

## DTU15N50SJ-VB Datasheet

### N-Channel 500V (D-S)Super Junction Power MOSFET

| PRODUCT SUMMARY                         |                        |      |
|-----------------------------------------|------------------------|------|
| $V_{DS}$ (V) at $T_J$ max.              | 500                    |      |
| $R_{DS(on)}$ max. at 25 °C ( $\Omega$ ) | $V_{GS} = 10\text{ V}$ | 0.29 |
| $Q_g$ max. (nC)                         | 38                     |      |
| $Q_{gs}$ (nC)                           | 5                      |      |
| $Q_{gd}$ (nC)                           | 22                     |      |
| Configuration                           | Single                 |      |

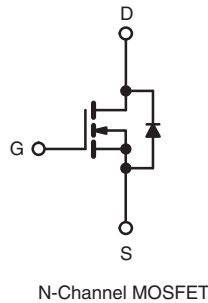
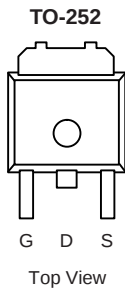
#### FEATURES

- Low figure-of-merit (FOM)  $R_{on} \times Q_g$
- Low input capacitance ( $C_{iss}$ )
- Reduced switching and conduction losses
- Ultra low gate charge ( $Q_g$ )
- Avalanche energy rated (UIS)



#### APPLICATIONS

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
  - High-intensity discharge (HID)
  - Fluorescent ballast lighting
- Industrial



| ABSOLUTE MAXIMUM RATINGS (T <sub>C</sub> = 25 °C, unless otherwise noted) |                         |                         |                                   |             |      |
|---------------------------------------------------------------------------|-------------------------|-------------------------|-----------------------------------|-------------|------|
| PARAMETER                                                                 |                         |                         | SYMBOL                            | LIMIT       | UNIT |
| Drain-Source Voltage                                                      |                         |                         | V <sub>DS</sub>                   | 500         | V    |
| Gate-Source Voltage                                                       |                         |                         | V <sub>GS</sub>                   | ± 30        |      |
| Continuous Drain Current (T <sub>J</sub> = 150 °C)                        | V <sub>GS</sub> at 10 V | T <sub>C</sub> = 25 °C  | I <sub>D</sub>                    | 15          | A    |
|                                                                           |                         | T <sub>C</sub> = 100 °C |                                   | 9.4         |      |
| Pulsed Drain Current <sup>a</sup>                                         |                         |                         | I <sub>DM</sub>                   | 45          |      |
| Linear Derating Factor                                                    |                         |                         |                                   | 3.6         | W/°C |
| Single Pulse Avalanche Energy <sup>b</sup>                                |                         |                         | E <sub>AS</sub>                   | 9           | mJ   |
| Maximum Power Dissipation                                                 |                         |                         | P <sub>D</sub>                    | 156/34      | W    |
| Operating Junction and Storage Temperature Range                          |                         |                         | T <sub>J</sub> , T <sub>stg</sub> | -55 to +150 | °C   |
| Drain-Source Voltage Slope                                                | T <sub>J</sub> = 125 °C |                         | dV/dt                             | 15          | V/ns |
| Reverse Diode dV/dt <sup>d</sup>                                          |                         | 4.1                     |                                   |             |      |
| Soldering Recommendations (Peak Temperature) <sup>c</sup>                 | for 10 s                |                         |                                   | 300         | °C   |

#### Notes

- Repetitive rating; pulse width limited by maximum junction temperature.
- $V_{DD} = 50\text{ V}$ , starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 28.2\text{ mH}$ ,  $R_g = 25\text{ }\Omega$ ,  $I_{AS} = 4.5\text{ A}$ .
- 1.6 mm from case.
- $I_{SD} \leq I_D$ ,  $dI/dt = 100\text{ A}/\mu\text{s}$ , starting  $T_J = 25\text{ }^\circ\text{C}$ .

