

|                   |   |       |
|-------------------|---|-------|
| $V_{DS}$          | = | 1700V |
| $R_{DS(on)}$      | = | 45mΩ  |
| $I_D@25^{\circ}C$ | = | 72A   |

## Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Easy to Parallel and Simple to Drive

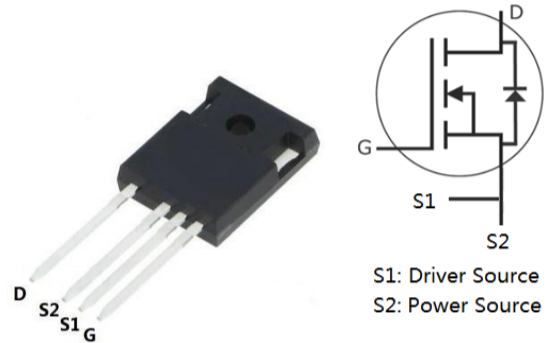
## Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

## Applications

- Power Supplies
- High Voltage DC/DC Converters
- Motor Drives
- Switch Mode Power Supplies
- Pulsed Power Applications

## Package



| Part Number | Package  |
|-------------|----------|
| YX170R045   | TO-247-4 |

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

| Symbol         | Parameter                                  | Value       | Unit        | Test Conditions                         | Note |
|----------------|--|-------------|-------------|---|------|
| $V_{DSmax}$    | Drain-Source Voltage                       | 1700        | V           | $V_{GS}=0V, I_D=100\mu A$               |      |
| $V_{GSmax}$    | Gate-Source Voltage                        | -10/+25     | V           | Absolute maximum values                 |      |
| $V_{GSop}$     | Gate-Source Voltage                        | -5/+20      | V           | Recommended operational values          |      |
| $I_D$          | Continuous Drain Current                   | 72          | A           | $V_{GS}=20V, T_c=25^{\circ}C$           |      |
|                |  | 48          |             | $V_{GS}=20V, T_c=100^{\circ}C$          |      |
| $I_{D(pulse)}$ | Pulsed Drain Current                       | 160         | A           | Pulse width $t_p$ limited by $T_{Jmax}$ |      |
| $P_D$          | Power Dissipation                          | 520         | W           | $T_c=25^{\circ}C, T_J=150^{\circ}C$     |      |
| $T_J, T_{STG}$ | Operating Junction and Storage Temperature | -40 to +150 | $^{\circ}C$ |   |      |

