

### Features

- Split Gate Trench MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low  $R_{DS(ON)}$

### Applications

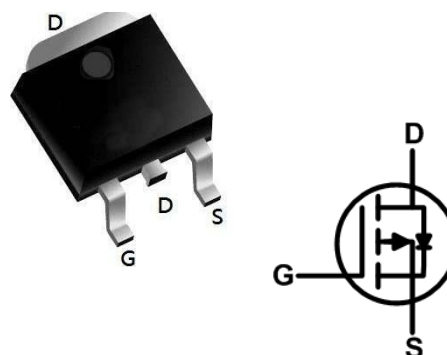
- Battery switching application
- Hard switched and high frequency circuits
- Power management

### Product Summary



| BVDSS | RDSON | ID   |
|-------|-------|------|
| -100V | 115mΩ | -15A |

### TO252 Pin Configuration



### Absolute Maximum Ratings:

| Symbol         | Parameter                                        |                                     | Value           | Units              |
|----------------|--------------------------------------------------|-------------------------------------|-----------------|--------------------|
| $V_{DSS}$      | Drain-to-Source Voltage                          |                                     | -100            | V                  |
| $I_D$          | Continuous Drain Current                         | $T_C = 25\text{ }^{\circ}\text{C}$  | -15             | A                  |
|                | Continuous Drain Current                         | $T_C = 100\text{ }^{\circ}\text{C}$ | -9.2            | A                  |
| $I_{DM}^{a1}$  | Pulsed Drain Current                             |                                     | -58             | A                  |
| $V_{GS}$       | Gate-to-Source Voltage                           |                                     | $\pm 20$        | V                  |
| $P_D$          | Power Dissipation                                |                                     | 69              | W                  |
| $T_J, T_{stg}$ | Operating Junction and Storage Temperature Range |                                     | 150, -55 to 150 | $^{\circ}\text{C}$ |
| $T_L$          | Maximum Temperature for Soldering                |                                     | 260             | $^{\circ}\text{C}$ |

### Thermal Characteristics:

| Symbol          | Parameter                               | Value | Units                |
|-----------------|-----------------------------------------|-------|----------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case    | 1.8   | $^{\circ}\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 75    | $^{\circ}\text{C/W}$ |

**Electrical Characteristics** (TA= 25°C unless otherwise specified) :

| <b>Static Characteristics</b> |                                   |                                                           |       |      |      |       |
|-------------------------------|-----------------------------------|-----------------------------------------------------------|-------|------|------|-------|
| Symbol                        | Parameter                         | Test Conditions                                           | Value |      |      | Units |
|                               |                                   |                                                           | Min.  | Typ. | Max. |       |
| V <sub>DSS</sub>              | Drain to Source Breakdown Voltage | V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA               | -100  | --   | --   | V     |
| I <sub>DSS</sub>              | Drain to Source Leakage Current   | V <sub>DS</sub> =-100V, V <sub>GS</sub> =0V               | --    | --   | 1    | μA    |
| I <sub>GSS(F)</sub>           | Gate to Source Forward Leakage    | V <sub>GS</sub> =-20V, V <sub>DS</sub> =0V                | --    | --   | 100  | nA    |
| I <sub>GSS(R)</sub>           | Gate to Source Reverse Leakage    | V <sub>GS</sub> =+20V, V <sub>DS</sub> =0V                | --    | --   | -100 | nA    |
| V <sub>GS(TH)</sub>           | Gate Threshold Voltage            | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA | -1.2  | -1.7 | -2.2 | V     |
| R <sub>DS(ON)1</sub>          | Drain-to-Source Resistance        | On-<br>V <sub>GS</sub> =-10V, I <sub>D</sub> =-5A         | --    | 115  | 150  | mΩ    |
| R <sub>DS(ON)2</sub>          | Drain-to-Source Resistance        | On-<br>V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-5A        | --    | 130  | 165  | mΩ    |

| <b>Dynamic Characteristics</b> |                              |                                                              |       |      |      |       |
|--------------------------------|------------------------------|--------------------------------------------------------------|-------|------|------|-------|
| Symbol                         | Parameter                    | Test Conditions                                              | Value |      |      | Units |
|                                |                              |                                                              | Min.  | Typ. | Max. |       |
| C <sub>iss</sub>               | Input Capacitance            | V <sub>GS</sub> = 0V<br>V <sub>DS</sub> = -50V<br>f = 1.0MHz | --    | 700  | --   | pF    |
| C <sub>oss</sub>               | Output Capacitance           |                                                              | --    | 56   | --   |       |
| C <sub>rss</sub>               | Reverse Transfer Capacitance |                                                              | --    | 8.6  | --   |       |

| <b>Resistive Switching Characteristics</b> |                     |                                                                                                |       |      |      |       |
|--------------------------------------------|---------------------|------------------------------------------------------------------------------------------------|-------|------|------|-------|
| Symbol                                     | Parameter           | Test Conditions                                                                                | Value |      |      | Units |
|                                            |                     |                                                                                                | Min.  | Typ. | Max. |       |
| t <sub>d(ON)</sub>                         | Turn-on Delay Time  | I <sub>D</sub> =-5A<br>V <sub>DS</sub> = -50V<br>V <sub>GS</sub> = -10V<br>R <sub>G</sub> = 5Ω | --    | 5.9  | --   | ns    |
| t <sub>r</sub>                             | Rise Time           |                                                                                                | --    | 3.7  | --   |       |
| t <sub>d(OFF)</sub>                        | Turn-Off Delay Time |                                                                                                | --    | 39.5 | --   |       |
| t <sub>f</sub>                             | Fall Time           |                                                                                                | --    | 24.6 | --   |       |
| Q <sub>g</sub>                             | Total Gate Charge   | V <sub>GS</sub> =-10V<br>V <sub>DS</sub> = -50V<br>I <sub>D</sub> =-5A                         | --    | 12.7 | --   | nC    |
| Q <sub>gs</sub>                            | Gate Source Charge  |                                                                                                | --    | 2.1  | --   |       |
| Q <sub>gd</sub>                            | Gate Drain Charge   |                                                                                                | --    | 2.3  | --   |       |

