Document Number: DS002N

Rev.02 May 2016

RF Power Field Effect Transistor

N-Channel Enhancement-Mode Lateral MOSFET

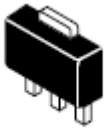
136–941 MHz, 2 W, 3.7V WIDEBAND RF POWER LDMOS TRANSISTOR

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

Wideband EVB Performance (3.7 Vdc,I_{DQ}=200mA, T_A = 25℃, CW)

f(MHz)	G_{max}(dB)	P_{out}(dBm)	PAE(%)
450	17.30	33.55	71.35
460	17.40	33.61	70.50
470	17.30	33.66	72.52

- Capable of Handling 10:1,@3.7Vdc, 2Watts, CW



Features

- Characterized for Operation from 136 to 941 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.

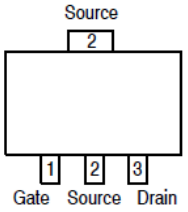


Figure 1. Pin Connections

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}	-6.0,+10	Vdc
Operating Voltage	V_{DD}	6, +0	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	℃

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case Case Temperature 79℃, 2.0 W CW, 3.7 Vdc, I_{DQ} = 200 mA, 450 MHz	$R_{\theta JC}$	4.4	℃/W

Table 3. ESD Protection Characteristics

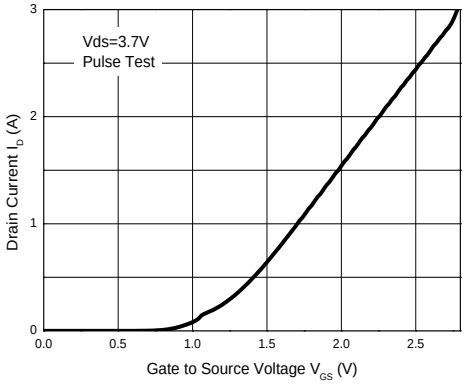
Test Methodology	Class
Human Body Model (per JESD22 -A114)	2C, passes 2000 V
Machine Model (per EIA/JESD22 -A115)	A, passes 100 V
Charge Device Model (per JESD22 -C101)	IV, passes 2000 V

Table 4. Electrical Characteristics (TA=25℃unless otherwise noted)

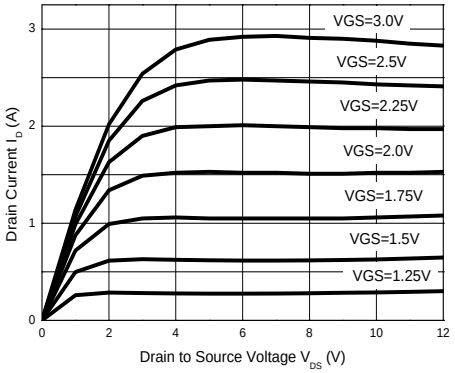
Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Gate-Source Leakage Current (V_{GS}=5Vdc, V_{DS}=0Vdc)	I_{GSS}	–	–	10	nAdc
Zero Gate Voltage Drain Leakage Current (V_{DS}=20Vdc, V_{GS}=0Vdc)	I_{DSS}	–	–	10	uAdc
Zero Gate Voltage Drain Leakage Current (V_{DS}=3.7Vdc, V_{GS}=0Vdc)	I_{DSS}	–	–	1	uAdc
On Characteristics					
Gate Threshold Voltage (V_{DS}=10Vdc, I_D=1mA)	$V_{GS(th)}$	0.6	0.8	1.2	Vdc
Gate Quiescent Voltage (V_{DD}=3.7Vdc,I_D=200mA Measured in Functional Test)	$V_{GS(Q)}$	0.9	1.1	1.6	Vdc
Drain-Source On-Voltage (V_{GS}=8Vdc, I_D=100mA)	$V_{DS(ON)}$	–	0.12	–	Vdc
Typical Performances(In 450 MHz Demo Board,50 ohm system)V_{DD}=3.7Vdc, I_{DQ}=200mA, P_{out} =2Watts,					
Power Gain	G_{ps}	–	17	–	dB
Drain Efficiency	η_D	–	71	–	%

