

Description

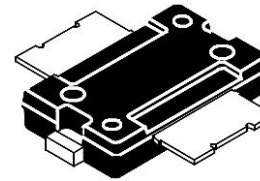
The HTN7G09S060P is an unmatched discrete LDMOS Power Amplifier with 60W saturated output power covering frequency range from 700 - 960 MHz.

Features

- Operating Frequency Range: 700 - 960 MHz
- Operating Drain Voltage: +48V
- Saturation Output Power: 60W
- Power Average: 8W
- Excellent thermal stability due to low thermal resistance package
- Enhanced robustness design without device degradation
- Internally integrated enhanced ESD design

Applications

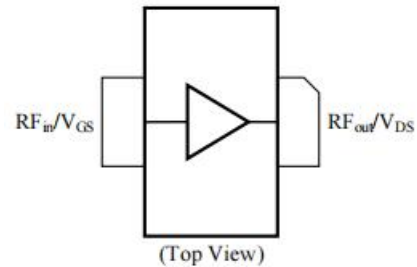
- CDMA
- W-CDMA
- GSM EDGE
- MC-GSM
- TDD/FDD LTE
- WiMAX



TO-270



Over-Molded 2 leads (Straight)



Note: Exposed backside of the package is the source terminal for the transistor

Pin Connections

Ordering Information

Part Number	Description
HTN7G09S060P	Reel Package
HTN7G09S060PEVB	700 - 960 MHz EVB

Typical Performance

RF Characteristics (WCDMA)

Freq (MHz)	Gain (dB)	Eff (%)	ACPR_L* @5MHz (dBc)	IRL (dB)
920	22.1	19.0	-45.3	10
940	21.8	19.5	-46.3	12
960	21.0	20.7	-47.8	8

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ= 550mA, PAVG = 39 dBm (7.94W), 1C-WCDMA 5MHz Signal, 9.9 dB PAR @ 0.01% CCDF test on WATECH Application Board

*Uncorrected DPD

Absolute Maximum Ratings

Parameter	Range/Value	Unit
Drain voltage (V _{DSS})	-0.5, +65	V
Gate voltage (V _{GS})	-5 to +10	V
Operation voltage (V _{DD})	+0 to +28	V
Storage Temperature (T _{STG})	-55 to +150	°C
Cases Temperature (T _c)	-40 to +150	°C
Junction Temperature (T _J)	-40 to +225	°C

Electrical Specification

DC Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Breakdown Voltage V _{(BR)DSS}	V _{gs} =0V, I _{ds} =48uA	65	-	-	V
Gate-Source Threshold Voltage V _{GS(th)}	V _{ds} =V _{gs} , I _{ds} =48uA	0.8	1.3	1.8	V
Drain Leakage Current I _{DSS}	V _{gs} =0V, V _{ds} =65V	-	-	10	uA
Gate Leakage Current I _{GSS}	V _{gs} =5V, V _{ds} =0V	-	-	1	uA



Load Mismatch Test

Condition	Test Result
VSWR=10:1, at all Phase Angles, VDD = +28Vdc, IDQ= 400mA, CW signal 100W @940 MHz test on WATECH Application Board	No Device Degradation

Thermal Information

Parameter	Condition	Value (Typ)	Unit
Thermal Resistance Junction to Case (R _{TH})	T _{CASE} = 60°C, VDD = +28Vdc, IDQ= 400mA, CW signal 60W	0.95	°C /W

Load Pull Performance for Maximum Power (P1dB/P3dB)

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ= 400mA, PW = 40us, DC= 4%

Max Output Power P1dB						
Freq (MHz)	Z _{source} (Ω)	Z _{load} [1] (Ω)	Gain (dB)	P1dB (dBm)	P1dB (W)	Eff (%)
920	0.78-j*0.90	2.22-j*0.20	22.0	49.87	97.05	56.92
1400	0.74-j*3.05	1.59-j*0.93	19.27	49.67	92.68	58.91
1800	0.34-j*3.35	1.33-j*2.96	16.70	48.96	78.70	52.68

[1] Load impedance for optimum P1dB pout

Max Output Power P3dB						
Freq (MHz)	Z _{source} (Ω)	Z _{load} [2] (Ω)	Gain (dB)	P3dB (dBm)	P3dB (W)	Eff (%)
920	0.78-j*0.90	2.26-j*0.65	22.02	50.89	122.74	61.81
1400	0.74-j*3.05	1.66-j*1.29	18.89	50.77	119.40	60.61
1800	0.34-j*3.35	1.57-j*3.12	16.68	50.13	103.04	55.67

