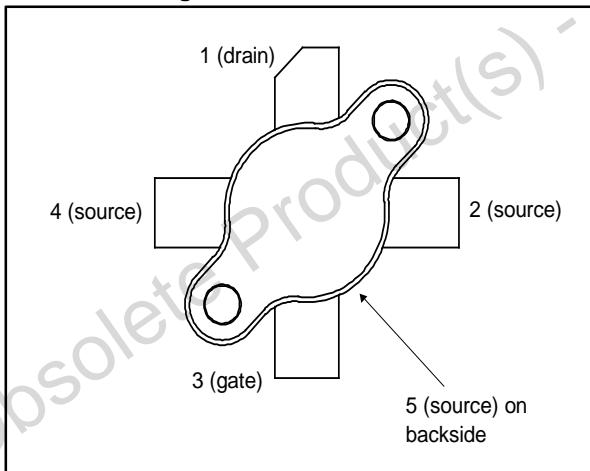


Figure 1: Pin connection



Features

- Operating frequency up to 27 MHz
- $P_{OUT} = 600\text{ W}$ typ. with 23 dB gain @ 13.56 MHz/250 V
- Designed for Class-AB, C, D and E operation
- $V_{(BR)DSS} > 1000\text{ V}$
- Housed in STAC® 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® 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 ⁽¹⁾ | STAC177B | Plastic tray |

Notes:

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

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Obsolete Product(s) - Obsolete Product(s)



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 | ± 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 | μA |
| I_{GSS} | $V_{GS} = 20\text{ V}; V_{DS} = 0\text{ V}$ | | | 1 | μA |
| 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 ⁽¹⁾ 65:1 | - | VSWR |
| | $V_{DD} = 250\text{ V}, P_{OUT} = 500\text{ W}$ | | 6:1 20:1 ⁽¹⁾ | - | |

Notes:

⁽¹⁾Under pulse conditions: 1 ms - 10%.

Table 6: Dynamic (frequency = 13.56 MHz Class-AB, I_{dq} = 25 mA)

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

Notes:⁽¹⁾Under pulse conditions: 1 ms - 10%.

