NXP Semiconductors
Technical Data

Document Number: A2T21S161W12S
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RoHS

RF Power LDMOS Transistor

N–Channel Enhancement–Mode Lateral MOSFET

This 38 W RF power LDMOS transistor is designed for cellular base station applications requiring very wide instantaneous bandwidth capability covering the frequency range of 2110 to 2200 MHz.

2100 MHz

- Typical Single–Carrier W–CDMA Performance: V_{DD} = 28 Vdc, I_{DQ} = 600 mA, P_{out} = 38 W Avg., Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF.

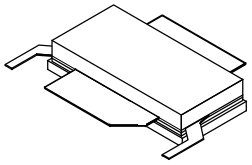
Frequency	G_{ps} (dB)	η_D (%)	Output PAR (dB)	ACPR (dBc)	IRL (dB)
2110 MHz	18.7	34.2	6.8	–32.3	–21
2140 MHz	18.9	34.0	6.8	–32.2	–18
2170 MHz	19.1	33.8	6.6	–32.3	–14
2200 MHz	19.2	34.0	6.5	–32.3	–12

Features

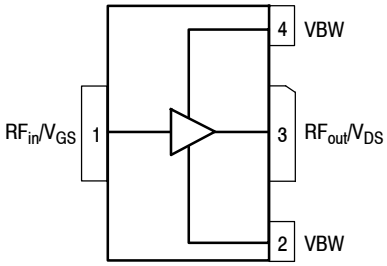
- Designed for wide instantaneous bandwidth applications
- Greater negative gate–source voltage range for improved Class C operation
- Able to withstand extremely high output VSWR and broadband operating conditions
- Optimized for Doherty applications

A2T21S161W12SR3

2110–2200 MHz, 38 W AVG., 28 V AIRFAST RF POWER LDMOS TRANSISTOR



NI–780S–2L2L



(Top View)

Figure 1. Pin Connections

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	–0.5, +65	Vdc
Gate-Source Voltage	V_{GS}	–6.0, +10	Vdc
Operating Voltage	V_{DD}	32, +0	Vdc
Storage Temperature Range	T_{stg}	–65 to +150	°C
Case Operating Temperature Range	T_C	–40 to +150	°C
Operating Junction Temperature Range (1,2)	T_J	–40 to +225	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value (2,3)	Unit
Thermal Resistance, Junction to Case Case Temperature 71°C, 38 W CW, 28 Vdc, I_{DQ} = 600 mA, 2140 MHz	$R_{\theta JC}$	0.33	°C/W

Table 3. ESD Protection Characteristics

Test Methodology	Class
Human Body Model (per JS-001-2017)	2
Charge Device Model (per JS-002-2014)	C3

Table 4. Electrical Characteristics (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Zero Gate Voltage Drain Leakage Current (V_{DS} = 65 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	10	μAdc
Zero Gate Voltage Drain Leakage Current (V_{DS} = 32 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	5	μAdc
Gate-Source Leakage Current (V_{GS} = 5 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	—	—	1	μAdc
On Characteristics					
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 151 μAdc)	$V_{GS(th)}$	1.4	1.8	2.2	Vdc
Gate Quiescent Voltage (V_{DD} = 28 Vdc, I_D = 600 mAdc, Measured in Functional Test)	$V_{GS(Q)}$	2.1	2.6	2.9	Vdc
Drain-Source On-Voltage (V_{GS} = 10 Vdc, I_D = 1.5 Adc)	$V_{DS(on)}$	0.1	0.2	0.3	Vdc

1. Continuous use at maximum temperature will affect MTTF.
2. MTTF calculator available at http://www.nxp.com/RF/calculators.
3. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers.* Go to http://www.nxp.com/RF and search for AN1955.

