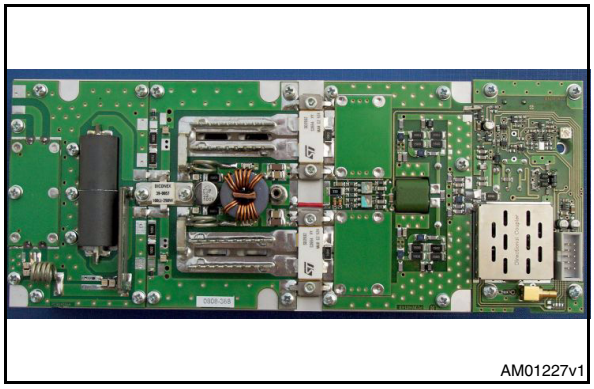
STEVAL-TDR009V1

RF power amplifier demonstration board using: 2 x SD2932 N-channel enhancement-mode lateral MOSFETs

Features

- Excellent thermal stability
- Frequency: 87.5 - 108 MHz
- Supply voltage: 48 V
- Output power: 650 W min.
- Gain: 19.5 dB min.
- Efficiency: 73 % min.
- Harmonics < - 36 dBc
- Gain flatness: ± 0.5 dB max



Description

The STEVAL-TDR009V1 is a RF broadband power amplifier intended for FM broadcast radio transmitters over the band 87.5 to 108 MHz using 2 x SD2932 gold metallized N-channel MOS field-effect transistors.

STEVAL-TDR009V1 is designed in cooperation with InnovAction s.r.l in italy.

Table 1. Device summary

Order code
STEVAL-TDR009V1

Contents

1 Electrical data

1.1 Maximum ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
P_{IN}	Input power	15	W
P_{OUT}	Output power	700	W
T_{STG}	Storage temperature range	-20 to +70	°C
T_C	Operating base plate temperature	0 to +70	°C
I_{DD}	Drain current	22	A
P_{DISS}	Power dissipation	400	W

2 Electrical characteristics

T_A = +25 °C, V_{DD} = 48 V, I_{dq} = 2 x 200 mA

Table 3. Electrical specification

Symbol	Test conditions	Min	Typ	Max	Unit
Frequency	Frequency range	87.5		108	MHz
P_{OUT}		650		700	W
Gain	P_{OUT} = 650 W	20 ± 1.0			dB
ND	P_{OUT} = 650 W	80			%
H2	2^{nd} harmonic @ P_{OUT} = 650 W	-40			dBc
H3	3^{rd} harmonic @ P_{OUT} = 650 W	-45			dBc
FL	gain flatness @ P_{OUT} = 650 W			± 0.5	dB

