

### General Description

- Latest Trench Power MOSFET technology
- Very Low RDS(on) at 4.5VGS
- Low Gate Charge
- High Current Capability
- RoHS and Halogen-Free Compliant

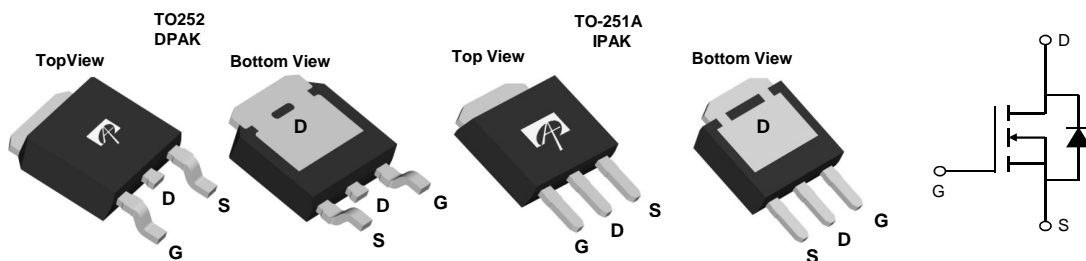
### Application

- DC/DC Converters in Computing
- Isolated DC/DC Converters in Telecom and Industrial

### Product Summary

|   |        |
|---|--------|
| V <sub>DS</sub>                                 | 30V    |
| I <sub>D</sub> (at V <sub>GS</sub> =10V)        | 46A    |
| R <sub>DS(ON)</sub> (at V <sub>GS</sub> =10V)   | < 5mΩ  |
| R <sub>DS(ON)</sub> (at V <sub>GS</sub> = 4.5V) | < 10mΩ |

100% UIS Tested  
 100% R<sub>g</sub> Tested



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

| Parameter                              | Symbol                            | Maximum               | Units |
|--|-----------------------------------|-----------------------|-------|
| Drain-Source Voltage                   | V <sub>DS</sub>                   | 30                    | V     |
| Gate-Source Voltage                    | V <sub>GS</sub>                   | ±20                   | V     |
| Continuous Drain Current <sup>G</sup>  | I <sub>D</sub>                    | T <sub>C</sub> =25°C  | 46    |
|  |                                   | T <sub>C</sub> =100°C | 36    |
| Pulsed Drain Current <sup>C</sup>      | I <sub>DM</sub>                   | 170                   | A     |
| Continuous Drain Current               | I <sub>DSM</sub>                  | T <sub>A</sub> =25°C  | 18    |
|  |                                   | T <sub>A</sub> =70°C  | 14    |
| Avalanche Current <sup>C</sup>         | I <sub>AS</sub>                   | 29                    | A     |
| Avalanche energy L=0.1mH <sup>C</sup>  | E <sub>AS</sub>                   | 42                    | mJ    |
| V <sub>DS</sub> Spike                  | V <sub>SPIKE</sub>                | 36                    | V     |
| Power Dissipation <sup>B</sup>         | P <sub>D</sub>                    | T <sub>C</sub> =25°C  | 50    |
|  |                                   | T <sub>C</sub> =100°C | 25    |
| Power Dissipation <sup>A</sup>         | P <sub>DSM</sub>                  | T <sub>A</sub> =25°C  | 2.5   |
|  |                                   | T <sub>A</sub> =70°C  | 1.6   |
| Junction and Storage Temperature Range | T <sub>J</sub> , T <sub>STG</sub> | -55 to 175            | °C    |

### Thermal Characteristics

| Parameter   | Symbol           | Typ | Max | Units |
|---|------------------|-----|-----|-------|
| Maximum Junction-to-Ambient <sup>A</sup>                | R <sub>θJA</sub> | 16  | 20  | °C/W  |
| Maximum Junction-to-Ambient <sup>A,D</sup> Steady-State |                  | 41  | 50  | °C/W  |
| Maximum Junction-to-Case Steady-State                   | R <sub>θJC</sub> | 2.5 | 3   | °C/W  |

