PF08103A

MOS FET Power Amplifier Module
for E-GSM900 and DCS1800 Dual Band Handy Phone

HITACHI

ADE-208-685B (Z)
3rd Edition
Apr. 1999

Application

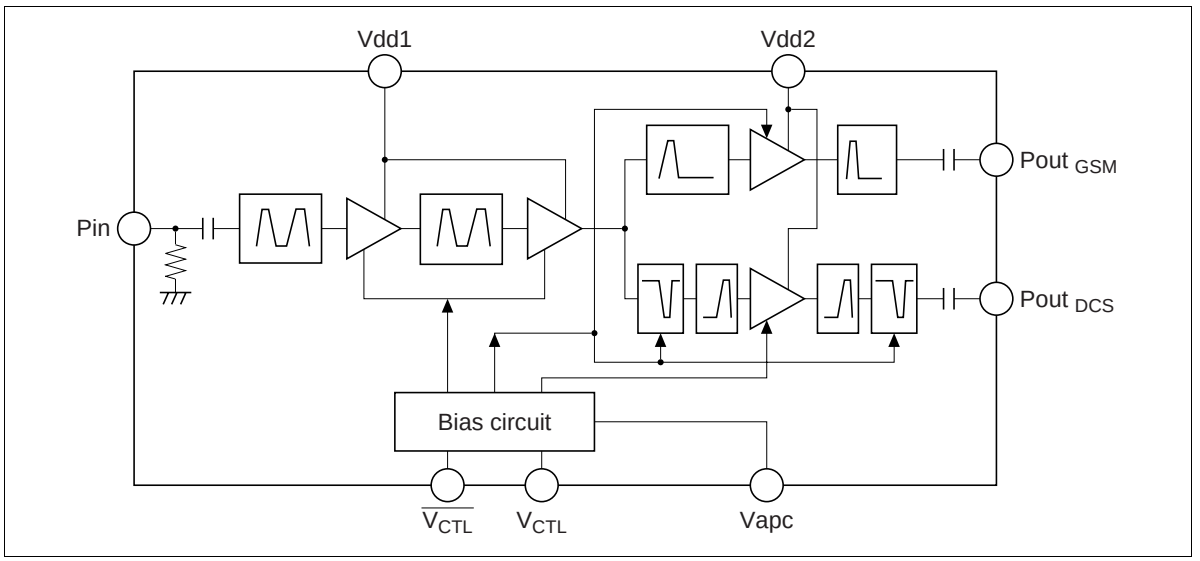
- Dual band amplifier for E-GSM900 (880 to 915 MHz) and DCS1800 (1710 to 1785 MHz).
- For 4.8 V nominal battery use

Features

- 1 in / 2 out dual band amplifier
- Simple external circuit including output matching circuit
- Simple band switching and power control
- High gain 3stage amplifier : +4.5 dBm input
- Lead less thin & Small package : $11 \times 13.75 \times 1.8$ mm
- High efficiency : 48% Typ at 34.5 dBm for E-GSM
  36% Typ at 31.5 dBm for DCS1800

Hitachi semiconductor

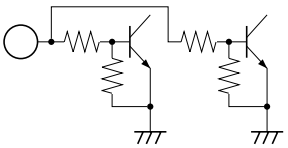
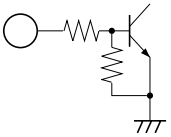
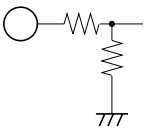
Internal Circuit Block Diagram