(continued)

Table 4. Electrical Characteristics (T_A = 25°C unless otherwise noted) **(continued)**

Characteristic	Symbol	Min	Typ	Max	Unit
Functional Tests (1) (In NXP Test Fixture, 50 ohm system) V_{DD} = 28 Vdc, I_{DQ} = 600 mA, P_{out} = 38 W Avg., f = 2170 MHz, Single-Carrier W-CDMA, IQ Magnitude Clipping, Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF. ACPR measured in 3.84 MHz Channel Bandwidth @ ±5 MHz Offset.					
Power Gain	G_{ps}	17.4	19.1	20.4	dB
Drain Efficiency	η_D	31.4	33.8	—	%
Output Peak-to-Average Ratio @ 0.01% Probability on CCDF	PAR	5.5	6.6	—	dB
Adjacent Channel Power Ratio	ACPR	—	–32.3	–27.7	dBc
Input Return Loss	IRL	—	–14	–7	dB
Load Mismatch (In NXP Test Fixture, 50 ohm system) I_{DQ} = 600 mA, f = 2140 MHz					
VSWR 10:1 at 32 Vdc, 219 W CW Output Power (3 dB Input Overdrive from 161 W CW Rated Power)	No Device Degradation				
Typical Performance (In NXP Test Fixture, 50 ohm system) V_{DD} = 28 Vdc, I_{DQ} = 600 mA, 2110–2200 MHz Bandwidth					
P_{out} @ 1 dB Compression Point, CW	P1dB	—	158	—	W
AM/PM (Maximum value measured at the P3dB compression point across the 2110–2200 MHz bandwidth)	Φ	—	–17	—	°
VBW Resonance Point (IMD Third Order Intermodulation Inflection Point)	VBW_{res}	—	140	—	MHz
Gain Flatness in 90 MHz Bandwidth @ P_{out} = 38 W Avg.	G_F	—	0.5	—	dB
Gain Variation over Temperature (–40°C to +85°C)	ΔG	—	0.013	—	dB/°C
Output Power Variation over Temperature (–40°C to +85°C)	ΔP1dB	—	0.001	—	dB/°C

Table 5. Ordering Information

Device	Tape and Reel Information	Package
A2T21S161W12SR3	R3 Suffix = 250 Units, 44 mm Tape Width, 13-inch Reel	NI-780S-2L2L

