ULTRA LOW NOISE, MEDIUM CURRENT

E-PHEMT Transistor

TAV2-14LN+

50Ω 0.05 to 10 GHz

THE BIG DEAL

- Low Noise Figure, 0.7 dB Typ. at 6 GHz, +4 V
- Gain, 16.4 dB Typ. at 6 GHz, +4 V
- High Output IP3, +30.9 dBm Typ. at 6 GHz, +4 V
- Output Power at 1 dB Comp., +18.8 dBm Typ. at 6 GHz, +4 V
- External Biasing and Matching Required
- Usable to 12 GHz



Generic photo used for illustration purposes only

CASE STYLE: MC1630-1

+RoHS Compliant
The +Suffix identifies RoHS Compliance.
See our website for methodologies and qualifications

APPLICATIONS

- 5G
- Cellular
- ISM
- GSM
- WCDMA
- WiMax
- WLAN
- UNII and HIPERLAN

PRODUCT OVERVIEW

Mini-Circuits' TAV2-14LN+ is a MMIC E-pHEMT* transistor with an operating frequency range from 0.05 to 10 GHz. This model combines high gain with extremely low noise figure, resulting in lower overall system noise. Low NF and IP3 performance make it an ideal choice for sensitive receivers in communications systems. Manufactured using highly repeatable E-pHEMT technology, the unit comes housed in a tiny 2 x 2 mm MCLP package. This model requires external biasing and matching.

KEY FEATURES

Features	Advantages
Wideband, 0.05 to 10 GHz Usable to 12 GHz	A single device covers many wireless communications bands including cellular, ISM, GSM, WCDMA, WiMax, WLAN, 5G and more.
High IP3 vs. DC Power Consumption • +30.9 dBm at 6 GHz, +4 V • +33.2 dBm at 12 GHz, +4 V	The TAV2-14LN+ matches industry leading IP3 performance relative to device size and power consumption. Enhanced linearity over a broad frequency range makes the device ideal for use in: • Driver amplifiers for complex waveform up converter paths • Drivers in linearized transmit systems
Combines High Gain (16.4 dB) with Very Low Noise Figure (0.7 dB)	The unique combination of high gain and low Noise Figure results in lower overall system noise.
2 x 2 mm 6-Lead MCLP Package	Tiny footprint saves space in dense layouts while providing low inductance, repeatable transitions, and excellent thermal contact to the PCB.

* Enhancement mode Pseudomorphic High Electron Mobility Transistor.

REV. B
ECO-025003
TAV2-14LN+
MCL NY
250326

E-PHEMT Transistor TAV2-14LN+

50Ω 0.05 to 10 GHz

ELECTRICAL SPECIFICATIONS AT T_{AMB}=+25°C

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
DC SPECIFICATIONS						
V_{TH}	Threshold Voltage	V_{DS}=+4 V, I_{DS}=4 mA		0.37		V
I_{DSS}	Saturated Drain Current	V_{DS}=+4 V, V_{GS}=0 V		2.0		µA
G_M	Transconductance	V_{DS} =+4 V, Gm =$\Delta I_{DS}/\Delta V_{GS}$, $\Delta V_{GS} = V_{GS2}-V_{GS1}$, V_{GS2}=+0.7 V, V_{GS1}=+0.6 V, ΔI_{DS} =(I_{DS} at V_{GS2})-(I_{DS} at V_{GS1})		192		mS
I_{GSS}	Gate leakage Current	V_{GD}=V_{GS}=-3 V		1.0		µA

RF & DC SPECIFICATIONS, Zo=50Ω

Parameter	Condition (GHz)	V_{DS} = +4 V[1], I_{DS} = 40 mA			V_{DS} = +2 V[1], I_{DS} = 20 mA	VS = +5 V[2]	VS = +3 V[2]	Units
		Min.	Typ.	Max.	Typ.	Typ.	Typ.	
Gain	0.05	21	23.4	25.7	22			dB
	6	14.7	16.4	18	15.9	12.7	11.9	
	8	12.5	13.9	15.3	13.3	10.1	9.4	
	10	10.8	11.8	13.2	11.3	9.8	9.1	
	12		10.2		10			
Input Return Loss	0.05							dB
	6		7		6	11	10	
	8		7		6	15	12	
	10		7		7	8	7	
	12		8		7			
Output Return Loss	0.05		5		5			dB
	6		13		13	7	7	
	8		20		17	8	9	
	10		20		17	7	7	
	12		19		16			
P1dB[3]	0.05		17.7		+13.3			dBm
	6		18.8		+13.1	+12.6	+8.5	
	8		19.1		+13.4	+11.2	+7.4	
	10		19.4		+13.5	+13.4	+10.2	
	12		19.1		+13			
OIP3 Pout=+5 dBm/Tone	0.05		27.1		+22.8			dBm
	6		30.9		+24.9	+25.9	+20.8	
	8		31.6		+25.9	+25.4	+18.6	
	10		33.0		+28.5	+27.0	+21.8	
	12		33.2		+29.0			
Noise Figure	0.05		2.5		0.7			dB
	6		0.7		0.6	0.8	0.7	
	8		0.7		0.6	1.0	0.8	
	10		0.8		0.7	1.0	0.7	
	12		1.0		0.8			
I_{DS}	DC		40		20	54	23	mA
V_{GS}	DC	0.44	0.65	0.72	0.58			V