[2] Load impedance for optimum P3dB pout

Load Pull Performance for Maximum Efficiency (P1dB/P3dB)

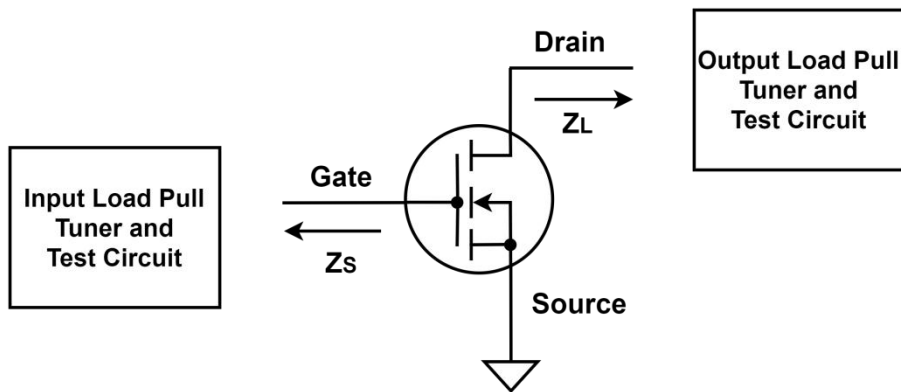
Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ= 400mA, PW = 40us, DC= 4%

Max Efficiency P1dB						
Freq (MHz)	Z _{source} (Ω)	Z _{load} [1] (Ω)	Gain (dB)	P1dB (dBm)	P1dB (W)	Eff (%)
920	0.78-j*0.90	2.56+j*1.75	24.74	48.22	66.37	72.51
1400	0.74-j*3.05	1.54+j*0.34	21.48	47.57	57.15	69.45
1800	0.34-j*3.35	1.08-j*2.06	18.96	47.57	57.15	59.14

[1] Load impedance for optimum P1dB efficiency

Max Efficiency P3dB						
Freq (MHz)	Z _{source} (Ω)	Z _{load} [2] (Ω)	Gain (dB)	P3dB (dBm)	P3dB (W)	Eff (%)
920	0.78-j*0.90	2.31+j*1.06	24.70	49.24	83.95	76.91
1400	0.74-j*3.05	1.61+j*0.04	21.00	49.33	85.70	71.75
1800	0.34-j*3.35	1.29-j*2.37	18.19	49.32	85.51	61.43

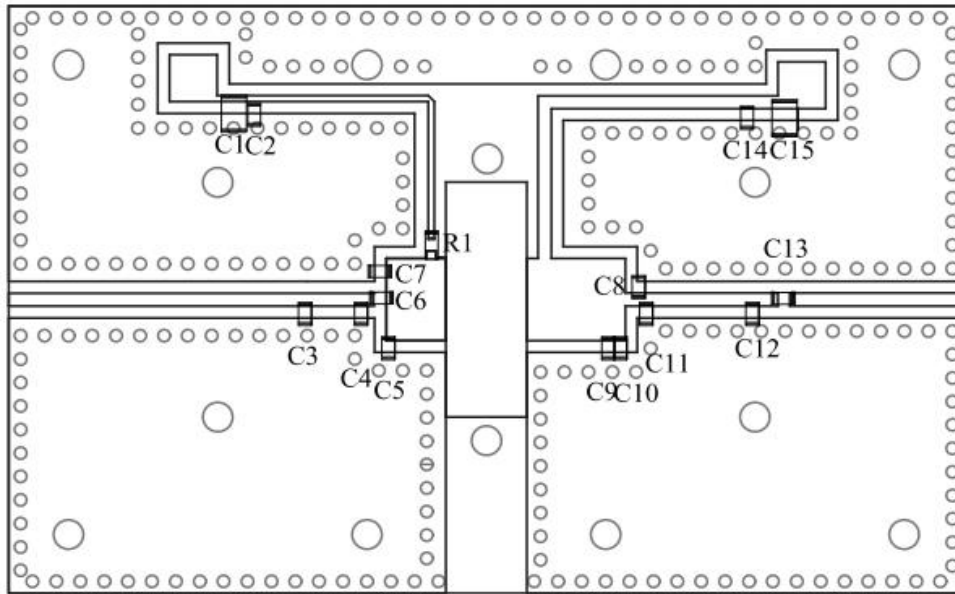
[2] Load impedance for optimum P3dB efficiency



