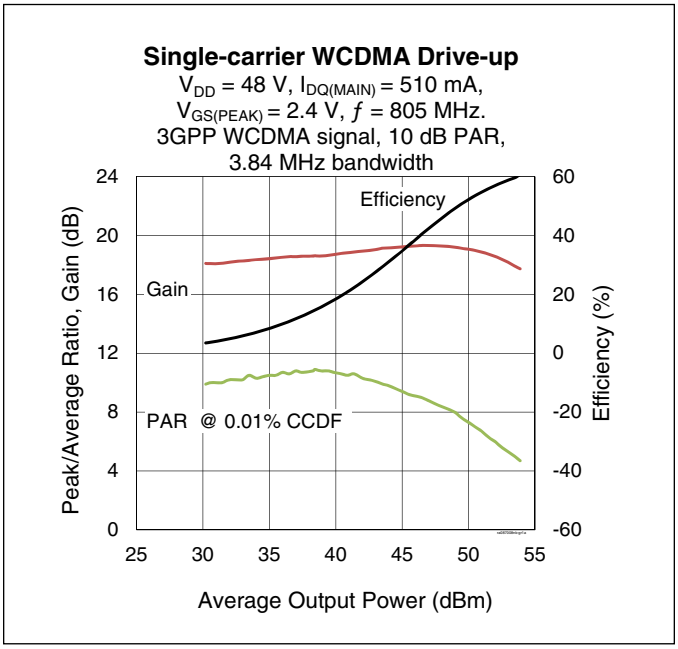
PTRA087008NB

Thermally-Enhanced High Power RF LDMOS FET
650 W, 48 V, 755 – 805 MHz

Package Types: PG-HB2SOF-6-1

Description

The PTRA087008NB is a 650-watt LDMOS FET. It is designed for use in multi-standard cellular power amplifier applications from 755 MHz to 805 MHz. Manufactured with an advanced LDMOS process, this device provides excellent thermal performance and superior reliability.



Features

- Broadband internal input and output matching
- Asymmetric design
  - Main: P_{1dB} = 245 W Typ
  - Peak: P_{1dB} = 380 W Typ
- Typical pulsed CW performance, 805 MHz, 48 V, Doherty configuration
  - Output power at P_{3dB} = 650 W
  - Efficiency = 52%
  - Gain = 19.5 dB
- Capable of handling 10:1 VSWR @48 V, 30 W (WCDMA) output power
- Human Body Model Class 2 (per ANSI/ESDA/JEDEC JS-001)
- Integrated ESD protection
- Low thermal resistance
- RoHS-compliant

RF Characteristics

Single-carrier WCDMA Specifications (tested in the Doherty test fixture)
V_{DD} = 48 V, I_{DQ} = 510 mA, P_{OUT} = 107 W avg, $V_{GS(PEAK)}$ = 2.4 V, f = 805 MHz, 3GPP, channel bandwidth = 3.84 MHz, peak/average = 10 dB @ 0.01% CCDF

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Gain	G_{ps}	17.5	18.5	—	dB
Drain Efficiency	η_D	48.5	52	—	%
Adjacent Channel Power Ratio	ACPR	—	–31	–28	dBc
Output PAR @ 0.01% CCDF	OPAR	6.7	-7.2	—	dB

Note:
All published data at T_{CASE} = 25°C unless otherwise indicated
ESD: Electrostatic discharge sensitive device—observe handling precautions!

RoHS compliant

DC Characteristics (each side)

Characteristic	Symbol	Min.	Typ.	Max.	Unit	Conditions
Drain-Source Breakdown Voltage	$V_{BR(DSS)}$	105	—	—	V	V_{GS} = 0 V, I_{DS} = 10 mA
Drain Leakage Current	I_{DSS}	—	—	1	µA	V_{DS} = 48 V, V_{GS} = 0 V
		—	—	10		V_{DS} = 105 V, V_{GS} = 0 V
Gate Leakage Current	I_{GSS}	—	—	1		V_{GS} = 10 V, V_{DS} = 0 V
On-State Resistance (main)	$R_{DS(on)}$	—	0.07	—	Ω	V_{GS} = 10 V, V_{DS} = 0.1 V
On-State Resistance (peak)		—	0.05	—		
Operating Gate Voltage (main)	V_{GS}	3	3.5	4	V	V_{DS} = 48 V, I_{DQ} = 0.2 A
Operating Gate Voltage (peak)		—	2.4	—		V_{DS} = 48 V, I_{DQ} = 0 A

Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source Voltage	V_{DSS}	105	V
Gate-source Voltage	V_{GS}	–6 to +12	
Operating Voltage	V_{DD}	0 to +55	
Junction Temperature	T_J	225	°C
Storage Temperature Range	T_{STG}	–65 to +150	

1. Operation above the maximum values listed here may cause permanent damage. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the component. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. For reliable continuous operation, the device should be operated within the operating voltage range (V_{DD}) specified above.
2. Parameters values can be affected by end application and product usage. Values may change over time.

Thermal Characteristics V_{DD} = 48 V, I_{DQ} = 500 mA, 780 MHz

Characteristics	Symbol	Value	Unit	Conditions
Thermal Resistance (Main)	$R_{\theta JC}$	0.70	°C/W	T_{CASE} = 70°C, P_{OUT} = 107 W CW

Moisture Sensitivity Level

Level	Test Signal	Package Temperature	Unit
3	IPC/JEDEC J-STD-020	260	°C

Ordering Information

Type and Version	Order Code	Package and Description	Shipping
PTRA087008NB V1 R2	PTRA087008NB-V1-R2	PG-HB2SOF-6-1, overmold	Tape & Reel, 250 pcs

Typical Performance (data taken in a production test fixture)

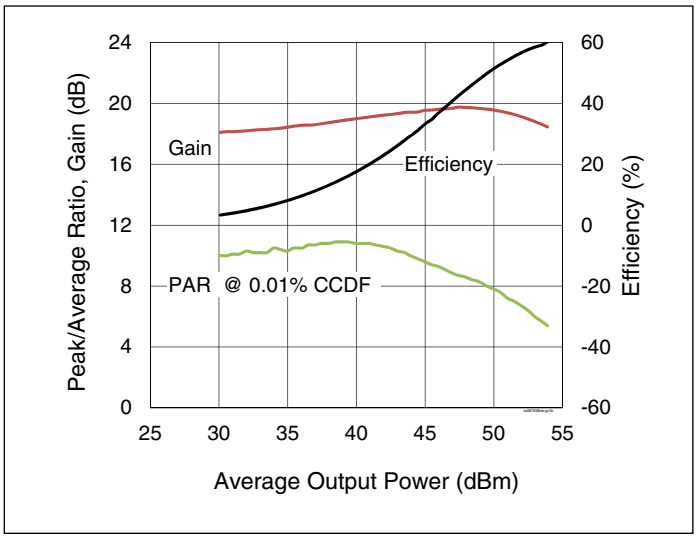


Figure 1. Single-carrier WCDMA Drive-up

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 510 mA,
$V_{GS(PEAK)}$ = 2.4 V, f = 780 MHz.
3GPP WCDMA signal, 10 dB PAR,
3.84 MHz bandwidth

