NZ5401S

TDD LTE Bands 34/39, FDD LTE Bands 1/2, WCDMA Bands 1/2, CDMA Band BC1

Description

The NZ5401S is a 10-pin power amplifier module developed for TDD LTE/FDD LTE/ WCDMA/ CDMA applications. With advanced InGaP HBT technology, the module supports full bandwidth of TDD LTE Bands 34/39, FDD LTF Bands 1/2, WCDMA Bands 1/2, CDMA Band BC1, and meets the stringent linearity requirements of LTE/WCDMA/ CDMA specifications.

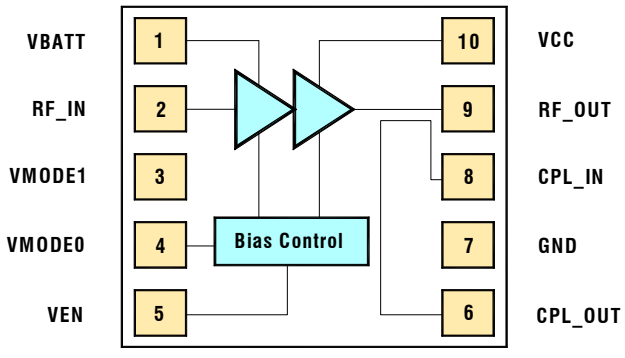
The NZ5401S is self contained with a GaAs power amplifier, a bias controller, input & output matching networks and internal directional coupler. The GaAs PA provides RF amplification in linear mode, while the integrated bias controller provides regulated voltage according to input control logic, which can be compatible with most of mobile device solutions. The module is fully matched to 50 ohms at all RF ports.

With Lansus's state-of-the-art technology and supporting three (high, medium and low) power modes with different gain settings, the NZ5401S 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 NZ5401S 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 0.85mm module, the NZ5401S performs with high efficiency, high linearity, low temperature variation, strong reliability and robust ruggedness. In addtion to the feature of RoHS compliant, the NZ5401S is free of hazardous substances and rated as green product.

The NZ5401S is rated to Moisture Sensitivity Level 3(MSL3) at 260°C per JEDEC J-STD-020.

Block Diagram



Features

- **TDD LTE Bands 34/39(2010-2025MHz, 1880-1920MHz)**
- **FDD LTE Bands 1/2(1920MHz-1980MHz, 1850MHz-1910MHz)**
- **WCDMA Bands 1/2(1920-1980MHz, 1850-1910MHz)**
- **CDMA Band BC1(1850-1910MHz)**
- **Supply Voltage 3V-4.5V**
- **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 0.85mm typically**
- **ESD Class 1C**
- **MSL rating level 3**
- **Green product**

Application

- **TDD LTE Bands 34/39**
- **FDD LTE Bands 1/2**
- **WCDMA Bands 1/2**
- **CDMA Band BC1**

NZ5401S

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
Operation Temperature	-30 to 100	°C
Storage Temperature	-40 to 150	°C
ESD-Human Body Mode(HBM)	-1 to 1	kV

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

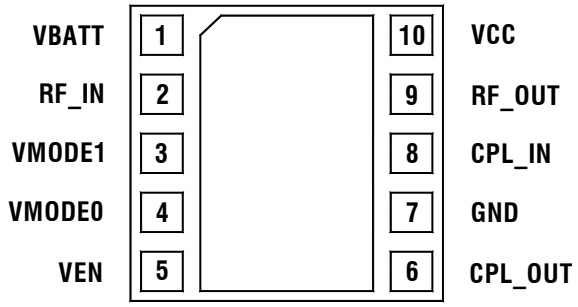
Recommended Operating Conditions

Parameter	Symbol	Condition	Minimum	Typical	Maximum	Unit
Operating Frequencies	Freq	Band 1/2/34/39	1850		2025	MHz
Supply Voltage	VBATT	All Power Modes	3.0	3.4	4.5	V
	Vcc	High Power Mode Medium Power Mode Low Power Mode		3.4 1.4 0.8		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	FDD LTE QPSK 10M 12RB, High Power Mode,Vcc = 3.4V Medium Power Mode,Vcc = 1.4V Low Power Mode,Vcc = 0.8V		 27.0 17 7		dBm
Operating Case Temperature	Tc		-20	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	≤27.0dBm
Medium Power Mode	High	High	Low	≤17dBm
Low Power Mode	High	High	High	≤7dBm

