

### Features

- High Speed Power Smooth Switching
- Maximum 175°C junction temperature
- Enhanced Body diode dv/dt capability
- Enhanced Avalanche Ruggedness

### Product Summary

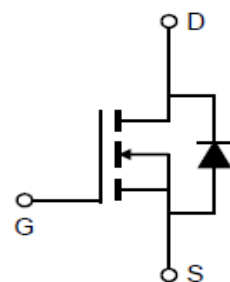
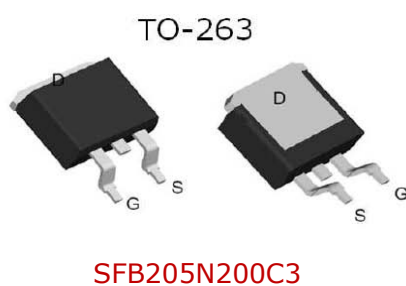
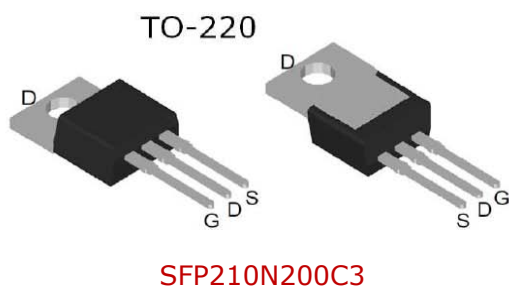
|              |      |
|--------------|------|
| $V_{DS}$     | 200V |
| $R_{DS(on)}$ | 16mΩ |
| $I_D$        | 75A  |

### Application

- Brushed and BLDC Motor drive systems
- Battery Management
- DC/DC and AC/DC Converter
- UPS

**100% DVDS Tested**

**100% Avalanche Tested**



### Package Marking and Ordering Information

| Part #       | Marking   | Package | Packing   | Reel Size  | Tape Width | Qty    |
|--------------|-----------|---------|-----------|------------|------------|--------|
| SFP210N200C3 | 210N200C3 | TO-220  | Tube      | N/A        | N/A        | 50pcs  |
| SFB205N200C3 | 205N200C3 | TO-263  | Reel&Tape | 330×24.8mm | 24mm       | 800pcs |

### Absolute Maximum Ratings

| Parameter                                                                      |                           | Symbol        | Value     | Unit |
|--------------------------------------------------------------------------------|---------------------------|---------------|-----------|------|
| Drain - Source Voltage                                                         |                           | $V_{DS}$      | 200       | V    |
| Gate - Source Voltage                                                          |                           | $V_{GS}$      | ±20       | V    |
| Continuous Drain Current                                                       | $T_C = 25^\circ\text{C}$  | $I_D$         | 75        | A    |
|                                                                                | $T_C = 100^\circ\text{C}$ |               | 52        | A    |
| Pulsed Drain Current( $T_C = 25^\circ\text{C}$ , $t_p$ limited by $T_{jmax}$ ) |                           | $I_{D,Pulse}$ | 300       | A    |
| Single Pulsed Avalanche Energy( $L=0.4\text{mH}$ , $T_C=25^\circ\text{C}$ )    |                           | $E_{AS}$      | 320       | mJ   |
| Power Dissipation                                                              | $T_C = 25^\circ\text{C}$  | $P_{tot}$     | 300       | W    |
| Junction Temperature                                                           |                           | $T_J$         | -55 ~ 175 | °C   |
| Storage Temperature                                                            |                           | $T_{STG}$     | -55 ~ 175 | °C   |

### Thermal Resistance

| Parameter                                               | Symbol     | Max | Unit |
|---------------------------------------------------------|------------|-----|------|
| Thermal resistance , junction – case                    | $R_{thJC}$ | 0.5 | °C/W |
| Thermal resistance , junction – ambient(min. footprint) | $R_{thJA}$ | 60  | °C/W |

### Electrical Characteristics ( $T_J = 25^{\circ}\text{C}$ unless otherwise noted)

| Parameter | Symbol | Test Condition | Min | Type | Max | Unit |
|-----------|--------|----------------|-----|------|-----|------|
|-----------|--------|----------------|-----|------|-----|------|

