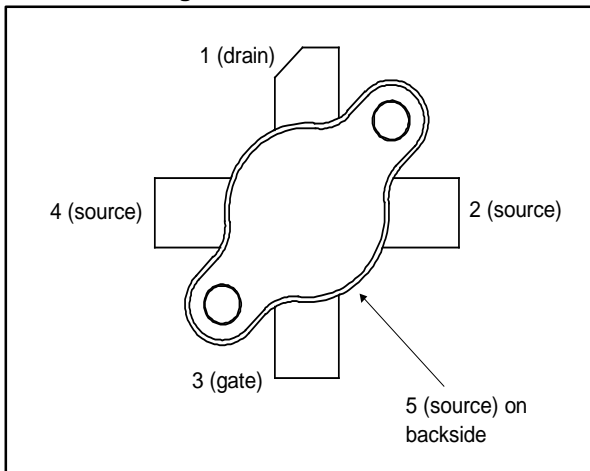


Figure 1: Pin connection



### Features

- Operating frequency up to 27 MHz
- $P_{OUT} = 600$  W typ. with 23 dB gain @ 13.56 MHz/250 V
- Designed for Class-AB, C, D and E operation
- $V_{(BR)DSS} > 1000$  V
- Housed in STAC<sup>®</sup> package, using air cavity packaging technology
- In compliance with the 2002/95/EC1 European Directive

### Description

The STAC250V2-500E uses the latest RF Power SuperDMOS technology specially designed for 150 V and 250 V industrial RF power Class-AB, C, D and E generators such as PECVD, plasma sputtering, flat panel and solar cell manufacturing equipment. The STAC250V2-500E benefits from the latest generation of STAC<sup>®</sup> air cavity packaging, which exhibits a 25% lower thermal resistance compared to equivalent ceramic packages.

Table 1: Device summary

| Order code     | Marking                  | Package  | Packing      |
|----------------|--------------------------|----------|--------------|
| STAC250V2-500E | 250V2-500 <sup>(1)</sup> | STAC177B | Plastic tray |

#### Notes:

<sup>(1)</sup>For more details please refer to [Section 6: "Marking, packing and shipping specifications"](#).

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# 1 Electrical data

## 1.1 Maximum ratings

( $T_{CASE} = 25\text{ °C}$ )

Table 2: Absolute maximum ratings

| Symbol        | Parameter                           | Value       | Unit               |
|---------------|-------------------------------------|-------------|--------------------|
| $V_{(BR)DSS}$ | Drain-source voltage                | 1000        | V                  |
| $V_{GS}$      | Gate-source voltage                 | $\pm 20$    | V                  |
| $T_J$         | Max. operating junction temperature | 200         | $^{\circ}\text{C}$ |
| $T_{STG}$     | Storage temperature                 | -65 to +150 | $^{\circ}\text{C}$ |

## 1.2 Thermal data

Table 3: Thermal data

| Symbol     | Parameter                        | Value | Unit                 |
|------------|----------------------------------|-------|----------------------|
| $R_{thJC}$ | Junction-case thermal resistance | 0.14  | $^{\circ}\text{C/W}$ |

## 2 Electrical characteristics

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

### 2.1 Static

Table 4: Static

| Symbol        | Test conditions  | Min. | Typ. | Max. | Unit          |
|---------------|--|------|------|------|---------------|
| $V_{(BR)DSS}$ | $I_D = 250\text{ }\mu\text{A}$                                 | 1000 |      |      | V             |
| $I_{DSS}$     | $V_{GS} = 0\text{ V}; V_{DS} = 750\text{ V}$                   |      |      | 1    | $\mu\text{A}$ |
| $I_{GSS}$     | $V_{GS} = 20\text{ V}; V_{DS} = 0\text{ V}$                    |      |      | 1    | $\mu\text{A}$ |
| $V_{TH}$      | $I_D = 250\text{ }\mu\text{A}$                                 | 3    | 4.7  | 6    | V             |
| $V_{DS(ON)}$  | $V_{GS} = 10\text{ V}; I_D = 7\text{ A}$                       |      | 4.2  | 5    | V             |
| $G_{FS}$      | $V_{DS} = 7\text{ V}; I_D = 3.5\text{ A}$                      |      | 4.4  |      | S             |
| $C_{ISS}$     | $V_{GS} = 0\text{ V}; V_{DS} = 150\text{ V}; f = 1\text{ MHz}$ |      | 980  |      | pF            |
| $C_{OSS}$     | $V_{GS} = 0\text{ V}; V_{DS} = 150\text{ V}; f = 1\text{ MHz}$ |      | 140  |      | pF            |
| $C_{RSS}$     | $V_{GS} = 0\text{ V}; V_{DS} = 150\text{ V}; f = 1\text{ MHz}$ |      | 1    |      | pF            |

