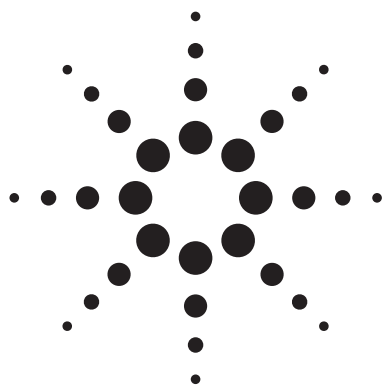




Agilent ACPM-7891

Tri-Band Power Amplifier Module

EGSM, DCS and PCS Multi-slot GPRS

Data Sheet

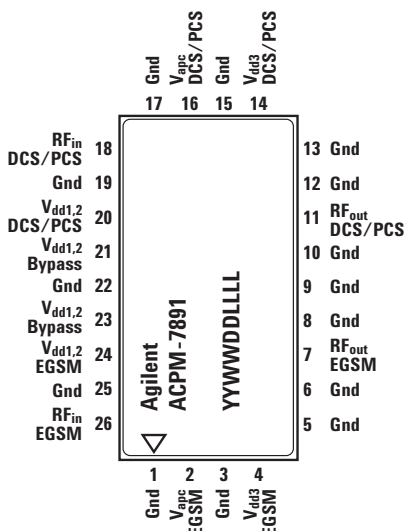
Description

The ACPM-7891 is a fully matched tri-band EGSM/DCS/PCS power amplifier module designed on Agilent Technologies' leading edge Enhancement Mode PHEMT (E-pHEMT) process.

The ACPM-7891 has the highest Power-added Efficiency (PAE) for all three bands of operation in the industry, enabling customers to design handset, PDA and data card with up to 15% longer transmit or talk time.

The Agilent ACPM-7891 provides a cost effective dual or tri-band GSM PA solution with the additional benefit of excellent efficiency enabling multi-slot GPRS operation and extended transmit time. The device is internally matched to 50Ω and therefore an effective design can be implemented quickly with a few additional capacitors for d.c. blocking of the output ports and bypassing of the supply pins.

Pin Connections and Package Marking



Notes:

Package marking provides orientation and identification.

"YYWWDDLLLL" = Year, Week, Day and Lot Code indicates the year, week, day and lot of manufacture.

Features

- Highest Power Added Efficiency in the industry
- Performance guaranteed for GPRS Class 10 (2-Slot) transmit operation
- Broadband DCS/PCS match for flat P_{out} and PAE
- Low harmonics
- Single 3.5 Volt supply (nominal)
- 50 Ohms input & output impedance
- Small SMT package 6 x 12 x 1.4 mm

Specifications

- 60% PAE at +35 dBm P_{out} for ESGM
- 56% PAE at +32.5 dBm P_{out} for DCS 1800
- 56% PAE at +32.5 dBm P_{out} for PCS 1900

Applications

- Cellular handsets
- Data modules for PDA
- Data cards for laptops



Agilent Technologies

Absolute Maximum Ratings

Symbol	Parameter	Units	Absolute Maximum
V_{dd}	Supply Voltage	V	6
$P_{in\ max}$	Input Power	dBm	+10
V_{apc}	Gain Control Voltage	V	4
I_{DS}	Operating Case Temperature	°C	-30 to 90
T_{STG}	Storage Temperature	°C	-40 to 125

Common Electrical Characteristics

Test conditions $V_{dd} = +3.5V$, a pulse width of 1154 μs and a duty cycle of 25% at a case temperature of +25°C unless otherwise stated.

Parameter	Test Conditions	Symbol	Min	Typ	Max	Units
Supply Voltage		V_{dd}	2.7	3.5	5.3	V
Leakage Current	$V_{apc} = 0.06V$	I_{dd}		20		μA
Control Voltage Range		V_{apc}	0		$V_{dd} - 0.3$	V
Control Current		I_{apc}			3	mA
Nominal Input Impedance		Z_{in}		50		Ω
Nominal Output Impedance		Z_{out}		50		Ω
Rise And Fall Time	T_r to ($P_{out1} - 0.5\ dB$) V_{apc} set to achieve P_{out1}	t_r, t_f		1	2	μs

EGSM Electrical Characteristics

Test conditions V_{dd}= +3.5V, a pulse width of 1154 μ s and a duty cycle of 25% at a case temperature of +25°C unless otherwise stated.

