

- ★ Super Low Gate Charge
- ★ 100% EAS Guaranteed
- ★ Green Device Available
- ★ Excellent CdV/dt effect decline
- ★ Advanced trench gate super junction technology

## 700V Super Junction Power MOSFET

### Product Summary



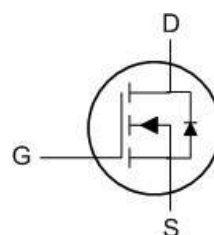
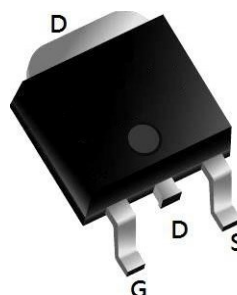
| BVDSS | RDS(ON) | ID  |
|-------|---------|-----|
| 700V  | 320mΩ   | 12A |

## Description

The UD70R320 use super junction technology and design to provide excellent RDS(ON) with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

The UD70R320 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

### TO252-3L Pin Configuration



### Absolute Maximum Ratings

| Symbol                 | Parameter                                      | Rating     | Units       |
|------------------------|------------------------------------------------|------------|-------------|
| $V_{DS}$               | Drain-Source Voltage                           | 700        | V           |
| $V_{GS}$               | Gate-Source Voltage                            | $\pm 30$   | V           |
| $I_D@T_C=25^{\circ}C$  | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | 12         | A           |
| $I_D@T_C=100^{\circ}C$ | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | 7          | A           |
| $I_{DM}$               | Pulsed Drain Current <sup>2</sup>              | 52         | A           |
| EAS                    | Single Pulse Avalanche Energy <sup>3</sup>     | 90         | mJ          |
| $I_{AS}$               | Avalanche Current                              | ---        | A           |
| $P_D@T_C=25^{\circ}C$  | Total Power Dissipation <sup>4</sup>           | 26         | W           |
| $T_{STG}$              | Storage Temperature Range                      | -55 to 150 | $^{\circ}C$ |
| $T_J$                  | Operating Junction Temperature Range           | -55 to 150 | $^{\circ}C$ |

### Thermal Data

| Symbol          | Parameter                                        | Typ. | Max. | Unit          |
|-----------------|--------------------------------------------------|------|------|---------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient <sup>1</sup> | ---  | 56   | $^{\circ}C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>    | ---  | 4.9  | $^{\circ}C/W$ |

**Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)**

| Symbol                       | Parameter                                      | Conditions                                                  | Min. | Typ. | Max.      | Unit                |
|------------------------------|------------------------------------------------|-------------------------------------------------------------|------|------|-----------|---------------------|
| $BV_{DSS}$                   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V$ , $I_D=250\mu A$                                | 700  | ---  | ---       | V                   |
| $\Delta BV_{DSS}/\Delta T_J$ | $BV_{DSS}$ Temperature Coefficient             | Reference to $25^\circ\text{C}$ , $I_D=1mA$                 | ---  | ---  | ---       | $V/^\circ\text{C}$  |
| $R_{DS(ON)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V$ , $I_D=3A$                                     | ---  | 320  | 369       | $m\Omega$           |
|                              |                                                | $V_{GS}=4.5V$ , $I_D=3A$                                    | ---  | ---  | ---       |                     |
| $V_{GS(th)}$                 | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                            | 3    | ---  | 4         | V                   |
| $\Delta V_{GS(th)}$          | $V_{GS(th)}$ Temperature Coefficient           |                                                             | ---  | ---  | ---       | $mV/^\circ\text{C}$ |
| $I_{DSS}$                    | Drain-Source Leakage Current                   | $V_{DS}=700V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$        | ---  | ---  | 1         | $\mu A$             |
|                              |                                                | $V_{DS}=700V$ , $V_{GS}=0V$ , $T_J=100^\circ\text{C}$       | ---  | 10   | ---       |                     |
| $I_{GSS}$                    | Gate-Source Leakage Current                    | $V_{GS}=\pm 30V$ , $V_{DS}=0V$                              | ---  | ---  | $\pm 100$ | nA                  |
| $g_{fs}$                     | Forward Transconductance                       | $V_{DS}=20V$ , $I_D=6A$                                     | ---  | 10   | ---       | S                   |
| $R_g$                        | Gate Resistance                                | $V_{DS}=0V$ , $V_{GS}=0V$ , $f=1MHz$                        | ---  | 9.3  | ---       | $\Omega$            |
| $Q_g$                        | Total Gate Charge                              | $V_{DS}=480V$ , $V_{GS}=10V$ , $I_D=6A$                     | ---  | 26   | ---       | nC                  |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                             | ---  | 3.7  | ---       |                     |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                             | ---  | 13.8 | ---       |                     |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{GS}=10V$ , $V_{DS}=400V$ ,<br>$R_G=10\Omega$ , $I_D=6A$ | ---  | 20   | ---       | ns                  |
| $T_r$                        | Rise Time                                      |                                                             | ---  | 26   | ---       |                     |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                             | ---  | 105  | ---       |                     |
| $T_f$                        | Fall Time                                      |                                                             | ---  | 32   | ---       |                     |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=100V$ , $V_{GS}=0V$ , $f=1MHz$                      | ---  | 753  | ---       | pF                  |
| $C_{oss}$                    | Output Capacitance                             |                                                             | ---  | 40   | ---       |                     |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                             | ---  | 1.4  | ---       |                     |

