HOPERF

RF Power Field Effect Transistor

HPL09S0P5N

N-Channel Enhancement-Mode MOSFET

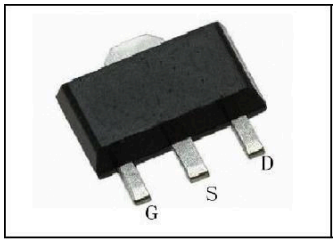
136–941 MHz, 0.5 W, 3.7 V
BROADBAND RF
POWER TRANSISTOR

Designed for handheld two–way radio applications with frequencies from 136 to 941 MHz. The high gain, ruggedness and Broadband performance of this device make it ideal for large–signal, common–source amplifier applications in handheld radio equipment.

Typical Broadband EVB Performance (I_{DQ}=200mA, T_A = 25℃, CW)

Freq.	V_{DD}	Gmax	Pout		PAE
[MHz]	[V]	[dB]	[dBm]	[Watts]	[%]
440	3.7	19.6	28.0	0.6	60.0
	4.5	20.0	29.6	0.9	60.1
	6.0	20.3	32.1	1.6	60.9

Capable of Handling 20:1 VSWR @ 6.0Vdc, 1.5Watts, CW



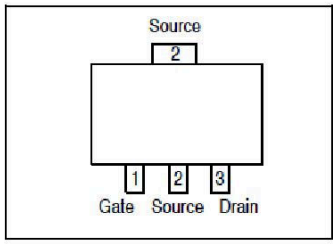


Figure 1. Pin Connections

Features

Characterized for Operation from 136 to 941 MHz
Unmatched Input and Output Allowing Broad Frequency Range Utilization
Integrated ESD Protection
Broadband – Full Power Across the Band
Exceptional Thermal Performance
Extreme Ruggedness

Typical Applications

Output Stage VHF Band Handheld Radio
Output Stage UHF Band Handheld Radio
Output Stage for 700–800 MHz Handheld Radio
Driver for 10–1000 MHz Applications

Table1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	–0.5, +20	Vdc
Gate-Source Voltage	V_{GS}	–0.5, +8	Vdc
Operating Voltage	V_{DD}	0, +6	Vdc
Storage Temperature Range	T_{stg}	–65 to +150	℃
Case Operating Temperature	T_C	–40 to +150	℃
Operating Junction Temperature	T_J	–40 to +150	℃
Power Dissipation @T_C=25℃	PD	3	W

Table 2. ESD Protection Characteristics

Test Methodology	Class
Human Body Model (per JESD22--A114)	2, passes 2500 V
Machine Model (per EIA/JESD22--A115)	A, passes 100 V
Charge Device Model (per JESD22--C101)	IV, passes 2000 V

Table 3. Electrical Characteristics (T_A=25℃ unless otherwise noted)

