

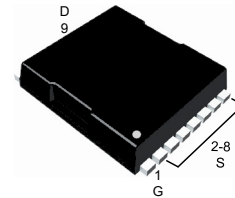
## Features

- 100V/220A  
 $R_{DS(ON)} = 2\text{m}\Omega(\text{typ.}) @ V_{GS} = 10\text{V}$
- 100% UIS +  $R_g$  Tested
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)
- Moisture Sensitivity Level MSL1 (per JEDEC J-STD-020D)

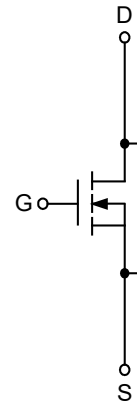
## Applications

- Brushed motor drive applications
- BLDC motor drive applications
- Half-bridge and full-bridge topologies
- Synchronous rectifier applications
- DC/DC and AC/DC converters

## Pin Description



TO-LL



N-Channel MOSFET

**Absolute Maximum Ratings** ( $T_A=25^{\circ}\text{C}$  Unless Otherwise Noted)

| Symbol                        | Parameter                              |                       | Rating     | Unit |
|-------------------------------|----------------------------------------|-----------------------|------------|------|
| Common Ratings                |                                        |                       |            |      |
| V <sub>DSS</sub>              | Drain-Source Voltage                   |                       | 100        | V    |
| V <sub>GSS</sub>              | Gate-Source Voltage                    |                       | ±20        |      |
| T <sub>J</sub>                | Maximum Junction Temperature           |                       | 175        | °C   |
| T <sub>STG</sub>              | Storage Temperature Range              |                       | -55 to 175 |      |
| I <sub>S</sub>                | Diode Continuous Forward Current       | T <sub>C</sub> =25°C  | 220        | A    |
| I <sub>D</sub>                | Continuous Drain Current               | T <sub>C</sub> =25°C  | 220        | A    |
|                               |                                        | T <sub>C</sub> =100°C | 165        |      |
| I <sub>DM</sub> <sup>a</sup>  | Pulsed Drain Current                   | T <sub>C</sub> =25°C  | 660        |      |
| P <sub>D</sub>                | Maximum Power Dissipation              | T <sub>C</sub> =25°C  | 375        | W    |
|                               |                                        | T <sub>C</sub> =100°C | 187        |      |
| R <sub>θJC</sub>              | Thermal Resistance-Junction to Case    |                       | 0.4        | °C/W |
| R <sub>θJA</sub> <sup>c</sup> | Thermal Resistance-Junction to Ambient |                       | 50         | °C/W |
| I <sub>AS</sub> <sup>b</sup>  | Avalanche Current, Single pulse        | L=0.5mH               | 64         | A    |
| E <sub>AS</sub> <sup>b</sup>  | Avalanche Energy, Single pulse         | L=0.5mH               | 1024       | mJ   |

Note a : Pulse width limited by max. junction temperature.

Note b : UIS tested and pulse width limited by maximum junction temperature (initial temperature  $T_J=25^{\circ}\text{C}$ ).

Note c : Surface Mounted on  $1\text{in}^2$  pad area.

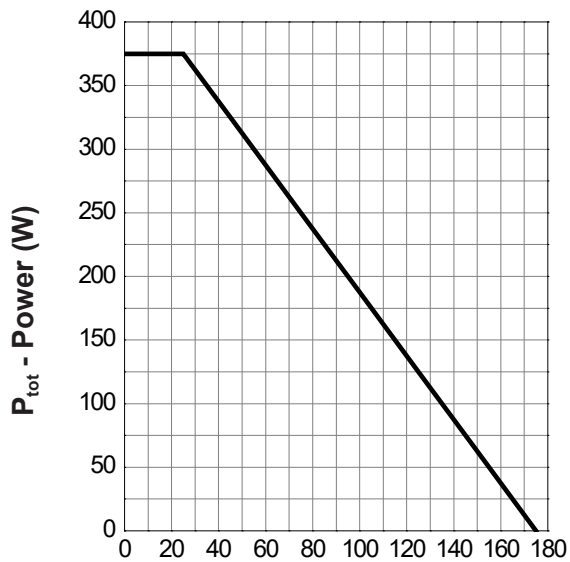
**Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

