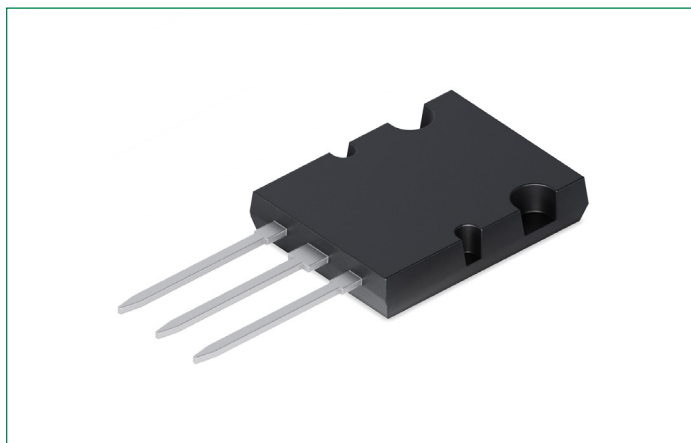


# IXFB44N100P

## 1000 V, 220 mΩ Polar™ HiPerFET™ Power MOSFET

### N-Channel Enhancement Mode



### Features:

- Unclamped Inductive Switching (UIS) Rated
- Low Package Inductance
  - Easy to Drive and to Protect
- N-Channel Enhancement Mode
- Fast Intrinsic Rectifier
- Avalanche Rated
- Low  $R_{DS(on)}$  and  $Q_G$

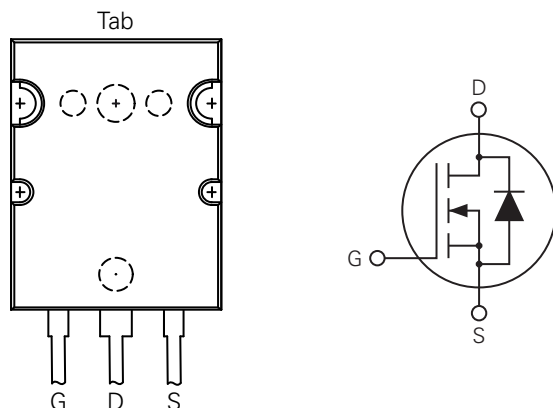
### Advantages:

- Plus 264™ Package for Clip or Spring Mounting
- Space Savings
- High Power Density

### Applications:

- Switched-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- Laser Drivers
- AC and DC Motor Controls
- Robotics and Servo Controls

### Pinout Diagram (PLUS TO-264)



**G:** Gate; **D:** Drain; **S:** Emitter; **Tab:** Drain

### Product Summary

| Characteristic | Value | Unit     |
|----------------|-------|----------|
| $V_{DSS}$      | 1000  | V        |
| $I_{D25}$      | 44    | A        |
| $R_{DS(on)}$   | 220   | $\Omega$ |
| $t_{rr}$       | 300   | ns       |

## Maximum Ratings

| Symbol     | Characteristics                | Conditions                                                                        | Value             | Units              |
|------------|--------------------------------|-----------------------------------------------------------------------------------|-------------------|--------------------|
| $V_{DSS}$  | Drain-Source Voltage           | $T_J = 25^{\circ}\text{C}$ to $150^{\circ}\text{C}$                               | 1000              | V                  |
| $V_{DGR}$  | Drain-Gate Voltage             | $T_J = 25^{\circ}\text{C}$ to $150^{\circ}\text{C}$ , $R_{GS} = 1\text{ M}\Omega$ | 1000              | V                  |
| $V_{GSS}$  | Gate-Source Voltage            | Continuous                                                                        | $\pm 30$          | V                  |
| $V_{GSM}$  |                                | Transient                                                                         | $\pm 40$          |                    |
| $I_{D25}$  | Drain Current                  | $T_C = 25^{\circ}\text{C}$                                                        | 44                | A                  |
| $I_{DM}$   |                                | $T_C = 25^{\circ}\text{C}$ , Pulse width limited by $T_{JM}$                      | 110               |                    |
| $I_{AR}$   | Avalanche Current              | $T_C = 25^{\circ}\text{C}$                                                        | 22                | A                  |
| $E_{AS}$   | Avalanche Energy               | $T_C = 25^{\circ}\text{C}$                                                        | 2                 | J                  |
| dV/dt      | Reverse Diode dV/dt            | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^{\circ}\text{C}$        | 15                | V/ns               |
| $P_D$      | Power Dissipation              | $T_C = 25^{\circ}\text{C}$                                                        | 1250              | W                  |
| $T_J$      | Operating Junction Temperature | –                                                                                 | -55 to +150       | $^{\circ}\text{C}$ |
| $T_{JM}$   | Maximum Junction Temperature   | –                                                                                 | 150               |                    |
| $T_{stg}$  | Storage Temperature            | –                                                                                 | -55 to +150       |                    |
| $V_{ISOL}$ | Isolation Voltage              | 50/60 Hz, $I_{ISOL} \leq 1\text{ mA}$ , $t = 1\text{ min}$                        | 2500              | V~                 |
|            |                                | 50/60 Hz, $I_{ISOL} \leq 1\text{ mA}$ , $t = 1\text{ s}$                          | 3000              |                    |
| $T_L$      | Lead Temperature for Soldering | 1.6 mm (0.062 in.) from case for 10 s                                             | 300               | $^{\circ}\text{C}$ |
| $F_C$      | Mounting Force                 | –                                                                                 | 30..120 / 6.7..27 | N/lb               |
| W          | Weight                         | –                                                                                 | 10                | g                  |