Main Characteristics

Typical Transfer Characterisitics

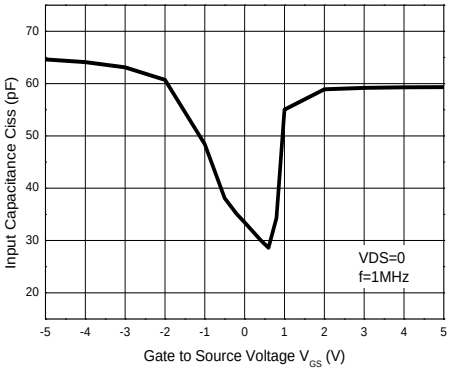


Typical Output Characteristics



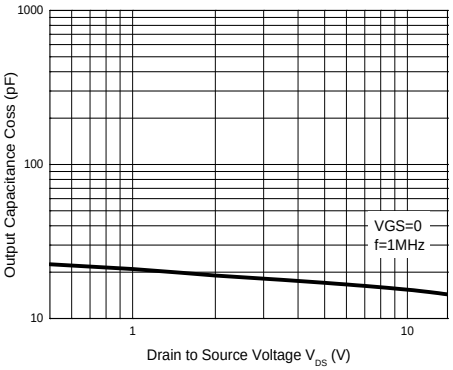
Input Capacitance vs.

Gate to Source Voltage



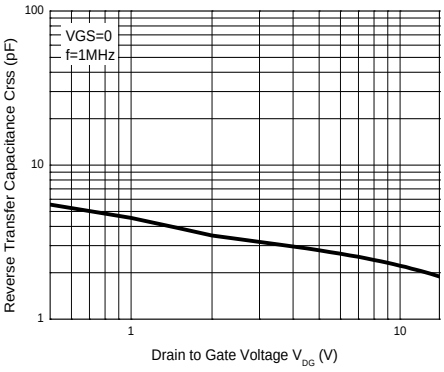
Output Capacitance vs.

Drain to Source Voltage

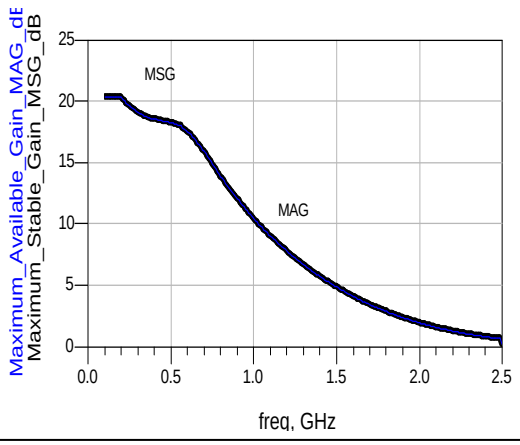


Reverse Transfer Capacitance vs.

