
PF08103B

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

HITACHI

ADE-208-785C (Z)
4th Edition
May 1999

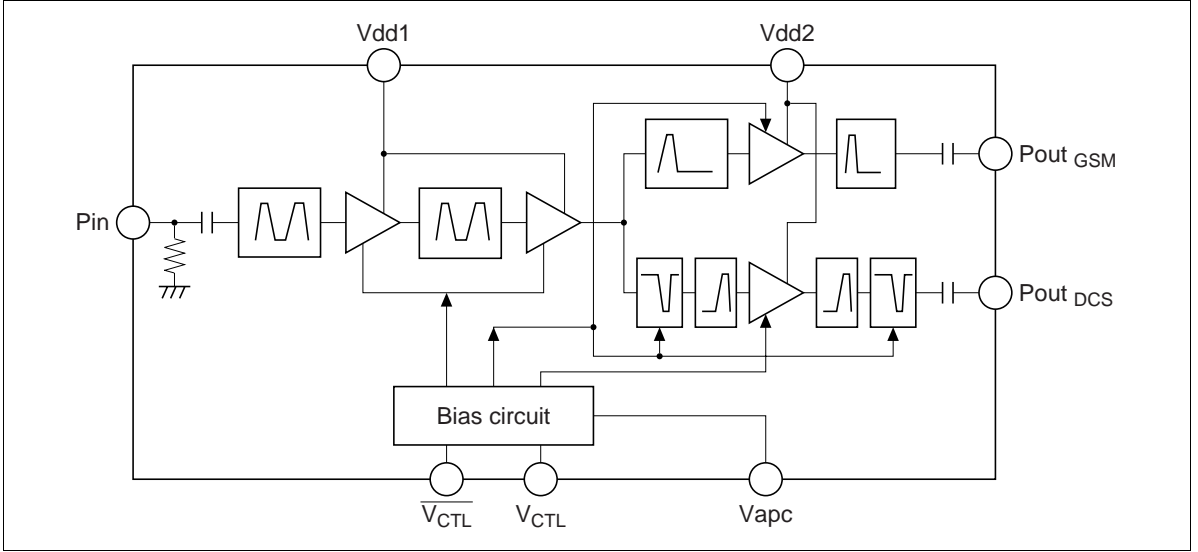
Application

- Dual band amplifier for E-GSM900 (880 to 915 MHz) and DCS1800 (1710 to 1785 MHz).
- For 3.5 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 : +1 dBm input for GSM, +4.5 dBm input for DCS
- Lead less thin & Small package : $11 \times 13.75 \times 1.8$ mm
- High efficiency : 45% Typ at 35.0 dBm for E-GSM
35% Typ at 32.5 dBm for DCS1800

Internal Circuit Block Diagram



Band Select and Power Control

Operating Mode	V_{CTL}	$\overline{V_{CTL}}$	V_{apc}
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}		2 μ A Max
$\overline{V_{CTL}}$		1 μ A Max
V_{apc}		3 mA Max at 2.2 V

Note: Control current is preliminary value.

Absolute Maximum Ratings ($T_c = 25^\circ\text{C}$)

Item	Symbol	Rating	Unit
Supply voltage	V_{DD}	8.5	V
Supply current	$I_{DD\text{ GSM}}$	3.5	A
	$I_{DD\text{ DCS}}$	2	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	T_c (op)	-30 to +100	$^\circ\text{C}$
Storage temperature	Tstg	-30 to +100	$^\circ\text{C}$
Output power	$P_{out\text{ GSM}}$	5	W
	$P_{out\text{ DCS}}$	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 ($T_c = 25^\circ\text{C}$)

