

## Features

- CRM(CQ) Super\_Junction technology
- Much lower  $R_{on} \cdot A$  performance for On-state efficiency
- Much lower FOM for fast switching efficiency

## Applications

- LED/LCD/PDP TV and monitor Lighting
- Solar/Renewable/UPS-Micro Inverter System
- Charger
- Power Supply

## Product Summary

|                    |      |
|--------------------|------|
| $V_{DS}$           | 650V |
| $R_{DS(on)_{typ}}$ | 81mΩ |
| $I_D$              | 35A  |

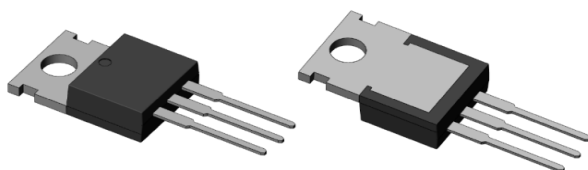
**100% DVDS Tested**

**100% Avalanche Tested**

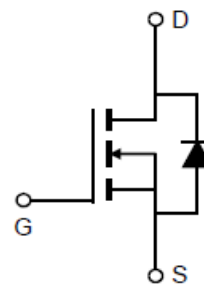


Top view

Bottom view



CRJT99N65G2



## Package Marking and Ordering Information

| Part #      | Marking | Package | Packing | Reel Size | Tape Width | Qty   |
|-------------|---------|---------|---------|-----------|------------|-------|
| CRJT99N65G2 | -       | TO-220  | Tube    | N/A       | N/A        | 50pcs |

## Absolute Maximum Ratings

| Parameter                                                                         | Symbol                | Value            | Unit             |
|-----------------------------------------------------------------------------------|-----------------------|------------------|------------------|
| Drain-source voltage                                                              | $V_{DS}$              | 650              | V                |
| Continuous drain current<br>$T_C = 25^\circ\text{C}$<br>$T_C = 100^\circ\text{C}$ | $I_D$                 | 35<br>22         | A                |
| Pulsed drain current ( $T_C = 25^\circ\text{C}$ , $t_p$ limited by $T_{jmax}$ )   | $I_{D \text{ pulse}}$ | 140              | A                |
| Avalanche energy, single pulse ( $L=60\text{mH}$ , $R_g=30\Omega$ )               | $E_{AS}$              | 480              | mJ               |
| Gate-Source voltage                                                               | $V_{GS}$              | $\pm 30$         | V                |
| Power dissipation ( $T_C = 25^\circ\text{C}$ )                                    | $P_{tot}$             | 252              | W                |
| Operating junction and storage temperature                                        | $T_j, T_{stg}$        | $-55 \dots +150$ | $^\circ\text{C}$ |

### Thermal Resistance

| Parameter                                   | Symbol | Value |       |      | Unit | Test Condition |
|---------------------------------------------|--------|-------|-------|------|------|----------------|
|                                             |        | min.  | typ.  | max. |      |                |
| Thermal resistance, junction – case. Max    | RthJC  | -     | 0.354 | 0.50 | °C/W |                |
| Thermal resistance, junction – ambient. Max | RthJA  | -     | -     | 75   | °C/W |                |

### Electrical Characteristic (at Tj = 25 °C, unless otherwise specified)

| Parameter | Symbol | Value |      |      | Unit | Test Condition |
|-----------|--------|-------|------|------|------|----------------|
|           |        | min.  | typ. | max. |      |                |

### Static Characteristic

|                                  |                     |     |      |      |    |                                                          |
|----------------------------------|---------------------|-----|------|------|----|----------------------------------------------------------|
| Drain-source breakdown voltage   | BV <sub>DSS</sub>   | 650 | -    | -    | V  | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA               |
| Gate threshold voltage           | V <sub>GS(th)</sub> | 3   | -    | 4    | V  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA |
| Zero gate voltage drain current  | I <sub>DSS</sub>    | -   | -    | 1    | μA | V <sub>DS</sub> =650V, V <sub>GS</sub> =0V               |
|                                  |                     | -   | 10   | -    |    | T <sub>C</sub> =25°C<br>T <sub>C</sub> =150°C            |
| Gate-source leakage current      | I <sub>GSS</sub>    | -   | -    | ±100 | nA | V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V               |
| Drain-source on-state resistance | R <sub>DS(on)</sub> | -   | 81   | 99   | mΩ | V <sub>GS</sub> =10V, I <sub>D</sub> =17A,               |
|                                  |                     | -   | 205  | -    |    | T <sub>C</sub> =25°C<br>T <sub>C</sub> =150°C            |
| Transconductance                 | g <sub>fs</sub>     | -   | 29.6 | -    | S  | V <sub>DS</sub> =20V, I <sub>D</sub> =17A                |

