

# TSD65R300

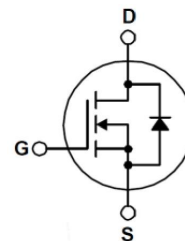
## 650V N-Channel MOSFET

### Description

The 65R300 is power MOSFET using Truesemi's advanced super junction technology that can realize very low on-resistance and gate charge. It will provide much high efficiency by using optimized charge coupling technology. These user friendly devices give an advantage of Low EMI to designers as well as low switching loss.

### Features

- 15A,650V,Max.RDS(on)=0.3Ω @ VGS =10V
- Super\_Junction technology
- Much lower Ron\*A performance for On-state efficiency
- Much lower FOM for fast switching efficiency



### Absolute Maximum Ratings T<sub>C</sub>=25°C unless otherwise specified

| Symbol                            | Parameter                                                                      |                        | Value       | Units |
|-----------------------------------|--------------------------------------------------------------------------------|------------------------|-------------|-------|
| V <sub>DSS</sub>                  | Drain-Source Voltage                                                           |                        | 650         | V     |
| V <sub>GS</sub>                   | Gate-Source Voltage                                                            |                        | ± 30        | V     |
| I <sub>D</sub>                    | Drain Current                                                                  | T <sub>C</sub> = 25°C  | 15          | A     |
|                                   |                                                                                | T <sub>C</sub> = 100°C | 11          | A     |
| I <sub>DM</sub>                   | Pulsed Drain Current (T <sub>C</sub> = 25°C, tp limited by T <sub>Jmax</sub> ) |                        | 60          | A     |
| E <sub>AS</sub>                   | Avalanche energy, single pulse (L=60mH, R <sub>g</sub> =30Ω)                   |                        | 120         | mJ    |
| P <sub>D</sub>                    | Power Dissipation (T <sub>C</sub> = 25°C)                                      |                        | 114         | W     |
| T <sub>J</sub> , T <sub>STG</sub> | Operating and Storage Temperature Range                                        |                        | -55 to +150 | °C    |

### Thermal Resistance Characteristics

| Symbol           | Parameter                                  | Value | Units |
|------------------|--------------------------------------------|-------|-------|
| R <sub>θJC</sub> | Thermal Resistance,Junction-to-Case.Max    | 1.1   | °C/W  |
| R <sub>θJA</sub> | Thermal Resistance,Junction-to-Ambient.Max | 137   | °C/W  |