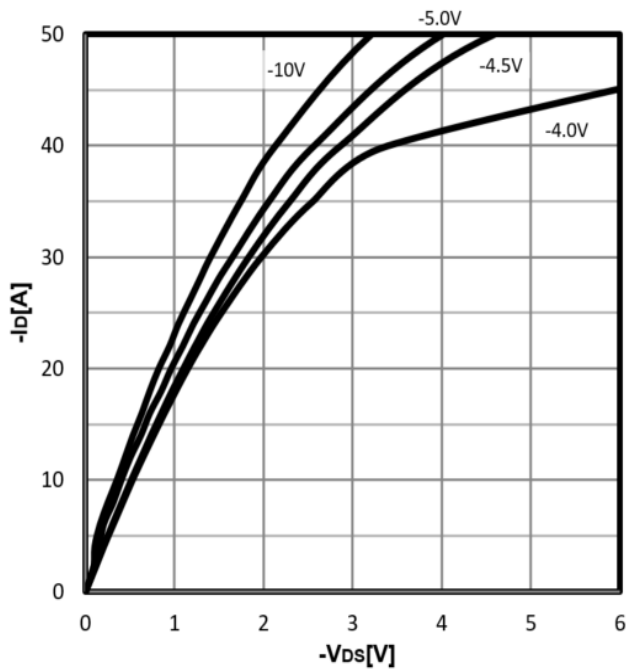
| <b>Source-Drain Diode Characteristics</b> |                         |                                            |       |      |      |       |
|-------------------------------------------|-------------------------|--------------------------------------------|-------|------|------|-------|
| Symbol                                    | Parameter               | Test Conditions                            | Value |      |      | Units |
|                                           |                         |                                            | Min.  | Typ. | Max. |       |
| V <sub>SD</sub>                           | Diode Forward Voltage   | I <sub>S</sub> =-5A, V <sub>GS</sub> =0V   | --    | --   | -1.2 | V     |
| t <sub>rr</sub>                           | Reverse Recovery time   | I <sub>S</sub> =-5A, V <sub>DD</sub> =-50V | --    | 66   | --   | ns    |
| Q <sub>rr</sub>                           | Reverse Recovery Charge | dI/dt=100A/μs                              | --    | 214  | --   | nC    |

<sup>a1</sup>: Repetitive rating; pulse width limited by maximum junction temperature

