

**800V SiC N-Channel MOSFET**

**MAIN CHARACTERISTICS**

|   |                 |
|---|-----------------|
| <b>I<sub>D</sub></b>  | 40A             |
| <b>V<sub>DS</sub></b>   | 800V            |
| <b>R<sub>DS(on)-typ</sub></b><br>(@V <sub>GS</sub> =18V T <sub>C</sub> =25°C) | <73mΩ(Typ:53mΩ) |

**FEATURES**

- ◆High Speed Switching with Low Capacitances
- ◆High Blocking Voltage with Low RDS(on)
- ◆Easy to Parallel
- ◆Simple to Drive
- ◆RoHS Compliant

**BENEFITS**

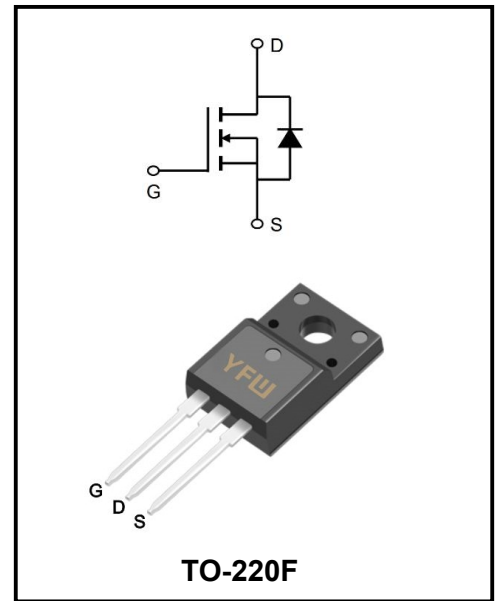
- ◆Increased Power Density
- ◆Faster Operating Freequenc
- ◆Reduction of Heat Sink Requirements
- ◆Higher Efficiency
- ◆Reduced EMI

**APPLICATIONS**

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

**MECHANICAL DATA**

- ◆Case: TO-220F/AF
- ◆Mounting Position: Any
- ◆Molded Plastic: UL Flammability Classification Rating 94V-0
- ◆Lead free in compliance with EU RoHS 2011/65/EU directive
- ◆Solder bath temperature 275°C maximum,10s per JESD 22-B106



**Maximum Ratings at Tc=25°C unless otherwise specified**

| Parameter                                    | Symbol                  | Value       | Unit        |
|--|-------------------------|-------------|-------------|
| Drain-Source Voltage                         | <b>V<sub>DS</sub></b>   | 800         | <b>V</b>    |
| Gate-Source Voltage                          | <b>V<sub>GS</sub></b>   | -8/+22      | <b>V</b>    |
| Recommended Operation Value                  | <b>V<sub>GSop</sub></b> | -4/+18      | <b>V</b>    |
| Continue Drain Current T <sub>c</sub> =25°C  | <b>I<sub>D</sub></b>    | 40          | <b>A</b>    |
| Continue Drain Current T <sub>c</sub> =100°C |                         | 28          |             |
| Pulsed Drain Current                         | <b>I<sub>DM</sub></b>   | 80          | <b>A</b>    |
| Power Dissipation TC=25°C                    | <b>P<sub>D</sub></b>    | 98          | <b>W</b>    |
| Operating Temperature Range                  | <b>T<sub>J</sub></b>    | -40 to +175 | <b>°C</b>   |
| Storage Temperature Range                    | <b>T<sub>STG</sub></b>  | -40 to +175 | <b>°C</b>   |
| Thermal Resistance, Junction to Case         | <b>R<sub>θJC</sub></b>  | 1.52        | <b>°C/W</b> |
| Thermal Resistance, Junction to Ambient      | <b>R<sub>θJA</sub></b>  | 60          | <b>°C/W</b> |

