

**Features**

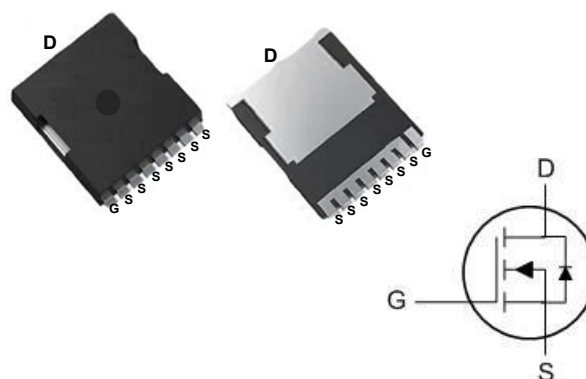
- Split Gate Trench MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low RDS(ON)

**Product Summary**


| BVDSS | RDS(ON) | ID   |
|-------|---------|------|
| 150V  | 5mΩ     | 180A |

**Applications**

- DC-DC Converters
- Power management functions
- Synchronous-rectification applications

**TOLL-8L Pin Configuration**

**Absolute Maximum Ratings**

| Symbol                      | Parameter                                      | Rating     | Units            |
|-----------------------------|------------------------------------------------|------------|------------------|
| $V_{DS}$                    | Drain-Source Voltage                           | 150        | V                |
| $V_{GS}$                    | Gate-Source Voltage                            | $\pm 20$   | V                |
| $I_D@T_C=25^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | 180        | A                |
| $I_D@T_C=100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V^{1,6}$ | 96         | A                |
| $I_{DM}$                    | Pulsed Drain Current <sup>2</sup>              | 560        | A                |
| EAS                         | Single Pulse Avalanche Energy <sup>3</sup>     | 1105       | mJ               |
| $I_{AS}$                    | Avalanche Current                              | 66         | A                |
| $P_D@T_C=25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>           | 298        | W                |
| $T_{STG}$                   | Storage Temperature Range                      | -55 to 150 | $^\circ\text{C}$ |
| $T_J$                       | Operating Junction Temperature Range           | -55 to 150 | $^\circ\text{C}$ |

**Thermal Data**

| Symbol          | Parameter                                        | Typ. | Max. | Unit               |
|-----------------|--------------------------------------------------|------|------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient <sup>1</sup> | ---  | 39   | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>    | ---  | 0.42 | $^\circ\text{C/W}$ |

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

| Symbol                       | Parameter                                      | Conditions                                                   | Min. | Typ.  | Max.      | Unit                |
|------------------------------|------------------------------------------------|--------------------------------------------------------------|------|-------|-----------|---------------------|
| $BV_{DSS}$                   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V$ , $I_D=250\mu A$                                 | 150  | ---   | ---       | V                   |
| $\Delta BV_{DSS}/\Delta T_J$ | $BV_{DSS}$ Temperature Coefficient             | Reference to $25^\circ\text{C}$ , $I_D=1\text{mA}$           | ---  | ---   | ---       | $V/^\circ\text{C}$  |
| $R_{DS(ON)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V$ , $I_D=60A$                                     | ---  | 5.0   | 6.3       | $m\Omega$           |
| $V_{GS(th)}$                 | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                             | 2    | 3     | 4         | V                   |
| $\Delta V_{GS(th)}$          | $V_{GS(th)}$ Temperature Coefficient           |                                                              | ---  | ---   | ---       | $mV/^\circ\text{C}$ |
| $I_{DSS}$                    | Drain-Source Leakage Current                   | $V_{DS}=150V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$         | ---  | ---   | 1         | $\mu A$             |
|                              |                                                | $V_{DS}=150V$ , $V_{GS}=0V$ , $T_J=100^\circ\text{C}$        | ---  | ---   | 100       |                     |
| $I_{GSS}$                    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                               | ---  | ---   | $\pm 100$ | nA                  |
| gfs                          | Forward Transconductance                       | $V_{DS}=5V$ , $I_D=60A$                                      | ---  | 100.8 | ---       | S                   |
| $R_g$                        | Gate Resistance                                | $V_{DS}=0V$ , $V_{GS}=0V$ , $f=1\text{MHz}$                  | ---  | 4     | ---       | $\Omega$            |
| $Q_g$                        | Total Gate Charge                              | $V_{DS}=75V$ , $V_{GS}=10V$ , $I_D=60A$                      | ---  | 74.5  | ---       | nC                  |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                              | ---  | 31.7  | ---       |                     |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                              | ---  | 15.2  | ---       |                     |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{GS}=10V$ , $V_{DD}=75V$ ,<br>$R_G=2.7\Omega$ , $I_D=60A$ | ---  | 19.1  | ---       | ns                  |
| $T_r$                        | Rise Time                                      |                                                              | ---  | 90.8  | ---       |                     |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                              | ---  | 52.4  | ---       |                     |
| $T_f$                        | Fall Time                                      |                                                              | ---  | 82.5  | ---       |                     |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=75V$ , $V_{GS}=0V$ , $f=1\text{MHz}$                 | ---  | 4936  | ---       | pF                  |
| $C_{oss}$                    | Output Capacitance                             |                                                              | ---  | 609   | ---       |                     |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                              | ---  | 21    | ---       |                     |

