

Demonstration board using the PD84002 for UHF RFID reader

Features

- Excellent thermal stability
- Frequency: 8
- 860 - 960 MHz
- Supply voltage: 7.2 V
- Output power: 2 W
- Power gain: 13.9 ± 0.5 dB
- Efficiency: 60 % - 63 %
- Load mismatch: 20:1
- BeO-free amplifier

Description

The STEVAL-TDR013V1 is an evaluation board using PD84002 LDMOS transistor and designed for UHF RFID reader and 2-way radio applications.

For additional information on PD84002, please refer to its datasheet.

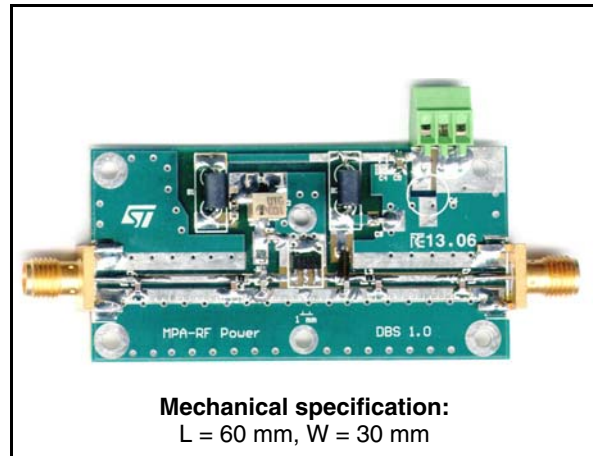


Table 1. Device summary

| Order code |
|-----------------|
| STEVAL-TDR013V1 |

Contents

| | | |
|----------|---|-----------|
| 1 | Electrical data | 3 |
| | 1.1 Maximum ratings | 3 |
| 2 | Electrical characteristics | 3 |
| 3 | Impedance | 4 |
| 4 | Typical performance | 5 |
| 5 | Test circuit | 7 |
| 6 | Circuit layout | 9 |
| 7 | Package mechanical data | 10 |
| | 7.1 Thermal pad and via design | 12 |
| | 7.2 Soldering profile | 13 |
| 8 | Revision history | 15 |

1 Electrical data

1.1 Maximum ratings

Table 2. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|------------|-----------------------------|------------|------|
| V_{DD} | Supply voltage | 16 | V |
| I_D | Drain current | 0.75 | A |
| T_{CASE} | Operating case temperature | -20 to +85 | °C |
| T_A | Maximum ambient temperature | +55 | °C |

2 Electrical characteristics

$T_A = +25\text{ °C}$, $V_{DD} = 7.2\text{ V}$, $I_{dq} = 100\text{ mA}$

Table 3. Electrical specifications

| Symbol | Test conditions | Min | Typ | Max | Unit |
|-----------|---|-----|----------------|------|------|
| Freq | Frequency range | 860 | | 960 | MHz |
| P_{OUT} | | | 2 | | W |
| Gain | @ $P_{IN} = 19\text{ dBm}$ | | 13.9 ± 0.5 | | dB |
| ND | @ $P_{IN} = 19\text{ dBm}$ | | 60 - 63 | | % |
| H2 | 2nd harmonic @ $P_{OUT} = 2\text{ W}$ | | -31 / -46 | | dBc |
| H3 | 3rd harmonic @ $P_{OUT} = 2\text{ W}$ | | -62 / -70 | | dBc |
| VSWR | Load mismatch all phases @ $P_{OUT} = 2\text{ W}$ | | | 20:1 | |