**Diode Characteristics**

| Symbol   | Parameter                                | Conditions                                       | Min. | Typ. | Max. | Unit |
|----------|------------------------------------------|--------------------------------------------------|------|------|------|------|
| $I_S$    | Continuous Source Current <sup>1,4</sup> | $V_G=V_D=0V$ , Force Current                     | ---  | ---  | 12   | A    |
| $V_{SD}$ | Diode Forward Voltage <sup>2</sup>       | $V_{GS}=0V$ , $I_S=16A$ , $T_J=25^\circ\text{C}$ | ---  | ---  | 1    | V    |
| $t_{rr}$ | Reverse Recovery Time                    | $I_F=10A$ , $di/dt=100A/\mu s$                   | ---  | 210  | ---  | nS   |
| $Q_{rr}$ | Reverse Recovery Charge                  | $\mu s$ , $T_J=25^\circ\text{C}$                 | ---  | 2.05 | ---  | nC   |

Note :

1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.

2.The data tested by pulsed , pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$

3.The EAS data shows Max. rating . The test condition is  $T_J=25^\circ\text{C}$ ,  $V_{DD}=200V$ ,  $V_{GS}=10V$ ,  $L=50mH$

4.The power dissipation is limited by  $150^\circ\text{C}$  junction temperature

5.The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications , should be limited by total power dissipation.

## Typical Performance Characteristics

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

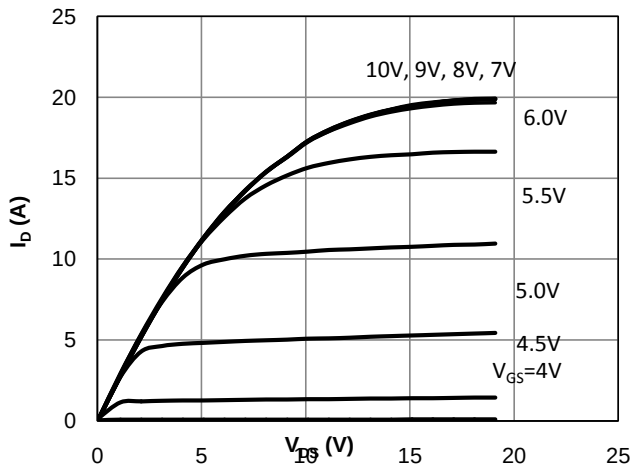


Fig 2. Output Characteristics ( $T_j=150^\circ\text{C}$ )