**Electrical Characteristics (T<sub>c</sub>=25°C unless otherwise specified)**

| Symbol               | Parameter                        | Min. | Typ. | Max. | Unit   | Test Conditions  | Note       |
|----------------------|----------------------------------|------|------|------|--|--|------------|
| V <sub>(BR)DSS</sub> | Drain-Source Breakdown Voltage   | 1700 | /    | /    | V  | V <sub>GS</sub> =0V, I <sub>D</sub> =100μA   |            |
| V <sub>GS(th)</sub>  | Gate Threshold Voltage           | 2.0  | 2.6  | 4.0  | V  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =18mA  | Fig. 11    |
|                      |                                  | /    | 1.8  | /    |  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =18mA, T <sub>J</sub> =150°C                                     |            |
| I <sub>DSS</sub>     | Zero Gate Voltage Drain Current  | /    | 1    | 100  | μA   | V <sub>DS</sub> =1700V, V <sub>GS</sub> =0V  |            |
| I <sub>GSS+</sub>    | Gate-Source Leakage Current      | /    | 10   | 250  | nA   | V <sub>DS</sub> =0V, V <sub>GS</sub> =25V  |            |
| I <sub>GSS-</sub>    | Gate-Source Leakage Current      | /    | 10   | 250  | nA   | V <sub>DS</sub> =0V, V <sub>GS</sub> =-10V   |            |
| R <sub>DS(on)</sub>  | Drain-Source On-State Resistance | /    | 45   | 70   | mΩ   | V <sub>GS</sub> =20V, I <sub>D</sub> =50A  |            |
|                      |                                  | /    | 90   | /    |  | V <sub>GS</sub> =20V, I <sub>D</sub> =50A, T <sub>J</sub> =150°C   |            |
| g <sub>fs</sub>      | Transconductance                 | /    | 25.8 | /    |  | V <sub>DS</sub> =20V, I <sub>D</sub> =50A  | Fig. 4,5,6 |
|                      |                                  | /    | 27.0 | /    | V <sub>DS</sub> =20V, I <sub>D</sub> =50A, T <sub>J</sub> =150°C |  |            |
| C <sub>iss</sub>     | Input Capacitance                | /    | 3550 | /    | pF   | V <sub>GS</sub> =0V  | Fig. 15,16 |
| C <sub>oss</sub>     | Output Capacitance               | /    | 165  | /    |  | V <sub>DS</sub> =1000V   |            |
| C <sub>rss</sub>     | Reverse Transfer Capacitance     | /    | 6.1  | /    |  | f=1MHz   |            |
| E <sub>oss</sub>     | C <sub>oss</sub> Stored Energy   | /    | 101  | /    | μJ   | V <sub>AC</sub> =25mV  |            |
| E <sub>ON</sub>      | Turn-On Switching Energy         | /    | 3.1  | /    | μJ   | V <sub>DS</sub> =1200V, V <sub>GS</sub> =-5V/20V   |            |
| E <sub>OFF</sub>     | Turn-Off Switching Energy        | /    | 1.1  | /    |  | I <sub>D</sub> =30A, R <sub>g</sub> =2.5Ω, L=200μH   |            |
| t <sub>d(on)</sub>   | Turn-On Delay Time               | /    | 27   | /    | ns   | V <sub>DS</sub> =1200V, V <sub>GS</sub> =-5V/20V, I <sub>D</sub> =30A<br>R <sub>g</sub> =2.5Ω, R <sub>L</sub> =20Ω |            |
| t <sub>r</sub>       | Rise Time                        | /    | 32   | /    |  |  |            |
| t <sub>d(off)</sub>  | Turn-Off Delay Time              | /    | 36   | /    |  |  |            |
| t <sub>f</sub>       | Fall Time                        | /    | 10   | /    |  |  |            |
| R <sub>G(int)</sub>  | Internal Gate Resistance         | /    | 2.6  | /    | Ω  | f=1MHz, V <sub>AC</sub> =25mV  |            |
| Q <sub>GS</sub>      | Gate to Source Charge            | /    | 54   | /    | nC   | V <sub>DS</sub> =1200V   |            |
| Q <sub>GD</sub>      | Gate to Drain Charge             | /    | 25   | /    |  | V <sub>GS</sub> =-5V/20V   |            |
| Q <sub>G</sub>       | Total Gate Charge                | /    | 193  | /    |  | I <sub>D</sub> =50A  |            |

**Reverse Diode Characteristics**

| Symbol           | Parameter                        | Typ. | Max. | Unit | Test Conditions  | Note        |
|------------------|----------------------------------|------|------|------|--|-------------|
| V <sub>SD</sub>  | Diode Forward Voltage            | 3.6  | /    | V    | V <sub>GS</sub> =-5V, I <sub>F</sub> =25A                        | Fig. 8,9,10 |
|                  |                                  | 3.3  | /    |      | V <sub>GS</sub> =-5V, I <sub>F</sub> =25A, T <sub>J</sub> =150°C |             |
| I <sub>S</sub>   | Continuous Diode Forward Current | /    | 72   | A    | T <sub>c</sub> =25°C   |             |
| t <sub>rr</sub>  | Reverse Recover Time             | 55   | /    | ns   | V <sub>R</sub> =1200V, I <sub>SD</sub> =50A                      |             |
| Q <sub>rr</sub>  | Reverse Recovery Charge          | 220  | /    | nC   |  |             |
| I <sub>rrm</sub> | Peak Reverse Recovery Current    | 6.7  | /    | A    |  |             |

**Reverse Diode Characteristics**

| Symbol           | Parameter          | Typ. | Max. | Unit | Test Conditions | Note |
|------------------|--------------------|------|------|------|-----------------|------|
| R <sub>θJC</sub> | Thermal Resistance | 0.24 | 0.28 | °C/W |                 |      |

