
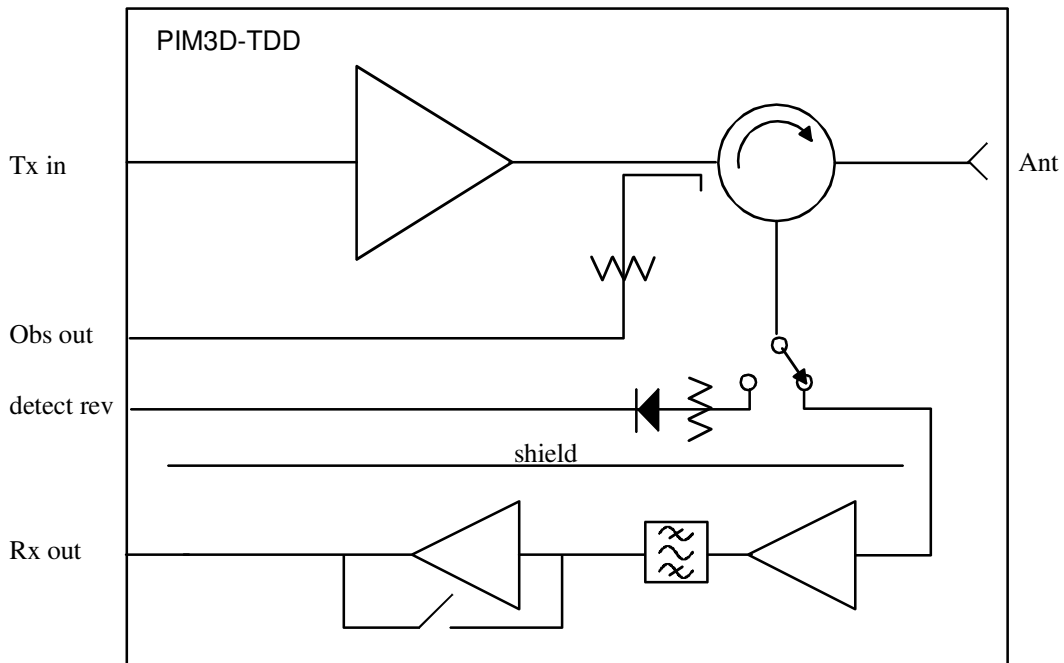


<p><b>PLUG IN AMPLIFIER MODULES</b></p>	<p><b>LPA-PIM3D-050DO-3400M-3600M-T0-02</b></p>	
<p><b>P1650</b></p>		
<p><b>FEATURES</b></p> <ul style="list-style-type: none"> <li>◆ Band 42 (3400-3600MHz) TDD MODULE</li> <li>◆ &lt;5µs Tx Rx SWITCHING, SINGLE CONTROL</li> </ul> <p>Tx :</p> <ul style="list-style-type: none"> <li>◆ DOHERTY CONFIGURATION, 50W PEAK POWER</li> <li>◆ 32dB GAIN; 50OHMS INPUT / OUTPUT</li> <li>◆ 28V/0.45A AT 5W OUTPUT AND 50% DUTY CYCLE</li> <li>◆ FORWARD OBSERVATION PATH</li> <li>◆ REVERSE POWER DETECTION</li> </ul> <p>Rx :</p> <ul style="list-style-type: none"> <li>◆ 30dB FULL GAIN ; 10dB GAIN WITH BYPASS</li> <li>◆ NF=2.2dB at 30dB GAIN</li> <li>◆ IIP3= +5 dBm at 30dB GAIN</li> <li>◆ IIP3= +15 dBm at 10dB GAIN</li> <li>◆ 5.5V/0.11A AT 50% DUTY CYCLE</li> </ul>		 <p>PACKAGE : PIM3D-TDD-PCB</p>
		<p><b>APPLICATIONS</b></p> <ul style="list-style-type: none"> <li>◆ RRU - RRH AMPLIFIERS</li> <li>◆ MIMO AMPLIFIERS</li> </ul>