**Characteristics Curve:**

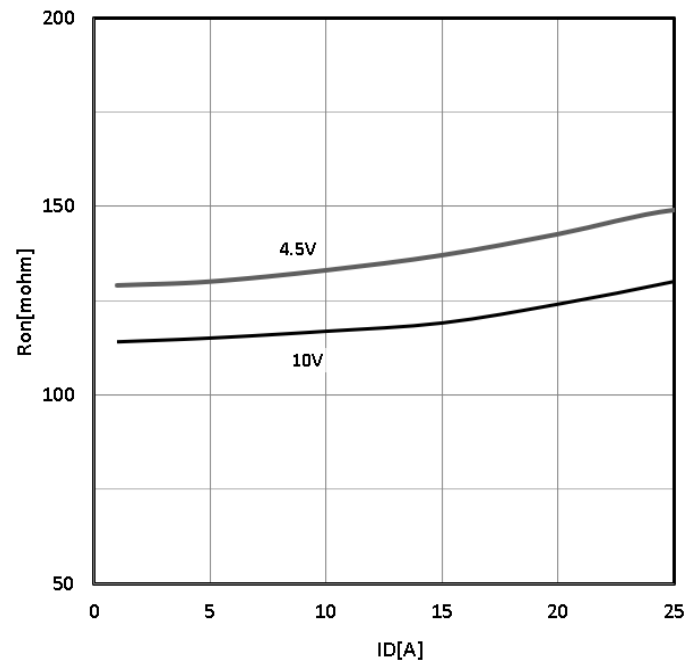
**Typ. output characteristics**

$$-I_D = f(-V_{DS})$$



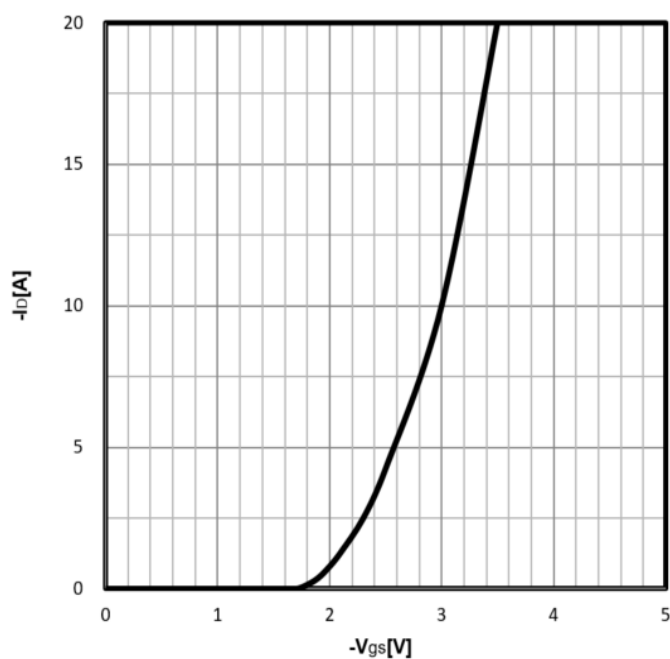
**Typ. drain-source on resistance**

$$R_{DS(on)} = f(-I_D)$$



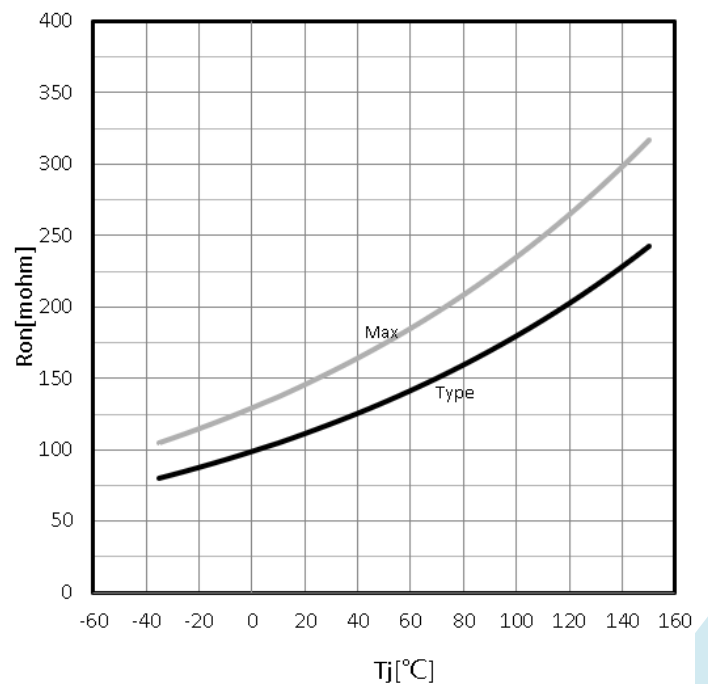
**Typ. transfer characteristics**

$$-I_D = f(-V_{GS})$$



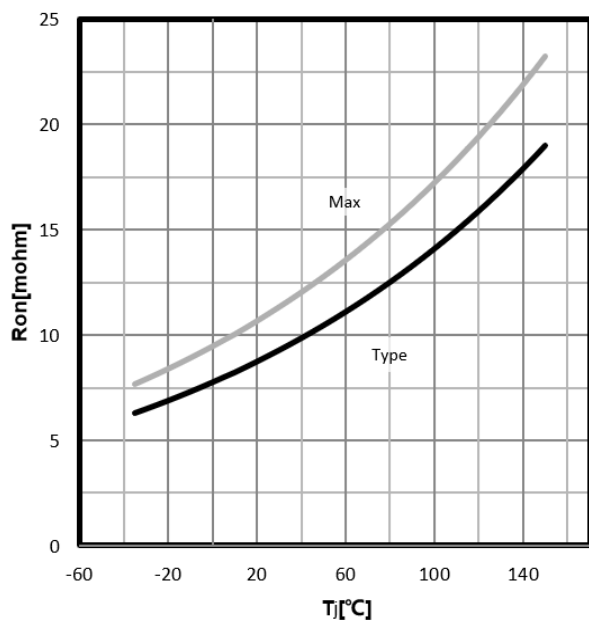
**Drain-source on-state resistance**

$$R_{DS(on)} = f(T_j); I_D = -5A; V_{GS} = -10V$$