### Dynamic Characteristic

|                              |                     |   |      |   |    |                                                                                                                   |
|------------------------------|---------------------|---|------|---|----|-------------------------------------------------------------------------------------------------------------------|
| Input Capacitance            | C <sub>iss</sub>    | - | 2345 | - | pF | V <sub>GS</sub> =0V, V <sub>DS</sub> =100V,<br>f=1MHz                                                             |
| Output Capacitance           | C <sub>oss</sub>    | - | 133  | - |    |                                                                                                                   |
| Reverse Transfer Capacitance | C <sub>rss</sub>    | - | 43   | - |    |                                                                                                                   |
| Gate Total Charge            | Q <sub>G</sub>      | - | 70   | - | nC | V <sub>GS</sub> =10V, V <sub>DS</sub> =480V,<br>I <sub>D</sub> =17A                                               |
| Gate-Source charge           | Q <sub>gs</sub>     | - | 15.6 | - |    |                                                                                                                   |
| Gate-Drain charge            | Q <sub>gd</sub>     | - | 28   | - |    |                                                                                                                   |
| Turn-on delay time           | t <sub>d(on)</sub>  | - | 36.5 | - | ns | T <sub>J</sub> =25°C, V <sub>GS</sub> =10V,<br>I <sub>D</sub> =17A, V <sub>DS</sub> =400V,<br>R <sub>g</sub> =27Ω |
| Rise time                    | t <sub>r</sub>      | - | 42.5 | - |    |                                                                                                                   |
| Turn-off delay time          | t <sub>d(off)</sub> | - | 254  | - |    |                                                                                                                   |
| Fall time                    | t <sub>f</sub>      | - | 40   | - |    |                                                                                                                   |
| Gate resistance              | R <sub>G</sub>      | - | 0.86 | - | Ω  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                                                  |

### Body Diode Characteristic

| Parameter                          | Symbol   | Value |      |      | Unit | Test Condition                                  |
|------------------------------------|----------|-------|------|------|------|-------------------------------------------------|
|                                    |          | min.  | typ. | max. |      |                                                 |
| Body Diode Forward Voltage         | $V_{SD}$ | 0.7   | 0.86 | 1.2  | V    | $V_{GS}=0V, I_{SD}=17A$                         |
| Body Diode Reverse Recovery Time   | $t_{rr}$ | -     | 347  | -    | ns   | $I_{SD}=17A$<br>$dI/dt=100A/\mu s, V_{DS}=400V$ |
| Body Diode Reverse Recovery Charge | $Q_{rr}$ | -     | 5.92 | -    | μC   |                                                 |

## Typical Performance Characteristics

Fig 1: Output Characteristics ( $T_j=25^\circ\text{C}$ )

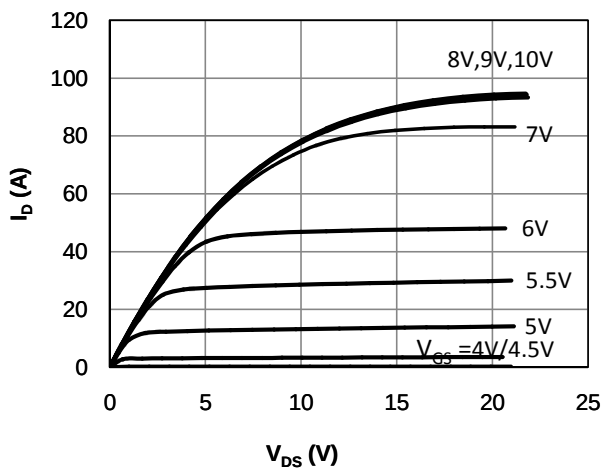


Fig 2: Output Characteristics ( $T_j=150^\circ\text{C}$ )

