

PTB 20151

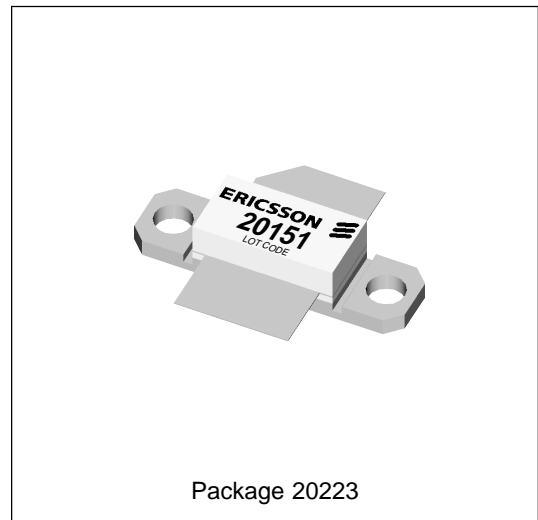
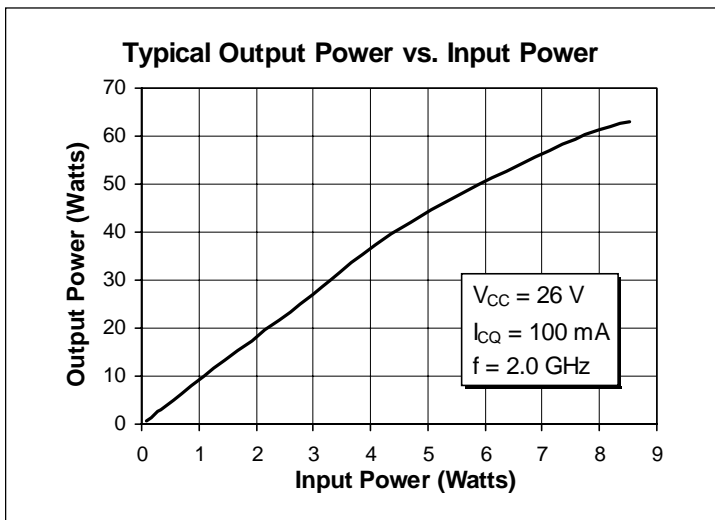
45 Watts, 1.8–2.0 GHz

PCN/PCS Power Transistor

Description

The 20151 is a class AB, NPN common emitter RF power transistor intended for 26 Vdc operation from 1.8 to 2.0 GHz. Rated at 45 watts minimum output power for PEP applications, it is specifically intended for operation as a final or driver stage in CDMA or TDMA systems. Ion implantation, nitride surface passivation and gold metallization ensure excellent device reliability. 100% lot traceability is standard.

- 45 Watts, 1.8–2.0 GHz
- Class AB Characteristics
- 40% Collector Efficiency at 45 W
- Gold Metallization
- Silicon Nitride Passivated



Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|-----------------|-------------|---------------|
| Collector-Emitter Voltage | V_{CER} | 50 | Vdc |
| Collector-Base Voltage | V_{CBO} | 50 | Vdc |
| Emitter-Base Voltage (collector open) | V_{EBO} | 4.0 | Vdc |
| Collector Current (continuous) | I_C | 7.7 | Adc |
| Total Device Dissipation at $T_{flange} = 25^\circ C$ Above $25^\circ C$ derate by | P_D | 200 1.2 | Watts W/°C |
| Storage Temperature Range | T_{STG} | -40 to +150 | °C |
| Thermal Resistance ($T_{flange} = 70^\circ C$) | $R_{\theta JC}$ | 0.85 | °C/W |