## Typical Performance

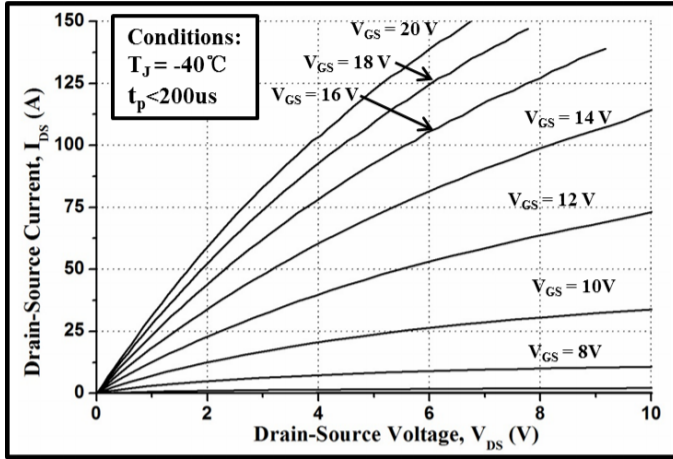


Figure 1. Output Characteristics  $T_J = -40^\circ\text{C}$

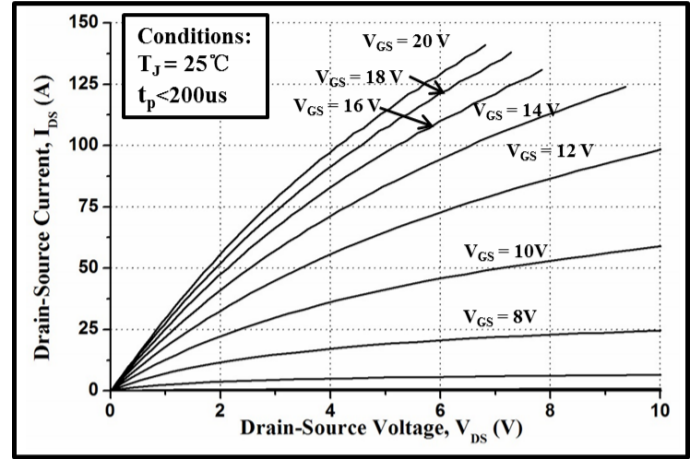


Figure 2. Output Characteristics  $T_J = 25^\circ\text{C}$

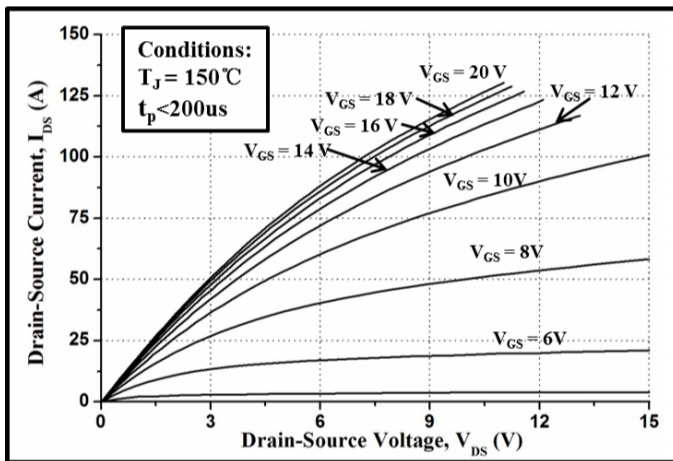


Figure 3. Output Characteristics  $T_J = 150^\circ\text{C}$

