PLUG IN AMPLIFIER MODULES	LPA-PIM3D-180DO-2496M-2690M-T1-00
P1940	

FEATURES

- ♦ BAND 41 (2496-2690MHz) TDD MODULE
- ♦ 150MHz INSTANTANEOUS BANDWIDTH
- ♦ +48V GAN Tx AMPLIFIER
- ♦ 5µs Tx Rx SWITCHING, SINGLE CONTROL

Tx :

- ♦ DOHERTY CONFIGURATION, 180W PEAK POWER
- ♦ 27dB GAIN; 50OHMS INPUT / OUTPUT
- ♦ +48V/1.3A AT 20W OUTPUT
- ♦ FORWARD / REVERSE OBSERVATION PATH

Rx :

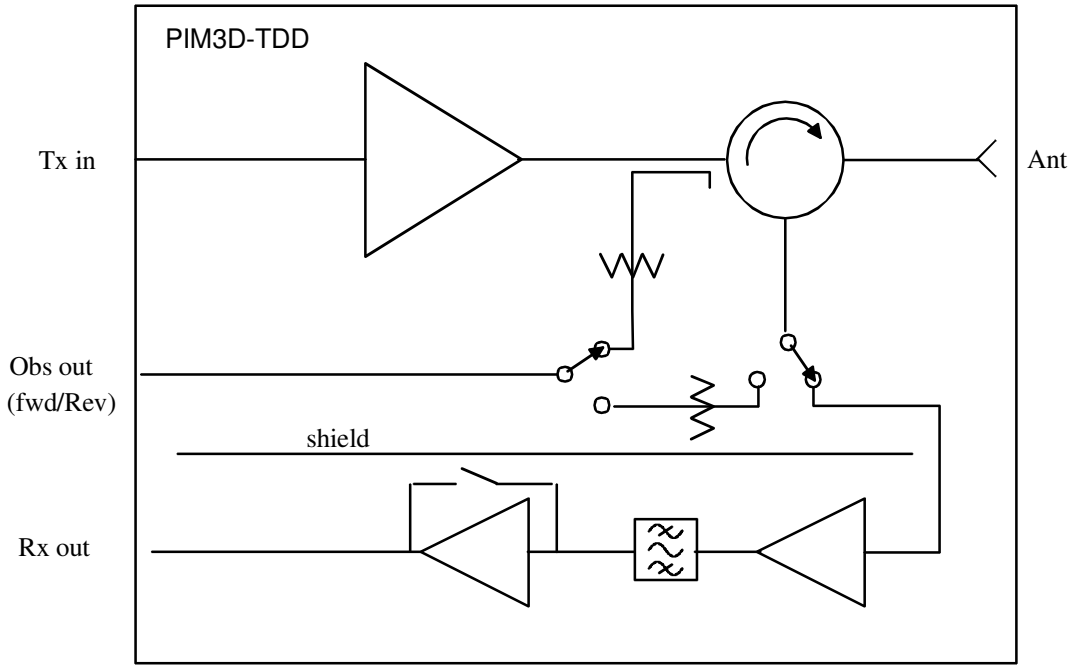
- ♦ 31dB GAIN / 12dB WITH BYPASS
- ♦ NF=2.5dB at 31dB GAIN
- ♦ IN BAND IIP3= +10dBm AT 31dB GAIN / 5.5V/0.23A
- ♦ IN BAND IIP3= +20dBm AT 12dB GAIN / 5.5V/0.16A

PACKAGE : PIM3D-TDD-MCX

APPLICATIONS

- ♦ RRU - RRH AMPLIFIERS
- ♦ MIMO AMPLIFIERS

Block diagram:



Transmit amplifier biasing :

The Tx amplifier is a GAN amplifier operating from +48V. It requires an auxiliary bias voltage of -8V. There is no particular sequence for applying these 2 voltages. The +48V will be internally switched off if the -8V is not present.

Transmit electrical characteristics: 50 ohms; Supply=+48V; Aux supply=-8V; Tx-Rx ctrl=high; 2496-2690MHz; -20°C to +75°C (1,2)

Ref	parameter	conditions	note	min	typ	max	units
1	Bandwidth			2496		2690	MHz
2	Gain Tx with Tx on	2593MHz ; 50°C; Tx -Rx ctrl = high			27		dB
3	Gain flatness	2496-2690MHz			0.5	1.0	dBpp
4	Gain vs temperature	2593MHz			4		dB
5	Instantaneous bandwidth	f=2593MHz @ 100Wp	4		150		MHz
6	Input return loss	50 ohms			-16		dB
7	Output return loss	50 ohms			-14		dB
8	Fwd Observation path	Tx out to Obs out			-37		dB
9	Fwd Obs accuracy	flatness 2400-2800MHz	5			0.2	dB
10	Peak power	LTE 10MHz TM1.1. PAR=9dB PARC=2dB		140	180		W
11	AM-PM	LTE 10MHz TM1.1. PAR=9dB PARC=2dB				20	deg.
12	Adjacent channel power ratio	20W/20MHz LTE signal ACLR1 ACLR2	3		 -30 -45		 dBc dBc
13	Output noise	2496-2690MHz during Tx			-33		dBm/MHz
14	2d harmonic rejection	1 tone 20W output			-50		dBc
15	Current consumption Tx	48V ; Idle;			0.15	0.17	A
16	Current consumption Aux supply	-8V			5	10	mA
17	Current consumption Tx with Tx off	48V; Tx enable = low			10		mA
18	Current consumption	48V ; Tx enable = high; 1 LTE 20MHz , PAPR@0.01%=9dB ; Pout=20Wavg continuous			1.3		A
19	Current consumption	48V ; Tx enable = high; 1 LTE 20MHz , PAPR@0.01%=9dB ; Pout=25Wavg continuous			1.5		A
20	Switching time off-on	Tx enable from 0V to 3V			3	4	µs
21	Switching time on off	Tx enable from 3V to 0V			2	3	µs

