RF Power LDMOS Transistor

High Ruggedness N--Channel
Enhancement--Mode Lateral MOSFET

TBD

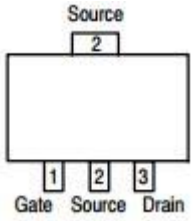
1. Features

- Characterized for Operation from 136 to 520 MHz
- Unmatched Input and Output Allowing Wide Frequency Range Utilization
- Integrated ESD Protection
- Integrated Stability Enhancements
- Wideband — Full Power Across the Band
- Exceptional Thermal Performance
- Extreme Ruggedness
- In Tape and Reel. T1 Suffix = 1,000 Units, 12 mm Tape Width, 7--inch Reel.

Package： **SOT89-3**
Mark： **"H0606E"**

2. Typical Applications

- Output Stage VHF Band Handheld Radio
- Output Stage UHF Band Handheld Radio
- Driver for 10–600 MHz Applications



Pin Connections

3. Typical RF Performance

Designed for handheld two-way radio applications with frequencies within UHF (400-520MHz) and VHF (136-174MHz) bands.

Table 1. UHF band performance 400-520MHz, V_{DD}=7.4V, Pin=+25.0dBm,

Freq.(MHz)	Pout (W)	Id (A)	Eff. (%)	Gain (dB)
400	6.68	1.50	59.98	13.58
410	6.82	1.49	61.67	13.41
420	6.75	1.46	62.07	13.67

430	6.81	1.45	63.04	13.62
440	6.78	1.44	63.38	13.58
450	6.84	1.43	64.21	13.33
460	6.71	1.41	63.94	13.30
470	6.47	1.38	63.18	13.07

Table 2. UHF band performance 400-520MHz, VDD=4.3V, Pin=+22.0dBm

Freq.(MHz)	Pout (W)	Id (A)	Eff. (%)	Gain (dB)
400	2.77	1.33	48.60	12.56
410	2.87	1.33	50.35	12.68
420	3.00	1.34	52.08	12.70
430	3.13	1.34	54.20	12.74
440	3.18	1.33	55.71	13.21
450	3.22	1.31	57.55	12.93
460	3.13	1.25	58.13	12.80
470	2.91	1.17	58.12	12.55

Table 3. UHF band performance 400-520MHz, VDD=3.7V, Pin=+22.0dBm

Freq.(MHz)	Pout (W)	Id (A)	Eff. (%)	Gain (dB)
400	2.17	1.17	50.32	11.12
410	2.22	1.17	51.68	11.56
420	2.29	1.16	53.37	11.56
430	2.38	1.17	55.19	11.56
440	2.40	1.15	56.53	12.01
450	2.43	1.13	58.23	11.69

460	2.34	1.08	58.87	11.62
470	2.18	1.00	58.75	11.28

Table 4. VHF band performance 136-174MHz, VDD=7.4V, Pin=+25.0dBm

Freq.(MHz)	Pout (W)	Id (A)	Eff. (%)	Gain (dB)
136	5.50	1.30	56.82	12.38
146	7.12	1.41	67.87	13.59
156	7.87	1.48	71.77	14.30
166	7.04	1.31	72.32	13.75
174	5.67	1.05	72.68	12.76

4. Maximum Ratings

Table 5. Maximum Ratingws

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	20	V
Gate-Source Voltage	V_{GG}	-5 ~ 10	V
Operating Voltage	V_{DD}	9	V
Drain Voltage	I_D	3.2	A
Storage Temperature	T_{stg}	-55 ~ 150	℃
Operating Junction Temperature	T_J	-40 ~ 150	℃

5. Thermal Characteristics

Table 6. Thermal Resistance

Rating	Symbol	Test Condition	Value	Unit

Thermal Resistance, Junction to Case	Zth(j-c)	Case Temperature： 50℃ Power Dissipation：15W	6.5	℃/W

Table 7. Maximum Power Dissipation

Case Temperature（℃）	Maximum Power Dissipation（W）
50	15.0
75	11.5
100	7.7
125	3.8
150	0

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

Table 8. Electrical Characteristics

Rating	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Breakdown Drain Voltage	$V_{(BR)DDS}$	V_{GG}=0V,I_D=39.6uA	20	-	-	V
Gate Threshold Voltage	$V_{GG(th)}$	V_{DD}=V_{GG},I_D=39.6uA	1.3	1.55	1.8	V
Zero Gate Voltage Drain Leakage Current	I_{DSS}	V_{DD}=20V,V_{GG}=0V	-	1	-	uA
Gate-Source Leakage Current	I_{GGS}	V_{DD}=0V,V_{GG}= 10V	-	1	-	uA
Quiescent Gate-Source Voltage	V_{GG}	V_{DD}=7.0V I_{DQ}=200mA	2.0	2.25	2.5	V

