

PF08107B

MOS FET Power Amplifier Module
for E-GSM and DCS1800 Dual Band Handy Phone

HITACHI

ADE-208-787F (Z)
7th Edition
Feb. 2001

Application

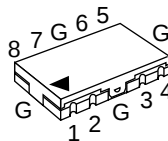
- Dual band amplifier for E-GSM (880 MHz to 915 MHz) and DCS1800 (1710 MHz to 1785 MHz).
- For 3.5 V nominal operation

Features

- 2 in / 2 out dual band amplifier
- Simple external circuit including output matching circuit
- One power control pin with one band switch
- High gain 3stage amplifier : 0 dBm input Typ
- Lead less thin & Small package : $8 \times 13.75 \times 1.6$ mm Typ
- High efficiency : 50 % Typ at 35.0 dBm for E-GSM
43 % Typ at 32.0 dBm for DCS1800

Pin Arrangement

- RF-K-8



1: Pin_{GSM}
2: Vapc
3: Vdd1
4: Pout_{GSM}
5: Pout_{DCS}
6: Vdd2
7: Vctl
8: Pin_{DCS}
G: GND

Absolute Maximum Ratings (Tc = 25°C)

Item	Symbol	Rating	Unit
Supply voltage	Vdd	8	V
Supply current	Idd _{GSM}	3.5	A
	Idd _{DCS}	2	A
Vctl voltage	Vctl	4	V
Vapc voltage	Vapc	4	V
Input power	Pin	10	dBm
Operating case temperature	Tc (op)	−30 to +100	°C
Storage temperature	Tstg	−30 to +100	°C
Output power	Pout _{GSM}	5	W
	Pout _{DCS}	3	W

Note: The maximum ratings shall be valid over both the E-GSM-band (880 to 915 MHz), and the DCS1800-band (1710 to 1785 MHz).

Electrical Characteristics for DC (Tc = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Condition
Drain cutoff current	Ids	—	—	20	μA	Vdd = 4.7 V, Vapc = 0 V, Vctl = 0.2 V
		—	—	300	μA	Vdd = 8 V, Vapc = 0 V, Vctl = 0.2 V, Tc = −20 to +70°C
Vapc control current	Iapc	—	—	3	mA	Vapc = 2.2 V
Vctl control current	Ictl	—	—	2	μA	Vctl = 3 V

Electrical Characteristics for E-GSM mode (T_c = 25°C)

Test conditions unless otherwise noted:

f = 880 to 915 MHz, V_{dd1} = V_{dd2} = 3.5 V, Pin = 0 dBm, V_{ctl} = 2.0 V, R_g = R_l = 50 Ω, T_c = 25°C, Pulse operation with pulse width 577 μs and duty cycle 1:8 shall be used.

Item	Symbol	Min	Typ	Max	Unit	Test Condition
Frequency range	F	880	—	915	MHz	
Band select (GSM active)	V _{ctl}	2.0	—	2.8	V	
Input power	Pin	−2	0	2	dBm	
Control voltage range	V _{apc}	0.2	—	2.2	V	
Supply voltage	V _{dd}	3.0	3.5	4.5	V	
Total efficiency	η _T	43	50	—	%	P _{out GSM} = 35 dBm, V _{apc} = controlled
2nd harmonic distortion	2nd H.D.	—	−45	−35	dBc	
3rd harmonic distortion	3rd H.D.	—	−45	−35	dBc	
4th~8th harmonic distortion	4th~8th H.D.	—	—	−35	dBc	
Input VSWR	VSWR (in)	—	1.5	3	—	
Output power (1)	P _{out} (1)	35.0	36.0	—	dBm	V _{apc} = 2.2 V
Output power (2)	P _{out} (2)	33.5	34.5	—	dBm	V _{dd} = 3.1 V, V _{apc} = 2.2 V, T _c = +70°C
Isolation	—	—	−42	−37	dBm	V _{apc} = 0.2 V, Pin = 2 dBm
Isolation at DCS RF-output when GSM is active	—	—	−30	−20	dBm	P _{out GSM} = 35 dBm, Measured at f = 1760 to 1830 MHz
Switching time	t _r , t _f	—	1	2	μs	P _{out GSM} = 0 to 35.0 dBm
Stability	—	No parasitic oscillation			—	V _{dd} = 3.1 to 4.5 V, P _{out} ≤ 35.0 dBm, V _{apc GSM} ≤ 2.2 V, R _g = 50 Ω, T _c = 25°C, Output VSWR = 6 : 1 All phases
Load VSWR tolerance	—	No degradation			—	V _{dd} = 3.1 to 4.5 V, P _{out GSM} ≤ 35.0 dBm, V _{apc GSM} ≤ 2.2 V, R _g = 50 Ω, t = 20 sec., T _c = 25°C, Output VSWR = 10 : 1 All phases
Noise power	P _{noise1}	—	—	−80	dBm	f ₀ = 915 MHz, f _{rx} = f ₀ +10 MHz, P _{out GSM} = 35 dBm, RES BW = 100 kHz
	P _{noise2}	—	—	−84	dBm	f ₀ = 915 MHz, f _{rx} = f ₀ +20 MHz, P _{out GSM} = 35 dBm, RES BW = 100 kHz

Electrical Characteristics for E-GSM mode (cont)

Item	Symbol	Min	Typ	Max	Unit	Test Condition
Slope Pout/Vapc	—	—	—	200	dB/V	Pout _{GSM} = 5 to 35 dBm
Phase shift	—	—	—	20	deg	Pout _{GSM} = 33.5 to 34.5 dBm
Total conversion gain1	—	—	—	−5	dB	f ₀ = 915 MHz, Other sig. = 895 MHz (−40 dBm) Pout _{GSM} = 33.5 dBm
Total conversion gain2	—	—	—	−5	dB	f ₀ = 915 MHz, Other sig. = 905 MHz (−40 dBm) Pout _{GSM} = 33.5 dBm
AM output	—	—	—	40	%	Pout _{GSM} = +5 dBm, 4%AM modulation at input 50 kHz modulation frequency

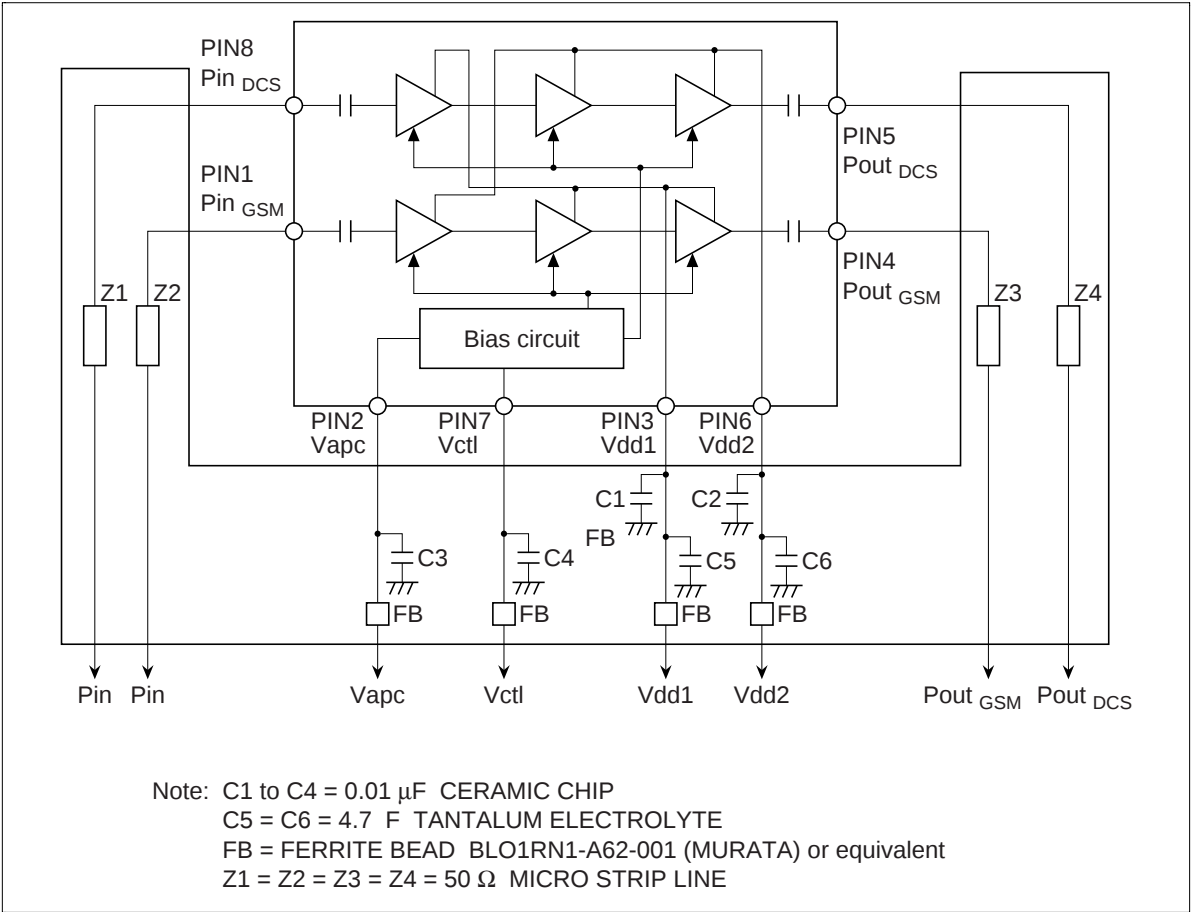
Electrical Characteristics for DCS1800 mode (T_c = 25°C)

Test conditions unless otherwise noted:

f = 1710 to 1785 MHz, V_{dd1} = V_{dd2} = 3.5 V, Pin = 0 dBm, V_{ctl} = 0 V, R_g = R_l = 50 Ω, T_c = 25°C,
Pulse operation with pulse width 577 μs and duty cycle 1:8 shall be used.

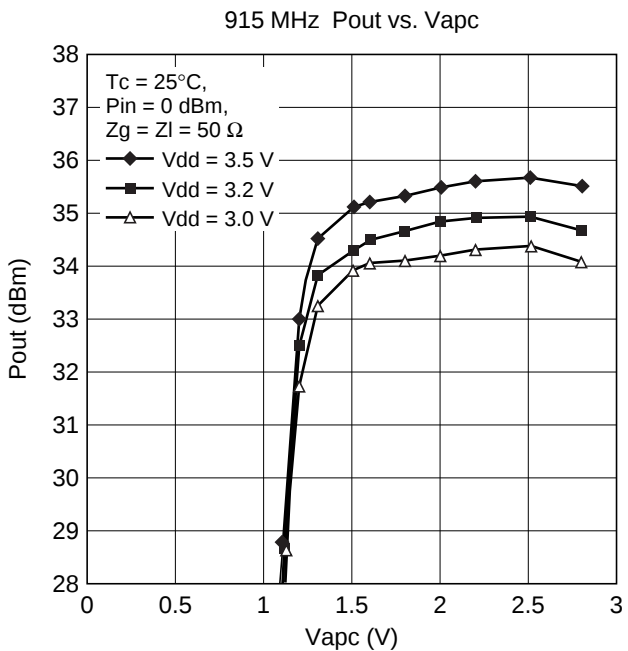
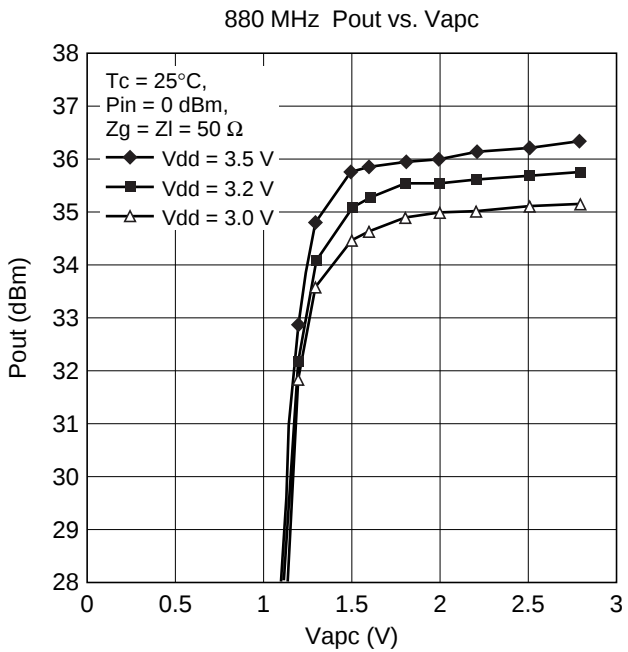
Item	Symbol	Min	Typ	Max	Unit	Test Condition
Frequency range	F	1710	—	1785	MHz	DCS1800 (1710 to 1785)
Band select (DCS active)	V _{ctl}	0	—	0.1	V	
Input power	Pin	-2	0	2	dBm	
Control voltage range	V _{apc}	0.2	—	2.2	V	
Supply voltage	V _{dd}	3.0	3.5	4.5	V	
Total efficiency	η _T	37	43	—	%	P _{out} _{DCS} = 32.0 dBm,
2nd harmonic distortion	2nd H.D.	—	-45	-35	dBc	V _{apc} = controlled
3rd harmonic distortion	3rd H.D.	—	-45	-35	dBc	
4th~8th harmonic distortion	4th~8th H.D.	—	—	-35	dBc	
Input VSWR	VSWR (in)	—	1.5	3	—	
Output power (1)	P _{out} (1)	32.0	33	—	dBm	V _{apc} = 2.2 V
Output power (2)	P _{out} (2)	30.5	31.5	—	dBm	V _{dd} = 3.1 V, V _{apc} = 2.2 V, T _c = +70°C
Isolation	—	—	-42	-37	dBm	V _{apc} = 0.2 V, Pin _{DCS} = 2 dBm
Switching time	t _r , t _f	—	1	2	μs	P _{out} _{DCS} = 0 to 32.0 dBm
Stability	—	No parasitic oscillation			—	V _{dd} = 3.1 to 4.5 V, P _{out} _{DCS} ≤ 32.0 dBm, V _{apc} ≤ 2.2 V, R _g = 50 Ω, Output VSWR = 6 : 1 All phases
Load VSWR tolerance	—	No degradation			—	V _{dd} = 3.1 to 4.5 V, P _{out} _{DCS} ≤ 32.0 dBm, V _{apc} ≤ 2.2 V, R _g = 50 Ω, t = 20 sec., Output VSWR = 10 : 1 All phases
Noise power	P _{noise}	—	—	-77	dBm	f ₀ = 1785 MHz, f _{rx} = f ₀ + 20 MHz, P _{out} _{DCS} = 32.0 dBm, RES BW = 100 kHz
Slope P _{out} /V _{apc}	—	—	—	200	dB/V	P _{out} _{DCS} = 0 to 32.0 dBm
Phase shift	—	—	—	20	deg	P _{out} _{DCS} = 30.5 to 31.5 dBm
Total conversion gain ¹	—	—	—	-5	dB	f ₀ = 1785 MHz, P _{out} _{DCS} = 30.5 dBm, Other sig. = 1765 MHz (-40 dBm)
AM output	—	—	—	40	%	P _{out} _{DCS} = 0 dBm, 4%AM modulation at input 50 kHz modulation frequency

