PF0121

MOS FET Power Amplifier Module for GSM Mobile Phone

HITACHI

ADE-208-097A (Z)
2nd Edition
July 1996

Application

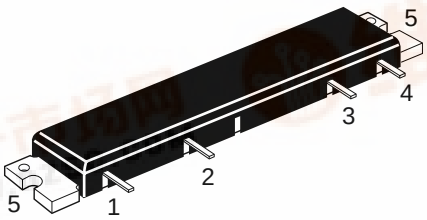
For GSM CLASS2 890 to 915 MHz

Features

- Low power control current: 0.9 mA Typ
- High speed switching: 1.5 µsec Typ
- Wide power control range: 100 dB Typ

Pin Arrangement

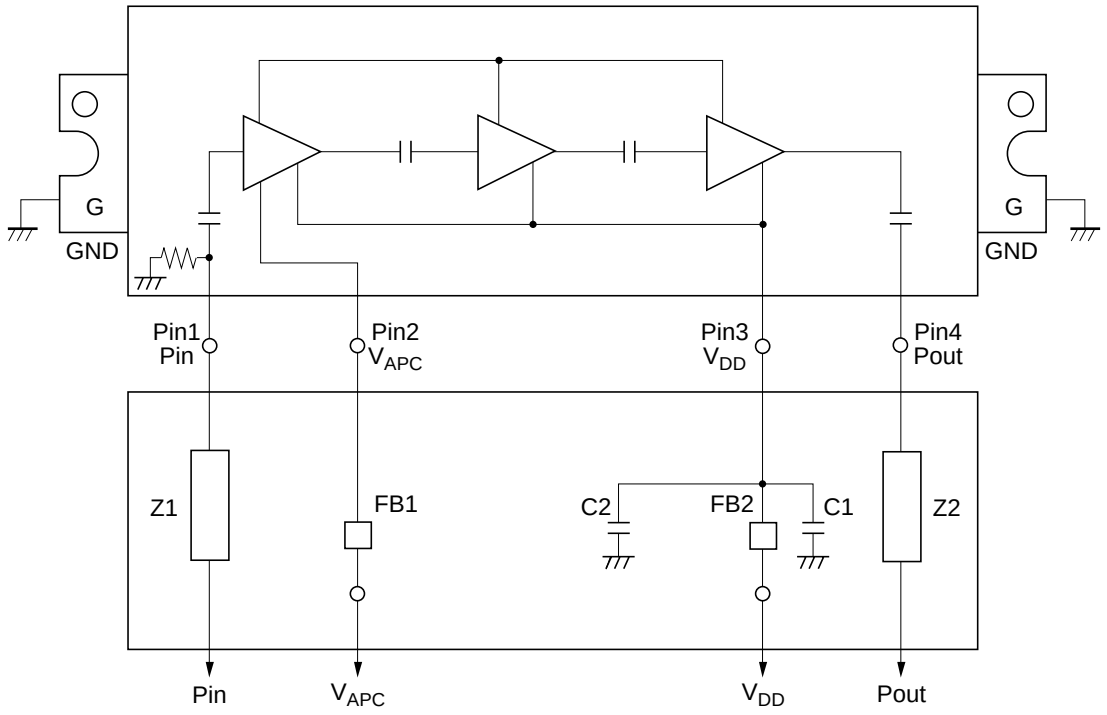
• RF-B2



1: Pin
2: V_{APC}
3: V_{DD}
4: Pout
5: GND

Hitachi semiconductor

Internal Diagram and External Circuit



C1 = 0.01 µF (Ceramic chip capacitor)
C2 = 330 µF (Aluminum Electrolyte Capacitor)
FB = Ferrite bead BL01RN1-A62-001 (Manufacture: MURATA) or equivalent
Z1 = Z2 = 50 Ω (Microstrip line)

