

## General Description

The Sanrise SRC65R068BS is a high voltage power MOSFET, fabricated using advanced super junction technology. The resulting device has extremely low on resistance, low gate charge and fast switching time, making it especially suitable for applications which require superior power density and outstanding efficiency.

The SRC65R068BS break down voltage is 650V and it has a high rugged avalanche characteristics. The SRC65R068BS is available in TO-Leadless package.

## Features

- Ultra Low  $R_{DS(ON)} = 68m\Omega @ V_{GS} = 10V$ .
- Ultra Low Gate Charge,  $Q_g = 116nC$  typ.
- Fast switching capability
- Robust design with better EAS performance
- EMI Improved
- Non-automotive Qualified
- Ultra-fast body diode

## Application

- Telecom Power
- EV Charger
- High Power Application

## Symbol

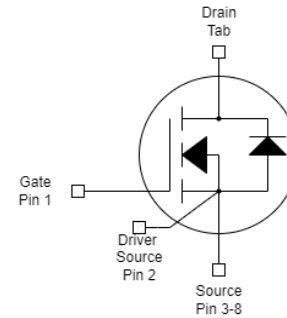
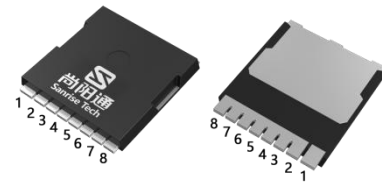


Figure 1 Symbol of SRC65R068BS

## Package Type



TO-LL

Figure 2 Package Type of SRC65R068BS

## Ordering Information

|                 |  |                 |  |                 |  |
|-----------------|--|-----------------|--|-----------------|--|
| Circuit Type    |  | SRC65R068BS□□-□ |  |                 |  |
| Package         |  |                 |  | E: Lead Free    |  |
| TL: TO-Leadless |  |                 |  | G: Green        |  |
|                 |  |                 |  | Blank: Tube     |  |
|                 |  |                 |  | TR: Tape & Reel |  |

| Package | Part Number       |                   | Marking ID     |                | Packing Type |
|---------|-------------------|-------------------|----------------|----------------|--------------|
|         | Lead Free         | Green             | Lead Free      | Green          |              |
| TO-LL   | SRC65R068BSTLTR-E | SRC65R068BSTLTR-G | SRC65R068BSTLE | SRC65R068BSTLG | Tape & Reel  |

**Absolute Maximum Ratings<sup>Note1</sup>**

| Parameter                                                          |                           | Symbol        | Rating     | Unit               |
|--------------------------------------------------------------------|---------------------------|---------------|------------|--------------------|
| Drain-Source Voltage                                               |                           | $V_{DS}$      | 650        | V                  |
| Gate-Source Voltage                                                |                           | $V_{GS}$      | ±30        | V                  |
| Power Dissipation(TO-LL, $T_c=25^{\circ}\text{C}$ )                |                           | $P_{tot}$     | 357.1      | W                  |
| Continuous Drain Current                                           | $T_c=25^{\circ}\text{C}$  | $I_D$         | 48         | A                  |
|                                                                    | $T_c=100^{\circ}\text{C}$ |               | 30.3       |                    |
|                                                                    | $T_c=125^{\circ}\text{C}$ |               | 21.5       |                    |
| Pulsed Drain Current (Note 2)                                      |                           | $I_{DM}$      | 144        | A                  |
| Avalanche Energy, Single Pulse (Note 3)                            |                           | $E_{AS}$      | 125        | mJ                 |
| Avalanche Energy, Repetitive (Note 2)                              |                           | $E_{AR}$      | 0.6        | mJ                 |
| Avalanche Current, Repetitive (Note 2)                             |                           | $I_{AR}$      | 5.0        | A                  |
| Continuous Diode Forward Current                                   |                           | $I_S$         | 48         | A                  |
| Diode Pulse Current                                                |                           | $I_{S,PULSE}$ | 144        | A                  |
| MOSFET dv/dt Ruggedness, $V_{DS} \leq 480\text{V}$                 |                           | dv/dt         | 80         | V/ns               |
| Reverse Diode dv/dt, $V_{DS} \leq 480\text{V}$ , $I_{SD} \leq I_D$ |                           | dv/dt         | 50         | V/ns               |
| ESD                                                                |                           | HBM           | >1000      | V                  |
| Operating Junction Temperature                                     |                           | $T_J$         | 150        | $^{\circ}\text{C}$ |
| Storage Temperature                                                |                           | $T_{STG}$     | -55 to 150 | $^{\circ}\text{C}$ |
| Lead Temperature (Soldering, 10 sec)                               |                           | $T_{LEAD}$    | 260        | $^{\circ}\text{C}$ |

Note:

1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.  
Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3.  $I_{AS} = 5.0\text{A}$ ,  $V_{DD} = 60\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^{\circ}\text{C}$

**Thermal characteristics**

| Parameter                               |       | Symbol     | Min | Typ | Max  | Unit                          |
|-----------------------------------------|-------|------------|-----|-----|------|-------------------------------|
| Thermal resistance, Junction-to-Case    | TO-LL | $R_{thJC}$ |     |     | 0.35 | $^{\circ}\text{C} / \text{W}$ |
| Thermal resistance, Junction-to-Ambient | TO-LL | $R_{thJA}$ |     |     | 58   | $^{\circ}\text{C} / \text{W}$ |