**Block diagram:**



## Transmit electrical characteristics : Supply=28V; Tx-Rx ctrl > 3V (3); 3400MHz-3600MHz; -20 °C to +75 °C (1,2)

Ref	parameter	conditions	note	min	typ	max	units
1	Bandwidth			3400		3600	MHz
2	Gain Tx with Tx on	3500MHz ; 50°C; Tx -Rx ctrl >3V			32.0		dB
3	Gain flatness	3400-3600MHz	4		1.0	1.5	dBpp
4	Gain vs temperature	3500MHz	4	-2		+2	dB
5	Gain Tx with Rx on	3500MHz ; 50°C; Tx -Rx ctrl <1V			-13		dB
6	Instantaneous bandwidth	F=3500MHz @ 50Wp			80		MHz
7	Input return loss	50 ohms			-20	-15	dB
8	Output return loss	50 ohms			-20	-15	dB
9	Fwd Observation path	Tx out to Obs out			-33		dB
10	Fwd Obs accuracy	flatness 3300-3700MHz				0.5	dB
11	Peak power	LTE 10MHz PARC=2dB		46	46.7		dBm
12	Adjacent channel power ratio	5W/20MHz LTE signal ACLR1 ACLR2			-33 -45		dBc dBc
13	Forward Intermodulation	2 x 2.5W/10MHz LTE signals			-30		dBc
14	Reverse intermodulation	10W 10MHz forward, 100mW 10MHz reverse				-70	dBc
15	2d harmonic rejection	1 tone 10W output			TBD		dBc
16	Current consumption Tx with Tx on	28V ; Idle; Tx -Rx ctrl >3V			0.26	0.28	A
17	Current consumption Tx with Tx off	28V; Tx -Rx ctrl <1V			0.06	0.08	A
18	Current consumption	28V ; Tx -Rx ctrl >3V; 1carrier LTE 20MHz ; PAR=9dB ; Pout=5.0Wavg continuous			0.9	1.0	A
19	Current consumption	28V ; Tx -Rx ctrl >3V; 1carrier LTE 20MHz ; PAR=7dB ; Pout=10.0Wavg continuous			1.45	1.5	A
20	Tx-Rx Switching level	For Tx on / Rx off		1.6		2.0	V
21	Tx-Rx Switching level	For Rx on / Tx off		0		0.8	V
22	Tx Switching time off-on	Tx -Rx ctrl from 0V to 3V				4	µs
23	Tx Switching time on off	Tx -Rx ctrl from 3V to 0V				3	µs

1. Unless otherwise specified
2. Housing temperature
3. internal pull up : Tx is default mode
4. small signal

## Receive electrical characteristics : Supply=5.5V; Tx-Rx ctrl < 0.6V; 3400MHz-3600MHz; -20 °C to +75 °C (1,2)

Ref	parameter	conditions	note	min	typ	max	units
1	Bandwidth			3400		3600	MHz
2	Max Gain Rx / Rx on / Bypass off	3500MHz ; Tx -Rx ctrl <0.6V; 50°C		28.0	29.0	30.0	dB
3	Max Gain Rx / Rx on / Bypass on	3500MHz ; Tx -Rx ctrl <0.6V; Bypass= 3V; 50°C		10.0	11.0	12.0	dB
3	Gain flatness	3400-3600MHz ; Full gain or bypass			1.0	2.0	dBpp
4	Gain vs temperature	3500MHz		-2		+2	dB
5	Gain Rx / Rx off	3500MHz ; Tx -Rx ctrl >3V; 50°C				0	dB
6	Input return loss	50 ohms			-20	-15	dB
7	Output return loss	50 ohms			-20	-15	dB
8	Noise figure	gain=30dB (Bypass off)			2.2	2.5	dB
9	Noise figure	gain=10dB (Bypass on)			2.2	2.5	dB
10	IIP3	gain=30dB (Bypass off)	5		+5		dBm
11	IIP3	gain=10dB (Bypass on)	6		+15		dBm
12	Current consumption Rx on / Bypass off	Supply 5.5V; Tx -Rx ctrl <0.6V			0.22	0.24	A
13	Current consumption Rx on / Bypass on	Supply 5.5V; Tx -Rx ctrl <0.6V			0.15	0.17	A
14	Current consumption Rx off	Supply 5.5V; Tx -Rx ctrl >3V			0.01	0.02	A
15	Rx Switching time off-on	Tx -Rx ctrl from 3V to 0V	7			4	µs
16	Rx Switching time on-off	Tx -Rx ctrl from 0V to 3V	7			3	µs

5. 2 tones -35dBm each at input
6. 2 tones -20dBm each at input
7. 0 to 90% level variation