Pin-Out



Pin Definitions

Pin	Name	Description
1	**VBATT**	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 GaAs PA

Electrical Specifications
FDD LTE Band 1 1920-1980MHz

(Test Condition V_{BATT} = 3.4V, V_{EN} = 1.8V, Tc = 25°C, FDD LTE QPSK 10M 12RB, MPR = 0, unless otherwise specified)

Parameter	Condition	Minimum	Typical	Maximum	Unit
Gain	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		28.5 25 19		dB
Power Added Efficiency	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		38.5 27 13		%
Supply Current	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		385 130 49		mA
Quiescent Current	High Power Mode Medium Power Mode Low Power Mode		60 43 30		mA
Enable Current	All Power Modes			0.01	mA
Mode Control Current	All Power Modes, V_{MODE0} and V_{MODE1}			0.01	mA
ACLR, EUTRA Offset	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-38 -41 -41		dBc
ACLR1, UTRA Offset	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-38 -42 -41		dBc
ACLR2, UTRA Offset	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-62 -66 -61		dBc
Error Vector Magnitude	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V		2.8		%
Harmonics	2nd, $P_{OUT} \leq$ 27.0dBm 3rd, $P_{OUT} \leq$ 27.0dBm 4th and above, $P_{OUT} \leq$ 27.0dBm		-30 -37 -55		dBc
Noise Power in Rx Band	Rx Band 1 2110-2170MHz, $P_{OUT} \leq$ 27.0dBm GPS Rx 1574-1577MHz, $P_{OUT} \leq$ 27.0dBm ISM Rx 2400-2483.5MHz, $P_{OUT} \leq$ 27.0dBm		-135 -136 -136		dBm/ Hz
Coupling Factor	$P_{OUT} \leq$ 27.0dBm		16		dB
Directivity	$P_{OUT} \leq$ 27.0dBm		16		dB
Phase Discontinuity	Phase shifting during power modes switching		10		deg
Input VSWR	$P_{OUT} \leq$ 27.0dBm		2:1		
Stability (Spurious Emissions)	6:1 VSWR, All Phases, $P_{OUT} \leq$ 27.0dBm V_{CC} = 3V~4.5V			-36	dBm
Ruggedness	10:1 VSWR, P_{OUT} = 27.0dBm, V_{CC} =3V~4.5V	No damage or permanent degradation			

Electrical Specifications
FDD LTE Band 2 1850-1910MHz

(Test Condition V_{BATT} = 3.4V, V_{EN} = 1.8V, Tc = 25°C, FDD LTE QPSK 10M 12RB, MPR = 0, unless otherwise specified)

Parameter	Condition	Minimum	Typical	Maximum	Unit
Gain	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		28 24.5 19		dB
Power Added Efficiency	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		37.5 26.5 12.5		%
Supply Current	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		390 130 49		mA
Quiescent Current	High Power Mode Medium Power Mode Low Power Mode		60 43 30		mA
Enable Current	All Power Modes			0.01	mA
Mode Control Current	All Power Modes, V_{MODE0} and V_{MODE1}			0.01	mA
ACLR, EUTRA Offset	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-38 -40 -41		dBc
ACLR1, UTRA Offset	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-38 -40 -41		dBc
ACLR2, UTRA Offset	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-63 -66 -61		dBc
Error Vector Magnitude	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V		2.8		%
Harmonics	2nd, $P_{OUT} \leq$ 27.0dBm 3rd, $P_{OUT} \leq$ 27.0dBm 4th and above, $P_{OUT} \leq$ 27.0dBm		-30 -37 -50		dBc
Noise Power in Rx Band	Rx Band 2 1930-1990MHz, $P_{OUT} \leq$ 27.0dBm GPS Rx 1574-1577MHz, $P_{OUT} \leq$ 27.0dBm ISM Rx 2400-2483.5MHz, $P_{OUT} \leq$ 27.0dBm		-135 -136 -136		dBm/ Hz
Coupling Factor	$P_{OUT} \leq$ 27.0dBm		16.5		dB
Directivity	$P_{OUT} \leq$ 27.0dBm		16		dB
Phase Discontinuity	Phase shifting during power modes switching		10		deg
Input VSWR	$P_{OUT} \leq$ 27.0dBm		2:1		
Stability (Spurious Emissions)	6:1 VSWR, All Phases, $P_{OUT} \leq$ 27.0dBm V_{CC} = 3V~4.5V			-36	dBm
Ruggedness	10:1 VSWR, P_{OUT} = 27.0dBm, V_{CC} =3V~4.5V	No damage or permanent degradation			

