

The MAX2291 Power Amplifier for TD-SCDMA Application

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China is in the midst of migrating existing GSM cell phone systems to an advanced third generation (3G) network. Time division synchronous code division multiple access (TD-SCDMA) offers a smooth and seamless path. This application note applies an existing Maxim radio frequency (RF) power amplifier (PA), the MAX2291, in the new system. The MAX2291 is a chip-scale-packaged linear RF power amplifier which was designed for use in narrow-band code division multiple access (N-CDMA) handsets in the 1900MHz PCS band. It performs well in the 2010-2025MHz TD-SCDMA band by re-matching the input and output port. The modifications are reflected in the bill of material (BOM) attached. The following performance was measured on the P5 evaluation board using IS-95 modulation with 1.2288 Mbit/s chip rate defined in the TD-SCDMA standard.

1. High Power Mode Measurements: (Vcc at 3.5 VDC)

Pout = +28dBm
Frequency = 2015MHz
ACP1= -37.7dBc (measured at 1.6MHz offset in 1.28MHz bandwidth) (adjacent channel power ratio)
ACP2=-55.6dBc (Measured at 3.2MHz offset in 1.28MHz bandwidth)
Power added Efficiency = 32%
Idle Icc = 165mA

Gain was measured at approximately 28dB with a -2dB slope over the band.

2. Low Power Mode Measurements: (Vcc at 3.5 VDC)

Pout = +14dBm
Frequency = 2015MHz
ACP1= -38dBc (measured at 1.6MHz offset in 1.28MHz bandwidth)
ACP2= -53.5dBc (measured at 3.2MHz offset in 1.28MHz bandwidth)
Power added Efficiency = 9.0%
Idle Icc = 35mA

Gain was measured at approximately 13.5dB with a -2dB slope over the band. Very little gain change was observed over temperature. At the low gain mode, the gain can be tuned by bias setting to increase system dynamic range. At the high gain mode, efficiency may be improved by reducing bias currents.

TD-SCDMA Application Test Setup

Equipment used (see the diagram below):

E4433B signal generator with options to support CDMA testing.
Rohde&Schwarz FSEA or FSEB spectrum analyzer.
Power supply, RF coupler, 20dB pad, RF power meter.

On the E4433B, select IS-95 modulation, up link, Chip rate = 1.28M/s

ACPR measurements:

Channel BW : 1.28MHz
1nd offset : +/-1.6MHz in 1.28MHz
2rd offset : +/-3.2MHz in 1.28MHz

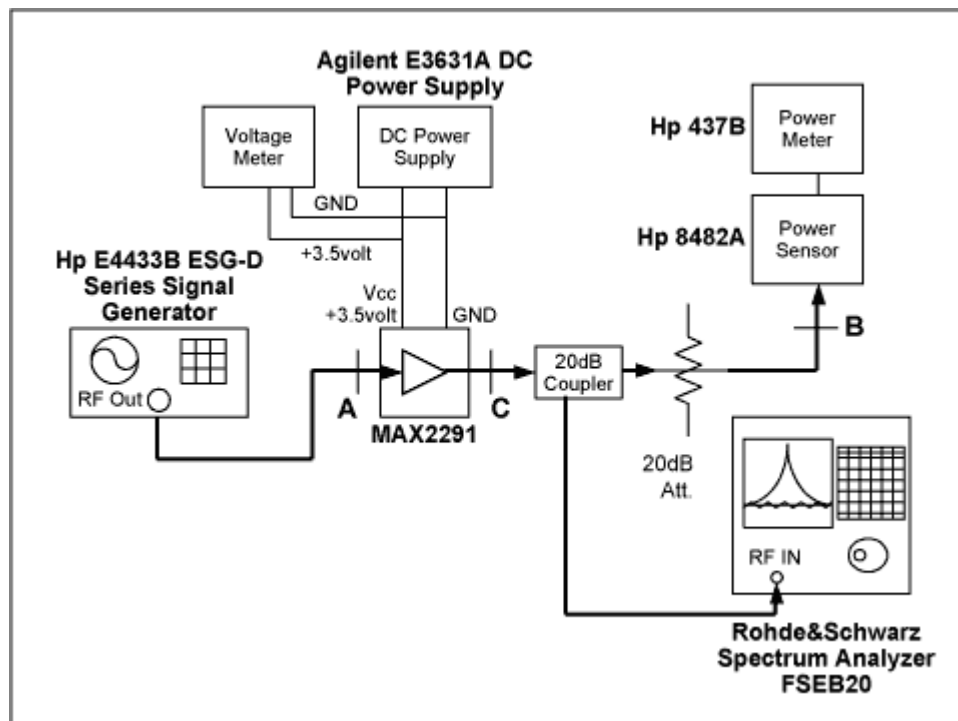


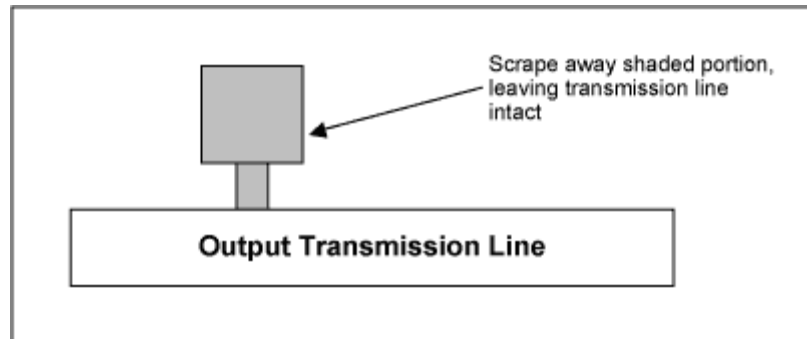
Figure 1. Test setup diagram features the MAX2291 applied as a TD-SCDMA power amplifier