**Note1:Pulse test: 300 μs pulse width, 2 % duty cycle**

**Electrical Characteristics at Tc=25°C unless otherwise specified**

| Parameter                                | Test Condition  | Symbol                    | Min | Typ  | Max  | Unit      |
|--|---|---------------------------|-----|------|------|-----------|
| Drain-Source Breakdown Voltage           | $V_{GS} = 0\text{ V}, I_D = 100\mu\text{A}$   | <b>BV<sub>DSS</sub></b>   | 800 | -    | -    | <b>V</b>  |
| Drain-Source Leakage Current             | $V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}$  | <b>I<sub>DSS</sub></b>    | -   | 1    | -    | <b>μA</b> |
| Gate Leakage Current                     | $V_{GS} = +18\text{ V}, V_{DS} = 0\text{ V}$  | <b>I<sub>GSS</sub></b>    | -   | -    | 250  | <b>nA</b> |
|  | $V_{GS} = -4\text{ V}, V_{DS} = 0\text{ V}$   |                           | -   | -    | -250 | <b>nA</b> |
| Gate-Source Threshold Voltage            | $V_{DS} = V_{GS}, I_D = 5\text{ mA}$  | <b>V<sub>GS(th)</sub></b> | 2   | 2.7  | 4    | <b>V</b>  |
| Drain-Source On-State Resistance         | $V_{GS} = 18\text{ V}, I_D = 20\text{ A}$   | <b>R<sub>DS(on)</sub></b> | -   | 53   | 73   | <b>mΩ</b> |
|  | $V_{GS} = 18\text{ V}, I_D = 20\text{ A}, T_J = 175^\circ\text{C}$  |                           | -   | 58   | -    | <b>mΩ</b> |
| Internal Gate Resistance                 | $f=1\text{MHz}$   | <b>RG</b>                 | -   | 2.1  | -    | <b>Ω</b>  |
| Input Capacitance                        | $V_{DS}=600\text{V}$<br>$V_{GS}=0\text{V}$<br>$f=1\text{MHz}$   | <b>C<sub>iss</sub></b>    | -   | 1301 | -    | <b>pF</b> |
| Output Capacitance                       |   | <b>C<sub>oss</sub></b>    | -   | 138  | -    | <b>pF</b> |
| Reverse Transfer Capacitance             |   | <b>C<sub>rss</sub></b>    | -   | 14   | -    | <b>pF</b> |
| Total Gate Charge(Note2)                 | $I_D = 20\text{ A}$<br>$V_{DD}=400\text{V}$<br>$V_{GS} = -4/+ 18\text{ V}$  | <b>Q<sub>g</sub></b>      | -   | 68   | -    | <b>nC</b> |
| Gate to Source Charge(Note2)             |   | <b>Q<sub>gs</sub></b>     | -   | 17   | -    | <b>nC</b> |
| Gate to Drain Charge(Note2)              |   | <b>Q<sub>gd</sub></b>     | -   | 22   | -    | <b>nC</b> |
| Turn-on Delay Time(Note2)                | $V_{DS} = 400\text{ V}, I_D=20\text{ A},$<br>$V_{GS} = -4/+18\text{ V},$<br>$R_G = 2.5\ \Omega$<br>$L=200\mu\text{H}$ | <b>t<sub>d(on)</sub></b>  | -   | 13   | -    | <b>ns</b> |
| Rise Time(Note2)                         |   | <b>t<sub>r</sub></b>      | -   | 20   | -    | <b>ns</b> |
| Turn-Off Delay Time(Note2)               |   | <b>t<sub>d(OFF)</sub></b> | -   | 20   | -    | <b>ns</b> |
| Fall Time(Note2)                         |   | <b>t<sub>f</sub></b>      | -   | 9    | -    | <b>ns</b> |
| Turn-on Switching Energy                 |   | <b>E<sub>on</sub></b>     | -   | 108  | -    | <b>μJ</b> |
| Turn-off Switching Energy                |   | <b>E<sub>off</sub></b>    | -   | 35   | -    | <b>μJ</b> |
| Maximun Body-Diode Continuous Current    | $V_{GS} = -4\text{ V}, T_c=25^\circ\text{C}$  | <b>I<sub>s</sub></b>      | -   | 33   | -    | <b>A</b>  |
|  | $V_{GS} = -4\text{ V}, T_c=100^\circ\text{C}$   |                           | -   | 18   | -    | <b>A</b>  |
| Maximun Body-Diode Pulsed Current(Note2) |   | <b>I<sub>SM</sub></b>     | -   | -    | 80   | <b>A</b>  |
| Drain-Source Diode Forward Voltage       | $V_{GS}=-4\text{V}, I_{SD}=10\text{A } T_j=25^\circ\text{C}$  | <b>V<sub>SD</sub></b>     | -   | 4.6  | -    | <b>V</b>  |
|  | $V_{GS}=-4\text{V}, I_{SD}=10\text{A } T_j=175^\circ\text{C}$   |                           | -   | 4    | -    | <b>V</b>  |
|  | $V_{GS}=-4\text{V}, I_{SD}=20\text{A } T_j=25^\circ\text{C}$  |                           | -   | 5.4  | -    | <b>V</b>  |
|  | $V_{GS}=-4\text{V}, I_{SD}=20\text{A } T_j=175^\circ\text{C}$   |                           | -   | 4.6  | -    | <b>V</b>  |
| Reverse Recovery Time(Note2)             | $V_{GS} = -4\text{ V}, I_{SD} = 20\text{ A}, V_R = 400\text{ V},$<br>$di/dt=989\text{A}/\mu\text{s}$                  | <b>trr</b>                | -   | 18   | -    | <b>ns</b> |
| Reverse Recovery Charge(Note2)           |   | <b>Qrr</b>                | -   | 104  | -    | <b>nC</b> |
| Peak Reverse Recovery Current            |   | <b>Irrm</b>               | -   | 10.2 | -    | <b>A</b>  |

