



LDMOS 射频功率晶体管

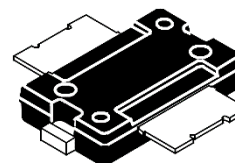
1. 产品特性

- 静电保护
- 高效率
- 高增益
- 高耐用性
- 优异的热稳定性

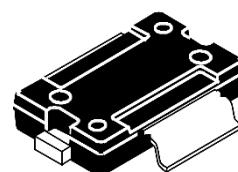
2. 产品应用

- CDMA
- W-CDMA
- GSM EDGE
- MC-GSM
- TDD/FDD LTE
- WiMAX

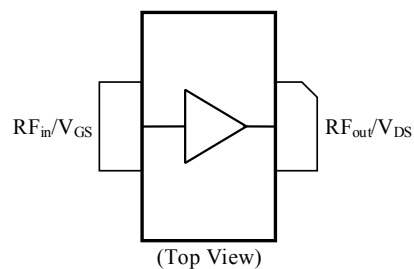
HTN7G21S040P



封装: TO-270



封装: TO-270-A



引脚连接

3. 典型性能

HTN7G21S040P 40W 射频功率晶体管是基站用 700-2100 MHz 频率范围内。

表 1. 测试条件: $V_{DD}=28V_{dc}$, $I_{DQ}=360mA$, Pulsed CW Signal, 基于华太 Demo PA 测试板。

Freq(MHz)	Gain(dB)	P1dB(dBm)	$\eta_D@P1dB(\%)$	P3dB(dBm)	$\eta_D@P3dB(\%)$
1800	15.5	46.3	47.4	47.6	52.3
1840	16.2	46.1	50.9	47.2	54.8
1880	16.0	45.6	52.7	46.5	56.4

表 2. 测试条件: $V_{DD}=28Vdc$, $I_{DQ}=360mA$, $P_{out}=36.0dBm$ (3.98W) Avg., Single Carrier W-CDMA, Input Signal PAR=9.9 dB @0.01%Probability on CCDF, 基于华太 Demo PA 测试板。

Freq(MHz)	Gain(dB)	η_D (%)	ACPR(dBc)	IRL(dB)
1800	15.4	15.4	-48	-8
1840	16.1	16.5	-47	-10
1880	15.9	17.6	-45	-7

4. 极限参数

表 3. 极限参数

参数	符号	值	单位
漏源电压	V_{DSS}	-0.5, +65	Vdc
栅源电压	V_{GS}	-5.0, +10	Vdc
工作电压	V_{DD}	28, +0	Vdc
温度存储	T_{stg}	-55 to +150	°C
工作封装温度	T_c	-40 to +150	°C
工作结温	T_J	-40 to +225	°C

5. 热性能

表 4. 热性能

参数	符号	条件	典型值	单位
热阻 (管芯至封装管脚)	$R_{\theta JC}$	封装管脚温度: 50°C CW 输出功率: 40W	0.84	°C/W

6. 电学特性

表 5. 直流特性

参数	符号	测试条件	最小值	典型值	最大值	单位
击穿电压	$V_{(BR)DSS}$	$V_{GS}=0V; I_D=48\mu A$	65	-	-	V
开启电压	$V_{GS(th)}$	$V_{DS}=V_{GS}; I_D=48\mu A$	1	1.3	1.6	V
漏极漏电流	I_{DSS}	$V_{DS}=65V; V_{GS}=0V$	-	-	10	μA
栅极漏电流	I_{GSS}	$V_{DS}=0V; V_{GS}=5V$	-	-	1	μA

表 6. ESD 特性

测试方法	等级
HBM (参考 JESD22-A114)	1B
MM (参考 EIA/JESD22-A115)	A
CDM (参考 JESD22-C101)	III

表 7. 负载失配测试 (基于华太 Demo PA 测试板)

测试条件	测试结果
VSWR=10:1, at all Phase Angles CW: $V_{DD}=28Vdc, I_{DQ}=360mA, f=1840MHz, P_{out}=47.0dBm$.	晶体管性能不变

