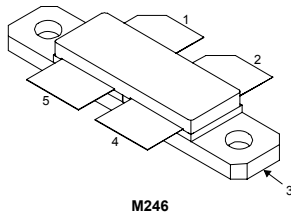


### 60 W, 28 V, HF to 1 GHz RF power LDMOS transistor



#### Features

| Order code | Frequency | V <sub>DD</sub> | P <sub>OUT</sub> | Gain  | Efficiency |
|------------|-----------|-----------------|------------------|-------|------------|
| SD56060    | 860 MHz   | 28 V            | 60 W             | 16 dB | 60         |

- Excellent thermal stability
- Common source configuration push-pull
- BeO-free package

#### Applications

- Ground/air communication
- ISM

#### Description

The **SD56060** 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 GHz. It is designed for high gain and broadband performance operating in common source mode at 28 V.



#### Product status link

[SD56060](#)

#### Product summary

|                    |         |
|--------------------|---------|
| Order code         | SD56060 |
| Marking            | SD56060 |
| Package            | M246    |
| Packing            | Box     |
| Base/bulk quantity | 20/60   |

## 1 Electrical ratings

**Table 1. Absolute maximum ratings ( $T_C = 25\text{ °C}$ )**

| Symbol    | Parameter                                       | Value      | Unit |
|-----------|-------------------------------------------------|------------|------|
| $V_{DS}$  | Drain-source voltage                            | 65         | V    |
| $V_{GS}$  | Gate-source voltage                             | $\pm 20$   | V    |
| $I_D$     | Drain current                                   | 8          | A    |
| $P_{TOT}$ | Total power dissipation at $T_C = 70\text{ °C}$ | 148        | W    |
| $T_{STG}$ | Storage temperature range                       | -65 to 150 | °C   |
| $T_J$     | Maximum junction temperature                    | 200        | °C   |

**Table 2. Thermal data**

| Symbol     | Parameter                            | Value | Unit |
|------------|--------------------------------------|-------|------|
| $R_{thJC}$ | Thermal resistance, junction-to-case | 0.875 | °C/W |

## 2 Electrical characteristics

$T_C = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

**Table 3. Static (per side)**

| Symbol        | Parameter                               | Test conditions                                                     | Min. | Typ. | Max. | Unit          |
|---------------|-----------------------------------------|---------------------------------------------------------------------|------|------|------|---------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage          | $V_{GS} = 0\text{ V}$ , $I_D = 1\text{ mA}$                         | 65   |      |      | V             |
| $I_{DSS}$     | Zero gate voltage drain leakage current | $V_{GS} = 0\text{ V}$ , $V_{DS} = 28\text{ V}$                      |      |      | 1    | $\mu\text{A}$ |
| $I_{GSS}$     | Gate-source leakage current             | $V_{GS} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$                      |      |      | 1    | $\mu\text{A}$ |
| $V_{GS(Q)}$   | Gate quiescent voltage                  | $V_{DS} = 28\text{ V}$ , $I_D = 100\text{ mA}$                      | 2.8  |      | 5.0  | V             |
| $V_{DS(on)}$  | Static drain-source on-voltage          | $V_{GS} = 10\text{ V}$ , $I_D = 3\text{ A}$                         |      | 1.3  |      | V             |
| $G_{FS}$      | Transconductance                        | $V_{DS} = 10\text{ V}$ , $I_D = 3\text{ A}$                         |      | 1.8  |      | S             |
| $C_{iss}$     | Common source input capacitance         | $V_{GS} = 0\text{ V}$ , $V_{DD} = 28\text{ V}$ , $f = 1\text{ MHz}$ |      | 58   |      | pF            |
| $C_{rss}$     | Common source feedback capacitance      |                                                                     |      | 34   |      | pF            |
| $C_{oss}$     | Common source output capacitance        |                                                                     |      | 2.7  |      | pF            |