Parameter	Test Conditions	Symbol	Min	Typ	Max	Units
Frequency Range		F _o	880	900	915	MHz
Output Power Nominal Conditions	P _{in} = +2 dBm V _{apc} = 2.2V	P _{out1}	34.5	35		dBm
Efficiency	P _{out} =P _{out1}	PAE	55	60		%
Output Power in off mode	V _{apc} = 0.2V, P _{in} = 4 dBm			-40	-36	dBm
Input Power		P _{in}	0	2	4	dBm
Input VSWR	P _{in} = 0 dBm			1.5	2.5	
Stability	V _{dd} = 3.0 to 5.3V, P _{in} = 0 – 4 dBm, P _{out} ≤ 34.5 dBm, V _{apc} ≤ 2.2V, VSWR ≤ 8:1, all phases		No parasitic oscillation > -36 dBm			
Load mismatch robustness	V _{dd} = 3.0 to 5.3V, P _{in} = 0 – 4 dBm, P _{out} ≤ 34.5 dBm, V _{apc} ≤ 2.2V, VSWR ≤ 10:1, all phases t = 20 sec		No module damage or permanent degradation			
Second Harmonic	V _{dd} = 3.5V P _{in} = 0 dBm P _{out} = 34.5 dBm V _{apc} = controlled for P _{out}	2F _o			-5	dBm
Third Harmonic	V _{dd} = 3.5V P _{in} = 0 dBm P _{out} = 34.5 dBm V _{apc} = controlled for P _{out}	3F _o			-5	dBm
Fourth to Eighth Harmonics	V _{dd} = 3.5V P _{in} = 0 dBm P _{out} = 34.5 dBm V _{apc} = controlled for P _{out}	4F _o -8F _o			-10	dBm
Noise Power	F=925 to 935 MHz, P _{out} ≤ 34.0 dBm, P _{in} = 0 dBm RBW = 100 kHz	P _n			-72	dBm
	F = 925 to 960 MHz, P _{out} ≤ 34.0 dBm, P _{in} = 0 dBm RBW = 100 kHz	P _n			-82	dBm
Band to Band Isolation	Measured at DCS freq EGSM signal: V _{dd} = 3.5V P _{in} = +2 dBm P _{out} = 34.5 dBm (fixed)				-25	dBm
Control Slope (Peak)	P _{out} = -5 dBm to P _{out}			400		dB/V
AM-AM	P _{in} = 0 – 4 dBm P _{out} = 6 dBm to P _{out}			5		dB/dB
AM-PM	P _{in} = 0 – 4 dBm P _{out} = 6 dBm to P _{out}			6		deg/dB

DCS & PCS Electrical Characteristics

Test conditions V_{dd}= +3.5V, a pulse width of 1154 μ s and a duty cycle of 25% at a case temperature of +25°C unless otherwise stated.

Parameter	Test Conditions	Symbol	Min	Typ	Max	Units
Frequency Range	DCS PCS	F _o	1710 1850	1750 1880	1785 1910	MHz
Output Power Nominal Conditions	P _{in} = 2 dBm V _{apc} = 2.2V	P _{out1}	32.0	32.5		dBm
Efficiency	P _{out} = P _{out1}	DCS PAE PCS PAE	50 50	56 56		%
Output Power in off mode	V _{apc} = 0.2V, P _{in} = 4 dBm			-40	-36	dBm
Input Power		P _{in}	0	2	4	dBm
Input VSWR	P _{in} = 0 dBm			1.5	2.5	
Stability	V _{dd} = 3.0 to 5.3V, P _{in} = 0–4 dBm, P _{out} ≤ 32 dBm, V _{apc} ≤ 2.2V, VSWR ≤ 8:1, all phases		No parasitic oscillation > -36 dBm			
Load mismatch robustness	V _{dd} = 5.3V, P _{in} = 0–4 dBm, P _{out} ≤ 32 dBm, V _{apc} ≤ 2.2V, VSWR ≤ 10:1, all phases t = 20 sec		No module damage or permanent degradation			
Second Harmonic	V _{dd} = 3.5V P _{in} = 0 dBm P _{out} = 32 dBm V _{apc} = controlled for P _{out}	2F _o			-5	dBm
Third Harmonic	V _{dd} = 3.5V P _{in} = 0 dBm P _{out} = 32 dBm V _{apc} = controlled for P _{out}	3F _o			-5	dBm
Fourth to Eighth Harmonics	V _{dd} = 3.5V P _{in} = 0 dBm P _{out} = 32 dBm V _{apc} = controlled for P _{out}	4F _o – 8F _o			-10	dBm
Noise Power	F = 1805 to 1880 MHz, F = 1930 to 1990 MHz, P _{out} ≤ 31.5 dBm, P _{in} = 0 dBm RBW = 100 kHz	P _n			-77	dBm
Control Slope (Peak)	P _{out} = -5 dBm to P _{out1}			350		dB/V
AM-AM	P _{in} = 0–4 dBm P _{out} = 6 dBm to P _{out1}			5		dB/dB
AM-PM	P _{in} = 0–4 dBm P _{out} = 6 dBm to P _{out1}			6		deg/dB

GPRS Electrical Characteristics

Test conditions Vdd= +3.5V, a pulse width of 1154 μ s and a duty cycle of 25% at a case temperature of +25°C unless otherwise stated.

