# PD57030-E

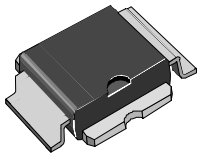
## RF POWER transistor, LdmoST plastic family N-channel enhancement-mode, lateral MOSFETs

## Features

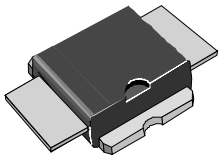
- Excellent thermal stability
- Common source configuration
- $P_{OUT}$ = 30 W with 14dB gain @ 945 MHz / 28 V
- New RF plastic package

## Description

The device is a common source N-channel, enhancement-mode lateral field-effect RF power transistor. It is designed for high gain, broad band commercial and industrial applications. It operates at 28 V in common source mode at frequencies up to 1 GHz. The device boasts the excellent gain, linearity and reliability of ST's latest LDMOS technology mounted in the first true SMD plastic RF power package, PowerSO-10RF. Device's superior linearity performance makes it an ideal solution for base station applications. The PowerSO-10 plastic package, designed to offer high reliability, is the first ST JEDEC approved, high power SMD package. It has been specially optimized for RF needs and offers excellent RF performance and ease of assembly. Mounting recommendations are available in www.st.com/rf/ (look for application note AN1294)



**PowerSO-10RF (formed lead)**



**PowerSO-10RF (straight lead)**

**Figure 1. Pin connection**

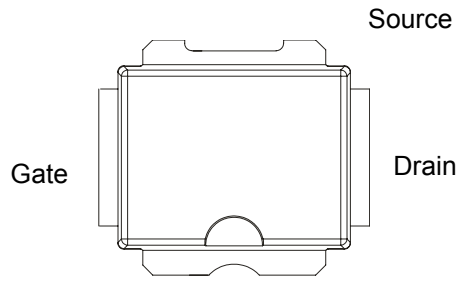



**Table 1. Device summary**

| Order code | Package | Packing |
|---|---|---|
| PD57030-E | PowerSO-10RF (formed lead) | Tube |
| PD57030S-E | PowerSO-10RF (straight lead) | Tube |
| PD57030TR-E | PowerSO-10RF (formed lead) | Tape and reel |
| PD57030STR-E | PowerSO-10RF (straight lead) | Tape and reel |

# Contents

# 1 Electrical data

## 1.1 Maximum ratings

**Table 2. Absolute maximum ratings** ($T_{CASE}$ = 25°C)

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-source voltage | 65 | V |
| $V_{GS}$ | Gate-source voltage | ± 20 | V |
| $I_D$ | Drain current | 4 | A |
| $P_{DISS}$ | Power dissipation (@ $T_C$ = 70°C) | 52.8 | W |
| $T_J$ | Max. operating junction temperature | 165 | °C |
| $T_{STG}$ | Storage temperature | -65 to +150 | °C |

## 1.2 Thermal data

**Table 3. Thermal data**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{thJC}$ | Junction - case thermal resistance | 1.8 | °C/W |

# 2 Electrical characteristics

$T_{CASE}$ = +25 °C

## 2.1 Static

**Table 4. Static**

| Symbol | Test conditions | | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | $V_{GS}$ = 0 | $I_{DS}$ = 10mA | | 65 | | | V |
| $I_{DSS}$ | $V_{GS}$ = 0 | $V_{DS}$ = 28 V | | | | 1 | µA |
| $I_{GSS}$ | $V_{GS}$ = 20 V | $V_{DS}$ = 0 | | | | 1 | µA |
| $V_{GS(Q)}$ | $V_{DS}$ = 28 V | $I_D$ = 50 mA | | 2.0 | | 5.0 | V |
| $V_{DS(ON)}$ | $V_{GS}$ = 10 V | $I_D$ = 3 A | | | 1.3 | | V |
| $g_{FS}$ | $V_{DS}$ = 10 V | $I_D$ = 3 A | | | 1.8 | | mho |
| $C_{ISS}$ | $V_{GS}$ = 0 | $V_{DS}$ = 28 V | f = 1 MHz | | 57 | | pF |
| $C_{OSS}$ | $V_{GS}$ = 0 | $V_{DS}$ = 28 V | f = 1 MHz | | 30 | | pF |
| $C_{RSS}$ | $V_{GS}$ = 0 | $V_{DS}$ = 28V | f = 1 MHz | | 2.3 | | pF |

## 2.2 Dynamic

**Table 5. Dynamic**

| Symbol | Test conditions | | | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|---|
| $P_{OUT}$ | $V_{DS}$ = 28 V | $I_{DQ}$ = 50 mA | | f = 945 MHz | 30 | | | W |
| $G_P$ | $V_{DS}$ = 28 V | $I_{DQ}$ = 50 mA | $P_{OUT}$ = 30 W | f = 945 MHz | 13 | 14 | | dB |
| $\eta_D$ | $V_{DS}$ = 28 V | $I_{DQ}$ = 50 mA | $P_{OUT}$ = 30 W | f = 945 MHz | 45 | 53 | | % |
| Load mismatch | $V_{DS}$ = 28 V all phase angles | $I_{DQ}$ = 50 mA | $P_{OUT}$ = 30 W | f = 945 MHz | 10:1 | | | VSWR |