3 Circuit schematic

Figure 1. RF amplifier module

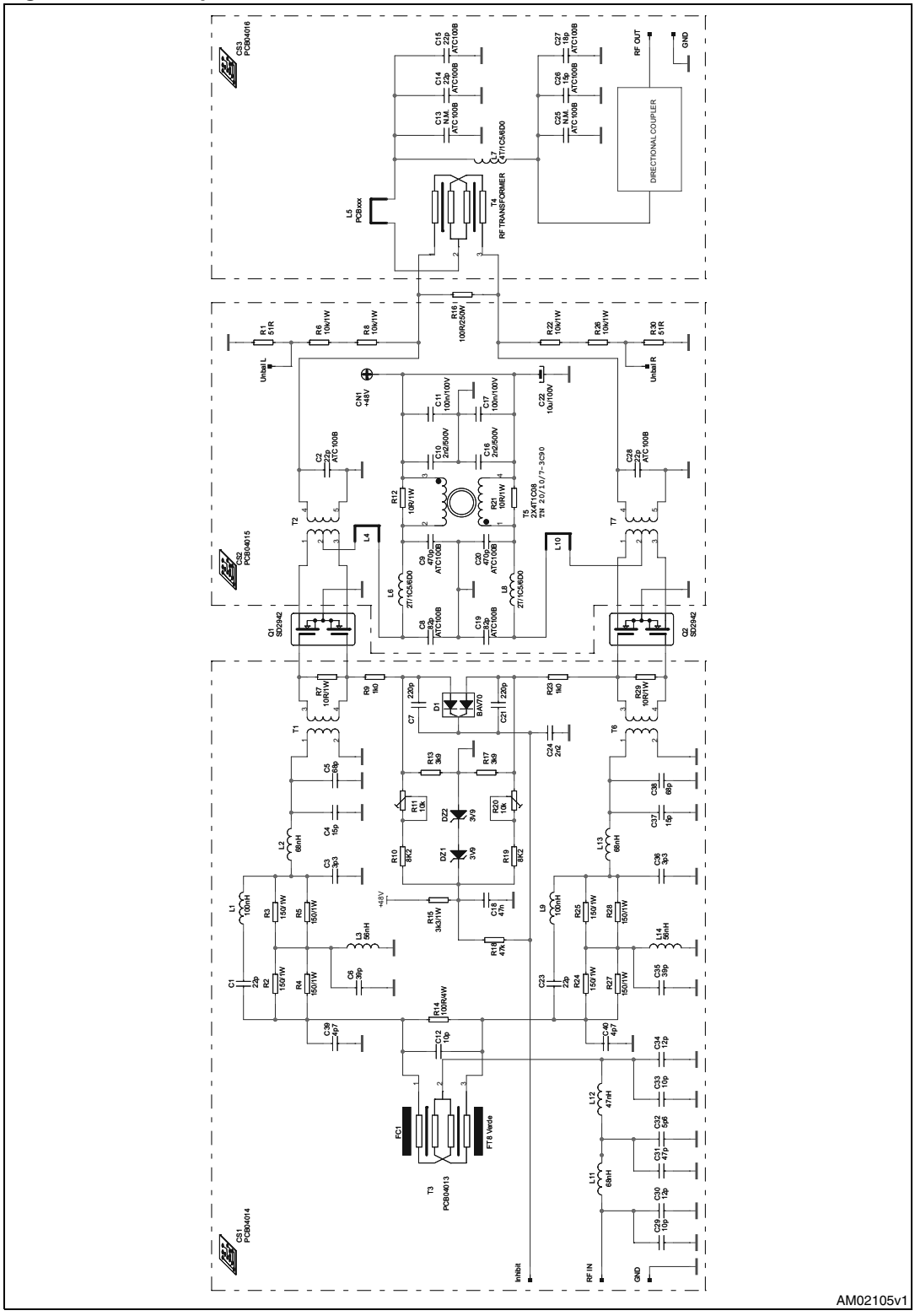