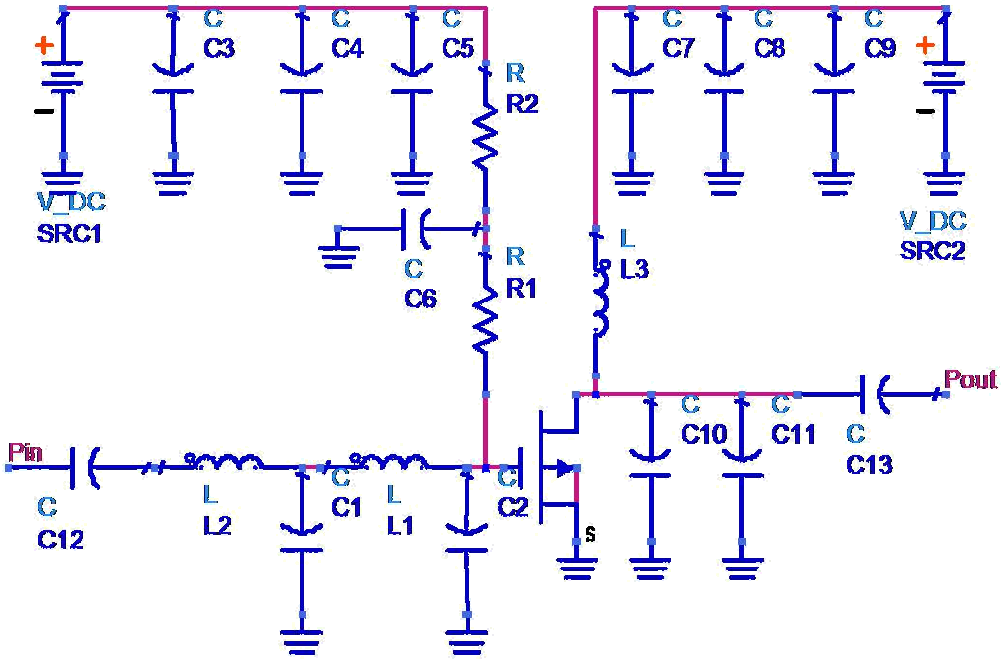
Characteristic	Symbol	Min	Typ.	Max	Unit
Off Characteristics					
Gate-Source Leakage Current (V_{GS}=5Vdc, V_{DS}=0Vdc)	I_{GSS}	-	-	500	nAdc
Zero Gate Voltage Drain Leakage Current (V_{DS}=16Vdc, V_{GS}=0Vdc)	I_{DSS}	-	-	1	μAdc
Zero Gate Voltage Drain Leakage Current (V_{DS}=3.7Vdc, V_{GS}=0Vdc)	I_{DSS}	-	-	500	nAdc
On Characteristics					
Gate Threshold Voltage (V_{DS}=3.7Vdc, I_D=1mA)	$V_{GS(th)}$	1.2	1.4	1.6	Vdc
Gate Quiescent Voltage (V_{DD}=3.7Vdc, I_D=200mA Measured in Functional Test)	$V_{GS(Q)}$	1.7	2.2	2.5	Vdc
Drain-Source On-Voltage (V_{GS}=8Vdc, I_D=200mA)	$V_{DS(ON)}$	-	0.12	-	Vdc
Dynamic Characteristics					
Reverse Transfer Capacitance (V_{DG}=3.7V, Level=30mVac@1MHz)	Crss	-	1.1	-	pF
Output Capacitance (V_{DS}=3.7V, Level=30mVac@1MHz)	Coss	-	5.0	-	pF
Input Capacitance (V_{GS}=5V, Level=30mVac@1MHz)	Ciss	-	17.4	-	pF

Typical Performances (In DuSemi Narrowband Test DEMO, 50 Ohm system)

Frequency=440MHz, V_{DD}=3.7Vdc, I_{DQ}=200mA, Pin=8dBm, T_A=25℃

Output Power	P_{out}	-	0.5	-	Watts
Power Gain	G_{PS}	-	20	-	dB
Drain Efficiency	η_D	-	60	-	%

Broadband Evaluation Circuit (f = 400 -470MHz)



Test Circuit Component Layout

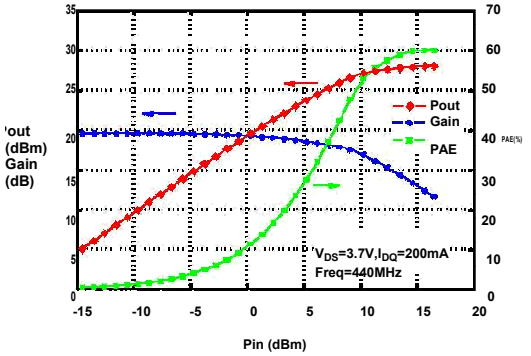
Table 5. Test Circuit Component Designations and Value

