

# PolarHT™ Power MOSFET

## IXTK 120N25P

$$V_{DSS} = 250 \text{ V}$$

$$I_{D25} = 120 \text{ A}$$

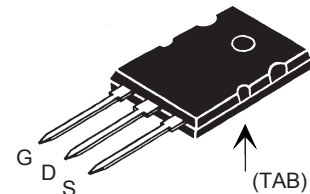
$$R_{DS(on)} \leq 24 \text{ m}\Omega$$

N-Channel Enhancement Mode  
Avalanche Rated



| Symbol        | Test Conditions   | Maximum Ratings |                  |
|---------------|---|-----------------|------------------|
|               |   |                 |                  |
| $V_{DSS}$     | $T_J = 25^\circ\text{C to } 175^\circ\text{C}$  | 250             | V                |
| $V_{DGR}$     | $T_J = 25^\circ\text{C to } 175^\circ\text{C}; R_{GS} = 1 \text{ M}\Omega$  | 250             | V                |
| $V_{GS}$      | Continuous  | $\pm 20$        | V                |
| $V_{GSM}$     | Transient   | $\pm 30$        | V                |
| $I_{D25}$     | $T_C = 25^\circ\text{C}$  | 120             | A                |
| $I_{D(RMS)}$  | External lead current limit   | 75              | A                |
| $I_{DM}$      | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$  | 300             | A                |
| $I_{AR}$      | $T_C = 25^\circ\text{C}$  | 60              | A                |
| $E_{AR}$      | $T_C = 25^\circ\text{C}$  | 60              | mJ               |
| $E_{AS}$      | $T_C = 25^\circ\text{C}$  | 2.5             | J                |
| $dv/dt$       | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 4 \Omega$ | 10              | V/ns             |
| $P_D$         | $T_C = 25^\circ\text{C}$  | 700             | W                |
| $T_J$         |   | -55 ... +175    | $^\circ\text{C}$ |
| $T_{JM}$      |   | 175             | $^\circ\text{C}$ |
| $T_{stg}$     |   | -55 ... +150    | $^\circ\text{C}$ |
| $T_L$         | 1.6 mm (0.062 in.) from case for 10 s   | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$    | Plastic body for 10 s   | 260             | $^\circ\text{C}$ |
| $M_d$         | Mounting torque   | 1.13/10         | Nm/lb.in.        |
| <b>Weight</b> |   | 10              | g                |

TO-264 (IXTK)



G = Gate      D = Drain  
S = Source      TAB = Drain

### Features

- † International standard package
- † Unclamped Inductive Switching (UIS) rated
- † Low package inductance
- easy to drive and to protect

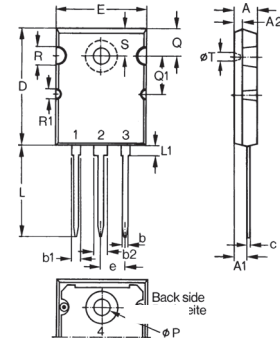
### Advantages

- † Easy to mount
- † Space savings
- † High power density

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                      | Characteristic Values |      |                                       |
|--------------|--|-----------------------|------|---------------------------------------|
|              |  | Min.                  | Typ. | Max.                                  |
| $BV_{DSS}$   | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$   | 250                   |      | V                                     |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 500 \mu\text{A}$  | 2.5                   |      | 5.0 V                                 |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}_{DC}$ , $V_{DS} = 0$  |                       |      | $\pm 200 \text{ nA}$                  |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$<br>$V_{GS} = 0 \text{ V}$ $T_J = 125^\circ\text{C}$   |                       |      | 25 $\mu\text{A}$<br>250 $\mu\text{A}$ |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2 \%$ | 19                    |      | 24 $\text{m}\Omega$                   |

