

PF08114B

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

HITACHI

ADE-208-1029B (Z)

Rev.2
Dec. 2001

Application

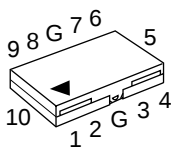
- Dual band amplifier for E-GSM (880 MHz to 915 MHz) and DCS1800 (1710 MHz to 1785 MHz)
- For 3.5 V nominal operation

Features

- 2 in / 2 out dual band amplifier
- Simple external circuit including output matching circuit
- Simple power control
- 2stage amplifier : 10 dBm input Typ
- Lead less thin & small package : $8 \times 12.3 \times 1.6$ mm Typ
- High efficiency : 54% Typ at 34.5 dBm for E-GSM
: 52% Typ at 31.5 dBm for DCS1800

Pin Arrangement

• RF-K1-10



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

Absolute Maximum Ratings

(Tc = 25°C)

Item	Symbol	Rating	Unit
Supply voltage	Vdd	7 * ¹	V
Vapc voltage	Vapc	4.3 * ²	V
Input power	Pin	15	dBm
Operating case temperature	Tc (op)	−25 to +100	°C
Storage temperature	Tstg	−30 to +100	°C

Notes: 1. This value is specified at no operation. (Vapc = 0 V)
2. This value is specified at no operation. (Vdd = 0 V)
At Vdd > 0, Vapc controlled, Idd = 0 to x A, where x = current at Pout = 34.5 dBm (@GSM),
31.5 dBm (@DCS), 50 Ω Load, Vdd = 3.5 V and Tcase = 25°C

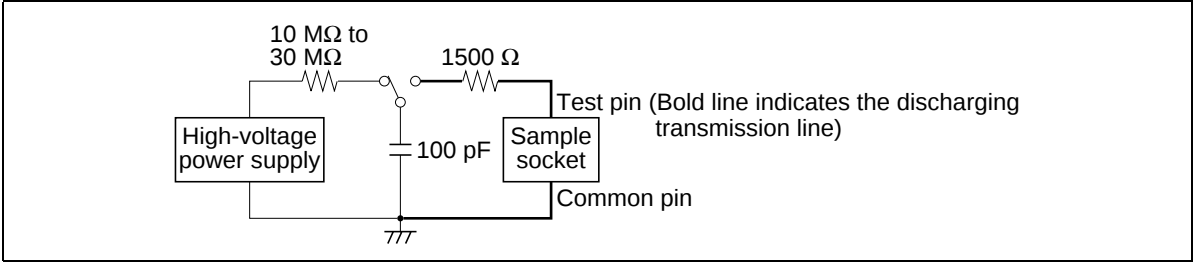
Electrical Characteristics for DC

(Tc = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Condition
Drain cutoff current	Ids	—	—	10	μA	Vdd = 4.5 V, Vapc = 0 V, Vband = 0 V
		—	—	500	μA	Vdd = 4.5 V, Vapc = 0 V, Vband = 2 V
Vapc control current	Iapc	—	—	3	mA	Vdd = 3.5 V, Pin = 8 to 12 dBm, Pout = 34.5 dBm @GSM900 Pout = 31.5 dBm @DCS1800 Vapc controlled, Rg = RI = 50 Ω

ESD

Product quality guide level for ESD is 500 V at following test circuit.



Electrical Characteristics for E-GSM mode

(Tc = 25°C)

Test conditions unless otherwise noted:

Vdd1 = Vdd2 = 3.5 V, Pin = 8 to 10 dBm, Vband = 0 V, Rg = Rl = 50 Ω, Tc = 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)	Vband	0.0	—	0.2	V	
Input power	Pin	8	10	12	dBm	
Supply voltage	Vdd	2.9	3.5	4.5	V	
Total efficiency	η_r	45	54	—	%	Pout _{GSM} = 34.5dBm, Vapc = controlled
2nd harmonic distortion	2nd H.D.	—	−50	−41.5	dBc	
3rd harmonic distortion	3rd H.D.	—	−50	−41.5	dBc	
Input VSWR	VSWR (in)	—	1.5	3	—	
Output power (1)	Pout (1)	34.5	35.0	—	dBm	Vapc = 2.2V
Output power (2)	Pout (2)	32.9	33.5	—	dBm	Vdd = 2.9V, Vapc = 2.2V, Tc = +90°C
Isolation	—	—	−40	−25	dBm	Vapc = 0.2 V, Pin = 12dBm
Isolation at DCS RF-output when GSM is active	—	—	−30	−20	dBm	Pout _{GSM} = 34.5dBm, Measured at f = 1760 to 1830MHz
Switching time	t _r , t _f	—	1	2	μs	Pout _{GSM} = −10 to 34.5dBm, t = 90%
Stability	—	No parasitic oscillation > −36 dBm			—	All combinations of the following parameters: Vapc controlled ^{*1} , Pin = min to max, Vdd = 2.9 to 4.5V, Tcase = −20 to 90°C, Load VSWR = 7.5 : 1, All phase angles
Load VSWR tolerance	—	No degradation			—	All combinations of the following parameters: Vapc controlled ^{*1} , Pin = min to max, Vdd = 2.9 to 4.5V, Tcase = −20 to 90°C, Load VSWR = 7.5 : 1, All phase angles

Note: 1. Id = 0 A to x A, where x = current at Pout = 34.5 dBm, 50 Ω load, Vdd = 3.5 V and Tcase = 25°C. Vapc can range from 0.2 V to 4.3 V to control Idd.