## 2.3 Moisture sensitivity level

**Table 6. Moisture sensitivity level**

| Test methodology | Rating |
|---|---|
| J-STD-020B | MSL 3 |

# 3 Impedance

**Figure 2. Current conventions**

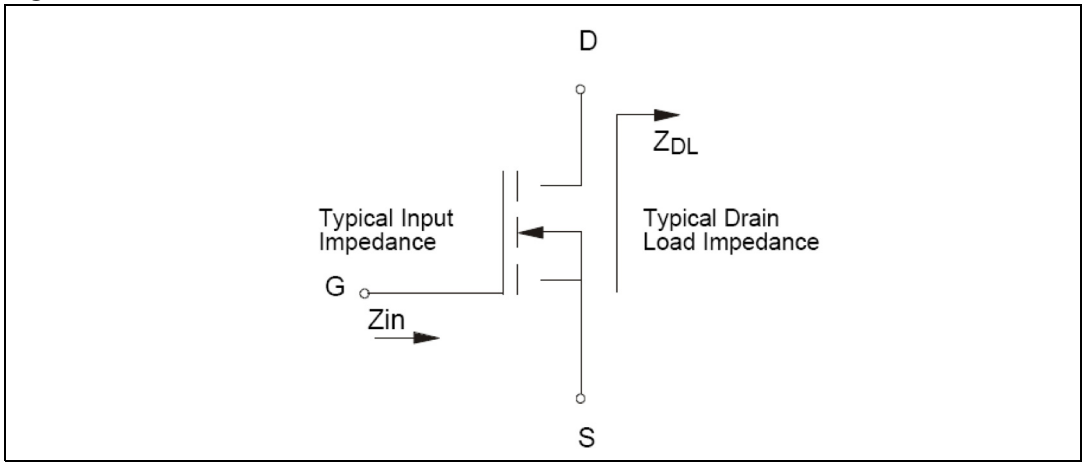



**Table 7. Impedance data**

| Freq. (MHz) | $Z_{IN}$ (Ω) | $Z_{DL}$(Ω) |
|---|---|---|
| 925 | 0.929 - j 0.315 | 2.60 + j 1.45 |
| 945 | 0.809 - j 0.085 | 2.46 + j 0.492 |
| 960 | 0.763 - j 0.428 | 2.35 + j 0.591 |

# 4 Typical performance

**Figure 3. Capacitance vs supply voltage**

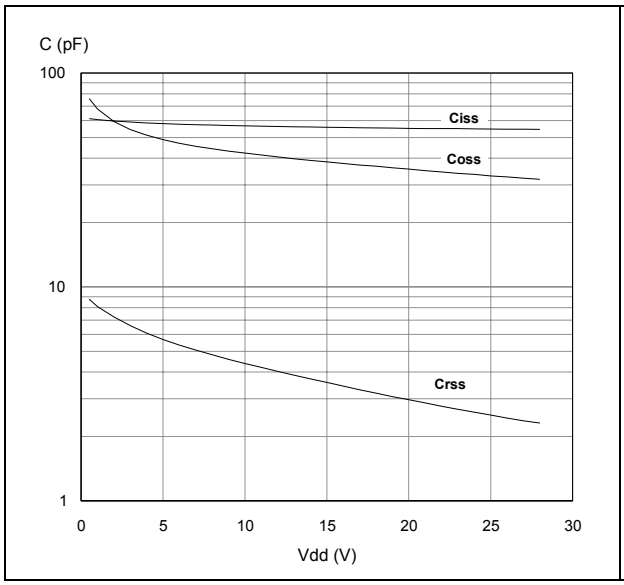
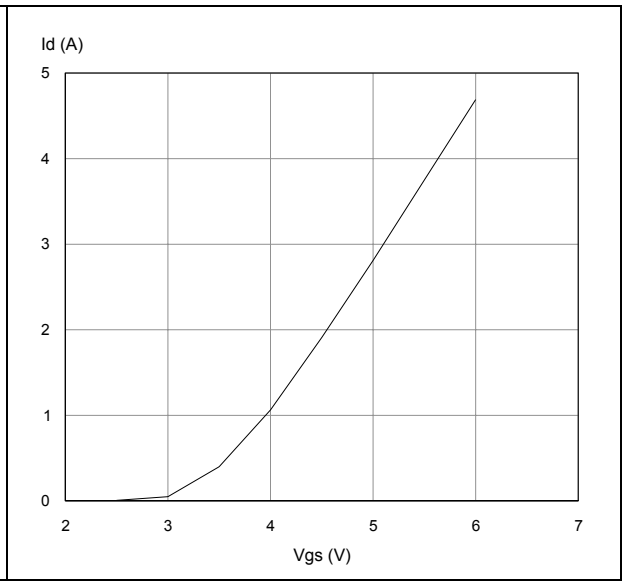
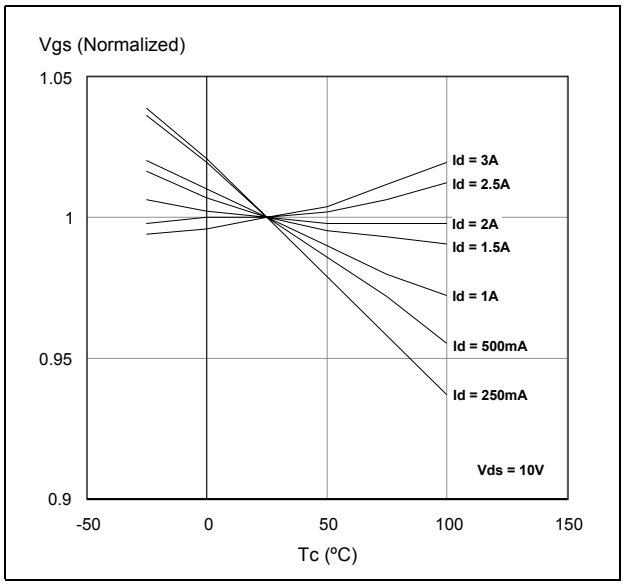



