

Wireless Bipolar Power Transistor, 2W

1.78 - 1.90 GHz

PH1819-2

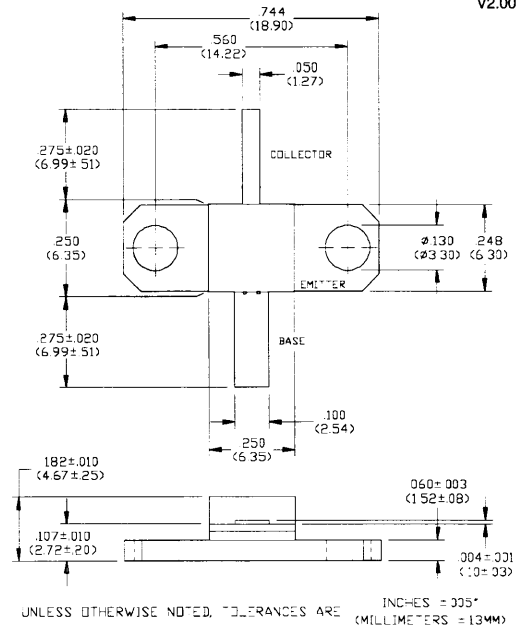
V2.00

Features

- Designed for Cellular Base Station Applications
- Class AB: -34 dBc Typ 3rd IMD at 2 Watts PEP
- Class A: +43 dBm Typ 3rd Order Intercept Point
- Common Emitter Configuration
- Internal Input Impedance Matching
- Diffused Emitter Ballasting

Absolute Maximum Ratings at 25°C

Parameter	Symbol	Rating	Units
Collector-Base Voltage	V_{CBO}	65	V
Collector-Emitter Voltage	V_{CES}	65	V
Emitter-Base Voltage	V_{EBO}	3.0	V
Collector Current	I_C	2.0	A
Power Dissipation	P_D	13.5	W
Junction Temperature	T_J	200	°C
Storage Temperature	T_{STG}	-55 to +150	°C
Thermal Resistance	θ_{JC}	13	°C/W

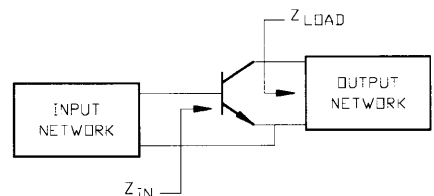


Electrical Characteristics at 25°C

Parameter	Symbol	Min	Max	Units	Test Conditions
Collector-Emitter Breakdown Voltage	BV_{CES}	65	-	V	$I_C=5\text{ mA}$
Collector-Emitter Leakage Current	I_{CES}	-	1.0	mA	$V_{CE}=25\text{ V}$
Collector-Emitter Breakdown Voltage	BV_{CEO}	22	-	V	$I_C=5\text{ mA}$
Collector-Emitter Breakdown Voltage	BV_{CER}	30	-	V	$I_C=5\text{ mA}, R_{BE}=220\ \Omega$
Emitter-Base Breakdown Voltage	BV_{EBO}	3.0	-	V	$I_B=5\text{ mA}$
DC Forward Current Gain	h_{FE}	15	120	-	$V_{CE}=5\text{ V}, I_C=200\text{ mA}$
Power Gain	G_P	10	-	dB	$V_{CC}=25\text{ V}, I_{CO}=25\text{ mA}, P_{OUT}=2.0\text{ W}, F=1.78, 1.85, 1.90\text{ GHz}$
Collector Efficiency	η_C	35	-	%	$V_{CC}=25\text{ V}, I_{CO}=25\text{ mA}, P_{OUT}=2.0\text{ W}, F=1.78, 1.85, 1.90\text{ GHz}$
Input Return Loss	RL	10	-	dB	$V_{CC}=25\text{ V}, I_{CO}=25\text{ mA}, P_{OUT}=2.0\text{ W}, F=1.78, 1.85, 1.90\text{ GHz}$
Load Mismatch Tolerance	VSWR-T	-	5:1	-	$V_{CC}=25\text{ V}, I_{CO}=25\text{ mA}, P_{OUT}=2.0\text{ W}, F=1.78, 1.85, 1.90\text{ GHz}$
3rd Order IMD	IMD_3	-	-32	dBc	$V_{CC}=25\text{ V}, I_{CO}=25\text{ mA}, P_{OUT}=2.0\text{ W PEP}, F=1850\text{ MHz}, \Delta F=100\text{ kHz}$

Typical Optimum Device Impedances

F(GHz)	$Z_{IN}(\Omega)$	$Z_{LOAD}(\Omega)$
1.78	$6.6 + j10.0$	$6.0 + j12.0$
1.85	$8.4 + j10.1$	$5.7 + j11.0$
1.90	$9.5 + j9.9$	$5.0 + j9.0$



Specifications Subject to Change Without Notice.

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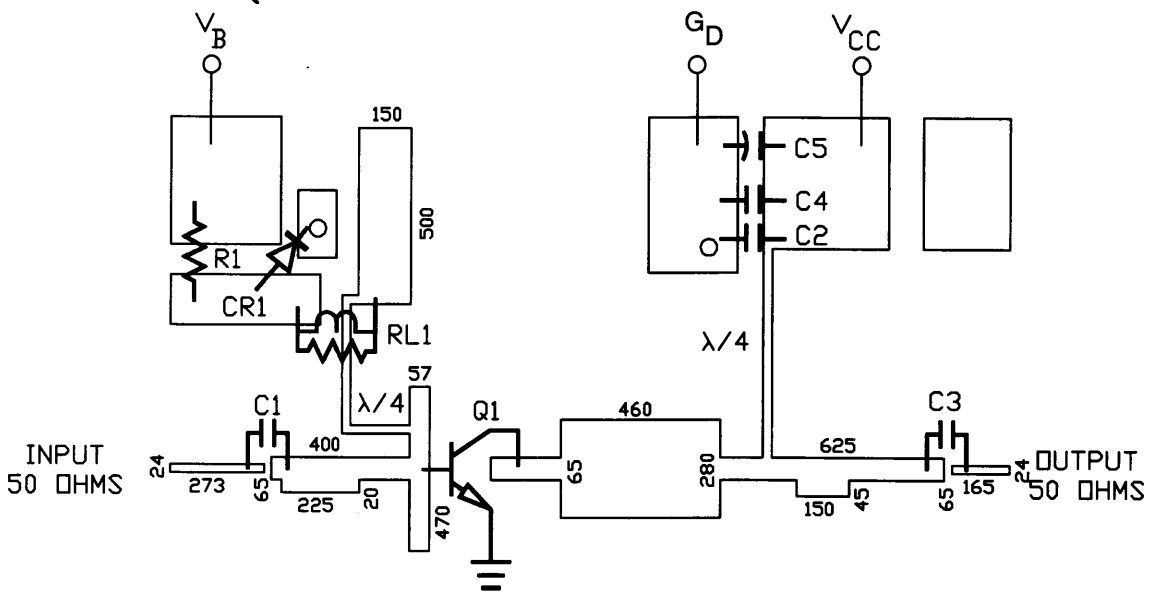
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RF Test Fixture