P_{sat}: Pin = 0 dBm; V_{apc} = 2.2V

	P_{out} (dBm) 880 MHz	900 MHz	915 MHz	PAE (%) 880 MHz	900 MHz	915 MHz
Class 8 (1-slot)	35.18	35.40	35.40	60.23	60.47	59.55
Class 10 (2-slot)	35.15	35.45	35.43	60.07	61.02	59.77
Class 12 (4-slot)	35.16	35.32	35.36	60.09	59.62	59.35

P_{sat}: Pin = 0 dBm; V_{apc} = 2.2V

	P_{out} (dBm) 1710 MHz	1750 MHz	1785 MHz	PAE (%) 1710 MHz	1750 MHz	1785 MHz
Class 8 (1-slot)	33.00	33.08	33.12	59.00	59.19	59.62
Class 10 (2-slot)	33.00	33.08	33.10	59.35	59.42	59.40
Class 12 (4-slot)	33.00	33.08	33.10	59.35	59.42	59.40

P_{sat}: Pin = 0 dBm; V_{apc} = 2.2V

	P_{out} (dBm) 1850 MHz	1880 MHz	1910 MHz	PAE (%) 1850 MHz	1880 MHz	1910 MHz
Class 8 (1-slot)	33.10	33.10	33.02	59.14	58.93	58.66
Class 10 (2-slot)	33.10	33.10	33.02	59.14	58.93	58.66
Class 12 (4-slot)	33.10	33.04	32.96	58.75	58.50	58.25

Typical Performance

Test conditions: $V_{dd} = +3.5V$, case temperature of $+25^{\circ}C$, and $Z_0=50$ ohms unless otherwise stated.

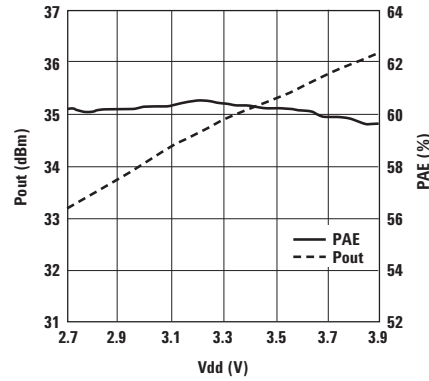


Figure 1. PAE and Pout vs Vdd (EGSM Band, $P_{in} = 2$ dBm, $V_{apc} = 2.2V$).

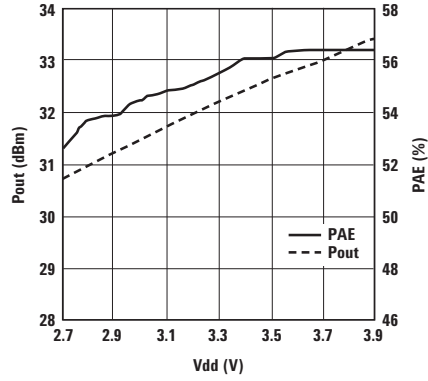


Figure 2. PAE and Pout vs Vdd (DCS 1750 MHz, $P_{in} = 2$ dBm, $V_{apc} = 2.2V$).

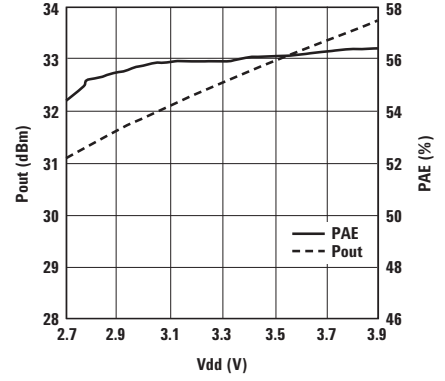


Figure 3. PAE and Pout vs Vdd (PCS 1880 MHz, $P_{in} = 2$ dBm, $V_{apc} = 2.2V$).

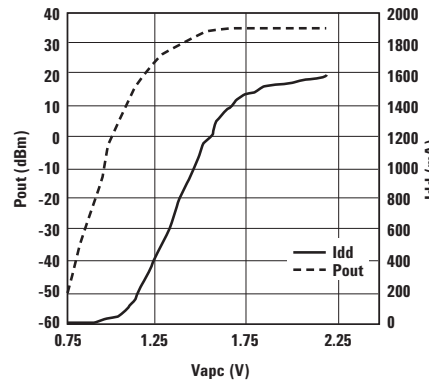


Figure 4. Pout and Idd vs Vapc (EGSM Band, $P_{in} = 0$ dBm, $V_{dd} = 3.5V$).

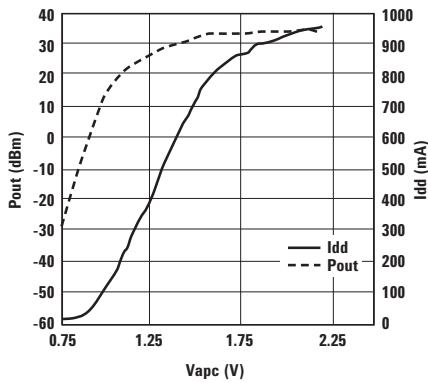


Figure 5. Pout and Idd vs Vapc (DCS 1750 MHz, $P_{in} = 0$ dBm, $V_{dd} = 3.5V$).

