



LET9045F

RF power transistor from the LdmoST family of n-channel enhancement-mode lateral MOSFETs

Features

- Excellent thermal stability
- Common source configuration
- POUT = 45 W with 18.5 dB gain @ 960 MHz
- BeO free package
- In compliance with the 2002/95/EC european directive

Description

The LET9045F is a common source n-channel enhancement-mode lateral field-effect RF power transistor designed for broadband commercial and industrial applications at frequencies up to 1.0 GHz. The LET9045F is designed for high gain and broadband performance operating in common source mode at 28 V. It is ideal for base station applications requiring high linearity.

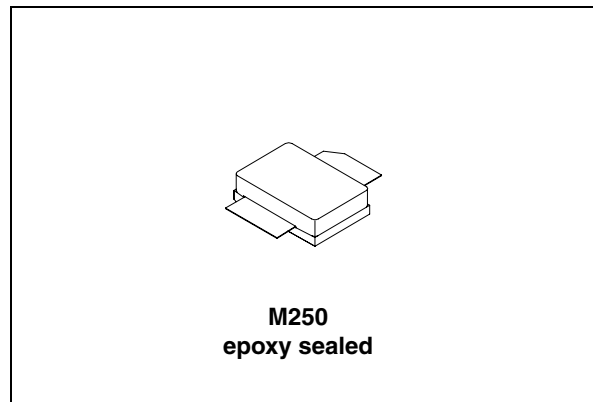


Figure 1. Pin out

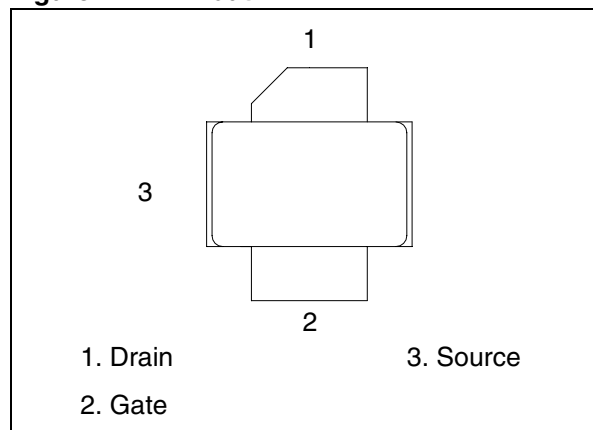


Table 1. Device summary

| Order code | Package | Branding |
|------------|---------|----------|
| LET9045F | M250 | LET9045F |

1 Maximum ratings

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

| Symbol | Parameter | Value | Unit |
|---------------|---|-------------|------|
| $V_{(BR)DSS}$ | Drain-source voltage | 80 | V |
| V_{GS} | Gate-source voltage | -0.5 to +15 | V |
| I_D | Drain current | 9 | A |
| P_{DISS} | Power dissipation (@ $T_C = 70\text{ °C}$) | 108 | W |
| T_J | Max. operating junction temperature | 200 | °C |
| T_{STG} | Storage temperature | -65 to +150 | °C |

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
|--------------|----------------------------------|-------|------|
| $R_{th(JC)}$ | Junction-case thermal resistance | 1.2 | °C/W |

2 Electrical characteristics

$T_C = 25\text{ }^\circ\text{C}$

Table 4. Static

| Symbol | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|---|------|------|------|---------------|
| $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}; I_{DS} = 10\text{ mA}$ | 80 | | | V |
| I_{DSS} | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$ | | | 1 | μA |
| I_{GSS} | $V_{GS} = 20\text{ V}; V_{DS} = 0\text{ V}$ | | | 1 | μA |
| $V_{GS(Q)}$ | $V_{DS} = 28\text{ V}; I_D = 300\text{ mA}$ | 2.0 | | 5.0 | V |
| $V_{DS(ON)}$ | $V_{GS} = 10\text{ V}; I_D = 3\text{ A}$ | | 0.9 | 1.2 | V |
| G_{FS} | $V_{DS} = 10\text{ V}; I_D = 3\text{ A}$ | 2.5 | | | mho |
| C_{ISS} | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}; f = 1\text{ MHz}$ | | 58 | | pF |
| C_{OSS} | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}; f = 1\text{ MHz}$ | | 29 | | pF |
| C_{RSS} | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}; f = 1\text{ MHz}$ | | 0.8 | | pF |