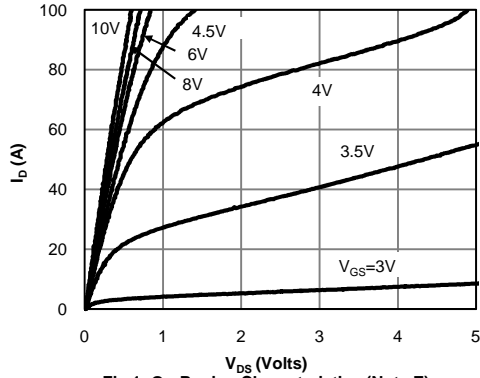
**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

| Symbol                      | Parameter  | Conditions   | Min                                | Typ  | Max    | Units |
|-----------------------------|--|--|------------------------------------|------|--------|-------|
| <b>STATIC PARAMETERS</b>    |  |  |                                    |      |        |       |
| BV <sub>DSS</sub>           | Drain-Source Breakdown Voltage                     | I <sub>D</sub> =250μA, V <sub>GS</sub> =0V   | 30                                 |      |        | V     |
| I <sub>DSS</sub>            | Zero Gate Voltage Drain Current                    | V <sub>DS</sub> =30V, V <sub>GS</sub> =0V<br>T <sub>J</sub> =55°C                          |                                    |      | 1<br>5 | μA    |
| I <sub>GSS</sub>            | Gate-Body leakage current                          | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V  |                                    |      | 100    | nA    |
| V <sub>GS(th)</sub>         | Gate Threshold Voltage                             | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                   | 1.6                                | 2    | 2.4    | V     |
| R <sub>DS(on)</sub>         | Static Drain-Source On-Resistance                  | V <sub>GS</sub> =10V, I <sub>D</sub> =20A<br>T <sub>J</sub> =125°C                         |                                    | 4    | 5      | mΩ    |
|                             |  | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A   |                                    | 5.4  | 6.8    |       |
| g <sub>FS</sub>             | Forward Transconductance                           | V <sub>DS</sub> =5V, I <sub>D</sub> =20A   |                                    | 83   |        | S     |
| V <sub>SD</sub>             | Diode Forward Voltage                              | I <sub>S</sub> =1A, V <sub>GS</sub> =0V  |                                    | 0.7  | 1      | V     |
| I <sub>S</sub>              | Maximum Body-Diode Continuous Current <sup>G</sup> |  |                                    |      | 46     | A     |
| <b>DYNAMIC PARAMETERS</b>   |  |  |                                    |      |        |       |
| C <sub>iss</sub>            | Input Capacitance                                  | V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz  |                                    | 1333 |        | pF    |
| C <sub>oss</sub>            | Output Capacitance                                 |  |                                    | 512  |        | pF    |
| C <sub>rss</sub>            | Reverse Transfer Capacitance                       |  |                                    | 42   |        | pF    |
| R <sub>g</sub>              | Gate resistance                                    | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz   | 0.8                                | 1.7  | 2.6    | Ω     |
| <b>SWITCHING PARAMETERS</b> |  |  |                                    |      |        |       |
| Q <sub>g</sub> (10V)        | Total Gate Charge                                  | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =20A                            |                                    | 18.3 | 33     | nC    |
| Q <sub>g</sub> (4.5V)       | Total Gate Charge                                  |  |                                    | 8.5  | 17     | nC    |
| Q <sub>gs</sub>             | Gate Source Charge                                 |  |                                    | 4.8  |        | nC    |
| Q <sub>gd</sub>             | Gate Drain Charge                                  |  |                                    | 2.5  |        | nC    |
| t <sub>D(on)</sub>          | Turn-On Delay Time                                 | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =0.75Ω,<br>R <sub>GEN</sub> =3Ω |                                    | 7.5  |        | ns    |
| t <sub>r</sub>              | Turn-On Rise Time                                  |  |                                    | 4.8  |        | ns    |
| t <sub>D(off)</sub>         | Turn-Off Delay Time                                |  |                                    | 23.3 |        | ns    |
| t <sub>f</sub>              | Turn-Off Fall Time                                 |  |                                    | 4.5  |        | ns    |
| t <sub>rr</sub>             | Body Diode Reverse Recovery Time                   |  | I <sub>F</sub> =20A, di/dt=500A/μs |      | 14.1   |       |
| Q <sub>rr</sub>             | Body Diode Reverse Recovery Charge                 | I <sub>F</sub> =20A, di/dt=500A/μs   |                                    | 16.2 |        | nC    |

