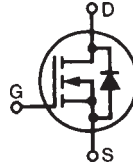


# X3-Class Power MOSFET™

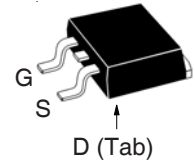
## IXTA90N20X3

$$\begin{aligned} V_{DSS} &= 200V \\ I_{D25} &= 90A \\ R_{DS(on)} &\leq 12m\Omega \end{aligned}$$

N-Channel Enhancement Mode  
Avalanche Rated



TO-263



G = Gate      D = Drain  
S = Source    Tab = Drain

| Symbol     | Test Conditions                                                          | Maximum Ratings    |                             |
|------------|--------------------------------------------------------------------------|--------------------|-----------------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$                          | 200                | V                           |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 200                | V                           |
| $V_{GSS}$  | Continuous                                                               | $\pm 20$           | V                           |
| $V_{GSM}$  | Transient                                                                | $\pm 30$           | V                           |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | 90                 | A                           |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | 220                | A                           |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | 45                 | A                           |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 1                  | J                           |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 20                 | V/ns                        |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 390                | W                           |
| $T_J$      |                                                                          | -55 ... +175       | $^\circ\text{C}$            |
| $T_{JM}$   |                                                                          | 175                | $^\circ\text{C}$            |
| $T_{stg}$  |                                                                          | -55 ... +175       | $^\circ\text{C}$            |
| $T_L$      | Maximum Lead Temperature for Soldering                                   | 300                | $^\circ\text{C}$            |
| $dT/dt$    | Heating / Cooling rate, $175^\circ\text{C} - 210^\circ\text{C}$          | 50                 | $^\circ\text{C}/\text{min}$ |
| $T_{SOLD}$ | 1.6 mm (0.062in.) from Case for 10s                                      | 260                | $^\circ\text{C}$            |
| $F_C$      | Mounting Force                                                           | 10..65 / 2.2..14.6 | N/lb                        |
| Weight     |                                                                          | 2.5                | g                           |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                          |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|--------------------------|
|              |                                                                             | Min.                  | Typ. | Max.                     |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                            | 200                   |      | V                        |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu A$                                        | 2.5                   |      | 4.5 V                    |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 100$ nA             |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$             |                       |      | 5 $\mu A$<br>100 $\mu A$ |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                         |                       |      | 12 m $\Omega$            |

### Features

- International Standard Package
- Low  $R_{DS(ON)}$  and  $Q_G$
- Avalanche Rated
- Low Package Inductance

### Advantages

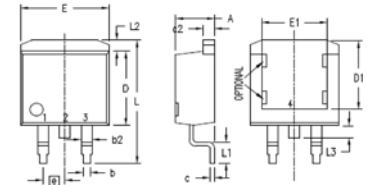
- High Power Density
- Easy to Mount
- Space Savings

### Applications

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- PFC Circuits
- AC and DC Motor Drives
- Robotics and Servo Controls

