

# PolarHT™ Power MOSFET

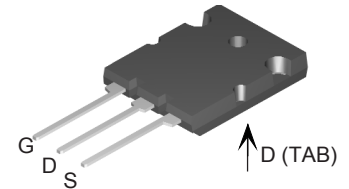
**IXTK 150N15P**  
**IXTQ 150N15P**

$$\begin{aligned} V_{DSS} &= 150 \text{ V} \\ I_{D25} &= 150 \text{ A} \\ R_{DS(on)} &\leq 13 \text{ m}\Omega \end{aligned}$$

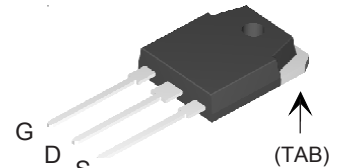
N-Channel Enhancement Mode  
Avalanche Rated



TO-264 (IXTK)



TO-3P (IXTQ)



G = Gate  
S = Source

D = Drain  
TAB = Drain

| Symbol        | Test Conditions                                                                                                                         | Maximum Ratings |                  |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$     | $T_J = 25^\circ\text{C to } 175^\circ\text{C}$                                                                                          | 150             | V                |
| $V_{DGR}$     | $T_J = 25^\circ\text{C to } 175^\circ\text{C}; R_{GS} = 1 \text{ M}\Omega$                                                              | 150             | V                |
| $V_{GS}$      | Continuous                                                                                                                              | $\pm 20$        | V                |
| $V_{GSM}$     | Transient                                                                                                                               | $\pm 30$        | V                |
| $I_{D25}$     | $T_C = 25^\circ\text{C}$                                                                                                                | 150             | A                |
| $I_{D(RMS)}$  | External lead current limit                                                                                                             | 75              | A                |
| $I_{DM}$      | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$                                                                              | 340             | A                |
| $I_{AR}$      | $T_C = 25^\circ\text{C}$                                                                                                                | 60              | A                |
| $E_{AR}$      | $T_C = 25^\circ\text{C}$                                                                                                                | 80              | 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>$T_J \leq 175^\circ\text{C}$ , $R_G = 4 \Omega$ | 10              | V/ns             |
| $P_D$         | $T_C = 25^\circ\text{C}$                                                                                                                | 714             | W                |
| $T_J$         |                                                                                                                                         | -55 ... +175    | $^\circ\text{C}$ |
| $T_{JM}$      |                                                                                                                                         | 175             | $^\circ\text{C}$ |
| $T_{stg}$     |                                                                                                                                         | -55 ... +175    | $^\circ\text{C}$ |
| $T_L$         | 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> | TO-3P                                                                                                                                   | 5.5             | g                |
|               | TO-264                                                                                                                                  | 10              | g                |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                      | Characteristic Values |      |                      |
|--------------|------------------------------------------------------------------------------------------------------------------|-----------------------|------|----------------------|
|              |                                                                                                                  | Min.                  | Typ. | Max.                 |
| $BV_{DSS}$   | $V_{GS} = 0 \text{ V}$ , $I_D = 250 \mu\text{A}$                                                                 | 150                   |      | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$                                                                      | 3.0                   |      | 5.0 V                |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}_{DC}$ , $V_{DS} = 0$                                                                  |                       |      | $\pm 100 \text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$                                                                                               |                       |      | 25 $\mu\text{A}$     |
|              | $V_{GS} = 0 \text{ V}$ , $T_J = 175^\circ\text{C}$                                                               |                       |      | 500 $\mu\text{A}$    |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>Pulse test, $t \leq 300 \mu\text{s}$ , duty cycle $d \leq 2 \%$ |                       |      | 13 $\text{m}\Omega$  |