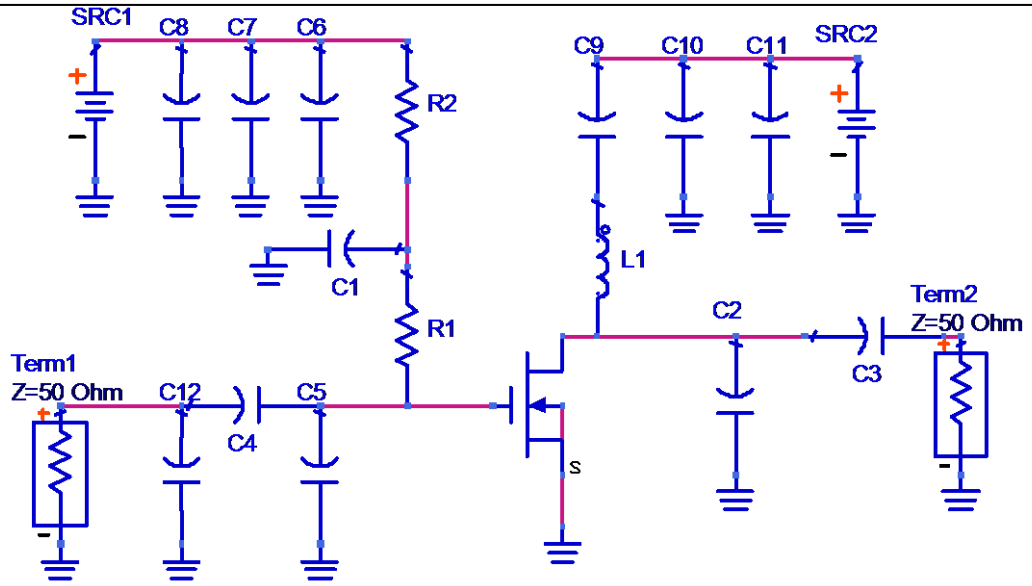
Drain to Gate Voltage



MSG, MAG vs. Frequency



Evaluation Circuit (@VDD = 3.7V, f = 450 MHz)



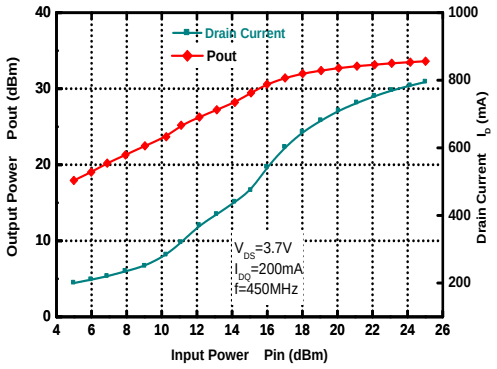
Test Circuit Component Layout

Table 5.Test Circuit Component Designations and Value

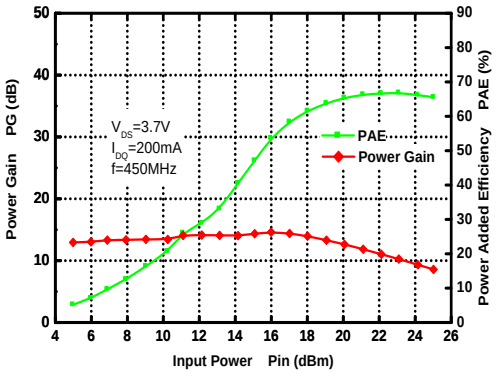
Part	Description	Part Number	Manufacturer
R1,R2	1 KOhm	–	–
L1	8 Turns D: 0.5 mm, φ 2.4 mm Enamel Wire	–	–
C1, C3,C4,C6,C9	100pF Chip Capacitors	GQM21P5C1H101JB01	Murata
C5	39pF Chip Capacitors	GRM1885C1H201JA01	Murata
C2,C12	20pF Chip Capacitors		
C7,C10	1000pF Chip Capacitors	GRM1885C1H102JA01	Murata
C8,C11	10uF,10VChip Capacitors	–	–
PCB	FR–4 0.030” ε_r4.5	–	–

TYPICAL CHARACTERISTICS

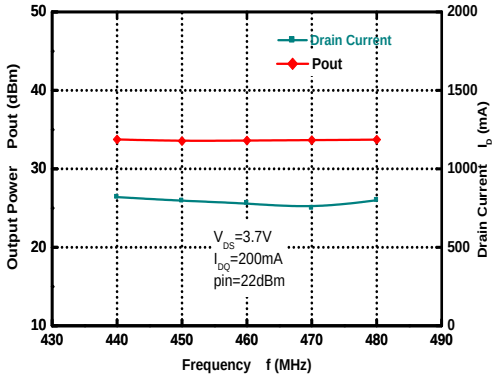
Output Power, Drain Current
vs. Input Power



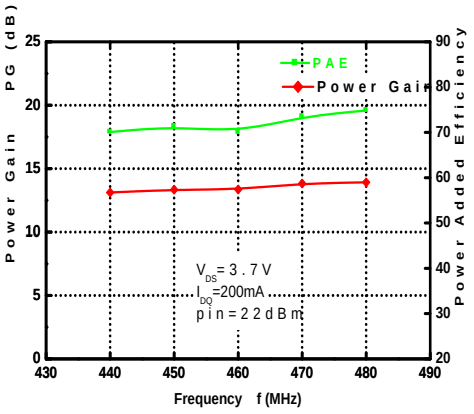
Power Gain, Power Added Efficiency
vs. Input Power



