



## DB-55025-540

RF power amplifier using 1 x PD55025  
N-channel enhancement-mode lateral MOSFETs

### Features

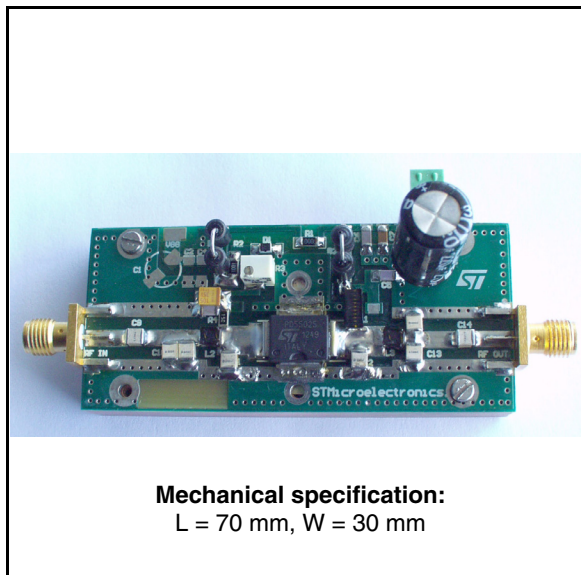
- Excellent thermal stability
- Frequency: 460 - 540MHz
- Supply voltage: 13.6V
- Output power: 20W
- Gain:  $12.5 \pm 0.5\text{dB}$
- Efficiency: 51% - 66%
- Load mismatch: 20:1
- BeO free amplifier
- In compliance with the 2002/95/EC european directive

### Description

The DB-55025-540 is a common source N-channel Enhancement-Mode Lateral Field Effect RF power amplifier designed for UHF mobile radio applications.

### Order code

- DB-55025-540



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# 1 Electrical data

## 1.1 Maximum ratings

**Table 1. Absolute maximum ratings**

| Symbol     | Parameter                  | Value      | Unit |
|------------|----------------------------|------------|------|
| $V_{DD}$   | Supply voltage             | 20         | V    |
| $I_D$      | Drain current              | 3          | A    |
| $T_{CASE}$ | Operating case temperature | -20 to +85 | °C   |
| $T_A$      | Max. ambient temperature   | +55        | °C   |

# 2 Electrical characteristics

$T_A = +25\text{ °C}$ ,  $V_{DD} = 13.6\text{V}$ ,  $I_{dq} = 150\text{mA}$

**Table 2. Electrical specification**

| Symbol     | Test conditions                                   | Min | Typ            | Max  | Unit |
|------------|---------------------------------------------------|-----|----------------|------|------|
| Freq       | Frequency range                                   | 460 |                | 540  | MHz  |
| $P_{OUT}$  |                                                   |     | 20             |      | W    |
| Gain       | @ $P_{OUT} = 20\text{W}$                          |     | $12.5 \pm 0.5$ |      | dB   |
| Efficiency | @ $P_{OUT} = 20\text{W}$                          |     | 51 - 66        |      | %    |
| H2         | @ $P_{OUT} = 20\text{W}$                          | -48 |                | -55  | dB   |
| H3         | @ $P_{OUT} = 20\text{W}$                          | -55 |                | -60  | dB   |
| VSWR       | Load Mismatch all phases @ $P_{OUT} = 20\text{W}$ |     |                | 20:1 |      |

