NZ5441

Power Amplifier Module
TD-LTE Band 38&41

Preliminary Data Sheet

Description

The NZ5441 is a 10-pin power amplifier module developed for TD-LTE applications. With advanced InGaP HBT technology, the module supports band 38 (2570-2620MHz) & 41(2496-2690MHz) for TD-LTE application. The NZ5441 meets the stringent linearity requirements of LTE QPSK specifications, as well as those of 16QAM modulation.

The NZ5441 is self contained with a GaAs power amplifier, a bias controller, input & output matching networks and internal directional coupler. The GaAs PA provides RF amplification in linear mode, while the integrated bias controller provides regulated voltage according to input control logic, which can be compatible with most of mobile handset or data device solutions. The integrated high-directivity coupler is designed as daisy-chain type to facilitate the use of the multi-band LTE PA applications. The module is fully matched to 50 ohms at all RF ports.

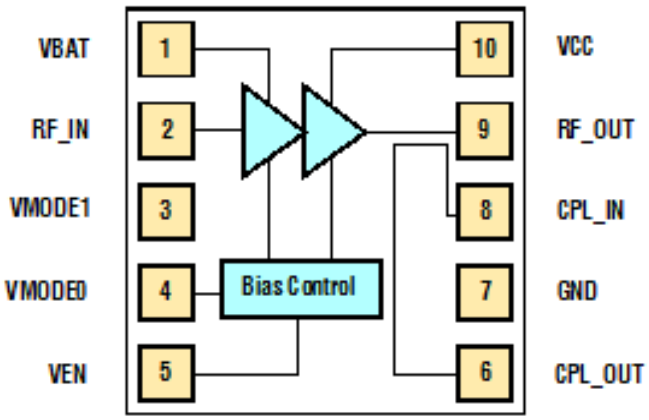
With Nationz's state-of-the-art technology and supporting three (high, medium and low) power modes with different gain settings, the NZ5441 reduces current consumption significantly in both high and low power operations. Furthermore, different gain steps also increase the system's dynamic range. Compatible with APT (Average Power Tracking) technology to extend battery life, the NZ5441 efficiency can be further improved with VCC2 supplied from DC-DC converter, which can be set from 0.5～3.4V accordingly to different output power level.

Packaged in a compact 3mm x 3mm x 0.9mm module, the NZ5441 performs with high efficiency, high linearity, low temperature variation, strong reliability and robust ruggedness. In addition to the feature of RoHS compliant, the NZ5441 is free of hazardous substances and rated as green product.

Features

- **TD-LTE 2496MHz-2690MHz**
- **QPSK & 16QAM**
- **Bandwidth 1.4MHz to 20MHz**
- **Up to 100 Resource Block**
- **Supply Voltage 3.2V-4.2V**
- **High efficiency**
- **Good Linearity**
- **APT Compatible**
  VCC2 adjustable to improve PAE
- **Integrated directional coupler**
- **Digital control pins**
- **No external voltage regulators required**
- **Compact size 3mm x 3mm**
- **Low profile 0.9mm typically**
- **ESD Class 1C**
- **MSL rating level 3**
- **Green product**

Block Diagram



Application

- **TD-LTE Band 41 Mobile Devices**

Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage (VCC)	6	V
Enable Voltage (VEN)	3.5	V
Mode Control Voltage (VMODE)	3.5	V
RF Input Power	10	dBm
Storage Temperature	-30 to 110	°C

ESD Caution
Appropriate precautions in handling, packaging and testing devices must be observed.

ESD	Minimum	Unit
HBM	1000	V
CDM	1000	V

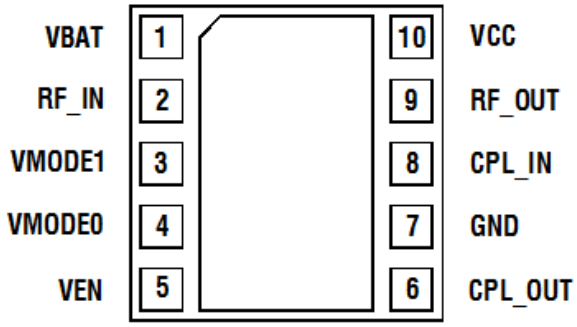
Recommended Operating Conditions

Parameter	Symbol	Condition	Minimum	Typical	Maximum	Unit
Operating Frequencies	freq	TD-LTE Band 41	2496		2690	MHz
VBAT Voltage	VBAT	All Power Modes	3.0	3.4	4.2	V
VCC Voltage	VCC	High Power Mode Medium Power Mode Low Power Mode	3.2 1.3 0.6	3.4 1.4 0.8	4.2 4.2 4.2	V
Enable Voltage	VEN	High Low	1.35 0	1.8 0	3.1 0.5	V
Mode Control Voltage	VMODE0 VMODE1	High Low	1.35 0	1.8 0	3.1 0.5	V
RF Output Power	POUT	TD-LTE QPSK 10M 12RB High Power Mode,VCC=3.4V Medium Power Mode,VCC=1.4V Low Power Mode,VCC=0.8V		 27 17 7		dBm
Operating Case Temperature	Tc		-30	25	85	°C