1. Part internally matched both on input and output.

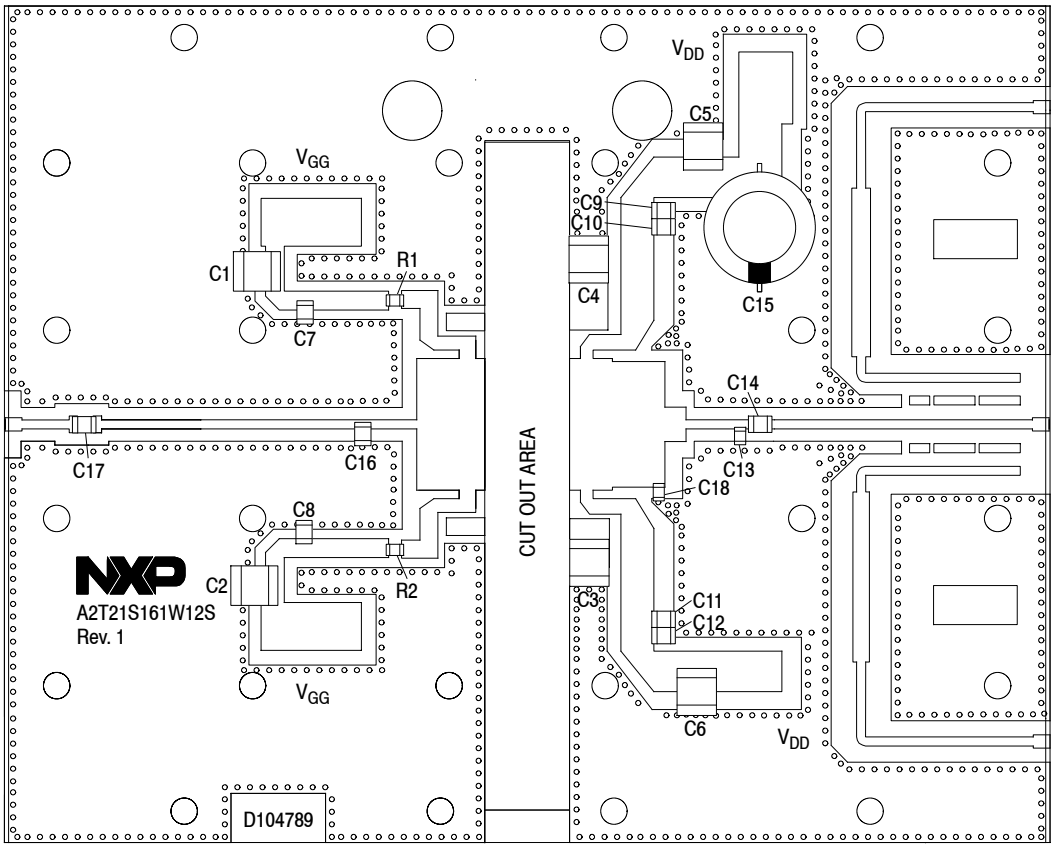
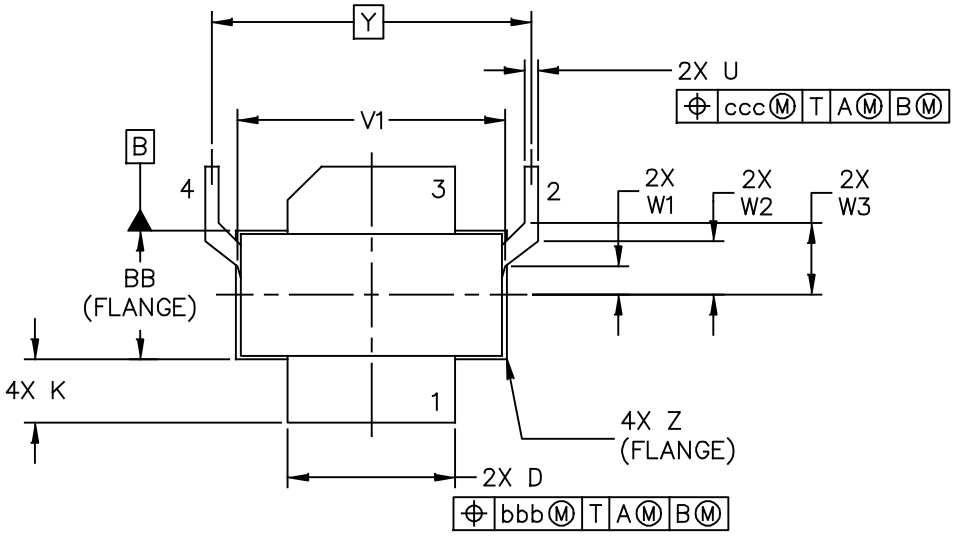


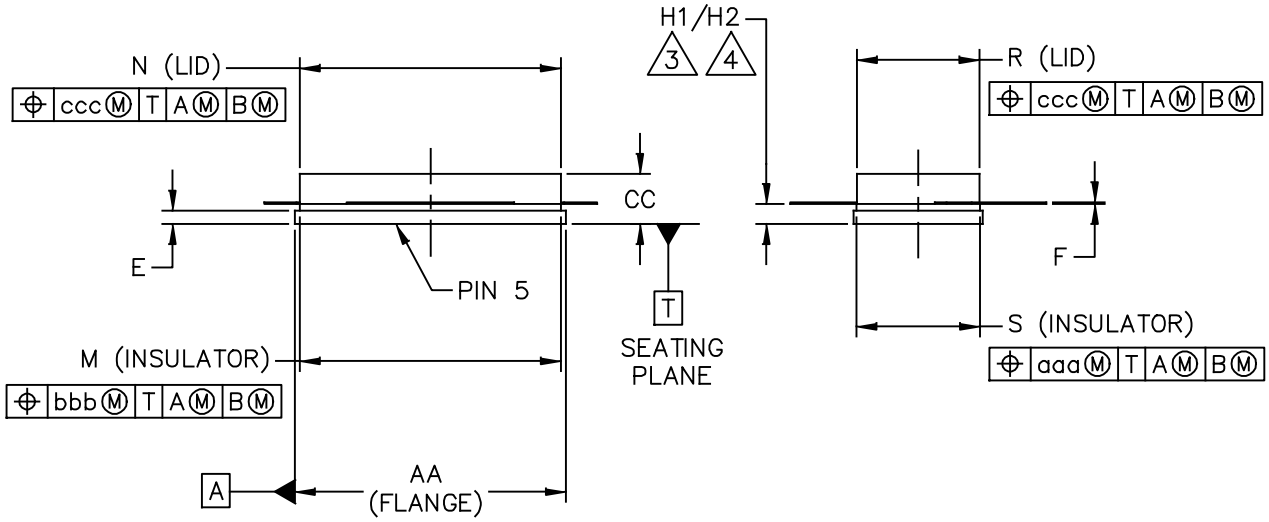
Figure 2. A2T21S161W12SR3 Test Circuit Component Layout