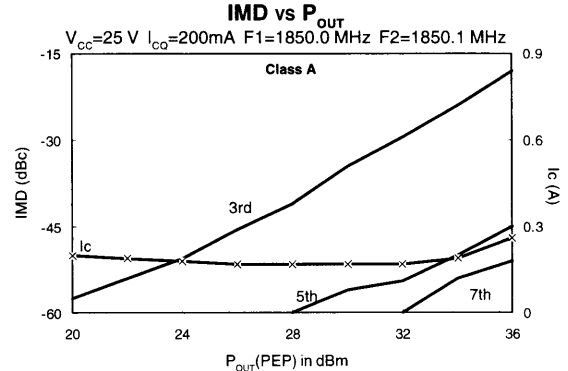
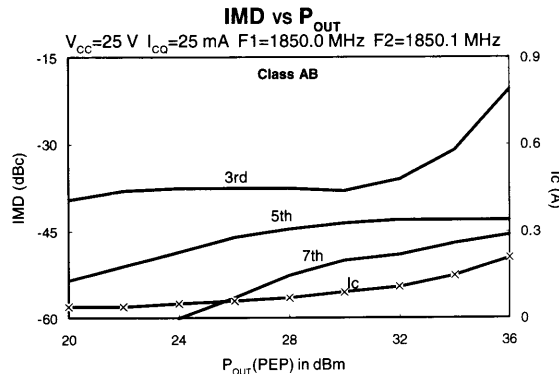
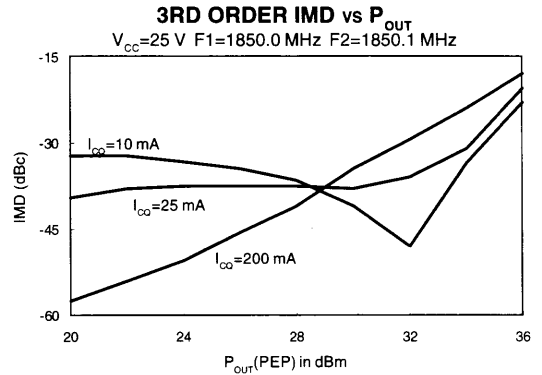
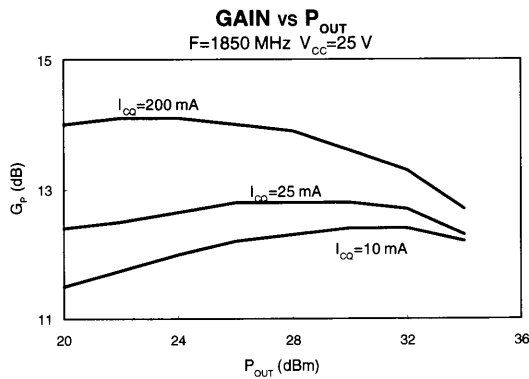
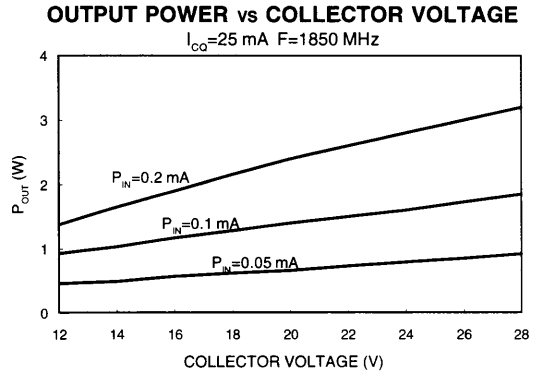
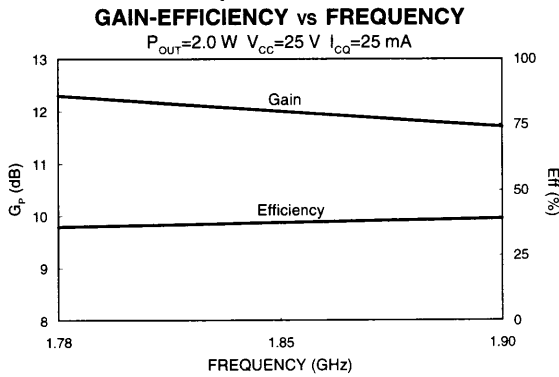
ARTWORK DIMENSIONS IN MILS

PARTS LIST

C1	C2	C3	33 pF ATC SIZE A
C4			5000 pF
C5			4.7 uF 63 VOLTS
CR1			1N914B DIODE
Q1			PH1819-2
R1			5 OHMS 1/4 WATT
RL1			6T/NO. 24 AWG ON 3 OHM 1/4 WATT
BOARD TYPE:			ROGERS 6010.5 .025" THICK, ER = 10.5

Specifications Subject to Change Without Notice.

Typical Performance Curves



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Typical S-Parameters

 $V_{cc}=25\text{ V}$, $I_{cc}=200\text{ mA}$

f(MHz)	S11		S21		S12		S22	
	Mag	Phase	Mag	Phase	Mag	Phase	Mag	Phase
100	1.10	171.5	23.80	120.3	0.012	-7.4	0.32	-74.5
200	0.75	175.1	12.15	92.1	0.014	-4.7	0.22	-89.6
300	0.79	-177.9	7.79	81.2	0.016	-4.5	0.20	-95.7
400	0.84	-177.4	5.77	74.4	0.016	-9.8	0.23	-98.7
500	0.87	-178.5	4.65	68.4	0.017	-3.7	0.26	-100.5
600	0.89	179.8	3.96	62.6	0.018	-5.9	0.27	-101.4
700	0.89	178.3	3.49	56.7	0.018	-0.7	0.29	-104.4
800	0.91	177.4	3.08	51.1	0.019	-2.7	0.33	-103.3
900	0.91	175.4	2.89	45.4	0.017	-3.4	0.36	-111.0
1000	0.91	174.1	2.74	38.9	0.019	-0.9	0.40	-114.6
1100	0.89	171.5	2.64	28.9	0.024	-6.1	0.46	-117.3
1200	0.87	171.7	2.45	22.8	0.024	-13.6	0.53	-120.8
1300	0.86	170.8	2.35	15.7	0.023	-18.3	0.57	-122.3
1400	0.86	170.3	2.32	7.6	0.026	-21.1	0.63	-145.5
1450	0.85	170.1	2.30	3.4	0.026	-22.9	0.65	-126.2
1500	0.84	169.9	2.27	-1.2	0.025	-22.3	0.66	-127.6
1550	0.83	169.7	2.26	-6.4	0.026	-31.0	0.68	-129.1
1600	0.82	169.7	2.24	-11.5	0.030	-37.3	0.71	-131.9
1650	0.82	170.0	2.22	-16.6	0.029	-43.2	0.72	-133.6
1700	0.81	170.5	2.19	-22.4	0.027	-48.5	0.73	-137.6
1750	0.80	171.1	2.14	-28.4	0.025	-52.2	0.76	-140.1
1800	0.80	171.5	2.11	-35.5	0.026	-60.2	0.76	-143.9
1850	0.80	171.9	2.05	-40.7	0.027	-60.1	0.81	-147.5
1900	0.81	172.6	1.99	-47.4	0.024	-67.1	0.81	-150.1
2000	0.82	173.6	1.83	-60.7	0.024	-80.8	0.86	-155.5
2100	0.84	174.5	1.61	-74.0	0.020	-94.0	0.88	-160.0
2200	0.88	174.2	1.40	-84.6	0.019	-104.7	0.87	-164.5
2300	0.90	173.6	1.21	-94.7	0.016	-128.7	0.86	-168.1

Specifications Subject to Change Without Notice.