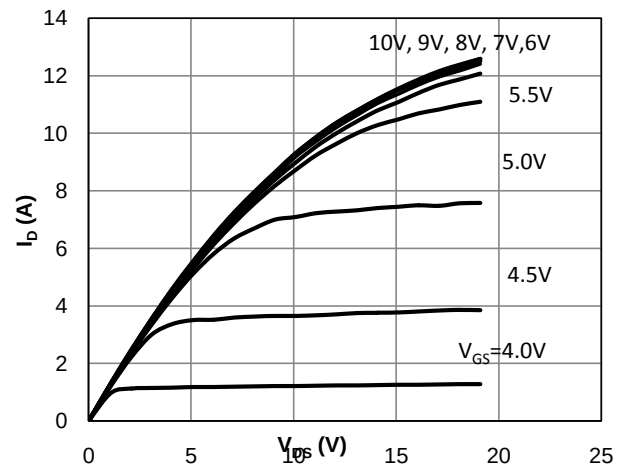


Fig 3: Transfer Characteristics

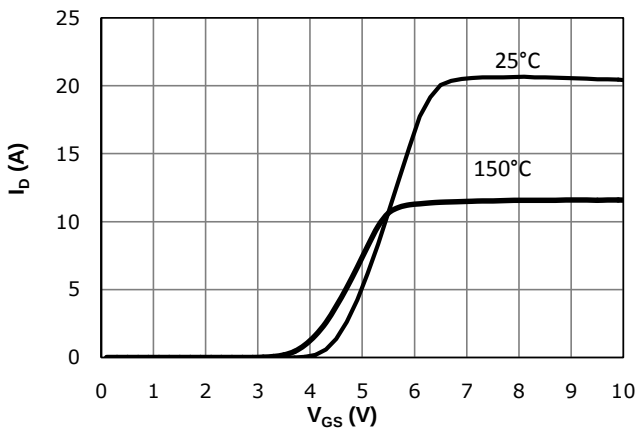


Fig 4:  $V_{TH}$  Vs  $T_j$  Temperature Characteristics

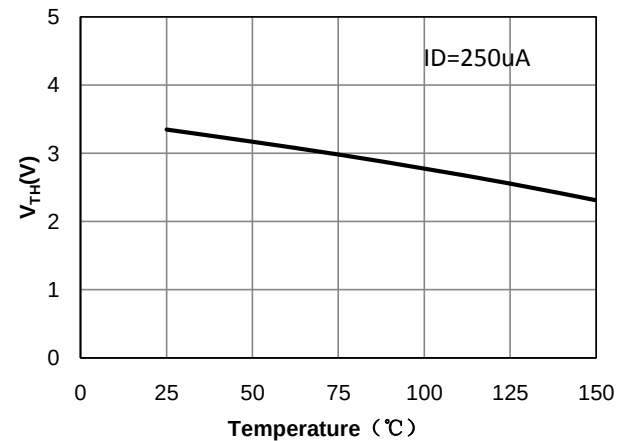


Fig 5:  $R_{DS(on)}$  Vs  $I_{DS}$  Characteristics ( $T_c=25^\circ\text{C}$ )

