

## Fast Switching Emitter Controlled Diode

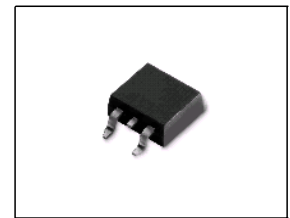


### Feature

- 600V Emitter Controlled technology
- Fast recovery
- Soft switching
- Low reverse recovery charge
- Low forward voltage
- 175°C operating temperature
- Easy paralleling
- Qualified according to JEDEC<sup>0)</sup> for target applications

### Product Summary

|            |     |    |
|------------|-----|----|
| $V_{RRM}$  | 600 | V  |
| $I_F$      | 15  | A  |
| $V_F$      | 1.5 | V  |
| $T_{jmax}$ | 175 | °C |



PG-TO263-3

| Type     | Package    | Ordering Code | Marking | Pin 1 | PIN 2 | PIN 3 |
|----------|------------|---------------|---------|-------|-------|-------|
| IDB15E60 | PG-TO263-3 | -             | D15E60  | NC    | C     | A     |

### Maximum Ratings, at $T_j = 25\text{ °C}$ , unless otherwise specified

| Parameter                                                                                             | Symbol    | Value        | Unit |
|-------------------------------------------------------------------------------------------------------|-----------|--------------|------|
| Repetitive peak reverse voltage                                                                       | $V_{RRM}$ | 600          | V    |
| Continuous forward current<br>$T_C = 25\text{ °C}$<br>$T_C = 90\text{ °C}$                            | $I_F$     | 29.2<br>19.6 | A    |
| Surge non repetitive forward current<br>$T_C = 25\text{ °C}$ , $t_p = 10\text{ ms}$ , sine halfwave   | $I_{FSM}$ | 60           | A    |
| Maximum repetitive forward current<br>$T_C = 25\text{ °C}$ , $t_p$ limited by $t_{j,max}$ , $D = 0.5$ | $I_{FRM}$ | 45           | A    |
| Power dissipation<br>$T_C = 25\text{ °C}$<br>$T_C = 90\text{ °C}$                                     | $P_{tot}$ | 83.3<br>47.2 | W    |
| Operating junction temperature                                                                        | $T_j$     | -40...+175   | °C   |
| Storage temperature                                                                                   | $T_{stg}$ | -55...+150   |      |
| Soldering temperature<br>1.6mm (0.063 in.) from case for 10 s                                         | $T_S$     | 260          |      |

## Thermal Characteristics

| Parameter                                      | Symbol     | Values |      |      | Unit |
|------------------------------------------------|------------|--------|------|------|------|
|                                                |            | min.   | typ. | max. |      |
| Characteristics                                |            |        |      |      |      |
| Thermal resistance, junction - case            | $R_{thJC}$ | -      | -    | 1.8  | K/W  |
| Thermal resistance, junction - ambient, leaded | $R_{thJA}$ | -      | -    | 62   |      |
| SMD version, device on PCB:                    | $R_{thJA}$ |        |      |      |      |
| @ min. footprint                               |            | -      | -    | 62   |      |
| @ 6 cm <sup>2</sup> cooling area <sup>1)</sup> |            | -      | 35   | -    |      |

## Electrical Characteristics, at $T_j = 25^\circ\text{C}$ , unless otherwise specified

| Parameter                                     | Symbol | Values |      |      | Unit          |
|-----------------------------------------------|--------|--------|------|------|---------------|
|                                               |        | min.   | typ. | max. |               |
| Static Characteristics                        |        |        |      |      |               |
| Reverse leakage current                       | $I_R$  |        |      |      | $\mu\text{A}$ |
| $V_R=600\text{V}$ , $T_j=25^{\circ}\text{C}$  |        | -      | -    | 50   |               |
| $V_R=600\text{V}$ , $T_j=150^{\circ}\text{C}$ |        | -      | -    | 1250 |               |
| Forward voltage drop                          | $V_F$  |        |      |      | V             |
| $I_F=15\text{A}$ , $T_j=25^{\circ}\text{C}$   |        | -      | 1.5  | 2    |               |
| $I_F=15\text{A}$ , $T_j=150^{\circ}\text{C}$  |        | -      | 1.5  | -    |               |

<sup>0</sup>J-STD20 and JESD22

<sup>1</sup>Device on 40mm\*40mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical without blown air.

