# PF0030 Series

MOS FET Power Amplifier

HITACHI

ADE-208-460 (Z)
1st Edition
July 1996

## Features

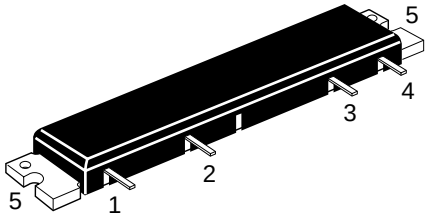
- High stability: Load VSWR = 20 : 1
- Low power control current: 400 µA
- Thin package: 5 mmt

## Ordering Information

| Type No | Operating Frequency | Application |
|---|---|---|
| PF0030 | 824 to 849 MHz | AMPS |
| PF0032 | 872 to 905 MHz | E-TACS |

## Pin Arrangement

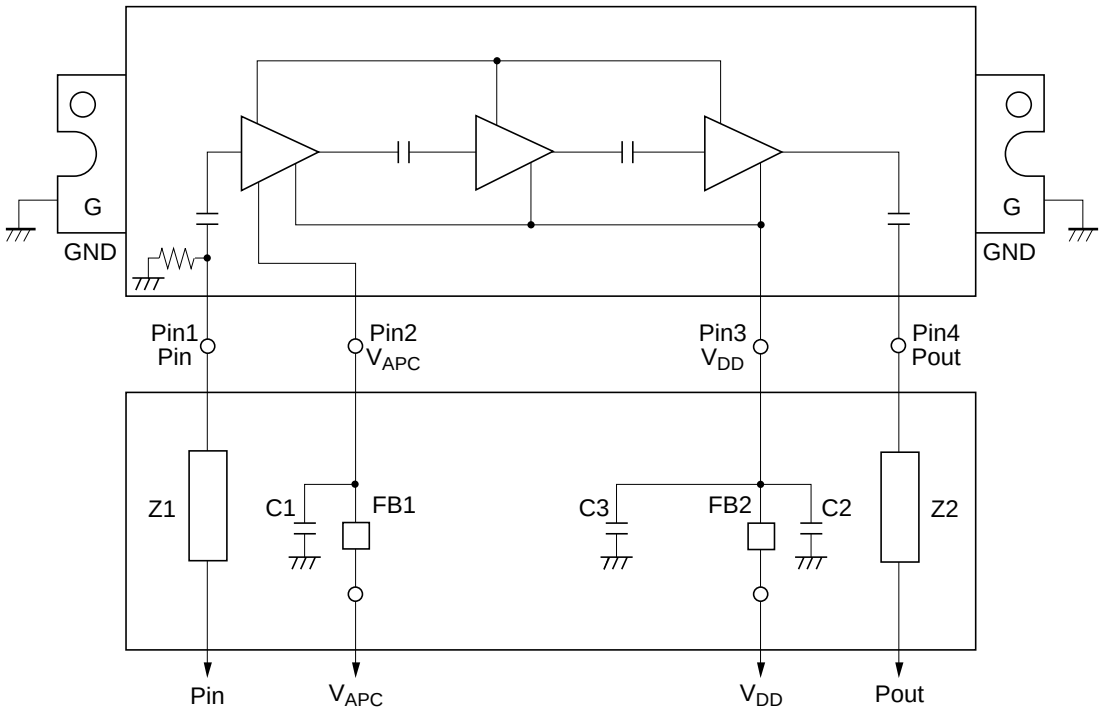
• RF-B2




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

Hitachi semiconductor

## Internal Diagram and External Circuit




C1 = C2 = 0.01 μF (Ceramic chip capacitor)
C3 = 10 μF (Aluminum Electrolyte Capacitor)
FB = Ferrite bead BL01RN1-A62-001 (Manufacture: MURATA) or equivalent
Z1 = Z2 = 50 Ω (Microstrip line)

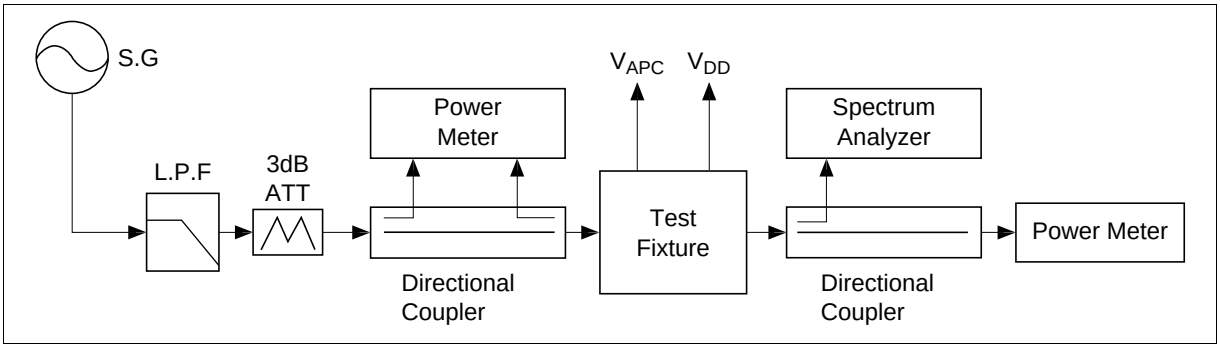
## Absolute Maximum Ratings (Ta = 25°C)

| Item | Symbol | Rating | Unit |
|---|---|---|---|
| Supply voltage | $V_{DD}$ | 17 | V |
| Supply current | $I_{DD}$ | 3 | 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 (Ta = 25°C)