Electrical Characteristics for DCS1800 mode

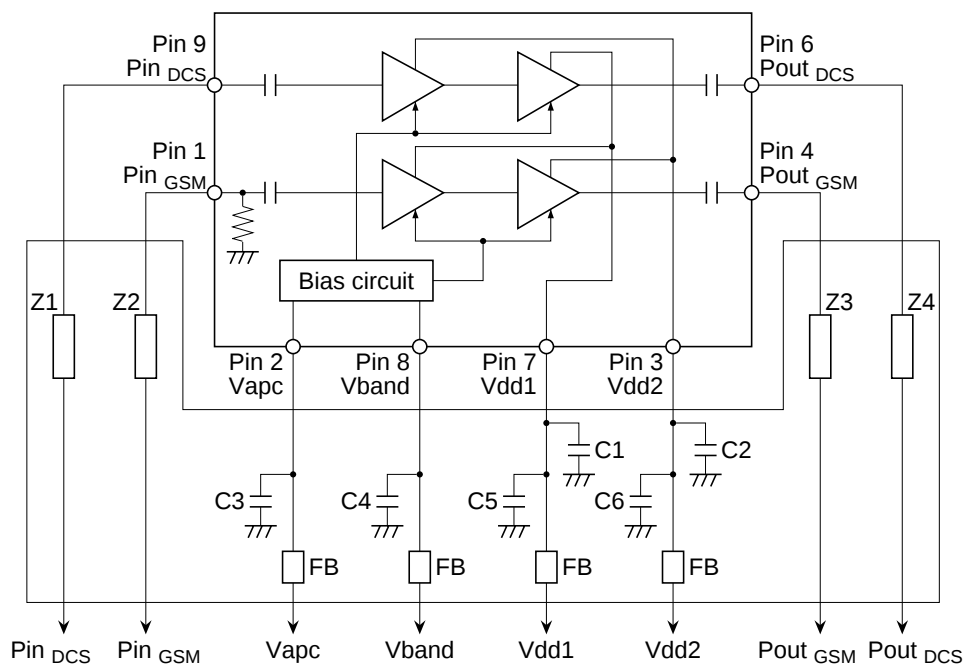
(Tc = 25°C)

Test conditions unless otherwise noted:
Vdd1 = Vdd2 = 3.5 V, Pin = 8 to 10 dBm, Vband = 2 V, Rg = Rl = 50 Ω, Tc = 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 1785MHz)
Band select (DCS active)	Vctl	1.9	—	2.9	V	
Input power	Pin	8	10	12	dBm	
Supply voltage	Vdd	2.9	3.5	4.5	V	
Total efficiency	η _r	45	52	—	%	Pout _{DCS} = 31.5dBm, Vapc = controlled
2nd harmonic distortion	2nd H.D.	—	−50	−38.5	dBc	
3rd harmonic distortion	3rd H.D.	—	−50	−38.5	dBc	
Input VSWR	VSWR (in)	—	1.5	3	—	
Output power (1)	Pout (1)	31.5	32.5	—	dBm	Vapc = 2.2V
Output power (2)	Pout (2)	30.0	31.0	—	dBm	Vdd = 2.9V, Vapc = 2.2V, Tc = +90°C
Isolation	—	—	−42	−36	dBm	Vapc = 0.2 V
Switching time	t _r , t _f	—	1	2	μs	Pout _{DCS} = −10 to 31.5dBm, t = 90%
Stability	—	No parasitic oscillation > −36 dBm			—	All combinations of the following parameters: Vapc controlled ^{*)} , Pin = min to max, Vdd = 2.9 to 4.5V, Tcase = −20 to 90°C, Load VSWR = 7.5 : 1, All phase angles
Intermodulation	—	—	−59	−52	dBc	Pout = 31.5dBm, Pinterferer at output, Fo + 3MHz at −11.5dBm, Measure Fo − 3MHz, RBW = 300kHz
Load VSWR tolerance	—	No degradation			—	All combinations of the following parameters: Vapc controlled ^{*)} , Pin = min to max, Vdd = 2.9 to 4.5V, Tcase = −20 to 90°C, Load VSWR = 7.5 : 1, All phase angles

Note: 1. Id = 0 A to x A, where x = current at Pout = 31.5 dBm, 50 Ω load, Vdd = 3.5 V and Tcase = 25°C.
Vapc can range from 0.2 V to 4.3 V to control Idd.

