



PD57030-E

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

Features

- Excellent thermal stability
- Common source configuration
- $P_{OUT} = 30\text{ W}$ 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)

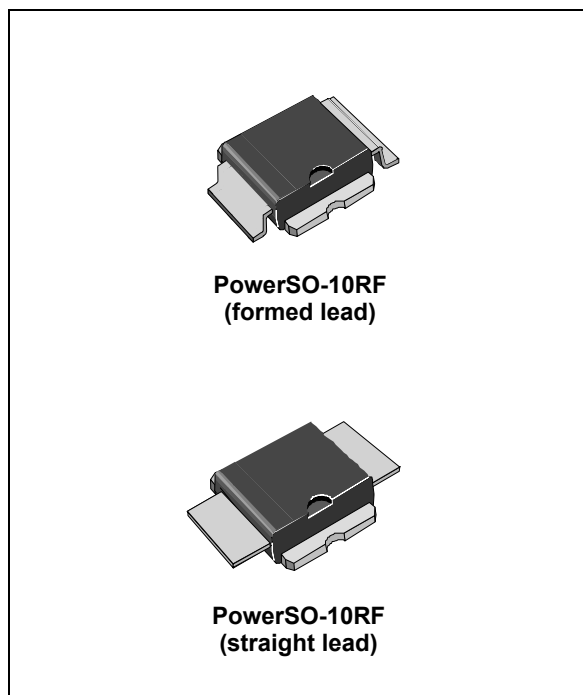


Figure 1. Pin connection

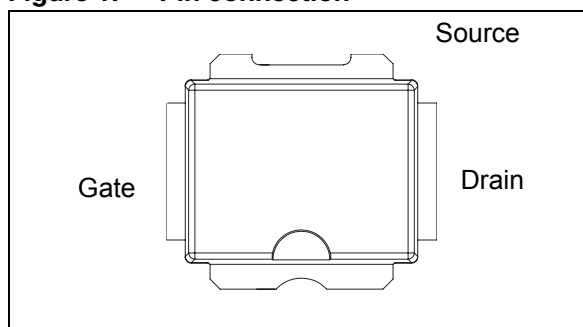


Table 1. Device summary

| 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 |

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1 Electrical data

1.1 Maximum ratings

Table 2. Absolute maximum ratings ($T_{CASE} = 25^{\circ}C$)

| 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 (@ $T_C = 70^{\circ}C$) | 52.8 | W |
| T_J | Max. operating junction temperature | 165 | $^{\circ}C$ |
| T_{STG} | Storage temperature | -65 to +150 | $^{\circ}C$ |

1.2 Thermal data

Table 3. Thermal data

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

2 Electrical characteristics

$T_{CASE} = +25\text{ }^{\circ}\text{C}$

2.1 Static

Table 4. Static

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

2.2 Dynamic

Table 5. Dynamic

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

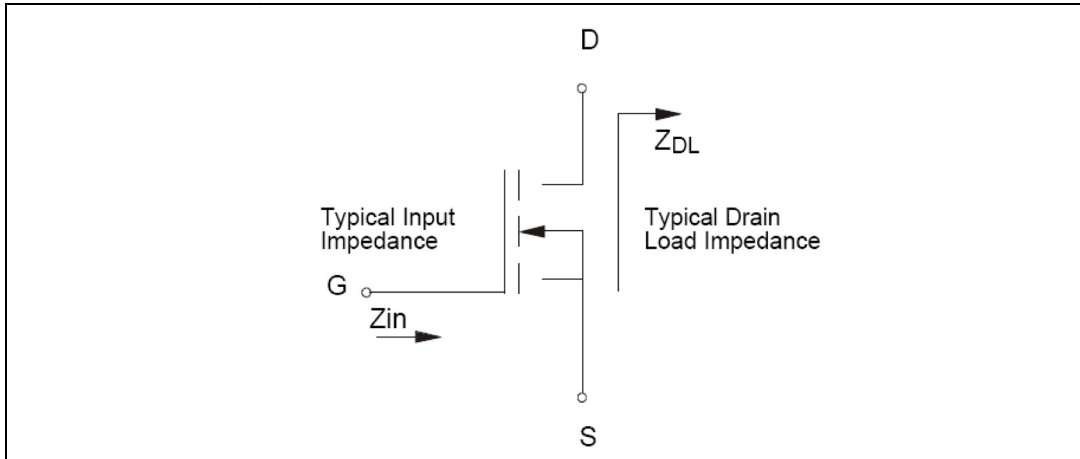


Table 7. Impedance data

| Freq. (MHz) | $Z_{IN} (\Omega)$ | $Z_{DL}(\Omega)$ |
|-------------|-------------------|------------------|
| 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