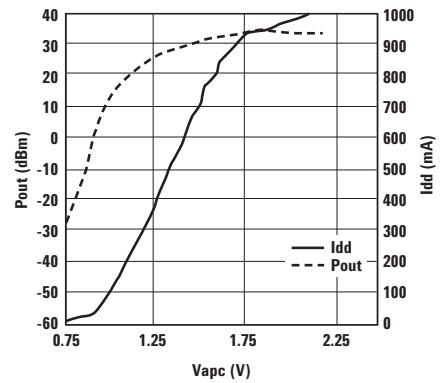


Figure 6. Pout and Idd vs Vapc (PCS 1880 MHz, $P_{in} = 0$ dBm, $V_{dd} = 3.5V$).

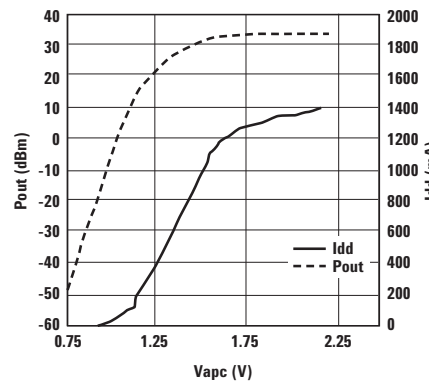


Figure 7. Pout and Idd vs Vapc (V_{dd} EGSM Band, $P_{in} = 0$ dBm, $V_{dd} = 3.0V$).

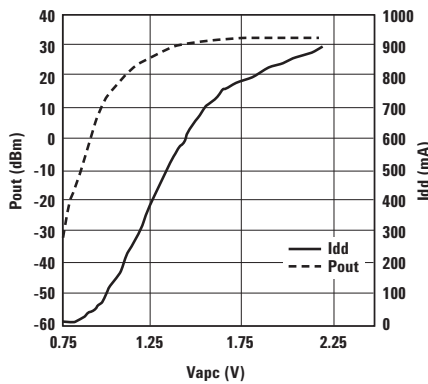


Figure 8. Pout and Idd vs Vapc (DCS 1750 MHz, $P_{in} = 0$ dBm, $V_{dd} = 3.0V$).

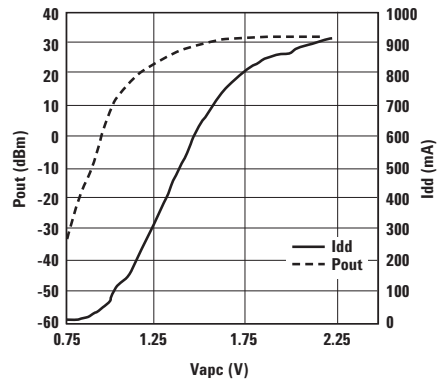


Figure 9. Pout and Idd vs Vapc (PCS 1880 MHz, $P_{in} = 0$ dBm, $V_{dd} = 3.0V$).

Typical Performance, continued

Test conditions: $V_{dd} = +3.5V$, case temperature of $+25^{\circ}C$, and $Z_0=50$ ohms unless otherwise stated.

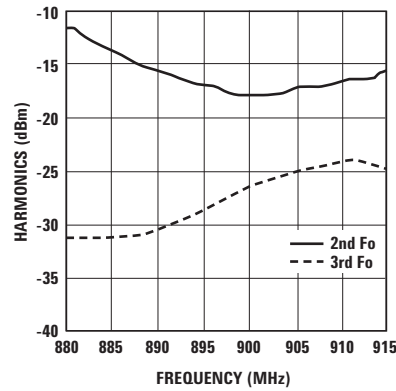


Figure 10. 2nd and 3rd Harmonic Performance (EGSM Band, $P_{in} = 0$ dBm, $P_{out} = 34.5$ dBm, $V_{dd} = 3.5V$).

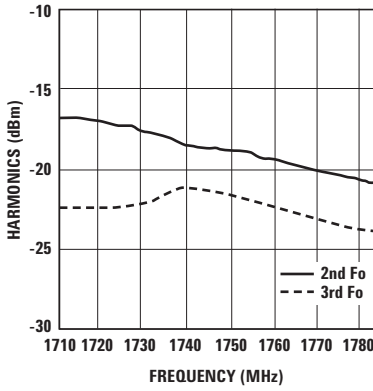


Figure 11. 2nd and 3rd Harmonic Performance (DCS Band, $P_{in} = 0$ dBm, $P_{out} = 32$ dBm, $V_{dd} = 3.5V$).

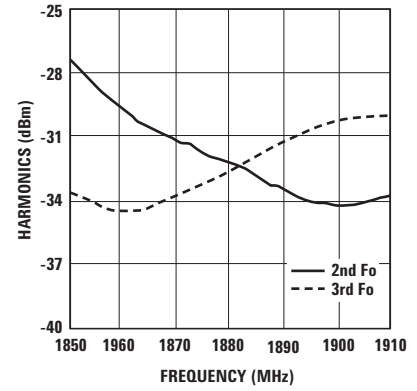


Figure 12. 2nd and 3rd Harmonic Performance (PCS Band, $P_{in} = 0$ dBm, $P_{out} = 32$ dBm, $V_{dd} = 3.5V$).

