ON Semiconductor®

APPLICATION NOTE AND9314/D

AX5043-1

DVK2b MODULE PERFORMANCE TX

Revision 2

ON Semiconductor®

Table of Contents

1. Introduction

This application note documents output power and transmit currents versus frequency, power settings and VDDIO for the following AX5043 modules: DVK2b-AX5043-2 V1.3 868 MHz / NB, DVK2b-AX5043-2 V1.3 433 MHz / NB and DVK2-AX5043-LF2 V1.2 169 MHz / NB.

2. DVK2b-AX5043-2 V1.3 868 MHz / NB Module

2.1. Setup

RF Module	DVK2b-AX5043-2 V1.3 868 MHz / NB with 16MHz TCXO unless stated otherwise. Using the internal VCO.
Main Board	DVK2b, powering the AX5043 via an external power supply
Setup Software	AX-RadioLAB_v2.1f
Software Setup	Basic & Regulatory Tests, Set Pattern, 10kbps GFSK, BT= 0.5. Output Power is varied by changing "Transmit Power" in the PHY panel, which determines the AX5043's TXPWRCOEFFB setting. Output power is plotted against TXPWRCOEFFB, rather than the "transmit power" setting.
RF Measurement equipment	Huber & Suhner 10dB attenuator directly at the RF Module, 0.5m Huber & Suhner RG-58 cable to Rhode & Schwarz FSEB spectrum analyzer. Measuring peak power with trace clear / write; RBW = 100kHz; detector AUTO SELECT, AUTO PEAK; ATTEN AUTO NORMAL Power levels are spectrum analyzer readings plus 11dB.

2.2. Output Power versus Power Setting and VDDIO

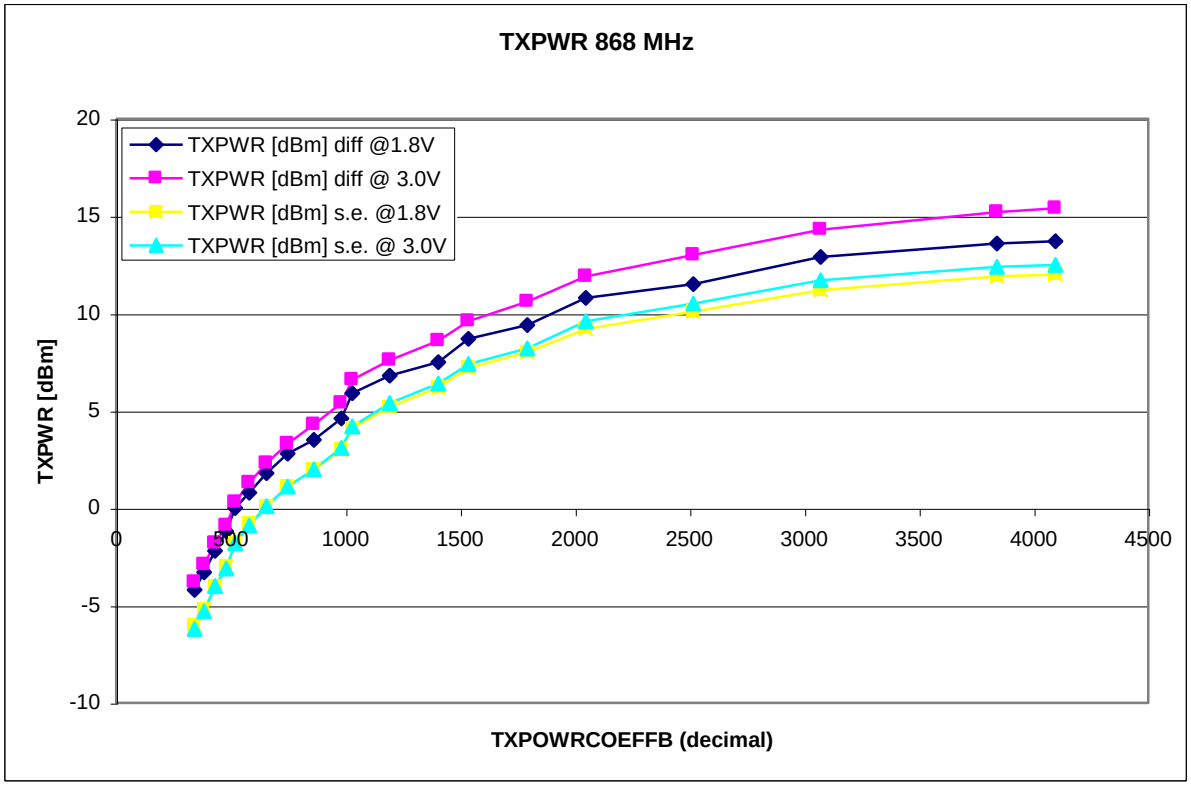

Figure 1: Output power of the differential and single ended PA versus TXPWRCOEFFB register setting at 868.3MHz, VDDIO = 1.8V and 3.0V.