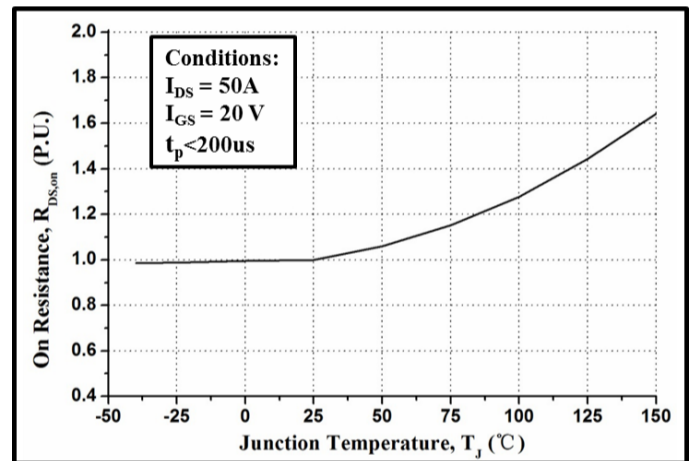


Figure 4. Normalized On-Resistance vs. Temperature

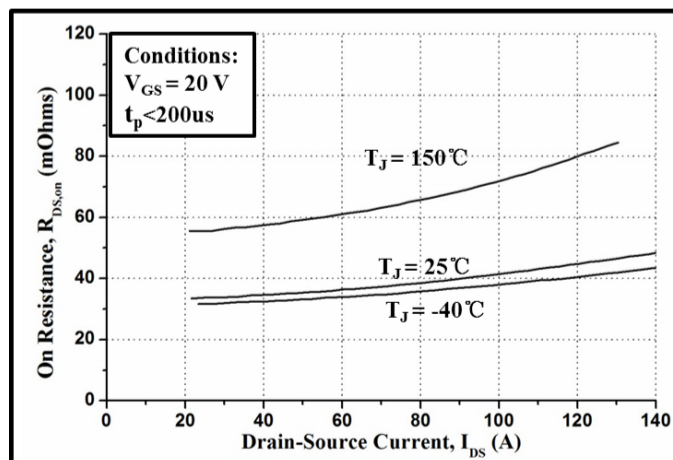


Figure 5. On-Resistance vs. Drain Current  
For Various Temperatures

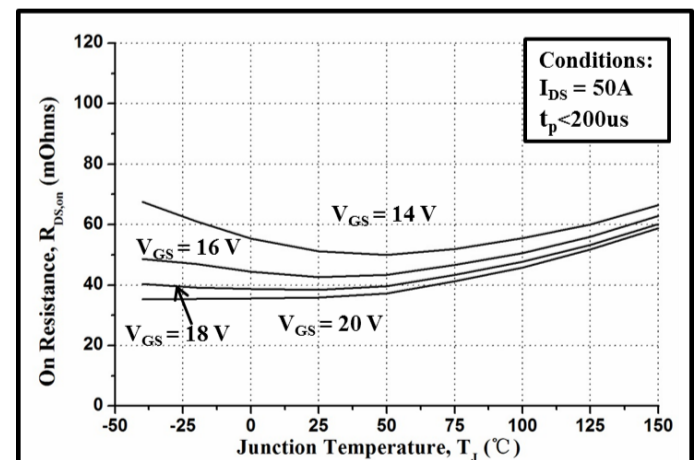


Figure 6. On-Resistance vs. Temperature  
For Various Gate Voltage