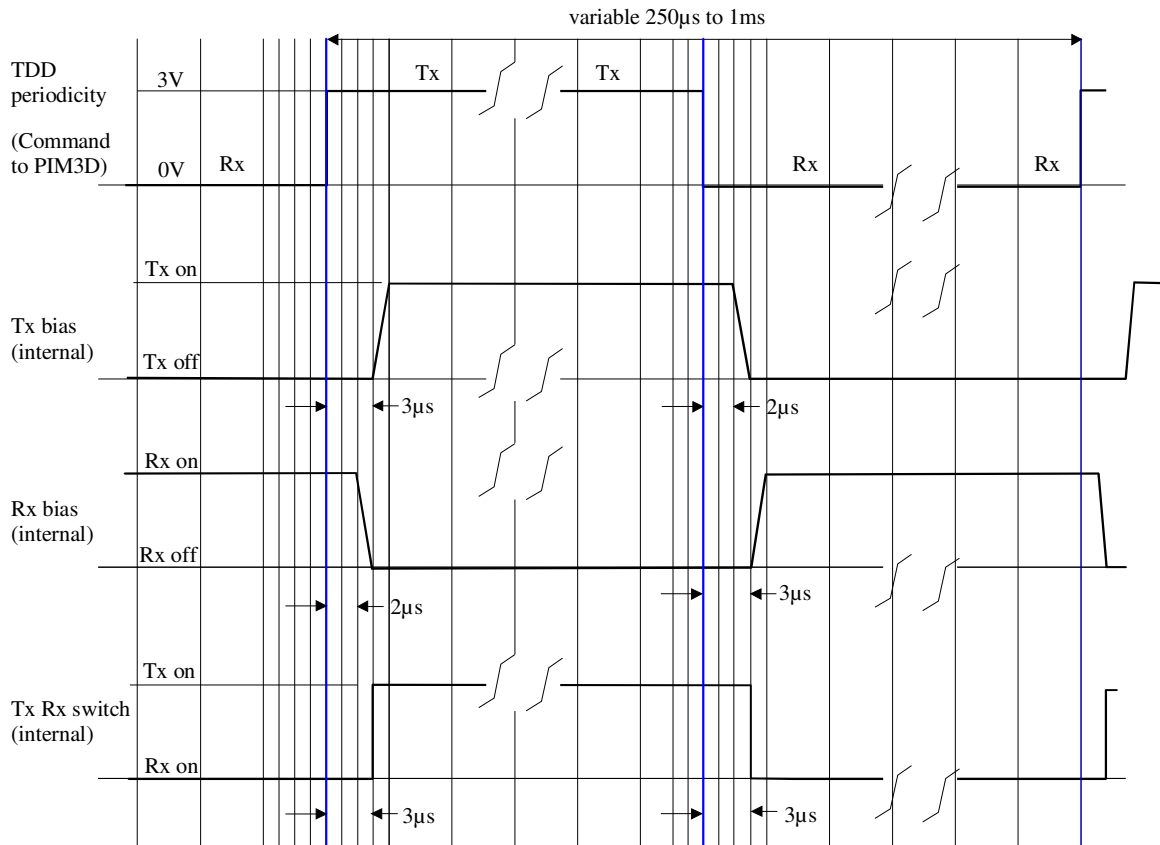
## Tx-Rx Switching characteristics : Supplies Tx=28V / Rx=5.5V; -20 °C to +75 °C (1,2)

Ref	parameter	conditions	note	min	typ	max	units
1	Tx-Rx Command signal	high		1.6			V
2	Tx-Rx Command signal	low		0		0.8	V
3	Tx-Rx Command signal transition time	Low to high and high to low				0.1	µs
<b>RX TURNS OFF / TX TURNS ON</b>							
4	Delay before Rx turns off		9			2	µs
5	Time to turn Rx off		9			1	µs
6	Delay before Tx turns on		9	3			µs
7	Time to turn Tx on		9			1	µs
<b>TX TURNS OFF / RX TURNS ON</b>							
8	Delay before Tx turns off		10			2	µs
9	Time to turn Tx off		10			1	µs
10	Delay before Rx turns on		10	3			µs
11	Time to turn Rx on		10			1	µs

8. after command signal rising edge
9. 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
2	Tx-Rx control			0		5	V
Transmit max ratings							
2	Supply voltage			0		32	V
3	Input peak power					+17	dBm
4	Input average power		10			+10	dBm
5	Output VSWR	At 5W output power		∞			-
Receive max ratings							
5	Supply voltage			5.5		8.0	V
6	Max input average power					+15	dBm

10. internal power limitation for Pout > 13Wav (power fold back)

Specifications and information are subject to change without notice

## Monitoring & Control

Ref	parameter	designation	conditions	Remarks
1	Temperature	TEMP	-40°C to +100°C	I <sup>2</sup> C bus
2	Reverse power	Rev detect	Rms 31mV/dB	1W reverse = 0.83V
3	Rx to Tx switching	Tx -Rx ctrl	3V ctrl	<3μs switching time
4	Tx to Rx switching	Tx -Rx ctrl	0V ctrl	<3μs switching time
5	Rx bypass switching	Byp	>2.5V = bypass	
6	Amplifier identity	Id		I <sup>2</sup> C bus