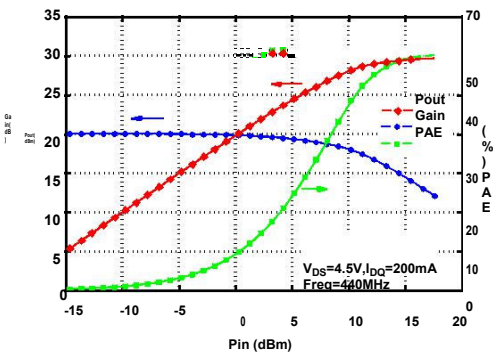
Part	Description	Part Number	Manufacturer
R1	470Ohm	—	—
R1	6.8KOhm	—	—
L1,L2	3.9nH	—	—
L3	8 Turns D: 0.5 mm, φ 2.4 mm Enamel Wire	—	—
C5, C6,C7,C12,C13	100pF Chip Capacitors	GQM21P5C1H101JB01	Murata
C1, C2	18pF Chip Capacitors	GRM1885C1H201JA01	Murata
C4,C8	1000pF Chip Capacitors	GRM1885C1H102JA01	Murata
C3,C9	10uF,25VChip Capacitors	—	—
C10	9pF Chip Capacitors	—	Murata
C11	4.3pF Chip Capacitors	—	Murata
PCB	FR-4 ,1.6mm,ε_r4.5	—	—

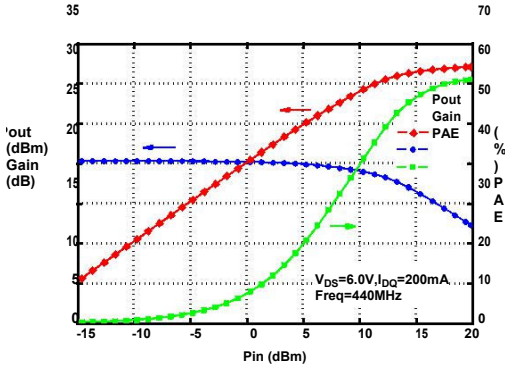
TYPICAL CHARACTERISTICS

1、Power Gain, Drain Efficiency and Output Power versus input power@440MHz

Freq	V_{DS}	$I_{DS(Q)}$	Pout		Gain	η_D
[MHz]	[V]	[mA]	[dBm]	[Watts]	[dB]	[%]
440	**3.7**	200	28.0	0.6	19.6	60.0
	4.5		29.6	0.9	20.0	60.1
	6.0		32.1	1.6	20.3	60.9