1. Unless otherwise specified
2. Housing temperature
3. Before correction
4. DPD corrected
5. 50ohms output load

Receive electrical characteristics : 50 ohms; Supply=5.5V; Tx-Rx ctrl = low; 2496-2690MHz; -20°C to +75°C (1,2)

Ref	parameter	conditions	note	min	typ	Max	units
1	Bandwidth			2496		2690	MHz
2	Gain Rx	2593MHz ; 50°C			31		dB
3	Gain flatness	2496-2690MHz			1.0	2.0	dBpp
4	Gain Rx with bypass	2593MHz ; 50°C			12		dB
5	Gain flatness with bypass	2496-2690MHz			1.0	2.0	dBpp
6	Gain vs temperature	2593MHz -20to +75°C max gain			2		dB
7	Input return loss	50 ohms			-16	-14	dB
8	Output return loss	50 ohms			-16	-14	dB
9	Noise figure	gain=31dB			2.5		dB
10	Noise figure	gain=12dB (bypass)			2.5		dB
11	IIP3	gain=31dB	6		+10		dBm
12	IIP3	gain=12dB	7		+20		dBm
13	Current consumption	Supply 5.5V ; Gain=31dB			0.23	0.25	A
14	Current consumption	Supply 5.5V ; Gain=12dB			0.16	0.18	A

6. 2 CW tones at input -30dBm each
7. 2 CW tones at input -20dBm each

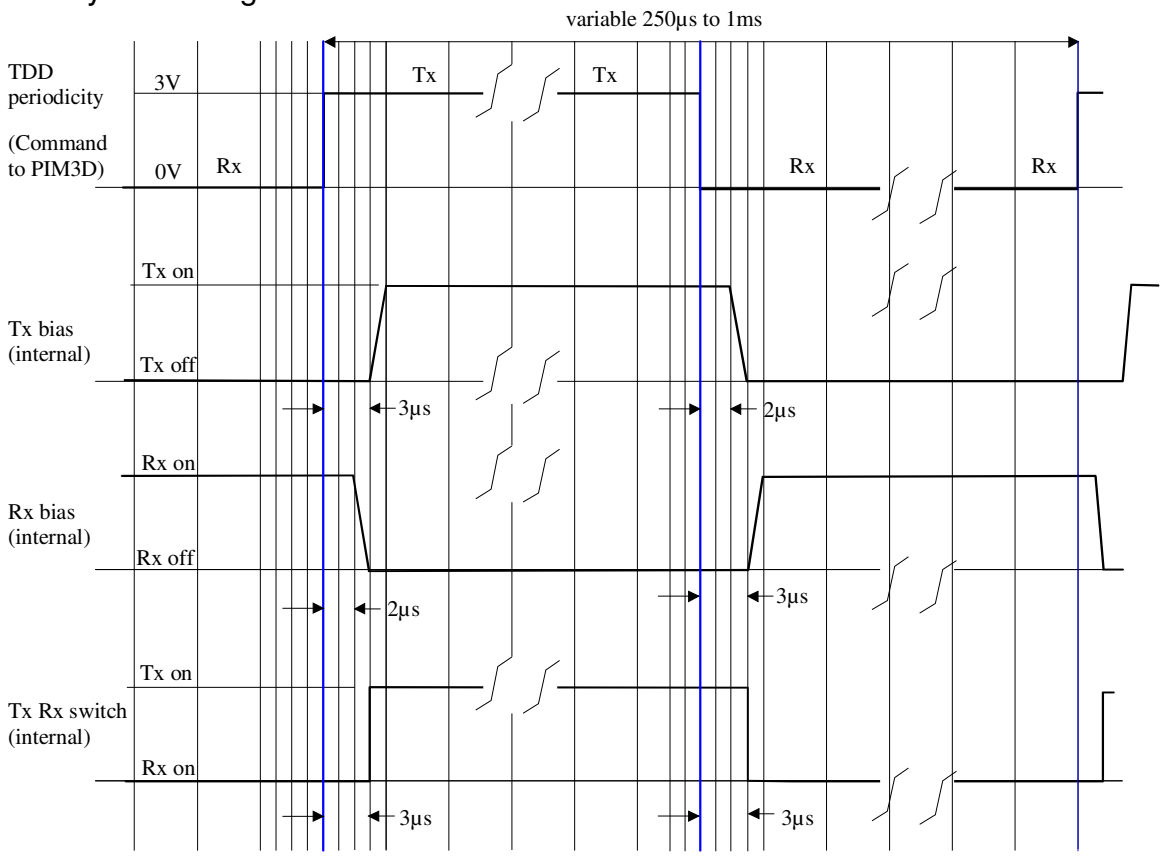
Tx-Rx Switching characteristics: Supplies Tx=48V / Rx=5.5V; -20°C to +75°C (1,2)