## Typical Performance

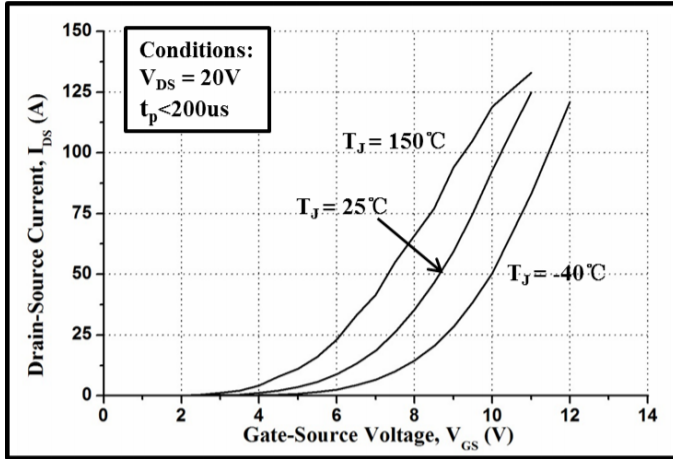


Figure 7. Transfer Characteristic for Various Junction Temperatures

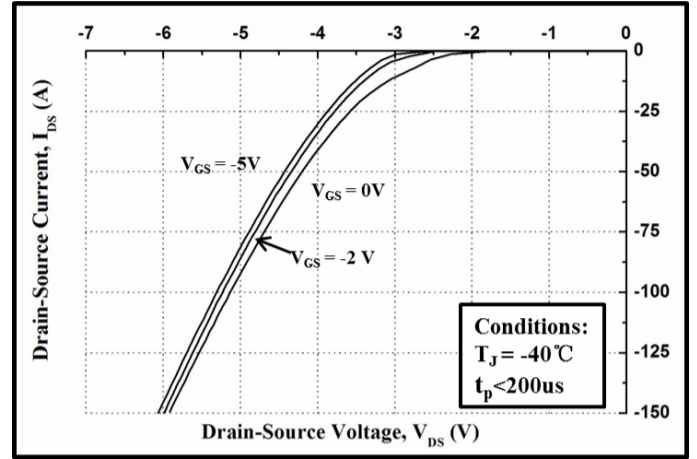


Figure 8. Body Diode Characteristic at -40°C

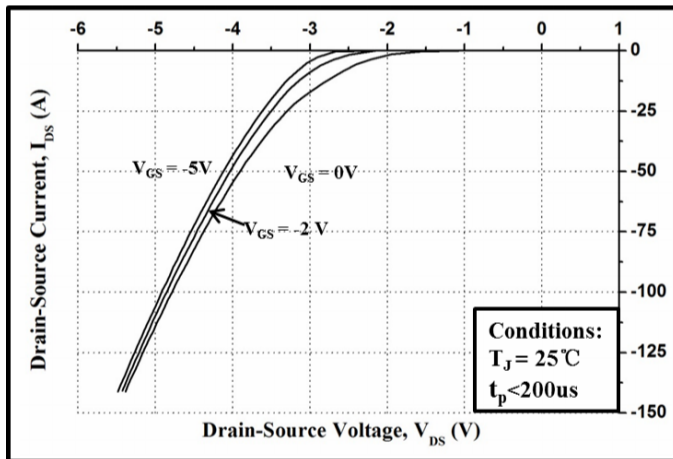


Figure 9. Body Diode Characteristic at 25°C

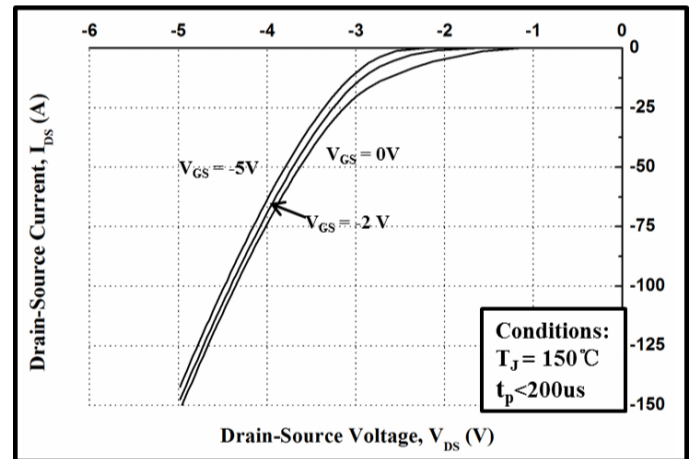