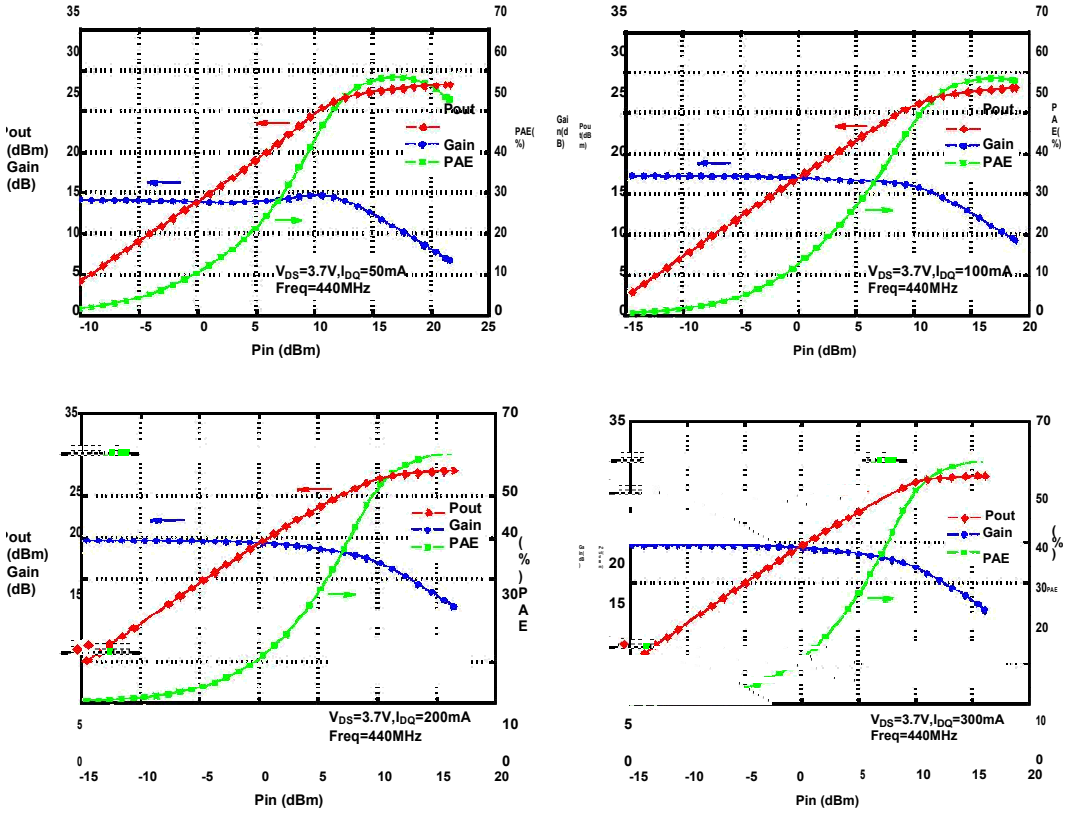






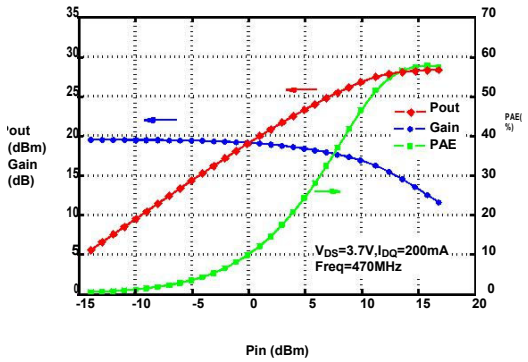
2、Power Gain, Drain Efficiency and Output Power versus Gate Quiescent Current @440MHz

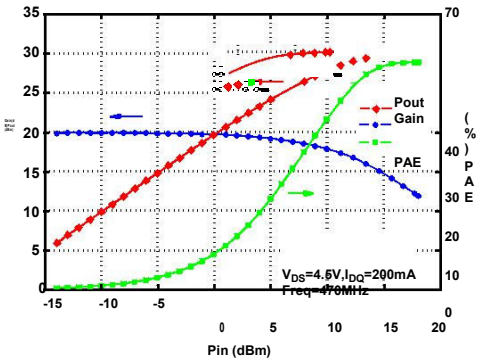
Freq	V_{DS}	$I_{DS(Q)}$	Pout		Gain	PAE
[MHz]	[V]	[mA]	[dBm]	[Watts]	[dB]	[%]
440	3.7	**50**	28.2	0.6	14.2	58.3
		100	28.0	0.6	17.3	58.6
		200	28.0	0.6	19.6	60.0
		300	28.2	0.6	20.1	60.6

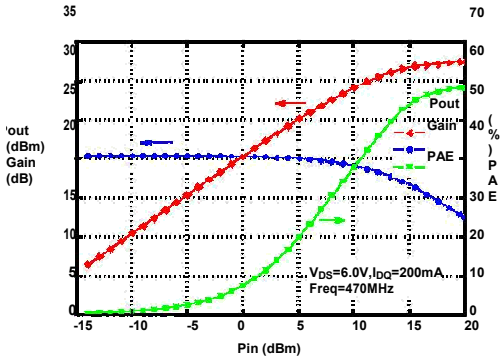


3、Power Gain, Drain Efficiency and Output Power versus input power@470MHz

Freq	V_{DS}	$I_{DS(Q)}$	Pout		Gain	PAE
[MHz]	[V]	[mA]	[dBm]	[Watts]	[dB]	[%]
470	**3.7**	200	28.3	0.6	19.5	57.8
	4.5		29.9	0.9	19.9	57.8
	6.0		32.4	1.7	20.4	58.1