## Features

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

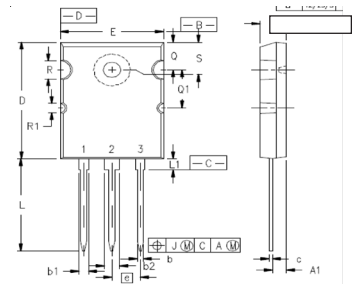
## Advantages

- Easy to mount
- Space savings
- High power density

| Symbol       | Test Conditions                                                                                     | 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                                           | 55                                                                                | 80   | S                      |
| $C_{iss}$    | $V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$                                 |                                                                                   | 5800 | pF                     |
| $C_{oss}$    |                                                                                                     |                                                                                   | 1730 | pF                     |
| $C_{rss}$    |                                                                                                     |                                                                                   | 400  | pF                     |
| $t_{d(on)}$  | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.5 V_{DSS}$ , $I_D = I_{D25}$<br>$R_G = 3.3\ \Omega$ (External) |                                                                                   | 30   | ns                     |
| $t_r$        |                                                                                                     |                                                                                   | 33   | ns                     |
| $t_{d(off)}$ |                                                                                                     |                                                                                   | 100  | ns                     |
| $t_f$        |                                                                                                     |                                                                                   | 28   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.5 V_{DSS}$ , $I_D = 0.5 I_{D25}$                               |                                                                                   | 190  | nC                     |
| $Q_{gs}$     |                                                                                                     |                                                                                   | 40   | nC                     |
| $Q_{gd}$     |                                                                                                     |                                                                                   | 105  | nC                     |
| $R_{thJC}$   |                                                                                                     |                                                                                   |      | $0.21^\circ\text{C/W}$ |
| $R_{thCK}$   | TO-3P                                                                                               |                                                                                   | 0.21 | $^\circ\text{C/W}$     |
| $R_{thCS}$   | TO-264                                                                                              |                                                                                   | 0.15 | $^\circ\text{C/W}$     |

| Source-Drain Diode |                                                                                                          | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |               |
|--------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------------|
| Symbol             | Test Conditions                                                                                          | Min.                                                                              | Typ. | Max.          |
| $I_S$              | $V_{GS} = 0\text{ V}$                                                                                    |                                                                                   |      | 150 A         |
| $I_{SM}$           | Repetitive                                                                                               |                                                                                   |      | 340 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         |
| $t_{rr}$           | $I_F = 25\text{ A}$<br>$-di/dt = 100\text{ A}/\mu\text{s}$                                               |                                                                                   | 150  | ns            |
| $Q_{RM}$           | $V_R = 100\text{ V}$ , $V_{GS} = 0\text{ V}$                                                             |                                                                                   | 2.3  | $\mu\text{C}$ |

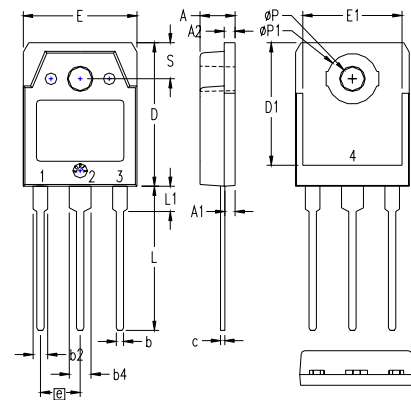
## TO-264 (IXTK) Outline



- 1 - GATE  
2, 4 - DRAIN (COLLECTOR)  
3 - SOURCE (EMITTER)

| SYM | INCHES   |       | MILLIMETERS |       |
|-----|----------|-------|-------------|-------|
|     | MIN      | MAX   | MIN         | MAX   |
| A   | .185     | .209  | 4.70        | 5.31  |
| A1  | .102     | .118  | 2.59        | 3.00  |
| b   | .037     | .055  | 0.94        | 1.40  |
| b1  | .087     | .102  | 2.21        | 2.59  |
| b2  | .110     | .126  | 2.79        | 3.20  |
| c   | .017     | .029  | 0.43        | 0.74  |
| D   | 1.007    | 1.047 | 25.58       | 26.59 |
| E   | .760     | .799  | 19.30       | 20.29 |
| e   | .215 BSC |       | 5.46 BSC    |       |
| J   | .000     | .010  | 0.00        | 0.25  |
| K   | .000     | .010  | 0.00        | 0.25  |
| L   | .779     | .842  | 19.79       | 21.39 |
| L1  | .087     | .102  | 2.21        | 2.59  |
| ØP  | .122     | .138  | 3.10        | 3.51  |
| Q   | .240     | .256  | 6.10        | 6.50  |
| Q1  | .330     | .346  | 8.38        | 8.79  |
| ØR  | .155     | .187  | 3.94        | 4.75  |
| ØR1 | .085     | .093  | 2.16        | 2.36  |
| S   | .243     | .253  | 6.17        | 6.43  |