Figure 10. Body Diode Characteristic at 150°C

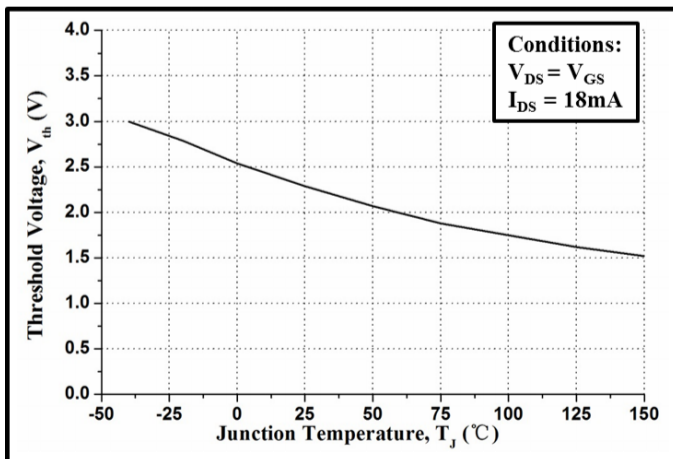


Figure 11. Threshold Voltage vs. Temperature

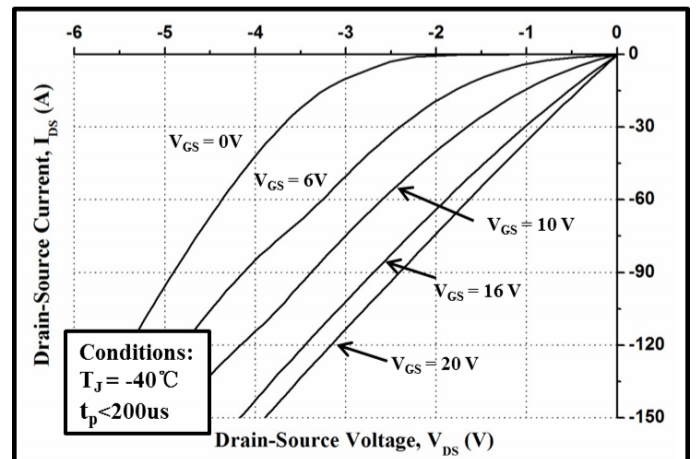


Figure 12. 3rd Quadrant Characteristic at -40°C

## Typical Performance

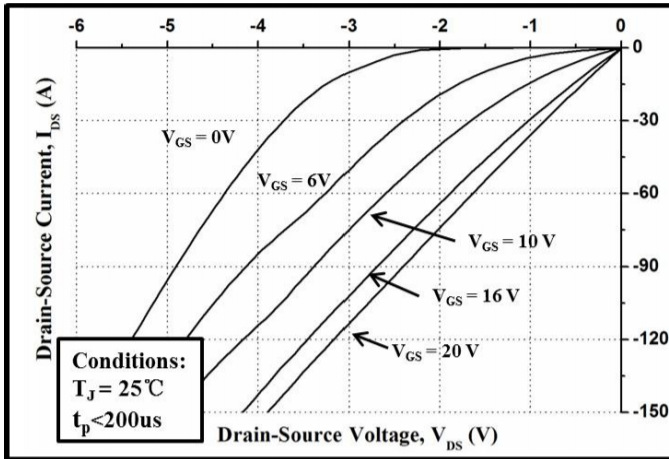