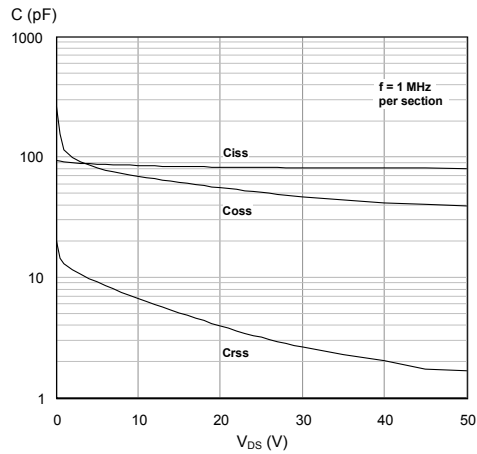
**Table 4. Dynamic**

| Symbol    | Parameter                  | Test conditions                                                                                                    | Min. | Typ. | Max. | Unit            |
|-----------|----------------------------|--------------------------------------------------------------------------------------------------------------------|------|------|------|-----------------|
| $P_{OUT}$ | Output power               | $V_{DD} = 28\text{ V}$ , $I_{DQ} = 100\text{ mA}$ , $f = 860\text{ MHz}$                                           | 60   |      | -    | W               |
| $G_{PS}$  | Power gain                 | $V_{DD} = 28\text{ V}$ , $I_{DQ} = 100\text{ mA}$ ,                                                                | 14   | 16   | -    | dB              |
| $\eta_D$  | Drain efficiency           | $P_{OUT} = 60\text{ W}$ , $f = 860\text{ MHz}$                                                                     | 50   | 60   | -    | %               |
| IMD       | Intermodulation distortion | $V_{DD} = 28\text{ V}$ , $I_{DQ} = 100\text{ mA}$ ,<br>$P_{OUT} = 60\text{ W}$ , PEP <sup>(1)</sup>                |      | -28  | -    | dB <sub>C</sub> |
| VSWR      | Load mismatch              | $V_{DD} = 28\text{ V}$ , $I_{DQ} = 100\text{ mA}$ ,<br>$P_{OUT} = 60\text{ W}$ , $f = 860\text{ MHz}$ , all phases | 5:1  |      | -    |                 |

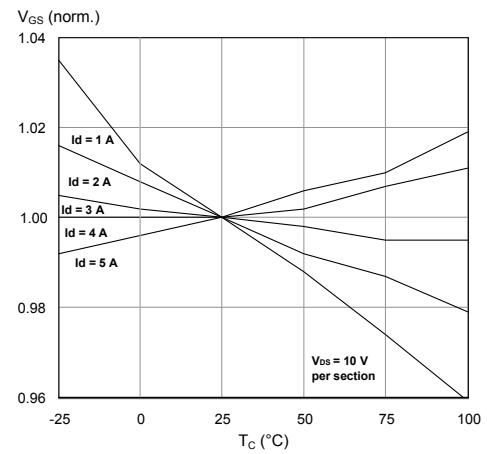
1. PEP is:  $f_1 = 860\text{ MHz}$  and  $f_2 = 860.1\text{ MHz}$ .

### 3 Typical performances

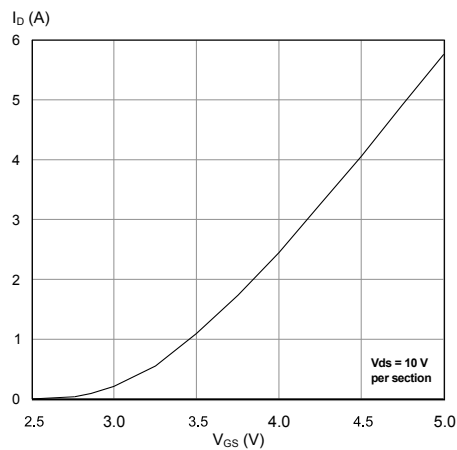
**Figure 1. Capacitance vs drain voltage (per section)**



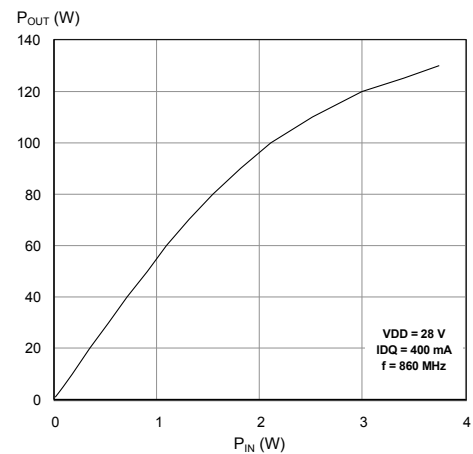
**Figure 2. Gate-source voltage vs case temperature**