3 Impedance data

Figure 2: Impedance data

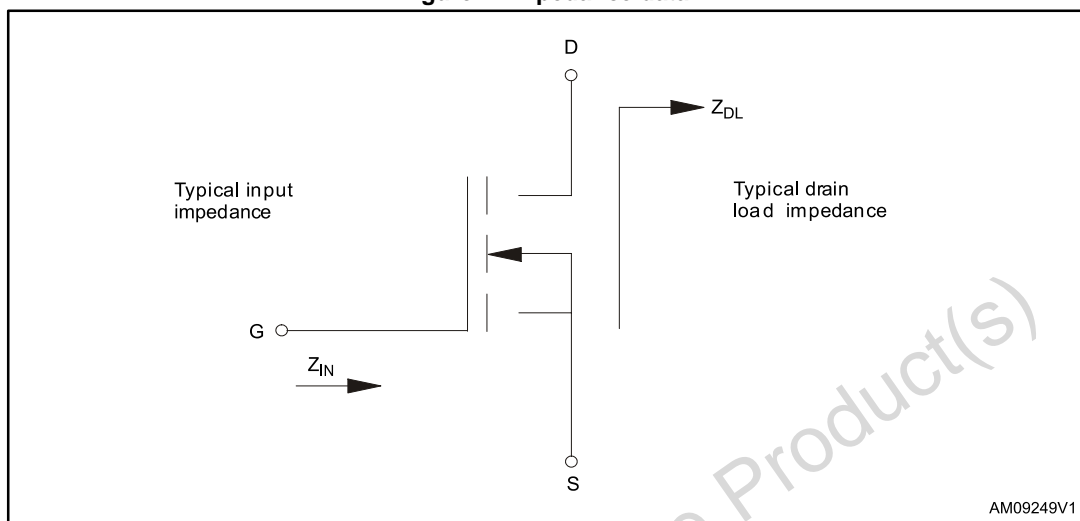


Table 7: Impedance values

| 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

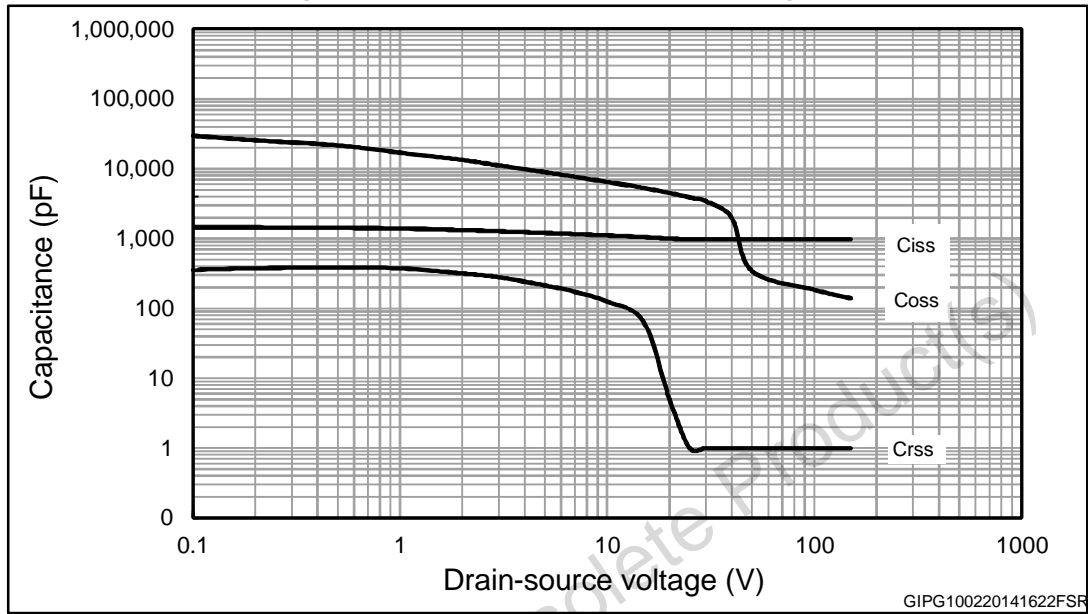


Figure 4: Gain vs. output power and supply voltage (frequency = 13.56 MHz Class-C)

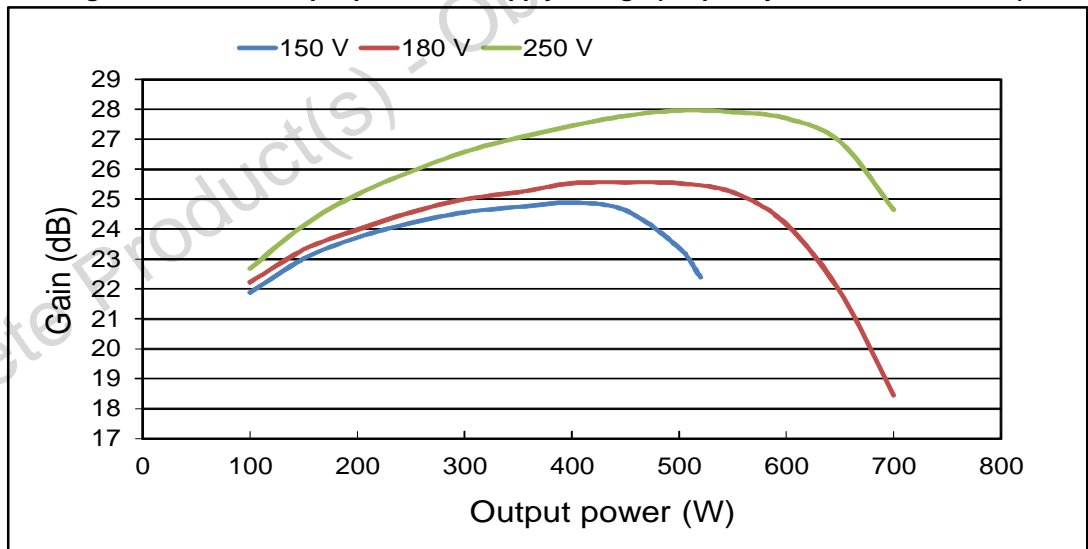


Figure 5: Efficiency vs. output power and supply voltage (frequency = 13.56 MHz Class-C)