Table 9. ESD Protection Characteristics

Test Methodology	Class
HBM (per JESD22--A114)	2
MM (per EIA/JESD22--A115)	B
CDM (per JESD22--C101)	IV

7. Reference Circuits

7.1 400-470MHz Broadband Production Test Fixture, V_{DD}=7.4V, V_{GG}=2.0V

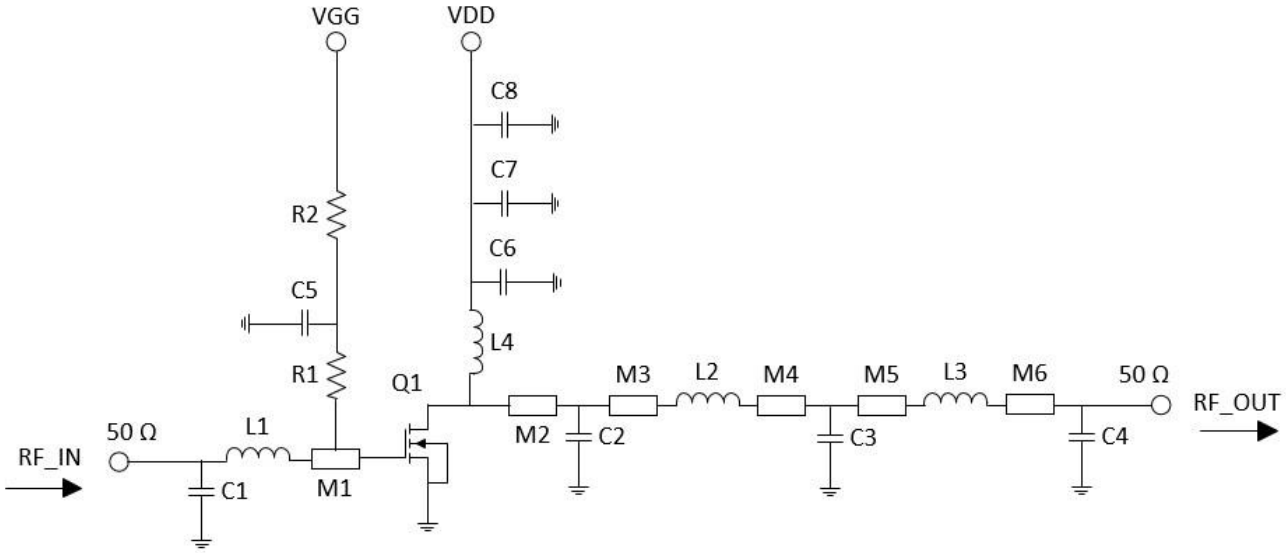


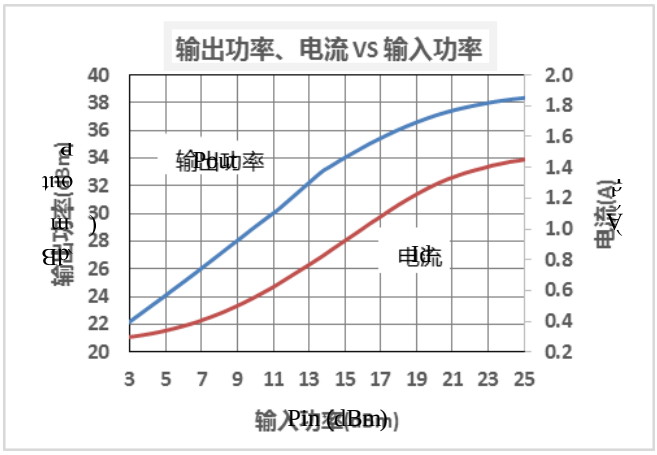
Table 10. Test Circuit in 7.1 Component Designations and Values