Internal Diagram and External Circuit



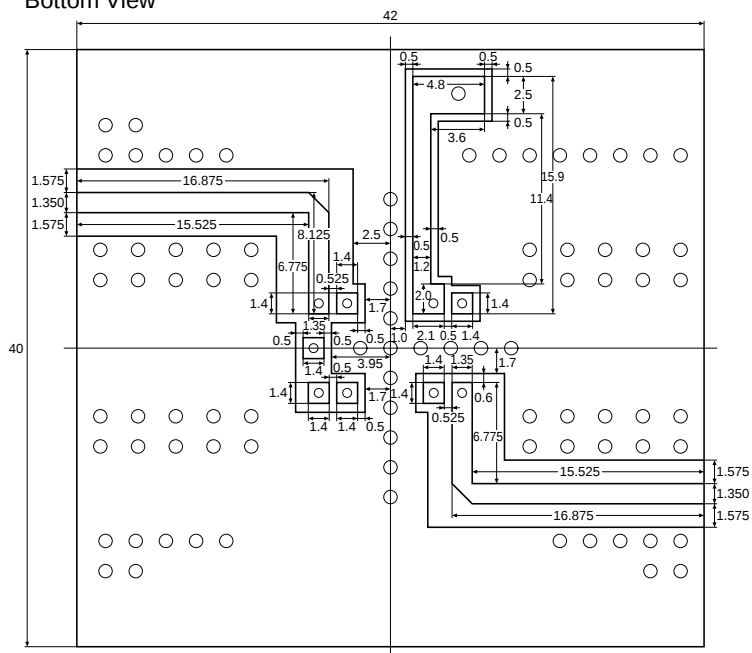
C1 = C2 = 10 μ F TANTALUM ELECTROLYTE

C3 = C4 = 1000 pF CERAMIC CHIP

C5 = C6 = C7 = 10000 pF CERAMIC CHIP

FB = FERRITE BEAD BLO1RN1-A62-001 (Manufacture: MURATA) or equivalent

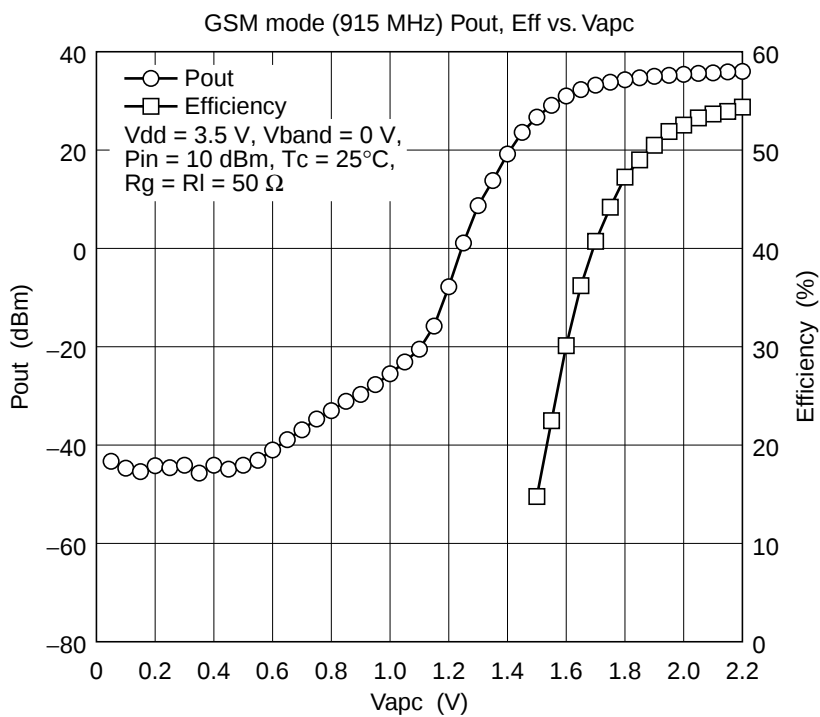
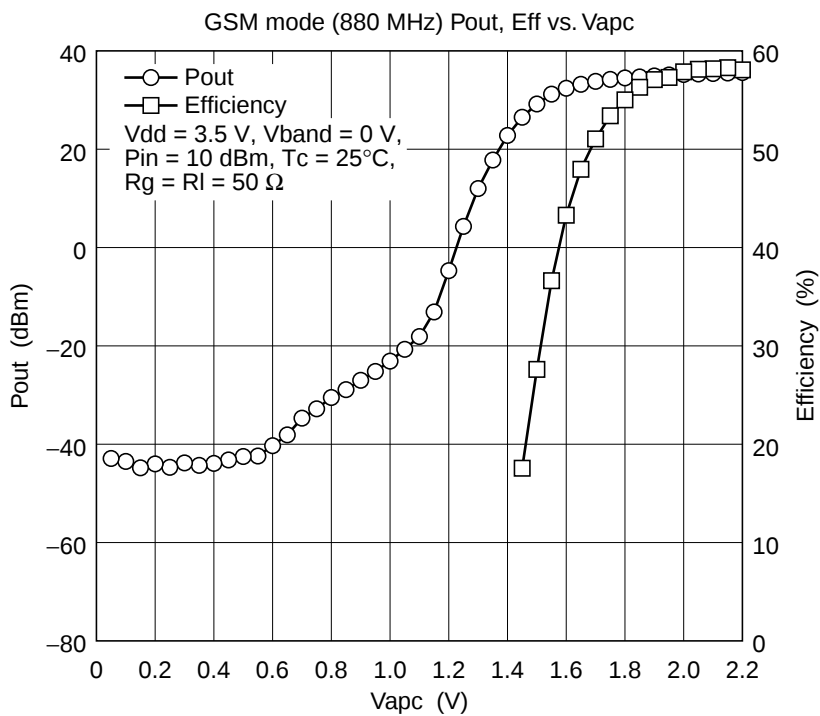
Z1 = Z2 = Z3 = Z4 = 50 Ω MICROSTRIP LINE