**Figure 4. Drain current vs gate source voltage**




**Gate-source voltage vs case temperature**



## 4.1 PD57030S-E

**Figure 5. Output power vs input power**

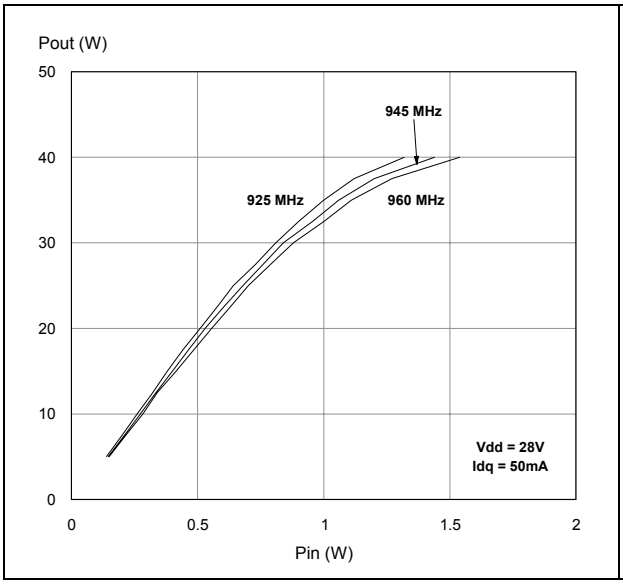



**Figure 6. Input return loss vs output power**

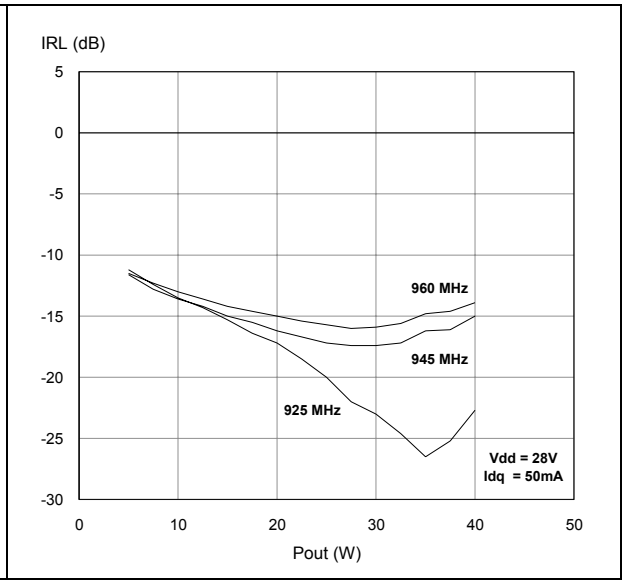



**Figure 7. Power gain vs output power**

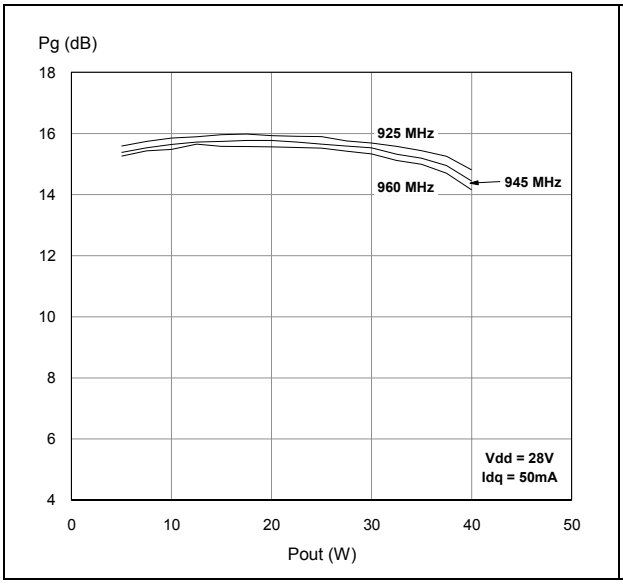



**Figure 8. Efficiency vs output power**

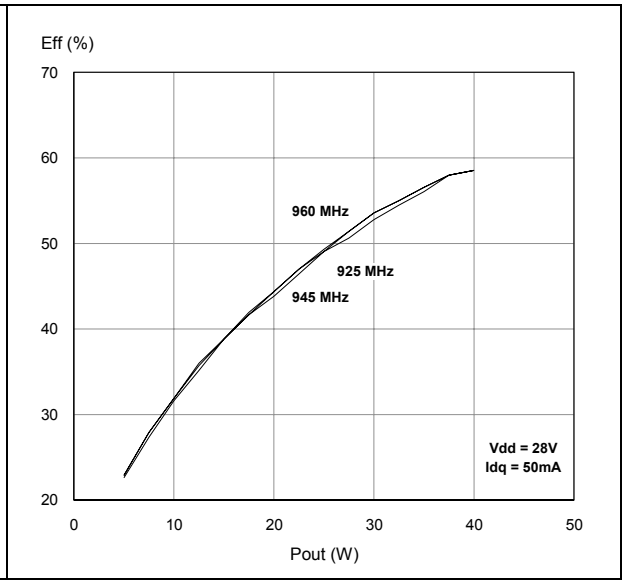


**Figure 9. Output power vs bias current**

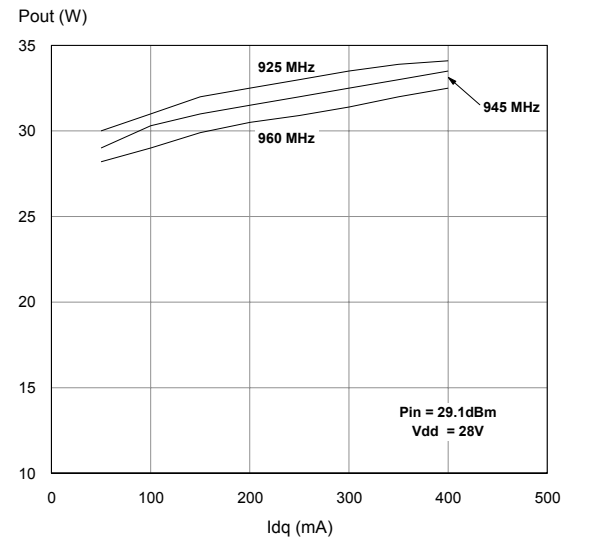



**Figure 10. Efficiency vs bias current**

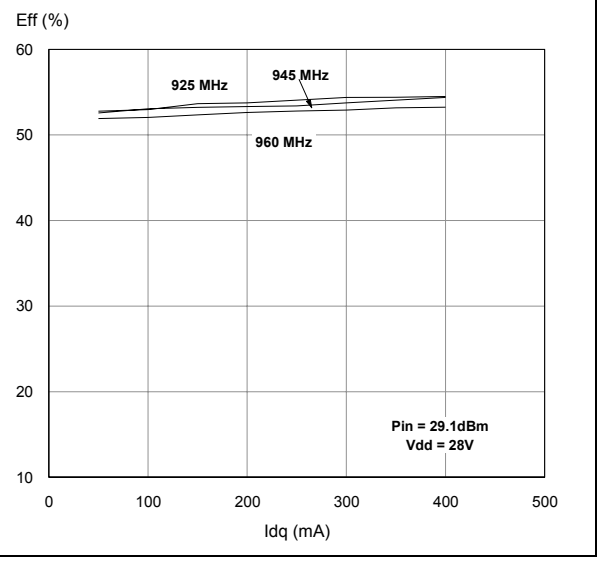



