LET9060F

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

## Features

■ Excellent thermal stability

- Common source configuration

■ $\mathrm{P}_{\text {OUT }}(@ 28 \mathrm{~V}$ )= 60 W with 18 dB gain @ 945 MHz
■ $P_{\text {OUT }}(@ 36 \mathrm{~V})=90 \mathrm{~W}$ with 18 dB gain @ 945 MHz

- BeO free package

■ In compliance with the 2002/95/EC european directive

## Description

The LET9060F 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 LET9060F 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 |
| :---: | :---: | :---: |
| LET9060F | M250 | LET9060F |

## 1 <br> Maximum ratings

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

| Symbol | Parameter | Value | Unit |
| :---: | :--- | :---: | :---: |
| $\mathrm{V}_{(\mathrm{BR}) \mathrm{DSS}}$ | Drain-source voltage | 80 | V |
| $\mathrm{~V}_{\mathrm{GS}}$ | Gate-source voltage | -0.5 to +15 | V |
| $\mathrm{I}_{\mathrm{D}}$ | Drain current | 12 | A |
| $\mathrm{P}_{\text {DISS }}$ | Power dissipation $\left(@ \mathrm{~T}_{\mathrm{C}}=70^{\circ} \mathrm{C}\right)$ | 130 | W |
| $\mathrm{~T}_{J}$ | Max. operating junction temperature | 200 | ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{T}_{\text {STG }}$ | Storage temperature | -65 to +150 | ${ }^{\circ} \mathrm{C}$ |

Table 3. Thermal data

| Symbol | Parameter | Value | Unit |
| :---: | :--- | :---: | :---: |
| $\mathrm{R}_{\mathrm{th}(\mathrm{JC})}$ | Junction-case thermal resistance | 1.0 | ${ }^{\circ} \mathrm{C} / \mathrm{W}$ |

## 2 Electrical characteristics

$\mathrm{T}_{\mathrm{C}}=25^{\circ} \mathrm{C}$
Table 4. Static

| Symbol | Test conditions | Min. | Typ. | Max. | Unit |
| :---: | :--- | :---: | :---: | :---: | :---: |
| $\mathrm{V}_{(\mathrm{BR}) \mathrm{DSS}}$ | $\mathrm{V}_{\mathrm{GS}}=0 \mathrm{~V} ; \mathrm{I}_{\mathrm{DS}}=10 \mathrm{~mA}$ | 80 |  |  | V |
| $\mathrm{I}_{\mathrm{DSS}}$ | $\mathrm{V}_{\mathrm{GS}}=0 \mathrm{~V} ; \mathrm{V}_{\mathrm{DS}}=28 \mathrm{~V}$ |  |  | 1 | $\mu \mathrm{~A}$ |
| $\mathrm{I}_{\mathrm{GSS}}$ | $\mathrm{V}_{\mathrm{GS}}=5 \mathrm{~V} ; \mathrm{V}_{\mathrm{DS}}=0 \mathrm{~V}$ |  |  | 1 | $\mu \mathrm{~A}$ |
| $\mathrm{~V}_{\mathrm{GS}(\mathrm{Q})}$ | $\mathrm{V}_{\mathrm{DS}}=28 \mathrm{~V} ; \mathrm{I}_{\mathrm{D}}=100 \mathrm{~mA}$ | 2.0 |  | 5.0 | V |
| $\mathrm{~V}_{\mathrm{DS}(\mathrm{ON})}$ | $\mathrm{V}_{\mathrm{GS}}=10 \mathrm{~V} ; \mathrm{I}_{\mathrm{D}}=3 \mathrm{~A}$ |  | 0.8 | 1.2 | V |
| $\mathrm{G}_{\mathrm{FS}}$ | $\mathrm{V}_{\mathrm{DS}}=10 \mathrm{~V} ; \mathrm{I}_{\mathrm{D}}=3 \mathrm{~A}$ | 2.5 |  |  | mho |
| $\mathrm{C}_{\mathrm{ISS}}$ | $\mathrm{V}_{\mathrm{GS}}=0 \mathrm{~V} ; \mathrm{V}_{\mathrm{DS}}=28 \mathrm{~V} ; \mathrm{f}=1 \mathrm{MHz}$ |  | 77 |  | pF |
| $\mathrm{C}_{\mathrm{OSS}}$ | $\mathrm{V}_{\mathrm{GS}}=0 \mathrm{~V} ; \mathrm{V}_{\mathrm{DS}}=28 \mathrm{~V} ; \mathrm{f}=1 \mathrm{MHz}$ |  | 39 |  | pF |
| $\mathrm{C}_{\mathrm{RSS}}$ | $\mathrm{V}_{\mathrm{GS}}=0 \mathrm{~V} ; \mathrm{V}_{\mathrm{DS}}=28 \mathrm{~V} ; \mathrm{f}=1 \mathrm{MHz}$ |  | 1.2 |  | pF |