Internal Diagram and External Circuit

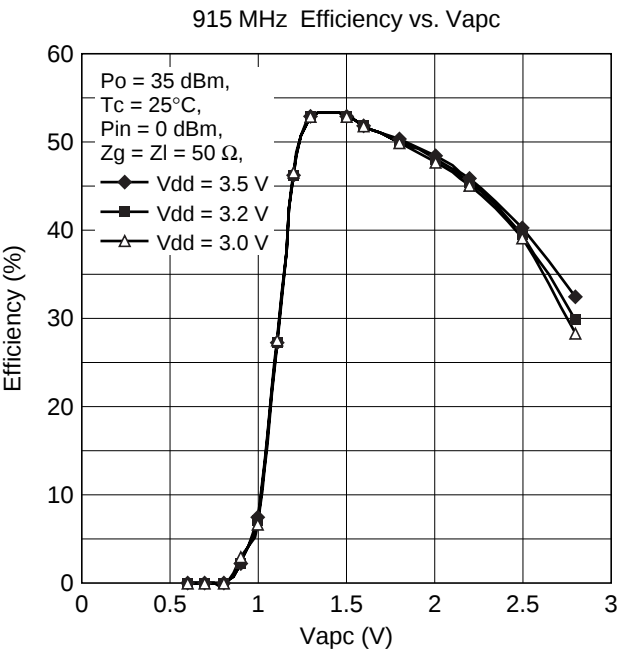
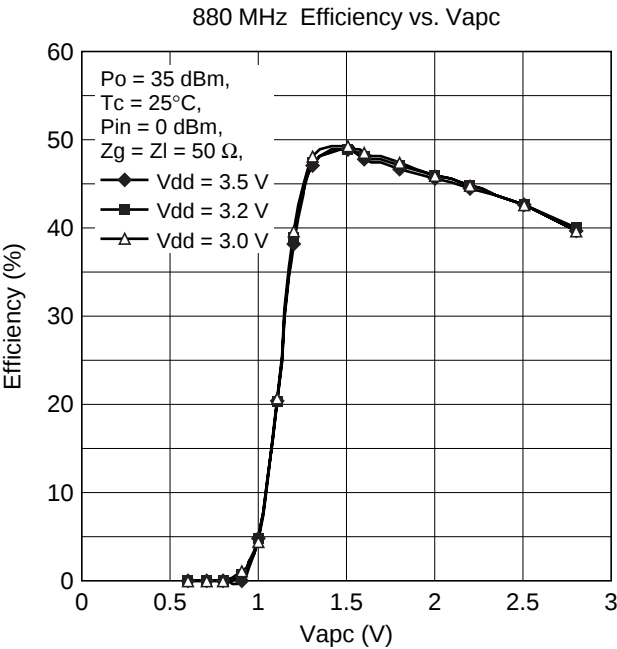


Characteristic Curves

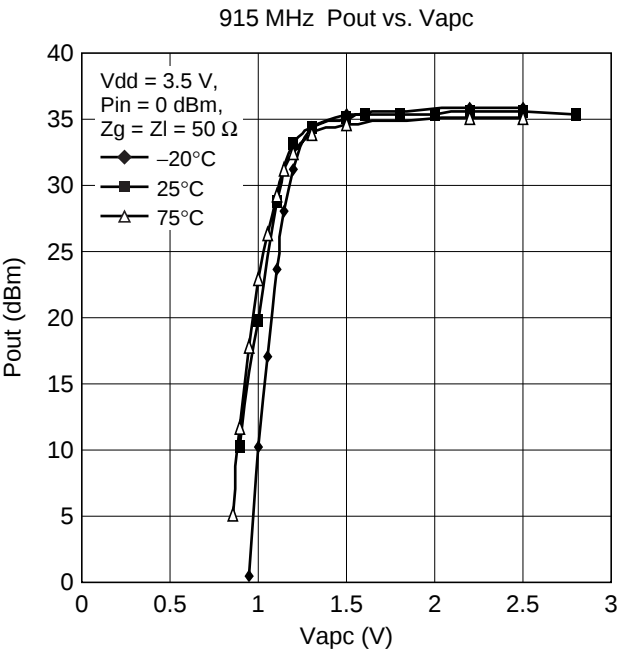
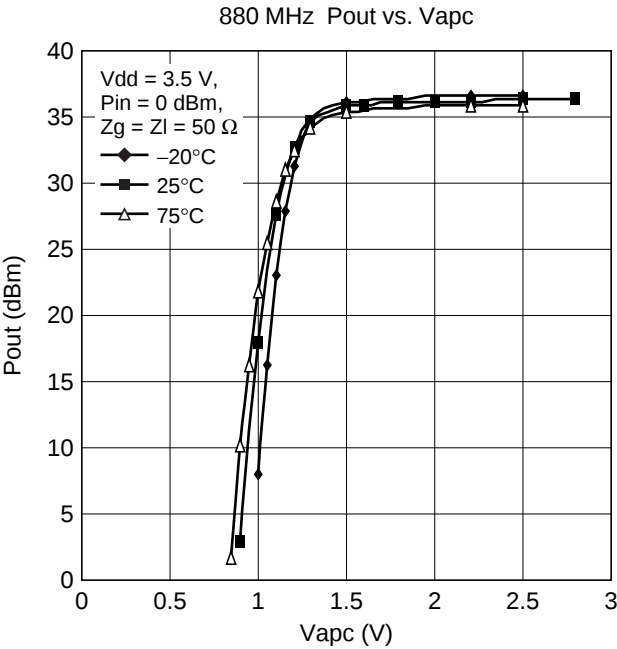
Vapc vs Pout – Vdd Dependence



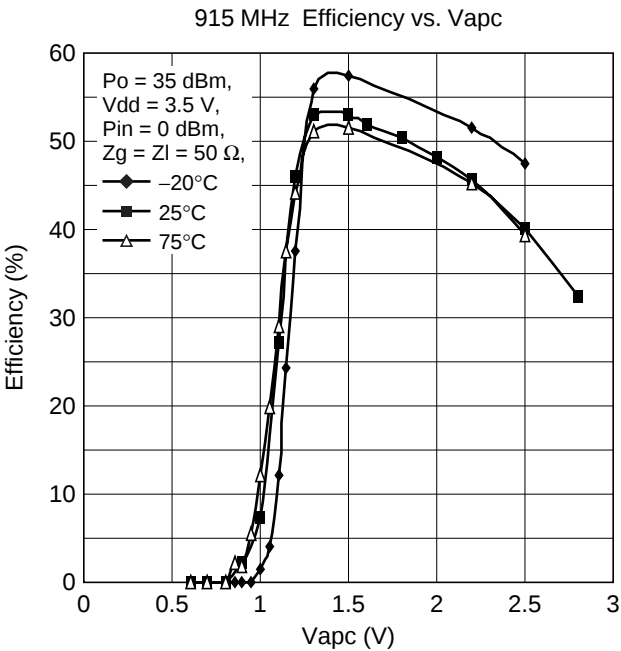
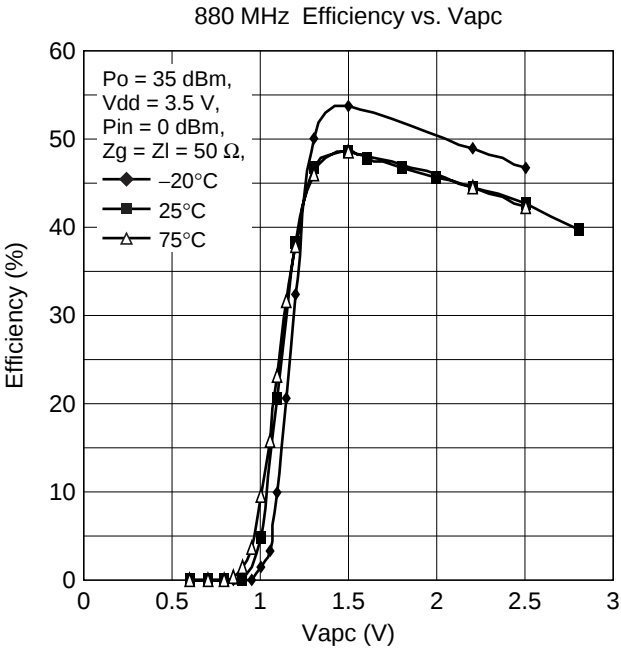
Vapc vs Efficiency – Vdd Dependence



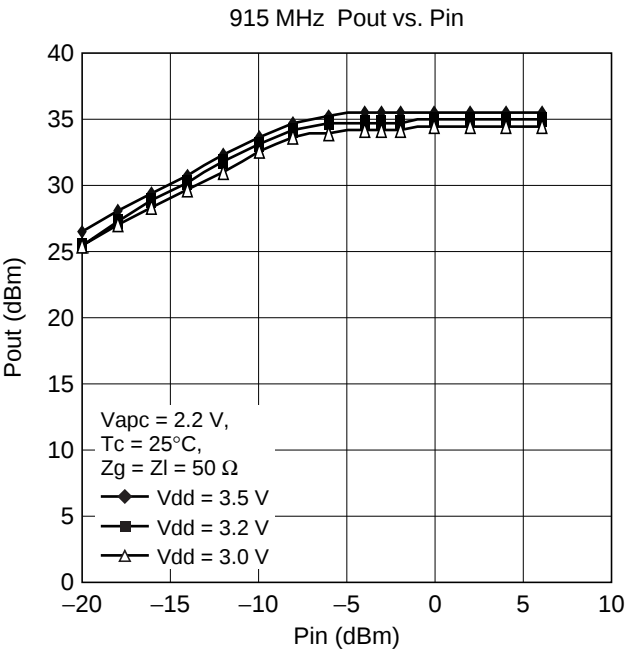
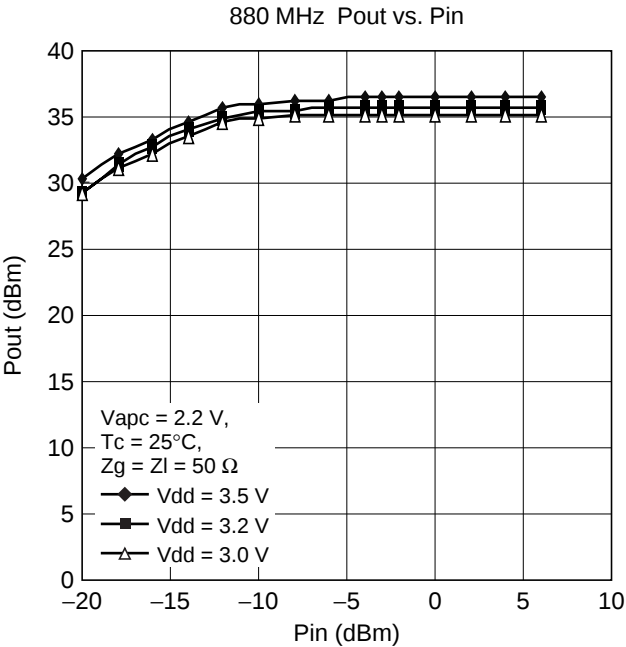
Vapc vs Pout – Temperature Dependence



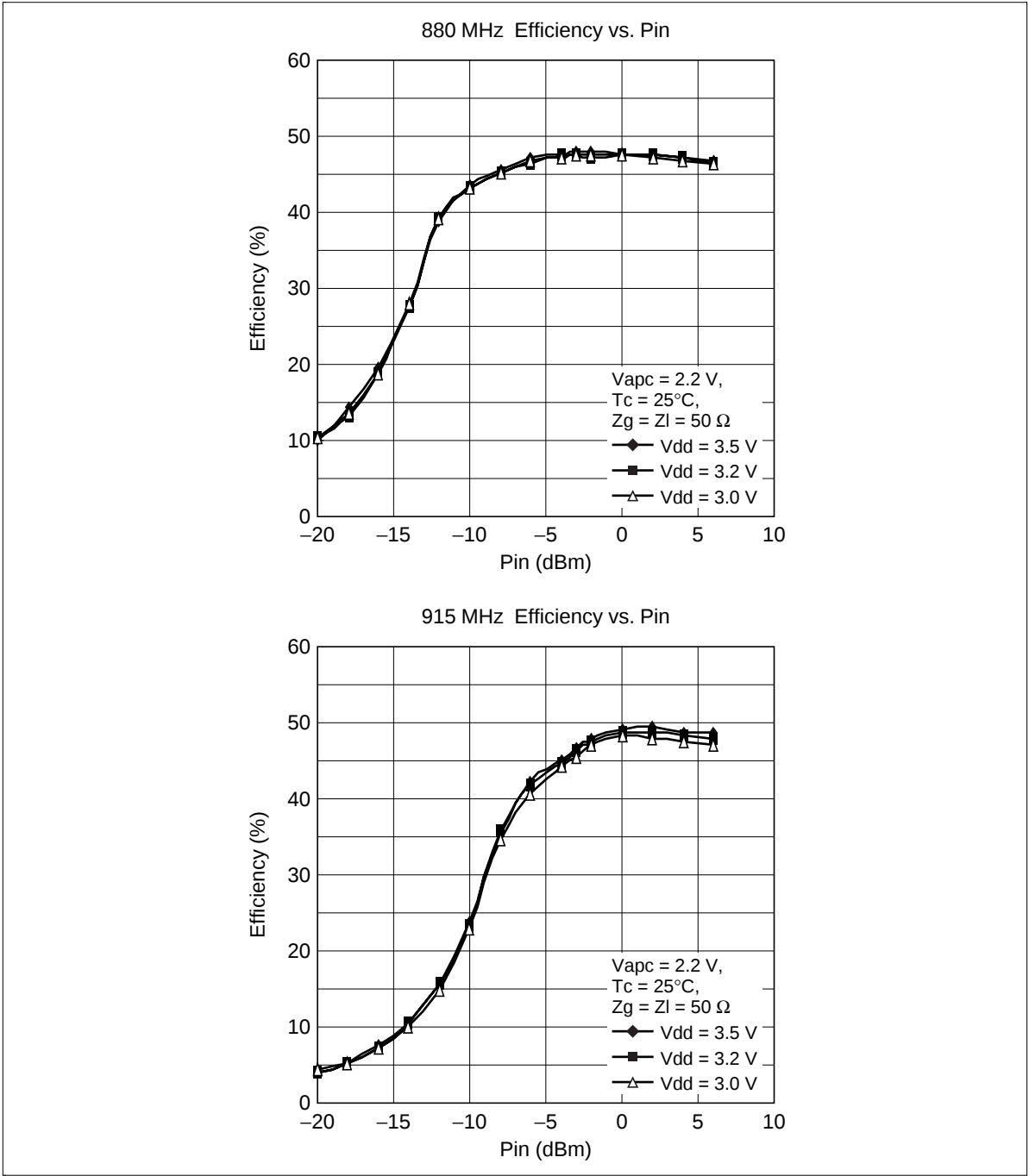
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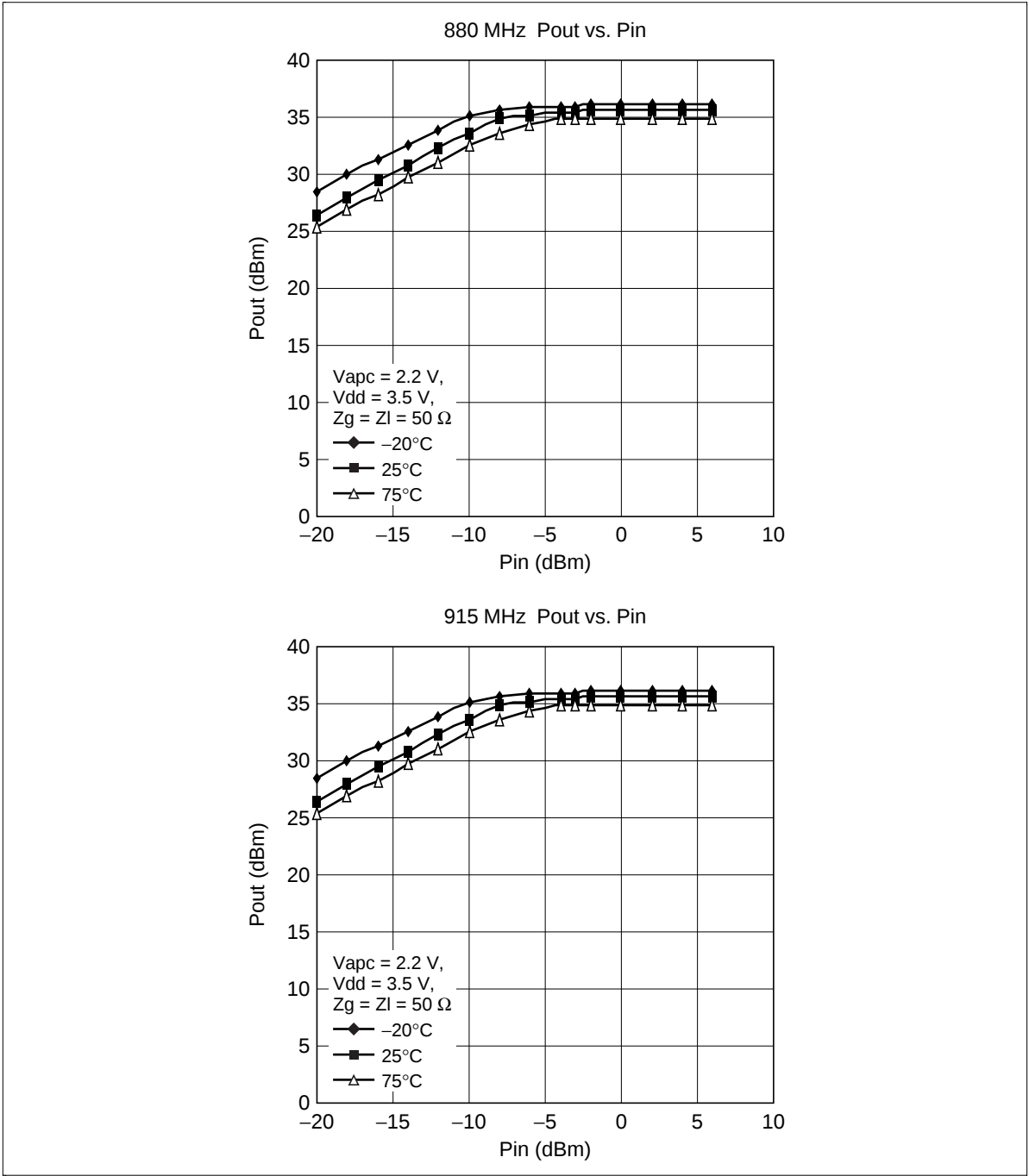
Pin vs Pout – Vdd Dependence