| Symbol       | Test Conditions   | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                        |
|--------------|---|---|------|------------------------|
|              |   | Min.  | Typ. | Max.                   |
| $g_{fs}$     | $V_{DS} = 10\text{ V}; I_D = 0.5 I_{D25}$ , pulse test  | 50  | 70   | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$                                     |   | 8000 | pF                     |
| $C_{oss}$    |   |   | 1300 | pF                     |
| $C_{rss}$    |   |   | 220  | pF                     |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 60\text{ A}$<br>$R_G = 3.3\ \Omega$ (External) |   | 30   | ns                     |
| $t_r$        |   |   | 33   | ns                     |
| $t_{d(off)}$ |   |   | 130  | ns                     |
| $t_f$        |   |   | 33   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 0.5 V_{DSS}, I_D = 0.5 I_{D25}$                                   |   | 185  | nC                     |
| $Q_{gs}$     |   |   | 50   | nC                     |
| $Q_{gd}$     |   |   | 80   | nC                     |
| $R_{thJC}$   |   |   |      | $0.18^\circ\text{C/W}$ |
| $R_{thCS}$   |   | 0.15  |      | $^\circ\text{C/W}$     |

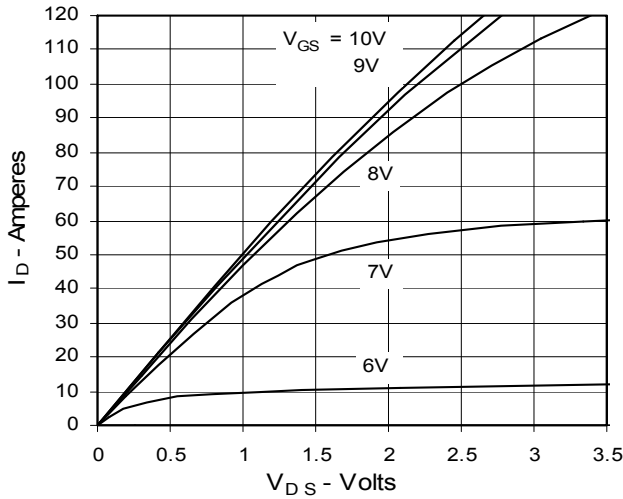
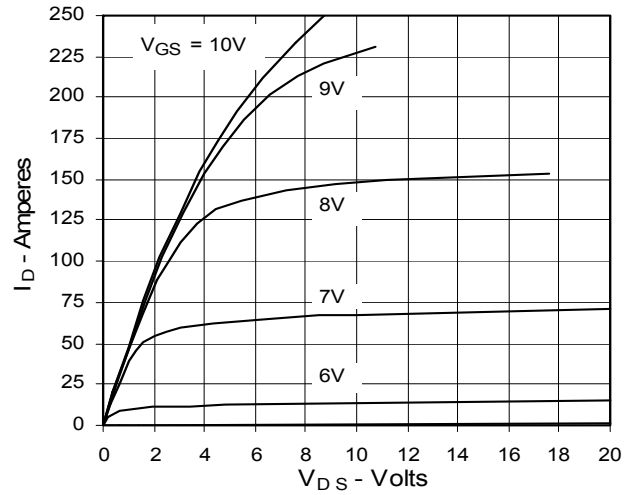
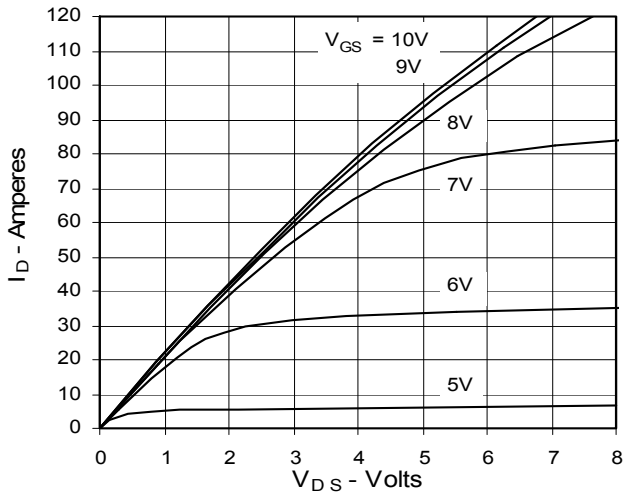
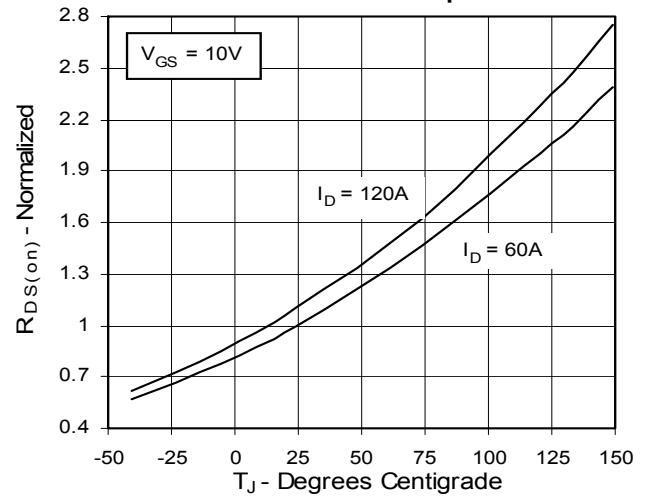
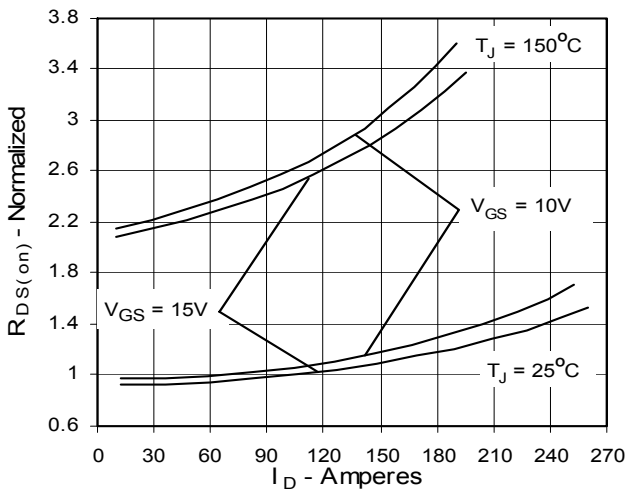
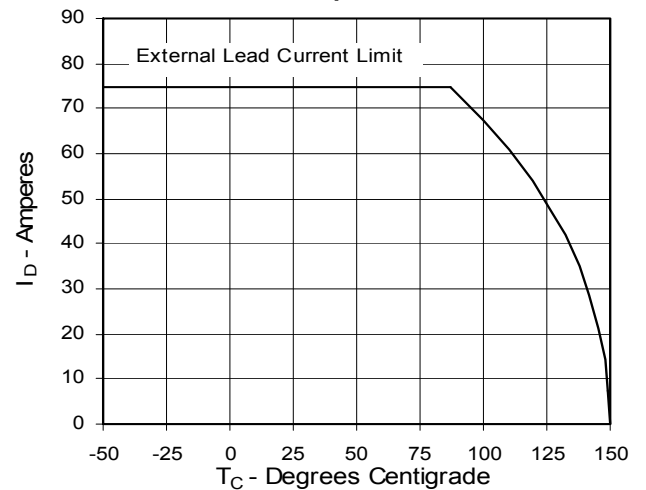
| Symbol   | Test Conditions   | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|----------|---|---|------|---------------|
|          |   | Min.  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{ V}$   |   |      | 120 A         |
| $I_{SM}$ | Repetitive  |   |      | 300 A         |
| $V_{SD}$ | $I_F = I_S, V_{GS} = 0\text{ V}$ ,<br>Pulse test, $t \leq 300\ \mu\text{s}$ , duty cycle $d \leq 2\%$ |   |      | 1.5 V         |
| $t_{rr}$ | $I_F = 25\text{ A}, -di/dt = 100\text{ A}/\mu\text{s}$<br>$V_R = 100\text{ V}, V_{GS} = 0\text{ V}$   |   | 200  | ns            |
| $Q_{RM}$ |   |   | 3.0  | $\mu\text{C}$ |