Electrical Specifications
TDD LTE Band 34 2010-2025MHz

(Test Condition V_{BATT} = 3.4V, V_{EN} = 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, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		29 26 18		dB
Power Added Efficiency	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		36 23 12		%
Supply Current	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		410 145 48		mA
Quiescent Current	High Power Mode Medium Power Mode Low Power Mode		60 43 30		mA
Enable Current	All Power Modes			0.01	mA
Mode Control Current	All Power Modes, $V_{MODE}0$ and $V_{MODE}1$			0.01	mA
ACLR, EUTRA Offset	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-37 -40 -43		dBc
ACLR1, UTRA Offset	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-38 -41 -44		dBc
ACLR2, UTRA Offset	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-63 -62 -61		dBc
Error Vector Magnitude	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V		2.8		%
Harmonics	2nd, $P_{OUT} \leq$ 27.0dBm 3rd, $P_{OUT} \leq$ 27.0dBm 4th and above, $P_{OUT} \leq$ 27.0dBm		-31 -38 -50		dBc
Noise Power in Rx Band	GPS Rx 1574-1577MHz, $P_{OUT} \leq$ 27.0dBm ISM Rx 2400-2483.5MHz, $P_{OUT} \leq$ 27.0dBm		-138 -135		dBm/Hz
Coupling Factor	$P_{OUT} \leq$ 27.0dBm		16		dB
Directivity	$P_{OUT} \leq$ 27.0dBm		16		dB
Phase Discontinuity	Phase shifting during power modes switching		10		deg
Input VSWR	$P_{OUT} \leq$ 27.0dBm		2:1		
Stability (Spurious Emissions)	6:1 VSWR, All Phases, $P_{OUT} \leq$ 27.0dBm V_{CC} = 3V~4.5V			-36	dBm
Ruggedness	10:1 VSWR, P_{OUT} = 27.0dBm, V_{CC} =3V~4.5V	No damage or permanent degradation			

Electrical Specifications
TDD LTE Band 39 1880-1920MHz

(Test Condition V_{BATT} = 3.4V, V_{EN} = 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, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		28 25 19		dB
Power Added Efficiency	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		37.5 26 12.5		%
Supply Current	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		390 130 49		mA
Quiescent Current	High Power Mode Medium Power Mode Low Power Mode		60 43 30		mA
Enable Current	All Power Modes			0.01	mA
Mode Control Current	All Power Modes, V_{MODE0} and V_{MODE1}			0.01	mA
ACLR, EUTRA Offset	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-38 -41 -41		dBc
ACLR1, UTRA Offset	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-38 -41 -41		dBc
ACLR2, UTRA Offset	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-63 -66 -62		dBc
Error Vector Magnitude	High Power Mode, P_{OUT} = 27.0dBm, V_{CC} = 3.4V		2.8		%
Harmonics	2nd, $P_{OUT} \leq$ 27.0dBm 3rd, $P_{OUT} \leq$ 27.0dBm 4th and above, $P_{OUT} \leq$ 27.0dBm		-31 -37 -51		dBc
Noise Power in Rx Band	GPS Rx 1574-1577MHz, $P_{OUT} \leq$ 27.0dBm ISM Rx 2400-2483.5MHz, $P_{OUT} \leq$ 27.0dBm		-139 -136		dBm/Hz
Coupling Factor	$P_{OUT} \leq$ 27.0dBm		16		dB
Directivity	$P_{OUT} \leq$ 27.0dBm		16		dB
Phase Discontinuity	Phase shifting during power modes switching		10		deg
Input VSWR	$P_{OUT} \leq$ 27.0dBm		2:1		
Stability (Spurious Emissions)	6:1 VSWR, All Phases, $P_{OUT} \leq$ 27.0dBm V_{CC} = 3V~4.5V			-36	dBm
Ruggedness	10:1 VSWR, P_{OUT} = 27.0dBm, V_{CC} =3V~4.5V	No damage or permanent degradation			

