

## Features

- Uses CRM(CQ) advanced SkyMOS2 technology
- Extremely low on-resistance  $R_{DS(on)}$
- Excellent  $Q_g \times R_{DS(on)}$  product(FOM)
- Qualified according to AEC-Q101 standard
- 175°C Operating Temperature

## Applications

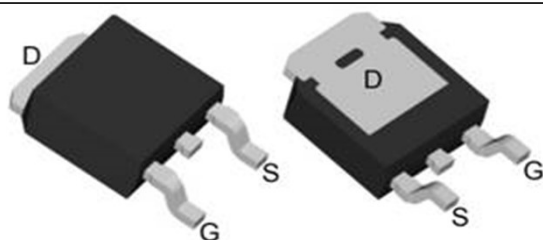
- Motor control and drive
- Battery management
- UPS (Uninterruptible Power Supplies)

## Product Summary

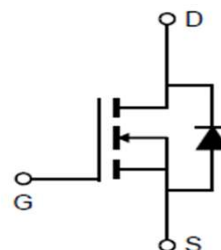
|                        |       |
|------------------------|-------|
| $V_{DS}$               | 60V   |
| $R_{DS(on)}@10V_{typ}$ | 9.5mΩ |
| $I_D$                  | 52A   |

**100% Avalanche Tested**

**100% DVDS Tested**



CRSD110N06L2Q



## Package Marking and Ordering Information

| Part #        | Marking   | Package | Packing   | Reel Size | Tape Width | Qty     |
|---------------|-----------|---------|-----------|-----------|------------|---------|
| CRSD110N06L2Q | 110N06L2Q | TO-252  | Tape&reel | N/A       | N/A        | 2500pcs |

## Absolute Maximum Ratings

| Parameter                                                                             | Symbol                | Value      | Unit             |
|---------------------------------------------------------------------------------------|-----------------------|------------|------------------|
| Drain-source voltage                                                                  | $V_{DS}$              | 60         | V                |
| Continuous drain current                                                              | $I_D$                 | 72         | A                |
| $T_C = 25^\circ\text{C}$ (Silicon limit)                                              |                       | 56         |                  |
| $T_C = 25^\circ\text{C}$ (Package limit)                                              |                       | 51         |                  |
| $T_C = 100^\circ\text{C}$ (Silicon limit)                                             |                       |            |                  |
| Pulsed drain current ( $T_C = 25^\circ\text{C}$ , $t_p$ limited by $T_{jmax}$ )       | $I_{D \text{ pulse}}$ | 224        | A                |
| Avalanche energy, single pulse ( $I_{AS} = 20\text{A}$ , $R_g=25\Omega$ )             | $E_{AS}$              | 60         | mJ               |
| Gate-Source voltage                                                                   | $V_{GS}$              | $\pm 20$   | V                |
| Power dissipation ( $T_C = 25^\circ\text{C}$ )                                        | $P_{tot}$             | 82         | W                |
| Operating junction and storage temperature                                            | $T_j, T_{stg}$        | -55...+175 | $^\circ\text{C}$ |
| Soldering temperature, wave soldering only allowed at leads (1.6mm from case for 10s) | $T_{sold}$            | 260        | $^\circ\text{C}$ |

※. Notes:1.EAS is tested at starting  $T_j = 25^\circ\text{C}$ ,  $L = 0.3\text{mH}$ ,  $I_{AS} = 20\text{A}$ ,  $V_{gs}=10\text{V}$ .

## Thermal Resistance

| Parameter                                              | Symbol     | Value |      |      | Unit | Test Condition |
|--------------------------------------------------------|------------|-------|------|------|------|----------------|
|                                                        |            | min.  | typ. | max. |      |                |
| Thermal resistance, junction – case.                   | $R_{thJC}$ | -     | 1.4  | 1.8  | °C/W |                |
| Thermal resistance, junction – ambient(min. footprint) | $R_{thJA}$ | -     | -    | 28.6 | °C/W |                |