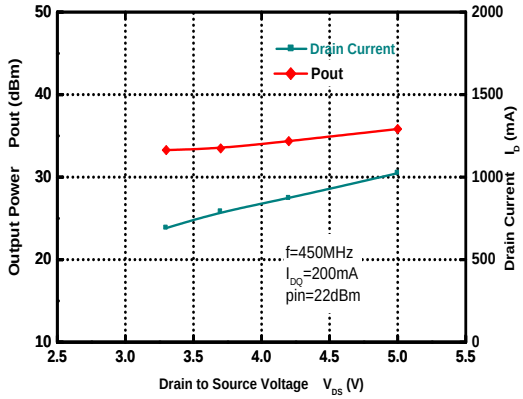
Output Power, Drain Current
vs. Frequency



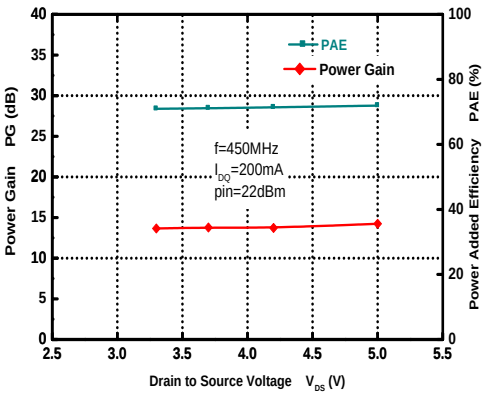
Power Gain, Power Added Efficiency
vs. Frequency



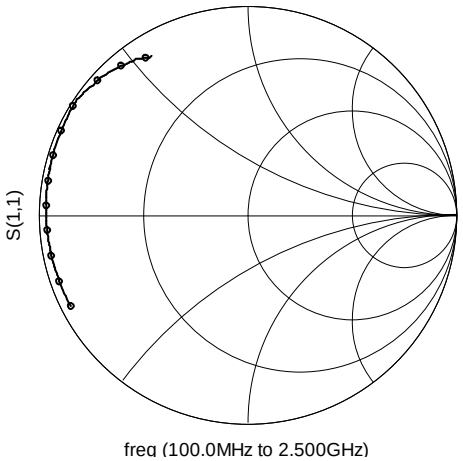
Output Power, Drain Current
vs. Drain to Source Voltage



Power Gain, Power Added Efficiency
vs. Drain to Source Voltage



S11 Parameter vs. Frequency

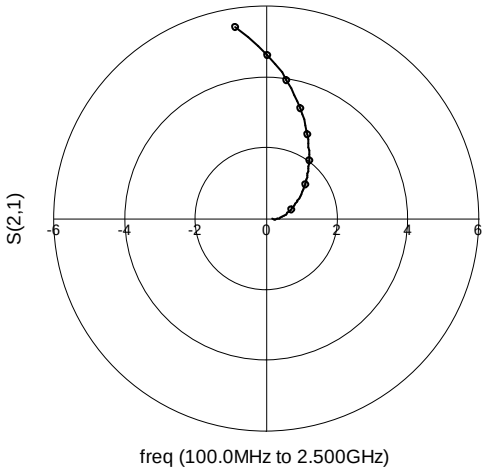


Test condition:

V_{DS} = 3.7 V, I_{DQ} = 200 mA, Z_O = 50 Ω

100 to 2500 MHz (50 MHz step)

S21 Parameter vs. Frequency

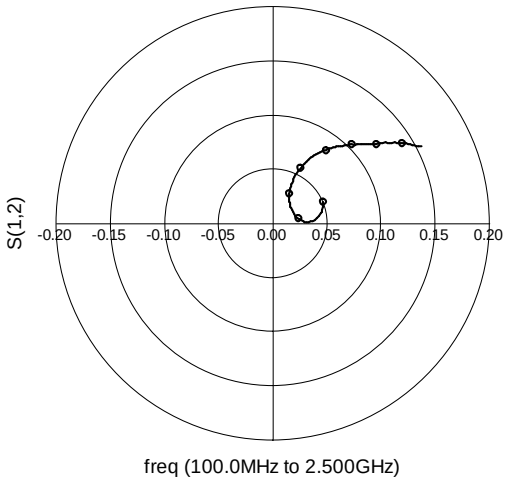


Test condition:

V_{DS} = 3.7V, I_{DQ} = 200 mA, Z_O = 50 Ω

100 to 2500 MHz (50 MHz step)

S12 Parameter vs. Frequency

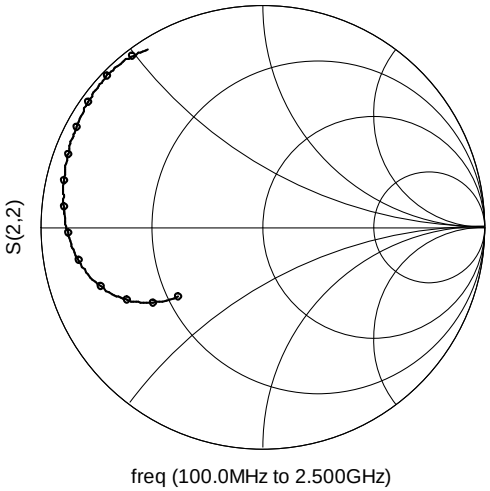


Test condition:

V_{DS} = 3.7 V, I_{DQ} = 200 mA, Z_O = 50 Ω

100 to 2500 MHz (50 MHz step)

S22 Parameter vs. Frequency



Test condition:

V_{DS} = 3.7V, I_{DQ} = 200 mA, Z_O = 50 Ω

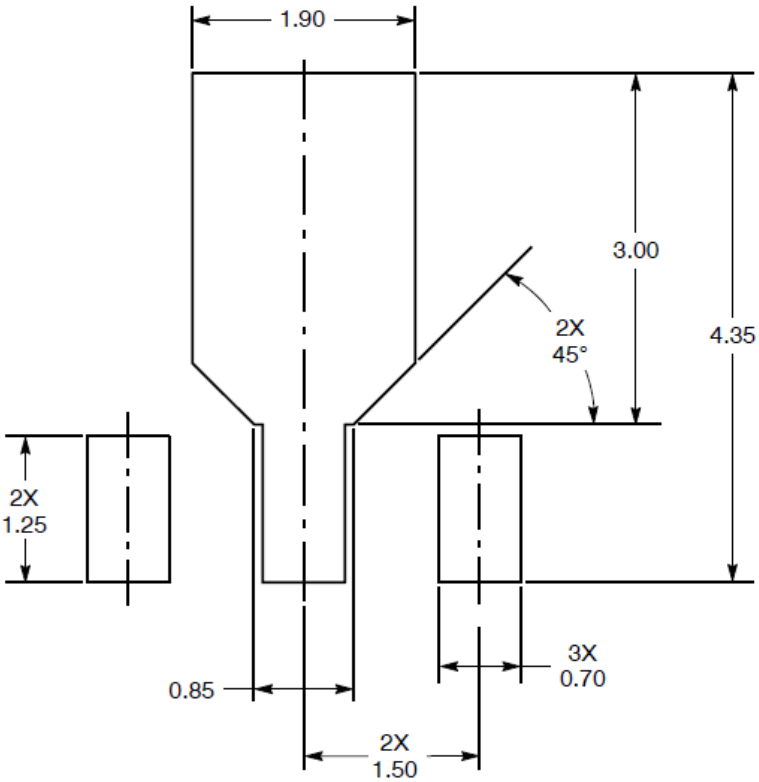
100 to 2500 MHz (50 MHz step)