7. Load-Pull 测试数据

Load-Pull 最大功率点特性

测试条件: 28V 漏极电压, 300mA 静态电流, 脉冲连续波信号, 40us 脉宽, 4% 占空比

f (MHz)	Z _{source} (Ω)	Max Output Power				
		P1dB				
		Z _{load} (Ω)	Gain (dB)	(dBm)	(W)	η _D (%)
1400	0.72-j2.49	2.89-j0.40	20.55	47.23	52.84	55.14
1800	0.82-j2.11	2.46-j2.50	18.63	47.04	50.58	54.55
2110	0.88-j4.65	1.87-j1.85	17.60	46.09	40.64	53.32

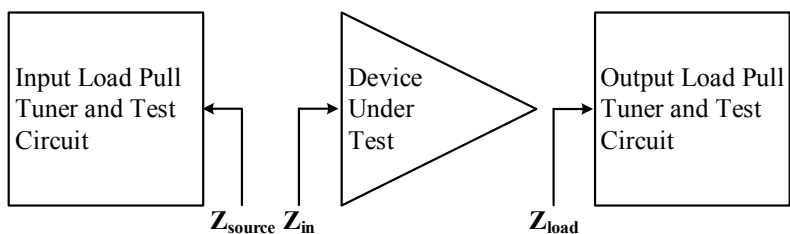
f (MHz)	Z _{source} (Ω)	Max Output Power				
		P3dB				
		Z _{load} (Ω)	Gain (dB)	(dBm)	(W)	η _D (%)
1400	0.72-j2.49	2.91-j0.85	20.12	48.53	71.29	57.91
1800	0.82-j2.11	2.47-j2.74	18.31	48.41	69.34	57.52
2110	0.88-j4.65	1.98-j2.15	17.07	47.65	58.21	56.24

Load-Pull 最大效率点特性

测试条件: 28V 漏极电压, 300mA 静态电流, 脉冲连续波信号, 40us 脉宽, 4% 占空比

f (MHz)	Z_{source} (Ω)	Max Drain Efficiency				
		P1dB				
		Z_{load} (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)
1400	0.72-j2.49	2.17+j1.73	22.53	45.52	35.65	64.25
1800	0.82-j2.11	1.09-j1.00	20.90	45.70	37.15	62.68
2110	0.88-j4.65	1.79-j1.17	18.99	45.72	37.33	58.85

f (MHz)	Z_{source} (Ω)	Max Drain Efficiency				
		P3dB				
		Z_{load} (Ω)	Gain (dB)	(dBm)	(W)	η_D (%)
1400	0.72-j2.49	2.73+j1.22	22.14	47.33	54.08	67.26
1800	0.82-j2.11	1.09-j1.04	20.80	46.55	45.19	65.97
2110	0.88-j4.65	1.76-j1.35	18.64	46.98	49.89	62.55