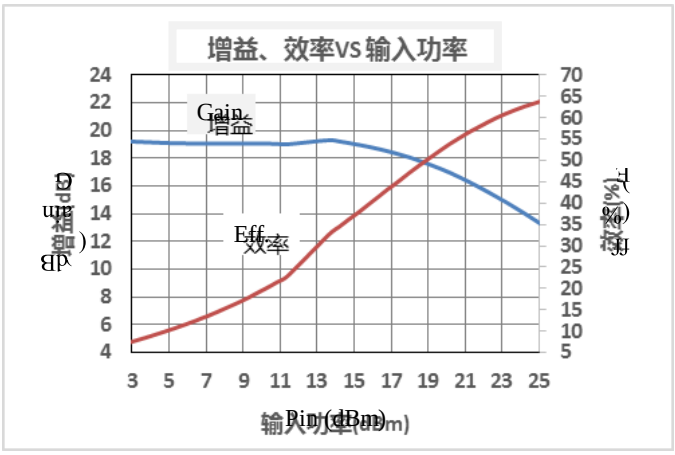
Part	Description	Part Number	Manufacturer
C1	22pF Chip Capacitor	GRM1885C1H220JA01	MuRata
C2	3pF Chip Capacitor	GRM1885C1H3R0CA01	MuRata
C3	39pF Chip Capacitor	GRM1885C1H390JA01	MuRata
C4	10pF Chip Capacitor	GRM1885C1H100JA01	MuRata
C5, C6	1nF Chip Capacitors	GRM1885C1H102JA01	MuRata
C7	220pF Chip Capacitor	GRM1885C1H220JA01	MuRata
C8	1uF Chip Capacitor	GRM32ER61H105KA12L	MuRata
L1, L2	Air-Core Inductors: Wire D.: 0.5mm, I.D.:0.8mm, Turns 1	N.A.	Arbitary
L3	Air-Core Inductor: Wire D.: 0.2mm, I.D.:1.0mm, Turns 3	N.A.	Arbitary

L4	Air-Core Inductor: Wire D.: 0.3mm, I.D.:1.5mm, Turns 8	N.A.	Arbitary
R1	51Ω Chip Resistor	Arbitary	Arbitary
R2	3.3KΩ Chip Resistor	Arbitary	Arbitary
M1, M2	50 Ohm Transmission Lines, Length：2.5mm		
M3, M4, M6	50 Ohm Transmission Lines, Length：1.4mm		
M5	50 Ohm Transmission Line, Length：2.9mm		
Q1	LDMOS RF Transistor		

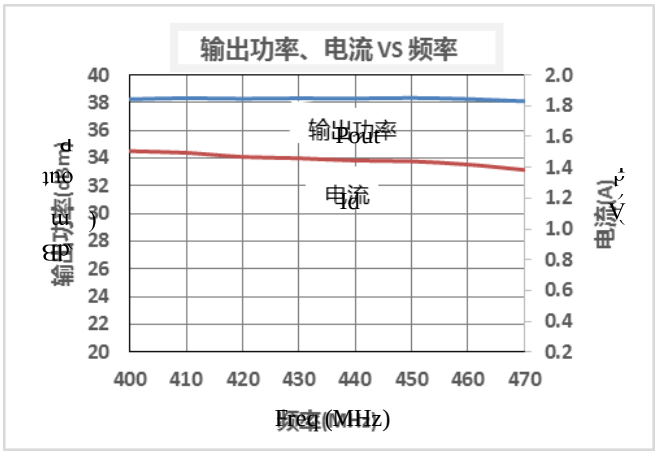
Typical Performance

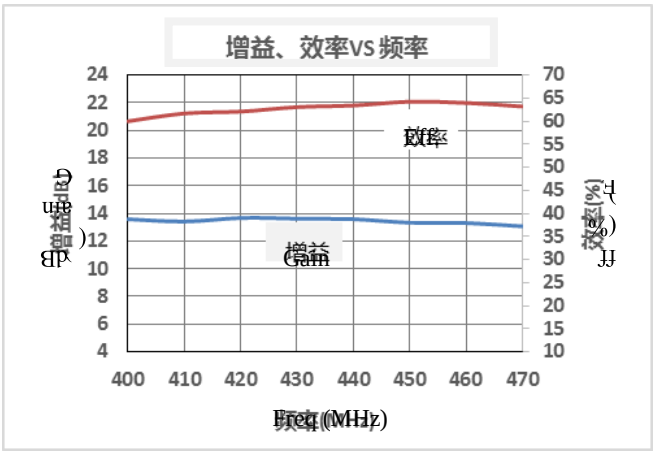
***Test Condition*：V_{DD}=7.4V, V_{GG}=2.0V, f=440MHz.**





***Test Condition*：V_{DD}=7.4V, V_{GG}=2.0V,P_{in}=+25.0dBm.**





7.2 400-470MHz Broadband Production Test Fixture, V_{DD}=4.3V and 3.7V, V_{GG}=2.0V