Figure 2. Input and protection board

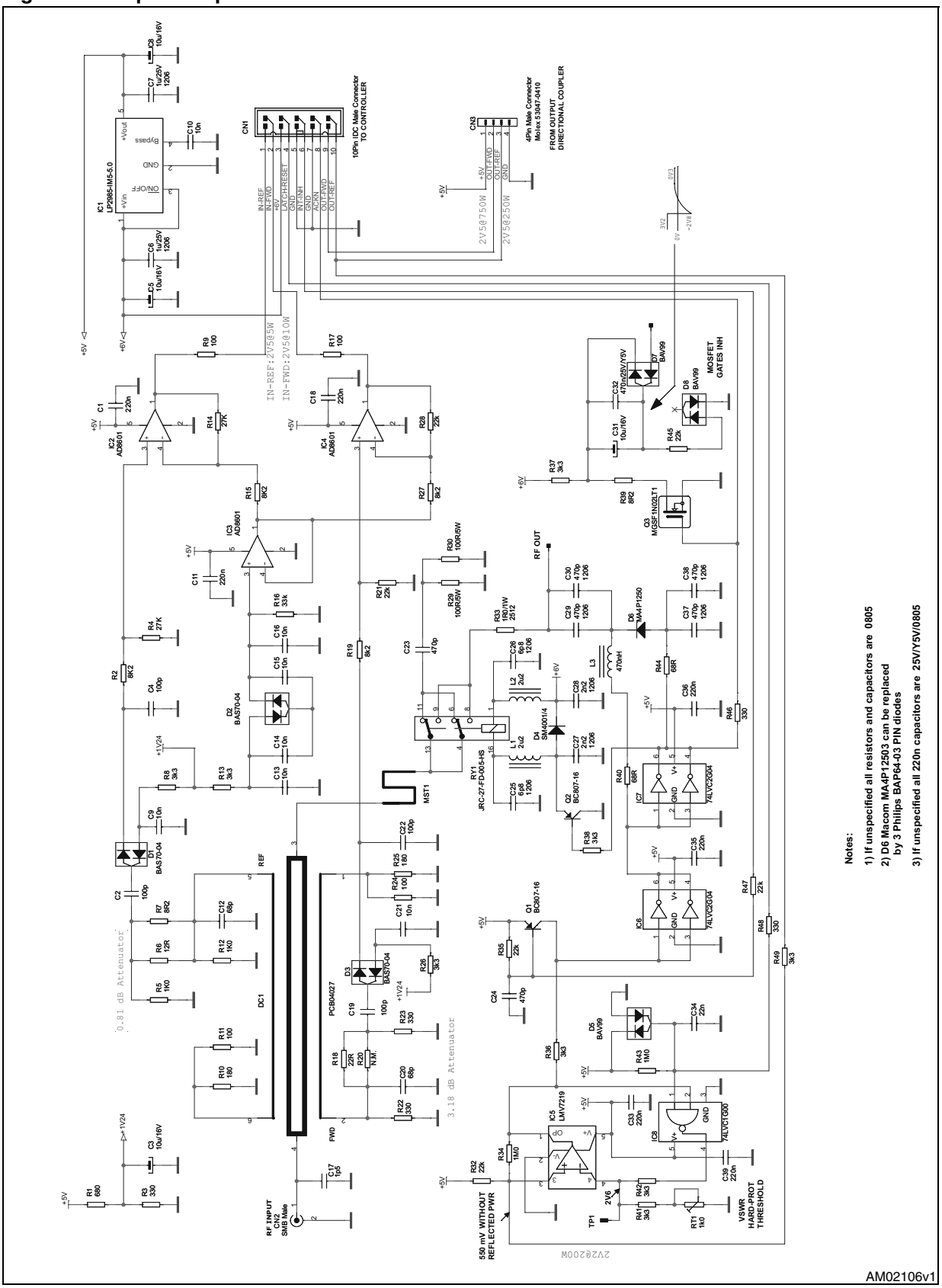