Ref	parameter	conditions	note	min	typ	max	units
1	Tx-Rx Command signal	high	8	1.6			V
2	Tx-Rx Command signal	low	9	0		0.6	V
3	Tx-Rx Command signal transition time	Low to high and high to low				0.1	µs
RX TURNS OFF / TX TURNS ON							
4	Delay before Rx turns off		10			2	µs
5	Time to turn Rx off		10			1	µs
6	Delay before Tx turns on		10	3			µs
7	Time to turn Tx on		10			1	µs
TX TURNS OFF / RX TURNS ON							
8	Delay before Tx turns off		11			2	µs
9	Time to turn Tx off		11			1	µs
10	Delay before Rx turns on		11	3			µs
11	Time to turn Rx on		11			1	µs

8. typically switches for Tx-Rx>1.2V
9. typically switches for Tx-Rx<0.8V
10. after command signal rising edge
11. after command signal falling edge

TDD INTERNAL SWITCHING:

All internal commands (Tx On/Off, Rx On/Off, TxRx switch) are derived from the TDD periodicity control signal



Maximum ratings

Ref	parameter	conditions	note	min	nom	max	units
1	Operating temperature	Flange temperature		-40°C		+90	°C
Transmit max ratings							
2	Supply voltage			30V		50	V
3	Input peak power					+19	dBm
4	Input average power					+9	dBm
5	Output VSWR	At 6W ouput power		∞			-
Receive max ratings							
5	Supply voltage			3.0		8.0	V
6	Max input average power					+15	dBm

Monitoring & Control

Ref	parameter	designation	conditions	Remarks
1	Temperature	TEMP	-40°C to +100°C	I²C bus
2	Tx Reverse /forward switching	Fwd/rev	0-3.3V	0V= rev 3V=fwd
3	Rx Bypass switching	Byp	0-3.3V	0V=full gain 3V=bypass
4	Rx to Tx switching	Tx -Rx ctrl	3V ctrl	<3µs switching time
5	Tx to Rx switching	Tx -Rx ctrl	0V ctrl	<3µs switching time
6	Amplifier identity	Id		I²C bus

PCB Connections

INPUT PCB (1.6mm +/- 0.2mm Multilayer)	OUTPUT PCB (1.6mm +/-0.1mm Double sided) (****)
Bottom surface of module to input PCB surface :1.6+/- 0.2mm	Bottom surface of module to output PCB surface: 1.6mm +/- 0.2mm
Landing pad 1 : RF Gnd (*)	Landing pad 15 : +48V in
Landing pad 2 : Tx input (*)	Landing pad 16 : Gnd (***)
Landing pad 3 : -8V aux supply	
Landing pad 4 : SCL (**)	
Landing pad 5 : SDA (**)	
Landing pad 6: Gnd (**)	
Landing pad 7 : TxRx control (**)	
Landing pad 8 : fwd/rev control (**)	
Landing pad 9 : Rx Bypass (**)	
Landing pad 10: RF Gnd (*)	
Landing pad 11 : fwd observation path (*)	
Landing pad 12 : +5.5V in (*)	
Landing pad 13 : Rx Out (*)	
Landing pad 14 : RF Gnd (*)	
(*) Harwin S70-220101045R contact pads on input PCB ; 4A max per contact (**) for Molex 78732-6021; 1A max per contact	(***) Harwin S70- S70-220101045R contact pads on output PCB ; 4A max per contact

Mechanical

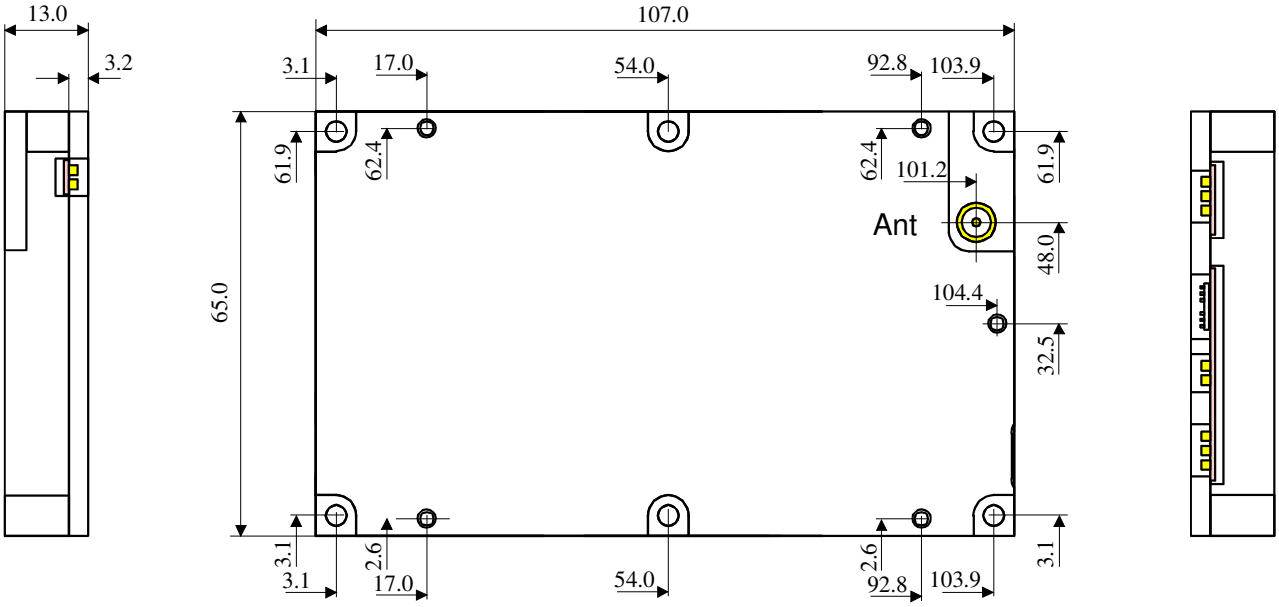
Ref	Characteristic	Description	Remarks
1	Housing size	107.0mm x 65mm x 13.0mm	
2	Mounting	6 M3 screws	
3	Base material	Aluminum 6082	
4	Base finish	Silver	
5	Housing cover finish	Electroless nickel	
6	weigth	150g	