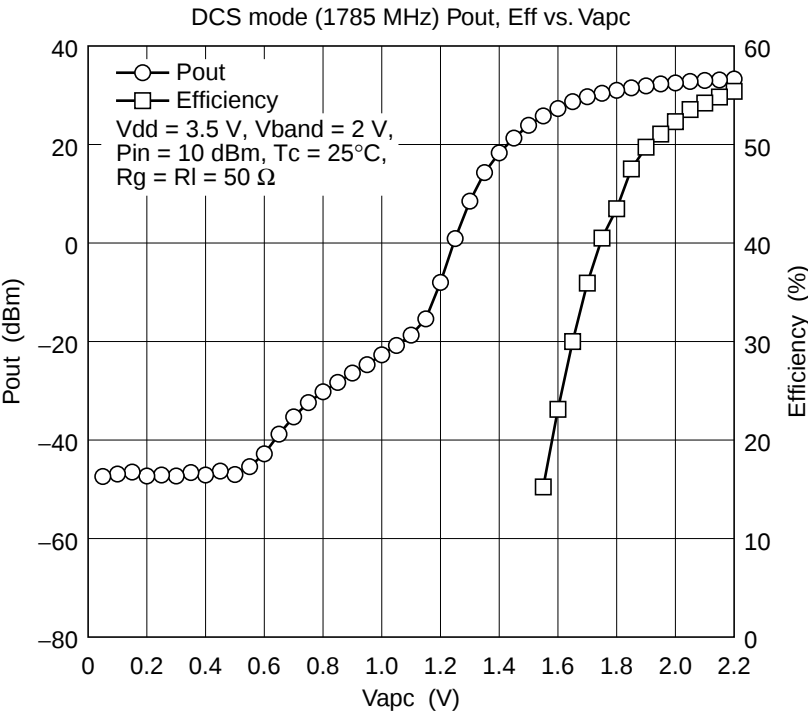
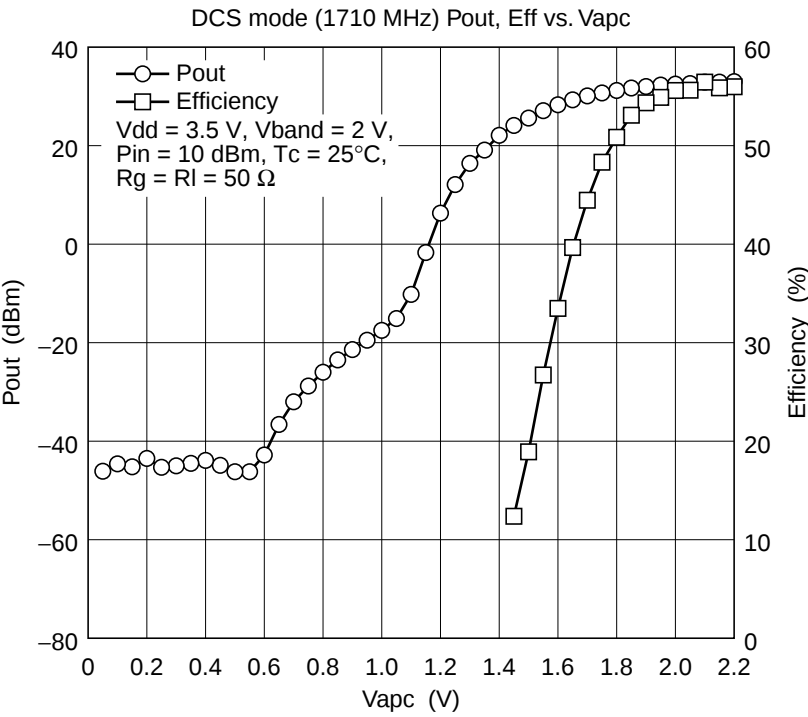


