# SONY

CXG1047FN

Dual-Band 3V Power Amplifier for GSM900/1800 Applications

Description

The CXG1047FN dual band GaAs PA is a 3-stage power amplifier that may be used for both GSM900 and DCS1800 applications. To achieve minimum die-size and package dimensions, it contains one amplifier chain with a single input and output.

The PA has a single RF input for both the GSM900 and DCS1800 transmit signals. The amplifier can be configured for 2 separate inputs. Power control is best achieved by variation of $V_{DD}1/V_{DD}2$ and $V_{DD}3$ drain voltages with an external transistor. A proposed power control circuit configuration is included. External PMOS drain switch should be used to achieve low leakage.

16 pin HSOF (Plastic)
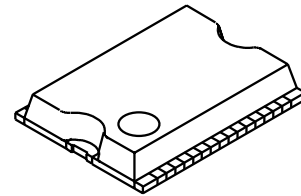
Features

• Single positive rail only
• Typical output power of 35.5dBm at 900MHz and 33dBm at 1800MHz
• Typical efficiency of 37% at 900MHz and 37% at 1800MHz
• Small package size with integral heat-sink: 16-pin HSOF ($5.6 \times 4.4 \times 0.9$mm)
• 3-stage amplifier chain for low cost
• Simple pin diode circuitry is used to switch between 1800 and 900MHz matching circuits
• Off mode insertion loss typically 27dB at 900MHz (Pin = +6dBm at V_{DD} = 0V)
• Typical transmit noise @20MHz offset −79dBm/100kHz

Applications

Dual-band handsets transmitting on the GSM900 or DCS1800 frequencies

Structure

GaAs J-FET MMIC

Absolute Maximum Ratings (Ta = 25°C)

|			
• Drain voltage	$V_{DD}1$, $V_{DD}2$, $V_{DD}3$	8	V
• Gate voltage	$V_{GG}1$, $V_{GG}2$, $V_{GG}3$	−5 to +1	V
• Input power	Pin, max.	12	dBm
• Channel temperature	Tch, max.	150	°C
• Operating temperature	Ta	−30 to +90	°C
• Storage temperature	Tstg	−40 to +150	°C

Note on Handling

GaAs MMICs are ESD sensitive devices. Special handling precautions are required. The IC will be damaged in the range from 60 to 100V@200pF, 0Ω. The actual ESD test data will be submitted later.
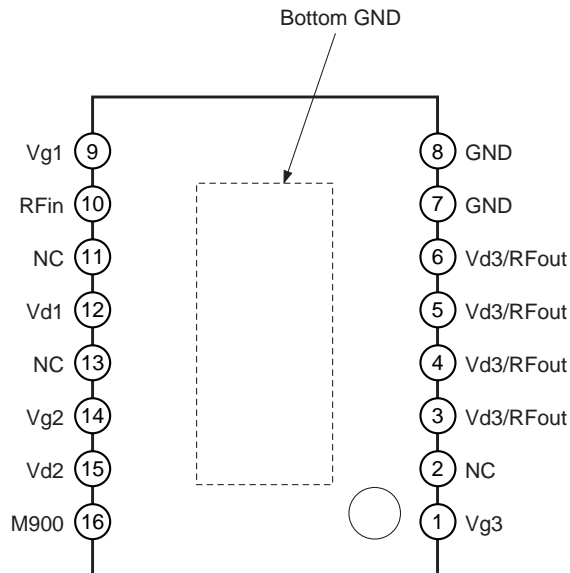
E00223-PS