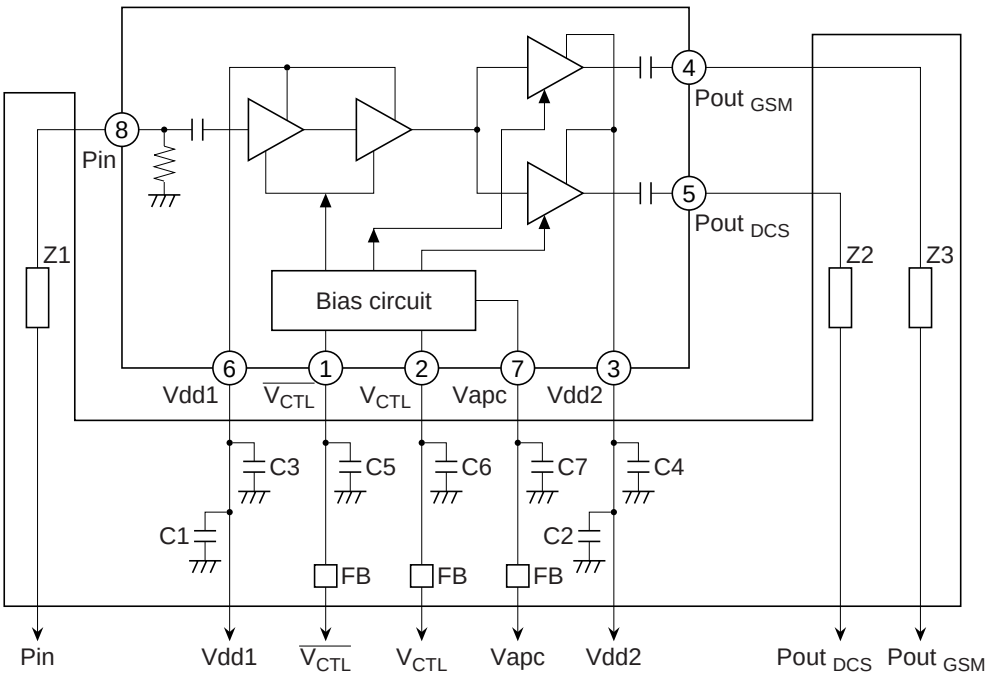
Band Select and Power Control (H: 2 V Min, L: 0.3 V Max)

Operating Mode	V_{CTL}	$\overline{V_{CTL}}$	Vapc
GSM Tx ON	H	L	Control
DCS Tx ON	L	H	Control
Tx OFF	L	L	< 0.2 V

Current of Control Pin

Control Pin	Equivalent Input Circuit	Control Current
V_{CTL}		160 µA Max at 3 V
$\overline{V_{CTL}}$		80 µA Max at 3 V
Vapc		3 mA Max at 3 V

Internal Diagram and External Circuit



Note: C1 = C2 = 4.7 µF TANTALUM ELECTROLYTE
C3 = C4 = 0.01 µF CERAMIC CHIP
C5 = C6 = C7 = 1000 pF CERAMIC CHIP
FB = FERRITE BEAD BLO1RN1-A62-001 (MURATA) or equivalent
Z1 = Z2 = Z3 = 50 Ω MICRO STRIP LINE

Absolute Maximum Ratings (Tc = 25°C)

Item	Symbol	Rating	Unit
Supply voltage	V_{DD}	8.5	V
Supply current	$I_{DD\ GSM}$	3	A
	$I_{DD\ DCS}$	3	A
V_{CTL} , $\overline{V_{CTL}}$ voltage	V_{CTL}, $\overline{V_{CTL}}$	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 (880-915 MHz), and the DCS-band (1710-1785 MHz).

Electrical Characteristics for DC (Tc = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Condition
Drain cutoff current	Ids	—	—	20	µA	Vdd = 6.0 V, Vapc = 0 V, V_{CTL} = 0 V, $\overline{V_{CTL}}$ = 0 V
		—	—	300	µA	Vdd = 8.5 V, Vapc = 0 V, V_{CTL} = 0 V, $\overline{V_{CTL}}$ = 0 V, Tc = –20 to +80°C
V_{CTL} control current	I_{CTL}	—	100	160	µA	V_{CTL} = 3.0 V
$\overline{V_{CTL}}$ control current	$\overline{I_{CTL}}$	—	50	80	µA	$\overline{V_{CTL}}$ = 3.0 V

Electrical Characteristics for GSM900 mode (Tc = 25°C)