Electrical Specifications
WCDMA Band 1 1920-1980MHz

(Test Condition V_{BATT} = 3.4V, V_{EN} = 1.8V, Tc = 25°C, WCDMA R99 modulation waveform, unless otherwise specified)

Parameter	Condition	Minimum	Typical	Maximum	Unit
Gain	High Power Mode, P_{OUT} = 28.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		28.5 24 16		dB
Power Added Efficiency	High Power Mode, P_{OUT} = 28.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		42 31 14		%
Supply Current	High Power Mode, P_{OUT} = 28.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		440 130 50		mA
Quiescent Current	High Power Mode Medium Power Mode Low Power Mode		60 43 30		mA
Enable Current	All Power Modes			0.01	mA
Mode Control Current	All Power Modes, V_{MODE}0 and V_{MODE}1			0.01	mA
ACLR1, 5MHz Offset	High Power Mode, P_{OUT} = 28.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-41 -42 -42		dBc
ACLR2, 10MHz Offset	High Power Mode, P_{OUT} = 28.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-53 -60 -59		dBc
Harmonics	2nd, $P_{OUT} \leq$ 28.0dBm 3rd, $P_{OUT} \leq$ 28.0dBm 4th and above, $P_{OUT} \leq$ 28.0dBm		-30 -37 -50		dBc
Noise Power in Rx Band	Band 1 Rx 2110-2170MHz, $P_{OUT} \leq$ 28.0dBm GPS Rx 1574-1577MHz, $P_{OUT} \leq$ 28.0dBm ISM Rx 2400-2483.5MHz, $P_{OUT} \leq$ 28.0dBm		-136 -139 -140		dBm/Hz
Coupling Factor	$P_{OUT} \leq$ 28.0dBm		20		dB
Directivity	$P_{OUT} \leq$ 28.0dBm		18		dB
Phase Discontinuity	Phase shifting during power modes switching		10		deg
Input VSWR	$P_{OUT} \leq$ 28.0dBm		2:1		
Stability (Spurious Emissions)	6:1 VSWR, All Phases, $P_{OUT} \leq$ 28.0dBm V_{CC} = 3V~4.5V			-36	dBm
Ruggedness	10:1 VSWR, P_{OUT} = 28.0dBm, V_{CC} =3V~4.5V	No damage or permanent degradation			

Electrical Specifications
WCDMA Band 2 1850-1910MHz

(Test Condition V_{BATT} = 3.4V, V_{EN} = 1.8V, Tc = 25°C, WCDMA R99 modulation waveform, unless otherwise specified)