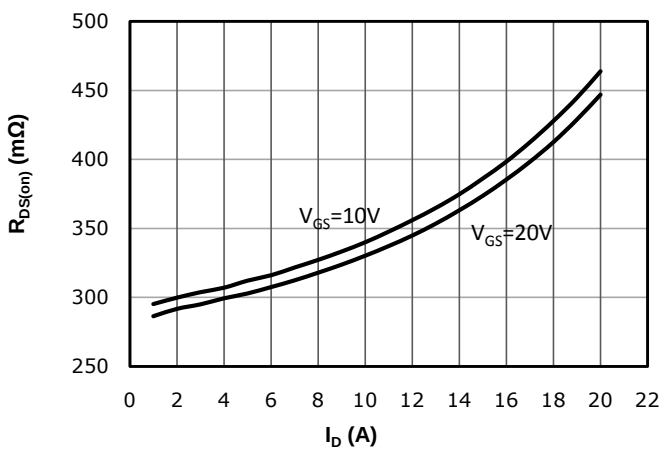


Fig 6:  $R_{DS(on)}$  vs. Temperature

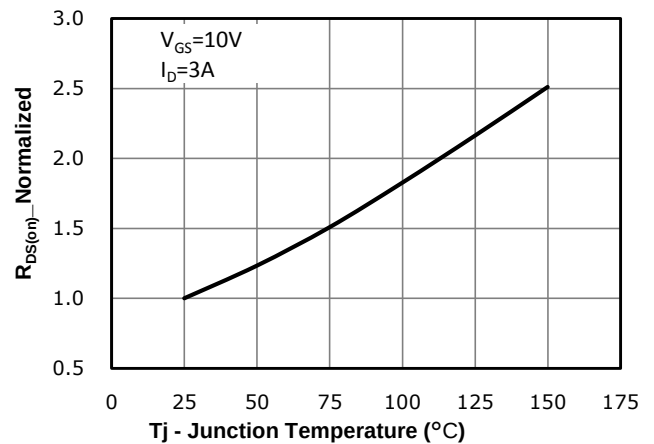


Fig 7: BVDSS vs. Temperature

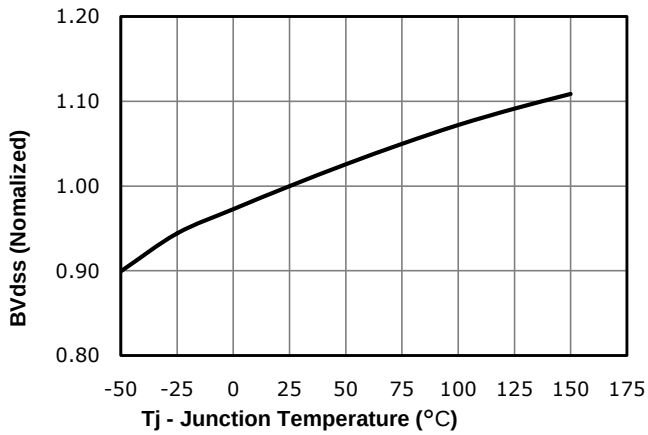


Fig 8: Rds(on) vs Gate Voltage

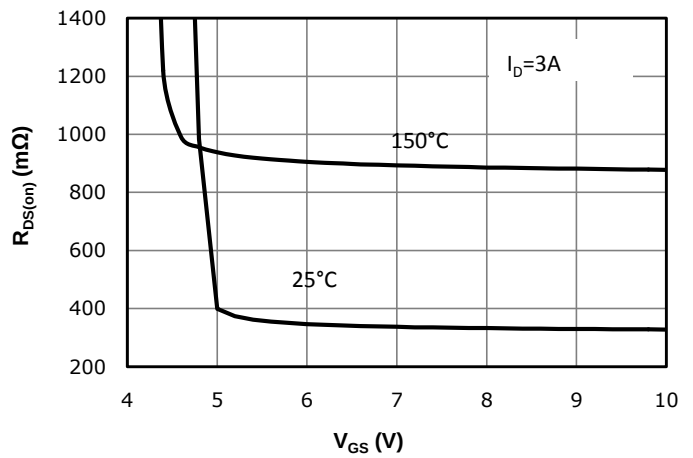