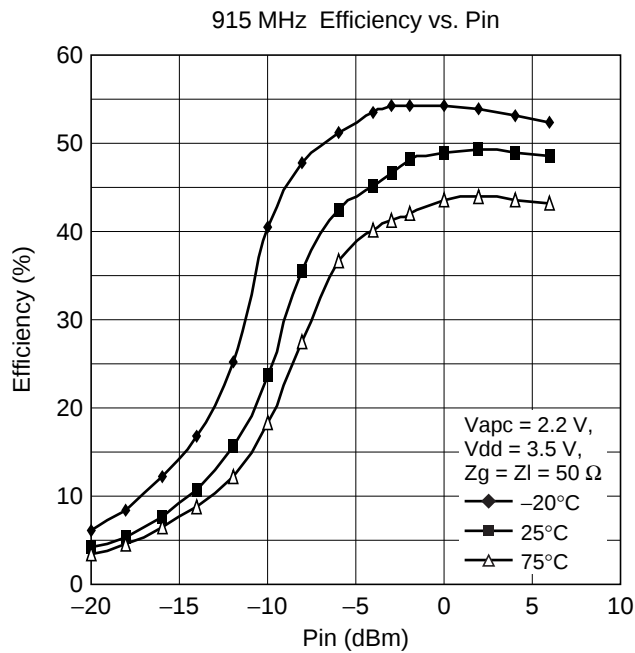
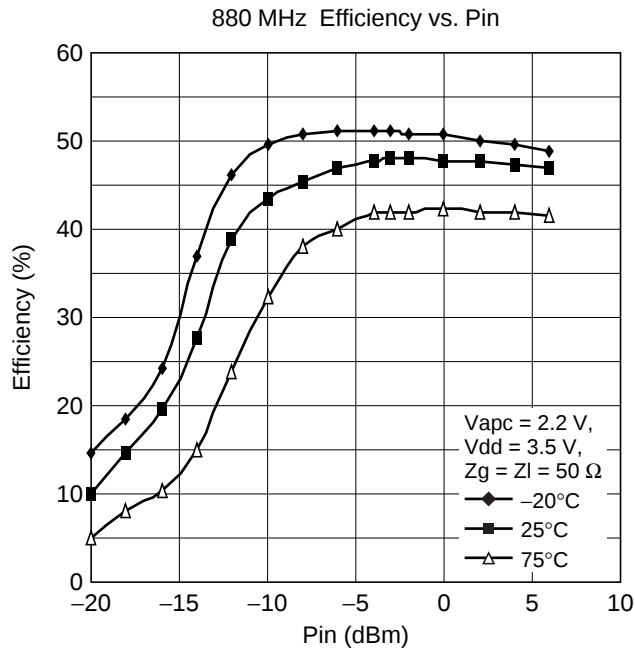
Pin vs Efficiency – Vdd Dependence



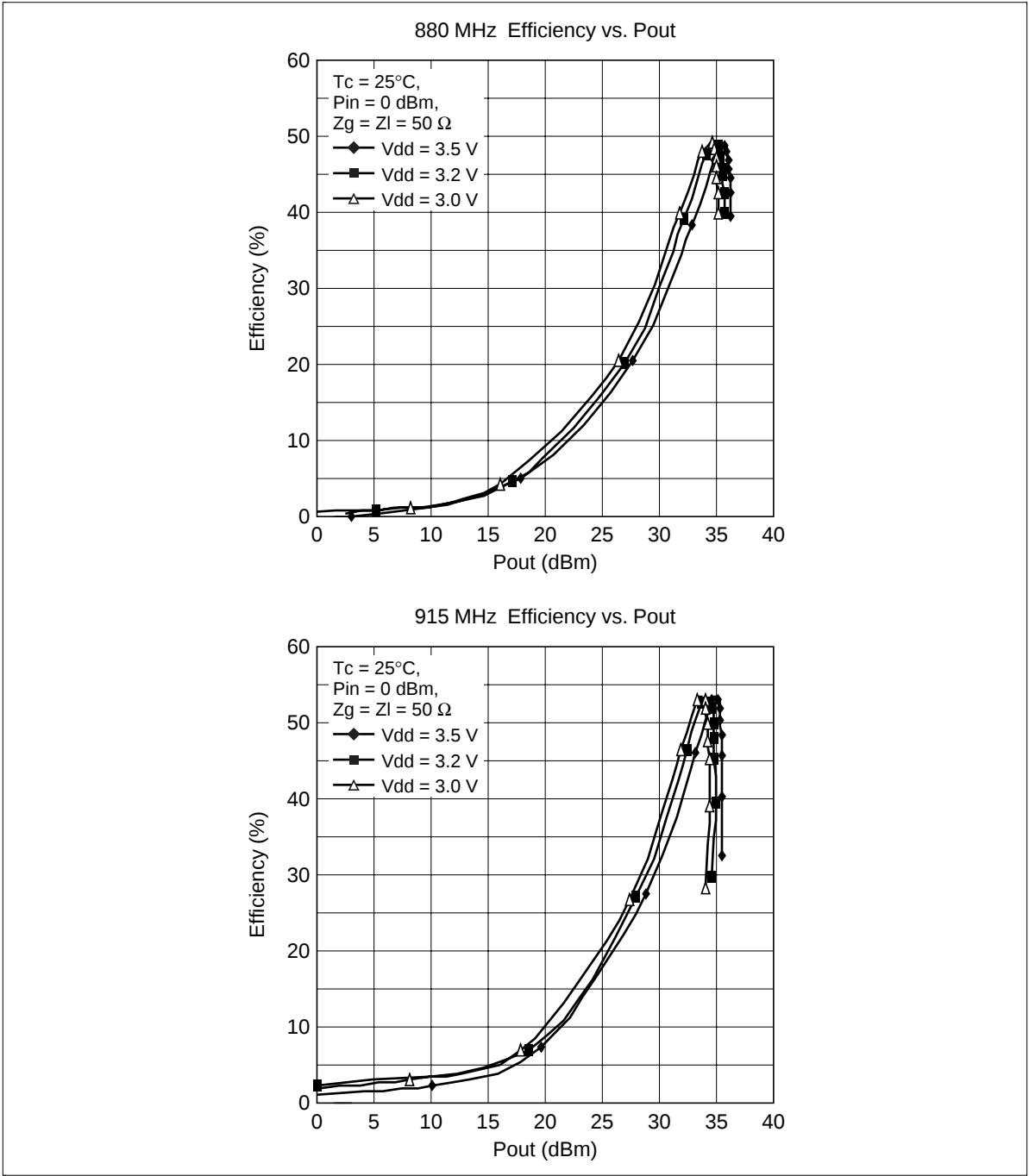
Pin vs Pout – Temperature Dependence



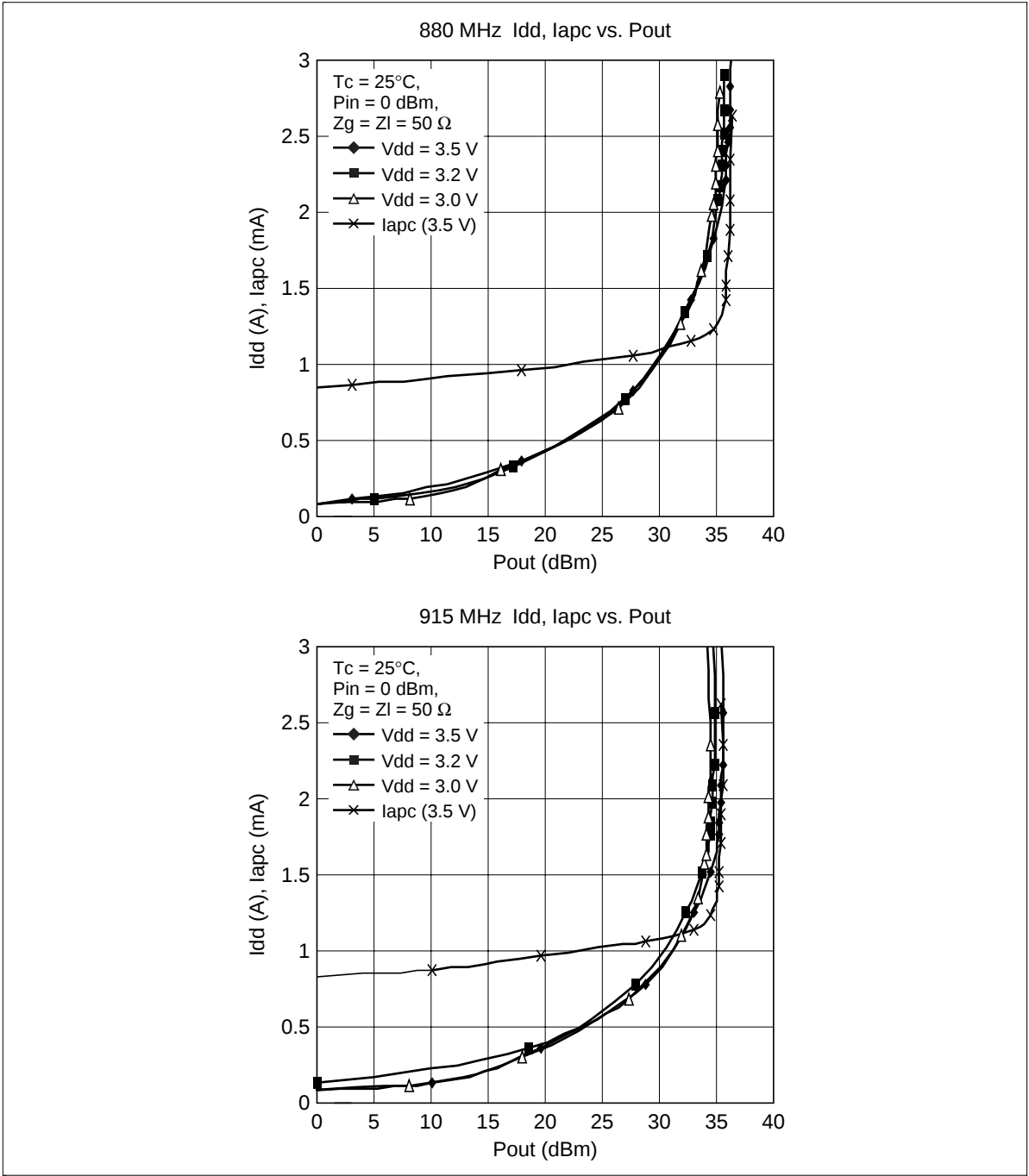
Pin vs Efficiency – Temperature Dependence