**Figure 11. Output power vs drain voltage**

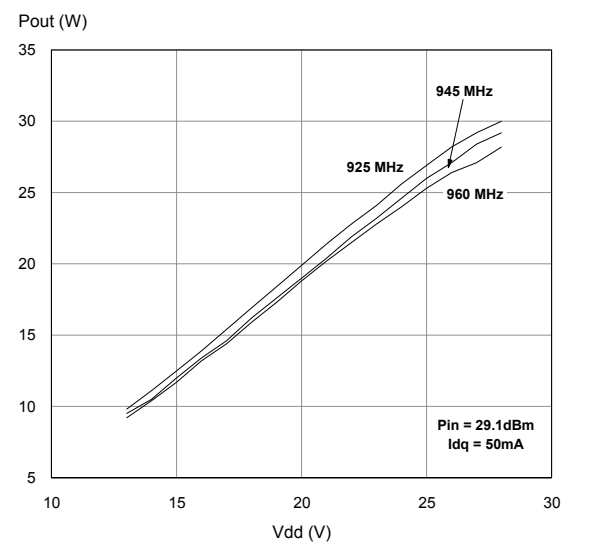



**Figure 12. Efficiency vs drain voltage**

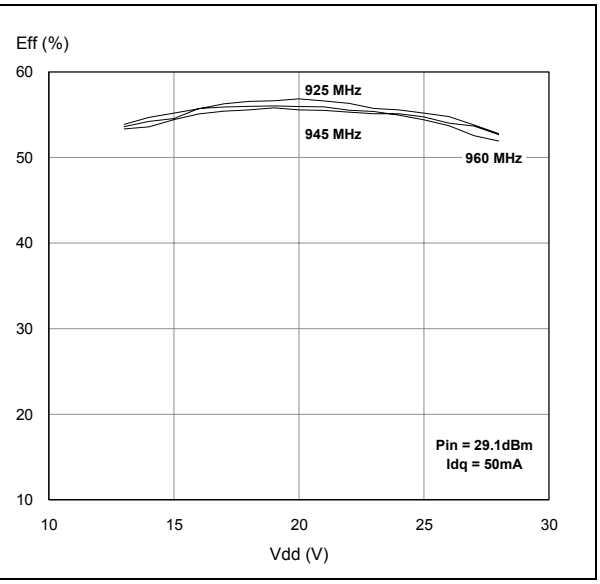
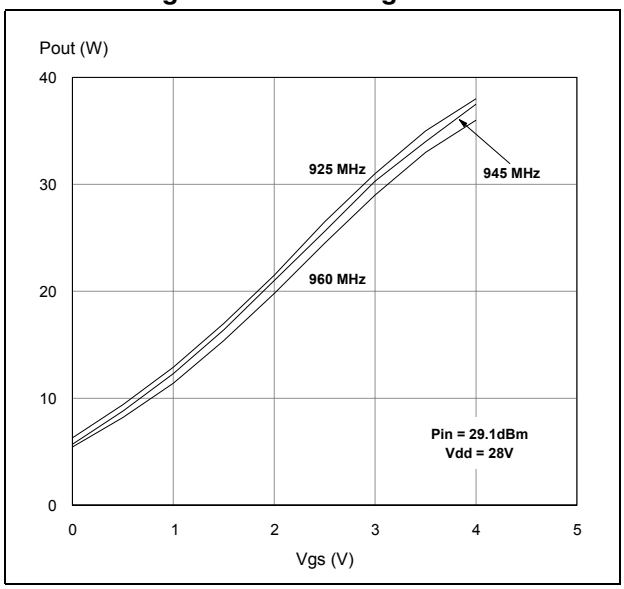


**Figure 13. Output power vs gate-source voltage**



# 5 Test circuit

**Figure 14. Test circuit schematic**

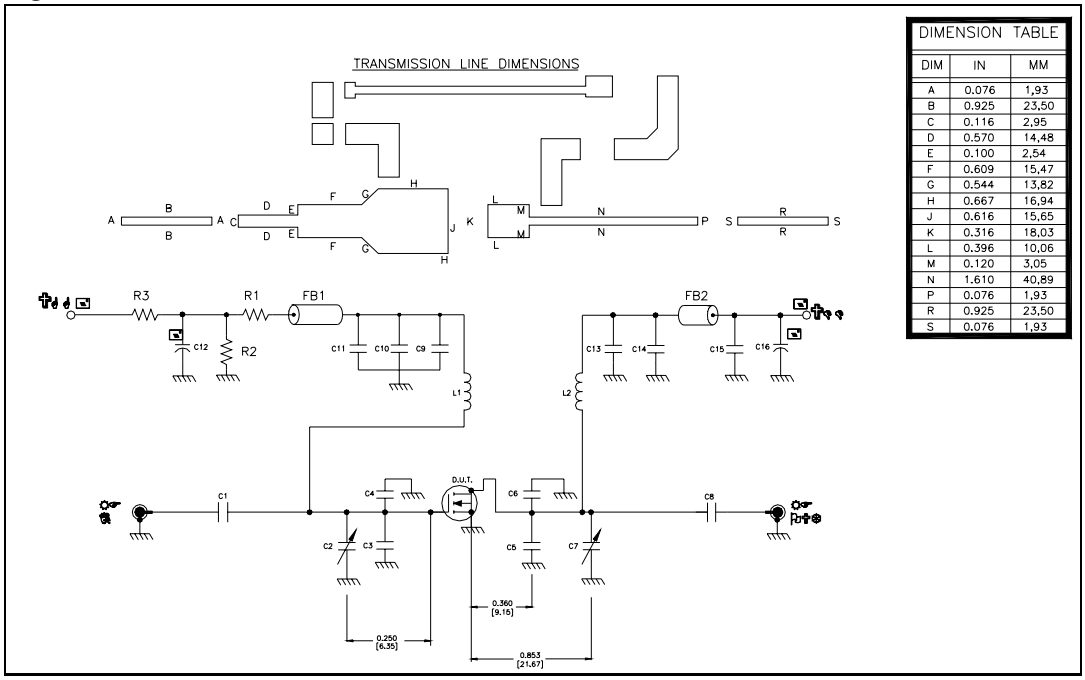



**Table 8. Test circuit component part list**

| Component | Description |
|---|---|
| C1, C8, C9, C13 | 47 pF ATC 100B Surface mount ceramic chip capacitor |
| C2, C7 | 0.8-8.0 pF Giga trim variable capacitor |
| C3, C4, C5, C6 | 7.5 pF ATC 100B surface mount ceramic chip capacitor |
| C10 | 1000 pF ATC 100B surface mount ceramic chip capacitor |
| C11, C15 | 0.1 µF / 500 V surface mount ceramic chip capacitor |
| C12 | 10 µF / 50 V aluminum electrolytic radial lead capacitor |
| C14 | 100 pF ATC 100B surface mount ceramic chip capacitor |
| C16 | 220 µF / 63 V aluminum electrolytic radial lead capacitor |
| R1 | 18 kΩ, 1 W surface mount chip resistor |
| R2 | 4.7 MΩ, 1 W surface mount chip resistor |
| R3 | 120 Ω, 2 W surface mount chip resistor |
| FB1, FB2 | Shield bead surface mount EMI |
| L1, L2 | Inductor, 5 turns air wound #22AWG, ID=0.059[1.49], nylon coated magnet wirE |