Table 5. Dynamic

| Symbol | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|---|------|------|------|------|
| P_{OUT} | $V_{DD} = 28\text{ V}; I_{DQ} = 300\text{ mA}; P_{IN} = 1\text{ W}; f = 960\text{ MHz}$ | 45 | 59 | | W |
| G_{PS} | $V_{DD} = 28\text{ V}; I_{DQ} = 300\text{ mA}; P_{IN} = 1\text{ W}; f = 960\text{ MHz}$ | 16.5 | 17.7 | | dB |
| h_D | $V_{DD} = 28\text{ V}; I_{DQ} = 300\text{ mA}; P_{IN} = 1\text{ W}; f = 960\text{ MHz}$ | 60 | 65 | | % |
| Load mismatch | $V_{DD} = 28\text{ V}; I_{DQ} = 300\text{ mA}; P_{IN} = 1\text{ W}; f = 960\text{ MHz}$ All phase angles | 10:1 | | | VSWR |

3 Impedance data

Figure 2. Impedance data

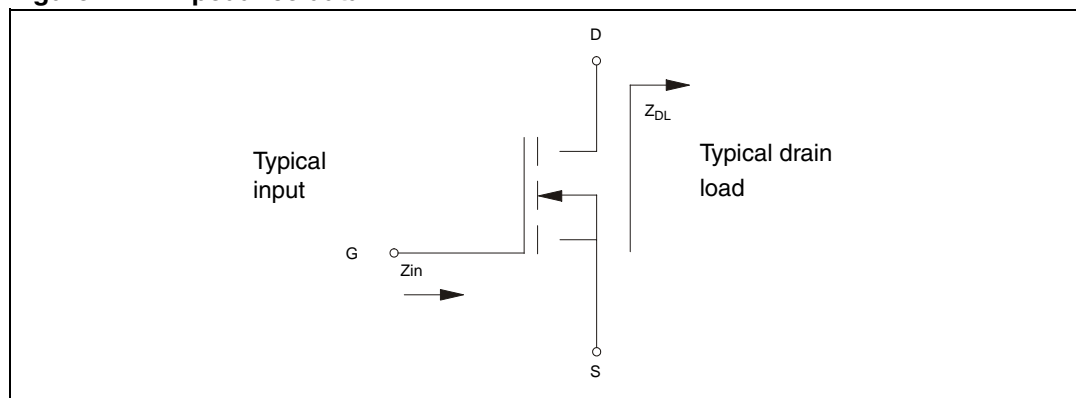


Table 6. Impedance data

| Frequency | $Z_{IN} (\Omega)$ | $Z_{DL} (\Omega)$ |
|-----------|-------------------|-------------------|
| 920 | $0.8 - j 0.08$ | $5.3 + j 0.63$ |
| 945 | $0.7 - j 0.4$ | $5 + j 1.5$ |
| 960 | $0.6 - j 0.6$ | $4.7 + j 2$ |

4 Typical performances

Figure 3. Gain vs output power and bias current, freq = 960 MHz, Vdd = 28 V

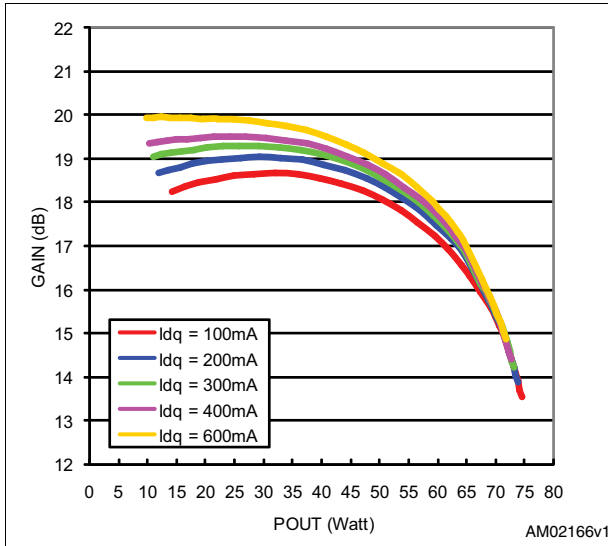


Figure 4. Gain and efficiency vs output power, freq = 960 MHz, Vdd = 28 V, Idq = 300 mA