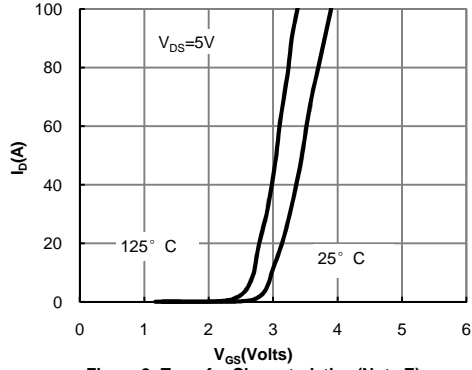
- A. The value of R<sub>θJA</sub> is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C. The Power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> and the maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design, and the maximum temperature of 175° C may be used if the PCB allows it.
- B. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=175° C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
- C. Single pulse width limited by junction temperature T<sub>J(MAX)</sub>=175° C.
- D. The R<sub>θJA</sub> is the sum of the thermal impedance from junction to case R<sub>θJC</sub> and case to ambient.
- E. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.
- F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T<sub>J(MAX)</sub>=175° C. The SOA curve provides a single pulse rating.
- G. The maximum current rating is package limited.
- H. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with T<sub>A</sub>=25° C.

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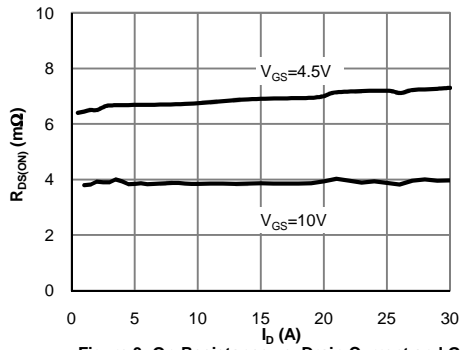
**TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS**



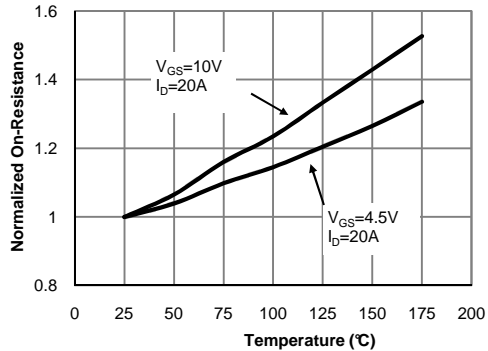
**Fig 1: On-Region Characteristics (Note E)**



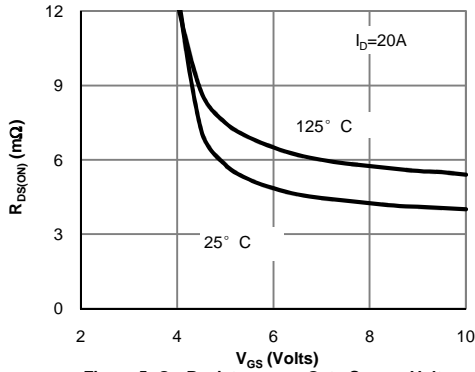
**Figure 2: Transfer Characteristics (Note E)**



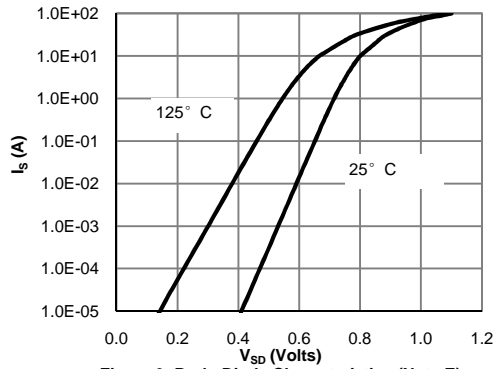
**Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)**