## Electrical Characteristics

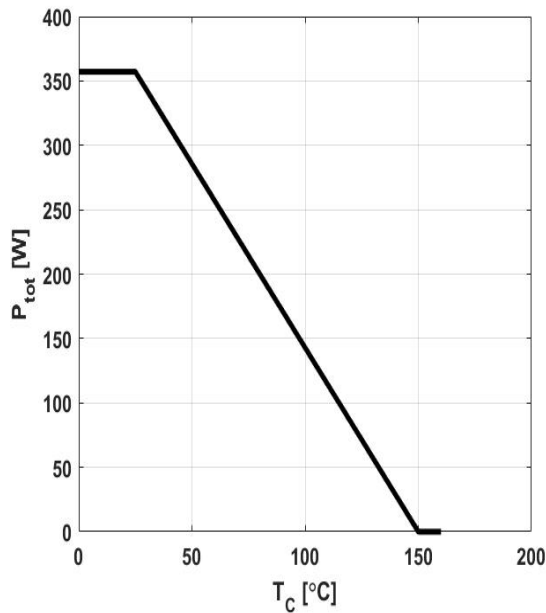
$T_J = 25^{\circ}\text{C}$ , unless otherwise specified.

| Parameter                                                     |         | Symbol               | Test Conditions                                                                         | Min | Typ  | Max  | Unit |
|---------------------------------------------------------------|---------|----------------------|-----------------------------------------------------------------------------------------|-----|------|------|------|
| Statistic Characteristics                                     |         |                      |                                                                                         |     |      |      |      |
| Drain-Source Breakdown Voltage                                |         | BV <sub>DSS</sub>    | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA                                              | 650 |      |      | V    |
| Zero Gate Voltage Drain Current                               |         | I <sub>DSS</sub>     | V <sub>DS</sub> =650V, V <sub>GS</sub> =0V                                              |     |      | 10   | uA   |
| Gate-Body Leakage Current                                     | Forward | I <sub>GSSF</sub>    | V <sub>GS</sub> =30V, V <sub>DS</sub> =0V                                               |     |      | 100  | nA   |
|                                                               | Reverse | I <sub>GSSR</sub>    | V <sub>GS</sub> =-30V, V <sub>DS</sub> =0V                                              |     |      | -100 |      |
| Gate Threshold Voltage                                        |         | V <sub>GS(TH)</sub>  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =1.0mA                                | 3.0 | 4.0  | 5.0  | V    |
| Static Drain-Source On-Resistance                             |         | R <sub>DS(ON)</sub>  | V <sub>GS</sub> =10V, I <sub>D</sub> =24A                                               |     | 57   | 68   | mΩ   |
| Gate Resistance                                               |         | R <sub>G</sub>       | f=1MHz, Open Drain                                                                      |     | 1.0  |      | Ω    |
| Dynamic Characteristics                                       |         |                      |                                                                                         |     |      |      |      |
| Input Capacitance                                             |         | C <sub>ISS</sub>     | V <sub>DS</sub> =50V, V <sub>GS</sub> =0V, f=1MHz                                       |     | 4.3  |      | nF   |
| Output Capacitance                                            |         | C <sub>OSS</sub>     |                                                                                         |     | 171  |      | pF   |
| Reverse Transfer Capacitance                                  |         | C <sub>RSS</sub>     |                                                                                         |     | 2.8  |      | pF   |
| Effective output capacitance, energy related <sup>NOTE5</sup> |         | C <sub>O(er)</sub>   | V <sub>GS</sub> =0V, V <sub>DS</sub> =0...400V                                          |     | 94   |      | pF   |
| Effective output capacitance, time related <sup>NOTE6</sup>   |         | C <sub>O(tr)</sub>   |                                                                                         |     | 550  |      |      |
| Turn-on Delay Time                                            |         | t <sub>d(on)</sub>   | V <sub>DD</sub> =400V, I <sub>D</sub> =24A<br>R <sub>G</sub> =10Ω, V <sub>GS</sub> =12V |     | 43.2 |      | ns   |
| Rise Time                                                     |         | t <sub>r</sub>       |                                                                                         |     | 9.6  |      |      |
| Turn-off Delay Time                                           |         | t <sub>d(off)</sub>  |                                                                                         |     | 69.6 |      |      |
| Fall Time                                                     |         | t <sub>f</sub>       |                                                                                         |     | 6.4  |      |      |
| Gate Charge Characteristics                                   |         |                      |                                                                                         |     |      |      |      |
| Gate to Source Charge                                         |         | Q <sub>gs</sub>      | V <sub>DD</sub> =480V, I <sub>D</sub> =24A<br>V <sub>GS</sub> =0 to 10V                 |     | 30.5 |      | nC   |
| Gate to Drain Charge                                          |         | Q <sub>gd</sub>      |                                                                                         |     | 66.8 |      |      |
| Gate Charge Total                                             |         | Q <sub>g</sub>       |                                                                                         |     | 116  |      |      |
| Gate Plateau Voltage                                          |         | V <sub>plateau</sub> |                                                                                         |     | 6.5  |      | V    |
| Reverse Diode Characteristics                                 |         |                      |                                                                                         |     |      |      |      |
| Drain-Source Diode Forward Voltage                            |         | V <sub>SD</sub>      | V <sub>GS</sub> =0V, I <sub>SD</sub> =24A                                               |     | 0.9  | 1.1  | V    |
| Reverse Recovery Time                                         |         | t <sub>rr</sub>      | V <sub>R</sub> =400V, I <sub>F</sub> =30A<br>dI <sub>F</sub> /dt=130A/us                |     | 115  |      | ns   |
| Reverse Recovery Charge                                       |         | Q <sub>rr</sub>      |                                                                                         |     | 0.77 |      | uC   |
| Peak Reverse Recovery Current                                 |         | I <sub>rrm</sub>     |                                                                                         |     | 11.7 |      | A    |