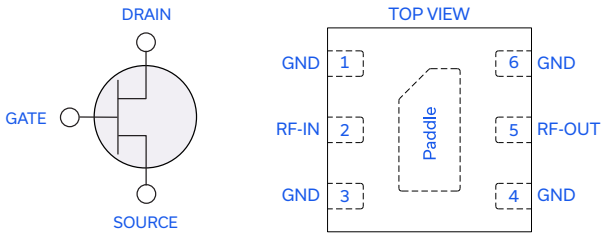
1. Measured in test board TB-TAV2-14LN+. See Fig 1.
2. Measured in eval board TB-TAV2-14LNE+ (designed for 6-10 GHz). See Fig. 2.
3. Drain current bias allowed to increase during compression measurement.

ABSOLUTE MAXIMUM RATINGS[4]

Symbol	Parameter	Max.
V_{DS}[5]	Drain-Source Voltage	+5 V
V_{GS}[5]	Gate-Source Voltage at V_{DS}=+4 V	-5 V & +1 V
I_{DS}[5]	Drain Current at V_{DS}=+4 V	65 mA
I_{GS}	Gate Current	15 µA
P_{DISS}	Total Dissipated Power	325 mW
P_{IN}[6]	RF Input Power	+18 dBm (5 -minute max.) +15 dBm (continuous)
T_{CH}	Channel Temperature	+150 °C
T_{OP}	Operating Temperature	-40 to +85 °C
T_{STD}	Storage Temperature	-65 to +150 °C
θjc	Thermal Resistance	170 °C/W

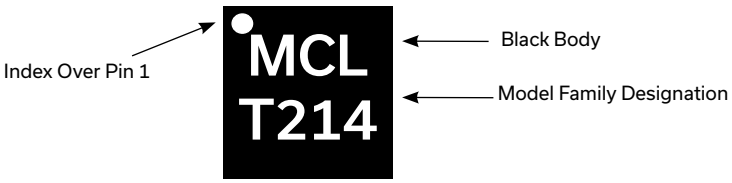
4. Operation of this device above any one of these parameters may cause permanent damage.
5. Assumes DC quiescent conditions.
6. I_{GS} is limited to 15µA during test.

SIMPLIFIED SCHEMATIC AND PAD DESCRIPTION



Function	Pad Number	Description
RF-IN	2	Gate used for RF input
RF-OUT	5	Drain used for RF output
GND	1,3,4,6 & Paddle	Source terminal, normally connected to ground.

PRODUCT MARKING



Marking may contain other features or characters for internal lot control.

CHARACTERIZATION TEST CIRCUIT

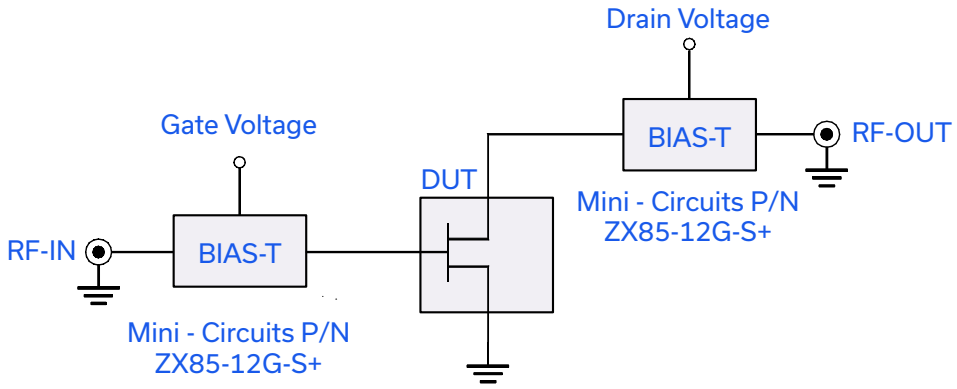
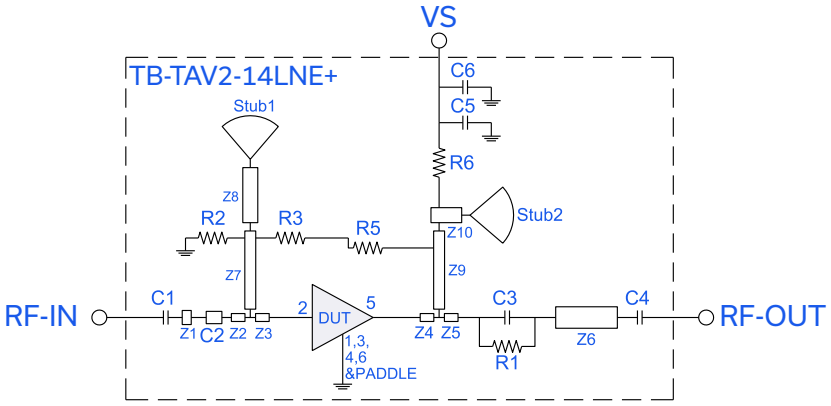


Fig 1. Block Diagram of Test Circuit used for characterization. (DUT is soldered on Mini-Circuits Test Board TB-TAV2-14LN+) Gain, Output Power at 1 dB Compression (P1dB), Noise Figure and Output IP3 (OIP3) are measured using Agilent's Microwave Network Analyzer N5242A PNA-X.