8. 参考设计

8.1 1800-1880MHz

8.1.1 电路设计版图及元件清单

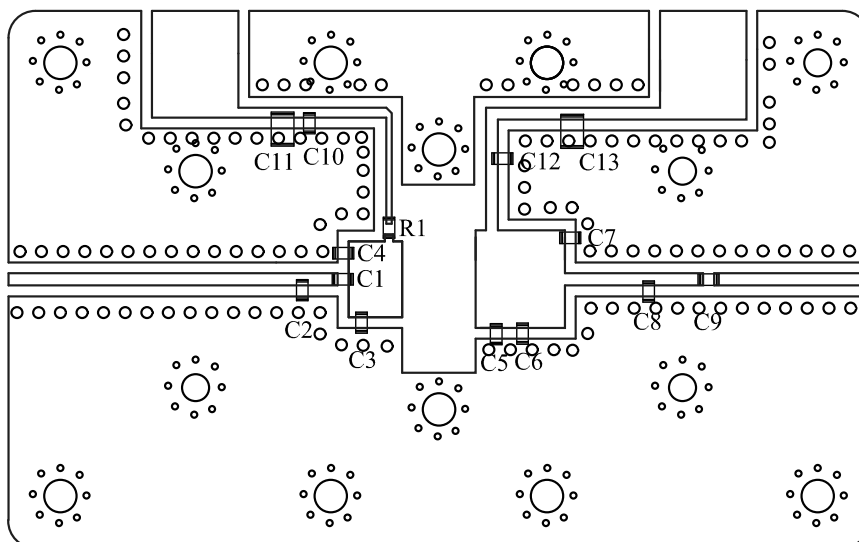


图 1. HTN7G21S040P 测试电路元件布局—1800-1880MHz

表 8. 参考设计电路元件清单

Part	Description	Part Number	Manufacturer
C1, C9, C10, C12	10pF Chip Capacitors	600S100BT260XT	ATC
C2, C4	2pF Chip Capacitors	600S2R0BT260XT	ATC
C3, C5, C6, C7	3.3pF Chip Capacitors	600S3R3BT260XT	ATC
C8	1pF Chip Capacitors	600S1R0BT260XT	ATC
C11, C13	10uF 50V Chip Capacitor	1210	Arbitrary
R1	10ohm Chip Resistor	0603	Arbitrary
PCB	Rogers RO4350B, H=20mil, $\epsilon_r=3.6$	-	ROGERS

8.1.2 测试数据图

连续波

测试条件: $V_{DD}=28Vdc$, $I_{DQ}=360mA$, CW Signal.

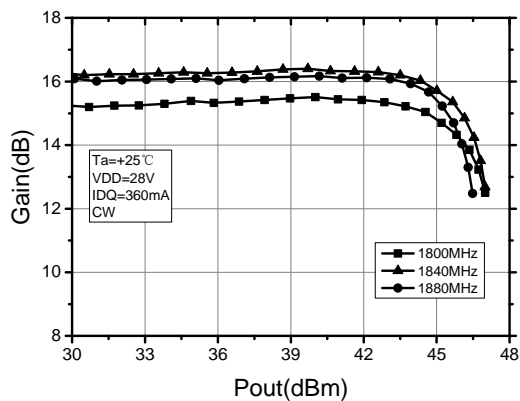


图 2. Gain vs Pout

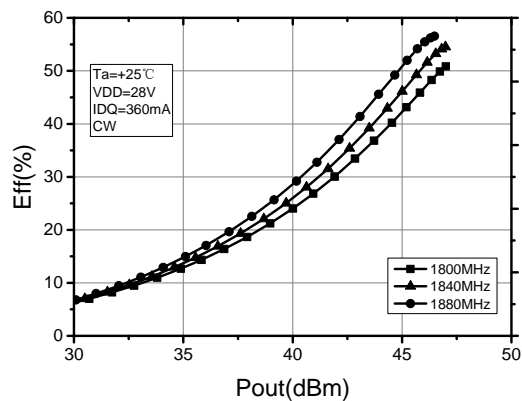


图 3. Drain Efficiency vs Pout

脉冲波

测试条件: $V_{DD}=28Vdc$, $I_{DQ}=360mA$, Pulsed CW Signal.

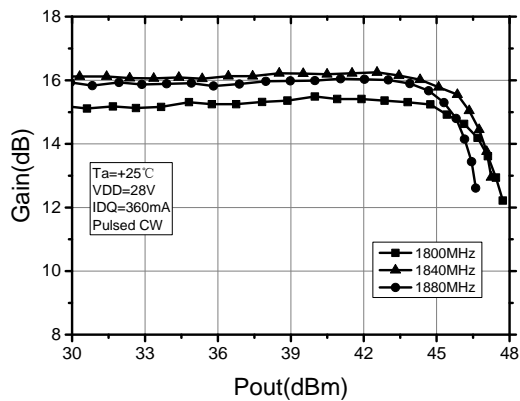


图 4. Gain vs Pout

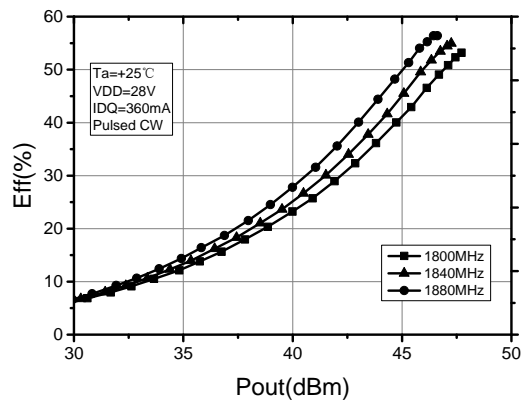


图 5. Drain Efficiency vs Pout

单载波 W-CDMA

测试条件: $V_{DD}=28Vdc$, $I_{DQ}=360mA$, Single Carrier W-CDMA, Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF.