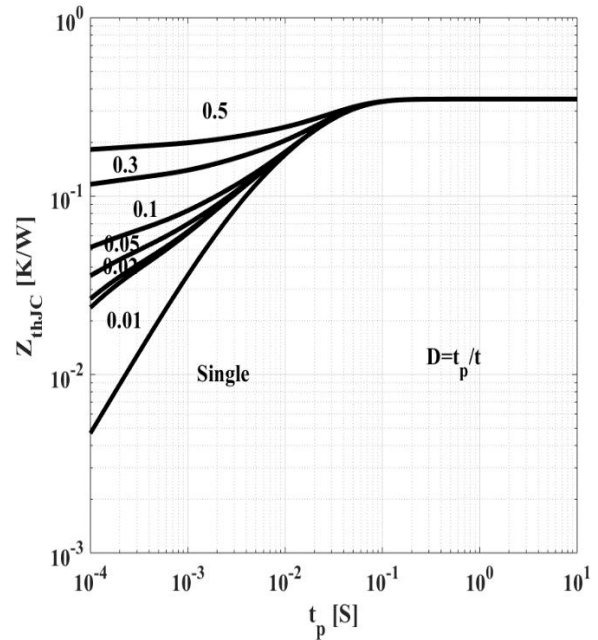
Note:

5.  $C_{O(er)}$  is a fixed capacitance that gives the same stored energy as  $C_{OSS}$  while  $V_{DS}$  is rising from 0 to 480V

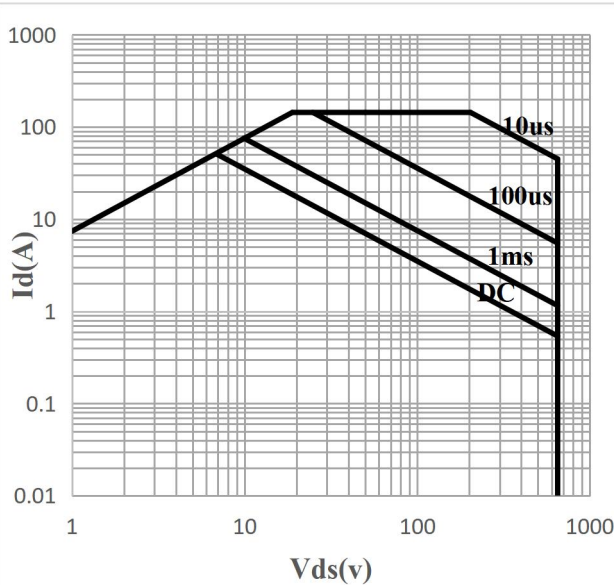
6.  $C_{O(tr)}$  is a fixed capacitance that gives the same charging time as  $C_{OSS}$  while  $V_{DS}$  is rising from 0 to 480 V