Block Diagram

Dual Band GSM900/18800 PA Configuration
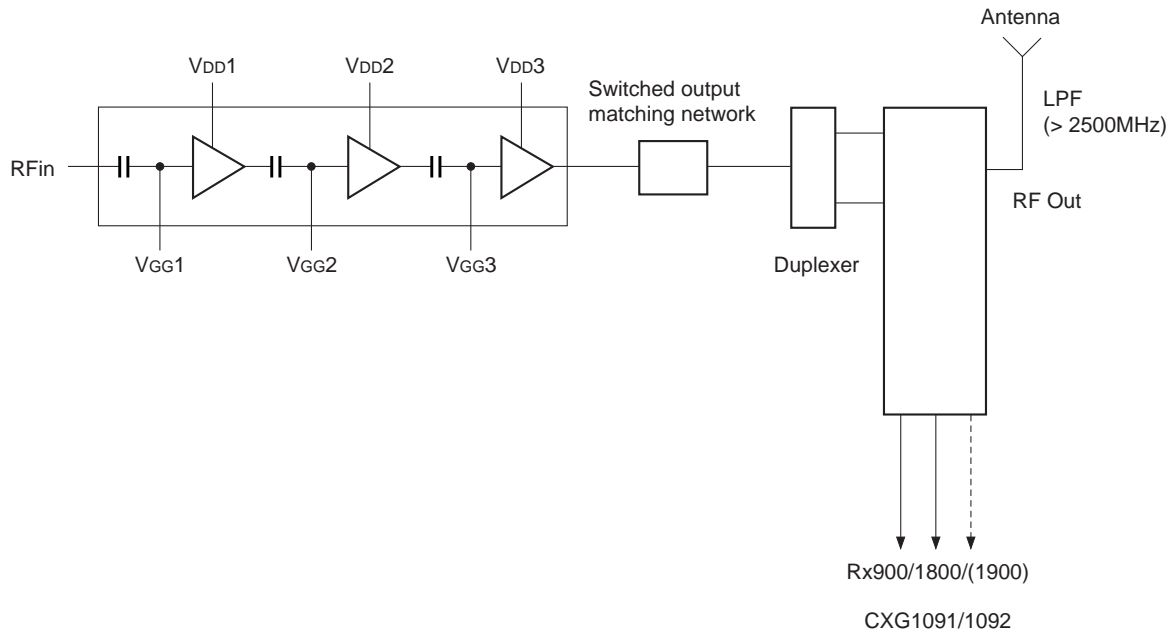
Pin Configuration

Bottom GND

Power Amplifier Performance

Measurement Conditions: Ta = 25°C, Pin = +6dBm at 900MHz and Pin = +9dBm at 1750MHz,
pulsed DC conditions: 12.5% duty cycle 577µs burst duration.

All items are specified with the recommended schematic shown on page 6.

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Frequency						
Frequency range (1)	GSM900		880		915	MHz
Frequency range (2)	DCS1800		1710		1785	MHz
Output Power						
(1) Output power – 900MHz	P_{OUT}	V_{DD} = 3.5V	34.5	35.5		dBm
(2) Output power – 1750MHz	P_{OUT}	V_{DD} = 3.5V	31.5	33		dBm
	P_{OUT}	V_{DD} = 4V, Pin = +7dBm	31.5	33		dBm
Power Control						
Power control range GSM900	P_{CTL}	*1	38			dB
Power control range DCS1800	P_{CTL}	*1	35			dB
Off insertion loss – 900MHz	Ins loss	V_{DD} = 0V Pin = +7dBm	25			dB
Off insertion loss – 1750MHz	Ins loss	V_{DD} = 0V Pin = +7dBm	35			dB
Efficiency						
Efficiency at 900MHz	PAE	V_{DD} = 3.5V Pin = +6dBm	32	37		%
Efficiency at 1750MHz	PAE	V_{DD} = 3.5V Pin = +9dBm	32	37		%
VSWR						
Input VSWR at GSM900/DCS1800				2:1	3:1	
Harmonics Tx = 900MHz						
2nd harmonics		After matching cct Po = 35dBm@3.5V		−30	−25	dBc
3rd harmonics		After matching cct Po = 35dBm@3.5V		−35	−28	dBc
4th harmonics		After matching cct Po = 35dBm@3.5V		−40	−33	dBc

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Harmonics Tx = 1750MHz						
2nd harmonics		Measured after matching cct Po = 32dBm@3.5V		−25	−20	dBc
3rd harmonics		After matching cct Po = 32dBm@3.5V		−30	−25	dBc
4th harmonics		After matching cct Po = 32dBm@3.5V		−40	−35	dBc
Stability						
Measured with 10:1 load impedance all angles		Over voltage range 3 to 5V and 0dBm to +10dBm input power	No oscillation present above −60dBm			
Load VSWR mismatch at 900MHz and 1800MHz		*2	10:1 Pin = +7dBm V_{DD} = 3 to 5V			VSWR
Transmit Noise						
GSM900 935MHz to 960MHz		P_{OUT} = 35dBm		−79		dBm/ 100kHz
DCS1800 1805MHz to 1880MHz		P_{OUT} = 32dBm		−79		dBm/ 100kHz

*1 Power control is achived by varying $V_{DD}1$/$V_{DD}2$ and $V_{DD}3$.