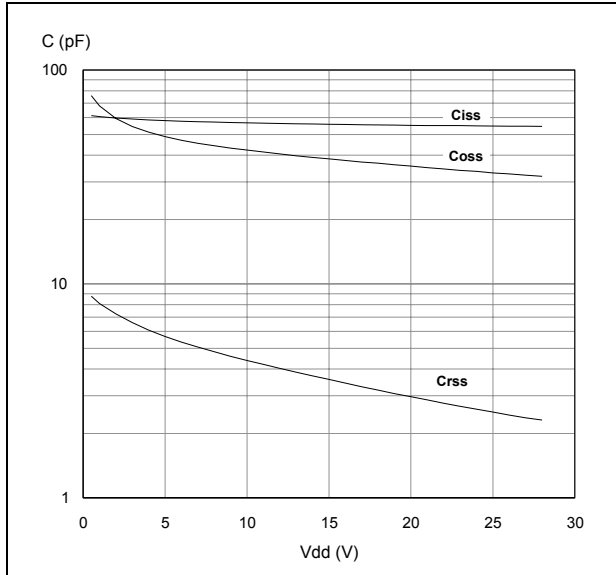
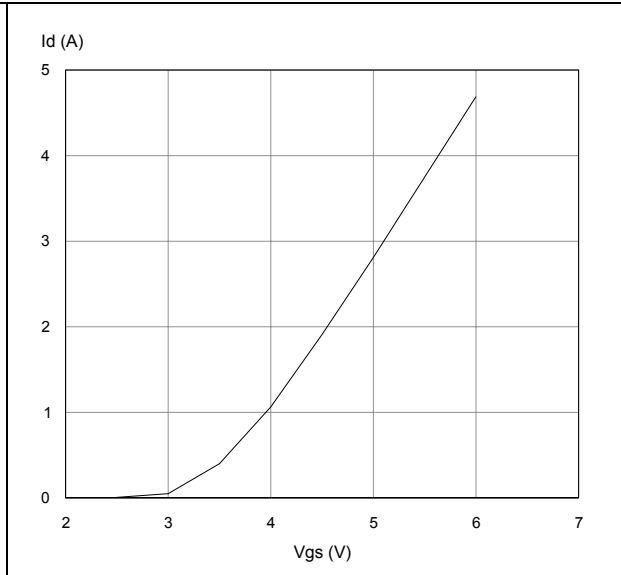
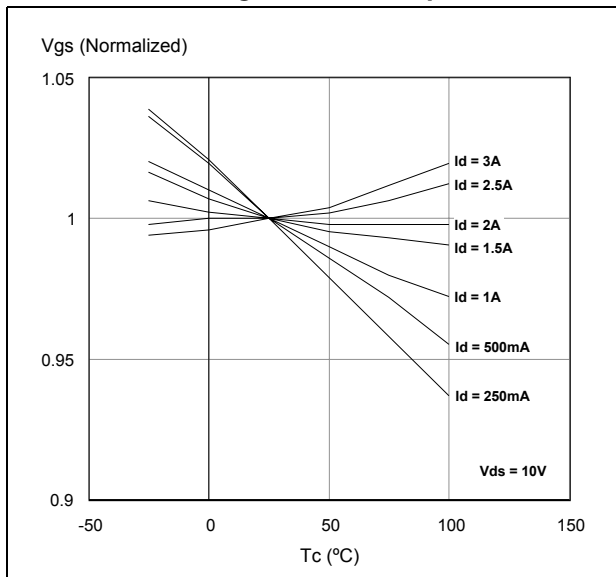