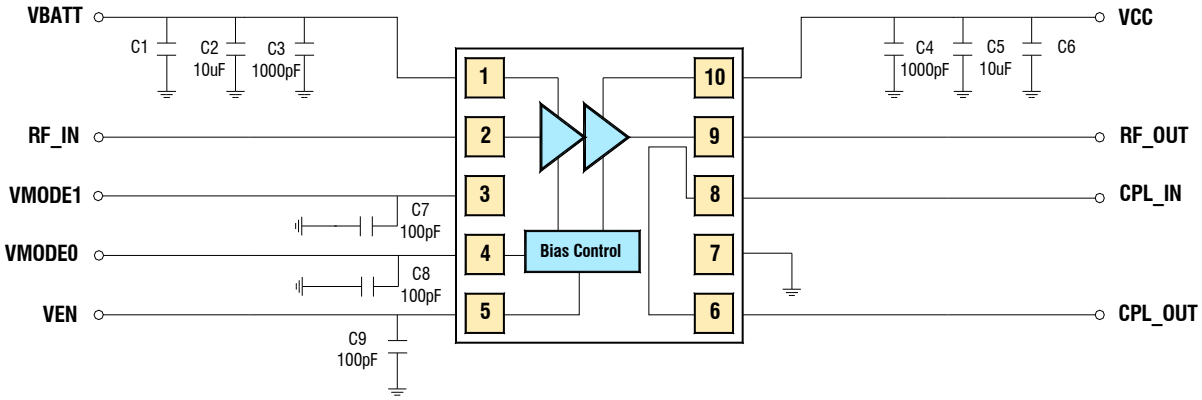
Parameter	Condition	Minimum	Typical	Maximum	Unit
Gain	High Power Mode, P_{OUT} = 28.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		28.5 22 18		dB
Power Added Efficiency	High Power Mode, P_{OUT} = 28.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		42 24 13		%
Supply Current	High Power Mode, P_{OUT} = 28.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		440 152 50		mA
Quiescent Current	High Power Mode Medium Power Mode Low Power Mode		60 43 30		mA
Enable Current	All Power Modes			0.01	mA
Mode Control Current	All Power Modes, V_{MODE0} and V_{MODE1}			0.01	mA
ACLR1, 5MHz Offset	High Power Mode, P_{OUT} = 28.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-40 -43 -43		dBc
ACLR2, 10MHz Offset	High Power Mode, P_{OUT} = 28.0dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-54 -56 -58		dBc
Harmonics	2nd, $P_{OUT} \le$ 28.0dBm 3rd, $P_{OUT} \le$ 28.0dBm 4th and above, $P_{OUT} \le$ 28.0dBm		-30 -37 -50		dBc
Noise Power in Rx Band	Band 2 Rx 1930-1990MHz, $P_{OUT} \le$ 28.0dBm GPS Rx 1574-1577MHz, $P_{OUT} \le$ 28.0dBm ISM Rx 2400-2483.5MHz, $P_{OUT} \le$ 28.0dBm		-135 -138 -140		dBm/Hz
Coupling Factor	$P_{OUT} \le$ 28.0dBm		20		dB
Directivity	$P_{OUT} \le$ 28.0dBm		18		dB
Phase Discontinuity	Phase shifting during power modes switching		10		deg
Input VSWR	$P_{OUT} \le$ 28.0dBm		2:1		
Stability (Spurious Emissions)	6:1 VSWR, All Phases, $P_{OUT} \le$ 28.0dBm V_{CC} = 3V~4.5V			-36	dBm
Ruggedness	10:1 VSWR, P_{OUT} = 28.0dBm, V_{CC} =3V~4.5V	No damage or permanent degradation			

Electrical Specifications
CDMA Band BC1 1850-1910MHz

(Test Condition V_{BATT} = 3.4V, V_{EN} = 1.8V, Tc = 25°C, CDMA IS95 modulation waveform, unless otherwise specified)