*2 When the output matching network is subjected to a 10:1 VSWR at all angles the amplifier shall suffer no permanent damage.
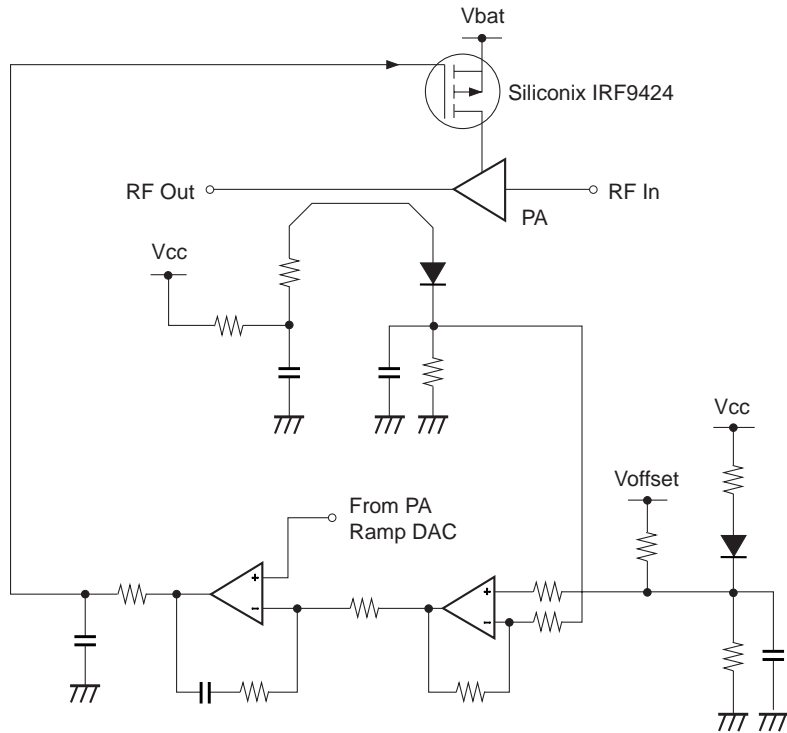