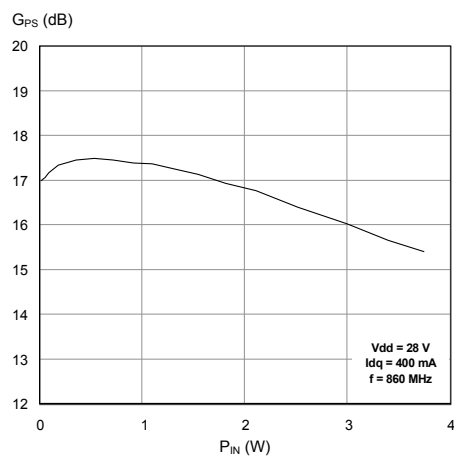
**Figure 3. Drain current vs gate voltage**



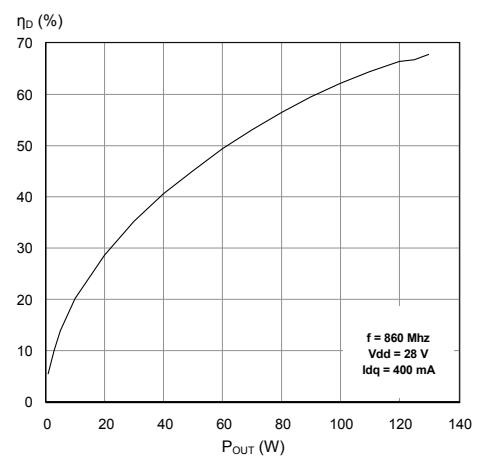
**Figure 4. Output power vs input power**



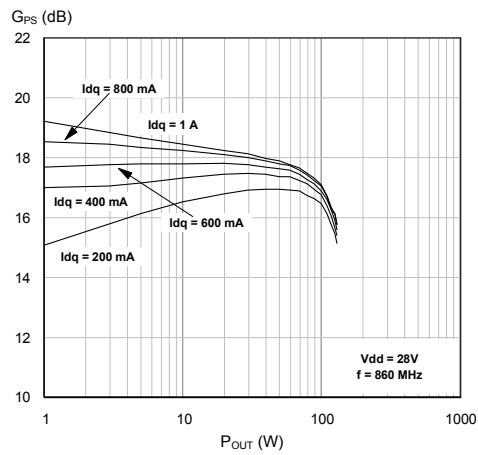
**Figure 5. Power gain vs input power**



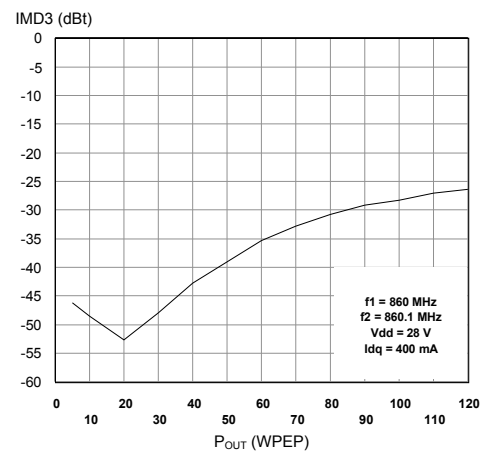
**Figure 6. Efficiency vs output power**



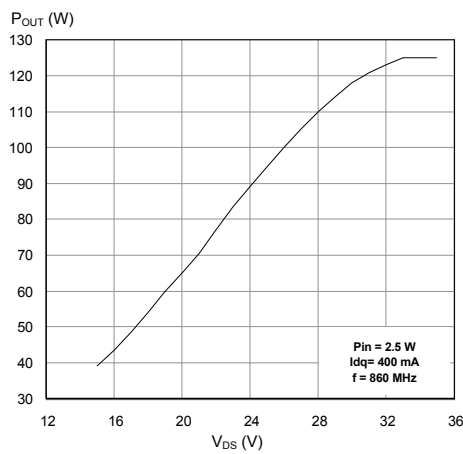
**Figure 7. Power gain vs output power**