Z_{source} : Measured impedance presented to the input of the device at the package reference plane

Z_{load} : Measured impedance presented to the output of the device at the package reference plane

HTN7G09S060P 920 - 960 MHz Reference Design



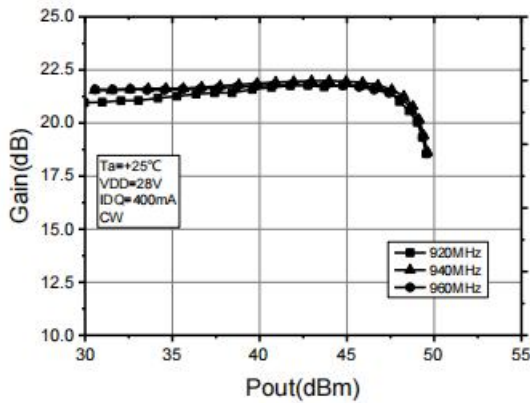
EVB Layout

Bill of Materials (BoM) - HTN7G09S060P

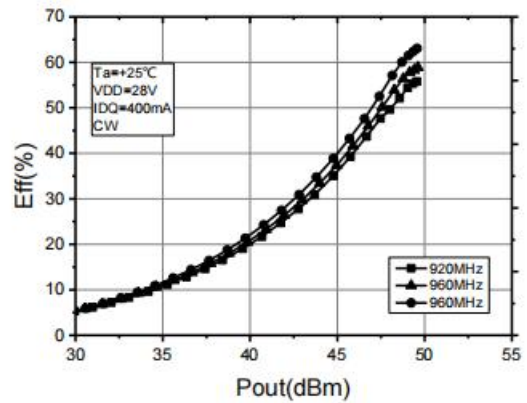
920 - 960 MHz Reference Design

Reference	Value	Description	Manufacturer	P/N
Q1	-	60W, 700 - 960 MHz LDMOS PA	Watech	HTN7G09S060P
C2, C6, C13, C14	47pF	MLCC	ATC	600S470BT260XT
C3, C4, C5, C7, C8	8p2F	MLCC	ATC	600S8R2BT260XT
C11, C12	4p3F	MLCC	ATC	600S4R3BT260XT
C9	2p5F	MLCC	ATC	600S2R5BT260XT
C10	2pF	MLCC	ATC	600S2R0BT260XT
C15	10uF	MLCC	Murata	GRM32EC72A106KE05
C1	4u7F	MLCC	Murata	GRM31CR71H475KA12L
R1	10Ω	Thick Film Resistor	YAGEO	RC0603FR-0710RL
PCB	Rogers4350B (er = 3.66), 30 mil (0.762 mm), 35 μm (1oz)			

Performance Plots

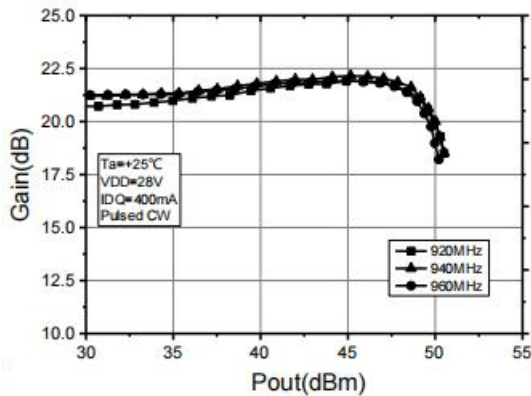


CW, Gain vs Pin

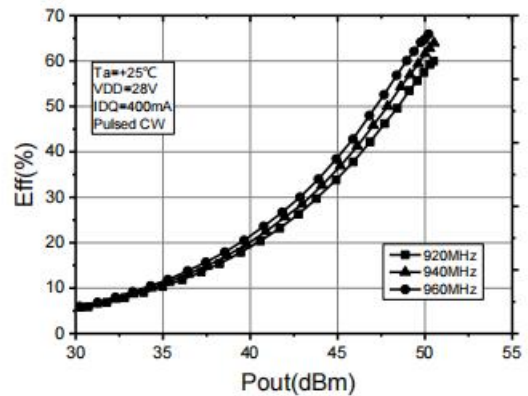


CW, Efficiency vs Pout

Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ=400mA test on WATECH Application Board