Logic Truth Table for Operation Modes

MODE	VEN	VMODE0	VMODE1	POUT for LTE
Shutdown	Low	Low	Low	-
High Power Mode	High	Low	Low	≤27dBm
Medium Power Mode	High	High	Low	≤17dBm
Low Power Mode	High	High	High	≤7dBm

Pin-Out



Pin Definitions

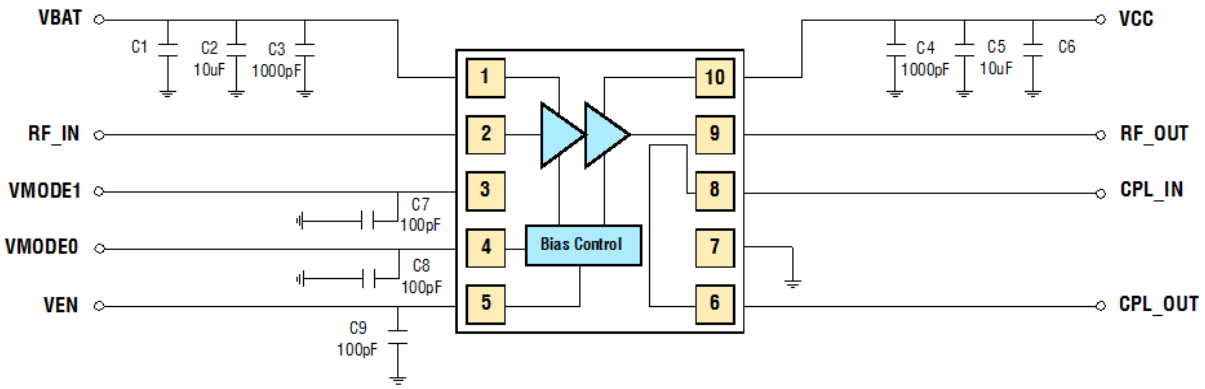
Pin	Name	Description
1	**VBAT**	Supply voltage from battery
2	**RF_IN**	RF input power
3	**VMODE1**	Mode control logic signal
4	**VMODE0**	Mode control logic signal
5	**VEN**	Enable logic signal
6	**CPL_OUT**	Internal coupler output
7	**GND**	Ground
8	**CPL_IN**	Internal coupler input
9	**RF_OUT**	RF output power
10	**VCC**	Supply voltage for PA

Electrical Specifications
LTE Band 38&41 2496-2690MHz

(Test Condition VCC=3.4V, Ven=1.8V, Tc=25°C, TD-LTE QPSK 10M 12RB, MPR=0, unless otherwise specified)

Parameter	Condition	Minimum	Typical	Maximum	Unit
Gain	High Power Mode, POUT=27dBm, VCC=3.4V Medium Power Mode, POUT=17dBm, VCC=1.4V Low Power Mode, POUT=7dBm, VCC=0.8V		31 28 23		dB
Power Added Efficiency	High Power Mode, POUT=27dBm, VCC=3.4V Medium Power Mode, POUT=17dBm, VCC=1.4V Low Power Mode, POUT=7dBm, VCC=0.8V		32 19 6		%
Supply Current	High Power Mode, POUT=27dBm, VCC=3.4V Medium Power Mode, POUT=17dBm, VCC=1.4V Low Power Mode, POUT=7dBm, VCC=0.8V		460 150 60		mA
Quiescent Current	High Power Mode Medium Power Mode Low Power Mode		105 67 45		mA
Enable Current	All Power Modes			0.01	mA
Mode Control Current	All Power Modes, VMODE0 and VMODE1			0.01	mA
ACLR, EUTRA Offset	High Power Mode, POUT=27dBm, VCC=3.4V Medium Power Mode, POUT=17dBm, VCC=1.4V Low Power Mode, POUT=7dBm, VCC=0.8V		-39 -43 -46		dBc
ACLR1, UTRA Offset	High Power Mode, POUT=27dBm, VCC=3.4V Medium Power Mode, POUT=17dBm, VCC=1.4V Low Power Mode, POUT=7dBm, VCC=0.8V		-39 -44 -49		dBc
ACLR2, UTRA Offset	High Power Mode, POUT=27dBm, VCC=3.4V Medium Power Mode, POUT=17dBm, VCC=1.4V Low Power Mode, POUT=7dBm, VCC=0.8V		-63 -66 -66		dBc
Error Vector Magnitude	High Power Mode, POUT=27dBm, VCC=3.4V Medium Power Mode, POUT=17dBm, VCC=1.4V Low Power Mode, POUT=7dBm, VCC=0.8V		3 2 2		%
Harmonics	2nd, POUT≤27dBm 3rd, POUT≤27dBm 4th and above, , POUT≤27dBm		-43 -43 -60		dBc
Noise Power in Rx Band	GPS Rx 1574-1577MHz, POUT≤27dBm ISM Rx 2400-2483.5MHz, POUT≤27dBm		-138 -135		dBm/Hz
Coupling Factor	POUT≤27dBm		16		dB
Directivity	POUT≤27dBm		16		dB
Phase Discontinuity	Phase shifting during power modes switching		10		deg
Input VSWR	POUT≤27dBm		2:1		
Stability (Spurious Emissions)	6:1 VSWR, All Phases, POUT≤27dBm VCC=3.2V~4.2V, Tc=-30°C~85°C			-36	dBm
Ruggedness	10:1 VSWR, POUT=27dBm VCC=3.2V~4.2V, Tc=-30°C~85°C	No damage or permanent degradation			