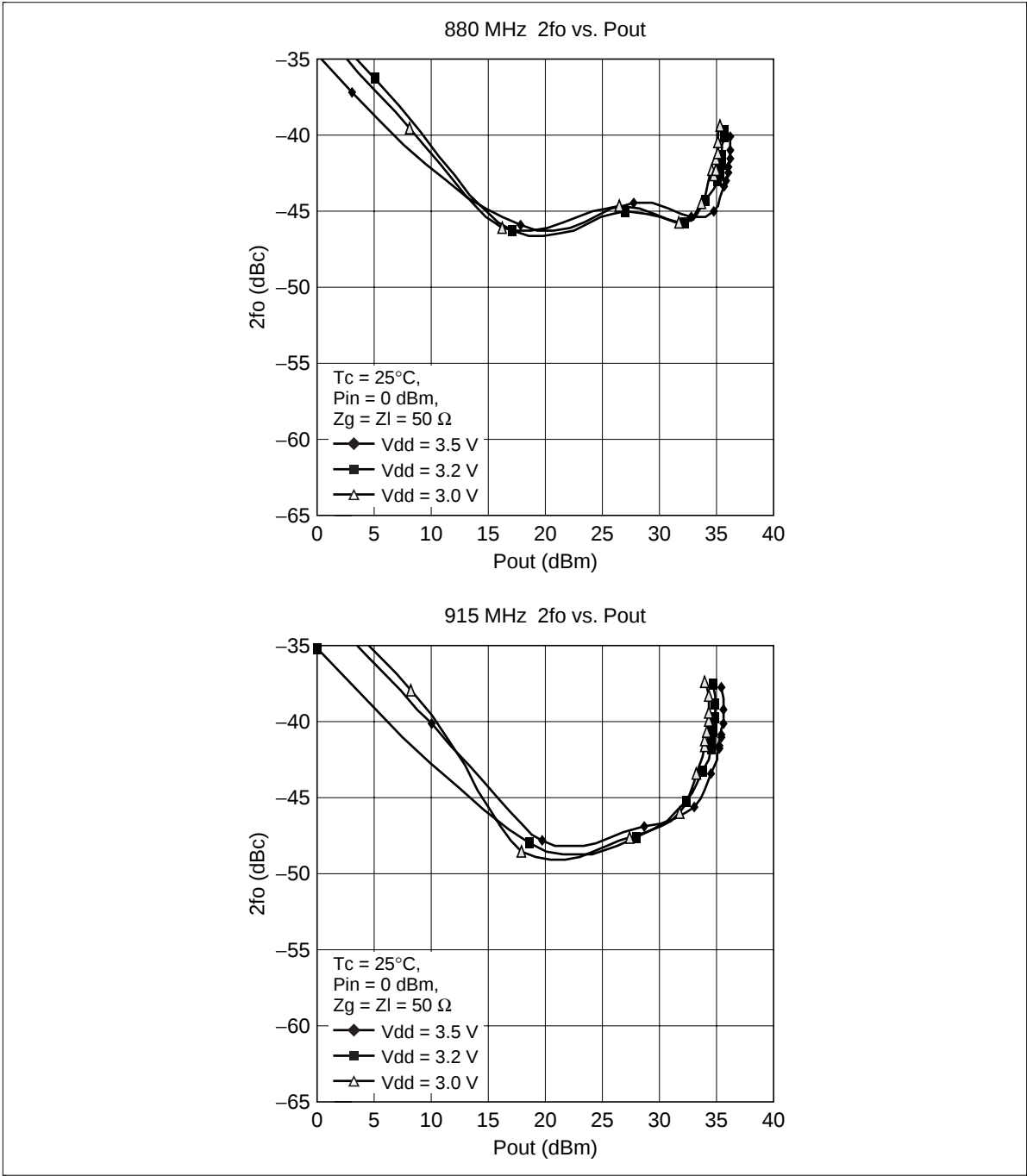
Pout vs Efficiency – Vdd Dependence



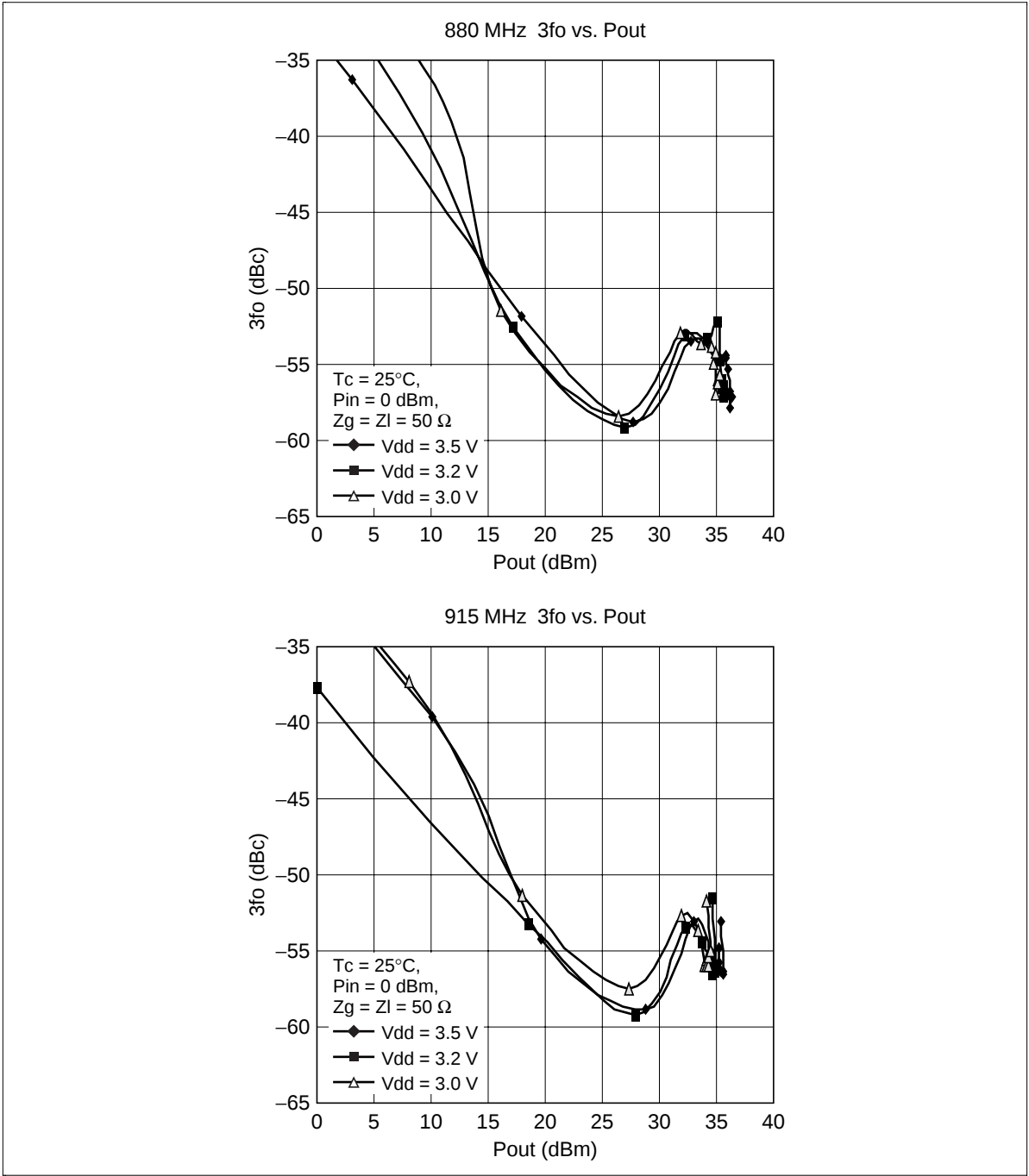
Pout vs Idd – Vdd Dependence



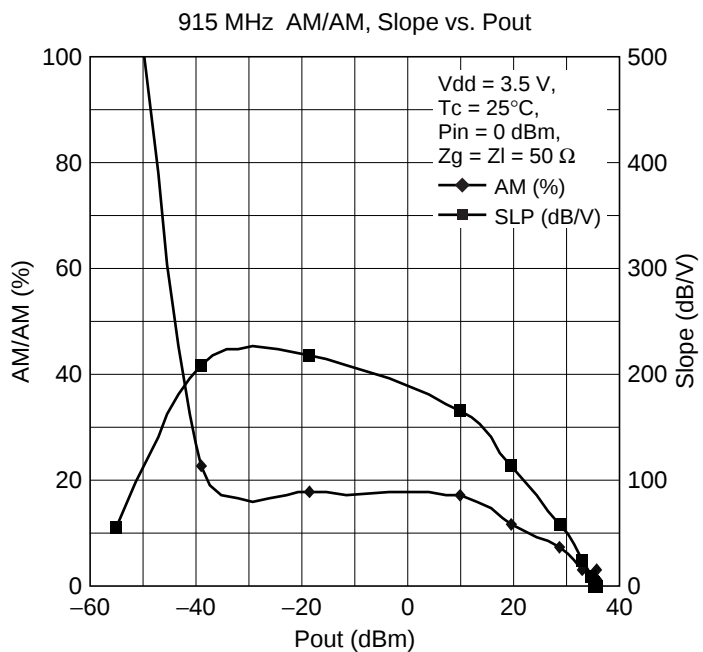
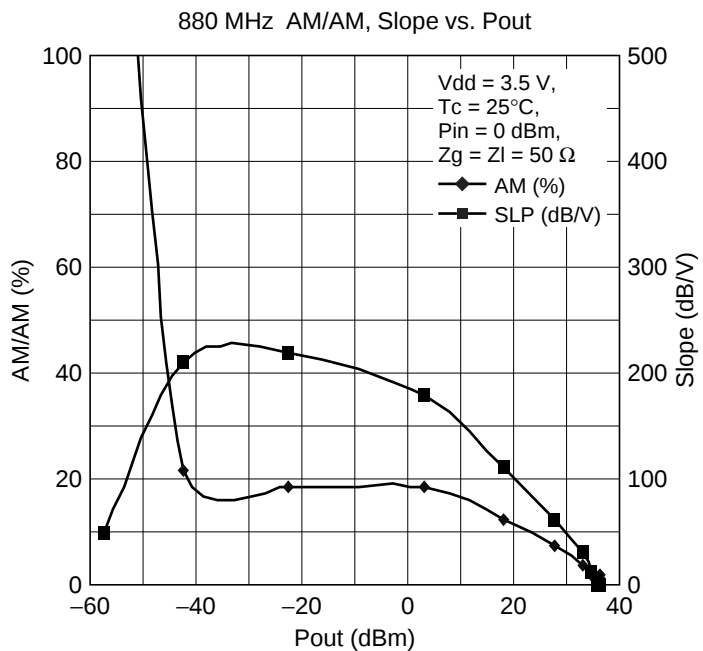
Pout vs Harmonic Distortion – Vdd Dependence



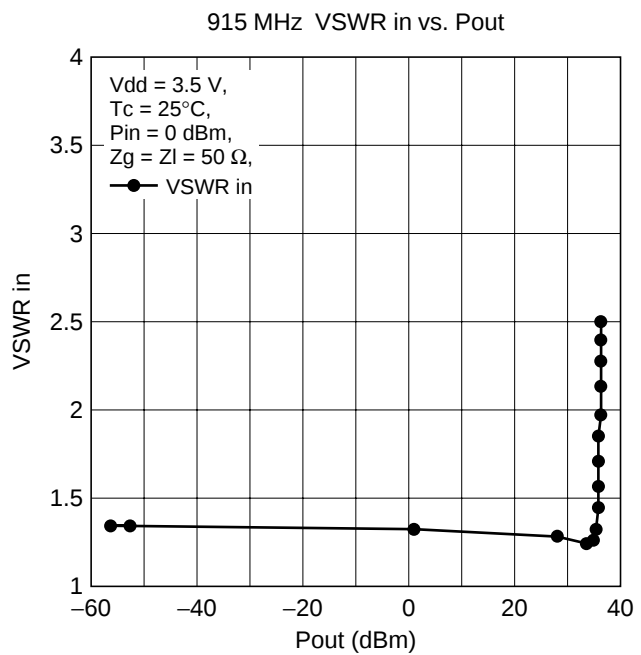
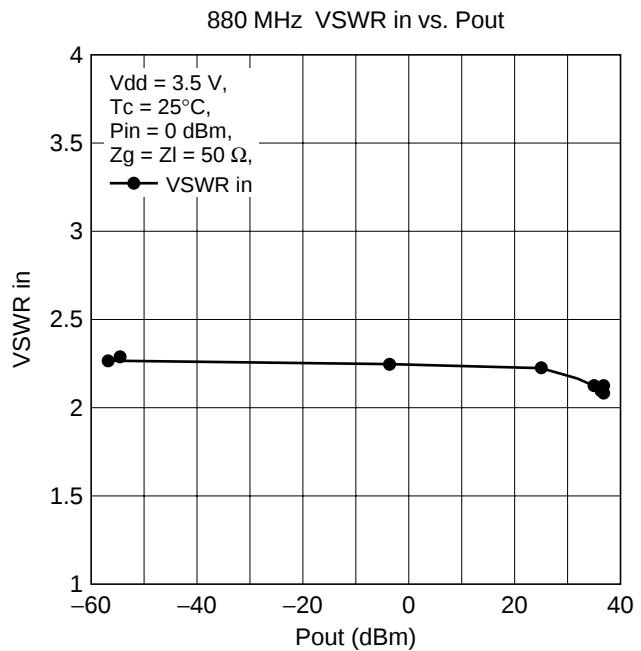
Pout vs Harmonic Distortion – Vdd Dependence (cont)



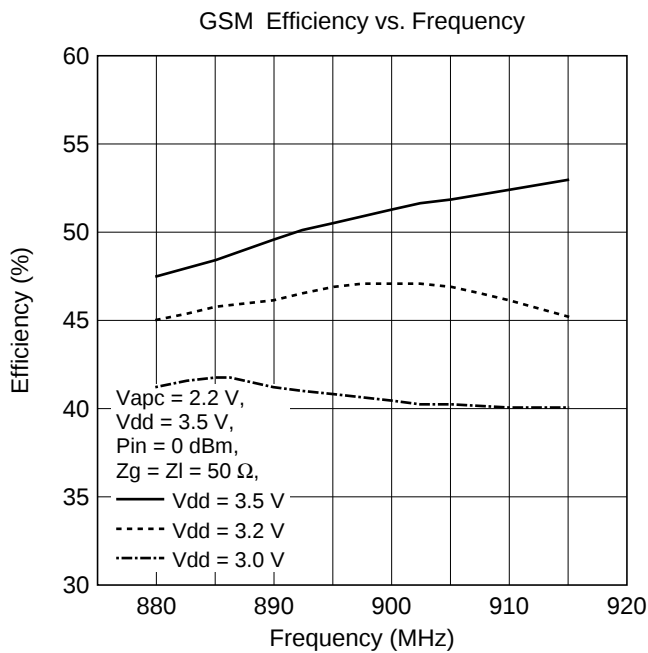
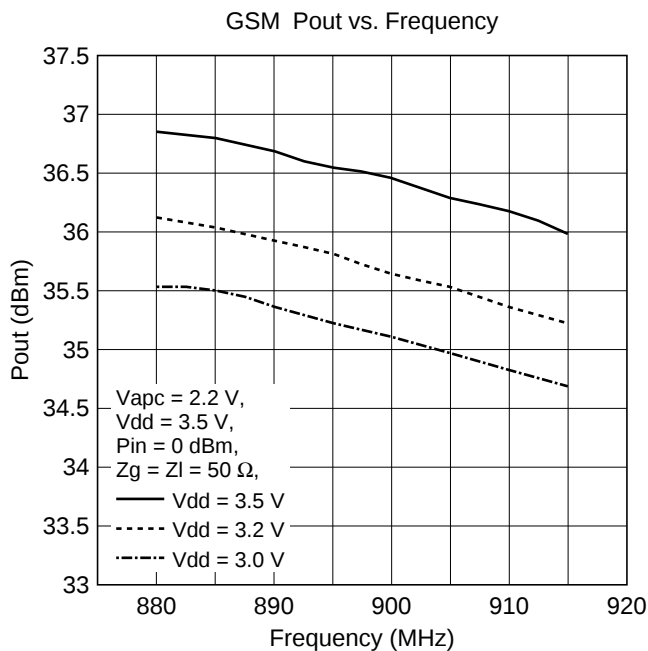
Pout vs Slope, AM-AM conversion