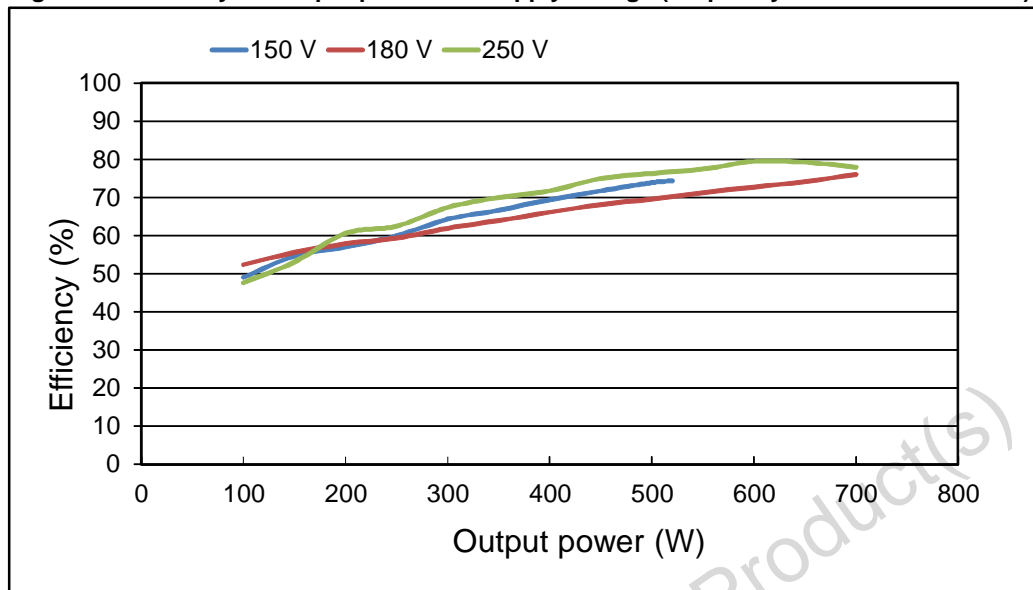


Figure 6: Gain vs. output power and supply voltage (frequency = 13.56 MHz Class-AB, Idq = 25 mA)

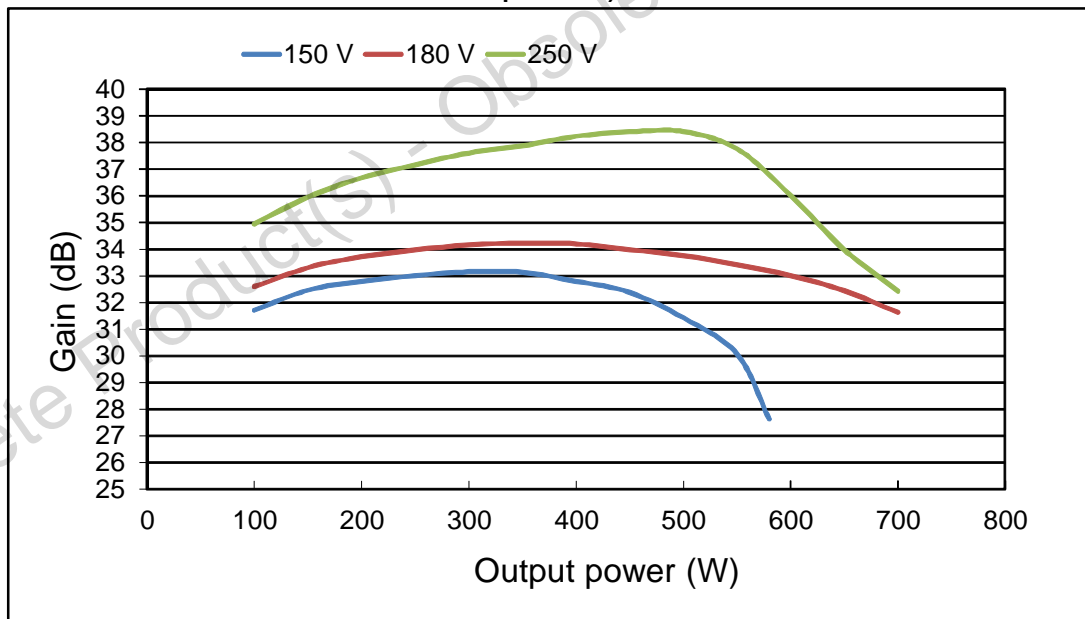
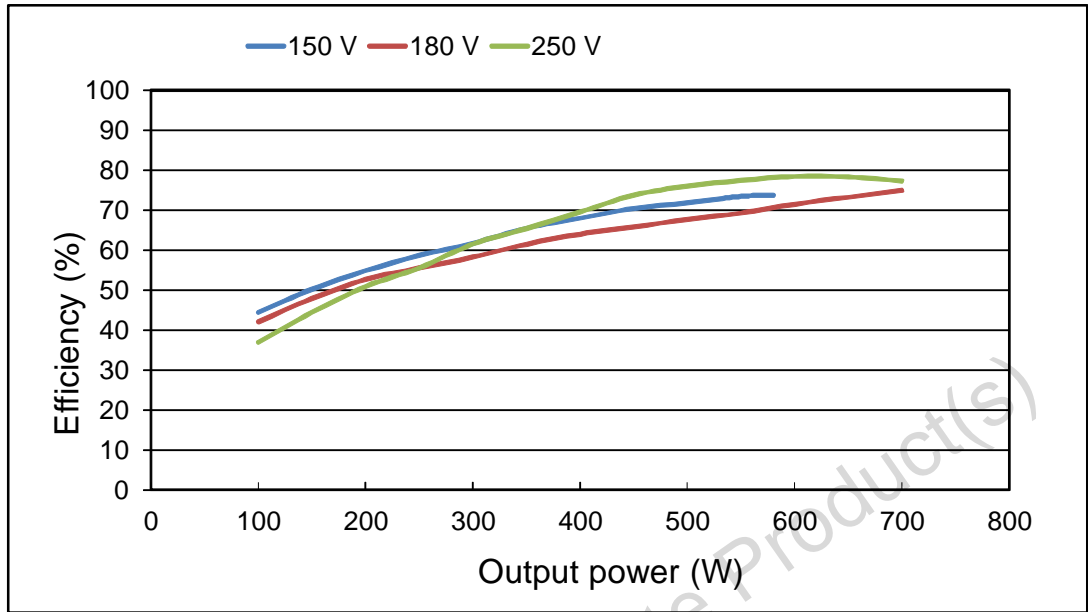