3 Impedance

Figure 1. Impedance illustration

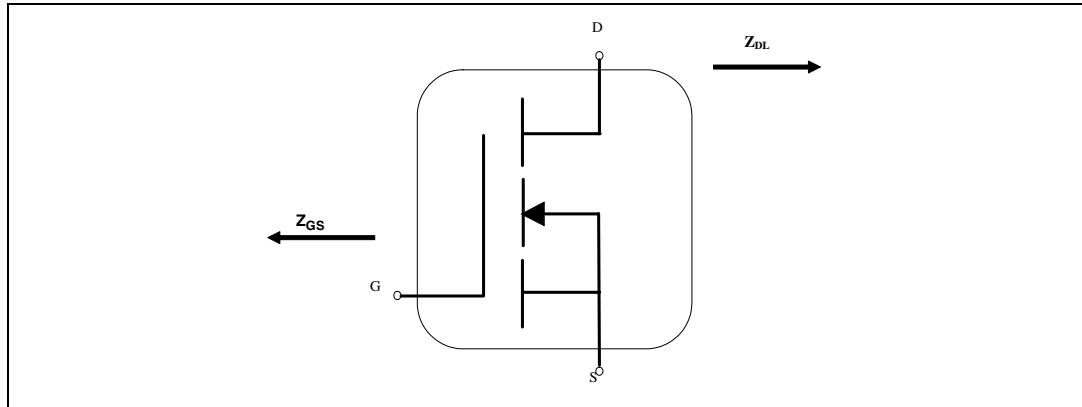


Table 4. Impedance data

| F(MHz) | Z_{GS} | Z_{DL} |
|--------|---------------|---------------|
| 860 | 1,80 + j 7,79 | 3,88 + j 2,41 |
| 870 | 1,84 + j 7,96 | 3,89 + j 2,69 |
| 880 | 1,83 + j 8,01 | 4,01 + j 2,96 |
| 890 | 1,76 + j 8,11 | 4,17 + j 3,16 |
| 900 | 1,70 + j 8,20 | 4,27 + j 3,32 |
| 910 | 1,63 + j 8,30 | 4,37 + j 3,40 |
| 920 | 1,57 + j 8,48 | 4,41 + j 3,46 |
| 930 | 1,43 + j 8,64 | 4,36 + j 3,51 |
| 940 | 1,41 + j 8,83 | 4,28 + j 3,51 |

