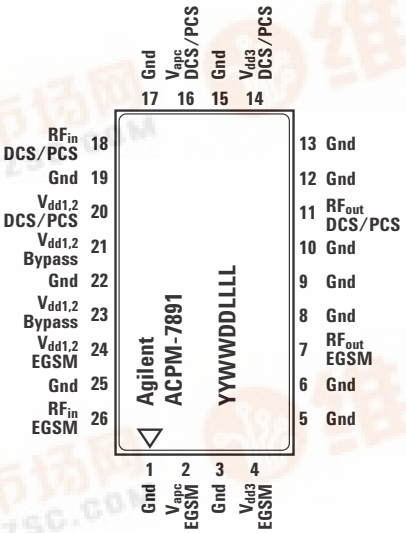
Agilent ACPM-7891
Tri-Band Power Amplifier Module EGSM, DCS and PCS Multi-slot GPRS
Data Sheet

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 Vdd = +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 Vdd= +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
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, $P_{out} \leq$ 34.5 dBm, $V_{apc} \leq$ 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, $P_{out} \leq$ 34.5 dBm, $V_{apc} \leq$ 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, $P_{out} \leq$ 34.0 dBm, Pin = 0 dBm RBW = 100 kHz F = 925 to 960 MHz, $P_{out} \leq$ 34.0 dBm, Pin = 0 dBm RBW = 100 kHz	P_n P_n			-72 -82	dBm 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)	Pout = -5 dBm to P_{out}			400		dB/V
AM-AM	Pin = 0 – 4 dBm Pout = 6 dBm to P_{out}			5		dB/dB
AM-PM	Pin = 0 – 4 dBm Pout = 6 dBm to P_{out}			6		deg/dB

DCS & PCS Electrical Characteristics

Test conditions Vdd= +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
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, $P_{out} \leq$ 32 dBm, $V_{apc} \leq$ 2.2V, VSWR ≤ 8:1, all phases		No parasitic oscillation > -36 dBm			
Load mismatch robustness	V_{dd} = 5.3V, P_{in} = 0 – 4 dBm, $P_{out} \leq$ 32 dBm, $V_{apc} \leq$ 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, $P_{out} \leq$ 31.5 dBm, Pin = 0 dBm RBW = 100 kHz	P_n			-77	dBm
Control Slope (Peak)	Pout = -5 dBm to P_{out1}			350		dB/V
AM-AM	Pin = 0 – 4 dBm Pout = 6 dBm to P_{out1}			5		dB/dB
AM-PM	Pin = 0 – 4 dBm Pout = 6 dBm to P_{out1}			6		deg/dB

GPRS Electrical Characteristics

Test conditions Vdd= +3.5V, a pulse width of 1154 µs 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: Vdd = +3.5V, case temperature of +25°C, and Zo=50 ohms unless otherwise stated.

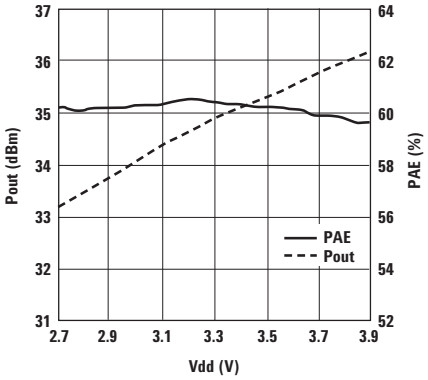


Figure 1. PAE and Pout vs Vdd (EGSM Band, Pin = 2 dBm, Vapc = 2.2V).

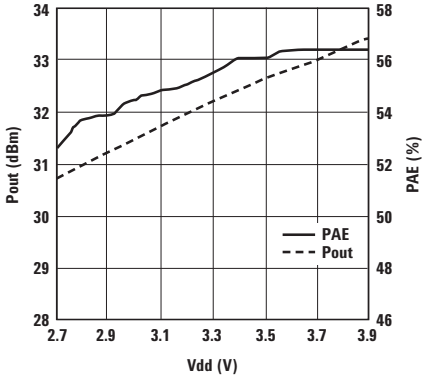


Figure 2. PAE and Pout vs Vdd (DCS 1750 MHz, Pin = 2 dBm, Vapc = 2.2V).