**Electrical Characteristics**  $T_C=25\text{ }^{\circ}\text{C}$  unless otherwise specified

| Symbol                                                 | Parameter                          | Test Conditions                                                                                              | Min | Typ  | Max  | Units |
|--------------------------------------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------------|-----|------|------|-------|
| On Characteristics                                     |                                    |                                                                                                              |     |      |      |       |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage             | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 uA                                                  | 2.7 | --   | 3.8  | V     |
| R <sub>DS(ON)</sub>                                    | Static Drain-Source On-Resistance  | V <sub>GS</sub> = 10 V, I <sub>D</sub> =7.5 A                                                                | --  | 0.26 | 0.30 | Ω     |
| g <sub>fs</sub>                                        | Forward transfer conductance       | V <sub>DS</sub> = 20V, I <sub>D</sub> = 7.5A                                                                 | --  | 13.6 | --   | S     |
| Off Characteristics                                    |                                    |                                                                                                              |     |      |      |       |
| BV <sub>DSS</sub>                                      | Drain-Source Breakdown Voltage     | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 uA                                                               | 650 | --   | --   | V     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current    | V <sub>DS</sub> = 650 V, V <sub>GS</sub> = 0 V                                                               | --  | --   | 1    | uA    |
|                                                        |                                    | V <sub>DS</sub> = 650 V, T <sub>C</sub> = 150℃                                                               | --  | 10   | --   | uA    |
| Dynamic Characteristics                                |                                    |                                                                                                              |     |      |      |       |
| C <sub>iss</sub>                                       | Input Capacitance                  | V <sub>DS</sub> = 100V, V <sub>GS</sub> = 0 V, f = 1.0 MHz                                                   | --  | 755  | --   | pF    |
| C <sub>oss</sub>                                       | Output Capacitance                 |                                                                                                              | --  | 47   | --   | pF    |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance       |                                                                                                              | --  | 30   | --   | pF    |
| Switching Characteristics                              |                                    |                                                                                                              |     |      |      |       |
| t <sub>d(on)</sub>                                     | Turn-On Time                       | T <sub>j</sub> =25°C, V <sub>GS</sub> =10V, I <sub>D</sub> =7.5A, V <sub>DS</sub> =400V, R <sub>g</sub> =27Ω | --  | 41   | --   | ns    |
| t <sub>r</sub>                                         | Turn-On Rise Time                  |                                                                                                              | --  | 38   | --   | ns    |
| t <sub>d(off)</sub>                                    | Turn-Off Delay Time                |                                                                                                              | --  | 177  | --   | ns    |
| t <sub>f</sub>                                         | Turn-Off Fall Time                 |                                                                                                              | --  | 17   | --   | ns    |
| R <sub>G</sub>                                         | Gate resistance                    | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz                                                             | --  | 2.6  | --   | Ω     |
| Q <sub>g</sub>                                         | Total Gate Charge                  | V <sub>GS</sub> =10V, V <sub>DS</sub> =480V, I <sub>D</sub> =7.5A, f=1MHz                                    | --  | 24   | --   | nC    |
| Q <sub>gs</sub>                                        | Gate-Source Charge                 |                                                                                                              | --  | 4.8  | --   | nC    |
| Q <sub>gd</sub>                                        | Gate-Drain Charge                  |                                                                                                              | --  | 9.5  | --   | nC    |
| Source-Drain Diode Maximum Ratings and Characteristics |                                    |                                                                                                              |     |      |      |       |
| V <sub>SD</sub>                                        | Source-Drain Diode Forward Voltage | I <sub>S</sub> =7.5A, V <sub>GS</sub> = 0 V                                                                  | 0.5 | 0.86 | 1.0  | V     |
| t <sub>rr</sub>                                        | Reverse Recovery Time              | I <sub>sd</sub> =7.5A<br>dI/dt=100A/us, V <sub>ds</sub> =100V                                                | --  | 252  | --   | ns    |
| Q <sub>rr</sub>                                        | Reverse Recovery Charge            |                                                                                                              | --  | 2.96 | --   | uC    |

## Typical Performance Characteristics

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

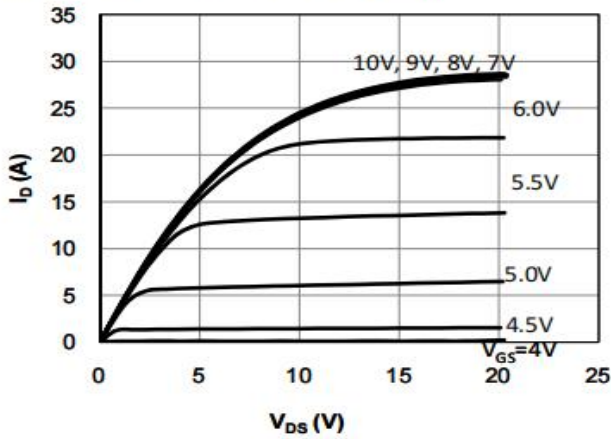


Fig 2. Output Characteristics ( $T_J=150^\circ\text{C}$ )