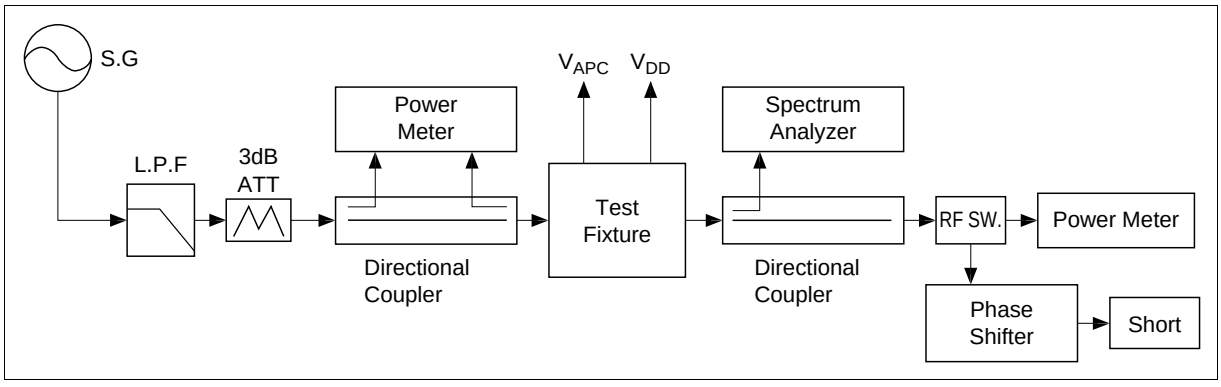
Absolute Maximum Ratings (Tc = 25°C)

Item	Symbol	Rating	Unit
Supply voltage	V_{DD}	17	V
Supply current	I_{DD}	6	A
APC voltage	V_{APC}	8	V
Input power	Pin	20	mW
Operating case temperature	Tc (op)	–30 to +110	°C
Storage temperature	Tstg	–40 to +110	°C

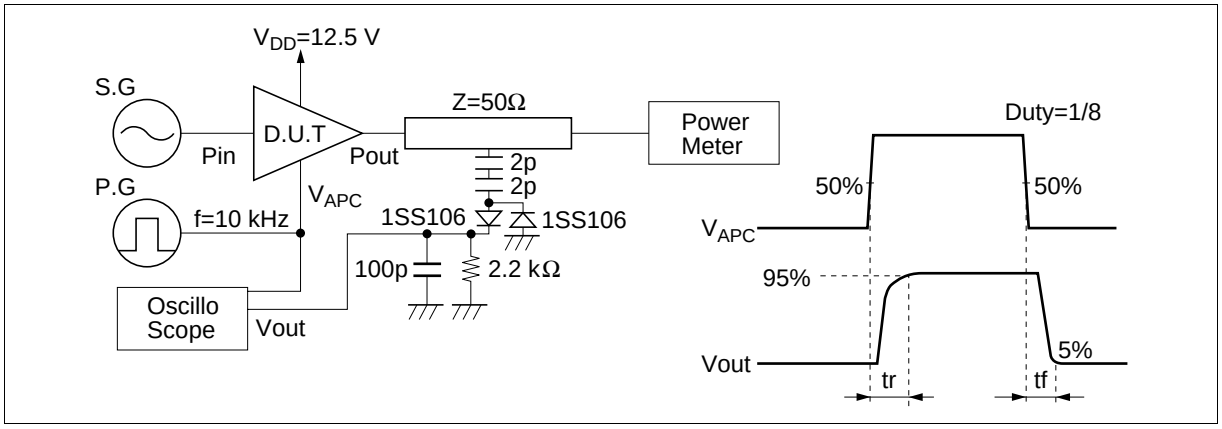
Electrical Characteristics (Tc = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Condition
Drain cutoff current	I_{DS}	—	—	500	µA	V_{DD} = 17 V, V_{APC} = 0 V
Total efficiency	η_T	30	35	—	%	Pin = 2 mW, V_{DD} = 12.5 V,
2nd harmonic distortion	2nd H.D.	—	–50	–40	dBc	Pout = 13 W (at APC controlled),
3rd harmonic distortion	3rd H.D.	—	–55	–45	dBc	R_L = Rg = 50 Ω, Tc = 25°C
Input VSWR	VSWR (in)	—	2	3	—	
Output power (1)	Pout (1)	17	23	—	W	Pin = 2 mW, V_{DD} = 12.5 V, V_{APC} = 7 V, R_L =Rg = 50 Ω, Tc = 25°C
Output power (2)	Pout (2)	9	12	—	W	Pin = 2 mW, V_{DD} = 10.3V, V_{APC} = 7 V, R_L = Rg = 50 Ω, Tc = 80°C
Isolation	—	—	–60	–40	dBm	Pin = 2 mW, V_{DD} = 12.5 V, V_{APC} = 0.5 V, R_L = Rg = 50 Ω, Tc = 25°C
Switching time	t_r, t_f	—	1.5	2	µs	Pin = 2 mW, V_{DD} = 12.5 V, Pout = 13 W, R_L = Rg = 50 Ω, Tc = 25°C
Stability	—	No parasitic oscillation			—	Pin = 2 mW, V_{DD} = 12.5 V, Pout ≤ 13 W (at APC controlled), Rg = 50 Ω, Tc = 25°C, Output VSWR = 20:1 All phases