Figure 7: Efficiency vs. output power and supply voltage (frequency = 13.56 MHz Class-AB, Idq = 25 mA)



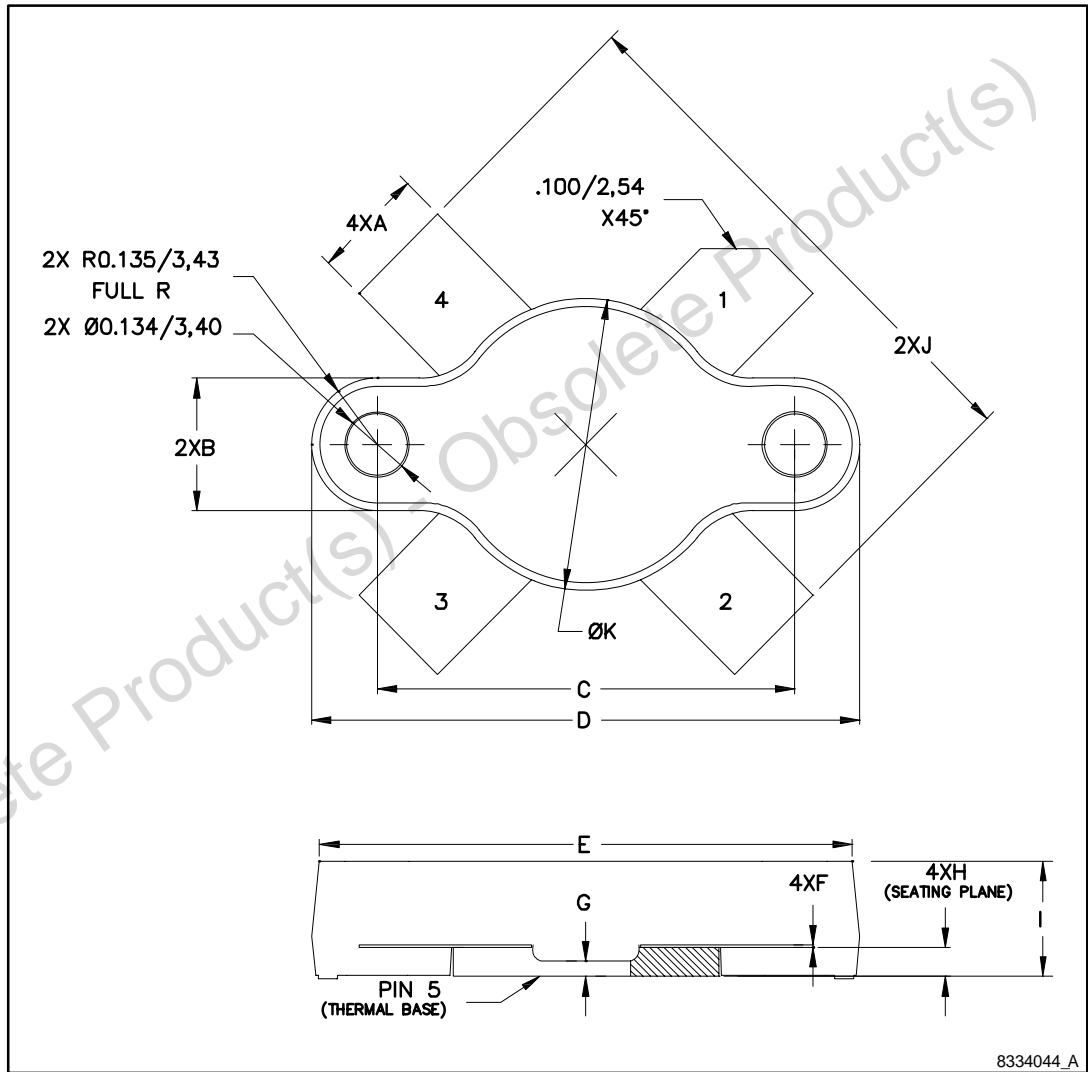
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5 Package information