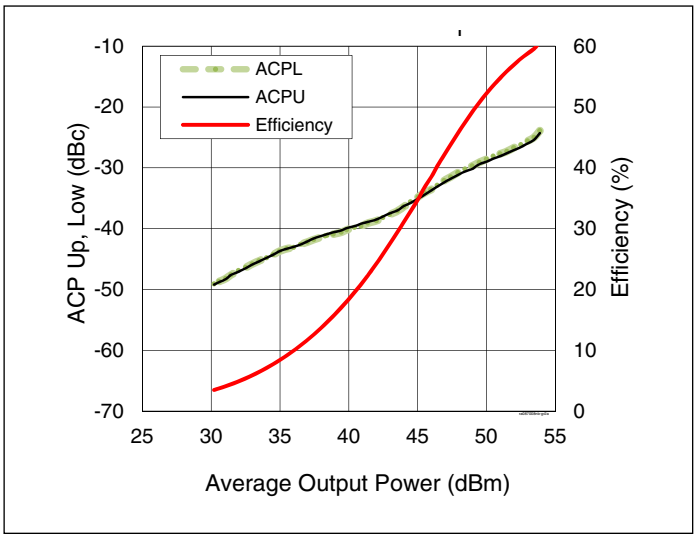


Figure 2. Single-carrier WCDMA Drive-up

V_{DD} = 50 V, $I_{DQ(MAIN)}$ = 510 mA,
$V_{GS(PEAK)}$ = 2.4 V, f = 805 MHz,
3GPP WCDMA signal, 10 dB PAR,
3.84 MHz bandwidth

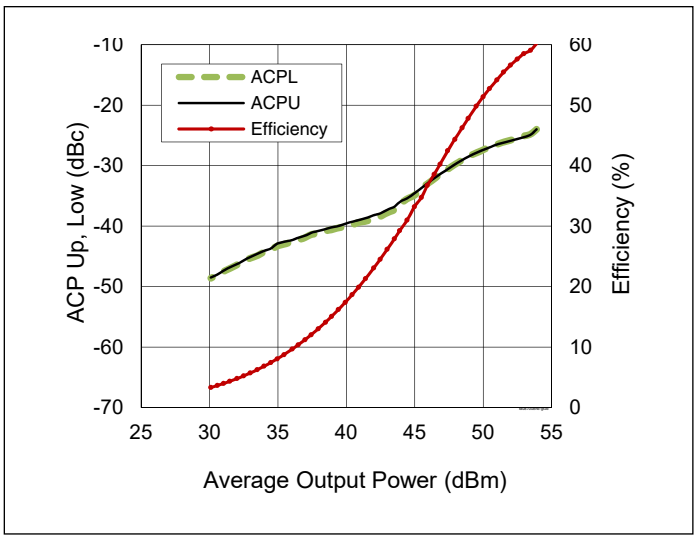


Figure 3. Single-carrier WCDMA Drive-up

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 510 mA,
$V_{GS(PEAK)}$ = 2.4 V, f = 780 MHz,
3GPP WCDMA signal, 10 dB PAR,
3.84 MHz bandwidth

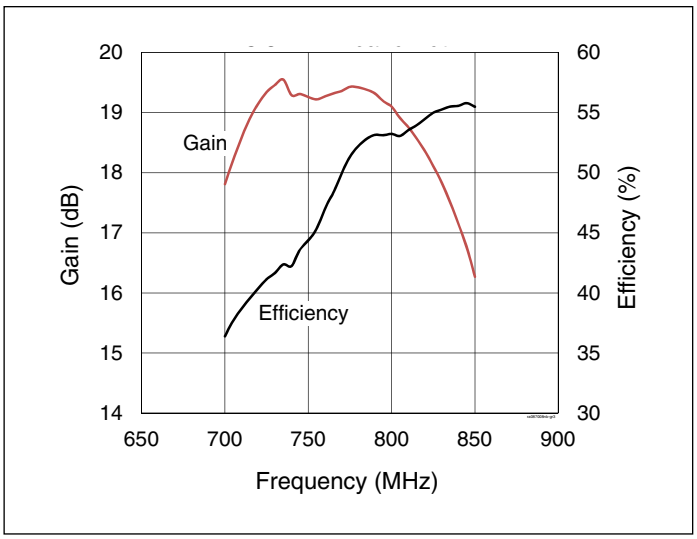


Figure 4. Single-carrier WCDMA Broadband

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 510 mA,
$V_{GS(PEAK)}$ = 2.4 V, P_{OUT} = 50.3 dBm,
3GPP WCDMA signal, 10 dB PAR,
3.84 MHz bandwidth

Typical Performance (cont.)