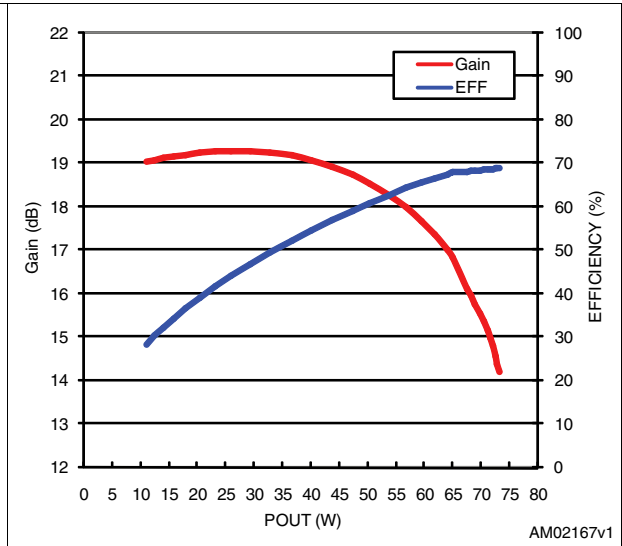
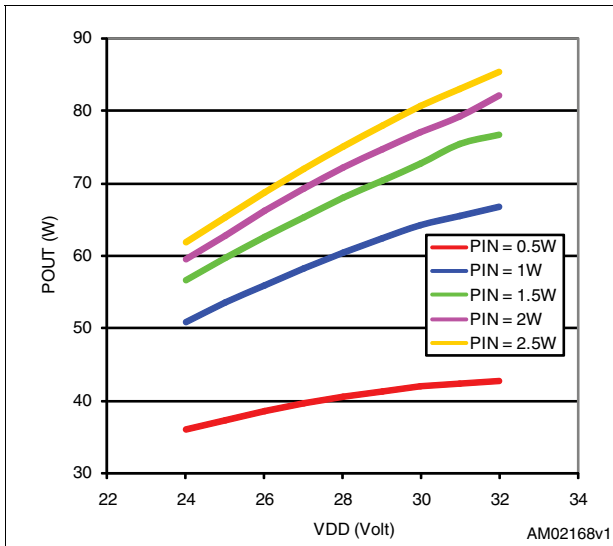