**Figure 15. Test circuit photomaster**

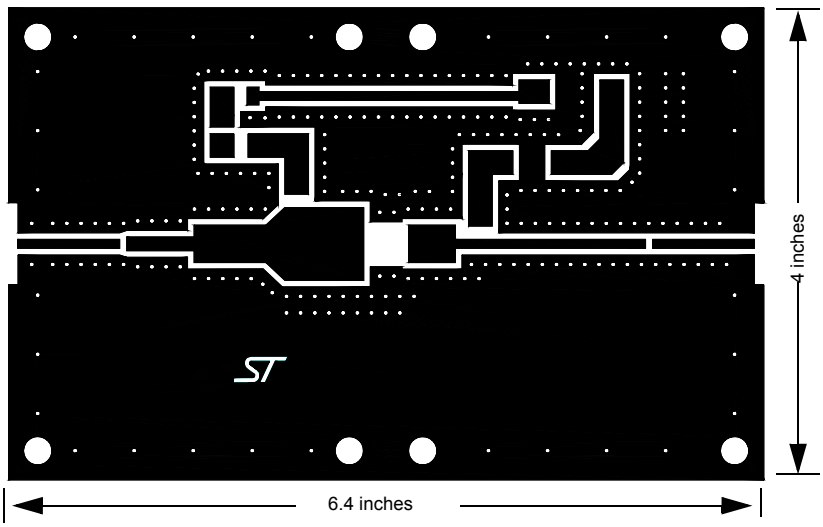
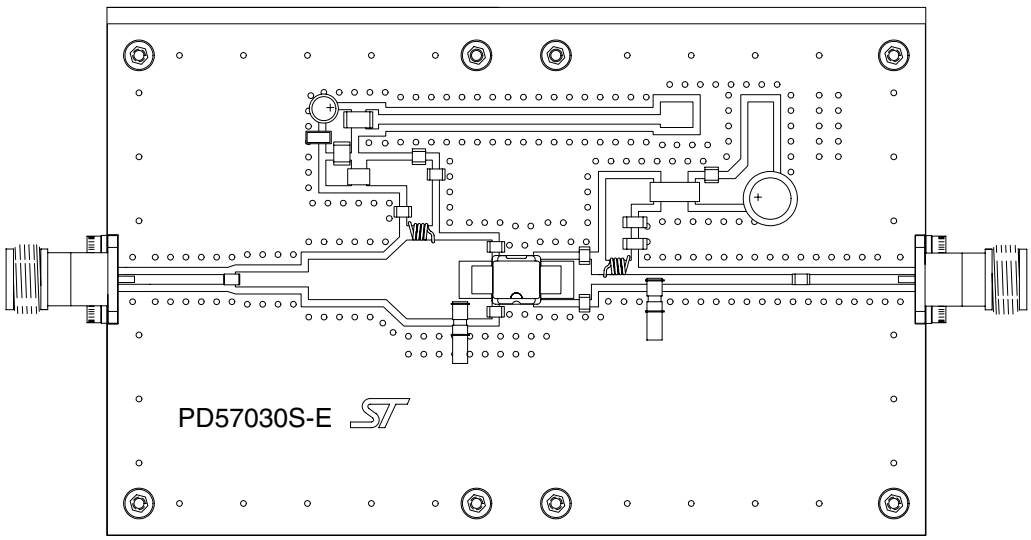



**Figure 16. Test circuit**



# 6 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 9. 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 17. Package dimensions**

