=5dBm, BW=100kHz, fo±20MHz offset			-84	dBm
2nd to 13th Harmonic Distortion		P_{OUT}=33dBm		-30	-25	dBc
Input VSWR		All power level		1.5:1	2:1	
Rise Time and Fall Time		P_{OUT}=33dBm			2	μsec

Electrical Characteristics

(V_{CC} = 6V, V_{SS} = 0V, T_A = 25°C, RL=50 Ohm, unless otherwise noted.)

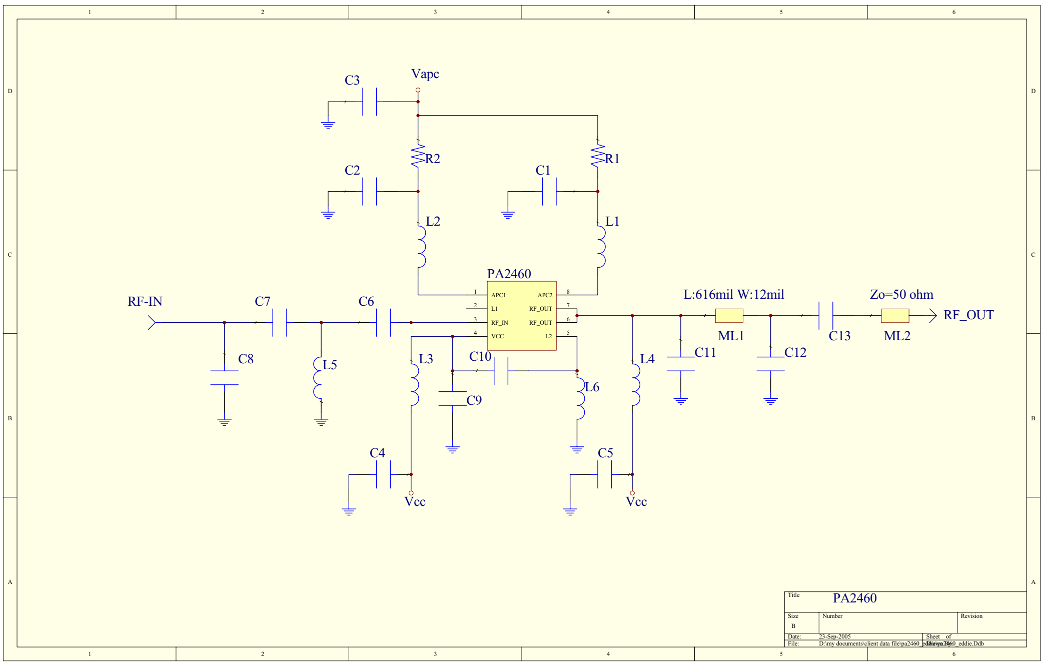
Parameter	Symbol	Condition	Value			Unit
			min.	typ.	max.	
VCC Supply Voltage	V_{CC}			6		V
Frequency Range	f_{RF}		130		500	MHz
Input Power	P_{IN}	P_{OUT}=33dBm	5		9	dBm
Output Power	P_{OUT}	P_{IN}=5dBm	33		34	dBm
Efficiency		P_{IN}=5dBm,P_{OUT}=33dBm	40	45	50	%
Current Consumption	I_{CC}	P_{OUT}=33dBm	650	750	850	mA
Control Voltage Range	V_{APC}		0.2		1.45	V
Full Power Control Voltage		P_{OUT}=33dBm	1.25	1.3	1.4	V
Control Current into V_{APC}	I_{APC}	P_{OUT}=33dBm	8	12	16	mA
Isolation		P_{IN}=5dBm, APC=0.2V	-40	-30	-25	dB
Noise Floor		P_{IN}=5dBm, BW=100kHz, fo±20MHz offset			-84	dBm
2nd to 13th Harmonic Distortion		P_{OUT}=33dBm		-30	-25	dBc
Input VSWR		All power level		1.5:1	2:1	
Rise Time and Fall Time		P_{OUT}=33dBm			2	μsec

Input/Output impedance (for reference only)

Frequency	Bias	Input impedance	Output impedance
410MHz	6V	26.35-j187.1	8.45-j1.55
410MHz	3.5V	15.35-j186.7	5.95-j2.70
465MHz	6V	27.35-j159.3	12.55-j3.45
465MHz	3.5V	27.35-j159.3	7.3-2.2j