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Wireless Bipolar Power Transistor, 4W

1.78 - 1.90 GHz

PH1819-4N

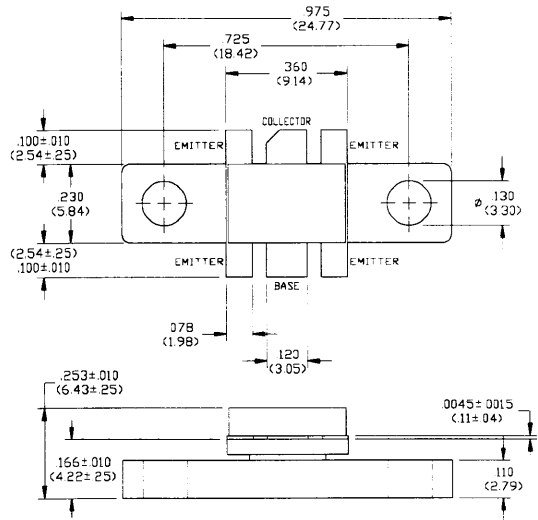
V2.00

Features

- NPN Silicon Microwave Power Transistor
- Designed for Linear Amplifier Applications
- Class AB: -34 dBc Typ 3rd IMD at 4 Watts PEP
- Class A: +44 dBm Typ 3rd Order Intercept Point
- Common Emitter Configuration
- Internal Input Impedance Matching
- Diffused Emitter Ballasting
- Gold Metallization System

Absolute Maximum Ratings at 25°C

Parameter	Symbol	Rating	Units
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CES}	60	V
Emitter-Base Voltage	V_{EBO}	3.0	V
Collector Current	I_C	0.7	A
Power Dissipation	P_D	19.5	W
Junction Temperature	T_J	200	°C
Storage Temperature	T_{STG}	-55 to +150	°C
Thermal Resistance	θ_{JC}	7.5	°C/W



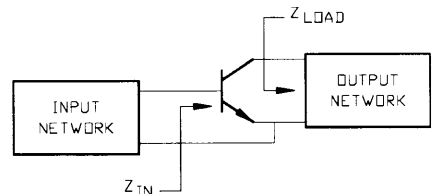
UNLESS OTHERWISE NOTED, TOLERANCES ARE INCHES = .005" (MILLIMETERS = .13MM)

Electrical Characteristics at 25°C

Parameter	Symbol	Min	Max	Units	Test Conditions
Collector-Emitter Breakdown Voltage	BV_{CES}	60	-	V	$I_C=5\text{ mA}$
Collector-Emitter Leakage Current	I_{CES}	-	2.0	mA	$V_{CE}=24\text{ V}$
Collector-Emitter Breakdown Voltage	BV_{CEO}	20	-	V	$I_C=5\text{ mA}$
Emitter-Base Breakdown Voltage	BV_{EBO}	3.0	-	V	$I_B=2.5\text{ mA}$
DC Forward Current Gain	h_{FE}	15	120	-	$V_{CE}=5\text{ V}, I_C=0.1\text{ A}$
Power Gain	G_p	10	-	dB	$V_{CC}=26\text{ V}, I_{CO}=20\text{ mA}, P_{OUT}=4\text{ W PEP}, F=1850\text{ MHz}, \Delta F=100\text{ kHz}$
Collector Efficiency	η_C	25	-	%	$V_{CC}=26\text{ V}, I_{CO}=20\text{ mA}, P_{OUT}=4\text{ W PEP}, F=1850\text{ MHz}, \Delta F=100\text{ kHz}$
Input Return Loss	RL	10	-	dB	$V_{CC}=26\text{ V}, I_{CO}=20\text{ mA}, P_{OUT}=4\text{ W PEP}, F=1850\text{ MHz}, \Delta F=100\text{ kHz}$
Load Mismatch Tolerance	VSWR-T	-	10:1	-	$V_{CC}=26\text{ V}, I_{CO}=20\text{ mA}, P_{OUT}=4\text{ W PEP}, F=1850\text{ MHz}, \Delta F=100\text{ kHz}$
3rd Order IMD	IMD_3	-	-30	dBc	$V_{CC}=26\text{ V}, I_{CO}=20\text{ mA}, P_{OUT}=4\text{ W PEP}, F=1850\text{ MHz}, \Delta F=100\text{ kHz}$

Typical Optimum Device Impedances

F(MHz)	$Z_{IN}(\Omega)$	$Z_{LOAD}(\Omega)$
1780	$3.5 + j9.3$	$3.5 + j5.6$
1850	$3.1 + j9.2$	$4.5 + j5.2$
1900	$3.3 + j8.9$	$4.8 + j5.5$



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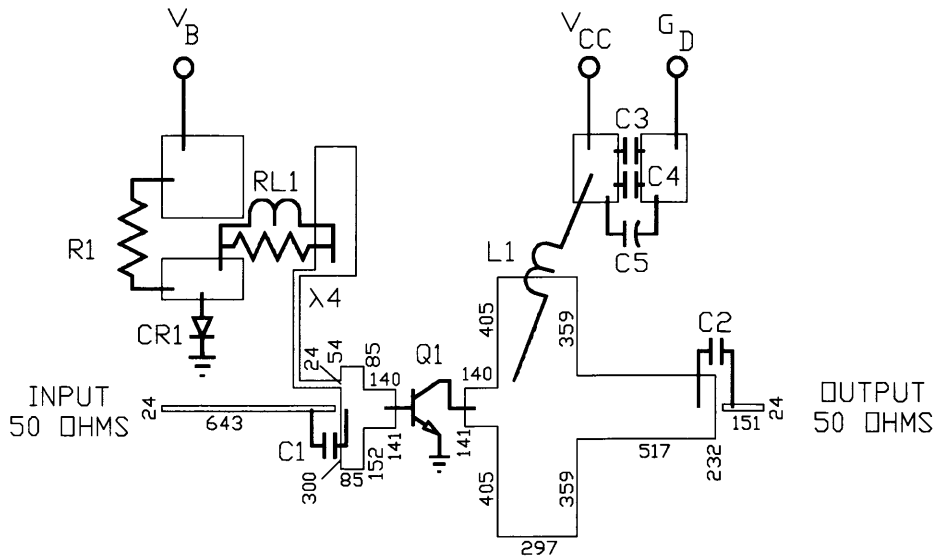
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RF Test Fixture