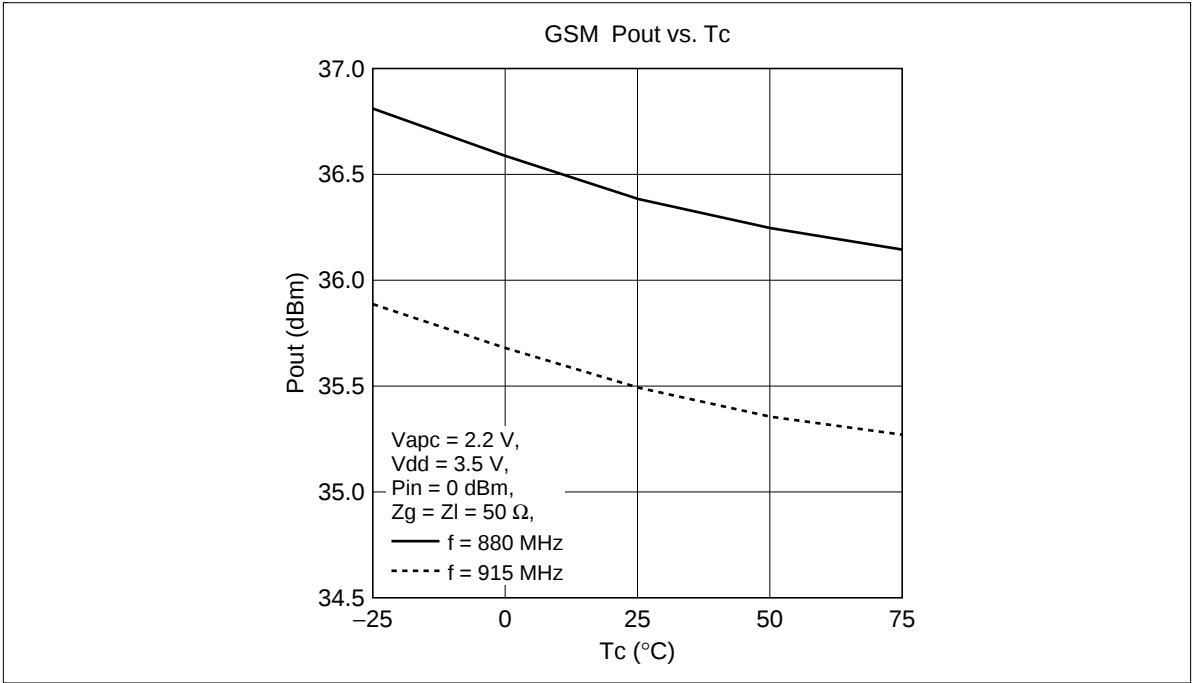
Pout vs Input VSWR



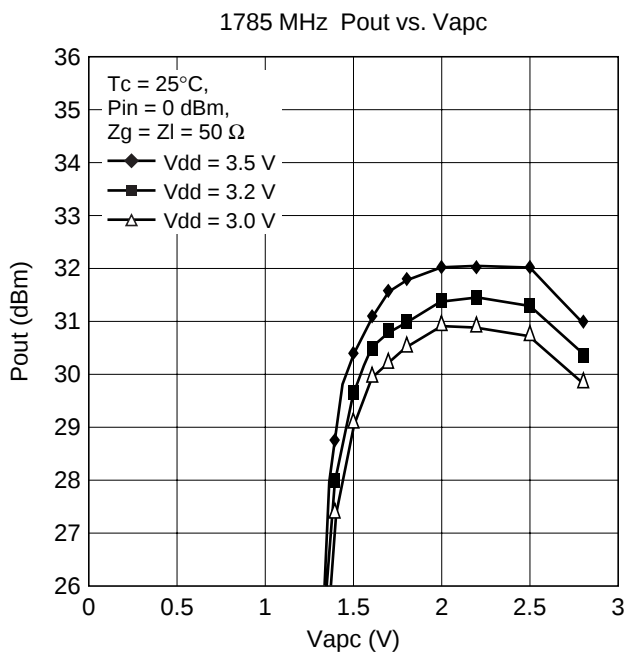
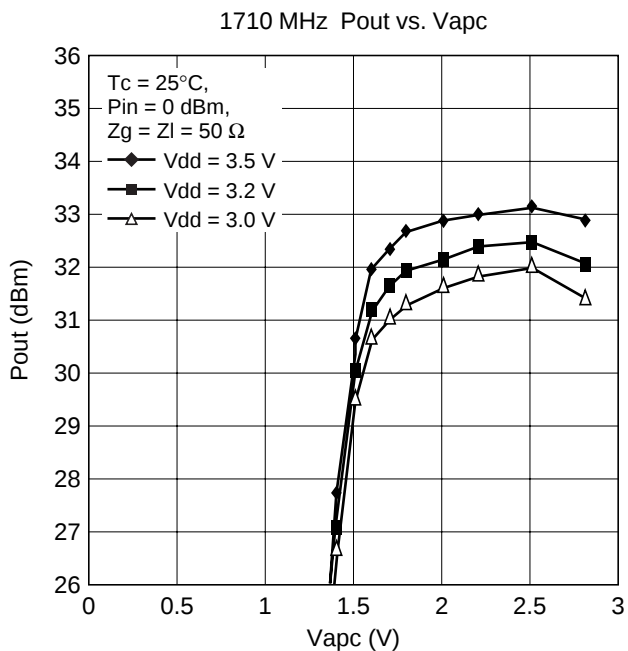
Frequency vs Pout, Efficiency – Vdd Dependence



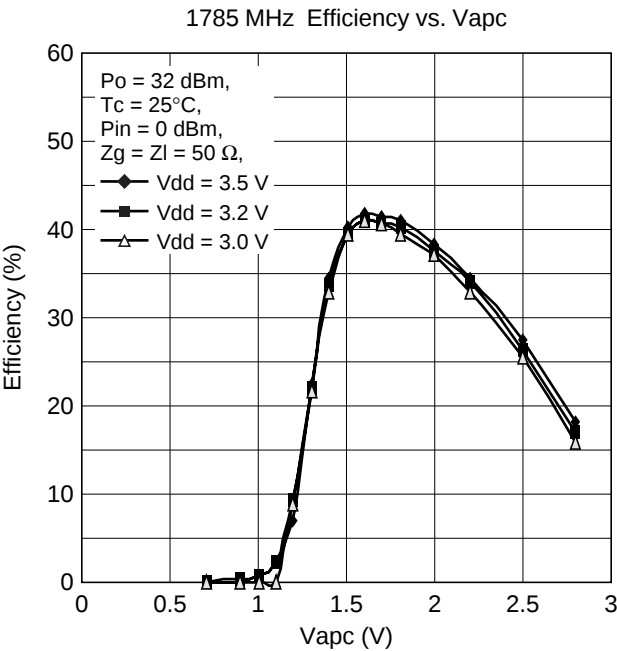
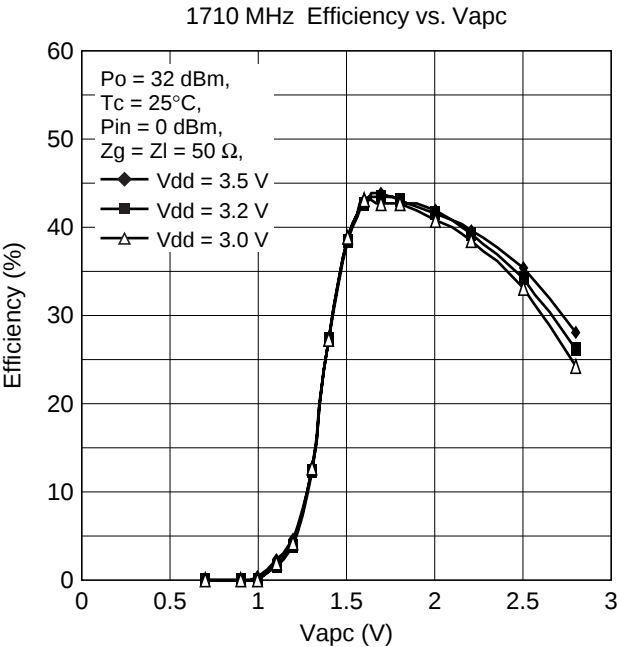
Pout – Temperature Dependence



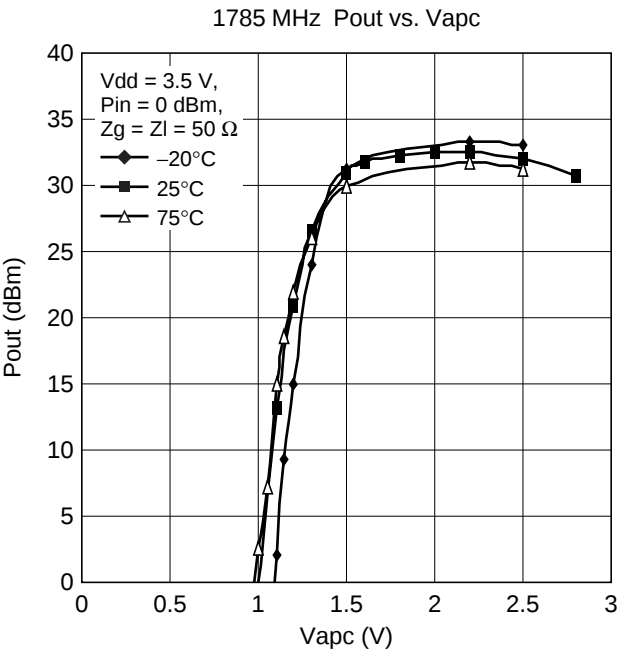
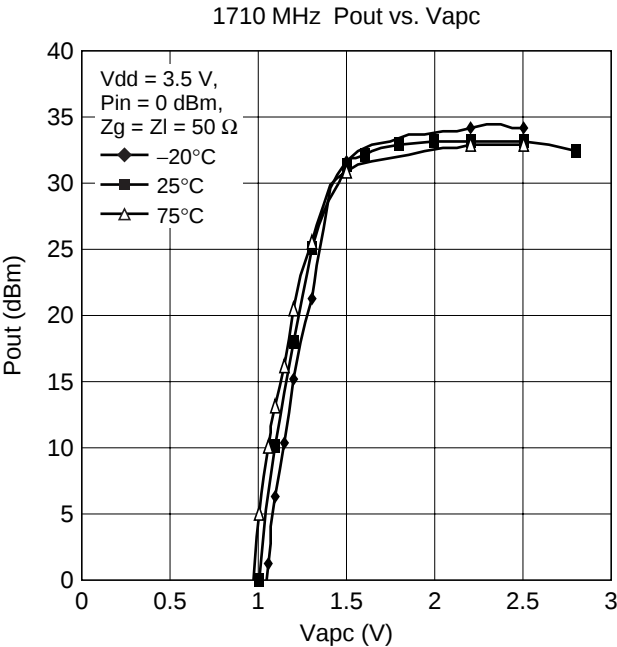
Vapc vs Pout – Vdd Dependence



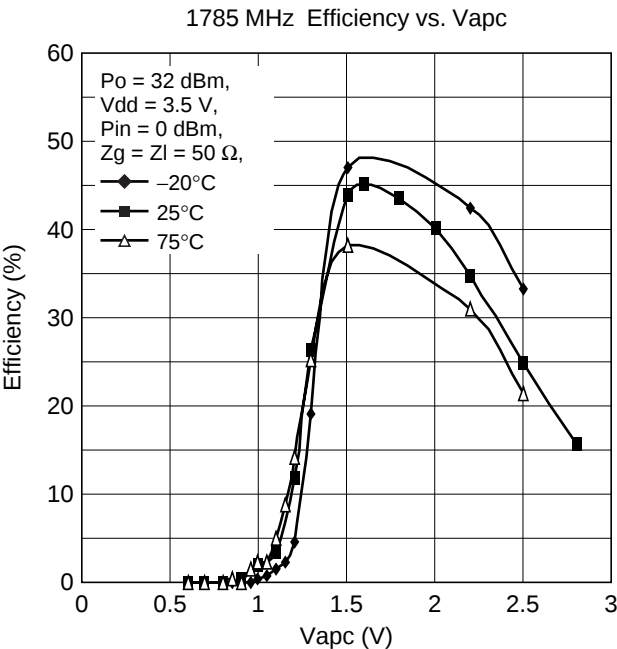
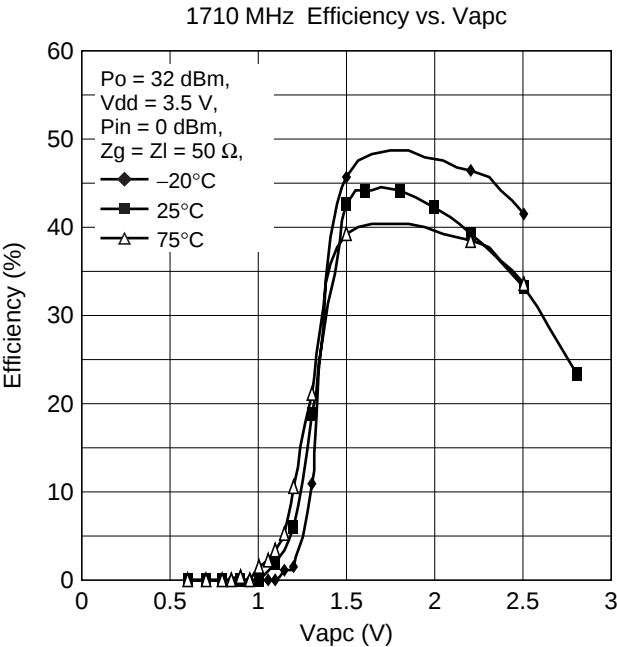
Vapc vs Efficiency – Vdd Dependence