Figure 4. Drain current vs gate source voltage



Gate-source voltage vs case temperature



4.1 PD57030S-E

Figure 5. Output power vs input power

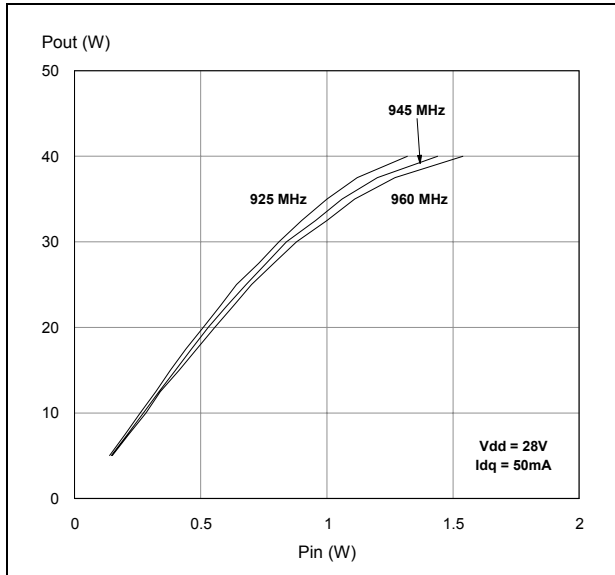


Figure 6. Input return loss vs output power

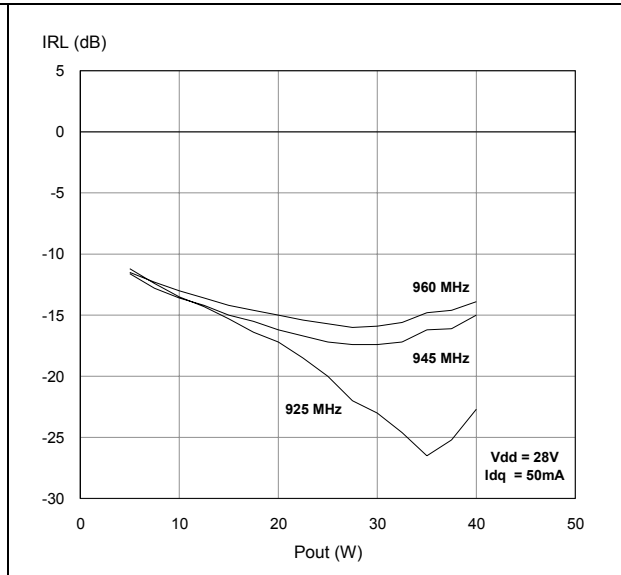


Figure 7. Power gain vs output power

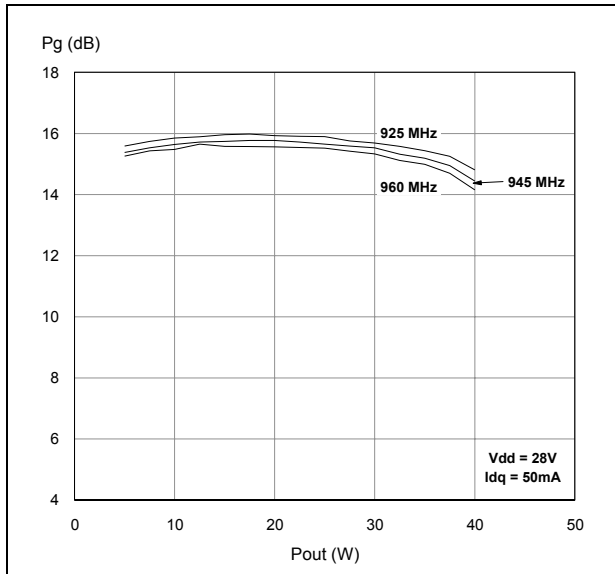


Figure 8. Efficiency vs output power