### 2.2 Dynamic

Frequency = 13.56 MHz Class-C

Table 5: Dynamic

| Symbol        | Test conditions                                 | Min. | Typ.                        | Max. | Unit |
|---------------|---|------|-----------------------------|------|------|
| $P_{OUT}$     | $V_{DD} = 150\text{ V}, P_{IN} = 3\text{ W}$    | 500  | 520                         | -    | W    |
|               | $V_{DD} = 250\text{ V}, P_{IN} = 2.4\text{ W}$  | 500  | 700                         | -    |      |
| Gain          | $V_{DD} = 150\text{ V}, P_{IN} = 3\text{ W}$    | 22   | 22.3                        | -    | dB   |
|               | $V_{DD} = 250\text{ V}, P_{IN} = 2.4\text{ W}$  | 24   | 24.6                        | -    |      |
| Efficiency    | $V_{DD} = 150\text{ V}, P_{OUT} = 3\text{ W}$   | 70   | 73                          | -    | %    |
|               | $V_{DD} = 250\text{ V}, P_{OUT} = 2.4\text{ W}$ | 70   | 74                          | -    | %    |
| Load mismatch | $V_{DD} = 150\text{ V}, P_{OUT} = 500\text{ W}$ |      | 10:1 <sup>(1)</sup><br>65:1 | -    | VSWR |
|               | $V_{DD} = 250\text{ V}, P_{OUT} = 500\text{ W}$ |      | 6:1<br>20:1 <sup>(1)</sup>  | -    |      |

**Notes:**

<sup>(1)</sup>Under pulse conditions: 1 ms - 10%.

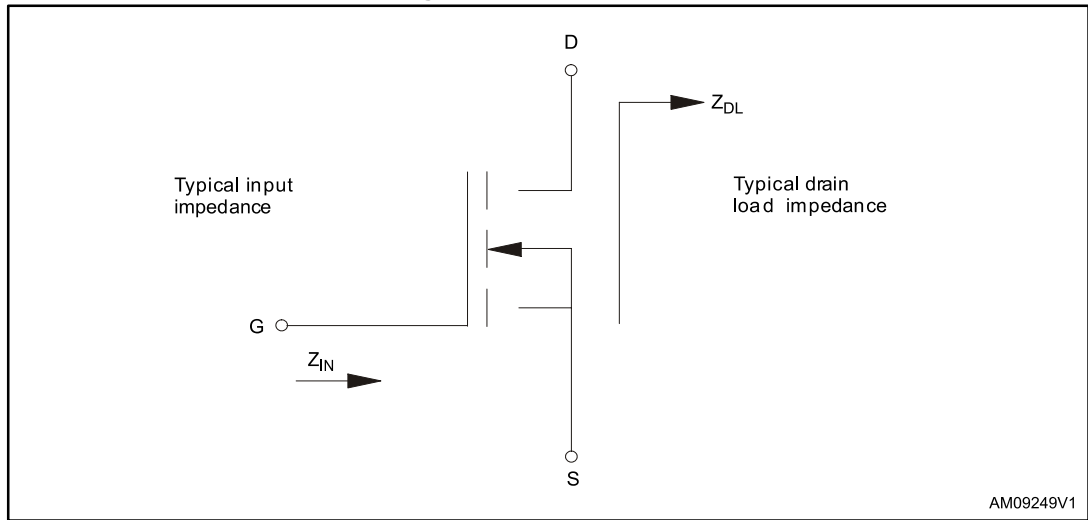
Table 6: Dynamic (frequency = 13.56 MHz Class-AB, I<sub>DQ</sub> = 25 mA)