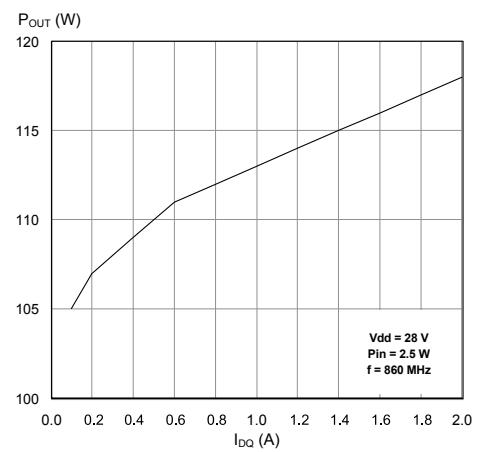
**Figure 8. Intermodulation distortion vs output power**



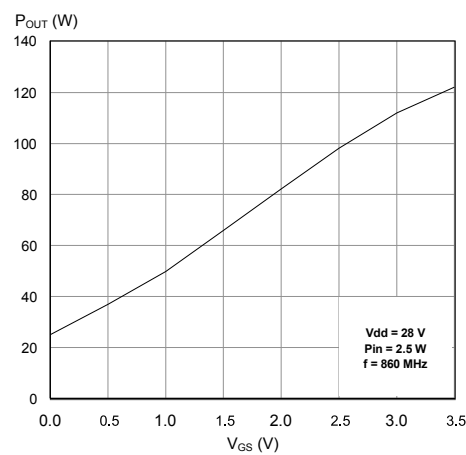
**Figure 9. Output power vs drain voltage**



**Figure 10. Output power vs bias current**

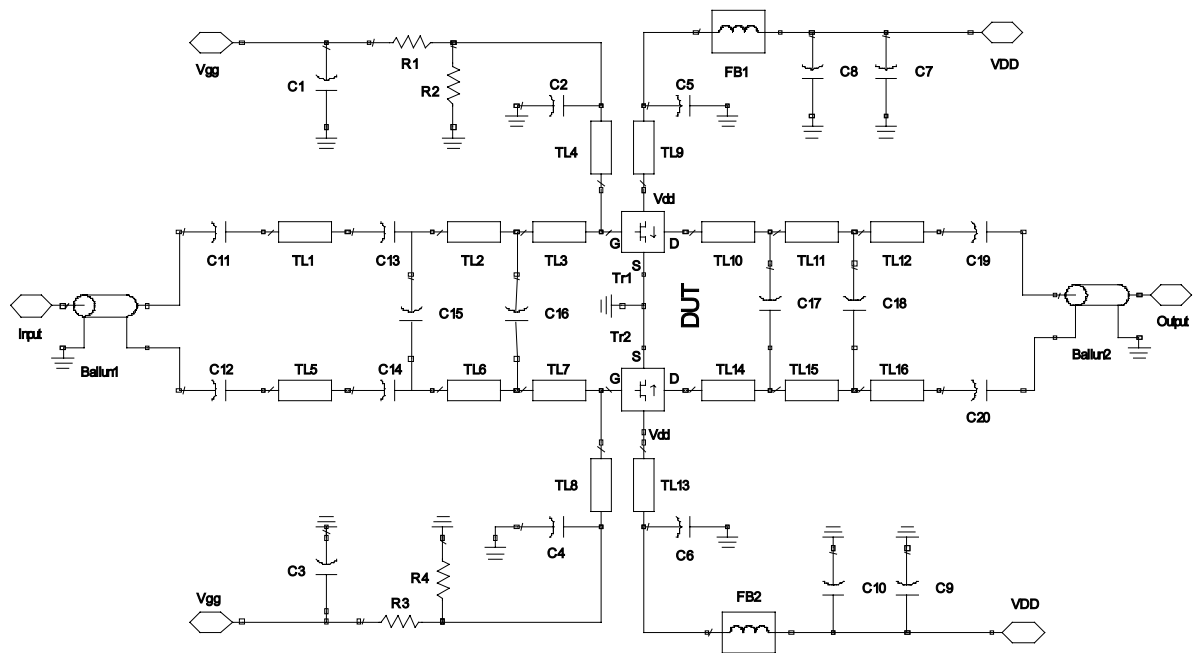


**Figure 11. Output power vs gate-source voltage**



## 4 Test circuits

**Figure 12. Test circuit schematic (f = 860 MHz)**



AM07851v1

Note:

1. Dimensions at component symbols are reference for component placement.
2. Gap between ground and transmission line = 0.056 in [1.42 mm] +0.002 in [0.05 mm] -0.000 in [0.00 mm] typ.

**Table 5. Components list**

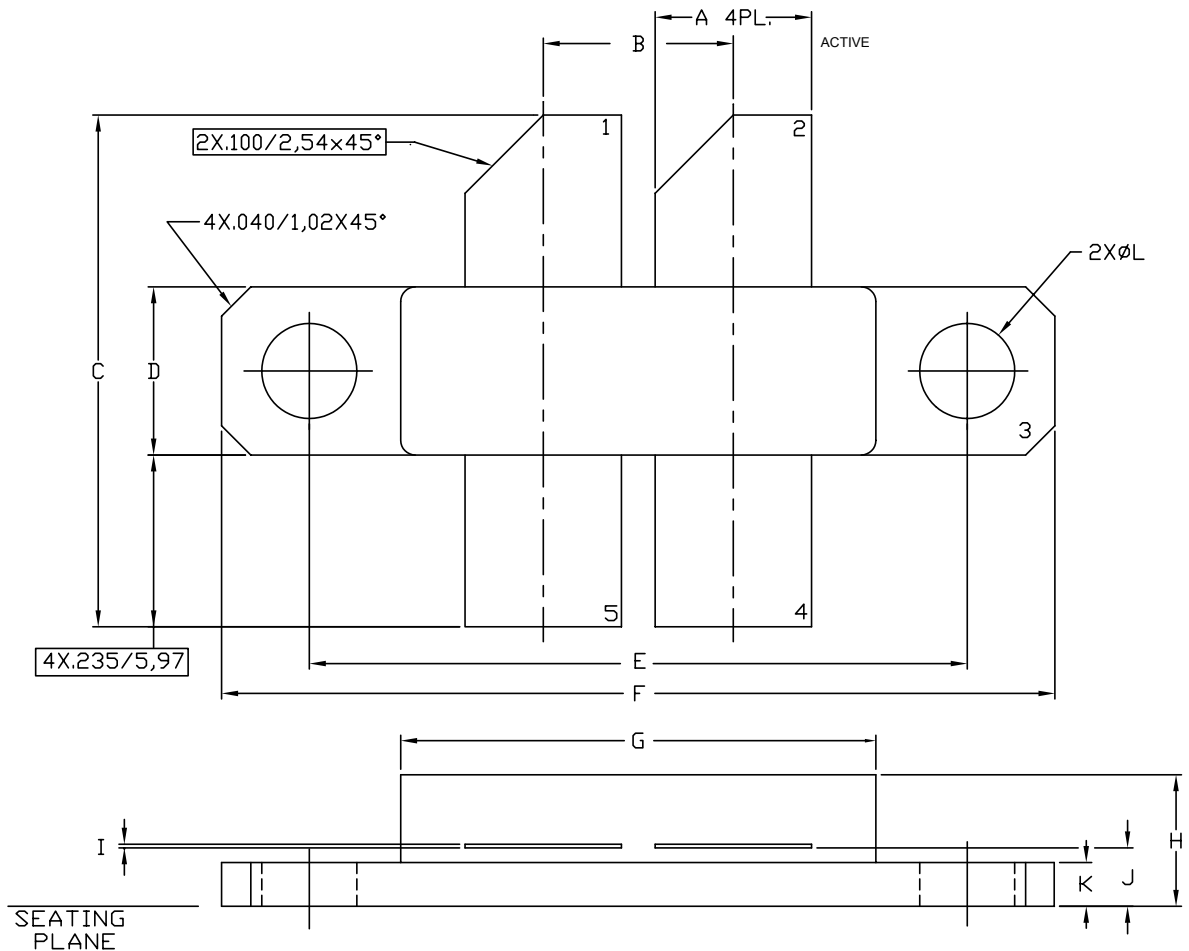
| Component           | Q.ty | Part number        | Vendor         | Description                                                                                                     |
|---------------------|------|--------------------|----------------|-----------------------------------------------------------------------------------------------------------------|
| R1, R3              | 2    | CR1206-8W-130JB    | VENKEL         | 13 $\Omega$ , 1/8 W surface mount chip resistor                                                                 |
| R2, R4              | 2    | CR1206-8W-122JB    | VENKEL         | 1.2 k $\Omega$ , 1/8 W surface mount chip resistor                                                              |
| R5, R6              | 2    | CR1206-8W-250JB    | VENKEL         | 25 $\Omega$ , 1/8 W surface mount chip resistor                                                                 |
| B1, B2              | 2    | 2743021447         | FAIR-RITE CORP | Surface mount EMI shield bead                                                                                   |
| C1, C3, C7, C9      | 4    |                    |                | 100 $\mu$ F, 63 V electrolytic capacitor                                                                        |
| C2, C4, C5, C6      | 4    | ATC100B910XXXX     | ATC            | 91 pF chip capacitor                                                                                            |
| C8, C10             | 2    | C1812X7R501-104KNE |                | 0.1 F 500 V surface mount ceramic chip capacitor                                                                |
| C11, C12            | 2    | ATC100B620XXXX     | ATC            | 62 pF chip capacitor                                                                                            |
| C13, C14            | 2    | ATC100B151XXXX     | ATC            | 150 pF chip capacitor                                                                                           |
| C15                 | 1    | ATC100B110XXXX     | ATC            | 5.1 pF chip capacitor                                                                                           |