4 Typical performance

Figure 2. Output power and efficiency vs frequency
7.2 V / 100 mA / Pin = 19 dBm

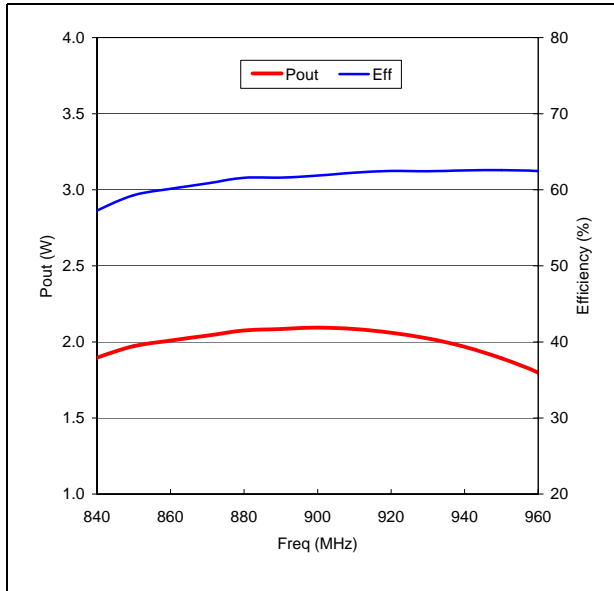


Figure 3. Gain vs frequency
7.2 V / 100 mA / Pin = 19 dBm

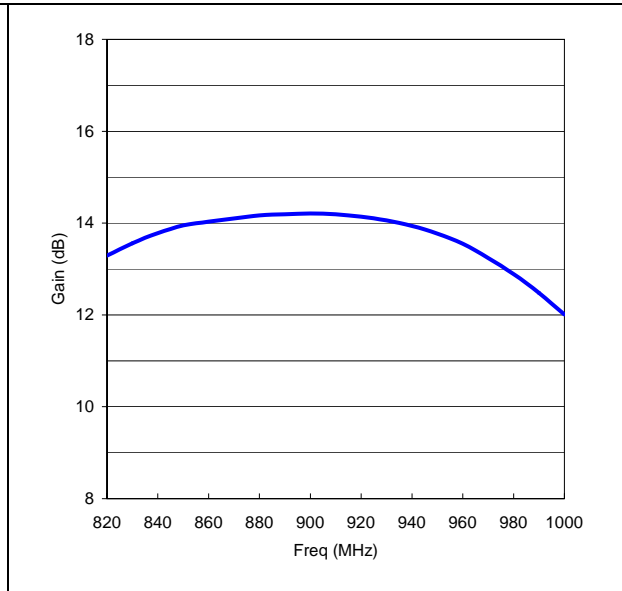


Figure 4. Gain vs Pout
7.2 V / 100 mA

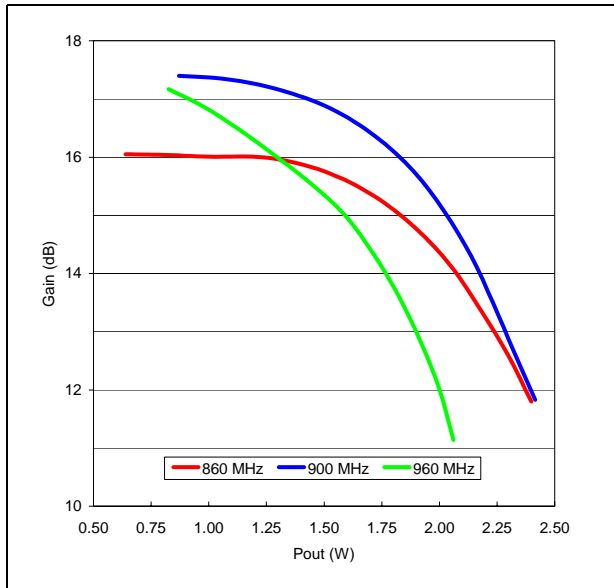


Figure 5. Harmonics vs frequency
7.2 V / 100 mA / Pin = 19 dBm

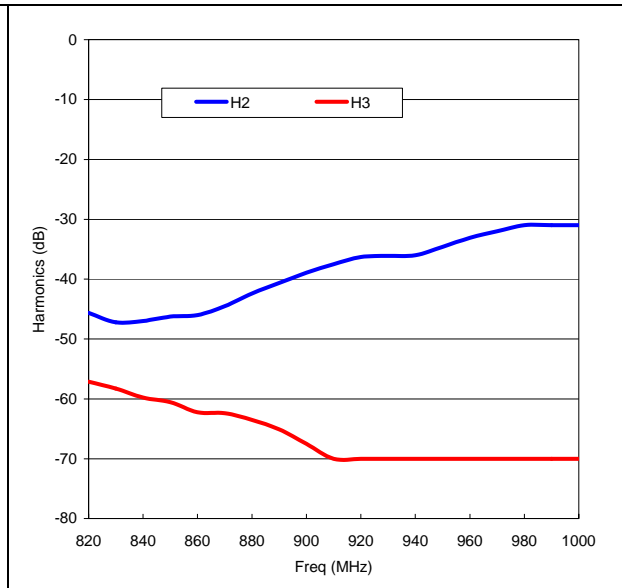
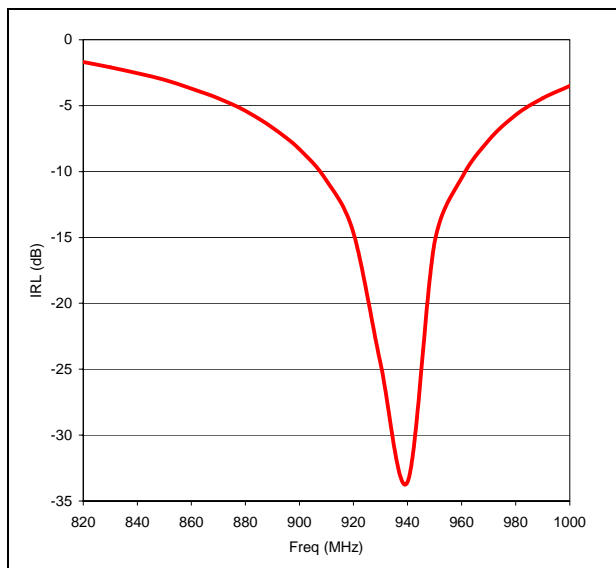