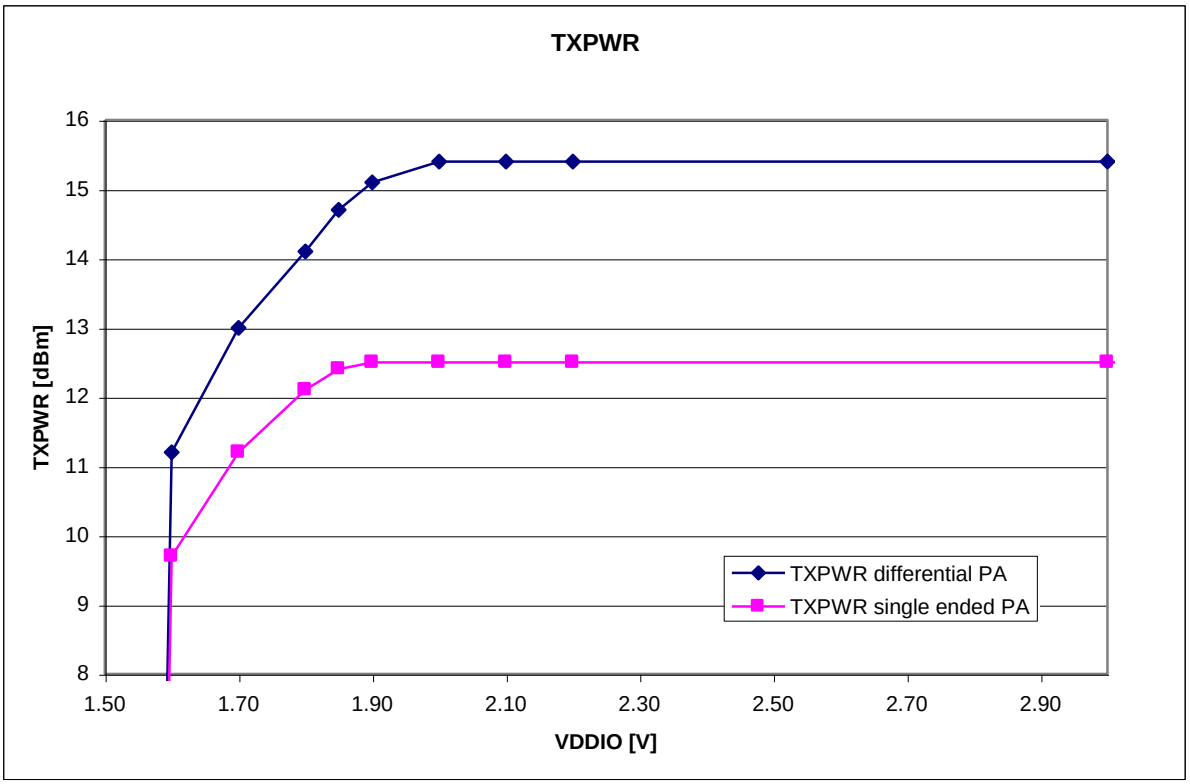

Figure 2: Output power of the differential and single ended PA versus VDDIO for TXPWRCOEFFB=0xFFF (maximum power) at 868.3MHz.

2.3. Transmit Current versus Output Power

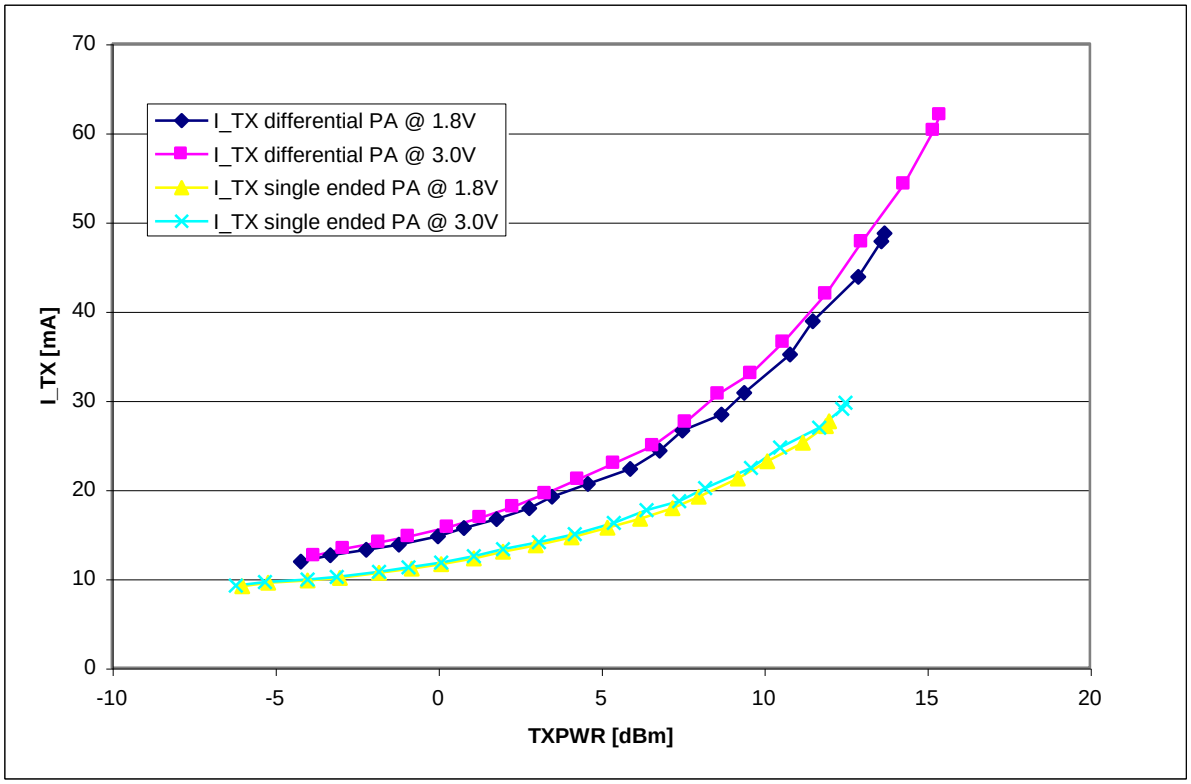

Figure 3: Transmit current versus output power of the differential and single ended PA at 868.3MHz using a 16MHz TCXO. (TCXO current not included.) VDDIO = 1.8V and 3.0V.