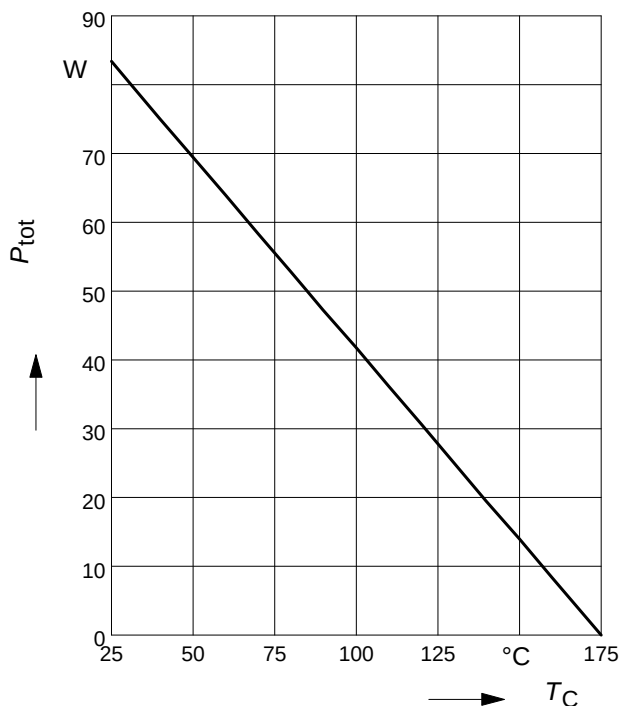
**Electrical Characteristics**, at  $T_j = 25^\circ\text{C}$ , unless otherwise specified

| Parameter                                                                                                                                                                                                                                            | Symbol    | Values      |                      |             | Unit |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------|----------------------|-------------|------|
|                                                                                                                                                                                                                                                      |           | min.        | typ.                 | max.        |      |
| Dynamic Characteristics                                                                                                                                                                                                                              |           |             |                      |             |      |
| Reverse recovery time<br>$V_R=400V$ , $I_F=15A$ , $di_F/dt=1000A/\mu s$ , $T_j=25^{\circ}C$<br>$V_R=400V$ , $I_F=15A$ , $di_F/dt=1000A/\mu s$ , $T_j=125^{\circ}C$<br>$V_R=400V$ , $I_F=15A$ , $di_F/dt=1000A/\mu s$ , $T_j=150^{\circ}C$            | $t_{rr}$  | -<br>-<br>- | 87<br>124<br>131     | -<br>-<br>- | ns   |
| Peak reverse current<br>$V_R=400V$ , $I_F=15A$ , $di_F/dt=1000A/\mu s$ , $T_j=25^{\circ}C$<br>$V_R=400V$ , $I_F=15A$ , $di_F/dt=1000A/\mu s$ , $T_j=125^{\circ}C$<br>$V_R=400V$ , $I_F=15A$ , $di_F/dt=1000A/\mu s$ , $T_j=150^{\circ}C$             | $I_{rrm}$ | -<br>-<br>- | 13.7<br>16.4<br>19.3 | -<br>-<br>- | A    |
| Reverse recovery charge<br>$V_R=400V$ , $I_F=15A$ , $di_F/dt=1000A/\mu s$ , $T_j=25^{\circ}C$<br>$V_R=400V$ , $I_F=15A$ , $di_F/dt=1000A/\mu s$ , $T_j=125^{\circ}C$<br>$V_R=400V$ , $I_F=15A$ , $di_F/dt=1000A/\mu s$ , $T_j=150^{\circ}C$          | $Q_{rr}$  | -<br>-<br>- | 595<br>995<br>1104   | -<br>-<br>- | nC   |
| Reverse recovery softness factor<br>$V_R=400V$ , $I_F=15A$ , $di_F/dt=1000A/\mu s$ , $T_j=25^{\circ}C$<br>$V_R=400V$ , $I_F=15A$ , $di_F/dt=1000A/\mu s$ , $T_j=125^{\circ}C$<br>$V_R=400V$ , $I_F=15A$ , $di_F/dt=1000A/\mu s$ , $T_j=150^{\circ}C$ | S         | -<br>-<br>- | 3.6<br>4.3<br>4.5    | -<br>-<br>- |      |