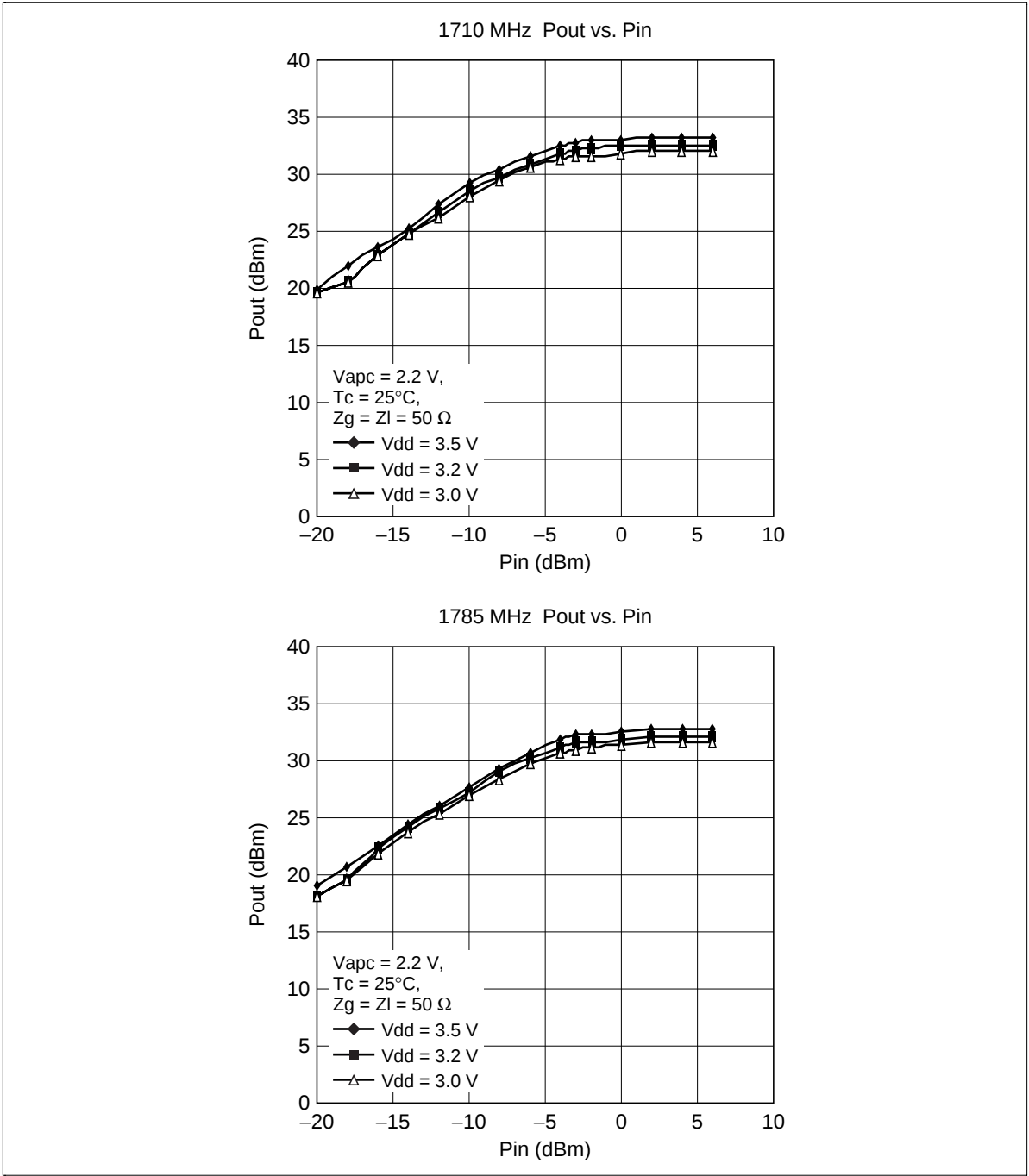
Vapc vs Pout – Temperature Dependence



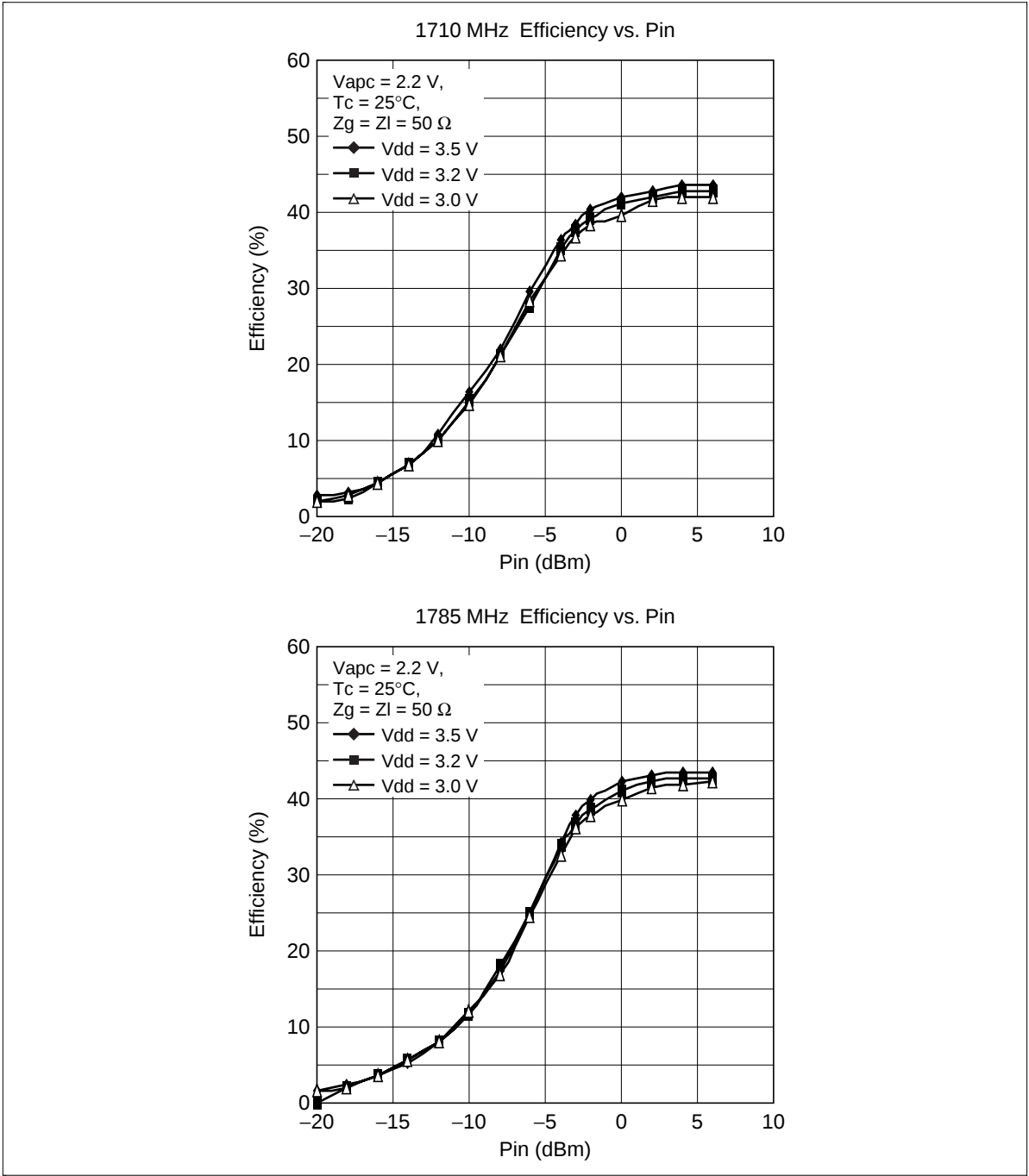
Vapc vs Efficiency – Temperature Dependence



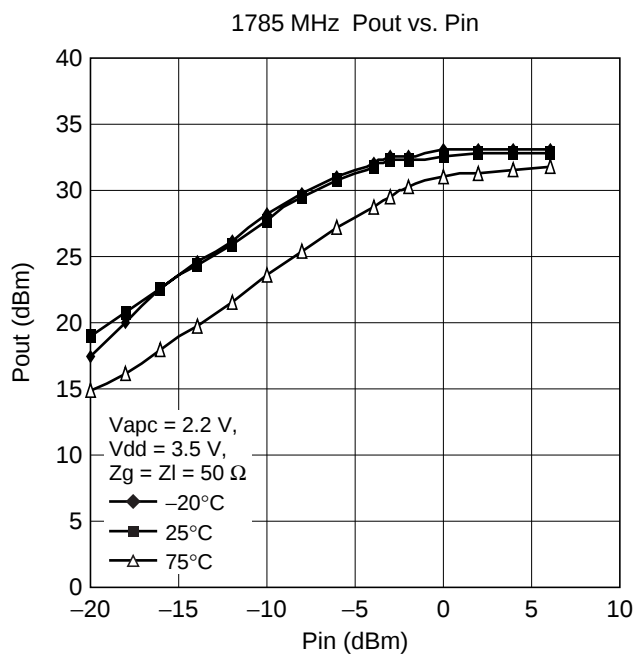
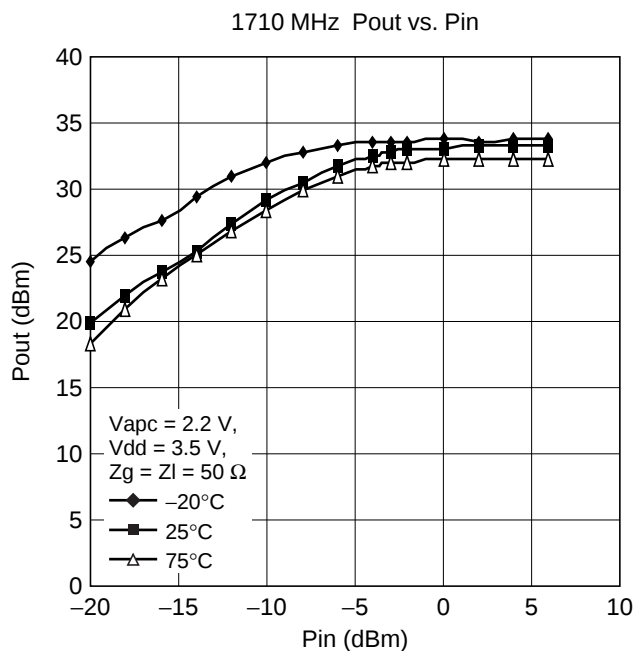
Pin vs Pout – Vdd Dependence



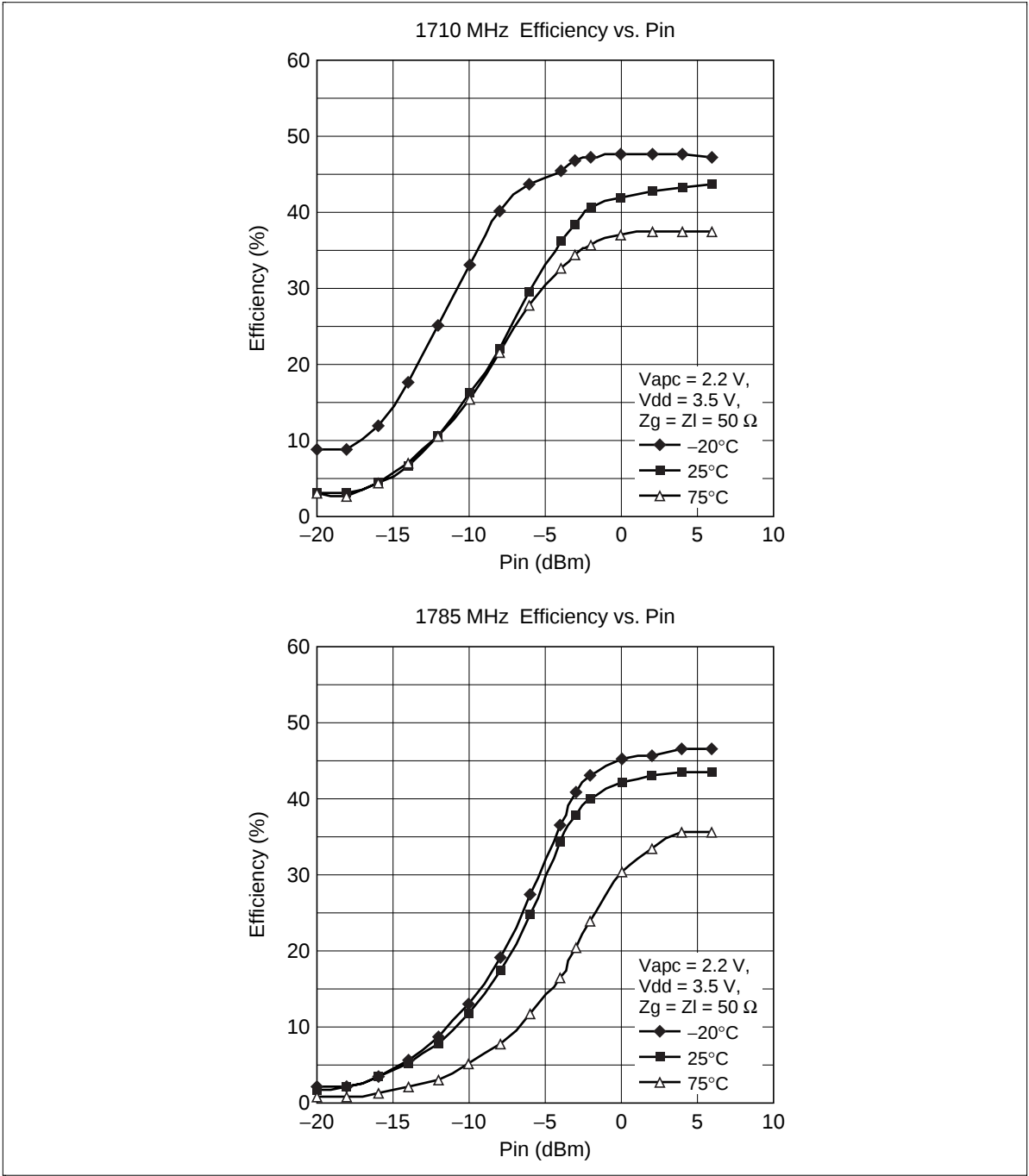
Pin vs Efficiency – Vdd Dependence



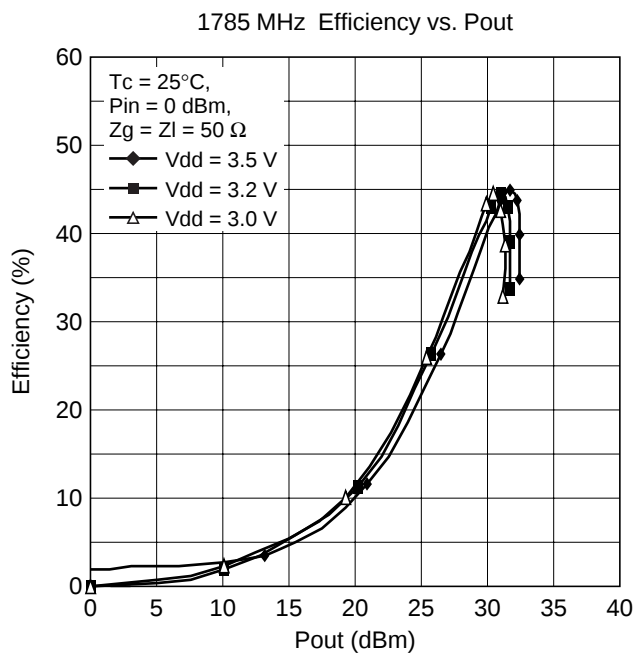
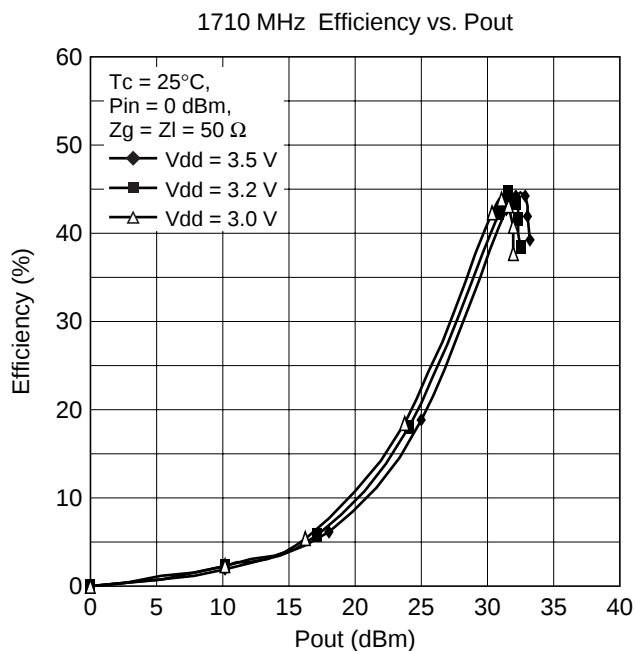
Pin vs Pout – Temperature Dependence



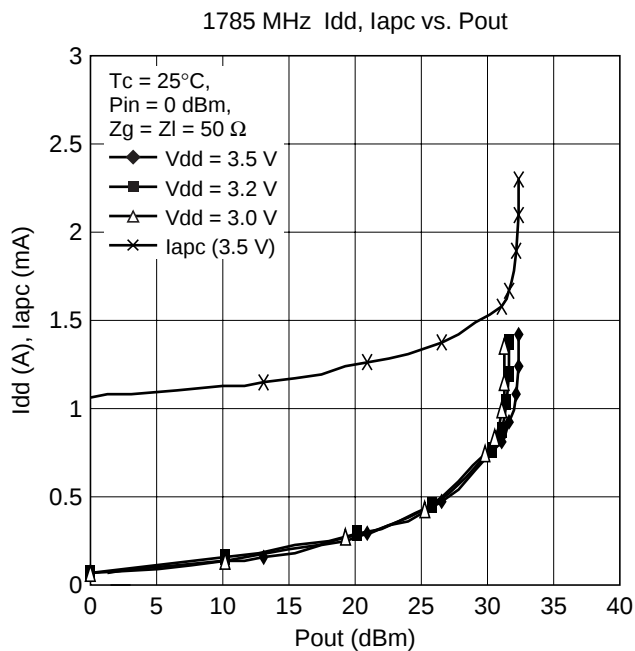
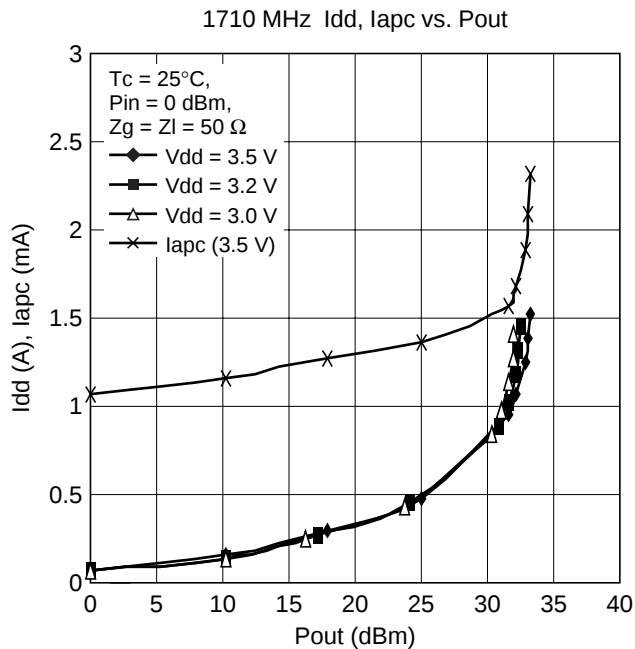
Pin vs Efficiency – Temperature Dependence