1. Output impedance: look into PA2460
2. Input impedance: look into PA2460

Evaluation Board Circuit

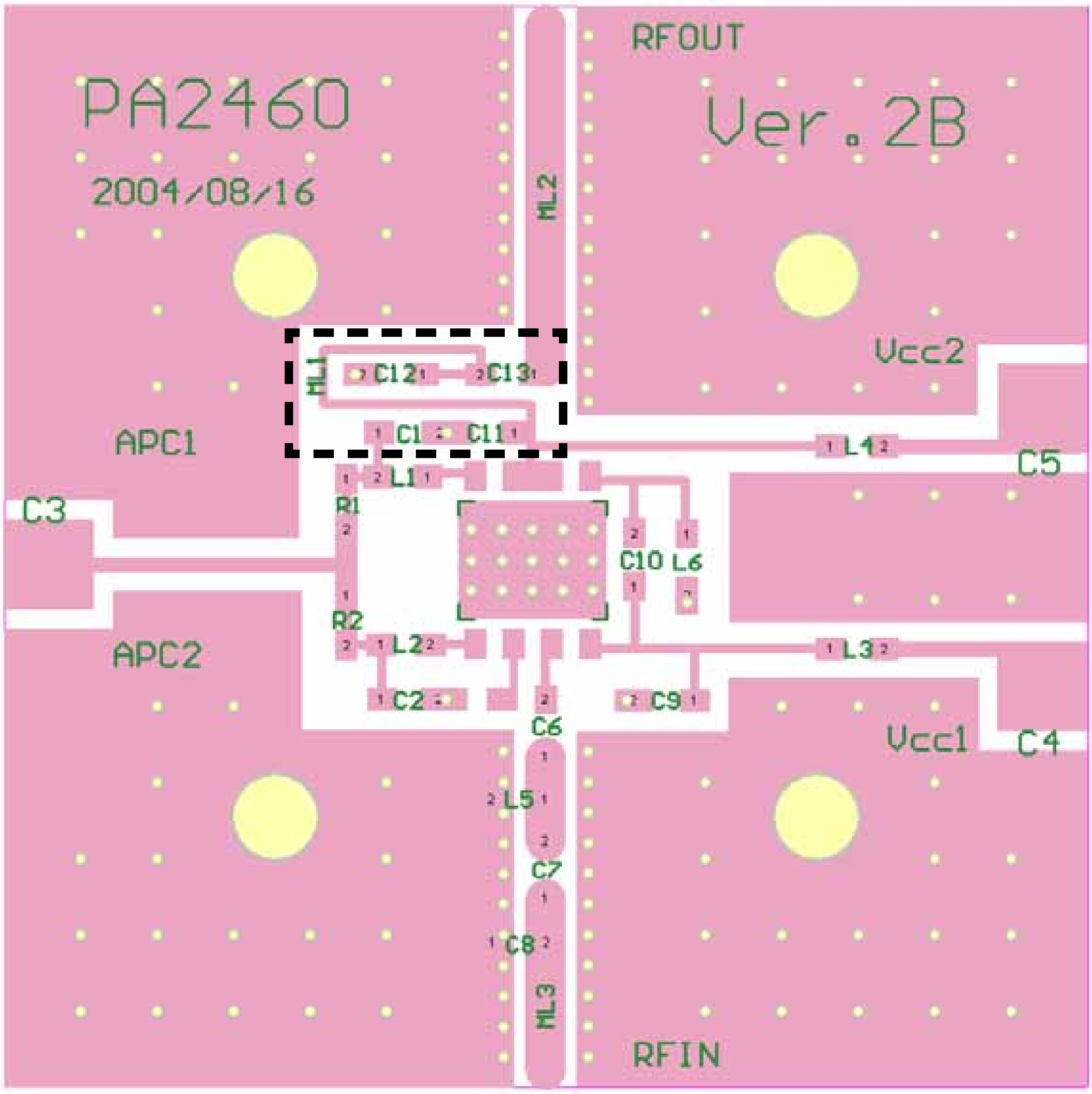


BOM

VCC	3.3V	3.5V					3.6V	5V				6V	
Freq.	433.92M	300M	315M	433.92M	460M	465M	380M	315M	390M	400M	433.92M	433.92M	465M
Vapc	1.4V	1.4V	1.4V	1.4V	1.4V	1.4V	1.4V	1.3V	1.3V	1.3V	1.3V	1.3V	1.3V
C1,C2	1nF	1nF					1nF	1nF				1nF	
C3,C4,C5	1uF	1uF					1uF	1uF				1uF	
C6	100pF	100pF					100pF	100pF				100pF	
L5	18nH	27nH	18nH	18nH	18nH	15nH	18nH	27nH	18nH	18nH	18nH	15nH	15nH
C7	5.6pF	10pF	15pF	5.6pF	4.7pF	5.6pF	5.6pF	8.2pF	8pF	7pF	6pF	8pF	5.6pF
C8	18pF	22pF	33pF	18pF	15pF	18pF	18pF	27pF	27pF	27pF	18pF	18pF	18pF
C9	NC	NC	NC	NC	NC	NC	NC	NC	7pF	7pF	4pF	6pF	4pF
C10	39pF	10pF	10pF	10pF	10pF	10pF	10pF	7pF	100pF	100pF	100pF	100pF	100pF
L6	6.8nH	8.2nH	8.2nH	5.6nH	5.6nH	5.6nH	5.6nH	12nH	5.6nH	5.6nH	4.7nH	3.3nH	2.2nH
C11	5pF	10pF	9pF	5pF	5pF	4pF	5pF	10pF	15pF	15pF	15pF	12pF	11pF
C12	9pF	22pF	22pF	10pF	8pF	8pF	10pF	22pF	14pF	12pF	10pF	11pF	9pF
C13	5pF	27pF	27pF	6pF	6pF	5pF	6pF	100pF	27pF	27pF	100pF	100pF	100pF
L1,L2	100nH	100nH					100nH	100nH				100nH	
*L3,L4	25nH	25nH					25nH	25nH				25nH	
R1	0 ohm	0 ohm					0 ohm	0 ohm				0 ohm	
R2	0 ohm	0 ohm					0 ohm	0 ohm				0 ohm	

* air coil inductor

Evaluation Board Layout



Critical layout guidelines:

1.C11 should be very close to pin6/pin7 (RF_OUT) of PA2460. (about 36mils away from pin7)

2.The dimension of microstrip line ML1 between C11 and C12 is 12mils * 616mils.

3.Z_o of microstrip line ML2/ML3 is 50 ohm.