### 1 Power dissipation

$$P_{\text{tot}} = f(T_C)$$

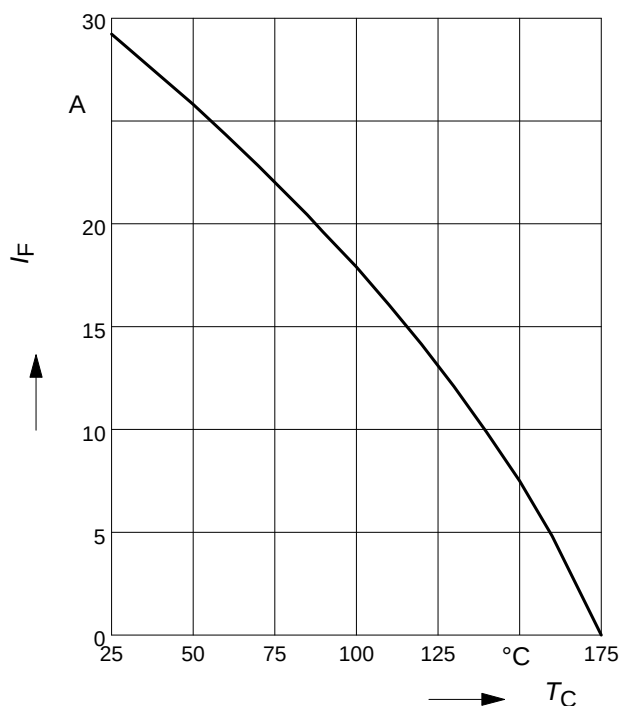
parameter:  $T_j \leq 175^\circ\text{C}$



