



## Features

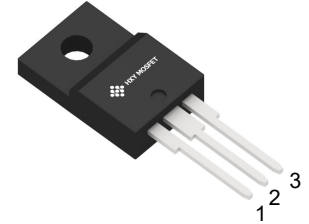
- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low  $R_{DS(on)}$
- Easy to drive and parallel
- Effectively lower down  $T_j$  and  $R_{th}$ , High anti-EMI ability
- RoHS Compliant

## Benefits

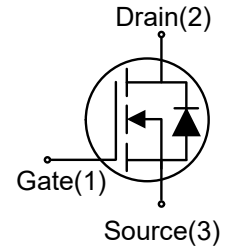
- Increased Power Density
- Faster Operating Frequency
- Reduction of Heat Sink Requirements
- Higher Efficiency
- Reduced EMI

## Applications

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



TO-220F



| Ordering Part Number | Package | Brand      |
|----------------------|---------|------------|
| R6524ENXC7G          | TO-220F | HXY MOSFET |

## Maximum Ratings ( $T_c = 25^\circ\text{C}$ unless otherwise specified)

| Symbol         | Parameter                                  | Value       | Unit             | Test Conditions                         |
|----------------|--------------------------------------------|-------------|------------------|-----------------------------------------|
| $V_{DSmax}$    | Drain - Source Voltage                     | 650         | V                |                                         |
| $V_{GSmax}$    | Gate - Source Voltage (dynamic)            | -5/+26      | V                |                                         |
| $V_{GSop}$     | Gate - Source Voltage (static)             | 0/+15       | V                |                                         |
| $I_D$          | Continuous Drain Current                   | 20          | A                | $T_C = 25^\circ\text{C}$                |
|                |                                            | 16.5        |                  | $T_C = 100^\circ\text{C}$               |
| $I_{D(pulse)}$ | Pulsed Drain Current                       | 30          | A                | Pulse width $t_p$ limited by $T_{jmax}$ |
| $P_D$          | Power Dissipation                          | 52          | W                | $T_C = 25^\circ\text{C}$                |
|                |                                            | 25          |                  | $T_C = 100^\circ\text{C}$               |
| $T_J, T_{stg}$ | Operating Junction and Storage Temperature | -55 to +175 | $^\circ\text{C}$ |                                         |