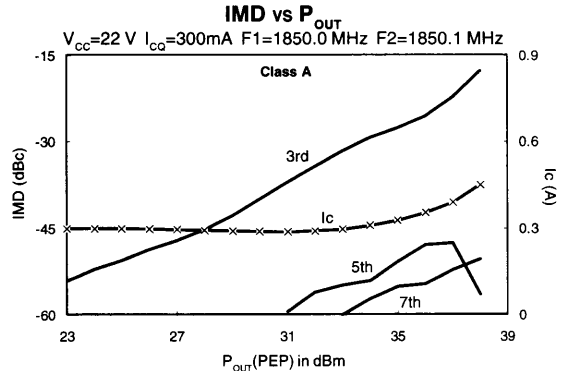
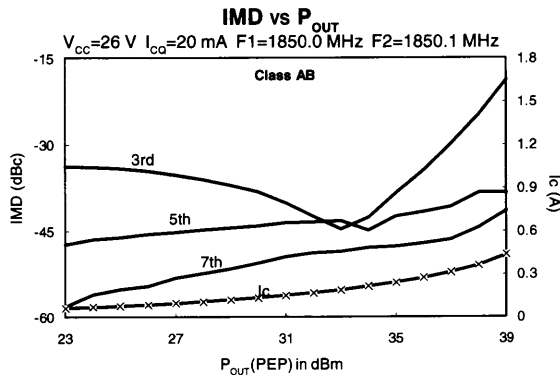
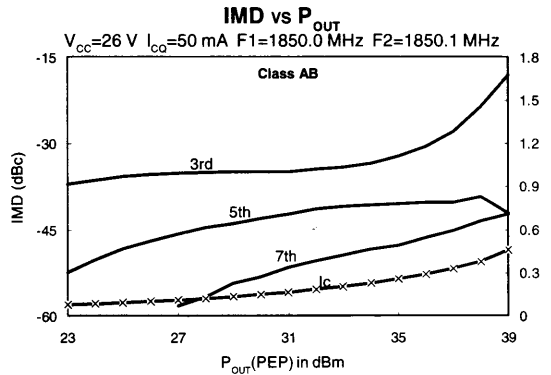
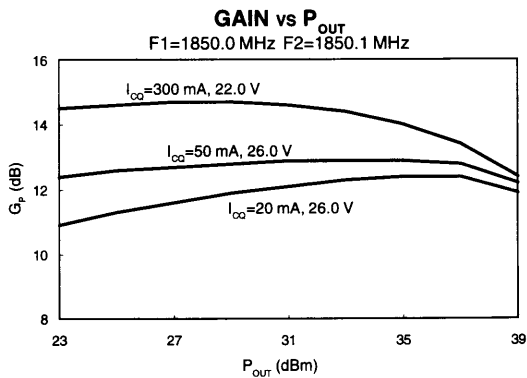
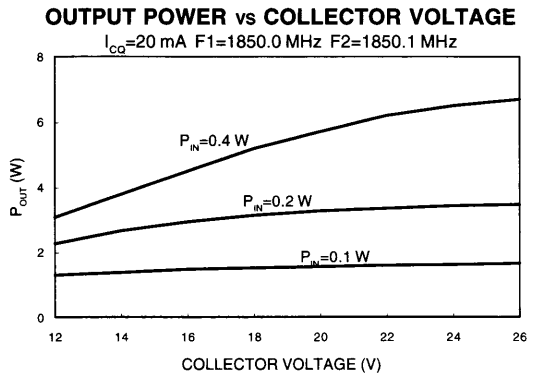
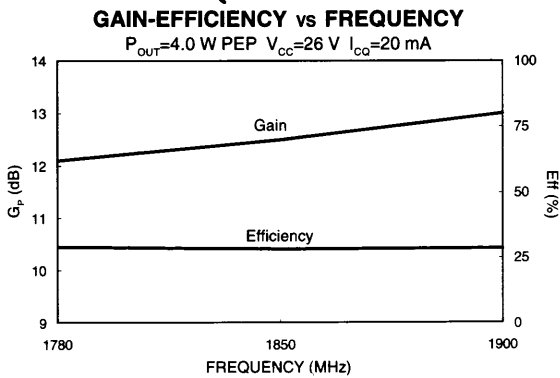
ARTWORK DIMENSIONS IN MILS

PARTS LIST

- C1 C2 C3 33 pF ATC SIZE A
- C4 5000 pF CHIP
- C5 50 uF 50 VOLTS
- CR1 1N4245 DIODE
- L1 5 TURNS OF NO. 20 AWG ON .160" DIA
- R1 4.7 OHMS 1/4 WATT
- RL1 7 TURNS OF NO. 24 AWG ON 3 OHM 1/4 WATT
- Q1 PH1819-4N
- BOARD TYPE: ROGERS 6010.5 .025" THICK, $E_R = 10.5$

Specifications Subject to Change Without Notice.

Typical Broadband Performance Curves



Specifications Subject to Change Without Notice.

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Wireless Bipolar Power Transistor, 10W

1.78 - 1.90 GHz

PH1819-10

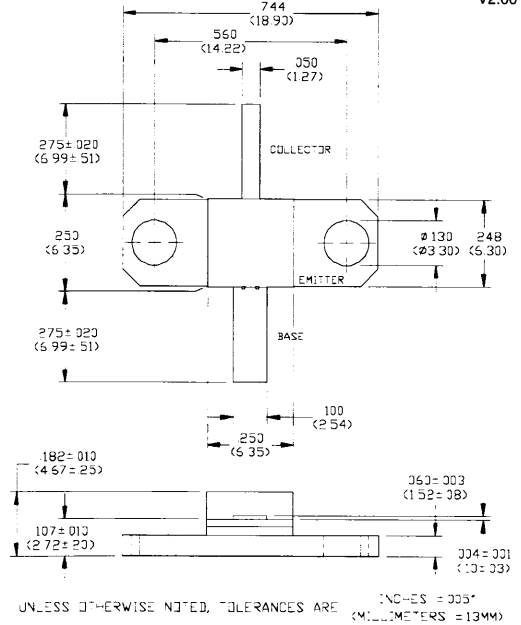
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Features

- Designed for Cellular Base Station Applications
- -30 dBc Typ 3rd IMD at 10 Watts PEP
- Common Emitter Configuration
- Internal Input Impedance Matching
- Diffused Emitter Ballasting

Absolute Maximum Ratings at 25°C

Parameter	Symbol	Rating	Units
Collector-Base Voltage	V_{CBO}	65	V
Collector-Emitter Voltage	V_{CES}	65	V
Emitter-Base Voltage	V_{EBO}	3.0	V
Collector Current	I_C	3.0	A
Power Dissipation	P_D	44	W
Junction Temperature	T_J	200	°C
Storage Temperature	T_{STG}	-55 to +150	°C
Thermal Resistance	θ_{JC}	4.0	°C/W

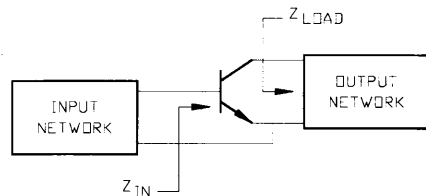


Electrical Characteristics at 25°C

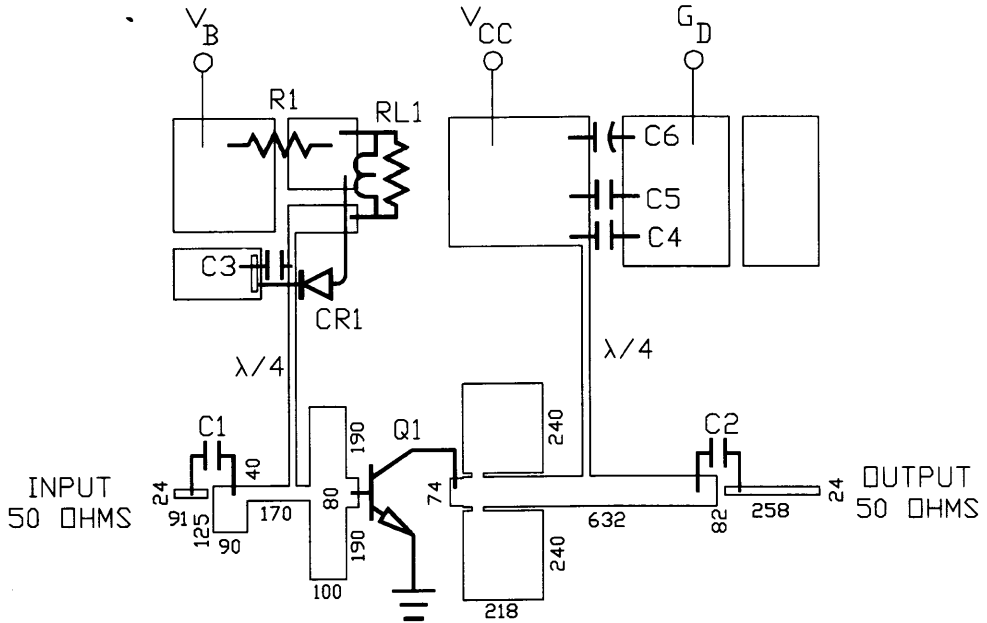
Parameter	Symbol	Min	Max	Units	Test Conditions
Collector-Emitter Breakdown Voltage	BV_{CES}	65	-	V	$I_C=10$ mA
Collector-Emitter Leakage Current	I_{CES}	-	2.0	mA	$V_{CE}=25$ V
Collector-Emitter Breakdown Voltage	BV_{CEO}	20	-	V	$I_C=10$ mA
Collector-Emitter Breakdown Voltage	BV_{CER}	30	-	V	$I_C=10$ mA, $R_{BE}=220$ Ω
Emitter-Base Breakdown Voltage	BV_{EBO}	3.0	-	V	$I_B=10$ mA
DC Forward Current Gain	h_{FE}	15	120	-	$V_{CE}=5$ V, $I_C=250$ mA
Power Gain	G_P	9.0	-	dB	$V_{CC}=25$ V, $I_{CO}=100$ mA, $P_{OUT}=10$ W, $F=1.78 - 1.90$ GHz
Collector Efficiency	η_C	40	-	%	$V_{CC}=25$ V, $I_{CO}=100$ mA, $P_{OUT}=10$ W, $F=1.78 - 1.90$ GHz
Input Return Loss	RL	10	-	dB	$V_{CC}=25$ V, $I_{CO}=100$ mA, $P_{OUT}=10$ W, $F=1.78 - 1.90$ GHz
Load Mismatch Tolerance	VSWR	-	3.0:1	-	$V_{CC}=25$ V, $I_{CO}=100$ mA, $P_{OUT}=10$ W, $F=1.78 - 1.90$ GHz
3rd Order IMD	IMD ₃	-	-28	dBc	$V_{CC}=25$ V, $I_{CO}=100$ mA, $P_{OUT}=10$ W PEP, $F=1850$ MHz, $\Delta F=100$ kHz