Parameter	Condition	Minimum	Typical	Maximum	Unit
Gain	High Power Mode, P_{OUT} = 27.5dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		29.5 26.5 22		dB
Power Added Efficiency	High Power Mode, P_{OUT} = 27.5dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		36 23 13		%
Supply Current	High Power Mode, P_{OUT} = 27.5dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		450 153 52		mA
Quiescent Current	High Power Mode Medium Power Mode Low Power Mode		60 43 30		mA
Enable Current	All Power Modes			0.01	mA
Mode Control Current	All Power Modes, $V_{MODE}0$ and $V_{MODE}1$			0.01	mA
ACPR1, 900kHz Offset	High Power Mode, P_{OUT} = 27.5dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-48 -50 -50		dBc
ACPR2, 1.98MHz Offset	High Power Mode, P_{OUT} = 27.5dBm, V_{CC} = 3.4V Medium Power Mode, P_{OUT} = 17dBm, V_{CC} = 1.4V Low Power Mode, P_{OUT} = 7dBm, V_{CC} = 0.8V		-62 -66 -66		dBc
Harmonics	2nd, $P_{OUT} \leq$ 27.5dBm 3rd, $P_{OUT} \leq$ 27.5dBm 4th and above, $P_{OUT} \leq$ 27.5dBm		-30 -37 -50		dBc
Noise Power in Rx Band	Band 2 Rx 1930-1990MHz, $P_{OUT} \leq$ 27.5dBm GPS Rx 1574-1577MHz, $P_{OUT} \leq$ 27.5dBm ISM Rx 2400-2483.5MHz, $P_{OUT} \leq$ 27.5dBm		-135 -138 -140		dBm/Hz
Coupling Factor	$P_{OUT} \leq$ 27.5dBm		20		dB
Directivity	$P_{OUT} \leq$ 27.5dBm		15		dB
Phase Discontinuity	Phase shifting during power modes switching		10		deg
Input VSWR	$P_{OUT} \leq$ 27.5dBm		2:1		
Stability (Spurious Emissions)	6:1 VSWR, All Phases, $P_{OUT} \leq$ 27.5dBm V_{CC} = 3V~4.5V			-36	dBm
Ruggedness	10:1 VSWR, P_{OUT} = 27.5dBm V_{CC} = 3V~4.5V	No damage or permanent degradation			

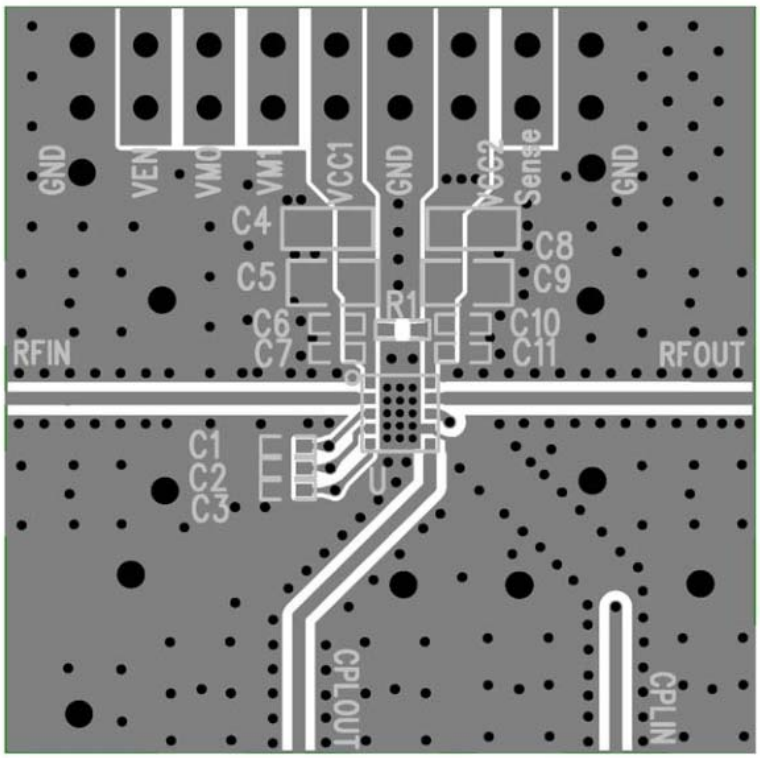
Application Schematic



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

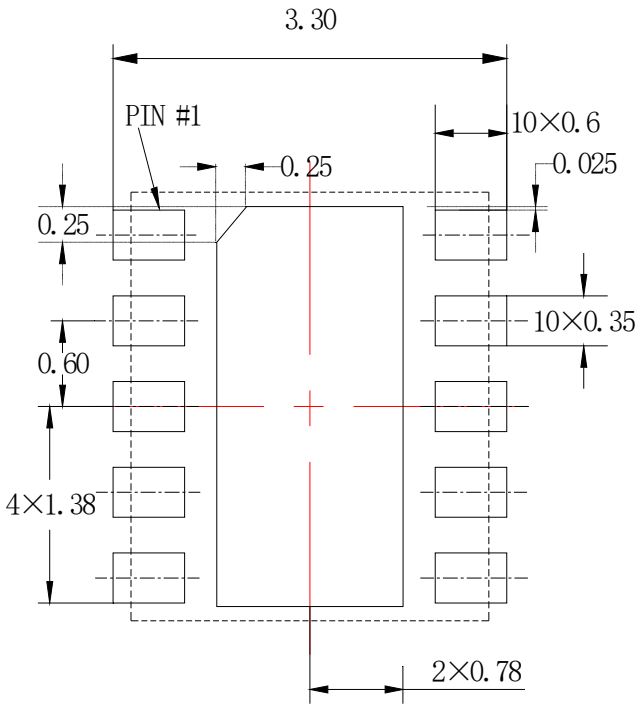
1. The copper pad on the bottom of the package should be soldered to the ground plane of the evaluation board.