### 3 Typical performance

Figure 1. Gain vs frequency

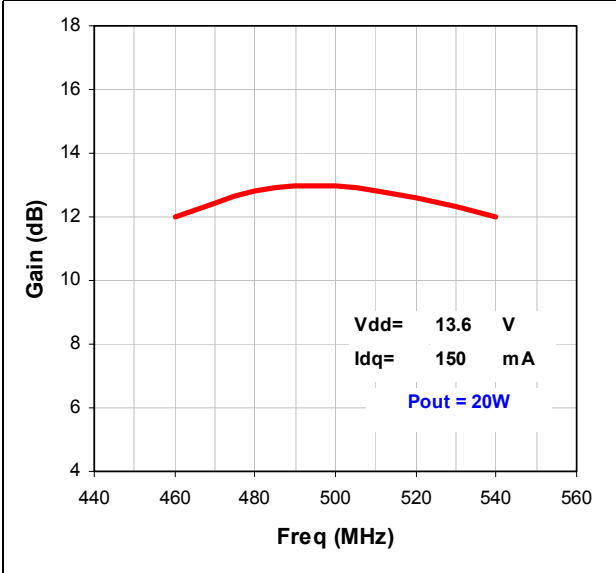


Figure 2. Efficiency vs frequency

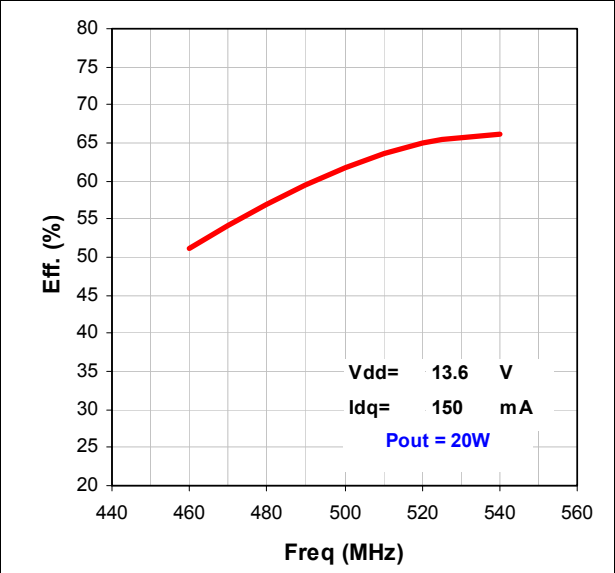


Figure 3. Harmonics vs frequency