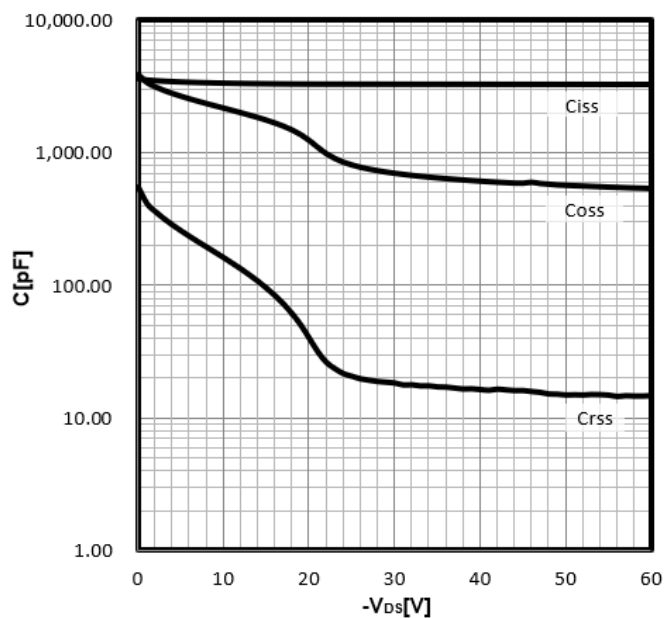
**Drain-source on-state resistance**

$$R_{DS(on)} = f(T_j); I_D = -20A; V_{GS} = -10V$$



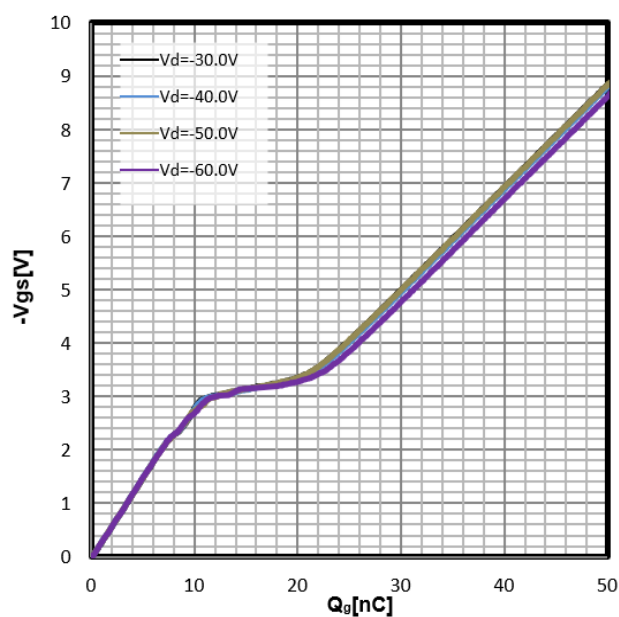
**Typ. capacitances**

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



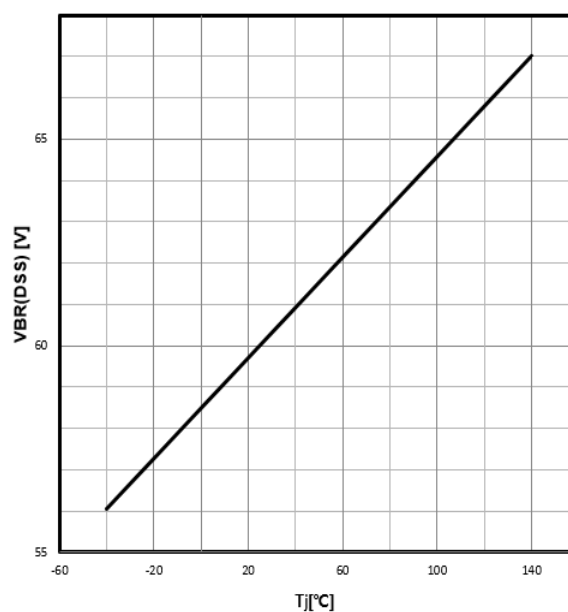
**Typ. gate charge**

$$V_{GS} = f(Q_{gate}); I_D = -20A$$

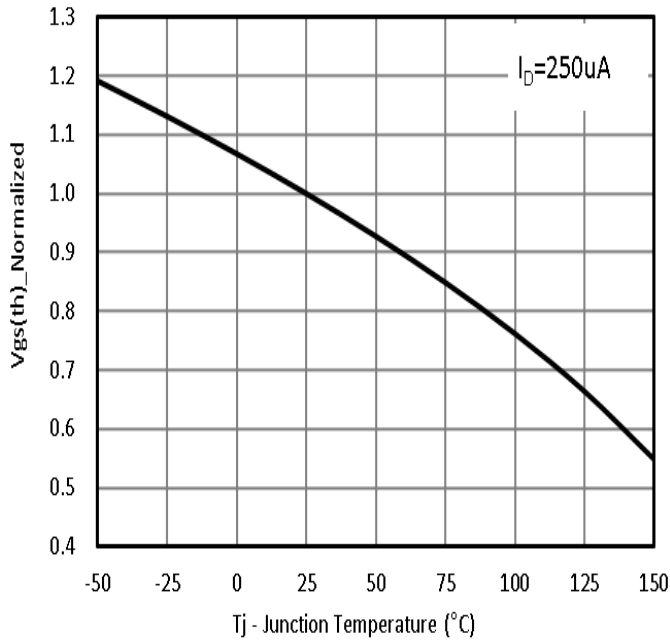