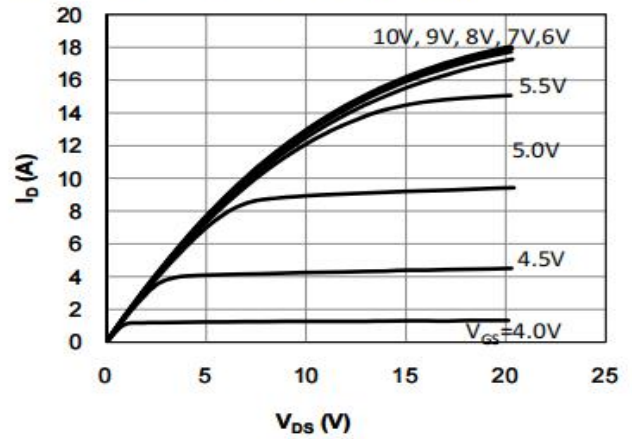


Fig 3: Transfer Characteristics

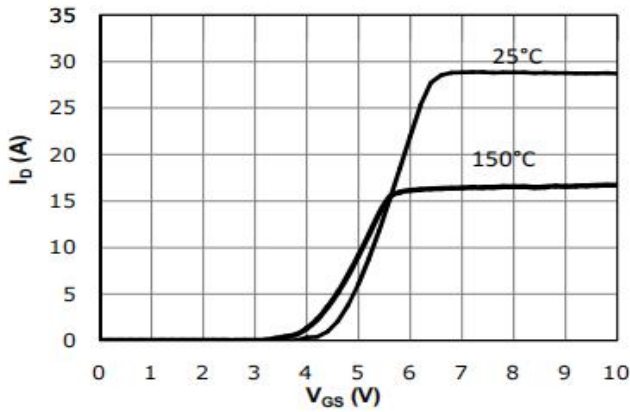


Fig 4:  $V_{TH}$  Vs  $T_J$  Temperature Characteristics

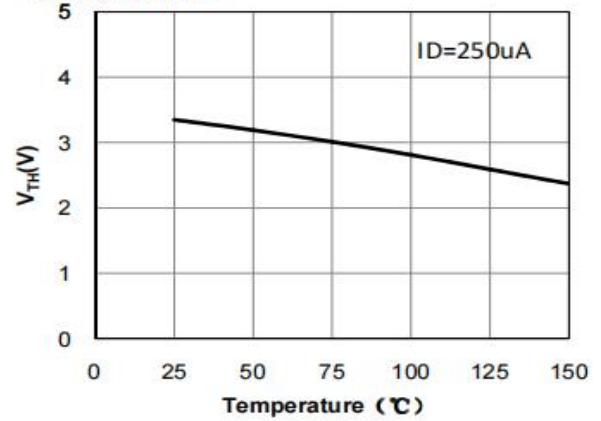


Fig 5:  $R_{DS(on)}$  Vs  $I_D$  Characteristics ( $T_C=25^\circ\text{C}$ )