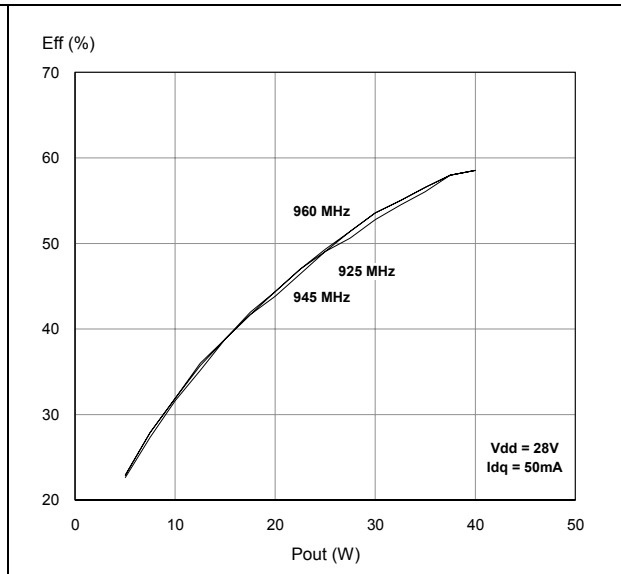


Figure 9. Output power vs bias current

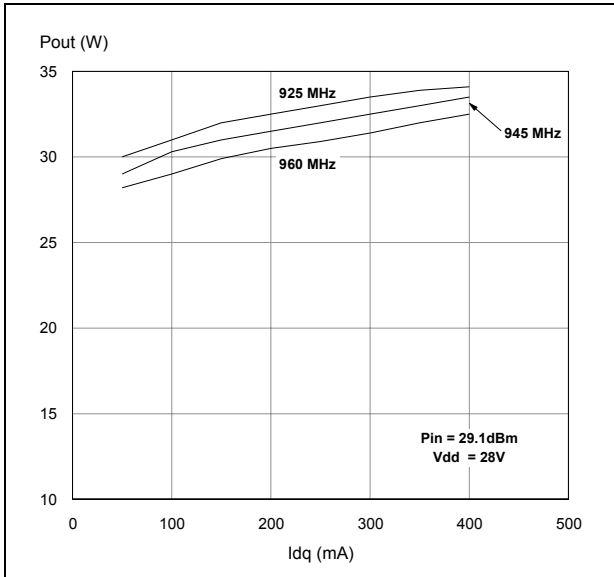


Figure 10. Efficiency vs bias current

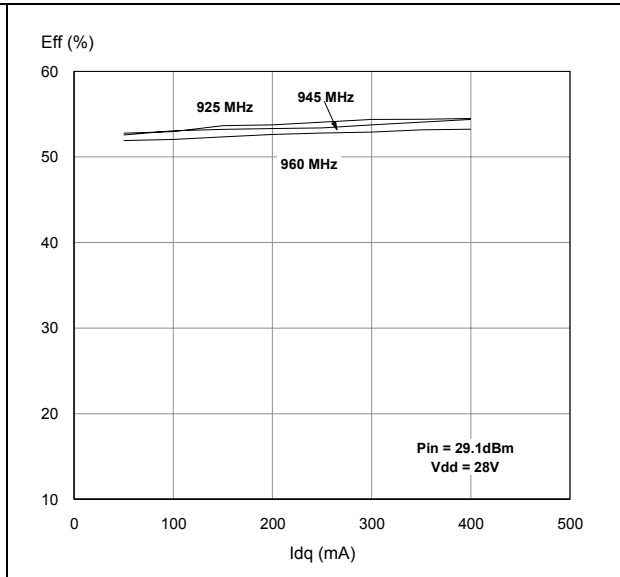


Figure 11. Output power vs drain voltage

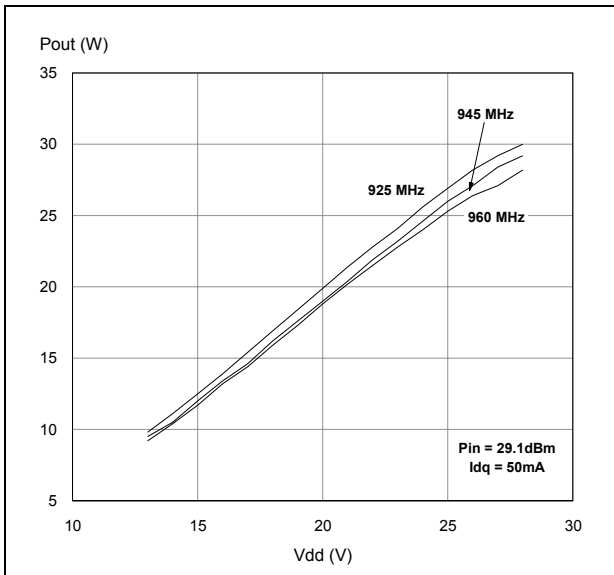


Figure 12. Efficiency vs drain voltage

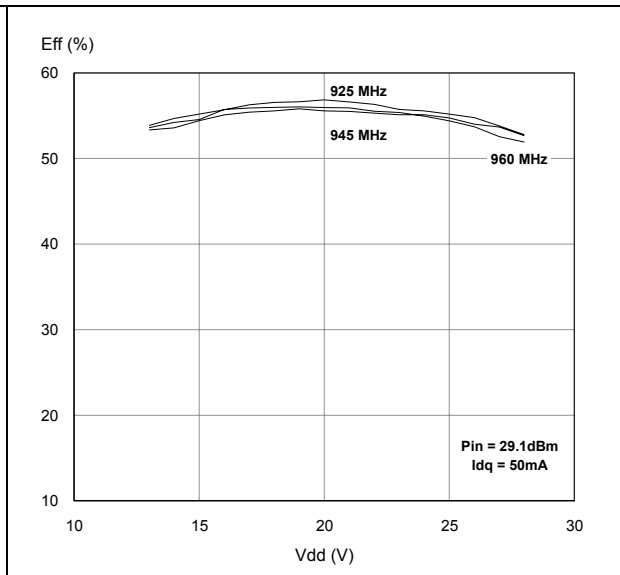
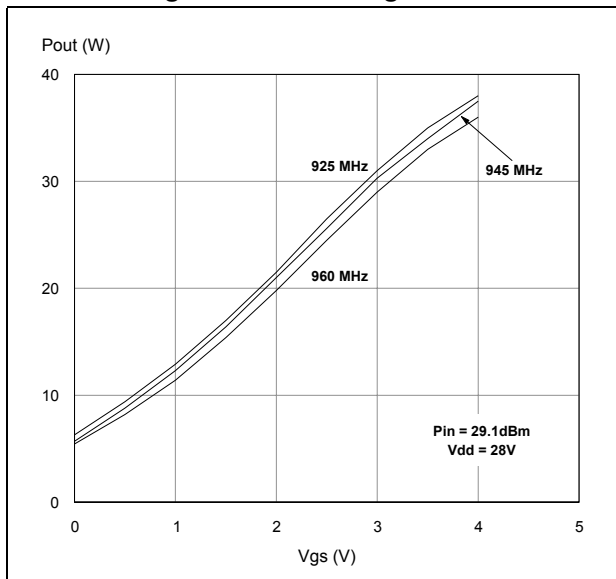