#### Static Characteristics

|                                  |                     |                                                            |        |    |      |      |    |
|----------------------------------|---------------------|------------------------------------------------------------|--------|----|------|------|----|
| Drain - Source Breakdown Voltage | BV <sub>DSS</sub>   | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA               | 200    | -  | -    | V    |    |
| Zero Gate Voltage Drain Current  | I <sub>DSS</sub>    | V <sub>DS</sub> = 200V, V <sub>GS</sub> = 0V               | -      | -  | 1    | μA   |    |
|                                  |                     | T <sub>J</sub> =25°C                                       | -      | -  | 100  |      |    |
| Gate - Body Leakage Current      | I <sub>GSS</sub>    | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V               |        |    | ±100 | nA   |    |
| Gate Threshold Voltage           | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA | 2      | 3  | 4    | V    |    |
| Drain-source On-resistance       | R <sub>DS(on)</sub> | V <sub>GS</sub> = 10V, I <sub>D</sub> = 20A                | TO-220 | -  | 16   | 21   | mΩ |
|                                  |                     |                                                            | TO-263 |    | 15.5 | 20.5 | mΩ |
| Forward Transconductance         | g <sub>FS</sub>     | V <sub>DS</sub> = 5V, I <sub>D</sub> = 20A                 | -      | 60 | -    | S    |    |

#### Dynamic Characteristics

|                              |           |                                               |   |      |   |    |
|------------------------------|-----------|-----------------------------------------------|---|------|---|----|
| Input Capacitance            | $C_{iss}$ | $V_{DS} = 100V, V_{GS} = 0V, f = 1\text{MHz}$ | - | 5700 | - | pF |
| Output Capacitance           | $C_{oss}$ |                                               | - | 213  | - |    |
| Reverse Transfer Capacitance | $C_{rss}$ |                                               | - | 60   | - |    |
| Gate Resistance              | $R_g$     | $V_{DS} = 0V, V_{GS} = 0V, f = 1\text{MHz}$   | - | 1.8  | - | Ω  |

#### Switching Characteristics

|                     |              |                                                               |   |     |   |    |
|---------------------|--------------|---------------------------------------------------------------|---|-----|---|----|
| Total Gate Charge   | $Q_g$        | $V_{DS} = 100V, V_{GS} = 10V, I_D = 20A,$                     | - | 102 | - | nC |
| Gate-source Charge  | $Q_{gs}$     |                                                               | - | 24  | - |    |
| Gate-drain Charge   | $Q_{gd}$     |                                                               | - | 38  | - |    |
| Turn-on Delay Time  | $t_{d(on)}$  | $V_{DD} = 100V, V_{GS} = 10V, I_D = 20A,$<br>$R_G = 10\Omega$ | - | 21  | - | ns |
| Turn-on Rise Time   | $t_r$        |                                                               | - | 17  | - |    |
| Turn-off Delay Time | $t_{d(off)}$ |                                                               | - | 38  | - |    |
| Turn-off Fall Time  | $t_f$        |                                                               | - | 15  | - |    |

### Body Diode Characteristic

| Parameter                          | Symbol        | Test Condition                  | Min | Type | Max | Unit |
|------------------------------------|---------------|---------------------------------|-----|------|-----|------|
| Diode continuous forward current   | $I_S$         | -                               | -   | -    | 75  | A    |
| Diode pulse current                | $I_{S,pulse}$ | Pulsed; $t_p \leq 10\mu s$      | -   | -    | 300 | A    |
| Body Diode Forward Voltage         | $V_{SD}$      | $V_{GS} = 0V, I_{SD} = 20A$     | -   | 0.9  | 1.2 | V    |
| Body Diode Reverse Recovery Time   | $T_{rr}$      | $I_F = 20A, dI/dt = 100A/\mu s$ | -   | 118  | -   | ns   |
| Body Diode Reverse Recovery Charge | $Q_{rr}$      | $I_F = 20A, dI/dt = 100A/\mu s$ | -   | 352  | -   | nC   |