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.

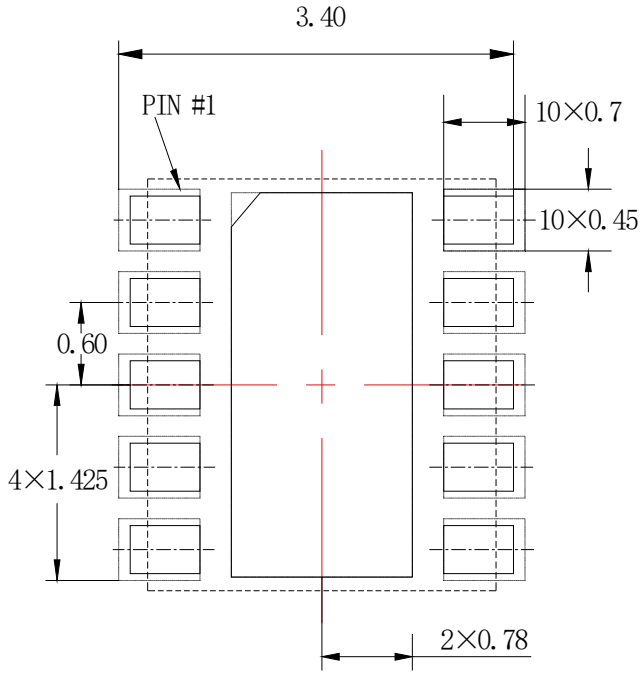
3. The thickness of copper on both surface sides of the evaluation board is recommended to be 1 or 2 ounce.