## Electrical Characteristic (at $T_j = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

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

## Static Characteristic

|                                  |              |     |      |           |         |                                                     |
|----------------------------------|--------------|-----|------|-----------|---------|-----------------------------------------------------|
| Drain-source breakdown voltage   | $BV_{DSS}$   | 60  | -    | -         | V       | $V_{GS}=0V, I_D=250\mu A$                           |
| Gate threshold voltage           | $V_{GS(th)}$ | 1.5 | -    | 2.5       | V       | $V_{DS}=V_{GS}, I_D=250\mu A$                       |
| Zero gate voltage drain current  | $I_{DSS}$    | -   | -    | 1         | $\mu A$ | $V_{DS}=60V, V_{GS}=0V$<br>$T_j=25^{\circ}\text{C}$ |
|                                  |              | -   | -    | 100       |         | $T_j=150^{\circ}\text{C}$                           |
| Gate-source leakage current      | $I_{GSS}$    | -   | -    | $\pm 100$ | nA      | $V_{GS}=\pm 20V, V_{DS}=0V$                         |
| Drain-source on-state resistance | $R_{DS(on)}$ | -   | 9.5  | 11.5      | mΩ      | $V_{GS}=10V, I_D=20A$                               |
|                                  |              | -   | 13.5 | 17.6      |         | $V_{GS}=4.5V, I_D=16A$                              |
| Transconductance                 | $g_{fs}$     | -   | 60   | -         | S       | $V_{DS}=5V, I_D=20A$                                |

## Dynamic Characteristic

|                              |           |     |      |      |    |                                                       |
|------------------------------|-----------|-----|------|------|----|-------------------------------------------------------|
| Input Capacitance            | $C_{iss}$ | 677 | 1016 | 1524 | pF | $V_{GS}=0V, V_{DS}=30V,$<br>$f=1\text{MHz}$           |
| Output Capacitance           | $C_{oss}$ | 161 | 242  | 363  |    |                                                       |
| Reverse Transfer Capacitance | $C_{rss}$ | 9   | 13   | 180  |    |                                                       |
| Gate Total Charge            | $Q_G$     | 12  | 18   | 26   | nC | $V_{GS}=10V, V_{DS}=30V,$<br>$I_D=20A, f=1\text{MHz}$ |
| Gate-Source charge           | $Q_{gs}$  | 3   | 5.0  | 10   |    |                                                       |
| Gate-Drain charge            | $Q_{gd}$  | 1.6 | 2.4  | 4.8  |    |                                                       |

| Parameter           | Symbol         | Value |      |      | Unit | Test Condition                                                                               |
|---------------------|----------------|-------|------|------|------|----------------------------------------------------------------------------------------------|
|                     |                | min.  | typ. | max. |      |                                                                                              |
| Turn-on delay time  | $t_{d(on)}$    | 5     | 10   | 17   | ns   | V <sub>ds</sub> =30V<br>I <sub>d</sub> =20A<br>R <sub>g</sub> =2.7Ω<br>V <sub>gs</sub> =10V; |
| Rise time           | $t_r$          | 33    | 60   | 107  |      |                                                                                              |
| Turn-off delay time | $t_{d(off)}$   | 12    | 22   | 39   |      |                                                                                              |
| Fall time           | $t_f$          | 27    | 48   | 87   |      |                                                                                              |
| Gate resistance     | R <sub>G</sub> | -     | 1.8  | -    | 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 <sub>SD</sub>      | 0.6   | 0.9  | 1.4  | V    | V <sub>GS</sub> =0V, I <sub>SD</sub> =20A                                  |
| Body Diode Continuous Forward Current | I <sub>S</sub>       | -     | -    | 56   | A    | T <sub>C</sub> = 25°C                                                      |
| Body Diode Pulsed Current             | I <sub>S pulse</sub> | -     | -    | 224  | A    | T <sub>C</sub> = 25°C                                                      |
| Body Diode Reverse Recovery Time      | $t_{rr}$             | 10    | 19   | 39   | ns   | I <sub>sd</sub> =20A, V <sub>gs</sub> =0V,<br>dI <sub>F</sub> /dt=300A/us; |
| Body Diode Reverse Recovery Charge    | Q <sub>rr</sub>      | 5     | 30   | 59   | nC   |                                                                            |