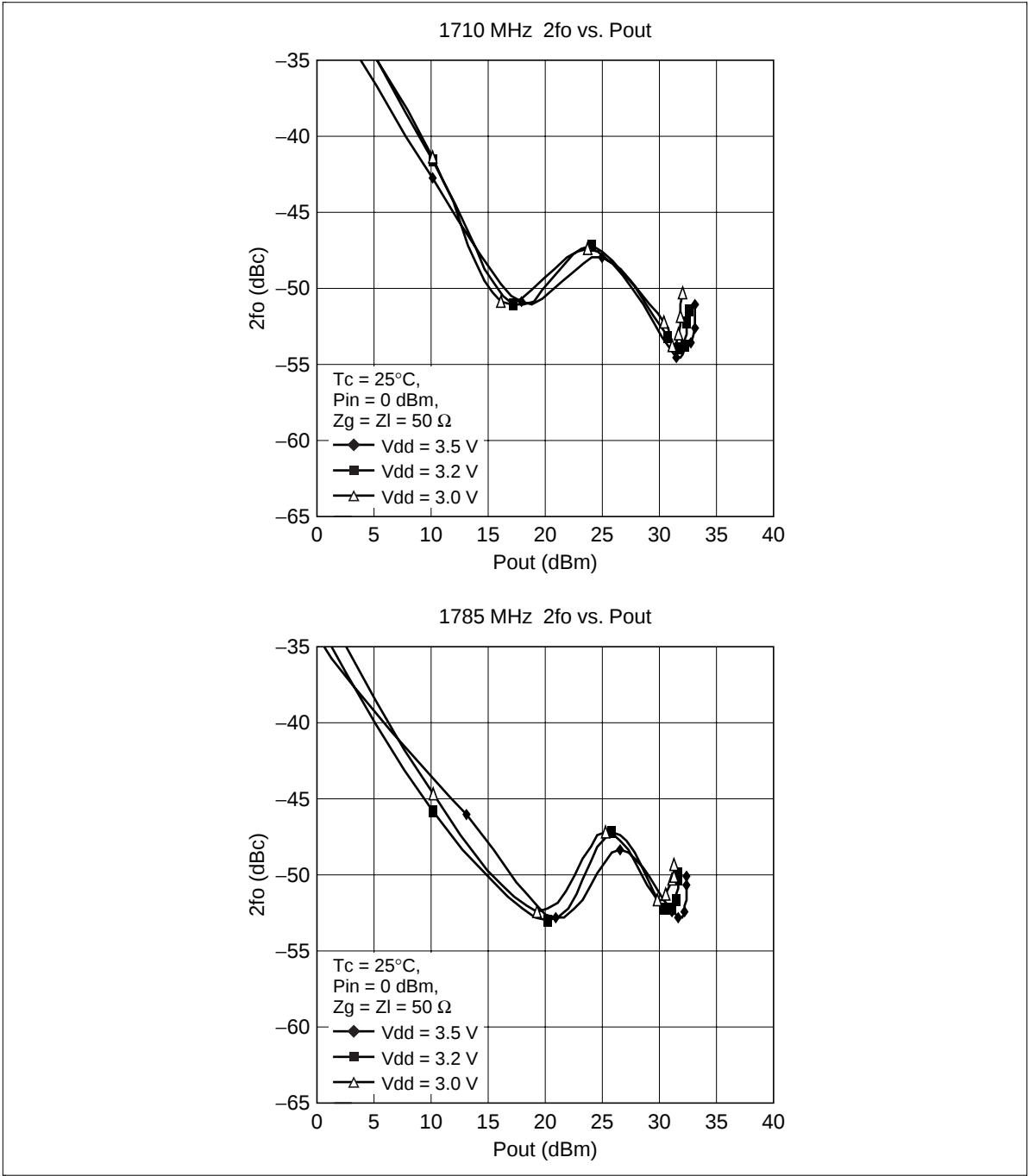
Pout vs Efficiency – Vdd Dependence



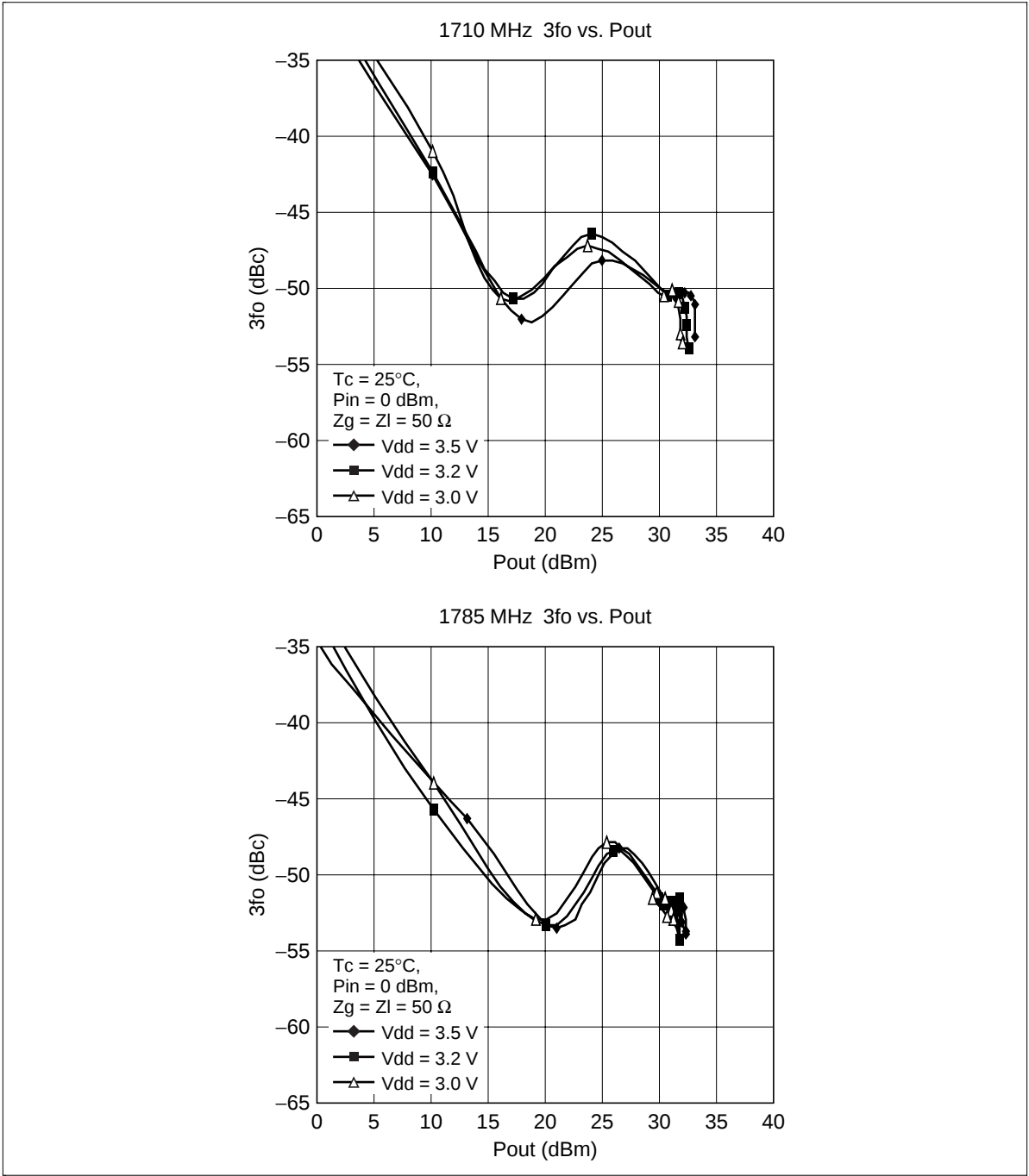
Pout vs Idd – Vdd Dependence



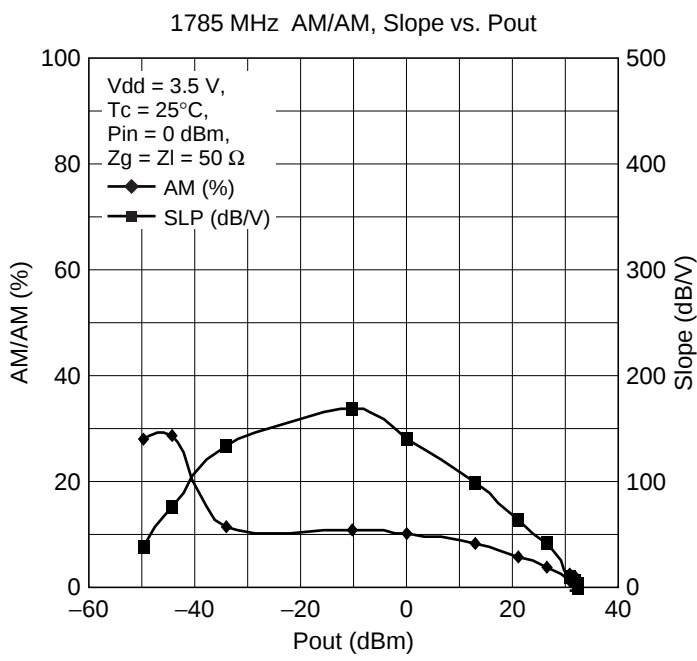
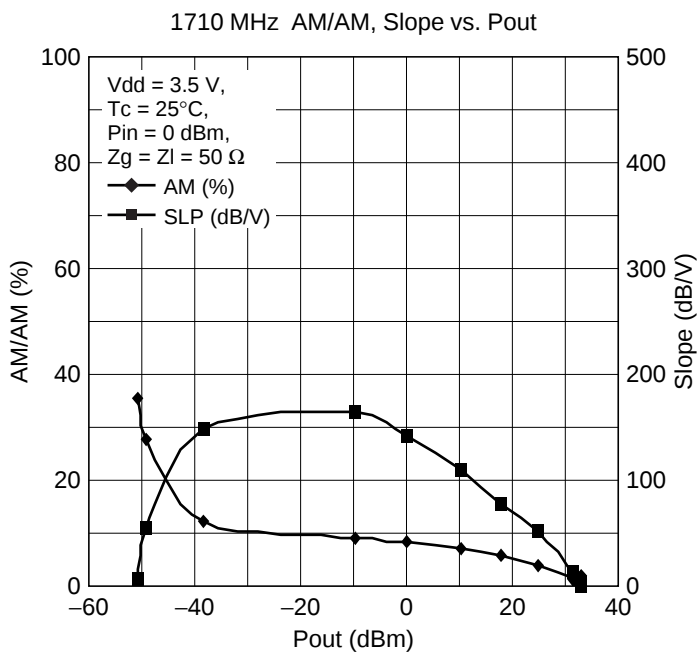
Pout vs Harmonic Distortion – Vdd Dependence



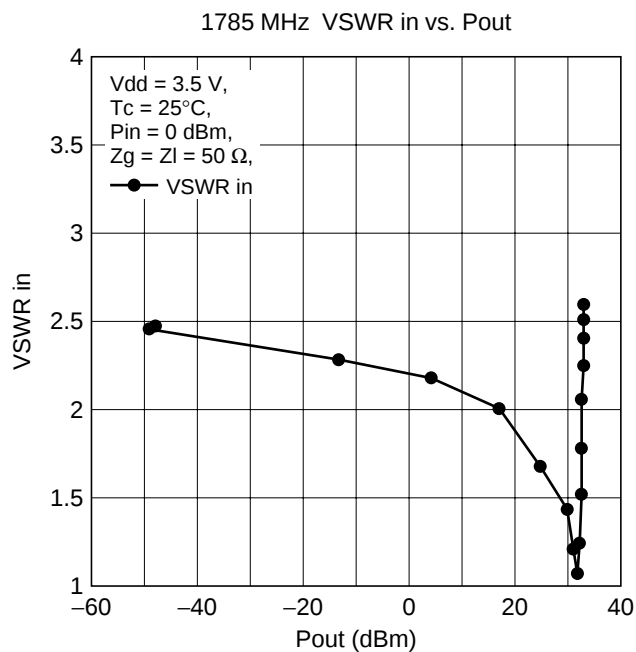
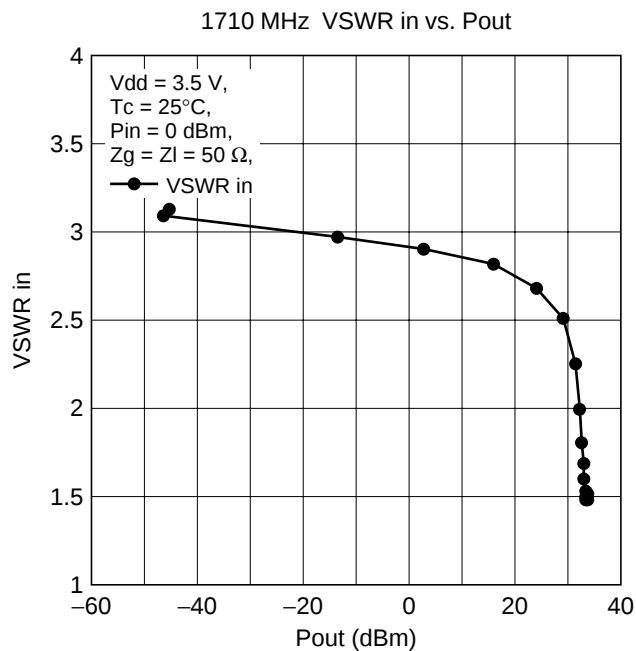
Pout vs Harmonic Distortion – Vdd Dependence



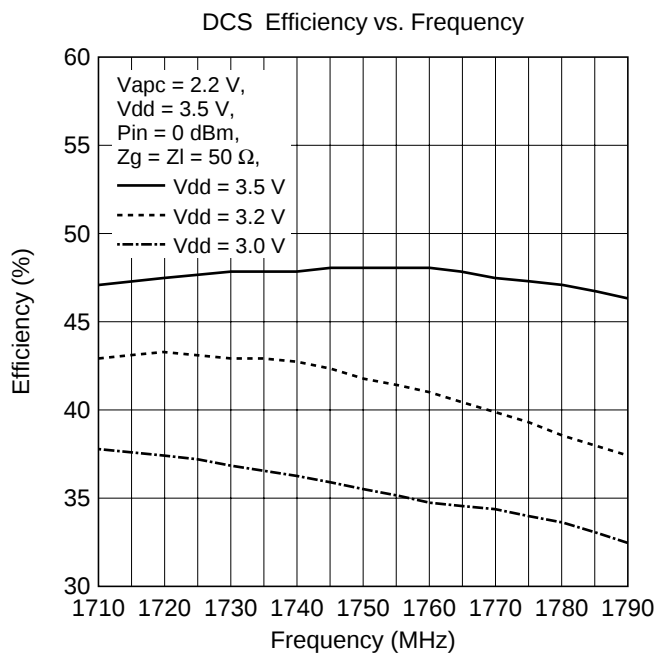
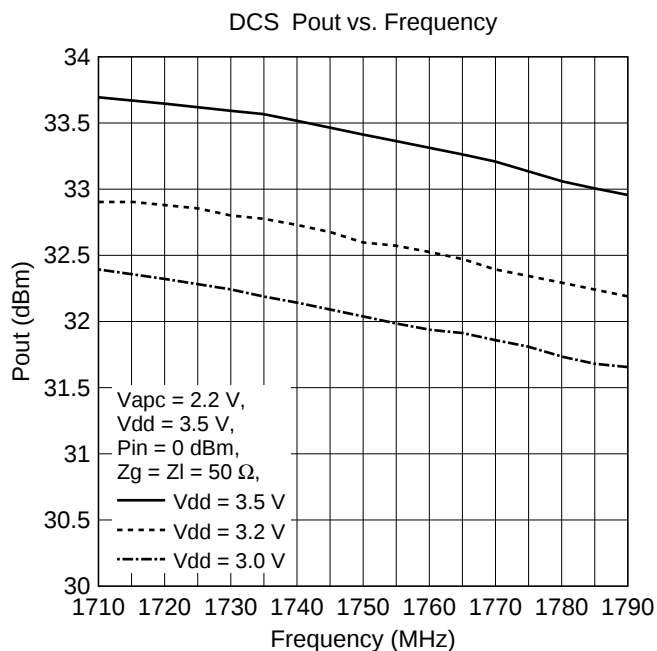
Pout vs Slope, AM-AM conversion