Note: This module is optimised for maximum output power. With a matching network optimised for 0dBm the transmit current at 0dBm is 8.5mA, rather than 12 – 15mA.

2.4. Output Power versus Frequency

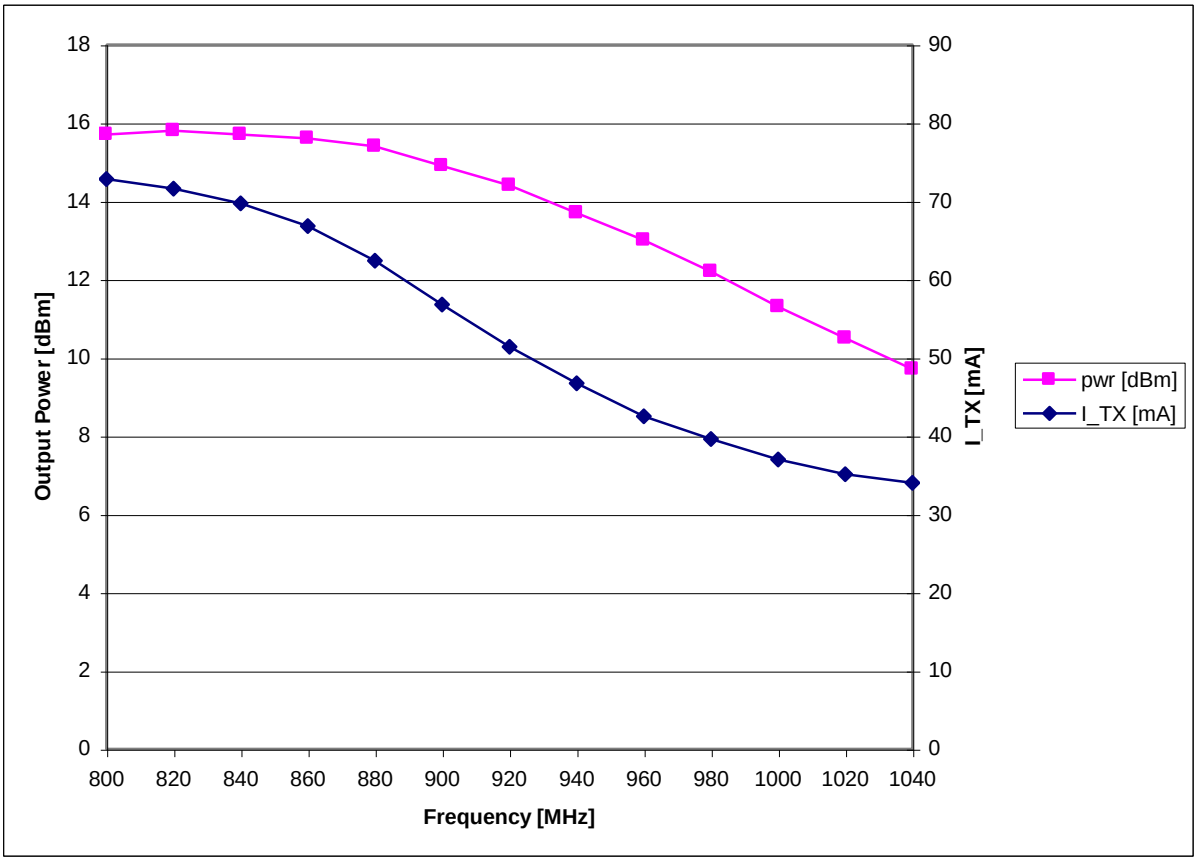

Figure 4 Output power and transmit current versus frequency for TXPWRCOEFFB = 0xFFF (maximum power) using the differential PA and a 48MHz TCXO. (TCXO current not included.). VDDIO = 3.0V.

3. DVK2b-AX5043-2 V1.3 433 MHz / NB Module

3.1. Setup

RF Module	DVK2b-AX5043-2 V1.3 433 MHz / NB with 16MHz TCXO unless stated otherwise. Using the internal VCO.
Main Board	DVK2b, powering the AX5043 via an external power supply
Setup Software	AX-RadioLAB_v2.1f
Software Setup	Basic & Regulatory Tests, Set Pattern, 10kbps GFSK, BT= 0.5. Output Power is varied by changing "Transmit Power" in the PHY panel, which determines the AX5043's TXPWRCOEFFB setting. Output power is plotted against TXPWRCOEFFB, rather than the "transmit power" setting.
RF Measurement equipment	Huber & Suhner 10dB attenuator directly at the RF Module, 0.5m Huber & Suhner RG-58 cable to Rhode & Schwarz FSEB spectrum analyzer. Measuring peak power with trace clear / write; RBW = 100kHz; detector AUTO SELECT, AUTO PEAK; ATTEN AUTO NORMAL Power levels are spectrum analyzer readings plus 10.75dB.