## Thermal Characteristics

| Symbol       | Characteristic                       | Value |      |      | Unit                        |
|--------------|--------------------------------------|-------|------|------|-----------------------------|
|              |                                      | Min.  | Typ. | Max. |                             |
| $R_{th, JC}$ | Thermal Resistance, junction-to-case | –     | –    | 0.10 | $^{\circ}\text{C}/\text{W}$ |
| $R_{th, CS}$ | Thermal Resistance, case-to-sink     | –     | 0.13 | –    | $^{\circ}\text{C}/\text{W}$ |

## Electrical Characteristics – Static ( $T_J = 25^{\circ}\text{C}$ unless otherwise specified)

| Symbol       | Characteristic                          | Conditions                                                               | Value |      |           | Unit          |
|--------------|-----------------------------------------|--------------------------------------------------------------------------|-------|------|-----------|---------------|
|              |                                         |                                                                          | Min.  | Typ. | Max.      |               |
| $BV_{DSS}$   | Drain-Source Breakdown Voltage          | $I_D = 3\text{ mA}$ , $V_{GS} = 0\text{ V}$                              | 1000  | –    | –         | V             |
| $V_{GS(th)}$ | Gate Threshold Voltage                  | $I_D = 1\text{ mA}$ , $V_{DS} = V_{GS}$                                  | 3.5   | –    | 6.5       | V             |
| $I_{GSS}$    | Gate-Source Leakage Current             | $V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 30\text{ V}$                       | –     | –    | $\pm 200$ | nA            |
| $I_{DSS}$    | Drain-Source Current                    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0\text{ V}$                               | –     | –    | 50        | $\mu\text{A}$ |
|              |                                         | $V_{DS} = V_{DSS}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125^{\circ}\text{C}$ | –     | –    | 3         | mA            |
| $R_{DS(on)}$ | Drain-Source On-Resistance <sup>1</sup> | $V_{GS} = 10\text{ V}$ , $I_D = 0.5 \times I_{D25}$                      | –     | –    | 220       | m $\Omega$    |