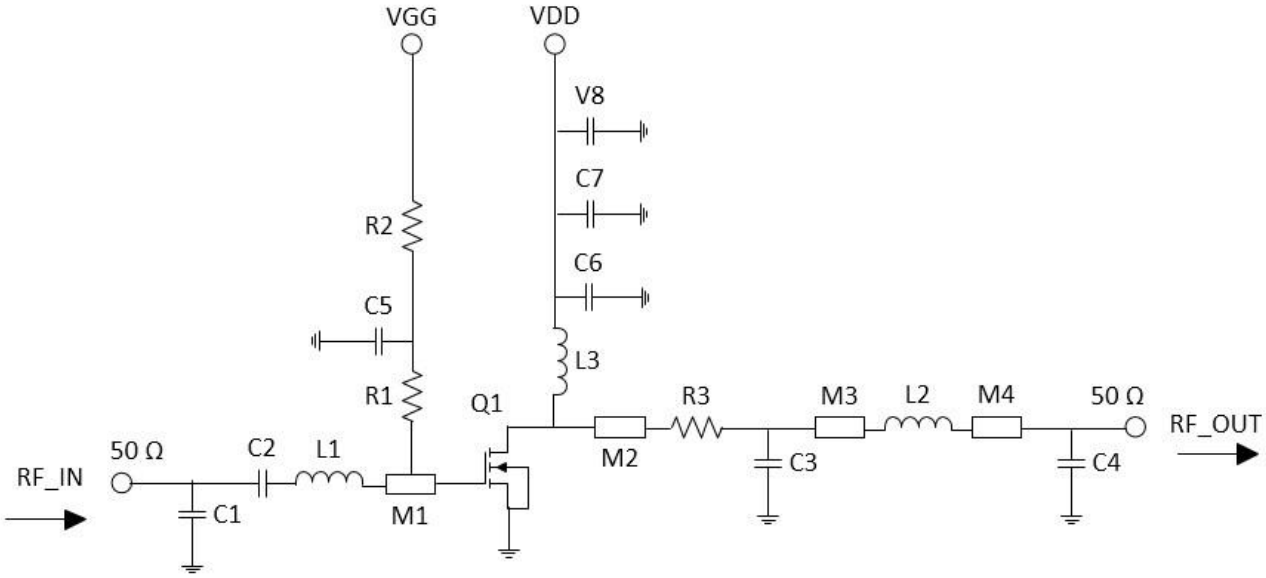


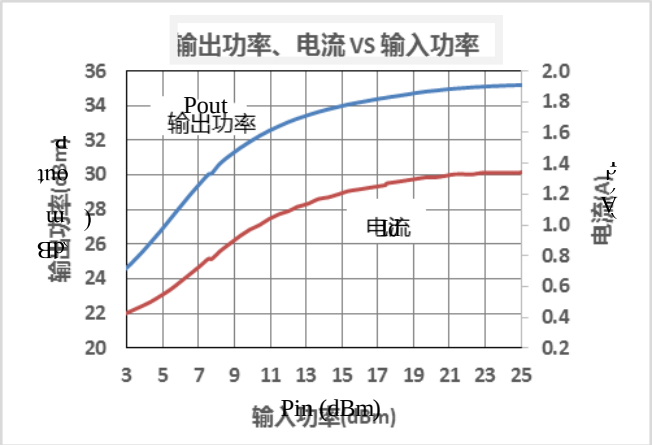
Table 11. Test Circuit in 7.2 Component Designations and Values

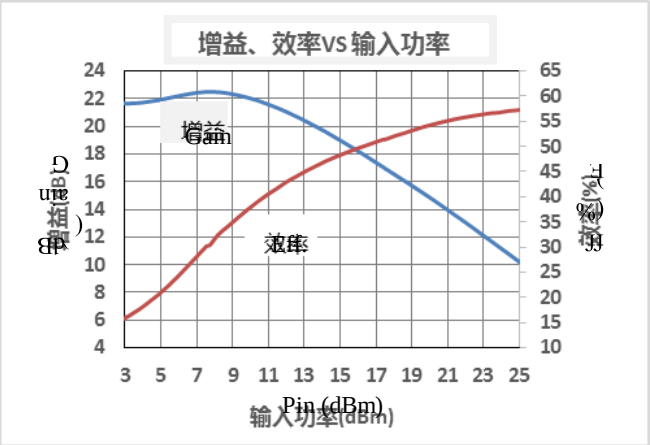
Part	Description	Part Number	Manufacturer
C1	22pF Chip Capacitor	GRM1885C1H220JA01	MuRata
C2	3pF Chip Capacitor	GRM1885C1H3R0CA01	MuRata
C3	47pF Chip Capacitor	GRM1885C1H470JA01	MuRata
C4	10pF Chip Capacitor	GRM1885C1H100JA01	MuRata
C5, C6	1nF Chip Capacitors	GRM1885C1H102JA01	MuRata
C7	220pF Chip Capacitor	GRM1885C1H220JA01	MuRata
C8	1uF Chip Capacitor	GRM32ER61H105KA12L	MuRata
L1	Air-Core Inductor: Wire D.: 0.5mm, I.D.:0.8mm, Turns 1	N.A.	Arbitary
L2	Air-Core Inductor: Wire D.: 0.2mm, I.D.:1.2mm, Turns 2	N.A.	Arbitary
L3	Air-Core Inductor: Wire D.: 0.3mm, I.D.:1.5mm, Turns 8	N.A.	Arbitary