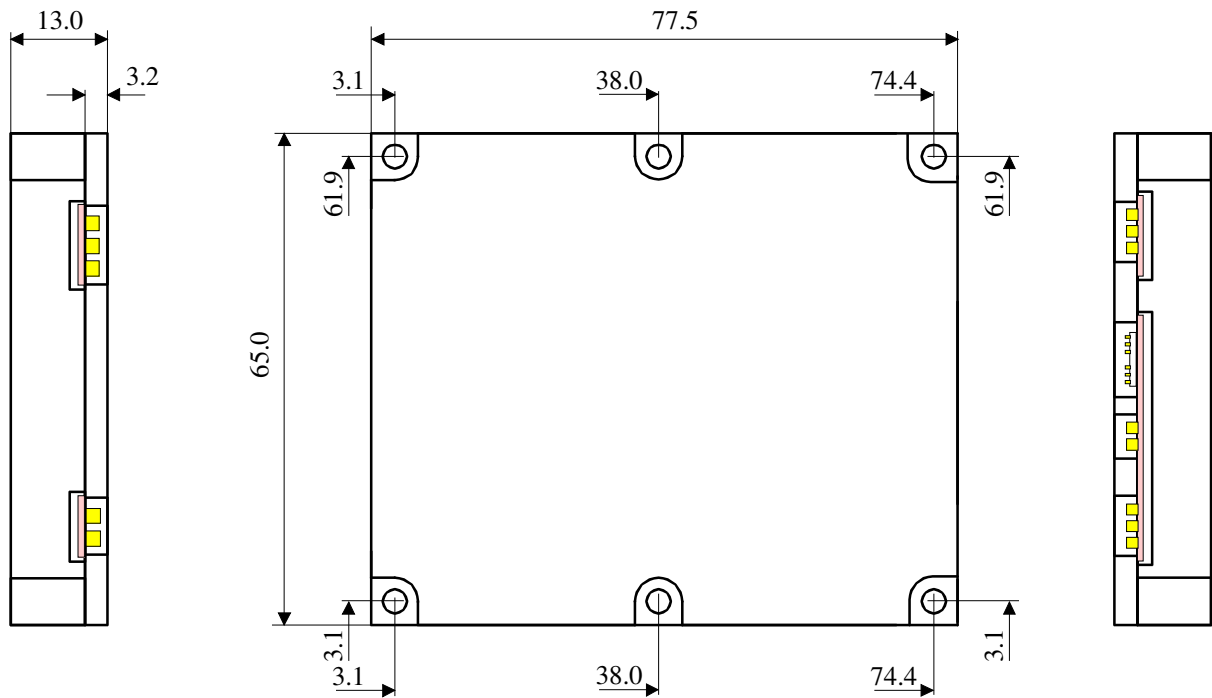
## PCB Connections

INPUT PCB (1.6mm +/- 0.2mm Multilayer)	OUTPUT PCB (0.8mm +/-0.1mm Double sided)
Bottom surface of module to input PCB surface :1.6+/- 0.2mm	Bottom surface of module to output PCB surface: 0.8 +/- 0.1mm
Landing pad 1 : RF Gnd (*)	Landing pad 15 : +28V in (***) (alternative to land pad 3)
Landing pad 2 : Tx input (*)	Landing pad 16 : RF Gnd (***)
Landing pad 3 : +28V in (*) (alternative to land pad 15)	Landing pad 17 : Tx output (***)
Landing pad 4 : SCL (**)	Landing pad 18 : Gnd (***)
Landing pad 5 : SDA (**)	Landing pad 19 : Gnd (***)
Landing pad 6: Gnd (**)	
Landing pad 7 : TxRx control (**)	
Landing pad 8 : Rev detect (**)	
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 S70-125161545R contact pads on output PCB ; 4A max per contact