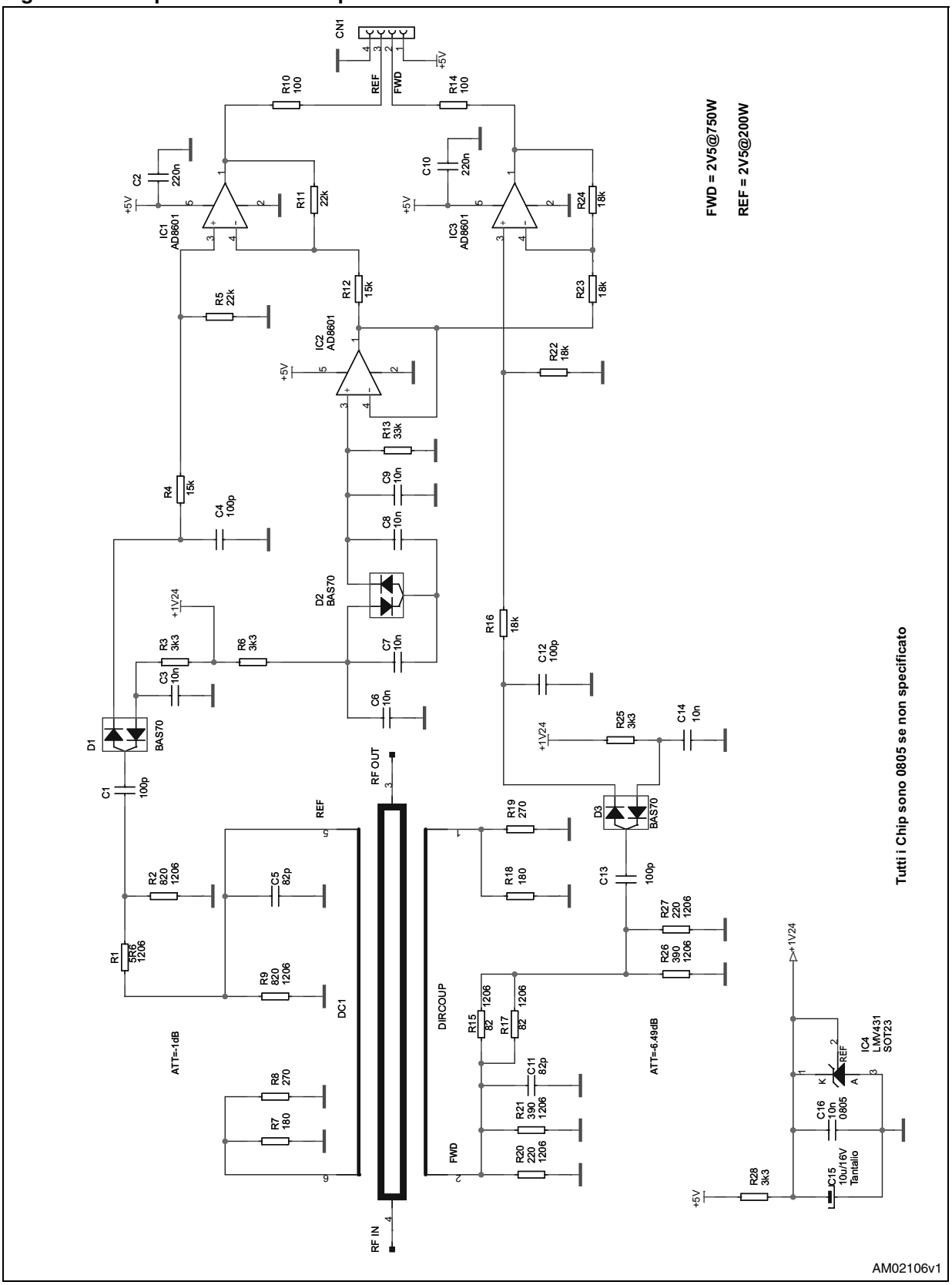
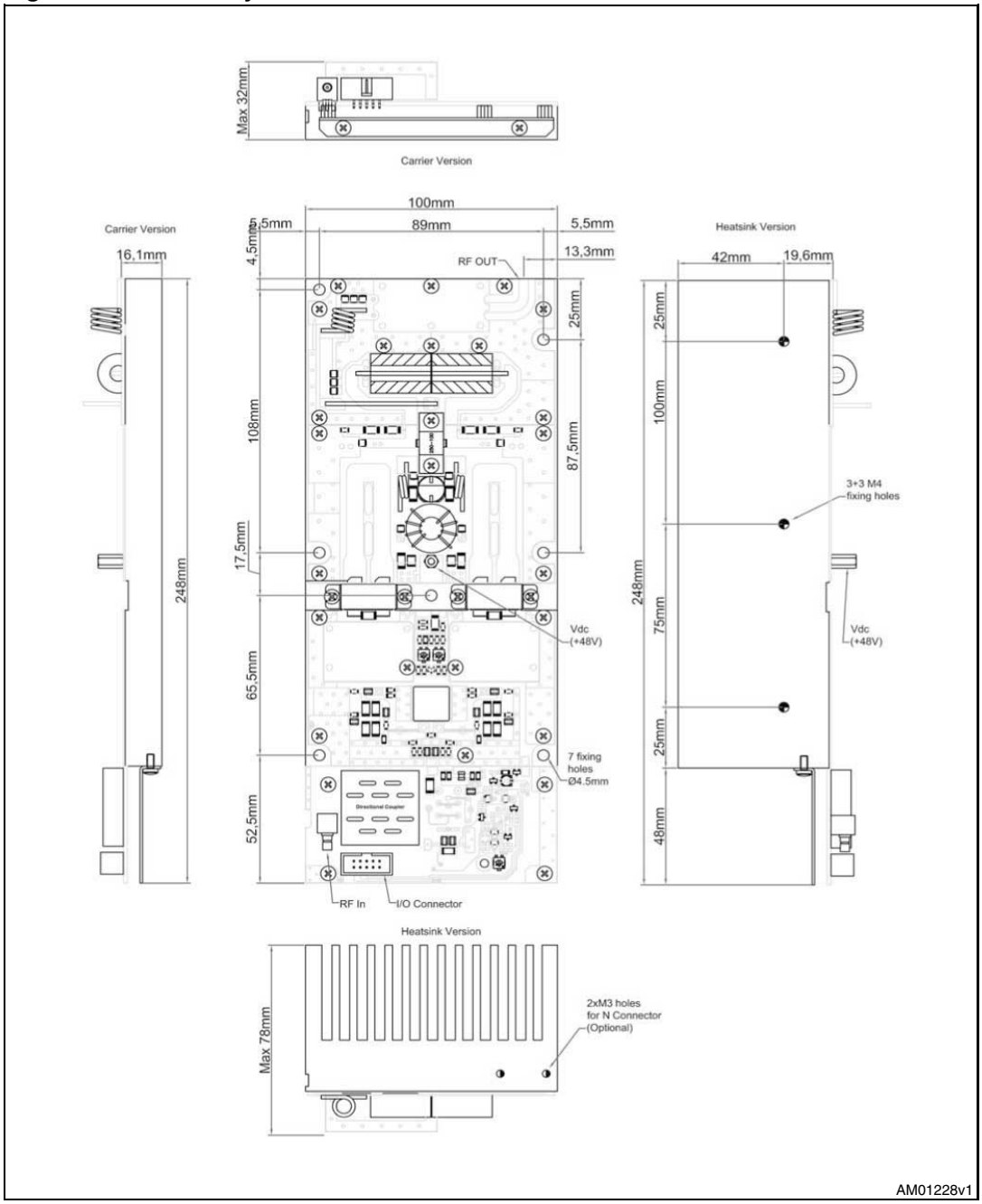