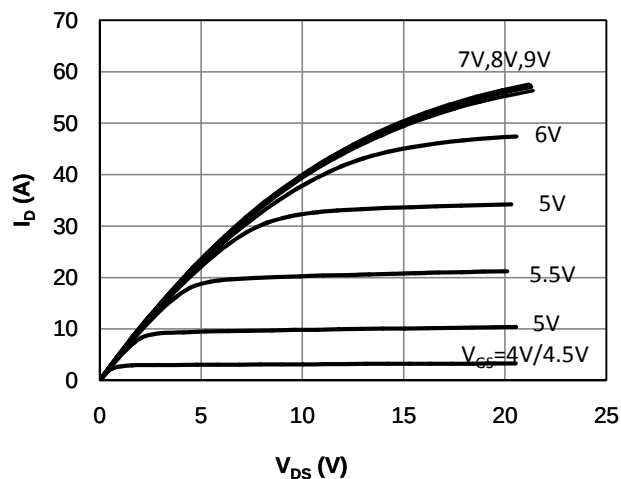


Fig 3: Transfer Characteristics

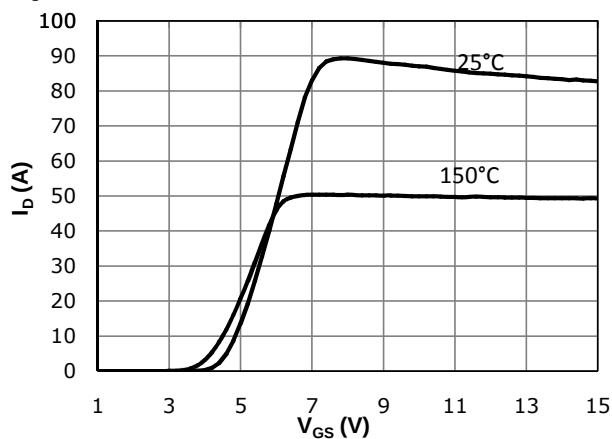


Fig 4:  $V_{TH}$  Vs  $T_j$  Temperature Characteristics

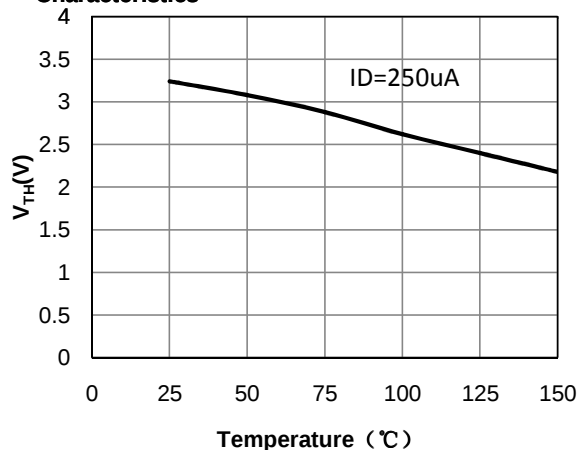


Fig 5:  $R_{DS(on)}$  Vs  $I_{DS}$  Characteristics ( $T_c=25^\circ\text{C}$ )