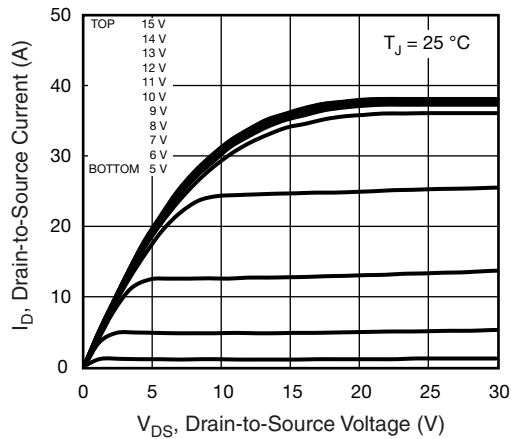
**THERMAL RESISTANCE RATINGS**

| PARAMETER                        | SYMBOL     | TYP. | MAX. | UNIT |
|----------------------------------|------------|------|------|------|
| Maximum Junction-to-Ambient      | $R_{thJA}$ | -    | 60   | °C/W |
| Maximum Junction-to-Case (Drain) | $R_{thJC}$ | -    | 0.8  |      |

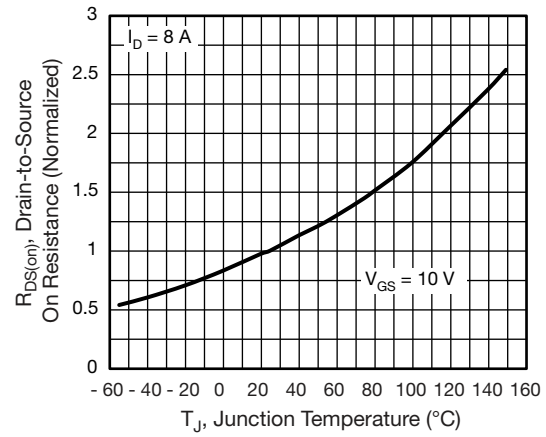
**SPECIFICATIONS** ( $T_J = 25\text{ °C}$ , unless otherwise noted)**Notes**

- a.  $C_{oss(er)}$  is a fixed capacitance that gives the same energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DSS}$ .  
 b.  $C_{oss(tr)}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 % to 80 %  $V_{DSS}$ .

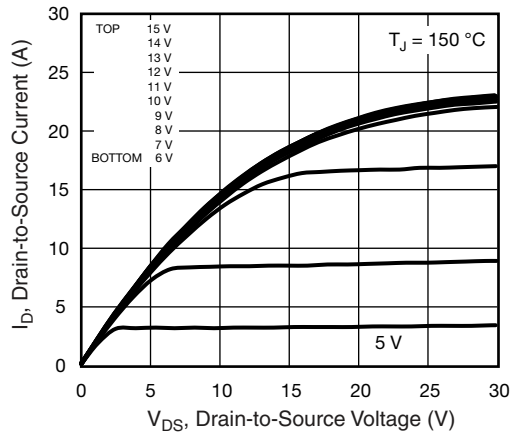
**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)



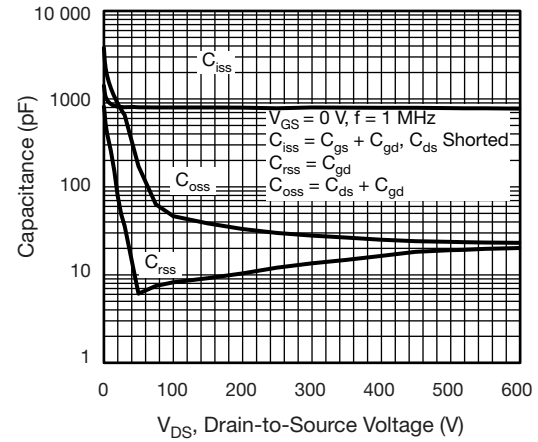
**Fig. 1 - Typical Output Characteristics**