Table 5. Dynamic

| Symbol | Test conditions | Min. | Typ. | Max. | Unit |
| :---: | :--- | :---: | :---: | :---: | :---: |
| $\mathrm{P}_{\mathrm{OUT}}$ | $\mathrm{V}_{\mathrm{DD}}=28 \mathrm{~V} ; \mathrm{I}_{\mathrm{DQ}}=400 \mathrm{~mA} ; \mathrm{P}_{\mathrm{IN}}=1.5 \mathrm{~W} ; \mathrm{f}=945 \mathrm{MHz}$ | 60 | 75 | - | W |
| $\mathrm{G}_{\mathrm{PS}}$ | $\mathrm{V}_{\mathrm{DD}}=28 \mathrm{~V} ; \mathrm{I}_{\mathrm{DQ}}=400 \mathrm{~mA} ; \mathrm{P}_{\mathrm{OUT}}=60 \mathrm{~W} ; \mathrm{f}=945 \mathrm{MHz}$ | 16 | 18 | - | dB |
| $\mathrm{h}_{\mathrm{D}}$ | $\mathrm{V}_{\mathrm{DD}}=28 \mathrm{~V} ; \mathrm{I}_{\mathrm{DQ}}=400 \mathrm{~mA} ; \mathrm{P}_{\mathrm{IN}}=1.5 \mathrm{~W} ; \mathrm{f}=945 \mathrm{MHz}$ | 60 | 70 | - | $\%$ |
| Load <br> mismatch | $\mathrm{V}_{\mathrm{DD}}=35 \mathrm{~V} ; \mathrm{I}_{\mathrm{DQ}}=400 \mathrm{~mA} ; \mathrm{P}_{\mathrm{OUT}}=100 \mathrm{~W} ; \mathrm{f}=945 \mathrm{MHz}$ <br> All phase angles |  | $20: 1$ |  | VSWR |

## 3 Impedance data

Figure 2. Impedance data


Table 6. Impedance data

| Frequency | $\mathbf{Z}_{\text {IN }}(\Omega)$ | $\mathbf{Z}_{\mathrm{DL}}(\Omega)$ |
| :---: | :---: | :---: |
| 945 | $0.34-\mathrm{j} 0.31$ | $2.78+\mathrm{j} 0.66$ |

## 4 Typical performances

Figure 3. Gain vs output power freq $=945$ $\mathrm{MHz}, \mathrm{Vdd}=28 \mathrm{~V}$


Figure 4. Gain and efficiency vs output power, freq $=945 \mathrm{MHz}$, Vdd $=28 \mathrm{~V}$, $\mathrm{Idq}=0.4 \mathrm{~A}$


Table 7. Gain vs output power, freq = 945 $\mathrm{MHz}, \mathrm{Idq}=0.4 \mathrm{~A}$


Figure 5. Gain and efficiency vs output power, freq = 945 MHz , Vdd $=35 \mathrm{~V}$, $\mathrm{Idq}=0.4 \mathrm{~A}$


Table 8. Output power vs supply voltage freq $=945 \mathrm{MHz}$, $\mathrm{Idq}=0.4 \mathrm{~A}$


Figure 6. Gain and efficiency vs output power, freq = 1850 MHz , $\mathrm{Vdd}=28 \mathrm{~V}, \mathrm{Idq}=0.4 \mathrm{~A}$


## 5 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK ${ }^{\circledR}$ packages, depending on their level of environmental compliance. ECOPACK ${ }^{\circledR}$ specifications, grade definitions and product status are available at: www.st.com. ECOPACK ${ }^{\circledR}$ is an ST trademark.

Table 9. M250 (. $230 \times .360$ 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. M250 package dimensions


## 6 Revision history

Table 10. Document revision history

| Date | Revision | Changes |
| :---: | :---: | :--- |
| 03-Dec-2009 | 1 | Initial release. |
| 11-Feb-2010 | 2 | Changed test condition for $\mathrm{V}_{(\mathrm{BR}) \mathrm{DSS}}$ in Table 4: Static. |
| 04-Apr-2011 | 3 | Updated features on cover page. |

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