## Typical Performance Characteristics

Fig 1: Output Characteristics

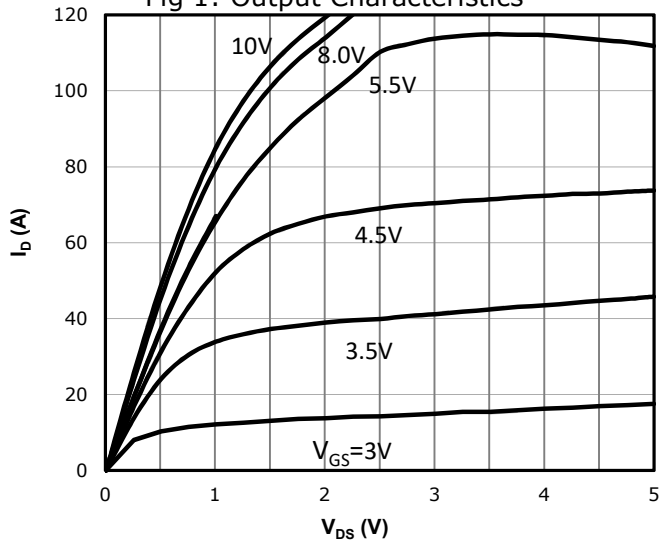


Fig 2: Transfer Characteristics

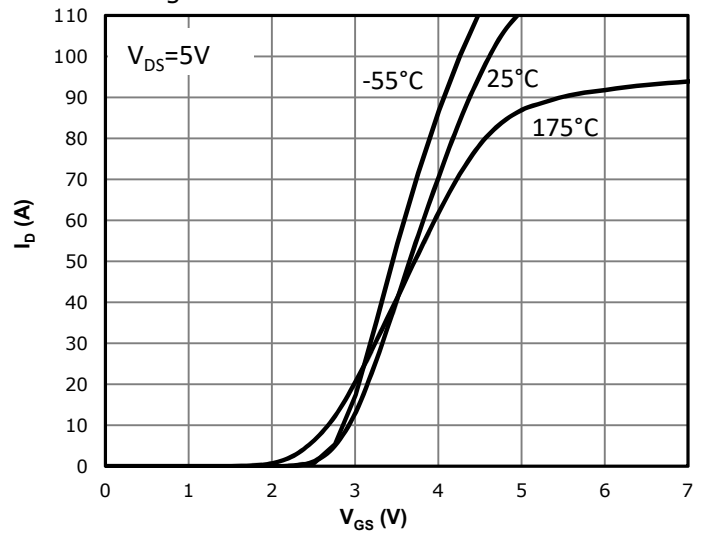


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

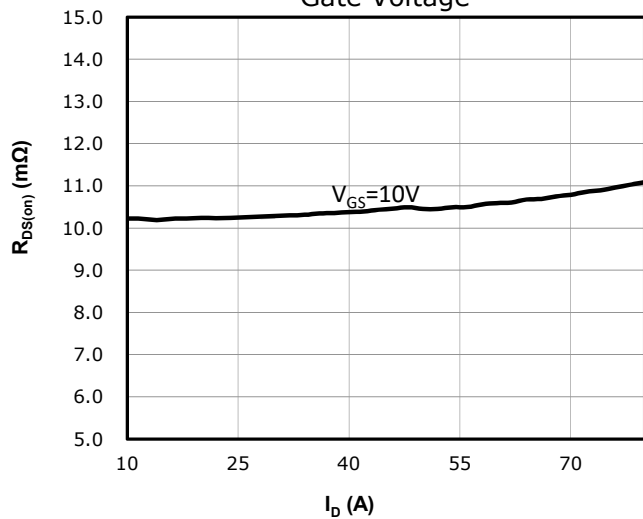