R1	51Ω Chip Resistor	Arbitary	Arbitary
R2	3.3KΩ Chip Resistor	Arbitary	Arbitary
R3	0Ω Chip Resistor	Arbitary	Arbitary
M1, M2	50 Ohm Transmission Lines, Length：2.5mm		
M3	50 Ohm Transmission Line, Length：2.8mm		
M4	50 Ohm Transmission Line, Length：2.9mm		
Q1	LDMOS RF Transistor		

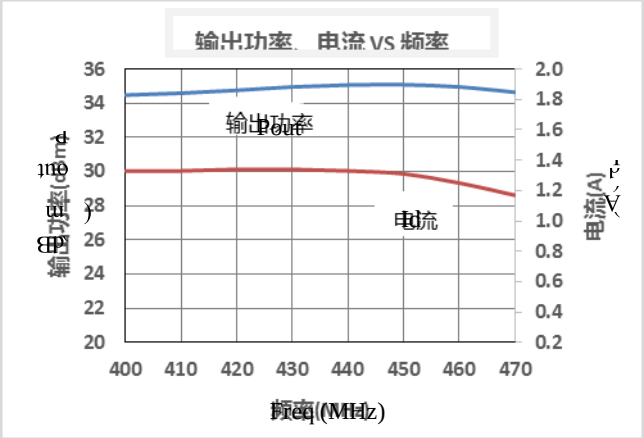
Typical Performance

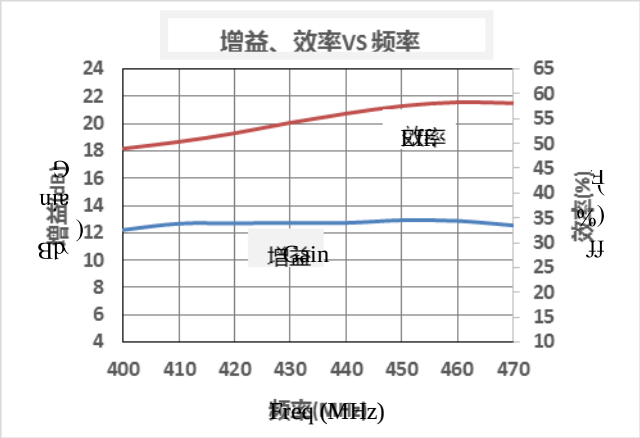
***Test Condition*：V_{DD}=4.3V, V_{GG}=2.0V, f=440MHz.**



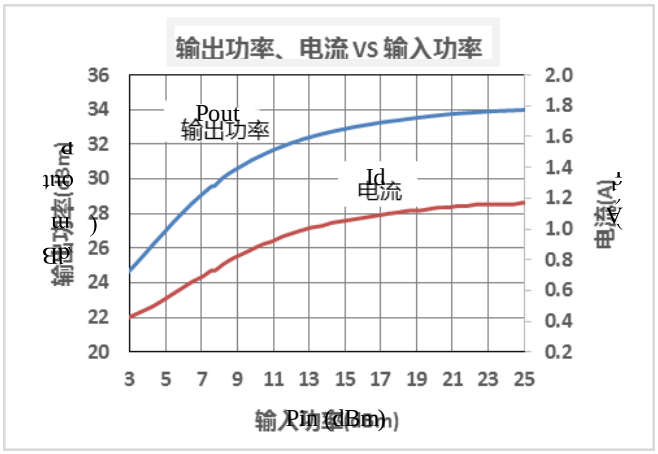


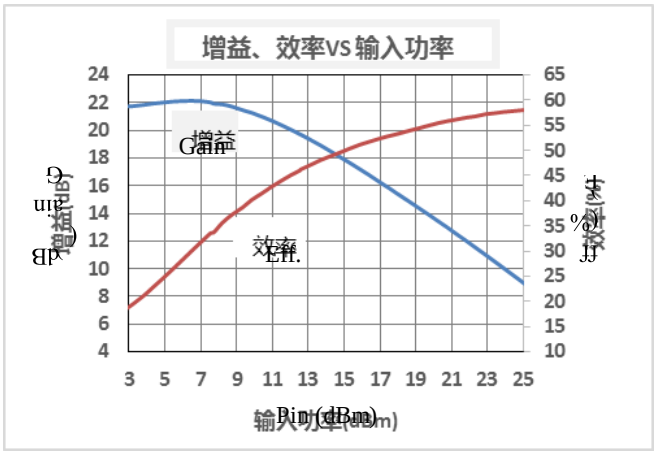
***Test Condition*：V_{DD}=4.3V, V_{GG}=2.0V,P_{in}=+22.0dBm.**