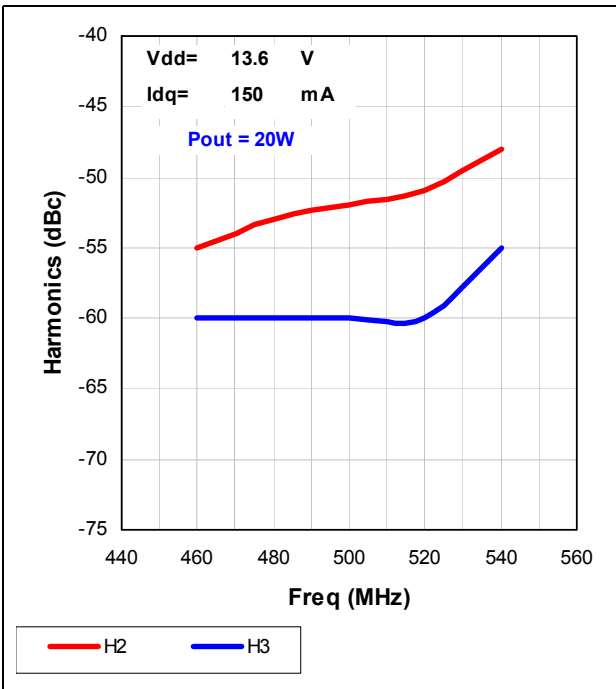


Figure 4. Output power vs drain supply voltage

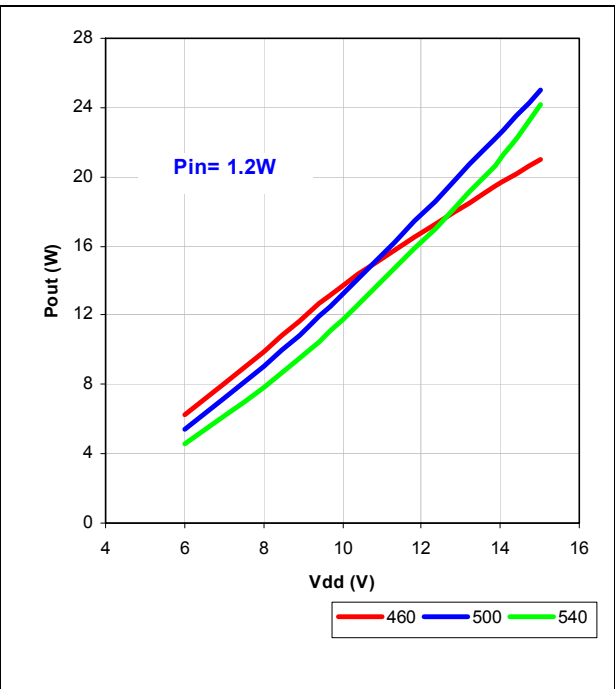
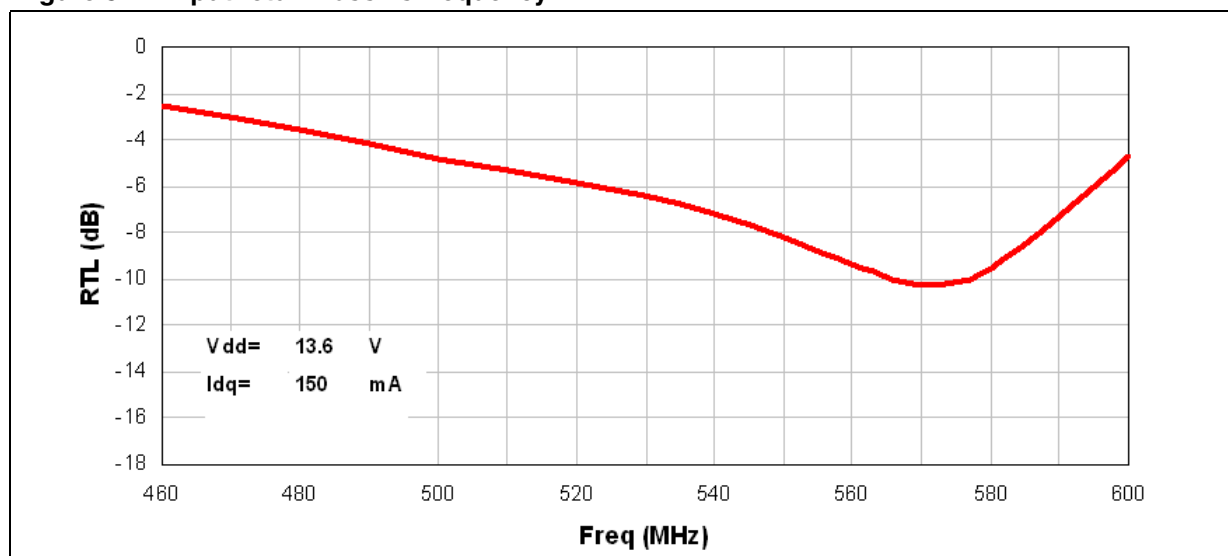
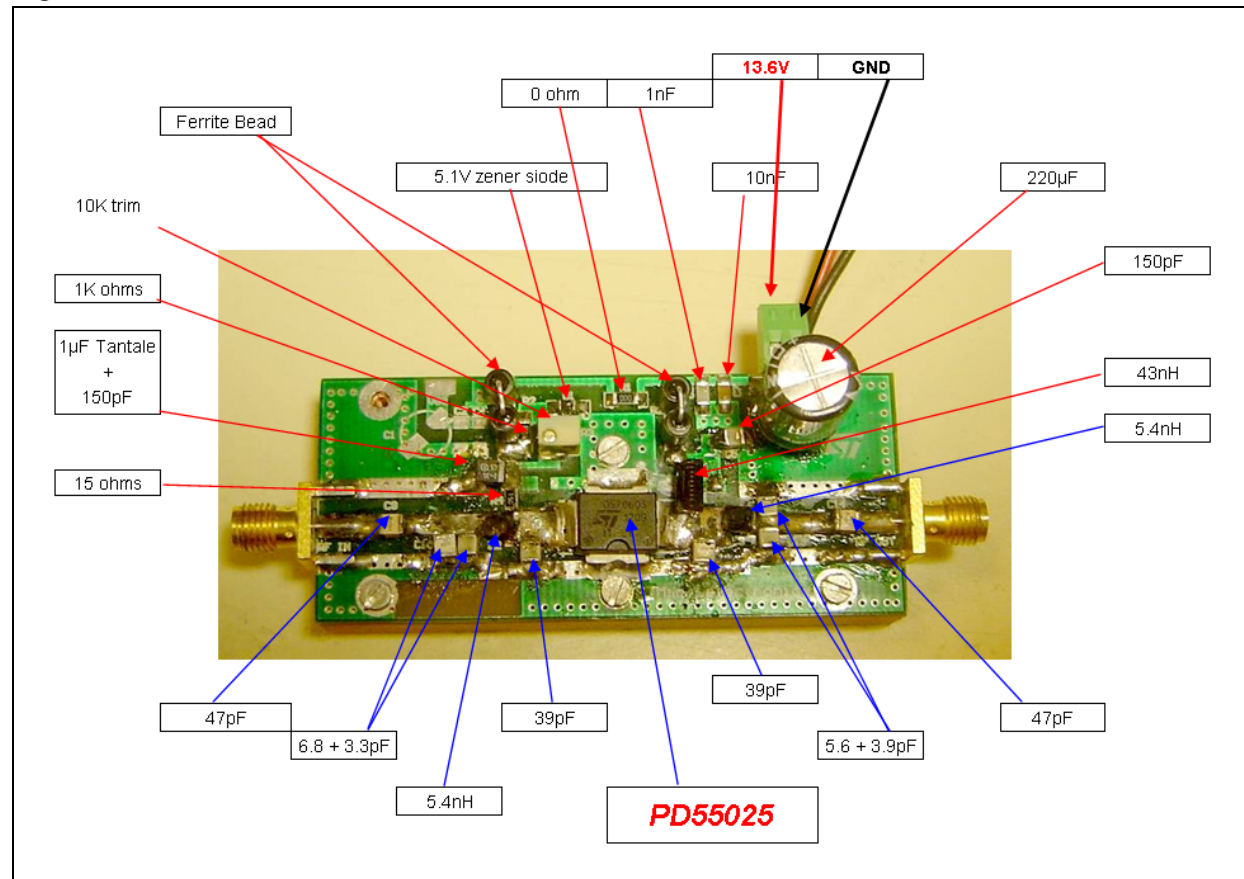