### 2 Diode forward current

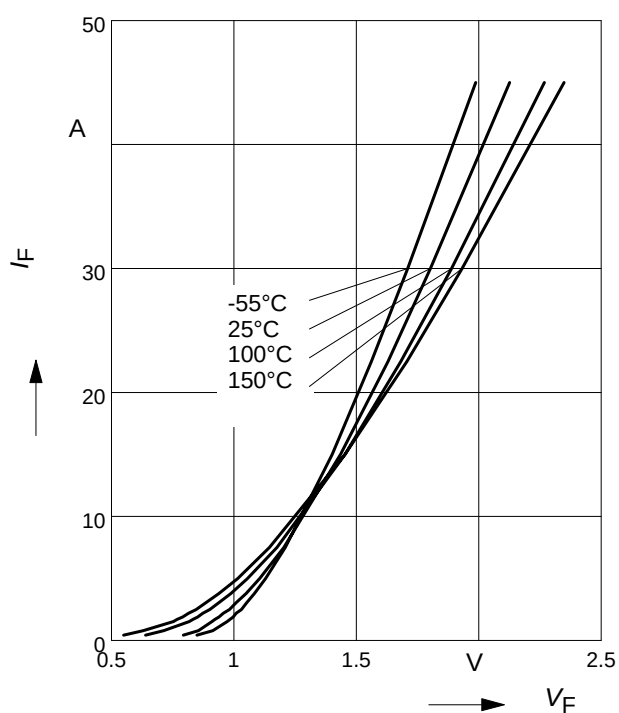
$$I_F = f(T_C)$$

parameter:  $T_j \leq 175^\circ\text{C}$



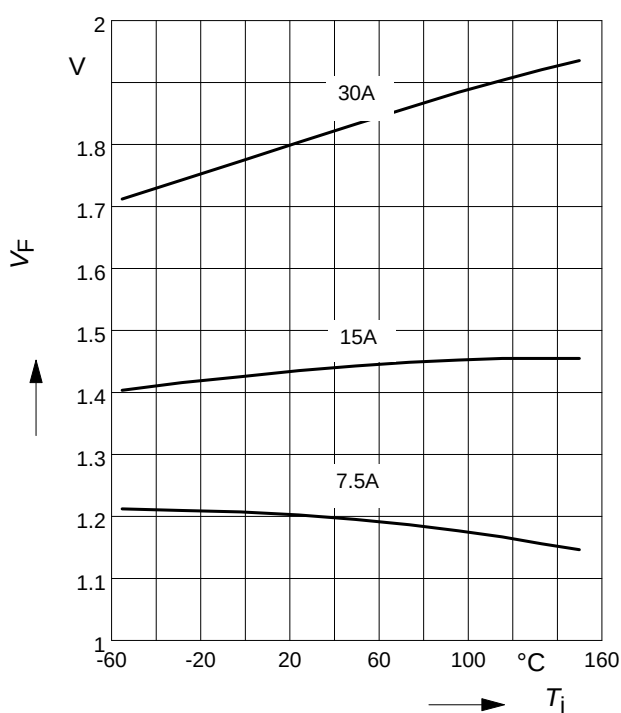
### 3 Typ. diode forward current

$$I_F = f(V_F)$$



### 4 Typ. diode forward voltage

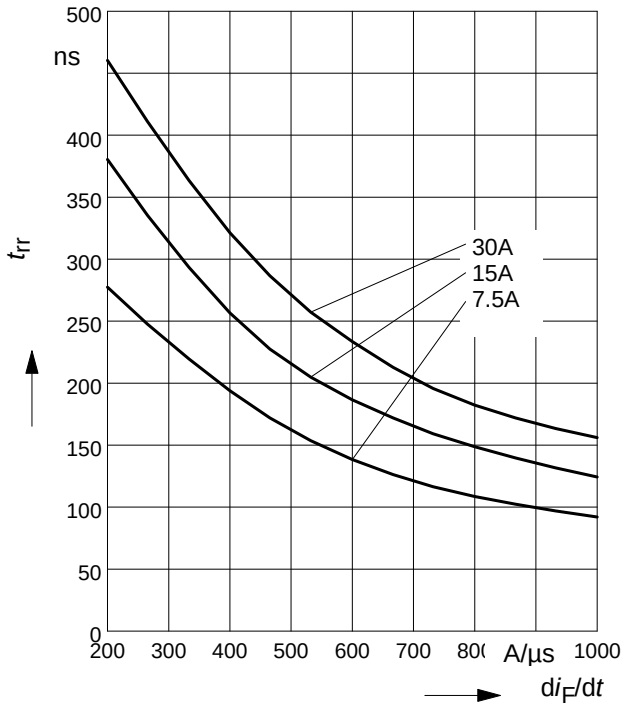
$$V_F = f(T_j)$$



## 5 Typ. reverse recovery time

$$t_{rr} = f(dI_F/dt)$$

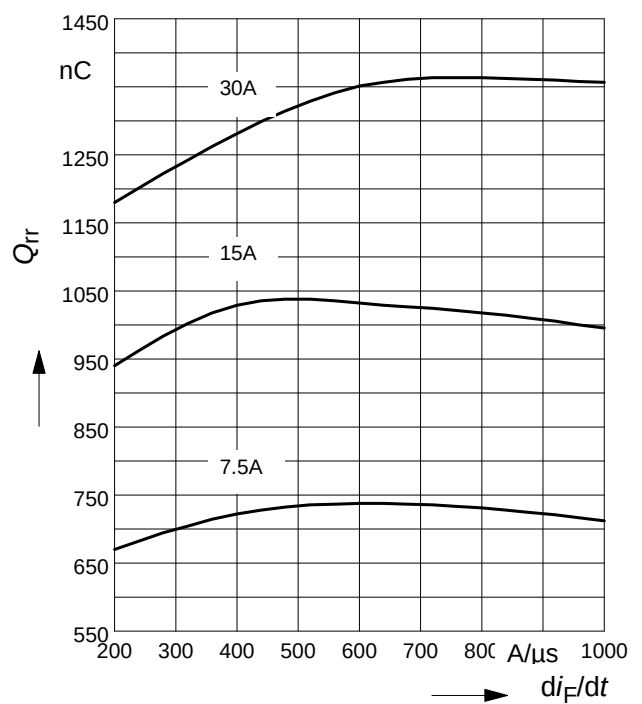
parameter:  $V_R = 400V$ ,  $T_j = 125^\circ C$