### Typical Performance Characteristics

Fig 1. Typical Output Characteristics

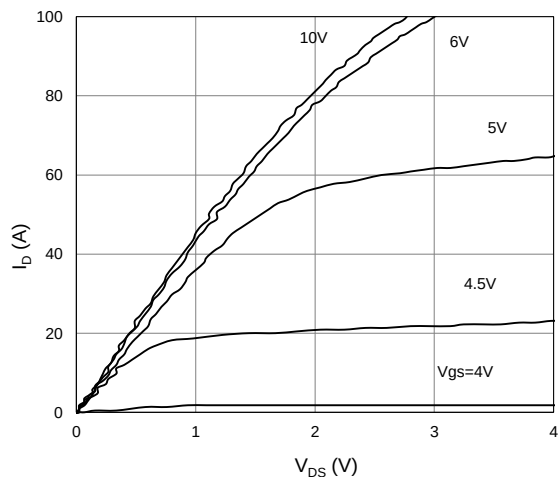


Figure 2. On-Resistance vs. Gate-Source Voltage

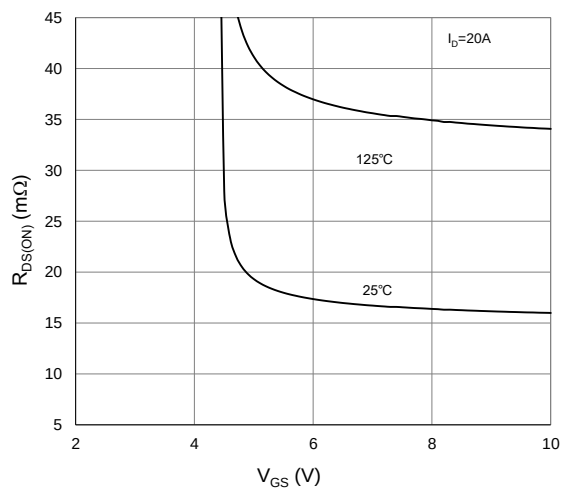


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

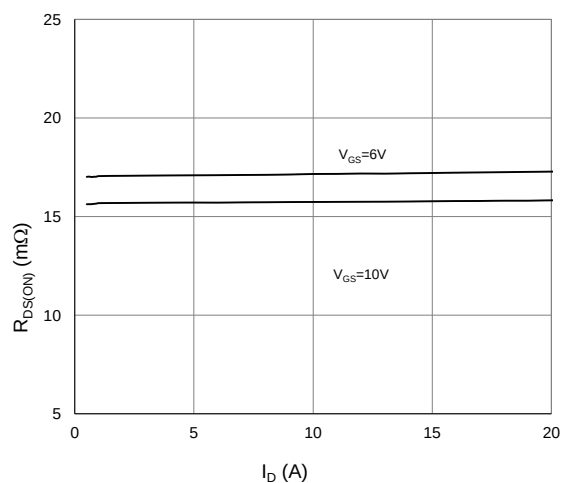


Figure 4. Normalized On-Resistance vs. Junction Temperature