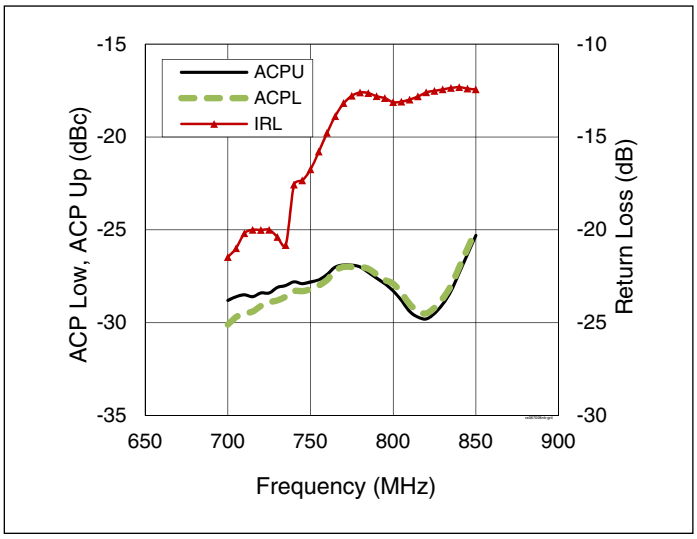


Figure 5. Single-carrier WCDMA Broadband

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 510 mA,
$V_{GS(PEAK)}$ = 2.4 V, P_{OUT} = 50.3 dBm,
3GPP WCDMA signal, 10 dB PAR,
3.84 MHz bandwidth

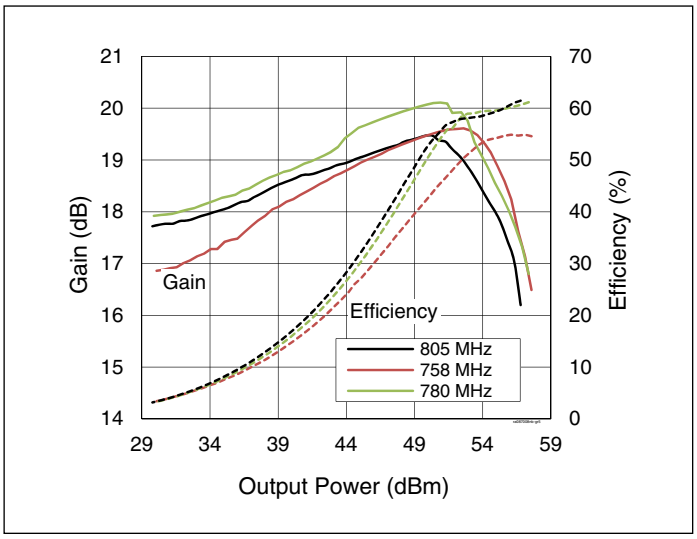


Figure 6. CW Performance

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 510 mA,
$V_{GS(PEAK)}$ = 2.4 V