| Symbol           | Test conditions                                   | Min. | Typ.                       | Max. | Unit |
|------------------|---|------|----------------------------|------|------|
| P <sub>OUT</sub> | V <sub>DD</sub> = 150 V, P <sub>IN</sub> = 1 W    | 500  | 580                        | -    | W    |
|                  | V <sub>DD</sub> = 250 V, P <sub>IN</sub> = 0.5 W  | 500  | 700                        | -    |      |
| Gain             | V <sub>DD</sub> = 150 V, P <sub>IN</sub> = 1 W    | 27   | 27.6                       | -    | dB   |
|                  | V <sub>DD</sub> = 250 V, P <sub>IN</sub> = 0.5 W  | 30   | 31                         | -    |      |
| Efficiency       | V <sub>DD</sub> = 150 V, P <sub>IN</sub> = 1 W    | 70   | 73                         | -    | %    |
|                  | V <sub>DD</sub> = 250 V, P <sub>IN</sub> = 0.5    | 70   | 75                         | -    | %    |
| Load mismatch    | V <sub>DD</sub> = 150 V, P <sub>OUT</sub> = 500 W |      | 6:1 <sup>(1)</sup><br>65:1 | -    | VSWR |
|                  | V <sub>DD</sub> = 250 V, P <sub>OUT</sub> = 500 W |      | 5:1<br>20:1 <sup>(1)</sup> | -    |      |

**Notes:**<sup>(1)</sup>Under pulse conditions: 1 ms - 10%.

### 3 Impedance data

Figure 2: Impedance data



AM09249V1

Table 7: Impedance values

| Frequency (MHz) | $Z_{in}$      | $Z_{dl}$ (150 V) | $Z_{dl}$ (180 V) | $Z_{dl}$ (250 V) |
|-----------------|---------------|------------------|------------------|------------------|
| 13.56           | $4.6 + j 3.2$ | $36 + j 18$      | $39 + j 22$      | $44 + j 56$      |

## 4 Typical performance

Figure 3: Capacitance vs. drain-source voltage

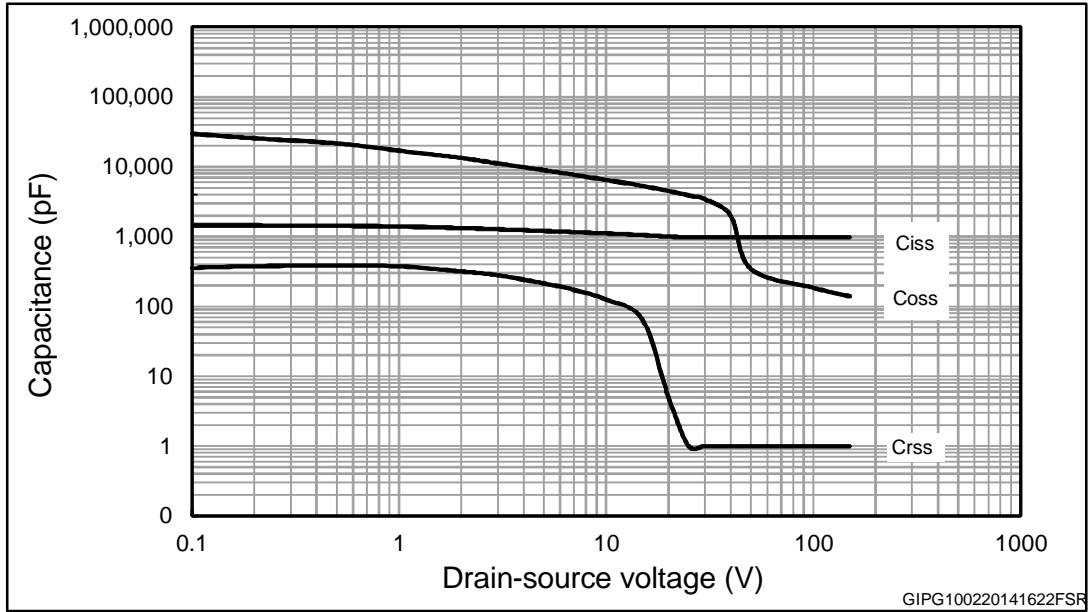


Figure 4: Gain and efficiency vs. output power @ 150 V (frequency = 13.56 MHz Class-C)