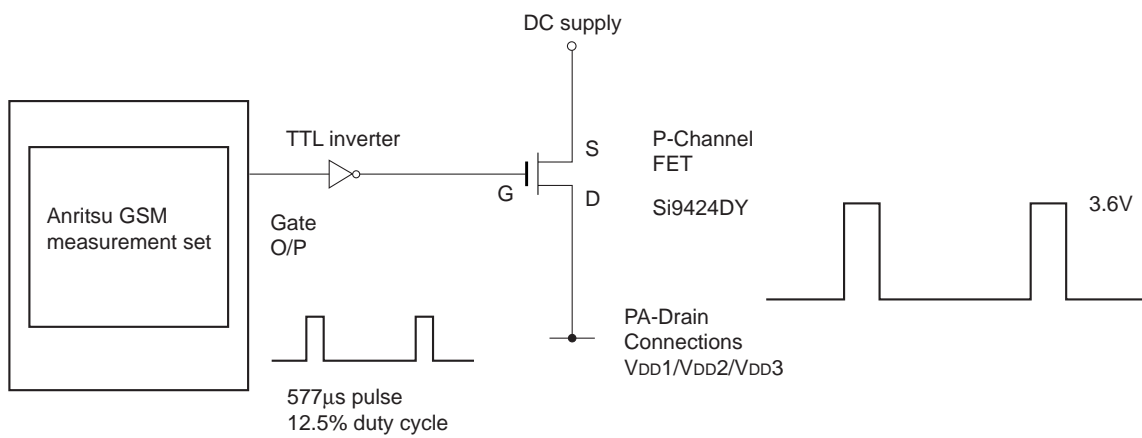
Dual Band Power Amplifier Schematic
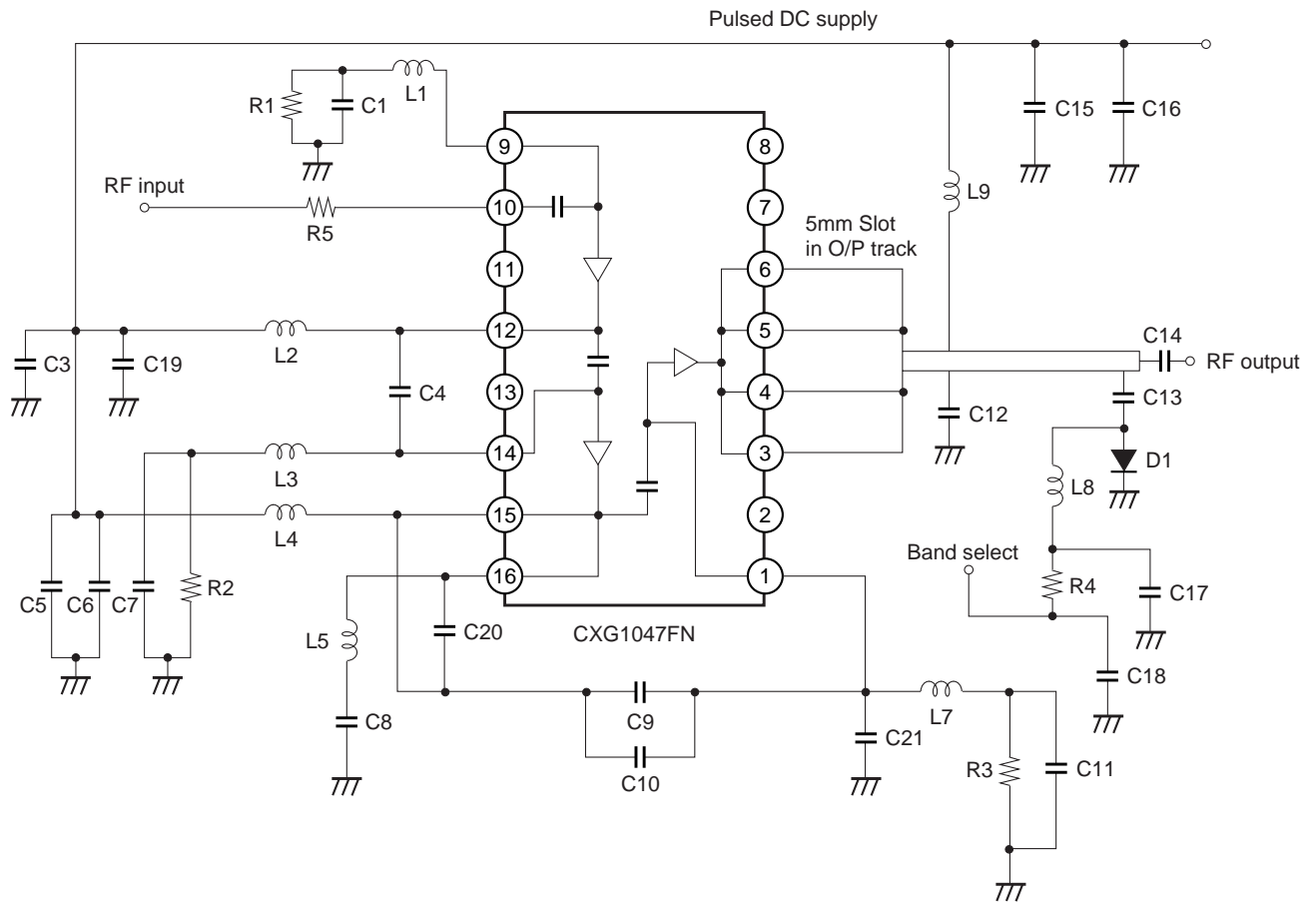
Dual Band Power Amplifier Component Values