## TO-3P (IXTQ) Outline



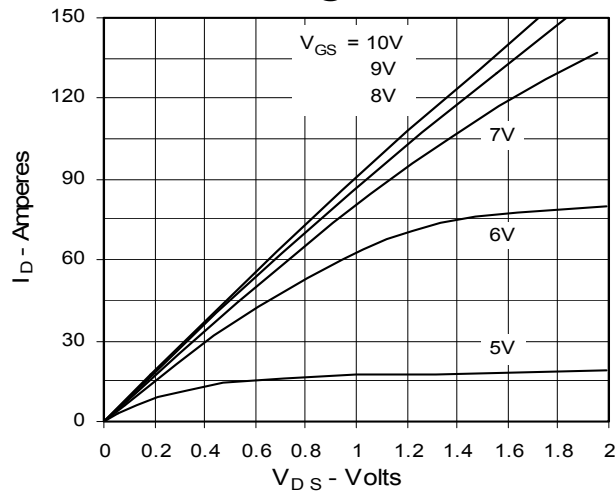
- 1 - GATE  
2 - DRAIN (COLLECTOR)  
3 - SOURCE (EMITTER)  
4 - DRAIN (COLLECTOR)

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .185     | .193 | 4.70        | 4.90  |
| A1  | .051     | .059 | 1.30        | 1.50  |
| A2  | .057     | .065 | 1.45        | 1.65  |
| b   | .035     | .045 | 0.90        | 1.15  |
| b2  | .075     | .087 | 1.90        | 2.20  |
| b4  | .114     | .126 | 2.90        | 3.20  |
| c   | .022     | .031 | 0.55        | 0.80  |
| D   | .780     | .799 | 19.80       | 20.30 |
| D1  | .665     | .677 | 16.90       | 17.20 |
| E   | .610     | .622 | 15.50       | 15.80 |
| E1  | .531     | .539 | 13.50       | 13.70 |
| e   | .215 BSC |      | 5.45 BSC    |       |
| L   | .779     | .795 | 19.80       | 20.20 |
| L1  | .134     | .142 | 3.40        | 3.60  |
| ØP  | .126     | .134 | 3.20        | 3.40  |
| ØP1 | .272     | .280 | 6.90        | 7.10  |
| S   | .193     | .201 | 4.90        | 5.10  |

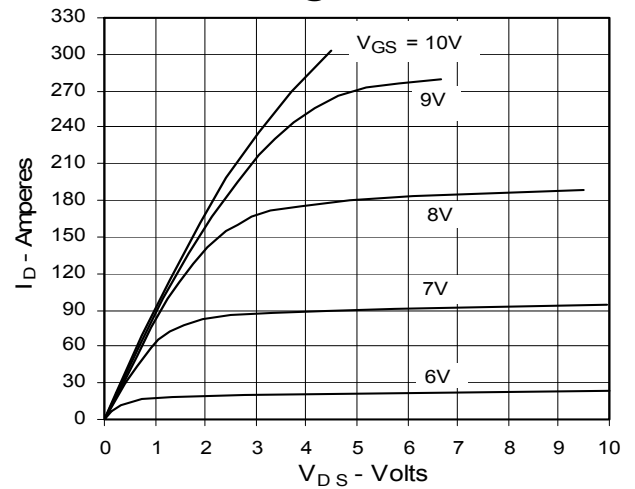
IXYS reserves the right to change limits, test conditions, and dimensions.