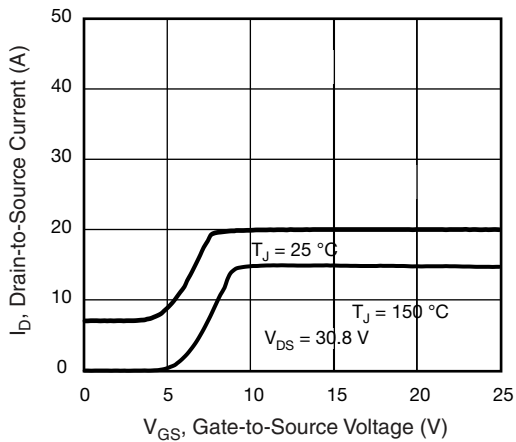
**Fig. 4 - Normalized On-Resistance vs. Temperature**



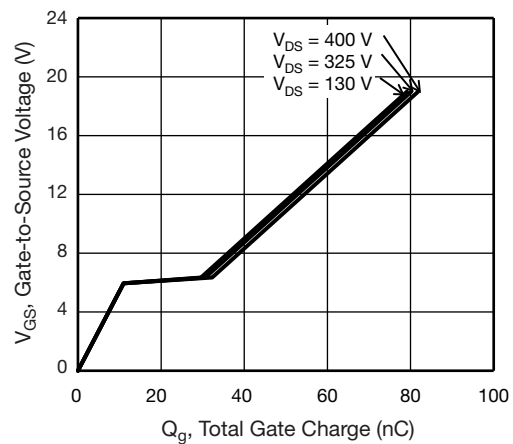
**Fig. 2 - Typical Output Characteristics**



**Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage**



**Fig. 3 - Typical Transfer Characteristics**



**Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage**

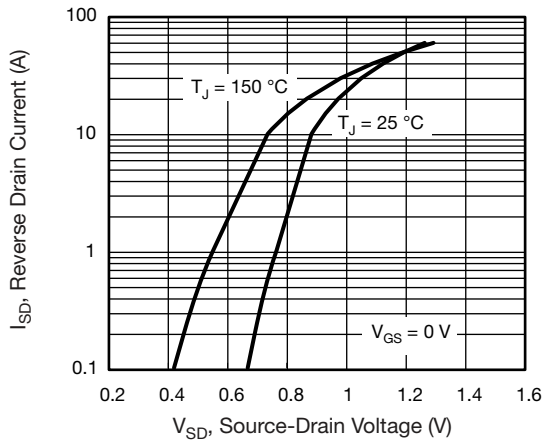


Fig. 7 - Typical Source-Drain Diode Forward Voltage

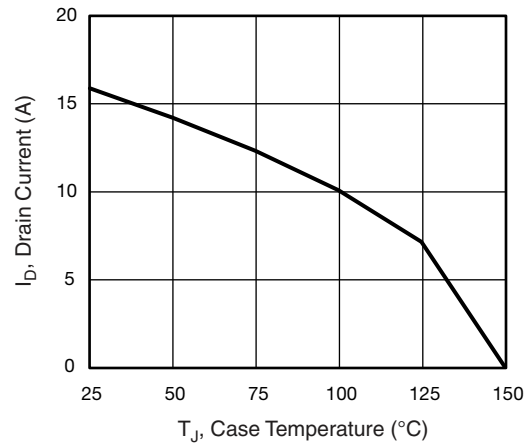


Fig. 9 - Maximum Drain Current vs. Case Temperature

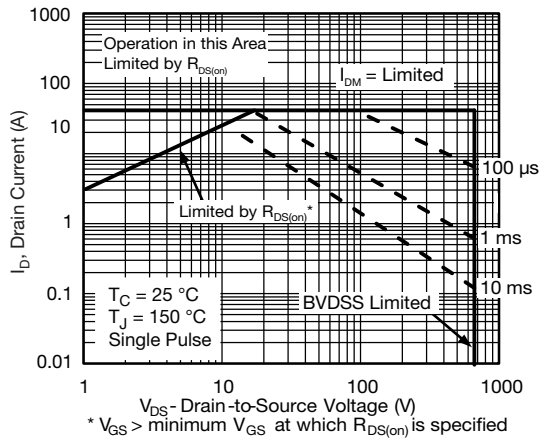


Fig. 8 - Maximum Safe Operating Area

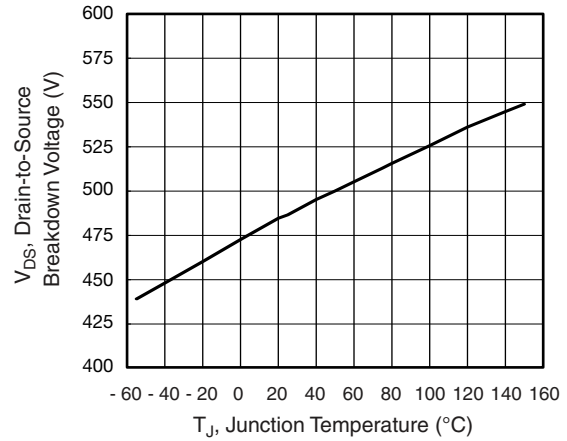


Fig. 10 - Temperature vs. Drain-to-Source Voltage

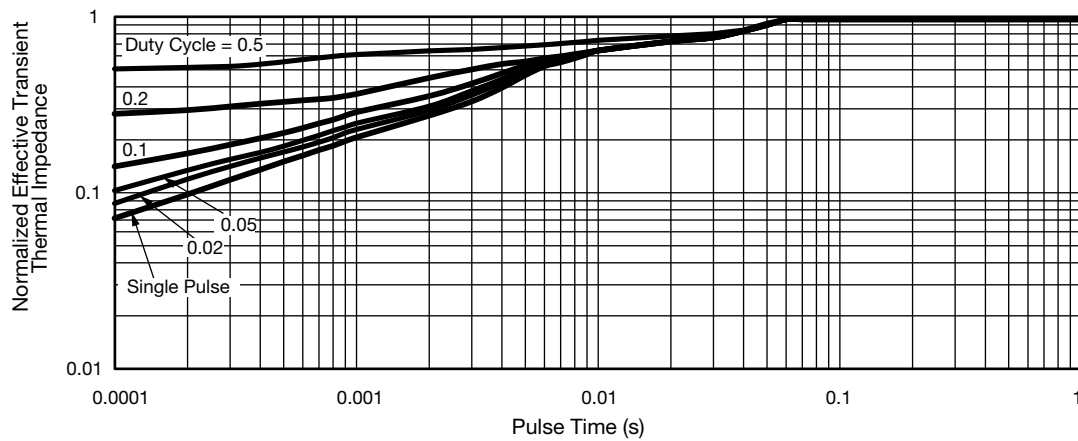