Typical Characteristics

410MHz,Vcc=3.5V,Pin=5dBm,Vapc=1.4V

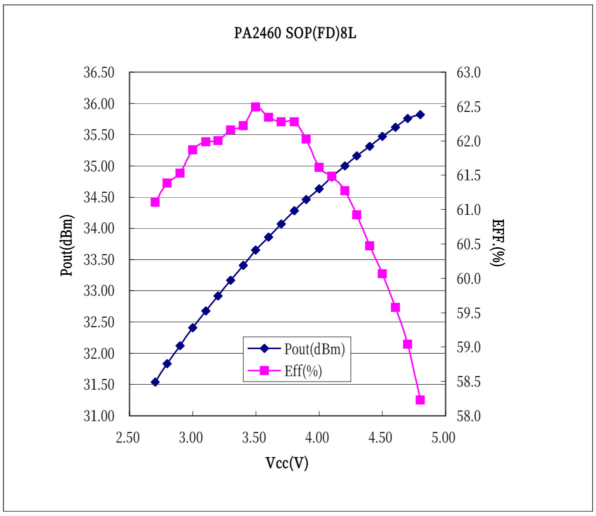


Fig 1.1 Power Output vs. Vcc

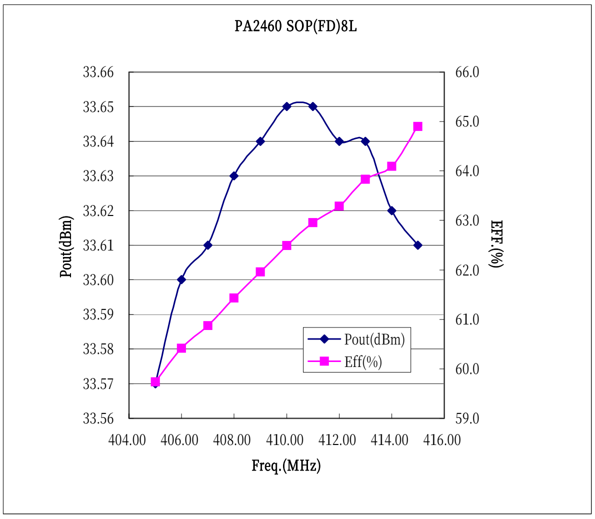


Fig 1.2 Power Output vs. Frequency

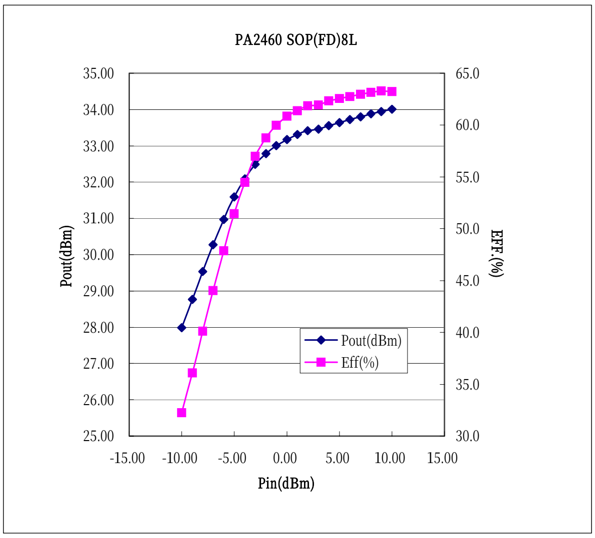


Fig 1.3 Power Output vs. Power Input

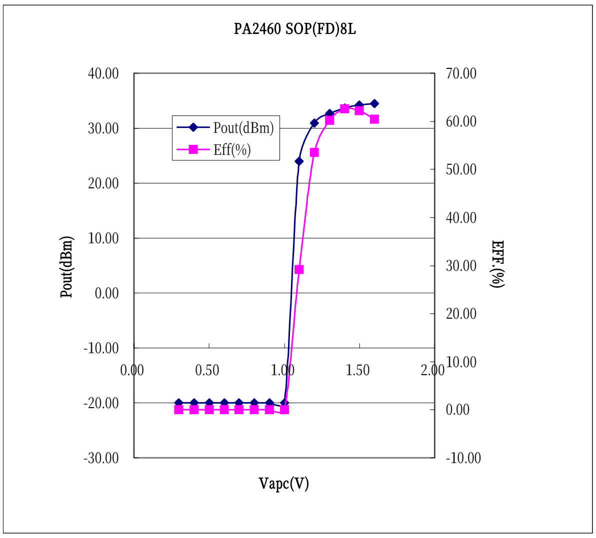


Fig 1.4 Power Output vs. Control Voltage

Typical Characteristics

465MHz,Vcc=3.5V,Pin=5dBm,Vapc=1.4V

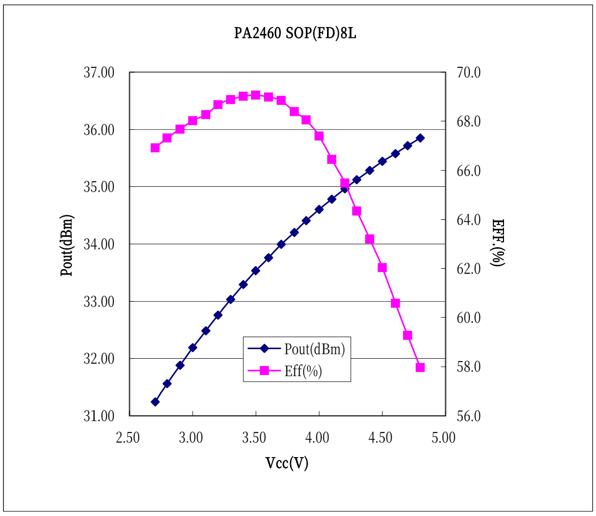


Fig 2.1 Power Output vs. Vcc