**Drain-source breakdown voltage**

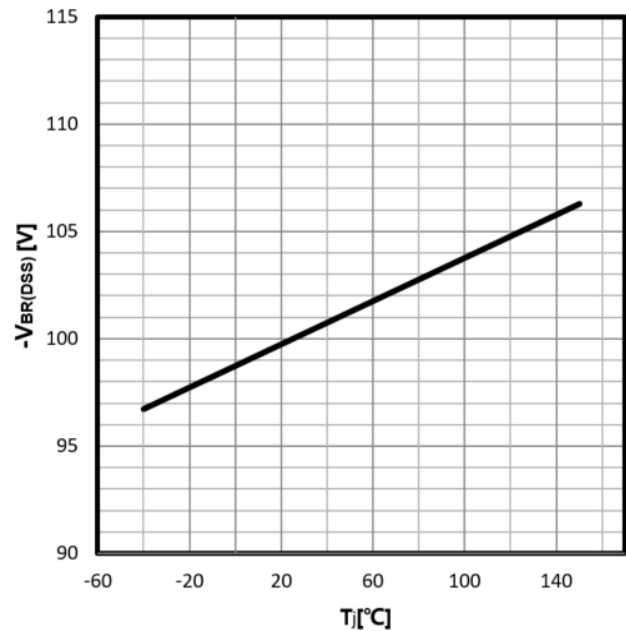
$$V_{BR(DSS)} = f(T_j); I_D = -250uA$$



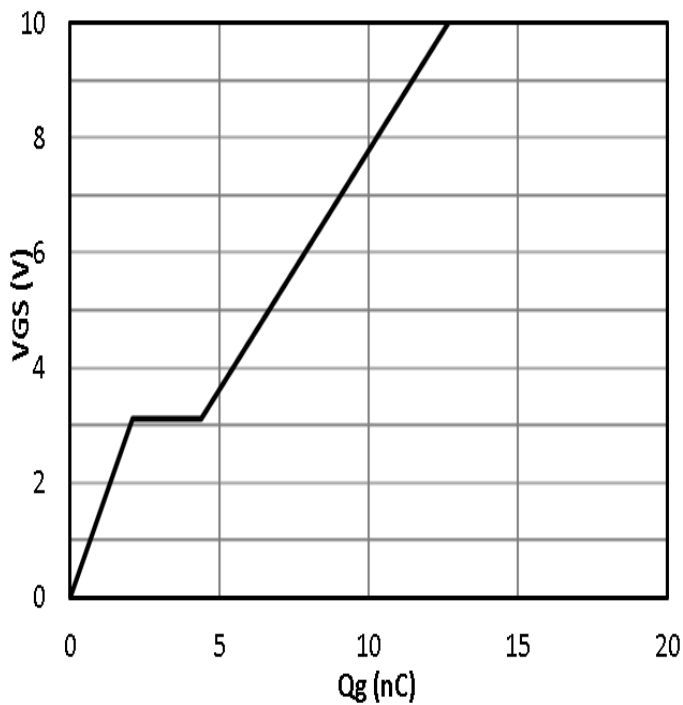
**Gate Threshold Voltage**  
 $-V_{TH}=f(T_j); I_D=-250\mu A$



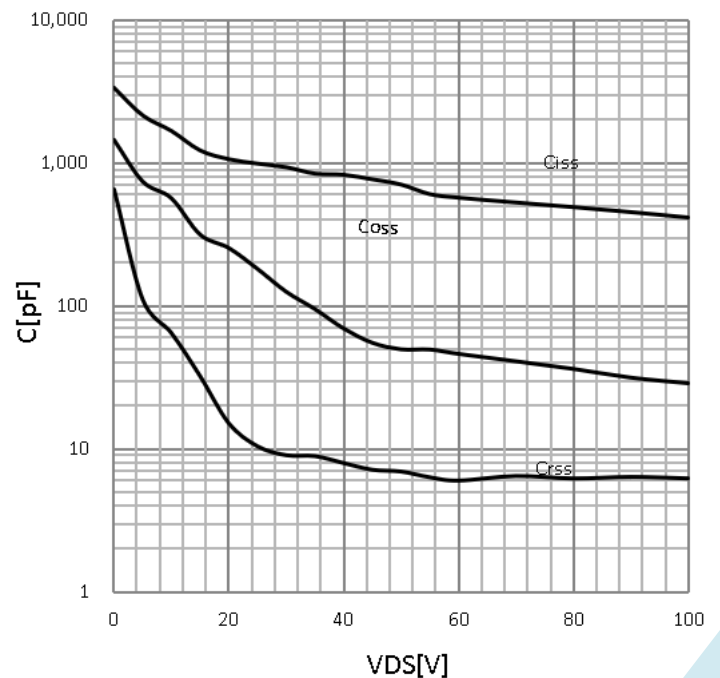
**Drain-source breakdown voltage**  
 $-V_{BR(DSS)}=f(T_j); I_D=-250\mu A$



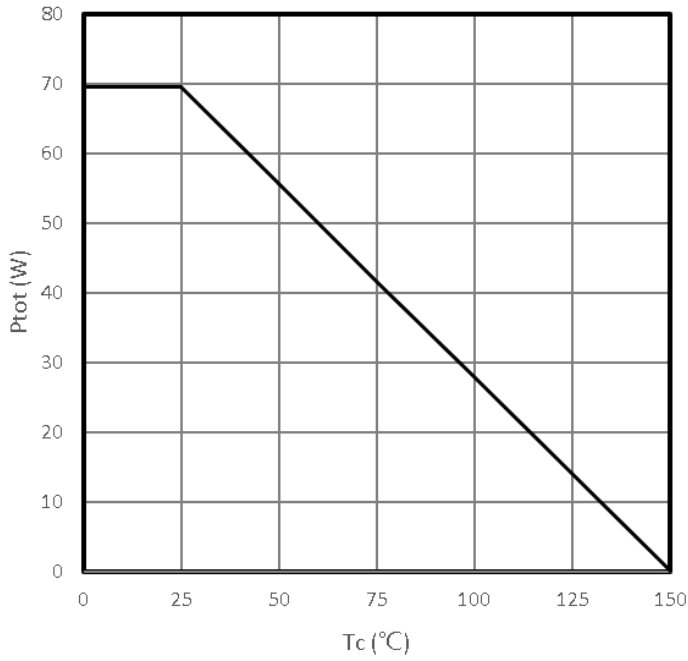
**Typ. gate charge**  
 $-V_{GS}=f(Q_g); I_D=-5A$