Figure 5. Input return loss vs frequency



## 4 Test circuit

Figure 6. Test circuit schematic



5 Circuit layout

Figure 7. Circuit layout

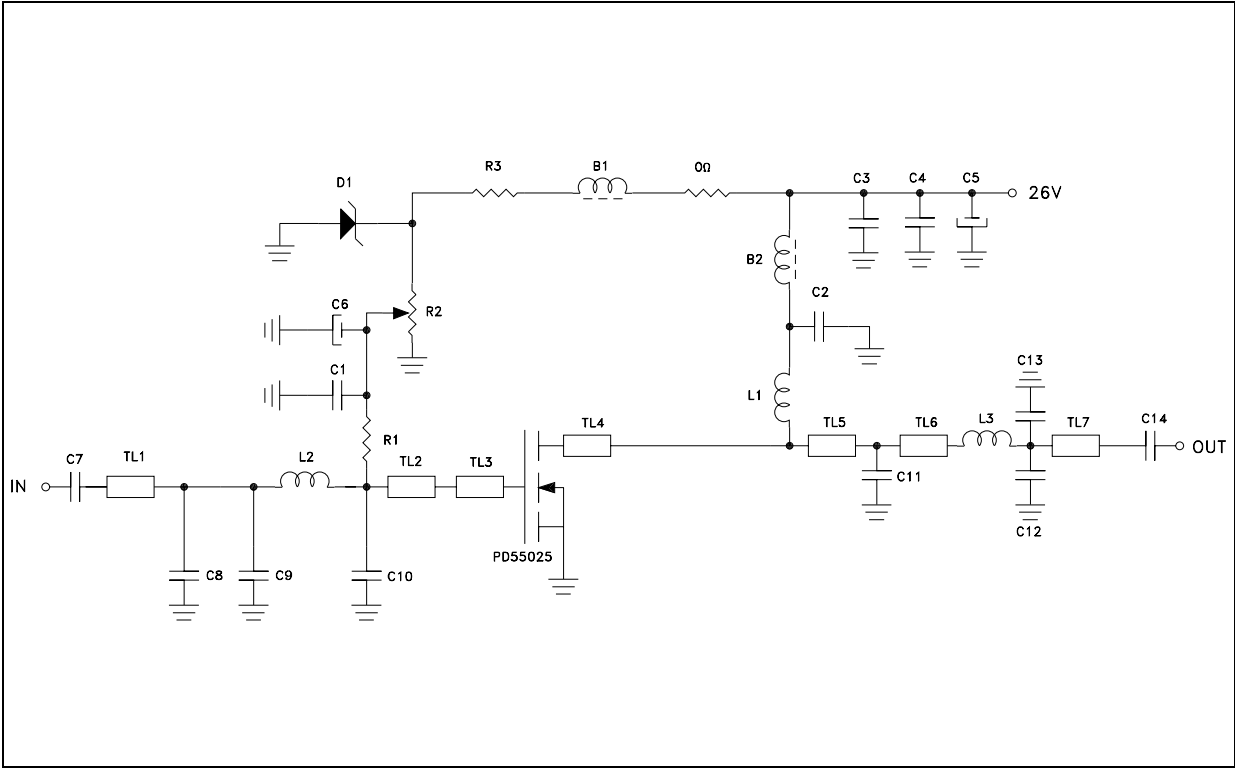


Table 3. Component part list

| Part type        | Component ID | Description | Value       | Case size | Manufacturer | Part code        |
|------------------|--------------|-------------|-------------|-----------|--------------|------------------|
| CAP              | C1           | Capacitor   | 150pF       | 1206      | Murata       | GRM42-6C0G151J50 |
| CAP              | C2           | Capacitor   | 150pF       | 1206      | Murata       | GRM42-6C0G151J50 |
| CAP              | C3           | Capacitor   | 1 nF        | 1206      | Murata       | GRM42-6C0G102J50 |
| CAP              | C4           | Capacitor   | 10 nF       | 1206      | Murata       | GRM42-6X7R104K50 |
| Electrolytic CAP | C5           | Capacitor   | 220 $\mu$ F |           |              |                  |
| Tantale CAP      | C6           | Capacitor   | 1 $\mu$ F   |           |              |                  |
| CAP              | C7           | Capacitor   | 47pF        | 100B      | ATC          | 470              |
| CAP              | C8           | Capacitor   | 3.3pF       | 100B      | ATC          | 3R3              |
| CAP              | C9           | Capacitor   | 6.8pF       | 100B      | ATC          | 6R8              |
| CAP              | C10          | Capacitor   | 39pF        | 100B      | ATC          | 390              |
| CAP              | C11          | Capacitor   | 39pF        | 100B      | ATC          | 390              |

**Table 3. Component part list (continued)**

| Part type    | Component ID                      | Description       | Value                 | Case size | Manufacturer          | Part code    |
|--------------|-----------------------------------|-------------------|-----------------------|-----------|-----------------------|--------------|
| CAP          | C12                               | Capacitor         | 5.6pF                 | 100B      | ATC                   | 5R6          |
| CAP          | C13                               | Capacitor         | 3.9pF                 | 100B      | ATC                   | 3R9          |
| CAP          | C14                               | Capacitor         | 47pF                  | 100B      | ATC                   | 470          |
| TL           | TL1, TL7                          | Transmission Line | W = 2.87 mm L = 6 mm  |           |                       |              |