Connectors

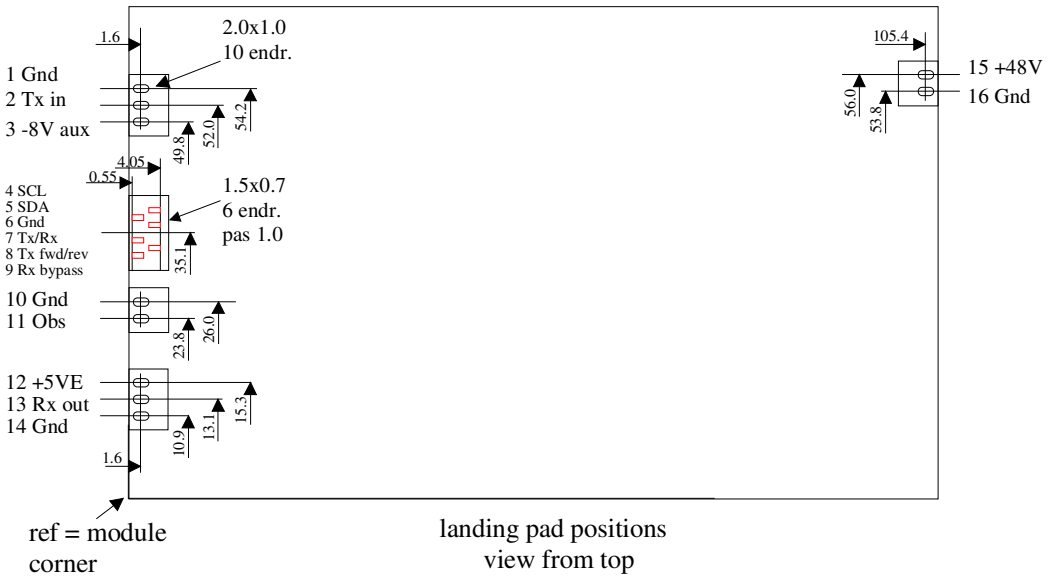
Ref	Characteristic	Description	Remarks
1	RF input/samples connectors	Spring contacts	Connects to 1.6mm multilayer board (*)
2	Antenna connector	MCX	
3	DC Supply connectors	Spring contacts	Connects to 1.6mm multilayer board (*)
4	Signal connectors	Molex 78732-6021	Connects to 1.6mm multilayer board (**)

(*) with gold plated tabs Harwin S70-220101045R
(**) direct connection to PCB

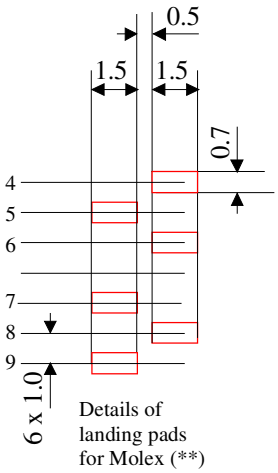
PIM3D - TDD - MCX package outline:



PIM3D landing pads on 1.6 (63mils) thick board:



Molex 78732-6021 detail of landing pads:



Note : landing pads for 78732-6021 are gold plated

Part numbering:

LPA-PIM3D-180DO-2496M-2690M-T1-00

Housing

Peak power (W)

Class of operation	
AA	Class A
AB	Class AB
DO	Doherty

DL Tx center frequency (FDD)
Low end of band (TDD)

UL Rx center frequency (FDD)
High end of band (TDD)

Specific functionnalities	
T0	TDD +28V
F0	FDD +28V
T1	TDD +48V
F1	FDD +48V

Other options	
00	MCX output
01	PSMP Output
02	Direct connection to board

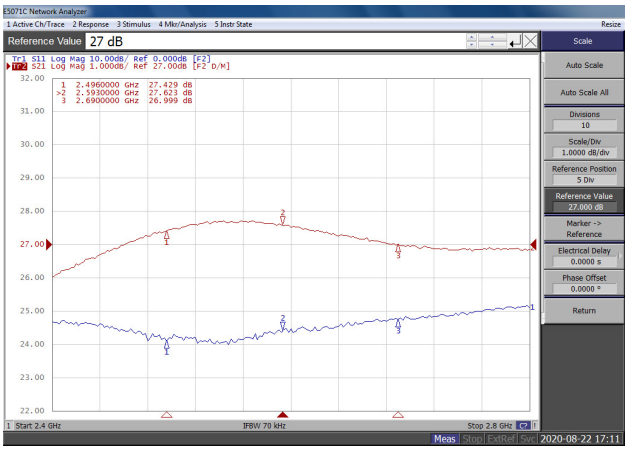
Support documents:

Ref	Document type	Document number	Title	Date
1	Application Note	APNT17001A	PIM3 Module product line	04/2018
2	Application Note	APNT18002	Using PIM3D modules	05/2018

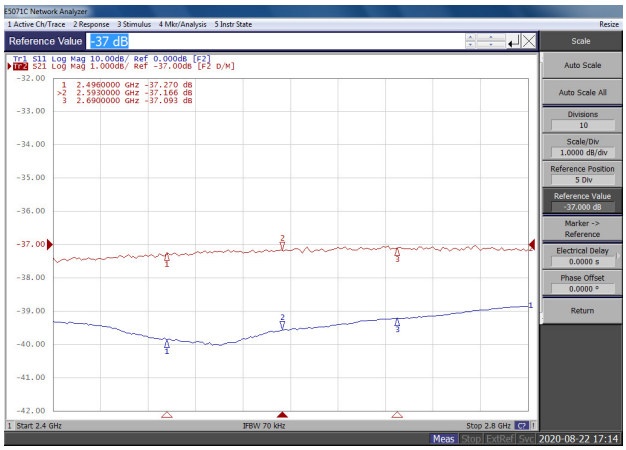
Related products:

Ref	Part number	Description	Product code
1	TF-PIM3D-GAN-150W-MCX	Test fixture PIM3D GAN MCX/PSMP	T200
2	TF-PIM3D-INTERFACE02	I2C-USB interface board	T190

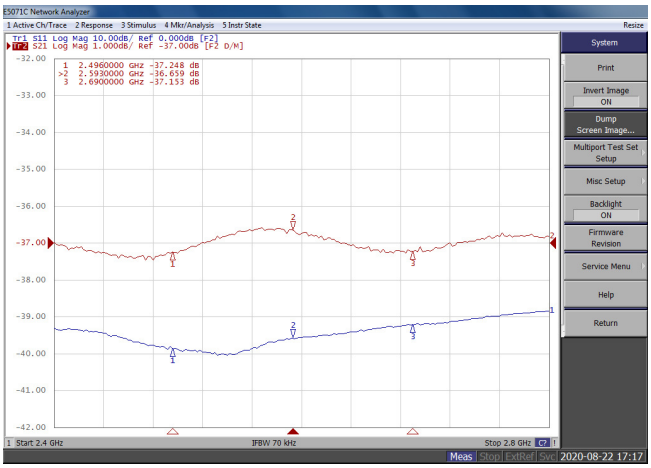
TRANSMIT TYPICAL PERFORMANCE



TX GAIN VS FREQUENCY

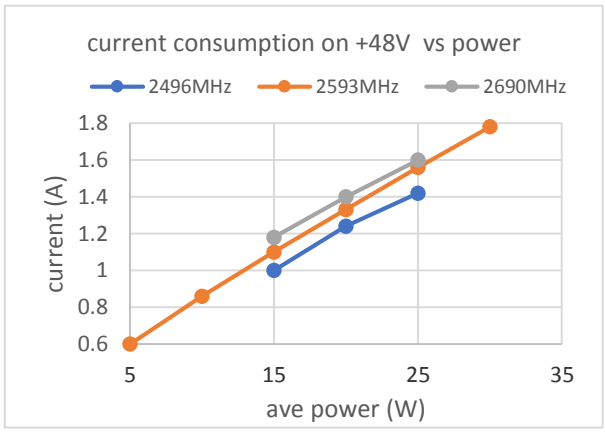


FORWARD OBSERVATION PATH OBS OUT RELATIVE TO RF OUT



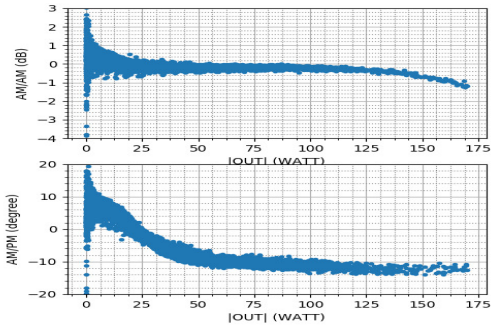
REVERSE OBSERVATION PATH TXIN TO OBS OUT (OUTPUT OPEN)

REVERSE OBSERVATION PATH TXIN TO OBS OUT (OUTPUT LOADED)

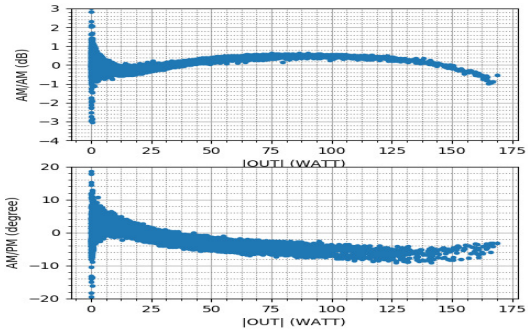


Current consumption on +48V vs output power
1LTE 20MHz signal ($PAPR_{@0.01\%}$=9dB)