S Parameter

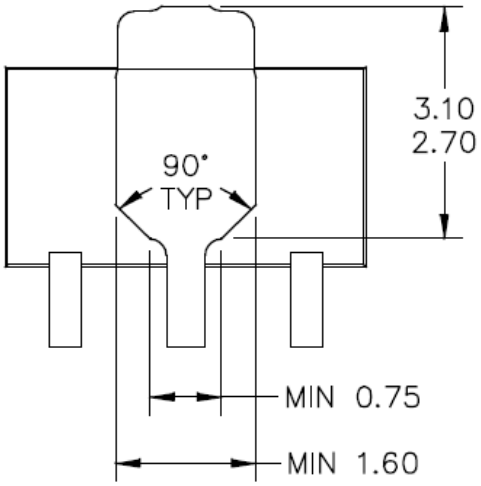
(V_{DS} = 3.7 V, I_{DQ} = 200 mA, Zo = 50)

f(MHz)	S11		S21		S12		S22	
	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)	MAG	ANG(deg.)
200	0.913	-152.7	5.460	99.2	0.051	22.4	0.493	-140.6
250	0.916	-157.8	4.141	83.9	0.045	11.3	0.577	-144.1
300	0.919	-161.3	3.269	72.6	0.040	5.1	0.636	-147.5
350	0.921	-164.1	2.643	63.8	0.035	2.0	0.682	-150.6
400	0.924	-166.6	2.189	56.3	0.031	1.8	0.715	-153.5
450	0.927	-169.4	1.849	49.6	0.027	4.6	0.746	-156.4
500	0.930	-172.0	1.583	43.8	0.024	10.1	0.771	-158.9
550	0.933	-174.2	1.365	38.8	0.021	18.4	0.792	-161.3
600	0.936	-176.5	1.198	34.6	0.021	30.3	0.808	-163.6
650	0.939	-178.9	1.059	30.4	0.022	40.4	0.823	-166.1
700	0.942	178.8	0.944	26.6	0.024	48.8	0.838	-168.5
750	0.945	176.3	0.841	22.9	0.027	56.0	0.850	-171.0
800	0.947	174.3	0.769	20.1	0.031	60.3	0.860	-173.1
850	0.950	172.1	0.691	16.9	0.035	62.7	0.870	-175.8
900	0.953	169.9	0.636	14.1	0.039	63.6	0.879	-178.2
950	0.956	167.6	0.581	11.4	0.044	64.5	0.889	179.2
1000	0.959	167.5	0.535	9.1	0.049	64.7	0.898	174.8
1050	0.962	163.3	0.494	6.8	0.053	64.1	0.903	174.1
1100	0.965	161.3	0.458	4.6	0.058	62.9	0.909	171.4
1150	0.968	159.3	0.425	2.7	0.062	61.8	0.917	168.8
1200	0.971	157.1	0.396	0.9	0.066	60.7	0.923	166.4
1250	0.973	155.2	0.371	-0.6	0.070	59.5	0.928	163.9
1300	0.976	153.4	0.347	-1.8	0.074	57.9	0.932	161.4
1350	0.979	151.3	0.326	-3.3	0.078	56.2	0.938	158.8
1400	0.982	149.3	0.307	-4.3	0.083	54.4	0.947	156.6
1450	0.985	147.6	0.289	-5.0	0.086	53.1	0.949	154.5
1500	0.988	145.6	0.273	-5.9	0.089	51.2	0.953	152.2
1550	0.983	144.0	0.259	-6.4	0.093	49.7	0.957	150.2
1600	0.977	142.1	0.246	-6.8	0.096	48.0	0.960	148.2
1650	0.973	140.6	0.235	-7.0	0.099	46.6	0.966	146.4
1700	0.968	139.2	0.224	-6.8	0.102	45.5	0.965	145.0
1750	0.964	137.6	0.215	-7.0	0.104	43.8	0.968	143.1
1800	0.960	136.1	0.207	-6.7	0.107	42.6	0.975	141.8
1850	0.956	134.5	0.200	-6.3	0.111	41.3	0.975	140.3
1900	0.950	133.3	0.194	-6.0	0.113	40.0	0.978	138.9
1950	0.943	132.0	0.189	-5.4	0.115	39.0	0.976	137.9
2000	0.944	130.8	0.184	-4.8	0.118	38.1	0.975	136.5
2050	0.934	129.8	0.180	-4.1	0.121	37.0	0.981	135.3
2100	0.931	128.6	0.179	-3.4	0.125	36.1	0.980	134.4
2150	0.926	128.0	0.176	-2.6	0.128	35.3	0.977	133.1
2200	0.919	126.8	0.176	-2.1	0.131	34.1	0.977	132.2
2250	0.919	125.5	0.176	-1.6	0.136	33.0	0.977	130.8
2300	0.912	124.9	0.175	-1.2	0.139	31.9	0.977	129.4
2350	0.906	123.7	0.176	-0.9	0.143	30.8	0.971	128.2
2400	0.901	123.1	0.176	-0.6	0.147	29.5	0.966	126.3
2450	0.891	122.2	0.178	-0.5	0.151	28.1	0.962	124.9
2500	0.889	121.1	0.180	-0.7	0.155	26.6	0.956	122.9