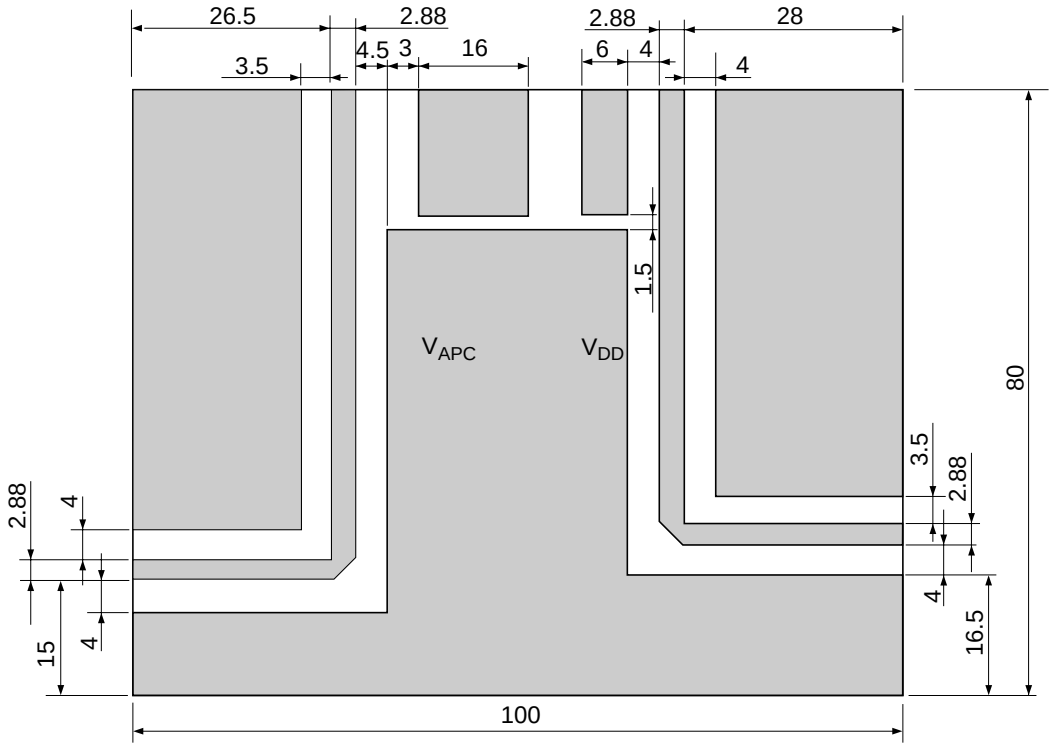
| Item | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| Drain cutoff current | $I_{DS}$ | — | — | 500 | μA | $V_{DD}$ = 17 V, $V_{APC}$ = 0 V |
| Total efficiency | $\eta_T$ | 35 | 40 | — | % | Pin = 2 mW, |
| 2nd harmonic distortion | 2nd H.D. | — | –50 | –30 | dB | $V_{DD}$ = 12.5 V, |
| 3rd harmonic distortion | 3rd H.D. | — | –50 | –30 | dB | Pout = 6 W (at APC controlled) |
| Input VSWR | VSWR (in) | — | 1.5 | 3 | — | Zin = Zout = 50 Ω |
| Output VSWR | VSWR (out) | — | 1.5 | — | — | |
| Stability | — | No parasitic oscillation | | | — | Pin = 2 mW, $V_{DD}$ = 12.5 V, Pout = 6 W (at APC controlled), Zin = 50 Ω, Output VSWR = 20:1 All phases, t = 20 sec |

## Test System Diagram



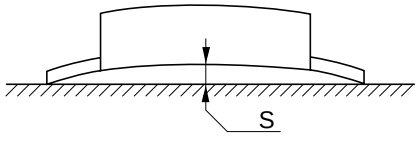
## Test Fixture Pattern

Unit: mm




Grass Epoxy Double sided PCB
(t = 1.6 mm, εr = 4.8)

## Mechanical Characteristics

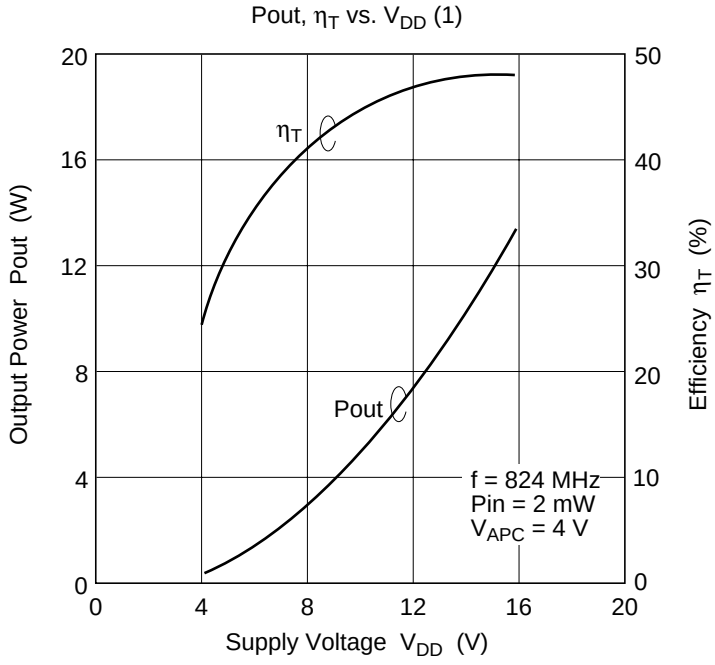
| Item | Conditions | Spec |
|---|---|---|
| Torque for screw up the heatsink flange | M3 Screw Bolts | 4 to 6 kg•cm |
| Warp size of the heatsink flange: S |   | S = 0<br>+0.3/–0 mm |

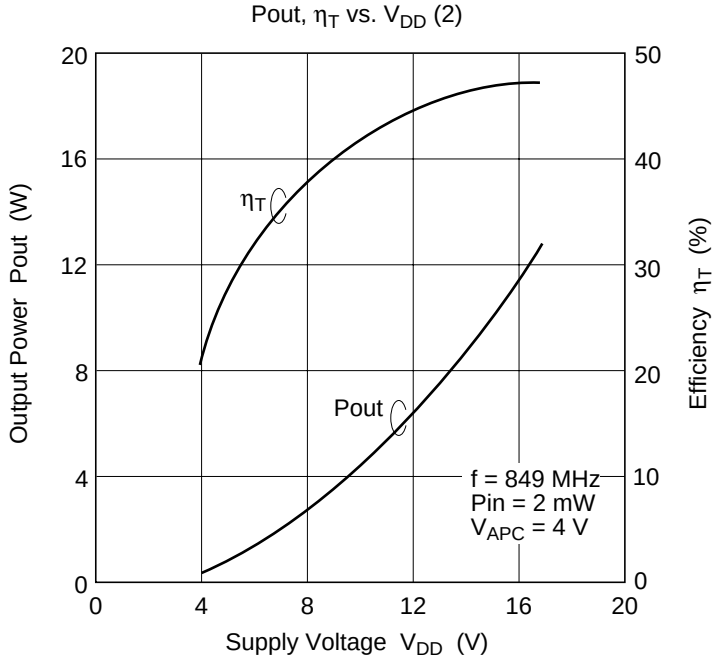
## Note for Use

- 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.