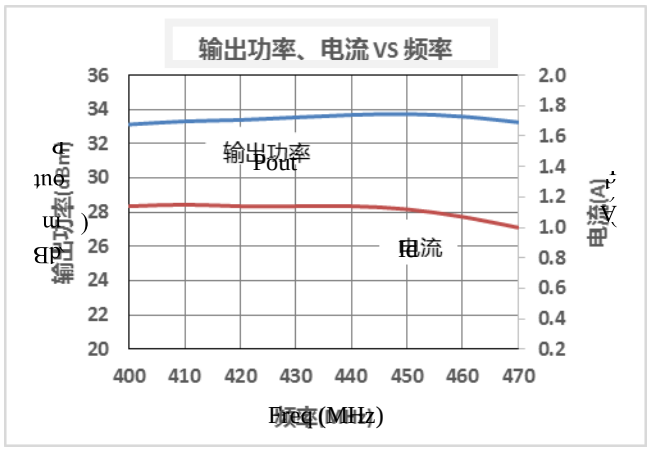


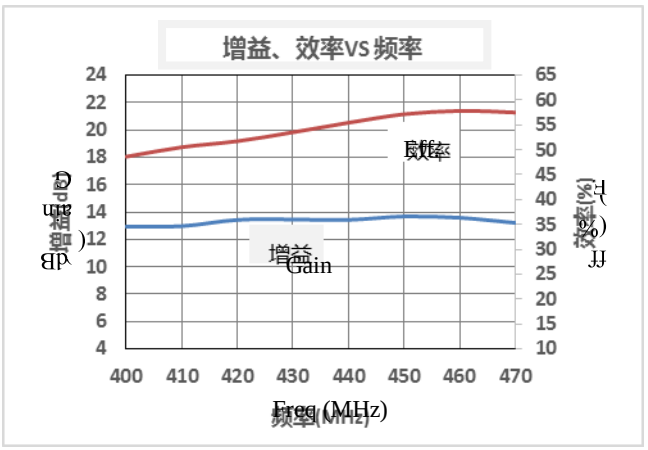
Test Condition：V_{DD}=3.7V, V_{GG}=2.0V, f=440MHz.





Test Condition：V_{DD}=3.7V, V_{GG}=2.0V,P_{in}=+22.0dBm.





7.2 136-174MHz Broadband Production Test Fixture, V_{DD}=7.4V, V_{GG}=2.0V

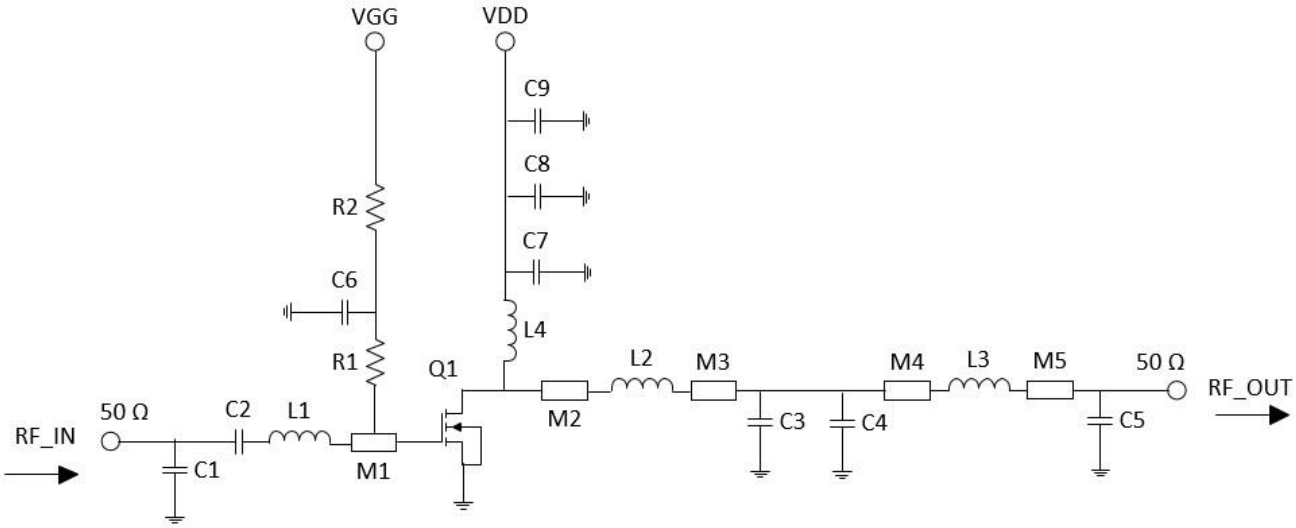
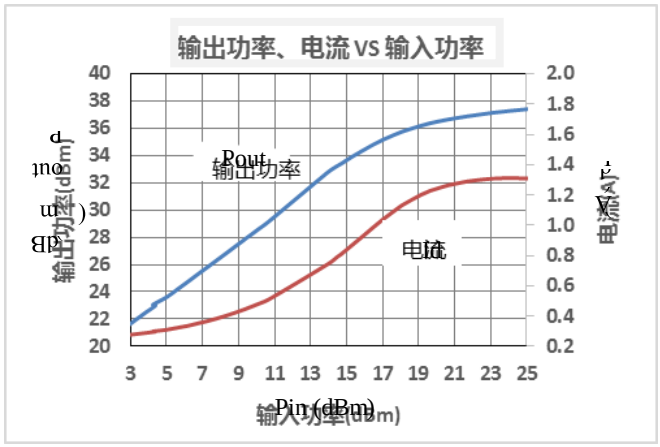