Fig 9: Body-diode Forward Characteristics

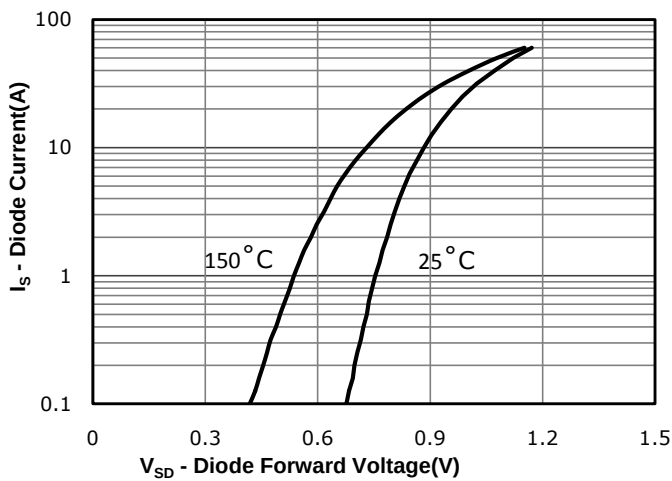


Fig 10: Gate Charge Characteristics

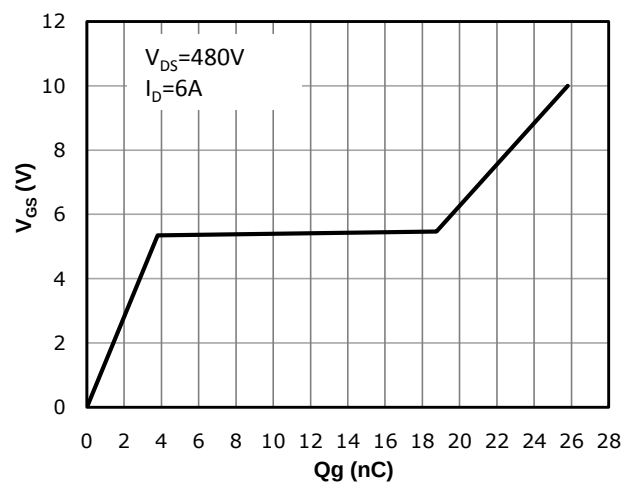


Fig 11: Capacitance Characteristics

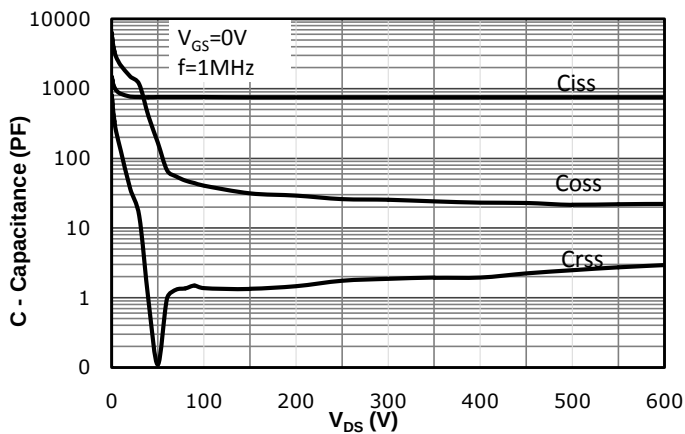