**Typical Performance Characteristics**
**Figure 3: Power Dissipation**


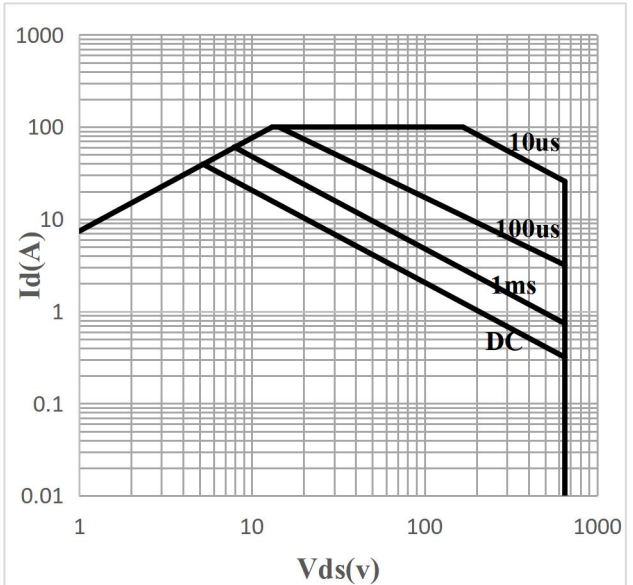
$$P_{tot} = f(T_c);$$

**Figure 4: Max. Transient Thermal Impedance**


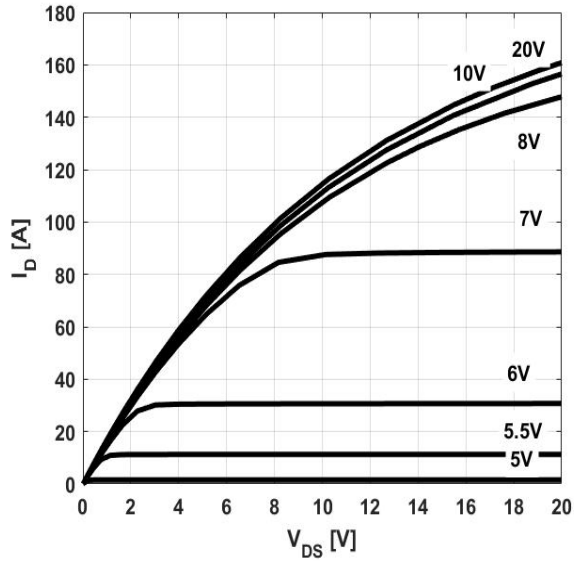
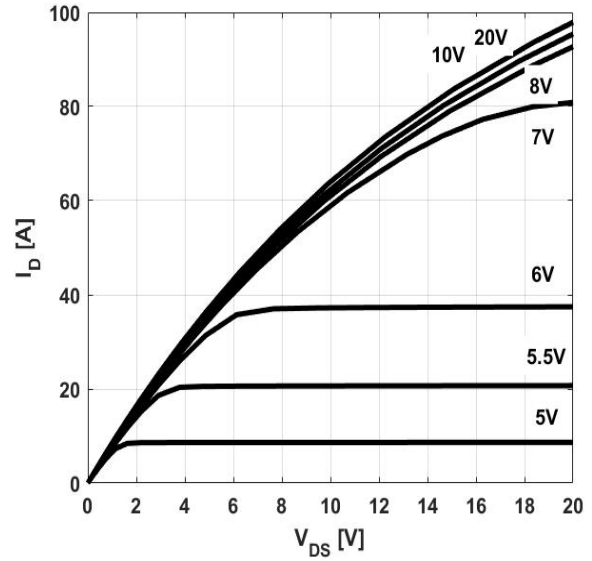
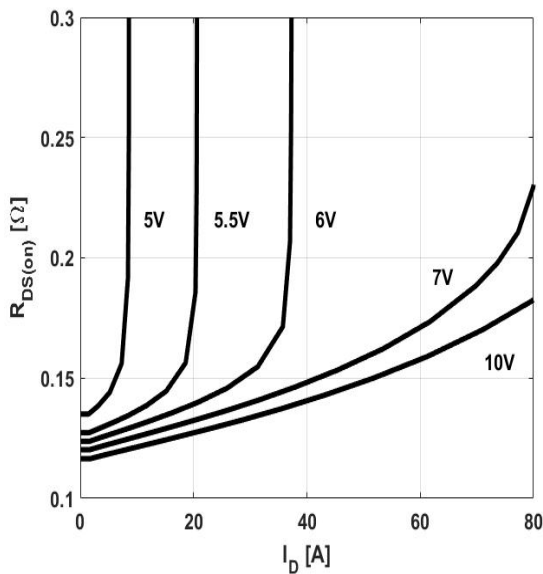
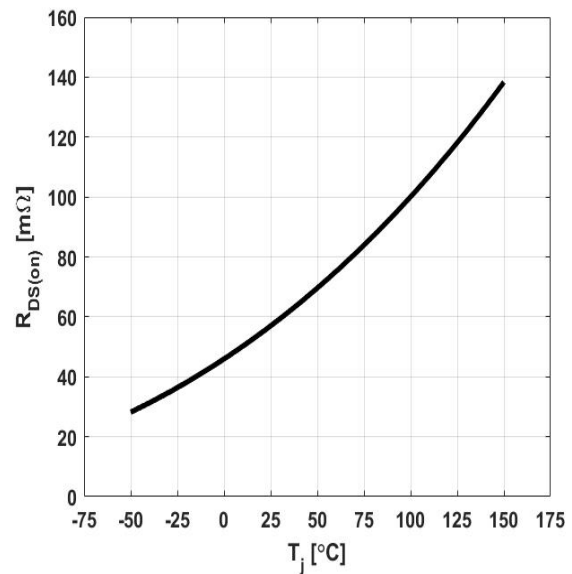
$$Z_{(th)JC} = f(t_p); \text{ parameter: } D = t_p/T;$$

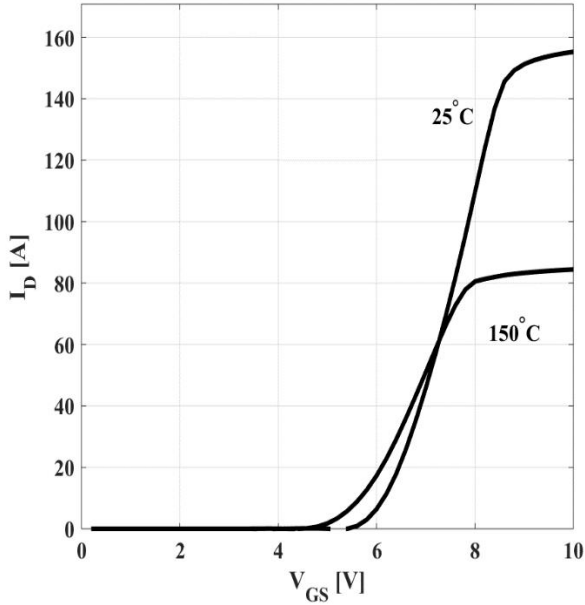
**Figure 5: Safe Operating Area**


$$I_D = f(V_{DS}); T_c = 25^\circ\text{C}; V_{GS} > 7\text{V}; \text{ parameter } t_p$$