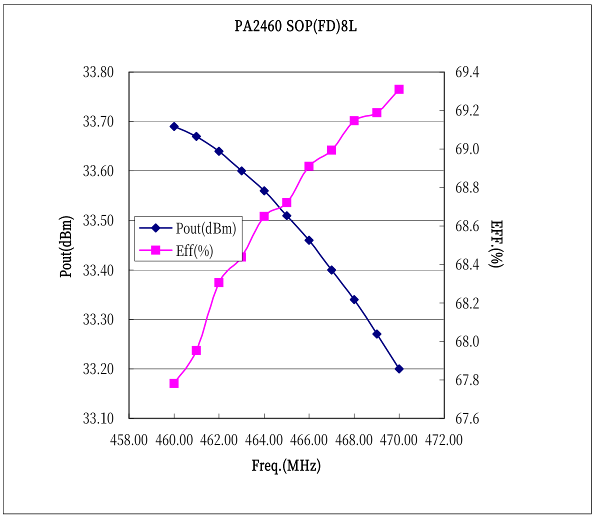


Fig 2.2 Power Output vs. Frequency

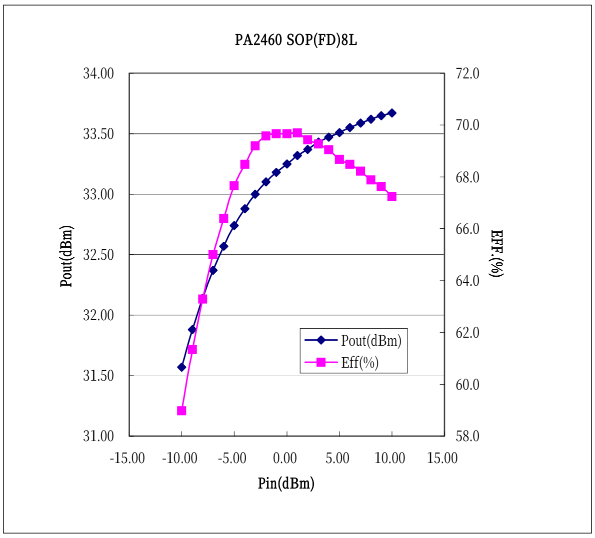


Fig 2.3 Power Output vs. Power Input

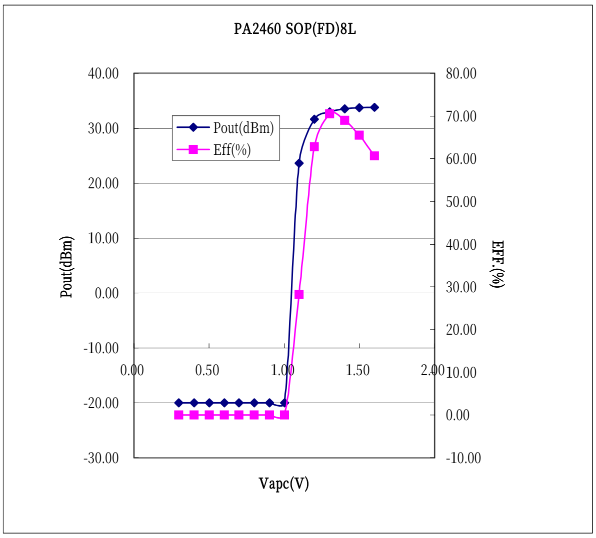


Fig 2.4 Power Output vs. Control Voltage

Typical Characteristics

410MHz,Vcc=6V,Pin=5dBm,Vapc=1.3V

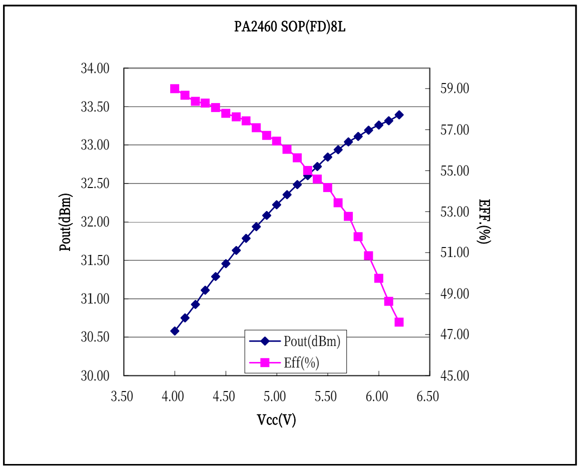


Fig 3.1 Power Output vs. Vcc

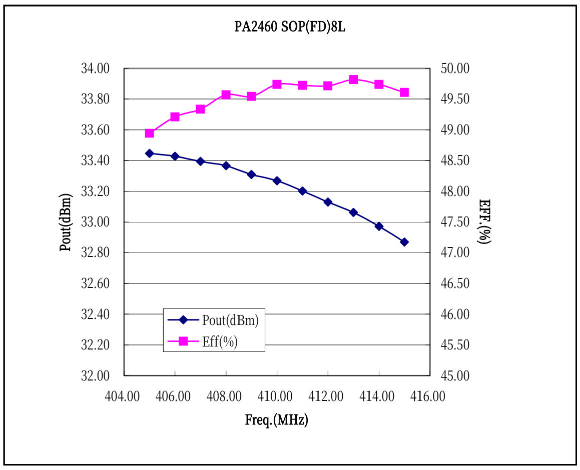


Fig 3.2 Power Output vs. Frequency

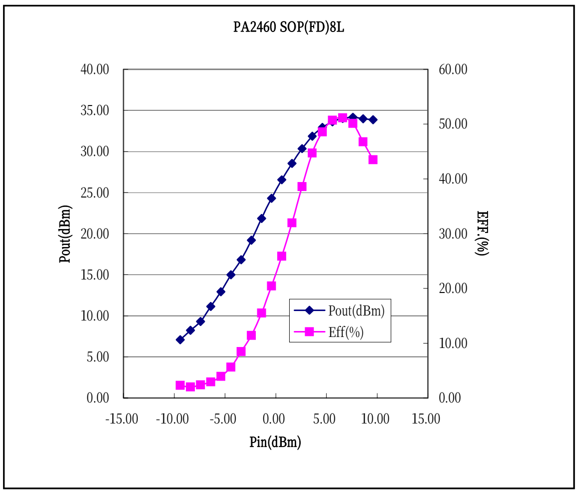