Typical Optimum Device Impedances

F(GHz)	$Z_{IN}(\Omega)$	$Z_{LOAD}(\Omega)$
1.78	$4.5 + j7.0$	$2.5 + j0.2$
1.85	$5.0 + j7.3$	$2.5 + j0$
1.90	$6.0 + j6.1$	$2.6 + j0.2$



RF Test Fixture



ARTWORK DIMENSIONS IN MILS

PARTS LIST

- C1 C2 C3 C4 33 pF ATC SIZE A
- C5 5000 pF
- C6 50 uF 50 VOLTS
- CR1 1N4245 DIODE
- Q1 PH1819-10
- R1 5.1 OHMS 1/4 WATT
- RL1 6T/NO. 24 AWG ON 3 OHM 1/4 WATT
- BOARD TYPE: ROGERS 6010.5 .025" THICK, $E_R = 10.5$

Specifications Subject to Change Without Notice.

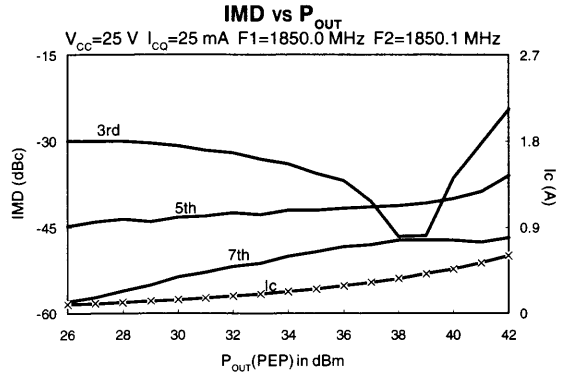
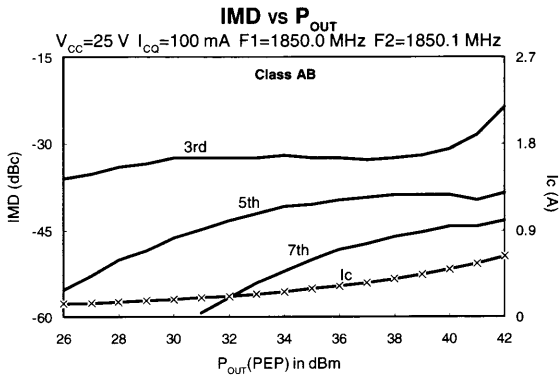
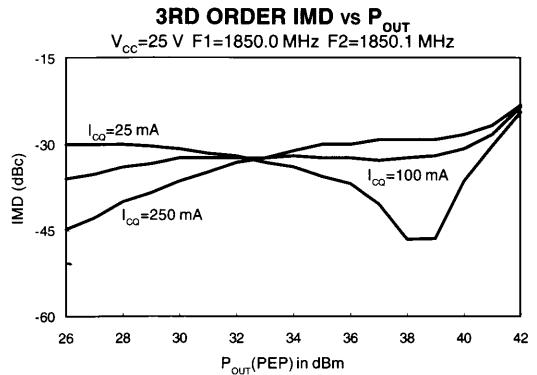
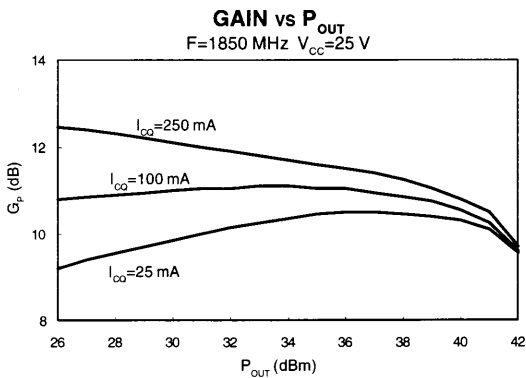
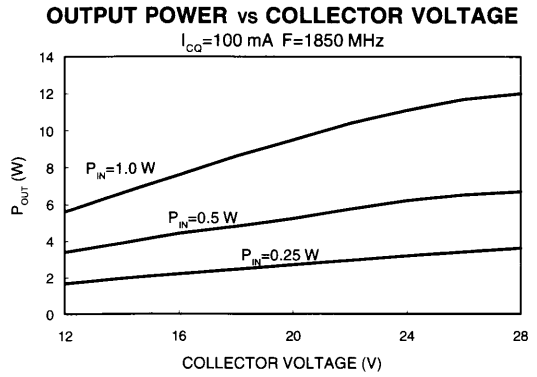
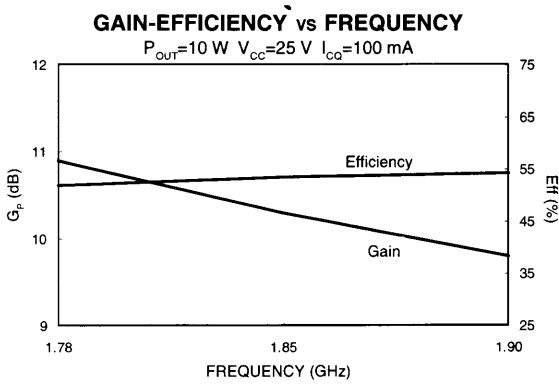
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Typical Broadband Performance Curves



Specifications Subject to Change Without Notice.