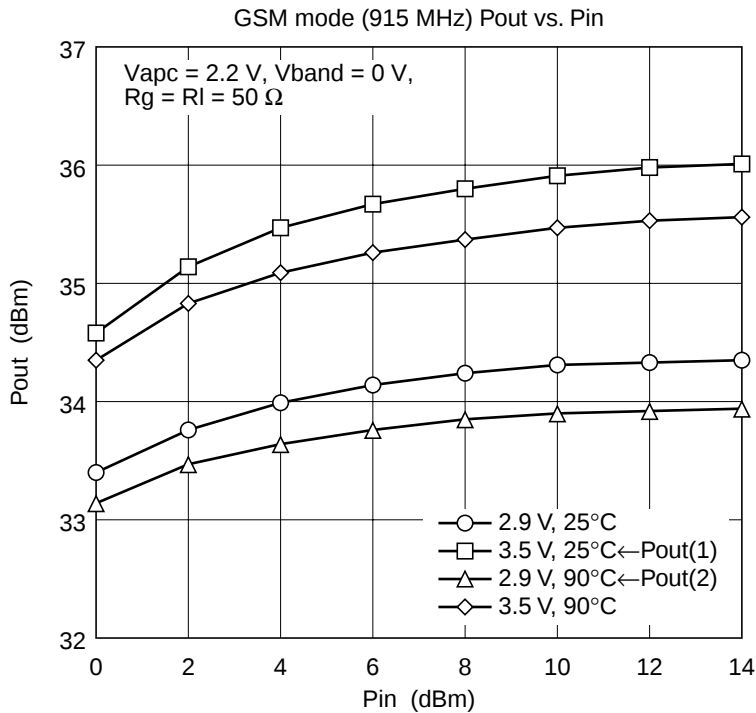
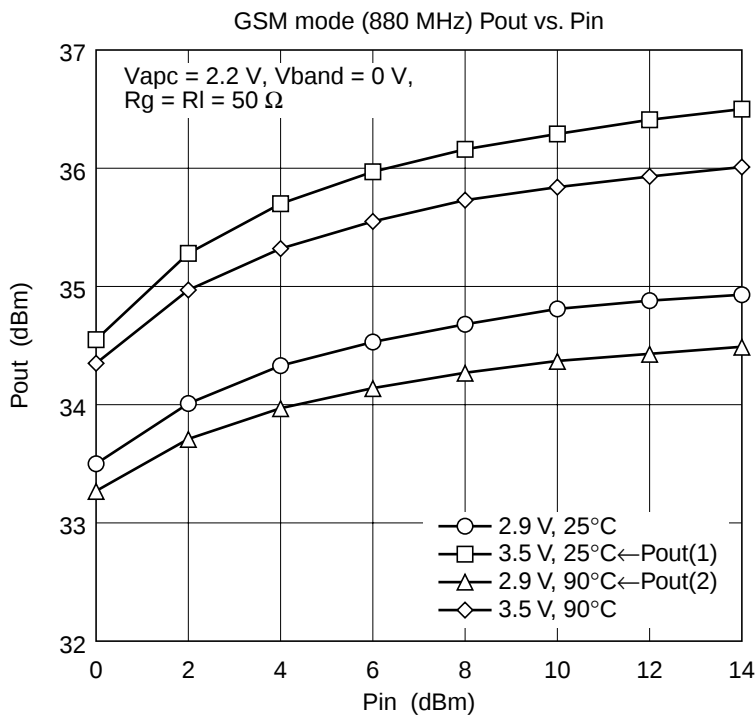
Scale: 1/1
Grass Epoxy Double sided P.C.B
($t = 1.6 \text{ mm}$, $\epsilon_r = 4.8$)