Test System Diagram

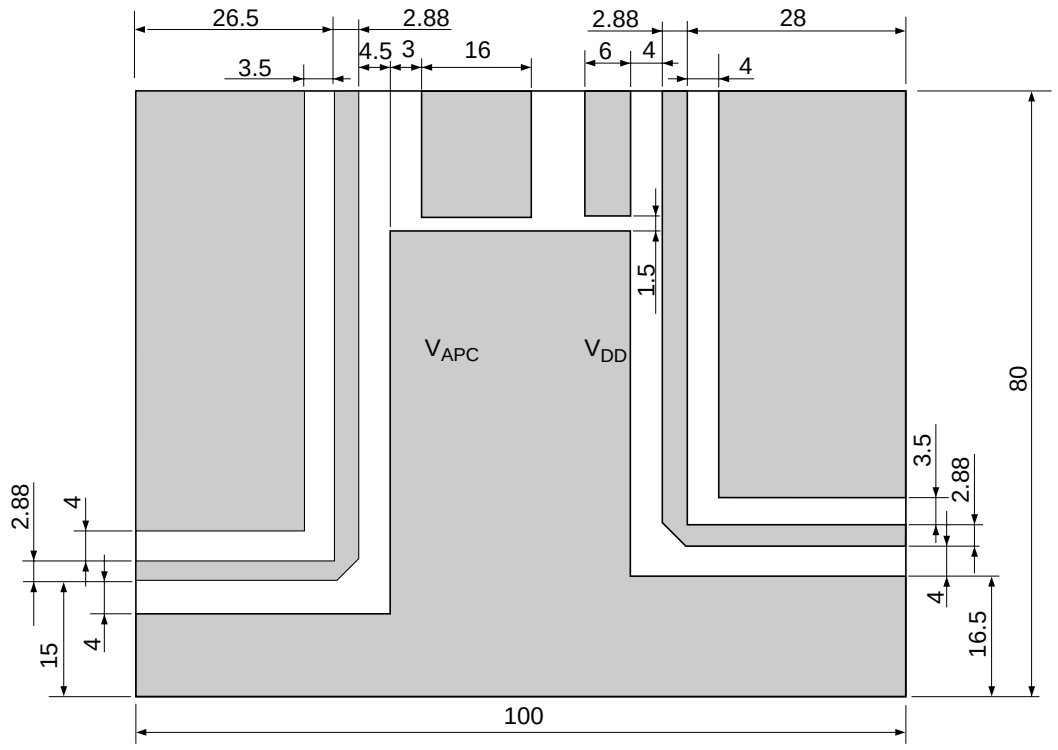


Switching Time Test Diagram



Test Fixture Pattern

Unit: mm

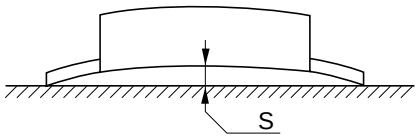


Grass Epoxy Double sided PCB
(t = 1.6 mm, εr = 4.8)
C1=0.01μF (Ceramic Chip Capacitor)
C2=330μF (Aluminum Electrolyte Capacitor)
L1=L2 : BLO2RN1-R62 (Manufacturer : MURATA) or equivalent (Ferrite Bead Inductor)

The coefficient of RF line loss in the P.C.B is showed bellow.