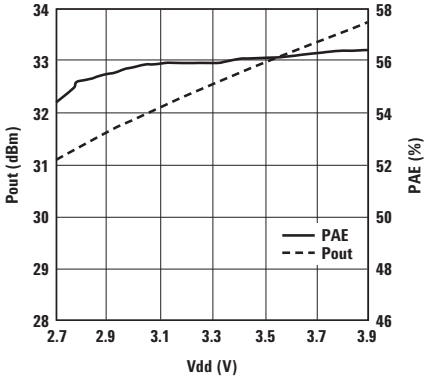


Figure 3. PAE and Pout vs Vdd (PCS 1880 MHz, Pin = 2 dBm, Vapc = 2.2V).

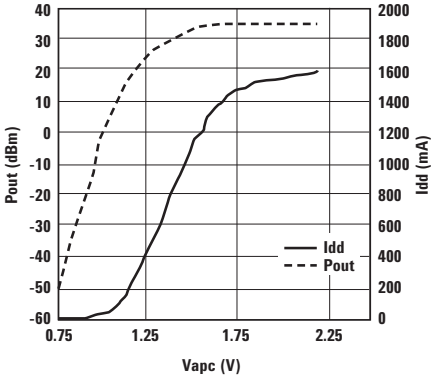


Figure 4. Pout and Idd vs Vapc (EGSM Band, Pin = 0 dBm, Vdd = 3.5V).

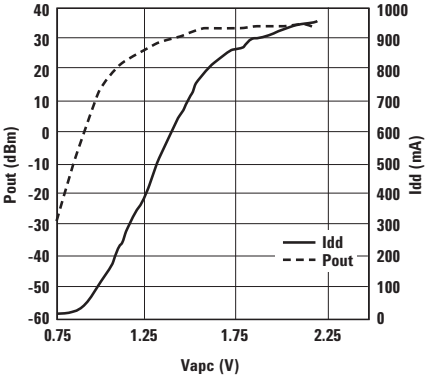


Figure 5. Pout and Idd vs Vapc (DCS 1750 MHz, Pin= 0 dBm, Vdd = 3.5V).

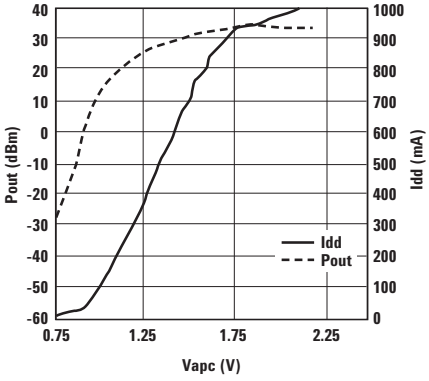


Figure 6. Pout and Idd vs Vapc (PCS 1880 MHz, Pin= 0 dBm, Vdd = 3.5V).

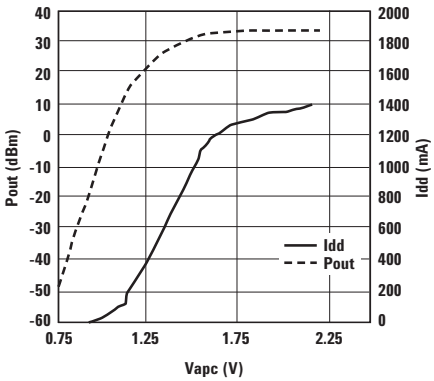


Figure 7. Pout and Idd vs Vapc (Vdd EGSM Band, Pin = 0 dBm, Vdd = 3.0V).

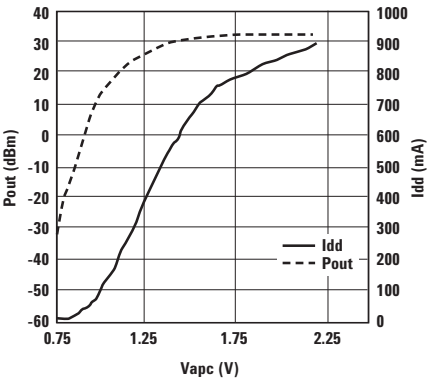


Figure 8. Pout and Idd vs Vapc (DCS 1750 MHz, Pin = 0 dBm, Vdd = 3.0V).