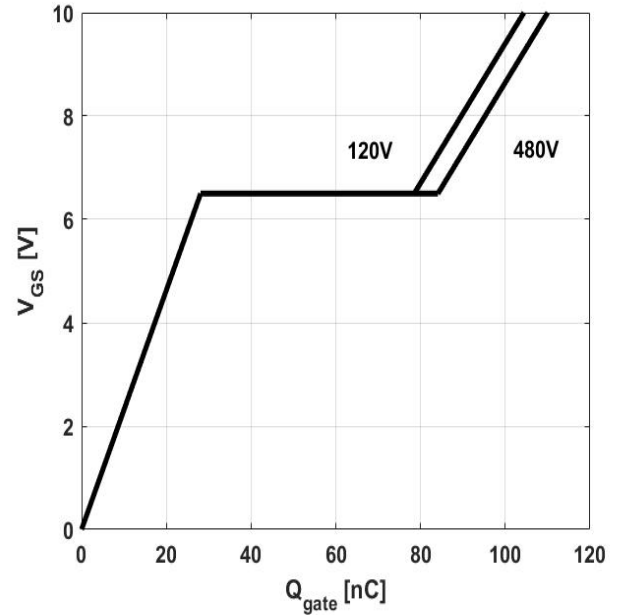
**Figure 6: Safe Operating Area**


$$I_D = f(V_{DS}); T_c = 80^\circ\text{C}; V_{GS} > 7\text{V}; \text{ parameter } t_p$$

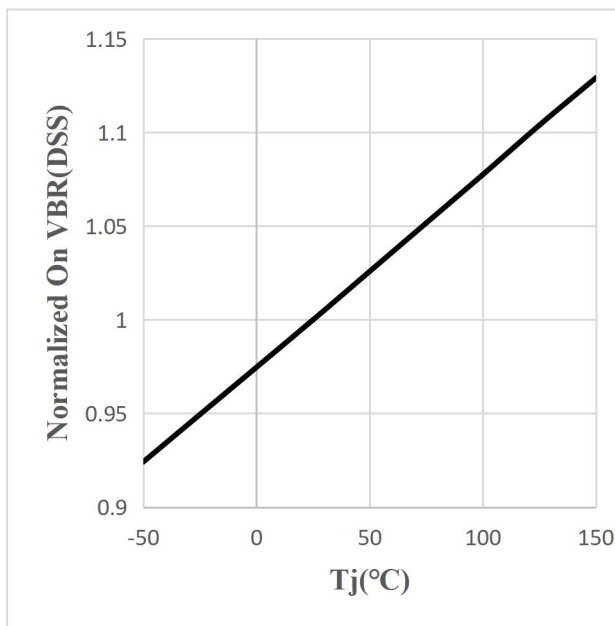
**68mΩ, 650V, Super Junction N-Channel Power MOSFET**
**SRC65R068BS**
**Figure 7: Typ. Output Characteristics**

 $I_D = f(V_{DS}); T_j = 25^\circ\text{C}; \text{parameter: } V_{GS}$ 
**Figure 8: Typ. Output Characteristics**

 $I_D = f(V_{DS}); T_j = 125^\circ\text{C}; \text{parameter: } V_{GS}$ 
**Figure 9: Typ. Drain-Source On-State Resistance**

 $R_{DS(ON)} = f(I_D); T_j = 125^\circ\text{C}; \text{parameter: } V_{GS}$ 
**Figure 10: Typ. Drain-Source On-State Resistance**