$1/ (S_{21})^2 = 1/ (0.9805)^2 = 1.068$

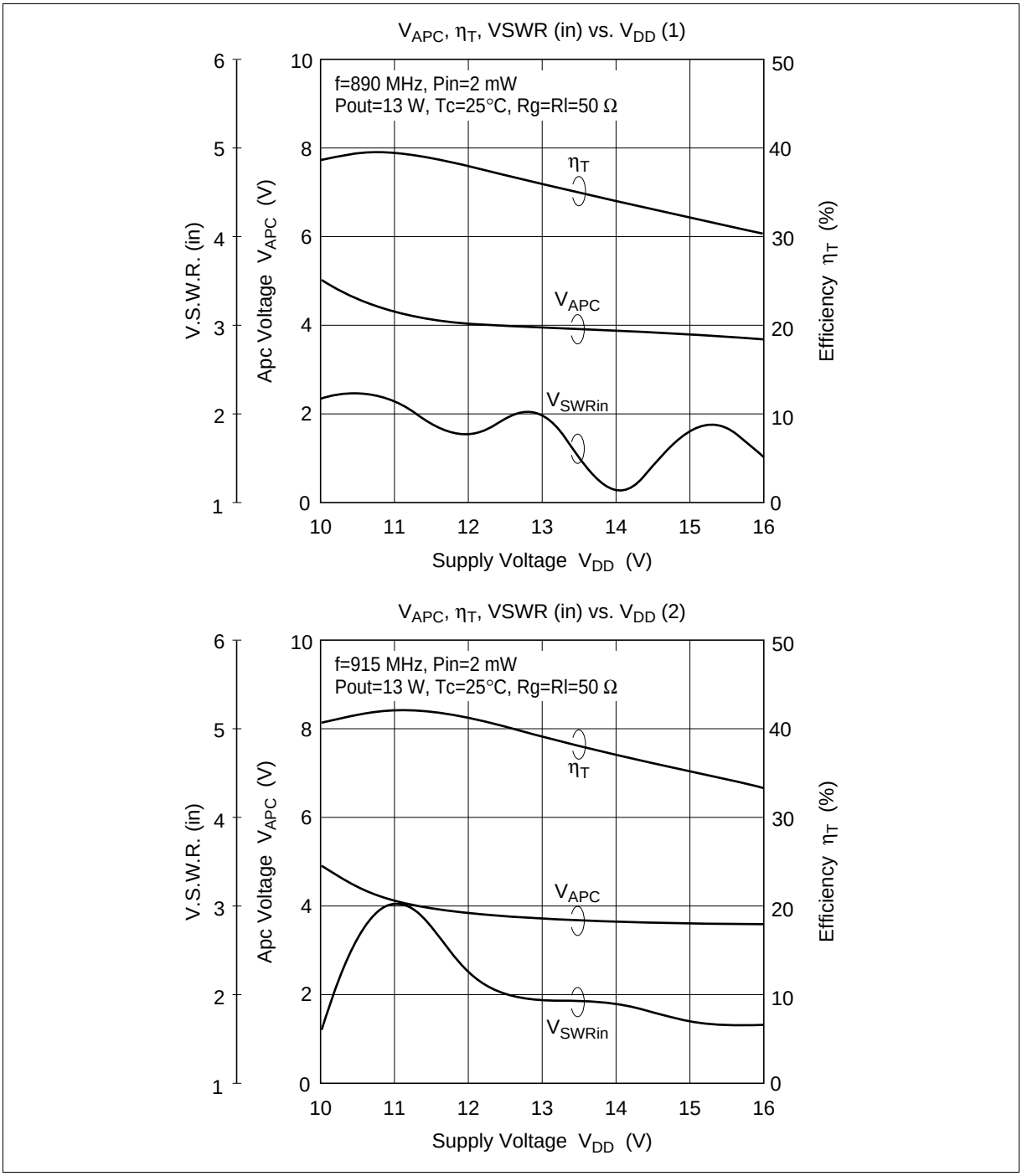
Mechanical Characteristics

Item	Conditions	Spec
Torque for screw up the heatsink flange	M3 Screw Bolts	4 to 6 kg•cm
Warp size of the heatsink flange: S		S = 0 +0.3/–0 mm

