N-Ch 150V Fast Switching MOSFETs

## Features

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

## Product Summary

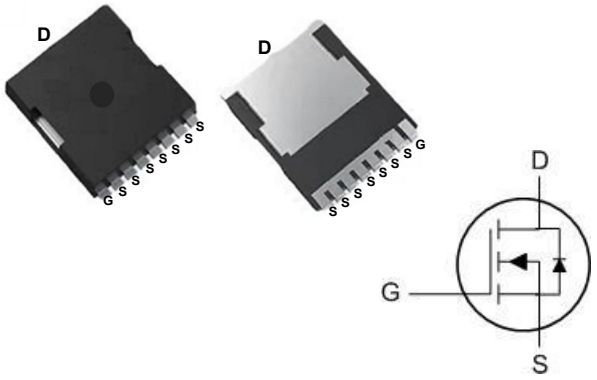
Green

| BVDSS | RDSON | 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 | ±20 | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1,6] | 180 | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1,6] | 96 | A |
| $I_{DM}$ | Pulsed Drain Current[2] | 560 | A |
| EAS | Single Pulse Avalanche Energy[3] | 1105 | mJ |
| $I_{AS}$ | Avalanche Current | 66 | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation[4] | 298 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |

## Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient [1] | --- | 39 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | --- | 0.42 | ℃/W |

## Electrical Characteristics ($T_J$=25 ℃, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=250uA | 150 | --- | --- | V |
| $\triangle BV_{DSS}/\triangle T_J$ | $BV_{DSS}$ Temperature Coefficient | Reference to 25℃ , $I_D$=1mA | --- | --- | --- | V/℃ |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance[2] | $V_{GS}$=10V , $I_D$=60A | --- | 5.0 | 6.3 | mΩ |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 2 | 3 | 4 | V |
| $\triangle V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | --- | --- | mV/℃ |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=150V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=150V, $V_{GS}$=0V , $T_J$=100℃ | --- | --- | 100 | |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±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=1MHz | --- | 4 | --- | Ω |
| $Q_g$ | 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, $R_G$=2.7Ω, $I_D$=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=1MHz | --- | 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[1,4] | $V_G$=$V_D$=0V , Force Current | --- | --- | 180 | A |
| $V_{SD}$ | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=60A , $T_J$=25℃ | --- | --- | 1.4 | V |
| $t_{rr}$ | Reverse Recovery Time | IF=17A , di/dt=100A/μs , $T_J$=25℃ | --- | 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°C
2. The EAS data shows Max. rating . The test condition is $V_{DD}$=75V,$V_{GS}$=10V,L=0.5mH，$I_{AS}$=66A.
3. The data tested by surface mounted on a 1 inch2 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 ≤ 300us , duty cycle ≤ 2%.
5. This value is guaranteed by design hence it is not included in the production test.