Wireless Bipolar Power Transistor, 15W

1.78 - 1.90 GHz

PH1819-15N

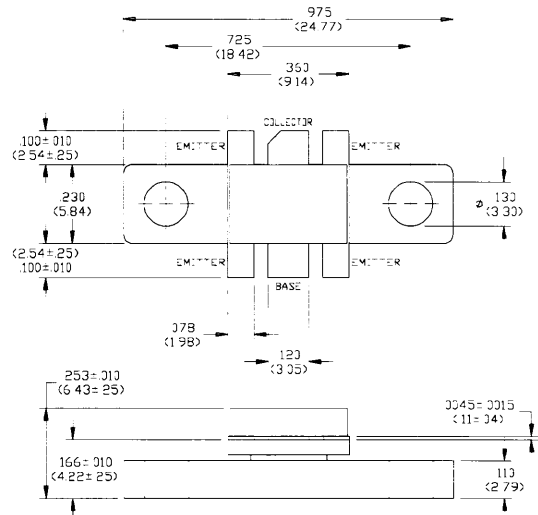
V2.00

Features

- NPN Silicon Microwave Power Transistor
- Designed for Linear Amplifier Applications
- Class AB: -34 dBc Typ 3rd IMD at 15 Watts PEP
- Class A: +48 dBm Typ 3rd Order Intercept Point
- Common Emitter Configuration
- Internal Input Impedance Matching
- Diffused Emitter Ballasting
- Gold Metallization System

Absolute Maximum Ratings at 25°C

Parameter	Symbol	Rating	Units
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CES}	60	V
Emitter-Base Voltage	V_{EBO}	3.0	V
Collector Current	I_C	2.0	A
Power Dissipation	P_D	58	W
Junction Temperature	T_J	200	°C
Storage Temperature	T_{STG}	-55 to +150	°C
Thermal Resistance	θ_{JC}	3.0	°C/W



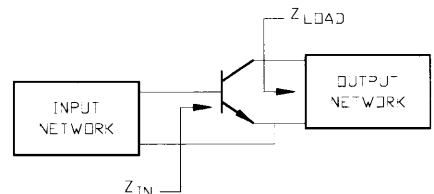
UNLESS OTHERWISE NOTED, TOLERANCES ARE INCHES = 0.005" (MILLIMETERS = 0.13MM)

Electrical Characteristics at 25°C

Parameter	Symbol	Min	Max	Units	Test Conditions
Collector-Emitter Breakdown Voltage	BV_{CES}	60	-	V	$I_C=10$ mA
Collector-Emitter Leakage Current	I_{CES}	-	1.0	mA	$V_{CE}=24$ V
Collector-Emitter Breakdown Voltage	BV_{CEO}	24	-	V	$I_C=10$ mA
Emitter-Base Breakdown Voltage	BV_{EBO}	3.0	-	V	$I_B=10$ mA
DC Forward Current Gain	h_{FE}	15	120	-	$V_{CE}=5$ V, $I_C=0.5$ A
Power Gain	G_P	7.0	-	dB	$V_{CC}=26$ V, $I_{CO}=25$ mA, $P_{OUT}=15$ W PEP, $F=1880$ MHz, $\Delta F=100$ kHz
Collector Efficiency	η_C	25	-	%	$V_{CC}=26$ V, $I_{CO}=25$ mA, $P_{OUT}=15$ W PEP, $F=1880$ MHz, $\Delta F=100$ kHz
Input Return Loss	RL	10	-	dB	$V_{CC}=26$ V, $I_{CO}=25$ mA, $P_{OUT}=15$ W PEP, $F=1880$ MHz, $\Delta F=100$ kHz
Load Mismatch Tolerance	VSWR-T	-	10:1	-	$V_{CC}=26$ V, $I_{CO}=25$ mA, $P_{OUT}=15$ W PEP, $F=1880$ MHz, $\Delta F=100$ kHz
3rd Order IMD	IMD ₃	-	-30	dBc	$V_{CC}=26$ V, $I_{CO}=25$ mA, $P_{OUT}=15$ W PEP, $F=1880$ MHz, $\Delta F=100$ kHz

Typical Optimum Device Impedances

F(MHz)	$Z_{IN}(\Omega)$	$Z_{LOAD}(\Omega)$
1780	$10.5 + j12.3$	$1.6 - j1.9$
1850	$11.4 + j11$	$1.6 - j2.2$
1880	$11.9 + j6.2$	$1.6 - j2.5$
1880	$9.9 + j3.6$	$1.6 - j2.7$
1900	$8.8 + j1.9$	$1.4 - j2.7$



Specifications Subject to Change Without Notice.

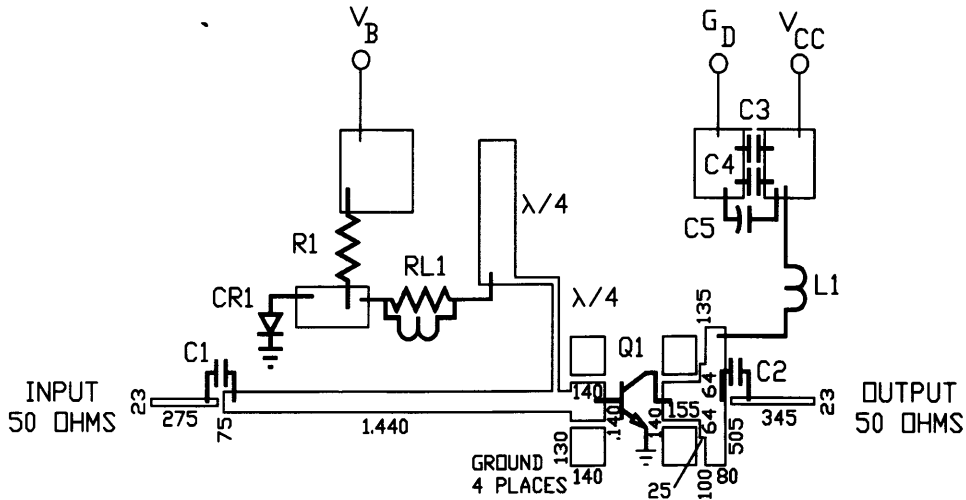
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RF Test Fixture



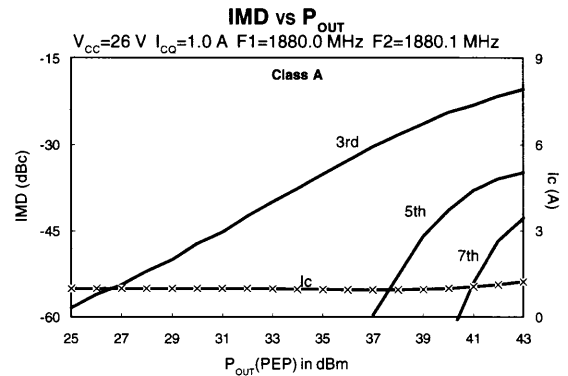
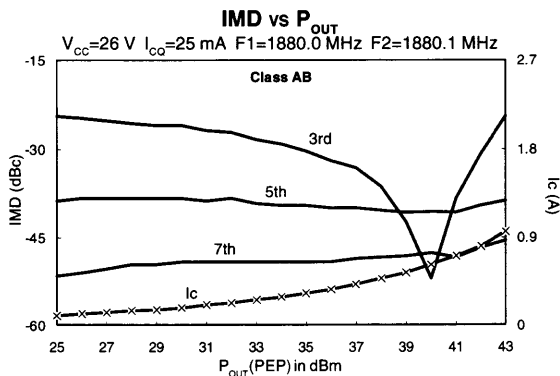
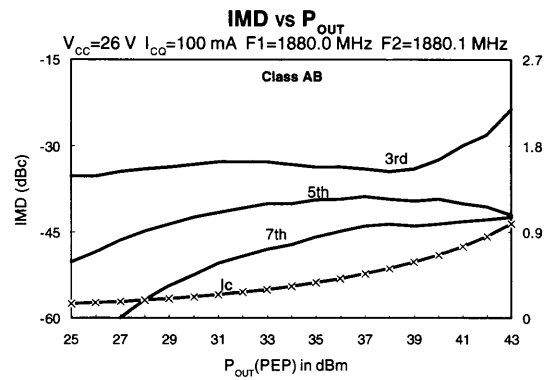
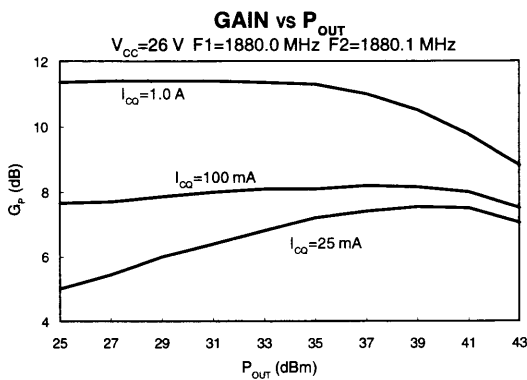
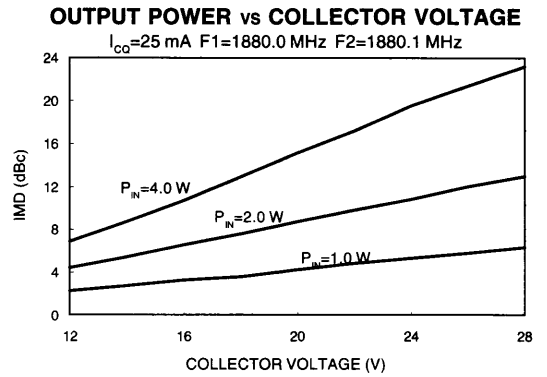
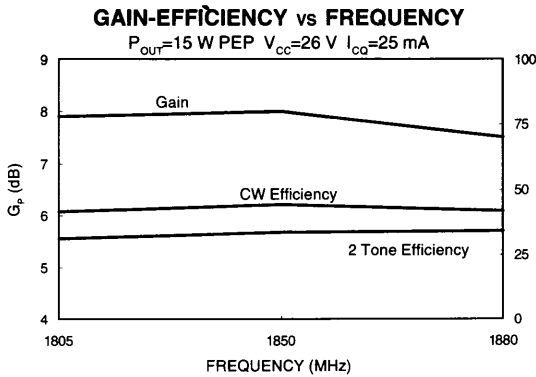
ARTWORK DIMENSIONS IN MILS