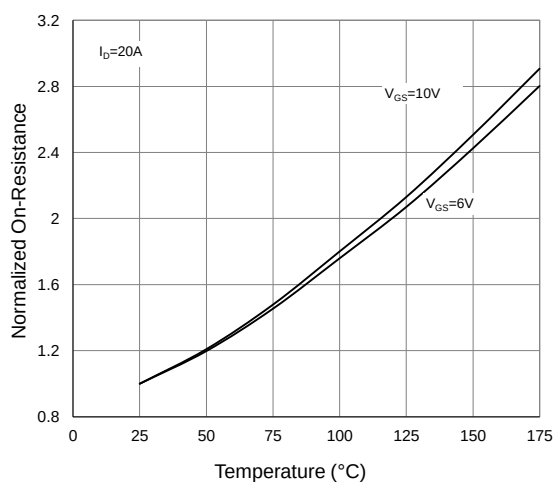


Figure 5. Typical Transfer Characteristics

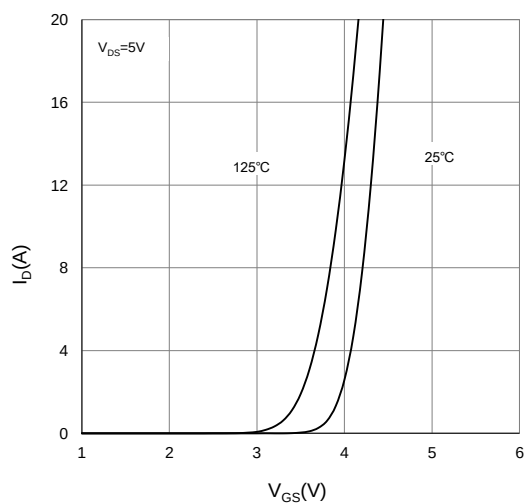


Figure 6. Typical Source-Drain Diode Forward Voltage

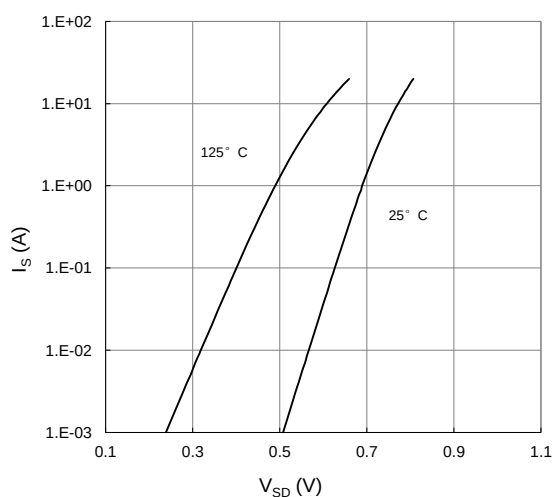


Figure 7. Typical Gate-Charge vs. Gate-to-Source Voltage

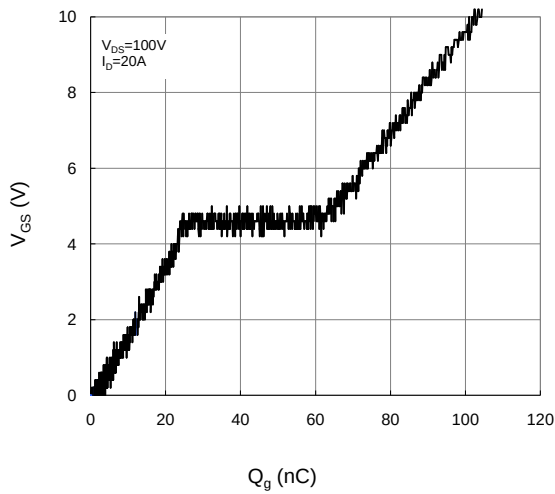


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