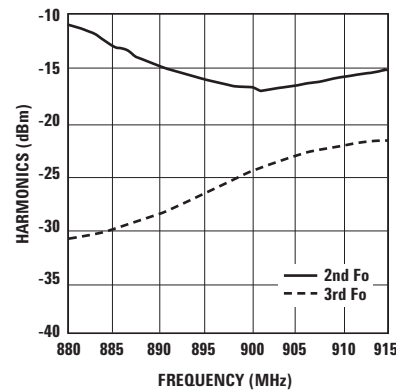


Figure 13. 2nd and 3rd Harmonic Performance (EGSM Band, $P_{in} = 0$ dBm, $P_{out} = 34.5$ dBm, $V_{dd} = 3.0V$).

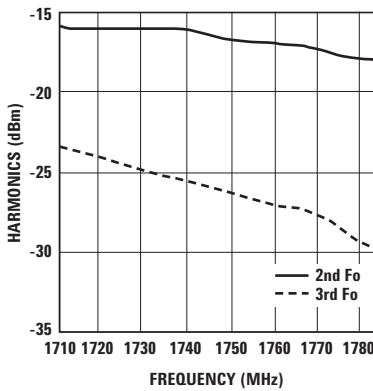


Figure 14. 2nd and 3rd Harmonic Performance (DCS Band, $P_{in} = 0$ dBm, $P_{out} = 32$ dBm, $V_{dd} = 3.0V$).

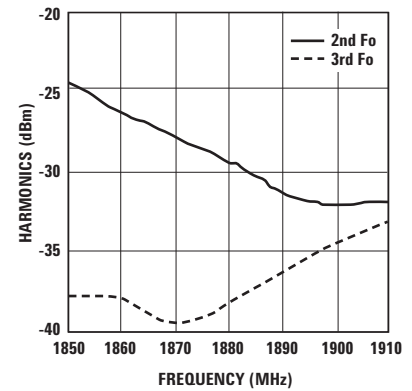


Figure 15. 2nd and 3rd Harmonic Performance (PCS Band, $P_{in} = 0$ dBm, $P_{out} = 32$ dBm, $V_{dd} = 3.0V$).

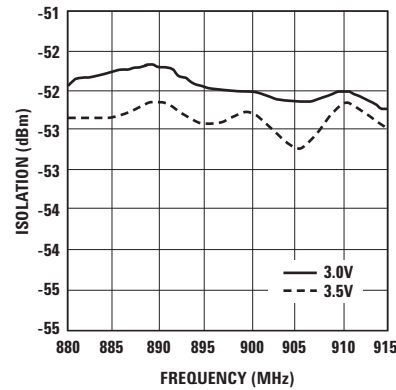


Figure 16. Isolation Performance (EGSM Band, $P_{in} = 4$ dBm, $V_{apc} = 0.2V$).

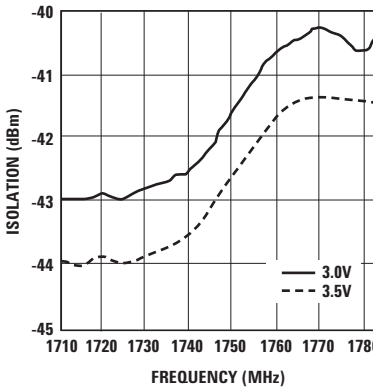


Figure 17. Isolation Performance (DCS Band, $P_{in} = 4$ dBm, $V_{apc} = 0.2V$).

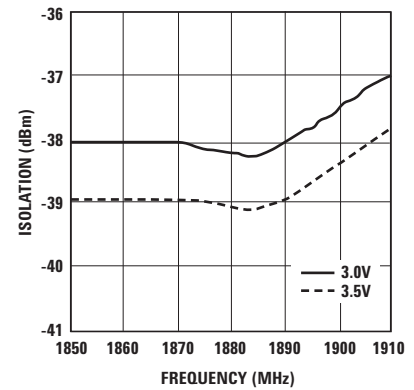


Figure 18. Isolation Performance (PCS Band, $P_{in} = 4$ dBm, $V_{apc} = 0.2V$).

Typical Performance, continued

Test conditions: $V_{dd} = +3.5V$, case temperature of $+25^{\circ}C$, and $Z_o=50$ ohms unless otherwise stated.

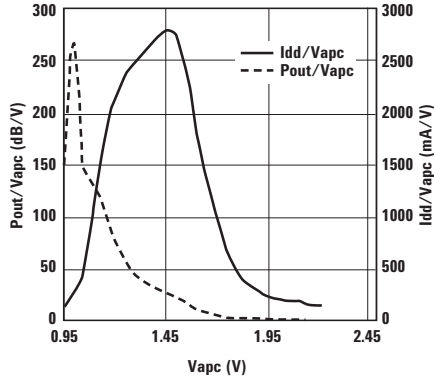


Figure 19. P_{out}/V_{apc} and I_{dd}/V_{apc} vs. V_{apc} (EGSM band, $V_{dd} = 3.5V$).

