

# DATA SHEET

**LTE21025R**

**NPN microwave power transistor**

Product specification  
Supersedes data of June 1992

1997 Feb 21

NPN microwave power transistor

LTE21025R

FEATURES

- Diffused emitter ballasting resistors provide excellent current sharing and withstanding a high VSWR
- Self-aligned process entirely ion implanted
- Gold metallization realizes very stable characteristics and excellent lifetime
- Input matching cell improves input impedance and allows an easier design of wideband circuits.

APPLICATIONS

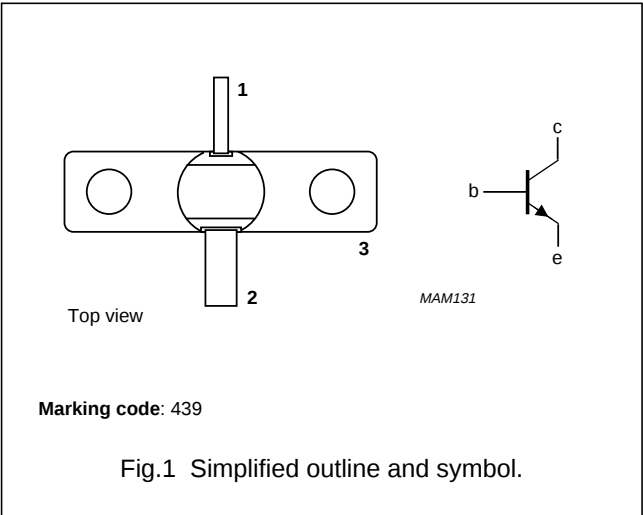
- Common emitter class-A linear power amplifiers up to 4.2 GHz.

DESCRIPTION

NPN silicon planar epitaxial microwave power transistor in a SOT440A metal ceramic flange package with the emitter connected to the flange.

PINNING - SOT440A

| PIN | DESCRIPTION                 |
|-----|-----------------------------|
| 1   | collector                   |
| 2   | base                        |
| 3   | emitter connected to flange |



QUICK REFERENCE DATA

RF performance up to  $T_{mb} = 25\text{ }^{\circ}\text{C}$  in a common emitter class-A test circuit.

| MODE OF OPERATION | f<br>(GHz) | V <sub>CE</sub><br>(V) | I <sub>C</sub><br>(mA) | P <sub>L1</sub><br>(W) | G <sub>po</sub><br>(dB) |
|-------------------|------------|------------------------|------------------------|------------------------|-------------------------|
| Class-A (CW)      | 2.1        | 16                     | 400                    | typ. 2.8               | typ. 7.8                |

| WARNING                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product and environmental safety - toxic materials                                                                                                                                                                                                                                                                                                                                                                                 |
| This product contains beryllium oxide. The product is entirely safe provided that the BeO slab is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste. |