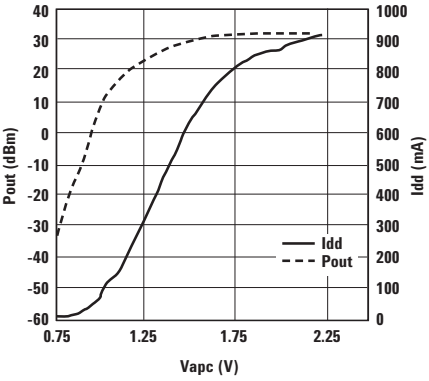


Figure 9. Pout and Idd vs Vapc (PCS 1880 MHz, Pin = 0 dBm, Vdd = 3.0V).

Typical Performance, continued

Test conditions: Vdd = +3.5V, case temperature of +25°C, and Zo=50 ohms unless otherwise stated.

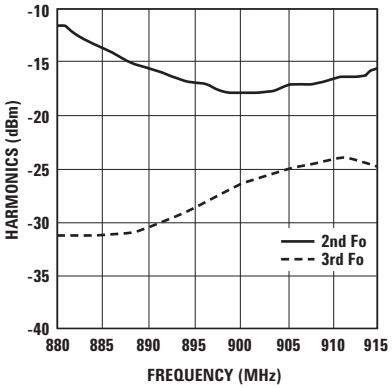


Figure 10. 2nd and 3rd Harmonic Performance (EGSM Band, Pin = 0 dBm, Pout = 34.5 dBm, Vdd = 3.5V).

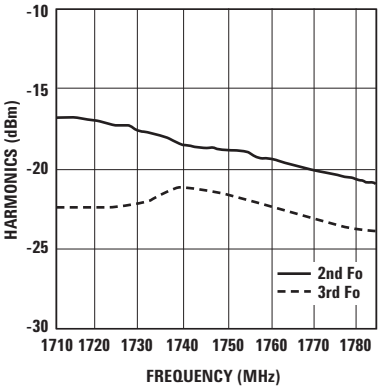


Figure 11. 2nd and 3rd Harmonic Performance (DCS Band, Pin = 0 dBm, Pout = 32 dBm, Vdd = 3.5V).

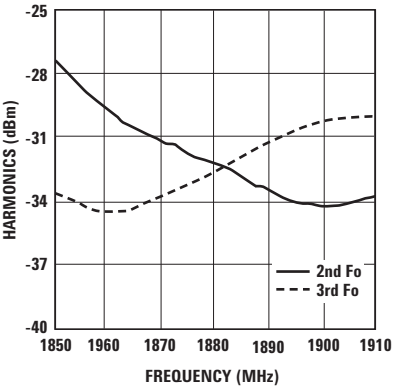


Figure 12. 2nd and 3rd Harmonic Performance (PCS Band, Pin = 0 dBm, Pout = 32 dBm, Vdd = 3.5V).

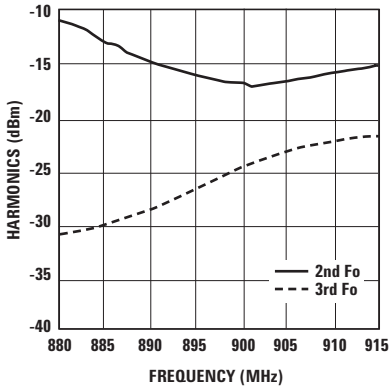


Figure 13. 2nd and 3rd Harmonic Performance (EGSM Band, Pin = 0 dBm, Pout = 34.5 dBm, Vdd = 3.0V).

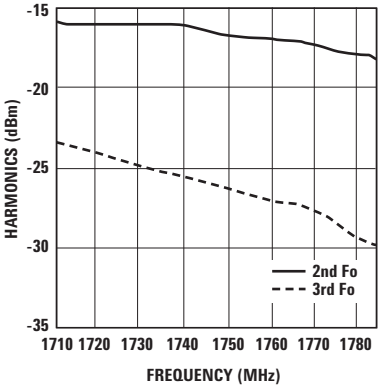


Figure 14. 2nd and 3rd Harmonic Performance (DCS Band, Pin = 0 dBm, Pout = 32 dBm, Vdd = 3.0V).