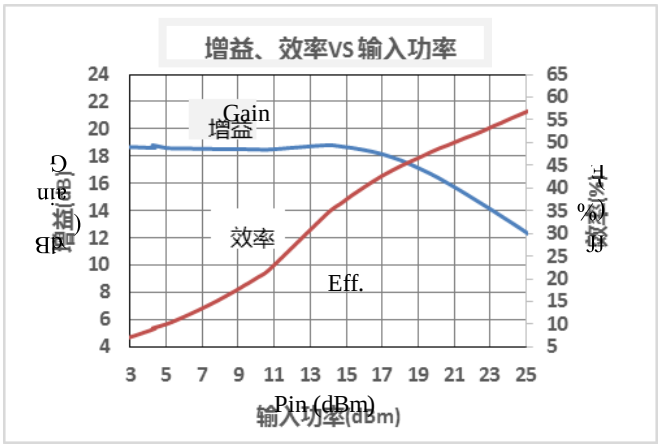
Table 12. Test Circuit in 7.3 Component Designations and Values

Part	Description	Part Number	Manufacturer
C1	33pF Chip Capacitor	GRM1885C1H330JA01	MuRata
C2	39pF Chip Capacitor	GRM1885C1H390JA01	MuRata
C3	68pF Chip Capacitor	GRM1885C1H680JA01	MuRata
C4	12pF Chip Capacitor	GRM1885C1H120JA01	MuRata
C5	47pF Chip Capacitor	GRM1885C1H470JA01	MuRata
C6, C7	1nF Chip Capacitors	GRM1885C1H102JA01	MuRata
C8	220pF Chip Capacitor	GRM1885C1H220JA01	MuRata
C9	1uF Chip Capacitor	GRM32ER61H105KA12L	MuRata
L1	47nH Chip Inductor	CLH1608T-47N	Qilixin
L2	Air-Core Inductors: Wire D.: 0.5mm, I.D.:1.2mm, Turns 1	N.A.	Arbitary
L3	Air-Core Inductors: Wire D.: 0.3mm, I.D.:1.0mm, Turns 4	N.A.	Arbitary
L4	Air-Core Inductors: Wire D.: 0.4mm, I.D.:1.5mm, Turns 8	N.A.	Arbitary
R1	30Ω Chip Resistor	Arbitary	Arbitary
R2	3.3KΩ Chip Resistor	Arbitary	Arbitary
M1, M2	50 Ohm Transmission Lines, Length：2.5mm		
M3, M4, M6	50 Ohm Transmission Lines, Length：1.4mm		
M5	50 Ohm Transmission Lines, Length：2.9mm		
Q1	LDMOS RF Power Transistor		