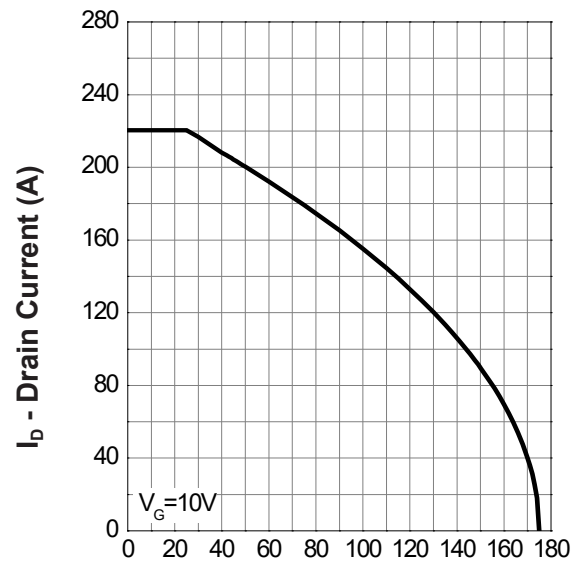
| Symbol                                   | Parameter                        | Test Conditions                                                                                                 | Min. | Typ. | Max.    | Unit |
|------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------|------|------|---------|------|
| Static Characteristics                   |                                  |                                                                                                                 |      |      |         |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA                                                                     | 100  | -    | -       | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =80V, V <sub>GS</sub> =0V<br>T <sub>J</sub> =85°C                                               | -    | -    | 1<br>30 | μA   |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA                                                       | 2    | 3    | 4       | V    |
| I <sub>GSS</sub>                         | Gate Leakage Current             | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                                      | -    | -    | ±100    | nA   |
| R <sub>DS(ON)</sub> <sup>d</sup>         | Drain-Source On-state Resistance | V <sub>GS</sub> =10V, I <sub>DS</sub> =100A                                                                     | -    | 2    | 2.5     | mΩ   |
| Diode Characteristics                    |                                  |                                                                                                                 |      |      |         |      |
| V <sub>SD</sub> <sup>d</sup>             | Diode Forward Voltage            | I <sub>SD</sub> =50A, V <sub>GS</sub> =0V                                                                       | -    | 0.8  | 1.3     | V    |
| t <sub>rr</sub> <sup>e</sup>             | Reverse Recovery Time            | I <sub>SD</sub> =100A, dI <sub>SD</sub> /dt=100A/μs                                                             | -    | 85   | -       | ns   |
| Q <sub>rr</sub> <sup>e</sup>             | Reverse Recovery Charge          |                                                                                                                 | -    | 215  | -       | nC   |
| Dynamic Characteristics <sup>e</sup>     |                                  |                                                                                                                 |      |      |         |      |
| R <sub>G</sub>                           | Gate Resistance                  | V <sub>GS</sub> =0V,V <sub>DS</sub> =0V,f=1MHz                                                                  | -    | 2    | -       | Ω    |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> =0V,<br>V <sub>DS</sub> =50V,<br>Frequency=1.0MHz                                               | -    | 8900 | 11600   | pF   |
| C <sub>oss</sub>                         | Output Capacitance               |                                                                                                                 | -    | 1600 | -       |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     |                                                                                                                 | -    | 100  | -       |      |
| t <sub>d(ON)</sub>                       | Turn-on Delay Time               | V <sub>DD</sub> =30V, R <sub>L</sub> =30Ω,<br>I <sub>DS</sub> =1A, V <sub>GEN</sub> =10V,<br>R <sub>G</sub> =6Ω | -    | 46   | 83      | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                                                 | -    | 35   | 63      |      |
| t <sub>d(OFF)</sub>                      | Turn-off Delay Time              |                                                                                                                 | -    | 126  | 227     |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                                                 | -    | 290  | 522     |      |
| Gate Charge Characteristics <sup>e</sup> |                                  |                                                                                                                 |      |      |         |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =50V, V <sub>GS</sub> =10V,<br>I <sub>DS</sub> =100A                                            | -    | 130  | 182     | nC   |
| Q <sub>gs</sub>                          | Gate-Source Charge               |                                                                                                                 | -    | 50   | -       |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                |                                                                                                                 | -    | 27   | -       |      |