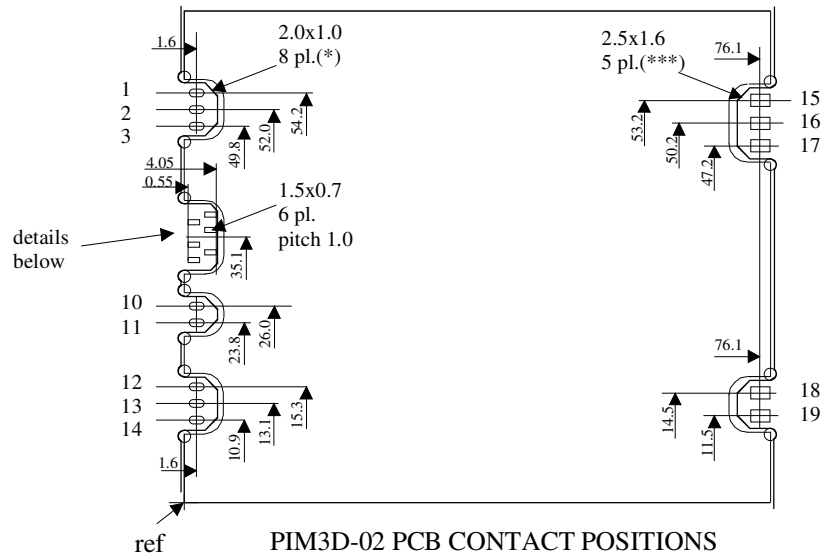
## Mechanical

Ref	Characteristic	Description	Remarks
1	Housing size	77.5mm 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	

PIM3D - TDD - PCB output package outline:



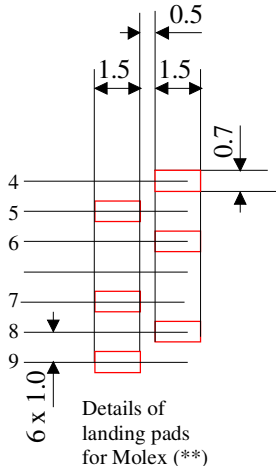
PIM3D landing pads on 1.6 (63mils) thick board at input and 0.8mm (32 mils) thick board at output.



(\*) Harwin S70-220101045R

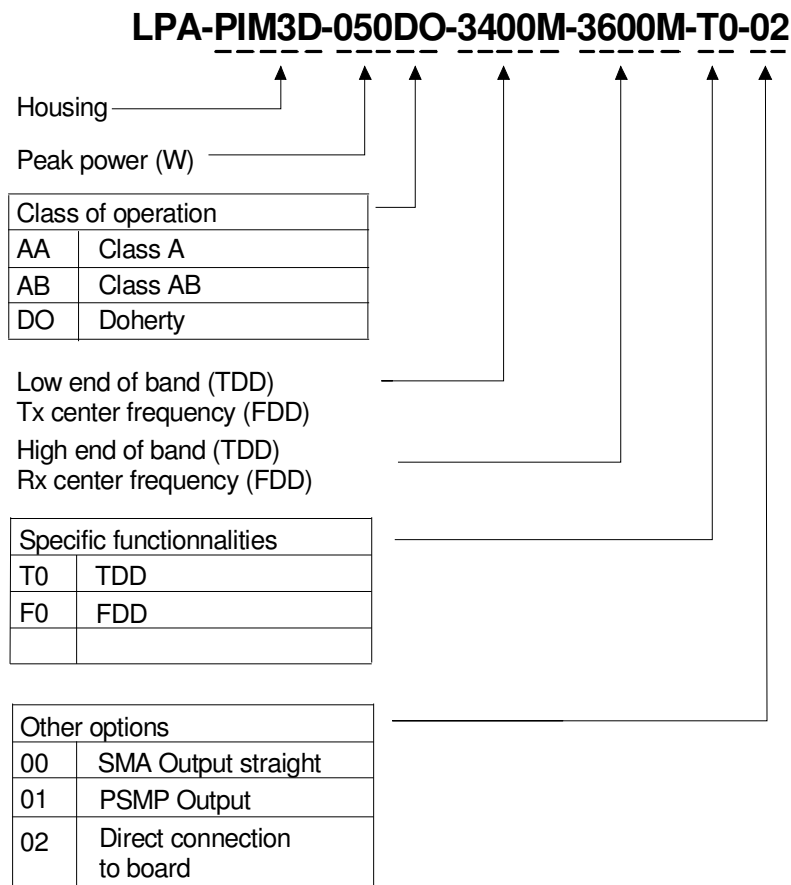
(\*\*\*) Harwin S70-125161545R

Molex 78732-6021 detail of landing pads:



Note : landing pads for 78732-6021 are gold plated

## Part numbering:



## Support documents:

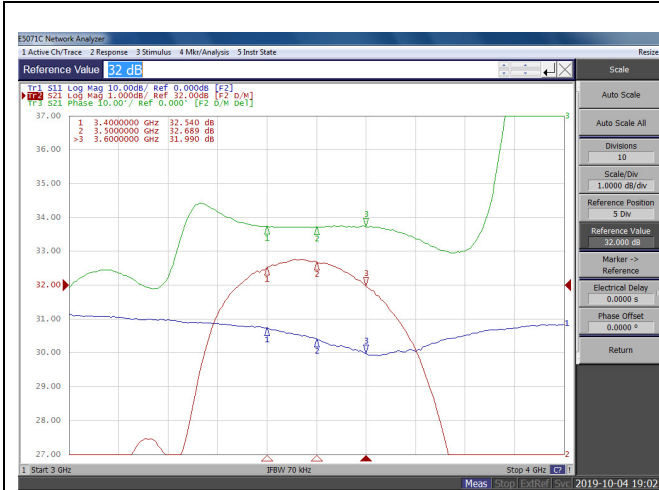
Ref	Document type	Document number	Title	Date
1	Application Note	APNT17001A	PIM3 Module product line	04/2018
2	Application Note	APNT18002B	Using PIM3D modules	12/2018

## Related products:

Ref	Part number	Description	Product code
1	TF-PIM3D-50W-TDD-PCB	Test fixture PIM3D TDD PCB output	T110
2	TF-PIM3D-INTERFACE01	interface for PIM3D with RS485 communication	T140
3	TF-PIM3D-50W-HS	Heatsink for T110 test fixture	T150