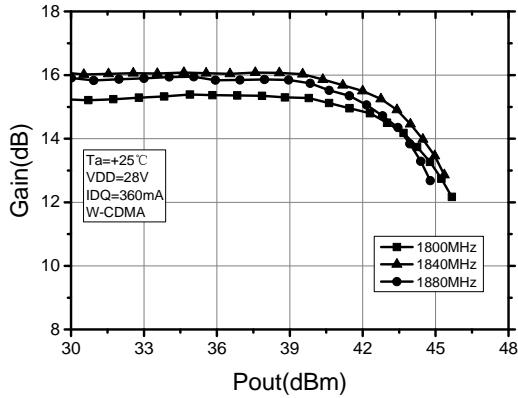


图 6. Gain vs Pout

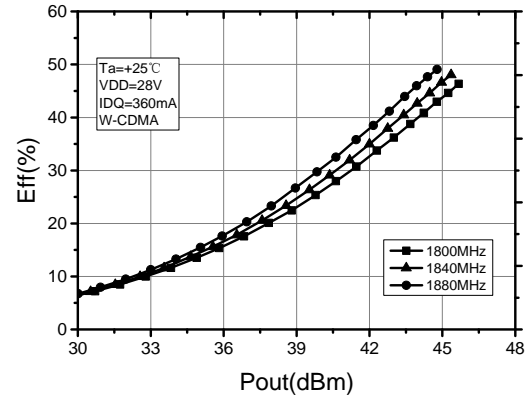


图 7. Drain Efficiency vs Pout

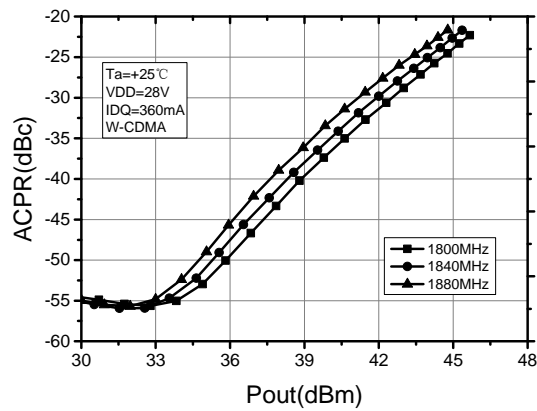
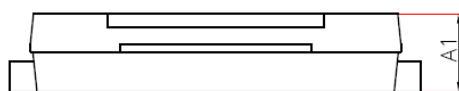
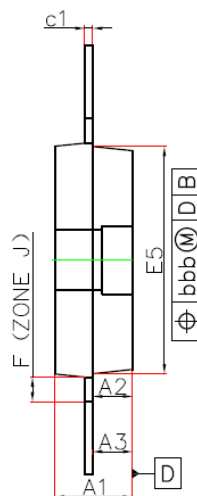
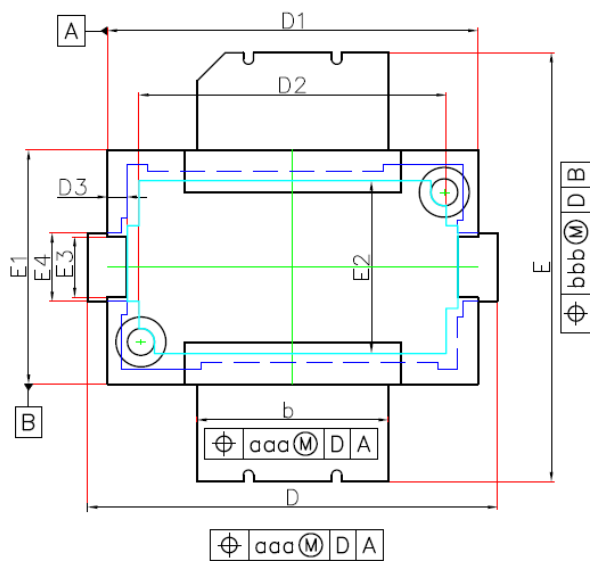