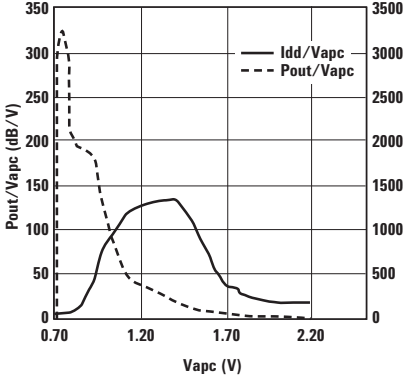


Figure 20. P_{out}/V_{apc} and I_{dd}/V_{apc} vs. V_{apc} (DCS 1750 MHz, $V_{dd} = 3.5V$).

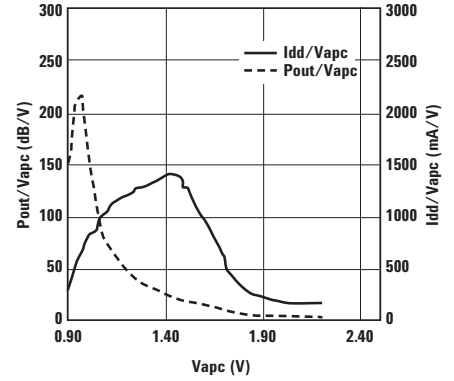


Figure 21. P_{out}/V_{apc} and I_{dd}/V_{apc} vs. V_{apc} (PCS 1880 MHz, $V_{dd} = 3.5V$).

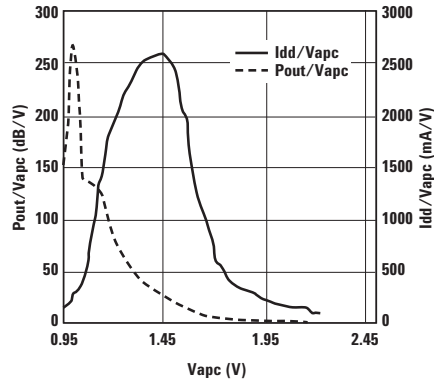


Figure 22. P_{out}/V_{apc} and I_{dd}/V_{apc} vs. V_{apc} (EGSM band, $V_{dd} = 3.0V$).

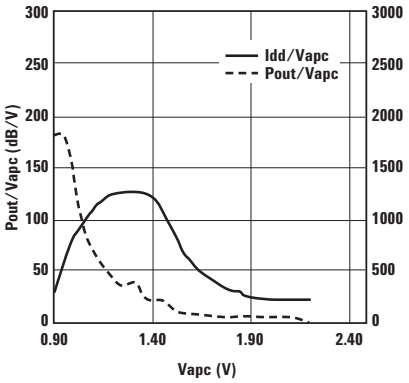


Figure 23. P_{out}/V_{apc} and I_{dd}/V_{apc} vs. V_{apc} (DCS 1750 MHz, $V_{dd} = 3.0V$).

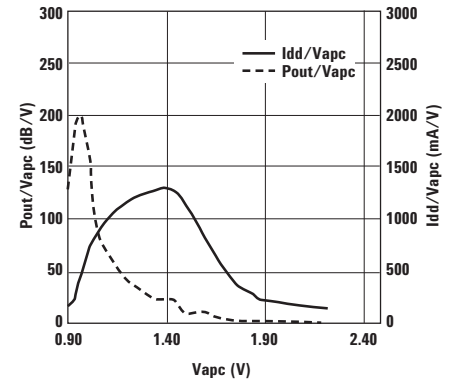
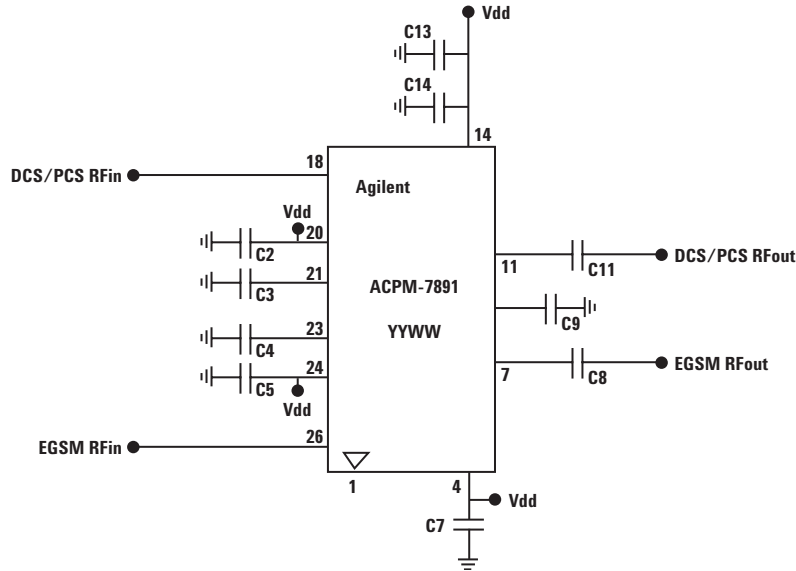


Figure 24. P_{out}/V_{apc} and I_{dd}/V_{apc} vs. V_{apc} (PCS 1880 MHz, $V_{dd} = 3.5V$).