Test conditions unless otherwise noted:
f = 880 to 915MHz, Vdd1 = Vdd2 = 4.8V, Pin = +4.5dBm, V_{CTL} = 2.0V, $\overline{V_{CTL}}$ = 0.3V, Rg = Rl = 50Ω, 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	
Control voltage range	Vapc	0.2	—	3.0	V	
Vapc control current	Iapc	—	—	3	mA	Vapc = 3.0V
Total efficiency	η_T	43	48	—	%	Pout $_{GSM}$ = 34.5dBm,
2nd harmonic distortion	2nd H.D.	—	–45	–35	dBc	Vapc = control
3rd harmonic distortion	3rd H.D.	—	–45	–35	dBc	
4th~8th harmonic distortion	4th~8th H.D.	—	—	–35	dBc	
Input VSWR	VSWR (in)	—	2	3	—	
Output power (1)	Pout (1)	35.0	35.7	—	dBm	Vapc = 3.0V
Output power (2)	Pout (2)	33.0	34.0	—	dBm	Vdd = 4.2V, Vapc = 3.0V, Tc = +85°C, Pin = +3dBm
Isolation	—	—	–40	–20	dBm	Vapc = 0.2 V
Isolation at DCS RF-output when GSM is active	—	—	–30	–20	dBm	Pout $_{GSM}$ = 34.5dBm (GSM mode) Measured at f = 1760 to 1830MHz
Switching time	tr, tf	—	1	2	µs	Pout $_{GSM}$ = –15 to 35.0dBm
Stability	—	No parasitic oscillation All spuriouses < –36 dBm			—	V_{DD} = 4.2 to 6.3V, Pout ≤ 35.0dBm, Vapc ≤ 3.0V GSM pulse. Rg = 50Ω, Tc = –20 to +85°C, Output VSWR = 6 : 1 All phases, RES BW = 3MHz
Load VSWR tolerance	—	No degradation or Permanent degradation			—	V_{DD} = 4.2 to 6.3V, Pout $_{GSM}$ ≤ 35.0dBm, Vapc ≤ 3.0V GSM pulse. Rg = 50Ω, t = 30sec., Tc = –20 to +85°C, Output VSWR = 10 : 1 All phases
Noise power	Pnoise1	—	—	–73	dBm	f0 = 915MHz, frx = f0 +10MHz Pout $_{GSM}$ = 35dBm, RES BW = 100kHz
	Pnoise2	—	—	–85	dBm	f0 = 915MHz, frx = f0 +20MHz Pout $_{GSM}$ = 35dBm, RES BW = 100kHz
	Pnoise3	—	—	–77	dBm	frx = 1805 to 1880MHz Pout $_{GSM}$ = 35dBm, RES BW = 100kHz
Slope Pout/Vapc	—	—	—	200	dB/V	Pout $_{GSM}$ = 0 to 35dBm

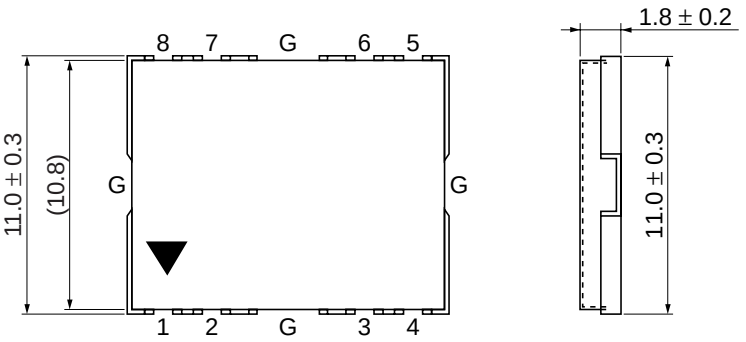
Electrical Characteristics for DCS1800 mode (Tc = 25°C)

Test conditions unless otherwise noted:
f = 1710 to 1785MHz, Vdd1 = Vdd2 = 4.8V, Pin = +4.5dBm, V_{CTL} = 0.3V, $\overline{V_{CTL}}$ = 2.0V, Rg = Rl = 50Ω, Tc = 25°C, Pulse operation with pulse width 577 µs and duty cycle 1:8 shall be used.

