# R6515KNXC7G

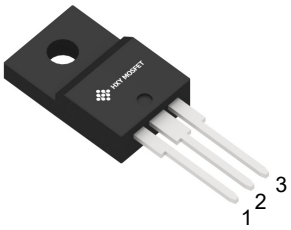
SiC Power MOSFET N-Channel Enhancement Mode

## Features

- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low $R_{DS(on)}$
- Easy to parallel
- Simple to drive
- RoHS Compliant

## Benefits

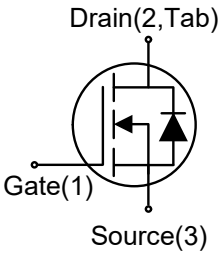
- Increased Power Density
- Faster Operating Freequency
- Reduction of Heat Sink Requirements
- Higher Efficiency
- Reduced EMI




TO-220F

## Applications

- Power Factor Correction Modules
- Switch Mode Power Supplies
- DC-AC Inverters
- High Voltage DC/DC Converters




| Ordering Part Number | Package | Brand |
|---|---|---|
| R6515KNXC7G | TO-220F | HXY MOSFET |

## Maximum Ratings ($T_C$ = 25 ˚C unless otherwise specified)

| Symbol | Parameter | Value | Unit | Test Conditions |
|---|---|---|---|---|
| $V_{DSmax}$ | Drain - Source Voltage | 650 | V | $V_{GS}$ = 0 V, $I_D$ = 100 μA |
| $V_{GSmax}$ | Gate - Source Voltage (dynamic) | -5/+26 | V | AC (f >1 Hz) |
| $V_{GSop}$ | Gate - Source Voltage (static) | 0/+18 | V | Static |
| $I_D$ | Continuous Drain Current | 15 | A | $T_C$ = 25˚C |
| | | 12 | | $T_C$ = 100˚C |
| $I_{DM}$ | Pulsed Drain Current | 39 | A | Pulse width $t_P$ limited by $T_{jmax}$ |
| $P_D$ | Power Dissipation | 52 | W | $T_C$ = 25˚C |
| | | 25 | | $T_C$ = 100˚C |
| $T_J$ , $T_{stg}$ | Operating Junction and Storage Temperature | -55 to +175 | ˚C | |

## Electrical Characteristics ($T_C$ = 25˚C unless other wise specified)

### Static Characteristics

| Symbol | Parameter | Test conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $I_D$=1 mA, $V_{GS}$=0V | 650 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=850V, $V_{GS}$=0V | | 1 | 15 | μA |
| GSS | Gate-Source Leakage Current | $V_{DS}$=0V, $V_{GS}$=18V | | | 50 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_D$=1mA<br>$T_j$=25°C<br>$T_j$=175°C | | 3.5<br>2.8 | 4 | V |
| $R_{DS(on)}$ | Drain-Source On-State Resistance | $V_{GS}$=18V, $I_D$=4.5A<br>$T_j$=25°C<br>$T_j$=175°C | | 180<br>205 | 220 | mΩ |
| | Drain-Source On-State Resistance | $V_{GS}$=15V, $I_D$=4.5A<br>$T_j$=25°C<br>$T_j$=175°C | | 260<br>295 | 300 | nA |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=400V, $f$=1MHz,<br>$V_{GS}$=0V | | 180 | | pF |
| $C_{oss}$ | Output Capacitance | | | 20 | | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | | 0.9 | | pF |
| $Q_g$ | Total Gate Charge | $V_{DS}$=400V, $I_D$=5A,<br>$R_G$ = 10 Ω<br>$V_{GS}$= 0/15V | | 11.2 | | nC |
| $Q_{gs}$ | Gate to Source Charge | | | 2.3 | | nC |
| $Q_{gd}$ | Gate to Drain Charge | | | 1.1 | | nC |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=400V, $I_D$=5 A,<br>$V_{GS}$=-5/18 V,<br>$R_G$=10Ω , | | 5 | | ns |
| $t_r$ | Rise Time | | | 17 | | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | 8 | | ns |
| $t_f$ | Fall Time | | | 10 | | ns |
| $E_{on}$ | Turn-On Energy | | | 25 | | μJ |
| $E_{off}$ | Turn-Off Energy | | | 10 | | μJ |