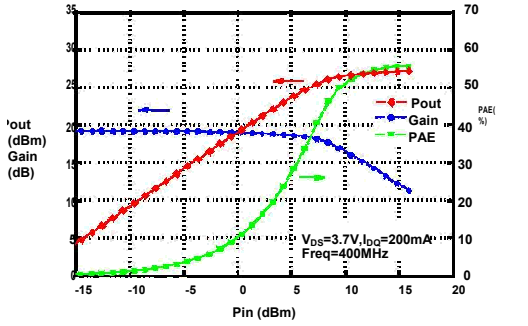


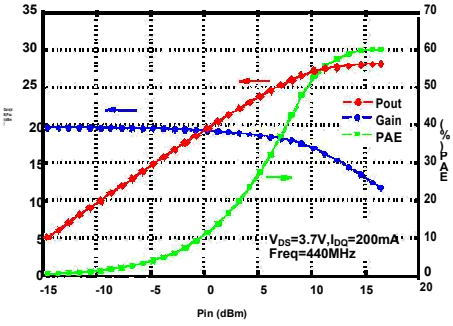


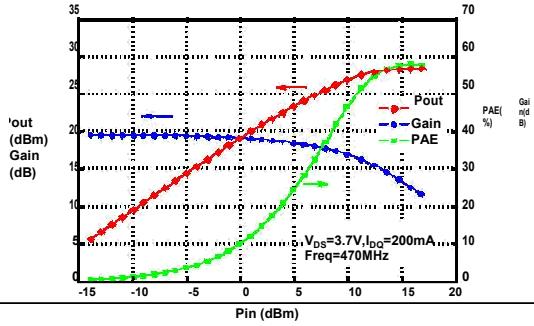


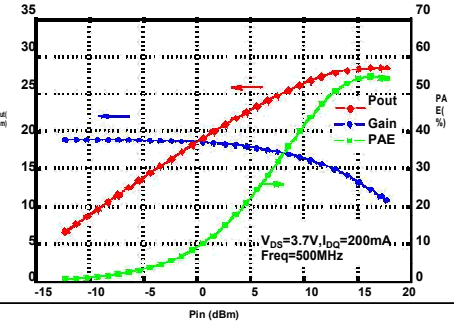
4、Power Gain, Drain Efficiency and Output Power versus Frequency

Freq.	V_{DS}	$I_{DS(Q)}$	Pout		Gain	PAE
[MHz]	[V]	[mA]	[dBm]	[Watts]	[dB]	[%]
400	3.7	200	27.1	0.5	19.2	55.4
440			28.0	0.6	19.6	60.0
470			28.3	0.6	19.5	57.8
500			28.4	0.7	18.9	54.5

