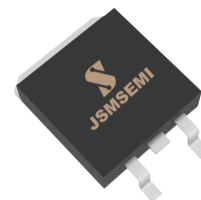


## FEATURES

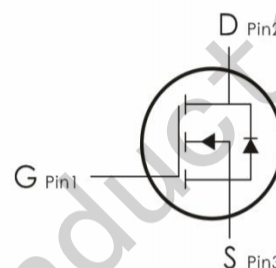
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

## APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)



TO-263-2L



| Device Marking and Package Information |         |          |
|----------------------------------------|---------|----------|
| Device                                 | Package | Marking  |
| STB11NK40ZT4                           | TO-263  | B11NK40Z |

| Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ , unless otherwise noted |                |                 |                  |
|----------------------------------------------------------------------------|----------------|-----------------|------------------|
| Parameter                                                                  | Symbol         | Value           | Unit             |
|                                                                            |                | TO-263          |                  |
| Drain-Source Voltage ( $V_{GS} = 0V$ )                                     | $V_{DSS}$      | 400             | V                |
| Continuous Drain Current                                                   | $I_D$          | 10              | A                |
| Pulsed Drain Current (note1)                                               | $I_{DM}$       | 40              | A                |
| Gate-Source Voltage                                                        | $V_{GSS}$      | $\pm 30$        | V                |
| Single Pulse Avalanche Energy (note2)                                      | $E_{AS}$       | 96              | mJ               |
| Avalanche Current (note1)                                                  | $I_{AS}$       | 4.4             | A                |
| Repetitive Avalanche Energy (note1)                                        | $E_{AR}$       | 57              | mJ               |
| Power Dissipation ( $T_C = 25^\circ\text{C}$ )                             | $P_D$          | 63              | W                |
| Operating Junction and Storage Temperature Range                           | $T_J, T_{stg}$ | $-55 \sim +150$ | $^\circ\text{C}$ |

| Thermal Resistance                      |            |        |      |
|-----------------------------------------|------------|--------|------|
| Parameter                               | Symbol     | Value  | Unit |
|                                         |            | TO-263 |      |
| Thermal Resistance, Junction-to-Case    | $R_{thJC}$ | 1.5    | K/W  |
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 60     |      |

| Specifications T <sub>J</sub> = 25°C, unless otherwise noted |                      |                                                                             |       |      |      |      |
|--------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------|-------|------|------|------|
| Parameter                                                    | Symbol               | Test Conditions                                                             | Value |      |      | Unit |
|                                                              |                      |                                                                             | Min.  | Typ. | Max. |      |
| Static                                                       |                      |                                                                             |       |      |      |      |
| Drain-Source Breakdown Voltage                               | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                                | 400   | --   | --   | V    |
| Zero Gate Voltage Drain Current                              | I <sub>DSS</sub>     | V <sub>DS</sub> = 400V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 25°C         | --    | --   | 1    | μA   |
| Gate-Source Leakage                                          | I <sub>GSS</sub>     | V <sub>GS</sub> = ±30V                                                      | --    | --   | ±100 | nA   |
| Gate-Source Threshold Voltage                                | V <sub>GS(th)</sub>  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = 250μA                   | 3.0   | --   | 4.0  | V    |
| Drain-Source On-Resistance (Note3)                           | R <sub>DS(on)</sub>  | V <sub>GS</sub> = 10V, I <sub>D</sub> = 5A                                  | --    | 0.45 | 0.55 | Ω    |
| Dynamic                                                      |                      |                                                                             |       |      |      |      |
| Input Capacitance                                            | C <sub>iss</sub>     | V <sub>GS</sub> = 0V,<br>V <sub>DS</sub> = 25V,<br>f = 1.0MHz               | --    | 1050 | --   | pF   |
| Output Capacitance                                           | C <sub>oss</sub>     |                                                                             | --    | 112  | --   |      |
| Reverse Transfer Capacitance                                 | C <sub>rss</sub>     |                                                                             | --    | 8    | --   |      |
| Total Gate Charge                                            | Q <sub>g</sub>       | V <sub>DD</sub> = 320V, I <sub>D</sub> = 10A,<br>V <sub>GS</sub> = 10V      | --    | 28   | --   | nC   |
| Gate-Source Charge                                           | Q <sub>gs</sub>      |                                                                             | --    | 9    | --   |      |
| Gate-Drain Charge                                            | Q <sub>gd</sub>      |                                                                             | --    | 7    | --   |      |
| Turn-on Delay Time                                           | t <sub>d(on)</sub>   | V <sub>DD</sub> = 200V, I <sub>D</sub> =10A,<br>R <sub>G</sub> = 25 Ω       | --    | 39   | --   | ns   |
| Turn-on Rise Time                                            | t <sub>r</sub>       |                                                                             | --    | 20   | --   |      |
| Turn-off Delay Time                                          | t <sub>d(off)</sub>  |                                                                             | --    | 138  | --   |      |
| Turn-off Fall Time                                           | t <sub>f</sub>       |                                                                             | --    | 34   | --   |      |
| Drain-Source Body Diode Characteristics                      |                      |                                                                             |       |      |      |      |
| Continuous Body Diode Current                                | I <sub>S</sub>       | T <sub>C</sub> = 25 °C                                                      | --    | --   | 10   | A    |
| Pulsed Diode Forward Current                                 | I <sub>SM</sub>      |                                                                             | --    | --   | 40   |      |
| Body Diode Voltage                                           | V <sub>SD</sub>      | T <sub>J</sub> = 25°C, I <sub>SD</sub> = 5A, V <sub>GS</sub> = 0V           | --    | --   | 1.4  | V    |
| Reverse Recovery Time                                        | t <sub>rr</sub>      | V <sub>GS</sub> = 0V,I <sub>S</sub> = 10A,<br>di <sub>F</sub> /dt =100A /μs | --    | 249  | --   | ns   |
| Reverse Recovery Charge                                      | Q <sub>rr</sub>      |                                                                             | --    | 1.87 | --   | μC   |