| TL           | TL2                               | Transmission Line | W = 4.9 mm L = 5 mm   |           |                       |              |
| TL           | TL3, TL4                          | Transmission Line | W = 6 mm L = 3 mm     |           |                       |              |
| TL           | TL5                               | Transmission Line | W = 4.9 mm L = 2.5 mm |           |                       |              |
| TL           | TL6                               | Transmission Line | W = 4.9 mm L = 2.5 mm |           |                       |              |
| Ferrite Bead | B1                                | Ferrite Bead      |                       |           | PANASONIC             | EXCELDRC35C  |
| Ferrite Bead | B2                                | Ferrite Bead      |                       |           | PANASONIC             | EXCELDRC35C  |
| INDUCTOR     | L1                                | Inductor          | 43nH                  |           | Coilcraft Mini Spring | B10TJ        |
| INDUCTOR     | L2                                | Inductor          | 5nH                   |           | Coilcraft Mini Spring | A02TJ        |
| INDUCTOR     | L3                                | Inductor          | 5nH                   |           | Coilcraft Mini Spring | A02TJ        |
| TRANSISTOR   | PD55025                           | LDMOS             |                       |           | STMicroelectronics    | PD55025      |
| Resistor     | R1                                | Resistor          | 15 ohms               | 1206      | TYCO ELECTRONICS      | 01623440-1   |
| POT          | R2                                | Potentiometer     | 10 K                  |           | BOURNS ELECTRONICS    | 3214W-1-103E |
| Resistor     | R3                                | Resistor          | 1K                    | 1206      | TYCO ELECTRONICS      | 01623440-1   |
| SMA-CONN     | RF in                             | SMA-CONN          |                       |           | Johnson               | 142-0701-801 |
| SMA-CONN     | RF out                            | SMA-CONN          |                       |           | Johnson               | 142-0701-801 |
| ZENER        | D1                                | Zener Diode       | 5.1 V                 | SOD110    | PHILIPS               | BZX284C5V1   |
| BOARD        | FR-4 THk=0.060" 2OZ Cu Both Sides |                   |                       |           |                       |              |