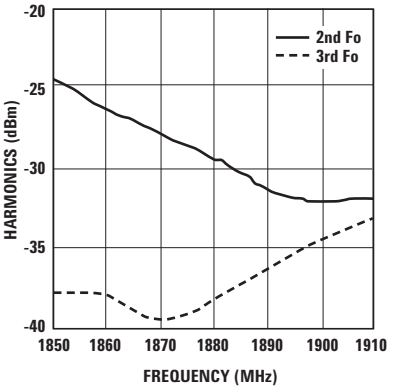


Figure 15. 2nd and 3rd Harmonic Performance (PCS Band, Pin = 0 dBm, Pout = 32 dBm, Vdd = 3.0V).

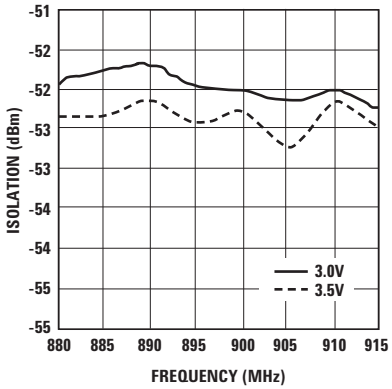


Figure 16. Isolation Performance (EGSM Band, Pin = 4 dBm, Vapc = 0.2V).

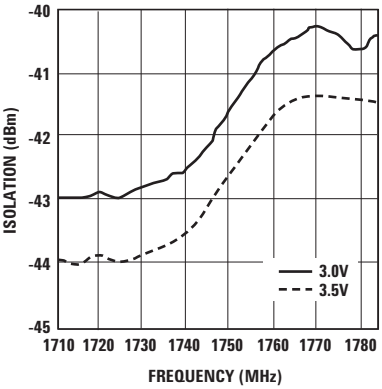


Figure 17. Isolation Performance (DCS Band, Pin = 4 dBm, Vapc = 0.2V).

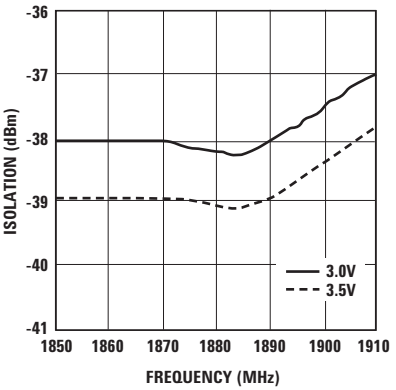


Figure 18. Isolation Performance (PCS Band, Pin=4 dBm, Vapc=0.2V).

Typical Performance, continued

Test conditions: Vdd = +3.5V, case temperature of +25°C, and Zo=50 ohms unless otherwise stated.

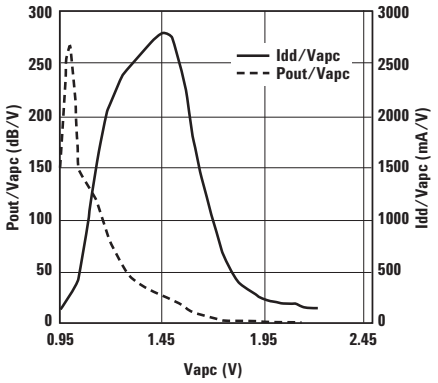


Figure 19. Pout/Vapc and Idd/Vapc vs. Vapc (EGSM band, Vdd = 3.5V).

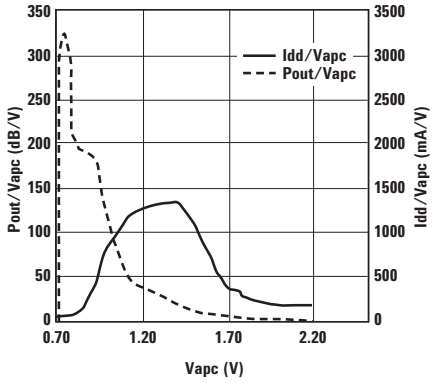


Figure 20. Pout/Vapc and Idd/Vapc vs. Vapc (DCS 1750 MHz, Vdd = 3.5V).