**Electrical Characteristics** ( $T_C = 25^\circ\text{C}$  unless other wise specified)

| Symbol        | Parameter                         | Min. | Typ. | Max. | Unit          | Test Conditions                                                                                        | Note    |
|---------------|-----------------------------------|------|------|------|---------------|--------------------------------------------------------------------------------------------------------|---------|
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage    | 650  |      | 850  | V             | $V_{GS} = 0\text{ V}$ , $I_D = 1\text{ mA}$                                                            |         |
| $I_{DSS}$     | Zero Gate Voltage Drain Current   |      | 2    | 100  | $\mu\text{A}$ | $V_{GS} = 0\text{ V}$ , $V_{DS} = 750\text{ V}$                                                        |         |
| $I_{GSS+}$    | Gate-Source Leakage Current       |      |      | 200  | nA            | $V_{DS} = 0\text{ V}$ , $V_{GS} = +22\text{ V}$                                                        |         |
| $I_{GSS-}$    | Gate-Source Leakage Current       |      |      | 200  | nA            | $V_{DS} = 0\text{ V}$ , $V_{GS} = -10\text{ V}$                                                        |         |
| $V_{GS(th)}$  | Gate Threshold Voltage            | 2.2  | 3.5  | 4.2  | V             | $V_{GS} = V_{DS}$ , $I_{DS} = 1\text{ mA}$ , $T_J = 25^\circ\text{C}$                                  | Fig. 14 |
|               |                                   |      | 2.6  |      |               | $V_{GS} = V_{DS}$ , $I_{DS} = 1\text{ mA}$ , $T_J = 175^\circ\text{C}$                                 |         |
| $R_{DS(on)}$  | Static Drain-Source On-Resistance |      | 160  | 180  | m $\Omega$    | $V_{GS} = 15\text{ V}$ , $I_D = 6\text{ A}$ , $T_J = 25^\circ\text{C}$                                 | Fig. 15 |
|               |                                   |      | 195  |      |               | $V_{GS} = 15\text{ V}$ , $I_D = 6\text{ A}$ , $T_J = 175^\circ\text{C}$                                |         |
| $C_{iss}$     | Input Capacitance                 |      | 208  |      | pF            | $V_{DS} = 400\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0\text{ V}$                                   | Fig. 8  |
| $C_{oss}$     | Output Capacitance                |      | 18   |      |               |                                                                                                        |         |
| $C_{rss}$     | Reverse Transfer Capacitance      |      | 1.8  |      |               |                                                                                                        |         |
| $Q_g$         | Total Gate Charge                 |      | 10.6 |      | nC            | $V_{DD} = 400\text{ V}$ , $V_{GS} = -5/18\text{ V}$ , $I_D = 5\text{ A}$                               | Fig. 7  |
| $Q_{gs}$      | Gate-Source Charge                |      | 5.1  |      |               |                                                                                                        |         |
| $Q_{gd}$      | Gate-Drain Charge                 |      | 2.2  |      |               |                                                                                                        |         |
| $R_{G(int)}$  | Gate Input Resistance             |      | 1.2  |      | $\Omega$      | $f = 1\text{ MHz}$ , $I_D = 0\text{ A}$                                                                |         |
| $E_{on}$      | Turn-On Switching Energy          |      | 25   |      | $\mu\text{J}$ | $V_{DD} = 400\text{ V}$ , $I_D = 5\text{ A}$ , $R_G = 10\text{ }\Omega$ ,<br>$V_{GS} = -5/18\text{ V}$ | Fig. 12 |
| $E_{off}$     | Turn-Off Switching Energy         |      | 10   |      |               |                                                                                                        |         |
| $t_{d(on)}$   | Turn-On Delay Time                |      | 5    |      | ns            | $V_{DD} = 400\text{ V}$ , $I_D = 5\text{ A}$ , $R_G = 10\text{ }\Omega$ ,<br>$V_{GS} = -5/18\text{ V}$ |         |
| $t_r$         | Rise Time                         |      | 17   |      |               |                                                                                                        |         |
| $t_{d(off)}$  | Turn-Off Delay Time               |      | 8    |      |               |                                                                                                        |         |
| $t_f$         | Fall Time                         |      | 10   |      |               |                                                                                                        |         |



### Reverse SiC Diode Characteristics

| Symbol    | Parameter                        | Typ. | Max. | Unit | Test Conditions                                                      | Note    |
|-----------|----------------------------------|------|------|------|----------------------------------------------------------------------|---------|
| $V_{SD}$  | Diode Forward Voltage            | 4.0  |      | V    | $V_{GS} = -4V, I_{SD} = 5A, T_J = 25^{\circ}C$                       | Fig. 16 |
|           |                                  | 3.6  |      |      | $V_{GS} = -4V, I_{SD} = 5A, T_J = 175^{\circ}C$                      | Fig. 17 |
| $*I_{SD}$ | Continuous Diode Forward Current |      | 18   | A    | $T_C = 25^{\circ}C$                                                  |         |
|           |                                  |      | 10   |      | $T_C = 175^{\circ}C$                                                 |         |
| $t_{rr}$  | Reverse Recovery Time            | 50   |      | ns   | $I_{SD} = 5A, di/dt = 1000A/\mu s,$<br>$V_{DD} = 400V, V_{GS} = -5V$ |         |
| $Q_{rr}$  | Reverse Recovery Charge          | 38   |      | nC   |                                                                      |         |
| $I_{RRM}$ | Peak Reverse Recovery Current    | 2.4  |      | A    |                                                                      |         |