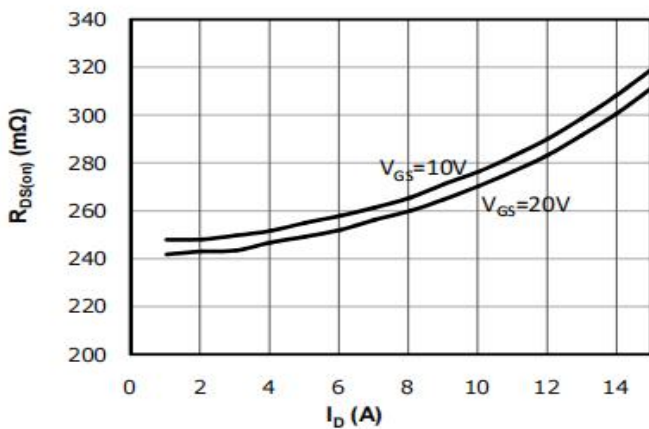


Fig 6:  $R_{DS(on)}$  vs. Temperature

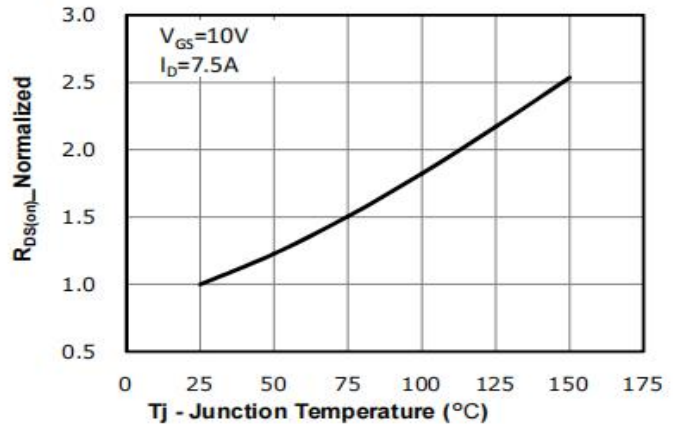


Fig 7: BVDSS vs. Temperature

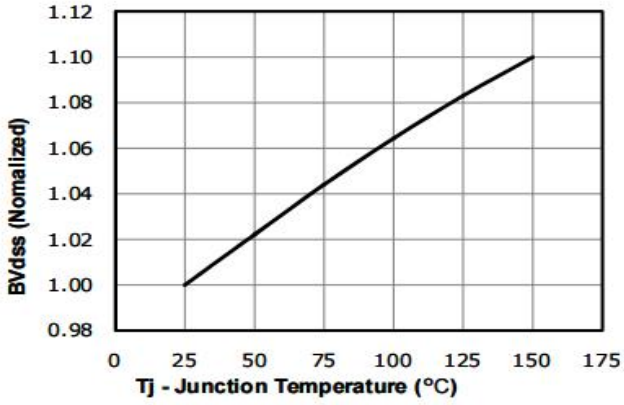


Fig 8: Rds(on) vs Gate Voltage

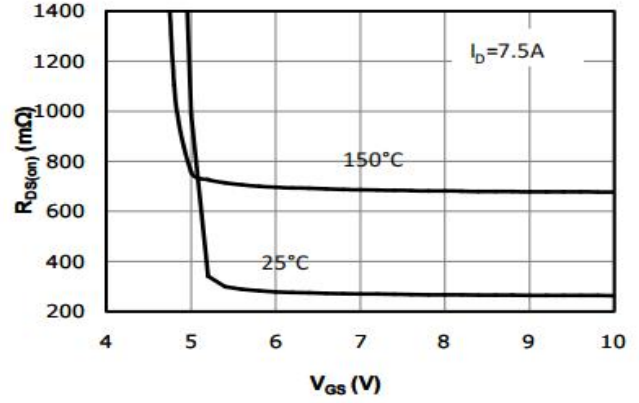


Fig 9: Body-diode Forward Characteristics