 $R_{DS(ON)} = f(T_j); I_D = 24\text{A}; V_{GS} = 10\text{V}$

**Figure 11: Typ. Transfer Characteristics**


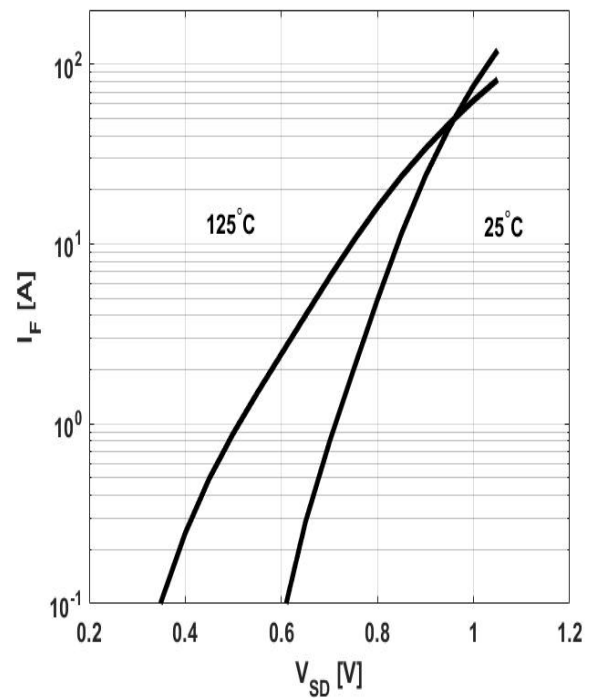
$$I_D = f(V_{GS}); V_{DS} = 20V$$

**Figure 12: Typ. Gate Charge**


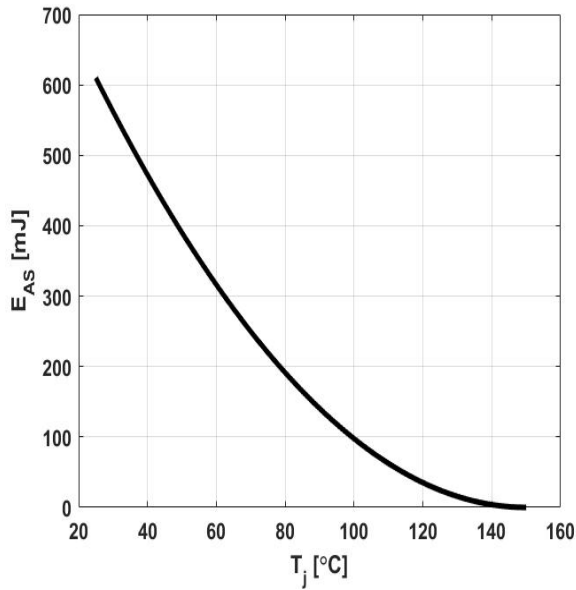
$$V_{GS} = f(Q_{gate}), I_D = 24A \text{ pulsed}$$

**Figure 13: Drain-Source Breakdown Voltage**


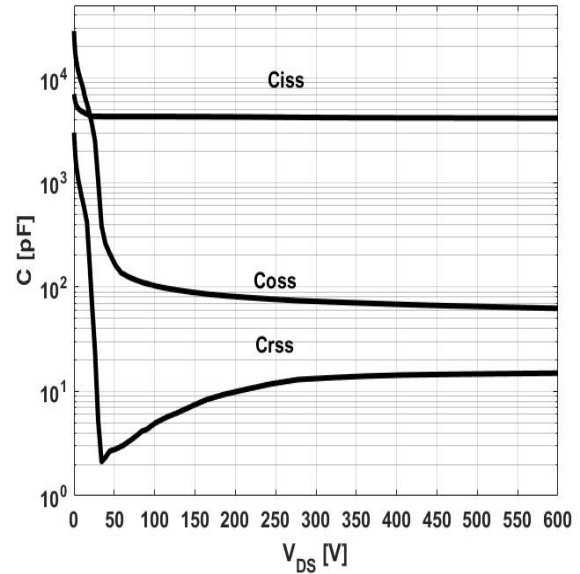
$$V_{BR}(DSS) = f(T_j); I_D = 10mA$$

**Figure 14: Forward Characteristics of Reverse Diode**


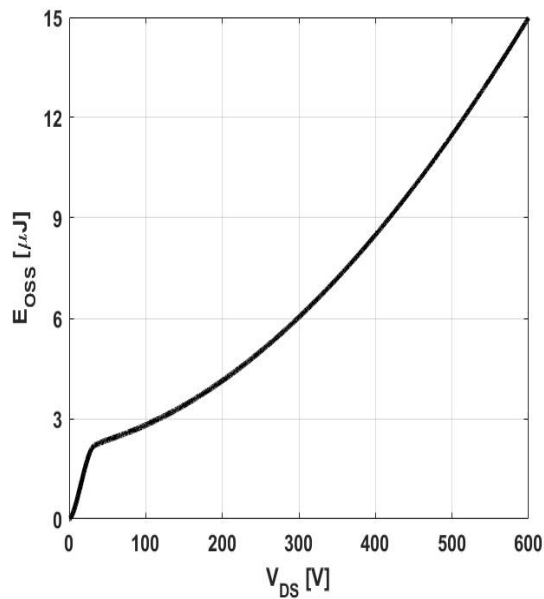
$$I_F = f(V_{SD}); \text{parameter: } T_j$$

**Figure 15: Avalanche Energy**


$$E_{AS}=f(T_J); I_D=4.8A; V_{DD}=60V$$

**Figure 16: Typ. Capacitances**


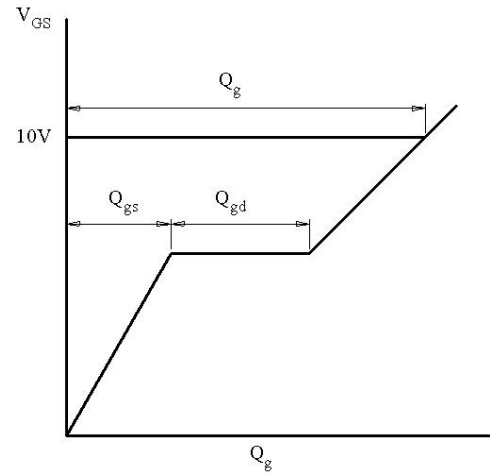
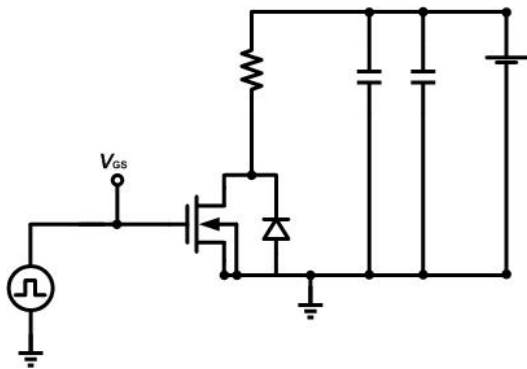
$$C=f(V_{DS}); V_{GS}=0; f=1MHz$$