Demo Board Schematic for PA Only



Component Label	Component Value
C2	.033 μ F
C3	12 pF
C4	220 pF
C5	.033 μ F
C7	220 pF
C8	33 pF
C9	.033 μ F
C11	33 pF
C13	.033 μ F
C14	27 pF

Pin Description Table

No.	Function	Description	Notes
1	Gnd		
2	Vapc EGSM	EGSM Control Voltage	See datasheet Figure 4
3	Gnd		
4	Vdd3 EGSM	EGSM Supply 3 rd stage	3.5V nominal – output stage, bypass with 0.033 μ F//220 pF ^[1]
5	Gnd		
6	Gnd		
7	RFout EGSM	EGSM Output	50 Ω nominal, external d.c. blocking required – 33 pF
8	Gnd		
9	Gnd		
10	Gnd		
11	RFout DCS/PCS	DCS/PCS Output	50 Ω nominal, external d.c. blocking required – 33 pF
12	Gnd		
13	Gnd		
14	Vdd3 DCS/PCS	DCS/PCS Supply 3 rd stage	3.5V nominal – output stage, bypass with 0.033 μ F//27 pF ^[1]
15	Gnd		
16	Vapc DCS/PCS	DCS/PCS Control voltage	See datasheet Figure 5 (DCS) and Figure 6 (PCS)
17	Gnd		
18	RFin DCS/PCS	DCS/PCS Input	+2dBm GMSK, 50 Ω nominal, internally d.c. blocked
19	Gnd		
20	Vdd1,2 DCS/PCS	DCS/PCS Supply 1 st and 2 nd stages	3.5V nominal – driver stages, bypass with 0.033 μ F
21	Vdd1,2 Bypass	DCS/PCS 1 st and 2 nd stage bypassing	bypass with 12 pF
22	Gnd		
23	Vdd1,2 Bypass	EGSM 1 st and 2 nd stage bypassing	bypass with 220 pF
24	Vdd1,2 EGSM	EGSM Supply 1 st and 2 nd stages	3.5V nominal – driver stages, bypass with 0.033 μ F
25	Gnd		
26	RFin EGSM	EGSM Input	+2 dBm GMSK, 50W nominal, internally d.c. blocked

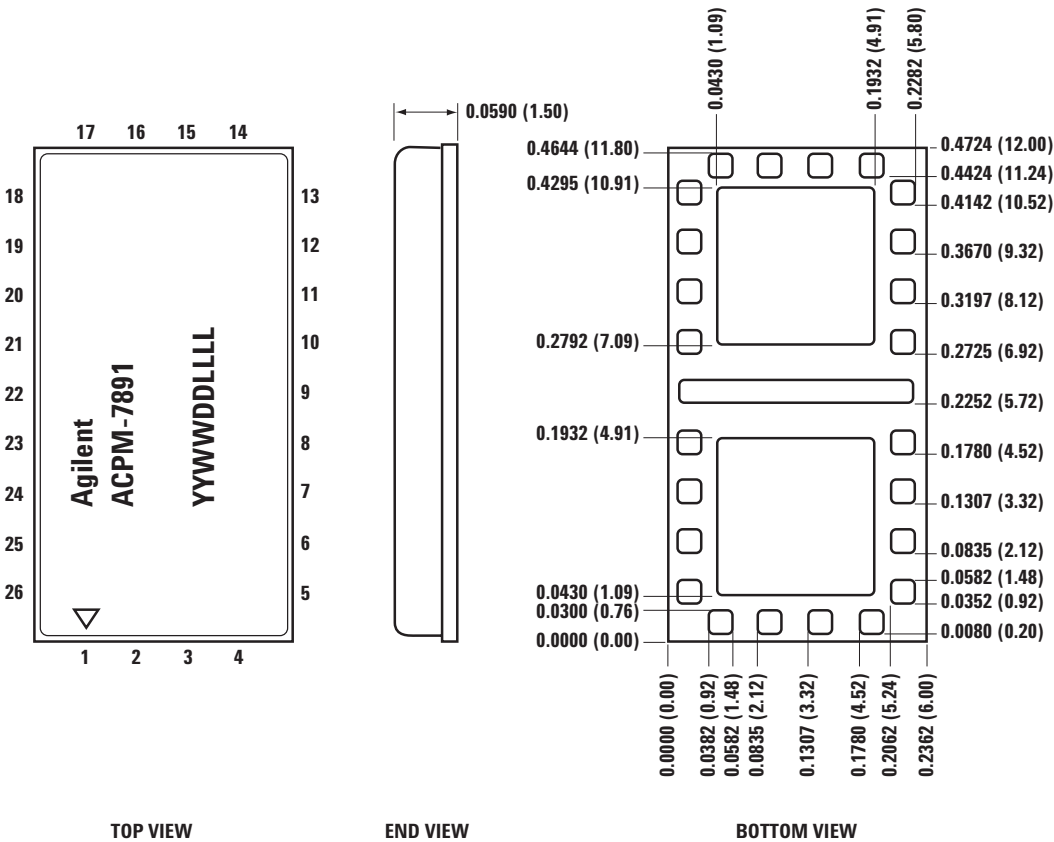
Note:

1. In addition a 2.2 μ F capacitor should be connected to pins 4 and 14 or alternatively star connections can be made from a single 2.2 μ F capacitor keeping the connection distances as short as possible.

Ordering Information

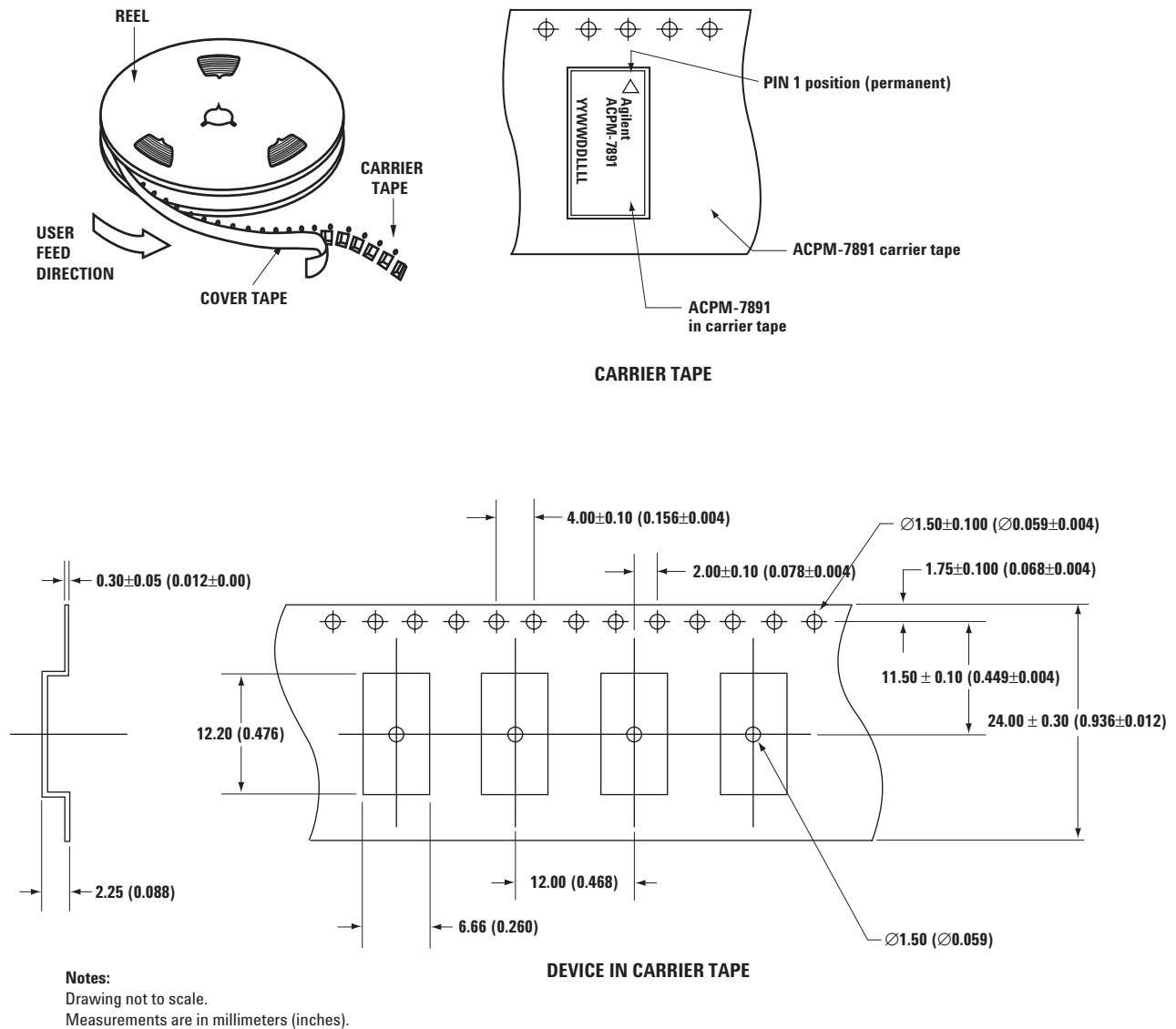
Part Number	No. of Devices	Container
ACPM-7891-BLK	10	Bulk
ACPM-7891-TR1	1000	13" Tape and Reel

Package Dimensions



Note:
Measurements are in inches (millimeters).

Tape Dimensions and Device Orientation



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For product information and a complete list of distributors, please go to our web site.

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Data subject to change.

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