## 6 Typ. reverse recovery charge

$$Q_{rr} = f(dI_F/dt)$$

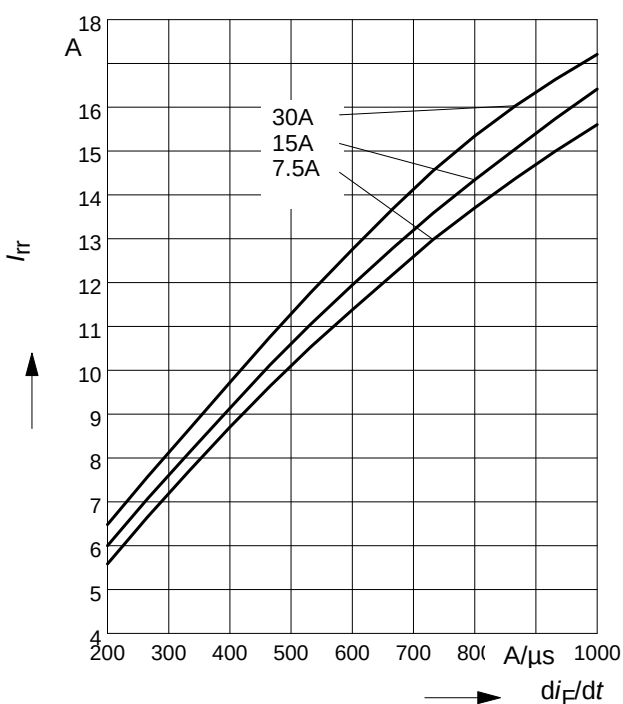
parameter:  $V_R = 400V$ ,  $T_j = 125^\circ C$



## 7 Typ. reverse recovery current

$$I_{rr} = f(dI_F/dt)$$

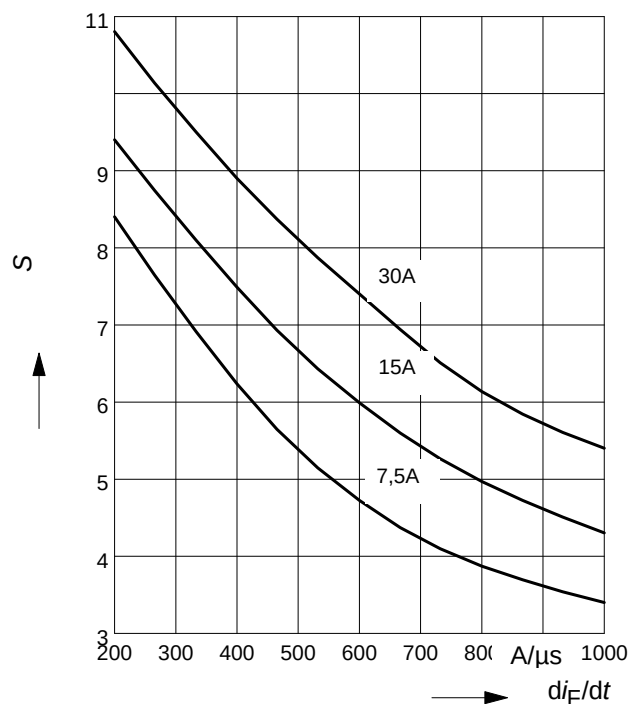
parameter:  $V_R = 400V$ ,  $T_j = 125^\circ C$



## 8 Typ. reverse recovery softness factor

$$S = f(dI_F/dt)$$

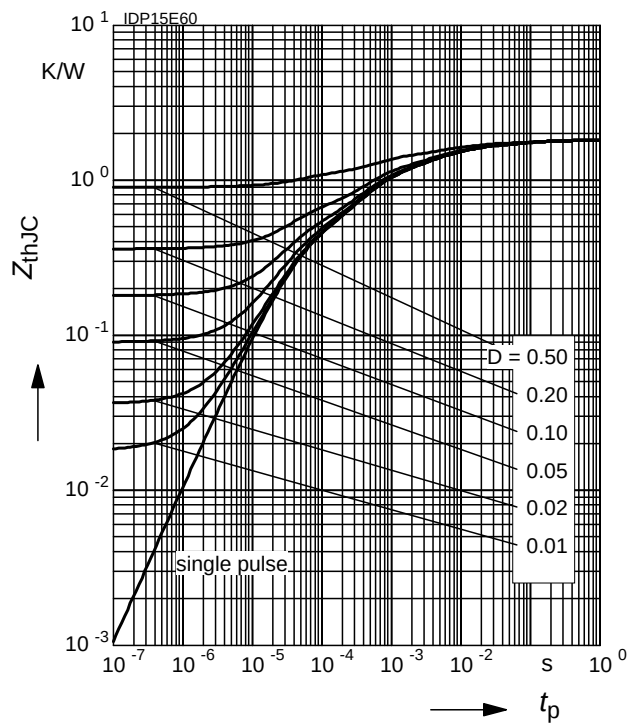
parameter:  $V_R = 400V$ ,  $T_j = 125^\circ C$