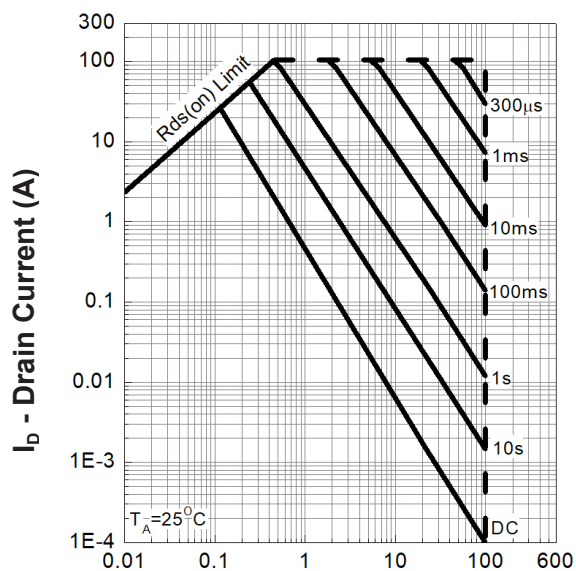
Note d : Pulse test ; pulse width $\leq 300\mu s$ , duty cycle $\leq 2\%$ .

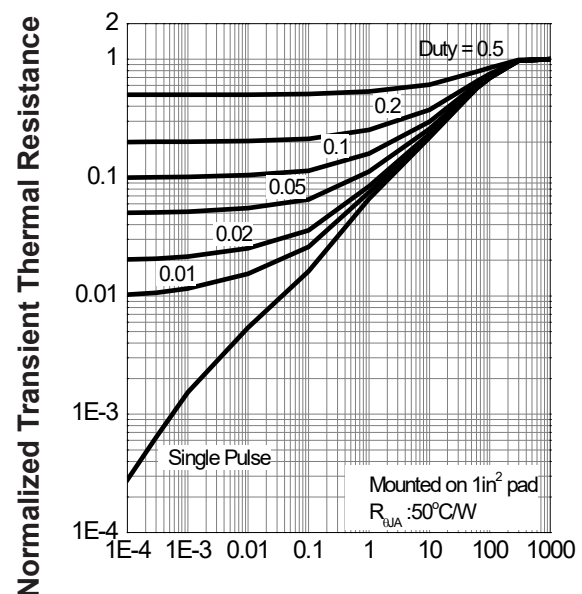
Note e : Guaranteed by design, not subject to production testing.

## Typical Operating Characteristics

**Power Dissipation**

 $T_c$  - Case Temperature (°C)

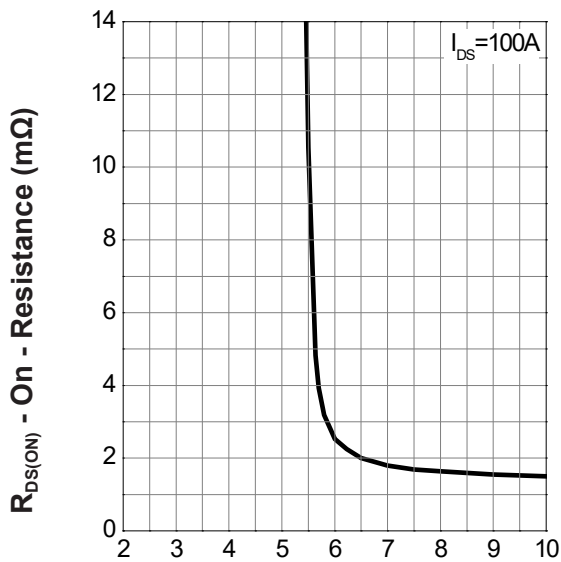
**Drain Current**

 $T_c$  - Case Temperature (°C)

**Safe Operation Area**

 $V_{DS}$  - Drain - Source Voltage (V)