Figure 6. Input return loss vs frequency
7.2 V / 100 mA / Pin = 19 dBm



5 Test circuit

Figure 7. Test circuit schematic

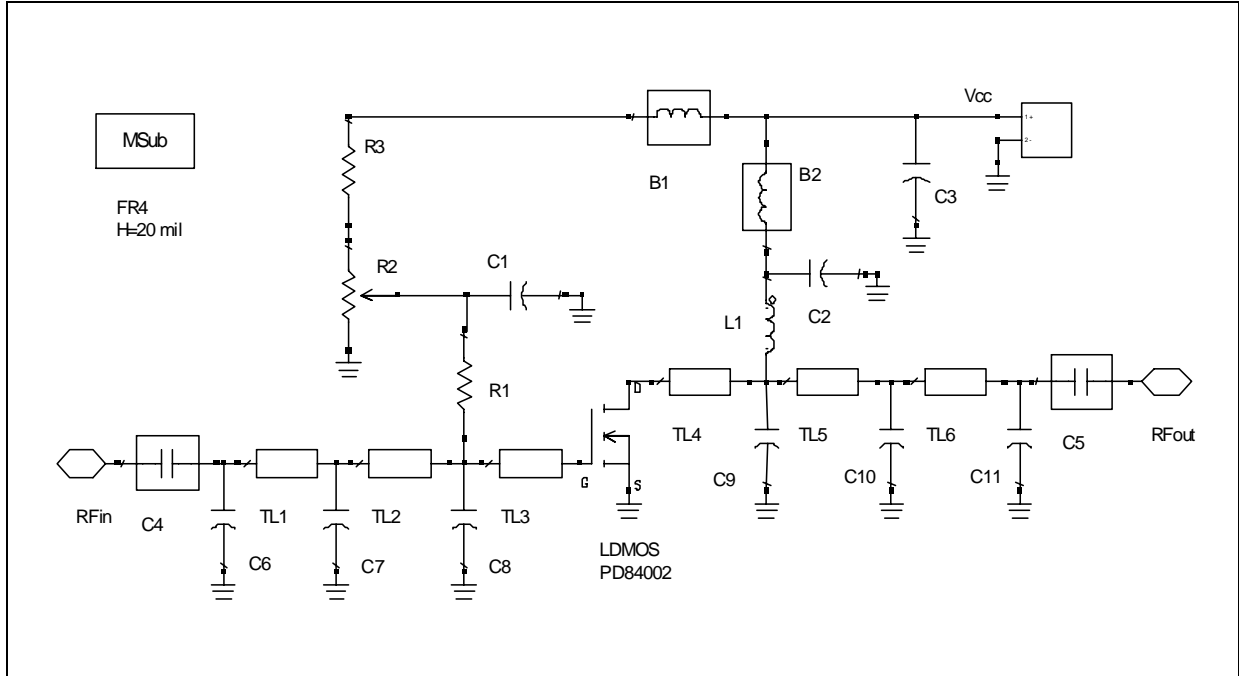


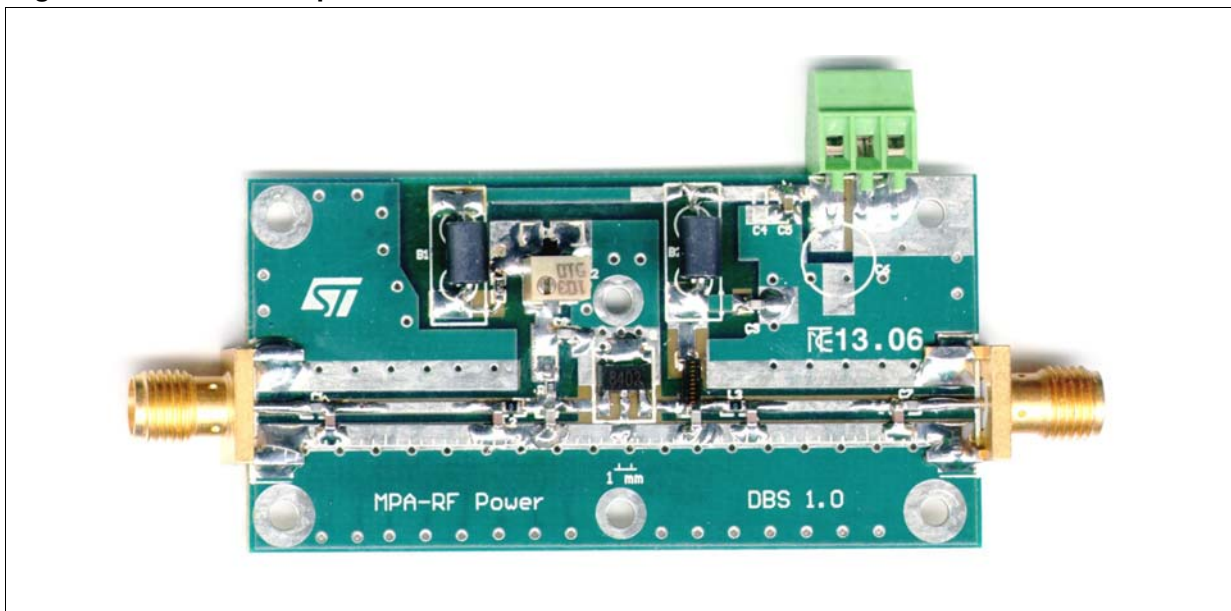
Table 5. Part list

| Component ID | Description | Value | Case size | Manufacturer | Part code |
|--------------|---------------|----------|-----------|--------------------|---------------------|
| B1 | Ferrite Bead | | | Panasonic | EXCELDRC35C |
| B2 | Ferrite Bead | | | Panasonic | EXCELDRC35C |
| C1, C2 | Capacitor | 120 pF | 0603 | Murata | GRM39-C0G121J50D500 |
| C3 | Capacitor | 1 uF | 0603 | Murata | GRM39-X5R105K16D52K |
| C4, C5 | Capacitor | 39 pF | 0603 | Murata | GRM39-C0G390J50D500 |
| C6, C10 | Capacitor | 3.3 pF | 0603 | Murata | GRM39-C0G3R3C50Z500 |
| C7 | Capacitor | 8.2 pF | 0603 | Murata | GRM39-C0G8R2D50Z500 |
| C8 | Capacitor | 22 pF | 0603 | Murata | GRM39-C0G220J50D500 |
| C9 | Capacitor | 12 pF | 0603 | Murata | GRM39-C0G120J50D500 |
| C11 | Capacitor | 2.7 pF | 0603 | Murata | GRM39-C0G2R7C50Z500 |
| L1 | Inductor | 12.55 nH | | Coilcraft | 1606-10 |
| R1 | Resistor | 150 Ω | 0603 | Tyco electronics | |
| R2 | Potentiometer | 10 KΩ | | Bourns electronics | 3214W-1-103E |
| R3 | Resistor | 1 K | 0603 | Tyco electronics | 01623440-1 |

Table 5. Part list (continued)

| Component ID | Description | Value | Case size | Manufacturer | Part code |
|---------------|-----------------------------------|------------|-------------|--------------------|--------------|
| TL1 | Transmission line | W = 0.92mm | L = 13.6 mm | | |
| TL2 | Transmission line | W = 0.92mm | L = 3.5 mm | | |
| TL3 | Transmission line | W = 0.92mm | L = 4.2 mm | | |
| TL4 | Transmission line | W = 0.92mm | L = 3.8 mm | | |
| TL5 | Transmission line | W = 0.92mm | L = 3.7 mm | | |
| TL6 | Transmission line | W = 0.92mm | L = 11.3 mm | | |
| RF in, RF out | SMA-CONN | 50 Ω | 60 mils | Johnson | 142-0701-801 |
| PD84002 | LDMOS | | | STMicroelectronics | PD84002 |
| Board | FR-4 THk=0.020" 2OZ Cu both sides | | | | |