**Note2:Pulse test: 300 us pulse width,2 % duty cycle**

**RATINGS AND CHARACTERISTIC CURVES**

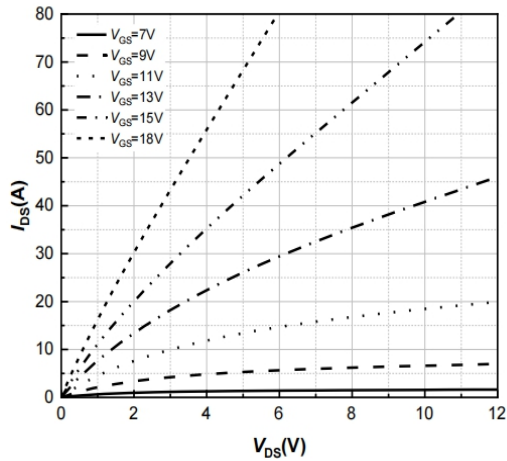


Figure 1. Output Characteristics  
 $T_j = -40^\circ\text{C}$

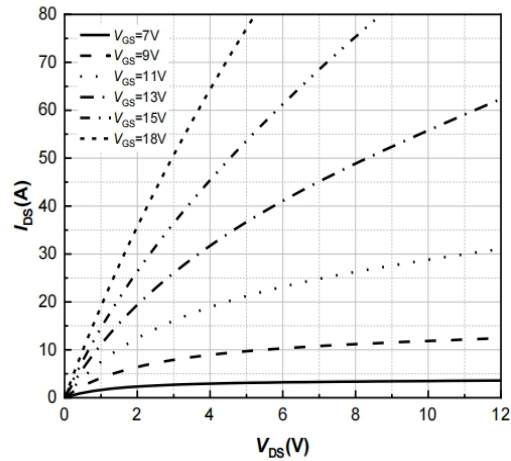


Figure 2. Output Characteristics  
 $T_j = 25^\circ\text{C}$

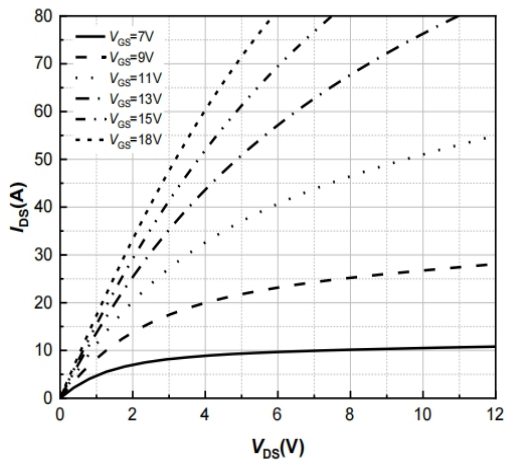


Figure 3. Output Characteristics  
 $T_j = 175^\circ\text{C}$

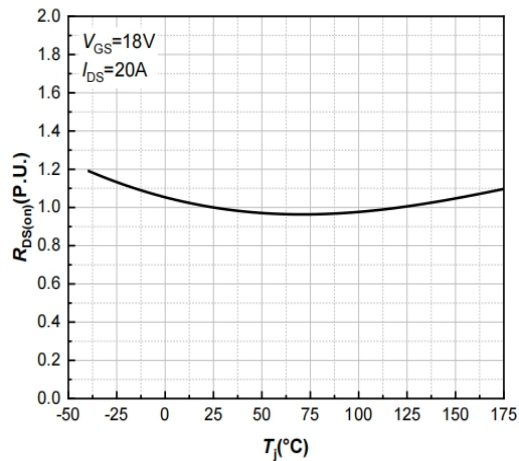


Figure 4. Normalized On-Resistance vs. Temperature

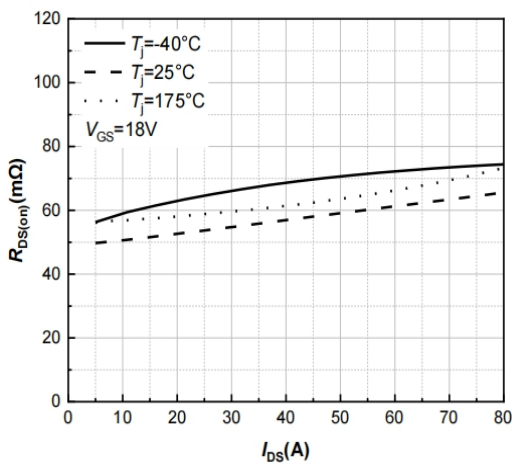


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

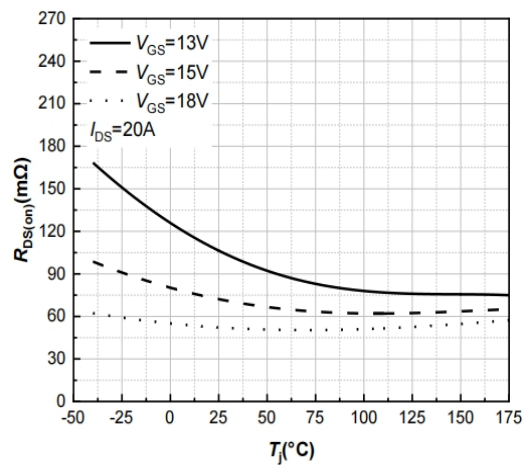