Fig 4:  $R_{DS(on)}$  vs Gate Voltage

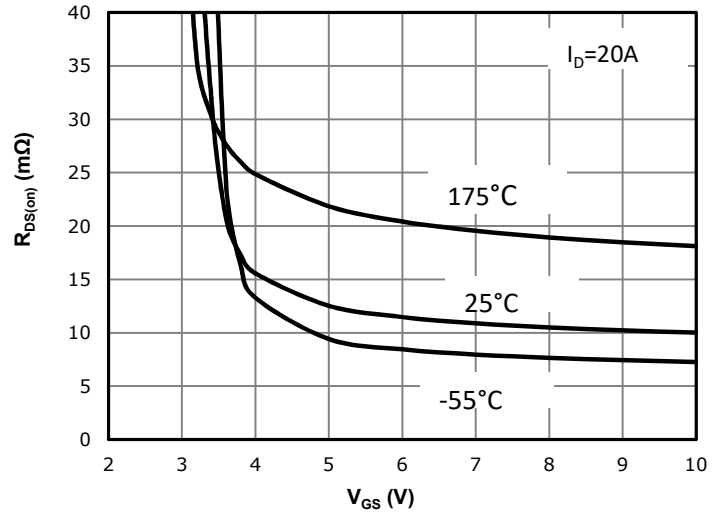


Fig 5:  $R_{DS(on)}$  vs. Temperature

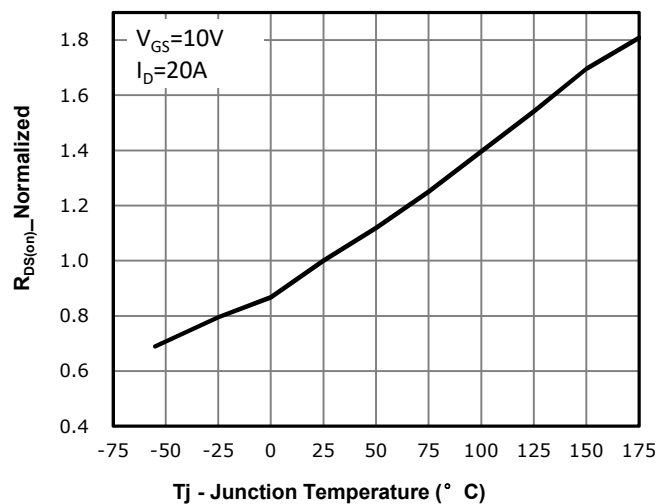


Fig 6: Capacitance Characteristics

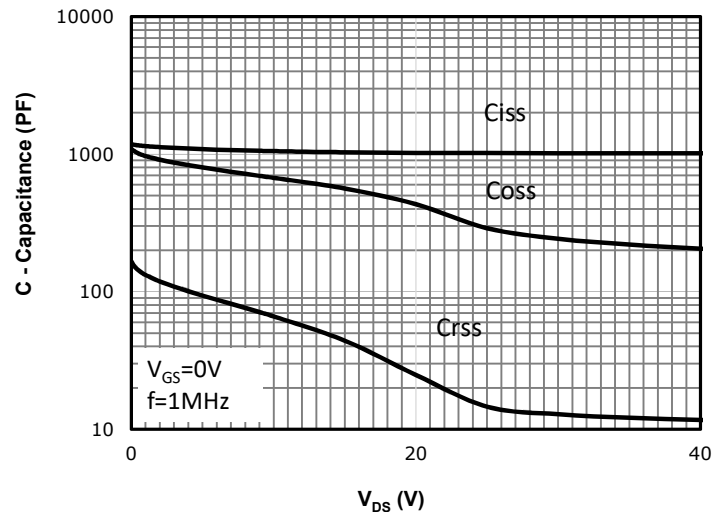


Fig 7:  $V_{gs(th)}$  vs. Temperature

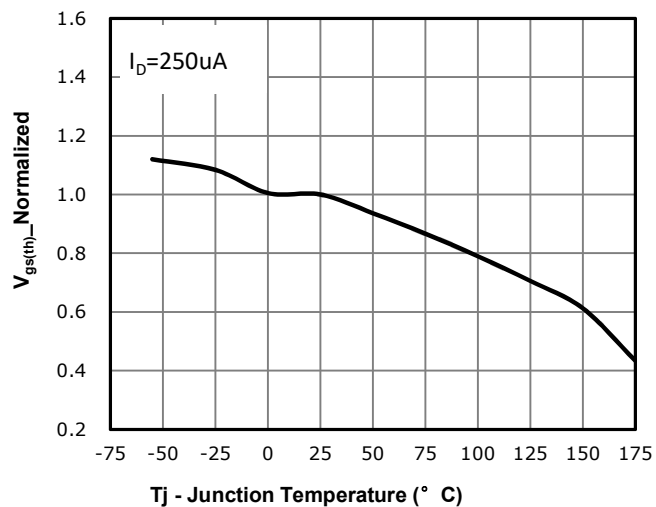