4. Measurement data in this datasheet is based on an Rogers board with 1.2 mm thickness and 1 ounce copper on surface.

PCB Layout Footprint

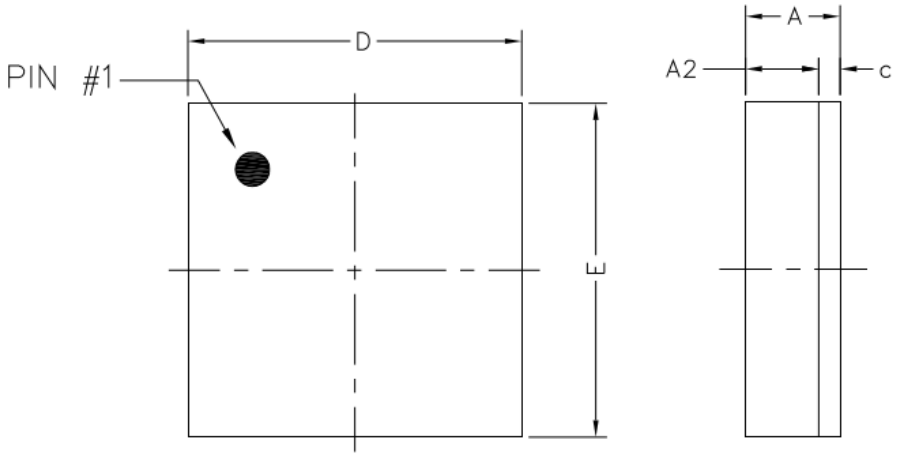


PCB Metal Top View



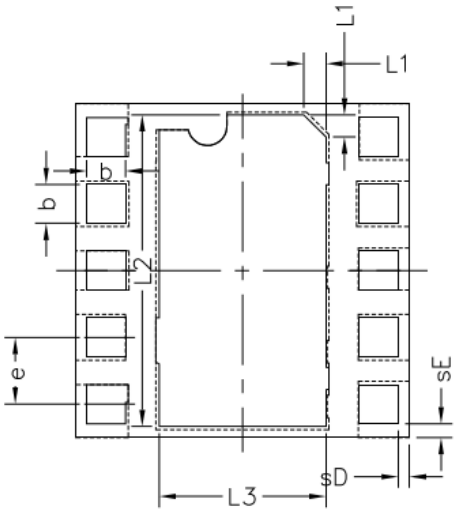
PCB Solder Mask Top View

Package Dimensions



Top View

Side View

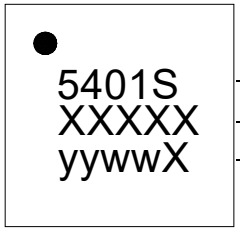


Bottom View

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

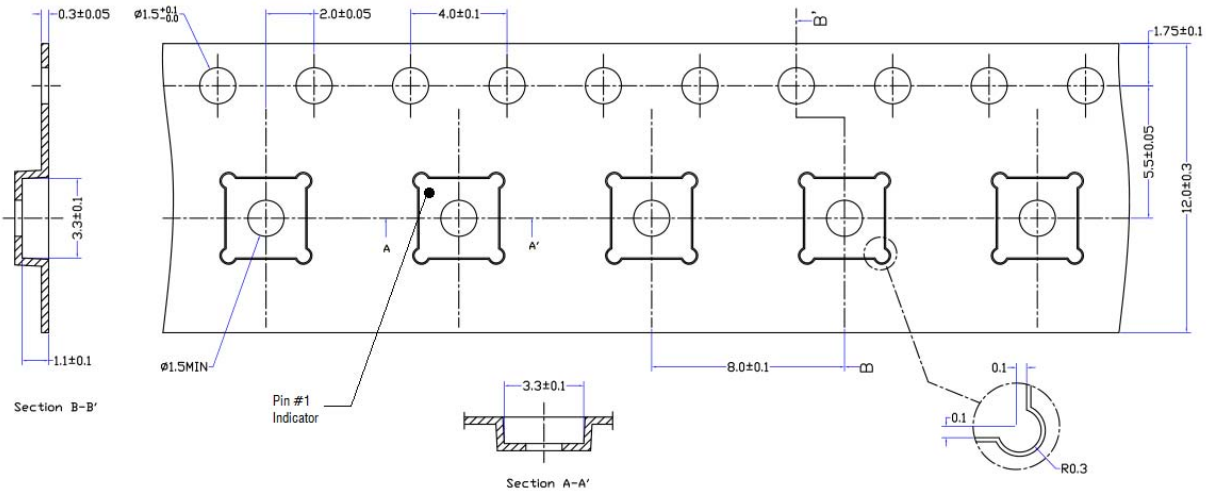
SYMBOL	MIN	NOM	MAX
A	0.80	0.85	0.90
A2	0.62	0.66	0.70
c	0.16	0.19	0.22
D	2.90	3.00	3.10
E	2.90	3.00	3.10
sD	0.025	0.100	0.175
sE	0.050	0.125	0.200
e	0.600 TYP		
b	0.350 TYP		
L1	0.200 TYP		
L2	2.800 TYP		
L3	1.500 TYP		

Marking Specification



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

Packaging Information



Package Type	Unit Size	Max Reel Diameter	Type Width	Pocket Pitch	Reel Capacity
Tape and Reel	3mm x 3mm x 0.85mm	13”	12mm	8mm	3000

Order Information

ORDER NUMBER	TEMPERATURE	PACKAGE DESCRIPTION	TYPE
NZ5401STR1	-30°C ~ 100°C	10-Pin, 3mm x 3mm x 0.85mm LGA Module Halogen Free	Tape & Reel, 3000 pcs per Reel

Revision History

Revision	Description
DS20170120	Initial release.
DS20170606	Update PCB Layout Footprint.

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Or send email to: **info@lansus.com.cn**