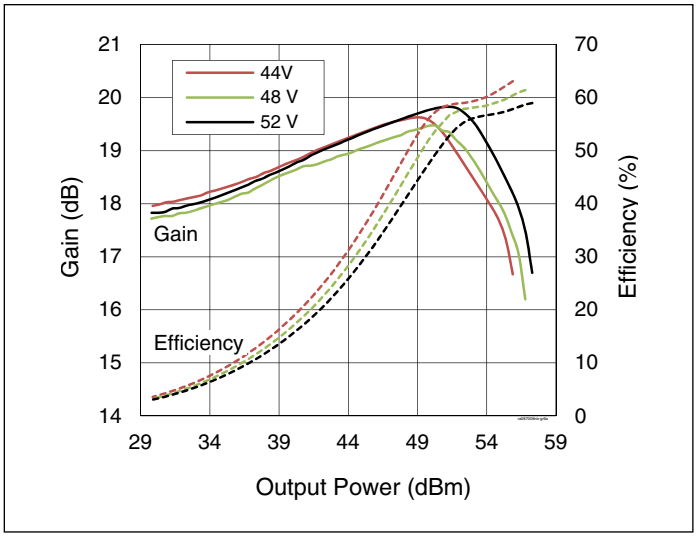


Figure 7. CW Performance at various V_{DD}

$I_{DQ(MAIN)}$ = 510 mA, $V_{GS(PEAK)}$ = 2.4 V,
f = 805 MHz

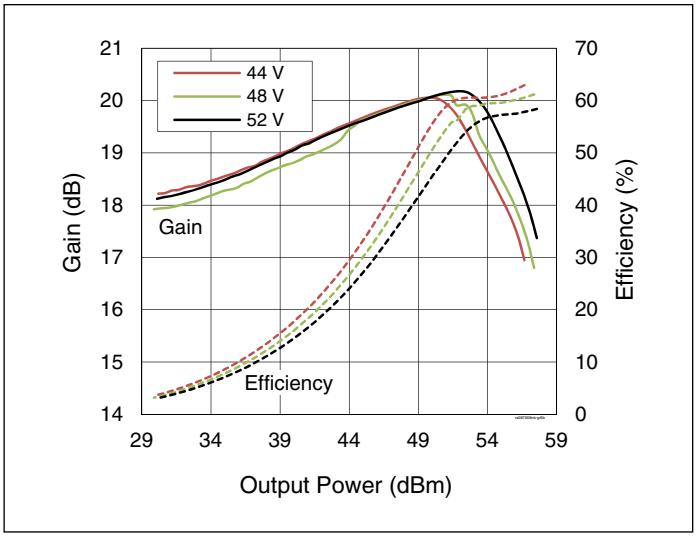


Figure 8. CW Performance at various V_{DD}

$I_{DQ(MAIN)}$ = 510 mA, $V_{GS(PEAK)}$ = 2.4 V,
f = 780 MHz

Typical Performance (cont.)

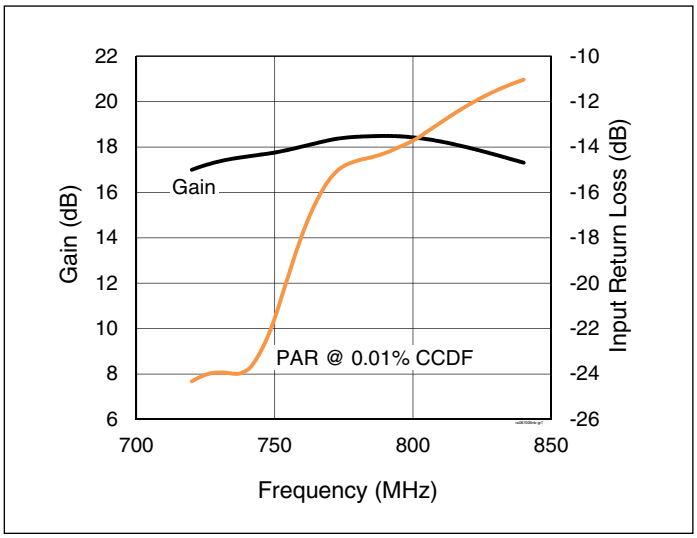


Figure 9. CW Performance Small Signal

V_{DD} = 48 V, $I_{DQ(MAIN)}$ = 510 mA,
$V_{GS(PEAK)}$ = 2.4 V

See Load Pull Performance, next page

Load Pull Performance

Main Side – Pulsed CW signal: 10 µsec, 10% duty cycle, V_{DD} = 48 V, I_{DQ} = 510 mA, class AB

		P_{1dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	ηD [%]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	ηD [%]
760	0.6 – j1.9	1.3 – j0.5	21.41	54.81	303	59.5	2.7 + j1.1	23.40	52.50	178	71.7
780	0.6 – j2.0	1.3 – j0.5	21.45	54.73	297	59.0	2.5 + j2.0	23.55	52.42	175	71.4
805	0.6 – j2.3	1.2 – j0.3	21.39	54.66	292	58.5	2.3 + j1.2	23.58	52.50	178	71.1

		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	ηD [%]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	ηD [%]
760	0.6 – j1.9	1.4 – j0.6	19.53	55.56	360	62.9	2.3 + j0.6	21.02	53.91	246	72.5
780	0.6 – j2.0	1.3 – j0.6	19.52	55.49	354	61.7	2.3 + j0.6	21.24	53.92	247	72.3
805	0.6 – j2.3	1.3 – j0.6	19.62	55.44	350	61.7	2.0 + j0.5	21.13	54.15	260	71.0