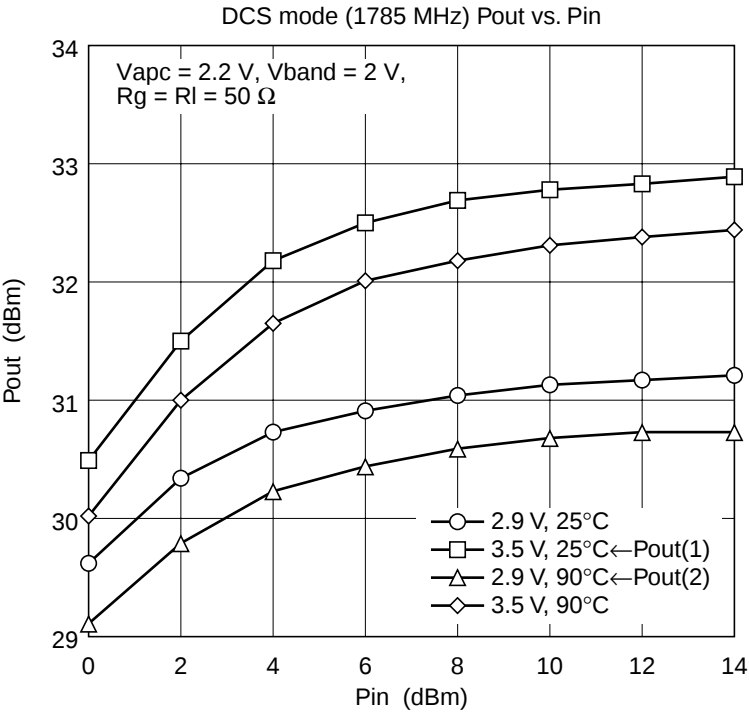
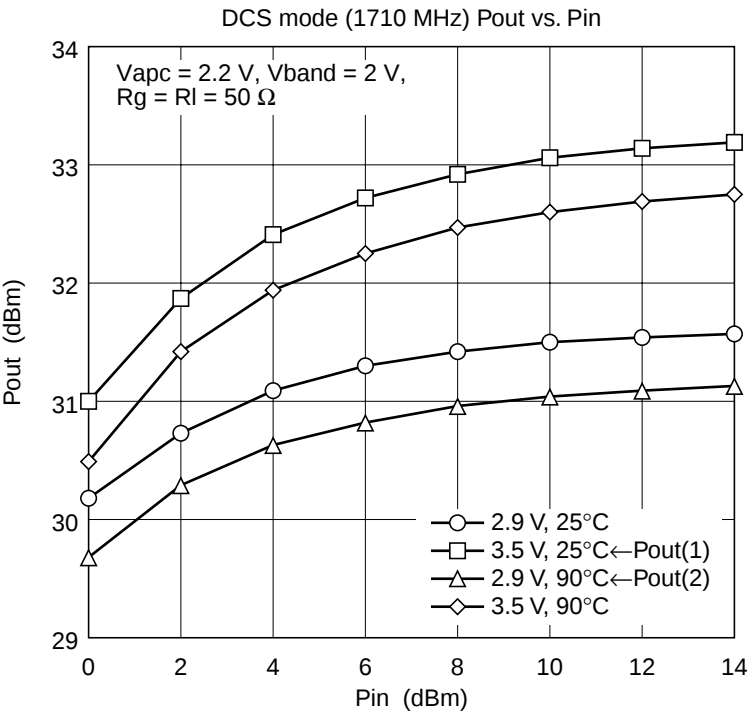
Unit: mm

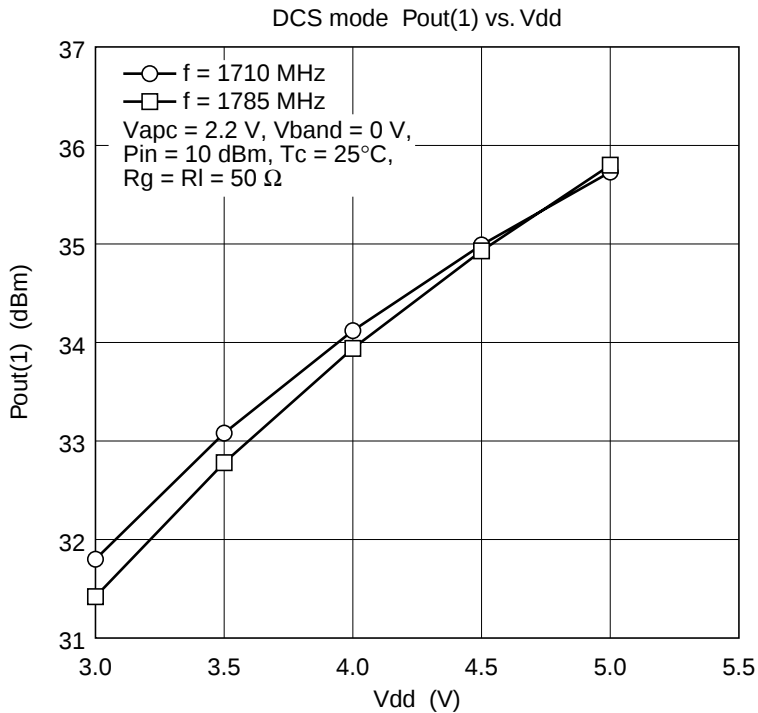
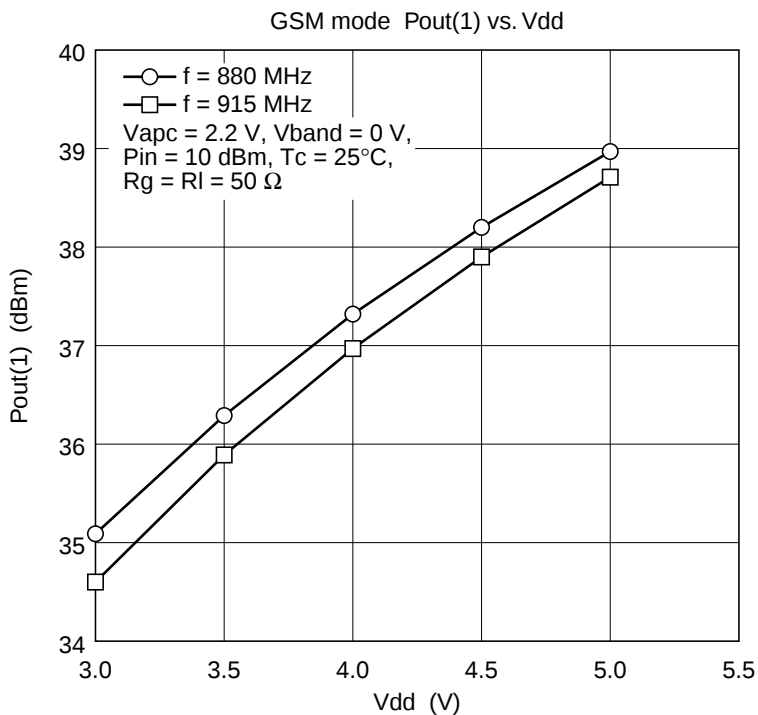
Characteristic Curves