Fig 8:  $BV_{dss}$  vs. Temperature

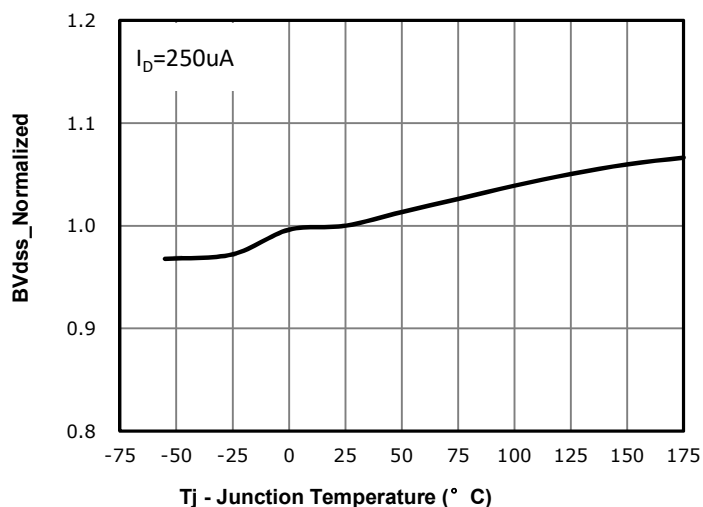


Fig 9: Gate Charge Characteristics

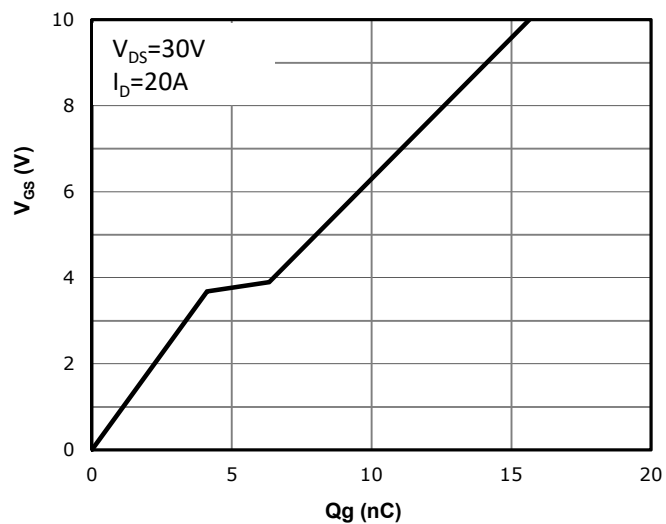


Fig 10: Body-diode Forward Characteristics

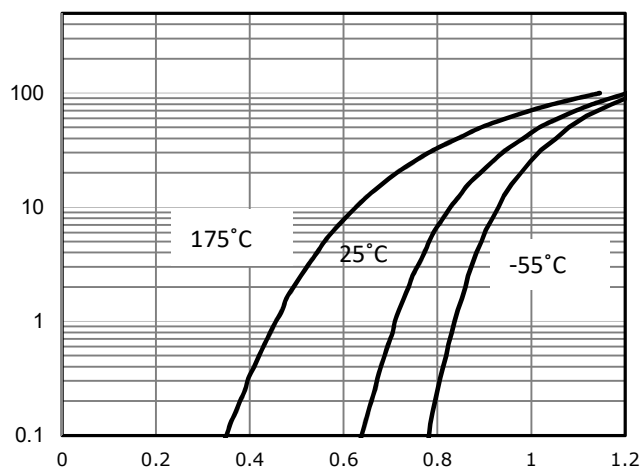


Fig 11: Power Dissipation