## 6 Mounting indications

Figure 8. PowerSO-10 mounting indications

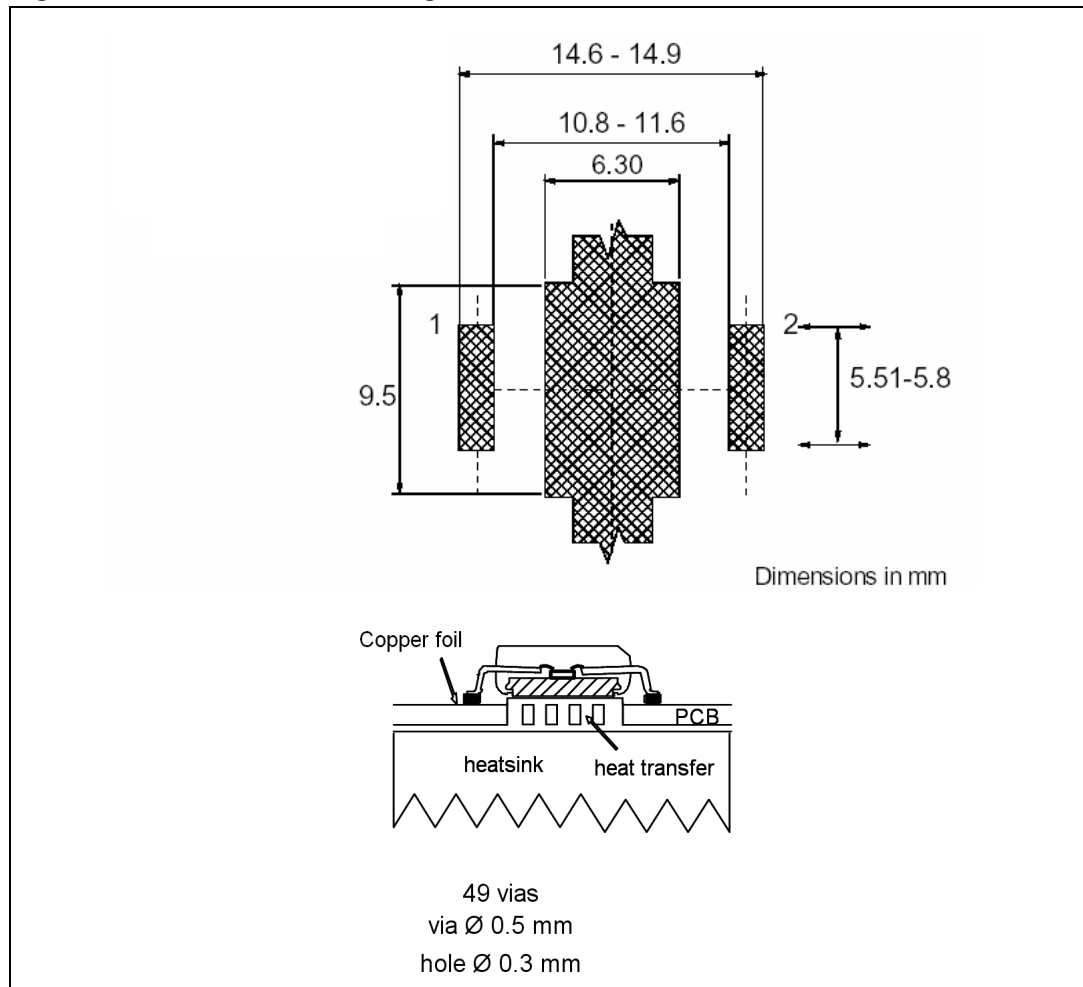
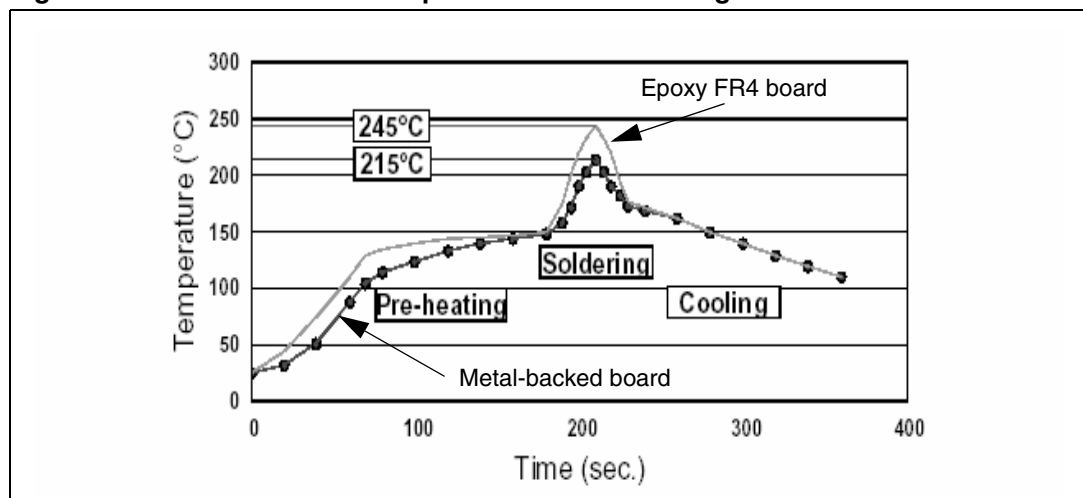