## Typical Performance Characteristics

Fig 1: Output Characteristics

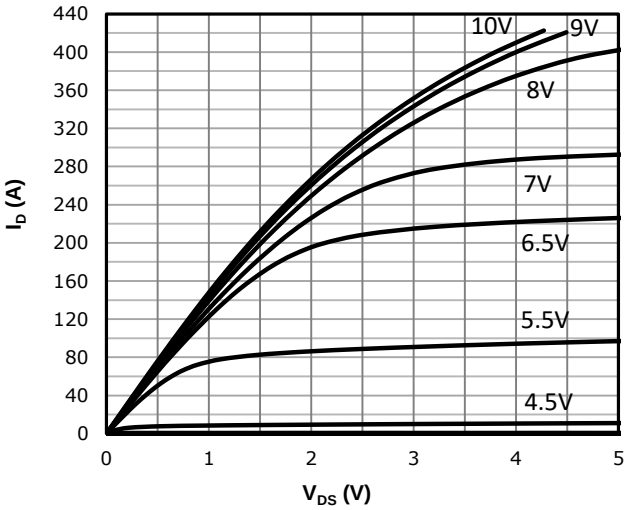



Fig 2: Transfer Characteristics

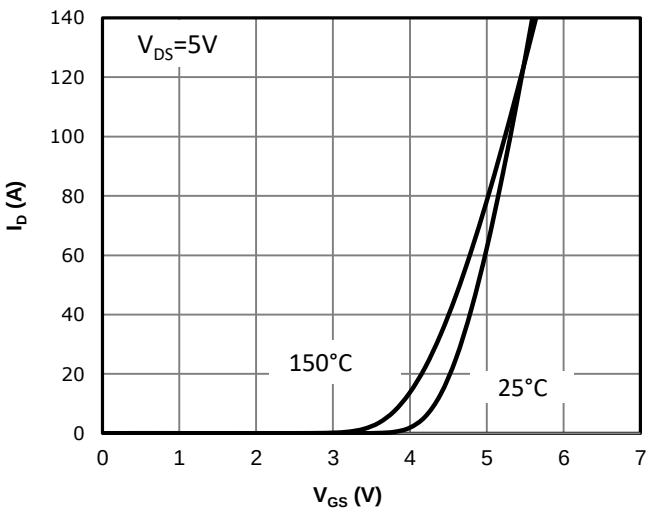



Fig 3: Rds(on) vs Drain Current and Gate Voltage