PACKAGE

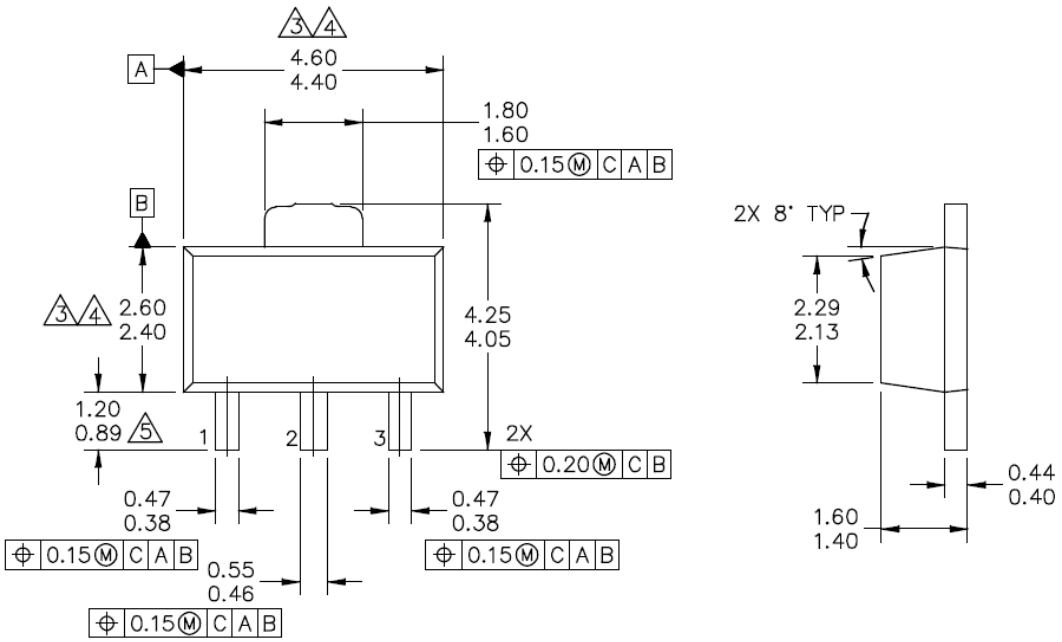


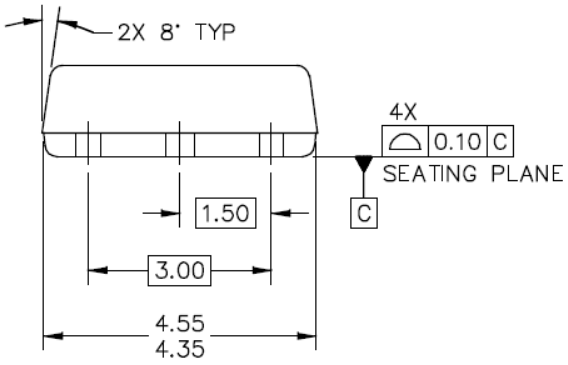
PCB Pad Layout for SOT– 89



BOTTOM VIEW

PACKAGE DIMENSIONS


3 4
A
4.60
4.40
1.80
1.60
0.15 M C A B
B
3 4
2.60
2.40
4.25
4.05
1.20
0.89
5
1
2
3
2X
0.20 M C B
0.47
0.38
0.47
0.38
0.15 M C A B
0.15 M C A B
0.55
0.46
0.15 M C A B
2X 8° TYP
2.29
2.13
0.44
0.40
1.60
1.40


2X 8° TYP
4X
0.10 C
SEATING PLANE
C
1.50
3.00
4.55
4.35