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

RATINGS AND CHARACTERISTIC CURVES

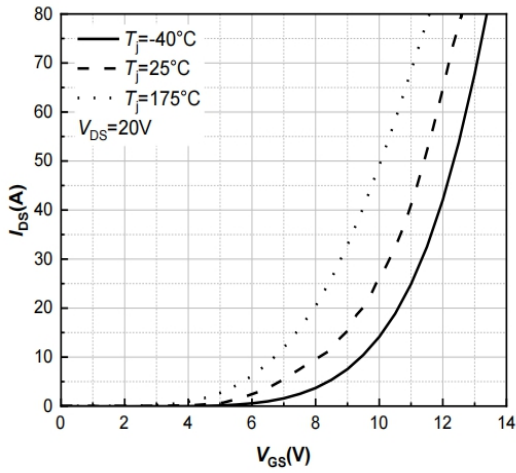


Figure 7. Transfer Characteristic for Various Junction Temperatures

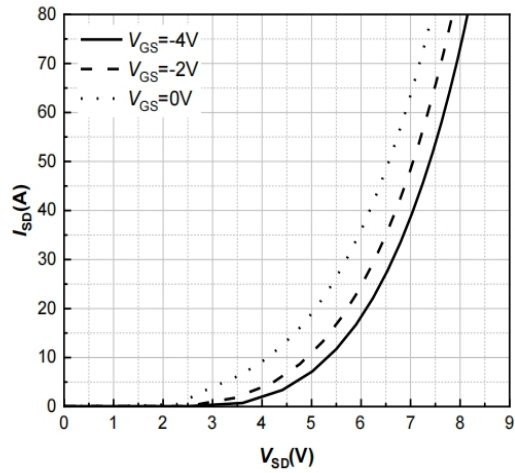


Figure 8. Body Diode Characteristic  $T_J = -40^\circ\text{C}$

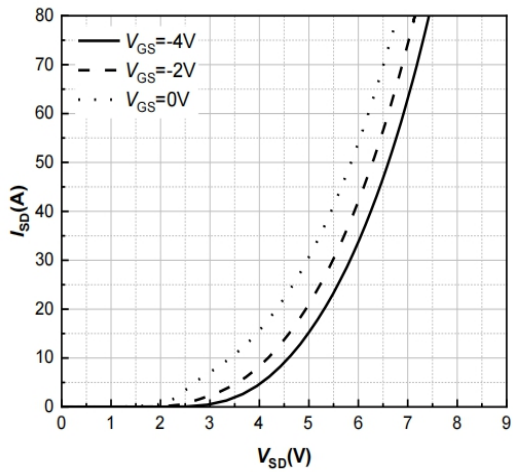


Figure 9. Body Diode Characteristic  $T_J = 25^\circ\text{C}$

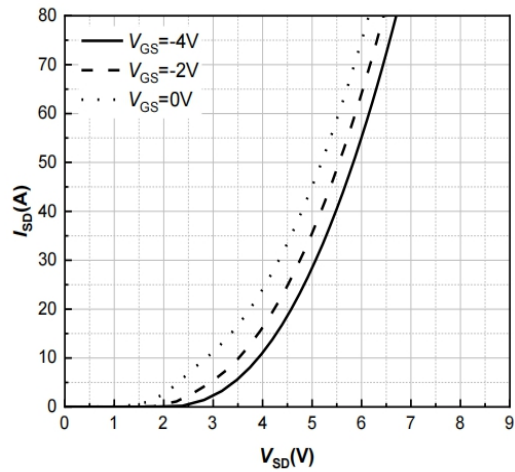


Figure 10. Body Diode Characteristic  $T_J = 175^\circ\text{C}$

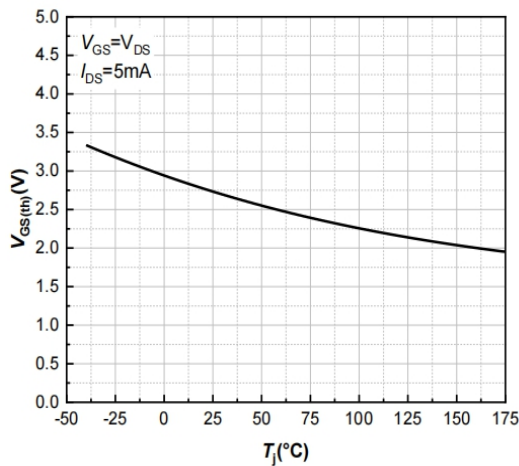


Figure 11. Threshold Voltage vs. Temperature

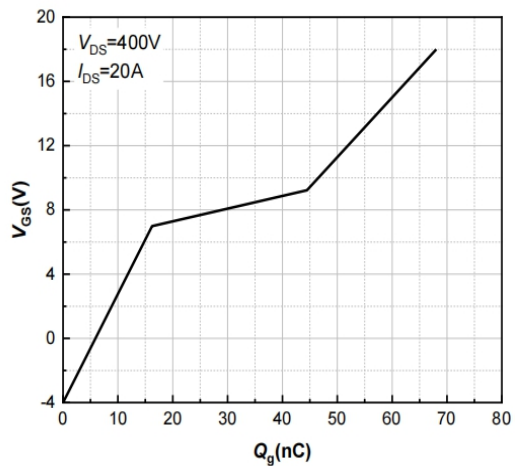