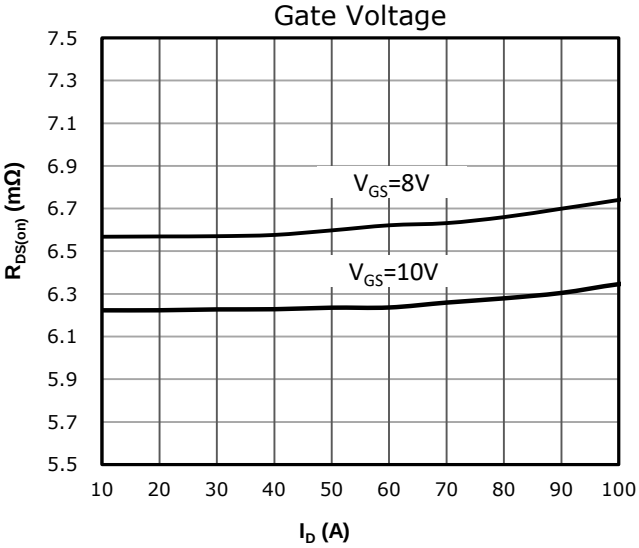



Fig 4: Rds(on) vs Gate Voltage

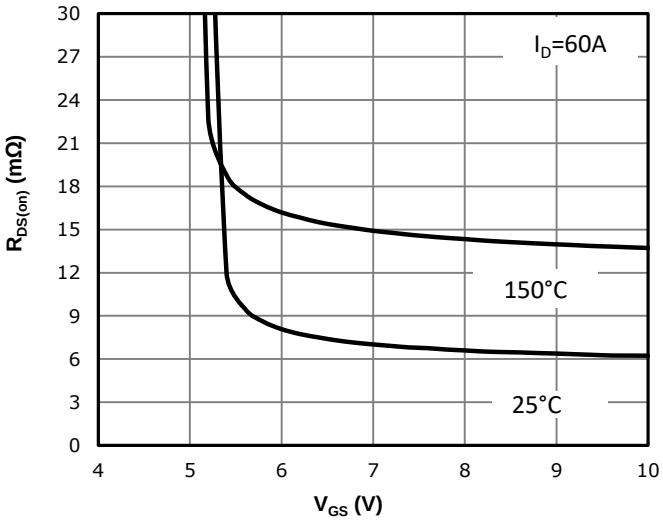



Fig 5: Rds(on) vs. Temperature

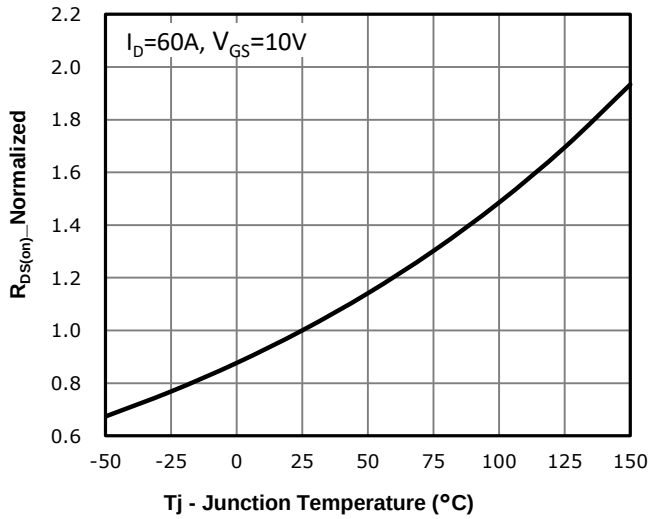