## Reverse Diode Characteristics

| Symbol | Parameter | Test conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$=-4V, $I_{SD}$=2.5A<br>$T_j$=25°C<br>$T_j$=175°C | | 4.0<br>3.6 | | V |
| $I_S$ | Continuous Diode Forward Current | $T_c$=25°C<br>$T_c$=100°C | | 15<br>12 | | A |
| $t_{rr}$ | Reverse Recovery Time | $I_{SD}$=-5A<br>$V_{GS}$=-5V, $I_{SD}$=4.5A,<br>$V_R$=400V,<br>di/dt=1000A/μs | | 50 | | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | | 38 | | nC |
| $I_{rrm}$ | Peak Reverse Recovery Current | | | 2.4 | | A |

## Thermal Characteristics

| Symbol | Parameter | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| $R_{th(j-c)}$ | Thermal Resistance from Junction to Case | | 2.88 | | °C/W |
| $R_{th(j-a)}$ | Thermal Resistance from Junction to Ambient | | 40 | | °C/W |

## Typical Performance

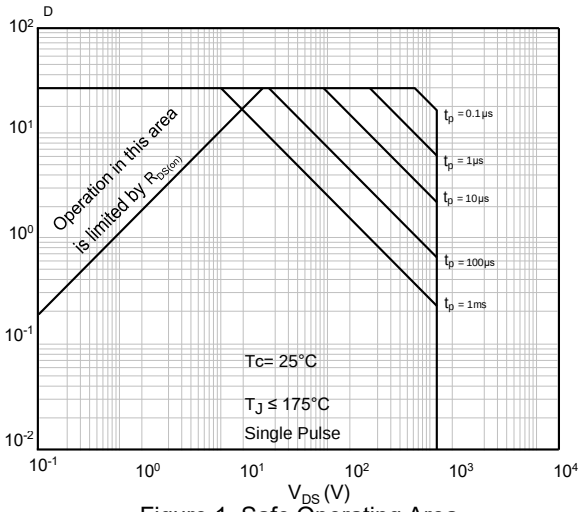



Figure 1. Safe Operating Area

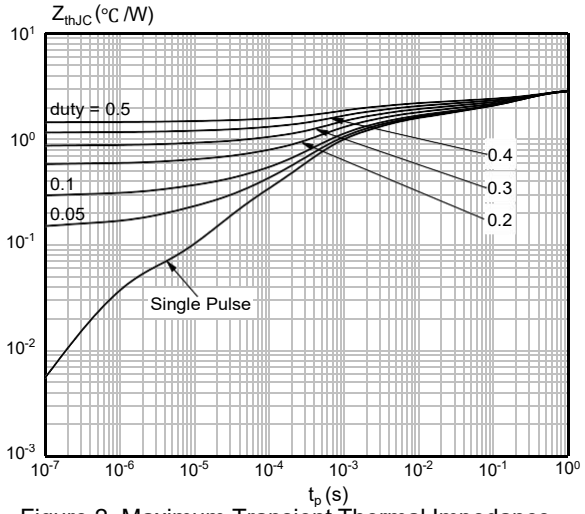



Figure 2. Maximum Transient Thermal Impedance

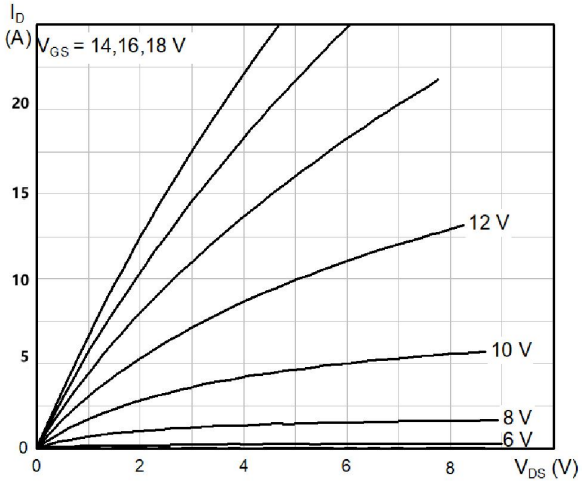



Figure 3. Typical Output Characteristics, $T_J$ = 25°C

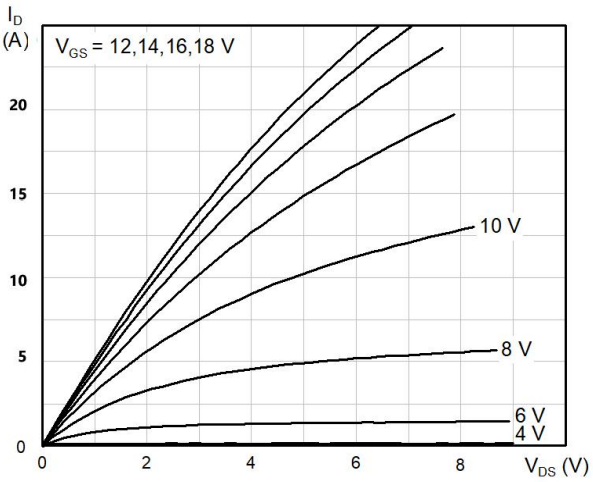



Figure 4. Typical Output Characteristics, $T_J$ = 175°C