| C16                 | 1    | ATC100B7R5XXXX     | ATC            | 7.5 pF chip capacitor                                                                                           |
| C17                 | 1    | ATC100B1R1XXXX     | ATC            | 1.1 pF chip capacitor                                                                                           |
| C18                 | 1    | 27291PC            | JOHANSON       | 0.8-8 pF giga trim variable capacitor                                                                           |
| C19, C20            | 2    | ATC100B101XXXX     | ATC            | 100 pF chip capacitor                                                                                           |
| TL1, TL5            |      |                    |                | L= 0.250 in [6.35 mm], W=0.214 in [5.44 mm]                                                                     |
| TL2, TL6            |      |                    |                | L= 0.182 in [4.62 mm], W=0.284 in [7.21 mm]                                                                     |
| TL3, TL7            |      |                    |                | L= 0.318 in [8.08 mm], W=0.284 in [7.21 mm]                                                                     |
| TL4, TL8, TL9, TL13 |      |                    |                | L= 2.37 in [60.19 mm], W=0.082 in [2.08 mm]                                                                     |
| TL10, TL14          |      |                    |                | L= 0.314 in [7.97 mm], W=0.230 in [5.84 mm]                                                                     |
| TL11, TL15          |      |                    |                | L= 0.460 in [11.68 mm], W=0.230 in [5.84 mm]                                                                    |
| TL12, TL16          |      |                    |                | L= 0.280 in [7.11 mm], W=0.230 in [5.84 mm]                                                                     |
| Board 3x5           | 1    |                    | Rogers Corp    | $\epsilon_r$ = 2.55, t (copper layer thickness) = 0.0026 in [0.066 mm], h (PCB thickness) = 0.030 in [0.762 mm] |

## 5 Package information

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](http://www.st.com). ECOPACK is an ST trademark.