Fig 6: Vgs(th) vs. Temperature

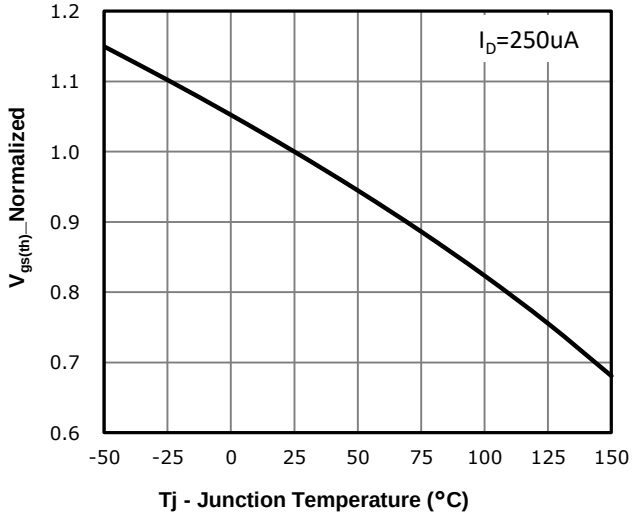


Fig 7: BVdss vs. Temperature

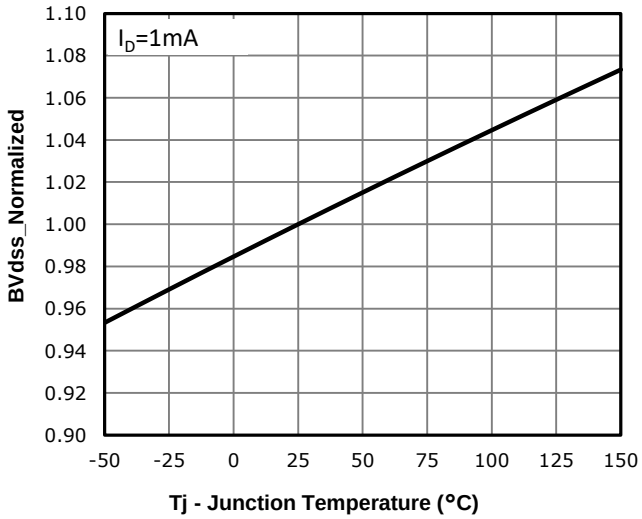



Fig 8: Capacitance Characteristics

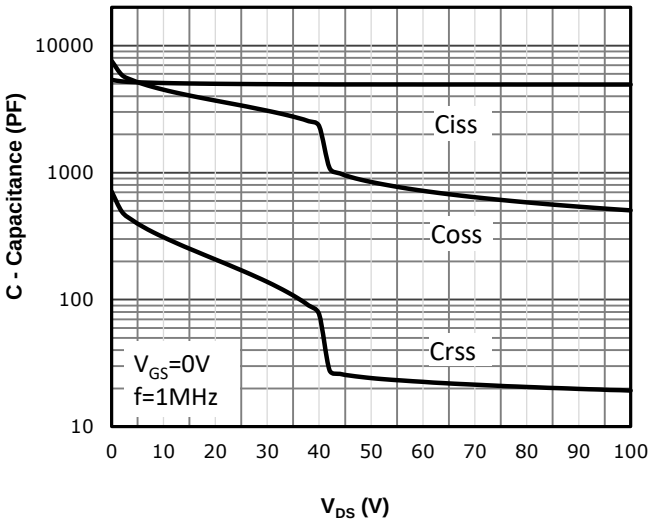