Item	Symbol	Min	Typ	Max	Unit	Test Condition
Drain cutoff current	Ids	—	—	20	μA	$V_{DD} = 4.7\text{ V}$, $V_{apc} = 0\text{ V}$, $V_{CTL} = 0\text{ V}$, $\overline{V_{CTL}} = 0\text{ V}$
		—	—	300	μA	$V_{DD} = 4.7\text{ V}$, $V_{apc} = 0\text{ V}$, $V_{CTL} = 0\text{ V}$, $\overline{V_{CTL}} = 0\text{ V}$, $T_c = -20\text{ to }+80^\circ\text{C}$
Vapc control current	Iapc	—	—	3	mA	$V_{apc} = 2.2\text{ V}$
V_{CTL} control current	I_{CTL}	—	—	2	μA	$V_{CTL} = 3\text{ V}$
$\overline{V_{CTL}}$ control current	$\overline{I_{CTL}}$	—	—	1	μA	$\overline{V_{CTL}} = 3\text{ V}$

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

Test conditions unless otherwise noted:

 $f = 880 \text{ to } 915\text{MHz}$, $V_{DD1} = V_{DD2} = 3.5\text{V}$, $P_{in} = +1\text{dBm}$, $V_{CTL} = 2.0\text{V}$, $\overline{V_{CTL}} = 0.1\text{V}$, $R_g = R_l = 50\Omega$,
 $T_c = 25^\circ\text{C}$, 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	V _{apc}	0.2	—	2.2	V	
Total efficiency	η_T	40	45	—	%	P _{out GSM} = 35dBm,
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	3.5	—	
Output power (1)	P _{out} (1)	35.0	36.0	—	dBm	V _{apc} = 2.2V
Output power (2)	P _{out} (2)	33.5	34.2	—	dBm	V _{DD} = 3.0V, V _{apc} = 2.2V, T _c = +85°C
Isolation	—	—	-45	-37	dBm	V _{apc} = 0.2 V
Isolation at DCS RF-output when GSM is active	—	—	-30	-20	dBm	P _{out GSM} = 35dBm (GSM mode) Measured at f = 1760 to 1830MHz, P _{in} (GSM) = +1dBm
Switching time	t _r , t _f	—	1	2	μs	P _{out GSM} = 0 to 35.0dBm
Stability	—	No parasitic oscillation			—	V _{DD} = 3 to 5.1V, P _{out} ≤ 35.0dBm, V _{apc GSM} ≤ 2.2V GSM pulse. R _g = 50Ω, T _c = 25°C, Output VSWR = 6 : 1 All phases
Load VSWR tolerance	—	No degradation			—	V _{DD} = 3 to 5.1V, P _{out GSM} ≤ 35.0dBm, V _{apc GSM} ≤ 2.2V GSM pulse. R _g = 50Ω, t = 20sec., T _c = 25°C, Output VSWR = 10 : 1 All phases
Noise power	P _{noise1}	—	—	-80	dBm	f ₀ = 915MHz, f _{rx} = f ₀ + 10MHz P _{out GSM} = 35dBm, RES BW = 100kHz
	P _{noise2}	—	—	-84	dBm	f ₀ = 915MHz, f _{rx} = f ₀ + 20MHz P _{out GSM} = 35dBm, RES BW = 100kHz
Slope P _{out} /V _{apc}	—	—	—	200	dB/V	P _{out GSM} = 0 to 35dBm
Phase shift	—	—	—	20	deg/ dB	P _{out GSM} = 34 to 35dBm
Total conversion gain1	—	—	—	-5	dB	f ₀ = 915MHz, (P _{in} = +1dBm) Other sig. = 895MHz (P _{in} = -40dBc) P _{out GSM} = 33.5dBm
Total conversion gain2	—	—	—	-5	dB	f ₀ = 915MHz, (P _{in} = +1dBm) Other sig. = 905MHz (P _{in} = -40dBc) P _{out GSM} = 33.5dBm
AM output	—	—	—	20	%	P _{out GSM} = +5dBm, 4%AM modulation at input 50kHz modulation frequency