Figure 13. 3rd Quadrant Characteristic at 25°C

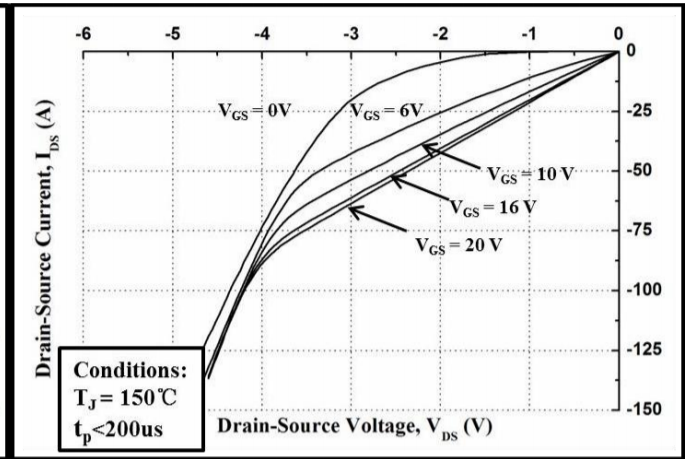


Figure 14. 3rd Quadrant Characteristic at 150°C

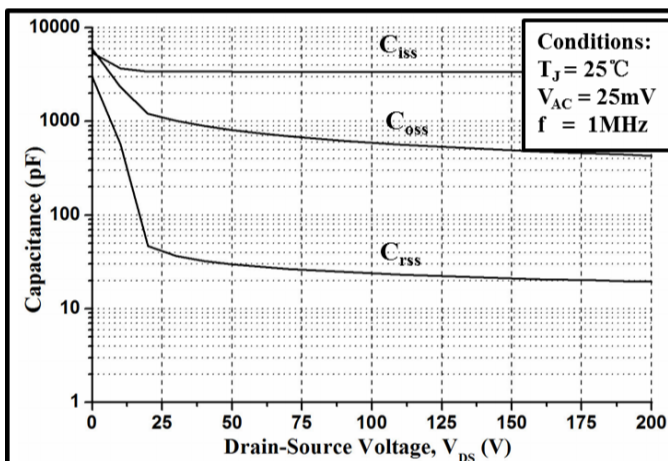


Figure 15. Capacitance vs. Drain-Source Voltage (0-200V)

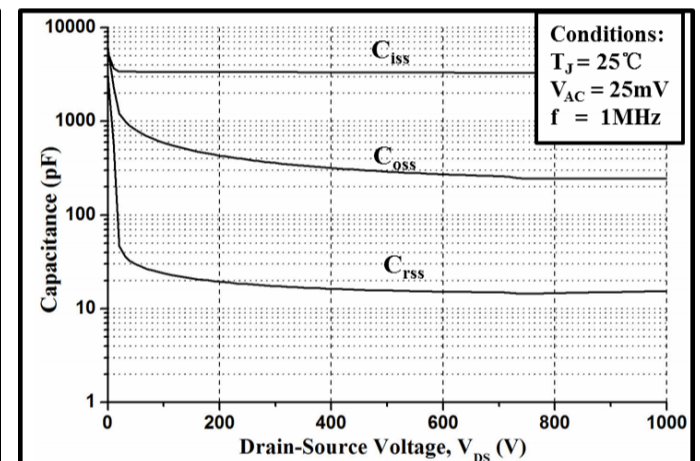


Figure 16. Capacitance vs. Drain-Source Voltage (0-1000V)