Fig 3.3 Power Output vs. Power Input

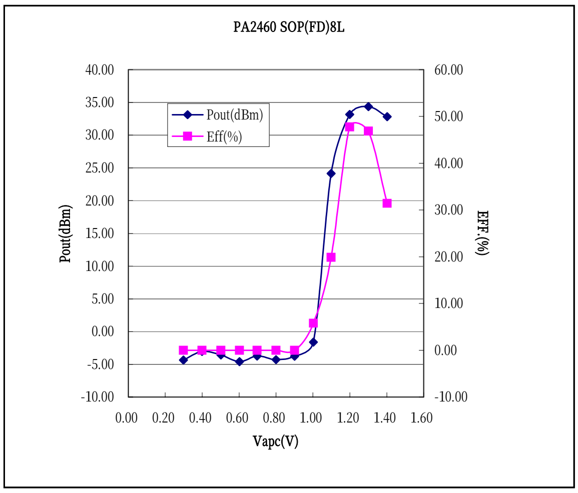


Fig 3.4 Power Output vs. Control Voltage

Typical Characteristics

465MHz,Vcc=6V,Pin=5dBm,Vapc=1.3V

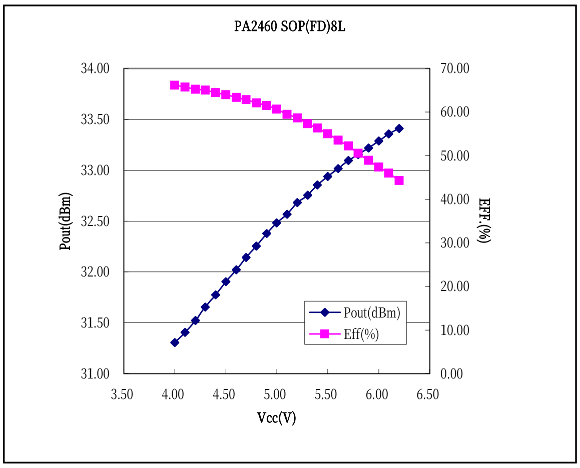


Fig 4.1 Power Output vs. Vcc

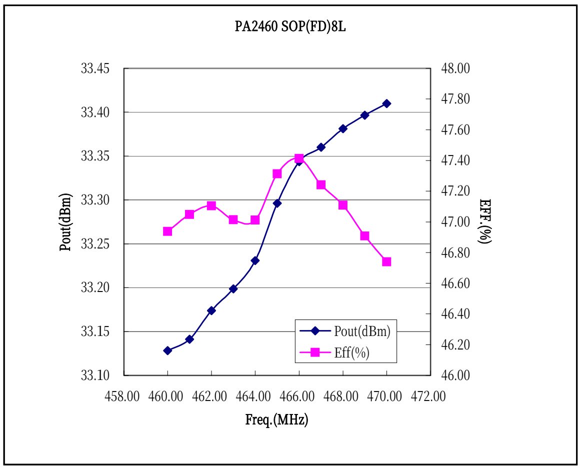


Fig 4.2 Power Output vs. Frequency

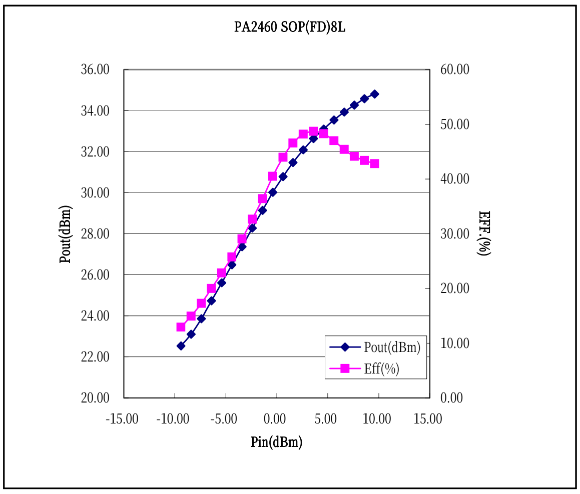


Fig 4.3 Power Output vs. Power Input

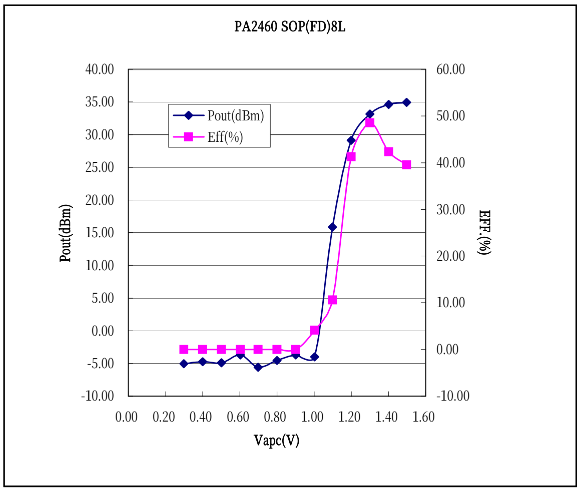


Fig 4.4 Power Output vs. Control Voltage