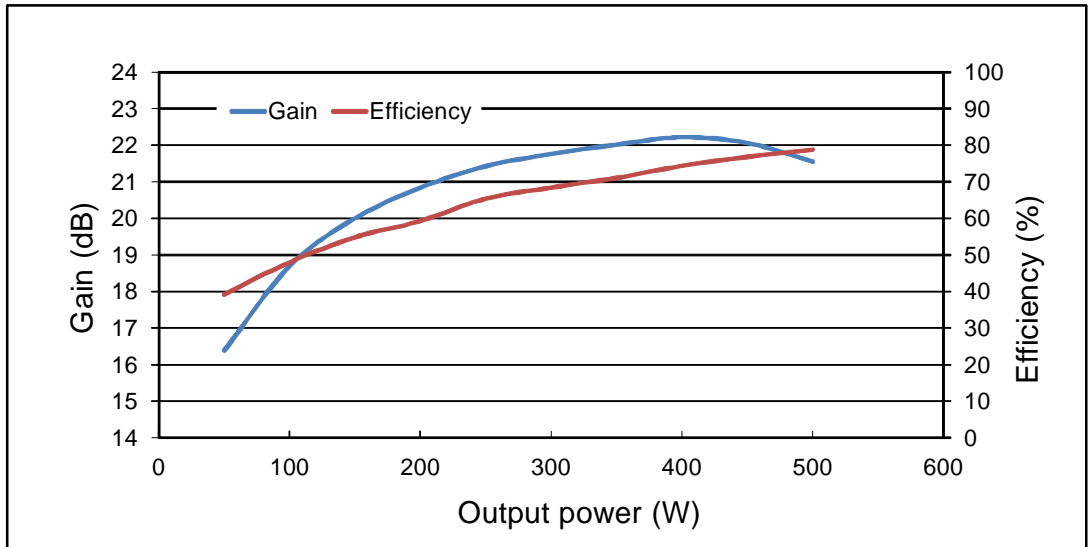
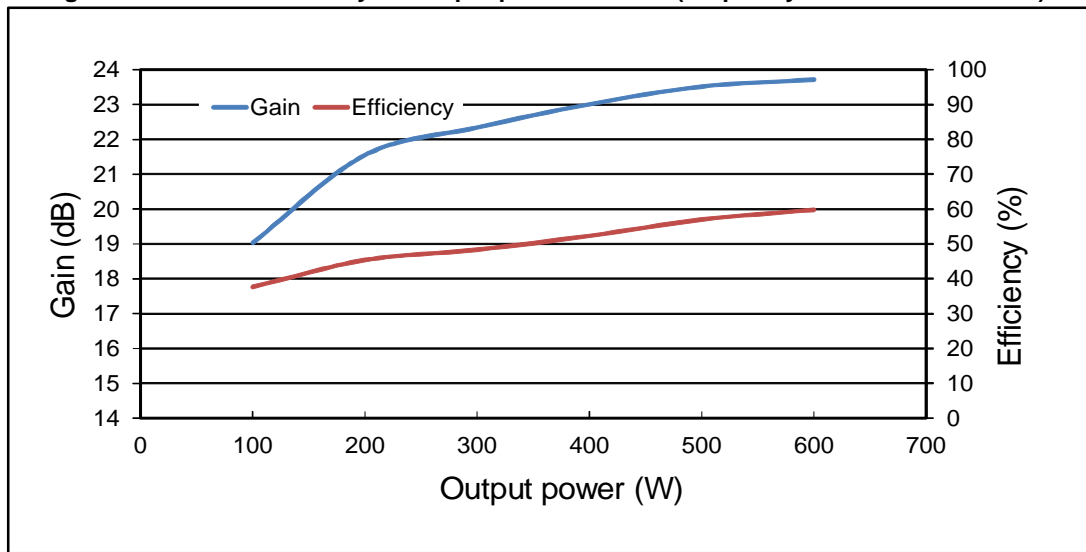