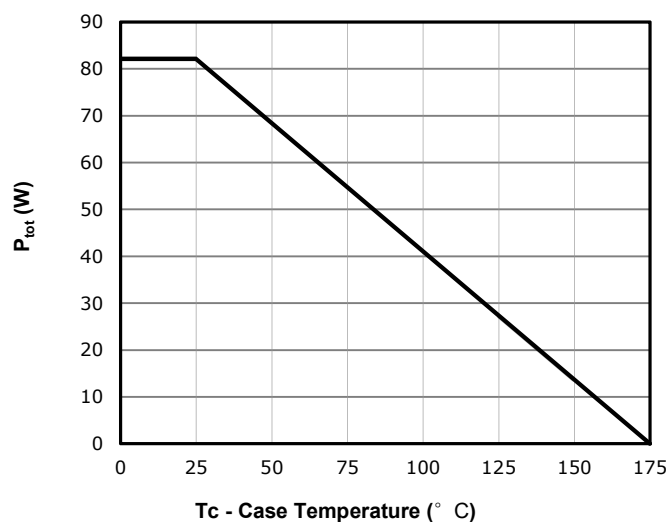


Fig 12: Drain Current Derating

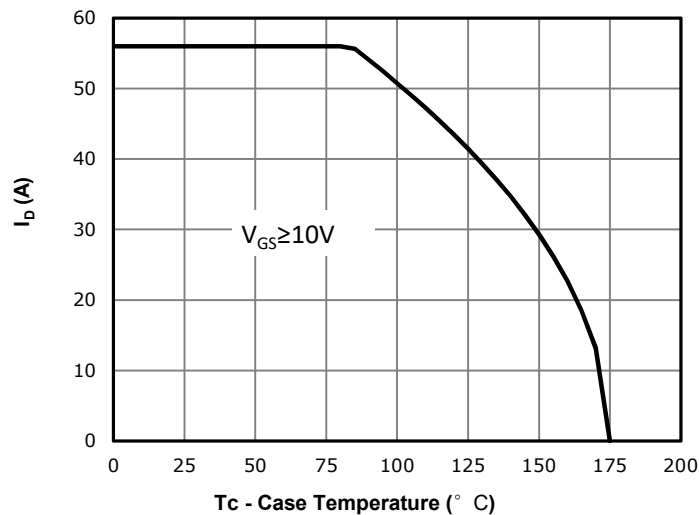


Fig 13: Safe Operating Area

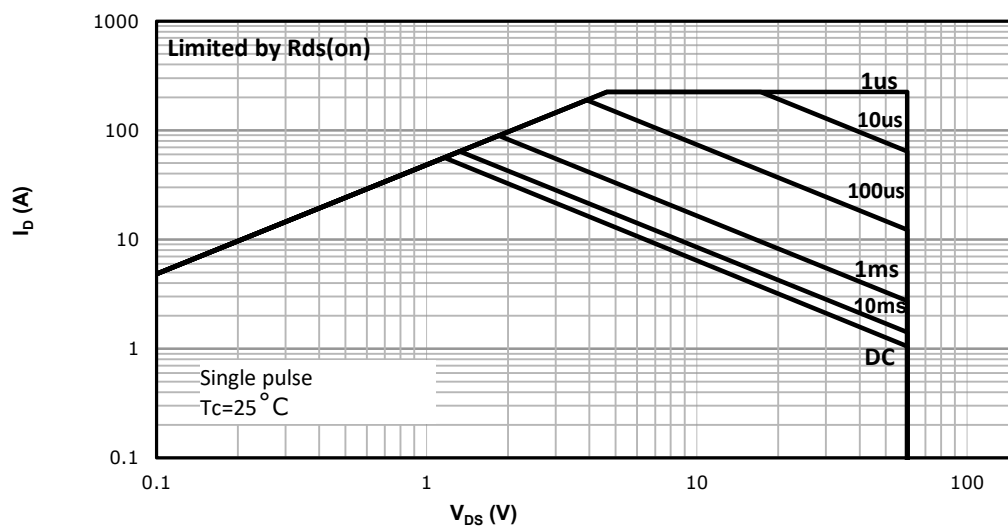
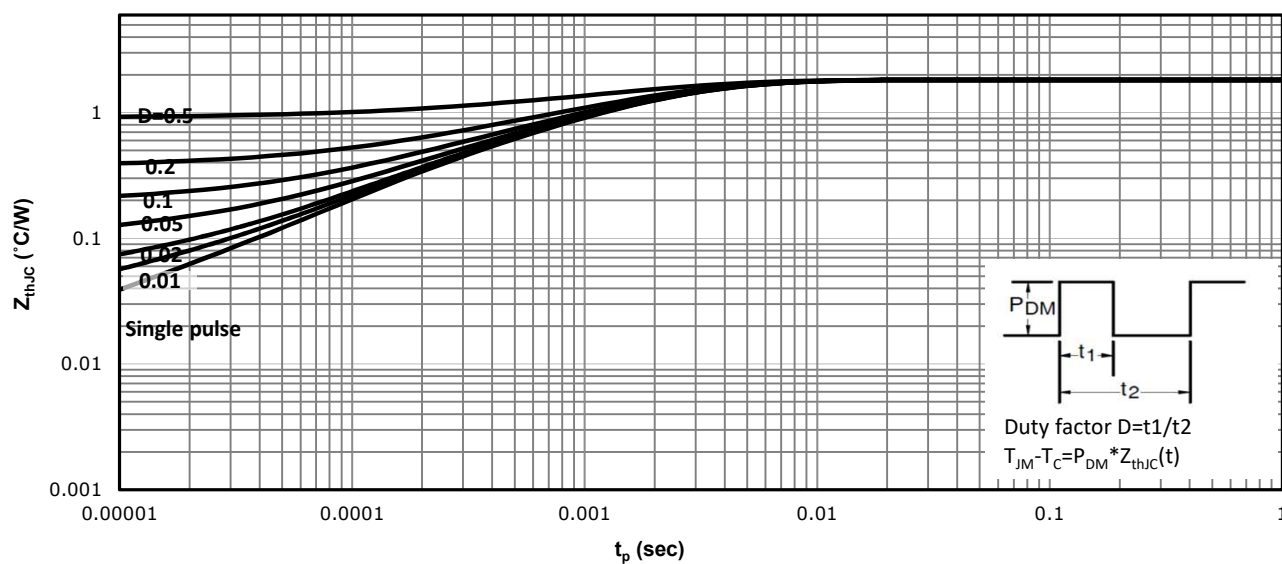
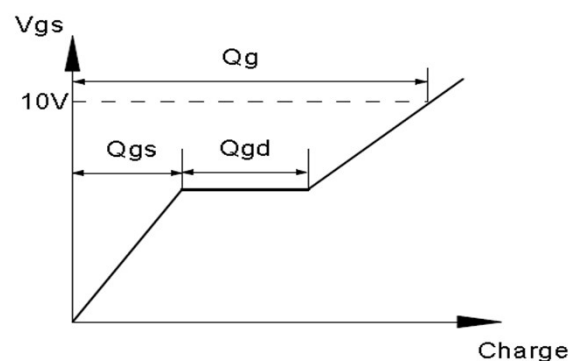
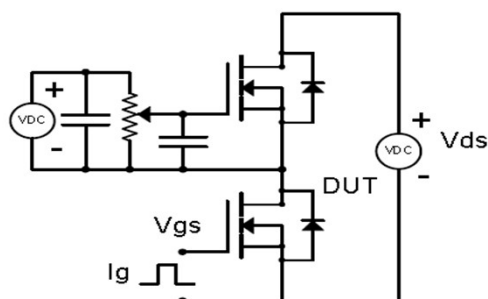