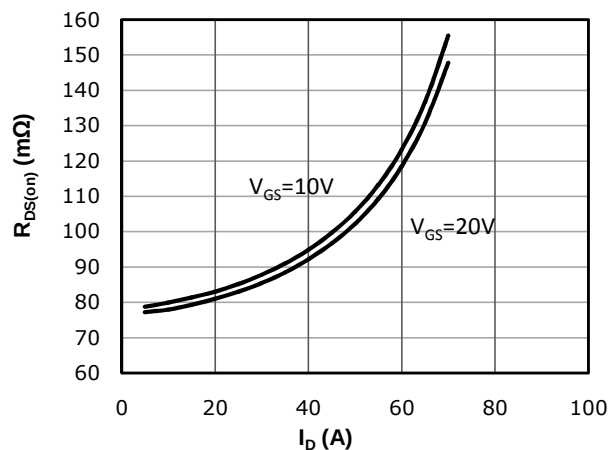


Fig 6:  $R_{DS(on)}$  vs. Temperature

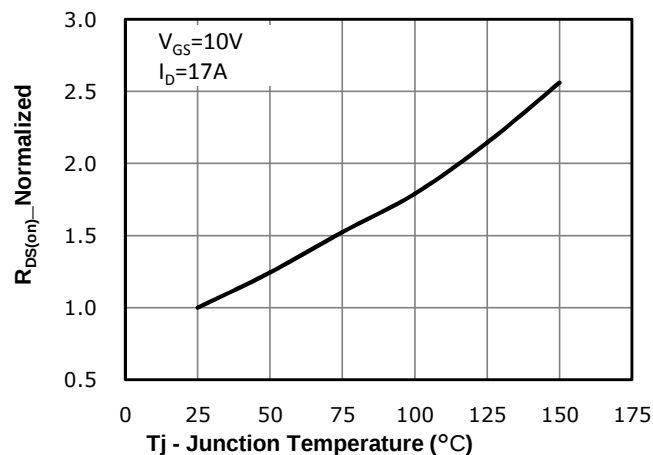


Fig 7: BVDSS vs. Temperature

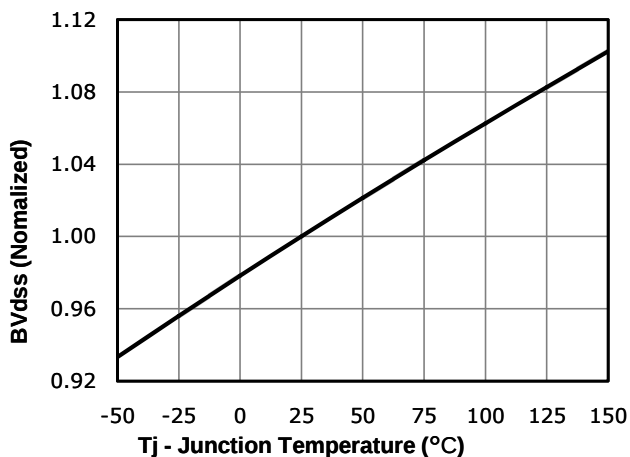


Fig 8: Rds(on) vs Gate Voltage

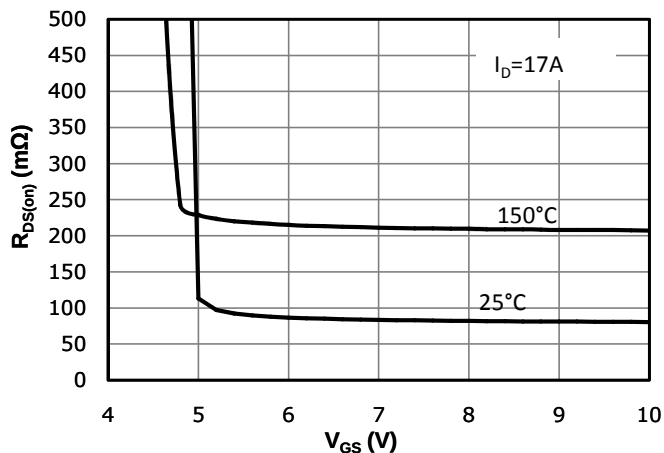


Fig 9: Body-diode Forward Characteristics

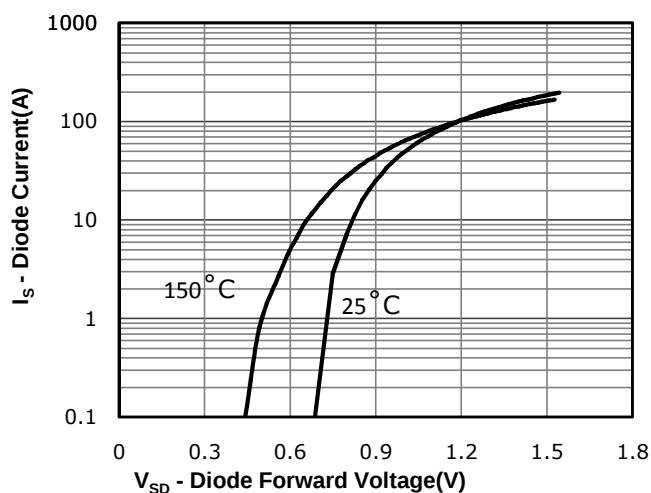