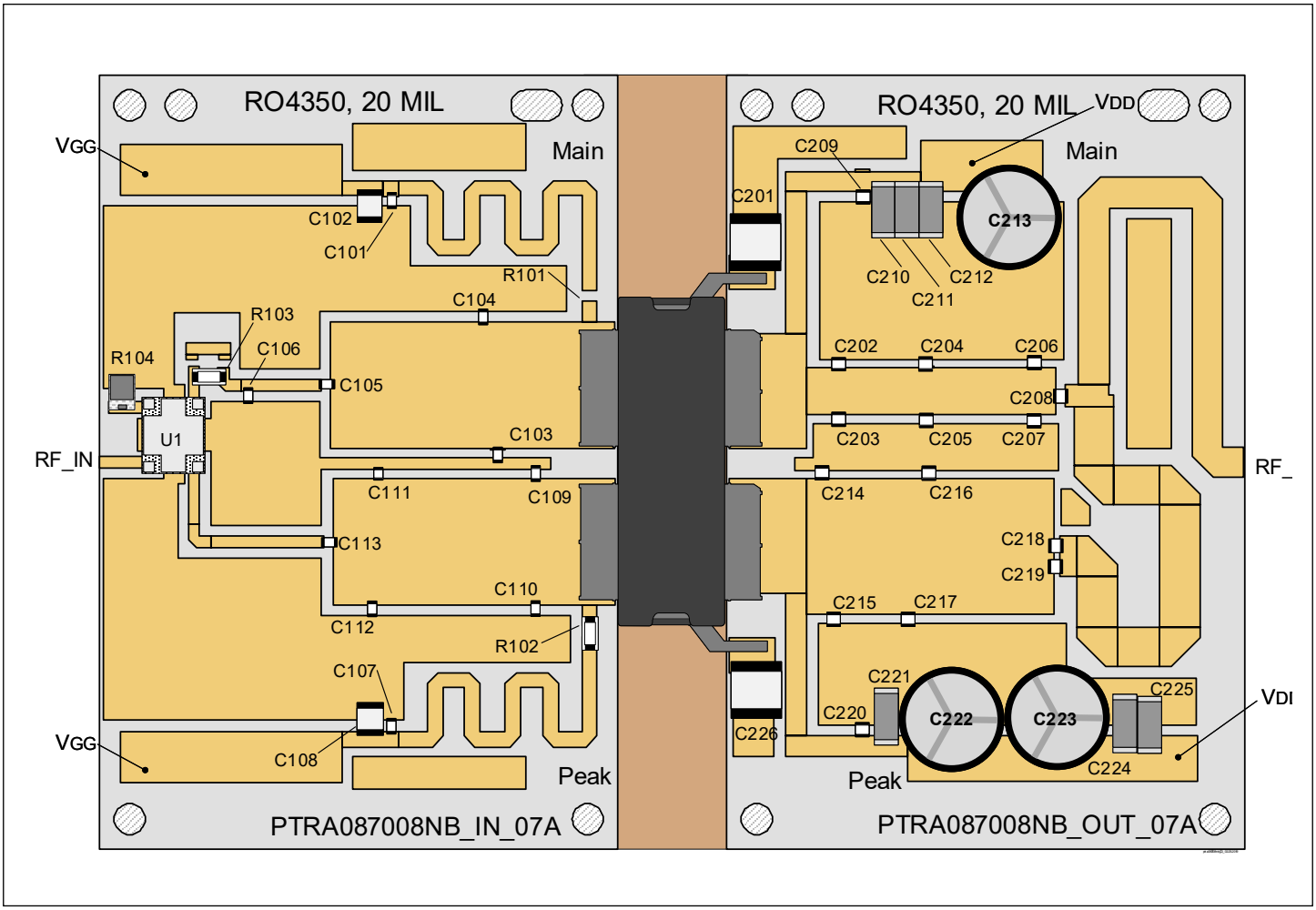
Peak Side – Pulsed CW signal: 10 µsec, 10% duty cycle, V_{DD} = 48 V, $V_{GS(PEAK)}$ = 2.4 V, class B