Figure 13. Output power vs gate-source voltage



5 Test circuit

Figure 14. Test circuit schematic

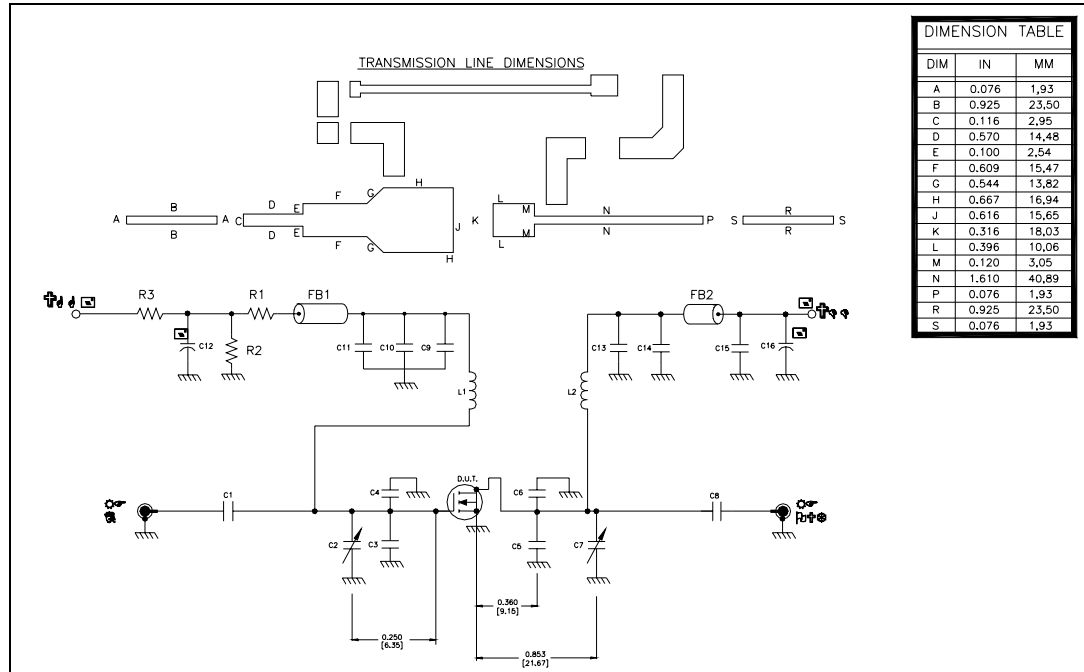