Fig 9:Gate Charge Characteristics

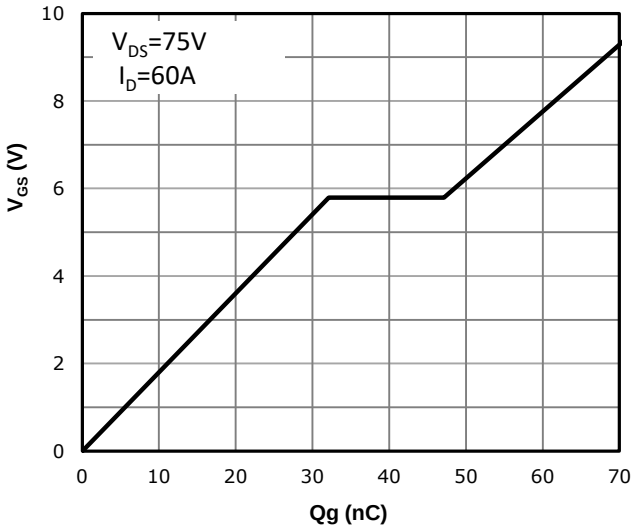



Fig 10: Body-diode Forward Characteristics

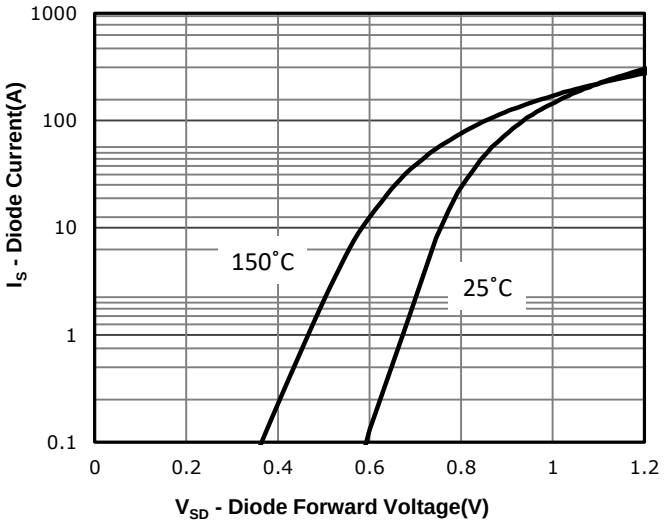



Fig 11: Power Dissipation

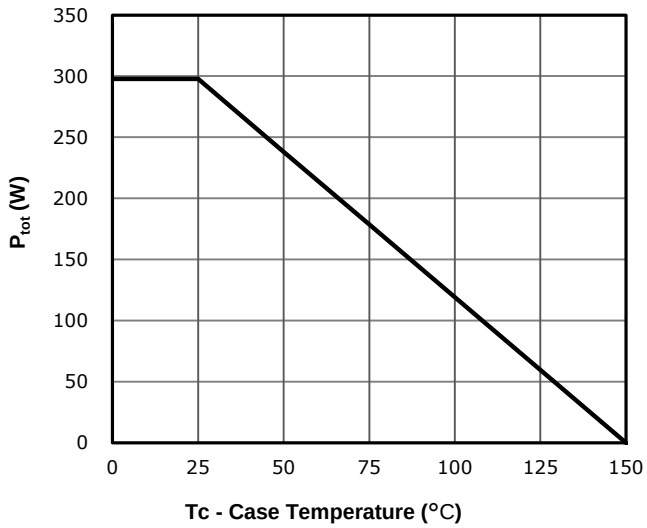