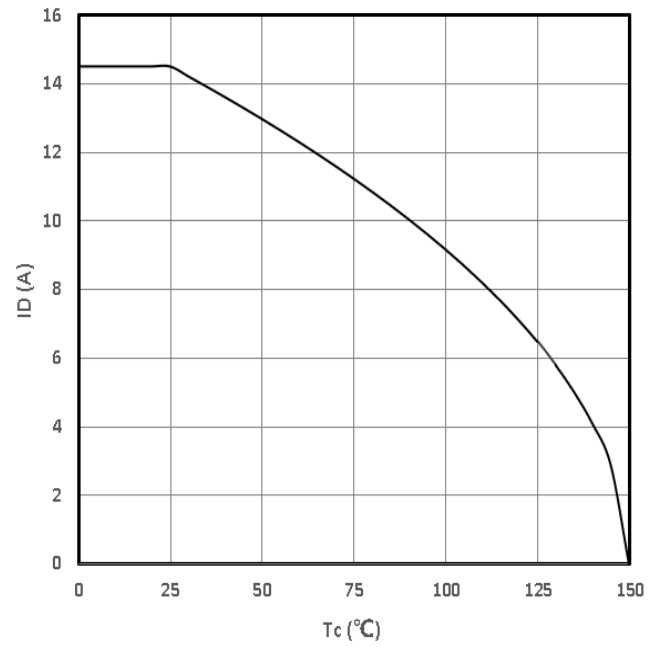
**Typ. capacitances**  
 $C=f(-V_{DS}); V_{GS}=0V; f=1MHz$



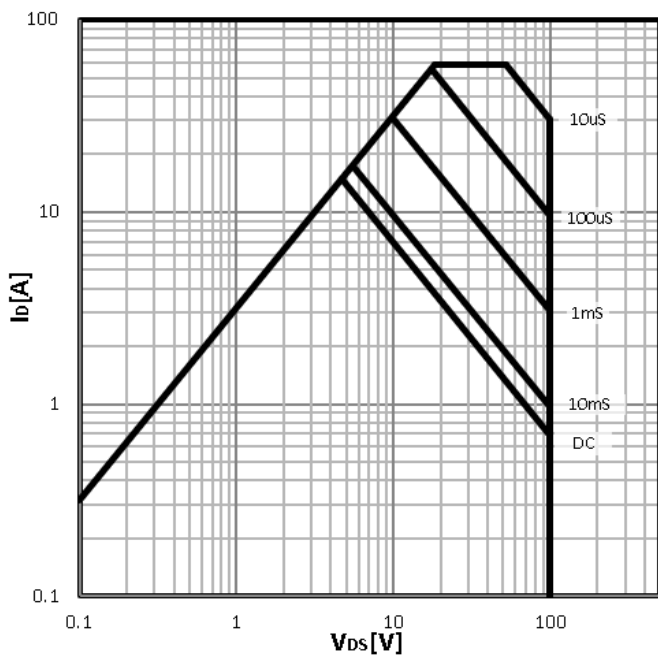
**Power Dissipation**  
 $P_{tot}=f(T_c)$



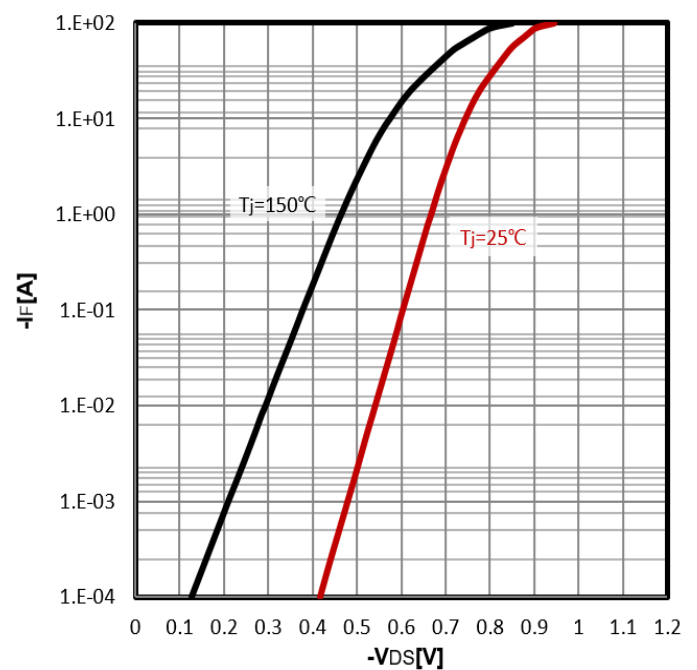
**Maximum Drain Current**  
 $-I_D=f(T_c)$



**Safe operating area**  
 $-I_D=f(-V_{DS})$



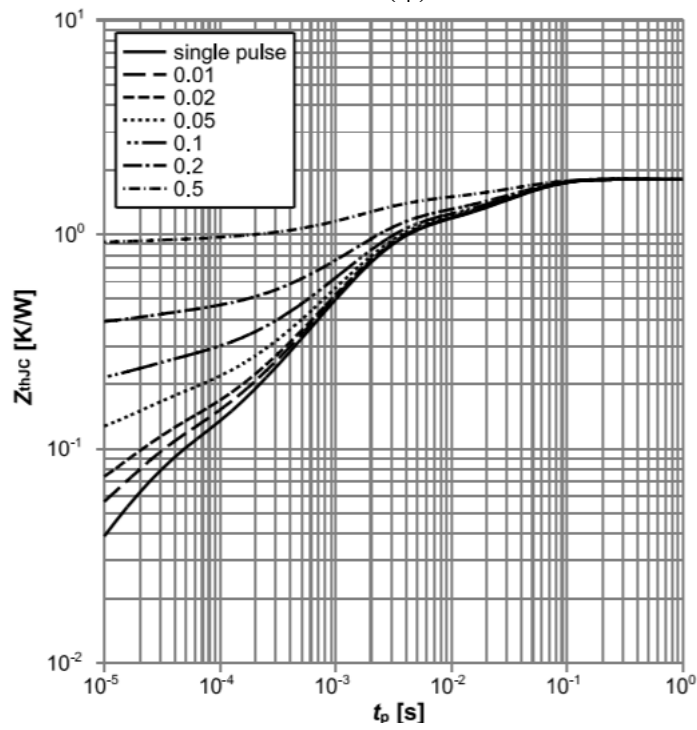
**Body Diode Forward Voltage Variation**  
 $-I_F=f(-V_{DS})$