PARTS LIST

C1 C4	20pF ATC SIZE A CAPACITOR
C2	2.2pF ATC SIZE A CAPACITOR
C3	5000pF CHIP CAPACITOR
C5	50 VOLT 50uF ELECTROLYTIC CAPACITOR
CR1	1N5417 DIODE
L1	10 TURNS OF NO. 22 AWG ON .125' DIA
Q1	PH1819-15N
R1	4.7 OHM 1/4 WATT RESISTOR
RL1	13 TURNS OF NO. 26 AWG ON 3 OHM 1/4 WATT RESISTOR
BOARD TYPE	ROGERS 6010.5 .025' THICK, $\epsilon_R = 10.5$

Specifications Subject to Change Without Notice.

Typical Broadband Performance Curves



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Wireless Power Transistor, 33W

1805 - 1880 MHz

PH1819-33

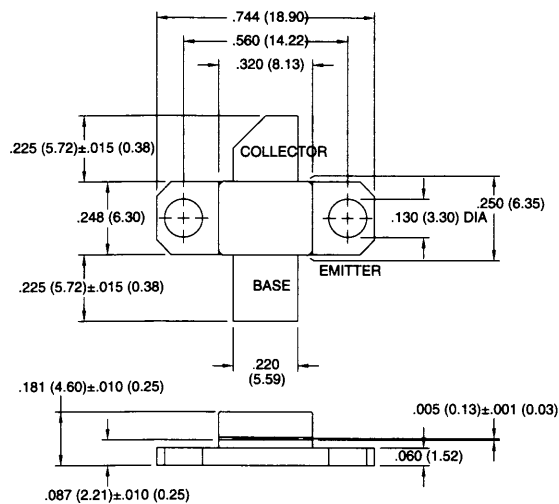
V2.01

Features

- NPN Silicon Microwave Power Transistor
- Common Emitter Class AB Operation
- Internal Input and Output Impedance Matching
- Diffused Emitter Ballasting
- Gold Metallization System

Absolute Maximum Ratings at 25°C

Parameter	Symbol	Rating	Units
Collector-Emitter Voltage	V_{CE0}	25	V
Collector-Emitter Voltage	V_{CES}	65	V
Emitter-Base Voltage	V_{EBO}	3.0	V
Collector Current	I_C	4.7	A
Power Dissipation	P_D	91	W
Storage Temperature	T_{STG}	-55 to +150	°C
Junction Temperature	T_J	200	°C
Thermal Resistance	θ_{JC}	3.0	°C/W

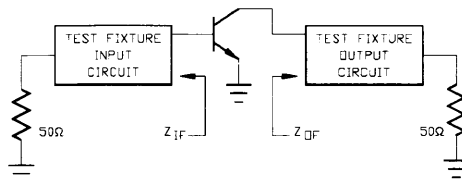


Electrical Characteristics at 25°C

Parameter	Symbol	Min	Max	Units	Test Conditions
Power Gain	G_p	7.0	-	dB	$V_{CC}=25\text{ V}$, $I_{CO}=200\text{ mA}$, $P_{OUT}=33\text{ W}$, $F=1805, 1880\text{ MHz}$
Collector Efficiency	η_c	40	-	%	$V_{CC}=25\text{ V}$, $I_{CO}=200\text{ mA}$, $P_{OUT}=33\text{ W}$, $F=1805, 1880\text{ MHz}$
Input Return Loss	RL	10	-	dB	$V_{CC}=25\text{ V}$, $I_{CO}=200\text{ mA}$, $P_{OUT}=33\text{ W}$, $F=1805, 1880\text{ MHz}$
Load Mismatch Tolerance	VSWR-T	-	2:1	-	$V_{CC}=25\text{ V}$, $I_{CO}=200\text{ mA}$, $P_{OUT}=33\text{ W}$, $F=1805, 1880\text{ MHz}$

Broadband Test Fixture Impedances

F(GHz)	$Z_{IF}(\Omega)$	$Z_{OF}(\Omega)$
1805	$1.8 - j5.5$	$4.0 - j1.4$
1850	$1.6 - j5.1$	$3.9 - j1.4$
1880	$1.7 - j4.8$	$4.0 - j0.9$



Specifications Subject to Change Without Notice.

9-192

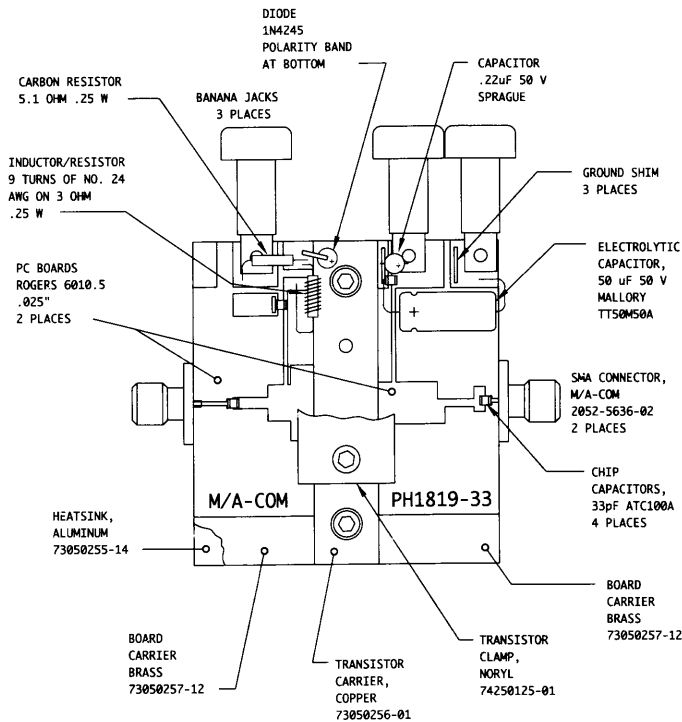
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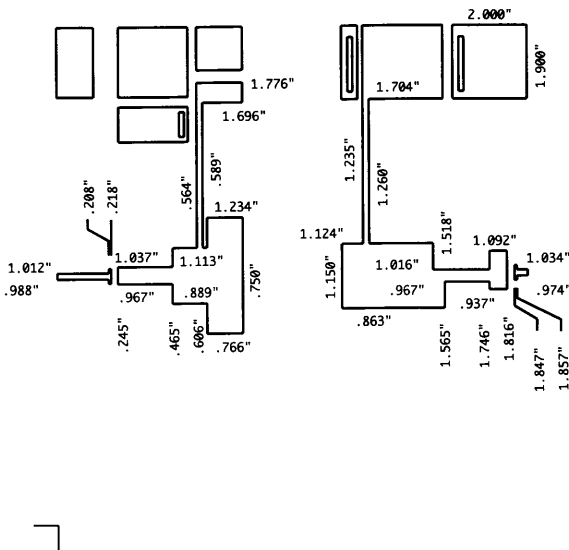
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RF Test Fixture