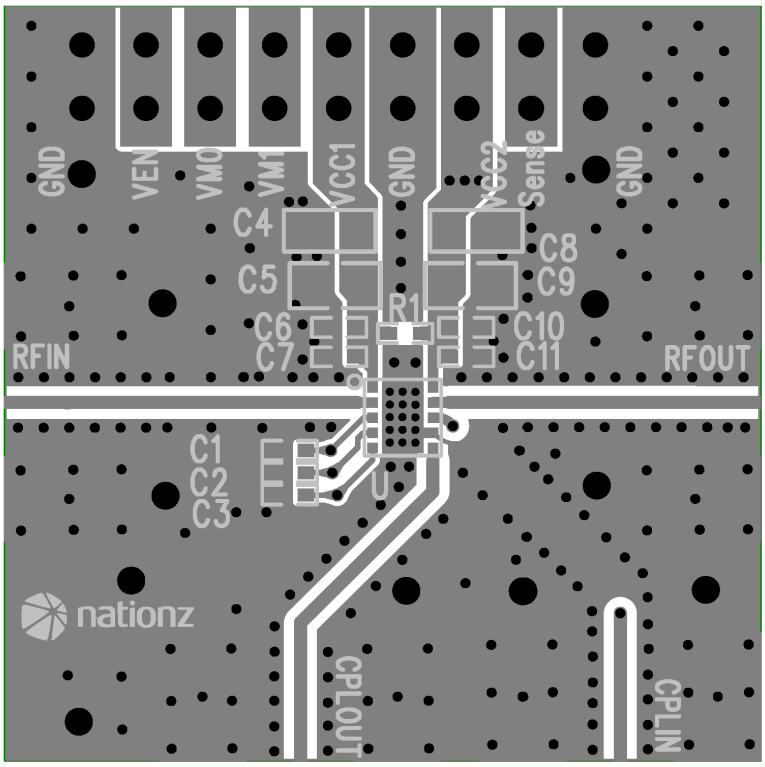
Application Schematic



1. RF input and output are 50-Ohm microstrip.
2. The values for decoupling capacitors on VBAT&VCC could be changed according to different applications.

Evaluation Board Layout

Board Size 30mm x 30mm



Notes for Evaluation Board

1. The copper pad on the bottom of the package should be soldered to the ground plane of the evaluation board.

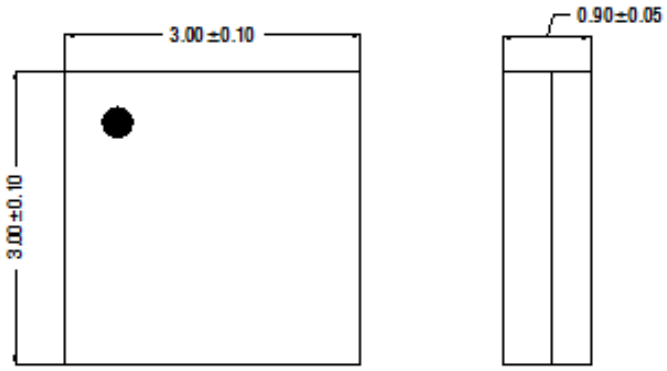
2. The ground pad area should be big enough and there should be many the through vias on this ground pad, which are critical for thermal and RF performance.