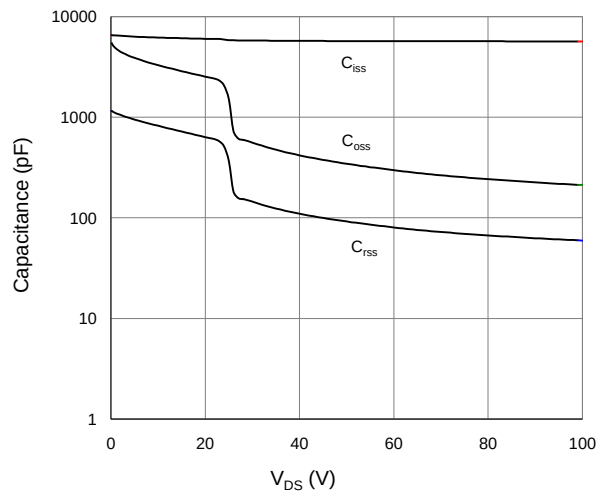


Figure 9. Maximum Safe Operating Area

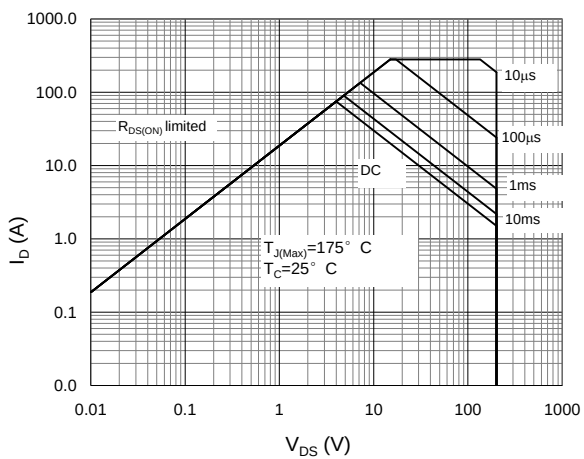


Figure 10. Maximum Drain Current vs. Case Temperature

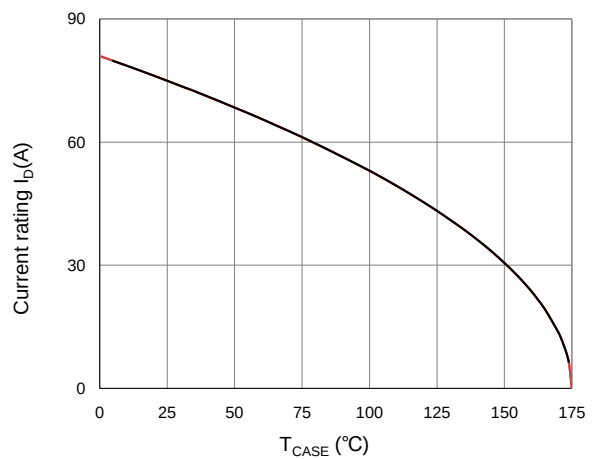
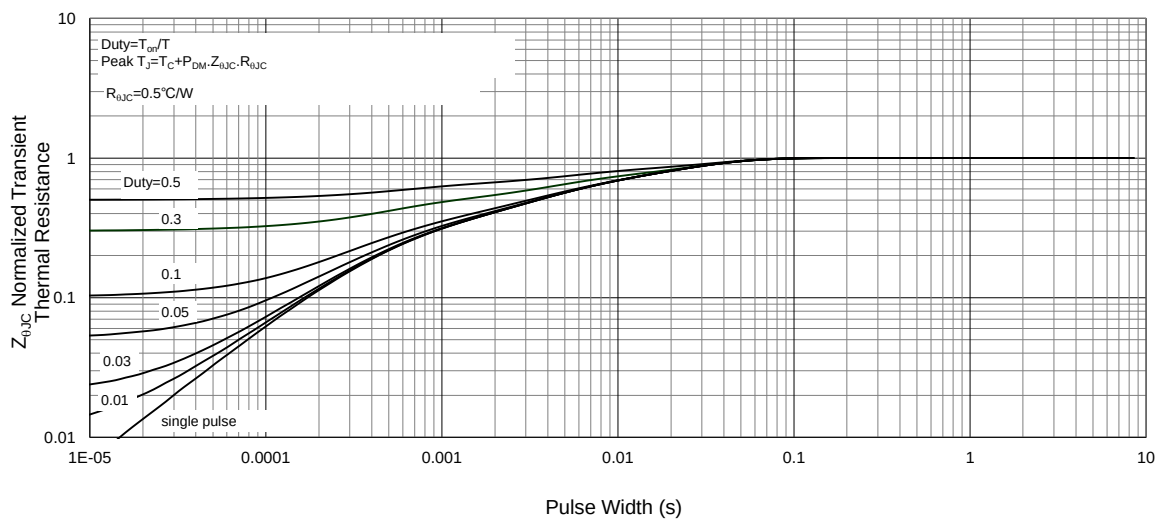
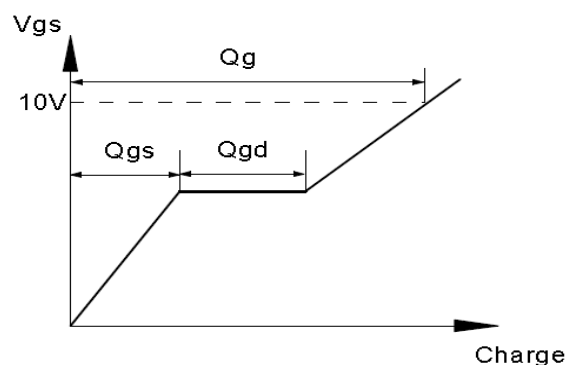
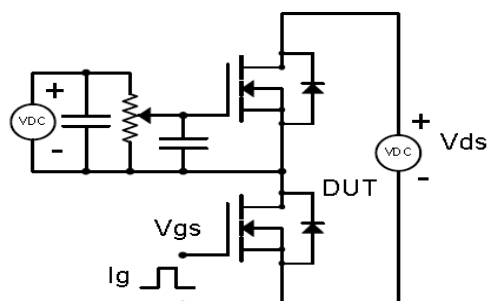


Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Case

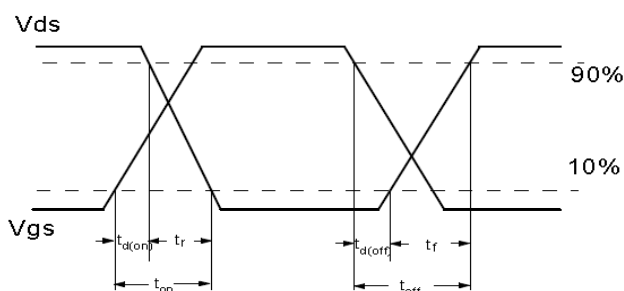
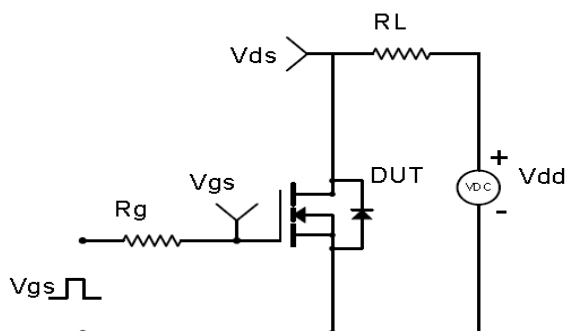


## Test Circuit & Waveform

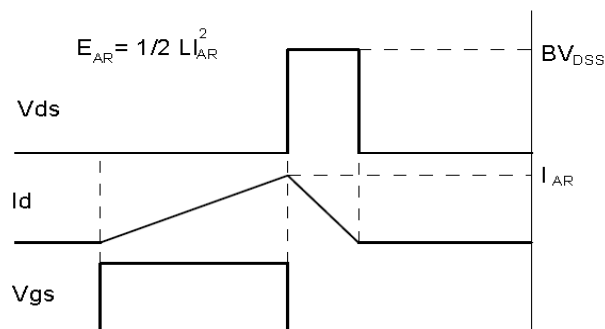
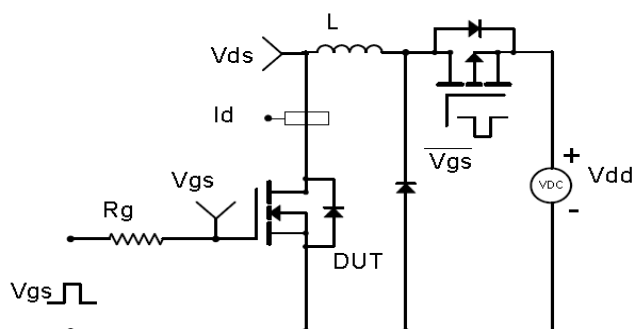
Gate Charge Test Circuit & Waveform



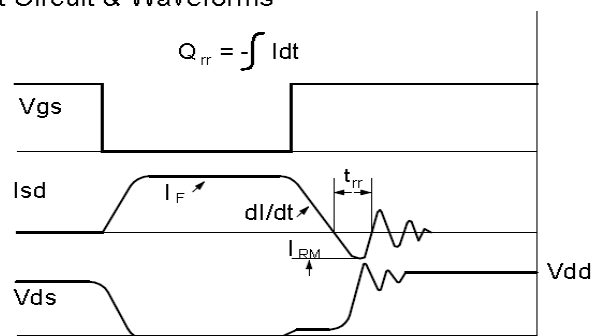
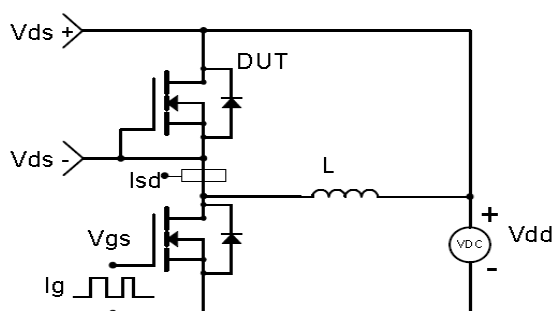
Resistive Switching Test Circuit & Waveforms