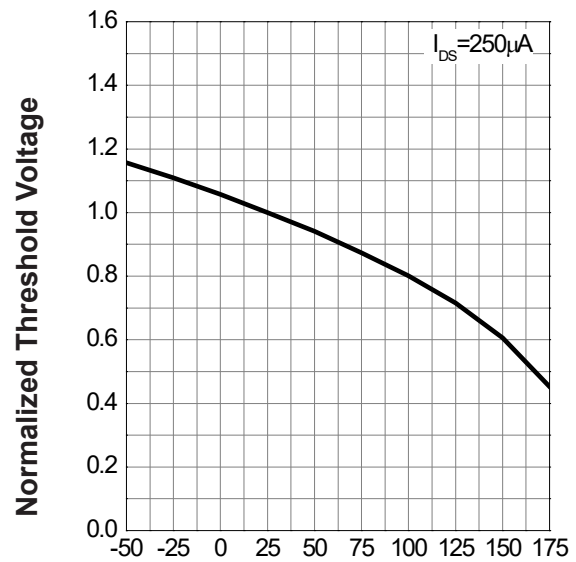
**Thermal Transient Impedance**


Square Wave Pulse Duration (sec)

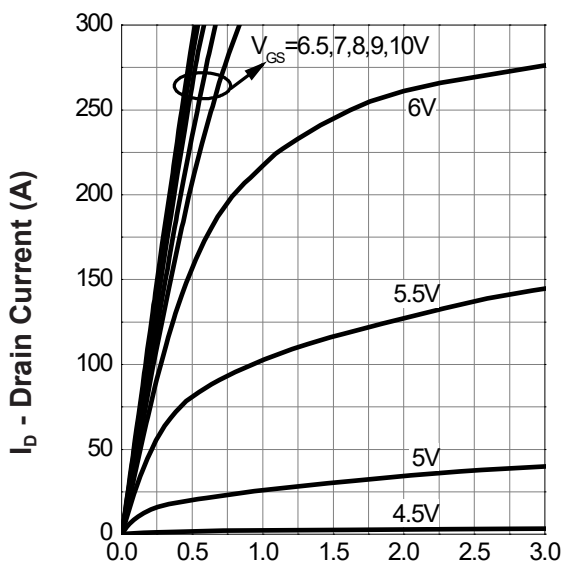
## Typical Operating Characteristics(Cont.)

**Gate-Source On Resistance**


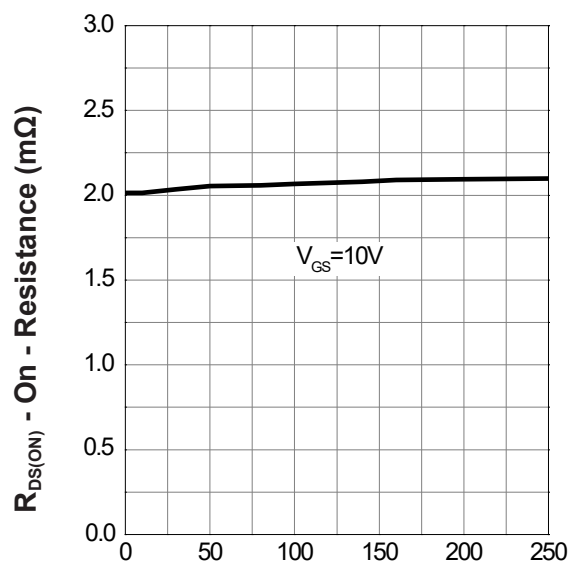
$V_{GS}$  - Gate - Source Voltage (V)

**Gate Threshold Voltage**


$T_j$  - Junction Temperature (°C)