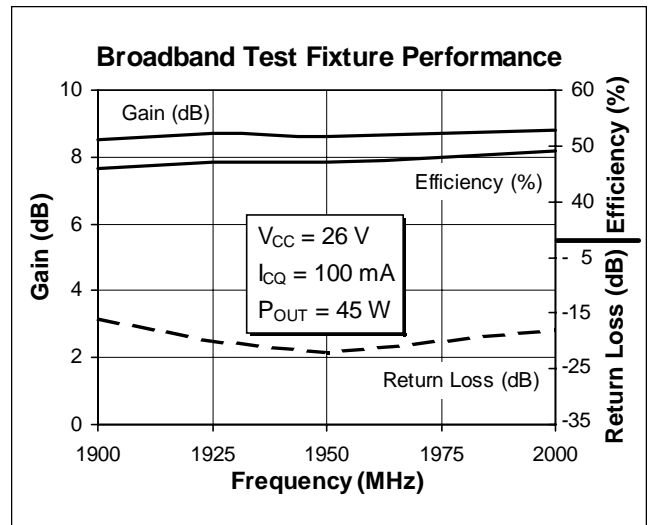
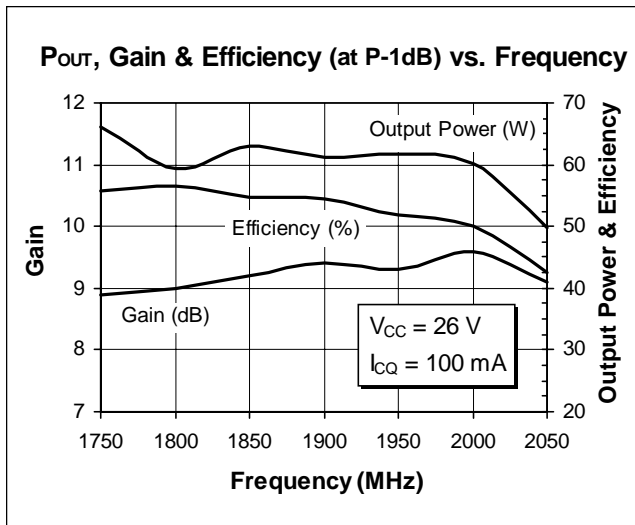
Electrical Characteristics (100% Tested)

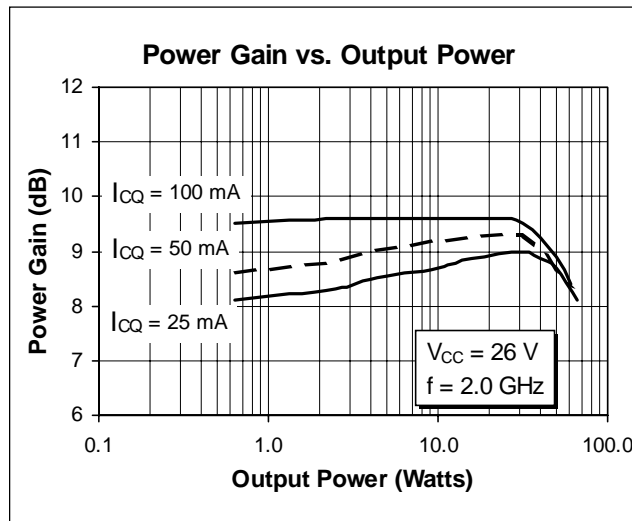
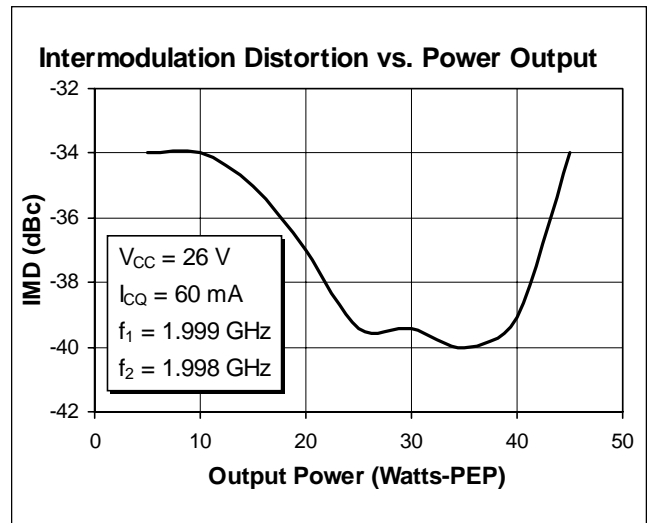
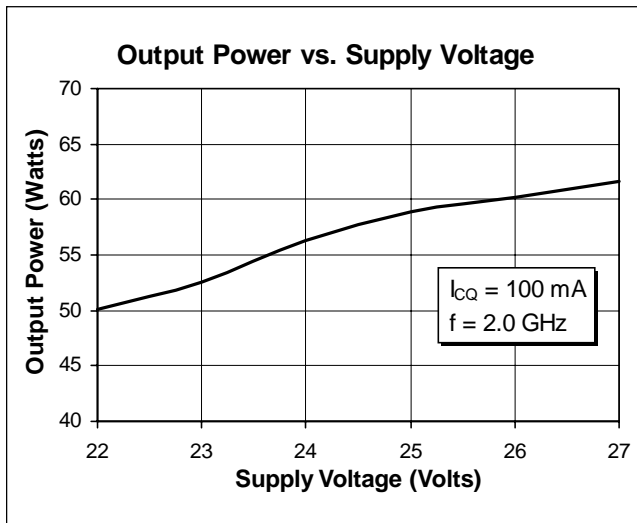
| Characteristic | Conditions | Symbol | Min | Typ | Max | Units |
|--------------------------|--|---------------|-----|-----|-----|-------|
| Breakdown Voltage C to E | $V_{BE} = 0\text{ V}, I_C = 100\text{ mA}$ | $V_{(BR)CES}$ | 50 | — | — | Volts |
| Breakdown Voltage C to E | $I_B = 0\text{ A}, I_C = 100\text{ mA}, R_{BE} = 22\ \Omega$ | $V_{(BR)CER}$ | 50 | — | — | Volts |
| Breakdown Voltage E to B | $I_C = 0\text{ A}, I_E = 5\text{ mA}$ | $V_{(BR)EBO}$ | 4.0 | 5.0 | — | Volts |
| DC Current Gain | $V_{CE} = 5\text{ V}, I_C = 1\text{ A}$ | h_{FE} | 20 | 40 | — | — |