Table 8. Test circuit component part list

| 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

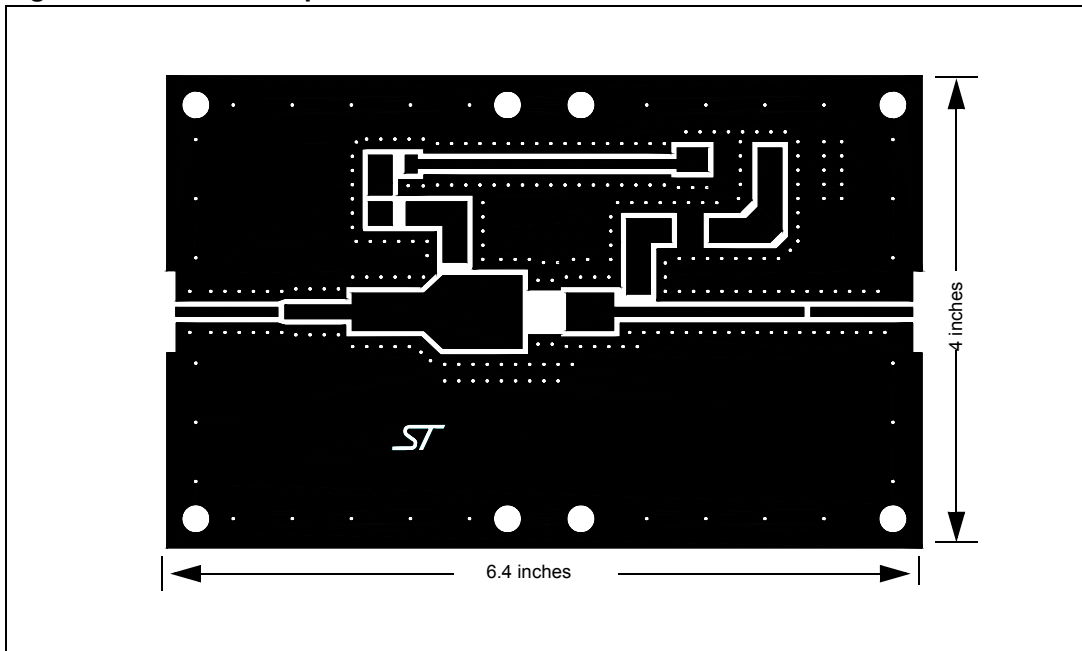
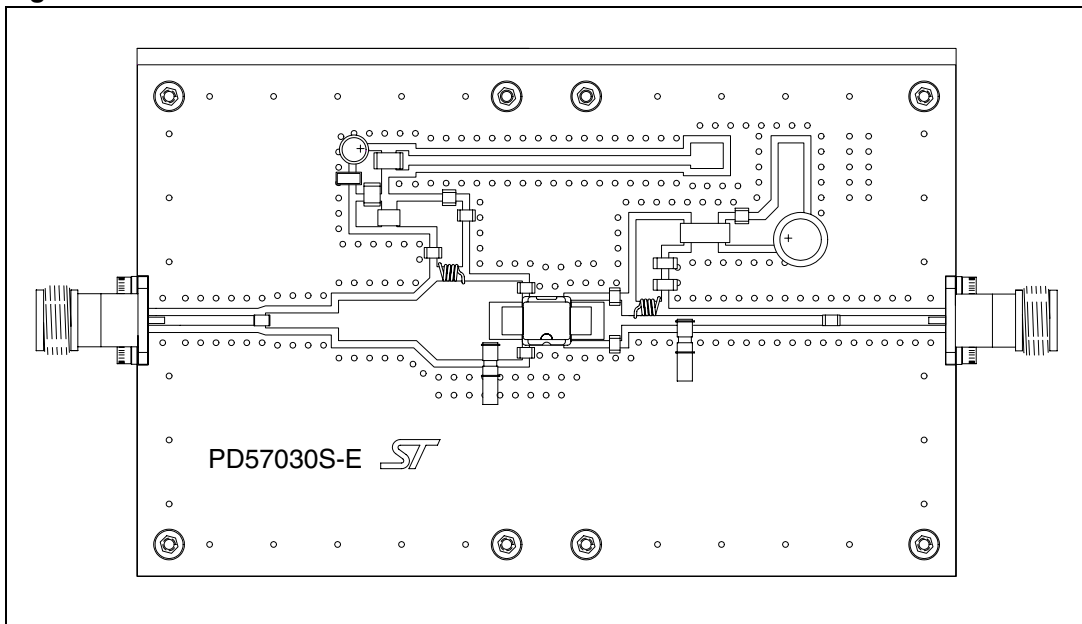