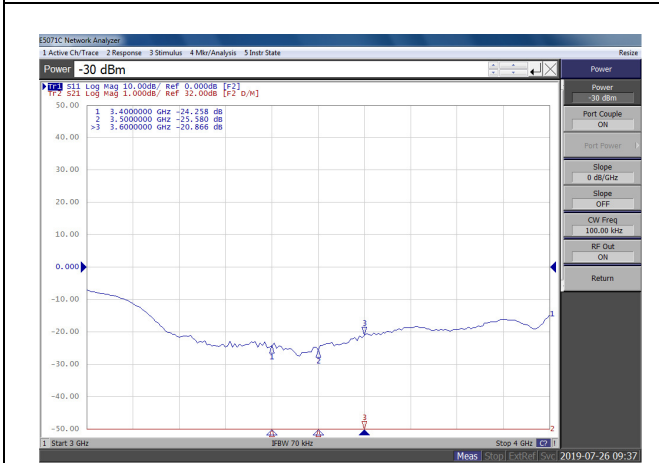
## TRANSMIT TYPICAL PERFORMANCE



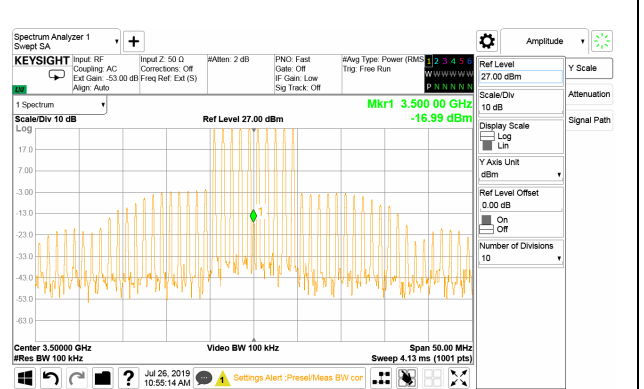
GAIN VS FREQUENCY TX MODE



OBSERVATION PATH RELATIVE TO TX OUTPUT



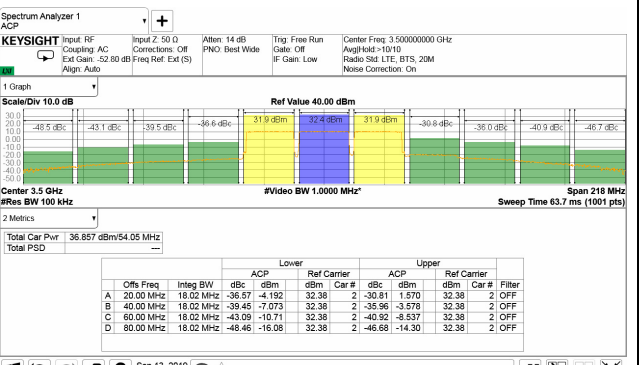
ANTENNA MATCH TX MODE



10 tones, 3500MHz,  $\Delta f=1$ MHz, 5Wave, 28V/0.83A

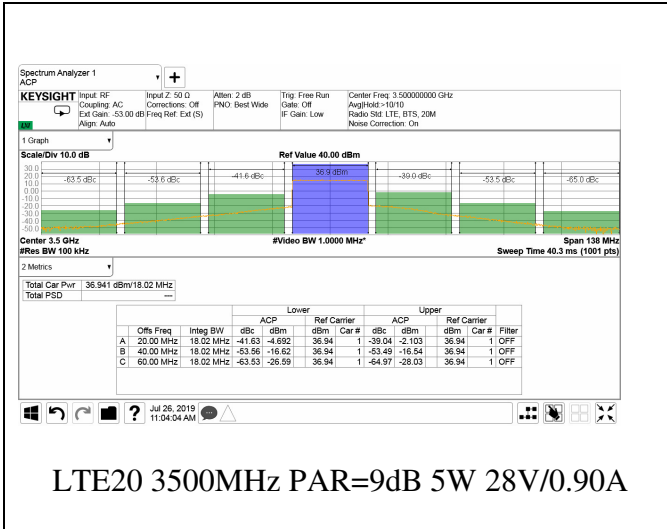


10 tones, 3500MHz, instant band = 76MHz, 5Wave, 28V/0.85A

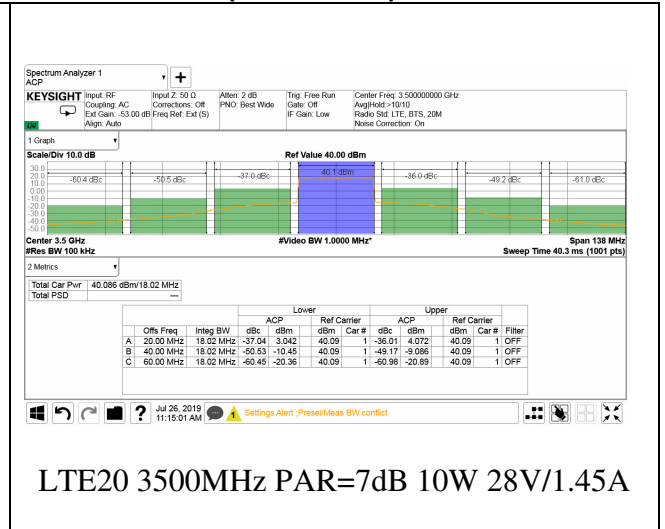


3xLTE20MHz, PAR=9dB, 3500MHz, instant band = 60MHz, 5Wave, 28V/0.88A

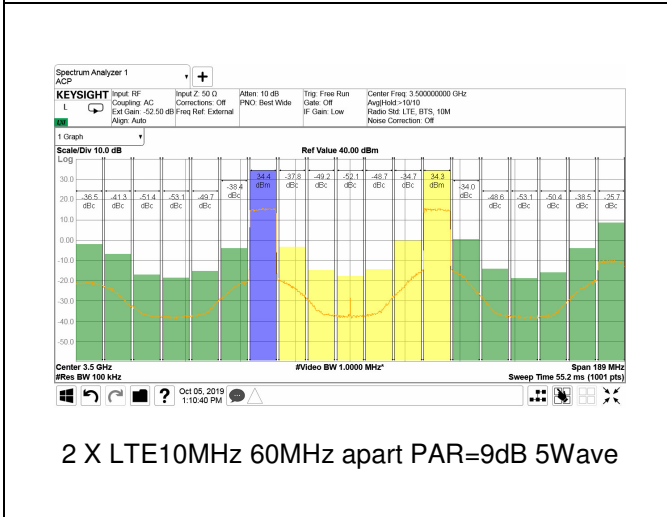
## TRANSMIT TYPICAL PERFORMANCE (continued)