Fig. 11 - Normalized Thermal Transient Impedance, Junction-to-Case

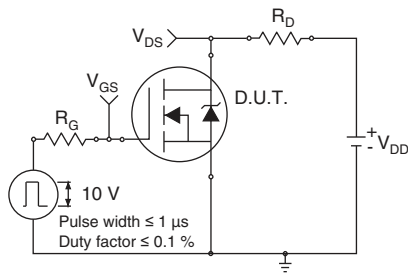


Fig. 12 - Switching Time Test Circuit

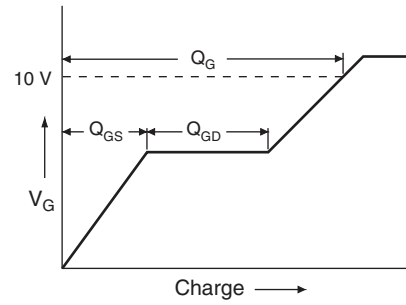


Fig. 16 - Basic Gate Charge Waveform

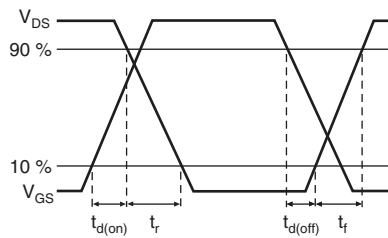


Fig. 13 - Switching Time Waveforms

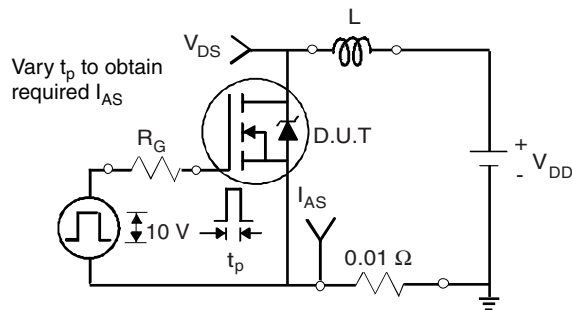


Fig. 14 - Unclamped Inductive Test Circuit

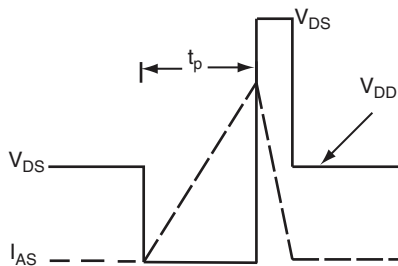


Fig. 15 - Unclamped Inductive Waveforms

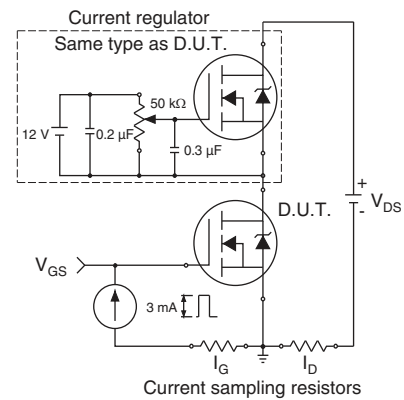
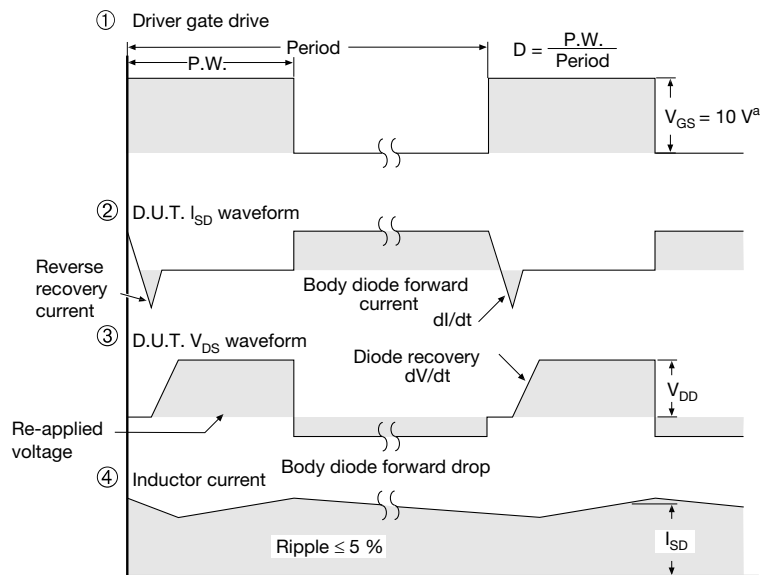
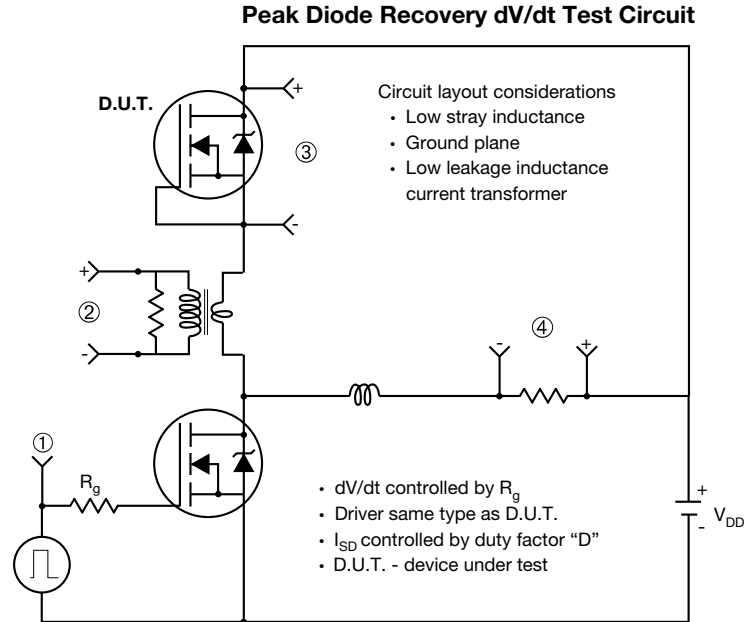