**Figure 4: On-Resistance vs. Junction Temperature (Note E)**



**Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)**



**Figure 6: Body-Diode Characteristics (Note E)**

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

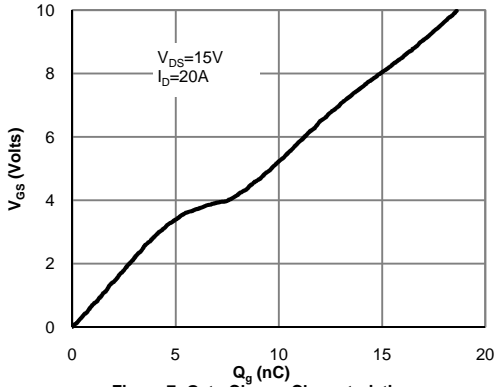


Figure 7: Gate-Charge Characteristics

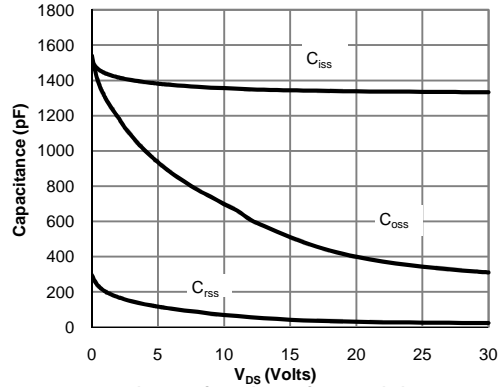


Figure 8: Capacitance Characteristics

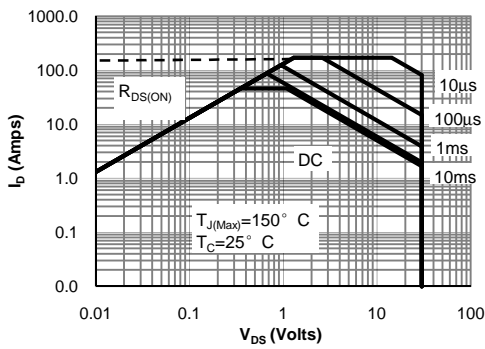


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

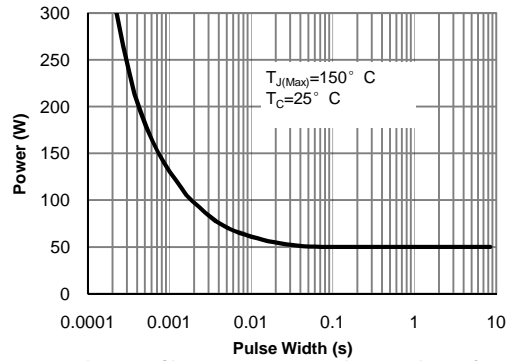


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

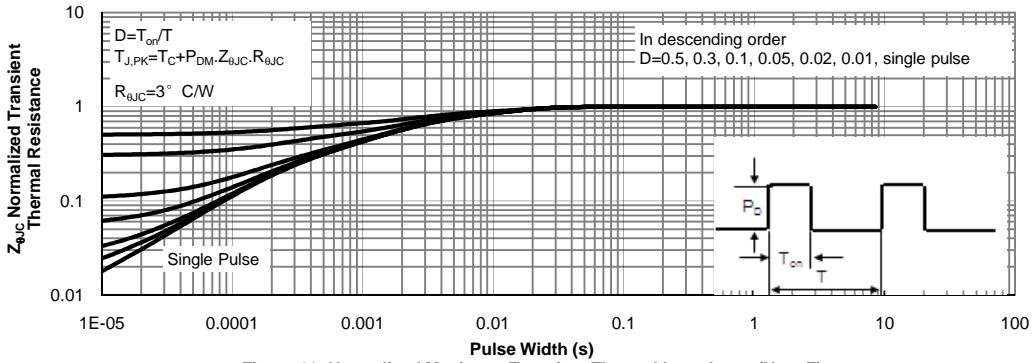


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

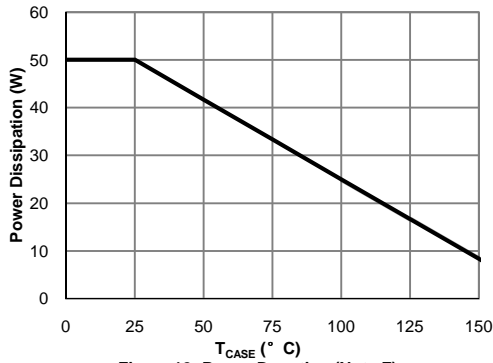


Figure 12: Power De-rating (Note F)

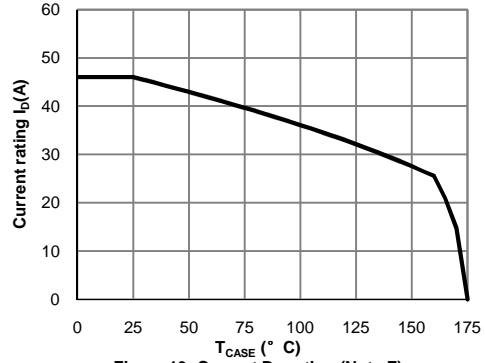


Figure 13: Current De-rating (Note F)