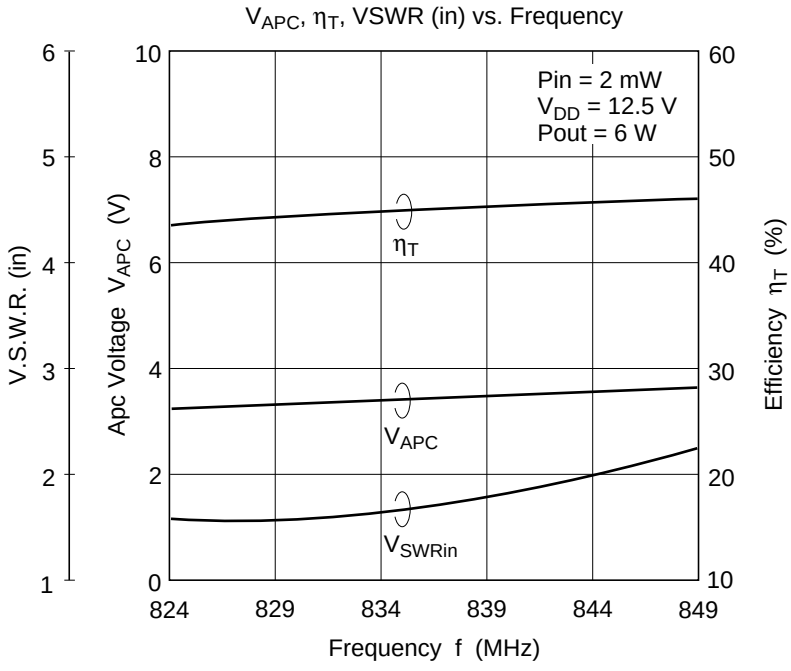
## Characteristics Curve

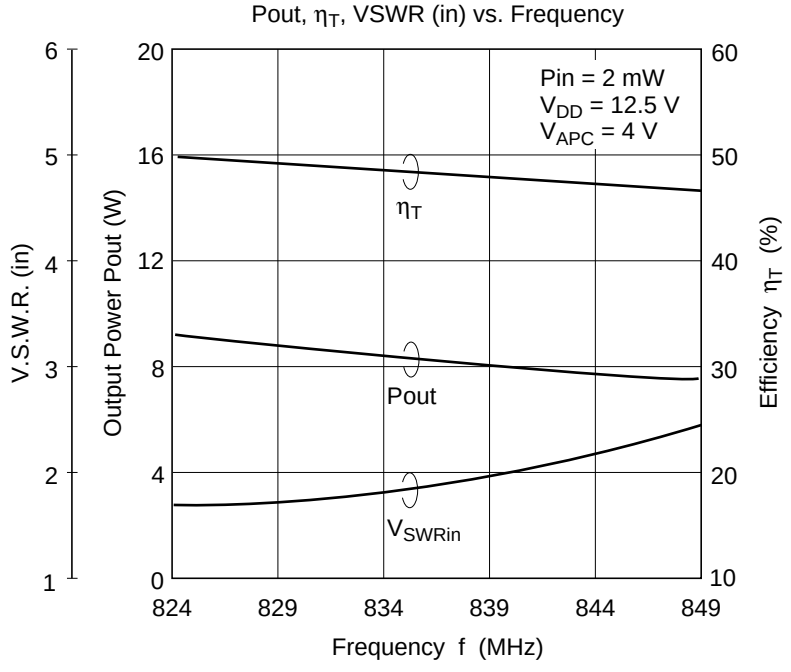
### PF0030



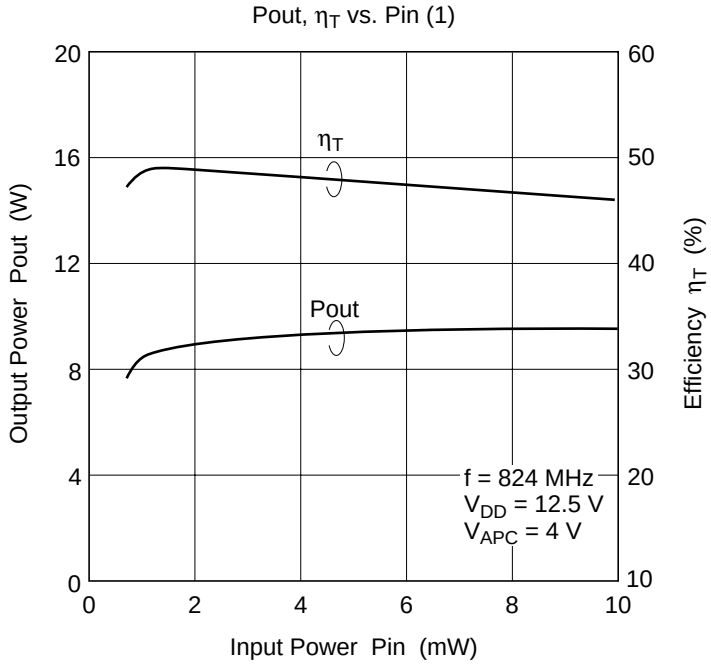



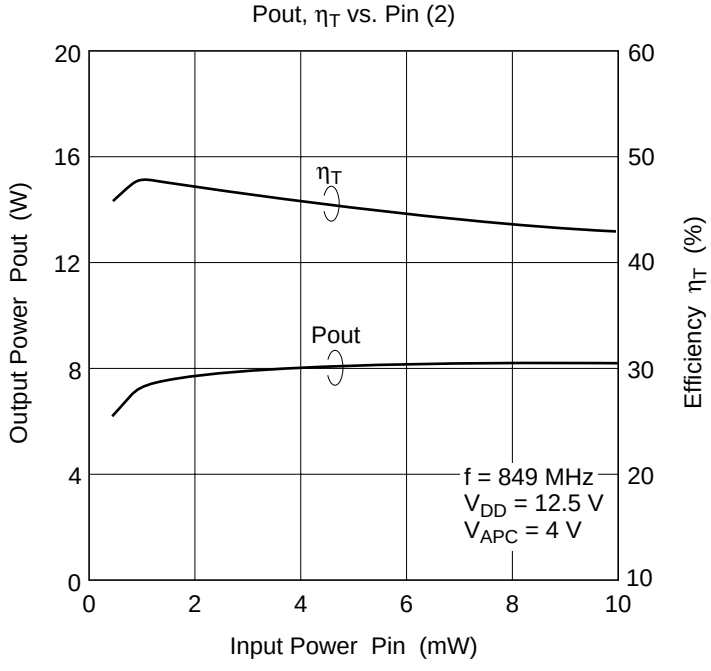
**PF0030** (cont)