Application Circuit

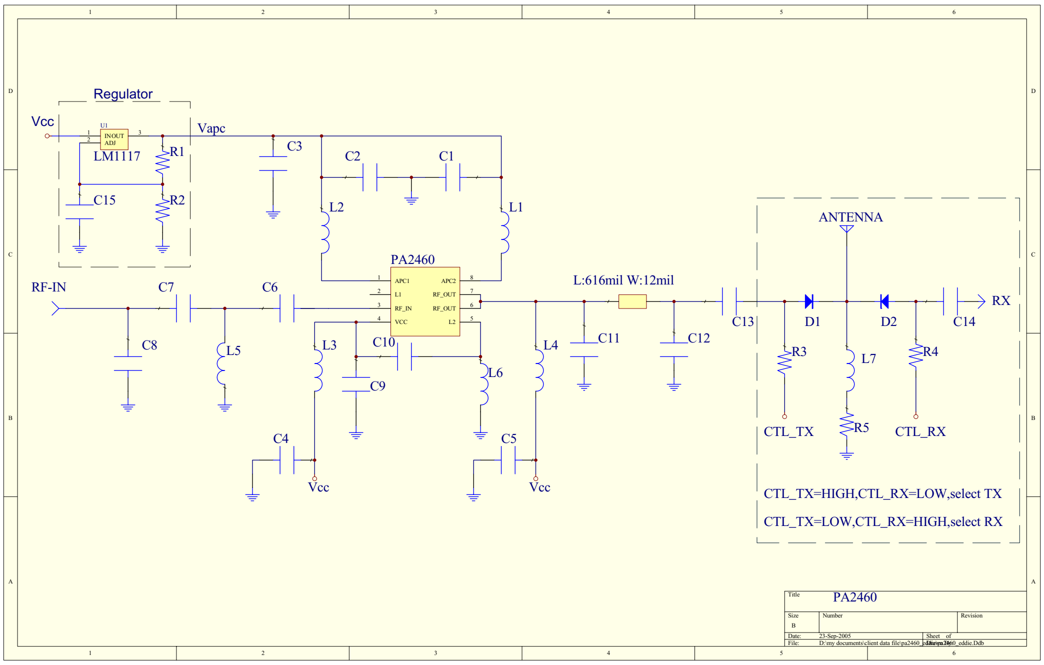


Fig 5

1.L7 > 120nH for RF choking.

2.Use R3 and R4 to adjust diode bias currents for low loss (~0.5dB loss at 1.1mA). And R3 and R4 must be large enough to provide an open to RF.

3.When CTL_TX is high and CTL_RX is low (select TX), then D1 is on and R5 provides a reverse bias voltage to turn off D2,and thus provides RX/TX isolation.

4.Since Pout is sensitive to Vapc, it is recommended to use a regulator to provide the Vapc voltage.