Test Fixture PC Board Dimensions



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Wireless Bipolar Power Transistor, 33W

1930 - 1990 MHz

PH1920-33

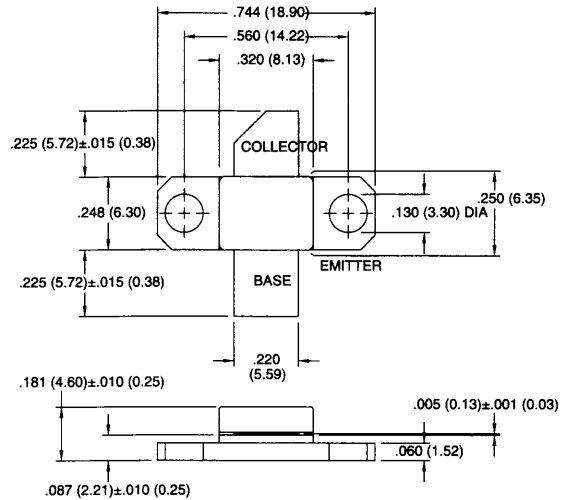
V2.01

Features

- NPN Silicon Microwave Power Transistor
- Common Emitter Class AB Operation
- Internal Input and Output Impedance Matching
- Diffused Emitter Ballasting
- Gold Metallization System

Absolute Maximum Ratings at 25°C

Parameter	Symbol	Rating	Units
Collector-Emitter Voltage	V_{CEO}	25	V
Collector-Emitter Voltage	V_{CES}	65	V
Emitter-Base Voltage	V_{EBO}	3.0	V
Collector Current	I_C	4.7	A
Power Dissipation	P_D	91	W
Storage Temperature	T_{STG}	-55 to +150	°C
Junction Temperature	T_J	200	°C
Thermal Resistance	θ_{JC}	1.6	°C/W



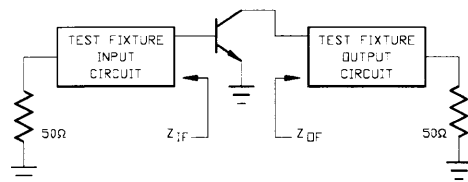
UNLESS OTHERWISE NOTED, TOLERANCES ARE
INCHES ± .005* (MILLIMETERS ± 0.13MM)

Electrical Characteristics at 25°C

Parameter	Symbol	Min	Max	Units	Test Conditions
Power Gain	G_p	7.0	-	dB	$V_{CC}=25\text{ V}$, $I_{CO}=200\text{ mA}$, $P_{OUT}=33\text{ W}$, $F=1930, 1990\text{ MHz}$
Collector Efficiency	η_c	40	-	%	$V_{CC}=25\text{ V}$, $I_{CO}=200\text{ mA}$, $P_{OUT}=33\text{ W}$, $F=1930, 1990\text{ MHz}$
Input Return Loss	RL	10	-	dB	$V_{CC}=25\text{ V}$, $I_{CO}=200\text{ mA}$, $P_{OUT}=33\text{ W}$, $F=1930, 1990\text{ MHz}$
Load Mismatch Tolerance	VSWR-T	-	2:1	-	$V_{CC}=25\text{ V}$, $I_{CO}=200\text{ mA}$, $P_{OUT}=33\text{ W}$, $F=1930, 1990\text{ MHz}$

Broadband Test Fixture Impedances

F(GHz)	$Z_{IF}(\Omega)$	$Z_{OF}(\Omega)$
1930	2.6 - j2.6	3.3 - j1.1
1960	2.5 - j2.5	3.8 - j1.0
1990	2.4 - j2.3	4.1 - j0.8



Specifications Subject to Change Without Notice.

9-194

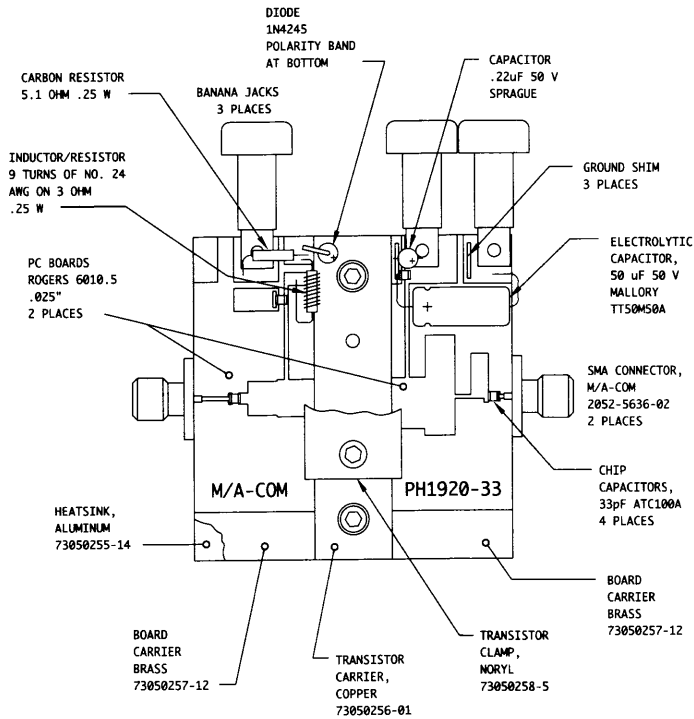
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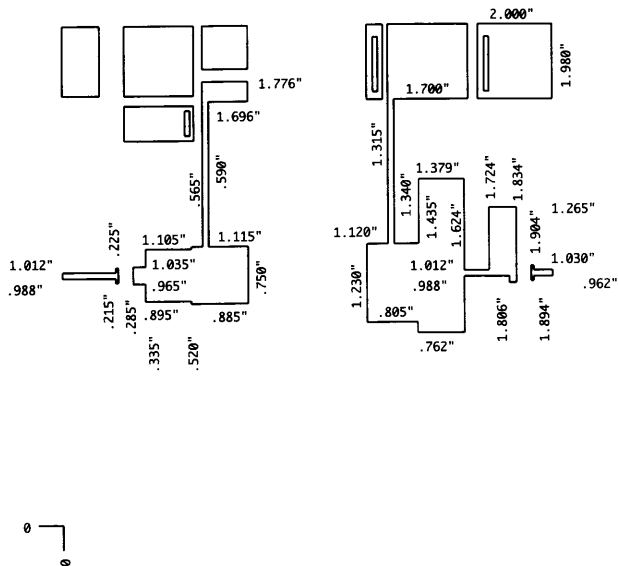
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RF Test Fixture



Test Fixture PC Board Dimensions



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