**Note 1:** Pulse test,  $t \leq 300\text{ }\mu\text{s}$ , duty cycle,  $d \leq 2\%$

**Electrical Characteristics – Dynamic** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

| Symbol       | Characteristic                | Conditions                                                                                                                               | Value |      |      | Unit     |
|--------------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-------|------|------|----------|
|              |                               |                                                                                                                                          | Min.  | Typ. | Max. |          |
| $g_{fs}$     | Transconductance <sup>1</sup> | $V_{DS} = 20\text{ V}, I_D = 0.5 \times I_{D25}$                                                                                         | 20    | 35   | –    | S        |
| $R_{Gi}$     | Gate Input Resistance         | –                                                                                                                                        | –     | 1.4  | –    | $\Omega$ |
| $C_{iss}$    | Input Capacitance             | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                                                            | –     | 16.9 | –    | nF       |
| $C_{oss}$    | Output Capacitance            |                                                                                                                                          | –     | 1100 | –    | pF       |
| $C_{rss}$    | Reverse Transfer Capacitance  |                                                                                                                                          | –     | 184  | –    | pF       |
| $Q_{g(on)}$  | Total Gate Charge             | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 \times V_{DSS},$<br>$I_D = 0.5 \times I_{D25}$                                                       | –     | 305  | –    | nC       |
| $Q_{gs}$     | Gate-Source Charge            |                                                                                                                                          | –     | 104  | –    |          |
| $Q_{gd}$     | Gate-Drain Charge             |                                                                                                                                          | –     | 126  | –    |          |
| $t_{d(on)}$  | Turn-on Delay Time            | <b>Resistive Switching</b><br>$V_{GS} = 10\text{ V}, V_{DS} = 0.5 \times V_{DSS},$<br>$I_D = 0.5 \times I_{D25}, R_{G(ext)} = 1\ \Omega$ | –     | 60   | –    | ns       |
| $t_r$        | Rise Time                     |                                                                                                                                          | –     | 68   | –    |          |
| $t_{d(off)}$ | Turn-off Delay Time           |                                                                                                                                          | –     | 90   | –    |          |
| $t_f$        | Fall Time                     |                                                                                                                                          | –     | 56   | –    |          |

**Note 1:** Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle,  $d \leq 2\%$

**Source-Drain Diode Characteristics** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

| Symbol   | Characteristic                     | Conditions                                                                      | Value |      |      | Unit          |
|----------|------------------------------------|---------------------------------------------------------------------------------|-------|------|------|---------------|
|          |                                    |                                                                                 | Min.  | Typ. | Max. |               |
| $I_S$    | Continuous Diode Forward Current   | $V_{GS} = 0\text{ V}$                                                           | –     | –    | 44   | A             |
| $I_{SM}$ | Diode Pulse Current                | Repetitive, Pulse width limited by $T_{JM}$                                     | –     | –    | 176  | A             |
| $V_{SD}$ | Diode Forward Voltage <sup>1</sup> | $I_F = I_S, V_{GS} = 0\text{ V}$                                                | –     | –    | 1.5  | V             |
| $t_{rr}$ | Reverse Recovery Time              | $I_F = 22\text{ A}, -di/dt = 100\text{ A}/\mu\text{s},$<br>$V_r = 100\text{ V}$ | –     | –    | 300  | ns            |
| $Q_{rm}$ | Reverse Recovery Charge            |                                                                                 | –     | 2.5  | –    | $\mu\text{C}$ |
| $I_{rm}$ | Reverse Recovery Current           |                                                                                 | –     | 17.0 | –    | A             |