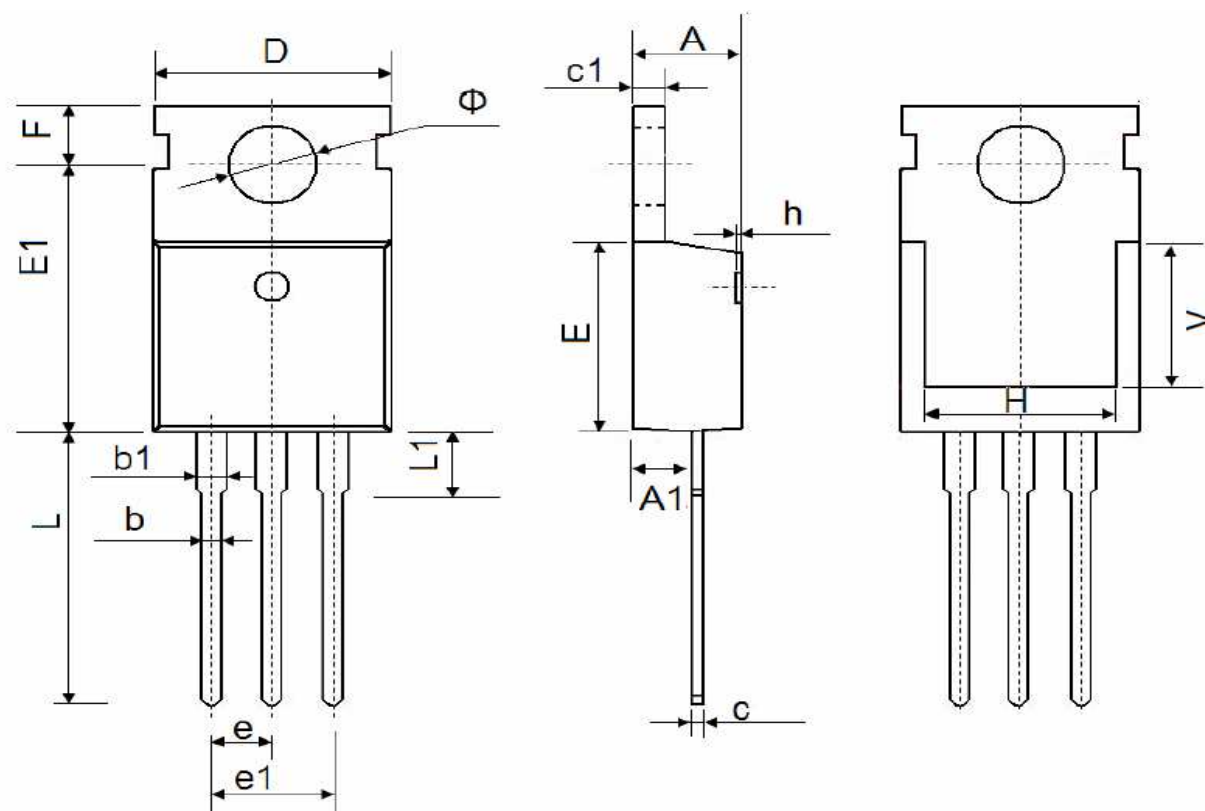


Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



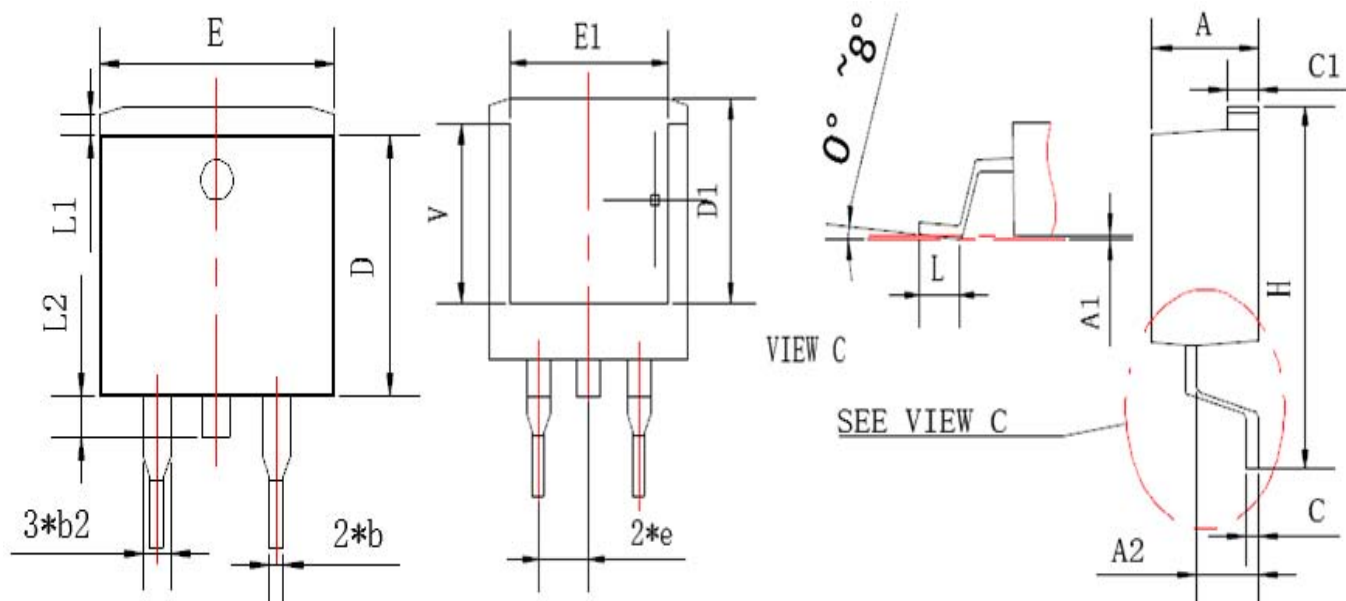
Diode Recovery Test Circuit & Waveforms



**Package Outline: TO-220-3L**


| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 4.30                      | 4.80  | 0.169                | 0.189 |
| A1     | 2.20                      | 2.70  | 0.087                | 0.106 |
| b      | 0.70                      | 0.95  | 0.276                | 0.037 |
| b1     | 1.10                      | 1.50  | 0.043                | 0.059 |
| c      | 0.40                      | 0.65  | 0.016                | 0.026 |
| c1     | 1.20                      | 1.45  | 0.047                | 0.057 |
| D      | 9.70                      | 10.30 | 0.382                | 0.406 |
| E      | 8.75                      | 9.65  | 0.344                | 0.380 |
| E1     | 12.50                     | 13.10 | 0.492                | 0.516 |
| e      | 2.540 Typ.                |       | 0.100 Typ.           |       |
| e1     | 4.98                      | 5.18  | 0.196                | 0.204 |
| F      | 2.60                      | 3.00  | 0.102                | 0.118 |
| H      | 7.00                      | 8.40  | 0.276                | 0.331 |
| h      | 0                         | 0.3   | 0                    | 0.012 |
| L      | 12.75                     | 13.90 | 0.502                | 0.547 |
| L1     | 2.85                      | 3.40  | 0.112                | 0.134 |
| V      | 6.700Ref.                 |       | 0.264Ref.            |       |
| Φ      | 3.50                      | 3.80  | 0.138                | 0.150 |

**Package Outline: TO-263**



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 4.30                      | 4.80  | 0.169                | 0.189 |
| A1     | 0.00                      | 0.25  | 0.000                | 0.010 |
| A2     | 2.35                      | 2.70  | 0.093                | 0.106 |