Pulsed CW, Pout vs Pin



Pulsed CW, Efficiency vs Pout

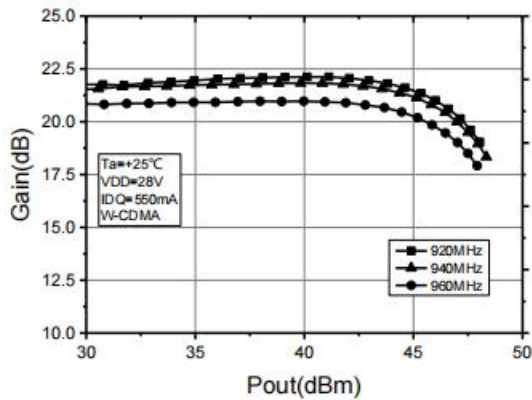
Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ=400mA, PW = 100us, DC= 10% test on WATECH Application Board



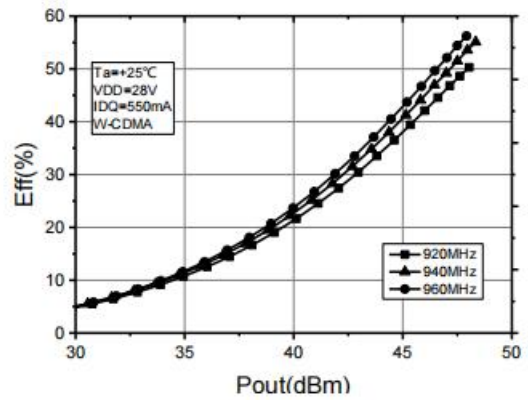
HTN7G09S060P

60W, 700 - 960 MHz LDMOS Amplifier

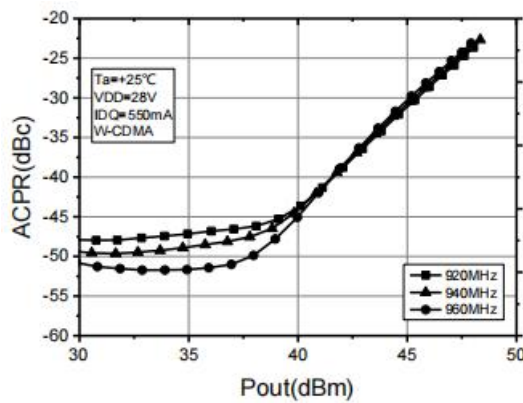
Product datasheet



WCDMA, Gain vs Pout

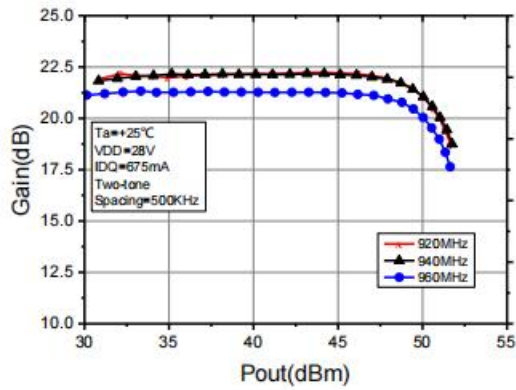


WCDMA, Efficiency vs Pout

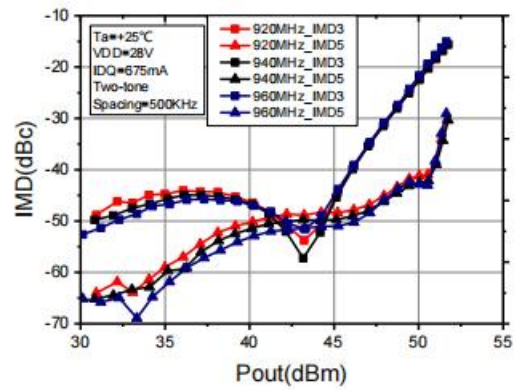


WCDMA, ACPR_5MHz, ACPR_10MHz vs Pout

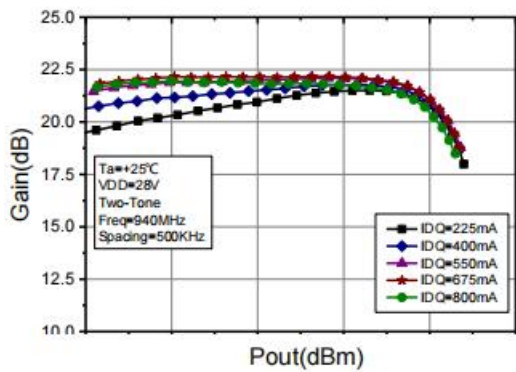
Test conditions unless otherwise noted: 25°C , $V_{DD} = +28\text{Vdc}$, $I_{DQ} = 550\text{mA}$, 1C-WCDMA 5MHz Signal, 9.9 dB PAR @ 0.01% CCDF test on WATECH Application Board