Fig 12: Max. Transient Thermal Impedance

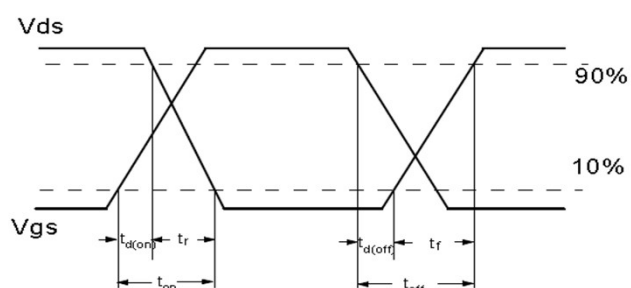
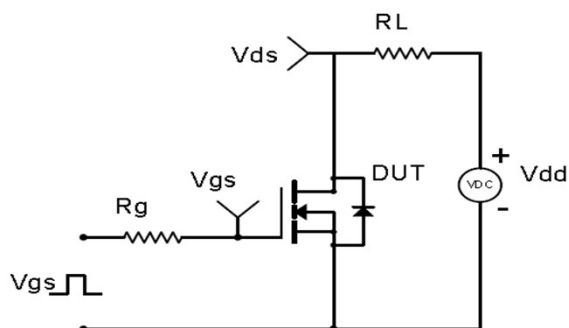


## Test Circuit & Waveform

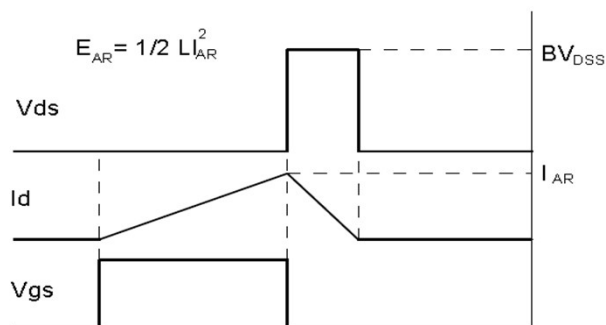
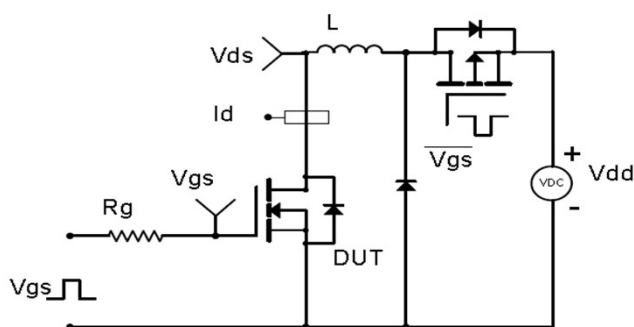
Gate Charge Test Circuit & Waveform



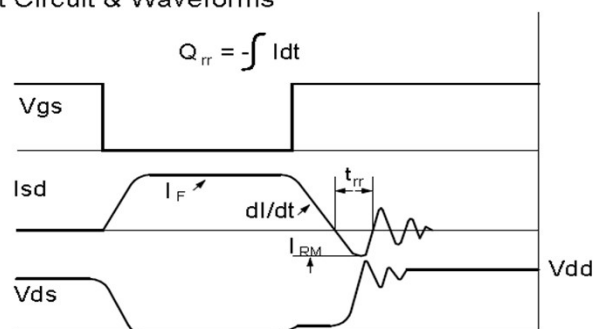
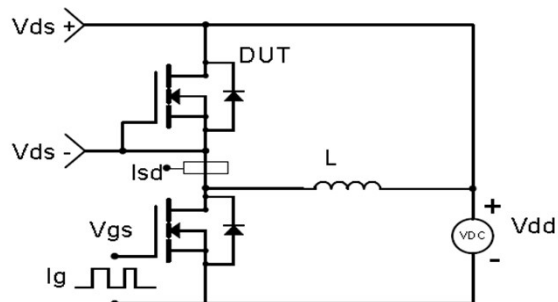
Resistive Switching Test Circuit & Waveforms