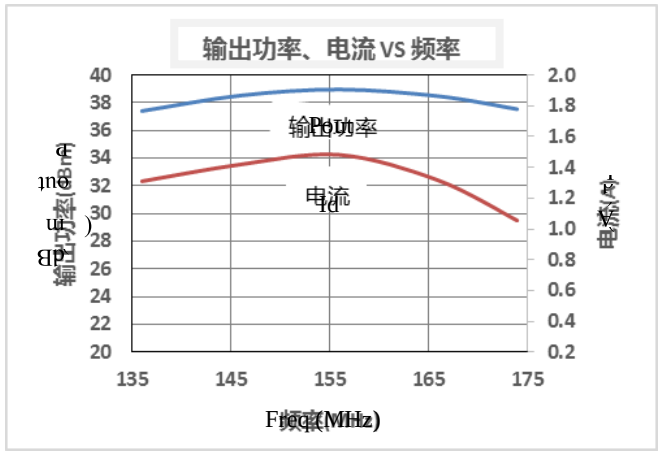
Typical Performance

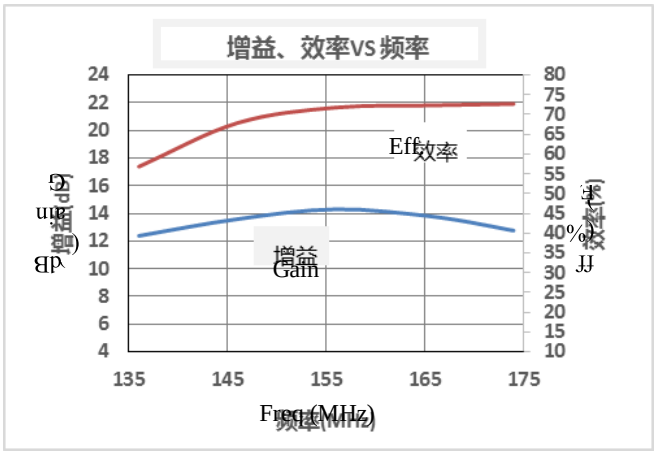
***Test Condition*： V_{DD}=7.4V, V_{GG}=2.0V, f=155MHz.**





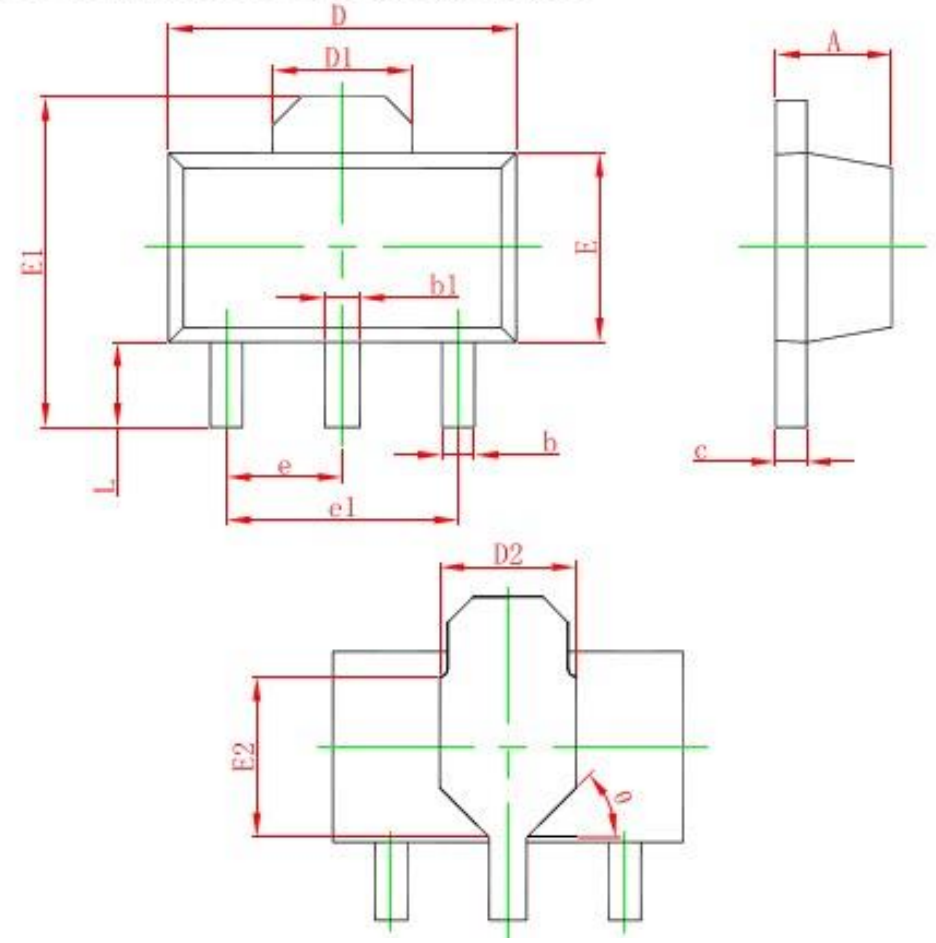
***Test Condition*： V_{DD}=7.4V, V_{GG}=2.0V,P_{in}=+25.0dBm.**





8. Package Dimensions

SOT-89-3L PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
D2	1.750 REF.		0.069 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
E2	1.900 REF.		0.075 REF.	
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047
θ	45°		45°	

9. Recommended PCB Pad Layout