Table 7. Output power vs supply voltage freq = 960 MHz, Vdd = 28 V, Idq = 300 mA



5 Test circuit

Figure 5. Test circuit

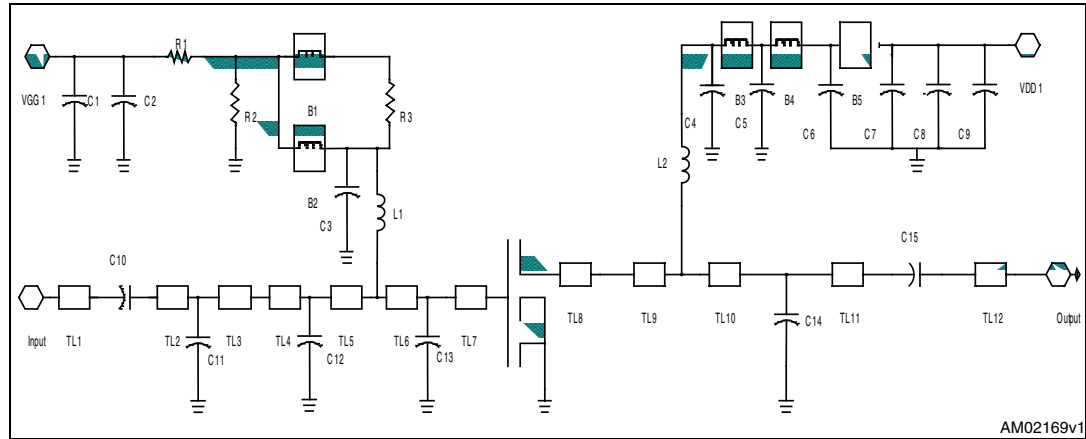


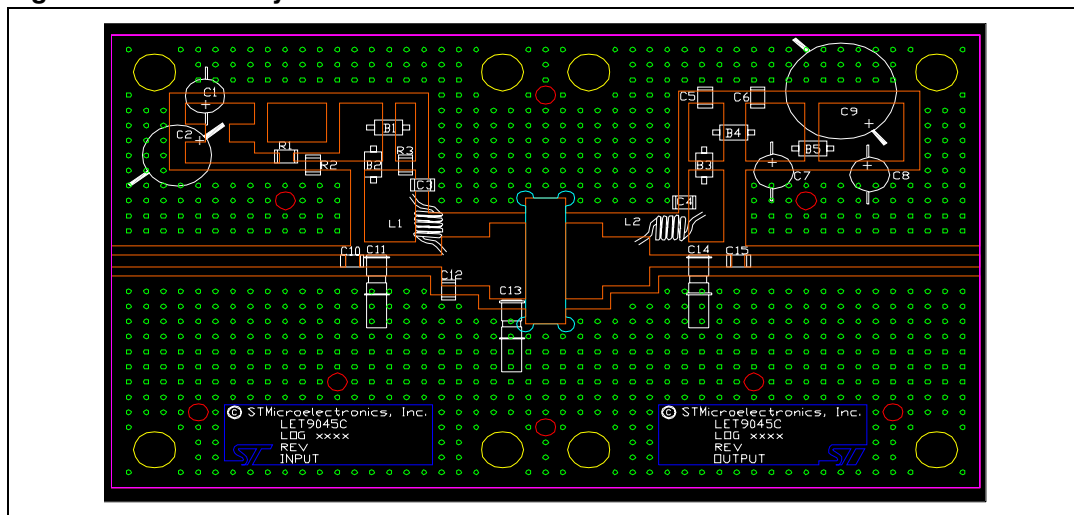
Table 8. LET9045F components list

| Item | Qty | Part number | Vendor | Description |
|------------------|-----|-----------------|----------------|--|
| R1, R2 | 2 | CR1206-8W-112JB | VENKEL | 1.1 kΩ 1/8W surface mount chip resistor |
| R3 | 1 | CR1206-8W-100JB | VENKEL | 10 Ω 1/8W surface mount chip resistor |
| Coil | 2 | | BELDEN | Inductor 5 turns air WOUND#20AWG ID =0.130 in (3.3 mm) bylon coated |
| B1,B2,B3,B4,B5 | 5 | 2743021447 | FAIR-RITE CORP | Surface mount EMI shield bead |
| C1,C7,C8 | 3 | T491D106K035AT | Kemet | 10 μF 35 V tantalum capacitors |
| C2 | 1 | | | 100 μF 63 V electrolytic capacitor |
| C3, C4, C10, C15 | 4 | ATC100B470XXXX | ATC | 47 pF chip capacitor |
| C5, C6 | 2 | ATC200B393MW | ATC | 39000 pF chip capacitor |
| C9 | 1 | | | 330 uF 50 V electrolytic capacitor |
| C11, C13, C14 | 3 | 27291PC | Johanson | 0.8-8 pF giga trim variable capacitor |
| C12 | 1 | ATC100B110XXXX | ATC | 11 pF chip capacitor |
| TL1 | | | | L = 1.350in [34.29 mm] W = 0.082in [02.08 mm] |
| TL2 | | | | L = 0.144in [3.65 mm] W = 0.082in [02.08 mm] |
| TL3 | | | | L = 0.311in [7.91 mm] W = 0.082in [02.08 mm] |
| TL4 | | | | L = 0.082in [2.09 mm] W = 0.323in [08.21 mm] |
| TL5 | | | | L = 0.194 in [4.94 mm] W = 0.323in [08.21 mm] |

Table 8. LET9045F components list (continued)

| Item | Qty | Part number | Vendor | Description |
|-----------|-----|-------------|-------------|---|
| TL6 | | | | L = 0.059in [1.49 mm] W= 0.506in [12.85 mm] |
| TL7 | | | | L = 0.144in [3.65 mm] W = 0.506in [12.85 mm] |
| TL8 | | | | L = 0.208in [5.28 mm] W = 0.506in [12.85 mm] |
| TL9 | | | | L = 0.275in [6.98 mm] W = 0.323in [08.21 mm] |
| TL10 | | | | L = 0.210in [5.33 mm] W = 0.082in [02.08 mm] |
| TL11 | | | | L = 0.260in [6.60 mm] W = 0.082in [02.08 mm] |
| TL12 | | | | L = 1.350in [34.29 mm] W = 0.082in [02.08 mm] |
| Board 3X5 | 1 | | Rogers corp | Er=2.55 t=0.0026in h=0.030in |