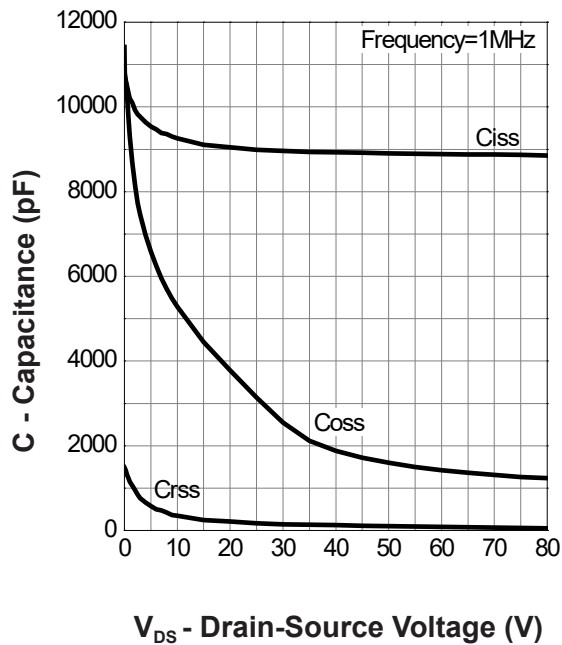
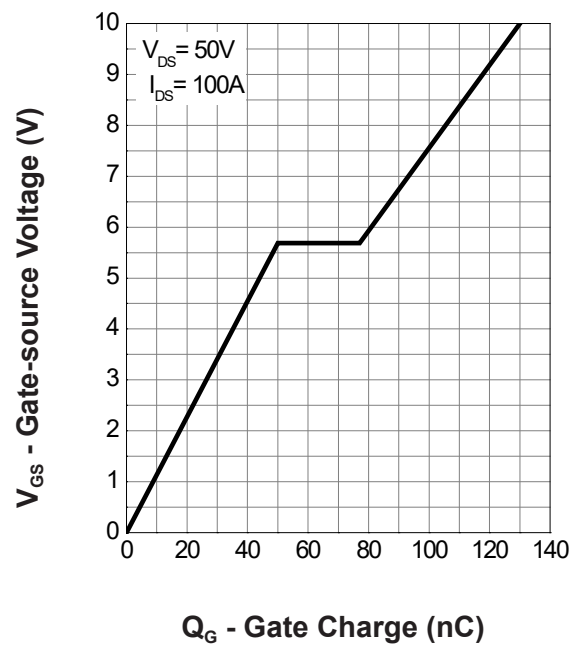
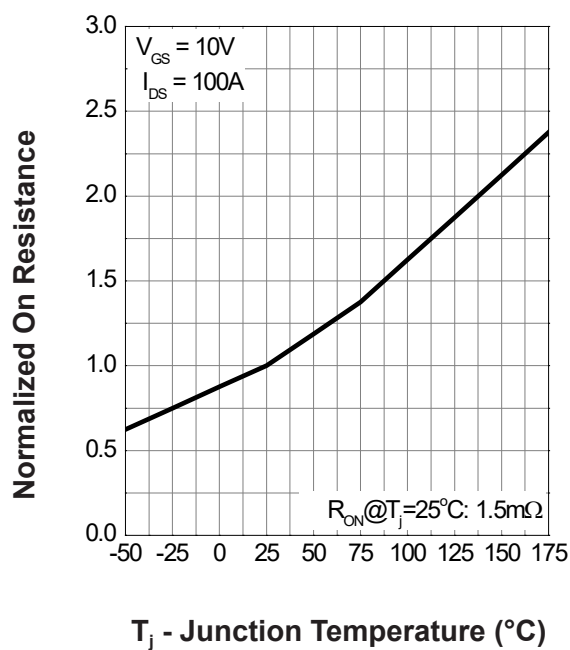
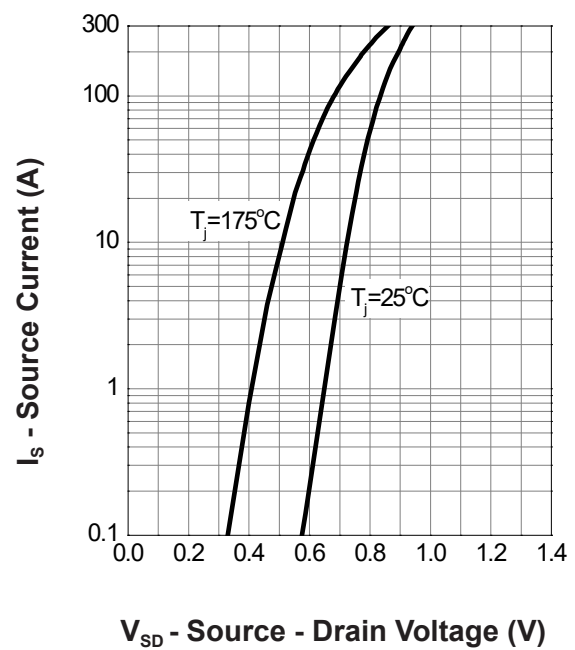
**Output Characteristics**


$V_{DS}$  - Drain - Source Voltage (V)