Fig 12: Safe Operating Area

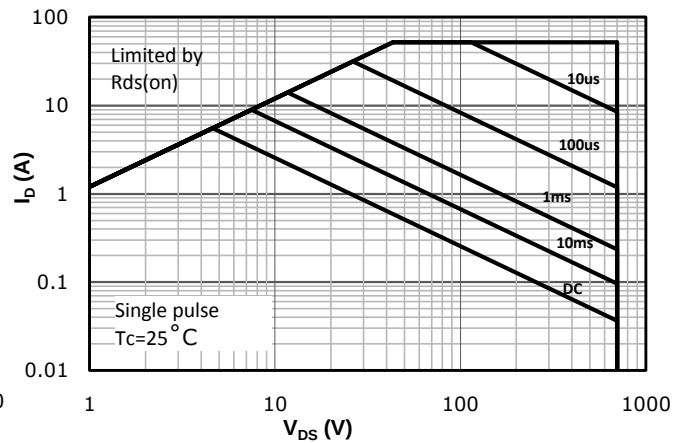
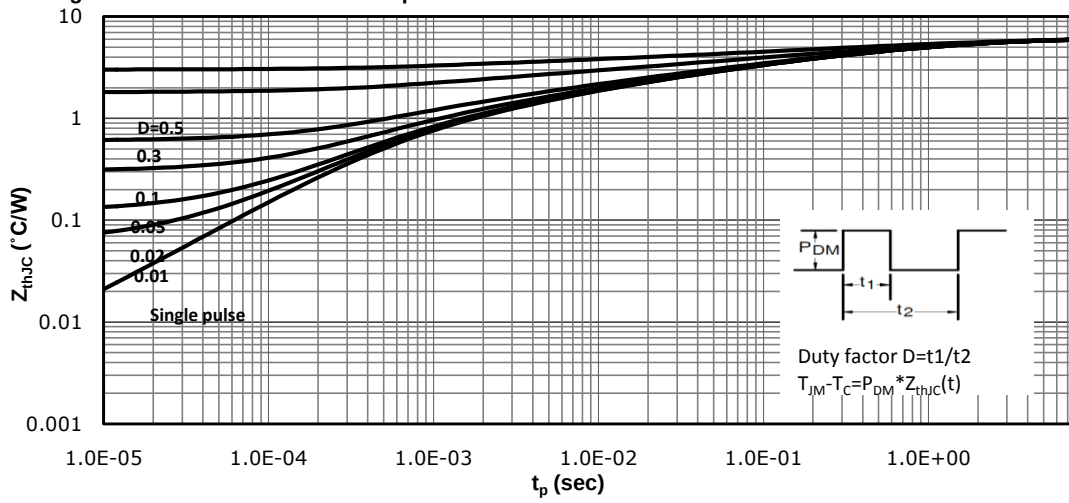
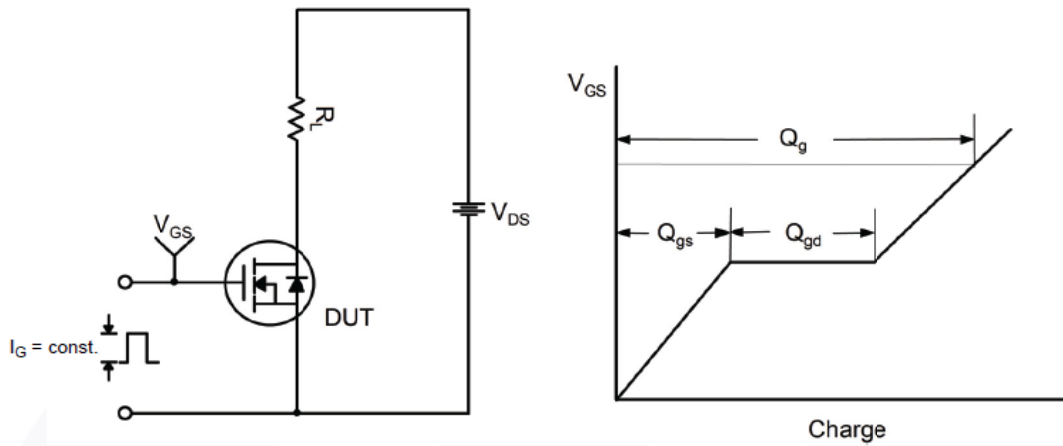


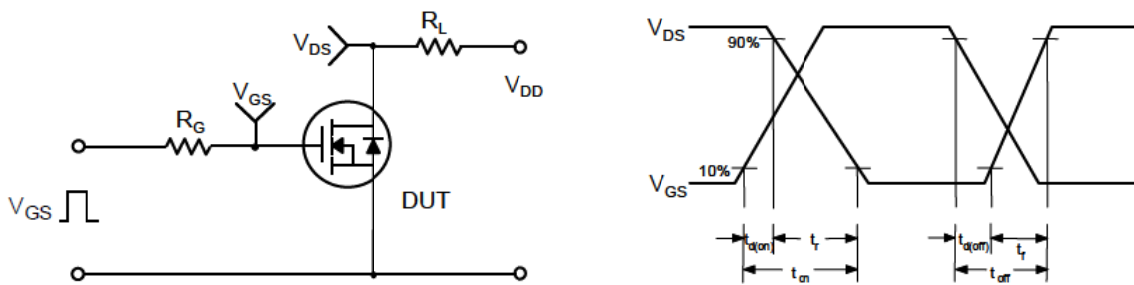
Fig 13: Max. Transient Thermal Impedance