**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                               | ---  | ---   | 180  | A    |
| $V_{SD}$ | Diode Forward Voltage <sup>2</sup>       | $V_{GS}=0V$ , $I_S=60A$ , $T_J=25^\circ\text{C}$           | ---  | ---   | 1.4  | V    |
| $t_{rr}$ | Reverse Recovery Time                    | $I_F=17A$ , $di/dt=100A/\mu s$ ,<br>$T_J=25^\circ\text{C}$ | ---  | 132.7 | ---  | nS   |
| $Q_{rr}$ | Reverse Recovery Charge                  |                                                            | ---  | 584.7 | ---  | nC   |

**Notes:**

1. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=150^\circ\text{C}$
2. The EAS data shows Max. rating . The test condition is  $V_{DD}=75V$ ,  $V_{GS}=10V$ ,  $L=0.5\text{mH}$ ,  $I_{AS}=66A$ .
3. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper, The value in any given application depends on the user's specific board design.
4. The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$ .
5. This value is guaranteed by design hence it is not included in the production test.

## Typical Performance Characteristics

Fig 1: Output Characteristics

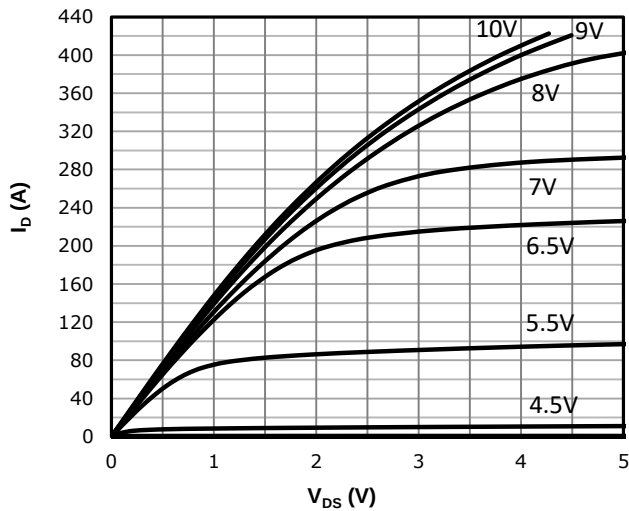


Fig 2: Transfer Characteristics

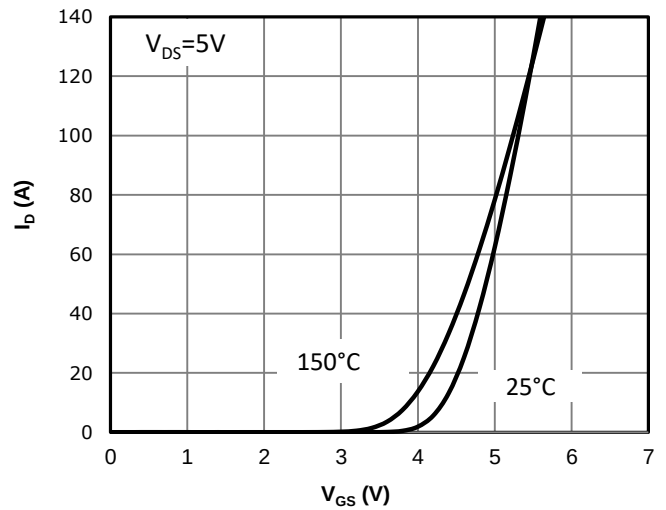


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

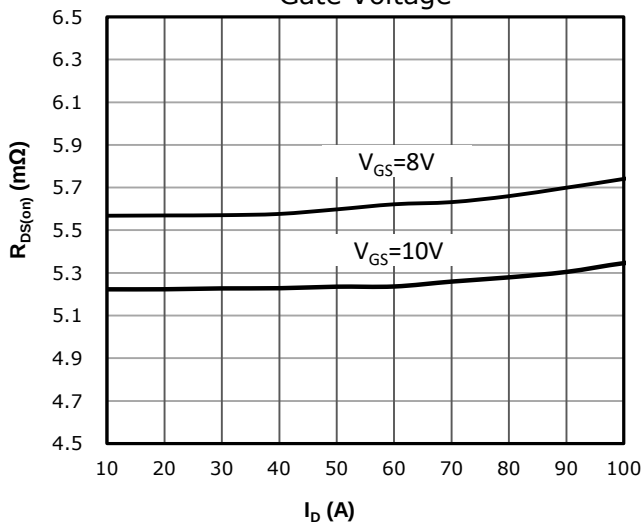