Fig 10: Gate Charge Characteristics

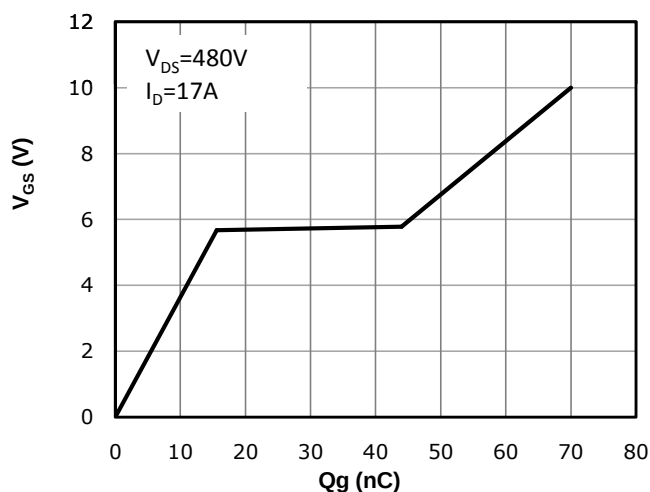


Fig 11: Capacitance Characteristics

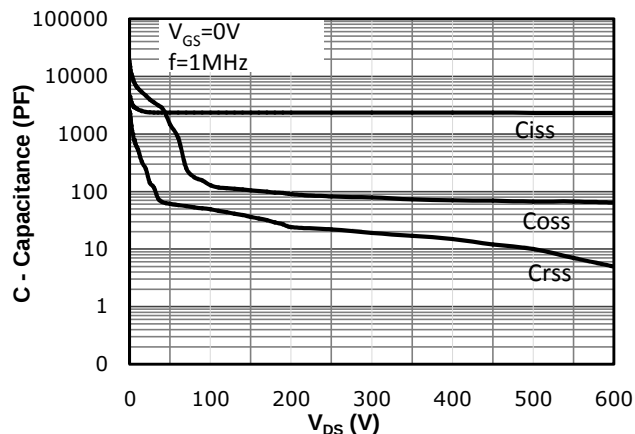


Fig 12: Safe Operating Area

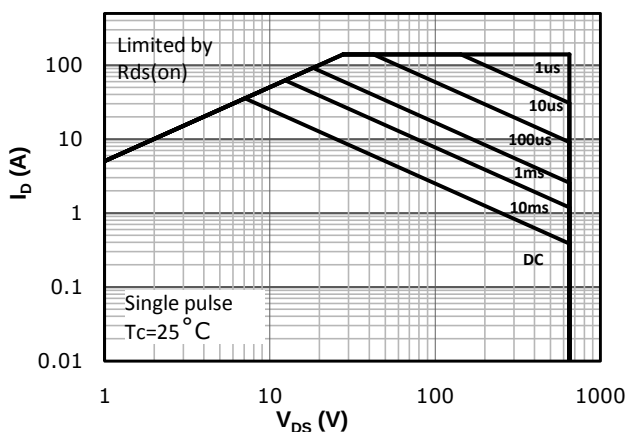
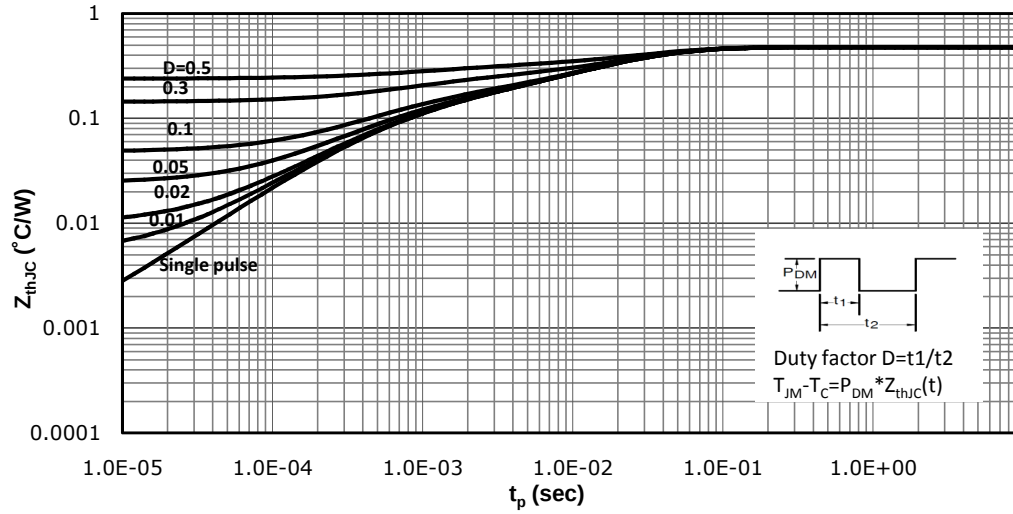
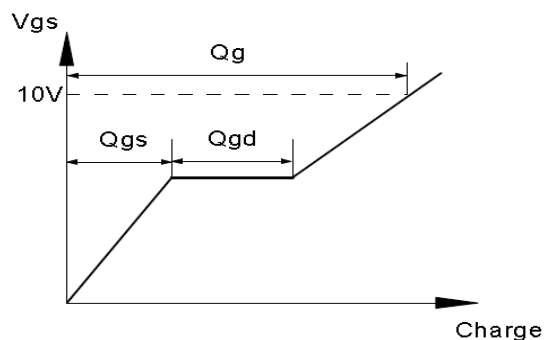
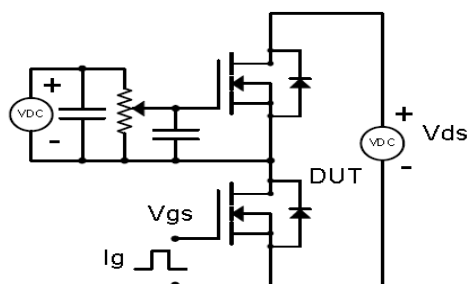