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 6,710,405 B2 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

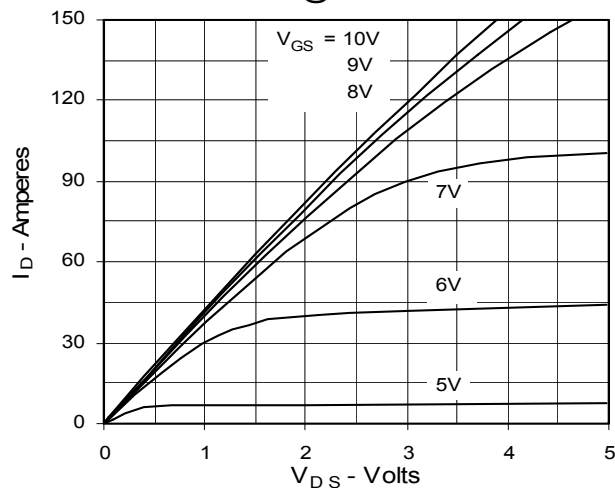
**Fig. 1. Output Characteristics**  
**@ 25°C**



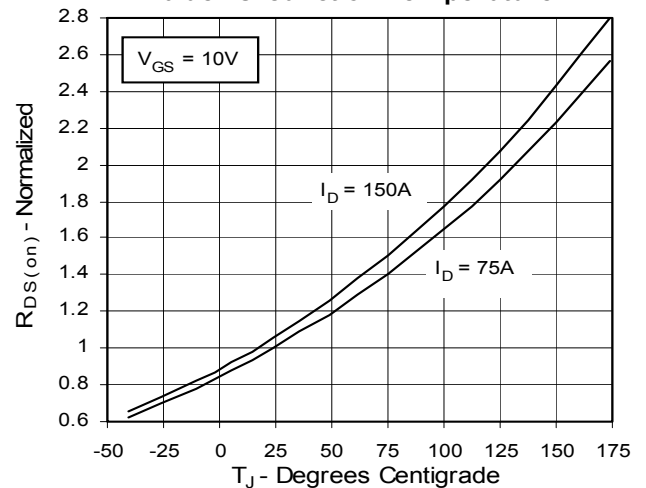
**Fig. 2. Extended Output Characteristics**  
**@ 25°C**



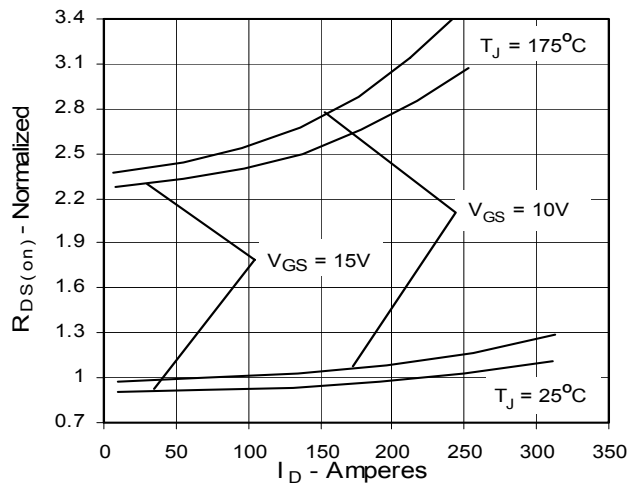
**Fig. 3. Output Characteristics**  
**@ 150°C**



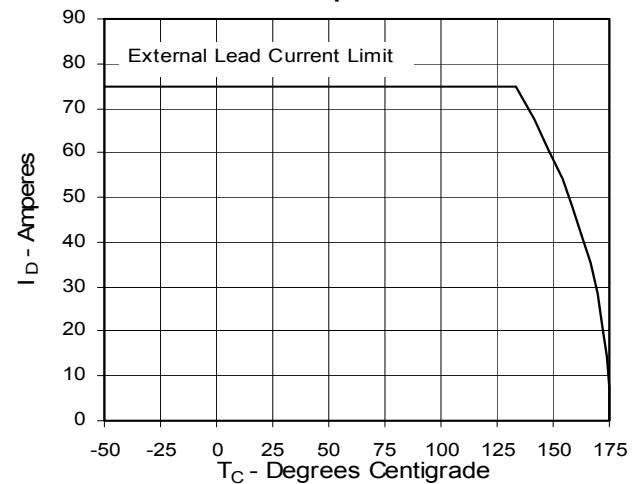
**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$**   
**Value vs. Junction Temperature**