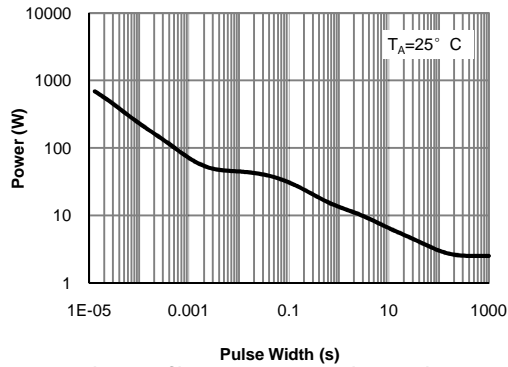


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

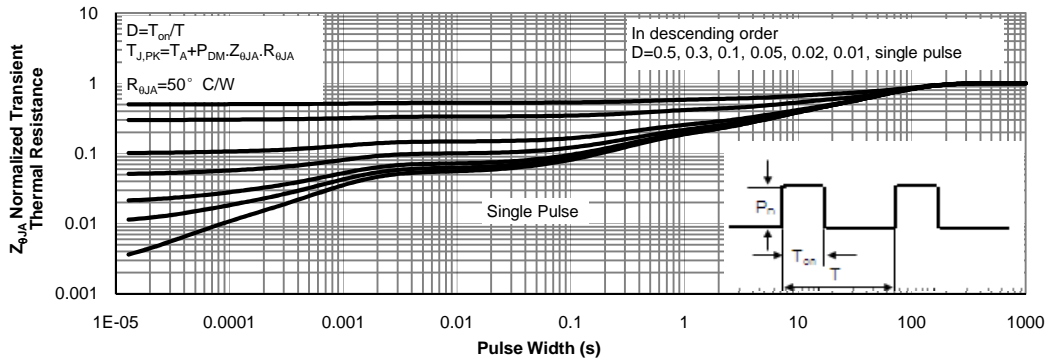
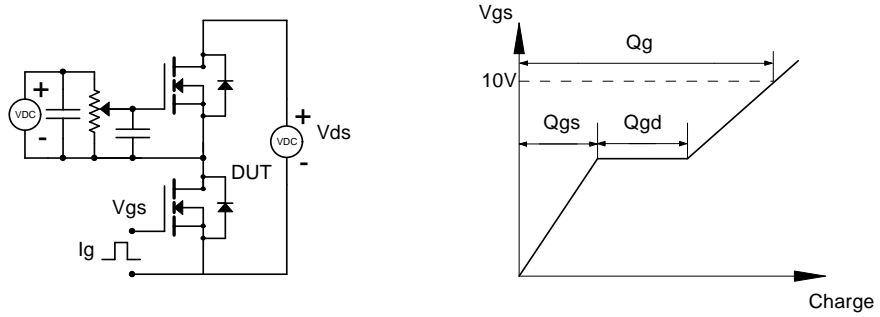
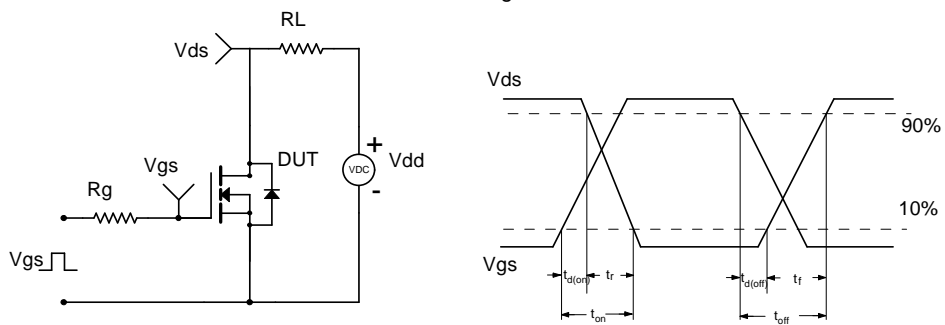


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

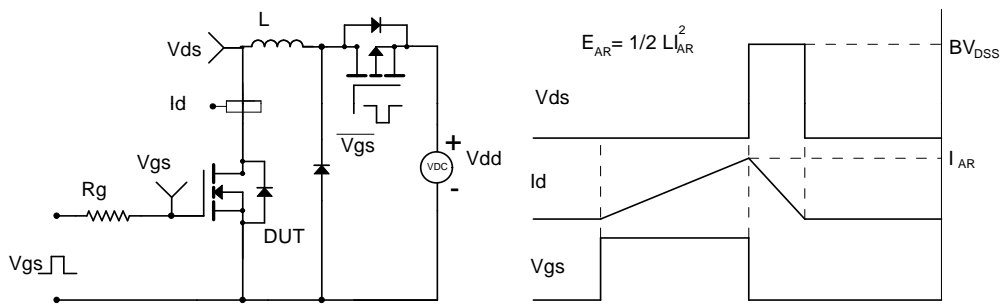
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



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



### Diode Recovery Test Circuit & Waveforms