\* Depends on bonding wire

### Thermal Characteristics

| Symbol     | Parameter                                   | Typ. | Unit          | Test Conditions | Note   |
|------------|---------------------------------------------|------|---------------|-----------------|--------|
| $R_{thJC}$ | Thermal Resistance from Junction to Case    | 2.88 | $^{\circ}C/W$ |                 | Fig. 2 |
| $R_{thJA}$ | Thermal Resistance From Junction to Ambient | 40   |               |                 |        |



## Typical Performance

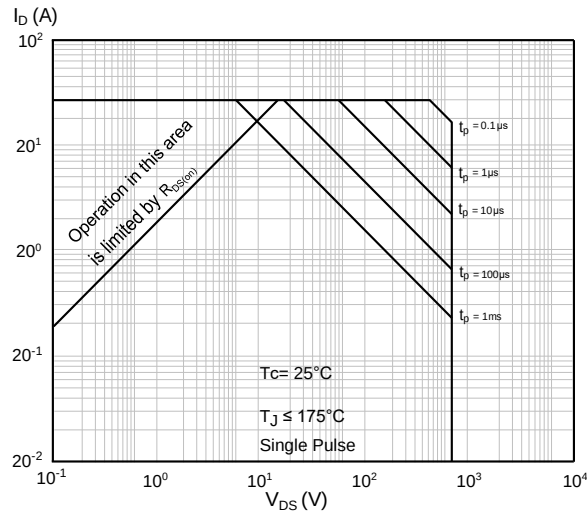


Figure 1. Safe Operating Area

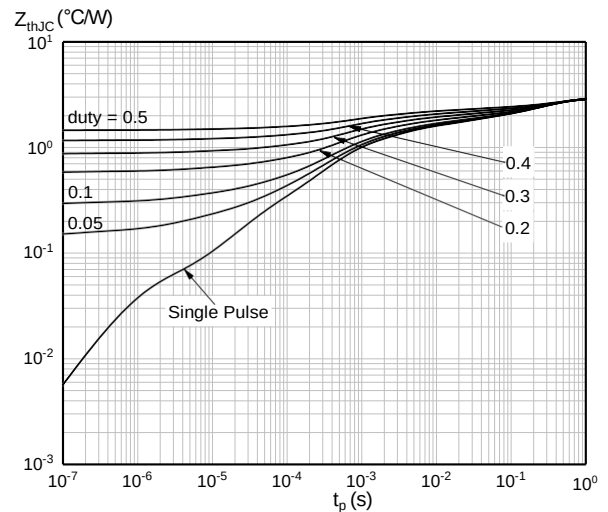


Figure 2. Maximum Transient Thermal Impedance

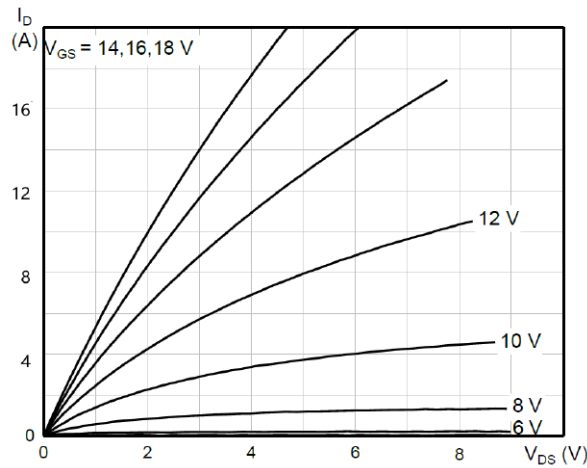


Figure 3. Typical Output Characteristics,  $T_J = 25^\circ\text{C}$

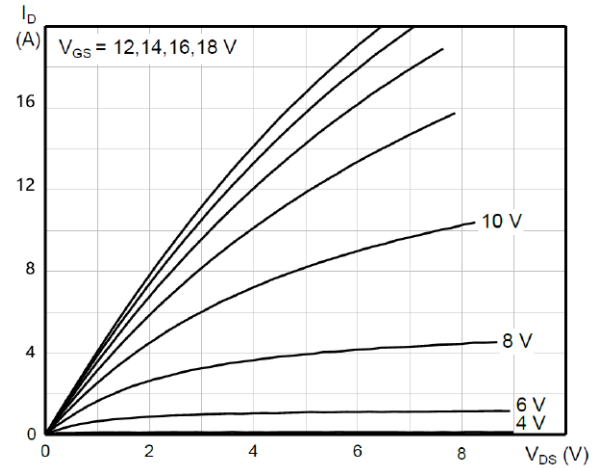