Figure 8. Demoboard photo



6 Circuit layout

Figure 9. Test fixture component layout

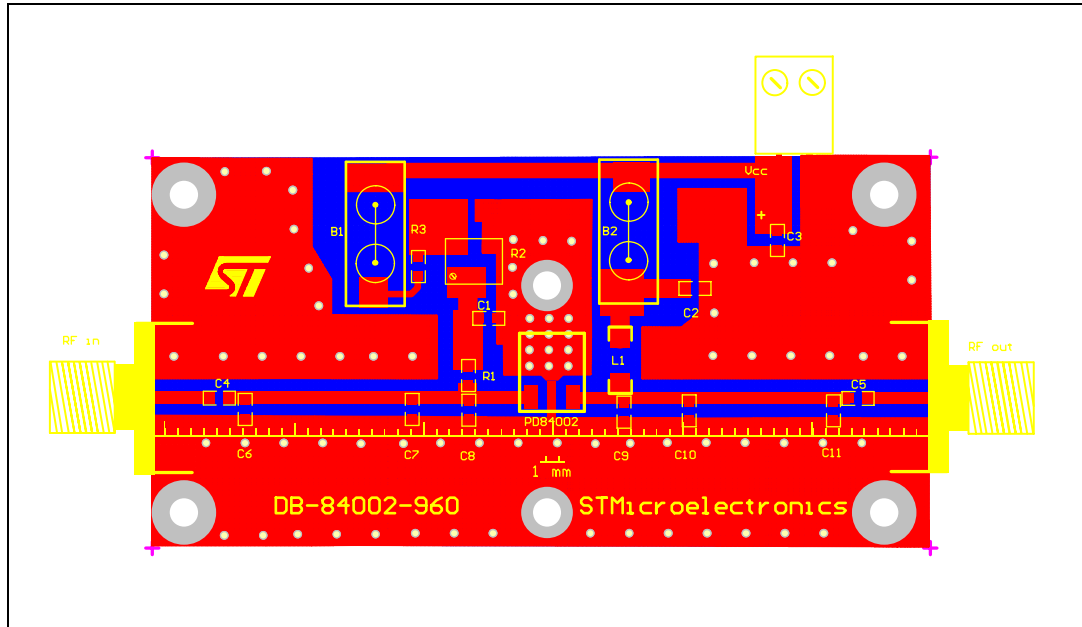
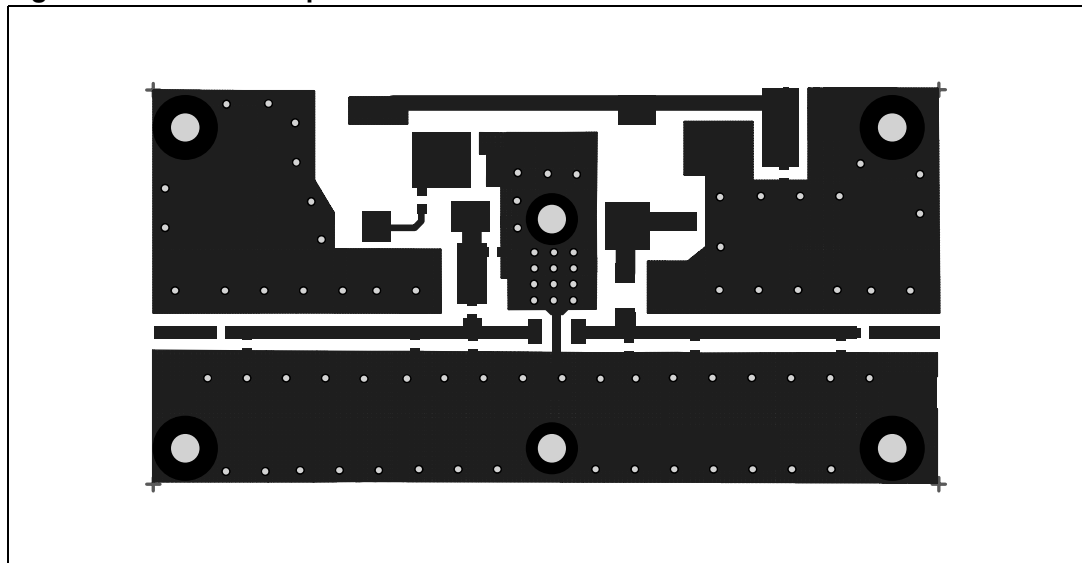