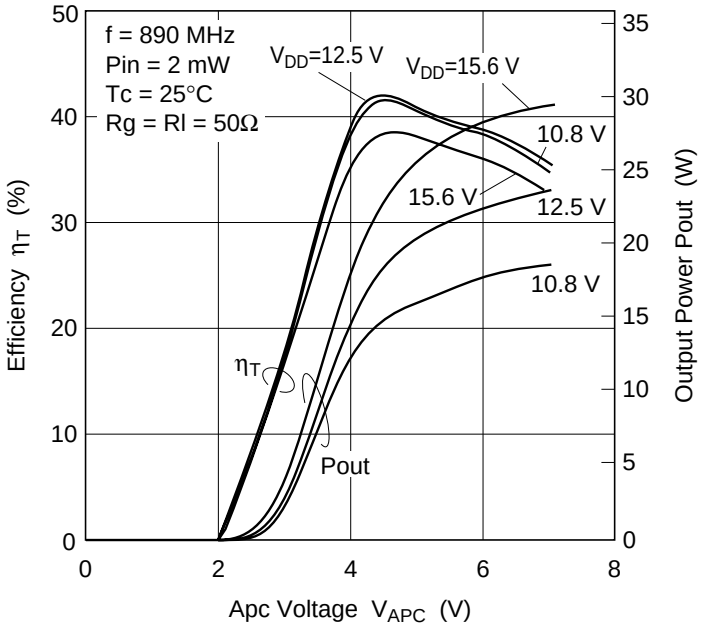
Note for Use

- Unevenness and distortion at the surface of the heatsink attached module should be less than 0.05 mm.
- It should not be existed any dust between module and heatsink.
- MODULE should be separated from PCB less than 1.5 mm.
  Soldering temperature and soldering time should be less than 230°C, 10 sec.
  (Soldering position spaced from the root point of the lead frame: 2 mm)
- Recommendation of thermal joint compounds is TYPE G746.
  (Manufacturer: Shin-Etsu Chemical, Co., Ltd.)
- To protect devices from electro-static damage, soldering iron, measuring-equipment and human body etc. should be grounded.
- Torque for screw up the heatsink flange should be 4 to 6 kg · cm with M3 screw bolts.
- Don't solder the flange directly.
- It should make the lead frame as straight as possible.
- The module should be screwed up before lead soldering.
- It should not be given mechanical and thermal stress to lead and flange of the module.
- When the external parts (Isolator, Duplexer, etc.) of the module are changed, the electrical characteristics should be evaluated enough.
- Don't washing the module except lead pins.
- To get good stability, ground impedance between the module GND flange and PCB GND pattern should be designed as low as possible.