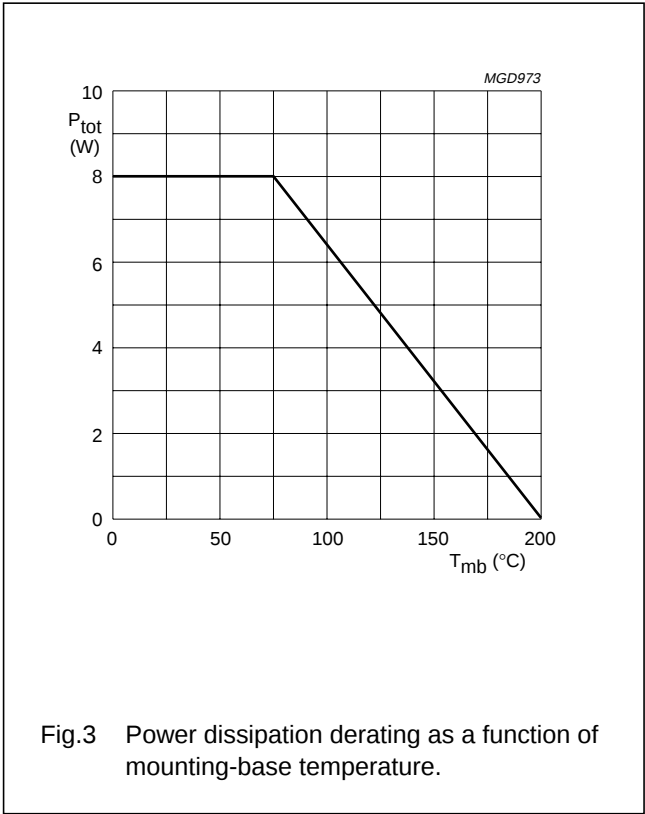
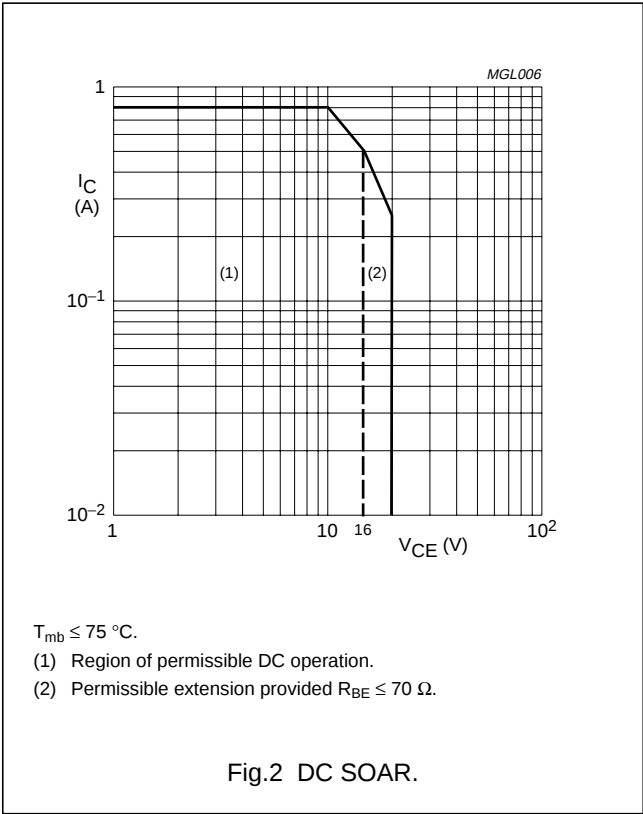
NPN microwave power transistor

LTE21025R

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL           | PARAMETER                      | CONDITIONS                          | MIN. | MAX. | UNIT |
|------------------|--------------------------------|-------------------------------------|------|------|------|
| V <sub>CBO</sub> | collector-base voltage         | open emitter                        | –    | 40   | V    |
| V <sub>CER</sub> | collector-emitter voltage      | R <sub>BE</sub> = 70 Ω              | –    | 20   | V    |
| V <sub>CEO</sub> | collector-emitter voltage      | open base                           | –    | 16   | V    |
| V <sub>EBO</sub> | emitter-base voltage           | open collector                      | –    | 3    | V    |
| I <sub>C</sub>   | collector current (DC)         |                                     | –    | 800  | mA   |
| P <sub>tot</sub> | total power dissipation        | T <sub>mb</sub> ≤ 75 °C             | –    | 8    | W    |
| T <sub>stg</sub> | storage temperature            |                                     | –65  | +200 | °C   |
| T <sub>j</sub>   | operating junction temperature |                                     | –    | 200  | °C   |
| T <sub>sld</sub> | soldering temperature          | at 0.3 mm from ceramic;<br>t ≤ 10 s | –    | 235  | °C   |



## NPN microwave power transistor

LTE21025R

## THERMAL CHARACTERISTICS

| SYMBOL         | PARAMETER                                         | CONDITIONS                          | MAX. | UNIT |
|----------------|---------------------------------------------------|-------------------------------------|------|------|
| $R_{th\ j-mb}$ | thermal resistance from junction to mounting-base | $T_j = 75\ ^\circ\text{C}$          | 10   | K/W  |
| $R_{th\ mb-h}$ | thermal resistance from mounting-base to heatsink | $T_j = 75\ ^\circ\text{C}$ ; note 1 | 0.7  | K/W  |