**Notes**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 10.0\text{mH}, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^{\circ}\text{C}$
3. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty Cycle  $\leq 1\%$

Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Figure 1. Output Characteristics ( $T_J = 25^\circ\text{C}$ )

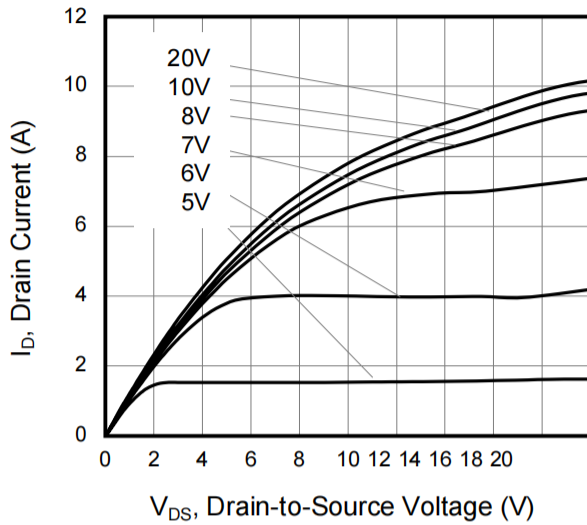


Figure 2. Body Diode Forward Voltage

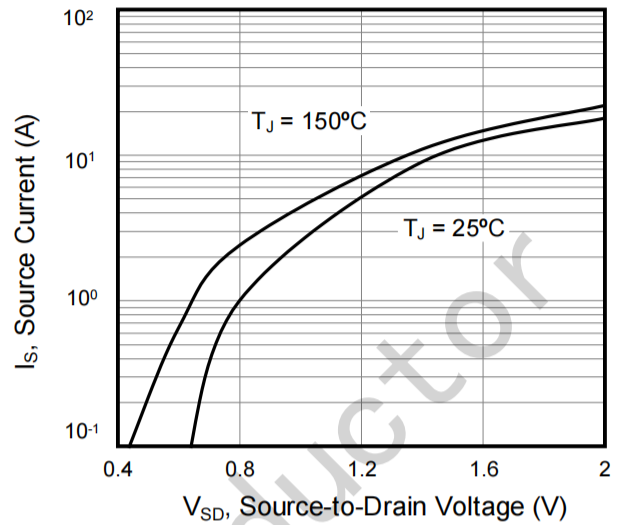


Figure 3. Drain Current vs. Temperature

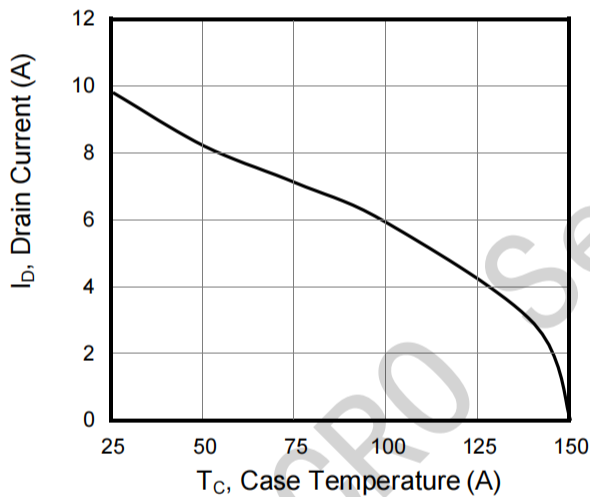


Figure 4.  $BV_{DSS}$  Variation vs. Temperature

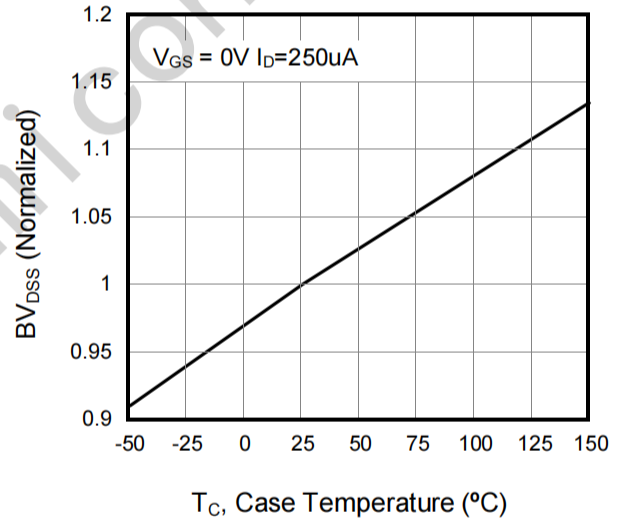


Figure 5. Transfer Characteristics

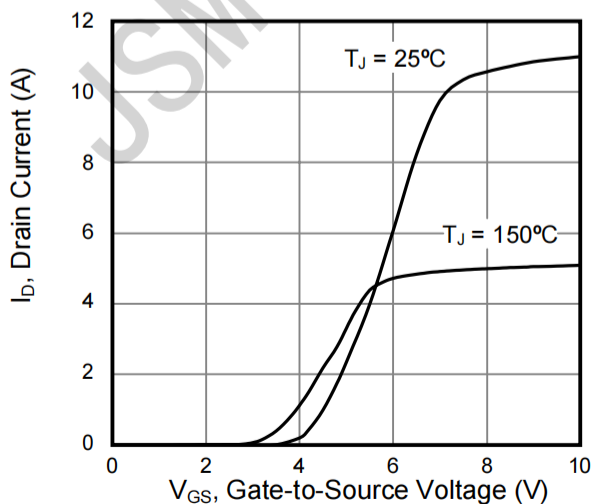
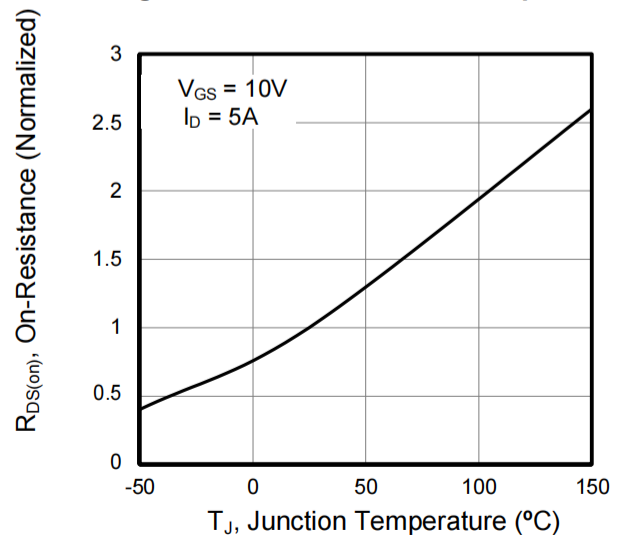