**Note 1:** Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle,  $d \leq 2\%$

## Characteristic Curves

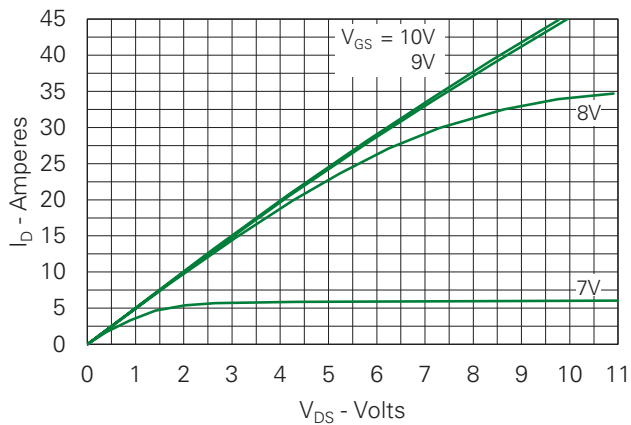
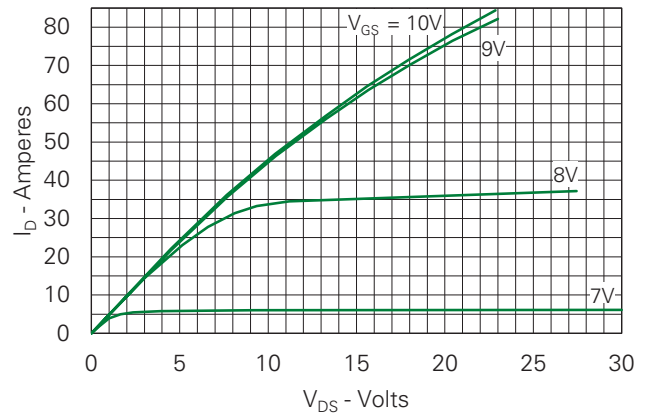
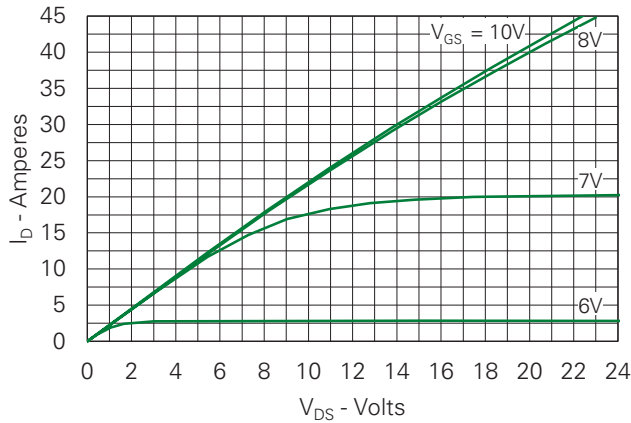
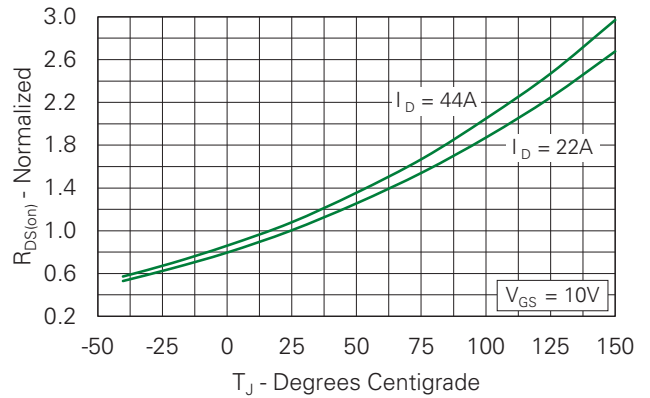
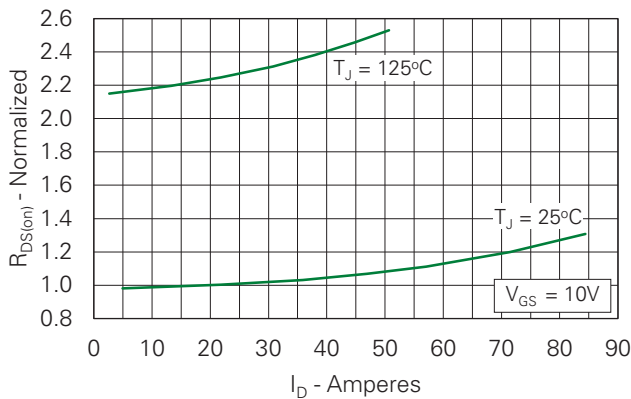
Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$ Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$ Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$ Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 22\text{A}$  Value vs. Junction TemperatureFig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 22\text{A}$  Value vs. Drain Current