Fig 12: Drain Current Derating

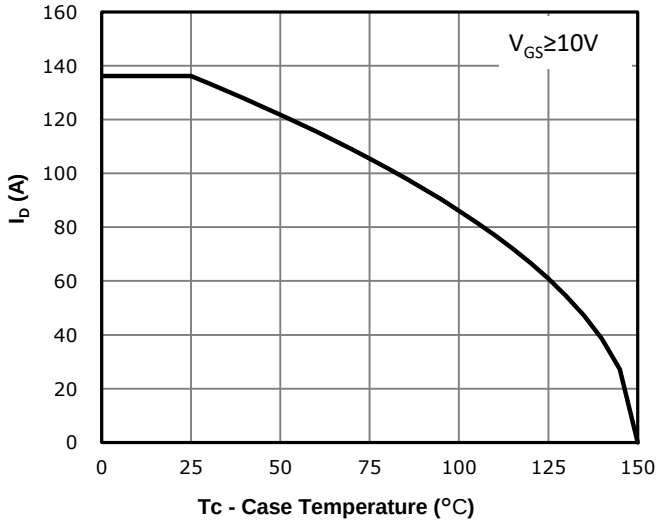


Fig 13: Safe Operating Area

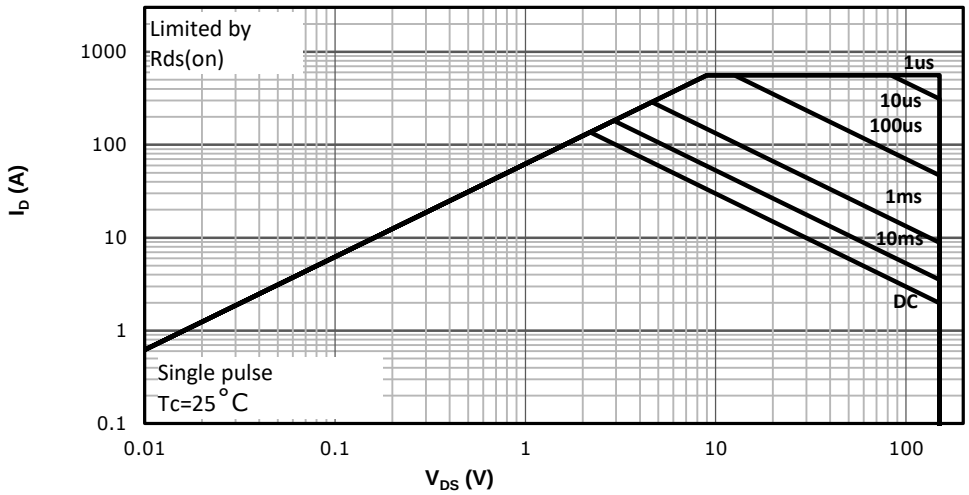
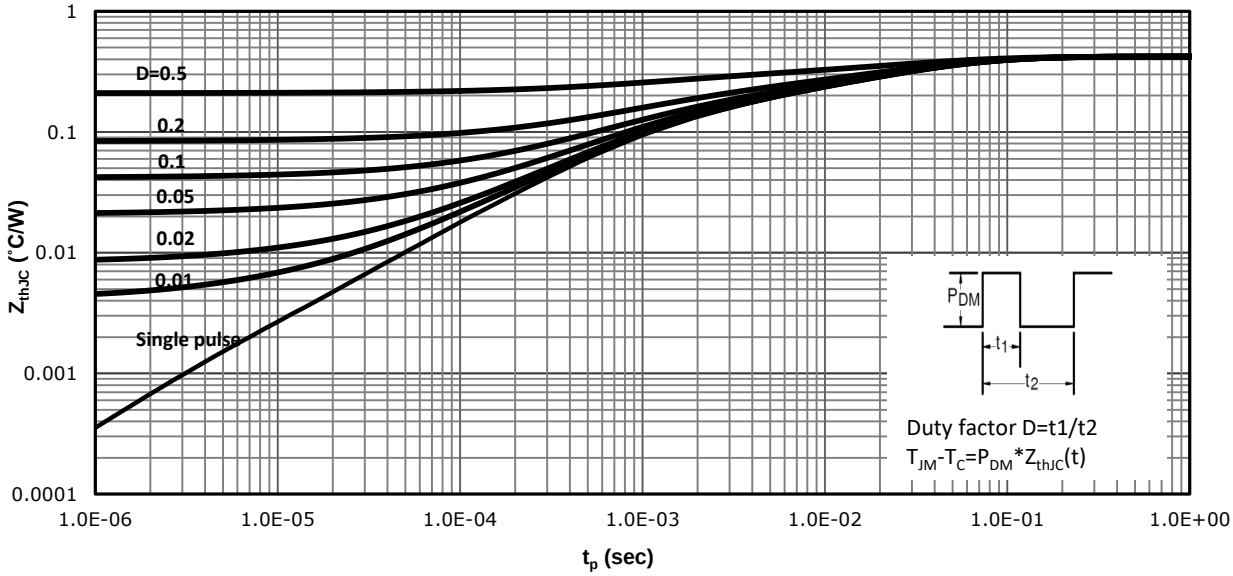
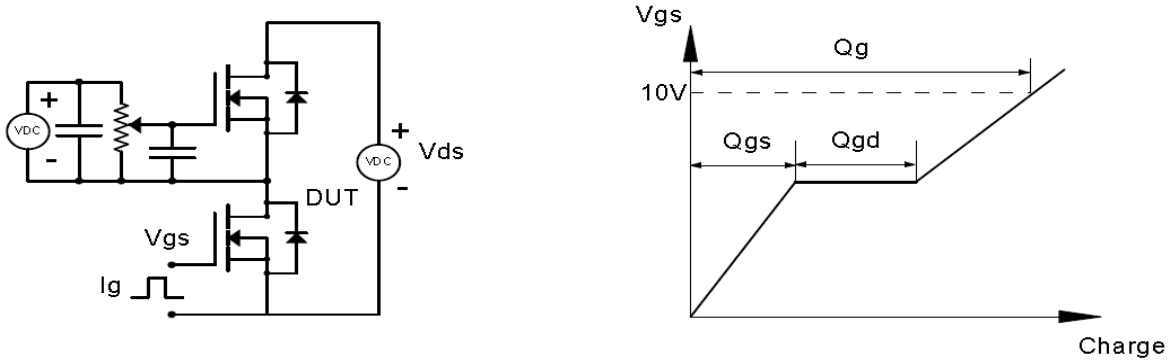