VAPC, ηT, VSWR (in) vs. Frequency
Pin = 2 mW
VDD = 12.5 V
Pout = 6 W
ηT
VAPC
VSWRin
V.S.W.R. (in)
Apc Voltage VAPC (V)
Efficiency ηT (%)
Frequency f (MHz)
824
829
834
839
844
849

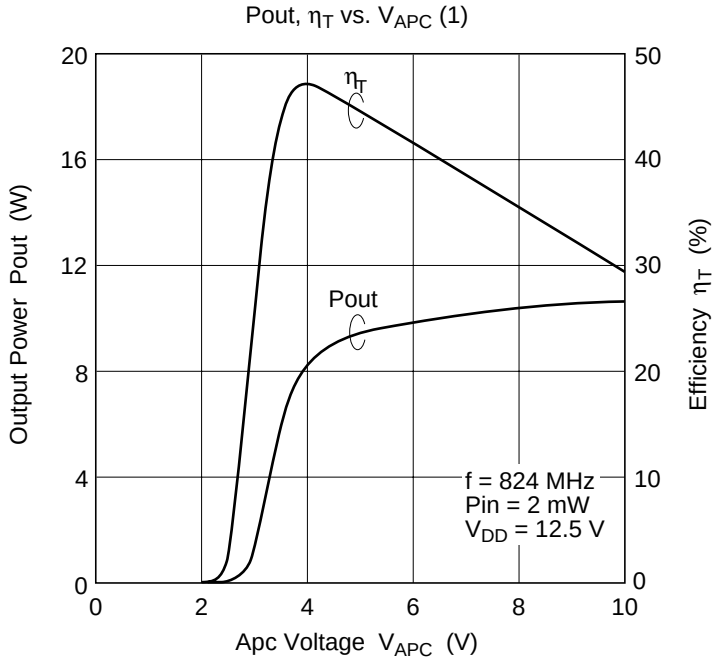

Pout, ηT, VSWR (in) vs. Frequency
Pin = 2 mW
VDD = 12.5 V
VAPC = 4 V
ηT
Pout
VSWRin
V.S.W.R. (in)
Output Power Pout (W)
Efficiency ηT (%)
Frequency f (MHz)
824
829
834
839
844
849

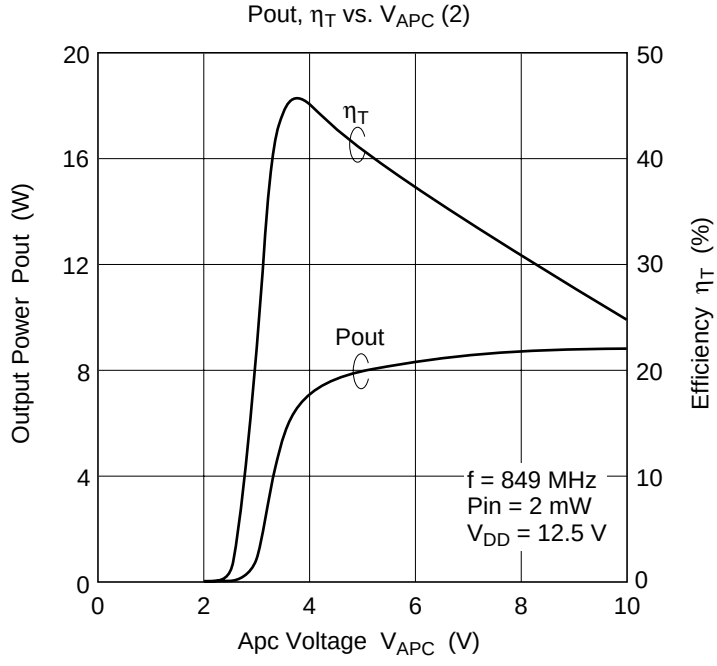
**PF0030** (cont)


Pout, ηT vs. Pin (1)
Output Power Pout (W)
Efficiency ηT (%)
Input Power Pin (mW)
ηT
Pout
f = 824 MHz
VDD = 12.5 V
VAPC = 4 V
0
4
8
12
16
20
10
20
30
40
50
60
0
2
4
6
8
10

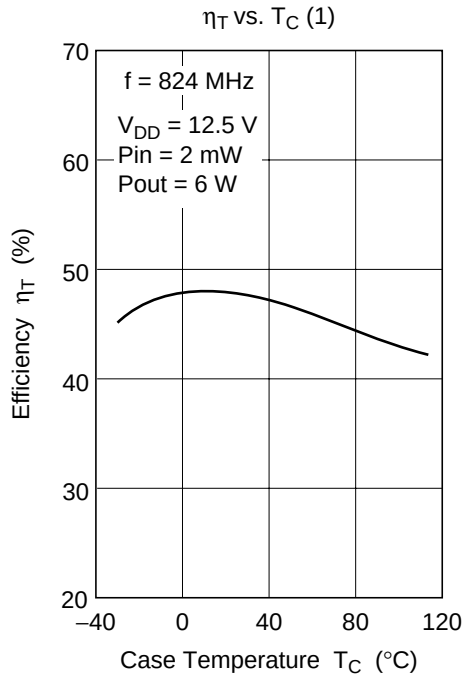

Pout, ηT vs. Pin (2)
Output Power Pout (W)
Efficiency ηT (%)
Input Power Pin (mW)
ηT
Pout
f = 849 MHz
VDD = 12.5 V
VAPC = 4 V
0
4
8
12
16
20
10
20
30
40
50
60
0
2
4
6
8
10