## Note

1. See "Mounting recommendations in the General part of handbook SC19a".

## CHARACTERISTICS

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

| SYMBOL    | PARAMETER                     | CONDITIONS                                                                             | MIN. | TYP. | MAX. | UNIT          |
|-----------|-------------------------------|----------------------------------------------------------------------------------------|------|------|------|---------------|
| $I_{CBO}$ | collector cut-off current     | $V_{CB} = 20\ \text{V}; I_E = 0$                                                       | –    | –    | 225  | $\mu\text{A}$ |
|           |                               | $V_{CB} = 40\ \text{V}; I_E = 0$                                                       | –    | –    | 1.5  | mA            |
| $I_{EBO}$ | emitter cut-off current       | $V_{EB} = 1.5\ \text{V}; I_C = 0$                                                      | –    | –    | 0.6  | $\mu\text{A}$ |
| $h_{FE}$  | DC current gain               | $V_{CE} = 5\ \text{V}; I_C = 400\ \text{mA}$                                           | 15   | –    | 150  |               |
| $C_{cb}$  | collector-base capacitance    | $V_{CB} = 16\ \text{V}; V_{EB} = 1.5\ \text{V};$<br>$I_E = I_C = 0; f = 1\ \text{MHz}$ | –    | 3    | –    | pF            |
| $C_{ce}$  | collector-emitter capacitance | $V_{CE} = 16\ \text{V}; V_{EB} = 1.5\ \text{V};$<br>$I_E = I_C = 0; f = 1\ \text{MHz}$ | –    | 1.5  | –    | pF            |
| $C_{eb}$  | emitter-base capacitance      | $V_{CB} = 10\ \text{V}; V_{EB} = 1\ \text{V};$<br>$I_C = I_E = 0; f = 1\ \text{MHz}$   | –    | 28   | –    | pF            |

## NPN microwave power transistor

## LTE21025R

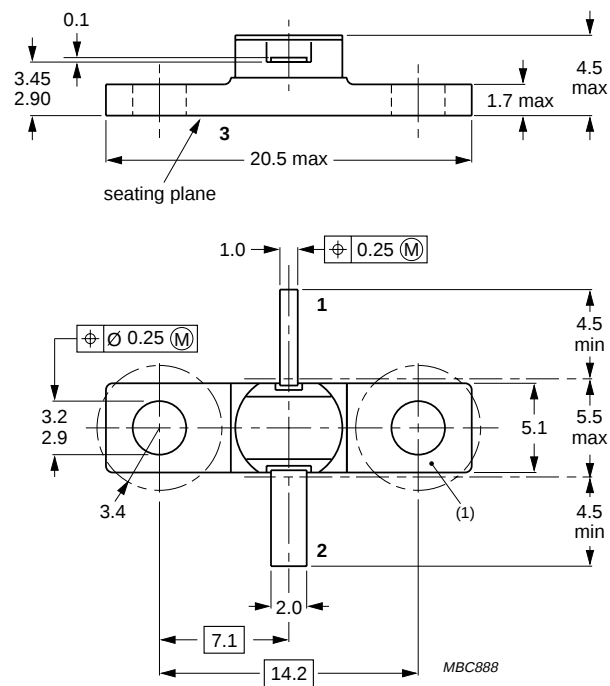
**Table 1** Scattering parameters:  $V_{CE} = 16\text{ V}$ ;  $I_C = 400\text{ mA}$  ( $V_{CE}$  and  $I_C$  regulated);  $T_{mb} = 25\text{ °C}$ ;  $Z_0 = 50\text{ }\Omega$ ; typical values. (The figures given between brackets are values in dB).