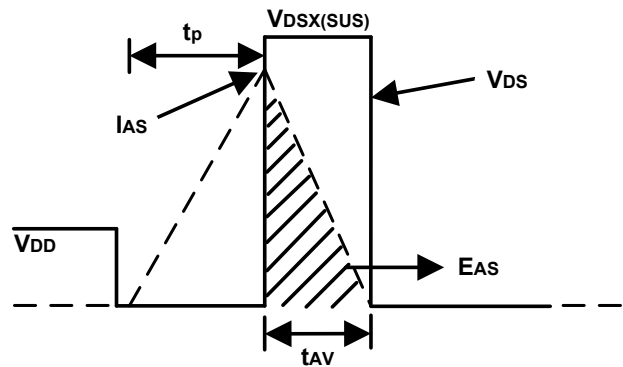
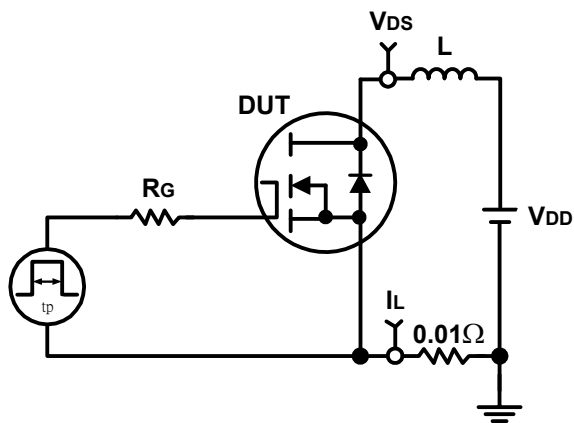
**Drain-Source On Resistance**


$I_D$  - Drain Current (A)

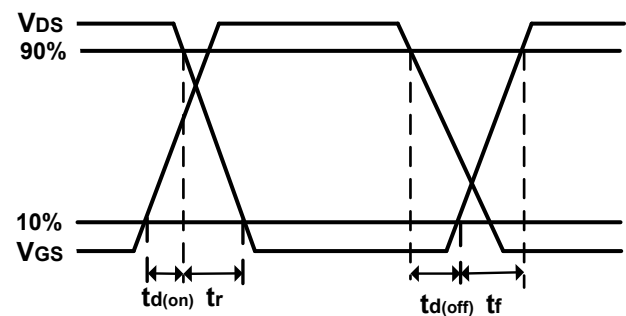
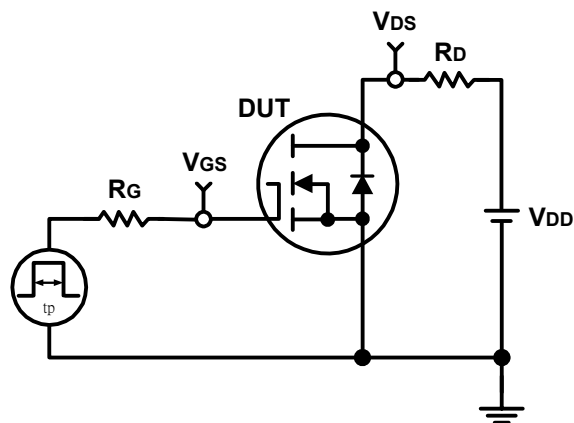
## Typical Operating Characteristics(Cont.)