Figure 9. Recommended heat profile / reflow soldering



## 7 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com)

**Table 4. PowerSO-10RF formed lead (Gull Wing) mechanical data**

| Dim. | mm.   |        |       | Inch  |        |        |
|------|-------|--------|-------|-------|--------|--------|
|      | Min   | Typ    | Max   | Min   | Typ    | Max    |
| A1   | 0     | 0.05   | 0.1   | 0.    | 0.0019 | 0.0038 |
| A2   | 3.4   | 3.5    | 3.6   | 0.134 | 0.137  | 0.142  |
| A3   | 1.2   | 1.3    | 1.4   | 0.046 | 0.05   | 0.054  |
| A4   | 0.15  | 0.2    | 0.25  | 0.005 | 0.007  | 0.009  |
| a    |       | 0.2    |       |       | 0.007  |        |
| b    | 5.4   | 5.53   | 5.65  | 0.212 | 0.217  | 0.221  |
| c    | 0.23  | 0.27   | 0.32  | 0.008 | 0.01   | 0.012  |
| D    | 9.4   | 9.5    | 9.6   | 0.370 | 0.374  | 0.377  |
| D1   | 7.4   | 7.5    | 7.6   | 0.290 | 0.295  | 0.298  |
| E    | 13.85 | 14.1   | 14.35 | 0.544 | 0.555  | 0.565  |
| E1   | 9.3   | 9.4    | 9.5   | 0.365 | 0.37   | 0.375  |
| E2   | 7.3   | 7.4    | 7.5   | 0.286 | 0.292  | 0.294  |
| E3   | 5.9   | 6.1    | 6.3   | 0.231 | 0.24   | 0.247  |
| F    |       | 0.5    |       |       | 0.019  |        |
| G    |       | 1.2    |       |       | 0.047  |        |
| L    | 0.8   | 1      | 1.1   | 0.030 | 0.039  | 0.042  |
| R1   |       |        | 0.25  |       |        | 0.01   |
| R2   |       | 0.8    |       |       | 0.031  |        |
| T    | 2 deg | 5 deg  | 8 deg | 2 deg | 5 deg  | 8 deg  |
| T1   |       | 6 deg  |       |       | 6 deg  |        |
| T2   |       | 10 deg |       |       | 10 deg |        |