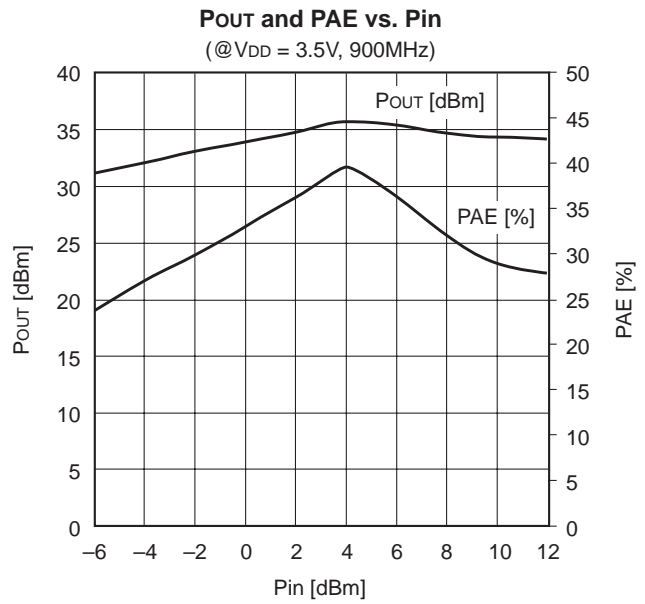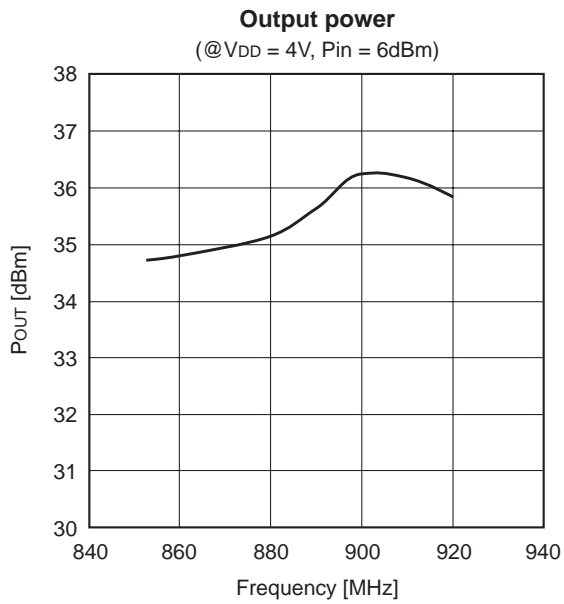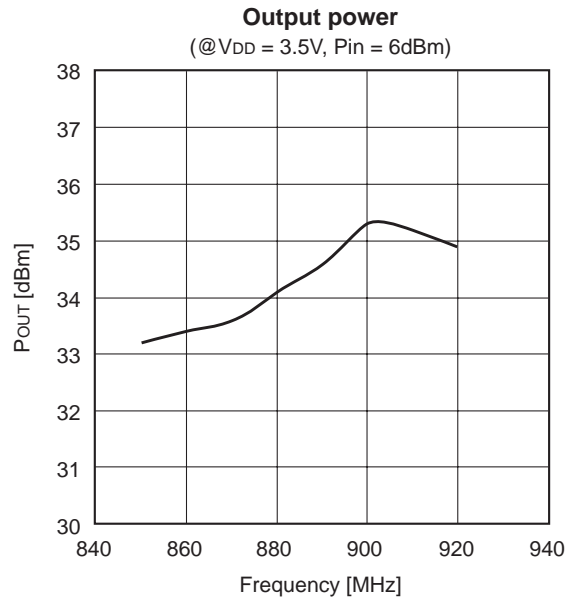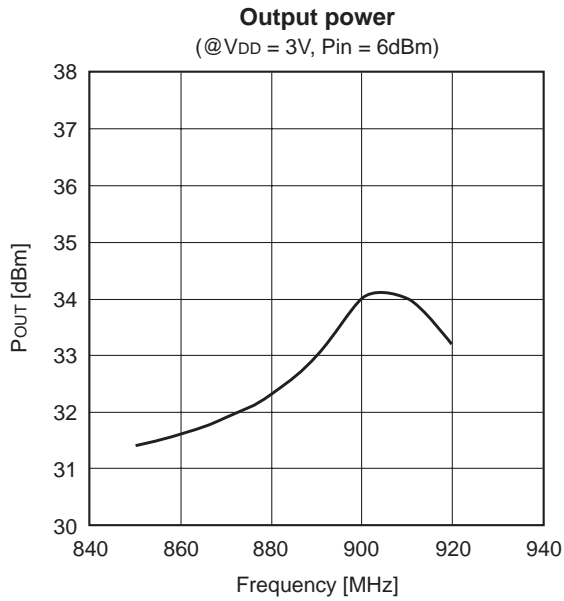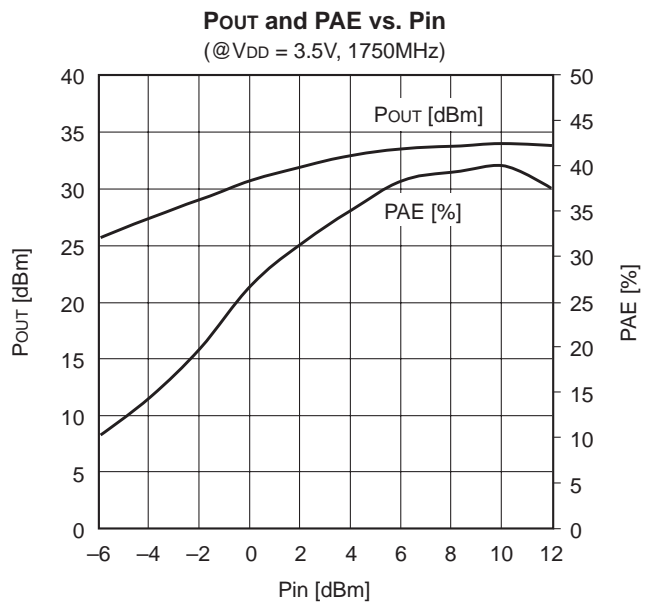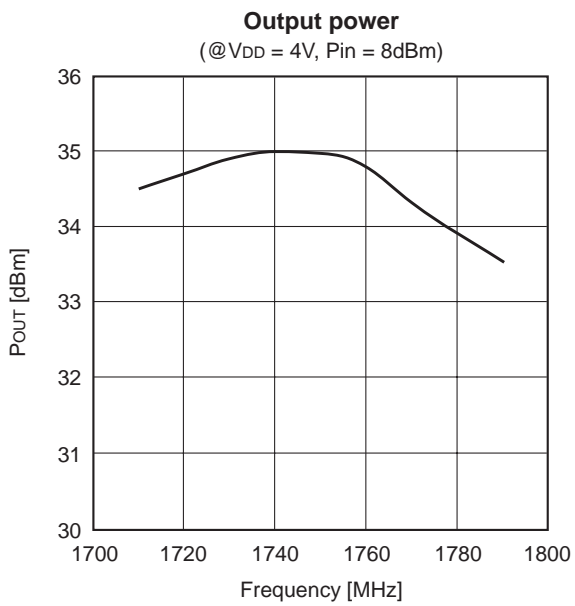|					
R1	12Ω	C1	47pF	L1	68nH
R2	12Ω	C3	47pF	L2	8.2nH
R3	160Ω	C4	8.2pF	L3	22nH
R4	36Ω	C5	47pF	L4	3.3nH
R5	8.2Ω	C6	1nF	L5	2.7nH
		C7	47pF	L7	68nH
		C8	1.5pF	L8	68nH
		C9	3.3pF	L9	8-turn coilcraft spring type
		C10	5.6pF		
		C11	47pF	D1	MA4P275-1146 Ma/Com
		C12	2.7/2.7/1.6pF		
		C13	8.2/1.2pF		
		C14	47pF		
		C15	22pF		
		C16	1nF		
		C17	47pF		
		C18	1nF		
		C19	1nF		
		C20	2.7pF		
		C21	8pF		