**Figure 17: Coss Stored Energy**


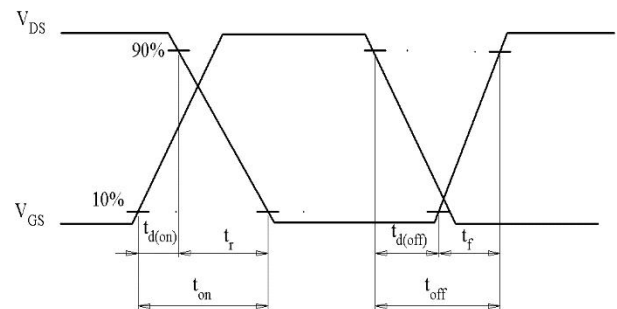
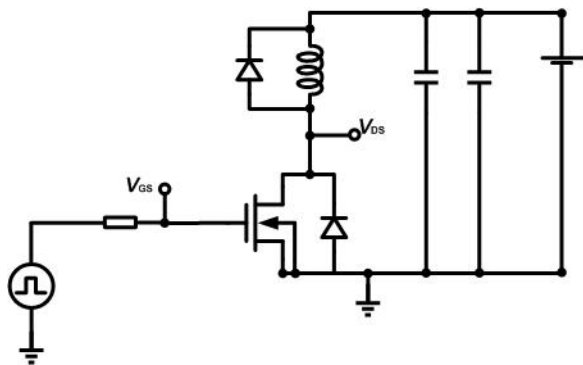
$$E_{OSS}=f(V_{DS})$$

## Test Circuits

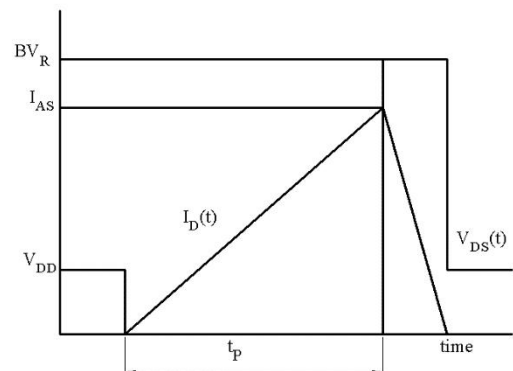
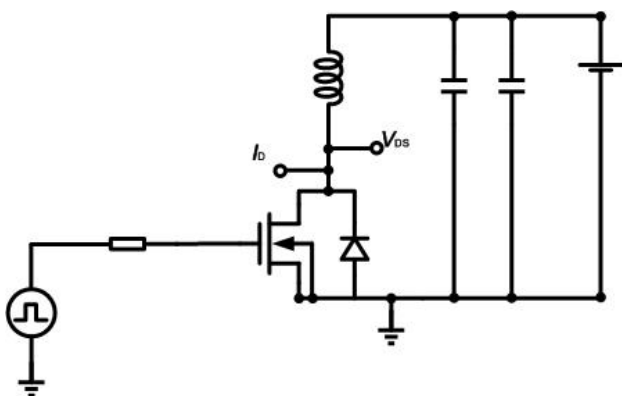
### 1. Gate Charge Test Circuit & Waveform



### 2. Switch Time Test Circuit

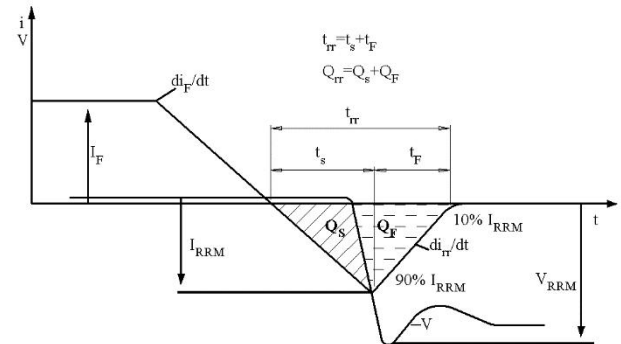
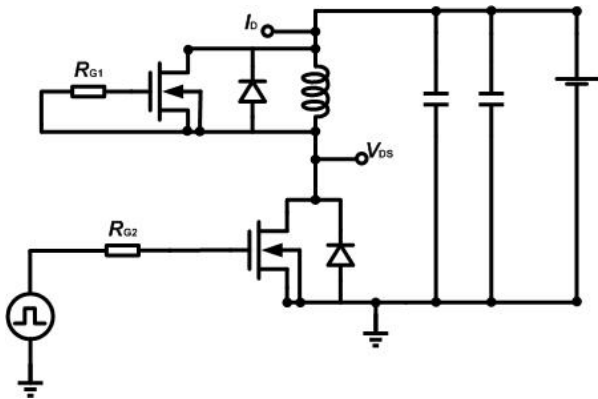