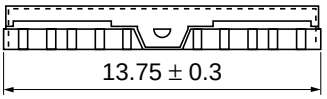
Item	Symbol	Min	Typ	Max	Unit	Test Condition
Frequency range	f	1710	—	1785	MHz	
Control voltage range	Vapc	0.2	—	3.0	V	
Vapc control current	Iapc	—	—	3	mA	Vapc = 3.0V
Total efficiency	η_T	33	36	—	%	Pout $_{DCS}$ = 31.5dBm,
2nd harmonic distortion	2nd H.D.	—	–45	–35	dBc	Vapc = control
3rd harmonic distortion	3rd H.D.	—	–45	–35	dBc	
4th~8th harmonic distortion	4th~8th H.D.	—	—	–35	dBc	
Input VSWR	VSWR (in)	—	3	5	—	
Output power (1)	Pout (1)	32.5	33.0	—	dBm	Vapc = 3.0V
Output power (2)	Pout (2)	31	31.5	—	dBm	Vdd = 4.8V, Vapc = 3.0V, Tc = +85°C, Pin = +3dBm
Isolation	—	—	–35	–30	dBm	Vapc = 0.2V
Switching time	tr, tf	—	1	2	µs	Pout $_{DCS}$ = –15 to 32.0dBm
Stability	—	No parasitic oscillation			—	V_{DD} = 4.2 to 6.3V, Pout $_{DCS}$ ≤ 32.5dBm, Vapc ≤ 3.0V DCS pulse. Rg = 50Ω, Tc = –20 to +85°C, Output VSWR = 6 : 1 All phases
Load VSWR tolerance	—	No degradation			—	V_{DD} = 4.2 to 6.3V, Pout $_{DCS}$ ≤ 32.5dBm, Vapc ≤ 3.0V DCS pulse. Rg = 50Ω, t = 30sec., Tc = –20 to +85°C, Output VSWR = 10 : 1 All phases
Noise power	Pnoise1	—	—	–77	dBm	f0 = 1785MHz, frx = f0 +20MHz, Pout $_{DCS}$ = 31.5dBm, RES BW = 30kHz
	Pnoise2	—	—	–74	dBm	frx = 925 to 935MHz, Pout $_{DCS}$ = 31.5dBm, RES BW = 30kHz
	Pnoise3	—	—	–85	dBm	frx = 935 to 960MHz, Pout $_{DCS}$ = 31.5dBm, RES BW = 30kHz
Slope Pout/Vapc	—	—	—	200	dB/V	Pout $_{DCS}$ = 0 to 32.0dBm
Intermodulation	—	—	—	–20	dBm	Pout = 31.5dBm, Interferer.CW f0 +800kHz, Pinterfer = –9dBm, RES BW = 300kHz, Measure at f0 –800kHz

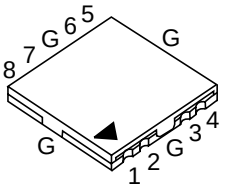
Package Dimensions

Unit: mm

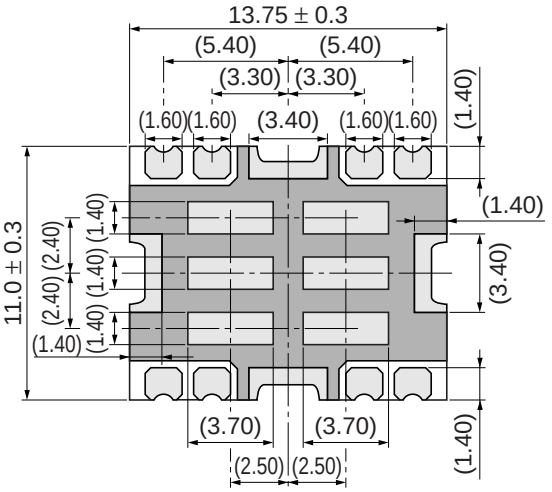


(Upper side)





Pin arrangement
1 : $\overline{V_{CTL}}$
2 : V_{CTL}
3 : Vdd2
4 : Pout $_{GSM}$
5 : Pout $_{DCS}$
6 : Vdd1
7 : Vapc
8 : Pin
G : GND



(Bottom side)

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

Hitachi Code	RF-O
JEDEC	—
EIAJ	—
Weight (reference value)	—

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