Recommended ALC Schematic

Measurement Circuit – Pulsed DC Supply

Example of Representative Characteristics

Output power
(@VDD = 3V, Pin = 6dBm)

Output power
(@VDD = 3.5V, Pin = 6dBm)

Output power
(@VDD = 4V, Pin = 6dBm)

POUT and PAE vs. Pin
(@VDD = 3.5V, 900MHz)

Output power
(@V$_{DD}$ = 3V, Pin = 8dBm)

Output power
(@V$_{DD}$ = 3.5V, Pin = 8dBm)

Output power
(@V$_{DD}$ = 4V, Pin = 8dBm)

P$_{OUT}$ and PAE vs. Pin
(@V$_{DD}$ = 3.5V, 1750MHz)
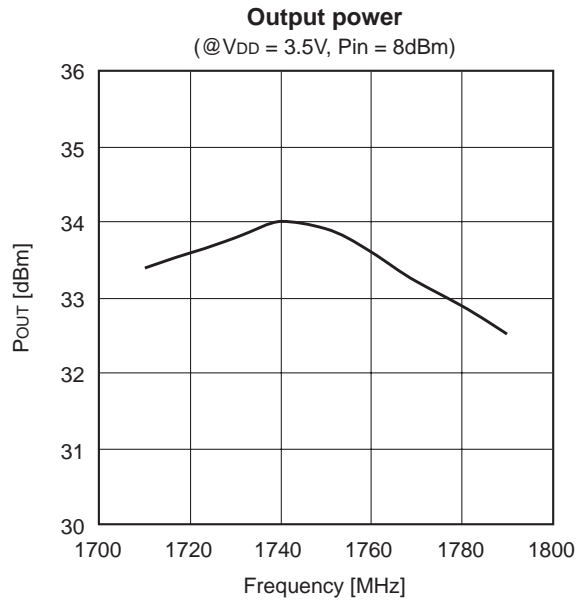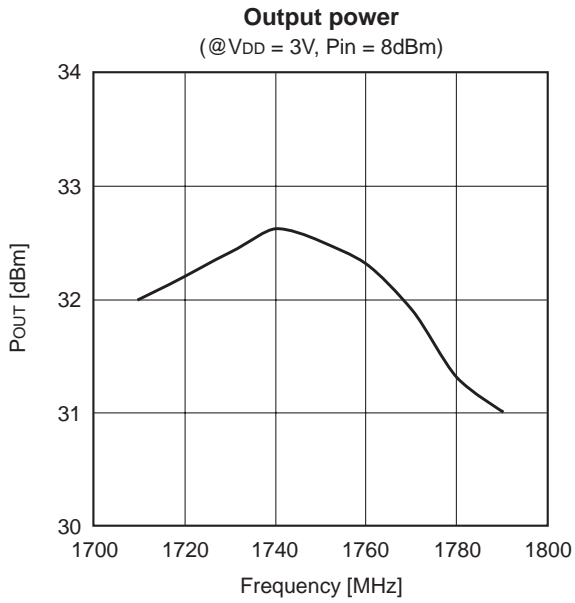
Package Outline   Unit: mm

HSOF 16PIN(PLASTIC)
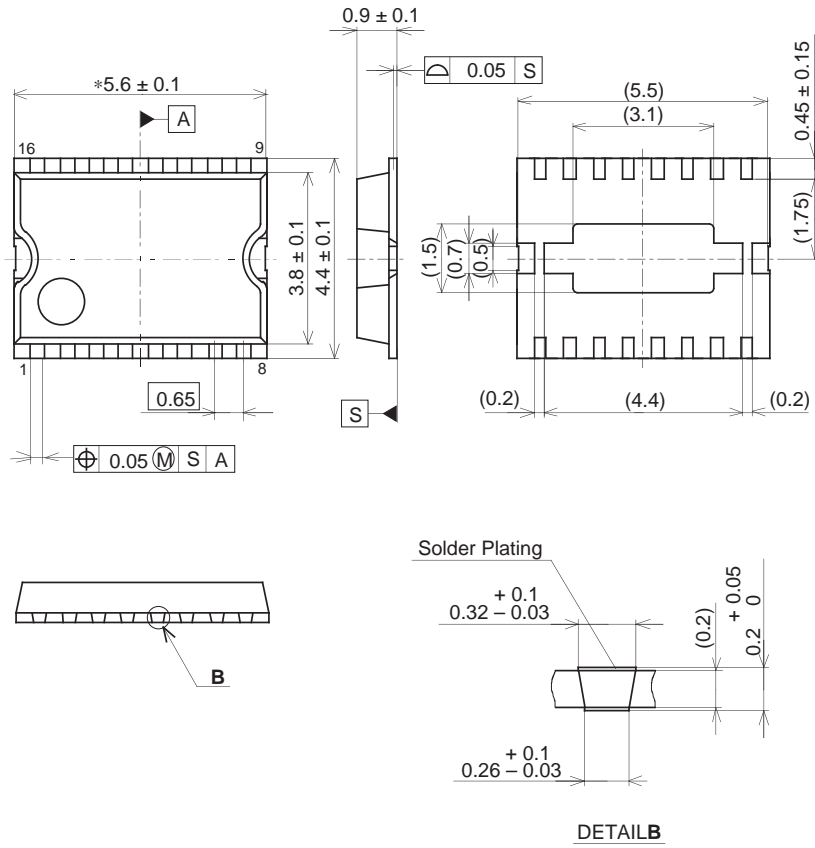
NOTE: Dimension "∗" does not include mold protrusion.

DETAIL**B**

SONY CODE	HSOF-16P-02
EIAJ CODE	—
JEDEC CODE	—

PACKAGE STRUCTURE

PACKAGE MATERIAL	EPOXY RESIN
LEAD TREATMENT	SOLDER PLATING
LEAD MATERIAL	COPPER ALLOY
PACKAGE MASS	0.06g