**Capacitance**

**Gate Charge**

**Drain-Source On Resistance**

**Source-Drain Diode Forward**


## Avalanche Test Circuit and Waveforms

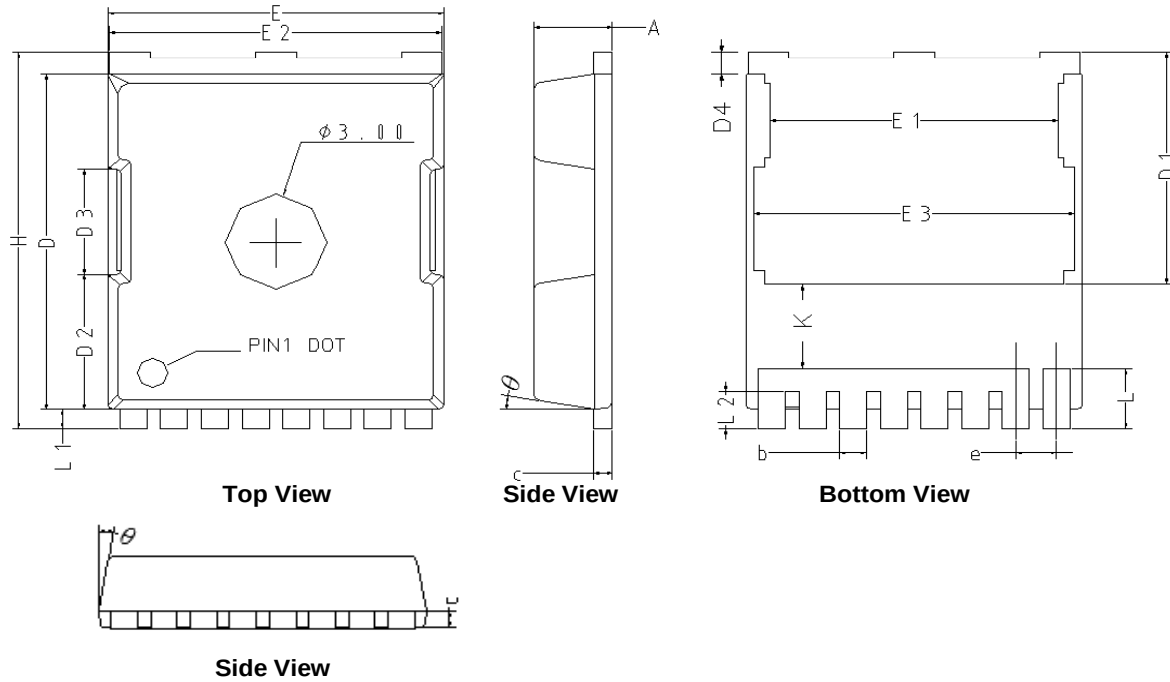


## Switching Time Test Circuit and Waveforms



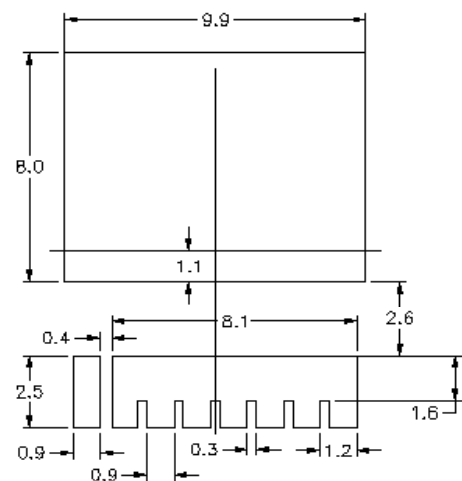
## Package Information

### TOLL



| SYMBOLS | TO-LL       |       |            |       |
|---------|-------------|-------|------------|-------|
|         | MILLIMETERS |       | INCHES     |       |
|         | MIN.        | MAX.  | MIN.       | MAX.  |
| A       | 2.20        | 2.40  | 0.087      | 0.094 |
| b       | 0.70        | 0.90  | 0.028      | 0.035 |
| c       | 0.40        | 0.60  | 0.016      | 0.024 |
| D       | 10.23       | 10.63 | 0.403      | 0.419 |
| D1      | 7.05        | 7.45  | 0.278      | 0.293 |
| D2      | 3.98        | 4.38  | 0.157      | 0.172 |
| D3      | 3.10        | 3.50  | 0.122      | 0.138 |
| D4      | 0.50        | 0.90  | 0.020      | 0.035 |
| E       | 9.70        | 10.10 | 0.382      | 0.398 |
| E1      | 8.30        | 8.70  | 0.327      | 0.343 |
| E2      | 9.60        | 10.00 | 0.378      | 0.394 |
| E3      | 9.26        | 9.66  | 0.365      | 0.380 |
| H       | 11.53       | 11.93 | 0.454      | 0.470 |
| e       | 1.2 BSC     |       | 0.0472 BSC |       |
| K       | 2.43        | 2.83  | 0.096      | 0.111 |
| L       | 1.65        | 2.05  | 0.065      | 0.081 |
| L1      | 0.40        | 0.80  | 0.016      | 0.031 |
| L2      | 0.95        | 1.35  | 0.037      | 0.053 |
| θ       | 6°          | 10°   | 6°         | 10°   |

### RECOMMENDED LAND PATTERN



UNIT: mm