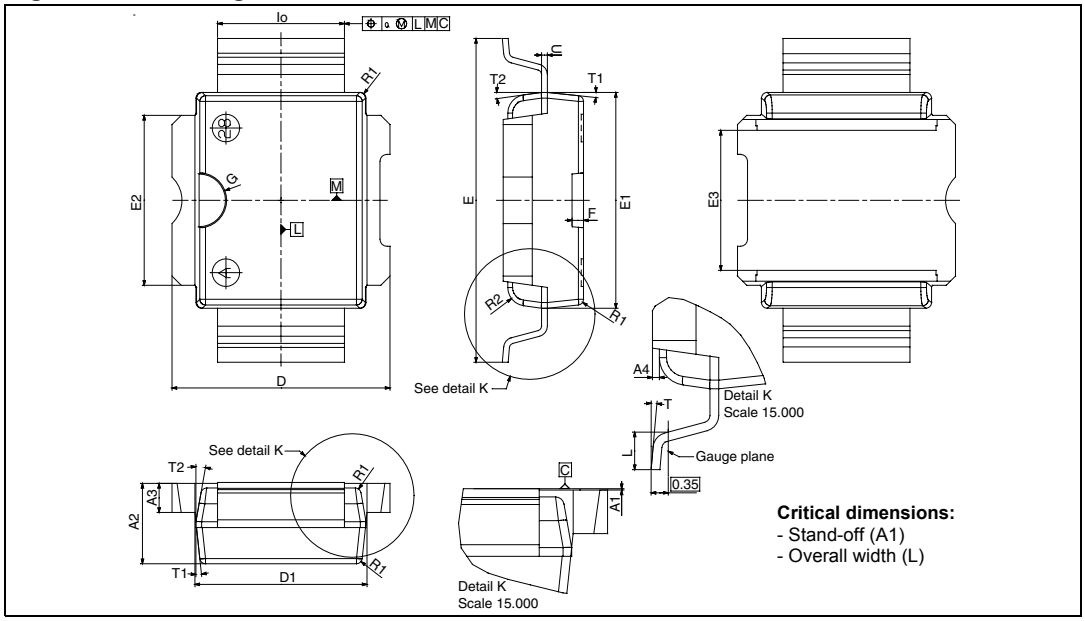


**Table 10. PowerSO-10RF straight lead mechanical data**

| Dim. | mm. | | | Inch | | |
|---|---|---|---|---|---|---|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A1 | 1.62 | 1.67 | 1.72 | 0.064 | 0.065 | 0.068 |
| 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 | 15.15 | 15.4 | 15.65 | 0.595 | 0.606 | 0.615 |
| 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 | |
| R1 | | | 0.25 | | | 0.01 |
| R2 | | 0.8 | | | 0.031 | |
| T1 | | 6 deg | | | 6 deg | |
| T2 | | 10 deg | | | 10 deg | |