Fig 4:  $R_{DS(on)}$  vs Gate Voltage

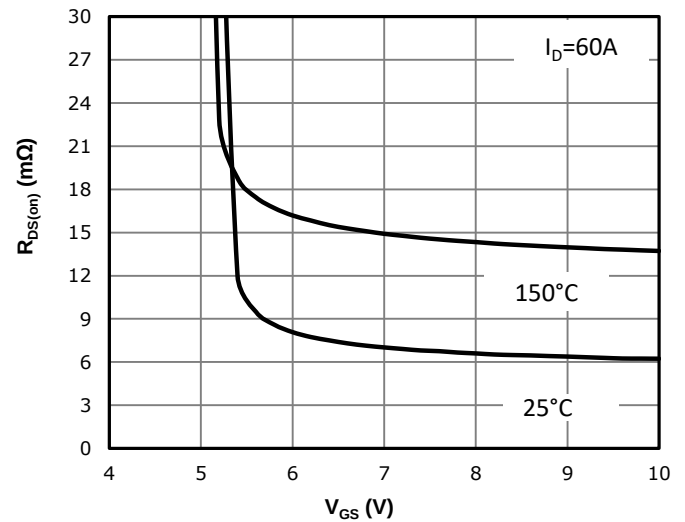


Fig 5:  $R_{DS(on)}$  vs. Temperature

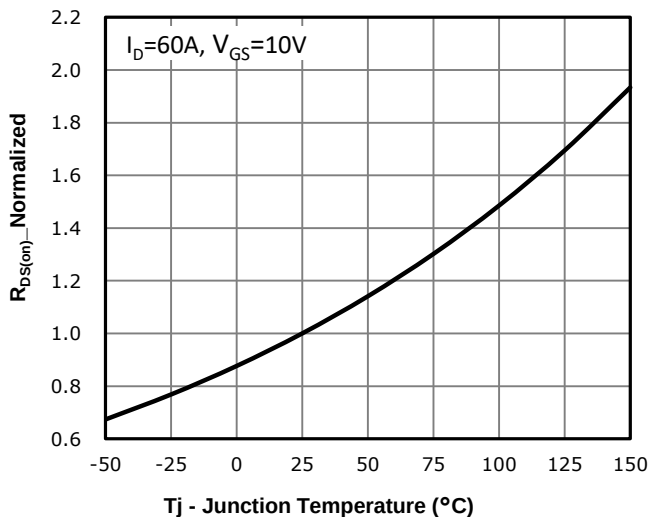


Fig 6:  $V_{GS(th)}$  vs. Temperature

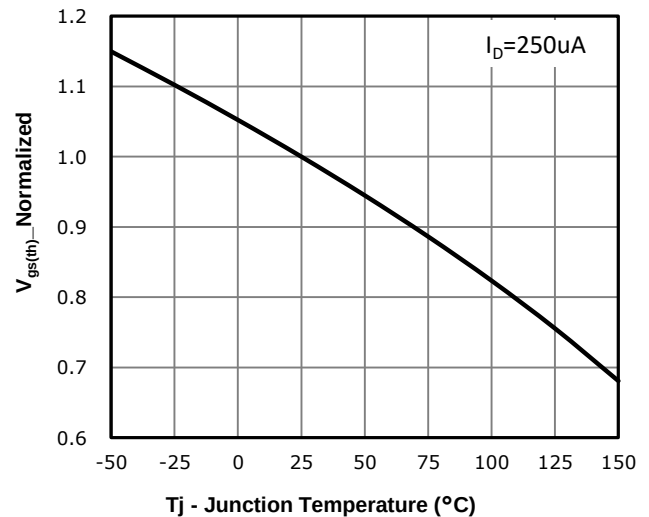


Fig 7: BVdss vs. Temperature

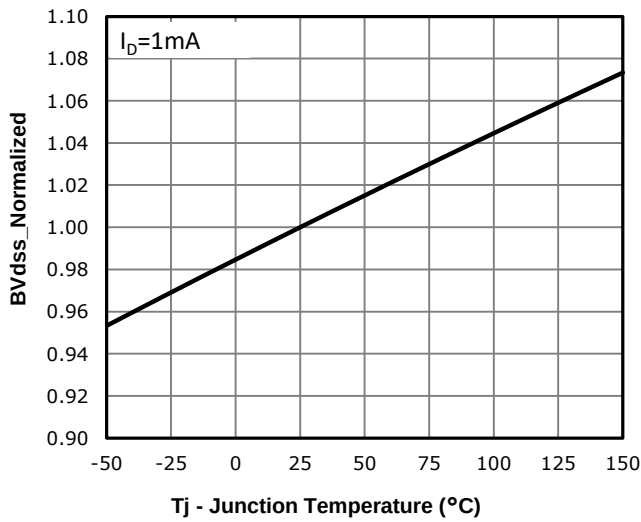


Fig 8: Capacitance Characteristics

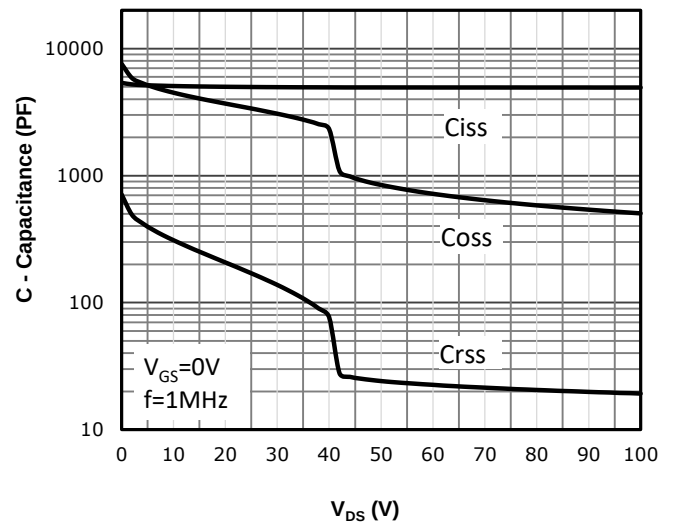


Fig 9: Gate Charge Characteristics