| b      | 0.70                      | 0.94  | 0.028                | 0.037 |
| b2     | 1.15                      | 1.35  | 0.045                | 0.053 |
| C      | 0.35                      | 0.65  | 0.014                | 0.026 |
| C1     | 1.20                      | 1.40  | 0.047                | 0.055 |
| D      | 8.40                      | 9.40  | 0.331                | 0.370 |
| D1     | 7.80                      | 8.10  | 0.307                | 0.319 |
| e      | 2.540 Typ.                |       | 0.100 Typ.           |       |
| E      | 9.85                      | 10.30 | 0.388                | 0.406 |
| E1     | 7.00                      | 8.50  | 0.276                | 0.335 |
| H      | 15.00                     | 15.70 | 0.591                | 0.618 |
| L      | 2.30                      | 2.80  | 0.091                | 0.110 |
| L1     | 0.90                      | 1.30  | 0.035                | 0.051 |
| V      | 6.700Ref.                 |       | 0.264Ref             |       |
| L2     | 1.00                      | 1.50  | 0.039                | 0.059 |

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**Revision History**

| Revision | Date      | Major Changes             |
|----------|-----------|---------------------------|
| 1.0      | 2023-3-22 | Release of formal version |

**Disclaimer**

Unless otherwise specified in the datasheet, the product is designed and qualified as a standard commercial product and is not intended for use in applications that require extraordinary levels of quality and reliability, such as automotive, aviation/aerospace and life-support devices or systems.

Any and all semiconductor products have certain probability to fail or malfunction, which may result in personal injury, death or property damage. Customer are solely responsible for providing adequate safe measures when design their systems.

Scilicon Electric reserves the right to improve product design,function and reliability without notice.