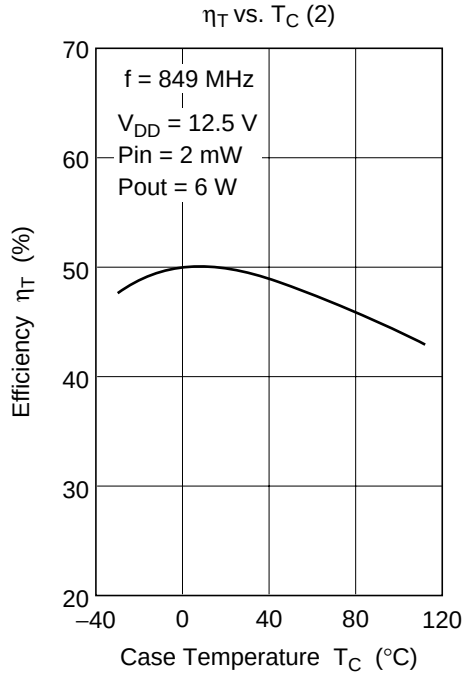
**PF0030** (cont)


Pout, ηT vs. VAPC (1)
ηT
Pout
f = 824 MHz
Pin = 2 mW
VDD = 12.5 V
Output Power Pout (W)
Efficiency ηT (%)
Apc Voltage VAPC (V)
0
4
8
12
16
20
0
10
20
30
40
50
0
2
4
6
8
10


Pout, ηT vs. VAPC (2)
ηT
Pout
f = 849 MHz
Pin = 2 mW
VDD = 12.5 V
Output Power Pout (W)
Efficiency ηT (%)
Apc Voltage VAPC (V)
0
4
8
12
16
20
0
10
20
30
40
50
0
2
4
6
8
10

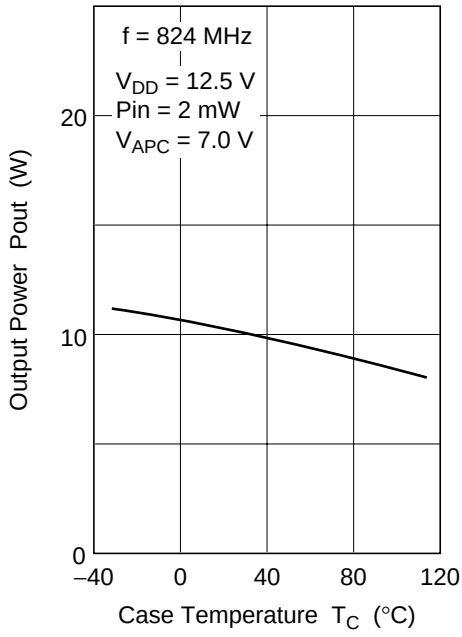
**PF0030** (cont)


ηT vs. TC (1)
f = 824 MHz
VDD = 12.5 V
Pin = 2 mW
Pout = 6 W
Efficiency ηT (%)
70
60
50
40
30
20
–40
0
40
80
120
Case Temperature TC (°C)

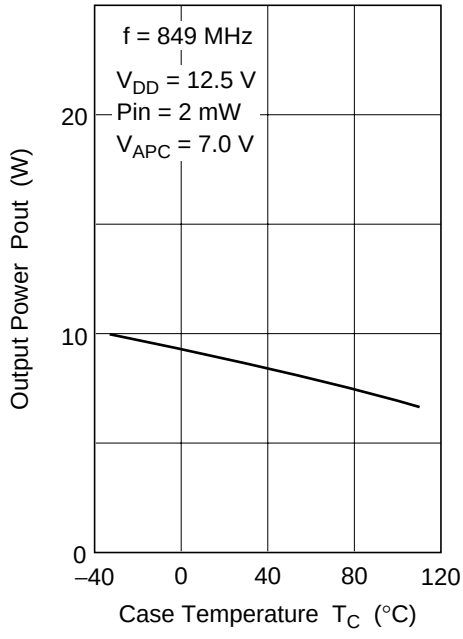

ηT vs. TC (2)
f = 849 MHz
VDD = 12.5 V
Pin = 2 mW
Pout = 6 W
Efficiency ηT (%)
70
60
50
40
30
20
–40
0
40
80
120
Case Temperature TC (°C)

**PF0030** (cont)

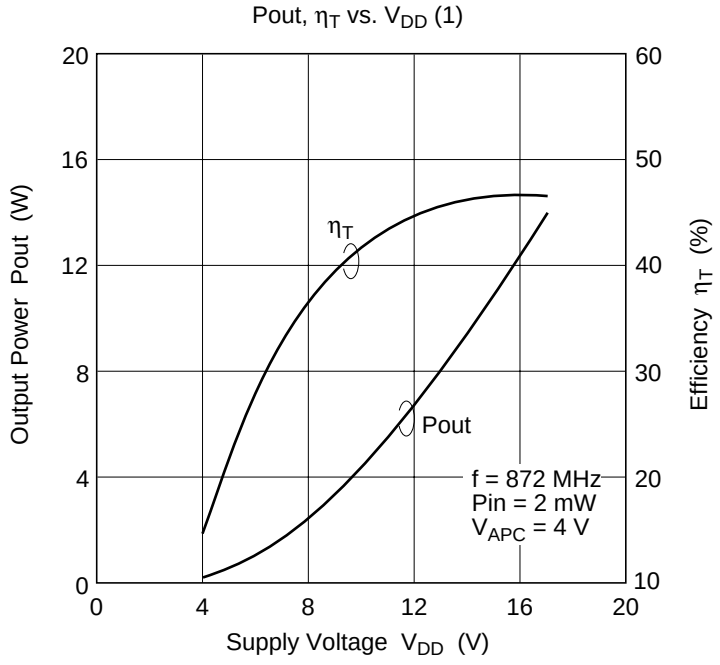
Pout vs. $T_C$ (1)

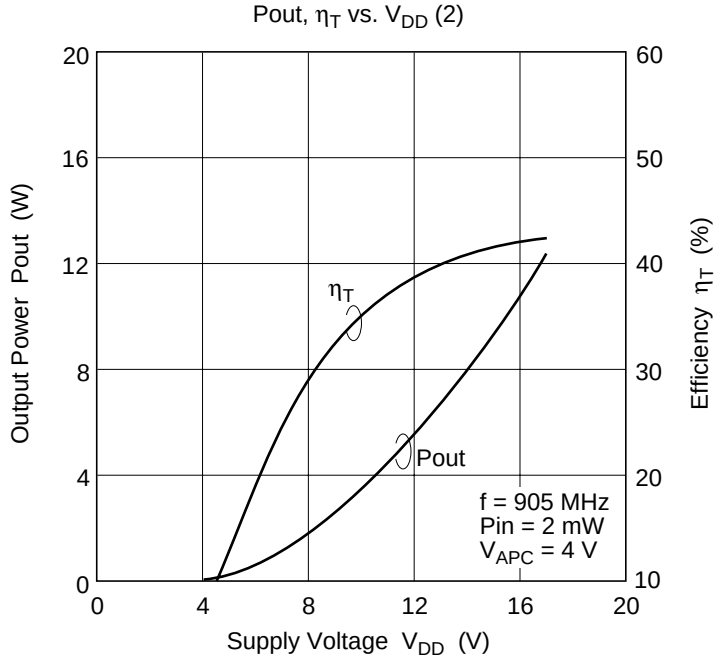



Pout vs. $T_C$ (2)