| f<br>(MHz) | S <sub>11</sub>      |                | S <sub>21</sub>      |                | S <sub>12</sub>      |                | S <sub>22</sub>      |                |
|------------|----------------------|----------------|----------------------|----------------|----------------------|----------------|----------------------|----------------|
|            | MAGNITUDE<br>(ratio) | ANGLE<br>(deg) | MAGNITUDE<br>(ratio) | ANGLE<br>(deg) | MAGNITUDE<br>(ratio) | ANGLE<br>(deg) | MAGNITUDE<br>(ratio) | ANGLE<br>(deg) |
| 500        | 0.94                 | 176            | 0.017 (–35.4)        | 43             | 2.79 (8.9)           | 81             | 0.49                 | –173           |
| 600        | 0.94                 | 174            | 0.018 (–34.7)        | 46             | 2.39 (7.6)           | 77             | 0.54                 | –173           |
| 700        | 0.94                 | 173            | 0.019 (–34.4)        | 47             | 2.07 (6.3)           | 72             | 0.52                 | –176           |
| 800        | 0.93                 | 172            | 0.020 (–34.1)        | 49             | 1.85 (5.3)           | 68             | 0.52                 | –177           |
| 900        | 0.93                 | 170            | 0.021 (–33.8)        | 49             | 1.66 (4.4)           | 64             | 0.53                 | –179           |
| 1000       | 0.93                 | 168            | 0.022 (–33.3)        | 50             | 1.50 (3.5)           | 60             | 0.53                 | 179            |
| 1100       | 0.92                 | 167            | 0.023 (–32.6)        | 50             | 1.39 (2.9)           | 57             | 0.53                 | 179            |
| 1200       | 0.93                 | 166            | 0.026 (–31.6)        | 50             | 1.31 (2.4)           | 53             | 0.54                 | 177            |
| 1300       | 0.93                 | 164            | 0.029 (–30.6)        | 49             | 1.23 (1.8)           | 49             | 0.54                 | 176            |
| 1400       | 0.93                 | 167            | 0.032 (–29.9)        | 54             | 1.16 (1.3)           | 48             | 0.55                 | 179            |
| 1500       | 0.93                 | 163            | 0.037 (–28.7)        | 54             | 1.11 (0.9)           | 43             | 0.54                 | 176            |
| 1600       | 0.93                 | 162            | 0.040 (–27.9)        | 53             | 1.07 (0.6)           | 39             | 0.55                 | 175            |
| 1700       | 0.93                 | 161            | 0.042 (–27.5)        | 51             | 1.03 (0.3)           | 35             | 0.55                 | 176            |
| 1800       | 0.92                 | 159            | 0.043 (–27.3)        | 49             | 0.99 (–0.1)          | 30             | 0.56                 | 174            |
| 2000       | 0.88                 | 151            | 0.046 (–26.7)        | 46             | 0.99 (–0.1)          | 22             | 0.56                 | 170            |
| 2200       | 0.89                 | 148            | 0.052 (–25.7)        | 43             | 0.92 (–0.7)          | 14             | 0.57                 | 168            |
| 2400       | 0.90                 | 147            | 0.059 (–24.6)        | 41             | 0.88 (–1.1)          | 9              | 0.58                 | 168            |
| 2600       | 0.90                 | 147            | 0.069 (–23.2)        | 38             | 0.90 (–0.9)          | 1              | 0.59                 | 168            |
| 2800       | 0.87                 | 142            | 0.073 (–22.8)        | 32             | 0.88 (–1.1)          | –8             | 0.60                 | 169            |
| 3000       | 0.83                 | 134            | 0.075 (–22.5)        | 26             | 0.90 (–0.9)          | –18            | 0.61                 | 168            |
| 3200       | 0.82                 | 129            | 0.077 (–22.2)        | 21             | 0.87 (–1.2)          | –27            | 0.63                 | 166            |
| 3400       | 0.83                 | 130            | 0.085 (–21.4)        | 18             | 0.90 (–1.0)          | –37            | 0.65                 | 165            |
| 3600       | 0.80                 | 130            | 0.091 (–20.8)        | 11             | 0.91 (–0.8)          | –50            | 0.69                 | 165            |
| 3800       | 0.73                 | 127            | 0.091 (–20.8)        | 3              | 0.94 (–0.5)          | –64            | 0.74                 | 164            |
| 4000       | 0.69                 | 122            | 0.087 (–21.2)        | –7             | 0.95 (–0.5)          | –82            | 0.79                 | 162            |
| 4200       | 0.67                 | 122            | 0.078 (–22.2)        | –15            | 0.89 (–1.0)          | –100           | 0.84                 | 157            |
| 4400       | 0.69                 | 126            | 0.071 (–23.0)        | –19            | 0.83 (–1.7)          | –121           | 0.89                 | 150            |
| 4600       | 0.72                 | 130            | 0.059 (–24.6)        | –18            | 0.70 (–3.1)          | –141           | 0.92                 | 143            |
| 4800       | 0.76                 | 128            | 0.054 (–25.4)        | –11            | 0.60 (–4.4)          | –160           | 0.94                 | 136            |

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LTE21025R

## PACKAGE OUTLINE



Dimensions in mm.  
Torque on screw: max. 0.4 Nm  
Recommended screw: M2.5

(1) Flatness of this area ensures full thermal contact with bolt head.

Fig.4 SOT440A.