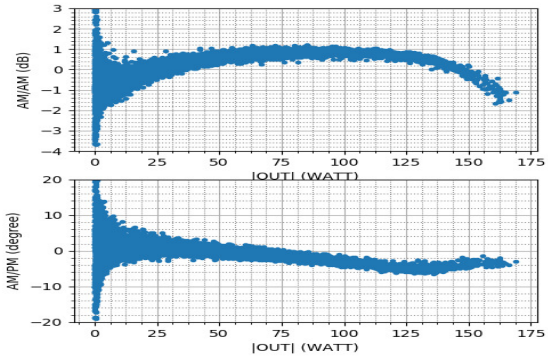
TRANSMIT TYPICAL PERFORMANCE (continued)



AM-AM and AM-PM; 2500MHz
LTE 20MHz PAR=9dB

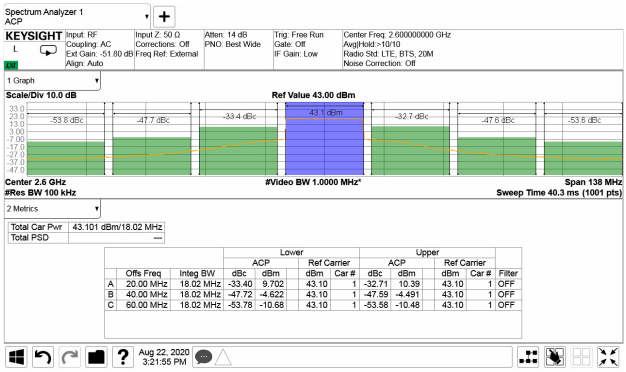


AM-AM and AM-PM; 2600MHz
LTE 20MHz PAR=9dB

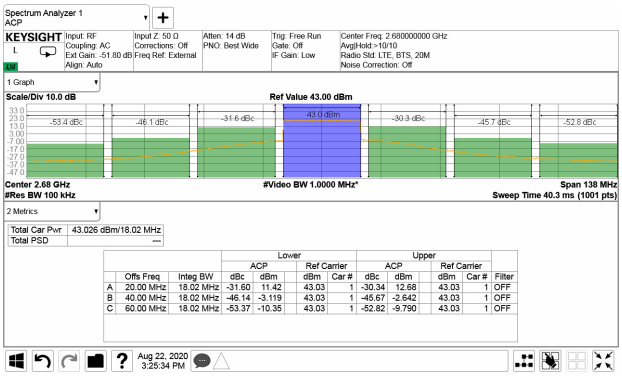


AM-AM and AM-PM; 2700MHz
LTE 20MHz PAR=9dB

ACLR LTE20MHz PAR=9dB 2510MHz 20W
48V/1.25A

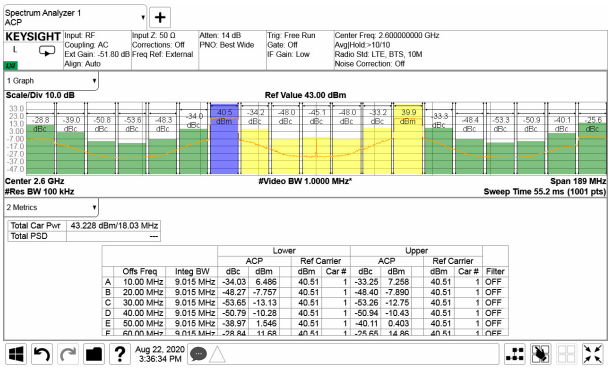


ACLR LTE20MHz PAR=9dB 2600MHz 20W
48V/1.33A



ACLR LTE20MHz PAR=9dB 2690MHz 20W
48V/1.40A

TRANSMIT TYPICAL PERFORMANCE (continued)

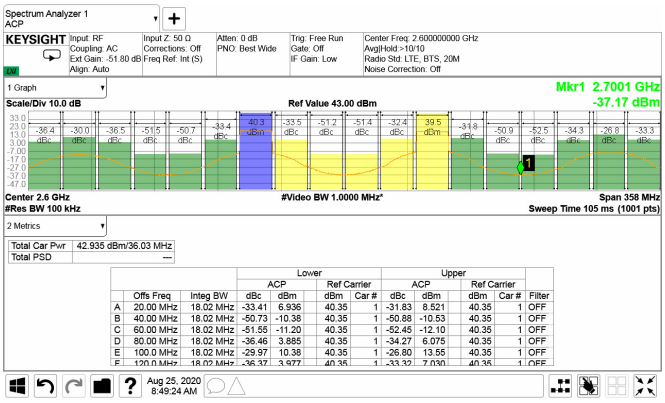


2 carriers LTE10 spaced 60MHz centered 2600MHz Pav=20W +48V/1.28A

	Offs Freq	Integ BW	Lower ACP dBc	Lower ACP dBm	Lower Ref Carrier dBm	Lower Ref Carrier Car #	Upper ACP dBc	Upper ACP dBm	Upper Ref Carrier dBm	Upper Ref Carrier Car #	Filter
A	10.00 MHz	9.015 MHz	-34.03	6.486	40.51	1	-33.26	7.258	40.51	1	OFF
B	20.00 MHz	9.015 MHz	-48.27	-7.757	40.51	1	-48.40	-7.890	40.51	1	OFF
C	30.00 MHz	9.015 MHz	-53.65	-13.13	40.51	1	-53.26	-12.75	40.51	1	OFF
D	40.00 MHz	9.015 MHz	-50.79	-10.28	40.51	1	-50.94	-10.43	40.51	1	OFF
E	50.00 MHz	9.015 MHz	-38.97	1.546	40.51	1	-40.11	0.403	40.51	1	OFF
F	60.00 MHz	9.015 MHz	-28.84	11.68	40.51	1	-25.65	14.86	40.51	1	OFF