Figure 5: Gain and efficiency vs. output power @ 250 V (frequency = 13.56 MHz Class-C)





## 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 STAC177B package information

Figure 6: STAC177B package outline

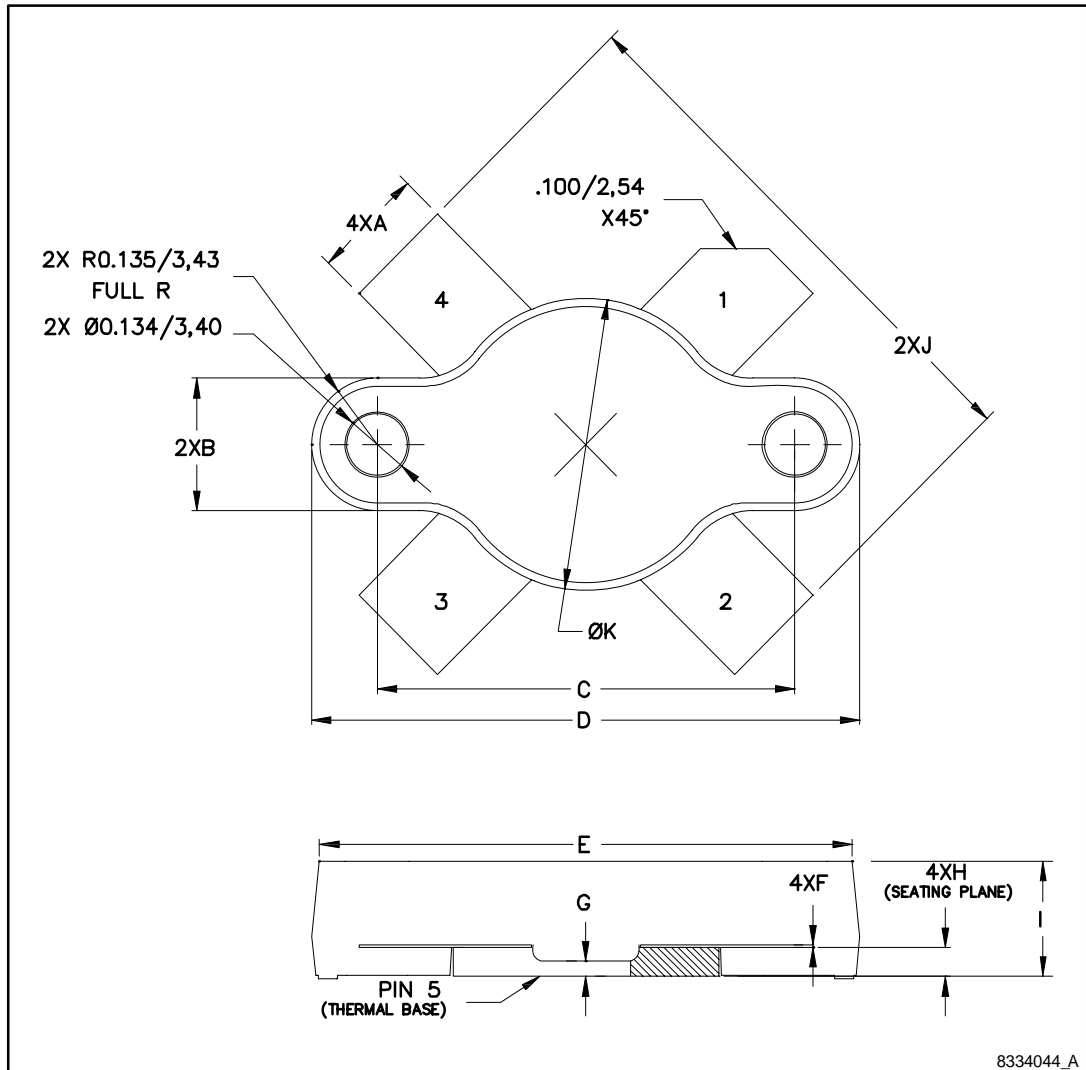


Table 8: STAC177B package mechanical data

| Dim. | mm    |       |       |
|------|-------|-------|-------|
|      | Min.  | Typ.  | Max.  |
| A    | 5.72  |       | 5.97  |
| B    | 6.73  |       | 6.99  |
| C    | 21.84 |       | 22.10 |
| D    | 28.70 |       | 28.96 |
| E    |       | 28.02 |       |
| F    | 0.10  |       | 0.15  |
| G    |       | 0.81  |       |
| H    | 1.45  |       | 1.70  |
| I    | 5.79  |       | 6.15  |
| J    | 27.43 |       | 28.45 |
| K    | 15.01 |       | 15.27 |