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. ECOPACK is an ST trademark.

5.1 STAC177B package information

Figure 8: STAC177B package outline



8334044_A

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 9: Marking layout

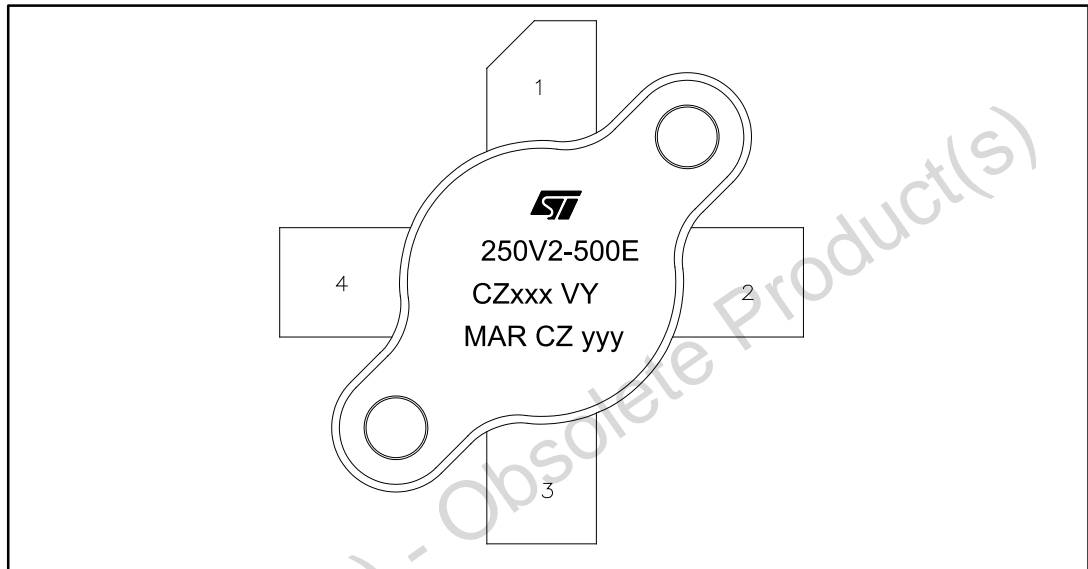


Table 10: Marking specifications

| 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. Updated static table. 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. Updated electrical data section. Updated the dynamic table, the table of impedance values and V(BR)DSS parameter in the static table. Changed figures of the typical performance section. Updated package information section. |
| 15-Oct-2015 | 6 | Changed <i>Figure 4: "Gain vs. output power and supply voltage (frequency = 13.56 MHz Class-C)"</i> and <i>Figure 5: "Efficiency vs. output power and supply voltage (frequency = 13.56 MHz Class-C)"</i> Added <i>Figure 6: "Gain vs. output power and supply voltage (frequency = 13.56 MHz Class-AB, Idq = 25 mA)"</i> and <i>Figure 7: "Efficiency vs. output power and supply voltage (frequency = 13.56 MHz Class-AB, Idq = 25 mA)"</i> . |

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