Figure 6. On-Resistance vs. Temperature



Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

Figure 7. Capacitance

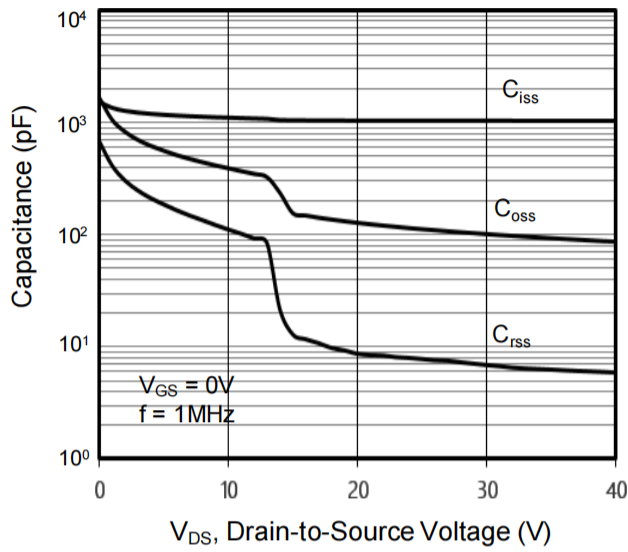


Figure 8. Gate Charge

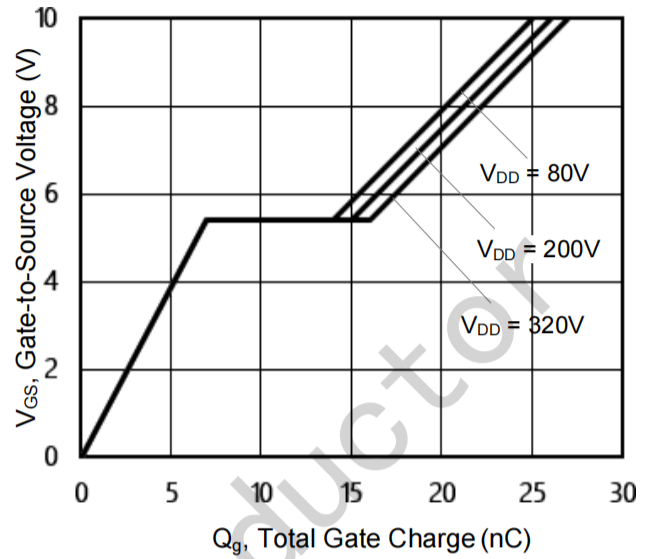


Figure 9. Transient Thermal Impedance

TO-220

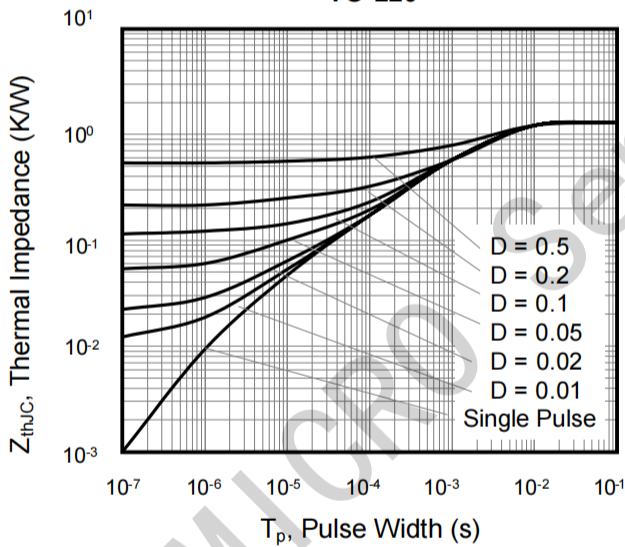


Figure 10. Transient Thermal Impedance

TO-220F

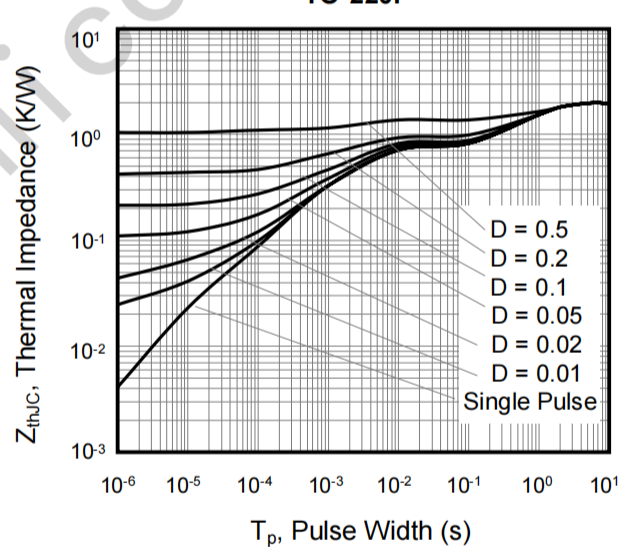