Figure 12. Gate Charge Characteristics

**RATINGS AND CHARACTERISTIC CURVES**

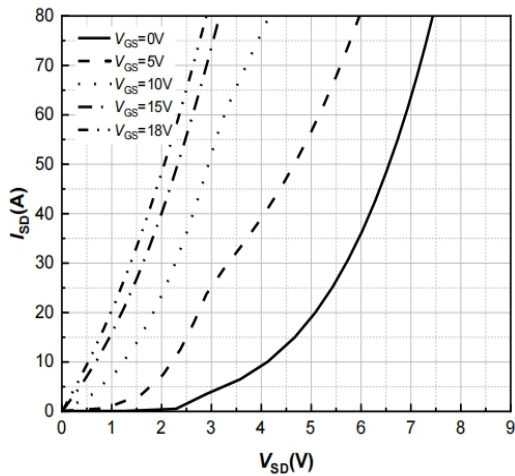


Figure 13. 3rd Quadrant Characteristic  
 $T_j = -40^\circ\text{C}$

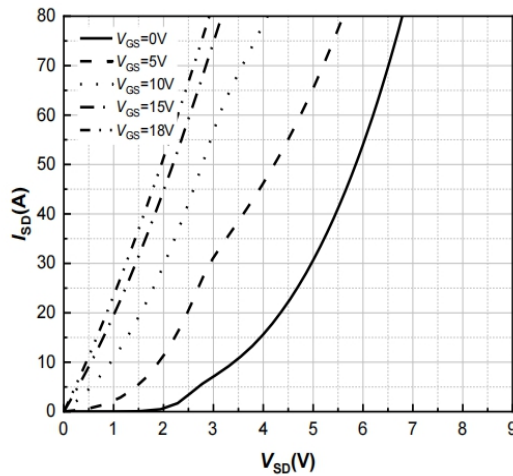


Figure 14. 3rd Quadrant Characteristic  
 $T_j = 25^\circ\text{C}$

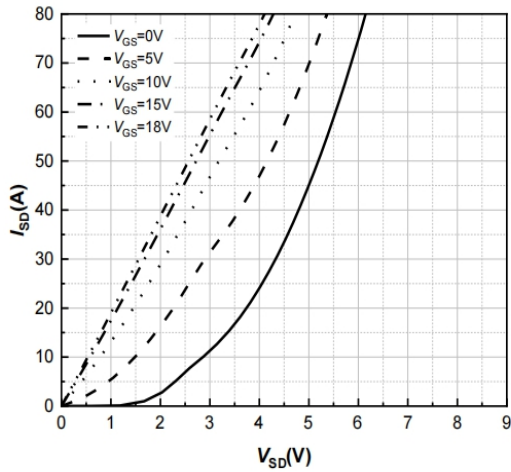


Figure 15. 3rd Quadrant Characteristic  
 $T_j = 175^\circ\text{C}$

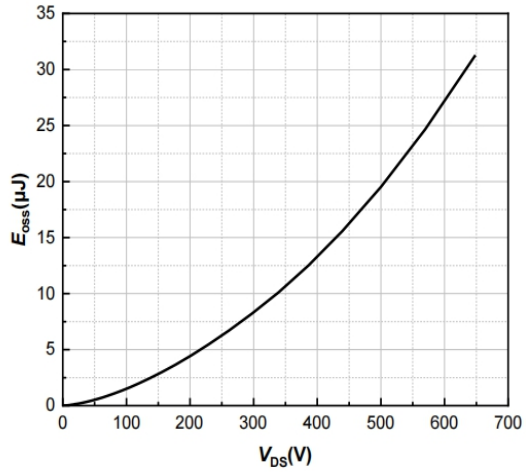


Figure 16. Output Capacitor Stored Energy

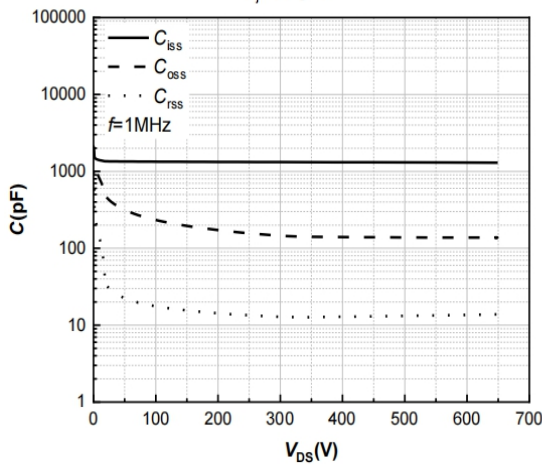


Figure 17. Capacitances vs. Drain-Source

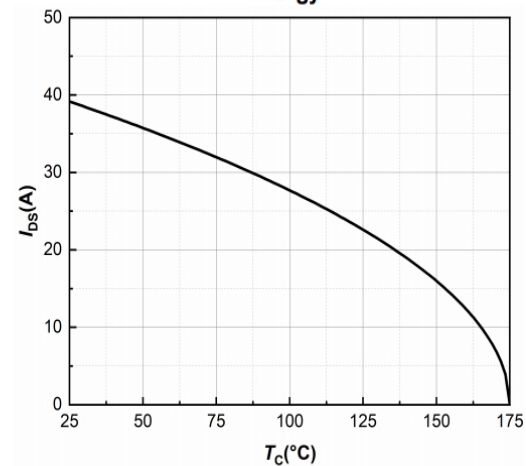