Figure 4. Typical Output Characteristics,  $T_J = 175^\circ\text{C}$

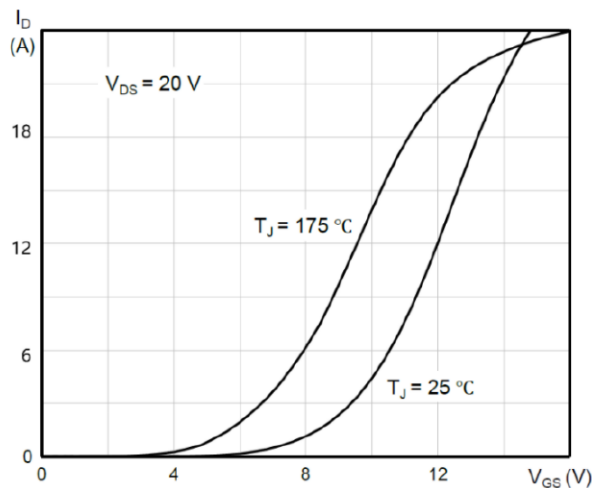


Figure 5. Typical Transfer Characteristics

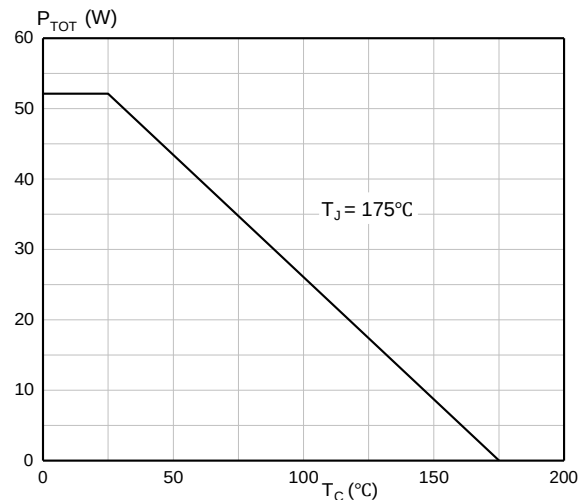
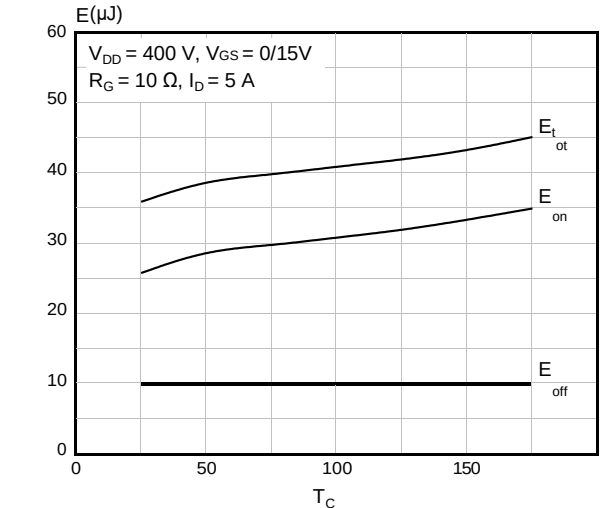
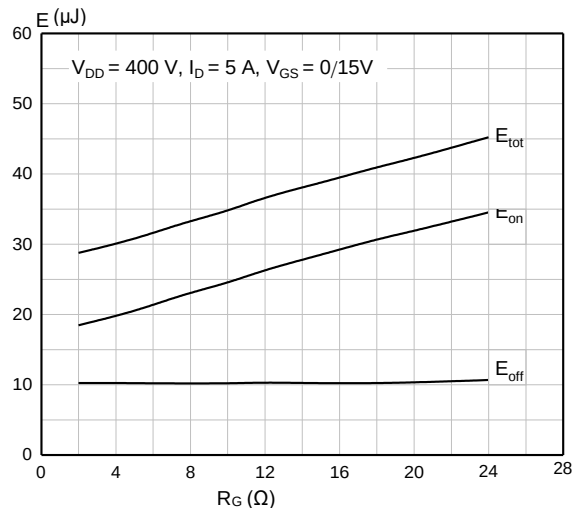
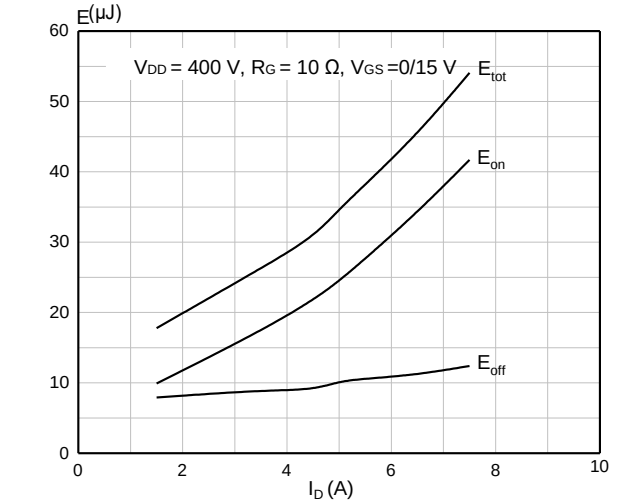
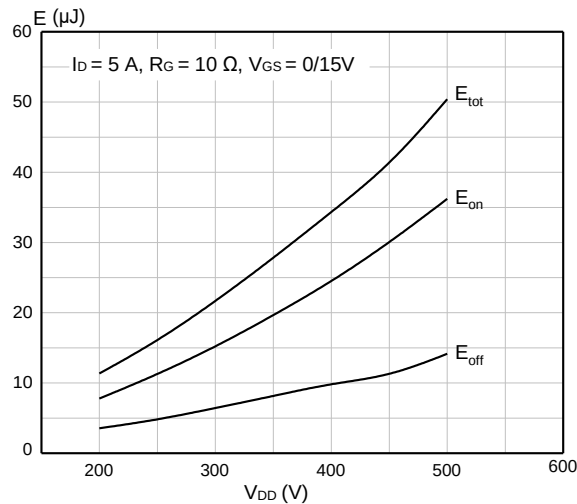
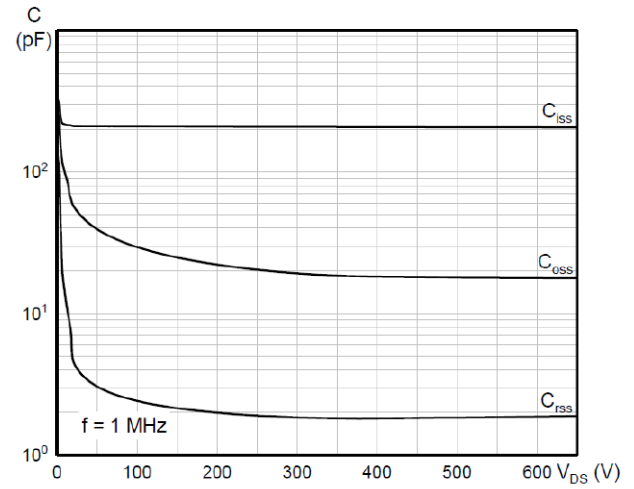
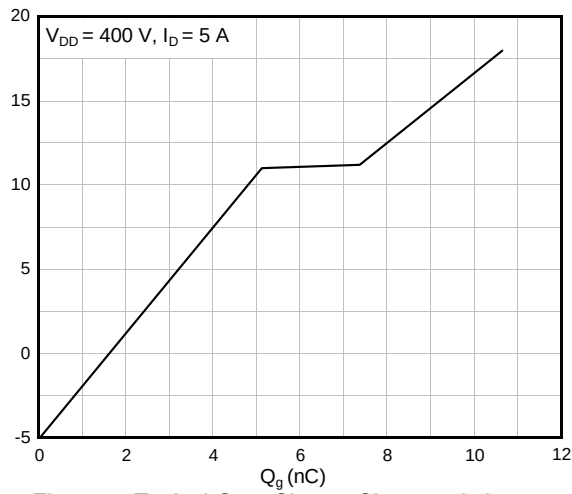