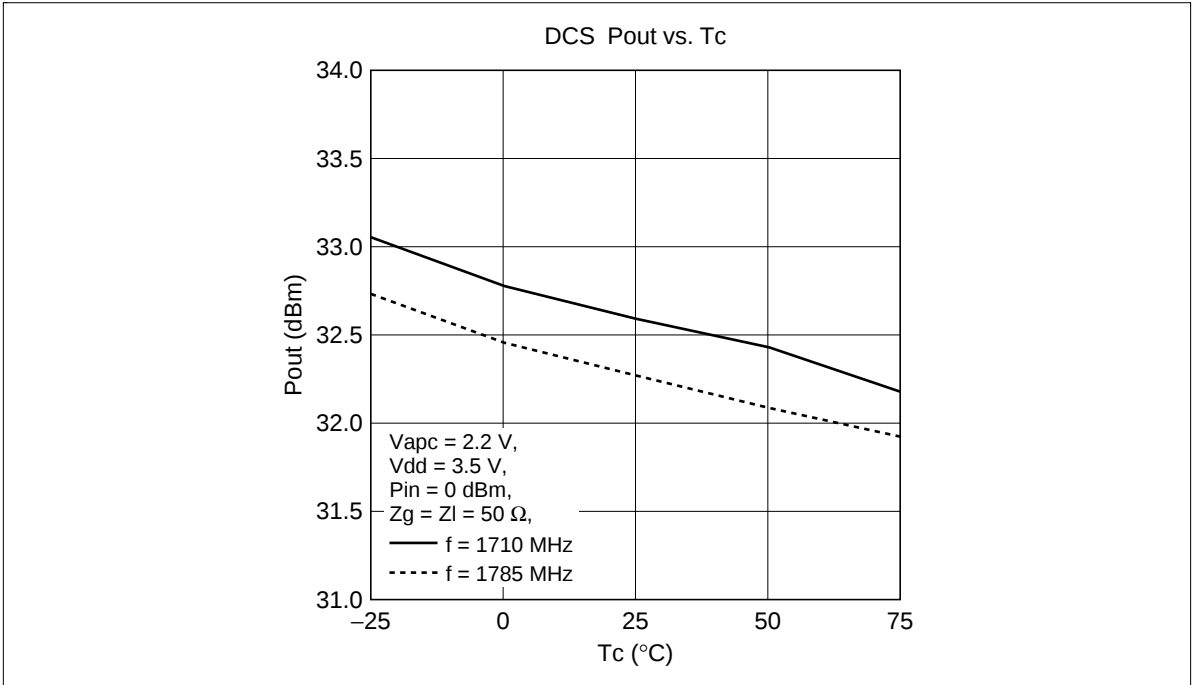
Pout vs Input VSWR



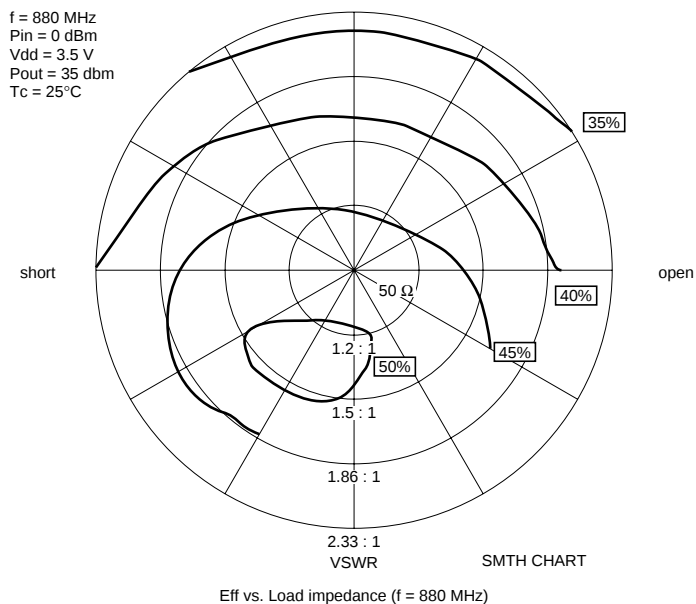
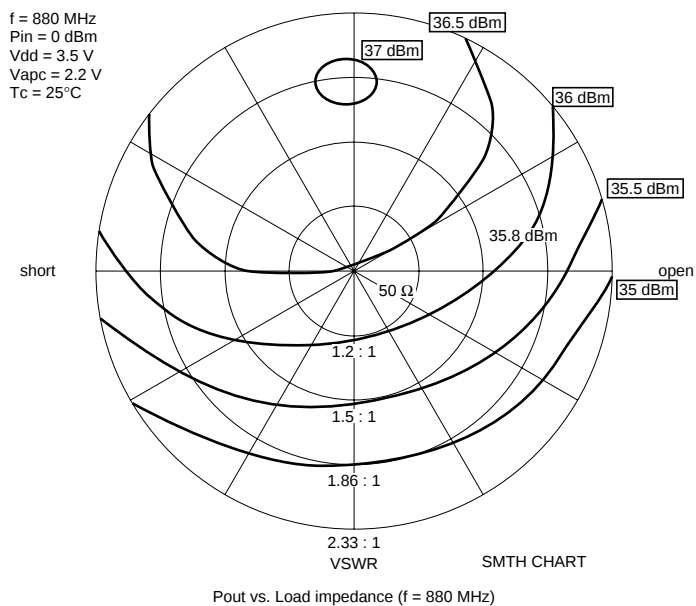
Frequency vs Pout, Efficiency – Vdd Dependence



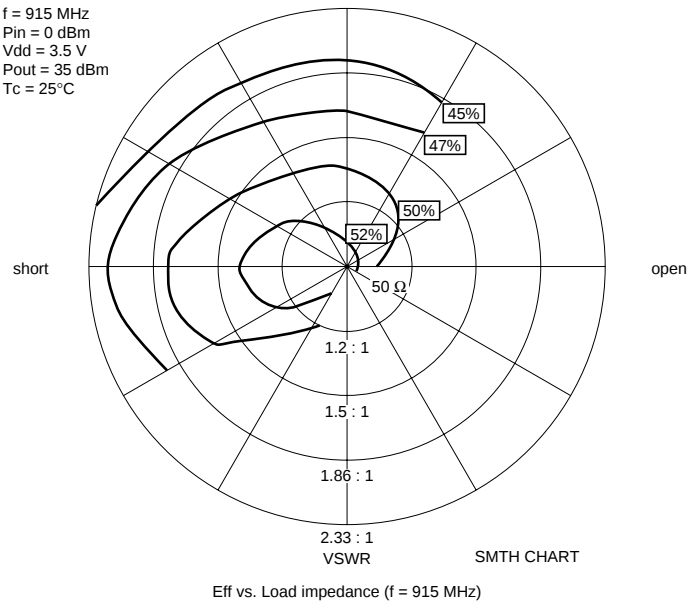
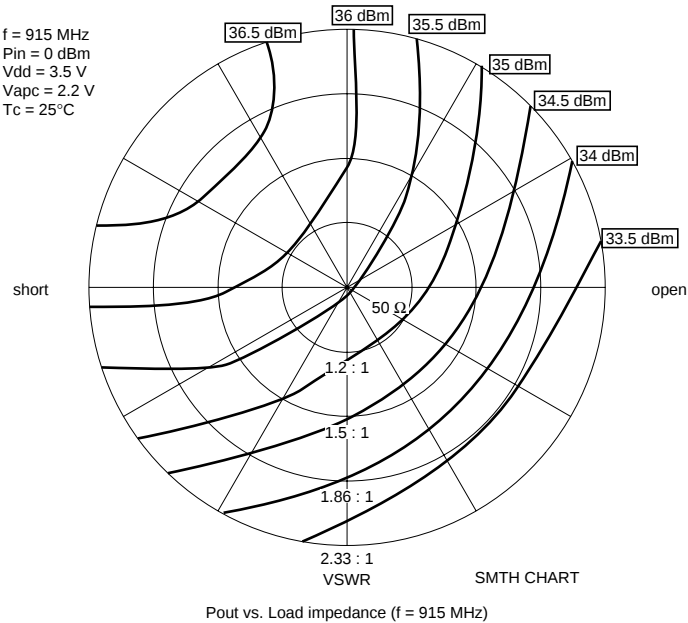
Pout – Temperature Dependence



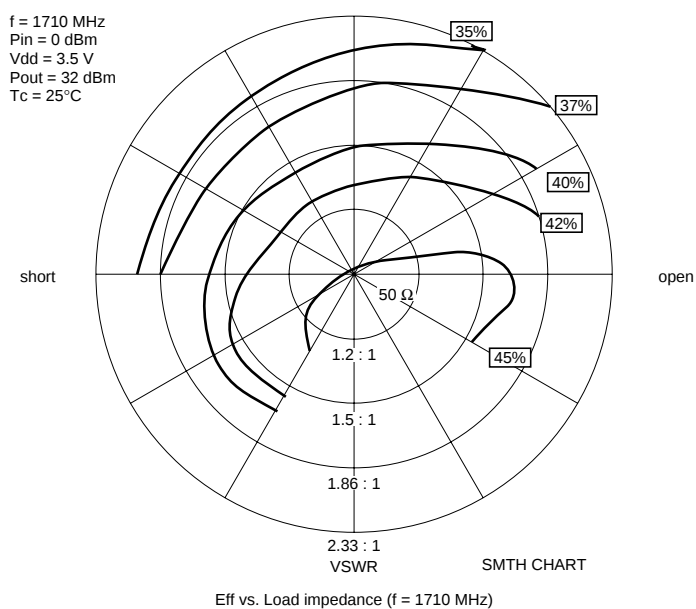
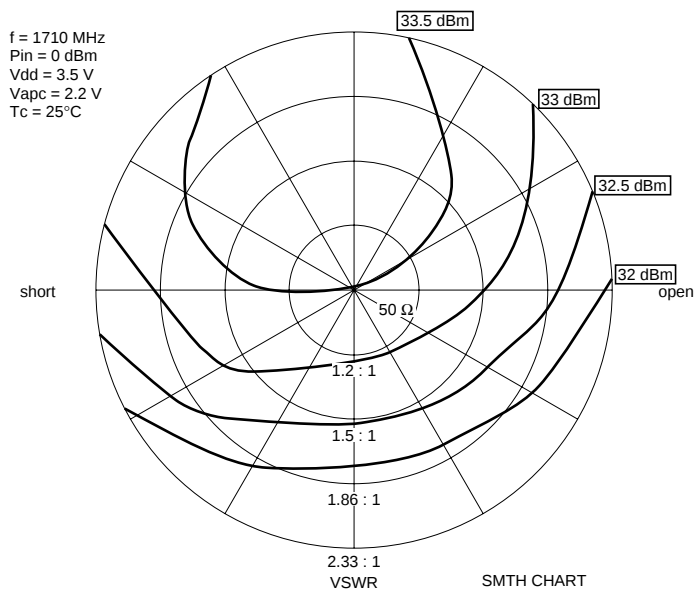
Pout, Eff vs Load impedance for PF08107B (f = 880 MHz)



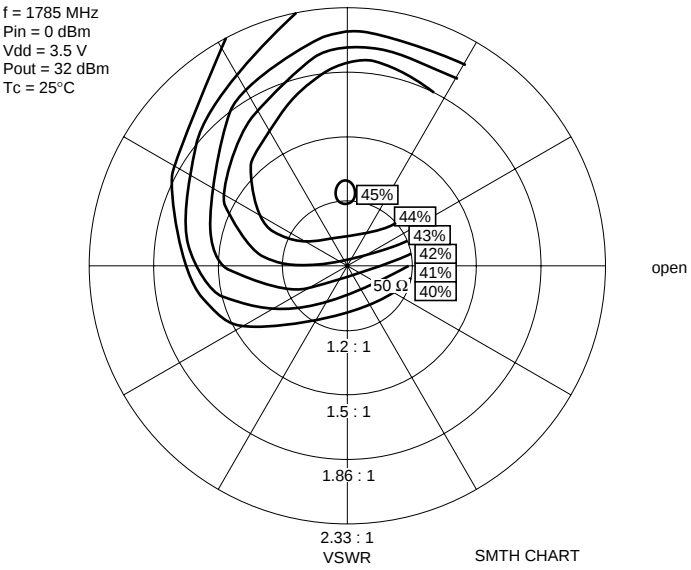
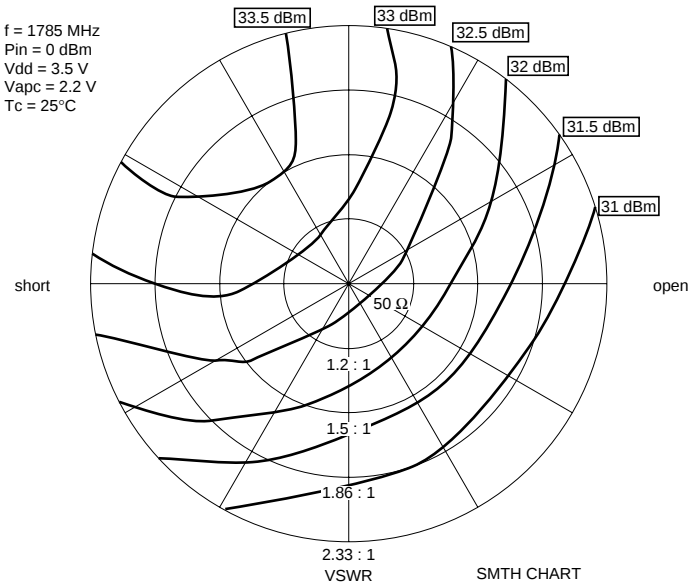
Pout, Eff vs Load impedance for PF08107B (f = 915 MHz)



Pout, Eff vs Load impedance for PF08107B (f = 1710 MHz)

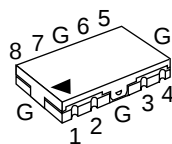
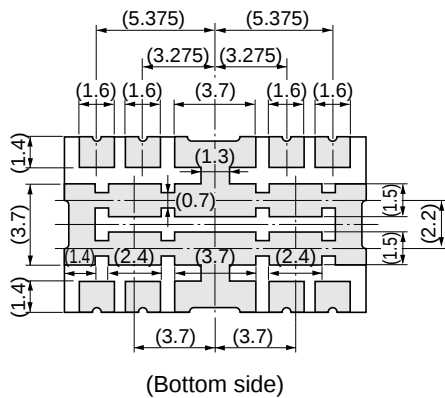
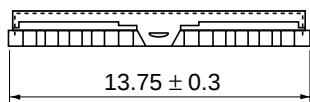
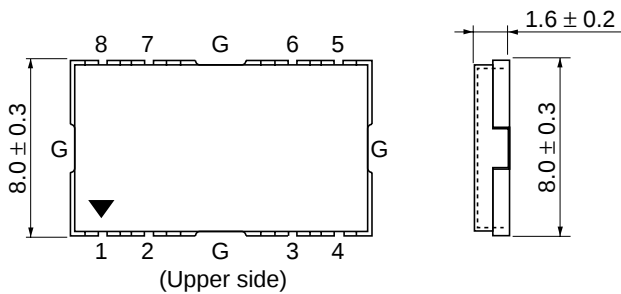


Pout, Eff vs Load impedance for PF08107B (f = 1785 MHz)



Package Dimensions

Unit: mm



- 1: Pin_{GSM}
- 2: V_{apc}
- 3: V_{dd1}
- 4: P_{out}_{GSM}
- 5: P_{out}_{DCS}
- 6: V_{dd2}
- 7: V_{ctl}
- 8: Pin_{DCS}
- G: GND

Remark:
Coplanarity of bottom side of terminals
are less than 0 ± 0.1mm.

Hitachi Code	RF-K-8
JEDEC	—
EIAJ	—
Mass (reference value)	—

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