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

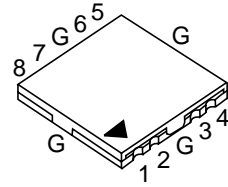
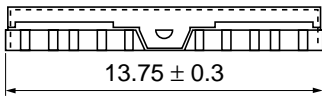
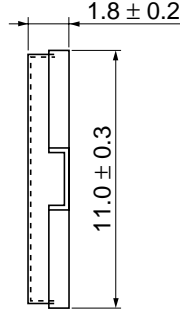
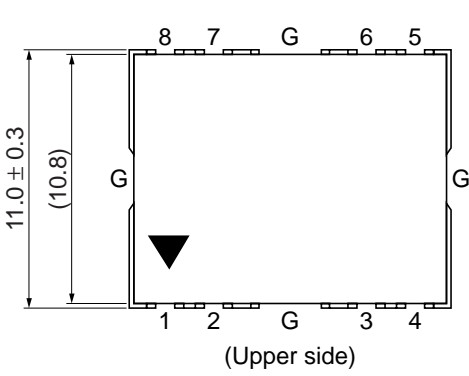
Test conditions unless otherwise noted:

f = 1710 to 1785MHz, V_{DD1} = V_{DD2} = 3.5V, Pin = +4.5dBm, V_{CTL} = 0.1V, $\overline{V_{CTL}} = 2.0V$, 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	—	2.2	V	
Total efficiency	η _T	30	35	—	%	Pout _{DCS} = 32.5dBm,
2nd harmonic distortion	2nd H.D.	—	-45	-35	dBc	Vapc = controlled
3rd harmonic distortion	3rd H.D.	—	-45	-35	dBc	
4th~8th harmonic distortion	4th~8th H.D.	—	—	-35	dBc	
Input VSWR	VSWR (in)	—	3	4	—	
Output power (1)	Pout (1)	32.5	33	—	dBm	Vapc = 2.2V
Output power (2)	Pout (2)	30.8	31.3	—	dBm	V _{DD} = 3.1V, Vapc = 2.2V, Tc = +85°C
Isolation	—	—	-42	-37	dBm	Vapc = 0.2V
Switching time	t _r , t _f	—	1	2	μs	Pout _{DCS} = 0 to 32.5dBm
Stability	—	No parasitic oscillation			—	V _{DD} = 3.1 to 5.1V, Pout _{DCS} ≤ 32.5dBm, Vapc ≤ 2.2V DCS pulse. Rg = 50Ω, Tc = 25°C, Output VSWR = 6 : 1 All phases
Load VSWR tolerance	—	No degradation			—	V _{DD} = 3.1 to 5.1V, Pout _{DCS} ≤ 32.5dBm, Vapc ≤ 2.2V DCS pulse. Rg = 50Ω, t = 20sec., Tc = 25°C, Output VSWR = 10 : 1 All phases
Noise power	Pnoise	—	—	-77	dBm	f ₀ = 1785MHz, f _{rx} = f ₀ + 20MHz, Pout _{DCS} = 32.5dBm, RES BW = 100kHz
Slope Pout/Vapc	—	—	—	200	dB/V	Pout _{DCS} = 0 to 32dBm
Phase shift	—	—	—	20	deg/ dB	Pout _{DCS} = 31 to 32dBm
Total conversion gain	—	—	—	-5	dB	f ₀ = 1785MHz, (Pin = +4.5dBm) Other sig. = 1765 MHz (-40dBc) Pout _{DCS} = 31dBm
AM output	—	—	—	20	%	Pout _{DCS} = 0dBm, 4%AM modulation at input 50kHz modulation frequency

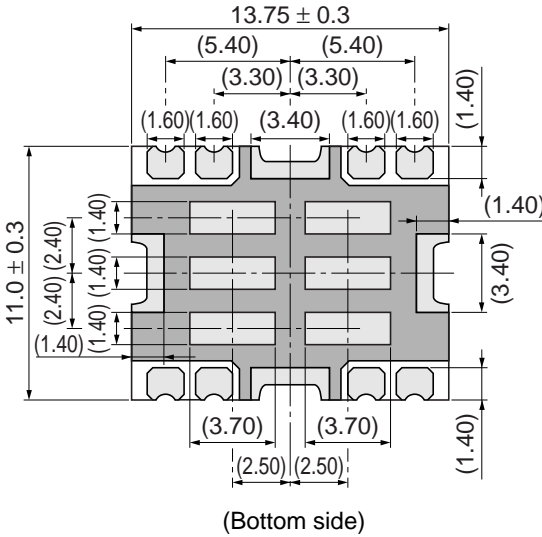
Package Dimensions

Unit: mm



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



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

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

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