| Symbol                              | Test Conditions<br>( $T_J = 25^{\circ}\text{C}$ , Unless Otherwise Specified)                                                 | Characteristic Values                                                                           |      |                           |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|------|---------------------------|
|                                     |                                                                                                                               | Min.                                                                                            | Typ. | Max                       |
| $g_{fs}$                            | $V_{DS} = 10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                    | 60                                                                                              | 100  | S                         |
| $R_{Gi}$                            | Gate Input Resistance                                                                                                         |                                                                                                 | 1.4  | $\Omega$                  |
| $C_{iss}$                           | $\left. \begin{array}{l} \\ \\ \end{array} \right\} V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$                 |                                                                                                 | 5420 | pF                        |
| $C_{oss}$                           |                                                                                                                               |                                                                                                 | 930  | pF                        |
| $C_{rss}$                           |                                                                                                                               |                                                                                                 | 4    | pF                        |
| <b>Effective Output Capacitance</b> |                                                                                                                               |                                                                                                 |      |                           |
| $C_{o(er)}$                         | Energy related                                                                                                                | $\left. \begin{array}{l} V_{GS} = 0\text{V} \\ V_{DS} = 0.8 \cdot V_{DSS} \end{array} \right\}$ | 420  | pF                        |
| $C_{o(tr)}$                         | Time related                                                                                                                  |                                                                                                 | 1300 | pF                        |
| $t_{d(on)}$                         | $\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \text{Resistive Switching Times}$                                      |                                                                                                 | 22   | ns                        |
| $t_r$                               |                                                                                                                               |                                                                                                 | 26   | ns                        |
| $t_{d(off)}$                        |                                                                                                                               |                                                                                                 | 62   | ns                        |
| $t_f$                               |                                                                                                                               |                                                                                                 | 13   | ns                        |
| $Q_{g(on)}$                         | $\left. \begin{array}{l} \\ \\ \end{array} \right\} V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$ |                                                                                                 | 78   | nC                        |
| $Q_{gs}$                            |                                                                                                                               |                                                                                                 | 23   | nC                        |
| $Q_{gd}$                            |                                                                                                                               |                                                                                                 | 22   | nC                        |
| $R_{thJC}$                          |                                                                                                                               |                                                                                                 |      | 0.32 $^{\circ}\text{C/W}$ |

## TO-263 (IXTA) Outline



- 1 = Gate  
2 = Drain  
3 = Source  
4 = Drain

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .160     | .190 | 4.06        | 4.83  |
| A1  | .080     | .110 | 2.03        | 2.79  |
| b   | .020     | .039 | 0.51        | 0.99  |
| b2  | .045     | .055 | 1.14        | 1.40  |
| c   | .016     | .029 | 0.40        | 0.74  |
| c2  | .045     | .055 | 1.14        | 1.40  |
| D   | .340     | .380 | 8.64        | 9.65  |
| D1  | .315     | .350 | 8.00        | 8.89  |
| E   | .380     | .410 | 9.65        | 10.41 |
| E1  | .245     | .320 | 6.22        | 8.13  |
| e   | .100 BSC |      | 2.54 BSC    |       |
| L   | .575     | .625 | 14.61       | 15.88 |
| L1  | .090     | .110 | 2.29        | 2.79  |
| L2  | .040     | .055 | 1.02        | 1.40  |
| L3  | .050     | .070 | 1.27        | 1.78  |
| L4  | 0        | .005 | 0           | 0.13  |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)    | Characteristic Values |      |       |
|----------|--------------------------------------------------------------------------------|-----------------------|------|-------|
|          |                                                                                | Min.                  | Typ. | Max   |
| $I_S$    | $V_{GS} = 0\text{V}$                                                           |                       |      | 90 A  |
| $I_{SM}$ | Repetitive, pulse Width Limited by $T_{JM}$                                    |                       |      | 360 A |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                    |                       |      | 1.4 V |
| $t_{rr}$ | $I_F = 45\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ |                       | 124  | ns    |
| $Q_{RM}$ |                                                                                |                       | 650  | nC    |
| $I_{RM}$ |                                                                                |                       | 10.5 | A     |

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

## ADVANCE TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

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|                                                                                  |           |           |           |           |             |             |             |             |             |             |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-------------|-------------|-------------|-------------|-------------|-------------|
| IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents: | 4,835,592 | 4,931,844 | 5,049,961 | 5,237,481 | 6,162,665   | 6,404,065B1 | 6,683,344   | 6,727,585   | 7,005,734B2 | 7,157,338B2 |
|                                                                                  | 4,860,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123B1 | 6,534,343   | 6,710,405B2 | 6,759,692   | 7,063,975B2 |             |
|                                                                                  | 4,881,106 | 5,034,796 | 5,187,117 | 5,486,715 | 6,306,728B1 | 6,583,505   | 6,710,463   | 6,771,478B2 | 7,071,537   |             |



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