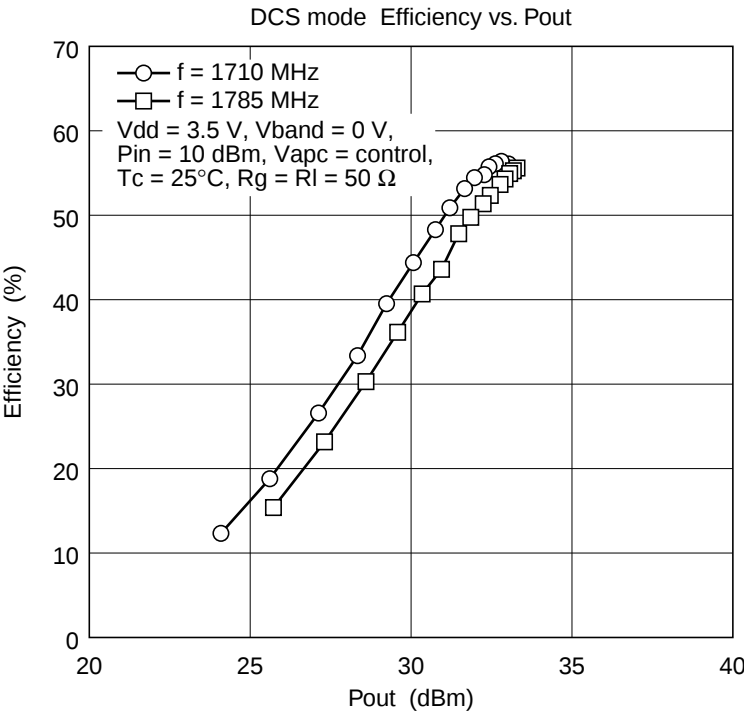
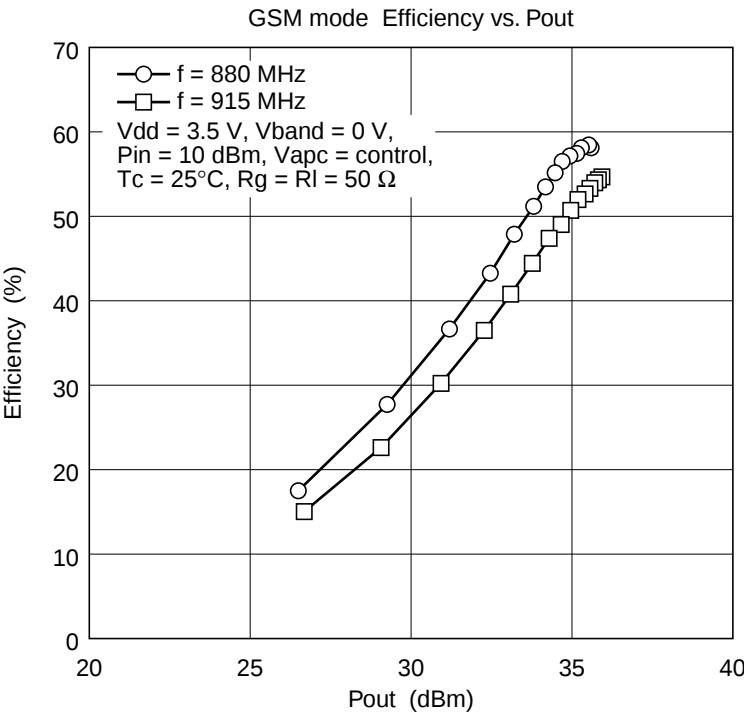


