

# X4-Class **Power MOSFET**

### IXTA60N20X4

 $\mathbf{V}_{\mathtt{DSS}}$ 200V 60A  $21.0 m\Omega$ 

N-Channel Enhancement Mode Avalanche Rated



| <b> </b> ►¬ <b> </b> ★) |        |
|-------------------------|--------|
|                         | TO-263 |
| os                      | (IXTA) |



| Symbol  | Test Conditions  | Maximum Ratings             |                |  |
|---|--|-----------------------------|----------------|--|
| V <sub>DSS</sub>                                | $T_J = 25^{\circ}\text{C to } 175^{\circ}\text{C}$<br>$T_J = 25^{\circ}\text{C to } 175^{\circ}\text{C}, R_{GS} = 1\text{M}\Omega$ | 200<br>200                  | V              |  |
| V <sub>GS</sub>                                 | Continuous<br>Transient  | ±20<br>±30                  | V              |  |
| I <sub>D25</sub>                                | $T_{\rm C} = 25^{\circ}{\rm C}$<br>$T_{\rm C} = 25^{\circ}{\rm C}$ , Pulse Width Limited by $T_{\rm JM}$                           | 60<br>106                   | A<br>A         |  |
| I <sub>A</sub><br>É <sub>AS</sub>               | T <sub>c</sub> = 25°C<br>T <sub>c</sub> = 25°C   | 30<br>350                   | A<br>mJ        |  |
| dv/dt   | $I_{_{S}} \le I_{_{DM}}, V_{_{DD}} \le V_{_{DSS}}, T_{_{J}} \le 150$ °C  | 50                          | V/ns           |  |
| P <sub>D</sub>                                  | T <sub>C</sub> = 25°C  | 250                         | W              |  |
| T <sub>J</sub> T <sub>JM</sub> T <sub>stg</sub> |  | -55 +175<br>175<br>-55 +175 | °C<br>°C<br>°C |  |
| T <sub>SOLD</sub>                               | Plastic Body for 10s   | 260                         | °C             |  |
| F <sub>c</sub>                                  | Mounting Force   | 1065 / 2.214.6              | N/lb           |  |
| Weight  |  | 2.5                         | g              |  |

| G = Gate   | D   | = Drain |
|------------|-----|---------|
| S = Source | Tab | = Drair |

#### **Features**

- International Standard Package
- Low R<sub>DS(ON)</sub> and Q<sub>G</sub>
   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

| SymbolTest ConditionsChar(T, = 25°C, Unless Otherwise Specified)Min. |   | acteristic Values<br><sub> </sub> Typ. <sub> </sub> Max. |      |      |                          |
|--|---|--|------|------|--------------------------|
| BV <sub>DSS</sub>  | $V_{GS} = 0V, I_{D} = 250\mu A$                         | 200  |      |      | V                        |
| V <sub>GS(th)</sub>  | $V_{DS} = V_{GS}, I_D = 250 \mu A$                      | 2.5  |      | 4.5  | V                        |
| I <sub>GSS</sub>   | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                      |  |      | ±100 | nA                       |
| I <sub>DSS</sub>   | $V_{DS} = V_{DSS}, V_{GS} = 0V$ $T_{J} = 150 ^{\circ}C$ |  |      |      | μ <b>Α</b><br>μ <b>Α</b> |
| R <sub>DS(on)</sub>  | $V_{GS} = 10V, I_{D} = 0.5 \cdot I_{D25}, Note 1$       |  | 17.6 | 21.0 | mΩ                       |