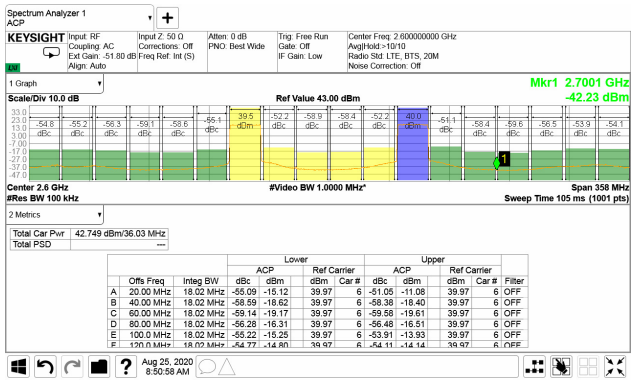
3 carriers LTE20 centered 2600MHz Pav=20W +48V/1.3A

	Offs Freq	Integ BW	Lower ACP dBc	Lower ACP dBm	Lower Ref Carrier dBm	Lower Ref Carrier Car #	Upper ACP dBc	Upper ACP dBm	Upper Ref Carrier dBm	Upper Ref Carrier Car #	Filter
A	20.00 MHz	18.02 MHz	-28.89	9.582	38.47	2	-26.78	11.69	38.47	2	OFF
B	40.00 MHz	18.02 MHz	-34.11	4.362	38.47	2	-32.84	5.630	38.47	2	OFF
C	60.00 MHz	18.02 MHz	-38.17	0.302	38.47	2	-38.04	0.435	38.47	2	OFF



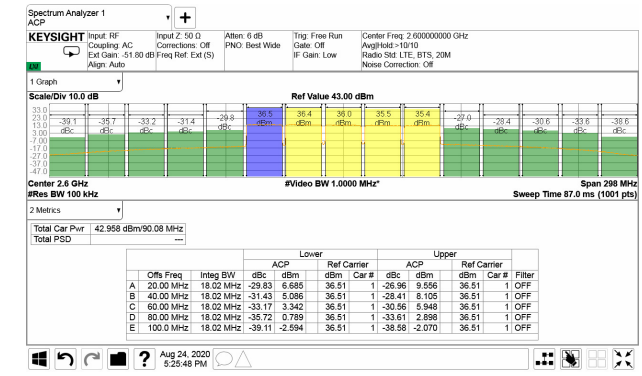
2 carriers 20MHz each spaced by 100MHz PARin=9dB 2600MHz 20W/48V/1.3A without linearization

	Offs Freq	Integ BW	Lower ACP dBc	Lower ACP dBm	Lower Ref Carrier dBm	Lower Ref Carrier Car #	Upper ACP dBc	Upper ACP dBm	Upper Ref Carrier dBm	Upper Ref Carrier Car #	Filter
A	20.00 MHz	18.02 MHz	-33.41	6.936	40.35	1	-31.83	8.521	40.35	1	OFF
B	40.00 MHz	18.02 MHz	-50.73	-10.38	40.35	1	-50.88	-10.53	40.35	1	OFF
C	60.00 MHz	18.02 MHz	-51.55	-11.20	40.35	1	-52.45	-12.10	40.35	1	OFF
D	80.00 MHz	18.02 MHz	-36.46	3.885	40.35	1	-34.27	6.075	40.35	1	OFF
E	100.0 MHz	18.02 MHz	-29.97	10.38	40.35	1	-26.80	13.55	40.35	1	OFF
F	120.0 MHz	18.02 MHz	-36.37	3.977	40.35	1	-33.32	7.030	40.35	1	OFF



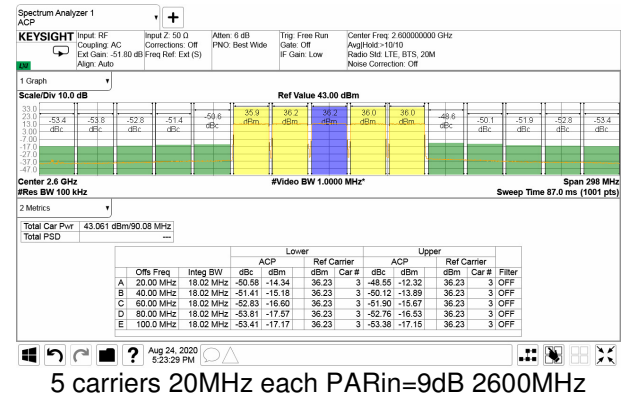
2 carriers 20MHz each spaced by 100MHz PARin=9dB 2600MHz 20W/48V/1.3A with linearization