		P_{1dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	ηD [%]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	ηD [%]
760	0.3 – j2.1	0.7 – j0.6	19.78	56.85	484	60.1	1.2 + j0.4	21.46	54.72	296	73.2
780	0.5 – j2.3	0.8 – j0.4	20.13	56.75	473	61.0	1.3 + j0.6	21.40	54.56	286	73.0
805	0.7 – j2.8	0.8 – j0.3	19.91	56.65	462	61.1	1.4 + j0.8	21.40	54.12	258	72.2

		P_{3dB}									
		Max Output Power					Max Drain Efficiency				
Freq [MHz]	Zs [Ω]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	ηD [%]	Zl [Ω]	Gain [dB]	P_{OUT} [dBm]	P_{OUT} [W]	ηD [%]
760	0.3 – j2.1	0.8 – j0.7	17.86	57.63	579	62.8	1.2 + j0.2	19.35	55.84	384	74.3
780	0.5 – j2.3	0.8 – j0.5	18.16	57.45	556	62.4	1.3 + j0.4	19.39	55.49	354	73.3
805	0.7 – j2.8	0.8 – j0.3	17.90	57.34	542	62.4	1.1 + j0.5	19.13	55.50	355	72.7

Evaluation Board, 755 to 805 MHz

Evaluation Board Part Number	LTA/PTRA087008NB-V1
PCB Information	Rogers 4360, 0.508 mm [0.020”] thick, 2 oz. copper, ε_r = 3.66

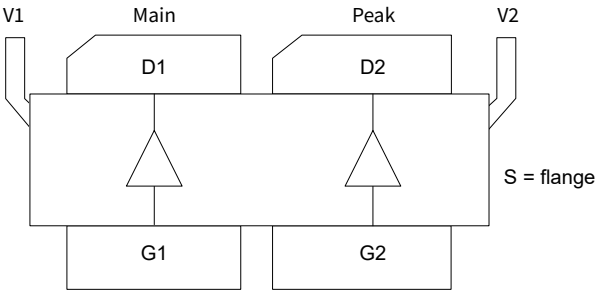


Reference circuit assembly diagram (not to scale)

Components Information

Component	Description	Manufacturer	P/N
Input			
C101, C105,C107, C113	Capacitor, 43 pF	ATC	ATC600F430JW250T
C102, C108	Capacitor, 10 µF	Taiyo Yuden	UMK325C7106MM-T
C103	Capacitor, 6.8 pF	ATC	ATC600F6R8JW250T
C104	Capacitor, 7.5 pF	ATC	ATC600F7R5JW250T
C106	Capacitor, 3.0 pF	ATC	ATC600F3R0CT250T
C109, C111, C112	Capacitor, 2.0 pF	ATC	ATC600F2R0CW250T
C110	Capacitor, 9.1 pF	ATC	ATC600F9R1JW250T
R101, R102	Resistor, 6.2 ohms	Panasonic	P6.2ECT-ND
R103	Resistor, 5.1 ohms	Panasonic	P5.1ETR-ND
R104	Resistor, 50 ohms	Anaren	C8A50Z4A
U1	Hybrid coupler	Anaren	X3C09P1-03S
Output			
C201, C210, C211, C212, C221, C224, C225, C226	Capacitor, 10 µF, 100 V	TDK Corporation	C5750X7S2A106M230KB
C202	Capacitor, 9.1 pF	ATC	ATC600F9R1JW250T
C203	Capacitor, 8.2 pF	ATC	ATC600F8R2JW250T
C204	Capacitor, 3.0 pF	ATC	ATC600F3R0CW250T
C205	Capacitor, 2.2 pF	ATC	ATC600F2R2CW250T
C206, C207	Capacitor, 0.6 pF	ATC	ATC600F0R6CW250T
C208, C214, C215	Capacitor, 10 pF	ATC	ATC600F100JW250T
C209, C218, C219, C220	Capacitor, 43 pF	ATC	ATC600F430JW250T
C213, C222, C223	Capacitor, 100 µF, 63 V	Panasonic	EEE-FK1J101P
C216, C217	Capacitor, 6.2 pF	ATC	ATC600F6R2JW250T