### 5.1 M246 package information

**Figure 13. M246 package outline**



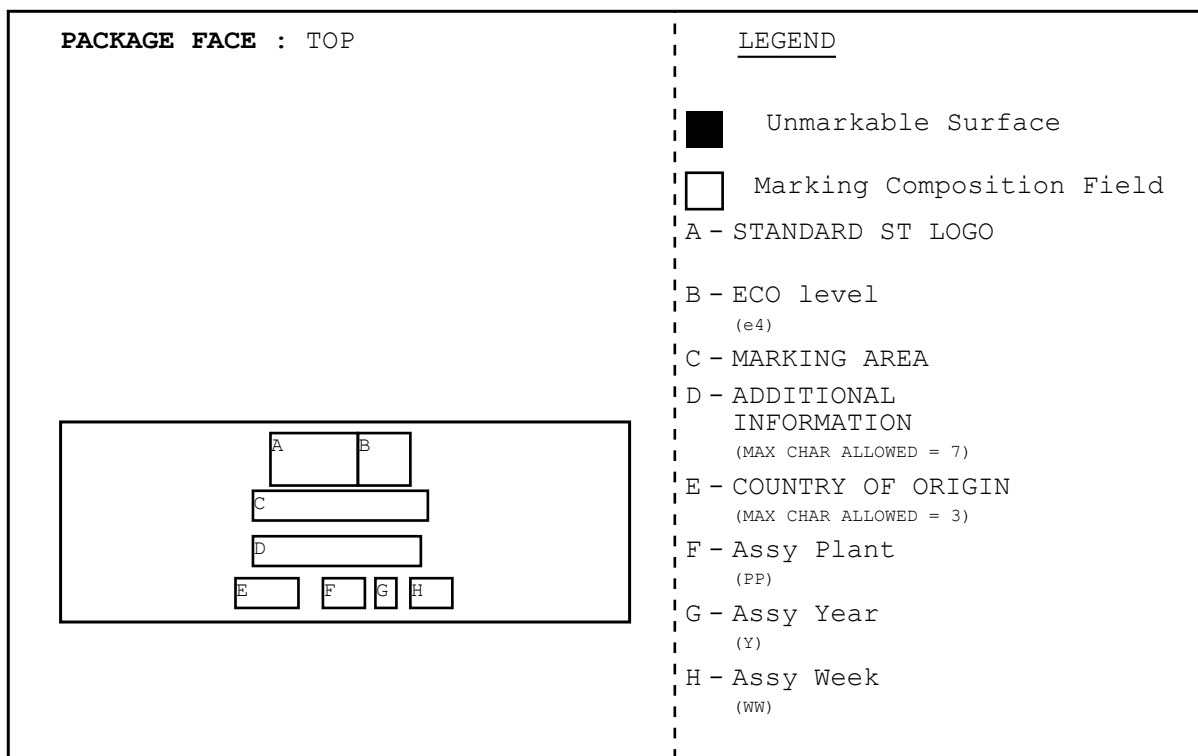
7145054\_5

**Table 6. M246 mechanical data**

| Symbol | Milimeters |       |       |
|--------|------------|-------|-------|
|        | Min.       | Typ.  | Max.  |
| A      | 5.33       |       | 5.59  |
| B      | 6.48       |       | 6.73  |
| C      | 17.27      |       | 18.29 |
| D      | 5.72       |       | 5.97  |
| E      |            | 22.86 |       |
| F      | 28.83      |       | 29.08 |
| G      | 16.26      |       | 16.76 |
| H      | 4.19       |       | 5.08  |
| I      | 0.08       |       | 0.15  |
| J      | 1.83       |       | 2.24  |
| K      | 1.40       |       | 1.65  |
| L      | 3.18       |       | 3.43  |

## 5.2 Marking information

Figure 14. Marking composition



GADG040220211644GT

## Revision history

**Table 7. Document revision history**

| Date        | Version | Changes                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15-Jun-2015 | 1       | First release.                                                                                                                                                                                                                                                                                                                                                                                         |
| 22-Dec-2021 | 2       | Updated title, <a href="#">Features</a> , <a href="#">Description</a> , <a href="#">Device summary</a> and added <a href="#">Applications</a> on cover page.<br>Updated <a href="#">Table 3. Static (per side)</a> .<br>Removed <i>Impedances</i> chapter.<br>Updated <a href="#">Section 5 Package information</a> and added <a href="#">Section 5.2 Marking information</a> .<br>Minor text changes. |

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