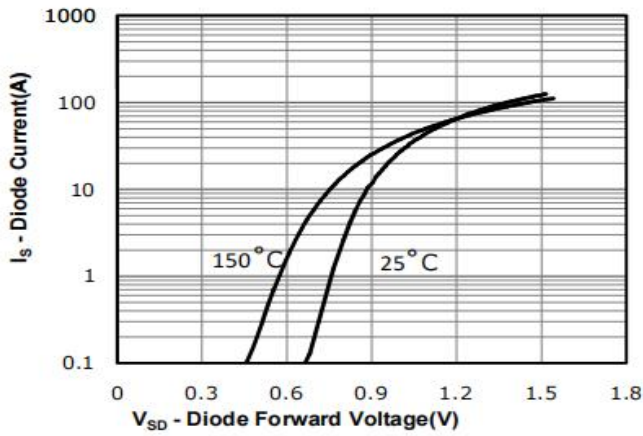


Fig 10: Gate Charge Characteristics

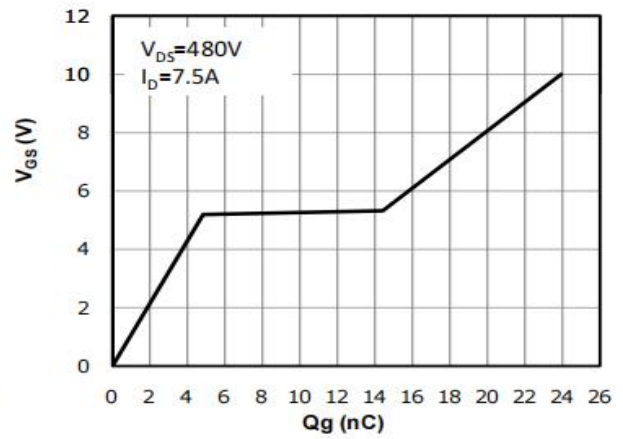


Fig 11: Capacitance Characteristics

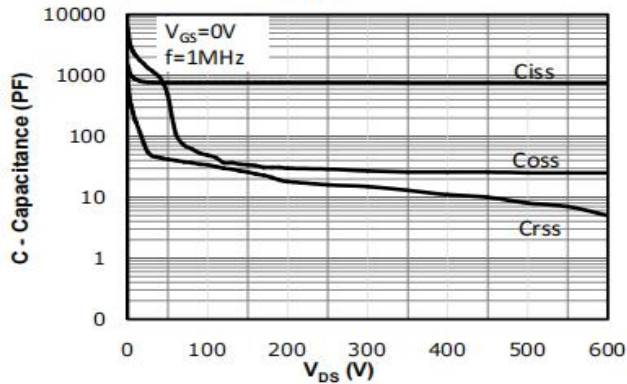
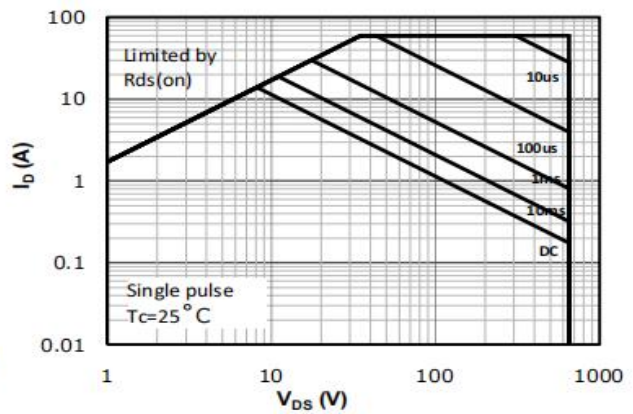
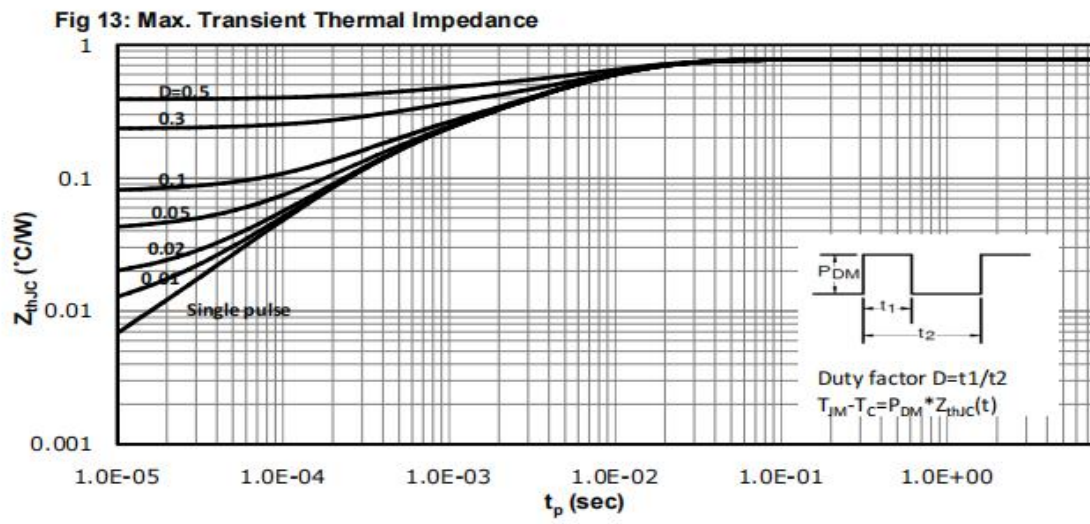