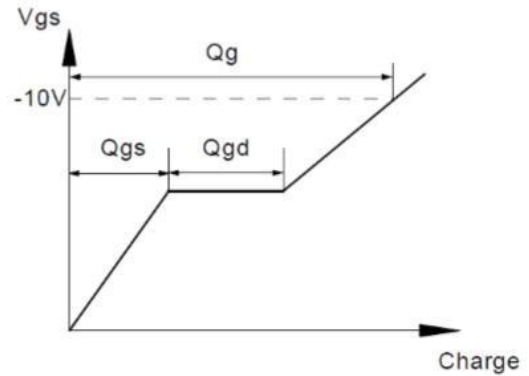
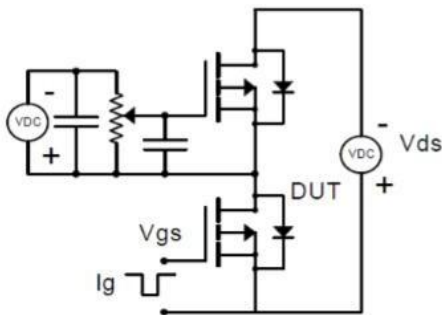
**Max. transient thermal impedance**

$$Z_{thJC}=f(t_p)$$

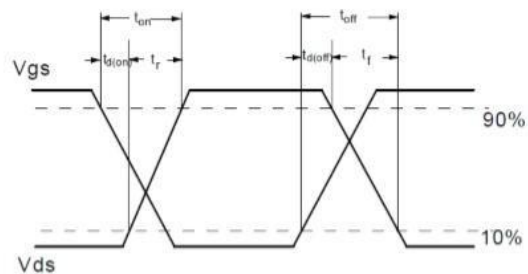
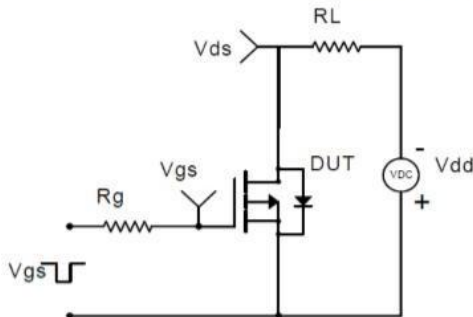


### Test Circuit and Waveform:

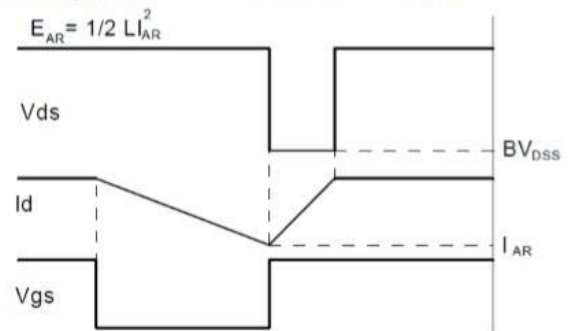
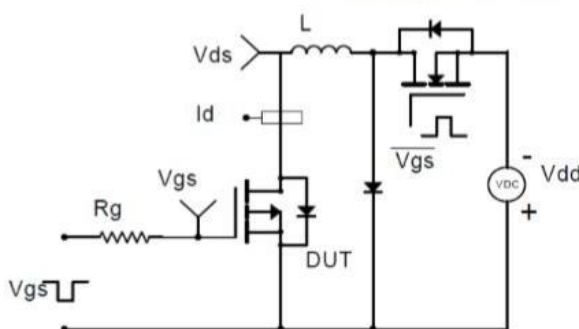
Gate Charge Test Circuit & Waveform



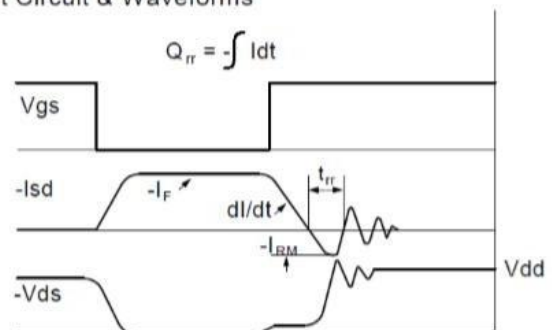
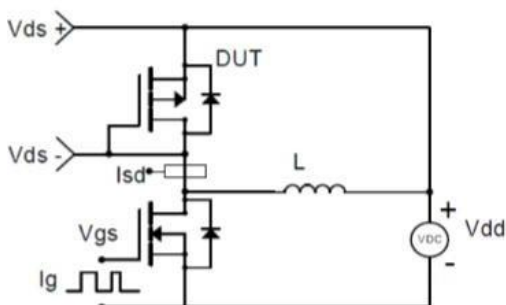
Resistive Switching Test Circuit & Waveforms