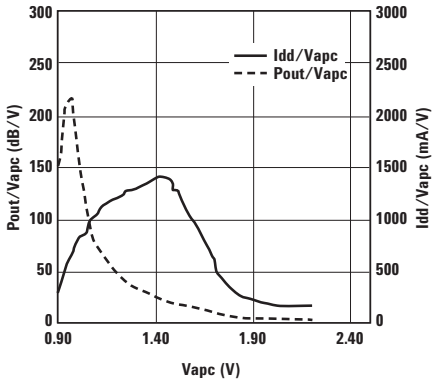


Figure 21. Pout/Vapc and Idd/Vapc vs. Vapc (PCS 1880 MHz, Vdd = 3.5V).

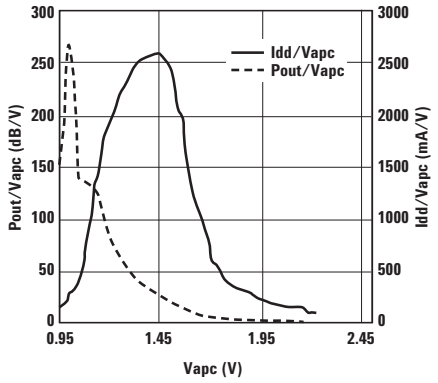


Figure 22. Pout/Vapc and Idd/Vapc vs. Vapc (EGSM band, Vdd = 3.0V).

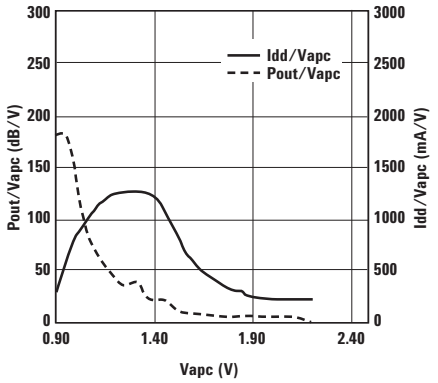


Figure 23. Pout/Vapc and Idd/Vapc vs. Vapc (DCS 1750 MHz, Vdd = 3.0V).

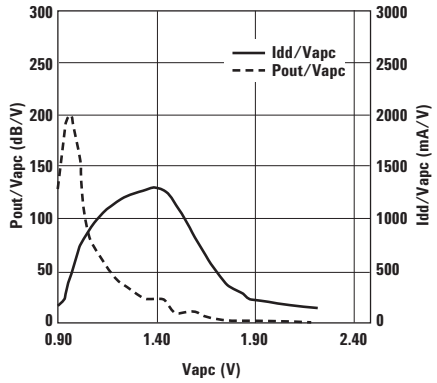
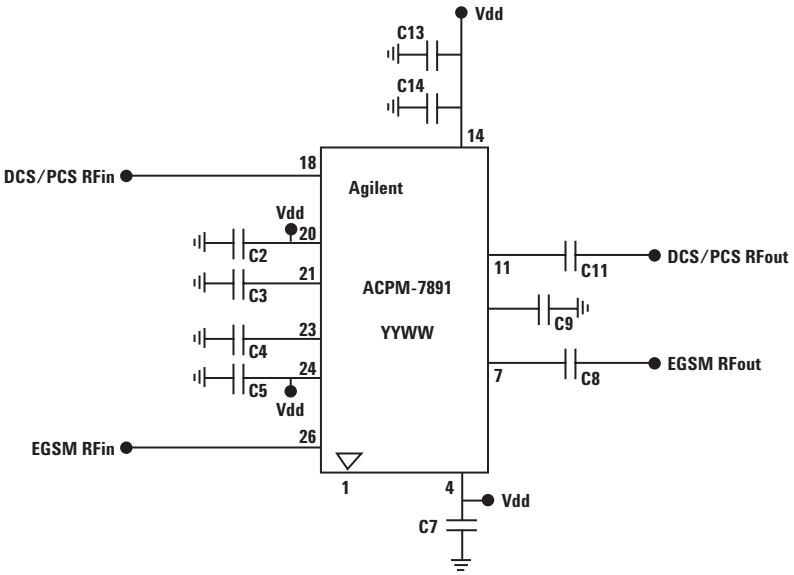


Figure 24. Pout/Vapc and Idd/Vapc vs. Vapc (PCS 1880 MHz, Vdd = 3.5V).