Figure 16. Test circuit



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

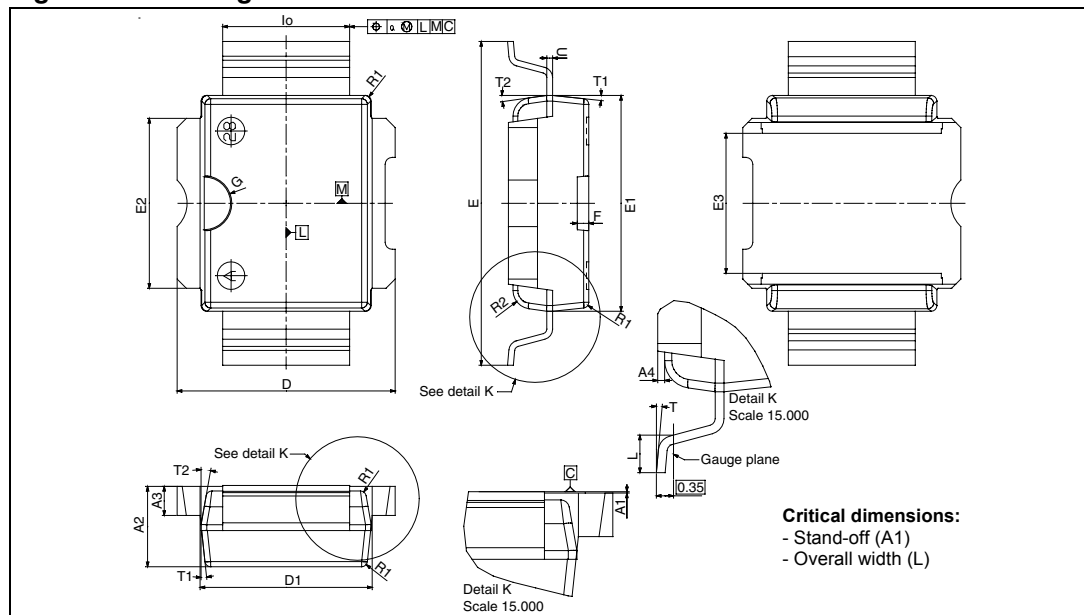


Table 10. PowerSO-10RF straight lead mechanical data

| 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

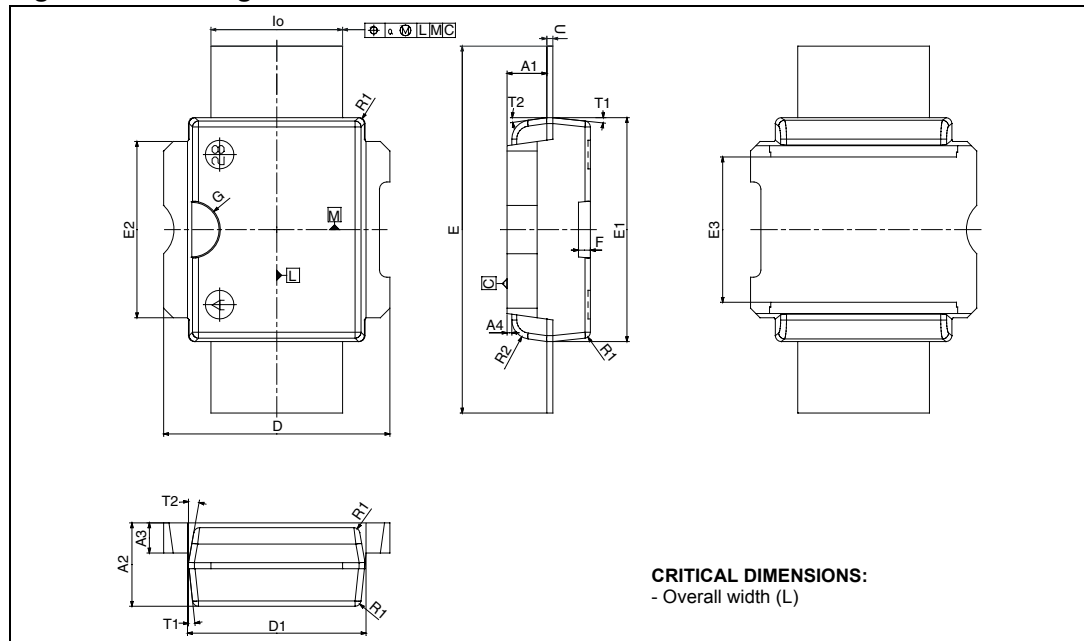