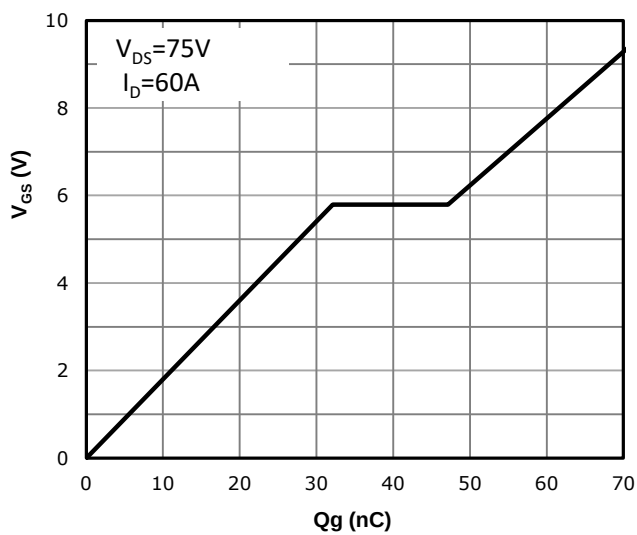


Fig 10: Body-diode Forward Characteristics

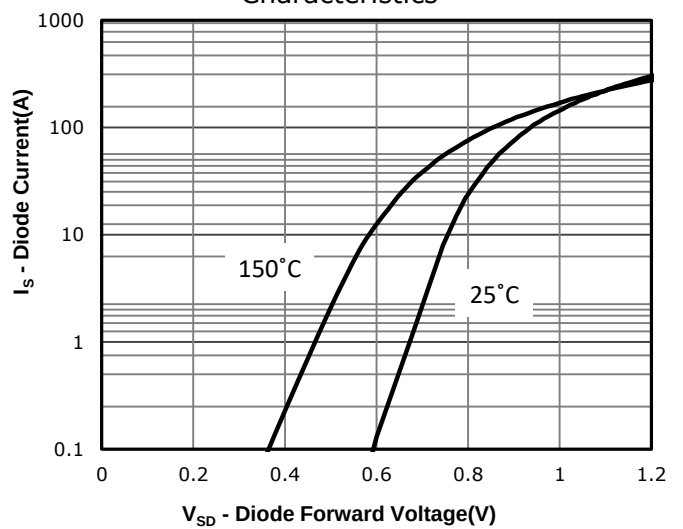


Fig 11: Power Dissipation

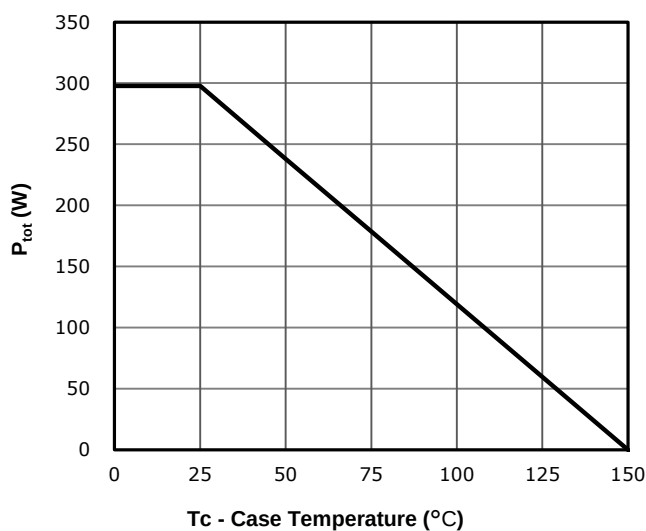


Fig 12: Drain Current Derating

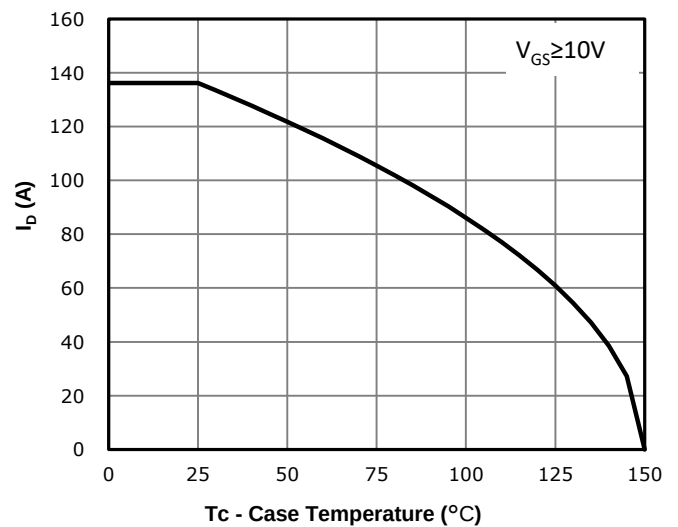


Fig 13: Safe Operating Area

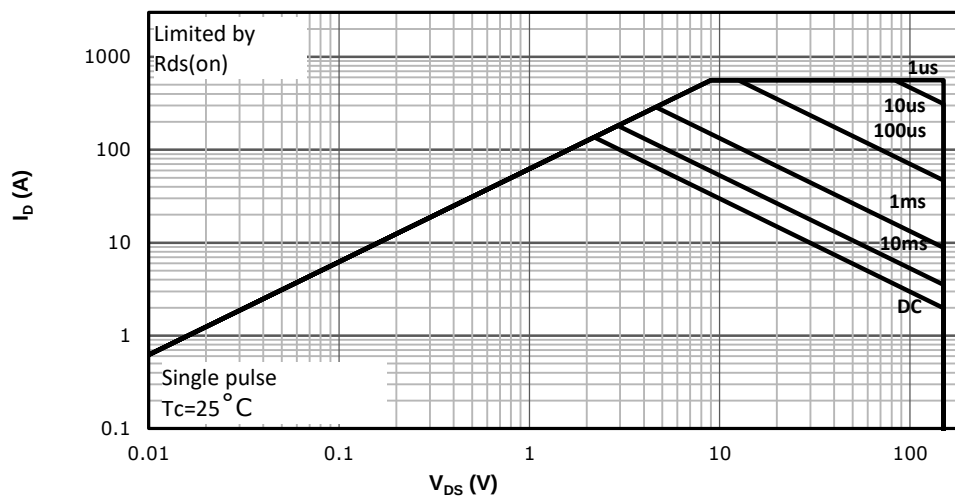
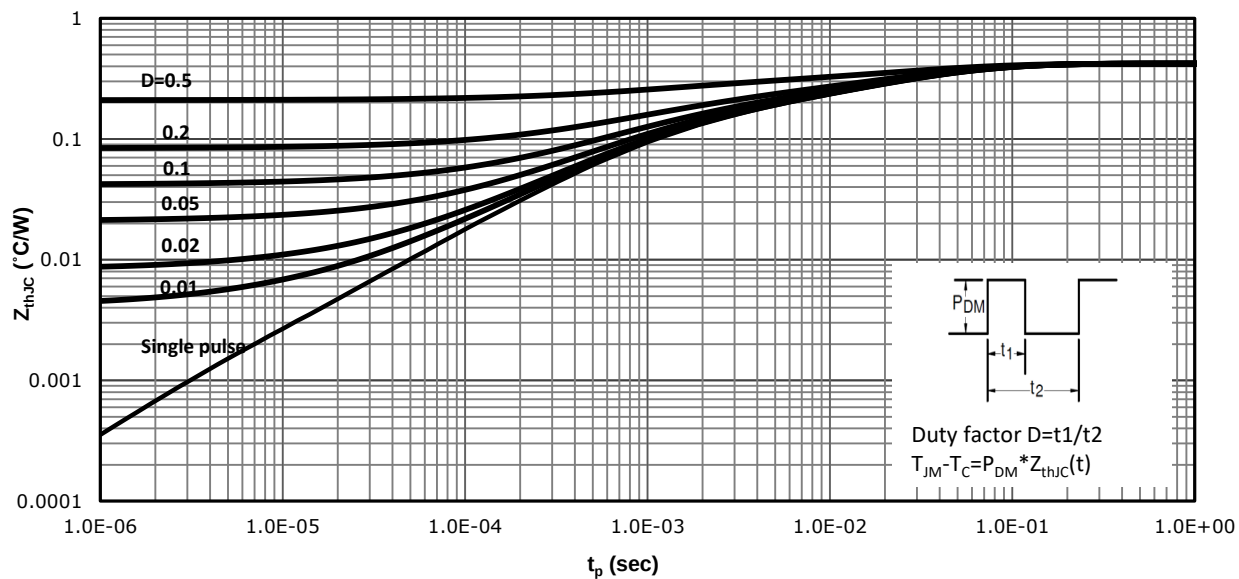
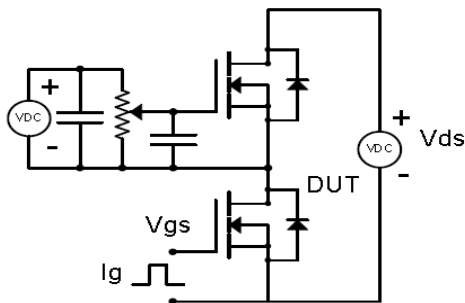
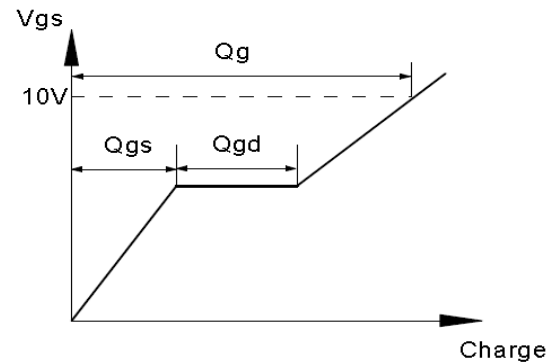