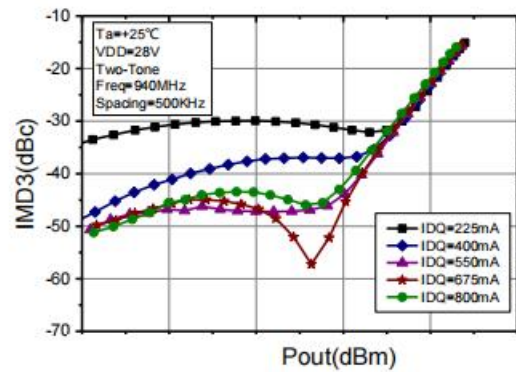
Two Tones Gain vs Pout (PEP) @ Freq's



Two Tones IMD vs Pout (PEP) @ Freq's



Two Tones Gain vs Pout (PEP) @ Idq's



Two Tones IMD vs Pout (PEP) @ Idq's

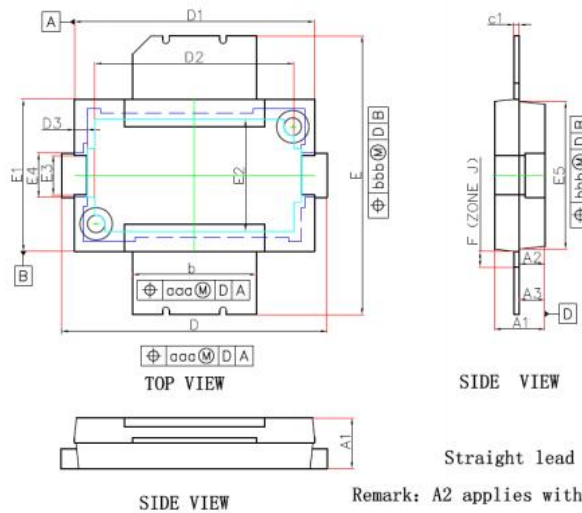
Test conditions unless otherwise noted: 25 °C, VDD = +28Vdc, IDQ=675mA, Two tone Test, Carrier Spacing @500KHz test on WATECH Application Board

Package Marking and Dimensions

TBD

- Line1 (fixed): Device name in W/O
 - Line2 (unfixed): Marking Lot No in W/O (Sample: E596-20140001)
 - Line3 (unfixed): Date Code + JY
- This Marking SPEC only stipulates the content of Marking. For marking requirements such as font and size, please refer to the latest version of “Watech Product Printing Specification”

Marking



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	

Package Dimensions

Tape and Reel Information


TBD

TBD

Tape & Reel Packaging Descriptions

Handling Precautions

Parameter	Grade
Moisture Sensitivity Level MSL	3

Parameter	Rating	Standard	
ESD – Human Body Model (HBM)	Class 1B	JESD22-A114	
ESD – Human Body Model (MM)	Class A	EIA/JESD22-A115	
ESD – Charged Device Model (CDM)	Class III	JESD22-C101	

RoHS Compliance

This product is compliant with the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU.

Datasheet Status

Document status	Product status	Definition
Objective Datasheet	Design simulation	Product objective specification
Preliminary Datasheet	Customer sample	Engineering samples and first test results
Product Datasheet	Mass production	Final product specification

Abbreviations

Acronym	Definition
LDMOS	Laterally-Diffused Metal-Oxide Semiconductor
CW	Continuous Waveform



Revision history

Document ID	Datasheet Status	Release Date	Revision Version
Rev X.X	TBD	TBD	TBD
Rev X.X	TBD	TBD	TBD
Rev X.X	TBD	TBD	TBD
Rev 2.1	Product	TBD	TBD
Rev 2.2	Product	March 2023	New format based on English version datasheet



HTN7G09S060P

60W, 700 - 960 MHz LDMOS Amplifier

Product datasheet

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations and information about WATECH:

- Web: www.watechelectronics.com
- Email: MKT@huatai-elec.com

For technical questions and application information:

- Email: MKT@huatai-elec.com

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