## 6 Marking, packing and shipping specifications

Table 9: Packing and shipping specifications

| Order code     | Packaging    | Pieces per tray | Dry pack humidity | Lot code  |
|----------------|--------------|-----------------|-------------------|-----------|
| STAC250V2-500E | Plastic tray | 25              | < 10%             | Not mixed |

Figure 7: Marking layout

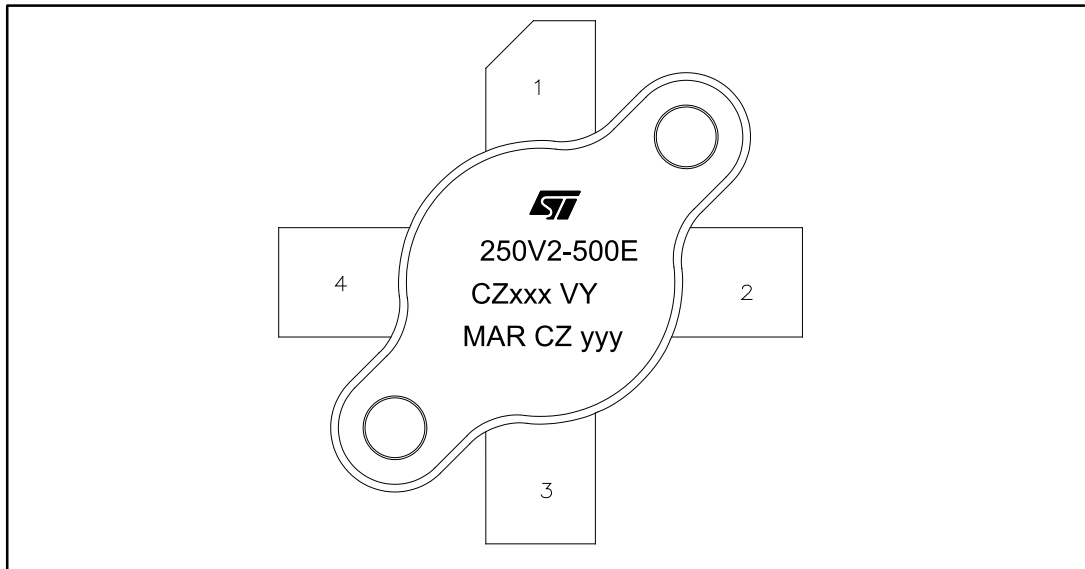


Table 10: Marking specifications

| Symbol | Description                    |
|--------|--------------------------------|
| CZ     | Assembly plant                 |
| xxx    | Last 3 digits of diffusion lot |
| VY     | Diffusion plant                |
| MAR    | Country of origin              |
| CZ     | Test and finishing plant       |
| y      | Assembly year                  |
| yy     | Assembly week                  |

## 7 Revision history

**Table 11: Document revision history**

| Date        | Revision | Changes   |
|-------------|----------|---|
| 14-Mar-2014 | 1        | Initial release.  |
| 04-Aug-2014 | 2        | Modified title in cover page.<br>Updated static table.<br>Minor text change   |
| 15-Sep-2014 | 3        | Document status promoted from preliminary to production data.   |
| 10-Nov-2014 | 4        | Updated title and features in cover page.   |
| 07-Oct-2015 | 5        | Updated features and description in cover page.<br>Updated electrical data section.<br>Updated the dynamic table, the table of impedance values and $V_{(BR)DSS}$ parameter in the static table.<br>Changed figures of the typical performance section.<br>Updated package information section. |

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