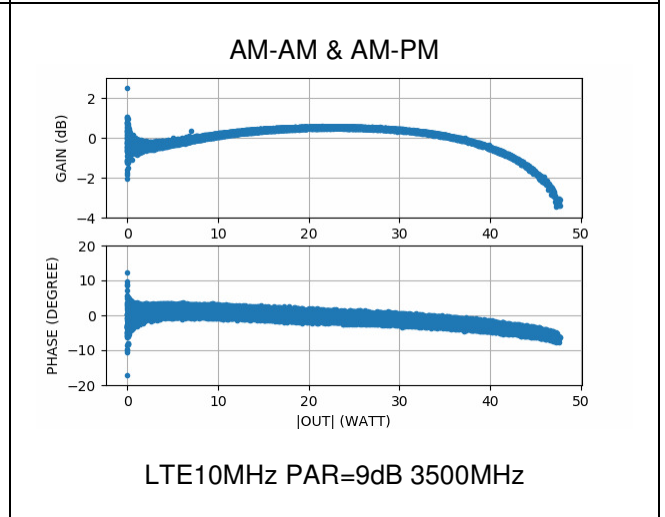
LTE20 3500MHz PAR=9dB 5W 28V/0.90A



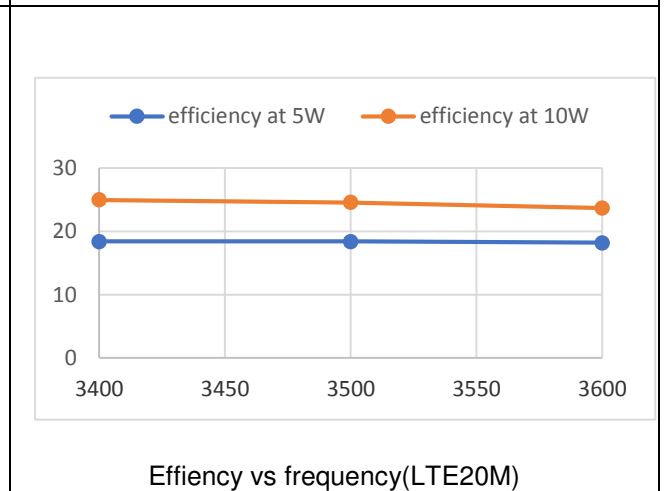
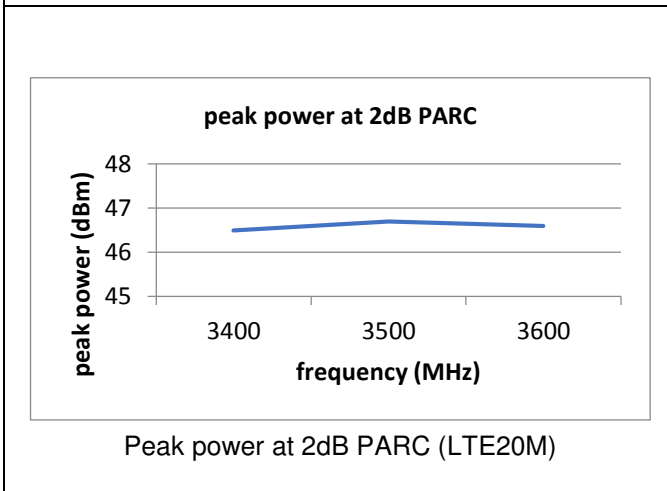
LTE20 3500MHz PAR=7dB 10W 28V/1.45A



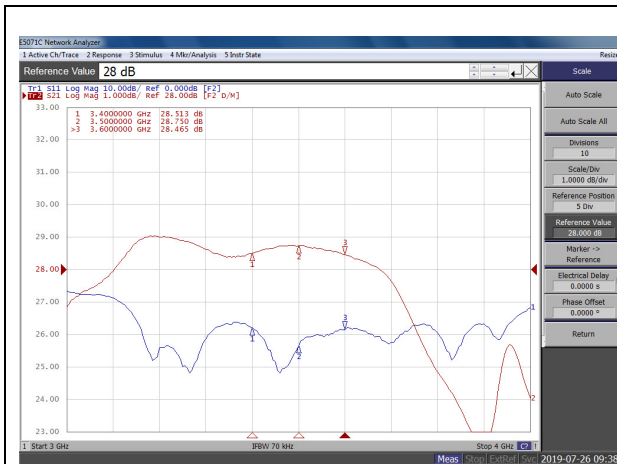
2 X LTE10MHz 60MHz apart PAR=9dB 5Wave



LTE10MHz PAR=9dB 3500MHz



## RECEIVE TYPICAL PERFORMANCE

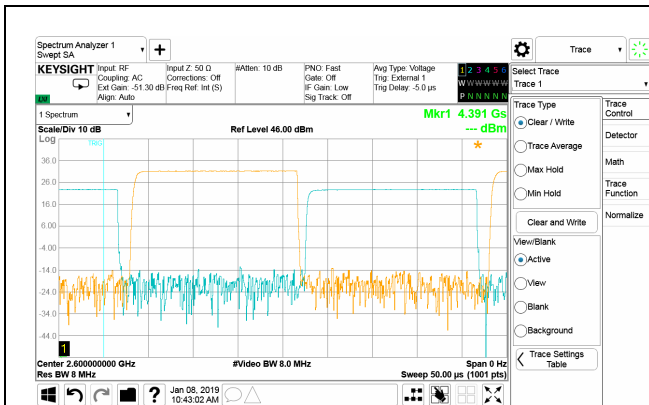


RX LINE UP FULL GAIN



GAIN RX LINE UP WITH BYPASS

## SWITCHING PERFORMANCE



Switching characteristics (Tx=yellow; Rx= blue)  
25kHz 0V-3V command signal (<0.1 $\mu$ s transitions)