Figure 19. Tube information

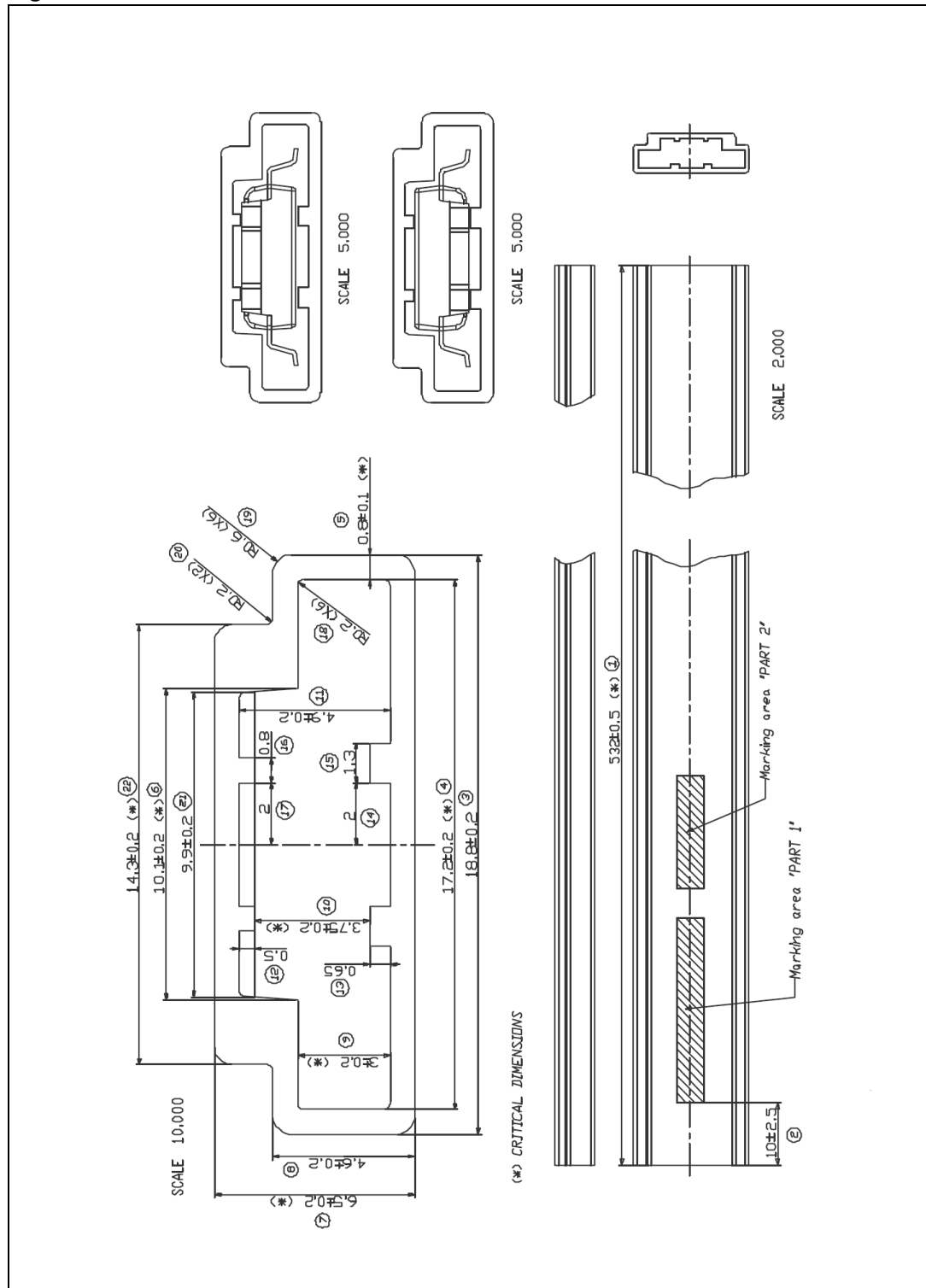
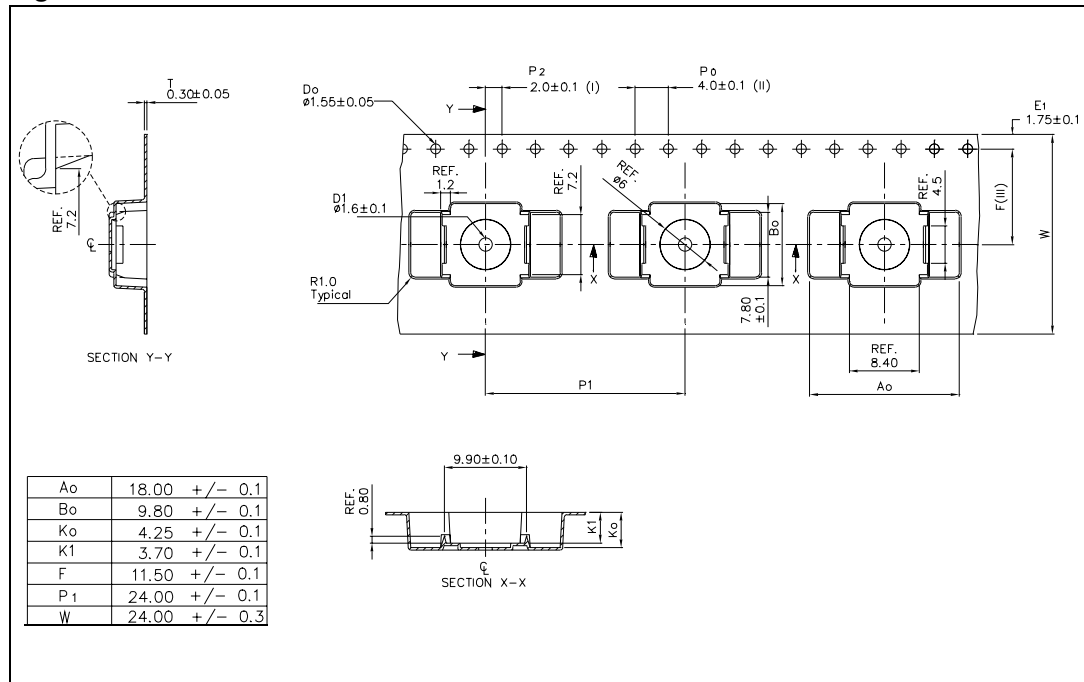


Figure 20. Reel information



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 |

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