Figure 3. Output directional coupler



4 Circuit layout and connections

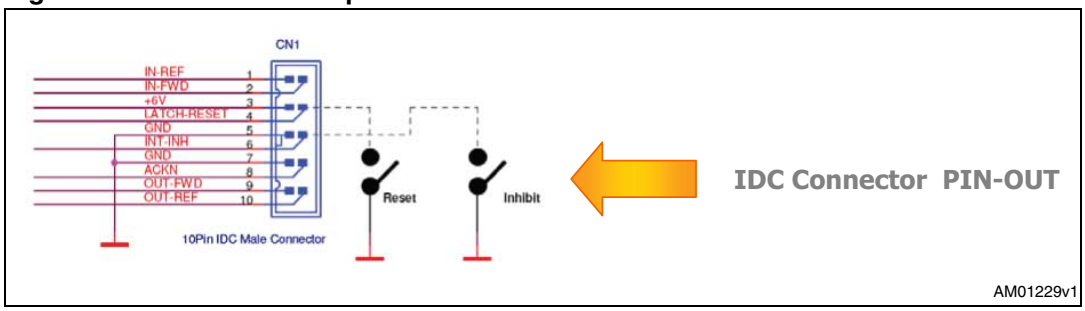
Figure 4. Circuit layout and connections



5 Features include

- 30 W input dummy load with automatic change-over case of alarm
- Input directional coupler
- Output directional coupler
- Input forward power measurement 2.5 V @ 10 W
- Input reflected power measurement 2.5 V @ 5 W
- Output forward power measurement 2.5 V @ 700 W
- Output reflected power measurement 2.5 V @ 250 W
- Latching protection
- Latch reset pin for manual restart (momentary to GND)
- Over reflected power ultrafast alarm (700 nS)
- Input pin for RF power inhibit
- Acknowledge pin alarm + 5 V

Figure 5. IDC connector piuout



6 SD2932 mounting recommendations

6.1 Mounting recommendations

- Ensure holes in heatsinks are free from burrs;
- Minimum depth of tapped holes in heatsinks is 6 mm;
- Use 4-40 UNC-2A cheese-head screws with a flat washer to spread the joint pressure;
- The minimum flatness of the mounting area is 0.02 mm;
- Mounting area roughness should be less than 0.5 µm (micro);
- Avoid, as much as possible, use of flux or flux solutions because flux can penetrate even when hermetically sealed ceramic-capped transistors. Tin and wash the printed-circuit board BEFORE mounting the power transistors, then solder the transistor leads without using flux;
- Transistor leads may be tinned by dipping them full-length into a solder bath at a temperature of about 230 °C. No flux should be used during tinning;
- Recommended heatsink compounds: WPSII (silicon free) from Austerlitz Electronics, 340 from dow corning etc.

6.2 Mounting sequence

- Apply a thin layer of evenly distributed heatsink compound to the flange;
- Position the device with flat washers in place;
- Tighten the screws until finger tight (0.05 Nm);
- Further tighten the screws until the specified torque is reached;
- For M174, M177 and M244 type of packages, torque should be minimum 0.6 Nm and 0.75 Nm max.