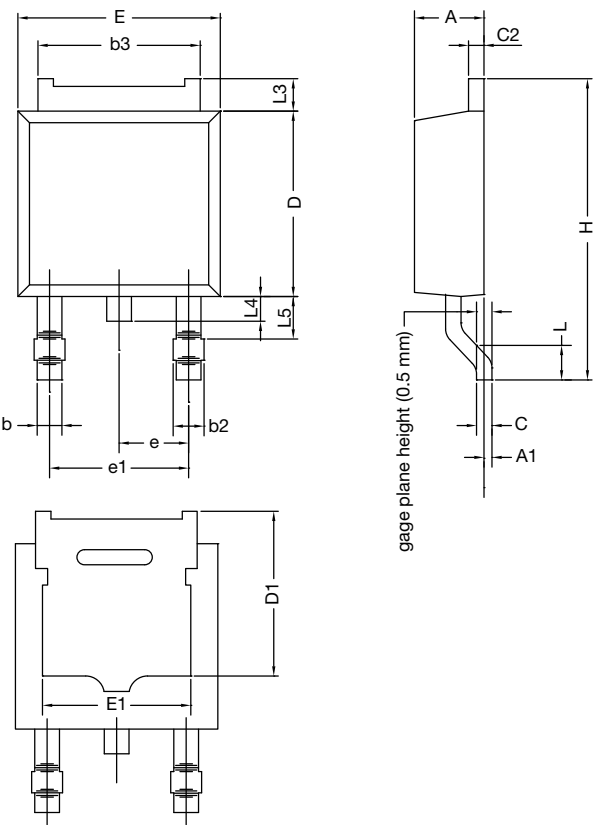
Fig. 17 - Gate Charge Test Circuit

**Note**

a.  $V_{GS} = 5\text{ V}$  for logic level devices

**Fig. 18 - For N-Channel**

TO-252AA CASE OUTLINE



| DIM.                                         | MILLIMETERS |       | INCHES    |       |
|----------------------------------------------|-------------|-------|-----------|-------|
|                                              | MIN.        | MAX.  | MIN.      | MAX.  |
| A                                            | 2.18        | 2.38  | 0.086     | 0.094 |
| A1                                           | -           | 0.127 | -         | 0.005 |
| b                                            | 0.64        | 0.88  | 0.025     | 0.035 |
| b2                                           | 0.76        | 1.14  | 0.030     | 0.045 |
| b3                                           | 4.95        | 5.46  | 0.195     | 0.215 |
| C                                            | 0.46        | 0.61  | 0.018     | 0.024 |
| C2                                           | 0.46        | 0.89  | 0.018     | 0.035 |
| D                                            | 5.97        | 6.22  | 0.235     | 0.245 |
| D1                                           | 5.21        | -     | 0.205     | -     |
| E                                            | 6.35        | 6.73  | 0.250     | 0.265 |
| E1                                           | 4.32        | -     | 0.170     | -     |
| H                                            | 9.40        | 10.41 | 0.370     | 0.410 |
| e                                            | 2.28 BSC    |       | 0.090 BSC |       |
| e1                                           | 4.56 BSC    |       | 0.180 BSC |       |
| L                                            | 1.40        | 1.78  | 0.055     | 0.070 |
| L3                                           | 0.89        | 1.27  | 0.035     | 0.050 |
| L4                                           | -           | 1.02  | -         | 0.040 |
| L5                                           | 1.14        | 1.52  | 0.045     | 0.060 |
| ECN: X12-0247-Rev. M, 24-Dec-12<br>DWG: 5347 |             |       |           |       |

Note

- Dimension L3 is for reference only.

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