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



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



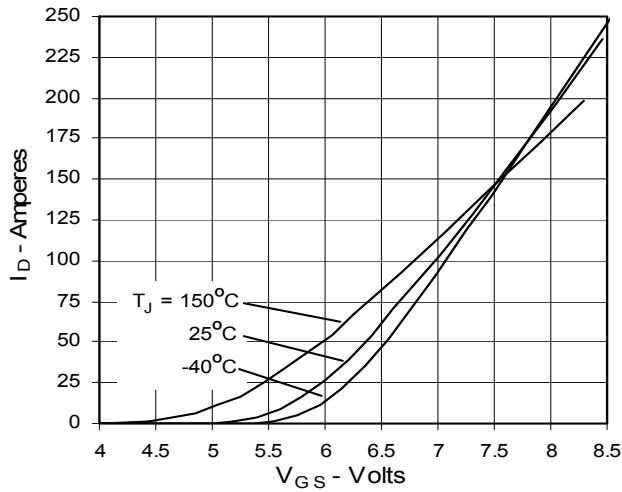
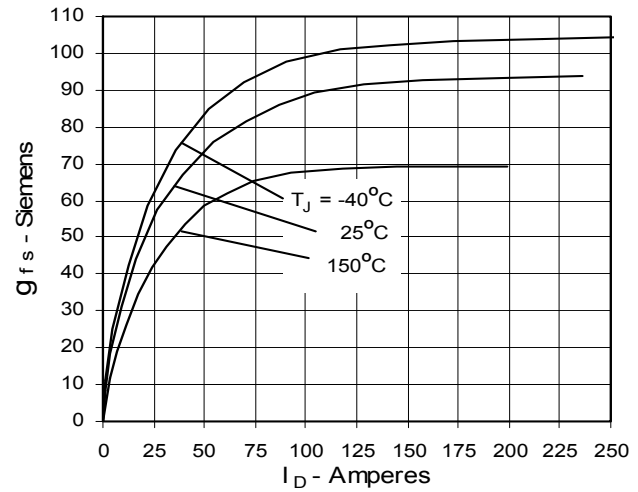
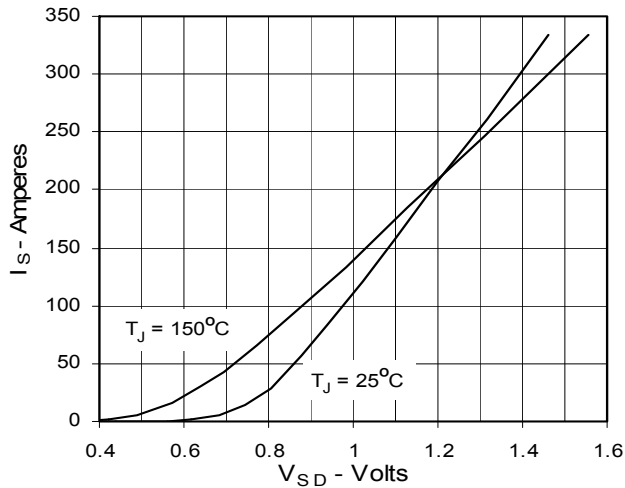
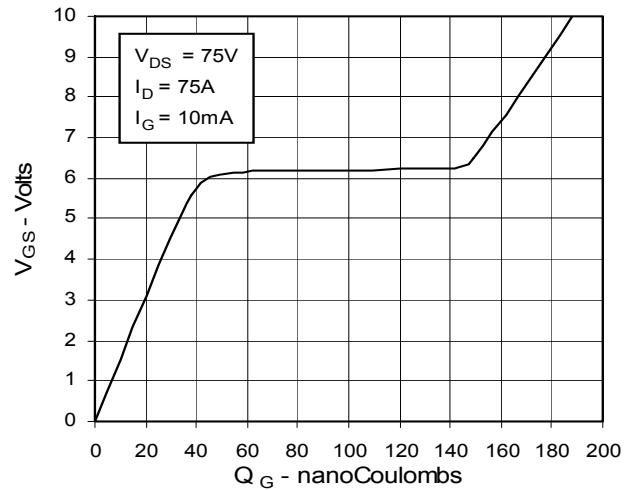