图 8. ACPR vs Pout

9. 封装尺寸及管脚分布

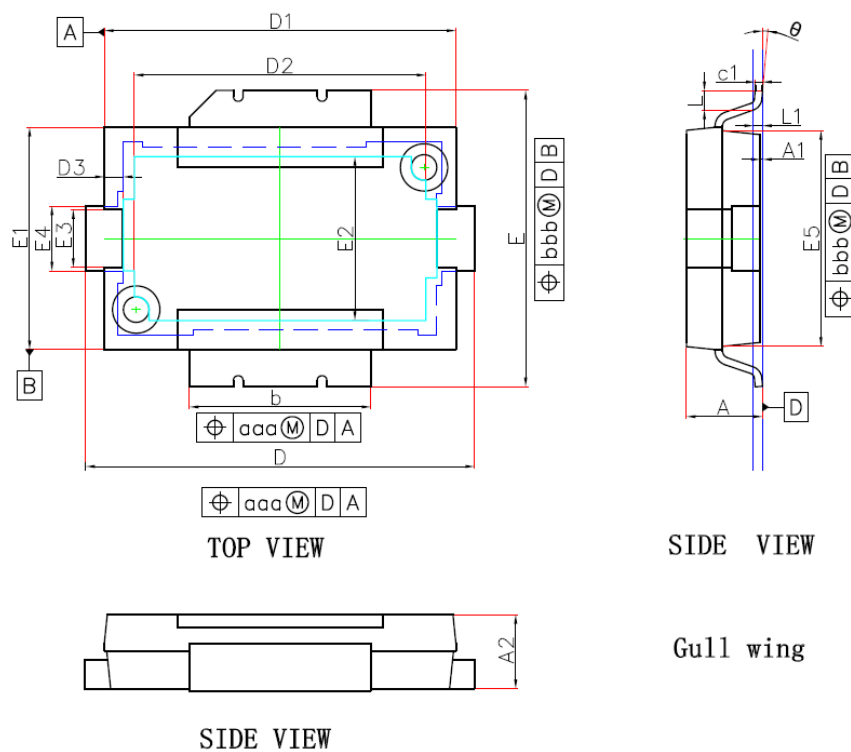


SIDE VIEW

Straight lead

Remark: A2 applies within zone J only

Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min.	Max.	Min.	Max.
A1	1.980	2.080	0.078	0.082
A2	1.020	1.070	0.040	0.042
A3	0.990	1.090	0.039	0.043
D	10.570	10.770	0.416	0.424
D1	9.600	9.700	0.378	0.382
D2	7.370MIN		0.290MIN	
D3	0.410	0.610	0.016	0.024
E	11.080	11.280	0.436	0.444
E1	6.050	6.150	0.238	0.242
E2	3.810MIN		0.150MIN	
E3	1.480	1.680	0.058	0.066
E4	1.680	1.880	0.066	0.074
E5	5.870	5.970	0.231	0.235
F	0.640BSC		0.025BSC	
b	4.900	5.060	0.193	0.199
c1	0.203REF		0.080REF	
aaa	0.100		0.004	
bbb	0.200		0.008	



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min.	Max.	Min.	Max.
A	1.960	2.230	0.077	0.088
A1	0.020	0.100	0.001	0.004
A2	1.980	2.080	0.078	0.082
D	10.570	10.770	0.416	0.424
D1	9.600	9.700	0.378	0.382
D2	7.370MIN		0.290MIN	
D3	0.410	0.610	0.016	0.024
E	8.030	8.230	0.316	0.324
E1	6.050	6.150	0.238	0.242
E2	3.810MIN		0.150MIN	
E3	1.480	1.680	0.058	0.066
E4	1.680	1.880	0.066	0.074
E5	5.870	5.970	0.231	0.235
b	4.900	5.060	0.193	0.199
c1	0.180	0.230	0.230 0.007	0.009
L	0.460	0.610	0.610 0.018	0.024
L1	0.260BSC		0.010BSC	
θ	2°	8°	2°	8°
aaa	0.100		0.004	
bbb	0.200		0.008	