	Offs Freq	Integ BW	Lower ACP dBc	Lower ACP dBm	Lower Ref Carrier dBm	Lower Ref Carrier Car #	Upper ACP dBc	Upper ACP dBm	Upper Ref Carrier dBm	Upper Ref Carrier Car #	Filter
A	20.00 MHz	18.02 MHz	-55.09	-15.12	39.97	6	-51.05	-11.08	39.97	6	OFF
B	40.00 MHz	18.02 MHz	-58.59	-18.62	39.97	6	-58.38	-18.40	39.97	6	OFF
C	60.00 MHz	18.02 MHz	-59.14	-19.17	39.97	6	-59.58	-19.61	39.97	6	OFF
D	80.00 MHz	18.02 MHz	-56.28	-16.31	39.97	6	-56.48	-16.51	39.97	6	OFF
E	100.0 MHz	18.02 MHz	-55.22	-15.25	39.97	6	-53.91	-13.93	39.97	6	OFF
F	120.0 MHz	18.02 MHz	-54.77	-14.80	39.97	6	-54.11	-14.14	39.97	6	OFF



5 carriers 20MHz each PARin=9dB 2600MHz 20W/48V/1.3A without linearization

	Offs Freq	Integ BW	Lower ACP dBc	Lower ACP dBm	Lower Ref Carrier dBm	Lower Ref Carrier Car #	Upper ACP dBc	Upper ACP dBm	Upper Ref Carrier dBm	Upper Ref Carrier Car #	Filter
A	20.00 MHz	18.02 MHz	-29.83	6.685	36.51	1	-26.96	9.556	36.51	1	OFF
B	40.00 MHz	18.02 MHz	-31.43	5.086	36.51	1	-28.41	8.105	36.51	1	OFF
C	60.00 MHz	18.02 MHz	-33.17	3.342	36.51	1	-30.56	5.948	36.51	1	OFF
D	80.00 MHz	18.02 MHz	-35.72	0.789	36.51	1	-33.61	2.898	36.51	1	OFF
E	100.0 MHz	18.02 MHz	-39.11	-2.594	36.51	1	-38.58	-2.070	36.51	1	OFF

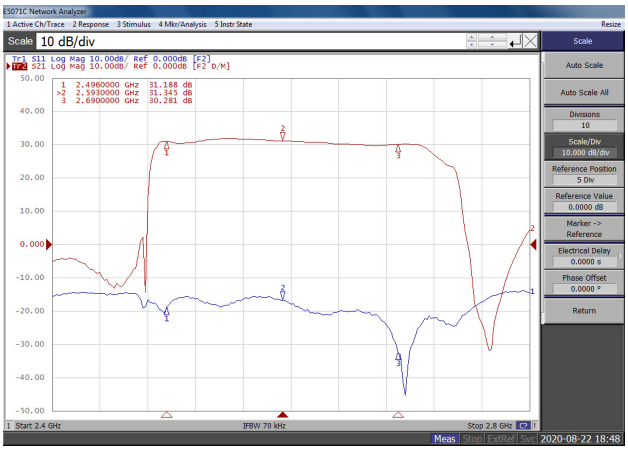


5 carriers 20MHz each PARin=9dB 2600MHz 20W/48V/1.3A with linearization

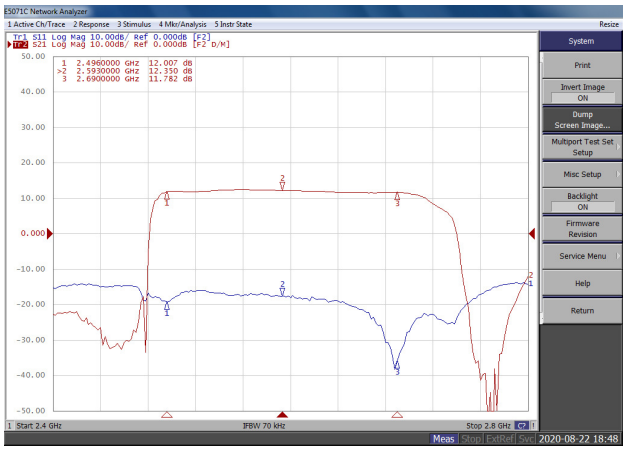
	Offs Freq	Integ BW	Lower ACP dBc	Lower ACP dBm	Lower Ref Carrier dBm	Lower Ref Carrier Car #	Upper ACP dBc	Upper ACP dBm	Upper Ref Carrier dBm	Upper Ref Carrier Car #	Filter
A	20.00 MHz	18.02 MHz	-50.58	-14.34	36.23	3	-48.55	-12.32	36.23	3	OFF
B	40.00 MHz	18.02 MHz	-51.41	-15.18	36.23	3	-50.12	-13.89	36.23	3	OFF
C	60.00 MHz	18.02 MHz	-52.83	-16.60	36.23	3	-51.90	-15.67	36.23	3	OFF
D	80.00 MHz	18.02 MHz	-53.81	-17.57	36.23	3	-52.76	-16.53	36.23	3	OFF
E	100.0 MHz	18.02 MHz	-53.41	-17.17	36.23	3	-53.38	-17.15	36.23	3	OFF

Note : DPD Xilinx 033

RECEIVE TYPICAL PERFORMANCE



GAIN Rx +5.5V/230mA



GAIN Rx with bypass +5.5V/160mA