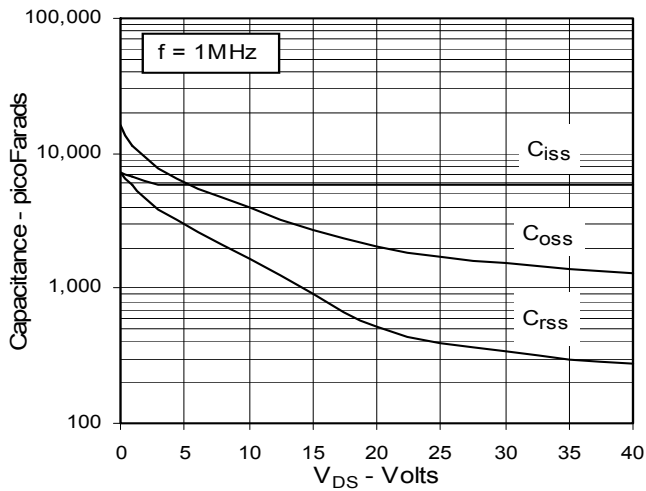
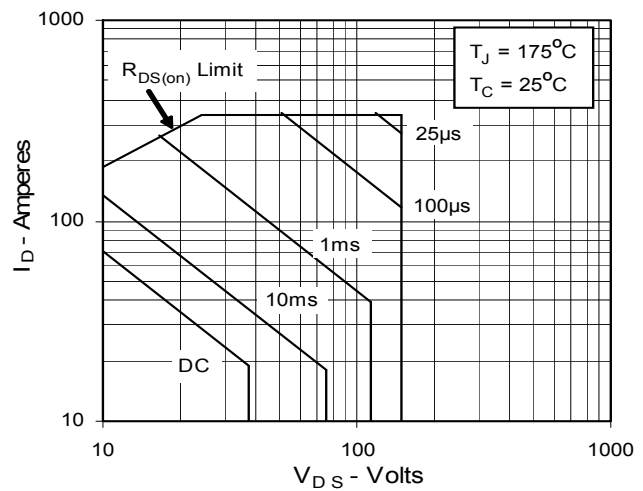
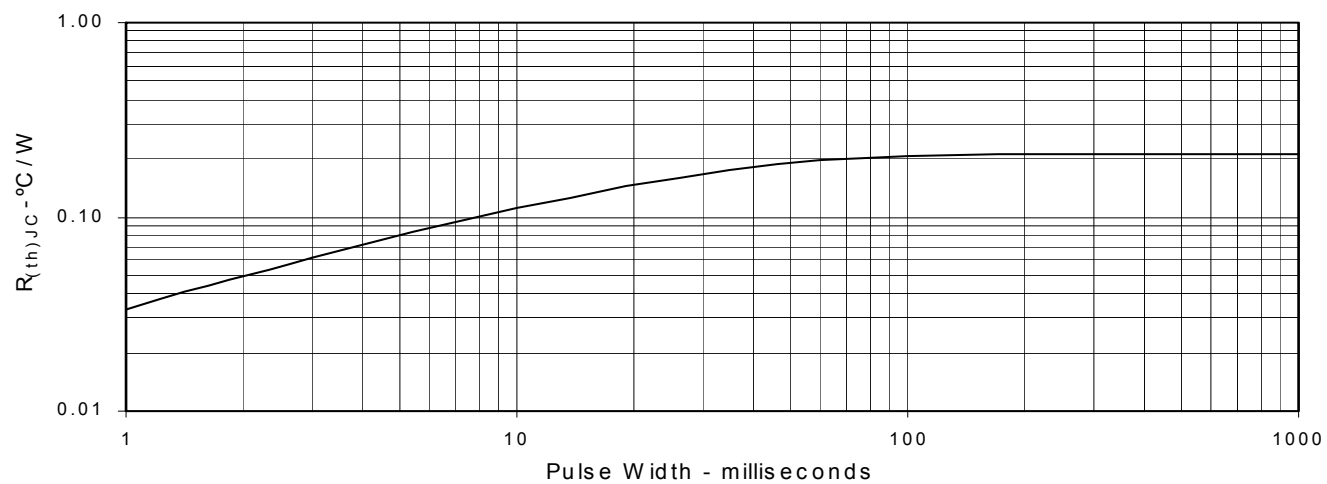
**Fig. 7. Input Admittance**

**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



# AMEYA360

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