Conditions:
1. Drain Voltage (with reference to source, V_{DS})= +2 V & +4 V as shown.
2. Gate Voltage (with reference to source, V_{GS}) is set to obtain desired Drain-Source current (IDS) as shown in graphs or specification table.
3. Gain: P_{IN}= -25 dBm
4. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, +5 dBm/tone at output.
5. No external matching components used.

APPLICATION TEST CIRCUIT



Component	Size	Value	Part Number	Manufacturer
C1	0402	1pF	GRM1555C1H1R0CA01D	Murata
C2	Low-Zc microstrip as 0.15pF shunt capacitor to GND (refer to PCB layout for dimensions)			
C3	0402	0.3pF	GJM1555C1HR30BB01D	Murata
C4	0402	1pF	GRM1555C1H1R0CA01D	Murata
C5	0402	3.3pF	GRM1555C1H3R3CA01D	Murata
C6	0805	1uF	GRM21BR71C105KA01L	Murata
R1	0402	33Ohm	RK73H1ETTP33R0F	Koa
R2	0402	5.6KOhm	RK73H1ETTP5601F	Koa
R3	0402	8.2KOhm	RK73H1ETTP8201F	Koa
R5	0402	4.7KOhm	RK73H1ETTP4701F	Koa
R6	0402	43Ohm	RK73H1ETTP43R0F	Koa
Stub1, Stub2	Radial stubs of length = 1.75mm, angle = 70 deg, input line width = 0.54mm			
Z1-Z10	Transmission-line matching elements, refer to PCB layout for physical dimensions			

Fig 2. Block Diagram of Test Circuit used for characterization. (DUT is soldered on Mini-Circuits Application test board TB-TAV2-14LNE+) Gain, Return Loss, Output Power at 1 dB Compression (P1dB), Output IP3 (OIP3) and Noise Figure measured using Agilent's microwave network analyzer N5242A PNA-X.

Conditions:
1. Supply Voltage, VS=+3 V & +5 V
2. Gain and Return Loss: P_{IN}= -25 dBm
3. Output IP3 (OIP3): Two Tones spaced 1 MHz apart, +5 dBm/tone at output.

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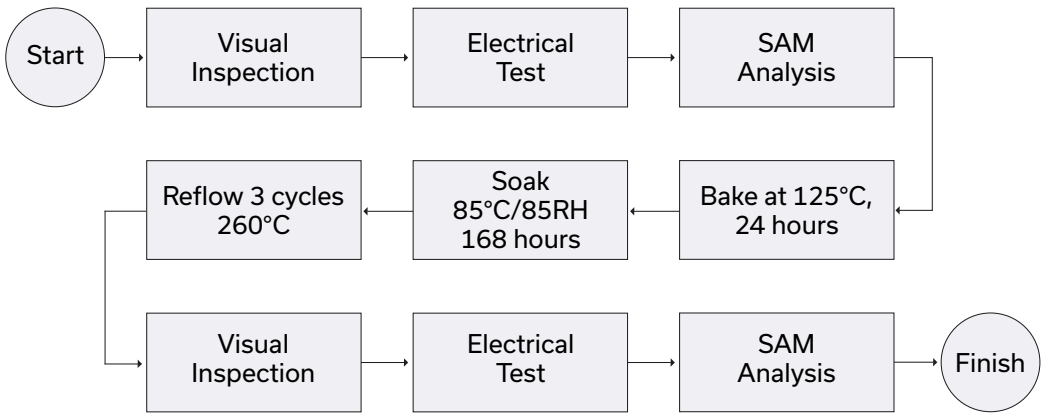
ADDITIONAL DETAILED TECHNICAL INFORMATION IS AVAILABLE ON OUR DASHBOARD. TO ACCESS CLICK HERE

Performance Data	Data Table Swept Graphs S-Parameter (S2P Files) Data Set (.zip file)
Case Style	MC1630-1 Plastic package, exposed paddle, lead finish: Matte-Tin
Tape & Reel **Standard Quantities Available on Reel**	F55 7" Reels with 20, 50, 100, 200, 500 or 2000 devices
Suggested Layout for PCB Design	PL-659
Evaluation Board	TB-TAV2-14LN+ & TB-TAV2-14LNE+
Environmental Ratings	ENV08T1

ESD RATING

Human Body Model (HBM): Class 0 (50 V to 250 V) in accordance with ANSI/ESD STM 5.1 - 2001

MSL TEST FLOW CHART



NOTES

A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
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