*Note: Resin protrusions not included (max value: 0.15 mm per side)*

**Figure 10. Package dimensions**

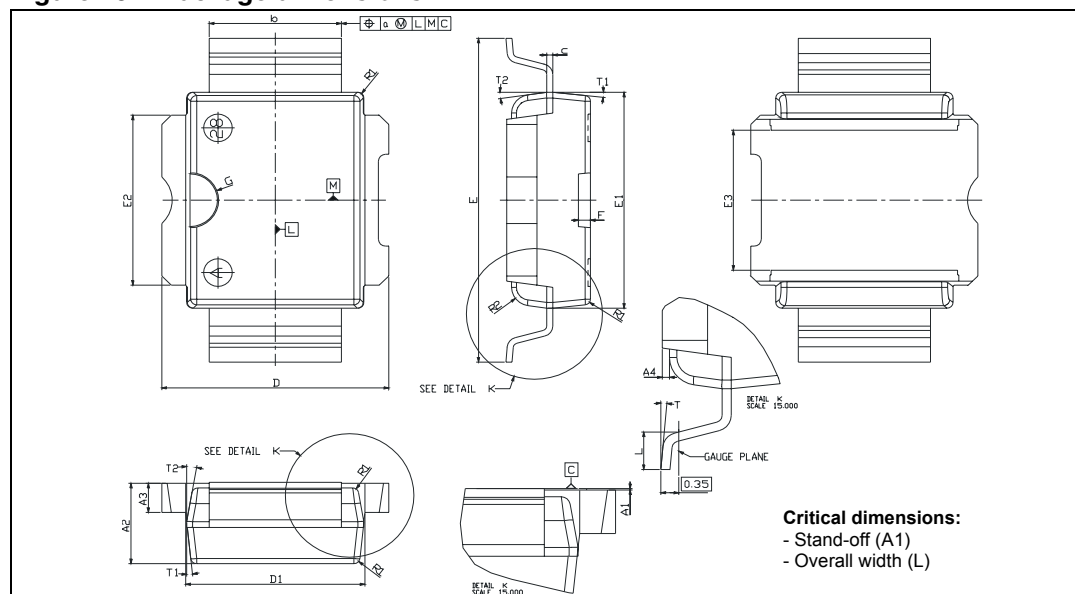
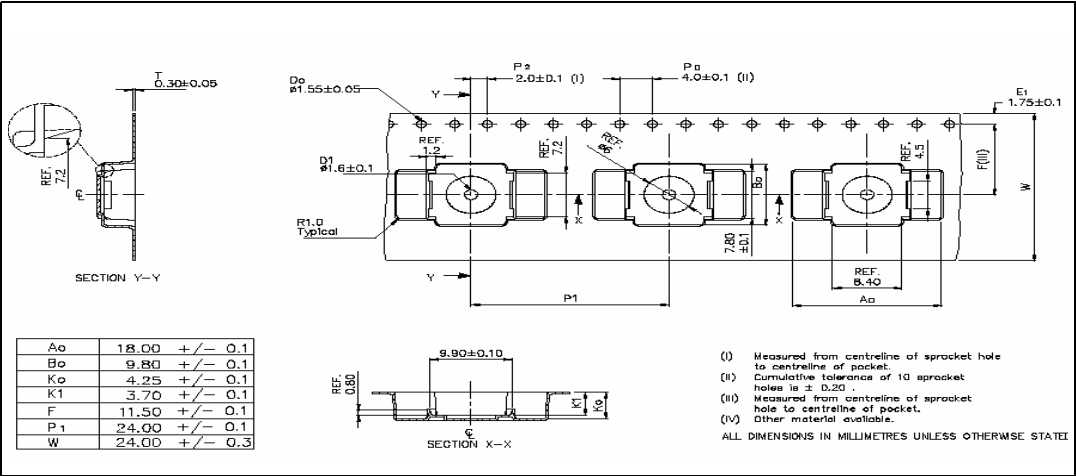


Figure 11. PowerSO-10RF tape & reel



## 8 Revision history

**Table 5. Revision history**

| Date        | Revision | Changes                                   |
|-------------|----------|-------------------------------------------|
| 20-Jun-2006 | 1        | Initial release                           |
| 31-Jul-2007 | 2        | Updated <a href="#">Table 2 on page 3</a> |

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