Figure 18. Continuous Drain Current Derating vs. Case Temperature

**RATINGS AND CHARACTERISTIC CURVES**

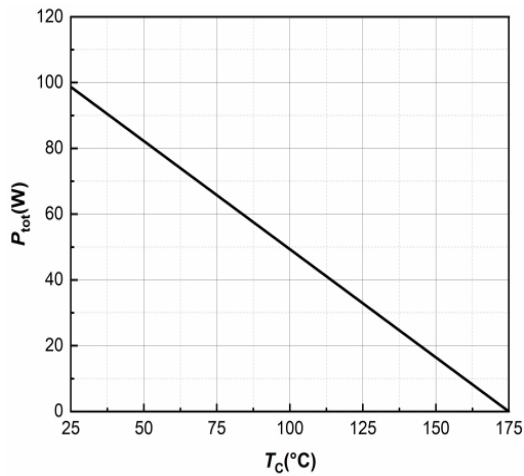


Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

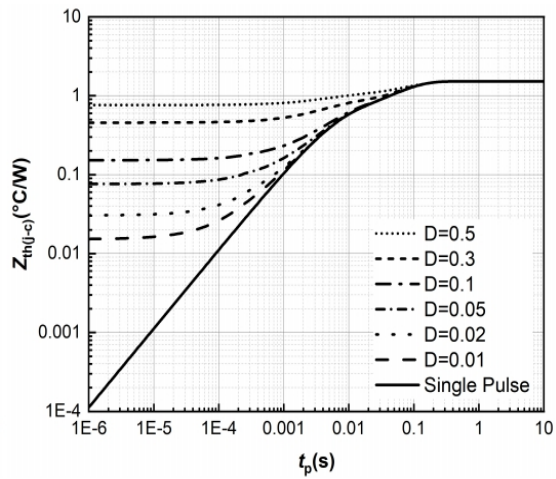


Figure 20. Transient Thermal Impedance

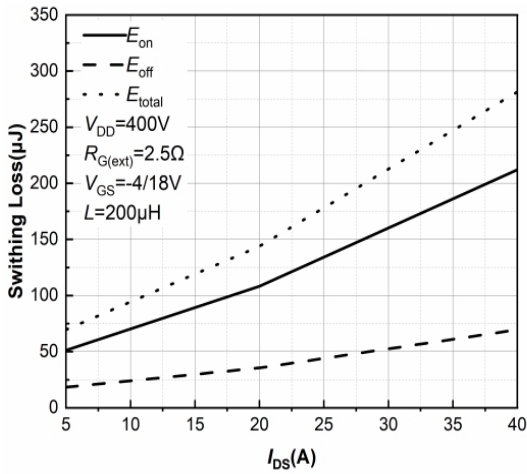


Figure 21. Clamped Inductive Switching Energy vs. Drain Current

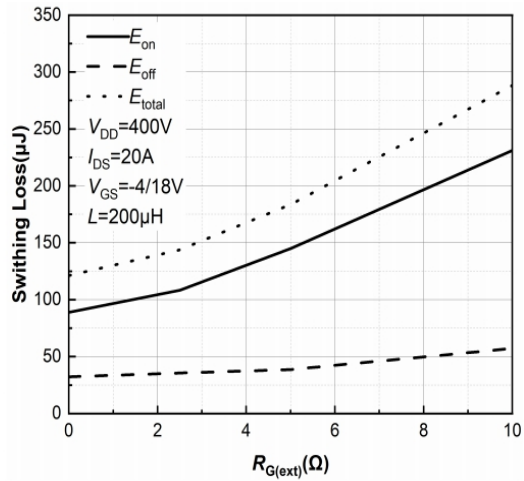


Figure 22. Clamped Inductive Switching Energy vs.  $R_{G(ext)}$

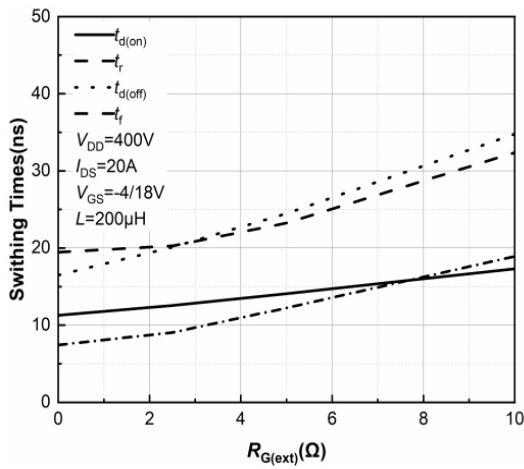


Figure 23. Switching Times vs.  $R_{G(ext)}$

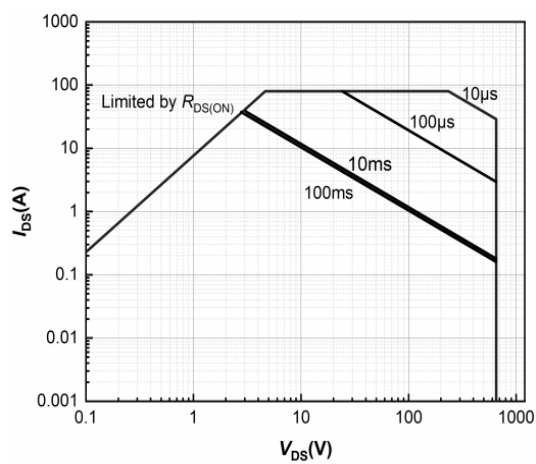
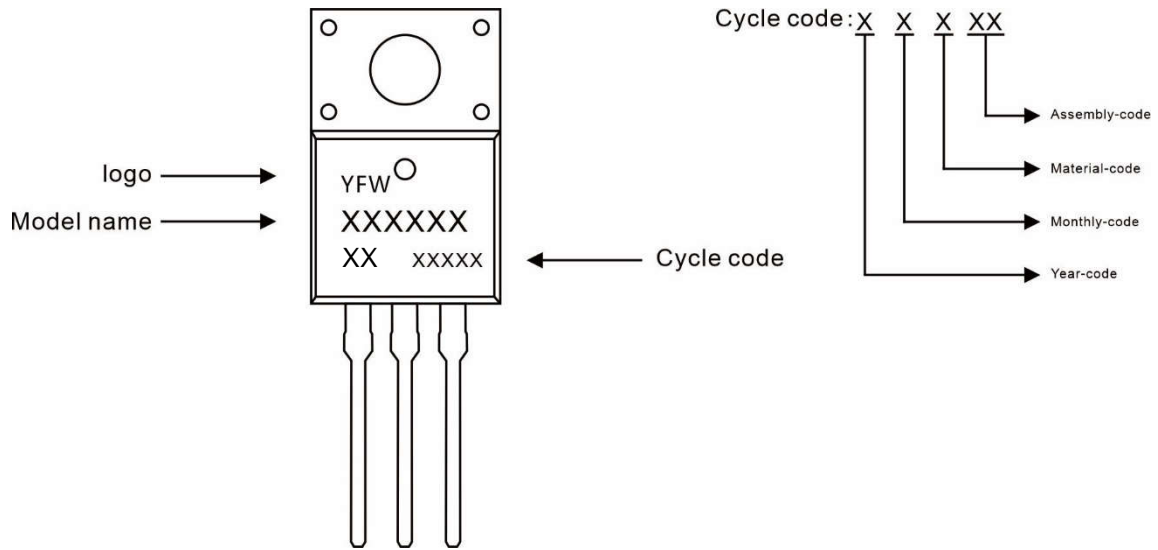