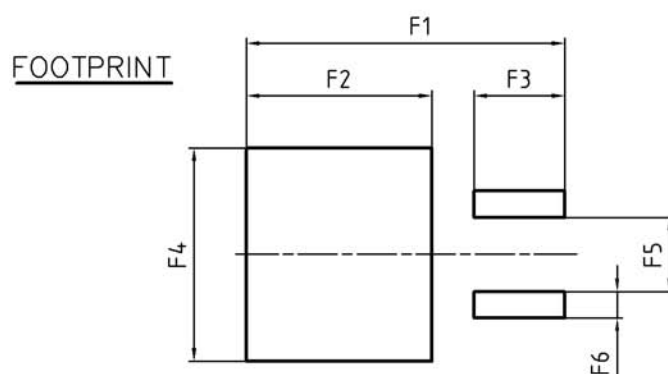
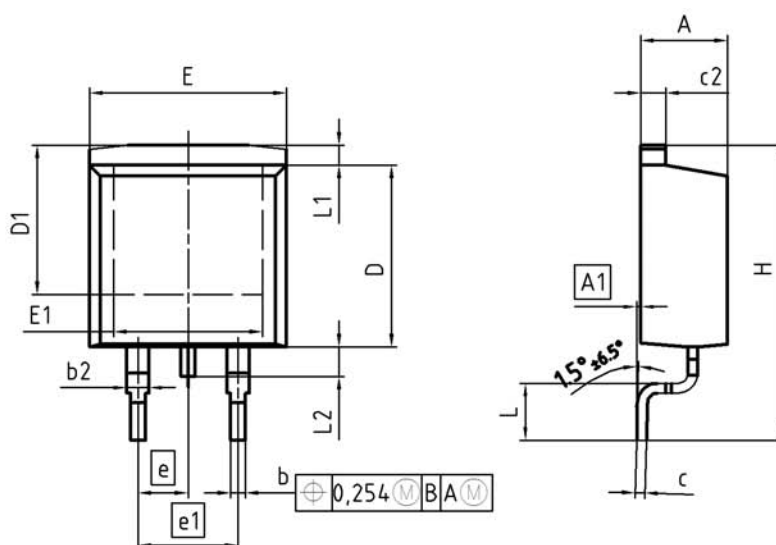


## 9 Max. transient thermal impedance

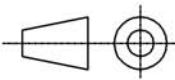
$$Z_{thJC} = f(t_p)$$

parameter :  $D = t_p/T$





| DIM | MILLIMETERS |       | INCHES |       |
|-----|-------------|-------|--------|-------|
|     | MIN         | MAX   | MIN    | MAX   |
| A   | 4.30        | 4.57  | 0.169  | 0.180 |
| A1  | 0.00        | 0.25  | 0.000  | 0.010 |
| b   | 0.65        | 0.85  | 0.026  | 0.033 |
| b2  | 0.95        | 1.15  | 0.037  | 0.045 |
| c   | 0.33        | 0.65  | 0.013  | 0.026 |
| c2  | 1.17        | 1.40  | 0.046  | 0.055 |
| D   | 8.51        | 9.45  | 0.335  | 0.372 |
| D1  | 7.10        | 7.90  | 0.280  | 0.311 |
| E   | 9.80        | 10.31 | 0.386  | 0.406 |
| E1  | 6.50        | 8.60  | 0.256  | 0.339 |
| e   | 2.54        |       | 0.100  |       |
| e1  | 5.08        |       | 0.200  |       |
| N   | 2           |       | 2      |       |
| H   | 14.61       | 15.88 | 0.575  | 0.625 |
| L   | 2.29        | 3.00  | 0.090  | 0.118 |
| L1  | 0.70        | 1.60  | 0.028  | 0.063 |
| L2  | 1.00        | 1.78  | 0.039  | 0.070 |
| F1  | 16.05       | 16.25 | 0.632  | 0.640 |
| F2  | 9.30        | 9.50  | 0.366  | 0.374 |
| F3  | 4.50        | 4.70  | 0.177  | 0.185 |
| F4  | 10.70       | 10.90 | 0.421  | 0.429 |
| F5  | 3.65        | 3.85  | 0.144  | 0.152 |
| F6  | 1.25        | 1.45  | 0.049  | 0.057 |

|                                                                                                              |
|--------------------------------------------------------------------------------------------------------------|
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| EUROPEAN PROJECTION<br> |
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