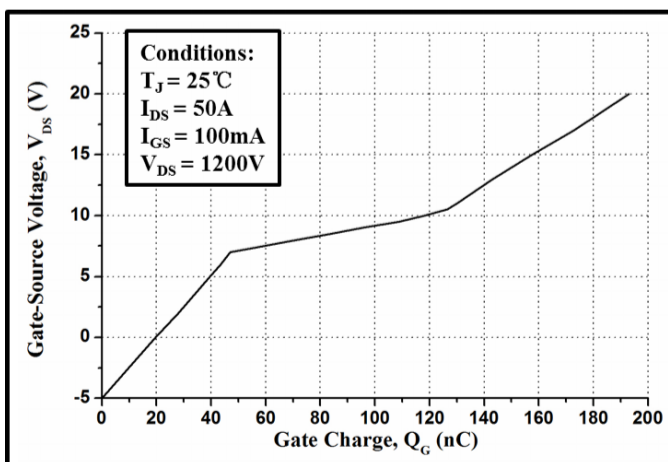


Figure 17. Gate Charge Characteristic

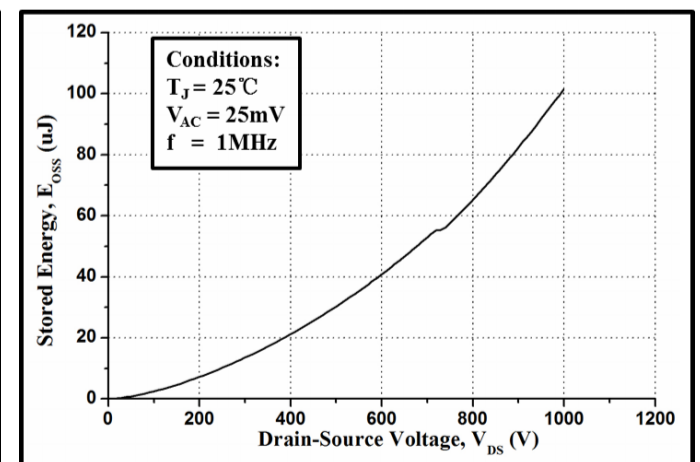
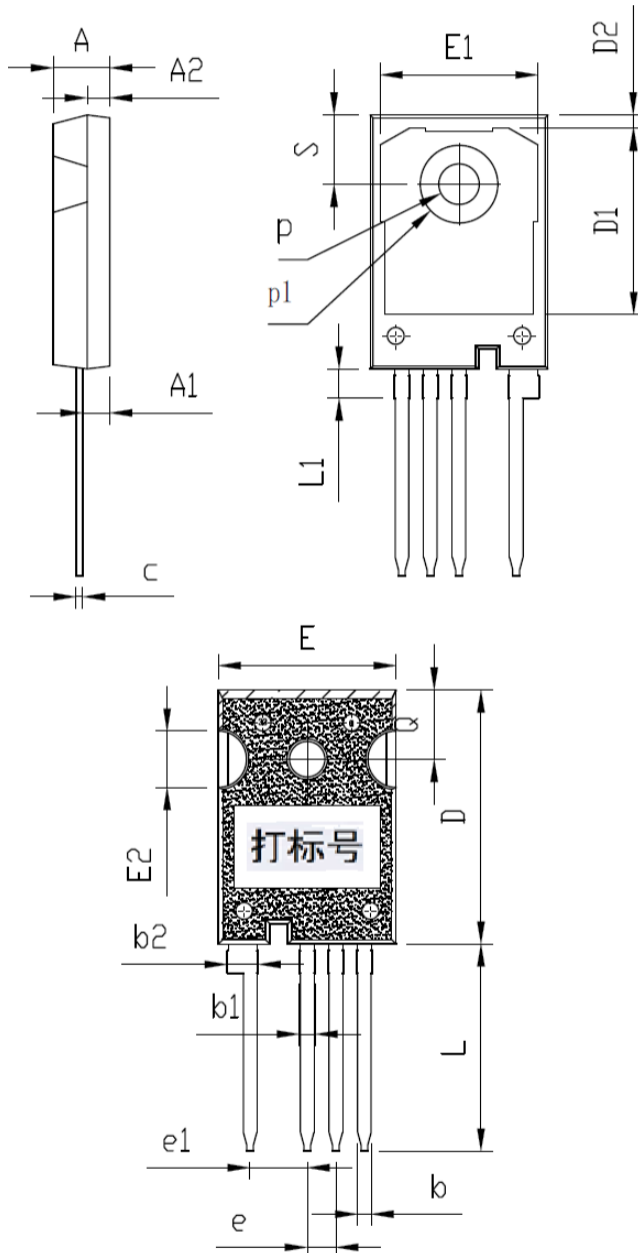


Figure 18. Output Capacitor Stored Energy



## Package Dimensions

Package TO-247-4



| SYMBOLS | DIMENSIONS IN MILLIMETERS |       |     |
|---------|---------------------------|-------|-----|
|         | MIN                       | NOM   | MAX |
| A       |                           | 5.00  |     |
| A1      |                           | 2.40  |     |
| A2      |                           | 2.00  |     |
| b       |                           | 1.20  |     |
| b1      |                           | 1.30  |     |
| b2      |                           | 2.65  |     |
| c       |                           | 0.6   |     |
| D       |                           | 22.54 |     |
| D1      |                           | 16.50 |     |
| D2      |                           | 1.17  |     |
| e       |                           | 2.54  |     |
| e1      |                           | 5.08  |     |
| E       |                           | 15.80 |     |
| E1      |                           | 14.00 |     |
| E2      |                           | 5.00  |     |
| L       |                           | 18.38 |     |
| L1      |                           | 2.58  |     |
| p       |                           | 3.60  |     |
| p1      |                           | 6.80  |     |
| Q       |                           | 6.15  |     |
| S       |                           | 6.15  |     |