Figure 10. Test circuit photomaster



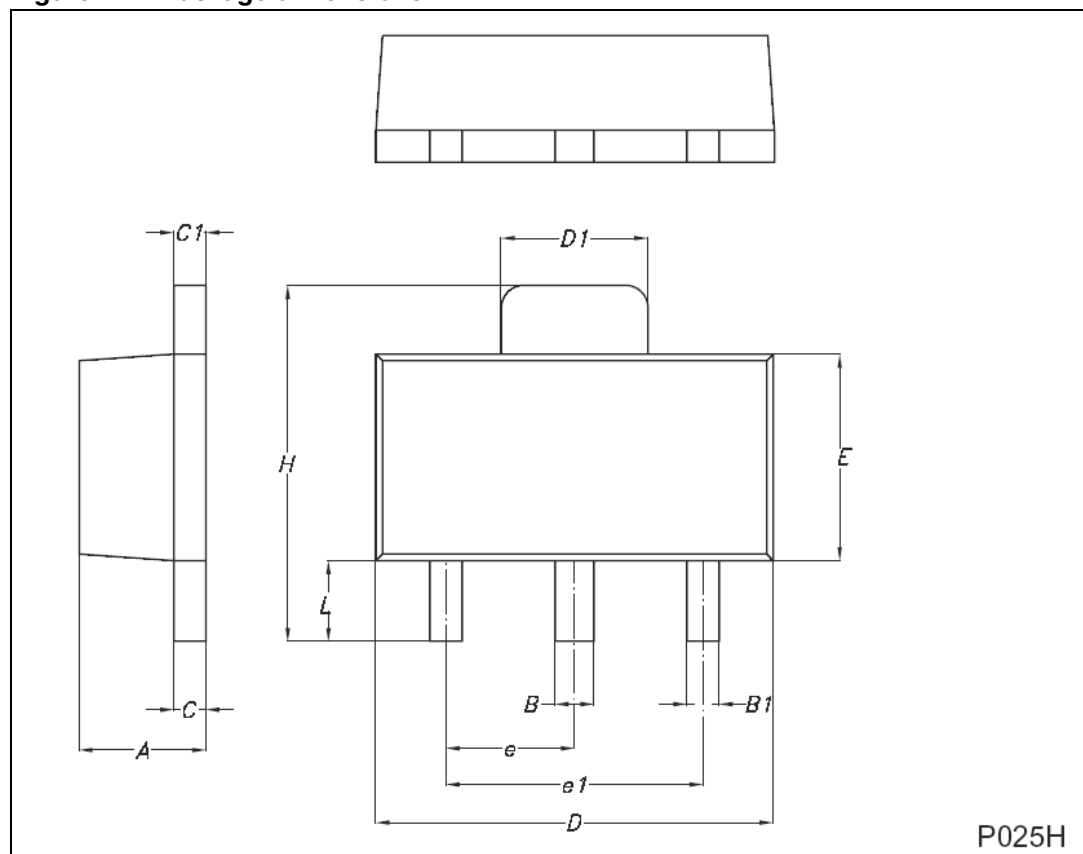
7 Package mechanical data

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 6. SOT-89 mechanical data

| Dim. | mm. | | | Inch | | |
|------|------|-----|------|-------|-----|-------|
| | Min | Typ | Max | Min | Typ | Max |
| A | 1.4 | | 1.6 | 55.1 | | 63.0 |
| B | 0.44 | | 0.56 | 17.3 | | 22.0 |
| B1 | 0.36 | | 0.48 | 14.2 | | 18.9 |
| C | 0.35 | | 0.44 | 13.8 | | 17.3 |
| C1 | 0.35 | | 0.44 | 13.8 | | 17.3 |
| D | 4.4 | | 4.6 | 173.2 | | 181.1 |
| D1 | 1.62 | | 1.83 | 63.8 | | 72.0 |
| E | 2.29 | | 2.6 | 90.2 | | 102.4 |
| e | 1.42 | | 1.57 | 55.9 | | 61.8 |
| e1 | 2.92 | | 3.07 | 115.0 | | 120.9 |
| H | 3.94 | | 4.25 | 155.1 | | 167.3 |
| L | 0.89 | | 1.2 | 35.0 | | 47.2 |