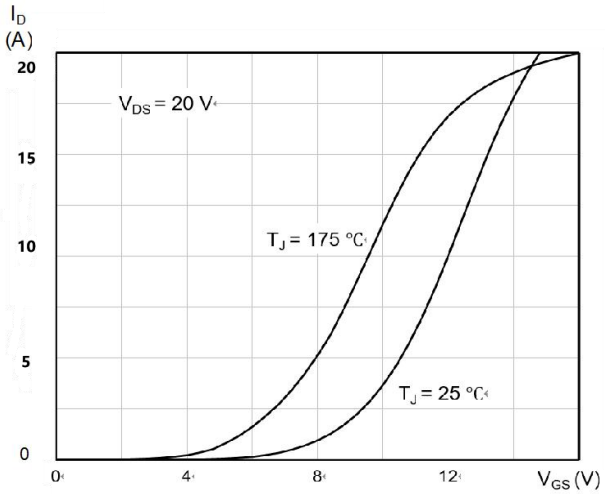



Figure 5 Typical Transfer Characteristics

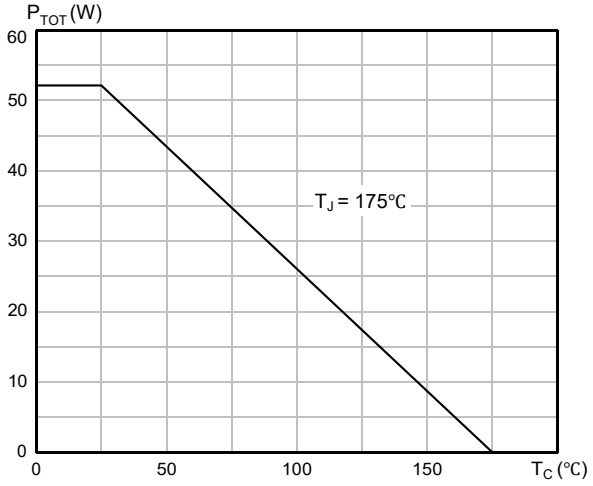



Figure 6. Total Power Dissipation

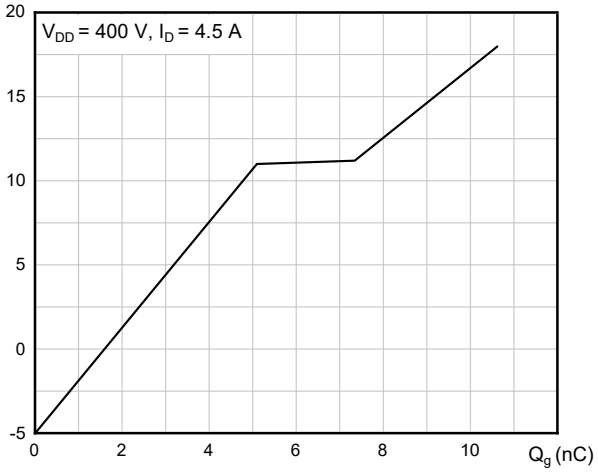



Figure 7. Typical Gate Charge Characteristics

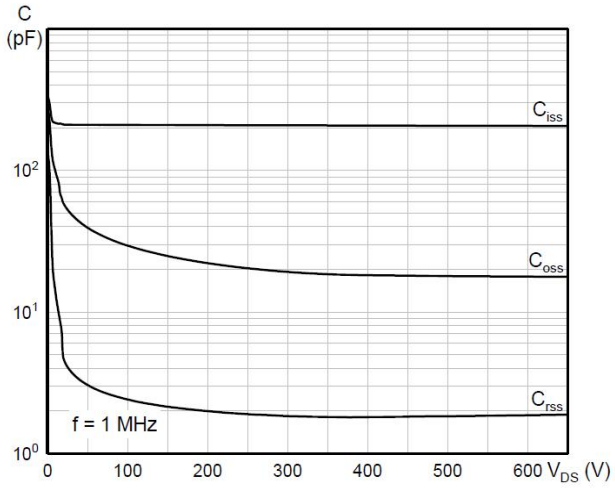



Figure 8. Typical Capacitance Characteristics

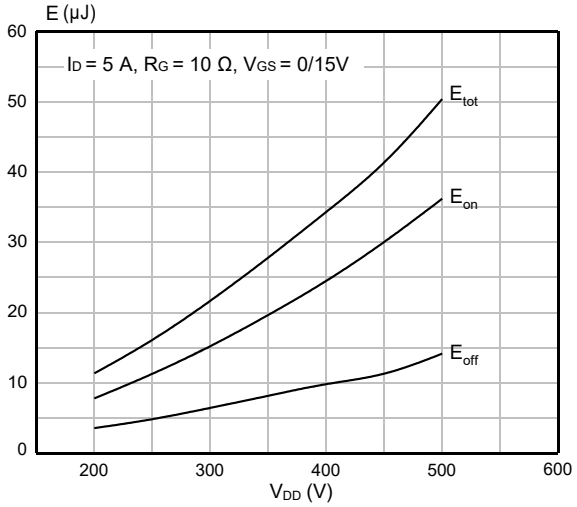



Figure 9. Typical Switching Energy vs. Supply Voltage

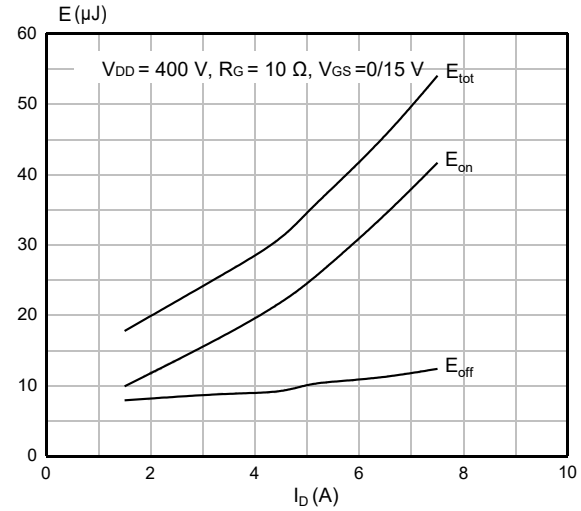



Figure 10. Typical Switching Energy vs. Drain Current

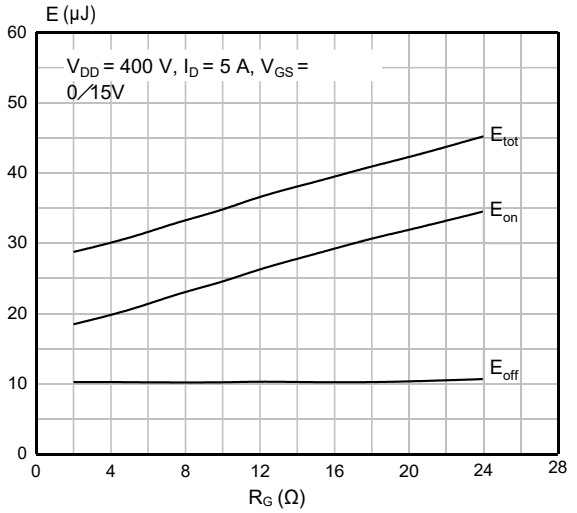