**TO-264 (IXTK) Outline**


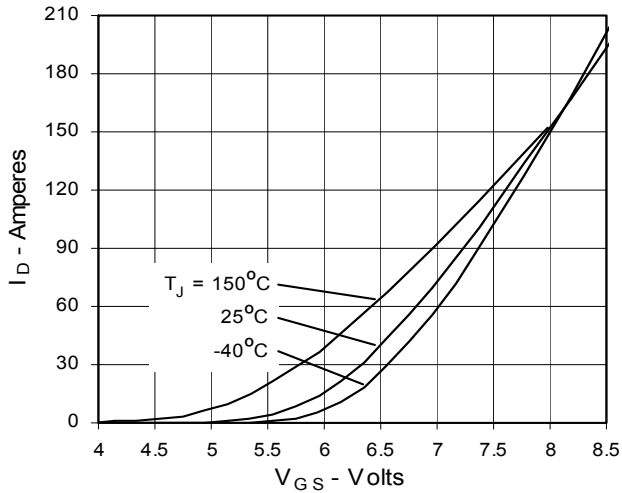
| Dim. | Millimeter |       | Inches   |       |
|------|------------|-------|----------|-------|
|      | Min.       | Max.  | Min.     | Max.  |
| A    | 4.82       | 5.13  | .190     | .202  |
| A1   | 2.54       | 2.89  | .100     | .114  |
| A2   | 2.00       | 2.10  | .079     | .083  |
| b    | 1.12       | 1.42  | .044     | .056  |
| b1   | 2.39       | 2.69  | .094     | .106  |
| b2   | 2.90       | 3.09  | .114     | .122  |
| c    | 0.53       | 0.83  | .021     | .033  |
| D    | 25.91      | 26.16 | 1.020    | 1.030 |
| E    | 19.81      | 19.96 | .780     | .786  |
| e    | 5.46 BSC   |       | .215 BSC |       |
| J    | 0.00       | 0.25  | .000     | .010  |
| K    | 0.00       | 0.25  | .000     | .010  |
| L    | 20.32      | 20.83 | .800     | .820  |
| L1   | 2.29       | 2.59  | .090     | .102  |
| P    | 3.17       | 3.66  | .125     | .144  |
| Q    | 6.07       | 6.27  | .239     | .247  |
| Q1   | 8.38       | 8.69  | .330     | .342  |
| R    | 3.81       | 4.32  | .150     | .170  |
| R1   | 1.78       | 2.29  | .070     | .090  |
| S    | 6.04       | 6.30  | .238     | .248  |
| T    | 1.57       | 1.83  | .062     | .072  |

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

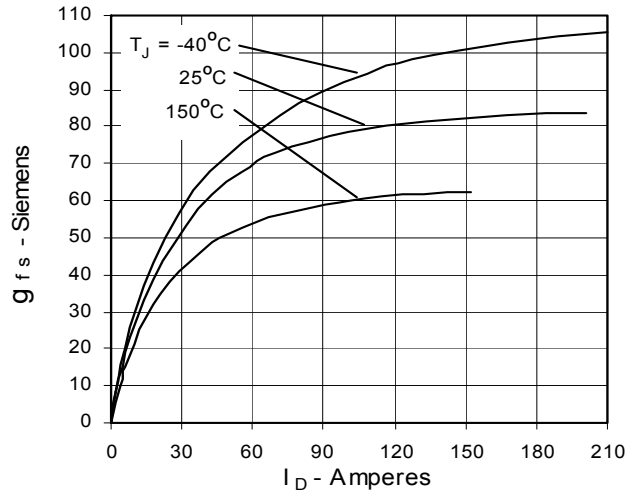
|  |           |           |           |           |              |              |             |              |
|--|-----------|-----------|-----------|-----------|--------------|--------------|-------------|--------------|
| IXYS MOSFETs and IGBTs are covered by      | 4,835,592 | 4,931,844 | 5,049,961 | 5,237,481 | 6,162,665    | 6,404,065 B1 | 6,683,344   | 6,727,585    |
| one or more of the following U.S. patents: | 4,850,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123 B1 | 6,534,343    | 6,710,405B2 | 6,759,692    |
|  | 4,881,106 | 5,034,796 | 5,187,117 | 5,486,715 | 6,306,728 B1 | 6,583,505    | 6,710,463   | 6,771,478 B2 |

**Fig. 1. Output Characteristics  
@ 25°C**

**Fig. 2. Extended Output Characteristics  
@ 25°C**

**Fig. 3. Output Characteristics  
@ 150°C**

**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$   
Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$   
Value vs. Drain Current**