Figure 11. Package dimensions

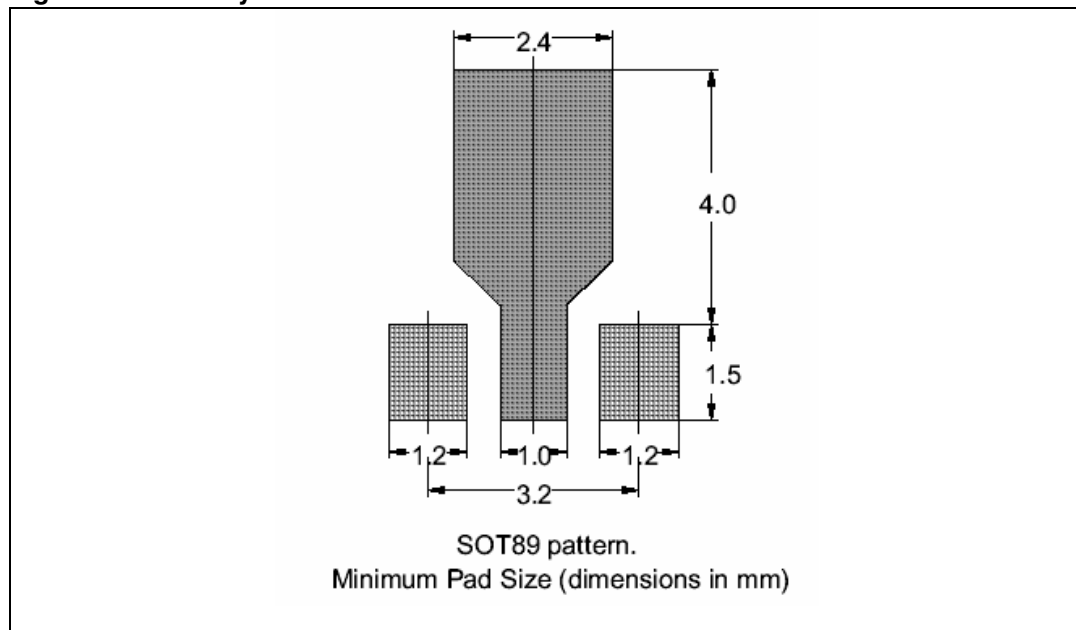


7.1 Thermal pad and via design

Thermal vias are required in the PCB layout to effectively conduct heat away from the package. The via pattern has been designed to address thermal, power dissipation and electrical requirements of the device.

The via pattern is based on thru-hole vias with 0.203mm to 0.330mm finished hole size on a 0.5mm to 1.2mm grid pattern with 0.025 plating on via walls. If micro vias are used in a design, it is suggested that the quantity of vias be increased by a 4:1 ratio to achieve similar results.

Figure 12. Pad layout details



7.2 Soldering profile

Figure 13 shows the recommended solder for devices that have Pb-free terminal plating and where a Pb-free solder is used.

Figure 13. Recommended solder profile

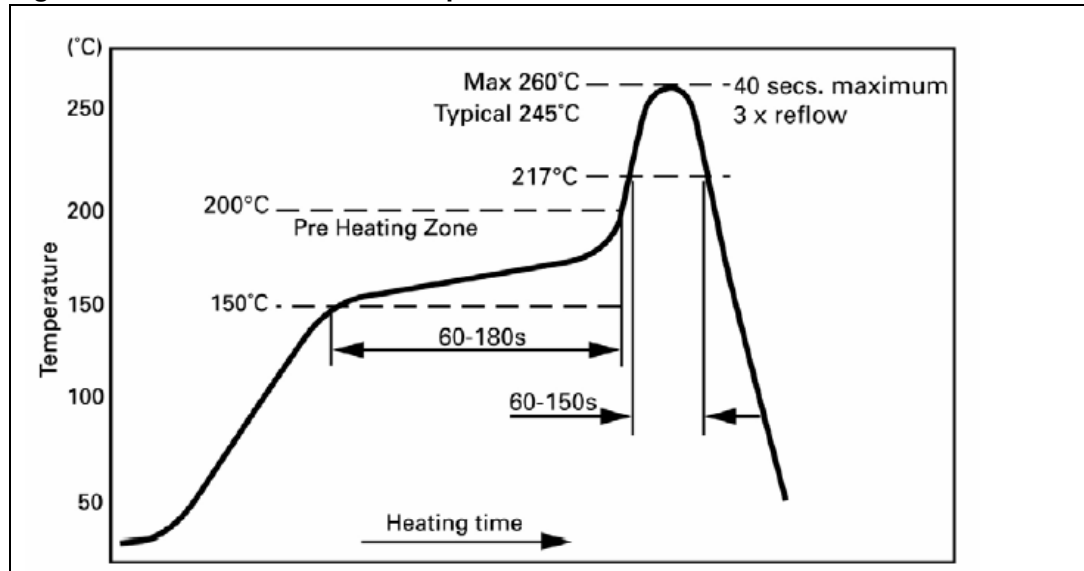


Figure 14 shows the recommended solder for devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with a leaded solder.