Figure 11.Switching Energy vs. Gate Resistance

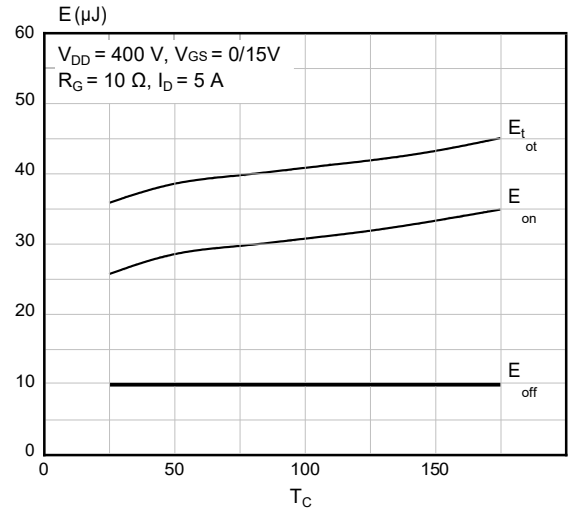



Figure 12. Typical Switching Energy vs. Temperature

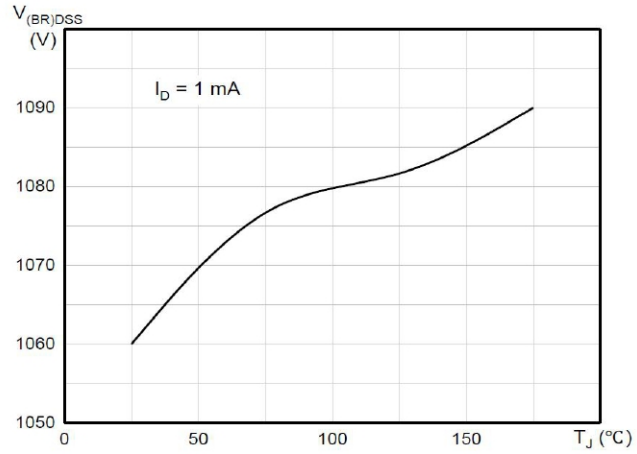



Figure 13. Breakdown Voltage vs. Temperature

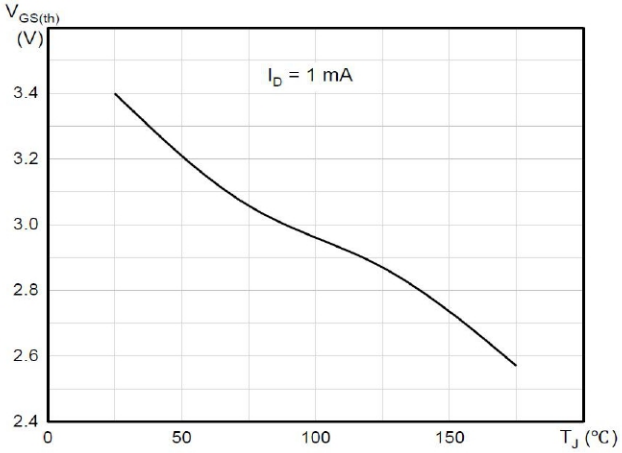



Figure 14. Gate Threshold vs. Temperature

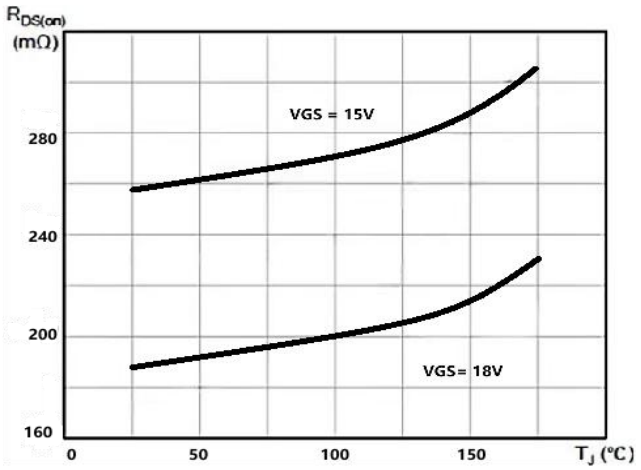



Figure 15. On-Resistance vs. Temperature

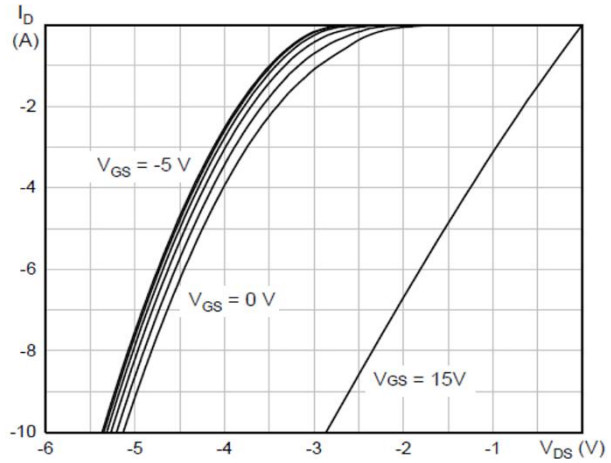



Figure 16. Body Diode Characteristics, $T_J$ = 25°C

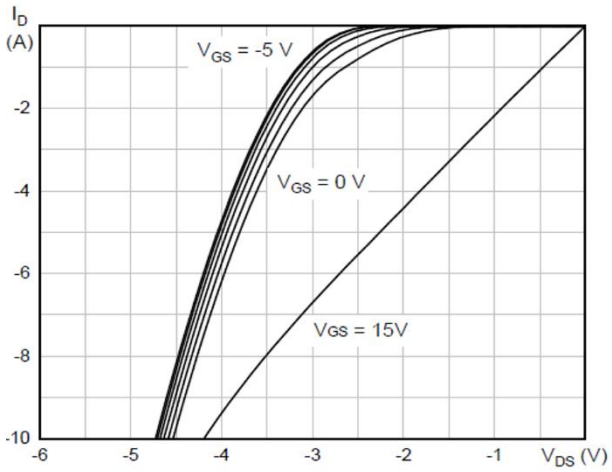
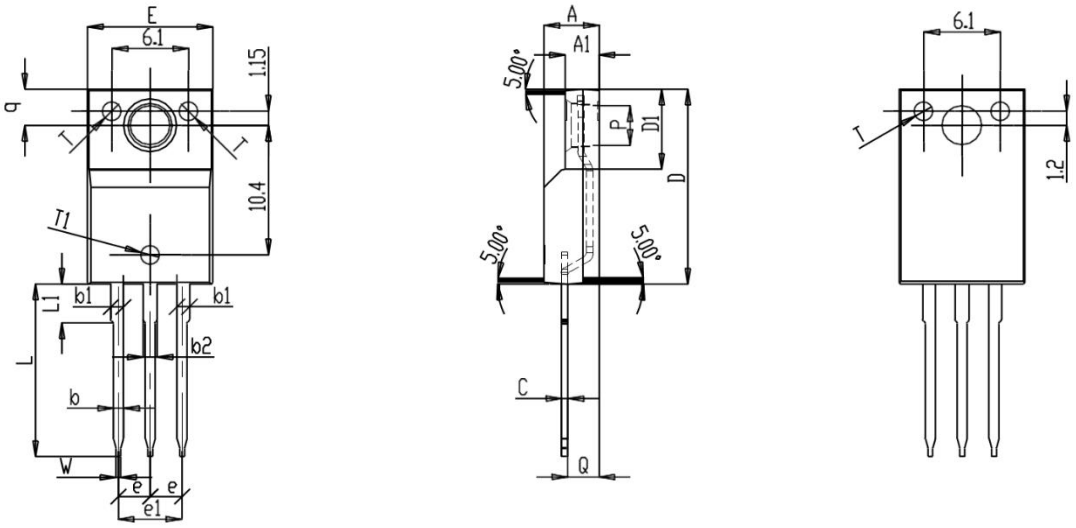