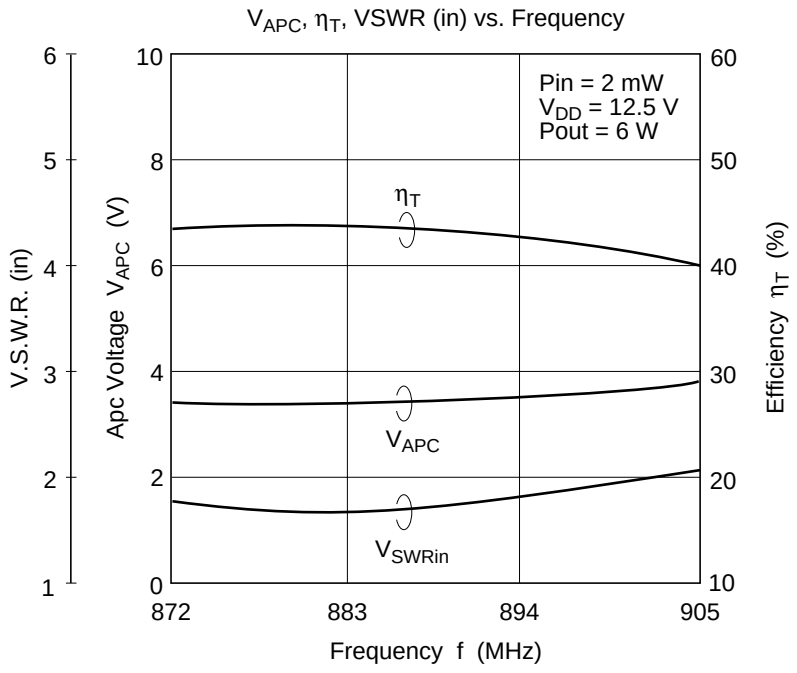


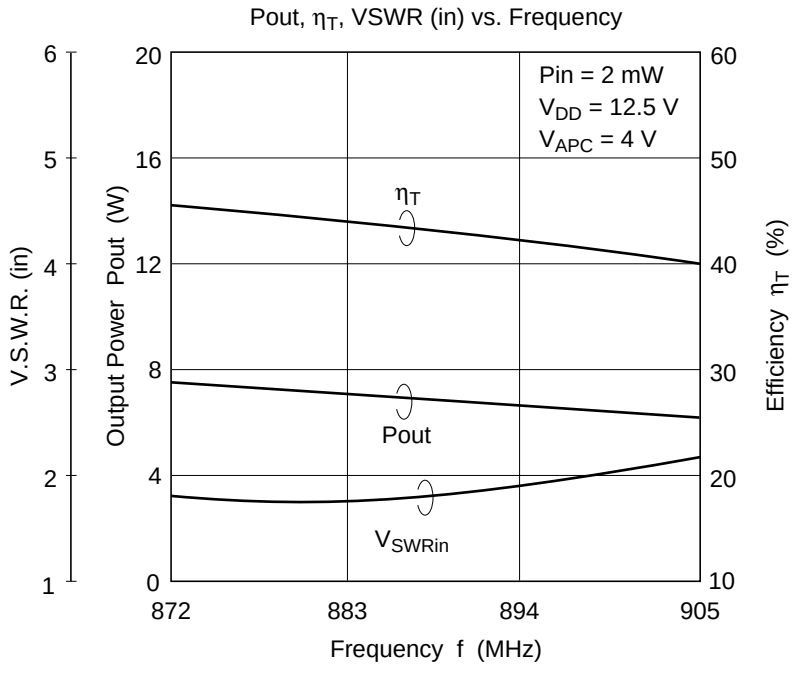
**PF0032**


Pout, ηT vs. VDD (1)
Output Power Pout (W)
Efficiency ηT (%)
Supply Voltage VDD (V)
ηT
Pout
f = 872 MHz
Pin = 2 mW
VAPC = 4 V
0
4
8
12
16
20
10
20
30
40
50
60

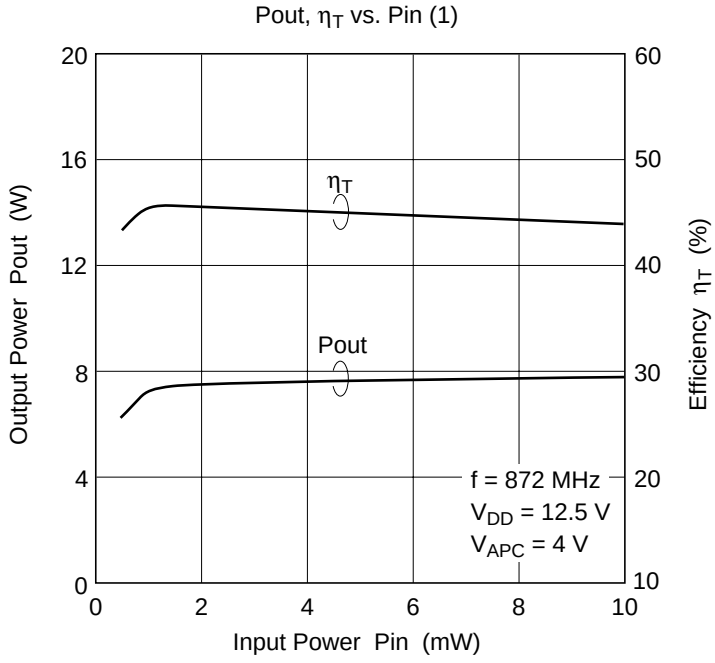

Pout, ηT vs. VDD (2)
Output Power Pout (W)
Efficiency ηT (%)
Supply Voltage VDD (V)
ηT
Pout
f = 905 MHz
Pin = 2 mW
VAPC = 4 V
0
4
8
12
16
20
10
20
30
40
50
60