Figure 14. Recommended solder profile for leaded devices

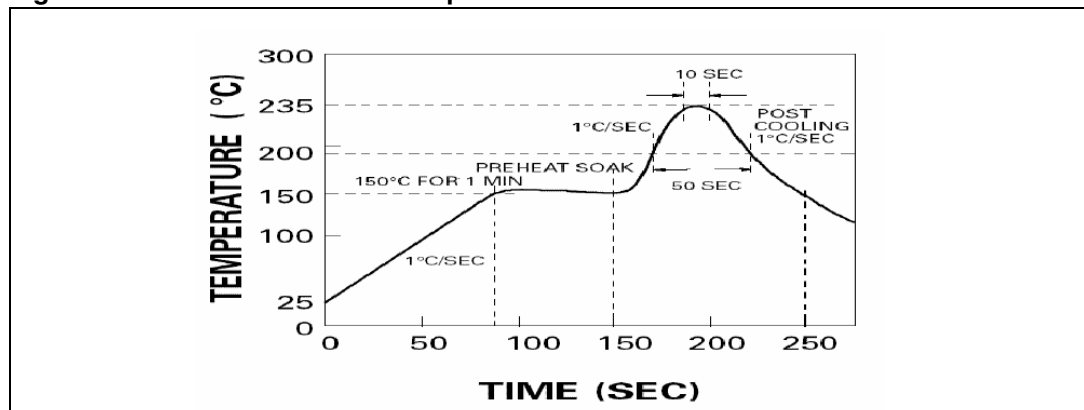
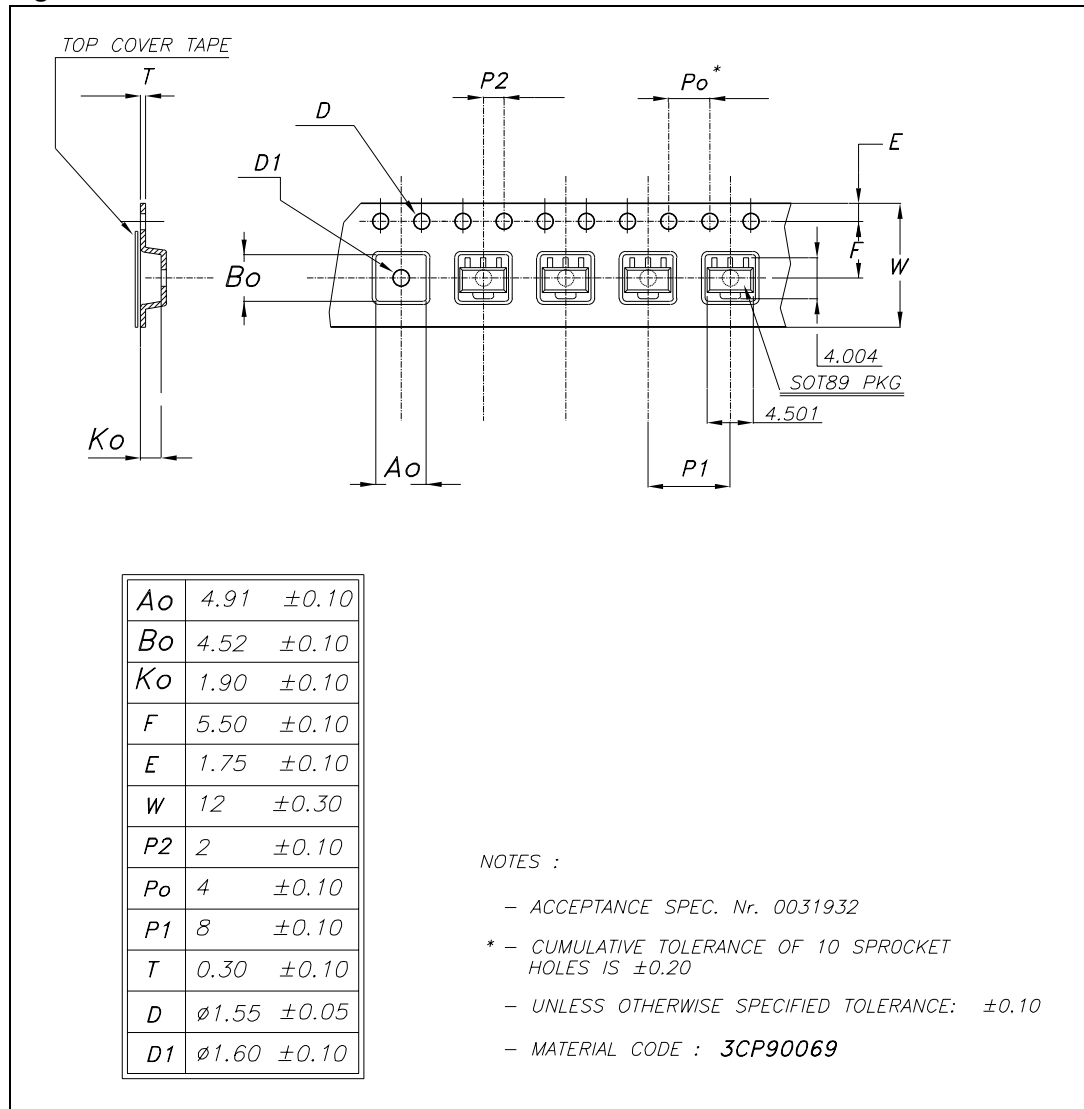


Figure 15. Reel information



8 Revision history

Table 7. Document revision history

| Date | Revision | Changes |
|-------------|----------|-----------------|
| 22-Sep-2007 | 1 | Initial release |

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2010 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com



Стандарт Электрон Связь

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331