Figure 6. Total Power Dissipation



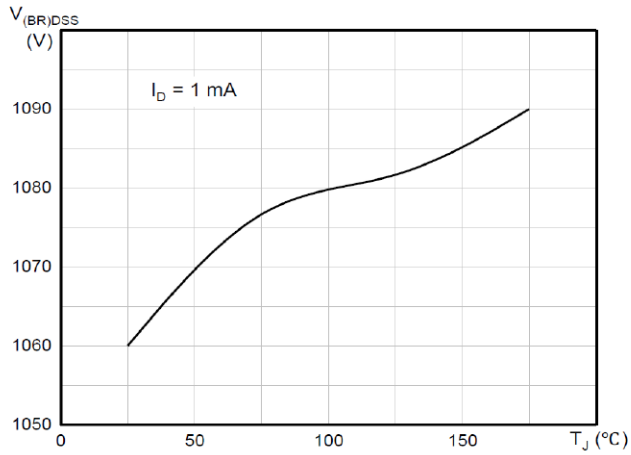


Figure 13. Breakdown Voltage vs. Temperature

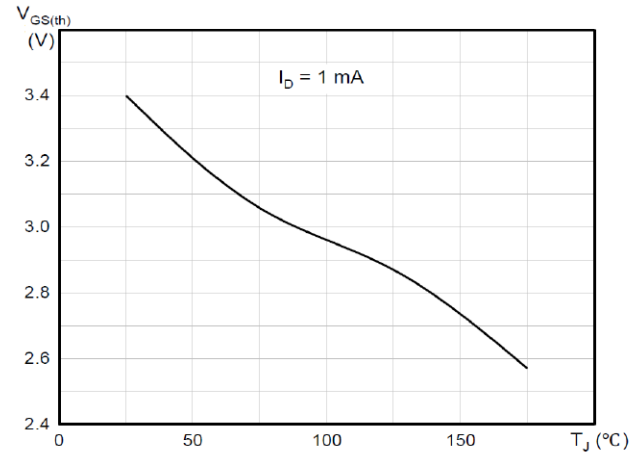


Figure 14. Gate Threshold vs. Temperature

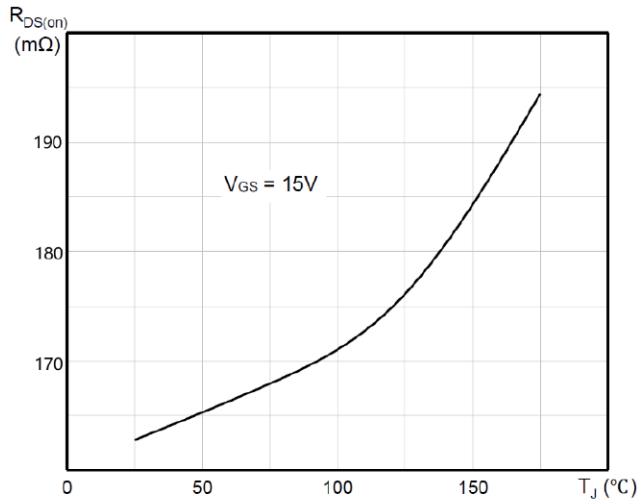


Figure 15. On-Resistance vs. Temperature

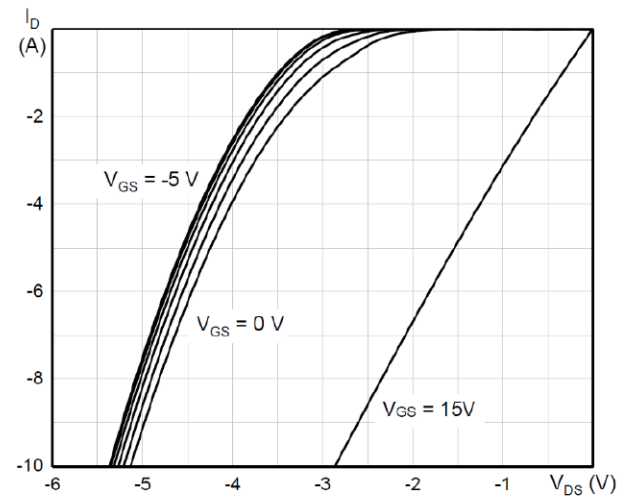
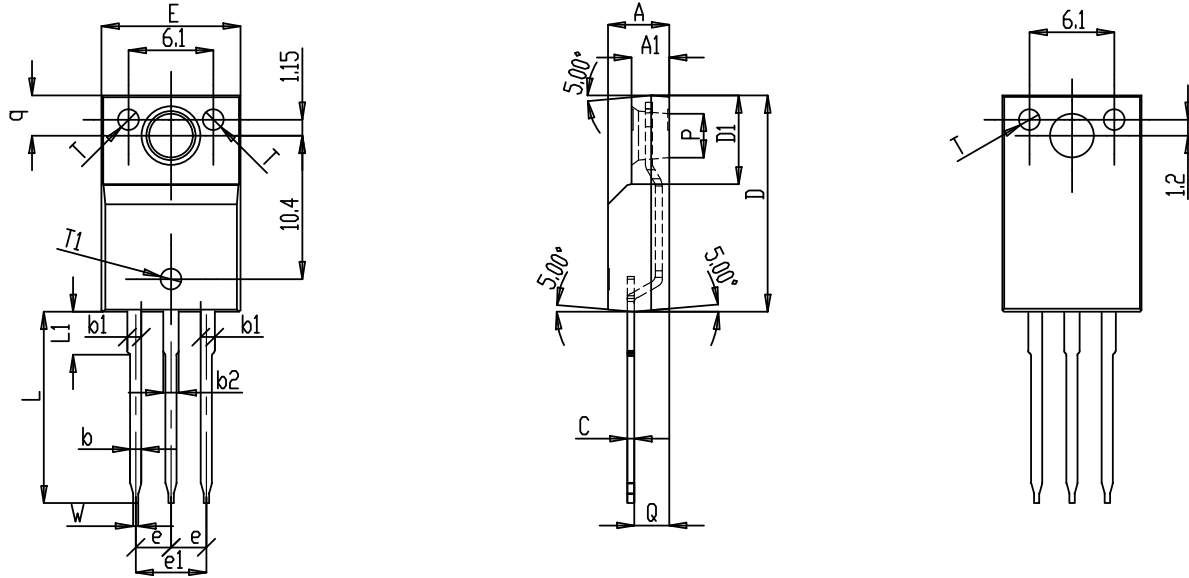


Figure 16. Body Diode Characteristics, T<sub>J</sub> = 25°C



## 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 |       |        |             |      |      |       |



### **Attention**

- Any and all HUA XUAN YANG ELECTRONICS products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your HUA XUAN YANG ELECTRONICS representative nearest you before using any HUA XUAN YANG ELECTRONICS products described or contained herein in such applications.
- HUA XUAN YANG ELECTRONICS assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all HUA XUAN YANG ELECTRONICS products described or contained herein.
- Specifications of any and all HUA XUAN YANG ELECTRONICS products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- HUA XUAN YANG ELECTRONICS CO.,LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all HUA XUAN YANG ELECTRONICS products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of HUA XUAN YANG ELECTRONICS CO.,LTD.
- Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. HUA XUAN YANG ELECTRONICS believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the HUA XUAN YANG ELECTRONICS product that you intend to use.