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LTE21025R

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**DEFINITIONS**

| <b>Data Sheet Status</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Objective specification                                                                                                                                                                                                                                                                                                                                                                                                                                   | This data sheet contains target or goal specifications for product development.       |
| Preliminary specification                                                                                                                                                                                                                                                                                                                                                                                                                                 | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification                                                                                                                                                                                                                                                                                                                                                                                                                                     | This data sheet contains final product specifications.                                |
| <b>Limiting values</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                       |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. |                                                                                       |
| <b>Application information</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                       |
| Where application information is given, it is advisory and does not form part of the specification.                                                                                                                                                                                                                                                                                                                                                       |                                                                                       |

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**Argentina:** see South America

**Australia:** 34 Waterloo Road, NORTH RYDE, NSW 2113,  
Tel. +61 2 9805 4455, Fax. +61 2 9805 4466

**Austria:** Computerstr. 6, A-1101 WIEN, P.O. Box 213,  
Tel. +43 1 60 101, Fax. +43 1 60 101 1210

**Belarus:** Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,  
220050 MINSK, Tel. +375 172 200 733, Fax. +375 172 200 773

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Tel. +359 2 689 211, Fax. +359 2 689 102

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72 Tat Chee Avenue, Kowloon Tong, HONG KONG,  
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**Colombia:** see South America

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**Denmark:** Prags Boulevard 80, PB 1919, DK-2300 COPENHAGEN S,  
Tel. +45 32 88 2636, Fax. +45 31 57 1949

**Finland:** Sinikalliontie 3, FIN-02630 ESPOO,  
Tel. +358 9 615800, Fax. +358 9 61580/xxx

**France:** 4 Rue du Port-aux-Vins, BP317, 92156 SURESNES Cedex,  
Tel. +33 1 40 99 6161, Fax. +33 1 40 99 6427

**Germany:** Hammerbrookstraße 69, D-20097 HAMBURG,  
Tel. +49 40 23 53 60, Fax. +49 40 23 536 300

**Greece:** No. 15, 25th March Street, GR 17778 TAVROS/ATHENS,  
Tel. +30 1 4894 339/239, Fax. +30 1 4814 240

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**India:** Philips INDIA Ltd, Shivsagar Estate, A Block, Dr. Annie Besant Rd.  
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**Indonesia:** see Singapore

**Ireland:** Newstead, Clonskeagh, DUBLIN 14,  
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**Israel:** RAPAC Electronics, 7 Kehilat Saloniki St, TEL AVIV 61180,  
Tel. +972 3 645 0444, Fax. +972 3 649 1007

**Italy:** PHILIPS SEMICONDUCTORS, Piazza IV Novembre 3,  
20124 MILANO, Tel. +39 2 6752 2531, Fax. +39 2 6752 2557

**Japan:** Philips Bldg 13-37, Kohnan 2-chome, Minato-ku, TOKYO 108,  
Tel. +81 3 3740 5130, Fax. +81 3 3740 5077

**Korea:** Philips House, 260-199 Itaewon-dong, Yongsan-ku, SEOUL,  
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**New Zealand:** 2 Wagener Place, C.P.O. Box 1041, AUCKLAND,  
Tel. +64 9 849 4160, Fax. +64 9 849 7811

**Norway:** Box 1, Manglerud 0612, OSLO,  
Tel. +47 22 74 8000, Fax. +47 22 74 8341

**Philippines:** Philips Semiconductors Philippines Inc.,  
106 Valero St. Salcedo Village, P.O. Box 2108 MCC, MAKATI,  
Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

**Poland:** Ul. Lukiska 10, PL 04-123 WARSZAWA,  
Tel. +48 22 612 2831, Fax. +48 22 612 2327

**Portugal:** see Spain

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Tel. +27 11 470 5911, Fax. +27 11 470 5494

**South America:** Rua do Rocio 220, 5th floor, Suite 51,  
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Tel. +55 11 821 2333, Fax. +55 11 829 1849

**Spain:** Balmes 22, 08007 BARCELONA,  
Tel. +34 3 301 6312, Fax. +34 3 301 4107

**Sweden:** Kottbygatan 7, Akalla, S-16485 STOCKHOLM,  
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**Switzerland:** Allmendstrasse 140, CH-8027 ZÜRICH,  
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**Taiwan:** Philips Semiconductors, 6F, No. 96, Chien Kuo N. Rd., Sec. 1,  
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**Turkey:** Talatpasa Cad. No. 5, 80640 GÜLTEPE/ISTANBUL,  
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**Ukraine:** PHILIPS UKRAINE, 4 Patrice Lumumba str., Building B, Floor 7,  
252042 KIEV, Tel. +380 44 264 2776, Fax. +380 44 268 0461

**United Kingdom:** Philips Semiconductors Ltd., 276 Bath Road, Hayes,  
MIDDLESEX UB3 5BX, Tel. +44 181 730 5000, Fax. +44 181 754 8421

**United States:** 811 East Arques Avenue, SUNNYVALE, CA 94088-3409,  
Tel. +1 800 234 7381

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Tel. +381 11 625 344, Fax. +381 11 635 777

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