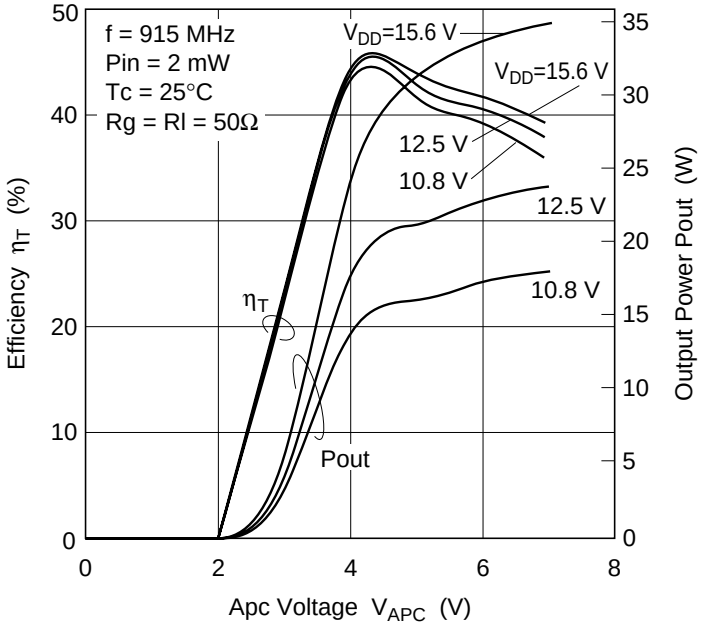
Characteristic Curves



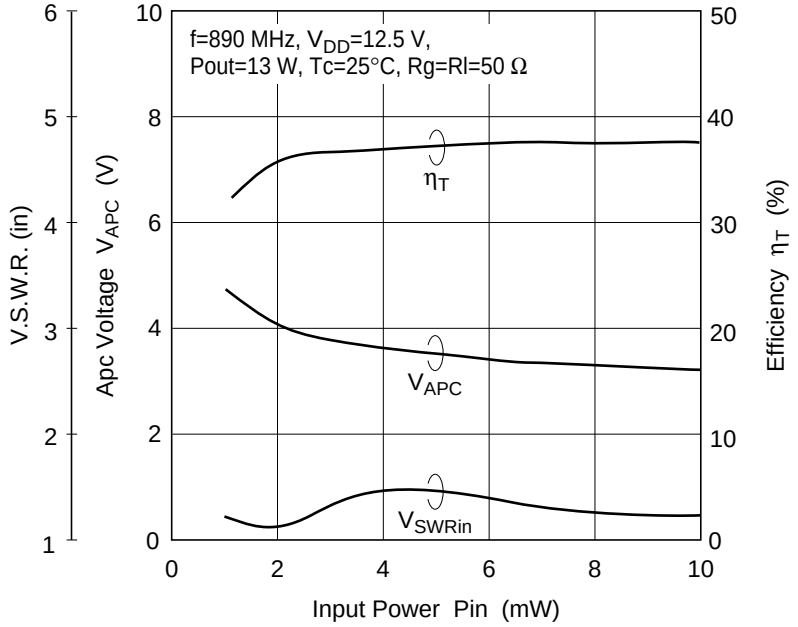
η_T, Pout vs. V_{APC} (1)



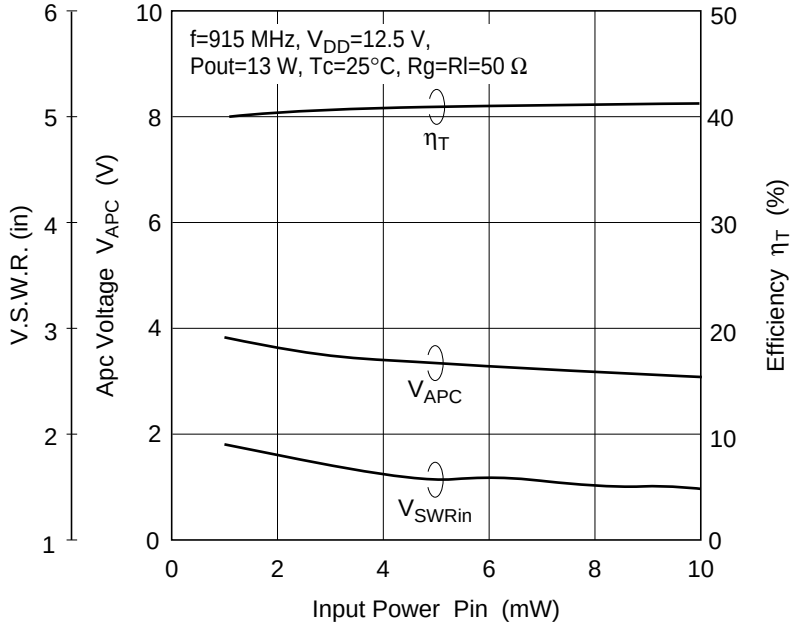
η_T, Pout vs. V_{APC} (2)