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

**Figure 18. Package dimensions**

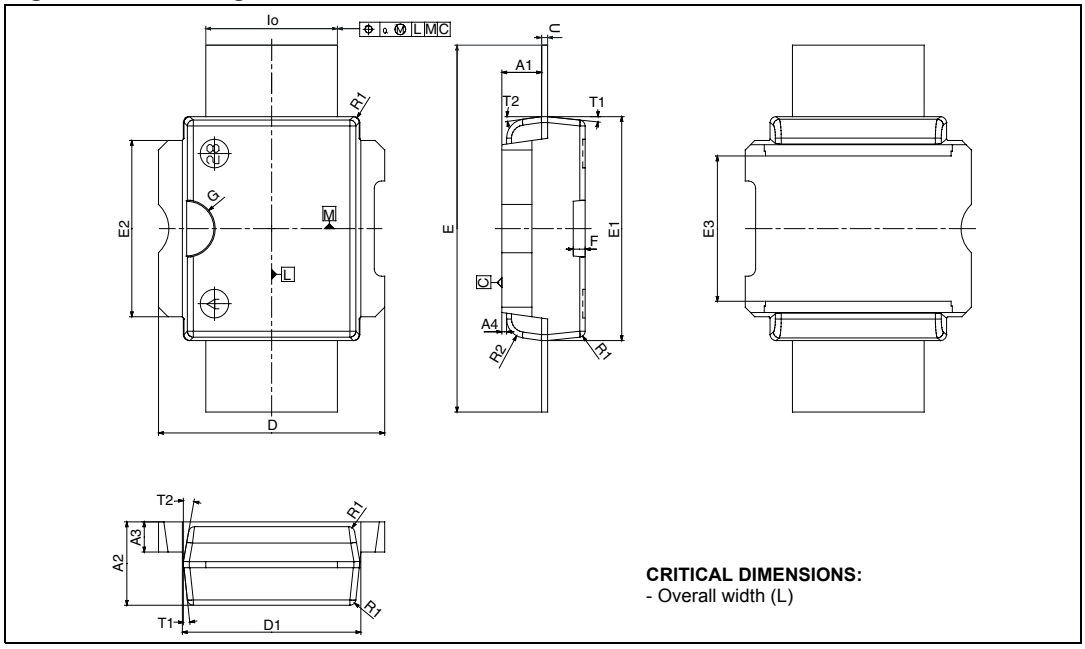


**Figure 19. Tube information**

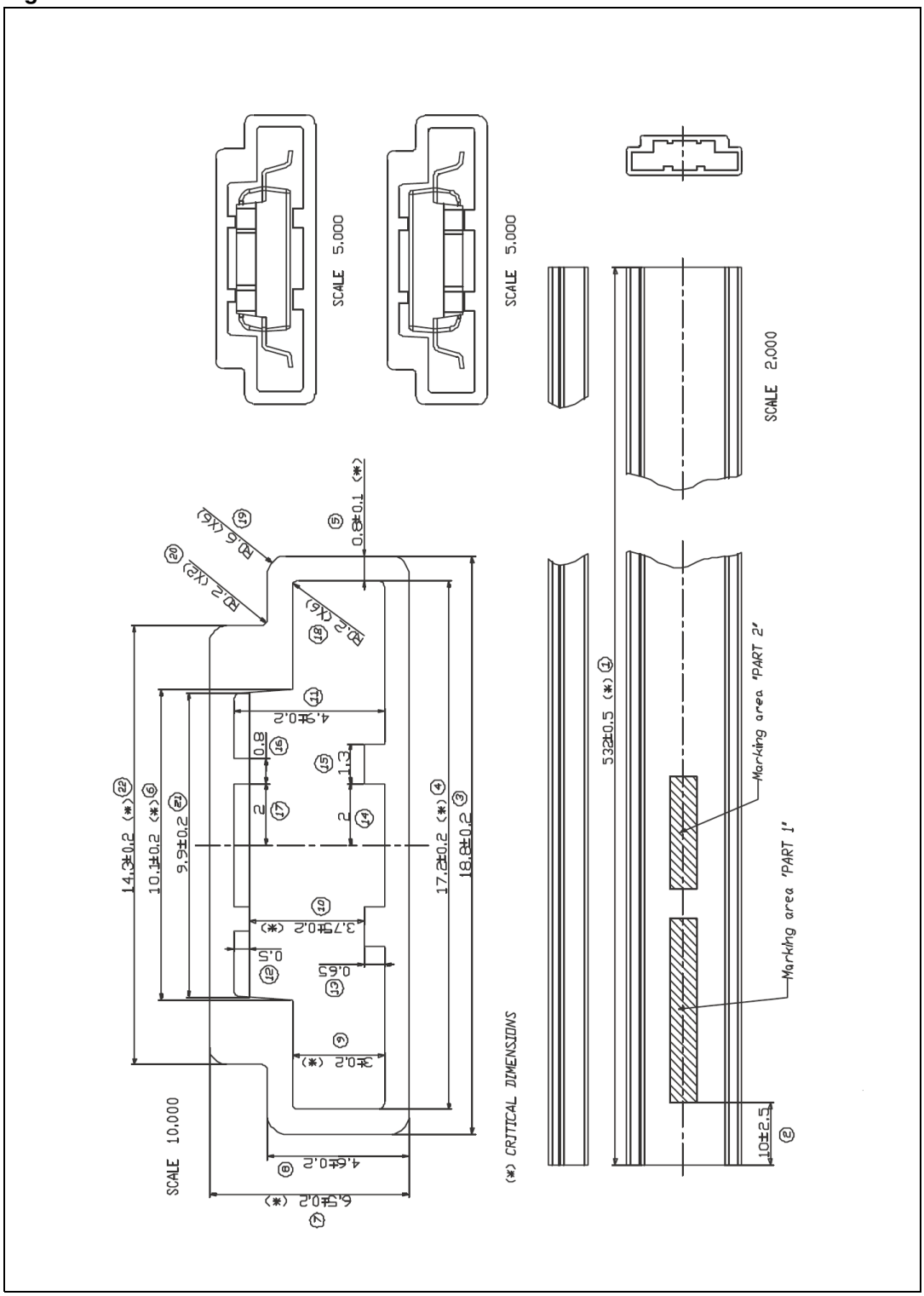
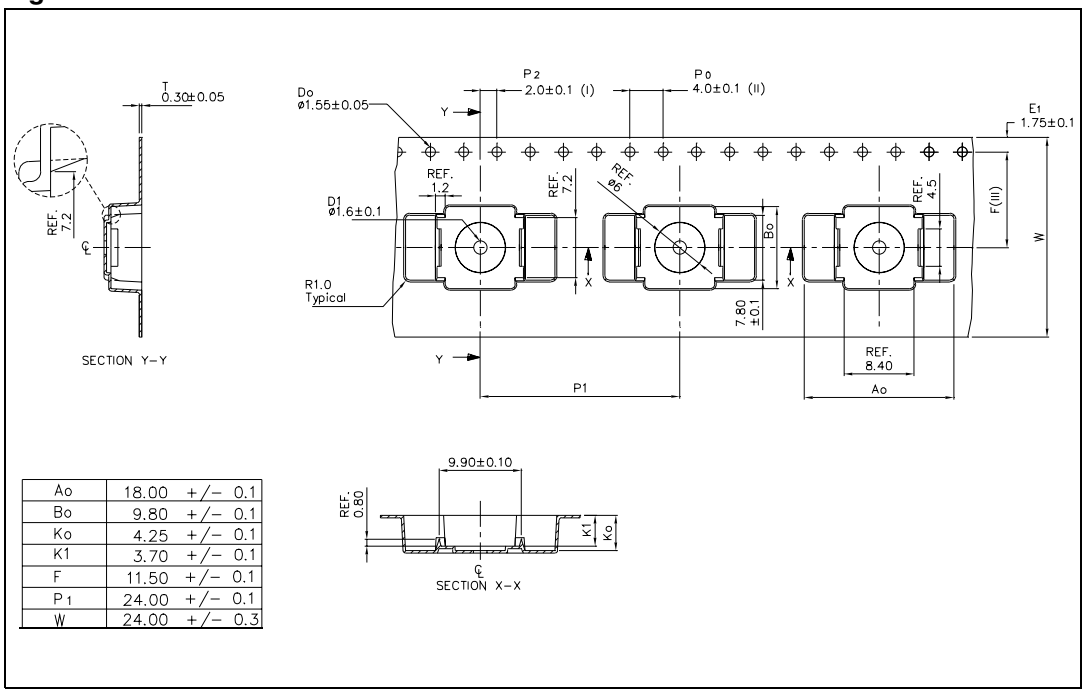


**Figure 20. Reel information**




| | |
|---|---|
| Ao | 18.00 +/- 0.1 |
| Bo | 9.80 +/- 0.1 |
| Ko | 4.25 +/- 0.1 |
| K1 | 3.70 +/- 0.1 |
| F | 11.50 +/- 0.1 |
| $P_1$ | 24.00 +/- 0.1 |
| W | 24.00 +/- 0.3 |

# 7 Revision history

**Table 11. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 07-Aug-2006 | 1 | Initial release. |
| 28-May-2010 | 2 | Added: *Table 6: Moisture sensitivity level*. |
| 24-Dec-2010 | 3 | Content reworked to improve readability |