3.2. Output Power versus Power Setting and VDDIO

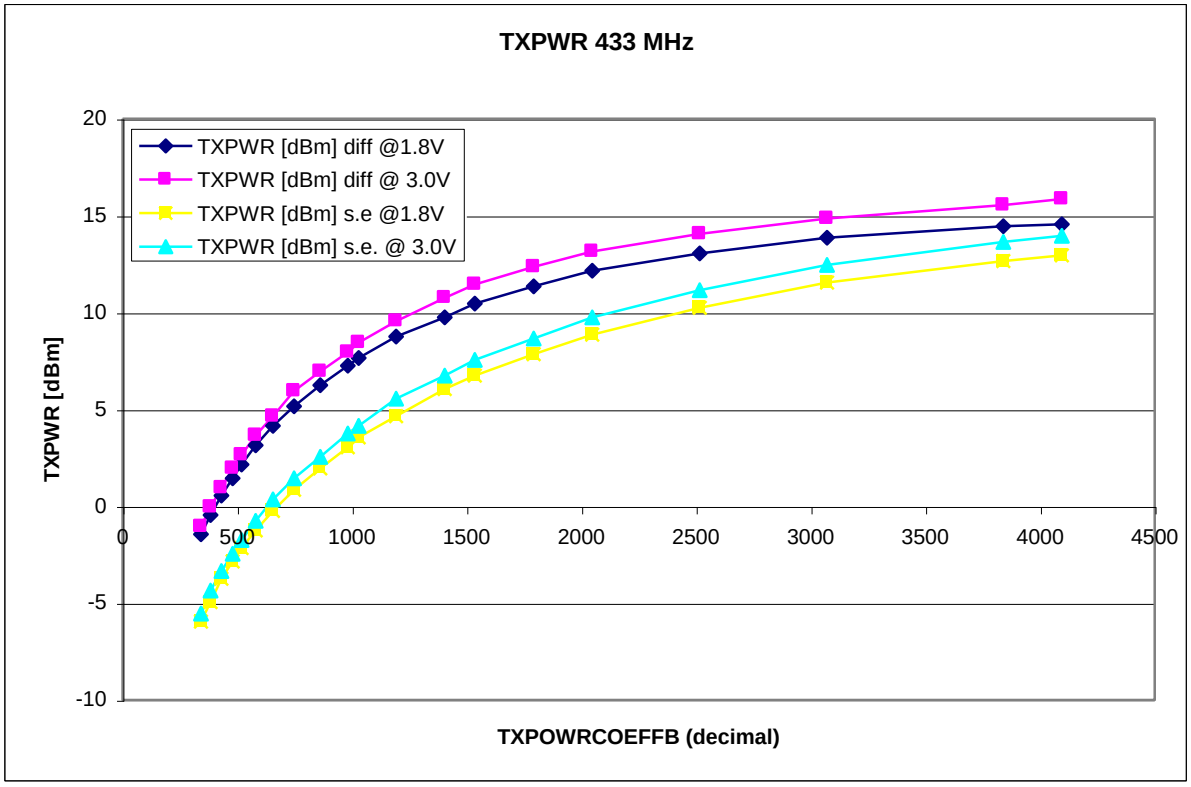

Figure 5: Output power of the differential and single ended PA versus TXPWRCOEFFB register setting at 433.15MHz, VDDIO = 1.8V and 3.0V.

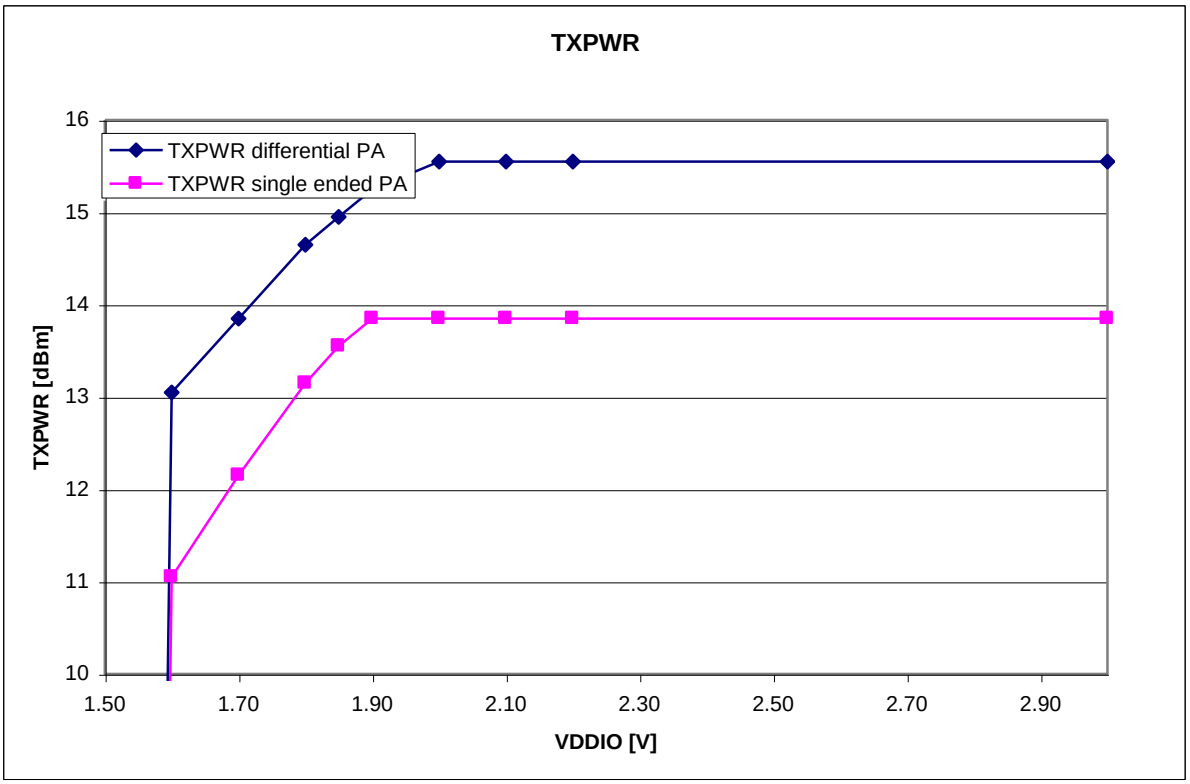

Figure 6: Output power of the differential and single ended PA versus VDDIO for TXPWRCOEFFB=0xFFF (maximum power) at 433.15MHz.