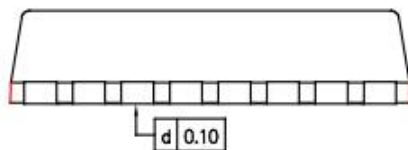
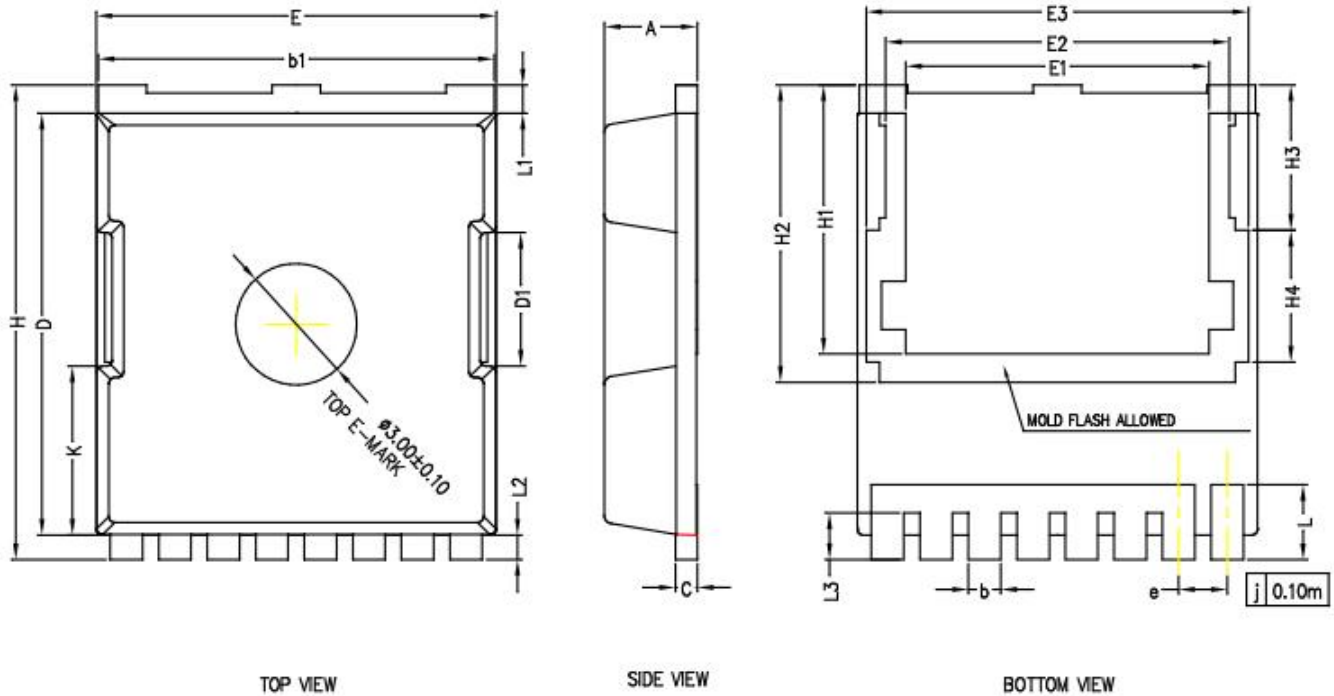
### 3. Unclaimed Inductive Switching Test Circuit & Waveforms





#### 4. Test Circuit and Waveform for Diode Characteristics



**Mechanical Dimension**
**TO-Leadless**
**Unit: mm**


| Symbol | Dimensions(mm) |       |       | Symbol | Dimensions(mm) |       |       |
|--------|----------------|-------|-------|--------|----------------|-------|-------|
|        | Min.           | Typ.  | Max.  |        | Min.           | Typ.  | Max.  |
| A      | 2.20           | 2.30  | 2.40  | H1     | 6.55           | 6.65  | 6.75  |
| b      | 0.70           | 0.80  | 0.90  | H2     | 7.20           | 7.35  | 7.50  |
| b1     | 9.70           | 9.80  | 9.90  | H3     | 3.44           | 3.59  | 3.74  |
| c      | 0.40           | 0.50  | 0.60  | H4     | 3.11           | 3.26  | 3.41  |
| D      | 10.28          | 10.43 | 10.58 | K      | 4.03           | 4.18  | 4.33  |
| D1     | 3.15           | 3.30  | 3.45  | L      | 1.60           | 1.85  | 2.10  |
| E      | 9.70           | 9.90  | 10.10 | L1     | 0.55           | 0.70  | 0.85  |
| E1     | 7.35           | 7.50  | 7.65  | L2     | 0.45           | 0.60  | 0.75  |
| E2     | 8.35           | 8.50  | 8.65  | L3     | 1.00           | 1.15  | 1.30  |
| E3     | 9.31           | 9.46  | 9.61  | H      | 11.48          | 11.73 | 11.88 |
| e      | 1.10           | 1.20  | 1.30  |        |                |       |       |



Shenzhen Sanrise Technology Co., LTD

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#### **Main Site:**

##### **- Headquarter**

Shenzhen Sanrise Technology Co., LTD  
A1206, Skyworth building, No. 008, gaoxinnan 1st Road,  
Gaoxin District, Yuehai street,, Nanshan District, ShenZhen,  
P.R.China  
Tel: +86-755-22953335  
Fax: +86-755-22916878

##### **- Shanghai Office**

Shenzhen Sanrise Technology Co., LTD  
Rm.401, Building B, No. 666, Zhangheng Road,  
Zhangjiang Hi-Tech Park, Shanghai, P.R.China

Tel: +86-21-68825918