Fig. 6. Maximum Drain Current vs. Case Temperature

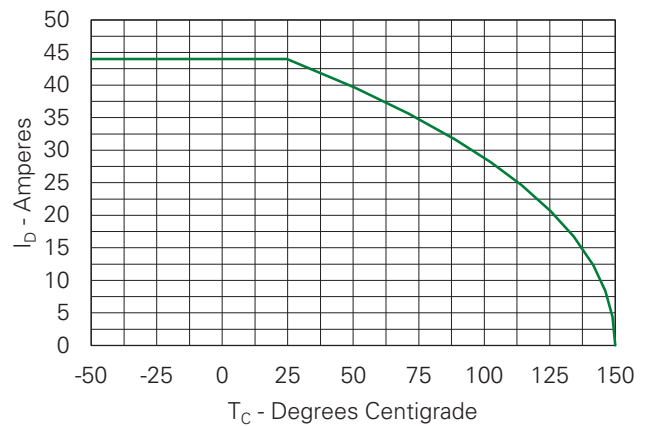


Fig. 7. Input Admittance

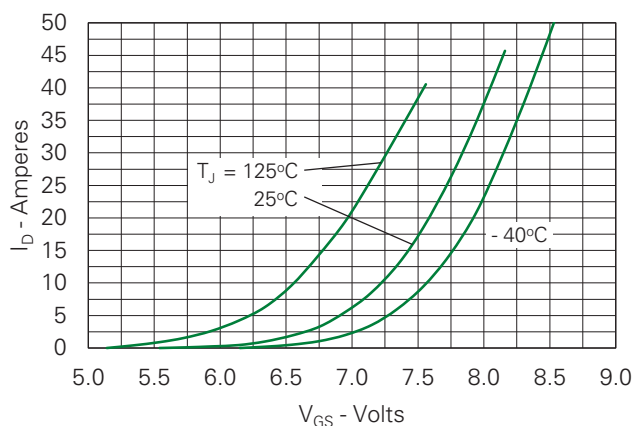


Fig. 8. Transconductance

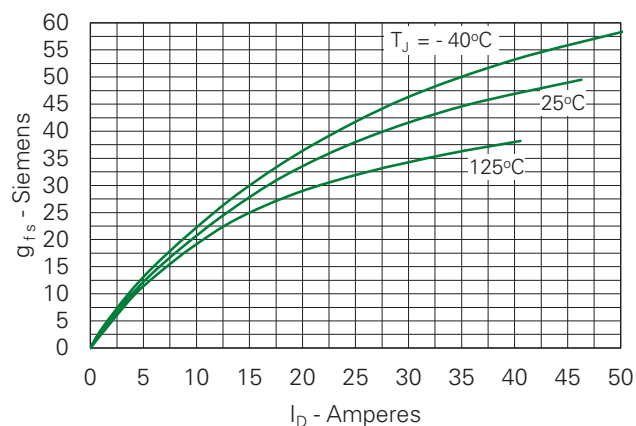


Fig. 9. Forward Voltage Drop of Intrinsic Diode

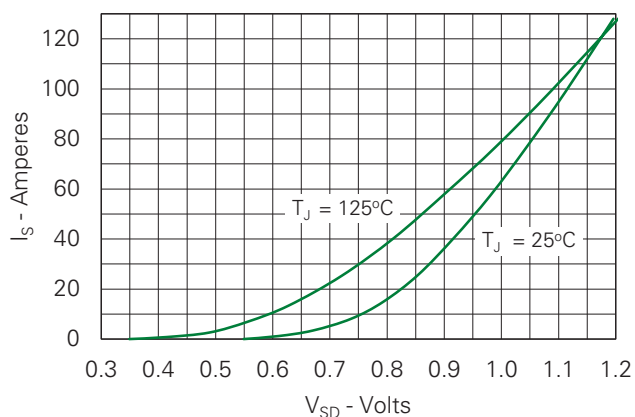


Fig. 10. Gate Charge

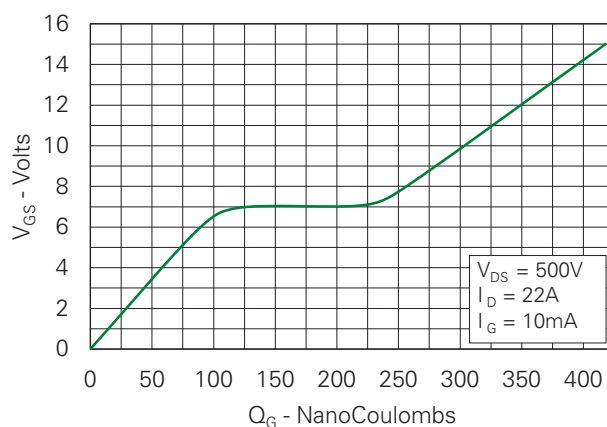


Fig. 11. Capacitance

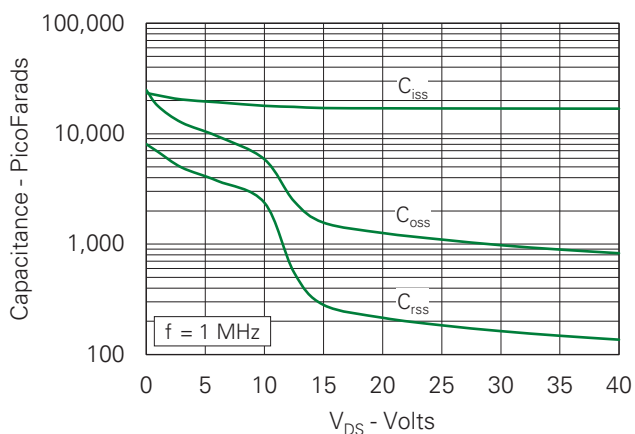
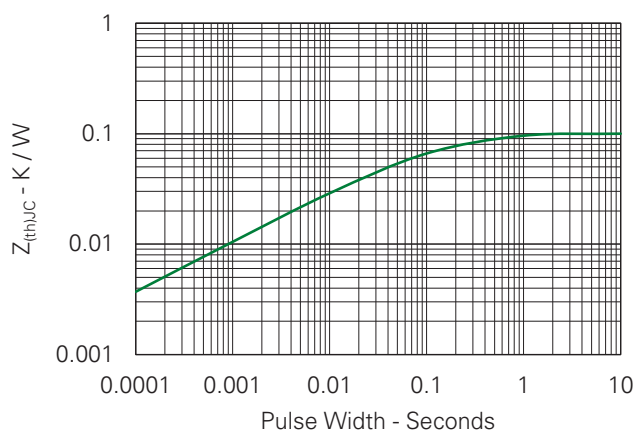
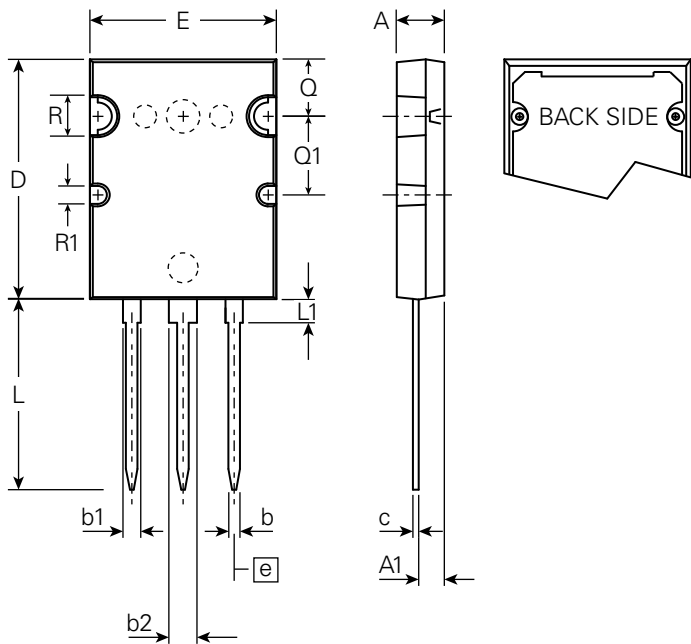


Fig. 12. Maximum Transient Thermal Impedance



Part Outline Drawing (PLUS TO-264)



| Symbol | Inches    |         |       | Millimeters |         |       |
|--------|-----------|---------|-------|-------------|---------|-------|
|        | Min.      | Typical | Max.  | Min.        | Typical | Max   |
| A      | 0.185     | –       | 0.209 | 4.70        | –       | 5.31  |
| A1     | 0.102     | –       | 0.118 | 2.59        | –       | 3.00  |
| b      | 0.037     | –       | 0.055 | 0.94        | –       | 1.40  |
| b1     | 0.087     | –       | 0.102 | 2.21        | –       | 2.59  |
| b2     | 0.110     | –       | 0.126 | 2.79        | –       | 3.20  |
| c      | 0.017     | –       | 0.029 | 0.43        | –       | 0.74  |
| D      | 1.007     | –       | 1.047 | 25.58       | –       | 26.59 |
| E      | 0.760     | –       | 0.799 | 19.30       | –       | 20.29 |
| e      | 0.215 BSC |         |       | 5.46 BSC    |         |       |
| L      | 0.779     | –       | 0.842 | 19.79       | –       | 21.39 |
| L1     | 0.087     | –       | 0.102 | 2.21        | –       | 2.59  |
| Q      | 0.240     | –       | 0.256 | 6.10        | –       | 6.50  |
| Q1     | 0.330     | –       | 0.346 | 8.38        | –       | 8.79  |
| ØR     | 0.155     | –       | 0.187 | 3.94        | –       | 4.75  |
| ØR1    | 0.085     | –       | 0.093 | 2.16        | –       | 2.36  |

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