3. The thickness of copper on both surface sides of the evaluation board is recommended to be 1 or 2 ounce.

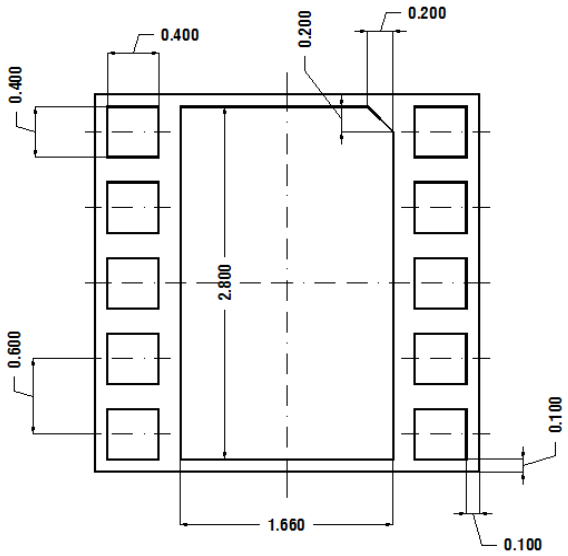
4. Measurement data in this datasheet is based on an FR4 board with 31mils thickness and 1 ounce copper on surface.

Package Dimensions

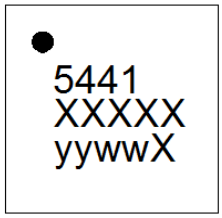
Top View **Side View**



Bottom View

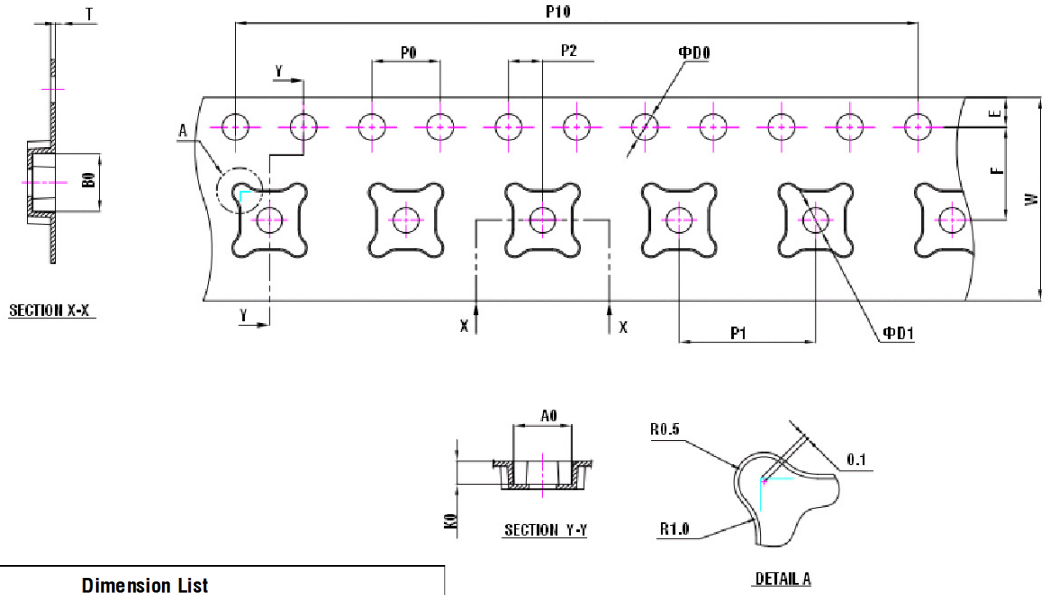


Marking Specification



Part Number (4 digits)
Lot Number (5 digits)
Year & Week of Manufacture (4 digits) and Tracking Code (1 digit)

Packaging Information



Dimension List			
Annote	Milimeter	Annote	Milimeter
A0	3.4±0.01	P2	2.00±0.10
B0	3.4±0.01	P10	40.00±0.20
K0	1.35±0.01	E	1.75±0.10
D0	1.55±0.05	F	5.50±0.10
D1	1.60±0.01	W	12.00±0.30
P0	4.00±0.01	T	0.30±0.05
P1	8.00±0.01		

Package Type	Unit Size	Max Reel Diameter	Type Width	Pocket Pitch	Reel Capacity
Tape and Reel	3mm x 3mm x 0.9mm	13”	12mm	8mm	3000

Order Information

ORDER NUMBER	TEMPERATURE	PACKAGE DESCRITION	TYPE
NZ5441TR1	-30°C ~ 85°C	10-Pin, 3mm x 3mm x 0.9mm LGA Module Halogen Free	Tape & Reel, 3000 pcs per Reel

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For product information, please go to our website: **www.lansus.com.cn**
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