Fig 14: Max. Transient Thermal Impedance

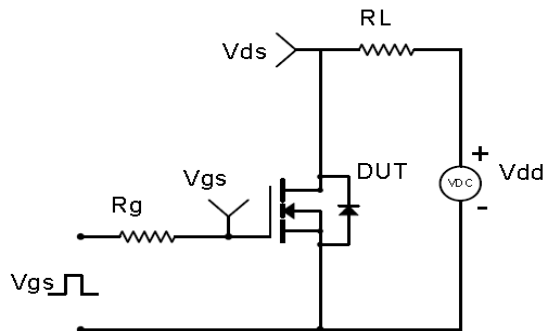
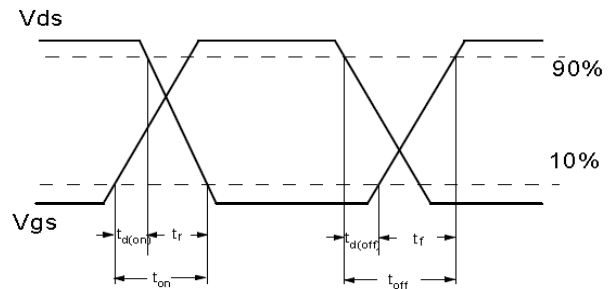


## Test Circuit & Waveform

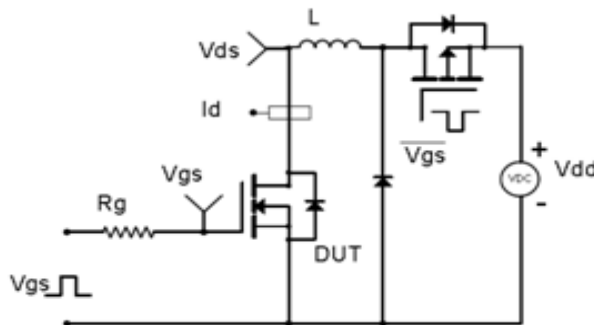
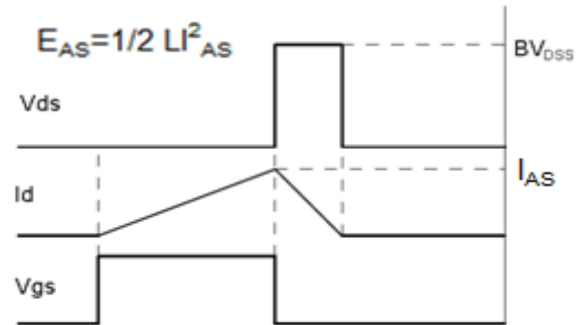
Gate Charge Test Circuit & Waveform