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| Symbol                   | Test Conditions (   |      | Characteristic Values |           |  |
|--------------------------|---|------|-----------------------|-----------|--|
| $(T_J = 25^{\circ}C, I)$ | Unless Otherwise Specified)   | Min. | Тур.                  | Max       |  |
| g <sub>fs</sub>          | $V_{DS} = 10V, I_{D} = 0.5 \cdot I_{D25}, Note 1$                     | 34   | 56                    | S         |  |
| $R_{Gi}$                 | Gate Input Resistance   |      | 7.45                  | Ω         |  |
| C <sub>iss</sub>         |   |      | 2450                  | pF        |  |
| c <sub>oss</sub>         | $V_{GS} = 0V, V_{DS} = 25V, f = 1MHz$                                 |      | 406                   | pF        |  |
| C <sub>rss</sub>         |   |      | 0.95                  | pF        |  |
|                          | Effective Output Capacitance  |      |                       |           |  |
| C <sub>o(er)</sub>       | Energy related  |      | 240                   | pF        |  |
| C <sub>o(tr)</sub>       | Time related $\int V_{DS}^{65} = 0.8 \cdot V_{DSS}$                   |      | 880                   | pF        |  |
| t <sub>d(on)</sub>       | Pagiativa Switching Times   |      | 13                    | ns        |  |
| t,                       | Resistive Switching Times   |      | 22                    | ns        |  |
| t <sub>d(off)</sub>      | $V_{GS} = 10V, V_{DS} = 0.5 \cdot V_{DSS}, I_{D} = 0.5 \cdot I_{D25}$ |      | 52                    | ns        |  |
| t,                       | $\int R_{\rm G} = 5\Omega \text{ (External)}$                         |      | 10                    | ns        |  |
| Q <sub>g(on)</sub>       |   |      | 33                    | nC        |  |
| Q <sub>gs</sub>          | $V_{GS} = 10V, V_{DS} = 0.5 \cdot V_{DSS}, I_{D} = 0.5 \cdot I_{D25}$ |      | 9                     | nC        |  |
| $\mathbf{Q}_{gd}$        | J   |      | 11                    | nC        |  |
| $R_{thJC}$               |   |      |                       | 0.60 °C/W |  |

#### Source-Drain Diode

| Symbol   | Test Conditions  | Characteristic Values |                  |     |               |
|--|--|-----------------------|------------------|-----|---------------|
| $(T_{J} = 25^{\circ}C,$  | Unless Otherwise Specified)                                      | Min.                  | Тур.             | Max |               |
| I <sub>s</sub>   | V <sub>GS</sub> = 0V   |                       |                  | 60  | Α             |
| I <sub>SM</sub>  | Repetitive, Pulse Width Limited by $\mathrm{T}_{_{\mathrm{JM}}}$ |                       |                  | 240 | Α             |
| $\mathbf{V}_{\mathtt{SD}}$   | $I_F = I_S$ , $V_{GS} = 0V$ , Note 1                             |                       |                  | 1.4 | V             |
| $\left\{egin{array}{c} \mathbf{t}_{rr} & \ \mathbf{Q}_{RM} & \ \mathbf{I}_{RM} & \end{array} ight\}$ | $I_F = 30A$ , -di/dt = 200A/ $\mu$ s<br>$V_R = 100V$             |                       | 107<br>920<br>17 |     | ns<br>nC<br>A |

Note 1: Pulse test,  $t \leq 300 \mu s,$  duty cycle, d  $\leq 2~\%$ 

## **IXTA60N20X4**



0

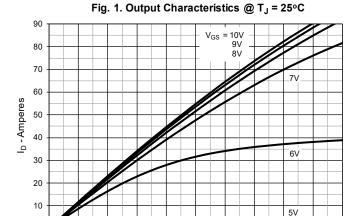
0.2

0.4

0.6

8.0

V<sub>DS</sub> - Volts



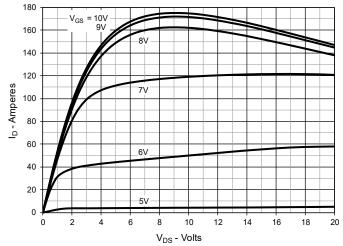
1.6

1.8

1.2

1.4

Fig. 2. Extended Output Characteristics @  $T_J = 25^{\circ}C$ 



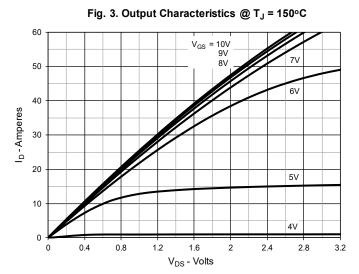
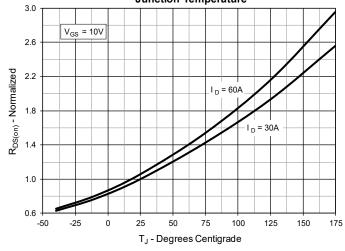


Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D$  = 30A Value vs. Junction Temperature



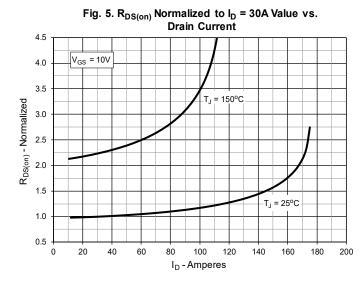
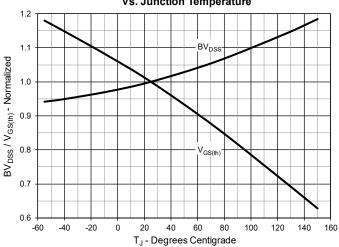


Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature



# **IXTA60N20X4**



Fig. 7. Maximum Drain Current vs. Case Temperature

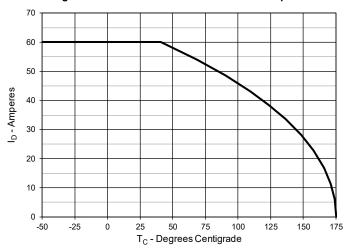


Fig. 8. Input Admittance

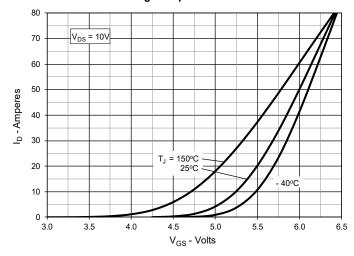


Fig. 9. Transconductance

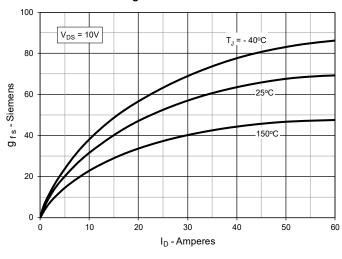


Fig. 10. Forward Voltage Drop of Intrinsic Diode

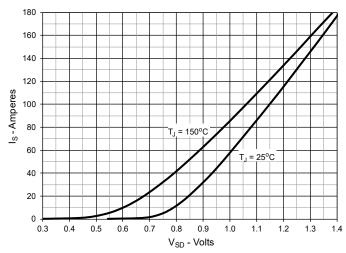


Fig. 11. Gate Charge

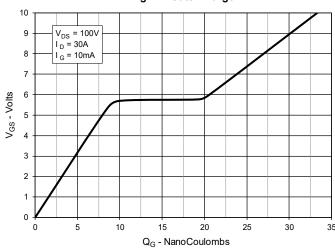
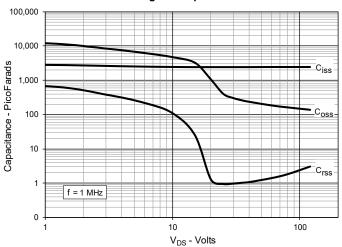


Fig. 12. Capacitance



Littelfuse reserves the right to change limits, test conditions and dimensions.



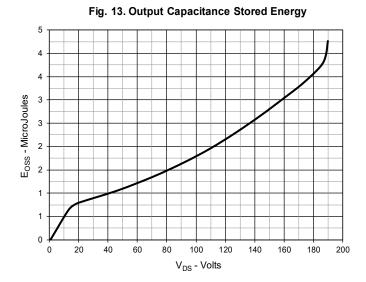


Fig. 14. Forward-Bias Safe Operating Area

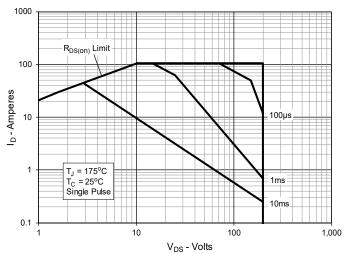
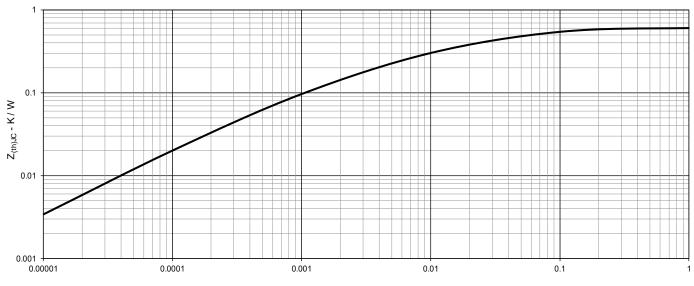


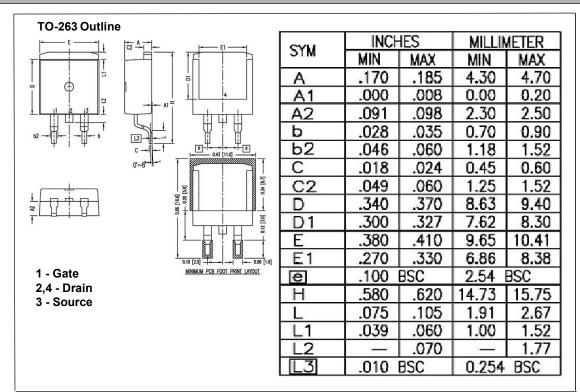
Fig. 15. Maximum Transient Thermal Impedance



Pulse Width - Second

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