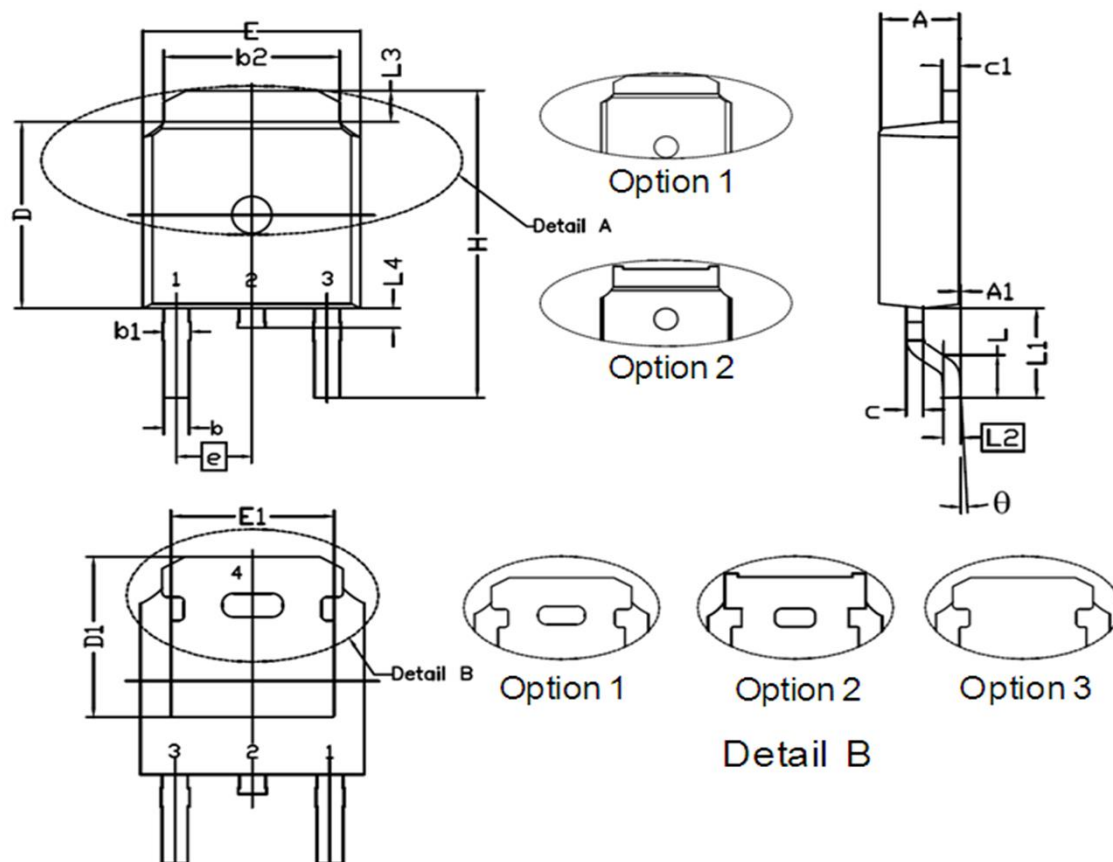
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



# Package Outline: TO-252



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 2.15                      | 2.45  | 0.085                | 0.096 |
| A1     | 0.00                      | 0.15  | 0.000                | 0.006 |
| b      | 0.60                      | 0.91  | 0.024                | 0.036 |
| b1     | 0.65                      | 1.15  | 0.026                | 0.045 |
| b2     | 5.00                      | 5.64  | 0.197                | 0.222 |
| c      | 0.45                      | 0.61  | 0.018                | 0.024 |
| c1     | 0.36                      | 0.66  | 0.014                | 0.026 |
| D      | 5.80                      | 6.30  | 0.228                | 0.248 |
| D1     | 5.21                      | --    | 0.205                | --    |
| e      | 2.29 BSC.                 |       | 0.090 BSC.           |       |
| E      | 6.30                      | 6.90  | 0.248                | 0.272 |
| E1     | 4.40                      | --    | 0.173                | --    |
| H      | 9.40                      | 10.48 | 0.370                | 0.413 |
| L      | 1.38                      | 1.78  | 0.054                | 0.070 |
| L1     | 2.92 REF                  |       | 0.115 REF            |       |
| L2     | 0.508 BSC.                |       | 0.020 BSC.           |       |
| L3     | 0.72                      | 1.35  | 0.028                | 0.053 |
| L4     | 0.60                      | 1.20  | 0.024                | 0.047 |
| θ      | 0°                        | 10°   | 0°                   | 10°   |

**Revision History**

| Revision | Date     | Major changes        |
|----------|----------|----------------------|
| 1.0      | 2023/2/3 | Priliminary Release; |
|          |          |                      |
|          |          |                      |

**Disclaimer**

Unless otherwise specified in the datasheet, the product is designed and qulified as a standard commercial product  
Any and all semiconductor products have certain probability to fail or malfunction, which may result in personal  
CRM(CQ) reserves the right to improve product design, function and reliability without notice.