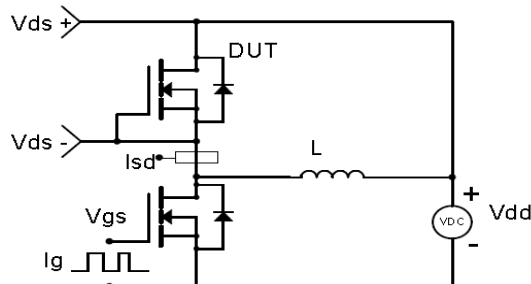
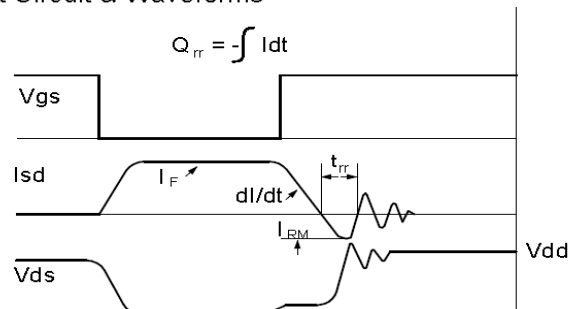
Resistive Switching Test Circuit & Waveforms



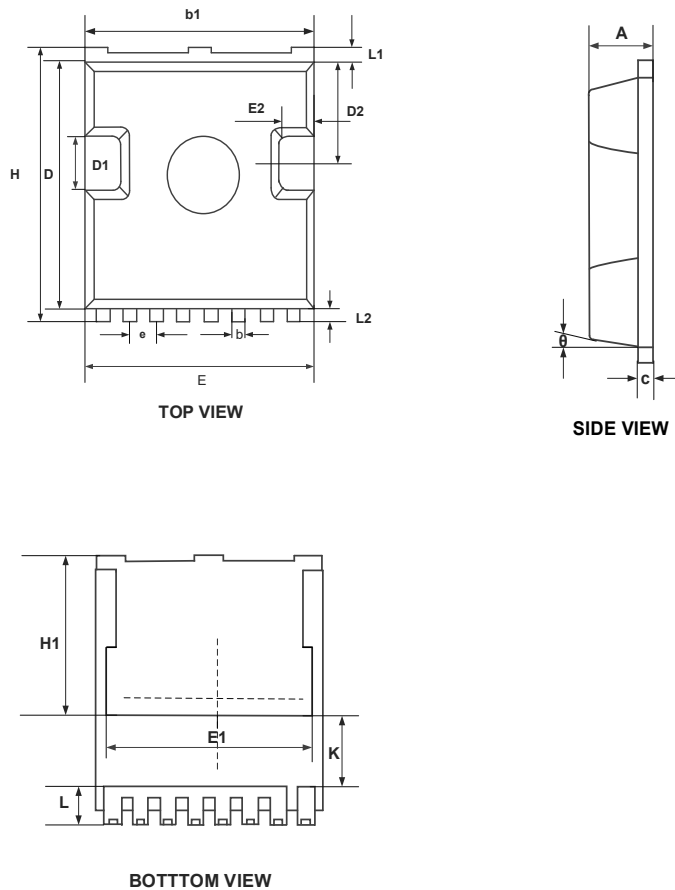
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Mechanical Dimensions for TOLL-8L



COMMON DIMENSIONS

| SYMBOL   | MM        |       |
|----------|-----------|-------|
|          | MIN       | MAX   |
| A        | 2.20      | 2.40  |
| b        | 0.60      | 0.90  |
| b1       | 9.70      | 9.90  |
| c        | 0.40      | 0.60  |
| D        | 10.20     | 10.60 |
| D1       | 3.10      | 3.50  |
| D2       | 4.45      | 4.75  |
| E        | 9.70      | 10.10 |
| E1       | 7.80BSC   |       |
| E2       | 0.50      | 0.70  |
| e        | 1.200 BSC |       |
| H        | 11.45     | 11.90 |
| H1       | 6.75 BSC  |       |
| K        | 3.10 REF  |       |
| L        | 1.70      | 2.10  |
| L1       | 0.60      | 0.80  |
| L2       | 0.50      | 0.70  |
| $\theta$ | 10° REF   |       |