Fig 13: Max. Transient Thermal Impedance

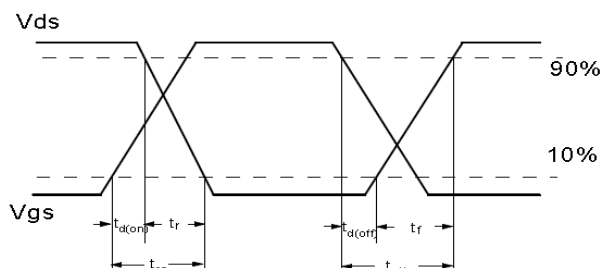
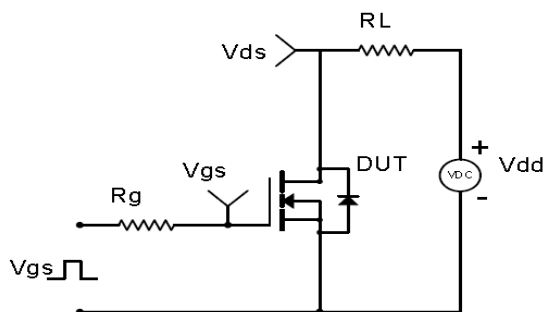


## Test Circuit & Waveform

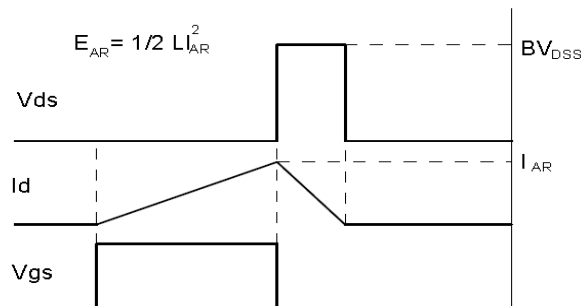
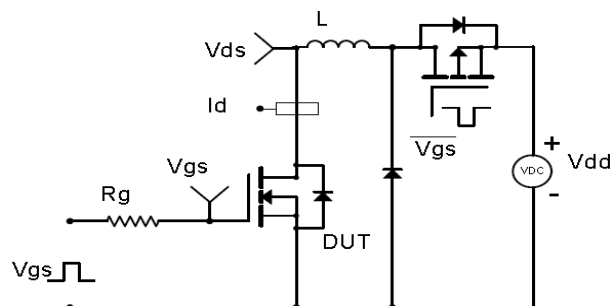
Gate Charge Test Circuit & Waveform