Figure 17. Body Diode Characteristics, $T_J$ = 175°C

## Package Dimensions

Package TO-220F




| SYMBOL | MILLIMETERS | | | NOTES | SYMBOL | MILLIMETERS | | | NOTES |
|---|---|---|---|---|---|---|---|---|---|
| | Normal | MIN. | MAX. | | | Normal | MIN. | MAX. | |
| A | 4.4 | 4.2 | 4.6 | | e1 | 5.08 | 5 | 5.12 | |
| A1 | 2.7 | 2.5 | 2.9 | | L | 13.90 | 13.5 | 14.4 | |
| b | 0.8 | 0.7 | 0.9 | | L1 | 3.12 | 2.8 | 3.3 | |
| b1 | 1.07 | 0.9 | 1.3 | | P | 3.14 | 3.00 | 3.20 | |
| b2 | 1.17 | 1 | 1.4 | | Q | 2.44 | 2.3 | 2.6 | |
| C | 0.5 | 0.4 | 0.6 | | q | 2.87 | 2.6 | 3 | |
| D | 15.63 | 15.4 | 15.8 | | W | 0.37 | 0.3 | 0.5 | |
| D1 | 6.22 | 6 | 6.4 | | T | 1.52 | 1.3 | 1.7 | |
| E | 10.06 | 9.7 | 10.3 | | T1 | 1.20 | 1.1 | 1.3 | |
| e | 2.54 | 2.5 | 2.58 | | | | | | |

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## HXY MOSFET:

PESDNC2XD5VBF RLSD32A121V ESD5LM5.0C-HXY HAZ4007-01H LM393DR-HXY PESDNC2XD5VBL TPSMB28A-VR HSD15C.TCT HSEN2411D3 HSEN3611D3 AQ15C-01FTG HSTS521050B331 PESDSC2FD5VU PJEC5V0M1FN2 HESDSLC3V3D3B HACPDQC5V0-HF PJSD24CW_R1 TPSMB100CA-VR AZ4836-01L BV05C-H HSG3D15B3.3MA 60N06 HCEZ36V,L3F HESD36VD3B HLY323BC1524L HPTVSUC3D5VB HRCLAMP3371ZCTFT AZ4007-01H ESD5L5.0C-HXY PESDLC2FD3V3BH