Pinout Diagram (top view)



Pin	Description
D1	Drain device 1 (Main)
D2	Drain device 2 (Peak)
G1	Gate device 1 (Main)
G2	Gate device 2 (Peak)
S	Source (flange)
V1, V2	Drain video decoupling, no DC Bias

Lead connections for PTRA087008NB

Package Outline Specifications – Package PG-HB2SOF-6-1 (top and side views)

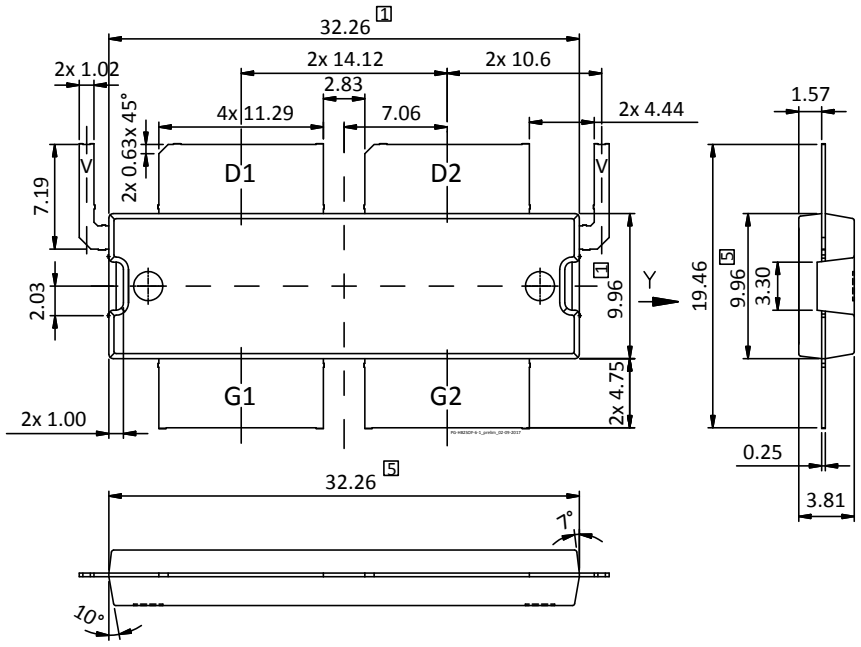
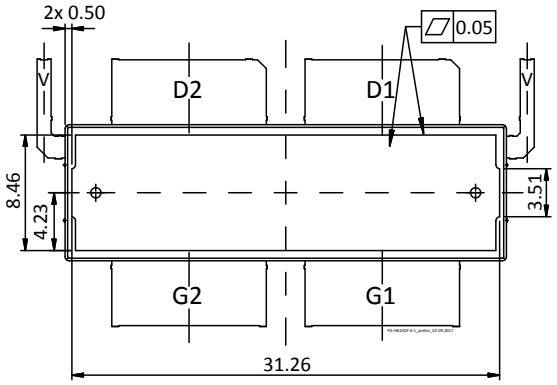


Diagram Notes—unless otherwise specified:

1. Mold/dam bar/metal protrusion of 0.30 mm max per side not included.
2. Fillets and radii: all radii are 0.3 mm max.
3. Interpret dimensions and tolerances per ISO 8015.
4. Dimensions are mm.
5. Does not include mold/dam bar and metal protrusion.
6. All tolerances ± 0.1 mm unless specified otherwise.
7. All metal surfaces tin pre-plated, except area of cut.
8. Lead thickness: 0.25 mm.
9. Pins: D1, D2 – drain; G1, G2 – gate; S – source;
   V – drain video decoupling, no DC bias

Package Outline Specifications (cont.) **– Package PG-HB2SOF-6-1** (bottom view)



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