**Fig. 6. Drain Current vs. Case  
Temperature**


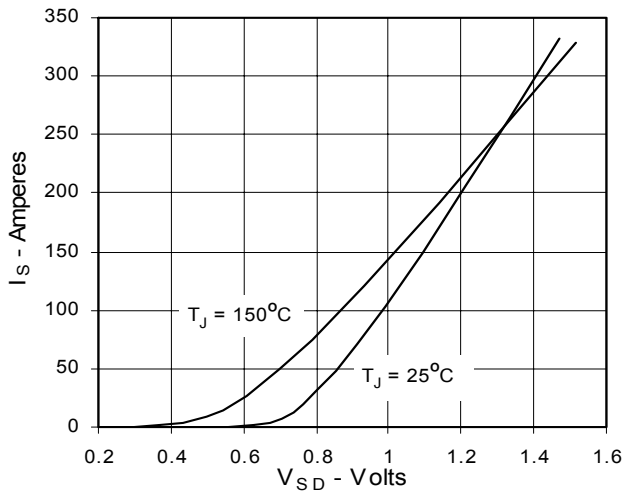
**Fig. 7. Input Admittance**



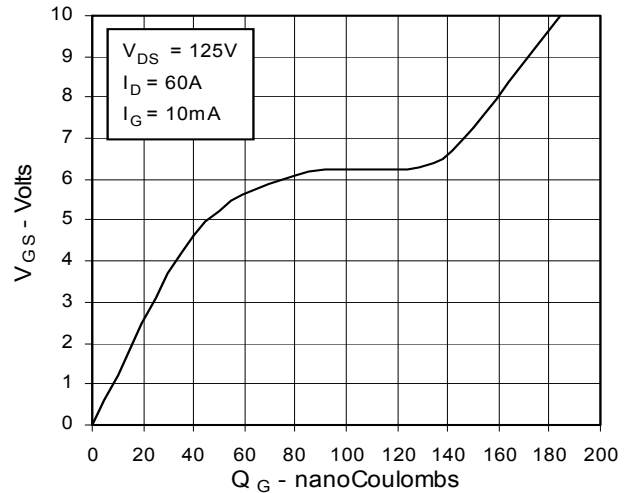
**Fig. 8. Transconductance**



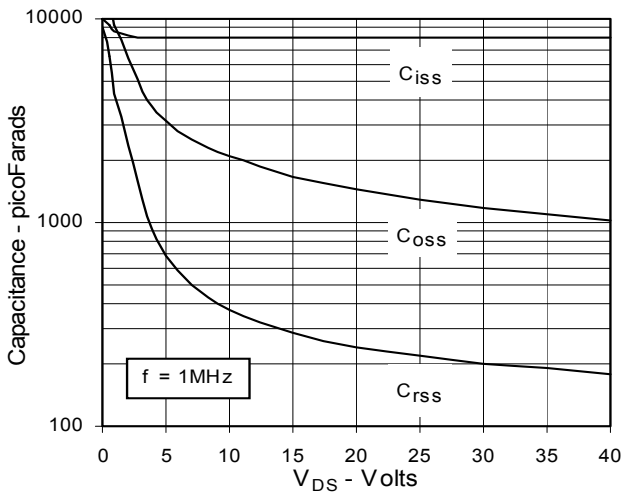
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



**Fig. 12. Forward-Bias Safe Operating Area**

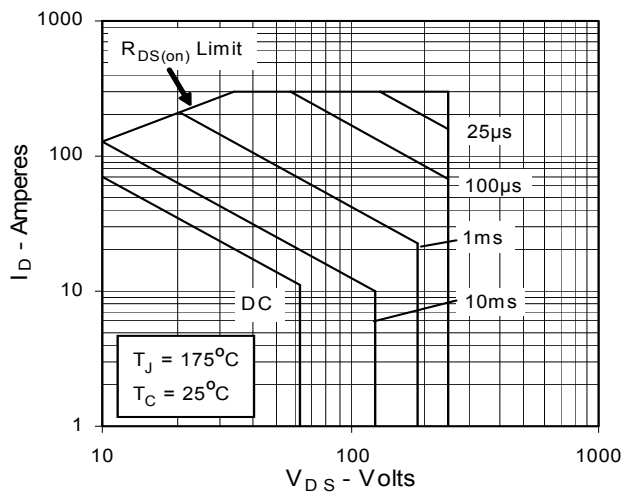


Fig. 13. Maximum Transient Thermal Resistance