3.3. Transmit Current versus Output Power

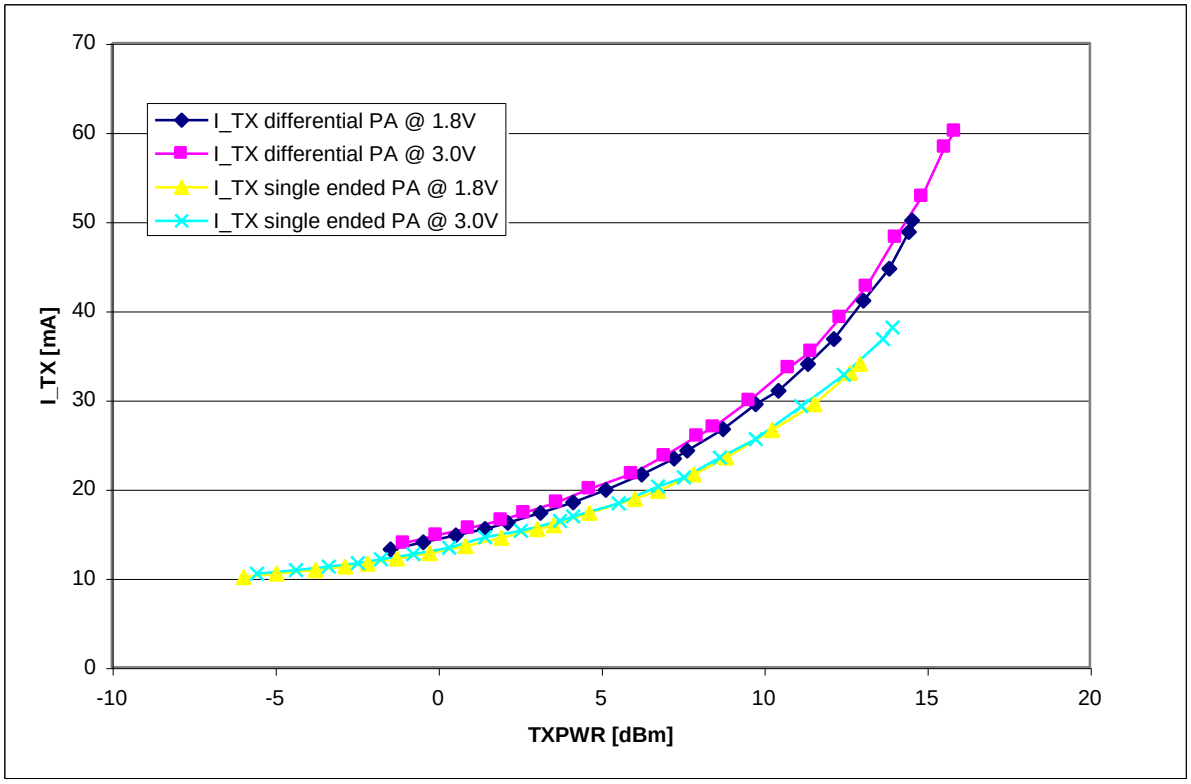

Figure 7: Transmit current versus output power of the differential and single ended PA at 433.15MHz using a 16MHz TCXO. (The TCXO current is not included.)

Note: This module is optimised for maximum output power. With a matching network optimised for 0dBm the transmit current at 0dBm is 8.5mA, rather than 12 – 15mA.