RF Specifications (100% Tested)

| Characteristic | Symbol | Min | Typ | Max | Units |
|---|----------|------|-----|-----|-------|
| Gain ($V_{CC} = 26\text{ Vdc}, P_{OUT} = 10\text{ W}, I_{CQ} = 100\text{ mA}, f = 2\text{ GHz}$) | G_{pe} | 8.0 | 9.5 | — | dB |
| Power Output at 1 dB Compression ($V_{CC} = 26\text{ Vdc}, P_{OUT} = 45\text{ W}, I_{CQ} = 100\text{ mA}, f = 2\text{ GHz}$) | P-1dB | 45.0 | — | — | Watts |
| Collector Efficiency ($V_{CC} = 26\text{ Vdc}, P_{OUT} = 45\text{ W}, I_{CQ} = 100\text{ mA}, f = 2\text{ GHz}$) | η_C | 40 | 47 | — | % |
| Load Mismatch Tolerance ($V_{CC} = 26\text{ Vdc}, P_{OUT} = 22.5\text{ W}, I_{CQ} = 100\text{ mA}, f = 2\text{ GHz}$ —all phase angles at frequency of test) | Ψ | — | — | 5:1 | — |

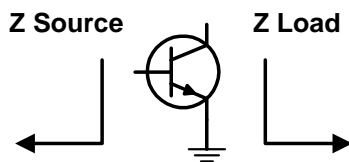
Typical Performance



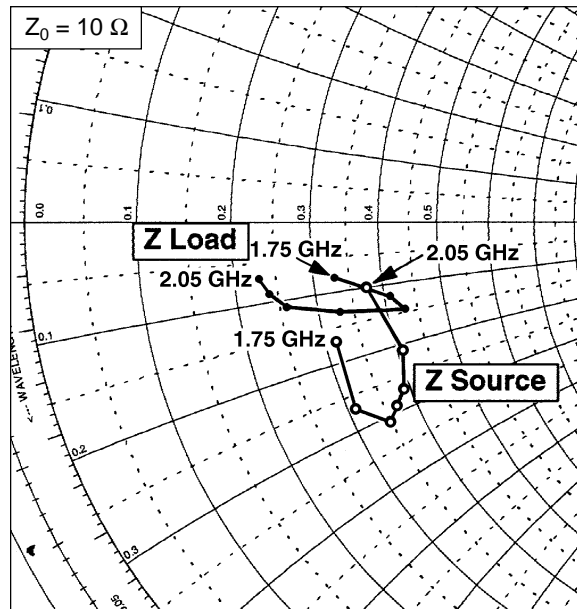


Impedance Data

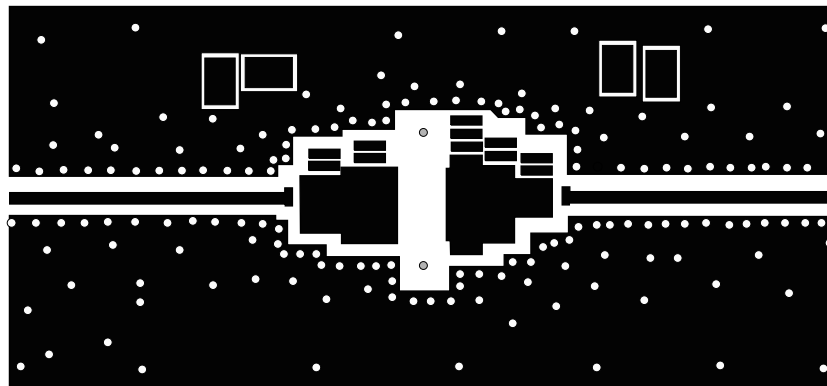
($V_{CC} = 26 \text{ Vdc}$, $P_{OUT} = 45 \text{ W}$, $I_{CQ} = 100 \text{ mA}$)




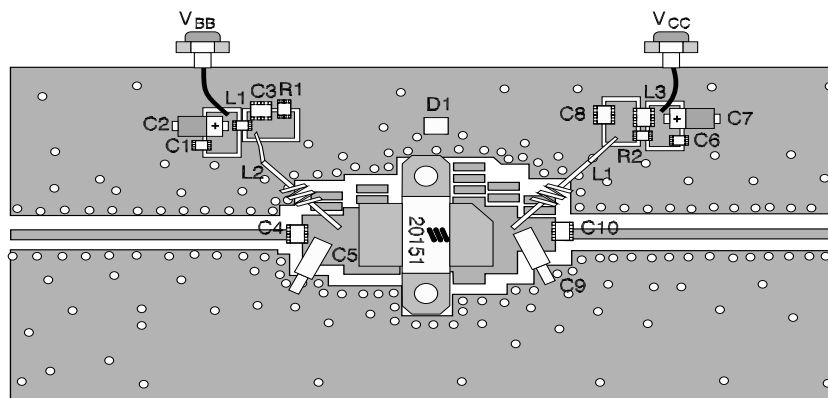
| Frequency GHz | Z Source | | Z Load | |
|------------------|----------|------|--------|------|
| | R | jX | R | jX |
| 1.75 | 3.15 | -1.7 | 3.3 | -0.8 |
| 1.80 | 3.10 | -2.7 | 4.1 | -1.2 |
| 1.85 | 3.50 | -3.1 | 4.3 | -1.5 |
| 1.90 | 3.70 | -2.9 | 3.3 | -1.3 |
| 1.95 | 3.90 | -2.7 | 2.6 | -1.1 |
| 2.00 | 4.10 | -2.1 | 2.4 | -0.9 |
| 2.05 | 3.75 | -1.0 | 2.3 | -0.7 |