Demo Board Schematic for PA Only



Component Label	Component Value
C2	.033 µF
C3	12 pF
C4	220 pF
C5	.033 µF
C7	220 pF
C8	33 pF
C9	.033 µF
C11	33 pF
C13	.033 µF
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 3rd stage	3.5V nominal – output stage, bypass with 0.033 µF//220 pF[1]
5	Gnd		
6	Gnd		
7	RFout EGSM	EGSM Output	50Ω nominal, external d.c. blocking required – 33 pF
8	Gnd		
9	Gnd		
10	Gnd		
11	RFout DCS/PCS	DCS/PCS Output	50Ω nominal, external d.c. blocking required – 33 pF
12	Gnd		
13	Gnd		
14	Vdd3 DCS/PCS	DCS/PCS Supply 3rd stage	3.5V nominal – output stage, bypass with 0.033 µF//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, 50Ω nominal, internally d.c. blocked
19	Gnd		
20	Vdd1,2 DCS/PCS	DCS/PCS Supply 1st and 2nd stages	3.5V nominal – driver stages, bypass with 0.033 µF
21	Vdd1,2 Bypass	DCS/PCS 1st and 2nd stage bypassing	bypass with 12 pF
22	Gnd		
23	Vdd1,2 Bypass	EGSM 1st and 2nd stage bypassing	bypass with 220 pF
24	Vdd1,2 EGSM	EGSM Supply 1st and 2nd stages	3.5V nominal – driver stages, bypass with 0.033 µF
25	Gnd		
26	RFin EGSM	EGSM Input	+2 dBm GMSK, 50W nominal, internally d.c. blocked

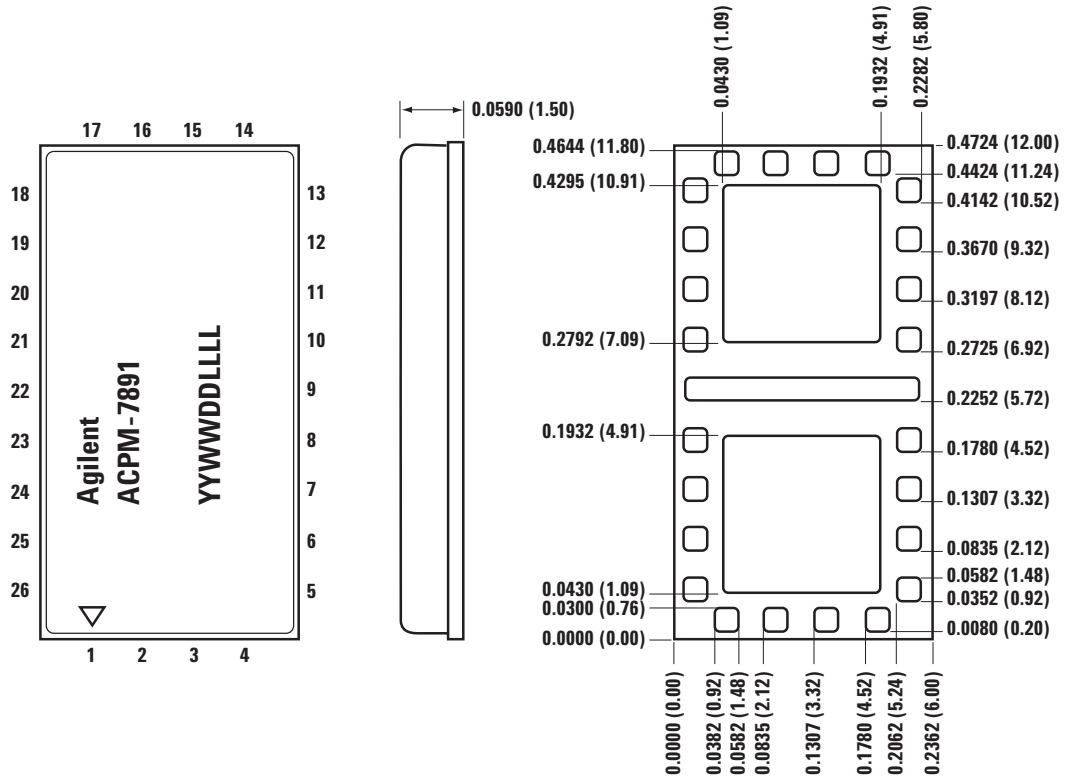
Note:

1. In addition a 2.2 µF capacitor should be connected to pins 4 and 14 or alternatively star connections can be made from a single 2,2 µF 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

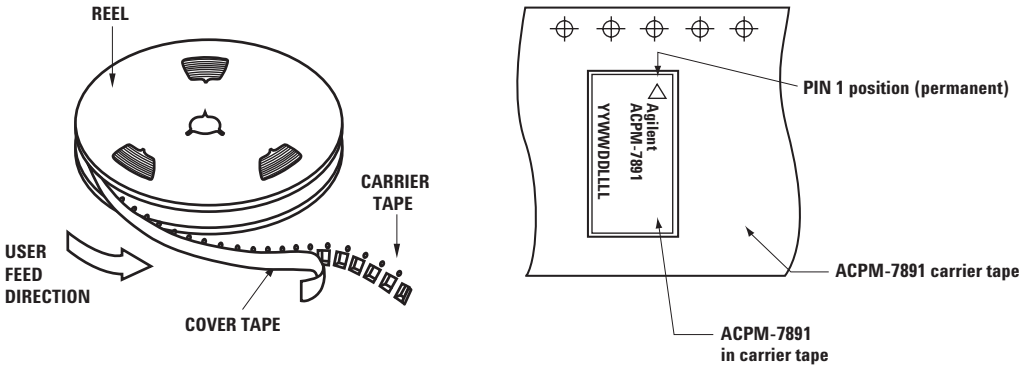
Package Dimensions



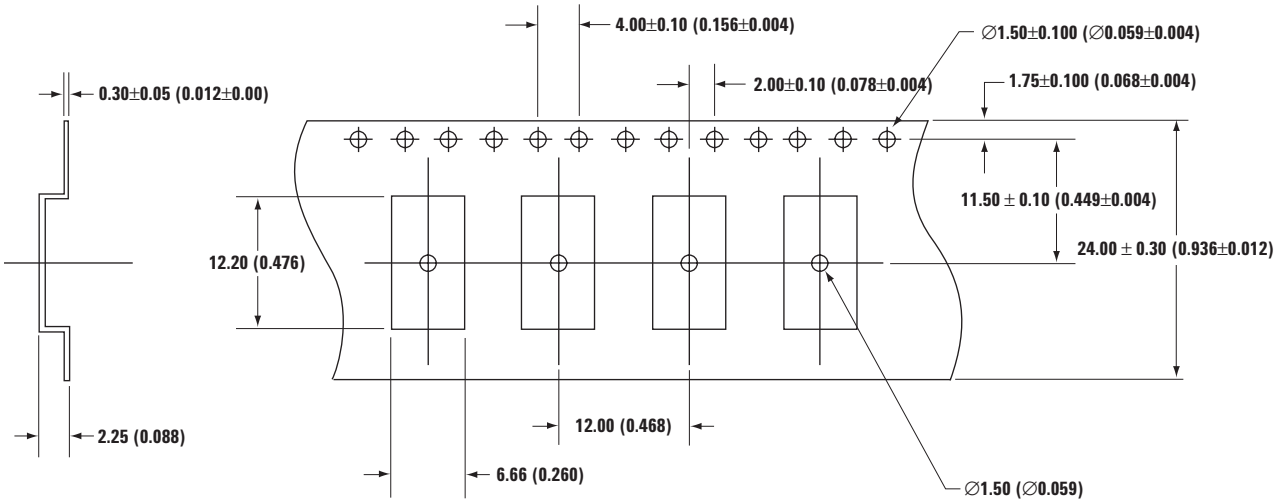
TOP VIEW **END VIEW** **BOTTOM VIEW**

Note:
Measurements are in inches (millimeters).

Tape Dimensions and Device Orientation



CARRIER TAPE



DEVICE IN CARRIER TAPE

Notes:
Drawing not to scale.
Measurements are in millimeters (inches).

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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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