3.4. Output Power versus Frequency

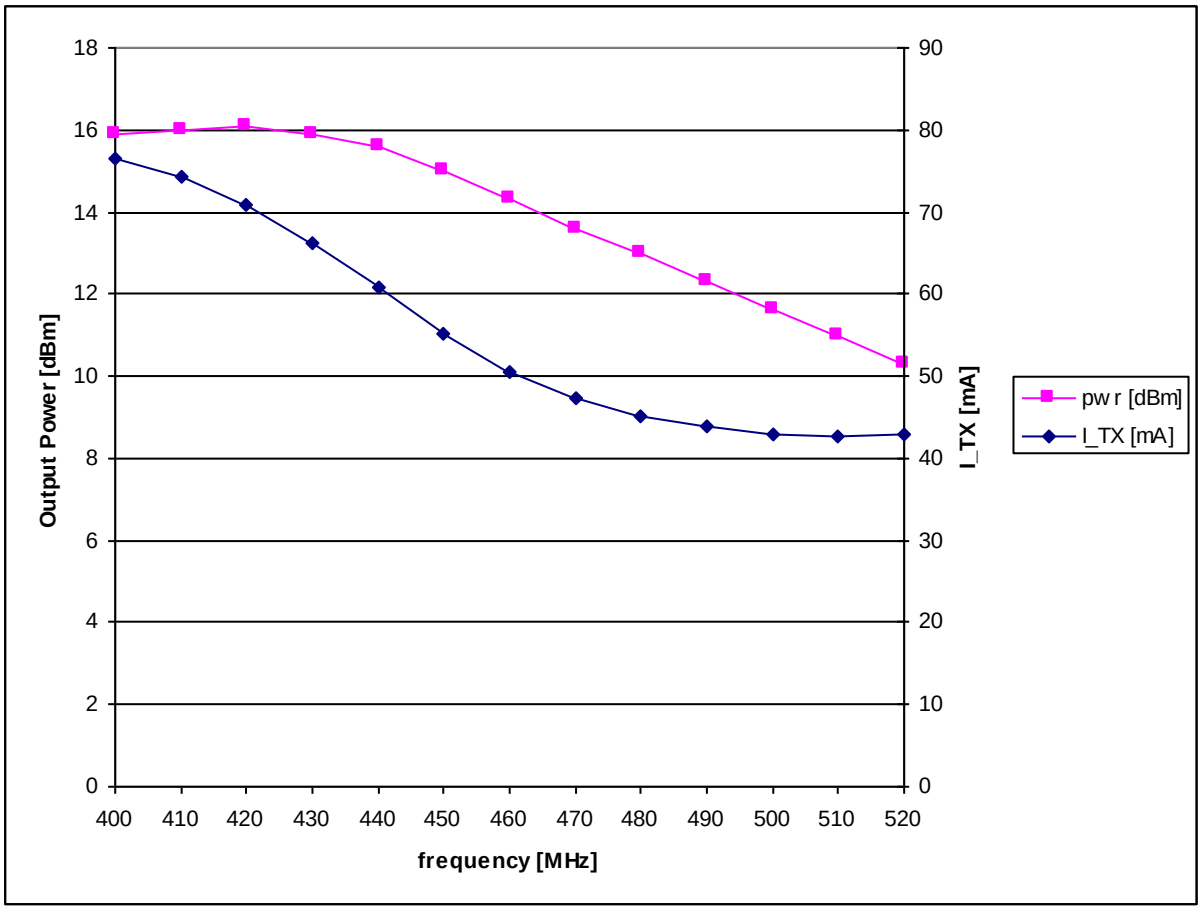

Figure 8 Output power and transmit current versus frequency for TXPWRCOEFFB = 0xFFF (maximum power) using the differential PA and a 48MHz TCXO. (TCXO current not included.) VDDIO = 3.0V.

4. DVK2-AX5043-LF2 V1.2 169 MHz / NB Module

4.1. Setup

RF Module	DVK2-AX5043-LF2 V1.2 169 MHz / NB with 16MHz TCXO unless stated otherwise. Using VCO2 with external L.
Main Board	DVK2b with connectors for DVK2 modules added, powering the AX5043 via an external power supply
Setup Software	AX-RadioLAB_v2.1f
Software Setup	Basic & Regulatory Tests, Set Pattern, 10kbps GFSK, BT= 0.5. Output Power is varied by changing "Transmit Power" in the PHY panel, which determines the AX5043's TXPWRCOEFFB setting. Output power is plotted against TXPWRCOEFFB, rather than the "transmit power" setting.
RF Measurement equipment	Huber & Suhner 10dB attenuator directly at the RF Module, 0.5m Huber & Suhner RG-58 cable to Rhode & Schwarz FSEB spectrum analyzer. Measuring peak power with trace clear / write; RBW = 100kHz; detector AUTO SELECT, AUTO PEAK; ATTEN AUTO NORMAL Power levels are spectrum analyzer readings plus 10.5dB.

4.2. Output Power versus Power Setting and VDDIO

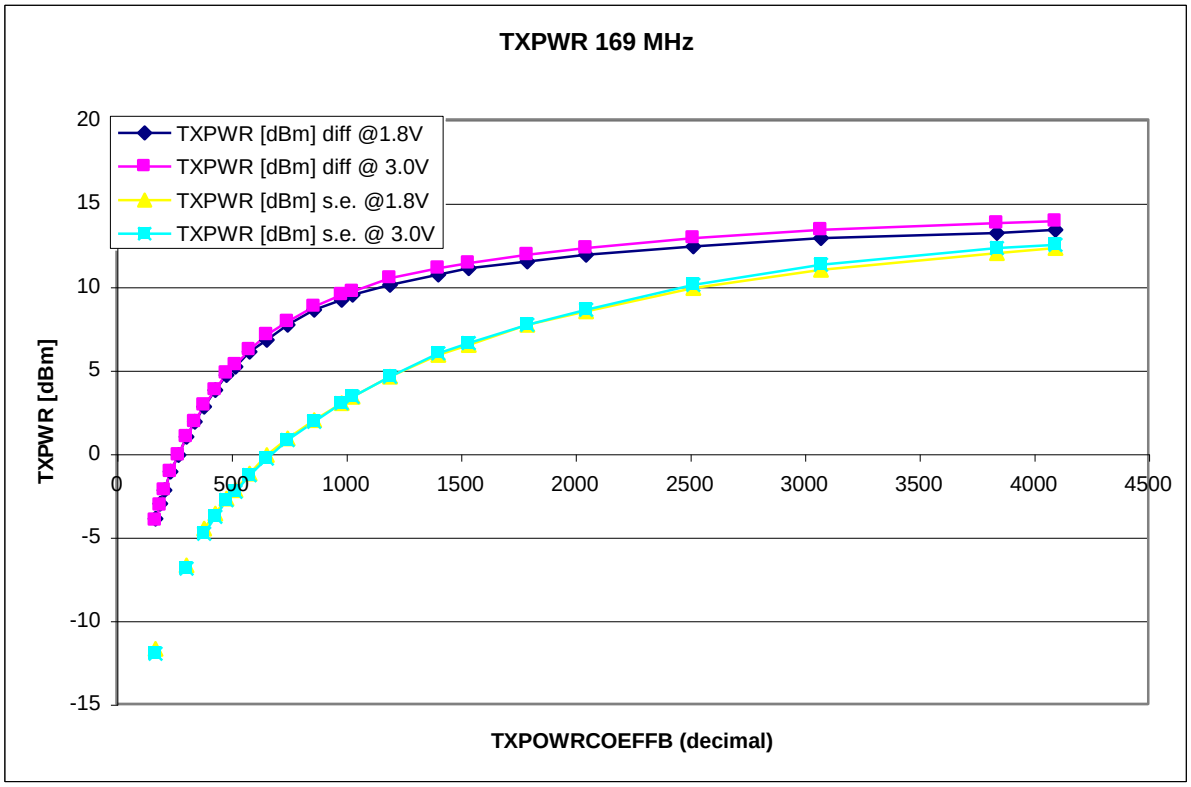

Figure 9: Output power of the differential and single ended PA versus TXPWRCOEFFB register setting at 169.3MHz, VDDIO = 1.8V and 3.0V.