Table 6. A2T21S161W12SR3 Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C2, C3, C4, C5, C6	10 μF Chip Capacitor	C5750X7S2A106M230KB	TDK
C7, C8, C10, C11, C14, C17	9.1 pF Chip Capacitor	ATC100B9R1CT500XT	ATC
C9	0.8 pF Chip Capacitor	ATC100B0R8BT500XT	ATC
C12	0.9 pF Chip Capacitor	ATC100B0R9BT500XT	ATC
C13, C18	0.1 pF Chip Capacitor	ATC600F0R1BT250XT	ATC
C15	470 μF, 63 V Electrolytic Capacitor	MCGPR63V477M13X26	Multicomp
C16	1.1 pF Chip Capacitor	ATC100B1R1BT500XT	ATC
R1, R2	3 Ω, 1/4 W Chip Resistor	CRCW12063R00JNEA	Vishay
PCB	Rogers RO4350B, 0.020″, ε_r = 3.66	D104789	MTL

PACKAGE DIMENSIONS





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	STANDARD: NON-JEDEC	
	SOT1785-1	16 MAR 2016

NOTES:

1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
3. DIMENSIONS H1 AND H2 ARE MEASURED .030 INCH (0.762 MM) AWAY FROM FLANGE TO CLEAR THE EPOXY FLOW OUT PARALLEL TO DATUM B. H1 APPLIES TO PINS 1 & 3. H2 APPLIES TO PINS 2 & 4.
4. TOLERANCE OF DIMENSION H2 IS TENTATIVE AND COULD CHANGE ONCE SUFFICIENT MANUFACTURING DATA IS AVAILABLE.

DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX	DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX
AA	.805	.815	20.45	20.70	R	.365	.375	9.27	9.53
BB	.380	.390	9.65	9.91	S	.365	.375	9.27	9.53
CC	.125	.170	3.18	4.32	U	.035	.045	0.89	1.14
D	.495	.505	12.57	12.83	V1	.795	.805	20.19	20.45
E	.035	.045	0.89	1.14	W1	.080	.090	2.03	2.29
F	.004	.007	0.10	0.18	W2	.155	.165	3.94	4.19
H1	.057	.067	1.45	1.70	W3	.210	.220	5.33	5.59
H2	.054	.070	1.37	1.78	Y	.956 BSC		24.28 BSC	
K	.170	.210	4.32	5.33	Z	R.000	R.040	R0.00	R1.02
M	.774	.786	19.66	19.96	aaa	.005		0.13	
N	.772	.788	19.61	20.02	bbb	.010		0.25	
					ccc	.015		0.38	

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PRODUCT DOCUMENTATION, SOFTWARE AND TOOLS

Refer to the following resources to aid your design process.

Application Notes

- AN1908: Solder Reflow Attach Method for High Power RF Devices in Air Cavity Packages
- AN1955: Thermal Measurement Methodology of RF Power Amplifiers

Engineering Bulletins

- EB212: Using Data Sheet Impedances for RF LDMOS Devices

Software

- Electromigration MTTF Calculator
- .s2p File

Development Tools

- Printed Circuit Boards

To Download Resources Specific to a Given Part Number:

1. Go to http://www.nxp.com/RF
2. Search by part number
3. Click part number link
4. Choose the desired resource from the drop down menu

REVISION HISTORY

The following table summarizes revisions to this document.

Revision	Date	Description
0	July 2018	• Initial release of data sheet

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