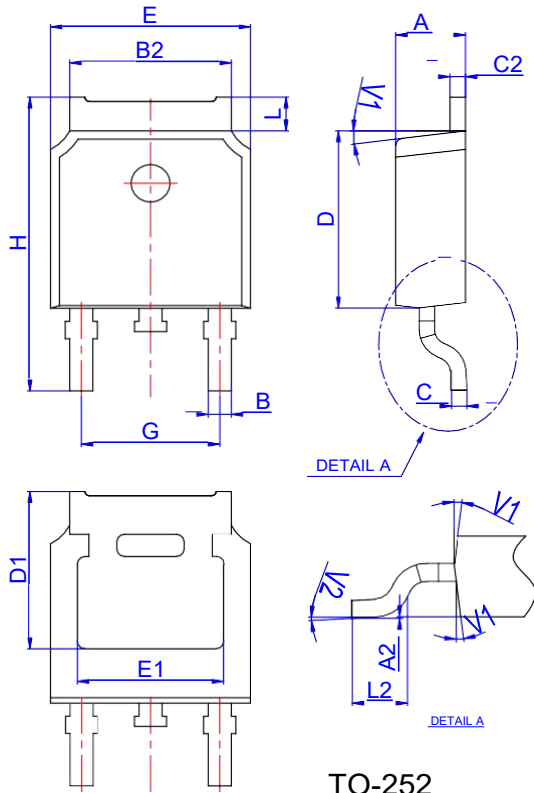
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

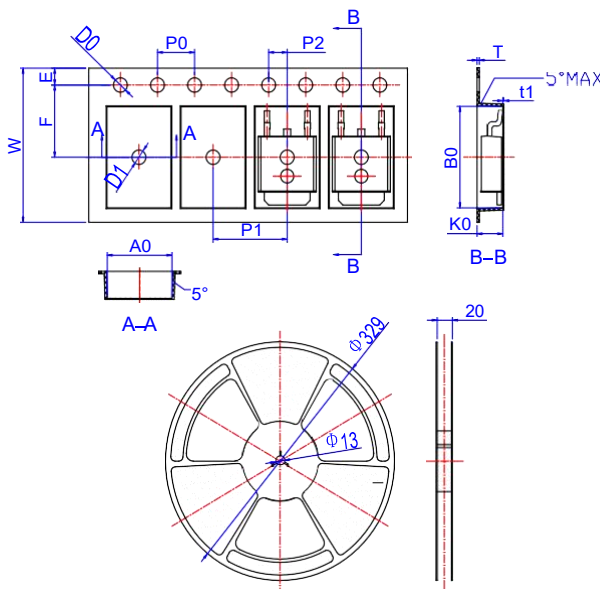


## Package Mechanical Data TO 252



| Ref. | Dimensions  |      |       |          |      |       |
|------|-------------|------|-------|----------|------|-------|
|      | Millimeters |      |       | Inches   |      |       |
|      | Min.        | Typ. | Max.  | Min.     | Typ. | Max.  |
| A    | 2.10        |      | 2.50  | 0.083    |      | 0.098 |
| A2   | 0           |      | 0.10  | 0        |      | 0.004 |
| B    | 0.66        |      | 0.86  | 0.026    |      | 0.034 |
| B2   | 5.18        |      | 5.48  | 0.202    |      | 0.216 |
| C    | 0.40        |      | 0.60  | 0.016    |      | 0.024 |
| C2   | 0.44        |      | 0.58  | 0.017    |      | 0.023 |
| D    | 5.90        |      | 6.30  | 0.232    |      | 0.248 |
| D1   | 5.30REF     |      |       | 0.209REF |      |       |
| E    | 6.40        |      | 6.80  | 0.252    |      | 0.268 |
| E1   | 4.63        |      |       | 0.182    |      |       |
| G    | 4.47        |      | 4.67  | 0.176    |      | 0.184 |
| H    | 9.50        |      | 10.70 | 0.374    |      | 0.421 |
| L    | 1.09        |      | 1.21  | 0.043    |      | 0.048 |
| L2   | 1.35        |      | 1.65  | 0.053    |      | 0.065 |
| V1   |             | 7°   |       |          | 7°   |       |
| V2   | 0°          |      | 6°    | 0°       |      | 6°    |

## Reel Specification-TO-252-4R



| Ref. | Dimensions  |       |       |        |       |       |
|------|-------------|-------|-------|--------|-------|-------|
|      | Millimeters |       |       | Inches |       |       |
|      | Min.        | Typ.  | Max.  | Min.   | Typ.  | Max.  |
| W    | 15.90       | 16.00 | 16.10 | 0.626  | 0.630 | 0.634 |
| E    | 1.65        | 1.75  | 1.85  | 0.065  | 0.069 | 0.073 |
| F    | 7.40        | 7.50  | 7.60  | 0.291  | 0.295 | 0.299 |
| D0   | 1.40        | 1.50  | 1.60  | 0.055  | 0.059 | 0.063 |
| D1   | 1.40        | 1.50  | 1.60  | 0.055  | 0.059 | 0.063 |
| P0   | 3.90        | 4.00  | 4.10  | 0.154  | 0.157 | 0.161 |
| P1   | 7.90        | 8.00  | 8.10  | 0.311  | 0.315 | 0.319 |
| P2   | 1.90        | 2.00  | 2.10  | 0.075  | 0.079 | 0.083 |
| A0   | 6.85        | 6.90  | 7.00  | 0.270  | 0.271 | 0.276 |
| B0   | 10.45       | 10.50 | 10.60 | 0.411  | 0.413 | 0.417 |
| K0   | 2.68        | 2.78  | 2.88  | 0.105  | 0.109 | 0.113 |
| T    | 0.24        |       | 0.27  | 0.009  |       | 0.011 |
| t1   | 0.10        |       |       | 0.004  |       |       |
| 10P0 | 39.80       | 40.00 | 40.20 | 1.567  | 1.575 | 1.583 |