Fig 14: Max. Transient Thermal Impedance

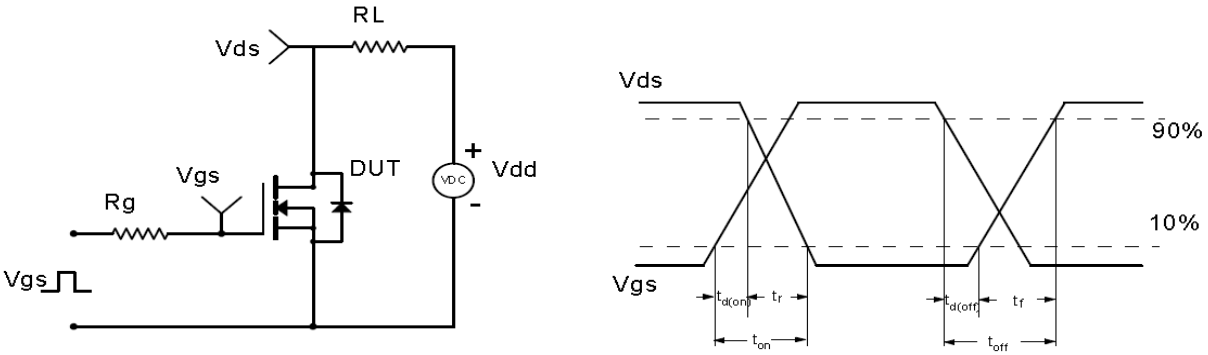


## Test Circuit & Waveform

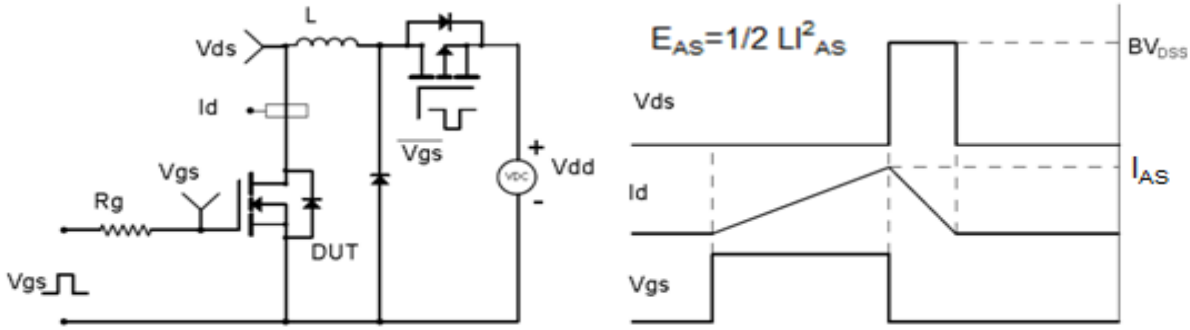
Gate Charge Test Circuit & Waveform



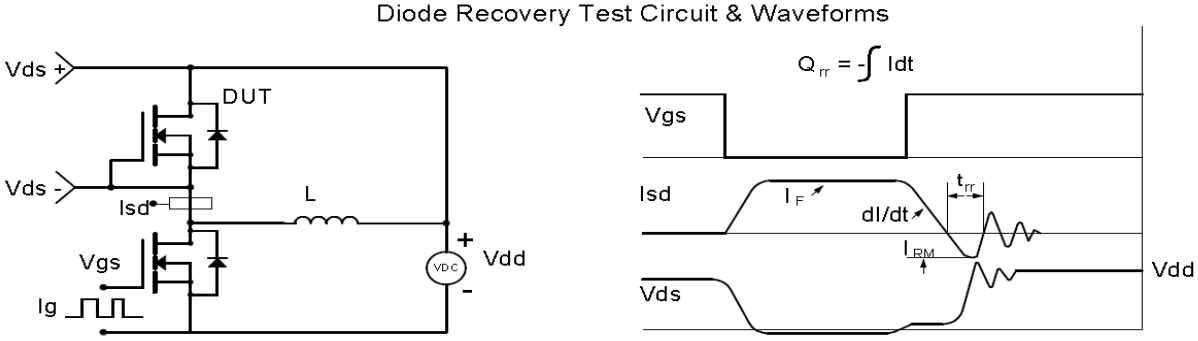

Resistive Switching Test Circuit & Waveforms



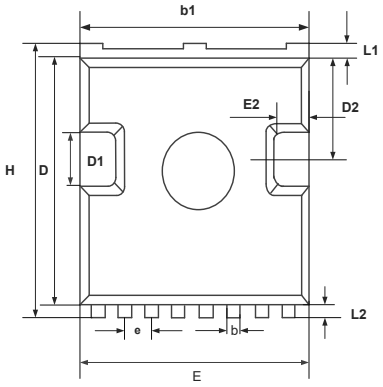

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



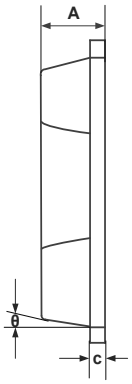

Diode Recovery Test Circuit & Waveforms



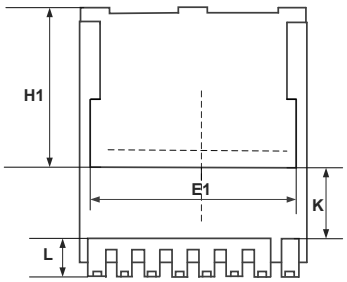
## Mechanical Dimensions for TOLL-8L




TOP VIEW




SIDE VIEW




BOTTTOM VIEW

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 |
| θ | 10° REF | |