Figure A: Gate Charge Test Circuit and Waveform

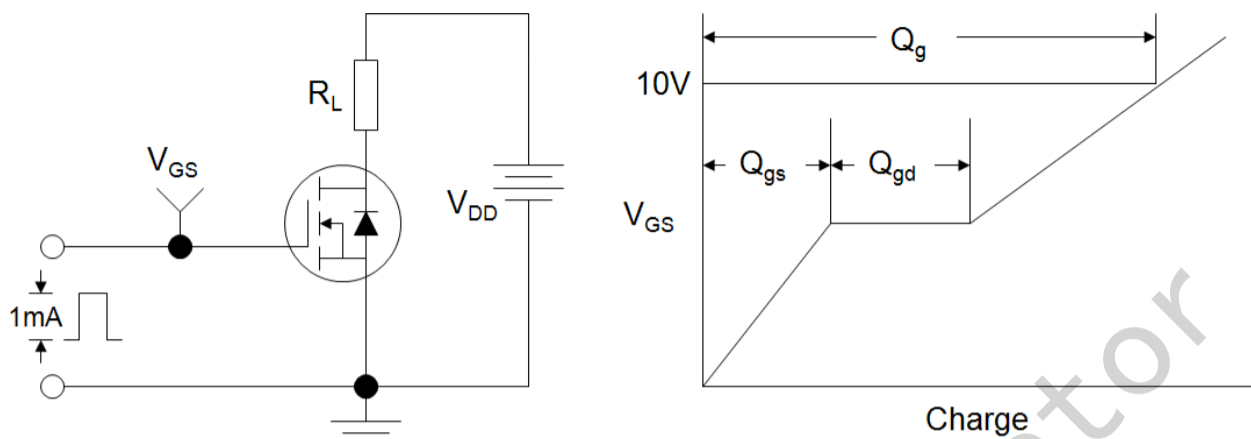


Figure B: Resistive Switching Test Circuit and Waveform

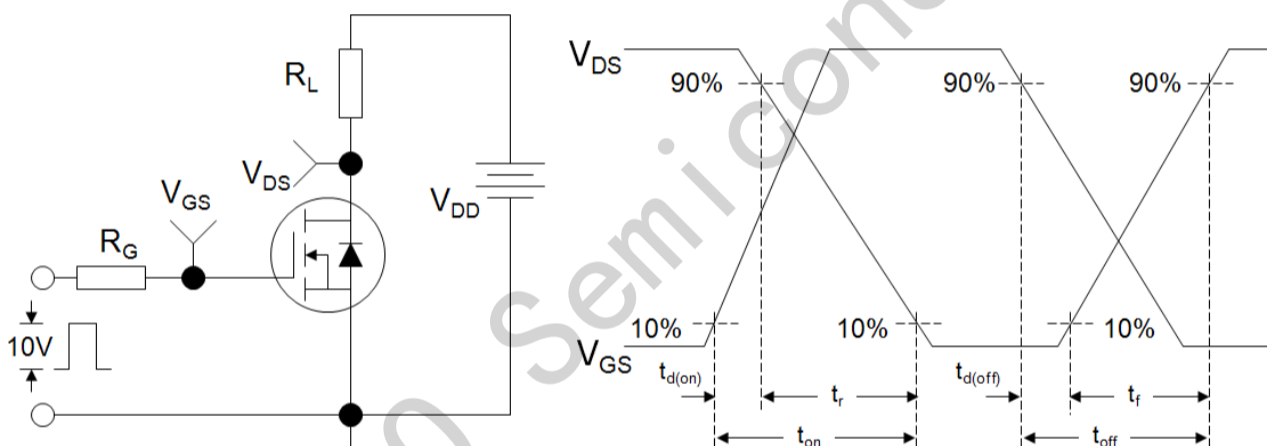
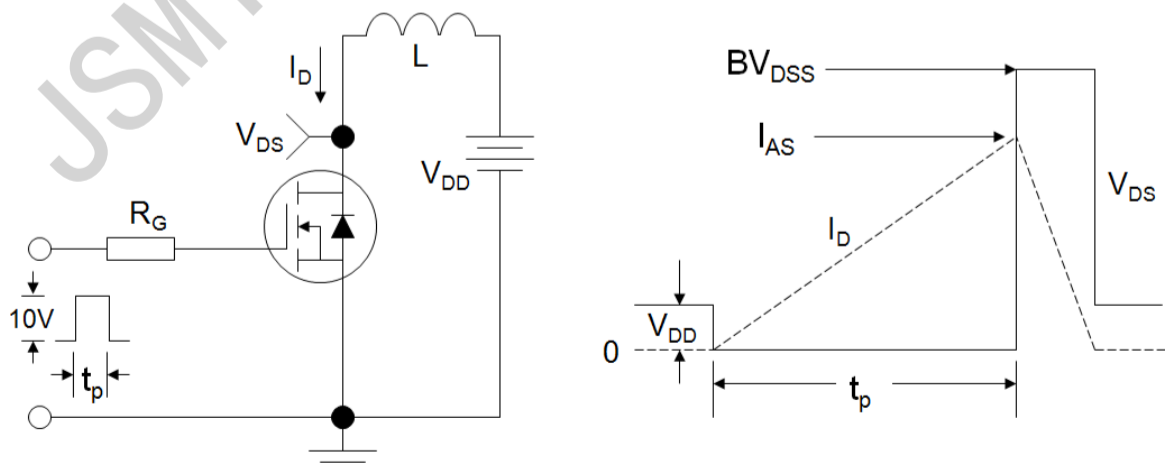
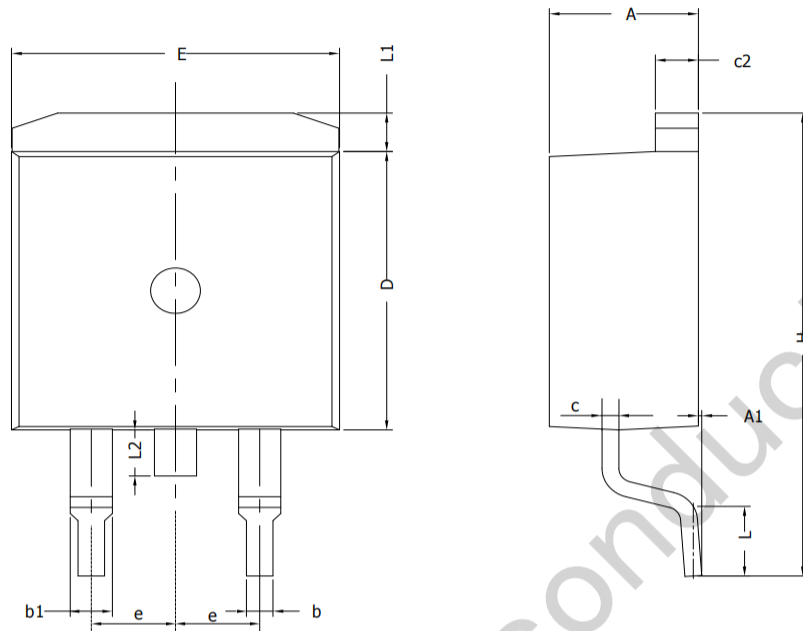


Figure C: Unclamped Inductive Switching Test Circuit and Waveform



Package Outline: TO-263



| SYMBOL | MIN     | NOM  | MAX   |
|--------|---------|------|-------|
| A      | 4.30    | 4.57 | 4.72  |
| A1     | 0       | 0.10 | 0.25  |
| b      | 0.71    | 0.81 | 0.91  |
| c      | 0.30    | ---  | 0.60  |
| c2     | 1.17    | 1.27 | 1.37  |
| D      | 8.50    | ---  | 9.35  |
| E      | 9.80    | ---  | 10.45 |
| e      | 2.54BSC |      |       |
| H      | 14.70   | ---  | 15.75 |
| L      | 2.00    | 2.30 | 2.74  |
| L1     | 1.12    | 1.27 | 1.42  |
| L2     | ---     | ---  | 1.75  |