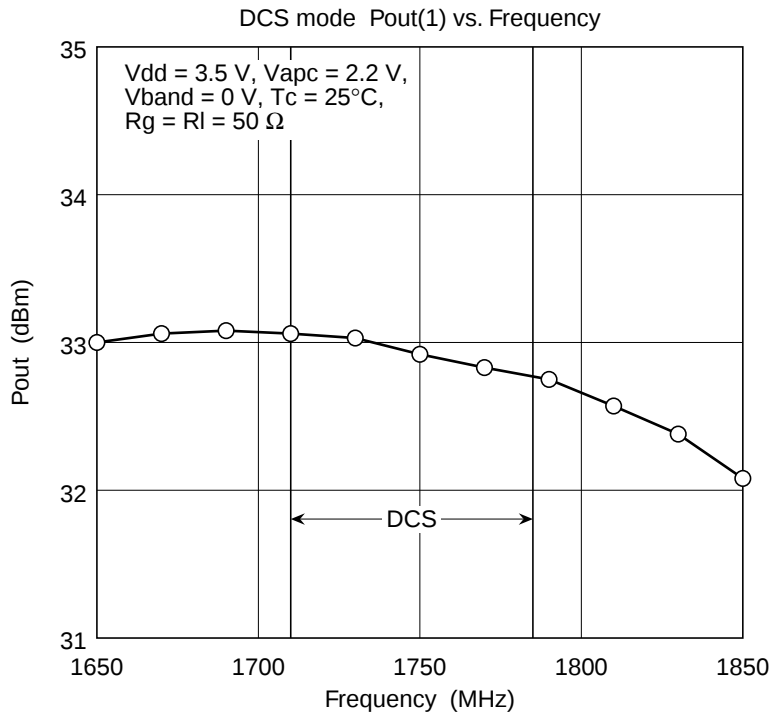
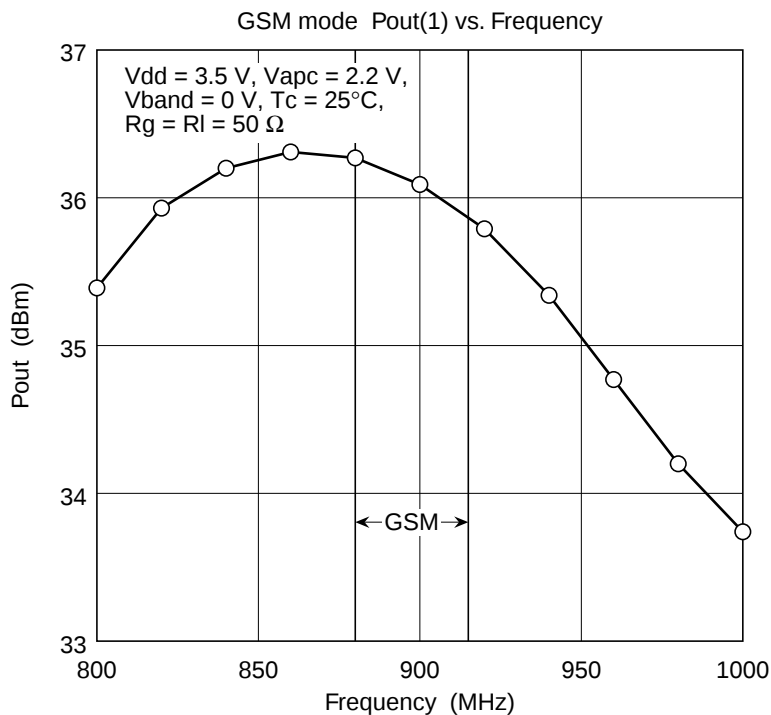


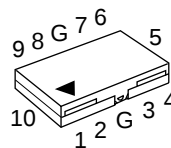
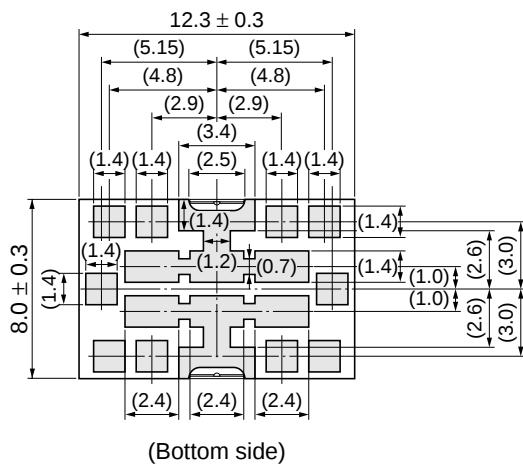
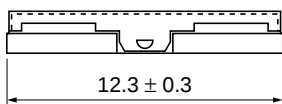












- 1: Pin_{GSM}
2: Vapc
3: Vdd2
4: Pout_{GSM}
5: GND
6: Pout_{DCS}
7: Vdd1
8: Vband
9: Pin_{DCS}
10: GND
G: GND

Remark:
Coplanarity of bottom side of terminals
are less than $0 \pm 0.1\text{mm}$.

Hitachi Code	RF-K1-10
JEDEC	—
JEITA	—
Mass (reference value)	—

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