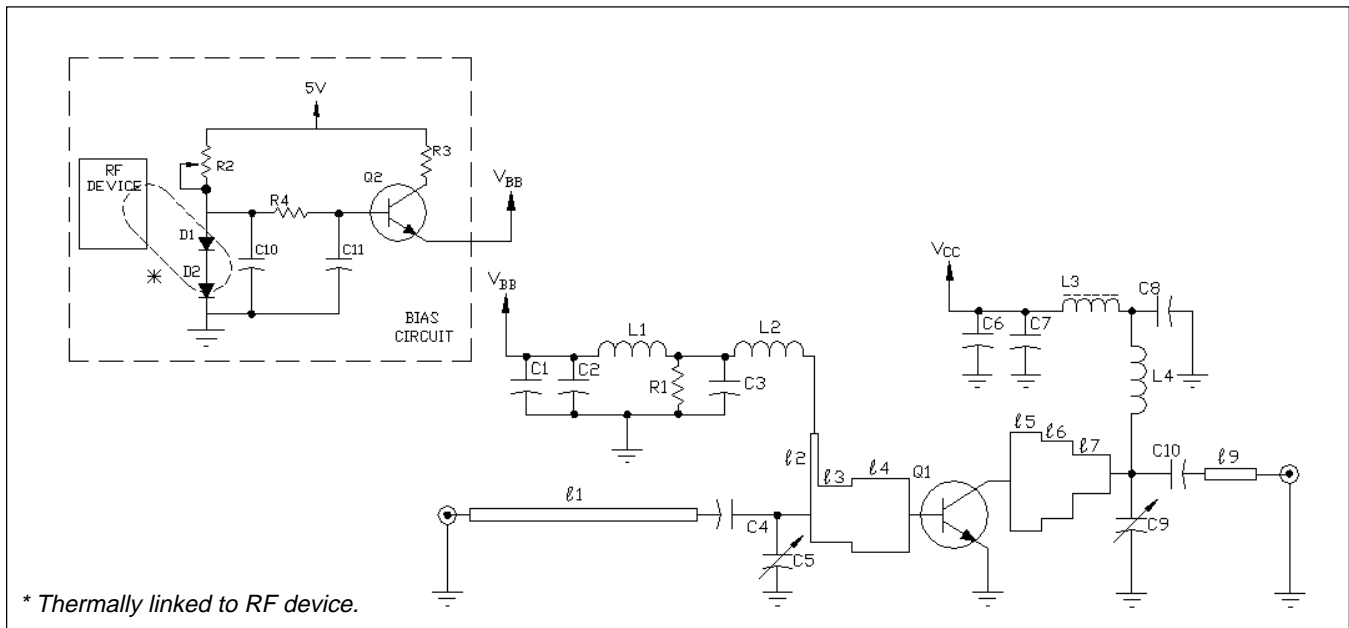
Test Circuit



Artwork (1 inch )



Parts Layout (not to scale)



Schematic for $f = 2$ GHz

| | | | | | |
|------------------|----------------------|--------------------------|---|---|--------------------|
| Q1 | PTB 20151 | NPN RF Transistor | L1 | 56 nh | SMT Inductor |
| $\ell 1, \ell 9$ | | Microstrip 50 Ω | L2, L4 | 3 Turn #22, 0.25" O.D. | |
| $\ell 2$ | .1 λ 2 GHz | Microstrip 75 Ω | L3 | 4 mm. | SMT Ferrite |
| $\ell 3$ | .065 λ 2 GHz | Microstrip 16 Ω | R1 | 22 Ω | 1206 SMT Resistor |
| $\ell 4$ | .095 λ 2 GHz | Microstrip 12.5 Ω | Board | 0.031 G-200 Solid Copper Bottom, AlliedSignal | |
| $\ell 5$ | .055 λ 2 GHz | Microstrip 9.7 Ω | <i>Bias Parts (not shown on layout)</i> | | |
| $\ell 6$ | .055 λ 2 GHz | Microstrip 12.5 Ω | Q2 | BCP 56 | SMT NPN Transistor |
| $\ell 7$ | .065 λ 2 GHz | Microstrip 22 Ω | D1 | BAV 99 | Diode |
| C1, C6 | 0.1 μ F | 1206 Chip | C10, C11 | 0.1 pF | SMT Capacitor |
| C2, C7 | 10 μ F, 35 V | SMT Tantalum | R2 | 2K | Potentiometer |
| C3, C4, C8, C10 | 20 pF | ATC-100 | R3, R4 | 10 Ω | 1206 SMT Resistor |
| C5, C9 | 0-4 pf | Johanson Trimmer | | | |