Table 4. DMOS packages - list of materials

Package Type	Description	Flange	Leadframe	Ceramic insulator	Plating		Torque (Nm)	
					Leads	Flange	Min	Max
M174	0.500 dia 4l non herm w/flange	Cu	Alloy 42 (Fe58 / Ni42)	BeO (99.5% min)	Au (100 µ min) over Ni (100 µ min / 350 µ max)	Ni(100 µ min) + Pd (10 µ min)	0.6	0.75
M174 (Moly disk)	0.500 dia 4l non herm w/flange (moly disk)	Cu-Mo-Cu	Alloy 42 (Fe58 / Ni42)	BeO (99.5% min)	Au (100 µ min) over Ni (100 µ min / 350 µ max)	Ni(100 µ min) + Pd (10 µ min)	0.6	0.75
M177	0.550 dia 4l non herm w/flange	Cu-Mo-Cu	Alloy 42 (Fe58 / Ni42)	BeO (99.5% min)	Au (60 µ min) over Ni (100 µ min / 350 µ max)	Au (100 µ min) over Ni (100 µ min / 350µ max)	0.6	0.75
M244	2 x 0.400x0.425 wide 2l lap n/h flange	W (85%) - Cu (15%)	Alloy 42 (Fe58 / Ni42)	BeO(99.5 % min)	Au (60 µ min) over Ni (100 µ min / 350µ max)	Au (60 µ min) over Ni (100 µ min / 350µ max)	0.6	0.75

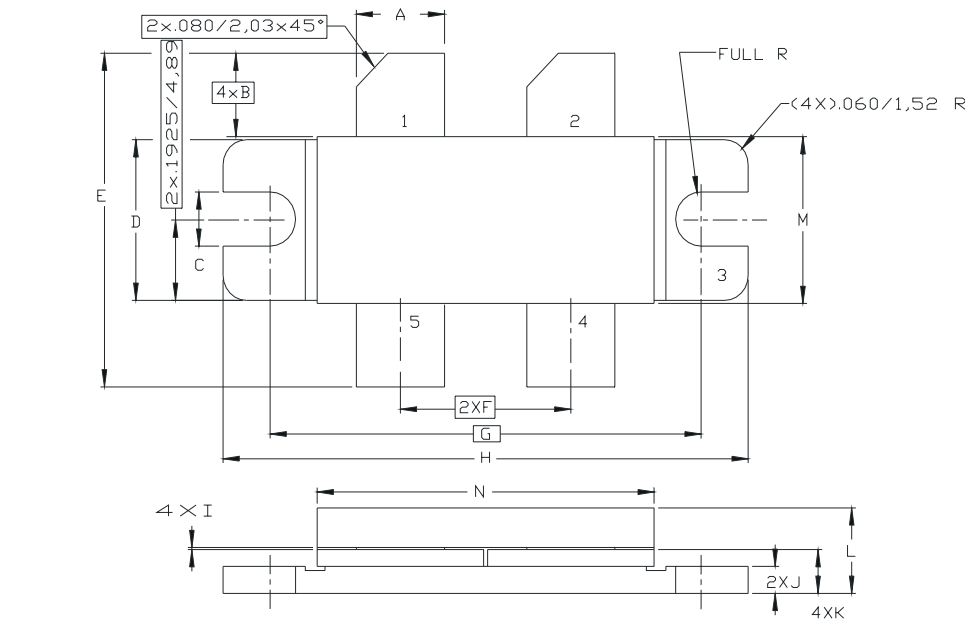
7 Package mechanical data:

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

Table 5. M244 (.400 x .860 4/L BAL N/HERM W/FLG) mechanical data

Dim.	mm.			Inch		
	Min	Typ	Max	Min	Typ	Max
A	5.59		5.84	0.220		0.230
B		5.08			0.200	
C	3.02		3.28	0.119		0.129
D	9.65		9.91	0.380		0.390
E	19.81		20.82	0.780		0.820
F	10.92		11.18	0.430		0.440
G		27.94			1.100	
H	33.91		34.16	1.335		1.345
I	0.10		0.15	0.004		0.006
J	1.52		1.78	0.060		0.070
K	2.59		2.84	0.102		0.112
L	4.83		5.84	0.190		0.230
M	10.03		10.34	0.395		0.407
N	21.59		22.10	0.850		0.870

Figure 6. Package dimensions



Controlling Dimension: Inches

1020876B

8 Revision history

Table 6. Document revision history

Date	Revision	Changes
26-Feb-2008	1	Initial release