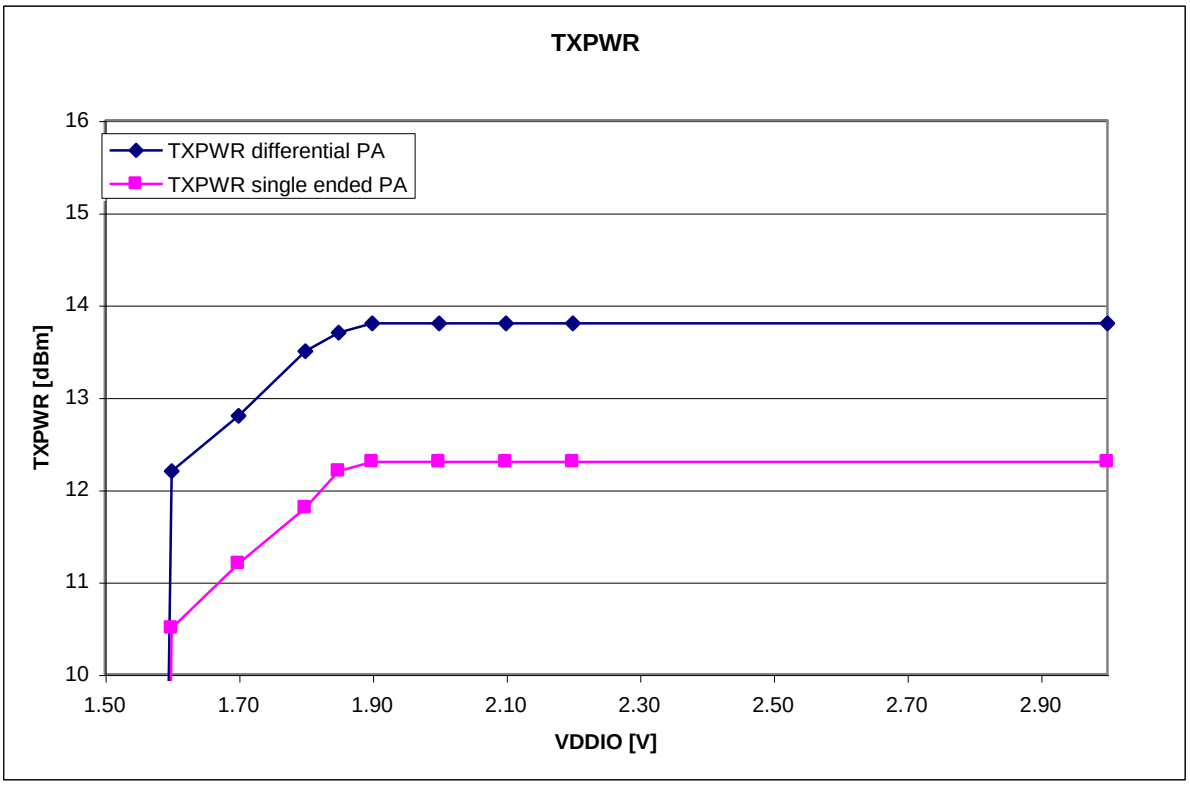

Figure 10: Output power of the differential and single ended PA versus VDDIO for TXPWRCOEFFB=0xFFF (maximum power) at 169.3MHz.