Figure 24. Safe Operating Area

**Marking Diagram**



**Ordering information**

| Model name     | Package | Unit Weight   | Base Quantity | Packing Quantity           |
|----------------|---------|---------------|---------------|----------------------------|
| YFWM305365AFG3 | TO-220F | 0.06oz(1.74g) | 50pcs/tube    | 1000PCS/Box 5000PCS/Carton |

**Package Dimensions**

**TO-220F**

| Symbol | Millimeter |       | Inches |       |
|--------|------------|-------|--------|-------|
|        | Min.       | Max.  | Min.   | Max.  |
| A      | 4.50       | 4.90  | 0.177  | 0.193 |
| A1     | 2.34       | 2.74  | 0.092  | 0.108 |
| A2     | 2.66       | 2.86  | 0.105  | 0.113 |
| b      | 0.75       | 0.85  | 0.030  | 0.033 |
| b1     | 1.24       | 1.44  | 0.049  | 0.057 |
| c      | 0.40       | 0.60  | 0.016  | 0.024 |
| D      | 10.00      | 10.32 | 0.394  | 0.406 |
| E      | 15.75      | 16.05 | 0.620  | 0.632 |
| e      | 2.44       | 2.64  | 0.096  | 0.104 |
| e1     | 4.88       | 5.28  | 0.192  | 0.208 |
| F      | 3.10       | 3.5   | 0.122  | 0.138 |
| L      | 13.50      | 13.90 | 0.531  | 0.547 |
| L1     | 2.90       | 3.30  | 0.114  | 0.130 |
| Φ      | 3.10       | 3.30  | 0.122  | 0.130 |

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