Application Circuit

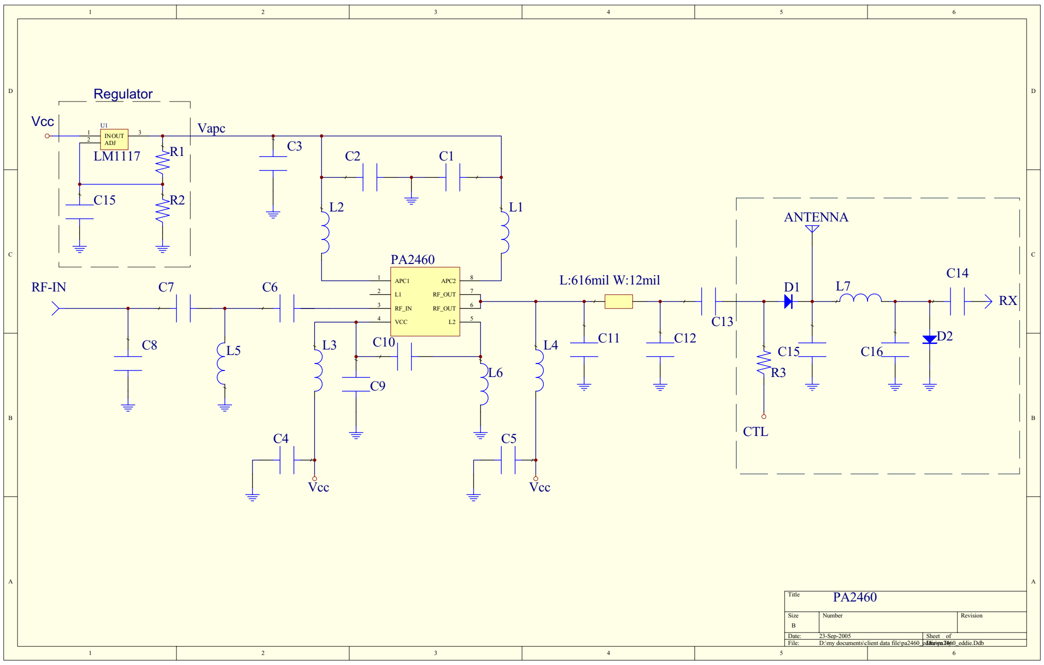


Fig 6

1.L7,C15 and C16 form an equivalent circuit of 1/4 wave length.

$L7=Z_0 / (2\pi f_0)$

$C15=C16=1/(2\pi f_0 Z_0)$

2.Use R3 to adjust diode bias current for low loss (~0.5dB loss at 1.1mA). And R3 must be large enough to provide an open to RF.
3.When CTL goes high (select TX), D1 and D2 are forward biased. L7/C15/ C16 combined with D2 make an open circuit to TX. When CTL goes low (select RX),D1 and D2 are off, and D1 provides an open to RX.
4.Since Pout is sensitive to Vapc, it is recommended to use a regulator to provide the Vapc voltage.

Application Circuit

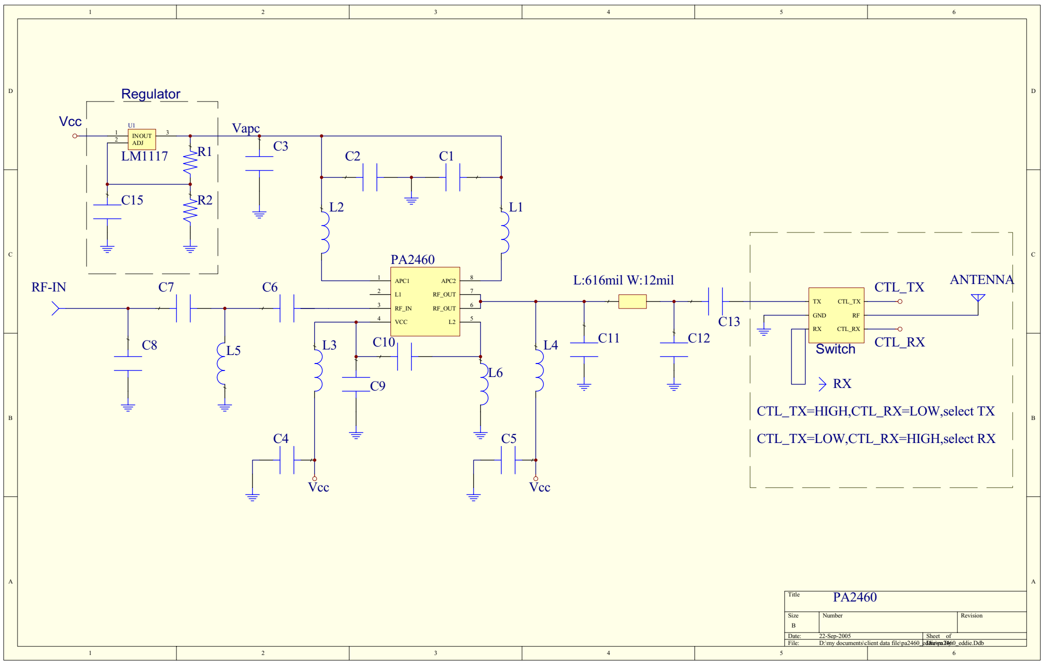


Fig 7

1.Since Pout is sensitive to Vapc, it is recommended to use a regulator to provide the Vapc voltage.

2.The loss of switch is around 0.5dB.