Figure 6. Circuit layout



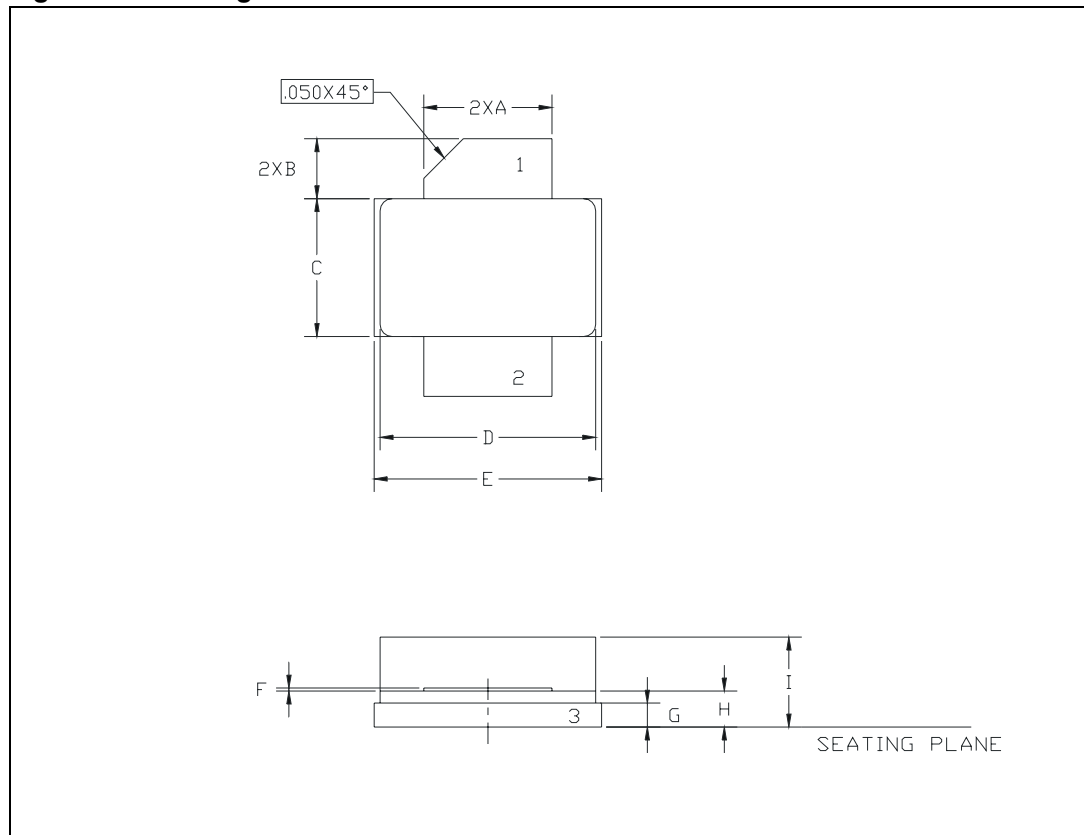
6 Package mechanical data

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. M250 (.230 x .360 2L N/HERM W/FLG) mechanical data

| Dim. | mm. | | | Inch | | |
|------|------|-----|------|-------|-----|-------|
| | Min | Typ | Max | Min | Typ | Max |
| A | 5.21 | | 5.71 | 0.205 | | 0.225 |
| B | 2.16 | | 2.92 | 0.085 | | 0.115 |
| C | 5.59 | | 6.09 | 0.220 | | 0.240 |
| D | 8.89 | | 9.40 | 0.350 | | 0.370 |
| E | 9.40 | | 9.91 | 0.370 | | 0.390 |
| F | 0.11 | | 0.15 | 0.004 | | 0.006 |
| G | 0.89 | | 1.14 | 0.035 | | 0.045 |
| H | 1.45 | | 1.70 | 0.057 | | 0.067 |
| I | 2.67 | | 3.94 | 0.105 | | 0.155 |

Figure 7. Package dimensions



7 Revision history

Table 10. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 02-Nov-2009 | 1 | Initial release. |
| 11-Feb-2010 | 2 | Changed test condition for $V_{(BR)DSS}$ in Table 4: Static . |

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