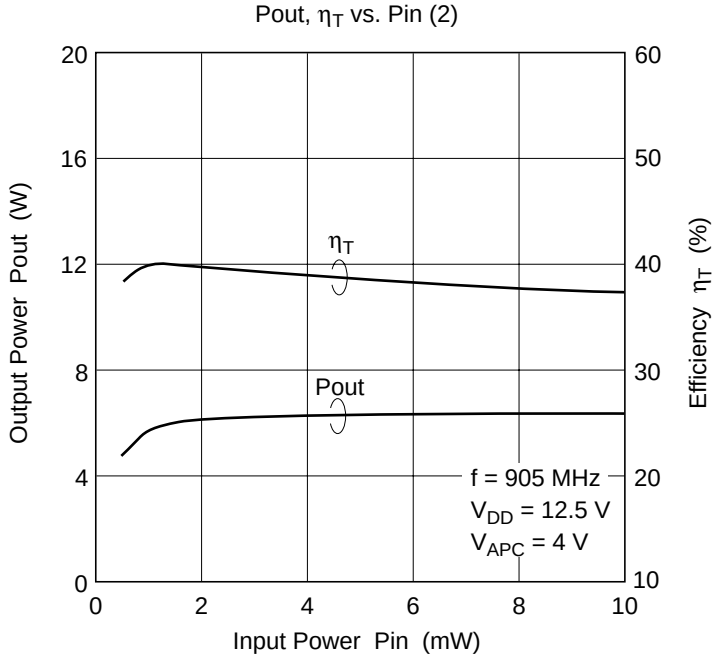
**PF0032** (cont)


VAPC, ηT, VSWR (in) vs. Frequency
Pin = 2 mW
VDD = 12.5 V
Pout = 6 W
ηT
VAPC
VSWRin
V.S.W.R. (in)
Apc Voltage VAPC (V)
Efficiency ηT (%)
Frequency f (MHz)
872
883
894
905

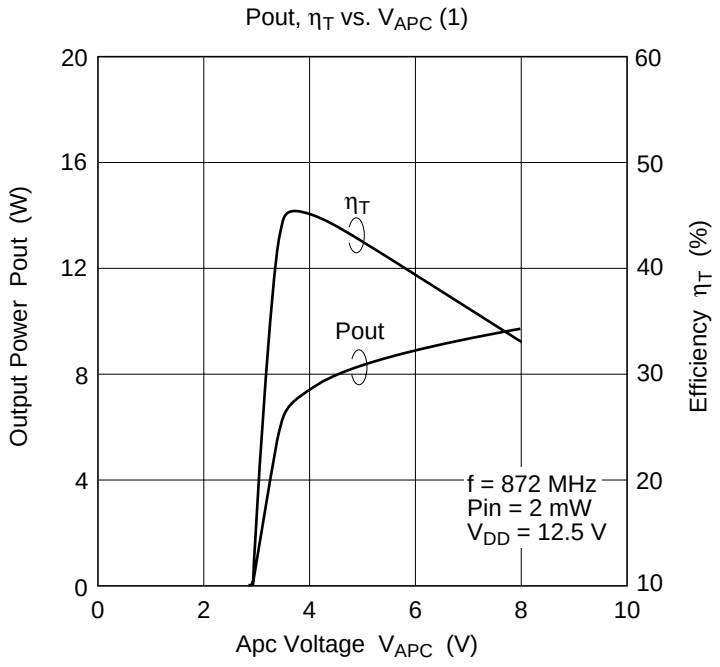

Pout, ηT, VSWR (in) vs. Frequency
Pin = 2 mW
VDD = 12.5 V
VAPC = 4 V
ηT
Pout
VSWRin
V.S.W.R. (in)
Output Power Pout (W)
Efficiency ηT (%)
Frequency f (MHz)
872
883
894
905

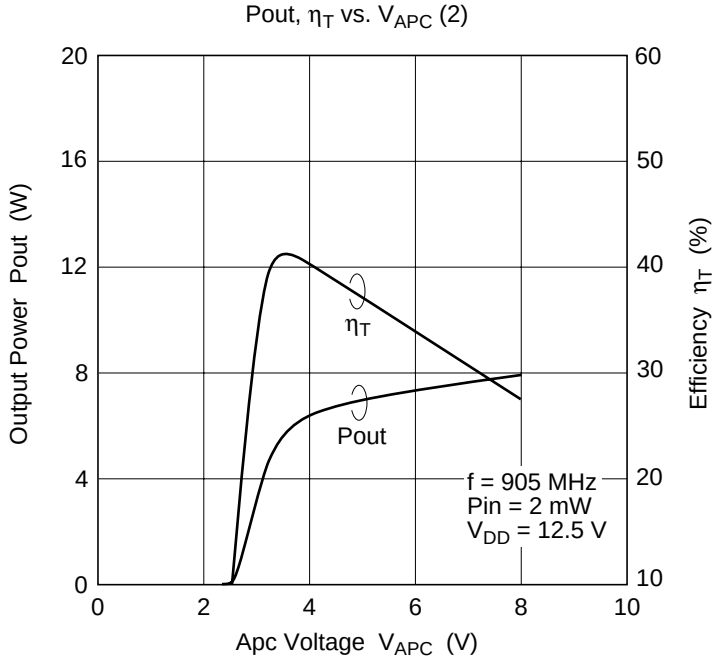
**PF0032** (cont)


Pout, ηT vs. Pin (1)
Output Power Pout (W)
Efficiency ηT (%)
Input Power Pin (mW)
ηT
Pout
f = 872 MHz
VDD = 12.5 V
VAPC = 4 V
0
4
8
12
16
20
10
20
30
40
50
60
0
2
4
6
8
10