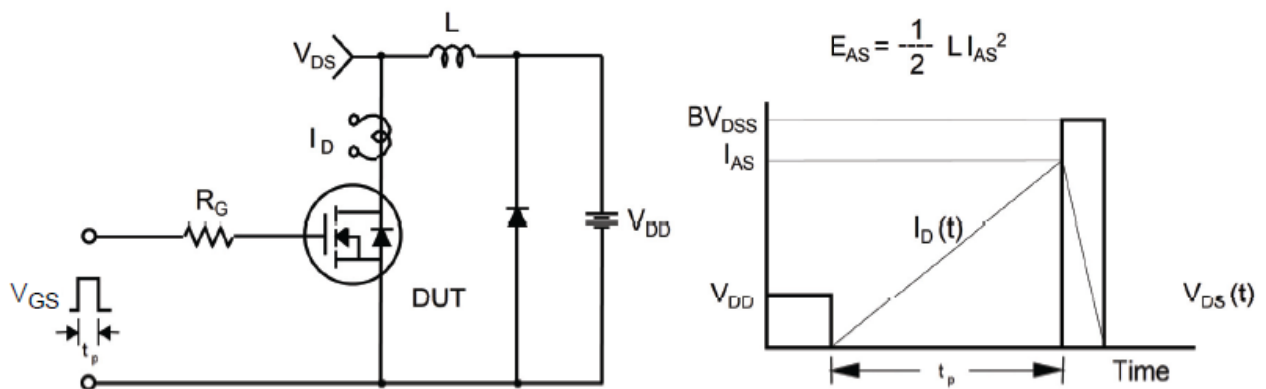
### Gate Charge Test Circuit & Waveform



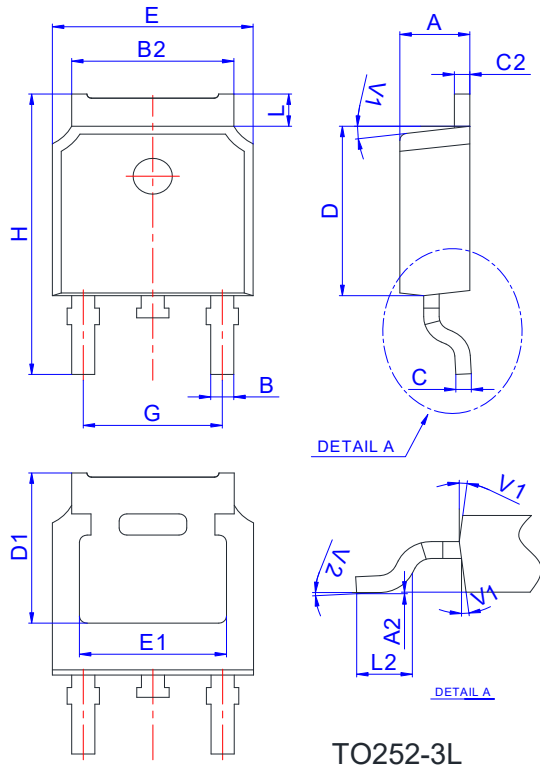
### Switching Test Circuit & Waveforms



### Unclamped Inductive Switching Test Circuit & Waveforms

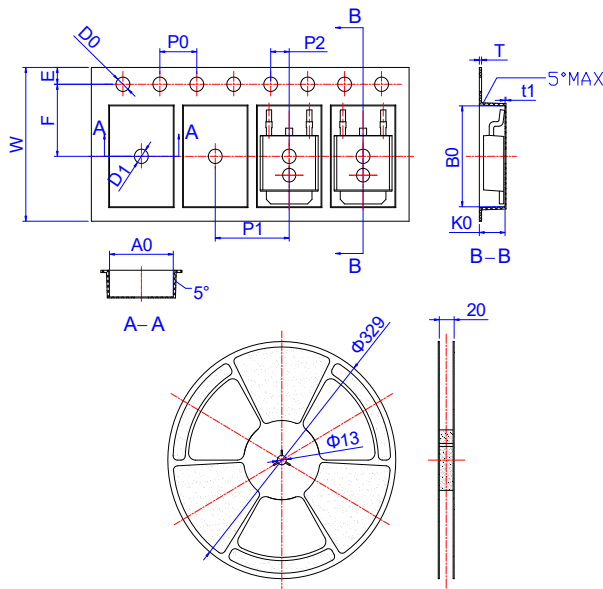


## Package Mechanical Data-TO252-3L



| 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-TO252-3L



| 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 |