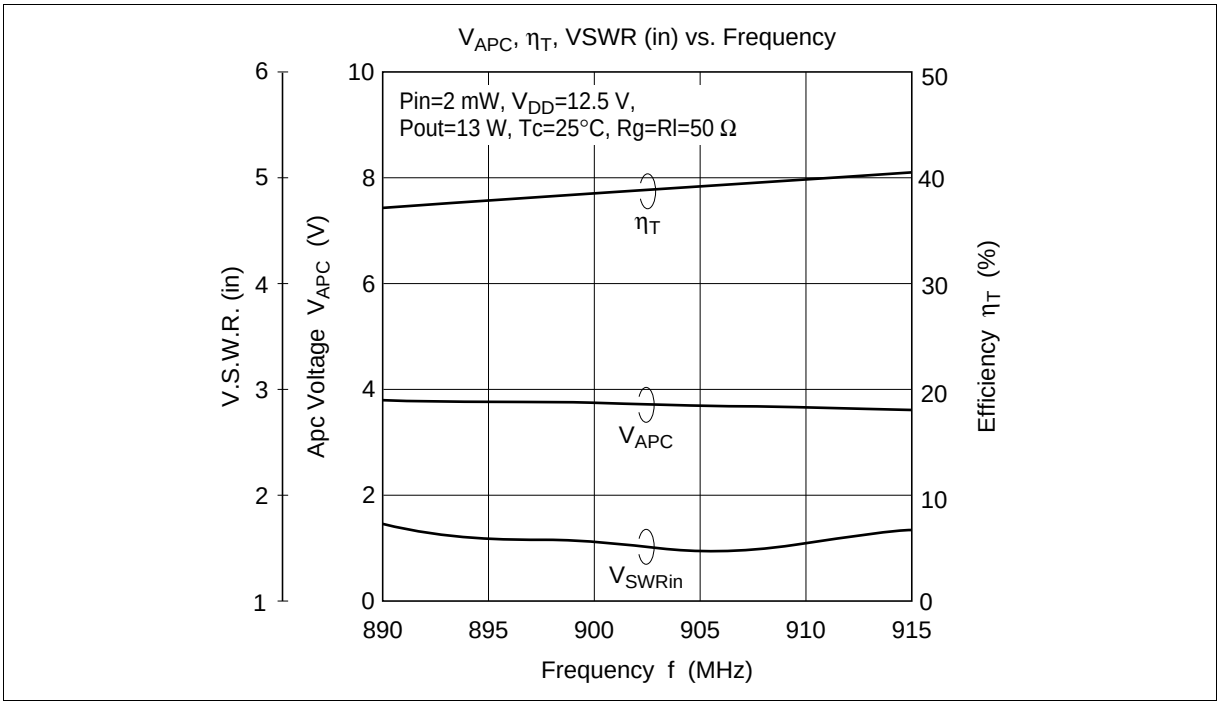


V_{APC}, η_T, VSWR (in) vs. Pin (1)



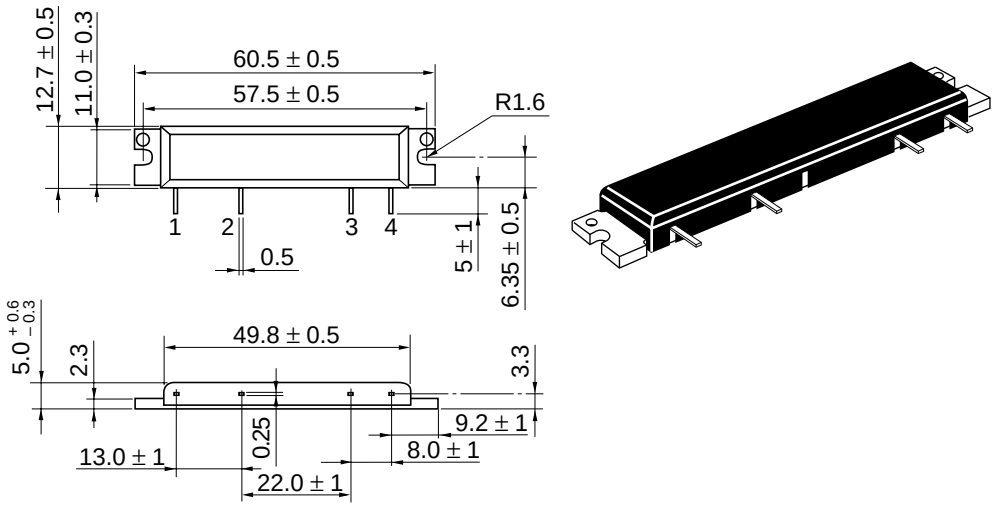
V_{APC}, η_T, VSWR (in) vs. Pin (2)




V_{APC}, η_T, VSWR (in) vs. Frequency
Pin=2 mW, V_{DD}=12.5 V,
Pout=13 W, Tc=25°C, Rg=Rl=50 Ω
η_T
V_{APC}
V_{SWRin}
V.S.W.R. (in)
Apc Voltage V_{APC} (V)
Efficiency η_T (%)
Frequency f (MHz)
6
5
4
3
2
1
10
8
6
4
2
0
50
40
30
20
10
0
890
895
900
905
910
915

Package Dimensions

Unit: mm



Hitachi Code	RF-B2
JEDEC	—
EIAJ	—
Weight (reference value)	16 g

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