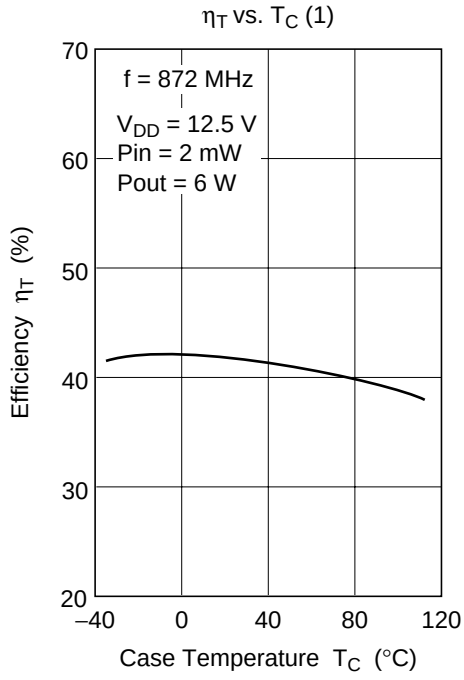

Pout, ηT vs. Pin (2)
Output Power Pout (W)
Efficiency ηT (%)
Input Power Pin (mW)
ηT
Pout
f = 905 MHz
VDD = 12.5 V
VAPC = 4 V
0
4
8
12
16
20
10
20
30
40
50
60
0
2
4
6
8
10

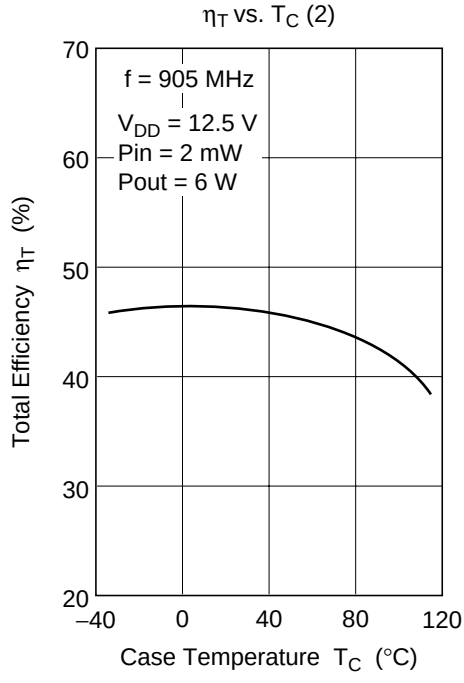
**PF0032** (cont)


Pout, ηT vs. VAPC (1)
Output Power Pout (W)
Efficiency ηT (%)
Apc Voltage VAPC (V)
ηT
Pout
f = 872 MHz
Pin = 2 mW
VDD = 12.5 V
0
4
8
12
16
20
10
20
30
40
50
60
0
2
4
6
8
10


Pout, ηT vs. VAPC (2)
Output Power Pout (W)
Efficiency ηT (%)
Apc Voltage VAPC (V)
ηT
Pout
f = 905 MHz
Pin = 2 mW
VDD = 12.5 V
0
4
8
12
16
20
10
20
30
40
50
60
0
2
4
6
8
10

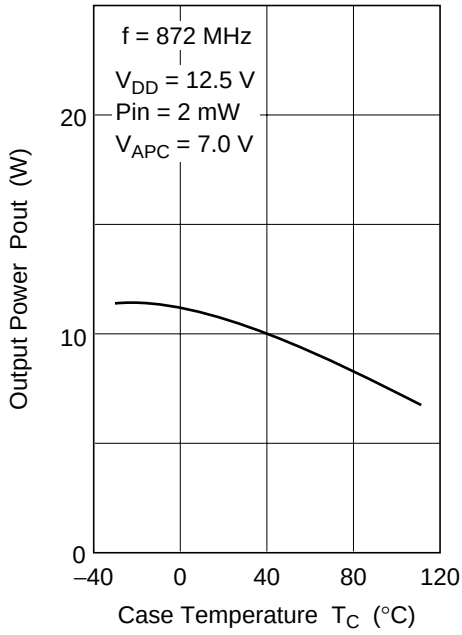
**PF0032** (cont)


ηT vs. TC (1)
f = 872 MHz
VDD = 12.5 V
Pin = 2 mW
Pout = 6 W
Efficiency ηT (%)
70
60
50
40
30
20
–40
0
40
80
120
Case Temperature TC (°C)

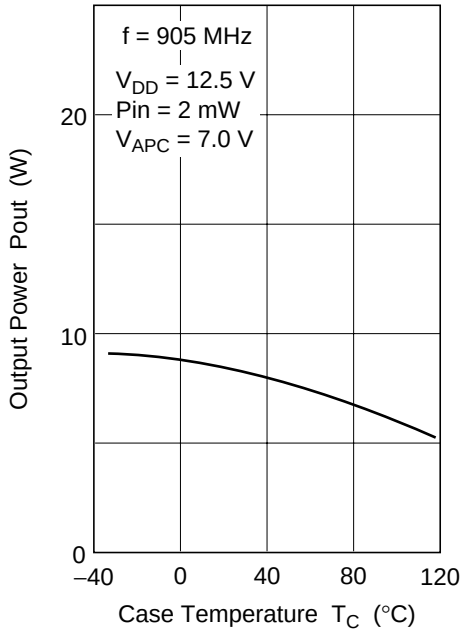

ηT vs. TC (2)
f = 905 MHz
VDD = 12.5 V
Pin = 2 mW
Pout = 6 W
Total Efficiency ηT (%)
70
60
50
40
30
20
–40
0
40
80
120
Case Temperature TC (°C)

**PF0032** (cont)

Pout vs. $T_C$ (1)

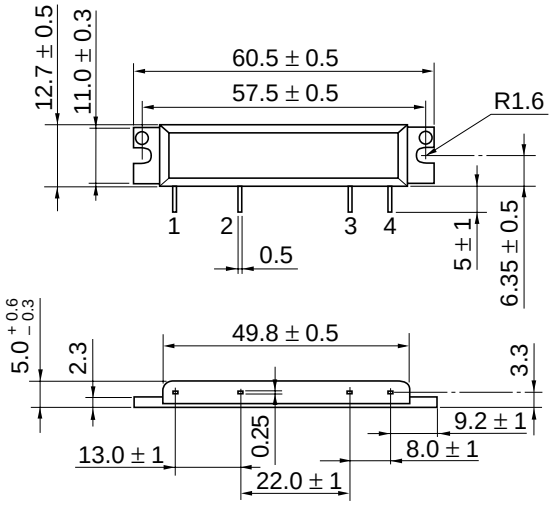


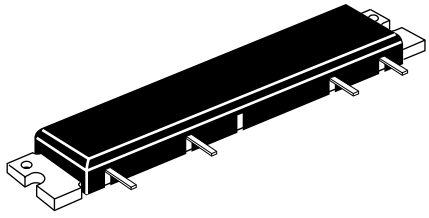

Pout vs. $T_C$ (2)



## Package Dimensions

Unit: mm



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

## Cautions

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