4.3. Transmit Current versus Output Power

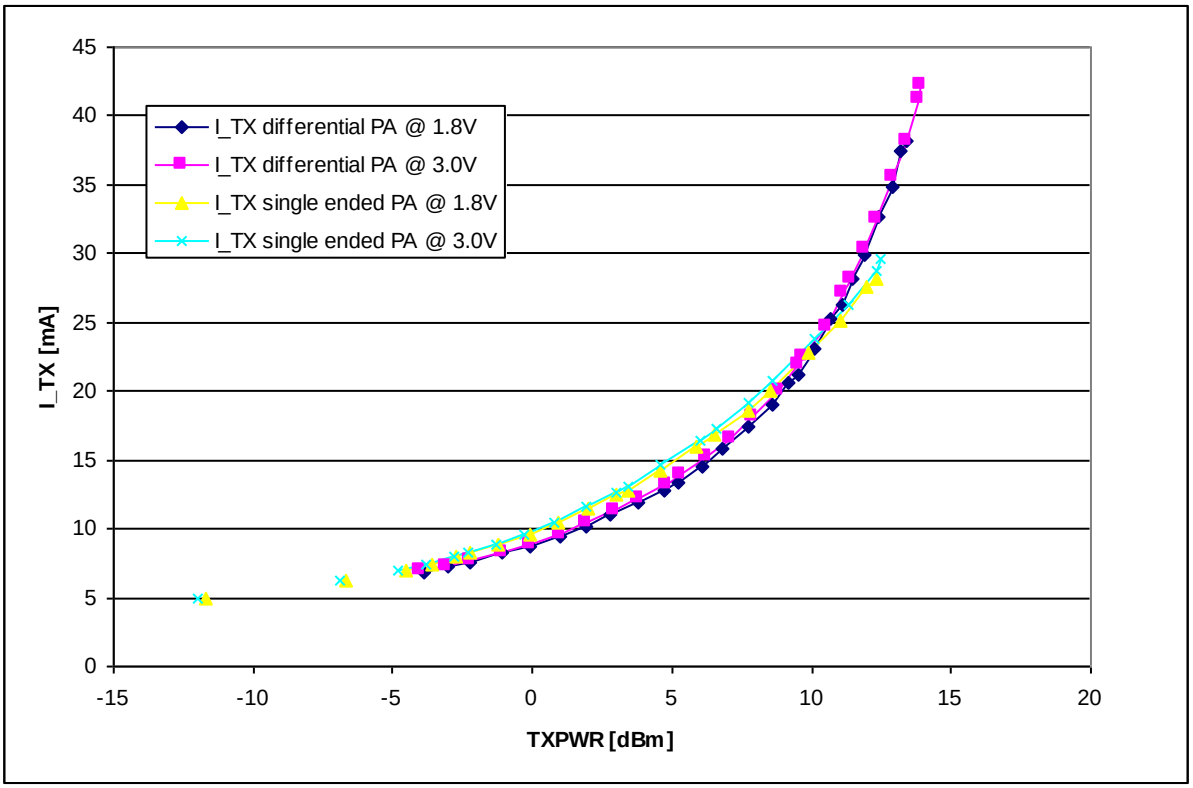

Figure 11: Transmit current versus output power of the differential and single ended PA at 169.3MHz using a 16MHz TCXO. (The TCXO current is not included.)

Note: This module is optimised for maximum output power. With a matching network optimised for 0dBm the transmit current at 0dBm is 5mA, rather than 9-10mA.

4.4. Output Power versus Frequency

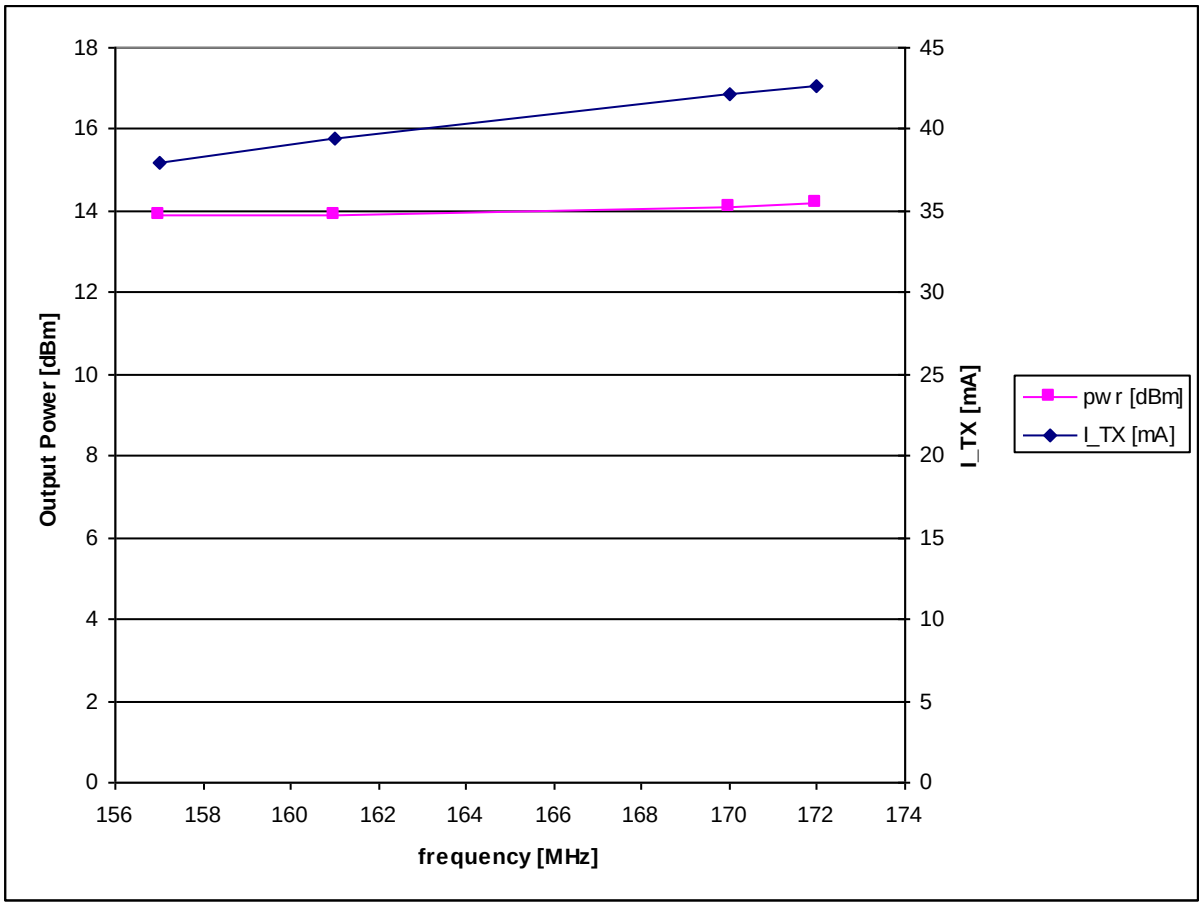

Figure 12 Output power and transmit current versus frequency for TXPWRCOEFFB = 0xFFF (maximum power) using the differential PA and a 48MHz TCXO. (TCXO current not included.) VDDIO = 3.0V.

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