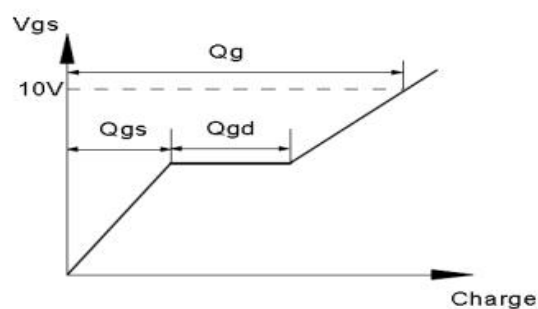
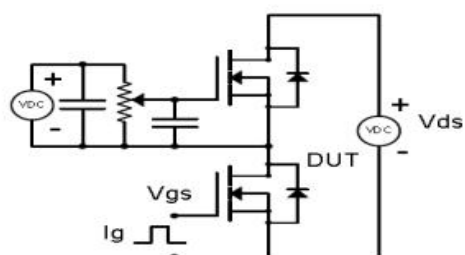
Fig 12: Safe Operating Area



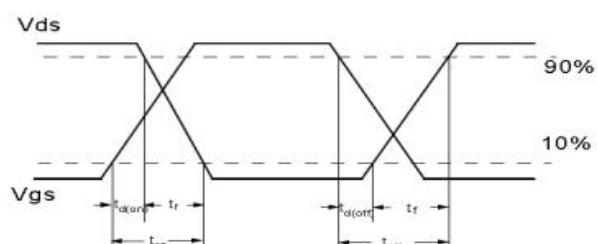
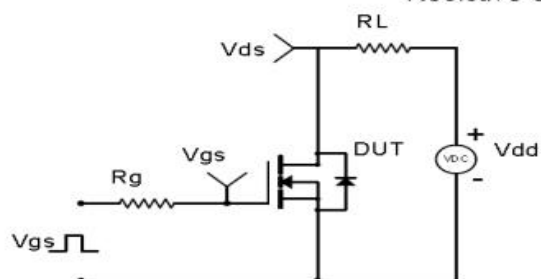


### Test Circuit & Waveform

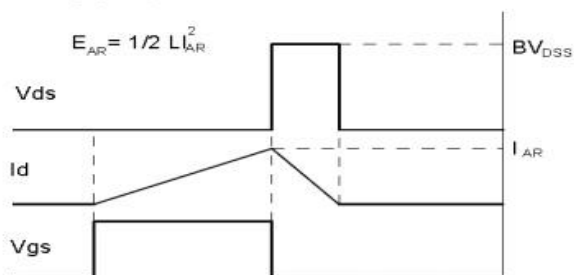
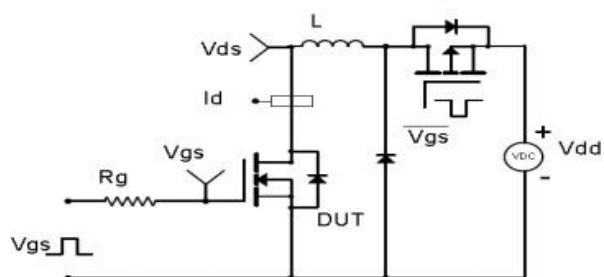
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



### Diode Recovery Test Circuit & Waveforms