Bill of Materials for the MAX2291 for TD-SCDMA Application

Designation	Quantity	Description
C90	1	ATC 3.6pF +/-0.1pF ATC600S3R9BW (see special assembly instruction 4)
C91	1	ATC 3.0pF +/-0.1pF ATC600S3R3BW (see special assembly instruction 4)
C92	1	Murata 0.5pF +/-0.1pF GRM36COG0R5B50 (see special assembly instruction 1)
C17, C46, C47, C50, L8, L12, D1, R2, IN4SMA	9	No Install
C45, C54, C57, C64	4	Murata 0.01uF GRM36X7R103K16
C48	1	Murata 470pF GRM36X7R471K50
C49	1	Murata 5.6pF +/-0.1pF GRM36COG5R6B50
C52	1	Murata 1.0pF +/-0.1pF GRM36COG1R2B50
C56	1	Murata 9.1pF +/-0.1pF GRM36COG9R1B50
C58	1	Murata 4.0pF +/-0.1pF GRM36COG4R0B50
C62	1	Murata 0.01uF GRM39X7R103K16
C65	1	10uF 6.3V 100mΩ Taiyo Yuden Ceramic, 1206 case size
C66	1	Murata 22pF GRM36COG220J50
L7	1	Alpha Pin Diode SMP1320-079
L9	1	0Ω 5% resistor
L11	1	Coilcraft 0906-3 (see special assembly instruction 2)
L14	1	Murata 33nH LQP10A33G00
L15	1	Bus Wire (see special assembly instruction 3)
R14	1	27.4kΩ 1% resistor (0402)
R15, R16	2	24kΩ 5% resistor (0402)
R17	1	15kΩ 1% resistor (0402)
R18	1	33.2kΩ 1% resistor (0402)
R19	1	8.25kΩ 1% resistor (0402)
U1	1	MAX2291 5x5 UCSP Lot#249-17-C
VCCCC, GNDC	2	Banana Jacks (Red for Vcc and Black for GND), solder to 2-pin headers straight up
VCCCC, GNDC	2	2-Pin Header (0.1" centers)
IN5, OUT4	2	0.031" Edge Mount SMA
JU7, JU8, JU9	3	3-Pin Header (0.1" centers)

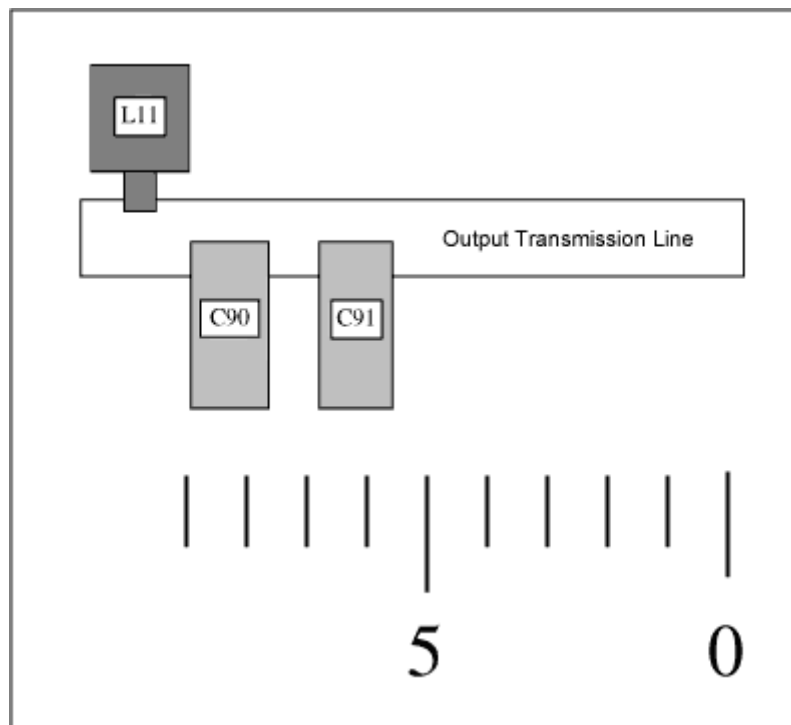
Special Assembly Instructions

1. Mount between the outside edge of C52 (facing SMA connector) and ground pad of L9.
2. Before mounting L11 the lower pad should be removed, as illustrated below:



The top lead of the inductor should be clipped to fit the upper pad. The bottom lead should be bent so that it reaches the output transmission line, where it will be soldered down.

3. Cut a small piece of bus wire and solder it between the pads designated L15.
4. C90 should be at left edge of tick mark #10 and C91 should be placed immediately adjacent, as shown below:



MORE INFORMATION

MAX2291: [QuickView](#) -- [Full \(PDF\) Data Sheet \(0k\)](#)