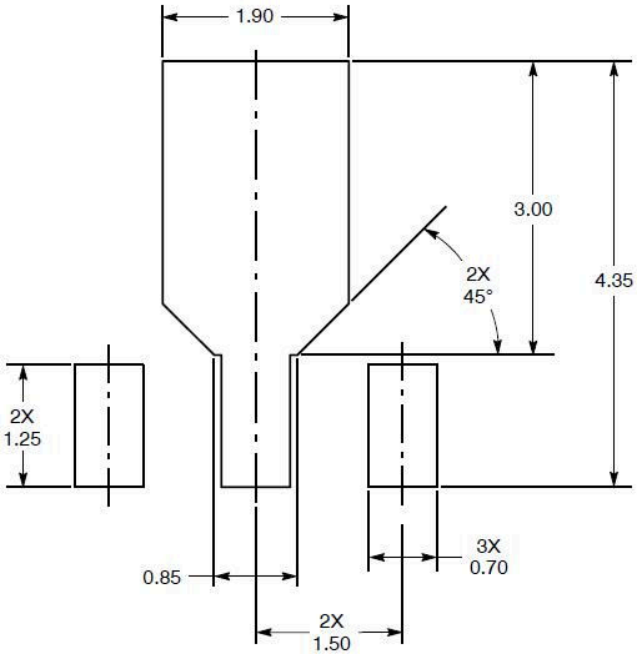




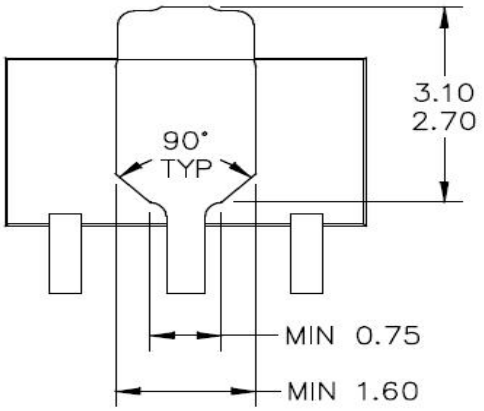




PACKAGE
Unit : mm

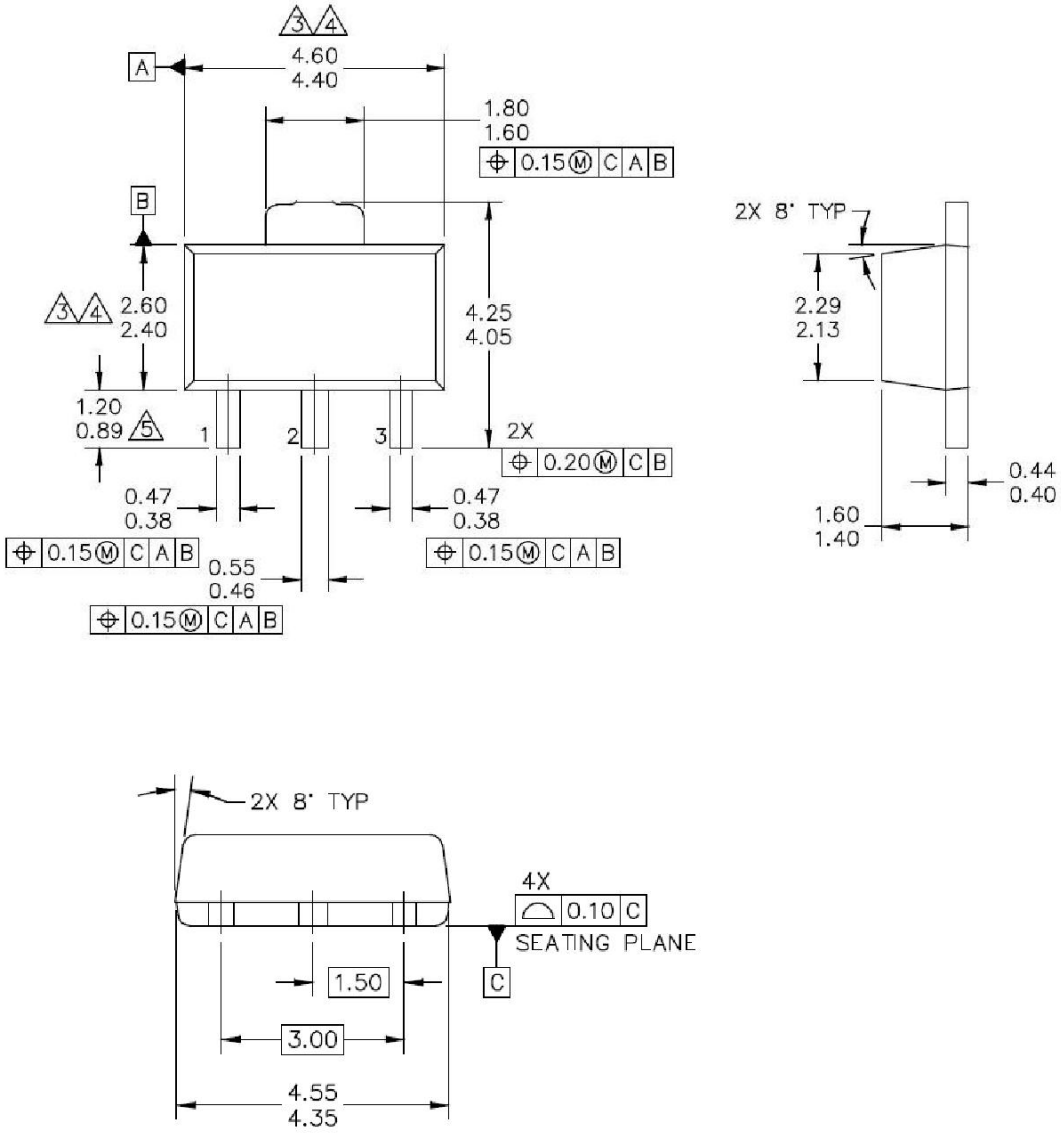


PCB Pad Layout for SOT– 89



Bottom View

PACKAGE DIMENSIONS



REVISION HISTORY

The following table summarizes revisions to this document.

Revision	Date	Description
1.0	May 2018	Initial Release of Data Sheet