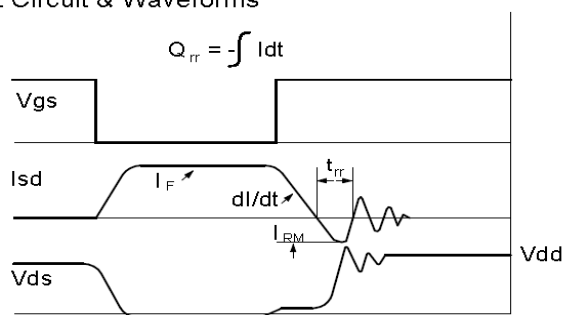
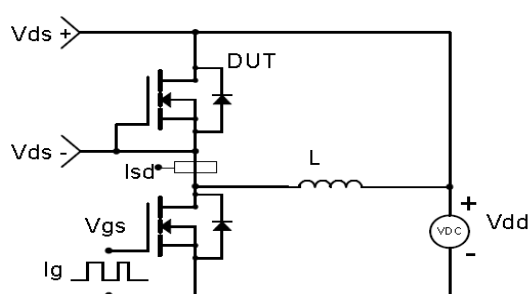
Resistive Switching Test Circuit & Waveforms



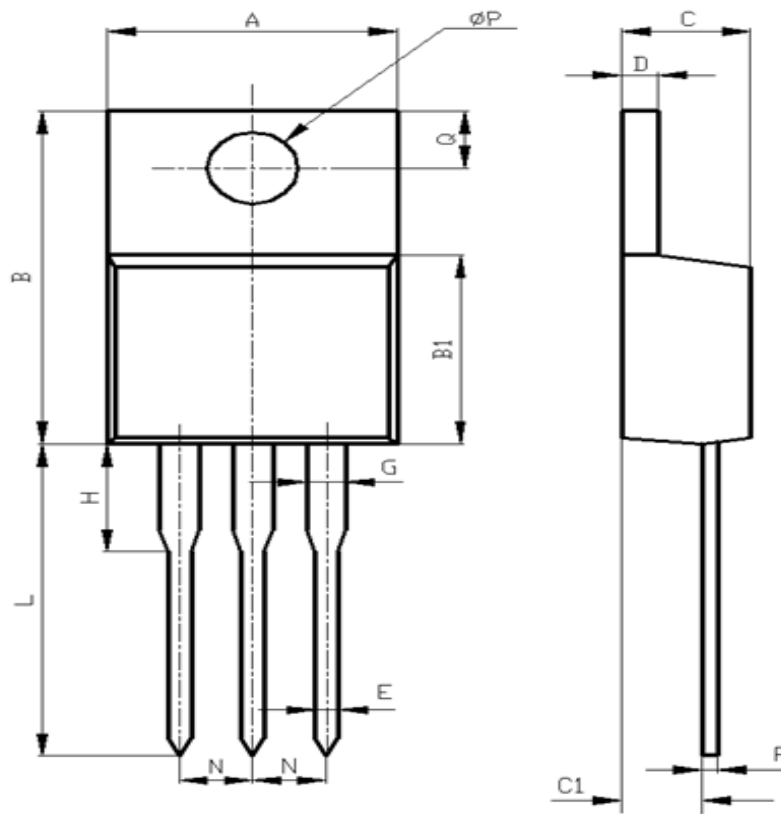
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



**Package Outline: TO-220**



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 9.60                      | 10.60 | 0.378                | 0.417 |
| B      | 15.00                     | 16.00 | 0.591                | 0.630 |
| B1     | 8.90                      | 9.50  | 0.350                | 0.374 |
| C      | 4.30                      | 4.80  | 0.169                | 0.189 |
| C1     | 2.30                      | 3.10  | 0.091                | 0.122 |
| D      | 1.20                      | 1.40  | 0.047                | 0.055 |
| E      | 0.70                      | 0.90  | 0.028                | 0.035 |
| F      | 0.30                      | 0.60  | 0.012                | 0.024 |
| G      | 1.17                      | 1.37  | 0.046                | 0.054 |
| H      | 2.70                      | 3.80  | 0.106                | 0.150 |
| L      | 12.60                     | 14.80 | 0.496                | 0.583 |
| N      | 2.34                      | 2.74  | 0.092                | 0.108 |
| Q      | 2.40                      | 3.00  | 0.094                | 0.118 |
| ØP     | 3.50                      | 3.90  | 0.138                | 0.154 |

## Marking



**NOTE:**

NXBBAAAAAY

X —Assembly location code

BB —Fab code

AAAA —Lot code

Y —Bin code

## Revision History

| Revision | Date      | Major changes |
|----------|-----------|---------------|
| 1.0      | 2020-8-19 | First 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.

CRM(CQ) reserves the right to improve product design, function and reliability without notice.